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Natural Resource Program Center

Vegetation Classification and Mapping Project Report, Curecanti National Recreation Area

Natural Resource Technical Report NPS/NCPN/NRTR—2010/408



ON THE COVER
Blue Mesa Reservoir, Sapinero Basin
Photograph by: NPS / Lisa Lynch

Vegetation Classification and Mapping Project Report, Curecanti National Recreation Area

Natural Resource Technical Report NPS/NCPN/NRTR—2010/408

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Acronyms and Abbreviations

AA	Accuracy Assessment
APFO	Aerial Photography Field Office (USDA)
BLCA	Black Canyon of the Gunnison National Park
BLM	United States Bureau of Land Management
BPU	Biophysical Unit
CEGL	Community Element Code
CNHP	Colorado Natural Heritage Program
CPVAC	Colorado Plateau Vegetation Advisory Committee
CURE	Curecanti National Recreation Area
DBH	Diameter at Breast Height (4.5 feet)
DCA	Detrended Correspondence Analysis
DEM	Digital Elevation Model
DOQQ	Digital Orthophotograph Quarter Quadrangle
DRC	Diameter at Root Crown
e^2M	engineering-environmental Management, Inc.
ES	Ecological System
ESRI	Environmental Systems Research Institute
FGDC	Federal Geographic Data Committee
GIS	Geographic Information System
GPS	Global Positioning System
I&M	Inventory and Monitoring Program
ISA	Indicator Species Analysis
ITIS	Integrated Taxonomic Information System
MMU	Minimum Mapping Unit
NAD	North American Datum
NCPN	Northern Colorado Plateau Network
NPS	National Park Service
NRA	National Recreation Area
NRCS	Natural Resource Conservation Service
NVC	National Vegetation Classification
NVCS	National Vegetation Classification Standard
PI	Photo Interpretation
QA/QC	Quality Assurance/Quality Control
RSGIG	Remote Sensing and Geographic Information Group (USBOR)
SEUG	Southeast Utah Group of the National Park Service
TNC	The Nature Conservancy
TSN	Taxonomic Serial Number
UNESCO	United Nations Education, Science, and Cultural Organization
USBOR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFS	United States Forest Service
USGS	United States Geological Survey
UTM	Universal Transverse Mercator

Summary

The Northern Colorado Plateau Inventory and Monitoring Network, with the support of the U.S. Geological Survey - National Park Service Vegetation Mapping Program described and mapped vegetation at Curecanti National Recreation Area (CURE). This collaborative effort involved many project partners, particularly CURE natural resources staff, the Western Region office of NatureServe, engineering-environmental Management, Inc., and their cooperators.

The mapping area is 48,639 hectares (120,189 acres), encompassing the entire recreation area as well as an environs of adjacent public and private lands. Ecologists and photointerpreters worked to identify plant associations for CURE and determine how best to map them using 1:12,000-scale, true color aerial photography and digital orthophotography. The team collected vegetation and environmental data from 281 vegetation classification plots and 99 observation points. Supplemental fuels data were collected during the project in sagebrush, Gambel oak, mixed mountain shrubland, pinyon-juniper, ponderosa pine, Douglas-fir, and quaking aspen communities. Assessment of map accuracy entailed sampling 1,037 additional data points. Fieldwork and mapping were completed between 2001 and 2005.

Analysis of the plot data revealed 131 National Vegetation Classification plant associations, alliances, or 'park special' vegetation types within the recreation area and environs, 56 of which are shared with the adjacent Black Canyon of the Gunnison National Park. Twenty-one associations were documented exclusively from accuracy assessment data, the remainder from vegetation plots, observation points, and field notes.

Vegetation and land use were interpreted to as detailed a level as possible from high-resolution, 9" x 9" stereo pairs of 1:12,000-scale true color aerial photography. Polygons representing vegetation or land use map classes were delineated on Mylar overlays on paper plots of the orthophotographs and transferred to a spatial database. The project used the program standard minimum mapping unit of 0.5 ha with few exceptions.

The CURE vegetation mapping project area was divided into 11,133 polygons and 42 map classes. A total of 10,520 map polygons represent 27 natural and semi-natural vegetation map classes. Fifteen land use map classes describe 613 other polygons within the mapping area. Average polygon size across all map classes is 4.4 ha (10.8 acres). Natural and semi-natural vegetation classes cover 43,624 ha (107,796 acres; 89.7% of the project area). Land use/land cover polygons, including roads, agricultural fields, bare ground, open water, and NPS facilities, total 5,015 ha (12,373 acres; 10.3% of the project area). The most widespread vegetation mapping unit is the Wyoming Big Sagebrush Shrubland (S-ARWY, #41) with 1,640 polygons covering 10,870 ha (26,861 acres) or 22.3% of the project area.

Map accuracy was assessed within the CURE boundary only. Results from a thematic accuracy assessment of 27 vegetation map classes remaining after accuracy assessment analysis indicated an estimate of 87.3% overall map accuracy (Kappa statistic = 85.7%). Fourteen map classes did not meet the 80% standard for either producer's or user's accuracy, but were retained because of their relative rarity and/or value to NRA managers. These map classes are described in the Accuracy Assessment section of this report, as is the justification for retaining them.

Products resulting from the CURE vegetation mapping project include:

Available in this report:

- project summary of methods and results
- illustrated dichotomous field key to the vegetation associations
- illustrated guide to the vegetation map classes
- detailed descriptions of vegetation associations
- samples of completed field forms
- field manual used to guide plot and observation point data collection

Available elsewhere[1]:

- geodatabase containing map polygon attribute, land use, aerial photography flight lines, plot data and monument and project boundaries
- ground photography of vegetation plots, observation points, and accuracy assessment points in hard copy and digital formats
- all field data (plot, observation point, and accuracy assessment point) stored in a Microsoft Access database
- hard copy vegetation maps
- metadata for all digital products

Geospatial products are in Universal Transverse Mercator (UTM) projection, Zone 12, using the North American Datum of 1983.

[1] This document and most of the digital products are available on the internet at: http://biology.usgs.gov/npsveg/. Hard copies of the orthophotos, stereo photos, and original data forms are retained by NCPN and the park.

Acknowledgments

This project was completed through the effort and dedication of numerous individuals and organizations. Details of the role of each person mentioned here is described in more detail in the Project Overview section. Angela Evenden (National Park Service), Mike Story and Tammy Hamer-Cook (NPS), Karl Brown (USGS/NPS) and Mike Mulligan (USGS) provided project oversight and coordination. Mike Pucherelli of the Bureau of Reclamation Remote Sensing and Geographic Information Group (RSGIG) also supported the early stages of the project. Funding for this project was provided through the USGS-NPS National Vegetation Mapping Program, NPS Fire Program, and the Northern Colorado Plateau Inventory and Monitoring Network.

Numerous individuals collected plot, observation point, and accuracy assessment field data. We appreciate the hard work of Sharon Anderson, Ginger Bradshaw and her NPS seasonal field crews, Bruce Condie, Karin Edwards, Dan Niosi, Buddy Smith, Matthew Smith, Sarah Topp, and Jim Von Loh.

Janet Coles (then of NatureServe) prepared the preliminary vegetation classification and assigned final association names. Further review and revisions of the classification were completed by Marion Reid and Keith Schulz of NatureServe. Marion Reid also created the local association description template. Keith wrote many of the local and global association descriptions.

Janet Coles (then of the RSGIG) prepared the initial photo interpretation. Ginger Bradshaw (NPS-BLCA) developed the initial map class concepts and wrote draft sections of the final report. Peter Williams (e^2M) wrote most of the “Project Area Description” section of the final report. Gerald Manis completed the photo interpretation and developed many of the map class attributes. Aneth Wight and Gery Wakefield (NPS) worked closely with Dan Cogan (then of USBOR) to produce the final vegetation map coverage.

Database management support and development were skillfully performed by Margaret Beer, Russ DenBleyker, and Helen Thomas (NPS) and Jack Doria (e^2M). Their preparation of a project MS Access database for plot, observation point, and accuracy assessment data simplified entry and analysis.

Special thanks to Ken Stahlnecker and Danguole Bockus of Curecanti National Recreation Area, who made us welcome whenever we arrived to check the map or collect field data, assisted with landowner contacts, and provided helpful advice as to the best way to access remote parts of the recreation area.

For these and other contributors to the success of the project, we are grateful.

Introduction

Vegetation Classification and Mapping Project, Curecanti National Recreation Area

The Curecanti National Recreation Area (CURE) Vegetation Mapping Project was organized and coordinated by the Northern Colorado Plateau Network (NCPN) Inventory and Monitoring (I&M) Program between 2001 and 2010, with assistance from several project cooperators. The purpose of this project was to describe and map existing plant associations on 48,639 hectares (120,189 acres) within CURE and its environs, and to provide this information in written, tabular, digital, and spatial formats useful to park resource managers, the NCPN I&M Program, and others. The basic project components consist of a classification and description of the park's vegetation and a spatial database encompassing an interpretation of the vegetation from aerial imagery.

In 2001, the NCPN I&M Program launched a multi-year project to complete vegetation classifications and maps for network park units. Funding was provided by the U.S. Geological Survey (USGS) – National Park Service (NPS) Vegetation Mapping Program and the Northern Colorado Plateau Network. The CURE Vegetation Classification and Mapping Project was initiated by the NCPN, the Bureau of Reclamation Remote Sensing and Geographic Information Group (RSGIG), CURE natural resources staff, NatureServe, and private contractors. Project work was coordinated with the USGS-NPS Vegetation Mapping Program. Vegetation plot and observation point data collection occurred between 2000 and 2003. Map accuracy assessment was completed in 2005.

The CURE Vegetation Classification and Mapping Project was closely coordinated with the vegetation classification and mapping effort at Black Canyon of the Gunnison National Park (BLCA) immediately adjacent to the west side of CURE. Project methods, results, and products are documented in this report. This introductory section describes the NPS I&M Program and the USGS-NPS Vegetation Mapping Program, as well as the CURE mapping project area. Later sections document the methods and results for each of the major steps in the project: scoping, vegetation classification and description, vegetation mapping, and map accuracy assessment.

The USGS-NPS Vegetation Mapping Program

The National Vegetation Mapping Program is a cooperative project between the USGS and the NPS to inventory, classify, describe, and map vegetation in more than 270 national park units within the United States. Consistent vegetation classification, mapping, and accuracy assessment protocols and standards are applied across projects supported by this program. The National Vegetation Mapping Program is administered by the USGS Center for Biological Informatics in cooperation with the NPS I&M Program. Through implementation of the NPS Natural Resource Challenge (NPS 1999), significant funding became available for completing important natural resource baseline inventories in park units, including vegetation classification and mapping. This support provided the NPS with the opportunity to move forward with dozens of new park unit vegetation classification and mapping projects, including CURE. Vegetation classification and mapping products produced by this program are incorporated into the USGS National Biological Information Infrastructure Program, which serves as an information-sharing network (http://biology.usgs.gov/npsveg/).

Northern Colorado Plateau Network Inventory and Monitoring Program

The National Park Service developed an inventory and long-term monitoring program for park natural resources over the last two decades of the twentieth century. This effort was enhanced by the NPS Natural Resource Challenge (NPS 1999); as a part of this initiative, the NCPN was formed in 2000 to develop an integrated inventory and monitoring program for 16 park units in Utah, Colorado, Arizona, and Wyoming.

A goal of the NPS I&M Program is to complete baseline inventories of biological and geophysical resources for each park unit. These inventories cover 12 basic data sets needed by park staff to guide resource management. Vegetation classification and mapping constitute one of these data sets. Early in the development of the network I&M program, the NCPN made completing vegetation maps for each network park unit a priority. In addition to assisting park management, vegetation maps and classification information were seen as contributing significantly to NCPN long-term monitoring efforts. In 2001, the network began implementation of a strategy to complete vegetation mapping in all network park units. The CURE vegetation mapping project is the tenth of the network-coordinated projects to be completed.

Vegetation Mapping Program Standards

The NPS I&M Program established guidance and standards for all vegetation mapping projects in a series of documents:

Protocols

- National Vegetation Classification System (TNC and ESRI 1994a, NatureServe 2003)
- Field methods and mapping procedures (TNC and ESRI 1994b)
- Statistically rigorous and consistent accuracy assessment procedures (ESRI and TNC 1994)
- Guidelines for using existing vegetation data (TNC 1996)

Standards

- National Vegetation Classification Standard (FGDC 1997)
- Spatial Data Transfer Standard (FGDC 1998b)
- Content Standard for Digital Geospatial Metadata (FGDC 1998a)
- United States National Map Accuracy Standards (USGS 1999)
- Integrated Taxonomic Information System
- Program-defined standards for map attribute accuracy and minimum mapping unit

These documents are available on the USGS-NPS Vegetation Program Web site (http://biology.usgs.gov/npsveg/standards.html).

National Vegetation Classification Standard

The National Vegetation Classification (NVC) is the system used in NCPN vegetation mapping projects (TNC and ESRI 1994a), and is based on the National Vegetation Classification Standard adopted by the Federal Geographic Data Committee (FGDC 1997). The NVC evolved from work conducted primarily by The Nature Conservancy (TNC), NatureServe, and the Natural Heritage Program network over more than two decades (Grossman et al. 1998). The structure of the NVC is based in part on an earlier international vegetation classification developed by the United Nations Educational, Cultural, and Scientific Organization (UNESCO 1973, Driscoll et al. 1984). Use of a standardized classification system helps to ensure data compatibility throughout the National Park Service and other agencies. The FGDC Vegetation Subcommittee works to keep this standard current and relevant. The substantial revisions to the upper levels of the NVC hierarchy adopted by the Vegetation Subcommittee as Version 2 (FGDC 2008) are not used in this project.

Vegetation classification systems attempt to recognize and describe repeating assemblages of plants in similar habitats. The NVC is a hierarchical system that incorporates physiognomic characters and floristic data to define seven levels of terrestrial vegetation classification. The five upper levels (class, subclass, group, subgroup, and formation) are based on physiognomic features. The two lower levels (alliance and association) are distinguished by differences in floristic composition. The physiognomic units have a broad geographic perspective and the floristic units have utility in local and site-specific applications (Grossman et al. 1998). The physiognomic levels of the NVC are based on physical, structural, and environmental characteristics identifiable from satellite imagery, aerial photography, or ground observations (Table 1). Specific criteria defining physiognomic units are based on ecologic characteristics that vary among major vegetation groups (FGDC 1997).

The alliance and association levels form the base of the NVC hierarchy and are determined by the most abundant or diagnostic species comprising the various layers of a homogenous vegetation community. An association is here defined as a plant community type with a consistent species composition, uniform physiognomy, and similar habitat conditions (Flahault and Schroter 1910). Species composition differentiates associations (TNC and ERSI 1994a). An alliance is "a physiognomically uniform group of plant associations sharing one or more dominant or diagnostic species which, as a rule, are found in the uppermost strata of the vegetation" (Reid and Comer 1998). NatureServe coordinates plant association data for the NCPN vegetation mapping projects. Associations are added to the NVC and older concepts are refined as new data become available.

Table 1. National Vegetation Classification System hierarchy for terrestrial vegetation (FGDC 1997).

Level	Criteria Delineating Level	Example
Class	Structure (height, cover) of dominant vegetation strata	Woodland
Subclass	Growth form characters including leaf type (evergreen, deciduous) for woody plants and persistence (perennial, annual) for herbaceous species	Evergreen woodland
Group	Leaf morphology (broad leaf, microphyllous, xeromorphic), leaf phenology, and climatic conditions	Temperate or subpolar needle-leaved evergreen woodland
Subgroup	Relative degree of human disturbance	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland

Table 1. National Vegetation Classification System hierarchy for terrestrial vegetation (FGDC 1997).

Level	Criteria Delineating Level	Example
Formation	Additional physiognomic characteristics, general environmental conditions, relative landscape position, and hydrologic regimes	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland
Alliance	Dominant or diagnostic species of uppermost or dominant stratum	*Pinus edulis* – (*Juniperus* spp.) Woodland Alliance
Association	Other dominant or diagnostic species from any stratum	*Pinus edulis* – *Juniperus* spp. / *Quercus gambelii* Woodland

Other Standards

In addition to vegetation classification, the FGDC sets standards for map spatial accuracy and for metadata employed in NPS vegetation mapping projects. Standards for map products stipulate map scales of 1:24,000 or finer, and minimum polygon size of 0.5 ha (1.24 acres). Positional accuracy for vegetation maps must meet National Map Accuracy Standards, which specify horizontal errors of less than 10.2 m (33.5 ft.) on the ground for 1:12,000-scale maps.

All digital vegetation products resulting from this project are accompanied by FGDC-compliant metadata. Metadata are "data about the data," and describe the content, quality, condition, and other characteristics of the spatial dataset. Metadata are critical elements that expedite the interpretation and exchange of information among users.

Project Area Description

Location and Setting

Curecanti National Recreation Area (CURE, recreation area) is comprised of approximately 17,068 ha (42,176 acres) extending along roughly 65 km (40 miles) of the Gunnison River basin in Gunnison and Montrose counties, Colorado (NPS 2008a). The recreation area is located along US Highway 50 between the cities of Montrose and Gunnison, approximately 318 km (200 miles) southwest of Denver, Colorado. The highway runs through CURE, crossing Blue Mesa Reservoir and providing access to both sides of the canyon on state highways 92 and 149.

Although CURE is recognized as a unit of the National Park Service and so funded by Congress, it has not been legislatively established. The existing NRA administrative boundary encompasses a patchwork of land ownership.

The recreation area is made up of federal lands and waters associated with the three dams and reservoirs of the Wayne N. Aspinall Storage Unit of the Upper Colorado River Storage Project, which was authorized by the Colorado River Storage Project Act of 1956. U.S. Bureau of Reclamation (USBOR) lands acquired under the Colorado River Storage Project Act were the minimum required for construction and operation of the storage project. An additional 465.5 ha (1,150 acres) under NPS ownership are included within CURE. About half of the lands surrounding CURE are in private ownership, with the remaining divided between the USBOR, USFS, Bureau of Land Management and Colorado Division of Wildlife (NPS 2008b).

CURE is administered by the NPS through a February 11, 1965 Memorandum of Agreement between NPS and the USBOR. Under the 1965 Memorandum of Agreement, USBOR manages the dams, reservoirs, power plants, access roads and related facilities of the storage project, while NPS manages the natural and cultural resources, public recreation and education, and related facilities. Although NPS manages most of these USBOR lands under the 1965 agreement, a small portion (81 ha, or 200 acres) is co-managed with the United States Forest Service (USFS). The Western Area Power Administration manages the distribution of electrical power, transmission lines and related facilities in the storage project in accordance with the Department of Energy Organization Act of 1977 (NPS 2008a).

As of this writing, a Resource Protection Study and accompanying Environmental Study (RPS/EIS) is in progress, at the request of Congress, in preparation for legislation to formally establish CURE and its boundaries. If such legislation occurs, CURE's boundaries will undergo significant changes. The specifics of the proposed changes are discussed in the "Land Use and Settlement History" section, below.

CURE is in the southeastern area of the Northern Colorado Plateau Network (Figure 1). The vegetation mapping project area includes CURE and adjacent federal, state, and private lands within a one mile buffer (Figure 2).

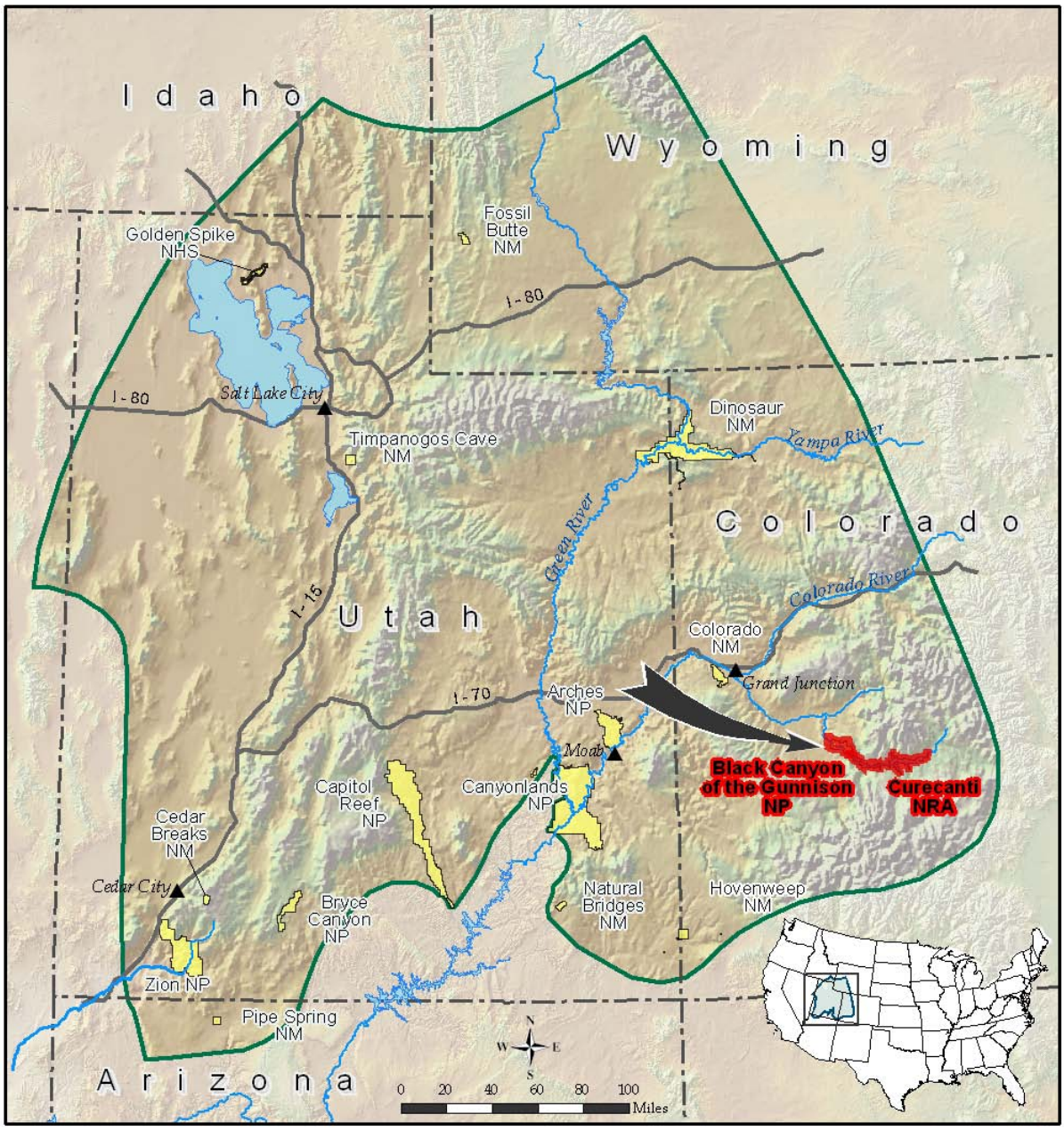


Figure 1. Location of CURE on the Colorado Plateau.

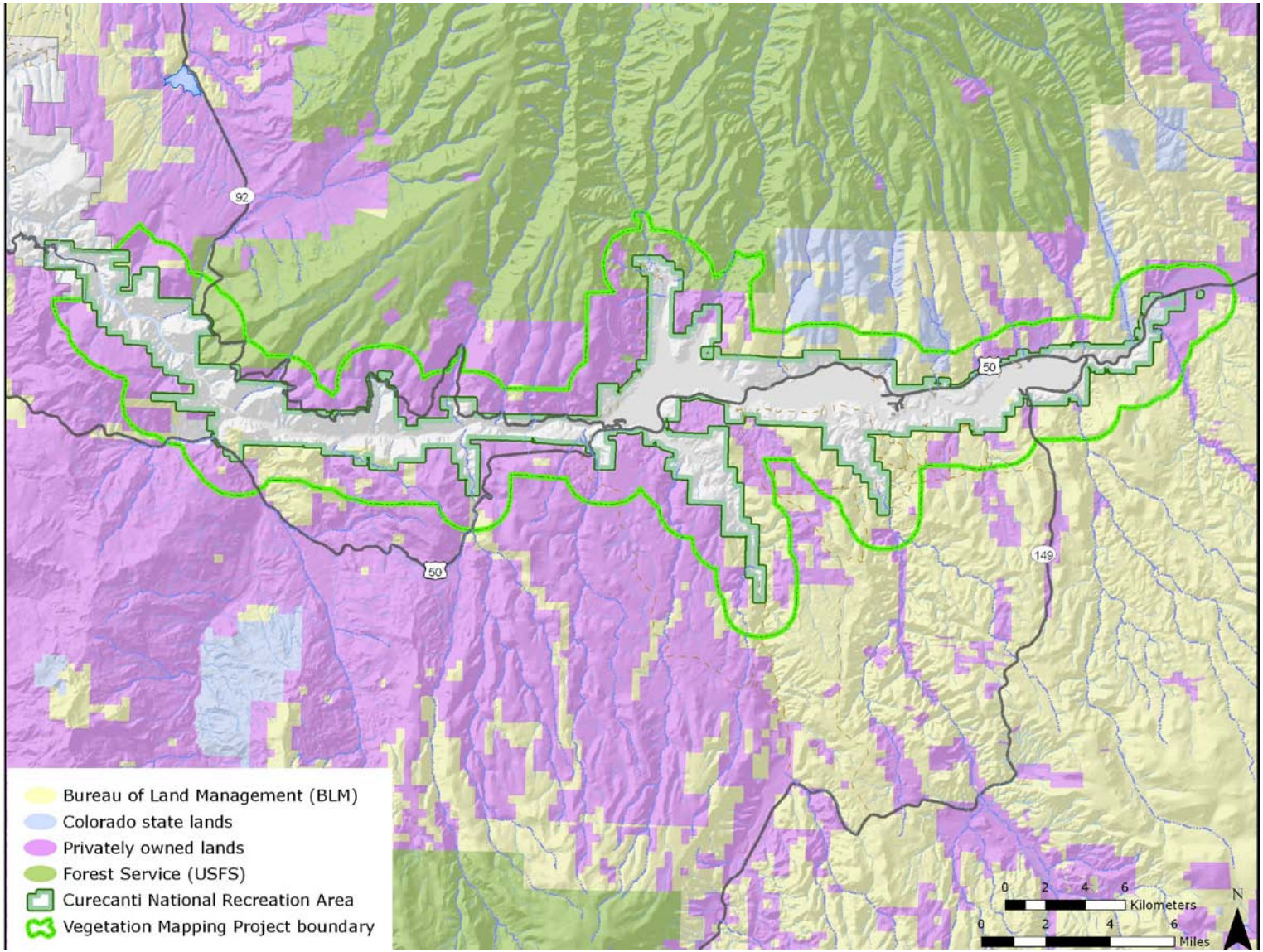


Figure 2. Map of the CURE vegetation mapping project area boundary showing adjacent land ownership.

Topography and Geologic History

CURE is located in the (locally indistinct) boundary between the Colorado Plateau physiographic province to the west and the Southern Rocky Mountains physiographic province to the east. It is part of the Gunnison uplift formed some 60 mya as part of the Laramide Orogeny. The area displays complex geologic features, including broad flat-topped mesas, sharp ridges, and canyons, which are in many ways representative of both provinces (Hansen 1965). The Gunnison River watershed is relatively confined to the area immediately surrounding the river as a consequence of regional uplifting during the Laramide Orogeny, which has tended to divert tributaries away from the Gunnison River (Thornberry-Ehrlich 2005). The Gunnison watershed is bounded by the West Elk Mountains to the north, the Sawatch Range to the east, and the San Juan Mountains to the south; to the west the elevation drops steeply to the broad river valley around Delta, Colorado.

Lands adjacent to CURE are characterized by high mesas and short tributary valleys. The uplands and western edge of CURE are flanked by Deadhorse and Black mesas on the North Rim and Coffee Pot Hill and Vernal and Fitzpatrick mesas on the South Rim. The central and eastern portions of the CURE uplands north of the Gunnison River include portions of Soap and Dillon mesas, Tenderfoot Hill, and the lower slopes of the West Elk Mountains. South of the Gunnison River, Blue and Sapinero mesas dominate the higher elevations near the recreation area. Elevations within CURE range from 1,981 meters (6,500 feet) at East Portal to 2,896 meters (9,500 feet) near Sheep Knob (O'Dell et al. 2005).

CURE is roughly linear in shape, narrowly paralleling the Gunnison River which flows west across a relatively broad valley above Blue Mesa Dam (at roughly the east-west center point of the recreation area) and into the deeply incised upper reaches of the Black Canyon of the Gunnison downriver from Blue Mesa Dam and Reservoir. Morrow Point and Crystal dams sit deep in the steep-walled inner reaches of the Black Canyon downstream of Blue Mesa Dam. Morrow Point Dam is the tallest of the three dams, at 143 m (469 feet) high, and forms a reservoir that is narrowly contained within the canyon, while Blue Mesa Reservoir is spread more broadly across the upper Gunnison River valley. Blue Mesa Reservoir is in fact the largest body of water in Colorado, with 155 km (96 miles) of shoreline (Thornberry-Ehrlich 2005), a surface area of 9,180 acres at full pool, and a storage capacity of 940,700 acre-ft of water (Redmond 2000).

Unique landmarks of CURE include the Curecanti Needle and the Dillon Pinnacles (Figure 3). The Curecanti Needle is located about 7.2 km (4.5 mi) downstream from Blue Mesa Dam adjacent to the Morrow Point Reservoir. A spire-like monolith rising nearly 244 m (800 ft), it is composed of intrusive igneous granitic quartz of Precambrian age. The Dillon Pinnacles are formed in West Elk Breccia, consisting of solidified lava flows intermixed with coarse fragments of previous volcanic origin, exceeding 305 m (1000 ft) in thickness, and are located north of Sapinero Basin (Thornberry-Ehrlich 2005).



Photo credit: NPS/Lisa Lynch

Figure 3. Curecanti Needle on Morrow Point Reservoir (left), Dillon Pinnacles above Blue Mesa Reservoir (right).

Climate

Records of climatic conditions have been maintained continuously since 1951 at Cimarron (Station 051609, WRCC 2009) on the rim of the Black Canyon section of CURE. Temperature and precipitation are seasonally variable (Figure 4), and show an average high temperature in July of 85.3°F (29.6°C) and an average low temperature in January of 0.5°F (-17.5°C). Conditions can change noticeably during a given day, from low to high elevations, and between seasons. Summers are short to moderate in length with cool to warm days; daytime temperatures at CURE range between 40º to 90°F (10º to 32°C), with nighttime temperatures of 40º to 60ºF (4º to 15ºC). Canyon bottoms are typically 5-8°C (10-15°F) warmer than the rims during summer months (O'Dell et al., 2005). Winter daytime temperatures at CURE range between -20º to 40°F (-29º to 4°C), with nighttime temperatures of -30º to 20°F (-34º to -7°C). Annual precipitation for this period averaged 34.5 cm (13.6 inches). Precipitation in the form of snow averaged 162.5 cm (64 inches) annually. However, accumulated snow depths on the ground never exceeded 15.25 cm (6 inches) in February, and other winter months typically averaged much less. Most precipitation occurs in the form of spring and late summer rainstorms (Figure 5).

Records of climatic conditions have been maintained continuously at Blue Mesa Dam and Reservoir since 1966 (Johnston et al. 2001). Temperature and precipitation data collected at the Western Regional Climate Center Blue Mesa Lake station, upstream along the shore of Blue Mesa Reservoir, varied only slightly from the Cimarron data (WRCC 2009).

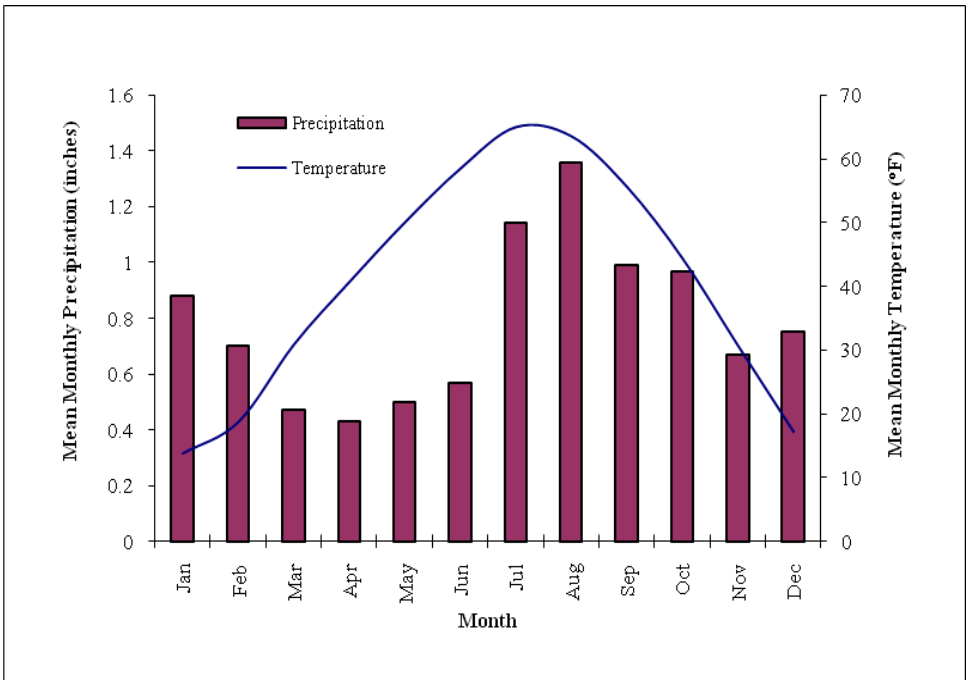


Figure 4. Mean monthly precipitation (in) and temperature (ºF) as recorded at Montrose, Colorado.



Figure 5. Summer thunderstorm at CURE.

Geology and Vegetation

At approximately 2 to 3 million years of age, The Black Canyon of the Gunnison is a relatively recent addition to the landscape at the western border of CURE, but the Precambrian gneisses, schists, granites and pegmatites forming its walls span a geologic history of roughly 1.725 billion years (Figure 6). Volcanic and sedimentary deposits collected in an oceanic environment were eventually compressed, folded and metamorphosed into the rocks visible in the canyon areas today (Thornberry-Ehrlich 2005).

The rock strata laid atop the Precambrian basement are younger in age, the oldest having been deposited in Jurassic times. There are no Paleozoic sedimentary rocks at CURE, a record of approximately 370 million years of earth history that is missing from the landscape. Rock exposures on the north rim of the Black Canyon in CURE, seen along Highway 92, were deposited in the early to middle Jurassic. These exposures include the northernmost lip of the Entrada Formation, deposited as eolian sands, and the Wanakah Formation, composed of interbedded sandstone, siltstone, gypsum and mudstone. Around 157 million years ago an inland sea began to inundate the area, and the late Jurassic Morrison Formation was deposited on top of the earlier Jurassic formations in a variable environment of mudflats, floodplains, stream channels, small eolian sand fields, and scattered lakes and ponds. The Morrison is visible along the shore of Blue Mesa Reservoir (Thornberry-Ehrlich 2005).

The Dakota Sandstone was deposited on top of the Morrison in the early Cretaceous. This fluvial deposit includes conglomerates and petrified wood fragments, and is well exposed in road cuts along Highway 50 just west of Elk Creek. By the beginning of late Cretaceous times the Cretaceous Sea had advanced into the CURE region, and the mudstones of the Mancos Shale were deposited on top of the Dakota in a deep marine environment (Thornberry-Ehrlich 2005).

The Laramide Orogeny began in the late Cretaceous, approximately 66 to 70 million years ago, and continued intermittently until between 35 and 50 million years ago. Locally, the Laramide produced the Gunnison uplift, beginning about 60 million years ago. This uplift is mainly an upfaulted but also partly arched block forming the dominant structural feature of the CURE area. The core of the uplift is now exposed in the depths of the Black Canyon of the Gunnison (Thornberry-Ehrlich 2005).

In Tertiary times, erosion beveled the Gunnison uplift nearly flat, and by the late Tertiary (26 to 35 million years ago) volcanism began in the region, building the West Elk Mountains and spreading deep blankets of West Elk Breccia over the region. The Dillon Pinnacles, on the northern shore of Blue Mesa Reservoir, are erosional remnants of this volcanic material. The West Elk Breccia is a massive layer of lava flows intermixed with fragments of material resulting from the explosive destruction of previous volcanic material, deposited across the region to depths of 305 m (1000 feet). Additional molten ash flows from the San Juan Mountains volcanism added resistant welded tuff cap rock layers found on the mesas of CURE today (Thornberry-Ehrlich 2005).

The creation of the West Elk Mountains and the deposition of the West Elk Breccia diverted the regional drainage of the Sawatch Range and San Juan Mountains southward so that it crossed the surface of the buried Gunnison uplift. This established the present course of the Gunnison River some 10 to 15 million years ago. Further uplifting of the region 5 to 10 million years ago resulted

in the river attaining the gradient needed to downcut through the Tertiary volcanics and Mesozoic sedimentary rocks deposited on the Precambrian core of the Gunnison uplift. When another rapid uplift occurred early in the Quaternary (2 to 3 million years ago), the Gunnison River was already well entrenched in the canyon. The increased gradient and high volume of the river in the Pleistocene climate initiated the deep down-cutting into the much harder Precambrian basement rock, at a rate estimated to be approximately one inch per one-hundred years. The result was the narrowly incised Black Canyon of today (Thornberry-Ehrlich 2005).

The orientation of the Black Canyon to the sun has produced some notable differences between its north- and south-facing slopes. Because the south-facing slopes receive more solar energy, moisture evaporates quickly. Erosion from freeze-thaw cycles on the south-facing slopes is therefore less, and vegetation has adapted to a more xeric environment. Typically, north-facing slopes are less precipitous because of the greater freeze-thaw erosion, and vegetation established on these slopes has the benefit of a cooler, moister environment. In the inner Black Canyon sections of CURE the plant communities are distinctly divided between a Douglas-fir (*Pseudotsuga menziesii*), mountain maple (*Acer glabrum*), and serviceberry (*Amelanchier* spp.) community on north-facing slopes and a big sagebrush (*Artemisia tridentata*) and juniper (*Juniperus* spp.) community on the south-facing slopes (NPS 2009a). Higher elevation areas on the south-facing north rim are also moister, and often support Douglas fir intermixed with stands of quaking aspen (*Populus tremuloides*), serviceberry and Gambel oak (*Quercus gambelii*).

Beyond the rims of the deeper canyon areas, CURE is characterized by a semi-arid shrubland community with big sagebrush mixed with rabbitbrush (*Ericameria nauseousus*) and Gambel oak. Intermittent pockets of Douglas-fir, quaking aspen, and blue spruce (*Picea pungens*) occur on upper slopes and ridgetops with moister and/or cooler microclimates. The shoreline slopes surrounding Blue Mesa Reservoir are a good example of the big sagebrush community (O'Dell et al. 2005).

The remainder of this section is a summary of the general distribution of vegetation in relation to geology across the CURE mapping area, organized from oldest to youngest rocks as described in NPS (2008c).

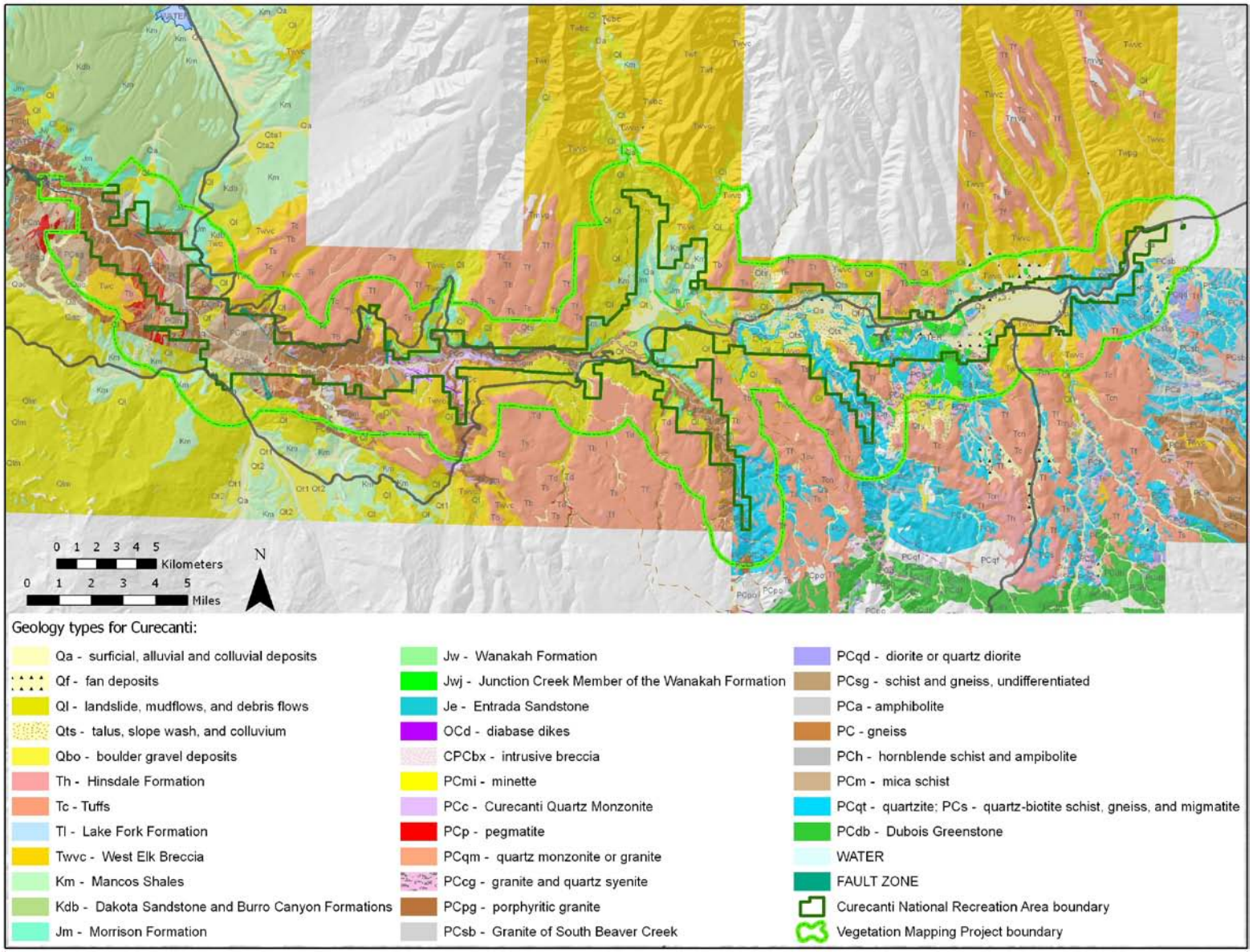


Figure 6. Geology map of CURE.

Metamorphic Gneiss and Schist (Precambrian). These dark-gray (former sedimentary) strata were formed approximately 1.7 billion years ago and represent the oldest exposures within CURE. They include Vernal Mesa quartz syenite, quartz monzonite or granite, amphibolite, migmatitic gneiss, layered quartzitic gneiss, massive quartzitic gneiss, pegmatite, and mica schist. Precambrian rocks at CURE are exposed within the canyon overlooking the two lower reservoirs, especially on north-facing canyon walls, and above Blue Mesa Reservoir. Precambrian exposures are typically devoid of vegetation and delineated as a geology map unit. However, where there are rooting sites in bedrock cracks and broken boulder areas on the canyon rims, Douglas-fir, ponderosa pine (*Pinus ponderosa*), two-needle pinyon pine (*Pinus edulis*), Rocky Mountain juniper (*Juniperus scopulorum*), Utah juniper (*Juniperus osteosperma*), Gambel oak, Utah serviceberry (*Amelanchier utahensis*), or rock spiraea (*Holodiscus dumosus*) woodland and shrubland stands may become established. Vegetation is similar to that found at Black Canyon, with the addition of seasonally flooded blue spruce forests established on shaded north- and east-facing slopes along tributary canyons. Vegetation also rarely occurs as hanging gardens on seeps in vertical cliffs above the riverbed, on steep rocky slopes of the upper canyon above the vertical canyon wall, and on the thin soils above the canyon rim (Figure 7).



Figure 7. Douglas-fir forests and rock spiraea shrublands on Metamorphic Gneiss/Schist.

Mesozoic Sandstones. Within CURE, these sandstones tend to support mixed tall shrublands similar to those at Black Canyon, with the addition of sagebrush shrublands (*Artemisia nova, A. tridentata*) with mixed grasses, and grasslands characterized by needle-and-thread (*Hesperostipa*

comata), blue grama (*Bouteloua gracilis*) and Indian ricegrass (*Achnatherum hymenoides*). Examples of these vegetation types occur on terraces along the Morrow Point Reservoir, and along the shores of Blue Mesa Reservoir.

Entrada Sandstone (Middle Jurassic). These cross-bedded eolian layers were deposited approximately 150 million years ago. Generally, this layer can be described as pink-to-yellow-gray eolian sandstone. They typically support woodlands of two-needle pinyon pine and Utah juniper, shrublands including littleleaf mountain mahogany (*Cercocarpus intricatus*), mountain mahogany (*Cercocarpus montanus*), green Mormon-tea (*Ephedra viridis*), Utah serviceberry, and snakeweed (*Gutierrezia sarothrae*), or grasslands characterized by muttongrass (*Poa fendleriana*) and Indian ricegrass, and the forb hairy golden-aster (*Heterotheca villosa*) (Figure 8).



Figure 8. Mountain mahogany shrublands and ricegrass on slopes of Entrada Sandstone.

Wanakah Formation (Middle Jurassic). These reddish siltstones were deposited approximately 150-145 million years ago. Of marginal marine origin, this formation may be fossil-bearing with fish, ostracods, and trace fossils, however it is mostly red siltstone, thin red and gray sandstone, and thin red clay beds. These siltstones typically support woodlands of Douglas-fir, ponderosa pine, two-needle pinyon pine, and Utah juniper; shrublands that include mountain mahogany, littleleaf mountain mahogany, green Mormon-tea, Utah serviceberry, western snowberry (*Symphoricarpos oreophilus*), and Gambel oak; and grassland stands characterized by muttongrass and Indian ricegrass (Figure 9).



Figure 9. Pinyon-juniper and Douglas-fir woodlands on Wanakah Formation.

Morrison Formation (Upper Jurassic). Deposited about 145 million years ago, the Morrison Formation occurs along the shoreline of Blue Mesa Reservoir, especially along Red Creek Canyon. It is a layer of sediments laid down as alluvium deposited by streams and rivers. Generally, this layer can be described as multi-colored mudstone and siltstone with bentonite, sandstone, and conglomerate that may contain dinosaur fossils. These sediments support a variety of vegetation, most often mixed shrublands and grasslands and some pinyon and juniper woodlands on the upper portion. Dominant shrubs are Gambel oak, fourwing saltbush (*Atriplex canescens*) and species of sagebrush. Grasslands generally include the bunchgrasses squirreltail (*Elymus elymoides*), Indian ricegrass, and galleta (*Pleuraphis jamesii*) (Figure 10).



Figure 10. Sagebrush shrublands and saltbush-ricegrass shrublands on Morrison Formation.

Dakota Sandstone and Burro Canyon Formation (Lower Cretaceous). These deposits represent shoreline beach and fluvial deposits laid down approximately 110-100 million years ago. These buff-colored sandstones form prominent outcrops at CURE in the roadcuts along Highway 50 west of Elk Creek. Generally, this layer can be described as hard, gray, fissile, siliceous shale, sandstones, gray to maroon mudstones, and some limestones. Coarse conglomerate sandstones, cross-stratification, petrified wood fragments, and erosional topography are characteristic of the lower Dakota Sandstone in the BLCA-CURE area (Thornberry-Ehrlich 2005).

Plot information and photos relating to this geologic layer are limited, but these formations tend to support vegetation on gently rolling erosional terrain where the resistant sandstone has

weathered. Vegetation consists primarily of big sagebrush (*Artemisia tridentata* ssp.) or Gambel oak shrublands (Figure 11).



Figure 11. Sagebrush shrublands on Dakota Formation.

Mancos Shale (Upper Cretaceous). This formation was deposited approximately 100 to 80 million years ago and the soft grays and yellows of the Mancos Shale form badlands, smooth slopes and rounded hills surrounding Blue Mesa Reservoir. The name "Soap Creek" alludes to the soapy consistency of the Mancos Shale when wet. Generally, this exposure can be described as dark gray, silty-to-clayey, marine shale weathering a light gray to light yellow. The formation features minor siltstone and sandstone in the upper portion, with layered bentonite and some limestone beds in the lower portion, and is locally fossiliferous. This soft mudstone supports sparse communities of Utah juniper woodlands or shrublands of fourwing saltbush, sagebrush (*Artemisia tridentata* ssp.), winterfat (*Krascheninnikovia lanata*), and mountain mahogany shrublands, or occasionally grasslands of Indian ricegrass and galleta (Figure 12).



Figure 12. Winterfat and saltbush shrublands on badland slopes of Mancos Shale.

Tertiary Volcanics. Following the Laramide Orogeny, volcanic activity in the West Elk Mountains to the northeast and the San Juan Mountains to the south resulted in large deposits of volcanic ash, tuff and breccia (Hansen 1965). These igneous rocks cap the mesas surrounding CURE today and include West Elk Breccia, Blue Mesa Tuff, Dillon Mesa Tuff and Carpenter Ridge Tuff. These volcanic soils support a variety of plant associations along mesa sides, on ridges, and mesa tops. Most common are short shrublands dominated by species of big sagebrush (*Artemisia tridentata* ssp. *wyomingensis,* ssp. *vaseyana*) with mixed grasses including

muttongrass and Indian ricegrass, and grasslands characterized by blue grama, galleta, muttongrass, Indian ricegrass, or needle-and-thread. On sheltered north and east-facing aspects and in gullies on the mesa sides, stands of quaking aspen or Douglas-fir occur, with understory shrubs of common juniper (*Juniperus communis*) or snowberry. A few sites support pinyon pine and Rocky Mountain juniper, with a sagebrush understory (Figure 13).



Figure 13. Sagebrush with muttongrass (a), Galleta grassland overlooking Blue Mesa Reservoir (b), quaking aspen woodland (c) and Douglas-fir woodland overlooking Blue Mesa Reservoir (d) on Tertiary Volcanics.

Surficial Deposits (Pleistocene and Holocene). Generally, the processes of weathering, erosion, and sedimentation contribute to the formation of soil, eolian sands and loess, new alluvium (stream and lake), talus, colluvium, and landslide deposits. Surficial Deposits may be devoid of vegetation and delineated as rock slides, channel bottoms, erosion fans, barrens, open water, or other unvegetated map units (Figure 14).

Landslide deposits consist of unconsolidated surficial sands, silts, clays, pebbles, gravels and boulders. At CURE, landslide deposits supporting stands of Douglas-fir with snowberry or Gambel oak occur on north and east-facing slopes and drainages on Tenderfoot Hill and East Portal north of Blue Mesa Reservoir, and along Pine Creek south of Morrow Point Reservoir. On south and west-facing slopes, Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) shrublands dominate, sometimes with scattered trees (*Pinus edulis*, *Juniperus* spp.). These are evident below the Dillon Pinnacles, and above the Cebolla and Soap Creek Arms of Blue Mesa Reservoir.

Quaternary silts, sands and gravels are preserved in the canyons and surface depressions as terrace deposits and alluvium (Thornberry-Ehrlich 2005).



Figure 14. Douglas-fir woodland (a), sagebrush with scattered mountain mahogany (b), and Pinyon-Juniper on landslide deposits (c). Narrow-leaf cottonwood woodland (d), rubber rabbitbrush at Blue Mesa Reservoir (e), and a wiregrass meadow at Neversink on new alluvium (f).

Within CURE, recent alluvium is found primarily in the floodplain of the upper Gunnison River, upstream from Blue Mesa Reservoir at the northeast end of the recreation area, and in side drainages near the lake. Typically, these sites support woodlands of narrow-leaved cottonwood (*Populus angustifolia*) and species of willow (*Salix exigua, S. geyeriana*), generally with a grass or forb understory consisting of the introduced grasses smooth brome (*Bromus inermis*) or Kentucky bluegrass (*Poa pratensis*), and the forb false Solomon's-seal (*Maianthemum*

stellatum). Alluvial deposits may also support shrublands of rubber rabbitbrush and/or big sagebrush, with introduced or native grasses including western wheatgrass (*Pascopyrum smithii*), and meadows with high water tables support species of sedge (*Carex* ssp.) and Baltic rush (*Juncus balticus*).

Soils

In areas of similar climate and topography, differences in the kind and amount of vegetation are closely related to soils. Soil series or other soil combinations are incompletely described for the recreation area but they vary widely in erodibility and productivity depending on topographic position, parent material, local hydrology, slope, and other factors influencing soil formation processes (USDA-NRCS 1975). Soils were formed from bedrock exposed at the surface (e.g. Entrada Sandstone, Wanakah Formation, Morrison Formation, Dakota Sandstone, Burro Canyon Formation, Mancos Shale, etc.) and by flowing water. Soil texture consists primarily of variations of loam and sand, although heavier soils occur on slopes and mountains. Gravels are present in river wash associated with streambeds, gulches, and floodplains. Soil associations have been developed for the BLCA/CURE area (USDA-NRCS 1967, 1975), and these are listed and briefly described in Table 2.

Generally formed from shale, limestone, and sandstone, badlands and rock outcrops have little or no soil development due to their predominant erosive features. Shallow soils (< 50 cm or 20 inches) occur throughout the recreation area on canyon slopes, hill slopes, mountains, mesas, and plateaus underlain by shale, limestone, and sandstone bedrock. Moderately deep to deep soils (>50 cm or 20 inches) are found on alluvial fans, basins, valley alluvium, and some areas of residual upland plains.

Table 2. Soil associations developed for the BLCA/CURE area.

Soil Association	Description
Evanston-Gas Creek-Irim	Deep, nearly level to strongly sloping, well-drained, somewhat poorly drained, and poorly drained loams and sandy loams on flood-plains, terraces, and alluvial fans
Billings-Christianburg	Deep, nearly level and gently sloping, fine textured and moderately fine textured soils on alluvial fans, flood-plains, and terraces
Chipeta-Persayo	Shallow, nearly level, gently sloping, and hilly, fine textured and moderately fine textured soils derived from shale
Vulcan-Wetterhorn-Ruby	Deep and moderately deep, moderately sloping to steep, well-drained gravelly sandy loams and stony loams on mountains, ridges, and mesas
Rock outcrop-Travesilla	Bare rock outcrop and shallow, rolling to steep, moderately coarse textured soils on hills, ridges, and sides of mesas

Hydrology and Water Resources

CURE resulted from construction of the Wayne N. Aspinall Storage Unit of the Colorado River Storage Project, which captures Gunnison River flows. However, the first dam built within the boundaries of CURE predates the storage unit by half a century, and is still used to divert water into the Gunnison Diversion Tunnel for irrigation in the Uncompahgre Valley. The three dams of the Wayne N. Aspinall Storage Unit work in concert to produce hydroelectric power and to provide stream flow regulation, flood control, and water storage as part of a coordinated system of dams regulating the entire upper Colorado River watershed. Together, the three dams of the

storage unit (Blue Mesa, Morrow Point, and Crystal) produce enough electricity to power a city of 240,000 (NPS 2009a).

The construction of dams on the Gunnison River inundated riparian habitat, altered stream flow patterns and temperature regimes, modified or eliminated native fish spawning habitat, and along with stocking programs, changed the composition of fish species and fish-food organisms in the reservoirs and downstream of the dams (O'Dell et al. 2005). The introduction of exotic fish species into the stream and reservoir system has created a valuable sport fishing resource but may have negatively impacted native species. Blue Mesa Reservoir now provides the largest kokanee salmon fishery in the United States (NPS2009a). The Colorado River cutthroat, displaced by the reservoir habitat, occupies some headwater streams tributary to the Gunnison River and is a native species of particular concern (O'Dell et al. 2005).

The eastern-most portion of CURE retains parts of the original riverine system which are essentially unaltered since reservoir construction. Approximately 18 km (11 miles) of the Gunnison River and 85 km (53 miles) of tributary streams are within the boundary of CURE. These areas encompass an alluvial floodplain and remain influenced by natural flood events. Diverse riparian communities, including mature narrowleaf cottonwood (*Populus angustifolia*) overstories with herbaceous understories occur on the eastern portion. The Gunnison River, providing 50 percent of the inflow to Blue Mesa Reservoir, has good water quality and supports both native and stocked trout fisheries. Many of the tributaries that flow into the CURE reservoirs originate from areas where the stream water quality is excellent, and support high quality, functioning aquatic systems (O'Dell et al. 2005).

Land Use and Settlement History

The first major archeological surveys at CURE took place in the late 1970s and early 1980s, in preparation for the construction of NPS visitor facilities. By 1992 enough significant prehistoric sites had been discovered to prompt the creation of the 2,024 ha (5,000 acre) Curecanti Archeological District within the boundaries of CURE (NPS 2009a).

Paleo-Indian use of the CURE region began at least 10,000 years ago. Archeological surveys and excavations have found ample evidence of a regular, but brief, summer seasonal occupation by these earliest hunters, likely in pursuit of now-extinct late Pleistocene megafauna. Lithic scatter, hearths and other evidence indicate that they often camped on bluffs overlooking the river valley now partially filled by Blue Mesa Reservoir. Early to early Middle Archaic peoples occupied the CURE region more extensively approximately 7,950 to 3,950 years ago. Excavated sites in the recreation area suggest that some of these camps must have been occupied for longer periods of time, possibly even through the winter. The location of the sites, typically at higher elevations above the Gunnison River and near the larger tributaries, suggests that they may have been base camps for hunting and plant gathering expeditions into the neighboring mountains (NPS 2009a).

In the late Prehistoric Stage, about 1,450 to 400 years ago, there was a shift to the use of smaller projectile points shot from bows and arrows, and the introduction of clay pottery. Horticulture began during this time regionally, but the higher elevations at CURE likely inhibited successful farming. The first evidence of Ute Indians traversing the area has been dated to between 625 and 330 years ago, but there is no evidence of permanent Ute habitations in CURE. Seasonal hunting

and gathering appears to have remained the primary use of the Curecanti area until historic times (NPS 2009a).

The first Europeans to enter the area may have been following a branch of the Old Spanish Trail, the course of which may have traversed portions of the eastern end of CURE (Levy 1968). The first documented exploration was that of Captain John Gunnison, who in 1854 traveled down the Gunnison River as far as the mouth of Lake Fork, near present-day Sapinero, before veering southwest to avoid the depths of the Black Canyon. Gunnison's expedition was in search of a viable railroad route to the Pacific Ocean, but his discoveries did not invite further investigation in the region for that purpose (NPS 2009a).

A little over 30 years later, William Jackson Palmer, in pursuit of gold and silver mining traffic, built his Denver and Rio Grande narrow gauge railroad through the upper section of the Black Canyon, between Sapinero and the mouth of the Cimarron River. Palmer's railroad was the first to cross the Rocky Mountains, reaching the town of Gunnison in 1881. Work continued through the winter and just a year later the first commercial train traffic entered the Black Canyon. Passenger traffic on this line lasted until 1940, with freight traffic continuing until the line was abandoned and the rails torn up in 1949. Most of the roadbed in CURE is now submerged by the Morrow Point and Blue Mesa Reservoirs (NPS 2009a). Palmer originally wished to extend his railroad line all the way through the lower Black Canyon, but was persuaded by his surveyors to divert it up the Cimarron River drainage and back onto the rim. The town of Cimarron began as a tent city for railroad construction workers where the line emerged from the canyon, and it soon evolved into a busy railroad stop, servicing mining traffic and later stockmen shipping cattle and sheep to market. Today it is the site of the CURE Cimarron Visitor Center, with exhibits focusing on the local railroad history (NPS 2009a).

By the 1890s the need for irrigation water for the settlements in the Uncompahgre Valley led to construction of a diversion tunnel to remove water from the Gunnison River. State backing was granted in 1901, but those minimal funds were quickly spent. The tunnel proponents remained persistent, and when Congress passed the Reclamation Act in 1902, the "Gunnison River Diversion" was incorporated into the language of the law as one of five initial projects to be undertaken by the new Reclamation Service. Completed in 1909, the Gunnison Diversion Tunnel was the longest ever built in the U.S. at the time (Levy 1968). The East Portal of the Gunnison Diversion Tunnel lies just within the west boundary of CURE, immediately downstream of the Crystal Dam. The tunnel is still in operation today, and is designated a National Historic Civil Engineering Landmark. The dams and reservoirs of the Wayne N. Aspinall Storage Unit are the most recent projects in the history of water engineering on the Gunnison River.

The Wayne N. Aspinall Storage Unit is comprised of three dams and reservoirs. Blue Mesa Dam was the first major dam built on the Gunnison River. Completed in 1965, it is a 119 m (390 feet) high and constructed of earth and rock fill. Blue Mesa reservoir is 20 miles long with 96 miles of shoreline. The primary purpose in the coordinated system of CURE dams is to store water, but Blue Mesa Dam does also produce some hydroelectric power. It is a popular recreation site with opportunities for windsurfing, water-skiing and fishing. Morrow Point Dam, 19 km (12 miles) downstream of Blue Mesa Dam, was completed in 1967. Morrow Point Dam is the hydroelectric workhorse of the three CURE dams, with a power capacity of 172,000 kw, almost twice that of Blue Mesa Dam. Morrow Point Dam is the highest of the three at 143 m (469 feet) high, and was

the first concrete, double curvature, thin arch dam constructed by USBOR. The most recent and smallest of the three dams, Crystal Dam was completed in 1976. Like Morrow Point Dam, Crystal Dam is a concrete, double curvature, thin arch dam. It is located 9.6 km (6 miles) below Morrow Point Dam. Crystal Dam produces some hydroelectricity, but its primary purpose is to regulate and stabilize the flow of water through Black Canyon of the Gunnison National Park, the boundary of which is approximately two miles downstream.

CURE was established with the completion of the Blue Mesa Dam in 1965, to facilitate recreational use of the new Blue Mesa Reservoir and the future Morrow Point and Crystal reservoirs. Recreation at CURE includes boating, fishing, swimming, picnicking and sightseeing (Figure 15). Increasing visitation and the construction of facilities including picnic areas and campgrounds, roads, boat ramps, and informational structures have affected the CURE environment (NPS 2008a). Visitation has hovered between 900,000 and one million since 1995 (NPS 2009b). Conflicts between recreational activities and other pre-existing uses of the land, i.e., grazing, coupled with the development of neighboring parcels of property, have increased the challenges involved in managing the natural and recreational resources at CURE. Population growth and land-use changes upstream from CURE have the potential to affect water quality and aquatic biology in the three reservoirs. Almost 48 percent of the CURE boundary abuts private property; many of these properties have proposed developments for recreational vehicle campgrounds and private homes (Bauch and Malick 2003). The current status of CURE as an unlegislated unit within NPS has hampered its ability to plan for long-term conservation of these resources (NPS 2008a).





Figure 15. Examples of hydrology and water resources at CURE.

As part of the 1999 legislation creating Black Canyon of the Gunnison National Monument, Congress requested that a study of be made of CURE lands and resources, preparatory to enacting legislation to formally establish CURE and its boundaries. NPS initiated a Resource Protection Study and accompanying Environmental Study (RPS/EIS) in the following year, and the Final RPS/EIS was released in September 2008 (NPS 2008b). As of this writing it is awaiting a Record of Decision (NPS 2009a).The Final RPS/EIS proposes to increase the area within the CURE boundaries to 20,975.5 ha (51,830 acres) through the acquisition of neighboring federal and state managed lands. The core USBOR lands presently included within CURE would remain in USBOR ownership, but additional acquired lands would be transferred to NPS ownership. In addition, a designated Conservation Opportunity Area (COA) would be created on surrounding

private lands outside of the new recreation area boundaries, to the extent of approximately 9,834 ha (24,300 acres). NPS would be authorized, subject to funding, to work with willing landowners within the COA to create opportunities for resource conservation, including the acquisition of conservation easements and fee simple ownership. The division of operational responsibilities between USBOR and NPS set forth in the 1965 Memorandum of Agreement would remain essentially unchanged (NPS 2008a).

Previous Vegetation Studies

CURE supports semiarid woodland, shrubland, and herbaceous vegetation within mountain and plateau topography deeply dissected by the Gunnison River. The juxtaposition of topography, geology, soils, hydrology and disturbance history results in a greater diversity of plant communities and species here than might be otherwise expected for an area of this size and elevation range. The vascular flora of CURE includes 679 taxa that have been confirmed or reliably reported as occurring in the recreation area (Hogan et al. 2009).

Hogan et al. (2009) reviewed vegetation studies at CURE, which are summarized here. The history of plant collection in the vicinity of CURE began with visits by pioneer botanists Marcus E. Jones in 1890 and C.A. Purpus in 1892. Herbert Wheeler completed the first comprehensive plant survey in 1898 in the vicinity of Sapinero as part of his M.S. thesis. No other significant vascular plant surveys and collections occurred in the vicinity of CURE for over a half-century. In 1961, USBOR contracted with the University of Utah to conduct baseline biological and archaeological surveys, which included an effort to identify plant species that would be flooded by the new dams being constructed. These taxonomic efforts documented 372 species within CURE (Flowers et al. 1962), of which 260 species have been confirmed in the past two decades. Over the next 34 years, small collections were made by Charles Clark and Dean Einwalter, Susan Engel, and various researchers. In 1995, NPS seasonal employees, Alex Tonneson and Cheryl O'Brien, collected more than 200 specimens for the CURE herbarium, confirmed a majority of species collected by Flowers and others, and added 71 new species to the recreation area list. Most additions to the list since 1995 were the result of NCPN vegetation mapping efforts and focused inventories of springs and seeps (Springer et al. 2006). The NCPN initiated a floristic study of BLCA with University of Colorado plant taxonomists in 2002, which was conducted from 2003 to 2004 by Tim Hogan, Nan Lederer, Dina Clark, and Luke Tembrock (Hogan et al. 2005). An updated and verified vascular plant list for the recreation area resulted from this effort and was used for this report (Hogan et al. 2009).

Vegetation classification plots (262 total) were located and sampled in BLCA and CURE between the years 1993 through 1997 and evaluated by NatureServe classification ecologists for this project (Von Loh et al. 2002). These plots were recorded on Colorado Plateau Vegetation Advisory Committee (CPVAC) Vegetation Record forms and were variable in size ranging from approximately 30 m^2 to 4.0 ha. The CPVAC was formed to standardize a Colorado Plateau vegetation classification approach in relation to automated, GIS database requirements (Deshler 1993). A handbook entitled Colorado Plateau Vegetation Advisory Committee Delineation Manual (1992) was prepared to explain the methods and techniques for vegetation sampling. This handbook is based on the Brown, Lowe, and Pase (1979) vegetation classification system of climax plant dominants.

Exotic Plant Management

Presently, 89 of the 679 plant species (13.1%) known to occur within CURE are non-native, and twenty three species are considered noxious weeds by the State of Colorado (Figure 16, Hogan et al. 2009). Some non-native species were imported accidentally by livestock, maintenance and construction activities, and visitors. Other species were intentionally introduced for food (chicory (*Cichorium intybus*), burdock (*Arctium minus*)), forage (reed canarygrass (*Phalaris arundinacea*), smooth brome (*Bromus inermis*), orchard grass (*Dactylis glomerata*)), or bank/soil stabilization (crested wheatgrass (*Agropyron cristatum*), intermediate wheatgrass (*Thinopyrum intermedium*), yellow sweetclover (*Melilotus officianalis*)). Early settlers to the area arrived in the mid 1800s and established homesteads and ranches, introducing some of the first non-native plants to the area for livestock forage and food. More recently, development of roads, campgrounds, trails, picnic areas, visitor centers, etc. to accommodate increased visitation since the 1960s contributed to the establishment of non-native species.

Although no Exotic Plant Management Plan now exists for the recreation area, CURE manages for invasive species because of three concerns: (1) effects to native plant communities and the wildlife that use them; (2) effects to natural river processes and aquatic and riparian resources; and (3) concerns for downriver agricultural producers regarding increased invasions of nonnative forbs and grasses into irrigated pastures and other farmland. During the past decade, resource management staff at CURE have mapped populations of and controlled via mechanical, manual, and chemical methods the non-native riparian shrub salt-cedar *(Tamarix ramosissima)*, along with about 20 other non-native plant species throughout the recreation area (Bockus 2010).



Photo Credit: USU Weed Survey Crew

Figure 16. Three species of knapweed (*Centaurea* spp.) are listed as noxious weeds in CURE.

Project Overview

General Approach and Timeline

The goals of this project were to inventory, describe, and map the existing vegetation at Curecanti National Recreation Area and its environs. The CURE project is part of a larger effort undertaken by the NCPN to classify and map vegetation in the 16 network parks. In order to facilitate coordination among network mapping projects, the NCPN developed standardized databases, mapping conventions, reporting standards, and naming conventions.

The NCPN vegetation classification and mapping program was launched in July 2001 at a scoping meeting among network park staff, NCPN staff, and potential project cooperators. Following this meeting, NCPN prepared a multi-year, multi-park project proposal to the USGS/NPS Vegetation Characterization Program to cost-share network I&M funding with the National Vegetation Characterization Program funding to complete vegetation maps for all network parks (Evenden 2001). Meetings to determine the CURE project boundary, biophysical model parameters, supplemental fuels data, and park specials were held in the spring of 2002. Table 3 is a timeline for the completion of major project components.

NCPN negotiated interagency agreements with the USDA Aerial Photography Field Office and the USDI Bureau of Reclamation Remote Sensing and Geographic Information Group to acquire aerial photography for each park, including CURE. Stereo aerial photography for CURE was flown during June 2002 overflight; orthophotography processing was complete in July 2003.

Table 3. Timeline for CURE vegetation mapping project tasks.

TASK DESCRIPTION	2001	2002	2003	2004	2005	2006-2007	2008-10
Planning and Scoping							
Acquire Aerial Imagery							
Field Data Collection							
Photo Interpretation							
Vegetation Classification							
Local & Global Descriptions							
Spatial Database							
Field Key to Plant Associations							
Accuracy Assessment							
Final Report and Products							

Vegetation classification plot and observation point data were collected by BLCA/CURE ecologists from 2001-2004, mainly during the summer and early fall seasons of 2001 and 2002, and supplemented by NCPN ecologists in 2003 and e^2M ecologists in 2002. The field sampling strategy was developed by the BLCA ecologist, Ginger Bradshaw, guided by a gradsect polygon or biophysical unit coverage prepared by Michael Schindel of NatureServe. Vegetation plot data

were entered into a MS Access database developed for the project and were analyzed during the fall of 2003. Analysis indicated that some vegetation types and sections of the recreation area were undersampled, prompting additional targeted vegetation sampling during the 2004 field season. These targeted field observations were tailored to meet the needs of photo-interpreters and they are less detailed than are plot or observation data. These data were not entered into the plot database but typically were used to produce narrative descriptions of plant communities for the photo-interpreter. These data were also used to refine the final classification. All the data were analyzed by ecologists (Julie Thompson and Matthew Smith) contracted by e^2M, who prepared local plant association descriptions based on preliminary vegetation classification during 2003 and 2004 and final local descriptions during 2004 following standardization of the process by NCPN, with minor revisions through 2010. Global plant association descriptions were completed by NatureServe ecologists in 2005. An illustrated field key to CURE plant associations was developed by e^2M ecologists prior to map accuracy assessment (AA) for CURE in 2005 and field tested during the initial stages of the AA.

Aerial photointerpretation (PI) and digital database development for the CURE vegetation map was completed by the PI consultant (Gerald Manis) and SEUG GIS Specialist during the fall and winter of 2004, and spring of 2005. The PI consultant met with BLCA/CURE ecologists during the 2003 and 2004 field season to conduct a reconnaissance of the mapping area, collect observation notes, and develop a general understanding of vegetation patterns at CURE. Map units or classes were defined for the project. A traditional PI/transfer/attribute mapping approach was employed by SEUG, supported by head's-up interpretation on the computer screen. Polygon attribution followed standards developed by NCPN for all park mapping projects (Evenden 2004). A guide to the map classes was drafted in 2004 and revised in 2006 and 2010.

A draft map and spatial database were completed for CURE in early summer 2005. Accuracy assessment data collection was completed by e^2M ecologists during the late summer and fall months of 2005 for CURE. AA data were entered into the CURE project database and then analyzed, with results tabulated into a contingency matrix. An AA meeting was held at ARCH with project cooperators from NPS, NatureServe, and e^2M in March 2006 for CURE to determine which map classes should be retained and which should be combined because they failed to meet the 80% accuracy standard. Final revisions were made to the vegetation classification, map, and spatial database during early and mid 2010.

Primary Partners and Project Roles

Many individuals working for several agencies and organizations were involved in completing the CURE Vegetation Mapping Project. The roles of each contributor are described below.

engineering-environmental Management, Inc.

- *Jim Von Loh, Senior Biologist* – prepared project work plan, helped prepare agendas and compile minutes for project meetings, managed AA field data collection, collected plot, observation point, and AA data, wrote draft field key and draft association local descriptions
- *Sharon Anderson, Ph.D., Plant Taxonomist* – Assisted with work plan development and classification plot data collection
- *Peter Williams, Consultant*– wrote sections of the final report
- *Dan Niosi, Staff Ecologist* – assisted with work plan development, production, and project meeting minutes, collected plot and observation point data

- *Jack Doria, Database Programmer* – developed the plots database
- *Frank (Buddy) Smith, Consulting Botanist* – collected plot and observation point data
- *Matthew Smith, Karin Edwards* – Conducted AA point data collection and entry, provided final report support
- *Wanda Lafferty* – assisted with preparing and editing the work plan contracted the printing
- *Gerald Manis, Consulting GIS Specialist* – photointerpretation and attribution of map classes as a subcontractor selected by NPS

Colorado Natural Heritage Program

- *Karin Decker, Ecologist*– editor of the final report

National Park Service, Northern Colorado Plateau Network

- *Angie Evenden, Ph.D., Vegetation Program Manager* – overall project coordination and management, set NCPN project standards, organized project meetings, managed budgets, agreements and contracts
- *Janet Coles, Vegetation Ecologist* – editor and co-author of the final report; coordinated creation of final products
- *Amy Tendick, Vegetation Ecologist* – editor and co-author of the final report; coordinated creation of final products; assisted with photointerpretation and edits to the attribution of map classes
- *Margaret Beer, Data Manager* – project database development
- *Helen Thomas* – project database support, photo database development
- *Russ DenBleyker* – project database support and QC
- *Bruce Condie, Sarah Topp, Biological Technicians* – collected plot and observation point data
- *Gery Wakefield, GIS Team Leader* – provided project boundary coverage, scanned and transferred PI work to a digital database, annotated polygons, assisted with final report, database, developed target preliminary plots and target accuracy assessment plots for field sampling using NVMP standards, generated final accuracy assessment contingency table
- *Aneth Wight, GIS Technician* – produced geodatabase; plots database support, project metadata

National Park Service, Black Canyon of the Gunnison National Park

- *Ken Stahlnecker, Chief of Resources* – managed project ecologist and vegetation sampling team and reviewed draft report
- *Danguole Bockus, Ecologist* – managed project ecologist and vegetation sampling team, provided logistical support, and reviewed draft report
- *Sarah Beetch, GIS Specialist* – provided GIS support
- *Ginger Bradshaw, Ecologist* – directed the field sampling program, provided classification plot data collection, data entry, QA/QC, reviewed draft local descriptions, reviewed the field key to plant associations, provided draft report information
- *J. Blum, Jessica Divens, M. Hart, D. Hedesh, J. Miller, D. Osborn, S. Ragusa, M. Rice, T. Ritz, T. Root, M. Sawyer, D. Smith, K. Truax, Biological Technicians* – collected plot and observation point data, completed data entry and preliminary QC

U.S. Department of Agriculture Aerial Photo Field Office

- *Cindy Sessions, Contracting Officer* – procured aerial photography (9" x 9" stereo coverage)
- *Mark Cox, Photography Specialist* – provided QA/QC of photography, developed photo index

USDI Bureau of Reclamation Remote Sensing and Geographic Information Group

- *Alan Bell, Photography Specialist* – provided aerial photo contract specifications, subcontracted with Horizons, Inc. for aerial photography and production of color DOQQs for project area, provided

QA/QC of orthoimagery
- *Janet Coles, Ecologist* – prepared preliminary photointerpretation, trained NPS ecologists in plot sampling and photointerpretation techniques
- *Dan Cogan, Ecologist, GIS Manager* – provided preliminary photointerpretation and PI instruction
- *Kathy Fenton, GIS Manager* – prepared preliminary photointerpretation

USGS Rocky Mountain Geographic Mapping Center

- *Tom Owens, Photography Specialist* – analyzed aerial photography, PI training, reviewed legacy data

NatureServe

- *Marion Reid, Senior Regional Ecologist* – project manager, reviewed classification
- *Janet Coles, Regional Ecologist* – reviewed preliminary classification and assigned final NVC names, reviewed field key and draft local descriptions, wrote global descriptions, analyzed AA data
- *Keith Schulz, Regional Ecologist* – prepared global association descriptions, edited and wrote final local association descriptions, tested field key
- *Michael Schindel, TNC Oregon Ecologist* – generated gradsect sampling design
- *Kathy Carsey, CNHP Ecologist* – Provided site review
- *Kristin Snow, Assistant Ecologist/Ecological Information Manager* – developed format for NCPN plant association local and global descriptions

U.S. Geological Survey – National Park Service National Vegetation Mapping Program

- *Mike Story, NPS Program Leader* – provided national level program oversight
- *Karl Brown, Ph.D., USGS Program Leader* – provided national level program oversight
- *Tammy Hamer, Vegetation Mapping Program Biologist* – facilitated generation of final products

Aerial Photography

High-quality aerial photography of an appropriate scale is an important part of all USGS-NPS National Vegetation Mapping Program projects. Orthophotography provides a base image for mapping vegetation in a digital format and is the basis for interpreting vegetation patterns. Stereo photographs acquired vertically from a fixed-wing aircraft, with adequate overlap, allow three-dimensional, high-resolution photointerpretation when viewed under a stereoscope (Avery 1978). At the beginning of the NCPN vegetation mapping program, network staff decided to acquire new stereo aerial photography, as well as orthorectified imagery at a 1:12,000 scale for eleven park units, including CURE.

To maximize cost savings, the NCPN acquired aerial photography concurrently for several park units. In order to minimize shadow effects associated with canyon topography and maximize vegetative expression, the goal was to minimize the sun angle by flying as close as possible to noon on the summer solstice (June 21). True color aerial photography was chosen because it minimizes the effects of shadows in deep canyons. It was also determined that true color photography would best illustrate the vegetation patterns of the park units being mapped.

Stereoscopic Aerial Photo Coverage

NCPN contracted with the USDA - Farm Services Agency Aerial Photography Field Office (APFO) to acquire new 23 cm x 23 cm (9 in x 9 in) true color aerial photographs for CURE. The imagery was acquired on June 18, 2002, by Blue Skies Consulting, LLC of Albuquerque, New Mexico. The photography was acquired at a nominal elevation of 6,000 ft (1,829 m) above

ground level in a Cessna T210N aircraft. A Wild RC10 camera with 15.2 cm (6 in) lens was used with Kodak Aerocolor negative film. The target scale for this photography was 1:12,000 (1 in = 1,000 ft). The mission was designed with approximately 30% sidelap between flight lines and 60% overlap between photos. The project encompassed both BLCA and Curecanti NRA. The CURE portion covered 489 linear km (304 miles) divided among 20 flight lines and 385 individual photos (Figure 17).

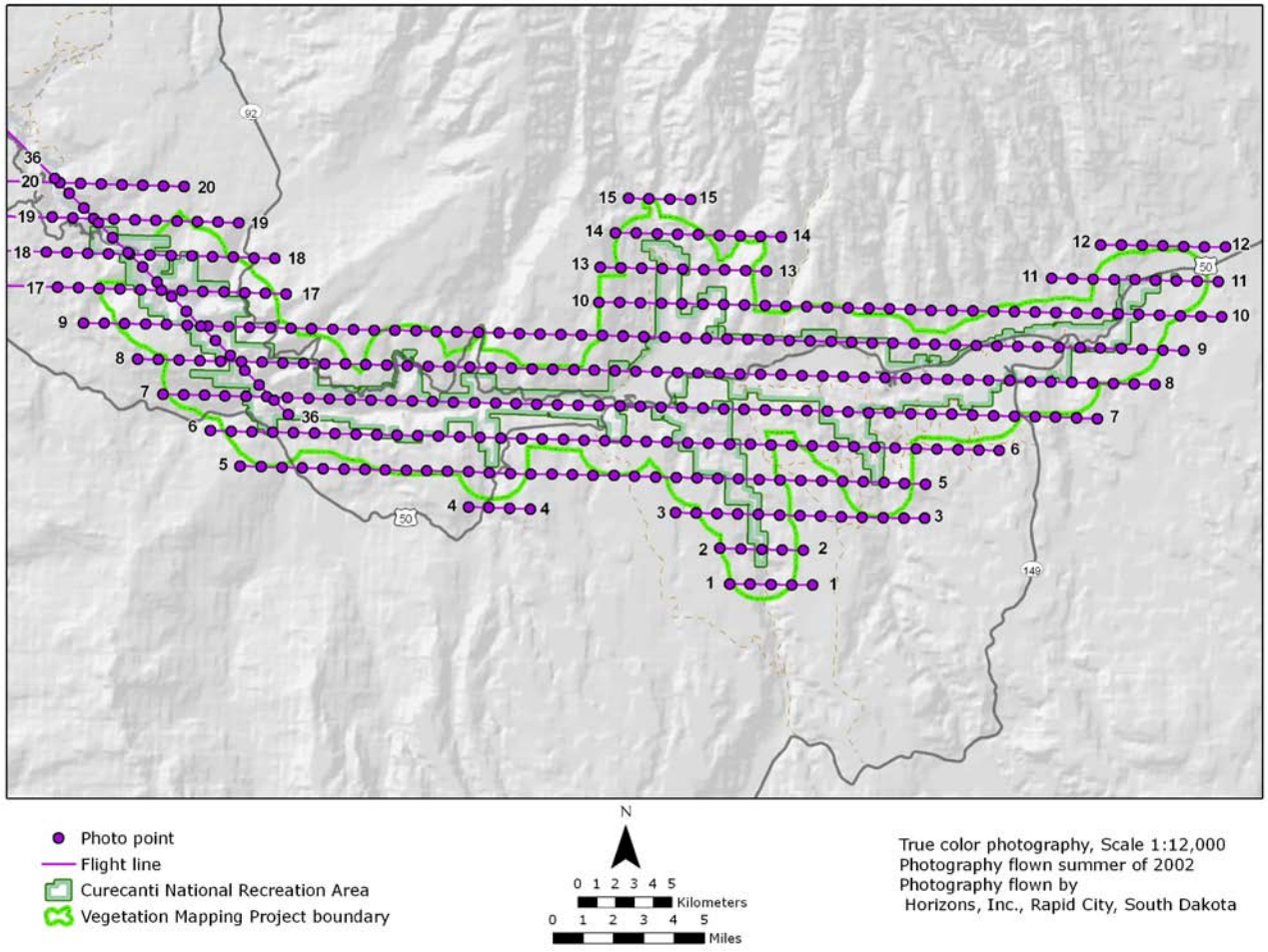


Figure 17. Flight lines for the 2002 stereo aerial photograph coverage of CURE.

Figure 18 is an example of the 23 cm x 23 cm aerial stereo photographs for CURE. These photographs were used for photo interpretation during the mapping phase of the project, as well as by field crews during plot data collection. The film negatives for this aerial photo coverage are permanently stored at the APFO in Salt Lake City, Utah. The APFO made two sets of color prints. One set was distributed to CURE and the other is retained at the NCPN offices in Moab, Utah.

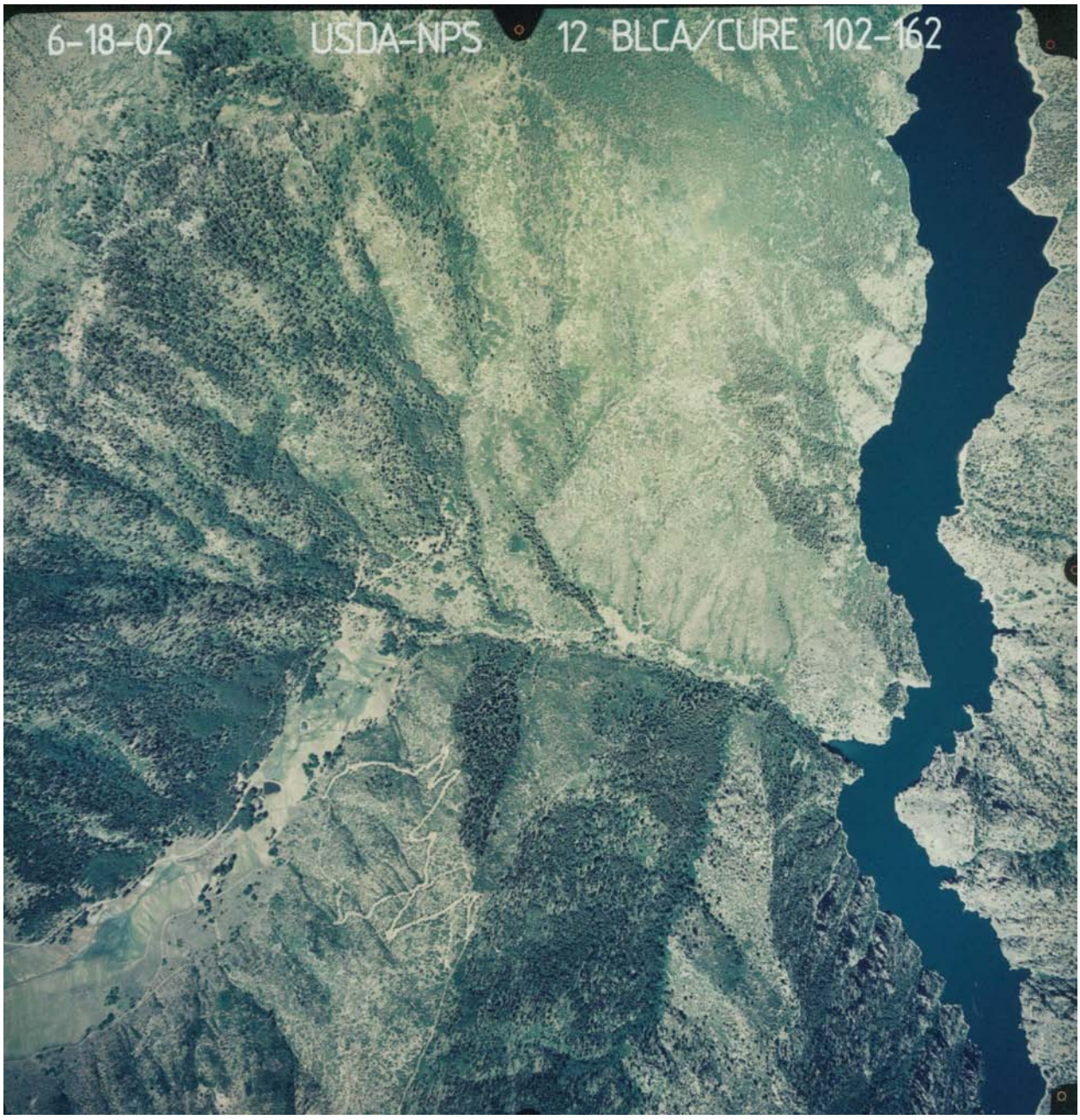


Figure 18. Example of a 9” x 9” stereo aerial photograph taken for the CURE vegetation classification and mapping project.

Digital Orthophotos

The USDI Bureau of Reclamation Remote Sensing and Geographic Information Group in Denver, Colorado, produced 1:12,000 scale digital orthophotography for CURE from new imagery . This work was subcontracted to Horizons Inc. of Rapid City, South Dakota. The photography was flown on June 18, 2002, at a mean above ground level elevation of 6,096 m (20,000 ft). Sidelap was approximately 40% and overlap about 60%. Airborne global positioning system (GPS) data were collected for each exposure. A Zeiss RMK 15/23 camera with a 15.2 cm

(6 in) lens was used with AGFA100 film. Aerial coverage was similar to the stereo photo imagery (Figure 18).

The original film was scanned at 21 microns to create pixels of approximately 0.84 m. Horizons, Inc. created a photographic mosaic by extracting the high quality image from the center of each photograph and stitching them together digitally. The photographic mosaic was then magnified to the 1:12,000 scale and corrected through a computational process that warps and stretches the image between known control points. The orthorectification process removes distortion caused by tilting of the camera and scale variation of the terrain. Control points for the orthorectification were obtained from USGS digital elevation model (DEM) 10 m data, aero triangulation data, and airborne GPS data. The X, Y, Z, omega, phi, and kappa for each photograph were calculated by Horizons, Inc. Final adjustments to the digital orthophoto database were solved using Erio Technologies ALBANY software. ALBANY is a simultaneous least squares bundle adjustment, which is designed for use with airborne GPS. Color adjustment of the final orthophoto coverage was achieved by visually matching the tone, contrast, and brightness to the original film. Each scanned image was checked for missing data as the final quality assurance step.

The composite image covering the project area was inspected for tone balance and image distortion. In areas of image distortion, imagery from a slightly different angle on an adjacent photo was inserted where possible. The final orthophotos were visually inspected for accuracy and consistency. Some areas of the final orthophoto imagery remain blurred due to the extreme terrain and limitations of the USGS DEM data. Film negatives for CURE 2002 color digital orthophotos are permanently archived in airtight containers at the USBOR Remote Sensing and Geographic Information Group offices in Denver, Colorado.

Project Boundary and Map Extent

A project environs was added (a strip approximately 1.6 km (1 mile) wide around the recreation area boundary) by network and CURE staff at the May 14, 2002 scoping meeting (Figure 2). The total project mapping area is 48,639 hectares (120,189 acres). Of this area, 17,068 ha (42,176 acres) are within the CURE boundary and 31,571 ha (78,013 acres) are in the environs. The environs were delineated to provide data to support management coordination on adjacent private, NPS, USFS, and BLM managed lands.

Minimum Mapping Unit

A standard 0.5 ha (1.24 acres) minimum mapping unit (MMU) was employed in the CURE vegetation mapping project. The major exception was that project photointerpreters attempted to delineate all wetland vegetation, regardless of stand size.

Ecological System Classification

The NCPN elected to use the ecological system (ES) classification structure developed by NatureServe (Comer et al. 2003, NatureServe 2003) as a framework for organizing and presenting plant community data. An ES is defined as a group of plant associations from two or more alliances that tend to co-exist in a given landscape due to similar ecologic processes, substrates, and/or environmental gradients. The ES classification was developed to provide larger scale classification units for application to resource management, mapping, and conservation. Current estimates are that Colorado includes more than 80 ecological systems (NatureServe 2008). This approach complements the NVC; the finer-scale associations provide a

basis for interpreting larger-scale ES patterns and concepts. A description of each of ecological system identified in CURE appears in Appendix A.

The ecological system classification addresses natural landscapes. Land-use categories used to identify developed areas are described elsewhere in this report. Twenty one ES units are known to occur within the CURE vegetation mapping project area (in alphabetic order with NatureServe identifying codes):

- Colorado Plateau Mixed Low Sagebrush Shrubland (CES304.762)
- Colorado Plateau Pinyon-Juniper Woodland (CES304.767)
- Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (CES304.776)
- Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)
- Inter-Mountain Basins Mixed Salt Desert Scrub (CES304.784)
- Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)
- Inter-Mountain Basins Semi-Desert Grassland (CES304.787)
- Inter-Mountain Basins Semi-Desert Shrub-Steppe (CES304.788)
- Inter-Mountain Basins Shale Badland (CES304.789)
- Southern Rocky Mountain Ponderosa Pine Woodland (CES306.648)
- Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
- Rocky Mountain Aspen Forest and Woodland (CES306.813)
- Rocky Mountain Cliff, Canyon and Massive Bedrock (CES306.815)
- Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)
- Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)
- Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)
- Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)
- Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)
- Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825)
- Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)
- Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

Vegetation Classification and Description

Pre-Field Methods

Preliminary Classification List

NatureServe compiled a preliminary list of vegetation associations and alliances for BLCA/CURE in 2002. This list was developed by intersecting NVC associations and alliances (e.g., NatureServe 2008) with Bailey ecoregions (Bailey 2001). Previous vegetation classification work, floristic information for CURE, the recreation area's plant species list, and expert local knowledge were used to refine the list. This process resulted in a preliminary list of 206 plant associations for the vegetation mapping project area (Von Loh et al. 2002). This association list was a useful gauge for estimating and planning field work and for assigning provisional association names to vegetation plots and observation points.

Legacy Data Review

Existing vegetation data for BLCA/CURE were reviewed for possible use in the classification. The primary dataset reviewed contained data from 262 sites sampled in 1993, 1994, 1995, and 1997 under the provisions of the Colorado Plateau Vegetation Advisory Committee (CPVAC). These data were determined to be useful for vegetation classification (TNC 1996). The vegetation classification presented in this report was derived from the legacy data and new field data collected specifically for the CURE vegetation mapping project.

Field Methods

The primary purpose of classification plot data was to document the composition and structure of CURE vegetation and associated environmental conditions. These data became the basis for classifying the vegetation at the recreation area. Field methods used in gathering new data for this project followed national program standards (e.g., TNC and ESRI 1994a, 1994b). Data gathered during this project also contribute to understanding vegetation relationships across broader landscapes beyond the boundaries of the recreation area. The plot dataset was enhanced by collecting observation point data, whose primary purpose was to support photo interpretation.

In addition to the basic vegetation data collected at each plot, the NCPN and park staff defined fuels and summary data fields to meet needs of network managers. Plot forms and individual data field descriptions appear in Appendix B.

Field Sampling Approach

The sampling area included the entire recreation area as well as public lands in the environs. Private lands in the environs as well as private inholdings within the recreation area were only visited when landowners agreed to grant access when contacted by NPS staff. Because the project area is topographically complex and access can be difficult, the areas to be sampled were selected in advance of the field season. The selection was based on biophysical units (BPUs) designed to ensure that all major environmental settings were visited and a good spatial dispersion of sample plots was achieved.

The BPUs were constructed by layering geology, solar budget, precipitation gradient, and slope information. The result was a set of polygons representing unique combinations of these environmental factors. The "cost" (distance from road or trail multiplied by a factor accounting for steep slopes) of accessing each polygon was calculated, and the polygons deemed too

difficult to access were withdrawn. A random sample of polygons representing each combination of factors became the target areas for sampling, although field crews were encouraged to use their judgment and sample areas outside the BPUs if they contained unusual vegetation types.

Field crews were led by ecologists with experience sampling plant communities in national parks and other landscapes. The list of 206 potential plant associations provided a starting point for naming communities sampled in the field. The sampling goal was to collect between three and five plots in every vegetation association within the CURE project area. However, some common associations were sampled more often to represent their range of variability, including among geologic substrates, and some rare types were sampled less often, as a result of difficulties encountering these types. An effort was made to achieve good spatial distribution of plots across the landscape and to capture the full range of variation of each association. Areas within CURE that were not accessible for sampling included steep walled canyon sides, dam sites of reservoirs, pinnacles and cliffs on mesas, and recreation area locations that were accessed through private land where permission to cross was denied.

More than one hundred vegetation plots were sampled by BLCA/CURE natural resources staff in 2000 in support of a park-managed vegetation mapping project. Review of these data found that many were placed in ecotones, lacked identification to the species level, or had imprecise cover data and therefore did not meet the data standards of the USGS-NPS vegetation mapping program. Of the original 2000 data set, only 14 plots were retained, all as observation points. An additional 87 plots and 3 observation points were collected by field crews in 2001. Field data were collected following USGS-NPS protocols during the 2002 and 2003 field seasons. One hundred forty two plots and 79 observation points were sampled in 2002 and 52 plots and 3 observation points in 2003.

Plot Data Collection

Field crews located classification plots subjectively within biophysical units in order to best represent the association being sampled. Crews also had the option of locating plots outside of BPUs. Ecotones (areas where two or more plant communities intermix) were avoided in general, except for broad transitional areas between pinyon-juniper woodlands and Gambel oak shrublands. Highly disturbed areas were also avoided unless they covered several hectares. Plots were generally located in stands exceeding the minimum mapping unit (MMU) of 0.5 hectares. A few plots were sampled in smaller patches of distinctive vegetation or communities of rare species, such as hanging gardens and riparian terraces, and a few plots, pre-August 2001, were sampled as larger rectangles (1,000 m²) in homogenous stands. Plot size and shape requirements were consistent with national Vegetation Mapping Program guidelines (TNC and ESRI 1994a). Plot size was determined by the physiognomy of the community being sampled (Table 4). CURE plot shape was adjusted as needed to sample linear bands of vegetation in drainage bottoms. Plot size and shape were recorded for all plots.

Table 4. Plot sizes used for vegetation classification sampling at CURE.

Vegetation Class	Area (m^2)	Radius (m)
Forest and Woodland	400	22.6
Shrubland	400	22.6
Herbaceous	100	11.3

Within each plot, field staff estimated and recorded an array of vegetation and environmental data using the field forms in Appendix B and data definitions in Appendix C. Four categories of data were collected for vegetation plots (Table 5):

- location and plot identifiers
- environmental description
- vegetation description
- other information

Location and Plot Identifiers CURE staff requested that the vegetation plot locations not be permanently marked. The bounds of each plot were marked temporarily using measuring tapes. The Universal Transverse Mercator (UTM) coordinates at the center of each plot were recorded (Zone 12, NAD83) on Trimble or Garmin hand-held GPS receivers. Other data fields documenting the location of each plot are listed in Table 5 and are described in detail in Appendix C. Locations were recorded on topographic maps during each field trip to avoid duplication of effort and to ensure good spatial distribution of sampling points within the recreation area.

Table 5. General plot data categories and specific data components collected at each vegetation classification plot.

Plot Data Category	Data Components
Location and Plot Identifiers	Plot code, park name, site name, state, county, quad name, BPU code, GPS unit, GPS file ID, UTM coordinates, UTM zone, GPS error, 3D differential, survey date, surveyor names, directions to plot, plot dimensions, photograph documentation
Environmental Description	Elevation, slope, aspect, topographic position, landform, geology, Cowardin wetland type, hydrologic regime, ground cover, soil texture, evidence of disturbance and animal use
Vegetation Description	Height and cover of all strata, cover by species, physiognomic type, provisional association name, plot representativeness
Other Information	Narrative description of the setting of the plot; describes adjacent communities, note unusual ecological processes, continue descriptions from other narrative fields

Environmental Description The physical characteristics of each plot were documented in both categorical and narrative fields (Table 5; Appendix B). These characteristics included physical site features (elevation, slope, aspect, topography), hydrology, geology, and soils. Description of the ground surface included an estimate of the cover of rocks, sand, litter, bare soil, biological soil crust, moss, and lichen. A narrative field was provided for a general description of the plot setting and the influence of disturbance and environmental factors on the vegetation.

Vegetation Description Every vascular plant species in each plot was assigned to one of 14 physiognomic strata (Appendix B). Within each stratum, the investigator recorded height and cover class for all species and by stratum using the cover class scales in Table 6. Differences in cover class scales used for field sampling in 2000 versus those used between the years 2001-2003 were resolved in the database and are noted in Table 7. Beginning in 2002, field crews also

began recording percent canopy cover by species (recorded for approximately 44% of all plots completed in CURE). Consistent and repeatable cover estimates were obtained by training field crews to relate the area occupied by an individual species to the area of the entire plot. When it was not possible to identify a species in the field, plant material was collected and pressed for later identification. All plant material collected for identification was destroyed in analysis. Provisional plant association names were assigned to each plot using the preliminary association list and professional judgment.

Other Information Field crews were encouraged to record general observations on how well the plot represented the stand, the relationship of site conditions to vegetative patterns, adjacent vegetation, and site disturbance history. The overall character of the vegetation and features of each plot were recorded in two or more 35 mm color slide photographs.

Table 6. Vegetation cover and height classes used in the CURE vegetation mapping project.

Species and Strata Canopy Cover Classes				Strata Height Classes			
Code	***Range***	***Code***	***Range***	***Code***	***Range***	***Code***	***Range***
0	0 (outside plot)	04	25-50%	01	<0.5 m	06	10-15 m
T	<1%	05	50-75%	02	0.5-1 m	07	15-20 m
P	1-5%	06	75-100%	03	1-2 m	08	20-35 m
01-a	1-10%			04	2-5 m	09	35-50 m
01-b	10-25%			05	5-10 m	10	> 50 m
03	5-25%						

Table 7. Reconciled differences in cover classes used in 2000 vs. 2001-2003 in the CURE vegetation mapping project.

Cover Code used in database	Range	2000 Code used on data sheets	2001-2003 Code used on data sheets
0	0 (outside plot)	n/a	n/a
T	<1%	n/a	01
P	1-5%	n/a	02
01-a	1-10%	01	n/a
01-b	10-25%	02	n/a
03	5-25%	n/a	03
04	25-50%	03 (25-60%)	04
05	50-75%	n/a	05
06	75-100%	04 (60-100%)	06

Data Processing and Analysis

Two hundred eighty one vegetation plots were sampled within the mapping project area during the 2001 through 2003 field seasons (Figure 18). Plot data were manually entered into the CURE Vegetation Mapping Project Database, developed by e²M and NCPN data management staff. This database is compatible with the data standards of the PLOTS Database System developed for the USGS-NPS Vegetation Characterization Program by TNC (1997), and revised by NatureServe in 2002. The NCPN database offers greater flexibility in overall data management than does the NatureServe PLOTS database, and is designed to accommodate all project field data recorded in plots, observation points, and accuracy assessment points. Data standards were

established by NCPN for all network vegetation mapping projects, allowing compatibility of data across network park units. Fields associated with the CURE plots database are described in Appendix C.

Each 35 mm slide associated with the project was scanned into digital format. The 1698 digital images of plots, observation points, accuracy assessment points and scenery were stored in a photograph database. A unique identifier allows each photograph to be linked with the plots and spatial databases.

Observation Points

In addition to classification plots, field crews collected vegetation and environmental data at 99 observation points from 2000-2003 (Figure 19). Data collected at observation points reflected the vegetation of a loosely undefined area around the point (the "stand") rather than a measured plot (Appendix B). Overall conditions at each observation point were documented by one or more 35mm color slide photographs. These data were intended primarily to support modeling and interpretation of the aerial imagery, but were also used to help describe plant associations. Field crews could choose to sample an observation point instead of a classification plot when:

- they were sampling a type which had been thoroughly sampled by plot work, but perhaps not in a given area
- they were sampling in an environment not conducive to laying out tapes (i.e. on vertical cliffs)
- they wished to document special features as requested by park staff such as weed patches and prairie dog colonies

A thorough quality assessment and quality check (QA/QC) was performed on all plot and observation point data following entry to the plots database. Individual plot data records were reviewed with the individual field data sheets in hand. Additional QA/QC was performed using a set of queries designed to identify inconsistencies across data fields and check for missing data. NCPN technicians standardized the scientific names in the database and noted name changes on the field forms. The primary authority used for plant names for the CURE vegetation mapping project and all other NCPN I&M projects is *A Utah Flora* (Welsh et al. 2003). Weber and Wittmann (2001) was the primary floristic key used in the field, but these names were converted to the corresponding Welsh names in the database. It is important to note that NatureServe, a primary project partner, follows Kartesz (1999) as its primary nomenclatural authority. As a result, nomenclature used in the body of this report follows Kartesz (1999), whereas nomenclature in the project database follows Welsh et al. (2003). Differences between the two nomenclatural authorities are reconciled in a crosswalk table (Appendix D).

Following completion of QA/QC procedures, the database was made available to e^2M and NatureServe ecologists for vegetation classification analysis. Slide labels were printed from the database. A GIS data layer (point data) was developed to document classification plot locations.

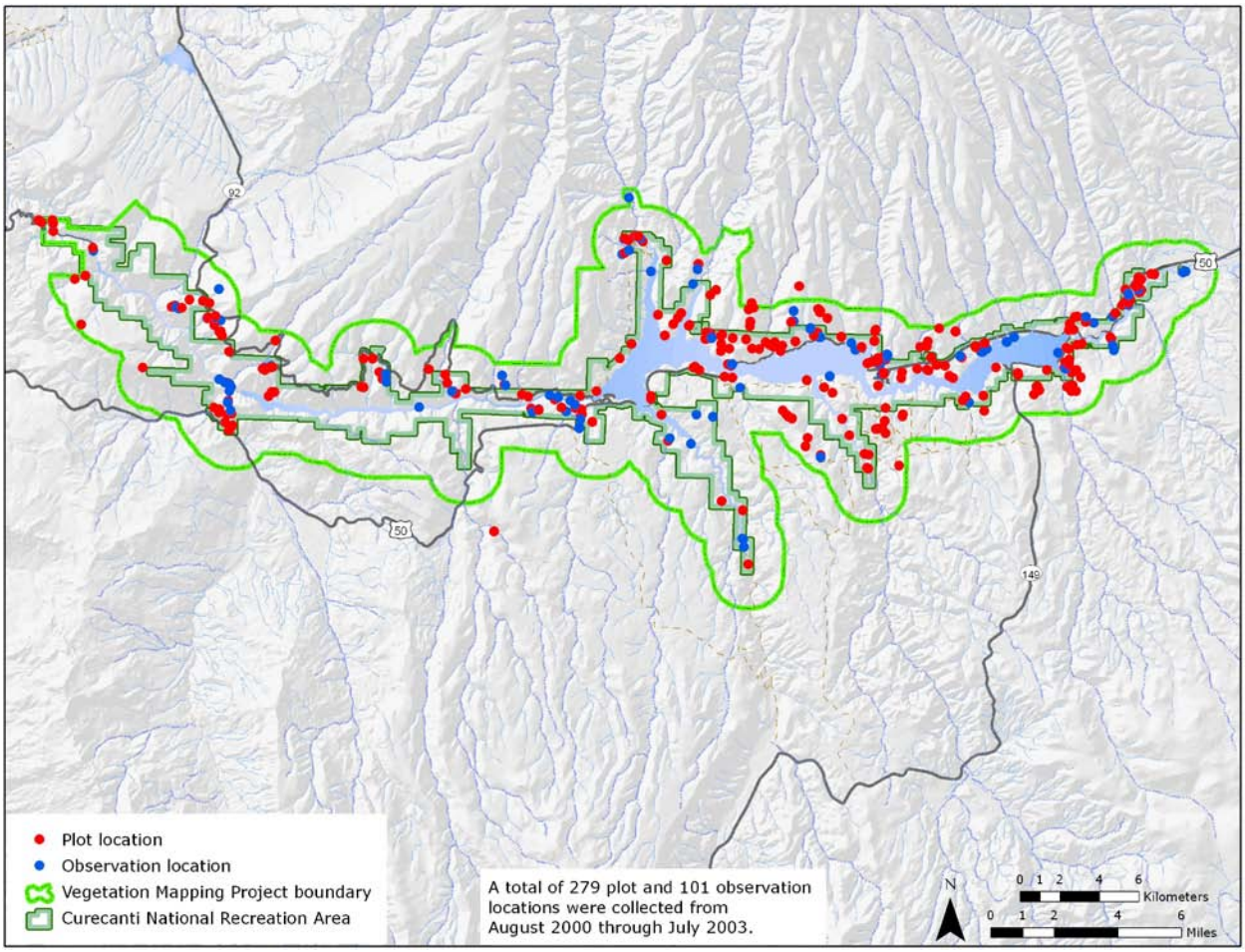


Figure 19. Vegetation plot and observation point locations in the CURE mapping project area.

Classification Data Analysis

Vegetation classification was performed jointly for CURE and BLCA and was accomplished through a multivariate analysis of classification plot data. Two hundred and ninety-five classification plots containing 366 species were available for the preliminary classification (Coles 2003). Species cover data were exported into spreadsheet format from the MS Access database and arranged into a plot by species data matrix, then imported into PC-Ord (McCune and Mefford 1999). Midpoints of canopy cover classes were used in all data analysis procedures and species with less than 1% were removed from further analysis. This step resulted in 258 species for the preliminary analysis. Values for differing strata were combined for a single species. Three classification plots containing mat saltbush (*Atriplex corrugata*) on clay barrens were unique and were removed from the dataset because the five species occurring in those plots did not occur in any other plots (Coles 2003). The entire dataset was re-analyzed following the 2003 field season using techniques used for the classification of vegetation at Natural Bridges National Monument and Arches National Park (Decker and Coles 2003).

2002 data set

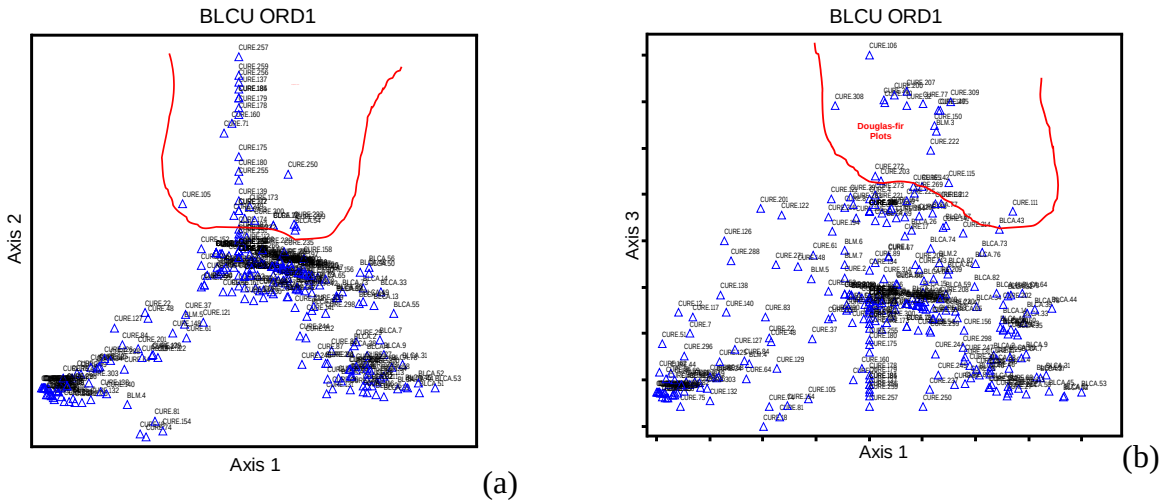
Ordinations work best on relatively homogenous data sets. In order to reduce variability in the data set, we ran several preliminary analyses to identify plots that were artificially inflating the

variability of the data. Outlier analysis (as run by PC-ORD v. 4.25) did not provide any useful information because the data were too heterogeneous (Coles 2003). Exploratory multivariate statistical analyses included predominantly Detrended Correspondence Analysis (DCA), which was used with the objective of summarizing the compositional and structural characteristics of the plant communities and assessing possible spatial patterns related to environmental gradients. Preliminary ordinations (DCA, Bray-Curtis) of the relativized data set clearly showed that the floodplain/swale/wetland (Figure 20a) and Douglas-fir plots (20b) were separate from the rest of the data. We removed these plots from the data set and analyzed them separately. Subsequent ordinations of the remainder revealed additional outlier groups of plots: pinyon-juniper (20c), black sagebrush (20d) and quaking aspen (20e).

Each group of outlier plots was removed in turn and the remaining data set re-analyzed. After this procedure was repeated four times, we couldn't identify any outlier groups, and the remaining 174 plots clumped nicely into identifiable groups (Figure 21). The few plots in the final diagram outside the final groups were assigned to a group based on their dominant species.

Bray-Curtis and DCA ordinations on the dataset produced 11 groups after the first ordination:

- Saltbush plots
- Floodplain plots
- Douglas-fir plots
- Black sagebrush plots
- Pinyon – juniper plots
- Quaking aspen plots
- Wyoming big sagebrush – Gambel oak plots
- Wyoming big sagebrush / Grass species plots
- Mountain big sagebrush plots
- Gambel oak – Serviceberry – Snowberry plots
- Grasslands and miscellaneous herbaceous plots



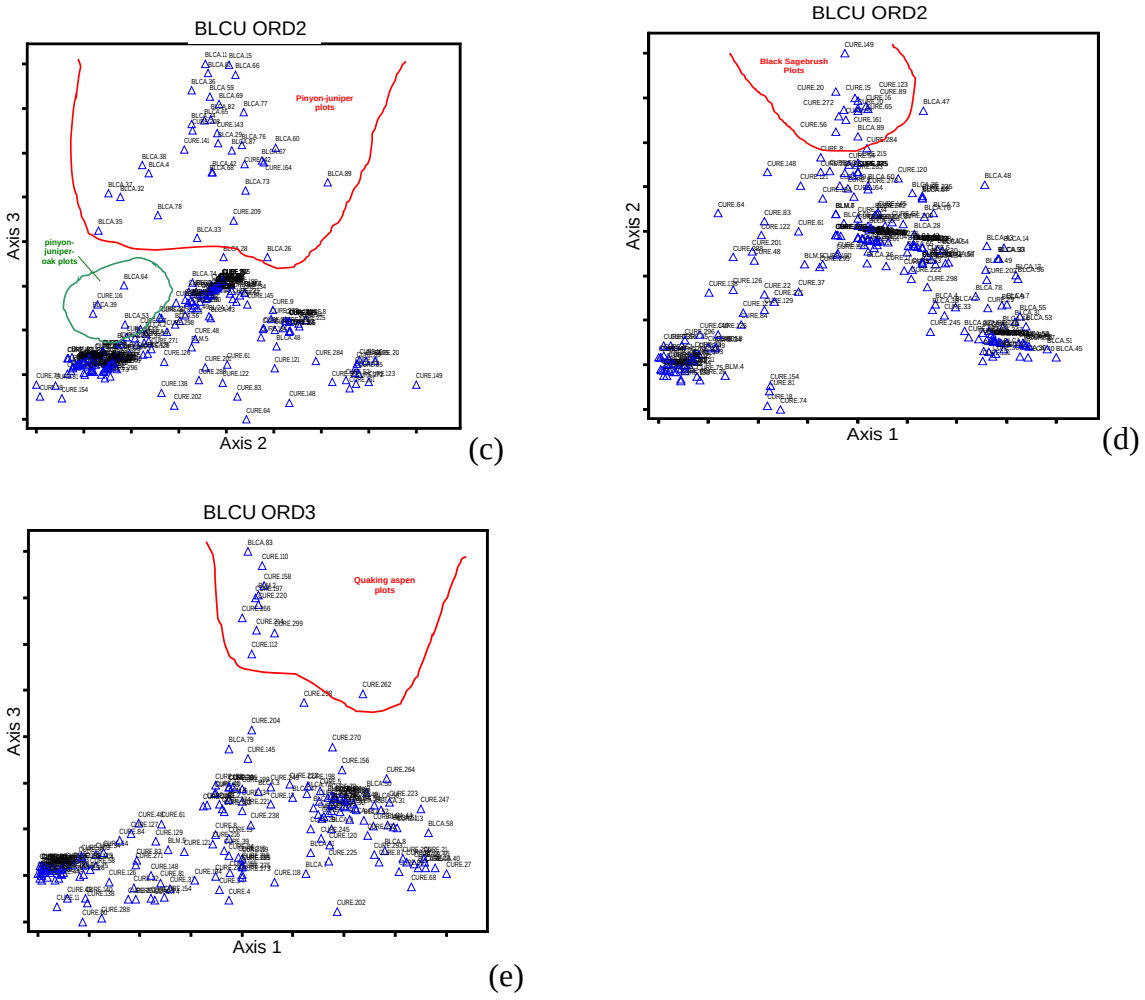


Figure 20. Bray-Curtis ordination of the 2002 relativized data matrix (292 plots, 253 species). These diagrams clearly show that the floodplain (a), Douglas-fir (b), pinyon-juniper (c), black sagebrush (d) and quaking aspen (e) plots (delineated by the red lines) are separate from the rest of the data.

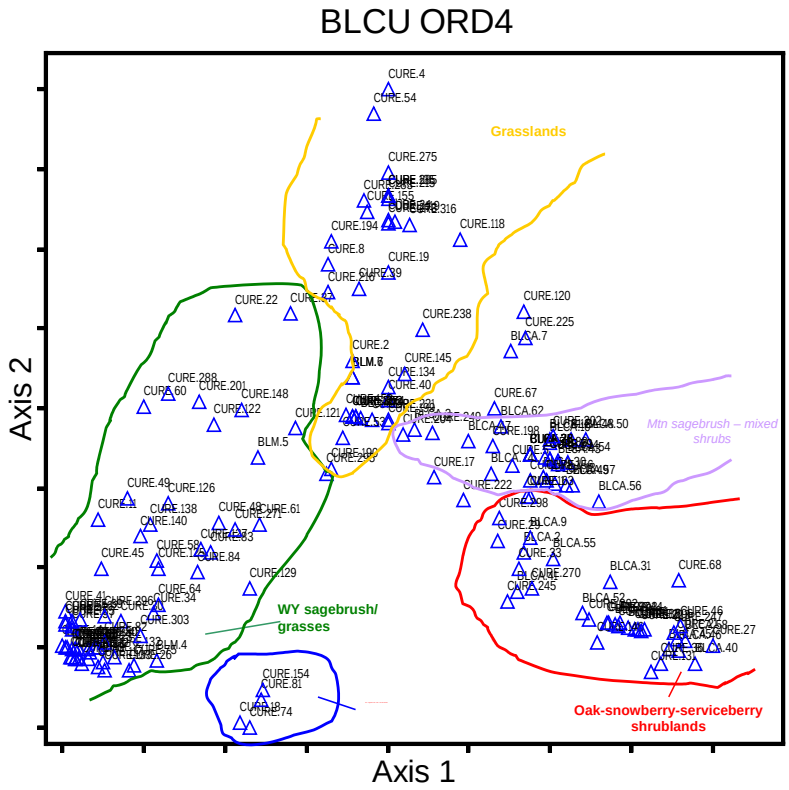


Figure 21. Detrended Correspondence Analysis of shrubland and grassland associations for BLCA/CURE.

2003 data set

Bray-Curtis and DCA ordinations on the full dataset produced uninterpretable results, with no separate groups evident as they were in 2002. Clustering analysis and Indicator Species Analysis indicated the ideal "pruning point" of the dendrogram at 10 groups. Inspection of the data supported nine groups (Figure 22), which corresponded very closely to groups that broke out in the first level of analysis of the 2002 data:

- Oak-serviceberry plots
- Mountain big sagebrush plots
- Quaking aspen plots
- Douglas-fir plots
- Pinyon-juniper plots
- Black sagebrush plots
- Wyoming big sagebrush plots
- Grassland plots
- Riparian and miscellaneous plots

To identify sub-groups, the nine groups resulting from the initial cluster analysis were analyzed with additional cluster, ISA, and ordination analyses. If the analysis indicated the presence of

subgroups, these were inspected to determine whether they were supported by the data. For eight of the groups, this technique did not reveal any strong subgroups and the plots in these groups were assigned to plant associations without further review. The largest group (Riparian and Miscellaneous) clearly required additional work (129 plots, 387 species). The eight mat saltbush plots were removed, as these had few species in common with the rest of the dataset. Species cover values were relativized in the remaining plots (species cover / total plot cover) and then subjected to additional ordination, clustering and ISA analyses. Two subgroups were revealed by this analysis, corresponding closely to the Grassland / Miscellaneous and Floodplain / Narrowleaf Cottonwood groups discovered during the 2002 analysis.

Following initial analyses, TWINSPAN was used to identify plant associations within each group, using the default PC-ORD settings (Table 8). Unlike ordination, which groups plots based on their similarity or dissimilarity, TWINSPAN accepts a group of plots and divides it based on the presence or absence of species. Each plot was provisionally assigned one of 104 association names and the entire dataset was then examined in detail by NatureServe ecologists, who attempted to fit the data to NVC. Following development of the preliminary classification, a meeting was held in April 2003 between field crews, BLCA/CURE, USBOR, and NatureServe ecologists to review the overall classification and discuss problem areas. An additional 96 classification plots sampled following the preliminary classification were analyzed manually by NatureServe ecologists during the winter of 2003. The initial analysis identified a total of 109 possible associations or groups of closely related associations.

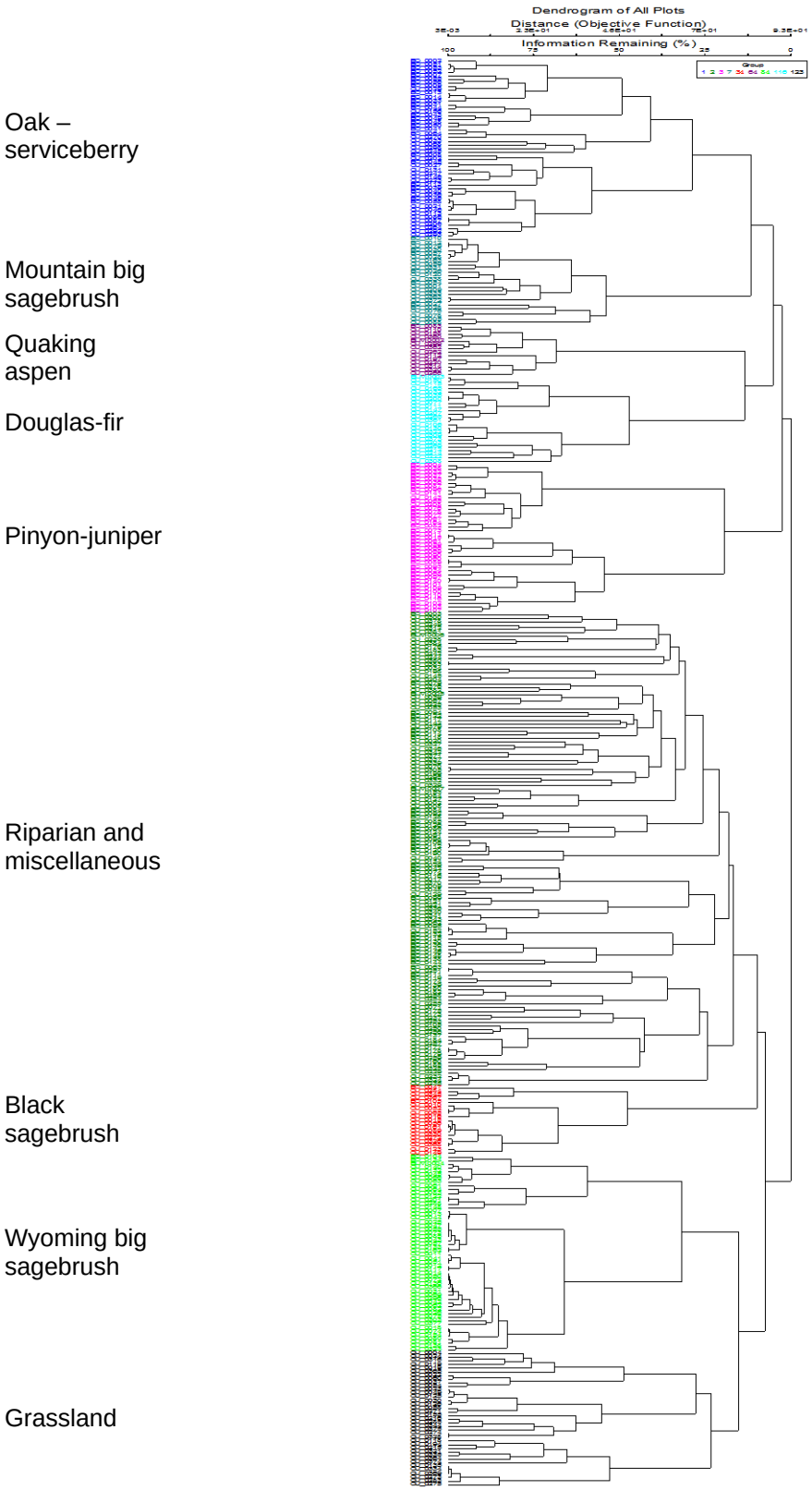


Figure 22. Cluster analysis dendrogram of BLCA/CURE plot data showing nine clusters.

Table 8. A summary of the ordination and Indicator Species Analysis results for the nine main groups identified in the BLCA/CURE cluster analysis (Figure 21).

Group	Ordination and ISA results
Oak - Serviceberry	This group is somewhat heterogeneous, because it includes several woodland plots that were included here because of sparse tree cover and dense shrub cover. In general, these plots represent the diversity of mixed mountain shrublands at BLCA-CURE. The plots were classified into six NVCS associations, one NVC alliance, and one provisional association. The provisional association was created to describe a shrub herbaceous community dominated by Gambel oak and Thurber fescue. This type may also occur on the Uncompahgre Plateau and possibly in similar highland situations in the Colorado Plateau and northwestern Colorado. It is probably uncommon, since it seems to be related to ARTRV / FETH, a G3/G4 community reported from Colorado.
Mountain big sagebrush	This group of plots includes shrublands with only a minor element of mountain big sagebrush, as well as plots where mountain big sagebrush was dominant. Many of the plots were difficult to classify, in that at BLCA-CURE, mountain big sagebrush often co-occurs with shrub and grass species usually associated with drier, lower-elevation Wyoming big sagebrush. Hybrids of Wyoming-mountain big sagebrush are also common and for convenience had to be assigned to one species or the other (Bradshaw, personal communication). The plots were placed into twelve NVC associations, two NVC alliances, and five Johnston et al. associations.
Quaking aspen	There is tremendous diversity among the quaking aspen plots sampled at BLCA-CURE; the plots classified into ten NVC types. Most of the plots are mesic; five are xeric and only one is truly wet. The quaking aspen associations at BLCA-CURE show closer affinities to northwestern Colorado types than they do to either Rocky Mountain or Colorado Plateau associations.
Douglas-fir	These plots tended to be on steeper, north-facing slopes on rocky soils. Their affinities are again to Douglas-fir types found further north and west; the Douglas-fir-white fir mixed conifer types of the San Juan Mountains are missing here. The plots were placed in six NVC associations and one provisional type. One plot was unclassifiable; it could be thought of as a Wyoming big sagebrush / Douglas-fir wooded shrubland. The provisional type was representative of open Douglas-fir stands on rocky slopes with significant sagebrush cover.
Pinyon-Juniper woodlands	Johnston, et al. (2001) doesn't cover pinyon-juniper woodlands, since they are essentially absent from the Upper Gunnison Basin. The plots were therefore placed into eight NVC associations and three provisional association. The PJ-Holodiscus dumosus provisional association was named to describe a type described by the data collectors as "representative of a large area". The PJ-black sagebrush – saline wild rye provisional association matches a type that also occurs at Dinosaur National Monument. Another provisional association deals with plots where the native understory has been replaced by cheatgrass. It may also be worth considering a fourth new association, tentatively named Pinus edulis – (Juniperus spp.) / Amelanchier utahensis Woodland. Six of the pinyon-juniper plots would fit this type better than the associations in which they were placed (PIED-(JUNIPE) / ARTR2 or PIED-(JUNIPE / QUGA).
Riparian and miscellaneous	Saltbush Visual inspection of the plot data revealed two groups of NVC associations. The mat saltbush group fell into one association and one alliance; the shadscale group fell into two associations and one alliance. Narrowleaf Cottonwood This type tends to have poorly developed and/or highly disturbed understory layers at BLCA-CURE. It was therefore difficult to place many of the plots securely into associations described by Johnston, et al. (2001) , or the NVC. The plots were placed, with varying degrees of confidence, into seven NVC associations, one NVC alliance, two Johnston, et al. (2001) associations and two provisional types. The provisional types were needed to account for plots dominated by exotic species. Floodplain This type is similar to the narrowleaf cottonwood group in that at least

Table 8. A summary of the ordination and Indicator Species Analysis results for the nine main groups identified in the BLCA/CURE cluster analysis (Figure 21).

Group	Ordination and ISA results
	one diagnostic layer tends to be poorly developed and/or highly disturbed. The plots were placed, with varying degrees of confidence, into 17 NVC associations, three NVC alliances, and one semi-natural provisional type. One plot was unclassifiable.
Black sagebrush	These plots fit poorly into the associations described by the NVC and by Johnston et al., so they were all placed within the *Artemisia nova* Shrubland Alliance of the NVC.
Wyoming big sagebrush	This large group included all plots with significant Wyoming big sagebrush cover. The plots in this group were placed into 11 NVC associations, one NVC alliance, and six Johnston et al. (2001) associations. One major subgroup was plots with Wyoming big sagebrush and black sagebrush as co-dominants. Although these plots were grouped into the *Artemisia nova* Shrubland Alliance, they may merit consideration as a new association, as the type is widespread and predictable in the Upper Gunnison Basin.
Grassland	Additional ordinations of this heterogeneous group revealed seven smaller groups of plots: galleta grasslands, winterfat-Indian ricegrass shrub-herbaceous, needle-and-thread grasslands, blue grama grasslands, Great Basin wildrye grasslands, ponderosa pine woodlands, and cheatgrass-dominated grasslands. The remaining plots were analyzed individually and compared with descriptions of NVC and Johnston, et al. (2001) associations. Altogether, the plots in this heterogeneous group were placed into 19 NVC associations, nine NVC alliances, one Johnston, et al. association, and two provisional associations. One provisional association is a placeholder to account for a diverse group of plots that represent rocky, windswept ridge tops with sparse vegetation. This is a type that has not been described in any published classification scheme. The other provisional association covers cheatgrass-dominated plots.

Classification Results

The draft final classification for CURE was issued by NatureServe in 2006, and underwent several revisions prior to release of the final classification in April 2010. Revisions included amending the classification to include 21 new associations identified during the accuracy assessment phase, amending local descriptions based on finding a rare association to be much more common during the accuracy assessment phase, and updating assignments of associations to ecological systems.

The vegetation of the CURE mapping project area is classified into 131 community types (Table 9). Of these, 128 are described at the plant association level; the other three are described as ‘park specials’ either because they occur only in small stands or because they appear to be unique to the recreation area. Park specials are not assigned to NVC associations or alliances. Twenty-one of the associations are documented exclusively from data gathered during accuracy assessment. The vegetation of the mapping project area is moderately diverse, including 58 NVC alliances and 21 ecological systems. Quaking aspen woodlands and sagebrush (*Artemisia* spp.) shrublands dominate the vegetation, accounting for 40 associations.

Each association, alliance, or park special is represented by between at least one and as many as 156 samples (vegetation plot, observation point, or AA point). Samples for each type are listed in Appendix E. Types with only one plot may have been rare in the recreation area, or were simply

undersampled as a result of difficult access or the limitations of the biophysical unit sampling design. Many of the types that appeared to be rare after the initial sampling were found to be more common during accuracy assessment.

Table 9. Classified plant associations for the Curecanti National Recreation Area vegetation mapping project area, arranged by ecological system within each physiognomic group*.

NVC Association	Common Name	Code†
UPLAND ASSOCIATIONS		
FORESTS		
Rocky Mountain Aspen Forest and Woodland (CES306.813)		
Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Calamagrostis rubescens Forest	Quaking Aspen / Saskatoon Serviceberry - Mountain Snowberry / Pinegrass Forest	CEGL000567
Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Mixed Graminoid Forest	Quaking Aspen / Saskatoon Serviceberry - Mountain Snowberry / Mixed Graminoid Forest	CEGL002816
Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Thalictrum fendleri Forest	Quaking Aspen / Saskatoon Serviceberry - Mountain Snowberry / Fendler's Meadowrue Forest	CEGL000569
Populus tremuloides / Carex geyeri Forest	Quaking Aspen / Geyer's Sedge Forest	CEGL000579
Populus tremuloides / Ceanothus velutinus Forest	Quaking Aspen / Tobacco-brush Forest	CEGL000581
Populus tremuloides / Invasive Perennial Grasses Forest	Quaking Aspen / Invasive Perennial Grasses Forest	CEGL003748
Populus tremuloides / Juniperus communis / Carex geyeri Forest	Quaking Aspen / Common Juniper / Geyer's Sedge Forest	CEGL000588
Populus tremuloides / Juniperus communis / Lupinus argenteus Forest	Quaking Aspen / Common Juniper / Silver-stem Lupine Forest	CEGL000589
Populus tremuloides / Mahonia repens Forest	Quaking Aspen / Creeping Oregon-grape Forest	CEGL000594
Populus tremuloides / Prunus virginiana Forest	Quaking Aspen / Chokecherry Forest	CEGL000596
Populus tremuloides / Quercus gambelii / Symphoricarpos oreophilus Forest	Quaking Aspen / Gambel Oak / Mountain Snowberry Forest	CEGL000598
Populus tremuloides / Symphoricarpos oreophilus / Thalictrum fendleri Forest	Quaking Aspen / Mountain Snowberry / Fendler's Meadowrue Forest	CEGL000616
Populus tremuloides / Symphoricarpos oreophilus Forest	Quaking Aspen / Mountain Snowberry Forest	CEGL000610
Populus tremuloides / Tall Forbs Forest	Quaking Aspen / Tall Forbs Forest	CEGL000618

Table 9. Classified plant associations for the Curecanti National Recreation Area vegetation mapping project area, arranged by ecological system within each physiognomic group*.

NVC Association	Common Name	Code†
Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)		
Pseudotsuga menziesii / Amelanchier alnifolia Forest	Douglas-fir / Saskatoon Serviceberry Forest	CEGL000420
Pseudotsuga menziesii / Carex geyeri Forest	Douglas-fir / Geyer's Sedge Forest	CEGL000430
Pseudotsuga menziesii / Mahonia repens Forest	Douglas-fir / Creeping Oregon-grape Forest	CEGL000442
Pseudotsuga menziesii / Quercus gambelii Forest	Douglas-fir / Gambel Oak Forest	CEGL000452
Pseudotsuga menziesii / Symphoricarpos oreophilus Forest	Douglas-fir / Mountain Snowberry Forest	CEGL000462
Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825)		
Picea pungens / Mahonia repens Forest	Blue Spruce / Creeping Oregon-grape Forest	CEGL000395
Pseudotsuga menziesii / Acer glabrum Forest	Douglas-fir / Rocky Mountain Maple Forest	CEGL000418
Pseudotsuga menziesii / Prunus virginiana Forest	Douglas-fir / Chokecherry Forest	Park Special
WOODLANDS		
Colorado Plateau Pinyon-Juniper Woodland (CES304.767)		
Juniperus osteosperma / Artemisia nova Woodland	Utah Juniper / Black Sagebrush Woodland	CEGL000728
Juniperus osteosperma / Mixed Shrubs Talus Woodland	Utah Juniper / Mixed Shrubs Talus Woodland	CEGL002266
Juniperus scopulorum – Quercus gambelii Woodland	Rocky Mountain Juniper – Gambel Oak Woodland	CEGL002967
Juniperus scopulorum / Artemisia tridentata Woodland	Rocky Mountain Juniper / Basin Big Sagebrush Woodland	CEGL000743
Pinus edulis - (Juniperus spp.) / Holodiscus dumosus Woodland	Two-needle Pinyon - (Juniper species) / Glandular Oceanspray Woodland	CEGL002802
Pinus edulis - Juniperus osteosperma / Sparse Understory Woodland	Two-needle Pinyon - Utah Juniper / Sparse Understory Woodland	CEGL002148
Pinus edulis - Juniperus spp. / Artemisia tridentata (ssp. wyomingensis, ssp. vaseyana) Woodland	Two-needle Pinyon - Juniper species / (Wyoming Big Sagebrush, Mountain Big Sagebrush) Woodland	CEGL000776
Pinus edulis - Juniperus spp. / Cercocarpus montanus - Mixed Shrubs Woodland	Two-needle Pinyon - Juniper species / Mountain-mahogany - Mixed Shrubs Woodland	CEGL000780

Table 9. Classified plant associations for the Curecanti National Recreation Area vegetation mapping project area, arranged by ecological system within each physiognomic group*.

NVC Association	Common Name	Code†
Pinus edulis - Juniperus spp. / Poa fendleriana Woodland	Two-needle Pinyon - Juniper species / Muttongrass Woodland	CEGL000787
Pinus edulis - Juniperus spp. / Quercus gambelii Woodland	Two-needle Pinyon - Juniper species / Gambel Oak Woodland	CEGL000791
Southern Rocky Mountain Ponderosa Pine Woodland (CES306.648)		
Pinus ponderosa / Purshia tridentata Woodland	Ponderosa Pine / Antelope Bitterbrush Woodland	CEGL000867
Pinus ponderosa / Quercus gambelii Woodland	Ponderosa Pine / Gambel Oak Woodland	CEGL000870
Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)		
Pseudotsuga menziesii / Artemisia tridentata (ssp. vaseyana, ssp. wyomingensis) Woodland	Douglas-fir / (Mountain Big Sagebrush, Wyoming Big Sagebrush) Woodland	CEGL002808
Pseudotsuga menziesii / Poa fendleriana Woodland	Douglas-fir / Muttongrass Woodland	CEGL002809
SHRUBLANDS AND SHRUB-HERBACEOUS VEGETATION		
Rocky Mountain Aspen Forest and Woodland (CES306.813)		
Ceanothus velutinus Shrubland	Tobacco-brush Shrubland	CEGL002167
Colorado Plateau Mixed Low Sagebrush Shrubland (CES304.762)		
Artemisia frigida - (Bouteloua gracilis, Achnatherum hymenoides, Poa secunda) - Lichens Rocky Mesa Dwarf-shrubland	Fringed Sagebrush - (Blue Grama, Indian Ricegrass, Curly Bluegrass) - Lichens Rocky Mesa Dwarf-shrubland	CEGL002344
Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)		
Artemisia tridentata / Pleuraphis jamesii Shrubland	Basin Big Sagebrush / James' Galleta Shrubland	CEGL001005
Artemisia tridentata ssp. tridentata / Pascopyrum smithii – (Elymus lanceolatus) Shrubland	Basin Big Sagebrush / Western Wheatgrass – (Streamside Wildrye) Shrubland	CEGL001017
Artemisia tridentata ssp. wyomingensis / (Agropyron cristatum, Psathyrostachys juncea) Seeded Grasses Semi-natural Shrubland	Wyoming Big Sagebrush / (Crested Wheatgrass, Russian Wildrye) Seeded Grasses Semi-natural Shrubland	CEGL002185
Artemisia tridentata ssp. wyomingensis / Achnatherum hymenoides Shrubland	Wyoming Big Sagebrush / Indian Ricegrass Shrubland	CEGL001046
Artemisia tridentata ssp. wyomingensis / Achnatherum pinetorum Shrubland	Wyoming Big Sagebrush / Pine Needlegrass Shrubland	CEGL002810

Table 9. Classified plant associations for the Curecanti National Recreation Area vegetation mapping project area, arranged by ecological system within each physiognomic group*.

NVC Association	Common Name	Code†
Artemisia tridentata ssp. wyomingensis / Bouteloua gracilis Shrubland	Wyoming Big Sagebrush / Blue Grama Shrubland	CEGL001041
Artemisia tridentata ssp. wyomingensis / Disturbed Understory Semi-natural Shrubland	Wyoming Big Sagebrush / Disturbed Understory Semi-natural Shrubland	CEGL002083
Artemisia tridentata ssp. wyomingensis / Hesperostipa comata Colorado Plateau Shrubland	Wyoming Big Sagebrush / Needle-and-Thread Colorado Plateau Shrubland	CEGL002761
Artemisia tridentata ssp. wyomingensis / Poa fendleriana Shrubland	Wyoming Big Sagebrush / Muttongrass Shrubland	CEGL002775
Artemisia tridentata ssp. wyomingensis / Sparse Understory Shrubland	Wyoming Big Sagebrush / Sparse Understory Shrubland	CEGL002768
Ericameria nauseosa Shrubland	Rubber Rabbitbrush Shrubland	CEGL002713
Inter-Mountain Basins Mixed Salt Desert Scrub (CES304.784)		
Atriplex canescens / Achnatherum hymenoides Shrubland	Fourwing Saltbush / Indian Ricegrass Shrubland	CEGL001289
Krascheninnikovia lanata / Achnatherum hymenoides Dwarf-shrubland	Winter-fat / Indian Ricegrass Dwarf-shrubland	CEGL001323
Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)		
Artemisia nova / Poa fendleriana Shrubland	Black Sagebrush / Muttongrass Shrubland	CEGL002698
Artemisia nova / Poa secunda Shrubland	Black Sagebrush / Curly Bluegrass Shrubland	CEGL001423
Artemisia tridentata (ssp. vaseyana, ssp. wyomingensis) - Amelanchier utahensis Shrubland	(Mountain Big Sagebrush, Wyoming Big Sagebrush) - Utah Serviceberry Shrubland	CEGL002820
Artemisia tridentata ssp. vaseyana - Holodiscus dumosus Shrubland [Provisional]	Mountain Big Sagebrush - Glandular Oceanspray Shrubland [Provisional]	CEGL002807
Artemisia tridentata ssp. vaseyana / Achnatherum hymenoides Shrubland	Mountain Big Sagebrush / Indian Ricegrass Shrubland	Park Special
Artemisia tridentata ssp. vaseyana / Achnatherum pinetorum Shrubland	Mountain Big Sagebrush / Pine Needlegrass Shrubland	CEGL002806
Artemisia tridentata ssp. vaseyana / Balsamorhiza sagittata Shrubland	Mountain Big Sagebrush / Arrowleaf Balsamroot Shrubland	CEGL001020
Artemisia tridentata ssp. vaseyana / Festuca thurberi Shrubland	Mountain Big Sagebrush / Thurber's Fescue Shrubland	CEGL001024

Table 9. Classified plant associations for the Curecanti National Recreation Area vegetation mapping project area, arranged by ecological system within each physiognomic group*.

NVC Association	Common Name	Code†
Artemisia tridentata ssp. vaseyana / Hesperostipa comata Shrubland	Mountain Big Sagebrush / Needle-and-Thread Shrubland	CEGL002931
Artemisia tridentata ssp. vaseyana / Pascopyrum smithii Shrubland	Mountain Big Sagebrush / Western Wheatgrass Shrubland	CEGL001028
Artemisia tridentata ssp. vaseyana / Piptatherum micranthum Shrubland	Mountain Big Sagebrush / Little-seed Mountain Ricegrass Shrubland	Park Special
Artemisia tridentata ssp. vaseyana / Poa fendleriana Shrubland	Mountain Big Sagebrush / Muttongrass Shrubland	CEGL002812
Artemisia tridentata ssp. vaseyana / Carex geyeri Shrub Herbaceous Vegetation	Mountain Big Sagebrush / Geyer's Sedge Shrub Herbaceous Vegetation	CEGL001532
Artemisia tridentata ssp. vaseyana / Poa (pratensis, compressa) Semi-natural Shrub Herbaceous Vegetation	Mountain Big Sagebrush / (Kentucky Bluegrass, Canada Bluegrass) Semi-natural Shrub Herbaceous Vegetation	CEGL002339
Inter-Mountain Basins Semi-Desert Shrub-Steppe (CES304.788)		
Chrysothamnus viscidiflorus / Hesperostipa comata Shrubland	Green Rabbitbrush / Needle-and-Thread Shrubland	CEGL002799
Chrysothamnus viscidiflorus / Poa pratensis Semi-natural Shrub Herbaceous Vegetation	Green Rabbitbrush / Kentucky Bluegrass Semi-natural Shrub Herbaceous Vegetation	CEGL002933
Ericameria parryi / Achnatherum hymenoides Shrubland	Parry's Rabbitbrush / Indian Ricegrass Shrubland	CEGL003751
Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)		
Amelanchier utahensis - Mixed Shrub / Carex geyeri Shrubland	Utah Serviceberry - Mixed Shrub / Geyer's Sedge Shrubland	CEGL001068
Quercus gambelii - Cercocarpus montanus / (Carex geyeri) Shrubland	Gambel Oak - Mountain-mahogany / (Geyer's Sedge) Shrubland	CEGL001113
Quercus gambelii - Holodiscus dumosus Shrubland	Gambel Oak - Glandular Oceanspray Shrubland	CEGL002341
Quercus gambelii / Amelanchier alnifolia Shrubland	Gambel Oak / Saskatoon Serviceberry Shrubland	CEGL001109
Quercus gambelii / Amelanchier utahensis Shrubland	Gambel Oak / Utah Serviceberry Shrubland	CEGL001110
Quercus gambelii / Artemisia tridentata Shrubland	Gambel Oak / Basin Big Sagebrush Shrubland	CEGL001111
Quercus gambelii / Carex geyeri Shrubland	Gambel Oak / Geyer's Sedge Shrubland	CEGL005995
Quercus gambelii / Festuca thurberi Shrubland	Gambel Oak / Thurber's Fescue Shrubland	CEGL002805
Quercus gambelii / Poa fendleriana Shrubland	Gambel Oak / Muttongrass Shrubland	CEGL002949

Table 9. Classified plant associations for the Curecanti National Recreation Area vegetation mapping project area, arranged by ecological system within each physiognomic group*.

NVC Association	Common Name	Code†
Quercus gambelii / Prunus virginiana Shrubland	Gambel Oak / Chokecherry Shrubland	CEGL005994
Quercus gambelii / Rhus trilobata Shrubland	Gambel Oak / Skunkbush Shrubland	CEGL002338
Quercus gambelii / Symphoricarpos oreophilus Shrubland	Gambel Oak / Mountain Snowberry Shrubland	CEGL001117
Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)		
Cercocarpus montanus Shale Shrubland	Mountain-mahogany Shale Shrubland	CEGL002798
Cercocarpus montanus – Artemisia tridentata Shrubland	Mountain-mahogany – Basin Big Sagebrush Shrubland	CEGL005805
Prunus virginiana - (Prunus americana) Shrubland	Chokecherry - (American Plum) Shrubland	CEGL001108
HERBACEOUS		
Inter-Mountain Basins Semi-Desert Grassland (CES304.787)		
Bromus tectorum Semi-natural Herbaceous Vegetation	Cheatgrass Semi-natural Herbaceous Vegetation	CEGL003019
Hesperostipa comata Great Basin Herbaceous Vegetation	Needle-and-Thread Great Basin Herbaceous Vegetation	CEGL001705
Hesperostipa comata - Achnatherum hymenoides Herbaceous Vegetation	Needle-and-Thread - Indian Ricegrass Herbaceous Vegetation	CEGL001703
Pleuraphis jamesii Herbaceous Vegetation	James' Galleta Herbaceous Vegetation	CEGL001777
Thinopyrum intermedium Semi-natural Herbaceous Vegetation	Intermediate Wheatgrass Semi-natural Herbaceous Vegetation	CEGL002935
Inter-Mountain Basins Shale Badland (CES304.789)		
Achnatherum hymenoides Shale Barren Herbaceous Vegetation	Indian Ricegrass Shale Barren Herbaceous Vegetation	CEGL001651
Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)		
Bromus inermis - (Pascopyrum smithii) Semi-natural Herbaceous Vegetation	Smooth Brome - (Western Wheatgrass) Semi-natural Herbaceous Vegetation	CEGL005264
Leymus cinereus Herbaceous Vegetation	Great Basin Lyme Grass Herbaceous Vegetation	CEGL001479
Pascopyrum smithii Herbaceous Vegetation	Western Wheatgrass Herbaceous Vegetation	CEGL001577

Table 9. Classified plant associations for the Curecanti National Recreation Area vegetation mapping project area, arranged by ecological system within each physiognomic group*.

NVC Association	Common Name	Code†
Poa fendleriana Herbaceous Vegetation	Muttongrass Herbaceous Vegetation	CEGL001925
Poa pratensis - (Pascopyrum smithii) Semi-natural Herbaceous Vegetation	Kentucky Bluegrass - (Western Wheatgrass) Semi-natural Herbaceous Vegetation	CEGL005265
Poa secunda Herbaceous Vegetation	Curly Bluegrass Herbaceous Vegetation	CEGL001657
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)		
Agrostis (gigantea, stolonifera) Semi-natural Herbaceous Vegetation	(Giant Bentgrass, Spreading Bentgrass) Semi-natural Herbaceous Vegetation	CEGL001558
Cirsium arvense - Weedy Forbs Great Plains Herbaceous Vegetation	Canada Thistle - Weedy Forbs Great Plains Herbaceous Vegetation	CEGL005260
Conyza canadensis Semi-natural Herbaceous Vegetation	Canada Horseweed Semi-natural Herbaceous Vegetation	CEGL002800
Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)		
Elymus repens Semi-natural Herbaceous Vegetation	Creeping Wild Rye Semi-natural Herbaceous Vegetation	CEGL005868
SPARSE/TALUS/BEDROCK		
Rocky Mountain Cliff, Canyon and Massive Bedrock (CES306.815)		
Holodiscus dumosus Rock Outcrop Sparse Vegetation	Glandular Oceanspray Rock Outcrop Sparse Vegetation	CEGL002801
Pseudotsuga menziesii / Holodiscus dumosus Scree Woodland	Douglas-fir / Rockspirea Scree Woodland	CEGL000902
Pseudotsuga menziesii Scree Woodland	Douglas-fir Scree Woodland	CEGL000911
RIPARIAN, WETLAND AND MESIC ASSOCIATIONS		
RIPARIAN AND WETLAND FORESTS		
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)		
Acer negundo / Cornus sericea Forest	Box-elder / Red-osier Dogwood Forest	CEGL000625
Populus angustifolia / Rosa woodsii Forest	Narrowleaf Cottonwood / Woods' Rose Forest	CEGL000653

Table 9. Classified plant associations for the Curecanti National Recreation Area vegetation mapping project area, arranged by ecological system within each physiognomic group*.

NVC Association	Common Name	Code†
Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (CES304.776)		
Populus tremuloides – Pseudotsuga menziesii / Amelanchier alnifolia Forest	Quaking Aspen – Douglas Fir / Saskatoon Serviceberry Forest	CEGL000543
RIPARIAN AND WETLAND WOODLANDS AND SHRUBLANDS		
Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)		
Picea pungens / Alnus incana Woodland	Blue Spruce / Speckled Alder Woodland	CEGL000894
Picea pungens / Cornus sericea Woodland	Blue Spruce / Red-osier Dogwood Woodland	CEGL000388
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)		
Acer negundo / Disturbed Understory Woodland	Box-elder / Disturbed Understory Woodland	CEGL002693
Acer negundo / Quercus gambelii Woodland	Box-elder / Gambel Oak Woodland	CEGL002797
Populus angustifolia – Juniperus scopulorum Woodland	Narrowleaf Cottonwood – Rocky Mountain Juniper Woodland	CEGL002640
Populus angustifolia – Picea pungens / Alnus incana Woodland	Narrowleaf Cottonwood – Blue Spruce / Speckled Alder Woodland	CEGL000934
Populus angustifolia / Alnus incana Woodland	Narrowleaf Cottonwood / Speckled Alder Woodland	CEGL002642
Populus angustifolia / Cornus sericea Woodland	Narrowleaf Cottonwood / Red-osier Dogwood Woodland	CEGL002664
Populus angustifolia / Crataegus rivularis Woodland	Narrowleaf Cottonwood / River Hawthorn Woodland	CEGL002644
Populus angustifolia / Invasive Perennial Grasses Semi-natural Woodland	Narrowleaf Cottonwood / Invasive Perennial Grasses Semi-natural Woodland	CEGL003749
Populus angustifolia / Prunus virgniana Woodland	Narrowleaf Cottonwood / Chokecherry Woodland	CEGL000651
Populus angustifolia / Quercus gambelii Woodland [Provisional]	Narrowleaf Cottonwood / Gambel Oak Woodland [Provisional]	CEGL002804
Populus angustifolia / Rhus trilobata Woodland	Narrowleaf Cottonwood / Skunkbush Woodland	CEGL000652
Populus angustifolia / Salix exigua Woodland	Narrowleaf Cottonwood / Coyote Willow Woodland	CEGL000654
Salix exigua / Mesic Forbs Shrubland	Coyote Willow / Mesic Forbs Shrubland	CEGL001202

Table 9. Classified plant associations for the Curecanti National Recreation Area vegetation mapping project area, arranged by ecological system within each physiognomic group*.

NVC Association	Common Name	Code†
Salix exigua / Mesic Graminoids Shrubland	Coyote Willow / Mesic Graminoids Shrubland	CEGL001203
Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)		
Alnus incana / Cornus sericea Shrubland	Speckled Alder / Red-osier Dogwood Shrubland	CEGL001145
Alnus incana / Mesic Graminoids Shrubland	Speckled Alder / Mesic Graminoids Shrubland	CEGL001148
Cornus sericea Shrubland	Red-osier Dogwood Shrubland	CEGL001165
Salix geyeriana / Mesic Forbs Shrubland	Geyer's Willow / Mesic Forbs Shrubland	CEGL002666
Salix geyeriana / Mesic Graminoids Shrubland	Geyer's Willow / Mesic Graminoids Shrubland	CEGL001210
RIPARIAN AND WETLAND HERBACEOUS COMMUNITIES		
Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)		
Carex utriculata Herbaceous Vegetation	Northwest Territory Sedge Herbaceous Vegetation	CEGL001562
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)		
Juncus balticus Herbaceous Vegetation	Baltic Rush Herbaceous Vegetation	CEGL001838
Hordeum jubatum Herbaceous Vegetation	Foxtail Barley Herbaceous Vegetation	CEGL001798
Phalaris arundinacea Western Herbaceous Vegetation	Reed Canarygrass Western Herbaceous Vegetation	CEGL001474
Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)		
Carex duriuscula Herbaceous Vegetation	Needleleaf Sedge Herbaceous Vegetation	CEGL001874

* Plant associations as determined from the vegetation plot, observation point and accuracy assessment point data. Associations are ordered by physiognomy and grouped by ES. Identification codes are provided for plant associations and ecological systems. Because ES units are not constrained by physiognomy, they may appear more than once in the table.

† NatureServe assigns CEGL codes to track NVC associations within their databases. Park Specials are not part of the NVC and therefore do not have a CEGL code.

‡ The NatureServe codes following each Ecological System unit name provide a means of tracking the evolution of the concept in NatureServe's Biotics Tracking Database.

Plant Community Descriptions

This section provides a summary of CURE vegetation by physiognomic group. Appendix F provides detailed local and global descriptions of the 131 plant associations, alliances and park special vegetation types that occur within the recreation area. Local descriptions are based on plot, observation point, and accuracy assessment point data from the recreation area and environs, supplemented by input from knowledgeable NPS staff. Global descriptions characterize the association across its range and are based primarily on published and unpublished literature.

Most of the plant communities sampled at CURE fit into existing NVC association concepts, or were considered significant enough to create new NVC associations for them. Three vegetation types were considered unique to the recreation area, and were designated as Park Specials. Twelve associations were semi-natural types dominated by non-native species. Twenty one types were documented from accuracy assessment data collected after the initial classification review by NatureServe was complete.

By far the most common physiognomic types in CURE are shrublands, dominated by big sagebrush subspecies (*Artemisia tridentata*) or Gambel oak (*Quercus gambelii*), woodlands dominated by narrowleaf cottonwood (*Populus angustifolia*), and forests dominated by quaking aspen (*Populus tremuloides*) and/or Douglas-fir (*Pseudotsuga menziesii*).

Upland Forest Associations

Forested vegetation types consist primarily of quaking aspen and Douglas-fir stands that occupy some of the relatively mesic slopes, cliff bases, and canyon bottoms and comprise a majority of the vegetation types found west of Blue Mesa Reservoir. The upland forest associations of CURE include (in alphabetical order):

- *Picea pungens / Mahonia repens* Forest
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Calamagrostis rubescens* Forest
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus /* Mixed Graminoid Forest
- *Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Thalictrum fendleri* Forest
- *Populus tremuloides / Carex geyeri* Forest
- *Populus tremuloides / Ceanothus velutinus* Forest
- *Populus tremuloides /* Invasive Perennial Grasses Forest
- *Populus tremuloides / Juniperus communis / Carex geyeri* Forest
- *Populus tremuloides / Juniperus communis / Lupinus argenteus* Forest
- *Populus tremuloides / Mahonia repens* Forest
- *Populus tremuloides / Prunus virginiana* Forest
- *Populus tremuloides / Symphoricarpos oreophilus / Thalictrum fendleri* Forest
- *Populus tremuloides / Symphoricarpos oreophilus* Forest
- *Populus tremuloides /* Tall Forbs Forest
- *Pseudotsuga menziesii / Acer glabrum* Forest
- *Pseudotsuga menziesii / Amelanchier alnifolia* Forest
- *Pseudotsuga menziesii / Carex geyeri* Forest
- *Pseudotsuga menziesii / Mahonia repens* Forest
- *Pseudotsuga menziesii / Prunus virginiana* Forest [Park Sepcial]
- *Pseudotsuga menziesii / Quercus gambelii* Forest
- *Pseudotsuga menziesii / Symphoricarpos oreophilus* Forest

Upland Woodland Associations

Woodland vegetation types are moderately diverse and common, occupying many available habitats within CURE. These evergreen woodlands occupy more xeric habitats of mesas, eolian deposits, canyon rims, scree slopes, canyon walls, and alluvial fans. The upland woodland associations of CURE include:

- *Juniperus osteosperma / Artemisia nova* Woodland
- *Juniperus osteosperma /* Mixed Shrubs Talus Woodland
- *Juniperus scopulorum – Quercus gambelii* Woodland
- *Juniperus scopulorum / Artemisia tridentata* Woodland
- *Pinus edulis - (Juniperus* spp.*) / Holodiscus dumosus* Woodland
- *Pinus edulis - Juniperus osteosperma /* Sparse Understory Woodland
- *Pinus edulis - Juniperus* spp. */ Artemisia tridentata (*ssp. *wyomingensis,* ssp. *vaseyana)* Woodland
- *Pinus edulis - Juniperus* spp. */ Cercocarpus montanus* - Mixed Shrubs Woodland
- *Pinus edulis - Juniperus* spp. */ Poa fendleriana* Woodland
- *Pinus edulis - Juniperus* spp. */ Quercus gambelii* Woodland
- *Pinus ponderosa / Purshia tridentata* Woodland
- *Pinus ponderosa / Quercus gambelii* Woodland
- *Pseudotsuga menziesii. / Artemisia tridentata (* ssp. *vaseyana,* ssp. *wyomingensis)* Woodland
- *Pseudotsuga menziesii / Holodiscus dumosus* Scree Woodland
- *Pseudotsuga menziesii* Scree Woodland

Upland Shrubland Associations

The shrubland vegetation types are by far the most common and occupy a large area of CURE, particularly the associations dominated by subspecies of big sagebrush (*Artemisia tridentata*) and Gambel oak (*Quercus gambelii*). Shrublands in CURE are characterized by dwarf, short, and tall species that occupy diverse ecological situations (e.g., mesic lowlands to xeric uplands and eolian sands to alkaline shale). The upland shrubland associations of CURE include:

- *Amelanchier utahensis - Mixed Shrub / Carex geyeri* Shrubland
- *Artemisia frigida - (Bouteloua gracilis, Achnatherum hymenoides, Poa secunda)* - Lichens Rocky Mesa Dwarf-shrubland
- *Artemisia nova / Poa fendleriana* Shrubland
- *Artemisia nova / Poa secunda* Shrubland
- *Artemisia tridentata / Pleuraphis jamesii* Shrubland
- *Atemisia tridentata* ssp. *tridentata / Pascopyrum smithii - (Elymus lanceolatus)* Shrubland
- *Artemisia tridentata (*ssp. *vaseyana,* ssp. *wyomingensis) - Amelanchier utahensis* Shrubland
- *Artemisia tridentata* ssp. *vaseyana - Holodiscus dumosus* Shrubland [Provisional]
- *Artemisia tridentata* ssp. *vaseyana / Achnatherum hymenoides* Shrubland [Park Special]
- *Artemisia tridentata* ssp. *vaseyana / Achnatherum pinetorum* Shrubland
- *Artemisia tridentata* ssp. *vaseyana / Balsamorhiza sagittata* Shrubland
- *Artemisia tridentata* ssp. *vaseyana / Festuca thurberi* Shrubland
- *Artemisia tridentata* ssp. *vaseyana / Hesperostipa comata* Shrubland
- *Artemisia tridentata* ssp. *vaseyana / Pascopyrum smithii* Shrubland
- *Artemisia tridentata* ssp. *vaseyana / Poa fendleriana* Shrubland
- *Artemisia tridentata* ssp. *vaseyana / Carex geyeri* Semi-natural Shrub Herbaceous Vegetation
- *Artemisia tridentata* ssp. *vaseyana / Piptatherum micranthum* Shrubland [Park Special]
- *Artemisia tridentata* ssp. *vaseyana / Poa (pratensis, compressa)* Semi-natural Shrub Herbaceous Vegetation

- *Artemisia tridentata* ssp. *wyominensis / (Agropyron cristatum, Psathyrostachys juncea)* Seeded Grasses Semi-natural Shrubland
- *Artemisia tridentata* ssp. *wyomingensis / Achnatherum hymenoides* Shrubland
- *Artemisia tridentata* ssp. *wyomingensis / Achnatherum pinetorum* Shrubland
- *Artemisia tridentata* ssp. *wyomingensis / Bouteloua gracilis* Shrubland
- *Artemisia tridentata* ssp. *wyomingensis /* Disturbed Understory Semi-natural Shrubland
- *Artemisia tridentata* ssp. *wyomingensis / Hesperostipa comata* Colorado Plateau Shrubland
- *Artemisia tridentata* ssp. *wyomingensis / Poa fendleriana* Shrubland
- *Artemisia tridentata* ssp. *wyomingensis* / Sparse Understory Shrubland
- *Atriplex canescens / Achnatherum hymenoides* Shrubland
- *Ceanothus velutinus* Shrubland
- *Cercocarpus montanus – Artemisia tridentata* Shrubland
- *Cercocarpus montanus* Shale Shrubland
- *Chrysothamnus viscidiflorus / Heperostipa comata* Shrubland
- *Chrysothamnus viscidiflorus / Poa pratensis* Shrubland
- *Ericameria nauseosa* Shrubland
- *Ericameria parryi / Achnatherum hymenoides* Shrubland
- *Holodiscus dumosus* Rock Outcrop Sparse Vegetation
- *Krascheninnikovia lanata / Achnatherum hymenoides* Dwarf-shrubland
- *Prunus virginiana – (Prunus americana)* Shrubland
- *Quercus gambelii - Cercocarpus montanus / (Carex geyeri)* Shrubland
- *Quercus gambelii - Holodiscus dumosus* Shrubland
- *Quercus gambelii / Amelanchier alnifolia* Shrubland
- *Quercus gambelii / Amelanchier utahensis* Shrubland
- *Quercus gambelii / Artemisia tridentata* Shrubland
- *Quercus gambelii / Carex geyeri* Shrubland
- *Quercus gambelii / Festuca thurberi* Shrubland
- *Quercus gambelii / Poa fendleriana* Shrubland
- *Quercus gambelii / Prunus virgniana* Shrubland
- *Quercus gambelii / Symphoricarpos oreophilus* Shrubland

Short shrublands dominated by sagebrush species are the most common, with varying understories of grasses generally sorted by elevation and moisture gradients. Some sagebrush shrublands have withstood alterations including chaining and mowing as well as grazing impacts and introduction of invasive species such as Kentucky bluegrass (*Poa pratensis*).

On lower slopes of mesas at middle and upper elevations, tall shrublands of Gambel oak, serviceberry, and mountain mahogany form a complex mosaic with big sagebrush. The clonal character of Gambel oak causes it to form clumps within other communities, with a distinct suite of species in the understory.

At the lowest elevations and concentrated in the environs of the recreation area are the saltbush and winterfat dominated shrublands typically occurring on alkaline clay soils. These communities are frequently species-poor but some harbor rare and endemic species such as clay-loving buckwheat (*Eriogonum pelinophilum*). These communities are also subject to degradation through grazing, off-highway vehicle (OHV) use, and invasion by weeds such as cheatgrass (*Bromus tectorum*).

Upland Herbaceous Associations

Herbaceous vegetation types are uncommon within CURE and often occur as patches smaller than the minimum mapping unit size of ½ hectare. Herbaceous stands represent several ecological situations and habitats, both natural and human-influenced, and generally occupy xeric uplands that have been affected by grazing livestock and wildlife (in rare instances burrowing wildlife, as well), and in some cases by fire. Herbaceous stands are becoming invaded by shrubs and trees resulting in the formation of shrub and wooded herbaceous associations. Forb plant associations are rare in CURE, except for the broad vegetation band occupying the Blue Mesa Reservoir shoreline. Other forb-dominated sites include historic burns and dry mesa tops. The upland herbaceous associations of CURE include:

- *Achnatherum hymenoides* Shale Barren Herbaceous Vegetation
- *Bromus inermis - (Pascopyrum smithii)* Semi-natural Herbaceous Vegetation
- *Bromus tectorum* Semi-natural Herbaceous Vegetation
- *Cirsium arvense* - Weedy Forbs Great Plains Herbaceous Vegetation
- *Conyza canadensis* Semi-natural Herbaceous Vegetation
- *Elymus repens* Semi-natural Herbaceous Vegetation
- *Hesperostipa comata* Great Basin Herbaceous Vegetation
- *Hesperostipa comata – Achnatherum hymenoides* Herbaceous Vegetation
- *Leymus cinereus* Herbaceous Vegetation
- *Pascopyrum smithii* Herbaceous Vegetation
- *Pleuraphis jamesii* Herbaceous Vegetation
- *Poa fendleriana* Herbaceous Vegetation
- *Poa pratensis - (Pascopyrum smithii)* Semi-natural Herbaceous Vegetation
- *Poa secunda* Herbaceous Vegetation
- *Thinopyrum intermedium* Semi-natural Herbaceous Vegetation

Riparian Forest and Woodland Associations

Riparian forest and woodland vegetation types consist primarily of narrowleaf cottonwood stands, as well as boxelder and blue spruce stands that occur along the Gunnison River floodplain and in its tributary canyons, in ravines, along small stream channels, and adjacent to old hay meadows. They vary according to the availability of water. Boxelder woodlands dominate the riverside alluvium of the canyon bottom, where a lack of flushing river flows allowed establishment of this tree as well as its weedy understory. Riparian forest and woodland associations of CURE include:

- *Acer negundo / Cornus sericea* Forest
- *Acer negundo / Disturbed Understory Woodland*
- *Acer negundo / Quercus gambelii* Woodland
- *Picea pungens / Alnus incana* Woodland
- *Picea pungens / Cornus sericea* Woodland
- *Populus angustifolia – Juniperus scopulorum* Woodland
- *Populus angustifolia – Picea pungens / Alnus incana* Woodland
- *Populus angustifolia / Alnus incana* Woodland
- *Populus angustifolia / Cornus sericea* Woodland
- *Populus angustifolia / Crataegus rivularis* Woodland
- *Populus angustifolia /* Invasive Perennial Grasses Semi-natural Woodland
- *Populus angustifolia / Prunus virginiana* Woodland
- *Populus angustifolia / Quercus gambelii* Woodland [Provisional]
- *Populus angustifolia / Rhus trilobata* Woodland

- *Populus angustifolia / Rosa woodsii* Forest
- *Populus angustifolia / Salix exigua* Woodland
- *Populus tremuloides / Quercus gambelii / Symphoricarpos oreophilus* Forest
- *Populus tremuloides – Pseudotsuga menziesii / Amelanchier alnifolia* Forest

Riparian Shrubland Associations

Riparian shrubland vegetation types consist of alder, dogwood, coyote willow, and Geyer willow stands that occur along the Gunnison River floodplain and in its tributary canyons, in ravines, along small stream channels, and adjacent to old hay meadows. They vary according to the availability of water. Riparian shrubland associations of CURE include:

- *Alnus incana / Cornus sericea* Shrubland
- *Alnus incana* / Mesic Graminoids Shrubland
- *Cornus sericea* Shrubland
- *Salix exigua* / Mesic Forbs Shrubland
- *Salix exigua* / Mesic Graminoids Shrubland
- *Salix geyeriana* / Mesic Forbs Shrubland
- *Salix geyeriana* / Mesic Graminoids Shrubland

Riparian and Wetland Herbaceous Associations

Riparian grasslands are widespread but uncommon and are restricted in their distribution to the Gunnison River floodplain, mesic lowlands and meadows (some adjacent to old hay meadows), and small drainages of the mesa top. All are restricted to areas with water at or near the surface for some or all of the growing season. Diversity is high, but most occur in patches smaller than the minimum mapping unit. Riparian and wetland herbaceous associations of CURE include:

- *Agrostis (gigantea, stolonifera)* Semi-natural Herbaceous Vegetation
- *Carex duriuscula* Herbaceous Vegetation
- *Carex utriculata* Herbaceous Vegetation
- *Hordeum jubatum* Herbaceous Vegetation
- *Juncus balticus* Herbaceous Vegetation
- *Phalaris arundinacea* Western Herbaceous Vegetation

Dense, monotypic stands of the non-native reed canary grass have become established, particularly along the Gunnison River. The seeds of this species are thought to have originally been transported from backyard feeders by birds as it is a common ingredient in bird seed.

Field Key Preparation

An illustrated dichotomous field key to plant associations of the CURE mapping area was developed for this project (Appendix G). The key is designed to assist users in identifying vegetation associations in the field. The key has two levels; the first level is defined by the physiognomy of the vegetation, i.e., forest, woodland, tall shrubland, shrubland, dwarf-shrubland, graminoid, or forb. The second level focuses on the dominant species' canopy cover. Brief environmental descriptions are included with the floristic descriptions to aid in identifying plant associations. To increase the utility of the key, individual plant associations are cross-referenced to map classes.

The association field key was constructed from data collected during the classification phase of the mapping project and revised following accuracy assessment of the map. Because the key is

based on a sample of the vegetation, it probably does not account for all associations occurring within CURE, nor does it explain the full range of variation of all associations as they appear in the recreation area.

The field key was tested by NatureServe using CURE vegetation plot data prior to its use by accuracy assessment field crews. A NatureServe ecologist selected random plots representing each association, removed the association identifier from the data and attempted to run each plot through the key using information contained in the MS Access database. Additional testing of the key occurred in the field during the accuracy assessment phase of this project. Areas where the key was confusing or unclear were identified and solutions proposed. The field key in Appendix G is the final version containing revisions based on these suggestions. It also contains the most important associations discovered during the accuracy assessment phase of the project.

Assessment of Global Rarity

CURE represents the more mesic eastern edge of the Colorado Plateau and as such is a unique landscape. Few plant associations at CURE are considered globally imperiled (NatureServe 2008); however not enough is known about many of the associations present to evaluate global rarity.

The Nature Conservancy and the Natural Heritage Network assess plant communities as to rarity and degree of imperilment by applying a global conservation status rank. The global scale for ranking ranges from 1 to 5, with a rank of “1” indicating critical imperilment due to rarity, endemism, and/or threats, and a rank of “5” indicating little or no risk of extirpation or elimination of the plant community. No plant associations occurring within CURE are considered critically imperiled (G1). There are 11 associations considered imperiled (G2):

Achnatherum hymenoides Shale Barren Herbaceous Vegetation, *Amelanchier utahensis* - Mixed Shrub / *Carex geyeri* Shrubland, *Hesperostipa comata - Achnatherum hymenoides* Herbaceous Vegetation, *Leymus cinereus* Herbaceous Vegetation, *Populus angustifolia - Juniperus scopulorum* Woodland (Figure 23), *Populus angustifolia / Crataegus rivularis* Woodland, *Populus angustifolia / Prunus virginiana* Woodland, *Populus angustifolia / Rosa woodsii* Forest, *Populus tremuloides / Ceanothus velutinus* Forest, *Pseudotsuga menziesii / Amelanchier alnifolia* Forest, and *Salix exigua* / Mesic Forbs Shrubland. Sixty-eight associations are ranked vulnerable to secure (G3, G4 and G5) and the remainder (52 associations) are not yet ranked or are new to the NVC.

Almost all vegetation communities within CURE are subject to change over time with the strong driving forces of drought, flood, and fire most likely representing the change agents. Riparian and wetland plant communities within CURE are threatened to some degree due to non-native plant species introductions. This threat is heightened because non-native plant species invade mesic habitats to a larger degree than dry, upland habitats (except recent burns, which are invaded by cheatgrass).



Figure 23. The globally imperiled *Populus angustfolia – Juniperus scopulorum* Woodland association at CURE.

Fuels Data Collection

Natural and prescribed fires are an established element of the CURE ecosystem. Under the current fire management plan, all fires are managed intensively, and suppressed if the prescribed conditions are not present (NPS 2006a). The proximity of private land, ranching operations, and developments adjacent to the recreation area boundary increases the concern associated with any fire. Information on stand structure and canopy characteristics is needed to model the potential for crown fire behavior. This information is of great importance for making fire management decisions. Fire fuels data were collected as part of the CURE vegetation mapping project, and along with new digital orthophotography, these data will assist managers with regional fire planning and management. The attributes described below were selected using the NCPN fuels protocols established for Dinosaur National Monument to supplement the vegetation plot data and map class attributes in providing a complete picture of fire fuels for CURE. These data were entered in the CURE MS Access database. Fuels data were not analyzed as part of this project.

Fuels Data

Beginning with the 2002 sampling season, field crews began collecting data to characterize woody fuels and woodland and forest canopy structure, following the forms and methods used for the Dinosaur National Monument vegetation mapping project (Coles et al. 2008), with some exceptions. In order to better characterize the structure of all woodland and forest types, height, diameter, canopy measurements and tree structure stage were estimated and recorded in some deciduous and riparian conifer stands, whereas the Dinosaur National Monument methods called for collecting these data only in pinyon-juniper, ponderosa pine and Douglas-fir stands. Quantitative fuels data collected in tree-dominated vegetation plots (except pinyon-juniper) at CURE included:

- trunk diameter at breast height (DBH)
- tree height (for deciduous species and riparian conifers)
- crown base height
- crown ratio
- structural stage (position in the canopy)
- litter and duff measurements

Different variables were measured in two-needle pinyon-Utah juniper woodland plots. Fuels data gathered for each stem or tree greater than 1.4 m (4.5 ft) in height included:

- stem diameter at root crown (DRC)
- crown base height (used primarily)
- crown height (used for 10 plots in place of crown base height)
- tree height
- crown width
- litter and duff measurements (taken only in some woodland stands and in all forest stands dominated by other species, i.e. Douglas-fir, ponderosa pine, etc.)

Field crews also collected qualitative information to support fuels categorization at each plot. Each pinyon-juniper woodland plot was placed in one of four age class categories (invasive,

young, mature, old-growth). Fuel conditions for each forest, woodland or shrubland plot were characterized by comparing the site to a photo series depicting different fuel loading conditions (USFS 2008, Ottmer et al. 2000a, Ottmer et al. 2000b, Fischer 1981) and recording the most representative photo number. Since a fuels photo series for quaking aspen or Gambel oak was not available at the time of data collection, an experienced field technician used plot photos and compared them to the fuels photo series to assign a fuels photo number. The technician also checked the pinyon-juniper fuels series data and filled in any missing data where possible. Notes describing ancillary information, including trees with dead crowns, twinning of the crown, etc. were recorded. In addition, a density attribute was applied to all sagebrush, Gambel oak, woodland, and forest polygons during the interpretation and digitizing process. Photographs taken to document conditions at all classification plots and observation points can support added fire fuels analyses. Field forms, protocols, and definitions for collecting fuels data appear in Appendix B.1 and Appendix B.3.

Vegetation Mapping

Methods

The process of mapping vegetation and land use in the CURE project area followed four steps:

1. Field reconnaissance
2. Map class development
3. Mapping
4. Spatial database development

Each step built upon the previous one. Field reconnaissance was intended to familiarize the photointerpreters with the recreation area, patterns of vegetation distribution, and environmental factors useful for developing mapping models. Map class development followed field reconnaissance and was based on intensive review of the aerial imagery in concert with data from the first year of vegetation plot sampling. The mapping phase applied the map class concepts to interpret and draw consistent, homogenous polygons on the base orthoimagery. The draft polygon set was digitized and attributed (spatial database development).

Field Reconnaissance and Map Class Development

Field reconnaissance by the BLCA/CURE plant ecologist and NCPN photo interpreter was conducted following vegetation/classification plot data collection during the summer and fall of 2003. The lead project ecologist joined the photo interpreter to familiarize him with CURE vegetation and local ecological relationships during two field sessions in the spring of 2004. Reconnaissance sessions focused on comparing site-based vegetation conditions with signatures on the project aerial photography, examining the accuracy of preliminary linework produced by the USBOR remote sensing staff, understanding environmental factors that influence vegetation patterns, and identifying those signatures that could be accurately interpreted from the true-color imagery. Prior to visiting the recreation area, paper plots of the orthoimagery were created for use in fieldwork, along with the original color stereo photography prints mounted with Mylar overlays for recording notes. Field notes were written directly on the plots and photograph overlays and were used for guidance during the interpretation, polygon attribution, and digital database process. Additional field reconnaissance data were collected during the 2004 field season that were tailored to meet the need of the photo interpreter and used to produce narrative descriptions of plant communities.

The goal of map class development was to identify meaningful units to represent existing vegetation and land uses for the CURE vegetation mapping project area. Map classes specific to this project were developed to characterize distinctive vegetation within the recreation area and the environs. Standard land-use map classes (Anderson et al. 2002) were used to map developed parts of the mapping area including recreation area facilities and roads. In unvegetated portions of the project area, map classes were defined by the geologic substrate and land use type. The same map classes were used within the recreation area and in the environs.

Interpretation and attribution of vegetation map classes addressed all types meeting the 0.5-hectare MMU. The mapping standard for the USGS-NPS Vegetation Mapping Program is to map to the association level of the NVC. Meeting this standard, however, is limited by the skill and experience of the photo interpreter, the quality of the available imagery, and the quantity and

quality of supporting information. In practice, relationships between map classes and plant associations within a project area are complex. Distinguishing floristic relationships on aerial photography is often difficult and as a result similar plant associations may be grouped into a single map class. Map classes for the CURE project were developed by the photo interpreter in consultation with the BLCA/CURE plant ecologist. A preliminary set of map classes was developed in the fall of 2003 using the results of the initial vegetation classification by NatureServe ecologists. Some map classes were represented by single plant associations and others were represented by groups of plant associations. Map class definitions and concepts were adjusted throughout the project as more information became available.

Polygon Attributes

In order to facilitate use of vegetation maps and mapping data across multiple parks, the NCPN adopted a convention for naming and presenting map classes. For each map class representing an NVC plant association, the NatureServe common name (e.g., Pinyon - Juniper / Gambel Oak Woodland) was used. Names for map classes representing complexes of associations followed the convention of using the unifying botanic and environmental factors, e.g., Shale Barrens Sparse Shrublands.

To facilitate tracking and management of vegetation map class information, NCPN developed a map class coding system. Photo interpreters tend to assign a unique number to each map class as shorthand for labeling polygons. These numeric codes have been retained within the spatial database and map class guide (Appendix J). NCPN developed five-letter alpha code system for map classes to be used in all park vegetation mapping projects. Each alpha code begins with the first letter of the corresponding NVC Class (F = Forest, W = Woodland, S = Shrubland, H = Herbaceous, N = nonvascular, and C = Complex). The subsequent four letters generally abbreviate the map class name. For example, the Pinyon - Juniper / Gambel Oak Woodland map class is represented by the alpha code “W-PJQU.” For map classes representing coarser levels of the NVC, geologic exposures, and other non-vegetated features, generic names incorporating vegetation and landscape features were used. Developed or barren sites were given the prefix L = land cover/land use.

Photo interpretation and polygon labeling and attribution procedures were standardized for all park vegetation mapping projects (Evenden 2004). After a map class was assigned to each polygon, the polygon was assigned attributes to characterize vegetation structure (density, pattern, height; Table 10), land use and disturbance. All map polygons were assigned to a land cover / land use type (Anderson et al. 2002; Appendix H). In addition, all polygons were assigned to higher levels of the NVC hierarchy, with the exception of non-vegetated map classes, which were coded as ‘unclassified’ or ‘unvegetated’ in the NVC columns.

Table 10. Physiognomic attributes of polygons. In some cases, these attributes were assigned to individual polygons. Otherwise, they were assigned to an entire map class.

Category	Attribute	Description
Vegetation Canopy Density	A	Closed Tree Canopy/Continuous (> 60% cover)
(Applied to forest, woodland, and	B	Open Tree Canopy/Discontinuous (25- 60% cover)
shrub-dominated map classes)	C	Dispersed – Sparse Tree Canopy (10-25% cover)
	D	Dense Shrub Canopy (> 40% cover)
	E	Light Shrub Canopy (10 – 40% cover)
Vegetation Pattern	1	Clumped/Bunched
(Applied to all vegetation map classes)	2	Linear
	3	Gradational/Transitional
	4	Regularly Alternating
	5	Homogenous
Vegetation Height	F	Forest and Woodlands > 30 meters tall
(Applied to woody terrestrial vegetation	G	Forest and Woodlands 15 – 30 meters
map classes only)	H	Forest and Woodlands 5 – 15 meters
	I	Forest and Woodlands 1 – 5 meters
	J	Forest and Woodlands < 0.5 meters
	K	Shrublands 1 – 5 meters
	L	Shrublands 0.5 – 1 meters
	M	Shrublands 0 – 0.5 meters

NCPN photo interpretation standards (Evenden 2004) defined a suite of polygon modifiers to describe altered vegetation, landforms, transportation and utilities, and other situations. Table 11 is a list of the modifiers used in the CURE project.

Table 11. Modifiers used to provide additional information for map polygons in the CURE vegetation mapping project area.

Category	Code	Name	Description
Vegetation Modifiers	a	Altered	Applies when some alteration is present, but the type is visually indistinguishable from unaltered stands
	b	Black sagebrush	Applies to systems where black sagebrush (*Artemisia nova*) may be present to dominant in the shrub layer
	f	Douglas-fir	Applies to quaking aspen (*Populus tremuloides*) stands where Douglas-fir (*Pseudotsuga menziesii*) may be a component in the canopy (present to co-dominant)
	i	Invasive	Applies to systems invaded or dominated by exotic plant species
	m	Older Burned	Applies to systems disturbed by burns more than one year old (as seen in photography).
	p	Prairie dog activity	Applies to systems disturbed by prairie dogs.

Table 11. Modifiers used to provide additional information for map polygons in the CURE vegetation mapping project area.

Category	Code	Name	Description
Landform Modifiers	q	Bare talus and rockfall	Rock fragments, usually large and angular, derived from and lying at the base of cliffs or steep rocky slopes.
	r	Bare exposed rock/sandstone cliff	Bedrock outcrops forming flat expanses, ledges, and hills, and vertical exposures of sedimentary rock.
	s	Sandbar	Cobble, gravel, sand and/or silt
Transportation Modifiers	t	Paved Road	A transportation corridor (travel lanes, median strips, interchanges, shoulders, borrow ditches and right-of-way) consisting of a roadbed overtopped by an asphalt or concrete surface. Right-of-way typically extends to the limit of cut and fill slopes associated with construction.
	u	Gravel/dirt Road	A transportation corridor (travel lanes, borrow ditches, and right-of-way) consisting of a roadbed of imported gravel or graded native soil and subsoil. Cut and fill slopes associated with construction may or may not be present.

Mapping

The mapping component of the CURE project used a combination of methods to interpret and delineate vegetation polygons. Initial line work was prepared by USBOR photointerpreters who delineated the most contrasting signatures, e.g., water bodies, exposed shoreline, unvegetated geology, land use types, and vegetation at the physiognomic level. The project photo interpreter used this baseline mapping and refined it by examining digital orthophotos in stereo. The stereo photography was used as needed to distinguish fine scale vegetation patterns. Ancillary datasets including plot and observation point data and classification and local descriptions of plant associations were used by the photointerpreter to assist with map class definitions and guide manual delineations. Polygons were drawn on Mylar overlays of printed orthophotos that were later scanned, or were drawn digitally on a computer screen. Heads-up digitizing consisted of delineating map class polygons on an electronic version of the digital orthophotos at a computer workstation. Digitizing was performed using vector editing in ArcGIS. The line work was refined and finalized by the SEUG GIS Specialist and the map class and other descriptive attributes for each polygon were assigned. The recreation area and the environs were interpreted and mapped to the same level of detail.

Spatial Database Development

Each polygon was assigned a map class number, alpha code, and name, Anderson land use class, and vegetation density, pattern, and height attributes. In order to improve the utility of the map and related data, the spatial database was moved into a geodatabase format, the general structure

of which is illustrated in Figure 24. This format allows text and image information to be incorporated and linked to spatial coordinates. A more detailed description of the geodatabase and its component data fields appears in Appendix C.

Map Classes

The original set of mapping concepts developed for CURE was based on the preliminary vegetation classification developed by NatureServe from 2000-2003 plot data. The intent was to map individual associations, if possible, through photo interpretation or ecological modeling. In practice, the set of map classes was reduced throughout the mapping phase of the project, as the photo interpreter and project ecologists realized that some associations were difficult to recognize consistently on the imagery. These associations were combined into complex or mosaic map classes based on ecological and morphological similarity. Changes to the map classes made following the 2005 accuracy assessment are discussed in a later section of this report.

The final map legend for CURE consists of forty-two map classes (Table 12). Of these, 27 are vegetation map classes and 15 are land-use map classes. Of the 27 vegetation map classes, 3 represent single NVC plant associations. The remaining 24 vegetation map classes represent polygons delineating multiple plant associations.

Ecological systems (Comer et al. 2003) are used to organize the vegetation map classes (see discussion in the Project Overview section and Appendix A). They were developed by NatureServe to complement the NVC by creating a mappable classification unit representing groups of biologic communities in similar environments and shaped by similar ecologic processes. Ecological systems typically occur in patches of tens to thousands of hectares and are expected to persist for 50 or more years. The timeframe allows successional dynamics to be integrated into the concept of each ecological system.

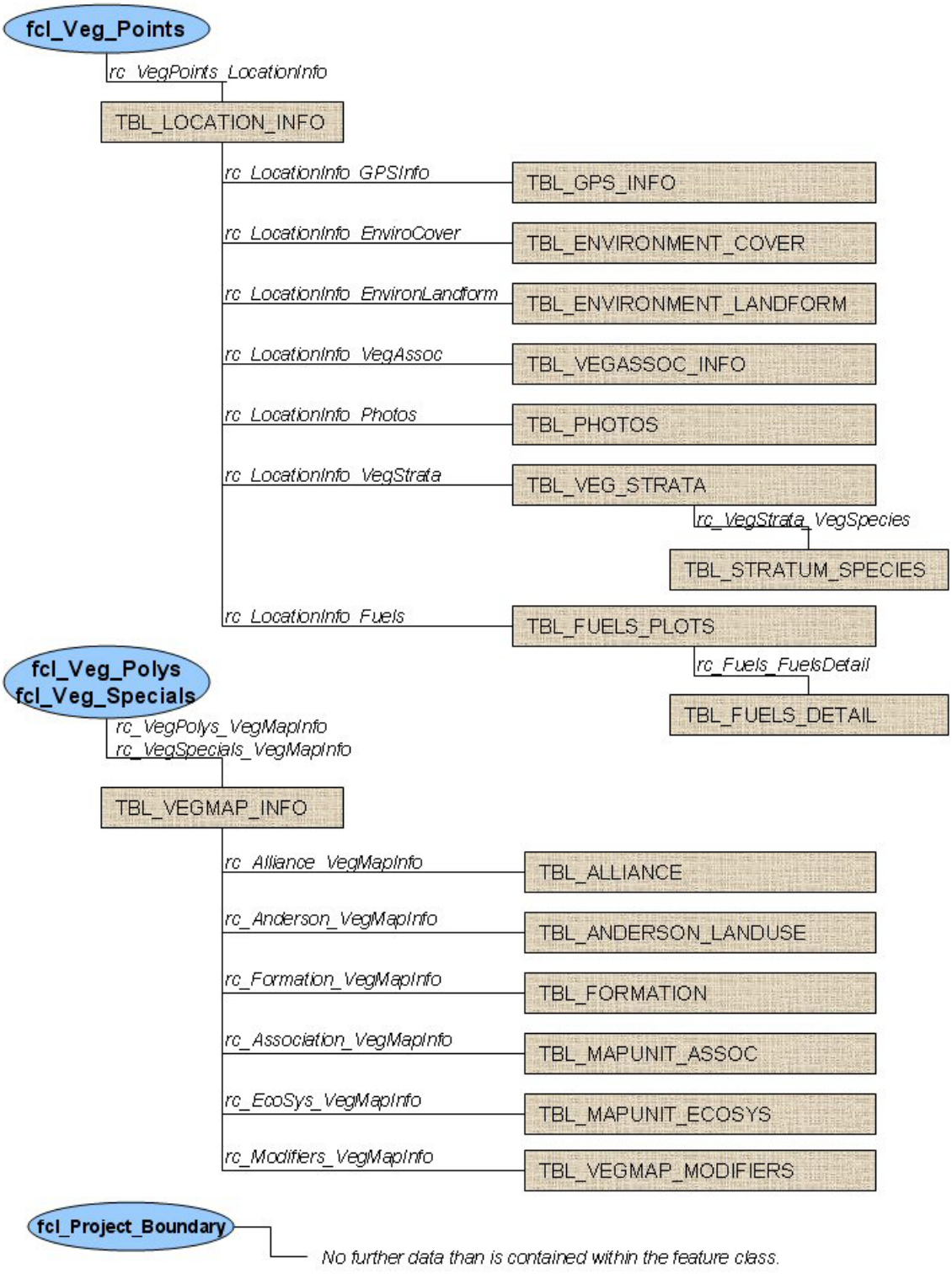


Figure 24. Structure of the CURE geodatabase.

Results

Table 12 shows the relationship of vegetation map classes to ecological systems, ordered roughly by physiognomy: upland forests/woodlands, riparian forests/woodlands, shrublands, riparian shrublands, grasslands, riparian grasslands, and sparse vegetation. Appendix A provides summary descriptions of each ecological system. The Anderson land use map classes could not be placed within the ecological system classification.

Map Class Descriptions

Appendix J provides detailed descriptions of all vegetation map classes used in the final version of the CURE vegetation mapping project. Each map class description includes:

- a summary of the ecological concept of the map class. Reference is made to the abundance and distribution of the map class within the recreation area as well as the entire project area
- a list of plant associations and common plant species occurring within the map class
- a qualitative description of the photographic signature along with representative samples from the orthophotography
- ground photographs
- statistics and accuracy assessment results

Map Polygons

The CURE vegetation map consists of 11,133 polygons totaling 48,639 hectares (120,189 acres). Average polygon size is 4.4 ha (10.8 acres). Lands within the recreation area make up 17,068 ha (42,176 acres) or 35% of the total project area. Of the total, 105,20 polygons (94.5%) represent natural or semi-natural vegetation map classes covering 89.7% of the mapping project area. Map classes representing non-vegetated rock outcrops, reservoir, and developed areas account for the remaining 613 polygons (5.5% of polygons and 10.3% of the area).

The polygon count includes adjacent polygons that have the same map code but different density or pattern attributes. The most common map class is Wyoming Big Sagebrush Shrubland (S-ARWY) with 1,640 polygons covering 22.3% of the mapping area. The largest average polygon size for vegetated map classes belongs to Reservoir Drawdown Semi-natural Herbaceous Vegetation (H-RESE) at 20.4 ha (50.5 acres) per polygon.

Figure 25 is an example of a map of the vegetation of CURE created from the GIS spatial database. Because we used a geodatabase format to store and organize spatial information, there are far more data in the spatial database than can be conveyed in a two-dimensional map. Maps can be produced with vegetation polygons labeled in many different ways at different levels of resolution. Table 13 provides summary statistics for CURE vegetation map polygons.

Table 12. Map classes used in the final CURE vegetation map, with map class number, code and name, crosswalk to NVC association, and the relationship of map class to plant associations. CURE vegetation map classes are arranged using the NatureServe ecological systems classification.

Map Class #	Map Class Code	Map Class Name	Description or Associations Assigned to Map Class	Relation
Multiple Ecological Systems: Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825) Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)				
9	W-PICE	Blue Spruce Woodland Alliance	Picea pungens / Alnus incana Woodland Picea pungens / Cornus sericea Woodland Picea pungens / Mahonia repens Forest	1 : many
Multiple Ecological Systems: Rocky Mountain Aspen Forest and Woodland (CES306.813) Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (CES304.776)				
52	F-POTR	Quaking Aspen Forest	Ceanothus velutinus Shrubland Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Calamagrostis rubescens Forest Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Mixed Graminoid Forest Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Thalictrum fendleri Forest Populus tremuloides / Carex geyeri Forest Populus tremuloides / Ceanothus velutinus Forest Populus tremuloides / Invasive Perennial Grasses Forest Populus tremuloides / Juniperus communis / Carex geyeri Forest Populus tremuloides / Juniperus communis / Lupinus argenteus Forest Populus tremuloides / Mahonia repens Forest Populus tremuloides / Prunus virginiana Forest Populus tremuloides / Symphoricarpos oreophilus / Thalictrum fendleri Forest Populus tremuloides / Symphoricarpos oreophilus Forest Populus tremuloides / Quercus gambelii - Symphoricarpos oreophilus Forest Populus tremuloides / Tall Forbs Forest Populus tremuloides – Pseudotsuga menziesii / Amelanchier alnifolia Forest	1 : many
Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)				
61	W-PSSG	Douglas-fir / Sagebrush – Muttongrass Open Woodland	Pseudotsuga menziesii / Artemisia tridentata (ssp. vaseyana, ssp. wyomingensis) Woodland Pseudotsuga menziesii / Poa fendleriana Woodland	1 : many

Table 12. Map classes used in the final CURE vegetation map, with map class number, code and name, crosswalk to NVC association, and the relationship of map class to plant associations. CURE vegetation map classes are arranged using the NatureServe ecological systems classification.

Map Class #	Map Class Code	Map Class Name	Description or Associations Assigned to Map Class	Relation
62	F-PSME	Douglas-fir Forest	Pseudotsuga menziesii / Acer glabrum Forest Pseudotsuga menziesii / Amelanchier alnifolia Forest Pseudotsuga menziesii / Carex geyeri Forest Pseudotsuga menziesii / Mahonia repens Forest Pseudotsuga menziesii / Prunus virginiana Forest [Park Special] Pseudotsuga menziesii / Quercus gambelii Forest Pseudotsuga menziesii / Symphoricarpos oreophilus Forest	1 : many
Southern Rocky Mountain Ponderosa Pine Woodland (CES306.648)				
67	W-PPGO	Ponderosa Pine / Gambel Oak Woodland	Pinus ponderosa / Purshia tridentata Woodland Pinus ponderosa / Quercus gambelii Woodland	1 : many
Colorado Plateau Pinyon-Juniper Woodland (CES304.767)				
69	W-PJSC	Pinyon - Juniper / Sparse Mixed Shrubs Scree Woodland	Pinus edulis – (Juniperus spp.) / Holodiscus dumosus Woodland	1 : 1
71	W-PJQU	Pinyon - Juniper / Gambel Oak Woodland	Juniperus scopulorum – Quercus gambelii Woodland Pinus edulis - Juniperus spp. / Quercus gambelii Woodland	1 : many
74	W-PJMX	PJ / Mixed Shrubs and Grasses Woodland	Juniperus osteosperma / Artemisia nova Woodland Juniperus osteosperma / Mixed Shrubs Talus Woodland Pinus edulis - Juniperus osteosperma / Sparse Understory Woodland Pinus edulis - Juniperus spp. / Artemisia tridentata (ssp. wyomingensis, ssp. vaseyana) Woodland Pinus edulis - Juniperus spp. / Cercocarpus montanus - Mixed Shrub Woodland Pinus edulis - Juniperus spp. / Poa fendleriana Woodland	1 : many

Table 12. Map classes used in the final CURE vegetation map, with map class number, code and name, crosswalk to NVC association, and the relationship of map class to plant associations. CURE vegetation map classes are arranged using the NatureServe ecological systems classification.

Map Class #	Map Class Code	Map Class Name	Description or Associations Assigned to Map Class	Relation
Multiple Ecological Systems: Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821) Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)				
5	C-CANY	Canyon Bottom Mosaic	Acer negundo / Cornus sericea Forest Acer negundo / Disturbed Understory Woodland Acer negundo / Quercus gambelii Woodland Cornus sericea Shrubland Phalaris arundinacea Western Herbaceous Vegetation	1 : many
7	W-POAN	Narrowleaf Cottonwood – (Alder, Coyote Willow) Riparian Woodland	Alnus incana / Cornus sericea Shrubland Alnus incana / Mesic Graminoids Shrubland Populus angustifolia – Juniperus scopulorum Woodland Populus angustifolia – Picea pungens / Alnus incana Woodland Populus angustifolia / Alnus incana Woodland Populus angustifolia / Cornus sericea Woodland Populus angustifolia / Crataegus rivularis Woodland Populus angustfolia / Invasive Perennial Grasses Woodland Populus angustifolia / Prunus virginiana Woodland Populus angustifolia / Quercus gambelii Woodland [Provisional] Populus angustifolia / Rhus trilobata Woodland Populus angustifolia / Rosa woodsii Forest Populus angustifolia / Salix exigua Woodland Salix exigua / Mesic Forbs Shrubland Salix exigua / Mesic Graminoids Shrubland	1 : many
Inter-Mountain Basins Semi-Desert Shrub-Steppe (CES304.788)				
28	S-ROAD	Roadcut Sparse Shrubland	Ericameria parryi / Achnatherum hymenoides Shrubland Ericameria nauseosa Shrubland	1 : many

Table 12. Map classes used in the final CURE vegetation map, with map class number, code and name, crosswalk to NVC association, and the relationship of map class to plant associations. CURE vegetation map classes are arranged using the NatureServe ecological systems classification.

Map Class #	Map Class Code	Map Class Name	Description or Associations Assigned to Map Class	Relation
Multiple Ecological Systems: Colorado Plateau Mixed Low Sagebrush Shrubland (CES304.762) Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)				
31	S-ARWY	Wyoming Big Sagebrush Shrubland	Artemisia nova / Poa fendleriana Shrubland Artemisia nova / Poa secunda Shrubland Artemisia tridentata / Pleuraphis jamesii Shrubland Artemisia tridentata ssp. tridentata / Pascopyrum smithii – (Elymus lanceolatus) Shrubland Artemisia tridentata ssp. wyomingensis / (Agropyron cristatum, Psathyrostachys juncea) Seeded Grasses Semi-natural Shrubland Artemisia tridentata ssp. wyomingensis / Achnatherum hymenoides Shrubland Artemisia tridentata ssp. wyomingensis / Achnatherum pinetorum Shrubland Artemisia tridentata ssp. wyomingensis / Bouteloua gracilis Shrubland Artemisia tridentata ssp. wyomingensis / Disturbed Understory Semi-natural Shrubland Artemisia tridentata ssp. wyomingensis / Hesperostipa comata Colorado Plateau Shrubland Artemisia tridentata ssp. wyomingensis / Poa fendleriana Shrubland Artemisia tridentata ssp. wyomingensis / Sparse Understory Shrubland Chrysothamnus viscidiflorus / Hesperostipa comata Shrubland Chrysothamnus viscidiflorus / Poa pratensis Semi-natural Shrub Herbaceous Vegetation Ericameria parryi / Achnatherum hymenoides Shrubland Ericameria nauseosa Shrubland	1 : many
Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)				
33	S-ARVA	Mountain Big Sagebrush Shrubland	Artemisia tridentata ssp. vaseyana / Achnatherum hymenoides Shrubland Artemisia tridentata ssp. vaseyana / Achnatherum pinetorum Shrubland Artemisia tridentata ssp. vaseyana / Balsamorhiza sagittata Shrubland Artemisia tridentata ssp. vaseyana / Carex geyeri Shrub Herbaceous Vegetation Artemisia tridentata ssp. vaseyana / Festuca thurberi Shrubland Artemisia tridentata ssp. vaseyana / Hesperostipa comata Shrubland Artemisia tridentata ssp. vaseyana / Pascopyrum smithii Shrubland Artemisia tridentata ssp. vaseyana / Piptatherum micranthum Shrubland Artemisia tridentata ssp. vaseyana / Poa fendleriana Shrubland Artemisia tridentata ssp. vaseyana / Poa (pratensis, compressa) Semi-natural Shrub Herbaceous Vegetation	1 : many

Table 12. Map classes used in the final CURE vegetation map, with map class number, code and name, crosswalk to NVC association, and the relationship of map class to plant associations. CURE vegetation map classes are arranged using the NatureServe ecological systems classification.

Map Class #	Map Class Code	Map Class Name	Description or Associations Assigned to Map Class	Relation
Multiple Ecological Systems: Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818) Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)				
41	C-MIXS	(Rocky Mountain Juniper) / Big Sagebrush – Mixed Montane Shrubs Mosaic	Artemisia tridentata (ssp. vaseyana, ssp. wyomingensis) – Amelanchier utahensis Shrubland Cercocarpus montanus – Artemisia tridentata Shrubland Juniperus scopulorum / Artemisia tridentata Woodland Quercus gambelii / Artemisia tridentata Shrubland	1 : many
42	S-QUMX	Gambel Oak / Mixed Montane Shrubland	Amelanchier utahensis - Mixed Shrub / Carex geyeri Shrubland Quercus gambelii / Amelanchier utahensis Shrubland Quercus gambelii - Cercocarpus montanus / (Carex geyeri) Shrubland Quercus gambelii / Festuca thurberi Shrubland Quercus gambelii / Poa fendleriana Shrubland	1 : many
43	S-QUSY	Gambel Oak Woodlands	Prunus virginiana – (Prunus americana) Shrubland Quercus gambelii / Amelanchier alnifolia Shrubland Quercus gambelii / Carex geyeri Shrubland Quercus gambelii / Prunus virginiana Shrubland Quercus gambelii / Rhus trilobata Shrubland Quercus gambelii / Symphoricarpos oreophilus Shrubland	1 : many
Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)				
46	S-CEMO	Mountain Mahogany Shale Shrubland	Cercocarpus montanus Shale Shrubland	1 : 1
Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)				
48	S-QUHO	Gambel Oak / Rockspirea Scree Shrubland	Quercus gambelii / Holodiscus dumosus Shrubland	1 : 1
Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)				
2	S-SALI	Geyer's Willow Seeps and Springs Shrubland	Salix geyeriana / Mesic Forbs Shrubland Salix geyeriana / Mesic Graminoids Shrubland	1 : many

Table 12. Map classes used in the final CURE vegetation map, with map class number, code and name, crosswalk to NVC association, and the relationship of map class to plant associations. CURE vegetation map classes are arranged using the NatureServe ecological systems classification.

Map Class #	Map Class Code	Map Class Name	Description or Associations Assigned to Map Class	Relation
Multiple Ecological Systems: Inter-Mountain Basins Semi-Desert Grassland (CES304.787) Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)				
17	H-RESE	Reservoir Drawdown Semi-natural Herbaceous Vegetation	Conyza canadensis Semi-natural Herbaceous Vegetation Hordeum jubatum Herbaceous Vegetation	1 : many
Multiple Ecological Systems: Inter-Mountain Basins Semi-Desert Grassland (CES304.787) Inter-Mountain Basins Shale Badland (CES304.789) Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821) Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)				
20	H-MXHE	Mixed Upland Grasslands	Achnatherum hymenoides Shale Barren Herbaceous Vegetation Agrostis (gigantea, stolonifera) Semi-natural Herbaceous Vegetation Bromus tectorum Semi-natural Herbaceous Vegetation Elymus repens Semi-natural Herbaceous Vegetation Hesperostipa comata Great Basin Herbaceous Vegetation Hesperostipa comata – Achnatherum hymenoides Herbaceous Vegetation Leymus cinereus Herbaceous Vegetation Pascopyrum smithii Herbaceous Vegetation Pleuraphis jamesii Herbaceous Vegetation Poa secunda Herbaceous Vegetation Poa fendleriana Herbaceous Vegetation Poa pratensis - (Pascopyrum smithii) Semi-natural Herbaceous Vegetation Thinopyrum intermedium Semi-natural Herbaceous Vegetation	1 : many
Multiple Ecological Systems: Rocky Mountain Alpine-Montane Wet Meadow (CES306.812) Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821) Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)				
14	H-RUSH	Baltic Rush and Sedges Herbaceous Vegetation	Bromus inermis - (Pascopyrum smithii) Semi-natural Herbaceous Vegetation Carex utriculata Herbaceous Vegetation Cirsium arvense – Weedy Forbs Great Plains Herbaceous Vegetation Juncus balticus Herbaceous Vegetation	1 : many

Table 12. Map classes used in the final CURE vegetation map, with map class number, code and name, crosswalk to NVC association, and the relationship of map class to plant associations. CURE vegetation map classes are arranged using the NatureServe ecological systems classification.

Map Class #	Map Class Code	Map Class Name	Description or Associations Assigned to Map Class	Relation
Inter-Mountain Basins Mixed Salt Desert Scrub (CES304.784)				
81	S-SHBA	Shale Barrens Sparse Shrublands	Atriplex canescens / Achnatherum hymenoides Shrubland Krascheninnikovia lanata / Achnatherum hymenoides Dwarf-shrubland	1 : many
Rocky Mountain Alpine-Montane Wet Meadow (CES306.812) Colorado Plateau Mixed Low Sagebrush Shrubland (CES304.762)				
90	S-ARFR	Fringed Sagebrush / Lichens Rocky Mesa	Artemisia frigida - (Bouteloua gracilis, Achnatherum hymenoides, Poa secunda) - Lichens Rocky Mesa Dwarf-shrubland Carex duriuscula Herbaceous Vegetation	1 : many
Rocky Mountain Cliff, Canyon and Massive Bedrock (CES306.815)				
93	S-HODU	Rockspirea Sparsely Vegetated Rock Outcrop	Artemisia tridentata ssp. vaseyana - Holodiscus dumosus Shrubland [Provisional] Holodiscus dumosus Rock Outcrop Sparse Vegetation	1 : many
60	W-PSHO	Douglas-fir / Rockspirea Scree Woodland	Pseudotsuga menziesii / Holodiscus dumosus Scree Woodland Pseudotsuga menziesii Scree Woodland	1 : many
Not Assigned to an Ecological System				
91	C-SPAR	Sparsely Vegetated Bedrock	N/A	N/A
LAND USE MAP CLASSES				
111	L-RIVE	Gunnison River	Streams and rivers	N/A
112	L-DITC	Canal / Ditch	Canal/ditch	N/A
113	L-POND	Natural Ponds / Lakes	Lakes or ponds	N/A
114	L-RESV	Reservoirs / Ponds	Reservoirs, stock ponds, and other man-made ponds	N/A
210	L-RESI	Residential	Residential (Single- and multi-family residential)	N/A

Table 12. Map classes used in the final CURE vegetation map, with map class number, code and name, crosswalk to NVC association, and the relationship of map class to plant associations. CURE vegetation map classes are arranged using the NatureServe ecological systems classification.

Map Class #	Map Class Code	Map Class Name	Description or Associations Assigned to Map Class	Relation
212	L-HOUS	Park Housing	Park Housing Area	N/A
221	L-INDU	Commercial / Light Industry	Commercial/Light Industry (Heavy equipment and junk yards, and associated facilities, as well as any retail stores and services)	N/A
2213	L-OFFI	Park Office / Visitor Center	Park Office/Visitor Center	N/A
223	L-COMM	Communications / Utility Corridors	Communications and utilities (Includes dams and electric substations, as well as sewage treatment ponds)	N/A
226	L-CORR	Transportation Corridors	Transportation (road and ditch/road bank)	N/A
227	L-CAMP	Recreation areas	Entertainment and Recreation (camping areas or other facilities, includes boat docks)	N/A
310	L-TRAN	Transitional Areas / Road Cuts	Transitional Bare Areas (Includes unvegetated road cuts)	N/A
320	L-QUAR	Quarries / Strip mines / Gravel pits	Quarries, strip mines, and gravel pits	N/A
330	L-BARE	Bare Ground	Bare rock or substrate (including bedrock, sandbars, talus, etc.)	N/A
422	L-CROP	Planted Fields	Cultivated Grasses, Pasture / Hay, Irrigated Pasture / Hay	N/A

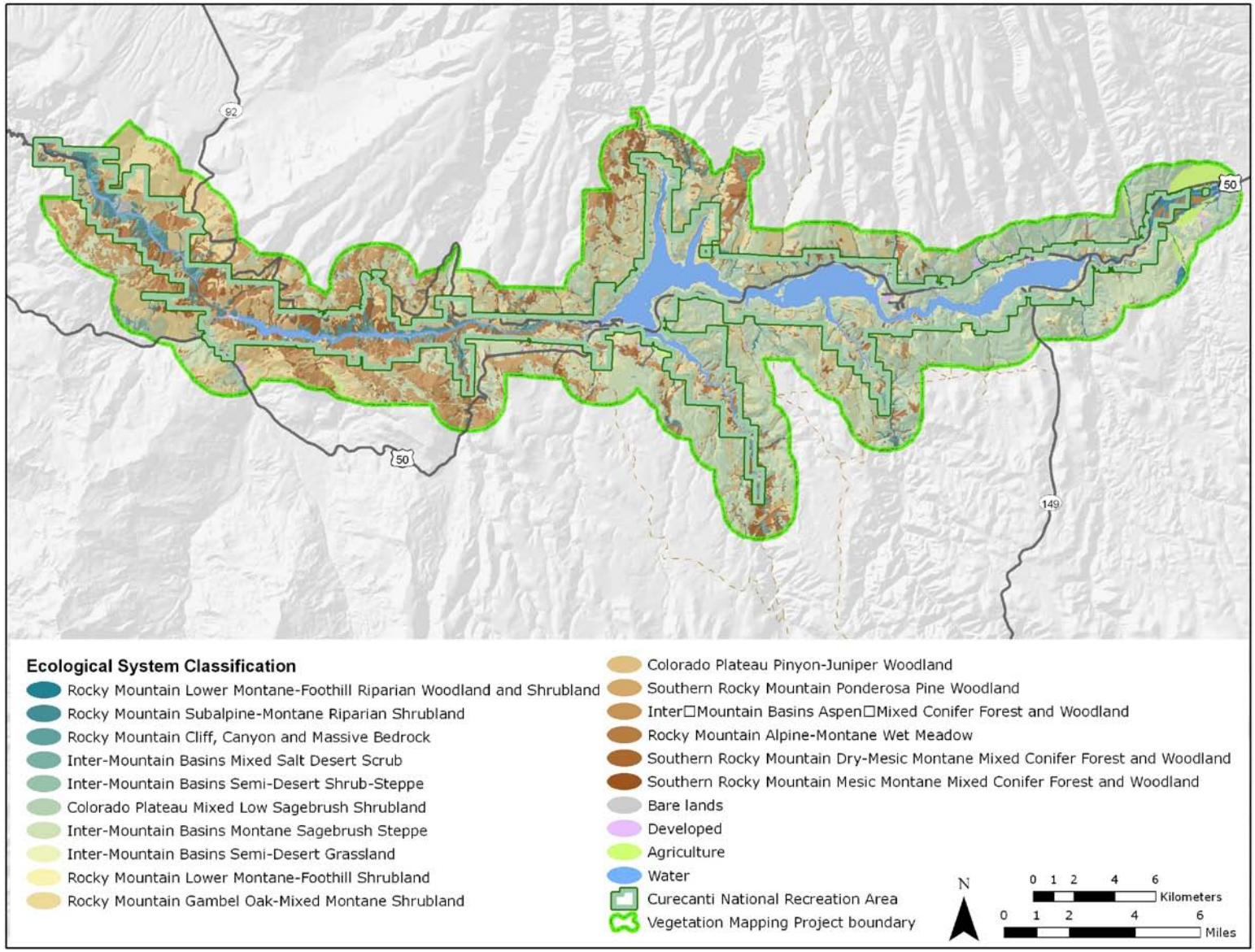


Figure 25. The CURE vegetation map based on ecological system groups of map classes.

Table 13. Summary statistics for polygons of each map class developed for the CURE vegetation mapping project.

Map Code	Map Class Common Name	Polygons			Area (hectares)		
		Park	Environs	Total Area*	Park	Environs	Total Area
Multiple Ecological Systems: Rocky Mountain Aspen Forest and Woodland (CES306.813) Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (CES304.776)							
F-POTR	Quaking Aspen Forest	141	696	837	342.8	3,298.3	3,641.1
	Subtotal	*141*	*696*	*837*	*342.8*	*3,298.3*	*3,641.1*
Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)							
F-PSME	Douglas-fir Forest	557	843	1,400	1,931.2	1,852.3	3,783.5
W-PSSG	Douglas-fir / Sagebrush – Muttongrass Open Woodland	221	391	612	401.3	866.7	1,268.0
	Subtotal	*778*	*1,234*	*2,012*	*2,332.5*	*2,719.0*	*5,051.5*
Southern Rocky Mountain Ponderosa Pine Woodland (CES306.648)							
W-PPGO	Ponderosa Pine / Gambel Oak Woodland	4	5	9	7.6	8.7	16.3
	Subtotal	*4*	*5*	*9*	*7.6*	*8.7*	*16.3*
Colorado Plateau Pinyon-Juniper Woodland (CES304.767)							
W-PJSC	Pinyon - Juniper / Sparse Mixed Shrubs Scree Woodland	5	0	5	8.0	0.0	8.0
W-PJQU	Pinyon - Juniper / Gambel Oak Woodland	36	81	117	255.5	199.8	455.4
W-PJMX	PJ / Mixed Shrubs and Grasses Woodland	74	75	149	284.0	236.6	520.6
	Subtotal	*115*	*156*	*271*	*547.5*	*436.4*	*984*
Multiple Ecological Systems: Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821) Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)							
C-CANY	Canyon Bottom Mosaic	25	1	26	45.5	1.0	46.5
W-POAN	Narrowleaf Cottonwood – (Alder, Coyote Willow) Riparian Woodland	193	273	466	248.7	490.0	738.7
	Subtotal	*218*	*274*	*492*	*294.2*	*491*	*785.2*

Table 13. Summary statistics for polygons of each map class developed for the CURE vegetation mapping project.

Map Code	Map Class Common Name	Polygons			Area (hectares)		
		Park	Environs	Total Area*	Park	Environs	Total Area
Multiple Ecological Systems: Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825) Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)							
W-PICE	Blue Spruce Woodland Alliance	9	2	11	16.0	7.0	23.0
	Subtotal	*9*	*2*	*11*	*16.0*	*7.0*	*23.0*
Inter-Mountain Basins Semi-Desert Shrub-Steppe (CES304.788)							
S-ROAD	Roadcut Sparse Shrubland	2	0	2	2.8	0.0	2.8
	Subtotal	2	0	2	2.8	0.0	2.8
Multiple Ecological Systems: Colorado Plateau Mixed Low Sagebrush Shrubland (CES304.762) Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)							
S-ARWY	Wyoming Big Sagebrush Shrubland	597	1,043	1,640	3,420.8	7,449.5	10,870.4
	Subtotal	*597*	*1,043*	*1,640*	*3,420.8*	*7,449.5*	*10,870.4*
Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)							
S-ARVA	Mountain Big Sagebrush Shrubland	247	843	1,090	839.1	7,598.9	8,438.0
	Subtotal	*247*	*843*	*1,090*	*839.1*	*7,598.9*	*8,438.0*
Multiple Ecological Systems: Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818) Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)							
C-MIXS	(Rocky Mountain Juniper) / Big Sagebrush – Mixed Montane Shrubs Mosaic	605	1,100	1,705	1,775.0	4,535.8	6,310.9
S-QUMX	Gambel Oak / Mixed Montane Shrubland	141	277	418	390.5	1,413.5	1,803.9
S-QUSY	Gambel Oak Woodlands	121	219	340	246.7	590.5	837.2
	Subtotal	*867*	*1,596*	*2,463*	*2,412.2*	*6,539.8*	*8,952.0*

Table 13. Summary statistics for polygons of each map class developed for the CURE vegetation mapping project.

Map Code	Map Class Common Name	Polygons			Area (hectares)		
		Park	Environs	Total Area*	Park	Environs	Total Area
Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)							
S-CEMO	Mountain Mahogany Shale Shrubland	4	2	6	27.9	0.1	28.0
	Subtotal	*4*	*2*	*6*	*27.9*	*0.1*	*28.0*
Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)							
S-QUHO	Gambel Oak / Rockspirea Scree Shrubland	127	71	198	515.9	144.9	660.8
	Subtotal	*127*	*71*	*198*	*515.9*	*144.9*	*660.8*
Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)							
S-SALI	Geyer's Willow Seeps and Springs Shrubland	9	32	41	4.5	18.1	22.6
	Subtotal	*9*	*32*	*41*	*4.5*	*18.1*	*22.6*
Multiple Ecological Systems: Inter-Mountain Basins Playa (CES304.786) Inter-Mountain Basins Semi-Desert Grassland (CES304.787) Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)							
H-RESE	Reservoir Drawdown Semi-natural Herbaceous Vegetation	40	1	41	837.6	0.2	837.8
	Subtotal	*40*	*1*	*41*	*837.6*	*0.2*	*837.8*
Multiple Ecological Systems: Inter-Mountain Basins Semi-Desert Grassland (CES304.787) Inter-Mountain Basins Shale Badland (CES304.789) Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821) Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)							
H-MXHE	Mixed Upland Grasslands	70	208	278	177.3	566.3	743.6
	Subtotal	*70*	*208*	*278*	*177.3*	*566.3*	*743.6*

Table 13. Summary statistics for polygons of each map class developed for the CURE vegetation mapping project.

Map Code	Map Class Common Name	Polygons			Area (hectares)		
		Park	Environs	Total Area*	Park	Environs	Total Area
Multiple Ecological Systems: Rocky Mountain Alpine-Montane Wet Meadow (CES306.812) Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821) Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)							
H-RUSH	Baltic Rush and Sedges Herbaceous Vegetation	39	157	196	80.8	223.0	303.7
	Subtotal	*39*	*157*	*196*	*80.8*	*223.0*	*303.7*
Inter-Mountain Basins Mixed Salt Desert Scrub (CES304.784)							
S-SHBA	Shale Barrens Sparse Shrublands	30	27	57	38.0	96.7	134.7
	Subtotal	*30*	*27*	*57*	*38.0*	*96.7*	*134.7*
Colorado Plateau Mixed Low Sagebrush Shrubland (CES304.762)							
S-ARFR	Fringed Sagebrush / Lichens Rocky Mesa	90	301	391	91.1	446.5	537.6
	Subtotal	*90*	*301*	*391*	*91.1*	*446.5*	*537.6*
Rocky Mountain Cliff, Canyon and Massive Bedrock (CES306.815)							
S-HODU	Rockspirea Sparsely Vegetated Rock Outcrop	192	129	321	753.9	252.9	1,006.8
W-PSHO	Douglas-fir / Rockspirea Scree Woodland	97	59	156	435.3	139.6	574.9
	Subtotal	*289*	*188*	*477*	*1,189.2*	*392.5*	*1,581.7*
Not Assigned to an Ecological System							
C-SPAR	Sparsely Vegetated Bedrock	0	8	8	0.0	8.8	8.8
	Subtotal	*0*	*8*	*8*	*0.0*	*8.8*	*8.8*
UNVEGETATED AND ANDERSON LAND USE MAP CLASSES							
L-RIVE	Gunnison River	9	11	20	35.3	24.0	59.3
L-DITC	Canal / Ditch	5	4	9	4.7	4.8	9.5
L-POND	Natural Ponds / Lakes	4	29	33	0.3	11.0	11.3

Table 13. Summary statistics for polygons of each map class developed for the CURE vegetation mapping project.

Map Code	Map Class Common Name	Polygons			Area (hectares)		
		Park	Environs	Total Area*	Park	Environs	Total Area
L-RESV	Reservoirs / Ponds	15	78	93	3,328.6	13.8	3,342.4
L-RESI	Residential	22	121	143	20.5	137.5	158.0
L-HOUS	Park Housing	1	7	1	3.1	20.8	3.1
L-INDU	Commercial / Light Industry	6	3	13	4.8	2.2	25.6
L-OFFI	Park Office / Visitor Center	1	0	1	2.3	0.0	2.3
L-COMM	Communications / Utility Corridors	9	57	12	12.1	227.4	14.2
L-CORR	Transportation Corridors	55	4	112	274.1	36.7	501.5
L-CAMP	Recreation areas	13	33	17	51.4	38.6	88.1
L-TRAN	Transitional Areas / Road Cuts	24	3	57	23.0	20.6	61.5
L-QUAR	Quarries / Strip mines / Gravel pits	2	20	5	7.7	18.3	28.3
L-BARE	Bare Ground	37	30	57	102.9	569.3	121.3
L-CROP	Planted Fields	10	0	40	19.4	31570.8	588.7
	Subtotal	*213*	*400*	*613*	*3,890.2*	*3,2695.8*	*5,015.1*
	Total All Map Classes	**3,889**	**7,244**	**11,133**	**17,068**	**63,142**	**48,639**

* Note: Total polygon area may be less in the full mapping project area because of cumulative rounding error.

Discussion

Mapping the vegetation of CURE presented challenges requiring the application of special techniques. The following summarizes the successes and shortcomings encountered during the project.

Things that worked well: The division of photointerpretation into preliminary (completed by a contractor before field data were available) and final (completed by NPS staff with access to field data) stages worked reasonably well, in that it helped speed the photointerpretation process and identified sites for field workers to visit in order to clarify difficult photo signatures. Good communication between the photointerpreters in each stage was essential.

Quality base data is essential to high quality scientific work. For the vegetation mapping at CURE, high quality orthophotography allowed for both confident manual interpretation and a solid source for deriving physiognomic classes and vegetation density.

Areas for Improvement: One problem encountered in both plot and AA field data collection was the undersampling of certain vegetation types and of whole sections of the NRA due to a variety of accessibility issues and constraints. The inner canyon, including river terraces and canyon walls, was excluded (most by the slope-mask) from gradsect analysis due to difficult access and time constraints. Exclusion meant that riparian vegetation types below Morrow Point Reservoir and the vegetation communities occupying canyon walls and slopes were undersampled and poorly described. Sampling in the environs and in remote areas within NPS boundaries but accessed through private lands was hampered by difficulty accessing private property. Permission was generally forthcoming once contact was made; however, it was very time-consuming to make contact with all affected landowners when many were busy running their ranching operations or were absentee landowners. Several gaps in plot data collection were filled in by field crews collecting AA data, except for the river corridor and inner canyon below Morrow Point Reservoir (the western corner of the NRA) and the area south of Kokanee Bay between Blue Creek and Round Corral Creek. These areas remain unsampled and park ecologists and future efforts may choose to target these areas for sampling and/or remapping efforts.

Undersampling presented one difficulty in creating a good classification for CURE; another challenge arose from the data. The cover classes used during plot data collection were too broad. Because most of the common species occurring in a plot fell into the 5-25% cover class, it was difficult to determine the truly dominant species in each sampled community. As a result, it was especially challenging to assign plots to the correct NVC association. For example, in mixed montane shrub communities, the NVC requires a minimum of 10% Gambel oak cover to classify a plot as a Gambel oak-dominated association. Plot photographs were usually little help in determining which species were dominant. This resulted in multiple revisions to the classification, both after the map classes were determined and again after the accuracy assessment. Consequently, map attributes had to be assigned more than once, which clouded the validity of the accuracy assessment. This experience reinforced the desirability of having a complete and final classification in hand before beginning mapping tasks.

The character of the vegetation presented a third difficulty. The ecotonal nature of the upland shrub communities at CURE meant that much of the mesa tops and hillsides surrounding the reservoirs were difficult to classify or map as distinct vegetation types. Boundaries between

sagebrush, serviceberry, oak, and pinyon-juniper vegetation communities were especially difficult to distinguish. It was also challenging to draw boundaries between different species and subspecies of the genus *Artemisia*. *Artemisia nova* was difficult to distinguish from *Artemisia tridentata* both by photosignature and landscape position. As a result, black sagebrush shrublands were overmapped and had to be combined with map class 31 (Wyoming big sagebrush shrublands) to improve map accuracy. There was also significant confusion between shrublands of *Artemisia tridentata* ssp. *wyomingensis* and ssp. *vaseyana* (including hybrids of the two) and some remapping was done post-AA to try to improve the accuracy of these two separate map classes. This remapping and subsequent recalculating of accuracy values may have resulted in some inflated final accuracy values and lingering uncertainty about the boundaries between these two map classes. Field crew misidentification of the subspecies of *Artemisia tridentata* may have contributed to some of the uncertainty. Park ecologists and future research efforts may choose to target these big sagebrush shrublands for sampling and/or remapping in order to better define the character and delineate the distribution of the subspecies of *Artemisia tridentata*.

Finally, the attempt to map most of CURE to the plant association level, while at the same time defining many map classes based more on geology or landscape features, was not completely successful. The majority of map classes were combined and redefined to improve map accuracy. Only three of the final 27 (58 original) map classes are single associations, the remainder are combinations of two or more associations. Broader initial map class concepts, defined by floristics, geology, soils, and landscape features and including combinations of associations which shared many of these characteristics, would have avoided much of the post-AA editing of the map, map class concepts and final accuracy tables.

Accuracy Assessment

Methods

Introduction

Accuracy assessment (AA) is a statistical test of how well polygon map class attributes represent vegetation on the ground. The AA compares field observations with the map class assignment of the sampled polygon. Errors occur when mapped polygon labels differ from field observations. Results of the AA allow users to evaluate the utility of the vegetation mapping data for particular applications. Accuracy assessment results come in two forms (Hop et al. 2005): "producer's accuracy" (the probability that an AA point was mapped correctly, also referred to as "errors of omission"), and "user's accuracy" (the probability that the map represents what was found on the ground, also referred to as "errors of commission"). High producer's accuracy combined with low user's accuracy indicates that the map class is under-mapped. Conversely, low producer's accuracy combined with high user's accuracy indicates that a type is over-mapped. Ideally, a map has both high user's and producer's accuracy.

Sampling Design

A stratified random sampling approach was used to determine AA sampling locations. The AA included most vegetation map classes and was limited to lands within the CURE boundary; private and federal outside of the recreation area were not included in the accuracy evaluation. Sample sizes for each evaluated map class were selected using the USGS-NPS Vegetation Mapping Program guidelines (ESRI and TNC 1994):

Scenario A: The class is abundant. It covers more than 50 ha (124 acres) and consists of at least 30 polygons. The recommended sample size is 30.

Scenario B: The class is relatively abundant. It covers more than 50 ha, but consists of fewer than 30 polygons. The recommended sample size is 20. The rationale for reducing the sample size for this type of class is that sample sites are more difficult to find because of the lower frequency of the class.

Scenario C: The class is relatively rare. It covers less than 50 ha but consists of more than 30 polygons. The recommended sample size is 20. The rationale for reducing the sample size is that the class occupies a small area. At the same time, however, the class consists of a considerable number of distinct polygons that are possibly widely distributed. The number of samples therefore remains relatively high because of the high frequency of the class.

Scenario D: The class is rare. It has more than five but fewer than 30 polygons and covers less than 50 ha. The recommended number of samples is five. The rationale for reducing the sample size is that the class consists of small polygons and the frequency of the polygons is low. Specifying more than five sample sites will likely result in multiple samples within the same (small) polygon. Collecting five samples will allow accuracy to be estimated, although the estimate will not be very precise.

Scenario E: The class is very rare. It has fewer than five polygons and occupies less than 50 ha. In this case, it is recommended that the existence of the class be confirmed by a visit to each polygon. The rationale for the recommendation is that with fewer than five sample sites

(assuming one site per polygon), no estimate of level of confidence can be established for the sample and the accuracy of the class can only be confirmed through a field census.

All but three of the original vegetated map classes were included in the accuracy assessment. Fifteen land-use map classes (L-XXXX) were excluded because they are essentially unvegetated or occur exclusively outside of the recreation area boundary.

Accuracy assessment sampling points were selected for each vegetation map class using guidelines A–E. The primary set of AA evaluation sites included 1,061 points. Ninety-two AA points were inaccessible due to denial of access. Eighty-eight additional AA points were re-selected, resulting in a new total for potential CURE AA points of 1,057. Secondary and tertiary sets of points were generated in case some of the points in the primary set could not be accessed safely. A 12.5 m interior buffer from polygon edges was generated for the map coverage to help ensure that 0.5 ha sampling points would fall cleanly within the polygon. The 12.5 m buffer worked in most situations; however, for small or linear polygons the buffer was reduced or eliminated. Sheer cliffs and steep talus were excluded from the AA point selection pool due to poor or dangerous access. Location (UTM) coordinates for all AA points were downloaded to hand-held GPS receivers for field sampling.

Field Data Collection

Accuracy assessment point data were collected at CURE during the 2005 field season. Field crews used GPS receivers and topographic maps to navigate precisely to each pre-selected AA point. They used paper maps of the sample point locations and polygon boundaries (without polygon labels) on an orthoimage base to help locate and determine the representativeness of each AA point. The crews evaluated an area approximately 5,000 m^2 centered on the AA point coordinates (Appendix B). Environmental data collected in the field included elevation, slope, aspect, topographic position, landform, unvegetated surface elements, and descriptive comments. Vegetation data included leaf type and physiognomic class, as well as height and canopy cover for the dominant species in each stratum. The illustrated field key was used to identify the plant association that best described the vegetation in the plot. In most cases, only one plant association name was recorded. When vegetation relationships were less clear, a secondary or tertiary plant association name was also recorded. Plant associations occurring within 50 m of the AA point boundary were recorded if they differed from the plant association within the sampling area. One or more 35 mm color slides were taken at each AA point to provide visual documentation of the site.

The field team collected data at 1,037 AA points (Figure 26). AA point data were manually entered into the plots database and a thorough quality assessment/quality check (QA/QC) was performed on the data prior to analysis. Nomenclature standards and other data management procedures were the same as for the classification plot data (see Vegetation Classification and Description section). Photographic slides were converted to digital format and catalogued in the same database as the classification plot photographs.

Data Analysis

All but five of the 1,037 AA data points collected in 2005 were used in the data analysis. These five points were excluded from AA data analysis because they fell in roadways. The field data were converted into a spatial data layer with coordinates and attributes. The first step in the AA

analysis intersected the AA point data with the map polygon data. The primary, secondary and tertiary plant association names, and, if listed, the association name within 50 m, assigned in the field to each AA point were compared to the map class code for that polygon. If any of these names agreed with the labeled map class for a given polygon, the point was considered correct. All other points were considered mismatches and marked incorrect.

The results of the initial analysis were arrayed in a preliminary contingency table in which producer's and user's accuracy was calculated for each map class. Producer's accuracy is computed by dividing the number of samples that agreed with their corresponding map class by the total number of samples in that class. User's accuracy was calculated by dividing the number of samples that agreed with their corresponding map class by the total number of samples whose field call belonged to that category.

The primary photo interpreter and project ecologists met to analyze the map errors revealed in the preliminary contingency table. Each AA point mismatch (disagreement between field call and polygon label) was evaluated for the type of error (true or false). Sources of "false" error include GPS receiver position error, questionable field determinations, edge error, and inclusions (small patches of vegetation within larger map polygons). Mismatches were corrected when a false error was identified. All other mismatches were deemed true errors. Patterns of error were analyzed and possible solutions for raising map class accuracy formulated (Appendix I).

In March, 2006, a meeting was held among the recreation area staff and project cooperators to complete the AA process. Participants discussed the alternative solutions developed during the analysis, and decided on the best solution for the purposes of natural resource management. In some cases, meeting participants recommended combining certain map classes to achieve higher levels of accuracy and more meaningful vegetation map classes. In other cases, the group recommended retaining map classes with lower accuracy, discussed below. Following the meeting, the original photo interpreter, and later an additional photo interpreter, made multiple edits to the final vegetation map based on field data calls, revised mapclass concepts, and general quality control issues discovered during the map editing process. After several iterations, a final contingency table was produced by project cartographers (Table 14). The spatial database was revised to reflect the final combinations of map classes. The original set of 58 vegetated map classes was ultimately reduced to 27 by consensus among project participants.

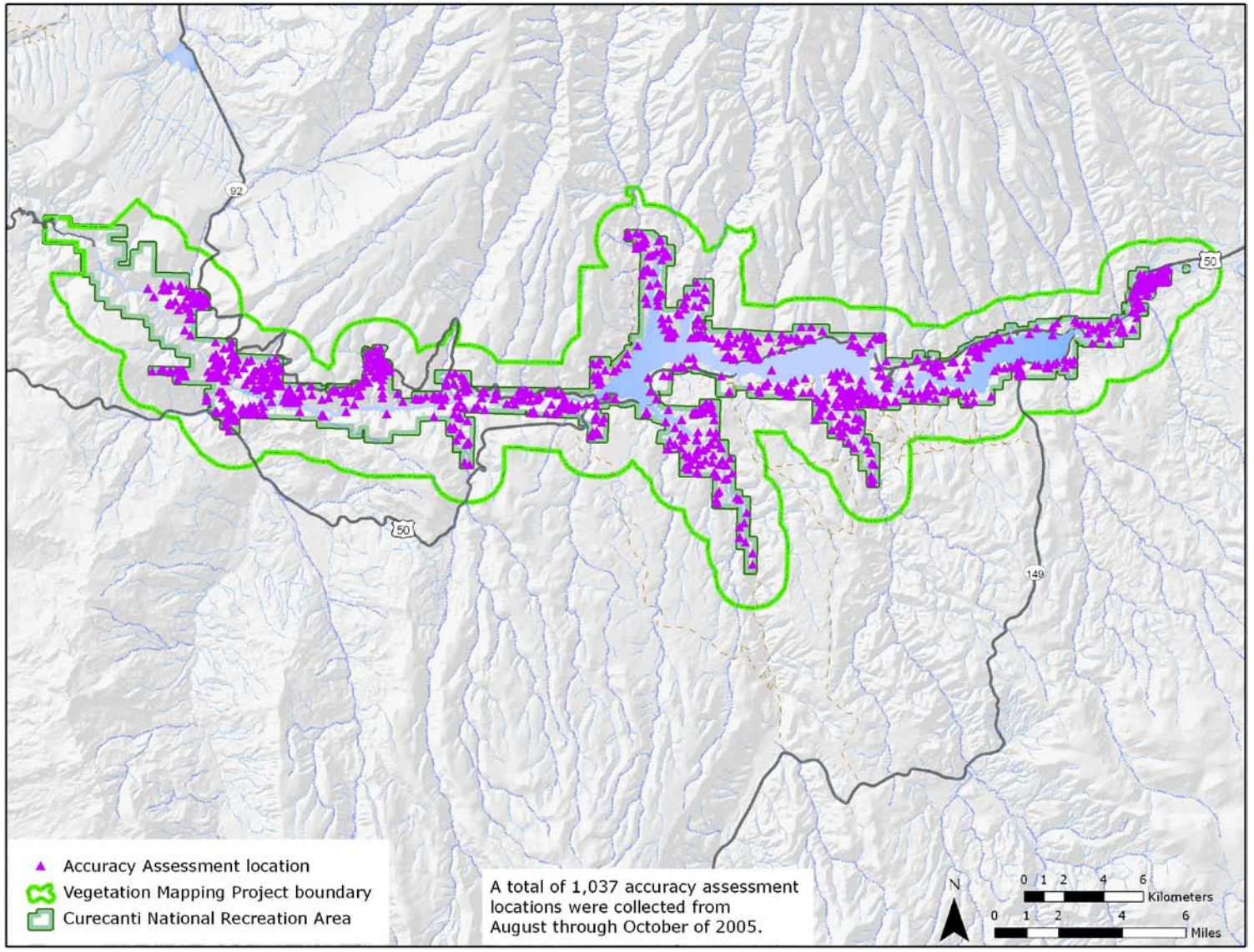


Figure 26. Location of accuracy assessment points sampled within CURE. The accuracy of the map outside of the recreation area boundary was not assessed.

Table 14. Final contingency table for CURE.
This table represents the 24 polygon map classes retained following accuracy assessment and revision whose accuracy was assessed1. Shaded boxes indicate the number of AA points that agree with the assigned map class. To read the table, columns represent the map class observed in the field, while the rows represent the map class assigned by the photointerpreter. Overall accuracy is 87.3% (Kappa statistic = 85.7%). User's and producer's accuracy values with 90% confidence intervals for each map class appear in Tables 15, 16, and 17.

		Accuracy Assessment Field Plot Data												Commission (User's) Error												Correct		90% C.I.	
		2	5	7	9	14	17	20	31	33	41	42	43	46	48	52	60	61	62	67	71	74	81	90	93	#	%	-	+
Mapped Data Omission (Producer's) Error	2	3		1																						4	75%	27%	123%
	5		2																							2	100%	75%	125%
	7	2	2	64						2	3	2				1		1	1						1	79	81%	73%	89%
	9		1		5																					6	83%	50%	117%
	14					24		1																		25	96%	88%	104%
	17			1		2	31	1		1																36	86%	75%	97%
	20						1	5	1	1																8	63%	28%	97%
	31							1	218	8		2						2						3	1	235	93%	90%	96%
	33					1			6	54		1														62	87%	79%	95%
	41			1					3	2	166	3	3								3	1			2	184	90%	86%	94%
	42										1	27	4						1		1					34	79%	67%	92%
	43										2	4	46		1	1										54	85%	76%	94%
	46										1			9												10	90%	69%	111%
	48												2		10						1				1	14	71%	48%	95%
	52	1											1			29			1							32	91%	81%	101%
	60																4									4	100%	88%	113%
	61										2							27			1	1				31	87%	76%	99%
	62									2	2	1				2		1	66		2					76	87%	80%	94%
	67																			3						3	100%	83%	117%
	71												1				1		1		28	3				34	82%	70%	95%
	74								2		2								1		2	44				51	86%	77%	95%
	81							1	1														8			10	80%	54%	106%
	90																						1	20		21	95%	85%	105%
	93							1	1		1		1		2				1		1	1			8	17	47%	24%	70%
correct	#	6	5	67	5	27	32	10	232	70	180	40	58	9	13	33	5	31	72	3	39	50	9	23	13	1032			
	%	50%	40%	96%	100%	89%	97%	50%	94%	77%	92%	68%	79%	100%	77%	88%	80%	87%	92%	100%	72%	88%	89%	87%	62%	87.3%			
90% C.I.	-	8%	-6%	91%	90%	77%	90%	19%	91%	68%	89%	54%	70%	94%	54%	77%	41%	76%	86%	83%	59%	79%	66%	73%	35%				
	+	92%	86%	100%	110%	101%	103%	81%	97%	86%	96%	81%	89%	106%	100%	99%	119%	99%	98%	117%	85%	97%	112%	101%	88%	Kappa = 0.8575			

[1]Vegetation map classes 28, 69, and 91 were not accuracy assessed due their extreme rarity in CURE.

Results and Discussion

The map classes shown in tables and figures in this document represent those that remained or were created following adjustment of map classes to improve CURE thematic accuracy. Appendix I contains the complete analysis of all map classes used in the draft map and evaluated during AA. Final overall map accuracy is 87.3% (Kappa correction = 85.7%). Individual map class producer's and user's accuracy values are given in the tables below with their 90% confidence intervals. The width of each confidence interval is affected by sample size; larger sample sizes result in narrower confidence intervals. Large confidence intervals (>20%) are generally a sign that a particular map class was undersampled and/or rare. Individual map class accuracy ranges from 40% to 100% (Table 15, Table 16, and Table 17).

Table 15. Final CURE vegetation map classes that met or exceeded the 80% program standard for both user's and producer's accuracy.

Map Class	Map Class #	Map Class Name	Producer's Accuracy (±90% CI)	User's Accuracy (±90% CI)
W-POAN	7	Narrowleaf Cottonwood - (Alder, Coyote Willow) Riparian Woodland	81% ± 8%	96% ± 5%
W-PICE	9	Blue Spruce Woodland Alliance	83% ± 33%	100%
H-RUSH	14	Baltic Rush and Sedges Herbaceous Vegetation	96% ± 8%	89% ± 12%
H-RESE	17	Reservoir Drawdown Semi-natural Herbaceous Vegetation	86% ± 11%	97% ± 7%
S-ARWY	31	Wyoming Big Sagebrush Shrubland	93% ± 3%	94% ± 3%
C-MIXS	41	(Rocky Mountain Juniper) / Big Sagebrush – Mixed Montane Shrubs Mosaic	90% ± 4%	92% ± 3%
S-CEMO	46	Mountain Mahogany Shale Shrubland	90% ± 21%	100%
F-POTR	52	Quaking Aspen Forest	91% ± 10%	88% ± 11%
W-PSHO	60	Douglas-fir / Rockspirea Scree Woodland	100%	80% ± 39%
W-PSSG	61	Douglas-fir / Sagebrush – Muttongrass Open Woodland	87% ± 12%	87% ± 12%
F-PSME	62	Douglas-fir Forest	87% ± 7%	92% ± 6%
W-PPGO	67	Ponderosa Pine / Gambel Oak Woodland	100%	100%
W-PJMX	74	PJ / Mixed Shrubs and Grasses Woodland	86% ± 9%	88% ± 9%
S-SHBA	81	Shale Barrens Sparse Shrublands	80% ± 26%	89% ± 23%
S-ARFR	90	Fringed Sagebrush / Lichens Rocky Mesa	95% ± 10%	87% ± 14%

Table 16. CURE vegetation map classes where either the user's or producer's accuracy did not meet the 80% program standard.

Map Class Code	Map Class #	Map Class Name	Producer's Accuracy (±90% CI)	User's Accuracy (±90% CI)	Confused with Map Class #
C-CANY	5	Canyon Bottom Mosaic	100%	40% ± 46%	7, 9
S-ARVA	33	Mountain Big Sagebrush Shrubland	87% ± 8%	77% ± 9%	31, 40
S-QUSY	43	Gambel Oak Woodlands	85% ± 9%	79% ± 10%	40, 42
W-PJQU	71	PJ / Gambel Oak Woodland	82% ± 13%	72% ± 13%	40, 62, 74

As shown in Table 16, four map classes were retained in the final vegetation map for CURE when either user's or producer's accuracy did not meet the 80% program standard. In most cases, the 90% confidence interval includes 80%; park staff therefore deemed the results to be acceptable. In some cases, park staff accepted a lower accuracy because the map class was rare in the recreation area and the accuracy was based on only a few points. In all other cases, park staff accepted less than 80% accuracy either because the classes were ecologically significant and therefore they wanted to keep them even with low accuracy, or because the errors were with closely related map classes.

Table 17. CURE vegetation map classes where neither the user's or producer's accuracy met the 80% program standard.

Map Class Code	Map Class #	Map Class Name	Producer's Accuracy (±90% CI)	User's Accuracy (±90% CI)	Confused with Map Class #
S-SALI	2	Geyer's Willow Seeps and Springs Shrubland	75% ± 48%	50% ± 19%	7, 52
H-MXHE	20	Mixed Upland Grasslands	63% ± 34%	50% ± 31%	14, 17, 31, 33, 81, 93
S-QUMX	42	Gambel Oak / Mixed Montane Shrubland	79% ± 13%	68% ± 14%	7, 31, 40, 43
S-QUHO	48	Gambel Oak / Rockspirea Scree Shrubland	71% ± 24%	77% ± 23%	42, 49
S-HODU	93	Rockspirea Sparsely Vegetated Rock Outcrop	47% ± 23%	62% ± 27%	40, 48

After the adjustment of map classes to improve CURE thematic accuracy, five map classes did not achieve the 80% standard for either user's or producer's accuracy (Table 17). These five map classes were retained in the final vegetation map for CURE because of their ecological significance. Reasons for the failure to meet the 80% standard for accuracy include:

- map class 2 is a rare map class that was difficult to sample adequately and it was confused with narrowleaf cottonwood woodlands (7) by the photo interpreter due to the similarities of their photo signatures;
- map class 20 commonly occurs as small patches/polygons in a mosaic with a variety of other vegetation communities/map classes, and was therefore slightly undersampled due

to the difficulties of generating points in small polygons, and was confused with a number of other map classes in which it was embedded;

- map class 42 was not reliably or consistently distinguished from the other two Gambel oak map classes (40 and 43) by the photo interpreter and was found to be slightly more common by field crews than it was mapped (undermapped); and
- map classes 48 and 93 were both undersampled due to accessibility constraints related to steep, scree habitats.

Three map classes (28, 69, and 91) were not accuracy assessed because they were extremely rare in CURE (more common in BLCA) and only occurred as a small handful of polygons near the boundary with BLCA.

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Appendix A. Ecological Systems of Curecanti National Recreation Area

Introduction

This appendix contains summary descriptions of 21 terrestrial and riparian/wetland ecological system (ES) units (NatureServe 2003b, Comer et al. 2003) occurring within Curecanti National Recreation Area. Each ecological system represents one or more National Vegetation Classification (NVC) plant associations or alliances (Table 9 within the main report). Map classes were also crosswalked to ES units (Table 12 within the main report).

The ecological systems classification was developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. One purpose of ecological systems is to provide a coarse-scale mapping unit that can be applied across management boundaries.

UPLAND ECOLOGICAL SYSTEMS

CES304.762 COLORADO PLATEAU MIXED LOW SAGEBRUSH SHRUBLAND
Division 304 (Inter-Mountain Basins); Shrubland

Spatial Scale & Pattern: Large Patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Ridge/Summit/Upper Slope; Temperate (Temperate Xeric); Aridic
Concept Summary: This ecological system occurs in the Colorado Plateau, Tavaputs Plateau and Uinta Basin in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 1800 m. Soils are often rocky, shallow, and alkaline. This type extends across northern New Mexico into the southern Great Plains on limestone hills. It includes open shrublands and steppe dominated by *Artemisia nova* or *Artemisia bigelovii* sometimes with *Artemisia tridentata* ssp. *wyomingensis* codominant. Semi-arid grasses such as *Achnatherum hymenoides, Aristida purpurea, Bouteloua gracilis, Hesperostipa comata, Pleuraphis jamesii*, or *Poa fendleriana* are often present and may form a graminoid layer with over 25% cover.
Range: Occurs in the Colorado Plateau, Tavaputs Plateau and Uinta Basin in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 1800 m.
Subnations: AZ, CO, NM, UT

CES304.767 COLORADO PLATEAU PINYON-JUNIPER WOODLAND
Division 304 (Inter-Mountain Basins); Forest and Woodland

Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Mesa; Ridge/Summit/Upper Slope; Sedimentary Rock; Temperate Xeric; Aridic; *Pinus edulis, Juniperus osteosperma*
Concept Summary: This ecological system occurs in dry mountain slopes, mesas, plateaus, and ridges of the Colorado Plateau region including the Western Slope of Colorado to the Wasatch Range, south to the Mogollon Rim and the northwestern corner of New Mexico. It is typically found at lower elevations (1500-2440 m). Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Soils supporting this system vary in texture ranging from stony, cobbly, gravelly sandy loams to clay loam or clay. *Pinus edulis* and/or *Juniperus osteosperma* dominate the tree canopy. In northern Arizona and northwestern New Mexico, *Juniperus monosperma* and hybrids of *Juniperus* spp. may dominate or codominate the tree canopy. *Juniperus scopulorum* may codominate or replace *Juniperus osteosperma* at higher elevations. Understory layers are variable and may be dominated by shrubs, graminoids, or be absent. Associated species include *Arctostaphylos patula, Artemisia tridentata, Cercocarpus intricatus, Cercocarpus montanus, Coleogyne ramosissima, Purshia stansburiana, Purshia tridentata, Quercus gambelii, Bouteloua gracilis, Pleuraphis jamesii*, or *Poa fendleriana*. This system occurs at higher elevations than Great Basin Pinyon-Juniper Woodland (CES304.773) and Colorado Plateau shrubland systems.

Range: Occurs on dry mountains and foothills of the Colorado Plateau region from the Western Slope of Colorado to the Wasatch Range, south to the Mogollon Rim. It is typically found at elevations ranging from 1500-2440 m.
Subnations: AZ, CO, NM, UT

CES304.776 INTER-MOUNTAIN BASINS ASPEN-MIXED CONIFER FOREST AND WOODLAND
Division 304 (Inter-Mountain Basins); Forest and Woodland

Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Needle-Leaved Tree; Broad-Leaved Deciduous Tree; Aspen – Conifer Mix
Concept Summary: This ecological system occurs on montane slopes and plateaus in Utah, western Colorado, northern Arizona, eastern Nevada, southern Idaho, western Wyoming, and in north-central Montana in the Big Snowy Mountains. Elevations range from 1700 to 2800 m. Occurrences are typically on gentle to steep slopes on any aspect but are often found on clay-rich soils in intermontane valleys. Soils are derived from alluvium, colluvium, and residuum from a variety of parent materials but most typically occur on sedimentary rocks. The tree canopy is composed of a mix of deciduous and coniferous species, codominated by *Populus tremuloides* and conifers. As the occurrences age, *Populus tremuloides* is slowly reduced until the conifer species become dominant. Common shrubs include *Amelanchier alnifolia, Prunus virginiana, Acer grandidentatum, Symphoricarpos oreophilus, Juniperus communis, Paxistima myrsinites, Rosa woodsii, Spirea betulifolia, Symphoricarpos albus,* or *Mahonia repens.* Herbaceous species include *Bromus carinatus, Calamagrostis rubescens, Carex geyeri, Elymus glaucus, Poa* spp., and *Achnatherum, Hesperostipa, Nassella,* and/or *Piptochaetium* spp. (=*Stipa* spp.), *Achillea millefolium, Arnica cordifolia,* Asteraceae spp., *Erigeron* spp., *Galium boreale, Geranium viscosissimum, Lathyrus* spp., *Lupinus argenteus, Mertensia arizonica, Mertensia lanceolata, Maianthemum stellatum, Osmorhiza berteroi* (=*chilensis*), and *Thalictrum fendleri.* Most occurrences at present represent a late-seral stage of aspen changing to a pure conifer occurrence. Nearly a hundred years of fire suppression and livestock grazing have converted much of the pure aspen occurrences to the present-day aspen-conifer forest and woodland ecological system. This is the typical meadow edge aspen-conifer setting in the Sierra Nevada where frequently, due to fire suppression, the conifers are replacing aspen.
Range: Occurs on montane slopes and plateaus in Utah, western Colorado, northern Arizona, eastern Nevada, southern Idaho, western Wyoming (in the Bighorn Mountains), and in north-central Montana in the Big Snowy Mountains. Elevations range from 1700 to 2800 m.
Subnations: AZ, CO, ID, MT, NV, UT, WY

CES304.777 INTER-MOUNTAIN BASINS BIG SAGEBRUSH SHRUBLAND
Division 304 (Inter-Mountain Basins); Shrubland

Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland; Shrubland; Toeslope/Valley Bottom; Deep Soil; Aridic; *Artemisia tridentata* ssp. *tridentata*
Concept Summary: This ecological system occurs throughout much of the western U.S., typically in basins, plains and foothills between 1500 and 2300 m elevation. Soils are typically deep, well-drained and non-saline. These shrublands are dominated by *Artemisia tridentata* ssp. *tridentata* and/or *Artemisia tridentata* ssp. *wyomingensis*. Scattered *Juniperus* spp., *Sarcobatus vermiculatus*, and *Atriplex* spp. may be present in some stands. *Ericameria nauseosa, Chrysothamnus viscidiflorus, Purshia tridentata*, or *Symphoricarpos oreophilus* may codominate disturbed stands. Perennial herbaceous components typically contribute less than 25% vegetative cover. Common graminoid species include *Achnatherum hymenoides, Bouteloua gracilis, Elymus lanceolatus, Festuca idahoensis, Hesperostipa comata, Leymus cinereus, Pleuraphis jamesii, Pascopyrum smithii, Poa secunda*, or *Pseudoroegneria spicata*. Some semi-natural communities are included that often originate on abandoned agricultural land or on other disturbed sites.
Range: Occurs throughout much of the western U.S., typically in broad basins between mountain ranges, plains and foothills between 1500-2300 m elevation.
Subnations: CA, CO, ID, MT, NV, OR, UT, WA, WY

CES304.784 INTER-MOUNTAIN BASINS MIXED SALT DESERT SCRUB
Division 304 (Inter-Mountain Basins); Shrubland

Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland; Shrubland; Alluvial flat; Alkaline Soil; Calcareous; Silt Soil Texture; Clay Soil Texture; Xeromorphic Shrub; Dwarf-Shrub; *Atriplex* spp.
Concept Summary: This ecological system includes open-canopied shrublands of typically saline basins, alluvial slopes and plains across the Intermountain U.S. This type also extends in limited distribution into the southern Great Plains. Substrates are often saline and calcareous, medium- to fine-textured, alkaline soils, but include some coarser-textured soils. The vegetation is characterized by a typically open to moderately dense shrubland composed of one or more *Atriplex* species such as *Atriplex confertifolia, Atriplex canescens, Atriplex polycarpa*, or *Atriplex spinifera*. Other shrubs present to codominant may include *Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus viscidiflorus, Ericameria nauseosa, Ephedra nevadensis, Grayia spinosa, Krascheninnikovia lanata, Lycium* spp., *Picrothamnus desertorum*, or *Tetradymia* spp. *Sarcobatus vermiculatus* is generally absent, but if present is not dominant. The herbaceous layer varies from sparse to moderately dense and is dominated by perennial graminoids such as *Achnatherum hymenoides, Bouteloua gracilis, Elymus lanceolatus* ssp. *lanceolatus, Pascopyrum smithii, Pleuraphis jamesii, Pleuraphis rigida, Poa secunda*, or *Sporobolus airoides*.
Range: Intermountain western U.S., extending into the southern Great Plains.
Subnations: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

CES304.785 INTER-MOUNTAIN BASINS MONTANE SAGEBRUSH STEPPE
Division 304 (Inter-Mountain Basins); Steppe/Savanna

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Upper Montane]; Montane [Montane]; Montane [Lower Montane]; Woody-Herbaceous
Concept Summary: This ecological system includes sagebrush communities occurring in foothills to montane and subalpine elevations across the western U.S. from 1000 m to over 3000 m in the southern Rockies. Climate is cool, semi-arid to subhumid. This system primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. In general, this system shows an affinity for mild topography, fine soils, some source of subsurface moisture or more mesic sites, zones of higher precipitation and areas of snow accumulation. Across its range of distribution, this is a compositionally diverse system. It is composed primarily of *Artemisia tridentata* ssp. *vaseyana*, *Artemisia cana* ssp. *vsicidula*, and related taxa such as *Artemisia tridentata* ssp. *spiciformis*. *Purshia tridentata* may codominate or even dominate some stands. Other common shrubs include *Symphoricarpos* spp., *Amelanchier* spp., *Ericameria nauseosa, Peraphyllum ramosissimum, Ribes cereum,* and *Chrysothamnus viscidiflorus. Artemisia tridentata* ssp. *wyomingensis* may be present to codominant if the stand is clearly montane as indicated by montane indicator species such as *Festuca idahoensis, Leuocopoa kingii,* or *Danthonia intermedia*. Most stands have an abundant herbaceous layer (over 25% cover, in many cases over 50% cover), but this system also includes *Artemisia tridentata* ssp. *vaseyana* shrublands. Common graminoids include *Danthonia intermedia, Festuca arizonica, Festuca idahoensis, Hesperostipa comata, Poa fendleriana, Elymus trachycaulis, Bromus carinatus, Poa secunda, Leucopoa kingii, Deschampsia caespitosa, Calamagrostis rubescens,* and *Pseudoroegneria spicata*. Species of *Achnatherum* are common. In many areas, wildfires can maintain an open herbaceous-rich steppe condition, although at most sites, shrub cover can be unusually high for a steppe system (>40%), with the moisture providing equally high grass and forb cover.
Range: This system is found at montane and subalpine elevations across the western U.S. from 1000 m to over 3000 m in the southern Rockies. This system occurs in mapzone 20 on the Rocky Mountain island ranges and on the western edge with mapzone 19.
Subnations: CA, CO, ID, MT, NM, NV, OR, UT, WA, WY

CES304.787 INTER-MOUNTAIN BASINS SEMI-DESERT GRASSLAND
Division 304 (Inter-Mountain Basins); Herbaceous

Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland Foothill; Herbaceous; Temperate Xeric; Alkaline Soil; Aridic; Graminoid
Concept Summary: This widespread ecological system occurs throughout the intermountain western U.S. on dry plains and mesas, at approximately 1450 to 2320 m (4750-7610 feet) elevation. These grasslands occur in lowland and upland areas and may occupy swales, playas, mesatops, plateau parks, alluvial flats, and plains, but sites are typically xeric. Substrates are often well-drained sandy or loamy-textured soils derived from sedimentary parent materials but are quite variable and may include fine-textured soils derived from igneous and metamorphic rocks. When they occur near foothill grasslands they will be at lower elevations. The dominant perennial bunch grasses and shrubs within this system are all very drought-resistant plants. These

grasslands are typically dominated or by *Achnatherum hymenoides, Aristida* spp., *Bouteloua gracilis, Hesperostipa comata, Muhlenbergia* sp., or *Pleuraphis jamesii* and may include scattered shrubs and dwarf-shrubs of species of *Artemisia, Atriplex, Coleogyne, Ephedra, Gutierrezia,* or *Krascheninnikovia lanata*.
Range: Occurs throughout the Intermountain western U.S. on dry plains and mesas, at approximately 1450 to 2320 m (4750-7610 feet) in elevation.
Subnations: AZ, CA, CO, ID, MT?, NM, NV, OR, UT, WA, WY

CES304.788 INTER-MOUNTAIN BASINS SEMI-DESERT SHRUB-STEPPE
Division 304 (Inter-Mountain Basins); Steppe-Savanna

Spatial Scale & Pattern: Large Patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Lowland [Foothill]; Woody-Herbaceous; Temperate Xeric; Alkaline Soil; Aridic; Very Short Disturbance Interval; G-Landscape/High Intensity; Graminoid
Concept Summary: This ecological system occurs throughout the arid intermountain western U.S., typically at lower elevations on alluvial fans and flats with moderate to deep soils, and extends into south-central Montana between the Pryor and Beartooth ranges where a distinct rainshadow effect occurs. This semi-arid shrub-steppe is typically dominated by graminoids (>25% cover) with an open to moderately dense shrub layer. The most widespread (but not always dominant) species is *Pseudoroegneria spicata*, which occurs from the Columbia Basin to the northern Rockies. Other characteristic grasses include *Achnatherum hymenoides, Bouteloua gracilis, Distichlis spicata, Poa secunda, Poa fendleriana, Sporobolus airoides*, *Hesperostipa comata, Pleuraphis jamesii*, and *Leymus salinus*. The woody layer is often a mixture of shrubs and dwarf-shrubs, although it may be dominated by a single species. Characteristic species include *Atriplex canescens, Artemisia tridentata, Chrysothamnus greenei, Chrysothamnus viscidiflorus, Ephedra* spp., *Ericameria nauseosa, Gutierrezia sarothrae,* and *Krascheninnikovia lanata*. *Artemisia tridentata* or *Atriplex canescens* may be present but does not dominate. Annual grasses, especially the exotics *Bromus japonicus* and *Bromus tectorum*, may be present to abundant. Forbs are generally of low importance and are highly variable across the range but may be diverse in some occurrences. The general aspect of occurrences may be either open shrubland with patchy grasses or patchy open herbaceous layers. Disturbance may be important in maintaining the woody component. Microphytic crust is very important in some stands.
Range: This system occurs throughout the intermountain western U.S., typically at lower elevations, and extends into Wyoming and Montana across the Great Divide Basin. It barely gets as far north into north-central Montana (mapzone 20) but is unlikely to be mapped.
Subnations: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WY

CES304.789 INTER-MOUNTAIN BASINS SHALE BADLAND
Division 304 (Inter-Mountain Basins); Barren

Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (<10% vasc.); Upland
Diagnostic Classifiers: Lowland; Badlands; Alkaline Soil; Shale and Mudstone; Silt Soil Texture; Clay Soil Texture

Concept Summary: This widespread system of the intermountain western U.S. is composed of barren and sparsely vegetated substrates (<10% plant cover) typically derived from marine shales but also from siltstones and mudstones (clay). Landforms are typically rounded hills and plains that form a rolling topography. The harsh soil properties and high rate of erosion and deposition are driving environmental variables supporting sparse dwarf-shrubs, e.g., *Atriplex corrugata, Atriplex gardneri, Artemisia pedatifida,* and herbaceous vegetation.
Range: This system is found in the intermountain western U.S. It is confirmed by Oregon and Washington review to not occur in either of those states.
Subnations: AZ, CA, CO, ID, MT, NM, NV, UT, WY

CES306.648 SOUTHERN ROCKY MOUNTAIN PONDEROSA PINE WOODLAND
Division 306 (Rocky Mountain); Forest and Woodland

Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Ridge/Summit/Upper Slope; Very Shallow Soil; Mineral: W/A-Horizon<10 cm; Sand Soil Texture; Aridic; Intermediate Disturbance Interval; F-Patch/ Medium Intensity; Needle-Leaved Tree; Pinus ponderosa with shrubby understory
Concept Summary: This very widespread ecological system is most common throughout the cordillera of the Rocky Mountains, from the Greater Yellowstone region south. It is also found in the Colorado Plateau region, west into scattered locations of the Great Basin. Its easternmost extent in Wyoming is in the Bighorn Mountains. These woodlands occur a t the lower treeline/ecotone between grassland or shrubland and more mesic coniferous forests typically in warm, dry, exposed sites. Elevations range from less than 1900 m in northern Wyoming to 2800 m in the New Mexico mountains. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops are most common. This ecological system generally occurs on soils derived from igneous, metamorphic, and sedimentary material, with characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. *Pinus ponderosa* is the predominant conifer; *Pseudotsuga menziesii, Pinus edulis, Pinus contorta, Populus tremuloides,* and *Juniperus* spp. may be present in the tree canopy. The understory is usually shrubby, with *Artemisia nova, Artemisia tridentata, Arctostaphylos patula, Arctostaphylos uva-ursi, Cercocarpus montanus, Purshia stansburiana, Purshia tridentata, Quercus gambelii, Symphoricarpos* spp., *Prunus virginiana, Amelanchier alnifolia,* and *Rosa* spp. common species. *Pseudoroegneria spicata, Pascopyrum smithii,* and species of *Hesperostipa, Achnatherum, Festuca, Muhlenbergia,* and *Bouteloua* are some of the common grasses. Mixed fire regimes and ground fires of variable return intervals maintain these woodlands, depending on climate, degree of soil development, and understory density.
Range: This system is found throughout much of the Rocky Mountains cordillera, from northwestern Wyoming, south through the Rocky Mountains of Colorado and into New Mexico. In Arizona, it occurs on the Mogollon Rim north into the Colorado Plateau region and west into scattered locations of the Great Basin.
Subnations: AZ, CO, ID?, NM, NV, UT, WY

CES306.813 ROCKY MOUNTAIN ASPEN FOREST AND WOODLAND

Division 306 (Rocky Mountain); Forest and Woodland

Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Forest and Woodland (Treed); Long Disturbance Interval; F-Patch/Medium Intensity; F-Landscape/Medium Intensity; Broad-Leaved Deciduous Tree; Populus tremuloides
Concept Summary: This widespread ecological system is more common in the southern and central Rocky Mountains but occurs in the montane and subalpine zones throughout much of the western U.S. and north into Canada. An eastern extension occurs along the Rocky Mountain foothills front. Elevations generally range from 1525 to 3050 m (5000-10,000 feet), but occurrences can be found at lower elevations in some regions. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand. Secondarily, it is limited by the length of the growing season or low temperatures. These are upland forest and woodlands dominated by *Populus tremuloides* without a significant conifer component (<25% relative tree cover). The understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layers. The herbaceous layer my be dense or sparse, dominated by graminoids or forbs. Associated shrub species include *Symphoricarpos* spp., *Rubus parviflorus, Amelanchier alnifolia,* and *Arctostaphylos uva-ursi.* Occurences of this system originate and are maintained by stand-replacing disturbances such as avalanches, crown fire, insect outbreak, disease and windthrow, or clearcutting by man or beaver, within the matrix of conifer forests.
Range: This system is more common in the central and southern Rocky Mountains extending south to the Sacramento Mountains, however, it occurs in the montane and subalpine zones throughout much of the western U.S. and north into Canada, as well as west into California. Elevations generally range from 1525 to 3050 (5000-10,000 feet), but occurrences can found at lower elevations in some regions. Very small occurrences may be found in a few scattered locations of the Trans-Pecos of Texas.
Subnations: AZ, CA, CO, ID, MT, NM, NV, OR, SD, TX, UT, WA, WY

CES306.815 ROCKY MOUNTAIN CLIFF, CANYON AND MASSIVE BEDROCK

Division 306 (Rocky Mountain); Barren

Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Upland
Diagnostic Classifiers: Canyon; Cliff (Landform); Ridgetop bedrock outcrop; Talus (Substrate); Rock Outcrops/Barrens/Glades; Oligotrophic Soil; Very Shallow Soil; Landslide
Concept Summary: This ecological system of barren and sparsely vegetated landscapes (generally <10% plant cover) is found from foothill to subalpine elevations on steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous (intrusives), sedimentary, and metamorphic bedrock types. It is located throughout the Rocky Mountains and northeastern Cascade Ranges in North America. Also included are unstable scree and talus slopes that typically occur below cliff faces. In general these are the dry sparsely vegetated places on a landscape. The biota on them reflect what is surrounding them, unless it is an extreme parent material. There may be small patches of dense vegetation, but it typically includes scattered trees

and/or shrubs. Characteristic trees include species from the surrounding landscape, such as *Pseudotsuga menziesii, Pinus ponderosa, Pinus flexilis, Populus tremuloides, Abies concolor, Abies lasiocarpa,* or *Pinus edulis* and *Juniperus* spp. at lower elevations. There may be scattered shrubs present, such as species of *Holodiscus, Ribes, Physocarpus, Rosa, Juniperus,* and *Jamesia Americana, Mahonia repens, Rhus trilobata,* or *Amelanchier alnifolia.* Soil development is limited, as is herbaceous cover.
Range: This system is located throughout the Rocky Mountain, including the isolated island ranges of central Montana, and northeastern Cascade Ranges in North America.
Subnations: AZ, CO, ID, MT, NM, OR, TX, UT, WA, WY

CES306.818 ROCKY MOUNTAIN GAMBEL OAK-MIXED MONTANE SHRUBLAND
Division 306 (Rocky Mountain); Shrubland

Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Shrubland; Shallow Soil; Mineral w/ A-Horizon <10 cm; Loam Soil Texture; Sand Soil Texture; Ustic; Unconsolidated; Intermediate Disturbance Interval [Periodicity/Polycyclic Disturbance]; Broad-Leaved Deciduous Shrub
Concept Summary: This ecological system occurs in the mountains, plateaus, and foothills in the southern Rocky Mountains and Colorado Plateau, including the Uinta and Wasatch ranges and the Mogollon Rim. These shrublands are commonly found on dry foothills, lower mountain slopes, and at the edge of the western Great Plains from approximately 2000 to 2900 m in elevation, and are often situated above pinyon-juniper woodlands. Substrates include soil types ranging from calcareous, fine-grained loams to sandy loams, gravelly loams, clay loams, deep alluvial sand, or coarse gravel. The vegetation is typically dominated by *Quercus gambelii* alone or with *Amelanchier alnifoliah, Amelanchier utahensis, Artemisia tridentata, Cercocarpus montanus, Prunus virginiana, Purshia stansburiana, Purshia tridentata, Robinia neomexicana, Symphoricarpos oreophilus*, or *Symphoricarpos rotundifolius*. There may be inclusions of other mesic montane shrublands with *Quercus gambelii* absent or as a minor component. This ecological system intergrades with the lower montane-foothills shrubland system and shares many of the same site characteristics. Density and cover of *Quercus gambelii* and *Amelanchier* spp. often increase after fire.
Range: Occurs in the mountains, plateaus and foothills in the southern Rocky Mountains and Colorado Plateau including the Uinta and Wasatch ranges and the Mogollon Rim.
Subnations: AZ, CO, NM, UT, WY

CES306.822 ROCKY MOUNTAIN LOWER MONTANE-FOOTHILL SHRUBLAND
Division 306 (Rocky Mountain); Shrubland

Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Very Shallow Soil; Aridic; Intermediate Disturbance Interval [Periodicity/Polycyclic Disturbance]

Concept Summary: This ecological system is found in the foothills, canyon slopes and lower mountains of the Rocky Mountains and on outcrops and canyon slopes in the western Great Plains. It ranges from southern New Mexico, extending north into Wyoming, and west into the InterMountain West region. These shrublands occur between 1500 and 2900 m elevation and are usually associated with exposed sites, rocky substrates and dry conditions, which limit tree growth. It is common where *Quercus gambelii* is absent, such as the northern Colorado Front Range and in drier foothills and prairie hills. This system is generally drier than Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818) but may include mesic montane shrublands where *Quercus gambelii* does not occur. *Cercocarpus montanus* dominates pure stands in parts of Wyoming and Colorado. Scattered trees or inclusions of grassland patches or steppe may be present, but the vegetation is typically dominated by a variety of shrubs, including *Amelanchier utahensis, Cercocarpus montanus, Purshia tridentata, Rhus trilobata, Ribes cereum, Symphoricarpos oreophilus,* or *Yucca glauca.* Grasses are represented as species of *Muhlenbergia, Bouteloua, Hesperostipa,* and *Pseudoroegneria spicata*. Fires play an important role in this system as the dominant shrubs usually have a severe die-back, although some plants will stump sprout. *Cercocarpus montanus* requires a disturbance such as fire to reproduce, either by seed sprout or root-crown sprouting. Fire suppression may have allowed an invasion of trees into some of these shrublands, but in many cases sites are too xeric for tree growth.
Range: This system is found in the foothills, canyon slopes and lower mountains of the Rocky Mountains and on outcrops and canyon slopes in the western Great Plains. It ranges from southern New Mexico, extending north into Wyoming, and west into the Intermountain West Region.
Subnations: CO, MT, NM, SD, WY

CES306.823 SOUTHERN ROCKY MOUNTAIN DRY-MESIC MONTANE MIXED CONIFER FOREST AND WOODLAND
Division 306 (Rocky Mountain); Forest and Woodland

Spatial Scale & Pattern: Matrix
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Montane [Montane]; Montane [Lower Montane]; Forest and Woodland (Treed); Aridic; Intermediate Disturbance Interval; F-Patch/Medium Intensity; F-Landscape/Medium Intensity; Needle-Leaved Tree; RM Montane Mesic Mixed Conifer; Moderate (100-150 yrs) Persistence
Concept Summary: This is a highly variable ecological system of the montane zone of the Rocky Mountains. It occurs throughout the soutehr Rockies, north and west into Utah, Nevada, Wyoming and Idaho. These are mixed-conifer forests occurring on all aspects at elevations ranging from 1200 to 3300 m. Rainfall averages less than 75 cm per year (40-60 cm), with summer “monsoons” during the growing season contributing substantial moisture. The composition and structure of the overstory are dependent upon the temperature and moisture relationships of the site and the successional status of the occurrence. *Pseudotsuga menziesii* and *Abies concolor* are most frequent, but *Pinus ponderosa* may be present to codominant. *Pinus flexilis* is common in Nevada. *Pseudotsuga menziesii* forestsoccupy drier sites, and *Pinus ponderosa* is a common codominant. *Abies concolor*-dominated forests occupy cooler sites, such as upper slopes at higher elevations, canyon sideslopes, ridgetops, and north- and east-facing

slopes which burn somewhat infrequently. *Picea pungens* is most often found in cool, moist locations, often occurring as smaller patches within a matrix of other associations. As many as seven conifers can be found growing in the same occurrence, and there are a number of cold-deciduous shrub and graminoid species common, including *Arctostaphylos uva-ursi, Mahonia repens, Paxistimia myrsinites, Symphoricarpos oreophilus, Jamesia americana, Quercus gambelii,* and *Festuca arizonica.* This system was undoubtedly characterized by a mixed-severity fire regime in its "natural condition," characterized by a high degree of variability in lethality and return interval.
Range: This system occurs throughout the southern Rockies, north and west into Utah, Nevada, eastern Wyoming (very southern in Laramie Range and possibly on Sheep Mountain) and Idaho. Although not common, it does occur in southeastern Oregon but does not extend farther west into the Cascades.
Subnations: AZ, CO, ID, NM, NV, OR, UT, WY

CES306.824 SOUTHERN ROCKY MOUNTAIN MONTANE-SUBALPINE GRASSLAND
Division 306 (Rocky Mountain); Herbaceous

Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland
Diagnostic Classifiers: Herbaceous; Acidic Soil; Mineral: W/ A-Horizon >10 cm; Loam Soil Texture; Silt Soil Texture; Aridic; Short Disturbance Interval; Graminoid; Cool-season bunch grasses
Concept Summary: This Rocky Mountain ecological system typically occurs between 2200 and 3000 m elevation on flat to rolling plains and parks on lower sideslopes that are dry, but it may extend up to 3350 m on warm aspects. Soils resemble prairie soils in that the A-horizon is dark brown, relatively high in organic matter, slightly acidic, and usually well-drained. An occurrence usually consists of a mosaic of two or three plant associations with one of the following dominant bunch grasses: *Danthonia intermedia, Danthonia parryi, Festuca idahoensis, Festuca arizonica, Festuca thurberi, Muhlenbergia filiculmis,* or *Pseudoroegneria spicata.* The subdominants include *Muhlenbergia montana, Bouteloua gracilis,* and *Poa secunda.* These large-patch grasslands are intermixed with matrix stands of spruce-fir, lodgepole pine, ponderosa pine, and aspen forests. In limited circumstances (e.g. South Park in Colorado), they form the "matrix" of high-elevation plateaus.
Range: This system occurs between 2200 and 3000 m elevation in the Colorado Rockies. Where it transitions in Wyoming to Northern Rocky Mountain Subalpine-Upper Montane Grassland (CES306.806) still needs to be clarified.
Subnations: AZ, CO, NM, UT, WY

CES306.825 SOUTHERN ROCKY MOUNTAIN MESIC MONTANE MIXED CONIFER FOREST AND WOODLAND
Division 306 (Rocky Mountain); Forest and Woodland

Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Ravine; Stream Terrace (undifferentiated); Toeslope; Mesotrophic Soil; Ustic; Long Disturbance Interval; F-Patch/Low Intensity; F-Landscape/Low Intensity; Needle-Leaved Tree; RM Montane Dry-Mesic Mixed Conifer
Concept Summary: These are mixed conifer forests of the Rocky Mountains west into the ranges of the Great Basin, occurring predominantly in cool ravines and on north-facing slopes. Elevations range from 1200 to 3300 m. Occurrences of this system are found on cooler and more mesic sites than Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823). Such sites include lower and middle slopes of ravines, along stream terraces, moist, concave topographic positions and north- and east-facing slopes which burn somewhat infrequently. *Pseudotsuga menziesii and Abies concolor* are most common canopy dominants, but *Picea engelmannii, Picea pungens,* or *Pinus ponderosa* may be present. This system includes mixed conifer/*Populus tremuloides* stands. A number of cold-deciduous shrub species can occur, including *Acer glabrum, Acer grandidentatum, Alnus incana, Betula occidentalis, Cornus sericea, Jamesia americana, Physocarpus malvaceus, Robinia neomexicana, Vaccinium membranaceum,* and *Vaccinium myrtillus.* Herbaceous species include *Bromus ciliatus, Carex geyeri, Carex rossii, Carex siccata, Muhlenbergia virescens, Pseudoroegneria spicata, Erigeron eximius, Fragraria virginiana, Luzula parviflora, Osmorhiza berteroi, Packera cardamine, Thalictrum occidentale,* and *Thalictrum fendleri.* Naturally occurring fires are of variable return intervals and mostly light, erratic, and infrequent due to the cool, moist conditions.
Range: This system is found in the southern Rocky Mountains of Arizona and New Mexico north and west into the ranges of the Great Basin, Wyoming and southeastern Idaho, occurring predominantly in cool ravines and on north-facing slopes.
Subnations: AZ, CO, ID, NM, NV, OR?, UT, WY

RIPARIAN AND WETLAND ECOLOGICAL SYSTEMS

CES306.812 ROCKY MOUNTAIN ALPINE-MONTANE WET MEADOW

Division 306 (Rocky Mountain); Herbaceous Wetland

Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland
Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Montane [Upper Montane]; Herbaceous; Seepage-Fed Sloping [Mineral]; Depressional [Lakeshore]; Depressional [Pond]; Graminoid
Concept Summary: These are high-elevation communities found throughout the Rocky Mountains and Intermountain regions, dominated by herbaceous species found on wetter sites with very low-velocity surface and subsurface flows. They range in elevation from montane to alpine (1000 to 3600 m). These types occur as large meadows in montane or subalpine valleys, as narrow strips bordering ponds, lakes and streams, and along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on sub-irrigated sites with slopes up to 10%. In alpine regions, sites typically are small depressions located below late-melting snow patches or on snow beds. Soils of this system may be mineral or organic. In either case, soils show typic hydric soil characteristics, including high organic content and/or low chroma and

redoximorphic features. This system often occurs as a mosaic of several plant associations, often dominated by graminoids, including *Calamagrostis stricta, Caltha leptosepala, Cardamine cordifolia, Carex illota, Carex microptera, Carex nigricans, Carex scopulorum, Carex utriculata, Carex vernacula, Deschampsia caesptiosa, Eleocharis quinqueflora, Juncus drummondii, Phippsia algida, Rorripa alpina, Senecio triangularis, Trifolium parryi,* and *Trollius laxus.* Often alpine dwarf-shrublands, especially those dominated by *Salix*, are immediately adjacent to the wet meadows. Wet meadows are tightly associated with snowmelt and typically not subjected to high disturbance events such as flooding.
Range: This system is found throughout the Rocky Mountains and Intermountain West regions, ranging in elevation from montane to alpine (1000-3600 m).
Subnations: AZ, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

CES306.821 ROCKY MOUNTAIN LOWER MONTANE RIPARIAN WOODLAND AND SHRUBLAND
Division 306 (Rocky Mountain); Woody Wetland

Spatial Scale & Pattern: Linear
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)
Diagnostic Classifiers: Lower Montane; Riverine / Alluvial; Mineral: W/ A-Horizon <10 cm; Unconsolidated; Short (<5 yrs) Flooding Interval; Short (50-100 yrs) Persistence
Concept Summary: This system is found throughout the Rocky Mountain and Colorado Plateau regions within a broad elevation range from approximately 900 to 2800 m. This system often occurs as a mosaic of multiple communities that are tree-dominated with a diverse shrub component. This system is dependent on a natural hydrologic regime, especially annual to episodic flooding. Occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, and immediate streambanks. They can form large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. It is also typically found in backwater channels and other perennially wet but less scoured sites, such as floodplains swales and irrigation ditches. Dominant trees may include *Acer negundo, P. angustifolia, P. balsamifera, P. deltoides, P. fremontii, Pseudotsuga menziesii, Picea pungens, Salix amygdaloides,* or *Juniperus scopulorum.* Dominant shrubs include *Acer glabrum, Alnus incana, Betula occidentalis, Cornus sericea, Crataegus rivularis, Forestiera pubescens, Prunus virginiana, Rhus trilobata, Salix monticola, Salix drummondiana, Salix exigua, Salix irrorata, Salix lucida, Shepherdia argentea,* or *Symphoricarpos* spp. Exotic trees of *Elaeagnus angustifolia* and *Tamarix* spp. are common in some stands. Generally, the upland vegetation surrounding this riparian system is different and ranges from grasslands to forests.
Range: Found throughout the Rocky Mountain and Colorado Plateau regions within a broad elevation range from approximately 900 to 2800 m.
Subnations: AZ, CO, ID, MT, NM, NV, OR, SD, UT, WY

CES306.832 ROCKY MOUNTAIN SUBALPINE-MONTANE RIPARIAN SHRUBLAND
Division 306 (Rocky Mountain); Woody Wetland

Spatial Scale & Pattern: Linear
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Montane [Upper Montane]; Montane [Montane]; Shrubland (Shrub-dominated); Riverine / Alluvial; Broad-Leaved Deciduous Shrub; Short (<5 yrs) Flooding Interval; RM Subalpine/Montane Riparian Woodland; Short (50-100 yrs) Persistence
Concept Summary: This system is found throughout the Rocky Mountain cordillera, from New Mexico north into Montana, and also occurs in mountainous areas of the Intermountain region and Colorado Plateau. These are montane to subalpine riparian shrublands occurring as narrow bands of shrubs lining streambanks and alluvial terraces in narrow to wide, low-gradient valley bottoms and floodplains with sinuous stream channels. Generally it is found at higher elevations, but can be found anywhere from 1700-3475 m. Occurrences can also be found around seeps, fens, and isolated springs on hillslopes away from valley bottoms. Many of the plant associations found within this system are associated with beaver activity. This system often occurs as a mosaic of multiple communities that are shrub- and herb-dominated and includes above-treeline, willow-dominated, snowmelt-fed basins that feed into streams. The dominant shrubs reflect the large elevational gradient and include *Alnus incana, Betula glandulosa, Betula occidentalis, Cornus sericea, Salix bebbiana, Salix boothii, Salix brachycarpa, Salix drummondiana, Salix eriocephala, Salix geyeriana, Salix monticola, Salix planifolia,* and *Salix wolfii.* Generally the upland vegetation surrounding these riparian systems are of either conifer or aspen forests.
Range: This system is found throughout the Rocky Mountain cordillera from New Mexico north into Montana (including the isolated island mountain ranges of central and eastern Montana), and also occurs in mountainous areas of the Intermountain West and Colorado Plateau.
Subnations: AZ, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

CES306.833 ROCKY MOUNTAIN SUBALPINE-MONTANE RIPARIAN WOODLAND
Division 306 (Rocky Mountain); Woody Wetland

Spatial Scale & Pattern: Linear
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland
Diagnostic Classifiers: Montane [Upper Montane]; Montane [Montane]; Forest and Woodland (Treed); Riverine / Alluvial; Short (<5 yrs) Flooding Interval; RM Subalpine/Montane Riparian Woodland
Concept Summary: This riparian woodland system is comprised of seasonally flooded forests and woodlands found at montane to subalpine elevations of the Rocky Mountain cordillera, from southern New Mexico north into Montana, and west into the Intermountain region and the Colorado Plateau. It occurs throughout the interior of British Columbia and the eastern slopes of the Cascade Mountains. This system contains the conifer and aspen woodlands that line montane streams. These are communities tolerant of periodic flooding and high water tables. Snowmelt moisture in this system may create shallow water tables or seeps for a portion of the growing season. Stands typically occur at elevations between 1500 and 3300 m (4920-10, 830 feet), farther north elevation ranges between 900 and 2000 m. This is confined to specific riparian environments occurring on floodplains or terraces of rivers and streams, in V-shaped, narrow valleys and canyons (where there is cold-air drainage). Less frequently, occurrences are found in moderate-wide valley bottoms on large floodplains along broad, meandering rivers, and on pond or lake margins. Dominant tree species vary across the latitudinal range, although it usually includes *Abies lasiocarpa* and/or *Picea engelmannii*; other important species include *Pseudotsuga menziesii, Picea pungens, Picea engelmanni X glauca, Populus tremuloides,* and

Juniperus scopulorum. Other trees possibly present but not usually dominant include *Alnus incana, Abies concolor, Abies grandis, Pinus contorta, Populus angustifolia, Populus balsamifera* ssp. *trichocarpa,* and *Juniperus osteosperma.*
Range: This system is found at montane to subalpine elevations of the Rocky Mountain cordillera, from southern New Mexico north into Montana, Alberta, and British Columbia, and west into the Intermountain region and the Colorado Plateau.
Subnations: AZ, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

Appendix B. Plot, Observation Point, Accuracy Assessment Point Instructions and Data Forms

Introduction

This appendix contains the forms and instruction manuals used in collecting field data for the Vegetation Mapping Project at Curecanti National Recreation Area. Two types of data were collected: vegetation plot (or observation point for larger, undefined plot area) and accuracy assessment point. Vegetation plots were used primarily in developing the NVC classification for the park. They were also used by photointerpreters to help recognize aerial photo signatures. Observation points were used primarily for assisting with photointerpretation, and secondarily for supporting NVC association descriptions and documenting non-standard vegetation types. Accuracy assessment data were used primarily for testing the thematic accuracy of the vegetation map and secondarily to support NVC association descriptions.

B.1. Plot and Observation Point Field Sampling Manual

2003/2004 SAMPLING AT NORTHERN COLORADO PLATEAU NETWORK PARKS

Black Canyon National Park / Curecanti National Recreation Area

A Basic Guide for Field Work
Modified for the 2001- 2005 Field Seasons, USGS/NPS Vegetation Mapping Program

This document is intended to give you general instructions and guidelines for conducting your field work at Black Canyon National Park and Curecanti National Recreation Area. Detailed, field-by-field coding conventions for the primary form you'll be completing in the field (the Plot Survey form) are provided in the 'cheat sheet' at the back of this guide. You will also be taking Observation Points on a form reduced from and similar to the Plot Survey form, it will be provided in the field. An Accuracy Assessment Point form—another form reduced from and similar to the Plot Survey form, will also be provided in the field.

OVERVIEW
The data that you collect this year will be used to create a relatively fine-scale delineation of vegetation pattern in this Northern Colorado Plateau Network (NCPN) park and its environs. The range of habitats and the corresponding diversity of vegetation types, found in this park are complex. The understanding of finer-scale, ecologically distinct vegetation types that you will help create may be used by the park to plan appropriate management activities, monitor the results of these activities, track long-term changes in vegetation, direct searches for rare species, model fire behavior, and portray the wealth of natural diversity on park lands to the public.

Establishing a field sampling strategy that captures sufficient data on all the distinct vegetation types in Black Canyon National Park and Curecanti National Recreation Area, areas that are very diverse and rugged, is a challenge. To make the sampling as efficient as possible, the key environmental variables thought to be driving vegetation pattern were identified. These included factors such as geology, soils, aspect, hydrology, elevation, and land use/fire history (see TNC 1998).

Initially, sampling will be conducted using aerial photographs, geology maps, and topographic maps in addition to overlays of the three data sources to adequately and thoroughly sample the vegetation using standard vegetation plots and ancillary observation points. A classification based on this sampling will result in interpretation of aerial photos to produce a vegetation map that will be assessed for accuracy the following field season. The photo interpreters will supply digital orthophotos with polygons delineated for accuracy assessment work. A combination of manual and electronic delineation and digitizing approaches, as well as on-screen and automated photo interpretation techniques, will be used for Black Canyon National Park and Curecanti National Recreation Area to delineate polygons and label the vegetation types. The vegetation "types" the photo interpreters will choose to name their polygons are those included in the preliminary classification of the parks vegetation created using the U.S. National Vegetation Classification System (Grossman et al. 1998).

The field crew will evaluate the field data, assign a preliminary vegetation type based on a list of potential vegetation types developed from the existing literature, and update the tally of vegetation types by number of plots still needed. The goal is to use your time as efficiently as possible: we are trying our best to avoid oversampling of some types and undersampling of others. Deciding where to sample to capture the full range of diversity throughout the park is going to be very much an iterative process as the field

season goes along!

GETTING THERE
You will have a Digital Ortho Quarter Quad (DOQQ) print and a copy of the 1:12,000-scale aerial photography to guide you. You and your partner will navigate towards each selected photo-signature using your park road and trail map, USGS 7.5 mm. topographic map, the DOQQ, and/or GPS. The DOQQ's will have roads and trails highlighted on them to help you as well.

Before you leave…check that you have all the materials needed to complete your field work (Please see the checklist and 'considerations for mission planning" at the end of this document to help you).

Every single morning…check your GPS receiver to make sure it is set to NAD 83.

Along the way...look around. The goal of this field work is to sample all the different vegetation types that occur in Black Canyon National Park and Curecanti National Recreation Area. If, on the way to one vegetation type, you see an assemblage of plants that seems unique and that is not included on the list of vegetation types, please sample if time allows. In this park, these undescribed vegetation types are more likely various pinyon – juniper woodland understories, herbaceous types, or shrublands. You will be better able to recognize these undescribed vegetation types as the season progresses and you become more familiar with the vegetation types and how they can look on the ground.

ONCE THERE
Establishing a Plot
1) Figure out where to place your plot. This is a subjective process. You'll want to place your plots in areas that seem to be both relatively **homogenous** and **representative** of the vegetation of the signature as a whole. In other words, avoid areas where the vegetation appears to be transitioning from one type to another (ecotones) and areas with anomalous or heterogeneous structure or species composition. Look at *all* the vegetation strata to determine if the area is structurally and floristically uniform and generally try to place your plots at least 30 m from what you see as the 'boundary' between this vegetation type and any neighboring, distinctly different types. During the training period this step will be emphasized and discussed in detail. However, the rule-of-thumb is to conduct a reconnaissance of the plot area if time and topography allows.

Note: In cases where a signature is very heterogeneous, more than one plot or a plot and observation points may be needed. Again, look around, use that human perception.

2) Using your GPS (Global Positioning System) receiver, record the UTM (Universal Transverse Mercator) coordinates in the center of the plot under the Field UTM X and Field UTM Y on the field form. Also mark and label the location of the plot on a USGS 7.5 min. topographic map and/or on an aerial photo. If you cannot obtain a GPS reading, estimate UTMs from the USGS topographic map and note on the form that you had to resort to this method. Plots may be circular, rectangular or square. Note shape and dimensions on the field form. If the plot is rectangular or square, record the azimuth of the long side (any side if square) to help relocate the plot. It may make more sense to establish rectangular plots in linear vegetation types (e.g. riparian or ridgeline types). Standard plot sizes should be as follows:

If you're in a ...	**You should usually make your plot…**	**Giving you a plot area of…**
Forest (i.e., trees have their crowns	11.3 m radius OR	400 m^2

overlapping, usually forming 60-100% cover)	20 m x 20 m	400 m^2
Woodland (i.e., open stands of trees with crowns usually not touching. Canopy tree cover is 25-60% OR exceeds shrub, dwarf-shrub, herb, and nonvascular cover).	11.3 m radius OR 20 m x 20 m	400 m^2 400 m^2
Shrubland (i.e., shrubs greater than 0.5 m tall are dominant, usually forming more than 25% cover OR exceeding tree, dwarf shrub, herb, and nonvascular cover)	11.3 m radius OR 20 m x 20 m	400 m^2 400 m^2
Dwarf-shrubland (heath) (i.e., Shrubs less than 0.5 m tall are dominant, usually forming more than 25% cover OR exceeding tree, shrub, herb, and nonvascular cover).	5.65 m radius OR 10 m x 10 m	100 m^2 100 m^2
Herbaceous (i.e., Herbs dominant usually forming more than 25 percent cover OR exceeding tree, shrub, dwarf-shrub, and nonvascular cover).	5.65 m radius OR 10 m x 10 m	100 m^2 100 m^2
Nonvascular (i.e., nonvascular cover dominant usually forming more than 25% cover).	2.82 m radius OR 5 m x *5* m	25 m^2 25 m^2

Note: You can deviate from the standard plot *shapes* where that makes sense, but the total plot *area* encompassed by the boundaries should be as listed above for each major class of vegetation. For example, forested riparian vegetation may be sampled in a more linear 10 x 40 m (400 m^2) plot; herbaceous riparian or ridgeline vegetation in a 2 x 50 m (100m^2) plot. You may also increase the size of the plot to the next standard size if necessary to sample the heterogeneity of the vegetation. Forests, woodlands, and shrublands can be increased to 1000 m^2. Please make a note on plot form.

3) Once the plot is established, it is generally a good time to fill out the **Identifiers/Locators** part of your Plot Survey Form (see the cheat sheet) and take the plot photos.

Taking photographs

Two color photos will be taken of each plot using slide film. The purpose is to obtain a good representation of the vegetation of the plot, not individual species. A piece of paper (or a chalk board or dry erase board) should be placed in the plot, with the plot number recorded on it, so that the photo includes the plot number. Preprinted plot numbers could be printed or copied onto colored paper (white has such strong contrast as to be unreadable in the photo) and attached to the back of a clipboard. This saves having to write plot numbers in the field. Take the photograph looking across the contour if plot is steep. Record roll #, frame #, and azimuth on plot form.

Data Collection

Environmental Description

See the coding instructions at the end of this document for guidance on the specific fields.

Vegetation Description
For guidance on the specific fields on the second page of the form, see the coding instructions.

As you begin to collect the species, DBH (diameter at breast height – 4.5'), and cover information, keep these rules in mind they will speed your data collection considerably:

1) Except in very diverse plots, don't spend more than **20 minutes** looking for new and different species to record. Remember that these plot data are to be used to classify the overall vegetation of the Park, not to make a complete species list for it. And if you had to spend much more than 20 minutes *to find* a species, it probably isn't going to be important in characterizing the vegetation type. For diverse plots with over 25 taxa you may take up to 30 minutes on the listing process.

2) If you can't identify a plant to species, record it on your form as "unknown species 1,' "unknown species 2,' "*Carex* unknown sp. I", etc. Record associated cover class and other data for the unknown as you would for any other species. Then do one of two things:

If you need the species identified right away because it appears to be dominant or diagnostic (you're seeing it all over the place or you're seeing much more in this particular vegetation type than in others), take a sample of the species with as much of the plant as possible, especially intact sexual parts (flowers and fruits), if present. Place the sample in a baggie, and label the baggie (or specimen) with the plot code and the name you gave it on the data form.

If you don't need the plant keyed right away, press it. Mark the pressed specimen with the plot code and the name you gave it on the data form.

Store specimens in a cool, dry place. Bagged specimens will keep fresh longer in the refrigerator or ice chest until pressed or identified. You can, of course, key some of these out yourself if you want to, but don't let plant keying get in the way of your primary responsibility: field data *collection.* No one expects you to identify every plant but you should make an effort to learn at least the common species that keep recurring in plots. A quick prioritization of what to key and what to press may be made based on the recurrence of the species in samples and on the cover-class estimate of the species in a particular plot. If the species has a high cover value (>1%) it is more of a priority to identify. Field crews should mark the specimen tag with its cover class estimate as well as its unique identifying number for the vegetation sample.

Observation Point Form
When you have sampled one particular vegetation type thoroughly, but want to further define its distribution or when you encounter small but unique vegetation patches that are below the minimum mapping unit in size (<1.5 ha), record the site on an Observation Point form. This is an abbreviated Plot Survey form and usually takes about 15 minutes to fill in the data. The major difference is that an Observation Point is unbounded and includes an area roughly equal to that of the minimum mapping unit (40 m radius around the observer) or it encompasses the entirety of a small but unique vegetation patch. The data fields are the same as those on the Plot Survey form, so use the above instructions. Minor differences in the Observation Point form from the Plot Survey form include the elimination of some data fields, more general cover classes for ground cover estimates, and only the dominant or diagnostic species are recorded. Also, only one photo is taken to record the Observation Point plant community.

Accuracy Assessment Point Form
You will navigate to pre-selected coordinates within polygons, scout out the polygon briefly to get a feel for what it is like, and record some general data to characterize it on an Accuracy Assessment Point form. This is also an abbreviated version of the Plot Survey form, much like the Observation Point form, and the same cheat sheet can be used to help with filling it out. A sample completed Accuracy Assessment Point form is provided at the end of this document.

INSTRUCTIONS FOR FILLING OUT FIELDS IN THE PLOT AND OBSERVATION POINT SURVEY FORMS

PLOT DESCRIPTION

Plot Code
Code indicating the specific plot within the vegetation polygon. For the 2003 field season, the codes will be in the following format "PARK ACRONYM.XXX" (i.e., "Black Canyon National Park or Curecanti National Recreation Area = BLCA or CURE.XXX"). Begin with BLCA or CURE.00l and go from there. If another team is working, decide with them which plot numbers each team will use to identify the data they gather. For example, if a second team is working one week at Black Canyon National Park / Curecanti National Recreation Area and approximately 100 plots have already been collected, they may sample plots BLCA.150 or CURE.200 through BLCA.175 or CURE.225.

Provisional Community Name
Using the provisional classification of the parks with which you've been provided, assign the name of the vegetation type that most closely resembles this type. Enter the finest level of the classification possible. In fact, *none* of the names may be a good fit; you may have found a new type. If that is the case, create a provisional name with the dominant and diagnostic species. The 'provisional community name' that is assigned will be used to update the tally of types x number of plots needed.

State CO

Park Name BLCA or CURE

Park Site Name
Provisional name assigned by field worker that describes where the data were collected. It should represent an identifiable feature on a topographic or park map.

Quad Name
Appropriate name/scale from survey map used; use 7.5-minute quadrangle if possible.

Quad Code
Code of quadrangle map.

Field UTM X
Use GPS, but if you can't obtain a GPS reading, estimate coordinates from a topographic map and note on the form that this method was used.

Field UTM Y

Use GPS, but if you can't obtain a GPS reading, estimate coordinates from a topographic map and note on the form that this method was used.

GPS Error
Note the error in the GPS reading off the unit.

Survey Date
Date the survey was taken; year, month, day.
Surveyors
Names of surveyors, with principal surveyor (usually the Lead Ecologist) listed first.

Directions to Plot
Precise directions to the site using a landmark (e.g., a named point on the topographic map, a major highway, using park naming conventions for roads) readily locatable on a 7.5 minute topographic or park map as the starting point. Use clear sentences that will be understandable to someone who is unfamiliar with the area and has only your directions to follow. Give distances as closely as possible to the 0.1 mile and use compass directions. Give additional directions to the plot within the site. Do not take more than a couple of minutes to fill this out.

Plot Length and Plot Width
Enter diameter for circular plots and width and length dimensions for square or rectangular plots. Choose the appropriate plot size based on the following:

Vegetation Class	Standard Plot Dimensions	PLOT AREA
Forest	11.3 m radius or 20 m x 20 m	400 m^2
Woodland	11.3 m radius or 20 m x 20 m	400 m^2
Shrubland	11.3 m radius or 20 m x 20 m	400 m^2
Dwarf-shrubland	5.65 m radius or 10 m x 10m	100 m^2
Herbaceous	5.65 m radius or 10 m x 10 m	100 m^2
Nonvascular	2.82 m radius or 5 m x 5 m	25 m^2

Plot Photos/ Roll Number/Frame Numbers
Indicate (Y or N) if photos of the plot have been taken at the time of sampling, and the roll and frame numbers of any photos. Also record azimuth of the photo if not taken in the standard direction.

Plot Permanent (if/when applicable)
Check off that the plot has been permanently marked.

Plot Representativeness
Does this plot represent the full variability of the photo signature? If not, were additional plots taken? Note additional species not seen in the plot in the space provided below. Note: we distinguish in this section the plot's ability to represent the stand or polygon you are sampling as one component and the ability of this sample to represent the range of variability of the association in the entire mapping area. The former comment may be ascertained by reconnaissance of the stand. The latter comment comes only after some familiarity with the vegetation type throughout the mapping area and may be left blank if you have no opinion at this time.

ENVIRONMENTAL DESCRIPTION

Elevation

Elevation of the plot. Specify whether in feet or meters (this will depend on the units used on the GPS or on the topographic map being used). In general, we have determined that the reading you get from a topographic map, provided you are certain where you are, is more accurate than the average reading from the GPS unit. Thus, please attempt to estimate your elevation with the topographic map.

Slope

Measure the slope in degrees using a clinometer.

Aspect

Measure the slope aspect using a compass (be sure to correct for the magnetic declination). Note: all compasses should be pre-set to an average declination for the park and thus, readings from the compasses carried by the field crews may be directly noted.

Topographic Position

Topographic position of the plot. Choose one:

INTERFLUVE (crest, summit, ridge). Linear top of ridge, hill, or mountain; the elevated area between two fluves (drainageways) that sheds water to the drainageways.

HIGH SLOPE (shoulder slope, upper slope, convex creep slope). Geomorphic component that forms the uppermost inclined surface at the top of a slope. Includes the transition zone from backslope to summit. Surface is dominantly convex in profile and erosional in origin.

HIGH LEVEL (mesa). Level top of a plateau.

MIDSLOPE (transportational midslope, middle slope). Intermediate slope position.

BACKSLOPE (dipslope). Subset of midslopes that are steep, linear, and may include cliff segments (fall faces).

STEP IN SLOPE (ledge, terraeette). Nearly level shelf interrupting a steep slope, rock wall, or cliff face.

LOWSLOPE (lower slope, foot slope, colluvial footslope). Inner gently inclined surface at the base of a slope. Surface profile is generally concave and a transition between midslope or backslope, and toeslope.

TOESLOPE (alluvial toeslope). Outermost gently inclined surface at base of a slope. In profile, commonly gentle and linear and characterized by alluvial deposition.

LOW LEVEL (terrace). Valley floor or shoreline representing the former position of an alluvial plain, lake, or shore.

CHANNEL WALL (bank). Sloping side of a channel.

CHANNEL BED (narrow valley bottom, gully, arroyo, wash). Bed of single or braided watercourse commonly barren of vegetation and formed of modern alluvium.

BASIN FLOOR (depression). Nearly level to gently sloping, bottom surface of a basin.

Landform
Enter the landform that describes the site where the plot was taken. Note on the code sheet the landform choices are listed at different scales. Thus, one can select more than one for plot if appropriate (e.g., mountain could be macro and ridge could be meso scale). You can develop your own list for BLCA/CURE. Please be consistent so we can analyze by landform.

Surficial Geology
Note the geologic substrate influencing the plant community (bedrock or surficial materials). Accurately recording the geology at the plot is especially important if the plot is on an inclusion in the type on the geology map. The list in the cheat sheet below provides types from the BLCA/CURE geology map.

Cowardin System
If the system is a wetland, check off the name of the USFWS system which best describes its hydrology and landform. Indicate "upland" if the system is not a wetland.

Assess the hydrologic regime of the plot using the descriptions below (adapted from Cowardin et al. 1979).

SEMIPERMANENTLY FLOODED - Surface water persists throughout growing season in most years except during periods of drought. Land surface is normally saturated when water level drops below soil surface. Includes Cowardin's Intermittently Exposed and Semipermanently Flooded modifiers.

SEASONALLY FLOODED - Surface water is present for extended periods during the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is very variable, extending from saturated to a water table well below the ground surface. Includes Cowardin's Seasonal, Seasonal-Saturated, and Seasonal-Well Drained modifiers.

SATURATED - Surface water is seldom present, but substrate is saturated to surface for extended periods during the growing season. Equivalent to Cowardin's Saturated modifier.

TEMPORARILY FLOODED - Surface water present for brief periods during growing season, but water table usually lies well below soil surface. Often characterizes flood-plain wetlands. Equivalent to Cowardin's Temporary modifier.

INTERMITTENTLY FLOODED - Substrate is usually exposed, but surface water can be present for variable periods without detectable seasonal periodicity. Inundation is not predictable to a given season and is dependent upon highly localized rain storms. This modifier was developed for use in the arid West for water regimes of playa lakes, intermittent streams, and dry washes but can be used in other parts of the U.S. where appropriate. This modifier can be applied to both wetland and non-wetland situations. Equivalent to Cowardin's Intermittently Flooded modifier.

PERMANENTLY FLOODED - Water covers the land surface at all times of the year in all years. Equivalent to Cowardin's "permanently flooded."

UNKNOWN - The water regime of the area is not known. The unit is simply described as a non-tidal wetland.

Environmental Comments
Enter any additional noteworthy comments on the environmental setting. This field can be used to describe site history such as fire events (date since last fire or evidence of severity) as well as other disturbance or reproduction factors.

Unvegetated Surface
Estimate the approximate percentage of the *total* surface area covered by each category. Only include categories with over 5 percent cover.

SOIL TEXTURE KEY

(Brewer and McCann 1982)

Soil primarily organic:
0a. Soil is black, is saturated with water, and often smells of rotten eggs ...……..**muck**
0b. Soil is dark brown, usually saturated, and consists of clearly identifiable plant parts ……...**peat**

Soil primarily mineral:
1a. Soil does not remain in a ball when squeezed, leaves your fingers clean ..…….....**sand**
1b. Soil remains in a ball when squeezed ……..…….....2

Squeeze the ball between your thumb and forefinger, attempting to make a ribbon that you push up over your finger.

2a. Soil makes no ribbon but leaves your fingers dirty …….……**loamy sand**
2b. Soil makes at least a very short ribbon .....……...3

3a. Ribbon extends less than 1 inch before breaking ….…….....4
3b. Ribbon extends 1 inch or more before breaking ….……..…….....5

4a. Add excess water to small amount of soil. Soil feels at least slightly gritty
……..…… ……..…**loam or sandy loam**
4b. Soil feels smooth....……..... **silt loam**

5a. Soil makes a ribbon that breaks when 1-2 inches long; cracks if bent into a ring 6
5b. Soil makes a ribbon 2+ inches long; does not crack when bent into a ring ……..…7

6a. Add excess water to small amount of soil; soil feels at least slightly gritty
…… **sandy clay loam**
6b. Soil feels smooth..……..... **silty clay loam**

7a. Add excess water to a small amount of soil; soil feels at least slightly gritty
…….……... **sandy clay**
7b. Soil feels smooth.....…….……..... **silty clay or clay**

Soil Drainage

The soil drainage classes are defined in terms of (l) actual moisture content (in excess of field moisture capacity) and (2) the extent of the period during which excess water is present in the plant-root zone. It is recognized that permeability, level of groundwater, and seepage are factors affecting moisture status. However, because these are not easily observed or measured in the field, they cannot generally be used as criteria of moisture status. It is further recognized that soil profile morphology, for example mottling, normally, but not always, reflects soil moisture status. Although soil morphology may be a valuable field indication of moisture status, it should not be the overriding criterion. Soil drainage classes cannot be based solely on the presence or absence of mottling. Topographic position and vegetation as well as soil morphology are useful field criteria for assessing soil moisture status.

RAPIDLY DRAINED - The soil moisture content seldom exceeds field capacity in any horizon except immediately after water addition. Soils are free from any evidence of gleying throughout the profile. Rapidly drained soils are commonly coarse textured or soils on steep slopes.

WELL DRAINED - The soil moisture content does not normally exceed field capacity in any horizon (except possibly the C) for a significant part of the year. Soils are usually free from mottling in the upper 3 feet, but may be mottled below this depth. B horizons, if present, are reddish, brownish, or yellowish.

MODERATELY WELL DRAINED - The soil moisture in excess of field capacity remains for a small but significant period of the year. Soils are commonly mottled (chroma <2) in the lower B and C horizons or below a depth of 2 feet. The Ae horizon, if present, may be faintly mottled in fine-textured soils and in medium-textured soils that have a slowly permeable layer below the solum. In grassland soils the B and C horizons may be only faintly mottled and the A horizon may be relatively thick and dark.

SOMEWHAT POORLY DRAINED - The soil moisture in excess of field capacity remains in subsurface horizons for moderately long periods during the year. Soils are commonly mottled in the B and C horizons; the Ac horizon, if present, may be mottled. The matrix generally has a lower chroma than in the well-drained soil on similar parent material.

POORLY DRA1NED - The soil moisture in excess of field capacity remains in all horizons for a large part of the year. The soils are usually very strongly gleyed. Except in high-chroma parent materials the B, if present and upper C horizons usually have matrix colors of low chroma. Faint mottling may occur throughout.

VERY POORLY DRAINED - Free water remains at or within 12 inches of the surface most of the year. The soils are usually very strongly gleyed. Subsurface horizons usually are of low chroma and yellowish to bluish hues. Mottling may be present but at the depth in the profile. Very poorly drained soils usually have a mucky or peaty surface horizon.

VEGETATION DESCRIPTION

Leaf Phenology

Select the value which best describes the leaf phenology of the dominant stratum. The dominant stratum is the uppermost stratum that contains at least 10% cover.

EVERGREEN - Greater than 75% of the total woody cover is never without green foliage.

COLD DECIDUOUS - Greater than 75% of the total woody cover sheds its foliage in connection with an unfavorable season mainly characterized by winter frost.

MIXED EVERGREEN - COLD DECIDUOUS - Evergreen and deciduous species generally contribute 25-75% of the total woody cover. Evergreen and cold-deciduous species admixed.

PERENNIAL - Herbaceous vegetation composed of more than 50% perennial species.

ANNUAL - Herbaceous vegetation composed of more than 50% annual species.

Leaf Type
Select one value which best describes the leaf form of the dominant stratum. The dominant stratum is the uppermost stratum that contains at least 10% cover.

BROAD-LEAVED - Woody vegetation primarily broad-leaved (generally contributes greater than 50 percent of the total woody cover).

NEEDLE-LEAVED - Woody vegetation primarily needle-leaved (generally contributes greater than 50 percent cover).

MICROPHYLLOUS - Woody cover primarily microphyllous.

GRAMINOID - Herbaceous vegetation composed of more than 50 percent graminoid/stipe leaf species.

FORB (BROAD-LEAF-HERBACEOUS) - Herbaceous vegetation composed of more than 50% broad-leaf forb species.

PTERIDOPHYTE - Herbaceous vegetation composed of more than 50 percent species with frond or frond-like leaves.

Physiognomic Class Choose one:

Forest: Trees with their crowns overlapping (generally forming 60-100% cover).

Woodland: Open stands of trees with crowns not usually touching (generally forming 25-60% cover). Canopy tree cover may be less than 25% in cases where it exceeds shrub, dwarf-shrub, herb, and nonvascular cover, respectively.

Shrubland: Shrubs generally greater than 0.5 m tall with individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees generally less than 25% cover). Shrub cover may be less than 25% where it exceeds tree, dwarf-shrub, herb, and nonvascular cover, respectively. Vegetation dominated by woody vines is generally treated in this class.

Dwarf-shrubland: Low-growing shrubs usually under 0.5 m tall. Individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees and tall shrubs

generally less than 25% cover). Dwarf-shrub cover may be less than 25% where it exceeds tree, shrub, herb, and nonvascular cover, respectively

Herbaceous: Herbs (graminoids, forbs, and ferns) dominant (generally forming at least 25% cover; trees, shrubs, and dwarf-shrubs generally with less than 25% cover). Herb cover may be less than 25% where it exceeds tree, shrub, dwarf-shrub, and nonvascular cover, respectively.

Nonvascular: Nonvascular cover (bryophytes, non-crustose lichens, and algae) dominant (generally forming at least 25% cover). Nonvascular cover may be less than *25%* where it exceeds tree, shrub, dwarf-shrub, and herb cover, respectively.

Sparse Vegetation: Abiotic substrate features dominant. Vegetation is scattered to nearly absent and generally restricted to areas of concentrated resources (total vegetation cover is typically less than 25% and greater than 0%).

Strata/Lifeform, Height, Cover, Diagnostic Species
Visually divide the community into vegetation layers (strata). Indicate the average height class of the stratum in the first column, using the Height Scale on the form. Enter the average percent cover class of the whole stratum in the second column, using the Cover Scale on the form. Height and Cover classes are also listed below.

Trees are defined as single-stemmed woody plants, generally *5* m in height or greater at maturity and under optimal growing conditions. Shrubs are defined as multiple-stemmed woody plants generally less than 5 m in height at maturity and under optimal growing conditions.

Herbaceous layers are: Ht = total, H1 = Graminoids (grass, sedge, rush), H2 = Forbs (Dicot herbaceous), H3 = Ferns and Fern allies, and H4 = tree seedlings. List the dominant species in each stratum. If a species present is known to be diagnostic of a particular vegetation type, list these as well, marking them with an asterisk.

Cover Scale for Strata		**Height Scale for Strata**	
01	<1%, <1%	01	<0.5 m
02	1-5%	02	0.5-1 m
03	5-25%	03	l-2 m
04	25-50%	04	2-5 m
05	50-75%	05	5-10 m
06	75-100%	06	l0-l5 m
		07	15-20 m
		08	20-35 m
		09	35-50 m
		10	>50 m

Animal Use Evidence
Comment on any evidence of use of the plot/polygon by non-domestic animals (i.e., tracks, scat, gopher or prairie dog mounds, etc.). Notes on domestic animals should be made in the field below.

Natural and Anthropogenic Disturbance
Comment on any evidence of natural or anthropogenic disturbance and specify the source.

Other Comments
Any other comments.

Species/DBH/Percent Cover Table
Starting with the uppermost stratum, list all the species present and cover class (using the 12 point scale) and percent cover of each species in that particular stratum. Indicate strata in the left-hand columns. If in the tree layer (single-stemmed woody plants, generally *5* m in height or greater at maturity), note in the "T" column if Tl (emergent tree), T2 (tree canopy), or T3 (tree sub-canopy). If in the shrub layer, note in the "5', column if S1 (tall shrub,> 2m), S2 (short shrub, <2m), or S3 (dwarf-shrub <0.5m). If in the ground layer, note in the "G" column if H1 (herbaceous - graminoid), H2 (herbaceous - forb), H3 (herbaceous - fern), H4 (tree seedlings) N (nonvascular other than ferns), V (vine/liana), or F (epiphyte).

*For plots with trees, estimate cover of seedlings, saplings, mature (all others), and total cover for each tree species. Use a separate line for each and assign the most appropriate strata class (by height). Seedlings are generally less than 1.5 m, but that may vary by species.

Also record the DBH (in cm) of all trees above *5* cm diameter. Separate the measurements with a comma. For plots with very high tree density DBH measurements will be done in a subplot. If the number of trees with a DBH greater than *5* cm is more than about 25, divide the plot into quarters and measure the DBH of trees in the southeast quadrant, or the quadrant nearest southeast. CLEARLY NOTE on the form that this is what you've done.

CONSIDERATIONS FOR PLANNING

Planning for the day:

1. Safety and sustenance: Plenty of food, water, first-aid kit, raingear, sunscreen.
2. Field communications:
   a. Develop a plan with other team(s) for radio check-in time.
   b. Do you have a radio and are batteries charged? If you have a walkie talkie, do you have extra batteries for it? Does park staff know the area in which you will be working?
3. Make sure you have the right maps and photos.
4. Check your GPS (Datum set to NAD83? Needs new batteries?).
5. Plan the day's mission before departing using a) USGS quads, b) aerial photo, c) park/BLM maps.
6. Considerations for mission planning:
   a. Plan travel based on topography, best access routes, density and complexity of vegetation (more time for forest and woodland plots, less for herbaceous and scrub).
   b. Plan data collection based on priority needs; new types get higher priority.
   c. Communicate with the other team(s) to make sure you aren't duplicating effort.

Planning for the Week (do this on the first day of the trip)

1. Do you have all appropriate maps, photos?
2. Develop a reasonable estimate of the number of plots for each team broken up by day and based on an estimate of individual team's travel logistics for the week.
3. Develop plan of attack for the week to capture all essential associations in the work area.
4. Balance points two and three above with the expected work schedule of the teams and ensure adequate time-off and reduce over-time concerns.
5. Do you have all necessary information and backups for the week's planning? E.g., blank field forms, film, plenty of AA batteries.

Wrapup (Do this on the last day of the trip, after you have returned to base)

1. Clean, recharge and repair equipment.
2. Hold brief meeting to discuss data collection issues, things that came up during the work week, and plan for next work hitch.
3. Edit field forms and file them systematically. File observation points separately.
4. Re-file the aerial photos and maps.
5. Send exposed roles of film to be developed.
6. Key unknown plants.
7. Enter edited data into database.

Communicate among teams / Topics for wrap-up meetings.

1. What were your questions about the polygons visited during the week?
2. Do you have any questions about the forms or fields?
3. What was accomplished, what was not accomplished?
4. Pass on developments and questions after every trip. Don't let them build up. For example, should we sample the new types we saw? Were there problems with interpreting the aerial photos, or are there personnel issues, problems in consistency in interpreting the forms, or with park-related logistics?

Vegetation Plot Sampling Materials Checklist

- Park research permit
- Topo maps
- Park and BLM maps for general navigation
- Maps of BPU locations
- Geology map
- Aerial photos
- DBH tape and 2 tape measure(s)
- Trowel or U-dig-it, soil water bottle
- Compass with adjustable declination
- Clinometer
- GPS unit
- Plenty of AA batteries for GPS and walkie talkie
- Radio or walkie talkie and/or cell phone
- 35 mm camera & film (allow at least 2 exposures per plot plus general and scenic photos)
- Baggies for temporary storage of unknown plants, and masking tape for labeling
- Plant press & paper
- Plant Keys / Flora(s)
- Pens / sharpies / dry erase marker
- Forms: plot survey (both pages) and observation point
- Clipboard/forms holder and clear page protector sleeve
- Pens, pencils, pencil lead, chalk (for slate board), and chalkboard eraser
- Stapler and extra staples
- Most recent version of provisional classification of the park, with the number of plots still needed per type (updated approx. every 2 weeks)
- All ancillary information (cheat sheet, species list, floras, sampling priority list for zone, main sampling protocol).
- First aid kit, personal gear (food, water, rain gear, etc.)

BLACK CANYON/CURECANTI CHEATSHEET

LANDFORM

Alluvial fan
Alluvial flat
Alluvial terrace
Arroyo
Badlands
Bajada
Bank
Basin
Bench
Butte
Canyon
Channel
Cinder cone
Cliff
Colluvial Slope
Debris slide
Depression
Drainage
Dune
Escarpment
Floodplain
Foothills
Gap
Gorge
Hill
Hogback
Interfluve
Lake
Landslide
Lowland
Mid slope
Mountain
Mud flat
Noseslope
Piedmont
Plain
Plateau
Ravine
Ridge
Rim
River
Rockfall
Saddle
Scree slope
Seep
Shoreline
Sinkhole
Slide
Slope
Slough
Soil creep slope
Stream terrace
Streambed
Swale
Talus slope
Toe slope
Terrace
Valley floor
Valley side
Wash

ASPECT

Flat
Azimuth (deg.)
Variable

PLOT SIZE

400m^2 (11.3m r):
Forests
Woodlands
Shrublands

100m^2 (5.6 m r):
Dwarf Shrublands
Shrub-Herbaceous
Herbaceous

25m^2 (2.8m r):
Non vascular

You may adapt plot size and shape to fit the situation; but never choose a plot size **smaller** than listed here.

TOPOGRAPHIC POSITION

Designation	Synonym(s)
Interfluve	crest, summit, ridge
High slope	shoulder slope, upper slope, convex creep slope
High level	mesa, plateau
Midslope	transportational midslope
Backslope	dipslope, cliff
Step in slope	ledge, terracette, bench
Lowslope	lower slope, foot slope, colluvial footslope
Toeslope	alluvial toeslope
Low level	terrace, valley floor, floodplain

SEE ALSO THE DIAGRAM OTHER SIDE

VEGETATIVE STRATA

T1 = emergent tree
T2 = tree canopy
T3 = tree sub-canopy.
S1 = tall shrub, > 2m
S2 = short shrub, < 2m
S3 = dwarf shrub. < 0.5m
H1 = graminoid
H2 = forb
H3 = fern or fern ally
H4 = Tree seedlings
N = nonvascular other than ferns
V = vine/liana
E = epiphyte

Physiognomic Class

Forest: Crowns touching
Woodland: Trees>25%, crowns not touching
Shrubland: Shrubs> grass, forbs or trees
Dwarf Shrubland: Shrubland <0.5 m tall
Shrub Herbaceous: Shrubs = Forbs/grasses
Herbaceous: Grass/forbs > trees or shrubs

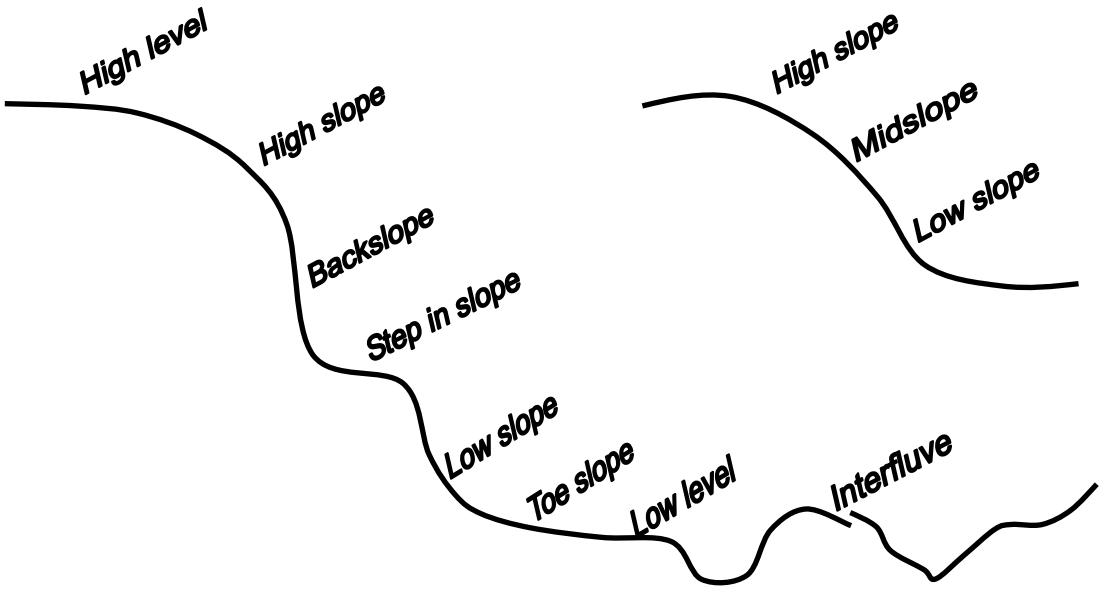
SOIL TEXTURE

Sand: clean, no ball
Loamy sand: ball, no ribbon
Sandy loam: gritty weak ribbon
Silt loam: smooth weak ribbon
Clay loam: long ribbon, no ring
Clay: smooth ribbon/ring, edible
Sandy Clay; gritty ribbon & ring
Silty Clay: smooth ribbon/ring
Peat: still has plant parts
Muck: smelly black ooze

SURFICIAL GEOLOGY

Amphibolite
Blue Mesa Tuff
Carpenter Ridge Tuff
Cimarron Ridge Tuff
Dakota Sandstone
Diabise Dikes
Dillon Mesa Tuff
Diorite or quartz diorite
Dubois Greenstone
Entrada Sandstone
Eolian Sands
Fan Deposits
Fault Zone
Fish Canyon Tuff
Frontier Sandstone
Fruiteland formation
Gabbro
Gartra Member/Shinarump
Granite of the South Beaver Creek
Hinsdale Formation
Humbug/Doughnut Shale
Lake Fork Formation
Layered quartzitic gneiss
Madison Limestone
Mancos Shale
Massive quartzittic gneiss
Mesosoic Sandstone
Mesosoic Shale
Metamorhpic/Granitic
Mica Schist
Migmattic gneiss
Morrison Formation
Mowry Shale
Nepheline Syenite
New Alluvium
Obscured by Soil
Old Alluvium
Park City Formation
Pegmatite
Pictured Cliffs Sandstone
Powderhorn Granitic
Pyroxenite
Quartzite
Rat Creek Tuff
Schist and gneiss
Talus/Colluvium/Landslide
Wanakah Formation
West Elk Breccia

TOPOGRAPHIC POSITION - CHEAT SHEET



B.2. Accuracy Assessment Point Field Sampling Manual

Black Canyon National Park / Curecanti National Recreation Area

This manual documents accuracy assessment (AA) data collection procedures for Black Canyon National Park / Curecanti National Recreation Area (BLCA/CURE). This project is directed by the Northern Colorado Plateau Network (NCPN) with assistance from engineering-environmental Management, Inc. (e^2M) and NatureServe.

Overview

The primary purpose of accuracy assessment (AA) fieldwork is to supply data that will test the accuracy of vegetation maps. It is also a continuation of the sampling of vegetation communities. The main uses of the AA data are:

- Verify accuracy of polygons drawn on the map (map units)
- Verify relationships between associations and mapping units
- Verify that field key works well to classify vegetation to association
- Check for classification completeness – undescribed associations not sampled during inventory
- Clarify concepts and augment descriptions of existing associations and possibly develop new associations

There are a number of factors that contribute to error on a vegetation map and some of these are listed below. It is important for the field investigator to be aware of these situations and to take actions to minimize error when at all possible.

- Locational error (when it is not possible to acquire reliable UTM coordinates, the AA point data collected may look like it is in another polygon, or if the polygons are small/narrow and the GPS receiver isn't working well, it may be difficult to know which polygon is supposed to be sampled).
- Field key is difficult to use, leading the investigator to assign the point to the wrong association.
- Field key does not include all plant associations in the park, also leading to confusion in which association to assign to a point.
- Field data error- either by mis-identifying diagnostic species, or by not reading the key carefully, resulting in a bad field call when the map attribute is accurate.
- AA point falls within an ecotone, which is impossible to classify but still has to be mapped as something.
- Relationships between plant associations and map units (modeling) are flawed.
- The polygon is heterogenous, including patches of varying vegetation that are too small to map individually. The AA point may happen to fall in a part of the polygon with a different community than observed by the photo interpreter in the bigger picture.

Navigating to a Point

The field investigator will navigate to each selected AA point using a handheld GPS receiver and map consisting of a digital orthophoto (DOQQ) base overlaid with AA point locations, mapped vegetation polygons, and USGS 7.5 minute topographic quadrangle maps.

- The DOQQ map will identify the location of the AA points, as well as the location, size and shape of the polygons.
- Topographic maps are useful in identifying the landscape when navigating to a point, and in determining the elevation of a point. They are also helpful for obtaining names of topographic features used for assigning site names.
- GPS receivers indicate the direction and the distance (as the crow flies) to the AA point. This can obviously lead to trouble if one were to navigate as the crow flies to AA points, not being aware of

canyons or other obstacles in the way. Use the DOQQ and topo maps to plan the route! ***Note***: *In very homogenous terrain, acquire the UTM coordinates of the field vehicle so one can find their way back!*

Use the GPS receiver to locate the point within 1 m of the UTM coordinates, but do not spend a lot of time trying to be exact. A 5000m^2 area around each AA point will be evaluated, which is the size of the project Minimum Mapping Unit (MMU = 0.5 ha). The MMU is the smallest area that the photo interpreters are required to map to vegetation class. (However, mappers can choose to delineate smaller polygons if the map class is distinctive). Typically the AA plot will be circular in shape (40 m radius), however, in some situations the plot shape will need to be varied to accommodate the map unit being sampled (e.g. a long-narrow riparian area).

At each AA point the investigator will key the vegetation to plant association using the field key. The MMU is a relatively large area - approximately the size of a football field with endzones (50m x100m rectangle, 71m x71m square, 80m diameter circle). The shape of the MMU may need to vary depending on the shape of the mapping polygon, but for large polygons, an 80m diameter circle may be easiest. If the polygon is smaller than the MMU, evaluate the whole polygon

Along the way... Identify the mapping polygons where the target AA points are located and if possible walk through part of the polygons on the way to the points, noting polygon boundaries. Is the map polygon uniform or variable? Is the AA point representative of the polygon? Record these observations on the AA form upon arrival at the point.

A word about safety… As with all fieldwork, navigation will occur through rough terrain, often off-trail, to reach the destination. However, particularly in AA work, there is a desire to reach as many points as possible in a day, and to get as close to each point as feasible. No AA point is worth risking one's health or life! Use good judgment. Alternate points will be provided in case an AA point cannot be reached due to difficult terrain or other reasons. If this happens, PLEASE document that the point was not reachable so that the effort is not repeated by someone else.

Occasionally the AA point will fall on the edge of two vegetation types or at the edge of a polygon. In these instances the field crew member will need to use judgment on how to record the data. If two distinct plant associations are present on a site record separate species lists for each of the communities on the field form. In addition, both types would be keyed and recorded on the field form. There will be many times where the point falls at the edge of a polygon. In selecting AA points, a 25 m buffer from the polygon edge is used to ensure that most AA points fall cleanly with the polygon boundaries. However, in some cases the AA point will partially include some of the adjacent polygon. In this situation the field crew member will need to clearly describe in the comments fields the situation and be clear about what is represented within and outside the polygon targeted for sampling.

AA Point Form Instructions

This section documents field by field instructions for AA point data collection and serves as guidance for completing the AA Point Data Form. Upon arrival at an AA point location, the field investigator will take a waypoint with the GPS receiver. Please make sure the GPS receiver is set for NAD83, and that the WAAS is on (see 3D differential, below). UTM coordinates and other locational data will be recorded manually to serve as a backup in case of GPS receiver failure. Park-specific cheatsheets are provided at the end of this section to assist ecologists with AA point data collection.

IDENTIFIERS / LOCATORS SECTION

AA Point Code:

AA point codes are derived from the codes assigned to points on the DOQQ photo map, with "_AA." inserted between the 4-letter park alphacode and point number. The four-letter park code for this project is BLCA or CURE. An example of an AA point would be BLCA_AA.0003 or CURE_AA.0101. Please note that park-specific datasheets already have the parkcode and '_AA.' delimiter listed. The field investigator will only need to record the 4-digit AA point number on the form.

Quad Name:
Record the full name of the 7.5 minute quadrangle.

County:
Enter county in which AA point occurs, e.g., Gunnison County.

State:
Enter state in which AA point occurs, e.g., CO.

Park Site Name:
This is best determined from the topographic map. Select a nearby feature that is an obvious waypoint, such as the name of a canyon, road, pinnacle, etc. This name does not need to be unique. If a number of AA points are sampled in a small area the same site name may be used for all of them.

Survey Date:
Enter the date the AA point was sampled. Please use the format Month – Day - Year.

Surveyor(s):
Full last name(s) of the field team member(s) collecting data.

AA Point Shape:
Select one of the following choices to describe the AA plot shape: circular or other. In the case of other please provide dimensions and comments in the classification comments field below.

GPS File:
Enter the name given to the waypoint when the AA point was marked in the GPS receiver. It would be useful to assign a name that incorporates the AA point number.

Field UTM X, Field UTM Y
Record the UTM easting and northing coordinates saved as a waypoint in the GPS receiver. Please double check to make sure the easting is six digits and the northing is seven digits.

In deep canyon country it is often difficult to obtain UTM coordinates (the GPS receiver has to be able to 'see' at least three or four satellites). If it is not possible to acquire UTM coordinates, or if the PDOP is greater than 8 (or EPE is greater than ±50m), first try to obtain a signal from a higher point nearby (but still close to) the AA point. If that fails then estimate the UTM coordinates from the digital orthophoto (NAD83), and manually enter them into the GPS receiver.

GPS Receiver:
Record the name and model of the GPS receiver being used to record data for the AA point. If a GPS receiver was not used to determine UTM coordinates record 'none' here and be sure to complete the 'GPS Comments' field below.

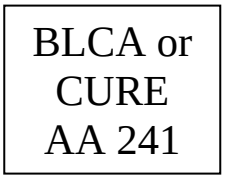
GPS Error
Note the “Estimated Position Error" (EPE) displayed on the GPS receiver. The lower the number the more accurate the reading.

3D Differential?
3D differential is obtained when the GPS receiver can "see" a satellite that does nothing but correct the tiny errors in the positioning or clocks of other GPS satellites. This satellite broadcasts a real-time differential correction so that the location coordinates are as accurate as possible. It is in geosynchronous orbit in the southern sky, so if the southern sky is visible, one will generally be able to acquire 3D differential. This system is known as the Wide-Area Augmentation System, or WAAS. Please make sure that WAAS is **always** on.

GPS Receiver Comments:
VERY IMPORTANT: If the field investigator resorted to estimating the AA point location, UTM coordinates on the digital orthophoto, note that in this field. If the investigator had to leave the point to acquire a reading from a higher site, record that here, along with the compass bearing and distance of the GPS location from the point center.

Camera:
Circle the appropriate camera name and model, or enter it next to “other” if it is not on the datasheet.

Taking Photographs:
Expose one color slide of each AA point. The purpose is to acquire a good representation that accurately captures the vegetative stand of the AA point. If the area is heterogeneous please represent this in the photo. Try to include a little sky, approximately 10% sky, for perspective. Use a chalkboard to record the point number and the direction the photo is exposed. Thus, for AA point 241, the board in the photo taken from the SE facing NW across the point will read "BLCA or CURE AA.0241, →NW". Take the photographs looking across the contour if the AA point is on a steep slope. In addition, a photograph log for all photos not taken at AA points will need to be maintained. It is not anticipated that crews would routinely take additional photos, however, if a crew member finds a new vegetation type not previously described it would be good to document this situation with a photograph.



Photos: Type/Roll Number/Frame Number/Photographer/Direction and Comments
For the photo taken at the AA point record the following: *Roll number*: record roll number (Roll numbers should be a team member's initials plus a sequential number, which are written on the film before it goes into the camera.) *Frame number*: record frame number of photo. *Photographer*: record last name of person taking photograph. *Directions/Comments*: record the direction the photos were exposed from and towards (SE→NW) and any other comments to clarify contents of the photo.

ASSOCIATION INFORMATION SECTION

Primary Name, Secondary Name, Tertiary Name:
Fill out this section last, after all the vegetation information has been collected. Using the environmental, stratum and cover data, key the vegetation in the half-hectare area around the AA point to association. Choose carefully! Write the name of the association in the primary association field. If the situation is borderline between two associations (e.g., some sagebrush, but also some muttongrass), write other association name in the secondary association field. A tertiary name field has also been provided for the

few occasions where a third call is needed. If vegetation near the AA point does not key well, make the best effort to fit it into one or two of the associations listed in the manual, then make detailed comments in the "Classification Comments" field to justify the selection and/or reasoning. If vegetation near the AA point does not fit the plant association key at all then create a new name using the dominant species of each strata (as would be done for a plot). Provide information to characterize the new association in the comments field.

Is Primary/Secondary/Tertiary Name a New Association?

If the investigator encountered a new vegetation type and applied a new name (not in the field key) then please check the 'box' to the right of the name indicating that the name is a new association. Please be sure to provide comments in the classification comments field.

Other Vegetation Associations Within 50 m:

List other associations that are within 50m of the outside border of the half-hectare AA point being evaluated.

Representativeness of AA point:

Because the AA points are randomly located within a polygon, there is no guarantee that they will land in a spot that is representative of either the polygon or of the plant associations included within the polygon's map unit. The point could easily land in a small gully or an inclusion that is too small to map, or an ecotone where trees are invading a shrubland, for instance. Because of this, it is important that the investigator pay attention not only to the vegetation within the ½ hectare sample area, but the larger area as well. For the primary plant association call please rank the representativeness of this AA point for the polygon (Good, Fair, Poor or Unknown). Please note in the Classification Comments field if the AA point falls in an ecotone or inclusion, or in an anomalous situation such as in a gully or on a rock outcrop. If the polygon is extremely large and the observer is unable to make an assessment then please use the 'unknown' field.

Fit of plant association to description in the key:

The key being used does not provide a lot of descriptive information for each association, and is likely not to contain all the associations that may be encountered. Rank the representativeness of the AA point's association to the description in the key (Good, Fair, Poor). It would also be helpful to note specific suggestions on how to make the key work better. It will provide information for improving the key for the final report.

ENVIRONMENTAL DESCRIPTION SECTION

Elevation:

Record the elevation of the AA point from the GPS receiver in feet/meters. Specify on the data sheet whether the measurement is in feet or meters, and whether it was obtained from a GPS receiver or a map.

Slope:

Measure the slope in degrees using a clinometer. The degree scale is the left-hand scale when looking through the clinometer. If the slope varies at the point then estimate an average. If the point is on rolling microtopography, enter "variable." Further information may be provided in the Environmental Comments section.

Aspect:

Measure aspect in degrees using a compass (set for local magnetic declination, which is given in the lower left hand corner of every USGS topo map). If the slope is flat, enter "n/a" for aspect. If the point

wraps around different aspects on a slope, enter “variable” and describe further in the Environmental Comments section.

Topographic Position:

This is the position of the point on its related landform. Determining this requires the investigator to think of the landform in cross-section, which is roughly diagramed on the back of the cheat sheet. One of the terms listed below **must** be used:

Interfluve (crest, summit, ridge). Linear top of ridge, hill, or mountain; the elevated area between two drainages that sheds water to the drainages.
High slope (shoulder slope, upper slope, convex creep slope). The uppermost inclined surface at the top of a slope. Includes the transition zone from backslope to summit. Surface is dominantly convex in profile and erosional in origin.
High level (mesa, summit). Level top of a plateau.
Midslope (transportational midslope). Intermediate slope position.
Backslope (dipslope). Subset of midslopes that are steep, linear, and may include cliff segments.
Step in slope (ledge, terracette). Nearly level shelf interrupting a steep slope, rock wall, or cliff face.
Lowslope (lower slope, foot slope, colluvial footslope). Inner gently inclined surface at the base of a slope. Surface profile is generally concave and a transition between midslope or backslope, and toeslope.
Toeslope (alluvial toeslope). Outermost gently inclined surface at base of a slope. In profile, usually gentle, linear and characterized by alluvial deposition.
Low level (terrace). Valley floor or shoreline representing the former position of an alluvial plain, lake, or shore.

Landform:

Enter the landform that best describes the site where the AA point is located. Referring to the topo map for the landscape context may help the investigator determine what landform(s) to choose. Note that the landform choices may describe different scales, or that a landform feature can be described by more than one term. For example, the AA point may be on a ledge on the rim of a canyon. A suggested list of landforms and definitions is provided in Appendix A. *Note: The topographic position selected above should relate to the scale of the landform chosen here.*

Surficial Geology:

List the primary geologic substrate where the AA point occurs. A list of geologic types is provided on a cheatsheet at the end of this document. The geology map should help, but if one is unable to decipher the geology, then provide a general description (e.g., coarse sandstone, green shale, aeolian sands or obscured by soils).

Environmental Comments:

Enter comments on the environmental setting and its effect on the vegetation. Examples include: "stunted trees due to shallow soils", "vegetation only where pockets of soil occur", or "large colluvial boulders and small rocks litter surface of soil". This field can also be used to describe site history such as fire events. This is an extremely important field for crews to document so please take the time to do a good job. Information from this field is used to prepare local descriptions of the plant communities, and to help assign AA points to associations not previously recorded in the park.

Unvegetated Surface:

This field is an ocular estimate of ground cover for the following: bedrock; litter/duff; wood (>1cm); large rocks (cobbles, boulders >10cm); small rocks (gravel 0.1-10 cm); sand (0.1-2mm); bare soil; other (please specify). For this estimation use the cover classes listed on the form. If an unvegetated surface category is not present in the observation point area, leave the corresponding line blank.

VEGETATION DESCRIPTION SECTION

Leaf Phenology:

Select the best description for the leaf phenology of the **dominant** stratum. The dominant stratum is the tallest stratum that contains at least 10% cover. Leave blank for non-vascular plant-dominated AA points.

Evergreen. Greater than 75% of the total woody cover is never without green foliage. (Some tricky examples: most *Artemisia*, *Ephedra*, and all *Atriplex* except *A. canescens*, all *Chrysothamnus*).
Cold deciduous. Greater than 75% of the total woody cover sheds its foliage in connection with an unfavorable season mainly characterized by winter frost (tricky ones: *Sarcobatus vermiculatus*, *Tamarix* spp.).
Mixed evergreen – Cold deciduous. Evergreen and deciduous species are mixed within the type and generally contribute 25-75% of the total woody cover.
Perennial. Herbaceous vegetation composed of more than 50% perennial species.

Annual. Herbaceous vegetation composed of more than 50% annual species.

Leaf Type:

Select the best description for the leaf form of the dominant stratum. The dominant stratum is the uppermost stratum that contains at least 10% total coverage. Within that dominant stratum, the species that makes up greater than 50% of cover defines the leaf type.

Broad-leaved. Woody vegetation that is primarily broad-leaved (sagebrush, oak, mountain mahogany).
Needle-leaved. Woody vegetation that is primarily needle-leaved (juniper, pinyon, tamarisk).

Microphyllous. Woody cover that is primarily microphyllous (*Ephedra*).
Graminoid. Herbaceous vegetation composed of more than 50 percent graminoid species (grasses, sedges, rushes, etc).
Forb (broad-leaf-herbaceous). Herbaceous vegetation composed of more than 50% broad-leaf forb species (*Phlox, Astragalus, Erigeron,* etc).
Pteridophyte. Herbaceous vegetation composed of more than 50 percent ferns or fern allies (scouring rushes).
Non-vascular. Dominated by lichens or mosses.
Mixed. As with leaf phenology, the dominant stratum may be composed approximately equally of species with several different leaf types. Describe the mix briefly or circle leaf types that apply.

Physiognomic Class:

This represents what is seen at the AA point when looking across at the vegetation. The following definitions can be used as guidelines, but may not always apply in desert locales. For example, areas with scattered pinyon and juniper may not fit the cover classes below but they would best be described as a woodland.

Forest. Trees with their crowns overlapping (generally forming 60-100% cover).
Woodland. Open stands of trees with crowns not usually touching (generally forming 10-60% cover). Canopy tree cover may be less than 10% in cases where it exceeds shrub, dwarf-shrub, herb, and nonvascular cover, respectively.

Shrubland. Shrubs generally greater than 0.5 m tall with individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees generally less than 10% cover). Shrub cover may be less than 25% where it exceeds tree, dwarf-shrub, herb, and nonvascular cover, respectively. Vegetation composed of woody vines is included this class.
Dwarf-shrubland. Low-growing shrubs usually under 0.5 m tall. Individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees and tall shrubs generally less than 10% cover). Dwarf-shrub cover may be less than 25% where it exceeds tree, shrub, herb, and nonvascular cover, respectively.
Shrub Herbaceous. Low or taller shrubs forming approximately equal cover with a grass or forb component. Individuals or clumps of shrubs generally not touching and usually forming more than 25% cover; trees less than 10% cover. Spaces between shrubs are generally mostly occupied by grasses and/or forbs.
Wooded Herbaceous. Trees forming approximately equal cover with a grass or forb component.
Herbaceous. Perennial or annual herbs (graminoids or forbs) dominant (generally forming at least 25% cover; trees, shrubs, and dwarf-shrubs generally with less than 10% cover). Herb cover may be less than 25% where it exceeds tree, shrub, dwarf-shrub, and nonvascular cover, respectively.
Nonvascular. Nonvascular cover (bryophytes, lichens, and algae) dominant (generally forming at least 25% cover). Nonvascular perennial vegetation cover may be less than 25%, as long as it exceeds tree, shrub, dwarf-shrub, and herb cover.
Sparsely Vegetated. Abiotic substrate features dominant. Perennial vegetation is scattered to nearly absent and generally restricted to areas of concentrated resources. Total vegetation cover is typically less than 5-7% and greater than 2%. Badlands or sand dunes supporting communities of annual plants should be included in this category, regardless of cover.

DOMINANT PLANT SPECIES LIST

[Record information on ***dominant species only***.]

Strata: Species names will be recorded within the appropriate stratum. It is important that all crew members are consistent in assignment of species to strata throughout this project. Following are some guidelines to use in determining strata.

Begin by assessing the strata at the AA point. Trees are defined as single-stemmed woody plants, generally 5 m in height or greater at maturity and under optimal growing conditions. Shrubs are defined as multiple-stemmed woody plants generally less than 5 m in height at maturity and under optimal growing conditions. The exception is mature pinyon and juniper plants, which are considered trees regardless of their height.

T1 Emergent, T2 Canopy, T3 Subcanopy: A uniform stand of pine or cottonwood trees would be a good example of T2"canopy", but where they are absent then begin with the shrub stratum, or herbaceous stratum if no shrubs are present. If the tree crowns at the AA point are mostly touching and similar in height, but a given tree species is much taller that species would be a T1"emergent." As another example, a sample area may be characterized by several tall scattered cottonwoods and then shorter scattered junipers. In this case, the cottonwoods would be the "canopy" and the junipers would be the "subcanopy". There may also be cottonwoods listed in the “subcanopy” layer, if there are a number of short saplings in addition to mature tall trees.

The remaining vegetative strata are (remember to check **with plant list for consistency):**

S1 Tall Shrub: >2 meters tall. For example, *Fraxinus anomala* and *Amelanchier utahensis.*

S2 Short Shrub: <2 meters tall. For example, *Artemisia,* all *Atriplex* except *gardneri* (which are dwarf).
S3 Dwarf-shrub: <0.5 meters tall. For example, *Gutierrezia, Opuntia polycantha.*
H Herbaceous: All herbaceous species including graminoids, forbs, ferns, and fern allies.
H4 Tree Seedlings: Seedlings are trees with vertical stems < 1.5 m tall, but that may vary by species (e.g. does not always apply to pinyon – juniper).
N Nonvascular: This is mainly dark cyanobacteria, mosses and lichens.

Height can be used to define strata, but is not how species should be placed in strata. **Species characteristically belong to one stratum or another** (e.g., pinyon and juniper are canopy (T2), Utah serviceberry is a tall shrub (S1), sagebrush is a short shrub (S2), snakeweed is a dwarf-shrub (S3), etc.), **EVEN when unusual environmental circumstances dictate that the plants have an unusually tall** (e.g., response of some plants to fire) **or unusually short growth form**. So even if the junipers growing in cracks are only 1.5 m tall, as long as they are mature trees, they are placed in the T2 category. About the only rule regarding height should be that the tree layer is (usually) higher than the tall shrub layer that is taller than the short shrub layer, etc.

The second thing is to avoid splitting species between strata. If a few mountain mahogany have been browsed to <1m tall, but most are 2m tall, they all are rolled into the tall shrub stratum. There are two exceptions: (1) each height class covers more than 10% of a point , or (2) there is a reproductive layer of baby shrubs or young trees.

The third thing is how to define some of the "borderline/confusing" species. What we want to avoid is having some crew members calling *Leptodactylon* a forb and some calling it a dwarf-shrub. Same for snakeweed, *Eriogonum microthecum*, fringed sagewort, *Brickellia* spp. and any number of other species. Consult the master plant species lists when in doubt. Crew members should keep the master plant list and strata assignments updated.

Completing the Species/Strata Table:

Dominant Species. List the dominant plant species using **full scientific name** by the strata listed below for each AA point. In some cases, due to severe drought conditions of recent years, a dominant species on the site may have experienced severe levels of mortality. In this case please record 'DEAD' in front of the scientific name and enter the cover value, independent of any live cover value for the same species. During data entry back in the office there will be a check field to use for 'DEAD'. It is also important to document these relationships in the comments field.

T1	Emergent	S3	Dwarf-shrub
T2	Canopy	H	Herbaceous
T3	Sub-canopy	H4	Tree Seedlings
S1	Tall Shrub	N	Non-vascular
S2	Short Shrub		

Diagnostic Species. Mark species that characterize the stand with an '*'.

Height Class. Use the height class code from the list below that best describes the overall height of each plant species within a given stratum.

01	<0.5 m	06	10-15 m
02	0.5-1 m	07	15-20 m
03	1-2 m	08	20-35 m
04	2-5 m	09	35-50 m
05	5-10 m	10	>50 m

Cover Class. For each plant species use the cover class codes listed below to estimate overall canopy cover for each species listed on the form.

T	<1%	04	36-45%
P	1-5%	05	46-55%
1a	6-10%	06	56-65%
1b	11-15%	07	64-75%
02	16-25%	08	76-85%
03	26-35%	09	86-95%

Percent (%) Cover. Estimate the percent aerial cover (T-100%) for each plant species recorded in the far right hand column on the form.

If the point is on the border between two types… (and both types are at least MMU-size) Make two species lists, one for each type, on the back of the AA point form. These will both be entered into the database for that AA point.

Accuracy Assessment Materials Checklist

- Park research permit
- Topo maps
- Park and BLM maps for general navigation
- DOQQ photos of AA point locations
- Geology map
- Compass with adjustable declination
- Clinometer
- GPS unit
- Extra AA batteries for walkie talkie
- Radio or walkie talkie and/or cell phone
- 35 mm camera & slide film (allow at least 2 exposures per AA point)
- Baggies for temporary storage of unknown plants, and masking tape for labeling
- Plant press & paper
- Plant Keys / Flora(s)
- Pencils / sharpies
- Forms: AA point and observation point
- Clipboard/forms holder
- Pens, pencils, pencil lead, slate board, chalk, and chalkboard eraser or supply of clean rags
- Key to the plant associations of the park
- Key to the map units of DINO (DINO only)
- All ancillary information (cheat sheet, species list, floras, sampling priority list for zone, main sampling protocol).
- First aid kit, personal gear (food, water, rain gear, etc.)

APPENDIX: Landform Glossary

(excerpted from http://soils.usda.gov/technical/handbook/contents/part629.html#00**)**

alluvial cone - A semi-conical type of alluvial fan with very steep slopes; it is higher, narrower, and steeper (e.g., > 40% slopes) than a fan, and composed of coarser, and thicker layers of material deposited by a combination of alluvial episodes and to a much lesser degree, landslides (e.g., debris flow).

alluvial fan - A low, outspread mass of loose materials and/or rock material, commonly with gentle slopes, shaped like an open fan or a segment of a cone, deposited by a stream (best expressed in semiarid regions) at the place where it issues from a narrow mountain or upland valley; or where a tributary stream is near or at its junction with the main stream. It is steepest near its apex which points upstream and slopes gently and convexly outward (downstream) with a gradual decrease in gradient.

alluvial flat (a) (colloquial: western US) A level, graded, alluvial surface in bolsons and semi-bolsons which commonly does not manifest traceable channels, terraces or floodplain levels. (b) (**not preferred**) A general term for a small flood plain bordering a river, on which alluvium is deposited during floods.

alluvial plain - (a) A large assemblage of fluvial landforms (braided streams, terraces, etc.,) that form low gradient, regional ramps along the flanks of mountains and extend great distances from their sources (e.g., High Plains of North America. SW (b) (not recommended, use flood plain.) An general, informal term for a broad flood plain or a low-gradient delta.

alluvial plain remnant - An erosional remnant of an alluvial plain which retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to a present-day stream or drainage network.

alluvial terrace - (not preferred) refer to stream terrace.

alluvium - Unconsolidated, clastic material subaerially deposited by running water, including gravel, sand, silt, clay, and various mixtures of these.

anticline - (a) A unit of folded strata that is convex upward and whose core contains the stratigraphically oldest rocks, and occurs at the earth's surface. In a single anticline, beds forming the opposing limbs of the fold dip away from its axial plane. (b) A fold, at any depth, generally convex upward whose core contains the stratigraphically older rocks.

arroyo - (colloquial: southwest A.) The channel of a flat-floored, ephemeral stream, commonly with very steep to vertical banks cut in unconsolidated material; sometimes called a wash. It is usually dry but can be transformed into a temporary watercourse or torrent after heavy rain within the watershed. Where arroyos intersect zones of ground-water discharge, they are better classed as intermittent stream channels.

artificial levee - An artificial embankment constructed along the bank of a watercourse or an arm of the sea, to protect land from inundation or to confine streamflow to its channel.

backslope - The hillslope profile position that forms the steepest and generally linear, middle portion of the slope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below. They may or may not include cliff segments (i.e. free faces). Backslopes are commonly erosional forms produced by mass movement, colluvial action, and running water.

badlands - A landscape which is intricately dissected and characterized by a very fine drainage network with high drainage densities and short, steep slopes with narrow interfluves. Badlands develop on surfaces with little or no vegetative cover, overlying unconsolidated or poorly cemented materials (clays, silts, or in some cases sandstones) sometimes with soluble minerals such as gypsum or halite.

bajada - (colloquial: southwestern US.) A broad, gently inclined, alluvial piedmont slope extending from the base of a mountain range out into a basin and formed by the lateral coalescence of a series of alluvial

fans. Typically it has a broadly undulating transverse profile, parallel to the mountain front, resulting from the convexities of component fans. The term is generally restricted to constructional slopes of intermontane basins. Synonym - coalescent fan piedmont.

ballena - (colloquial: western US.) A fan remnant having a distinctively-rounded surface of fan alluvium. The ballena's broadly-rounded shoulders meet from either side to form a narrow summit and merge smoothly with concave sideslopes and then concave, short pediments which form smoothly-rounded drainageways between adjacent ballenas. A partial ballena is a fan remnant large enough to retain some relict fan surface on a remnant summit.

bar - A general term for a ridge-like accumulation of sand, gravel, or other alluvial material formed in the channel, along the banks, or at the mouth of a stream where a decrease in velocity induces deposition; e.g. a channel bar or a meander bar.

barchan dune - A crescent-shaped dune with tips extending leeward (downwind), making this side concave and the windward (upwind) side convex. Barchan dunes tend to be arranged in chains extending in the dominant wind direction.

base slope - A geomorphic component of hills consisting of the concave to linear slope (perpendicular to the contour) which, regardless of the lateral shape is an area that forms an apron or wedge at the bottom of a hillside dominated by colluvial and slope wash processes and sediments (e.g., colluvium and slope alluvium). Distal base slope sediments commonly grade to, or interfinger with, alluvial fills, or gradually thin to form pedisediment over residuum.

basin - (a) Drainage basin; (b) A low area in the Earth's crust, of tectonic origin, in which sediments have accumulated. (c) (colloquial: western US) A general term for the nearly level to gently sloping, bottom surface of an intermontane basin (bolson). Landforms include playas, broad alluvial flats containing ephemeral drainageways, and relict alluvial and lacustrine surfaces that rarely, if ever, are subject to flooding. Where through-drainage systems are well developed, flood plains are dominant and lake plains are absent or of limited extent. Basin floors grade mountainward to distal parts of piedmont slopes.

basin floor - A general term for the nearly level, lower-most part of intermontane basins (i.e. bolsons, semi-bolsons). The floor includes all alluvial, eolian, and erosional landforms below the piedmont slope.

basin-floor remnant - (colloquial: western US) A flat erosional remnant of any former landform of a basin floor that has been dissected following the incision of an axial stream.

bench - (not preferred) refer to structural bench.

beveled base - The lower portion of a canyon wall or escarpment marked by a sharp reduction in slope gradient from the precipitous cliff above, and characteristically composed of thinly mantled colluvium (e.g. < 1 m) and / or carapaced with a thin surficial mantle of large rock fragments from above, which overly residuum of less resistant rock (e.g., shale) whose thin strata intermittently outcrop at the surface; a zone of erosion and transport common in the canyonlands of the semi-arid, southwestern US.

blowout - A saucer-, cup-, or trough-shaped depression formed by wind erosion on a preexisting dune or other sand deposit, especially in an area of shifting sand, loose soil, or where protective vegetation is disturbed or destroyed; the adjoining accumulation of sand derived from the depression, where recognizable, is commonly included. Commonly small, some blowouts may be kilometers in diameter.

bluff - (a) A high bank or bold headland, with a broad, precipitous, sometimes rounded cliff face overlooking a plain or body of water, especially on the outside of a stream meander; ex. a river bluff. (b) (not preferred) use cliff. Any cliff with a steep, broad face.

borrow pit - An excavated area from which earthy material has been removed typically for construction purposes offsite; also called barrow pit.

bottomland - (not recommended) use flood plain. An obsolete, informal term loosely applied to varying portions of a flood plain.

box canyon - a) A narrow gorge or canyon containing an intermittent stream following a zigzag course, characterized by high, steep rock walls and typically closed upstream by a similar wall, giving the impression, as viewed from its bottom, of being surrounded or "boxed in" by almost vertical walls. b) A steep-walled canyon heading against a cliff a dead-end canyon.

braided stream - A channel or stream with multiple channels that interweave as a result of repeated bifurcation and convergence of flow around inter-channel bars, resembling (in plan view) the strands of a complex braid. Braiding is generally confined to broad, shallow streams of low sinuosity, high bedload, non-cohesive bank material, and a steep gradient. At bank-full discharge, braided streams have steeper slopes and shallower, broader, and less stable channel cross sections than meandering streams.

breaks - (colloquial: western US) A landscape or large tract of steep, rough or broken land dissected by ravines and gullies and marks a sudden change in topography as from an elevated plain to lower hilly terrain, or a line of irregular cliffs at the edge of a mesa or a river (e.g., the Missouri River breaks).

butte - An isolated, generally flat-topped hill or mountain with steep slopes and talus or cliffs and characterized by summit width that is less than the height of bounding escarpments, commonly topped by a caprock of resistant material and representing an erosion remnant carved from flat-lying rocks.

canyon - A long, deep, narrow, very steep-sided valley cut primarily in bedrock with high and precipitous walls in an area of high local relief (e.g., mountain or high plateau terrain), often with a perennial stream at the bottom; similar to but larger than a gorge. **canyon bench** - One of a series of relatively narrow, flat landforms occurring along a canyon wall and caused by differential erosion of alternating strong and weak horizontal strata; a type of structural bench.

canyonlands - A deeply and extensively dissected landscape composed predominantly of relatively narrow, steep-walled valleys with small flood plains or valley floors; commonly with considerable outcrops of hard bedrock on steep slopes, ledges, or cliffs, and with broader summits or interfluves than found in badlands. Sideslopes exhibit extensive erosion, active back-wearing, and sparse vegetation.

channel - (a) The hollow bed where a natural body of surface water flows or may flow. The deepest or central part of the bed of a stream, containing the main current and occupied more or less continuously by water. (b) (colloquial: western US.) The bed of a single or braided watercourse that commonly is barren of vegetation and is formed of modern alluvium. Channels may be enclosed by banks or splayed across and slightly mounded above a fan surface and include bars and mounds of cobbles and stones. (c) Small, trough-like, arcuate or sinuous channels separated by small bars or ridges, caused by fluvial processes; common to flood plains and young alluvial terraces; a constituent part of *bar and channel* topography.

cliff - Any high, very steep to perpendicular or overhanging face of rock or earth; a precipice.

climbing dune - A dune formed by the piling-up of sand by wind against a cliff or mountain slope; very common in arid regions with substantial local relief and strong winds.

closed depression - A generic name for an enclosed area that has no surface drainage outlet and from which water escapes only by evaporation or subsurface drainage; an area of low ground indicated on a topographic map by a hachured contour line forming a closed loop.

collapse sinkhole - A type of sinkhole that is formed by collapse of a cave within the underlying soluble bedrock (e.g., limestone, gypsum, salt).

colluvium - Unconsolidated, unsorted material being transported or deposited on sideslopes and/or at the base of slopes by mass movement (e.g. direct gravitational action) and by local, unconcentrated runoff.

complex landslide - A category of mass movement processes, associated sediments (complex landslide deposit) or resultant landforms characterized by a composite of several mass movement processes none of

which dominates or leaves a prevailing landform. Numerous types of complex landslides can be specified by naming the constituent processes evident (e.g. a complex earth spread - earth flow landslide).

crest - (a) The commonly linear, narrow top of a ridge, hill, or mountain. It is appropriately applied to elevated areas where retreating backslopes are converging such that these high areas are almost exclusively composed of convex shoulders; (b) (not preferred) Sometimes used as an alternative for the hillslope component *summit*.

cuesta - An asymmetric, homoclinal ridge capped by resistant rock layers of slight to moderate dip (less than 15 percent); produced by differential erosion of interbedded resistant and weak rocks. A cuesta has a long, gentle slope on one side (dip slope), that roughly parallels the inclined beds, and on the other side has a relatively short and steep or cliff-like slope (scarp) that cuts through the tilted rocks.

cuesta valley - A low relief, low angle, asymmetrical depression which lies parallel to the strike of underlying strata; a type of strike valley. It's formed by the differential erosion of weaker strata interbedded with more resistant bedrock. It may or may not contain a local drainage network and commonly lies above and is not connected to the regional drainage system.

debris fall - The process, associated sediments (debris fall deposit) or resultant landform characterized by a rapid type of *fall* involving the relatively free, downslope movement or collapse of detached, unconsolidated material which falls freely through the air (lacks an underlying slip face); sediments have substantial proportions of both fine earth and coarse fragments; common along undercut stream banks.

debris flow - The process, associated sediments (debris flow deposit) or landform resulting from a very rapid type of *flow* dominated by a sudden downslope movement of a mass of rock, soil, and mud (more than 50% of the particles are > 2mm), and whether saturated or comparatively dry, behaves much as a viscous fluid when moving.

deflation basin - A topographic basin excavated and maintained by wind erosion which removes unconsolidated material and commonly leaves a rim of resistant material surrounding the depression. Unlike a blowout, a deflation basin does not include adjacent deposits derived from the basin.

depression - Any relatively sunken part of the Earth's surface; especially a low-lying area surrounded by higher ground. A closed depression has no natural outlet for surface drainage. An open depression has a natural outlet for surface drainage.

desert pavement - A natural, residual concentration or layer of wind-polished, closely packed gravel, boulders, and other rock fragments, mantling a desert surface. It is formed where wind action and sheetwash have removed all smaller particles or where coarse fragments have migrated upward through sediments to the surface. It usually protects the underlying, finer-grained material from further deflation. The coarse fragments commonly are cemented by mineral matter.

dip - A geomorphic component (characteristic piece) of flat plains (e.g., lake plain, low coastal plain, low-relief till plain) consisting of a shallow and typically closed depression that tends to be an area of focused groundwater recharge but not a permanent water body and that lies slightly lower and is wetter than the adjacent talf, and favors the accumulation of fine sediments and organic materials.

ditch - An open and usually unlined channel or trench excavated to convey water for drainage or irrigation to or from a landscape; smaller than a canal; some ditches are modified natural waterways.

divide - (a) The line of separation; (b) The summit area, or narrow tract of higher ground that constitutes the watershed boundary between two adjacent drainage basins; it divides the surface waters that flow naturally in one direction from those that flow in the opposite direction.

drainageway - (a) A general term for a course or channel along which water moves in draining an area. (b) a term restricted to relatively small, roughly linear or arcuate depressions that move concentrated water at some time, and either lack a defined channel (e.g. head slope, swale) or have a small, defined channel (e.g. low order streams).

draw - A small, natural watercourse cut in unconsolidated materials, generally more open with a broader floor and more gently sloping sides than an arroyo, ravine or gulch, and whose present stream channel may appear inadequate to have cut the drainageway that it occupies.

dune - A low mound, ridge, bank or hill of loose, windblown, subaerially deposited granular material (generally sand), either barren and capable of movement from place to place, or covered and stabilized with vegetation, but retaining its characteristic shape. (See barchan dune, parabolic dune, parna dune, shrub-coppice dune, seif dune, transverse dune).

dune field - An assemblage of moving and/or stabilized dunes, together with sand plains, interdune areas, and the ponds, lakes, or swamps produced by the blocking of steams by the sand. See dune lake.

earthflow - The process, sediments (earthflow deposit) or resultant landforms characterized by slow to rapid types of flow dominated by downslope movement of soil, rock, and mud (more than 50% of the particles are < 2 mm), and whether saturated or not, behaves as a viscous fluid when moving.

eolian deposit - Sand, silt or clay-sized clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sheet of sand or loess. Conventionally, primary volcanic deposits (e.g. tephra) are handled separately.

eolian sands - Sand-sized, clastic material transported and deposited primarily by wind, commonly in the form of a dune or a sand sheet.

ephemeral stream - Generally a small stream, or upper reach of a stream, that flows only in direct response to precipitation. It receives no protracted water supply from melting snow or other sources and its channel is above the water table at all times.

eroded fan remnant - All, or a portion of an alluvial fan that is much more extensively eroded and dissected than a fan remnant; sometimes called an *erosional fan remnant*. It consists primarily of a) eroded and highly dissected sides (*eroded fan-remnant sideslopes*) dominated by hillslope positions (shoulder, backslope, etc.), and b) to a lesser extent an intact, relatively planar, relict alluvial fan "summit" area best described as a tread.

eroded fan-remnant sideslope - A rough margin of an *eroded fan remnant* highly dissected by ravines and gullies that can be just a fringe or make up a large part of an eroded alluvial fan; its bounding escarpments, originally formed by inset channels, have become highly dissected and irregular such that terrace components (tread and riser) have been consumed or modified and replaced by hillslope positions and components (shoulder, backslope, footslope, etc.); sometimes referred to as *fan remnant sideslopes*.

escarpment - A continuous, steep slope or cliff produced by erosion or faulting and that topographically interrupts or breaks the general continuity of more gently sloping land surfaces . The term is most commonly applied to cliffs produced by differential erosion. Synonym = scarp.

falling dune - An accumulation of sand that is formed as sand is blown off a mesa top or over a cliff face or steep slope, forming a solid wall, sloping at the angle of repose of dry sand, or a fan extending downward from a re-entrant in the mesa wall.

fan - (a) A gently sloping, fan-shaped mass of detritus forming a section of a low-angle cone commonly at a place where there is a notable decrease in gradient; specifically an alluvial fan.

fan apron - A sheet-like mantle of relatively young alluvium and soils covering part of an older fan piedmont (and occasionally alluvial fan) surface, commonly thicker and further down slope (e.g., mid-fan or mid-fan piedmont) than a fan collar. It somewhere buries an older soil that can be traced to the edge of the fan apron where the older soil emerges as the land surface, or relict soil. No buried soils should occur within a fan-apron mantle itself.

fan collar - A landform comprised of a thin, short, relatively young mantle of alluvium along the very upper margin (near the proximal end or apex) of a major alluvial fan. The young mantle somewhere

buries an older soil that can be traced to the edge of the collar where the older soil emerges at the land surface as a relict soil.

fan remnant - A general term for landforms that are the remaining parts of older fan-landforms, such as alluvial fans, fan aprons, inset fans, and fan skirts, that either have been dissected (erosional fan-remnants) or partially buried (nonburied fan-remnants). An erosional fan remnant must have a relatively flat summit that is a relict fan-surface. A nonburied fan-remnant is a relict surface in its entirety.

fan skirt - The zone of smooth, laterally-coalescing, small alluvial fans that issue from gullies cut into the fan piedmont of a basin or that are coalescing extensions of the inset fans of the fan piedmont, and that merge with the basin floor at their toeslopes. These are generally younger fans which onlap older fan surfaces.

fault-line scarp - A steep slope or cliff formed by differential erosion along a fault line, as by the more rapid erosion of soft rock on one side of a fault as compared to more resistant rock on the other side; e.g. the east face of the Sierra Nevada in California.

finger ridge - One in a group of small, tertiary spur ridges that form crudely palmate extensions of erosional remnants along the flanks or nose of larger ridges.

flat - (a) (adjective) Said of an area characterized by a continuous surface or stretch of land that is smooth, even, or horizontal, or nearly so, and that lacks any significant curvature, slope, elevations, or depressions. (b) (noun) An informal, generic term for a level or nearly level surface or small area of land marked by little or no local relief. (c) (not recommended) A nearly level region that visibly displays less relief than its surroundings.

flood plain - The nearly level plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of the streams.

foothills - A steeply sloping upland composed of hills with relief of 30 up to 300 meters and fringes a mountain range or high-plateau escarpment.

footslope - The hillslope profile position that forms the concave surface at the base of a hillslope. It is a transition zone between upslope sites of erosion and transport (shoulder, backslope) and downslope sites of deposition (toeslope).

free face - A geomorphic component of hills and mountains consisting of an outcrop of bare rock that sheds rock fragments and other sediments to, and commonly stands more steeply than the angle of repose of, the colluvial slope immediately below; most commonly found on shoulder and backslope positions, and can comprise part or all of a nose slope or side slope.

gorge - (a) A narrow, deep valley with nearly vertical, rocky walls, smaller than a canyon, and more steep-sided than a ravine; especially a restricted, steep-walled part of a canyon. (b) A narrow defile or passage between hills or mountains.

graben - An elongate trough or basin bounded on both sides by high-angle, normal faults that dip towards the interior of the trough. It is a structural form, it may be geomorphically expressed as a rift valley.

gravel pit - A depression, ditch or pit excavated to furnish gravel for roads or other construction purposes; a type of borrow pit.

ground soil - Any soil at the present-day land surface and actively undergoing pedogenesis,

gulch - (colloquial: western US.; not preferred - refer to ravine) A small stream channel, narrow and steep-sided in cross section, and larger than a gully, cut in unconsolidated materials. = Ravine.

gully - A small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water usually during and immediately following heavy rains or ice /

snow melt. A gully generally is an obstacle to wheeled vehicles and too deep (e.g., > 0.5 m) to be obliterated by ordinary tillage; (a rill is of lesser depth and can be smoothed over by ordinary tillage).

hanging valley - A tributary valley whose floor at the lower end is notably higher than the floor of the main valley in the area of junction.

head slope - A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway, resulting in converging overland water flow (e.g. sheet wash); head slopes are dominated by colluvium and slope wash sediments (e.g., slope alluvium); contour lines form concave curves. Slope complexity (downslope shape) can range from simple to complex. Headslopes are comparatively moister portions of hillslopes and tend to accumulate sediments (e.g., cummulic profiles) where they are not directly contributing materials to channel flow.

headwall - A steep slope at the head of a valley; e.g. the rock cliff at the back of a cirque.

hill - A generic term for an elevated area of the land surface, rising at least 30 m (100 ft.) to as much as 300 meters (approx. 1000 ft.) above surrounding lowlands, usually with a nominal summit area relative to bounding slopes, a well-defined, rounded outline and slopes that generally exceed 15 percent. A hill can occur as a single, isolated mass or in a group. A hill can be further specified based on the magnitude of local relief: *low hill* (30 - 90 m) or *high hill* (90 - 300 m). Informal distinctions between a hill and a mountain are often arbitrary and dependent on local convention.

hillock - A generic name for a small, low hill, generally between 3 - 30 m in height and slopes between 5 and 50% (e.g., bigger than a mound but smaller than a hill); commonly considered a microfeature.

hillslope - A generic term for the steeper part of a hill between its summit and the drainage line, valley flat, or depression floor at the base of the hill.

hogback - A sharp-crested, symmetric (homoclinal) ridge formed by highly tilted resistant rock layers; produced by differential erosion of interlayered resistant and weak rocks with dips greater than about 25 degrees (45 percent).

hoodoo - A column, pinnacle, or pillar of rock produced by differential weathering or erosion in a region of sporadically heavy rainfall. Formation is facilitated by joints and layers of varying hardness.

horst - An elongate block that is bounded on both sides by normal faults that dip away from the interior of the horst. It is a structural form and may or may not be expressed geomorphically.

hummock - (a) (not preferred - see hillock). An imprecise, general term for a rounded or conical mound or other small elevation. (b) (not preferred) A slight rise of ground above a level surface.

impact crater - a) A generally circular or elliptical depression formed by hypervelocity impact of an experimental projectile or ordinance into earthy or rock material. b) (not recommended - use meteorite crater) A generally circular crater formed by the impact of an interplanetary body (projectile) on a planetary surface.

inset fan - (colloquial; western US) The flood plain of an ephemeral stream that is confined between fan remnants, ballenas, basin-floor remnants, or closely-opposed fan toeslopes of a basin.

interdune - The relatively flat surface, whether sand-free or sand-covered, between dunes.

interfluve - A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

intermittent stream - A stream, or reach of a stream, that does not flow year-round (commonly dry for 3 or more months out of 12) and whose channel is generally below the local water table; it flows only when it receives a) base flow (i.e. solely during wet periods), or b) ground-water discharge or protracted contributions from melting snow or other erratic surface and shallow subsurface sources.

island - (a) Land completely surrounded by water; (b) An elevated area of land surrounded by swamp, or marsh, or isolated at high water or during floods.

knob - (a) A rounded eminence, a small hill or mountain; especially a prominent or isolated hill with steep sides, commonly found in the Southern United States. (b) A peak or other projection from the top of a hill or mountain. Also, a boulder or group of boulders or an area of resistant rocks protruding from the side of a hill or mountain.

knoll - A small, low, rounded hill rising above adjacent landforms.

landslide - A general, encompassing term for most types of mass movement landforms and processes involving the downslope transport and outward deposition of soil and rock materials, caused by gravitational forces and which may or may not involve saturated materials. Names of landslide types generally reflect the dominant process and/or the resultant landform. The main operational categories of mass movement are *fall* (rockfall, soil fall, topple), *slide* (rotational landslide, block glide, debris slide, lateral spread), *flow* [rock fragment flow (especially rockfall avalanche), debris avalanche, debris flow (e.g., lahar), earthflow, (creep, mudflow)], and *complex landslides*.

ledge - (a) A narrow shelf of rock, much longer than wide, formed on a rock wall or cliff face, as along a coast by differential wave action on softer rocks; erosion is by combined biological and chemical weathering. (b) A rocky outcrop; solid rock. (c) A shelf-like quarry exposure or natural rock outcrop.

levee - An artificial or natural embankment built along the margin of a watercourse or an arm of the sea, to protect land from inundation or to confine streamflow to its channel.

longitudinal dune - A long, narrow sand dune, usually symmetrical in cross profile, oriented parallel to the prevailing wind direction ; it is wider and steeper on the windward side but tapers to a point on the lee side. It commonly forms behind an obstacle in an area where sand is abundant and the wind is strong and constant. Such dunes can be a few meters high and up to 100 km long.

low hill - A generic name for an elevated, generally rounded land surface with low local relief, rising between 30 meters (100 ft.) to as much as 90 m (approx. 300 ft.) above surrounding lowlands.

lowland - (a) A generic, imprecise term for low-lying land or an extensive region of low-lying land, especially near a coast and including the extended plains or country lying not far above tide level. (b) (not preferred) A generic, imprecise term for a landscape of low, comparatively level ground of a region or local area, in contrast with the adjacent higher country. (c) (not recommended - use valley, bolson, etc.) A generic term for a large valley.

marsh - Periodically wet or continually flooded areas with the surface not deeply submerged. Covered dominantly with sedges, cattails, rushes, or other hydrophytic plants.

meander belt - The zone within which migration of a meandering channel occurs; the flood-plain area included between two imaginary lines drawn tangential to the outer bends of active channel loops. Landform components of the meander-belt surface are produced by a combination of gradual (lateral and down-valley) migration of meander loops and avulsive channel shifts causing abrupt cut-offs of loop segments. Landforms flanking the sinuous stream channel include: point bars, abandoned meanders, meander scrolls, oxbow lakes, natural levees, and flood-plain splays. Meander belts may not exhibit prominent natural levee or splay forms. Flood plains of broad valleys may contain one or more abandoned meander belts in addition to the zone flanking the active stream channel.

meander scar - (a) A crescent-shaped, concave or linear mark on the face of a bluff or valley wall, produced by the lateral erosion of a meandering stream which impinged upon and undercut the bluff; if it's no longer adjacent to the modern stream channel it indicates an abandoned route of the stream; (b) (not recommended - refer to oxbow) An abandoned meander, commonly filled in by deposition and vegetation, but still discernable.

meander scroll - (a) One of a series of long, parallel, close fitting, crescent-shaped ridges and troughs formed along the inner bank of a stream meander as the channel migrated laterally down-valley and toward the outer bank. (b) (not recommended; refer to oxbow lake) - A small, elongate lake on a flood plain in a well-defined part of an abandoned stream channel.

mesa - A broad, nearly flat-topped, and usually isolated landmass bounded by steep slopes or precipitous cliff and capped by layers of resistant, nearly horizontal, rocky summit width greater than the height of bounding escarpments. (Colloquial: western US; not preferred) Also used to designate broad structural benches and alluvial terraces that occupy intermediate levels in stepped sequences of platforms bordering canyons and valleys.

monocline - (a) A unit of folded strata that dips from the horizontal in one direction only, is not part of an anticline or syncline, and occurs at the earth's surface.. This structure is typically present in plateau areas where nearly flat strata locally assume steep dips caused by differential vertical movements without faulting. (b) - A local steepening in an otherwise uniform gentle dip.

mountain - A generic term for an elevated area of the land surface, rising more than 300 meters above surrounding lowlands, usually with a nominal summit area relative to bounding slopes and generally with steep sides (greater than 25 percent slope) with or without considerable bare-rock exposed. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are primarily formed by tectonic activity and/or volcanic action and secondarily by differential erosion.

natural levee - A long, broad low ridge or embankment of sand and coarse silt, built by a stream on its flood plain and along both sides of its channel, especially in time of flood when water overflowing the normal banks is forced to deposit the coarsest part of its load. It has a gentle slope away from the river and toward the surrounding floodplain, and its highest elevation is closest to the river bank.

open depression - A generic name for any enclosed or low area that has a surface drainage outlet whereby surface water can leave the enclosure; an area of lower ground indicated on a topographic map by contour lines forming an incomplete loop or basin indicating at least one surface exit.

overbank deposit - Fine-grained sediments (silt and clay) deposited from suspension on a flood plain by floodwaters that cannot be contained within the stream channel.

overflow stream channel - A watercourse that is generally dry but conducts flood waters that have overflowed the banks of a river, commonly from large storms or annual meltwater.

parabolic dune - A sand dune with a long, scoop-shaped form, convex in the downwind direction so that its horns point upwind, whose ground plan approximates the form of a parabola.

peak - Sharp or rugged upward extension of a ridge chain, usually at the junction of two or more ridges; the prominent highest point of a summit area.

pediment - A gently sloping erosional surface at the foot of a receding hill or mountain slope. The surface may be essentially bare, exposing earth material that extends beneath adjacent uplands; or it may be thinly mantled with alluvium and colluvium, ultimately in transit from upland front to basin or valley lowland. In hill-foot slope terrain the mantle is designated “pedisediment.” The term has been used in several geomorphic contexts: Pediments may be classed with respect to (a) landscape positions, for example, intermontane-basin piedmont or valley-border footslope surfaces (respectively, apron and terrace pediments); (b) type of material eroded, bedrock or regolith; or (c) combinations of the above.

perennial stream - A stream or reach of a stream that flows continuously throughout the year and whose surface is generally lower than the water table adjacent to the region adjoining the stream.

plain - A general term referring to any flat, lowland area, large or small, at a low elevation. Specifically, any extensive region of comparatively smooth and level gently undulating land. A plain has few or no prominent hills or valleys but sometimes has considerable slope, and usually occurs at low elevation

relative to surrounding areas. Where dissected, remnants of a plain can form the local uplands. A plain may be forested or bare of trees and may be formed by deposition or erosion.

plateau - A comparatively flat area of great extent and elevation; specifically an extensive land region considerably elevated (more than 100 meters) above adjacent lower-lying terrain, and is commonly limited on at least one side by an abrupt descent, has a flat or nearly level surface. A comparatively large part of a plateau surface is near summit level.

playa - The usually dry and nearly level lake plain occupying the lowest parts of closed depressions, such as those occurring on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation-runoff events. Playa deposits are fine grained and may or may not have high water table and saline conditions.

point bar - One of a series of low, arcuate ridges of sand and gravel developed on the inside of a growing meander by the migration of the channel toward the outer bank.

pond - (a) A natural body of standing fresh water occupying a small surface depression, usually smaller than a lake and larger than a pool. (b) A small artificial body of water, used as a source of water.

pool - A small, natural body of standing water, usually fresh; e.g. a stagnant body of water in a marsh, or a transient puddle in a depression following a rain.

quarry - Excavation areas, open to the sky, usually for the extraction of stone.

ravine - A small stream channel; narrow, steep-sided, commonly V-shaped in cross section and larger than a gully, cut in unconsolidated materials. General synonym (not preferred) - gulch.

reef - (a) A ridge-like or mound-like structure, layered or massive, built by sedentary calcareous organisms, especially corals, and consisting mostly of their remains; it is wave-resistant and stands above the surrounding contemporaneously deposited sediment. Also, such a structure built in the geologic past and now enclosed in rock, commonly of differing lithology.

ridge - A long, narrow elevation of the land, usually sharp crested with steep sides and forming an extended upland between valleys. The term is used in areas of both hill and mountain relief.

rill - A very small channel with steep sides caused by erosion and cut in unconsolidated materials by concentrated but intermittent flow of water, usually during and immediately following moderate rains or after ice/snow melt. Generally, a rill is not an obstacle to wheeled vehicles and is shallow enough to be obliterated by ordinary tillage.

rim - The border, margin, edge, or face of a landform, such as the curved brim surrounding the top part of a crater or caldera; specifically the rimrock of a plateau or canyon.

rise - (refer to lake plain) (a) A general term for a slight increase in slope and elevation of the land surface, usually with a broad summit and gently sloping sides. (b) same as (a) but the term is restricted to microfeatures in areas of very low relief such as lake plains or coastal plains.

river - (a) A general term for a natural, freshwater surface stream of considerable volume and generally with a permanent base flow, moving in a defined channel toward a larger river, lake, or sea.

river valley - an elongate depression of the Earth's surface carved by a river during its development.

rockfall - The process, associated sediments (rockfall deposit) or resultant landform characterized by a very rapid type of *fall* dominated by downslope movement of detached rock bodies which fall freely through the air or by leaps and bounds (lacks an underlying slip face); also spelled rock fall.

rock pediment - An erosion surface of low relief, cut directly into and across bedrock and composed of either bare rock or thinly veneered pedisediment or residuum (e.g. < 1.5 m) over bedrock; it occurs along the flanks of mountain fronts, or at the base of mountains or high hills. Its surface grades to the

backwearing mountain slopes or hillslopes above, and generally grades down to and merges with a lower-lying alluvial plain, piedmont slope or valley floor below.

rotational slide - The process, associated sediments (rotational landslide deposit) or resultant landforms characterized by an extremely slow to moderately rapid type of slide, composed of comparatively dry and largely soil-rock materials, portions of which remain largely intact and in which movement occurs along a well-defined, concave shear surface and resulting in a backward rotation of the displaced mass. The landform may be single, successive (repeated up and down slope), or multiple (as the number of slide components increase).

rubble - An accumulation of loose angular rock fragments, commonly overlying outcropping rock; the unconsolidated equivalent of a breccia.

saddle - A low point on a ridge or interfluve, generally a divide (pass, col) between the heads of streams flowing in opposite directions.

sandhills - A region of semi-stabilized sand dunes or sandy hills, either covered with vegetation or bare, as in north-central Nebraska and the midlands of the Carolinas.

sand plain - (a) A sand-covered plain which may originate by deflation of sand dunes, and who's lower limit of erosion is governed by the ground-water level. Also spelled *sandplain*. (b) (not preferred - refer to *sandy* outwash plain) A small outwash plain composed chiefly of sand deposited by meltwater streams flowing from a glacier.

sand ramp - A sand sheet blown up onto the lower slopes of a bedrock hill or mountain and forming an inclined plane, sometimes filling small mountain-side valleys and even crossing low passes.

sand sheet - A large, irregularly shaped, commonly thin, surficial mantle of eolian sand, lacking the discernible slip faces that are common on dunes.

scarp - An escarpment, cliff, or steep slope of some extent along the margin of a plateau, mesa, terrace, or structural bench. A scarp may be of any height.

scarp slope - The relatively steeper face of a cuesta, facing in a direction opposite to the dip of the strata.

scree - A collective term for an accumulation of coarse rock debris mantling a slope. Scree is not a synonym of talus, as scree includes loose, coarse fragment material on slopes without cliffs.

scree slope - A portion of a hillside or mountain mantled by scree and lacking an upslope rockfall source.

seep - (noun) An area, generally small, where water or oil percolates slowly to the land surface. For water, it may be considered as a seepage spring, but it is used by some for flows too small to be considered as springs.

shoulder - The hillslope profile position that forms the convex, erosional surface near the top of a hillslope. If present, it comprises the transition zone from summit to backslope.

shrub-coppice dune - A small, streamlined dune that forms around brush and clump vegetation.

side slope - A laterally planar area of a hillside, resulting in predominantly parallel overland water flow (e.g., sheet wash); contour lines generally form straight lines. Side slopes are dominated by colluvium and slope wash sediments. Slope complexity (downslope shape) can range from simple to complex. The slope bounding a drainageway and lying between the drainageway and the adjacent interfluve. It is generally linear along the slope width.

slide - (a) Mass movement processes, associated sediments (slide deposit) or resultant landforms (e.g., rotational, translational, and snow slide) characterized by a failure of earth, snow, or rock under shear stress along one or several surfaces that are either visible or may reasonably be inferred. The moving mass may or may not be greatly deformed, and movement may be rotational (rotational slide) or planar (translational slide). A slide can result from lateral erosion, lateral pressure, weight of overlying material,

accumulation of moisture, earthquakes, expansion owing to freeze-thaw of water in cracks, regional tilting, undermining, fire, and human agencies. (b) The track of bare rock or furrowed earth left by a slide. (c) The mass of material moved by or deposited by a slide.

slip face - The steeply sloping surface of a dune, standing at or near the angle of repose of loose sand, and advancing downwind by a succession of slides wherever that angle is exceeded.

slope - (also called slope gradient or gradient) The inclination of the land surface from the horizontal. Percent slope is the vertical distance divided by the horizontal distance, then multiplied by 100.

slope alluvium - Sediment gradually transported down mountain or hill slopes primarily by non-channel alluvial processes (i.e., slope wash processes) and characterized by particle sorting. Lateral particle sorting is evident on long slopes. In a profile sequence, sediments may be distinguished by differences in size and/or specific gravity of coarse fragments and may be separated by stone lines. Sorting of pebbles or cobbles and burnished peds distinguish these materials from unsorted colluvial deposits.

slope wash - A collective term for non-fluvial, incipient alluvial *processes* (e.g. overland flow, minor rills) that detach, transport, and deposit sediments down hill and mountain slopes. Related sediments (*slope alluvium*) exhibit nominal sorting or rounding of particles, peds, etc., and lateral sorting downslope on long slopes; stratification is crude and intermittent and readily destroyed by pedoturbation and frost action. Also called *slope wash processes*.

slot canyon - A long, narrow, deep and tortuous channel or drainageway with sheer rock walls eroded into sandstone or other sedimentary rocks, especially in the semi-arid western US (e.g. Colorado Plateau); subject to flash flood events; depth to width ratios exceed 10:1 over most of its length and can approach 100:1; commonly containing unique ecological communities distinct from the adjacent, drier uplands.

strath terrace - A type of stream terrace, formed as an erosional surface cut on bedrock and thinly mantled with stream deposits (alluvium).

stream - (a) A body of running water that moves under gravity to progressively lower levels, in a relatively narrow but clearly defined channel on the ground surface, in a subterranean cavern, or beneath or in a glacier. It is a mixture of water and dissolved, suspended, or entrained matter. (b) A term used in quantitative geomorphology interchangeably with channel.

stream terrace - One or a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream, and representing the remnants of an abandoned flood plain, stream bed, or valley floor (i.e., currently very rarely or never floods; inactive cut and fill and/or scour and fill processes). Erosional surfaces cut into bedrock and thinly mantled with stream deposits (alluvium) are called “strath terraces.” Remnants of constructional valley floors thickly mantled with alluvium are called alluvial terraces.

strike valley - A subsequent valley eroded in, and developed parallel to the strike of, underlying weak strata; such as a cuesta; a valley that often, but not necessarily contains a strike valley.

structural bench - A platform-like, nearly level to gently inclined erosional surface developed on resistant strata in areas where valleys are cut in alternating strong and weak layers with an essentially horizontal attitude. Structural benches are bedrock controlled, and in contrast to stream terraces, have no geomorphic implication of former, partial erosion cycles and base-level controls, nor do they represent a stage of flood-plain development following an episode of valley trenching.

summit - (a) The topographically highest position of a hillslope profile with a nearly level (planar or only slightly convex) surface. (b) A general term for the top, or highest area of a landform such as a hill, mountain, or tableland. It usually refers to a high interfluve area of relatively gentle slope that is flanked by steeper slopes, e.g., mountain fronts or tableland escarpments.

swale - (a) A shallow, open depression in unconsolidated materials which lacks a defined channel but can funnel overland or subsurface flow into a drainageway. Soils in swales tend to be more moist and thicker

(cummulic) compared to surrounding soils. (b) A small, shallow, typically closed depression in an undulating ground moraine formed by uneven glacial deposition; (c) (not preferred; refer to interdune) A long, narrow, generally shallow, trough-like depression between two beach ridges, and aligned roughly parallel to the coastline.

syncline - (a) A unit of folded strata that is concave upward whose core contains the stratigraphically younger rocks, and occurs at the earth's surface. In a single syncline, beds forming the opposing limbs of the fold dip toward its axial plane. (b) A fold, at any depth, generally concave upward whose core contains the stratigraphically younger rocks.

tableland - A term for a broad upland with an extensive, nearly level or undulating summit area and steep side slopes descending to surrounding lowlands.

talus - Rock fragments of any size or shape (usually coarse and angular) derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of loose broken rock formed chiefly by falling, rolling, or sliding.

talus cone - A small, steep, cone-shaped landform at the base of a cliff or escarpment, that heads in a relatively small declivity or ravine, and composed of poorly sorted rock and soil debris that has accumulated primarily by episodic rockfall or, to a lesser degree, by slope wash. Not to be confused with an *alluvial cone*; a similar feature but of fluvial origin, composed of better stratified and more sorted material, and that tapers up into a more extensive drainageway.

talus slope - a portion of a hillslope or mountainslope mantled by talus and lying below a rock source.

tank - (colloquial: southwestern US) A natural depression or cavity in impervious rocks in which water collects and remains for the greater part of the year.

terrace - A step-like surface, bordering a valley floor or shoreline, that represents the former position of a flood plain, or lake or sea shore. The term is usually applied to both the relatively flat summit surface (tread), cut or built by stream or wave action, and the steeper slope (scarp, riser), descending to a lower level. Practically, terraces are considered to be generally flat alluvial areas above the 100 yr. flood stage.

terracettes - Small, irregular step-like forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may be induced or enhanced by trampling of livestock such as sheep or cattle. Synonyms (not preferred) - catstep, sheep or cattle track.

toeslope - The hillslope position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear, and are constructional surfaces forming the lower part of a hill-slope continuum that grades to valley or closed-depression floors.

translational slide - A category of mass movement processes, associated sediments (translational slide deposit) or resultant landforms characterized by the extremely slow to moderately rapid downslope displacement of comparatively dry soil-rock material on a surface (slip face) that is roughly parallel to the general ground surface, in contrast to falls, topples, and rotational slides. The term includes such diverse *slide* types as translational debris slides, translational earth slide, translational rock slide, block glides, and slab or flake slides.

valley - An elongate, relatively large, externally drained depression of the Earth's surface that is primarily developed by stream erosion or glacial activity.

valley floor - A general term for the nearly level to gently sloping, lowest surface of a valley. Landforms include axial stream channels, the flood plain, flood-plain steps, and, in some areas, low terrace surfaces.

valley side - The sloping to very steep surfaces between the valley floor and summits of adjacent uplands. Well-defined, steep valley sides have been termed valley walls (not recommended). Note: Scale, relief, and perspective may require use of closely related terms such as hill slope or mountain slope.

wash (dry wash) - (colloquial: western US.) The broad, flat- floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in alluvium. Note: When channels reach intersect zones of ground-water discharge they are more properly classed as “intermittent stream” channels.

zibar - A small, low-relief sand dune that lacks discernible slip faces and commonly occurs on sand sheets, in interdune areas, or in corridors between larger dunes. Zibar spacing can range from 50-400 m with local relief < 10 m. Unlike coppice dunes, zibars are unrelated to deposition around vegetation. Generally dominated by coarser sands.

B.3. Example of a Vegetation Plot Data Form

CURE 115

NATIONAL PARK SERVICE VEGETATION MAPPING PROGRAM: MODIFIED RELEVE FORM
(Modified from TNC and WICA FORMS for BLCA/CURE) *mod_releve 8/21/01*

JRD 7/11/02

INDENTIFIERS AND LOCATORS

Plot Code F12402A Aerial Photo/Polygon _____ Digital Polygon _____ Associated Releve _____

Provisional Association Name PSME / CAGE2 Forest

State CO Park CURE Location Name W. side of Cimarron Point (W. of Hermit's Rest)

Survey Date 6/26/02 Surveyors GBradshaw, J. Divers

Directions to plot and town, range, section information *(especially if no GPS is available)*:

Quad Name Cimarron Plot Dimensions 20 x 20 M Plot Shape Square

GPS File Name X062615B Field UTM: 279,641.52 m East(X), 4260,001.54 m North(Y)

ArcView File Name Plot_bc062602 Corrected UTM: 279641.1602 m East(X), 4260003962 m North(Y)

Photo Roll#/Frame #2002/12,13 Camera Kodak Film Type APS

ENVIROMENTAL DESCRIPTION *(see instruction booklet for definitions and additional positions and landforms)*

Elevation 8694 ft 2649 Slope 68% Aspect 324°

Topographic Position (ridgetop, mesa, toeslope, midslope, etc) Midslope

Landform (active slope, floodplain, crest, gorge, etc) gully in ridgeline below saddle

Cowardin System (check one) ✓Upland __Riverine __Palustrine __Lacustrine

Hydrological Regime (check one) __Semipermanently Flooded __Seasonally Flooded __Saturated __Temporarily Flooded __Intermittently Flooded __Permanently Flooded

Soil Taxon (circle one): (Gunnison) Paonia Montrose Texture Sandy loam

Soil Survey (ie Gunnison) RO - Rock Outcrop

Environmental Comments
Fire evidence around - moderate fuels loads.

Composition of **UNVEGETATED** Surface *(use cover scale and codes below)*
- 2 Bedrock
- 20 Large rocks (cobbles, boulders > 10cm)
- 1 Small rocks (gravel, 0.2 – 10 cm)
- 0 Sand (0.1 – 2 mm)
- 5 Litter
- 1 Wood
- 1 Bare soil
- 1 Other Poop?

VEGETATION DESCRIPTION

Leaf Type (of dominant stratum)	Leaf Phenology (of dominant stratum)	Physiognomic Class	Cover Scale (for veg and unvegetated)	Height Scale for Vegetation
___Broad-leaved ✓Needle-leaved ___Microphyllus ___Graminoid ___Forb	✓Evergreen ___Cold-deciduous ___Drought-deciduous ___Mixed evergreen/cold-deciduous ___Mixed evergreen/ drought deciduous	✓Forest ___Woodland ___Shrubland ___Dwarf Shrubland ___Herbaceous ___Nonvascular ___Sparsley vegetated	Code % cover 01 <1 02 1 – 5 03 5 – 25 04 25 – 50 05 50 – 75 06 75 – 100	Code meters 01 <0.5 02 0.5 – 1 03 1 – 2 04 2 – 5 05 5 – 10 06 10 – 15 07 15 – 20 08 20 – 35 09 35 – 50 10 > 50

Strata Descriptions: T1-Emergent T2-Canopy T3-Sub-canopy S1-Tall shrub S2-Short shrub S3-Dwarf shrub H-Herbaceous N-Non-vascular *(biotic crusts, lichens, etc.)* V-Vine/Liana E-Epiphyte

On the following page(s), list the stratum code, species, height and covercode for each stratum. Use the codes provided above. List all species, if possible, or at least all species with 5% or greater cover, in each strata in which it occurs. Put an asterisk next to any known diagnostic species. Check the box if a specimen was collected. Indicate whether collected specimens were identified in the field ('F') or office ('O') or awaiting identification ('W') or initials if an expert makes a positive ID. Fill in the page number and total number of pages at the bottom of each form used.

least sun; middle west; >70% slope; no geology

NATIONAL PARK SERVICE VEGETATION MAPPING PROGRAM: OBSERVATION POINT FORM

(Modified from TNC and WICA FORMS for BLCA/CURE)

Plot Code_____ Aerial Photo/Polygon_____ Digital Polygon_____ Associated Releve_____

State CO Park CURE Location West side of Cimarron PT

Survey Date 6/25/07 Surveyor(s) GB JD

Stratum (beginning with uppermost)	Height Code	Cover Code	Species Code	Species Name	Notes on unknowns	GPS Check	0 or 1 GPS
T1	07	03	PSME	Pseudotsuga menziesii			
* T2	05	04	PSME	Pseudotsuga menziesii			
T2	05	03	POTR5	Populus tremuloides			
T3	04	02	PSME	Pseudotsuga menziesii			
T3	↓	02	POTR5	Populus tremuloides			
S1	03	02	AMUT	Amelanchier utahensis			
S1	↓	01	PRVI	Prunus virginiana			
S2	02	03	PRVI	Prunus virginiana			
		02	AMUT	Amelanchier utahensis			
		04	SYRO	Symphoricarpos rotundifolius			
		02	RUID	Rubus idaeus			
	↓	02	PSME	Pseudotsuga menziesii			
T3	04	02	ACGL	Acer glabrum - 1 many stemmed plant			
S2	02	02	RIWO	Ribes wolfii			
S3	01	03	MARE11	Mahonia repens			
S3	01	02	PAMY	Paxistima myrsinites			
* H	01	04	CAGE2	Carex geyeri			
		01	POFE	Poa fendleriana			
		01	PSJA2	Pseudostellaria jamesiana			
		02	MARAF	Maianthemum racemosum spp. amplexicaules	+ NECS		
		02	CLCOC2	Clematis columbiana var columbiana			
		01	CAMI12	Castilleja miniata			
		01	LUPIN	Lupinus sp.	Short stature, lvs sm. Hrts narrow, hairy both sdw		
		01	ARCO9	Arnica cordifolia			
	↓						
S2	02	02	JUSC2	Juniperus scopulorum			
N	01	02	MOSS				
S1	03	01	PIPU	Picea pungens			

General Comments (dominance, differences from type norm, wildlife signs)

Page __ of __

Cimarron Pt PSME/ CAGE2 Forest 6/26/02 JD, GB

F1240A

Tree DBH and Fuels Form Units in (cm)/ in (circle one) Subplot? (Y /(N) Plot Code [redacted]. CURE. 115

Entered 1 of 2 pg 8/13/03

Record the diameter at root crown (DRC) of all stems of trees more than 4.5 feet tall.

Record duff, depth and other tree crown characteristics only in Douglas-fir and ponderosa pine plots.

Fuels Photo Guides

Series	Page/Photo #
Ponderosa/Douglas-fir	___
Pinyon-Juniper	___
Sagebrush	___

P-J age class

- ✓ Not P-J
- ___ Old-growth
- ___ Mature
- ___ Young
- ___ Invasive

PIPO/DF Litter & Duff Loading

Location	Litter Depth	Duff Depth
Origin		
10m N		
10m E		
10 m S		
10m W		

Canopy and Fuel Loading Characteristics

DRC	Species	Ht	Crown Ratio	Crown Base Height	Tree Structure Stage	DRC	Species	Ht	Crown Ratio	Crown Base Height	Tree Structure Stage	DRC	Species
~~17.0~~	~~PSME~~												
7.4	PSME												
12.1	PSME												
~~7.3~~	~~POTR5~~												
~~16.3~~	~~POTR5~~												
5.0	PSME												
13.1	PSME												
8.4	PSME												
28.4	PSME												
39.1	PSME												
11.2	PSME												

Plot 2

Cimarron Pt. 9 1.5 PSME/CAGE2 Forest 7 10cm 6/26/02 JD,OB
13.5 13.6 D: F1240A

Tree DBH and Fuels Form Units in cm / in (circle one) Subplot? (Y / N) Plot Code ~~BIN9~~ CURE115

Record the diameter at root crown (DRC) of all stems of trees more than 4.5 feet tall.

Record duff, depth and other tree crown characteristics only in Douglas-fir and ponderosa pine plots.

Entered Jan 2 gis 8/29/03

Fuels Photo Guides

Series	Page/Photo #
Ponderosa/Douglas-fir	___
Pinyon-Juniper	___
Sagebrush	___

P-J age class

- ✓ Not P-J
- ___ Old-growth
- ___ Mature
- ___ Young
- ___ Invasive

PIPO/DF Litter & Duff Loading (cm)

Location	Litter Depth	Duff Depth
Origin	8	4
10m N	2	5
10m E	3	10
10 m S	1	1
10m W	2	1

Canopy and Fuel Loading Characteristics (meters)

DBH (cm) DRC	Species	(meters) Ht	Crown Ratio	Crown Base Height	Tree Structure Stage	DBH DRC	Species	Ht	Crown Ratio	Crown Base Height	Tree Structure Stage	DRC	Species
~~13.9~~	~~PSME~~	~~8.6~~	~~.0~~	~~.0~~	~~DEAD~~	3.0	PSME	2.0	.6	1.0	suppressed		
24.8	PSME	14	.8	0	dominant	5.4	PIPU	3.0	1.0	0	suppressed		
32.5		15	.8	0	codominant	2.3	PIPU	2.0	1.0	0	suppressed		
16.2		11	.6	1m	codominant								
12.1		10	.8	0	Codominant								
51.5		21m	.6	2.5	dominant								
30.9		19m	.6	3m	dominant								
~~15.5~~		~~11m~~	~~0~~	~~.0~~	~~DEAD~~								
8.6		2m	.8	0	suppressed								
4.7		3.5	.8	0	suppressed								
23.3		14	.8	0.5m	codominant								
2.6		2.0	.8	0	suppressed								
2.6/4.8		2.0	.8	0	suppressed								
~~10.5~~	~~POTR5~~	~~9.0~~	~~—~~	~~—~~	~~DEAD~~								
7.0	POTR5	3.0	—	—	DEAD								
5.8	PSME	3.5	.8	0	suppressed								
13.3	PSME	8.0	.6	1.0	intermed.								
~~10.3~~	~~PSME~~	~~8.5~~	~~—~~	~~—~~	~~DEAD~~								
15.0	PSME	9.5	.8	0	codominant								
~~12.1~~	~~POTR5~~	~~10.0~~	~~—~~	~~—~~	~~DEAD~~								
~~16.7~~	~~POTR5~~	~~11.0~~	~~—~~	~~—~~	~~DEAD~~								
~~14.4~~	~~POTR5~~	~~8.5~~	~~—~~	~~—~~	~~DEAD~~								
~~10.2~~	~~POTR5~~	~~9.0~~	~~—~~	~~—~~	~~DEAD~~								
~~7.3~~	~~POTR5~~	~~3.5~~	~~—~~	~~—~~	~~DEAD~~								
5.2	PSME	3.0	.8	0	suppressed								

— = no branches or crown

P2 of 2

B.4. Example of an Accuracy Assessment Data Form

2005 ACCURACY ASSESSMENT POINT FORM – CURECANTI NATIONAL RECREATION AREA
NORTHERN COLORADO PLATEAU NETWORK VEGETATION MAPPING PROJECT

IDENTIFIERS/LOCATORS

AA Point Code: CURE_AA. D883 Quad name: _____ AA Point Shape: ☒ circle ☐ other

Park Site Name East of Cebolla arm, B8

Survey Date 9/1/05 Surveyor(s) K Edwards

GPS file name CA883 Field UTM X 309614 m E Field UTM Y 4257634 m N

☐ Coordinates from USGS NAD27 Quad Map (if checked enter coordinates under GPS comments)

GPS Unit: (circle one): Trimble XM (Garmin) Flat /None/ Other: etrex PDOP: _____ 3D Differential? ☒ yes ☐ no

Datum NAD 83 Zone: 13S Error +/-: 16 m (Flat Garmin only)

GPS Comments:

Camera Name and Model (circle one): (Olympus Stylus) / Canon Sureshot / Minolta FZ/ Other: _____

Roll #	Frame #	Photographer	Direction/Comments
Vje 10	20	K Edwards	N → S

PLANT ASSOCIATION INFORMATION

ASSOCIATIONS AT AA POINT	New?	OTHER ASSOCIATIONS WITHIN 50 M OF AA POINT
Primary Name Pseudotsuga menziesii/Poa fendleriana Woodland	☐	1.
Secondary Name	☐	2.
Tertiary Name	☐	3.

Representativeness of point within polygon: ☐ Good ☐ Fair ☐ Poor ☒ Unk .....of association to description: ☒ Good ☐ Fair ☐ Poor

Classification Comments: (complications, uncertainties, explanation of poor representativeness)

ENVIRONMENTAL DESCRIPTION

Elevation 8041 m (ft) From: (GPS) Map (circle one) Slope 37° Aspect 320°

Topographic Position: mid slope

Landform: hill Geology: alluvium & surficial deposits

Environmental Comments: volcanic rock and bedrock on the point with trees growing closest to drainages, on less rockier slopes, and talus/scree slopes between intermittent drainages. The Muhlenbergia is growing in the shadier areas of the point.

2005: June 9

2005 ACCURACY ASSESSMENT POINT FORM – CURECANTI NATIONAL RECREATION AREA
NORTHERN COLORADO PLATEAU NETWORK VEGETATION MAPPING PROJECT

Unvegetated Surface Cover+: *(please use the cover scale below)*

1a	Bedrock	03	Large rocks (cobbles, boulders > 10 cm)	—	Sand (0.1-2 mm)
1a	Litter, duff	03	Small rocks (gravel, 0.2-10 cm)	04	Bare soil
P	Wood (> 1 cm)			—	Other:

VEGETATION DESCRIPTION

Leaf phenology (dominant stratum)	Leaf Type (of dominant stratum)	Physiognomic Class	Height Class (m)	Cover Scale
Trees and Shrubs			01 - <0.5	T - <1%
X Evergreen	X Broad-leaved	Forest	02 - 0.5-1	P - 1-5%
Cold-deciduous	Needle-leaved	X Woodland	03 - 1-2	1a - 6-10%
Mixed evergreen - cold-deciduous	Microphyllous	Shrubland	04 - 2-5	1b- 11-15%
Herbs	Graminoid	Dwarf- shrubland	05 - 5-10	02 - 16-25%
Perennial	Forb	Shrub herbaceous	06 - 10-15	03 - 26-35%
Annual	Pteridophyte	Wooded herbaceous	07 - 15-20	04 - 36-45%
	Non Vascular	Wooded Shrubland	08 - 20-35	05 - 46-55%
	Mixed	Herbaceous	09 - 35-50	06 - 56-65%
		Nonvascular	10 - >50	07 - 66-75%
		Sparsely vegetated		08 - 76-85%
				09 - 86-95%

Strata	Height Class	Cover Class	Dominant species (mark any known diagnostic species with a *)	% Cover
T1 Emergent				
T2 Canopy	05	03	Pseudotsuga menziesii	30
T3 Sub-canopy	03	P	Juniperus scopulorum	1
S1 Tall shrub				
S2 Short Shrub	01	P	Ribes cereum	3
			Holodiscus dumosus	1
S3 Dwarf-shrub				
H Herbaceous	01	03	Poa fendleriana	25
			Muhlenbergia montana	5
H4 Tree Seedlings				
N Non-vascular	01	1a	Lichens on rocks	7

☐ Please check this box if AA point has more than one plant association (e.g. two or more species list at a point recorded on form)

2005: June 9

Appendix C. Database Documentation

C.1 Plots Database Documentation

Background

This database, designed for data resulting from fieldwork related to vegetation mapping projects, was developed by the Northern Colorado Plateau Network (NCPN). The Plots Database System, developed by The Nature Conservancy, was the starting point for this database. From this starting point, NCPN normalized the data structure, added fields and lookup tables, and developed an extensive user interface. Similar versions of this database, subsequently referred to as the CURE VegMapDB, have been used for all vegetation mapping projects conducted by NCPN. CURE VegMapDB contains plot, observation point, and accuracy assessment data collected during project field work.

Two database files are required to use CURE VegMapDB:

- *CURE_PlotsAA_XP.mdb.* This "frontend" file contains all queries, forms, reports, associated modules and Visual Basic code.
- *CURE_PlotsAA_XP_be.mdb*. This "backend" file contains the database tables.

The frontend/backend file structure allows multiple users to enter data in a network environment, and allows for easy backup and transfer of the data tables. Users typically launch the frontend file, and a utility will prompt them to establish a link to the backend file. The contents of the backend file, however, can be used independently of the frontend.

Entity Relationship Diagram

The primary tables and relationships from the backend file (CURE_PlotsAA_XP_be.mdb) are illustrated below. The database follows the design structure of the National Park Service Natural Resource Database Template, which is based on a location record, one or more related event records, and observation data elements linked to each event.

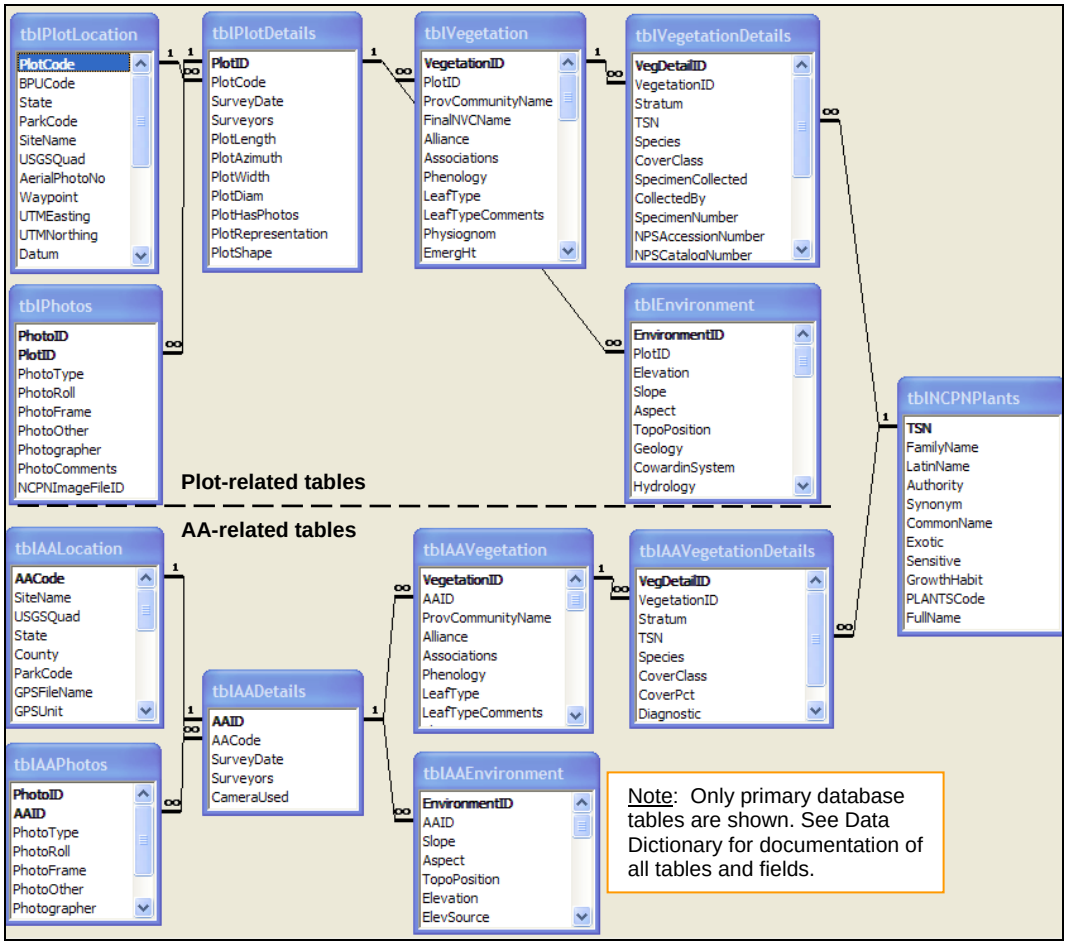


Figure 1. Entity Relationship Diagram for CURE VegMapDB

Data Dictionary

The database consists of three types of tables: plot data, accuracy assessment data, and lookup tables that provide a standardized list of values to be used for certain data fields. Tables appear in alphabetical order within each of these three categories.

Plot-related tables

Table Name: tblDataMgmtLog
Description: Table containing a log of data set manipulations or database object alterations.

Field Name	Field Description	Field Type	Field Width
ActionDate	The date on which the data set was massaged or manipulated.	dbDate	8
ActionMonth	If ActionDate known to month only, use this field and the ActionYear field.	dbText	50
ActionYear	If ActionDate known to year only, use this field.	dbText	50
Action	What was done with the data set. How was it altered, massaged, manipulated, etc. Include changes to data and changes to database objects or structures.	dbMemo	0
Who	The name of the person who performed the action with the data set.	dbText	50

Table Name: tblEnvironment
Description: Table containing values on environmental features and conditions of plot or observation point.

Field Name	Field Description	Field Type	Field Width
EnvironmentID	Unique record identifier	dbLong	4
PlotID	Foreign key; links record to tblPlotDetails	dbLong	4
Elevation	Elevation of plot in meters as estimated from either map or GPS unit	dbLong	4
Slope	Slope of plot measured in degrees	dbLong	4
Aspect	Aspect of plot	dbText	50
TopoPosition	Topographic position of plot; value selected from tlkpTopography	dbText	50
Landform	Landform on which plot is located, any landform could be entered by crew.	dbText	50
Geology	Geologic substrate influencing the plant community; value selected from tlkpGeology	dbText	75
CowardinSystem	If the plot is in a wetland system, select term that best describes its hydrology; value selected from tlkpCowardin	dbText	12
Hydrology	Select value that best describes hydrology of plot from tlkpHydrology	dbText	50
EnvironmentalComments	Comments on environmental setting and its effect on the vegetation; also comments on any disturbance or reproduction factors	dbMemo	0
BareSoil	Estimate to the nearest percentage of bare soil ground cover	dbText	3
Bedrock	Estimate to the nearest percentage of bedrock ground cover	dbText	3
Sand	Estimate to the nearest percentage of sand (particle size 0.1-2mm) ground cover	dbText	3
Moss	Estimate to the nearest percentage of moss ground cover	dbText	3
Other	Estimate to the nearest percentage of other type of ground cover	dbText	3
OtherPctDesc	Description of the other type of ground cover components in the previous column	dbText	255
Litter	Estimate to the nearest percentage of litter ground cover	dbText	3
Rocks	Estimate to the nearest percentage of rocks >10cm wide ground cover	dbText	3
Lichen	Estimate to the nearest percentage of lichen ground cover	dbText	3
Wood	Estimate to the nearest percentage of wood >1cm ground cover	dbText	3
Gravel	Estimate to the nearest percentage of rocks <10cm wide ground cover	dbText	3
Water	Estimate to the nearest percentage of water ground cover	dbText	3
Cryptogam	Estimate to the nearest percentage of cryptogram ground cover	dbText	3
SoilTexture	Assessment of average soil texture from sample taken a few inches below the surface; values selected from tlkpSoilTexture	dbText	50

Field Name	Field Description	Field Type	Field Width
SoilDrainage	Soil drainage class based on actual moisture content and extent period; values selected from tlkpSoilDrainage	dbText	30
AnimalUseComments	Comments on evidence of use by non-domestic animals in plot area	dbMemo	0
DisturbanceComments	Comments on evidence of natural or anthropogenic disturbance in plot area, severity and effects on vegetation	dbMemo	0
OtherComments	Other general comments	dbMemo	0
LandscapeComments	Description of landscape context of plot, including any important landscape features influencing the community	dbMemo	0
SoilTaxonDesc	Field used for either identifying soils keyed, or to describe if large rocks or outcrops are present on the surface	dbText	255
LiveVegLitter	Estimate to the nearest percentage of live veg litter ground cover	dbText	3
LiveVegWood	Estimate to the nearest percentage of live veg wood ground cover	dbText	3
LichenRocks	Estimate to the nearest percentage of lichen covering rocks	dbText	3
LichenGround	Estimate to the nearest percentage of lichen ground cover (on the soil, associated with cryptogams)	dbText	3
MossPct	Estimate to the nearest percentage of moss ground cover	dbText	3
DarkCyanobacteria	Estimate to the nearest percentage of dark cyanobacteria ground cover	dbText	3
TotalPct	Total ground cover pct - used for QC check.	dbLong	4

Table Name: tblEnvironmentDetails
Description: Table containing values on environmental features and conditions of plot or observation point.

Field Name	Field Description	Field Type	Field Width
EnvDetailID	Unique record identifier	dbLong	4
EnvironmentID	Foreign key; links to tblEnvironment	dbLong	4
Landform	One or more landform values corresponding to plot location; any value may be entered by crew	dbText	50

Table Name: tblFinalAssociationNamesPlots
Description: Table containing final Association Names (plots) assigned by NatureServe.

Field Name	Field Description	Field Type	Field Width
PlotCode	Identifier assigned to plot by survey crew	dbText	255
ELC_Code	Unique ID assigned by NatureServe	dbText	255
Association_Name	Association Name assigned by NatureServe	dbText	255

Table Name: tblFuels
Description: Table containing details on fuels characteristics of plot.

Field Name	Field Description	Field Type	Field Width
FuelsID	Unique record ID	dbLong	4

Field Name	Field Description	Field Type	Field Width
PlotID	Foreign key; links to tblPlotDetails	dbLong	4
GOPhotoGuide	For Gambel oak plots, the page number of the photo that most closely resembles the plot in terms of vegetation structure and down fuel.	dbText	3
ASPPhotoGuide	For aspen plots, the page number of the photo that most closely resembles the plot in terms of vegetation structure and down fuel.	dbText	3
PPDFPhotoGuide	For ponderosa pine and Douglas-fir plots, the page number of the photo that most closely resembles the plot in terms of vegetation structure and down fuel. Ref: W.C. Fischer 1981.	dbText	3
PJPhotoGuide	For pinyon-juniper plots, the page number of the photo that most closely resembles the plot in terms of vegetation structure and down fuel. Ref: Ottmar et al. 2000.	dbText	3
SBPhotoGuide	For sagebrush plots, the page number of the photo that most closely resembles the plot in terms of vegetation structure and down fuel. Ref: Ottmar et al. 2000.	dbText	3
PJAgeClass	If plot contains pinyon and/or juniper, enter value that best describes the age class of the stand; values stored in tlkpPJAge	dbText	15
LitterOrigin	Litter thickness at plot center	dbText	3
LitterNorth	Litter thickness 20m north of plot center	dbText	3
LitterEast	Litter thickness 20m east of plot center	dbText	3
LitterSouth	Litter thickness 20m south of plot center	dbText	3
LitterWest	Litter thickness 20m west of plot center	dbText	3
DuffOrigin	Duff thickness at plot center	dbText	3
DuffNorth	Duff thickness 20m north of plot center	dbText	3
DuffEast	Duff thickness 20m east of plot center	dbText	3
DuffSouth	Duff thickness 20m south of plot center	dbText	3
DuffWest	Duff thickness 20m west of plot center	dbText	3
IsSubplot	Indicate if measurements are for subplot (if plot has >25 trees, one quadrant (subplot) of plot can be measured for fuels	dbBoolean	1
FuelsComments	Comments about fuels characteristics	dbMemo	0

Table Name: tblFuelsDetails
Description: Details on stems, height, crown width, and other attributes of trees within plot.

Field Name	Field Description	Field Type	Field Width
FuelsDetailID	Unique identifier for record	dbLong	4
FuelsID	Foreign key, links to tblFuels	dbLong	4
StemCount	Number of stems measured. Value will be 1 if forest species; >=1 if woodland species.	dbInteger	2
StemDiameter	Diameter in cm of stem(s). If stem count =1 for a forest species, diameter represents dbh. If stem count is >1 for a woodland species, diameter represents the average diameter of all stems measured at crown base.	dbDouble	8
TSN	Taxonomic Serial Number - unique taxon identifier assigned by ITIS	dbDouble	8
WoodlandCrownBaseHeight	Estimate of height, in meters, of crown base of woodland tree.	dbDouble	8
WoodlandTotalHeight	Estimate of height for woodland tree (not height of	dbDouble	8

Field Name	Field Description	Field Type	Field Width
	crown base), in meters.		
WoodlandCrownWidth	Width, in meters, of woodland tree crown	dbDouble	8
WoodlandCrownHeight	Height, in meters, of woodland tree	dbDouble	8
WoodlandCrownRatio	Crown ratio was collected in lieu of crown diameter on some woodland plots or on plots with mixed woodland and forest species.	dbDouble	8
ForestCrownBaseHeight	Height, in meters, of crown base of forest tree	dbDouble	8
ForestTotalHeight	Estimate of height for forest tree (not height of crown base), in meters.	dbDouble	8
ForestCrownHeight	Height, in meters, of forest tree (PP or DF)	dbDouble	8
CrownRatio	For ponderosa pine and Douglas-fir plots, the ratio of live tree crown to overall tree height	dbText	12
StructureStage	Stage of tree; values selected from tlkpStructureStages	dbText	12
Comments	Brief comments (e.g., dead top, twinned, ladder fuels, diseased)	dbText	255

Table Name: tblPhotos
Description: Details on individual photos taken of plot or observation point.

Field Name	Field Description	Field Type	Field Width
PhotoID	Unique record identifer	dbLong	4
PlotID	Foreign key, links to tblPlotDetails	dbLong	4
PhotoType	Type of photo being referenced.	dbText	16
PhotoRoll	Reference number for film roll of photo.	dbText	12
PhotoFrame	Frame number of photo within roll.	dbText	50
PhotoOther	Other unique identifier or reference number for digital photo or name of movie file.	dbText	12
Photographer	Name of photographer.	dbText	50
PhotoComments	Brief description of photo.	dbText	255
NCPNImageFileID	Cross-reference for NCPN Photo Database field, NCPNImageFileID	dbText	50

Table Name: tblPlotCodeLink
Description: Table used to map plot identifiers from previously-assigned variable-length format to new 4-digit format.

Field Name	Field Description	Field Type	Field Width
NewPlotCode	Plot identifier in 4-digit format	dbText	20
OldPlotCode	Plot identifier in old, variable-length format	dbText	20
BogusCode	Temporary field for plot identifier	dbText	50

Table Name: tblPlotDetails
Description: Information on a plot that is specific to a visit.

Field Name	Field Description	Field Type	Field Width
PlotID	Unique identifier for record	dbLong	4
PlotCode	Foreign key, links to tblPlotLocation	dbText	10
SurveyDate	Date plot was visited and data collected	dbDate	8
Surveyors	Names of persons collecting data at plot (last names)	dbText	75
PlotLength	Length of plot, in meters	dbText	5
PlotAzimuth	Azimuth of plot; synonymous with aspect. One or the other,	dbText	5

Field Name	Field Description	Field Type	Field Width
	or both, can be used		
PlotWidth	Width of plot, in meters	dbText	5
PlotDiam	Diameter of plot, in meters, if plot is circular	dbText	5
PlotHasPhotos	Yes if photos are taken of plot	dbBoolean	1
PlotRepresentation	Description or discussion of representativeness of plot in stand, and in comparison to associations outside the park (if known)	dbMemo	0
PlotShape	Shape of plot	dbText	15

Table Name: tblPlotLocation
Description: Basic and unchanging information on plot or observation point location.

Field Name	Field Description	Field Type	Field Width
PlotCode	Identifier assigned to plot by survey crew	dbText	10
BPUCode	Biophysical unit code where plot is located.	dbText	10
State	State where plot is located	dbText	2
ParkCode	Park unit where plot is located	dbText	4
SiteName	Short, descriptive name of site where plot is located	dbText	100
USGSQuad	USGS quadrangle (1:24K) where plot is located	dbText	50
AerialPhotoNo	Aerial photo number corresponding to plot location	dbText	10
Waypoint	Garmin plot code	dbText	50
UTMEasting	UTM easting of plot	dbDouble	8
UTMNorthing	UTM northing of plot	dbDouble	8
Datum	Datum of UTM coordinates	dbText	10
UTMZone	UTM zone of coordinates	dbText	4
UTM Error	error, in meters, of location data (based on reading from Garmin GPS unit)	dbText	5
DiffCorrected	Indicate if coordinates have been differentially corrected	dbText	3
DirectionsToPlot	Precise directions to plot	dbMemo	0
County	County where plot is located.	dbText	50
GPSUnit	Manufacturer and model of GPS unit (e.g., Trimble GeoExplorer 3)	dbText	25
GPSComments	Any brief comments on GPS data collection at plot.	dbMemo	0
InPark	Select Yes if plot is within park boundaries.	dbBoolean	1
IsObservationPt	Yes if observation point.	dbBoolean	1

Table Name: tblVegetation
Description: Overall vegetation characteristics of a plot or observation point.

Field Name	Field Description	Field Type	Field Width
VegetationID	Unique record ID	dbLong	4
PlotID	Foreign key, links to tblPlotDetails	dbLong	4
ProvCommunityName	Community name (provisional) assigned by field crews by following naming protocols as described in field manual and training 04/04.	dbText	120
Alliance	Alliance corresponding to provisional community name	dbText	100
Associations	Association corresponding to provisional community name	dbText	100
FinalNVCName	Final association name as provided by NatureServe. Links to tbl_final_classification	dbText	240
Phenology	Leaf phenology of the dominant stratum. Field is blank for	dbText	35

Field Name	Field Description	Field Type	Field Width
	non-vascular plots		
LeafType	Leaf form of the dominant stratum.	dbText	35
LeafTypeComments	If Leaf Type is "mixed," this field describes the multiple leaf types found in the dominant stratum.	dbText	255
Physiognom	Physiognomic class of plot (from tllkPhysiogClass)	dbText	20
EmergHt	Height class of emergent stratum (tlkpHeightClass)	dbText	2
EmergCovTot	Cover class of emergent stratum (tlkpCover)	dbText	5
CanHt	Height class of canopy stratum (tlkpHeightClass)	dbText	2
CanCovTot	Cover class of canopy stratum (tlkpCover)	dbText	50
SubHt	Height class of subcanopy stratum (tlkpHeightClass)	dbText	2
SubCovTot	Cover class of subcanopy stratum (tlkpCover)	dbText	5
TallShHt	Height class of Tall shrub stratum (tlkpHeightClass)	dbText	2
TallShCovTot	Cover class of tall shrub stratum (tlkpCover)	dbText	5
ShrubHt	Height class of shrub stratum (tlkpHeightClass)	dbText	2
ShrubCovTot	Cover class of shrub stratum (tlkpCover)	dbText	5
DwarfHt	Height class of dwarf shrub stratum (tlkpHeightClass)	dbText	2
DwarfCovTot	Cover class of dwarf shrub stratum (tlkpCover)	dbText	5
HerbHt	Height class of herbaceous (total) stratum (tlkpHeightClass)	dbText	2
HerbCovTot	Cover class of herbaceous (total) stratum	dbText	5
GramHt	Height class of graminoid stratum (tlkpHeightClass)	dbText	2
GramCovTot	Cover class of graminoid stratum (tlkpCover)	dbText	5
ForbHt	Height class of forb stratum (tlkpHeightClass)	dbText	2
ForbCovTot	Cover class of forb stratum (tlkpCover)	dbText	5
FernHt	Height class of fern stratum (tlkpHeightClass)	dbText	2
FernCovTot	Cover class of fern stratum (tlkpCover)	dbText	5
SeedlHt	Height class of tree seedling stratum (tlkpHeightClass)	dbText	2
SeedlCovTot	Cover class of tree seedling stratum (tlkpCover)	dbText	5
NonvasHt	Height class of nonvascular stratum (tlkpHeightClass)	dbText	2
NonvasCovTot	Cover class of nonvascular stratum (tlkpCover)	dbText	5
VineHt	Height class of vine stratum (tlkpHeightClass)	dbText	2
VineTotCov	Cover class of vine stratum (tlkpCover)	dbText	5
EpiHt	Height class of epiphyte stratum (tlkpHeightClass)	dbText	2
EpiTotCov	Cover class of epiphyteb stratum (tlkpCover)	dbText	5
TotalPct	Total veg cover pct - used for QC check.	dbInteger	2
RelativeCover	Is cover percentage relative?	dbBoolean	1

Table Name: tblVegetationDetails
Description: Species and strata-specific data related to a plot or observation point.

Field Name	Field Description	Field Type	Field Width
VegDetailID	Unique record ID	dbLong	4
VegetationID	Foreign key; links to tblVegetation	dbLong	4
Stratum	Strata class from tlkpStrata	dbText	2
TSN	Taxonomic Serial Number - unique taxon identifier assigned by ITIS	dbDouble	8
Species	Latin name of species, from tblNCPNPlants	dbText	100
CoverClass	Cover class to describe species and strata (from tlkpCover)	dbText	5
PercentCover	Actual percentage of cover for this species	dbInteger	2

Field Name	Field Description	Field Type	Field Width
Diagnostic	Check yes if the species is known to be diagnostic of the vegetation type.	dbBoolean	1
SpecimenCollected	Check yes if a specimen of the species was collected.	dbBoolean	1
CollectedBy	Name of person collecting specimen	dbText	75
NPSAccessionNumber	Accession number corresponding to all collections made under research permit; provided by park curator	dbText	50
NPSCatalogNumber	Unique reference number for individual specimen; numbers provided by park curator	dbText	50
SpecimenNumber	Enter the collector's reference number for the specimen collected.	dbText	50
SpecimenLocality	Brief description of collection location, suitable for specimen label	dbText	240
SpecimenHabitat	Brief description of collection habitat, suitable for specimen label	dbText	240
SpecimenAssocSpecies	Brief description of associated species in collection area, suitable for specimen label	dbText	240

Accuracy assessment-related tables

Table Name: tblAADetails
Description: Information on an AA point that is specific to a visit.

Field Name	Field Description	Field Type	Field Width
AAID	Unique identifier for record	dbLong	4
AACode	Identifier of AA record; assigned by field crew	dbText	13
SurveyDate	Date AA point was visited and data was collected	dbDate	8
Surveyors	Name(s) of persons who collected data at an AA point (Last name and first initial)	dbText	75
CameraUsed	Make and model of camera used to photograph plot	dbText	50

Table Name: tblAAEnvironment
Description: Table containing values on environmental features and conditions of an AA point.

Field Name	Field Description	Field Type	Field Width
EnvironmentID	Unique record identifier	dbLong	4
AAID	Foreign key; links to tblAADetails	dbLong	4
Slope	Slope of AA point measured in degrees	dbText	50
Aspect	Aspect of AA point	dbText	50
TopoPosition	Topographic position of AA point; value selected from tlkpTopography	dbText	50
Elevation	Elevation of AA point in meters as estimated from either map or GPS unit	dbLong	4
ElevSource	How elevation was derived in the field (GPS or Quad Map)	dbText	50
EnvironmentalComments	Comments on environmental setting and its effect on the vegetation; also comments on any disturbance or reproduction factors	dbMemo	0
BareSoil	Estimate to the nearest percentage of bare soil ground cover	dbText	3
Bedrock	Estimate to the nearest percentage of bedrock ground	dbText	3

Field Name	Field Description	Field Type	Field Width
	cover		
Sand	Estimate to the nearest percentage of sand (particle size 0.1-2mm) ground cover	dbText	3
Moss	Estimate to the nearest percentage of moss ground cover	dbText	3
Other	Estimate to the nearest percentage of other type of ground cover	dbText	3
OtherPctDesc	Description of "other" category in previous column	dbText	255
Litter	Estimate to the nearest percentage of litter ground cover	dbText	3
Rocks	Estimate to the nearest percentage of rocks >10cm wide ground cover	dbText	3
Lichen	Estimate to the nearest percentage of lichen ground cover	dbText	3
Gravel	Estimate to the nearest percentage of gravel <10cm wide ground cover	dbText	3
LiveVegLitter	Estimate to the nearest percentage of live veg litter ground cover	dbText	3
LiveVegWood	Estimate to the nearest percentage of live veg wood ground cover	dbText	3
Wood	Estimate to the nearest percentage of wood >1cm ground cover	dbText	3
LichenRocks	Estimate to the nearest percentage of lichen covering rocks	dbText	3
LichenGround	Estimate to the nearest percentage of lichen covering ground (associated with biocrust)	dbText	3
DarkCyanobacteria	Estimate to the nearest percentage of dark cyanobacteria ground cover	dbText	3
Water	Estimate to the nearest percentage of water ground cover	dbText	3
Geology	Geology	dbText	75
BBareSoil	[not used for CURE]	dbText	3
BBedrock	[not used for CURE]	dbText	3
BSand	[not used for CURE]	dbText	3
BOther	[not used for CURE]	dbText	3
BLitter	[not used for CURE]	dbText	3
BRocks	[not used for CURE]	dbText	3
BGravel	[not used for CURE]	dbText	3
BWood	[not used for CURE]	dbText	3
CBareSoil	Estimate to the nearest percentage of bare soil ground cover (field added 2/8/2006 to split out BLCA and CURE cover)	dbText	3
CBedrock	Estimate to the nearest percentage of bedrock ground cover (field added 2/8/2006 to split out BLCA and CURE cover)	dbText	3
CSand	Estimate to the nearest percentage of sand (particle size 0.1-2mm) ground cover (field added 2/8/2006 to split out BLCA and CURE cover)	dbText	3
COther	Estimate to the nearest percentage of other type of ground cover (field added 2/8/2006 to split out BLCA and CURE cover)	dbText	3

Field Name	Field Description	Field Type	Field Width
CLitter	Estimate to the nearest percentage of litter ground cover (field added 2/8/2006 to split out BLCA and CURE cover)	dbText	3
CRocks	Estimate to the nearest percentage of rocks >10cm wide ground cover (field added 2/8/2006 to split out BLCA and CURE cover)	dbText	3
CGravel	Estimate to the nearest percentage of gravel <10cm wide ground cover	dbText	3
CWood	Estimate to the nearest percentage of wood >1cm ground cover (field added 2/8/2006 to split out BLCA and CURE cover)	dbText	3

Table Name: tblAAEnvironmentDetails
Description: Table containing values on environmental features and conditions of an AA point.

Field Name	Field Description	Field Type	Field Width
EnvDetailID	Unique record identifier	dbLong	4
EnvironmentID	Foreign key; provides link to tblEnvironment	dbLong	4
Landform	One or more landform values corresponding to AA point location; any value may be entered by crew	dbText	50

Table Name: tblAALocation
Description: Basic and unchanging information on AA point location.

Field Name	Field Description	Field Type	Field Width
AACode	Identifier assigned to AA point by survey crew	dbText	13
SiteName	Short, descriptive name of site where point is located	dbText	100
State	State where point is located	dbText	2
County	County where plot is located.	dbText	50
ParkCode	Park unit where point is located	dbText	4
GPSFileName	Name of corresponding GPS file	dbText	50
GPSUnit	Manufacturer and model of GPS unit (e.g., Trimble GeoExplorer 3)	dbText	25
UTMEasting	UTM easting of point	dbDouble	8
UTMNorthing	UTM northing of point	dbDouble	8
UTMZone	UTM zone of coordinates	dbText	4
DiffCorrected	Indicate if coordinates have been differentially corrected	dbText	3
Datum	Datum of UTM coordinates	dbText	10
PDOP	satellite Precision Dilution of Position (based on reading from Trimble GPS unit)	dbText	50
UTM Error	error, in meters, of location data (based on reading from Garmin GPS unit)	dbText	5
InPark	Select Yes if plot is within park boundaries.	dbBoolean	1
GPSComments	Any brief comments on GPS data collection.	dbText	255
RepresentPWP	Representativeness of point within polygon.	dbText	7
RepresentATD	Representativeness of association to description.	dbText	4
ClassificationComments	Classification comments.	dbMemo	0
PlotShape	Plot shape.	dbText	10
USGSQuad	USGS Quad map name.	dbText	50

Table Name: tblAAPhotos
Description: Details on individual photos taken of an AA point.

Field Name	Field Description	Field Type	Field Width
PhotoID	Unique record identifier	dbLong	4
AAID	Foreign key; provides link to tblAADetails	dbLong	4
PhotoType	Type of photo being referenced.	dbText	16
PhotoRoll	Reference number for film roll of photo.	dbText	12
PhotoFrame	Frame number of photo within roll.	dbText	50
PhotoOther	Other unique identifier or reference number for digital photo or name of movie file.	dbText	25
Photographer	Name of photographer.	dbText	50
PhotoComments	Brief description of photo.	dbText	255
NCPNImageFileID	Corresponds to the NCPN Photodatabase image file ID	dbText	50

Table Name: tblAAVegAssociation
Description: Vegetation association at AA location

Field Name	Field Description	Field Type	Field Width
VegAssocID	Unique record identifier	dbLong	4
AAID	Foreign key; provides link to tblAADetails	dbLong	4
VegAssocCode	Identification code of vegetation association; provided by NatureServe	dbText	25
VegAssocRank	Rank of vegetation association (primary, secondary, tertiary)	dbText	15
FieldKey	Was name obtained from field key?	dbBoolean	1
NewName	New classification name?	dbBoolean	1
Post_Field_Name	Post-field name?	dbBoolean	1
OtherAssocCode	Other associations within 50 m	dbText	255

Table Name: tblAAVegetation
Description: Overall vegetation characteristics of an AA point.

Field Name	Field Description	Field Type	Field Width
VegetationID	Unique record identifier	dbLong	4
AAID	Foreign key; provides link to tblAADetails	dbLong	4
ProvCommunityName	Community name (provisional) assigned by field crews by following naming protocols as described in field manual and training 04/04.	dbText	120
Alliance	Alliance corresponding to provisional community name	dbText	100
Associations	Association corresponding to provisional community name	dbText	100
Phenology	Leaf phenology of the dominant stratum.	dbText	35
LeafType	Leaf form of the dominant stratum.	dbText	35
LeafTypeComments	Comments about leaf form of the dominant stratum.	dbText	255
Physiognom	Physiognomic class of plot (from tllkPhysiogClass)	dbText	20
EmergHt	Height class of emergent stratum (tlkpHeightClass)	dbText	2
EmergCovTot	Cover class of emergent stratum (tlkpCoverAA)	dbText	15
EmergCovPercent	[not used]	dbText	50
CanHt	Height class of canopy stratum (tlkpHeightClass)	dbText	2
CanCovTot	Cover class of canopy stratum (tlkpCoverAA)	dbText	15
CanCovPercent	[not used]	dbText	50
SubHt	Height class of subcanopy stratum (tlkpHeightClass)	dbText	2

Field Name	Field Description	Field Type	Field Width
SubCovTot	Cover class of subcanopy stratum (tlkpCoverAA)	dbText	15
SubCovPercent	[not used]	dbText	50
TallShHt	Height class of tall shrub stratum (tlkpHeightClass)	dbText	2
TallShCovTot	Cover class of tall shrub stratum (tlkpCoverAA)	dbText	15
TallShCovPercent	[not used]	dbText	50
ShrubHt	Height class of shrub stratum (tlkpHeightClass)	dbText	2
ShrubCovTot	Cover class of shrub stratum (tlkpCoverAA)	dbText	15
ShrubCovPercent	[not used]	dbText	50
DwarfHt	Height class of dwarf shrub stratum (tlkpHeightClass)	dbText	2
DwarfCovTot	Cover class of dwarf shrub stratum (tlkpCoverAA)	dbText	15
DwarfCovPercent	[not used]	dbText	50
HerbHt	Height class of herbaceous stratum (tlkpHeightClass)	dbText	2
HerbCovTot	Cover class of herbaceous stratum (tlkpCoverAA)	dbText	15
HerbCovPercent	[not used]	dbText	50
NonvasHt	Height class of nonvascular stratum (tlkpHeightClass)	dbText	2
NonvasCovTot	Cover class of nonvascular stratum (tlkpCoverAA)	dbText	15
NonvasCovPercent	[not used]	dbText	50
VineHt	Height class of vine stratum (tlkpHeightClass)	dbText	2
VineTotCov	Cover class of vine stratum (tlkpCoverAA)	dbText	15
VineTotPercent	[not used]	dbText	50
EpiHt	Height class of epiphyte stratum (tlkpHeightClass)	dbText	2
EpiTotCov	Cover class of epiphyte stratum (tlkpCoverAA)	dbText	15
EpiTotPercent	[not used]	dbText	50
GramHt	Height class of graminoid stratum (tlkpHeightClass)	dbText	2
GramCovTot	Cover class of graminoid stratum (tlkpCoverAA)	dbText	15
GramCovPercent	[not used]	dbText	50
ForbHt	Height class of forb stratum (tlkpHeightClass)	dbText	2
ForbCovTot	Cover class of forb stratum (tlkpCoverAA)	dbText	15
ForbCovPercent	[not used]	dbText	50
FernHt	Height class of fern stratum (tlkpHeightClass)	dbText	2
FernCovTot	Cover class of fern stratum (tlkpCoverAA)	dbText	15
FernCovPercent	[not used]	dbText	50
SeedlHt	Height class of tree seedling stratum (tlkpHeightClass)	dbText	2
SeedlCovTot	Cover class of tree seedling stratum (tlkpCoverAA)	dbText	15
SeedCovPercent	[not used]	dbText	50
OutsidePlotHt	Height class of species occurring outside plot (tlkpHeightClass)	dbText	50
OutsidePlotTotCov	Cover class of species occurring stratum (tlkpCoverAA)	dbText	50
OutsidePlotTotPercent	[not used]	dbText	50
HTotalHt	Height class of total herbaceous stratum (tlkpHeightClass)	dbText	2
HTotalCover	Cover class of total herbaceous stratum (tlkpCoverAA)	dbText	15
HTotalCoverPercent	[not used]	dbText	50
H4Ht	Height class of tree seedling stratum (tlkpHeightClass)	dbText	2
H4Cover	Cover class of tree seedling stratum (tlkpCoverAA)	dbText	15
H4CoverPercent	[not used]	dbText	50
PlantSpeciesComments	Comments on plant species list	dbMemo	0
ClassificationComments	Old style form - moved to main page, but not deleted because it contains data.	dbMemo	0
MultipleAssoc	List represents more than one association.	dbBoolean	1

Field Name	Field Description	Field Type	Field Width
BEmergCovTot	Cover class of emergent stratum - BLCA	dbText	15
BCanCovTot	Cover class of canopy stratum - BLCA	dbText	15
BSubCovTot	Cover class of subcanopy stratum - BLCA	dbText	15
BTallShCovTot	Cover class of tall shrub stratum - BLCA	dbText	15
BShrubCovTot	Cover class of shrub stratum - BLCA	dbText	15
BDwarfCovTot	Cover class of dwarf shrub stratum - BLCA	dbText	15
BHerbCovTot	Cover class of herbaceous stratum - BLCA	dbText	15
BNonvasCovTot	Cover class of nonvascular stratum - BLCA	dbText	15
BVineTotCov	Cover class of vine stratum - BLCA	dbText	15
BEpiTotCov	Cover class of epiphyte stratum - BLCA	dbText	15
BSeedlCovTot	Cover class of tree seedling stratum - BLCA	dbText	15
BHTotalCover	Cover class of total herbaceous stratum - BLCA	dbText	15
BH4Cover	Cover class of tree seedling stratum - BLCA	dbText	15
CEmergCovTot	Cover class of emergent stratum - CURE	dbText	15
CCanCovTot	Cover class of canopy stratum - CURE	dbText	15
CSubCovTot	Cover class of subcanopy stratum - CURE	dbText	15
CTallShCovTot	Cover class of tall shrub stratum - CURE	dbText	15
CShrubCovTot	Cover class of shrub stratum - CURE	dbText	15
CDwarfCovTot	Cover class of dwarf shrub stratum - CURE	dbText	15
CHerbCovTot	Cover class of herbaceous stratum - CURE	dbText	15
CNonvasCovTot	Cover class of nonvascular stratum - CURE	dbText	15
CVineTotCov	Cover class of vine stratum - CURE	dbText	15
CEpiTotCov	Cover class of epiphyte stratum - CURE	dbText	15
CSeedlCovTot	Cover class of tree seedling stratum - CURE	dbText	15
CHTotalCover	Cover class of total herbaceous stratum - CURE	dbText	15
CH4Cover	Cover class of tree seedling stratum - CURE	dbText	15

Table Name: tblAAVegetationDetails
Description: Species and strata-specific data related to an AA point.

Field Name	Field Description	Field Type	Field Width
VegDetailID	Unique record ID	dbLong	4
VegetationID	Foreign key; links to tblAAVegetation	dbLong	4
Stratum	Strata class from tllkStrata	dbText	2
TSN	Taxonomic Serial Number - unique taxon identifier assigned by ITIS	dbDouble	8
Species	Latin names of species, from tblNCPNPlants	dbText	100
CoverClass	Cover class to describe species and strata (from tllkCover)	dbText	5
CoverPct	Percent cover observed for that species in the field.	dbText	5
Diagnostic	Diagnostic?	dbBoolean	1
Dead	Dead?	dbBoolean	1

Table Name: tblFinalAssociationNamesAA
Description: Table containing final Association Names (AA points) assigned by NatureServe.

Field Name	Field Description	Field Type	Field Width
PlotCode	Identifier of AA record; assigned by field crew	dbText	255
ELC_Code	Unique ID assigned by NatureServe	dbText	255
Association_Name	Association Name assigned by NatureServe	dbText	255

Lookup tables

Table Name: tblNCPNPlants
Description: Master look-up table for plant species names and taxonomic information. Derived from ITIS (USDA - Integrated Taxonomic Information System)

Field Name	Field Description	Field Type	Field Width
TSN	Taxonomic Serial Number - unique taxon identifier assigned by ITIS	dbDouble	8
FamilyName	Family name of taxon	dbText	255
LatinName	Latin name of taxon	dbText	255
Authority	Authority of Latin name	dbText	255
Synonym	Accepted synonyms of taxon	dbText	255
CommonName	Locally accepted common name for taxon	dbText	255
Exotic	Check yes if species is exotic	dbBoolean	1
Sensitive	check yes if species is threatened, endangered, or sensitive	dbBoolean	1
GrowthHabit	Select GrowthHabit for species -- habit can vary based on region; edit as needed to reflect habit in park	dbText	255
PLANTSCode	Code for taxonomic unit assigned by USDA PLANTS	dbText	255
FullName	temporary field; concatenation of Latin name and authority	dbText	255

Table Name: tlkpAAVegAssociation
Description: Lookup of vegetation association codes (CEGL codes from NatureServe) and vegetation association name.

Field Name	Field Description	Field Type	Field Width
VegAssocCode	NVCElCode	dbText	255
VegAssocName	NVCFinalAssociationName	dbText	255

Table Name: tlkpAAVegAssocRanks
Description: Rank of vegetation association (primary, secondary, tertiary).

Field Name	Field Description	Field Type	Field Width
VegAssocRank	Indicates whether the vegetation association represents a primary, secondary, or tertiary collection by field crews	dbText	255

Table Name: tlkpAlliances
Description: Look-up of provisional community names.

Field Name	Field Description	Field Type	Field Width
Alliance	Alliance name from NatureServe classification	dbText	100

Table Name: tlkpAssociations
Description: Look-up of association names.

Field Name	Field Description	Field Type	Field Width
Associations	Association names from NatureServe classification	dbText	125

Table Name: tlkpCamera
Description: Lookup of Camera make/models used for plot photos.

Field Name	Field Description	Field Type	Field Width
CameraType	Model and make of camera used for photographs of plot	dbText	50
CameraComments	Additional comments on camera, including default focal length	dbText	50

Table Name: tlkpCover
Description: Look-up of cover classes assigned to species and strata in VegetationDetails.

Field Name	Field Description	Field Type	Field Width
CoverClass	Cover class code: 0, T, P, 01-a, 01-b, 03, 04, 05, 06	dbText	50
CoverClassDesc	Cover class description: 0=0 (outside plot), T=<1%, P=1-5%, 01-a=1-10%, 01-b=10-25%, 03=5-25%, 04=25-50%, 05=50-75%, 06=75-100%	dbText	255

Table Name: tlkpCoverAA
Description: Look-up of cover classes assigned to species and strata in AAVegetationDetails.

Field Name	Field Description	Field Type	Field Width
CoverClass	T=<1%, 01=1-5%, 02=6-15%, 03=16-25%, 04=26-35%, 05=36-45%, 06=46-55%, 07=56-65%, 08=66-75%, 09=76-85%, 10=86-95%, 11=96-100%	dbText	50

Table Name: tlkpCowardin
Description: Look-up of Cowardin system categories for Environment descriptions.

Field Name	Field Description	Field Type	Field Width
CowardinSystem	Cowardin system descriptors for environmental description of plot.	dbText	50

Table Name: tlkpElevSource
Description: Lookup table of options for source of elevation data.

Field Name	Field Description	Field Type	Field Width
ElevSource	Source of elevation data entered on field forms	dbText	50

Table Name: tlkpGeology
Description: Look-up of geology types to describe substrate of plot.

Field Name	Field Description	Field Type	Field Width
Geology	Geology types used to describe substrate of plot or observation point	dbText	75

Table Name: tlkpHeightClass
Description: Look-up of height classes assigned to strata in VegetationDetails.

Field Name	Field Description	Field Type	Field Width
HeightClass	01<.5m 02=.5-1m 03=1-2m 04=2-5m 05=5-10m 06=10-15m 07=15-20m 08=20-35m 09=35-50m 10=>50m	dbText	2

Table Name: tlkpHydrology
Description: Look-up of hydrology types from Cowardin et al. 1979.

Field Name	Field Description	Field Type	Field Width
Hydrology	Hydrology descriptors for plots that are in a wetland or upland with intermittent flooding (dry wash).	dbText	50

Table Name: tlkpLandform
Description: Look-up of landforms in Veg Mapping Manual (from http://soils.usda.gov/technical/handbook/contents/part629.html#00).

Field Name	Field Description	Field Type	Field Width

Field Name	Field Description	Field Type	Field Width
Landform	landforms from appendix 1 of field manual	dbText	50

Table Name: tlkpLeafPhen
Description: Look-up of phenology types to describe dominant stratum (from Veg Mapping Manual).

Field Name	Field Description	Field Type	Field Width
Phenology	Leaf phenology descriptors to describe dominant stratum	dbText	40

Table Name: tlkpLeafType
Description: Look-up of leaf form of dominant stratum (from Veg Mapping Manual).

Field Name	Field Description	Field Type	Field Width
LeafType	Leaf form description of the dominant stratum	dbText	35

Table Name: tlkpParks
Description: Look-up of parks in the Northern Colorado Plateau network of I&M.

Field Name	Field Description	Field Type	Field Width
ParkCode	Four-letter abbreviation for park code	dbText	4
ParkName	Full name of park where data were collected	dbText	50

Table Name: tlkpPhotoComments
Description: Lookup table of photo comments

Field Name	Field Description	Field Type	Field Width
PhotoComments	Photograph comments.	dbText	50

Table Name: tlkpPhotographer
Description: Lookup table of photographer names

Field Name	Field Description	Field Type	Field Width
Photographer	Photographer name.	dbText	50

Table Name: tlkpPhotoTypes
Description: Look-up of types of photos taken during data collection.

Field Name	Field Description	Field Type	Field Width
PhotoType	Type of photo taken, associated with plot.	dbText	50

Table Name: tlkpPhysiogClass
Description: Look-up of physiognomic types to describe each plot or observation point.

Field Name	Field Description	Field Type	Field Width
Physiognom	Physiognomic class used to describe plot	dbText	50

Table Name: tlkpPJAge
Description: Look-up of Pinyon-Juniper age classes.

Field Name	Field Description	Field Type	Field Width
PJAgeClass	Pinyon- Juniper age class, if plot contains either of these two species.	dbText	15

Table Name: tlkpPlotShapes
Description: Look-up of shapes of plots.

Field Name	Field Description	Field Type	Field Width
PlotShape	Shapes of plots	dbText	15

Table Name: tlkpSoilDrainage
Description: Look-up of soil drainage classes to describe plot or observation point.

Field Name	Field Description	Field Type	Field Width
SoilDrainage	Soil drainage classes used to describe soil where plot is located	dbText	30

Table Name: tlkpSoilTexture
Description: Look-up of soil textures based on Bowker 2003 field key for CANY, ARCH, and NABR.

Field Name	Field Description	Field Type	Field Width
SoilTexture	Look-up of soil textures based on Bowker 2003 field key for CANY, ARCH, and NABR.	dbText	15

Table Name: tlkpStates
Description: Look-up of all states in the USA.

Field Name	Field Description	Field Type	Field Width
StateCode	Two-letter abbreviation for each state	dbText	2
StateName	Full name of each state in the USA	dbText	50

Table Name: tlkpStrata
Description: Look-up of strata classes in VegetationDetails (from Veg Mapping Manual).

Field Name	Field Description	Field Type	Field Width
Stratum	T1=Emergent T2=Canopy T3=Subcanopy S1=Tall Shrub S2=Short Shrub S3=Dwarf Shrub H1=Graminoid H2=Forb H3=Fern H4=Tree Seedl N=Nonvasc V=Vine E=Epiphyte	dbText	3

Table Name: tlkpStructureStages
Description: Look-up

Field Name	Field Description	Field Type	Field Width
StructureStage	Standard fuel model classes for forest and woodland trees indicating their position in the canopy	dbText	12

Table Name: tlkpSurveyors
Description: Look-up of names of data collection individuals for BLCA/CURE data collection.

Field Name	Field Description	Field Type	Field Width
SurveyorName	Last names of crew members on each data collection team.	dbText	75

Table Name: tlkpTopography
Description: Look-up of topographic positions to describe where plot or observation point is located on its related landform.

Field Name	Field Description	Field Type	Field Width
TopoPosition	Topographic positions used to describe where plot or observation point is located on its related landform.	dbText	50

Table Name: tlkpUSGS_Quad
Description: Look-up of all 7.5 minute USGS quads for BLCA/CURE.

Field Name	Field Description	Field Type	Field Width
USGSQuad	Names of all 7.5 minute USGS quads for BLCA/CURE	dbText	50
USGSQuadCode	n/a for CURE	dbText	7

Table Name: tlkpUTMZone
Description: Look-up for UTM zone of BLCA/CURE.

Field Name	Field Description	Field Type	Field Width
UTMZone	UTM zone where all BLCA/CURE plots were collected	dbText	5

C.2 Geodatabase Documentation

Background

The geodatabase was designed to consolidate all spatial and non-spatial (i.e., tabular) data from the CURE vegetation mapping project. In the geodatabase, feature classes were created for the spatial datasets, including plots, observation points, AA points, and polygons. These feature classes were then linked to the tables in the Plots database via relationship classes.

Entity Relationship Diagram

The primary tables and relationships for the geodatabase are illustrated below.

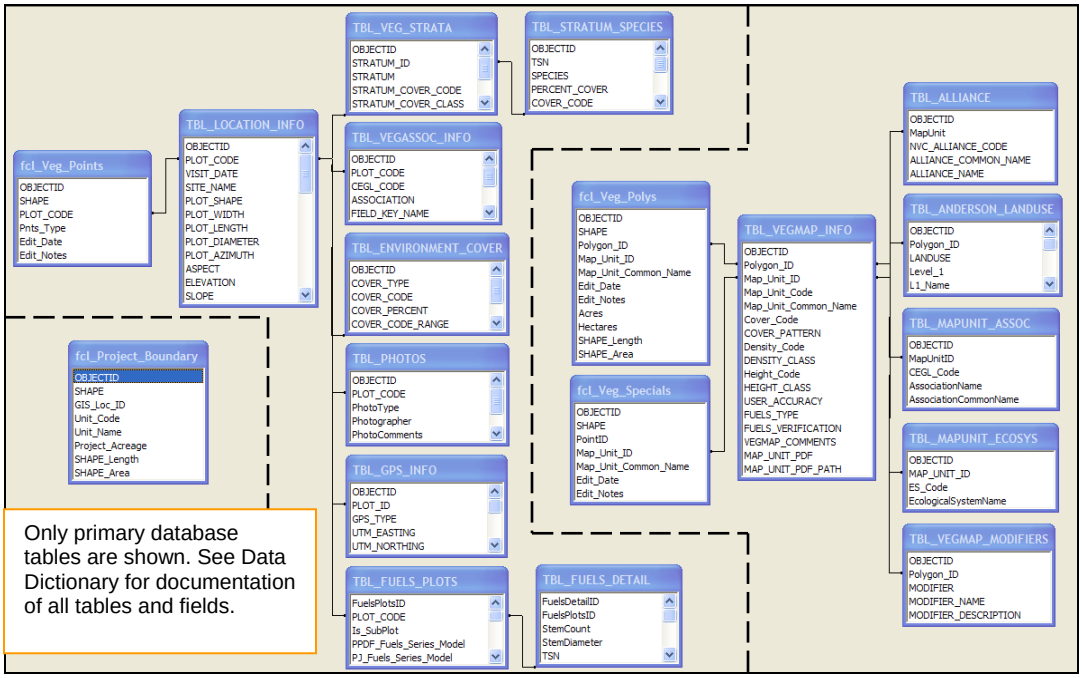


Figure 2. Entity Relationship Diagram for CURE Geodatabase

Data Dictionary

The geodatabase consists of two types of tables: spatial (i.e., feature classes), and non-spatial tables. Tables appear in alphabetical order within these two categories.

Spatial tables

Table Name: fcl_Project_Boundary
Description: The feature class of the boundary of the vegetation mapping project area.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
SHAPE	ESRI generated	dbLongBinary	0
GIS_Loc_ID	unique ID	dbText	128
Unit_Code	Four-letter park code (CURE)	dbText	10
Unit_Name	Full name of national park (Curecanti National Recreation Area)	dbText	255

Field Name	Field Description	Field Type	Field Width
Project_Acreage	Acreage of project area	dbLong	4
SHAPE_Length	ESRI generated	dbDouble	8
SHAPE_Area	ESRI generated	dbDouble	8

Table Name: fcl_Veg_Points
Description: The feature class containing all point data associated with the vegetation project (Plots, Observations, Fuels, AA).

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
SHAPE	ESRI generated	dbLongBinary	0
PLOT_CODE	Unique Plot code, used for relating tables and feature class (TBL_LOCATION_INFO)	dbText	20
Pnts_Type	Type of point (fuels, plot, observation, aa, misc)	dbLong	4
Edit_Date	Date of any edits to the point or data	dbText	10
Edit_Notes	Notes regarding any edits	dbText	255

Table Name: fcl_Veg_Polys
Description: The feature class displaying the vegetation mapping units for the park.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
SHAPE	ESRI generated	dbLongBinary	0
Polygon_ID	Unique polygon code, used for relating tables (TBL_VEGMAP_INFO)	dbText	128
Map_Unit_ID	The map unit identifier, used by the mappers (aka: grid_code or map class code)	dbText	10
Map_Unit_Common_Name	The name of the map unit (or map class)	dbText	250
Edit_Date	Date of any edits to the polygon or its attributes	dbDate	8
Edit_Notes	Notes regarding any edits to the polygon or its attributes	dbText	250
Acres	Acres per polygon, generated using ArcMap	dbDouble	8
Hectares	Hectares per polygon, generated using ArcMap	dbDouble	8
SHAPE_Length	ESRI generated	dbDouble	8
SHAPE_Area	ESRI generated	dbDouble	8

Table Name: fcl_Veg_Specials
Description: The feature class containing point data for vegetation types of special interest to the park too small to delineate with a polygon.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
SHAPE	ESRI generated	dbLongBinary	0
PointID	Unique Plot code, used for relating tables (TBL_VEGMAP_INFO)	dbText	15
Map_Unit_ID	The map unit identifier, used by the mappers (aka: grid_code or map class code)	dbText	15
Map_Unit_Common_Name	The name of the map unit (or map class)	dbText	250
Edit_Date	Date of any edits to the point or its attributes	dbText	20
Edit_Notes	Notes regarding any edits to the point or its attributes	dbText	150

Non-spatial tables

Table Name: TBL_ALLIANCE
Description: Contains the alliances for the vegetation polygons by map unit ID.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
MapUnit	The map unit identifier, used by the mappers (aka: grid_code or map class code, usually a number)	dbText	12
NVC_ALLIANCE_CODE	The NVC alliance code	dbText	20
ALLIANCE_COMMON_NAME	NVC alliance common name	dbText	250
ALLIANCE_NAME	NVC alliance latin name	dbText	250

Table Name: TBL_ANDERSON_LANDUSE
Description: Contains the Anderson Landuse classes for the vegetation polygons.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
Polygon_ID	Unique polygon code, used for relating tables (TBL_VEGMAP_INFO)	dbText	20
LANDUSE	The Anderson landuse classes of the polygon (version 1.5, January 2002)	dbDouble	8
Level_1	Anderson landuse code for level one	dbText	255
L1_Name	Anderson landuse name for level one	dbText	255
Level_2	Anderson landuse code for level two	dbText	50
L2_Name	Anderson landuse name for level two	dbText	255
Level_3	Anderson landuse code for level three	dbText	255
L3_Name	Anderson landuse name for level three	dbText	255
Level_4	Anderson landuse code for level four	dbText	255
L4_Name	Anderson landuse name for level four	dbText	255
Level_5	Anderson landuse code for level five	dbText	255
L5_Name	Anderson landuse name for level five	dbText	255
Level_6	Anderson landuse code for level six	dbText	255
L6_Name	Anderson landuse name for level six	dbText	255

Table Name: TBL_ENVIRONMENT_COVER
Description: Contains ground cover data for the veg points feature class.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
COVER_TYPE	Ground cover type	dbText	30
COVER_CODE	Cover code from field sheet - AA & observation points only	dbText	5
COVER_PERCENT	Field estimate to the nearest percentage of ground cover type (plots only).	dbDouble	8
COVER_CODE_RANGE	Cover code range - for plots with non-integer percentages.	dbText	50
COVER_PERCENT_DESC	Description of cover, if "other"	dbText	255
PLOT_CODE	Unique Plot code, used for relating tables	dbText	20

Table Name: TBL_ENVIRONMENT_LANDFORM
Description: Contains landform data for the veg points feature class.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
LANDFORM	Landform on which plot is located, any landform could be entered by crew.	dbText	100
PLOT_CODE	Unique Plot code, used for relating tables (TBL_LOCATION_INFO)	dbText	20

Table Name: TBL_FORMATION
Description: Contains NVC formation level data for the vegetation polygons.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
MAP_UNIT_ID	The map unit identifier, used by the mappers (aka: grid_code or map class code)	dbText	10
Formation_Code	NVC formation level code	dbText	30
Formation_Name	NVC formation level name	dbText	255

Table Name: TBL_FUELS_DETAIL
Description: Details on stems, height, crown width, and other attributes of trees within plot for the veg points feature class.

Field Name	Field Description	Field Type	Field Width
FuelsDetailID	Unique identifier for record	dbLong	4
FuelsPlotsID	Foreign key to TBL_FUELS_PLOTS	dbLong	4
StemCount	Number of stems measured. Value will be 1 if forest species; >=1 if woodland species.	dbInteger	2
StemDiameter	Diameter in cm of stem(s). If stem count =1 for a forest species, diameter represents dbh. If stem count is >1 for a woodland species, diameter represents the average diameter of all stems measured at crown base.	dbDouble	8
TSN	Taxonomic Serial Number - unique taxon identifier assigned by ITIS	dbDouble	8
Species	Species name	dbText	250
WoodlandCrownWidth	In PJ woodlands, the width of the tree crown at its widest point, in meters to the nearest half-meter	dbDouble	8
WoodlandCrownHeight	In PJ woodlands, distance from the ground to the top of the living tree crown, in meters to the nearest half-meter	dbDouble	8
ForestCrownBaseHeight	In Douglas-fir, ponderosa pine, or other tall tree woodlands, the distance from the ground to the base of the living tree crown, exclusive of dead or single branches, in meters to the nearest half-meter	dbDouble	8
ForestCrownHeight	Same as for woodlands, but for real trees	dbDouble	8
CrownRatio	The ratio of crown height to total tree height.	dbText	12
StructureStage	Describes the place of the tree in the canopy - emergent above the canopy, main canopy, sub canopy, sapling, seedling	dbText	12
Comments	General comments regarding the fuels at a specific plot.	dbText	255
PLOT_CODE	Unique Plot code, used for relating tables (TBL_LOCATION_INFO)	dbText	20

Table Name: TBL_FUELS_PLOTS
Description: Details on stems, height, crown width, and other attributes of trees within plot for the veg points feature class.

Field Name	Field Description	Field Type	Field Width
FuelsPlotsID	Unique identifier for record	dbLong	4
PLOT_CODE	Unique Plot code, used for relating tables (TBL_LOCATION_INFO)	dbText	20
Is_SubPlot	Indicate if measurements are for subplot (if plot has >25 trees, one quadrant (subplot) of plot can be measured for fuels. “-1” = Yes, “0” = No	dbText	4
PPDF_Fuels_Series_Model	n/a for CURE	dbText	6
PJ_Fuels_Series_Model	n/a for CURE	dbText	6
SB_Fuels_Series_Model	n/a for CURE	dbText	6
PJ_Age_Class	If plot contains pinyon and/or juniper, enter value that best describes the age class of the stand	dbText	50
LitterOrigin	Litter measured in cm at origin of plot	dbText	3
LitterNorth	Litter measured in cm at 10 m north of plot center	dbText	3
LitterSouth	Litter measured in cm at 10 m south of plot center	dbText	3
LitterEast	Litter measured in cm at 10 m east of plot center	dbText	3
LitterWest	Litter measured in cm at 10 m west of plot center	dbText	3
DuffOrigin	Duff measured in cm at origin of plot	dbText	3
DuffNorth	Duff measured in cm at 10 m north of plot center	dbText	3
DuffSouth	Duff measured in cm at 10 m south of plot center	dbText	3
DuffEast	Duff measured in cm at 10 m east of plot center	dbText	3
DuffWest	Duff measured in cm at 10 m west of plot center	dbText	3

Table Name: TBL_GPS_INFO
Description: Contains information about the GPS unit and accuracies of data collected for the veg points feature class.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
PLOT_ID	Unique Plot code, used for relating tables (TBL_LOCATION_INFO)	dbText	20
GPS_TYPE	Manufacturer / model of GPS unit (e.g., Garmin Etrex or Trimble XM)	dbText	30
UTM_EASTING	UTM easting of plot	dbDouble	8
UTM_NORTHING	UTM northing of plot	dbDouble	8
UTM_ZONE	UTM zone of coordinates	dbText	3
DATUM	Datum of UTM coordinates (NAD83)	dbText	10
GPS_ERROR	Error, in meters, of location data (based on reading from Garmin GPS unit)	dbText	5
DIFF_CORRECTED	Indicates if coordinates have been differentially corrected (from Garmin screen)	dbText	3
GPS_COMMENTS	Any brief comments on GPS data collection at plot.	dbText	255
GPS_QUALITY	Indicates the quality of the GPS unit used (recreational, mapping grade)	dbText	35
PDOP	Positional Dilution Of Precision reading (from Garmin screen)	dbText	30
ERROR_RANGE	General error range, in meters, of the type of GPS unit used.	dbText	20

Table Name: TBL_LOCATION_INFO
Description: Contains data about the location of the point and general observations about the area for the veg points feature class.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
PLOT_CODE	Unique Plot code, used for relating tables and feature class (fcl_Veg_Points)	dbText	20
VISIT_DATE	Date the location was visited	dbText	10
SITE_NAME	General Site name given by field crew	dbText	180
PLOT_SHAPE	The shape of the area observed as a point	dbText	20
PLOT_WIDTH	The width of the point (plot and obs only)	dbText	3
PLOT_LENGTH	The length of the point (plot and obs only)	dbText	3
PLOT_DIAMETER	The diameter of the point (plot and obs only)	dbText	5
PLOT_AZIMUTH	The azimuth of the point (plot and obs only)	dbText	5
ASPECT	Aspect of plot	dbText	10
ELEVATION	Elevation of plot in meters, generated by GPS unit	dbDouble	8
SLOPE	Slope of plot measured in degrees	dbText	15
TOPO_POSITION	Topographic position of plot	dbText	50
DIRECTIONS_PLOT	Directions to the location of the plot (plot and obs only)	dbText	255
REPRESENTATIVENESS	The representativeness of the vegetation (at plots and obs only)	dbText	255
OBSERVER	The names of the field crew member(s) observing the site.	dbText	50
IN_PARK	Indicates if the point was inside or outside the park boundary (only applicable to Plots and Observation points, all AA pts inside park. “1” = In Park, “0” = Not in park)	dbBoolean	1
UNIT_CODE	4 letter park code (CURE)	dbText	10
AERIAL_PHOTO_NO	9X9 photo name on which the point most directly falls (2002 flight, plots & obs only)	dbText	30
STATE_CODE	State (CO)	dbText	2
USGS_NAME	USGS 1:24k Topo Name	dbText	75
COUNTY_NAME	County where plot is located (Montrose or Gunnison County)	dbText	80
PHENOLOGY	Leaf phenology of the dominant stratum. Field is blank for non-vascular plots	dbText	50
PHYSIOGNOMIC_NAME	Physiognomic class of plot	dbText	80
LEAF_TYPE	Leaf form of the dominant stratum.	dbText	80
LEAF_TYPE_COMMENTS	If Leaf Type is "mixed," this field describes the multiple leaf types found in the dominant stratum.	dbText	250
PROVISIONAL_COMM_NAME	Community name (provisional) assigned by field crews by following naming protocols as described in field manual and training (plot and obs only).	dbText	220
ALLIANCE	Alliance corresponding to provisional community name (plots and obs only)	dbText	150
PLANT_SPECIES_COMMENTS	Comments about the plant species observed.	dbText	200
COWARDIN_SYSTEM	If the plot is in a wetland system, select term that best describes its hydrology (Upland,	dbText	40

Field Name	Field Description	Field Type	Field Width
	Palustrine, Riverine, Lacustrine). plot and obs only		
HYDROLOGY	Describes hydrology of plot (plot and obs only)	dbText	40
GEOLOGY	Geologic substrate influencing the plant community (plot and obs only); Surficial geology (AA points)	dbText	60
ENV_COMMENTS	Comments on environmental setting and its effect on the vegetation; also comments on any disturbance or reproduction factors	dbText	255
LANDSCAPE_COMMENTS	Description of landscape context of plot, including any important landscape features influencing the community (plot and obs only)	dbText	255
ANIMAL_USE_COMMENTS	Comments on evidence of use by non-domestic animals in plot area (plot and obs only)	dbText	255
DISTURBANCE_COMMENTS	Comments on evidence of natural or anthropogenic disturbance in plot area, severity and effects on vegetation (plot and obs only)	dbText	255
OTHER_COMMENTS	Other general comments (plot and obs only)	dbText	255
SOIL_TEXTURE	Assessment of average soil texture from sample taken a few inches below the surface (plot and obs only)	dbText	50
SOIL_DRAINAGE	Soil drainage class based on actual moisture content and extent period (plot and obs only)	dbText	30
SOIL_TAXON_DESC	Field used for either identifying soils keyed, or to describe if large rocks or outcrops are present on the surface (plot and obs only)	dbText	255

Table Name: TBL_MAPUNIT_ASSOC
Description: Contains association data for the vegetation polygons by map unit ID.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
MapUnitID	The map unit identifier, used by the mappers (aka: grid_code or map class code)	dbText	20
CEGL_Code	NVC association code	dbText	18
AssociationName	The NVC Association name (scientific)	dbText	250
AssociationCommonName	The NVC Association Common name	dbText	250

Table Name: TBL_MAPUNIT_ECOSYS
Description: Contains ecological system data for the vegetation polygons by map unit ID.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
MAP_UNIT_ID	The map unit identifier, used by the mappers (aka: grid_code or map class code)	dbText	10
ES_Code	Ecological System code	dbText	30
EcologicalSystemName	Ecological system name (mid-scale classification, larger than associations or alliances, smaller than ecoregions).	dbText	255

Table Name: TBL_PHOTOS
Description: Details on individual photos taken of a point.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
PLOT_CODE	Unique Plot code, used for relating tables (TBL_LOCATION_INFO)	dbText	50
PhotoType	Type of photo being referenced.	dbText	16
Photographer	Name of photographer.	dbText	50
PhotoComments	Brief description of photo.	dbText	255
IMAGE_ID	NCPN Photo Database (unique) file name.	dbText	50
PHOTO_PATH	Hard-coded path name to photos (update this field)	dbText	200

Table Name: TBL_STRATUM_SPECIES
Description: Contains species level data by stratum.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
TSN	Taxonomic Serial Number - unique taxon identifier assigned by ITIS	dbDouble	8
SPECIES	Latin names of species	dbText	255
PERCENT_COVER	Applicable to AA data only, percent cover by species	dbText	4
COVER_CODE	Cover class code to describe species and strata	dbText	5
COVER_CLASS	Cover class to describe species and strata	dbText	50
DIAGNOSTIC	Check yes if the species is known to be diagnostic of the vegetation type.	dbInteger	2
SPECIMEN_COLLECTED	"yes" (-1) if a specimen of the species was collected.	dbInteger	2
SPECIMEN_NO	The collector's reference number for the specimen collected.	dbText	10
DEAD	Percent cover of dead species seen at plot. Not completed of every species, but always done if diagnostic species.	dbInteger	2
STRATUM_ID	Unique ID, relates to TBL_VEG_STRATA	dbLong	4

Table Name: TBL_VEG_STRATA
Description: Contains stratum data for the veg points feature class.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
STRATUM_ID	Links to strata	dbLong	4
STRATUM	Stratum name/type	dbText	20
STRATUM_COVER_CODE	stratum cover code	dbText	5
STRATUM_COVER_CLASS	stratum percentage cover class	dbText	50
STRATUM_HEIGHT_CODE	stratum height code	dbText	5
STRATUM_HEIGHT_CLASS	stratum height class in meters	dbText	50
PLOT_CODE	Unique Plot code, used for relating tables (TBL_STRATUM_SPECIES)	dbText	15

Table Name: TBL_VEGASSOC_INFO
Description: Contains association data for all points (plots, obs, and AA points) in the veg points feature class.

Field Name	Field Description	Field Type	Field Width

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
PLOT_CODE	Unique Plot code, used for relating tables	dbText	35
CEGL_CODE	CEGL (association) code	dbText	10
ASSOCIATION	Association corresponding to provisional community name	dbText	180
FIELD_KEY_NAME	Yes if association name was chosen from field key	dbText	10
CREATED_NAME	Yes if no name really fits from the field key, the surveyor will create a new name.	dbText	10
POST_AA_FIELD_NAME	Yes if association name was assigned after AA field work, based on species lists and comments fields -- during AA meetings.	dbText	10
ASSOC_RANK	Rank of vegetation association (primary, secondary, tertiary)	dbText	50
OTHER_ASSOC_50M	Other associations noted in a 50 meter area beyond plot	dbText	200

Table Name: TBL_VEGMAP_INFO
Description: Contains map unit level data for each vegetation map unit polygon.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
Polygon_ID	Unique polygon code, used for relating tables and feature classes (fcl_Veg_polys)	dbText	30
Map_Unit_ID	The map unit identifier, used by the mappers (aka: grid_code or map class code)	dbText	10
Map_Unit_Code	NCPN code (e.g., C-MIXS)	dbText	10
Map_Unit_Common_Name	The name of the map unit (or map class)	dbText	250
Cover_Code	n/a for CURE	dbText	1
COVER_PATTERN	n/a for CURE	dbText	100
Density_Code	Density value code	dbText	1
DENSITY_CLASS	Density of Forest/Woodland vegetation, and density for sagebrush communities per polygon.	dbText	100
Height_Code	n/a for CURE	dbText	1
HEIGHT_CLASS	n/a for CURE	dbText	100
USER_ACCURACY	User accuracy of the map unit (determined during AA meetings). N/A means the class was not accuracy assessed.	dbText	3
FUELS_TYPE	Fuels vegetation types (if applicable)	dbText	50
FUELS_VERIFICATION	Fuels verification (if applicable)	dbText	255
VEGMAP_COMMENTS	Any comments about the particular polygon or map class.	dbText	255
MAP_UNIT_PDF	File name of pdf describing map unit (class)	dbText	50
MAP_UNIT_PDF_PATH	Hard-coded link to Map Unit description PDF document - path name (e.g. C:/CURE/Vegetation/MapClassDescriptions/C-MIXS_mu40.pdf)	dbText	250

Table Name: TBL_VEGMAP_MODIFIERS
Description: Contains modifiers for the vegetation map unit polygons.

Field Name	Field Description	Field Type	Field Width
OBJECTID	ESRI generated autonumber	dbLong	4
Polygon_ID	Unique polygon code, used for relating tables (TBL_VEGMAP_INFO)	dbText	20
MODIFIER	Modifier code (one lower case letter)	dbText	12
MODIFIER_NAME	Name/type of modifier	dbText	50
MODIFIER_DESCRIPTION	Description of modifier	dbText	255

Appendix D. Plant Species List and Crosswalk

Five hundred thirty-eight vascular plant species representing 69 families were noted during plot, observation point and accuracy assessment point data collection at Curecanti National Recreation Area (CURE). The Northern Colorado Plateau Network uses three taxonomic authorities for vascular plants: Welsh et al. 2003 as the nomenclatural authority for Utah parks, Weber and Wittmann 2001 for Colorado parks, and Dorn and Lichvar 1984 for the single park in Wyoming; the BLCA vegetation mapping project database reflects scientific names as assigned by Welsh. These names are crosswalked to Kartesz 1999, which is the nomenclatural authority used by NatureServe for the National Vegetation Classification. Scientific and common names used by NatureServe are presented in this crosswalk; these names are used throughout the CURE vegetation mapping report and in the individual association descriptions in Appendix F. The taxonomic serial number (TSN) assigned by the Integrated Taxonomic Information System (ITIS) is provided for each species. The list is sorted by Kartez (1999) scientific name within family.

VASCULAR PLANTS

Family	Scientific Name (Welsh et al. 2003)	Scientific Name (Kartesz 1999)	Common Name (NatureServe)	TSN
Aceraceae	Acer glabrum Torr.	Acer glabrum	Rocky Mountain maple	28742
	Acer negundo L.	Acer negundo	box elder	28749
Agavaceae	Yucca angustissima Engelm. ex Trel.	Yucca angustissima	narrowleaf yucca	43131
	Yucca harrimaniae Trel.	Yucca harrimaniae	Spanish bayonet	43144
	Yucca L.	Yucca sp.	yucca	43116
Alismataceae	Sagittaria cuneata Sheldon	Sagittaria cuneata	arum-leaf arrowhead	38917
Anacardiaceae	Rhus aromatica var. trilobata (Nutt.) Gray ex. S. Wats.	Rhus trilobata	threeleaf sumac	539586
	Toxicodendron rydbergii (Small ex Rydb.) Greene	Toxicodendron rydbergii	western poison ivy	28822
Apiaceae	Angelica ampla A. Nels.	Angelica ampla	giant angelica	29433
	Angelica L.	Angelica sp.	angelica	29431
	Cicuta douglasii (DC.) Coult. & Rose	Cicuta douglasii	western water hemlock	29457
	Cymopterus multinervatus (Coult. & Rose) Tidestrom	Cymopterus multinervatus	purplenerve springparsley	29648
	Cymopterus planosus (Osterhout) Mathias	Cymopterus planosus	Rocky Mountain springparsley	29652
	Heracleum lanatum Michx.	Heracleum maximum	cow parsnip	29670
	Ligusticum porteri Coult. & Rose	Ligusticum porteri	Porter's licoriceroot	29532
	Lomatium dissectum (Nutt.) Mathias & Constance	Lomatium dissectum	fernleaf biscuitroot	503534
	Osmorhiza berteroi DC.	Osmorhiza berteroi	sweet cicely	507093
	Osmorhiza depauperata Phil.	Osmorhiza depauperata	bluntseed sweetroot	29790
	Osmorhiza occidentalis (Nutt. ex Torr. & Gray) Torr.	Osmorhiza occidentalis	western sweetroot	29792
	Osmorhiza Raf.	Osmorhiza sp.	sweetroot	29784
	Oryzopsis micrantha (Trin. & Rupr.) Thurb.	Piptatherum micranthum	littleseed ricegrass	41989
	Pseudocymopterus montanus (Gray) Coult. & Rose	Pseudocymopterus montanus	alpine false springparsley	29837
	Sium suave Walt.	Sium suave	hemlock waterparsnip	29558
Apocynaceae	Apocynum cannabinum L.	Apocynum cannabinum	Indianhemp	30157
Asclepiadaceae	Asclepias hallii Gray	Asclepias hallii	Hall's milkweed	30270
	Asclepias involucrata Engelm. ex Torr.	Asclepias involucrata	dwarf milkweed	30275
Asteraceae	Achillea millefolium L.	Achillea millefolium	common yarrow	35423
	Agoseris heterophylla (Nutt.) Greene	Agoseris heterophylla	annual agoseris	36492

Family	Scientific Name (Welsh et al. 2003)	Scientific Name (Kartesz 1999)	Common Name (NatureServe)	TSN
Asteraceae	Agoseris Raf.	Agoseris sp.	agoseris	36485
	Aster pauciflorus Nutt.	Almutaster pauciflorus	alkali marsh aster	507576
	Ambrosia trifida L.	Ambrosia trifida	great ragweed	36521
	Antennaria dimorpha (Nutt.) Torr. & Gray	Antennaria dimorpha	low pussytoes	36727
	Antennaria parvifolia Nutt.	Antennaria parvifolia	small-leaf pussytoes	36749
	Antennaria rosea Greene	Antennaria rosea	rosy pussytoes	36754
	Antennaria Gaertn.	Antennaria sp.	pussytoes	36716
	Argentina anserina (L.) Rydb.	Argentina anserina	silverweed cinquefoil	184598
	Arnica cordifolia Hook.	Arnica cordifolia	heartleaf arnica	36561
	Artemisia absinthium L.	Artemisia absinthium	absinthe	35445
	Artemisia campestris L.	Artemisia campestris	field sagewort	183748
	Artemisia campestris ssp. borealis (Pallas) Hall & Clements	Artemisia campestris ssp. borealis	northern sagewort	523668
	Artemisia dracunculus L.	Artemisia dracunculus	wild tarragon	35462
	Artemisia frigida Willd.	Artemisia frigida	fringed sagebrush	35465
	Artemisia ludoviciana Nutt.	Artemisia ludoviciana	white sagebrush	35474
	Artemisia michauxiana Bess.	Artemisia michauxiana	Michaux's wormwood	35479
	Artemisia nova A. Nels.	Artemisia nova	black sagebrush	500971
	Artemisia L.	Artemisia sp.	sagebrush	35431
	Artemisia tridentata Nutt.	Artemisia tridentata	sagebush	35498
	Artemisia tridentata ssp. tridentata Nutt.	Artemisia tridentata ssp. tridentata	basin big sagebrush	35499
	Artemisia tridentata ssp. vaseyana (Rydb.) Beetle	Artemisia tridentata ssp. vaseyana	mountain big sagebrush	183740
	Artemisia tridentata ssp. wyomingensis Beetle & Young	Artemisia tridentata ssp. wyomingensis	Wyoming big sagebrush	183741
	Aster L.	Aster sp.	aster	35510
	Balsamorhiza sagittata (Pursh) Nutt.	Balsamorhiza sagittata	arrowleaf balsamroot	36818
	Brickellia grandiflora (Hook.) Nutt.	Brickellia grandiflora	tasselflower brickellbush	36878
	Brickellia microphylla (Nutt.) Gray	Brickellia microphylla	littleleaf brickellbush	36886
	Carduus nutans L.	Carduus nutans	nodding plumeless thistle	35787
	Chaenactis douglasii (Hook.) Hook. & Arn.	Chaenactis douglasii	Douglas' dustymaiden	36987
	Chaetopappa ericoides (Torr.) Nesom	Chaetopappa ericoides	rose heath	501376

Family	Scientific Name (Welsh et al. 2003)	Scientific Name (Kartesz 1999)	Common Name (NatureServe)	TSN
Asteraceae	Chrysothamnus depressus Nutt.	Chrysothamnus depressus	longflower rabbitbrush	37051
	Chrysothamnus parryi (Gray) Greene	Chrysothamnus parryi	Parry's rabbitbrush	37071
	Chrysothamnus vaseyi (Gray) Greene	Chrysothamnus vaseyi	Vasey's rabbittbrush	37089
	Chrysothamnus viscidiflorus (Hook.) Nutt.	Chrysothamnus viscidiflorus	sticky rabbitbrush	37090
	Cirsium araneans Rydb.	Cirsium araneans	jeweled thistle	501530
	Cirsium arvense (L.) Scop.	Cirsium arvense	Canada thistle	36335
	Cirsium calcareum (M.E. Jones) Woot. & Standl.	Cirsium calcareum	Cainville thistle	36346
	Cirsium eatonii (Gray) B.L. Robins.	Cirsium eatonii	Eaton's thistle	36365
	Cirsium perplexans (Rydb.) Petrak	Cirsium perplexans	Rocky Mountain thistle	36399
	Cirsium P. Mill.	Cirsium sp.	thistle	36334
	Cirsium undulatum var. tracyi (Rydb.) Welsh	Cirsium undulatum var. tracyi	Tracy's thistle	36420
	Conyza canadensis (L.) Cronq.	Conyza canadensis	Canadian horseweed	37113
	Crepis acuminata Nutt.	Crepis acuminata	tapertip hawksbeard	37169
	Crepis L.	Crepis sp.	hawksbeard	37168
	Chrysothamnus nauseosus (Pallas ex Pursh) Britt.	Ericameria nauseosa	rubber rabbitbrush	37055
	Erigeron concinnus (Hook. & Arn.) Torr. & Gray	Erigeron concinnus	Navajo fleabane	502385
	Erigeron divergens Torr. & Gray	Erigeron divergens	spreading fleabane	35852
	Erigeron engelmannii A. Nels.	Erigeron engelmannii	Engelmann's fleabane	35859
	Erigeron flagellaris Gray	Erigeron flagellaris	trailing fleabane	35865
	Erigeron pumilus Nutt.	Erigeron pumilus	shaggy fleabane	35934
	Erigeron L.	Erigeron sp.	fleabane	35803
	Erigeron speciosus (Lindl.) DC.	Erigeron speciosus	aspen fleabane	35950
	Erigeron subtrinervis Rydb. ex Porter & Britt.	Erigeron subtrinervis	threenerve fleabane	35953
	Erigeron vetensis Rydb.	Erigeron vetensis	early bluetop fleabane	35970
	Aster glaucodes var. glaucodes Blake	Eurybia glauca	gray aster	193138
	Gnaphalium palustre Nutt.	Gnaphalium palustre	western marsh cudweed	36709
	Gnaphalium uliginosum L.	Gnaphalium uliginosum	marsh cudweed	502816
	Grindelia arizonica Gray	Grindelia arizonica	Arizona gumweed	37442
	Grindelia squarrosa (Pursh) Dunal	Grindelia squarrosa	curlycup gumweed	37472
	Gutierrezia sarothrae (Pursh) Britt. & Rusby	Gutierrezia sarothrae	broom snakeweed	37483

Family	Scientific Name (Welsh et al. 2003)	Scientific Name (Kartesz 1999)	Common Name (NatureServe)	TSN
Asteraceae	Gutierrezia Lag.	Gutierrezia sp.	snakeweed	37478
	Hackelia floribunda (Lehm.) I.M. Johnston	Hackelia floribunda	manyflower stickseed	31927
	Helianthella uniflora (Nutt.) Torr. & Gray	Helianthella uniflora	oneflower helianthella	37598
	Helianthus nuttallii Torr. & Gray	Helianthus nuttallii	Nuttall's sunflower	36662
	Heliomeris multiflora Nutt.	Heliomeris multiflora	showy goldeneye	37603
	Heterotheca subaxillaris (Lam.) Britt. & Rusby	Heterotheca subaxillaris	camphorweed	37686
	Chrysopsis villosa (Pursh) Nutt. ex DC.	Heterotheca villosa	hairy false goldenaster	510984
	Hymenopappus filifolius Hook.	Hymenopappus filifolius	fineleaf hymenopappus	37766
	Lactuca serriola L.	Lactuca serriola	prickly lettuce	36608
	Chrysanthemum leucanthemum L.	Leucanthemum vulgare	oxeye daisy	510896
	Lygodesmia juncea (Pursh) D. Don ex Hook.	Lygodesmia juncea	rush skeletonplant	503623
	Machaeranthera canescens (Pursh) Gray	Machaeranthera canescens	hoary tansyaster	37984
	Haplopappus gracilis (Nutt.) Gray	Machaeranthera gracilis	slender goldenweed	514427
	Machaeranthera grindelioides (Nutt.) Shinners	Machaeranthera grindelioides	rayless tansyaster	37992
	Machaeranthera Nees	Machaeranthera sp.	tansyaster	37970
	Senecio tridenticulatus Rydb.	Packera tridenticulata	threetooth ragwort	999002
	Petradoria pumila (Nutt.) Greene	Petradoria pumila	grassy rockgoldenrod	38233
	Rudbeckia hirta L.	Rudbeckia hirta	blackeyed Susan	36765
	Rudbeckia ampla A. Nels.	Rudbeckia laciniata var. ampla	cutleaf coneflower	520571
	Rudbeckia L.	Rudbeckia sp.	coneflower	36764
	Senecio integerrimus Nutt.	Senecio integerrimus	lambstongue groundsel	36148
	Senecio pudicus Greene	Senecio pudicus	bashful ragwort	36172
	Senecio serra Hook.	Senecio serra	tall ragwort	36182
	Senecio L.	Senecio sp.	groundsel	36084
	Solidago canadensis L.	Solidago canadensis	Canada goldenrod	36224
	Solidago multiradiata Ait.	Solidago multiradiata	Rocky Mountain goldenrod	36279
	Solidago nana Nutt.	Solidago nana	baby goldenrod	36280
	Solidago nemoralis Ait.	Solidago nemoralis	gray goldenrod	36281
	Solidago simplex Kunth	Solidago simplex	Mt. Albert goldenrod	505288
	Solidago L.	Solidago sp.	goldenrod	36223

Family	Scientific Name (Welsh et al. 2003)	Scientific Name (Kartesz 1999)	Common Name (NatureServe)	TSN
Asteraceae	Solidago velutina DC.	Solidago velutina	threenerve goldenrod	505290
	Haplopappus acaulis (Nutt.) Gray	Stenotus acaulis	stemless mock goldenweed	37499
	Haplopappus armerioides (Nutt.) Gray	Stenotus armerioides	thrift mock goldenweed	37506
	Stephanomeria minor (Hook.) Nutt. var. minor	Stephanomeria minor	narrowleaf wirelettuce	566323
	Aster ascendens Lindl.	Symphyotrichum ascendens	western aster	522184
	Aster campestris Nutt.	Symphyotrichum campestre	western meadow aster	522188
	Aster foliaceus DC.	Symphyotrichum foliaceum	alpine leafybract aster	522208
	Aster lanceolatus Willd.	Symphyotrichum lanceolatum	white panicle aster	522219
	Tanacetum vulgare L.	Tanacetum vulgare	common tansy	36328
	Taraxacum officinale G.H. Weber ex Wiggers	Taraxacum officinale	dandelion	36213
	Taraxacum G.H. Weber ex Wiggers	Taraxacum sp.	dandelion	36199
	Tetradymia canescens DC.	Tetradymia canescens	gray horsebrush	38494
	Tetradymia nuttallii Torr. & Gray	Tetradymia nuttallii	Nuttall's horsebrush	38498
	Tetradymia DC.	Tetradymia sp.	horsebrush	38491
	Hymenoxys acaulis (Pursh) Parker	Tetraneuris acaulis var. acaulis	stemless four-nerve daisy	514991
	Hymenoxys torreyana (Nutt.) Parker	Tetraneuris torreyana	Torrey's four-nerve daisy	515002
	Townsendia strigosa Nutt.	Townsendia strigosa	hairy Townsend daisy	38559
	Tragopogon dubius Scop.	Tragopogon dubius	yellow salsify	38564
	Matricaria perforata Mérat	Tripleurospermum perforatum	scentless mayweed	38078
	Verbesina encelioides (Cav.) Benth. & Hook. f. ex Gray	Verbesina encelioides	golden crownbeard	38601
	Wyethia amplexicaulis (Nutt.) Nutt.	Wyethia amplexicaulis	mulesear wyethia	38674
Berberidaceae	Berberis fendleri Gray	Berberis fendleri	Colorado barberry	18820
	Mahonia repens (Lindl.) G. Don	Mahonia repens	Oregon grape	195045
Betulaceae	Alnus incana (L.) Moench	Alnus incana	speckled alder	181887
	Alnus incana (L.) Moench ssp. tenuifolia (Nutt.) Breitung	Alnus incana ssp. tenuifolia	thinleaf alder	999003
	Betula occidentalis Hook.	Betula occidentalis	water birch	19488
Boraginaceae	Cryptantha flavoculata (A. Nels.) Payson	Cryptantha flavoculata	roughseed cryptantha	31809
	Cryptantha Lehm. ex G. Don	Cryptantha sp.	cryptantha	31765
	Lappula occidentalis (S. Wats.) Greene	Lappula occidentalis	beggar's tick	528678
	Lithospermum L.	Lithospermum sp.	stoneseed	31937

Family	Scientific Name (Welsh et al. 2003)	Scientific Name (Kartesz 1999)	Common Name (NatureServe)	TSN
	Lithospermum ruderale Dougl. ex Lehm.	Lithospermum ruderale	western stoneseed	31953
	Mertensia brevistyla S. Wats.	Mertensia brevistyla	shortstyle bluebells	31676
	Mertensia Roth	Mertensia sp.	bluebells	31660
	Cryptantha cinerea var. jamesii Cronq.	Cryptantha cinerea var. jamesii	James' cryptantha	527550
	Cryptantha fendleri (Gray) Greene	Cryptantha fendleri	sanddune catseye	31807
	Cryptantha sericea (Gray) Payson	Cryptantha sericea	silky cryptantha	31869
	Cynoglossum officinale L.	Cynoglossum officinale	houndstongue	31890
	Lithospermum incisum Lehm.	Lithospermum incisum	narrowleaf stoneseed	31940
	Mertensia ciliata (James ex Torr.) G. Don	Mertensia ciliata	mountain bluebells	31668
	Alyssum L.	Alyssum sp.	alyssum	23029
Brassicaceae	Arabis crandallii B.L. Robins.	Arabis crandallii	Crandall's rockcress	22682
	Arabis drummondii Gray	Arabis drummondii	Drummond's rockcress	22689
	Arabis fendleri (S. Wats.) Greene	Arabis fendleri	Fendler's rockcress	22690
	Arabis glabra (L.) Bernh.	Arabis glabra	tower rockcress	22695
	Arabis gunnisoniana Rollins	Arabis gunnisoniana	Gunnison's rockcress	22698
	Arabis holboellii var. retrofracta (Graham) Rydb.	Arabis holboellii var. retrofracta	second rockcress	184362
	Arabis lignifera A. Nels.	Arabis lignifera	desert rockcress	22708
	Arabis oxylobula Greene	Arabis oxylobula	Glenwood Springs rockcress	22716
	Arabis pallidifolia Rollins	Arabis pallidifolia	Gunnison County rockcress	507688
	Arabis perennans S. Wats.	Arabis perennans	perennial rockcress	22720
	Arabis selbyi Rydb.	Arabis selbyi	Selby's rockcress	22731
	Arabis L.	Arabis sp.	rockcress	22671
	Arabis x divaricarpa A. Nels. (pro sp.)	Arabis x divaricarpa	spreadingpod rockcress	22688
	Barbarea orthoceras Ledeb.	Barbarea orthoceras	American yellowrocket	22740
	Capsella bursa-pastoris (L.) Medik.	Capsella bursa-pastoris	shepherd's purse	22766
	Cardaria chalapensis (L.) Hand.-Maz.	Cardaria chalapensis	lenspod whitetop	23071
	Cardaria pubescens (C.A. Mey.) Jarmolenko	Cardaria pubescens	hairy whitetop	23073
	Descurainia californica (Gray) O.E. Schulz	Descurainia californica	Sierra tansymustard	22821
	Descurainia incana ssp. incisa (Engelm.) Kartesz & Gandhi	Descurainia incana ssp. incisa	mountain tansymustard	523967

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Brassicaceae	Descurainia pinnata (Walt.) Britt.	Descurainia pinnata	western tansymustard	22826
	Descurainia pinnata ssp. filipes (Gray) Detling	Descurainia pinnata ssp. filipes	western tansymustard	22829
	Descurainia pinnata ssp. nelsonii (Rydb.) Detling	Descurainia pinnata ssp. nelsonii	Nelson's tansymustard	22834
	Descurainia sophia (L.) Webb ex Prantl	Descurainia sophia	herb sophia	22843
	Descurainia Webb & Berth.	Descurainia sp.	tansymustard	22819
	Erysimum inconspicuum (S. Wats.) MacM.	Erysimum inconspicuum	shy wallflower	502432
	Lepidium campestre (L.) Ait. f.	Lepidium campestre	field pepperweed	22954
	Lepidium densiflorum Schrad.	Lepidium densiflorum	common pepperweed	22960
	Lepidium L.	Lepidium sp.	pepperweed	22953
	Physaria acutifolia Rydb.	Physaria acutifolia	sharpleaf twinpod	23270
	Physaria rollinsii Mulligan	Physaria rollinsii	Rollins' twinpod	23284
	Physaria (Nutt. ex Torr. & Gray) Gray	Physaria sp.	twinpod	23269
	Rorippa palustris ssp. hispida (Desv.) Jonsell	Rorippa palustris ssp. hispida	hispid yellowcress	23009
	Schoenocrambe linearifolia (Gray) Rollins	Schoenocrambe linearifolia	slimleaf plainsmustard	195791
	Schoenocrambe linifolia (Nutt.) Greene	Schoenocrambe linifolia	flaxleaf plainsmustard	23296
	Schoenocrambe Greene	Schoenocrambe sp.	plains mustard	23295
	Sisymbrium altissimum L.	Sisymbrium altissimum	tumblemustard	23312
	Sisymbrium L.	Sisymbrium sp.	hedgemustard	23311
	Thlaspi arvense L.	Thlaspi arvense	field pennycress	23422
Cactaceae	Echinocereus triglochidiatus Engelm.	Echinocereus triglochidiatus	kingcup cactus	19815
	Opuntia fragilis (Nutt.) Haw.	Opuntia fragilis	brittle pricklypear	19707
	Opuntia polyacantha Haw.	Opuntia polyacantha	plains pricklypear	19726
	Opuntia P. Mill.	Opuntia sp.	pricklypear	19686
	Pediocactus simpsonii (Engelm.) Britt. & Rose	Pediocactus simpsonii	Simpson's hedgehog cactus	19776
Campanulaceae	Campanula parryi Gray	Campanula parryi	Parry's bellflower	34489
	Campanula rotundifolia L.	Campanula rotundifolia	roundleaf harebell	34497
Cannabaceae	Humulus lupulus L.	Humulus lupulus	common hops	19160
Caprifoliaceae	Linnaea borealis L.	Linnaea borealis	twinflower	35314
	Lonicera involucrata Banks ex Spreng.	Lonicera involucrata	twinberry honeysuckle	35297
	Sambucus racemosa L.	Sambucus racemosa	red elderberry	35326

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Caprifoliaceae	Sambucus racemosa var. microbotrys (Rydb.) Kearney & Peebles	Sambucus racemosa	red elderberry	540293
	Symphoricarpos oreophilus Gray	Symphoricarpos oreophilus	mountain snowberry	35338
	Symphoricarpos rotundifolius Gray	Symphoricarpos oreophilus	roundleaf snowberry	35341
Caryophyllaceae	Arenaria congesta Nutt.	Arenaria congesta	ballhead sandwort	20243
	Cerastium arvense L.	Cerastium arvense	field chickweed	19947
	Paronychia sessiliflora Nutt.	Paronychia sessiliflora	stemless nailwort	20346
	Phlox austromontana Coville	Phlox austromontana	mountain phlox	30913
	Phlox condensata (Gray) E. Nels.	Phlox condensata	dwarf phlox	504314
	Phlox hoodii Richards.	Phlox hoodii	spiny phlox	30948
	Phlox longifolia Nutt.	Phlox longifolia	longleaf phlox	30956
	Phlox multiflora A. Nels.	Phlox multiflora	flowery phlox	30964
	Phlox pulvinata (Wherry) Cronq.	Phlox pulvinata	cushion phlox	30980
	Phlox L.	Phlox sp.	phlox	30897
	Pseudostellaria jamesiana (Torr.) W.A. Weber & R.L. Hartman	Pseudostellaria jamesiana	tuber starwort	20358
	Silene L.	Silene sp.	catchfly	20040
	Stellaria longifolia Muhl. ex Willd.	Stellaria longifolia	longleaf starwort	20185
Celastraceae	Paxistima myrsinites (Pursh) Raf.	Paxistima myrsinites	mountain lover	504149
Chenopodiaceae	Atriplex canescens (Pursh) Nutt.	Atriplex canescens	fourwing saltbush	20518
	Axyris amaranthoides L.	Axyris amaranthoides	Russian pigweed	20683
	Kochia scoparia (L.) Schrad.	Bassia scoparia	burningbush	565741
	Chenopodium L.	Chenopodium	goosefoot	20589
	Chenopodium album L.	Chenopodium album	lambsquarters	20592
	Chenopodium atrovirens Rydb.	Chenopodium atrovirens	pinyon goosefoot	20593
	Chenopodium fremontii S. Wats.	Chenopodium fremontii	Fremont's goosefoot	20607
	Chenopodium glaucum L.	Chenopodium glaucum	oakleaf goosefoot	20610
	Chenopodium leptophyllum (Moq.) Nutt. ex S. Wats.	Chenopodium leptophyllum	narrowleaved goosefoot	20616
	Krascheninnikovia lanata (Pursh) A.D.J. Meeuse & Smit	Krascheninnikovia lanata	winterfat	503290
	Salsola tragus L.	Salsola tragus	prickly Russian thistle	520950
	Sarcobatus vermiculatus (Hook.) Torr.	Sarcobatus vermiculatus	black greasewood	20707

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Cornaceae	Cornus sericea L.	Cornus sericea	redosier dogwood	501637
Crassulaceae	Sedum lanceolatum Torr.	Sedum lanceolatum	lanceleaf stonecrop	24126
Cupressaceae	Juniperus communis L.	Juniperus communis	common juniper	194820
	Juniperus osteosperma (Torr.) Little	Juniperus osteosperma	Utah juniper	194859
	Juniperus scopulorum Sarg.	Juniperus scopulorum	Rocky Mountain juniper	194872
Cyperaceae	Carex aquatilis Wahlenb.	Carex aquatilis	water sedge	39374
	Carex athrostachya Olney	Carex athrostachya	slenderbeak sedge	501205
	Carex bebbii Olney ex Fern.	Carex bebbii	Bebb's sedge	39520
	Carex duriuscula C.A. Mey.	Carex duriuscula	needleleaf sedge	501216
	Carex egglestonii Mackenzie	Carex egglestonii	Eggleston's sedge	39585
	Carex geophila Mackenzie	Carex geophila	White Mountain sedge	39612
	Carex geyeri Boott	Carex geyeri	elk sedge	39613
	Carex microptera Mackenzie	Carex microptera	smallwing sedge	39699
	Carex lanuginosa auct. non Michx.	Carex pellita	woolly sedge	507767
	Carex L.	Carex sp.	sedge	39369
	Carex utriculata Boott	Carex utriculata	Northwest Territory sedge	501288
	Carex vallicola Dewey	Carex vallicola	valley sedge	39860
	Eleocharis acicularis (L.) Roemer & J.A. Schultes	Eleocharis acicularis	needle spikerush	40025
	Eleocharis palustris (L.) Roemer & J.A. Schultes	Eleocharis palustris	common spikerush	40019
	Scirpus acutus Muhl. ex Big.	Schoenoplectus acutus var. acutus	hardstem bulrush	531332
	Scirpus microcarpus J.& K. Presl	Scirpus microcarpus	panicled bulrush	40235
Dennstaedtiaceae	Pteridium Gleditsch ex Scop.	Pteridium sp.	brackenfern	17223
Dryopteridaceae	Athyrium filix-femina (L.) Roth	Athyrium filix-femina	common ladyfern	17413
Elaeagnaceae	Shepherdia argentea (Pursh) Nutt.	Shepherdia argentea	silver buffaloberry	27778
	Shepherdia canadensis (L.) Nutt.	Shepherdia canadensis	russet buffaloberry	27779
Equisetaceae	Equisetum arvense L.	Equisetum arvense	field horsetail	17152
	Equisetum hyemale L.	Equisetum hyemale	scouringrush horsetail	17154
	Equisetum laevigatum A. Braun	Equisetum laevigatum	smooth horsetail	17156
Ericaceae	Arctostaphylos uva-ursi (L.) Spreng.	Arctostaphylos uva-ursi	kinnikinnick	23530
Fabaceae	Astragalus anisus M.E. Jones	Astragalus anisus	Gunnison milkvetch	25417

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Fabaceae	Astragalus convallarius Greene	Astragalus convallarius	timber milkvetch	25477
	Astragalus drummondii Dougl. ex Hook.	Astragalus drummondii	Drummond's milkvetch	25500
	Astragalus oophorus S. Wats.	Astragalus oophorus	egg milkvetch	25616
	Astragalus L.	Astragalus sp.	milkvetch	25392
	Astragalus tenellus Pursh	Astragalus tenellus	looseflower milkvetch	25696
	Lathyrus lanszwertii var. leucanthus (Rydb.) Dorn	Lathyrus lanszwertii var. leucanthus	aspen peavine	528691
	Lathyrus L.	Lathyrus sp.	peavine	25834
	Lotus wrightii (Gray) Greene	Lotus wrightii	Wright's deervetch	26411
	Lupinus argenteus Pursh	Lupinus argenteus	silvery lupine	503575
	Lupinus bakeri Greene	Lupinus bakeri	Baker's lupine	25961
	Lupinus caudatus Kellogg	Lupinus caudatus	tailcup lupine	25981
	Lupinus prunophilus M.E. Jones	Lupinus prunophilus	hairy bigleaf lupine	26097
	Lupinus sericeus Pursh	Lupinus sericeus	silky lupine	26112
	Lupinus L.	Lupinus sp.	lupine	25916
	Medicago sativa L.	Medicago sativa	alfalfa	183623
	Melilotus officinalis (L.) Lam.	Melilotus officinalis	yellow sweetclover	26150
	Thermopsis montana Nutt.	Thermopsis montana	mountain goldenbanner	508158
	Thermopsis rhombifolia (Nutt. ex Pursh) Nutt. ex Richards.	Thermopsis rhombifolia	prairie thermopsis	27003
	Trifolium gymnocarpon Nutt.	Trifolium gymnocarpon	hollyleaf clover	26255
	Trifolium pratense L.	Trifolium pratense	red clover	26313
	Trifolium pratense L.	Trifolium pratense	white clover	26206
	Trifolium L.	Trifolium sp.	clover	26204
	Vicia americana Muhl. ex Willd.	Vicia americana	American vetch	26331
Fagaceae	Quercus gambelii Nutt.	Quercus gambelii	Gambel oak	19337
Fumariaceae	Corydalis aurea Willd.	Corydalis aurea	golden corydalis	18999
Gentianaceae	Frasera speciosa Dougl. ex Griseb.	Frasera speciosa	monument plant	502660
	Gentiana affinis Griseb.	Gentiana affinis	Rocky Mountain gentian	29964
	Gentiana L.	Gentiana sp.	gentian	29963
Geraniaceae	Erodium cicutarium (L.) L'Hér. ex Ait.	Erodium cicutarium	cutleaf filaree	29147
	Geranium caespitosum James	Geranium caespitosum	tufted geranium	29130

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Geraniaceae	Geranium richardsonii Fisch. & Trautv.	Geranium richardsonii	Richardson's geranium	29118
	Geranium L.	Geranium sp.	geranium	29104
	Geranium viscosissimum Fisch. & C.A. Mey. ex C.A. Mey.	Geranium viscosissimum	sticky geranium	29125
Grossulariaceae	Ribes cereum Dougl.	Ribes cereum	wax currant	24457
	Ribes inerme Rydb.	Ribes inerme	whitestem gooseberry	24473
	Ribes lacustre (Pers.) Poir.	Ribes lacustre	prickly currant	24476
	Ribes laxiflorum Pursh	Ribes laxiflorum	trailing black currant	24478
	Ribes leptanthum Gray	Ribes leptanthum	trumpet gooseberry	24479
	Ribes montigenum McClatchie	Ribes montigenum	gooseberry currant	24486
	Ribes L.	Ribes sp.	currant	24448
	Ribes wolfii Rothrock	Ribes wolfii	Wolf's currant	24512
Haloragaceae	Myriophyllum L.	Myriophyllum sp.	watermilfoil	27034
Hippuridaceae	Hippuris vulgaris L.	Hippuris vulgaris	common mares-tail	27069
Hydrangeaceae	Fendlera rupicola Gray	Fendlera rupicola	fendlerbush	24331
	Fendlerella utahensis (S. Wats.) Heller	Fendlerella utahensis	Utah fendlerbush	24334
	Philadelphus microphyllus Gray	Philadelphus microphyllus	littleleaf mockorange	24437
Hydrophyllaceae	Hydrophyllum capitatum Dougl. ex Benth.	Hydrophyllum capitatum	ballhead waterleaf	31391
	Phacelia alba Rydb.	Phacelia alba	white scorpionweed	31435
	Phacelia bakeri (Brand) J.F. Macbr.	Phacelia bakeri	Baker's phacelia	504269
Iridaceae	Iris missouriensis Nutt.	Iris missouriensis	Rocky Mountain iris	43221
Juncaceae	Juncus arcticus Willd.	Juncus arcticus	arctic rush	39222
	Juncus bufonius L.	Juncus bufonius	toad rush	39227
	Juncus confusus Coville	Juncus confusus	Colorado rush	39261
	Juncus ensifolius Wikstr.	Juncus ensifolius	swordleaf rush	39269
	Juncus longistylis Torr.	Juncus longistylis	longstyle rush	503256
	Juncus nodosus L.	Juncus nodosus	knotted rush	39297
	Juncus parryi Engelm.	Juncus parryi	Parry's rush	39300
	Juncus L.	Juncus sp.	rush	39220
	Juncus torreyi Coville	Juncus torreyi	Torrey's rush	39320
Lamiaceae	Dracocephalum parviflorum Nutt.	Dracocephalum parviflorum	American dragonhead	32490

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Lamiaceae	Marrubium vulgare L.	Marrubium vulgare	horehound	32561
	Mentha arvensis L.	Mentha arvensis	wild mint	565302
Liliaceae	Allium cernuum Roth	Allium cernuum	nodding onion	42721
	Allium L.	Allium sp.	wild onion	42634
	Calochortus gunnisonii S. Wats.	Calochortus gunnisonii	Gunnison mariposa lily	42849
	Smilacina racemosa (L.) Desf.	Maianthemum racemosum	feathery false lily of the valley	43036
	Smilacina stellata (L.) Desf.	Maianthemum stellatum	starry false lily of the valley	43038
	Veratrum tenuipetalum Heller	Veratrum tenuipetalum	Colorado false hellebore	505649
	Zigadenus venenosus S. Wats.	Zigadenus venenosus	meadow deathcamas	43168
Linaceae	Linum lewisii Pursh	Linum lewisii	Lewis flax	29214
	Linum perenne var. lewisii (Pursh) Eat. & J. Wright	Linum perenne	blue flax	536821
Malvaceae	Sphaeralcea coccinea (Nutt.) Rydb.	Sphaeralcea coccinea	scarlet globemallow	21920
Nyctaginaceae	Mirabilis linearis (Pursh) Heimerl	Mirabilis linearis	narrowleaf four-o'clock	19651
Onagraceae	Epilobium angustifolium L.	Chamerion angustifolium	fireweed	510756
	Epilobium brachycarpum K. Presl	Epilobium brachycarpum	tall annual willowherb	27288
	Epilobium lactiflorum Hausskn.	Epilobium lactiflorum	milkflower willowherb	27309
	Gayophytum ramosissimum Torr. & Gray	Gayophytum ramosissimum	pinyon groundsmoke	27679
Orchidaceae	Corallorrhiza maculata (Raf.) Raf.	Corralorhiza maculata	spotted coralroot	43523
	Abies concolor (Gord. & Glend.) Lindl. ex Hildebr.	Abies concolor	white fir	181826
	Picea pungens Engelm.	Picea pungens	colorado blue spruce	183307
Pinaceae	Pinus edulis Engelm.	Pinus edulis	two-needle pinyon pine	183336
	Pinus ponderosa P. & C. Lawson	Pinus ponderosa	ponderosa pine	183365
	Pseudotsuga menziesii (Mirbel) Franco	Pseudotsuga menziesii	Douglas-fir	183424
Plantaginaceae	Plantago major L.	Plantago major	common plantain	32887
Poaceae	Stipa hymenoides Roemer & J.A. Schultes	Achnatherum hymenoides	Indian ricegrass	522063
	Stipa lettermanii Vasey	Achnatherum lettermanii	Letterman needlegrass	522065
	Stipa nelsonii Scribn.	Achnatherum nelsonii	Nelson needlegrass	42182
	Stipa pinetorum M.E. Jones	Achnatherum pinetorum	Pine needlegrass	42188
	Stipa robusta	Achnatherum robustum	sleepygrass	507956
	Agropyron cristatum (L.) Gaertn.	Agropyron cristatum	crested wheatgrass	182478

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Poaceae	Agropyron Gaertn.	Agropyron sp.	wheatgrass	40353
	Agrostis gigantea Roth	Agrostis gigantea	redtop	40414
	Agrostis scabra Willd.	Agrostis scabra	rough bentgrass	40424
	Agrostis L.	Agrostis sp.	bentgrass	40389
	Agrostis stolonifera L.	Agrostis stolonifera	creeping bentgrass	40400
	Alopecurus aequalis Sobol.	Alopecurus aequalis	shortawn foxtail	40436
	Aristida purpurea Nutt.	Aristida purpurea	purple threeawn	41429
	Beckmannia syzigachne (Steud.) Fern.	Beckmannia syzigachne	American sloughgrass	41325
	Bouteloua gracilis (Willd. ex Kunth) Lag. ex Griffiths	Bouteloua gracilis	blue grama	41493
	Bromus anomalus Rupr. ex Fourn.	Bromus anomalus	nodding brome	40491
	Bromus ciliatus L.	Bromus ciliatus	fringed brome	40496
	Bromus inermis Leyss.	Bromus inermis	smooth brome	40502
	Bromus lanatipes (Shear) Rydb.	Bromus lanatipes	woolly brome	501071
	Bromus porteri (Coult.) Nash	Bromus porteri	Porter brome	40486
	Bromus secalinus L.	Bromus secalinus	rye brome	40519
	Bromus L.	Bromus sp.	brome	40478
	Bromus tectorum L.	Bromus tectorum	cheatgrass	40524
	Calamagrostis Adans.	Calamagrostis sp.	reedgrass	40529
	Dactylis glomerata L.	Dactylis glomerata	orchardgrass	193446
	Deschampsia cespitosa (L.) Beauv.	Deschampsia cespitosa	tufted hairgrass	40586
	Elymus albicans (Scribn. & J.G. Sm.) A. Löve	Elymus albicans	Montana wheatgrass	512804
	Agropyron bakeri E. Nels.	Elymus bakeri	Baker wheatgrass	40366
	Elymus canadensis L.	Elymus canadensis	Canada wildrye	40683
	Elymus elymoides (Raf.) Swezey	Elymus elymoides	bottlebrush squirreltail	502264
	Elymus glaucus Buckl.	Elymus glaucus	blue wildrye	40684
	Elymus repens (L.) Gould	Elymus repens	quackgrass	512839
	Elymus L.	Elymus sp.	wildrye	40677
	Elymus L.	Elymus sp.	wildrye	40677
	Elymus trachycaulus (Link) Gould ex Shinners	Elymus trachycaulus	slender wheatgrass	502282
	Festuca arizonica Vasey	Festuca arizonica	Arizona fescue	40809

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Poaceae	Festuca L.	Festuca sp.	fescue	40792
	Festuca thurberi Vasey	Festuca thurberi	Thurber's fescue	40828
	Glyceria grandis S. Wats.	Glyceria grandis	manna grass	502812
	Glyceria striata (Lam.) A.S. Hitchc.	Glyceria striata	fowl mannagrass	40833
	Stipa comata Trin. & Rupr.	Hesperostipa comata	needle-and-thread	42172
	Hordeum brachyantherum Nevski	Hordeum brachyantherum	meadow barley	40875
	Hordeum jubatum L.	Hordeum jubatum	foxtail barley	40871
	Koeleria macrantha (Ledeb.) J.A. Schultes	Koeleria macrantha	Junegrass	503284
	Leucopoa kingii (S. Wats.) W.A. Weber	Leucopoa kingii	spike fescue	41832
	Elymus cinereus Scribn. & Merr.	Leymus cinereus	Great Basin wildrye	40689
	Elymus salinus M.E. Jones	Leymus salinus	Salina lyme grass	512841
	Muhlenbergia minutissima (Steud.) Swallen	Muhlenbergia minutissima	annual muhly	41926
	Muhlenbergia montana (Nutt.) A.S. Hitchc.	Muhlenbergia montana	mountain muhly	41927
	Muhlenbergia richardsonis (Trin.) Rydb.	Muhlenbergia richardsonis	mat muhly	41938
	Muhlenbergia wrightii Vasey ex Coult.	Muhlenbergia wrightii	spike muhly	41950
	Nassella viridula (Trin.) Barkworth	Nassella viridula	green needlegrass	507086
	Elymus smithii (Rydb.) Gould	Pascopyrum smithii	western wheatgrass	512844
	Phalaris arundinacea L.	Phalaris arundinacea	reed canarygrass	41335
	Phleum pratense L.	Phleum pratense	timothy	41062
	Hilaria jamesii (Torr.) Benth.	Pleuraphis jamesii	James' galleta	41768
	Poa compressa L.	Poa compressa	Canada bluegrass	41082
	Poa fendleriana (Steud.) Vasey	Poa fendleriana	muttongrass	504467
	Poa nemoralis L.	Poa nemoralis	wood bluegrass	41146
	Poa nervosa (Hook.) Vasey	Poa nervosa	Wheeler bluegrass	41097
	Poa palustris L.	Poa palustris	fowl bluegrass	41151
	Poa pratensis L.	Poa pratensis	Kentucky bluegrass	41088
	Poa secunda J. Presl	Poa secunda	Sandberg's bluegrass	41103
	Poa L.	Poa sp.	bluegrass	41074
	Elymus junceus Fisch.	Psathyrostachys juncea	Russian wildrye	40702
	Elymus spicatus (Pursh) Gould	Pseudoroegneria spicata	bluebunch wheatgrass	512845

Family	Scientific Name (Welsh et al. 2003)	Scientific Name (Kartesz 1999)	Common Name (NatureServe)	TSN
Poaceae	Festuca pratensis Huds.	Schedonorus pratensis	meadow fescue	40822
	Sporobolus cryptandrus (Torr.) Gray	Sporobolus cryptandrus	sand dropseed	42132
	Agropyron intermedium (Host) P. Beauv.	Thinopyrum intermedium	intermediate wheatgrass	522540
Polemoniaceae	Collomia linearis Nutt.	Collomia linearis	tiny trumpet	31041
	Ipomopsis aggregata (Pursh) V. Grant	Ipomopsis aggregata	scarlet gilia	31192
	Linanthus septentrionalis Mason	Linanthus septentrionalis	northern linanthus	31277
	Leptodactylon Hook. & Arn.	Leptodactylon sp.	prickly phlox	31229
	Leptodactylon pungens (Torr.) Torr. ex Nutt.	Leptodactylon pungens	granite prickly phlox	31233
Polygonaceae	Eriogonum cernuum Nutt.	Eriogonum cernuum	nodding wild buckwheat	21090
	Eriogonum flavum Nutt.	Eriogonum flavum	alpine golden buckwheat	21134
	Eriogonum hookeri S. Wats.	Eriogonum hookeri	Hooker's wild buckwheat	21156
	Eriogonum lonchophyllum Torr. & Gray	Eriogonum lonchophyllum	spearleaf buckwheat	21185
	Eriogonum microthecum Nutt.	Eriogonum microthecum	slender buckwheat	21192
	Eriogonum microthecum var. simpsonii (Benth.) Reveal	Eriogonum microthecum var. simpsonii	Simpson's buckwheat	195533
	Eriogonum racemosum Nutt.	Eriogonum racemosum	redroot buckwheat	21230
	Eriogonum Michx.	Eriogonum sp.	wild buckwheat	21054
	Eriogonum umbellatum Torr.	Eriogonum umbellatum	sulphur-flower buckwheat	21266
	Eriogonum umbellatum ssp. subaridum (S. Stokes) Munz	Eriogonum umbellatum var subaridum	sulphur-flower buckwheat	195621
	Eriogonum umbellatum var. majus Hook.	Eriogonum umbellatum var. majus	sulphur-flower buckwheat	528020
	Polygonum arenastrum Jord. ex Boreau	Polygonum arenastrum	oval-leaf knotweed	20872
	Polygonum douglasii Greene	Polygonum douglasii	Douglas' knotweed	20891
	Polygonum minimum S. Wats.	Polygonum minimum	dwarf knotweed	20903
	Polygonum L.	Polygonum sp.	knotweed	20847
	Rumex crispus L.	Rumex crispus	curly dock	20937
	Rumex maritimus L.	Rumex maritimus	golden dock	20965
	Rumex salicifolius var. mexicanus (Meisn.) C.L. Hitchc.	Rumex salicifolius var. mexicanus	Mexican dock	530197
	Rumex salicifolius var. transitorius (Rech. f.) Hickman	Rumex salicifolius var. transitorius	willow dock	530200
	Rumex L.	Rumex sp.	dock	20933
Portulacaceae	Claytonia L.	Claytonia sp.	springbeauty	20376

Family	Scientific Name (Welsh et al. 2003)	Scientific Name (Kartesz 1999)	Common Name (NatureServe)	TSN
Primulaceae	Androsace septentrionalis L.	Androsace septentrionalis	pygmy rockjasmine	23935
Pyrolaceae	Chimaphila umbellata (L.) W. Bart.	Chimaphila umbellata	pipsissewa	23769
Ranunculaceae	Aconitum columbianum Nutt.	Aconitum columbianum	Columbian monkshood	18416
	Actaea rubra (Ait.) Willd.	Actaea rubra ssp. arguta	red baneberry	18723
	Anemone L.	Anemone sp.	anemone	18425
	Aquilegia L.	Aquilegia sp.	columbine	18728
	Clematis columbiana (Nutt.) Torr. & Gray	Clematis columbiana	rock clematis	18693
	Clematis hirsutissima Pursh	Clematis hirsutissima	sugarbowls	18699
	Clematis ligusticifolia Nutt.	Clematis ligusticifolia	virgins bower	18702
	Clematis L.	Clematis sp.	clematis	18685
	Delphinium nuttallianum Pritz. ex Walp.	Delphinium nuttallianum	Nuttall's larkspur	18483
	Delphinium L.	Delphinium sp.	larkspur	18457
	Ranunculus cymbalaria Pursh	Ranunculus cymbalaria	alkali buttercup	18600
	Ranunculus gmelini De Candolle	Ranunculus gmelini	Gmelin's buttercup	18567
	Ranunculus ranunculinus (Nutt.) Rydb.	Ranunculus ranunculinus	tadpole buttercup	504728
	Ranunculus L.	Ranunculus sp.	buttercup	18558
	Thalictrum fendleri Engelm. ex Gray	Thalictrum fendleri	Fendler's meadowrue	18670
Rhamnaceae	Ceanothus velutinus Dougl. ex Hook.	Ceanothus velutinus	snowbush	28517
Rosaceae	Amelanchier alnifolia (Nutt.) Nutt. ex M. Roemer	Amelanchier alnifolia	Saskatoon serviceberry	25109
	Amelanchier Medik.	Amelanchier sp.	serviceberry	25108
	Amelanchier utahensis Koehne	Amelanchier utahensis	Utah serviceberry	25121
	Cercocarpus montanus Raf.	Cercocarpus montanus	true mountain mahogany	25136
	Crataegus douglasii var. rivularis (Nutt.) Sarg.	Crataegus rivularis	river hawthorn	533926
	Potentilla fruticosa auct. non L.	Dasiphora floribunda	shrubby cinquefoil	24710
	Fragaria L.	Fragaria sp.	wild strawberry	24624
	Fragaria virginiana Duchesne	Fragaria virginiana	Virginia strawberry	24639
	Geum L.	Geum sp.	avens	24644
	Geum triflorum var. triflorum Pursh	Geum triflorum var. triflorum	old man's whiskers	195836
	Holodiscus dumosus (Nutt. ex Hook.) Heller	Holodiscus dumosus	rockspirea	25178
	Peraphyllum ramosissimum Nutt.	Peraphyllum ramosissimum	squawapple	25270

Family	Scientific Name (Welsh et al. 2003)	Scientific Name (Kartesz 1999)	Common Name (NatureServe)	TSN
Rosaceae	Potentilla biennis Greene	Potentilla biennis	biennial cinquefoil	24695
	Potentilla diversifolia Lehm.	Potentilla diversifolia	varileaf cinquefoil	24702
	Potentilla gracilis Dougl. ex Hook.	Potentilla gracilis	slender cinquefoil	24714
	Potentilla hippiana Lehm.	Potentilla hippiana	woolly cinquefoil	24718
	Potentilla pulcherrima Lehm.	Potentilla pulcherrima	beautiful cinquefoil	504586
	Potentilla rivalis Nutt.	Potentilla rivalis	brook cinquefoil	24744
	Potentilla L.	Potentilla sp.	cinquefoil	24666
	Prunus virginiana L.	Prunus virginiana	chokecherry	24806
	Purshia tridentata (Pursh) DC.	Purshia tridentata	antelope bitterbrush	25290
	Rosa woodsii Lindl.	Rosa woodsii	Woods' rose	24847
	Rubus deliciosus Torr.	Rubus deliciosus	delicious raspberry	24910
	Rubus idaeus ssp. strigosus (Michx.) Focke	Rubus idaeus ssp. strigosus	grayleaf raspberry	524636
Rubiaceae	Galium boreale L.	Galium boreale	northern bedstraw	565204
	Galium coloradoense W. Wight	Galium coloradoense	Colorado bedstraw	34847
	Galium L.	Galium sp.	bedstraw	34796
Salicaceae	Populus angustifolia James	Populus angustifolia	narrowleaf cottonwood	22452
	Populus fremontii var. wislizeni S. Wats	Populus deltoides ssp. wislizeni	Rio Grande cottonwood	22462
	Populus tremuloides Michx.	Populus tremuloides	quaking aspen	195773
	Salix bebbiana Sarg.	Salix bebbiana	Bebb's willow	22507
	Salix boothii Dorn	Salix boothii	Booth's willow	22509
	Salix drummondiana Barratt ex Hook.	Salix drummondiana	Drummond's willow	22525
	Salix lutea	Salix eriocephala	Missouri River williow	22528
	Salix exigua Nutt.	Salix exigua	sandbar willow	22529
	Salix geyeriana Anderss.	Salix geyeriana	Geyer's willow	504965
	Salix eriocephala Michx. var. ligulifolia (C.R. Ball) Dorn	Salix ligulifolia	strapleaf willow	540018
	Salix lucida ssp. lasiandra (Benth.) E. Murr.	Salix lucida ssp. lasiandra	Pacific willow	524653
	Salix monticola Bebb	Salix monticola	mountain willow	22558
	Salix scouleriana Barratt ex Hook.	Salix scouleriana	Scouler's willow	504980
	Salix L.	Salix sp.	willow	22476
Santalaceae	Comandra umbellata (L.) Nutt.	Comandra umbellata	bastard toadflax	501614

Family	Scientific Name (Welsh et al. 2003)	Scientific Name (Kartesz 1999)	Common Name (NatureServe)	TSN
Saxifragaceae	Heuchera L.	Heuchera sp.	alumroot	24337
	Saxifraga bronchialis ssp. austromontana (Wieg.) Piper	Saxifraga bronchialis ssp. austromontana	matted saxifrage	524663
	Saxifraga L.	Saxifraga sp.	saxifrage	24213
	Saxifraga odontoloma Piper	Saxifraga odontoloma	brook saxifrage	505027
Scrophulariaceae	Castilleja applegatei ssp. martinii (Abrams) Chuang & Heck.	Castilleja applegatei ssp. martinii	wavyleaf Indian paintbrush	525154
	Castilleja linariifolia Benth.	Castilleja linariifolia	Wyoming Indian paintbrush	33138
	Castilleja miniata Dougl. ex Hook.	Castilleja miniata	giant red Indian paintbrush	33069
	Castilleja rhexiifolia Rydb.	Castilleja rhexiifolia	splitleaf Indian paintbrush	33164
	Castilleja scabrida Eastw.	Castilleja scabrida	rough Indian paintbrush	33165
	Castilleja Mutis ex L. f.	Castilleja sp.	Indian paintbrush	33049
	Collinsia parviflora Lindl.	Collinsia parviflora	maiden blue eyed Mary	33534
	Limosella aquatica L.	Limosella aquatica	northern mudwort	33207
	Linaria vulgaris P. Mill.	Linaria vulgaris	butter and eggs	33216
	Mimulus L.	Mimulus sp.	monkeyflower	33233
	Orthocarpus luteus Nutt.	Orthocarpus luteus	yellow owl's-clover	33437
	Pedicularis procera Gray	Pedicularis procera	giant lousewort	504166
	Penstemon caespitosus Nutt. ex Gray	Penstemon caespitosus	mat penstemon	33839
	Penstemon Schmidel	Penstemon sp.	beardtongue	33665
	Penstemon strictus Benth.	Penstemon strictus	Rocky Mountain beardtongue	33772
	Penstemon teucrioides Greene	Penstemon teucrioides	germander beardtongue	34000
	Verbascum thapsus L.	Verbascum thapsus	common mullein	33394
	Veronica americana Schwein. ex Benth.	Veronica americana	American speedwell	33399
	Veronica anagallis-aquatica L.	Veronica anagallis-aquatica	water speedwell	565594
	Veronica peregrina L.	Veronica peregrina	purslane speedwell	33421
	Veronica scutellata L.	Veronica scutellata	skullcap speedwell	33422
	Veronica L.	Veronica sp.	speedwell	33396
Solanaceae	Solanum triflorum Nutt.	Solanum triflorum	cutleaf nightshade	30461
Typhaceae	Typha domingensis Pers.	Typha domingensis	southern cattail	42327
Urticaceae	Urtica dioica L.	Urtica dioica	slender nettle	19152

Family	Scientific Name (Welsh et al. 2003)	Scientific Name (Kartesz 1999)	Common Name (NatureServe)	TSN
	Urtica dioica ssp. gracilis (Ait.) Seland.	Urtica dioica ssp. gracilis	California nettle	19154
	Urtica dioica var. procera (Muhl. ex Willd.) Weddell	Urtica dioica ssp. gracilis	California nettle	541531
Verbenaceae	Verbena bracteata Lag. & Rodr.	Verbena bracteata	prostrate verbena	32085
Violaceae	Viola L.	Viola sp.	violet	22030

NON-VASCULAR PLANTS

Family	Scientific Name	Scientific Name	Common Name (NatureServe)	TSN
Selaginellaceae	*Selaginella* Beauv.	*Selaginella* sp.	spikemoss	17064
	Selaginella densa Rydb.	*Selaginella densa*	lesser spikemoss	17076

Appendix E. Field Plot Crosswalk to NVC Associations

Plots, observation points, and accuracy assessment (AA) points are assigned to National Vegetation Classification associations based on their composition and structure as they were recorded in the field. A total of 128 NVC associations and three “Park Specials” were described for Curecanti. Twenty-one associations in the table below were documented only during accuracy assessment (Plot codes in the rightmost column contain the letters “AA”). Accuracy assessment points assigned to associations already described from plots or observation points are not included in this table unless they comprise the majority of plots sampled in the type. Element codes are used by NatureServe and state Natural Heritage Programs to track nomenclature and status of rare plants, rare animals, and communities (“elements”). Nomenclature used by the NVC follows Kartesz (1999).

Plant Association Scientific Name	Element Code	No. of Samples	Supporting Plot, Observation Point, and AA Point Assignments
Acer negundo / Cornus sericea Forest	CEGL000625	2	CURE_AA.0079, CURE_AA.1060
Acer negundo / Disturbed Understory Woodland	CEGL002693	1	CURE.0242
Acer negundo / Quercus gambelii Woodland	CEGL002797	2	CURE.0189, CURE.0244
Achnatherum hymenoides Shale Barren Herbaceous Vegetation	CEGL001651	2	CURE.0020, CURE.0305
Agrostis (gigantea, stolonifera) Semi-natural Herbaceous Vegetation	CEGL001558	1	CURE.0255
Alnus incana / Cornus sericea Shrubland	CEGL001145	2	CURE.0231, CURE.0325
Alnus incana / Mesic Graminoids Shrubland	CEGL001148	2	CURE_AA.0081, CURE_AA.0084
Amelanchier utahensis - Mixed Shrub / Carex geyeri Shrubland	CEGL001068	8	CURE.0017, CURE.0048, CURE.0099, CURE.0129, CURE.0156, CURE.0340, CURE.0370, CURE.0392
Artemisia frigida - (Bouteloua gracilis, Achnatherum hymenoides, Poa secunda) - Lichens Rocky Mesa Dwarf-shrubland	CEGL002344	22	CURE.0008, CURE.0053, CURE.0155, CURE.0194, CURE.0199, CURE.0215, CURE.0216, CURE.0273, CURE.0274, CURE.0275, CURE.0283, CURE.0285, CURE.0321, CURE.0327, CURE.0328, CURE.0334, CURE.0335, CURE.0337, CURE.0339, CURE.0344, CURE.0369, CURE.0374
Artemisia nova / Poa fendleriana Shrubland	CEGL002698	22	CURE.0010, CURE.0015, CURE.0016, CURE.0052, CURE.0056, CURE.0061, CURE.0064, CURE.0065, CURE.0089, CURE.0097, CURE.0121, CURE.0123, CURE.0149, CURE.0161, CURE.0239, CURE.0272, CURE.0284, CURE.0326, CURE.0330, CURE.0345, CURE.0367, CURE.0368
Artemisia nova / Poa secunda Shrubland	CEGL001423	2	CURE_AA.0344, CURE_AA.0611

Plant Association Scientific Name	Element Code	No. of Samples	Supporting Plot, Observation Point, and AA Point Assignments
Artemisia tridentata (ssp. vaseyana, ssp. wyomingensis) - Amelanchier utahensis Shrubland	CEGL002820	1	CURE.0196
Artemisia tridentata / Pleuraphis jamesii Shrubland	CEGL001005	2	CURE.0082, CURE.0393
Artemisia tridentata ssp. tridentata / Pascopyrum smithii - (Elymus lanceolatus) Shrubland	CEGL001017	2	CURE.0303, CURE.0376
Artemisia tridentata ssp. vaseyana - Holodiscus dumosus Shrubland [Provisional]	CEGL002807	3	CURE.0118, CURE.0120, CURE.0144
Artemisia tridentata ssp. vaseyana / Achnatherum hymenoides Shrubland	Park Special	5	CURE_AA.0187, CURE_AA.0200, CURE_AA.0569, CURE_AA.0759, CURE_AA.0760
Artemisia tridentata ssp. vaseyana / Achnatherum pinetorum Shrubland	CEGL002806	6	CURE.0001, CURE.0078, CURE.0163, CURE.0315, CURE.0317, CURE.0331
Artemisia tridentata ssp. vaseyana / Balsamorhiza sagittata Shrubland	CEGL001020	1	CURE.0333
Artemisia tridentata ssp. vaseyana / Carex geyeri Shrub Herbaceous Vegetation	CEGL001532	1	CURE.0198
Artemisia tridentata ssp. vaseyana / Festuca thurberi Shrubland	CEGL001024	2	CURE.0005, CURE.0088
Artemisia tridentata ssp. vaseyana / Hesperostipa comata Shrubland	CEGL002931	3	CURE.0313, CURE.0363, CURE.0372
Artemisia tridentata ssp. vaseyana / Pascopyrum smithii Shrubland	CEGL001028	4	CURE.0079, CURE_AA.0261, CURE_AA.0551, CURE_AA.0992
Artemisia tridentata ssp. vaseyana / Piptatherum micranthum Shrubland	Park Special	1	CURE.0059
Artemisia tridentata ssp. vaseyana / Poa (pratensis, compressa) Semi-natural Shrub Herbaceous	CEGL002339	5	CURE.0291, CURE_AA.0080, CURE_AA.0400, CURE_AA.0408, CURE_AA.0626

Plant Association Scientific Name	Element Code	No. of Samples	Supporting Plot, Observation Point, and AA Point Assignments
Artemisia tridentata ssp. vaseyana / Poa fendleriana Shrubland	CEGL002812	4	CURE.0076, CURE.0218, CURE.0338, CURE.0341
Artemisia tridentata ssp. wyomingensis / (Agropyron cristatum, Psathyrostachys juncea) Seeded Grasses Semi-natural Shrubland	CEGL002185	15	CURE.0377, CURE_AA.0241, CURE_AA.0242, CURE_AA.0251, CURE_AA.0307, CURE_AA.0346, CURE_AA.0393, CURE_AA.0488, CURE_AA.0523, CURE_AA.0535, CURE_AA.0629, CURE_AA.0636, CURE_AA.0637, CURE_AA.0727, CURE_AA.0733
Artemisia tridentata ssp. wyomingensis / Achnatherum hymenoides Shrubland	CEGL001046	15	CURE.0002, CURE.0014, CURE.0025, CURE.0038, CURE.0042, CURE.0050, CURE.0063, CURE.0080, CURE.0084, CURE.0103, CURE.0127, CURE.0132, CURE.0159, CURE.0294, CURE.0296
Artemisia tridentata ssp. wyomingensis / Achnatherum pinetorum Shrubland	CEGL002810	12	CURE.0007, CURE.0013, CURE.0043, CURE.0044, CURE.0062, CURE.0072, CURE.0075, CURE.0133, CURE.0136, CURE.0138, CURE.0148, CURE.0323
Artemisia tridentata ssp. wyomingensis / Bouteloua gracilis Shrubland	CEGL001041	6	CURE.0023, CURE.0030, CURE.0031, CURE.0058, CURE.0066, CURE.0125
Artemisia tridentata ssp. wyomingensis / Disturbed Understory Semi-natural Shrubland	CEGL002083	8	CURE.0382, CURE.0278, CURE_AA.0119, CURE_AA.0121, CURE_AA.0209, CURE_AA.0338, CURE_AA.0653, CURE_AA.0823, CURE_AA.1367
Artemisia tridentata ssp. wyomingensis / Hesperostipa comata Colorado Plateau Shrubland	CEGL002761	15	CURE.0011, CURE.0022, CURE.0037, CURE.0041, CURE.0045, CURE.0047, CURE.0049, CURE.0055, CURE.0057, CURE.0060, CURE.0069, CURE.0092, CURE.0140, CURE.0366, CURE.0386
Artemisia tridentata ssp. wyomingensis / Poa fendleriana Shrubland	CEGL002775	13	CURE.0012, CURE.0051, CURE.0083, CURE.0085, CURE.0094, CURE.0117, CURE.0122, CURE.0126, CURE.0201, CURE.0271,CURE.0288, CURE.0311, CURE.0388
Artemisia tridentata ssp. wyomingensis / Sparse Understory Shrubland	CEGL002768	5	CURE.0028, CURE.0034, CURE.0073, CURE.0124, CURE.0162

Plant Association Scientific Name	Element Code	No. of Samples	Supporting Plot, Observation Point, and AA Point Assignments
Atriplex canescens / Achnatherum hymenoides Shrubland	CEGL001289	3	CURE.0391, CURE_AA.0745, CURE_AA.0859
Bromus inermis - (Pascopyrum smithii) Semi-natural Herbaceous Vegetation	CEGL005264	3	CURE.0253, CURE_AA.0052, CURE_AA.0062
Bromus tectorum Semi-natural Herbaceous Vegetation	CEGL003019	2	CURE.0152, CURE.0153
Carex duriuscula Herbaceous Vegetation	CEGL001874	1	CURE.0135
Carex utriculata Herbaceous Vegetation	CEGL001562	4	CURE.0180, CURE.0182, CURE.0254, CURE.0258
Ceanothus velutinus Shrubland	CELG002167	1	CURE.0151
Cercocarpus montanus - Artemisia tridentata Shrubland	CEGL005805	16	CURE_AA.0161, CURE_AA.0171, CURE_AA.0174, CURE_AA.0195, CURE_AA.0212, CURE_AA.0258, CURE_AA.0324, CURE_AA.0420, CURE_AA.0465, CURE_AA.0482, CURE_AA.0495, CURE_AA.0731, CURE_AA.0938, CURE_AA.1038, CURE_AA.1043, CURE_AA.1294
Cercocarpus montanus Shale Shrubland	CEGL002798	9	CURE.0009, CURE_AA.0207, CURE_AA.0213, CURE_AA.0217, CURE_AA.0218, CURE_AA.0224, CURE_AA.0225, CURE_AA.0233, CURE_AA.0234
Chrysothamnus viscidiflorus / Hesperostipa comata Shrubland	CEGL002799	1	CURE.0365
Chrysothamnus viscidiflorus / Poa pratensis Semi-natural Shrub Herbaceous Vegetation	CEGL002933	1	CURE.0249
Cirsium arvense - Weedy Forbs Great Plains Herbaceous Vegetation	CEGL005260	13	CURE_AA.0057, CURE_AA.0063, CURE_AA.0072, CURE_AA.0075, CURE_AA.0094, CURE_AA.0097, CURE_AA.0120, CURE_AA.0134, CURE_AA.0252, CURE_AA.0262, CURE_AA.0398, CURE_AA.0591, CURE_AA.0608

Plant Association Scientific Name	Element Code	No. of Samples	Supporting Plot, Observation Point, and AA Point Assignments
Conyza canadensis Semi-natural Herbaceous Vegetation	CEGL002800	8	CURE.0166, CURE.0169, CURE_AA.0104, CURE_AA.0282, CURE_AA.0288, CURE_AA.0294, CURE_AA.0304, CURE_AA.0336
Cornus sericea Shrubland	CEGL001165	1	CURE.0192
Elymus repens Semi-natural Herbaceous Vegetation	CEGL005868	4	CURE.0379, CURE_AA.0130, CURE_AA.0133, CURE_AA.0582
Ericameria nauseosa Shrubland	CEGL002713	12	CURE.0380, CURE.0383, CURE_AA.0268, CURE_AA.0303, CURE_AA.0305, CURE_AA.0306, CURE_AA.0309, CURE_AA.0310, CURE_AA.0313, CURE_AA.0519, CURE_AA.0609, CURE_AA.0890
Ericameria parryi / Achnatherum hymenoides Shrubland	CEGL003040	4	CURE.0233, CURE.0276, CURE.0279, CURE.0304
Hesperostipa comata - Achnatherum hymenoides Herbaceous Vegetation	CEGL001703	5	CURE.0090, CURE.0093, CURE.0287, CURE.0346, CURE.0371
Hesperostipa comata Great Basin Herbaceous Vegetation	CEGL001705	7	CURE.0004, CURE.0019, CURE.0024, CURE.0054, CURE.0119, CURE.0316, CURE.0375
Holodiscus dumosus Rock Outcrop Sparse Vegetation	CEGL002801	7	CURE.0188, CURE.0191, CURE.0210, CURE.0228, CURE.0282, CURE.0302, CURE.0306
Hordeum jubatum Herbaceous Vegetation	CEGL001798	6	CURE_AA.0018, CURE_AA.0216, CURE_AA.0289, CURE_AA.0416, CURE_AA.0578, CURE_AA.0588
Juncus balticus Herbaceous Vegetation	CEGL001838	4	CURE.0176, CURE.0181, CURE.0183, CURE.0277
Juniperus osteosperma / Artemisia nova Woodland	CEGL000728	1	CURE_AA.0467
Juniperus osteosperma / Mixed Shrubs Talus Woodland	CEGL002266	1	CURE_AA.1057
Juniperus scopulorum ‑ Quercus gambelii Woodland	CEGL002967	3	CURE_AA.0663, CURE_AA.1002, CURE_AA.1166
Juniperus scopulorum / Artemisia tridentata Woodland	CEGL000743	6	CURE.0026, CURE.0039, CURE.0067, CURE.0213, CURE.0225, CURE.0389

Plant Association Scientific Name	Element Code	No. of Samples	Supporting Plot, Observation Point, and AA Point Assignments
Krascheninnikovia lanata / Achnatherum hymenoides Dwarf-shrubland	CEGL001323	6	CURE.0070, CURE_AA.0185, CURE_AA.0553, CURE_AA.0860, CURE_AA.0872, CURE_AA.0884
Leymus cinereus Herbaceous Vegetation	CEGL001479	3	CURE.0238, CURE.0384, CURE.0390
Pascopyrum smithii Herbaceous Vegetation	CEGL001577	2	CURE.0295, CURE.0332
Phalaris arundinacea Western Herbaceous Vegetation	CEGL001474	1	CURE.0251
Picea pungens / Alnus incana Woodland	CEGL000894	2	CURE.0235, CURE.0324
Picea pungens / Cornus sericea Woodland	CEGL000388	2	CURE.0230, CURE.0232
Picea pungens / Mahonia repens Forest	CEGL000395	2	CURE.0033, CURE.0229
Pinus edulis – (Juniperus spp). / Holodiscus dumosus Woodland	CEGL002802	1	CURE.0143
Pinus edulis - Juniperus osteosperma / Sparse Understory Woodland	CEGL002148	11	CURE.0164, CURE_AA.0498, CURE_AA.0747, CURE_AA.0769, CURE_AA.0782, CURE_AA.0808, CURE_AA.0818, CURE_AA.0828, CURE_AA.0841, CURE_AA.0851, CURE_AA.0873
Pinus edulis - Juniperus spp. / Artemisia tridentata (ssp. wyomingensis, ssp. vaseyana) Woodland	CEGL000776	18	CURE.0208, CURE.0209, CURE_AA.0437, CURE_AA.0500, CURE_AA.0508, CURE_AA.0517, CURE_AA.0665, CURE_AA.0687, CURE_AA.0737, CURE_AA.0738, CURE_AA.0748, CURE_AA.0749, CURE_AA.0755, CURE_AA.0770, CURE_AA.0771, CURE_AA.0772, CURE_AA.0789, CURE_AA.0891

Plant Association Scientific Name	Element Code	No. of Samples	Supporting Plot, Observation Point, and AA Point Assignments
Pinus edulis - Juniperus spp. / Cercocarpus montanus - Mixed Shrubs Woodland	CEGL000780	25	CURE.0142, CURE_AA.0100, CURE_AA.0101, CURE_AA.0317, CURE_AA.0319, CURE_AA.0351, CURE_AA.0378, CURE_AA.0385, CURE_AA.0413, CURE_AA.0448, CURE_AA.0471, CURE_AA.0472, CURE_AA.0485, CURE_AA.0499, CURE_AA.0509, CURE_AA.0510, CURE_AA.0556, CURE_AA.0616, CURE_AA.0656, CURE_AA.0664, CURE_AA.0666, CURE_AA.0677, CURE_AA.0678, CURE_AA.0710, CURE_AA.0754
Pinus edulis - Juniperus spp. / Poa fendleriana Woodland	CEGL000787	1	CURE.0141
Pinus edulis - Juniperus spp. / Quercus gambelii Woodland	CEGL000791	33	CURE.0116, CURE.0243, CURE_AA.0090, CURE_AA.0138, CURE_AA.0164, CURE_AA.0318, CURE_AA.0352, CURE_AA.0368, CURE_AA.0369, CURE_AA.0372, CURE_AA.0373, CURE_AA.0384, CURE_AA.0405, CURE_AA.0406, CURE_AA.0411, CURE_AA.0433, CURE_AA.0458, CURE_AA.0511, CURE_AA.0544, CURE_AA.0557, CURE_AA.0581, CURE_AA.0599, CURE_AA.0625, CURE_AA.0631, CURE_AA.0639, CURE_AA.0647, CURE_AA.0655, CURE_AA.0756, CURE_AA.0806, CURE_AA.0807, CURE_AA.0829, CURE_AA.0861, CURE_AA.1180
Pinus ponderosa / Purshia tridentata Woodland	CEGL000867	2	CURE.0145, CURE.0204
Pinus ponderosa / Quercus gambelii Woodland	CEGL000870	2	CURE.0146, CURE.0223
Pleuraphis jamesii Herbaceous Vegetation	CEGL001777	3	CURE.0040, CURE.0134, CURE.0190
Poa fendleriana Herbaceous Vegetation	CEGL001925	2	CURE.0221, CURE.0342
Poa pratensis - (Pascopyrum smithii) Semi-natural Herbaceous Vegetation	CEGL005265	5	CURE.0300, CURE_AA.0158, CURE_AA.0475, CURE_AA.0537, CURE_AA.0595

Plant Association Scientific Name	Element Code	No. of Samples	Supporting Plot, Observation Point, and AA Point Assignments
Poa secunda Herbaceous Vegetation	CEGL001657	1	CURE.0329
Populus angustifolia - Juniperus scopulorum Woodland	CEGL002640	3	CURE.0108, CURE.0173, CURE.0237
Populus angustifolia - Picea pungens / Alnus incana Woodland	CEGL000934	1	CURE.0236
Populus angustifolia / Alnus incana Woodland	CEGL002642	4	CURE.0071, CURE.0160, CURE.0185, CURE.0259
Populus angustifolia / Cornus sericea Woodland	CEGL002664	1	CURE.0193
Populus angustifolia / Crataegus rivularis Woodland	CEGL002644	5	CURE.0137, CURE.0178, CURE.0256, CURE.0257, CURE.0261
Populus angustifolia / Invasive Perennial Grasses Semi-natural Woodland	CEGL003749	14	CURE.0177, CURE.0184, CURE_AA.0026, CURE_AA.0031, CURE_AA.0045, CURE_AA.0047, CURE_AA.0058, CURE_AA.0061, CURE_AA.0065, CURE_AA.0066, CURE_AA.0067, CURE_AA.0069, CURE_AA.0074, CURE_AA.0142
Populus angustifolia / Prunus virginiana Woodland	CEGL000651	1	CURE.0157
Populus angustifolia / Quercus gambelii Woodland	CEGL002804	1	CURE_AA.0239
Populus angustifolia / Rhus trilobata Woodland	CEGL000652	2	CURE.0240, CURE.0246
Populus angustifolia / Rosa woodsii Forest	CEGL000653	3	CURE.0105, CURE.0179, CURE.0250
Populus angustifolia / Salix exigua Woodland	CEGL000654	2	CURE_AA.0077, CURE_AA.0098
Populus tremuloides - Pseudotsuga menziesii / Amelanchier alnifolia Forest	CEGL000543	2	CURE.0269, CURE.0396

Plant Association Scientific Name	Element Code	No. of Samples	Supporting Plot, Observation Point, and AA Point Assignments
Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Calamagrostis rubescens Forest	CEGL000567	1	CURE.0360
Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Mixed Graminoid Forest	CEGL002816	2	CURE_AA.0333, CURE_AA.1211
Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Thalictrum fendleri Forest	CEGL000569	2	CURE.0110, CURE.0158
Populus tremuloides / Carex geyeri Forest	CEGL000579	1	CURE.0220
Populus tremuloides / Ceanothus velutinus Forest	CEGL000581	1	CURE.0266
Populus tremuloides / Invasive Perennial Grasses Forest	CEGL003748	1	CURE.0299
Populus tremuloides / Juniperus communis / Carex geyeri Forest	CEGL000588	3	CURE.0314, CURE.0320, CURE.0385
Populus tremuloides / Juniperus communis / Lupinus argenteus Forest	CEGL000589	2	CURE.0197, CURE.0336
Populus tremuloides / Mahonia repens Forest	CEGL000594	4	CURE_AA.0359, CURE_AA.0360, CURE_AA.0621, CURE_AA.0622
Populus tremuloides / Prunus virginiana Forest	CEGL000596	3	CURE.0006, CURE.0100, CURE.0268
Populus tremuloides / Quercus gambelii / Symphoricarpos oreophilus Forest	CEGL000598	2	CURE.0262, CURE.0263
Populus tremuloides / Symphoricarpos oreophilus / Thalictrum fendleri Forest	CEGL000616	1	CURE.0362
Populus tremuloides / Symphoricarpos oreophilus Forest	CEGL000610	7	CURE_AA.0382, CURE_AA.0525, CURE_AA.0532, CURE_AA.0558, CURE_AA.0619, CURE_AA.1171, CURE_AA.1461
Populus tremuloides / Tall Forbs Forest	CEGL000618	1	CURE.0112

Plant Association Scientific Name	Element Code	No. of Samples	Supporting Plot, Observation Point, and AA Point Assignments
Prunus virginiana - (Prunus americana) Shrubland	CEGL001108	4	CURE_AA.0096, CURE_AA.0122, CURE_AA.0126, CURE_AA.0526
Pseudotsuga menziesii / Acer glabrum Forest	CEGL000418	1	CURE.0186
Pseudotsuga menziesii / Amelanchier alnifolia Forest	CEGL000420	7	CURE_AA.0116, CURE_AA.0752, CURE_AA.0774, CURE_AA.0886, CURE_AA.0967, CURE_AA.1054, CURE_AA.1058
Pseudotsuga menziesii / Artemisia tridentata (ssp. vaseyana, ssp. wyomingensis) Woodland	CEGL002808	3	CURE.0211, CURE.0322, CURE.0364
Pseudotsuga menziesii / Carex geyeri Forest	CEGL000430	5	CURE.0077, CURE.0115, CURE.0150, CURE.0165, CURE.0361
Pseudotsuga menziesii / Holodiscus dumosus Scree Woodland	CEGL000902	4	CURE.0003, CURE.0227, CURE.0308, CURE.0373
Pseudotsuga menziesii / Mahonia repens Forest	CEGL000442	6	CURE.0098, CURE.0205, CURE.0265, CURE.0267, CURE.0297, CURE.0395
Pseudotsuga menziesii / Poa fendleriana Woodland	CEGL002809	3	CURE.0106, CURE.0130, CURE.0219
Pseudotsuga menziesii / Prunus virginiana Forest	Park Special	6	CURE_AA.0089, CURE_AA.0136, CURE_AA.0396, CURE_AA.0419, CURE_AA.0660, CURE_AA.0700
Pseudotsuga menziesii / Quercus gambelii Forest	CEGL000452	12	CURE.0021, CURE.0096, CURE.0104, CURE.0111, CURE.0203, CURE.0207, CURE.0212, CURE.0214, CURE.0222, CURE.0248, CURE.0309, CURE.0318
Pseudotsuga menziesii / Symphoricarpos oreophilus Forest	CEGL000462	5	CURE.0032, CURE.0035, CURE.0147, CURE.0200, CURE.0343
Pseudotsuga menziesii Scree Woodland	CEGL000911	9	CURE.0301, CURE.0310, CURE_AA.0794, CURE_AA.0796, CURE_AA.0869, CURE_AA.1052, CURE_AA.1056, CURE_AA.1209, CURE_AA.1368

Plant Association Scientific Name	Element Code	No. of Samples	Supporting Plot, Observation Point, and AA Point Assignments
Quercus gambelii - Cercocarpus montanus / (Carex geyeri) Shrubland	CEGL001113	17	CURE.0029, CURE.0245, CURE_AA.0078, CURE_AA.0249, CURE_AA.0340, CURE_AA.0341, CURE_AA.0371, CURE_AA.0483, CURE_AA.0559, CURE_AA.0592, CURE_AA.0600, CURE_AA.0685, CURE_AA.0790, CURE_AA.0853, CURE_AA.0858, CURE_AA.0927, CURE_AA.1181
Quercus gambelii – Holodiscus dumosus Shrubland	CEGL002341	15	CURE.0046, CURE.0202, CURE_AA.0155, CURE_AA.0438, CURE_AA.0441, CURE_AA.0442, CURE_AA.0443, CURE_AA.0445, CURE_AA.0450, CURE_AA.0454, CURE_AA.0476, CURE_AA.0477, CURE_AA.0484, CURE_AA.0713, CURE_AA.1018
Quercus gambelii – Prunus virginiana Shrubland	CEGL005994	13	CURE_AA.0093, CURE_AA.0191, CURE_AA.0237, CURE_AA.0295, CURE_AA.0435, CURE_AA.0440, CURE_AA.0444, CURE_AA.0446, CURE_AA.0550, CURE_AA.0617, CURE_AA.0689, CURE_AA.0714, CURE_AA.1453
Quercus gambelii / Amelanchier alnifolia Shrubland	CEGL001109	15	CURE.0195, CURE.0247, CURE.0298, CURE_AA.0088, CURE_AA.0140, CURE_AA.0149, CURE_AA.0156, CURE_AA.0270, CURE_AA.0374, CURE_AA.0407, CURE_AA.0474, CURE_AA.0601, CURE_AA.0607, CURE_AA.0659, CURE_AA.0711
Quercus gambelii / Amelanchier utahensis Shrubland	CEGL001110	22	CURE.0270, CURE.0293, CURE_AA.0128, CURE_AA.0141, CURE_AA.0278, CURE_AA.0285, CURE_AA.0297, CURE_AA.0343, CURE_AA.0415, CURE_AA.0679, CURE_AA.0686, CURE_AA.0712, CURE_AA.0809, CURE_AA.0813, CURE_AA.0863, CURE_AA.0866, CURE_AA.0867, CURE_AA.0959, CURE_AA.1061, CURE_AA.1087, CURE_AA.1147, CURE_AA.1151
Quercus gambelii / Artemisia tridentata Shrubland	CEGL001111	11	CURE.0018, CURE.0027, CURE.0068, CURE.0074, CURE.0081, CURE.0101, CURE.0114, CURE.0154, CURE.0226, CURE.0280, CURE.0290
Quercus gambelii / Carex geyeri Shrubland [Provisional]	CEGL005995	9	CURE_AA.0422, CURE_AA.0460, CURE_AA.0513, CURE_AA.0570, CURE_AA.0648, CURE_AA.0702, CURE_AA.0830, CURE_AA.0862, CURE_AA.1452

Plant Association Scientific Name	Element Code	No. of Samples	Supporting Plot, Observation Point, and AA Point Assignments
Quercus gambelii / Festuca thurberi Shrubland	CELG002805	3	CURE.0086, CURE.0087, CURE.0206
Quercus gambelii / Poa fendleriana Shrubland	CEGL002949	3	CURE.0036, CURE.0091, CURE.0131
Quercus gambelii / Rhus trilobata Shrubland	CELG002805	2	CURE_AA.0017, CURE_AA.0767
Quercus gambelii / Symphoricarpos oreophilus Shrubland	CEGL001117	15	CURE.0113, CURE.0264, CURE.0292, CURE_AA.0110, CURE_AA.0114, CURE_AA.0117, CURE_AA.0230, CURE_AA.0299, CURE_AA.0530, CURE_AA.0590, CURE_AA.0602, CURE_AA.0618, CURE_AA.0632, CURE_AA.0642, CURE_AA.1251
Salix exigua / Mesic Forbs Shrubland	CEGL001202	1	CURE.0175
Salix exigua / Mesic Graminoids Shrubland	CEGL001203	10	CURE.0139, CURE.0174, CURE_AA.0036, CURE_AA.0037, CURE_AA.0048, CURE_AA.0083, CURE_AA.0085, CURE_AA.0086, CURE_AA.0221, CURE_AA.0846
Salix geyeriana / Mesic Forbs Shrubland	CEGL002666	1	CURE.0381
Salix geyeriana / Mesic Graminoids Shrubland	CEGL001210	5	CURE.0312, CURE_AA.0076, CURE_AA.0108, CURE_AA.0816, CURE_AA.1457
Thinopyrum intermedium Semi-natural Herbaceous Vegetation	CEGL002935	1	CURE.0241

Appendix F. Plant Association Descriptions for Curecanti National Recreation Area

NATIONAL VEGETATION CLASSIFICATION

Vegetation Associations of Curecanti National Recreation Area

24 June 2010

by

NatureServe

1101 Wilson Blvd., 15th floor
Arlington, VA 22209

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This subset of the International Ecological Classification Standard covers vegetation associations of Curecanti National Recreation Area. This classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Comments and suggestions regarding the contents of this subset should be directed to Mary J. Russo, Central Ecology Data Manager, Durham, NC mary_russo@natureserve.org, and/or Keith Schulz, Vegetation Ecologist, Boulder, CO keith_schulz@natureserve.org.

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[1] NatureServe is an international organization including NatureServe regional offices, a NatureServe central office, U.S. State Natural Heritage Programs, and Conservation Data Centres (CDC) in Canada and Latin America and the Caribbean. Ecologists from the following organizations have contributed the development of the ecological systems classification:

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Central NatureServe Office, Arlington, VA; Eastern Regional Office, Boston, MA; Midwestern Regional Office, Minneapolis, MN; Southeastern Regional Office, Durham, NC; Western Regional Office, Boulder, CO; Alabama Natural Heritage Program, Montgomery AL; Alaska Natural Heritage Program, Anchorage, AK; Arizona Heritage Data Management Center, Phoenix AZ; Arkansas Natural Heritage Commission Little Rock, AR; Blue Ridge Parkway, Asheville, NC; California Natural Heritage Program, Sacramento, CA; Colorado Natural Heritage Program, Fort Collins, CO; Connecticut Natural Diversity Database, Hartford, CT; Delaware Natural Heritage Program, Smyrna, DE; District of Columbia Natural Heritage Program/National Capital Region Conservation Data Center, Washington DC; Florida Natural Areas Inventory, Tallahassee, FL; Georgia Natural Heritage Program, Social Circle, GA; Great Smoky Mountains National Park, Gatlinburg, TN; Gulf Islands National Seashore, Gulf Breeze, FL; Hawaii Natural Heritage Program, Honolulu, Hawaii; Idaho Conservation Data Center, Boise, ID; Illinois Natural Heritage Division/Illinois Natural Heritage Database Program, Springfield, IL; Indiana Natural Heritage Data Center, Indianapolis, IN; Iowa Natural Areas Inventory, Des Moines, IA; Kansas Natural Heritage Inventory, Lawrence, KS; Kentucky Natural Heritage Program, Frankfort, KY; Louisiana Natural Heritage Program, Baton Rouge, LA; Maine Natural Areas Program, Augusta, ME; Mammoth Cave National Park, Mammoth Cave, KY; Maryland Wildlife & Heritage Division, Annapolis, MD; Massachusetts Natural Heritage & Endangered Species Program, Westborough, MA; Michigan Natural Features Inventory, Lansing, MI; Minnesota Natural Heritage & Nongame Research and Minnesota County Biological Survey, St. Paul, MN; Mississippi Natural Heritage Program, Jackson, MI; Missouri Natural Heritage Database, Jefferson City, MO; Montana Natural Heritage Program, Helena, MT; National Forest in North Carolina, Asheville, NC; National Forests in Florida, Tallahassee, FL; National Park Service, Southeastern Regional Office, Atlanta, GA; Navajo Natural Heritage Program, Window Rock, AZ; Nebraska Natural Heritage Program, Lincoln, NE; Nevada Natural Heritage Program, Carson City, NV; New Hampshire Natural Heritage Inventory, Concord, NH; New Jersey Natural Heritage Program, Trenton, NJ; New Mexico Natural Heritage Program, Albuquerque , NM; New York Natural Heritage Program, Latham, NY; North Carolina Natural Heritage Program, Raleigh, NC; North Dakota Natural Heritage Inventory, Bismarck, ND; Ohio Natural Heritage Database, Columbus, OH; Oklahoma Natural Heritage Inventory, Norman, OK; Oregon Natural Heritage Program, Portland, OR; Pennsylvania Natural Diversity Inventory, PA; Rhode Island Natural Heritage Program, Providence, RI; South Carolina Heritage Trust, Columbia, SC; South Dakota Natural Heritage Data Base, Pierre, SD; Tennessee Division of Natural Heritage, Nashville, TN; Tennessee Valley Authority Heritage Program, Norris, TN; Texas Conservation Data Center, San Antonio, TX; Utah Natural Heritage Program, Salt Lake City, UT; Vermont Nongame & Natural Heritage Program, Waterbury, VT; Virginia Division of Natural Heritage, Richmond, VA; Washington Natural Heritage Program, Olympia, WA; West Virginia Natural Heritage Program, Elkins, WV; Wisconsin Natural Heritage Program, Madison, WI; Wyoming Natural Diversity Database, Laramie, WY

Canada
Alberta Natural Heritage Information Centre, Edmonton, AB, Canada; Atlantic Canada Conservation Data Centre, Sackville, New Brunswick, Canada; British Columbia Conservation Data Centre, Victoria, BC, Canada; Manitoba Conservation Data Centre. Winnipeg, MB, Canada; Ontario Natural Heritage Information Centre, Peterborough, ON, Canada; Quebec Conservation Data Centre, Quebec, QC, Canada; Saskatchewan Conservation Data Centre, Regina, SK, Canada; Yukon Conservation Data Centre, Yukon, Canada

Latin American and Caribbean
Centro de Datos para la Conservacion de Bolivia, La Paz , Bolivia; Centro de Datos para la Conservacion de Colombia, Cali,Valle, Columbia; Centro de Datos para la Conservacion de Ecuador, Quito, Ecuador; Centro de Datos para la Conservacion de Guatemala, Ciudad de Guatemala , Guatemala; Centro de Datos para la Conservacion de Panama, Querry Heights , Panama; Centro de Datos para la Conservacion de Paraguay, San Lorenzo , Paraguay; Centro de Datos para la Conservacion de Peru, Lima, Peru; Centro de Datos para la Conservacion de Sonora, Hermosillo, Sonora , Mexico; Netherlands Antilles Natural Heritage Program, Curacao , Netherlands Antilles; Puerto Rico-Departmento De Recursos Naturales Y Ambientales, Puerto Rico; Virgin Islands Conservation Data Center, St. Thomas, Virgin Islands.

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Picea pungens / Mahonia repens Forest

Blue Spruce / Creeping Oregon-grape Forest

CODE	CEGL000395
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
ALLIANCE	*PICEA PUNGENS* FOREST ALLIANCE (A.165) Blue Spruce Forest Alliance
ECOLOGICAL SYSTEM(S):	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825)
USFWS WETLAND SYSTEM:	Not applicable

CONCEPT SUMMARY

Globally

These forests occur at middle elevations of 2380 to 2740 m (7800-9000 feet) in mountains and plateaus of the central and southern Rocky Mountains and Colorado Plateau, with low-elevation sites often associated with drainages and seeps. These forests occur on a variety of aspects, on cool, gentle to very steep slopes and benches, sometimes in relatively mesic concave areas. Substrates are colluvium, residuum and less commonly alluvium. Soils are often well-drained, gravelly, sandy to clay loams. Surface rock is often moderately high, with litter/duff cover variable. These forests are characterized by the dominance or codominance of *Picea pungens* in the open to moderately dense forest canopy and usually represent a mesic phase of the mixed conifer forests of the southern Rocky Mountains and Colorado Plateau. Other conifers are usually present in these stands, depending upon geographic location, site moisture, and stand history. *Pseudotsuga menziesii* is the most common associate, but others include *Abies lasiocarpa, Pinus ponderosa, Pinus flexilis, Pinus contorta* (northern stands only), and *Juniperus scopulorum*. *Populus tremuloides* is the only widespread deciduous associate. The diagnostic low-shrub layer usually has moderately dense cover and is dominated by the cold-deciduous species *Mahonia repens*, often with *Arctostaphylos uva-ursi* and *Juniperus communis* present. Other shrub species present may include *Acer glabrum, Artemisia tridentata* ssp. *vaseyana, Ceanothus velutinus, Chrysothamnus viscidiflorus, Paxistima myrsinites, Purshia tridentata, Quercus gambelii, Ribes cereum, Rosa woodsii, Shepherdia canadensis*, and *Symphoricarpos oreophilus*. The herbaceous layer is generally sparse, except along drainages, but is usually a diverse mixture of forbs and graminoids. Adjacent vegetation is usually *Pinus ponderosa - Pseudotsuga menziesii* forests at the upslope margin and herbaceous or woody riparian communities where this vegetation grades into streamside wetlands.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is rare to uncommon in the recreation area and was sampled on the hill above Morrow Point Reservoir and near the Ponderosa Campground, above Soap Creek. It may be found on similar sites throughout the project area.

Globally

This forest association occurs at middle elevations in mountains and plateaus of the central (Uinta Mountains) and southern Rocky Mountains and the Colorado Plateau.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This forest association occurs near seeps in midslope positions. The sites are moderately steep (20-44% slope), occur between 2315 and 2426 m elevation, and have northerly aspects. The unvegetated surface has high cover of litter. Parent material is Quaternary alluvium. Soils are well-drained loamy sands to loams.

Globally
These forests occur at middle elevations of 2380 to 2740 m (7800-9000 feet) in mountains and plateaus of the central and southern Rocky Mountains and the Colorado Plateau, with low-elevation sites often associated with drainages and seeps. These forests occur on a variety of aspects, on cool, gentle to very steep slopes and benches, sometimes in relatively mesic concave areas. Substrates are colluvium, residuum and less commonly alluvium. They are typically of non-igneous parent materials (Youngblood and Mauk 1985). Parent materials include limestone, dolomite, sandstone, basalt, andesite, quartzite, and other weakly calcareous to noncalcareous sedimentary rocks (Mauk and Henderson 1984, Youngblood and Mauk 1985). Soils are often well-drained, gravelly, sandy to clay loams. Surface rock is often moderately high, with litter/duff cover variable.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 88% to more than 100% in this type. *Picea pungens* forms an open to moderately closed canopy 10-35 m tall that provides 25 to 50% cover. The canopy trees *Populus tremuloides* and *Pseudotsuga menziesii* also provide sparse cover. A 5- to 15-m tall subcanopy stratum of *Picea pungens* and sparse cover by *Juniperus scopulorum* and *Populus tremuloides* are present in one stand. The shrub layer is diverse and provides low to moderate cover. The dwarf-shrub *Mahonia repens* provides sparse cover. Other shrubs commonly present include *Quercus gambelii, Arctostaphylos uva-ursi, Artemisia tridentata* ssp. *vaseyana, Chrysothamnus viscidiflorus, Juniperus communis, Paxistima myrsinites, Purshia tridentata, Ribes inerme, Rosa woodsii*, and *Symphoricarpos rotundifolius*. The herbaceous layer is diverse and provides low to moderate cover. Graminoids provide moderate cover and include *Achnatherum lettermanii, Bromus porteri, Carex geyeri, Festuca thurberi, Juncus balticus, Hesperostipa comata*, and *Poa fendleriana*. Forbs provide sparse to low cover and include *Achillea millefolium var. occidentalis, Arenaria congesta, Cirsium arvense, Galium boreale, Geranium viscosissimum, Ligusticum porteri, Maianthemum stellatum, Mertensia ciliata*, and *Vicia americana*. Moss species provide up to 5% cover.

Globally
These forests are characterized by the dominance or codominance of *Picea pungens* in the open to moderately dense forest canopy and usually represent a mesic phase of the mixed conifer forests of the southern Rocky Mountains and Colorado Plateau. Other conifers are usually present in these stands, depending upon geographic location, site moisture, and stand history. *Pseudotsuga menziesii* is the most common associate, but others include *Abies lasiocarpa, Pinus ponderosa, Pinus flexilis, Pinus contorta* (northern stands only), and *Juniperus scopulorum* (Mauk and Henderson 1984, Youngblood and Mauk 1985). *Populus tremuloides* is the only widespread deciduous associate. The diagnostic low-shrub layer usually has moderately dense cover and is dominated by the cold-deciduous species *Mahonia repens*, often with *Arctostaphylos uva-ursi* and *Juniperus communis* present. Other shrub species present may include *Acer glabrum, Artemisia tridentata* ssp. *vaseyana, Ceanothus velutinus, Chrysothamnus viscidiflorus, Paxistima myrsinites, Purshia tridentata, Quercus gambelii, Ribes cereum, Rosa woodsii, Shepherdia canadensis*, and *Symphoricarpos oreophilus* (Mauk and Henderson 1984, Youngblood and Mauk 1985). The herbaceous layer is generally sparse, except along drainages, but is usually a diverse mixture of forbs and graminoids, including *Achillea millefolium, Achnatherum lettermanii, Arenaria congesta, Arnica cordifolia, Astragalus miser, Bromus porteri, Carex geyeri, Carex rossii, Erigeron eximius, Festuca thurberi, Fragaria virginiana, Galium boreale, Geranium* spp., *Hesperostipa comata, Linnaea borealis, Mertensia ciliata, Poa fendleriana, Thalictrum fendleri*, and *Vicia americana*. Adjacent vegetation is usually *Pinus ponderosa - Pseudotsuga menziesii* forests at the upslope margin and herbaceous or woody riparian communities where this vegetation grades into streamside wetlands.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Picea pungens*
Tree canopy	*Populus tremuloides*
Tall shrub/sapling	*Quercus gambelii*
Short shrub/sapling	*Ribes inerme*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Carex geyeri, Festuca thurberi*

Globally

Stratum	Species
Tree canopy	*Picea pungens*, *Pinus ponderosa*, *Pseudotsuga menziesii*
Tree canopy	*Populus tremuloides*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Mahonia repens*
Herb (field)	*Carex geyeri*, *Carex rossii*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Cirsium arvense* (exotic noxious weed, High/Medium), *Poa pratensis* (exotic, Medium), *Taraxacum officinale* (exotic).

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association is closely aligned with *Picea pungens / Arctostaphylos uva-ursi* Forest (CEGL000385) and *Picea pungens / Juniperus communis* Forest (CEGL000392). The presence and abundance of *Arctostaphylos uva-ursi* keys to the former, while presence and abundance of *Juniperus communis* and lack of *Mahonia repens* keys to the later.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: More quantitative data are needed to define this association locally, especially to clarify the dominant understory species. When this stand was sampled, a plot size of 10 x 50 square meters was used. This may have led to sampling of the margins of the site and inclusion of ecotonal species.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0033, CURE.0229, and three observation points: CURE_AA.0001, CURE_AA.0007).
Local Description Authors: J. Von Loh, mod. G. Bradshaw and K.A. Schulz
Global Description Authors: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Graybosch and Buchanan 1983, Kerr and Henderson 1979, Mauk and Henderson 1984, Pfister 1972, Western Ecology Working Group n.d., Youngblood and Mauk 1985

Pseudotsuga menziesii / Acer glabrum Forest

Douglas-fir / Rocky Mountain Maple Forest

CODE	CEGL000418
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
ALLIANCE	*PSEUDOTSUGA MENZIESII* FOREST ALLIANCE (A.157) Douglas-fir Forest Alliance

ECOLOGICAL SYSTEM(S): Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This montane forest association occurs in the montane zone in the southern, central and northern Rocky Mountains. Elevations vary from 1465 to 2654 m (4800-8700 feet). Sites are cool and moist, generally occurring on northern or eastern aspects, on steep, mid to lower slopes, and ravines or stream bottoms where cold-air drainage is a factor. Substrates are variable and may be gravelly or not, with soil texture ranging from sandy loam to clay derived from colluvium. The vegetation is characterized by a *Pseudotsuga menziesii*-dominated tree canopy with *Acer glabrum* dominating or codominating the understory. The evergreen needle-leaved tree canopy is generally moderately dense to dense (50-80% cover). Mature seral tree species such as *Pinus contorta, Pinus flexilis, Pinus ponderosa, Larix occidentalis, Populus angustifolia*, or *Populus tremuloides* may be present to codominant. *Abies concolor* is typically absent. The tall-shrub layer is open (patchy) to moderately dense and dominated or codominated by *Acer glabrum* with other tall shrubs such as *Amelanchier alnifolia, Cornus sericea, Quercus gambelii, Prunus virginiana, Sorbus scopulina, Spiraea betulifolia*, or *Salix scouleriana*. An open to moderately dense short-shrub layer is usually present and often dominated by *Physocarpus malvaceus* with other species such as *Lonicera utahensis, Mahonia repens, Paxistima myrsinites, Rosa* spp., *Ribes cereum, Symphoricarpos albus*, or *Symphoricarpos oreophilus*. The vine *Clematis columbiana* may also be present in small amounts. In some stands the tall- and short-shrub layers are not distinct. Herbaceous layer generally has low cover and is composed of diverse forbs with graminoids present to codominant.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is uncommon in the Curecanti National Recreation Area and was sampled at Morrow Point Reservoir and on the streambank south of the Colorado State Highway 92 hairpin.

Globally

This forest association occurs in the montane zone in the southern, central and northern Rocky Mountains from northern Colorado, through Utah, Wyoming, and Idaho, extending into Oregon and Alberta, and possibly Montana.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This mesic forest association is found on banks of streams and reservoirs. Sites are steep (about 30-degree slopes), occur between 2209 and 2642 m elevation, and are oriented to northerly aspects. The unvegetated ground surface is rocky with variable cover of litter and bare ground.

Globally

This montane forest association occurs in the montane zone in the southern, central and northern Rocky Mountains. Elevations vary from 1465 to 2654 m (4800-8700 feet). Sites are cool and moist, generally occurring on northern or eastern aspects, on steep, mid to lower slopes, and ravines or stream bottoms where cold-air drainage is a factor. Substrates are variable and may be gravelly or not, with soil texture ranging from sandy loam to clay derived from colluvium. Parent materials include loess, basalt, diorite, dolomite, limestone, granite, quartz monzonite or

sandstone. Ground surface has high cover of litter 3-7 cm deep, sometimes with significant cover of rock, and low cover of bare soil.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This mesic Douglas-fir association is rare in the park. The open to moderately dense (10-25% cover) tree canopy is dominated by 10- to 15-m tall *Pseudotsuga menziesii* with *Populus tremuloides* present to codominant. *Acer glabrum* dominates the tall-shrub layer with between 5 and 15% cover. The remaining shrub and dwarf-shrub cover is variable and may include *Alnus incana, Amelanchier alnifolia, Holodiscus dumosus, Mahonia repens, Prunus virginiana, Ribes inerme, Rosa woodsii, Rubus idaeus, Salix scouleriana, Sambucus racemosa*, and *Symphoricarpos oreophilus*. *Quercus gambelii*, if present, has less than 5% cover. The herbaceous layer provides sparse cover because of the dense shade cast by the canopy. Common graminoid or forb species include *Agrostis scabra, Angelica ampla, Carex geyeri, Erigeron speciosus, Helianthella uniflora, Heracleum maximum (= Heracleum lanatum), Thalictrum fendleri*, and *Urtica dioica* ssp. *gracilis (= Urtica dioica var. procera)*; exotics *Phleum pratense* and *Poa pratensis* provide less than 10% total cover. Mosses are present with less than 5% cover.

Globally

This minor Rocky Mountain conifer association is characterized by a *Pseudotsuga menziesii*-dominated tree canopy with *Acer glabrum* dominating or codominating the understory. The evergreen needle-leaved tree canopy is generally moderately dense to dense (50-80% cover), although occasionally the cover will be as low as 15%. Mature seral tree species such as *Pinus contorta, Pinus flexilis, Pinus ponderosa, Larix occidentalis, Populus angustifolia*, or *Populus tremuloides* may be present to codominant. *Abies concolor* is typically absent. The tall-shrub layer is open (patchy) to moderately dense and dominated or codominated by *Acer glabrum* with other tall shrubs such as *Amelanchier alnifolia, Cornus sericea, Quercus gambelii, Prunus virginiana, Sorbus scopulina, Spiraea betulifolia*, or *Salix scouleriana*. An open to moderately dense short-shrub layer is usually present and often dominated by *Physocarpus malvaceus* with other species such as *Holodiscus dumosus, Lonicera utahensis, Mahonia repens, Paxistima myrsinites, Prunus virginiana, Rosa* spp., *Ribes cereum, Ribes inerme, Sambucus racemosa, Symphoricarpos albus*, or *Symphoricarpos oreophilus*. The vine *Clematis columbiana* may also be present in small amounts. In some stands the tall- and short-shrub layers are not distinct. Herbaceous layer generally has low cover and is composed of diverse forbs with graminoids present to codominant. Species may include *Agrostis scabra, Arnica cordifolia, Calamagrostis rubescens, Carex geyeri, Cystopteris fragilis, Elymus glaucus, Erigeron speciosus, Heracleum maximum (= Heracleum lanatum), Eurybia conspicua, Fragaria vesca, Galium triflorum, Mitella stauropetala, Moehringia macrophylla (= Arenaria macrophylla),Osmorhiza berteroi (= Osmorhiza chilensis), Penstemon wilcoxii, Poa nervosa, Maianthemum racemosum* ssp. *amplexicaule, Thalictrum fendleri*, or *Thalictrum occidentale*.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree (canopy & subcanopy)	*Pseudotsuga menziesii*
Tree subcanopy	*Populus tremuloides*
Tall shrub/sapling	*Acer glabrum, Amelanchier alnifolia, Sambucus racemosa*
Short shrub/sapling	*Prunus virginiana, Salix scouleriana, Symphoricarpos oreophilus*
Herb (field)	*Angelica ampla, Erigeron speciosus*

Globally

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Tall shrub/sapling	*Acer glabrum*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Phleum pratense* (exotic, Medium), *Poa pratensis* (exotic, Medium)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G4? (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
All phases of the *Pseudotsuga menziesii / Acer glabrum* Habitat Type are included in the concept of this association (Steele et al. 1981, 1983, Mauk and Henderson 1984).

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (one plot: CURE.0186, and two observation points observation points: CURE_AA.0521, CURE_AA.0742).
Local Description Authors: K.A. Schulz
Global Description Authors: K.A. Schulz, mod. G. Kittel and J. Coles

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Driscoll et al. 1984, Henderson et al. 1976, Johnson and Simon 1987, Johnston 1987, Jones and Ogle 2000, Kagan et al. 2000, Mauk and Henderson 1984, Steele et al. 1981, Steele et al. 1983, Titus et al. 1998, Western Ecology Working Group n.d.

Pseudotsuga menziesii / Amelanchier alnifolia Forest

Douglas-fir / Saskatoon Serviceberry Forest

CODE	CEGL000420
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
ALLIANCE	*PSEUDOTSUGA MENZIESII* FOREST ALLIANCE (A.157) Douglas-fir Forest Alliance
ECOLOGICAL SYSTEM(S):	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This association has been reported from colluvial slopes, ridges, mountains and canyon walls in northwestern Colorado, northwestern Wyoming and central Montana. In the northern part of its range, stands occur on warm, southerly slopes, whereas in Colorado the type is restricted to cold north-facing slopes. Slopes range from moderate to very steep (over 100%); elevations range from 1220 m in Montana to more than 2250 m in Colorado (4000-8350 feet). Soils are gravelly loams and sandy loams derived from granite or sandstone and often are very rocky. Litter and duff cover much of the unvegetated ground surface. *Pseudotsuga menziesii* dominates the tree canopy of this association with at least 20% cover, except in Montana, where cover may be as low as 5%. Other trees, such as *Pinus albicaulis, Pinus flexilis, Pinus ponderosa, Populus tremuloides*, or *Juniperus scopulorum*, may be present to codominant. In younger stands, these species may have higher cover than *Pseudotsuga menziesii*. *Abies concolor* is

typically absent. The shrub layer is often dense. Dominant shrubs in the understory include *Amelanchier alnifolia, Prunus virginiana, Spiraea betulifolia,* and *Symphoricarpos* spp., as well as lesser amounts of *Rosa* spp., *Ribes* spp, *Juniperus communis, Mahonia repens,* and *Paxistima myrsinites*. Graminoids are rare to abundant; *Pseudoroegneria spicata, Bromus carinatus, Achnatherum lettermanii, Elymus trachycaulus, Carex geyeri,* and *Agrostis scabra* are common species. Common forbs include *Eurybia conspicua (= Aster conspicuus), Eucephalus engelmannii, Helianthella uniflora, Fragaria virginiana, Symphyotrichum ascendens,* and *Maianthemum racemosum*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association was sampled in the recreation area west of Lake Fork, west of Cebolla Arm, west of Colorado State Highway 92, north of Ute Mountain Indian Reservation, and south of Blue Mesa Reservoir near Dillon Pinnacles.

Globally
This association is known from just north of Grand Teton National Park in Wyoming, from Dinosaur National Monument in northwestern Colorado and from the Bear's Paw Mountains of the Montana Isolated Mountain Ranges Subsection of the Northwestern Glaciated Plains Section (Roberts 1980).

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This forest association is found on mid- to upper slopes of hills, benches, gullies and drainage banks. Sites are gentle or more typically steep, ranging from 5- to 38-degree slopes on cooler northwest-northeast aspects between 2325 and 2523 m elevation. The unvegetated ground surface is often rocky, sometimes with high cover of litter.

Globally
This association has been reported from colluvial slopes, ridges, mountains and canyon walls in northwestern Colorado, northwestern Wyoming and central Montana. In the northern part of its range, stands occur on warm, southerly slopes, whereas in Colorado it is restricted to cold north-facing slopes. Slopes range from moderate to very steep (over 100%); elevations range from 1220 m in Montana to more than 2250 m in Colorado (4000-8350 feet). Mean annual precipitation is about 40-50 cm in Montana (Soil Conservation Service 1981b). Soils are gravelly loams and sandy loams with a slightly acidic reaction and often are very rocky. Litter and duff cover much of the unvegetated ground surface. Parent materials include granite and sandstone.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This mesic Douglas-fir association has an open to moderately dense (10-40% cover) tree canopy and is strongly dominated by 5- to 15-m tall *Pseudotsuga menziesii,* with low cover of *Abies concolor, Picea pungens,* and *Populus tremuloides* present in one stand. *Abies concolor* is typically absent in this association but was included because *Abies concolor* cover was low (<5%) and considered "accidental" for the type. The open to moderately dense shrub layer is dominated by *Amelanchier alnifolia* with between 5 and 20% cover. The remaining shrub and dwarf-shrub cover is variable and commonly includes *Mahonia repens, Prunus virginiana, Ribes cereum,* and *Symphoricarpos oreophilus*. Other shrubs present may include *Artemisia tridentata* ssp. *wyomingensis, Cercocarpus montanus, Cornus sericea, Holodiscus dumosus, Purshia tridentata, Ribes inerme,* or *Rosa woodsii*. *Quercus gambelii,* if present, has less than 5% cover. The herbaceous layer has sparse to low cover (1-15%) because of the dense shade cast by the tree and shrub canopies. *Poa fendleriana* is the most frequent graminoid. Other graminoid or forb species include *Bromus anomalus, Carex geyeri, Solidago canadensis, Achnatherum nelsonii (= Stipa nelsonii),* and the introduced forage species *Agrostis stolonifera*.

Globally
Pseudotsuga menziesii dominates the tree canopy of this association with at least 20% cover, except in Montana, where cover may be as low as 5%. Other trees, such as *Pinus albicaulis, Pinus flexilis, Pinus ponderosa, Populus tremuloides,* or *Juniperus scopulorum,* may be present to codominant. In younger stands, these species may have higher cover than *Pseudotsuga menziesii*. *Abies concolor* is typically absent. The shrub layer is often dense. Dominant shrubs in the understory include *Amelanchier alnifolia* (5-30% cover), *Prunus virginiana* (5-15%), *Spiraea betulifolia* (0-15%), and *Symphoricarpos* spp. (3-10%), as well as lesser amounts of *Rosa* spp., *Ribes* spp, *Juniperus communis, Mahonia repens,* and *Paxistima myrsinites*. Graminoids are rare to abundant; *Pseudoroegneria spicata, Bromus carinatus, Achnatherum lettermanii, Elymus trachycaulus, Carex geyeri,* and *Agrostis scabra* are

common species. Common forbs include *Eurybia conspicua (= Aster conspicuus), Eucephalus engelmannii, Helianthella uniflora, Fragaria virginiana, Symphyotrichum ascendens*, and *Maianthemum racemosum*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Tree subcanopy	*Populus tremuloides*
Tall shrub/sapling	*Amelanchier alnifolia, Sambucus racemosa*
Short shrub/sapling	*Prunus virginiana, Ribes cereum, Symphoricarpos oreophilus*
Herb (field)	*Mahonia repens*
Herb (field)	*Solidago canadensis*

Globally

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Short shrub/sapling	*Amelanchier alnifolia*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic species: *Agrostis stolonifera* (G5)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G2Q (6-Jul-2005). The rank for this type needs to be reviewed. This association has now been described from the Bear's Paw Mountains of central Montana, as well as from Grand Teton National Park and Dinosaur National Monument. It appears to be restricted to steep, rocky slopes with northerly aspects and elevations ranging from 1220 m to more than 2250 m (4000-8350 feet). Stands tend to be relatively small and somewhat isolated. It is possible that seral stages of other climax associations may pass through a stage that compositionally overlaps with *Pseudotsuga menziesii / Amelanchier alnifolia* Forest (CEGL000420), but their site parameters would differ. Potential threats to this type include logging, firewood cutting, wildfire, and ungulate browsing (*Amelanchier alnifolia* is a highly preferred browse species). Fire on these slopes is followed by bunchgrass- and then tall shrub-dominated structural/seral stages, with more than 80 years post-fire required to attain the current forest structure.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Abies concolor is typically absent in *Pseudotsuga menziesii* stands. However, in one accuracy assessment plot (CURE_AA.1054), a small amount (1-5% cover) of *Abies concolor* was recorded in the subcanopy and was viewed as "accidental" and not typical of the stand, so the plot was classified as a *Pseudotsuga menziesii* association. *Abies concolor* is on the northern edge of its range in Curecanti National Recreation Area. The Curecanti plots were strongly dominated by *Pseudotsuga menziesii*, with *Pinus ponderosa* absent or at low cover in these plots.

Globally
Roberts' (1980) 5 stands are in a relatively early-seral stage, dominated by *Pinus ponderosa* (average cover 38%), with a constant presence of *Pseudotsuga menziesii* with average cover of only 5%. The Grand Teton and Dinosaur plots have no ponderosa pine, but do have other pines and early-seral species. To better fit with the NatureServe concept of plant associations as existing vegetation, it is suggested that we place the Roberts type in *Pinus ponderosa / Amelanchier alnifolia* Woodland (CEGL000840).

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Two AA points (CURE_AA.1058 and CURE_AA.0752) have 30% *Quercus gambelii* shrub understory in adjacent plots.

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (7 observation points: CURE_AA.0116, CURE_AA.0752, CURE_AA.0774, CURE_AA.0886, CURE_AA.0967, CURE_AA.1054, CURE_AA.1058).
Local Description Authors: K.A. Schulz
Global Description Authors: P. Lesica and S.V. Cooper, mod. G. Kittel and J. Coles

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Fischer and Clayton 1983, MTNHP 2002b, Pfister et al. 1977, Roberts 1980, Soil Conservation Service 1981b, Western Ecology Working Group n.d.

Pseudotsuga menziesii / Carex geyeri Forest

Douglas-fir / Geyer's Sedge Forest

CODE	CEGL000430
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
ALLIANCE	*PSEUDOTSUGA MENZIESII* FOREST ALLIANCE (A.157) Douglas-fir Forest Alliance
ECOLOGICAL SYSTEM(S):	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823) Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805)
USFWS WETLAND SYSTEM:	Not applicable

CONCEPT SUMMARY
Globally
This association has been found in the montane zone of the Rocky Mountains of Colorado, Idaho, Montana, Oregon and Washington. Stands occur at lower montane elevations of these mountainous regions, on sites typically drier than most other *Pseudotsuga menziesii* associations. Site slope and aspect vary greatly. Slopes where this association is found in Colorado are reported to be steep to very steep (45-80%). Parent materials include granitics, conglomerates, sandstones, basalts, and shales. Exposed bare ground is low (less than 30%), and litter/duff is relatively thin, usually less than 5 cm deep. Vegetation is characterized by the dominance of *Pseudotsuga menziesii*, with a relatively closed canopy, as well as stands that are more open or have a mixed conifer tree canopy. *Pseudotsuga* is self-regenerating in this association. Several other conifers may be present to codominant, including *Pinus ponderosa* or *Juniperus scopulorum* in southern Rocky Mountain stands, and *Abies lasiocarpa, Pinus albicaulis, Pinus contorta,* or *Populus tremuloides* in stands farther north. These species are typically present only in early-seral stands of this association. There is no shrub layer, although several shrub species are typically present with low cover. These include the evergreen needle-leaved *Juniperus communis* and the broad-leaved cold-deciduous *Amelanchier alnifolia, Lonicera utahensis, Mahonia repens, Paxistima myrsinites, Purshia tridentata, Spiraea betulifolia, Vaccinium membranaceum, Vaccinium scoparium,* and *Symphoricarpos occidentalis* or *Symphoricarpos oreophilus*. The herbaceous layer is dominated by the perennial sedge *Carex geyeri* (averaging 35% cover). No other herbaceous species are well-represented, but many different forbs can occur in low amounts.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association is common in the recreation area and was sampled near the Curecanti Creek Trail, near Crystal Trail, Crystal Trail at Bear Trap Gulch, and along the west side of Cimarron Point in the Curecanti National Recreation Area, and the Blue Creek area of Gunnison National Forest.

Globally
This association has been found in the montane zone throughout much of the Rocky Mountains from Colorado to Montana, and west into Oregon and Washington.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This forest association occurs on slopes in drainages, gulches, ridges, mesas and canyons. Sites are steep (53-68% slopes), occur between 2418 and 2649 m elevation, and are oriented to northern aspects. The unvegetated surface has moderate to high cover of litter and downed wood. Low to moderate cover of large and small rocks is common. Litter (0.7-8.0 cm deep) and duff (0-10.0 cm deep) depth were measured. Parent materials are Tertiary volcanic rocks and metamorphic/granitic rocks. Soils are rapidly drained sandy loams and silty clay loams.

Globally

This association has been found throughout much of the Rocky Mountains. Stands occur at lower montane elevations of these mountainous regions, on sites typically drier than most other *Pseudotsuga menziesii* associations. Elevations range from 1480-1500 m (4854-4920 feet) in Alberta, to 1860-2315 m (6100-7600 feet) in southern Montana, 2315-2800 m (7600-9200 feet) in central Colorado, and from 1125-2650 m (3700-8700 feet) in Idaho. Slope and aspect of sites vary greatly. Slopes vary from gentle to very steep (3-80%) but are generally moderate to steep (20-45%). Parent materials include granitics, conglomerates, sandstone, siltstone, rhyolite, basalt, and shale. Soils are rapidly drained loamy sand to silty clay loams. Exposed bare ground is low (less than 30%), and litter/duff is relatively thin, usually less than 5 cm deep.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 100 to 130% in this type. *Pseudotsuga menziesii* forms an open to moderately closed canopy 5-20 m high that contributes 5 to 100% cover, and the graminoid *Carex geyeri* provides 5 to 75% cover. The emergent stratum forms an open canopy 10-20 m high of *Pseudotsuga menziesii* and *Pinus ponderosa* trees that provide low to moderate cover. Other canopy trees providing low to moderate cover include *Picea pungens, Populus tremuloides,* and *Juniperus scopulorum.* The subcanopy stratum (2-15 m tall) provides sparse to low cover and includes *Populus tremuloides, Pseudotsuga menziesii*, and *Picea pungens*. The shrub layer is diverse in terms of species composition and provides moderate cover. The tall-shrub layer (1-5 m high) includes *Amelanchier alnifolia, Amelanchier utahensis, Populus tremuloides* saplings, *Pseudotsuga menziesii* saplings, and *Prunus virginiana*. Short and dwarf-shrubs commonly present include *Mahonia repens* and *Symphoricarpos rotundifolius*. The herbaceous layer is moderately diverse and provides moderate to high cover. Additional graminoids include *Bromus porteri* and *Poa fendleriana*. Common forbs include *Antennaria parvifolia, Arnica cordifolia, Galium boreale, Lupinus* sp., *Maianthemum racemosum* ssp. *amplexicaule*, and *Pseudostellaria jamesiana*. Mosses and lichens are often present and provide 1 to 25% and 0 to 25% cover, respectively.

Globally

This is an association dominated by the evergreen needle-leaved tree *Pseudotsuga menziesii*, with a relatively closed canopy. *Pseudotsuga* is self-regenerating in this association. Several other canopy trees may be present, including *Pinus ponderosa, Juniperus scopulorum*, and *Populus tremuloides*, with *Pinus albicaulis, Pinus contorta, Pinus flexilis,* or *Abies lasiocarpa* more typical in stands further north. These species are typically present only in early-seral stands of this association (Steele et al. 1981). It is reported that in some Idaho stands the canopy may be more open, with larger, more widely spaced trees in late-seral stands. There is no shrub layer, although several shrub or dwarf-shrub species are typically present with low cover. These include the evergreen needle-leaved *Juniperus communis* and the broad-leaved, cold-deciduous *Amelanchier* spp., *Dasiphora fruticosa* ssp. *floribunda, Lonicera utahensis, Mahonia repens, Paxistima myrsinites, Prunus virginiana, Purshia tridentata, Spiraea betulifolia, Symphoricarpos occidentalis,* or *Symphoricarpos oreophilus* depending on geographic region. The herbaceous layer is dominated by the perennial sedge *Carex geyeri*. Typically no other herbaceous species are well-represented, but many different forbs can occur in low amounts, including *Fragaria* spp., *Arnica cordifolia, Achillea millefolium , Antennaria parvifolia, Osmorhiza* spp., and *Astragalus* spp. Other graminoids can include *Poa* spp., *Bromus porteri, Carex siccata (= Carex foenea),* and *Calamagrostis rubescens*.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Picea pungens*, *Pinus ponderosa*, *Pseudotsuga menziesii*
Tree canopy	*Populus tremuloides*
Tree subcanopy	*Picea pungens*, *Pseudotsuga menziesii*

Tall shrub/sapling	*Amelanchier alnifolia, Populus tremuloides, Pseudotsuga menziesii*
Short shrub/sapling	*Juniperus communis*
Short shrub/sapling	*Amelanchier alnifolia, Populus tremuloides, Quercus gambelii, Rosa woodsii, Symphoricarpos rotundifolius*
Short shrub/sapling	*Purshia tridentata*
Herb (field)	*Arctostaphylos uva-ursi, Mahonia repens, Paxistima myrsinites*
Herb (field)	*Arenaria congesta, Galium boreale*
Herb (field)	*Bromus porteri, Carex geyeri*

Globally

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Herb (field)	*Carex geyeri*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G4? (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Some stands had an open tree canopy (40% cover) that could be classified as a woodland, but were included in this forest association until review of this association is completed rangewide. Stands included in this association from Colorado may be different from stands in the northwestern United States and northern Rocky Mountains and need to be re-analyzed.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: The fuel loading is moderate to high, particularly for downed limbs and trunks. There is some evidence of past burns. Big game use of the stands is common.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (5 plots: CURE.0077, CURE.0115, CURE.0150, CURE.0165, CURE.0361 and 10 observation points: BLCA_AA.202, BLCA_AA.207, BLCA_AA.278, BLCA_AA.394, BLCA_AA.480, BLCA_AA.903, CURE_AA.0436, CURE_AA.0842, CURE_AA.1005, CURE_AA.1097).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Bell et al. 2009, Bourgeron and Engelking 1994, Boyce 1977, CONHP unpubl. data 2003, Clausnitzer and Zamora 1987, Cooper et al. 1987, Driscoll et al. 1984, Giese 1975, Hess 1981, Hess and Alexander 1986, Johnson and Clausnitzer 1992, Johnston 1987, Jones and Ogle 2000, Kagan et al. 2000, Komarkova et al. 1988a, MTNHP 2002b, Pfister et al. 1977, Steele et al. 1981, Steele et al. 1983, Topik et al. 1988, Western Ecology Working Group n.d., Williams and Smith 1990

Pseudotsuga menziesii / Mahonia repens Forest

Douglas-fir / Creeping Oregon-grape Forest

CODE	CEGL000442
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
ALLIANCE	*PSEUDOTSUGA MENZIESII* FOREST ALLIANCE (A.157) Douglas-fir Forest Alliance
ECOLOGICAL SYSTEM(S):	Middle Rocky Mountain Montane Douglas-fir Forest and Woodland (CES306.959) Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)
USFWS WETLAND SYSTEM:	Not applicable

CONCEPT SUMMARY

Globally

This forest association occurs on dry, often nutrient-poor sites in the southern and central Rocky Mountains and high plateaus of the Colorado Plateau from northern Arizona and New Mexico north through Colorado and Utah into central Idaho, Wyoming and Montana, and extends to the eastern Cascades in Oregon. Stands occur on lower mountain slopes and upper canyon slopes. Elevations range from 1740 to 2930 m (5700-9600 feet) in northern New Mexico, Arizona and Colorado, and 1375 to 2595 m (4500-8500 feet) in Utah, Wyoming and southern Idaho. Soils are variable in texture and parent material but are usually deep and often rocky. The vegetation is representative of closed-canopy stands of *Pseudotsuga menziesii* where most species other than *Mahonia repens* have been shaded out. In some stands, a few individual *Pinus ponderosa, Pinus contorta, Pinus flexilis, Pinus strobiformis, Populus tremuloides*, or *Juniperus scopulorum* may persist in the canopy or subcanopy. The understory may be sparse, with 10% or less total cover, but sometimes will have up to 30% total herbaceous and shrub cover. *Mahonia repens* is the dominant species with at least 1% cover, but other species are usually present with at least trace cover, including *Juniperus communis, Symphoricarpos oreophilus, Paxistima myrsinites*, and *Prunus virginiana*. The herbaceous layer is generally sparse but may include small amounts of graminoids such as *Poa fendleriana, Festuca arizonica, Carex geyeri, Carex rossii*, and scattered forbs such as *Arnica cordifolia, Galium boreale*, and *Thalictrum fendleri*. The mature, older canopy trees in some stands are fire-scarred, indicating that ground-fire activity may be important in stands of this type. Some stands appear to be ponderosa pine woodlands that have filled in within the last 150 years with a closed canopy of Douglas-fir.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association was sampled along Crystal Trail in Curecanti National Recreation Area and in Long Gulch in the Gunnison National Forest.

Globally

This association occurs in dry mountain and canyon sites in northern Arizona and New Mexico, north through central Utah into Oregon and southern Idaho, and east into Wyoming and Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This forest association occurs on the slopes of ridges and in valleys. Sites are very steep (70% slopes), occur around 2675 m elevation, and are oriented to north aspects. The unvegetated surface has high cover of litter and downed wood. Litter (0.3-1.0 cm deep) and duff (0-1.0 cm deep) depths were measured on one stand. Parent materials are metamorphic/granitic rocks. Soils are rapidly drained sandy loams and sandy clay loams.

Globally
This forest occurs on dry, often nutrient-poor sites in northern Arizona and New Mexico north through Colorado and Utah into Idaho, Wyoming and Montana, and extends to the eastern Cascades in Oregon (Cole 1982, Atzet and Wheeler 1984, Mauk and Henderson 1984, Stuever and Hayden 1997b). Stands occur on lower mountain slopes and upper canyon slopes. Elevations range from 2135 to 2595 m (7000-8500 feet) in northern Arizona and New Mexico, 1740 to 2930 m (5700-9600 feet) in Colorado, and 1375 to 2595 m (4500-8500 feet) in Utah, Wyoming and southern Idaho. Soils are variable in texture and parent material but are usually deep and often rocky. Litter and downed wood cover nearly all the unvegetated surface.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 119% to approximately 150% in these stands. *Pseudotsuga menziesii* forms a moderately closed canopy 10-20 m high that contributes 40 to 75% cover, and the dwarf-shrub *Mahonia repens* provides 20 to 50% cover. An emergent layer of 20- to 35-m tall *Pseudotsuga menziesii* trees provides up to 25% cover. *Populus tremuloides* trees provide low cover in the canopy layer. *Pseudotsuga menziesii* trees from 2-10 m tall provide up to 25% cover in the subcanopy layer. The shrub layer has low species diversity and provides moderate cover. Short shrubs and additional dwarf-shrubs include *Amelanchier alnifolia, Paxistima myrsinites, Rosa woodsii*, and *Symphoricarpos rotundifolius*. The herbaceous layer is low in terms of species diversity and provides moderate cover. Graminoid cover, up to 50%, is provided by *Carex geyeri*. Forbs provide sparse cover and include *Arnica cordifolia, Castilleja miniata*, and *Lathyrus lanszwertii*. The vine or liana *Clematis ligusticifolia* also provides sparse cover. Lichens and mosses provide up to 6% cover.

Globally
This association represents closed-canopy stands of *Pseudotsuga menziesii* where most species other than *Mahonia repens* have been shaded out. In some stands, a few individual *Pinus ponderosa, Pinus contorta, Pinus flexilis, Pinus strobiformis, Populus tremuloides*, or *Juniperus scopulorum* may persist in the canopy or subcanopy. The understory may be sparse, with 10% or less total cover, but sometimes will have up to 30% total herbaceous and shrub cover. *Mahonia repens* is the dominant species with at least 1% cover, but other species are usually present with at least trace cover, including *Juniperus communis, Symphoricarpos oreophilus, Paxistima myrsinites*, and *Prunus virginiana*. The herbaceous layer is generally sparse but may include small amounts of *Poa fendleriana, Festuca arizonica, Carex geyeri, Carex rossii, Arnica cordifolia, Maianthemum racemosum (= Smilacina racemosa), Galium boreale, Bromus ciliatus, Clematis columbiana*, and *Thalictrum fendleri*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Tree subcanopy	*Pseudotsuga menziesii*
Tree subcanopy	*Populus tremuloides*
Herb (field)	*Mahonia repens*
Herb (field)	*Arnica cordifolia*
Herb (field)	*Carex geyeri*

Globally

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Herb (field)	*Mahonia repens*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association describes a dry, mature to old-growth, closed-canopy *Pseudotsuga menziesii* forest of the interior western U.S.; earlier seral stages have a more open, mixed canopy and more diversity and cover by shrubs and herbaceous species. *Mahonia repens* is a common understory species in all seral stages of these dry Douglas-fir forests, but usually is mixed with varying amounts of species that are also indicators in other associations. It is not necessarily clear what degree of dominance by *Mahonia repens* versus other diagnostic species (such as *Carex geyeri*, *Paxistima myrsinites*, *Symphoricarpos oreophilus*, or *Juniperus communis*) constitutes a stand of this association. This association is similar to *Pseudotsuga menziesii / Arnica cordifolia* Habitat Type of Pfister et al. (1977) in Montana.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Historic fire created canopy openings resulting in high graminoid cover. Downed wood is common to these stands.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (6 plots: CURE.0098, CURE.0205, CURE.0265, CURE.0267, CURE.0297, CURE.0395 and 6 observation points: BLCA_AA.274, CURE_AA.0135, CURE_AA.0144, CURE_AA.0831, CURE_AA.1095, CURE_AA.1369).
Local Description Authors: J. Von Loh
Global Description Authors: J. Coles, mod. K.A. Schulz

REFERENCES: Alexander et al. 1984b, Atzet and Wheeler 1984, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Cole 1977b, Cole 1982, Driscoll et al. 1984, Hoffman and Alexander 1976, Johnston 1984, Johnston 1987, Jones and Ogle 2000, Kagan et al. 2004, Larson and Moir 1987, MTNHP 2002b, Mauk and Henderson 1984, Pfister et al. 1977, Roberts 1980, Roberts et al. 1992, Steele et al. 1981, Steele et al. 1983, Stuever and Hayden 1997b, Western Ecology Working Group n.d., Youngblood and Mauk 1985

Pseudotsuga menziesii / Quercus gambelii Forest

Douglas-fir / Gambel Oak Forest

CODE	CEGL000452
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
ALLIANCE	*PSEUDOTSUGA MENZIESII* FOREST ALLIANCE (A.157) Douglas-fir Forest Alliance
ECOLOGICAL SYSTEM(S):	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823) Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825)
USFWS WETLAND SYSTEM:	Not applicable

CONCEPT SUMMARY

Globally

This forest association occurs on mountains and plateaus from Colorado to Trans-Pecos Texas, west into New Mexico, Arizona and Utah. Elevation ranges from 1229 to 2870 m (4030-9400 feet). Stands are found along drainages, lower and middle slopes, steep upper slopes and gentle to rolling tops of mesas and ridges. Aspects are variable. This forest occurs as both a non-obligate riparian community on the outer margins of riparian areas in desert canyons and steep draws, and as an upland forest forming extensive stands on typically north-facing hillslopes (southern aspects at higher elevations). Soils vary but are often shallow and rocky, ranging from sand to clay, often derived from sandstone. The vegetation is characterized by a relatively sparse to dense evergreen tree canopy dominated by *Pseudotsuga menziesii*, sometimes with *Quercus gambelii* well-represented in the understory. Scattered large *Pinus ponderosa, Pinus strobiformis, Pinus flexilis, Pinus edulis*, or *Juniperus* spp. (especially on drier sites) may be present in the tree canopy or subcanopy. *Abies concolor* is typically not present. *Quercus gambelii* dominates both the subcanopy (tree form, if present) and the moderately dense tall-shrub layer that consists of dense clumps of oak. *Quercus gambelii* must have at least 5% cover, but there is frequently well over 25%. At higher elevations, *Quercus gambelii* are more treelike and *Symphoricarpos oreophilus* will be present with significant cover in the short-shrub layer. At lower elevations, scattered *Pinus edulis, Juniperus osteosperma*, or *Juniperus deppeana* are often present. The presence of *Chrysothamnus depressus* in some stands reflects the presence of fairly well-developed soils. The herbaceous layer is generally sparse and composed of mostly graminoids with scattered forbs, but it can be moderately dense and diverse. Many other species are associated, such as *Amelanchier* spp., *Holodiscus dumosus, Fendlera rupicola, Fraxinus anomala, Mahonia repens, Paxistima myrsinites, Quercus X pauciloba, Robinia neomexicana, Rosa woodsii, Carex* spp., *Festuca arizonica, Koeleria macrantha, Muhlenbergia virescens, Poa fendleriana, Lathyrus lanszwertii var. leucanthus, Thalictrum fendleri*, and *Vicia americana*. The shrub layer has equal or greater cover than graminoids.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is common within the recreation area and was sampled near Corral Creek on Curecanti Ranch, near the Dillon Pinnacles, near the Cimarron Power Line Road, west of Pine Creek, on the east side of Dillon Mesa, Cebolla Creek, in Tenderfoot Gulch, and west of Hermit's Rest within the Curecanti National Recreation Area.

Globally

This *Pseudotsuga menziesii* forest association occurs in the southern Rocky Mountains and southwestern U.S. and is found on foothills, mountains and plateaus from Colorado to Trans-Pecos Texas, west to Arizona and Utah.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This forest association occurs on the slopes of ridges, shoulders, ravines, and gorges. Sites are moderately steep to steep (27-86% slopes), occur between 2361 and 2747 m elevation, and are oriented to all aspects. The unvegetated

surface has moderate to high cover of litter and downed wood. Large and small rocks may be absent or provide moderate cover. Litter and duff depths for these stands ranged from 0-10 cm and 0-12 cm deep, respectively. Parent materials are Tertiary volcanic rocks, metamorphic/granitic rocks, and Quaternary landslide deposits. Soils are rapidly drained and variable, ranging from sands to clay loams.

Globally
This forest association occurs on mountains and plateaus at elevations ranging from 1229 to 2870 m (4030-9400 feet). Stands are found along drainages, gentle to moderate lower and middle slopes, steep upper slopes and gentle to rolling tops of mesas and ridges. Aspects are variable. This forest occurs as both a non-obligate riparian community on the outer margins of riparian areas in desert canyons and steep draws, and as an upland forest forming extensive stands on typically north-facing hillslopes, canyon sideslopes and mesa escarpments (southern aspects at higher elevations). Soils vary but are often shallow and rocky, ranging from sand to clay, often derived from sandstone. The surface is generally largely covered with a thin layer of litter. Parent materials are variable and include recent alluvium, fractured limestone, sandstone, metamorphic/granitic rocks, basalt, andesite, volcanic tuff, eroded Claron Formation (Pink Member), and even slickrock. Occasionally, talus to large blocks of rock and bedrock dominate the surface of sites on colluvial slopes / landslide deposits.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 52 to 77% in these stands. *Pseudotsuga menziesii* forms an open canopy 5-35 m high that contributes 1 to 75% cover, and *Quercus gambelii* tall shrubs (1-5 m tall) provided 6 to 75% cover. The emergent layer is rarely present and consists of 10- to 20-m tall *Pseudotsuga menziesii* trees that provide 7 to 15% cover. The subcanopy layer (2-15 m high) provides low to moderate cover and includes *Juniperus scopulorum, Populus tremuloides, Pseudotsuga menziesii*, and *Quercus gambelii*. The shrub layer is moderate in terms of species diversity and provides low to dense cover. The tall-shrub layer (1-5 m tall) provides sparse to low cover and includes *Pseudotsuga menziesii* and *Quercus gambelii*. Short and dwarf-shrubs provide moderate cover and include *Mahonia repens, Quercus gambelii, Ribes cereum, Ribes inerme*, and *Symphoricarpos rotundifolius*. The herbaceous layer is moderately diverse and provides sparse to moderate cover. Common graminoids include *Achnatherum hymenoides, Carex geyeri*, and *Poa fendleriana*. Forbs commonly present include only *Achillea millefolium var. occidentalis*. Mosses and lichens provide low cover, ranging from 0-10% and 0-20%, respectively.

Globally
This forest is characterized by a relatively sparse to moderately dense evergreen tree canopy dominated by *Pseudotsuga menziesii*, with *Quercus gambelii* well-represented in the understory. Scattered large *Pinus ponderosa, Pinus strobiformis, Pinus flexilis, Pinus edulis*, or *Juniperus* spp. (especially on drier sites) may be present in the tree canopy or subcanopy. *Abies concolor* is typically not present. *Quercus gambelii* typically dominates both the subcanopy (tree form, if present) and the open to moderately dense tall-shrub layer that often consists of dense clumps of oak. *Quercus gambelii* must have at least 5% cover, but there is frequently well over 25%. At higher elevations, *Quercus gambelii* are more treelike, and *Symphoricarpos oreophilus* will be present with significant cover in the short-shrub layer. At lower elevations, scattered *Pinus edulis, Juniperus osteosperma*, or *Juniperus deppeana* are often present. The presence of *Chrysothamnus depressus* in some stands reflects the presence of fairly well-developed soils. Other common shrub species, depending on geographic location, may include *Acer glabrum, Arctostaphylos patula, Amelanchier* spp., *Brickellia longifolia, Cercocarpus montanus, Fendlera rupicola, Fraxinus anomala, Holodiscus dumosus, Mahonia repens, Paxistima myrsinites, Prunus virginiana, Purshia tridentata, Quercus X pauciloba, Rhus trilobata, Ribes cereum, Robinia neomexicana, Rosa woodsii, Shepherdia rotundifolia*, and *Yucca* spp. The generally sparse herbaceous layer is composed of mostly graminoids with scattered forbs but ranges to moderately dense and diverse. Species vary greatly by site characteristics and location. Associated graminoids may include *Achnatherum hymenoides, Bromus* spp., *Carex geyeri, Carex rossii, Elymus elymoides, Festuca arizonica, Koeleria macrantha, Muhlenbergia montana, Muhlenbergia virescens, Piptatherum micranthum*, and *Poa fendleriana*. Common forbs include *Achillea millefolium var. occidentalis, Cryptantha* sp., *Galium coloradoense, Gilia stenothyrsa, Lathyrus lanszwertii var. leucanthus, Lepidium montanum, Machaeranthera grindelioides, Maianthemum stellatum, Packera multilobata, Packera neomexicana, Physaria acutifolia, Thalictrum fendleri, Solidago* spp., and *Vicia americana*. The shrub layer generally has equal or greater cover than graminoids. Post-burn stands may have relatively low cover of *Quercus gambelii* temporarily, as these shrubs resprout and grow. This open conifer forest transitions to *Quercus gambelii* woodlands in drier sites and at lower elevations.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Tree subcanopy	*Juniperus scopulorum, Pseudotsuga menziesii*
Tree subcanopy	*Populus tremuloides, Quercus gambelii*
Tall shrub/sapling	*Quercus gambelii, Ribes cereum, Ribes inerme*
Tall shrub/sapling	*Cercocarpus montanus*
Short shrub/sapling	*Amelanchier utahensis, Quercus gambelii, Symphoricarpos rotundifolius*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana, Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Mahonia repens*
Herb (field)	*Apocynum cannabinum, Solidago nemoralis, Solidago velutina*
Herb (field)	*Achnatherum hymenoides, Carex geyeri, Leymus cinereus, Poa fendleriana*

Globally

Stratum	Species
Tree canopy	*Pinus ponderosa, Pseudotsuga menziesii*
Tall shrub/sapling	*Quercus gambelii*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Poa pratensis* (exotic, Medium)

Globally

Vulnerable: *Gilia stenothyrsa* (globally imperiled, G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (23-Feb-1994).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

This is a broadly defined association characterized by dominance or codominance of two widespread species, *Pseudotsuga menziesii* and *Quercus gambelii*. Within the literature on habitat type, there are four phases mentioned: *Festuca arizonica* phase, *Holodiscus dumosus* phase, *Muhlenbergia virescens* phase (all defined by having at least 5% cover of both *Quercus gambelii* and the nominal species), and *Quercus gambelii* (typic) phase by a undeveloped herbaceous layer (Alexander et al. 1984b, DeVelice et al. 1986, Alexander et al. 1987, Fitzhugh et al. 1987, Johnston 1987, Larson and Moir 1987, Muldavin et al. 1996, Stuever and Hayden 1997b). There are three similar *Pseudotsuga menziesii* associations in the USNVC that use these phase species as nominal species. These phases represent "intermediate" vegetation. Review of these associations is needed to clarify relationships among associations and possibly subdivide this broadly defined association into types based on herbaceous layer and habitat.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Some stands of *Pseudotsuga menziesii* trees have moderate canopy openings. One stand is supported on a narrow bedrock ledge and another in a mesic alcove between pinnacles. An arid stand occupies a west-facing slope with very large boulders as the substrate. Downed wood is abundant in some stands. Big game use is common in all stands.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (14 plots: BLCA.0022, BLCA.0023, CURE.0021, CURE.0096, CURE.0104, CURE.0111, CURE.0203, CURE.0207, CURE.0212, CURE.0214, CURE.0222, CURE.0248, CURE.0309, CURE.0318. and 58 observation points: BLCA_AA.173, BLCA_AA.182, BLCA_AA.263, BLCA_AA.265, BLCA_AA.368, BLCA_AA.369, BLCA_AA.370, BLCA_AA.387, BLCA_AA.395, BLCA_AA.415, BLCA_AA.425, BLCA_AA.427, BLCA_AA.446, BLCA_AA.547, BLCA_AA.902, BLCA_AA.905, BLCA_AA.906,

CURE_AA.0165, CURE_AA.0226, CURE_AA.0259, CURE_AA.0269, CURE_AA.0362, CURE_AA.0394, CURE_AA.0404, CURE_AA.0412, CURE_AA.0414, CURE_AA.0418, CURE_AA.0423, CURE_AA.0432, CURE_AA.0473, CURE_AA.0512, CURE_AA.0524, CURE_AA.0536, CURE_AA.0543, CURE_AA.0562, CURE_AA.0563, CURE_AA.0579, CURE_AA.0589, CURE_AA.0597, CURE_AA.0598, CURE_AA.0615, CURE_AA.0657, CURE_AA.0676, CURE_AA.0768, CURE_AA.0783, CURE_AA.0791, CURE_AA.0793, CURE_AA.0832, CURE_AA.0833, CURE_AA.0852, CURE_AA.0880, CURE_AA.0985, CURE_AA.1045, CURE_AA.1051, CURE_AA.1053, CURE_AA.1115, CURE_AA.1293, CURE_AA.1460).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz, mod. J. Drake

REFERENCES: Alexander et al. 1984b, Alexander et al. 1987, Bader 1932, Blackhawk Coal Company 1981, Bourgeron and Engelking 1994, Bourgeron et al. 1993b, Bourgeron et al. 1995, CONHP unpubl. data 2003, Cogan et al. 2004, DeVelice et al. 1986, Diamond 1993, Fitzhugh et al. 1987, Freeman and Dick-Peddie 1970, Hansen et al. 2004d, Hess and Wasser 1982, Johnston 1987, Keammerer 1974b, Kittel et al. 1994, Kittel et al. 1999b, Komarkova et al. 1988a, Komarkova et al. 1988b, Larson and Moir 1987, Muldavin et al. 1996, Stuever and Hayden 1997b, Tiedemann and Terwilliger 1978, Western Ecology Working Group n.d., Youngblood and Mauk 1985

Pseudotsuga menziesii / Symphoricarpos oreophilus Forest

Douglas-fir / Mountain Snowberry Forest

CODE	CEGL000462
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest (I.A.8.N.)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
ALLIANCE	*PSEUDOTSUGA MENZIESII* FOREST ALLIANCE (A.157) Douglas-fir Forest Alliance
ECOLOGICAL SYSTEM(S):	Middle Rocky Mountain Montane Douglas-fir Forest and Woodland (CES306.959) Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (CES306.805) Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)
USFWS WETLAND SYSTEM:	Not applicable

CONCEPT SUMMARY
Globally
This widespread forest association occurs in foothills, mountains and plateaus from southwestern Montana through Wyoming and Colorado to Trans-Pecos Texas, west to Arizona, Utah, and into eastern Oregon and Washington. Elevation ranges from 700-2900 m (2310-9500 feet). This broadly defined forest association occurs as both a non-obligate riparian community and as an upland community. In more arid regions stands occur along drainages along narrow riparian areas in ravines, canyons, and up steep draws. It continues upland on steep north-facing slopes in narrow canyons where dense shade and steepness preclude any significant shrub or herbaceous understory. Elsewhere at more northern latitudes, it occurs near lower treeline on warm, dry southern aspects with moderate to very steep mid- and upper slopes and ridges. Soils are variable and range from deep silt loam to shallow, rocky substrates. Most stands have abundant litter on the ground, and some have high rock cover. The vegetation is characterized by a relatively sparse to dense evergreen tree canopy dominated by *Pseudotsuga menziesii*, sometimes with scattered large *Pinus ponderosa, Pinus flexilis, Populus tremuloides, Juniperus scopulorum*, or *Juniperus occidentalis*, especially on drier sites. *Abies concolor* is typically not present. *Symphoricarpos oreophilus* dominates the sparse to moderately dense short-shrub layer. Shrub associates vary depending on range and habitat and may include *Acer glabrum, Amelanchier* spp., *Artemisia tridentata* ssp. *vaseyana, Cercocarpus montanus, Holodiscus dumosus, Juniperus communis, Mahonia repens, Paxistima myrsinites, Prunus virginiana, Quercus gambelii, Ribes*

cereum, Ribes inerme, Rosa woodsii, or *Shepherdia canadensis*. The generally sparse herbaceous layer is composed of mostly graminoids with scattered forbs.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association is uncommon and was sampled on Tenderfoot Hill, northeast of the Ponderosa Campground, on Pine Creek Mesa, above the Pine Creek boat dock, and in Kezar Basin in the Curecanti National Recreation Area.

Globally
This widespread montane forest association occurs in foothills, mountains and plateaus from southwestern Montana through Wyoming and Colorado to Trans-Pecos Texas, west to Arizona, Utah, and into eastern Oregon and Washington.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This forest association occurs on the slopes of ridges, valleys, mesas and hills, as well as in gullies below a saddle and on ancient landslides. Slopes range from gentle to steep (10-80% slopes), occur between 2270 and 2658 m elevation, and are oriented to northern aspects. The unvegetated surface has moderate to high cover of litter and low to high cover of downed wood. Large and small rocks may provide low to moderate cover. Litter and duff depths range from 0-8 cm and 0-10 cm, respectively. Parent materials are Tertiary volcanic rocks, Quaternary landslide deposits, and Quaternary alluvium. Soils are rapidly drained loamy sands, silty clay loams, and peat.

Globally
This widespread Douglas-fir forest occurs in foothills, mountains and plateaus from southwestern Montana through Wyoming and Colorado to Trans-Pecos Texas, west to Arizona, Utah, and into eastern Oregon and Washington. Elevation ranges from 700-2900 m (2310-9500 feet). This broadly defined forest association occurs as both a non-obligate riparian community and as an upland community. In more arid regions stands occur along drainages along narrow riparian areas in ravines, canyons, and up steep draws. It continues upland on steep north-facing slopes in narrow canyons where dense shade and steepness preclude any significant shrub or herbaceous understory. Elsewhere at more northern latitudes, it occurs near lower treeline on warm, dry southern aspects on moderate to very steep mid- and upper slopes and ridges. Soils are variable and range from deep loamy sands, silt loams, silty clay loams, sandy clay loams and peat to shallow, rocky substrates. Parent materials are also variable and may include colluvium or residuum derived from calcareous shale, sandstone, granite, limestone, rhyolite and basalt. Most stands have abundant litter on the ground, and some have high rock cover.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 12% to approximately 90% in these stands. *Pseudotsuga menziesii* trees form an open canopy 5-35 m high that contributes 1 to 75 % cover, and *Symphoricarpos rotundifolius* short shrubs provide 1 to 50% cover. Emergent *Pseudotsuga menziesii* trees (15-20 m tall) provide sparse cover in a single stand. Other tree species forming portions of the canopy layer and providing sparse cover include *Juniperus scopulorum* and *Pinus ponderosa*. The subcanopy layer (5-10 m high) provides sparse cover and includes *Pseudotsuga menziesii* and *Juniperus scopulorum*. The shrub layer is low to moderate in terms of species diversity and provides low to moderate cover. Tall shrubs provide sparse to low cover and include *Amelanchier alnifolia, Holodiscus dumosus,* and *Pseudotsuga menziesii* saplings. Additional short and dwarf-shrubs provide low cover and include *Cercocarpus montanus, Juniperus communis, Mahonia repens, Ribes cereum*, and *Prunus virginiana*. The herbaceous layer is low in terms of species diversity and provides low to moderate cover. Common graminoids include *Carex geyeri, Poa fendleriana,* and *Poa secunda*. Forbs provide sparse cover with only *Packera tridenticulata (= Senecio tridenticulatus)* providing over 1% cover. Moss and lichen cover is moderate to high, up to 75% in one stand.

Globally
This forest is characterized by a relatively sparse to dense evergreen tree canopy dominated by *Pseudotsuga menziesii*, sometimes with scattered large *Pinus ponderosa, Pinus flexilis, Populus tremuloides, Juniperus scopulorum,* or *Juniperus occidentalis* in canopy or subcanopy, especially on drier sites. *Abies concolor* is typically not present. *Symphoricarpos oreophilus* is present and usually dominates the sparse to moderately dense short-shrub layer. Shrub associates vary depending on location and habitat and may include sparse cover of *Acer glabrum, Amelanchier* spp., *Artemisia tridentata* ssp. *vaseyana, Cercocarpus montanus, Holodiscus dumosus, Juniperus*

communis, Mahonia repens, Paxistima myrsinites, Prunus virginiana, Quercus gambelii, Ribes cereum, Ribes inerme, Rosa woodsii, or *Shepherdia canadensis*. The generally sparse herbaceous layer is composed of mostly graminoids with scattered forbs. Associated graminoids may include *Bromus* spp., *Carex geyeri, Carex rossii, Elymus lanceolatus, Festuca idahoensis, Leucopoa kingii, Leymus cinereus, Koeleria macrantha*, and *Poa fendleriana, Poa secunda*. Common forbs include *Achillea millefolium, Arnica cordifolia, Artemisia frigida, Balsamorhiza sagittata, Thalictrum fendleri*, and *Vicia americana*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Tree subcanopy	*Pseudotsuga menziesii*
Tall shrub/sapling	*Pseudotsuga menziesii*
Tall shrub/sapling	*Amelanchier alnifolia*
Short shrub/sapling	*Symphoricarpos rotundifolius*
Herb (field)	*Carex geyeri, Poa fendleriana*

Globally

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Short shrub/sapling	*Symphoricarpos oreophilus*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Poa pratensis* (exotic, Medium); **Other**: *Descurainia pinnata* (G5)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This is a broadly defined *Pseudotsuga menziesii* association which includes a variety of stands from different environments that are tied together by a common widespread species, *Symphoricarpos oreophilus*.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Evidence of fire is strong on one site. *Pseudotsuga menziesii* trees are growing from shelving slumps on one ridge. One small stand is succumbing to drought and disease. Big game use is high in all stands.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (5 plots: CURE.0032, CURE.0035, CURE.0147, CURE.0200, CURE.0343 and 12 observation points: BLCA_AA.279, BLCA_AA.351, BLCA_AA.518, CURE_AA.0004, CURE_AA.0005, CURE_AA.0132, CURE_AA.0375, CURE_AA.0751, CURE_AA.0773, CURE_AA.1004, CURE_AA.1024, CURE_AA.1093).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz, mod. J. Drake, J. Coles, K.A. Schulz

REFERENCES: Arno 1980, Bell et al. 2009, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Cogan et al. 2004, Day and Wright 1985, Diamond 1993, Fischer and Bradley 1987, Hess and Wasser 1982, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Johnston 1987, Jones and Ogle 2000, Kagan et al. 2000, Kittel et al. 1994, Kittel et al. 1999b, Komarkova et al. 1988b, Lillybridge et al. 1995, MTNHP 2002b, Mauk and Henderson 1984, Muldavin et al. 1996, Pfister et al. 1977, Reed 1976, Steele et al. 1981, Steele et al. 1983, Western Ecology

Working Group n.d., Williams and Lillybridge 1983, Williams and Lillybridge 1985, Williams et al. 1990b, Wright et al. 1979, Youngblood and Mauk 1985

Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Calamagrostis rubescens Forest

Quaking Aspen / Saskatoon Serviceberry - Mountain Snowberry / Pinegrass Forest

CODE	CEGL000567
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
FORMATION	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
ALLIANCE	*POPULUS TREMULOIDES* FOREST ALLIANCE (A.274) Quaking Aspen Forest Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This is a multi-layered deciduous forest that occurs at relatively low elevations in the Rocky Mountains. Most of the stands occur at less than 2135 m (7000 feet) elevation. Elevation range is 1680 to 2517 m (5500-8257 feet). It occurs on any aspect but can favor southerly and westerly aspects, on moderate to very steep slopes. The tree layer consists almost exclusively of *Populus tremuloides*. Conifers can be present in small amounts. The undergrowth is multi-structured. A tall-shrub stratum exists that is usually dominated by *Amelanchier alnifolia* or *Prunus virginiana*. Occasionally *Acer grandidentatum* is abundant. This layer may be broken or ill-defined but generally exceeds 10% cover. The low-shrub stratum is dominated by *Symphoricarpos oreophilus* or *Symphoricarpos albus*. Occasionally *Paxistima myrsinites* or *Spiraea betulifolia* can be abundant. The herbaceous layer is dominated by *Calamagrostis rubescens* and sometimes *Carex geyeri*. Other herbs present include *Elymus glaucus, Lupinus* spp., *Galium boreale*, and *Geranium viscosissimum*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is rare and was observed and sampled near East Portal Road in the park and in Pool Gulch in the recreation area.

Globally

This association is known from eastern Idaho, western Wyoming, northern Utah, western Colorado, and southwestern Montana.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This forest association was observed on sides of gulches. Sites are moderately steep (32-35% slopes), occur from 2412 to 2517 m elevation, and are oriented to northern aspects. The unvegetated surface has high cover of litter and low to moderate cover of downed wood. Soils are moderately well-drained loams to sandy loams derived from local alluvium.

Globally

This is a major aspen association, making up 22% of the aspen communities on the Targhee National Forest and 15% of those on the Caribou National Forest. It is known from Grand Teton National Park, northern Utah, Idaho, and western Colorado. It is a lush and relatively low-elevation type; most of the stands occur at less than 2100 m (7000 feet) elevation. Elevation range is 1675 to 2517 m (5500-8257 feet). It occurs on any aspect but can favor southerly and westerly aspects, on moderate to very steep slopes (3-27 degrees). It can occur in isolated clumps in moist depressions surrounded by *Artemisia - Symphoricarpos* meadows, or surrounded by aspen, conifer or mixed

aspen-conifer forests. The soils are moderately well- to well-drained loams or moderately well-drained silty clay loams, mostly derived from sandstone.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 148 to 224% in these stands with multiple canopy and understory layers. This forest association is characterized by a closed tree canopy that is typically 20 to 35 m tall of *Populus tremuloides* trees that range in cover from 60 to 65%. The subcanopy layer is present in one stand, with *Populus tremuloides* and *Amelanchier alnifolia* trees from 5 to 10 m tall providing 15% and 8% cover, respectively. The shrub layer is highly variable in composition and provides moderate cover. Tall shrubs from 2 to 5 m tall provide moderate cover and include *Amelanchier alnifolia* and *Prunus virginiana*. Short and dwarf-shrubs are diverse and provide moderate cover, including *Amelanchier alnifolia, Mahonia repens, Populus tremuloides, Prunus virginiana, Ribes inerme, Rosa woodsii,* and *Symphoricarpos rotundifolius*. The herbaceous layer is typically dense and diverse. Graminoids have low diversity but provide moderate cover by *Carex geyeri* and *Poa pratensis*. Forbs have moderately high diversity, provide low to moderate cover, and include *Achillea millefolium var. occidentalis, Lathyrus lanszwertii var. leucanthus,* and *Maianthemum racemosum* ssp. *amplexicaule*. Cryptogam cover is typically sparse.

Globally

This is a very lush, multi-layered deciduous forest. The tree layer consists almost exclusively of *Populus tremuloides*. Conifers, such as *Pseudotsuga menziesii, Abies lasiocarpa,* or *Picea engelmannii,* can be present in small amounts. The undergrowth is multi-structured. A tall-shrub stratum exists that is usually dominated by *Amelanchier alnifolia* or *Prunus virginiana*. Occasionally *Acer grandidentatum* is abundant. This layer may be broken or ill-defined but generally exceeds 10% cover. The low-shrub stratum is dominated by *Symphoricarpos oreophilus* or *Symphoricarpos albus*. Frequently *Paxistima myrsinites* and occasionally *Spiraea betulifolia* are abundant. The herbaceous layer is dominated by *Calamagrostis rubescens* and sometimes *Carex geyeri*. Other herbs present include *Elymus glaucus, Lupinus* spp., *Galium boreale,* and *Geranium viscosissimum*.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus tremuloides*
Tall shrub/sapling	*Amelanchier alnifolia, Prunus virginiana*
Short shrub/sapling	*Ribes inerme, Rosa woodsii, Symphoricarpos rotundifolius*
Herb (field)	*Mahonia repens, Quercus gambelii*
Herb (field)	*Achillea millefolium* var. *occidentalis, Galium boreale, Lathyrus lanszwertii* var. *leucanthus, Ligusticum porteri, Maianthemum racemosum* ssp. *amplexicaule, Vicia americana*
Herb (field)	*Carex geyeri*

Globally

Stratum	Species
Tree canopy	*Populus tremuloides*
Tall shrub/sapling	*Amelanchier alnifolia, Prunus virginiana*
Short shrub/sapling	*Symphoricarpos oreophilus*
Herb (field)	*Calamagrostis rubescens*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally
Compare this association to *Populus tremuloides / Prunus virginiana* Forest (CEGL000596).

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: There is much downed wood collected in associated drainage of one stand. One stand is heavily grazed by sheep.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: BLCA.0083, CURE.0360).
Local Description Authors: J. Von Loh, mod. J. Coles
Global Description Authors: G. Kittel, mod. J. Drake

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Hoffman and Alexander 1983, Mueggler 1988, Mueggler and Campbell 1982, Mueggler and Campbell 1986, Western Ecology Working Group n.d., Youngblood and Mueggler 1981

Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Mixed Graminoid Forest

Quaking Aspen / Saskatoon Serviceberry - Mountain Snowberry / Mixed Graminoid Forest

CODE	CEGL002816
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
FORMATION	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
ALLIANCE	*POPULUS TREMULOIDES* FOREST ALLIANCE (A.274) Quaking Aspen Forest Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This aspen forest is found in northwestern Colorado and southwestern Wyoming on moderate to moderately steep slopes (10-30%) of mountains, plateaus and buttes between 2242 and 2724 m elevation. It occurs in small stands on toeslopes, slump slopes, benches, and ridges often with north aspects or in other areas that collect snow or have a higher soil moisture throughout the growing season (seeps). The unvegetated surface generally has low cover of small and large rocks and high cover of leaf litter and downed wood, although in some stands the cover by large rocks may be as high as 40%. Soils are well-drained to poorly drained with soil textures ranging from sandy loam to silt to clay loam. The vegetation is characterized by an open to dense tree canopy 2-10 m tall that is dominated by *Populus tremuloides* with open to dense shrub layers dominated by tall shrubs *Amelanchier alnifolia* or *Amelanchier utahensis* and short shrub *Symphoricarpos oreophilus*. Scattered *Pseudotsuga menziesii* or *Pinus flexilis* may be present in some stands. Other tall shrubs may include *Salix scouleriana* and *Prunus virginiana*. Short- and dwarf-shrub associates, such as *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *vaseyana*, *Juniperus communis*, *Mahonia repens*, *Paxistima myrsinites*, *Rosa woodsii*, *Shepherdia canadensis*, and *Ribes cereum*, may be present with low cover. The herbaceous layer is characterized by mixed graminoids, such as *Achnatherum lettermanii*, *Hesperostipa comata*, *Bromus* sp., *Carex geyeri*, and *Poa secunda*, and low cover of diverse forbs. Exotic species *Poa pratensis* and *Taraxacum officinale* are common in some stands.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This aspen forest is found in Utah, at Dinosaur National Monument in northwestern Colorado and Fossil Butte Monument in southwestern Wyoming, and is likely more widespread in this region.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This forest association is known from hills and midslopes. Sites occur on variable aspects from 2543 to 2724 m elevation. Slope are gentle (4-5%). Parent materials include quartz-biotite schist, volcaniclastic material, gneiss and migmatite.

Globally
This aspen forest is found in northwestern Colorado and southwestern Wyoming on moderate to moderately steep slopes (10-30%) of mountains, plateaus and buttes between 2242 and 2724 m elevation. It occurs in small stands on toeslopes, slump slopes, benches, and ridges often with north aspects or in other areas that collect snow or have a higher soil moisture throughout the growing season (seeps). The unvegetated surface generally has low cover of small and large rocks and high cover of leaf litter and downed wood, although in some stands the cover by large rocks may be as high as 40%. Soils are well-drained to poorly drained with soil textures ranging from sandy loam to silt to clay loam.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association is characterized by an open canopy of *Populus tremuloides* with an open tall-shrub layer of *Amelanchier alnifolia*, short-shrub layer of *Symphoricarpos oreophilus*, and a mixed graminoid herbaceous layer. Some stands may have a tall-shrub layer codominated by *Quercus gambelii* or *Prunus virginiana*. Other shrub species include *Crataegus rivularis (= Crataegus douglasii var. rivularis), Mahonia repens, Salix scouleriana, Rosa woodsii*, and *Ribes inerme*. Common graminoids include *Poa pratensis, Bromus anomalus, Achnatherum nelsonii (= Stipa nelsonii), Deschampsia caespitosa, Carex geyeri*, and *Bromus ciliatus*. Forbs may contribute a significant portion of the herbaceous cover and may include *Ligusticum tenuifolium, Heracleum maximum (= Heracleum lanatum),* and *Urtica dioica* ssp. *gracilis (= Urtica dioica var. procera).*

Globally
This association is characterized by an open to dense (20-80% cover) tree canopy (2-10 m tall) that is dominated by *Populus tremuloides* with open to dense shrub layers dominated by tall shrubs *Amelanchier alnifolia* or *Amelanchier utahensis* and short shrub *Symphoricarpos oreophilus*. Emergent *Pseudotsuga menziesii* trees are observed in some stands, and *Pinus flexilis* and *Populus tremuloides* seedlings and saplings provide sparse cover in others. The understory may have distinct tall-shrub (5-80% cover) and short-shrub (10-30% cover) layers or have a mixed appearance. Other tall shrubs may include *Salix scouleriana* and *Prunus virginiana*. Short- and dwarf-shrub associates, such as *Artemisia tridentata* ssp. *tridentata, Artemisia tridentata* ssp. *vaseyana, Juniperus communis, Mahonia repens, Paxistima myrsinites, Rosa woodsii, Shepherdia canadensis*, and *Ribes cereum*, may be present with low cover. The herbaceous layer is characterized by mixed graminoids, such as *Achnatherum lettermanii, Hesperostipa comata, Bromus* sp., *Carex geyeri*, and *Poa secunda*, and low cover of diverse forbs, such as *Astragalus agrestis, Chamerion angustifolium (= Epilobium angustifolium), Galium boreale, Geranium richardsonii, Lupinus argenteus, Lupinus sericeus, Mertensia oblongifolia*, and *Thalictrum venulosum*. Exotic species *Poa pratensis* and *Taraxacum officinale* are common in some stands.

MOST ABUNDANT SPECIES
*Black Canyon of the Gunnison National Park - Curecanti National Recreation Area*Data are not available.

Globally

Stratum	Species
Tree (canopy & subcanopy)	*Populus tremuloides*
Tall shrub/sapling	*Amelanchier alnifolia, Amelanchier utahensis*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Exotic/Invasive: *Poa pratensis* (exotic, Medium), *Taraxacum officinale* (exotic)

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (11-Jul-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: This type was described from field notes.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: Data are not available.
Local Description Authors: M.E. Hall
Global Description Authors: J. Coles, mod. K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Thalictrum fendleri Forest

Quaking Aspen / Saskatoon Serviceberry - Mountain Snowberry / Fendler's Meadowrue Forest

CODE	CEGL000569
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
FORMATION	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
ALLIANCE	*POPULUS TREMULOIDES* FOREST ALLIANCE (A.274) Quaking Aspen Forest Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This is a low- to moderate-elevation aspen forest association that occurs in the central and southern Rocky Mountains west into northeastern Nevada. Elevation ranges from 1770 to 2678 m (5800-8780 feet). It occurs on gentle slopes (<25%) on lower and midslope positions and occasionally on valley bottoms to moderately steep to steep slopes (33-65%). Aspects are variable. The soils are well-drained sandy loams to sandy clay loams. This montane deciduous forest is multi-layered and is dominated by *Populus tremuloides* in the tree canopy (generally >70% relative cover of tree canopy). *Abies lasiocarpa* or *Pseudotsuga menziesii* are occasionally present in small amounts (<10% cover). The undergrowth has a multi-layered structure of tall shrubs, low shrubs, and a fairly low-growing layer of herbaceous species. The association is characterized by the presence of both a tall- and

short-shrub layer, and the lack of significant quantities of both tall forbs and graminoids (<10% cover, total). The most common tall shrubs are *Amelanchier alnifolia* and *Prunus virginiana*. This stratum can be open and scattered but usually has at least 10% cover and is often greater than 50%. The low-shrub component, with *Symphoricarpos oreophilus* or *Symphoricarpos rotundifolius* and *Rosa woodsii*, is always prominent (>10% cover). *Mahonia repens, Paxistima myrsinites, Ribes* spp., or *Spiraea betulifolia* are often present to abundant. Occasionally *Symphoricarpos albus* replaces *Symphoricarpos oreophilus.* The herbaceous layer is dominated by low-growing forb species such as *Thalictrum fendleri, Geranium viscosissimum, Osmorhiza* spp., and *Lupinus argenteus* (generally >10% cover). Occasional tall forbs, such as *Agastache urticifolia, Eucephalus engelmannii (= Aster engelmannii*, or *Senecio serra),* may be present, but they never form a prominent part of the undergrowth (>10% cover). Graminoids can be present with low cover (<10%).

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This rare association was sampled in Meyer's Gulch and Long Gulch in Curecanti National Recreation Area.

Globally
This aspen forest association occurs in the central and southern Rocky Mountains west into northeastern Nevada and Idaho.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This forest association occurs on the banks of gulches and on drainage slopes. Sites are moderately steep to steep (33-65% slopes), occur at 2611 and 2678 m elevation, and are oriented to northeastern aspects. The unvegetated surface has high cover of litter and downed wood. Soils are well-drained sandy loams and sandy clay loams.

Globally
This is a low- to moderate-elevation aspen forest association that occurs in the central and southern Rocky Mountains west into northeastern Nevada. Elevation ranges from 1770 to 2678 m (5800-8780 feet). It occurs on gentle slopes (<25%) on lower and midslope positions and occasionally on valley bottoms to moderately steep to steep slopes (33-65%). Aspects are variable and range from northerly along drainage slopes and gulches to west- and southeast-facing moderate slopes (Komarkova et al. 1988b, Mueggler 1988). The soils are well-drained sandy loams to sandy clay loams derived from a variety of parent materials, but sandstone is common. The unvegetated surface has high cover of litter and downed wood.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is in excess of 200% in this type. *Populus tremuloides* forms a closed canopy 10-20 m high that provides 50 to 75% cover to the canopy layer. *Amelanchier alnifolia* and *Symphoricarpos rotundifolius* shrubs provide moderately dense cover of 1 to 25% and 25 to 50%, respectively, and the forb *Thalictrum fendleri* provides low to moderate cover of 1 to 25%. An emergent layer of 20- to 35-m tall *Populus tremuloides* trees provides 25 to 50% cover in one stand. The subcanopy layer of *Populus tremuloides* trees provides moderate cover, from 25 to 50%. The shrub layer is low in terms of species diversity and provides moderate cover. Additional tall and short shrubs include *Prunus virginiana, Ribes wolfii,* and *Rosa woodsii*. The herbaceous layer is high in terms of species diversity and provides low to moderate cover. Common graminoids that provide moderate cover include *Carex geyeri, Bromus porteri, Elymus trachycaulus*, and *Poa pratensis*. Additional forbs that provide low cover include *Achillea millefolium var. occidentalis, Galium boreale, Heracleum maximum, Ligusticum porteri, Urtica dioica*, and *Vicia americana*.

Globally
This montane deciduous forest is multi-layered. The forest canopy consists primarily of *Populus tremuloides* (generally >70% relative cover of tree canopy). *Abies lasiocarpa* or *Pseudotsuga menziesii* are occasionally present in small amounts (<10% cover). The undergrowth has a multi-layered structure of tall shrubs, low shrubs, and a fairly low-growing layer of herbaceous species. The association is characterized by the lack of significant amounts of cover by conifers in the tree stratum, the presence of both a tall- and short-shrub layer, and the lack of significant quantities of both tall forbs and the graminoids *Bromus carinatus, Elymus glaucus, Elymus trachycaulus, Calamagrostis rubescens*, and *Carex geyeri* (<10% cover, total) (Mueggler 1988). The most common tall shrubs are *Amelanchier alnifolia* and *Prunus virginiana*. This stratum can be open and scattered but usually has at least 10%

cover and is often greater than 50%. The low-shrub component, with *Symphoricarpos oreophilus* or *Symphoricarpos rotundifolius* and *Rosa woodsii*, is always prominent (>10% cover). *Mahonia repens*, *Ribes* spp., or *Spiraea betulifolia* are often present to abundant. Occasionally *Symphoricarpos albus* replaces *Symphoricarpos oreophilus*. Some stands have high abundance of *Paxistima myrsinites*. The herbaceous layer is dominated by low-growing forb species such as *Thalictrum fendleri, Geranium viscosissimum, Osmorhiza berteroi (= Osmorhiza chilensis), Osmorhiza depauperata*, and *Lupinus argenteus* (generally >10% cover). Occasional tall forbs, such as *Agastache urticifolia, Senecio serra*, or *Eucephalus engelmannii (= Aster engelmannii)*, may be present, but they never form a prominent part of the undergrowth (>10% cover). Graminoids can be present with low cover (<10% cover) and include *Bromus carinatus, Calamagrostis rubescens, Carex geyeri, Carex hoodii, Elymus glaucus, Elymus trachycaulus, Poa pratensis*, and *Poa secunda*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus tremuloides*
Tree subcanopy	*Populus tremuloides*
Tall shrub/sapling	*Amelanchier alnifolia*, *Prunus virginiana*
Short shrub/sapling	*Symphoricarpos rotundifolius*
Herb (field)	*Achillea millefolium* var. *occidentalis*, *Thalictrum fendleri*
Herb (field)	*Carex geyeri*, *Poa pratensis*

Globally

Stratum	Species
Tree canopy	*Populus tremuloides*
Tall shrub/sapling	*Amelanchier alnifolia*, *Prunus virginiana*
Short shrub/sapling	*Symphoricarpos oreophilus*
Herb (field)	*Thalictrum fendleri*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Capsella bursa-pastoris* (exotic, Insignificant), *Poa pratensis* (exotic, Medium), *Tragopogon dubius* (exotic, Medium/Low)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Mueggler (1988) includes a key to community types that may help clarify some of the USNVC aspen associations in the Intermountain Western U.S. region.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Sites have evidence of past fire, livestock grazing and big game use.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0110, CURE.0158).
Local Description Authors: J. Von Loh
Global Description Authors: G. Kittel, mod. K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, CONHP Ecology Team 2001, Driscoll et al. 1984, Johnston and Hendzel 1985, Komarkova et al. 1988a, Komarkova et al. 1988b, Mueggler 1988, Western Ecology Working Group n.d.

Populus tremuloides / Carex geyeri Forest

Quaking Aspen / Geyer's Sedge Forest

CODE	CEGL000579
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
FORMATION	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
ALLIANCE	*POPULUS TREMULOIDES* FOREST ALLIANCE (A.274)
	Quaking Aspen Forest Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This relatively common deciduous forest association occurs in the southern and central Rocky Mountains and may extend north into Montana. This montane to subalpine forest type ranges from 2350 to 3170 m (7700-10,400 feet) elevation. Sites are variable, but stands often occur on cool, well-drained, gentle slopes (<20%). Substrates are moderately deep, sandy loam to clayey soils. The vegetation is characterized by a moderately dense to dense tree canopy dominated by *Populus tremuloides*, with no shrub layer, and a *Carex geyeri*-dominated herbaceous layer. Scattered conifers (*Picea pungens, Pseudotsuga menziesii, Pinus contorta*) may be present in the tree canopy. Occasional shrubs, such as *Amelanchier alnifolia, Arctostaphylos uva-ursi, Mahonia repens, Paxistima myrsinites, Rosa woodsii, Symphoricarpos oreophilus*, or *Symphoricarpos rotundifolius*, may be present but are too sparse to be considered a shrub layer (<10% cover). The moderate herbaceous layer is composed mostly of graminoids and is characteristically dominated by *Carex geyeri*. Other graminoids present include *Achnatherum lettermanii, Achnatherum occidentale, Bromus* spp., *Elymus glaucus, Elymus trachycaulus, Festuca arizonica, Leucopoa kingii, Poa fendleriana*, and the introduced perennial graminoid *Poa pratensis*. *Calamagrostis rubescens, Carex rossii*, and *Festuca thurberi* are absent or have low cover. Forb species have low cover with relatively low diversity when compared to other aspen types.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled on Tenderfoot Hill in the Curecanti National Recreation Area.

Globally

This relatively common Rocky Mountain forest association occurs in Colorado, Wyoming Utah and possibly Montana.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This forest association occurs on mesatops. The sampled site is mildly sloping (14% slope), occurs at 2816 m elevation, and is oriented to the southwest. The unvegetated surface has high cover of litter and downed wood. Parent materials are Tertiary volcanic rocks. Soils are rapidly drained loamy sands.

Globally

This relatively common deciduous forest association occurs in the southern and central Rocky Mountains and may extend north into Montana. This montane to subalpine forest type ranges from 2350 to 3170 m (7700-10,400 feet) elevation. Sites are variable, but stands often occur on cool, well-drained, gentle slopes (<20%) (Henderson et al. 1977, Hess 1981, Alexander et al. 1986, Hess and Alexander 1986). Substrates are moderately deep, sandy loam to

clayey soils from alluvium and colluvium derived from a variety of parent materials, including sedimentary and volcanic rocks. Litter covers much of the ground surface.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

The total vegetation cover is 115% in this forest type. *Populus tremuloides* trees 5-10 m tall form a closed canopy that provides 80% cover, and the graminoid *Carex geyeri* provides 20% cover. The shrub layer is low in species diversity and provides sparse cover, consisting only of the short shrub *Symphoricarpos rotundifolius*. The herbaceous layer has moderate species diversity and provides moderate cover. Additional graminoids provide sparse cover and include *Achnatherum lettermanii, Achnatherum nelsonii, Bromus lanatipes, Elymus elymoides, Elymus trachycaulus, Festuca arizonica, Leucopoa kingii,* and *Poa fendleriana*. Forbs provide sparse cover and include *Achillea millefolium var. occidentalis, Lathyrus lanszwertii,* and *Maianthemum stellatum*.

Globally

The association is characterized by a moderately dense to dense tree canopy dominated by *Populus tremuloides,* the lack of a shrub layer, and a *Carex geyeri*-dominated herbaceous layer. Scattered conifers (*Picea pungens, Pseudotsuga menziesii, Pinus contorta*) may be present in the tree canopy. Occasional shrubs, such as *Amelanchier alnifolia, Arctostaphylos uva-ursi, Mahonia repens, Paxistima myrsinites, Rosa woodsii, Symphoricarpos oreophilus,* or *Symphoricarpos rotundifolius,* may be present but are too sparse to be considered a shrub layer (<10% cover). *Juniperus communis* is typically absent or trace cover. The moderate herbaceous layer is composed mostly of graminoids and is characteristically dominated by *Carex geyeri* (Henderson et al. 1977, Hess 1981, Alexander et al. 1986, Hess and Alexander 1986). Other graminoids present include *Achnatherum lettermanii, Achnatherum occidentale, Bromus ciliatus, Chaenactis douglasii (= Chaenactis angustifolia), Elymus glaucus, Elymus trachycaulus, Festuca arizonica, Leucopoa kingii, Poa fendleriana,* and the introduced perennial graminoid *Poa pratensis*. *Calamagrostis rubescens, Carex rossii,* and *Festuca thurberi* are absent or have low cover. Forb species have low cover with relatively low diversity when compared to other aspen types; they may include *Achillea millefolium, Antennaria microphylla, Arnica cordifolia, Astragalus miser, Galium boreale, Geranium viscosissimum, Lathyrus lanszwertii, Lathyrus lanszwertii var. leucanthus (= Lathyrus leucanthus), Ligusticum porteri, Lupinus argenteus, Maianthemum stellatum, Osmorhiza berteroi (= Osmorhiza chilensis),* and the introduced *Taraxacum officinale*.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus tremuloides*
Short shrub/sapling	*Symphoricarpos rotundifolius*
Herb (field)	*Carex geyeri*

Globally

Stratum	Species
Tree canopy	*Populus tremuloides*
Herb (field)	*Carex geyeri*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Compare this association to *Populus tremuloides / Juniperus communis / Carex geyeri* Forest (CEGL000588).

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: The *Populus tremuloides* trunks average 14 cm dbh and are heavily scarred by elk.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0220).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Alexander 1986, Alexander et al. 1986, Bond 1959, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Driscoll et al. 1984, Giese 1975, Henderson et al. 1977, Hess 1981, Hess and Alexander 1986, Hess and Wasser 1982, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Johnston 1987, Jones and Ogle 2000, Keammerer and Stoecker 1980, MTNHP 2002b, Marr et al. 1973a, Mueggler 1988, Terwilliger et al. 1979a, Wasser and Hess 1982, Western Ecology Working Group n.d.

Populus tremuloides / Ceanothus velutinus Forest

Quaking Aspen / Tobacco-brush Forest

CODE	CEGL000581
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
FORMATION	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
ALLIANCE	*POPULUS TREMULOIDES* FOREST ALLIANCE (A.274) Quaking Aspen Forest Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This association occurs on the slopes of ridges and mountains in northwestern Wyoming and western Colorado. Elevations range from 2225-2680 m (7300-8800 feet). These forests occur on north to northeast slopes in Colorado and southern slopes in Wyoming. Soils vary from very well-drained, non-skeletal sandy loam and loam to very coarse rocky colluvium, and may be shallow to deep. Stands are often located at the middle to upper portions of the slope; slopes range from level to more than 100%. *Populus tremuloides* makes up a pure, but often open, tree canopy, while the shrub layer consists of a variable mix in which *Ceanothus velutinus* is usually dominant. Other common shrub species include *Mahonia repens*, *Paxistima myrsinites*, *Rosa woodsii*, *Rubus parviflorus*, *Symphoricarpos oreophilus, Amelanchier alnifolia, Spiraea betulifolia*, and *Sorbus scopulina*. The herbaceous layer is diverse and may include *Eucephalus engelmannii (= Aster engelmannii), Eurybia glauca, Lathyrus lanszwertii, Lupinus* spp., *Thalictrum fendleri, Machaeranthera canescens, Arnica cordifolia, Iliamna rivularis, Calamagrostis rubescens, Bromus porteri, Bromus carinatus, Achnatherum lettermanii*, and *Carex geyeri*. This association appears to be maintained by stand-replacing fire, as both *Populus tremuloides* and *Ceanothus velutinus* will resprout after a cool fire. The seeds of *Ceanothus velutinus* and the rootstocks of *Populus tremuloides* can persist in the soil for more than 100 years, and re-establish themselves from seeds and sprouts following a hot fire.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This rare association was sampled near Crystal Trail in Curecanti National Recreation Area.
Globally
This association is known from scattered, isolated stands in Montrose, Gunnison, Moffat and Routt counties of western Colorado, and north of Grand Teton National Park, Wyoming.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This forest association occurs on the slopes of ridges. The sampled site is steep (64% slope), occurs at 2678 m elevation, and is oriented to the northeast. The unvegetated surface has high cover of litter and downed wood. Parent materials are metamorphic/granitic rocks. Soils are rapidly drained sandy loams.

Globally

This association occurs on the slopes of ridges and mountains in northwestern Wyoming and western Colorado. Elevations range from 2225-2680 m (7300-8800 feet). These forests occur on north to northeast slopes in the southern part of the range, and southern slopes in the northern part of the range. Soils vary from very well-drained, non-skeletal sandy loam and loam to very coarse rocky colluvium, and may be shallow to deep. Stands are often located at the middle to upper portions of the slope; slopes range from level to more than 100%. The unvegetated ground surface is well-covered by litter and downed wood.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

The total vegetation cover is 153% in this forest type. *Populus tremuloides* trees 5-10 m tall form a moderately closed to closed canopy that provide 60% cover, and *Ceanothus velutinus* tall shrubs (1-2 m tall) provide 70% cover. The remaining shrub layer is low in species diversity and provides sparse cover. Short and dwarf-shrubs include *Amelanchier alnifolia, Mahonia repens, Paxistima myrsinites, Rosa woodsii*, and *Symphoricarpos rotundifolius*. The herbaceous layer is low in species diversity and provides sparse cover. Graminoid and forb species include *Bromus porteri, Carex geyeri, Eurybia glauca, Lathyrus lanszwertii*, and *Lupinus caudatus*. Sparse cover by lichens also occurs.

Globally

Populus tremuloides makes up a pure, but often open, tree canopy, while the shrub layer consists of a variable mix in which *Ceanothus velutinus* is usually dominant. Other common shrub species include *Mahonia repens, Paxistima myrsinites, Rosa woodsii, Rubus parviflorus, Symphoricarpos oreophilus, Amelanchier alnifolia, Spiraea betulifolia*, and *Sorbus scopulina*. The herbaceous layer is diverse and may include *Eucephalus engelmannii (= Aster engelmannii), Eurybia glauca, Lathyrus lanszwertii, Lupinus* spp., *Thalictrum fendleri, Machaeranthera canescens, Arnica cordifolia, Iliamna rivularis, Calamagrostis rubescens, Bromus porteri, Bromus carinatus, Achnatherum lettermanii*, and *Carex geyeri*.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus tremuloides*
Tree subcanopy	*Populus tremuloides*
Tall shrub/sapling	*Ceanothus velutinus*

Globally

Stratum	Species
Tree canopy	*Populus tremuloides*
Short shrub/sapling	*Ceanothus velutinus*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (16-Dec-1999). This association is known from fewer than 30 stands in Colorado. The literature indicates that stands occur on very well-drained soils at the middle to upper position of slopes.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association is only known from Colorado and Wyoming. No other studies reviewed mentioned *Populus tremuloides*-dominated communities with any *Ceanothus* spp. in the understory. Bunin (1975c) indicated the existence of a variant of this association in which *Rubus parviflorus* was the dominant shrub; however, there are no other references to *Ceanothus* spp. as a component of *Populus tremuloides / Rubus parviflorus* Forest (CEGL000602). Other studies did mention *Populus tremuloides* associations with some of the same understory species (such as *Symphoricarpos oreophilus* and *Amelanchier alnifolia*); however, these did not include reference to any *Ceanothus* spp. Johnston (1987) suggested that this association would fit better as a phase of his *Populus tremuloides / Amelanchier alnifolia - Prunus virginiana* Plant Association; however, no *Ceanothus* is mentioned. This is probably a fire-maintained type that succeeds to another association with enough time post fire.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: This stand of *Populus tremuloides* trees is young, post fire about 20 years ago; soil still contains charred wood.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0266).
Local Description Authors: J. Von Loh
Global Description Authors: J. Thompson and J. Stevens, mod. G. Kittel and J. Coles

REFERENCES: Bourgeron and Engelking 1994, Bunin 1975a, Bunin 1975c, CONHP unpubl. data, CONHP unpubl. data 2003, Driscoll et al. 1984, Johnston 1987, Western Ecology Working Group n.d.

Populus tremuloides / Invasive Perennial Grasses Forest

Quaking Aspen / Invasive Perennial Grasses Forest

CODE	CEGL003748
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
FORMATION	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
ALLIANCE	*POPULUS TREMULOIDES* FOREST ALLIANCE (A.274) Quaking Aspen Forest Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This association is a widespread grazing-induced type found across much of the western U.S. within the range of aspen, including the southern and central Rocky Mountains west into the Colorado Plateau and Great Basin into eastern California and throughout much of Idaho and Montana. Stands typically occur within the elevational range of 1830-2830 m (6000-9280 feet) on flat to moderate (1-27%) benches, alluvial terraces and lower slopes, swales, near springs and especially along stream channels and valley bottoms where livestock congregate. Stands typically have current or past heavy grazing. Aspects and substrates are variable. Soils are often relatively mesic and well-developed (Mollisols) but include sandy, silty, or clay loams derived from recent alluvium, shales, granite or volcanics. The vegetation is characterized by a moderately dense (40-60% cover) tree canopy 5-15 m tall composed of *Populus tremuloides* but may include sparse and scattered conifers, such as *Pinus contorta*, *Picea engelmannii*, and *Abies lasiocarpa*. There is no distinct shrub stratum; however, scattered shrubs, such as *Dasiphora fruticosa* ssp. *floribunda, Juniperus communis var. montana, Mahonia repens, Ribes inerme, Rosa woodsii*, and *Symphoricarpos rotundifolius*, may be present.. The diagnostic feature of the understory is the lush herbaceous layer that is strongly dominated by introduced perennial graminoids, usually *Poa pratensis* (20-30% cover or more), or other introduced forage species, such as *Agrostis stolonifera, Alopecurus* spp., *Bromus inermis*, *Dactylis glomerata*, and *Phleum pratense*. Other graminoid species may include *Bromus carinatus, Bromus ciliatus, Bromus porteri, Carex* spp., *Elymus trachycaulus*, and *Juncus balticus*. Forb cover is generally low but often diverse. Forb species with high frequency include *Achillea millefolium, Artemisia ludoviciana, Astragalus miser, Fragaria* spp., *Galium boreale, Geranium viscosissimum, Ligusticum porteri, Lupinus* sp., *Potentilla* spp., *Thalictrum fendleri, Thermopsis divaricarpa*, and *Trifolium longipes*. Introduced species, such *Taraxacum officinale* and *Trifolium* spp., are common in this frequently grazing-disturbed type.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled east of Myers Gulch near State Highway 92 in the Curecanti National Recreation Area.

Globally

This association is a widespread grazing-induced type found across much of the western U.S. within the range of aspen, including the southern and central Rocky Mountains west into the Colorado Plateau and Great Basin into eastern California and throughout southern and eastern Idaho and much of Montana and western Wyoming.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This forest association occurs on the slopes of gulches. The sampled site is moderately steep (27% slope), occurs at 2637 m elevation, and is oriented to the northwest. The unvegetated surface has high cover of litter and downed wood. Parent materials are Tertiary volcanic rocks. Soils are rapidly drained silty loams.

Globally
This association is a widespread grazing-induced type found across much of the western U.S. within the range of aspen, including the southern and central Rocky Mountains west into the Colorado Plateau and Great Basin into eastern California and throughout much of Idaho and Montana. Stands typically occur within the elevational range of 1830-2830 m (6000-9280 feet) on typically flat to moderate (1-54%) benches, alluvial terraces and lower slopes, moist hillsides, swales, near springs and especially along stream channels and valley bottoms where livestock congregate. In semi-arid areas, stands are found on seep-saturated hillslopes. Stands typically have current or past heavy livestock grazing. Aspects and substrates are variable. Soils are often relatively mesic and well-developed (Mollisols) but include sandy, silty, or clay loams derived from recent alluvium, shales, granite or volcanics. Surface rock does not play a large role in the surface cover; however, litter and duff may comprise significant ground cover.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
The total vegetation cover is 179% in this forest type. *Populus tremuloides* trees 2-10 m tall form a moderately closed canopy that provides 57% cover, and the non-native grass *Poa pratensis* provides 50% cover. The shrub layer is low in species diversity and provides moderate cover, consisting only of the short shrubs *Rosa woodsii* and *Symphoricarpos rotundifolius*. The herbaceous layer is diverse and provides dense cover. Additional graminoids provide moderate cover and include only *Bromus porteri* and *Carex geyeri*. Forbs are diverse, provide low cover and include *Achillea millefolium var. occidentalis, Ligusticum porteri, Lupinus* sp., *Taraxacum officinale*, and *Thalictrum fendleri*.

Globally
This deciduous forest association is characterized by a moderately dense (40-60% cover) tree canopy 5-15 m tall composed of *Populus tremuloides* but may include sparse and scattered conifers, such as *Pinus contorta, Picea engelmannii*, and *Abies lasiocarpa*. There is no distinct shrub stratum; however, scattered shrubs, such as *Artemisia cana, Dasiphora fruticosa* ssp. *floribunda, Juniperus communis var. montana, Mahonia repens, Ribes inerme, Rosa woodsii*, and *Symphoricarpos rotundifolius*, may be present. The diagnostic feature of the understory is the lush herbaceous layer that is strongly dominated by introduced perennial graminoids, usually *Poa pratensis* (20-30% cover or more), or other introduced forage species, such as *Agrostis stolonifera, Alopecurus* spp., *Bromus inermis, Dactylis glomerata,* and *Phleum pratense*. Other graminoid species may include *Bromus carinatus, Bromus ciliatus, Bromus porteri, Carex* spp., *Deschampsia caespitosa, Elymus trachycaulus*, and *Juncus balticus*. Forb cover is generally low but often diverse. Forb species with high frequency include *Achillea millefolium, Artemisia ludoviciana, Astragalus miser, Fragaria* spp., *Galium boreale, Geranium viscosissimum, Ligusticum filicinum, Ligusticum porteri, Lupinus* sp., *Maianthemum stellatum, Potentilla* spp., *Senecio integerrimus, Thalictrum fendleri, Thermopsis divaricarpa*, and *Trifolium longipes*. Introduced species, such *Taraxacum officinale* and *Trifolium* spp., are common in this frequently grazing-disturbed type (Mueggler 1988, Powell 1988a, Padgett et al. 1989, Hansen et al. 1995).

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus tremuloides*
Short shrub/sapling	*Symphoricarpos rotundifolius*
Herb (field)	*Achillea millefolium* var. *occidentalis*
Herb (field)	*Carex geyeri, Poa pratensis*

Globally

Stratum	Species
Tree canopy	*Populus tremuloides*
Herb (field)	*Agrostis stolonifera, Bromus inermis, Dactylis glomerata, Phleum pratense, Poa pratensis*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNA (ruderal) (26-May-2004).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
The concept of this semi-natural aspen forest association includes aspen stands with understories dominated by introduced herbaceous species, especially forage species that have escaped from cultivation, such as *Agrostis stolonifera, Alopecurus* spp., *Bromus inermis, Dactylis glomerata, Phleum pratense, Medicago sativa, Melilotus officinalis,* and *Trifolium* spp.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: This *Populus tremuloides* stand is young, mostly saplings, within an area of logging, grazing, and burning.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (3 plots: CURE.0177, CURE.0184, CURE.0299 and 10 observation points : CURE_AA.0350, CURE_AA.0357, CURE_AA.0358, CURE_AA.0361, CURE_AA.0623, CURE_AA.0812, CURE_AA.0931, CURE_AA.1020, CURE_AA.1177, CURE_AA.1433).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Girard et al. 1997, Hall and Hansen 1997, Hansen et al. 1995, Manning and Padgett 1995, Mueggler 1988, Mueggler and Campbell 1982, Mueggler and Campbell 1986, Padgett et al. 1989, Powell 1988a, Western Ecology Working Group n.d., Wexelman et al. 1999

Populus tremuloides / Juniperus communis / Carex geyeri Forest

Quaking Aspen / Common Juniper / Geyer's Sedge Forest

CODE	CEGL000588
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
FORMATION	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
ALLIANCE	*POPULUS TREMULOIDES* FOREST ALLIANCE (A.274)
	Quaking Aspen Forest Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This deciduous forest is known from the southern and central Rocky Mountains and northern Colorado Plateau where it occurs on mountain slopes. Elevations range from 2400-2700 m (8000-9000 feet). Stands occur on gentle to moderately steep slopes (<40%) with southeastern aspects. Substrates are variable, but soils tend to be well-drained loams or silty loams. Litter covers much of the ground surface. The vegetation is characterized by a moderately dense to dense tree canopy dominated by *Populus tremuloides*, a low-shrub layer (>10% cover) with *Juniperus communis* dominant or at least prominent, and a *Carex geyeri*-dominated herbaceous layer. Several other shrubs, such as *Mahonia repens, Paxistima myrsinites, Symphoricarpos oreophilus*, or *Symphoricarpos rotundifolius*, may

also be present in the low-shrub layer. Scattered conifers may be present in the tree canopy, and occasional *Amelanchier alnifolia* and conifer saplings are present but do not form a tall-shrub layer. The moderate herbaceous layer is mostly graminoids and characteristically dominated by *Carex geyeri* or *Calamagrostis rubescens*, but other graminoids present may include *Achnatherum occidentale, Elymus trachycaulus, Festuca thurberi*, and the introduced perennial grass *Poa pratensis*. Forb cover is typically low but may be moderately diverse.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This uncommon association was sampled along Upper Pine Creek and on Carpenter Ridge in the Curecanti National Recreation Area.

Globally
This forest association is known from the southern and central Rocky Mountains and northern Colorado Plateau in Colorado and Utah.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This forest association occurs as patches (0.8-1.5 hectares) on the slopes of hills and ridges. Sites are moderately steep (32-38% slope), occur between 2445 and 2634 m elevation, and are oriented to northern aspects. The unvegetated surface has high cover of litter. Downed wood is common to abundant. Parent materials include Tertiary volcanic rocks and mixed material of a Quaternary landslide. Soils are well-drained silty loams and loams.

Globally
This deciduous forest is known from the southern and central Rocky Mountains and northern Colorado Plateau where it occurs on mountain slopes. Elevations range from 2400-2700 m (8000-9000 feet). Stands occur on gentle to moderately steep slopes (<40%) with southeastern aspects (Mueggler 1988). Substrates are variable, but soils tend to be well-drained loams or silty loams derived from sandstone (most frequent), Tertiary volcanics, or other rocks. Litter covers much of the ground surface.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 121 to 130% in these stands. *Populus tremuloides* forms a moderately closed canopy 10-15 m high that contributes 50 to 60% cover. In one stand, 10- to 15-m tall *Pseudotsuga menziesii* trees contribute 2% cover to the canopy layer. A subcanopy of 2- to 5-m tall *Populus tremuloides* and *Pseudotsuga menziesii* trees contributes sparse cover. Tree seedlings 1-2 m tall may include *Juniperus scopulorum, Picea pungens*, and *Pseudotsuga menziesii* and may contribute up to 5% cover. The shrub layer is diverse and dense, contributing moderate to dense cover. The tall shrub *Amelanchier alnifolia* contributes sparse cover and is 2-5 m tall. Short shrubs are characterized by the understory dominant *Juniperus communis* that contributes 25 to 50% cover. Other short and dwarf-shrubs include *Symphoricarpos rotundifolius, Arctostaphylos uva-ursi, Mahonia repens*, and *Paxistima myrsinites*. The moderately diverse herbaceous layer provides low to moderate cover. Graminoids are characterized by *Carex geyeri* and *Festuca thurberi* that contribute up to 10% cover. Forbs provide sparse cover and commonly include *Achillea millefolium var. occidentalis, Galium boreale, Arnica cordifolia*, and *Maianthemum stellatum*.

Globally
The association is characterized by a moderately dense to dense tree canopy dominated by *Populus tremuloides*, a low-shrub layer (>10% cover) with *Juniperus communis* dominant or at least prominent, and a *Carex geyeri*-dominated herbaceous layer (Mueggler 1988). Several other shrubs, such as *Arctostaphylos uva-ursi, Mahonia repens, Paxistima myrsinites, Rosa woodsii, Symphoricarpos oreophilus*, or *Symphoricarpos rotundifolius*, may be present in the low-shrub layer. Scattered conifers (*Picea pungens, Pseudotsuga menziesii, Pinus contorta*) may be present in the tree canopy, and occasional *Amelanchier alnifolia* and conifer saplings are present but do not form a tall-shrub layer. The moderate herbaceous layer is mostly graminoids and characteristically dominated by *Carex geyeri* or *Calamagrostis rubescens* (Mueggler 1988). Other graminoids present include *Achnatherum occidentale, Elymus trachycaulus, Festuca thurberi*, and the introduced perennial graminoid *Poa pratensis*. Forb species have low cover and may include *Achillea millefolium, Antennaria microphylla, Arnica cordifolia, Astragalus miser, Galium boreale, Geranium viscosissimum, Lupinus argenteus, Maianthemum stellatum, Osmorhiza berteroi (= Osmorhiza chilensis)*, and the introduced *Taraxacum officinale*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus tremuloides*
Short shrub/sapling	*Juniperus communis*
Short shrub/sapling	*Symphoricarpos rotundifolius*
Herb (field)	*Carex geyeri*

Globally

Stratum	Species
Tree canopy	*Populus tremuloides*
Short shrub/sapling	*Juniperus communis*
Herb (field)	*Carex geyeri*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G4G5 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Some stands have higher cover by *Juniperus communis* than the sampled stands. One stand occurs in a 20-m wide band of vegetation.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (3 plots: CURE.0314, CURE.0320, CURE.0385).
Local Description Authors: J. Von Loh, mod. G. Bradshaw and J. Coles
Global Description Authors: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Mueggler 1988, Mueggler and Campbell 1986, Western Ecology Working Group n.d.

Populus tremuloides / Juniperus communis / Lupinus argenteus Forest

Quaking Aspen / Common Juniper / Silver-stem Lupine Forest

CODE	CEGL000589
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
FORMATION	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
ALLIANCE	*POPULUS TREMULOIDES* FOREST ALLIANCE (A.274) Quaking Aspen Forest Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This deciduous forest association is known from plateaus and mountain slopes on Fishland Plateau on the Colorado Plateau, and the southern and central Rocky Mountains from western Colorado and northern Utah to the Wind River Mountains in Wyoming. Elevations range from 2400-2745 m (8000-9000 feet). Stands occur on gentle slopes (<10%) on ridgetops and mesas often on northerly to southeasterly aspects. Substrates are variable and do not seem to restrict this type. Litter covers much of the ground surface. The vegetation is characterized by a moderately dense to dense tree canopy dominated by *Populus tremuloides* and a low-shrub layer (>10% cover) with *Juniperus communis* dominant or at least prominent. Several other shrubs, such as *Arctostaphylos uva-ursi, Artemisia tridentata, Mahonia repens, Paxistima myrsinites, Symphoricarpos oreophilus*, or *Symphoricarpos rotundifolius*, may be present in the low-shrub layer. Scattered conifers may be present in the tree canopy. Occasional tall shrubs *Amelanchier alnifolia* and conifer seedlings may also be present but do not form a tall-shrub layer. The moderate herbaceous layer is mostly forbs and is characteristically dominated by *Lupinus argenteus* with the absence or low cover of *Carex geyeri* and *Calamagrostis rubescens*. Other common forb species frequently include *Achillea millefolium, Antennaria microphylla, Arnica cordifolia, Astragalus miser, Geranium viscosissimum, Thalictrum fendleri*, and the introduced *Taraxacum officinale*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled on Carpenter Ridge and Tenderfoot Hill in the Curecanti National Recreation Area.

Globally

This forest association is known from Fishland Plateau in the Colorado Plateau, and the southern and central Rocky Mountains from western Colorado and northern Utah to western Wyoming.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This forest association occurs on ridgetops and mesatops. Sites are gently sloped (5-7% slopes), occur between 2691 and 2744 m elevation, and are oriented to northeast and southeast aspects. The unvegetated surface has high cover of litter and low cover of downed wood. Parent materials include Tertiary volcanic rocks. Soils are rapidly drained silt loams and sandy loams.

Globally

This deciduous forest association is known from plateaus and mountain slopes on Fishland Plateau on the Colorado Plateau, and the southern and central Rocky Mountains from western Colorado and northern Utah to the Wind River Mountains in Wyoming. Elevations range from 2400-2745 m (8000-9000 feet). Stands occur on gentle slopes (<10%) on ridgetops and mesas often on northerly to southeasterly aspects (Mueggler 1988). Substrates are variable and do not seem to restrict this type; they include silty and sandy loams derived from volcanics. Litter covers much of the ground surface.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 110 to 120% in these stands. *Populus tremuloides* forms an open to moderately closed canopy 5-20 m high that contributes 20 to 50% cover, *Juniperus communis* short shrubs provide 5 to 20% cover, and *Lupinus argenteus* forbs provide 1 to 25% cover. The subcanopy layer of 2- to 10-m tall *Populus tremuloides* and *Pseudotsuga menziesii* trees provides sparse cover, <5%. The remaining shrub layer is moderately diverse and provides moderate cover. The tall shrub *Amelanchier alnifolia* contributes sparse cover. Short and dwarf-shrubs provide moderate cover and include *Artemisia tridentata* ssp. *vaseyana, Symphoricarpos rotundifolius, Arctostaphylos uva-ursi*, and *Mahonia repens*. The herbaceous layer is moderate in terms of species diversity and provides moderate cover. Graminoids providing low to moderate cover include *Achnatherum lettermanii, Carex geyeri*, and *Festuca arizonica*. Other common forbs include *Achillea millefolium var. occidentalis* and *Comandra umbellata*.

Globally

The association is characterized by a moderately dense to dense tree canopy dominated by *Populus tremuloides* and a low-shrub layer (>10% cover) with *Juniperus communis* dominant or at least prominent (Mueggler 1988). Several other shrubs, such as *Arctostaphylos uva-ursi, Artemisia tridentata, Mahonia repens, Paxistima myrsinites, Symphoricarpos oreophilus*, or *Symphoricarpos rotundifolius*, may be present in the low-shrub layer. Scattered conifers (*Picea pungens, Pseudotsuga menziesii, Pinus contorta*, and less often *Pinus flexilis* or *Pinus ponderosa*) may be present in the tree canopy. Occasional tall shrubs *Amelanchier alnifolia* and conifer seedlings may also be present but do not form a tall-shrub layer. The moderate herbaceous layer is mostly forbs and is characteristically dominated by *Lupinus argenteus* with the absence or low cover of *Carex geyeri* and *Calamagrostis rubescens* (Mueggler 1988). Other common forb species frequently include *Achillea millefolium, Antennaria microphylla, Arnica cordifolia, Astragalus miser, Geranium viscosissimum, Thalictrum fendleri*, and the introduced *Taraxacum officinale*. Other graminoids present include *Achnatherum lettermanii, Achnatherum occidentale, Bromus porteri (= Bromus anomalus), Elymus trachycaulus, Festuca arizonica, Poa fendleriana*, and the introduced perennial graminoid *Poa pratensis*.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus tremuloides*
Short shrub/sapling	*Juniperus communis*
Herb (field)	*Lupinus argenteus*
Herb (field)	*Carex geyeri, Festuca arizonica, Poa fendleriana*

Globally

Stratum	Species
Tree canopy	*Populus tremuloides*
Short shrub/sapling	*Juniperus communis*
Herb (field)	*Lupinus argenteus*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Other: *Juniperus scopulorum* (G5), *Picea pungens* (G5), *Pinus ponderosa* (G5), *Pseudotsuga menziesii* (G5)

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (23-Feb-1994).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: One stand consists of a small vegetation patch. Another stand was more mature, in an area that had burned in the past.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plotss: CURE.0197, CURE.0336).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Mueggler 1988, Mueggler and Campbell 1986, Western Ecology Working Group n.d.

Populus tremuloides / Mahonia repens Forest

Quaking Aspen / Creeping Oregon-grape Forest

CODE	CEGL000594
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
FORMATION	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
ALLIANCE	*POPULUS TREMULOIDES* FOREST ALLIANCE (A.274) Quaking Aspen Forest Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This widespread aspen association occurs in the southern and middle Rocky Mountains and Black Hills in a variety of habitats. Stands occur along streams, in upland ravines and on gentle to moderately steep slopes. At lower elevations, stands tend to occur along drainages on cooler northerly aspects, whereas at higher elevation, stands are more upland and northern aspects are uncommon. Elevations range from 920-1200 m (3020-3940 feet) in the hills in eastern Montana and southwestern North Dakota to 1450-2892 m (4750-9480 feet) in the Black Hills and Rocky Mountains. The vegetation is characterized by an open to dense (20-86% cover) tree canopy dominated by 10- to 15-m tall *Populus tremuloides*. Scattered *Fraxinus pennsylvanica, Acer negundo*, or invading conifers, such as *Pseudotsuga menziesii, Pinus contorta, Pinus flexilis, Pinus ponderosa*, or *Picea glauca*, may occur in the tree canopy and shrub layers. The dwarf-shrub *Mahonia repens* is consistently present and typically dominates the understory with between 5-25% cover. Scattered taller shrubs may be present and include *Acer grandidentatum, Amelanchier alnifolia, Prunus virginiana, Ribes* spp., *Rosa woodsii, Rubus idaeus, Spiraea betulifolia var. lucida (= Spiraea lucida), Symphoricarpos albus, Symphoricarpos oreophilus*, and *Toxicodendron rydbergii*. *Quercus gambelii*, if present, has less than 5% cover. The mixed grass and forb herbaceous layer is provides sparse to moderate cover. Common graminoid or forb species include *Symphyotrichum laeve (= Aster laevis), Bromus anomalus, Bromus ciliatus, Carex sprengelii, Deschampsia caespitosa, Elymus virginicus, Galium boreale, Geranium richardsonii, Lathyrus ochroleucus, Ligusticum porteri, Lupinus argenteus, Maianthemum stellatum, Oryzopsis asperifolia*, and *Thalictrum dasycarpum*. The introduced perennial grass *Poa pratensis* may provide moderate cover (30-40%) in some stands.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association was sampled on Sheep Knob at Curecanti National Recreation Area.

Globally
This widespread aspen association occurs in the southern and middle Rocky Mountains and Black Hills from western Colorado to western Montana, in northeastern Wyoming, southeastern Montana and western South Dakota, and southwestern North Dakota.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This aspen forest association is found on upper hillslopes at Sheep Knob. The sample sites occur on gentle slopes (<5 degrees) on cooler northeastern aspects at 2872 and 2892 m elevation. There is high cover of litter (65-75% cover) with <10% bare ground on all plots.

Globally
This widespread aspen association occurs in the southern and middle Rocky Mountains and Black Hills in a variety of habitats. Stands occur along streams, in upland ravines and on gentle to moderately steep slopes. At lower elevations, stands tend to occur along drainages on cooler northerly aspects, whereas at higher elevations, stands are more upland and northern aspects are uncommon. Elevations range from 920-1200 m (3020-3940 feet) in the hills in eastern Montana and southwestern North Dakota to 1450-2892 m (4750-9480 feet) in the Black Hills and Rocky Mountains. Soils are variable and range from coarse, poorly consolidated colluvium sandstones to glacial tills and alluvial benches. In the Black Hills, substrates are often derived from limestone or sandstone-shale-limestone conglomerate. Soil texture is often loam or sandy loam.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association is rare in the park. The open to moderately dense (20-30% cover) tree canopy is dominated by 10- to 15-m tall *Populus tremuloides*. The dwarf-shrub *Mahonia repens* dominates the shrub layer with between 5-25% cover. *Symphoricarpos oreophilus* is the only other shrub present (<5% cover). The herbaceous layer is dominated by graminoids and provides sparse to moderate cover depending on shrub and tree canopy density. *Carex geyeri* and the exotic species *Poa pratensis* are the most abundant graminoids. *Deschampsia caespitosa* and *Elymus albicans* are also common. The exotic forb *Taraxacum officinale* is common on one site.

Globally
The vegetation is characterized by an open to moderately dense (20-45% cover) tree canopy dominated by 10- to 15-m tall *Populus tremuloides*. Scattered *Fraxinus pennsylvanica, Acer negundo*, or invading conifers, such as *Pseudotsuga menziesii, Pinus contorta, Pinus flexilis, Pinus ponderosa*, or *Picea glauca*, may occur in the tree canopy and shrub layers. The dwarf-shrub *Mahonia repens* is consistently present and typically dominates the understory with between 5-25% cover. Scattered taller shrubs may be present and include *Acer grandidentatum, Amelanchier alnifolia, Prunus virginiana, Ribes* spp., *Rosa woodsii, Rubus idaeus, Spiraea betulifolia var. lucida (= Spiraea lucida), Symphoricarpos albus, Symphoricarpos oreophilus*, and *Toxicodendron rydbergii*. *Quercus gambelii*, if present, has less than 5% cover. The mixed grass and forb herbaceous layer provides sparse to moderate cover. Common graminoid or forb species include *Symphyotrichum laeve (= Aster laevis), Bromus anomalus, Bromus ciliatus, Carex sprengelii, Deschampsia caespitosa, Elymus virginicus, Galium boreale, Geranium richardsonii, Lathyrus ochroleucus, Ligusticum porteri, Lupinus argenteus, Maianthemum stellatum, Oryzopsis asperifolia*, and *Thalictrum dasycarpum*. The introduced perennial grass *Poa pratensis* may provide moderate cover (30-40%) in some stands.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus tremuloides*
Short shrub/sapling	*Symphoricarpos oreophilus*
Herb (field)	*Mahonia repens*

Globally

Stratum	Species
Tree canopy	*Populus tremuloides*
Short shrub/sapling	*Symphoricarpos oreophilus*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Poa pratensis* (exotic, Medium), *Taraxacum officinale* (exotic)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G3 (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
There is a significant variation in stands classified to this association and some overlap with other classifications (Youngblood and Mueggler 1981, Mueggler 1988). Additional vegetation classification work is needed to clarify the relationship between similar associations in the western U.S.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data collected during accuracy assessment (4 observation points: CURE_AA.0359, CURE_AA.0360, CURE_AA.0621, CURE_AA.0622).
Local Description Authors: K.A. Schulz
Global Description Authors: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Hansen and Hoffman 1988, Hansen et al. 1991, Hansen et al. 1995, Johnston 1987, Jones 1992b, MTNHP 2002b, Mueggler 1988, Severson and Thilenius 1976, Western Ecology Working Group n.d., Youngblood and Mueggler 1981

Populus tremuloides / Prunus virginiana Forest

Quaking Aspen / Chokecherry Forest

CODE	CEGL000596
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
FORMATION	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
ALLIANCE	*POPULUS TREMULOIDES* FOREST ALLIANCE (A.274) Quaking Aspen Forest Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This aspen forest type is found in the Rocky Mountains and Black Hills of the western United States. It occurs on slope crests and midslopes with sandy loam, loam, or clay loam soils from approximately 1545 to 2720 m (5100-8980 feet) in elevation. Aspects are highly variable, and slopes are primarily gentle (0-20%) but may also be steep (50-100%). This association is dominated by *Populus tremuloides*. Conifers are sparse when present and can include *Pseudotsuga menziesii, Pinus contorta, Pinus ponderosa*, and *Picea glauca* in the Black Hills. The shrub layer can be a rich multilayered mixture of medium- and low-height shrubs. *Prunus virginiana* is often dominant or codominant with *Amelanchier alnifolia*. Additional shrub associates can include *Acer grandidentatum, Ribes inerme, Ribes oxyacanthoides* ssp. *setosum (= Ribes setosum), Rosa woodsii, Cornus sericea, Paxistima myrsinites, Rubus parviflorus, Symphoricarpos occidentalis*, and *Symphoricarpos oreophilus*. Herbaceous species can have low cover due to the well-developed shrub layer but commonly include *Agastache urticifolia, Aralia nudicaulis, Bromus carinatus, Carex sprengelii, Calamagrostis rubescens, Carex geyeri, Elymus glaucus, Fragaria virginiana, Galium boreale, Geranium viscosissimum, Maianthemum stellatum, Osmorhiza depauperata, Osmorhiza berteroi (= Osmorhiza chilensis), Rudbeckia occidentalis, Senecio serra*, and *Thalictrum fendleri*. Diagnostic features of this association are *Populus tremuloides* dominant in the canopy and *Prunus virginiana* well-represented in the shrub layer.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled at two sites south of Colorado State Highway 92 in the Curecanti National Recreation Area.

Globally

This aspen forest type is found in the Rocky Mountains and Black Hills of the western United States, ranging from South Dakota west to Wyoming and Oregon, and south to Colorado and Utah.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This forest association is found on banks of a stream and on a north-facing hillside. Sites are flat to moderately steep (1- to 13-degree slopes) and occur at 2659 and 2719 m elevation. The unvegetated ground surface is variable and ranges from low to high bare ground or litter with low cover of rock and gravel.

Globally

This aspen forest type occurs on slope crests and midslopes with sandy loam, loam, or clay loam soils from approximately 1545 to 2720 m (5100-8980 feet) in elevation. Aspects are highly variable, and slopes are primarily gentle (0-20%) but may be steep (50-100%). In the Black Hills, stands occur along mesic valley bottoms. The slopes can vary from steep (at the bottom of the hillslope) to gentle (along the valley bottom) (H. Marriott pers. comm. 1999). In the southern Rocky Mountains, a stand occurs on a steep, southeasterly midslope on granitic substrates, and on the Colorado Plateau a stand occurs at the end of a box canyon on a steep northwesterly slope on sandstone colluvium.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This forest association is characterized by an open tree canopy of 10- to 15-m tall *Populus tremuloides* that provides 25% cover with a moderately dense (40-50% cover) tall-shrub layer dominated by *Prunus virginiana*. Scattered *Pseudotsuga menziesii* may be present in the tree canopy. Other shrubs present may include *Alnus incana, Amelanchier utahensis, Rosa woodsii*, and *Symphoricarpos oreophilus*. If *Quercus gambelii* is present, then cover is low (<5%). The herbaceous layer is open to moderate (10-30% cover) and composed of a mixture of graminoids and forbs such as *Bromus anomalus, Carex geyeri, Elymus albicans, Heracleum maximum (= Heracleum lanatum), Urtica dioica* ssp. *gracilis (= Urtica dioica var. procera)*, and introduced perennial grasses *Phleum pratense* and *Poa pratensis*.

Globally

This association is dominated by *Populus tremuloides*. Conifers are sparse (<25% of the tree canopy) when present and can include *Pseudotsuga menziesii, Pinus contorta, Pinus ponderosa*, and *Picea glauca* in the Black Hills. The shrub layer can be a rich multilayered mixture of medium- and low-height shrubs. *Prunus virginiana* is often

dominant or codominant with *Amelanchier alnifolia*. Additional shrub associates can include *Acer grandidentatum, Amelanchier utahensis, Cornus sericea, Mahonia repens, Ribes inerme, Ribes oxyacanthoides* ssp. *setosum (= Ribes setosum), Rosa woodsii, Paxistima myrsinites, Rubus parviflorus, Symphoricarpos occidentalis*, and *Symphoricarpos oreophilus*. Herbaceous species have low cover due to the well-developed shrub layer but commonly include *Agastache urticifolia, Aralia nudicaulis, Artemisia ludoviciana, Bromus carinatus, Carex sprengelii, Calamagrostis rubescens, Carex geyeri, Elymus glaucus, Fragaria virginiana, Galium boreale, Geranium viscosissimum, Maianthemum stellatum, Osmorhiza depauperata, Osmorhiza berteroi (= Osmorhiza chilensis), Piptatherum micranthum, Rudbeckia occidentalis, Senecio serra, Thermopsis divaricarpa,* and *Thalictrum fendleri*. Exotic graminoids, such as *Agropyron cristatum, Bromus tectorum, Phleum pratense,* and *Poa pratensis*, may dominate disturbed herbaceous layers. Diagnostic features of this association are *Populus tremuloides* dominant in the canopy and *Prunus virginiana* well-represented in the shrub layer.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus tremuloides*

Globally

Stratum	Species
Tree canopy	*Populus tremuloides*
Shrub/sapling (tall & short)	*Amelanchier alnifolia, Prunus virginiana*
Tall shrub/sapling	*Amelanchier utahensis*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Phleum pratense* (exotic, Medium), *Poa pratensis* (exotic, Medium)

Globally
Exotic/Invasive: *Agropyron cristatum* (invasive, Medium/Low), *Bromus tectorum* (invasive, High), *Phleum pratense* (invasive, Medium), *Poa pratensis* (invasive, Medium); **Other**: *Bonasa umbellus* (G5)

CONSERVATION STATUS RANK
Global Rank & Reasons: G3G4 (24-Oct-2002). This community has a relatively restricted range (which would not change even if combined with *Populus tremuloides / Prunus virginiana* Woodland (CEGL002130)). Stands are somewhat patchy on the landscape, with relatively small occurrences. They require a moderately specific set of abiotic factors, being found in drainage bottoms, with or without flowing streams. Few Element Occurrences have been documented. The restriction of this type to primarily riparian areas or moist drainages makes it susceptible to impacts caused by cattle grazing, especially at lower elevations.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This type appears to be most common in riparian areas (Marriott and Faber-Langendoen 2000). This type seems equivalent to *Populus tremuloides / Prunus virginiana* Woodland (CEGL002130).

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (3 plots: CURE.0006, CURE.0100, CURE.0268 and 2 observation points: CURE_AA.0534, CURE_AA.1459).
Local Description Authors: K.A. Schulz
Global Description Authors: J. Drake, mod. S.L. Neid and K.A. Schulz

REFERENCES: Bell et al. 2009, Coenenberg and Depuit 1979, Crowe et al. 2004, Driscoll et al. 1984, Johnston 1987, Kagan et al. 2004, Komarkova et al. 1988b, MTNHP 2002b, Marriott and Faber-Langendoen 2000, Marriott pers. comm., Midwestern Ecology Working Group n.d., Mueggler 1988, Mueggler and Campbell 1986, Titus et al. 1998, Youngblood and Mueggler 1981

Populus tremuloides / Symphoricarpos oreophilus / Thalictrum fendleri Forest

Quaking Aspen / Mountain Snowberry / Fendler's Meadowrue Forest

CODE	CEGL000616
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
FORMATION	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
ALLIANCE	*POPULUS TREMULOIDES* FOREST ALLIANCE (A.274) Quaking Aspen Forest Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This is a major aspen forest association common in the mountains of the Colorado Plateau, the eastern Great Basin, and the central and southern Rocky Mountains. Stands can occur from 1585-2848 m (5200-9340 feet) elevation but generally occur at moderate elevations. Stands grow on gentle slopes of less the 25% or mountains and mesas, rather than on benches or flats. The vegetation is characterized by a *Populus tremuloides*-dominated overstory canopy (40-100% cover), with an open, yet distinct low-shrub stratum comprised of *Symphoricarpos oreophilus* or *Symphoricarpos rotundifolius*. Other tree species present include *Abies lasiocarpa* and *Pseudotsuga menziesii* with low cover (generally <5% cover) and several other conifers in trace amounts. Other low shrubs present include *Artemisia tridentata* ssp. *vaseyana*, *Mahonia repens (= Berberis repens)*, *Paxistima myrsinites*, and *Rosa woodsii*. Tall shrubs may be present but are never abundant enough to form a distinct stratum. The herbaceous layer is rich with many forbs. The most abundant forbs are *Thalictrum fendleri, Geranium viscosissimum, Helianthella uniflora, Osmorhiza berteroi (= Osmorhiza chilensis), Lathyrus lanszwertii, Galium boreale, Achillea millefolium*, and the introduced species *Taraxacum officinale*. Common graminoids include *Bromus carinatus, Poa secunda, Elymus trachycaulus*, and the introduced *Poa pratensis*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled on Poverty Mesa in the Curecanti National Recreation Area.

Globally

This is a major aspen forest association common in the mountains of the Colorado Plateau, the eastern Great Basin, and the central and southern Rocky Mountains from the Abajo Mountains in southern Utah, northern and eastern Nevada, eastern Idaho, and into western Wyoming and western Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This forest association occurs on the slopes of mesas. The site is gently sloped (9%), occurs at 2848 m elevation, and is oriented to the northeast. The unvegetated surface has high cover of litter and moderate exposure of bare soil. Downed wood is common. Parent materials are Tertiary volcanic rocks. Soils are rapidly drained loams.

Globally

This is a major aspen forest association common in the mountains of the Colorado Plateau, the eastern Great Basin, and the central and southern Rocky Mountains. Stands can occur between 1585 and 2848 m (5200-9340 feet) elevation but generally occur at moderate elevations between 1828 and 2651 m (6000-8700 feet) (Mueggler 1988). Stands grow on gentle slopes of less the 25% or mountains and mesas, rather than on benches or flats. They are found on all aspects and on soil derived from igneous and sedimentary parent materials.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is 165% in this densely vegetated type. *Populus tremuloides* trees 15-20 m tall form closed canopies that provide 65% cover, the short shrub *Symphoricarpos rotundifolius* contributes 40% cover, and the tall forb *Thalictrum fendleri* contributes 15% cover. The subcanopy provides sparse cover by 5- to 10-m tall *Populus tremuloides* trees. The shrub layer is limited to a single species, the short shrub *Symphoricarpos rotundifolius*, which provides moderate cover. The herbaceous layer is moderate in species diversity and provides moderate to dense cover. Graminoids provide low to moderate cover by the non-native *Poa pratensis*. Forbs are moderately diverse, provide moderate cover and include *Achillea millefolium var. occidentalis, Galium boreale, Geranium* sp., and *Lathyrus lanszwertii var. leucanthus*.

Globally

This montane forest association has a relatively simple vegetation structure. The dominant overstory canopy is *Populus tremuloides* (40-100% cover with 70% average), with an open, yet distinct low-shrub stratum comprised of *Symphoricarpos oreophilus* or *Symphoricarpos rotundifolius* (Mueggler 1988). Other tree species present include *Abies lasiocarpa* and *Pseudotsuga menziesii* with low cover (generally <5% cover). Several other conifers may be present in trace amounts, such as *Abies concolor, Picea pungens, Pinus contorta*, and *Pinus flexilis*. Other low shrubs present include *Artemisia tridentata* ssp. *vaseyana, Mahonia repens (= Berberis repens), Paxistima myrsinites*, and *Rosa woodsii*. Tall shrubs, such as *Acer glabrum, Amelanchier alnifolia*, and *Prunus virginiana*, may be present but are never abundant enough to form a distinct stratum. The herbaceous layer is rich with many forbs. The most abundant forbs are *Thalictrum fendleri, Geranium viscosissimum, Helianthella uniflora, Osmorhiza berteroi (= Osmorhiza chilensis), Lathyrus lanszwertii, Galium boreale, Achillea millefolium*, and the introduced species *Taraxacum officinale* (Mueggler 1988). Common graminoids include *Bromus carinatus, Poa secunda, Elymus trachycaulus*, and the introduced *Poa pratensis*.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus tremuloides*
Short shrub/sapling	*Symphoricarpos rotundifolius*
Herb (field)	*Thalictrum fendleri*
Herb (field)	*Poa pratensis*

Globally

Stratum	Species
Tree canopy	*Populus tremuloides*
Short shrub/sapling	*Symphoricarpos oreophilus*
Herb (field)	*Geranium viscosissimum*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Exotic/Invasive: *Poa pratensis* (exotic, Medium), *Taraxacum officinale* (exotic)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association is differentiated from the similar *Populus tremuloides / Symphoricarpos oreophilus / Calamagrostis rubescens* Community Type (Mueggler 1988) by the lack of the principal indicator species *Calamagrostis rubescens* or *Carex geyeri*, reduced prominence of *Lupinus argenteus*, and a greater abundance of *Bromus carinatus*, *Pseudostellaria jamesiana (= Stellaria jamesiana)*, and annuals.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: The sampled site is a *Populus tremuloides* stand surrounded by *Symphoricarpos oreophilus* shrubland and occupying a gentle, mesic slope. Grazing by domestic livestock is evident, including the presence of non-native plant species.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0362 and 10 observation points: BLCA_AA.281, BLCA_AA.293, BLCA_AA.300, BLCA_AA.301, BLCA_AA.306, BLCA_AA.317, BLCA_AA.895, BLCA_AA.972, BLCA_AA.974, BLCA_AA.975).
Local Description Authors: J. Von Loh
Global Description Authors: G. Kittel, mod. K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Hoffman and Alexander 1980, Mueggler 1988, Mueggler and Campbell 1982, Mueggler and Campbell 1986, Western Ecology Working Group n.d., Youngblood and Mueggler 1981

Populus tremuloides / Symphoricarpos oreophilus Forest

Quaking Aspen / Mountain Snowberry Forest

CODE	CEGL000610
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
FORMATION	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
ALLIANCE	*POPULUS TREMULOIDES* FOREST ALLIANCE (A.274)
	Quaking Aspen Forest Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This deciduous forest association is widespread in the Rocky Mountains and found in mountains of the interior western U.S. Stands occur at montane and subalpine elevations of 2010 to 2960 m (6600-9700 feet) on a variety of intermediately mesic sites, including lower slopes and benches, draws, sheltered slopes, and high benches that range from flat to steep slopes of any aspect. Northern to eastern aspects are common in the drier and warmer environments such as the southern portions of its range. Soils are generally well-developed, well-drained loams or sandy loams. Vegetation is characterized by a moderately dense to dense tree canopy of *Populus tremuloides* with a short-shrub layer that is dominated by *Symphoricarpos oreophilus*. Occasional conifer trees are possible in the stand but do not make up more than 25% of the tree canopy.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.
Globally

This aspen forest association occurs throughout the Rocky Mountain region and in mountains in the interior western U.S. and possibly Trans-Pecos Texas.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This forest association is known from mid to upper slopes, ridgetops and low-lying areas such as meadows. Aspects are variable and elevations range from 2614 to 2877 m. Parent materials include quartz, quartz-biotite schist, migmatitic gneiss, breccia-volcaniclastic facies, pegmatite, and tuff. The unvegetated surface is largely bare soil and litter.

Globally

This deciduous forest association is widespread in the Rocky Mountains and found in mountains of the interior western U.S. Stands occur at montane and subalpine elevations of 2010-2960 m (6600-9700 feet) on a variety of intermediately mesic sites, including lower slopes and benches, draws, sheltered slopes, and high plateaus that range from flat to steep slopes of any aspect. Northern to eastern aspects are common in the drier and warmer environments such as the southern portions of its range. Soils are generally deep and well-developed, well-drained loams or sandy loams.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is characterized by an open canopy of *Populus tremuloides* (typically <30% cover) with a short-shrub layer dominated by *Symphoricarpos oreophilus*. Other shrubs include *Prunus virginiana, Salix scouleriana, Mahonia repens, Ericameria nauseosa (= Chrysothamnus nauseosus), Amelanchier alnifolia, Quercus gambelii,* and *Artemisia tridentata*. Graminoids can be abundant and can include *Agrostis stolonifera, Bromus ciliatus, Deschampsia caespitosa, Hordeum jubatum, Poa pratensis, Poa fendleriana, Achnatherum lettermanii (= Stipa lettermanii), Achnatherum nelsonii (= Stipa nelsonii), Achnatherum pinetorum (= Stipa pinetorum),* and *Elymus repens*. Forbs contribute less cover and may include *Carduus nutans, Urtica dioica* ssp. *gracilis (= Urtica dioica var. procera), Erigeron speciosus, Veratrum tenuipetalum, Ligusticum porteri*, and *Solidago canadensis*.

Globally

This association is characterized by a moderately dense to dense tree canopy of *Populus tremuloides* with a short-shrub layer that is dominated by *Symphoricarpos oreophilus* (usually >10% cover). Associated shrubs with lesser cover include *Rosa woodsii, Mahonia repens, Amelanchier utahensis, Prunus virginiana, Paxistima myrsinites,* and *Amelanchier alnifolia*. The generally sparse herbaceous layer is composed primarily of graminoid species such as *Carex geyeri, Achnatherum lettermanii, Poa fendleriana, Elymus glaucus,* and *Festuca thurberi*. Associated herbaceous species include *Achillea millefolium, Thalictrum fendleri, Geranium richardsonii, Geranium caespitosum, Lupinus argenteus, Osmorhiza* spp., and *Fragaria virginiana*. Occasional conifer trees are possible in the stand, including *Juniperus scopulorum, Picea pungens,* and *Pseudotsuga menziesii*, but do not make up more than 25% of the tree canopy. Total vegetation cover is often in excess of 100%, although the tree canopy may only have 20% closure.

MOST ABUNDANT SPECIES

*Black Canyon of the Gunnison National Park - Curecanti National Recreation Area*Data are not available.

Globally

Stratum	Species
Tree canopy	*Populus tremuloides*
Short shrub/sapling	*Symphoricarpos oreophilus*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Exotic/Invasive: *Poa pratensis* (Introduced perennial cool-season grass common in many mesic environments., Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Apr-1999).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
There are many similar associations. This *Populus tremuloides* forest association is based in part on community types and habitat types that were more broadly defined and may include several of the more narrowly defined USNVC associations based on Mueggler (1988) community types. Generally, this aspen association is characterized by having a shrub layer dominated by *Symphoricarpos oreophilus* (usually >20% cover) without *Quercus gambelii* or *Amelanchier alnifolia* codominating (<5% cover). The understory is often sparse, but if not sparse will not have more than 10% cover of any of the following species: *Bromus carinatus, Calamagrostis rubescens, Carex rossii, Festuca thurberi, Thalictrum fendleri, Wyethia amplexicaulis*, or tall forbs including *Agastache urticifolia, Eucephalus engelmannii, Hackelia floribunda, Mertensia arizonica, Osmorhiza occidentalis, Senecio serra*, and *Valeriana occidentalis.*

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: This type was described from field notes.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: Data are not available.
Local Description Authors: M.E. Hall
Global Description Authors: K.A. Schulz, mod. J. Coles

REFERENCES: Baker 1982b, Bourgeron and Engelking 1994, Boyce 1977, CONHP Ecology Team 2001, Day and Wright 1985, Dorn 1969, Driscoll et al. 1984, Ferchau 1973, Hess and Wasser 1982, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Johnston 1987, Johnston and Hendzel 1985, Jones and Ogle 2000, Kagan et al. 2000, Keammerer and Peterson 1981, Keammerer and Stoecker 1975, Keammerer and Stoecker 1980, Komarkova et al. 1988a, Kovalchik 1987, Lewis 1975a, MTNHP 2002b, Mueggler 1988, Reed 1971, Titus et al. 1998, Western Ecology Working Group n.d., Youngblood and Mueggler 1981

Populus tremuloides / Tall Forbs Forest

Quaking Aspen / Tall Forbs Forest

CODE	CEGL000618
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
FORMATION	Montane or boreal cold-deciduous forest (I.B.2.N.b.)
ALLIANCE	*POPULUS TREMULOIDES* FOREST ALLIANCE (A.274) Quaking Aspen Forest Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Aspen Forest and Woodland (CES306.813)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This *Populus tremuloides* forest is one of the most common and abundant aspen forest types in the Rocky Mountains. It occurs throughout mountainous areas and occurs on any aspect but tends to occur more often on north-facing slopes. It can be found on steep moist hillsides and often along narrow riparian areas. The broad-leaved deciduous tree canopy in dominated by *Populus tremuloides*. Low shrubs are virtually absent from this type. The undergrowth is characterized by a thick carpet of tall forbs (<1 m) with no one species dominant. Tall forbs include *Agastache urticifolia, Delphinium X occidentale, Eucephalus engelmannii (= Aster engelmannii), Hackelia*

floribunda, Heracleum maximum (= Heracleum lanatum), Mertensia arizonica, Osmorhiza occidentalis, Senecio serra, and *Valeriana occidentalis*. Other herbaceous species are present, including graminoid species. Forb species in streambank stands can be different from hillside stands.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This rare association was sampled along Mesa Creek near State Highway 92 in Curecanti National Recreation Area.

Globally
This deciduous forest association occurs in the southern and central Rocky Mountains and plateaus and mountains of the Colorado Plateau and extends into the Jarbridge and Independence mountains of northeastern Nevada and into southwestern Montana.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This forest association occurs on valley slopes. The site is steep (54% slope), occurs at 2704 m elevation, and is oriented to the southeast. The unvegetated surface has a high cover of litter and downed wood. Parent materials are from Quaternary landslide. Soils are rapidly drained sandy clay loams.

Globally
This deciduous forest association occurs in the southern and central Rocky Mountains and plateaus and mountains of the Colorado Plateau and extends into the Jarbridge and Independence mountains of northeastern Nevada and into southwestern Montana. Stands occupy flat to gently sloping, moist to wet sites, often adjacent to streams. Slope positions are topographically low-lying, such as toeslopes or lower sidehills, flats, valley bottoms, and stream terraces. It is generally found on concave landforms where moisture can accumulate, rarely on convex topography. Aspect is variable, but many easterly or northerly stands are reported in the literature. Elevations are upper montane to lower subalpine and range from about 2100-3080 m (7000-10,000 feet), with most examples reported above 2745 m (9000 feet). Soils underlying this community type are derived from alluvial deposition of a variety of parent materials, but rarely is it found on volcanic soils (Mueggler 1988). The soils are deep, well-drained loams, sandy loams to clay loams in texture (Boyce 1977, Hess and Wasser 1982). With increasing depth, coarse and rock fragments increase in proportion. Hess and Wasser (1982) report very thin litter layers, and Boyce (1977) reports a low percentage of organic matter in the A horizon. Litter and duff comprise the majority of the unvegetated ground cover.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is 140% in this densely vegetated type. *Populus tremuloides* trees 20-35 m tall form an open to moderately closed canopy that provides 50% cover. *Populus tremuloides* saplings are also present in the subcanopy (5-10 m tall) and tall shrub (1-2 m tall) strata providing low cover. The short-shrub layer has low species diversity, provides sparse cover and includes *Symphoricarpos rotundifolius, Ribes inerme,* and *Rosa woodsii*. The herbaceous layer is diverse and provides dense cover. Graminoids are low in species diversity, provide moderate cover and include *Carex* sp., *Elymus canadensis, Phalaris arundinacea,* and *Poa pratensis*. Forbs are diverse in terms of species composition and provide dense cover, including *Heracleum maximum, Osmorhiza berteroi, Urtica dioica* ssp. *gracilis, Angelica* sp., *Geranium* sp., and *Maianthemum stellatum*. Seedling/root sprouts of *Populus tremuloides* trees provide sparse cover in the herbaceous layer.

Globally
The vegetation of this type is structurally simple but may be compositionally complex. The canopy is dominated by *Populus tremuloides,* with occasional small amounts of conifer species present (particularly *Abies lasiocarpa* and *Picea engelmannii*). Shrubs are poorly represented, but *Juniperus communis, Ribes* sp., *Sambucus racemosa,* and *Symphoricarpos oreophilus* may occur with low cover. The herbaceous layer is characterized by the presence of several species of mesic tall forbs, accompanied by a mixture of low forbs and graminoids. The unifying characteristic of this type is the presence and usual prominence of one or more members of the tall-forb group of species, the absence of distinct shrub layers, and a lack of substantial amounts of conifers in the tree layer. Members of the tall-forb guild are *Agastache urticifolia, Delphinium X occidentale, Eucephalus engelmannii (= Aster engelmannii), Hackelia floribunda, Heracleum maximum (= Heracleum lanatum), Mertensia arizonica, Osmorhiza occidentalis, Senecio serra,* and *Valeriana occidentalis* (Mueggler 1988). No one member of this group is

consistently dominant or even present, but as a group they form the dominant cover of the herbaceous layer, often exceeding 10%. Additional low forbs may include *Achillea millefolium var. occidentalis (= Achillea lanulosa), Galium boreale, Galium triflorum, Geranium richardsonii, Geranium viscosissimum, Helianthella quinquenervis, Hydrophyllum fendleri, Ligusticum filicinum, Maianthemum stellatum, Streptopus amplexifolius, Thalictrum fendleri, Urtica dioica*, and *Viola* spp. Common graminoids include *Bromus* spp., *Calamagrostis canadensis, Carex* spp., *Elymus glaucus*, and *Poa pratensis*. At higher elevations, with cooler conditions, Powell (1988a) describes two stands of this community type with *Elymus glaucus* dominating, which otherwise are floristically the same as described here. Many of the stands of this type are species-rich, and cover of the herbaceous understory is very high, usually over 200%.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus tremuloides*
Tree subcanopy	*Populus tremuloides*
Short shrub/sapling	*Symphoricarpos rotundifolius*
Herb (field)	*Heracleum maximum*, *Osmorhiza berteroi*, *Urtica dioica* ssp. *gracilis*
Herb (field)	*Elymus canadensis*

Globally

Stratum	Species
Tree canopy	*Populus tremuloides*
Herb (field)	*Heracleum maximum*, *Osmorhiza occidentalis*, *Valeriana occidentalis*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Poa pratensis* (exotic, Medium), *Trifolium repens* (exotic, Medium/Low); **Other**: *Phalaris arundinacea* (G5)

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Data are not available.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: The sampled site has been disturbed by cattle grazing and is less dense in terms of cover than other areas of the surrounding forest.

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0112 and 2 observation points: CURE_AA.0386, CURE_AA.1159).

Local Description Authors: J. Von Loh

Global Description Authors: M.S. Reid, mod. G. Kittel and K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Boyce 1977, Bunin 1975a, Bunin 1975c, CONHP unpubl. data 2003, Carsey et al. 2003a, Driscoll et al. 1984, Hess and Wasser 1982, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Johnston and Hendzel 1985, Keammerer and Stoecker 1980, Kittel et al. 1994, Kittel et al. 1997a, Kittel et al. 1999a, Kittel et al. 1999b, Lewis 1975a, MTNHP 2002b, MTNHP unpubl. data, Marr et al. 1973a, Mueggler 1988, Mueggler and Campbell 1982, Mueggler and Campbell 1986, Powell 1988a, Richard et al. 1996, Western Ecology Working Group n.d., Youngblood and Mueggler 1981

Acer negundo / Cornus sericea Forest

Box-elder / Red-osier Dogwood Forest

CODE	CEGL000625
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
ALLIANCE	*ACER NEGUNDO* TEMPORARILY FLOODED FOREST ALLIANCE (A.278) Box-elder Temporarily Flooded Forest Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This association is known from lower montane canyons in Utah, western Colorado, and the southeastern corner of Idaho at elevations of less than 1985 to 2350 m (<6500-7700 feet). It occurs on gently sloping terraces and benches in narrow, shady canyons on second-order and higher streams. The overstory of this forest association is dominated by *Acer negundo*. *Betula occidentalis, Alnus incana,* or *Acer grandidentatum* occasionally form a dense low-tree layer. Cover of *Cornus sericea* is usually greater than 25%, and *Salix lutea* or *Salix exigua* are occasionally present. Minor amounts of *Rosa* spp., *Ribes inerme*, and *Symphoricarpos oreophilus* may also be present. The herbaceous layer is highly variable, with *Maianthemum stellatum (= Smilacina stellata)* and *Geranium richardsonii* commonly occurring. *Populus angustifolia, Salix exigua*, or other *Acer negundo* types may dominate adjacent riparian plant communities.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon riparian forest association was sampled along drainages on the north side of Crystal Reservoir and west of Colorado State Highway 92 in the Curecanti National Recreation Area.

Globally

This community is known from lower montane canyons in Utah, southeastern Idaho, and western Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This riparian forest association is found on banks of streams and intermittent drainageways bounded by bedrock wall/cliffs. Sites are gentle to moderately steep (4- to 15-degree slopes), occur at 2065 and 2104 m elevation, and are oriented to southwesterly aspects. Substrates are alluvium. The unvegetated ground surface has high cover of bedrock and rock with moderate cover (30%) of litter and low cover of bare ground (<10%). There is a history of fire with charred deadfall in one of the stands.

Globally

This association is known from lower montane canyons in the Colorado Plateau (including the La Sal Mountains), Wasatch Range and extends into western Colorado and the southeastern corner of Idaho along riparian corridors. Elevation ranges from below 1985 to 2350 m (<6500-7700 feet). Stands occur on gently sloping terraces and benches in narrow, shady canyons on second-order and higher streams. Soils are derived from alluvium and include sandy, coarse to fine loamy, and loamy skeletal (Padgett et al. 1989, Kittel et al. 1999b, Carsey et al. 2003a). Depth to water table ranges from 21 cm to below 1 m. Wetter sites have mottles within 1 m of surface indicating a seasonally high water table. Soils are often classified as Mollisols with a few Entisols and Inceptisols (Padgett et al. 1989).

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This riparian forest association is characterized by an open (about 10% cover) tree canopy dominated by 5- to 10-m tall *Acer negundo* with a moderately dense tall-shrub layer dominated by 15-25% cover of *Cornus sericea*. *Pseudotsuga menziesii* with *Populus angustifolia* may be present. *Betula occidentalis, Alnus incana,* or *Acer grandidentatum* occasionally will form a dense low-tree layer. Other shrub and dwarf-shrub cover is variable and may include *Chrysothamnus viscidiflorus, Holodiscus dumosus, Philadelphus microphyllus, Prunus virginiana, Rhus trilobata,* and *Ribes inerme*. *Quercus gambelii,* if present, has less than 5% cover. The herbaceous layer provides sparse cover because of the dense shade cast by the tree and shrub canopies.

Globally

This riparian forest association is characterized by an open to moderately dense tree canopy dominated by *Acer negundo*. *Betula occidentalis, Alnus incana,* or *Acer grandidentatum* may occasionally form a dense tree subcanopy/tall-shrub layer. Scattered *Abies concolor, Abies lasiocarpa, Pseudotsuga menziesii*, and *Populus angustifolia* may be present in the tree canopy (Padgett et al. 1989). Cover of *Cornus sericea* is usually greater than 25%, and *Salix irrorata, Salix lutea*, or *Salix exigua* are occasionally present. Minor amounts of *Acer glabrum, Chrysothamnus viscidiflorus, Fraxinus anomala, Holodiscus dumosus, Paxistima myrsinites, Philadelphus microphyllus, Prunus virginiana, Rhus trilobata, Ribes inerme, Rosa* spp., *Rubus idaeus*, and *Symphoricarpos oreophilus* may also be present (Padgett et al. 1989, Kittel et al. 1999b, Carsey et al. 2003a). *Quercus gambelii*, if present, has less than 5% cover. The herbaceous layer is highly variable in species composition and cover depending on shrub cover and disturbance. Characteristic species include *Actaea rubra, Arctium lappa, Carex geyeri, Equisetum* spp., *Geranium richardsonii, Heracleum maximum (= Heracleum lanatum), Heracleum maximum, Maianthemum stellatum (= Smilacina stellata), Mertensia franciscana, Osmorhiza berteroi (= Osmorhiza chilensis), Senecio serra,* and *Urtica dioica* (Padgett et al. 1989, Kittel et al. 1999b, Carsey et al. 2003a). The introduced forage grass *Poa pratensis* and exotic annual forb *Taraxacum officinale* dominate the herbaceous layer of some stands.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Acer negundo*
Tall shrub/sapling	*Cornus sericea*, *Holodiscus dumosus*, *Prunus virginiana*, *Rhus trilobata*

Globally

Stratum	Species
Tree canopy	*Acer negundo*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Phleum pratense* (exotic, Medium), *Poa pratensis* (exotic, Medium)

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (19-Sep-2000). This community is known from lower montane canyons in Utah, southeastern Idaho, western Colorado, and south western Wyoming. There are less than 50 known occurrences of this community. Many more occurrences are expected to occur, although its full range has not yet been adequately searched or inventoried. This association occurs in narrow canyon bottoms typically above the channel bankfull level but often subject to at least seasonally saturated soils. Excessive livestock and wildlife use can severely damage standing trees and reduce the reproduction success of *Acer negundo*. *Cornus sericea* is highly palatable to livestock and wildlife. Browsing of both these species can be high if there is easy access into the community. Habitat for this association is limited and often impacted.

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally
This association is documented from 13 quantitative sample plots in Utah and 4 quantitative sample plots in Colorado. Although two varieties of *Acer negundo* are recognized in Colorado, they are not differentiated for the purposes of this association. Some stands have open canopies and are better classified as woodlands. This question needs rangewide review.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data collected during accuracy assessment (2 observation points: CURE_AA.0079, CURE_AA.1060).
Local Description Authors: K.A. Schulz
Global Description Authors: J. Thompson and J. Stevens, mod. K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Dawson and Ehleringer 1993, Driscoll et al. 1984, IDCDC 2005, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1999a, Kittel et al. 1999b, Padgett et al. 1988b, Padgett et al. 1989, Richard et al. 1996, Western Ecology Working Group n.d., Youngblood et al. 1985b

Populus angustifolia / Rosa woodsii Forest

Narrowleaf Cottonwood / Woods' Rose Forest

CODE	CEGL000653
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
ALLIANCE	*POPULUS ANGUSTIFOLIA* TEMPORARILY FLOODED FOREST ALLIANCE (A.310) Narrowleaf Cottonwood Temporarily Flooded Forest Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY
Globally
This deciduous riparian forest occurs on stream terraces and adjacent floodplains in the LaSal and Abajo mountains in southeastern Utah, the west slope of the Wasatch Range in central Utah, in western Wyoming, and in various mountain ranges in Nevada. It may also occur in Colorado. Elevation ranges from 1780-2300 m. Substrates are moderately well-drained alluvial soils derived from sandstone or other sedimentary rock. The community is one of the drier *Populus angustifolia* plant associations. This association has a closed upper tree canopy that is dominated by *Populus angustifolia*. Other tree species may include *Quercus gambelii, Populus tremuloides*, and an occasional *Juniperus osteosperma* or other upland tree species. *Prunus virginiana* and *Salix bebbiana* may form a tall-shrub layer, especially streamside. A dense short-shrub layer dominated by *Rosa woodsii* or *Rosa nutkana* is diagnostic of this type. *Symphoricarpos oreophilus* is often present and occasionally codominant. *Rhus trilobata, Mahonia repens*, or *Cornus sericea* are present in some stands. The vine *Clematis ligusticifolia* is abundant in some stands. The herbaceous layer is generally sparse but may be denser in openings where the introduced grasses *Poa pratensis* and *Agrostis stolonifera* and the native *Elymus glaucus* are dominant. Common native forbs include *Maianthemum stellatum, Thalictrum fendleri, Osmorhiza berteroi (= Osmorhiza chilensis), Geranium richardsonii*, and *Galium boreale*. The introduced forb *Taraxacum officinale* is often also present. The dense short-shrub layer dominated by

Rosa spp. separates this association from other *Populus angustifolia* riparian forests. If present, *Cornus sericea* is always a minor component.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This uncommon association was sampled at Wilson's Landing and along the Neversink Trail on the Gunnison River floodplain in Curecanti National Recreation Area.

Globally
This riparian forest occurs locally in the LaSal and Abajo mountains in southeastern Utah, on the western slope of the Wasatch Range in central Utah, in western Wyoming, and in various mountain ranges in Nevada. This association may also occur in Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This forest association occurs on floodplain terraces and toeslopes of the Gunnison River. Sites are gently sloped (3-8% slope), occur between 2309 and 2313 m elevation, and are oriented to the northwest. The unvegetated surface has high cover of litter and downed wood. Parent materials are Quaternary alluvium. Soils are poorly drained loamy sands and sandy clay loams. Some organic soils are present.

Globally
This deciduous riparian forest occurs on stream terraces and adjacent floodplains in isolated mountains and tablelands of the Colorado Plateau, the west slope of the Wasatch Range in Wyoming, and in various mountain ranges in Nevada. It may also occur on the western slope of the southern Rocky Mountains. Elevation ranges from 1780-2300 m. Substrates are moderately well-drained alluvial soils derived from sandstone or other sedimentary rock.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 91 to over 100% in this type. *Populus angustifolia* forms an open canopy 5-35 m high that contributes 25 to 50% cover, and the short shrub *Rosa woodsii* provides 1 to 5% cover. The subcanopy layer of 2- to 15-m tall *Populus angustifolia* trees provides 3 to 25% cover. The shrub layer has low species diversity and provides low to moderate cover. Tall and short shrubs providing low to moderate cover include *Artemisia tridentata* ssp. *wyomingensis, Lonicera involucrata*, and *Ribes montigenum*. The herbaceous layer is moderately diverse in terms of species composition and provides low to moderate cover. Graminoids include *Bromus inermis, Carex geyeri, Juncus balticus, Phalaris arundinacea, Poa compressa*, and *Poa pratensis*. Forbs provide sparse to low cover and include *Cirsium arvense, Maianthemum stellatum*, and *Thermopsis montana*.

Globally
This deciduous riparian forest is one of the drier *Populus angustifolia* plant associations. This association has a closed upper tree canopy that is dominated by *Populus angustifolia*. Other tree species may include *Quercus gambelii, Populus tremuloides*, and an occasional *Juniperus osteosperma* or other upland tree species. *Prunus virginiana* and *Salix bebbiana* may form a tall-shrub layer, especially streamside. A dense short-shrub layer dominated by *Rosa woodsii* or *Rosa nutkana* is diagnostic of this type. *Symphoricarpos oreophilus* is often present and occasionally codominant. *Rhus trilobata, Mahonia repens*, or *Cornus sericea* are present in some stands. The vine *Clematis ligusticifolia* is abundant in some stands. The herbaceous layer is generally sparse but may be denser in openings where the introduced grasses *Poa pratensis* and *Agrostis stolonifera* and the native *Elymus glaucus* are dominant. Common native forbs include *Maianthemum stellatum, Thalictrum fendleri, Osmorhiza berteroi (= Osmorhiza chilensis), Geranium richardsonii*, and *Galium boreale*. The introduced forb *Taraxacum officinale* is often also present. The dense short-shrub layer dominated by *Rosa* spp. separates this association from other *Populus angustifolia* riparian forests. If present, *Cornus sericea* is always a minor component.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus angustifolia*
Tree subcanopy	*Populus angustifolia*

Short shrub/sapling	*Ribes montigenum, Rosa woodsii*
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Maianthemum stellatum*
Herb (field)	*Poa compressa*

Globally

Stratum	Species
Tree canopy	*Populus angustifolia*
Short shrub/sapling	*Rosa woodsii*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G2G3 (27-Dec-1999). This riparian woodland association is rare and has only been described from 5 stands in three mountain ranges in Utah. There are over 20 occurrences estimated for this type rangewide. Although this association appears stable, the condition of high quality occurrences is extremely threatened. Development, heavy recreation use, expansion and maintenance of roads and railroads, improper grazing, and modification of the hydrologic processes threaten this community with the introduction of non-native species, accelerated erosion, and damage to native vegetation. Hydrologically modified streams may lack the processes necessary to regenerate the *Populus angustifolia* tree canopy. Additional survey is needed to determine if it occurs in Colorado and elsewhere in Utah.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Compare this association with *Populus angustifolia / Cornus sericea* Woodland (CEGL002664).

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Stands are grazed by livestock and are potentially affected by Blue Mesa Reservoir at high water levels and by irrigation ditch operation.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (3 plots: CURE.0105, CURE.0179, CURE.0250 and 7 observation points: CURE_AA.0022, CURE_AA.0040, CURE_AA.0043, CURE_AA.0228, CURE_AA.0229, CURE_AA.0240, CURE_AA.0250).
Local Description Authors: J. Von Loh
Global Description Authors: J. Nachlinger, mod. K.A. Schulz and J. Coles

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Jones 1992b, Jones and Ogle 2000, Manning and Padgett 1992, Manning and Padgett 1995, Nachlinger and Reese 1996, Padgett and Manning 1988, Padgett et al. 1988b, Padgett et al. 1989, Western Ecology Working Group n.d.

Populus tremuloides / Quercus gambelii / Symphoricarpos oreophilus Forest

Quaking Aspen / Gambel Oak / Mountain Snowberry Forest

CODE	CEGL000598
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Deciduous forest (I.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous forest (I.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
ALLIANCE	*POPULUS TREMULOIDES* TEMPORARILY FLOODED FOREST ALLIANCE (A.300) Quaking Aspen Temporarily Flooded Forest Alliance
ECOLOGICAL SYSTEM(S):	Rocky Mountain Aspen Forest and Woodland (CES306.813) Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)
USFWS WETLAND SYSTEM:	Palustrine

CONCEPT SUMMARY

Globally

This deciduous forest is known from central New Mexico, the southwestern Colorado Plateau and southern Rocky Mountains where it occurs along drainages on plateaus and in draws on mountain slopes. Elevations range from 2240-2538 m. Stands occur along intermittent streams on moderately steep to steep slopes with southwestern to northwestern aspects. Soils tend to be relatively shallow, finer-textured loams derived from alluvium and residuum from volcanic or sedimentary rocks. Litter covers much of the ground surface. The vegetation is characterized by a moderately dense to dense tree canopy dominated by *Populus tremuloides*. *Quercus gambelii* dominates the tall-shrub layer (>10% cover) and may be present in the tree canopy. *Symphoricarpos oreophilus* or *Symphoricarpos rotundifolius* form the short-shrub layer (>10% cover) with several other shrub species. The herbaceous layer is generally sparse, but may be moderately dense, and is usually a diverse mixture of grasses and forbs.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled near the Crystal Overlook pullout south of Crystal Trail in Curecanti National Recreation Area.

Globally

This deciduous forest association is known from the Sacramento Mountains of central New Mexico, the southwestern Colorado Plateau and southern Rocky Mountains in western Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This forest association occurs on the slopes of drainages between ridges. The site is moderately steep (50% slope), occurs at 2538 m elevation, and is oriented to the northwest. The unvegetated surface has high cover of litter. Downed wood is common. Measurements of litter (1.5-4.2 cm deep) and duff (2.8-4.8 cm deep) were recorded. Parent materials are Tertiary volcanic rocks. Soils are rapidly drained silty loams.

Globally

This deciduous forest is known from the Sacramento Mountains of central New Mexico, the southwestern Colorado Plateau and southern Rocky Mountains where it occurs along drainages on plateaus and in draws on mountain slopes. Elevations range from 2240-2538 m. Stands occur along intermittent streams on moderately steep to steep slopes with southwestern to northwestern aspects. Soils tend to be relatively shallow, finer-textured loams derived from alluvium and residuum from volcanic or sedimentary rocks. Litter covers much of the ground surface.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is 149% in this forest type. *Populus tremuloides* trees 20-35 m tall form a moderately closed canopy that provides 55% cover, and 1- to 2-m tall *Quercus gambelii* and *Symphoricarpos rotundifolius* shrubs provide 40% and 15% cover, respectively. The subcanopy layer of 2- to 5-m tall *Quercus gambelii* and *Populus*

tremuloides trees provide low cover. The shrub layer is moderately diverse and provides moderate cover. Additional tall, short, and dwarf-shrubs provide low to moderate cover and include *Amelanchier alnifolia, Prunus virginiana, Pseudotsuga menziesii, Mahonia repens, Paxistima myrsinites*, and *Rosa woodsii*. The herbaceous layer is diverse and provides low to moderate cover. Graminoids are low in diversity, provide moderate cover, and include *Bromus porteri, Carex geyeri, Festuca thurberi*, and the non-native *Poa pratensis*. Forbs are diverse but provide only sparse cover, including *Achillea millefolium var. occidentalis, Galium boreale, Geranium* sp., *Heracleum maximum, Lathyrus lanszwertii, Ligusticum porteri, Maianthemum stellatum, Pedicularis procera, Thalictrum fendleri*, and *Vicia americana*. Seedling *Quercus gambelii* provide up to 2% cover in this stand.

Globally
The association is characterized by a moderately dense to dense tree canopy dominated by *Populus tremuloides*. *Quercus gambelii* dominates the tall-shrub layer (>10% cover) and may be present in the tree canopy. *Symphoricarpos oreophilus* or *Symphoricarpos rotundifolius* form the short-shrub layer (>10% cover) with several other shrub species. Additional tall, short, and dwarf-shrubs provide low to moderate cover and include *Amelanchier alnifolia, Mahonia repens, Paxistima myrsinites, Prunus virginiana, Pseudotsuga menziesii* seedlings, and *Rosa woodsii*. The herbaceous layer is generally sparse, but may be moderately dense, and is usually a diverse mixture of grasses and forbs. Forb species may include *Achillea millefolium, Galium boreale, Geranium* sp., *Heracleum maximum, Lathyrus lanszwertii, Ligusticum porteri, Maianthemum stellatum, Pedicularis procera, Senecio eremophilus, Solidago velutina, Thalictrum fendleri*, and *Vicia americana*. Common graminoids include *Bromus anomalus, Bromus porteri, Carex geyeri, Festuca thurberi*, and the introduced perennial *Poa pratensis*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus tremuloides*
Tree subcanopy	*Populus tremuloides, Quercus gambelii*
Tall shrub/sapling	*Amelanchier alnifolia, Prunus virginiana, Quercus gambelii*
Short shrub/sapling	*Quercus gambelii, Symphoricarpos rotundifolius*
Herb (field)	*Bromus porteri*

Globally

Stratum	Species
Tree canopy	*Populus tremuloides, Quercus gambelii*
Short shrub/sapling	*Symphoricarpos oreophilus*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Poa pratensis* (exotic, Medium)

Globally
Exotic/Invasive: *Poa pratensis* (invasive, Medium)

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This poorly known association is reported from only 2 locations and needs additional classification work to further define the type and its range.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: This is an unusual association of *Populus tremuloides* and *Quercus gambelii* on a mesic slope; in the drainage below, *Populus tremuloides* is associated with *Amelanchier alnifolia* and *Prunus virginiana* in one area and with *Acer glabrum* in another portion. The stand is bordered by *Pseudotsuga menziesii* on the upper border, and the south-facing slope is dominated by *Quercus gambelii* and *Amelanchier utahensis*.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0262, CURE.0263 and 5 observation points: BLCA_AA.189, BLCA_AA.286, BLCA_AA.894, BLCA_AA.973, CURE_AA.0125).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Cogan et al. 2004, Driscoll et al. 1984, Freeman and Dick-Peddie 1970, Western Ecology Working Group n.d.

Populus tremuloides - Pseudotsuga menziesii / Amelanchier alnifolia Forest

Quaking Aspen - Douglas-fir / Saskatoon Serviceberry Forest

CODE	CEGL000543
PHYSIOGNOMIC CLASS	Forest (I)
PHYSIOGNOMIC SUBCLASS	Mixed evergreen-deciduous forest (I.C.)
PHYSIOGNOMIC GROUP	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.)
FORMATION	Mixed needle-leaved evergreen - cold-deciduous forest (I.C.3.N.a.)
ALLIANCE	*POPULUS TREMULOIDES - PSEUDOTSUGA MENZIESII* FOREST ALLIANCE (A.426) Quaking Aspen - Douglas-fir Forest Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland (CES304.776)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This mixed deciduous-evergreen forest is uncommon but wide-ranging, occurring from the southern Rocky Mountains and Colorado Plateau to the Yellowstone Plateau of eastern Idaho and northwestern Wyoming. It occurs between 1700 and 2695 m (5600-8840 feet) elevation. Stands are usually on moderate to steep slopes of various aspects, and soils are generally derived from sedimentary parent materials. The vegetative structure of this association is complex. It consists of multi-layers of trees, shrubs and herbs. The characteristic features are the moderately dense to dense mixed canopy of *Populus tremuloides* and *Pseudotsuga menziesii* in the overstory with 25-75% relative canopy cover of each and a tall-shrub stratum dominated by one or a combination of the following shrubs: *Amelanchier alnifolia, Prunus virginiana,* or *Acer grandidentatum*. A distinct low-shrub layer is also present and is comprised of *Symphoricarpos* spp., *Rosa woodsii, Mahonia repens, Spiraea betulifolia,* and *Paxistima myrsinites*. The herbaceous layer is an abundant mix of graminoids and forbs. Common species include *Elymus* spp., *Thalictrum* spp., *Osmorhiza* spp., and *Geranium viscosissimum*. Occasionally *Calamagrostis rubescens, Carex geyeri,* or *Arnica cordifolia* may be abundant.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This rare association was sampled near the Crystal Trail in Curecanti National Recreation Area and Long Gulch in the Gunnison National Forest.

Globally
This association is known from the southern and central Rocky Mountains and occurs from western Colorado and the Colorado Plateau to northern Utah, eastern Idaho and northwestern Wyoming.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This forest association occurs on the slopes of gulches and ridges. Sites are moderately steep to steep (31-55% slopes), occur between 2682 and 2695 m elevation, and are oriented to the north. The unvegetated surface has high cover of litter and downed wood. Parent materials are metamorphic granites and rocks associated with a fault zone. Soils are well-drained sandy loams.

Globally

This mixed deciduous-evergreen forest is uncommon but wide-ranging, occurring from the La Sal Mountains in southern Utah and the southern Rocky Mountains of western Colorado to the Yellowstone Plateau of eastern Idaho and northwestern Wyoming. It occurs between 1700 and 2695 m (5600-8840 feet) elevation. Stands are usually on moderate to steep slopes of various aspects, and soils are generally derived from sedimentary parent materials but include metamorphic granites (Mueggler 1988). Substrates are frequently well-drained, sandy loam soils.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is 100 to 150% in this forest type. *Populus tremuloides* and *Pseudotsuga menziesii* trees 10-35 m tall form a closed canopy and together provide 55 to 100% cover, along with *Amelanchier alnifolia* tall shrubs (1-5 m tall) that provide 1 to 25% cover. The subcanopy layer consists of 2- to 10-m tall *Pseudotsuga menziesii* and *Populus tremuloides* trees that provide sparse to low cover. The shrub layer is moderately diverse and provides low to moderate cover. Short and dwarf-shrubs provide low to moderate cover and include *Symphoricarpos rotundifolius, Rosa woodsii,* and *Mahonia repens,* in addition to the less abundant *Prunus virginiana* and *Paxistima myrsinites*. The diverse herbaceous layer contributes moderate cover. Graminoids provide low to moderate cover and include *Bromus porteri, Carex geyeri, Elymus glaucus,* and *Poa pratensis*. Forbs providing sparse to low cover include *Galium boreale, Lathyrus lanszwertii, Ligusticum porteri, Maianthemum racemosum* ssp. *amplexicaule, Osmorhiza depauperata*, and *Thalictrum fendleri.*

Globally

The vegetative structure of this association is complex. It consists of multi-layers of trees, shrubs and herbs. The characteristic features are the moderately dense to dense mixed canopy of *Populus tremuloides* and *Pseudotsuga menziesii* in the overstory with 25-75% relative canopy cover of each and a tall-shrub stratum dominated by one or a combination of *Amelanchier alnifolia, Prunus virginiana,* or *Acer grandidentatum*. A distinct low-shrub layer is also present and is comprised of *Symphoricarpos* spp., *Rosa woodsii, Lonicera utahensis, Mahonia repens, Spiraea betulifolia,* and *Paxistima myrsinites*. The sparse to moderately dense herbaceous layer is a mixture of graminoids and forbs. Common species include *Bromus porteri, Elymus trachycaulus, Eucephalus engelmannii, Galium boreale, Geranium viscosissimum, Lathyrus lanszwertii, Ligusticum porteri, Maianthemum racemosum, Osmorhiza* spp., and *Thalictrum* spp. Occasionally *Calamagrostis rubescens, Elymus glaucus, Carex geyeri*, or *Arnica cordifolia* may be abundant (Mueggler 1988). Introduced perennial grass *Poa pratensis* is reported from some stands.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Tree canopy	*Populus tremuloides*
Tree subcanopy	*Pseudotsuga menziesii*
Tree subcanopy	*Populus tremuloides*
Tall shrub/sapling	*Amelanchier alnifolia*
Short shrub/sapling	*Symphoricarpos rotundifolius*
Herb (field)	*Carex geyeri*

Globally

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Tree canopy	*Populus tremuloides*
Tall shrub/sapling	*Amelanchier alnifolia, Prunus virginiana*

Herb (field) *Mahonia repens, Rosa woodsii*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Poa pratensis* (exotic, Medium)

Globally
Exotic/Invasive: *Poa pratensis* (exotic, Medium)

CONSERVATION STATUS RANK
Global Rank & Reasons: G3? (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0269, CURE.0396).
Local Description Authors: J. Von Loh
Global Description Authors: G. Kittel, mod. K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Mueggler 1988, Mueggler and Campbell 1982, Mueggler and Campbell 1986, Western Ecology Working Group n.d., Youngblood and Mueggler 1981

Juniperus osteosperma / Artemisia nova Woodland

Utah Juniper / Black Sagebrush Woodland

CODE	CEGL000728
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	*JUNIPERUS OSTEOSPERMA* WOODLAND ALLIANCE (A.536) Utah Juniper Woodland Alliance
ECOLOGICAL SYSTEM(S):	Great Basin Pinyon-Juniper Woodland (CES304.773) Colorado Plateau Pinyon-Juniper Woodland (CES304.767)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This association occurs on the slopes of ridges, saddles and benches below 2200 m elevation in the Colorado Plateau and Great Basin. Substrates and soils are variable but tend to be coarse and contain a calcareous element. *Juniperus osteosperma* forms an open canopy, with a sparse to moderate understory of *Artemisia nova*. The herbaceous layer tends to be sparse and dominated by graminoids, including *Poa secunda*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association was observed and sampled in the Red Rocks area near the boundary between the park and adjacent land managed by the U.S. Bureau of Land Management.

Globally
This association is known to occur in Idaho, western Colorado, northeastern Utah, and northern and central Nevada. It is suspected to occur in eastern California but has not yet been documented from there.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This woodland association was observed on the high slopes of saddles. The sampled site is gentle (5% slope), occurs at 2180 m elevation, and is oriented to the southeast. The unvegetated surface has high exposure of bare soil and low to moderate cover of litter. The soil is rapidly drained sandy loam derived from Morrison Formation.

Globally
This association occurs in small to moderate patches (<1 to approximately 10 ha) on saddles, benches and ridges within the Colorado Plateau and Great Basin. Stands occur on gentle to moderate slopes oriented to any aspect between 1500 and 2200 m (4920-7220 feet) elevation. The substrate is often a calcareous shale, sandstone, or volcanic tuff. Soils are generally shallow sandy loams with a high percentage of bare ground or desert pavement accounting for most of the non-vegetated surface.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This woodland association is restricted to the western edge of the park. Total vegetation cover ranges from 10 to 40%. The open canopy consists of *Juniperus osteosperma* trees with about 10% cover. *Pinus edulis* are incidental, providing less than 1% cover. The understory is characterized by the short shrub *Artemisia nova* with about 2% cover. The associated shrub layer is moderate in diversity but provides only sparse cover. Short and dwarf-shrubs present include *Amelanchier utahensis, Cercocarpus montanus, Chrysothamnus depressus, Ephedra viridis, Gutierrezia sarothrae,* and the succulent *Opuntia fragilis*. The parasitic species *Phoradendron juniperinum* is present with less than 1% cover. The herbaceous layer is diverse but provides sparse cover. Graminoids provide up to 1% cover of any individual species, and include *Bromus tectorum, Leymus salinus, Pleuraphis jamesii, Poa fendleriana,* and *Poa secunda*. Forbs are varied without any single species contributing 1% or more cover; characteristic species include *Arenaria hookeri, Descurainia pinnata, Phlox longifolia*, and *Tetraneuris acaulis*. Seedlings of *Juniperus osteosperma* and *Pinus edulis* contribute less than 1% cover in the herbaceous layer.

Globally
This woodland association is characterized by an open canopy (10-40% cover) of *Juniperus osteosperma*. *Pinus edulis* is occasionally present with less than 1% cover. *Artemisia nova* dominates the sparse to moderate shrub layer (2-25% cover); other shrubs that may contribute to the shrub layer include *Ephedra viridis, Gutierrezia sarothrae, Amelanchier utahensis*, and *Purshia tridentata*. The herbaceous layer is variable and generally sparse, with few species exceeding 1% cover. The most common herbaceous species include *Poa secunda, Leymus salinus, Pleuraphis jamesii*, and *Phlox* spp.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Juniperus osteosperma, Pinus edulis*
Herb (field)	*Artemisia nova*

Globally

Stratum	Species
Tree canopy	*Juniperus osteosperma*
Short shrub/sapling	*Artemisia nova*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus tectorum* (exotic, High)

Globally
Exotic/Invasive: *Bromus tectorum* (exotic, High)

CONSERVATION STATUS RANK
Global Rank & Reasons: G5? (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: This type is very similar to *Pinus edulis - Juniperus osteosperma / Artemisia nova* Woodland. More quantitative data are needed to define this association and differentiate it from similar associations. Field researchers noted the presence of eolian sand and rain crust that resembles cryptogams.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plott: BLCA.0100 and 1 observation point: CURE_AA.0467).
Local Description Authors: J. Von Loh, mod. G. Bradshaw and J. Coles
Global Description Authors: J. Coles

REFERENCES: Blackburn et al. 1968c, Blackburn et al. 1971, Bourgeron and Engelking 1994, Caicco and Wellner 1983c, Driscoll et al. 1984, Western Ecology Working Group n.d.

Juniperus osteosperma / Mixed Shrubs Talus Woodland

Utah Juniper / Mixed Shrubs Talus Woodland

CODE	CEGL002266
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	*JUNIPERUS OSTEOSPERMA* WOODLAND ALLIANCE (A.536) Utah Juniper Woodland Alliance
ECOLOGICAL SYSTEM(S):	Great Basin Pinyon-Juniper Woodland (CES304.773) Colorado Plateau Pinyon-Juniper Woodland (CES304.767)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This association is known from Arches National Park and Colorado National Monument but likely is widespread in the canyons of the Colorado Plateau. Stands occur on midslopes, ledges, benches, bottoms and especially talus or rockfall slopes of canyons and midslopes of ridges. Elevations range between 1376 and 1585 m. Sites are moderately steep to very steep (16-84% slopes) and include all aspects. Soils are shallow, poorly developed, rapidly drained sandy clays, clay loams and sandy loams. The unvegetated surface has low to moderate cover of litter and bare soil and high cover of bedrock and large and small rocks. Parent materials are sandstones, shale, and Precambrian gneiss. This woodland is characterized by an open tree canopy of stunted *Juniperus osteosperma* that ranges in cover from 5 to 40%, but may be less if juniper cover is still significant relative to total vegetation and stand appears wooded. *Pinus edulis* and *Fraxinus anomala* may occasionally be present. The shrub layer is highly variable in cover and composition among stands and can include *Amelanchier utahensis, Artemisia bigelovii,*

Artemisia tridentata ssp. *tridentata, Atriplex canescens, Brickellia microphylla, Cercocarpus montanus, Chrysothamnus viscidiflorus, Coleogyne ramosissima, Ephedra torreyana, Ephedra viridis, Ericameria nauseosa, Eriogonum corymbosum, Eriogonum microthecum, Fendlera rupicola, Fraxinus anomala, Gutierrezia sarothrae, Rhus trilobata,* and a number of succulents. The herbaceous layer is typically sparse to low in terms of cover but high in species diversity. Common graminoids provide sparse to low cover and include *Achnatherum hymenoides, Aristida purpurea, Bouteloua curtipendula, Bromus tectorum, Elymus elymoides, Vulpia octoflora, Hesperostipa comata, Leymus salinus, Pleuraphis jamesii, Poa fendleriana,* and *Pseudoroegneria spicata*. *Pleuraphis jamesii* consistently provides the highest cover of the graminoid species. Common forbs include scattered *Eriogonum inflatum* and *Chamaesyce fendleri*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association was observed and sampled on a steep slope on the north side of Crystal Reservoir .

Globally
This association is known from Arches National Park and Colorado National Monument but likely is widespread in the canyonlands of the Colorado Plateau in western Colorado and eastern Utah.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This woodland association was observed on a steep rocky slope The site is steep (27 degrees), occurs at 2121 m elevation, and is oriented to the east (100 degrees). The unvegetated surface has high exposure of large and small rock (~50% cover), bedrock (~20% cover), bare soil (~20% cover) and low cover of litter. The soil is derived from Wanaka Formation.

Globally
This association is known from Arches National Park and Colorado National Monument but likely is widespread in the canyons of the Colorado Plateau. Stands occur on midslopes, ledges, benches, bottoms and especially talus or rockfall slopes of canyons and midslopes of ridges. Elevations range between 1376 and 1585 m. Sites are moderately steep to very steep (16-84% slopes) and include all aspects. Soils are shallow, poorly developed, rapidly drained sandy clays, clay loams and sandy loams. The unvegetated surface has low to moderate cover of litter and bare soil and high cover of bedrock and large and small rocks. Parent materials are sandstones, shale, and Precambrian gneiss. Typical sites at Arches National Park are Morrison or Chinle shales overlain by Wingate or Salt Wash sandstone colluvium. Other parent materials include Moenkopi Formation, Navajo sandstone, and Elephant Canyon Formation at Canyonlands National Park, and Tidwell Member of the Morrison Formation and Kayenta Formation at Black Canyon National Park

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This woodland association was sampled at only one site but is likely more widespread. Total vegetation cover is about 25%. The open canopy, typically 2-5 m tall, is dominated by *Juniperus osteosperma. Pinus edulis* is typically absent or has very low cover. The understory is characterized by an open short shrub layer of *Philadelphus microphyllus* that provides 8% cover with scattered *Holodiscus dumosa*. Herbaceous cover is sparse with only scattered *Achnatherum hymenoides* present..

Globally
This woodland is characterized by an open tree canopy of stunted *Juniperus osteosperma* that ranges in cover from 5 to 40%, but may be less if juniper cover is still significant relative to total vegetation and stand appears wooded. *Pinus edulis* and *Fraxinus anomala* may occasionally be present. The shrub layer is highly variable in cover and composition among stands and can include *Amelanchier utahensis, Artemisia bigelovii, Artemisia tridentata* ssp. *tridentata, Atriplex canescens, Brickellia microphylla, Cercocarpus montanus, Chrysothamnus viscidiflorus, Coleogyne ramosissima, Ephedra torreyana, Ephedra viridis, Ericameria nauseosa, Eriogonum corymbosum, Eriogonum microthecum, Fendlera rupicola, Fraxinus anomala, Gutierrezia sarothrae, Philadelphus microphyllus, Rhus trilobata,* and a number of succulents. The herbaceous layer is typically sparse to low in terms of cover but high in species diversity. Common graminoids provide sparse to low cover and include *Achnatherum hymenoides, Aristida purpurea, Bouteloua curtipendula, Bromus tectorum, Elymus elymoides, Vulpia octoflora, Hesperostipa comata, Leymus salinus, Pleuraphis jamesii, Poa fendleriana,* and *Pseudoroegneria spicata*. *Pleuraphis jamesii*

consistently provides the highest cover of the graminoid species. Common forbs include scattered *Eriogonum inflatum* and *Chamaesyce fendleri*.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Juniperus osteosperma*
Herb (field)	*Philadelphus microphyllus*

Globally

Stratum	Species
Tree canopy	*Juniperus osteosperma*
Short shrub/sapling	*Amelanchier utahensis, Artemisia bigelovii, Atriplex canescens, Cercocarpus montanus, Chrysothamnus viscidiflorus, Coleogyne ramosissima, Ephedra torreyana, Ephedra viridis, Eriogonum corymbosum, Fendlera rupicola, Fraxinus anomala, Rhus trilobata*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association is closely related to a number of other colluvial slope types with sparse, variable vegetation described for the northern Colorado Plateau network of national parks. These include *~Fendlera rupicola* Talus Shrubland (CEGL002765)$$ (ARCH, COLM), *~Atriplex canescens - Ephedra viridis* Talus Shrubland (CEGL001287)$$ (CANY, CARE, COLM), and *~Chrysothamnus viscidiflorus* Talus Shrubland (CEGL002347)$$ (CANY, CARE, DINO). At some point the plots assigned to the various types should be re-analyzed to see if patterns are apparent and particular names can be assigned to groups of plots, or if a generic name such as this should be retained.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: This type is very similar to *Pinus edulis - Juniperus osteosperma /* mixed shrubs talus Woodland, but lacks *Pinus edulis*. More quantitative data are needed to define this association and differentiate it from similar associations.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 observation point: CURE_AA.1057).
Local Description Authors: K. A. Schulz
Global Description Authors: M.S. Reid and J. Coles, mod. K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Juniperus scopulorum - Quercus gambelii Woodland

Rocky Mountain Juniper - Gambel Oak Woodland

CODE	CEGL002967
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	*JUNIPERUS SCOPULORUM* WOODLAND ALLIANCE (A.506) Rocky Mountain Juniper Woodland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)
Colorado Plateau Pinyon-Juniper Woodland (CES304.767)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This woodland association is known from the southern Colorado Plateau in northeastern Arizona and southwestern Utah at elevations ranging from 1647-2238 m (5400-7343 feet). Stands occur in gently sloping drainage bottomlands and swales and occasionally hillsides. Soils include sandy loams, and ground litter ranges from 15-50% cover. The vegetation is characterized by an open to relatively dense tree canopy (20-80% cover) codominated by *Juniperus scopulorum* and *Quercus gambelii*. *Juniperus osteosperma* may also be present to common in the tree canopy of some stands, and occasional emergent *Pinus ponderosa* trees may be present with <5% cover. *Pinus edulis* and *Pinus monophylla* are typically absent but may occur with low cover (<5%). In some stands the oaks may form more of a tall-shrub layer than a tree canopy. Otherwise, the shrub layer is typically sparse with scattered *Artemisia tridentata, Cercocarpus montanus, Chrysothamnus depressus, Fendlera rupicola, Gutierrezia microcephala, Purshia tridentata,* and *Yucca angustissima*. The herbaceous layer is variable with sparse to moderate cover (5-50%) and low to high diversity of species. Common species may include *Antennaria parvifolia* and *Pascopyrum smithii*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled on a site south of Colorado State Highway 92 and southwest of Pappy's Restaurant in the Curecanti National Recreation Area.

Globally

This association has currently only been described from Canyon de Chelly National Monument and Zion National Park in northeastern Arizona and southwestern Utah, and in Curecanti National Recreation Area in western Colorado. It will likely be found elsewhere in the southern Colorado Plateau.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association is found on midslopes and hilltops on gentle to moderate (2- to 16-degree slopes) sites at 2326 and 2421 m elevation, and are oriented to southerly and northeasterly aspects. Some stands are located near intermittent drainages. The unvegetated ground surface is either strongly dominated by bare ground (70% cover) or a mixture of rock, gravel and bare ground. Parent material is Curecanti quartz monzonite or Junction Creek Member of the Wanakah Formation. Lichen cover is significant in one stand.

Globally

This woodland association is known from the southern Colorado Plateau in northeastern Arizona and southwestern Utah at elevations ranging from 1647-2238 m (5400-7343 feet). Stands occur in gently sloping drainage bottomlands and swales and occasionally hillsides. Soils include sandy loams, and ground litter ranges from 15-50% cover.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association is characterized by an open canopy dominated by *Juniperus scopulorum* and by >5% cover of *Quercus gambelii*. Scattered *Pseudotsuga menziesii* trees may be present in the canopy. If *Quercus gambelii* is not in the tree canopy, it occurs in the shrub layer with >5% cover. Other shrubs may be present but usually with relatively low cover, such as *Artemisia tridentata* ssp. *vaseyana, Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus viscidiflorus, Purshia tridentata*, and *Symphoricarpos oreophilus*. Herbaceous cover is sparse to open (<25% cover) and composed of *Achnatherum pinetorum, Balsamorhiza sagittata, Carex geyeri*, and *Poa fendleriana*.

Globally
This association is characterized by an open to relatively dense tree canopy (20-80% cover) codominated by *Juniperus scopulorum* and *Quercus gambelii*. *Juniperus osteosperma* may also be present to common in the tree canopy of some stands, and occasional emergent *Pinus ponderosa* trees may be present with <5% cover. *Pinus edulis* and *Pinus monophylla* (western stands) are typically absent but may occur with low cover (<5%). In some stands the oaks may form more of a tall-shrub layer than a tree canopy. Otherwise, the shrub layer is typically sparse with scattered *Artemisia tridentata, Cercocarpus montanus, Chrysothamnus depressus, Fendlera rupicola, Gutierrezia microcephala, Purshia tridentata*, and *Yucca angustissima*. The herbaceous layer is variable with sparse to moderate cover (5-50%) and low to high diversity of species. Common species may include *Antennaria parvifolia* and *Pascopyrum smithii*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Juniperus scopulorum*
Tall shrub/sapling	*Quercus gambelii*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*, *Artemisia tridentata* ssp. *wyomingensis*

Globally

Stratum	Species
Tree canopy	*Juniperus scopulorum*
Tree canopy	*Quercus gambelii*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Phleum pratense* (exotic, Medium), *Poa pratensis* (exotic, Medium)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (22-Jan-2002).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (3 observation points: CURE_AA.0663, CURE_AA.1002, CURE_AA.1166).
Local Description Authors: K.A. Schulz
Global Description Authors: K.A. Schulz

REFERENCES: CONHP unpubl. data 2003, Cogan et al. 2004, Western Ecology Working Group n.d.

Juniperus scopulorum / Artemisia tridentata Woodland

Rocky Mountain Juniper / Basin Big Sagebrush Woodland

CODE	CEGL000743
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	*JUNIPERUS SCOPULORUM* WOODLAND ALLIANCE (A.506) Rocky Mountain Juniper Woodland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Foothill Limber Pine-Juniper Woodland (CES306.955)
Colorado Plateau Pinyon-Juniper Woodland (CES304.767)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This association occurs locally in Colorado, the portions of Wyoming surrounding the Bighorn Basin, and Montana's Greenhorn Range. Stands develop on foothills, plateaus, piedmont fans, rockslides and canyons. Elevations range from 1680 to 1830 m (5500-6000 feet) in Montana and 2200 to 2600 m (7545-8120 feet) in Colorado and Wyoming. Slopes are gentle to very steep (5-70%), may be oriented to any aspect, and are frequently rocky but include shaly substrates. Litter and duff are restricted to plant bases leaving much exposed soil, rock, bedrock and gravel. Bare ground also results from rill and sheet erosion and animal trailing. Soils are variable and include clay loams, sands and silt loams; some soils effervesce violently. Although this is not a riparian association, the best-developed examples occur in gullies and swales. The vegetation is characterized by a sparse to moderately dense, sometimes clumpy canopy of *Juniperus scopulorum* (constituting between 5 and 40% canopy cover) and a somewhat depauperate undergrowth as well, in which a sparse to moderate shrub layer dominated by *Artemisia tridentata* ssp. *vaseyana* or *Artemisia tridentata* ssp. *wyomingensis* is sometimes matched by a well-developed herbaceous layer. Associated shrubs may include *Amelanchier utahensis, Artemisia frigida, Juniperus communis, Mahonia repens, Opuntia polyacantha, Paxistima myrsinites, Prunus virginiana, Purshia tridentata, Ribes cereum*, and *Symphoricarpos rotundifolius*. The herbaceous layer is diverse in terms of species composition and provides sparse to moderate cover. Graminoids dominate the herbaceous layer, including *Pseudoroegneria spicata, Achnatherum hymenoides, Bouteloua gracilis, Hesperostipa comata, Koeleria macrantha, Carex rossii, Elymus elymoides*, and *Poa fendleriana*. Forbs provide little cover but may include *Eriogonum umbellatum, Cryptantha flavoculata*, and *Physaria rollinsii*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is uncommon to common in the recreation area and environs and was sampled on East Elk Creek in Sapinero State Wildlife Area, near the Dillon Pinnacles, near Pine Creek Road near the picnic area, above Steuben IV, and on the Soap Creek Arm of Blue Mesa Reservoir.

Globally

This poorly documented association is known from widely scattered foothills, canyons and plateaus in Colorado, Wyoming and west-central Montana. In Wyoming it is most likely to be found around the margins of the Bighorn Basin (western flank of Bighorn Mountains, northern flank of Owl Creek Mountains, and eastern flank of Absaroka Mountains) and possibly the eastern flank of the Wind River Range. In Montana it has been cursorily documented only from the foothills and piedmont fans at the northern end of the Gravelly Range; in Colorado it occurs along the Front Range between Denver and the Wyoming stateline (in the same landscape position as its Montana representation), on the western slope in the Gunnison Basin and in the northwestern part of the state. However, the ranges of the component indicator species are extensive, and the association could occur locally throughout the West.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs on the slopes of ridges and canyons. Sites are moderately steep to very steep (31-71% slopes), occur between 2348 and 2476 m elevation, and include south to west aspects. The unvegetated surface has high cover of bedrock and large and small rocks, low to moderate cover of litter, and moderate exposure of bare soil. Dead and downed wood is a constant but small component of the unvegetated surface. Parent materials are variable and include Quaternary landslide and Black Canyon schist and gneiss. Soils, when they have developed, are rapidly drained sandy clay loams or sands.

Globally
This association is found locally in Colorado, the portions of Wyoming surrounding the Bighorn Basin and Fossil Butte, and Montana's Greenhorn Range. Stands occur on the slopes of ridges and canyons, on foothills, plateaus, piedmont fans, and soil slumps lobe rockslides. Elevation ranges from 1680 to 1830 m (5500-6000 feet) in Montana to 2200 to 2475 m (7215-8120 feet) in Colorado and Wyoming (Wasser and Hess 1982, Hess and Alexander 1986, Cooper et al. 1995). Slopes are gentle to very steep (5-70%), may be oriented to any aspect, and are frequently rocky. Litter and duff are restricted to plant bases, leaving much exposed soil, rock, bedrock and gravel. Soils are variable and include clay loams, sands and silt loams; some soils effervesce violently. Parent materials are variable and include colluvial and residual schists and gneisses, sandstones, limestones, shales (Wasatch Formation) and eolian sand deposits.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 20 to 50%. *Juniperus scopulorum* trees 2-5 m tall form a canopy that contributes from 5 to 40% cover, and the short shrubs *Artemisia tridentata* ssp. *wyomingensis* or *Artemisia tridentata* ssp. *vaseyana* provide up to 50% or 25% cover, respectively. *Juniperus scopulorum* trees may form a short-statured subcanopy (0.5-2 m tall) providing 1 to 20% cover. The shrub layer is diverse in terms of species composition and contributes sparse to moderate cover. Additional short shrubs are moderately diverse, provide sparse to moderate cover and include *Amelanchier utahensis, Holodiscus dumosus, Purshia tridentata, Ribes cereum*, and *Symphoricarpos rotundifolius*. Dwarf-shrubs are low in species diversity, contribute sparse cover, and include *Artemisia frigida, Gutierrezia sarothrae*, and *Opuntia polyacantha*. The herbaceous layer is diverse in terms of species composition and provides sparse to low cover. Graminoids commonly present include *Achnatherum hymenoides, Achnatherum pinetorum, Bouteloua gracilis, Bromus tectorum, Elymus elymoides*, and *Poa fendleriana*. Forbs are diverse, contribute sparse to low cover, and include *Arabis crandallii, Cryptantha flavoculata, Physaria rollinsii, Packera* spp., and *Solidago* spp. Both foliose and crustose lichens provide low cover, up to 10% within sampled stands.

Globally
This open woodland association is characterized by a sparse to moderately dense, sometimes clumpy canopy of *Juniperus scopulorum* (constituting between 5 and 40% canopy cover) and a somewhat depauperate undergrowth as well, in which a sparse to moderate shrub layer dominated by *Artemisia tridentata* ssp. *vaseyana* or *Artemisia tridentata* ssp. *wyomingensis* is sometimes matched by a well-developed herbaceous layer. Associated shrubs may include *Amelanchier utahensis, Artemisia frigida, Cercocarpus montanus, Holodiscus dumosus, Juniperus communis, Mahonia repens, Opuntia polyacantha, Paxistima myrsinites, Prunus virginiana, Purshia tridentata, Ribes cereum*, and *Symphoricarpos rotundifolius*. The herbaceous layer is diverse in terms of species composition and provides sparse to moderate cover depending on the degree of canopy closure. Graminoids dominate the herbaceous layer and include *Pseudoroegneria spicata, Achnatherum hymenoides, Achnatherum lettermanii, Achnatherum pinetorum, Aristida purpurea, Bouteloua gracilis, Hesperostipa comata, Koeleria macrantha, Carex rossii, Elymus elymoides, Leymus cinereus*, and *Poa fendleriana*. Forbs provide little cover but may include *Arabis crandallii, Cryptantha flavoculata, Eriogonum umbellatum, Penstemon procerus, Phlox hoodii, Physaria rollinsii*, and *Potentilla fissa* (Hess and Alexander 1986).

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Juniperus scopulorum*
Tree subcanopy	*Juniperus scopulorum*
Short shrub/sapling	*Ericameria nauseosa, Holodiscus dumosus, Quercus gambelii, Ribes cereum, Symphoricarpos rotundifolius*

Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*, *Artemisia tridentata* ssp. *wyomingensis*, *Cercocarpus montanus*
Herb (field)	*Arabis crandallii*
Herb (field)	*Achnatherum hymenoides*, *Bouteloua gracilis*, *Elymus elymoides*, *Poa fendleriana*

Globally

Stratum	Species
Tree canopy	*Juniperus scopulorum*
Short shrub/sapling	*Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *vaseyana*, *Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Achnatherum hymenoides*, *Bouteloua gracilis*, *Hesperostipa comata*, *Poa fendleriana*, *Pseudoroegneria spicata*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus tectorum* (exotic noxious weed, High)

Globally
Vulnerable: *Arabis crandallii* (globally imperiled, G2), *Physaria rollinsii* (globally imperiled, G2);
Exotic/Invasive: *Bromus tectorum* (exotic, High)

CONSERVATION STATUS RANK
Global Rank & Reasons: G3Q (30-Nov-1998). This association is represented by fewer than 15 sample plots, but hypothetically it could be relatively common given the current extensive distribution of indicator species for the type and unspecific habitat requirements. Neither of the indicator species are under any particular threat, and presumably the type as currently defined would thus not be imperiled; however, the graminoid component is not clearly understood or defined for this association and could be significantly altered by livestock grazing. A real question exists as to the taxonomy of this entity. If the bunchgrass component is the dominant aspect and canopy cover of *Juniperus scopulorum* and *Artemisia tridentata* is generally under 20%, then this is not technically a woodland (or shrubland). Other occurrences of the type may have been appropriately classed as shrub-steppe or grassland plant associations [see DeVelice et al. (1995)].

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Without tightly defined occurrence specifications, stands of this association may have been classified as shrub-steppe or grassland plant associations because (1) the cover of *Juniperus scopulorum* itself is sometimes so low that these stands would not have been considered woodlands but merely medium-tall temperate or subpolar grasslands with a sparse needle-leaved evergreen layer or even a medium-tall temperate or subpolar grassland with a sparse microphyllous evergreen shrub layer, and (2) alternatively, with sufficient cover of *Juniperus scopulorum* but *Artemisia tridentata* poorly represented, stands could be placed in *Juniperus scopulorum / Pseudoroegneria spicata* Woodland (CEGL000748).

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Stands occur on active slides and are patchy and difficult to sample. Future studies of this association should evaluate whether it is more properly woodland or wooded shrubland.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (6 plots: CURE.0026, CURE.0039, CURE.0067, CURE.0213, CURE.0225, CURE.0389 and 11 observation points: CURE_AA.0145, CURE_AA.0163, CURE_AA.0181, CURE_AA.0202, CURE_AA.0732, CURE_AA.0826, CURE_AA.0827, CURE_AA.0838, CURE_AA.0840, CURE_AA.0961, CURE_AA.0965).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: S.V. Cooper, mod. J. Coles and K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Cooper et al. 1995, DeVelice 1992, DeVelice et al. 1995, Driscoll et al. 1984, Hess 1981, Hess and Alexander 1986, Jennings 1978, Jennings 1979, Johnston 1987, Jones 1992b, MTNHP 2002b, Wasser and Hess 1982, Western Ecology Working Group n.d.

Pinus edulis - Juniperus osteosperma / Sparse Understory Woodland

Two-needle Pinyon - Utah Juniper / Sparse Understory Woodland

CODE	CEGL002148
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	*PINUS EDULIS - (JUNIPERUS* SPP.) WOODLAND ALLIANCE (A.516) Two-needle Pinyon - (Juniper species) Woodland Alliance
ECOLOGICAL SYSTEM(S):	Colorado Plateau Pinyon-Juniper Woodland (CES304.767) Great Basin Pinyon-Juniper Woodland (CES304.773)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This variable woodland association is widespread in parts of western Colorado and eastern Utah. It is found most commonly on mid- to upper slopes, though other topographic positions are possible. It has been sampled at elevations between 1354 and 2389 m and on all aspects. At higher elevations, it tends toward southwestern aspects. Sites range from flat to moderately steep. The ground has variable amounts of litter and often has moderate to high amounts of gravel, rocks, and exposed bedrock. Cryptogamic cover is usually low to moderate, but some sites have up to 55-65% cover. Soils are always rapidly drained to moderately well-drained. Parent materials are also highly variable and can be sandstones, shales, or limestones. The lack of an understory may be due to high rock cover, low soil moisture, or a closed evergreen canopy of pinyon and juniper. This widespread association occurs as relatively sparse to moderately vegetated stands with total vegetation cover ranging from 10-75%. Sparsely vegetated stands (<10% total vegetation cover) composed of only trees are included as a best fit in this woodland association in extremely dry, rocky portions of the Colorado Plateau. The tree canopy is dominated by *Pinus edulis* and *Juniperus osteosperma*. Both typically range from 1-35% cover with some stands having canopy cover by one species up to 50%. The tree canopy is short, usually 2-10 m tall, and open to moderately closed. *Fraxinus anomala* has been observed in the canopy of some stands but always at no more than 5% cover. Several shrub species are commonly found in this association, but they occur as widely scattered individuals or an open shrub stratum. Scattered small *Pinus edulis* and *Juniperus osteosperma* are found along with shrubs such as *Amelanchier utahensis, Artemisia tridentata* ssp. *wyomingensis, Cercocarpus montanus, Ephedra viridis, Eriogonum microthecum, Shepherdia rotundifolia*, and *Opuntia* spp. The herbaceous layer is low in cover (<5%) and usually low in diversity. *Achnatherum hymenoides, Bouteloua gracilis, Bromus tectorum, Poa fendleriana*, and *Pleuraphis jamesii* are common graminoids. Forbs are not abundant, but typical species include *Descurainia pinnata, Cryptantha* spp., and *Tetraneuris acaulis*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association was observed and sampled near Spring Draw on BLM-administered land and at Cimarron in the recreation area.

Globally

This association is known to occur in western Colorado and eastern Utah.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This woodland association was observed on midslopes of ridges and on high slopes of hills. Sites are moderately steep (17-30% slope), occur between 2317 and 2389 m elevation, and are oriented to southwestern aspects. The unvegetated surface has high cover of litter and low cover of cryptogams. Bedrock, large and small rocks, and exposures of bare soil comprise a moderate amount of the unvegetated surface. Soils are rapidly drained sandy loams and loamy sands derived from Mesozoic sandstones and Tertiary volcanic rocks.

Globally
This woodland association is found most commonly on mid- to upper slopes, though other topographic positions are possible, such as valley floors, plateaus, colluvial slopes, hills, canyon rims, canyon sides, mesas, plains, and benches.. It has been sampled at elevations between 1354 and 2389 m and on all aspects. At higher elevations, such as in Black Canyon of the Gunnison National Park it tends toward southwestern aspects. Sites range from flat to moderately steep (0-25 degrees). The ground has variable amounts of litter and often has moderate to high amounts of gravel, rocks, and exposed bedrock. Cryptogamic cover is usually low to moderate, but some sites have up to 55-65% cover. Soils vary in texture and can be loamy sand, silts, loams or silty clay but are always rapidly drained to moderately well-drained. Parent materials are also highly variable and can be sandstones, shales, limestones, among others.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 40 to 75% in these stands. The canopy consists of 5-10 m tall, of *Pinus edulis* trees that range in cover from 35 to 50%. *Juniperus osteosperma* is incidental in the canopy. A subcanopy layer of *Pinus edulis, Juniperus osteosperma,* and *Juniperus scopulorum* trees is present, each with <5% cover. *Pinus edulis* and *Juniperus scopulorum* also occur as shorter saplings and seedlings but with sparse cover. The shrub layer is diverse but sparse to low in cover, providing less than 5% cover per stratum. Common shrubs include *Amelanchier utahensis, Artemisia tridentata* ssp. *wyomingensis, Cercocarpus montanus, Opuntia fragilis, Quercus gambelii, Ribes inerme, Symphoricarpos oreophilus,* and *Symphoricarpos rotundifolius*. The herbaceous layer is low in diversity and sparse, providing less than 5% cover for both graminoids and forbs. Common graminoids include *Achnatherum hymenoides, Bromus tectorum, Carex geyeri,* and *Poa fendleriana*. Forbs are of moderate diversity and include *Agoseris glauca var. laciniata, Allium* sp., *Antennaria rosea, Arabis* spp., *Arenaria fendleri, Astragalus* sp., *Balsamorhiza sagittata, Chaenactis douglasii, Collinsia parviflora, Descurainia pinnata, Eriogonum lonchophyllum, Heterotheca villosa, Lomatium simplex, Phlox longifolia,* and *Senecio* spp.

Globally
This widespread pinyon-juniper woodland association occurs as relatively sparse to moderately vegetated stands with total vegetation cover ranging from 10-75%. Sparsely vegetated stands (<10% total vegetation cover) composed of only trees are included as a best fit in this woodland association in extremely dry, rocky portions of the Colorado Plateau. The tree canopy is dominated by *Pinus edulis* and *Juniperus osteosperma*. Both typically range from 1-35% cover with some stands having canopy cover by one species up to 50%. The tree canopy is short, usually 2-10 m tall, and open to moderately closed. *Fraxinus anomala* has been observed in the canopy of some stands at Colorado National Monument but always at no more than 5% cover. Several shrub species are commonly found in this association, but they occur as widely scattered individuals or an open shrub stratum. Scattered small *Pinus edulis* and *Juniperus osteosperma* are found along with shrubs such as *Amelanchier utahensis, Artemisia bigelovii, Artemisia tridentata* ssp. *wyomingensis, Cercocarpus montanus, Chrysothamnus viscidiflorus, Coleogyne ramosissima, Ephedra viridis, Eriogonum microthecum, Gutierrezia sarothrae, Shepherdia rotundifolia, Symphoricarpos longiflorus,* and *Opuntia* spp., usually *Opuntia fragilis* or *Opuntia polyacantha*. The herbaceous layer is low in cover (<5%) and usually low in diversity. *Achnatherum hymenoides, Bouteloua gracilis, Bromus tectorum, Poa fendleriana,* and *Pleuraphis jamesii* are common graminoids. Forbs are not abundant, but typical species include *Descurainia pinnata, Cryptantha* spp., and *Tetraneuris acaulis*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Juniperus osteosperma, Pinus edulis*
Tree subcanopy	*Pinus edulis*

Globally

Stratum	Species
Tree canopy	*Juniperus osteosperma, Pinus edulis*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus tectorum* (exotic, High), *Marrubium vulgare* (exotic, Medium/Low), *Phleum pratense* (exotic, Medium), *Poa pratensis* (exotic, Medium), *Verbena bracteata* (weedy native)

Globally
Exotic/Invasive: *Bromus tectorum* (invasive, High)

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (15-Dec-2004).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Environmental and physiognomic variability within this association is high. There are few consistent understory species across all parks, but that is part of the concept of this type. The general sparseness of the understory is one of the main diagnostic features. Because of the wide range of circumstances that result in a sparse understory, a lot of variability in the floristic components of the understory is allowed. It is possible that this type will be split into several associations based on environmental factors, since floristic factors are not diagnostic. On dry, rocky or slickrock sites on the Colorado Plateau, this pinyon-juniper woodland association may include stands with very open tree canopies (5-10% cover) in cases where the total vegetation cover is less than 15%, and they are considered a variation of the woodland type because of the ecological values of the trees.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Trees are of medium age, and boulders occupy one slope.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: BLCA.0146, CURE.0164 and 67 observation points: BLCA_AA.227, BLCA_AA.291, BLCA_AA.328, BLCA_AA.330, BLCA_AA.343, BLCA_AA.366, BLCA_AA.377, BLCA_AA.378, BLCA_AA.381, BLCA_AA.412, BLCA_AA.424, BLCA_AA.475, BLCA_AA.478, BLCA_AA.481, BLCA_AA.482, BLCA_AA.486, BLCA_AA.487, BLCA_AA.493, BLCA_AA.498, BLCA_AA.499, BLCA_AA.514, BLCA_AA.515, BLCA_AA.528, BLCA_AA.530, BLCA_AA.531, BLCA_AA.575, BLCA_AA.598, BLCA_AA.599, BLCA_AA.602, BLCA_AA.604, BLCA_AA.626, BLCA_AA.653, BLCA_AA.658, BLCA_AA.691, BLCA_AA.722, BLCA_AA.744, BLCA_AA.754, BLCA_AA.760, BLCA_AA.761, BLCA_AA.763, BLCA_AA.770, BLCA_AA.772, BLCA_AA.800, BLCA_AA.810, BLCA_AA.829, BLCA_AA.839, BLCA_AA.840, BLCA_AA.841, BLCA_AA.844, BLCA_AA.850, BLCA_AA.852, BLCA_AA.859, BLCA_AA.860, BLCA_AA.862, BLCA_AA.866, BLCA_AA.907, BLCA_AA.909, CURE_AA.0498, CURE_AA.0747, CURE_AA.0769, CURE_AA.0782, CURE_AA.0808, CURE_AA.0818, CURE_AA.0828, CURE_AA.0841, CURE_AA.0851, CURE_AA.0873).
Local Description Authors: J. Von Loh, mod. J. Coles
Global Description Authors: J. Drake, mod. J. Coles and K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Pinus edulis – (Juniperus spp.*) / Holodiscus dumosus* Woodland

Two-needle Pinyon - Juniper species / Rockspirea Woodland

CODE	CEGL002802
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	*PINUS EDULIS - (JUNIPERUS* SPP.) WOODLAND ALLIANCE (A.516)
	Two-needle Pinyon - (Juniper species) Woodland Alliance

ECOLOGICAL SYSTEM(S): Colorado Plateau Pinyon-Juniper Woodland (CES304.767)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This woodland association is currently known from Black Canyon of the Gunnison, Curecanti National Recreation Area and Great Sand Dunes in Colorado and El Malpais National Monument in New Mexico. More survey and classification work are needed to fully characterize this type. The sampled Colorado stand occurs on a steep (100%), southwest-facing midslope on a ridge at 2303 m elevation. The unvegetated surface has moderate cover of litter and bedrock, large rocks, and small rocks. Downed wood is common. Substrate is a rapidly drained loamy sand soil derived from Black Canyon schist (mica schist). At El Malpais, this association occurs between about 2240 and 2390 m (7340-7850 feet) elevation on very gently rolling lava plateaus and collapse features, to steep slopes of cinder cones. Substrates are derived from basalt lava rock and cinders from cinder cone flows. Ground surface is made up of lava rock with abundant litter and occasional soil and coarse woody debris present. The vegetation is characterized by an open to moderately closed (30-60% cover) tree canopy 2-5 m tall codominated by *Pinus edulis* and *Juniperus scopulorum* with a short-shrub layer dominated by *Holodiscus dumosus*. The shrub layer is diverse in terms of species composition and provides low to moderate cover. Associated shrub species include *Cercocarpus montanus, Quercus gambelii, Artemisia tridentata, Philadelphus microphyllus, Pinus edulis* saplings, and *Artemisia frigida*. In New Mexico, *Ribes cereum* is common, and the cacti *Echinocereus coccineus* and *Opuntia polyacantha* are frequent associates, though cover is low. The herbaceous layer is low in species diversity and provides sparse to low cover. Species include *Achnatherum hymenoides, Arabis crandallii, Artemisia carruthii, Bouteloua gracilis, Descurainia incana, Poa fendleriana*, and *Senecio integerrimus*. Lichens and mosses can each provide low cover, up to 5%.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled near Hermit's Rest in the vicinity of Morrow Point Reservoir on Curecanti National Recreation Area.

Globally

This woodland association is currently known from Black Canyon of the Gunnison, Curecanti National Recreation Area and Great Sand Dunes in Colorado and El Malpais National Monument in New Mexico. More survey work is needed to fully document its global range.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs midslope on ridges. The site is steep (100% slope), occurs at 2303 m elevation, and is oriented to the southwest. The unvegetated surface has moderate cover of litter and bedrock, large rocks, and small rocks. Downed wood is common. Litter depth ranges from 0.5-3 cm, with no measurable duff. Parent materials are Black Canyon schist (mica schist). Soils are rapidly drained loamy sands.

Globally

This woodland association occurs midslope on an extremely steep site with 100% slope at Black Canyon and on gently rolling lava plateaus, collapse features and steep slopes of cinder cones at El Malpais from 2240-2390 m

elevation. Parent materials include mica schist, basalt and cinders. Unvegetated surfaces include bedrock, large rocks, small rocks with moderate to abundant litter and downed wood.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is 65% in this woodland type. *Pinus edulis* and *Juniperus scopulorum* trees 2-5 m tall form a sparse to open canopy and contribute 25% and 5% cover, respectively, and *Holodiscus dumosus* short shrubs contribute up to 15% cover. The shrub layer is diverse in terms of species composition and provides low to moderate cover. Associated tall, short, and dwarf-shrubs include *Cercocarpus montanus, Quercus gambelii, Artemisia tridentata, Philadelphus microphyllus, Pinus edulis* saplings, and *Artemisia frigida*. The herbaceous layer is low in species diversity and provides sparse to low cover. The medium-tall bunchgrass *Achnatherum hymenoides* is the only grass present and provides sparse cover. Forbs provide sparse cover and include *Arabis crandallii, Descurainia incana* ssp. *incisa*, and *Senecio integerrimus*. A few *Pinus edulis* seedlings were present. Lichen and moss each provide low cover, up to 5%.

Globally

Vegetation of this association is characterized by a open to moderately closed (30-60%) canopy codominated by *Pinus edulis* and *Juniperus scopulorum* with a short-shrub layer of *Holodiscus dumosus*. Other coniferous species such as *Pinus ponderosa* or *Pseudotsuga menziesii* may be present but incidental. Shrub cover varies from low to abundant (up to 30%). Associated shrubs include *Cercocarpus montanus, Quercus gambelii, Artemisia tridentata, Philadelphus microphyllus, Artemisia frigida, Ribes cereum*, and cacti including *Echinocereus coccineus* and *Opuntia polyacantha*. Herbaceous diversity is low. At Black Canyon, the only documented graminoid is *Achnatherum hymenoides*, whereas at El Malpais, *Poa fendleriana* and *Bouteloua gracilis* are the most abundant, but do not exceed 5% cover. Forbs are sparse and sporadic and may include, but are not limited to, *Arabis crandallii, Artemisia carruthii, Descurainia incana* ssp. *incisa*, and *Senecio integerrimus*.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Juniperus scopulorum, Pinus edulis*
Tall shrub/sapling	*Holodiscus dumosus*
Tall shrub/sapling	*Cercocarpus montanus*
Short shrub/sapling	*Philadelphus microphyllus*
Short shrub/sapling	*Artemisia tridentata*

Globally

Stratum	Species
Tree canopy	*Juniperus scopulorum, Pinus edulis*
Tall shrub/sapling	*Holodiscus dumosus*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Vulnerable: *Arabis crandallii* (globally imperiled, G2)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (23-Jun-2005).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

This association has only been sampled from one location in Curecanti National Recreation Area in western Colorado. More surveys and classification work are needed to change the provisional status of this association.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Type occurs on steep slopes. More quantitative data are needed to define this association.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0143 and 3 observation points: BLCA_AA.316, BLCA_AA.614, CURE_AA.0383).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: K.A. Schulz, mod. M.E. Hall

REFERENCES: Western Ecology Working Group n.d.

*Pinus edulis - Juniperus spp. / Artemisia tridentata (*ssp. *wyomingensis,* ssp. *vaseyana)* Woodland

Two-needle Pinyon - Juniper species / (Wyoming Big Sagebrush, Mountain Big Sagebrush) Woodland

CODE	CEGL000776
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	*PINUS EDULIS - (JUNIPERUS* SPP.) WOODLAND ALLIANCE (A.516) Two-needle Pinyon - (Juniper species) Woodland Alliance
ECOLOGICAL SYSTEM(S):	Colorado Plateau Pinyon-Juniper Woodland (CES304.767) Southern Rocky Mountain Pinyon-Juniper Woodland (CES306.835)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This broadly defined woodland association is common in the Colorado Plateau but also occurs on dry foothills and mesas from north-central New Mexico and southern Colorado west to the eastern Mojave Desert, in extreme northwestern Colorado and adjacent Utah. Elevations range from 1465 to 2500 m (4800-8200 feet). Stands occur most often on flat to gentle slopes on all aspects. The soils are generally poorly developed, moderately deep to deep, well-drained to rapidly drained loams and sands. Ground cover is variable; bare soil is common, but bedrock, litter, and large or small rocks can also be abundant on some sites. Parent material includes sandstone and shale. The vegetation is characterized by a typically open tree canopy (10-30% cover but ranges up to 50% cover) that is codominated by *Pinus edulis* and *Juniperus* spp. The species of *Juniperus* varies with geography and elevation. *Juniperus monosperma* is common in north-central New Mexico and southern Colorado. *Juniperus osteosperma* is common from northwestern New Mexico west and north into Arizona and Utah. *Juniperus scopulorum* is more common in higher elevation stands. *Artemisia tridentata* (either ssp. *vaseyana* or ssp. *wyomingensis* depending on location) strongly dominates the sparse to moderately dense short-shrub layer (10-35% cover). *Purshia stansburiana* is typically absent or scarce. Other shrubs present may include *Amelanchier utahensis, Arctostaphylos patula, Cercocarpus montanus, Ephedra viridis, Gutierrezia sarothrae, Quercus gambelii* (typically <5% cover), or species of *Yucca* and *Opuntia*. Herbaceous cover is variable but generally sparse and dominated by graminoids (<5% cover) with scattered forbs.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This uncommon type was sampled along the Cimarron Utility Road of the recreation area and in Red Rock Canyon and the Green Mountain Basin of the park.

Globally
This woodland association is common on the Colorado Plateau, occurring from north-central New Mexico and southern Colorado west to the Mogollon Rim of Arizona and the eastern Mojave Desert, and in extreme northwestern Colorado and adjacent Utah.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This woodland association was observed on all slope positions of ridges. Sites are gentle to steep (8-74% slopes), occur between 2046 and 2502 m elevation, and are oriented to the southeast and southwest. The unvegetated surface has low to high cover of litter, gravel, cobbles, boulders, and bedrock. Exposure of bare soil is highest on the sites of the Green Mountain area. Litter and duff depths measured 0-4 cm and 0-6 cm, respectively. Soils are well-drained to rapidly drained sandy loams, loamy sands, and silt loams derived from Precambrian schist and gneiss, Quaternary alluvium and colluvium, or Morrison Formation.

Globally
This broadly defined woodland association occurs on dry foothills and mesas across much of the Colorado Plateau and adjacent areas. Elevations range from 1459 to 2502 m. Stands occur most often on flat to gentle slopes but can be found on moderate to moderately steep slopes on all aspects. The soils are often deep, generally poorly developed, moderately well-drained to rapidly drained loams and sands, and skeletal. Ground cover is variable; bare soil is common, but bedrock, litter, and large or small rocks can also be abundant on some sites. Parent material includes sandstone and shale.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 39 to 89% in these stands. This woodland association is characterized by an open canopy, typically 2-10 m tall, of *Pinus edulis* and *Juniperus osteosperma* trees that range in cover from 5 to 25% and 5 to 50%, respectively. Subcanopy trees provide low to moderate cover, up to 20% cover, and include *Pinus edulis, Juniperus osteosperma*, and *Juniperus scopulorum*. The understory is characterized by the short shrub *Artemisia tridentata* ssp. *vaseyana* that ranges in cover from 5 to 20%. The shrub layer is diverse and provides low to moderate cover. The tall-shrub layer consists of sapling trees that provide sparse cover and include *Juniperus osteosperma, Juniperus scopulorum*, and *Pinus edulis*. Short and dwarf-shrubs provide low to moderate cover, including *Amelanchier utahensis, Ephedra viridis, Gutierrezia sarothrae*, and *Opuntia fragilis*. The herbaceous layer has high diversity and provides sparse to low cover. Common graminoids include *Achnatherum hymenoides, Bromus tectorum, Elymus elymoides*, and *Poa fendleriana*. Forbs commonly present include *Eriogonum racemosum* and *Sphaeralcea coccinea*. A few seedling *Pinus edulis, Juniperus osteosperma, Juniperus scopulorum*, and *Quercus gambelii* are occasionally present. Cryptogams are commonly present and provide cover from 5 to 25%.

Globally
This woodland is characterized by a typically open tree canopy (usually 10-30% cover but ranges up to 50% cover) that ranges from 2 to 10 m tall in most stands. The tree canopy is codominated by *Pinus edulis* and *Juniperus* spp. The species of *Juniperus* varies with geography and elevation. *Juniperus monosperma* is common in north-central New Mexico and southern Colorado. *Juniperus osteosperma* is common in stands reported from northwestern New Mexico, western Colorado, Arizona and Utah. *Juniperus scopulorum* is more common in higher elevation stands. *Artemisia tridentata* strongly dominates the relatively sparse to moderately dense short-shrub layer (10-35% cover); either ssp. *vaseyana* or ssp. *wyomingensis* may be present, with ssp. *vaseyana* being more characteristic of higher elevations or more mesic conditions. *Purshia stansburiana* is typically absent or scarce. Other shrubs present may include *Amelanchier utahensis, Arctostaphylos patula, Cercocarpus montanus, Ephedra viridis, Gutierrezia sarothrae, Quercus gambelii* (typically <5% cover), or species of *Yucca* and *Opuntia*. Herbaceous cover is variable but is generally sparse and dominated by graminoids (<5% cover) with scattered forbs. Associated graminoids include *Achnatherum hymenoides (= Oryzopsis hymenoides), Bouteloua gracilis, Carex filifolia, Hesperostipa comata, Koeleria macrantha, Muhlenbergia torreyi, Pascopyrum smithii, Pleuraphis jamesii*, and *Poa fendleriana*. Forbs include species of *Cryptantha, Eriogonum, Penstemon*, and *Phlox*. Cryptogram cover tends to be low, but some stands may have moderate cover.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Juniperus osteosperma, Juniperus scopulorum, Pinus edulis*
Tree subcanopy	*Juniperus osteosperma, Pinus edulis*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Opuntia fragilis*
Herb (field)	*Bromus tectorum, Poa fendleriana*

Globally

Stratum	Species
Tree canopy	*Juniperus monosperma, Juniperus osteosperma, Pinus edulis*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
On dry, rocky or slickrock sites on the Colorado Plateau, this pinyon-juniper woodland association may include stands with very open tree canopies (5-10% cover) in cases where the total vegetation cover is less than 15%. These stands may be similar to open *Artemisia tridentata* shrublands with scattered pinyon and juniper trees but is considered to be a variation of the woodland type because of the ecological values of the trees.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Sites are located on scree and ledgy cliff faces.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (8 plots: BLCA.0033, BLCA.0034, BLCA.0059, BLCA.0065, BLCA.0067, BLCA.0068, CURE.0208, CURE.0209 and 36 observation points: BLCA_AA.294, BLCA_AA.315, BLCA_AA.341, BLCA_AA.342, BLCA_AA.349, BLCA_AA.364, BLCA_AA.376, BLCA_AA.403, BLCA_AA.454, BLCA_AA.455, BLCA_AA.458, BLCA_AA.468, BLCA_AA.488, BLCA_AA.494, BLCA_AA.500, BLCA_AA.501, BLCA_AA.516, BLCA_AA.553, BLCA_AA.554, BLCA_AA.577, BLCA_AA.578, CURE_AA.0437, CURE_AA.0500, CURE_AA.0508, CURE_AA.0517, CURE_AA.0665, CURE_AA.0687, CURE_AA.0737, CURE_AA.0738, CURE_AA.0748, CURE_AA.0749, CURE_AA.0755, CURE_AA.0770, CURE_AA.0771, CURE_AA.0772, CURE_AA.0789, CURE_AA.0891).
Local Description Authors: J. Von Loh, mod. G. Bradshaw and J. Coles
Global Description Authors: K.A. Schulz, mod. J. Drake and J. Coles

REFERENCES: Bourgeron and Engelking 1994, Bunting 1987, CONHP unpubl. data 2003, Cogan et al. 2004, Dick-Peddie 1993, Driscoll et al. 1984, Erdman 1970, Everett 1987, Heinze et al. 1962, Isaacson 1967, Jameson et al. 1962, Johnston 1987, Larson and Moir 1987, Mason et al. 1967, Moir and Carleton 1987, Salas et al. 2009, Stuever and Hayden 1997a, Tiedemann 1978, USFS 1983a, USFS 1985a, USFS 1985e, Warren et al. 1982, Western Ecology Working Group n.d., Wright et al. 1979

Pinus edulis - Juniperus spp. / Cercocarpus montanus - Mixed Shrubs Woodland

Two-needle Pinyon - Juniper species / Alderleaf Mountain-mahogany - Mixed Shrubs Woodland

CODE	CEGL000780
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	*PINUS EDULIS - (JUNIPERUS* SPP.) WOODLAND ALLIANCE (A.516) Two-needle Pinyon - (Juniper species) Woodland Alliance
ECOLOGICAL SYSTEM(S):	Colorado Plateau Pinyon-Juniper Shrubland (CES304.766) Colorado Plateau Pinyon-Juniper Woodland (CES304.767) Southern Rocky Mountain Pinyon-Juniper Woodland (CES306.835)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This broadly defined woodland association is common on the Colorado Plateau, occurring on sheltered colluvial slopes, sandstone hogbacks, dry foothills and mesas from north-central New Mexico and southern Colorado west to the Mogollon Rim of Arizona, and in western Colorado and adjacent Utah. It can be found on any slope position, though lower slopes are less common. Elevations range from 1472 to 2480 m (4830-8135 feet). Stands occur on gentle to steep slopes on all aspects. The soils are variable but generally shallow, poorly developed and skeletal, ranging from clayey marl to loamy sands. The unvegetated surface is characterized by bedrock, large and small rocks, and/or bare soil with little litter. Sandstone or shale are the most common parent materials. This association is characterized by an open to moderately dense tree canopy (10-60% cover) dominated by a combination of *Pinus edulis* and *Juniperus* spp. with a shrub layer dominated by *Cercocarpus montanus*. The tree canopy averages 2-5 m tall, but some stands may be as tall as 10 m. *Pinus edulis* and *Juniperus* spp. codominate in most stands, but sometimes one may be more prevalent than the other. The species of *Juniperus* varies with geography and elevation and includes *Juniperus deppeana, Juniperus monosperma, Juniperus osteosperma*, and *Juniperus scopulorum*. The total shrub cover may range from sparse to moderate. *Cercocarpus montanus* is the dominant shrub with up to 35% cover. It typically occurs as a short shrub but can be a tall shrub on some sites. Other shrubs may be present, including *Amelanchier* spp., *Artemisia bigelovii, Artemisia tridentata, Ephedra viridis, Chrysothamnus viscidiflorus, Gutierrezia sarothrae, Fendlera rupicola, Garrya ovata, Mahonia* spp., *Nolina microcarpa, Quercus gambelii, Quercus grisea, Rhus trilobata*, or species of *Yucca* and *Opuntia*. Herbaceous cover is variable, ranging from sparse to moderately dense, and generally dominated by graminoids (>5% cover) with scattered forbs. Extremely open stands of this association, usually occurring on fractured slickrock exposures, may have as little as 5% total vegetation cover and an upper canopy only 2 m tall.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This common association was sampled in Green Mountain Basin, on the South Rim in the vicinity of Warner Point and the High Point Trail, near North Vista Trail, on the North Rim across from the South Rim Visitor Center, Pleasant Park, Red Rocks, and northwest of the Big Island Overlook on the park and on land managed by the BLM at June's Draw and at Red Rocks.

Globally

This widespread woodland association is found from southern Colorado and north-central New Mexico to the Mogollon Rim of Arizona, north across the Colorado Plateau into western Colorado and adjacent Utah.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs on all slope positions on ridges. Sites are moderately steep to steep (18-62% slopes), occur between 2045 and 2480 m elevation, and are oriented to southeast through northwest aspects. The

unvegetated surface has low to high cover of rocks in the form of gravel, cobbles, boulders, and bedrock. Low to moderate cover by litter and exposure of bare soil also characterize the unvegetated surface. Litter and duff depths were measured on some plots; the range of depths for litter is 0-4 cm and for duff is 0-1 cm. Soils are well-drained to rapidly drained sandy loams, loamy sands, sandy clay loams, and clays derived from diverse sources, including colluvium or Wanakah, Entrada, Dakota and Morrison formations.

Globally
This broadly defined woodland association is common on the Colorado Plateau, occurring on sheltered colluvial slopes, sandstone hogbacks, dry foothills and mesas. It can be found on any slope position (upper, middle, or lower), though lower slopes are the least common. Elevations range from 1472 to 2480 m (4830-8135 feet). Stands occur on gentle to steep (3- to 36-degree) slopes on all aspects. The soils are variable but generally shallow, poorly developed and skeletal, ranging from clayey marl to loamy sands. The unvegetated surface is characterized by bedrock, large and small rocks, and/or bare soil. Litter has low cover. Parent materials are often sandstone or shale, but others are possible.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 50 to 108% in these stands. This woodland association is characterized by an open to somewhat closed canopy, typically 2-10 m tall, of *Pinus edulis* and *Juniperus osteosperma* trees that each range in cover from 1 to 50%. The understory is characterized by the tall- and short-shrub *Cercocarpus montanus* that ranges in cover from 1 to 25%. A subcanopy tree layer is also present on three of the nine plots and is characterized by *Pinus edulis* with up to 30% cover, and *Juniperus osteosperma* with up to 5% cover. *Pinus edulis* and *Juniperus osteosperma* also occur with sparse to low cover as saplings and seedlings in shrub and herbaceous layers. The shrub layer is diverse and provides low to moderate cover. The common shrubs present include *Amelanchier utahensis* and *Ephedra viridis* and the succulent *Opuntia fragilis*. The herbaceous layer is diverse but typically provides sparse to low cover in a given stand. The common graminoids include *Achnatherum hymenoides, Carex geyeri, Elymus elymoides,* and *Poa fendleriana*. Forbs common to the association include *Cryptantha flavoculata, Balsamorhiza sagittata, Draba cuneifolia, Lesquerella rectipes,* and *Stenotus armerioides*. A few seedling *Pinus edulis, Juniperus osteosperma, Quercus gambelii,* and *Cercocarpus montanus* are occasionally present. Cryptogams provide low cover, up to 8%. One stand (BLCA.0097) has excellent crusts on about half the plot area.

Globally
This association is characterized by an open to moderately dense tree canopy (10-60% cover) dominated by a combination of *Pinus edulis* and *Juniperus* spp. The canopy averages 2-5 m tall, but some stands may be as tall as 10 m. *Pinus edulis* and *Juniperus* spp. codominate in most stands, but sometimes one may be more prevalent than the other. *Pinus edulis* and *Juniperus* spp. are also present as smaller individuals in the shrub and field strata. The species of *Juniperus* varies with geography and elevation. *Juniperus monosperma* is common in north-central New Mexico and southern Colorado. *Juniperus deppeana* is common in southern New Mexico, and *Juniperus osteosperma* is common from northwestern New Mexico west into Arizona and north into western Colorado and Utah. *Juniperus scopulorum* is more common in higher elevation stands. The total shrub cover may range from sparse to moderate. *Cercocarpus montanus* is the dominant shrub with 1-35% cover. It typically occurs as a short shrub <2 m tall but can be a tall shrub (2-5 m) on some sites. Other shrubs may be present, including *Amelanchier* spp., *Artemisia bigelovii, Artemisia tridentata, Ephedra viridis, Chrysothamnus viscidiflorus, Gutierrezia sarothrae, Fendlera rupicola, Fraxinus anomala, Garrya ovata, Mahonia* spp., *Nolina microcarpa, Purshia stansburiana, Quercus gambelii* (<5% cover), *Quercus grisea, Rhus trilobata, Symphoricarpos oreophilus*, or species of *Yucca* and *Opuntia*. Herbaceous cover is variable, ranging from sparse to moderately dense, and generally dominated by graminoids (>5% cover) with scattered forbs. Associated graminoids include *Achnatherum hymenoides (= Oryzopsis hymenoides), Andropogon gerardii, Aristida purpurea, Bouteloua curtipendula, Bouteloua gracilis, Bouteloua hirsuta, Carex rossii, Hesperostipa comata, Koeleria macrantha, Leymus salinus (= Elymus salinus), Muhlenbergia pauciflora, Pascopyrum smithii, Pleuraphis jamesii, Poa fendleriana, Pseudoroegneria spicata,* and *Schizachyrium scoparium*. Common forbs include species of *Chamaesyce, Cryptantha, Eriogonum, Machaeranthera, Packera, Penstemon, Petradoria, Phlox,* and *Tetraneuris*. Extremely open stands of this association occurring on exposed and fractured slickrock may have as little as 5% total vegetation cover and an upper canopy only 2 m tall. Biological soil crusts are patchy but may contribute up to 27% cover and are generally well-developed.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Juniperus osteosperma, Pinus edulis*
Short shrub/sapling	*Amelanchier utahensis*
Short shrub/sapling	*Cercocarpus montanus*
Herb (field)	*Opuntia fragilis*
Herb (field)	*Achnatherum hymenoides, Poa fendleriana*

Globally

Stratum	Species
Tree canopy	*Juniperus monosperma, Juniperus osteosperma, Pinus edulis*
Short shrub/sapling	*Cercocarpus montanus*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus tectorum* (exotic, High)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This is a widely distributed and variable association, found throughout much of the Colorado Plateau, edges of the Colorado Rockies and south into New Mexico. On dry, rocky or slickrock sites on the Colorado Plateau, this pinyon-juniper woodland association may include stands with very open tree canopies (5-10% cover) in cases where the total vegetation cover is less than 15%. These stands may be similar to open *Cercocarpus montanus* shrublands with scattered pinyon and juniper trees but is considered to be a variation of the woodland type because of the ecological values of the trees.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Mature stands that are regularly and heavily grazed and browsed.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (10 plots: BLCA.0015, BLCA. 0017, BLCA.0029, BLCA.0042, BLCA.0061, BLCA.0076, BLCA.0090, BLCA.0097, BLCA.0102 CURE.0142 and 80 observation points Observation Points: BLCA_AA.164, BLCA_AA.179, BLCA_AA.183, BLCA_AA.184, BLCA_AA.185, BLCA_AA.186, BLCA_AA.190, BLCA_AA.196, BLCA_AA.200, BLCA_AA.205, BLCA_AA.474, BLCA_AA.485, BLCA_AA.495, BLCA_AA.505, BLCA_AA.512, BLCA_AA.513, BLCA_AA.521, BLCA_AA.535, BLCA_AA.545, BLCA_AA.552, BLCA_AA.567, BLCA_AA.568, BLCA_AA.574, BLCA_AA.592, BLCA_AA.593, BLCA_AA.600, BLCA_AA.603, BLCA_AA.605, BLCA_AA.611, BLCA_AA.622, BLCA_AA.630, BLCA_AA.631, BLCA_AA.651, BLCA_AA.668, BLCA_AA.733, BLCA_AA.739, BLCA_AA.748, BLCA_AA.750, BLCA_AA.757, BLCA_AA.764, BLCA_AA.766, BLCA_AA.767, BLCA_AA.771, BLCA_AA.780, BLCA_AA.790, BLCA_AA.818, BLCA_AA.826, BLCA_AA.855, BLCA_AA.861, BLCA_AA.863, BLCA_AA.867, BLCA_AA.870, BLCA_AA.871, BLCA_AA.872, BLCA_AA.873, BLCA_AA.918, CURE_AA.0100, CURE_AA.0101, CURE_AA.0317, CURE_AA.0319, CURE_AA.0351, CURE_AA.0378, CURE_AA.0385, CURE_AA.0413, CURE_AA.0448, CURE_AA.0471, CURE_AA.0472, CURE_AA.0485, CURE_AA.0499, CURE_AA.0509, CURE_AA.0510, CURE_AA.0556, CURE_AA.0616, CURE_AA.0656, CURE_AA.0664, CURE_AA.0666, CURE_AA.0677, CURE_AA.0678, CURE_AA.0710, CURE_AA.0754).

Local Description Authors: J. Von Loh, mod. G. Bradshaw and J. Coles
Global Description Authors: K.A. Schulz, mod. J. Drake and J. Coles

REFERENCES: Baker 1983b, Baker 1984a, Baker and Kennedy 1985, Bourgeron and Engelking 1994, Bradley et al. 1992, CONHP unpubl. data 2003, Cogan et al. 2004, Driscoll et al. 1984, Erdman 1962, Erdman 1969, Hansen et al. 2004d, Hess and Wasser 1982, Isaacson 1967, Johnston 1987, Kennedy 1983a, Larson and Moir 1987, Marr et al. 1979, Medina 1986, Moir 1963, Moir and Carleton 1987, Moir and Ludwig 1979, Pase and Lindenmuth 1971, Stuever and Hayden 1997a, USFS 1981a, USFS 1981b, USFS 1983a, USFS 1985d, USFS 1985e, USFS 1985g, Vories 1974, Western Ecology Working Group n.d., Wright et al. 1979

Pinus edulis - Juniperus spp. / Poa fendleriana Woodland

Two-needle Pinyon - Juniper species / Muttongrass Woodland

CODE	CEGL000787
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	*PINUS EDULIS - (JUNIPERUS* SPP.) WOODLAND ALLIANCE (A.516) Two-needle Pinyon - (Juniper species) Woodland Alliance
ECOLOGICAL SYSTEM(S):	Colorado Plateau Pinyon-Juniper Woodland (CES304.767) Southern Rocky Mountain Pinyon-Juniper Woodland (CES306.835)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This association is widespread and common throughout the Colorado Plateau of Utah, Arizona, New Mexico and Colorado. It occurs on the slopes of canyons, ridges, toeslopes, alluvial fans, benches and plateaus at elevations ranging from 1525 to 2560 m (5000-8400 feet). Stands may occur on slopes ranging from 7 to 48% that are oriented to any aspect. Most stands are on sandy soils, with a few on silt loam or clay loam soils derived from sedimentary, granitic or metamorphic rocks. Total vegetation cover ranges from 40% to more than 75%. This woodland association is characterized by an open to moderately closed, mixed canopy of *Pinus edulis* and *Juniperus osteosperma* 2-10 m tall. In the southern part of the range, *Juniperus monosperma* and *Juniperus scopulorum* may be present in the canopy. The understory is dominated by the bunchgrass *Poa fendleriana* with between 1 and 25% cover. Scattered shrubs fail to form a stratum but may include *Amelanchier utahensis, Artemisia nova, Cercocarpus montanus, Ephedra viridis, Quercus gambelii, Purshia tridentata, Yucca baccata, Opuntia* spp., *Symphoricarpos oreophilus, Fallugia paradoxa*, and *Fendlera rupicola*. Other common herbaceous species (always with less cover than *Poa fendleriana*) include *Achnatherum hymenoides, Koeleria macrantha, Muhlenbergia montana, Blepharoneuron tricholepis, Pascopyrum smithii, Bouteloua gracilis, Balsamorhiza sagittata, Mirabilis multiflora, Penstemon linarioides*, and *Petradoria pumila*.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association was sampled on Jones Summit, in Jones Draw, along North Vista Trail, at High Point, near the campground at Chasm View Trail, and in Green Mountain Basin in the park and east of the Hermit's Rest Trail in the recreation area.

Globally
This association occurs at moderate elevations in the Colorado Plateau region of western Colorado, northern Arizona and New Mexico and eastern Utah.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association was observed on all slope positions of ridges and on toeslopes of canyons. Sites are moderately steep to steep (13-48% slope), occur between 2311 and 2516 m elevation, and are oriented to aspects ranging from southeast to southwest. The unvegetated surface has moderate to high cover of litter and low to moderate cover of large and small rocks and exposure of bare soil. Downed wood is uncommon to common, up to 25% cover. Litter and duff depth ranges from 0-4 cm and 0-2 cm, respectively. Soils are well-drained sandy loams, loamy sands, and silt loams derived from a variety of sources, including Jurassic and Cretaceous sedimentary rocks and Precambrian metamorphic and granitic rocks.

Globally
This association is widespread and common throughout the Colorado Plateau of Utah, Arizona, New Mexico and Colorado. It occurs on the gentle to moderate slopes of canyons, ridges, toeslopes, benches and plateaus at elevations ranging from 1525 to 2560 m (5000-8400 feet). Stands may occur on slopes ranging from 7 to 48% and oriented to any aspect. Most stands are on sandy soils, with a few on silt loam or clay loam soils derived from sedimentary, granitic or metamorphic rocks. A third to half the unvegetated ground surface is bare ground, and in some plots large rocks and gravel cover up to a third of the surface. In some cases, cryptogamic crusts and moss or litter cover up to 25% of the soil surface.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 65 to 100% in these stands. This woodland association is characterized by an open to moderately closed canopy, typically 2-10 m tall, of *Pinus edulis* and *Juniperus osteosperma* trees that range in cover from 25 to 50% and 1 to 50%, respectively. The understory is characterized by the bunchgrass *Poa fendleriana* that provides from 1 to 25%. A subcanopy layer of *Pinus edulis* and *Juniperus osteosperma* trees provides up to 15% cover for each species. *Juniperus osteosperma* and *Pinus edulis* saplings or mature, stunted trees occasionally occur in the shrub layers. The shrub layer is highly variable in cover and composition. The tall- and short-shrub layers provide low cover by *Quercus gambelii*. Dwarf-shrubs also provide sparse cover, most commonly by the succulent *Opuntia fragilis*. The herbaceous layer is diverse and provides sparse to low cover, usually less than 10% cover per stand. The common associated graminoids include *Bromus tectorum* and *Elymus elymoides*. Forbs are diverse but provide cover, the most common include *Balsamorhiza sagittata, Collinsia parviflora*, and *Descurainia pinnata*. Seedlings of *Juniperus osteosperma* and *Pinus edulis* trees and *Ribes inerme* and *Quercus gambelii* shrubs are sometimes present providing sparse cover. Cryptogams provide sparse cover, up to 10%.

Globally
This woodland association is widespread and relatively common at moderate elevations throughout the Colorado Plateau. Total vegetation cover ranges from 40% to more than 75%. This woodland association is characterized by an open to moderately closed, mixed canopy of *Pinus edulis* and *Juniperus osteosperma* 2-10 m tall. In the southern part of the range, *Juniperus monosperma* and *Juniperus scopulorum* may be present in the canopy. The understory is dominated by the bunchgrass *Poa fendleriana* with between 1 and 25% cover. Scattered shrubs present include *Amelanchier utahensis, Artemisia nova, Cercocarpus montanus, Quercus gambelii, Purshia tridentata, Yucca baccata, Opuntia* spp., *Symphoricarpos oreophilus, Fallugia paradoxa*, and *Fendlera rupicola*. Other common herbaceous species (always with less cover than *Poa fendleriana*) include *Achnatherum hymenoides, Koeleria macrantha, Muhlenbergia montana, Blepharoneuron tricholepis, Pascopyrum smithii, Bouteloua gracilis, Balsamorhiza sagittata, Mirabilis multiflora, Penstemon linarioides*, and *Petradoria pumila*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Juniperus osteosperma, Pinus edulis*
Tree subcanopy	*Juniperus osteosperma, Pinus edulis*
Herb (field)	*Opuntia fragilis*
Herb (field)	*Bromus tectorum, Poa fendleriana*

Globally

Stratum	Species
Tree canopy	*Juniperus osteosperma, Pinus edulis*
Herb (field)	*Poa fendleriana*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus tectorum* (exotic, High)

Globally
Vulnerable: *Arabis fernaldiana* var. *fernaldiana* (rare, endemic (known only from Dinosaur NM), G4T3T4);
Exotic/Invasive: *Bromus tectorum* (exotic, High)

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Even if stands have relatively sparse cover of *Poa fendleriana* (<5%), if no other species are present with more than trace cover, they have been placed in this association rather than *Pinus edulis - Juniperus osteosperma* / Sparse Understory Woodland (CEGL002148).

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Slopes are moderate to steep; soils range from deep to rocky talus.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (10 plots: BLCA.0011, BLCA.0018, BLCA.0036, BLCA.0077, BLCA.0096, BLCA.0140, BLCA.0142, BLCA.0144, BLCA.0148, CURE.0141 and 4 observation points: BLCA_AA.523, BLCA_AA.674, BLCA_AA.716, BLCA_AA.795).
Local Description Authors: J. Von Loh, mod. G. Bradshaw and J. Coles
Global Description Authors: J. Coles

REFERENCES: Baker 1982b, Barnes 1987, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Driscoll et al. 1984, Erdman 1962, Erdman 1969, Erdman et al. 1969, Floyd 2003, Floyd et al. 2001, Isaacson 1967, Johnston 1987, Larson and Moir 1987, Moir and Carleton 1987, USFS 1985a, Western Ecology Working Group n.d.

Pinus edulis - *Juniperus* spp. / *Quercus gambelii* Woodland

Two-needle Pinyon - Juniper species / Gambel Oak Woodland

CODE	CEGL000791
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	*PINUS EDULIS* - *(JUNIPERUS* SPP.) WOODLAND ALLIANCE (A.516) Two-needle Pinyon - (Juniper species) Woodland Alliance

ECOLOGICAL SYSTEM(S): Colorado Plateau Pinyon-Juniper Woodland (CES304.767)
Southern Rocky Mountain Pinyon-Juniper Woodland (CES306.835)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This widespread woodland association is known from the Colorado Plateau and southern Rocky Mountains, occurring from south-central Colorado to south-central New Mexico, west along the Mogollon Rim of Arizona, and north into Utah and western Colorado. Elevations normally range from 1509-2665 m but may be higher in stands in southern New Mexico. Sites are variable but generally are relatively mesic. Stands occur on flat to moderate slopes along drainages and on mesatops, and on moderate to steep, rocky slopes of foothills, mountains and canyons, especially in draws where soil moisture is concentrated, or on northern aspects or where shaded by upper canyon walls. The soils are variable and range from deep to shallow, silty clay to sandy loam, and often gravelly. Litter from *Quercus gambelii* and other shrubs is often extensive (over 50% cover). The vegetation is characterized by an open to moderately dense tree canopy (10-60% cover) codominated by *Pinus edulis* and *Juniperus* spp. The species of *Juniperus* varies with geography and elevation. *Juniperus monosperma* is common in north-central New Mexico and southern Colorado. *Juniperus deppeana* is common in southern New Mexico, and *Juniperus osteosperma* is common in northwestern New Mexico, northern Arizona and in Utah. *Juniperus scopulorum* is more common in higher elevation stands. An occasional *Pinus ponderosa* tree may be present in some stands. *Quercus gambelii* dominates the often patchy, moderately dense tall-shrub layer with at least 5% cover, but often over 25% cover. *Amelanchier utahensis, Cercocarpus montanus, Symphoricarpos oreophilus,* or species of *Yucca* and *Opuntia* are common shrub associates. Herbaceous cover is variable, ranging from sparse to moderately dense, but generally dominated by graminoids (>5% cover) with scattered forbs. Associated graminoids include *Achnatherum hymenoides (= Oryzopsis hymenoides), Bouteloua gracilis, Carex geyeri, Carex rossii, Elymus elymoides, Festuca arizonica, Koeleria macrantha, Muhlenbergia montana, Poa fendleriana,* and *Schizachyrium scoparium*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This common association was sampled near Cimarron Point, west of Hermit's Rest in the recreation area and in the Green Mountain Basin, on Green Mountain, near Deadhorse Trail near Grizzly Gulch, and along North Vista Trail in the park.

Globally

This woodland association occurs in foothills and mesas from southern Colorado to south-central New Mexico, west along the Mogollon Rim of Arizona, and north into Utah and western Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association was observed on the midslopes to shoulder position of ridges. Sites are gentle to moderately steep (2-48% slope), occur between 2342 and 2664 m elevation, and are oriented to southeastern to western aspects. The unvegetated surface has moderate to high cover by litter and moderate cover of large and small rocks. Exposures of bare soil may also be moderate in terms of the unvegetated surface area. Dead and downed wood is present, providing up to 35% cover. The range of depths for litter is 0-6 cm and for duff is 0-9 cm. Soils are

well-drained to rapidly drained sandy loams, sandy clay loams, loamy sands, and silty loams derived from sedimentary rocks of the Wanakah and Morrison formations.

Globally
This widespread woodland association is known from the Colorado Plateau and southern Rocky Mountains, occurring from south-central Colorado to south-central New Mexico, west along the Mogollon Rim of Arizona, and north into Utah and western Colorado. Elevations normally range from 1509-2665 m but may be higher in stands in southern New Mexico. Sites are variable but generally are relatively mesic. Stands occur on flat to moderate slopes along drainages and on mesatops, and on moderate to steep, sometimes rocky slopes of foothills, mountains and canyons, especially in draws where soil moisture is concentrated, or on northern aspects or where shaded by upper canyon walls. Stands are less common on hot south-facing slopes, unless they are located in a moisture-concentrating gully. Soils are variable and range from deep to shallow, silty clay to sandy loam, and are often gravelly or rocky. Litter from *Quercus gambelii* and other shrubs is often extensive (over 50% cover). Parent materials include alluvial, colluvial or eolian deposits derived from sandstone, shale, limestone and rhyolite.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 66 to 143% in these stands. This woodland association is characterized by an open canopy, typically 2-10 m tall, of *Pinus edulis* and *Juniperus osteosperma* trees range in cover from 5 to 75% and 1 to 25%, respectively, and the tall shrub *Quercus gambelii* that ranges in cover from 5 to 50%. A subcanopy layer of *Pinus edulis* trees is occasionally present and provides from 1 to 20% cover. The shrub layer is moderately diverse and provides moderate cover. Additional tall shrubs that provide low to moderate cover include *Amelanchier utahensis* and *Cercocarpus montanus*. Short and dwarf-shrubs commonly present include *Artemisia tridentata* ssp. *vaseyana, Cercocarpus montanus, Quercus gambelii,* and *Symphoricarpos rotundifolius*. The herbaceous layer is diverse across stands but typically sparse to low in terms of cover. The most common graminoids include *Carex geyeri* and *Poa fendleriana*. Forbs are diverse and variable, contribute sparse cover, and include *Balsamorhiza sagittata, Ipomopsis aggregata,* and *Petradoria pumila*. Seedlings of *Quercus gambelii* shrubs are very common, and *Amelanchier utahensis, Juniperus osteosperma,* and *Pinus edulis* seedlings are also sometimes present. Cryptogam cover is sparse and occurs sporadically among sites.

Globally
This widespread association is characterized by an open to moderately dense tree canopy (10-70% cover) codominated by *Pinus edulis* and *Juniperus* spp. The species of *Juniperus* varies with geography and elevation. *Juniperus monosperma* is common in north-central New Mexico and southern Colorado. *Juniperus deppeana* is common in southern New Mexico, and *Juniperus osteosperma* is common in northwestern New Mexico, northern Arizona and in Utah. *Juniperus scopulorum* is more common in higher elevation stands. An occasional *Pinus ponderosa* tree may be present is some stands. *Quercus gambelii* dominates the often patchy, moderately dense tall-shrub layer with at least 5% cover, but often with more than 25% cover. *Amelanchier utahensis, Cercocarpus montanus, Symphoricarpos oreophilus*, or species of *Yucca* and *Opuntia* are common shrub associates. Other shrubs, depending on geography, may include *Artemisia tridentata, Artemisia nova, Arctostaphylos patula, Cercocarpus ledifolius, Ephedra viridis, Fendlera rupicola, Gutierrezia sarothrae, Garrya* spp., *Mahonia fremontii, Ptelea trifoliata, Prunus* spp., *Quercus X pauciloba, Robinia neomexicana*, or *Rosa* spp. Herbaceous cover is variable, ranging from sparse to moderately dense, but generally dominated by graminoids (>5% cover) with scattered forbs. Associated graminoids include *Achnatherum hymenoides (= Oryzopsis hymenoides), Bouteloua gracilis, Carex geyeri, Carex rossii, Elymus elymoides, Festuca arizonica, Koeleria macrantha, Muhlenbergia montana, Poa fendleriana,* and *Schizachyrium scoparium*. Common forbs may include *Artemisia frigida, Balsamorhiza sagittata, Geranium caespitosum, Lepidium montanum, Machaeranthera grindelioides, Packera neomexicana, Thalictrum fendleri, Tetraneuris acaulis,* or *Vicia americana*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Juniperus osteosperma, Pinus edulis*
Tall shrub/sapling	*Quercus gambelii*
Short shrub/sapling	*Symphoricarpos rotundifolius*
Short shrub/sapling	*Cercocarpus montanus*

Herb (field)	*Balsamorhiza sagittata, Ipomopsis aggregata, Petradoria pumila*
Herb (field)	*Carex geyeri, Poa fendleriana*

Globally

Stratum	Species
Tree canopy	*Juniperus monosperma, Juniperus osteosperma, Juniperus scopulorum, Pinus edulis*
Tall shrub/sapling	*Amelanchier utahensis, Quercus gambelii*
Tall shrub/sapling	*Cercocarpus montanus*
Short shrub/sapling	*Symphoricarpos oreophilus*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Some plots are not diverse. There is a lot of downed wood on some plots.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (10 plots: BLCA.0004, BLCA.0019, BLCA.0032, BLCA.0035, BLCA.0037, BLCA.0038, BLCA.0053, BLCA.0078, CURE.0116, CURE.0243 and 111 observation points: BLCA_AA.162, BLCA_AA.174, BLCA_AA.216, BLCA_AA.220, BLCA_AA.287, BLCA_AA.298, BLCA_AA.322, BLCA_AA.338, BLCA_AA.382, BLCA_AA.469, BLCA_AA.476, BLCA_AA.496, BLCA_AA.504, BLCA_AA.517, BLCA_AA.524, BLCA_AA.525, BLCA_AA.527, BLCA_AA.529, BLCA_AA.532, BLCA_AA.541, BLCA_AA.546, BLCA_AA.555, BLCA_AA.559, BLCA_AA.569, BLCA_AA.570, BLCA_AA.571, BLCA_AA.606, BLCA_AA.615, BLCA_AA.620, BLCA_AA.623, BLCA_AA.624, BLCA_AA.632, BLCA_AA.643, BLCA_AA.644, BLCA_AA.647, BLCA_AA.675, BLCA_AA.708, BLCA_AA.712, BLCA_AA.715, BLCA_AA.717, BLCA_AA.723, BLCA_AA.734, BLCA_AA.741, BLCA_AA.742, BLCA_AA.751, BLCA_AA.755, BLCA_AA.756, BLCA_AA.759, BLCA_AA.773, BLCA_AA.776, BLCA_AA.779, BLCA_AA.783, BLCA_AA.786, BLCA_AA.791, BLCA_AA.793, BLCA_AA.794, BLCA_AA.796, BLCA_AA.797, BLCA_AA.799, BLCA_AA.805, BLCA_AA.807, BLCA_AA.811, BLCA_AA.822, BLCA_AA.823, BLCA_AA.827, BLCA_AA.831, BLCA_AA.832, BLCA_AA.835, BLCA_AA.836, BLCA_AA.837, BLCA_AA.838, BLCA_AA.842, BLCA_AA.843, BLCA_AA.846, BLCA_AA.847, BLCA_AA.853, BLCA_AA.874, BLCA_AA.886, BLCA_AA.901, BLCA_AA.908, CURE_AA.0090, CURE_AA.0138, CURE_AA.0164, CURE_AA.0318, CURE_AA.0352, CURE_AA.0368, CURE_AA.0369, CURE_AA.0372, CURE_AA.0373, CURE_AA.0384, CURE_AA.0405, CURE_AA.0406, CURE_AA.0411, CURE_AA.0433, CURE_AA.0458, CURE_AA.0511, CURE_AA.0544, CURE_AA.0557, CURE_AA.0581, CURE_AA.0599, CURE_AA.0625, CURE_AA.0631, CURE_AA.0639, CURE_AA.0647, CURE_AA.0655, CURE_AA.0756, CURE_AA.0806, CURE_AA.0807, CURE_AA.0829, CURE_AA.0861, CURE_AA.1180).
Local Description Authors: J. Von Loh, mod. G. Bradshaw and J. Coles
Global Description Authors: K.A. Schulz, mod. J. Coles

REFERENCES: Bassett 1987, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Cogan et al. 2004, Driscoll et al. 1984, Harmon 1980, Hess and Wasser 1982, Holm 1927, Isaacson 1967, Johnston 1987, Kallender 1959, Larson and Moir 1987, Marr et al. 1973b, Muldavin et al. 1994a, Muldavin et al. 2000b, Steinhoff 1978, Stuever and Hayden 1997a, Vories 1974, Warren et al. 1982, Western Ecology Working Group n.d., Wright 1972, Wright et al. 1979

Pinus ponderosa / Purshia tridentata Woodland

Ponderosa Pine / Antelope Bitterbrush Woodland

CODE	CEGL000867
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	*PINUS PONDEROSA* WOODLAND ALLIANCE (A.530) Ponderosa Pine Woodland Alliance

ECOLOGICAL SYSTEM(S): Northern Rocky Mountain Foothill Conifer Wooded Steppe (CES306.958)
Southern Rocky Mountain Ponderosa Pine Woodland (CES306.648)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This *Pinus ponderosa* woodland occurs in montane zones in the Rocky Mountains and in sheltered canyons and high plateaus in the Colorado Plateau, from Colorado to Montana west to Utah, Washington, Oregon, and California. Stands tend to occupy south-facing, moderate to somewhat steep slopes (10-49%) in the Rockies, whereas Colorado Plateau stands prefer northern and eastern slopes and benches. Elevations range from 2165 to 2760 m (7100-9040 feet). Soils are relatively deep, mesic, well-drained sandy loams or loamy sands derived from sandstone, granite, colluvium or alluvium. Ground cover of litter and duff is often significant (30-60%). This *Pinus ponderosa* woodland is strongly dominated by *Pinus ponderosa*, often in open stands (10-40% cover) 10 to 35 m tall. *Pseudotsuga menziesii, Juniperus scopulorum, Pinus edulis*, and *Populus tremuloides* are common associates. The shrub layer is characterized and dominated by *Purshia tridentata*, although cover may be as low as 1% in sparsely vegetated stands. Additional species include *Quercus gambelii* (<10% cover), *Arctostaphylos uva-ursi, Artemisia bigelovii, Artemisia tridentata, Mahonia repens, Ribes cereum*, and *Juniperus communis*. In the northern states, *Amelanchier alnifolia, Prunus virginiana*, or *Symphoricarpos albus* occur. The herbaceous layer is inversely proportional to shrub cover and is dominated by graminoids, especially *Muhlenbergia montana*. Additional graminoids include *Bouteloua gracilis, Carex geyeri, Carex rossii, Danthonia parryi, Poa fendleriana, Pseudoroegneria spicata, Hesperostipa comata, Leucopoa kingii*, and *Festuca idahoensis*. Forbs are present and often diverse but have low cover. Forb composition largely depends on geographic region but often includes *Achillea millefolium var. occidentalis (= Achillea lanulosa), Antennaria* spp., *Artemisia ludoviciana, Eriogonum racemosum, Penstemon virens*, and *Sedum lanceolatum*, among many others. Bare ground and needle duff can be prevalent in some stands.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled near Soap Creek Arm and at Pioneer Point in Curecanti National Recreation Area.

Globally

This *Pinus ponderosa* woodland occurs in montane zones in the western United States from Colorado to Montana west to Utah and California.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs at the heads of drainages and on the shoulders of ridges and hills. Sites are moderately steep (25-33% slopes), occur between 2456 and 2461 m elevation, and are oriented to northwestern aspects. The unvegetated surface has high cover of litter and low to high cover of downed wood. Litter and duff depths were measured; litter ranged from 0.1-5.0 cm deep, while the duff ranged from 0-6.2 cm deep. Parent materials are metamorphic/granitic rocks and Quaternary alluvium. Soils are rapidly drained silty clays and loamy sands.

Globally
This *Pinus ponderosa* woodland occurs in montane zones in the Rocky Mountains and in sheltered canyons and high plateaus in the Colorado Plateau from Colorado to Montana west to Utah, Washington, Oregon, and California. Stands tend to occupy south-facing, moderate to somewhat steep slopes (10-49%) in the Rockies, whereas Colorado Plateau stands prefer northern and eastern slopes and benches. Elevations range from 2165 to 2760 m (7100-9040 feet). Soils are relatively deep, mesic, well-drained sandy loams or loamy sands derived from sandstone, granite, colluvium or alluvium. Ground cover of litter and duff is often significant (30-60%).

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 89 to 150% in these stands. *Pinus ponderosa* and *Pseudotsuga menziesii* form an open canopy 5-35 m high that provides 20 to 50% cover and 10 to 25% cover, respectively. The subcanopy layer is 2-15 m high and low in diversity but provides moderate cover, up to 25% cover, by *Juniperus scopulorum, Pinus ponderosa, Pseudotsuga menziesii*, and *Populus tremuloides* trees. The shrub layer is diverse in terms of species composition and provides moderate cover, up to 32%. Tall, short and dwarf-shrubs commonly present include *Purshia tridentata, Amelanchier alnifolia, Amelanchier utahensis, Arctostaphylos uva-ursi, Artemisia tridentata* ssp. *vaseyana, Mahonia repens*, and *Symphoricarpos rotundifolius*. The herbaceous layer is diverse and provides low to dense cover. Graminoids commonly present include *Carex geyeri* and *Poa fendleriana*. Forbs are diverse but provide sparse cover, including *Achillea millefolium var. occidentalis, Antennaria rosea, Arenaria congesta, Astragalus convallarius, Galium boreale, Lithospermum ruderale*, and *Maianthemum stellatum*. Moss and lichens provide sparse to moderate cover, up to 25%.

Globally
This *Pinus ponderosa* woodland is strongly dominated by *Pinus ponderosa*, often in open stands (10-40% cover) 10 to 35 m tall. *Pseudotsuga menziesii, Juniperus scopulorum, Pinus edulis*, and *Populus tremuloides* are common associates. The shrub layer is characterized and dominated by *Purshia tridentata*, although cover may be as low as 1% in sparsely vegetated stands. Additional species include *Quercus gambelii* (<10% cover), *Arctostaphylos uva-ursi, Artemisia bigelovii, Artemisia tridentata, Mahonia repens, Ribes cereum*, and *Juniperus communis*. In the northern states, *Amelanchier alnifolia, Prunus virginiana*, or *Symphoricarpos albus* occur. The herbaceous layer is inversely proportional to shrub cover and is dominated by graminoids, especially *Muhlenbergia montana*. Additional graminoids include *Bouteloua gracilis, Carex geyeri, Carex rossii, Danthonia parryi, Poa fendleriana, Pseudoroegneria spicata, Hesperostipa comata, Leucopoa kingii*, and *Festuca idahoensis*. Forbs are present and often diverse but have low cover. Forb composition largely depends on geographic region but often includes *Achillea millefolium var. occidentalis (= Achillea lanulosa), Antennaria* spp., *Artemisia ludoviciana, Eriogonum racemosum, Penstemon virens*, and *Sedum lanceolatum*, among many others. Bare ground and needle duff can be prevalent in some stands.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree (canopy & subcanopy)	*Pseudotsuga menziesii*
Tree canopy	*Pinus ponderosa*
Tall shrub/sapling	*Amelanchier alnifolia*
Short shrub/sapling	*Symphoricarpos rotundifolius*
Herb (field)	*Arctostaphylos uva-ursi, Mahonia repens*
Herb (field)	*Achillea millefolium* var. *occidentalis, Antennaria parvifolia, Arenaria congesta, Lathyrus lanszwertii*
Herb (field)	*Carex geyeri, Poa fendleriana*

Globally

Stratum	Species
Tree canopy	*Pinus ponderosa* var. *scopulorum*
Shrub/sapling (tall & short)	*Purshia tridentata*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Exotic/Invasive: *Bromus tectorum* (invasive, High)

CONSERVATION STATUS RANK
Global Rank & Reasons: G3G5 (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: One stand is considered sparse for a woodland and has frost-kill of the tops of *Quercus gambelii* shrubs.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0145, CURE.0204).
Local Description Authors: J. Von Loh, mod. K.A. Schulz
Global Description Authors: S.L. Neid, mod. J. Coles

REFERENCES: Baker 1984a, Barrows et al. 1977, Bourgeron and Engelking 1994, Brayshaw 1965, CONHP unpubl. data 2003, Clausnitzer and Zamora 1987, Daubenmire 1952, Daubenmire and Daubenmire 1968, Driscoll et al. 1984, Franklin and Dyrness 1973, Hall 1973, Hess 1981, Hess and Alexander 1986, Hess and Wasser 1982, Hopkins 1979b, Johnson and Simon 1987, Johnston 1987, Johnston and Huckaby 2001, Larson 1974, MTNHP 2002b, Mauk and Henderson 1984, Peet 1975, Pfister et al. 1977, Roberts et al. 1992, Rowdabaugh 1978, Steele et al. 1981, Wasser and Hess 1982, Western Ecology Working Group n.d., Williams and Lillybridge 1985, Youngblood and Mauk 1985, Zlatnik 1999

Pinus ponderosa / Quercus gambelii Woodland

Ponderosa Pine / Gambel Oak Woodland

CODE	CEGL000870
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	*PINUS PONDEROSA* WOODLAND ALLIANCE (A.530) Ponderosa Pine Woodland Alliance

ECOLOGICAL SYSTEM(S): Southern Rocky Mountain Ponderosa Pine Woodland (CES306.648)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This major ponderosa pine woodland is widespread and has been reported from foothills, mountains and plateaus from Colorado to Texas, west to Arizona and Nevada. Elevation ranges from 1830-2800 m (6000-9200 feet). Stands often occur along drainages, on lower and middle slopes and benches on all aspects. Soils are typically shallow and rocky, ranging from sandy loams to clay loams. At El Malpais National Monument in western New Mexico, it generally occurs on rolling lava plateaus, steep sideslopes of volcano craters, on gentle toeslopes of low cinder hills, or on sandstone outcrops. Substrates are derived from basalt or sandstone, with rock, gravel, and occasional patches of sandy soil. Litter is often abundant in patches. *Pinus ponderosa* dominates or sometimes codominates the sparse to moderately dense tree canopy with *Pinus edulis* and *Juniperus* spp. *Pseudotsuga menziesii* is accidental and *Abies concolor* is not present. *Quercus gambelii* dominates both the subcanopy (tree form, if present) and the typically moderately dense tall-shrub layer consisting of dense clumps of oak. *Quercus gambelii* must have at least 5% cover, but there is frequently over 25%. At higher elevations, the *Quercus gambelii* are more treelike, and *Symphoricarpos oreophilus* will be present with significant cover in the short-shrub layer. At lower elevations, scattered *Artemisia tridentata* ssp. *vaseyana, Pinus edulis*, and *Juniperus osteosperma* are often present. At El Malpais, *Forestiera pubescens* is the most commonly occurring shrub, along with occasional *Ribes cereum*. Other common shrub species may include *Amelanchier* spp., *Mahonia repens*, and *Rosa woodsii*. The herbaceous layer is generally sparse and composed of mostly graminoids and scattered forbs.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled in the vicinity of the Ponderosa Campground in Curecanti National Recreation Area.

Globally

This ponderosa pine woodland association is widespread in the southern Rocky Mountains and southwestern U.S. and occurs in foothills, mountains and plateaus from Colorado to Trans-Pecos Texas, west to Arizona and Nevada.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs on the shoulders and midslopes of hills. Sites are steep (38-40% slopes), occur between 2408 and 2453 m elevation, and are oriented to northeastern aspects. The unvegetated surface has high cover of litter and low to high cover of downed wood. Litter and duff depth was measured; litter ranged from 0.5-10 cm deep, while the duff ranged from 0-2.5 cm deep. Parent materials are Quaternary alluvium. Soils are rapidly drained sandy loams.

Globally

This woodland association is widespread and has been reported from foothills, mountains and plateaus from Colorado to Trans-Pecos Texas, west to Arizona and Nevada. Elevation ranges from 1830-2800 m (6000-9200 feet). Stands often occur along drainages, on lower and middle slopes and benches on all aspects. Slopes are typically gentle or moderate, but may also be steep (>45%). Soils are typically shallow and rocky ranging from sandy loams to clay loams. Parent materials are commonly sandstones, but fractured limestone, basalt, andesite, and alluvium are also reported. At El Malpais National Monument in western New Mexico, it gently occurs on rolling lava plateaus, steep sideslopes of volcano craters, on gentle toeslopes of low cinder hills, or on sandstone outcrops. Substrates are derived from basalt or sandstone, with rock, gravel, and occasional patches of sandy soil. High litter cover (70-90%) about 5 cm deep is common in many stands. Rock outcrops (about 10%) and some bare soil are not uncommon. This conifer woodland transitions to *Quercus gambelii* shrubland in drier sites and at lower elevations. This community is the highest elevation *Pinus ponderosa* / oak woodland present in Trans-Pecos Texas. It typically grades downslope to *Pinus ponderosa / Quercus hypoleucoides* Woodland (CEGL000872).

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 83% up to 100% in these stands. *Pinus ponderosa* trees 20-35 m tall form an open canopy that provides 20 to 25% cover, and the tall shrub *Quercus gambelii* (1-5 m tall) provides 25 to 50% cover. *Pseudotsuga menziesii* 15-20 m tall provides sparse canopy cover in one stand. The shrub layer is diverse and provides sparse cover. Short and dwarf-shrubs provide moderate cover and include *Amelanchier alnifolia, Amelanchier utahensis, Arctostaphylos uva-ursi, Artemisia tridentata* ssp. *vaseyana, Artemisia tridentata* ssp.

wyomingensis, Chrysothamnus viscidiflorus, Mahonia repens, Paxistima myrsinites, Prunus virginiana, Purshia tridentata, Rosa woodsii, and *Symphoricarpos rotundifolius*. The herbaceous layer is diverse and provides moderate cover. Graminoids providing moderate cover include *Carex geyeri, Elymus elymoides, Koeleria macrantha, Poa fendleriana, Poa pratensis*, and *Poa secunda*. Forbs are diverse in terms of species composition, provide sparse cover, and include *Achillea millefolium var. occidentalis, Antennaria parvifolia, Arenaria congesta, Galium boreale, Lathyrus lanszwertii, Maianthemum stellatum, Symphyotrichum campestre*, and *Thalictrum fendleri*. Species of moss provide sparse cover, up to 5%.

Globally
This broadly defined coniferous woodland is widespread and is characterized by a sparse to moderately closed evergreen needle-leaved tree canopy dominated by *Pinus ponderosa*, or sometimes codominated by *Pinus edulis* and scattered *Juniperus scopulorum, Juniperus monosperma,* or *Juniperus osteosperma*. In southern stands *Juniperus deppeana* and *Pinus strobiformis* may be present to codominant. *Pseudotsuga menziesii* is accidental and *Abies concolor* is not present. *Quercus gambelii* dominates both the subcanopy (tree form, if present) and the typically moderately dense tall-shrub layer, which consists of dense clumps of oak. This community must have at least 5% cover of *Quercus gambelii*, but there is frequently over 25%. At higher elevations, the *Quercus gambelii* are more treelike, and *Symphoricarpos oreophilus* will be present with significant cover in a short-shrub layer. At lower elevations, scattered *Artemisia tridentata* ssp. *vaseyana, Pinus edulis*, and *Juniperus osteosperma* are often present. At El Malpais, *Forestiera pubescens* is the most commonly occurring shrub, along with occasional *Ribes cereum*. Other common shrub species may include *Arctostaphylos patula, Amelanchier* spp., *Cercocarpus montanus, Juniperus communis, Mahonia repens, Robinia neomexicana, Rosa woodsii,* and *Shepherdia rotundifolia*. The herbaceous layer is generally sparse (<10% cover) but may equal the shrub cover. It is composed of mostly graminoids, such as *Bouteloua gracilis, Elymus elymoides, Festuca arizonica, Koeleria macrantha, Muhlenbergia longiligula, Muhlenbergia montana, Poa fendleriana, Schizachyrium scoparium*, and *Carex* spp., especially *Carex geyeri* and *Carex rossii*. Scattered forbs include *Artemisia ludoviciana, Balsamorhiza sagittata, Eriogonum* spp., *Erigeron* spp., *Hymenoxys* spp., *Lithospermum multiflorum, Packera multilobata,* and *Wyethia amplexicaulis*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Pinus ponderosa*
Shrub/sapling (tall & short)	*Quercus gambelii*
Short shrub/sapling	*Symphoricarpos rotundifolius*
Herb (field)	*Arctostaphylos uva-ursi, Mahonia repens*
Herb (field)	*Achillea millefolium* var. *occidentalis, Antennaria parvifolia, Lathyrus lanszwertii*
Herb (field)	*Carex geyeri, Poa fendleriana*

Globally

Stratum	Species
Tree canopy	*Pinus ponderosa*
Tall shrub/sapling	*Quercus gambelii*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally

This ponderosa pine woodland is a broadly defined plant association. Stuever and Hayden (1997b) report seven phases for this plant association: the *Quercus gambelii, Festuca arizonica, Muhlenbergia longiligula, Pinus edulis, Muhlenbergia montana, Bouteloua gracilis,* and *Robinia neomexicana* phases. More classification review is needed to further define the relationships between these phases and other similar plant associations.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: One stand is considered sparse for a woodland and has frost-kill of the tops of *Quercus gambelii* shrubs.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0146, CURE.0223 and 1 observation point: CURE_AA.0868).
Local Description Authors: J. Von Loh, mod. D. Clark
Global Description Authors: K.A. Schulz, mod. J. Coles and M.E. Hall

REFERENCES: Alexander et al. 1984a, Alexander et al. 1987, Bader 1932, Blackburn et al. 1969d, Blackburn et al. 1969e, Bourgeron and Engelking 1994, Bradley et al. 1992, Bunin 1975c, CONHP unpubl. data 2003, Clary 1992, Cogan et al. 2004, DeVelice et al. 1986, Diamond 1993, Dixon 1935, Donart et al. 1978a, Driscoll et al. 1984, Fitzhugh et al. 1987, Hanks et al. 1983, Hansen et al. 2004c, Hansen et al. 2004d, Hanson and Ball 1928, Harmon 1980, Helm 1977, Hess and Wasser 1982, Johnston 1987, Johnston and Hendzel 1985, Larson and Moir 1987, Madany and West 1980b, Marr et al. 1973a, Muldavin et al. 1996, Nixon 1967b, Peet 1975, Peet 1981, Roberts et al. 1992, Savage and Swetnam 1990, Schmoll 1935, Somers et al. 1980, Steinhoff 1978, Stuever and Hayden 1997b, Terwilliger et al. 1979a, USFS 1983b, Wasser and Hess 1982, Western Ecology Working Group n.d., Wright et al. 1973, Youngblood and Mauk 1985

*Pseudotsuga menziesii / Artemisia tridentata (*ssp. *vaseyana,* ssp. *wyomingensis)* Woodland

Douglas-fir / (Mountain Big Sagebrush, Wyoming Big Sagebrush) Woodland

CODE	CEGL002808
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.b.)
ALLIANCE	*PSEUDOTSUGA MENZIESII* WOODLAND ALLIANCE (A.552) Douglas-fir Woodland Alliance

ECOLOGICAL SYSTEM(S): Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This woodland association is only known from the Curecanti National Recreation Area in western Colorado in the Gunnison River Canyon and along Cebolla Creek. More survey and classification work are needed to fully characterize this type. Stands occur on talus slopes in canyons and ravines. Sites are steep (64-78% slopes), occur between 2340 and 2358 m elevation, and are oriented to the northeast. Substrates are rapidly drained sandy soils derived from gneiss talus and colluvium. The unvegetated surface has low to moderate cover of litter and exposure of bare soil. Large and small rocks provide low to moderate cover. Downed wood is common. The vegetation is characterized by an open tree canopy(15-28% cover) 10-35 m high composed of *Pseudotsuga menziesii*, and a relatively open short-shrub layer of *Artemisia tridentata* ssp. *wyomingensis* shrubs provide 15 to 20% cover. Scattered *Pseudotsuga menziesii* and *Juniperus scopulorum* 2-10 m tall form a subcanopy. Other shrubs present include *Cercocarpus montanus, Chrysothamnus viscidiflorus, Quercus gambelii,* and *Symphoricarpos rotundifolius*. The low to moderately dense herbaceous layer is moderately diverse and mostly composed of graminoids, such as

Achnatherum hymenoides, Elymus elymoides, Koeleria macrantha, Poa fendleriana, Poa secunda, and sparse cover of forbs. Lichens and mosses provide sparse to moderate cover, up to 25%.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled along Cebolla Creek and in the Gunnison River Canyon in the Curecanti National Recreation Area.

Globally

This association is only known from the Curecanti National Recreation Area in western Colorado in the Gunnison River Canyon and along Cebolla Creek. More survey and classification work are needed to document the global range of this association.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs on talus slopes in canyons and ravines. Sites occupy steep slopes (64-78%) between 2340 and 2358 m elevation, oriented to the northeast. The unvegetated surface has low to moderate cover of litter and exposure of bare soil. Large and small rocks provide low to moderate cover. Downed wood is common. Litter and duff depths were recorded and are 0.3-3.6 cm and 0-0.4 cm, respectively. Soils are rapidly drained and sandy.

Globally

Data are not available.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 67 to 85% in this woodland association. *Pseudotsuga menziesii* forms an open canopy 10-35 m high that provides 15 to 28% cover, and *Artemisia tridentata* ssp. *wyomingensis* short shrubs provide 15 to 20% cover. Emergent *Pseudotsuga menziesii* trees, from 15-20 m high, provide sparse cover. A subcanopy layer of 2- to 10-m tall *Pseudotsuga menziesii* and *Juniperus scopulorum* trees provides sparse cover. The shrub layer is low in terms of species diversity and provides low to moderate cover. Additional short and dwarf-shrubs that provide sparse cover include *Cercocarpus montanus, Chrysothamnus viscidiflorus, Quercus gambelii*, and *Symphoricarpos rotundifolius*. The herbaceous layer is moderately diverse in species composition and provides low to moderate cover. Graminoids include *Achnatherum hymenoides, Elymus elymoides, Koeleria macrantha, Poa fendleriana*, and *Poa secunda*. Forbs provide sparse cover and include *Androsace septentrionalis, Lappula occidentalis*, and *Schoenocrambe linifolia*. Species of lichen and moss provide sparse to moderate cover, up to 25%.

Globally

Data are not available.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Tree subcanopy	*Pseudotsuga menziesii*
Short shrub/sapling	*Symphoricarpos rotundifolius*
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Poa fendleriana*, *Poa secunda*

Globally

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*, *Artemisia tridentata* ssp. *wyomingensis*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Other: *Descurainia pinnata* (G5)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (27-Jun-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association has only been sampled from two locations in Curecanti National Recreation Area in western Colorado. More survey and classification work are needed to change the provisional status of this association.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: The sites are on steep north-facing slopes with stabilized talus (gneiss) and along a steep side-creek. This type is common on the steep north-facing slopes of the river canyon east of Blue Mesa and around the reservoir on upper slopes.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (3 plots: CURE.0211, CURE.0322, CURE.0364 and13 observation points: CURE_AA.0073, CURE_AA.0179, CURE_AA.0192, CURE_AA.0280, CURE_AA.0468, CURE_AA.0652, CURE_AA.0691, CURE_AA.0792, CURE_AA.0986, CURE_AA.0989, CURE_AA.1008, CURE_AA.1025, CURE_AA.1048).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Pseudotsuga menziesii / Holodiscus dumosus Scree Woodland

Douglas-fir / Rockspirea Scree Woodland

CODE	CEGL000902
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.b.)
ALLIANCE	*PSEUDOTSUGA MENZIESII* WOODLAND ALLIANCE (A.552) Douglas-fir Woodland Alliance
ECOLOGICAL SYSTEM(S):	Rocky Mountain Cliff, Canyon and Massive Bedrock (CES306.815) Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This plant association is documented from the mountains of Arizona and New Mexico and the Gunnison Basin of Colorado. It has also been reported from Arizona and likely occurs in the Sangre de Cristo Mountains of southern Colorado. Stands grow on steep slopes with rocky colluvial soils derived from sandstone or volcanic talus. *Pseudotsuga menziesii* dominates the open canopy. The understory is distinctly shrubby and characterized by *Holodiscus dumosus* and *Symphoricarpos oreophilus*, among the many species that may be present. The herbaceous layer is poorly represented.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association is uncommon within the park and recreation area and was observed and sampled at Gateview, near the Lake Fork of the Gunnison River, at West Elk Creek, and also near the Tomichi Point turnoff.

Globally
This limited-range endemic is reported from the Mogollon Mountains (Fitzhugh et al. 1987) and Sangre de Cristo Mountains (DeVelice et al. 1986) in New Mexico and the Gunnison Basin in Colorado, but it is expected to occur elsewhere at high elevations in New Mexico and Arizona.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This woodland association was observed on the upper slopes of mesas and on midslopes of active slopes. Sites are steep (38-75% slopes), occur between 2435 and 2474 m elevation, and occupy southwestern to northwestern aspects. The unvegetated surface has low cover of litter and moderate to high cover of bedrock, large and small rocks, and bare soil. Litter and duff depths were recorded and are 0-7 cm deep and 0-8 cm deep, respectively. Downed wood is common, providing up to 15% cover. Soils are rapidly drained loams and sandy loams derived from volcanic colluvium.

Globally
This association is restricted to steep to very steep talus slopes in the mountains of New Mexico, Arizona and Colorado. Up to 80% of the ground surface and 90% of the soil volume are cobbles, rocks or boulders. Stands in Colorado and northern New Mexico occur at around 2450 m (8040 feet) elevation, while in the mountains of southern New Mexico stands occur at elevations as high as 3020 m (9900 feet).

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 28 to 55% in these stands. This woodland association is characterized by an open tree canopy that is typically 5-20 m tall of *Pseudotsuga menziesii* that ranges in cover from 10 to 50%. The subcanopy layer is occasionally present, provides low to moderate cover, and is characterized by 2- to 5-m tall *Pseudotsuga menziesii*, *Juniperus scopulorum*, and *Acer glabrum* trees that each provide from 2 to 25% cover. The shrub layer is variable in cover and composition, particularly between stands. *Holodiscus dumosus* is present in all stands, ranging in cover from 2 to 25%, and with heights varying from 0.5-5 m tall. Short and dwarf-shrubs are diverse, provide low to moderate cover, and include *Amelanchier utahensis*, *Artemisia tridentata* ssp. *wyomingensis*, *Cornus sericea*, *Mahonia repens*, *Paxistima myrsinites*, *Ribes cereum*, *Ribes inerme*, and *Symphoricarpos rotundifolius*. The herbaceous layer is typically sparse, usually less than 10% total cover and often less. A diverse group of species occurs across stands, but any one stand usually has low to moderate diversity. Common graminoids include *Carex geyeri*, *Elymus elymoides*, and *Poa fendleriana*. Forbs commonly present include *Heterotheca villosa* and *Saxifraga bronchialis*. The liana *Clematis* sp. is rarely present. Cryptogam cover is variable, with some stands having little, but cover can be as high as 25%.

Globally
This is an open woodland association with a sparse canopy of sometimes very large *Pseudotsuga menziesii* trees up to 20 m tall. Occasionally the canopy and subcanopy will contain other species, such as *Juniperus scopulorum* or *Pinus strobiformis*. Total vegetation cover is limited by the high percentage of rock in the soil and averages around 50%. The shrub understory is dominated by *Holodiscus dumosus* but is well-developed and diverse. Typical shrub associates include *Acer glabrum*, *Mahonia repens*, *Symphoricarpos oreophilus*, *Ribes* spp., *Jamesia americana*, *Cornus sericea*, and *Salix scouleriana*. The herbaceous layer is sparse, inconsistent, and generally poorly developed in most stands.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Tree subcanopy	*Juniperus scopulorum, Pseudotsuga menziesii*
Short shrub/sapling	*Ribes cereum*
Herb (field)	*Paxistima myrsinites, Symphoricarpos rotundifolius*

Globally

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Short shrub/sapling	*Holodiscus dumosus*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G3G4 (1-Dec-2000). This woodland community is a regional endemic to the higher elevations of southwestern U.S. mountains where it is associated with talus/scree slopes. Stands tend to be small, and many have been impacted by logging removals leading to increased fragmentation and loss. High-quality occurrences are not likely to exceed 100 in number. Most of the remaining high-quality occurrences are found in remote areas of national forest lands where logging has not occurred.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This type is similar to other scree/talus types such as *Abies concolor / Leymus triticoides* Woodland (CEGL000886), *Abies lasiocarpa / Holodiscus dumosus* Scree Woodland (CEGL000918), and *Abies lasiocarpa / Jamesia americana* Forest (CEGL000312).

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Occurs predominantly on colluvium or talus slopes that are very steep. Bedrock exposures may also be present.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (5 plots: BLCA.0005, CURE.0003, CURE.0227, CURE.0308, CURE.0373 and 6 observation points: BLCA_AA.267, BLCA_AA.276, BLCA_AA.619, CURE_AA.0699, CURE_AA.0814, CURE_AA.1296).
Local Description Authors: J. Von Loh, mod. J. Coles
Global Description Authors: E. Muldavin, mod. J. Coles

REFERENCES: Bourgeron and Engelking 1994, DeVelice et al. 1986, Driscoll et al. 1984, Fitzhugh et al. 1987, Larson and Moir 1986, Larson and Moir 1987, Western Ecology Working Group n.d.

Pseudotsuga menziesii / Poa fendleriana Woodland

Douglas-fir / Muttongrass Woodland

CODE	CEGL002809
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.b.)
ALLIANCE	*PSEUDOTSUGA MENZIESII* WOODLAND ALLIANCE (A.552) Douglas-fir Woodland Alliance

ECOLOGICAL SYSTEM(S): Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This woodland association is only known from a few stands in Curecanti National Recreation Area in western Colorado and from Dinosaur National Monument in Utah. Stands occupy the slopes of canyons and gulches and are on moderately steep to steep (38-70%) sites, between 2178 and 2363 m elevation, and are oriented to northerly aspects. Soils are rapidly drained, coarse-textured and derived from sedimentary rocks. The vegetation is characterized by an open to moderately dense (25 to 50%) tree canopy 10-35 m tall composed of *Pseudotsuga menziesii*, with an open to moderately dense herbaceous layer dominated by the short bunchgrass *Poa fendleriana* providing 5 to 25% cover. Single trees of *Pinus ponderosa* may occur in the canopy, and scattered sapling *Pseudotsuga menziesii* and *Juniperus scopulorum* 2-10 m tall form an open subcanopy. Shrubs are generally present but too sparse to constitute a stratum; *Cercocarpus montanus, Cercocarpus intricatus, Artemisia tridentata, Ribes* spp., *Quercus gambelii*, and *Symphoricarpos oreophilus* are common species. The remaining herbaceous layer is mostly composed of graminoids, such as *Achnatherum hymenoides, Elymus elymoides, Koeleria macrantha, Poa secunda*, and sparse cover of forbs. *Pseudoroegneria spicata* is absent. Lichens and mosses provide to 25% cover.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled near Wilson's Landing, on the south side on the slope above the river and along West Elk Creek on the east side of Arm II in Curecanti National Recreation Area.

Globally

This association is only known from the Curecanti National Recreation Area in western Colorado along the Gunnison River and West Elk Creek. It was also sampled on Split Mountain in Dinosaur National Monument in eastern Utah and at Canyon de Chelly in Arizona. More survey and classification work are needed to document the global range of this association.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs on the slopes of canyons and gulches. Sites are moderately steep to steep (38-70%), occur between 2353 and 2363 m elevation, and are oriented to northwest aspects. The unvegetated surface has moderate cover of litter and high cover of large and small rocks on one site. Downed wood cover is high. Parent materials are Quaternary alluvium and Mesozoic shale. Soils are rapidly drained sandy loams and loamy sands.

Globally

This woodland association is known from only a handful of stands in the Curecanti National Recreation Area and Dinosaur National Monument in western Colorado. More survey and classification work are needed to document the global range of this association. Stands occur on the slopes of canyons and gulches and are on moderately steep to steep (38-70%) sites, between 2178 and 2363 m (7155-7750 feet) elevation, and are oriented to northwest to

northeast aspects. Litter, rocks and downed wood cover most of the unvegetated surface. Soils are rapidly drained sandy loam or loamy sand derived from sandstone, alluvium or shale.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 34 to 100% in this woodland association. *Pseudotsuga menziesii* trees, typically 10-15 m tall, form open to moderately closed canopies that range in cover from 25 to 50%, and the short bunchgrass *Poa fendleriana* provides 5 to 25% cover. A subcanopy layer of 5- to 10-m tall *Pseudotsuga menziesii* trees is present in one stand and contributes 1 to 5% cover. *Pseudotsuga menziesii* and *Juniperus scopulorum* trees also occur in stands as saplings, usually with cover of less than 5%. The shrub layer is moderately diverse in terms of species composition and provides low cover. The tall shrub *Quercus gambelii* (1-2 m tall) provides sparse cover in one stand. Short shrubs provide sparse to low cover and include *Artemisia tridentata, Artemisia tridentata* ssp. *wyomingensis, Krascheninnikovia lanata, Ribes cereum, Ribes inerme,* and *Symphoricarpos rotundifolius*. The herbaceous layer is low in species diversity and contributes moderate cover. Additional graminoids include only *Carex* sp. Forbs provide sparse cover and include *Arabis* sp., *Arenaria congesta, Artemisia frigida, Clematis* sp., and *Erigeron* sp. Lichens and mosses contribute low to moderate cover, up to 25%.

Globally

The vegetation is characterized by an open to moderately dense (25 to 50%) tree canopy 10-35 m tall composed of *Pseudotsuga menziesii*, with an open to moderately dense herbaceous layer dominated by the short bunchgrass *Poa fendleriana* providing 5 to 25% cover. Large *Pinus ponderosa* may be scattered throughout the canopy, with not more than 10% cover. Scattered young *Pseudotsuga menziesii* and *Juniperus scopulorum* 2-10 m tall form a subcanopy. Shrubs are generally present but do not provide enough cover to constitute a stratum; *Cercocarpus montanus, Cercocarpus intricatus, Artemisia tridentata, Ribes cereum, Ribes inerme, Quercus gambelii*, and *Symphoricarpos oreophilus* are common species. The remaining herbaceous layer is moderately diverse and mostly composed of graminoids, such as *Achnatherum hymenoides, Elymus elymoides, Koeleria macrantha*, and *Poa secunda*. *Pseudoroegneria spicata* is absent. Forbs are sparse and inconsistent among sites; recorded species include *Arenaria congesta, Artemisia frigida, Clematis* sp., and *Erigeron* sp. Lichens and mosses provide up to 25% cover.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Tall shrub/sapling	*Juniperus scopulorum*
Tall shrub/sapling	*Quercus gambelii*
Herb (field)	*Poa fendleriana*

Globally

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Herb (field)	*Poa fendleriana*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (27-Jun-2005).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

This association has only been documented from two locations in Curecanti National Recreation Area and one site in Dinosaur National Monument in western Colorado and adjacent Utah. More survey and classification work are needed to change the provisional status of this association.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: There is evidence of historic logging, fire, and heavy big game use in the sampled stands.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (3 plots: CURE.0106, CURE.0130, CURE.0219 and 14 observation points: CURE_AA.0032, CURE_AA.0177, CURE_AA.0447, CURE_AA.0504, CURE_AA.0820, CURE_AA.0850, CURE_AA.0881, CURE_AA.0882, CURE_AA.0883, CURE_AA.1000, CURE_AA.1001, CURE_AA.1010, CURE_AA.1016, CURE_AA.1039).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz and J. Coles

REFERENCES: Western Ecology Working Group n.d.

Pseudotsuga menziesii Scree Woodland

Douglas-fir Scree Woodland, Douglas-fir Scree Slope

CODE	CEGL000911
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.b.)
ALLIANCE	*PSEUDOTSUGA MENZIESII* WOODLAND ALLIANCE (A.552) Douglas-fir Woodland Alliance
ECOLOGICAL SYSTEM(S):	Rocky Mountain Cliff, Canyon and Massive Bedrock (CES306.815) Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This association occurs throughout the interior western U.S. but is restricted to steep slopes covered by loose rock and colluvium on mountain or canyon slopes. It has the appearance of a stand of scattered trees with a sparse understory; the vegetation is limited by the lack of soil development. Slopes generally exceed 60% and are generally unstable, with constantly shifting rocks on the slopes as well as additional rockfall from outcrops upslope. Elevations at the northern end of the range (Montana) are from 915 to 2180 m (3100-7150 feet), and sites are usually limited to warm, south- to west-facing slopes in canyons. In northern Arizona, stands occur on various aspects around 2930 m (9600 feet) elevation, and in southern Colorado stands have been documented at around 2560 m (8400 feet). Most of the unvegetated ground surface is covered by rocks and boulders, with small amounts of litter and dead wood. Soils are poorly developed and often too rocky to sample. The rocky slope is the dominant visual element of the community. The sparse to open canopy of this association is generally mixed and rarely exceeds 35% cover. *Pseudotsuga menziesii* is always present and dominant or codominant; other tree species may include *Juniperus osteosperma, Juniperus scopulorum, Picea engelmannii, Pinus edulis, Pinus flexilis, Pinus strobiformis, Pinus ponderosa, Populus tremuloides, Abies concolor*, and *Abies lasiocarpa*. Shrubs are variable depending on the site, but cover is too sparse and the mix either lacks a diagnostic species in the understory or the shrub layer is too poorly developed to be diagnostic. Shrub species present may include *Arctostaphylos uva-ursi, Acer glabrum, Amelanchier utahensis, Juniperus communis, Dasiphora fruticosa* ssp. *floribunda, Holodiscus dumosus, Prunus*

virginiana, Ribes inerme, Ribes montigenum, Salix scouleriana, Shepherdia canadensis, Shepherdia rotundifolia, and *Symphoricarpos oreophilus*. Herbaceous species are sparse and inconsistent among sites.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This montane woodland association is restricted to colluvial slopes in canyons and on mountainsides south of Blue Mesa Dam, near Dillon Pinnacles, and south, east and west of Lake Fork of the Gunnison River, and north of Ute Mountain Indian Reservation in the Curecanti National Recreation Area.

Globally
This association has been documented from sites scattered throughout the interior western U.S., including Montana, Utah, New Mexico, Arizona and Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This woodland association is found on colluvial slopes of canyons and mountain slopes. Sites are typically moderate to steep (17- to 35-degree slopes) with one stand occurring on a gentle slope. Stands were sampled between 2309 and 2528 m elevation on typically northerly aspects, but also one westerly and one southerly. Substrates include exposed bedrock and a large coverage of boulders and loose, unstable soil or talus with variable stability. Lichen growth is consistent with stability, so these rocks must not experience much disturbance. There is evidence of landslide, mudflows and debris flows on some sites. The ground is typically rocky with moderate to high (30-90%) cover of bedrock, rock and gravel, with a couple sites having relatively high litter, duff and deadwood cover (50-70%) and one site with 50% bare ground. Lichens and mosses are important on a couple stands.

Globally
This association occurs throughout the interior western U.S. but is restricted to steep slopes covered by loose rock and colluvium on mountain or canyon slopes. Slopes generally exceed 60% and are generally unstable, with constantly shifting rocks on the slopes as well as additional rockfall from outcrops upslope. Elevations at the northern end of the range (Montana) are from 915 to 2180 m (3100-7150 feet), and sites are usually limited to warm, south- to west-facing slopes in canyons. In northern Arizona, stands occur on various aspects around 2930 m (9600 feet) elevation, and in southern Colorado stands have been documented at around 2560 m (8400 feet). Most of the unvegetated ground surface is covered by rocks and boulders, with small amounts of litter and dead wood. Soils are poorly developed and often too rocky to sample.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This woodland association is characterized by an open to dense (20-90% cover) tree layer dominated by *Pseudotsuga menziesii*. Other tree species present, especially in the subcanopy, include *Acer negundo, Juniperus scopulorum, Populus angustifolia*, or *Populus tremuloides*. The shrub layers are sparse to open and typically without dominant/characteristic species. Shrubs may include *Amelanchier alnifolia, Artemisia tridentata* ssp. *vaseyana, Holodiscus dumosus, Mahonia repens, Prunus virginiana, Ribes cereum, Ribes inerme,* and *Symphoricarpos oreophilus*. If *Quercus gambelii* is present, then cove is low (<5%). The herbaceous layer is sparse and depauperate, only *Deschampsia caespitosa* and *Poa fendleriana* were recorded.

Globally
This association has the appearance of a stand of scattered trees with a sparse understory; the vegetation is limited by the lack of soil development. The rocky slope is the dominant visual element of the community. The sparse to open canopy of this association is generally mixed and rarely exceeds 35% cover. *Pseudotsuga menziesii* is always present and dominant or codominant; other tree species may include *Juniperus osteosperma, Juniperus scopulorum, Picea engelmannii, Pinus edulis, Pinus flexilis, Pinus strobiformis, Pinus ponderosa, Populus tremuloides, Abies concolor,* and *Abies lasiocarpa*. Shrubs are variable depending on the site, but cover is too sparse and the mix either lacks a diagnostic species in the understory or the shrub layer is too poorly developed to be diagnostic. Shrub species present may include *Arctostaphylos uva-ursi, Acer glabrum, Amelanchier utahensis, Juniperus communis, Dasiphora fruticosa* ssp. *floribunda, Holodiscus dumosus, Prunus virginiana, Ribes inerme, Ribes montigenum, Salix scouleriana, Shepherdia canadensis, Shepherdia rotundifolia,* and *Symphoricarpos oreophilus*. Herbaceous species are sparse and inconsistent among sites.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*

Globally

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Exotic/Invasive: *Bromus tectorum* (exotic, High)

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association is distinguished from other scree woodland associations by the clear dominance of *Pseudotsuga menziesii* in the canopy and a shrub layer that is too sparse and scattered to be diagnostic.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0301, CURE.0310 and 9 observation points: BLCA_AA.642, BLCA_AA.646, CURE_AA.0794, CURE_AA.0796, CURE_AA.0869, CURE_AA.1052, CURE_AA.1056, CURE_AA.1209, CURE_AA.1368).
Local Description Authors: K.A. Schulz
Global Description Authors: J. Coles

REFERENCES: Bourgeron and Engelking 1994, DeVelice et al. 1986, Driscoll et al. 1984, Fitzhugh et al. 1987, MTNHP 2002b, Pfister et al. 1977, Western Ecology Working Group n.d.

Picea pungens / Alnus incana Woodland

Blue Spruce / Gray Alder Woodland

CODE	CEGL000894
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION (II.A.4.N.d.)	Temporarily flooded temperate or subpolar needle-leaved evergreen woodland
ALLIANCE	*PICEA PUNGENS* TEMPORARILY FLOODED WOODLAND ALLIANCE (A.567) Blue Spruce Temporarily Flooded Woodland Alliance
ECOLOGICAL SYSTEM(S):	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825) Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This spruce woodland occurs in montane-subalpine riparian areas in Colorado, Wyoming and possibly New Mexico. Elevation ranges from 1900 to 3200 m (6100-10,650 feet). Stands occur in deep, shaded canyons and narrow valleys along relatively straight stream reaches where it generally forms small patches, but can be continuous for several river miles. These canyon floodplains and stream benches are variable in width but are in areas with cold-air drainage and limited sunlight. Soils are generally shallow and range from loamy sand to silty clay loams with high organic matter content over gravel, cobbles, or boulders. Vegetation is characterized by a somewhat open to moderately dense canopy (20-70% cover) that is typically strongly dominated by *Picea pungens* with 10-70% cover in overstory. Other trees occur infrequently but may include *Pseudotsuga menziesii, Populus angustifolia, Picea engelmannii*, or *Pinus ponderosa*. *Abies lasiocarpa* may be present to codominant with 1-50% cover in higher elevation stands. There are typically many seedlings and saplings as well as mature trees. The thick shrub understory is confined to a narrow band lining the stream channel. Shrub species include 10-80% cover of *Alnus incana*, 0-40% cover of *Salix drummondiana*, 0-30% cover each of *Salix monticola* and *Acer glabrum*, and 0-10% cover each of *Cornus sericea* and *Lonicera involucrata*. Additional shrubs include *Rosa woodsii, Dasiphora fruticosa* ssp. *floribunda, Ribes lacustre, Salix monticola*, and *Sambucus racemosa*, in addition to incidental shrubs more common in the surrounding uplands. The forb layer is species-rich with up to 40 species and dense, with a total of up to 50% cover. Forb species include *Actaea rubra, Conioselinum scopulorum, Oxypolis fendleri, Geranium richardsonii, Heracleum maximum (= Heracleum lanatum), Maianthemum stellatum, Mertensia ciliata, Osmorhiza berteroi, Rudbeckia laciniata*, and *Equisetum arvense*. Graminoids often include *Calamagrostis canadensis, Bromus ciliatus*, and *Carex* spp.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled along Cebolla Creek and Willow Creek in the Curecanti National Recreation Area.

Globally

This riparian woodland is found in the southern Rocky Mountains north to the Grand Tetons.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs on narrow floodplain terraces of tributaries to the Gunnison River where it is dammed to form Blue Mesa Reservoir. Sites are flat to gently sloping (1-5% slope), occur at 2293 and 2323 m elevation, and are oriented to northern aspects. The unvegetated surface has high cover of litter and downed wood. Parent material is Black Canyon schist and gneiss. Soils are poorly drained sandy loams.

Globally
This montane riparian woodland is found in the southern Rocky Mountains and north to the Grand Tetons. Elevation ranges from 1900 to 3200 m (6100-10,650 feet). Stands occur along moderate-sized, gravel-bed rivers and streams in valleys that are typically narrow, rocky canyons where it generally forms small patches, but can be continuous for several river miles. These canyon floodplains and stream benches are variable in width but are in areas with cold-air drainage and limited sunlight. Soils are well-drained to poorly drained, are derived from coarse Quaternary alluvium, and are poorly developed, shallow loamy sand to silty clay loams with high organic matter content over gravel, cobbles or boulders. Other parent materials include Black Canyon schist and gneiss, and granite. Cover of litter and duff can be 20-40% of the ground surface. Rock cover is generally low, but cover of gravel may be high.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 119 to 152% in these stands. *Picea pungens* trees 15-20 m tall form a closed canopy that provides from 70 to 85% cover, and the 5- to 10-m tall shrub/subcanopy tree *Alnus incana* provides 3 to 10% cover. An emergent layer (20-35 m tall) of *Picea pungens* trees occurs in one stand and provides sparse cover. The subcanopy layer (2-15 m tall) comprised of *Picea pungens* and *Juniperus scopulorum* trees provides sparse to low cover. The shrub layer is diverse in terms of species composition and provides low to moderate cover. An additional tall shrub, *Quercus gambelii*, provides sparse cover. Short and dwarf-shrubs provide low cover and include *Paxistima myrsinites, Prunus virginiana, Rosa woodsii, Ribes cereum*, and *Symphoricarpos rotundifolius*. The herbaceous layer is low to moderate in terms of species composition and provides sparse to moderate cover. Graminoids include *Agrostis gigantea, Bromus lanatipes, Carex* spp., and *Juncus balticus*. Forbs can provide low to moderate cover and include *Actaea rubra, Equisetum arvense, Heracleum maximum, Maianthemum stellatum, Rudbeckia laciniata var. ampla*, and *Thalictrum fendleri*. Species of moss provide sparse cover, up to 5%.

Globally
The vegetation is characterized by a somewhat open to moderately dense canopy (20-70% cover) that is typically strongly dominated by *Picea pungens* with 10-70% cover in the overstory. Other trees occur infrequently but may include *Juniperus scopulorum, Pseudotsuga menziesii, Populus angustifolia, Populus tremuloides, Picea engelmannii, Pinus contorta*, or *Pinus ponderosa*. *Abies lasiocarpa* may be present to codominant with 1-50% cover in higher elevation stands. The understory is typically dominated by a layer of the tall, broad-leaved deciduous shrub *Alnus incana*, varying in abundance from 10-80% cover. However, the understory is highly variable, with *Alnus incana* only present in some stands, and the shrub layer is dominated by other shrubs, such as *Acer glabrum, Amelanchier utahensis, Cornus sericea, Lonicera involucrata, Dasiphora fruticosa* ssp. *floribunda, Ribes lacustre, Rosa woodsii, Salix boothii, Salix drummondiana, Salix monticola, Salix wolfii*, and *Sambucus racemosa*, in addition to incidental shrubs more common in the surrounding uplands. The herbaceous layer is well-developed and diverse in most stands and is dominated by the perennial herbs *Equisetum arvense* and *Maianthemum stellatum (= Smilacina stellata)*, each with 5-25% cover. Additional forb species include *Actaea rubra, Conioselinum scopulorum, Oxypolis fendleri, Geranium richardsonii, Heracleum maximum (= Heracleum lanatum), Mertensia ciliata, Osmorhiza berteroi*, and *Rudbeckia laciniata*. Common perennial graminoids include *Bromus ciliatus, Juncus balticus*, and *Calamagrostis canadensis*. Some sedge species may be locally abundant, such as *Carex geyeri* and *Carex pellita (= Carex lanuginosa).*

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Picea pungens*
Tree subcanopy	*Picea pungens*
Tall shrub/sapling	*Alnus incana*
Herb (field)	*Maianthemum stellatum*

Globally

Stratum	Species
Tree canopy	*Picea pungens*
Tall shrub/sapling	*Alnus incana*, *Cornus sericea*, *Lonicera involucrata* var. *involucrata*, *Rosa woodsii*
Herb (field)	*Maianthemum stellatum*, *Osmorhiza depauperata*
Herb (field)	*Calamagrostis canadensis*

Herb (field) *Equisetum arvense*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Cirsium arvense* (exotic noxious weed, High/Medium)

Globally
Exotic/Invasive: *Poa pratensis* (increased coverage of this exotic species due to livestock grazing., Medium), *Taraxacum officinale* (increased coverage of this exotic species due to livestock grazing.)

CONSERVATION STATUS RANK
Global Rank & Reasons: G3 (14-Nov-1997). This riparian plant association is somewhat widespread on the western slope of Colorado, and may also occur in Wyoming and New Mexico. In Colorado, it has been found in the Routt National Forest, south to the Rio Grande and San Juan National Forests. This association occurs along narrow to moderately wide floodplains and stream benches in narrow canyons subject to cold air drainage and limited sunlight, typically in small patches and scattered locations. Recent inventory efforts by the Colorado Natural Heritage Program have found this association to be more common in Colorado than previously thought. While many stands have been negatively impacted by livestock grazing, and dams or hydrologic alterations are threats, the association does not appear to be rare or severely threatened. Therefore the global rank has been lowered to G3.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Stands occupy floodplains of narrow river canyon and creek terraces; the hydrological regime is disturbed by raising and lowering reservoir water levels. More quantitative data are needed to define this association locally.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0235, CURE.0324 and1 observation point: CURE_AA.1455).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: M.S. Reid, mod. S.L. Neid and K.A. Schulz

REFERENCES: Baker 1986, Baker 1989a, Baker 1989b, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Cooper and Cottrell 1990, Driscoll et al. 1984, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1999a, Kittel et al. 1999b, Richard et al. 1996, UNESCO 1973, Western Ecology Working Group n.d.

Picea pungens / Cornus sericea Woodland

Blue Spruce / Red-osier Dogwood Woodland

CODE	CEGL000388
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.)
FORMATION (II.A.4.N.d.)	Temporarily flooded temperate or subpolar needle-leaved evergreen woodland
ALLIANCE	*PICEA PUNGENS* TEMPORARILY FLOODED WOODLAND ALLIANCE (A.567) Blue Spruce Temporarily Flooded Woodland Alliance
ECOLOGICAL SYSTEM(S):	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (CES306.825) Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This riparian woodland association is best developed on cool, narrow floodplains in the montane zone of Colorado, New Mexico and Utah. Scattered, isolated stands also occur in canyons of the Colorado Plateau. Sites flood periodically and range from nearly flat on broader floodplains to moderately steep in the narrowest canyons. In Colorado, the association occurs between 2100 and 2600 m (7000-8500 feet) elevation and in New Mexico between approximately 2500 and 3230 m (8200-10,600 feet). Soils tend to be poorly developed coarse alluvium. The evergreen needle-leaved tree canopy has 10 to 80% cover, is dominated by *Picea pungens*, and shades an open to dense shrub layer dominated by *Cornus sericea*. Other tree species may be present in the canopy, including *Populus angustifolia, Populus tremuloides, Picea engelmannii*, and *Abies lasiocarpa*. Other components of the shrub layer include *Symphoricarpos oreophilus, Betula occidentalis, Alnus incana, Crataegus rivularis, Salix monticola, Salix geyeriana, Acer glabrum, Amelanchier* spp., and *Prunus virginiana*. The herbaceous layer is variable in cover and composition depending on the density of the canopy and shrub layers and the frequency of flooding. Common herbaceous species include *Equisetum hyemale, Equisetum arvense, Chamerion angustifolium (= Epilobium angustifolium), Heracleum maximum*, and *Maianthemum stellatum*. *Picea pungens / Cornus sericea* Woodland (CEGL000388) was once a more common type and represents slightly more stable habitats than those of *Picea pungens / Alnus incana* Woodland (CEGL000894).

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is uncommon in the recreation area and was sampled adjacent to Soap Creek, above Ponderosa Campground.

Globally

This association has been documented from New Mexico, Utah, central and western Colorado. It is likely to occur in northern Arizona.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs in narrow floodplains on terraces of tributaries to the Gunnison River. Sites are nearly flat to moderately steep (2-53% slopes), occur between 2312 and 2319 m elevation, and are oriented to the northeast. The unvegetated surface has high cover of litter and downed wood. Litter and duff are 0-7 cm deep and 0-3 cm deep, respectively. Parent material is Quaternary alluvium. Soils are poorly drained loamy sands and sandy loams.

Globally

This riparian woodland association is best developed on cool, narrow floodplains in the montane zone of Colorado, New Mexico and Utah. Scattered, isolated stands also occur in canyons of the Colorado Plateau. It is likely to occur

in northern Arizona. Sites flood periodically and range from nearly flat on broader floodplains to moderately steep in the narrowest canyons. In Colorado, the association is restricted to the montane zone, between 2100 and 2600 m (7000-8500 feet) (Carsey et al. 2003a). In New Mexico, this association occurs between approximately 2500 and 3230 m (8200-10,600 feet) (Dick-Peddie 1993). Soils tend to be poorly developed coarse alluvium.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 63 to 111% in this woodland association. *Picea pungens* trees 20-35 m tall form an open to closed canopy that provides 10 to 80% cover, and the short shrub *Cornus sericea* provides 5 to 8% cover. A 10- to 15-m tall subcanopy layer of *Picea pungens* and *Populus angustifolia* trees provides sparse to low cover. The shrub layer is low in terms of species diversity and provides sparse to low cover. Tall, short, and dwarf-shrubs, including seedling and sapling trees providing sparse to low cover, include *Alnus incana* ssp. *tenuifolia*, *Amelanchier alnifolia, Crataegus rivularis, Juniperus scopulorum, Picea pungens, Quercus gambelii*, and *Rosa woodsii*. The herbaceous layer is low in terms of species diversity and provides sparse cover. Graminoids include *Bromus* spp., *Carex geyeri*, and *Poa pratensis*. Forbs provide sparse cover, and some diagnostic species include *Chamerion angustifolium, Equisetum hyemale, Heracleum maximum*, and *Maianthemum stellatum*. Species of moss provide sparse cover, up to 2%.

Globally

The evergreen needle-leaved tree canopy has 10 to 80% cover, is dominated by *Picea pungens*, and shades the open to dense shrub layer dominated by *Cornus sericea*. Other tree species may be present in the canopy, including *Populus angustifolia, Populus tremuloides, Picea engelmannii*, and *Abies lasiocarpa*. *Cornus sericea* is not tolerant of deep shade (Crane 1989); its presence in closed-canopy stands is usually limited to the margins and to openings. In more open stands, the red-osier dogwood understory may be quite dense. Other components of the shrub layer include *Symphoricarpos oreophilus, Betula occidentalis, Alnus incana, Crataegus rivularis, Salix monticola, Salix geyeriana, Acer glabrum, Amelanchier* spp., and *Prunus virginiana*. The herbaceous layer is variable in cover and composition depending on the density of the canopy and shrub layers and the frequency of flooding. Common herbaceous species include *Equisetum hyemale, Equisetum arvense, Chamerion angustifolium (= Epilobium angustifolium), Heracleum maximum*, and *Maianthemum stellatum*. *Picea pungens / Cornus sericea* Woodland (CEGL000388) was once a more common type and represents slightly more stable habitats than those of *Picea pungens / Alnus incana* Woodland (CEGL000894).

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Picea pungens*
Tree subcanopy	*Picea pungens*
Tree subcanopy	*Populus angustifolia*
Tall shrub/sapling	*Alnus incana* ssp. *tenuifolia*
Short shrub/sapling	*Cornus sericea, Rosa woodsii*

Globally

Stratum	Species
Tree canopy	*Picea pungens*
Short shrub/sapling	*Cornus sericea*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Most of the available information for this association comes from Colorado stands.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: More quantitative data are needed to define this association locally. One stand (CURE.0230) is very small (10x10 m), has significant cover of *Alnus incana* ssp. *tenuifolia*, and is not dense in terms of tree cover.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on 2002 field data (1 plot: CURE.0232 and1 observation point: CURE.0230).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: J. Coles, mod. K.A. Schulz

REFERENCES: Alexander et al. 1987, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Crane 1989, DeVelice and Ludwig 1983a, DeVelice et al. 1986, Dick-Peddie 1993, Driscoll et al. 1984, Fitzhugh et al. 1987, Hess and Wasser 1982, Johnston 1984, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1999a, Komarkova et al. 1988a, Larson and Moir 1987, Moir and Ludwig 1979, Richard et al. 1996, Western Ecology Working Group n.d.

Acer negundo / Disturbed Understory Woodland

Box-elder / Disturbed Understory Woodland

CODE	CEGL002693
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE	*ACER NEGUNDO* TEMPORARILY FLOODED WOODLAND ALLIANCE (A.642) Box-elder Temporarily Flooded Woodland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY
Globally
This riparian association is found in the Colorado Plateau and other areas of the southwestern U.S. on upper alluvial terraces below 2015 m (6600 feet) elevation. Sites are on gentle slopes or flat areas near permanent or temporary streams but are rarely flooded because of their location on high, abandoned stream terraces. Soils are usually sandy. The tree canopy of this association is open to moderately closed and 5-15 m tall. The dominant tree species is *Acer negundo* with scattered *Acer glabrum, Juniperus osteosperma*, or *Juniperus scopulorum*. There is a sparse shrub layer up to 2 m tall with *Artemisia tridentata, Ericameria nauseosa, Fraxinus anomala, Rhus trilobata, Ribes cereum, Tamarix ramosissima*, and (in the south) *Quercus gambelii*. Herbaceous cover and species composition are variable. The herbaceous stratum may be sparse or dominated by native and introduced species typically found in disturbed areas. *Bromus tectorum* is common. Other typical species are *Heterotheca villosa, Poa pratensis, Sisymbrium altissimum, Lepidium latifolium, Taraxacum officinale*, and *Verbascum thapsus*.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is distributed along the Gunnison River and was observed and sampled on the alluvium of a river terrace adjacent to East Portal Road in the park and on roadway fill (riprap) that created an artificial embankment above the Gunnison River within the recreation area.

Globally
This association has been sampled in the Colorado Plateau from northwestern Colorado to southwestern Utah and northeastern Arizona; it is likely widespread elsewhere in the southwestern U.S.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This woodland association was observed on alluvial flats and riprap slopes adjacent to the Gunnison River. Sites are nearly flat to gentle (2-10% slopes), occur between 1712 to 2015 m elevation, and are oriented to various aspects. The unvegetated surface has low cover of litter and high cover by bedrock, large and small rocks, and exposure of bare soil. Soils are well-drained to poorly drained sands at one site, with no soil occurring on the riprap.

Globally
This association is found on flat to gently sloping riparian sites near permanent or temporary streams below 2015 m (6600 feet) elevation. Sites are usually found on terraces several meters above the active floodplain and below the steeper upland slopes on any aspect. They rarely flood. Soils are usually sandy alluvium and can range from well-drained to poorly drained. The ground surface is largely covered by large rocks, litter, downed wood, or bare soil.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This type is restricted to the banks of the Gunnison River. Total vegetation cover ranges from 45 to 100% in these stands. This association is characterized by an open to closed canopy, from 1-10 m tall, of *Acer negundo* trees that range in cover from 5 to 35%. *Acer negundo* is present in nearly all cover classes from short shrub through canopy tree providing a majority of the cover in these stands. The shrub layer is low in diversity and typically sparse to low in cover, an exception being a dense stand of *Salix exigua* short shrubs that are 1-2 m tall and contribute 50-75% cover in one stand. Other short and dwarf-shrubs present and providing sparse cover include *Ericameria parryi, Rhus trilobata, Ribes cereum, Solidago velutina,* and *Tamarix ramosissima*. The herbaceous layer provides sparse to moderate cover and is somewhat diverse, with several exotic species present. Common graminoids include *Agrostis gigantea, Bromus tectorum, Dichanthelium oligosanthes var. scribnerianum, Elymus repens, Phalaris arundinacea, Poa fendleriana,* and *Thinopyrum intermedium*. Forbs commonly observed include *Artemisia dracunculus, Artemisia ludoviciana, Asclepias* sp., *Brickellia grandiflora, Cirsium* sp., *Equisetum hyemale var. affine, Heterotheca villosa, Melilotus officinalis (= Melilotus albus), Taraxacum officinale, Toxicodendron rydbergii,* and *Verbascum thapsus*. Seedling *Amelanchier utahensis* and *Rhus trilobata* shrubs are present in one stand.

Globally
This woodland association has an open to moderately closed (10-80%) tree canopy and moderate to dense total vegetation cover. The tree canopy is between 5 and 15 m tall and dominated by *Acer negundo*. *Acer negundo* is also present as seedlings and saplings. Other trees that can be present are *Acer glabrum, Juniperus osteosperma,* and *Juniperus scopulorum*. Shrub cover is sparse, though it can be more prominent when the tree canopy is open. The shrub stratum is usually less than 2 m tall and contains species such as *Artemisia tridentata* ssp. *tridentata, Ericameria nauseosa, Fraxinus anomala, Rhus trilobata, Ribes cereum, Tamarix ramosissima,* and (in the south) *Quercus gambelii*. Herbaceous cover and species composition are variable. The herbaceous stratum is dominated by native and introduced species typically found in disturbed areas. *Bromus tectorum* is common. Other typical components of the herbaceous stratum are *Heterotheca villosa, Poa pratensis, Lepidium latifolium, Sisymbrium altissimum, Taraxacum officinale,* and *Verbascum thapsus*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Acer negundo*
Tree subcanopy	*Acer negundo*
Short shrub/sapling	*Salix exigua*

Herb (field)	*Phalaris arundinacea*
Herb (field)	*Equisetum hyemale* var. *affine*

Globally

Stratum	Species
Tree canopy	*Acer negundo*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus tectorum* (exotic, High), *Elymus repens* (exotic, High/Medium), *Melilotus officinalis* (exotic, Medium/Low), *Phalaris arundinacea* (exotic, High), *Tamarix ramosissima* (exotic, High), *Taraxacum officinale* (exotic), *Thinopyrum intermedium* (exotic, Medium/Insignificant), *Verbascum thapsus* (exotic, Medium)

Globally
Exotic/Invasive: *Bromus tectorum* (exotic, High), *Poa pratensis* (exotic, Medium)

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (14-Aug-2001).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: While this is a common semi-natural association along the Gunnison River in the canyon areas, it was not extensively sampled due to inaccessibility of inner-canyon sites, and a lack of emphasis placed upon sampling semi-natural communities. Park hydrologists have monitored *Acer negundo* stands in Black Canyon for the past several years to help quantify the effects of the altered hydrological regime on canyon ecosystems.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: BLCA.0119, CURE.0242).
Local Description Authors: J. Von Loh and G. Bradshaw, mod. J. Coles
Global Description Authors: J. Drake, mod. J. Coles and K.A. Schulz

REFERENCES: Cogan et al. 2004, Western Ecology Working Group n.d.

Acer negundo / Quercus gambelii Woodland

Box-elder / Gambel Oak Woodland

CODE	CEGL002797
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE	*ACER NEGUNDO* TEMPORARILY FLOODED WOODLAND ALLIANCE (A.642) Box-elder Temporarily Flooded Woodland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This woodland association is only known from along the Gunnison River in Curecanti National Recreation Area. Stands occur in riparian sites with natural or human disturbance, including constructed roadway fill slopes and rockfall or talus from adjacent cliffs. Sites are steep (75% slopes), occur between 2032 and 2073 m elevation, and are oriented to northeastern and southern aspects. The unvegetated surface has high cover of bedrock, large and small rocks, and low to moderate cover of litter. Soil was not present in the rockfill and rockfall substrate in the sampled stands. The vegetation is characterized by an open to moderately dense tree canopy of *Acer negundo* and *Quercus gambelii*. Occasional emergent *Pseudotsuga menziesii* trees or subcanopy *Juniperus scopulorum* may be present. The understory is typically sparse and variable in species composition. Tall, short, and dwarf-shrubs contribute low cover and include *Cornus sericea, Fendlerella utahensis, Holodiscus dumosus, Mahonia repens, Rhus trilobata, Ribes cereum, Ribes inerme,* and *Prunus virginiana*. The herbaceous layer is sparse and has low in species diversity. Species include *Piptatherum micranthum, Arabis* sp., *Brickellia grandiflora,* and *Artemisia michauxiana*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled along the Gunnison River below Crystal Dam and the Gunnison River below Morrow Point Dam in Curecanti National Recreation Area.

Globally

This association has only been sampled from one location in Curecanti National Recreation Area in western Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs in riparian sites with natural or human disturbance, including constructed roadway fill slopes and rockfall or talus from adjacent cliffs. Sites are steep (75% slopes), occur between 2032 and 2073 m elevation, and are oriented to northeastern and southern aspects. The unvegetated surface has high cover of bedrock, large rocks, and small rocks and low to moderate cover of litter. Downed wood is uncommon. Parent materials include Tertiary volcanic rockfall and introduced volcanic rubble. Soil was not present in the rockfill and rockfall substrate in the sampled stands.

Globally

Data are not available.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is distributed in narrow belts along the Gunnison River in Curecanti National Recreation Area. Total vegetation cover ranges from 36 to 79%. *Acer negundo* and *Quercus gambelii* trees 2-12 m high range in cover from 10 to 60% and 8 to 25%, respectively. One stand has an emergent *Pseudotsuga menziesii* tree 10-15 m

tall that contributed sparse cover. *Acer negundo* trees to 6 m tall also form a subcanopy layer, contributing 5% cover in one stand. Sapling *Juniperus scopulorum* and seedling *Pseudotsuga menziesii* trees contributing sparse cover are present in one stand. The shrub layer is diverse in cover and species composition. Tall, short, and dwarf-shrubs contribute low cover and include *Cornus sericea, Fendlerella utahensis, Holodiscus dumosus, Mahonia repens, Rhus trilobata, Ribes cereum, Ribes inerme,* and *Prunus virginiana*. The herbaceous layer is low in diversity and provides sparse cover. The only graminoid present in one stand is *Piptatherum micranthum*. Forbs are uncommon, contribute sparse cover, and include *Arabis* sp., *Brickellia grandiflora*, and *Artemisia michauxiana*.

Globally
Data are not available.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Acer negundo, Quercus gambelii*
Tall shrub/sapling	*Prunus virginiana, Rhus trilobata*
Short shrub/sapling	*Fendlerella utahensis*
Herb (field)	*Mahonia repens*

Globally

Stratum	Species
Tree canopy	*Acer negundo, Quercus gambelii*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (21-Jun-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association has only been sampled from one location in Curecanti National Recreation Area in western Colorado. More survey and classification work are needed to change the provisional status of this association.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Narrow bands of vegetation on rocky substrates along the Gunnison River.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0189, CURE.0244 and 5 observation points: BLCA_AA.597, BLCA_AA.601, BLCA_AA.608, BLCA_AA.610, BLCA_AA.618).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Populus angustifolia - Juniperus scopulorum Woodland

Narrowleaf Cottonwood - Rocky Mountain Juniper Woodland

CODE	CEGL002640
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE (A.641)	*POPULUS ANGUSTIFOLIA* TEMPORARILY FLOODED WOODLAND ALLIANCE Narrowleaf Cottonwood Temporarily Flooded Woodland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This semi-riparian woodland association occurs in north-central Wyoming, western Colorado and northern New Mexico on terraces or slopes of gorges, ravines, and moderate-sized intermittent or perennial drainages between 1740 and 2400 m (5725-7875 feet) elevation. This type usually occurs on high, dry stream terraces with level slopes and a sandy surface soil texture. Stands are infrequently flooded (10- to 100-year recurrence intervals). The vegetation is characterized by moderately open canopies (25-60% cover) dominated by *Populus angustifolia*, with *Juniperus scopulorum* or occasionally *Juniperus monosperma, Betula occidentalis*, or *Pinus edulis* in the subcanopy. An open grassy understory with abundant *Sporobolus cryptandrus* is characteristic, although other grasses such as *Carex geyeri, Juncus balticus, Leymus cinereus*, and *Poa fendleriana* may also be present. In disturbed stands the native grasses may have been replaced by exotic species such as *Bromus inermis*. Although shrubs are uncommon, those present, such as *Brickellia californica, Quercus gambelii, Artemisia tridentata, Mahonia repens, Purshia tridentata, Rosa woodsii*, and *Symphoricarpos oreophilus*, reflect relatively dry site conditions. The herbaceous understory also reflects open, dry site conditions. Facultative and upland forbs such as *Thalictrum fendleri, Achillea millefolium, Maianthemum stellatum, Solidago nemoralis*, and *Penstemon barbatus* are common. In open areas *Bouteloua curtipendula* is common. Regardless of the drier conditions, a variety of native wetland indicators can occur, including *Juncus effusus, Glyceria striata, Carex nebrascensis, Agrostis exarata, Rudbeckia laciniata, Equisetum arvense, Epilobium ciliatum, Mertensia ciliata*, and *Equisetum laevigatum*. Many stands have decadent *Populus angustifolia* trees that are being replaced by *Juniperus scopulorum*. Other stands periodically flood and retain a large amount of woody debris. In all cases the vegetation and topographic position indicate a community that is becoming isolated from the water table. As the water table drops, the facultative and obligate wetland plants will be replaced by upland species.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is rare to uncommon and was sampled on Tenderfoot Hill, in Dillon Gulch and in the upper drainage south of Wilson's Landing within Curecanti National Recreation Area.

Globally

This association has been documented in north-central Wyoming, western Colorado and northern New Mexico. It may occur in Utah.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs on the slopes of gorges and ravines and in channel bottoms. Sites are gently sloping (10-12%), occur between 2321 and 2383 m elevation, and are oriented to all aspects. The unvegetated surface has moderate cover of litter and moderate to high cover of downed wood. Litter depth was measured at one site and is from 0.3-1.5 cm deep. Parent materials are Quaternary alluvium. Soils are well-drained sandy loams.

Globally
The community is found in mountainous regions of north-central Wyoming, western Colorado and northern New Mexico on terraces or slopes of gorges, ravines, and moderate-sized intermittent or perennial drainages with elevations ranging from 1740 to 2400 m (5725-7875 feet). This type usually occurs on higher and drier terraces that have a relatively flat surface topography, and they are mostly composed of sandy alluvial sediments. As a result, stands are infrequently flooded (10- to 100-year recurrence intervals). Soils are young, weakly developed Entisols. Thick organic layers (Mollisols) have had time to develop in some stands. Soils tend to be dry, well-drained and mostly sandy or silty at the surface, although commonly gravelly/cobbly with depth. Some of the lower terraces may be very moist at depths within the rooting zone, particularly during seasonal high water events.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from approximately 100 to 134% in these stands. *Populus angustifolia* forms an open to moderately closed canopy 10-20 m high that contributes 25 to 50% cover, and *Juniperus scopulorum* occupies the subcanopy 2-10 m high and provides 20 to 50% cover. One stand has subcanopy cover of 5- to 10-m tall *Betula occidentalis (= Betula fontinalis)* trees that provide 10% cover. The shrub layer is moderately diverse and provides low to moderate cover. Tall shrubs provide low cover and include *Juniperus scopulorum, Quercus gambelii*, and *Rhus trilobata*. Short and dwarf-shrubs provide sparse to low cover and include *Artemisia tridentata* ssp. *wyomingensis, Mahonia repens, Purshia tridentata, Rosa woodsii*, and *Symphoricarpos rotundifolius*. The herbaceous layer is moderately diverse and provides sparse to low cover. Graminoids provide sparse cover and include *Carex geyeri, Juncus balticus, Leymus cinereus*, and *Poa fendleriana*. Forbs provide sparse cover and commonly include *Achillea millefolium var. occidentalis*, *Astragalus* sp., *Maianthemum stellatum*, and *Solidago nemoralis*.

Globally
The species composition and percent cover in this association are variable and depend on aspect, elevation, and streamflow, in addition to the degree of disturbance by recreational use and livestock grazing. This type is characterized by mature, moderately open stands (25-60% cover) dominated by *Populus angustifolia*, with *Juniperus scopulorum* or occasionally *Juniperus monosperma*, *Betula occidentalis*, or *Pinus edulis* in the subcanopy. Total biomass and canopy cover are usually low. An open grassy understory with abundant *Sporobolus cryptandrus* is characteristic, although other grasses such as *Carex geyeri, Juncus balticus, Leymus cinereus*, and *Poa fendleriana* may also be present. In disturbed stands the native grasses may have been replaced by exotic species such as *Bromus inermis*. Cottonwood reproduction occurs vegetatively from root sprouts, and young junipers are common. Although shrubs are uncommon, those present, such as *Brickellia californica, Quercus gambelii, Artemisia tridentata, Mahonia repens, Purshia tridentata, Rosa woodsii*, and *Symphoricarpos oreophilus*, reflect relatively dry site conditions. The herbaceous understory also reflects the open, drier site conditions. Facultative and upland forbs such as *Thalictrum fendleri, Achillea millefolium, Maianthemum stellatum, Solidago nemoralis*, and *Penstemon barbatus* are common. In open areas *Bouteloua curtipendula* is common. Regardless of the drier conditions, a variety of native wetland indicators can occur: *Juncus effusus, Glyceria striata, Muhlenbergia racemosa, Carex nebrascensis, Agrostis exarata, Rudbeckia laciniata, Equisetum arvense, Epilobium ciliatum, Mertensia ciliata, Lycopus asper, Equisetum laevigatum*, and *Asclepias incarnata*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus angustifolia*
Tree subcanopy	*Juniperus scopulorum*
Tree subcanopy	*Betula occidentalis, Populus angustifolia*
Tall shrub/sapling	*Juniperus scopulorum*
Tall shrub/sapling	*Quercus gambelii*
Short shrub/sapling	*Populus angustifolia*
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis, Purshia tridentata*
Herb (field)	*Carex geyeri, Leymus cinereus*

Globally

Stratum	Species
Tree canopy	*Populus angustifolia*
Tree subcanopy	*Juniperus scopulorum*
Herb (field)	*Sporobolus cryptandrus*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Exotic/Invasive: *Bromus inermis* (exotic, High/Medium)

CONSERVATION STATUS RANK
Global Rank & Reasons: G2G3 (7-Apr-1998).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
These mature riparian forests occupy some of the driest sites in the floodplain. Some stands may be directly adjacent to the stream but still situated several meters above it due to downcut streambanks, or they may be dry because the stream only flows intermittently. In these stands, the cottonwoods have limited self-sustaining capabilities except vegetatively by root sprouts. Many of the trees are often decadent or dying, and junipers are commonly growing up under them, colonizing the drying terraces. Further, the presence of juniper in these and other floodplain communities is often considered invasive. Juniper, as a codominant in these communities, is at least viewed as an indicator that flooding occurs infrequently. Only the largest of floods will remove these communities.

This type is a refinement of the *Populus angustifolia / Juniperus scopulorum* Association reported by Muldavin (1991) for northern New Mexico and Kittel et al. (1994, 1996) for Colorado. It is synonymous with *Populus angustifolia / Physocarpus monogynus - Padus virginiana* in Bighorn National Forest, Wyoming (Girard et al. 1997), and *Populus angustifolia - Juniperus scopulorum* in New Mexico (Durkin et al. 1995a). *Padus virginiana* is an old name for *Prunus virginiana*.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: One stand has decadent *Populus angustifolia* trees, and the stand is being replaced by *Juniperus scopulorum*. Another stand periodically floods and retains a large amount of debris.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (3 plots: CURE.0108, CURE.0173, CURE.0237 and 6 observation points: CURE_AA.0046, CURE_AA.0246, CURE_AA.0254, CURE_AA.0290, CURE_AA.0765, CURE_AA.0786).
Local Description Authors: J. Von Loh
Global Description Authors: Muldavin et al., mod. J. Coles

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Cooper and Cottrell 1990, Durkin et al. 1994b, Durkin et al. 1995a, Girard et al. 1997, Kittel et al. 1994, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Muldavin 1991, Muldavin et al. 2000a, Western Ecology Working Group n.d.

Populus angustifolia - Picea pungens / Alnus incana Woodland

Narrowleaf Cottonwood - Blue Spruce / Gray Alder Woodland

CODE	CEGL000934
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE (A.641)	*POPULUS ANGUSTIFOLIA* TEMPORARILY FLOODED WOODLAND ALLIANCE Narrowleaf Cottonwood Temporarily Flooded Woodland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This plant association is a common riparian woodland in Colorado. Elevation ranges from roughly 1950-2925 m (6400-9600 feet). Stands occur along moderate-sized meandering streams and rivers in narrow to moderately wide mountain valleys and deep canyons with moderate stream gradients. It occurs on floodplains, active channel margins, and stream terraces. The shallow soils are derived from cobbly alluvium. Stands have an open to moderately dense (20-60% cover), mixed deciduous-evergreen tree canopy with *Populus angustifolia* and *Picea pungens* codominant. Frequently, other conifer trees are present, but not as abundant as *Picea pungens*. The shrub understory is typically dense and diverse. *Alnus incana* is always present. The moderate herbaceous layer is diverse, provides up to 30% cover, and is dominated by various graminoids with low cover of often diverse forbs.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled along the channel and terraces of Willow Creek in Curecanti National Recreation Area.

Globally

This type may be geographically widespread, but it is centered in western Colorado. Similar associations have been described as far west as Idaho and Utah and as far north as Montana, but primarily in small stands (Hansen et al. 1995).

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs adjacent to the channel and on the associated terraces of Willow Creek. The site is gently sloped (5%), occurs at 2311 m elevation, and is oriented to the north. The unvegetated surface has high cover of litter, and downed wood is abundant. Parent materials are metamorphic/granitic rocks. Soils are poorly drained sandy clay loams high in organic matter.

Globally

This type is found in a mountainous region, along moderate-sized meandering streams and rivers, from roughly 1980-2500 m (6500-8200 feet) elevation. Climate is continental and varied, with warm summers and cold winters. Precipitation falls primarily as snow during the winter and spring, although summer convective showers make a significant contribution to the total. Valleys and deep canyons are narrow to moderately wide (10-200 m), and stream gradients are moderate, from 2 to 12% (Baker 1986, Kittel et al. 1999b, Carsey et al. 2003a). It occurs on floodplains, active channel margins, and riverbanks. The shallow soils are derived from cobbly alluvium, which is found 0.5 to 1 m below the soil surface. Textures are sandy to silty clay loams over thick sands (approximately 0.5 m), often stratified with finer textures from depositional events. Organic matter may be high in some soil.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is about 150% in this riparian woodland type. *Picea pungens, Populus angustifolia*, and *Pseudotsuga menziesii* trees 15-35 m tall form a moderately closed canopy that provides cover of 50%, 5%, and 3%, respectively. A subcanopy of *Pseudotsuga menziesii* and *Juniperus scopulorum* saplings, 5-10 m tall, contributes sparse cover. *Populus angustifolia, Pseudotsuga menziesii*, and *Juniperus scopulorum* also occur as seedlings in the shrub layer (0.5-1 m tall) and contribute sparse cover. The shrub layer is somewhat diverse in terms of species composition and contributes moderate to dense cover. The tall shrub *Alnus incana* ssp. *tenuifolia* (2-5 m tall) provides low to moderate cover. Additional tall shrubs that provide low cover include *Prunus virginiana* and *Salix monticola*. Short and dwarf-shrubs provide moderate cover and include *Amelanchier alnifolia, Cornus sericea, Mahonia repens, Rosa woodsii, Rubus idaeus* ssp. *strigosus*, and *Symphoricarpos rotundifolius*. The herbaceous layer is diverse and provides moderate cover, up to 30%. Graminoids are diverse, and common species include *Carex geyeri, Agrostis gigantea, Bromus lanatipes, Glyceria striata*, and *Piptatherum micranthum*. Forbs are diverse, provide sparse to low cover, and include *Maianthemum stellatum, Geranium* sp., *Equisetum arvense, Epilobium brachycarpum, Heracleum maximum, Humulus lupulus, Senecio pudicus (= Ligularia pudica)*, and *Solidago canadensis*. Seedling *Alnus incana* ssp. *tenuifolia* and *Quercus gambelii* shrubs are present in the herbaceous layer, contributing sparse cover.

Globally
This is a riparian forest association characterized by an open to moderately dense (20-60% cover), mixed deciduous-evergreen tree canopy with *Populus angustifolia* and *Picea pungens* codominant. *Populus tremuloides, Picea engelmannii, Pseudotsuga menziesii*, and *Juniperus scopulorum* are occasionally present in small amounts. The broad-leaved deciduous *Populus angustifolia* has 5-50% cover, and the needle-leaved evergreen tree *Picea pungens* has 7-50% canopy cover in most stands. The shrub layer is well-developed and is composed primarily of broad-leaved deciduous species, mostly over 2 m tall. *Cornus sericea* often dominates as a dense layer under the tree canopy, while *Alnus incana* and *Betula occidentalis* are abundant along streambanks (Baker 1989b, Kittel et al. 1999b, Carsey et al. 2003a). These three shrubs together consistently have 25% to over 60% cover. Other common shrubs may include *Amelanchier alnifolia, Cornus sericea, Lonicera involucrata, Mahonia repens, Prunus virginiana, Rosa woodsii, Rubus idaeus* ssp. *strigosus, Ribes inerme, Salix monticola*, and *Symphoricarpos rotundifolius*. The herbaceous layer is not as lush as some other riparian forest types, perhaps due to the dense canopy of shrubs. The most common species include the perennial forbs *Actaea rubra, Equisetum arvense, Epilobium brachycarpum, Galium triflorum, Geranium richardsonii, Maianthemum stellatum (= Smilacina stellata), Heracleum maximum (= Heracleum lanatum)*, and *Solidago canadensis*. Graminoids are sparse and include *Bromus ciliatus, Carex geyeri, Elymus glaucus, Glyceria striata*, and *Poa pratensis*. Total herbaceous cover is typically less than 20%.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Picea pungens*
Tree canopy	*Populus angustifolia*
Tall shrub/sapling	*Alnus incana* ssp. *tenuifolia*, *Prunus virginiana*
Short shrub/sapling	*Rosa woodsii*
Herb (field)	*Maianthemum stellatum*
Herb (field)	*Carex geyeri*

Globally

Stratum	Species
Tree canopy	*Picea pungens*
Tree canopy	*Populus angustifolia*
Tree subcanopy	*Alnus incana, Betula occidentalis, Cornus sericea*
Herb (field)	*Actaea rubra*, *Maianthemum stellatum*
Herb (field)	*Equisetum arvense*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Cirsium arvense* (exotic, High/Medium)
Globally

Other: *Salix exigua* (G5), *Salix ligulifolia* (G5)

CONSERVATION STATUS RANK
Global Rank & Reasons: G3 (14-Nov-1997). This association may be geographically widespread, but it is centered in western Colorado, where there are 33 known sites. Similar associations have been described as far west as Idaho and Utah and as far north as Montana, but primarily in small stands (Hansen et al. 1995). Most stands of this association have been altered in species composition by livestock grazing. Many streams of the southern Rockies have been impacted by dams or water diversion, gravel and gold mining, and development. The mixture of coniferous (*Picea*) and deciduous vegetation (*Populus*) is maintained by a combination of periodic flooding and cold-air drainage (Baker 1989b). Perturbations of flow regime due to water development, logging, or channel entrenchment could detrimentally impact this association.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: *Picea pungens* occupies the third stream terrace and *Alnus incana* the second.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0236).
Local Description Authors: J. Von Loh
Global Description Authors: M.S. Reid, mod. K.A. Schulz

REFERENCES: Baker 1986, Baker 1989a, Baker 1989b, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Driscoll et al. 1984, Hansen et al. 1995, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1999a, Kittel et al. 1999b, Richard et al. 1996, UNESCO 1973, Western Ecology Working Group n.d.

Populus angustifolia / Alnus incana Woodland

Narrowleaf Cottonwood / Gray Alder Woodland

CODE	CEGL002642
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE (A.641)	*POPULUS ANGUSTIFOLIA* TEMPORARILY FLOODED WOODLAND ALLIANCE Narrowleaf Cottonwood Temporarily Flooded Woodland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This plant association is found in narrow bands on the floodplains and benches of montane streams (1900-2700 m elevation) in Colorado and New Mexico, primarily in the southern Rocky Mountains. Stands occur on banks and benches along narrow streams with active floodplains in broad valleys and narrow canyons. These narrow streams may be higher gradient, fast-moving or low gradient, highly sinuous stream reaches. Substrates are typically deep sand or shaly sandy loam but may be stratified with finer-textured alluvial layers. The vegetation is characterized by a open to nearly closed deciduous tree canopy of *Populus angustifolia* with a dense layer of *Alnus incana* lining the streambank. *Populus angustifolia* is always present, although sometimes only as a sapling. A variety of riparian and upland tree species may also be present. *Alnus incana* is the most abundant shrub within the stand with a minimum of 10% cover. Other shrubs may include *Salix bebbiana, Salix monticola, Salix drummondiana, Salix ligulifolia (= Salix eriocephala var. ligulifolia), Salix lucida* ssp. *caudata, Salix exigua, Rosa woodsii, Rubus idaeus, Acer glabrum*, and *Betula occidentalis*. If present, *Cornus sericea* does not codominate. Herbaceous growth is generally a sparse mixture of mesic and wetland graminoids and forbs.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association was sampled on terraces in the Gunnison River floodplain at Neversink and Riverway and at Cimarron in Curecanti National Recreation Area and on the channel bank of Beaver Creek in the Sapinero State Wildlife Area.

Globally

This riparian forest association occurs in the southern Rocky Mountains of Colorado and New Mexico. It has been reported from western Wyoming and Oregon.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs in the floodplain on terraces of the Gunnison River and Beaver Creek. Sites are nearly flat to moderately sloped (1-45%), occur between 2120 and 2334 m elevation, and are oriented to the southwest. The unvegetated surface has moderate to high cover of litter and downed wood. Exposure of bare soil is moderate in one stand. Parent materials are Quaternary alluvium. Soils are poorly drained sandy clay loams, sandy loams, loamy sands, and sands.

Globally

This plant association is found in narrow bands on the floodplains and benches of montane streams (1900-2700 m elevation) in Colorado and New Mexico, primarily in the southern Rocky Mountains. Stands occur on banks and benches along narrow streams with active floodplains in broad valleys and narrow canyons. These narrow streams may be higher gradient, fast-moving or low gradient, highly sinuous stream reaches. Substrates are typically deep sand or shaly sandy loam but may be stratified with finer-textured alluvial layers (Kittel et al. 1999b, Carsey et al. 2003a).

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 110 to 135% in this riparian woodland type. *Populus angustifolia* forms an open to moderately closed canopy 10-35 m high that contributes 25 to 50% cover, and the tall shrub *Alnus incana* ssp. *tenuifolia* (2-10 m tall) provides 1 to 75% cover. The subcanopy layer is sometimes present and provides up to 10% cover by *Alnus incana* ssp. *tenuifolia, Juniperus scopulorum*, and *Populus angustifolia*. The shrub layer is moderately diverse in terms of species composition and provides low to moderate cover. Common shrubs include the short shrubs *Rosa woodsii* and *Rubus idaeus*. The herbaceous layer is diverse in terms of species composition and provides moderate to dense cover, up to 71%. Common graminoids are the non-native *Bromus inermis, Phalaris arundinacea*, and *Poa pratensis* and the graminoid *Juncus balticus*. Forbs commonly present include *Equisetum arvense* and *Maianthemum stellatum*.

Globally

This montane riparian association is characterized by an open to nearly closed deciduous tree canopy of *Populus angustifolia* with a dense layer of *Alnus incana* lining the streambank. *Populus angustifolia* is always present, although sometimes only as a sapling. A variety of riparian and upland tree species may also be present, including

Populus X acuminata, Populus tremuloides, Pseudotsuga menziesii, Salix amygdaloides, Juniperus scopulorum, Pinus ponderosa, Abies concolor, or *Picea pungens*. *Alnus incana* is the most abundant shrub within the stand with a minimum of 10% cover. Other shrubs may include *Salix bebbiana, Salix monticola, Salix drummondiana, Salix ligulifolia (= Salix eriocephala var. ligulifolia), Salix lucida* ssp. *caudata, Salix exigua, Cornus sericea (= Swida sericea), Rosa woodsii, Rubus idaeus, Acer glabrum*, and *Betula occidentalis*. If present, *Cornus sericea* does not codominate. Herbaceous growth is generally a sparse mixture of mesic and wetland graminoids and forbs. Herbaceous species include *Calamagrostis canadensis, Cardamine cordifolia, Carex rossii, Carex praegracilis, Carex nebrascensis, Equisetum arvense, Heracleum maximum, Juncus balticus, Maianthemum stellatum, Phalaris arundinacea, Rudbeckia laciniata, Thermopsis montana*, and introduced species, such as *Poa pratensis, Agrostis stolonifera, Agrostis gigantea, Bromus inermis, Dactylis glomerata, Phleum pratense, Poa palustris*, and *Taraxacum officinale* (Kittel et al. 1999b, Carsey et al. 2003a).

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus angustifolia*
Tree subcanopy	*Alnus incana* ssp. *tenuifolia*, *Populus angustifolia*
Tall shrub/sapling	*Alnus incana* ssp. *tenuifolia*
Short shrub/sapling	*Rosa woodsii*, *Rubus idaeus*
Herb (field)	*Cirsium arvense*, *Maianthemum stellatum*, *Thermopsis montana*
Herb (field)	*Agrostis gigantea*, *Bromus inermis*, *Phalaris arundinacea*, *Poa pratensis*

Globally

Stratum	Species
Tree (canopy & subcanopy)	*Populus angustifolia*
Tree subcanopy	*Alnus incana* ssp. *tenuifolia*
Tall shrub/sapling	*Alnus incana* ssp. *tenuifolia*
Short shrub/sapling	*Rosa woodsii*, *Salix lucida* ssp. *caudata*
Herb (field)	*Maianthemum stellatum, Thermopsis montana*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Exotic/Invasive: *Agrostis gigantea* (exotic, Medium/Low), *Bromus inermis* (exotic, High/Medium), *Poa pratensis* (exotic, Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (30-Dec-2000). This association is known from New Mexico and Colorado. Although not documented from other states, it is expected to occur throughout the range of *Populus angustifolia* in the Rocky Mountains. Ten of the 16 known occurrences in Colorado are in stable or better condition; however, all but one have been negatively impacted by livestock grazing and invasion of introduced species. Hydrologic modifications also threaten these riparian woodlands.

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Classification is based on at least 38 quantitative plots in Colorado. It is known from New Mexico as well. The criteria for identifying a *Populus angustifolia*-dominated association is at least 20% canopy cover of *Populus angustifolia* and total conifer cover less than 10%. Stands with shrub layers codominated by *Cornus sericea* and *Alnus incana* should be classified as *Populus angustifolia / Cornus sericea* Woodland (CEGL002664) (Carsey et al. 2003b).

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: One stand consists of young *Populus angustifolia* trees. Flooding causes driftwood accumulation in stands.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (4 plots: CURE.0071, CURE.0160, CURE.0185, CURE.0259 and 9 observation points: CURE_AA.0033, CURE_AA.0034, CURE_AA.0051, CURE_AA.0053, CURE_AA.0054, CURE_AA.0055, CURE_AA.0059, CURE_AA.0060, CURE_AA.0478).
Local Description Authors: J. Von Loh
Global Description Authors: A.E. Black, mod. K.A. Schulz

REFERENCES: Baker 1989b, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Crowe et al. 2004, Durkin et al. 1995a, Johnston 1987, Kagan et al. 2004, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1996, Kittel et al. 1997a, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova et al. 1988b, Muldavin et al. 2000a, Richard et al. 1996, Western Ecology Working Group n.d.

Populus angustifolia / Cornus sericea Woodland

Narrowleaf Cottonwood / Red-osier Dogwood Woodland

CODE	CEGL002664
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE (A.641)	*POPULUS ANGUSTIFOLIA* TEMPORARILY FLOODED WOODLAND ALLIANCE Narrowleaf Cottonwood Temporarily Flooded Woodland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY
Globally
This narrowleaf cottonwood forest type is found in the western Great Plains and western mountain regions of the United States, north into Alberta, Canada. Elevations range from 2360 to 2720 m (7750-8900 feet) in northern New Mexico to 945 to 2044 m (3100-6700 feet) in Montana (east of the Continental Divide). Stands occur along major streams and small to moderate-sized rivers in the foothill-montane zone and northern plains and in the grassland zone of Alberta. Sites include narrow valleys (10 m) with swift, steep streams (4% gradient) where it occurs on narrow benches, and on wide valleys (150 m) on broad floodplains along, moderately steep, meandering rivers (2% gradients). Soils are highly variable and stratified. The vegetation is characterized by a closed to open canopy of deciduous trees dominated by *Populus angustifolia* and a thick understory of *Cornus sericea*. The tree canopy composition is highly variable but typically has less than 10% cover of other tree species, including conifers *Picea pungens, Pseudotsuga menziesii, Pinus ponderosa, Abies concolor, Abies lasiocarpa,* and deciduous trees such as *Populus tremuloides* in mountains and *Populus deltoides* in lower foothills and on plains. *Populus X acuminata* may codominate stands in the Great Basin and in Alberta. In northern plains, stands may have *Populus deltoides* and/or *Populus balsamifera* ssp. *trichocarpa (= Populus trichocarpa)* present. The introduced tree *Elaeagnus angustifolia* may be common on disturbed stands. The moderately dense to dense shrub layer consists mostly of *Cornus sericea* (10-80%) but may be diverse. Other shrub species can be abundant, but rarely more than *Cornus sericea*, and may include *Acer glabrum, Alnus incana, Amelanchier* spp., *Crataegus rivularis, Betula occidentalis, Lonicera involucrata, Prunus virginiana, Quercus gambelii, Ribes* spp., *Rosa woodsii, Rubus* spp., many species of *Salix,* and *Symphoricarpos* spp. The herbaceous cover can be abundant (>50% cover) and diverse. Forb species may include *Equisetum arvense, Heracleum maximum, Maianthemum stellatum, Rudbeckia laciniata, Osmorhiza* spp., *Solidago canadensis*, and *Symphyotrichum foliaceum (= Aster foliaceus)*. Graminoid cover can also be abundant and includes

Bromus anomalus, Carex pellita (= Carex lanuginosa), Elymus glaucus, Glyceria striata, and *Phalaris arundinacea*. Introduced species, such as *Agrostis gigantea, Agrostis stolonifera, Alopecurus pratensis, Bromus inermis, Cirsium arvense, Dactylis glomerata, Medicago sativa, Phleum pratense, Poa compressa, Poa palustris,* and *Poa pratensis,* are often abundant.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This uncommon association was sampled below Morrow Point Dam along Mesa Creek Trail within Curecanti National Recreation Area.

Globally
This narrowleaf cottonwood forest type is found in the western Great Plains and western mountain regions of the United States, ranging from Montana west to Oregon, south to New Mexico and possibly Nevada, east to Colorado and north to the Black Hills of South Dakota. It is common in the upper Rio Grande and Pecos watersheds in north-central New Mexico and widespread in the southern Rocky Mountains. It is also found north into the Oldman River drainage of southwestern Alberta, Canada.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This woodland association occurs in drainage bottoms. The site is gently sloped (10%), occurs at 2655 m elevation, and is oriented to the southwest. The unvegetated surface has high cover of large and small rocks and bedrock. Parent materials are Quaternary alluvium. Soils are poorly drained sandy loams.

Globally
This narrowleaf cottonwood forest type is found in the western Great Plains and western mountain regions of the United States. Elevations range from 2360 to 2720 m (7750-8900 feet) in northern New Mexico to 945 to 2044 m (3100-6700 feet) in Montana (east of the Continental Divide), where it occurs at intermediate elevations below *Populus balsamifera* ssp. *trichocarpa (= Populus trichocarpa)* and above *Populus deltoides* (Hansen et al. 1995), and is found at mid-elevations in Alberta (770-1180 m [2526-3871 feet]). Stands occur along major streams and small to moderate-sized rivers in the foothill-montane zone and northern plains and in Alberta is usually associated with recent sediment deposits on floodplains along major streams and rivers (Thompson and Hansen 2002). Sites include narrow valleys (10 m) with swift, steep streams (4% gradient), where it occurs on narrow benches, and on wide valleys (150 m) on broad floodplains along, moderately steep, meandering rivers (2% gradients) (Kittel et al. 1999b, Carsey et al. 2003a). Canyons are not generally associated with where this association occurs on the Alberta plains. Stream channels vary widely in slope and width and range from steep and narrow to broad, moderately sinuous with moderate gradients to broad, highly sinuous with low gradients. Soils are highly variable and stratified and are moist, weakly developed Entisols (Fluvaquents or Udifluvents) or Regosols. Soil textures include silty clays, silty clay loams, clay loams, sandy clays, sandy clay loams, and loamy sands. The soils are 0.5-1 m deep and become skeletal at depth. Soils are typically moist, and some are mottled because of a shallow water table. Soils are commonly wet within 1 m, especially during seasonal flooding (Muldavin et al. 2000a).

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is 64% in this riparian woodland type. *Populus angustifolia* trees 10 m tall form an open to moderately closed canopy that provides 50% cover, and *Cornus sericea* short shrubs provide 3% cover. The shrub layer is low in species diversity and provides low cover. Additional short shrubs include *Populus angustifolia* saplings and *Prunus virginiana*. The herbaceous layer is also low in species diversity and provides sparse cover; there are no graminoids. The forbs *Brickellia grandiflora* and *Mentha arvensis* are present in sparse cover. The vine *Humulus lupulus* provides sparse cover.

Globally
This association is one of the most diverse cottonwood-dominated riparian woodlands and is characterized by a closed to open canopy of deciduous trees and a thick understory of *Cornus sericea*. It is highly variable in the number of tree and shrub species present; however, it is generally recognized by a clear dominance of *Populus angustifolia* (20-70% cover), typically with less than 10% cover of other tree species. The upper canopy can consist of several species, including conifers *Picea pungens, Pseudotsuga menziesii, Pinus ponderosa, Abies concolor, Abies lasiocarpa,* and deciduous trees, such as *Populus tremuloides* in mountains and *Populus deltoides* in lower

foothills and on plains (Kittel et al. 1999b, Carsey et al. 2003a). *Populus X acuminata* may codominate stands in the Great Basin (Manning and Padgett 1995), and *Populus balsamifera* ssp. *trichocarpa (= Populus trichocarpa)* may be present in northern stands (Hansen et al. 1995, Hall and Hansen 1997). The introduced tree *Elaeagnus angustifolia* may be common on disturbed stands. The moderately dense to dense shrub layer consists mostly of *Cornus sericea* (10-80%) but may be diverse. Other shrub species can be abundant, but rarely more than *Cornus sericea*, and may include *Acer glabrum, Alnus incana, Amelanchier* spp., *Crataegus rivularis, Betula occidentalis, Lonicera involucrata, Prunus virginiana, Quercus gambelii, Ribes* spp., *Rosa woodsii, Rubus* spp., *Salix X bebbii, Salix ligulifolia (= Salix eriocephala var. ligulifolia), Salix exigua, Salix drummondiana, Salix irrorata, Salix lucida* ssp. *caudata, Salix lutea, Salix monticola*, and *Symphoricarpos* spp. The vine *Clematis ligusticifolia* may be abundant is some stands. Stands vary in aspect and shade provided; some are relatively moist and shady, others are relatively dry and open. In moister environments, herbaceous cover can be abundant (>50% cover) and diverse. Forb species may include *Achillea millefolium, Aconitum columbianum, Equisetum arvense, Galium* spp., *Geum macrophyllum, Heracleum maximum, Maianthemum stellatum, Mertensia* spp., *Rudbeckia laciniata, Osmorhiza* spp., *Solidago canadensis*, and *Symphyotrichum foliaceum (= Aster foliaceus)*. Graminoid cover can also be abundant and includes *Bromus anomalus, Carex pellita (= Carex lanuginosa), Elymus glaucus, Glyceria striata*, and *Phalaris arundinacea*. Introduced species, such as *Agrostis gigantea, Agrostis stolonifera, Alopecurus pratensis, Bromus inermis, Cirsium arvense, Dactylis glomerata, Medicago sativa, Phleum pratense, Poa compressa, Poa palustris*, and *Poa pratensis*, are often abundant. In Alberta, confers are not a significant factor. *Populus angustifolia* dominates the canopy (30-60% cover), although *Populus deltoides* and *Populus balsamifera* may also be present. Throughout its range in Alberta, *Cornus sericea* is always present in the shrub layer but varies in cover from sparse (3%) to high (60%). Other shrubs that may be present with significant cover are *Rosa* spp., *Salix exigua*, and *Symphoricarpos occidentalis*. Graminoids do not usually make up a significant component, although in some stands, *Agrostis stolonifera* has up to 30% cover (although it may be absent). No forbs were significant or consistently present in the 17 stands looked at by Thompson and Hansen (2002).

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus angustifolia*
Short shrub/sapling	*Cornus sericea, Prunus virginiana*

Globally

Stratum	Species
Tree canopy	*Populus angustifolia, Populus* x *acuminata*
Short shrub/sapling	*Cornus sericea*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (1-Feb-1996).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

The community is densely shaded and provides valuable cover for wildlife. Seasonally high water tables allow for continued reproduction of the cottonwoods, alders, dogwood and the numerous other obligate riparian shrubs and herbs. Minimal disturbance from recreation, livestock usage, forestry practices, and mining maintain the biodiversity and good condition of the community. Severe alterations of the hydrology or upland conditions can contribute to loss of valuable habitat.

In the upper canyon segments, floodplains are narrow along the river, and the coniferous *Picea pungens* becomes more dominant, mixing with *Alnus incana* ssp. *tenuifolia* on the streambanks. In wider valleys, *Populus angustifolia* will dominate higher and drier terraces which will contain fewer shrubs and more junipers or introduced grasses from nearby hay meadows. Uplands are typically dominated by mixed coniferous forests of spruce and fir on cooler north-facing aspects or *Pinus ponderosa* on drier slopes.

In Alberta, stands dominated by pure *Populus angustifolia* are being lost to stands dominated by hybrids of *Populus angustifolia* and *Populus balsamifera* (Floate 2004).

This type was first described by Baker (1989b) in Colorado and is part of a group of ecologically related types that include (1) the *Populus angustifolia / Alnus incana* type with less *Cornus* reported for Colorado by Baker (1989b), Kittel and Lederer (1993), Kittel et al. (1994, 1996), Walford and Baker (1995), and Richard et al. (1996); and (2) the *Populus angustifolia / Cornus sericea* type that generally lacks *Alnus incana* ssp. *tenuifolia* and has been well-documented for the southern Rocky Mountains (Kittel and Lederer 1993, Kittel et al. 1994, 1995), and by Hansen et al. (1990), Johnston (1987), Padgett et al. (1988b, 1989), and Youngblood et al. (1985a, 1985b). This type as described here is probably inclusive of the above two types.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: The site has a boulder substrate in a tributary creek to the Gunnison River.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0193 and 2 observation points: CURE_AA.0339, CURE_AA.0638).
Local Description Authors: J. Von Loh
Global Description Authors: H. Marriott and D. Faber-Langendoen, mod. E. Muldavin et al., K.A. Schulz, L. Allen

REFERENCES: Allen 2005, Baker 1989b, Bourgeron and Engelking 1994, CONHP pers. comm., CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Crowe et al. 2004, DeLeuw, Cather & Company 1977, Driscoll et al. 1984, Hall and Hansen 1997, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Johnston 1987, Jones 1992b, Jones and Ogle 2000, Kagan et al. 2000, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova et al. 1988b, MTNHP 2002b, Manning and Padgett 1995, Marriott and Faber-Langendoen 2000, Muldavin et al. 1993b, Muldavin et al. 2000a, Padgett et al. 1988b, Padgett et al. 1989, Richard et al. 1996, Thompson and Hansen 2002, Walford and Baker 1995, Western Ecology Working Group n.d., Youngblood et al. 1985a, Youngblood et al. 1985b

Populus angustifolia / Crataegus rivularis Woodland

Narrowleaf Cottonwood / River Hawthorn Woodland

CODE	CEGL002644
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE (A.641)	*POPULUS ANGUSTIFOLIA* TEMPORARILY FLOODED WOODLAND ALLIANCE Narrowleaf Cottonwood Temporarily Flooded Woodland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This riparian woodland association is found on the lower slopes (2400-2500 m elevation) of the San Juan Mountains and along wide, sinuous tributaries of the San Miguel and Yampa rivers in western Colorado. Stands occur away from the main channel along dry back channels or ephemeral streams in sandy clay soils. This open to moderately dense deciduous woodland is characterized by mature *Populus angustifolia* trees (10-57% cover) in the overstory and dense stands of *Crataegus rivularis* (10-70% cover) in the understory. Tree canopy often includes other species, such as *Pinus ponderosa, Quercus gambelii*, and *Pseudotsuga menziesii*. The shrub canopy is usually diverse, with no single species codominant in all stands. Common shrubs include *Rosa woodsii, Cornus sericea, Symphoricarpos rotundifolius*, and several *Salix* species, including *Salix bebbiana, Salix ligulifolia (= Salix eriocephala var. ligulifolia)*, and *Salix monticola*. Forb and graminoid cover is minimal due to dry soil conditions.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is rare to uncommon in the recreation area and was sampled in the Neversink, Cooper's Ranch, and Riverway areas in the floodplain of the Gunnison River.

Globally

This type is documented only in western Colorado within the southern Rocky Mountains and eastern Colorado Plateau.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs in the floodplain of the Gunnison River. Sites are flat to gently sloped (0-3%), occur between 2313 and 2322 m elevation, and are oriented to southeast and southwest aspects. The unvegetated surface has moderate to high cover of litter and downed wood. Parent materials are Quaternary alluvium. Soils are poorly drained silty clay loams, loamy sands, and sandy loams.

Globally

This riparian woodland association is found on the lower slopes of the San Juan Mountains and along sinuous tributaries of the San Miguel and Yampa rivers in moderate to wide valleys in western Colorado. Elevation ranges from 2100-2500 m (6900-8000 feet). Stands generally occur away from the immediate streambank in moderately wide valleys on relatively dry riparian sites and along ephemeral streams and dry back channels, where surface flooding is likely infrequent (Kittel et al. 1999b, Carsey et al. 2003a). Stream channels are wide and moderately to highly sinuous (Rosgen's Channel Type: B3 and C6) (Rosgen 1996). Soils include sandy clays, silty clay loams, loamy sands, sandy loams, and highly stratified alluvium.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 108 to 150% in these stands. *Populus angustifolia* forms an open to moderately closed canopy 20-35 m high that contributes 25 to 50% cover, and the tall shrub *Crataegus rivularis* (2-5 m tall) provides 1 to 40% cover. The subcanopy layer, comprised of 10- to 20-m tall *Populus angustifolia* and *Alnus incana* saplings, provides up to 20% cover in some stands. The shrub layer is moderately diverse in terms of species composition and provides low to dense cover. Common shrubs include *Rosa woodsii* and *Ribes inerme* that provide up to 6% cover. The herbaceous layer is moderately diverse and provides moderate to dense cover, up to 50%. Graminoids common to most stands are non-native and include *Bromus inermis, Poa pratensis*, and *Agrostis gigantea*. The forbs commonly present include *Equisetum arvense, Cirsium arvense, Galium boreale, Achillea millefolium var. occidentalis*, and *Thalictrum fendleri*.

Globally

This deciduous woodland association is characterized an open to dense (10-65% cover) tree canopy dominated by *Populus angustifolia* with a dense short-shrub layer dominated by *Crataegus rivularis* (10-70% cover) (Kittel et al. 1999b, Carsey et al. 2003a). Tree canopy often includes other species, such as *Pinus ponderosa, Quercus gambelii*, and *Pseudotsuga menziesii*. The shrub canopy is usually diverse, with no single species codominant in all stands. Common shrubs include *Rosa woodsii, Ribes inerme, Amelanchier alnifolia, Cornus sericea, Dasiphora fruticosa* ssp. *floribunda, Symphoricarpos rotundifolius*, and several *Salix* species, including *Salix bebbiana, Salix ligulifolia (= Salix eriocephala var. ligulifolia)*, and *Salix monticola*. Graminoid and forb cover is typically low due to dry soil

conditions. Frequent species are *Carex praegracilis, Delphinium nuttallianum, Iris missouriensis, Juncus balticus, Maianthemum stellatum, Osmorhiza depauperata, Rudbeckia laciniata, Thalictrum fendleri*, and *Thermopsis montana*. Introduced species *Bromus inermis, Melilotus officinale, Phleum pratense, Poa pratensis* and *Taraxacum officinale* are common.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus angustifolia*
Tree subcanopy	*Populus angustifolia*
Tall shrub/sapling	*Crataegus rivularis*
Short shrub/sapling	*Cornus sericea*, *Ribes inerme*, *Rosa woodsii*
Herb (field)	*Galium boreale*, *Maianthemum stellatum, Solidago multiradiata, Thermopsis montana, Vicia americana*
Herb (field)	*Agrostis gigantea, Bromus inermis, Poa pratensis*
Herb (field)	*Equisetum arvense*

Globally

Stratum	Species
Tree (canopy & subcanopy)	*Populus angustifolia*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Bromus inermis* (exotic, High/Medium), *Cirsium arvense* (exotic noxious weed, High/Medium), *Elymus repens* (exotic noxious weed, High/Medium), *Phleum pratense* (exotic, Medium), *Poa pratensis* (exotic, Medium), *Trifolium repens* (exotic, Medium/Low); **Other**: *Phalaris arundinacea* (G5)

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: G2? (30-Dec-2000). This association is known only from 7 occurrences in the Colorado portion of the Southern Rocky Mountains. None of the occurrences are in excellent condition. Stands are stable to declining because of invasion by introduced species, continued inappropriate grazing by livestock, and lack of regeneration on more than half of the known locations. Establishment of *Populus* seedlings requires scouring flood events, and is retarded by grazing. The effects of current water management practices are unclear and need review.

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Data are not available.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: One stand has high cover of *Poa pratensis*. Sites are subject to periodic flooding and downed wood accumulation.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (5 plots: CURE.0137, CURE.0178, CURE.0256, CURE.0257, CURE.0261 and 2 observation points: CURE_AA.0039, CURE_AA.0148).
Local Description Authors: J. Von Loh
Global Description Authors: A.E. Black, mod. K.A. Schulz

REFERENCES: CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Hess and Wasser 1982, Johnston 1987, Kittel et al. 1999a, Kittel et al. 1999b, Reid 1990, Richard et al. 1996, Rosgen 1996, Western Ecology Working Group n.d.

Populus angustifolia / Invasive Perennial Grasses Semi-natural Woodland

Narrowleaf Cottonwood / Invasive Perennial Grasses Semi-natural Woodland

CODE	CEGL003749
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE (A.641)	*POPULUS ANGUSTIFOLIA* TEMPORARILY FLOODED WOODLAND ALLIANCE Narrowleaf Cottonwood Temporarily Flooded Woodland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This riparian association occurs in the foothill and lower montane zones of the Rocky Mountains extending west into the Great Basin and east onto the northern plains. Sites are between 945 and 2490 m (3100-8160 feet) elevation and are found along streams and rivers in broad valleys to narrow canyons. Stands extend onto the floodplain and stream terraces. Generally, soils are well-drained sand, loam or silt with river gravels and cobbles mixed within the matrix. This vegetation is characterized by a moderately open to closed (50-90%c over) tree canopy 10-15-m tall dominated by *Populus angustifolia*, with an understory dominated by introduced perennial grasses without a notable shrub layer. *Acer negundo, Fraxinus velutina, Populus fremontii* (in the southwestern part of range), or *Salix amygdaloides* are often present, and *Juniperus scopulorum, Juniperus monosperma,* or *Juniperus deppeana* may be common in subcanopy. Shrubs are absent or present only as scattered individuals. The moderately dense to dense herbaceous layer is frequently dominated or codominated by *Poa pratensis, Bromus inermis*, or other introduced graminoids, such as *Agrostis stolonifera, Agrostis gigantea, Alopecurus geniculatus, Elymus repens, Dactylis glomerata,* and *Phleum pratense*. Native graminoids are often present but have low cover and may include *Carex* spp., *Bromus porteri, Elymus canadensis, Elymus trachycaulus, Juncus balticus*, and *Pascopyrum smithii*. Forb diversity is moderately high but variable. The introduced invasives *Cirsium arvense, Melilotus officinalis*, and *Taraxacum officinale* are common on disturbed sites. Adjacent, lower alluvial bars may be dominated by *Salix* spp. and *Alnus* spp. and occasionally emergent wetlands. Uplands may be open grasslands and hillslopes that support mixed coniferous spruce-fir forests on north-facing aspects and pine or juniper woodlands on south-facing slopes.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled along the Gunnison River in the Neversink area of Curecanti National Recreation Area.

Globally

This riparian association is widespread in mountainous regions of the Rio Grande, Pecos, and Gila River watersheds and is widely distributed in foothills and lower montane zones throughout much of the Rocky Mountains and Intermountain West from New Mexico to Montana and Idaho extending west into the Great Basin and east onto the northern plains.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs on floodplain terraces of the Gunnison River. Sites are flat to gently sloped (0-3%), occur between 2318 and 2321 m elevation, and are oriented to all aspects. The unvegetated surface has high cover of litter and downed wood. Parent materials are Quaternary alluvium. Soils are well-drained loamy sands.

Globally
This riparian association occurs in the foothill and lower montane zones of the Rocky Mountains extending west into the Great Basin and east onto the northern plains. Sites are between 945 and 2490 m (3100-8160 feet) elevation and are found along streams and rivers in broad valleys to narrow canyons. Stands extend onto the floodplain and stream terraces. Terraces may border the channel but are elevated several meters above the stream. Consequently, the community is only periodically flooded (10- to 25-year recurrence interval). On the older elevated terraces, soils show some development (Inceptisols), with some beginning to develop a rich organic layer from decomposition and leaching of leaves and branches (Mollic Epipedons). On recently aggraded bars, soils lack development (Entisols). These soils are located closer to the active channel and therefore can be wet or moist well within rooting depth. Generally, all soils are well-drained sand, loam or silt with river gravels and cobbles mixed within the matrix.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 40 to 115% in these stands. *Populus angustifolia* trees 10-35 m tall form an open canopy and contribute a range in cover from 25 to 50%, and the non-native grasses *Bromus inermis* and *Poa pratensis* range in cover from 1 to 10% and 0 to 25%, respectively. The subcanopy layer of *Populus angustifolia* trees 5-10 m tall contributes low cover in one stand. Sapling and seedling/root sprouts of *Populus angustifolia* and *Juniperus scopulorum* trees are less than 2 m tall and together provide sparse cover. The shrub layer is absent from these stands. The herbaceous layer is diverse in terms of species composition and provides moderate to dense cover. Associated graminoids provide sparse cover and include *Juncus balticus, Elymus repens, Agrostis scabra*, and *Pascopyrum smithii*. Forbs also provide sparse cover and include *Maianthemum stellatum, Thermopsis montana, Artemisia ludoviciana, Heracleum maximum, Solidago canadensis, Achillea millefolium var. occidentalis, Thalictrum fendleri, Vicia americana*, and the non-native *Cirsium arvense*.

Globally
This riparian association is characterized by a moderately open to closed (50-90%cover) tree canopy 10-15-m tall dominated by *Populus angustifolia*, with an understory dominated by introduced perennial grasses without a notable shrub layer. *Acer negundo, Fraxinus velutina, Populus fremontii* (in southwest), or *Salix amygdaloides* are often present in the tree canopy at lower elevations and *Pinus ponderosa* at higher elevations. *Juniperus scopulorum, Juniperus monosperma*, or *Juniperus deppeana* may be common in the subcanopy. Shrubs are absent or present only as scattered individuals. Shrub species are varied and include *Acer glabrum, Crataegus douglasii, Chrysothamnus viscidiflorus, Cornus sericea* ssp. *sericea, Juniperus communis, Prunus virginiana, Ribes* spp., *Rosa woodsii, Rubus deliciosus, Salix irrorata, Salix exigua, Salix lutea, Symphoricarpos* spp., and the vine *Clematis ligusticifolia*. Sapling and seedling/root sprouts of *Populus angustifolia* and *Juniperus* spp. may also be present. The moderately dense to dense herbaceous layer is frequently dominated or codominated by *Poa pratensis, Bromus inermis*, or other introduced graminoids, such as *Agrostis stolonifera, Agrostis gigantea, Alopecurus geniculatus, Elymus repens, Dactylis glomerata*, and *Phleum pratense*. Native graminoids are often present but have low cover. Other graminoids include *Carex* spp., *Bromus porteri, Elymus canadensis, Elymus glaucus, Elymus trachycaulus, Juncus balticus*, and *Pascopyrum smithii*. Forb diversity is moderately high but variable. The most abundant forbs are *Achillea millefolium, Allium* sp., *Anemone* sp., *Artemisia ludoviciana, Chenopodium leptophyllum, Equisetum* spp., *Geranium* sp., *Galium boreale, Grindelia squarrosa, Heracleum maximum, Heterotheca villosa, Maianthemum stellatum, Pedicularis procera, Potentilla pulcherrima, Solidago canadensis, Thalictrum fendleri, Thermopsis montana*, and *Vicia americana*. The introduced invasives *Cirsium arvense, Melilotus officinalis*, and *Taraxacum officinale* are common on disturbed sites.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus angustifolia*
Tree subcanopy	*Populus angustifolia*
Herb (field)	*Maianthemum stellatum*
Herb (field)	*Bromus inermis, Juncus balticus, Poa pratensis*

Globally

Stratum	Species
Tree canopy	*Populus angustifolia*
Herb (field)	*Agrostis stolonifera*, *Bromus inermis*, *Dactylis glomerata*, *Phleum pratense*, *Poa pratensis*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Cirsium arvense* (exotic noxious weed, High/Medium), *Elymus repens* (exotic noxious weed, High/Medium)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNA (ruderal) (26-May-2004).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This *Populus angustifolia* forest association is the result of combining former *Populus angustifolia / Poa pratensis* Woodland (CEGL005963) and former *Populus angustifolia / Bromus inermis* Semi-natural Woodland (CEGL005847). It includes all *Populus angustifolia* forest stands that have a herbaceous layer dominated by introduced graminoids species and lack a shrub layer, although scattered shrubs may be present. It typically occurs as a result of heavy grazing and browsing use.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Stands are medium-aged to mature and have quite a lot of dead wood. One stand has a fire history contributing to standing dead and downed wood accumulation.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (12 observation points: CURE_AA.0026, CURE_AA.0031, CURE_AA.0045, CURE_AA.0047, CURE_AA.0058, CURE_AA.0061, CURE_AA.0065, CURE_AA.0066, CURE_AA.0067, CURE_AA.0069, CURE_AA.0074, CURE_AA.0142).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Carsey et al. 2003a, Fitzhugh et al. 1987, Hall and Hansen 1997, Hansen et al. 1995, Jones and Walford 1995, Manning and Padgett 1995, Muldavin 1991, Muldavin et al. 2000a, Padgett et al. 1989, Western Ecology Working Group n.d., Youngblood et al. 1985a, Youngblood et al. 1985b

Populus angustifolia / Prunus virginiana Woodland

Narrowleaf Cottonwood / Chokecherry Woodland

CODE	CEGL000651
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE (A.641)	*POPULUS ANGUSTIFOLIA* TEMPORARILY FLOODED WOODLAND ALLIANCE Narrowleaf Cottonwood Temporarily Flooded Woodland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This is a riparian woodland of low-elevation (1600-2500 m [5240-8200 feet]) foothills in Colorado, New Mexico, and Wyoming, along the western edge of the Great Plains and in the intermountain basins. Stands of this association occur in narrow to moderately broad stream valleys and narrow canyons in the foothills on narrow, elevated, or steeply sloping streambanks and benches. On these higher terraces, stands are infrequently flooded (10- to 100-year estimated recurrence interval). Stream channels are broad, low- to medium-gradient, and slightly sinuous. Soils are typically shallow sandy clay loams with many fine layers from fluvial deposition. The vegetation is characterized by a moderately dense (>50% cover) overstory canopy dominated by *Populus angustifolia* (or in some stands *Populus X acuminata*) with a moderately dense to very dense shrub layer dominated by *Prunus virginiana*. Other trees occasionally present with low cover include *Juniperus scopulorum, Pinus ponderosa, Pseudotsuga menziesii, Populus tremuloides*, and *Quercus gambelii*, especially at on the fringes of stands. *Acer negundo* may also be present in substantial amounts. The shrub layer may also include substantial amounts of *Acer glabrum, Alnus incana, Amelanchier alnifolia, Cornus sericea* ssp. *sericea, Betula occidentalis, Ribes* spp., *Rosa woodsii, Symphoricarpos* spp., tree saplings, and the woody vine *Parthenocissus vitacea*. *Salix* spp. are typically poorly represented or absent. *Prunus virginiana* is considered a non-obligate riparian species because it typically grows on the outer edge of the riparian area. The herbaceous cover is moderate to dense and frequently dominated by introduced perennial grasses such as *Poa pratensis, Agrostis gigantea, Agrostis stolonifera, Bromus inermis, Bromus tectorum*, and *Phleum pratense*. Native graminoids *Carex geyeri, Carex pellita, Carex praegracilis, Elymus canadensis, Elymus trachycaulus, Juncus arcticus*, and wet or mesic forbs, such as *Equisetum arvense, Galium* spp., *Hydrophyllum fendleri, Heracleum maximum*, and *Solidago canadensis*, are also common.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled in the bottom of Long Gulch within Curecanti National Recreation Area.

Globally

This foothill riparian woodland association occurs from the San Juan and Canadian river watersheds in northern New Mexico, north along the Colorado Front Range and on tributaries of the Gunnison River on the western slope of Colorado to north-central Wyoming.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs in the bottom of Long Gulch. The site is gently sloped (5%), occurs at 2642 m elevation, and is oriented to the west. The unvegetated surface has high cover of litter and low to moderate cover of large and small rocks. Downed wood is common. Parent materials are Mesozoic sandstone. Soils are moderately well-drained sandy loams.

Globally

This is a riparian woodland of low-elevation (1600-2642 m [5240-8200 feet]) foothills in Colorado, New Mexico, and Wyoming, along the western edge of the Great Plains as well as into the intermountain basins. Stands of this association occur in narrow to moderately broad stream valleys and narrow canyons in the foothills on narrow, elevated, or steeply sloping streambanks and benches. On these higher terraces, stands are infrequently flooded (10- to 100-year estimated recurrence interval) (Muldavin et al. 2000a). Stream channels are broad, low- to medium-gradient, and slightly sinuous (Girard et al. 1997, Kittel et al. 1999b, Carsey et al. 2003a). Soils are typically shallow sandy loams or sandy clay loams with many fine layers from fluvial deposition and vary from wet and rocky Fluvaquentic Endoaquolls to drier Fluventic Ustochrepts (Muldavin et al. 2000a).

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is 160% in this type. *Populus angustifolia* trees 20-35 m tall form a moderately closed stand that provides 50% cover, and the tall shrub *Prunus virginiana* provides 55% cover. A subcanopy layer of 5- to 10-m tall *Juniperus scopulorum* trees contribute sparse cover. The shrub layer is low in diversity and contributes dense cover. The tall-shrub layer provides dense cover; an additional tall shrub includes 2- to 5-m tall sapling *Populus angustifolia* trees that provide low cover. Short shrubs provide low to moderate cover and include *Amelanchier alnifolia*, *Ribes wolfii*, and *Rosa woodsii*. The herbaceous layer is low in diversity and provides dense cover. The most abundant graminoids include *Bromus inermis, Carex geyeri,* and *Poa pratensis*. Forbs providing the highest cover include *Geranium* sp. and *Taraxacum officinale*.

Globally

This riparian woodland association is characterized by a moderately dense (>50% cover) overstory canopy dominated by *Populus angustifolia* (or in some stands *Populus X acuminata*), with a moderately dense to very dense shrub layer dominated by *Prunus virginiana*. Other trees occasionally present with low cover include *Juniperus scopulorum, Pinus ponderosa, Pseudotsuga menziesii, Populus tremuloides*, and *Quercus gambelii*, especially on the fringes of stands. *Acer negundo* may also be present in substantial amounts. The shrub layer may also include substantial amounts of *Acer glabrum, Alnus incana, Amelanchier alnifolia, Cornus sericea* ssp. *sericea, Betula occidentalis, Ribes* spp., *Rosa woodsii, Symphoricarpos* spp., tree saplings, and the woody vine *Parthenocissus vitacea*. *Salix* spp. are typically poorly represented or absent. *Prunus virginiana* is considered a non-obligate riparian species because it typically grows on the outer edge of the riparian area. The herbaceous cover is moderate to dense and frequently dominated by introduced grasses, such as *Poa pratensis, Agrostis gigantea, Agrostis stolonifera, Bromus inermis, Bromus tectorum*, and *Phleum pratense*. Native graminoids *Carex geyeri, Carex pellita, Carex praegracilis, Elymus canadensis, Elymus trachycaulus, Juncus arcticus*, and wet or mesic forbs, such as *Equisetum arvense, Galium* spp., *Hydrophyllum fendleri, Heracleum maximum*, and *Solidago canadensis*, are also common.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus angustifolia*
Tall shrub/sapling	*Prunus virginiana*
Short shrub/sapling	*Rosa woodsii*
Herb (field)	*Poa pratensis*

Globally

Stratum	Species
Tree canopy	*Populus angustifolia*
Tall shrub/sapling	*Prunus virginiana*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Bromus inermis* (exotic, High/Medium), *Poa pratensis* (exotic, Medium)

Globally

Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G2Q (30-Nov-1998). The range of this association apparently extends from central Colorado, north to north-central Wyoming, a distance of ca. 400 miles. So far, the range appears very narrow (<100 miles) from east to west. Exotic species (especially *Poa pratensis* and *Agrostis stolonifera*) are common in the herbaceous layer of the stands described to date. Stands in Colorado are threatened by development and alterations in stream flow. The rank has been changed from G2G3 to G2Q based on the assumptions that the range of this association contains about a dozen stands, and that a high proportion of those stands face little threat because they grow in inaccessible locations. The "Q" portion is based on the uncertainty about whether the Wyoming stands and the Colorado stands belong to the same association, as well as some uncertainty about the range and number of stands.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This type is similar to some stands of *Populus angustifolia / Cornus sericea* Woodland (CEGL002664), *Acer negundo - Populus angustifolia / Cornus sericea* Forest (CEGL000627), and *Populus angustifolia - Acer negundo* Woodland (CEGL005992), when stands include patches of *Prunus virginiana* or are codominated by *Acer negundo*. The type needs further survey and classification work to insure it is distinct from these other similar association. Medina (1986) describes a *Populus angustifolia / Prunus serotina - Salix bonplandiana* community type from southern New Mexico which shares some similarities to this type.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Site is heavily grazed and has livestock trails, compacted soil, and non-native plant species.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0157).
Local Description Authors: J. Von Loh
Global Description Authors: G.P. Jones, mod. E. Muldavin, K.A. Schulz, K.S. King

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Driscoll et al. 1984, Girard et al. 1997, Gom and Rood 1999, Jones 1992b, Kittel et al. 1999a, Kittel et al. 1999b, Marriott and Jones 1989, Medina 1986, Muldavin et al. 2000a, Walford 1996, Western Ecology Working Group n.d.

Populus angustifolia / Quercus gambelii Woodland

Narrowleaf Cottonwood / Gambel Oak Woodland

CODE	CEGL002804
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE (A.641)	*POPULUS ANGUSTIFOLIA* TEMPORARILY FLOODED WOODLAND ALLIANCE Narrowleaf Cottonwood Temporarily Flooded Woodland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This association is only known from Curecanti National Recreation Area in western Colorado. The single sampled stand occurs at the bottom of McIntyre Gulch. The site is gently sloped (8%) with an eastern aspect and occurs at 2314 m elevation. Soil is a moderately well-drained silty clay loam. There is high cover of litter and low cover of bare soil on the ground surface. The vegetation is characterized by a moderately closed tree canopy (about 50% cover), dominated by *Populus angustifolia* trees 20-35 m tall and a moderately dense tall-shrub layer (2-5m tall), with over 10% cover of *Quercus gambelii*. Other tall shrubs present may include *Amelanchier alnifolia, Rhus trilobata*, and *Lonicera involucrata*. Short shrubs are diverse, provide moderate cover, and include *Rosa woodsii, Juniperus communis, Juniperus scopulorum, Mahonia repens, Dasiphora fruticosa* ssp. *floribunda (= Pentaphylloides floribunda)*, and *Symphoricarpos rotundifolius*. Seedling *Quercus gambelii* are also present and provide sparse cover. The herbaceous layer is moderately diverse and provides low cover.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled in the bottom of McIntyre Gulch within Curecanti National Recreation Area.

Globally

This association is only known from Curecanti National Recreation Area in western Colorado. More sampling is needed in the southern Rocky Mountains and Colorado Plateau to determine the full extent of this type.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs in the bottom of McIntyre Gulch. The site is gently sloped (8%), occurs at 2314 m elevation, and is oriented to an eastern aspect. The unvegetated surface has high cover of litter and low exposure of bare soil. Downed wood is common. Parent materials are mixed Quaternary landslide deposits. Soils are moderately well-drained silty clay loams.

Globally

Data are not available.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is 109% in the one sampled stand. *Populus angustifolia* trees 20-35 m tall form a moderately closed to closed canopy that provides 50% cover, and *Quercus gambelii* tall and short shrubs provide 16% cover. A subcanopy layer of 5- to 10-m tall *Populus angustifolia* and *Juniperus scopulorum* trees contribute sparse cover. The shrub layer is diverse in terms of species composition and provides moderate cover. The tall-shrub layer is characterized by 2- to 5-m tall *Amelanchier alnifolia, Rhus trilobata*, and *Lonicera involucrata* that provide sparse cover. Short shrubs are diverse, provide moderate cover, and include *Rosa woodsii, Juniperus communis, Juniperus scopulorum, Mahonia repens, Dasiphora fruticosa* ssp. *floribunda (= Pentaphylloides floribunda)*, and *Symphoricarpos rotundifolius*. Seedling *Quercus gambelii* are also present and provide sparse cover. The herbaceous layer is moderately diverse and provides low cover. Graminoids provide sparse cover and include the non-natives *Bromus inermis* and *Poa pratensis* and the natives *Elymus elymoides* and *Poa fendleriana*. Forbs provide sparse to low cover and include *Maianthemum stellatum* and *Galium boreale*.

Globally

Data are not available.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus angustifolia*
Tall shrub/sapling	*Quercus gambelii*
Short shrub/sapling	*Juniperus communis*
Short shrub/sapling	*Rosa woodsii*, *Symphoricarpos rotundifolius*
Herb (field)	*Galium boreale, Maianthemum stellatum*

Globally

Stratum	Species
Tree canopy	*Populus angustifolia*
Tall shrub/sapling	*Quercus gambelii*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus inermis* (exotic, High/Medium), *Poa pratensis* (exotic, Medium)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (27-Jun-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association has only been sampled from one location in Curecanti National Recreation Area in western Colorado. More survey and classification work are needed to change the provisional status of this association.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Stand occupies a small tributary to the Gunnison River and contains large, old *Populus angustifolia* trees.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 observation point: CURE_AA.0239).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Populus angustifolia / Rhus trilobata Woodland

Narrowleaf Cottonwood / Skunkbush Sumac Woodland

CODE	CEGL000652
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE (A.641)	*POPULUS ANGUSTIFOLIA* TEMPORARILY FLOODED WOODLAND ALLIANCE Narrowleaf Cottonwood Temporarily Flooded Woodland Alliance
ECOLOGICAL SYSTEM(S):	Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland (CES304.045) Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This deciduous riparian woodland occurs on dry upper stream terraces of perennial streams and on lower terraces or banks of intermittent stream courses in the mountains, canyons and plateaus of Utah, Colorado, Wyoming and Idaho. This community is one of the drier *Populus angustifolia* plant associations and rarely floods. Elevations range from 1360 to 2400 m (4265-7875 feet), with lower stands occurring in Idaho and higher stands at the southern end of the range. Slopes are gentle, and the lack of flooding is indicated by the fact that downed wood and litter cover most of the unvegetated ground surface. Substrates are well-drained, rocky alluvium. The association has an open upper tree canopy that is dominated by *Populus angustifolia* or *Populus X acuminata*. Other tree species in the canopy and subcanopy may include *Acer negundo, Populus deltoides, Pinus ponderosa, Pinus edulis*, and *Juniperus* spp. Tall shrubs, such as *Betula occidentalis, Prunus virginiana, Amelanchier utahensis, Salix monticola, Crataegus rivularis*, and *Quercus gambelii*, form an open layer. A moderately dense to dense short-shrub layer dominated by *Rhus trilobata* is diagnostic of this type. *Cornus sericea, Rosa woodsii, Symphoricarpos oreophilus, Artemisia tridentata, Chrysothamnus viscidiflorus, Ericameria parryi, Ribes montigenum, Forestiera pubescens, Berberis fendleri, Crataegus rivularis*, and *Symphoricarpos* spp. may also be present. The herbaceous layer is generally sparse but may be dense in openings where introduced grasses such as *Poa pratensis, Phragmites australis, Dactylis glomerata, Bromus inermis*, or *Bromus tectorum* may dominate. Introduced forbs may include *Cynoglossum officinale, Carduus nutans, Cirsium arvense, Melilotus officinalis*, or *Taraxacum officinale*. Common native forbs include *Maianthemum stellatum* and *Glycyrrhiza lepidota*, and the vine *Clematis ligusticifolia* is abundant in some stands. The mix of riparian and upland species indicates that this association occurs on riparian terraces that are in the process of becoming isolated from the water table. Over time as the stand continues to dry out, the more mesic species, such as *Betula occidentalis, Salix monticola*, and *Cornus sericea*, will be replaced by additional upland species.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled near the bottom of Saddle Creek and at the Blue Mesa Reservoir shoreline near the Windsurfing turnout within Curecanti National Recreation Area.

Globally

This riparian woodland occurs locally in small stands in the mountains and canyons of Utah, Wyoming, Colorado and Idaho. It is likely to occur along any perennial tributary stream where low gradients allow for the development of cottonwood gallery forests.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This woodland association occurs on toeslopes of drainages and on the Blue Mesa Reservoir shoreline. Sites are nearly level (2% slope), occur between 2307 and 2312 m elevation, and are oriented to the southwest. The unvegetated surface has moderately high litter cover and low to high cover by large and small rocks. Exposure of bare soil can be high. Downed wood is common to abundant. Parent materials are Quaternary alluvium. Soils are well-drained sandy loams and silty clay loams.

Globally

This deciduous riparian woodland occurs on toeslopes and upper stream terraces of perennial streams and on lower terraces or banks of intermittent stream courses in the mountains, canyons and plateaus of Utah, Colorado, Wyoming and Idaho. This community is one of the drier *Populus angustifolia* plant associations and rarely floods. Elevations range from 1360 to 2400 m (4265-7875 feet), with lower stands occurring in Idaho and higher stands at the southern end of the range in western Colorado and eastern Utah. Slopes are gentle, not exceeding 10%. The major components covering the unvegetated ground surface include litter, large rocks and downed wood. Substrates are well-drained, rocky alluvium poorly developed into sandy loam and clay loam soils.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is 57 to 79% in these stands. *Populus angustifolia* trees 10-20 m tall form an open canopy providing 8 to 30% cover, with *Populus deltoides* ssp. *wislizeni* trees contributing 10% cover in one stand, and the tall shrub *Rhus trilobata* providing 1 to 7% cover. A subcanopy layer of 5- to 15-m tall *Populus angustifolia* and *Juniperus scopulorum* trees contributes sparse to low cover. The shrub layer is diverse in terms of species

composition and provides low to moderate cover. The tall-shrub layer (2-5 m tall) provides moderate cover and includes *Prunus virginiana, Populus angustifolia, Amelanchier utahensis, Salix monticola,* and *Crataegus rivularis*. Short and dwarf-shrubs provide sparse to low cover and include *Artemisia tridentata* ssp. *wyomingensis, Artemisia tridentata* ssp. *vaseyana, Juniperus scopulorum, Chrysothamnus viscidiflorus, Ericameria parryi, Rosa woodsii*, and *Ribes montigenum*. The herbaceous layer is moderately diverse and provides low cover. The non-native grass *Poa pratensis* provides up to 15% cover, while the mixed non-natives and natives *Agropyron cristatum, Bromus inermis, Carex geyeri, Carex utriculata, Elymus elymoides, Pascopyrum smithii*, and *Poa fendleriana* provide sparse cover. Forbs are relatively diverse, but no species contributed more than sparse cover, including *Artemisia frigida, Carduus nutans, Cirsium arvense, Erigeron* sp., *Grindelia squarrosa, Lupinus argenteus, Maianthemum stellatum, Phlox* sp., and *Tanacetum vulgare*.

Globally
The association has an open upper tree canopy that is dominated by *Populus angustifolia* or *Populus X acuminata*. Other tree species in the canopy and subcanopy may include *Acer negundo, Populus deltoides, Pinus ponderosa, Pinus edulis, Juniperus scopulorum*, and *Juniperus osteosperma*. Tall shrubs, such as *Betula occidentalis, Prunus virginiana, Amelanchier utahensis, Salix monticola, Crataegus rivularis*, and *Quercus gambelii*, form an open layer. A moderately dense to dense short-shrub layer dominated by *Rhus trilobata* is diagnostic of this type. *Cornus sericea, Rosa woodsii, Symphoricarpos oreophilus, Artemisia tridentata, Chrysothamnus viscidiflorus, Ericameria parryi, Ribes montigenum, Forestiera pubescens, Berberis fendleri, Crataegus rivularis*, and *Symphoricarpos* spp. may also be present. The herbaceous layer is generally sparse but may be dense in openings where introduced grasses such as *Poa pratensis, Phragmites australis, Dactylis glomerata, Bromus inermis*, or *Bromus tectorum* may dominate. Introduced forbs may include *Cynoglossum officinale, Carduus nutans, Cirsium arvense, Melilotus officinalis*, or *Taraxacum officinale*. Common native forbs include *Maianthemum stellatum* and *Glycyrrhiza lepidota*. The vine *Clematis ligusticifolia* is abundant in some stands.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus angustifolia*
Tall shrub/sapling	*Prunus virginiana, Rhus trilobata*
Herb (field)	*Poa pratensis*

Globally

Stratum	Species
Tree canopy	*Populus angustifolia*
Tall shrub/sapling	*Rhus trilobata*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Agropyron cristatum* (exotic, Medium/Low), *Bromus inermis* (exotic, High/Medium), *Carduus nutans* (exotic noxious weed, High/Low), *Cirsium arvense* (exotic noxious weed, High/Medium), *Poa pratensis* (exotic, Medium)

Globally
Exotic/Invasive: *Bromus inermis* (exotic, High/Medium), *Carduus nutans* (exotic, High/Low), *Cirsium arvense* (exotic, High/Medium), *Melilotus officinalis* (exotic, Medium/Low), *Poa pratensis* (exotic, Medium)

CONSERVATION STATUS RANK
Global Rank & Reasons: G3 (27-Dec-1999). This riparian woodland is uncommon and occurs locally throughout much of its range. There are more than 20 occurrences estimated for this type rangewide. Although this association appears stable, the condition of high-quality occurrences is extremely threatened. Development, heavy recreational use, expansion and maintenance of roads and railroads, improper grazing, and modification of the hydrologic processes threaten this community with the introduction of non-native species, accelerated erosion, and damage to native vegetation. Hydrologically modified streams may lack the processes necessary to regenerate the *Populus angustifolia* tree canopy.

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: One stand was disturbed by ditch construction, and the other has driftwood from past flooding of the site.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0240, CURE.0246).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz, mod. J. Coles

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Driscoll et al. 1984, IDCDC 2005, Jones 1992b, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Manning and Padgett 1995, Padgett et al. 1988b, Padgett et al. 1989, Richard et al. 1996, Walford 1996, Western Ecology Working Group n.d.

Populus angustifolia / Salix exigua Woodland

Narrowleaf Cottonwood / Coyote Willow Woodland

CODE	CEGL000654
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE (A.641)	*POPULUS ANGUSTIFOLIA* TEMPORARILY FLOODED WOODLAND ALLIANCE Narrowleaf Cottonwood Temporarily Flooded Woodland Alliance

ECOLOGICAL SYSTEM(S): North American Warm Desert Lower Montane Riparian Woodland and Shrubland (CES302.748)
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY
Globally
The type is widespread in mountainous regions of the San Juan, Pecos, and Rio Grande river basins in northern and central New Mexico and widely distributed throughout the Rocky Mountain region and Intermountain West. It is found in wide to narrow valleys at mid- to upper elevations from 1670 to 2360 m (5480-7750 feet). It occurs on streamside alluvial bars that border perennial rivers and intermittent streams of low to moderate gradients (0.7-2.8%). In Colorado, this riparian woodland occupies point bars, gravel bars, benches and low areas that are flooded annually. It is a very common plant community of young seedling and sapling *Populus angustifolia* intermixed with *Salix exigua*. Sites are typically flooded every five years, sometime more often, and most are within the 25-year floodplain. Stream channel materials are usually coarse and comprised of cobbles or gravel. Soils are young and weakly developed Entisols with wet (aquic) conditions within the top 50 cm or at least within rooting depth. They are well-drained sands and sandy loams mixed with gravels and cobbles. This type is characterized by middle-aged stands of *Populus angustifolia* in an open upper canopy, with a shrubby understory dominated by *Salix exigua*. *Populus angustifolia* saplings (derived from root sprouts) are common beneath the canopy. Other shrubs

such as *Salix irrorata* may be well-represented but clearly subordinate to *Salix exigua*. The herbaceous layer is very diverse, with 98 species recorded for the type, 23 of which are native wetland indicators.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This uncommon association was sampled in the floodplain at Cooper Ranch picnic area on the west side of the Gunnison River in the Curecanti National Recreation Area.

Globally
This association is widespread in mountainous regions of the San Juan, Pecos, and Rio Grande river basins in northern and central New Mexico and widely distributed throughout the Rocky Mountain region and Intermountain West.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This woodland association occurs within river floodplains often on gravel bars. Sites are nearly flat and occur at 2313 m elevation. The unvegetated ground surface is variable with one site having high cover of litter and low cover of bare ground; the other site has the reverse. There was about 20% cover of rocks on the site with high cover of bare ground.

Globally
The type is found in wide valleys to narrow canyons at mid to upper elevations from 1670 to 2360 m (5480-7750 feet). It occurs on streamside alluvial bars that border perennial rivers and intermittent streams of low to moderate gradients (0.7-2.8%). In the Colorado Plateau, some stands occupy canyon alcoves. Sites are typically flooded every five years, sometime more often, and most are within the 25-year floodplain. Stream channel materials are usually coarse and comprised of cobbles or gravel. Soils are young and weakly developed Entisols with wet (aquic) conditions within the top 50 cm or at least within rooting depth. They are well-drained sands and sandy loams mixed with gravels and cobbles.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This riparian association is characterized by an open to moderately dense (20-50% cover) tree canopy of *Populus angustifolia* and open (20-30% cover) tall-shrub layer dominated by *Salix exigua*. *Alnus incana* may also be present. Depending on hydrologic conditions and canopy closure, the herbaceous layer may be sparse to dense and is generally highly diverse. Some dominant species in these wet conditions include *Carex utriculata* and the introduced species *Agrostis stolonifera* and *Bromus inermis*.

Globally
This type is characterized by middle-aged stands of *Populus angustifolia* in an open upper canopy, with a shrubby understory dominated by *Salix exigua*. *Populus angustifolia* saplings (derived from root sprouts) are common beneath the canopy. The canopy may contain individuals of *Populus deltoides* ssp. *deltoides* or *Acer negundo*. Other shrubs, such as *Salix irrorata* or *Salix monticola*, may be well-represented but clearly subordinate to *Salix exigua*. Depending on hydrologic conditions and canopy closure, the herbaceous layer may be sparse to dense and is generally highly diverse, with 98 species recorded for the type, 23 of which are native wetland indicators. The most common and abundant native wetland species are *Eleocharis palustris, Juncus balticus, Juncus saximontanus, Equisetum arvense, Equisetum laevigatum, Epilobium ciliatum, Prunella vulgaris, Schoenoplectus pungens (= Scirpus pungens)*, and *Schoenoplectus tabernaemontani (= Scirpus tabernaemontani)*. The most consistent grass is the introduced *Agrostis stolonifera* or *Agrostis gigantea*. Other forb species can also be prevalent, including *Melilotus officinalis, Glycyrrhiza lepidota*, and *Xanthium strumarium*.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Populus angustifolia, Populus deltoides* ssp. *wislizeni*
Tall shrub/sapling	*Salix exigua*
Herb (field)	*Carex utriculata*

Globally

Stratum	Species
Tree canopy	*Populus angustifolia*
Tall shrub/sapling	*Salix exigua*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Agrostis stolonifera* (weedy native, Medium/Low), *Bromus inermis* (exotic, High/Medium)

Globally
Vulnerable: *Cirsium ownbeyi* (vulnerable, G3); **Exotic/Invasive**: *Agrostis gigantea* (exotic, Medium/Low), *Melilotus officinalis* (exotic, Medium/Low)

CONSERVATION STATUS RANK
Global Rank & Reasons: G4 (7-Apr-1998).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Several other *Salix* species may be present, and the canopy may have other species of *Populus* as well.

The community is widely distributed on younger depositional bars of moderate-sized streams with unregulated flows and few diversions. Since the stands are well-adapted to flooding, they are well-suited for streambank stabilization. Typically found in wider valleys where ranches and livestock are common, the coarse-textured soils are not susceptible to compaction. However, the streamside location of these stands makes them prone to heavy usage by livestock. Without careful management, woody components such as saplings and shrubs decrease. Under continuous pressure from grazing, these stands have limited self-sustainability and are eventually replaced by non-cottonwood-dominated stands prone to streambank erosion. Managers should maintain a buffer strip of cottonwoods along streambanks to avoid erosion. When grazing pressure is lessened, regrowth of cottonwoods is rapid, riparian shrubs return, and streambanks become more stable. In addition, species diversity and wildlife habitat increase. *Populus angustifolia* and *Salix exigua* are obligate riparian species which require flooding for reproduction, growth, and maintenance. Depending on the depth of the water table, these stands will respond positively to fire disturbance with rapid regrowth. Both species are highly palatable to beaver and livestock, and potential usage is high.

Medina (1986) described a *Populus acuminata / Salix exigua* community type in southwestern New Mexico that is very similar to this one. A *Populus angustifolia / Salix exigua* Subseries has been identified by the U.S. Forest Service's Terrestrial Ecosystem Survey for northern New Mexico (Stuever and Hayden 1997a). This type has been well-documented in Colorado (Ramaley 1942, Woodbury et al. 1961, Hess 1981, Baker 1984a, Hess and Alexander 1986, Johnston 1987, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1996) and in Nevada (Manning and Padgett 1995).

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data collected during accuracy assessment (2 observation points: CURE_AA.0077, CURE_AA.0098).
Local Description Authors: K.A. Schulz
Global Description Authors: E. Muldavin et al., mod. J. Coles

REFERENCES: Baker 1984a, Beidleman 1954, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, DeLeuw, Cather & Company 1977, Driscoll et al. 1984, Durkin et al. 1994b, Durkin et al. 1995a, Hess 1981, Hess and Alexander 1986, Johnston 1987, Keammerer 1974a, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1996, Kittel et al. 1997a, Kittel et al. 1999a, Kittel et al. 1999b, Manning and Padgett 1995,

Medina 1986, Muldavin et al. 2000a, Ramaley 1942, Richard et al. 1996, Stuever and Hayden 1997a, Western Ecology Working Group n.d., Woodbury et al. 1961

Ceanothus velutinus Shrubland

Tobacco-brush Shrubland

CODE	CEGL002167
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
FORMATION	Sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.c.)
ALLIANCE	*CEANOTHUS (FENDLERI, VELUTINUS)* SHRUBLAND ALLIANCE (A.787) (Fendler's Buckbrush, Tobacco-brush) Shrubland Alliance
ECOLOGICAL SYSTEM(S):	Rocky Mountain Lodgepole Pine Forest (CES306.820) Rocky Mountain Aspen Forest and Woodland (CES306.813) Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland (CES306.823)
USFWS WETLAND SYSTEM:	Not applicable

CONCEPT SUMMARY

Globally

Patches of this early-seral shrubland occur on montane slopes in western Colorado, northwestern Wyoming and the Black Hills of South Dakota, although it is likely to be more common and widespread than is currently reported. Stands have been recorded above 1400 m (4500 feet) elevation in South Dakota and as high as 2690 m (8825 feet) in western Colorado. Typical occurrences are an acre or two in size and are somewhat isolated, as they are usually part of a mosaic of post-burn vegetation types. Sites range from moderate to steep (14-73% slope) and tend to prefer cooler north or east aspects. Parent materials are variable, and soils are well-drained, rocky and generally coarse in texture. *Ceanothus velutinus* is a slow-growing shrub; it may take 20 years following fire before the shrub will dominate a stand. The vegetation in mature stands is dominated by a uniform layer of 1- to 2-m tall shrubs. *Ceanothus velutinus* is the major dominant, although there may be a few scattered *Spiraea betulifolia, Symphoricarpos* spp., *Mahonia repens, Artemisia tridentata, Cercocarpus* spp., *Rosa* spp., *Amelanchier* sp., and *Prunus virginiana*, among others. A variety of herbaceous species may be present, including *Carex geyeri, Achnatherum* spp., *Hesperostipa comata, Elymus* spp., *Heterotheca villosa, Balsamorhiza sagittata, Eriogonum umbellatum, Geranium viscosissimum, Thalictrum* sp., and *Campanula rotundifolia*, and may occur in the looser "openings" in the shrub layer, but *Ceanothus velutinus* can form a dense canopy and shade out the ground layer. Seedlings and saplings of *Populus tremuloides* or *Pseudotsuga menziesii* may have nearly as much cover as the shrub layer.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled along Crystal Trail in the Curecanti National Recreation Area.

Globally

This shrubland is found in the Black Hills of South Dakota, western Colorado and northwestern Wyoming. It is likely to be locally abundant throughout the Rocky Mountains.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This short-shrub association occurs on mesa slopes. The site is moderately steep (38% slope), occurs at 2691 m elevation, and is oriented to the north. The unvegetated surface has high cover of litter. Downed wood is common. Parent materials are metamorphic/granitic rocks. Soils are rapidly drained.

Globally
Patches of this early-seral montane shrubland occur on mesic slopes and mountains in western Colorado, northwestern Wyoming and the Black Hills of South Dakota. Stands have been recorded above 1400 m (4500 feet) elevation in South Dakota and as high as 2690 m (8825 feet) in western Colorado. Typical occurrences are an acre or two in size and are somewhat isolated, as they are usually part of a mosaic of post-burn vegetation types. Sites range from moderate to steep (14-73% slope) and tend to prefer cooler north or east aspects. Parent materials are variable, and soils are well-drained, rocky and generally coarse in texture.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is 125% in this shrubland type. A layer composed of sapling *Populus tremuloides* and *Pseudotsuga menziesii* trees contribute 10 to 25% and less than 10% cover, respectively, and represent the forest recovering from fire. Seedling *Pseudotsuga menziesii* trees are also present providing sparse cover. The shrub layer is low in diversity and provides moderate to dense cover. *Ceanothus velutinus* forms a closed canopy that contributes more than 75% cover. Other short and dwarf-shrubs include *Amelanchier utahensis, Artemisia tridentata* ssp. *vaseyana, Mahonia repens*, and *Symphoricarpos rotundifolius*. The herbaceous layer is low in diversity and contributes moderate cover. Graminoids provide moderate cover and include *Carex geyeri* and *Elymus trachycaulus*. Forbs provide sparse cover and include *Arabis drummondii* and *Solidago* sp.

Globally
Ceanothus velutinus is a slow-growing shrub; it may take 20 years following fire before the shrub will dominate a stand. The vegetation is dominated by a uniform layer of 1- to 2-m tall shrubs. *Ceanothus velutinus* is the major dominant, although there may be a few scattered *Spiraea betulifolia, Symphoricarpos* spp., *Mahonia repens, Artemisia tridentata, Cercocarpus* spp., *Rosa* spp., *Amelanchier* sp., and *Prunus virginiana*, among others. A variety of herbaceous species may be present, including *Carex geyeri, Achnatherum* spp., *Hesperostipa comata, Elymus* spp., *Heterotheca villosa, Balsamorhiza sagittata, Eriogonum umbellatum, Geranium viscosissimum, Thalictrum* sp., and *Campanula rotundifolia*, and may occur in the looser "openings" in the shrub layer, but *Ceanothus velutinus* can grow together quite densely and shade out the ground layer. In mature stands, seedlings and saplings of the regenerating aspen or Douglas-fir forest may have nearly as much cover as the shrub layer.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Ceanothus velutinus*
Herb (field)	*Mahonia repens*
Herb (field)	*Carex geyeri*

Globally

Stratum	Species
Short shrub/sapling	*Ceanothus velutinus*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (3-Oct-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally

Most of the major habitat typing studies in the western U.S. do not characterize seral types, so it should not be any surprise that this type is poorly described and sampled. The alliance and association concepts remain somewhat tentative and need review as more data become available. This type is likely to be widespread in the Rocky Mountains of Colorado, Wyoming and Montana, but was originally described from observations by D. Ode (pers. comm. 1999) at three sites in the Black Hills: (1) on the northwest-facing top slope of Terry Peak, present since at least the 1960s; (2) on north-facing slopes of Mt. Theodore Roosevelt located just north of Deadwood; and (3) in a powerline corridor near Spearfish Peak above Spearfish Canyon. The biggest stands might be in the Bear Lodge, but the largest seen is 2-3 acres on Terry Peak, surrounded by aspen; it generally does not occur under the aspen.

Thilenius (1971) reports *Ceanothus velutinus* in his *Populus tremuloides / Spiraea betulifolia / Lathyrus ochroleucus* type as having a constancy of 25%, compared with much higher constancies (>85%) for *Spiraea betulifolia* and *Symphoricarpos albus* (H. Marriott pers. comm. 1999). Thilenius (1971) also describes a *Ceanothus velutinus* shrubland type on old forest burns in the Igneous Cone area of the northern Hills (this refers to the zone of Tertiary igneous features (knobs, buttes, etc.). It also occurs under the *Pinus ponderosa* canopy on unburned sites in the region. It is difficult to know from his report how significant these stands are and whether they constitute an association, as he also recognizes *Pinus flexilis* and *Pinus contorta* types for the Black Hills, both of which are really only minor (though unusual) species populations in other *Pinus ponderosa* types.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Stand resulted from a 1974 fire.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0151).
Local Description Authors: J. Von Loh
Global Description Authors: D. Ode, mod. D. Faber-Langendoen, G. Kittel, J. Coles

REFERENCES: Anderson 2001a, Marriott pers. comm., Midwestern Ecology Working Group n.d., Ode pers. comm., Thilenius 1971

Artemisia nova / Poa fendleriana Shrubland

Black Sagebrush / Muttongrass Shrubland

CODE	CEGL002698
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA NOVA* SHRUBLAND ALLIANCE (A.1105) Black Sagebrush Shrubland Alliance
ECOLOGICAL SYSTEM(S):	Great Basin Xeric Mixed Sagebrush Shrubland (CES304.774) Colorado Plateau Mixed Low Sagebrush Shrubland (CES304.762) Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This short-shrub association occurs locally in southern Utah and western Colorado on the slopes and tops of ridges and plateaus, as well as the sides of drainages. Stands are usually small to medium-sized patches in a mosaic of other types of shrubland. Elevations range from 1830 to 3000 m (6000-9840 feet). Stands occur on gentle to moderately steep slopes with a tendency toward north and east aspects. Soils and substrates are variable but generally are rocky and shallow. The vegetation is characterized by a shrub layer dominated by *Artemisia nova* with

between 5 and 25% cover; associated species such as *Amelanchier utahensis, Artemisia tridentata, Tetradymia canescens, Symphoricarpos oreophilus*, and *Purshia tridentata* contribute another 10-25%. The herbaceous layer is diverse, but *Poa fendleriana* is among the dominants with between 5 and 20% cover. Other common grasses include *Koeleria macrantha, Bouteloua gracilis, Elymus elymoides*, and *Poa secunda*. Forbs contribute relative little cover and are inconsistent among sites.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is common in the park and recreation area and was sampled between the "Bay of Chickens" and Elk Creek Campground, near South Willow Creek along Powerline Road, above Steuben Creek, on mesas west of South Willow Creek, in side drainages of Willow Creek near State Highway 149, on the south shore of Iola Landing across from Sometimes Isle, north of the Recreation Ranch, opposite Cooper's Ranch, on Haystack Mesa, on Dry Creek Mesa, on Dillon Mesa, in Cebolla Campground, in Kezar Basin, along Dry Creek East, opposite Rainbow Lake Road, east of Dry Creek, and at a site called the "Inlet" in Curecanti National Recreation Area.

Globally

This association has been documented from Zion and Capitol Reef national parks in southern Utah and from Curecanti National Recreation Area in western Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This short-shrub association occurs on active slopes and the sides of drainages, gullies, shoulders, and mesas, as well as on ridgetops and mesatops. Sites are gently sloped to moderately steep (3-35% slopes), occur between 2305 and 2998 m elevation, and are oriented to nearly all aspects, although there is a slight tendency toward a northwestern aspect. The unvegetated surface has low cover of litter. Large and small rocks and exposure of bare soil comprise most of the unvegetated surface. Parent materials are Tertiary volcanic rocks, metamorphic/granitic rocks, Mesozoic sandstone and shale, and Quaternary alluvial deposits. Soils are rapidly drained silty clay loams, silty loams, sandy clays, sandy clay loams, sandy loams and sands.

Globally

This short-shrub association occurs locally in southern Utah and western Colorado on the slopes and tops of ridges, mesas and plateaus, as well as the sides of drainages. Elevations range from 1830 to 3000 m (6000-9840 feet). Stands occur on gentle to moderately steep slopes (3-35%) with a tendency toward north and east aspects. Soils and substrates are variable but generally are rocky and shallow, with bare ground, gravel and rock providing a high percentage of the unvegetated ground cover. There is a slight tendency for *Artemisia nova* shrublands to occur on calcareous substrates such as limestone, marlstone and some types of volcanic rock.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 30 to 90% in this shrubland association. *Artemisia nova* forms open to closed-canopy stands and provides 5 to 85% cover. Other short- and dwarf-shrub species that contribute low to moderate cover include *Amelanchier utahensis, Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus depressus, Gutierrezia sarothrae, Purshia tridentata*, and *Symphoricarpos oreophilus*, as well as the succulents *Opuntia polyacantha, Pediocactus simpsonii*, and *Yucca harrimaniae*. The herbaceous layer is diverse in terms of species composition and provides low to moderate cover. Common perennial grasses provide low to moderate cover and include *Achnatherum pinetorum, Poa fendleriana, Elymus elymoides*, and *Poa secunda*. Forbs are diverse but typically provide sparse cover and include *Erigeron concinnus, Penstemon teucrioides, Phlox hoodii*, and *Stenotus armerioides*. Moss and lichens (crustose and foliose) are present on rocks, on soil crusts, and are loose on the soil and provide up to 25% cover.

Globally

This short-shrub association occurs in small patches, usually surrounded by other types of shrublands. Total vegetation cover ranges from 10 to 60%. The shrub layer is dominated by *Artemisia nova* with between 5 and 25% cover; associated species such as *Amelanchier utahensis, Artemisia tridentata, Tetradymia canescens, Symphoricarpos oreophilus*, and *Purshia tridentata* contribute another 10-25%. The herbaceous layer is diverse, but *Poa fendleriana* is among the dominants with between 5 and 20% cover. Other common grasses include *Koeleria*

macrantha, *Bouteloua gracilis*, *Elymus elymoides*, and *Poa secunda*. Forbs contribute relative little cover and are inconsistent among sites.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia nova*, *Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Koeleria macrantha*, *Poa fendleriana*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia nova*
Herb (field)	*Poa fendleriana*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus tectorum* (exotic, High)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (14-Aug-2001).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association may be a southern analogue of *Artemisia nova / Pseudoroegneria spicata* Shrubland (CEGL001424), which is common from northwestern Colorado north through Wyoming and the Columbia Basin.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Occurs as small, homogenous stands on rocky sites.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (22 plots: CURE.0010, CURE.0015, CURE.0016, CURE.0052, CURE.0056, CURE.0061, CURE.0064, CURE.0065, CURE.0089, CURE.0097, CURE.0121, CURE.0123, CURE.0149, CURE.0161, CURE.0239, CURE.0272, CURE.0284, CURE.0326, CURE.0330, CURE.0345, CURE.0367, CURE.0368 and 14 observation points: BLCA_AA.731, CURE_AA.0198, CURE_AA.0219, CURE_AA.0245, CURE_AA.0365, CURE_AA.0379, CURE_AA.0568, CURE_AA.0628, CURE_AA.0635, CURE_AA.0717, CURE_AA.0960, CURE_AA.0995, CURE_AA.0998, CURE_AA.1036).
Local Description Authors: J. Von Loh
Global Description Authors: J. Coles

REFERENCES: Cogan et al. 2004, Western Ecology Working Group n.d.

Artemisia nova / Poa secunda Shrubland

Black Sagebrush / Sandberg Bluegrass Shrubland

CODE	CEGL001423
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA NOVA* SHRUBLAND ALLIANCE (A.1105) Black Sagebrush Shrubland Alliance
ECOLOGICAL SYSTEM(S):	Great Basin Xeric Mixed Sagebrush Shrubland (CES304.774) Colorado Plateau Mixed Low Sagebrush Shrubland (CES304.762) Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)
USFWS WETLAND SYSTEM:	Not applicable

CONCEPT SUMMARY

Globally

This plant association is discontinuously distributed from southeastern Oregon to southeastern and central Idaho, with a disjunct occurrence in western Colorado. It is purported to occur in California and expected to occur in northern Nevada and Utah. The association has been reported from a wide variety of habitats at elevations ranging from about 1525 to 2745 m (5000-9000 feet). Stands are on shallow, rocky and gravelly calcareous soils that may be of volcanic origin or derived from limestone. Although it is often in mosaic with *Artemisia tridentata* or *Juniperus* spp. stands, this association does not support significant cover or reproduction of these species, nor perennial grasses other than *Poa secunda*. Some (but not all) stands may represent overgrazed stands of *Artemisia nova / Pseudoroegneria spicata* Shrubland (CEGL001424). *Artemisia nova / Poa secunda* stands are expected to have low amounts of other shrubs, such as *Artemisia arbuscula*, *Artemisia tridentata* ssp. *vaseyana*, *Chrysothamnus viscidiflorus*, *Eriogonum microthecum*, and *Tetradymia canescens*. Other herbs to be expected in these stands include perennial grasses, such as *Achnatherum* spp., *Koeleria macrantha*, and *Elymus elymoides*, and forbs common on shallow soils, such as *Balsamorhiza hookeri*, *Castilleja* spp., *Eriogonum* spp., *Petradoria pumila*, *Phlox* spp., and *Penstemon* spp. Its presence in Colorado may represent another *Artemisia nova* association that has been degraded by grazing until only *Poa secunda* and *Koeleria macrantha* remain.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled on U.S. Bureau of Land Management-administered land northwest of the park and west of Black Canyon Road.

Globally

Artemisia nova associations are widely distributed throughout the western United States. This plant association, however, is apparently an uncommon *Artemisia nova* type. It is found in southeastern Oregon and again in central, south-central, and southeastern Idaho (IDCDC unpubl. data 2001, ORNHP unpubl. data 2001). Its presence in Colorado may represent another *Artemisia nova* association that has been degraded by grazing until only *Poa secunda* and *Koeleria macrantha* remain. In Idaho, the association is known from the Boulder Mountains in Custer County, Cassia County (near the Utah border), Bannock County (in the Portneuf Range), and at Menan Buttes on the Snake River Plain. It is purported to occur in California and is expected to occur in (but not documented in) northern Nevada and Utah.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This dwarf-shrub association was observed on upper midslopes of the shoulders of large hills. The site is gentle (10% slope), occurs at 2384 m elevation, and is oriented to a western aspect. The unvegetated surface has low cover of litter and moss and moderate cover of wildlife scat, possibly from domestic livestock. Large and small rocks and exposures of bare soil comprise much of the unvegetated surface. Soils are rapidly drained silty clay loams derived from alluvium.

Globally
This plant association is distributed discontinuously from southeastern Oregon to southeastern and central Idaho. An isolated occurrence has been reported from western Colorado. It is purported to occur in California and expected to occur in northern Nevada and Utah. The association has been reported from a wide variety of habitats and slope angles, including ridges, alluvial fans and hill slopes at elevations ranging from about 1525 m (5000 feet) on the Snake River Plain of eastern Idaho to 2745 m (9000 feet) in the Boulder Mountains of central Idaho. The Colorado stand is intermediate in elevation at 2384 m (7820 feet). Stands are on shallow, rocky and gravelly calcareous soils that may be of volcanic or sedimentary origin.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is 34% in the one sampled stand. This dwarf-shrub association is characterized by an open stand of 0.5-m tall *Artemisia nova* shrubs that provide 20% cover. Other dwarf-shrub species present in the stand provide sparse cover and include *Amelanchier utahensis, Artemisia tridentata* ssp. *vaseyana*, and *Tetradymia canescens*. The herbaceous layer is also sparse, providing up to 10% cover that is evenly split between graminoids and forbs. The graminoids include *Koeleria macrantha* and *Poa secunda*. Forbs include *Astragalus* sp., *Erigeron pumilus, Eriogonum lonchophyllum, Lupinus* sp., *Petradoria pumila*, and *Phlox longifolia*. Moss is present but is very sparse.

Globally
This association is characterized by a sparse to moderate shrub layer dominated by *Artemisia nova* (average 20% cover); other shrubs present may include *Artemisia arbuscula, Artemisia tridentata* ssp. *vaseyana, Chrysothamnus viscidiflorus, Eriogonum microthecum*, and *Tetradymia canescens*. The herbaceous layer also tends to have 10% or less cover and is dominated by *Poa secunda*. Other herbs to be expected in these stands include perennial grasses, such as *Achnatherum* spp., *Koeleria macrantha*, and *Elymus elymoides*, and forbs common on shallow soils, such as *Balsamorhiza hookeri, Castilleja* spp., *Eriogonum* spp., *Petradoria pumila, Phlox* spp., and *Penstemon* spp.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia nova*
Herb (field)	*Poa secunda*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia nova*
Herb (field)	*Poa secunda*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G3 (19-Jan-2001). Within the range of *Artemisia nova*, this plant association is infrequently observed and has a discontinuous distribution. The association is likely restricted to shallow, rocky soil sites unable to support *Festuca idahoensis* and *Pseudoroegneria spicata*. It is the most common *Artemisia nova* association mapped in southeastern Oregon but is not common in Idaho. In addition, it has not been documented in Nevada or Utah where *Artemisia nova* stands are relatively common, nor is it known from the Owyhee Plateau of southwestern Idaho. The Colorado stand has been subjects to a long history of heavy grazing and may represent another *Artemisia nova* association that has become degraded. Numerous stands are currently protected, though some low-elevation sites with *Artemisia nova / Poa secunda* are at risk to *Bromus tectorum* invasion and subsequent wildfire. There are currently only 15-30 estimated occurrences of this association, and documentation of threats or condition trends are lacking. Further sampling and field assessment of the plant association are needed.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
It is probably distinct from other *Artemisia nova* associations in lacking significant cover of perennial grasses other than *Poa secunda* (e.g., *Festuca idahoensis, Hesperostipa comata*, and *Pseudoroegneria spicata*). In south-central and southeastern Idaho, the plant association is often observed in a mosaic with *Juniperus osteosperma* associations (IDCDC 2001). In such mosaic areas of Idaho and Nevada, researchers have recognized a *Juniperus osteosperma / Artemisia nova / Poa secunda* plant association (Rust 1999). This association may have as little as 1% cover of *Juniperus osteosperma*, though its presence is used to indicate the site's potential. *Artemisia nova / Poa secunda* Shrubland (CEGL001423) lacks reproducing *Juniperus osteosperma* or other *Juniperus* spp. Hironaka et al. (1983) note the replacement of *Pseudoroegneria spicata* by *Poa secunda* in overgrazed stands of *Artemisia nova / Pseudoroegneria spicata* Shrubland (CEGL001424). It is possible that some, but probably not all, stands of *Artemisia nova / Poa secunda* are early seral.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Other examples of this association may occur in the vicinity. This occurrence is located near the edge of the sampled area.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: BLCA.0047 and 2 observation points: CURE_AA.0344, CURE_AA.0611).
Local Description Authors: J. Von Loh and G. Bradshaw, mod. J. Coles
Global Description Authors: C. Murphy, mod. J. Coles

REFERENCES: Bourgeron and Engelking 1994, Caicco and Wellner 1983f, Driscoll et al. 1984, Hironaka et al. 1983, IDCDC unpubl. data, Kagan et al. 2000, ORNHP unpubl. data, Rust 1999, Western Ecology Working Group n.d.

Artemisia tridentata ssp. *tridentata / Pascopyrum smithii - (Elymus lanceolatus)* Shrubland

Basin Big Sagebrush / Western Wheatgrass - (Streambank Wheatgrass) Shrubland

CODE	CEGL001017
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA (SSP. TRIDENTATA, SSP. XERICENSIS)* SHRUBLAND ALLIANCE (A.830) (Basin Big Sagebrush, Foothill Big Sagebrush) Shrubland Alliance
ECOLOGICAL SYSTEM(S):	Inter-Mountain Basins Big Sagebrush Steppe (CES304.778) Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This widespread sagebrush shrubland occurs on valley bottoms, stream terraces and other relatively mesic sites west of the Great Plains throughout much of the intermountain western U.S. Stands occur over an elevational range of 1800-2410 m (5900-7900 feet). Most stands grow on alluvial terraces in stream alluvium, although a few occur on upland swales. Soils generally are loamy or sandy. Water tables may be within 2 m of the soil surface. The stream channel often is dry and may be incised. Soils are moderately well-drained sandy loam to sandy clay loam derived from alluvium. This association is characterized by a sparse to moderately dense short-shrub layer (up to about 40%

canopy cover and to 1.5 m tall) that is dominated by *Artemisia tridentata* ssp. *tridentata*, with an herbaceous layer that is usually dominated by *Pascopyrum smithii* or *Elymus lanceolatus*. Other shrubs may be present in small amounts, especially *Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus viscidiflorus, Ericameria nauseosa (= Chrysothamnus nauseosus), Ericameria parryi, Krascheninnikovia lanata*, or *Quercus gambelii*. The sparse to dense herbaceous layer is dominated by graminoids and is poor in species richness relative to other sagebrush types. Other species that may be present in substantial amounts are *Achnatherum hymenoides, Achnatherum pinetorum, Bromus inermis, Elymus elymoides, Leymus cinereus, Muhlenbergia richardsonis, Poa fendleriana, Poa secunda (= Poa nevadensis),* and introduced species *Bromus inermis* and *Poa pratensis*. Forbs contribute much less cover than do grasses. Species that often occur are *Achillea millefolium, Astragalus* spp., *Erigeron compositus, Packera cana (= Senecio canus), Penstemon* spp., *Symphyotrichum ascendens (= Aster ascendens)*, and introduced species *Taraxacum officinale* and *Melilotus officinalis*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This uncommon association was sampled along West Elk Creek and near Cimarron in Curecanti National Recreation Area. Other examples of this association may exist in the project area but may be limited in extent due to the relatively high elevation of the recreation area.

Globally
This association occurs across the interior western U.S. from southwestern Montana, southwestern Wyoming, and north-central Colorado to southwestern Utah and northeastern Nevada. It may also occur in Washington, Oregon, and Idaho given the broad geographic ranges of *Artemisia tridentata* ssp. *tridentata* and *Pascopyrum smithii*.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This short-shrub association occurs in the bottoms of arroyos. Sites are gently sloped to moderately steep (14-17% slopes), occur between 2161 and 2407 m elevation, and are oriented to the south. The unvegetated surface has high exposure of bare soil and low cover of litter and wildlife scat. Parent material is Quaternary alluvium. Soils are moderately well-drained sandy clay loams.

Globally
This widespread sagebrush shrubland occurs on valley bottoms, stream terraces and other relatively mesic sites west of the Great Plains. Stands occur over an elevational range of 1800-2410 m (5900-7900 feet). Most stands grow on alluvial terraces in stream alluvium, although a few occur on upland swales. Soils generally are loamy or sandy. Water tables may be within 2 m of the soil surface. The stream channel often is dry and may be incised. Soils are moderately well-drained sandy loam to sandy clay loam derived from alluvium.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is approximately 75% in this shrubland association. *Artemisia tridentata* ssp. *tridentata* shrubs 1-2 m tall form an open to moderately closed canopy and provide approximately 30 to 40% cover, and the medium-tall, rhizomatous grass *Pascopyrum smithii* provides 6 to 15% cover. The shrub layer is diverse and provides dense cover. Additional short and dwarf-shrubs provide low to moderate cover and include *Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus viscidiflorus, Ericameria parryi*, and *Krascheninnikovia lanata*. The herbaceous layer provides low cover and has moderate species diversity. Graminoid cover is low to moderate and additional grasses include *Achnatherum hymenoides, Achnatherum pinetorum, Bromus inermis, Elymus elymoides*, and *Poa fendleriana*. Forbs are diverse, contribute sparse cover, and include *Achillea millefolium var. occidentalis, Astragalus convallarius, Astragalus drummondii, Astragalus tenellus*, and *Penstemon strictus*. Mosses provide low to moderate cover, up to 25% cover.

Globally
This association is characterized by a sparse to moderately dense short-shrub layer (up to about 40% canopy cover and to 1.5 m tall) that is dominated by *Artemisia tridentata* ssp. *tridentata*, with an herbaceous layer that is usually dominated by *Pascopyrum smithii* or *Elymus lanceolatus*. Other shrubs may be present in small amounts, especially *Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus viscidiflorus, Ericameria nauseosa (= Chrysothamnus nauseosus), Ericameria parryi, Krascheninnikovia lanata,* or *Quercus gambelii*. The sparse to dense herbaceous layer is dominated by graminoids and is poor in species richness relative to other sagebrush types. Other species that

may be present in substantial amounts are *Achnatherum hymenoides, Achnatherum pinetorum, Bromus inermis, Elymus elymoides*, and *Poa fendleriana* in Colorado (Tiedemann et al. 1987), *Poa secunda (= Poa nevadensis)* and *Muhlenbergia richardsonis* in Nevada (Blackburn et al. 1971), and *Leymus cinereus* and *Poa pratensis* in Montana (Cooper et al. 1995). Forbs contribute much less cover than do grasses. Species that often occur are *Symphyotrichum ascendens (= Aster ascendens)* and *Collinsia parviflora* in Nevada (Blackburn et al. 1971), *Achillea millefolium, Astragalus convallarius, Astragalus drummondii, Astragalus tenellus, Penstemon strictus*, and *Penstemon caespitosus* in north-central Colorado (Tiedemann et al. 1987), *Achillea millefolium, Erigeron compositus, Packera cana (= Senecio canus)*, and *Taraxacum officinale* in southwestern Montana (Cooper et al. 1995), and *Cordylanthus ramosus* in southwestern Wyoming (Jones and Fertig 1996). Mosses and lichens may be important ground cover.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Ericameria parryi*
Short shrub/sapling	*Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Chrysothamnus viscidiflorus*
Herb (field)	*Achnatherum pinetorum*, *Pascopyrum smithii*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *tridentata*
Herb (field)	*Elymus lanceolatus*, *Pascopyrum smithii*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus inermis* (exotic, High/Medium), *Melilotus officinalis* (exotic, Medium/Low)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G3? (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: The sagebrush on CURE.0303 was originally identified as *Artemisia tridentata* ssp. *wyomingensis* but was changed to *Artemisia tridentata* ssp. *tridentata* in 2004 after revisiting. Some confusion may remain among the subspecies. However, *Artemisia tridentata* ssp. *tridentata* is still thought to be the least common of the three subspecies currently thought to be prevalent in the Gunnison Basin. Additional quantitative data would be useful to help establish the local range and variability of this association.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0303, CURE.0376).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: K.A. Schulz

REFERENCES: Beetle and Johnson 1982, Blackburn et al. 1971, Bourgeron and Engelking 1994, Bunting 1987, CONHP Ecology Team 2001, Cogan et al. 2004, Cooper et al. 1995, Driscoll et al. 1984, Everett 1987, Francis 1983, Johnston 1987, Jones and Fertig 1996, Keammerer 1977, MTNHP 2002b, Strong 1980, Tiedemann et al. 1987, Western Ecology Working Group n.d., Wright et al. 1979

*Artemisia tridentata (*ssp. *vaseyana,* ssp. *wyomingensis) - Amelanchier utahensis* Shrubland

(Mountain Big Sagebrush, Wyoming Big Sagebrush) - Utah Serviceberry Shrubland

CODE	CEGL002820
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA* SHRUBLAND ALLIANCE (A.829) Basin Big Sagebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This association has been described from Dinosaur National Monument, the Roan Plateau and the Piceance Basin in northwestern Colorado and adjacent Utah. It also occurs in southwestern Wyoming. Sites are on level to moderately sloping hills, valleys and benches. Elevation ranges from 2165 to 2600 m, and stands may be oriented to any aspect. The deep, well-drained soils are derived from sandstone, shale, loess or limestone and range in texture from clay loam and silt loam to loamy sand. Organic litter is typically a significant component of the ground surface cover. The vegetation is characterized by the codominance in the canopy of *Artemisia tridentata* (ssp. *vaseyana* or ssp. *wyomingensis*, or sometimes a hybrid of the two) and *Amelanchier utahensis* with 15 to 55% total cover. It often takes the appearance of a tall shrubland type in which clumps of serviceberry grow in a matrix of sagebrush. Although serviceberry and sagebrush are visually dominant, in some stands *Symphoricarpos oreophilus* may have the highest cover of the three shrub species. *Chrysothamnus viscidiflorus, Mahonia repens,* and *Purshia tridentata* may be minor components of the shrub canopy. *Quercus gambelii*, if present, has less than 1% cover. Graminoids tend to dominate the well-developed herbaceous layer; typical species are *Pascopyrum smithii (= Agropyron smithii), Melica spectabilis (= Bromelica spectabilis), Carex geyeri, Koeleria macrantha, Poa fendleriana, Achnatherum nelsonii* ssp. *dorei (= Stipa columbiana), Hesperostipa comata (= Stipa comata),* and *Achnatherum lettermanii (= Stipa lettermanii)*. The forb component of the understory is usually diverse and may contribute significant cover, especially in stands that have been grazed. *Achillea millefolium, Balsamorhiza sagittata, Comandra umbellata, Crepis acuminata, Eriogonum umbellatum, Lathyrus lanszwertii var. leucanthus (= Lathyrus leucanthus), Lupinus argenteus, Penstemon caespitosus, Sphaeralcea coccinea*, and *Viola nuttallii* are common species. *Poa pratensis* may be the dominant grass in areas that have a history of grazing.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association is in the recreation area and was sampled on ridges near the Entrance Road, North Rim Access Road, and North Vista Trail in the Curecanti National Recreation Area.

Globally

This association is currently known from the highlands of Dinosaur National Monument and Black Canyon of the Gunnison National Park, as well as the Roan Plateau and Piceance Basin in northwestern Colorado and northeastern Utah. It also occurs at Fossil Butte National Monument in southwestern Wyoming and is likely more widespread.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This montane shrubland association is found on midslopes of ridges. Sites are gently sloping (2- to 3-degree slopes) and occur at 2387 and 2490 m elevation on a variety of aspects. The unvegetated ground surface has moderate to high cover of bare ground (30-60%) with low to moderate cover (<30%) of gravel and typically lower cover of litter (20%) with one stand having 60% cover.

Globally

This association occurs on level to moderately sloping hills, plateaus, valleys, ridgetops and benches in northwestern Colorado. Sites are gentle to steep (2- to 20-degree slopes), occur at elevation ranges from 2165 to 2600 m (7100-8530 feet), and may be oriented to any aspect. The deep, well-drained soils are derived from sandstone, shale, loess or limestone and range in texture from clay loam and silt loam to loamy sand. Organic litter is typically a significant component of the ground surface cover.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This mixed mountain shrubland association is characterized by the codominance of *Artemisia tridentata* ssp. *vaseyana* (sagebrush) and *Amelanchier utahensis* (Utah serviceberry). Sagebrush generally has equal or higher cover than serviceberry and forms a moderately dense short-shrub layer with tall-shrub serviceberry forming an open canopy or denser clumps. Cover ranges between 15 and 45% for sagebrush and 15-35% for serviceberry. Other shrubs present include *Symphoricarpos oreophilus*. Herbaceous species are highly diverse but contribute minimal total cover. Species most likely to occur include *Poa fendleriana, Koeleria macrantha, Pascopyrum smithii*, and *Balsamorhiza sagittata*.

Globally

This mountain shrubland association is characterized by the codominance in the canopy of *Artemisia tridentata* ssp. *vaseyana* or *Artemisia tridentata* ssp. *wyomingensis* and *Amelanchier utahensis* with 15 to 75% total cover. It often takes the appearance of a tall shrubland type in which clumps of serviceberry grow in a matrix of sagebrush. Although serviceberry and sagebrush are visually dominant, in some stands *Symphoricarpos oreophilus* may have the highest cover of the three shrub species. *Chrysothamnus viscidiflorus, Mahonia repens*, and *Purshia tridentata* may be minor components of the shrub canopy. *Quercus gambelii*, if present, has less than 1% cover. Graminoids tend to dominate the well-developed herbaceous layer; typical species are *Pascopyrum smithii (= Agropyron smithii), Melica spectabilis (= Bromelica spectabilis), Carex geyeri, Koeleria macrantha, Poa fendleriana, Achnatherum nelsonii* ssp. *dorei (= Stipa columbiana), Hesperostipa comata (= Stipa comata)*, and *Achnatherum lettermanii (= Stipa lettermanii)*. The forb component of the understory is usually diverse and may contribute significant cover, especially in stands that have been grazed. *Achillea millefolium, Balsamorhiza sagittata, Comandra umbellata, Crepis acuminata, Eriogonum umbellatum, Lathyrus lanszwertii var. leucanthus (= Lathyrus leucanthus), Lupinus argenteus, Penstemon caespitosus, Sphaeralcea coccinea*, and *Viola nuttallii* are common species. *Poa pratensis* may be the dominant grass in areas that have a history of grazing.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Amelanchier utahensis*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*

Globally

Stratum	Species
Tall shrub/sapling	*Amelanchier utahensis*
Short shrub/sapling	*Symphoricarpos oreophilus*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*, *Artemisia tridentata* ssp. *wyomingensis*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (12-Jul-2005).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally
There is some overlap between this community and the various sagebrush - snowberry associations in the IVC, but the codominance of *Artemisia tridentata* and *Amelanchier utahensis* distinguishes it from them. This association is not ecotonal between sagebrush shrublands and mixed mountain shrublands; instead, it appears to occupy its own habitat and can cover extensive areas.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (7 observation points: BLCA_AA.704, BLCA_AA.798, BLCA_AA.801, BLCA_AA.806, BLCA_AA.833, BLCA_AA.834, CURE_AA.0889).
Local Description Authors: K.A. Schulz
Global Description Authors: J. Coles, mod. K.A. Schulz

REFERENCES: Keammerer and Peterson 1981, Keammerer and Stoecker 1975, Western Ecology Working Group n.d.

Artemisia tridentata / Pleuraphis jamesii Shrubland

Basin Big Sagebrush / James' Galleta Shrubland

CODE	CEGL001005
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA* SHRUBLAND ALLIANCE (A.829) Basin Big Sagebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This shrubland association occurs on warm sites with relatively deep soils at around 2000 m (6560 feet) elevation in the Colorado Plateau and Great Basin. Slopes are gentle to moderate, aspects tend to be southerly, and the sandy soils may have a high percentage of bare soil, rock and gravel. This shrubland association is characterized by low to moderate cover of *Artemisia tridentata* and an understory dominated by grasses, chief among them *Pleuraphis jamesii*. *Chrysothamnus depressus* and various species of cactus are common in the shrub layer but with very low cover. Many other grasses may grow with the *Pleuraphis*, including *Achnatherum hymenoides, Elymus elymoides, Hesperostipa comata*, and *Pascopyrum smithii*. Forbs are sparse and include no diagnostic species. Most stands have been impacted by domestic livestock grazing.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association is rare and was observed and sampled in Red Rock Canyon on private land adjacent to the park and on the Lake Fork Arm.

Globally
This species has been reported from Nevada (Tueller et al. 1966) and western Colorado. Nothing is known about the habitat characteristics or species composition of stands in Nevada. Examples from both states may actually belong in *Artemisia tridentata* ssp. *wyomingensis / Pleuraphis jamesii* Shrubland (CEGL002084).

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This shrubland association was observed on the slopes of hills. Sites range from moderate to steep (16-47% slopes), occur between 2085 and 2295 m elevation, and are oriented to southerly aspects. The unvegetated surface has high cover of bedrock, large and small rocks, and exposure of bare soil. Soils are rapidly drained and coarse in texture, derived from Quaternary alluvial deposits.

Globally

This shrubland association occurs on warm sites with relatively deep soils at around 2000 m (6560 feet) elevation in Colorado. Slopes are gentle to moderate, aspects tend to be southerly, and the sandy soils may have a high percentage of bare soil, rock and gravel.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This mountain big sagebrush / James' galleta shrubland association occurs only in the environs. Total vegetation cover is between 45 and 65%. The shrub layer is characterized by *Artemisia tridentata* ssp. *vaseyana* or *Artemisia tridentata* ssp. *wyomingensis* that are from 0.5-1 m tall and provide 5 to 50% cover and the short bunchgrass *Pleuraphis jamesii* that provides from 1 to 25% cover. The associated shrub layer is moderately diverse in composition and provides sparse to low cover. The succulents *Echinocereus triglochidiatus, Opuntia polyacantha*, and *Pediocactus simpsonii* provide minimal cover. The herbaceous layer is diverse and provides moderate cover by graminoids and forbs. Additional graminoids are present with much less cover than *Pleuraphis jamesii* and include *Achnatherum hymenoides, Elymus elymoides*, and *Hesperostipa comata*. Common forbs include *Chaenactis douglasii* and *Sphaeralcea coccinea*. Seedling *Juniperus osteosperma* are present and provide sparse cover in stands.

Globally

This shrubland association is characterized by low to moderate cover of *Artemisia tridentata* and an understory dominated by grasses, chief among them *Pleuraphis jamesii*. *Chrysothamnus depressus* and various species of cactus are common in the shrub layer but with very low cover. Many other grasses may grow with the *Pleuraphis*, including *Achnatherum hymenoides, Elymus elymoides, Hesperostipa comata*, and *Pascopyrum smithii*. Forbs are sparse and include no diagnostic species.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*, *Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Pleuraphis jamesii*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata*
Herb (field)	*Pleuraphis jamesii*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Agropyron cristatum* (exotic, Medium/Low), *Elymus trachycaulus* (exotic)

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (23-Feb-1994).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

The plot at Black Canyon of the Gunnison National Park was placed in this association because the dominant shrub was identified as *Artemisia tridentata* ssp. *vaseyana*. It is possible that this plot contains a hybrid of *Artemisia tridentata* ssp. *wyomingensis* and *Artemisia tridentata* ssp. *vaseyana*. Most examples of this association are probably dominated by *Artemisia tridentata* ssp. *wyomingensis* and should be placed in a different association [see CEGL002084].

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: The dominant species in one of the plots, *Artemisia tridentata* ssp. *vaseyana*, is not typically found at this low elevation, nor associated with these species. There is no indication in the database whether a UV-light test was done on a sample from the plot. Therefore, it is possible that the subspecies would more correctly be *Artemisia tridentata* ssp. *wyomingensis*. It could also be a hybrid of the two subspecies.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (3 plots: BLCA.0028, CURE.0082, CURE.0393 and 1 observation point: CURE_AA.1028).
Local Description Authors: J. Von Loh, mod. J. Coles
Global Description Authors: J. Coles

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Salas et al. 2009, Tueller et al. 1966, Western Ecology Working Group n.d.

Artemisia tridentata ssp. *vaseyana* - *Holodiscus dumosus* Shrubland [Provisional]

Mountain Big Sagebrush - Rockspirea Shrubland

CODE	CEGL002807
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. VASEYANA* SHRUBLAND ALLIANCE (A.831) Mountain Big Sagebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This mountain big sagebrush short-shrub association is uncommon and known only from two sites sampled at Curecanti National Recreation Area in the Gunnison River Valley in western Colorado. Stands occur on active slopes within ravines and gulches. Sites are steep (70-78% slopes), occur between 2352 and 2355 m elevation, and are oriented to the north and southwest. The unvegetated surface has high cover of bedrock, large and small rocks, and exposure of bare soil. Parent materials are metamorphic/granitic rocks. Soils are rapidly drained loamy sands. The vegetation is characterized by sparsely to moderately vegetated stands (10-70% total cover) with a typically open to moderately dense shrub layer dominated by *Artemisia tridentata* ssp. *vaseyana* and codominated by *Holodiscus dumosus*. Other short and dwarf-shrubs provide sparse to low cover and include *Amelanchier utahensis, Chrysothamnus viscidiflorus, Ribes leptanthum,* and *Symphoricarpos rotundifolius,* and the succulent *Opuntia polyacantha*. Occasional *Pseudotsuga menziesii* and *Juniperus scopulorum* saplings or seedlings may be present. The herbaceous layer is diverse but sparse. Graminoids provide sparse to low cover and include *Achnatherum hymenoides, Achnatherum pinetorum, Bouteloua gracilis, Elymus elymoides, Poa compressa, Poa fendleriana,* and *Poa secunda*. Forbs provide sparse cover. Crustose lichens may provide up to 25% cover within this association.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This uncommon association was sampled above the cove of the Lake Fork Arm of Blue Mesa Reservoir and south of Cebolla Creek in Curecanti National Recreation Area.

Globally
This association has only been sampled from two locations in Curecanti National Recreation Area in western Colorado.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This short-shrub association occurs on active slopes within ravines and gulches. Sites are steep (70-78% slopes), occur between 2352 and 2355 m elevation, and are oriented to the north and southwest. The unvegetated surface has low cover of litter, moderate cover of mosses and lichens, and high cover of bedrock, large and small rocks, and exposure of bare soil. Parent materials are metamorphic/granitic rocks. Soils are rapidly drained loamy sands.

Globally
Data are not available.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 10 to 70% in these stands. *Artemisia tridentata* ssp. *vaseyana* and *Holodiscus dumosus* shrubs form an open canopy that provides 1 to 50% and 1 to 5% cover, respectively. Other short and dwarf-shrubs provide sparse to low cover and include *Amelanchier utahensis, Chrysothamnus viscidiflorus, Ribes leptanthum*, and *Symphoricarpos rotundifolius*, and the succulent *Opuntia polyacantha*. One stand has sparse cover of *Pseudotsuga menziesii* saplings in the tall-shrub layer that are 1-2 m tall and *Juniperus scopulorum* saplings or seedlings in the short-shrub layer. The herbaceous layer is diverse but sparse. Graminoids provide sparse to low cover and include *Achnatherum hymenoides, Achnatherum pinetorum, Bouteloua gracilis, Elymus elymoides, Poa compressa, Poa fendleriana*, and *Poa secunda*. Forbs provide sparse cover and include *Achillea millefolium var. occidentalis, Androsace septentrionalis, Antennaria parvifolia, Artemisia frigida, Artemisia ludoviciana, Chaenactis douglasii, Eriogonum umbellatum, Heterotheca villosa, Penstemon teucrioides, Sedum lanceolatum*, and *Senecio integerrimus*. Crustose lichens may provide up to 25% cover within this association.

Globally
Data are not available.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Amelanchier utahensis, Holodiscus dumosus, Symphoricarpos rotundifolius*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Antennaria parvifolia, Artemisia frigida*
Herb (field)	*Achnatherum hymenoides, Poa fendleriana, Poa secunda*

Globally

Stratum	Species
Short shrub/sapling	*Holodiscus dumosus*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Achnatherum hymenoides, Poa fendleriana*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (22-Jun-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: The terrain is steep and rocky with talus slopes.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (3 plots: CURE.0118, CURE.0120, CURE.0144 and 1 observation point: CURE_AA.0201).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Artemisia tridentata ssp. *vaseyana / Achnatherum pinetorum* Shrubland

Mountain Big Sagebrush / Pine Needlegrass Shrubland

CODE	CEGL002806
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. VASEYANA* SHRUBLAND ALLIANCE (A.831) Mountain Big Sagebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This shrubland association is known from Black Canyon National Park and Curecanti National Recreation Area in the Gunnison River Valley and below Monarch Pass in western Colorado. Sites are gentle to moderately steep slopes (6-24% slopes) and valley bottoms. Stands occur between 2310 and 2706 m elevation, and most are oriented to east and southeast aspects. Soils are rapidly drained loams and sandy clay loams derived from Mesozoic sandstone. The vegetation is characterized by an open to closed (25-75% cover) short-shrub layer (to 1 m tall) that is dominated by *Artemisia tridentata* ssp. *vaseyana*, with a typically patchy graminoid layer dominated by the bunch grasses *Poa fendleriana* and *Achnatherum pinetorum* with 1-25% cover each. The shrub layer is variable in cover and composition. Other short and dwarf-shrubs present and providing sparse to low cover include *Artemisia frigida, Amelanchier utahensis, Ericameria nauseosa, Gutierrezia sarothrae*, and *Symphoricarpos oreophilus*, and the succulents *Opuntia polyacantha* and *Pediocactus simpsonii*. *Chrysothamnus viscidiflorus* and *Purshia tridentata* contribute high cover in a few stands. The herbaceous layer is diverse and provides low to moderate cover. Associated graminoids provide low to moderate cover and include *Achnatherum hymenoides, Koeleria macrantha, Poa secunda*, and *Elymus elymoides*. Forbs are also diverse and provide sparse cover, including *Castilleja linariifolia, Chaenactis douglasii, Comandra umbellata, Phlox multiflora*, and *Polygonum douglasii*. Species of moss and crustose lichen provide sparse cover.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This uncommon association was sampled on Dillon Mesa, near Dillon Pinnacles, on the North Rim Drive, and near Cooper's Ranch in Curecanti National Recreation Area.

Globally
This shrubland association is known from Black Canyon National Park and Curecanti National Recreation Area in the Gunnison River Valley and below Monarch Pass (Komarkova 1986) in western Colorado. More survey is needed to determine its full extent.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This shrubland association occurs on toeslopes. Sites are gentle to moderately steep (6-24% slopes), occur between 2310 and 2706 m elevation, and mostly are oriented to east and southeast aspects. The unvegetated surface has no cover to moderate cover of litter, high exposure of bare soil, and moderate cover by large and small rocks. Downed wood is uncommon. Parent materials are Mesozoic sandstone. Soils are rapidly drained loams and sandy clay loams.

Globally
This shrubland association is known from Black Canyon National Park and Curecanti National Recreation Area in the Gunnison River Valley and below Monarch Pass in western Colorado. Sites are gentle to moderately steep slopes (6-24% slopes) and valley bottoms. Stands occur between 2310 and 2706 m elevation, and most are oriented to east and southeast aspects. Soils are rapidly drained loams and sandy clay loams derived from Mesozoic sandstone.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 80 to over 100% in these stands. *Artemisia tridentata* ssp. *vaseyana* shrubs up to 1 m tall form open to closed canopies and provide from 25 to 75% cover. The bunch grasses *Poa fendleriana* and *Achnatherum pinetorum* form patchy open canopies, each species provides between 1% and 25% cover. The shrub layer is variable in cover and composition. Other short and dwarf-shrubs present and providing sparse to low cover include *Amelanchier utahensis*, *Gutierrezia sarothrae*, and *Symphoricarpos oreophilus*, and the succulents *Opuntia polyacantha* and *Pediocactus simpsonii*. *Chrysothamnus viscidiflorus* and *Purshia tridentata* contribute high cover in a few stands. The herbaceous layer is diverse and provides low to moderate cover. Associated graminoids provide low to moderate cover and include *Achnatherum hymenoides*, *Poa secunda*, and *Elymus elymoides*. Forbs are also diverse and provide sparse cover, including *Artemisia frigida, Chaenactis douglasii, Comandra umbellata*, and *Polygonum douglasii*. Species of moss and crustose lichen provide sparse cover.

Globally
The vegetation is characterized by an open to closed (25-75% cover) short-shrub layer (to 1 m tall) that is dominated by *Artemisia tridentata* ssp. *vaseyana*, with a typically patchy graminoid layer dominated by the bunch grasses *Poa fendleriana* and *Achnatherum pinetorum* with 1-25% cover each. The shrub layer is variable in cover and composition. Other short and dwarf-shrubs present and providing sparse to low cover include *Artemisia frigida, Amelanchier utahensis, Ericameria nauseosa, Gutierrezia sarothrae*, and *Symphoricarpos oreophilus*, and the succulents *Opuntia polyacantha* and *Pediocactus simpsonii*. *Chrysothamnus viscidiflorus* and *Purshia tridentata* contribute high cover in a few stands. The herbaceous layer is diverse and provides low to moderate cover. Associated graminoids provide low to moderate cover and include *Achnatherum hymenoides, Koeleria macrantha, Poa secunda*, and *Elymus elymoides*. Forbs are also diverse and provide sparse cover, including *Castilleja linariifolia, Chaenactis douglasii, Comandra umbellata, Phlox multiflora*, and *Polygonum douglasii* (Komarkova 1986). Species of moss and crustose lichen provide sparse cover.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Chrysothamnus viscidiflorus*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*, *Purshia tridentata*
Herb (field)	*Achnatherum pinetorum*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Achnatherum pinetorum*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (22-Jun-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Classification of these stands is complicated by extended drought conditions, which persisted throughout the sampling period and reduced the cover of perennial herbaceous species. Some stands may classify as a shrub herbaceous association during normal and above-average water years.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (7 plots: BLCA.0010, CURE.0001, CURE.0078, CURE.0163, CURE.0315, CURE.0317, CURE.0331 and 18 observation points: CURE_AA.0008, CURE_AA.0010, CURE_AA.0014, CURE_AA.0021, CURE_AA.0023, CURE_AA.0024, CURE_AA.0102, CURE_AA.0160, CURE_AA.0167, CURE_AA.0292, CURE_AA.0409, CURE_AA.0493, CURE_AA.0584, CURE_AA.0651, CURE_AA.0845, CURE_AA.0983, CURE_AA.1429, CURE_AA.1430).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: K.A. Schulz

REFERENCES: Johnston 2001, Komarkova 1986, Western Ecology Working Group n.d.

Artemisia tridentata ssp. *vaseyana / Balsamorhiza sagittata* Shrubland

Mountain Big Sagebrush / Arrowleaf Balsamroot Shrubland

CODE	CEGL001020
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. VASEYANA* SHRUBLAND ALLIANCE (A.831) Mountain Big Sagebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland occurs on ridges, benches and mesas in the northern Colorado Plateau and western slope of the southern Rocky Mountains. Stands occur in somewhat isolated upland patches in western Colorado and in southwestern Wyoming. Slopes range from level to moderate and occur between 2300 and 2675 m (7545-8776 feet) elevation. Soils are derived from a wide variety of substrates; textures vary accordingly from clays to sandy loams. Biological soil crusts may be present but rarely have significant cover. Total vegetation cover ranges from 25 to nearly 100%. The vegetation is characterized by a shrub canopy of *Artemisia tridentata* ssp. *vaseyana* (15-75%), often associated with *Amelanchier utahensis, Symphoricarpos oreophilus*, and *Purshia tridentata*. The herbaceous understory is dominated by *Balsamorhiza sagittata* and other forbs, including *Phlox* spp., *Eriogonum umbellatum, Castilleja linariifolia, Senecio integerrimus, Arenaria congesta*, and *Crepis acuminata*. Total herbaceous cover ranges from 10 to 30%. Grasses vary among sites and may include *Poa fendleriana, Poa secunda, Hesperostipa comata, Pseudoroegneria spicata, Achnatherum pinetorum, Achnatherum lettermanii*, and *Pascopyrum smithii*. Scattered *Juniperus osteosperma* may be present, but pinyon or juniper trees appear not to threaten stands on high slopes and ridgetops because of their relatively thin soils. Fire tends to convert these sites to grasslands dominated by the herbaceous species present before the burn.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled on Dillon Mesa in the recreation area and on the North Rim, northwest of Island Peaks Overlook in the park. It is also found on both rims of the Black Canyon, commonly occurring in a mosaic with *Quercus gambelii* shrublands.

Globally

This association is known from the northern Colorado Plateau and western slope of the southern Rocky Mountains. Stands occur in somewhat isolated upland patches in western Colorado and in southwestern Wyoming.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This shrubland association was observed on midslopes of mesas and toeslopes of swales. Sites are nearly level to gentle (3-12% slopes), occur between 2438 and 2675 m elevation, and include all aspects. The unvegetated surface has high exposure of bare soil and low to moderate cover of small rocks and litter. Soils are rapidly drained clay loams and silty loams derived from Morrison Formation shale and Sapinero Mesa tuff.

Globally

This shrubland occurs on ridges, benches and mesas in the northern Colorado Plateau. Slopes range from level to moderate, and known sites occur between 2300 and 2675 m (7545-8776 feet) elevation. Soils are derived from a wide variety of substrates, including shales, volcanic tuff and limestone; textures vary accordingly from clays to clay loams and silty loams to sandy loams. The unvegetated surface has high exposure of bare soil and low to moderate cover of small rocks and litter. Biological soil crusts may be present but rarely have significant cover.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 59 to 120% in these stands. This shrubland association is characterized by a closed canopy, typically <0.5-1 m tall, of *Artemisia tridentata* ssp. *vaseyana* shrubs that range in cover from 30 to 75%, and the forb *Balsamorhiza sagittata* that ranges in cover from 6 to 25%. The remaining shrub layer is sparse in terms of diversity and provides low cover. Additional short and dwarf-shrubs and succulents include *Amelanchier utahensis, Chrysothamnus depressus*, and *Opuntia fragilis*. The herbaceous layer is diverse and provides sparse cover of graminoids and moderate cover of forbs. Graminoids include *Achnatherum lettermanii, Achnatherum pinetorum, Carex geyeri, Elymus elymoides, Hesperostipa comata, Pascopyrum smithii, Poa fendleriana*, and *Poa secunda*. Additional common forbs include *Arabis* spp., *Arenaria congesta, Castilleja integra, Castilleja linariifolia, Crepis acuminata, Erigeron divergens, Eriogonum umbellatum, Phlox multiflora*, and *Senecio integerrimus*. Seedling *Amelanchier utahensis* and *Symphoricarpos rotundifolius* shrubs are present and provide sparse cover. Species of lichen and/or moss provide sparse to low cover.

Globally

This shrubland is characterized by a sparse to dense cover of *Artemisia tridentata* ssp. *vaseyana* (15-75%), with an herbaceous understory in which *Balsamorhiza sagittata* is the most conspicuous species. Total vegetation cover ranges from 25 to nearly 100%. Other shrubs are usually present as minor canopy elements, including *Purshia tridentata, Symphoricarpos oreophilus, Amelanchier utahensis, Chrysothamnus viscidiflorus*, and the dwarf-shrub *Mahonia repens*. Total herbaceous cover ranges from 10 to 30%. Grasses often have 5 to 10% cover in the forb-dominated understory, but amounts vary among sites, and include *Poa fendleriana, Poa secunda, Hesperostipa comata, Pseudoroegneria spicata, Achnatherum pinetorum, Achnatherum lettermanii, Leymus cinereus*, and *Pascopyrum smithii*. Common forbs in addition to *Balsamorhiza* include *Phlox* spp., *Eriogonum umbellatum, Arenaria congesta, Castilleja linariifolia, Crepis acuminata, Mertensia oblongifolia, Pteryxia terebinthina (= Cymopterus terebinthinus), Senecio integerrimus*, and *Wyethia amplexicaulis*. Scattered individuals of *Juniperus osteosperma* may be present with less than 10% cover.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Amelanchier utahensis*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Chrysothamnus depressus*
Herb (field)	*Balsamorhiza sagittata*, *Phlox multiflora*
Herb (field)	*Poa fendleriana*, *Poa secunda*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Balsamorhiza sagittata*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (23-Feb-1994).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Data are not available.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Two observation points (BLCA.0024 and BLCA.0025) were sampled in 2000 as part of a mosaic with *Quercus gambelii / Amelanchier utahensis* Shrubland (CEGL001110). One quantitative plot in that area would be of use to round out the description of the community.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: BLCA.0030, CURE.0333).
Local Description Authors: J. Von Loh, mod. G. Bradshaw and J. Coles
Global Description Authors: J. Coles, mod. K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Driscoll et al. 1984, Hess and Wasser 1982, Johnston 2001, Komarkova 1986, Terwilliger and Tiedemann 1978, Western Ecology Working Group n.d.

Artemisia tridentata ssp. *vaseyana / Festuca thurberi* Shrubland

Mountain Big Sagebrush / Thurber's Fescue Shrubland

CODE	CEGL001024
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. VASEYANA* SHRUBLAND ALLIANCE (A.831) Mountain Big Sagebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This relatively common mountain sagebrush shrubland occurs in the southern Rocky Mountains in central, north-central, and northwestern Colorado. Stands are found on mesic high-elevation sites with gentle to steep slopes (5-72% slopes) often on warm, southerly aspects too dry for forests at higher elevations and on more mesic north and northeasterly aspects at lower elevations. Elevations generally range between 2550 and 3200 m (8360-10,500 feet) but are reported up to 3660 m (12,000 feet). Substrates are typically deep, well-drained, variably gravelly or cobbly (skeletal) loamy to clayey soils derived from a variety of parent materials. The vegetation is characterized by an open to moderate (25-50% cover) short-shrub layer (to 1 m tall) that is dominated by *Artemisia tridentata* ssp. *vaseyana*, with a typically patchy graminoid layer dominated by the tall bunchgrass *Festuca thurberi*. The shrub layer is typically diverse, with additional short and dwarf-shrubs providing low cover, such as *Chrysothamnus viscidiflorus, Ericameria parryi, Mahonia repens, Rosa woodsii*, and *Symphoricarpos rotundifolius*. Disturbed sites may have high cover of *Ericameria nauseosa*. The herbaceous layer is diverse and provides moderate to dense cover. Additional graminoids that provide low to moderate cover include *Achnatherum pinetorum, Achnatherum lettermanii, Achnatherum nelsonii, Carex geyeri, Bromus anomalus, Bromus porteri, Elymus trachycaulus, Koeleria macrantha, Poa fendleriana*, and introduced species *Bromus inermis* and *Poa pratensis*. Forbs are diverse and provide moderate cover, including *Achillea millefolium var. occidentalis, Campanula rotundifolia, Cirsium undulatum var. tracyi, Delphinium X occidentale, Eriogonum umbellatum, Lathyrus lanszwertii*, and *Vicia americana*.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled in Myers Gulch, near Hermit's Rest, and near Curecanti Creek adjacent to State Highway 92 in the Curecanti National Recreation Area.

Globally
This mountain sagebrush shrubland occurs in the southern Rocky Mountains in central, north-central and northwestern Colorado.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association occurs on canyon slopes. Sites are moderately steep (22-26% slopes), occur between 2627 and 2726 m elevation, and are oriented to the southwest. The unvegetated surface is entirely covered by litter. Parent materials include migmatitic gneiss and Morrison Formation shale. Soils are rapidly drained loams.

Globally
This relatively common mountain sagebrush shrubland occurs in the southern Rocky Mountains in central, north-central, and northwestern Colorado. Stands are found on mesic high-elevation sites with gentle to steep slopes (5-72% slopes) often on warm, southerly aspects too dry for forests at higher elevations and on more mesic north and northeasterly aspects at lower elevations (Wasser and Hess 1982, Tiedemann et al. 1987). Elevations generally range between 2550 and 3200 m (8360-10,500 feet) but are reported up to 3660 m (12,000 feet) (Wasser and Hess 1982, Johnston 1987, Tiedemann et al. 1987). Substrates are typically deep, well-drained, variably gravelly or cobbly (skeletal) loamy to clayey soils derived from a variety of parent materials, including sandstone, limestone, and less frequently metamorphic rocks such as migmatitic gneiss and shale (Wasser and Hess 1982).

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges up to 100% cover in this shrubland type. *Artemisia tridentata* ssp. *vaseyana* shrubs form an open canopy and provide from 25 to 50% cover, and the tall bunchgrass *Festuca thurberi* also provides 25 to 50% cover. The shrub layer is diverse and provides moderate to high cover. Additional short and dwarf-shrubs providing low cover include *Chrysothamnus viscidiflorus, Ericameria nauseosa, Ericameria parryi, Mahonia repens, Rosa woodsii*, and *Symphoricarpos rotundifolius*. The herbaceous layer is diverse and provides moderate to dense cover. Additional graminoids that provide low to moderate cover include *Achnatherum lettermanii, Achnatherum nelsonii, Bromus porteri, Bromus inermis*, and *Poa pratensis*. Forbs are diverse, provide moderate cover and include *Achillea millefolium var. occidentalis, Cirsium undulatum var. tracyi, Lathyrus lanszwertii, Eriogonum umbellatum*, and *Vicia americana*.

Globally
The vegetation is characterized by an open to moderate (25-50% cover) short-shrub layer (to 1 m tall) that is dominated by *Artemisia tridentata* ssp. *vaseyana*, with a typically patchy graminoid layer dominated by the tall bunchgrass *Festuca thurberi*. The shrub layer is typically diverse, with additional short and dwarf-shrubs providing low cover, such as *Chrysothamnus viscidiflorus, Ericameria parryi, Mahonia repens, Rosa woodsii*, and *Symphoricarpos rotundifolius*. Disturbed sites may have high cover of *Ericameria nauseosa* (Tiedemann et al. 1987). The herbaceous layer is diverse and provides moderate to dense cover. Additional graminoids that provide low to moderate cover include *Achnatherum pinetorum, Achnatherum lettermanii, Achnatherum nelsonii, Carex geyeri, Bromus anomalus, Bromus porteri, Elymus trachycaulus, Koeleria macrantha, Poa fendleriana*, and introduced species *Bromus inermis* and *Poa pratensis*. Forbs are diverse and provide moderate cover, including *Achillea millefolium var. occidentalis, Campanula rotundifolia, Cirsium undulatum var. tracyi, Delphinium X occidentale, Eriogonum umbellatum, Lathyrus lanszwertii*, and *Vicia americana* (Wasser and Hess 1982, Johnston 1987).

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Quercus gambelii*
Short shrub/sapling	*Chrysothamnus viscidiflorus, Ericameria parryi, Symphoricarpos rotundifolius*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Festuca thurberi*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Festuca thurberi*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus inermis* (exotic, High/Medium), *Capsella bursa-pastoris* (exotic, Insignificant), *Poa pratensis* (exotic, Medium)

Globally
Exotic/Invasive: *Bromus inermis* (exotic, High/Medium), *Poa pratensis* (exotic, Medium)

CONSERVATION STATUS RANK
Global Rank & Reasons: G3G4 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Stands in this association have high cover (>25%) of perennial graminoids in the herbaceous layer and fit the concept of a sagebrush steppe (shrub herbaceous association).

Globally
Some stands in this association have high cover (>25%) of perennial graminoids in the herbaceous layer and fit the concept of a sagebrush steppe (shrub herbaceous association). More survey and classification work are needed to determine if this association should be changed from a shrubland to a shrub herbaceous type.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Very high vegetative cover. Sites tend to be moist and densely vegetated compared to other *Artemisia tridentata* sites, occurring on lower midslopes extending into moderately deep canyons of the recreation area. More of a mixed mountain shrubland with *Festuca thurberi* (Plot: CURE.0005).
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0005, CURE.0088).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Boyce 1977, CONHP unpubl. data 2003, Driscoll et al. 1984, Francis 1983, Giese 1975, Hess 1981, Hess and Wasser 1982, Johnston 1987, Johnston 2001, Komarkova 1986, Terwilliger and Tiedemann 1978, Tiedemann et al. 1987, Wasser and Hess 1982, Western Ecology Working Group n.d.

Artemisia tridentata ssp. *vaseyana / Hesperostipa comata* Shrubland

Mountain Big Sagebrush / Needle-and-Thread Shrubland

CODE	CEGL002931
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. VASEYANA* SHRUBLAND ALLIANCE (A.831) Mountain Big Sagebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This association is known from southern Utah to southern Idaho and western Wyoming and is likely to occur in northern Nevada. It occurs on moderate slopes between 1372 to 2850 m (4500-9350 feet) elevation. Soils are deep and range from clay loam to sandy loams. *Artemisia tridentata* ssp. *vaseyana* is the dominant shrub. *Purshia tridentata, Symphoricarpos oreophilus, Ericameria* sp., *Artemisia tripartita,* and *Amelanchier alnifolia* may be present at upper elevations, and at lower altitudes *Chrysothamnus viscidiflorus* and *Tetradymia canescens* can be common. *Hesperostipa comata (= Stipa comata)* is the principal understory species. *Festuca idahoensis, Pseudoroegneria spicata (= Agropyron spicatum),* and *Koeleria macrantha* may be present in small amounts. Other herbaceous species that may be present include *Carex rossii, Achnatherum lettermanii, Achnatherum nelsonii, Pseudoroegneria spicata, Poa pratensis, Antennaria microphylla,* and *Eriogonum umbellatum*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled in the Upper Pine Creek area, on Sheep Knob, and near West Elk Creek in the recreation area.

Globally

This association is known from southern Utah to southern Idaho and western Wyoming. It is likely to occur in northern Nevada.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This shrubland association was observed in shallow drainages or linear depressions on valley slopes, on shoulder slopes and ridge tops, and on dry benches on basin floors. Sites are gentle to moderately steep (5-25% slopes), occur between 2417 and 2850 m elevation, and are oriented to southwest-facing aspects. The unvegetated surface has low to high cover of litter, large and small rocks, and exposure of bare soil. Downed wood is relatively common, with cover up to 6%. Soils are moderately well-drained and are sandy loam derived from Quaternary alluvium.

Globally

This association occurs on gentle to moderate slopes, ridges, depressions and plateaus between 1370 and 2850 m (4500-9350 feet) elevation. The lower elevations tend to occur at the northern end of the association's range. Soils are derived from alluvium, eolian sands or loess, are deep and range in texture from clay loam to sandy loams.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 70 to 90% in these stands. This shrub herbaceous association is characterized by the bunchgrass *Hesperostipa comata* that provides from 1 to 40% cover, and the short shrub *Artemisia tridentata* ssp. *vaseyana* that provides from 30 to 75% cover. The herbaceous layer is very diverse, typically dominated by graminoids, and contributes from 10 to 45% cover. Other graminoids provide low to moderate total cover and include *Achnatherum hymenoides, Achnatherum pinetorum, Carex geyeri, Elymus elymoides, Festuca thurberi, Koeleria macrantha, Poa fendleriana,* and *Poa secunda*. Forbs are diverse and provide low cover, including

Antennaria parvifolia, Erigeron pumilus, Eriogonum racemosum, Lupinus spp., and *Penstemon teucrioides*. The shrub layer is somewhat variable in cover and composition. Short and dwarf-shrubs are diverse but typically contribute less than 5% cover per species; the more common include *Ericameria parryi, Opuntia fragilis*, and *Symphoricarpos rotundifolius*. Cryptogam cover of less than 5% may be present in some stands.

Globally
Total vegetation cover usually exceeds 60% in these moderately to densely vegetated communities. *Artemisia tridentata* ssp. *vaseyana* is the dominant shrub, with between 1 and 40% cover. *Purshia tridentata, Symphoricarpos oreophilus, Ericameria* sp., *Artemisia tripartita*, and *Amelanchier alnifolia* may be present at upper elevations, and at lower altitudes *Chrysothamnus viscidiflorus, Cercocarpus montanus*, and *Tetradymia canescens* can be common. *Hesperostipa comata (= Stipa comata)* is the principal understory species. *Festuca idahoensis, Pseudoroegneria spicata (= Agropyron spicatum)*, and *Koeleria macrantha* may be present in small amounts. Other herbaceous species that may be present include *Bouteloua gracilis, Poa fendleriana, Muhlenbergia* spp., *Carex rossii, Achnatherum lettermanii, Achnatherum nelsonii, Pseudoroegneria spicata, Poa pratensis, Antennaria microphylla*, and *Eriogonum umbellatum*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Hesperostipa comata*, *Poa fendleriana*

Globally

Stratum	Species
Short shrub/sapling	*Purshia tridentata*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Antennaria microphylla*, *Eriogonum umbellatum*
Herb (field)	*Hesperostipa comata*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus tectorum* (exotic, High), *Poa pratensis* (exotic, Medium), *Taraxacum officinale* (exotic)

Globally
Other: *Arenaria congesta* var. *wheelerensis* (G5T2T3Q)

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (14-Aug-2001).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
The global description is based on Hironaka et al. (1983) and Grand Teton National Park and Zion National Park local descriptions. Of all the references for this association, only Hironaka et al. (1983) clearly reference an *Artemisia tridentata* ssp. *vaseyana / Stipa comata* vegetation type. All the others (Poulton 1955, Tueller et al. 1966, Blackburn 1967, Blackburn et al. 1968c, 1971, McLean 1970, Tueller and Blackburn 1974, DeVelice and Lesica 1993) do not provide information as to the subspecies of *Artemisia tridentata*. Further clarification of which published materials relate to this association is needed. Based on habitat information and photos available for the study areas in Nevada, these could reference *Artemisia tridentata* ssp. *tridentata / Stipa comata* vegetation types.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Some grazing is evident; stands have dense herbaceous layer.

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (3 plots: CURE.0313, CURE.0363, CURE.0372 and 13 observation points: BLCA_AA.706, CURE_AA.0038, CURE_AA.0042, CURE_AA.0168, CURE_AA.0173, CURE_AA.0175, CURE_AA.0178, CURE_AA.0180, CURE_AA.0183, CURE_AA.0186, CURE_AA.0296, CURE_AA.0328, CURE_AA.0834).
Local Description Authors: J. Von Loh, mod. J. Coles
Global Description Authors: G. Kittel, mod. J. Coles

REFERENCES: Bell et al. 2009, Blackburn 1967, Blackburn et al. 1968c, Blackburn et al. 1971, Bramble-Brodahl 1978, CONHP unpubl. data 2003, Cogan et al. 2004, DeVelice and Lesica 1993, Hironaka et al. 1983, McLean 1970, Poulton 1955, Tueller and Blackburn 1974, Tueller et al. 1966, Western Ecology Working Group n.d.

Artemisia tridentata ssp. *vaseyana / Pascopyrum smithii* Shrubland

Mountain Big Sagebrush / Western Wheatgrass Shrubland

CODE	CEGL001028
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. VASEYANA* SHRUBLAND ALLIANCE (A.831) Mountain Big Sagebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)
Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This mesic sagebrush association occurs in upland areas where snow accumulates, including swales and valley bottoms. Documented stands are known from Wyoming, Montana and northern and western Colorado. Elevations range from 2200 to 2500 m (7200-8200 feet). Sites are level to gently sloping and may be oriented to any aspect. Soils may be derived from eolian sediments, sandstone or shale, and often have a silty loam or clay loam texture. The amount of litter on the ground surface is inversely proportional to the intensity of grazing. Total vegetation cover ranges from a low of around 20% to approximately 75%. *Artemisia tridentata* ssp. *vaseyana* dominates the shrub layer with 10 to 50% cover, and *Pascopyrum smithii* dominates a diverse herbaceous layer. Other shrubs comprise a minority of the shrub canopy, including *Symphoricarpos oreophilus, Amelanchier utahensis, Purshia tridentata, Ericameria nauseosa, Tetradymia canescens, Krascheninnikovia lanata*, and *Chrysothamnus viscidiflorus*. The grass component of the understory is often diverse and may include a combination of *Poa fendleriana, Achnatherum pinetorum, Achnatherum hymenoides, Bouteloua gracilis, Elymus lanceolatus, Leymus cinereus, Hesperostipa comata, Elymus elymoides*, and *Poa secunda*. Forbs such as *Artemisia frigida, Achillea millefolium,* and *Phlox hoodii* ssp. *muscoides (= Phlox bryoides)* generally contribute little cover.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This rare association was sampled near State Highway 92 in the Curecanti National Recreation Area.

Globally
This association is known from Montana, northern and western Colorado, and Wyoming.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This short-shrub association occurs on slopes. The site is gently sloped (14%), occurs at 2453 m elevation, and is oriented to the northwest. The unvegetated surface has high cover of litter and high exposure of bare soil. Large and

small rocks provide low cover. Downed wood is common, probably as a result of grazing. Parent materials are Mesozoic sandstone. Soils are sandy and well-drained.

Globally
This mesic sagebrush association occurs in uplands in areas where snow accumulates, including swales and valley bottoms. Documented stands are in Wyoming and in northern and western Colorado, but this association is likely to be widespread. Elevations range from 2200 to 2500 m (7200-8200 feet). Sites are level to gently sloping and may occur on any aspect. Soils may be derived from eolian deposits, sandstone or shale, and often have a silty loam or clay loam texture. The amount of litter on the ground surface is inversely proportional to the intensity of grazing.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is approximately 85% for the one sampled stand of this type. *Artemisia tridentata* ssp. *vaseyana* shrubs 1-2 m tall form a moderately open to closed canopy and provide 50-75% cover, and the perennial, rhizomatous grass *Pascopyrum smithii* provides up to 5% cover. The shrub layer is low in diversity and provides moderate to dense cover. Additional short shrubs providing sparse cover include *Chrysothamnus viscidiflorus, Tetradymia canescens*, and *Purshia tridentata*. The dwarf-shrub layer is sparse in terms of cover and includes *Ericameria nauseosa* and *Gutierrezia sarothrae*. The herbaceous layer is diverse and provides moderate cover. Graminoids are moderately diverse and provide low cover, principally by the non-native grass *Poa pratensis*. Other graminoids present providing sparse cover include *Achnatherum hymenoides, Achnatherum pinetorum, Elymus elymoides*, and *Koeleria macrantha*. Forbs are diverse but sparse and include *Achillea millefolium var. occidentalis, Astragalus tenellus*, and *Orthocarpus luteus*. Species of moss provide sparse cover.

Globally
Total vegetation cover in these sagebrush shrublands ranges from 20% to approximately 75%. *Artemisia tridentata* ssp. *vaseyana* dominates the shrub layer with 10-50% cover, and *Pascopyrum smithii* dominates the diverse herbaceous layer. Other shrubs may comprise a minor component of the shrub canopy, including *Symphoricarpos oreophilus, Amelanchier utahensis, Purshia tridentata, Ericameria nauseosa, Tetradymia canescens, Krascheninnikovia lanata*, and *Chrysothamnus viscidiflorus*. The grass component of the understory is often diverse and may include a combination of *Poa fendleriana, Achnatherum pinetorum, Achnatherum hymenoides, Bouteloua gracilis, Elymus lanceolatus, Leymus cinereus, Hesperostipa comata, Elymus elymoides*, and *Poa secunda*. Forbs such as *Artemisia frigida, Achillea millefolium*, and *Phlox hoodii* ssp. *muscoides (= Phlox bryoides)* generally contribute little cover.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Achillea millefolium* var. *occidentalis*, *Astragalus tenellus*, *Orthocarpus luteus*
Herb (field)	*Pascopyrum smithii*, *Poa pratensis*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Pascopyrum smithii*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Poa pratensis* (exotic, Medium)

Globally
Exotic/Invasive: *Poa pratensis* (exotic, Medium)

CONSERVATION STATUS RANK
Global Rank & Reasons: G3? (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: The area is intensively grazed.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0079 and 21 observation points: BLCA_AA.264, BLCA_AA.266, BLCA_AA.270, BLCA_AA.273, BLCA_AA.320, BLCA_AA.326, BLCA_AA.397, BLCA_AA.893, BLCA_AA.931, BLCA_AA.932, BLCA_AA.933, BLCA_AA.934, BLCA_AA.935, BLCA_AA.943, BLCA_AA.948, BLCA_AA.953, BLCA_AA.959, BLCA_AA.960, CURE_AA.0261, CURE_AA.0551, CURE_AA.0992).
Local Description Authors: J. Von Loh
Global Description Authors: J. Coles

REFERENCES: Baker 1984a, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Driscoll et al. 1984, Jones 1992b, MTNHP 2002b, Rzedowski 1981, Skull Point Mine Application n.d., Skull Point Mine Permit Renewal n.d., Smith 1966, Terwilliger and Smith 1978, Western Ecology Working Group n.d.

Artemisia tridentata ssp. *vaseyana / Poa fendleriana* Shrubland

Mountain Big Sagebrush / Muttongrass Shrubland

CODE	CEGL002812
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. VASEYANA* SHRUBLAND ALLIANCE (A.831) Mountain Big Sagebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This sagebrush shrubland covers medium to large patches on the slopes of mesas, valleys, plateaus, hills and ridges in western Colorado, eastern Utah and southwestern Wyoming. It often occurs in a mosaic with other sagebrush communities that cover very large areas. Elevations range from 2100 to 2875 m (6900-9430 feet). Slopes vary from gentle to steep and may be oriented to any aspect. Litter cover is generally high, and soils are deep and mostly relatively fine-textured clay loams or clays, with a few stands on sandy sites. Total vegetation cover ranges from approximately 35% to nearly 100%. The shrub layer is dominated by *Artemisia tridentata* ssp. *vaseyana* shrubs up to 1 m tall with between 20 and 50% cover. The bunchgrass *Poa fendleriana* is dominant in the herbaceous layer with 1 to 25% cover. Other shrub species present, in addition to the sagebrush, include *Purshia tridentata, Chrysothamnus viscidiflorus*, and *Symphoricarpos oreophilus*. The herbaceous layer may be sparse to dense and well-developed, diverse or depauperate, depending on location and grazing history. The grass component in particular is generally mixed, and common associated or codominant graminoids include *Koeleria macrantha, Poa secunda, Elymus lanceolatus, Bouteloua gracilis, Carex duriuscula (= Carex stenophylla), Elymus elymoides, Pseudoroegneria spicata*, and *Hesperostipa comata*. Forbs commonly present may include *Antennaria parvifolia, Castilleja linariifolia, Eriogonum umbellatum, Lupinus sericeus, Artemisia frigida*, and *Penstemon caespitosus*.

Grazing has likely contributed to the increase in cover by mountain big sagebrush in these stands at the expense of native grasses. Fire would eliminate the mountain big sagebrush canopy in favor of a mixed graminoid and forb community. In the absence of fire over long periods, some stands show evidence of invasion by *Pinus edulis, Juniperus osteosperma,* or *Pseudotsuga menziesii*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This uncommon association was sampled on Carpenter Ridge in Curecanti National Recreation Area.

Globally
This association has been documented in the Colorado Plateau and Rocky Mountains in western Colorado, eastern Utah and southwestern Wyoming. It is likely to be significantly more common than is currently known.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This shrubland association occurs on the slopes of mesas and ridges. Sites are moderate to steeply sloping (9-48%), occur at 2695 m elevation, and are oriented to north and east aspects. The unvegetated surface consists of litter and gravel. Parent materials include Tertiary volcanic rocks, and the soils are rapidly drained sandy loams and clay loams.

Globally
This sagebrush shrubland association covers medium to large patches on the slopes of mesas, valleys, plateaus, hills and ridges in western Colorado, eastern Utah and southwestern Wyoming. Elevations range from 2100 to 2875 m (6900-9430 feet). Slopes vary from gentle to steep and may be oriented to any aspect. Litter cover is generally high, and soils are deep and mostly relatively fine-textured clay loams or clays, with a few stands on sandy sites. Parent materials include volcanic rocks and shale from the Wasatch Formation.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is approximately 50% in this type. *Artemisia tridentata* ssp. *vaseyana* shrubs up to 1 m tall provide 50% cover. The bunchgrass *Poa fendleriana* is dominant in the herbaceous layer with up to 25% cover. Other shrub species present, in addition to the sagebrush, include *Chrysothamnus viscidiflorus* and *Symphoricarpos oreophilus*. The herbaceous layer is limited and provides sparse cover, including *Artemisia frigida* and *Penstemon caespitosus*.

Globally
This Wyoming big sagebrush association occurs in a mosaic with other sagebrush communities that in aggregate may cover entire landscapes. Total vegetation cover ranges from approximately 35% to nearly 100%. The shrub layer is dominated by *Artemisia tridentata* ssp. *vaseyana* shrubs up to 1 m tall with between 20 and 50% cover. The bunchgrass *Poa fendleriana* is dominant in the herbaceous layer with 1 to 25% cover. Other shrub species present, in addition to the sagebrush, include *Purshia tridentata, Amelanchier utahensis, Artemisia arbuscula* ssp. *longiloba, Chrysothamnus viscidiflorus,* and *Symphoricarpos oreophilus*. The herbaceous layer may be sparse to dense and well-developed, diverse or depauperate, depending on location and grazing history. The grass component in particular is generally mixed, and common associated or codominant graminoids include *Koeleria macrantha, Poa secunda, Elymus lanceolatus, Bouteloua gracilis, Carex duriuscula (= Carex stenophylla), Elymus elymoides, Leymus cinereus, Pascopyrum smithii, Pseudoroegneria spicata,* and *Hesperostipa comata*. Forbs commonly present may include *Antennaria parvifolia, Castilleja linariifolia, Cirsium undulatum, Eriogonum umbellatum, Lupinus sericeus, Argentina anserina (= Potentilla anserina), Artemisia frigida,* and *Penstemon caespitosus*. The non-native annual *Bromus tectorum* and the non-native perennial *Poa pratensis* are common in some stands.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Poa fendleriana*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Poa fendleriana*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Exotic/Invasive: *Bromus tectorum* (exotic, High), *Poa pratensis* (exotic, Medium)

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (28-Jun-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Although *Poa fendleriana* is the dominant grass in the understory of this sagebrush association, it is often accompanied by other grasses, many with significant cover and indicator value. In a sagebrush landscape, the dominant grass in any given spot may depend on many variables, including grazing history and drought cycles, as well as subtle differences in soil, aspect, slope and slope position. In practice it may be difficult to distinguish this association in the field from many of the similar associations listed above.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: One stand has scattered *Pseudotsuga menziesii* trees.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (4 plots: CURE.0076, CURE.0218, CURE.0338, CURE.0341 and 53 observation points: BLCA_AA.204, BLCA_AA.245, BLCA_AA.305, BLCA_AA.308, BLCA_AA.324, BLCA_AA.325, BLCA_AA.339, BLCA_AA.344, BLCA_AA.406, BLCA_AA.407, BLCA_AA.434, BLCA_AA.438, BLCA_AA.472, BLCA_AA.713, BLCA_AA.814, BLCA_AA.828, BLCA_AA.929, BLCA_AA.930, BLCA_AA.940, BLCA_AA.945, BLCA_AA.946, BLCA_AA.951, BLCA_AA.952, BLCA_AA.954, BLCA_AA.957, BLCA_AA.958, CURE_AA.0011, CURE_AA.0013, CURE_AA.0029, CURE_AA.0030, CURE_AA.0152, CURE_AA.0154, CURE_AA.0169, CURE_AA.0172, CURE_AA.0193, CURE_AA.0194, CURE_AA.0203, CURE_AA.0235, CURE_AA.0300, CURE_AA.0353, CURE_AA.0388, CURE_AA.0456, CURE_AA.0496, CURE_AA.0505, CURE_AA.0614, CURE_AA.0644, CURE_AA.0821, CURE_AA.0822, CURE_AA.0849, CURE_AA.0910, CURE_AA.0941, CURE_AA.1022, CURE_AA.1094).
Local Description Authors: J. Coles
Global Description Authors: J. Coles, mod. K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Artemisia tridentata ssp. *wyomingensis / (Agropyron cristatum, Psathyrostachys juncea)* Seeded Grasses Semi-natural Shrubland

Wyoming Big Sagebrush / (Crested Wheatgrass, Russian Wildrye) Seeded Grasses Semi-natural Shrubland

CODE	CEGL002185
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. WYOMINGENSIS* SHRUBLAND ALLIANCE (A.832) Wyoming Big Sagebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland association has been observed in western Colorado and eastern Utah, though it is very likely to be more widespread in the western U.S. It occurs on generally level topography that has been or is currently disturbed by land-management activities such as chaining or heavy grazing. Stands have been observed at mid-elevations, though more data are likely to expand this range. The unvegetated surfaces is generally dominated by litter and bare soil. Dead shrubs can be abundant due to past land-treatment activities. Soils are poorly drained to moderately well-drained sandy loams or loamy sands. Most observed sites have been on eolian deposits derived from sandstone. There is a short (1-2 m) open shrub canopy dominated by *Artemisia tridentata* ssp. *wyomingensis* with other shrubs contributing low cover. Common associates are *Artemisia dracunculus, Artemisia frigida, Chrysothamnus viscidiflorus, Ericameria nauseosa, Gutierrezia sarothrae*, and *Opuntia* spp. Scattered short to medium-tall *Pinus edulis* and *Juniperus osteosperma* trees may be present. The herbaceous stratum has sparse to low cover and is characterized by seeded exotic species, especially *Agropyron cristatum* or *Psathyrostachys juncea*. *Bromus tectorum* is another common exotic species. Native species, which may have been seeded or migrated from nearby seed sources, include *Achnatherum hymenoides, Aristida purpurea, Bouteloua gracilis, Elymus elymoides, Hesperostipa comata, Poa fendleriana, Sporobolus cryptandrus*, and *Vulpia octoflora*. Nonvascular component is usually poor due to the disturbance of these sites.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled in the vicinity of East Elk Creek in Curecanti National Recreation Area.

Globally

This association has been observed in western Colorado and eastern Utah, though it is very likely to occur elsewhere in the western U.S. *Psathyrostachys juncea* is particularly prevalent in northwestern Colorado, as a local seed-producer specialized in this species for revegetation of degraded rangelands.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This short-shrub association occurs on valley slopes. The site is gently sloped (12% slope), occurs at 2323 m elevation, and is oriented to the south. The unvegetated surface has low cover of litter, high cover of small rocks, and moderate to high exposure of bare soil. Downed wood is uncommon; there is some standing dead wood present. Parent materials are Quaternary alluvial deposits. Soils are rapidly drained sandy clay loams.

Globally

This association is found on generally level topography such as mesatops, benches, and plateau. Sites can be flat to gently sloping on any aspect. Observed sites in western Colorado have been at mid-elevations (2024-2128 m), though a wider range is certain as more data are available. The unvegetated surfaces is generally dominated by litter

and bare soil. Dead shrubs can be abundant due to past land-treatment activities. Soils are poorly drained to moderately well-drained sandy loams or loamy sands. Most observed sites have been on eolian deposits derived from sandstone.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is 50% in this shrubland type. *Artemisia tridentata* ssp. *wyomingensis* shrubs form an open canopy that provides 30% cover, and the non-native, medium-tall, bunchgrass *Agropyron cristatum* provides 13% cover. The shrub layer is low in diversity and provides moderate cover. The dwarf-shrub layer provides sparse cover and includes *Gutierrezia sarothrae* and *Symphoricarpos rotundifolius* and the succulent *Opuntia polyacantha*. The herbaceous layer is diverse and provides moderate cover. Additional graminoids that provide low to moderate cover include *Leymus salinus, Achnatherum hymenoides, Bouteloua gracilis, Elymus elymoides, Hesperostipa comata*, and *Poa fendleriana*. Forbs are relatively diverse, provide sparse cover, and include *Arabis glabra, Astragalus convallarius, Astragalus drummondii, Erigeron engelmannii, Penstemon teucrioides, Phlox hoodii*, and *Physaria rollinsii*.

Globally

This shrubland has sparse to moderate total vegetation cover with an open short-shrub canopy. The dominant species in the shrub stratum is *Artemisia tridentata* ssp. *wyomingensis* which may have between 4 and 50% cover. *Artemisia dracunculus, Artemisia frigida, Chrysothamnus viscidiflorus, Ericameria nauseosa, Gutierrezia sarothrae*, and *Opuntia* spp. are common associates with low cover. Short to medium-tall trees, typically *Juniperus osteosperma* or *Pinus edulis*, may be scattered throughout stands of this association. The herbaceous stratum is dominated by exotic species that have been seeded at some time in the past, most commonly *Agropyron cristatum* or *Psathyrostachys juncea* with 1-25% cover. *Bromus tectorum* is another common exotic species. Native species, which may have been seeded or migrated from nearby seed sources, include *Achnatherum hymenoides, Aristida purpurea, Bouteloua gracilis, Elymus elymoides, Hesperostipa comata, Poa fendleriana, Sporobolus cryptandrus*, and *Vulpia octoflora*. Nonvascular component is usually poor due to the disturbance of these sites.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Achnatherum hymenoides, Agropyron cristatum, Bouteloua gracilis, Elymus elymoides, Leymus salinus*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Agropyron cristatum*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (6-Jan-2005).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Site was manipulated historically, possibly to guide runoff, resulting in 1-m wide ridges occurring across the slope at regular intervals.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0377 and 15 observation points: BLCA_AA.348, CURE_AA.0241, CURE_AA.0242, CURE_AA.0251, CURE_AA.0307, CURE_AA.0346, CURE_AA.0393, CURE_AA.0488, CURE_AA.0523, CURE_AA.0535, CURE_AA.0629, CURE_AA.0636, CURE_AA.0637, CURE_AA.0727, CURE_AA.0733).
Local Description Authors: J. Von Loh
Global Description Authors: J. Drake

REFERENCES: Western Ecology Working Group n.d.

Artemisia tridentata ssp. *wyomingensis / Achnatherum hymenoides* Shrubland

Wyoming Big Sagebrush / Indian Ricegrass Shrubland

CODE	CEGL001046
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. WYOMINGENSIS* SHRUBLAND ALLIANCE (A.832) Wyoming Big Sagebrush Shrubland Alliance
ECOLOGICAL SYSTEM(S):	Great Basin Xeric Mixed Sagebrush Shrubland (CES304.774) Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)
USFWS WETLAND SYSTEM:	Not applicable

CONCEPT SUMMARY
Globally
This sagebrush shrubland association is known from the Gunnison River Valley and the Piceance Basin in western Colorado and the Columbia Basin in Oregon and Idaho, and possibly California. This shrubland association occurs on slopes and terraces above drainages and ridges. Sites are gentle to steep (4-100%) colluvial slopes and alluvial benches often on warmer southeast to southwest aspects between 1830 and 2710 m (6000-8900 feet) elevation. Substrates are variable but are typically moderately deep, well-drained soils with sandy clay loam, sandy loam and loam textures. The ground surface has high cover of large and small rocks, low to moderate cover of litter, and occasionally high cover of bare ground. The vegetation is characterized by an open to dense (10-75% cover) short-shrub canopy (to 1 m tall) dominated by *Artemisia tridentata* ssp. *wyomingensis*, with the bunchgrass *Achnatherum hymenoides* dominant in a patchy open herbaceous layer. Other shrub species present include *Artemisia frigida, Chrysothamnus viscidiflorus, Krascheninnikovia lanata, Purshia tridentata, Symphoricarpos oreophilus, Yucca harrimaniae,* and the succulent *Opuntia polyacantha*. The herbaceous layer is diverse and provides low to moderate cover. Associated graminoids include *Achnatherum pinetorum, Bouteloua gracilis, Elymus elymoides, Hesperostipa comata, Pascopyrum smithii, Pleuraphis jamesii, Poa fendleriana,* and introduced grasses *Bromus tectorum* and *Poa pratensis*. Forbs are variable, provide sparse cover, and include *Erigeron* spp., *Penstemon teucrioides, Phlox* spp., and *Sphaeralcea coccinea*. *Juniperus scopulorum* trees are occasionally present.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This common, widespread association occurs throughout the recreation area. It was sampled along East Elk Creek at Sapinero State Wildlife Area, near Blue Mesa Dam, in the Dillon Pinnacles Area near Middle Bridge, opposite Dillon Pinnacles, near Iola Landing, along Cebolla Creek, within Kezar Basin drainages, above the State Highway 50 quarry, along Dry Creek east of Rainbow Lake Road, along South Willow Creek near the Powerline Road, along Soap Creek Road, near Steuben Creek, along the West Elk Arm of Blue Mesa Reservoir, on Dillon Mesa, on the

west flank of Haystack Mesa, and at Cimarron. It is one of the most extensive big sagebrush types occurring at the bases and on the sides of mesas and also occurs in all drainages in this portion of the Upper Gunnison Basin.

Globally
This sagebrush shrubland association is known from the Gunnison River Valley and the Piceance Basin in western Colorado and the Columbia Basin in Oregon and Idaho, and possibly California and elsewhere within the range of these common western species.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This short-shrub association occurs on the slopes of gullies and ridges. Sites are nearly flat to steep (4-73% slopes), occur between 2180 and 2445 m elevation, and most are oriented to southeast to southwest aspects. The unvegetated surface has high cover of large and small rocks and low to moderate cover of litter. Exposure of bare soil is occasionally high. Cryptobiotic soil crusts may provide sparse to low cover. Parent materials are Tertiary volcanic rocks, metamorphic/granitic rocks, Mesozoic sandstone and shale. Soils are variable and well-drained and include sandy clay loams, sandy loams and loams.

Globally
This sagebrush shrubland association is known from the Gunnison River Valley and the Piceance Basin in western Colorado and the Columbia Basin in Oregon and Idaho, and possibly California. This shrubland association occurs on slopes and terraces above drainages and ridges. Sites are gentle to steep (4-100%) colluvial slopes and alluvial benches often on warmer southeast to southwest aspects between 1830 and 2710 m (6000-8900 feet) elevation. Substrates are variable but are typically moderately deep, well-drained soils with sandy clay loam, sandy loam and loam textures. Parent materials are Tertiary volcanic rocks (breccia, tuff), metamorphic/granitic rocks (granite, gneiss, felsite, schist), Mesozoic sandstone, mudstone and shale. The ground surface has high cover of large and small rocks, low to moderate cover of litter, and occasionally high cover of bare ground. Cryptobiotic soil crusts may provide sparse to low cover.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 10% to approximately 65% in these stands. *Artemisia tridentata* ssp. *wyomingensis* short shrubs form open to closed canopies and provide 5 to 75% cover, and the moderately tall bunchgrass *Achnatherum hymenoides* provides 1 to 50% cover. The shrub layer is diverse and provides sparse to moderate cover. Additional short and dwarf-shrubs include *Artemisia frigida, Opuntia polyacantha, Purshia tridentata, Symphoricarpos oreophilus,* and *Yucca harrimaniae*. The herbaceous layer is diverse and provides low to moderate cover. Graminoid cover is sparse to low and additional species include *Achnatherum pinetorum, Bouteloua gracilis, Elymus elymoides, Pleuraphis jamesii*, and *Poa fendleriana*. Forbs are variable, provide sparse cover, and include *Erigeron concinnus, Penstemon teucrioides*, and *Phlox hoodii*. *Juniperus scopulorum* trees are occasionally present providing sparse cover. Mosses and lichens provide sparse to low cover, up to 10%.

Globally
This association is characterized by an open to dense (10-75% cover) short-shrub canopy (to 1 m tall) dominated by *Artemisia tridentata* ssp. *wyomingensis*, with the bunchgrass *Achnatherum hymenoides* dominant in a patchy open herbaceous layer. Other shrub species present include *Artemisia frigida, Chrysothamnus viscidiflorus, Krascheninnikovia lanata, Purshia tridentata, Symphoricarpos oreophilus, Yucca harrimaniae*, and the succulent *Opuntia polyacantha*. The herbaceous layer is diverse and provides low to moderate cover. Associated graminoids include *Achnatherum pinetorum, Bouteloua gracilis, Elymus elymoides, Hesperostipa comata, Pascopyrum smithii, Pleuraphis jamesii, Poa fendleriana*, and introduced grasses *Bromus inermis, Bromus tectorum*, and *Poa pratensis*. Forbs are variable, provide sparse cover, and include *Erigeron concinnus, Erigeron subtrinervis, Penstemon teucrioides, Phlox hoodii, Phlox longifolia, Phlox multiflora*, and *Sphaeralcea coccinea*. *Juniperus scopulorum* trees are occasionally present providing sparse cover. Mosses and lichens provide sparse to low cover, up to 10%.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Krascheninnikovia lanata*
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis, Purshia tridentata, Yucca harrimaniae*

Herb (field)	*Achnatherum hymenoides*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Achnatherum hymenoides*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Vulnerable: *Astragalus anisus* (globally imperiled endemic, G2G3); **Exotic/Invasive**: *Bromus inermis* (exotic, High/Medium), *Melilotus officinalis* (exotic, Medium/Low)

Globally
Vulnerable: *Astragalus anisus* (globally imperiled, G2G3), *Penstemon teucrioides* (vulnerable, G2G3Q); **Exotic/Invasive**: *Bromus inermis* (exotic, High/Medium), *Bromus tectorum* (exotic, High), *Melilotus officinalis* (exotic, Medium/Low), *Poa pratensis* (exotic, Medium)

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
The current list of plant association of Oregon (Kagan et al. 2004) does not include this type. The most similar type listed is *Purshia tridentata - Artemisia tridentata* ssp. *wyomingensis / Oryzopsis hymenoides - Hesperostipa comata* Shrubland that occurs on inland dunes and is based on Poulton (1955). Further clarification is needed on the extent of this type in the Columbia Basin.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: On some sites, *Artemisia tridentata* ssp. *wyomingensis* mixes or hybridizes with other subspecies of big sagebrush, such as *Artemisia tridentata* ssp. *vaseyana* and *Artemisia tridentata* ssp. *tridentata*, adding to the difficulty of distinguishing associations.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (15 plots: CURE.0002, CURE.0014, CURE.0025, CURE.0038, CURE.0042, CURE.0050, CURE.0063, CURE.0080, CURE.0084, CURE.0103, CURE.0127, CURE.0132, CURE.0159, CURE.0294, CURE.0296 and 61 observation points: CURE_AA.0196, CURE_AA.0204, CURE_AA.0211, CURE_AA.0222, CURE_AA.0223, CURE_AA.0227, CURE_AA.0256, CURE_AA.0260, CURE_AA.0276, CURE_AA.0286, CURE_AA.0287, CURE_AA.0291, CURE_AA.0293, CURE_AA.0311, CURE_AA.0312, CURE_AA.0327, CURE_AA.0347, CURE_AA.0354, CURE_AA.0355, CURE_AA.0381, CURE_AA.0399, CURE_AA.0426, CURE_AA.0431, CURE_AA.0455, CURE_AA.0469, CURE_AA.0497, CURE_AA.0506, CURE_AA.0527, CURE_AA.0541, CURE_AA.0542, CURE_AA.0549, CURE_AA.0565, CURE_AA.0566, CURE_AA.0574, CURE_AA.0585, CURE_AA.0586, CURE_AA.0587, CURE_AA.0594, CURE_AA.0613, CURE_AA.0630, CURE_AA.0654, CURE_AA.0672, CURE_AA.0707, CURE_AA.0728, CURE_AA.0758, CURE_AA.0775, CURE_AA.0781, CURE_AA.0803, CURE_AA.0804, CURE_AA.0805, CURE_AA.0857, CURE_AA.0887, CURE_AA.0966, CURE_AA.0993, CURE_AA.1006, CURE_AA.1012, CURE_AA.1014, CURE_AA.1026, CURE_AA.1027, CURE_AA.1040, CURE_AA.1055).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: K.A. Schulz

REFERENCES: Baker 1982b, Bell et al. 2009, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Driscoll et al. 1984, Ferchau 1973, Johnston 1987, Johnston 2001, Kagan et al. 2000, Kagan et al. 2004, Poulton 1955, Thorne Ecological Institute 1973a, Thorne Ecological Institute 1973b, Western Ecology Working Group n.d.

Artemisia tridentata ssp. *wyomingensis / Achnatherum pinetorum* Shrubland

Wyoming Big Sagebrush / Pine Needlegrass Shrubland

CODE	CEGL002810
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. WYOMINGENSIS* SHRUBLAND ALLIANCE (A.832) Wyoming Big Sagebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland association is based on 12 plots from Curecanti National Recreation Area in the Gunnison River Valley in western Colorado. This shrubland association occurs on slopes of ridges, saddles, hills, plains and valleys. Sites are level to moderately steep (1-46% slopes), occur between 2308 and 2414 m elevation, and are oriented to all aspects. The unvegetated surface has moderate cover of litter, bare soil, and gravel. Downed wood may have low to moderate cover. Parent materials include Mesozoic sandstone and shale, metamorphic/granitic rocks and Tertiary volcanic rocks. Soils are rapidly drained loams and loamy sands and sandy clay loams. The vegetation is characterized by an open to dense (10-75% cover) short-shrub canopy (to 1 m tall) dominated by *Artemisia tridentata* ssp. *wyomingensis*, with the bunchgrass *Achnatherum pinetorum* dominant in a patchy open herbaceous layer. Other shrub species present include *Gutierrezia sarothrae*, *Chrysothamnus depressus*, and *Symphoricarpos oreophilus*, and the succulent *Opuntia polyacantha*. The herbaceous layer is diverse and provides low to moderate cover. Associated graminoids include *Achnatherum hymenoides, Poa fendleriana*, and *Elymus elymoides*. Forbs are also diverse and provide sparse cover, including *Phlox hoodii*, *Antennaria parvifolia, Erigeron concinnus*, and *Penstemon teucrioides*. Species of moss and crustose lichen provide sparse to moderate cover.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This common association was sampled on Cebolla Creek, Dillon Pinnacles, Dry Creek, Elk Creek area, Iola area, Kezar Basin area, North Willow Creek area and Soap Creek Road in Curecanti National Recreation Area.

Globally

This shrubland association occurs in Curecanti National Recreation Area in the Gunnison River Valley in western Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This shrubland association occurs on slopes of ridges, saddles, hills, plains and valleys. Sites are level to moderately steep (1-46% slopes), occur between 2308 and 2414 m elevation, and are oriented to all aspects. The unvegetated surface has moderate cover of litter, bare soil, and gravel. Downed wood may have low to moderate cover. Parent materials include Mesozoic sandstone and shale, metamorphic/granitic rocks and Tertiary volcanic rocks. Soils are rapidly drained loams and loamy sands and sandy clay loams.

Globally

Data are not available.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 10% to over 100% in these stands. *Artemisia tridentata* ssp. *wyomingensis* shrubs up to 1 m tall form open to closed canopies and provide from 5 to 75% cover. The bunchgrass *Achnatherum*

pinetorum is dominant and forms a patchy open layer with between 1 and 25% cover. Other shrub species present, in addition to the sagebrush, include *Gutierrezia sarothrae, Chrysothamnus depressus*, and *Symphoricarpos oreophilus*, and the succulent *Opuntia polyacantha*. The herbaceous layer is diverse and provides low to moderate cover. Associated graminoids include *Achnatherum hymenoides, Poa fendleriana*, and *Elymus elymoides*. Forbs are also diverse and provide sparse cover, including *Phlox hoodii, Antennaria parvifolia, Erigeron concinnus*, and *Penstemon teucrioides*. Species of moss and crustose lichen provide sparse to moderate cover.

Globally
Data are not available.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Chrysothamnus depressus, Gutierrezia sarothrae*
Short shrub/sapling	*Artemisia nova, Artemisia tridentata* ssp. *wyomingensis, Cercocarpus montanus*
Herb (field)	*Achnatherum pinetorum, Poa fendleriana*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Achnatherum pinetorum*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Vulnerable: *Penstemon teucrioides* (vulnerable, G2G3Q)

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (28-Jun-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Relatively sparse stands (10% total vegetation cover with 1% *Achnatherum pinetorum*) were included in this association. More survey is needed to determine if that is typical of the type globally.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Classification of these stands is complicated by extended drought conditions, which persisted throughout the sampling period and reduced the cover of perennial herbaceous species. Some stands may classify as a shrub herbaceous association during normal and above-average water years.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (12 plots: CURE.0007, CURE.0013, CURE.0043, CURE.0044, CURE.0062, CURE.0072, CURE.0075, CURE.0133, CURE.0136, CURE.0138, CURE.0148, CURE.0323 and 19 observation points: CURE_AA.0020, CURE_AA.0103, CURE_AA.0118, CURE_AA.0166, CURE_AA.0189, CURE_AA.0190, CURE_AA.0205, CURE_AA.0323, CURE_AA.0363, CURE_AA.0376, CURE_AA.0424, CURE_AA.0817, CURE_AA.0904, CURE_AA.0911, CURE_AA.0978, CURE_AA.1033, CURE_AA.1035, CURE_AA.1167, CURE_AA.1458, CURE_AA.1500).
Local Description Authors: J. Coles
Global Description Authors: K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Artemisia tridentata ssp. *wyomingensis / Bouteloua gracilis* Shrubland

Wyoming Big Sagebrush / Blue Grama Shrubland

CODE	CEGL001041
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. WYOMINGENSIS* SHRUBLAND ALLIANCE (A.832) Wyoming Big Sagebrush Shrubland Alliance
ECOLOGICAL SYSTEM(S):	Great Basin Xeric Mixed Sagebrush Shrubland (CES304.774) Colorado Plateau Mixed Low Sagebrush Shrubland (CES304.762) Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)
USFWS WETLAND SYSTEM:	Not applicable

CONCEPT SUMMARY

Globally

This common sagebrush association occurs on ridges, plateaus and benches, and valleys in Wyoming, western Colorado and southeastern Utah. Elevations range from 1840to 2430 m (6030-7975 feet). Sites are on gentle to steep slopes and may be oriented to any aspect. Substrates include sandstone, granite and metamorphic rocks, and soils range from clay to sandy loam. The cover of bare ground is high in areas that are grazed by domestic livestock. Total vegetation cover may be sparse to moderately dense, depending on site conditions and grazing history. *Artemisia tridentata* ssp. *wyomingensis* dominates the shrub layer, which may also include lesser amounts of *Artemisia cana, Chrysothamnus viscidiflorus, Sarcobatus vermiculatus, Rhus trilobata, Opuntia polyacantha*, and *Atriplex canescens*. The understory usually is dominated by *Bouteloua gracilis* together with a combination of *Pascopyrum smithii, Pseudoroegneria spicata, Hesperostipa comata, Koeleria macrantha, Poa secunda, Pleuraphis jamesii, Achnatherum hymenoides, Sporobolus cryptandrus*, and *Elymus elymoides*. The introduced grasses *Bromus tectorum* and *Bromus japonicus* are often present. A mix of herbs, including *Artemisia frigida, Gutierrezia sarothrae, Vulpia octoflora (= Festuca octoflora), Phlox hoodii*, and *Sphaeralcea coccinea*, contribute little cover. The combination of relatively high cover by sagebrush and dominance of the understory by a grazing increaser such as *Bouteloua gracilis* indicate that this association may represent degraded forms of other Wyoming sagebrush / native grass associations.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled in the drainages of Steuben Creek, Cebolla Creek and South Willow Creek in the Curecanti National Recreation Area.

Globally

This Wyoming big sagebrush type is found in the Great Basin region of the western United States and possibly into the Great Plains. Documented sites include the Bighorn, Powder River and Wind River basins in Wyoming, Curecanti National Recreation Area in western Colorado, and Capitol Reef and Canyonlands national parks in southeastern Utah.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This shrubland association occurs on slopes of ridges and valleys. Sites are gently to steeply sloping (1-46%), occur between 2312 and 2428 m elevation, and are oriented primarily to a southwest aspect. The unvegetated surface has moderate cover of bare soil, rocks and gravel. Litter and wood cover are minimal. Parent materials include metamorphic/granitic rocks and Tertiary volcanic rocks. Soils are rapidly drained loams and sandy loams.

Globally

This common sagebrush shrubland occurs on the slopes of ridges and valleys and on plateaus, plains and benches in Wyoming, western Colorado and southeastern Utah. Elevations range from 1840 to 2430 m (6030-7975 feet). Sites

are on gentle to steep slopes and may be oriented to any aspect. Substrates are variable and include clay to sandy loam soils derived from granite and metamorphic rocks, sandstone, shale, alluvium or eolian deposits. The cover of bare ground is high in areas that are grazed by domestic livestock.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 20 to 50% in these stands. *Artemisia tridentata* ssp. *wyomingensis* shrubs up to 1 m tall form open to closed canopies and provide from 5 to 50% cover. The native sod-forming grass *Bouteloua gracilis* is dominant in the herbaceous layer with between 1 and 25% cover. Other shrub species present, in addition to the sagebrush, include *Rhus trilobata* and the succulents *Opuntia polyacantha* and *Yucca harrimaniae*. The herbaceous layer is diverse and provides low to moderate cover. Associated graminoids include *Achnatherum hymenoides, Hesperostipa comata, Sporobolus cryptandrus*, and *Elymus elymoides*. Forbs are also diverse and provide sparse cover, including *Phlox hoodii, Arabis crandallii, Erigeron concinnus*, and *Penstemon teucrioides*. Species of moss and crustose lichen provide sparse or no cover.

Globally

Total vegetation cover may be sparse to moderately dense, depending on site conditions and grazing history. *Artemisia tridentata* ssp. *wyomingensis* dominates the shrub layer, which may also include lesser amounts of *Artemisia cana, Chrysothamnus viscidiflorus, Sarcobatus vermiculatus, Rhus trilobata, Opuntia polyacantha*, and *Atriplex canescens*. The understory usually is dominated by *Bouteloua gracilis* together with a combination of *Pascopyrum smithii, Pseudoroegneria spicata, Hesperostipa comata, Carex filifolia, Koeleria macrantha, Poa secunda, Pleuraphis jamesii, Achnatherum hymenoides, Sporobolus cryptandrus*, and *Elymus elymoides*. The introduced grasses *Bromus tectorum* and *Bromus japonicus* are often present but generally contribute less cover. A mix of herbs, including *Artemisia frigida, Gutierrezia sarothrae, Vulpia octoflora (= Festuca octoflora), Phlox hoodii*, and *Sphaeralcea coccinea*, often are present but generally contribute little cover.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Achnatherum hymenoides*, *Bouteloua gracilis*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Bouteloua gracilis*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Exotic/Invasive: *Bromus japonicus* (exotic), *Bromus tectorum* (exotic, High)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (23-Feb-1994).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

This association may represent a situation in which *Bouteloua gracilis* is dominant in the understory because other grasses have been removed by grazing. Jones (1992b) states that some stands of this type may represent degraded forms of *Artemisia tridentata* ssp. *wyomingensis / Pascopyrum smithii* or *Artemisia tridentata* ssp. *wyomingensis / Pseudoroegneria spicata* shrublands.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Classification of these stands is complicated by extended drought conditions, which persisted throughout the sampling period and reduced the cover of perennial herbaceous species. Some stands may classify as a shrub herbaceous association during normal and above-average water years.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (6 plots: CURE.0023, CURE.0030, CURE.0031, CURE.0058, CURE.0066, CURE.0125 and 6 observation points: CURE_AA.0428, CURE_AA.0721, CURE_AA.0729, CURE_AA.0991, CURE_AA.1017, CURE_AA.1046).
Local Description Authors: J. Coles
Global Description Authors: J. Coles, mod. K.A. Schulz

REFERENCES: Bighorn Coal Mine n.d., Bourgeron and Engelking 1994, Driscoll et al. 1984, Fisser 1964, Fisser 1970, Francis 1986, Jones 1992b, Keammerer 1987, Knight et al. 1987, MTNHP 2002b, NDNHI unpubl. data, Nichols 1964a, Nichols 1964b, Smith unpubl. data b, Stoecker-Keammerer Consultants n.d.a, Van Pelt 1978, Warren et al. 1992, Western Ecology Working Group n.d.

Artemisia tridentata ssp. *wyomingensis* / Disturbed Understory Semi-natural Shrubland

Wyoming Big Sagebrush / Disturbed Understory Semi-natural Shrubland

CODE	CEGL002083
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. WYOMINGENSIS* SHRUBLAND ALLIANCE (A.832) Wyoming Big Sagebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This Wyoming big sagebrush shrubland has been found in northern Arizona, western Colorado, eastern Utah and southwestern Wyoming and is likely widespread in other parts of the interior western U.S. It can occur on a variety of landscape positions on sites that are flat to moderately steep. This association has been sampled at elevations between 1455 and 2372 m (4770-7777 feet) but is probably found elsewhere. The unvegetated surface is mostly composed of litter, bare soil, and rocks. Soils are typically eolian, alluvial, or colluvial loamy sands to clay loams. This shrubland association has moderately open to dense vegetation cover with an open to closed short-shrub layer. The dominant shrub is *Artemisia tridentata* ssp. *wyomingensis* with low to moderate cover. Scattered *Pinus edulis*, *Juniperus osteosperma*, and *Juniperus scopulorum* trees (2-5 m tall) may be present with sparse cover. Other tall, short, and dwarf-shrubs that may be found are *Ericameria nauseosa, Ephedra viridis, Gutierrezia sarothrae, Sarcobatus vermiculatus*, and succulents. The herbaceous stratum has low to high cover and diversity, but weedy, exotic and invasive species, such as *Aristida purpurea, Astragalus nuttallianus, Bromus tectorum, Chenopodium album, Descurainia pinnata, Elymus elymoides, Erodium cicutarium, Lappula occidentalis, Lepidium* sp., *Phacelia crenulata*, or *Vulpia octoflora*, tend to dominate.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association was sampled in the park near Elk Park Campground and Loop, Chukar Trailhead, Bostwick Park and the North Rim Entrance Road and south of Highway 50, east of Cimarron Visitor Center, and west of Lake Fork Arm in the recreation area.

Globally
This association has been observed in northern Arizona, western Colorado, eastern Utah and southwestern Wyoming. It is very likely to occur in other parts of the western U.S.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This shrubland association was often observed in valley bottoms, but it was also found on midslopes of hills and ridges, terraces, and plains. Elevations range from 1978-2372 m. Sites are typically flat to gently sloping (0-11 degrees), occasionally steep (29-degree slope), and include all aspects. The ground surface has moderate to high cover of bare soil and low to high cover of rock or litter. Sites are disturbed by a variety of things such as grazing and vehicles.

Globally
This association has been found on a variety of landscape features, including mesatops, mid- and low slopes of canyons, hills, valleys, stream terraces and alluvial flats on the Colorado Plateau and in southwestern Wyoming. Sites can be flat to moderately steep (0-15 degrees) and have any aspect. Sampled sites have elevations between 1455 and 2372 m (4770-7777 feet). The unvegetated surface can be composed of variable amounts of litter, bare soil, and large or small rocks. Soils are typically eolian, alluvial, or colluvial loamy sands to clay loams. Finer-textured soils may include rapidly drained silt loams or clay loams derived from alluvium. Biological soil crust cover is absent to low (up to 15%).

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This shrubland association is characterized by an open to relatively closed short-shrub canopy of *Artemisia tridentata* ssp. *wyomingensis* that generally ranges in cover from 10 to 40%. Cover of *Artemisia tridentata* ssp. *wyomingensis* may be less than 10% on heavily disturbed sites. Scattered trees, such as *Pinus edulis, Juniperus osteosperma*, and *Juniperus scopulorum*, are occasionally present and provide up to 10% cover. The shrub layer is low in diversity and may include low cover of *Amelanchier utahensis, Artemisia dracunculus, Artemisia frigida, Atriplex canescens, Chrysothamnus viscidiflorus, Ericameria nauseosa, Gutierrezia sarothrae, Krascheninnikovia lanata, Peraphyllum ramosissimum*, and *Quercus gambelii*. Cacti such as *Opuntia polyacantha* or *Opuntia fragilis* are not uncommon. The generally sparse to moderate herbaceous layer occasionally provides high cover of weedy vegetation. Common introduced species include *Agropyron cristatum, Bromus tectorum, Poa pratensis*, and forbs *Erodium cicutarium, Chenopodium album*, and *Lepidium* sp. Common native species typically include the perennial grasses *Achnatherum hymenoides, Elymus elymoides, Hesperostipa comata, Pleuraphis jamesii, Poa fendleriana*, or *Sporobolus* sp.

Globally
This shrubland association has moderately open to dense herbaceous cover (28-89%) with an open to closed short-shrub layer. The dominant shrub, *Artemisia tridentata* ssp. *wyomingensis*, typically has 5-45% cover, though some stands may have more or less. Scattered *Pinus edulis, Juniperus osteosperma*, and *Juniperus scopulorum* trees (2-5 m tall) may provide up to 5-10% cover. In addition to *Artemisia tridentata* ssp. *wyomingensis*, other tall, short, and dwarf-shrubs that may be found are *Atriplex gardneri, Chrysothamnus viscidiflorus, Ericameria nauseosa, Ephedra viridis, Gutierrezia sarothrae, Sarcobatus vermiculatus*, and succulents such as *Opuntia* spp. The herbaceous stratum has low to high cover and diversity and tends to be dominated by weedy and exotic species, especially *Bromus tectorum*. Common graminoids include *Achnatherum hymenoides, Alyssum desertorum, Aristida purpurea, Bouteloua gracilis, Bromus tectorum, Vulpia octoflora, Elymus elymoides, Elymus lanceolatus, Hesperostipa comata, Pascopyrum smithii, Poa fendleriana*, and *Pleuraphis jamesii*. Forbs provide sparse to high cover and include *Astragalus nuttallianus, Ceratocephala testiculata (= Ranunculus testiculatus), Chenopodium album, Descurainia pinnata, Erigeron concinnus, Erodium cicutarium, Lappula occidentalis, Lepidium* sp., *Phacelia crenulata, Plantago patagonica, Sphaeralcea coccinea, Taraxacum officinale*, and *Trifolium gymnocarpon*. Biological soil crust cover is sparse.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Juniperus osteosperma*
Short shrub/sapling	*Ericameria nauseosa*

Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Erodium cicutarium*
Herb (field)	*Bromus tectorum*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNA (invasive) (14-Dec-2004).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association is closely related to *Artemisia tridentata - (Ericameria nauseosa) / Bromus tectorum* Semi-natural Shrubland (CEGL002699), and there may be overlap between the two. Clear criteria need to be developed to distinguish these associations from one another.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0278, CURE.0382 and 16 observation points: BLCA_AA.290, BLCA_AA.384, BLCA_AA.385, BLCA_AA.423, BLCA_AA.612, BLCA_AA.667, BLCA_AA.738, BLCA_AA.758, BLCA_AA.928, CURE_AA.0119, CURE_AA.0121, CURE_AA.0209, CURE_AA.0338, CURE_AA.0653, CURE_AA.0823, CURE_AA.1367).
Local Description Authors: K.A. Schulz
Global Description Authors: J. Drake, mod. J. Coles and K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Artemisia tridentata ssp. *wyomingensis / Hesperostipa comata* Colorado Plateau Shrubland

Wyoming Big Sagebrush / Needle-and-Thread Colorado Plateau Shrubland

CODE	CEGL002761
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. WYOMINGENSIS* SHRUBLAND ALLIANCE (A.832) Wyoming Big Sagebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland association occurs on deep soils on the slopes and summits of plateaus, ridges, hills and mesas throughout the Colorado Plateau in eastern Utah and western Colorado. The type is likely to occur in southwestern Wyoming as well. Elevations range from 1450 to 2419 m (4750-7940 feet). Slopes are level to moderately steep (0-50%). Substrates include eolian sands, loess and landslide deposits; most often soils are not residual but develop from these secondary sources. Total vegetation cover ranges from 25 to 75%, dominated by *Artemisia tridentata* ssp. *wyomingensis*. Other shrubs provide little additional cover but may include *Chrysothamnus viscidiflorus, Gutierrezia sarothrae, Leptodactylon pungens, Opuntia polyacantha*, and *Yucca harrimaniae*. *Hesperostipa comata* dominates the sparse to moderately dense herbaceous layer. Other grass species present depend on the soil texture, with *Achnatherum hymenoides, Elymus elymoides*, and *Koeleria macrantha* more common on sandy soils, whereas *Pleuraphis jamesii, Bouteloua gracilis*, and *Poa fendleriana* are more common on silty soils. Forbs provide little total cover but may include *Arenaria fendleri, Calochortus gunnisonii, Lepidium montanum, Linum lewisii, Phlox hoodii, Penstemon teucrioides*, and *Sphaeralcea coccinea*. *Bromus tectorum* may be codominant in heavily disturbed sites. Scattered young *Juniperus osteosperma* and *Pinus edulis* trees are often present. Cryptobiotic soil crusts are common in this type, but development is uneven and tends to be sparse in sites that have been grazed by domestic livestock.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This common association was sampled at Haystack, Steuben Creek, Soap Creek Road, Dillon Pinnacles, South Willow Creek Area, Dry Creek Area, Cimarron and South Willow Creek in the Curecanti National Recreation Area.

Globally

This shrubland association occurs on deep soils on the slopes and summits of plateaus, ridges, hills and mesas throughout the Colorado Plateau in eastern Utah and western Colorado, and may extend into Wyoming.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This shrubland association occurs on active slopes as well as on shoulders, midslopes, toeslopes and ridgetops. Sites are gentle to moderately steep (8-51% slopes), occur between 2134 and 2419 m elevation, and are oriented to south and northwest aspects. The unvegetated surface has sparse to moderate cover of litter and low cover of mosses and lichens. Large and small rocks, bedrock, and exposures of bare soil comprise most of the unvegetated surface on all but one stand. Downed wood is uncommon, although one stand has 15% cover. Parent materials are metamorphic/granitic rocks, Tertiary volcanic rocks, Mesozoic sandstone, and Quaternary landslide deposits. Soils are rapidly drained sandy loams and loams.

Globally

This widespread shrubland association occurs on deep soils on the slopes and summits of plateaus, ridges, hills and mesas throughout the Colorado Plateau in eastern Utah and western Colorado. The type is likely to occur in southwestern Wyoming as well. Elevations range from 1450 to 2419 m (4750-7940 feet). Slopes are level to

moderately steep (0-50%). Substrates include eolian sands, loess and landslide deposits; most often soils are not residual but develop from these secondary sources. In sparsely vegetated stands, there is usually an abundance of exposed soil on the ground surface, whereas in denser stands litter covers most of the ground.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 55% to more than 100% in these stands. *Hesperostipa comata* forms an open to closed herbaceous layer that ranges in cover from 1 to 75%. The short shrub *Artemisia tridentata* ssp. *wyomingensis* forms open to closed canopies and provides 5 to 95% cover. Short and dwarf-shrubs are diverse in terms of species composition and contribute low to moderate cover. Other short and dwarf-shrubs present include *Gutierrezia sarothrae, Opuntia polyacantha*, and *Yucca harrimaniae*. The herbaceous layer is diverse in terms of species composition and provides low to moderately dense cover. Other graminoids commonly present provide sparse to low cover and include *Achnatherum hymenoides* and *Elymus elymoides*. Forbs commonly present with sparse cover include *Cryptantha flavoculata, Erigeron concinnus, Penstemon teucrioides*, and *Sphaeralcea coccinea*. Sapling *Juniperus scopulorum* trees that are 2-5 m tall and contribute sparse cover occupy one stand. Cryptogam cover is sparse in this association.

Globally

This sagebrush association is widespread throughout the northern Colorado Plateau and is abundant in northwestern Colorado. Total vegetation cover ranges from 14 to 75% and is dominated by *Artemisia tridentata* ssp. *wyomingensis* with between 5 and 65% cover. Other shrubs provide little additional cover but may include *Chrysothamnus viscidiflorus, Gutierrezia sarothrae, Leptodactylon pungens, Opuntia polyacantha*, and *Yucca harrimaniae*. Scattered *Pinus edulis* and *Juniperus osteosperma* trees and seedlings may be present but do not form a layer. *Hesperostipa comata* dominates the sparse to moderately dense herbaceous layer. Other grass species present depend on the soil texture, with *Achnatherum hymenoides, Elymus elymoides*, and *Koeleria macrantha* more common on sandy soils, whereas *Pleuraphis jamesii, Bouteloua gracilis*, and *Poa fendleriana* are more common on silty soils. Forbs provide little total cover but may include *Arenaria fendleri, Calochortus gunnisonii, Eriogonum cernuum, Lepidium montanum, Linum lewisii, Machaeranthera canescens, Oenothera albicaulis, Phlox hoodii, Penstemon teucrioides*, and *Sphaeralcea coccinea*. *Bromus tectorum* may be codominant in heavily disturbed sites. Scattered young *Juniperus osteosperma* and *Pinus edulis* trees are often present. Cryptobiotic soil crusts are common in this type, but development is uneven and tends to be sparse in sites that have been grazed by domestic livestock.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Achnatherum hymenoides*, *Bouteloua gracilis*, *Hesperostipa comata*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Hesperostipa comata*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Agropyron cristatum* (exotic, Medium/Low), *Bromus tectorum* (exotic noxious weed, High), *Cirsium arvense* (exotic noxious weed, High/Medium), *Melilotus officinalis* (exotic, Medium/Low), *Poa pratensis* (exotic, Medium)

Globally

Vulnerable: *Penstemon teucrioides* (vulnerable, G2G3Q)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (12-Apr-2005).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.
Globally
A similar association, *Artemisia tridentata* ssp. *wyomingensis / Hesperostipa comata* Shrubland (CEGL001051), describes a shrubland type of the Columbia River Basin of Oregon and Washington and the Snake River Plain of Idaho that is restricted to dry calcareous hardpan sites. However, little is known of the specifics of this association and its possible relationship to the Colorado Plateau shrubland. Baker's (1984a) concept of *Artemisia tridentata* ssp. *wyomingensis / Stipa comata* Association includes both the Colorado and Columbia Basin/Snake River Plain communities. As more data become available, and especially as the range of the Colorado Plateau shrubland type is better known, these two associations should be revisited and compared to justify their separation.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (16 plots: BLCA.0104, CURE.0011, CURE.0022, CURE.0037, CURE.0041, CURE.0045, CURE.0047, CURE.0049, CURE.0055, CURE.0057, CURE.0060, CURE.0069, CURE.0092, CURE.0140, CURE.0366, CURE.0386 and 27 observation points: BLCA_AA.590, BLCA_AA.656, BLCA_AA.705, BLCA_AA.747, BLCA_AA.927, BLCA_AA.939, BLCA_AA.941, BLCA_AA.942, BLCA_AA.944, CURE_AA.0019, CURE_AA.0170, CURE_AA.0188, CURE_AA.0380, CURE_AA.0528, CURE_AA.0529, CURE_AA.0539, CURE_AA.0540, CURE_AA.0554, CURE_AA.0561, CURE_AA.0567, CURE_AA.0604, CURE_AA.0610, CURE_AA.0697, CURE_AA.0701, CURE_AA.0708, CURE_AA.0735, CURE_AA.0949).
Local Description Authors: J. Von Loh
Global Description Authors: J. Coles, mod. K.A. Schulz

REFERENCES: Baker 1984a, Western Ecology Working Group n.d.

Artemisia tridentata ssp. *wyomingensis / Poa fendleriana* Shrubland

Wyoming Big Sagebrush / Muttongrass Shrubland

CODE	CEGL002775
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. WYOMINGENSIS* SHRUBLAND ALLIANCE (A.832) Wyoming Big Sagebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This sagebrush shrubland association is widespread throughout the northern Colorado Plateau, occurring on ridges, mesas and hills between 1600 and 2400 m (5250-7875 feet) elevation. Stands may cover entire plateaus or less than an acre in small openings in pinyon-juniper woodlands. Slopes range from 3% to more than 50% and are oriented to all aspects. Soils are deep and often derived from eolian loess or sand, although some stands are on residual soils derived from the underlying sandstone or shale. Total vegetation cover ranges widely, from 10 to 80%. The shrub layer is sparse in hot, dry sites (around 10% cover) but may cover more than 50% in sheltered areas. Other shrubs are usually present and may include *Purshia tridentata*, *Atriplex confertifolia*, *Symphoricarpos oreophilus*, *Amelanchier utahensis*, and *Chrysothamnus viscidiflorus*. The herbaceous understory is generally well-developed and is dominated by *Poa fendleriana* with around 3% cover in sparse shrublands and up to 35% cover in denser shrublands. Associated herbaceous species vary but generally include a number of grass species, especially

Achnatherum hymenoides, Hesperostipa comata, Koeleria macrantha, Pseudoroegneria spicata, Bouteloua gracilis, and *Achnatherum pinetorum*. Forbs are inconsistent and usually contribute 1% cover or less. Some stands will have scattered *Pinus edulis* and *Juniperus osteosperma* trees.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This shrubland association is common within the recreation area and was sampled along Elk Creek, Cebolla Creek, South Willow Creek, Iola area, Dillon area and Haystack.

Globally
This association is widespread within the sagebrush shrublands of the Colorado Plateau. It has been documented from western Colorado and eastern Utah.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This shrubland association occurs on toeslopes, active slopes, mesas and swales. Sites are nearly level to steep (2-65% slopes), occur between 2320 and 2390 m elevation, and are oriented to all aspects. The unvegetated surface has low cover of litter. Bedrock, large and small rocks, and exposures of bare soil comprise most of the unvegetated surface cover. Cryptogamic soils have low cover on some sites. Parent materials include Mesozoic sandstones, alluvium, landslide deposits, and Tertiary volcanic rocks. Soils are tend to be sandy and rapidly drained, but a few sites are on silty clay loam, silty clay loam or sand.

Globally
This sagebrush shrubland is widespread throughout the northern Colorado Plateau, occurring on ridges, mesas and hills between 1600 and 2400 m (5250-7875 feet) elevation. Stands may cover hundreds of acres or less than an acre in small openings in pinyon-juniper woodlands. Slopes range from 3% to more than 50% and are oriented to all aspects. Soils are deep and often derived from eolian loess or sand, although some stands are on residual soils derived from the underlying sandstone or shale.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 25 to 80% in these stands. The short shrub *Artemisia tridentata* ssp. *wyomingensis* forms an open to moderately closed canopy and contributes from 5 to 50% cover, with 1-25% cover of the perennial bunchgrass *Poa fendleriana*. Other minor shrubs present may include *Amelanchier utahensis, Artemisia nova, Chrysothamnus depressus, Gutierrezia sarothrae*, and *Opuntia polyacantha*. The herbaceous layer is diverse and typically provides moderate to high cover. Other graminoids provide sparse cover and include *Achnatherum pinetorum, Bouteloua gracilis*, and *Elymus elymoides*. Common forbs provide sparse cover and include *Erigeron concinnus, Penstemon teucrioides*, and *Phlox hoodii*. Mosses and lichens are occasionally present and contribute up to 25% cover.

Globally
This type of Wyoming big sagebrush shrubland is common in the northern Colorado Plateau. The total vegetation cover ranges widely from 10 to 80%. The shrub layer ranges from sparse in hot, dry sites (around 10% cover) to more than 50% in sheltered sites. Other shrubs are usually present and may include *Purshia tridentata, Atriplex confertifolia, Symphoricarpos oreophilus, Amelanchier utahensis*, and *Chrysothamnus viscidiflorus*. The herbaceous understory is generally well-developed and is dominated by *Poa fendleriana* with around 3% cover in sparse shrublands and up to 35% cover in denser shrublands. Associated herbaceous species vary but generally include a number of grass species, especially *Achnatherum hymenoides, Hesperostipa comata, Koeleria macrantha, Pseudoroegneria spicata, Bouteloua gracilis*, and *Achnatherum pinetorum*. Forbs are inconsistent and usually contribute 1% cover or less. Some stands will have scattered trees of *Pinus edulis* and *Juniperus osteosperma*.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia nova*, *Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Poa fendleriana*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Poa fendleriana*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Exotic/Invasive: *Bromus tectorum* (exotic, High)

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (13-Apr-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Some sites are rocky, and south-facing stands are sparser than those on other aspects.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (13 plots: CURE.0012, CURE.0051, CURE.0083, CURE.0085, CURE.0094, CURE.0117, CURE.0122, CURE.0126, CURE.0201, CURE.0271, CURE.0288, CURE.0311, CURE.0388 and 60 observation points: CURE_AA.0009, CURE_AA.0111, CURE_AA.0153, CURE_AA.0157, CURE_AA.0159, CURE_AA.0184, CURE_AA.0210, CURE_AA.0236, CURE_AA.0283, CURE_AA.0325, CURE_AA.0326, CURE_AA.0331, CURE_AA.0332, CURE_AA.0334, CURE_AA.0335, CURE_AA.0349, CURE_AA.0391, CURE_AA.0402, CURE_AA.0417, CURE_AA.0421, CURE_AA.0457, CURE_AA.0466, CURE_AA.0470, CURE_AA.0514, CURE_AA.0522, CURE_AA.0573, CURE_AA.0603, CURE_AA.0605, CURE_AA.0633, CURE_AA.0693, CURE_AA.0696, CURE_AA.0698, CURE_AA.0722, CURE_AA.0734, CURE_AA.0744, CURE_AA.0761, CURE_AA.0762, CURE_AA.0763, CURE_AA.0766, CURE_AA.0777, CURE_AA.0787, CURE_AA.0811, CURE_AA.0819, CURE_AA.0837, CURE_AA.0871, CURE_AA.0923, CURE_AA.0934, CURE_AA.0939, CURE_AA.0948, CURE_AA.0950, CURE_AA.1021, CURE_AA.1023, CURE_AA.1029, CURE_AA.1030, CURE_AA.1031, CURE_AA.1032, CURE_AA.1041, CURE_AA.1047, CURE_AA.1062, CURE_AA.1303).
Local Description Authors: J. Von Loh
Global Description Authors: J. Coles

REFERENCES: Western Ecology Working Group n.d.

Artemisia tridentata ssp. *wyomingensis* / Sparse Understory Shrubland

Wyoming Big Sagebrush / Sparse Understory Shrubland

CODE	CEGL002768
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. WYOMINGENSIS* SHRUBLAND ALLIANCE (A.832) Wyoming Big Sagebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This association is intended to represent sagebrush shrublands where the sparse understory is the result of edaphic conditions, not grazing or other disturbance. It occurs in scattered patches throughout the sagebrush zone of the Colorado Plateau and western Rocky Mountains of Colorado and Utah. Elevations range from 1590 to 2390 m (5215-7840 feet), and sites occur on level to moderately steep slopes. There is a slight tendency toward hot western and southern exposures. Soils may be thin over bedrock, or loose, unstable sands, or tight clays, or extremely well-drained gravels; all of these situations tend to discourage herbaceous growth. Total vegetation cover is somewhat sparse in these sagebrush communities, rarely exceeding 40% and usually closer to 25%. The shrub layer consists of dwarfed *Artemisia tridentata* ssp. *wyomingensis* shrubs, sometimes accompanied by *Purshia tridentata, Atriplex confertifolia, Ephedra viridis*, or *Ericameria nauseosa*. The understory of dwarf-shrubs and herbaceous species has less than 5% cover, and usually much less. Common species include *Gutierrezia sarothrae, Achnatherum hymenoides, Pleuraphis jamesii*, and *Bouteloua gracilis*. Cryptobiotic crusts may be well-developed in sandy sites.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled near the Pine Creek Boat Dock, on Pine Creek Road near the Dam Road, near Iola and near Neversink in the Curecanti National Recreation Area.

Globally

This association is scattered widely over the Colorado Plateau of Utah and Colorado and extends west into the southern Rocky Mountains.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This short-shrub association occurs on canyon rims and on hillsides. Sites are nearly flat to moderately steep (3-28% slopes), occur between 2340 and 2386 m elevation, and are oriented to all aspects. The unvegetated surface has high cover of small and large rocks and moderate exposure of bare soil. Litter cover is sparse to low. Downed wood is uncommon. Parent materials are Mesozoic sandstone. Soils are rapidly drained sandy loams and clay loams.

Globally

This association occurs in scattered patches throughout the sagebrush zone of the Colorado Plateau and western Rocky Mountains. Elevations range from 1590 to 2390 m (5215-7840 feet), and sites occur on level to moderately steep slopes. There is a slight tendency toward hot western and southern exposures. Soils may be thin over bedrock, or loose, unstable sands, or tight clays, or extremely well-drained gravels; all of these situations tend to discourage herbaceous growth.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 45 to 75% in this shrubland association. *Artemisia tridentata* ssp. *wyomingensis* forms a moderately open to relatively closed canopy that ranges in cover from 10-75%. Associated short and

dwarf-shrubs that provide low to moderate cover include *Purshia tridentata*. The understory is sparse with less than 5% cover, and usually much less. The herbaceous layer is sparse in terms of cover but is diverse in composition. Graminoids contribute sparse to low cover and include *Achnatherum hymenoides, Achnatherum pinetorum,* and *Elymus elymoides*. Forbs are diverse and provide sparse cover, mostly as scattered individuals that include *Castilleja linariifolia* and *Penstemon teucrioides* Lichens provide low cover.

Globally
Total vegetation cover is relatively low in these sagebrush communities, rarely exceeding 40% and usually closer to 25%. The shrub layer consists of dwarfed *Artemisia tridentata* ssp. *wyomingensis* shrubs, sometimes accompanied by *Purshia tridentata, Atriplex confertifolia, Ephedra viridis*, or *Ericameria nauseosa*. The understory of dwarf-shrubs and herbaceous species has less than 5% cover, and usually much less. Common species include *Gutierrezia sarothrae, Achnatherum hymenoides, Pleuraphis jamesii*, and *Bouteloua gracilis*. Cryptobiotic crusts may be well-developed in sandy sites.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis, Purshia tridentata*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Poa pratensis* (exotic, Medium)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (13-Apr-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association is intended to represent sagebrush shrublands in which the substrate is such that few herbaceous species can grow. Situations in which the understory has been removed by grazing or other disturbance should be assigned to *Artemisia tridentata* ssp. *wyomingensis* / Disturbed Understory Semi-natural Shrubland (CEGL002083).

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: All stands appear to have been grazed.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (5 plots: CURE.0028, CURE.0034, CURE.0073, CURE.0124, CURE.0162 and 3 observation points: CURE_AA.0272, CURE_AA.0273, CURE_AA.0279).
Local Description Authors: J. Von Loh
Global Description Authors: J. Coles

REFERENCES: Western Ecology Working Group n.d.

Chrysothamnus viscidiflorus / Hesperostipa comata Shrubland

Yellow Rabbitbrush / Needle-and-Thread Shrubland

CODE	CEGL002799
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*CHRYSOTHAMNUS VISCIDIFLORUS* SHRUBLAND ALLIANCE (A.2651) Yellow Rabbitbrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Semi-Desert Shrub-Steppe (CES304.788)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This association occurs on disturbed ridges and valleys in the northern Colorado Plateau of Colorado and Utah and into the southern Rocky Mountains between 1800 and 2440 m (5900-8000 feet) elevation. Slopes range from gentle to moderately steep. Soils have textures ranging from silt loam to sandy loam to loamy sand, and bare soil covers most of the unvegetated ground surface. The total vegetation cover rarely exceeds 60% and is characterized by an open shrub canopy of *Chrysothamnus viscidiflorus* with between 5 and 35% cover. The native bunchgrass *Hesperostipa comata* contributes 10 to 20% cover. Other short shrubs providing sparse cover include *Symphoricarpos oreophilus, Artemisia nova*, and *Tetradymia canescens*. The herbaceous layer is diverse in terms of species composition. Associated graminoids include *Achnatherum hymenoides, Bouteloua gracilis, Elymus elymoides, Pascopyrum smithii, Poa fendleriana*, and *Poa secunda*. Forbs are diverse but contribute very little cover, including *Chenopodium leptophyllum, Crepis acuminata, Cryptantha cinerea var. jamesii, Erigeron engelmannii, Eriogonum umbellatum, Lupinus caudatus, Opuntia fragilis, Packera tridenticulata, Sedum lanceolatum, Senecio spartioides, Leptodactylon pungens, Heterotheca villosa (= Chrysopsis villosa)*, and *Schoenocrambe linifolia*. This community generally occurs in areas that have experienced significant disturbance (such as fire) or on-going natural disturbance such as season-long grazing.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled in the Gunnison River Canyon of Curecanti National Recreation Area.

Globally

This association is apparently relatively uncommon and has been documented from western Colorado and Utah. It is likely to occur throughout the interior western U.S. in sandy, disturbed areas that normally support sagebrush shrublands.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This short-shrub association occurs on ridgetops. The site is gently sloping (16%), occurs at 2441 m elevation, and is oriented to the northeast. The unvegetated surface has low cover of litter, small rocks, and exposure of bedrock. High exposure of bare soil occurs. Parent materials are metamorphic/granitic rocks. Soils are rapidly drained loamy sands.

Globally

This association occurs on level to moderately sloping disturbed sites on ridges and in valleys between 1800 and 2440 m (5900-8000 feet) elevation. Substrates include eolian sands, metamorphic rocks, granite or limestone, and the soil is likewise variable, with textures ranging from silt loam to sandy loam to loamy sand. Bare soil covers most of the unvegetated ground surface.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is 60% in this shrubland association. *Chrysothamnus viscidiflorus* shrubs form an open canopy that contributes 35% cover, and the medium-tall bunchgrass *Hesperostipa comata* contributes up to 20% cover. Other short shrubs providing sparse cover include *Symphoricarpos rotundifolius* and *Tetradymia canescens*. The herbaceous layer is diverse in terms of species composition and contributes moderate cover. Additional graminoids provide sparse cover and include *Achnatherum hymenoides, Bouteloua gracilis, Elymus elymoides, Pascopyrum smithii, Poa fendleriana*, and *Poa secunda*. Forbs are diverse but contribute sparse cover, including *Chenopodium leptophyllum, Crepis acuminata, Cryptantha cinerea var. jamesii, Erigeron engelmannii, Eriogonum umbellatum, Lupinus caudatus, Packera tridenticulata, Sedum lanceolatum*, and *Schoenocrambe linifolia*.

Globally
The total vegetation cover rarely exceeds 60% and is characterized by an open shrub canopy of *Chrysothamnus viscidiflorus* with between 5 and 35% cover. The native bunchgrass *Hesperostipa comata* contributes 10 to 20% cover. Other short shrubs providing sparse cover include *Symphoricarpos oreophilus, Artemisia nova*, and *Tetradymia canescens*. The herbaceous layer is diverse in terms of species composition. Associated graminoids include *Achnatherum hymenoides, Bouteloua gracilis, Elymus elymoides, Pascopyrum smithii, Poa fendleriana*, and *Poa secunda*. The non-native *Bromus tectorum* may also be present. Forbs are diverse but contribute very little cover, including *Chenopodium leptophyllum, Crepis acuminata, Cryptantha cinerea var. jamesii, Erigeron engelmannii, Eriogonum umbellatum, Lupinus caudatus, Opuntia fragilis, Packera tridenticulata, Sedum lanceolatum, Senecio spartioides, Leptodactylon pungens, Heterotheca villosa (= Chrysopsis villosa)*, and *Schoenocrambe linifolia*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Chrysothamnus viscidiflorus*
Herb (field)	*Lupinus caudatus*
Herb (field)	*Achnatherum hymenoides, Bouteloua gracilis, Hesperostipa comata*

Globally

Stratum	Species
Short shrub/sapling	*Chrysothamnus viscidiflorus*
Herb (field)	*Achnatherum hymenoides, Hesperostipa comata*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Exotic/Invasive: *Bromus tectorum* (invasive/exotic, High)

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (23-Jun-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: A previously sagebrush-dominated site that burned and has recovered to this community.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0365 and 1 observation point: CURE_AA.0176).
Local Description Authors: J. Von Loh

Global Description Authors: J. Coles, mod. G. Kittel

REFERENCES: Bell et al. 2009, Western Ecology Working Group n.d.

Ericameria nauseosa Shrubland

Rubber Rabbitbrush Shrubland

CODE	CEGL002713
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ERICAMERIA NAUSEOSA* SHRUBLAND ALLIANCE (A.835) Rubber Rabbitbrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This is a broadly defined, semi-arid upland shrubland currently described from western Colorado, Nevada, and Utah and is likely more widespread. Elevations range from 1191 to 2420 m (3900-8000 feet). Stands occur on flat to gently sloping (<8%), dry alluvial terraces above ephemeral washes or perennial stream and river channels or may form a band in the alluvial flats above playas. Substrates are deep, moderately well- to well-drained silty clay loam to sandy loam soils derived from stratified alluvium. The ground surface has moderate to high cover of bare soil. The vegetation is characterized by a moderately dense to dense (40-70% cover) shrub canopy dominated by *Ericameria nauseosa* shrubs 0.5-3 m tall, with a relatively sparse herbaceous layer. Some stands have low diversity, others have additional associated short and dwarf-shrubs such as *Artemisia frigida, Artemisia tridentata* ssp. *wyomingensis, Atriplex canescens, Chrysothamnus viscidiflorus, Gutierrezia sarothrae, Psorothamnus polydenius, Rosa woodsii, Sarcobatus vermiculatus,* and *Tetradymia tetrameres*. The sparse herbaceous layer is a mixture of grasses and forbs. Grass cover is generally low and may include native species such as *Achnatherum lettermanii, Achnatherum hymenoides, Distichlis spicata, Pseudoroegneria spicata, Sporobolus airoides,* and *Elymus elymoides*. Non-native grasses include *Bromus tectorum* and *Poa pratensis*. Common forbs may include the native species *Erigeron flagellaris, Tragopogon dubius, Achillea millefolium, Agoseris glauca, Potentilla crinita, Artemisia ludoviciana, Eriogonum hookeri, Rumex salicifolius,* and *Verbesina encelioides*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled near the mouth of North Willow Creek and in the vicinity of Elk Creek in Curecanti National Recreation Area.

Globally

This is a broadly defined upland shrubland association currently described from western Colorado, Utah and Nevada, but it likely occurs more widely in the western U.S.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This short- or tall-shrub association occurs on toeslopes of the Gunnison River Valley, on what would have originally been terraces 15-30 m above the river channel, near Blue Mesa Reservoir. Sites are gently sloped (5-8%), occur between 2291 m and 2312 m elevation, and are oriented to all aspects. The unvegetated surface has moderate to high exposure of bare soil and cover of litter. Parent materials are Quaternary alluvium. Soils are moderately well-drained silty clay loams and sandy loams. A few abandoned or active Gunnison's prairie dog burrows may be present.

Globally
This is a broadly defined, semi-arid upland shrubland association currently described from western Colorado , Nevada, and Utah and is likely more widespread. Elevations range from 1191-2420 m (3900-8000 feet). Stands occur on flat to gently sloping (<8%), dry alluvial terraces above ephemeral washes or perennial stream and river channels or may form a band in the alluvial flats above playas. Substrates are deep, moderately well- to well-drained silty clay loam to sandy loam soils derived from stratified alluvium. Sand or other coarse-textured material may underlay finer-textured layers (Bundy et al. 1996). The ground surface has moderate to high cover of bare soil.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 60 to 75% in these stands. *Ericameria nauseosa* shrubs 0.5-3 m tall form a moderately closed to closed canopy that provides from 54 to 70% cover. The shrub layer is low in diversity and provides dense cover. Additional short and dwarf-shrubs providing sparse cover include *Artemisia frigida, Artemisia tridentata* ssp. *wyomingensis*, and *Rosa woodsii*. The herbaceous layer provides sparse cover and consists predominantly of forbs. The short bunchgrass *Elymus elymoides* provides sparse cover. Forbs provide sparse cover and include the non-natives *Cirsium arvense, Descurainia incana* ssp. *incisa, Erodium cicutarium, Lepidium campestre,* and *Sisymbrium altissimum*, and the natives *Eriogonum hookeri, Rumex salicifolius*, and *Verbesina encelioides*.

Globally
The vegetation is characterized by a moderately dense to dense (40-70% cover) shrub canopy dominated by *Ericameria nauseosa* shrubs 0.5-3 m tall, with a relatively sparse herbaceous layer. In Colorado, stands have low diversity. Additional associated short and dwarf-shrubs are *Artemisia frigida, Artemisia tridentata* ssp. *wyomingensis*, and *Rosa woodsii*. In Nevada, stands are more diverse, and several other shrubs, such as *Atriplex canescens, Psorothamnus polydenius, Sarcobatus vermiculatus*, and *Tetradymia tetrameres*, may be important. The sparse herbaceous layer is a mixture of grasses and forbs. Native grasses include *Achnatherum hymenoides, Distichlis spicata*, and *Elymus elymoides*. Common forbs may include the non-natives *Cirsium arvense, Descurainia incana* ssp. *incisa, Erodium cicutarium, Lepidium campestre, Iva axillaris, Salsola tragus*, and *Sisymbrium altissimum*, and the natives *Eriogonum hookeri, Rumex salicifolius*, and *Verbesina encelioides*. The introduced annual grass *Bromus tectorum* and native grasses *Pseudoroegneria spicata* and *Sporobolus airoides* are typically absent or have low cover.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Ericameria nauseosa*
Short shrub/sapling	*Ericameria nauseosa*
Herb (field)	*Artemisia frigida, Rosa woodsii*
Herb (field)	*Cirsium arvense, Lepidium campestre*

Globally

Stratum	Species
Short shrub/sapling	*Ericameria nauseosa*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Cirsium arvense* (exotic, High/Medium), *Erodium cicutarium* (exotic, Medium/Low), *Lepidium campestre* (exotic), *Sisymbrium altissimum* (exotic)

Globally
Exotic/Invasive: *Bromus tectorum* (invasive/exotic, High), *Cirsium arvense* (invasive/exotic, High/Medium), *Descurainia pinnata* (invasive/exotic), *Erodium cicutarium* (invasive/exotic, Medium/Low), *Iva axillaris* (invasive/exotic), *Lepidium campestre* (invasive/exotic), *Poa pratensis* (invasive/exotic, Medium), *Salsola tragus* (invasive/exotic), *Sisymbrium altissimum* (invasive/exotic), *Taraxacum officinale* (invasive/exotic), *Tragopogon dubius* (invasive/exotic, Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (26-Jun-2001).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This broadly defined upland *Ericameria nauseosa* association is not limited to washes or dune/sandsheet shrubland. Diagnostic of this type is a sparse herbaceous layer that is not dominated by the widespread introduced annual grass *Bromus tectorum* or the native grasses *Pseudoroegneria spicata* or *Sporobolus airoides*. One of the stands classified by Bundy et al. (1996) is codominated by *Tetradymia tetrameres*. These transitional types are difficult to classify, and further survey and classification work are needed to fully characterize this association.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Some confusion may exist between this type and those dominated by *Ericameria parryi*. Both associations tend to occur in disturbed areas, and the species are somewhat difficult to separate. It would be useful to know if the species tend to be segregated by the type of disturbance, or if they are more cosmopolitan, occurring in mixed stands.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0380, CURE.0383 and 13 observation points: BLCA_AA.169, BLCA_AA.234, BLCA_AA.375, CURE_AA.0268, CURE_AA.0303, CURE_AA.0305, CURE_AA.0306, CURE_AA.0309, CURE_AA.0310, CURE_AA.0313, CURE_AA.0519, CURE_AA.0609, CURE_AA.0890).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: K.A. Schulz, mod. G. Kittel

REFERENCES: Bundy et al. 1996, FEIS 2006, McArthur et al. 1997, USFS 1937, Western Ecology Working Group n.d.

Ericameria parryi / Achnatherum hymenoides Shrubland

Parry's Rabbitbrush / Indian Ricegrass Shrubland

CODE	CEGL003751
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ERICAMERIA PARRYI* SHRUBLAND ALLIANCE (A.818) Parry's Rabbitbrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Semi-Desert Shrub-Steppe (CES304.788)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This shrubland association is described from Middle Park in central Colorado and Black Canyon National Park and Curecanti National Recreation Area in the Gunnison River valley and likely occurs elsewhere in western Colorado. Stands occur on flats, slopes, ridges, shaly badlands and cut-and-fill slopes. Sites are flat to steep (0-75%), occur between 2191 and 2650 m elevation, and include all aspects, especially westerly and southerly. Stands occur in a variety of disturbed areas, including burned areas, highway cut-and-fill slopes, naturally eroded shale outcrops, and prairie dog towns with varying attributes. The roadcut sites have high cover of bedrock, rocks and gravel. The burned sites have low to high cover of litter and low to moderate exposure of bare soil. The prairie dog town localities have low to high cover of litter and low to high exposure of bare soil. Soils are shallow, rapidly drained to well-drained sandy loams, silty loams, or silty clay loams derived from Quaternary alluvium, Pierre shale and

metamorphic rocks or poorly drained clays derived from Pierre shale. The vegetation is characterized by an open to closed canopy of *Ericameria parryi* shrubs (1-2 m tall) that ranges in cover from 5 to 50% with total vegetation cover ranging from 20 to 80%. The remaining shrub layer is low in diversity and cover and includes the short and dwarf-shrubs *Amelanchier alnifolia, Artemisia frigida, Artemisia tridentata* ssp. *vaseyana, Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus viscidiflorus, Mahonia repens*, and *Symphoricarpos rotundifolius*. The herbaceous layer is diverse and variable among sites, providing sparse to low cover. Common graminoids provide low cover and include *Achnatherum hymenoides, Elymus elymoides, Juncus balticus, Pascopyrum smithii*, and introduced annual *Bromus tectorum*. Forbs provide sparse to low cover, including *Artemisia dracunculus, Chaenactis douglasii, Eriogonum brevicaule, Eriogonum cernuum, Lupinus argenteus, Oenothera caespitosa*, and introduced species such as *Melilotus officinalis* and *Verbascum thapsus*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association occupies disturbed sites (road cut-and-fill slopes, burns, prairie dog colonies) and was sampled along East Portal Road in the park and on Cooper's Ranch, near Ponderosa Campground, near Soap Creek Campground, and along North Willow Creek in the recreation area.

Globally

This shrubland association is described from Middle Park in central Colorado and Black Canyon National Park and Curecanti National Recreation Area in the Gunnison River valley and likely occurs elsewhere in western Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This short-shrub association was observed on flats, slopes, ridges, and cut-and-fill slopes. Sites are flat to moderately steep (0-70%), occur between 2191 and 2444 m elevation, and include all aspects. Stands occur in a variety of disturbed areas, including burned areas, highway cut-and-fill slopes, and prairie dog towns with varying attributes. The unvegetated surface of the roadcut sites has high cover of bedrock, rocks and gravel. The unvegetated surface of the burned sites has low to high cover of litter and low to moderate exposure of bare soil. The unvegetated surface of the prairie dog town localities has low to high cover of litter and low to high exposure of bare soil. Soils are rapidly drained to well-drained sandy loams, silty loams, or silty clay loams derived from Quaternary alluvium and metamorphic rocks.

Globally

This shrubland association is described from Middle Park in central Colorado and Black Canyon National Park and Curecanti National Recreation Area in the Gunnison River valley and likely occurs elsewhere in western Colorado. Stands occur on flats, slopes, ridges, shaly badlands and cut-and-fill slopes. Sites are flat to steep (0-75%), occur between 2191 and 2650 m elevation, and include all aspects, especially westerly and southerly. Stands occur in a variety of disturbed areas, including burned areas, highway cut-and-fill slopes, naturally eroded shale outcrops, and prairie dog towns with varying attributes. The roadcut sites have high cover of bedrock, rocks and gravel. The burned sites have low to high cover of litter and low to moderate exposure of bare soil. The prairie dog town localities have low to high cover of litter and low to high exposure of bare soil. Soils are shallow, rapidly drained to well-drained sandy loams, silty loams, or silty clay loams derived from Quaternary alluvium, Pierre shale and metamorphic rocks or poorly drained clays derived from Pierre shale (Tiedemann et al. 1987).

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 20 to 80% in these stands. This shrubland association is characterized by an open to closed canopy, typically 1-2 m tall, of *Ericameria parryi* shrubs that ranges in cover from 5 to 50%. The remaining shrub layer is low in diversity and cover and includes the short and dwarf-shrubs *Amelanchier alnifolia, Artemisia frigida, Artemisia tridentata* ssp. *vaseyana*, *Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus viscidiflorus*, and *Symphoricarpos rotundifolius*. The herbaceous layer is diverse and variable among sites, providing sparse to low cover. Common graminoids provide low cover and include *Achnatherum hymenoides, Bromus tectorum, Elymus elymoides, Juncus balticus*, and *Pascopyrum smithii*. Forbs tend to be weedy and provide sparse to low cover, including *Artemisia dracunculus, Eriogonum cernuum, Lupinus argenteus, Melilotus officinalis*, and *Verbascum thapsus*.

Globally
This association is characterized by an open to moderately dense canopy of *Ericameria parryi* shrubs (0.5-2 m tall) that ranges in cover from 5 to 50% with total vegetation cover ranging from 20 to 80%. The remaining shrub layer is low in diversity and cover and includes the short and dwarf-shrubs *Amelanchier alnifolia, Artemisia frigida, Artemisia tridentata* ssp. *vaseyana, Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus viscidiflorus, Mahonia repens*, and *Symphoricarpos rotundifolius* (Tiedemann et al. 1987). The herbaceous layer is diverse and variable among sites, providing sparse to low cover with *Achnatherum hymenoides* typically present to dominant. Other common graminoids provide low cover and include *Elymus elymoides, Juncus balticus, Pascopyrum smithii*, and introduced annual *Bromus tectorum*. Forbs provide sparse to low cover, including *Artemisia dracunculus, Chaenactis douglasii, Eriogonum brevicaule, Eriogonum cernuum, Lupinus argenteus, Oenothera caespitosa*, and introduced species such as *Melilotus officinalis*, and *Verbascum thapsus*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Ericameria parryi*
Herb (field)	*Artemisia frigida*
Herb (field)	*Eriogonum cernuum*
Herb (field)	*Achnatherum hymenoides*, *Achnatherum lettermanii*, *Juncus balticus*

Globally

Stratum	Species
Short shrub/sapling	*Ericameria parryi*
Herb (field)	*Eriogonum brevicaule*, *Eriogonum cernuum*
Herb (field)	*Achnatherum hymenoides*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus tectorum* (exotic, High)

Globally
Exotic/Invasive: *Bromus tectorum* (exotic, High)

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (27-Feb-2006).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Some confusion may exist between this type and those dominated by *Ericameria nauseosa*. Both associations tend to occur in disturbed areas, and the species are somewhat difficult to separate. It would be useful to know if the species tend to be segregated by the type of disturbance, or if they are more cosmopolitan, occurring in mixed stands. Sites with high cover of *Achnatherum hymenoides* may be difficult to distinguish from *Achnatherum hymenoides* Shale Barren Herbaceous Vegetation (CEGL001651), which may have a sparse layer of *Ericameria parryi*.

Globally
This association includes a variety of human- and naturally disturbed stands on a variety of substrates. More survey and classification work are needed to clarify the role of substrates in this type.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (6 plots: BLCA.0079, BLCA.0081, CURE.0233, CURE.0276, CURE.0279, CURE.0304 and 3 observation points: BLCA_AA.167, BLCA_AA.172, CURE_AA.0016).
Local Description Authors: J. Von Loh, mod. G. Bradshaw and J. Coles

Global Description Authors: K.A. Schulz

REFERENCES: Tiedemann et al. 1987, Western Ecology Working Group n.d.

Atriplex canescens / Achnatherum hymenoides Shrubland

Fourwing Saltbush / Indian Ricegrass Shrubland

CODE	CEGL001289
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Extremely xeromorphic evergreen shrubland (III.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural extremely xeromorphic evergreen shrubland (III.A.5.N.)
FORMATION	Facultatively deciduous extremely xeromorphic subdesert shrubland (III.A.5.N.b.)
ALLIANCE	*ATRIPLEX CANESCENS* SHRUBLAND ALLIANCE (A.869) Fourwing Saltbush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Mixed Salt Desert Scrub (CES304.784)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland is found on the western slope of the Colorado Rocky Mountains, adjacent northeastern Utah and the Great Salt Lake Desert. Elevation ranges from approximately 1300-2454 m (4260-8545 feet). Stands occur on level desert plains, toeslopes, alluvial terraces and steep slopes at the base of mesas. Soils are well-drained, somewhat alkaline and include sandy clay loam. The vegetation is characterized by an open (10 to 25% cover) short-shrub layer that is dominated by *Atriplex canescens*, with an herbaceous layer dominated by the bunchgrass *Achnatherum hymenoides*. Associated shrubby species provide sparse cover and may include *Rhus trilobata* and *Krascheninnikovia lanata*. The herbaceous layer is low in species diversity and provides sparse to low cover, except in disturbed stands, where *Bromus tectorum* is present to codominant in the understory.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is known from a mesa east of Rainbow Lake Road within Sapinero State Wildlife Refuge, near Curecanti National Recreation Area. Other examples may be found on similar sites but the type is rare locally.

Globally

This shrubland is found on the western slope of the Colorado Rocky Mountains, adjacent northeastern Utah and the Great Salt Lake Desert. This association may have a wider distribution as both diagnostic species are common in the semi-arid western U.S.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This short-shrub association occurs at the base of caprock cliffs on steep-sided mesas. The site is steep (60% slope), occurs at 2454 m elevation, and is oriented to a south aspect. The unvegetated surface has high cover of small and large rocks and moderate exposure of sand. Downed wood is common. Parent materials are Tertiary volcanic rocks of the West Elk breccia. Soils are rapidly drained sandy clay loams.

Globally

This shrubland is found on the western slope of the Colorado Rocky Mountains, adjacent northeastern Utah and the Great Salt Lake Desert. Elevation ranges from approximately 1300-2454 m (4260-8545 feet). Stands occur on level desert plains, toeslopes, alluvial terraces and steep slopes at the base of mesas. Soils are well-drained, somewhat alkaline and include sandy clay loam.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is 25% in this shrubland association. *Atriplex canescens* forms an open canopy and with the medium-tall bunchgrass *Achnatherum hymenoides*, each provides up to 25% cover. Another short shrub, *Rhus trilobata*, provides sparse cover, as does the dwarf-shrub *Krascheninnikovia lanata*. The herbaceous layer is low in species diversity and provides sparse to low cover. Additional grasses include *Elymus elymoides* and *Bouteloua gracilis*. Forbs provide sparse cover and include *Eriogonum lonchophyllum, Sphaeralcea coccinea*, and *Stephanomeria minor var. minor (= Stephanomeria tenuifolia var. tenuifolia)*. *Atriplex canescens* seedlings are present and provide sparse cover.

Globally
This semi-desert to desert association is characterized by an open (10 to 25% cover) short-shrub layer that is dominated by *Atriplex canescens*, with an herbaceous layer dominated by the bunchgrass *Achnatherum hymenoides*. Associated shrubby species provide sparse cover and may include *Rhus trilobata, Grayia spinosa, Chrysothamnus viscidiflorus*, and *Krascheninnikovia lanata*. The herbaceous layer is low in species diversity and provides sparse to low cover. Additional species in Colorado may include the grasses *Elymus elymoides, Sporobolus cryptandrus*, and *Bouteloua gracilis*, with sparse cover of forbs, including *Eriogonum lonchophyllum, Sphaeralcea coccinea*, and *Stephanomeria minor var. minor (= Stephanomeria tenuifolia var. tenuifolia)*. *Bromus tectorum* may be abundant in disturbed stands.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Rhus trilobata*
Short shrub/sapling	*Atriplex canescens*
Herb (field)	*Krascheninnikovia lanata*
Herb (field)	*Eriogonum lonchophyllum*
Herb (field)	*Achnatherum hymenoides*

Globally

Stratum	Species
Short shrub/sapling	*Atriplex canescens*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Exotic/Invasive: *Bromus tectorum* (invasive, High)

CONSERVATION STATUS RANK
Global Rank & Reasons: G3G5 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Little information is available on this associations. More survey and classification work are needed to fully characterize it across its range.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Association occupies a narrow band on BLM land outside the recreation area. Further quantitative data are needed to describe this association.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0391 and 2 observation points: CURE_AA.0745, CURE_AA.0859).
Local Description Authors: J. Von Loh, mod. G. Bradshaw

Global Description Authors: K.A. Schulz, mod. J. Coles

REFERENCES: Bourgeron and Engelking 1994, Driscoll et al. 1984, Salas et al. 2009, Vest 1962a, Western Ecology Working Group n.d.

Amelanchier utahensis - Mixed Shrub / *Carex geyeri* Shrubland

Utah Serviceberry - Mixed Shrub / Geyer's Sedge Shrubland

CODE	CEGL001068
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*AMELANCHIER UTAHENSIS* SHRUBLAND ALLIANCE (A.916) Utah Serviceberry Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This association occurs on the rocky slopes and summits of hills and ridges in western and north-central Colorado. A few stands occur in the bottom of dry gullies. Elevations range from 2225 to 2765 m (7300-9070 feet), and stands tend to occur on gentle to moderately steep north- or east-facing slopes. Substrates include volcanic or sedimentary rock as well as landslides. The moderately dense to dense shrub layer is variable in its composition and dominance, but is characterized by relatively high cover of *Amelanchier utahensis*, a lack of *Quercus gambelii* and relatively low cover by *Artemisia tridentata* (ssp. *vaseyana* or ssp. *wyomingensis*). Other shrubs, including *Cercocarpus montanus, Chrysothamnus viscidiflorus, Symphoricarpos oreophilus*, and *Purshia tridentata*, may be present and sometimes may be codominant with the *Amelanchier*. The herbaceous layer tends to be relatively sparse, rarely exceeding 20% total cover. *Carex geyeri* has at least 5% cover, and many other graminoids and forbs may be present in small amounts, including *Achnatherum lettermanii, Balsamorhiza sagittata, Galium boreale, Lupinus* sp., *Lathyrus lanszwertii var. leucanthus, Poa pratensis, Allium acuminatum, Achillea millefolium*, and *Pseudostellaria jamesiana*. Grazing by domestic animals decreases the cover of *Carex geyeri* and increases the cover of *Poa pratensis*, and browsing by elk may hedge the dominant shrub species.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is widely distributed and was sampled on a dry tributary of Red Creek, above South Willow Creek, on Pine Creek, on West Elk on the east side of Arm I, in Long Gulch, and on Carpenter Ridge in the recreation area.

Globally

This association is known to occur in western and north-central Colorado. It is likely to occur in southwestern Wyoming and northeastern Utah on similar substrates (especially Green River Shale and Uinta Formation).

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall-shrub association was observed on plains, midslopes and shoulders of ridges and on ridgetops, shoulders and slopes in gulches, on hillslopes, and in drainage channels. Sites are gentle to steep (6-62% slopes), occur between 2340 and 2765 m elevation, and are oriented to all aspects. The unvegetated surface has low to high cover of litter, bedrock, and large and small rocks, and exposure of bare soil across stands. Cryptogam cover is up to 10% on one stand. Downed wood may contribute up to 5% cover. The underlying geology is variable and includes metamorphic/granitic rocks, Quaternary alluvium and landslide deposits, Mesozoic sandstones and shale, and

Tertiary volcanic rocks. Soils are rapidly drained silty clay loams, silt loams, sandy clay loams, and sandy loams. Peat is present on one site.

Globally
This association occurs on the slopes and summits of hills and ridges in western and north-central Colorado. A few stands occur in the bottom of dry gullies. Elevations range from 2225 to 2765 m (7300-9070 feet), and stands tend to occur on gentle to moderately steep north- or east-facing slopes. Substrates include volcanic or sedimentary rock as well as landslides. Soil textures vary, but soils are often quite rocky.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 40 to 162% in these stands. This tall-shrub association is characterized by an open to closed canopy, typically 2-5 m tall, of *Amelanchier utahensis* and/or *Cercocarpus montanus* shrubs that range in cover from 0 to 50% and 0 to 55%, respectively. *Pseudotsuga menziesii* was present in one stand as saplings up to 2 m tall and contributes sparse cover. The shrub layer is variable in cover and composition. Other tall shrubs and sapling trees commonly present, but typically with less than 5% cover, include *Juniperus scopulorum, Pinus edulis*, and *Quercus gambelii* that are 1-5 m tall. Short and dwarf-shrubs can contribute moderate cover for each species; species commonly present include *Amelanchier utahensis, Artemisia nova, Artemisia tridentata* ssp. *vaseyana, Artemisia tridentata* ssp. *wyomingensis, Cercocarpus montanus, Chrysothamnus depressus, Chrysothamnus viscidiflorus, Mahonia repens, Quercus gambelii, Peraphyllum ramosissimum, Purshia tridentata*, and *Symphoricarpos rotundifolius*. The succulents *Opuntia fragilis, Opuntia polyacantha, Pediocactus simpsonii*, and *Yucca harrimaniae* are occasionally present but provide sparse cover. The herbaceous layer typically provides moderate cover and is present with moderate to high species richness. The characteristic graminoid is *Carex geyeri* that contributes from 0 to 25% cover. Other graminoids commonly present and providing sparse to moderate cover include *Achnatherum hymenoides, Achnatherum pinetorum, Carex vallicola, Elymus elymoides, Koeleria macrantha, Pascopyrum smithii, Poa compressa, Poa fendleriana, Poa pratensis*, and *Poa secunda*. Forbs commonly present include *Achillea millefolium var. occidentalis, Allium* sp., *Antennaria parvifolia, Arabis* spp., *Astragalus* spp., *Balsamorhiza sagittata, Castilleja* spp., *Chaenactis douglasii, Comandra umbellata, Cryptantha* spp., *Erigeron* spp., *Eriogonum* spp., *Lupinus* spp., *Penstemon teucrioides, Petradoria pumila, Phlox* spp., *Senecio* spp., *Sphaeralcea coccinea*, and *Stenotus armerioides*. Mosses and lichens provide sparse cover, up to 5% cover in some stands.

Globally
This tall shrubland association is variable in its shrub composition and dominance but is characterized by relatively high cover of *Amelanchier utahensis*, a lack of *Quercus gambelii* and relatively low cover by *Artemisia tridentata* (ssp. *vaseyana* or ssp. *wyomingensis*). Other shrubs, including *Cercocarpus montanus, Chrysothamnus viscidiflorus, Symphoricarpos oreophilus*, and *Purshia tridentata*, may be present and sometimes may be codominant with the *Amelanchier*. Total shrub cover ranges from 25% to more than 100% in these moderately dense to dense stands, and the shrub layer may be 1-2 m tall. Because of the dense shade cast by the shrub layer, the herbaceous layer tends to be relatively sparse, rarely exceeding 20% total cover. *Carex geyeri* has at least 5% cover, and many other graminoids and forbs may be present, including *Achnatherum lettermanii, Balsamorhiza sagittata, Galium boreale, Lupinus* sp., *Lathyrus lanszwertii var. leucanthus, Poa pratensis, Allium acuminatum, Achillea millefolium*, and *Pseudostellaria jamesiana*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Amelanchier utahensis*
Tall shrub/sapling	*Cercocarpus montanus*
Short shrub/sapling	*Amelanchier utahensis, Symphoricarpos rotundifolius*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana, Artemisia tridentata* ssp. *wyomingensis, Cercocarpus montanus*
Herb (field)	*Balsamorhiza sagittata, Phlox hoodii, Stenotus armerioides*
Herb (field)	*Achnatherum hymenoides, Carex geyeri, Poa fendleriana*

Globally

Stratum	Species
Tall shrub/sapling	*Amelanchier utahensis*
Tall shrub/sapling	*Cercocarpus montanus*
Short shrub/sapling	*Symphoricarpos rotundifolius*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Carex geyeri*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus inermis* (exotic, High/Medium), *Bromus tectorum* (exotic, High), *Cirsium arvense* (exotic, High/Medium), *Melilotus officinalis* (exotic, Medium/Low), *Poa compressa* (exotic, High/Low), *Poa pratensis* (exotic, Medium), *Sisymbrium altissimum* (exotic)

Globally
Exotic/Invasive: *Cirsium arvense* (exotic, High/Medium), *Melilotus officinalis* (exotic, Medium/Low), *Poa pratensis* (exotic, Medium)

CONSERVATION STATUS RANK
Global Rank & Reasons: G2G3 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Tiedemann et al. (1987) describe a community dominated by *Amelanchier alnifolia*. The other references used in this description describe communities dominated by *Amelanchier utahensis*. Because it can be difficult to distinguish the two species, it makes sense to include all stands dominated by either species of *Amelanchier* in this association.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: The ranges of *Amelanchier utahensis* and *Amelanchier alnifolia* overlap here and the species intergrade. While every effort was made to identify and separate these species, there is a possibility that some *Amelanchier alnifolia* stands were misidentified and placed in this class.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (16 plots: BLCA.0007, BLCA.0013, BLCA.0014, BLCA.0043, BLCA.0048, BLCA.0049, BLCA.0050, BLCA.0056, CURE.0017, CURE.0048, CURE.0099, CURE.0129, CURE.0156, CURE.0340, CURE.0370, CURE.0392 and 45 observation points: BLCA_AA.191, BLCA_AA.192, BLCA_AA.194, BLCA_AA.195, BLCA_AA.197, BLCA_AA.199, BLCA_AA.201, BLCA_AA.210, BLCA_AA.225, BLCA_AA.240, BLCA_AA.272, BLCA_AA.288, BLCA_AA.337, BLCA_AA.340, BLCA_AA.352, BLCA_AA.383, BLCA_AA.389, BLCA_AA.396, BLCA_AA.408, BLCA_AA.416, BLCA_AA.417, BLCA_AA.418, BLCA_AA.419, BLCA_AA.429, BLCA_AA.430, BLCA_AA.439, BLCA_AA.440, BLCA_AA.447, BLCA_AA.449, BLCA_AA.453, BLCA_AA.461, BLCA_AA.462, BLCA_AA.470, BLCA_AA.477, BLCA_AA.483, BLCA_AA.489, BLCA_AA.497, BLCA_AA.503, BLCA_AA.508, BLCA_AA.556, BLCA_AA.596, BLCA_AA.725, BLCA_AA.890, BLCA_AA.964, CURE_AA.1092).
Local Description Authors: J. Von Loh and G. Bradshaw, mod. J. Coles
Global Description Authors: J. Coles

REFERENCES: Baker 1982b, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Current 1984, Driscoll et al. 1984, Keammerer and Peterson 1981, Tiedemann et al. 1987, Vories 1974, Western Ecology Working Group n.d.

Cercocarpus montanus - Artemisia tridentata Shrubland

Alderleaf Mountain-mahogany - Basin Big Sagebrush Shrubland

CODE	CEGL005805
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*CERCOCARPUS MONTANUS* SHRUBLAND ALLIANCE (A.896) Alderleaf Mountain-mahogany Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland association is only known from 16 sites sampled at Curecanti National Recreation Area in the Gunnison River Valley in western Colorado. Stands generally occur on hills, ridges, along intermittent drainages, near the shoreline of a reservoir and in a badland area. Sites are gentle to steep (4-40%), low to midslopes at 2315-2490 m elevation and occur on all aspects. Soil texture is variable and includes clay loam. Soil surface typically has moderate to high cover (30-80%) of bare ground with moderate to low cover (<45%) of gravel, rock and litter. Parent materials include shale, blocky sandstone and volcanic rock. The vegetation is characterized by an open to moderately dense (10-40% cover) canopy of tall shrubs (1-2 m) codominated by *Cercocarpus montanus* and *Artemisia tridentata* (ssp. *wyomingensis*, ssp. *vaseyana*). Associated shrubs may include *Amelanchier alnifolia, Amelanchier utahensis, Chrysothamnus viscidiflorus, Purshia tridentata, lanata,* and *Symphoricarpos oreophilus*. If present, *Quercus gambelii* has low cover (<5%). The herbaceous layer has low to moderate (<20%) cover that is dominated by graminoids such as *Achnatherum hymenoides, Elymus elymoides, Pleuraphis jamesii,* and *Poa fendleriana*. Forbs provide low cover.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This shrubland association is known from 16 sampled sites at Curecanti National Recreation Area in the Gunnison River Valley in western Colorado. Stands occur north, south and west of Blue Mesa Reservoir, including south of Lake Fork and west of Cebolla Creek.

Globally

This shrubland association is known from 16 sampled sites at Curecanti National Recreation Area in the Gunnison River Valley in western Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This shrubland association is only known from 16 sites sampled at Curecanti National Recreation Area in the Gunnison River Valley in western Colorado. Stands generally occur on hills, ridges, along intermittent drainages, near the shoreline of a reservoir and in a badland area. Sites are gentle to steep (4-40%), low to midslopes at 2315-2490 m elevation and occur on all aspects. Soil texture is variable and includes clay loam. Soil surface typically has moderate to high cover (30-80%) of bare ground with moderate to low cover (<45%) of gravel, rock and litter. Parent materials include shale, blocky sandstone and volcanic rock.

Globally

This shrubland association is only known from Curecanti National Recreation Area in western Colorado. Global information is not available.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is characterized by an open to moderately dense (10-40% cover) canopy of tall shrubs (1-2 m) codominated by *Cercocarpus montanus* and *Artemisia tridentata* (ssp. *wyomingensis*, ssp. *vaseyana*). Associated shrubs may include *Amelanchier alnifolia, Amelanchier utahensis, Chrysothamnus viscidiflorus, Purshia tridentata, lanata*, and *Symphoricarpos oreophilus*. If present, *Quercus gambelii* has low cover (<5%). The herbaceous layer has low to moderate (<20%) cover that is dominated by graminoids such as *Achnatherum hymenoides, Elymus elymoides, Pleuraphis jamesii*, and *Poa fendleriana*. Forbs such as *Eriogonum microthecum var. simpsonii* or *Eriogonum umbellatum var. subaridum* provide low cover.

Globally
This shrubland association is only known from Curecanti National Recreation Area in western Colorado. Global information is not available.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Cercocarpus montanus*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*, *Artemisia tridentata* ssp. *wyomingensis*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (23-May-2007).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This provisional shrubland association is based on data from 16 accuracy assessment points from Curecanti National Recreation Area in the Gunnison River Valley in western Colorado. More survey and classification work are needed to fully characterized the concept of this provisional type.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data collected in 2004 during accuracy assessment (16 observation points: CURE_AA.0161, CURE_AA.0171, CURE_AA.0174, CURE_AA.0195, CURE_AA.0212, CURE_AA.0258, CURE_AA.0324, CURE_AA.0420, CURE_AA.0465, CURE_AA.0482, CURE_AA.0495, CURE_AA.0731, CURE_AA.0938, CURE_AA.1038, CURE_AA.1043, CURE_AA.1294).
Local Description Authors: K.A. Schulz
Global Description Authors: K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Cercocarpus montanus Shale Shrubland

Mountain-mahogany Shale Shrubland

CODE	CEGL002798
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*CERCOCARPUS MONTANUS* SHRUBLAND ALLIANCE (A.896) Alderleaf Mountain-mahogany Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland association is uncommon and known only from one site sampled at Curecanti National Recreation Area in the Gunnison River Valley in western Colorado. The stands occur on steep (48% slope), active slopes at 2314 m elevation on a northwest aspect. Soils are rapidly drained clays derived from Mesozoic shale. The unvegetated surface has moderate cover of litter and high cover of large and small rocks. There is low to moderate exposure of bare soil. The vegetation is characterized by a dense to closed canopy of tall shrubs (1-2 m) dominated by *Cercocarpus montanus*. The associated shrub layer is low in species diversity and provides sparse cover. Short and dwarf-shrubs include *Artemisia frigida, Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus viscidiflorus, Krascheninnikovia lanata,* and *Symphoricarpos rotundifolius*. The herbaceous layer is moderately diverse and provides moderate cover. Graminoids provide low cover and include *Achnatherum hymenoides, Achnatherum pinetorum*, and *Elymus elymoides*. Forbs provide low to moderate cover and include *Antennaria parvifolia, Arabis crandallii, Arabis X divaricarpa, Eriogonum lonchophyllum, Penstemon teucrioides, Phlox hoodii*, and *Stenotus armerioides*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This type is known from a single location near Highway 50 and the lake shoreline in the vicinity of Elk Creek.

Globally

This shrubland association is uncommon and known only from one sampled site at Curecanti National Recreation Area in the Gunnison River Valley in western Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall-shrub association occurs on active slopes. The site is steep (48% slope), occurs at 2314 m elevation, and is oriented to a northwest aspect. The unvegetated surface has moderate cover of litter and high cover of large and small rocks. There is low to moderate exposure of bare soil. Downed wood is uncommon. Parent materials are Mesozoic shale. Soils are rapidly drained clays.

Globally

Data are not available.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is 85 to 130% in this shrubland association. *Cercocarpus montanus* tall shrubs (1-2 m tall) form a closed canopy of 75 to 100% cover. The associated shrub layer is low in species diversity and provides sparse cover. Short and dwarf-shrubs include *Artemisia frigida, Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus viscidiflorus, Krascheninnikovia lanata,* and *Symphoricarpos rotundifolius*. The herbaceous layer is moderately diverse and provides moderate cover. Graminoids provide low cover and include *Achnatherum*

hymenoides, Achnatherum pinetorum, and *Elymus elymoides*. Forbs provide low to moderate cover and include *Antennaria parvifolia, Arabis crandallii, Arabis X divaricarpa, Eriogonum lonchophyllum, Penstemon teucrioides, Phlox hoodii,* and *Stenotus armerioides*.
Globally
Data are not available.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Cercocarpus montanus*
Herb (field)	*Stenotus armerioides*

Globally

Stratum	Species
Tall shrub/sapling	*Cercocarpus montanus*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Vulnerable: *Arabis crandallii* (globally imperiled, G2), *Penstemon teucrioides* (vulnerable, G2G3Q)

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (22-Jun-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Slope is subject to slides and has a high degree of erosion.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0009 and 15 observation points: BLCA_AA.168, BLCA_AA.171, BLCA_AA.176, BLCA_AA.177, BLCA_AA.180, BLCA_AA.431, BLCA_AA.616, CURE_AA.0207, CURE_AA.0213, CURE_AA.0217, CURE_AA.0218, CURE_AA.0224, CURE_AA.0225, CURE_AA.0233, CURE_AA.0234).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Prunus virginiana - (Prunus americana) Shrubland

Chokecherry - (American Plum) Shrubland

CODE	CEGL001108
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*PRUNUS VIRGINIANA* SHRUBLAND ALLIANCE (A.919) Chokecherry Shrubland Alliance
ECOLOGICAL SYSTEM(S): (CES306.994)	Northern Rocky Mountain Montane-Foothill Deciduous Shrubland Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822) Western Great Plains Wooded Draw and Ravine (CES303.680)
USFWS WETLAND SYSTEM:	Not applicable

CONCEPT SUMMARY

Globally

This widespread small-patch shrubland is known from the Columbia Plateau of eastern Washington and eastern Oregon, throughout much of the western Great Plains, Rocky Mountain and interior western U.S. It occurs in the foothills and lower slopes of mountain ranges, along higher creeks and upper alluvial terraces of perennial streams, and in draws and ravines of high plateaus and the Great Plains. The elevational range is 680 to 2652 m (2234-8700 feet). This association grows at the interface between larger riparian areas and the adjacent upland and occurs as small dense thickets, narrow bands, or irregular patches. It often occupies draws, ephemeral creeks in steep narrow-bottomed canyons, and shallow ravines. It can occur on slopes below seeps and springs and on high slopes where snow collects. Shrub cover ranges from 100% to more open stands of 30%. Shrub cover is generally greater in drainage bottoms and on lowermost slopes, and less on upper slopes. *Prunus virginiana* is usually the dominant shrub species, but *Prunus americana* may be solely present to codominant as well. Stands can be dominated by one species but are often a mix of three to six other shrub species, which can be as abundant and even more abundant than the *Prunus*. Other shrubs include *Rhus trilobata, Ribes aureum, Ribes cereum, Ribes lacustre, Ribes inerme, Salix exigua, Sambucus* spp., *Amelanchier* spp., *Amorpha canescens, Ericameria nauseosa, Symphoricarpos oreophilus, Symphoricarpos occidentalis, Juniperus scopulorum, Rosa woodsii*, and *Toxicodendron rydbergii*. In drainage bottoms, herbaceous cover is usually sparse, less than 10%. On slopes, the shrubs typically occur in some grassland type, and graminoid cover can be greater than 75%. Herbaceous species may include *Achnatherum lettermanii, Achnatherum nelsonii, Carex vallicola, Erigeron flagellaris, Leymus cinereus, Geranium caespitosum var. caespitosum, Heracleum maximum (= Heracleum lanatum), Juncus arcticus, Maianthemum stellatum (= Smilacina stellata), Muhlenbergia montana*, and *Potentilla hippiana*. Exotic species *Bromus inermis, Cirsium arvense, Poa pratensis*, and *Bromus tectorum* are common on disturbed sites.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled along a drainage east of Soap Creek Road and in a steep gully and along the roadside west of Colorado State Highway 92 in the Curecanti National Recreation Area.

Globally

This widespread small-patch shrubland is known from the Columbia Plateau of eastern Washington and eastern Oregon, throughout much of the western Great Plains, Rocky Mountain and interior western U.S.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This shrubland association is found in drainages along streams gullies and on disturbed sites. Sites are on gentle midslopes (3-6 degrees), occur at 2234 and 2642 m elevation, and have a variety of aspects (currently not southerly). The unvegetated ground surface has moderate to high cover of litter and significant bare ground.

Globally

This widespread small-patch shrubland occurs from the Columbia Plateau of eastern Washington, eastern Oregon, throughout much of the western Great Plains, Rocky Mountain and interior western U.S. It occurs in the foothills and lower slopes of mountains, along higher creeks and upper alluvial terraces of perennial streams, in moist soils that receive bedrock runoff in the Colorado Plateau, and in draws and ravines of plateaus and the Great Plains. The elevational range is 716 to 2846 m (2234-9330 feet), and slopes are gentle to steep (to 20 degrees). This association often grows at the interface between larger riparian areas and the adjacent upland, as well as on higher ridges where snow collects, and occurs as small dense thickets, narrow bands or irregular patches. It often occupies draws, ephemeral creeks in steep narrow-bottomed canyons, and shallow ravines. It can occur on slopes below seeps and springs. Stands can also occur as small pockets on higher terraces or as narrow bands along the high-water mark of steep banks and incised channels. It also grows at the base of cliffs adjacent to rivers. Slope varies from flat to very steep, with variable aspects, and can be associated with rock outcrops and talus. Stands are typically on very well-drained, rocky soils but occasionally have finer soils. Soil texture ranges from sandy loam to clay loam.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is dominated by an open to moderate tall-shrub layer (5-45% cover) dominated or codominated by *Prunus virginiana* with a short-shrub layer with a mix of other shrub species, which can be as abundant as the *Prunus*. Other shrubs include *Artemisia tridentata* ssp. *vaseyana, Chrysothamnus viscidiflorus, Amelanchier* spp., *Rhus trilobata, Rosa woodsii*, and *Symphoricarpos oreophilus*. If *Quercus gambelii* is present, then it has low cover (<5%). Scattered *Juniperus scopulorum, Populus tremuloides*, or *Pseudotsuga menziesii* trees may also be present. Herbaceous cover ranges from sparse to moderate (5-35%). Common species include graminoids *Bromus ciliatus, Carex geyeri, Elymus elymoides, Juncus arcticus*, forbs *Achillea millefolium* and *Heracleum maximum (= Heracleum lanatum)*, and introduced species *Poa pratensis* and *Cirsium arvense*.

Globally

Shrub cover ranges from total coverage (>90%) to more open stands of 30% canopy cover, with the higher values tending to occur in sites located in drainage bottoms and on lowermost slopes, and the lower values on higher slopes. *Prunus virginiana* is usually the dominant shrub species, but *Prunus americana* may be solely present to codominant. Stands can be dominated by one species but are often a mix of three to six other shrub species, which can be as abundant and sometimes more abundant than *Prunus*. Other shrubs include *Rhus trilobata, Ribes aureum, Ribes cereum, Ribes lacustre, Ribes inerme, Rosa* spp., *Salix exigua, Sambucus* spp., *Amelanchier* spp., *Amorpha canescens, Artemisia tridentata, Ericameria nauseosa, Symphoricarpos oreophilus, Symphoricarpos occidentalis, Juniperus scopulorum, Rosa woodsii, Mahonia repens*, and *Toxicodendron* spp. The tree *Populus tremuloides* may provide sparse cover. In drainage bottoms, herbaceous cover is usually sparse, less than 10%. On slopes, the shrubs typically occur in a matrix of other shrubland or grassland types, and graminoid cover can be greater than 75%. Herbaceous species are variable. Graminoids include *Achnatherum lettermanii, Achnatherum nelsonii, Artemisia frigida, Bromus carinatus, Carex vallicola, Elymus lanceolatus, Elymus trachycaulus, Juncus balticus, Leymus cinereus, Muhlenbergia montana, Pascopyrum smithii*, and *Poa fendleriana*. Forb species are often diverse but are often relatively mesic. Common species include *Achillea millefolium, Agastache urticifolia, Balsamorhiza sagittata, Delphinium nuttallianum, Erigeron flagellaris, Eriogonum umbellatum, Geranium caespitosum var. caespitosum, Geranium viscosissimum, Heracleum maximum (= Heracleum lanatum), Heterotheca villosa, Maianthemum stellatum (= Smilacina stellata), Mertensia oblongifolia, Osmorhiza berteroi (= Osmorhiza chilensis), Potentilla hippiana*, and *Psoralidium lanceolatum*. Exotic herbaceous species may be present, including *Bromus inermis, Cirsium arvense, Poa pratensis*, and *Bromus tectorum*, especially on disturbed sites.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Amelanchier alnifolia, Sambucus racemosa*
Short shrub/sapling	*Prunus virginiana, Symphoricarpos oreophilus*
Herb (field)	*Angelica ampla, Erigeron speciosus*

Globally

Stratum	Species
Short shrub/sapling	*Prunus americana, Prunus virginiana*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Poa pratensis* (exotic, Medium)

Globally
Exotic/Invasive: *Bromus inermis* (invasive/exotic, High/Medium), *Bromus tectorum* (invasive/exotic, High), *Cirsium arvense* (invasive/exotic, High/Medium), *Poa pratensis* (invasive/exotic, Medium); **Other**: *Pascopyrum smithii* (G5), *Prunus americana* (G5), *Symphoricarpos occidentalis* (G5)

CONSERVATION STATUS RANK
Global Rank & Reasons: G4Q (1-Feb-1996). This type is widespread, but it represents a broadly defined dominance type, with little information on the associated species or habitats that might help define the type more precisely. If, e.g. a Great Plains type was separated out from the other types, such a type could be relatively rare.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This is a widespread and highly variable, yet distinct, type. In semi-arid regions, it is restricted to mesic and wet areas that often occur as small patches or limited to streambanks. Kovalchik (1987) briefly describes a similar type called Mixed Shrub Canyon Bottom Association from 4 plots. It occurs in low-elevation canyons below U.S. Forest Service ownership in eastern Oregon. Tall shrubs include *Prunus virginiana, Amelanchier alnifolia, Rosa woodsii, Cornus sericea, Salix* spp., *Prunus subcordata*, and/or *Alnus incana*. This may be the same concept.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data collected in 2004 during accuracy assessment (4 observation points: CURE_AA.0096, CURE_AA.0122, CURE_AA.0126, CURE_AA.0526).
Local Description Authors: K.A. Schulz
Global Description Authors: D. Faber-Langendoen, mod. G. Kittel, J. Coles, K.A. Schulz, K.S. King

REFERENCES: Bourgeron and Engelking 1994, CONHP pers. comm., CONHP unpubl. data 2003, Caicco and Wellner 1983n, Carsey et al. 2003a, Copeland 1980a, Driscoll et al. 1984, Evans 1989a, Evans 1989b, Hall and Hansen 1997, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Johnston 1987, Jones 1992b, Jones and Walford 1995, Kagan et al. 2000, Kittel et al. 1996, Kittel et al. 1999b, Kovalchik 1987, Kudray et al. 2004, MTNHP 2002b, Manning and Padgett 1995, Marriott pers. comm., Von Loh et al. 1999, Western Ecology Working Group n.d.

Quercus gambelii - Cercocarpus montanus / (Carex geyeri) Shrubland

Gambel Oak - Alderleaf Mountain-mahogany / (Geyer's Sedge) Shrubland

CODE	CEGL001113
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*QUERCUS GAMBELII* SHRUBLAND ALLIANCE (A.920) Gambel Oak Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This mixed montane shrubland is reported from foothills, mountains and mesatops in western Colorado and Utah. Stands occur on gentle, moderate and steep slopes. Aspect varies with elevation with low-elevation stands restricted to more mesic northern and eastern aspects, and higher elevation stands occurring on southern and western aspects. Substrates are typically shallow and rocky, derived from sandstone and shale parent materials, and range from sandy- to clayey-textured soil. The vegetation is characterized by a moderately dense to dense thicket of tall (2-5 m) deciduous shrubs (on unstable, eroding or talus slopes the shrub canopy may be open). Codominance of *Quercus gambelii* and *Cercocarpus montanus* (at least 10% cover of each) is diagnostic of this plant association, but *Amelanchier utahensis* is often also abundant to codominant. Low cover of other mixed shrub associates is common. *Arctostaphylos patula, Arctostaphylos pungens, Artemisia tridentata, Fendlera rupicola, Fraxinus anomala, Peraphyllum ramosissimum, Physocarpus monogynus, Purshia tridentata, Prunus virginiana, Rhus trilobata, Rosa woodsii, Quercus turbinella, Symphoricarpos oreophilus,* and *Yucca* spp. may be present depending on geography. Occasional *Juniperus osteosperma* and *Pinus edulis* trees may also be present. The herbaceous layer is generally sparse because of the dense overstory, but *Carex geyeri* may provide low to moderate cover.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled across from the Pine Creek entrance and near the East Portal in the recreation area.

Globally

This montane shrubland association occurs in the foothills, mountains and mesatops of Utah and western Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall shrubland association was observed on the midslopes of swales, gorges, active slopes, and ridges. Sites are moderately steep to steep (15-75% slopes), occur between 2163 and 2451 m, and include all aspects. The unvegetated surface has moderate to high cover of litter and low to moderate cover of bedrock, large and small rocks, and exposure of bare soil. Downed wood can have cover as high as 10%. Soils are rapidly drained sandy loam, loamy sand, and clay loam derived from landslide material; one site was considered rich in gravel and another was termed very rocky with little soil.

Globally

This mixed montane shrubland association is reported from foothills, mountains and mesa tops in western Colorado and Utah. Elevation ranges from 1550-2500 m (5850-8200 feet). Stands occur on flat to steep slopes. Aspect varies with elevation with low elevation stands restricted to more mesic northern and eastern aspects, and higher elevation stands occurring on southern and western aspects. Substrates range from shallow and rocky, derived from sandstone, shale and alluvium or colluvium parent materials. Soil textures range from sandy to clayey to rapidly drained loamy sands.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 40 to 85% in these stands. This shrubland association is characterized by an open to closed tall-shrub canopy, typically 2-5 m tall, of *Quercus gambelii, Cercocarpus montanus*, and *Amelanchier utahensis* shrubs that each range in cover from 5 to 50%. These tall-shrub species are also present in the short-shrub layer and contribute up to 25% cover. Additional tall shrubs provide sparse to low cover, including *Juniperus osteosperma, Prunus virginiana*, and *Pinus edulis*. Short and dwarf-shrubs are diverse, provide low to moderate cover, and include *Amelanchier alnifolia, Artemisia tridentata* ssp. *vaseyana, Chrysothamnus viscidiflorus, Fendlerella utahensis, Gutierrezia sarothrae, Mahonia repens, Opuntia fragilis, Peraphyllum ramosissimum, Philadelphus microphyllus*, and *Symphoricarpos rotundifolius*. The herbaceous layer is diverse and provides low to moderate cover within stands. Common graminoids include *Achnatherum hymenoides, Bromus tectorum, Carex geyeri, Elymus elymoides*, and *Poa fendleriana*. Forbs are diverse, provide sparse cover, and include *Arenaria congesta, Artemisia frigida, Artemisia michauxiana, Balsamorhiza sagittata, Petradoria pumila*, and *Phlox austromontana*. Seedling *Artemisia tridentata* ssp. *vaseyana* and *Cercocarpus montanus* provide sparse cover in one stand. Cryptogams provide sparse cover, typically less than 5%.

Globally
This association is characterized by a moderately dense to dense thicket of tall deciduous shrubs 2-5 m tall (on unstable, eroding or talus slopes the shrub canopy may be more open). Codominance of *Quercus gambelii* and *Cercocarpus montanus* (at least 10% cover of each) is diagnostic of this plant association, but *Amelanchier utahensis* is often also abundant to codominant. Low cover of other mixed shrub associates is common. *Arctostaphylos patula, Arctostaphylos pungens, Artemisia bigelovii, Artemisia tridentata, Ephedra viridis, Fendlera rupicola, Fraxinus anomala, Mahonia fremontii, Peraphyllum ramosissimum, Physocarpus monogynus, Purshia tridentata, Rhus trilobata, Rosa woodsii, Quercus turbinella, Symphoricarpos oreophilus, Tetradymia canescens*, and *Yucca* spp. may be present depending on geography. Occasional *Juniperus osteosperma, Juniperus scopulorum*, and *Pinus edulis* trees may be present also. The herbaceous layer is generally sparse because of dense overstory. It is typically composed of scattered graminoids such as *Achnatherum hymenoides, Carex geyeri, Pleuraphis jamesii, Poa fendleriana, Sporobolus cryptandrus*, and forbs such as *Artemisia ludoviciana, Chaetopappa ericoides, Cirsium neomexicanum, Erigeron utahensis, Heterotheca villosa, Hymenopappus filifolius, Lathyrus* spp., *Lepidium montanum, Lupinus* spp., *Packera multilobata (= Senecio multilobatus), Pedicularis centranthera, Tetraneuris acaulis (= Hymenoxys acaulis)*, and *Vicia americana*. The non-native grass *Bromus tectorum* may also be present to abundant in disturbed stands.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Amelanchier utahensis, Quercus gambelii*
Tall shrub/sapling	*Cercocarpus montanus*
Short shrub/sapling	*Symphoricarpos rotundifolius*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana, Cercocarpus montanus*
Herb (field)	*Artemisia michauxiana, Balsamorhiza sagittata*
Herb (field)	*Achnatherum hymenoides, Carex geyeri, Poa fendleriana*

Globally

Stratum	Species
Tall shrub/sapling	*Amelanchier utahensis, Quercus gambelii*
Tall shrub/sapling	*Cercocarpus montanus*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Exotic/Invasive: *Bromus tectorum* (invasive/exotic, High)

CONSERVATION STATUS RANK
Global Rank & Reasons: G3 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This plant association is similar to other montane Gambel oak shrublands except for the codominance of *Cercocarpus montanus* (10% cover or more). Other shrubs species may be present to codominant.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: There are some scree and landslide slopes in this type. Large mammal use is notable, including heavy browsing.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (5 plots: BLCA.0009, BLCA.0031, BLCA.0041, CURE.0029, CURE.0245 and18 observation points: BLCA_AA.268, BLCA_AA.309, BLCA_AA.878, CURE_AA.0078, CURE_AA.0249, CURE_AA.0340, CURE_AA.0341, CURE_AA.0371, CURE_AA.0483, CURE_AA.0559, CURE_AA.0592, CURE_AA.0600, CURE_AA.0685, CURE_AA.0790, CURE_AA.0853, CURE_AA.0858, CURE_AA.0927, CURE_AA.1181).
Local Description Authors: J. Von Loh, mod. J. Coles
Global Description Authors: K.A. Schulz, mod. J. Coles and G. Kittel

REFERENCES: Baker 1982b, Bourgeron and Engelking 1994, Bradley et al. 1992, CONHP unpubl. data 2003, Clary 1992, Cogan et al. 2004, Dillinger 1970, Driscoll et al. 1984, Ellis and Hackney 1981, Erdman 1962, Ferchau 1973, Hanson and Ball 1928, Keammerer and Peterson 1981, Muldavin et al. 1998b, Pase and Lindenmuth 1971, Schmoll 1935, Vories 1974, Western Ecology Working Group n.d.

Quercus gambelii - Holodiscus dumosus Shrubland

Gambel Oak - Rockspirea Shrubland

CODE	CEGL002341
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*QUERCUS GAMBELII* SHRUBLAND ALLIANCE (A.920) Gambel Oak Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This uncommon tall-shrub association occurs in scattered small patches on rock outcrops and landslide deposits on the slopes of mesas and canyons. Sites are moderately steep to steep and occur between 1700 and 2550 m elevation. The unvegetated surface has moderate to high cover of litter, bedrock, rocks, and bare soil. The underlying geology includes Tertiary volcanic rocks, metamorphic and granitic rocks, and Quaternary landslide deposits. Total vegetation cover ranges from 60 to 90%. The tall-shrub canopy is typically 1-2 m tall and characteristically consists of *Quercus gambelii* with 5 to 100% cover, *Amelanchier utahensis* with 1 to 15% cover, and *Holodiscus dumosus* with 1 to 50% cover. Other shrubs that contribute to the total cover can include *Acer negundo*, *Artemisia tridentata* ssp. *wyomingensis*, *Mahonia repens*, *Prunus virginiana*, *Philadelphus microphyllus*, *Quercus gambelii*, *Rhus trilobata*, *Ribes cereum*, and *Symphoricarpos rotundifolius*. The herbaceous layer provides up to 15% total cover and may include *Achnatherum hymenoides*, *Carex geyeri*, *Elymus trachycaulus*, *Poa fendleriana*, *Artemisia frigida*, *Artemisia ludoviciana*, *Galium boreale*, *Geranium* sp., *Hymenopappus filifolius*, *Maianthemum stellatum*, *Solidago velutina*, and *Toxicodendron rydbergii*. Lichens and mosses provide up to 45% cover.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association was sampled near East Portal 2 above the hairpin turn, near the bottom of East Portal across from the picnic area, along the Warner Route in Black Canyon, and on Dillon Mesa in the park and recreation area.

Globally

This association is known only from Black Canyon of the Gunnison National Park and Curecanti National Recreation Area.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall-shrub association was observed on the midslopes to upper slopes of slopes, mesas, and landslides and on the low slope of a canyon. Sites are moderately steep to steep (19-73% slopes), occur between 1719 and 2552 m elevation, and are oriented to all aspects. The unvegetated surface has moderate to high cover of litter, bedrock, large and small rocks, and exposure of bare soil. Downed wood is common, up to 15%. The underlying geology includes Tertiary volcanic rocks, metamorphic, granitic rocks, and Quaternary landslide deposits. Soils are sandy loams or are rocky with no soil present.

Globally

This tall-shrub association occurs on the slopes of mesas, canyons and landslides. Sites are moderately steep to steep (19-73% slopes), occur between 1719 and 2552 m elevation, and are oriented to all aspects. The unvegetated surface has moderate to high cover of litter, bedrock, large and small rocks, and exposure of bare soil. Downed wood has up to 15% cover. The underlying geology includes Tertiary volcanic rocks, metamorphic and granitic rocks, and Quaternary landslide deposits. Soils are sandy loams or are rocky with no soil available to sample.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 60 to 90% in these stands. This tall-shrub association is characterized by a closed canopy that is typically 1-2 m tall of *Quercus gambelii* shrubs that range in cover from 5 to 100%. Another tall shrub present is *Amelanchier utahensis* that provides 1 to 15% cover. The short- and dwarf-shrub layer is high in diversity and is characterized by *Holodiscus dumosus* that provides 1 to 50% cover. Other short and dwarf-shrubs contribute low to high total cover and include *Acer negundo, Amelanchier utahensis, Artemisia tridentata* ssp. *wyomingensis, Mahonia repens, Prunus virginiana, Philadelphus microphyllus, Quercus gambelii, Rhus trilobata, Ribes cereum, Ribes leptanthum*, and *Symphoricarpos rotundifolius*. The herbaceous layer is relatively diverse and provides low total cover, up to 15%. Graminoids provide sparse to low cover and include *Achnatherum hymenoides, Bromus tectorum, Carex geyeri, Elymus elymoides, Elymus trachycaulus*, and *Poa fendleriana*. Forbs provide sparse to low cover and include *Arabis* spp., *Artemisia frigida, Artemisia ludoviciana, Artemisia michauxiana, Chenopodium foliosum, Galium aparine, Galium boreale, Gayophytum diffusum, Geranium* sp., *Hymenopappus filifolius, Maianthemum stellatum, Solidago velutina*, and *Toxicodendron rydbergii*. Lichens and mosses provide up to 40% cover and up to 2% cover, respectively.

Globally

This tall-shrub association is uncommon. The total vegetation cover ranges from 60 to 90% in these densely vegetated stands. This association is characterized by a tall-shrub canopy that is typically 1-2 m tall of *Quercus gambelii* shrubs that range in cover from 5 to 100%. Another tall shrub present is *Amelanchier utahensis* that provides 1 to 15% cover. The short-shrub layer is diverse and characterized by *Holodiscus dumosus* with between 1 and 50% cover. Other shrubs that contribute to the total cover include *Acer negundo, Artemisia tridentata* ssp. *wyomingensis, Mahonia repens, Prunus virginiana, Philadelphus microphyllus, Quercus gambelii, Rhus trilobata, Ribes cereum, Ribes leptanthum*, and *Symphoricarpos rotundifolius*. The herbaceous layer is relatively diverse and provides up to 15% total cover. Graminoids provide sparse to low cover and include *Achnatherum hymenoides, Carex geyeri, Elymus elymoides, Elymus trachycaulus*, and *Poa fendleriana*. Forbs provide sparse to low cover and include *Artemisia frigida, Artemisia ludoviciana, Galium boreale, Gayophytum diffusum, Geranium* sp., *Hymenopappus filifolius, Maianthemum stellatum, Solidago velutina*, and *Toxicodendron rydbergii*. Lichens and mosses provide up to 45% cover.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Amelanchier utahensis*, *Quercus gambelii*
Short shrub/sapling	*Holodiscus dumosus*
Herb (field)	*Galium aparine*
Herb (field)	*Carex geyeri*

Globally

Stratum	Species
Tall shrub/sapling	*Amelanchier utahensis*, *Quercus gambelii*
Short shrub/sapling	*Holodiscus dumosus*
Herb (field)	*Carex geyeri*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus tectorum* (exotic, High)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (20-Jan-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: This association is likely to be found in similar habitats within the park and recreation area, such as on small outcroppings of rock. Many of these occurrences are likely to be small, however, and not conducive to sampling.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (4 plots: BLCA.0008, BLCA.0113, CURE.0046, CURE.0202 and13 observation points: CURE_AA.0155, CURE_AA.0438, CURE_AA.0441, CURE_AA.0442, CURE_AA.0443, CURE_AA.0445, CURE_AA.0450, CURE_AA.0454, CURE_AA.0476, CURE_AA.0477, CURE_AA.0484, CURE_AA.0713, CURE_AA.1018).
Local Description Authors: J. Von Loh and G. Bradshaw, mod. J. Coles
Global Description Authors: J. Coles

REFERENCES: Western Ecology Working Group n.d.

Quercus gambelii / Amelanchier alnifolia Shrubland

Gambel Oak / Saskatoon Serviceberry Shrubland

CODE	CEGL001109
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*QUERCUS GAMBELII* SHRUBLAND ALLIANCE (A.920) Gambel Oak Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This montane shrubland association has been described from mountains and plateaus of Utah and western Colorado. Elevation ranges from 1830-2745 m (6000-9000 feet). Sites include nearly level mesas to steep mountain slopes (to 40%). Soils are gravelly loams. Litter usually dominates the ground surface (about 60% cover), with rock cover also abundant. The vegetation is characterized by a moderately dense to dense tall-shrub layer (2-5 m tall) that is dominated by *Quercus gambelii* (10-90% cover) with a sparse to moderately dense short-shrub layer dominated by *Amelanchier alnifolia* or *Amelanchier pallida*. If *Amelanchier utahensis* is present, it is subdominant. *Arctostaphylos patula, Artemisia tridentata* ssp. *vaseyana*, and *Cercocarpus montanus* may also be present with low cover (<10%) and do not codominate. Other shrubs and dwarf-shrubs present may include *Arctostaphylos uva-ursi, Artemisia nova, Chrysothamnus viscidiflorus, Mahonia repens, Prunus virginiana, Purshia tridentata, Opuntia* spp., *Rosa* spp., and *Symphoricarpos* spp. The relatively sparse to moderately dense herbaceous layer is a diverse mixture of grasses and forbs. Graminoids commonly present are *Bromus porteri, Carex* spp., *Elymus elymoides, Festuca thurberi, Koeleria macrantha, Poa fendleriana, Pseudoroegneria spicata*, and *Sporobolus cryptandrus*. Common forbs include *Achillea millefolium, Astragalus* sp., *Erigeron speciosus, Eriogonum* sp., *Galium* spp., *Ipomopsis aggregata, Ligusticum porteri, Lathyrus* spp., *Lupinus argenteus, Phlox longifolia, Penstemon palmeri, Potentilla pulcherrima, Solidago velutina (= Solidago sparsiflora), Thalictrum fendleri*, or *Vicia americana*. Introduced species such as *Bromus tectorum* and *Poa pratensis* are frequently present.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled along East Portal Road and East of Myers Gulch near State Highway 92 in the Curecanti National Recreation Area.

Globally

This montane shrubland association has been described from mountains and plateaus of Utah and western Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall-shrub association occurs midslope in gorges and on the slopes of ridges or interfluves. Sites are steep (44-52%), occur between 2208 and 2744 m elevation, and are oriented to southern and western aspects. The unvegetated surface has high cover of litter and low to moderate cover of large rocks. Downed wood is common. Parent materials are Tertiary volcanic and metamorphic/granitic rocks. Soils are rapidly drained silty clay loams and sandy clay loams.

Globally

This montane shrubland association has been described from mountains and plateaus of Utah and western Colorado. Elevation ranges from 1830-2745 m (6000-9000 feet). Sites include nearly level mesas to steep mountain slopes (to 40%). Soils are gravelly loams. Litter usually dominates the ground surface (about 60% cover), with rock cover also abundant.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 95 to 100% in these stands. *Quercus gambelii* and *Amelanchier alnifolia* tall shrubs (2-10 m tall) form an open to relatively closed canopy and provide 25 to 65% and 13 to 16% cover, respectively. The shrub layer is diverse and provides dense cover. The relatively diverse and dense short-shrub stratum includes *Artemisia tridentata* ssp. *vaseyana*, *Chrysothamnus viscidiflorus, Pinus edulis, Prunus virginiana, Rosa woodsii*, and *Symphoricarpos rotundifolius*. Dwarf-shrubs are low in species diversity and provide sparse cover, including *Arctostaphylos uva-ursi* and *Mahonia repens*. The herbaceous layer is diverse in terms of species composition and provides sparse to moderate cover. Graminoids providing sparse to moderate cover include *Bromus porteri, Bromus tectorum, Carex geyeri, Festuca thurberi, Poa fendleriana*, and *Poa pratensis*. Forbs provide sparse to low cover and include *Achillea millefolium var. occidentalis, Erigeron speciosus, Ligusticum porteri, Linum lewisii, Lupinus* sp., *Potentilla pulcherrima*, and *Thalictrum fendleri*. *Quercus gambelii* seedlings provide sparse cover in one stand. Species of moss and lichen provide sparse to low cover, up to 5%.

Globally

This association is characterized by a moderately dense to dense tall-shrub layer (2-5 m tall) that is dominated by *Quercus gambelii* (10-90% cover) with a sparse to moderately dense short-shrub layer dominated by *Amelanchier alnifolia* or *Amelanchier pallida*. If *Amelanchier utahensis* is present, it is subdominant. *Arctostaphylos patula, Artemisia tridentata* ssp. *vaseyana*, and *Cercocarpus montanus* may also be present with low cover (<10%) and do not codominate. Other shrubs and dwarf-shrubs present may include *Arctostaphylos uva-ursi, Artemisia nova, Chrysothamnus viscidiflorus, Mahonia repens, Prunus virginiana, Purshia tridentata, Opuntia* spp., *Rosa* spp., and *Symphoricarpos* spp. The relatively sparse to moderately dense herbaceous layer is a diverse mixture of grasses and forbs. Graminoids commonly present are *Bromus porteri, Carex siccata (= Carex foenea), Carex geyeri, Carex hoodii, Carex rossii, Elymus elymoides, Festuca thurberi, Koeleria macrantha, Poa fendleriana, Pseudoroegneria spicata*, and *Sporobolus cryptandrus*. Common forbs include *Achillea millefolium, Astragalus* sp., *Erigeron speciosus, Eriogonum* sp., *Galium* spp., *Ipomopsis aggregata, Ligusticum porteri, Linum lewisii, Lathyrus lanszwertii var. leucanthus (= Lathyrus leucanthus), Lathyrus pauciflorus, Lupinus argenteus, Phlox longifolia, Penstemon palmeri, Potentilla pulcherrima, Solidago velutina (= Solidago sparsiflora), Thalictrum fendleri*, or *Vicia americana*. Introduced species such as *Bromus tectorum* and *Poa pratensis* are frequently present.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Amelanchier alnifolia, Quercus gambelii*
Short shrub/sapling	*Amelanchier alnifolia, Chrysothamnus viscidiflorus, Prunus virginiana, Quercus gambelii, Rosa woodsii, Symphoricarpos rotundifolius*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Achillea millefolium* var. *occidentalis, Ligusticum porteri, Thalictrum fendleri*
Herb (field)	*Bromus porteri, Carex geyeri, Festuca thurberi, Poa fendleriana, Poa pratensis*

Globally

Stratum	Species
Tall shrub/sapling	*Amelanchier alnifolia, Quercus gambelii*
Short shrub/sapling	*Amelanchier alnifolia*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Bromus tectorum* (exotic noxious weed, High), *Poa pratensis* (exotic, Medium)

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G5 (23-Feb-1994).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: This association occupies moderate to steep slopes with talus or scree, also areas of deeper soils.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (3 plots: CURE.0195, CURE.0247, CURE.0298 and 18 observation points: BLCA_AA.404, BLCA_AA.405, BLCA_AA.414, BLCA_AA.452, BLCA_AA.473, BLCA_AA.579, CURE_AA.0088, CURE_AA.0140, CURE_AA.0149, CURE_AA.0156, CURE_AA.0270, CURE_AA.0374, CURE_AA.0407, CURE_AA.0474, CURE_AA.0601, CURE_AA.0607, CURE_AA.0659, CURE_AA.0711).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Baker 1984a, Blackburn et al. 1969d, Bourgeron and Engelking 1994, Bunting 1987, Christensen 1949, Clary 1992, Driscoll et al. 1984, Evans 1926, Evans 1936, Everett 1987, Forsling and Storm 1929, Johnston 1987, Johnston 2001, Kartesz 1999, Komarkova 1986, Kunzler et al. 1981, McKell 1950, Ream 1960, Ream 1964, Steinhoff 1978, Western Ecology Working Group n.d., Wright et al. 1979

Quercus gambelii / Amelanchier utahensis Shrubland

Gambel Oak / Utah Serviceberry Shrubland

CODE	CEGL001110
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*QUERCUS GAMBELII* SHRUBLAND ALLIANCE (A.920) Gambel Oak Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This mixed mountain shrubland occurs in southern Utah and western Colorado. Stands occur in canyons, or on mesas, benches, plateaus, ridges, foothills scarps and mountains. Elevation ranges from 1525 to 2700 m (5000-8860 feet). Slopes are gentle to steep (1-100%) and may be oriented to any aspect. Soil are generally deep, well-developed and are derived from a variety of sources, including sandstones, shales and metamorphic rocks. The vegetation is characterized by a sparse to dense (10-100+% cover) tall-shrub layer (2-5 m tall) codominated by *Quercus gambelii* and *Amelanchier utahensis*. Common shrub associates include *Artemisia tridentata* and *Symphoricarpos oreophilus*. *Cercocarpus montanus* is absent or poorly represented (<5% cover). Other shrubs and dwarf-shrubs present with low cover may include *Chrysothamnus viscidiflorus, Ephedra viridis, Gutierrezia sarothrae, Mahonia repens, Opuntia* spp., *Purshia tridentata*, and *Prunus virginiana*. Graminoids, such as *Pascopyrum smithii, Achnatherum hymenoides, Carex geyeri, Hesperostipa comata*, or *Poa fendleriana*, dominate the sparse herbaceous layer (<10% total cover). Common forbs include *Achillea millefolium, Artemisia ludoviciana, Allium acuminatum, Comandra umbellata, Erigeron speciosus, Lathyrus lanszwertii, Balsamorhiza sagittata, Packera multilobata, Phlox austromontana, Thalictrum fendleri*, or *Vicia americana*. Occasionally, scattered individual trees are present in the overstory, including *Pinus edulis, Pseudotsuga menziesii*, or *Juniperus osteosperma*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is widely distributed on deeper soils and was sampled on Cedar Point, along the Deadhorse Mesa Trail, on the flat west of Poison Spring Hill, in Poison Spring Gulch, on the east side of Black Canyon Road, northeast of the North Rim - Black Canyon Road intersection, across the road from the Tomichi Point lookout, along Oak Flat Trail on the South Rim of the park, and along Crystal Trail near the trailhead in the recreation area.

Globally

This montane shrubland occurs in southern Utah and western Colorado. It occurs in small scattered patches on Dry Bench in Capitol Reef National Park, and on high alluvial terraces in the canyons of Natural Bridges National Monument. It is one of the most abundant and widespread shrubland types in Black Canyon of the Gunnison National Park and Curecanti National Recreation Area.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall-shrub association was observed on plains and on midslopes and upper midslopes of active slopes, scarp slopes, swales and valley sides, large hills, and mesas, shoulders of gulches, bottoms of draws, gentle slopes on canyon rims, and on ridgetops. Sites are nearly flat to moderately steep (1-51% slopes), occur from 2350 to 2708 m elevation, and include all aspects. The unvegetated surface has moderate to high cover of litter and low to moderate exposure of bare soil. Downed wood is variable but may be as high as 15%. Soils are moderately well-drained to rapidly drained silty clay loams, silt loams, loams, sandy loams, and sandy clay loams derived from a variety of sources, including Mesozoic sandstones and shale and metamorphic granitic rocks.

Globally

This mountain shrubland occurs in southern Utah and western Colorado. Elevation ranges from 1525 to 2700 m (5000-8860 feet). Stands occur in canyons or on mesas, benches, plateaus, ridges, foothills scarps and mountains. Slopes are gentle to steep (1-100%) and may be oriented to any aspect. Soil are generally deep, well-developed and are derived from a variety of sources, including sandstones, shales and metamorphic rocks.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 66 to 145% in these stands. This tall-shrub association is characterized by a closed canopy that is typically 2-5 m tall of *Quercus gambelii* and *Amelanchier utahensis* shrubs that range in cover from 5 to 90% and 3 to 40%, respectively. The canopy trees *Juniperus osteosperma* and *Pseudotsuga menziesii* are from 2 to 10 m tall, present in one stand each, and provide sparse to low cover. Short and dwarf-shrubs provide low to moderate cover and include *Artemisia tridentata* ssp. *vaseyana, Mahonia repens, Quercus gambelii*, and *Symphoricarpos rotundifolius*. The herbaceous layer provides low to moderate cover and has high diversity. Common graminoids include *Carex geyeri, Elymus elymoides, Poa fendleriana*, and *Poa pratensis*. Forbs commonly present include *Achillea millefolium var. occidentalis, Allium acuminatum, Arabis drummondii, Balsamorhiza sagittata, Comandra umbellata, Erigeron speciosus*, and *Lathyrus lanszwertii var. leucanthus*. Seedling *Artemisia tridentata* ssp. *vaseyana* and *Quercus gambelii* shrubs provide sparse cover in some stands. Cryptogams are rare in this association and provide sparse to low cover.

Globally

This association is characterized by a sparse to dense (10-100+% cover) tall-shrub layer (2-5 m tall) that is dominated by *Quercus gambelii* and codominated by *Amelanchier utahensis*. Sparse stands tend to occur in areas that have burned recently. Common associates include *Artemisia tridentata* and *Symphoricarpos oreophilus*. *Cercocarpus montanus* is absent or poorly represented (<5% cover). Other shrubs and dwarf-shrubs present with low cover may include *Chrysothamnus viscidiflorus, Ephedra viridis, Gutierrezia sarothrae, Mahonia repens, Opuntia* spp., *Purshia tridentata*, and *Prunus virginiana*. Graminoids, such as *Pascopyrum smithii, Achnatherum hymenoides, Carex geyeri, Hesperostipa comata*, or *Poa fendleriana*, dominate the sparse herbaceous layer (<10% total cover). Common forbs include *Achillea millefolium, Artemisia ludoviciana, Allium acuminatum, Comandra umbellata, Erigeron speciosus, Lathyrus lanszwertii, Balsamorhiza sagittata, Packera multilobata, Phlox austromontana, Thalictrum fendleri*, or *Vicia americana*. Occasionally, tree species are present in the overstory, including *Pinus edulis, Pseudotsuga menziesii*, or *Juniperus osteosperma*.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Amelanchier utahensis*, *Quercus gambelii*
Short shrub/sapling	*Quercus gambelii*, *Symphoricarpos rotundifolius*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Achillea millefolium* var. *occidentalis*, *Lathyrus lanszwertii* var. *leucanthus*
Herb (field)	*Carex geyeri*, *Poa fendleriana*, *Poa pratensis*

Globally

Stratum	Species
Tall shrub/sapling	*Amelanchier utahensis*, *Quercus gambelii*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G5 (23-Feb-1994).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This plant association is similar to other montane Gambel oak shrublands except for the codominance of *Amelanchier utahensis* with only minor amounts (<10% or 5% cover, respectively) of *Artemisia tridentata* or *Cercocarpus montanus*.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Most stands are very dense. Some stands have small openings throughout. There is cattle grazing throughout the area resulting in many trails and causing some hummocking of soil.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (16 plots: BLCA.0002, BLCA.0006, BLCA.0016, BLCA.0024, BLCA.0025, BLCA.0044, BLCA.0045, BLCA.0046, BLCA.0051, BLCA.0052, BLCA.0055, BLCA.0058, BLCA.0064, BLCA.0075, CURE.0270, CURE.0293 and 106 observation points: BLCA_AA.193, BLCA_AA.198, BLCA_AA.206, BLCA_AA.231, BLCA_AA.232, BLCA_AA.236, BLCA_AA.238, BLCA_AA.239, BLCA_AA.247, BLCA_AA.248, BLCA_AA.249, BLCA_AA.252, BLCA_AA.259, BLCA_AA.260, BLCA_AA.269, BLCA_AA.292, BLCA_AA.295, BLCA_AA.331, BLCA_AA.346, BLCA_AA.380, BLCA_AA.410, BLCA_AA.420, BLCA_AA.459, BLCA_AA.460, BLCA_AA.463, BLCA_AA.464, BLCA_AA.471, BLCA_AA.491, BLCA_AA.492, BLCA_AA.507, BLCA_AA.509, BLCA_AA.510, BLCA_AA.519, BLCA_AA.522, BLCA_AA.533, BLCA_AA.534, BLCA_AA.539, BLCA_AA.548, BLCA_AA.557, BLCA_AA.560, BLCA_AA.561, BLCA_AA.562, BLCA_AA.565, BLCA_AA.629, BLCA_AA.633, BLCA_AA.639, BLCA_AA.648, BLCA_AA.649, BLCA_AA.652, BLCA_AA.655, BLCA_AA.659, BLCA_AA.661, BLCA_AA.665, BLCA_AA.672, BLCA_AA.680, BLCA_AA.681, BLCA_AA.682, BLCA_AA.683, BLCA_AA.684, BLCA_AA.685, BLCA_AA.686, BLCA_AA.687, BLCA_AA.688, BLCA_AA.693, BLCA_AA.732, BLCA_AA.736, BLCA_AA.743, BLCA_AA.745, BLCA_AA.746, BLCA_AA.752, BLCA_AA.762, BLCA_AA.765, BLCA_AA.774, BLCA_AA.777, BLCA_AA.787, BLCA_AA.815, BLCA_AA.819, BLCA_AA.824, BLCA_AA.876, BLCA_AA.879, BLCA_AA.880, BLCA_AA.881, BLCA_AA.882, BLCA_AA.887, BLCA_AA.892, BLCA_AA.961, CURE_AA.0128, CURE_AA.0141, CURE_AA.0278, CURE_AA.0285, CURE_AA.0297, CURE_AA.0343, CURE_AA.0415, CURE_AA.0679, CURE_AA.0686, CURE_AA.0712, CURE_AA.0809, CURE_AA.0813, CURE_AA.0863,

CURE_AA.0866, CURE_AA.0867, CURE_AA.0959, CURE_AA.1061, CURE_AA.1087, CURE_AA.1147, CURE_AA.1151).
Local Description Authors: J. Von Loh, mod. J. Coles
Global Description Authors: K.A. Schulz, mod. J. Coles

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carmichael et al. 1978, Cedar Creek Associates, Inc. 1987, Clary 1992, Cogan et al. 2004, Crane 1982, Driscoll et al. 1984, Muldavin et al. 1998b, Western Ecology Working Group n.d.

Quercus gambelii / Artemisia tridentata Shrubland

Gambel Oak / Basin Big Sagebrush Shrubland

CODE	CEGL001111
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*QUERCUS GAMBELII* SHRUBLAND ALLIANCE (A.920) Gambel Oak Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This montane shrubland association has been described from mountains and plateaus of Utah and western Colorado. Sites are on nearly level mesas to steep hillslopes (to 75%). Elevation ranges from 1830-2506 m (6000-8215 feet). Soils are rapidly drained sandy loam, loamy sand, and gravelly loams. There is typically high cover of litter and low to moderate cover by bedrock, large and small rocks, and bare ground. The vegetation is characterized by a moderately dense to dense (10-65% cover) tall-shrub layer (2-5 m tall) that is dominated by *Quercus gambelii*, with a sparse to moderately dense short-shrub layer dominated by *Artemisia tridentata*, often forming a mosaic of oak and sagebrush. If present, *Amelanchier* spp. and *Cercocarpus montanus* occur in minor amounts (<10% cover). Other shrubs that may be present include *Chrysothamnus viscidiflorus, Purshia tridentata, Opuntia* spp., *Rosa* spp., *Symphoricarpos* spp., and *Tetradymia canescens*. The relatively sparse herbaceous layer is a mixture of grasses and forbs. In stands with a relatively sparse mixed shrub layer (<25% total shrub cover), *Artemisia tridentata* needs to strongly dominate (have twice the cover of other short shrubs such as *Amelanchier* spp. and *Cercocarpus montanus*) to separate from similar associations.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association is relatively common and was sampled east of Red Creek Road, north of State Highway 92 above the Pine Creek dock, in the Soap Creek area, off Big Road near Coal Creek, in Dry Gulch, near the Lake Fork Bridge, near West Elk Creek on the west side of the arm, and near the mouth of the West Elk Arm in the recreation area.

Globally
This montane shrubland association occurs in mountains and plateaus of Utah and western Colorado.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This tall shrubland association was observed on the midslopes of mesas, active slopes, slopes, and gulches, and in drainages. Sites are moderately steep to steep (11-71% slopes), occur between 2313 and 2506 m, and include all aspects. The unvegetated surface typically has high cover of litter and low to moderate cover by bedrock, large and

small rocks, and exposures of bare ground. Downed wood is common and can be up to 10% cover. Soils are rapidly drained sandy loam, loamy sand, and gravelly loam derived from Mesozoic sandstones and shales reworked by landslides.

Globally
This shrubland association has been described from mountains and plateaus of Utah and western Colorado. Elevation ranges from 1830-2506 m (6000-8215 feet). Sites are on nearly level mesas to steep hillslopes (to 75%). Soils are rapidly drained sandy loam, loamy sand, and gravelly loams. There is typically high cover of litter and low to moderate cover by bedrock, large and small rocks, and bare ground.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 50 to 155% in these stands. This shrubland association is characterized by an open to closed tall-shrub canopy, typically 2-5 m tall, of *Quercus gambelii* that ranges in cover from 15 to 65%. Three stands had sparse cover of the canopy tree *Juniperus scopulorum* that was 2-5 m tall. The shrub layer is variable in cover and composition. *Artemisia tridentata* (ssp. *vaseyana,* ssp. *wyomingensis*) is present in all stands, ranging in cover from 3 to 40%. Another tall shrub providing less than 5% cover is *Amelanchier utahensis*. Short and dwarf-shrubs can contribute moderate cover; species present in most stands include *Amelanchier utahensis, Artemisia tridentata* ssp. *vaseyana, Artemisia tridentata* ssp. *wyomingensis, Cercocarpus montanus, Chrysothamnus viscidiflorus, Purshia tridentata, Quercus gambelii*, and *Symphoricarpos rotundifolius*. The herbaceous layer is typically low in cover, but a diverse group of species can occur across stands. Common graminoids include *Achnatherum hymenoides, Achnatherum pinetorum, Carex geyeri, Elymus elymoides*, and *Poa fendleriana*. Forbs are diverse, but sparse in terms of cover, including *Achillea millefolium var. occidentalis, Astragalus drummondii, Ipomopsis aggregata*, and *Penstemon teucrioides*. Seedling shrubs provided sparse cover from a variety of species, including *Amelanchier alnifolia, Amelanchier utahensis, Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus viscidiflorus, Quercus gambelii*, and *Purshia tridentata*. Cryptogams provide sparse cover, typically less than 5%.

Globally
This association is characterized by a moderately dense to dense (10-65% cover) tall-shrub layer (2-5 m tall) that is dominated by *Quercus gambelii*, with a sparse to moderately dense short-shrub layer dominated by *Artemisia tridentata*, often forming a mosaic of oak and sagebrush. Scattered *Juniperus scopulorum* trees may be present with low cover. If present, *Amelanchier* spp. and *Cercocarpus montanus* occur in minor amounts (<10% cover). Other shrubs that may be present include *Chrysothamnus viscidiflorus, Purshia tridentata, Opuntia* spp., *Rosa* spp., *Symphoricarpos* spp., and *Tetradymia canescens*. In stands with a relatively sparse mixed shrub layer (<25% total shrub cover), *Artemisia tridentata* needs to strongly dominate (have twice the cover of other short shrubs such as *Amelanchier* spp. and *Cercocarpus montanus*) to separate from similar associations. The relatively sparse herbaceous layer is a mixture of grasses and forbs. Graminoids commonly present are *Achnatherum hymenoides, Achnatherum pinetorum, Carex geyeri, Carex rossii, Elymus elymoides, Poa fendleriana, Pseudoroegneria spicata*, and *Sporobolus cryptandrus*. Common forbs include *Achillea millefolium, Artemisia ludoviciana, Astragalus drummondii, Penstemon teucrioides, Thalictrum fendleri*, or *Vicia americana*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Quercus gambelii*
Short shrub/sapling	*Chrysothamnus viscidiflorus*, *Symphoricarpos rotundifolius*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*, *Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Achnatherum hymenoides*, *Carex geyeri*, *Elymus elymoides*

Globally

Stratum	Species
Tall shrub/sapling	*Quercus gambelii*
Tall shrub/sapling	*Artemisia tridentata*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Vulnerable: *Penstemon teucrioides* (vulnerable, G2G3Q)

CONSERVATION STATUS RANK
Global Rank & Reasons: G4G5 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This plant association is similar to other montane Gambel oak shrublands, except for the codominance of *Artemisia tridentata* with only minor amounts (<10% cover) of *Amelanchier utahensis* or *Cercocarpus montanus*. In stands with a relatively sparse mixed shrub layer (<25% total shrub cover), *Artemisia tridentata* needs to strongly dominate (have twice the cover of other short shrubs such as *Amelanchier* spp. and *Cercocarpus montanus*) to separate from similar associations.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Some stands are dense in terms of cover. One stand had a number of dead stems nearby, possibly from a fire.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on 2001 and 2002 field data (12 plots: BLCA.0040, CURE.0018, CURE.0027, CURE.0068, CURE.0074, CURE.0081, CURE.0101, CURE.0114, CURE.0154, CURE.0226, CURE.0280, CURE.0290 and 182 observation points: BLCA_AA.170, BLCA_AA.244, BLCA_AA.246, BLCA_AA.256, BLCA_AA.275, BLCA_AA.456, BLCA_AA.542, BLCA_AA.549, BLCA_AA.563, BLCA_AA.564, BLCA_AA.585, BLCA_AA.609, BLCA_AA.625, BLCA_AA.660, BLCA_AA.666, BLCA_AA.671, BLCA_AA.678, BLCA_AA.679, BLCA_AA.692, BLCA_AA.694, BLCA_AA.700, BLCA_AA.709, BLCA_AA.730, BLCA_AA.737, BLCA_AA.740, BLCA_AA.788, BLCA_AA.825, BLCA_AA.877, BLCA_AA.884, BLCA_AA.885, BLCA_AA.889, BLCA_AA.947, BLCA_AA.967, CURE_AA.0015, CURE_AA.0028, CURE_AA.0035, CURE_AA.0044, CURE_AA.0123, CURE_AA.0124, CURE_AA.0127, CURE_AA.0129, CURE_AA.0137, CURE_AA.0147, CURE_AA.0151, CURE_AA.0162, CURE_AA.0197, CURE_AA.0206, CURE_AA.0208, CURE_AA.0238, CURE_AA.0247, CURE_AA.0257, CURE_AA.0265, CURE_AA.0271, CURE_AA.0277, CURE_AA.0281, CURE_AA.0301, CURE_AA.0320, CURE_AA.0321, CURE_AA.0322, CURE_AA.0329, CURE_AA.0330, CURE_AA.0342, CURE_AA.0367, CURE_AA.0389, CURE_AA.0390, CURE_AA.0397, CURE_AA.0403, CURE_AA.0425, CURE_AA.0429, CURE_AA.0434, CURE_AA.0452, CURE_AA.0453, CURE_AA.0459, CURE_AA.0461, CURE_AA.0462, CURE_AA.0479, CURE_AA.0486, CURE_AA.0487, CURE_AA.0489, CURE_AA.0490, CURE_AA.0494, CURE_AA.0501, CURE_AA.0571, CURE_AA.0572, CURE_AA.0580, CURE_AA.0583, CURE_AA.0624, CURE_AA.0641, CURE_AA.0645, CURE_AA.0646, CURE_AA.0649, CURE_AA.0650, CURE_AA.0658, CURE_AA.0661, CURE_AA.0662, CURE_AA.0667, CURE_AA.0668, CURE_AA.0669, CURE_AA.0670, CURE_AA.0671, CURE_AA.0673, CURE_AA.0674, CURE_AA.0675, CURE_AA.0681, CURE_AA.0682, CURE_AA.0684, CURE_AA.0688, CURE_AA.0692, CURE_AA.0704, CURE_AA.0705, CURE_AA.0715, CURE_AA.0716, CURE_AA.0718, CURE_AA.0719, CURE_AA.0720, CURE_AA.0723, CURE_AA.0724, CURE_AA.0725, CURE_AA.0726, CURE_AA.0739, CURE_AA.0740, CURE_AA.0743, CURE_AA.0746, CURE_AA.0750, CURE_AA.0753, CURE_AA.0757, CURE_AA.0764, CURE_AA.0776, CURE_AA.0778, CURE_AA.0779, CURE_AA.0784, CURE_AA.0785, CURE_AA.0788, CURE_AA.0795, CURE_AA.0797, CURE_AA.0798, CURE_AA.0802, CURE_AA.0815, CURE_AA.0824, CURE_AA.0835, CURE_AA.0843, CURE_AA.0844, CURE_AA.0847, CURE_AA.0864, CURE_AA.0865, CURE_AA.0870, CURE_AA.0898, CURE_AA.0903, CURE_AA.0912, CURE_AA.0932, CURE_AA.0933, CURE_AA.0971, CURE_AA.0975, CURE_AA.0976, CURE_AA.0977, CURE_AA.0981, CURE_AA.0987, CURE_AA.0988, CURE_AA.0990, CURE_AA.0994, CURE_AA.0997, CURE_AA.0999, CURE_AA.1003, CURE_AA.1007, CURE_AA.1009, CURE_AA.1011, CURE_AA.1013, CURE_AA.1015, CURE_AA.1019, CURE_AA.1037, CURE_AA.1042, CURE_AA.1044, CURE_AA.1074, CURE_AA.1100, CURE_AA.1114, CURE_AA.1228, CURE_AA.1266, CURE_AA.1302, CURE_AA.1308, CURE_AA.1364, CURE_AA.1437, CURE_AA.1454).

Local Description Authors: J. Von Loh, mod. J. Coles
Global Description Authors: K.A. Schulz

REFERENCES: Blackhawk Coal Company 1981, Boucek 1986, Bourgeron and Engelking 1994, Bunting 1987, Christensen 1955, Clary 1992, Cogan et al. 2004, Driscoll et al. 1984, Everett 1987, Western Ecology Working Group n.d., Wright et al. 1979

Quercus gambelii / Carex geyeri Shrubland

Gambel Oak / Geyer's Sedge Shrubland

CODE	CEGL005995
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*QUERCUS GAMBELII* SHRUBLAND ALLIANCE (A.920) Gambel Oak Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This tall shrubland association is known from the Black Canyon of the Gunnison National Park and Curecanti National Recreation Area where it was observed on the midslopes of canyons, hills, ridges, ridgetops, gullies, and lower slope hills. Sites are moderately steep to steep (3-43 degrees), occur between 2229 and 2698 m elevation, and include all aspects. The unvegetated surface has moderate to high cover of litter and bare soil and low to moderate cover of bedrock, large and small rocks. The vegetation is characterized by a moderately dense to dense tall-shrub layer (2-5 m tall) that is dominated by *Quercus gambelii* with a moderately dense to dense herbaceous layer dominated or codominated by *Carex geyeri*. Short shrubs are typically sparse and do not form a layer. Scattered trees (*Pseudotsuga menziesii, Juniperus osteosperma, Juniperus scopulorum*, and *Pinus edulis*) may be present with low cover. If *Amelanchier alnifolia, Amelanchier utahensis, Artemisia tridentata, Cercocarpus montanus, Prunus virginiana*, or *Symphoricarpos oreophilus* shrubs are present, they have low cover (<5% cover) in the short-shrub layer. Other scattered shrubs species may include *Fendlera rupicola, Mahonia repens, Philadelphus microphyllus, Ribes cereum*, and *Rosa woodsii*. The herbaceous layer is moderately dense to dense and characterizes the understory. *Poa fendleriana* is frequently present and often codominates with *Carex geyeri*. Other common species include graminoids, such as *Achnatherum hymenoides, Achnatherum pinetorum, Bromus porteri (= Bromus anomalus), Deschampsia caespitosa, Elymus elymoides*, and *Pleuraphis jamesii*, and forbs, including *Aquilegia* spp., *Balsamorhiza sagittata, Erigeron speciosus, Heterotheca villosa*, and *Lathyrus lanszwertii*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association was sampled south of Morrow Point Reservoir, southeast of Hermit's Trailhead, southwest of Pioneer Point and south, north and west of State Highway 92.

Globally

This association is currently only known from the Black Canyon of the Gunnison National Park and Curecanti National Recreation Area in western Colorado. Global information is not available.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall shrubland association was observed on the midslopes of canyons, hills, ridges, ridgetops, gullies, and lower slope hills. Sites are moderately steep to steep (3-43 degrees), occur between 2229 and 2698 m elevation, and

include all aspects. The unvegetated surface has moderate to high cover of litter and bare soil and low to moderate cover of bedrock, large and small rocks.

Globally
This association is only known from the Black Canyon of the Gunnison National Park and Curecanti National Recreation Area. Global information is not available.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This Gambel Oak / Geyer's sedge association is characterized by a moderately dense to dense tall-shrub layer (2-5 m tall) that is dominated by *Quercus gambelii* with a moderately dense to dense herbaceous layer dominated or codominated by *Carex geyeri*. Short shrubs are typically sparse and do not form a layer. Scattered trees (*Pseudotsuga menziesii, Juniperus osteosperma, Juniperus scopulorum*, and *Pinus edulis*) may be present with low cover. If *Amelanchier alnifolia, Amelanchier utahensis, Artemisia tridentata, Cercocarpus montanus, Prunus virginiana*, or *Symphoricarpos oreophilus* shrubs are present, they have low cover (<5% cover) in the short-shrub layer. Other scattered shrubs species may include *Fendlera rupicola, Mahonia repens, Philadelphus microphyllus, Ribes cereum*, and *Rosa woodsii*. The herbaceous layer is moderately dense to dense and characterizes the understory. *Poa fendleriana* is frequently present and often codominates with *Carex geyeri*. Other common species include graminoids, such as *Achnatherum hymenoides, Achnatherum pinetorum, Bromus porteri (= Bromus anomalus), Deschampsia caespitosa, Elymus elymoides*, and *Pleuraphis jamesii*, and forbs, including *Aquilegia* spp., *Balsamorhiza sagittata, Erigeron speciosus, Heterotheca villosa*, and *Lathyrus lanszwertii*. Introduced species such as *Bromus inermis* or *Poa pratensis* are frequently present.

Globally
This association is only known from the Black Canyon of the Gunnison National Park and Curecanti National Recreation Area. Global information is not available.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Quercus gambelii*
Herb (field)	*Carex geyeri*, *Poa fendleriana*

Globally

Stratum	Species
Tall shrub/sapling	*Quercus gambelii*
Herb (field)	*Carex geyeri*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (23-May-2007).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This provisional shrubland association is based on data from 16 accuracy assessment points from Black Canyon of the Gunnison National Park and Curecanti National Recreation Area in the Gunnison River Valley in western Colorado. More survey and classification work are needed to fully characterized the concept of this provisional type.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data collected in 2004 during accuracy assessment (13 observation points: BLCA_AA.271, BLCA_AA.719, BLCA_AA.724, BLCA_AA.729, CURE_AA.0422, CURE_AA.0460, CURE_AA.0513, CURE_AA.0570, CURE_AA.0648, CURE_AA.0702, CURE_AA.0830, CURE_AA.0862, CURE_AA.1452).
Local Description Authors: K.A. Schulz
Global Description Authors: K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Quercus gambelii / Festuca thurberi Shrubland

Gambel Oak / Thurber's Fescue Shrubland

CODE	CEGL002805
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*QUERCUS GAMBELII* SHRUBLAND ALLIANCE (A.920) Gambel Oak Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This tall-shrub association is only described from Curecanti National Recreation Area in west-central Colorado. Stands occur on moderately steep (29-48%) slopes and ridges, between 2667 and 2718 m elevation, and are oriented to all aspects. The unvegetated surface has high cover of litter. Parent materials are Tertiary volcanic rocks and metamorphic/granitic rocks. Soils are rapidly drained silty clay loams. The vegetation is characterized by an open to nearly closed shrub canopy 1-5 m tall dominated by *Quercus gambelii*, which contributes 6 to 100% cover, and the tall bunchgrass *Festuca thurberi* which provides 25 to 100% cover. The shrub layer is moderately diverse in terms of species composition and provides moderate to dense cover. Short and dwarf-shrubs include *Amelanchier alnifolia, Amelanchier utahensis, Artemisia tridentata* ssp. *vaseyana, Chrysothamnus viscidiflorus, Rosa woodsii*, and *Symphoricarpos rotundifolius*. Occasionally *Quercus gambelii* will attain tree height (5-10 m tall) and structure. The herbaceous layer is diverse in terms of species composition and provides moderate to dense cover. Additional graminoids that provide sparse to low cover include *Carex geyeri, Elymus elymoides, Bromus porteri, Poa fendleriana*, and *Poa pratensis*. Forbs provide sparse cover and include *Achillea millefolium var. occidentalis, Arabis drummondii, Balsamorhiza sagittata, Eriogonum umbellatum, Galium boreale*, and *Ligusticum porteri*.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This rare association was sampled within Myers Gulch and near Hermit's Rest in Curecanti National Recreation Area.

Globally
This tall-shrub association is only described from Curecanti National Recreation Area in west-central Colorado. It likely occurs elsewhere in western Colorado.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall-shrub association occurs on slopes and ridges. Sites are moderately steep (29-48% slopes), occur between 2667 and 2718 m elevation, and are oriented to all aspects. The unvegetated surface has high cover of litter. Parent materials are Tertiary volcanic rocks and metamorphic/granitic rocks. Soils are rapidly drained silty clay loams.

Globally
Data are not available.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 125% to approximately 200% in these stands. Clones of *Quercus gambelii* shrubs form an open to nearly closed canopy 1-5 m high that contributes 6 to 100% cover, and the tall bunchgrass *Festuca thurberi* provides 25 to 100% cover. *Quercus gambelii* attains tree height (5-10 m tall) in one stand. The shrub layer is moderately diverse in terms of species composition and provides moderate to dense cover. Short and dwarf-shrubs include *Amelanchier alnifolia, Amelanchier utahensis, Artemisia tridentata* ssp. *vaseyana, Chrysothamnus viscidiflorus, Rosa woodsii,* and *Symphoricarpos rotundifolius*. The herbaceous layer is diverse in terms of species composition and provides moderate to dense cover. Additional graminoids that provide sparse to low cover include *Carex geyeri, Elymus elymoides, Bromus porteri, Poa fendleriana*, and *Poa pratensis*. Forbs provide sparse cover and include *Achillea millefolium var. occidentalis, Arabis drummondii, Balsamorhiza sagittata, Eriogonum umbellatum, Galium boreale*, and *Ligusticum porteri*.

Globally
Data are not available.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Quercus gambelii*
Tall shrub/sapling	*Quercus gambelii*
Short shrub/sapling	*Chrysothamnus viscidiflorus, Quercus gambelii, Rosa woodsii*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Festuca thurberi*

Globally

Stratum	Species
Shrub/sapling (tall & short)	*Quercus gambelii*
Herb (field)	*Festuca thurberi*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (28-Jun-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Stands occur on deep soil with many burrowing small mammals.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on 2001 and 2002 field data (3 plots: CURE.0086, CURE.0087, CURE.0206).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Quercus gambelii / Poa fendleriana Shrubland

Gambel Oak / Muttongrass Shrubland

CODE	CEGL002949
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*QUERCUS GAMBELII* SHRUBLAND ALLIANCE (A.920) Gambel Oak Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This montane shrubland association has been described from the Colorado Plateau and the western slope of the southern Rocky Mountains. Elevation ranges from 1770-2337 m (5800-7660 feet). Sites are on nearly level mesas to steep hillslopes (to 59%). Soils are rapidly drained loamy sand and sandy loam derived from sandstones. There is typically high cover of litter and moderate cover of large rocks and bare ground. The vegetation is characterized by an open to moderately dense (10-65% cover) tall-shrub layer (2-5 m tall) that is dominated by *Quercus gambelii*. Other shrubs may be present with low cover and do not form a separate short-shrub layer (generally <10% total). Species include *Amelanchier utahensis, Artemisia tridentata* ssp. *wyomingensis, Purshia tridentata, Mahonia repens,* and *Symphoricarpos* spp. The herbaceous layer may be diverse and provides low to high cover depending on overstory canopy density. The bunchgrass *Poa fendleriana* is usually dominant (to 30% cover) and occurs consistently. Additional graminoids provide sparse to low cover, such as *Achnatherum hymenoides, Bouteloua gracilis, Carex geyeri*, and *Hesperostipa comata*. Forbs typically have low cover but may be diverse. Common forbs include *Arenaria* spp., *Artemisia ludoviciana, Eriogonum* spp., *Petradoria pumila*, and *Phlox austromontana*.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association was sampled on the west side of the West Elk Arm of Blue Mesa Reservoir.

Globally
This montane shrubland association has been described from the Colorado Plateau and the western slope of the southern Rocky Mountains in southwestern Utah and west-central Colorado.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This tall-shrub association was observed on the midslopes of a gulch. The site is steep (59% slope) and at 2337 m elevation. The unvegetated surface has a high cover of litter and moderate cover of large rocks. Exposure of bare soil is moderate. Downed wood is moderate, with up to 10% cover. The soil is a sandy loam derived from local sandstones.

Globally
This montane shrubland association has been described from the Colorado Plateau and the western slope of the southern Rocky Mountains. Elevation ranges from 1770-2337 m (5800-7660 feet). Sites are on nearly level mesas to steep hillslopes (to 59%). Soils are rapidly drained loamy sand and sandy loam derived from sandstones. There is typically high cover of litter and moderate cover of large rocks and bare ground.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is around 65% in these stands. This tall-shrub association is characterized by a relatively closed canopy, typically 1-5 m tall, of *Quercus gambelii* shrubs with up to 60% cover. The sampled stand has canopy *Juniperus scopulorum* trees that are 2-5 m tall and provide up to 5% cover. Additional shrubs provide low to moderate cover and include *Amelanchier utahensis, Artemisia tridentata* ssp. *wyomingensis, Purshia tridentata,* and *Mahonia repens.* The herbaceous layer is diverse and provides low to high cover depending on overstory canopy density. The herbaceous layer is characterized by the bunchgrass *Poa fendleriana* that contributes up to 25% cover. Additional graminoids provide sparse to low cover and include *Carex geyeri* and *Phlox austromontana*.

Globally
The vegetation is characterized by an open to moderately dense (10-65% cover) tall-shrub layer (2-5 m tall) that is dominated by *Quercus gambelii*. Other shrubs may be present with low cover and do not form a separate short-shrub layer (generally <10% total). Species include *Amelanchier utahensis, Artemisia tridentata* ssp. *wyomingensis, Purshia tridentata, Mahonia repens*, and *Symphoricarpos* spp. The herbaceous layer may be diverse and provides low to high cover depending on overstory canopy density. The bunchgrass *Poa fendleriana* is usually dominant (to 30% cover) and occurs consistently. Additional graminoids provide sparse to low cover, such as *Achnatherum hymenoides, Bouteloua gracilis, Carex geyeri*, and *Hesperostipa comata*. Forbs typically have low cover but may be diverse. Common forbs include *Arenaria fendleri, Arenaria macradenia, Artemisia ludoviciana, Eriogonum racemosum, Eriogonum umbellatum, Petradoria pumila*, and *Phlox austromontana*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Amelanchier utahensis, Quercus gambelii*
Short shrub/sapling	*Symphoricarpos rotundifolius*
Herb (field)	*Poa fendleriana*

Globally

Stratum	Species
Tall shrub/sapling	*Quercus gambelii*
Short shrub/sapling	*Symphoricarpos rotundifolius*
Herb (field)	*Poa fendleriana*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (14-Aug-2001).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Stands are mesic and dense. Graminoids dominate the understory.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (4 plots: BLCA.0039, CURE.0036, CURE.0091, CURE.0131 and 9 observation points: BLCA_AA.215, BLCA_AA.657, BLCA_AA.721, CURE_AA.0139, CURE_AA.0214, CURE_AA.0370, CURE_AA.0531, CURE_AA.0640, CURE_AA.0703).
Local Description Authors: J. Von Loh, mod. J. Coles
Global Description Authors: K.A. Schulz

REFERENCES: Cogan et al. 2004, Western Ecology Working Group n.d.

Quercus gambelii / Prunus virginiana Shrubland

Gambel Oak / Chokecherry Shrubland

CODE	CEGL005994
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*QUERCUS GAMBELII* SHRUBLAND ALLIANCE (A.920) Gambel Oak Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This montane shrubland association has been described from mountains of western Colorado and plateaus of southwestern Utah. Elevation ranges from 2000-2737 m (6560-8977 feet). Sites include nearly level mesas, talus slopes, hillslopes, benches, gullies and streambeds to steep mountain slopes (to 34 degrees). North and northwest aspects are most frequent, but stands are reported from all aspects. Sites are often relatively mesic, occurring at the base of cliff bands and talus slopes, on concave slopes, near rivers and along drainages. Soils are often deep, well-drained clay loam derived from sandstone; however, substrates are variable and are derived from a variety of parent materials. The vegetation is characterized by an open to dense tall-shrub layer (2-5 m tall) that is dominated by *Quercus gambelii* with a open to moderately dense short-shrub layer dominated by *Prunus virginiana,*. Scattered trees (especially *Pseudotsuga menziesii*) may be present with low cover. If *Amelanchier alnifolia* or *Amelanchier utahensis* are present, they are subdominant in the short-shrub layer, although they may have up to 25% cover. Other shrubs present with low cover (typically <5%) include *Acer glabrum, Artemisia tridentata, Chrysothamnus viscidiflorus, Cornus sericea, Mahonia repens, Paxistima myrsinites, Philadelphus microphyllus, Rhus trilobata, Ribes cereum, Ribes inerme, Rosa woodsii, Salix geyeriana, Salix scouleriana*, and *Symphoricarpos oreophilus*. *Holodiscus dumosus* is common on many of the talus sites, often forming its own community about the oak-choke cherry shrubland. *Salix exigua* is abundant in one streambed plot. The herbaceous layer varies from absent to moderate (0-30% cover). Common herbaceous species include graminoids, such as *Carex geyeri, Deschampsia caespitosa, Elymus elymoides, Hesperostipa comata*, and *Poa fendleriana*, and forbs, including *Artemisia ludoviciana, Galium boreale, Maianthemum stellatum, Solidago canadensis, Thalictrum fendleri, Vicia americana*, and *Wyethia amplexicaulis*.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association was found near Crystal Creek, south of Crystal Lake, Hermits Rest Trail, northwest of Red Creek Campground, Moro Point Reservoir, and north, south and west of State Highway 92 in the Curecanti National Recreation Area.

Globally
This montane shrubland association has been described from mountains of western Colorado and plateaus of southwestern Utah.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This tall-shrub association is found on the western slope of the southern Rocky Mountains between 2081 and 2737m (6825-8977 feet) elevation on midslopes and sometime on low slopes ranging from 3-34 degrees on all aspects. Landforms include talus slopes, hillslopes, benches, mesatops, gullies and streambeds. Sites are often relatively mesic, occurring at the base of cliff bands and talus slopes, concave slopes, near rivers or along drainages. The unvegetated surface is variable and has low to high cover of litter and low to moderate cover of large rocks, bedrock or gravel. Parent materials include new alluvium, talus/colluvium/landslides, amphibolite, Morrison Formation, migmatitic gneiss, pegmatite, layered quartzitic gneiss, and West Elk Breccia (volcaniclastic facies).

Globally
This montane shrubland association has been described from mountains of western Colorado and plateaus of southwestern Utah. Elevation ranges from 2000-2737m (6560-8977 feet). Sites include nearly level mesas, talus slopes, hillslopes, benches, gullies and streambeds to steep mountain slopes (up to 34 degrees). North and northwest aspects are most frequent, but stands are reported from all aspects (Hess and Wasser 1982). Sites are often relatively mesic, occurring at the base of cliff bands and talus slopes, on concave slopes, near rivers and along drainages. Soils are often deep, well-drained clay loam derived from sandstone (Hess and Wasser 1982); however, substrates are variable and are derived from a variety of parent materials.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association is characterized by an open to dense tall-shrub layer (2-5 m tall) that is dominated by *Quercus gambelii* with a open to moderately dense short-shrub layer dominated by *Prunus virginiana*. Scattered trees (*Pseudotsuga menziesii, Juniperus scopulorum*, or less commonly *Pinus edulis, Pinus ponderosa*, and *Populus tremuloides*) may be present with low cover. If *Amelanchier alnifolia* or *Amelanchier utahensis* are present, they are subdominant in the short-shrub layer. Other shrubs present with low cover (typically <5%) include *Acer glabrum, Artemisia tridentata, Chrysothamnus viscidiflorus, Cornus sericea, Mahonia repens, Paxistima myrsinites, Philadelphus microphyllus, Rhus trilobata, Ribes cereum, Ribes inerme, Salix geyeriana, Salix scouleriana*, and *Symphoricarpos oreophilus*. *Holodiscus dumosus* is common on many of the talus sites, often forming its own community about the oak-choke cherry shrubland. *Salix exigua* is abundant in one streambed plot. The herbaceous layer varies from absent to moderate (0-30% cover). Common herbaceous species include graminoids, such as *Achnatherum hymenoides, Achnatherum nelsonii, Achnatherum pinetorum, Carex geyeri, Deschampsia caespitosa, Elymus elymoides, Hesperostipa comata*, and *Poa fendleriana*, and forbs, including *Artemisia ludoviciana, Heterotheca villosa, Solidago canadensis*, and *Wyethia amplexicaulis*. Introduced species, such as *Bromus inermis, Bromus tectorum, Cirsium arvense, Medicago sativa*, or *Poa pratensis*, are frequently present.

Globally
This association is characterized by an open to dense tall-shrub layer (2-5 m tall) that is dominated by *Quercus gambelii* with a open to moderately dense short-shrub layer dominated by *Prunus virginiana,*. Scattered trees (*Pseudotsuga menziesii, Juniperus scopulorum*, or less commonly *Pinus edulis, Pinus ponderosa*, and *Populus tremuloides*) may be present with low cover. If *Amelanchier alnifolia* or *Amelanchier utahensis* are present, they are subdominant in the short-shrub layer, although they may have up to 25% cover. Other shrubs present with low cover (typically <5%) include *Acer glabrum, Artemisia tridentata, Chrysothamnus viscidiflorus, Cornus sericea, Mahonia repens, Paxistima myrsinites, Philadelphus microphyllus, Rhus trilobata, Ribes cereum, Ribes inerme, Rosa woodsii, Salix geyeriana, Salix scouleriana*, and *Symphoricarpos oreophilus*. *Holodiscus dumosus* is common on many of the talus sites, often forming its own community about the oak-choke cherry shrubland. *Salix exigua* is abundant in one streambed plot. The herbaceous layer varies from absent to moderate (0-30% cover). Common herbaceous species include graminoids, such as *Achnatherum hymenoides, Achnatherum nelsonii, Achnatherum*

pinetorum, Carex geyeri, Deschampsia caespitosa, Elymus elymoides, Hesperostipa comata, and *Poa fendleriana*, and forbs, including *Artemisia ludoviciana, Galium boreale, Heterotheca villosa, Ligusticum porteri, Maianthemum stellatum, Solidago canadensis, Thalictrum fendleri, Vicia americana*, and *Wyethia amplexicaulis* (Hess and Wasser 1982, Komarkova 1986). Introduced species, such as *Bromus inermis, Bromus tectorum, Cirsium arvense, Medicago sativa*, or *Poa pratensis*, are frequently present.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Quercus gambelii*
Short shrub/sapling	*Prunus virginiana*

Globally

Stratum	Species
Tall shrub/sapling	*Quercus gambelii*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (23-May-2007).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data collected in 2004 during accuracy assessment (13 observation points: CURE_AA.0093, CURE_AA.0191, CURE_AA.0237, CURE_AA.0295, CURE_AA.0435, CURE_AA.0440, CURE_AA.0444, CURE_AA.0446, CURE_AA.0550, CURE_AA.0617, CURE_AA.0689, CURE_AA.0714, CURE_AA.1453).
Local Description Authors: K.A. Schulz
Global Description Authors: K.A. Schulz

REFERENCES: Hess and Wasser 1982, Johnston 1987, Komarkova 1986, Wasser and Hess 1982, Western Ecology Working Group n.d.

Quercus gambelii / Rhus trilobata Shrubland

Gambel Oak / Skunkbush Sumac Woodland

CODE	CEGL002338
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*QUERCUS GAMBELII* SHRUBLAND ALLIANCE (A.920) Gambel Oak Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This tall-shrub (or occasionally woodland) association occurs on colluvial slopes in canyons of the Colorado Plateau, as well as at the base of sandstone outcrops and in canyon bottoms. Sites range from moderately steep to steep (6-38% slopes), occur between 1685 and 2337 m elevation, and are oriented to north and east aspects. Total vegetation cover may range from 67% to well over 100%. This oak shrubland has an open to dense canopy of single-stemmed *Quercus gambelii* shrubs. *Rhus trilobata* shrubs between 1 and 2 m tall are always present, with cover ranging from 2 to 20%. A diverse array of other mesic shrubs are generally present as well, including *Amelanchier utahensis, Prunus virginiana, Fendlera rupicola, Acer glabrum*, or *Cercocarpus montanus*. The herbaceous layer ranges from sparse to moderately dense in cover and is usually diverse. Common species include *Poa fendleriana, Maianthemum stellatum, Senecio amplectens*, and the vine *Clematis ligusticifolia*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is uncommon, with stands sampled near the mouth of Blue Creek, Morrow Point Reservoir and east of Soap Creek in the Curecanti National Recreation Area.

Globally

This association is known from narrow canyons in western Colorado and eastern Utah. It is likely a rare and restricted type because of its preferred habitat and combination of species.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall shrubland association is found on slopes and benches near streams and reservoirs. Sites are moderately steep to steep (19- to 33-degree slopes), occur at 2183 and 2337 m elevation, and are typically oriented to northerly aspects, but may include southwest. The unvegetated ground surface is rocky with variable cover of litter and bare ground. Substrate is rocky with bedrock and some underlying talus or rocky, steep badlands. The badland sites has evidence of past heavy erosion.

Globally

This tall-shrub association occurs on colluvial slopes in canyons of the Colorado Plateau, as well as at the base of sandstone outcrops and on slopes and benches in canyon bottoms near streams and reservoirs. Sites range from moderately steep to steep (6-38% slopes), occur between 1685 and 2337 m elevation, and are generally oriented to north and east aspects, but may include southwest at higher elevations. The unvegetated ground surface typically has high cover of oak leaf litter (greater than 90%), although stands are variable, and there may be significant cover of bare ground. Substrates are rocky with bedrock and some underlying talus or rocky, steep badlands. Parent materials are sandstone colluvium or eolian/alluvial sands, and soils are moderately well-drained sandy loams and loams.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall shrubland association has an open to moderate canopy of tall (>5m) of *Quercus gambelii* shrubs. *Rhus trilobata* shrubs between 1 and 2 m tall are always present, with cover ranging from 2 to 10%. A diverse array of other mesic shrubs are generally present as well, including *Artemisia tridentata* ssp. *vaseyana, Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus viscidiflorus, Cornus sericea, Holodiscus dumosus, Prunus virginiana,* or *Purshia tridentata*. The herbaceous layer ranges from sparse to moderate (2-15% cover) and is somewhat mesic. Common species include *Achnatherum hymenoides, Agrostis scabra, Artemisia frigida, Hesperostipa comata, Achnatherum pinetorum,* and *Mentha arvensis*. Scattered, emergent *Pseudotsuga menziesii* may also be present.

Globally

This minor Gambel oak association may take the form of a woodland, with a canopy of *Quercus gambelii* clones between 5 and 10 m tall providing 35 to 95% cover. *Rhus trilobata* shrubs between 1 and 2 m tall are always present, with cover ranging from 2 to 20%. A diverse array of other mesic shrubs with lesser cover are generally present as well and may include *Acer glabrum, Amelanchier utahensis, Artemisia tridentata* ssp. *vaseyana, Cercocarpus montanus, Ericameria nauseosa, Fendlera rupicola, Mahonia repens, Prunus virginiana, Rosa woodsii,* or *Symphoricarpos occidentalis*. The herbaceous layer ranges from sparse to moderately dense in cover and is usually diverse. Common graminoids include *Poa fendleriana* and *Piptatherum micranthum*; common forbs include *Lepidium montanum, Maianthemum stellatum,* and *Senecio amplectens,* and the vine *Clematis ligusticifolia* often present. Other herbaceous associates include *Achnatherum hymenoides, Artemisia dracunculus, Comandra umbellata, Descurainia pinnata, Elymus elymoides, Elymus trachycaulus, Heterotheca villosa, Heuchera parvifolia, Lepidium densiflorum, Maianthemum stellatum, Silene antirrhina, Sisymbrium altissimum, Streptanthella longirostris,* and *Vicia americana*. Exotic species *Agropyron cristatum, Bromus tectorum,* and *Chenopodium album* are present in some stands.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Prunus virginiana, Quercus gambelii*
Short shrub/sapling	*Rhus trilobata*

Globally

Stratum	Species
Tall shrub/sapling	*Quercus gambelii*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Other: *Mentha arvensis* (G5)

Globally

Exotic/**Invasive**: *Agropyron cristatum* (exotic, Medium/Low), *Bromus tectorum* (exotic, High), *Chenopodium album* (exotic), *Mentha arvensis* (exotic)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (13-Jan-2005).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Data are not available.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on data collected during accuracy assessment (2 observation points: CURE_AA.0017, CURE_AA.0767).
Local Description Authors: K.A. Schulz
Global Description Authors: J. Coles, mod. K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Quercus gambelii / Symphoricarpos oreophilus Shrubland

Gambel Oak / Mountain Snowberry Shrubland

CODE	CEGL001117
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*QUERCUS GAMBELII* SHRUBLAND ALLIANCE (A.920) Gambel Oak Shrubland Alliance
ECOLOGICAL SYSTEM(S):	Madrean Lower Montane Pine-Oak Forest and Woodland (CES305.796) Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818) Southwestern Great Plains Canyon (CES303.664)
USFWS WETLAND SYSTEM:	Not applicable

CONCEPT SUMMARY
Globally
This shrubland association is found in foothills, plateaus and mountains from western Texas to southern and western Colorado and throughout southern Utah north into the Wasatch Range, and likely occurs in northern Arizona. It is a mesic upland and non-obligate riparian community. Some stands appear to be transitional between riparian areas and drier upland communities such as *Artemisia* spp. It occurs on cool, moist sites, such as along drainages in canyons and steep draws in more xeric areas, and as a mesic upland shrubland forming extensive stands on cooler northern slopes. Substrates are typically deep, well-drained sandy loam to clay loam derived from alluvium or colluvium. The vegetation is characterized by an open to closed, typically tall-shrub layer (2-5 m tall) that is dominated by *Quercus gambelii*. The understory is composed of a short-shrub layer that is dominated by *Symphoricarpos oreophilus* or a closely related local *Symphoricarpos* species such as *Symphoricarpos rotundifolius* or *Symphoricarpos palmeri*. Other mesic shrubs may be present, including *Amelanchier* spp., *Prunus virginiana, Robinia neomexicana*, and *Brickellia* sp. In some stands, the *Quercus gambelii* develop into small trees that form a tree canopy. These "woodlands" are included in this association because their floristic composition is identical to the tall shrublands. In other stands the oak is mostly under 2 m tall, forming a short-shrub layer. The herbaceous layer is sparse to moderately dense, depending on density of woody canopy, and is often dominated by graminoids, such as species of *Achnatherum, Bromus, Elymus, Poa*, and *Koeleria*. Common forbs include *Vicia americana, Thalictrum fendleri*, and *Achillea millefolium*. Occasionally, tree species are present in the overstory.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association is uncommon and was sampled in Jones Draw in Black Canyon of the Gunnison National Park and in Long Gulch, south of Crystal Trail, and Crystal Trail across State Highway 92 from the parking area in Curecanti National Recreation Area.

Globally
This shrubland is reported from foothills, plateaus and mountains of western Texas to southern and western Colorado, southern Utah north into the Wasatch Range, and likely occurs in Arizona.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall-shrub association was observed on the midslope of slopes, ridges, ravines, and shoulders of hills. Sites are moderately steep (30-51% slopes), occur between 2390 and 2745 m elevation, and include all aspects. The unvegetated surface has high cover of litter and low to moderate exposure of bare soil. Downed wood is common, up to 10% cover. Soils are rapidly drained sandy loams, silty loams, and silty clay loams derived from local sandstones, shales, and granite.

Globally
This shrubland is found in foothills, plateaus and mountains from western Texas to southern and western Colorado, throughout southern Utah north into the Wasatch Range, and likely occurs in northern Arizona. Elevation ranges from 1750-2745 m (6000-8600 feet). It is a mesic upland and non-obligate riparian community. Some stands appear to be transitional between riparian areas and drier upland communities such as *Artemisia* shrublands. It occurs on hills, high slopes, ridges, mesas, canyon rims, knolls and valley floors typically on cooler, moist sites at lower elevations, such as along drainages in canyons and steep draws in more xeric areas, and as a mesic upland shrubland forming extensive stands on cooler northern slopes. Higher-elevation stands occur on all aspects. Substrates are typically deep, well-drained sandy loam to silty clay loam derived from alluvium or colluvium. Parent materials include sandstone, shale, and granite conglomerate.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 35 to 185% in these stands. This tall shrubland association is characterized by a closed canopy, typically 2-5 m tall, of *Quercus gambelii* shrubs that range in cover from 5 to 100%, and *Symphoricarpos rotundifolius* short shrubs that range in cover from <1 to 50%. In one stand *Quercus gambelii* is tree-like, with dbh measurements up to 20 cm and with cover to 65%. The short-shrub layer provides low to moderate cover and includes *Amelanchier utahensis, Artemisia tridentata* ssp. *vaseyana, Prunus virginiana,* and *Quercus gambelii*. The herbaceous layer provides low to high cover and is extremely diverse. Common graminoids include *Bromus porteri, Carex geyeri, Poa fendleriana,* and *Poa pratensis*. Forbs commonly present include *Achillea millefolium var. occidentalis, Balsamorhiza sagittata, Galium aparine, Lathyrus lanszwertii, Ligusticum porteri, Taraxacum officinale,* and *Wyethia amplexicaulis*. Seedling shrubs provide sparse cover and include *Rosa woodsii, Amelanchier alnifolia, Quercus gambelii,* and *Prunus virginiana*. Sparse cover is provided by cryptogams.

Globally
The vegetation is characterized by an open to closed, tall-shrub layer (2-5 m tall) that is dominated by *Quercus gambelii*. The understory is composed of a short-shrub layer that is dominated by *Symphoricarpos oreophilus* or a closely related local *Symphoricarpos* species such as *Symphoricarpos rotundifolius* or *Symphoricarpos palmeri*. Other shrubs may be present, including *Amelanchier* spp., *Artemisia nova, Artemisia tridentata, Chrysothamnus viscidiflorus, Ericameria nauseosa, Mahonia repens, Peraphyllum ramosissimum, Prunus virginiana, Purshia tridentata, Robinia neomexicana, Rosa woodsii,* and *Tetradymia canescens*. Occasionally, emergent trees such as *Pseudotsuga menziesii* or under canopy trees such as *Juniperus scopulorum* may be present. In some stands, *Quercus gambelii* develop into small trees that form a tree canopy. These "woodlands" are included in this association because their floristic composition is identical to the tall shrublands. In other stands, the oak is mostly under 2 m tall, forming a short-shrub layer. The herbaceous layer is sparse to moderately dense, depending on density of woody canopy, and is often dominated by graminoids, such as species of *Achnatherum, Bromus, Elymus, Poa, Pseudoroegneria spicata,* and *Koeleria macrantha*. Common forbs include *Achillea millefolium, Balsamorhiza sagittata, Chenopodium leptophyllum, Clematis ligusticifolia, Ligusticum porteri, Lupinus argenteus, Thalictrum fendleri,* and *Vicia americana*. Occasionally, tree species are present in the overstory, including *Pinus ponderosa, Juniperus scopulorum,* and *Pseudotsuga menziesii*. Introduced graminoids such as *Bromus inermis* and *Poa pratensis* are often common in stands that have been disturbed by heavy livestock grazing.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Quercus gambelii*
Tall shrub/sapling	*Quercus gambelii*
Short shrub/sapling	*Amelanchier utahensis, Prunus virginiana, Quercus gambelii, Symphoricarpos rotundifolius*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*

Herb (field)	*Achillea millefolium* var. *occidentalis*, *Balsamorhiza sagittata*, *Lathyrus lanszwertii*, *Wyethia amplexicaulis*
Herb (field)	*Carex geyeri*, *Poa fendleriana*, *Poa pratensis*

Globally

Stratum	Species
Tall shrub/sapling	*Quercus gambelii*
Tall shrub/sapling	*Symphoricarpos oreophilus*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Exotic/Invasive: *Bromus inermis* (invasive, High/Medium), *Poa pratensis* (invasive, Medium)

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This plant association is similar to other montane Gambel oak shrublands except for the codominance of *Symphoricarpos oreophilus* with only minor amounts (<10% cover) of *Amelanchier utahensis*, *Artemisia tridentata*, or *Cercocarpus montanus*.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Some Gambel oak stands are tree-like, to 20 cm dbh. Stands are often grazed by cattle.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (4 plots: BLCA.0138, CURE.0113, CURE.0264, CURE.0292 and 44 observation points: BLCA_AA.211, BLCA_AA.219, BLCA_AA.233, BLCA_AA.235, BLCA_AA.237, BLCA_AA.250, BLCA_AA.253, BLCA_AA.258, BLCA_AA.347, BLCA_AA.353, BLCA_AA.371, BLCA_AA.421, BLCA_AA.422, BLCA_AA.426, BLCA_AA.432, BLCA_AA.433, BLCA_AA.457, BLCA_AA.484, BLCA_AA.520, BLCA_AA.566, BLCA_AA.582, BLCA_AA.586, BLCA_AA.695, BLCA_AA.701, BLCA_AA.883, BLCA_AA.888, BLCA_AA.968, BLCA_AA.969, BLCA_AA.970, BLCA_AA.971, BLCA_AA.980, BLCA_AA.981, CURE_AA.0110, CURE_AA.0114, CURE_AA.0117, CURE_AA.0230, CURE_AA.0299, CURE_AA.0530, CURE_AA.0590, CURE_AA.0602, CURE_AA.0618, CURE_AA.0632, CURE_AA.0642, CURE_AA.1251).
Local Description Authors: J. Von Loh, mod. J. Coles
Global Description Authors: K.A. Schulz, mod. J. Coles

REFERENCES: Baker 1982b, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Clary 1992, Cogan et al. 2004, Crane 1982, Driscoll et al. 1984, Erdman 1962, Hess and Wasser 1982, Hoffman and Alexander 1980, Hoffman and Alexander 1983, Johnston 1987, Kittel et al. 1994, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova et al. 1988a, Muldavin 1994, Muldavin and Mehlhop 1992, Muldavin et al. 1994a, Muldavin et al. 1998b, Muldavin et al. 2000b, Soil Conservation Service 1978, Western Ecology Working Group n.d., Wright et al. 1979

Alnus incana / Cornus sericea Shrubland

Gray Alder / Red-osier Dogwood Shrubland

CODE	CEGL001145
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
ALLIANCE	*ALNUS INCANA* TEMPORARILY FLOODED SHRUBLAND ALLIANCE (A.950) Gray Alder Temporarily Flooded Shrubland Alliance
ECOLOGICAL SYSTEM(S):	Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland (CES304.045) North Pacific Montane Riparian Woodland and Shrubland (CES204.866) Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)
USFWS WETLAND SYSTEM:	Palustrine

CONCEPT SUMMARY

Globally

This riparian, tall-shrub association is present throughout Idaho and Montana, eastern Oregon and Washington, and the mountains of Colorado. It is considered a minor type throughout Utah and north-northeastern Nevada and is largely restricted to the higher, more northerly mountains of California. This type is predominantly present in narrow V-shaped canyons between 1219 and 2438 m (4000-8000 feet) elevation on gentle undulating, low to moderate-height terraces of various aspects. Stands primarily occupy streambanks but may also be found on floodplains and alluvial bars. Soils are of a sandy loam formed by fluvial deposits. *Alnus incana* dominates the low tree overstory with a dense shrub layer of *Cornus sericea*. Common shrubs usually intermixed within this layer include *Amelanchier alnifolia, Lonicera involucrata, Ribes hudsonianum, Rosa* spp., *Salix* spp., and *Symphoricarpos oreophilus*. The density of the shrub layer determines the presence of the herbaceous understory. When present, common species include *Agrostis stolonifera, Angelica arguta, Calamagrostis canadensis, Equisetum arvense, Galium* spp. and *Maianthemum stellatum (= Smilacina stellata).*

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled along Cebolla and Soap creeks in Curecanti National Recreation Area.

Globally

This tall-shrub association is widely distributed in the western United States and is present throughout Idaho, Montana, eastern Oregon and Washington, western Colorado (one occurrence east of the Continental Divide), California (northern half of state), New Mexico (from the upper watersheds of the Pecos, Little Colorado, and Rio Grande in northern New Mexico), and is considered a minor type throughout Utah and north-northeastern Nevada.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall-shrub association occurs on floodplain terraces of tributaries to the Gunnison River, growing from the riverbanks to the canyon walls. Sites are nearly level to gently sloping (1-10% slopes), occur between 2302 and 2311 m elevation, and are oriented to all aspects. The unvegetated surface has high cover of litter. Downed wood is common to abundant. Parent material is Quaternary alluvium. The soils are well-drained sandy loams.

Globally

It is predominantly present in narrow V-shaped canyons between 1219 and 2438 m (4000-8000 feet) elevation on gentle undulating, low to moderate-height terraces of various aspects. Stands primarily occupy streambanks but may also be found on floodplains and alluvial bars. Soils are of a sandy loam formed by fluvial deposits.

In New Mexico, this community is a major riparian shrubland that occurs in narrow valleys and canyons of mountainous regions along moderate-sized streams. It occurs at upper elevations ranging from 2350 to 2690 m

(7725-8825 feet). Typically, it occurs along banks of bedrock-controlled, moderate-gradient streams (0.8 to 2%) that alternate between rapids and deep pools that are created by bedrock and large boulders and cobbles that line the riverbed and banks. Depositional features are limited through steeper reaches, but vegetated bars and terraces can develop to a limited extent as the river channel cuts through wider canyons and the gradient flattens. Small overflow channels can dissect the larger bars. Sites are frequently flooded, commonly on a yearly basis up to five years. Woody debris carried by high-energy flows often become lodged among boulders, the streambanks, or on bars. Alluvial sediments are generally very coarse and sandy, and soils are characterized by coarse-loamy layers over sandy layers, with deeper skeletal layers of cobbles and gravel. The soil matrix may have as much as 80% rock fragment. Soils may at some point in the season be dry at the surface but tend to be moist at shallow depths and through the top 10 to 50 cm (4-20 inches) of the soil profile during most years.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall-shrub association occurs in occasional patches on the banks and first terraces of creeks and rivers. The total vegetation cover ranges from 60 to 100% in these stands. *Alnus incana* ssp. *tenuifolia* shrubs 2-10 m tall form an open to somewhat closed canopy providing 30 to 60% cover, and *Cornus sericea* shrubs 1-5 m tall form a subcanopy layer that provides 10 to 30% cover. In one stand, emergent (20-25 m tall) *Picea pungens* trees provide low cover. The shrub layer provides moderate to dense cover. Additional tall shrubs provide low cover and include *Salix bebbiana* and *Salix exigua*. The short-shrub layer provides low to dense cover and includes *Ribes lacustre, Salix exigua*, and *Rosa woodsii*. The herbaceous layer is low in species diversity and provides sparse cover. Graminoids include *Poa palustris, Poa* sp., and *Carex geyeri*. Forbs include *Heracleum maximum* and *Maianthemum stellatum*.

Globally

In this type *Alnus incana* ssp. *tenuifolia* forms dense shrubby thickets with canopies from 50 to 90% cover or more, and heights of 3 to 5 m (9-15 feet). Stands are codominated by *Cornus sericea* ssp. *sericea*, a shorter thicket-forming shrub that often sprawls among other shrubs. Young *Populus angustifolia* or *Picea pungens* may be present, but mature trees are infrequent. *Salix* spp. may be present, but they usually are poorly represented. Other common associated shrubs include *Lonicera involucrata, Ribes inerme, Ribes lacustre, Rubus deliciosus, Rosa woodsii, Rubus idaeus* ssp. *strigosus (= Rubus strigosus)*, and *Salix exigua*. A well-developed and diverse herbaceous layer can be present beneath the shrub canopy (over 90 herbaceous species have been recorded for the type). Native forbs are more consistently represented than graminoids and include 24 wetland indicators. These include *Aconitum columbianum, Symphyotrichum foliaceum (= Aster foliaceus), Epilobium ciliatum, Equisetum arvense, Equisetum laevigatum, Geum macrophyllum, Heracleum maximum, Maianthemum stellatum, Mertensia franciscana, Oxypolis fendleri, Prunella vulgaris, Ranunculus inamoenus*, and *Rudbeckia laciniata*. Exotic grasses such as *Agrostis gigantea, Poa palustris*, or *Lolium pratense (= Festuca pratensis)* are often abundant invaders of the undergrowth.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Picea pungens*
Tall shrub/sapling	*Alnus incana* ssp. *tenuifolia*, *Cornus sericea*
Short shrub/sapling	*Ribes lacustre*, *Salix exigua*
Herb (field)	*Maianthemum stellatum*
Herb (field)	*Carex geyeri*, *Poa palustris*

Globally

Stratum	Species
Tall shrub/sapling	*Alnus incana* ssp. *tenuifolia*, *Cornus sericea*
Herb (field)	*Aconitum columbianum*, *Geum macrophyllum*, *Heracleum maximum*, *Rudbeckia laciniata*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G3G4 (24-Feb-2004). This is a widespread riparian association found in narrow V-shaped canyons throughout Idaho, eastern Oregon and Washington, and western Colorado. It is considered a minor type throughout Utah and north-northeastern Nevada and is largely restricted to the higher, more northerly mountains of California. It primarily occurs on gentle undulating streambanks of various aspects but may also be found on floodplains and alluvial bars. Soils are of a sandy loam formed by fluvial deposits. Approximately 50 stands have been sampled throughout the range of the association, however, the estimated total number of extant stands is higher. A primary threat to the viability of these stands is the alteration of stream hydrology due to excess of sedimentation from outside of the system. Excess sedimentation can be a result of road construction, cutbanks, livestock trailing, clubbing, and grazing, and other miscellaneous activities leading to erosion. The introduction of exotic species and noxious weeds is also an increasing threat and concern in these occurrences.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Vegetation overhangs the banks somewhat, providing valuable cover for fish habitat. The type relies on an intact hydrological regime for reproduction, growth, and maintenance. Seasonally high water tables allow continued reproduction of the alders and dogwood and associated shrubs and herbs. Minimal recreation and livestock disturbance maintain the biodiversity and good condition of the community. Severe alterations of stream hydrology or upland conditions can contribute to loss of valuable habitat.

Adjacent floodplains can be very narrow along the river. The coniferous tree *Picea pungens* becomes more dominant at upper elevations and mixes with *Alnus incana* ssp. *tenuifolia* on the streambanks. In wider valleys at lower elevations, *Populus angustifolia* becomes more prevalent and will dominate higher and drier terraces. In these stands, shrubs generally decrease, although junipers or introduced grasses from nearby hay meadows increase. Uplands are typically dominated by mixed coniferous forests of spruce and fir on cooler north-facing aspects or *Pinus ponderosa* on drier slopes.

This type is reported from all the western states except Arizona and described in detail for the Rocky Mountains by Kittel and Lederer (1993), Kittel et al. (1995, 1996), Manning and Padgett (1995), Muldavin et al. (1993a), and Padgett et al. (1989). Hansen et al. (1990) describe a major *Alnus incana* community type that is present throughout Montana in which *Cornus sericea (= Cornus stolonifera)* has an average cover of 15% in half of a 60-plot sample.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Tending to occur in small and narrow patches, this association presents some difficulty to samplers because many stands may be interpreted as small openings within larger stands of *Picea pungens*. In order to clarify the classification, further quantitative plots are needed. One observation point included 10% cover of *Salix exigua*, shown in the plot photo as a narrow band along the streambank. It is likely that this species indicates the presence of a small patch of a *Salix exigua*-dominated association, rather than a codominant within the *Alnus incana / Cornus sericea* stand.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0231, CURE.0325).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: E. Muldavin et al., mod. K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Cooper and Cottrell 1990, Crowe and Clausnitzer 1997, Driscoll et al. 1984, Durkin et al. 1994b, Hansen et al. 1990, Hansen et al. 1995, IDCDC 2005, Johnston 1987, Jones 1992b, Kagan et al. 2000, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Komarkova 1986, Kovalchik 1993, MTNHP 2002b, Manning and Padgett 1995, Muldavin et al. 1993a, Muldavin et al. 2000a, Padgett et al. 1988b, Padgett et al. 1989, Richard et al. 1996, Tuhy and Jensen 1982, Western Ecology Working Group n.d., Youngblood et al. 1985a

Alnus incana / Mesic Graminoids Shrubland

Gray Alder / Mesic Graminoids Shrubland

CODE	CEGL001148
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
ALLIANCE	*ALNUS INCANA* TEMPORARILY FLOODED SHRUBLAND ALLIANCE (A.950) Gray Alder Temporarily Flooded Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This shrubland association is a widespread community of limited extent in the western states of Idaho, Colorado, Utah, Wyoming, and Nevada. Stands occur in narrow to moderately wide floodplains on stream benches, in association with abandoned meanders, on islands and pointbars, and on hillside seeps. These shrublands are characterized by stands of medium-tall and tall, deciduous shrubs and a thick herbaceous undergrowth of wetland-indicator grasses, and little to no overstory tree canopy. Total shrub cover is usually over 50% and is dominated by *Alnus incana*, the diagnostic shrub. Other shrubs include *Salix* spp., *Betula occidentalis*, and *Cornus sericea*. The understory of undisturbed stands has a dense herbaceous cover including *Glyceria* spp., *Calamagrostis canadensis*, *Elymus glaucus*, *Carex* spp., and *Equisetum* spp. Heavily disturbed stands have abundant non-native grasses. In Nevada, Utah, southeastern Idaho, and Wyoming, this type is considered a grazing-induced community derived from *Alnus incana* / Mesic Forbs Shrubland (CEGL001147). However, several stands in Colorado are undisturbed and the undergrowth is dominated by native graminoid cover.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This shrubland association is known from the Gunnison River and Crystal Reservoir.

Globally

This plant association is a minor riparian type in Idaho, Colorado, Utah, Wyoming, and Nevada.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This shrubland association is known from the Gunnison River and Crystal Reservoir. Sites are low-level areas including gravel bars on the river channel and drawdown areas next to the reservoir on flat to gentle slopes (2% or less). Parent materials include alluvium derived of quartz-biotite schist, gneiss and migmatite. Substrates are composed mainly of bare soil, rocks, gravel and open water.

Globally

This mesic shrubland association occurs across much of the southern and central Rocky Mountains at 1710 to 3000 m (5600-9860 feet) elevation. Stands occur in narrow to moderately wide floodplains on stream benches, in association with abandoned meanders, on islands and pointbars, and on hillside seeps. *Alnus incana* tends to dominate narrow streambanks where stream gradients are relatively steep, or on more cobbly substrates than their willow neighbors in broad floodplain settings (Padgett et al. 1989, Manning and Padgett 1995, Kittel et al. 1999b, Carsey et al. 2003a). Stream channels can be steep and straight to highly sinuous (Rosgen's Channel Type: A3, A4, F3) or moderately steep and sinuous (Rosgen's Channel Type: B2, B3, B4, B6) (Rosgen 1996). Where this association occurs on pointbars, stream channels are low gradient (<1% gradient) and highly sinuous (Rosgen's Channel Type: C5) (Rosgen 1996). Soils are mostly coarse alluvium but characteristically have silt loams or sandy clay loams at the surface with a high percentage of organic matter. Soils are shallow to moderately deep, 35-62 cm (15-30 inches) and become increasingly skeletal with depth. Most profiles have 10-50% mottles at 18-25 cm (7-10

inches) depth. One profile had gleyed mineral soils indicating saturated conditions (Kittel et al. 1999b, Carsey et al. 2003a).

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This shrubland is characterized by a tall-shrub layer of *Alnus incana*. *Salix exigua* contributes significant cover in some stands. Scattered *Populus angustifolia* may be present in the tree canopy. Other shrubs may include *Symphoricarpos oreophilus, Chrysothamnus viscidiflorus, Artemisia tridentata*, and *Quercus gambelii*. The herbaceous layer is dominated by graminoids, including *Agrostis scabra, Phalaris arundinacea, Phleum pratense, Hordeum jubatum, Carex utriculata, Achnatherum pinetorum (= Stipa pinetorum),* and *Poa fendleriana*. The only documented forbs are *Carduus nutans* and *Cirsium eatonii*.

Globally

These shrublands are characterized by stands of medium-tall and tall, deciduous shrubs and a thick herbaceous undergrowth of wetland-indicator grasses, and little to no overstory tree canopy. Total shrub cover is usually over 50% and is dominated by *Alnus incana*, the diagnostic shrub. *Alnus incana* ssp. *tenuifolia* dominates the upper canopy with 10-90% cover. Other shrubs occasionally present include *Salix exigua, Salix monticola, Rubus deliciosus, Salix bebbiana, Salix drummondiana, Rosa woodsii*, and *Cornus sericea*. Occasionally, trees may be scattered throughout the shrubland, or occur along one edge. Tree species include *Abies lasiocarpa, Pinus contorta, Populus angustifolia, Populus balsamifera* ssp. *trichocarpa, Populus deltoides, Populus tremuloides, Picea engelmannii, Pseudotsuga menziesii*, and *Salix fragilis* (Padgett et al. 1989, Manning and Padgett 1995, Kittel et al. 1999b, Carsey et al. 2003a).

The herbaceous layer is a thick carpet of grasses. Native graminoids include *Calamagrostis canadensis, Carex aquatilis, Carex utriculata, Glyceria striata, Carex pellita (= Carex lanuginosa), Elymus glaucus*, and *Festuca rubra*. Heavily disturbed stands are dominated by introduced, non-native grasses, including *Poa pratensis, Agrostis stolonifera*, and *Bromus inermis*. Forb cover is usually low relative to the amount of graminoid cover but can include a high variety of species, including *Thalictrum fendleri, Mertensia ciliata, Mentha arvensis, Geranium richardsonii, Erigeron peregrinus, Cardamine cordifolia, Aconitum columbianum*, and *Caltha leptosepala* (Kittel et al. 1999b, Carsey et al. 2003a).

MOST ABUNDANT SPECIES

*Black Canyon of the Gunnison National Park - Curecanti National Recreation Area*Data are not available.

Globally

Stratum	Species
Shrub/sapling (tall & short)	*Alnus incana*
Herb (field)	*Achillea millefolium, Mertensia ciliata*
Herb (field)	*Calamagrostis canadensis*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Exotic/Invasive: *Poa pratensis* (invasive, Medium), *Taraxacum officinale* (introduced invasive forb)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (16-Oct-2000). This association has a wide range, but stands of this shrubland association are restricted to small patches less than 10 acres in size. High-quality examples of this association without non-native species are very rare. Threats are numerous as most stands are within watersheds with a continuing history of livestock grazing, logging, recreational activities, hydrologic modifications, and road building. Stands are used as loafing grounds by livestock because of the presence of shade, and cover of shrubs may be reduced due to trampling. Heavy grazing will reduce the cover of herbaceous species and compact soils, which may increase soil erosion. Other activities in the watershed such as road and railroad construction and maintenance, logging, and heavy recreational use may contribute weeds and sediments that alter species composition in stands. Stands are also threatened by impacts to hydrology from streamflow modification.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Classification is based on data collected from throughout the range of the association. Some classifications have considered this a grazing-induced sere of the *Alnus incana* / Mesic Forbs Shrubland (CEGL001147) (Padgett et al. 1989, Manning and Padgett 1995). High-quality stands with a native understory are uncommon, but are reported in Colorado and Idaho, and are suspected in Wyoming. In Oregon, five *Alnus incana* plant associations (*Alnus incana / Glyceria elata, Alnus incana / Calamagrostis canadensis, Alnus incana / Scirpus microcarpus, Alnus incana / Carex amplifolia*, and *Alnus incana / Carex pellita)* were described and one or more may belong in this association.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: Data are not available.
Local Description Authors: M.E. Hall
Global Description Authors: M. Jankovsky-Jones, mod. G. Kittel and K.A. Schulz

REFERENCES: Binkley 1986, Bourgeron and Engelking 1994, Bowman and Steltzer 1998, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Chapin et al. 1994, Crowe et al. 2004, Driscoll et al. 1984, Hansen et al. 1988b, Hansen et al. 1989, IDCDC 2005, Jones 1992b, Jones and Ogle 2000, Kettler and McMullen 1996, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Manning and Padgett 1995, Padgett et al. 1989, Richard et al. 1996, Rosgen 1996, Van Cleve et al. 1971, Viereck 1970, Western Ecology Working Group n.d.

Cornus sericea Shrubland

Red-osier Dogwood Shrubland

CODE	CEGL001165
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
ALLIANCE	*CORNUS SERICEA* TEMPORARILY FLOODED SHRUBLAND ALLIANCE (A.968) Red-osier Dogwood Temporarily Flooded Shrubland Alliance
ECOLOGICAL SYSTEM(S):	Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland (CES304.045) Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832) Western Great Plains Wooded Draw and Ravine (CES303.680)
USFWS WETLAND SYSTEM:	Palustrine

CONCEPT SUMMARY
Globally
This riparian tall shrubland is widespread in the Columbia Basin, the Intermountain Basin, and in the Rocky Mountains, and is discontinuously scattered in sheltered areas of the Colorado Plateau. It often forms continuous, narrow bands along streambanks, benches and bars, as well as in slot canyons. Many stands are located on nearly level, frequently flooded banks, in burns in steep avalanche chutes, or otherwise experience periodic disturbance. It also can form very dense, small stands with limited disturbance, often at the base of a cliff. Soils are relatively deep, well-drained silty to sandy clay loams derived from alluvium, colluvium or glacial till. Elevations range from 715 to 2700 m (2300-8800 feet), with the lower elevations occurring at the northern end of the range in Montana, the higher elevations in Utah and Colorado. The tall (1-2 m) deciduous shrub canopy is dominated by *Cornus sericea*,

generally accompanied by other tall shrubs, including *Prunus virginiana, Ribes aureum, Crataegus douglasii, Acer glabrum, Alnus incana, Salix bebbiana, Salix scouleriana, Cercocarpus ledifolius*, and *Juniperus scopulorum*. Short shrubs have sparse to moderate cover and include *Rosa woodsii, Symphoricarpos* spp., *Paxistima myrsinites, Mahonia repens, Arctostaphylos patula, Ribes cereum*, and the liana *Clematis ligusticifolia*. The understory is diverse and ranges from sparse to dense depending on how closed the tall-shrub layer is. Common forbs include *Thalictrum occidentale, Solidago canadensis, Aralia nudicaulis, Heracleum maximum, Heliomeris multiflora, Erythronium grandiflorum, Equisetum arvense, Maianthemum stellatum, Sanicula marilandica, Angelica arguta*, and *Symphyotrichum laeve (= Aster laevis)*. Graminoids are generally less important but may include significant cover by *Elymus glaucus* or *Calamagrostis canadensis*. The majority of the herbaceous layer may consist of non-native species, including *Cirsium arvense, Dactylis glomerata, Agrostis stolonifera, Poa palustris, Phalaris arundinacea*, and *Phleum pratense*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This rare association was sampled along the Gunnison River below Morrow Point Dam in Curecanti National Recreation Area.

Globally
This is a widespread western riparian shrubland that is documented by plot data in Washington, Oregon, Idaho, Nevada, Utah, Montana, Wyoming and Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This tall shrubland association occurs on toeslopes and the edges of floodplain terraces of the Gunnison River. The site is steep (65% slope), occurs at 2073 m elevation, and is oriented to the southwest. The unvegetated surface has sparse cover of litter and high cover by large and small rocks. Parent materials are metamorphic/granitic rocks. Soils are poorly drained sand.

Globally
This tall shrubland association occurs as a narrow stringer adjacent to stream channels, near seeps on moist toeslopes of canyon walls, on narrow benches in ravines, narrow terraces of wider valleys, as well as floodplains. Stands have been documented in the Columbia Basin, the Great Basin, throughout the lower elevations of the Rocky Mountains, and in sheltered riparian areas of the Colorado Plateau. Elevations range from 715 m (3600 feet) near the Canadian border in Montana to 2700 m (8800 feet) in southern Utah and Colorado. Stands may occur on nearly level riparian sites or on steep, wet, rocky slopes or at the base of cliffs. Rocks and litter often cover most of the unvegetated surface. The soils are generally derived from glacial till, alluvium or colluvium and are often sandy loams or clay loams.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is 78% in this type. *Cornus sericea* and *Prunus virginiana* tall shrubs (1-2 m tall) contribute 25 to 50% and 5 to 25% cover, respectively. The short shrub *Ribes cereum* contributes sparse cover. Herbaceous species are low in terms of species diversity and contribute sparse cover, including only the forbs *Arabis crandallii* and *Artemisia frigida*.

Globally
This shrubland can be a pure stand of impenetrable *Cornus sericea* or more open with several other shrub species. Typically *Cornus sericea* is the dominant shrub; other shrubs commonly present include *Prunus virginiana, Crataegus douglasii, Acer glabrum, Alnus incana, Ribes aureum, Rosa woodsii, Salix bebbiana, Salix scouleriana, Cercocarpus ledifolius*, and *Juniperus scopulorum*. Short shrubs have sparse to moderate cover and include *Rosa woodsii, Symphoricarpos oreophilus, Symphoricarpos albus, Paxistima myrsinites, Mahonia repens, Arctostaphylos patula*, and *Ribes cereum*. The understory is diverse and ranges from sparse to dense depending on how closed the tall-shrub layer is. Total vegetation cover is rarely less than 75% and often exceeds 100%. Some stands are dominated by *Heracleum maximum*, others by *Equisetum arvense*, and others by *Maianthemum stellatum* with other forbs, such as *Thalictrum occidentale, Solidago canadensis, Aralia nudicaulis, Heliomeris multiflora, Erythronium grandiflorum, Mimulus eastwoodiae, Aquilegia micrantha, Platanthera zothecina (= Habenaria zothecina)*, and *Artemisia ludoviciana*. *Sanicula marilandica, Angelica arguta*, and *Symphyotrichum laeve (= Aster laevis)*.

Graminoids are generally less important but may include significant cover by *Carex aurea, Elymus glaucus, Calamagrostis canadensis*, and *Calamagrostis scopulorum*. The majority of the herbaceous layer may consist of non-native species, including *Cirsium arvense, Dactylis glomerata, Agrostis stolonifera, Poa palustris, Phalaris arundinacea*, and *Phleum pratense*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Cornus sericea, Prunus virginiana*

Globally

Stratum	Species
Tall shrub/sapling	*Cornus sericea*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Vulnerable: *Arabis crandallii* (globally imperiled, G2), *Mimulus eastwoodiae* (rare/endemic, G3G4), *Platanthera zothecina* (globally imperiled, G2); **Exotic/Invasive**: *Agrostis stolonifera* (exotic, Medium/Low), *Cirsium arvense* (exotic, High/Medium), *Dactylis glomerata* (exotic, Medium/Insignificant), *Linaria vulgaris* (exotic, High/Low), *Medicago lupulina* (exotic, Medium/Insignificant), *Phalaris arundinacea* (exotic, High), *Phleum pratense* (exotic, Medium), *Poa pratensis* (exotic, Medium), *Taraxacum officinale* (exotic), *Trifolium pratense* (exotic, Low/Insignificant)

CONSERVATION STATUS RANK
Global Rank & Reasons: G4Q (27-Apr-2000).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association appears to be a broadly defined type that may be split in the future as more information becomes available. As such it is low-confidence. All references are surprising similar in their acceptance of variability within this type.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Small vegetation patch growing on the riverbank.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0192 and 1 observation point: CURE_AA.0854).
Local Description Authors: J. Von Loh
Global Description Authors: G. Kittel, mod. J. Coles

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Crawford 2001, Crawford 2003, Crowe and Clausnitzer 1997, Crowe et al. 2004, Diaz and Mellen 1996, Driscoll et al. 1984, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, IDCDC 2005, Jankovsky-Jones et al. 2001, Jones 1992b, Jones and Ogle 2000, Kagan et al. 2000, Kittel et al. 1994, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1993, MTNHP 2002b, MacKenzie and Moran 2004, Manning and Padgett 1995, Padgett et al. 1989, WNHP unpubl. data, Western Ecology Working Group n.d., Youngblood et al. 1985a

Salix exigua / Mesic Forbs Shrubland

Coyote Willow / Mesic Forbs Shrubland

CODE	CEGL001202
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
ALLIANCE	*SALIX (EXIGUA, INTERIOR)* TEMPORARILY FLOODED SHRUBLAND ALLIANCE (A.947) (Coyote Willow, Sandbar Willow) Temporarily Flooded Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This association typically occurs between 1464 and 2562 m (4800-8400 feet) elevation in Utah, western Colorado, central Nevada and eastern Idaho, where it occupies streambanks, terraces, and meadows along a wide variety of low- to moderate-gradient stream types. In contrast, a low-elevation phase of this plant association is found below 1128 m (3700 feet) in south-central and southwestern Idaho on annually flooded banks, islands, and terraces of reservoirs and large rivers (e.g., the Snake River and Boise River). This type usually occurs on well-developed sandy to silty alluvial loam soils, on the wettest (often flooded) but stable sites supporting *Salix exigua* associations. Both phases are dominated by a tall-shrub overstory of open to dense *Salix exigua*, although *Salix lutea, Ribes* spp., and *Rosa woodsii* are sometimes also present in lesser amounts. In the typical phase, the herbaceous understory is clearly dominated by a lush understory of mixed tall forbs, each with moderate cover, with *Aconitum columbianum, Equisetum arvense, Heracleum maximum, Maianthemum stellatum, Mertensia ciliata, Rudbeckia* spp., *Solidago canadensis*, and *Urtica dioica* being most common. No single forb has consistently high constancy and cover across the association's range. In the low-elevation phase, flood-disturbed stands in riverine habitats contain abundant native colonizing forbs (e.g., *Apocynum cannabinum, Euthamia occidentalis, Glycyrrhiza lepidota*, and *Polygonum* spp.) often mixed with dense exotic forbs (e.g., *Dipsacus fullonum, Lythrum salicaria, Melilotus officinalis*, and *Xanthium strumarium*). Total mesic graminoid cover is low in both phases of this association (with each species having only low cover) and composed of both native species (e.g., *Carex* spp., *Elymus glaucus*) and/or exotics (e.g., *Phalaris arundinacea, Poa pratensis*).

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled along the Gunnison River in the Neversink area in Curecanti National Recreation Area.

Globally

This association has been documented to occur at mid elevations in central Nevada, Utah and western Colorado, north through eastern Idaho. It is expected to occur in similar habitats in Wyoming.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall-shrub association occurs on the lowest floodplain terraces and cobble bars of the Gunnison River. This site is nearly flat (1% slope), occurs at 2310 m elevation, and is oriented to the east. The unvegetated surface has high cover of large and small rocks and low cover of litter and exposure of bare soil. Downed wood in the form of driftwood is common. Parent materials are Quaternary alluvium. Soils are poorly drained silty loams.

Globally

This association typically occurs between 1464 and 2562 m (4800-8400 feet) elevation in Utah, western Colorado, central Nevada and eastern Idaho, where it occupies streambanks, terraces, and meadows along a wide variety of low- to moderate-gradient stream types. In contrast, a low-elevation phase of this plant association is found below

1128 m (3700 feet) in south-central and southwestern Idaho on annually flooded banks, islands, and terraces of reservoirs and large rivers (e.g., the Snake River and Boise River). This type usually occurs on well-developed sandy to silty alluvial loam soils, on the wettest (often flooded) but stable sites supporting *Salix exigua* associations.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is approximately 100% in this type. *Salix exigua* shrubs 1-2 m tall form an open canopy that provides up to 30% cover. The associated shrub layer consists only of sapling *Populus angustifolia* trees and provides moderate cover. The herbaceous layer is diverse and provides moderate cover. Graminoids provide sparse to low cover and include *Alopecurus aequalis, Phalaris arundinacea*, and *Poa pratensis*. Forbs provide low to moderate cover and include the non-natives *Ambrosia trifida, Tripleurospermum perforata (= Matricaria perforata), Melilotus officinalis (= Melilotus albus), Trifolium repens*, and *Veronica anagallis-aquatica*, and the native *Epilobium brachycarpum*. Sparse cover of mosses also occurs.

Globally

Both phases are dominated by a tall-shrub overstory of open to dense *Salix exigua*, although *Salix lutea, Ribes* spp., and *Rosa woodsii* are sometimes also present in lesser amounts. Sapling *Populus angustifolia* or *Tamarix ramosissima* may also be present. In the typical phase, the herbaceous understory is clearly dominated by a lush understory of mixed tall forbs, each with moderate cover, with *Aconitum columbianum, Asclepias speciosa, Equisetum arvense, Heracleum maximum, Maianthemum stellatum, Mertensia ciliata, Rudbeckia* spp., *Solidago canadensis*, and *Urtica dioica* being most common. No single forb has consistently high constancy and cover across the association's range. In the low-elevation phase, flood-disturbed stands in riverine habitats contain abundant native colonizing forbs (e.g., *Apocynum cannabinum, Euthamia occidentalis, Glycyrrhiza lepidota, Veronica anagallis-aquatica*, and *Polygonum* spp.) often mixed with dense exotic forbs (e.g., *Ambrosia trifida, Dipsacus fullonum, Lythrum salicaria, Melilotus officinalis, Tripleurospermum perforata (= Matricaria perforata)*, and *Xanthium strumarium*). Total mesic graminoid cover is low in both phases of this association (with each species having only low cover) and composed of both native species (e.g., *Carex* spp., *Elymus glaucus*) and/or exotics (e.g., *Phalaris arundinacea, Poa pratensis*).

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Populus angustifolia, Salix exigua*
Herb (field)	*Melilotus officinalis*
Herb (field)	*Alopecurus aequalis, Phalaris arundinacea, Poa pratensis*

Globally

Stratum	Species
Tall shrub/sapling	*Salix exigua*
Herb (field)	*Aconitum columbianum, Asclepias speciosa, Heracleum maximum, Maianthemum stellatum, Mertensia ciliata, Solidago canadensis, Urtica dioica*
Herb (field)	*Equisetum arvense*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Alopecurus aequalis* (exotic), *Ambrosia trifida* (exotic), *Cirsium arvense* (exotic, High/Medium), *Linaria vulgaris* (exotic, High/Low), *Melilotus officinalis* (exotic, Medium/Low), *Phalaris arundinacea* (exotic, High), *Plantago major* (exotic), *Poa pratensis* (exotic, Medium), *Trifolium repens* (exotic, Medium/Low), *Tripleurospermum perforata* (exotic)

Globally

Vulnerable: *Spiranthes diluvialis* (Federally listed threatened, G2G3); **Exotic/Invasive**: *Alopecurus aequalis* (exotic), *Ambrosia trifida* (exotic), *Cirsium arvense* (exotic, High/Medium), *Linaria vulgaris* (exotic, High/Low), *Lythrum salicaria* (exotic, High), *Melilotus officinalis* (exotic, Medium/Low), *Phalaris arundinacea* (exotic, High), *Plantago major* (exotic), *Poa pratensis* (exotic, Medium), *Trifolium repens* (exotic, Medium/Low), *Tripleurospermum perforata* (exotic), *Xanthium strumarium* (exotic)

CONSERVATION STATUS RANK
Global Rank & Reasons: G2 (22-Oct-2002). This association is moderately wide-ranging but infrequently sampled throughout the core of its range at mid elevations in central Nevada, western Colorado and Utah, north through eastern Idaho. In this range, the association occurs along a wide variety of streams and river types on various fluvial landforms. However, it is mid- to late-seral and mostly limited to wet but stable sites with well-developed loamy soil. A dense understory layer of heterogeneous tall mesic forbs and low cover of mesic graminoid species characterizes the typical phase of this association. Stands are threatened by livestock overgrazing leading to invasion by exotic graminoid species. A low-elevation, disturbance-induced phase of this association is known from about 15 stands on the lower Snake River and its larger tributaries of southwestern Idaho. This phase is often in poor to fair ecological condition and may be better classified as *Salix exigua / Euthamia occidentalis* or another type. There are only about 15 to 20 known occurrences of the higher elevation, less-disturbed phase of the association, despite the abundance of other *Salix exigua* associations in this region. Only the higher elevation typical stands were considered in changing the rank from G2? to G2.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association is quantitatively described from 22 plots: 4 plots in Utah and southeastern Idaho (Padgett et al. 1989) and 4 plots in central Nevada (Manning and Padgett 1995). The low-elevation phase is described from at least 14 plots of *Salix exigua* / mixed riparian forb plant association sampled along the middle Snake River by Cole (1996), as well as *Salix exigua* communities with understories dominated by colonizing forbs such as *Apocynum cannabinum* and *Melilotus officinalis* (Cole 1995, Holmstead 2001). *Euthamia occidentalis* has high constancy and sometimes high cover in many of these low-elevation stands. The higher elevation phase is usually a stable, mid- to late-seral association (unless disturbed by excessive grazing), while the low-elevation phase is an early-seral association. The compositional heterogeneity inherent in early-seral, flood-disturbed *Salix exigua* stands has led some researchers to lump stands into a *Salix exigua* dominance type (e.g., Hansen et al. (1995) in Montana; Crowe and Clausnitzer (1997) in eastern Oregon; Crawford (2001) in eastern Washington; Hansen and Hall (2002) in southeastern Idaho). Examination of composition data for the *Salix exigua* dominance type reveals that most stands have greater graminoid cover than forb cover and have no mesic forb species with moderate to high cover and constancy. Some of these stands would better fit with the *Salix exigua / Equisetum arvense* association described by Youngblood et al. (1985a) but do not (except for rare cases) include stands of *Salix exigua* / mesic forbs. The *Salix exigua* / mesic forbs association is probably successionally related to the *Salix exigua* / bench community type described by Manning and Padgett (1995) from 8 locations in Nevada. *Salix exigua* ssp. *melanopsis* is now synonymous with *Salix melanopsis*. Although recent classifications (i.e., Crowe et al. 2002) have separated *Salix exigua* and *Salix melanopsis* associations, most *Salix melanopsis* stands are considered synonymous with *Salix exigua* associations by other researchers.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: The area in which the sampled plot occurs is popular among anglers and hunters on this reach of the Gunnison River.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0175).
Local Description Authors: J. Von Loh
Global Description Authors: J. Coles

REFERENCES: Bourgeron and Engelking 1994, Cole 1995, Cole 1996, Crawford 2001, Crowe and Clausnitzer 1997, Crowe et al. 2002, Driscoll et al. 1984, Hansen and Hall 2002, Hansen et al. 1995, Holmstead 2001, IDCDC 2005, IDCDC unpubl. data 2002, Jankovsky-Jones et al. 2001, Jones 1992b, Manning and Padgett 1995, Padgett et al. 1988b, Padgett et al. 1989, Western Ecology Working Group n.d.

Salix exigua / Mesic Graminoids Shrubland

Coyote Willow / Mesic Graminoids Shrubland

CODE	CEGL001203
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
ALLIANCE	*SALIX (EXIGUA, INTERIOR)* TEMPORARILY FLOODED SHRUBLAND ALLIANCE (A.947) (Coyote Willow, Sandbar Willow) Temporarily Flooded Shrubland Alliance
ECOLOGICAL SYSTEM(S):	Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821) Western Great Plains Floodplain (CES303.678) Northwestern Great Plains Canyon (CES303.658)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This riparian association is found primarily in the central Great Plains but also occurs in parts of the Rocky Mountains and Intermountain semi-desert regions. It generally occurs along backwater channels and other perennially wet but less scoured sites such as floodplain swales and irrigation ditches. The vegetation is characterized by the dominance of *Salix exigua* in a moderately dense tall-shrub canopy with a dense herbaceous layer dominated by graminoids. Other common shrubs include saplings of *Populus deltoides* or *Salix amygdaloides, Salix eriocephala, Salix lutea*, and *Amorpha fruticosa*. Tall perennial grasses can appear to codominate the stand when *Spartina pectinata, Panicum virgatum* or other tall grasses are present. Other mesic graminoids, such as *Carex* spp., *Eleocharis* spp., *Juncus* spp., *Pascopyrum smithii, Schoenoplectus pungens (= Scirpus pungens)*, and *Sphenopholis obtusata*, may be present. Common forb species include *Bidens* spp., *Lobelia siphilitica, Lycopus americanus, Lythrum alatum, Polygonum* spp., and *Xanthium strumarium*. Diagnostic features of this association include the nearly pure stands of *Salix exigua* shrubs, with a dense herbaceous layer of at least 30% cover of mesic graminoids.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled along the Gunnison River in the Neversink area in Curecanti National Recreation Area.

Globally

This association is found primarily in the central Great Plains, but also parts of the Rocky Mountains and Intermountain Semi-desert regions, ranging from Wyoming west to possibly Idaho, south to Utah, and east to Oklahoma.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall-shrub association occurs in the channels and on cobble bars of the Gunnison River. Sites are nearly flat to gently sloped (2-9% slopes), occur between 2312 and 2313 m elevation, and are oriented to the east and southeast. The unvegetated surface has high cover of litter. Downed wood in the form of driftwood is common. Parent materials are Quaternary alluvium. Soils are poorly drained and sandy clays.

Globally

This riparian association is found along alluvial terraces of backwater channels and other perennially wet but less scoured sites such as floodplain swales and irrigation ditches. It is found at elevations from 937 to 2700 m (3075-9100 feet). This community is found on sandbars, islands, and shorelines of stream channels and braided

rivers in Nebraska (Steinauer and Rolfsmeier 2000). Stands usually occur within 1 m vertical distance of the stream channel on point bars, low floodplains, terraces and along overflow channels. It can also occur away from the stream channel in mesic swales or along the margins of beaver ponds and seeps. Sites are usually relatively flat, though rarely they can have moderate or moderately steep slopes. Soils are derived from alluvium and are quite variable in development, ranging from thin (<1 m) and skeletal with depth (10-50% cobbles) to well-developed Mollisols (Kittel et al. 1999a). Textures are typically loamy sands interspersed with layers of silty clays and alternating with coarse sands. Upper layers (10-30 cm) often have 25-30% organic matter (Kittel et al. 1999a), and organic litter covers most of the unvegetated ground surface.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from approximately 130 to 150% in these stands. *Salix exigua* shrubs 2-5 m tall form moderately closed to closed canopies that provide 55 to 80% cover. The shrub layer provides dense cover and includes the 1- to 5-m tall *Alnus incana* ssp. *tenuifolia, Salix lutea*, and *Salix monticola*, in addition to sapling trees of *Populus angustifolia*. The herbaceous layer is diverse and provides moderate cover. Graminoids provide low to moderate cover and include *Agrostis gigantea, Alopecurus aequalis, Carex utriculata, Juncus balticus*, and *Phalaris arundinacea*. Forbs provide sparse to low cover and include *Artemisia dracunculus, Cirsium arvense, Sium suave*, and *Trifolium repens*.

Globally

This association is characterized by the dominance of *Salix exigua* in the moderately dense tall-shrub canopy with a dense herbaceous layer dominated by graminoids. Others common shrubs may include saplings of *Populus deltoides, Salix amygdaloides, Salix bebbiana, Salix eriocephala, Salix geyeriana, Salix lucida* ssp. *lasiandra (= Salix lasiandra), Salix lutea, Salix monticola, Salix planifolia, Amorpha fruticosa*, or *Rosa woodsii*. Tall perennial grasses can appear to codominate the stand when *Spartina pectinata, Sorghastrum nutans, Panicum virgatum*, or other tall grasses are present. Mesic graminoids dominate the diverse understory and include *Carex pellita (= Carex lanuginosa), Carex nebrascensis, Carex rostrata, Deschampsia caespitosa, Eleocharis palustris, Elymus canadensis, Equisetum* spp., *Glyceria* spp., *Juncus balticus, Juncus longistylis, Juncus tenuis, Juncus torreyi, Luzula parviflora, Pascopyrum smithii, Polygonum* spp., *Schoenoplectus americanus, Schoenoplectus pungens (= Scirpus pungens), Sphenopholis obtusata*, and others. The sparse forb cover may include *Lobelia siphilitica, Bidens* spp., *Geum macrophyllum, Lycopus americanus, Lythrum alatum, Mentha arvensis, Typha angustifolia, Veronica americana*, and *Xanthium strumarium*. *Agrostis stolonifera, Bromus inermis, Melilotus* spp., *Poa pratensis*, or *Phleum pratense*, and other introduced forage species may be present to abundant in disturbed stands of this community. Diagnostic features of this association include the nearly pure stands of *Salix exigua* shrubs, with a dense ground layer of at least 30% cover of graminoids.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Alnus incana* ssp. *tenuifolia*, *Populus angustifolia*, *Salix exigua*, *Salix lutea*, *Salix monticola*
Herb (field)	*Cirsium arvense*
Herb (field)	*Agrostis gigantea*, *Alopecurus aequalis*, *Phalaris arundinacea*

Globally

Stratum	Species
Tall shrub/sapling	*Salix exigua*
Herb (field)	*Pascopyrum smithii*, *Poa pratensis*, *Schoenoplectus americanus*, *Sorghastrum nutans*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Alopecurus aequalis* (exotic), *Cirsium arvense* (exotic, High/Medium), *Phalaris arundinacea* (exotic, High), *Phleum pratense* (exotic, Medium), *Trifolium repens* (exotic, Medium/Low)

Globally

Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (7-Apr-1998).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This broadly defined plant association occupies a rather large range and currently includes *Salix exigua* shrublands with herbaceous layers dominated by the introduced mesic, perennial, sod-grass *Poa pratensis*. Classification review of descriptions from the western part of its range need further review to determine if the type should be split. In addition, western stands may all belong to *Salix exigua sensu stricto*, and Great Plains stands may belong to either *Salix exigua* or *Salix interior* (or intermediates). *Salix interior* is an entirely Great Plains and eastward species (Kartesz 1999). In Nebraska, this community intergrades and is a successional stage that appears after both Riverine Sand Flats - Bars Sparse Vegetation (CEGL002049) and *Salix exigua* Temporarily Flooded Shrubland (CEGL001197), which is more frequently disturbed and lacks many of the more mesic herbaceous species.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Stands are patchy and invaded by weeds.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0139, CURE.0174 and 8 observation points: CURE_AA.0036, CURE_AA.0037, CURE_AA.0048, CURE_AA.0083, CURE_AA.0085, CURE_AA.0086, CURE_AA.0221, CURE_AA.0846).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz, mod. J. Drake and J. Coles

REFERENCES: Bourgeron and Engelking 1994, Butler et al. 2002, CONHP unpubl. data 2003, Carsey et al. 2003a, Cogan et al. 2004, Cooper and Cottrell 1990, Driscoll et al. 1984, Hansen et al. 1995, Hoagland 1998c, Hoagland 2000, IDCDC 2005, Jones 1992b, Jones and Walford 1995, Kittel 1994, Kittel and Lederer 1993, Kittel et al. 1996, Kittel et al. 1999a, Lauver et al. 1999, Padgett et al. 1988b, Padgett et al. 1989, Steinauer and Rolfsmeier 2000, Steinauer and Rolfsmeier 2003, Walford et al. 2001, Western Ecology Working Group n.d.

Salix geyeriana / Mesic Forbs Shrubland

Geyer's Willow / Mesic Forbs Shrubland

CODE	CEGL002666
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
ALLIANCE	*SALIX GEYERIANA* TEMPORARILY FLOODED SHRUBLAND ALLIANCE (A.975) Geyer's Willow Temporarily Flooded Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

The association is widely distributed, but infrequently sampled, in the northern central and southern Rocky Mountains at mid to high elevations of about 1122 to over 3019 m (3680-9900 feet). This association usually occurs in wide, low-gradient valley bottoms with sinuous streams or large rivers, but it is also known from narrower, slightly steeper valleys of headwater creeks. Sites supporting this association include terraces and streambanks (at or much higher than mean high water), as well as the drier margins of wetland floodplains. Soils are highly stratified alluvium and range from well-drained sandy loams and clay loams, with large amounts of coarse fragments intermixed, to highly organic and poorly drained, silty clay loams with mottling. The association is clearly dominated by clumps of 1.5- to 2.5-m tall *Salix geyeriana* (usually 60-90% cover) with *Salix boothii* sometimes also present with low to moderate cover. Other willows, such as *Salix drummondiana*, low shrubs (especially *Dasiphora fruticosa* ssp. *floribunda, Ericameria parryi, Ribes inerme, Ribes lacustre*, and/or *Rosa woodsii*), and trees occasionally occur with low to moderate cover in stands. There is a diverse mixture of mesic forbs (with cover greater than that of mesic graminoids) in the understory, forming multiple height layers. No single species has consistently high cover or constancy. The most common and widespread forbs are *Aconitum columbianum, Equisetum arvense, Fragaria virginiana, Geranium* spp., *Geum macrophyllum, Maianthemum stellatum, Pedicularis groenlandica, Swertia perennis*, and *Symphyotrichum foliaceum*. Other tall forb species, sometimes with moderate cover but lower constancy, include *Angelica arguta, Heracleum maximum, Mertensia* spp., *Polemonium occidentale, Potentilla gracilis, Thalictrum* spp., and *Urtica dioica*. The graminoid layer is poorly developed, tending to be dominated by exotic species with low cover (e.g., *Agrostis gigantea, Agrostis stolonifera, Poa pratensis*, and *Phleum pratense*), but also includes native graminoids (most commonly *Bromus ciliatus, Calamagrostis canadensis, Carex microptera, Carex utriculata*, or *Juncus balticus*).

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled on the eastern bank of North Willow Creek, south of State Highway 50 in Curecanti National Recreation Area.

Globally

This association is known mainly from mid to high elevations of the northern, central and southern Rocky Mountains from Montana and Idaho to Colorado extending west into the high plateaus of Utah. Very similar associations, if determined synonymous, may extend the range to Nevada and Oregon (Weixelman et al. 1996, Crowe and Clausnitzer 1997).

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall-shrub association occurs on floodplain terraces adjacent to North Willow Creek. The site is gently sloped (8%), occurs at 2296 m elevation, and is oriented to the southeast. The unvegetated surface has high cover of litter, and downed wood in the form of driftwood is abundant. Parent materials are Quaternary alluvium. Soils are poorly drained silty clay loams.

Globally
The association is widely distributed, but infrequently sampled, in the northern central and southern Rocky Mountains at mid to high elevations of about 1122 to over 3019 m (3680-9900 feet). This association usually occurs in wide, low-gradient valley bottoms with sinuous streams or large rivers, but it is also known from narrower, slightly steeper valleys of headwater creeks. Sites supporting this association include terraces and streambanks (at or much higher than mean high water), as well as the drier margins of wetland floodplains. Soils are highly stratified alluvium and range from well-drained sandy loams and clay loams, with large amounts of coarse fragments intermixed, to highly organic and poorly drained, silty clay loams with mottling (Padgett et al. 1989, Kittel et al. 1999b, Carsey et al. 2003a).

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is 90% in this tall shrubland type. *Salix geyeriana* shrubs 2-5 m tall form a closed canopy that provides 82% cover. The short- and dwarf-shrub layer is low in species diversity and provides sparse to low cover, including *Ericameria parryi, Ribes lacustre*, and *Rosa woodsii*. The herbaceous layer is moderately diverse and provides low to moderate cover. Graminoids provide sparse cover and include *Agrostis gigantea, Juncus balticus*, and *Poa pratensis*. Forbs provide low to moderate cover and include the non-natives *Cardaria chalapensis, Cirsium arvense, Descurainia sophia,* and *Lepidium campestre*, and the natives *Chenopodium fremontii, Lappula occidentalis, Phacelia alba, Rumex salicifolius var. mexicanus, Urtica dioica* ssp. *gracilis*, and *Vicia americana*.

Globally
The association is clearly dominated by clumps of 1.5- to 2.5-m tall *Salix geyeriana* (usually 60-90% cover) with *Salix boothii* sometimes also present (with low to moderate cover). Other tall willows, such as *Salix drummondiana*, low shrubs (especially *Dasiphora fruticosa* ssp. *floribunda, Ericameria parryi, Ribes inerme, Ribes lacustre*, and/or *Rosa woodsii*), and trees occasionally occur with low to moderate cover in stands. There is a diverse mixture of mesic forbs (with cover greater than that of mesic graminoids) in the understory, forming multiple height layers. No single species has consistently high cover or constancy. The most common and widespread forbs are *Aconitum columbianum, Equisetum arvense, Fragaria virginiana, Geranium* spp., *Geum macrophyllum, Maianthemum stellatum, Pedicularis groenlandica, Swertia perennis*, and *Symphyotrichum foliaceum*. Other tall forb species, sometimes with moderate cover but lower constancy, include *Angelica arguta, Heracleum maximum, Mertensia* spp., *Polemonium occidentale, Potentilla gracilis, Rumex salicifolius, Thalictrum* spp., *Urtica dioica*, and *Vicia americana*. The graminoid layer is poorly developed, tending to be dominated by exotic species with low cover (e.g., *Agrostis gigantea, Agrostis stolonifera, Poa pratensis*, and *Phleum pratense*), but also includes native graminoids (most commonly *Bromus ciliatus, Calamagrostis canadensis, Carex microptera, Carex utriculata,* or *Juncus balticus*). Introduced forbs include *Cardaria chalapensis, Cirsium arvense, Descurainia sophia, Lepidium campestre*, and *Taraxacum officinale*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Salix geyeriana*
Herb (field)	*Rosa woodsii*
Herb (field)	*Cirsium arvense, Lepidium campestre*
Herb (field)	*Juncus balticus*

Globally

Stratum	Species
Tall shrub/sapling	*Salix boothii, Salix geyeriana*
Short shrub/sapling	*Dasiphora fruticosa* ssp. *floribunda, Ribes inerme*
Herb (field)	*Rosa woodsii*
Herb (field)	*Aconitum columbianum, Fragaria virginiana, Geum macrophyllum, Maianthemum stellatum*
Herb (field)	*Bromus ciliatus, Carex microptera, Juncus balticus*
Herb (field)	*Equisetum arvense*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Exotic/Invasive: *Agrostis stolonifera* (native weed, Medium/Low), *Phleum pratense* (exotic, Medium), *Poa pratensis* (invasive, Medium)

CONSERVATION STATUS RANK
Global Rank & Reasons: G3 (22-Oct-2002). This association is a widely distributed and well-documented association known mainly from mid to high elevations of the northern Rockies (especially central and eastern Idaho) and central Rockies (especially Colorado). This association usually occurs on streambanks and terraces in wide, low-gradient valley bottoms of variable size streams, but it may also occur on the drier margins of floodplains. Habitats and soils supporting this association are variable but are relatively common across the landscape. Despite the association's broad geographic range, wide distribution of potential habitat, and relatively low environmental specificity, stands of this type are infrequently observed. Large stands in good to excellent ecological condition, with no exotic grasses or forbs in the understory, are rare. This association is known from only about 60-100 occurrences. Because this is a broadly defined association by some researchers, degraded stands with exotic species in the understory have been included in classification results. This makes estimation of the exact number of occurrences difficult. Livestock overgrazing, hydrologic alterations, road building, and recreational use are documented threats to the association. Stands are apparently under-represented in protected areas.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Classification of this association is based on over 20 plots from throughout the range of the association (Youngblood et al. 1985a, Padgett et al. 1989, Kittel et al. 1999b, Jankovsky-Jones et al. 2001, Walford et al. 2001, IDCDC 2002). This association is sometimes lumped within broader associations when dominance by *Salix geyeriana* is not obvious. A general *Salix geyeriana* association described in eastern Idaho may include stands with mesic forb understories (Hansen and Hall 2002). In contrast, other studies may have split this association into finer types that are included here; some of these may represent grazing-induced variants of this association. Several other associations, such as *Salix boothii* / Mesic Forbs Shrubland (CEGL001180), may floristically resemble this association. However, when undisturbed, this association is defined by obvious *Salix geyeriana* dominance with an understory dominated by mixed native mesic forbs, none of which has consistently high cover and constancy (Youngblood et al. 1985a, Padgett et al. 1989).

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Site occupies a terrace of the creek that at one time was flooded by Blue Mesa Reservoir as indicated by driftwood.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0381 and 2 observation points: CURE_AA.0012, CURE_AA.0387).
Local Description Authors: J. Von Loh
Global Description Authors: C. Murphy, mod. G. Kittel and K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Crowe and Clausnitzer 1997, Driscoll et al. 1984, Hansen and Hall 2002, IDCDC 2005, IDCDC unpubl. data 2002, Jankovsky-Jones et al. 2001, Jensen and Tuhy 1981, Johnston 1987, Jones and Ogle 2000, Kettler and McMullen 1996, Kittel et al. 1999a, Kittel et al. 1999b, Mattson 1984, Padgett et al. 1988b, Padgett et al. 1989, Phillips 1977, Richard et al. 1996, Tuhy 1981, Walford et al. 2001, Weixelman et al. 1996, Western Ecology Working Group n.d., Youngblood et al. 1985a, Youngblood et al. 1985b

Salix geyeriana / Mesic Graminoids Shrubland

Geyer's Willow / Mesic Graminoids Shrubland

CODE	CEGL001210
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
ALLIANCE	*SALIX GEYERIANA* TEMPORARILY FLOODED SHRUBLAND ALLIANCE (A.975) Geyer's Willow Temporarily Flooded Shrubland Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This is an important association in Idaho, Oregon, Montana, Utah, Colorado, and northwestern Wyoming. Stands of this association are often found in wide mountain valleys, cirques, and troughs, at elevations from about 1525 to 2745 m (5000-9000 feet) with narrow, meandering streams or braided rivers. The association mainly occurs on seasonally saturated or flooded sites such as streambanks, terraces, floodplains, abandoned meanders, spring-fed meadows, lake or reservoir shores, and occasionally alluvial gravel bars. Soils vary but are mostly silt to clay loams with organic/sedge peat horizons. An open canopy of tall, clumped *Salix geyeriana*, with occasionally intermixed *Salix boothii* (with <20% cover), characterizes this association. Other shrubs, including *Dasiphora fruticosa* ssp. *floribunda, Ribes* spp., *Rosa woodsii*, and low *Salix* spp., are scattered around the bases of taller *Salix* clumps. The herbaceous understory is dominated by a diverse mix of mesic graminoid species that always has greater total cover than the total cover of mesic forbs. In good-condition, mid- to late-seral stands, the most common graminoids are *Carex microptera, Carex pellita, Deschampsia caespitosa*, and occasionally *Carex nebrascensis*, but no single species consistently has high cover. Other graminoids with moderate cover and constancy include *Calamagrostis canadensis, Carex aquatilis, Carex praegracilis, Carex rostrata, Carex utriculata, Glyceria* spp., and *Juncus balticus*. *Poa pratensis* is present in nearly all stands, but its cover varies depending on the amount of grazing disturbance and site desiccation. Stands in poor condition need to be codominated by a mixture of native graminoids (not a single species such as *Deschampsia caespitosa*) with the introduced graminoids and forbs. The most common forb species are sometimes indicative of grazing disturbance (e.g., *Achillea millefolium, Geum macrophyllum, Iris missouriensis, Maianthemum stellatum, Potentilla gracilis, Thalictrum* spp., *Taraxacum officinale*, and *Trifolium* spp.).

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled on upper Pine Creek near the canyon rim in Curecanti National Recreation Area.

Globally

This association is widely distributed in the West at mid to high elevations, ranging from Idaho, Wyoming, Utah, Nevada, Colorado, and possibly California, Montana and Oregon.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall-shrub association occurs in seeps within swales in basin bottoms. The site is nearly level (1% slope), occurs at 2395 m elevation, and is oriented to the northeast. The unvegetated surface has high cover of litter, and downed wood is abundant. Parent materials are Quaternary landslide deposits. Soils are poorly drained silty loams, black in color.

Globally

This riparian shrubland association is found in Idaho, Oregon, Montana, Utah, Colorado, and northwestern Wyoming. Stands of this association are often found in wide mountain valleys, cirques, and troughs, at elevations from about 1525 to 3000 m (5000-9900 feet), with narrow, meandering streams or braided rivers. The association

mainly occurs on seasonally saturated or flooded sites, such as streambanks, terraces, floodplains, abandoned meanders, spring-fed meadows, lake or reservoir shores, and occasionally alluvial gravel bars. Soils vary but are mostly moderately well-drained to poorly drained, silt to clay loams with organic/sedge peat horizons. Ground surface has high cover of litter and duff.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is 89% in this shrubland association. *Salix geyeriana* shrubs 2-5 m tall form a moderately closed canopy and provide 40% cover. Another tall shrub, *Salix lucida* ssp. *lasiandra (= Salix lasiandra)*, provides low cover. The short-shrub layer is low in species diversity and provides moderate cover. Short shrubs include *Dasiphora fruticosa* ssp. *floribunda (= Dasiphora floribunda), Ribes lacustre, Rosa woodsii*, and *Rubus idaeus*. The herbaceous layer is diverse in terms of species composition and provides moderate cover. Graminoids provide moderate cover and include *Bromus porteri, Elymus glaucus, Festuca thurberi, Hordeum jubatum, Juncus balticus, Phalaris arundinacea*, and *Poa pratensis*. *Poa pratensis*, a non-native grass species, provides most of the graminoid cover, up to 25%. Forbs provide sparse cover and include *Achillea millefolium var. occidentalis, Cirsium* sp., *Iris missouriensis, Taraxacum officinale, Urtica dioica, Veronica* sp., and *Vicia americana*.

Globally

This plant association is a tall (2-5m), deciduous shrubland with an open to nearly closed canopy of clumped willows and a thick layer of sedges and grasses in the undergrowth. Dominance of *Salix geyeriana* (20-70% cover), occasionally intermixed with *Salix boothii* (with <20% cover), characterizes this association. Other shrubs, including *Alnus incana* ssp. *tenuifolia, Dasiphora fruticosa* ssp. *floribunda, Ribes inerme, Ribes lacustre, Rosa woodsii*, and other *Salix* spp. such as *Salix drummondiana, Salix lemmonii, Salix lucida* ssp. *lasiandra (= Salix lasiandra), Salix monticola, Salix planifolia*, or *Salix wolfii*, are scattered around the bases of taller *Salix* clumps. The herbaceous understory is dominated by a diverse mix of mesic graminoid species that always has greater total cover than the total cover of mesic forbs. In good-condition, mid- to late-seral stands, the most common graminoids are *Carex microptera, Carex pellita, Deschampsia caespitosa*, and occasionally *Carex nebrascensis*, but no single species consistently has high cover. Other graminoids with low to moderate cover and constancy include *Bromus porteri, Calamagrostis canadensis, Carex aquatilis, Carex athrostachya, Carex pellita (= Carex lanuginosa), Carex praegracilis, Carex rostrata, Carex simulata, Carex subnigricans, Carex utriculata, Elymus glaucus, Festuca thurberi, Hordeum jubatum, Glyceria* spp., *Juncus balticus, Juncus orthophyllus*, and *Muhlenbergia richardsonis*. Introduced grasses *Phalaris arundinacea, Phleum pratense*, and *Poa pratensis* are frequently present, but their cover varies depending on the amount of grazing disturbance and site desiccation. Stands in poor condition need to be codominated by a mixture of native graminoids (not a single species such as *Deschampsia caespitosa*) with the introduced graminoids and forbs. The most common forb species are sometimes indicative of grazing disturbance. Associated species include *Achillea millefolium, Antennaria* spp., *Caltha leptosepala, Cirsium* sp., *Geum macrophyllum, Iris missouriensis, Maianthemum stellatum, Pedicularis groenlandica, Penstemon* spp., *Polygonum bistortoides, Potentilla gracilis, Thalictrum* spp., *Taraxacum officinale, Trifolium* spp., *Urtica dioica, Veronica* sp., and *Vicia americana*.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Salix geyeriana*
Short shrub/sapling	*Ribes lacustre*
Short shrub/sapling	*Dasiphora fruticosa* ssp. *floribunda*
Herb (field)	*Iris missouriensis, Urtica dioica*
Herb (field)	*Juncus balticus, Phalaris arundinacea, Poa pratensis*

Globally

Stratum	Species
Shrub/sapling (tall & short)	*Salix geyeriana*
Herb (field)	*Carex microptera, Carex pellita, Deschampsia caespitosa*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally
Exotic/Invasive: *Agrostis stolonifera* (invasive, Medium/Low), *Phleum pratense* (invasive, Medium), *Poa palustris* (invasive), *Poa pratensis* (invasive, Medium)

CONSERVATION STATUS RANK
Global Rank & Reasons: G3? (22-Oct-2002). This association is widely distributed at mid to high elevations, ranging from the Great Basin to the Central Rockies, north to central and eastern Idaho and adjacent Wyoming. Extensive stands of the association are relatively frequently observed in a wide variety of fluvial settings, but they are especially common on seasonally wet sites in wide montane valley bottoms (e.g., glacial troughs and basins). This association is distinguished by having moderate cover and constancy of mixed mesic graminoid species, none of which are distinctly dominant. The high cover of mesic graminoids under an open *Salix geyeriana* canopy makes this association susceptible to overgrazing by livestock and conversion of the understory to dominance by exotic grasses (e.g., *Poa pratensis*). While stands of this type do exist in less disturbed, late-seral states with native understory species, the association is more often expressed as disturbance-induced stands. If stands in poor to fair ecological condition with understories dominated by exotic grass species are not considered, the total known occurrences of this association is probably less than 100. Unfortunately, this is a broadly defined type that sometimes encompasses *Salix geyeriana / Poa pratensis* and other disturbance-induced *Salix geyeriana* stands with no clearly dominant understory graminoid species. In addition, some stands dominated by *Salix boothii* are also included within this association based on similarities in environmental setting and composition. This broad lumping is problematic for determining a clear definition of this association and assessing its true extent across its range. More in-depth analysis of existing stand data needs to occur in order to determine the actual number of occurrences. Until this occurs, G3? is an appropriate rank.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association has a high cover and constancy of *Poa pratensis* and may be anthropogenic. This is a widespread, well-sampled association. It has been sampled throughout eastern Idaho (5 plots by Youngblood et al. 1985a; 2 plots by Padgett et al. 1989) and across central Idaho (at least 6 plots) (IDCDC 2002). The association has been sampled in northwestern Wyoming (6 plots by Walford et al. 2001), Utah (4 plots by Padgett et al. 1989), northern and central Nevada (9 plots by Manning and Padgett 1995). An unknown portion of 71 plots sampled in Montana (Hansen et al. 1995) and 58 plots sampled in southeastern Idaho (Hansen and Hall 2002) of a broader *Salix geyeriana* community type likely include stands fitting this association. When ecological conditions are good, this type is clearly distinguished from other *Salix geyeriana*-dominated stands by having moderate cover and constancy of mixed native mesic graminoid species including (but not limited to) *Calamagrostis canadensis, Carex aquatilis, Carex pellita, Carex utriculata*, and/or *Deschampsia caespitosa*, none of which are distinctly dominant. This can cause confusion with *Salix geyeriana* associations named for dominance of any one of these species (Mutz and Queiroz 1983, Youngblood et al. 1985a, Padgett et al. 1989, Hansen et al. 1995, Manning and Padgett 1995, Walford et al. 2001, Hansen and Hall 2002, Crowe et al. 2002). This association is a broadly defined type that encompasses *Salix geyeriana / Poa pratensis* (as in Padgett et al. 1989) and other disturbance-induced *Salix geyeriana* stands with no clearly dominant understory graminoid species (as in Evenden 1990). Some stands dominated by *Salix boothii* are also included based on similarities in environmental setting and composition (Hansen et al. 1995, Hansen and Hall 2002). This broad lumping is problematic for determining a clear definition of this association and assessing its true extent.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: The plot is characterized by patchy distribution of several codominant grasses, located in a seep similar to others in the area; gopher activity, large bedding and grazed area occupy about 5% of the plot.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0312 and 4 observation points: CURE_AA.0076, CURE_AA.0108, CURE_AA.0816, CURE_AA.1457).
Local Description Authors: J. Von Loh

Global Description Authors: C. Murphy, mod. K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Crowe et al. 2002, Driscoll et al. 1984, Evenden 1990, Hansen and Hall 2002, Hansen et al. 1995, IDCDC 2005, IDCDC unpubl. data 2002, Kovalchik 2001, Manning and Padgett 1995, Mutz and Queiroz 1983, Norton et al. 1981, Padgett et al. 1988b, Padgett et al. 1989, Walford et al. 2001, Weixelman et al. 1996, Western Ecology Working Group n.d., Youngblood et al. 1985a

Krascheninnikovia lanata / Achnatherum hymenoides Dwarf-shrubland

Winterfat / Indian Ricegrass Dwarf-shrubland

CODE	CEGL001323
PHYSIOGNOMIC CLASS	Dwarf-shrubland (IV)
PHYSIOGNOMIC SUBCLASS	Evergreen dwarf-shrubland (IV.A.)
PHYSIOGNOMIC GROUP	Extremely xeromorphic evergreen dwarf-shrubland (IV.A.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural extremely xeromorphic evergreen dwarf-shrubland (IV.A.2.N.)
FORMATION	Extremely xeromorphic evergreen subdesert dwarf-shrubland (IV.A.2.N.a.)
ALLIANCE	*KRASCHENINNIKOVIA LANATA* DWARF-SHRUBLAND ALLIANCE (A.1104) Winterfat Dwarf-shrubland Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Mixed Salt Desert Scrub (CES304.784)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This dwarf-shrubland occurs in the Great Basin, western and southern Colorado and western Wyoming. Sites include gently sloping valley bottoms and toeslopes, and steep, shaly windswept ridges. Soils are shallow, rapidly drained sandy loam to silty clay loam derived from alluvium and shale. The ground surface has moderate to high cover (40-85%) of bare soil; gravel cover is variable. This vegetation is characterized by an open to moderately dense (to 25% cover) dwarf-shrub canopy dominated by *Krascheninnikovia lanata*, with the medium-tall bunchgrass *Achnatherum hymenoides* in the understory. The dwarf-shrub layer is low in diversity. Other dwarf-shrubs may include *Artemisia tridentata* ssp. *wyomingensis, Atriplex canescens, Ericameria parryi*, and *Grayia spinosa*. Herbaceous vegetation is typically patchy and sparse, but may form an open to moderately dense herbaceous layer with low species diversity. *Achnatherum hymenoides* is a constant species with up to 10% cover. Other common species include *Elymus elymoides, Pascopyrum smithii, Pleuraphis jamesii*, and a variety of native forbs such as *Chenopodium* sp., *Eriogonum* spp., *Eriophyllum pringlei, Mentzelia multiflora, Opuntia polyacantha, Phacelia* sp., and *Sphaeralcea coccinea*. Introduced species *Bromus inermis, Bromus tectorum, Halogeton glomeratus*, and *Salsola tragus* are common in disturbed sites.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled in the Cimarron area east of the Visitor Center in Curecanti National Recreation Area.

Globally

This dwarf-shrubland is reported from the San Luis Valley and Western Slope in the southern Rocky Mountains, the northern Great Basin and western Wyoming. It likely is more widespread in the intermountain western U.S.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This dwarf-shrub association occurs on a slope on an eroded ridge. The site is steep (40% slope), occurs at 2161 m elevation, and is oriented to the west. Parent materials are Morrison Formation shale. Soils are rapidly drained silty clay loams.

Globally
This dwarf-shrubland occurs in the Great Basin, western and southern Colorado and western Wyoming. Sites include gently sloping valley bottoms and toeslopes, and steep, shaly windswept ridges. Soils are shallow, sandy or silty clay loams, or less often loamy sand. Parent materials are alluvium and shale often derived from the Morrison or Wasatch formations. The ground surface has moderate to high cover (40-85%) of bare soil (Blackburn et al. 1968c, 1969c). Gravel cover is variable.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is up to 30% in this dwarf-shrub community type. *Krascheninnikovia lanata* forms an open canopy and provides up to 25% cover, and the medium-tall bunchgrass *Achnatherum hymenoides* provides up to 5% cover. The dwarf-shrub layer is low in diversity and provides low to moderate cover. Other dwarf-shrubs include *Artemisia tridentata* ssp. *wyomingensis, Atriplex canescens*, and *Ericameria parryi*. The herbaceous layer is low in species diversity and provides low cover. Additional grasses provide sparse cover and include the non-natives *Bromus inermis* and *Bromus tectorum* and the natives *Elymus elymoides* and *Pascopyrum smithii*. Forbs are low in diversity and provide sparse cover, including *Almutaster pauciflorus, Androsace septentrionalis*, and *Eriogonum lonchophyllum*.

Globally
This vegetation is characterized by an open to moderately dense (to 25% cover) dwarf-shrub canopy dominated by *Krascheninnikovia lanata*, with the medium-tall bunchgrass *Achnatherum hymenoides* in the understory. The dwarf-shrub layer is variable but generally low in diversity. Other dwarf-shrubs may include *Artemisia dracunculus, Artemisia frigida, Artemisia tridentata* ssp. *wyomingensis, Atriplex canescens, Atriplex confertifolia, Chrysothamnus viscidiflorus, Ericameria nauseosa, Ericameria parryi*, and *Grayia spinosa*. Herbaceous vegetation is typically patchy and sparse, but may form an open to moderately dense herbaceous layer with low species diversity . *Achnatherum hymenoides* is a constant species with up to 10% cover. Other species present with low cover may include other grasses such as *Bouteloua gracilis, Elymus elymoides, Elymus lanceolatus, Hesperostipa comata, Pascopyrum smithii, Pleuraphis jamesii, Poa secunda*, and *Pseudoroegneria spicata*, and forbs *Almutaster pauciflorus, Androsace septentrionalis, Astragalus jejunus, Astragalus spatulatus, Chenopodium leptophyllum, Eriogonum brevicaule, Eriogonum lonchophyllum, Eriophyllum pringlei, Machaeranthera canescens, Mentzelia multiflora, Opuntia polyacantha, Phacelia* sp., *Phlox hoodii, Pteryxia terebinthina (= Cymopterus terebinthinus)*, and *Sphaeralcea coccinea*. Introduced species *Bromus inermis, Bromus tectorum, Halogeton glomeratus*, and *Salsola tragus* are common in disturbed sites.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Atriplex canescens*, *Ericameria parryi*, *Krascheninnikovia lanata*
Herb (field)	*Almutaster pauciflorus*
Herb (field)	*Achnatherum hymenoides*, *Pascopyrum smithii*

Globally

Stratum	Species
Short shrub/sapling	*Krascheninnikovia lanata*
Herb (field)	*Achnatherum hymenoides*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus inermis* (exotic, High/Medium), *Bromus tectorum* (exotic, High)

Globally
Exotic/Invasive: *Bromus inermis* (exotic, High/Medium), *Bromus tectorum* (exotic, High), *Halogeton glomeratus* (exotic, High/Medium), *Salsola tragus* (exotic)

CONSERVATION STATUS RANK
Global Rank & Reasons: G4 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Sampled site occupies a disturbed area above State Highway 50. Further quantitative plots are needed to define this association locally.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0070 and 7 observation points: BLCA_AA.707, BLCA_AA.710, CURE_AA.0185, CURE_AA.0553, CURE_AA.0860, CURE_AA.0872, CURE_AA.0884).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: K.A. Schulz

REFERENCES: Baker 1984a, Blackburn et al. 1968c, Blackburn et al. 1969c, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Daubenmire 1970, DeVelice et al. 1995, Driscoll et al. 1984, Fautin 1946, Francis 1986, Soil Conservation Service 1978, Western Ecology Working Group n.d.

Artemisia frigida - (Bouteloua gracilis, Achnatherum hymenoides, Poa secunda) - Lichens Rocky Mesa Dwarf-shrubland

Fringed Sagebrush - (Blue Grama, Indian Ricegrass, Sandberg Bluegrass) - Lichens Rocky Mesa Dwarf-shrubland

CODE	CEGL002344
PHYSIOGNOMIC CLASS	Dwarf-shrubland (IV)
PHYSIOGNOMIC SUBCLASS	Deciduous dwarf-shrubland (IV.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous dwarf-shrubland (IV.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous dwarf-shrubland (IV.B.2.N.)
FORMATION	Cespitose cold-deciduous dwarf-shrubland (IV.B.2.N.a.)
ALLIANCE	*ARTEMISIA FRIGIDA* DWARF-SHRUBLAND ALLIANCE (A.2565) Fringed Sagebrush Dwarf-shrubland Alliance

ECOLOGICAL SYSTEM(S): Colorado Plateau Mixed Low Sagebrush Shrubland (CES304.762)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This shrubland association is described from the Colorado Plateau and western slope of the southern Rocky Mountains and is typically found on exposed, wind-blown sites. Stands occur on mid- to upper slopes and tops of mesas, hills and ridges, but also occurs on midslopes of mountains, active slopes and on valley terraces. Site are flat to moderately steep (to 53 % slope) on all aspects between 2315 and 2965 m elevation. Various amounts of bedrock, large and small rocks, and bare soil compose the majority of the ground surface, with sparse to low cover of litter. Parent materials are frequently volcanic (basalt) rocks that are present as bedrock, boulders and gravel, Mesozoic shale, and Quaternary landslide deposits. Soils are shallow, rapidly drained and range from coarse sand and sandy loam to sandy clay loam and sandy clay. The sparse to moderately dense vegetation (4-85% cover) is characterized by the presence of *Artemisia frigida*, a suffrutescent plant that occurs as both a dwarf-shrub and forb. The other characteristic species are perennial graminoids *Bouteloua gracilis, Achnatherum hymenoides,* and *Poa secunda*, ranging from absent to 35% cover. Other common shrubs and dwarf-shrubs include *Artemisia nova, Chrysothamnus*

viscidiflorus, Gutierrezia sarothrae, Krascheninnikovia lanata, Tetradymia canescens, and the cactus *Pediocactus simpsonii*. The herbaceous layer is sparse to moderate and often composed of low-growing cushion plants. Species are often diverse, but have sparse to low cover, and may include *Festuca brachyphylla, Hymenoxys richardsonii, Paronychia sessiliflora, Penstemon strictus, Poa fendleriana, Stenotus armerioides, Stephanomeria spinosa (= Lygodesmia spinosa)*, and *Tetraneuris torreyana*. Cryptogam cover varies from low to moderate and is occasionally as high as 55%, mostly composed of crustose and foliose lichens.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association is limited in its distribution in the recreation area. It was sampled on Carpenter Ridge, Tenderfoot Hill, Dillon Mesa, Dillon Pinnacles, Haystack Mesa, Dry Creek Mesa II, Water Tank Hill, East of Red Creek, Soap Creek/West Elk Point, Carpenter Ridge, Big Game Hill, South Willow Creek, and in Cesar Basin

Globally
This dwarf-shrubland association is described from the Colorado Plateau and western slope of the southern Rocky Mountains.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This herbaceous association occurs on the wind-scoured tops of mesas, hills, and ridges, on the upper slopes of mesas, on the shoulders and valley terraces. Sites are flat to moderately steep (0-53% slopes), occur between 2315 and 2726 m elevation, and include all aspects. The unvegetated surface typically has low cover of litter. Bedrock, large and small rocks, and exposures of bare soil comprise much of the unvegetated surface but are variable. Parent materials are Tertiary volcanic rocks, Mesozoic shale, and Quaternary landslide deposits. Soils are rapidly drained and range from sand, loamy sand, sandy loam and sandy clay loam to clay loam. A few stands had no soil, rather were covered by thick gravel, cobble, or rock.

Globally
This shrubland association is described from the Colorado Plateau and western slope of the southern Rocky Mountains and is typically found on exposed, wind-blown sites. Stands occur on mid- to upper slopes and tops of mesas, hills and ridges, but also midslopes of mountains, active slopes and on valley terraces. Site are flat to moderately steep (to 53 % slope) on all aspects between 2315 and 2965 m elevation. Various amounts of bedrock, large and small rocks, and bare soil compose the majority of the ground surface, with sparse to low cover of litter. Parent materials are frequently volcanic (basalt) rocks that are present as bedrock, boulders and gravel, Mesozoic shale, and Quaternary landslide deposits. Soils are shallow, rapidly drained and range from coarse sand and sandy loam to sandy clay loam and sandy clay. Lichens often provide high cover between shrubs.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 4 to 40% in this unique herbaceous type. The forb *Artemisia frigida* is scattered within stands and provides from 0 to 2% cover, and the grasses *Bouteloua gracilis, Achnatherum hymenoides*, and *Poa secunda* range in cover from 0 to 35%, 0 to 10%, and 0 to 14%, respectively. The herbaceous layer is diverse and provides sparse to moderate cover. Additional forbs commonly present providing sparse to low cover include *Tetraneuris torreyana, Stenotus armerioides*, and *Eriogonum* spp. Another grass commonly present is *Elymus elymoides*. The short- and dwarf-shrub layer typically provides sparse to low cover. Shrubs and succulents commonly present include *Gutierrezia sarothrae, Krascheninnikovia lanata*, and *Pediocactus simpsonii*. Cryptogam cover, mostly in the form of crustose and foliose lichens, is variable, with some stands having very little, but occasionally cover can be as high as 55%.

Globally
This association has sparse to moderately dense vegetation (4-85% cover) and is characterized by the presence of *Artemisia frigida*, a suffrutescent plant that occurs as both a dwarf-shrub and forb. The other characteristic species are perennial graminoids *Bouteloua gracilis, Achnatherum hymenoides*, and *Poa secunda*, ranging from absent to 35% cover. Other common shrubs and dwarf-shrubs include *Artemisia nova, Chrysothamnus viscidiflorus, Gutierrezia sarothrae, Krascheninnikovia lanata, Tetradymia canescens*, and the cactus *Pediocactus simpsonii*. The herbaceous layer is sparse to moderate and often composed of low-growing cushion plants. Species are often diverse, but have sparse to low cover, and may include *Allium cernuum, Elymus elymoides, Elymus lanceolatus,*

Erigeron sp., *Eriogonum* spp., *Festuca brachyphylla, Hymenoxys richardsonii, Paronychia sessiliflora, Penstemon strictus, Poa fendleriana, Stenotus armerioides, Stephanomeria spinosa (= Lygodesmia spinosa)*, and *Tetraneuris torreyana*. Cryptogam cover varies from low to moderate and is occasionally as high as 55%, mostly composed of crustose and foliose lichens.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia frigida, Gutierrezia sarothrae, Krascheninnikovia lanata*
Herb (field)	*Artemisia frigida, Stenotus armerioides, Tetraneuris torreyana*
Herb (field)	*Achnatherum hymenoides, Bouteloua gracilis, Elymus elymoides*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia frigida, Gutierrezia sarothrae, Krascheninnikovia lanata*
Herb (field)	*Hymenoxys richardsonii, Paronychia sessiliflora, Stenotus armerioides, Tetraneuris torreyana*
Herb (field)	*Achnatherum hymenoides, Bouteloua gracilis, Carex duriuscula, Elymus lanceolatus, Poa fendleriana*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (17-Mar-2005).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Rocky and gravelly sites exposed to prevailing westerly winds during warm months. Heavily lichen encrusted. Linear frost lines present on ridgetops.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (22 plots: CURE.0008, CURE.0053, CURE.0155, CURE.0194, CURE.0199, CURE.0215, CURE.0216, CURE.0273, CURE.0274, CURE.0275, CURE.0283, CURE.0285, CURE.0321, CURE.0327, CURE.0328, CURE.0334, CURE.0335, CURE.0337, CURE.0339, CURE.0344, CURE.0369, CURE.0374 and 22 observation points: CURE_AA.0220, CURE_AA.0308, CURE_AA.0345, CURE_AA.0348, CURE_AA.0463, CURE_AA.0464, CURE_AA.0481, CURE_AA.0491, CURE_AA.0492, CURE_AA.0503, CURE_AA.0515, CURE_AA.0577, CURE_AA.0606, CURE_AA.0683, CURE_AA.0694, CURE_AA.0706, CURE_AA.0730, CURE_AA.0848, CURE_AA.0888, CURE_AA.0926, CURE_AA.0970, CURE_AA.1049).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Leymus cinereus Herbaceous Vegetation

Great Basin Wildrye Herbaceous Vegetation, Great Basin Wildrye Tallgrass Prairie

CODE	CEGL001479
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Tall bunch temperate grassland (V.A.5.N.b.)
ALLIANCE	*LEYMUS CINEREUS* HERBACEOUS ALLIANCE (A.1204) Great Basin Wildrye Herbaceous Alliance
ECOLOGICAL SYSTEM(S):	Inter-Mountain Basins Greasewood Flat (CES304.780) Columbia Basin Palouse Prairie (CES304.792) Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)
USFWS WETLAND SYSTEM:	Palustrine

CONCEPT SUMMARY

Globally

This Great Basin lyme grass association is found along lower elevation riparian corridors and some moderately alkaline valley bottomlands from Colorado to the Pacific Coast states. Elevations range between 305 and 780 m (1000-2550 feet) in northeastern and central Oregon, between 915 and 1525 m (3000-5000 feet) in the Great Basin, and from 1830 to 2451 m (6000-8036 feet) in western Colorado and southwestern Wyoming. Generally, stands of this type are described as growing on mesic sites with more soil moisture than is available to the surrounding vegetation, including mesic swales and seeps, canyon bottoms, foothill ravines, moist bottomlands, and along streams. Sites are flat to steep and occur on all aspects. Soils are rapidly drained, often with a shallow water table. Soil texture is variable and ranges from silty clays to deep loamy sands derived from alluvium and colluvium. The vegetation is characterized by a tall (over 1.5 m), moderately dense to more typically dense grassland dominated by high cover (30-95%) of *Leymus cinereus (= Elymus cinereus*). Other plants are found mainly between the clumps of *Leymus cinereus* or on the edges of the dense stands. Scattered shrubs may be present, including *Artemisia tridentata, Chrysothamnus viscidiflorus, Ericameria nauseosa (= Chrysothamnus nauseosus), Rhus trilobata, Ribes* spp., *Rosa* spp., and *Symphoricarpos oreophilus*. Associated species occurring at lower cover include graminoids such as *Achnatherum hymenoides, Achnatherum lettermanii, Carex douglasii, Elymus glaucus, Hesperostipa comata, Juncus balticus, Pascopyrum smithii*, and introduced species *Bromus tectorum* and *Poa pratensis*, and forbs such as *Achillea millefolium, Agastache urticifolia, Castilleja* spp., *Iris missouriensis, Potentilla gracilis var. flabelliformis (= Potentilla flabelliformis), Rumex crispus, Sidalcea oregana, Stephanomeria minor*, and *Vicia americana*. *Claytonia perfoliata (= Montia perfoliata)* is always associated in northwestern Oregon, while more alkaline forbs (*Suaeda* spp.) are more important in northern Great Basin valleys.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled near Red Creek on Dillon Mesa, near North Willow Creek, and on Tenderfoot Hill in Curecanti National Recreation Area.

Globally

This type is found mainly in the Great Basin and the Intermountain Region, and just reaches the western part of the Northern Great Plains. Although it occupies a small amount of area in Oregon or in any western state, it has a fairly large range. Unfortunately, few high-quality remnants remain.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This herbaceous vegetation association occurs in mesic sites in valleys, seeps, and at the base of mesa caprock. Sites are gently sloped (5 to 7%), occur between 2299 and 2451 m elevation, and include eastern and southern aspects. The unvegetated surface has high cover of litter and low to moderate exposure of bare soil. One site has high cover of large rocks, small rocks, and sand. Parent materials are alluvium or colluvium derived from volcanic rocks. Soils are rapidly drained silt loams, sandy clay loams, and loamy sands.

Globally
This association is found along lower elevation riparian corridors and some moderately alkaline valley bottomlands. Elevations range between 305 and 780 m (1000-2550 feet) in northeastern and central Oregon, between 915 and 1525 m (3000-5000 feet) in the Great Basin, and from 1830 to 2451 m (6000-8036 feet) in western Colorado and southwestern Wyoming. Generally, stands tend to be patchy and grow on mesic sites with more soil moisture than is available to the surrounding vegetation, including mesic swales and seeps (Thilenius et al. 1995), foothill ravines (Knight et al. 1976), moist bottomlands (Stoddart 1941), along streams (Mueggler and Stewart 1980), and on gentle slopes in canyon bottoms in Oregon. Sites are flat to steep and occur on all aspects. Soils are rapidly drained, often with a shallow water table. Soil texture is variable and ranges from silty clays to deep loamy sands. Parent materials are alluvium or colluvium derived from a variety of parent materials, including sandstone, shale, and volcanic rocks.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 50 to 95% in these stands. The tall bunchgrass *Leymus cinereus* forms an open to closed canopy and provides from 30 to 85% cover. The herbaceous layer is moderately diverse and provides low cover. Additional graminoid species include *Achnatherum hymenoides, Achnatherum lettermanii, Hesperostipa comata, Juncus balticus*, and *Poa pratensis*. Forbs present and providing sparse cover include *Iris missouriensis* and *Stephanomeria minor var. minor*. Short shrubs contribute low cover and include *Artemisia tridentata* ssp. *wyomingensis* and *Artemisia tridentata* ssp. *vaseyana, Chrysothamnus viscidiflorus, Ericameria nauseosa*, and *Rhus trilobata*.

Globally
The association is a characteristically tall (over 1.5 m), moderately dense to more typically dense grassland dominated by high cover (30-95%) of *Leymus cinereus (= Elymus cinereus*). Other plants are found mainly between the clumps of *Leymus cinereus* or on the edges of the dense stands. Scattered shrubs may be present, including *Amelanchier utahensis, Artemisia tridentata, Chrysothamnus viscidiflorus, Ericameria nauseosa (= Chrysothamnus nauseosus), Purshia tridentata, Rhus trilobata, Ribes* spp., *Rosa* spp., and *Symphoricarpos oreophilus*. Associated species occurring at lower cover include graminoids such as *Achnatherum hymenoides, Achnatherum lettermanii, Carex douglasii, Elymus glaucus, Hesperostipa comata, Juncus balticus, Pascopyrum smithii*, and introduced species *Bromus tectorum* and *Poa pratensis*, and forbs such as *Achillea millefolium, Agastache urticifolia, Balsamorhiza sagittata, Castilleja* spp., *Eriogonum brevicaule, Iris missouriensis, Iva axillaris, Mertensia oblongifolia, Pteryxia terebinthina (= Cymopterus terebinthinus), Potentilla gracilis var. flabelliformis (= Potentilla flabelliformis), Rumex crispus, Sidalcea oregana, Stephanomeria minor*, and *Vicia americana*. *Claytonia perfoliata (= Montia perfoliata)* is always associated in northwestern Oregon, while more alkaline forbs (*Suaeda* spp.) are more important in northern Great Basin valleys.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Ericameria nauseosa*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Juncus balticus, Leymus cinereus*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Poa pratensis* (exotic, Medium)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G2G3Q (29-Mar-1999). This is a very widespread community, being found in many western states, but is badly degraded everywhere. It has declined markedly throughout its range, and probably represents two or more separate community types. This type was formerly very abundant in interior valleys. Early

settlers described the very tall grasslands (up to the their horses backs) in many areas. Most of these sites have been converted to agriculture. Even as described here as a broad association floristically and geographically - the size and quality of most occurrences should make it a G2. More knowledge of its distribution is needed, but it should remain a priority for conservation. Most sites are threatened by livestock grazing, agriculture, altered stream hydrology, and altered fire regime.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Stands of *Leymus cinereus* are widely distributed in the Intermountain Region and the Great Basin, but little quantitative information is available on the composition of stands in different areas. The type has been very poorly sampled, since there are only a few examples which have not been very altered from grazing and altered stream function. This is therefore a broadly defined association that could be split. This *Leymus cinereus* Herbaceous Vegetation association includes stands growing on relatively non-saline soils in a variety of landscape positions, and is based on the limited information in the literature. It is also very likely that the types found along alluvial terraces in the somewhat alkaline, mid- to high-elevation valleys in the Blue Mountains and the Basin and Range are very different from the non-alkaline, low-elevation stream drainages from the Columbia Basin. Until additional reference sites are found, the type will have to be treated as a single community.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Because of the typically small size of the occurrences of this type (<0.5 ha), it was not sampled as frequently as it otherwise might have been. Field researchers often had difficulty configuring a plot to total 100 square meters (the standard herbaceous type plot size), even when elongating or curving the plot shape. This also may have resulted in sampling ecotonal areas. More quantitative data may help to clear up these questions, if researchers have the flexibility to sample small occurrences. The site at the base of the mesa caprock (BLM.0006) is not unique: a similar site was observed at the base of the caprock on Tenderfoot Hill (CURE.0196), which has a sparse shrub canopy of *Amelanchier utahensis*. This observation point was not classified.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (3 plots: CURE.0238, CURE.0384, CURE.0390 and 1 observation point: CURE_AA.0612).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: G.P. Jones and M.P. Murray, mod. K.A. Schulz

REFERENCES: Aldous and Shantz 1924, Baker 1982b, Baker 1984a, Bell et al. 2009, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Daubenmire 1970, Daubenmire 1988, DeVelice 1992, Dean 1960, Driscoll et al. 1984, Ferchau 1973, IDCDC 2005, Johnson and Simon 1985, Johnson and Simon 1987, Jones and Ogle 2000, Keammerer 1977, Knight et al. 1976, MTNHP 1988, MTNHP 2002b, Mueggler and Stewart 1980, Stoddart 1941, Thilenius et al. 1995, Thorne Ecological Institute 1973a, USFS 1937, Vories 1974, WNHP unpubl. data, Walker and Brotherson 1982, Western Ecology Working Group n.d.

Elymus repens Semi-natural Herbaceous Vegetation

Quackgrass Semi-natural Herbaceous Vegetation

CODE	CEGL005868
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Medium-tall sod temperate or subpolar grassland (V.A.5.N.c.)
ALLIANCE	*ELYMUS REPENS* HERBACEOUS ALLIANCE (A.2658) Quackgrass Herbaceous Alliance
ECOLOGICAL SYSTEM(S):	Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040) Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821) Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)
USFWS WETLAND SYSTEM:	Not applicable

CONCEPT SUMMARY

Globally

This association occurs on disturbed low-elevation sites, including floodplains, on the east side of Glacier National Park in Montana and in western Colorado. This community develops in response to disturbance and is composed mainly of noxious weeds, exotics and native increaser species. This association was sampled on flat to gently sloping lower slopes, toeslopes and valley bottoms at elevations between 1450 and 1555 m (4750-5100 feet) in Montana and between 1710 and 2285 m (5610-7500 feet) in Colorado. Soils are derived from glacial or fluvial deposits but are variable in soil texture, ranging from moderately well-drained sandy loams to clay loams to poorly drained gravel and rock. Litter dominates the ground surface. This montane, mesic to subhygric herbaceous association has low overall species diversity due to the dominance of *Elymus repens (= Elytrigia repens var. repens)*, an exotic rhizomatous grass. *Elymus repens* is a highly invasive species in mesic areas and tends to exclude other species once established. Overall herbaceous cover ranges from 25-85% with *Elymus repens* clearly dominating this association with 5-80% cover. Other species sometimes present with low cover include *Cerastium arvense, Carex* spp., *Symphyotrichum laeve (= Aster laevis), Achillea millefolium, Equisetum laevigatum, Iva axillaris, Taraxacum officinale, Poa palustris*, and *Penstemon confertus*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled on East Elk Creek in Curecanti National Recreation Area.

Globally

This association has been documented from stands in northwestern Montana and western Colorado. It is likely to be much more common and widely distributed than the limited data indicate.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This herbaceous vegetation association occurs on floodplain terraces. The site is nearly flat (2% slope), occurs at 2284 m elevation, and is oriented to the southeast. The unvegetated surface has high cover of litter and low exposure of bare soil. Parent materials are Quaternary alluvium. Soils are moderately well-drained clay loams.

Globally

This association is characteristic of disturbed low-elevation sites, including floodplains, in western Colorado and in Glacier National Park, Montana. It is very likely to be more common and widespread than is currently documented. This community develops in response to disturbance and is composed mainly of noxious weeds, exotics and native increaser species. It occurs on flat to gently sloping lower slopes, toeslopes and valley bottoms at elevations between 1450 and 1555 m (4750-5100 feet) in Montana and between 1710 and 2285 m (5610-7500 feet) in Colorado. Soils

are derived from glacial or fluvial deposits but are variable in soil texture, ranging from moderately well-drained sandy loams to clay loams to poorly drained gravel and rock. Litter dominates the ground surface.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is approximately 85% in this type. The noxious weed *Elymus repens* forms a dense canopy that provides 85% cover. *Elymus repens*, a rhizomatous perennial grass, is the only species present in the stand.

Globally
This montane, mesic to subhygric herbaceous association has low overall species diversity due to the dominance of *Elymus repens (= Elytrigia repens var. repens)*, an exotic rhizomatous grass. *Elymus repens* is a highly invasive species in mesic areas and tends to exclude other species once established. Overall herbaceous cover ranges from 25-85% with *Elymus repens* clearly dominating this association with 5-80% cover. Other species sometimes present with low cover include *Cerastium arvense, Carex* spp., *Symphyotrichum laeve (= Aster laevis), Achillea millefolium, Equisetum laevigatum, Iva axillaris, Taraxacum officinale, Poa palustris*, and *Penstemon confertus*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Herb (field)	*Elymus repens*

Globally

Stratum	Species
Herb (field)	*Elymus repens*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNA (invasive) (4-Feb-2004).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Identification of this association is usually unequivocal as *Elymus repens* tends to form dense monocultures exclusive of most other species.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: This is a pure, dense stand. More quantitative data are needed to define this association.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0379 and 3 observation points: CURE_AA.0130, CURE_AA.0133, CURE_AA.0582).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: J. Coles

REFERENCES: Beetle 1955, Gross and Werner 1982, Western Ecology Working Group n.d.

Pascopyrum smithii Herbaceous Vegetation

Western Wheatgrass Herbaceous Vegetation, Western Wheatgrass Mixedgrass Prairie

CODE	CEGL001577
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Medium-tall sod temperate or subpolar grassland (V.A.5.N.c.)
ALLIANCE	*PASCOPYRUM SMITHII* HERBACEOUS ALLIANCE (A.1232) Western Wheatgrass Herbaceous Alliance
ECOLOGICAL SYSTEM(S):	Central Mixedgrass Prairie (CES303.659) Northwestern Great Plains Mixedgrass Prairie (CES303.674) Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824) Inter-Mountain Basins Semi-Desert Grassland (CES304.787)
USFWS WETLAND SYSTEM:	Palustrine

CONCEPT SUMMARY

Globally

This midgrass prairie type is found in the northern and western Great Plains, Rocky Mountains, Colorado Plateau, and the interior western United States and Canada at elevations from 600-3000 m (1960-9850 feet). Stands occur on level to gently sloping terrain. They are found on alluvial fans, swales, river terraces, floodplains, valley floors and basins. The soils are typically clay, clay loam, and silt loam but may include sand or loamy sand. *Pascopyrum smithii* strongly dominates the open to dense (15-100% cover) mixedgrass herbaceous layer that grows 0.5-1 m tall. Other graminoids that co-occur and may achieve local dominance are *Koeleria macrantha, Eleocharis palustris*, and *Poa* spp. Many other species common in midgrass prairies and other grasslands are also found in this community, including *Artemisia ludoviciana, Eriogonum* spp., *Bouteloua gracilis, Nassella viridula*, and *Hesperostipa comata (= Stipa comata).* Shrubs and dwarf-shrubs are rare in this community, but occasional woody plants, such as *Artemisia tridentata*, *Symphoricarpos* spp., *Ericameria nauseosa*, or *Krascheninnikovia lanata*, may be present. Introduced species, such as *Bromus tectorum, Bromus inermis, Poa pratensis, Melilotus* spp. or *Cirsium arvense*, are common in some stands, especially where disturbed.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled on Dillon Mesa and near Cimarron along the East Powerline Road in Curecanti National Recreation Area.

Globally

This midgrass prairie type is found in the northern and western Great Plains, Rocky Mountains, intermountain western United States and Canada, ranging from North Dakota and Saskatchewan, south to Nebraska and Colorado, and west to northern Arizona, Utah and Idaho.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This herbaceous vegetation association occurs on the lower slopes of ridges and in overflow channels. Sites are gently sloped (7-15%), occur between 2186 and 2708 m elevation, and are oriented to south-facing aspects. The unvegetated surface has high exposure of bare soil and low to moderate cover of litter and small rocks and gravel. Parent materials are Quaternary landslide deposits, alluvium and volcanic rocks. Soils are moderately well-drained loams and silty clays.

Globally

This grassland association is widespread in the northern and western Great Plains of the U.S. and Canada, Rocky Mountains, Colorado Plateau, and the intermountain western United States. Elevation ranges from 600-3000 m. Stands occur on level to gently sloping terrain. They are found on alluvial fans, swales, river terraces, floodplains, valley bottoms and basins. The soils are typically deep (40-100 cm), slightly alkaline and well-developed with clay,

clay loam, and silt loam textures, but also coarser textures such as sand and loamy sand. Some stands occur on perched water tables. Parent materials include Quaternary landslide deposits, volcanic rocks, sandstones and shale that have eroded and deposited as secondary stream alluvium.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 24 to 70% in these tands. The rhizomatous perennial *Pascopyrum smithii* forms scattered to open canopies and provides from 13 to 55% cover. The herbaceous layer is diverse and provides low to moderate cover. Additional graminoids include *Achnatherum hymenoides, Poa fendleriana,* and *Poa secunda*. Forbs commonly present and providing sparse to low cover include *Delphinium nuttallianum, Grindelia* sp., *Taraxacum officinale,* and *Trifolium gymnocarpon.* Short and dwarf-shrubs provide sparse cover and include *Artemisia tridentata* ssp. *wyomingensis, Ericameria parryi*, and *Gutierrezia sarothrae*.

Globally

This association is characterized by an open to dense (15-100% cover) mixedgrass herbaceous layer that grows 0.5-1 m tall and is strongly dominated by *Pascopyrum smithii*. Herbaceous cover may be significantly less on drier sites or after scarce cool-season precipitation. Other graminoids that co-occur and may achieve local dominance are *Bouteloua gracilis, Distichlis spicata, Eleocharis palustris, Koeleria macrantha,* and *Sporobolus airoides*. Many other species common in prairies and other grasslands are also found in this community, including *Achnatherum lettermanii, Achillea millefolium, Artemisia frigida, Artemisia ludoviciana, Bouteloua curtipendula, Carex* spp., *Eriogonum* spp., *Hesperostipa comata (= Stipa comata), Juncus balticus, Lupinus argenteus, Nassella viridula, Pleuraphis jamesii, Pseudoroegneria spicata (= Elymus spicatus), Poa fendleriana, Poa secunda, Schizachyrium scoparium,* and *Solidago* sp. Shrubs and dwarf-shrubs are rare in this community, but occasional woody plants, such as *Artemisia arbuscula* ssp. *longiloba, Artemisia tridentata, Artemisia tridentata* ssp. *vaseyana, Atriplex canescens, Ericameria nauseosa, Krascheninnikovia lanata, Rhus trilobata*, or *Symphoricarpos* spp., may be present. Introduced species, such as *Agropyron cristatum, Cirsium arvense, Bromus japonicus, Bromus tectorum, Ceratocephala testiculata, Conyza canadensis, Iva axillaris, Lactuca serriola, Melilotus* spp., *Poa pratensis, Salsola kali, Sisymbrium altissimum*, and *Taraxacum officinale,* are common in some stands, especially where disturbed.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Ericameria parryi*
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Gutierrezia sarothrae*
Herb (field)	*Grindelia arizonica*
Herb (field)	*Achnatherum hymenoides, Pascopyrum smithii*

Globally

Stratum	Species
Herb (field)	*Pascopyrum smithii*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Melilotus officinalis* (exotic, Medium/Low)

Globally

Exotic/Invasive: *Agropyron cristatum* (exotic, Medium/Low), *Bromus japonicus* (exotic), *Bromus tectorum* (exotic, High), *Ceratocephala testiculata* (exotic), *Cirsium arvense* (exotic noxious weed, High/Medium), *Conyza canadensis* (introduced), *Iva axillaris* (introduced), *Lactuca serriola* (exotic, Low/Insignificant), *Poa pratensis* (exotic, Medium), *Salsola kali* (exotic), *Sisymbrium altissimum* (exotic), *Taraxacum officinale* (exotic)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G5Q (1-Feb-1996).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This community is similar to several others that are dominated or codominated by *Pascopyrum smithii*. As currently defined, it represents a western Great Plains and foothills version of the western wheatgrass types in the central Great Plains. Further work needs to be done to refine the differences in composition and environmental characteristics. See recent descriptions by Thilenius et al. (1995) (*Pascopyrum smithii* sodgrass steppe, a more playa-like wheatgrass type) and by Steinauer and Rolfsmeier (2000). In Nebraska, Steinauer and Rolfsmeier (2000) suggest that their stands may resemble *Pascopyrum smithii - Nassella viridula* Herbaceous Vegetation (CEGL001583). In Alberta, this association is clearly dominated by dense, nearly pure stands of *Pascopyrum smithii* and tends to occur in depressions in areas of fine-textured saline soils with a hardpan layer. The hardpan holds rain and spring runoff.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: More quantitative data are needed to define this association.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: Descriptions are based on field data (2 plots: CURE.0295, CURE.0332 and 2 observation points: BLCA_AA.950, BLCA_AA.956).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: J. Drake, mod. K.A. Schulz and J. Coles

REFERENCES: ANHIC n.d., Aldous and Shantz 1924, Baker 1983c, Baker 1984a, Baker and Kennedy 1985, Bell et al. 2009, Bourgeron and Engelking 1994, Bunin 1985, CONHP unpubl. data 2003, Christensen and Welsh 1963, Driscoll et al. 1984, FEIS 2001, Godfread 1994, Hall and Hansen 1997, Hansen et al. 1991, Hansen et al. 1995, Hansen et al. 2004c, Hansen et al. 2004d, IDCDC 2005, Jones and Walford 1995, MTNHP 2002b, Marr and Buckner 1974, Ramaley 1916b, Ramaley 1919b, Ramaley 1942, Shanks 1977, Soil Conservation Service 1978, Steinauer and Rolfsmeier 2000, Thilenius et al. 1995, Thompson and Hansen 2002, Von Loh 2000, Vujnovic and Bentz 2001, Western Ecology Working Group n.d.

Thinopyrum intermedium Semi-natural Herbaceous Vegetation

Intermediate Wheatgrass Semi-natural Herbaceous Vegetation

CODE	CEGL002935
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Medium-tall sod temperate or subpolar grassland (V.A.5.N.c.)
ALLIANCE	*THINOPYRUM INTERMEDIUM* SEMI-NATURAL HERBACEOUS ALLIANCE (A.2529) Intermediate Wheatgrass Semi-natural Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Semi-Desert Grassland (CES304.787)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This *Thinopyrum intermedium* type occurs widely throughout the northern Great Plains of the United States, and perhaps more widely in the midwestern U.S. and Canada. It also occurs in the Colorado Plateau and southern Rocky Mountains at montane elevations and likely occurs elsewhere in the western U.S. Stands can occur in a wide variety of human-disturbed habitats. *Thinopyrum intermedium (= Agropyron intermedium)* is widely planted as pasture and hayland along road ditches for Conservation Reserve Program lands, and in dense-nesting-cover mixes. It is

commonly found on reseeded cultivated lands planted with legumes, such as sweetclover and alfalfa, and may also have escaped into surrounding habitats. It is most abundant on dry, medium-textured soils but has adapted to a broad range of soil textures and moisture conditions. Vegetation is primarily medium-tall (0.5-1 m) graminoids dominated by *Thinopyrum intermedium*, a naturalized, cool-season grass species from eastern Europe. Other weedy species such as *Bromus inermis* may occur as well, but native species are generally less than 20% cover. Native grass species will rarely, if ever, reestablish in sites dominated by *Thinopyrum intermedium*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled on constructed berms above the Ranger Station near East Portal Road in Curecanti National Recreation Area.

Globally

This type occurs widely throughout the northern Great Plains of the United States, and perhaps more widely in the Midwest and Canada, but is poorly documented.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This herbaceous vegetation association occurs on berms constructed to guide storm water runoff from access roads and slopes away from park and recreation area facilities. The berm is moderately steep (25% slope), occurs at 2022 m elevation, and is oriented to the east. The unvegetated surface has high cover of litter, large rocks, and gravel, in addition to low exposure of bare soil. Parent materials are volcanic in origin; large rocks were dumped onsite. Soils are rapidly drained loamy sands.

Globally

The *Thinopyrum intermedium* type occurs widely throughout the northern Great Plains of the United States, and perhaps more widely in the midwestern U.S. and Canada. It also is reported from the Colorado Plateau and southern Rocky Mountains at montane elevations and likely occurs elsewhere in the western U.S. Stands can occur in a wide variety of human-disturbed habitats. *Thinopyrum intermedium* is widely planted as pasture and hayland along road ditches for Conservation Reserve Program lands, and in dense-nesting-cover mixes (D. Ode pers. comm.). It is commonly found on reseeded cultivated lands planted with legumes, such as sweetclover and alfalfa, and may also have escaped into surrounding habitats (D. Ode pers. comm.). It is most abundant on dry, medium-textured soils but has adapted to a broad range of soil textures and moisture conditions.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is 46% in this introduced grassland type. The medium-tall bunchgrass *Thinopyrum intermedium* forms an open canopy and contributes up to 40% cover. The herbaceous layer is low in terms of species diversity and provides low cover. The only associated grass is the non-native annual *Bromus tectorum* that provides sparse cover. Forbs also provide sparse cover and include *Artemisia dracunculus, Artemisia ludoviciana, Artemisia michauxiana, Solidago velutina*, and *Humulus lupulus*. Short and dwarf-shrubs provide sparse cover and include *Artemisia tridentata* ssp. *vaseyana, Ericameria parryi*, and *Ribes inerme*.

Globally

Vegetation is primarily medium-tall (0.5-1 m) graminoids dominated by *Thinopyrum intermedium (= Agropyron intermedium, = Elytrigia intermedia)*, a naturalized, cool-season grass species from eastern Europe. *Thinopyrum intermedium* often contributes 90% of the cover for this community; however, other exotics such as *Bromus inermis* can invade into these areas. Native species are generally less than 20% cover and almost never reestablish in areas dominated by *Thinopyrum intermedium*. In the intermountain western U.S., the herbaceous layer is also low in species diversity and cover. Forbs include *Artemisia dracunculus, Artemisia ludoviciana, Artemisia michauxiana, Mertensia arizonica, Solidago velutina*, and *Vicia americana*,. Short and dwarf-shrubs such as *Artemisia tridentata* ssp. *vaseyana, Ericameria parryi*, and *Ribes inerme* may be present. Associated grasses include the non-native annual *Bromus tectorum* and perennial *Bromus inermis* which provide sparse cover.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Herb (field)	*Artemisia dracunculus*
Herb (field)	*Bromus tectorum, Thinopyrum intermedium*

Globally

Stratum	Species
Herb (field)	*Thinopyrum intermedium*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus tectorum* (exotic, High)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNA (invasive) (10-Oct-2001).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
The *Thinopyrum intermedium* type occurs widely throughout the northern Great Plains of the United States, and perhaps more widely in the midwestern U.S. and Canada. It also is reported from Utah and western Colorado and likely occurs elsewhere in the western U.S. where *Thinopyrum intermedium* has been seeded or escaped from plantings.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: The large berm lies up-drainage of the Ranger Station and below the East Portal Road toe-of-fill. It was installed to direct flows away from facilities and seeded to *Thinopyrum intermedium*.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0241).
Local Description Authors: J. Von Loh
Global Description Authors: S. Menard, mod. K.A. Schulz

REFERENCES: Butler et al. 2002, Cogan et al. 2004, Ode pers. comm., Western Ecology Working Group n.d.

Achnatherum hymenoides Shale Barren Herbaceous Vegetation

Indian Ricegrass Shale Barren Herbaceous Vegetation

CODE	CEGL001651
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
ALLIANCE	*ACHNATHERUM HYMENOIDES* HERBACEOUS ALLIANCE (A.1262) Indian Ricegrass Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Shale Badland (CES304.789)
Columbia Plateau Ash and Tuff Badland (CES304.081)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This association is found on shale outcrops in Colorado and likely is more widespread. Elevations range from 2200-2321m (7200-7610 feet) in north-central Colorado and west-central Colorado to lower elevation sites at 1415 m (4640 feet) on mesatops in the Colorado Plateau. This association is described as a topo-edaphic climax, occurring on soils derived from shales or mudstones. It occupies stabilized badlands with rolling topography, commonly on ridgetops exposed to wind, desiccation and sheet erosion. Aspects are often southerly. Soils derived from shale and mudstone are typically shallow, calcareous, alkaline and clayey, often capped by a thin gravel layer. Total vegetative cover is relatively sparse, and bare soil ranges from 75% to near 100%. The vegetation has a relatively sparse (5-25% cover) herbaceous layer characterized by the perennial bunchgrass *Achnatherum hymenoides (= Oryzopsis hymenoides)*. The low mat-forming suffrutescent forb *Eriogonum brevicaule* may codominate some higher elevation stands. Scattered shrubs may be present, including *Artemisia nova, Artemisia tridentata* ssp. *wyomingensis, Ericameria nauseosa, Gutierrezia sarothrae, Krascheninnikovia lanata, Sarcobatus vermiculatus,* and *Tetradymia spinosa*. Associated grasses include *Achnatherum pinetorum, Elymus elymoides, Koeleria macrantha, Pascopyrum smithii*, and *Pleuraphis jamesii*. Forbs present and providing sparse cover include *Artemisia frigida, Eriogonum contortum, Eriogonum lonchophyllum*, and *Stenotus armerioides*. Other associated species are the non-native bunchgrass *Agropyron cristatum* and the exotic annual grass *Bromus tectorum*. As many as 40 species may occur in this association, but stands are highly variable.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare association was sampled at Cimarron and near Red Creek in Curecanti National Recreation Area.

Globally

This association has been described from the southern Rocky Mountains in north-central Colorado, in a high intermountain basin known as Middle Park in Grand and Eagle counties. It is also found in the Gunnison River valley and in Mesa County in western Colorado, where it was described as a large island surrounded by agricultural fields.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This herbaceous association occurs on the sides of ridges. Sites are moderately steep to steep (8-50% slopes), occur between 2188 and 2321 m elevation, and are oriented to south and southwest aspects. The unvegetated surface consists of bare soil exposures with sparse litter and low cover by small rocks. Parent materials are Mesozoic shale. Soils are rapidly drained silty clays.

Globally

This association is found on shale outcrops in Colorado and likely is more widespread. Elevations range from 2200 to 2321 m (7200-7610 feet) in north-central Colorado and west-central Colorado (Francis 1983, Tiedemann et al. 1987) to lower elevation sites at 1415 m (4640 feet) on mesatops in the Colorado Plateau. This association is described as a topo-edaphic climax, occurring on soils derived from shales or mudstones. It occupies stabilized badlands with rolling topography, commonly on ridgetops exposed to wind, desiccation and sheet erosion. Aspects are often southerly. Soils derived from shale and mudstone are typically shallow, calcareous, alkaline and clayey, often capped by a thin gravel layer. Total vegetative cover is relatively sparse, and bare soil ranges from 75% to near 100%.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is approximately 10 to 15%. The bunchgrass *Achnatherum hymenoides* forms a sparse canopy that provides up to 5% cover. The herbaceous layer is low to moderately diverse and provides sparse cover. Associated grasses include the non-native bunchgrass *Agropyron cristatum* and the native grasses *Achnatherum pinetorum, Elymus elymoides, Koeleria macrantha,* and *Pascopyrum smithii*. Forbs present and providing sparse cover include *Artemisia frigida, Eriogonum lonchophyllum,* and *Stenotus armerioides*. The shrub layer is low in terms of species diversity and provides low cover. Scattered shrubs are present, including *Artemisia nova, Artemisia tridentata* ssp. *wyomingensis, Gutierrezia sarothrae,* and *Krascheninnikovia lanata*.

Globally
The vegetation of this association has a relatively sparse (5-25% cover) herbaceous layer characterized by the perennial bunchgrass *Achnatherum hymenoides (= Oryzopsis hymenoides)*. The low, mat-forming suffruticose forb *Eriogonum brevicaule* codominates some higher elevation stands. Scattered shrubs may be present, including *Artemisia nova, Artemisia tridentata* ssp. *wyomingensis, Gutierrezia sarothrae*, and *Krascheninnikovia lanata*. Associated grasses include the non-native bunchgrass *Agropyron cristatum* and the native grasses *Achnatherum pinetorum, Elymus elymoides, Koeleria macrantha*, and *Pascopyrum smithii*. Forbs present and providing sparse cover include *Artemisia frigida, Eriogonum lonchophyllum*, and *Stenotus armerioides* (Francis 1983, Tiedemann et al. 1987). The lower elevation, shaly ridge site in western Colorado had cover of 5-25% *Achnatherum hymenoides*, 5-25% *Gutierrezia sarothrae*, 10% *Pleuraphis jamesii (= Hilaria jamesii)*, 5% *Krascheninnikovia lanata*, and 1% each for *Sarcobatus vermiculatus, Ericameria nauseosa*, and *Tetradymia spinosa*. Other associated species were *Eriogonum contortum* and the exotic annual grass *Bromus tectorum* (P. Lyons pers. comm.). As many as 40 species may occur in this association, but stands are highly variable.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia nova, Krascheninnikovia lanata*
Herb (field)	*Eriogonum lonchophyllum, Stenotus armerioides*
Herb (field)	*Achnatherum hymenoides*

Globally

Stratum	Species
Herb (field)	*Eriogonum brevicaule*
Herb (field)	*Achnatherum hymenoides*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Agropyron cristatum* (exotic, Medium/Low), *Bromus tectorum* (introduced, High)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G2 (13-Nov-1997). This plant association is described as a topo-edaphic climax from a high intermountain basin known as Middle Park in north-central Colorado in Grand and Eagle counties. It has also been found in Mesa County in western Colorado where it is described as an large island surrounded by agricultural fields. This sparse grassland occupies stabilized badlands with rolling topography, commonly on ridgetops. It is found on uncommon substrates, occurring on soils derived from shales or mudstones. Improperly managed livestock grazing could potentially increased soil erosion and decrease cover of palatable plant species in increase weedy species.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This is a relatively sparse, chasmophytic community with 25% total cover.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Steep clay slopes with soil creep. One site may have become established on fill material from a road cut.

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0020, CURE.0305 and 1 observation point: BLCA_AA.641).
Local Description Authors: J. Von Loh
Global Description Authors: M.S. Reid, mod. K.A. Schulz

REFERENCES: Baker 1984a, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Driscoll et al. 1984, Francis 1983, Lyon pers. comm., Reid et al. 1994, Strong 1980, Terwilliger and Tiedemann 1978, Thorne Ecological Institute 1973a, Tiedemann et al. 1987, Western Ecology Working Group n.d.

Bromus inermis - (Pascopyrum smithii) Semi-natural Herbaceous Vegetation

Smooth Brome - (Western Wheatgrass) Semi-natural Herbaceous Vegetation

Smooth Brome Semi-natural Grassland

CODE	CEGL005264
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
ALLIANCE	*BROMUS INERMIS* SEMI-NATURAL HERBACEOUS ALLIANCE (A.3561) Smooth Brome Semi-natural Herbaceous Alliance
ECOLOGICAL SYSTEM(S):	Inter-Mountain Basins Semi-Desert Grassland (CES304.787) Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824) Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)
USFWS WETLAND SYSTEM:	Not applicable

CONCEPT SUMMARY
Globally
This smooth brome grassland type occurs widely throughout the northern Great Plains, in disturbed montane meadows in the Rocky Mountains, on relatively mesic sites in the semi-arid interior western United States, and perhaps more widely in the midwestern U.S. and Canada. Stands can occur in a wide variety of human-disturbed habitats, including highway rights-of-way, jeep trails, etc. The type is also widely planted for revegetating disturbed land, pasture and hay fields, and has escaped into a variety of habitats, including prairie, riparian grasslands, and mesic mountain meadows. The dominant grass is *Bromus inermis*, a naturalized species from Eurasia that forms moderately dense to dense stands that often develop into monocultures. Other weedy species such as *Cirsium arvense* and *Poa pratensis* may occur as well, but native species are generally less than 10% cover. Native species may include mixed-grass prairie and montane meadow grasses, such as *Pascopyrum smithii, Deschampsia caespitosa*, and *Hesperostipa comata (= Stipa comata)*, and sparse, scattered mesic shrubs such as *Symphoricarpos* spp., as well as many others. However, the native species are not conspicuous enough to identify the native plant association that could occupy the site, or the stand would be typed as such.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This rare association was sampled in the Gunnison River floodplain at Cooper's Ranch in Curecanti National Recreation Area. This site is former private ranchland, and stands with similar vegetation composition and hydrology are likely to occur on private lands adjacent to the NPS-managed property.

Globally
This type occurs widely throughout the northern Great Plains, montane meadows in the Rocky Mountains, in relatively mesic sites in Utah and Wyoming, and perhaps more widely in the midwestern and western U.S. and Canada, as well where *Bromus inermis* has escaped from revegetation and forage plantings.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This herbaceous association occurs on intermittently flooded sites in the floodplain of the Gunnison River. The site is nearly flat (2% slope), occurs at 2313 m elevation, and is oriented to the southeast. The unvegetated surface has high cover of litter and low exposure of bare soil. Parent materials are Quaternary alluvium. Soils are moderately well-drained silty clay loams.

Globally

This smooth brome grassland type occurs widely throughout the northern Great Plains, on relatively mesic sites in the semi-arid interior western United States, and perhaps more widely in the midwestern U.S. and Canada. Stands can occur in a wide variety of human-disturbed habitats, including highway rights-of-way, jeep trails, etc. The type is also widely planted for revegetating disturbed land, pasture and hay fields, and has escaped into a variety of habitats, including prairie, riparian grasslands, and mesic mountain meadows. This community is found at all elevational ranges with best examples occurring on mesic alluvial terraces. *Bromus inermis* grows best on moist, well-drained, finer-textured loam and clay loams, not heavy clays or sand, and does not tolerate prolonged flooding, however, it does persist quite well on well-drained sandy loam derived from granitic parent material. It also occurs in foothills and plains at lower elevations on relatively mesic sites. It occurs on poorly drained sites to rapidly drained sites with fine-textured alluvial soils derived from shale formations found in Utah. This community persists because it is rhizomatous, and once seeded, with enough moisture, will persist, regardless of elevation, soil or landform.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover is 71% in this introduced grassland type. The rhizomatous grass *Bromus inermis* forms a moderately closed stand and provides 65% cover. The remaining herbaceous layer is low to moderate in diversity and provides low cover. Additional graminoids include *Carex* sp. and *Juncus balticus*. Forbs common to this stand provide sparse cover and include *Achillea millefolium var. occidentalis, Cirsium arvense, Iris missouriensis, Solidago canadensis*, and *Thermopsis montana*. The shrub layer provides sparse cover, including tall shrubs of *Populus angustifolia* and *Salix exigua* and the short shrub *Rosa woodsii*.

Globally

This association is dominated by medium-tall (0.5-1 m) graminoids. The dominant grass is *Bromus inermis*, a naturalized species from Eurasia that forms moderately dense to dense stands that often develop into monocultures. Other weedy species, such as *Cirsium arvense*, *Poa pratensis*, and other introduced forage species, may occur as well, but native species are generally less than 10% cover. Native species may include mixed-grass prairie and montane meadow grasses, such as *Juncus balticus, Pascopyrum smithii, Deschampsia caespitosa*, and *Hesperostipa comata (= Stipa comata)*, and sparse scattered mesic shrubs, such as *Artemisia tridentata* ssp. *wyomingensis, Ericameria nauseosa*, and *Symphoricarpos* spp., and ruderal forbs, such as *Heterotheca villosa*, as well as many others. However, the native species are not conspicuous enough to identify the native plant association that could occupy the site, or the stand would be typed as such.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tall shrub/sapling	*Populus angustifolia*
Short shrub/sapling	*Rosa woodsii*
Herb (field)	*Bromus inermis*, *Juncus balticus*

Globally

Stratum	Species
Herb (field)	*Bromus inermis*, *Pascopyrum smithii*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Cirsium arvense* (exotic, High/Medium)

Globally
Exotic/Invasive: *Bromus inermis* (invasive, High/Medium), *Cirsium arvense* (exotic, High/Medium), *Poa pratensis* (invasive, Medium)

CONSERVATION STATUS RANK
Global Rank & Reasons: GNA (invasive) (17-Jun-1999). This is a naturalized type from Europe and Asia, widely planted for cover, pasture, and hay, and has escaped into a variety of habitats.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Where native species are conspicuous enough to identify the native plant association that could occupy the site, the stand should be typed as such. *Bromus inermis* occurs widely throughout the midwestern and western U.S., and perhaps this association should be broadened to include almost any stand dominated almost exclusively by *Bromus inermis*.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: The site is occasionally flooded and contains flood debris. More quantitative data are needed to describe this association locally.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0253 and 3 observation points: BLCA_AA.936, CURE_AA.0052, CURE_AA.0062).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: D. Faber-Langendoen, mod. K.A. Schulz and J. Coles

REFERENCES: Butler et al. 2002, Cogan et al. 2004, Cooper 2003, Cronquist et al. 1977, Hansen et al. 1995, MTNHP 2002b, Midwestern Ecology Working Group n.d., NDNHI unpubl. data, Salas and Pucherelli 2002, Trammel and Butler 1995, Von Loh et al. 2000

Hesperostipa comata - Achnatherum hymenoides Herbaceous Vegetation

Needle-and-Thread - Indian Ricegrass Herbaceous Vegetation

Needle-and-Thread - Indian Ricegrass Mixedgrass Prairie

CODE	CEGL001703
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
ALLIANCE	*HESPEROSTIPA COMATA* BUNCH HERBACEOUS ALLIANCE (A.1270) Needle-and-Thread Bunch Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Semi-Desert Grassland (CES304.787)
Western Great Plains Foothill and Piedmont Grassland (CES303.817)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This grassland association has been described from western Colorado, northeastern Utah and south-central Wyoming. Stands develop on benches, plateaus and ridges ranging in elevation from 1550 to 2750 m (5085-9015

feet). The stands reported from northwestern Colorado resulted from burning sagebrush shrublands on sandy soils. Slopes are gentle to moderately steep and may be oriented to any aspect. Soils tend to be well-drained, deep and sandy, although they may be derived from a variety of sources. The unvegetated ground surface is mostly covered by litter and bare ground. This grassland occurs in small to medium-sized patches, often in sagebrush shrublands that have burned. Total vegetation cover often does not exceed 40% and may be as low as 20%. *Hesperostipa comata* and *Achnatherum hymenoides* codominate the vegetation, and *Pascopyrum smithii* and *Elymus elymoides* are common secondary species. Forbs have moderate diversity but are inconsistent among sites; common species include *Phlox hoodii, Eriogonum flavum,* and *Sphaeralcea coccinea*. Scattered shrubs are often present, including *Artemisia tridentata* ssp. *wyomingensis, Krascheninnikovia lanata, Gutierrezia sarothrae,* and *Ericameria nauseosa*. Other species sometimes present with low cover include *Cerastium arvense, Carex* spp., *Symphyotrichum laeve (= Aster laevis), Achillea millefolium, Equisetum laevigatum, Iva axillaris, Taraxacum officinale, Poa palustris,* and *Penstemon confertus*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This uncommon association was sampled near South Willow Creek and in Kezar Basin in Curecanti National Recreation Area.

Globally
This type has been described from western Colorado, northeastern Utah and the Great Divide Basin of south-central Wyoming. Other basins in south-central and southwestern Wyoming are similar in climate and geology, and this association may well extend over a wide area of the two states.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This herbaceous vegetation association occurs on the slopes of mesas and ridges. Sites are gently sloped to moderately steep (11-43%), occur between 2390 and 2562 m elevation, and are oriented to western aspects. The unvegetated surface has high cover of large rocks and gravel and low cover of litter. Exposure of bare soil is low to moderate. Parent materials are Tertiary volcanic rocks of Fish Canyon tuff and West Elk breccia. Soils are rapidly drained loamy sands and sandy loams.

Globally
This grassland association has been described from western Colorado, northeastern Utah and the Great Divide Basin in south-central Wyoming. Stands develop on benches, plateaus and ridges ranging in elevation from 1550 to 2750 m (5085-9015 feet). Slopes are gentle to moderately steep and may be oriented to any aspect. Soils tend to be well-drained, deep and sandy, although they may be derived from a variety of sources. The unvegetated ground surface is mostly covered by litter and bare ground.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association occurs as small patches (less than 0.5 ha) on harsh, xeric sites. Total vegetation cover ranges up to 19%. The bunch grasses *Hesperostipa comata* and *Achnatherum hymenoides* form scattered to open stands and range in cover from 1 to 5% and <1 to 2%, respectively. The herbaceous layer is low to moderate in terms of species diversity and provides low cover. Other graminoid species include *Elymus elymoides* and *Pascopyrum smithii*. Forbs contribute low cover, *Sphaeralcea coccinea* being the only constant species that occurs along with *Eriogonum flavum* and *Phlox hoodii*. The shrub layer is comprised of sparse dwarf-shrubs that include *Artemisia frigida, Gutierrezia sarothrae,* and *Krascheninnikovia lanata*. Species of lichen, including foliose lichens, contribute low cover, up to 5%.

Globally
This grassland occurs in small to medium-sized patches, often in sagebrush shrublands that have burned. Total vegetation cover often does not exceed 40% and may be as low as 20%. *Hesperostipa comata* and *Achnatherum hymenoides* codominate the vegetation, and *Pascopyrum smithii* and *Elymus elymoides* are common secondary species. Forbs have moderate diversity but are inconsistent among sites; common species include *Phlox hoodii, Eriogonum flavum,* and *Sphaeralcea coccinea*. Scattered shrubs are often present, including *Artemisia tridentata* ssp. *wyomingensis, Krascheninnikovia lanata, Gutierrezia sarothrae,* and *Ericameria nauseosa*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia frigida, Gutierrezia sarothrae, Krascheninnikovia lanata*
Herb (field)	*Sphaeralcea coccinea*
Herb (field)	*Achnatherum hymenoides, Elymus elymoides, Hesperostipa comata*

Globally

Stratum	Species
Herb (field)	*Achnatherum hymenoides, Hesperostipa comata*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Exotic/Invasive: *Bromus tectorum* (exotic, High)

CONSERVATION STATUS RANK
Global Rank & Reasons: G2? (30-Nov-1998). This type apparently has been described in western Colorado and in the Great Divide Basin of south-central Wyoming. Other basins in south-central and southwestern Wyoming are similar in climate and geology, and this association may well extend over a wide area of the two states. The G2 portion of the rank is based on a limited known range and few known stands. The "?" portion of the rank indicates the strong uncertainty over the distribution of this association and its relationship to *Hesperostipa comata* types named from other areas.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This grassland needs to be rechecked against the *Oryzopsis hymenoides - Stipa comata* montane grassland in Baker (1984a), and a thorough comparison is needed between the information on this association and the descriptions of other grassland types in the region. Sparse stands or those with significant *Bouteloua gracilis* may be difficult to separate from *Artemisia frigida - (Bouteloua gracilis, Achnatherum hymenoides, Poa secunda)* - Lichens Rocky Mesa Dwarf-shrubland (CEGL002344). Codominance by *Achnatherum hymenoides* distinguishes this association from *Hesperostipa comata* Great Basin Herbaceous Vegetation (CEGL001705) that is widespread in the Great Basin and Colorado Plateau.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Sparse stands or those with significant *Bouteloua gracilis* may be difficult to separate from *Artemisia frigida - (Bouteloua gracilis, Achnatherum hymenoides, Poa secunda)* - Lichens Rocky Mesa Herbaceous Vegetation (CEGL002344).
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (5 plots: CURE.0090, CURE.0093, CURE.0287, CURE.0346, CURE.0371 and 3 observation points: CURE_AA.0244, CURE_AA.0547, CURE_AA.0552).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: G.P. Jones, mod. J. Coles

REFERENCES: Baker 1984a, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Driscoll et al. 1984, Sweetwater Uranium Project 1978, Western Ecology Working Group n.d.

Hesperostipa comata Great Basin Herbaceous Vegetation

Needle-and-Thread Great Basin Herbaceous Vegetation

CODE	CEGL001705
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
ALLIANCE	*HESPEROSTIPA COMATA* BUNCH HERBACEOUS ALLIANCE (A.1270) Needle-and-Thread Bunch Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Semi-Desert Grassland (CES304.787)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This semi-arid grassland occurs on the Great Basin and Colorado Plateau and high plateaus of southern Utah, east into the western slope of the southern Rocky Mountains. Stands are found on a variety of sites, such as on point bars, stream terraces, in sand-filled potholes in slickrock washes, on plains, valleys, canyon floors, gentle hillslopes, knolls and bluffs, mesatops, and plateau parks. Sites are generally flat to gently sloping, but occasionally are steep (to 53% slope). Soils are variable and range from sand to silty clay. The unvegetated surface has moderate to high cover of bare soil with sparse to moderate cover of litter. Biological soil crusts are often present with low cover. The vegetation is characterized by a relatively sparse to moderate herbaceous layer (10-40% cover) that is strongly dominated by the medium-tall, cool-season bunchgrass *Hesperostipa comata*, but it may also include stands with less than 10% total vegetation cover. Low cover of other grasses, such as *Achnatherum hymenoides, Achnatherum lettermanii, Aristida purpurea, Elymus elymoides, Koeleria macrantha, Leymus salinus, Pleuraphis jamesii, Poa fendleriana*, or *Sporobolus cryptandrus*, may be present. However, *Bouteloua eriopoda* is not present. Forb cover ranges from sparse to moderate and may be diverse. Associated forbs include *Balsamorhiza sagittata, Hymenopappus filifolius, Machaeranthera canescens, Sphaeralcea coccinea, Vicia americana*, and species of *Antennaria, Astragalus, Cryptantha, Eriogonum, Gilia*, and *Lappula*. Scattered shrubs and dwarf-shrubs may present with less than 5% total cover. Common species include *Artemisia tridentata, Chrysothamnus viscidiflorus, Ericameria nauseosa, Gutierrezia sarothrae, Krascheninnikovia lanata, Opuntia polyacantha*, and *Symphoricarpos oreophilus*. The widespread introduced annual grass *Bromus tectorum* often contributes significant cover in disturbed stands. Some stands have high cover of biological soil crusts.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is widely distributed throughout the project area, at low to middle elevations and was sampled on the south side of Blue Mesa Reservoir, near Red Creek, at the base of the Dillon Pinnacles, south of Willow Creek near the Powerline Road, along the Beaver-Stueben Jeep Road, and on Big Game Hill in Curecanti National Recreation Area.

Globally

This grassland is found on the west slope of the Colorado Rocky Mountains, on the Colorado Plateau and in the Great Basin in Colorado and Utah, and probably occurs in adjacent states.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This herbaceous vegetation association occurs on the slopes of mesas, hills and ridges. Sites are gently to steeply sloped (5-53%), occur between 2286 and 2461 m elevation, and are oriented to all aspects. The unvegetated surface has high cover of large and small rocks, low cover of litter, and low to moderate exposure of sand and bare soil. Parent materials are Tertiary volcanic rocks, including West Elk breccia, and Quaternary terrace deposits. Soils are rapidly drained loams, sandy loams and sands. One stand is on a blow-out feature or deflation basin.

Globally
This grassland occurs on the Great Basin and Colorado Plateau east into the western slope of the southern Rocky Mountains. Stands are found a variety of sites, such as on point bars, stream terraces, in sand-filled potholes in slickrock washes, on plains, valleys, canyon floors, gentle hillslopes, knolls and bluffs, mesatops, and plateau parks. Sites are generally flat to gently sloping, but occasionally are steep (to 53% slope). Elevation ranges from 1250-2683 m. The unvegetated surface has moderate to high cover of bare soil with sparse to moderate cover of litter. Biological soil crusts are often present with low cover. Soils are variable and include sand, cobbles, sandy, silt and clay loams and silty clay. Common parent materials are sandstones and shale that have been eroded and redistributed in alluvial and eolian deposits, but include Tertiary volcanic rocks. Fires may be important in maintaining these grasslands by reducing woody cover, but burning during the growing season could also damage *Hesperostipa comata* plants.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 20 to 70% in these stands. The bunchgrass *Hesperostipa comata* forms a sparse to uniform canopy and provides from 2 to 63% cover. The herbaceous layer is diverse and provides moderate to dense cover. Other graminoid species contribute low to moderate cover and include *Achnatherum hymenoides, Bouteloua gracilis, Elymus elymoides, Koeleria macrantha, Pleuraphis jamesii*, and *Poa secunda*. Forbs are common and variable, providing sparse to low cover, and include *Arabis crandallii, Arabis lignifera, Balsamorhiza sagittata, Cryptantha flavoculata, Phlox hoodii, Packera tridenticulata*, and *Sphaeralcea coccinea*. The shrub layer provides sparse to low cover and includes the short and dwarf-shrubs *Artemisia frigida, Gutierrezia sarothrae, Krascheninnikovia lanata, Opuntia polyacantha, Pediocactus simpsonii*, and *Yucca harrimaniae*. Both crustose and foliose lichens are often present, usually contribute 1-2% cover, but may occasionally contribute up to 50% cover. The herbaceous layer is diverse and provides moderate cover. Additional graminoids provide sparse to low cover and include *Achnatherum hymenoides, Bromus tectorum, Carex geyeri, Elymus canadensis, Elymus elymoides*, and *Pascopyrum smithii*. Forbs provide sparse cover and include *Cryptantha flavoculata*. The shrub layer is low in diversity and provides sparse cover, including the short and dwarf-shrubs *Artemisia tridentata* ssp. *vaseyana, Chrysothamnus viscidiflorus*, and *Symphoricarpos rotundifolius*, and the succulents *Opuntia fragilis* and *Echinocereus triglochidiatus*.

Globally
This association is characterized by a relatively sparse to moderate herbaceous layer (10-40% cover) that is strongly dominated by the medium-tall, cool-season bunchgrass *Hesperostipa comata*, but it may also include stands with less than 10% total vegetation cover. Low cover of other grasses, such as *Achnatherum hymenoides, Achnatherum lettermanii, Aristida purpurea, Elymus elymoides, Koeleria macrantha, Leymus salinus, Pleuraphis jamesii, Poa fendleriana, Poa secunda, Sporobolus airoides*, or *Sporobolus cryptandrus*, may be present. However, *Bouteloua eriopoda* is not present. Forb cover ranges from sparse to moderate and may be diverse. Associated species include *Artemisia campestris, Artemisia dracunculus, Artemisia ludoviciana, Balsamorhiza sagittata, Cirsium arizonicum, Cryptantha crassisepala, Hymenopappus filifolius, Machaeranthera canescens, Sphaeralcea coccinea, Vicia americana*, and species of *Antennaria, Astragalus, Eriogonum, Gilia*, and *Lappula*. Scattered shrubs and dwarf-shrubs may present with less than 5% total cover. *Artemisia tridentata* ssp. *tridentata, Artemisia tridentata* ssp. *vaseyana, Atriplex canescens, Chrysothamnus depressus, Chrysothamnus viscidiflorus, Ericameria nauseosa, Gutierrezia sarothrae, Krascheninnikovia lanata, Opuntia polyacantha, Purshia tridentata, Ribes cereum*, and *Symphoricarpos oreophilus* have been reported from this grassland. The widespread introduced annual grass *Bromus tectorum* often contributes significant cover in disturbed stands. Several other exotic species may be present to abundant and include *Salsola tragus, Bassia scoparia (= Kochia scoparia), Poa pratensis, Sisymbrium altissimum*, and *Tragopogon dubius*. Some stands have high cover of cryptogams on the soil, including *Collema tenax, Tortula ruralis, Buellia papillata*, and *Fulgensia bracteata* (Kleiner and Harper 1977).

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Short shrub/sapling	*Artemisia frigida*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, *Opuntia polyacantha*, *Pediocactus simpsonii*, *Yucca harrimaniae*
Herb (field)	*Chrysothamnus viscidiflorus*

Herb (field)	*Cryptantha flavoculata, Packera tridenticulata, Phlox hoodii, Sphaeralcea coccinea*
Herb (field)	*Achnatherum hymenoides, Bouteloua gracilis, Elymus elymoides, Hesperostipa comata, Pleuraphis jamesii, Poa secunda*

Globally

Stratum	Species
Herb (field)	*Hesperostipa comata*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Vulnerable: *Astragalus anisus* (globally imperiled endemic, G2G3); **Exotic/Invasive**: *Bromus tectorum* (exotic, High)

Globally
Vulnerable: *Arabis crandallii* (globally imperiled, G2), *Astragalus anisus* (globally imperiled, G2G3), *Cirsium arizonicum* (UT state -vulnerable, G5); **Exotic/Invasive**: *Bassia scoparia* (exotic, Low), *Bromus tectorum* (exotic, High), *Poa pratensis* (exotic, Medium), *Salsola tragus* (exotic), *Sisymbrium altissimum* (exotic), *Tragopogon dubius* (exotic, Medium/Low)

CONSERVATION STATUS RANK
Global Rank & Reasons: G2G4 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association is composed of relatively pure *Hesperostipa comata* grasslands in the Intermountain West. The similar associations are distinguished by the codominance by other grass species or a shrub layer.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Sparse stands or those with significant *Bouteloua gracilis* may be difficult to separate from *Artemisia frigida - (Bouteloua gracilis, Achnatherum hymenoides, Poa secunda)* - Lichens Rocky Mesa Herbaceous Vegetation (CEGL002344).
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (7 plots: CURE.0004, CURE.0019, CURE.0024, CURE.0054, CURE.0119, CURE.0316, CURE.0375 and 2 observation points: BLCA_AA.435, CURE_AA.0548).
Local Description Authors: J. Von Loh, mod. G. Bradshaw and K.A. Schulz
Global Description Authors: K.A. Schulz, mod. J. Coles

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Cogan et al. 2004, Coles pers. comm., Daubenmire 1970, Driscoll et al. 1984, FEIS 1998, Kleiner 1968, Kleiner 1983, Kleiner and Harper 1977, Thilenius et al. 1995, Western Ecology Working Group n.d.

Poa fendleriana Herbaceous Vegetation

Muttongrass Herbaceous Vegetation

CODE	CEGL001925
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
ALLIANCE	*POA FENDLERIANA* HERBACEOUS ALLIANCE (A.1336) Muttongrass Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This herbaceous association was observed on lower slopes of hills and midslopes of ridges and mesas in western Colorado, eastern and southern Utah and is likely more widespread. Sites are flat, moderately steep to steep (11-55% slopes), occur between 2339 to 2700 m elevation, and include all aspects. The unvegetated surface has sparse to low cover of litter and low to high cover by large and small rocks and exposures of bare soil. Parent materials are Tertiary volcanic rocks that have eroded to colluvium or talus on slopes. Soils are rapidly drained and texturally range from loamy sand to sandy clay loam and sandy loam. This sparsely to moderately vegetated grassland is characterized by the bunchgrass *Poa fendleriana* that provides from up to 25% cover. The herbaceous layer is often diverse and may include low cover of graminoids such as *Achnatherum pinetorum, Agropyron cristatum, Bouteloua gracilis, Bromus tectorum*, and *Elymus elymoides*. Forbs commonly present include *Antennaria dimorpha, Eriogonum umbellatum, Lepidium montanum, Phlox hoodii, Senecio spartioides var. multicapitatus (= Senecio multicapitatus)*, and *Sphaeralcea parvifolia*. Scattered tall, short and dwarf-shrubs may be present, such as *Artemisia frigida, Chrysothamnus depressus, Fraxinus anomala, Gutierrezia sarothrae, Krascheninnikovia lanata, Mahonia fremontii*, and *Purshia tridentata*. Cryptogam cover is sparse for all sampled stands.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was observed and sampled in the Red Rocks area of Black Canyon of the Gunnison National Park, on Tenderfoot Hill in Curecanti National Recreation Area, and in Kezar Basin on adjacent BLM land.

Globally

This herbaceous association was observed on lower slopes of hills and midslopes of ridges and mesas in western Colorado and eastern Utah and is likely more widespread.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This herbaceous association was observed on lower slopes of hills and midslopes of ridges and mesas. Sites are moderately steep to steep (11-55% slopes), occur between 2339 to 2640 m elevation, and include all aspects. The unvegetated surface has sparse to low cover of litter and low to high cover by large and small rocks and exposures of bare soil. Parent materials are Tertiary volcanic rocks that have eroded to colluvium or talus on slopes. Soils are rapidly drained and texturally range from loamy sand to sandy clay loam and sandy loam.

Globally

This herbaceous association was observed on lower slopes of hills and midslopes of ridges and mesas. Sites occur on moderately steep to steep (11-55%) slopes between 1750 and 2700 m elevation and include all aspects. The unvegetated surface has sparse to low cover of litter and low to high cover by large and small rocks and exposures of bare soil. Parent materials are Tertiary volcanic rocks that have eroded to colluvium or talus on slopes or sandstones that have been eroded to alluvium. Soils are well- to rapidly drained and texturally range from loamy sand to sandy clay loam and sandy loam. The cryptogamic soil community provides low cover.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 5 to 40% in these stands. This herbaceous association is characterized by the bunchgrass *Poa fendleriana* that provides from 1 to 25% cover. The herbaceous layer is diverse and provides low to moderate cover. Additional graminoids that provide sparse cover include *Achnatherum pinetorum, Agropyron cristatum, Bouteloua gracilis, Bromus tectorum*, and *Elymus elymoides*. Forbs commonly present and providing sparse cover include *Antennaria dimorpha, Eriogonum umbellatum*, and *Phlox hoodii*. The short and dwarf-shrubs provide sparse cover and include *Chrysothamnus depressus, Gutierrezia sarothrae*, and *Purshia tridentata*. Cryptogam cover is sparse for all sampled stands.

Globally
This herbaceous association is characterized by a sparse to moderately dense herbaceous layer (5-40% total cover) that is typically dominated by the bunchgrass *Poa fendleriana* that provides from up to 25% cover. The herbaceous layer is often diverse and may include graminoids that provide low cover of *Achnatherum pinetorum, Agropyron cristatum, Bouteloua gracilis, Bromus tectorum*, and *Elymus elymoides*. Forbs commonly present include *Antennaria dimorpha, Eriogonum umbellatum, Lepidium montanum, Phlox hoodii, Senecio spartioides var. multicapitatus (= Senecio multicapitatus)*, and *Sphaeralcea parvifolia*. Scattered tall, short and dwarf-shrubs may be present, such as *Artemisia frigida, Chrysothamnus depressus, Fraxinus anomala, Gutierrezia sarothrae, Krascheninnikovia lanata, Mahonia fremontii*, and *Purshia tridentata*. The cryptogamic soil community provides low cover and includes dark cyanobacteria, moss, *Collema* sp., and *Fulgensia* sp.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Gutierrezia sarothrae*
Herb (field)	*Crepis acuminata, Eriogonum umbellatum, Phlox hoodii*
Herb (field)	*Bouteloua gracilis, Poa fendleriana*

Globally

Stratum	Species
Herb (field)	*Poa fendleriana*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Exotic/Invasive: *Agropyron cristatum* (invasive/exotic, Medium/Low), *Bromus tectorum* (invasive/exotic, High)

CONSERVATION STATUS RANK
Global Rank & Reasons: GU (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data from Loder (1964) and Olgeirson (1972, 1974) indicate that this association may also occur in the subalpine/alpine zones. The data contained in these references do not give enough information to say for certain that this is a valid association. More field inventories are needed.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (3 plots: BLCA.0099, CURE.0221, CURE.0342 and 3 observation points: BLCA_AA.289, BLCA_AA.640, BLCA_AA.789).

Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: K.A. Schulz, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Driscoll et al. 1984, Loder 1964, Olgeirson 1972, Olgeirson 1974, Western Ecology Working Group n.d.

Poa pratensis - (Pascopyrum smithii) Semi-natural Herbaceous Vegetation

Kentucky Bluegrass - (Western Wheatgrass) Semi-natural Herbaceous Vegetation

Kentucky Bluegrass Semi-natural Grassland

CODE	CEGL005265
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
ALLIANCE	*POA PRATENSIS* SEMI-NATURAL HERBACEOUS ALLIANCE (A.3562) Kentucky Bluegrass Semi-natural Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY
Globally
This Kentucky bluegrass type is widespread throughout the Great Plains, the midwestern United States and plains of Canada, throughout montane elevations in the Colorado Plateau and southern Rocky Mountains. Stands can occur in a wide variety of upland human-disturbed and native habitats. Stands are typically found on fine-textured, poorly drained, often alluvial or well-developed soils that are topographically situated to receive supplemental moisture, such as flat areas, swales, creek bottoms, riparian areas, moist toeslopes of upland draws and drainages. The vegetation is dominated by medium-tall (0.5-1 m) graminoids. The dominant grass is *Poa pratensis*, considered to be both a native and naturalized species from Eurasia. Other native species may occur as well, but they are generally less than 10% cover. Native species may include mixed-grass prairie grasses, such as *Pascopyrum smithii* and *Hesperostipa comata (= Stipa comata)*, as well as others. Where native species are conspicuous enough to identify the native plant association that could occupy the site, the stand should be typed as such. This type includes only naturalized examples of *Poa pratensis* stands. Maintained lawns are treated as cultural types.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association was only sampled on private lands of the Curecanti Ranch, occupying a nearly level, irrigated terrace.

Globally
This Kentucky bluegrass type is potentially widespread throughout the Great Plains and into the midwestern United States and Canada. Stands are also found on upland sites in the northwestern Great Plains and occur elsewhere in the western U.S. where *Poa pratensis* has invaded native western rangeland.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This herbaceous vegetation association occurs in a swale on a high terrace above Curecanti Creek on Curecanti Ranch. The site is nearly flat (3% slope), occurs at 2574 m elevation, and is oriented to the northwest. The unvegetated surface has high cover of litter and moderate cover of large rocks and cattle and elk scat. Parent materials are Mesozoic shale. Soils are poorly drained sandy loams.

Globally
This Kentucky bluegrass type is potentially widespread throughout the Great Plains and into the midwestern United States and Canada, at montane elevations in the Colorado Plateau and southern Rocky Mountains, and elsewhere in the western U.S. where the introduced perennial *Poa pratensis* has invaded native western rangeland. Stands can occur in a wide variety of upland human-disturbed and native habitats. Stands in western North Dakota are found on deep, well-developed, fine-textured soils that are topographically situated to receive supplemental moisture in the form of runoff from adjacent slopes. Such conditions exist in the toeslopes of upland draws and drainages, and in shallow depressions on north- and east-facing, nearly level slopes. Stands in the semi-arid western U.S. are typically found at montane elevations (1800-3250 m) on lowland and relatively mesic upland sites, such as canyon floors and swales on high terraces with permanently saturated soils. Substrates are also typically finer-textured, poorly drained alluvial soils. The unvegetated surface has a moderate to high cover of litter.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is 65% in this introduced grassland type. The non-native grass *Poa pratensis* forms an open canopy and provides up to 25% cover, along with the native graminoids *Juncus balticus* and *Pascopyrum smithii* that provide 15% and 5% cover, respectively. The herbaceous layer is somewhat diverse and provides moderate cover. Forbs provide low to moderate cover and include *Taraxacum officinale, Achillea millefolium var. occidentalis,* and Asteraceae sp. (= *Aster* sp.). The short shrub *Artemisia tridentata* ssp. *vaseyana* provides sparse cover.

Globally
The vegetation is dominated by medium-tall (0.5-1 m) graminoids. The dominant grass is *Poa pratensis*, considered to be both a native and naturalized species from Eurasia (Great Plains Flora Association 1986, Gleason and Cronquist 1991). Other native species may occur as well, but they are generally less than 10% cover. Native species may include mixedgrass prairie grasses, such as *Pascopyrum smithii* and *Hesperostipa comata (= Stipa comata)*, as well as other mesic forbs, such as *Achillea millefolium* and exotic *Taraxacum officinale*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Herb (field)	*Achillea millefolium* var. *occidentalis, Taraxacum officinale*
Herb (field)	*Juncus balticus, Pascopyrum smithii, Poa pratensis*

Globally

Stratum	Species
Herb (field)	*Poa pratensis*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Tragopogon dubius* (exotic, Medium/Low)

Globally
Exotic/Invasive: *Poa pratensis* (invasive, Medium), *Taraxacum officinale* (exotic)

CONSERVATION STATUS RANK
Global Rank & Reasons: GNA (invasive) (17-Jun-1999). This is primarily a naturalized type from Europe and Asia, widely planted for lawns and pasture, and it has escaped into a variety of habitats (Great Plains Flora Association 1986, Gleason and Cronquist 1991). Although native populations do exist and may be integral parts of some prairie and other native habitats, most stands that are thoroughly dominated by *Poa pratensis* are a result of human modifications to the habitat.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.
Globally
The debate over whether *Poa pratensis* is either native or introduced appears to be resolved in favor of it being both (Great Plains Flora Association 1986, Gleason and Cronquist 1991). The Great Plains Flora Association (1986) cites

Boivin and Love (1960) as the source of this decision. Gleason and Cronquist (1991) state that in most parts of their Manual's range (Northeast and Midwest United States and adjacent Canada), the species is introduced, but that it is probably native along their northern boundary and in Canada.

This type could be narrowly restricted to mixed-grass prairie stands where *Poa pratensis* dominates to the exclusion of most other species, or it could be expanded to include almost any naturalized stand dominated by *Poa pratensis*. Where native species are conspicuous enough to identify the native plant association that could occupy the site, the stand should be typed as such. This type includes only naturalized examples of *Poa pratensis* stands. Maintained lawns are treated as cultural types.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Stand occurs below an irrigated pasture and associated ditch.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0300 and 7 observation points: BLCA_AA.450, BLCA_AA.891, BLCA_AA.949, CURE_AA.0158, CURE_AA.0475, CURE_AA.0537, CURE_AA.0595).
Local Description Authors: J. Von Loh
Global Description Authors: D. Faber-Langendoen, mod. K.A. Schulz

REFERENCES: Butler et al. 2002, Gleason and Cronquist 1991, Great Plains Flora Association 1986, MTNHP 2002b, Midwestern Ecology Working Group n.d., NDNHI unpubl. data, Trammell 1994, USFS 1937, Von Loh et al. 2000

Carex duriuscula Herbaceous Vegetation

Needleleaf Sedge Herbaceous Vegetation

Sedge Wet Meadow

CODE	CEGL001874
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Short sod temperate or subpolar grassland (V.A.5.N.e.)
ALLIANCE	*CAREX DURIUSCULA* HERBACEOUS ALLIANCE (A.1283) Needleleaf Sedge Herbaceous Alliance
ECOLOGICAL SYSTEM(S):	Rocky Mountain Alpine-Montane Wet Meadow (CES306.812) Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)
USFWS WETLAND SYSTEM:	Not applicable

CONCEPT SUMMARY
Globally
This herbaceous association is abundant in foothills and mountain slopes of the southern Rocky Mountains, on mesatops in adjacent dry plains, and may be more widespread in the Great Plains and western North America. Elevation ranges from 1200 to 2500 m (occasionally up to 3000 m). Stands occur in open parks on mesas in plains near mountain fronts and in foothill and montane zones on flat or gentle slopes with coarse-textured soil. This is also one of the early communities to develop on "rock-wash" alluvial fans that exit from canyons. Substrates are rapidly drained silty clay loams to coarse sandy and gravelly soil (granitic) lacking humus, often with moderate to high cover of large and small rocks and low cover of bare ground. Vegetation is characterized by an open to moderately dense graminoid layer dominated by *Carex duriuscula*. *Poa secunda* may codominate in the graminoid layer. Other associated graminoids can include *Elymus elymoides, Festuca saximontana, Hesperostipa comata, Koeleria macrantha, Poa fendleriana*, and the introduced species *Poa palustris*. Commonly occurring forbs include *Achillea*

millefolium, Artemisia campestris, Artemisia frigida, Cryptantha virgata, Gaillardia aristata, and *Tetraneuris torreyana*, and the cacti *Opuntia polyacantha*. Scattered dwarf-shrub *Krascheninnikovia lanata* may provide low cover. *Selaginella densa* is common, and lichens are important on the soil surface, sometimes providing abundant cover (about 25%).

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This rare association was sampled on the mesatop across from Elk Creek Marina in Curecanti National Recreation Area.

Globally
This herbaceous association in known from the southern Rocky Mountains of Colorado and Wyoming.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This herbaceous vegetation association occurs on mesatops. The site is nearly flat (1% slope), occurs at 2458 m elevation, and is oriented to the south. The unvegetated surface has moderate to high cover of large and small rocks and animal scat. Litter is present providing low cover, and there is low exposure of bare ground. Parent materials include Sapinero Mesa tuff. Soils are rapidly drained silty clay loams.

Globally
This herbaceous association is abundant in foothills and mountain slopes of the southern Rocky Mountains, on mesatops in adjacent dry plains, and may be more widespread in the Great Plains and western North America. Elevations range from 1200 to 2500 m (occasionally up to 3000 m) (Ramaley 1919a, c, Hermann 1970). Ramaley (1916b, 1919a, b, c) states that this type occurs in open parks on mesas in plains near mountain fronts and in foothill and montane zones on flat or gentle slopes with coarse-textured soil. This is also one of the early communities to develop on "rock-wash" alluvial fans that exit from canyons (Ramaley 1919b). Substrates are rapidly drained silty clay loams to coarse sandy and gravelly soil (granitic) lacking humus, often with moderate to high cover of large and small rocks and low cover of bare ground.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is approximately 12% in this type. The sedge *Carex duriuscula* forms an open stand and provides approximately 10% cover. The herbaceous layer is low in diversity, and associated species provide sparse cover. Additional graminoid species include *Elymus elymoides*, *Hesperostipa comata*, and *Poa fendleriana*. The forbs *Artemisia frigida* and *Tetraneuris torreyana* provide sparse cover. The shrub layer provides sparse cover and includes only *Krascheninnikovia lanata*. Lichens are an important component on this site, providing approximately 25% cover.

Globally
This herbaceous association is characterized by an open to moderately dense graminoid layer dominated by *Carex duriuscula*. *Poa secunda* may codominate in the graminoid layer. Other associated graminoids can include *Elymus elymoides, Festuca saximontana, Hesperostipa comata, Koeleria macrantha, Poa fendleriana*, and introduced *Poa palustris*. Commonly occurring forbs include *Achillea millefolium, Artemisia campestris, Artemisia frigida, Cryptantha virgata, Gaillardia aristata*, and *Tetraneuris torreyana*, and the cacti *Opuntia polyacantha*. Scattered dwarf-shrub *Krascheninnikovia lanata* may provide low cover. *Selaginella densa* is common, and lichens are important on the soil surface, sometimes providing abundant cover (about 25%).

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Herb (field)	*Carex duriuscula*, *Elymus elymoides*

Globally

Stratum	Species
Herb (field)	*Carex duriuscula*, *Poa fendleriana*, *Poa secunda*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GUQ (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Carex stenophylla Wahlenb. and *Carex eleocharis* Bailey are synonyms for *Carex duriuscula* C.A. Mey. Immature and depauperate specimens are often confused with *Carex praegracilis*, a common prairie sedge (McGregor and Barkley 1986). This species ranges widely in the Great Plains and western North America and may occur abundantly enough locally to form a community (Hermann 1970, Kartesz 1999). More survey is needed to document stands on the plains and compare them to foothill and mountain stands.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: More quantitative data are needed to define this association.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0135).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Driscoll et al. 1984, Hermann 1970, Kartesz 1999, McGregor and Barkley 1986, Ramaley 1916b, Ramaley 1919a, Ramaley 1919b, Ramaley 1919c, Ramaley 1942, Western Ecology Working Group n.d.

Pleuraphis jamesii Herbaceous Vegetation

James' Galleta Herbaceous Vegetation

CODE	CEGL001777
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Short sod temperate or subpolar grassland (V.A.5.N.e.)
ALLIANCE	*PLEURAPHIS JAMESII* HERBACEOUS ALLIANCE (A.1287) James' Galleta Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Semi-Desert Grassland (CES304.787)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This widespread grassland association is found on alluvial flats, plateau parks, mesas and plains in the Colorado Plateau and elsewhere in the southwestern U.S. Landforms vary from mesatops and slopes to basin floors. Stands may be small woodland parks or more extensive grasslands on the plains. Soils in bottomland stands tend to be fine-textured; however, stands also occur on a variety of substrates. Vegetation is characterized by a relatively

sparse to moderately dense (10-60% cover) perennial herbaceous layer that is strongly dominated by the warm-season bunchgrass *Pleuraphis jamesii*. Low cover of other grasses, such as *Achnatherum hymenoides, Bouteloua eriopoda, Bouteloua gracilis, Hesperostipa comata, Muhlenbergia porteri, Sporobolus airoides*, or *Sporobolus cryptandrus*, may be present. Forb cover is usually sparse and includes species of *Plantago, Gilia, Lappula*, and prickly pear cacti (*Opuntia* spp.). Many species of shrubs and dwarf-shrubs may be present; however, they are not dense enough to form a shrub layer. Some stands have high cover of cryptogams on the soil surface.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This uncommon association was sampled near Red Rocks and at the Chukar Trailhead Road in the Black Canyon of the Gunnison National Park and above the Middle Bridge Boat Ramp, in Kezar Basin, and below Morrow Point Dam in Curecanti National Recreation Area.

Globally
This widespread grassland association is found on alluvial flats, plateau parks and plains in the Colorado Plateau and elsewhere in the southwestern U.S.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This herbaceous vegetation association was observed on the toe- and midslopes of ridges, ridgetops, valley sides and benches, and lower slopes of gorges in the park and recreation area. Sites are moderately sloping to steep (7-65% slopes), occur between 1875 and 2423 m elevation, and are oriented to all aspects. The unvegetated surface has low to high litter cover and often has moderate to high cover of large and small rocks and exposure of bare soil. The sites are underlain by a diversity of geologic substrate, including Tertiary volcanic and Mesozoic shale rocks and Quaternary landslide deposits. Soils reflect the diversity of substrate, ranging from rapidly drained clay loams and sandy loams to sandy clay loams and loamy sands.

Globally
This widespread grassland association is found on a variety of sites, including alluvial flats, toeslopes, valley floors, benches, hillsides, washes, colluvial slopes, plateau parks, mesas and plains in the Colorado Plateau and elsewhere in the southwestern U.S. Elevation ranges from 1220-1930 m, with a few sites on the western edge of the southern Rocky Mountains extending to 2400 m. Landforms vary from mesatops and slopes to basin floors. Sites are flat to moderately steep (up to 53% slope). Stands may be small woodland parks or more extensive on the plains. Soils are variable. In bottomland stands, soils tend to be fine-textured; however, stands also occur on sandy loams derived from sandstone, remnant lavaflow, basaltic cobbles, black or red cinders, or alluvium derived from relict Pleistocene river cobbles, sandstone, sand, or clay soils.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 7 to 90% in these stands. This herbaceous association is characterized by the short bunchgrass *Pleuraphis jamesii* that ranges in cover from 5 to 75%. The herbaceous layer is moderately diverse and can provide moderate cover. Additional graminoids commonly present and providing sparse to low cover include *Bromus tectorum, Bouteloua gracilis*, and *Hesperostipa comata*. Forbs are diverse but typically provide sparse cover and include the exotic annuals *Erodium cicutarium* and *Descurainia pinnata*. Short and dwarf-shrubs are diverse and provide sparse cover, including *Opuntia fragilis* and *Opuntia polyacantha*. Cryptogams are absent or sparse and typically provide less than 1% cover.

Globally
This association is characterized by a sparse to moderately dense perennial herbaceous layer (5-60% cover) that is strongly dominated by the warm-season bunchgrass *Pleuraphis jamesii*. Low cover of other grasses, such as *Aristida* spp., *Achnatherum hymenoides, Achnatherum speciosum, Bouteloua eriopoda, Bouteloua gracilis, Hesperostipa comata, Muhlenbergia porteri, Sporobolus airoides*, or *Sporobolus cryptandrus*, may be present. Forb cover is usually sparse and includes *Artemisia campestris, Cymopterus newberryi, Eriogonum inflatum, Phacelia crenulata, Plantago patagonica, Sphaeralcea parvifolia*, and *Townsendia annua* along with species of *Gilia, Lappula, Zinnia*, and prickly-pear cacti (*Opuntia* spp.). Many species of shrubs and dwarf-shrubs may be present, but they are not abundant enough to form a shrub layer. Woody species may include *Artemisia bigelovii, Artemisia filifolia, Atriplex canescens, Atriplex confertifolia, Brickellia oblongifolia, Ephedra torreyana, Ephedra viridis, Ericameria nauseosa,*

Fallugia paradoxa, *Gutierrezia* spp., *Krascheninnikovia lanata*, *Tetradymia* spp., and occasional *Juniperus* spp. trees. The widespread introduced annual grass *Bromus tectorum* and several other exotic species, such as *Salsola kali*, *Bassia scoparia (= Kochia scoparia)*, and *Sisymbrium altissimum*, may be present to abundant, especially on disturbed sites. Some stands have high cover of cryptogams on the soil, including *Collema tenax, Tortula ruralis, Buellia papillata*, and *Fulgensia bracteata*.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Opuntia fragilis*, *Opuntia polyacantha*
Herb (field)	*Erodium cicutarium*
Herb (field)	*Bromus tectorum*, *Hesperostipa comata*, *Pleuraphis jamesii*

Globally

Stratum	Species
Herb (field)	*Pleuraphis jamesii*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Exotic/Invasive: *Bassia scoparia* (exotic, Low), *Bromus tectorum* (exotic, High), *Salsola kali* (exotic), *Sisymbrium altissimum* (exotic)

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G4 (23-Feb-1994).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association is defined by the dominance of *Pleuraphis jamesii* in the graminoid layer without codominance of other grass species or the presence of a shrub layer.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Sites are moderately grazed, and signs of sheep and elk are abundant. Type occurs on deeper soils of exposed ridgetops.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (6 plots: BLCA.0098, BLCA.0106, BLCA.0112, CURE.0040, CURE.0134, CURE.0190 and 1 observation point: CURE_AA.0516).
Local Description Authors: J. Von Loh, mod. J. Coles
Global Description Authors: K.A. Schulz, mod. J. Coles and G. Kittel

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Cannon 1960, Cogan et al. 2004, Collins 1984, Driscoll et al. 1984, Francis 1986, Francis and Aldon 1983, Hansen et al. 2004b, Helm 1981, Kleiner 1968, Kleiner 1983, Kleiner and Harper 1972, Kleiner and Harper 1977, Marr et al. 1973a, Nichol 1937, Salas et al. 2009, Stewart et al. 1940, USFS 1937, Utah Environmental and Agricultural Consultants 1973, Von Loh et al. 2002, Weaver and Albertson 1956, West et al. 1972, Western Ecology Working Group n.d.

Hordeum jubatum Herbaceous Vegetation

Foxtail Barley Herbaceous Vegetation

Foxtail Barley Meadow

CODE	CEGL005285
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Temporarily flooded temperate or subpolar grassland (V.A.5.N.j.)
ALLIANCE	*HORDEUM JUBATUM* TEMPORARILY FLOODED HERBACEOUS ALLIANCE (A.1358) Foxtail Barley Temporarily Flooded Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Playa (CES304.786)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This foxtail barley community type is found in the mountains and basins of the western United States and Canada north into the Boreal Plains of Alberta, in intermountain parks in Colorado and northeastern Utah and may occur elsewhere in the interior western U.S. Stands are found in lowlands with moderately to strongly saline or alkaline soils. The topography is flat, and the soils are often flooded or saturated in the spring. The vegetation is dominated by short and medium tall graminoids with a total vegetation cover of nearly 100%. Shrubs are usually absent. *Hordeum jubatum* dominates the community. Other common species in this community are *Elymus trachycaulus, Distichlis spicata, Pascopyrum smithii, Poa arida, Poa compressa*, and *Rumex crispus*.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This common association occupies the disturbed shoreline habitat of Blue Mesa Reservoir in the Curecanti National Recreation Area.

Globally

This foxtail barley community type is found in the mountains and basins of the western U.S. and Canada, ranging from New Mexico and Utah north to Alberta, where it occurs north into the Boreal Plains.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is found on disturbed shorelines of reservoirs and in moist depressions. Sites are flat to gently sloping (to 4-degree slopes) and occur at 2292 and 2298 m elevation. Sampled sites have mostly southerly or northerly aspects, but that is an artifact of the reservoir's shape. The unvegetated ground surface has moderate to high cover of bare ground, low to moderate cover of rocks and gravel and very low cover of litter.

Globally

This association has been reported from lowlands across the northern Great Plains, north into the Boreal Plains and in intermountain parks in Colorado and northeastern Utah. The climate is semi-arid continental with mean annual precipitation of 25-48 cm. Elevation generally ranges from 600-1600 m and up to 2600 m in South Park, Colorado. Stands are located in lowlands with moderately to strongly saline soils (Barnes and Tieszen 1978). Soils may also be alkaline (Thompson and Hansen 2002). The topography is flat, and the soils are often flooded or saturated in the spring (Redmann 1972). *Hordeum jubatum* is often found dominating disturbed areas such as roadsides and overgrazed bottomland.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This foxtail barley herbaceous association is common on disturbed reservoir shorelines and characterized by a sparse herbaceous layer dominated or codominated by the native graminoid *Hordeum jubatum*. Other species include *Bromus tectorum, Medicago sativa, Poa pratensis, Sisymbrium altissimum,* and scattered *Ericameria nauseosa (= Chrysothamnus nauseosus)* shrubs.

Globally
The typically dense vegetation is dominated by short and medium-tall graminoids with a total vegetation cover of nearly 100%, but it may occur as sparser stands (15-30% cover) (Barnes and Tieszen 1978, Von Loh 2000). Shrubs are usually absent. *Hordeum jubatum* dominates the community. No other dominants are usually associated with this association, perhaps due to fluctuating moisture conditions in combination with an alkaline or saline environment. Other common species in this community are *Elymus trachycaulus, Distichlis spicata, Pascopyrum smithii, Poa arida, Poa compressa, Rumex crispus, Ambrosia tomentosa*, and *Malvella leprosa*. Introduced species may be common in some stands, including *Bassia scoparia (= Kochia scoparia), Sonchus arvensis*, and *Lepidium latifolium*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Herb (field)	*Hordeum jubatum*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus tectorum* (exotic, High), *Medicago sativa* (exotic, Insignificant), *Poa pratensis* (exotic, Medium), *Sisymbrium altissimum* (exotic)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G4 (19-May-2010).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Although this is a common community type in the interior West, it is poorly sampled and defined. This abstract is based on two descriptions of *Hordeum jubatum*-dominated stands which are assumed to be examples of this community, and plot data from a single national park (Colorado National Park). These stands may be variants of *Distichlis spicata - Hordeum jubatum - Puccinellia nuttalliana - Suaeda calceoliformis* Herbaceous Vegetation (CEGL002273) and *Pascopyrum smithii - Hordeum jubatum* Herbaceous Vegetation (CEGL001582). The relationship between *Hordeum jubatum* Herbaceous Vegetation (CEGL001798) and these types is unclear. Both communities usually contain *Hordeum jubatum* and *Distichlis spicata* or *Pascopyrum smithii* in varying amounts. The presence of *Puccinellia nuttalliana* or *Suaeda calceoliformis* may be distinguishing factors. They appear to be more characteristic of strongly saline areas, while *Hordeum jubatum* can dominate on less saline sites (Redmann 1972). Classification problems may arise on intermediate sites when *Hordeum jubatum* is the dominant species and *Distichlis spicata, Pascopyrum smithii, Puccinellia nuttalliana*, and *Suaeda calceoliformis* are present in more than minor amounts.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data and data collected during accuracy assessment (6 observation points: CURE_AA.0018, CURE_AA.0216, CURE_AA.0289, CURE_AA.0416, CURE_AA.0578, CURE_AA.0588).
Local Description Authors: K.A. Schulz
Global Description Authors: J. Drake, mod. K. Schulz, J. Coles, L. Allen

REFERENCES: Baker 1984a, Bourgeron and Engelking 1994, Carsey et al. 2003a, Driscoll et al. 1984, Hansen et al. 1995, Thompson and Hansen 2002, Vestal 1914, Western Ecology Working Group n.d.

Agrostis (gigantea, stolonifera) Semi-natural Herbaceous Vegetation

(Giant Bentgrass, Creeping Bentgrass) Semi-natural Herbaceous Vegetation

CODE	CEGL001558
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
ALLIANCE	*AGROSTIS STOLONIFERA* SEASONALLY FLOODED HERBACEOUS ALLIANCE (A.1405) Creeping Bentgrass Seasonally Flooded Herbaceous Alliance
ECOLOGICAL SYSTEM(S):	Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)
USFWS WETLAND SYSTEM:	Palustrine

CONCEPT SUMMARY
Globally
This semi-natural herbaceous association is typically found in more mesic areas such as riparian floodplains and seasonally flooded wetlands in the semi-arid western U.S. where *Agrostis* spp. have escaped from cultivation. Sites are typically flat to gently sloping or undulating. Elevations range from 854-2671 m (2800-8760 feet). Stands occur along low- to medium-gradient streams, often in broad, relatively flat, wet or irrigated meadows. Soil moisture ranges from dry to seasonally wet with stream and groundwater present. Substrates are variable. This type grows best on moist to temporarily wet soils, but it will tolerate poorly drained soils with high water tables and some flooding. Soil textures range from coarse alluvial sand and colluvium to fine clay, but it does best on clay loam and loam soils. The vegetation is characterized by a moderate to dense perennial graminoid layer dominated by introduced forage species *Agrostis gigantea* or *Agrostis stolonifera*. Other herbaceous species may occur as well, but they are generally less than 10% cover. Occasional shrubs or saplings may be present such as *Alnus incana* ssp. *tenuifolia, Populus angustifolia, Rosa woodsii*, or species of *Salix*. Common native species include graminoids *Carex* spp., *Deschampsia elongata, Eleocharis quinqueflora (= Eleocharis pauciflora), Hordeum jubatum, Juncus* spp., *Muhlenbergia asperifolia*, and forbs *Achillea millefolium, Argentina anserina, Artemisia ludoviciana, Equisetum* spp., *Iris missouriensis*, and *Thermopsis montana*. Other introduced species are common, such as *Bromus inermis, Cirsium arvense, Dactylis glomerata, Lolium pratense (= Festuca pratensis), Melilotus officinalis, Phalaris arundinacea, Phleum pratense, Plantago lanceolata, Poa pratensis, Rumex crispus, Taraxacum officinale, Trifolium* spp., and others.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This rare association was sampled in the Gunnison River floodplain at the Cooper's Ranch site in Curecanti National Recreation Area. This association is likely to be found on similar sites in small patches throughout the floodplain area of the main branch of the Gunnison River above Blue Mesa Reservoir, which is the uppermost of the three reservoirs of the Aspinall Unit.

Globally
This semi-natural hay meadow type occurs widely across the western U.S. and is typically restricted to mesic areas such as riparian floodplains and seasonally flooded wetlands in semi-arid climates.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This herbaceous association occurs in a canopy opening of a *Populus angustifolia* woodland that occupies flat, wide sand bars. The sand bars are adjacent to pools of water that remain as flows in the Gunnison River recede in late summer. The site is flat (1% slope), occurs at 2324 m elevation, and has a west-facing aspect. The unvegetated surface has high cover by litter and low cover of downed wood. Parent materials are Quaternary alluvium. Soils are poorly drained sandy loams.

Globally
This semi-natural herbaceous association is typically found in more mesic areas such as riparian floodplains and seasonally flooded wetlands in the semi-arid western U.S. where *Agrostis* spp. have escaped from cultivation. Sites are typically flat to gently sloping or undulating. Elevations range from 854-2671 m (2800-8760 feet). Stands occur along low- to medium-gradient streams, often in broad, relatively flat, wet or irrigated meadows (Carsey et al. 2003a). Soil moisture ranges from dry to seasonally wet with stream and groundwater present. Substrates are variable. It grows best on moist to temporarily wet soils, but it will tolerate poorly drained soils with high water tables and some flooding. Soil textures range from coarse alluvial sand and colluvium to fine clay, but it does best on clay loam and loam soils (Hansen et al. 1995, Manning and Padgett 1995).

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is 82% in this type. The grass *Agrostis stolonifera* forms a moderately dense stand that contributes up to 50% cover. The herbaceous layer is diverse and provides low to moderate cover. Additional graminoids that contribute low cover include *Carex pellita, Carex utriculata, Phalaris arundinacea*, and *Poa pratensis*. The noxious weed *Cirsium arvense* provides moderate cover, and other forbs provide low cover, including *Argentina anserina* and *Thermopsis montana*. Sapling *Populus angustifolia* trees from 1-2 m tall contribute low cover, along with *Alnus incana* ssp. *tenuifolia* shrubs 2-5 m tall.

Globally
This association is characterized by a moderate to dense perennial graminoid layer dominated by introduced forage species *Agrostis gigantea* or *Agrostis stolonifera*. Other herbaceous species may occur as well, but they are generally less than 10% cover. Occasional shrubs or saplings may be present such as *Alnus incana* ssp. *tenuifolia, Populus angustifolia, Rosa woodsii*, or species of *Salix*. Common native species include graminoids *Carex microptera, Carex nebrascensis, Carex pellita, Carex simulata, Carex utriculata, Deschampsia elongata, Eleocharis quinqueflora (= Eleocharis pauciflora), Hordeum jubatum, Juncus balticus, Juncus longistylis, Muhlenbergia asperifolia*, and forbs *Achillea millefolium, Argentina anserina, Artemisia ludoviciana, Equisetum hyemale, Equisetum laevigatum, Iris missouriensis*, and *Thermopsis montana* (Hansen et al. 1995, Manning and Padgett 1995, Hall and Hansen 1997, Carsey et al. 2003a). Other introduced species are common, such as *Bromus inermis, Cirsium arvense, Dactylis glomerata, Lolium pratense (= Festuca pratensis), Melilotus officinalis, Phalaris arundinacea, Phleum pratense, Plantago lanceolata, Poa pratensis, Rumex crispus, Taraxacum officinale, Trifolium pratense, Trifolium repens*, and others.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Herb (field)	*Cirsium arvense*
Herb (field)	*Agrostis stolonifera*

Globally

Stratum	Species
Herb (field)	*Agrostis stolonifera*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Cirsium arvense* (exotic, High/Medium), *Phalaris arundinacea* (exotic, High), *Poa pratensis* (exotic, Medium)

Globally
Exotic/Invasive: *Bromus inermis* (exotic, High/Medium), *Cirsium arvense* (exotic, High/Medium), *Dactylis glomerata* (exotic, Medium/Insignificant), *Lolium pratense* (exotic, High/Low), *Melilotus officinalis* (exotic, Medium/Low), *Phalaris arundinacea* (exotic, High), *Phleum pratense* (exotic, Medium), *Plantago lanceolata* (exotic, High/Low), *Poa pratensis* (exotic, Medium), *Rumex crispus* (exotic, Low/Insignificant), *Trifolium pratense* (exotic, Low/Insignificant), *Trifolium repens* (exotic, Medium/Low)

CONSERVATION STATUS RANK
Global Rank & Reasons: GNA (modified/managed) (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
The concept of this association was broadened to include dominance by *Agrostis gigantea*, a species closely related to *Agrostis stolonifera* and also a commonly planted forage species.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Further quantitative plots are needed to define this association in this park. This association may be difficult to distinguish from disturbed examples of *Carex utriculata* Herbaceous Vegetation (CEGL001562) and *Phalaris arundinacea* Western Herbaceous Vegetation (CEGL001474) where *Agrostis gigantea* is codominant.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on 2002 field data (1 plot: CURE.0255).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: K.A. Schulz

REFERENCES: Bourgeron and Engelking 1994, Carsey et al. 2003a, Driscoll et al. 1984, Hall and Hansen 1997, Hansen et al. 1991, Hansen et al. 1995, Kittel et al. 1999b, MTNHP 2002b, Manning and Padgett 1995, Western Ecology Working Group n.d., Wohl and Hammack 1995

Carex utriculata Herbaceous Vegetation

Northwest Territory Sedge Herbaceous Vegetation

Beaked Sedge Wet Meadow

CODE	CEGL001562
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
ALLIANCE	*CAREX (ROSTRATA, UTRICULATA)* SEASONALLY FLOODED HERBACEOUS ALLIANCE (A.1403) (Beaked Sedge, Northwest Territory Sedge) Seasonally Flooded Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Interdunal Swale Wetland (CES304.059)
North American Arid West Emergent Marsh (CES300.729)
Northern Columbia Plateau Basalt Pothole Pond (CES304.058)
Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
Rocky Mountain Subalpine-Montane Fen (CES306.831)
Temperate Pacific Freshwater Emergent Marsh (CES200.877)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This herbaceous wetland association is found throughout much of the western U.S. Stands occur in montane and subalpine areas around the edges of lakes and beaver ponds, along the margins of slow-moving reaches of streams and rivers, and in marshy swales and overflow channels on broad floodplains. Sites are flat to undulating, often with a hummocky microtopography. The water table is usually near the surface for most of the growing season. There are a wide variety of soil types for this association. The vegetation is characterized by a moderately dense to dense perennial graminoid layer dominated or codominated by *Carex utriculata* (20-99% cover). Stands often appear to be nearly pure *Carex utriculata*, but a variety of other graminoid species may be present as well. Other *Carex* species present include *Carex aquatilis, Carex canescens, Carex lenticularis, Carex aquatilis*, and *Carex microptera*, but usually with low cover. Other graminoid species that may be present include *Calamagrostis canadensis, Eriophorum angustifolium, Glyceria striata*, and *Juncus balticus*. The sparse forb cover can include *Geum macrophyllum, Fragaria virginiana, Mentha arvensis*, and *Mimulus guttatus*. Scattered *Salix* spp. shrubs may be present because these riparian shrublands are often adjacent. *Salix* species vary depending on elevation and geography. This association is distinguished from *Carex aquatilis - Carex utriculata* Herbaceous Vegetation (CEGL001803) by the dominance of *Carex utriculata*. *Carex aquatilis*, if present, is not more than one-third of the total cover.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This locally common association was sampled in overflow channels of the Gunnison River in the Neversink and Cooper's Ranch locales of Curecanti National Recreation Area. Additional stands are possible on other relatively wide, flat floodplains such as that of Beaver Creek. These stands are expected to be small, with a high percentage of introduced species due to the agricultural history of the area.

Globally

This wetland association in found at montane and subalpine elevations throughout much of the western U.S.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This herbaceous vegetation association occurs on the bottoms of abandoned channels of the Gunnison River. Sites are nearly flat (1-3% slope), occur between 2309 and 2313 m elevation, and are oriented to southern aspects. The channels are typically incised to approximately 1.5 meters below the general elevation of the floodplain and have groundwater contact. The unvegetated surface has high litter cover. One stand has low cover of downed wood, deposited by flood flows. Parent materials are Quaternary alluvium. Soils are saturated for at least part of the growing season and range from silty clay loams and sandy clay loams to muck. One site has orange-colored mottles in the soil matrix.

Globally

This herbaceous wetland association is found throughout much of the western U.S. Elevation ranges from near sea level in California to more than 3400 m (0-11,150 feet) in the Rocky Mountains. Stands typically occur in montane and subalpine areas around the edges of lakes and beaver ponds, along the margins of slow-moving reaches of streams and rivers, and in marshy swales and overflow channels on broad floodplains (Kittel et al. 1999b). Sites are flat to undulating, often with a hummocky microtopography (Kovalchik 1993). The water table is usually near the surface for most of the growing season. There are a wide variety of soil types for this association ranging from saturated organics or fine silty clays to clays over cobbles and alluvium to fine-loamy and sandy-skeletal, with an organic surface layer. Many stands occur on organic muck or peat soils. Mottling and gleying often occur near the surface because of the high water table.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This sedge association is confined to the saturated soils of the Gunnison River floodplain. Total vegetation cover ranges from 50 to 85% in these stands. The sedge *Carex utriculata* forms a moderately closed canopy and provides from 25 to 45% cover. The herbaceous layer is diverse and provides moderate to dense cover. Additional graminoids that provide low to moderate cover include *Agrostis gigantea, Bromus inermis, Eleocharis palustris, Juncus balticus, Phalaris arundinacea*, and *Poa pratensis*. Forbs provide low to moderate cover and include the non-native *Cirsium arvense* and the natives *Epilobium brachycarpum* and *Mentha arvensis*. The short- and tall-shrub layers provide sparse to low cover and include *Dasiphora fruticosa* ssp. *floribunda (= Dasiphora floribunda), Salix exigua, Salix lutea*, and *Salix monticola*, in addition to *Populus angustifolia* saplings. Seedlings of one or more of the willow tall-shrub species *Salix exigua, Salix lutea*, and *Salix monticola* and *Populus angustifolia* trees are present on most sites with up to 5% cover.

Globally

This plant association is characterized by a moderately dense to dense perennial graminoid layer dominated or codominated by *Carex utriculata* (20-99% cover). Stands often appear to be nearly pure *Carex utriculata*, but a variety of other graminoid species may be present as well. Other *Carex* species present include *Carex aquatilis, Carex canescens, Carex lenticularis, Carex microptera, Carex nebrascensis*, and *Carex scopulorum*, but usually with low cover. Other graminoid species that may be present include *Calamagrostis canadensis, Deschampsia caespitosa, Eriophorum angustifolium, Glyceria striata*, and *Juncus balticus*. Sparse forb cover may include *Epilobium* spp., *Geum macrophyllum, Fragaria virginiana, Mentha arvensis, Mimulus guttatus*, and *Polemonium occidentale*. Scattered *Salix* spp. shrubs may be present because these riparian shrublands are often adjacent. *Salix* species vary depending on elevation and geography. *Salix monticola, Salix drummondiana, Salix geyeriana, Salix planifolia, Salix wolfii*, and *Salix exigua* are common species.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Herb (field)	*Barbarea orthoceras, Cirsium arvense, Trifolium pratense*
Herb (field)	*Carex utriculata*

Globally

Stratum	Species
Herb (field)	*Carex utriculata*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Cirsium arvense* (exotic, High/Medium), *Phalaris arundinacea* (exotic, High), *Tripleurospermum perforata* (exotic)

Globally

Vulnerable: *Juncus chlorocephalus* (G3?); **Exotic/Invasive**: *Poa pratensis* (invasive, Medium), *Taraxacum officinale* (invasive)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally

Carex rostrata var. utriculata (Boott) Bailey was recognized as a distinct species from *Carex rostrata* Stokes and named *Carex utriculata* Boott (Kartesz 1999). This taxonomic change has led to confusion in some of the earlier vegetation classification literature where no distinction was made between the subspecies. *Carex utriculata* Herbaceous Vegetation (CEGL001562) is known only from the western U.S., and for now, *Carex rostrata* communities are known only from the midwestern U.S. and Canada. According to Kartesz (1999), *Carex rostrata* is

reported from most of Canada, some Great Lakes states, and Montana, Idaho, and Washington in the western U.S. There is significant overlap in the species ranges, and additional survey work is needed to help clarify this.

This association (CEGL001562) is distinguished from the mixed *Carex aquatilis - Carex utriculata* Herbaceous Vegetation (CEGL001803) and *Carex aquatilis* Herbaceous Vegetation (CEGL001802) by having a clear dominance of *Carex utriculata*. *Carex aquatilis* can be present but can have no more than one-third the cover of *Carex utriculata*. *Carex aquatilis* Herbaceous Vegetation (CEGL001802) can have up to one-third the cover by *Carex utriculata*; in both cases the dominant sedge is at least two-thirds the total cover in the stand. In *Carex aquatilis - Carex utriculata* Herbaceous Vegetation (CEGL001803), there is an even mix, such that the two species have even abundance and distribution throughout the stand, so that it is difficult to say one is more dominant over the other. In addition, *Carex utriculata* occurs on wetter sites than *Carex aquatilis*-dominated stands and often, but not exclusively, occupies organic soils.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Although this association appears to be adequately described from the current data, researchers should be alert for additional sites in areas where it may occur.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (4 plots: CURE.0180, CURE.0182, CURE.0254, CURE.0258 and 8 observation points: CURE_AA.0002, CURE_AA.0064, CURE_AA.0068, CURE_AA.0070, CURE_AA.0071, CURE_AA.0107, CURE_AA.0115, CURE_AA.1431).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: K.A. Schulz, mod. G. Kittel

REFERENCES: Achuff et al. 2002a, Andrews 1983, Baker 1983a, Benedict 1983, Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Christy 2004, Cogan et al. 2004, Cole 1977b, Cole 1982, Crowe and Clausnitzer 1997, Crowe et al. 2004, Driscoll et al. 1984, Evans 1989b, Franklin and Dyrness 1973, Frenkel et al. 1986, Hall and Hansen 1997, Halpern 1986, Hansen et al. 1988b, Hansen et al. 1991, Hansen et al. 1995, Hess and Wasser 1982, IDCDC 2005, Jankovsky-Jones et al. 1999, Johnson and Simon 1987, Jones and Ogle 2000, Kagan et al. 2000, Kartesz 1999, Kauffman 1982, Kauffman et al. 1985, Kerr and Henderson 1979, Kittel et al. 1997a, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Kunze 1994, Looman 1982, MTNHP 2002b, Manning and Padgett 1995, Mattson 1984, Moseley 1998, Murray 2000, Mutel 1973, Mutel 1976, Mutel and Marr 1973, Mutz and Graham 1982, Mutz and Queiroz 1983, Nachlinger 1985, Norton et al. 1981, Padgett 1982, Padgett et al. 1988b, Padgett et al. 1989, Ramaley 1919a, Ramaley and Robbins 1909, Ratliff 1982, Schlatterer 1972, Seyer 1979, Seyer 1981, Stuth 1975, Taylor 1984, Titus and Christy 1996a, Titus and Christy 1999, Titus unpubl. data 1996, Tuhy 1981, Tuhy and Jensen 1982, WNHP unpubl. data, Western Ecology Working Group n.d., Wohl and Hammack 1995, Youngblood et al. 1985a, Youngblood et al. 1985b

Juncus balticus Herbaceous Vegetation

Baltic Rush Herbaceous Vegetation

Baltic Rush Wet Meadow

CODE	CEGL001838
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
ALLIANCE	*JUNCUS BALTICUS* SEASONALLY FLOODED HERBACEOUS ALLIANCE (A.1374) Baltic Rush Seasonally Flooded Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Interdunal Swale Wetland (CES304.059)

Boreal Wet Meadow (CES103.873)
North American Arid West Emergent Marsh (CES300.729)
Northern Columbia Plateau Basalt Pothole Pond (CES304.058)
Western Great Plains Open Freshwater Depression Wetland (CES303.675)
Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This Baltic rush community is found widely throughout the western United States and into western Canada. This herbaceous wet meadow occurs as small to extensive, open to typically dense patches on flat stream benches, along overflow channels, and near springs. Habitats are often alkaline meadows and may have long-term grazing disturbance. Soils are variable and range from poorly to well-drained, sandy clay loam to fine sand-textured and are usually mottled or gleyed. Stands are characterized by dense swards of *Juncus balticus*. In montane zones and the Great Basin, minor cover of *Carex* species, including *Carex aquatilis, Carex praegracilis, Carex nebrascensis*, or *Carex utriculata*, is often present; other common species include *Deschampsia caespitosa, Distichlis spicata, Glyceria striata, Hordeum jubatum, Muhlenbergia asperifolia, Pascopyrum smithii, Phleum alpinum*, and *Sporobolus airoides*. The introduced perennial sod grasses *Poa pratensis* or *Agrostis stolonifera* codominate some stands. Forb cover is generally low and includes wetland species such as *Caltha leptosepala, Rumex aquaticus*, and *Dodecatheon pulchellum*. *Iris missouriensis* can be common in heavily grazed stands. Shrubs are not common. This association is often considered to be a grazing-induced community since it increases with disturbance, though it can be a stable late-seral community.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled on historically irrigated floodplain terraces of the Gunnison River within Curecanti National Recreation Area.

Globally

This Baltic rush wet meadow community is found widely throughout the western United States, ranging from South Dakota and Nebraska west to Washington, south to California, and east to New Mexico. It also occurs in western Canada.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This herbaceous vegetation association occurs on floodplain terraces of the Gunnison River. Sites are flat to gently sloped (1-4% slopes), occur between 2311 and 2314 m elevation, and are oriented to all aspects. The unvegetated surface has high cover of litter and low to moderate exposure of bare soil. Parent materials are Quaternary alluvium. Soils are well-drained silt loams and silty clay loams. The soils contain orange mottles at one site.

Globally

This broadly defined and widespread herbaceous wetland community is found throughout western North America. Elevation ranges from 138 to 3500 m (454-11,475 feet). Far northern stands in the Boreal Plains are at about 800 m (2625 feet). Stands usually occur as small, dense patches on flat to gently sloping sites near seeps and streams. Stream channels are highly variable in size and type, ranging from narrow to moderately wide, and from deeply entrenched to very sinuous (Kittel et al. 1999b). In the boreal regions, this community occurs more commonly on gradual sandy shorelines. Soils are also variable and range from sandy well-drained to poorly drained silty clay loam or silty clay alluvium to organic muck; however, soils tend to be finer-textured, alkaline and may be saline (Brotherson and Barnes 1984, Padgett et al. 1989, Kittel et al. 1999b). Sites with sandy soils are usually saturated for part of the growing season or have high water tables. Cobbles and gravel are common on many sites, and gleyed and mottled horizons are often present because of flooding or high water tables (Kittel et al. 1999b).

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 20 to 60% in these stands. The graminoid *Juncus balticus* forms open, patchy stands and provides from 9 to 55% cover. The herbaceous layer is moderately diverse and provides moderate to dense cover. Other graminoid species contribute low cover and include *Bromus inermis, Muhlenbergia richardsonis*, and *Pascopyrum smithii*. Forbs have low diversity, provide sparse to low cover, and include *Cirsium arvense, Equisetum laevigatum, Iris missouriensis*, and *Solidago* sp.

Globally

This broadly defined association is characterized by a low (<50 cm), open to typically dense graminoid layer dominated by the rhizomatous perennial *Juncus balticus*. In montane zones and the Great Basin, minor cover of *Carex* species, including *Carex aquatilis, Carex praegracilis, Carex microptera, Carex nebrascensis*, or *Carex utriculata*, is often present. Other common graminoids include *Deschampsia caespitosa, Distichlis spicata, Glyceria striata, Hordeum brachyantherum, Hordeum jubatum, Muhlenbergia andina, Muhlenbergia asperifolia, Pascopyrum smithii, Poa nemoralis* ssp. *interior, Phleum alpinum*, and *Sporobolus airoides*. Forb cover is generally low but may include *Achillea millefolium, Artemisia ludoviciana, Caltha leptosepala, Cirsium scariosum (= Cirsium tioganum), Dodecatheon pulchellum, Glaux maritima, Iris missouriensis, Maianthemum stellatum, Rumex aquaticus, Polygonum bistortoides, Potentilla plattensis*, and *Solidago canadensis*. Many other forb species may be present, given the wide elevational amplitude and broad geographic spread of this type. Shrubs and dwarf-shrubs are not common; however, *Artemisia frigida* cover may be significant in some stands, and occasional *Artemisia cana, Artemisia tridentata* ssp. *tridentata, Dasiphora fruticosa* ssp. *floribunda, Ericameria nauseosa, Populus* spp., *Rosa woodsii, Salix* spp., or *Sarcobatus vermiculatus* shrubs may occur. Some stands may be codominated by the introduced perennial sod grasses *Poa pratensis, Bromus inermis*, or *Agrostis stolonifera*. Other introduced species, such as *Cirsium arvense, Cirsium vulgare, Erodium cicutarium, Iva axillaris, Lactuca serriola, Phleum pratense, Taraxacum officinale, Thinopyrum intermedium, Trifolium* spp., *Tragopogon dubius, Xanthium strumarium*, and others, may occur in disturbed stands.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Herb (field)	*Cirsium arvense, Iris missouriensis*
Herb (field)	*Bromus inermis, Juncus balticus, Muhlenbergia richardsonis*
Herb (field)	*Equisetum laevigatum*

Globally

Stratum	Species
Herb (field)	*Juncus balticus*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Bromus inermis* (exotic, High/Medium), *Cirsium arvense* (exotic, High/Medium), *Medicago sativa* (exotic, Insignificant), *Phalaris arundinacea* (exotic, High), *Poa pratensis* (exotic, Medium)

Globally

Exotic/Invasive: *Agrostis stolonifera* (weedy native, Medium/Low), *Bromus inermis* (exotic, High/Medium), *Cirsium arvense* (exotic noxious weed, High/Medium), *Cirsium vulgare* (exotic noxious weed, Medium/Low), *Erodium cicutarium* (exotic, Medium/Low), *Iva axillaris* (noxious weed), *Lactuca serriola* (exotic, Low/Insignificant), *Phleum pratense* (exotic, Medium), *Poa pratensis* (invasive, Medium), *Taraxacum officinale* (exotic), *Thinopyrum intermedium* (exotic, Medium/Insignificant), *Tragopogon dubius* (exotic, Medium/Low), *Xanthium strumarium* (noxious weed)

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association is often considered to be a grazing-induced community since it increases with grazing disturbance. Based on the extensive geographic and environmental range (from alpine meadows to sagebrush-dominated landscapes), it verges on astonishing that any number of *Juncus balticus* associations have not been recognized.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Some stands persist on previously irrigated pastures, and others are patches among sedge associations.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (5 plots: BLCA.0003, CURE. 0176, CURE.0181, CURE.0183, CURE.0277 and 10 observation points: BLCA_AA.323, CURE_AA.0049, CURE_AA.0050, CURE_AA.0056, CURE_AA.0082, CURE_AA.0087, CURE_AA.0091, CURE_AA.0092, CURE_AA.0856, CURE_AA.1432).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: J. Drake, mod. D. Faber-Langendoen, K.A. Schulz, L. Allen, G. Kittel

REFERENCES: ANHIC n.d., Baker 1984a, Bell et al. 2009, Bourgeron and Engelking 1994, Brotherson and Barnes 1984, Bunin 1985, Butler et al. 2002, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Christy 2004, Cogan et al. 2004, Cowardin et al. 1979, Crowe and Clausnitzer 1997, Crowe et al. 2004, Donnelly et al. 2006, Driscoll et al. 1984, Evans 1989b, Evenden 1990, Faber-Langendoen 2001, Flowers 1962, Hall and Hansen 1997, Hansen et al. 1995, Henderson and McAllister 1983, Hess 1981, IDCDC 2005, Jankovsky-Jones et al. 1999, Jankovsky-Jones et al. 2001, Johnston 1987, Jones 1992b, Jones and Walford 1995, Kagan et al. 2000, Kartesz 1994a, Kierstead and Pogson 1976, Kittel and Lederer 1993, Kittel et al. 1997a, Kittel et al. 1999a, Kittel et al. 1999b, Klein et al. 2007, Komarkova 1986, Kovalchik 1987, Kunze 1994, MTNHP 2002b, Manning 1988, Manning and Padgett 1991, Manning and Padgett 1992, Muldavin et al. 2000a, Muldavin et al. 2003, Muldavin et al. 2006, Murray 2000, Mutel 1973, Mutz and Graham 1982, Olson and Gerhart 1982, Padgett 1981, Padgett 1982, Padgett et al. 1989, Rector 1979, Richard et al. 1996, Shupe et al. 1986, Stewart 1940, Taylor 1980, Taylor and Teare 1979a, Thompson and Hansen 2002, Titus and Christy 1996a, Tuhy and Jensen 1982, Volland 1976, WNHP unpubl. data, Wasser and Hess 1982, Western Ecology Working Group n.d., Youngblood et al. 1985a

Phalaris arundinacea Western Herbaceous Vegetation

Reed Canarygrass Western Herbaceous Vegetation

Reed Canarygrass Wet Meadow

CODE	CEGL001474
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
ALLIANCE	*PHALARIS ARUNDINACEA* SEASONALLY FLOODED HERBACEOUS ALLIANCE (A.1381) Reed Canarygrass Seasonally Flooded Herbaceous Alliance
ECOLOGICAL SYSTEM(S):	North American Arid West Emergent Marsh (CES300.729) Northern Columbia Plateau Basalt Pothole Pond (CES304.058) Western Great Plains Open Freshwater Depression Wetland (CES303.675) Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This herbaceous association is reported from throughout Washington, Colorado, Nebraska, Montana, Idaho, and into northeastern Utah, but is likely more widespread in the western United States. It also occurs in Canada , in the southern two-thirds of British Columbia in areas with warm and relatively dry summers and in Alberta, from the Great Plains north into the Boreal Plains. Its distribution as a natural type is complicated because this native species is widely cultivated as a forage crop and has escaped and established in wetlands and riparian areas, displacing the local flora. Elevations range from near sea level to 2307 m. Stands are found along riparian areas, pond and lake margins, wet meadows, and intermittent drainages. The poorly drained alluvial soils are commonly fine-textured (occasionally coarse-textured) and may be flooded for brief to extended periods. The vegetation is characterized by a dense, tall herbaceous layer (often >80% canopy cover and 1.5-2 m tall) that is dominated by *Phalaris arundinacea*, which tends to occur in monocultures. Associated species may include *Equisetum arvense, Muhlenbergia asperifolia, Mentha arvensis, Schoenoplectus acutus (= Scirpus acutus),* and many other species in trace amounts where disturbed. Introduced species such as *Agrostis gigantea, Bromus inermis, Bromus tectorum, Cirsium arvense, Elymus repens, Euphorbia esula, Hordeum brachyantherum, Lepidium latifolium, Melilotus officinalis, Phleum pratense, Poa pratensis,* and *Sonchus oleraceus* are common in some disturbed stands.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association is limited to perennial streams carrying runoff irrigation water and was sampled on the Gunnison River near the Warner Route into Black Canyon and on drainages tributary to the Gunnison River at the border with the Sandberg property and at Cooper's Ranch.

Globally

This association is reported from Colorado, Nebraska, Montana, Idaho, Washington and northeastern Utah and is likely more widespread in the western United States. It has been documented to occur in British Columbia and Alberta, Canada, and is likely widespread elsewhere in southern parts of Canadian provinces. Its distribution as a natural type is complicated because this native species is widely cultivated as a forage crop and has escaped and established in many wetlands and riparian areas.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This tall herbaceous vegetation association was observed in both narrow and broad floodplains of the Gunnison River and its tributaries. Sites are nearly flat (1-6% slopes), between 1723 and 2307 m elevation, and are oriented to the direction of the drainage and its slopes. The unvegetated surface always has high cover of litter. Downed wood in the form of driftwood can be locally common. Soils are poorly drained, usually saturated sandy loams or loamy sands derived from local alluvium.

Globally

This association is reported from throughout Washington, Colorado, Nebraska, Montana, Idaho, and northeastern Utah, but is likely more widespread in the western United States. It also occurs in Alberta, Canada. Elevations range from near sea level to 2307 m (7564 feet). Stands are found along riparian areas, pond and lake margins, wet meadows, and intermittent drainages. Sites are flat to rolling. The poorly drained soils are derived from alluvium and are commonly fine-textured but can also be coarser in texture. Subsoil is often mottled and gleyed (Crawford 2001). Sites are generally flooded from brief to extended periods, and soils remain saturated throughout the growing season.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Thotal vegetation cover ranges from 81 to 100%. This association is characterized by *Phalaris arundinacea* that provides 65 to 98% cover. Another grass, *Agrostis gigantea*, sometimes provides up to 10% cover, while other graminoid species are sparse, including the exotics *Bromus inermis, Bromus tectorum*, and *Elymus repens*. Forbs are mostly exotic, uncommon and variable between sites, provide sparse to low cover, and include *Artemisia dracunculus, Cirsium arvense, Melilotus officinalis,* and *Rumex crispus*. Occasional tall or short shrubs provide

sparse cover, including *Salix exigua*, *Amelanchier utahensis*, and *Quercus gambelii*. The canopy tree *Acer negundo* is present along the Gunnison River and provides sparse cover.

Globally
This association is characterized by a dense, tall herbaceous layer (often >90% canopy cover and 1.5-2 m tall) that is dominated by *Phalaris arundinacea*, which tends to occur in monocultures. Associated species such as *Equisetum arvense, Muhlenbergia asperifolia, Mentha arvensis, Schoenoplectus acutus (= Scirpus acutus), Polygonum amphibium, Solidago canadensis, Urtica dioica*, and many other species may be present in trace amounts especially where disturbed. Occasional *Populus tremuloides, Salix exigua, Rubus idaeus*, or *Symphoricarpos albus* may be present is some stands. Introduced species such as *Agrostis gigantea, Bromus inermis, Bromus tectorum, Cirsium arvense, Elymus repens, Euphorbia esula, Hordeum brachyantherum, Lepidium latifolium, Melilotus officinalis, Phleum pratense, Poa pratensis*, and *Sonchus oleraceus* are common in some disturbed stands.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Herb (field)	*Artemisia dracunculus*
Herb (field)	*Agrostis gigantea*, *Phalaris arundinacea*

Globally

Stratum	Species
Herb (field)	*Phalaris arundinacea*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus inermis* (exotic, High/Medium), *Bromus tectorum* (exotic, High), *Cirsium arvense* (exotic, High/Medium), *Elymus repens* (exotic, High/Medium), *Melilotus officinalis* (exotic, Medium/Low), *Phleum pratense* (exotic, Medium), *Poa pratensis* (exotic, Medium), *Rumex crispus* (exotic, Low/Insignificant), *Thlaspi arvense* (exotic, Low/Insignificant)

Globally
Exotic/Invasive: *Agrostis gigantea* (exotic, Medium/Low), *Bromus inermis* (exotic, High/Medium), *Bromus tectorum* (exotic, High), *Cirsium arvense* (exotic, High/Medium), *Elymus repens* (exotic, High/Medium), *Euphorbia esula* (exotic, High/Medium), *Lepidium latifolium* (exotic, High), *Melilotus officinalis* (exotic, Medium/Low), *Phleum pratense* (exotic, Medium), *Poa pratensis* (exotic, Medium), *Sonchus oleraceus* (exotic)

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (3-Mar-1999).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Other natural associations included in this alliance are found throughout the northeastern United States, but this western association's distribution as a natural type is not clear because of extensive planting as a forage crop (Hansen et al. 1995, Hall and Hansen 1997). The species is native and widespread in Alberta, although some introduced genotypes may be present. Further work is required to resolve the natural versus introduced nature of this type in western North America.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: This tall grass has been introduced into agriculture and is escaping into the park and recreation area along perennial streams fed by waste irrigation water.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (3 plots: BLCA.0063, BLCA.0111, CURE.0251 and 9 observation points: BLCA_AA.443,

BLCA_AA.544, BLCA_AA.550, BLCA_AA.558, BLCA_AA.573, BLCA_AA.576, CURE_AA.0027, CURE_AA.0253, CURE_AA.0620).
Local Description Authors: J. Von Loh, mod. G. Bradshaw and J. Coles
Global Description Authors: K.A. Schulz, mod. L. Allen and G. Kittel

REFERENCES: ANHIC n.d., Bourgeron and Engelking 1994, Carsey et al. 2003a, Cooper et al. 1995, Crawford 2001, Driscoll et al. 1984, Hall and Hansen 1997, Hansen et al. 1995, IDCDC 2005, MTNHP 2002b, MacKenzie and Moran 2004, Muldavin et al. 2000a, Salas and Pucherelli 2002, Thompson and Hansen 2002, Von Loh 2000, Western Ecology Working Group n.d., Willoughby et al. 2004

Poa secunda Herbaceous Vegetation

Sandberg Bluegrass Herbaceous Vegetation

CODE	CEGL001657
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
ALLIANCE	*POA SECUNDA* SEASONALLY FLOODED HERBACEOUS ALLIANCE (A.1410) Sandberg Bluegrass Seasonally Flooded Herbaceous Alliance
ECOLOGICAL SYSTEM(S):	Inter-Mountain Basins Semi-Desert Grassland (CES304.787) Southern Rocky Mountain Montane-Subalpine Grassland (CES306.824)
USFWS WETLAND SYSTEM:	Palustrine

CONCEPT SUMMARY
Globally
This widespread grassland association occurs across the intermountain western U.S. Elevation ranges from 1440 to 2722 m (4720-8925 feet). Stands occur on uplands in swales, gentle slopes and drainage bottoms, often with easterly facing aspects. Substrates are deep, well-drained loam and clay loam soils. The vegetation is characterized by a somewhat open to dense graminoid canopy dominated by the short bunchgrass *Poa secunda* (up to 50% cover). The herbaceous layer is diverse, with additional graminoids such as *Carex microptera, Eleocharis quinqueflora (= Eleocharis pauciflora), Hordeum brachyantherum* ssp. *californicum, Leymus simplex, Juncus* spp., and *Pascopyrum smithii* providing low to moderate cover. Forbs provide moderate cover and include *Achillea millefolium, Agoseris glauca, Iris missouriensis, Iva axillaris, Potentilla gracilis, Senecio* sp., and *Trifolium* spp. The short shrub *Artemisia tridentata* ssp. *wyomingensis* may be present with sparse cover. Introduced species may also be common in some stands.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This rare association was sampled on Dillon Mesa in Curecanti National Recreation Area.

Globally
This grassland association occurs across the intermountain western U.S. from western Colorado to California, north to Idaho and Oregon.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This herbaceous vegetation association occurs in swales. The site is mildly sloping (6%), occurs at 2722 m elevation, and is oriented to the southeast. The unvegetated surface has high cover of litter and exposure of bare soil. Parent materials are Tertiary volcanic rocks. Soils are well-drained clay loams.

Globally
This widespread grassland association occurs across the intermountain western U.S. Elevation ranges from 1440 to 2722 m (4720-8925 feet). Stands occur on uplands in swales, gentle slopes and drainage bottoms and valley floors, often with easterly facing aspects. Substrates are deep, well-drained loam, clay loam and silty clay soils derived from alluvium. Litter cover is variable but often relatively high.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is 85% in this type. The bunchgrass *Poa secunda* forms a somewhat open to dense canopy and provides up to 50% cover. The herbaceous layer is diverse and provides dense cover. Additional graminoids that provide low to moderate cover include *Juncus confusus* and *Pascopyrum smithii*. Forbs provide moderate cover and include *Achillea millefolium var. occidentalis, Senecio* sp., and *Trifolium gymnocarpon*. The short shrub *Artemisia tridentata* ssp. *wyomingensis* provides sparse cover.

Globally
This herbaceous vegetation association forms a somewhat open to dense graminoid canopy strongly dominated by the short bunchgrass *Poa secunda* (up to 50% cover). The herbaceous layer may be diverse, with additional graminoids such as *Carex microptera, Eleocharis quinqueflora (= Eleocharis pauciflora), Elymus trachycaulus, Hordeum brachyantherum* ssp. *californicum, Leymus simplex, Koeleria macrantha, Juncus balticus, Juncus confusus, Juncus ensifolius,* and *Pascopyrum smithii* providing low to moderate cover. Forbs provide moderate cover and include *Achillea millefolium, Agoseris glauca, Elymus trachycaulus, Iris missouriensis, Potentilla gracilis, Machaeranthera canescens, Senecio* sp., *Trifolium cyathiferum, Trifolium dubium*, and *Trifolium gymnocarpon*. The short shrubs *Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus viscidiflorus, Ericameria nauseosa, Gutierrezia sarothrae*, and *Krascheninnikovia lanata* may be present with sparse cover. Introduced species may also be common, including *Descurainia sophia, Iva axillaris, Lepidium perfoliatum, Poa pratensis, Taraxacum officinale*, and *Tragopogon dubius*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Herb (field)	*Achillea millefolium* var. *occidentalis, Trifolium gymnocarpon*
Herb (field)	*Juncus confusus, Pascopyrum smithii, Poa secunda*

Globally

Stratum	Species
Herb (field)	*Poa secunda*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Exotic/Invasive: *Descurainia sophia* (exotic, Medium/Low), *Iva axillaris* (introduced), *Lepidium perfoliatum* (exotic, Low/Insignificant), *Poa pratensis* (exotic, Medium), *Taraxacum officinale* (exotic), *Tragopogon dubius* (exotic, Medium/Low), *Trifolium dubium* (exotic)

CONSERVATION STATUS RANK
Global Rank & Reasons: G4? (1-Feb-1996).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
The dominant grass in this association, *Poa secunda*, was originally identified as *Poa nevadensis*, a taxon which Kartesz (1999) has subsumed into *Poa secunda*.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: *Artemisia tridentata* ssp. *wyomingensis* is just beginning to invade; the site is a drainage of some sort, either catching runoff from adjacent slopes or a seep or spring, two or three graminoids with a plethora of forbs, little litter or thatch.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (1 plot: CURE.0329).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Bell et al. 2009, Blackburn et al. 1969a, Bourgeron and Engelking 1994, Driscoll et al. 1984, IDCDC 2005, Kagan et al. 2000, Kagan et al. 2004, Manning 1988, Manning and Padgett 1995, Western Ecology Working Group n.d.

Artemisia tridentata ssp. *vaseyana / Carex geyeri* Shrub Herbaceous Vegetation

Mountain Big Sagebrush / Geyer's Sedge Shrub Herbaceous Vegetation

CODE	CEGL001532
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland with a sparse shrub layer (V.A.7.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland with a sparse shrub layer (V.A.7.N.)
FORMATION	Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer (V.A.7.N.e.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. VASEYANA* SHRUB HERBACEOUS ALLIANCE (A.1526) Mountain Big Sagebrush Shrub Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This shrubland association is present in southern and central Idaho, western Wyoming, northeastern Oregon, and central and western Colorado. Stands are found above 1524 m (5000 feet) elevation predominantly on southerly aspects of moderate to steep mountain ridges and slopes. In Colorado, the association is found on gentle slopes or ridgetops. Soils are derived from colluvial deposits with a moderate to high percentage of course fragments. *Artemisia tridentata* ssp. *vaseyana* dominates the shrub overstory. Commonly the shrub *Symphoricarpos oreophilus* may be present but with low cover. The understory is dominated by *Carex geyeri*. Common herbaceous species include *Arenaria aculeata, Eriogonum heracleoides, Eriogonum umbellatum, Festuca idahoensis*, *Hesperostipa comata* ssp. *comata*, and *Lupinus argenteus*.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This rare association was sampled on Tenderfoot Hill in Curecanti National Recreation Area.

Globally
This shrubland association is present on the Snake River Plains and Pioneer Mountains of southern Idaho, central Idaho, and in the Blue and Ochoco mountains, and Hells Canyon National Recreation Area in northeastern Oregon. It also occurs in central Colorado in Pitkin County.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This shrub herbaceous vegetation association occurs on ridgetops. The site is gently sloped (8%), occurs at 2728 m elevation, and is oriented to the east. The unvegetated surface has high cover of litter and low exposure of bare soil. Downed wood is common. Parent materials are Tertiary volcanic rocks. Soils are rapidly drained loamy sands.

Globally
This association occurs from 1551 to 2730 m (5090-8960 feet) on ridgetops, upper or middle slopes or occasionally valley floors, as well as on foothills, canyon slopes, or rough and rolling terrain. It occurs on moderate to steep slopes (3-80%) and on south or west aspects. Soils are sandy loams to clay loams. Ground cover is either duff (20-70%), pavement (3-60%), or gravels (0-20%).

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is 86% in this type. The short shrub *Artemisia tridentata* ssp. *vaseyana* forms an open canopy and provides up to 25% cover, and the graminoid *Carex geyeri* provides up to 5% cover. The shrub layer is low in diversity but provides dense cover, up to 65% cover is provided by the short shrub *Purshia tridentata*. Additional short and dwarf-shrubs include *Artemisia nova, Chrysothamnus viscidiflorus*, and *Symphoricarpos rotundifolius*. The herbaceous layer is diverse and provides sparse to moderate cover. Other graminoids include *Festuca arizonica* and *Poa* sp. Forbs provide sparse to low cover and include *Artemisia frigida, Antennaria parvifolia, Comandra umbellata, Eriogonum* spp., *Lupinus argenteus*, and *Penstemon teucrioides*.

Globally
Artemisia tridentata ssp. *vaseyana* is the dominant shrub with 20-50% cover. Other shrubs than can be absent to abundant include *Purshia tridentata, Symphoricarpos oreophilus, Symphoricarpos rotundifolius*, and *Chrysothamnus viscidiflorus*. The herbaceous layer is sparse to abundant, with *Carex geyeri* most abundant at 5-50% cover. Other graminoids that may be present include *Hesperostipa comata, Bromus carinatus, Festuca arizonica*, and *Carex hoodii*. Common forb species include *Linanthus nuttallii, Balsamorhiza sagittata, Arenaria aculeata, Eriogonum heracleoides, Eriogonum umbellatum, Achillea millefolium*, and *Lupinus argenteus*.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*, *Purshia tridentata*
Herb (field)	*Comandra umbellata*
Herb (field)	*Carex geyeri*, *Festuca arizonica*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Carex geyeri*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G3 (17-Mar-2004). This shrubland association is present in central to southern Idaho (Snake River Plains and Sawtooth National Forest), northeastern Oregon (Hells Canyon National Recreation Area, Blue Mountains, and Ochoco Mountains), and central-east Colorado (Pitkin and Gunnison counties). Stands are located predominantly on southerly aspects of moderate to steep mountain ridges and slopes above 1524 m (5000 feet) elevation. In Colorado, stands are located on gentle slopes of westerly aspects. Soils are of colluvium deposits with a moderate to high percentage of course fragments. The number, condition, and size of stands are degraded by intensive livestock grazing and bedding, introduction of exotic species, and alteration of the fire regime. Suppression of fire has lead to conifer encroachment of these stands. Land-use conversion is a concerning threat in Colorado.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
This association (1 plot) may also occur in west-central Colorado within Black Canyon National Park. The stand has a high percentage cover of *Purshia tridentata* and has yet to be crosswalked (Johnston 1987) to the USNVC. Not sure what Colorado ref is being used for the Pitkin County reference. A plot from the Black Canyon National Park vegetation classification and mapping project (data collected in 2003) has been classified as this type. Not sure what Johnston (1987) has to do with this; the type is not listed there.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: This stand represents a short shrubland in structure, shrub density, and cover.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on 2002 field data (1 plot: CURE.0198).
Local Description Authors: J. Von Loh
Global Description Authors: J.J. Miller, mod. G. Kittel and J. Coles

REFERENCES: Bourgeron and Engelking 1994, CONHP unpubl. data 2003, Driscoll et al. 1984, Hall 1973, Hironaka et al. 1983, Johnson and Clausnitzer 1992, Johnson and Simon 1987, Kagan et al. 2000, Western Ecology Working Group n.d.

Artemisia tridentata ssp. *vaseyana / Poa (pratensis, compressa)* Semi-natural Shrub Herbaceous Vegetation

Mountain Big Sagebrush / (Kentucky Bluegrass, Canada Bluegrass) Semi-natural Shrub Herbaceous Vegetation

CODE	CEGL002339
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland with a sparse shrub layer (V.A.7.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland with a sparse shrub layer (V.A.7.N.)
FORMATION	Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer (V.A.7.N.e.)
ALLIANCE	*ARTEMISIA TRIDENTATA SSP. VASEYANA* SHRUB HERBACEOUS ALLIANCE (A.1526) Mountain Big Sagebrush Shrub Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Montane Sagebrush Steppe (CES304.785)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This shrub herbaceous association is known only from Black Canyon of the Gunnison National Park. Stands occur on toeslopes, plateaus, ridgetops, and in valley bottoms between 2311 and 2456 m elevation. Sites are flat to gently sloping with cooler northern to southeastern aspects. The unvegetated surface has moderate to dense cover of litter and exposure of bare soil. The underlying geology is varied and includes Mesozoic sandstone, metamorphic granitic rocks, and Quaternary alluvium. Soils are moderately well-drained and range from silty clay loams to sandy loams depending on parent materials. The vegetation is characterized by an open to relatively closed short-shrub canopy, from 0.5-2 m tall, of *Artemisia tridentata* ssp. *vaseyana* (5-50% cover), with a moderately dense herbaceous layer dominated by exotic grasses *Poa pratensis* and *Poa compressa*. The associated shrubs and dwarf-shrubs are diverse and provide low cover, including *Amelanchier utahensis, Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus viscidiflorus, Ericameria parryi, Gutierrezia sarothrae, Mahonia repens, Opuntia fragilis, Peraphyllum ramosissimum, Rosa woodsii, Symphoricarpos oreophilus*, and *Symphoricarpos rotundifolius*. The herbaceous layer has moderate to sometimes low cover and is very diverse. The associated graminoids include *Achnatherum lettermanii, Elymus elymoides*, and *Hesperostipa comata*. Forb cover is diverse but sparse.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This uncommon association was sampled on the North Rim near the "Y" intersection off North Rim Drive and in Grizzly Gulch and also along the Deadhorse Mesa Trail in Black Canyon of the Gunnison National Park and in Big Draw on adjacent private land.

Globally

This association is known only from Black Canyon of the Gunnison National Park, Colorado.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This shrub herbaceous association was observed on toeslopes, plateaus, ridgetops, and in valley bottoms. Sites are nearly level (0-7% slopes), occur between 2311 and 2456 m elevation, and are oriented to northern to southeastern aspects. The unvegetated surface has moderate to dense cover of litter and exposure of bare soil. Downed wood is uncommon to common. The underlying geology is varied and includes Mesozoic sandstone, metamorphic granitic rocks, and Quaternary alluvium. Soils are moderately well-drained silty clay loams, silt loams, and sandy loams derived from mixed sources.

Globally

Data are not available.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 45 to 95% in these stands. This shrub herbaceous association is characterized by an open to relatively closed short-shrub canopy, from 0.5-2 m tall, of *Artemisia tridentata* ssp. *vaseyana* that ranges in cover from 5 to 50%, and the exotic grasses *Poa pratensis* and *Poa compressa* that range in cover from 0 to 40% and 0 to 25%, respectively. The associated shrubs are diverse and provide low cover, including the tall shrub *Amelanchier utahensis* and the short and dwarf-shrubs *Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus viscidiflorus, Ericameria parryi, Gutierrezia sarothrae, Mahonia repens, Opuntia fragilis, Peraphyllum ramosissimum, Rosa woodsii, Symphoricarpos oreophilus*, and *Symphoricarpos rotundifolius*. The herbaceous layer is very diverse and provides low to moderate cover. The associated graminoids include *Achnatherum lettermanii, Elymus elymoides*, and *Hesperostipa comata*. Forbs are diverse, contribute sparse cover, and the most common include *Achillea millefolium var. occidentalis, Antennaria parvifolia, Artemisia ludoviciana, Astragalus* spp., *Castilleja* spp., *Cirsium undulatum var. tracyi, Comandra umbellata, Eriogonum racemosum, Ipomopsis aggregata, Lupinus* spp., and *Phlox longifolia*. Mosses provide less than 1% cover.

Globally

Data are not available.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Peraphyllum ramosissimum*
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Achnatherum lettermanii, Poa compressa, Poa pratensis*

Globally

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Poa compressa, Poa pratensis*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Bromus tectorum* (exotic, High)

Globally

Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNA (ruderal) (19-Jan-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (5 plots: BLCA.0012, BLCA.0027, BLCA.0054, BLCA.0134, CURE.0291 and 11 observation points: BLCA_AA.937, BLCA_AA.938, BLCA_AA.955, BLCA_AA.962, BLCA_AA.963, BLCA_AA.965, BLCA_AA.966, CURE_AA.0080, CURE_AA.0400, CURE_AA.0408, CURE_AA.0626).
Local Description Authors: J. Von Loh, mod. G. Bradshaw and J. Coles
Global Description Authors: J. Coles, mod. K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Chrysothamnus viscidiflorus / Poa pratensis Semi-natural Shrub Herbaceous Vegetation

Yellow Rabbitbrush / Kentucky Bluegrass Semi-natural Shrub Herbaceous Vegetation

CODE	CEGL002933
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland with a sparse shrub layer (V.A.7.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland with a sparse shrub layer (V.A.7.N.)
FORMATION	Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer (V.A.7.N.e.)
ALLIANCE	*CHRYSOTHAMNUS VISCIDIFLORUS* SHRUB HERBACEOUS ALLIANCE (A.1524) Yellow Rabbitbrush Shrub Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Semi-Desert Shrub-Steppe (CES304.788)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This association is known from the southern Rocky Mountains and Colorado Plateau at 2200-2445 m (7200-8015 feet) elevation and likely is more widespread. Stands occur on the lower slopes of ridges, on terraces above drainages, and in valley bottoms. Sites are gently sloping, often on cooler northerly aspects. Ground surfaces may have high cover of litter. Soils are moderately well-drained to rapidly drained loams and silty clay loams derived from alluvium. The vegetation is characterized by a moderately dense herbaceous layer dominated by the introduced rhizomatous grass *Poa pratensis* with an open to moderately dense (10-50% cover) short-shrub layer dominated by *Chrysothamnus viscidiflorus*. Additional short and dwarf-shrubs that provide low cover include *Artemisia tridentata, Mahonia repens*, and *Symphoricarpos rotundifolius*. Other common graminoids with low cover include *Achnatherum lettermanii, Bromus porteri, Festuca thurberi*, and *Sporobolus cryptandrus*. Forb cover is sparse but may be diverse and include *Artemisia ludoviciana, Eriogonum racemosum, Eriogonum umbellatum, Lupinus argenteus, Penstemon palmeri*, and *Tragopogon dubius*. Seedling *Chrysothamnus viscidiflorus* short shrubs are present in the stand and provide sparse cover.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This rare shrub herbaceous association was sampled southwest of the Ponderosa Campground in Curecanti National Recreation Area.

Globally
This association has currently only been described from southwestern Utah and western Colorado.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This shrub herbaceous vegetation association occurs on the lower slopes of ridges. The site is gently sloped (13%), occurs at 2444 m elevation, and is oriented to the north. The unvegetated surface has high cover of litter. Downed wood is uncommon. Low exposure of bare soil results mostly from pocket gopher burrowing activity. Parent materials are Quaternary alluvium. Soils are rapidly drained silty clay loams.

Globally
This association is known from the southern Rocky Mountains and Colorado Plateau at 2200-2445 m (7200-8015 feet) elevation and likely is more widespread. Stands occur on the lower slopes of ridges, on terraces above drainages, and in valley bottoms. Sites are gently sloping, often on cooler northerly aspects. Ground surfaces may have high cover of litter. Soils are moderately well-drained to rapidly drained loams and silty clay loams derived from alluvium.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover is 79% in this type. The short shrub *Chrysothamnus viscidiflorus* forms an open canopy and provides 10% cover, and the non-native rhizomatous grass *Poa pratensis* provides 45% cover. Additional short and dwarf-shrubs that provide low cover include *Symphoricarpos rotundifolius* and *Mahonia repens*. Other graminoids common to the stand and contributing low cover include *Festuca thurberi, Achnatherum lettermanii*, and *Bromus porteri*. Forbs are diverse, contribute sparse cover, and include *Artemisia ludoviciana, Eriogonum racemosum, Eriogonum umbellatum, Lupinus argenteus*, and *Tragopogon dubius*. Seedling *Chrysothamnus viscidiflorus* short shrubs are present in the stand and provide sparse cover.

Globally
This association is characterized by a moderately dense herbaceous layer dominated by the introduced rhizomatous grass *Poa pratensis* with an open to moderately dense (10-50% cover) short-shrub layer dominated by *Chrysothamnus viscidiflorus*. Additional short and dwarf-shrubs that provide low cover include *Artemisia tridentata, Mahonia repens*, and *Symphoricarpos rotundifolius*. Other common graminoids with low cover include *Achnatherum lettermanii, Bromus porteri, Festuca thurberi*, and *Sporobolus cryptandrus*. Forb cover is sparse but may be diverse and include *Artemisia ludoviciana, Eriogonum racemosum, Eriogonum umbellatum, Lupinus argenteus, Penstemon palmeri*, and *Tragopogon dubius*. Seedling *Chrysothamnus viscidiflorus* short shrubs are present in the stand and provide sparse cover.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Chrysothamnus viscidiflorus, Symphoricarpos oreophilus*
Herb (field)	*Artemisia ludoviciana, Lupinus argenteus, Tragopogon dubius*
Herb (field)	*Achnatherum lettermanii, Bromus porteri, Festuca thurberi, Hesperostipa comata, Poa pratensis*

Globally

Stratum	Species
Short shrub/sapling	*Chrysothamnus viscidiflorus*
Herb (field)	*Poa pratensis*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Bromus inermis* (exotic, High/Medium), *Tragopogon dubius* (exotic, Medium/Low)

Globally
Exotic/Invasive: *Poa pratensis* (exotic, Medium), *Tragopogon dubius* (exotic, Medium/Low)

CONSERVATION STATUS RANK
Global Rank & Reasons: GNA (ruderal) (14-Aug-2001).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
The diagnostic characteristic of this semi-natural shrub-steppe association is the lush mesic graminoid layer dominated by *Poa pratensis*; however, cover of *Chrysothamnus viscidiflorus* is variable and may resemble an open shrubland.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Although this community was sampled only once, this and a similar community dominated by *Symphoricarpos oreophilus* are likely to occur in burned areas in the adjacent Gunnison National Forest. Such occurrences were observed and mapped with a medium level of confidence on aerial photography.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on 2002 field data (1 plot: CURE.0249).
Local Description Authors: J. Von Loh, mod. G. Bradshaw
Global Description Authors: K.A. Schulz

REFERENCES: Cogan et al. 2004, Western Ecology Working Group n.d.

Cirsium arvense - Weedy Forbs Great Plains Herbaceous Vegetation

Canada Thistle - Weedy Forbs Great Plains Herbaceous Vegetation

Great Plains Weedy Forbs Meadow

CODE	CEGL005260
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial forb vegetation (V.B.)
PHYSIOGNOMIC GROUP	Temperate or subpolar perennial forb vegetation (V.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
FORMATION	Tall temperate or subpolar perennial forb vegetation (V.B.2.N.a.)
ALLIANCE	*(CIRSIUM ARVENSE, EUPHORBIA ESULA, MELILOTUS* SPP.) - MIXED FORBS HERBACEOUS ALLIANCE (A.3564) (Canada Thistle, Leafy Spurge, Sweetclover species) - Mixed Forbs Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This Canada thistle type is widely naturalized in the northern United States and Canada. Stands occur on a variety of open disturbed habitats, including pastures, ditches, bottomlands, and waste areas. The vegetation is dominated by medium-tall (0.5-1 m) forbs. In semi-arid and arid regions, sites tend to be relatively mesic. The dominant forb is *Cirsium arvense*, a naturalized species from Eurasia. Other weedy species may occur as well, but native species are generally less than 10% cover. Native species may include mixed-grass prairie grasses, such as *Pascopyrum smithii*

and *Hesperostipa comata (= Stipa comata),* as well as others. Where native species are conspicuous enough to identify the native plant association that could occupy the site, the stand should be typed as such.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This common and widespread association was sampled south of the Gunnison River and Neversink Area, southeast and east of the Gunnison River, east of the Cooper Ranch Recreation Site, southeast and southwest of Old Steven's Recreation/Picnic Area, south of Blue Mesa Reservoir and near Sapinero, Blue Mesa Reservoir.

Globally

This type is widely naturalized in the northern United States and Canada.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Patches of *Cirsium arvense* occur on floodplains and terraces around the reservoir, rivers and streams. Sites are flat to gently sloping (to 3-degree slopes) and occur at 2291 and 2313 m elevation on a variety of aspects. The unvegetated ground surface typically has high cover of bare ground with low to moderate cover of rock and gravel, and very low cover of litter, except for one stand where it is abundant. Most stands occur on sites with current or past human or natural disturbances, such as river or reservoir level fluctuations, cattle grazing, old hay meadow, and prairie dog and other small mammal activity.

Globally

Stands occur on a variety of open disturbed habitats, including pastures, ditches, bottomlands, and waste areas (Great Plains Flora Association 1986).

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stands of this type are characterized by an open to moderately dense herbaceous layer 0.5-1.0 m tall. The introduced noxious weed *Cirsium arvense* dominates or codominates the stand with 15-80% cover. Common native species found are *Achillea millefolium, Agrostis scabra, Carex athrostachya, Carex utriculata, Hordeum jubatum, Juncus arcticus,* and *Pascopyrum smithii,* which typically contribute from 1-5% herbaceous cover. Other introduced species include *Bromus inermis, Elymus repens, Lolium pratense (= Festuca pratensis), Medicago sativa, Phalaris arundinacea, Phleum pratense, Poa pratensis,* and *Rumex crispus*. Scattered woody species may also be present, such as *Populus angustifolia, Populus deltoides, Salix exigua,* and *Salix geyeriana* on riparian and palustrine sites, and *Ericameria nauseosa* on disturbed sites.

Globally

The vegetation is dominated by medium-tall (0.5-1 m) forbs. The dominant forb is *Cirsium arvense,* a naturalized species from Eurasia (Great Plains Flora Association 1986). Other weedy species may occur as well, but native species are generally less than 10% cover. Native species may include mixed-grass prairie grasses, such as *Pascopyrum smithii* and *Hesperostipa comata (= Stipa comata),* as well as others. In semi-arid and arid regions, sites tend to be relatively mesic and include many mesic species such as *Carex utriculata, Hordeum jubatum, Juncus arcticus,* and *Juncus balticus*. Scattered woody species may also be present, such as *Populus angustifolia, Populus deltoides, Salix exigua,* and *Salix geyeriana* on riparian and palustrine sites, and *Ericameria nauseosa* may be common on disturbed sites. Where native species are conspicuous enough to identify the native plant association that could occupy the site, the stand should be classified as such. Other introduced species include *Bromus inermis, Conyza canadensis, Elymus repens, Linaria vulgaris, Lolium pratense (= Festuca pratensis), Marrubium vulgare, Medicago sativa, Phalaris arundinacea, Phleum pratense, Poa pratensis, Rumex crispus, Thlaspi arvense,* and *Verbascum thapsus*.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Herb (field)	*Cirsium arvense*

Globally

Stratum	Species
Herb (field)	*Cirsium arvense*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Phleum pratense* (exotic, Medium), *Poa pratensis* (exotic, Medium)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNA (invasive) (13-Apr-1999). This type is widely naturalized from Eurasia across the northern United States and Canada, where it has invaded on disturbed areas (Great Plains Flora Association 1986). It is not planted by humans.

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
The stands at Florissant Fossil Beds National Monument most closely fit this association that has been described for the midwestern United States. At Florissant native and introduced graminoid species co-occur with the *Cirsium*, but these communities are very similar to those found throughout the Midwest and in Colorado.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: *Data are not available.*
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (13 observation points: CURE_AA.0057, CURE_AA.0063, CURE_AA.0072, CURE_AA.0075, CURE_AA.0094, CURE_AA.0097, CURE_AA.0120, CURE_AA.0134, CURE_AA.0252, CURE_AA.0262, CURE_AA.0398, CURE_AA.0591, CURE_AA.0608).
Local Description Authors: K.A. Schulz
Global Description Authors: D. Faber-Langendoen, mod. K.A. Schulz

REFERENCES: Great Plains Flora Association 1986, Midwestern Ecology Working Group n.d., NDNHI unpubl. data, Von Loh et al. 2000

Bromus tectorum Semi-natural Herbaceous Vegetation

Cheatgrass Semi-natural Herbaceous Vegetation

Cheatgrass Annual Grassland

CODE	CEGL003019
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Annual graminoid or forb vegetation (V.D.)
PHYSIOGNOMIC GROUP	Temperate or subpolar annual grasslands or forb vegetation (V.D.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar annual grasslands or forb vegetation (V.D.2.N.)
FORMATION	Short temperate annual grassland (V.D.2.N.d.)
ALLIANCE	*BROMUS TECTORUM* SEMI-NATURAL HERBACEOUS ALLIANCE (A.1814) Cheatgrass Semi-natural Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Semi-Desert Grassland (CES304.787)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This herbaceous vegetation type is found throughout much of western North America from the western Great Plains to the Intermountain West. It occurs most often after disturbance of a natural shrub- or grass-dominated community that results in the replacement of the natural vegetation by non-native, annual grass species of *Bromus*. *Bromus tectorum* typically dominates the community with over 80-90% of the total vegetation cover, making it difficult to determine what natural community was formerly present. This vegetation also includes grasslands dominated or codominated by other Eurasian introduced annual *Bromus* species such as *Bromus hordeaceus, Bromus madritensis, Bromus japonicus, Bromus rigidus*, or *Bromus rubens*. It is distinct from the annual *Bromus* communities found along the Pacific Coast typical of the Mediterranean or maritime climates.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This association occurs throughout developed and disturbed areas of the park and recreation area and was observed and sampled on the 1994 burn at Red Rocks, near the Pumphouse at the Red Rocks Campground, and on the burn in Jones Draw.

Globally

This alliance-level herbaceous vegetation type is found throughout much of western North America from the western Great Plains to intermountain and southwestern U.S.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

This herbaceous association was observed on the midslopes of swales, ridges and hills and on ridgetops. It is found principally on disturbed areas throughout the park and recreation area, apparently without regard to slope, aspect, elevation or geomorphology. Sites are moderately steep to steep (9-42% slopes), occur between 1905 and 2499 m elevation, and include all aspects. The unvegetated surface has low to moderately high cover of litter and exposure of bare soil. Large and small rocks may be absent or provide high cover. Downed wood can provide low to moderate cover in some stands. Soils are rapidly drained sandy clay loam, sandy loams, and loams derived from Quaternary alluvium, metamorphic rocks and Mesozoic shales.

Globally

This herbaceous vegetation type is found throughout much of western North America from the western Great Plains to the Intermountain and southwestern U.S. Elevation ranges from sea level to 2200 m. Stands occur after disturbance of a natural shrub- or grass-dominated community, resulting in the replacement of the natural vegetation by non-native, annual grass species of *Bromus*, although invasion of undisturbed sites has also been reported (e.g., Evans et al. 2001). At Wind Cave National Park in South Dakota, weedy non-native graminoid vegetation occurs on recently disturbed areas, most commonly along roads. Small stands also occur in prairie dog towns (H. Marriott

pers. comm. 1999). In the Great Basin, *Bromus tectorum* grasslands have invaded large areas of burned-over sagebrush steppe. *Bromus tectorum* increases the fire frequency of steppe communities, which eventually eliminates sagebrush (FEIS 2001).

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Total vegetation cover ranges from 15 to 75% in these stands and varies greatly from year to year and season to season. This herbaceous association is characterized by the exotic annual *Bromus tectorum* that provides cover ranging from 15 to 50%. Other graminoids may contribute up to 25%, but usually less than 5% cover, including *Achnatherum hymenoides, Elymus elymoides, Pleuraphis jamesii*, and *Poa secunda*. Forbs are variable among sites, generally provide sparse cover, and include *Descurainia pinnata, Lappula occidentalis var. occidentalis*, and *Sphaeralcea coccinea*. The shrub layer is typically present, provides sparse to low cover, and includes *Amelanchier utahensis, Artemisia tridentata* ssp. *vaseyana, Artemisia tridentata* ssp. *wyomingensis*, *Opuntia polyacantha, Quercus gambelii*, and *Symphoricarpos rotundifolius*. In most cases the shrubs survived the fire or resprouted from the root crown.

Globally

This vegetation type is characterized by a sparse to dense, short, annual graminoid layer that is typically dominated by *Bromus tectorum* with over 80-90% of the total vegetation cover. Other Eurasian introduced annual species of *Bromus* which may alternatively dominate or codominate are *Bromus carinatus, Bromus hordeaceus, Bromus madritensis, Bromus japonicus, Bromus rigidus*, or *Bromus rubens*. Although there may be remnant species of the former native vegetation, the high cover of annual bromes makes it difficult to determine what natural community was formerly present. Weedy and exotic annual forbs may also have significant cover in some stands. Scattered shrubs and dwarf-shrubs, especially *Chrysothamnus viscidiflorus, Ericameria nauseosa, Ephedra viridis, Gutierrezia sarothrae*, and *Opuntia polyacantha*, may be present with low cover. At Wind Cave National Park in South Dakota, this weedy non-native graminoid vegetation is usually dominated by several perennial and annual brome grasses, including *Bromus inermis, Bromus japonicus*, and *Bromus tectorum*. Cover is variable (H. Marriott pers. comm. 1999), and in drought years, *Bromus tectorum* may be sparse or absent.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *wyomingensis*
Herb (field)	*Opuntia polyacantha*
Herb (field)	*Achnatherum hymenoides*, *Bromus tectorum*

Globally

Stratum	Species
Herb (field)	*Bromus hordeaceus*, *Bromus japonicus*, *Bromus madritensis*, *Bromus rigidus*, *Bromus rubens*, *Bromus tectorum*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Exotic/Invasive: *Alyssum minus* var. *micranthum* (= Alyssum minus; exotic), *Erodium cicutarium* (exotic, Medium/Low), *Melilotus officinalis* (exotic, Medium/Low), *Tragopogon dubius* (exotic, Medium/Low)

Globally

Exotic/Invasive: *Bromus carinatus* (weedy native), *Bromus hordeaceus* (exotic), *Bromus japonicus* (exotic), *Bromus madritensis* (exotic), *Bromus rigidus* (exotic), *Bromus rubens* (exotic), *Bromus tectorum* (exotic, High)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (invasive) (1-Dec-1997).

CLASSIFICATION COMMENTS

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Data are not available.

Globally
This alliance also includes grasslands dominated or codominated by other Eurasian introduced annual *Bromus* species. It is distinct from the annual *Bromus* communities found along the Pacific Coast with Mediterranean or maritime climates because it does not have the introduced annual oatgrass (*Avena barbata* and *Avena fatua*), or other species typical of the California annual grassland (Sawyer and Keeler-Wolf 1995).

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: This type may be related to *Ericameria nauseosa / Bromus tectorum* Semi-natural Shrubland (CEGL002937) identified from Utah. It may also be difficult to separate from the native communities that have been invaded by cheatgrass.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (5 plots: BLCA.0095, BLCA.0120, BLCA.0132, CURE.152, CURE.0153 and 32 observation points: BLCA_AA.175, BLCA_AA.241, BLCA_AA.242, BLCA_AA.251, BLCA_AA.254, BLCA_AA.255, BLCA_AA.257, BLCA_AA.261, BLCA_AA.262, BLCA_AA.390, BLCA_AA.627, BLCA_AA.628, BLCA_AA.634, BLCA_AA.635, BLCA_AA.636, BLCA_AA.662, BLCA_AA.663, BLCA_AA.669, BLCA_AA.670, BLCA_AA.676, BLCA_AA.677, BLCA_AA.689, BLCA_AA.697, BLCA_AA.775, BLCA_AA.778, BLCA_AA.784, BLCA_AA.792, BLCA_AA.910, BLCA_AA.911, BLCA_AA.912, BLCA_AA.913, CURE_AA.0025).
Local Description Authors: J. Von Loh, mod. G. Bradshaw and J. Coles
Global Description Authors: D. Faber-Langendoen, mod. K. Schulz and J. Coles

REFERENCES: Beatley 1976, Bell et al. 2009, Cogan et al. 2004, Daubenmire 1975, Englund 2004, Evans et al. 2001, FEIS 2001, Hansen et al. 2004d, Karl et al. 1999, Marriott pers. comm., Naumann pers. comm., Redente et al. 1992, Sawyer and Keeler-Wolf 1995, Western Ecology Working Group n.d., Young and Evans 1973, Young and Evans 1978

Conyza canadensis Semi-natural Herbaceous Vegetation

Canadian Horseweed Semi-natural Herbaceous Vegetation

CODE	CEGL002800
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Annual graminoid or forb vegetation (V.D.)
PHYSIOGNOMIC GROUP	Temperate or subpolar annual grasslands or forb vegetation (V.D.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar annual grasslands or forb vegetation (V.D.2.N.)
FORMATION	Seasonally flooded temperate annual forb vegetation (V.D.2.N.h.)
ALLIANCE	*CONYZA CANADENSIS* SEASONALLY FLOODED HERBACEOUS ALLIANCE (A.2657) Canadian Horseweed Seasonally Flooded Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This semi-natural herbaceous association is described from only Curecanti National Recreation Area but likely is more widely distributed in mesic, disturbed sites. Stands occur in the drawdown zone of Blue Mesa Reservoir, which is exposed during the summer, and occupy the entire slope of the exposed reservoir shoreline in addition to narrow areas above the ordinary high water line. Sites are moderately steep (18-25% slopes) and occur between 2284 and 2300 m elevation. The unvegetated surface is predominantly cobble, gravel, and sand. Soils are sandy and well-drained when not inundated by the reservoir. The vegetation is characterized by a sparse to moderately vegetated (to 35% cover) herbaceous layer dominated by the tall forb *Conyza canadensis*. The herbaceous layer is

low in diversity and consists of concentric bands of vegetation, with *Conyza canadensis* occupying the area at and above the ordinary high water line and *Chenopodium album* occupying the area at and below the ordinary high water line to the water's edge. Other commonly associated forbs present and contributing low to moderate cover include *Chenopodium glaucum, Lactuca serriola, Melilotus officinalis, Salsola tragus, Rorippa palustris* ssp. *hispida*, and *Verbascum thapsus*. The only graminoid observed on the reservoir drawdown zone is *Hordeum jubatum*, which provides low cover.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association is common around reservoir shorelines in the recreation area and was sampled on the drawdown zone where it forms bands above, at, and below the ordinary high water line of Blue Mesa Reservoir. The larger stands sampled occurred in the North Willow Creek and Old Stevens Picnic Area sites of Curecanti National Recreation Area.

Globally
This association has been described from only Curecanti National Recreation Area but likely is more widely distributed in mesic, disturbed sites such as reservoir drawdown zones.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This herbaceous association occurs in the drawdown zone of Blue Mesa Reservoir, which was exposed during the summer of 2002 as regional drought conditions reduced the stored water supply. The type occupied the entire slope of the exposed reservoir shoreline in addition to narrow areas above the ordinary high water line. Shoreline sites are moderately steep (18-25% slopes), occur between 2284 and 2300 m elevation, and include all aspects. The unvegetated surface is predominantly cobble, gravel, and sand with extremely small amounts of litter present. Parent materials are Quaternary alluvium. Soils are sandy and well-drained when not inundated by the reservoir.

Globally
Data are not available.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 30 to 35% in these stands. The tall forb *Conyza canadensis* forms open stands and provides up to 30% cover. The herbaceous layer is low in diversity and consists of concentric bands of vegetation, with *Conyza canadensis* occupying the area at and above the ordinary high water line and *Chenopodium album* occupying the area at and below the ordinary high water line to the water's edge. Other commonly associated forbs present and contributing low to moderate cover include *Chenopodium glaucum, Lactuca serriola, Melilotus officinalis, Salsola tragus, Rorippa palustris* ssp. *hispida*, and *Verbascum thapsus*. The only graminoid observed on the reservoir drawdown zone is *Hordeum jubatum*, which provides low cover.

Globally
Data are not available.

MOST ABUNDANT SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Herb (field)	*Chenopodium album, Conyza canadensis, Lactuca serriola, Melilotus officinalis*
Herb (field)	*Hordeum jubatum*

Globally

Stratum	Species
Herb (field)	*Conyza canadensis*

OTHER NOTEWORTHY SPECIES

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Chenopodium glaucum* (exotic), *Medicago sativa* (exotic, Insignificant), *Salsola tragus* (exotic), *Verbascum thapsus* (exotic, Medium)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNA (ruderal) (23-Jun-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Plant species growing on the Blue Mesa Reservoir drawdown zone are stratified by species, emerging as the water recedes.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (2 plots: CURE.0166, CURE.0169 and 6 observation points: CURE_AA.0104, CURE_AA.0282, CURE_AA.0288, CURE_AA.0294, CURE_AA.0304, CURE_AA.0336).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Western Ecology Working Group n.d.

Holodiscus dumosus Rock Outcrop Sparse Vegetation

Rockspirea Rock Outcrop Sparse Vegetation

CODE	CEGL002801
PHYSIOGNOMIC CLASS	Sparse Vegetation (VII)
PHYSIOGNOMIC SUBCLASS	Consolidated rock sparse vegetation (VII.A.)
PHYSIOGNOMIC GROUP	Sparsely vegetated cliffs (VII.A.1.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural sparsely vegetated cliffs (VII.A.1.N.)
FORMATION	Cliffs with sparse vascular vegetation (VII.A.1.N.a.)
ALLIANCE	ROCK OUTCROP SPARSELY VEGETATED ALLIANCE (A.1838) Rock Outcrop Sparsely Vegetated Alliance

ECOLOGICAL SYSTEM(S): Rocky Mountain Cliff, Canyon and Massive Bedrock (CES306.815)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This sparsely vegetated association is described from Curecanti National Recreation Area and nearby Gunnison National Forest in western Colorado, but it likely occurs elsewhere in the southern Rocky Mountains. Stands are found on the upper edges and ledges of mesa cliffs, talus deposits below cliffs, on cliffs in canyons or gorges, boulder fields and on ridgetop outcrops. Sites are moderately sloped to steep (20-140% slopes) and occur between 2205 and 3075 m (7230-10,080 feet) elevation. Stands occur on all aspects but are mostly southerly at higher elevations. The ground surface has high cover of bedrock, large and small rocks, and bare soil. Soils are rapidly drained gravelly sandy loams. The vegetation is characterized by a sparse to open canopy of *Holodiscus dumosus* up to 2 m tall. Scattered trees such as *Juniperus scopulorum, Pinus contorta, Pinus edulis, Pinus flexilis, Pinus ponderosa,* and *Pseudotsuga menziesii* are occasionally present as saplings from 1.5-3 m tall. The tall shrub *Acer glabrum* may be present and provide sparse cover. The associated short and dwarf-shrubs are diverse and include *Amelanchier utahensis, Artemisia frigida, Brickellia grandiflora, Fendlera rupicola, Mahonia repens, Philadelphus microphyllus, Prunus virginiana, Ribes cereum, Ribes inerme,* and *Symphoricarpos oreophilus.* The herbaceous layer is a moderately diverse to depauperate mixture of graminoids and forbs contributing low to moderate cover.

Common graminoids include *Bouteloua gracilis, Bromus porteri, Carex geyeri, Elymus elymoides, Muhlenbergia montana, Piptatherum micranthum, Poa fendleriana, Poa pratensis*, and *Poa secunda*; various forbs may include *Antennaria parvifolia, Artemisia frigida, Artemisia ludoviciana, Artemisia michauxiana, Eriogonum cernuum, Galium* spp., *Heterotheca villosa, Penstemon teucrioides, Saxifraga bronchialis* ssp. *austromontana, Saxifraga odontoloma*, and *Selaginella* sp.

DISTRIBUTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This uncommon association was sampled along the Pine Creek Trail, below Morrow Point Dam, along the Cimarron Utility Road, on Haystack Mesa, east of Myers Gulch, and east of the Lake Fork Arm of Blue Mesa Reservoir in Curecanti National Recreation Area.

Globally
This association is described from Curecanti National Recreation Area, Gunnison and Rio Grande national forests in south-central Colorado, but it likely occurs elsewhere in the southern Rocky Mountains.

ENVIRONMENTAL DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This sparsely vegetated association occurs on the upper edges and ledges of mesa cliffs, talus deposits below cliffs, on cliffs in canyons or gorges, and on ridgetop outcrops. Sites are moderately sloped to steep (20-140% slopes), occur between 2205 and 2755 m elevation, and are oriented to all aspects. The unvegetated surface has sparse cover of litter, high exposure of bedrock and bare soil, and high cover of large and small rocks. Downed wood is absent or uncommon. Parent materials are variable and include Tertiary volcanic rocks, metamorphic/granitic rocks, and Quaternary landslide deposits. Soils are rapidly drained when present and are gravelly sandy loams.

Globally
This sparsely vegetated association is described from Curecanti National Recreation Area and nearby Gunnison National Forest in western Colorado, but it likely occurs elsewhere in the southern Rocky Mountains. Stands are found on the upper edges and ledges of mesa cliffs, talus deposits below cliffs, on cliffs in canyons or gorges, boulder fields and on ridgetop outcrops. Sites are moderately sloped to steep (20-140% slopes) and occur between 2205 and 3075 m (7230-10,080 feet) elevation. Stands occur on all aspects but are mostly southerly at higher elevations (Shepherd 1975). The ground surface has high cover of bedrock, large and small rocks, and bare soil. Soils are rapidly drained gravelly sandy loams. Parent materials are variable and include Tertiary volcanic rocks, metamorphic/granitic rocks, and Quaternary landslide deposits.

VEGETATION DESCRIPTION

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Total vegetation cover ranges from 5 to 41% in these stands. *Holodiscus dumosus* short shrubs, to 2 m tall, form an open canopy that ranges in cover from 1 to 25%. The tree species *Juniperus scopulorum, Pinus edulis*, and *Pseudotsuga menziesii* are occasionally present as saplings from 1.5-3 m tall, and together contribute sparse cover. The shrub layer provides sparse to moderate cover. The tall shrub *Acer glabrum* may be present and provide sparse cover. The associated short- and dwarf-shrub layer is diverse and includes *Amelanchier utahensis, Artemisia frigida, Fendlera rupicola, Mahonia repens, Philadelphus microphyllus, Prunus virginiana, Ribes cereum, Ribes inerme*, and *Symphoricarpos oreophilus*. The herbaceous layer is moderately diverse and contributes low to moderate cover. Graminoids are moderately diverse, provide sparse cover, and include *Bromus porteri, Carex geyeri, Elymus elymoides, Piptatherum micranthum, Poa fendleriana, Poa pratensis*, and *Poa secunda*. Forbs contribute sparse to low cover and include *Antennaria parvifolia, Artemisia frigida, Artemisia ludoviciana, Artemisia michauxiana, Brickellia grandiflora, Eriogonum cernuum, Galium boreale, Galium coloradoense, Heterotheca villosa, Penstemon teucrioides, Saxifraga bronchialis* ssp. *austromontana, Saxifraga odontoloma*, and *Selaginella* sp. One stand has seedling *Picea pungens* trees contributing sparse cover. Lichens and mosses are common on the rocks of this association and contribute 10 to 75% and <1 to 10% cover, respectively.

Globally
This vegetation is characterized by a sparse to open canopy of *Holodiscus dumosus* up to 2 m tall. Scattered trees such as *Juniperus scopulorum, Pinus contorta, Pinus edulis, Pinus flexilis, Pinus ponderosa*, and *Pseudotsuga menziesii* are occasionally present as saplings from 1.5-3 m tall. The tall shrub *Acer glabrum* may be present and provide sparse cover. The associated short and dwarf-shrubs are diverse and include *Amelanchier utahensis,*

Artemisia frigida, Brickellia grandiflora, Fendlera rupicola, Mahonia repens, Philadelphus microphyllus, Prunus virginiana, Ribes cereum, Ribes inerme, and *Symphoricarpos oreophilus*. The herbaceous layer is a moderately diverse to depauperate mixture of graminoids and forbs contributing low to moderate cover. Common graminoids include *Bouteloua gracilis, Bromus ciliatus, Bromus porteri, Carex geyeri, Elymus elymoides, Festuca arizonica, Muhlenbergia montana, Piptatherum micranthum, Poa fendleriana, Poa pratensis*, and *Poa secunda*; various forbs may include *Achillea millefolium, Antennaria parvifolia, Artemisia frigida, Artemisia ludoviciana, Artemisia michauxiana, Eriogonum cernuum, Galium* spp., *Heterotheca villosa, Penstemon teucrioides, Saxifraga bronchialis* ssp. *austromontana, Saxifraga odontoloma,* and *Selaginella* sp. Lichens and mosses are common to abundant on the rocks and bare soil.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Holodiscus dumosus, Ribes cereum*
Herb (field)	*Poa fendleriana*

Globally

Stratum	Species
Short shrub/sapling	*Holodiscus dumosus, Ribes cereum*
Herb (field)	*Poa fendleriana*

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Poa pratensis* (exotic, Medium)

Globally
Vulnerable: *Penstemon teucrioides* (vulnerable, G2G3Q)

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (23-Jun-2005).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: This association occupies canyon wall crevices, fissures, ledges, and talus deposits. It is described using observation point data only and should be further sampled using more comprehensive vegetation plots.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data (7 plots: CURE.0188, CURE.0191, CURE.0210, CURE.0228, CURE.0282, CURE.0302, CURE.0306 and 12 observation points: BLCA_AA.537, BLCA_AA.538, BLCA_AA.607, CURE_AA.0199, CURE_AA.0255, CURE_AA.0316, CURE_AA.0395, CURE_AA.0680, CURE_AA.0956, CURE_AA.0974, CURE_AA.1050, CURE_AA.1059).
Local Description Authors: J. Von Loh
Global Description Authors: K.A. Schulz

REFERENCES: Johnston 2001, Komarkova 1986, Shepherd 1975, Western Ecology Working Group n.d.

Artemisia tridentata ssp. *vaseyana / Achnatherum hymenoides* Shrubland [Park Special]

Mountain Big Sagebrush / Indian Ricegrass Shrubland [Park Special]

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
ALLIANCE	Not Applicable

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally

Data are not available.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association was sampled on a slope and near cliff bands east of Cebolla Fork, along a drainageway east of Highway 149, and on hillslopes north of Highway 50 in the Curecanti National Recreation Area.

Globally
Data are not available.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This sagebrush association occurs on a variety of landforms in the recreation area. Stands were sampled on a midslope near a cliff band at the top of a mesa, on hillslopes, and along a drainageway. The sampled sites are gentle to moderate (4- to 24-degree slopes) and occur at 2317-2546 m elevation. The unvegetated surface has moderate to high cover (40-70%) of bare ground with moderate to low cover (<30%) of rocks and gravel and low cover (<15%) of litter.

Globally
Data are not available.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This big sagebrush / Indian ricegrass shrubland is characterized by a moderately dense short-shrub layer dominated by *Artemisia tridentata* ssp. *vaseyana* and an open herbaceous layer dominated by the large bunchgrass *Achnatherum hymenoides*. The remaining shrub layer has low diversity, provides sparse to low cover, and may include *Artemisia frigida*, *Chrysothamnus viscidiflorus*, *Opuntia* spp., *Quercus gambelii*, and *Rhus trilobata*. If *Quercus gambelii* is present, then it has low cover (<5%). Scattered *Juniperus scopulorum* or *Pseudotsuga menziesii* trees may also be present. The herbaceous layer provides low to moderate cover. Other herbs present include graminoids *Elymus elymoides* and *Hesperostipa comata* and forbs *Eriogonum umbellatum* and *Phlox hoodii*.

Globally
Data are not available.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Achnatherum hymenoides*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Exotic/Invasive: *Phleum pratense* (exotic, Medium), *Poa pratensis* (exotic, Medium)

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G3G5 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data collected during accuracy assessment (5 observation points: CURE_AA.0187, CURE_AA.0200, CURE_AA.0569, CURE_AA.0759, CURE_AA.0760).
Local Description Authors: K.A. Schulz
Global Description Authors:

REFERENCES: Western Ecology Working Group n.d.

Artemisia tridentata ssp. *vaseyana / Piptatherum micranthum* Shrubland [Park Special]

Mountain Big Sagebrush / Little-seed Ricegrass Shrubland [Park Special]

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
ALLIANCE	Not Applicable

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally

Data are not available.

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This community was sampled on a slope of Big Game Hill in the Curecanti National Recreation Area.

Globally
Data are not available.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This sagebrush association occurred on a moderately steep (28%) mid-slope with a northly aspect a 2341 m elevation. The unvegetated surface has high cover (82%) of litter with 10% cover of wood, and low cover of rocks and bare soil. Soil classified as Parlin Mergel gravelly loam and was derived from Mesosoic sandstone.

Globally
Data are not available.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This mountain big sagebrush / little-seed ricegrass shrubland is characterized by a moderately dense short-shrub layer dominated by *Artemisia tridentata* ssp. *vaseyana* and an open herbaceous layer dominated by *Piptatherum micranthum (= Oryzopsis micrantha). Chrysothamnus viscidiflorus* and *Symphoricarpos rotundifolius* were present with significant cover and *Ribe cereum* was present. The herbaceous layer is relatively diverse with low cover of everything but *Piptatherum micranthum.* Other herbs present include graminoids *Achnatherum hymenoides,Achnatherum pinetorum, Elymus elymoides, Pascopyrum smithii* and *Poa fendleriana* and forbs *Antennaria parvifolia, Arabis oxylobula, Eriogonum umbellatum, Leptodactylon pungens, Lupinus* sp.*, Penstemon teucrioides,* and *Senecio integerrimus.*

Globally
Data are not available.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Short shrub/sapling	*Artemisia tridentata* ssp. *vaseyana*
Herb (field)	*Piptatherum micranthum*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G3G5 (23-Feb-1994).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes: Data are not available.

Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data collected in 2001 (1 plot: CURE_0059).
Local Description Authors: K.A. Schulz
Global Description Authors:

REFERENCES: Western Ecology Working Group n.d.

Pseudotsuga menziesii / Prunus virginiana Forest [Park Special]

Douglas-fir / Saskatoon Serviceberry Forest [Park Special]

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
ALLIANCE	Not Applicable

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally

DISTRIBUTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This association was not sampled in the recreation area until the accuracy assessment phase of the project.

Globally
Data are not available.

ENVIRONMENTAL DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This forest association is found on mid to upper slopes of hills, valley floors, depressions and streambeds from elevations ranging from 2099 to 2640 m. Slopes are gentle to steep (4-19%) on all aspects. Parent materials include amphibolite, alluvial fan deposits, tuff, quartzite, and migmatitic gneiss. Unvegetated surfaces are composed mostly of litter with lesser amounts of gravel, rocks and occasional standing water.

Globally
Data are not available.

VEGETATION DESCRIPTION
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
This mesic Douglas-fir association has an open to moderately dense (10-50%) canopy of *Pseudotsuga menziesii*. Other canopy associates include *Acer negundo, Populus angustifolia*, and *Populus tremuloides*. The understory is characterized by a moderately dense to dense tall-shrub layer of *Prunus virginiana* (20-50%). *Amelanchier alnifolia* is frequent but never dominant. Other common shrubs include *Artemisia frigida, Alnus incana, Ambrosia artemisiifolia, Acer glabrum, Cornus sericea, Mahonia repens, Holodiscus dumosus, Quercus gambelii, Chrysothamnus viscidiflorus, Symphoricarpos oreophilus, Rosa woodsii, Paxistima myrsinites, Salix exigua*, and *Cornus sericea*. Herbaceous cover is low (10-15%), and graminoid species may include *Carex utriculata, Elymus repens, Bromus secalinus, Phalaris arundinacea, Deschampsia caespitosa, Hesperostipa comata, Agrostis scabra, Carex geyeri*, and *Poa fendleriana*. Forb cover tends to be sparse and may include *Actaea rubra, Erigeron speciosus, Solidago canadensis*, and *Urtica dioica* ssp. *gracilis (= Urtica dioica var. procera)*.

Globally
Data are not available.

MOST ABUNDANT SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Tree subcanopy	*Populus tremuloides*
Tall shrub/sapling	*Amelanchier alnifolia, Sambucus racemosa*
Short shrub/sapling	*Ribes cereum, Symphoricarpos oreophilus*
Herb (field)	*Mahonia repens*
Herb (field)	*Solidago canadensis*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Data are not available.

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (18-Jun-2010).

CLASSIFICATION COMMENTS
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area
Abies concolor is typically absent in *Pseudotsuga menziesii* stands.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Inventory Notes:
Data are not available.
Black Canyon of the Gunnison National Park - Curecanti National Recreation Area Plots: The description is based on field data collected during accuracy assessment (6 observation points: CURE_AA.0089, CURE_AA.0136, CURE_AA.0396, CURE_AA.0419, CURE_AA.0660, CURE_AA.0700).
Local Description Authors: M.E. Hall
Global Description Authors:
REFERENCES: Western Ecology Working Group n.d.

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Appendix G. Illustrated Keys to the Plant Associations of Curecanti National Recreation Area

The vegetation of Curecanti National Recreation Area was sampled and classified in under the US Geological Survey and National Park Service Vegetation Mapping Program. This dichotomous key, illustrated with images taken during the vegetation sampling, has been prepared to assist in the accurate field identification of 131 plant associations described from Curecanti National Recreation Area. Twenty-one associations of these were added to the key and to the final classification following accuracy assessment.

This key is structured to facilitate identification of plant associations using one or more dominant or characteristic species in concert with habitat information. Because of natural variation within plant associations, it is possible that a community can be keyed using more than one of the physiognomic keys. Ecotonal communities (areas where dominant species from several associations mix) may be difficult to key. This guide also allows the user to crosswalk plant associations directly to the Curecanti National Recreation Area vegetation map so that all subsequent research may have a common focal point relative to the baseline years of aerial photography (2002) and field data collection (2000 to 2004).

HOW TO USE THE KEY:

The key approaches plant association identification at two levels. The first level is physiognomic, and allows the user to determine which major group is being evaluated, e.g., Forest and Woodland, Shrub and Shrub Herbaceous Vegetation, Graminoid, or Forb. The second level allows identification to plant association based on dominant species foliar cover, usually assisted by a brief description of the typical habitat. As an aid to observers in the field, representative photographs demonstrating variation within vegetation types are included.

It is possible that in using this key, you will have difficulty arriving at an association that describes your community. There are several potential reasons for this, and each has a solution:

1. You are observing vegetation that you think is an herbaceous or shrubland community, but it has some tree cover. In this case, try keying the vegetation through the woodland key as well as the herbaceous or shrubland key. In general with any layer, if it does not cover at least 10% (tree layer) or 5% (shrub or herbaceous layers), it is ignored. The exception is in very sparse communities (see #2 below).

2. Communities that are sparsely vegetated (e.g., < 15% total vascular plant cover) should be run through multiple keys. Even though they contain trees or shrubs,

   they may not fall cleanly into a “woodland “or “shrubland” category. "Sparse" vegetation is defined as having total vascular plant cover of < 10%.

3. You can follow a key to a certain point, but you clearly have something not described in the key. This is not unexpected, as a plant association could be missed during the sampling phases of the project or have too low of a classification confidence to include in the final classification and field key. Check the list of additional vegetation types found during AA that were not included in the Final Classification at the end of each key. Document new types with plot sampling.

Key I: Major Physiognomic Groups

1a Vegetation woody or appearing woody; composed predominantly of trees or shrubs, dwarf-shrubs; total vegetation cover may range from sparse to dense. Included here are savannas, which are stands with relatively low cover of trees (5-15%) with a high cover of graminoids and are treated as woodlands in this key (2)

1b Vegetation non-woody; composed predominantly of grasses, grass-like herbs (graminoids), and broad-leaf herbs (forbs), which may be tall and coarse; total vegetation cover may range from sparse to dense. If woody plants are present, they are a minor part of the total foliar cover (<5%, only one to two individuals, not dominant and not characteristic. If border-line, key both ways.) (3)

2a Vegetation of forest (predominantly interlocking tree canopies) or woodland or savanna (predominantly open, non-interlocking tree canopies); characteristic genera include *Acer*, *Juniperus*, *Picea*, *Pinus*, *Populus*, and *Pseudotsuga*
(**Key II**)

2b Vegetation of tall shrubs, short shrubs, or dwarf-shrubs; canopies may interlock, but are more commonly less dense. This group includes shrub herbaceous associations with 10-25% cover of shrubs and herbaceous cover exceeding shrub cover. Some stands may have less shrub cover (5-9%) when total vegetation cover is low (10-20%), but not sparse (<10% cover). Characteristic genera include *Alnus*, *Amelanchier*, *Artemisia, Atriplex*, *Ceanothus*, *Cercocarpus*, *Chrysothamnus*, *Cornus*, *Ericameria, Glossopetalon*, *Holodiscus*, *Krascheninnikovia*, *Purshia*, *Quercus*, *Salix*, *Sarcobatus*, and *Symphoricarpos* (**Key III**)

3a Vegetation herbaceous; composed primarily of graminoid species and some forb species, although scattered shrubs or trees may be present and contribute a low amount of cover; wetland or upland habitats; characteristic genera include *Achnatherum, Agrostis*, *Bromus*, *Carex*, *Elymus*, *Hesperostipa*, *Hordeum*, *Juncus*, *Leymus*, *Pascopyrum*, *Phalaris*, *Pleuraphis*, *Poa*, or *Thinopyrum* and the forb genera *Artemisia*, *Conyza*, or *Cirsium* (**Key IV**)

Key II: Forest and Woodland Vegetation

1a Forest or woodland associations of evergreen trees with interlocking or open tree canopies; typically providing 15-100% canopy cover; characterized by the genera *Juniperus, Picea, Pinus* or *Pseudotsuga*. Includes savannas (relatively low cover of trees and high cover of graminoids) and sparse woodlands where trees dominate the low total vegetation (10-15% cover). Open canopy stands often have scattered sapling trees or shrubs present in canopy openings **(2)**

1b Forest or woodland associations of deciduous trees with interlocking or open tree canopies; providing 15-100% canopy cover; characterized by the genera *Acer* or *Populus.* Open canopy stands often have scattered sapling trees or shrubs present in canopy openings **(28)**

2a (from couplet 1) Forest or woodland associations dominated by *Picea* or *Pseudotsuga* **(3)**

2b Forest of woodland associations dominated by *Pinus or Juniperus* **(17)**

3a (2) Evergreen forest or woodland with a canopy characterized by the genus *Picea* **(4)**

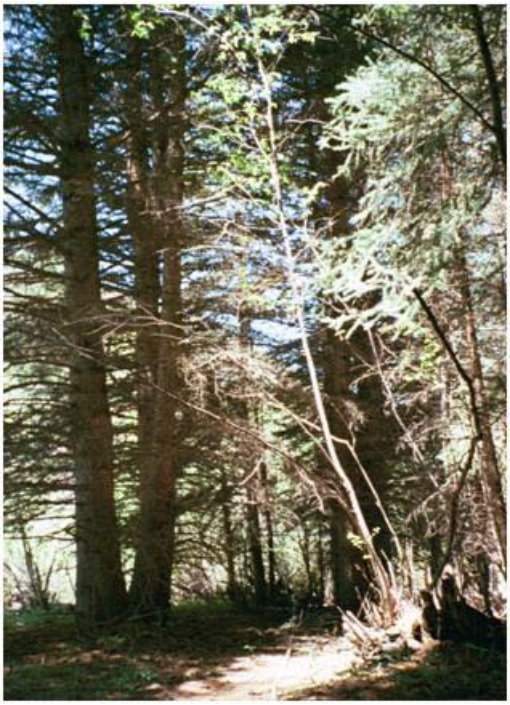
3b Evergreen forest or woodland with a canopy characterized by the genus *Pseudotsuga* **(6)**

4a (3) Forest or woodland principally composed of *Picea pungens* with a dwarf-shrub understory of *Mahonia repens* – ***Picea pungens* / *Mahonia repens* (Blue Spruce / Creeping Barberry) Forest [Map Class 9]**



4b *Picea pungens* forest or woodland stands with a tall shrub understory composed of *Alnus incana* or *Cornus sericea* **(5)**

5a (4) *Picea pungens* forest or woodland stands with a tall shrub understory primarily composed of *Alnus incana*; other diagnostic shrubs may be present in lesser amounts – ***Picea pungens* / *Alnus incana* (Blue Spruce / Speckled Alder) Woodland [Map Class 9]**



5b *Picea pungens* forest or woodland stands with a tall shrub understory composed primarily of *Cornus sericea*; other diagnostic shrubs may be present in lesser amounts – ***Picea pungens* / *Cornus sericea* (Blue Spruce / Redosier Dogwood) Woodland [Map Class 9]**



6a (3) *Pseudotsuga menziesii* forest or woodland stands codominated by *Populus tremuloides* in the tree canopy and an understory tall shrub layer of *Amelanchier alnifolia* – ***Populus tremuloides* - *Pseudotsuga menziesii* / *Amelanchier alnifolia* (Quaking Aspen – Douglas-fir / Saskatoon Serviceberry) Forest [Map Class 52]**



6b *Pseudotsuga menziesii* forest or woodland stands not codominated by *Populus tremuloides* in the tree canopy **(7)**

7a (6) *Pseudotsuga menziesii* forest or woodland stands with a predominantly herbaceous understory characterized by genera *Carex* or *Poa* **(8)**

7b *Pseudotsuga menziesii* forest stands with understory absent or if present then composed of short or tall shrub layers **(9)**

8a (7) *Pseudotsuga menziesii* forest or woodland stands with an herbaceous understory composed of *Carex geyeri* – ***Pseudotsuga menziesii* / *Carex geyeri* (Douglas-fir / Geyer's Sedge) Forest [Map Class 62]**



8b *Pseudotsuga menziesii* forest or woodland stands with an herbaceous understory composed of *Poa fendleriana* – ***Pseudotsuga menziesii* / *Poa fendleriana* (Douglas-fir / Muttongrass) Forest [Map Class 61]**





9a (7) *Pseudotsuga menziesii* forest or woodland stands without an understory, typically occurring on steep talus and scree slopes with sparse understory or with shrub layer dominated by genus *Holodiscus* **(10)**

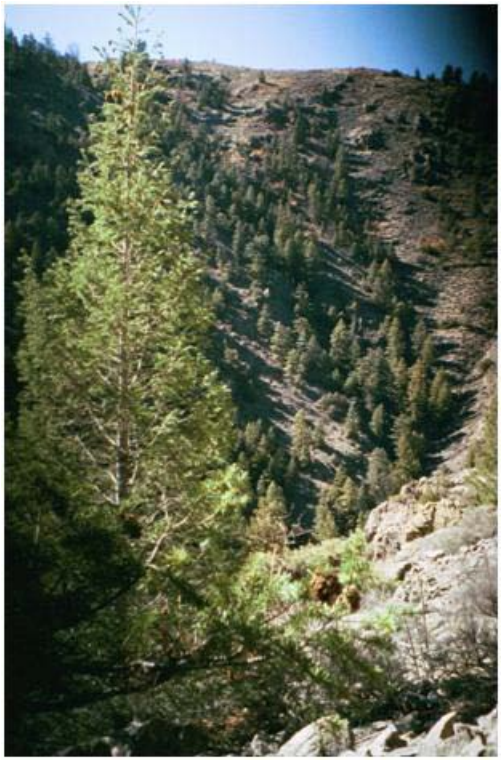
9b *Pseudotsuga menziesii* forest or woodland stands with a short or tall shrub understory composed of the genera *Acer*, *Artemisia*, *Mahonia*, *Prunus*, *Quercus*, or *Symphoricarpos* **(11)**

10a (9) *Pseudotsuga menziesii* forest or woodland stands without an understory, typically occurring on scree slopes – ***Pseudotsuga menziesii* Scree (Douglas-fir Scree) Woodland [Map Class 60]**





10b *Pseudotsuga menziesii* forest or woodland stands of scree slopes with a short shrub understory of *Holodiscus dumosus* – ***Pseudotsuga menziesii* / *Holodiscus dumosus* (Douglas-fir / Rockspirea) Scree Woodland [Map Class 60]**

11a (9) *Pseudotsuga menziesii* forest or woodland stands on steep to gentle slopes or flats but not scree or talus slopes, with a short or tall shrub understory composed of the genera *Acer*, *Mahonia*, or *Prunus* **(12)**

11b *Pseudotsuga menziesii* forest or woodland stands with a short or tall shrub understory composed of the genera *Artemisia, Amelanchier, Quercus*, or *Symphoricarpos* **(14)**

12a (11) *Pseudotsuga menziesii* forest stands with a *Mahonia repens* understory – ***Pseudotsuga menziesii* / *Mahonia repens* (Douglas-fir / Creeping Barberry) Forest [Map Class 62]**





12b *Pseudotsuga menziesii* forest stands with a short shrub understory composed of the genera *Acer* or *Prunus.* Stands tend to occur on north-facing slopes and in mesic bottomland sites along drainages and seeps **(13)**

13a (12) *Pseudotsuga menziesii* forest stands with a tall shrub understory characterized by *Acer glabrum* – ***Pseudotsuga menziesii* /*Acer glabrum* (Douglas-fir / Rocky Mountain Maple) Forest [Map Class 62]**



13b *Pseudotsuga menziesii* forest stands with a tall shrub understory characterized by *Prunus virginiana.* (If *Quercus* codominates or has over 5% cover then go to #13) – ***Pseudotsuga menziesii* / *Prunus virginiana* (Douglas-fir / Chokecherry) Forest [Map Class 62]**



14a (11) *Pseudotsuga menziesii* forest and woodland stands with a tall shrub understory characterized by *Quercus gambelii*, generally with at least 5% cover of oak – ***Pseudotsuga menziesii* / *Quercus gambelii* (Douglas-fir / Gambel Oak) Forest [Map Class 62]**





14b *Pseudotsuga menziesii* forest or woodland stands with a short or tall shrub understory composed of the genera *Artemisia, Amelanchier,* or *Symphoricarpos* **(15)**

15a (14) *Pseudotsuga menziesii* forest and woodland stands of shallow and sometimes rocky slopes with a short shrub understory of *Artemisia tridentata.* In mixed shrub understory stands *Artemisia tridentata* is the dominant shrub – ***Pseudotsuga menziesii* / *Artemisia tridentata* (ssp. *vaseyana, wyomingensis*) (Douglas-fir / (Mountain, Wyoming) Big Sagebrush) Woodland [Map Class 61]**




15b *Pseudotsuga menziesii* forest or woodland stands with a short or tall shrub understory composed of the genera *Amelanchier* or *Symphoricarpos* **(16)**

16a (15) *Pseudotsuga menziesii* forest stands with an *Amelanchier alnifolia* understory – ***Pseudotsuga menziesii* / *Amelanchier alnifolia* (Douglas-fir / Saskatoon Serviceberry) Forest [Map Class 62]**




16b *Pseudotsuga menziesii* forest stands with a *Symphoricarpos oreophilus* understory – ***Pseudotsuga menziesii* / *Symphoricarpos oreophilus* (Douglas-fir / Mountain Snowberry) Forest [Map Class 62]**




17a (2) Vegetation of evergreen trees with overlapping scale-like leaves; composed of *Juniperus osteosperma* or *Juniperus scopulorum.* If species of *Pinus* are present then cover is very low (<5% cover) **(18)**

17b Vegetation of *Pinus* spp. evergreen trees with needles borne in fascicles of 2 or 3; may also be associated with species of *Juniperus*, but *Pinus* species are present with at least 5% cover **(21)**

18a (17) Woodland stands dominated by *Juniperus scopulorum* **(19)**

18b Woodland stands dominated by *Juniperus osteosperma* **(20)**

19a (18) *Juniperus scopulorum* woodland stands characterized by tall or short shrub understory of *Quercus gambelii*– ***Juniperus scopulorum* - *Quercus gambelii* (Rocky Mountain Juniper / Gambel Oak) Woodland [Map Class 71]**



19b *Juniperus scopulorum* woodland stands characterized by short shrub understory of *Artemisia tridentata* – ***Juniperus scopulorum* / *Artemisia tridentata* (Rocky Mountain Juniper / Big Sagebrush) Woodland [Map Class 41]**





20a (18) *Juniperus osteosperma* woodland stands characterized by an understory composed of mixed shrub such as *Holodiscus dumosus* and *Philadelphus microphyllus* on talus slope – ***Juniperus osteosperma* / Mixed Shrubs Talus (Utah Juniper / Mixed Shrubs Talus) Woodland [Map Class 74]**



20b *Juniperus osteosperma* woodland stands of shale soils or badland habitats with an understory of the short shrub *Artemisia nova* – ***Juniperus osteosperma* / *Artemisia nova* (Utah Juniper / Black Sagebrush) Woodland [Map Class 74]**



21a (17) Canopy dominated by Ponderosa pine, whose understory tall and short shrub layers are characterized by *Quercus* or *Purshia* **(22)**

21b Canopy of *Pinus edulis*; characterized by an association with *Juniperus osteosperma* and/or *Artemisia*, *Amelanchier*, *Cercocarpus*, *Glossopetalon*, *Holodiscus*, *Leymus*, *Quercus*, or *Poa*; the woodland understory may consist of mixed shrubs or may be extremely sparse **(23)**

22a (21) Large pine trees of mesic sites characterized by an understory of *Purshia tridentata* – ***Pinus ponderosa* / *Purshia tridentata*** **(Ponderosa pine / Antelope Bitterbrush) Woodland [Map Class 67]**





22b Large pine trees of xeric sites characterized by an understory of *Quercus gambelii* – ***Pinus ponderosa* / *Quercus gambelii*** **(Ponderosa pine / Gambel Oak) Woodland [Map Class 67]**





23a (21) *Pinus edulis* stands characterized by a sparse understory or by understory of graminoids, including the genera *Poa*; *Juniperus* spp. is usually present, but some stands may have only *Pinus edulis* foliar cover **(24)**

23b *Pinus edulis* stands characterized by *Juniperus osteosperma* with an understory of shrubs such as *Artemisia, Amelanchier, Cercocarpus, Holodiscus,* or *Quercus*; some stands may have a mix of these genera as well as other shrubs present in the understory **(25)**

24a (23) *Pinus edulis* and *Juniperus osteosperma* stands growing in habitats supporting less than 5% foliar cover of understory species – ***Pinus edulis - Juniperus osteosperma*** **(Two Needle Pinyon Pine - Utah Juniper) / Sparse Understory Woodland [Map Class 74]**





24b Mature to old growth stands of *Pinus edulis* with or without *Juniperus* spp. with an understory of *Poa fendleriana* – ***Pinus edulis – Juniperus*** **spp. / *Poa fendleriana*** **(Two Needle Pinyon Pine – Juniper species / Muttongrass) Woodland [Map Class 74]**



25a (23) *Pinus edulis* and *Juniperus osteosperma* (*scopulorum*) stands characterized by the understory short shrub species of *Artemisia tridentata* or *Holodiscus dumosus* **(26)**

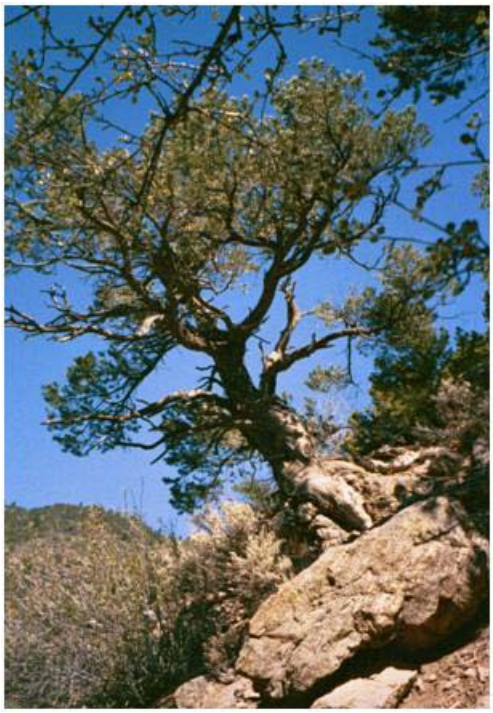
25b *Pinus edulis* and *Juniperus osteosperma* stands characterized by the understory tall shrub species of *Amelanchier utahensis*, *Cercocarpus montanus*, or *Quercus gambelii* **(27)**

26a (25) *Pinus edulis* and *Juniperus osteosperma* or *J.* scopulorum stands characterized by a short shrub understory of *Artemisia tridentata* – ***Pinus edulis* - *Juniperus* spp. / *Artemisia tridentata* (ssp. *wyomingensis,* ssp. *vaseyana*) (Two Needle Pinyon Pine – Juniper species / Big Sagebrush) Woodland [Map Class 74]**





26b *Pinus edulis* and *Juniperus osteosperma* stands growing on scree slopes characterized by a short shrub understory of *Holodiscus dumosus* – ***Pinus edulis* - (*Juniperus* spp.) / *Holodiscus dumosus* (Two Needle Pinyon Pine – (Juniper species) / Rockspirea) Woodland [Map Class 69]**



27a (25) *Pinus edulis* and *Juniperus (osteosperma, scopulorum)* stands characterized by a tall shrub understory of *Quercus gambelii* – ***Pinus edulis - Juniperus* spp. / *Quercus gambelii* (Two Needle Pinyon Pine - Juniper species / Gambel Oak) Woodland [Map Class 71]**





27b *Pinus edulis* and *Juniperus osteosperma* stands with an understory characterized predominantly by the tall shrub *Cercocarpus montanus*, which can have sparse to moderate cover – ***Pinus edulis - Juniperus* spp. / *Cercocarpus montanus* – Mixed Shrub (Two Needle Pinyon Pine - Juniper species / Mountain Mahogany – Mixed Shrub) Woodland [Map Class 74]**





Deciduous Forest and Woodland

28a (1) Woodland associations composed principally of the riparian and talus slope tree species *Acer negundo* **(29)**

28b Forest and Woodland associations composed principally of the riparian tree species *Populus angustifolia* or *Populus tremuloides* **(31)**

29a (28) Woodland association of *Acer negundo* trees with an understory of either exotic herbaceous species or extremely sparse foliar cover – ***Acer negundo*** **(Box Elder) / Disturbed Understory Woodland [Map Class 5]**



29b Woodland association of *Acer negundo* trees with subcanopy or tall shrub *Quercus gambelii* or *Cornus sericea* present **(30)**

30a (29) Woodland association of *Acer negundo* trees with subcanopy or tall shrub *Quercus gambelii* present – ***Acer negundo*** **/** ***Quercus gambelii*** **(Box Elder / Gambel Oak) Woodland [Map Class 5]**



30b Woodland association of *Acer negundo* trees with short or tall shrub layer characterized by Cornus sericea. *Quercus gambelii* is absent or has very low cover – ***Acer negundo* / *Cornus sericea* (Box Elder / Red-osier Dogwood) Woodland [Map Class 5]**

No Photos Available

31a (28) Forest and woodland associations composed principally of the riparian tree species *Populus angustifolia. Populus tremuloides* may be common or absent **(32)**

31b Forest and woodland associations composed principally of the riparian and upland tree species *Populus tremuloides. Populus angustifolia* is generally absent or has low cover **(42)**

32a (31) Forest and woodland association of *Populus angustifolia* trees with an understory principally of the exotic graminoids *Bromus inermis* and/or *Poa pratensis* – ***Populus angustifolia* (Narrowleaf Cottonwood) / Invasive Perennial Grasses Semi-natural Woodland [Map Class 7]**





32b Forest and woodland associations of *Populus angustifolia* trees with an understory composed principally of evergreen trees (*Juniperus scopulorum* and *Picea pungens)* or principally of shrub species, including *Alnus, Cornus, Crataegus, Prunus, Quercus, Rhus, Rosa,* or *Salix* **(33)**

33a (32) Woodland associations of *Populus angustifolia* trees with an understory composed principally of evergreen trees and growing along drainage tributaries of the Gunnison River **(34)**

33b Woodland associations of *Populus angustifolia* trees with an understory composed principally of deciduous shrubs and growing along the main channel or smaller tributaries of the Gunnison River **(35)**

34a (33) *Populus angustifolia* woodland stands with an understory composed of the single-needle (needle is supported by a short peg) evergreen tree, *Picea pungens,* and typically the tall shrub, *Alnus incana* – ***Populus angustifolia – Picea pungens* / *Alnus incana*** **(Narrowleaf Cottonwood – Blue Spruce / Speckled Alder) Woodland [Map Class 7]**



34b *Populus angustifolia* woodland stands with an understory composed of the scaly-leaved evergreen *Juniperus scopulorum* – ***Populus angustifolia – Juniperus scopulorum*** **(Narrowleaf Cottonwood – Rocky Mountain Juniper) Woodland [Map Class 7]**





35a (33) *Populus angustifolia* forest and woodland stands, generally occurring along the Gunnison River and its larger tributaries, with understories composed of very mesic tall shrubs of the genera *Alnus*, *Cornus*, *Crataegus*, *Rosa* or *Salix* **(36)**

35b *Populus angustifolia* forest and woodland stands, generally occurring adjacent to smaller tributaries and gulches, with understories composed of mesic tall shrubs of the genera *Prunus*, *Quercus*, or *Rhus* **(40)**

36a (36) *Populus angustifolia* forest and woodland stands with a short shrub understory dominated by *Rosa woodsii* – ***Populus angustifolia* / *Rosa woodsii* (Narrowleaf Cottonwood / Woods' Rose) Forest [Map Class 7]**



36b *Populus angustifolia* woodland stands with a tall shrub understory of *Alnus incana*, *Cornus sericea*, *Crataegus rivularis* or *Salix exigua* **(37)**

37a (36) *Populus angustifolia* woodland stands with a tall shrub understory composed primarily of *Salix exigua*; other diagnostic shrubs may be present in lesser amounts – ***Populus angustifolia* / *Salix exigua* (Narrowleaf Cottonwood / Narrowleaf Willow) Woodland [Map Class 7]**

No Photos Available

37b *Populus angustifolia* woodland stands with a tall shrub understory of *Alnus incana*, *Cornus sericea* or *Crataegus rivularis* **(38)**

38a (37) *Populus angustifolia* woodland stands with a tall shrub understory composed primarily of *Alnus incana*; other diagnostic shrubs may be present in lesser amounts – ***Populus angustifolia* / *Alnus incana* (Narrowleaf Cottonwood / Speckled Alder) Woodland [Map Class 7]**





38b *Populus angustifolia* woodland stands with a tall shrub understory of either *Cornus sericea* or *Crataegus rivularis* **(39)**

39a (38) *Populus angustifolia* woodland stands with a tall shrub understory composed primarily of *Cornus sericea*; other diagnostic shrubs may be present in lesser amounts – ***Populus angustifolia* / *Cornus sericea* (Narrowleaf Cottonwood / Redosier Dogwood) Woodland [Map Class 7]**



39b *Populus angustifolia* woodland stands with a tall shrub understory of *Crataegus rivularis*; other diagnostic shrubs may be present in lesser amounts – ***Populus angustifolia* / *Crataegus rivularis* (Narrowleaf Cottonwood / River Hawthorn) Woodland [Map Class 7]**





40a (35) *Populus angustifolia* woodland stands with a tall shrub understory of *Quercus gambelii*; other diagnostic shrubs may be present in lesser amounts – ***Populus angustifolia* / *Quercus gambelii* (Narrowleaf Cottonwood / Gambel Oak) Woodland [Map Class 7]**

No Photos Available

40b *Populus angustifolia* woodland stands with a tall shrub understory of *Prunus virginiana* or *Rhus trilobata* **(41)**

41a (41) *Populus angustifolia* woodland stands with a tall shrub understory of primarily *Prunus virginiana*; other diagnostic shrubs may be present but in lesser amounts – ***Populus angustifolia* / *Prunus virginiana* (Narrowleaf Cottonwood / Chokecherry) Woodland [Map Class 7]**



41b *Populus angustifolia* woodland stands with a tall shrub understory primarily of *Rhus trilobata*; other diagnostic species may be present in lesser amounts – ***Populus angustifolia* / *Rhus trilobata* (Narrowleaf Cottonwood / Skunkbush Sumac) Woodland [Map Class 7]**



42a (31) *Populus tremuloides* forest stands with a *Pseudotsuga menziesii* subcanopy and an understory tall shrub layer of *Amelanchier alnifolia* – ***Populus tremuloides* - *Pseudotsuga menziesii* / *Amelanchier alnifolia* (Quaking Aspen – Douglas-fir / Saskatoon Serviceberry) Forest [Map Class 52]**

See Previous Photo for Type

42b *Populus tremuloides* forest or woodland stands not codominated by *Pseudotsuga menziesii* in the tree canopy **(53)**

43a (42) *Populus tremuloides* forest stands with graminoid or tall forb understories. Shrubs are sparse or absent **(44)**

43b *Populus tremuloides* forest stands with short and/or tall shrub understories. Herbaceous layer also be present **(46)**

44a (43) *Populus tremuloides* forest stands with a predominantly tall forb understory. Diagnostic tall forbs include *Agastache urticifolia, Heracleum maximum, Mertensia arizonica, Osmorhiza berteroi, Osmorhiza occidentalis, Senecio serra, and Valeriana occidentalis* – ***Populus tremuloides* (Quaking Aspen) / Tall Forbs Forest [Map Class 52]**



44b *Populus tremuloides* forest stands with a predominantly graminoid understory characterized by the genera *Carex* or *Poa* **(45)**

45a (44) *Populus tremuloides* forest stands with an understory of the native sedge *Carex geyeri* – ***Populus tremuloides* / *Carex geyeri* (Quaking Aspen / Geyer's Sedge) Forest [Map Class 52]**



45b *Populus tremuloides* forest stands with an understory of the exotic grass *Poa pratensis*. Other invasive perennial grasses & forbs present may include *Bromus inermis, Bromus tectorum, Cirsium* spp. – ***Populus tremuloides* (Quaking Aspen) / Invasive Perennial Grasses Forest [Map Class 52]**





46a (43) *Populus tremuloides* forest stands with an understory of *Ceanothus velutinus* shrubs – ***Populus tremuloides* / *Ceanothus velutinus* (Quaking Aspen / Snowbrush Ceanothus) Forest [Map Class 52]**



46b *Populus tremuloides* forest stands with an understory characterized by *Amelanchier alnifolia, Mahonia, Quercus gambelii,* or *Symphoricarpos oreophilus* shrubs **(47)**

47a (46) *Populus tremuloides* forest stands with an understory of predominantly evergreen shrubs characterized by *Juniperus communis* **(48)**

47b *Populus tremuloides* forest stands with an understory of predominantly deciduous shrubs characterized by the genera *Amelanchier, Quercus, Mahonia* or *Symphoricarpos* **(49)**

48a (47) *Populus tremuloides* forest stands with an understory of *Juniperus communis* shrubs and the sedge *Carex geyeri* – ***Populus tremuloides* / *Juniperus communis* / *Carex geyeri* (Quaking Aspen / Common Juniper / Geyer's Sedge) Forest [Map Class 52]**





48b *Populus tremuloides* forest stands with an understory of *Juniperus communis* shrubs and the forb *Lupinus argenteus* – ***Populus tremuloides* / *Juniperus communis* / *Lupinus argenteus* (Quaking Aspen / Common Juniper / Silvery Lupine) Forest [Map Class 52]**



49a (47) *Populus tremuloides* forest stands with an understory of *Prunus virginiana* shrubs – ***Populus tremuloides* / *Prunus virginiana* (Quaking Aspen / Chokecherry) Forest [Map Class 52]**





49b *Populus tremuloides* forest stands with an understory characterized by *Amelanchier alnifolia, Mahonia, Quercus gambelii*, or *Symphoricarpos oreophilus* shrubs **(50)**

50a (49) *Populus tremuloides* forest stands with an understory of *Mahonia repens* shrubs – ***Populus tremuloides / Mahonia repens*** **(Quaking Aspen / Creeping Barberry) Forest [Map Class 52]**



50b *Populus tremuloides* forest stands with an understory characterized by *Amelanchier alnifolia, Quercus gambelii*, or *Symphoricarpos oreophilus* shrubs **(51)**

51a (50) *Populus tremuloides* forest stands with a *Quercus gambelii* in the subcanopy or as tall shrub layer and *Symphoricarpos oreophilus* forming a short shrub layer. In recently disturbed stands *Quercus gambelii* may form a short shrub layer with as little as 5% cover. – ***Populus tremuloides / Quercus gambelii / Symphoricarpos oreophilus*** **(Quaking Aspen / Gambel Oak / Mountain Snowberry) Forest [Map Class 52]**





51b *Populus tremuloides* forest stands with an understory characterized by *Amelanchier alnifolia, Quercus gambelii*, and/or *Symphoricarpos oreophilus* shrubs **(52)**

52a (51) *Populus tremuloides* forest stands with an understory characterized by *Amelanchier alnifolia* and/or *Symphoricarpos oreophilus* shrubs, and an herbaceous layer **(54)**

52b *Populus tremuloides* forest stands with an understory characterized by a tall shrub layer of *Quercus gambelii* and/or a *Symphoricarpos oreophilus* short shrub layer without significant *Amelanchier alnifolia* tall shrubs present **(55)**

53a (52) *Populus tremuloides* forest stands with an understory of the tall shrub *Amelanchier alnifolia*, the short shrub *Symphoricarpos oreophilus*, and the herbaceous layer composed of mixed graminoids such as *Achnatherum nelsonii, Bromus anomalus, Bromus ciliates, Carex geyeri, Deschampsia caespitosa*, and *Poa pratensis* – ***Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus /*** **Mixed Graminoid (Quaking Aspen / Saskatoon Serviceberry - Mountain Snowberry / Mixed Graminoid) Forest [Map Class 52]**



53b *Populus tremuloides* forest stands with an understory of the tall shrub *Amelanchier alnifolia*, the short shrub *Symphoricarpos oreophilus*, with an herbaceous layer composed of *Calamagrostis rubescens* or *Thalictrum fendleri* **(54)**

54a (53) *Populus tremuloides* forest stands with an understory of the tall shrub *Amelanchier alnifolia*, the short shrub *Symphoricarpos oreophilus*, and the forb *Thalictrum fendleri* – ***Populus tremuloides* / *Amelanchier alnifolia – Symphoricarpos oreophilus* / *Thalictrum fendleri*** **Forest (Quaking Aspen / Saskatoon Serviceberry – Mountain Snowberry / Fendler's Meadow-rue) Forest [Map Class 52]**



54b *Populus tremuloides* forest stands with an understory of the tall shrub *Amelanchier alnifolia*, the short shrub *Symphoricarpos oreophilus*, and the grass *Calamagrostis rubescens* – ***Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / *Calamagrostis rubescens*** **(Quaking Aspen / Saskatoon Serviceberry - Mountain Snowberry / Pinegrass) Forest [Map Class 52]**



55a (52) *Populus tremuloides* forest stands with an understory of predominantly *Populus tremuloides* forest stands with an understory characterized by the short shrub *Symphoricarpos oreophilus* with the forb *Thalictrum fendleri* is absent. Herbaceous layer composed of other species or absent – ***Populus tremuloides* / *Quercus gambelii* / *Symphoricarpos oreophilus*** **(Quaking Aspen / Mountain Snowberry) Forest [Map Class 52]**



55b *Populus tremuloides* forest stands with an understory characterized by a *Symphoricarpos oreophilus* short shrub layer without significant *Amelanchier alnifolia* tall shrubs present and with or without a forb layer dominated by *Thalictrum fendleri* **(56)**

56a (55) *Populus tremuloides* forest stands with an understory characterized by the short shrub *Symphoricarpos oreophilus* and the forb *Thalictrum fendleri* – ***Populus tremuloides* / *Symphoricarpos oreophilus* / *Thalictrum fendleri* (Quaking Aspen / Mountain Snowberry / Fendler's Meadow-rue) Forest [Map Class 52]**



56b *Populus tremuloides* forest stands with an understory characterized by the short shrub *Symphoricarpos oreophilus* – ***Populus tremuloides* / *Symphoricarpos oreophilus* (Quaking Aspen / Mountain Snowberry) Forest [Map Class 52]**





Key III: Shrubland Vegetation

1a Tall shrub associations of perennially wet to saturated riparian habitats, seeps, and springs; characterized by the genera *Alnus*, *Cornus*, *Prunus* or *Salix* **(2)**

1b Tall, short, and dwarf-shrub associations of dry to mesic sites; characterized by the genera *Amelanchier*, *Artemisia*, *Atriplex*, *Ceanothus*, *Cercocarpus*, *Chrysothamnus*, *Ericameria*, *Holodiscus*, *Krascheninnikovia*, *Prunus* or *Quercus* **(9)**

2a (1) Riparian associations of river and stream banks, seeps, springs, and floodplains; characterized by *Prunus viginiana*, *Salix geyeriana* or *Salix exigua* **(3)**

2b Riparian associations of river and stream banks and floodplains; characterized by *Alnus incana* or *Cornus sericea* **(7)**

3a (2) *Prunus viginiana* dominates the shrub layer – ***Prunus virginiana - (Prunus americana)*** **Shrubland [Map Class 43]**



3b *Salix exigua* or *Salix geyeriana* dominate shrub layer. *Prunus viginiana* may be present but does not dominate shrub layer **(4)**

4a (3) Riparian associations occurring predominantly on river and stream banks and composed of *Salix exigua* with forb or graminoid understory cover **(5)**

4b Riparian associations occurring predominantly on floodplains, seeps or springs and composed of *Salix geyeriana* with forb or graminoid understory cover **(6)**

5a (4) *Salix exigua* foliar cover of at least 5%; understory composed of predominantly forb species – ***Salix exigua* (Narrowleaf Willow) / Mesic Forbs Shrubland [Map Class 7]**



5b *Salix exigua* foliar cover of at least 60%; understory composed of predominantly graminoid species – ***Salix exigua* (Narrowleaf Willow) / Mesic Graminoids Shrubland [Map Class 7]**





6a (4) *Salix geyeriana* foliar cover of at least 60%; understory composed predominantly of forb species – ***Salix geyeriana* (Geyer's Willow) / Mesic Forbs Shrubland [Map Class 2]**





6b *Salix geyeriana* foliar cover of at least 40%; understory composed predominantly of graminoid species – ***Salix geyeriana* (Geyer's Willow) / Mesic Graminoids Shrubland [Map Class 2]**



7a (2) *Alnus incana* shrubs with foliar cover of at least 20%. Salix spp. may be present with lower cover. Understory dominated by mesic graminoids. *Cornus sericea* absent or with low cover – ***Alnus incana* / Mesic Graminoids (Speckled Alder) / Mesic Graminoids Shrubland [Map Class 7]**



7b *Cornus sericea* dominant or codominant in shrub layer **(8)**

8a (7) *Cornus sericea* foliar cover of at least 25%, *Alnus incana* generally absent. May occur in a complex with *Acer negundo* woodlands and *Quercus gambelii* shrublands – ***Cornus sericea* (Redosier Dogwood) Shrubland [Map Class 5]**



8b *Alnus incana* foliar cover of at least 30%; *Cornus sericea* present to co-dominant with over 10% cover – ***Alnus incana - Cornus sericea*** **(Speckled Alder – Redosier Dogwood) Shrubland [Map Class 7]**



9a (1) Tall shrub associations of canyons, slopes, and mesas; characterized by the genera *Amelanchier*, *Cercocarpus,* and/or *Quercus* **(10)**

9b Short shrub and dwarf-shrub associations of canyons, slopes, mesas, and disturbed sites; characterized by the genera *Artemisia*, *Atriplex*, *Ceanothus*, *Chrysothamnus*, *Ericameria*, *Holodiscus, Krascheninnikovia,* or *Prunus* **(24)**

10a (9) Tall shrub associations characterized by *Amelanchier utahensis* or *Cercocarpus montanus*; often in mixed stands with *Artemisia tridentata* **(11)**

10b Tall shrub associations characterized by at least 10% foliar cover of *Quercus gambelii* with a variety of understory co-dominants including species of the genera *Amelanchier*, *Artemisia, Cercocarpus, Festuca, Holodiscus*, *Poa, Prunus* or *Symphoricarpos* **(14)**

11a (10) Shrubland codominated by *Cercocarpus montanus* and *Artemisia tridentata* – ***Cercocarpus montanus - Artemisia tridentata*** **(Mountain Mahogany – Big Sagebrush) Shrubland [Map Class 41]**





11b Shrublands where *Cercocarpus montanus* and/or *Amelanchier utahensis* shrubs are dominant; often in mixed stands with *Artemisia tridentata* **(12)**

12a (11) *Cercocarpus montanus* association with a combination of mixed short shrubs; generally associated with steep, south-facing talus slopes – ***Cercocarpus montanus*** **(Mountain Mahogany) Shale Shrubland [Map Class 46]**





12b Shrublands where *Amelanchier utahensis* is dominant or co-dominant in mixed stands with other montane shrubs, inluding *Artemisia tridentata* . Stands not associated with south-facing talus slopes **(13)**

13a (12) Shrubland codominated by *Amelanchier utahensis* and *Artemisia tridentata* – ***Artemisia tridentata*** **(ssp.** ***vaseyana,*** **ssp.** ***wyomingensis*****) –** ***Amelanchier utahensis*** **((Mountain Big Sagebrush, Wyoming Big Sagebrush) – Utah Serviceberry) Shrubland [Map Class 41]**



13b *Amelanchier utahensis* association with a combination of mixed tall and short shrubs (*Quercus gambelii* may have sparse to moderate cover); the graminoid *Carex geyeri* is present in the herbaceous understory stratum – ***Amelanchier utahensis* - Mixed Shrub / *Carex geyeri* (Utah Serviceberry – Mixed Shrub / Geyer's Sedge) Shrubland [Map Class 42]**





14a (10) *Quercus gambelii* associations with a predominantly graminoid understory characterized by *Carex geyeri, Festuca thurberi* or *Poa fendleriana* **(15)**

14b *Quercus gambelii* associations with a predominantly co-dominant tall or short shrub understory characterized by the genera *Amelanchier*, *Artemisia*, *Cercocarpus*, *Holodiscus, Prunus, Rhus*, or *Symphoricarpos* **(17)**

15a (14) *Quercus gambelii* association with the understory characterized by the dry site sedge *Carex geyeri* – ***Quercus gambelii / Carex geyeri Shrubland* (Gambel Oak / Geyer's Sedge) Shrubland [Map Class 43]**




15b *Quercus gambelii* association with the understory bunchgrass dominated by *Festuca thurberi* or *Poa fendleriana* **(16)**

16a (16) *Quercus gambelii* association with the understory tall bunch grass *Festuca thurberi* – ***Quercus gambelii* / *Festuca thurberi* (Gambel Oak / Thurber's fescue) Shrubland [Map Class 42]**




16b *Quercus gambelii* association with the understory short bunch grass *Poa fendleriana* – ***Quercus gambelii* / *Poa fendleriana* (Gambel Oak / Muttongrass) Shrubland [Map Class 42]**




17a (14) *Quercus gambelii* associations with shrubs in the genera *Amelanchier, Cercocarpus* or *Prunus* forming a tall shrub layer. *Artemisia* may also be present **(18)**

17b *Quercus gambelii* associations with short shrubs in the genera *Artemisia, Holodiscus, Rhus trilobata* or *Symphoricarpos* **(21)**

18a (17) *Quercus gambelii* associated predominantly with *Prunus virginiana* – ***Quercus gambelii - Prunus virginiana*** **(Gambel Oak – Chokecherry) Shrubland [Map Class 43]**





18b *Quercus gambelii* associated predominantly with *Amelanchier alnifolia* or *Amelanchier utahensis* **(19)**

19a (18) *Quercus gambelii* associated predominantly with *Cercocarpus montanus* – ***Quercus gambelii – Cercocarpus montanus*** **/ (*Carex geyeri*) (Gambel Oak – Mountain Mahogany / (Geyer's Sedge)) Shrubland [Map Class 42]**





19b *Quercus gambelii* associated predominantly with *Amelanchier alnifolia* or *Amelanchier utahensis* **(20)**

20a (19) *Quercus gambelii* associated predominantly with *Amelanchier alnifolia* – ***Quercus gambelii / Amelanchier alnifolia*** **(Gambel Oak – Saskatoon Serviceberry) Shrubland [Map Class 43]**





20b *Quercus gambelii* associated predominantly with *Amelanchier utahensis* – ***Quercus gambelii / Amelanchier utahensis*** **(Gambel Oak – Utah Serviceberry) Shrubland [Map Class 42]**





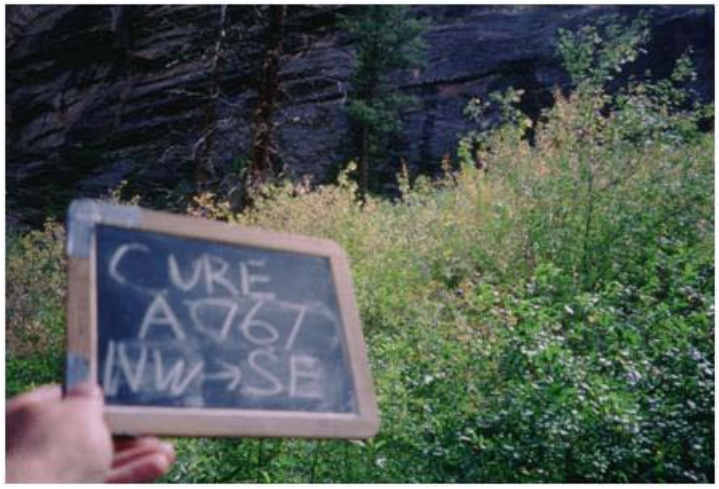
21a (17) *Quercus gambelii* associated predominantly with *Artemisia tridentata* – ***Quercus gambelii / Artemisia tridentata*** **(Gambel Oak – Big Sagebrush) Shrubland [Map Class 41]**





21b *Quercus gambelii* associated predominantly with *Holodiscus dumosus, Rhus trilobata* or *Symphoricarpos oreophilus* **(22)**

22a (21) *Quercus gambelii* associated predominantly with *Rhus trilobata* – ***Quercus gambelii / Rhus trilobata*** **(Gambel Oak / Skunkbush Sumac) Shrubland [Map Class 43]**



22b *Quercus gambelii* associated predominantly with *Holodiscus dumosus* or *Symphoricarpos oreophilus* **(23)**

23a (22) *Quercus gambelii* associated predominantly with *Holodiscus dumosus* – ***Quercus gambelii – Holodiscus dumosus*** **(Gambel Oak – Rockspirea) Shrubland [Map Class 48]**





23b *Quercus gambelii* associated predominantly with *Symphoricarpos oreophilus* – ***Quercus gambelii / Symphoricarpos oreophilus*** **(Gambel Oak – Utah Snowberry) Shrubland [Map Class 43]**





24a (9) Dwarf-shrub association of slopes; characterized by *Krascheninnikovia lanata* contributing from 5 to 25% foliar cover and *Achnatherum hymenoides* contributing between 1 and 5% foliar cover – ***Krascheninnikovia lanata* / *Achnatherum hymenoides*** **(Winterfat / Indian Ricegrass) Dwarf-shrubland [Map Class 81]**



24b Short shrub associations in a variety of habitats; characterized by the genera *Artemisia*, *Atriplex*, *Ceanothus*, *Chrysothamnus*, *Ericameria*, *Holodiscus* or *Prunus* **(25)**

25a (24) *Prunus viginiana* dominated shrub layer – ***Prunus virginiana - (Prunus americana)*** **(Chokecherry – (American Plum)) Shrubland [Map Class 43]**





25b Short shrub associations occurring in a variety of habitats including historic burns; characterized by the genera *Artemisia*, *Atriplex*, *Ceanothus*,*Chrysothamnus*, *Ericameria*, or *Holodiscus* **(26)**

26a (25) Short shrub association occurring in historical burned areas; characterized by *Ceanothus velutinus* as the most abundant shrub present, can contribute >60% foliar cover – ***Ceanothus velutinus*** (**Snowbrush Ceanothus) Shrubland [Map Class 52]**



26b Short shrub associations occurring in a variety of habitats including historic burns; characterized by the genera *Artemisia*, *Atriplex*, *Chrysothamnus*, *Ericameria*, or *Holodiscus* **(27)**

27a (26) Short shrub association characterized by *Holodiscus dumosus* contributing between 1 and 75% foliar cover (often the most abundant single shrub species present) and occupying very steep slopes – ***Holodiscus dumosus*** **(Rockspirea) Sparsely Vegetated Rock Outcrop [Map Class 93]**





27b Short shrub associations characterized by the genera *Artemisia*, *Atriplex*, *Chrysothamnus*, or *Ericameria*. If *Holodiscus dumosus* present it is not as abundant as other shrubs present and does not characterize the stand **(28)**

28a (27) Short shrub associations of disturbed sites, including floodplains, road rights-of-way, old fields, and historic burns; characterized by the genera *Atriplex*, *Chrysothamnus*, or *Ericameria* **(29)**

28b Short shrub associations in a variety of habitats lacking recent disturbance; characterized by the genus *Artemisia* **(33)**

29a (28) *Atriplex canescens* associated with the bunch grass *Achnatherum hymenoides*; each species contributing from 5 to 25% foliar cover; occurring on shoulders of mesas – ***Atriplex canescens* / *Achnatherum hymenoides* (Fourwing Saltbush / Indian Ricegrass) Shrubland [Map Class 81]**



29b Short shrub associations characterized by the genera *Chrysothamnus* or *Ericameria* **(30)**

30a (29) *Ericameria* spp. associations growing on the margins of prairie dog towns, road cut and fill slopes, and old burns **(31)**

30b Short shrub associations characterized by *Chrysothamnus viscidiflorus*, with a grassy understory dominated by either *Hesperostipa comata* or *Poa pratensis* **(32)**

31a (30) *Ericameria nauseosa* associated with sites disturbed by prairie dog burrowing and foraging, sometimes associated with sites disturbed by road construction (cut and fill slopes) – ***Ericameria nauseosa*** **(Rubber Rabbitbrush) Shrubland [Map Classes 28 & 31]**





31b *Ericameria parryi* associated with sites disturbed by road construction (cut and fill slopes) and historical fires with *Achnatherum hymenoides* typically present to dominant in the understory – ***Ericameria parryi / Achnatherum hymenoides*** **(Parry's Rabbitbrush / Indian Ricegrass) Shrubland [Map Classes 28 & 31]**





32a (30) *Chrysothamnus viscidiflorus* associated with the medium tall bunch grass *Hesperostipa comata*; foliar cover of each species exceeding 30% and 15% – ***Chrysothamnus viscidiflorus / Hesperostipa comata*** **(Yellow Rabbitbrush / Needle-and-thread) Shrubland [Map Class 31]**



32b Grassland / shrub herbaceous association characterized by the short shrub *Chrysothamnus viscidiflorus* and the graminoid *Poa pratensis* – ***Chrysothamnus viscidiflorus* / *Poa pratensis*** **(Yellow Rabbitbrush / Kentucky Bluegrass) Semi-natural Shrub Herbaceous Vegetation [Map Class 31]**



33a (28) Associations characterized by the short shrub *Artemisia nova* and understory grass species of the genera *Achnatherum* or *Poa* **(34)**

33b Associations characterized by *Artemisia tridentata*; either *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *vaseyana*, or *Artemisia tridentata* ssp. *wyomingensis* **(35)**

34a (33) *Artemisia nova* occurring with the short bunch grass *Poa secunda* with associated foliar cover exceeding 15% and 1%, respectively – ***Artemisia nova* / *Poa secunda*** **(Black Sagebrush / Sandberg Bluegrass) Shrubland [Map Class 31]**





34b *Artemisia nova* (5% - 75% cover) associated with the short bunch grass *Poa fendleriana* (1 - 50% cover) with or without *Achnatherum pinetorum* (<1% cover) – ***Artemisia nova / Poa fendleriana* (Black Sagebrush / Muttongrass) Shrubland [Map Class 31]**





35a (33) Short shrub associations characterized by *Artemisia tridentata* ssp. *wyomingensis* often with substantial cover of *Bromus tectorum* or *Artemisia tridentata* ssp. *tridentata* **(36)**

35b Short shrub associations characterized by *Artemisia tridentata* ssp. *wyomingensis* or *Artemisia tridentata* ssp. *vaseyana* **(38)**

36a (35) *Artemisia tridentata* ssp. *wyomingensis* growing in areas disturbed by prairie dogs or in shallow swales and drainages, commonly accompanied by *Ericameria nauseosa*, with *Bromus tectorum* or other weedy species of disturbed sites dominant in the understory – ***Artemisia tridentata* ssp. *wyomingensis* (Wyoming Big Sagebrush) / Disturbed Understory Semi-natural Shrubland [Map Class 31]**





36b *Artemisia tridentata* or *Artemisia tridentata* ssp. *tridentata* growing in association with the grasses *Pascopyrum smithii* or *Pleuraphis jamesii* **(37)**

37a (36) *Artemisia tridentata* ssp. *tridentata* occurring in a swale in association with the rhizomatous grass, *Pascopyrum smithii* – ***Artemisia tridentata* ssp. *tridentata* / *Pascopyrum smithii* - (*Elymus lanceolatus*) (Basin Big Sagebrush – Western Wheatgrass - (Streambank Wheatgrass)) Shrubland [Map Class 31]**





37b *Artemisia tridentata* occurring on a slope in association with the short bunch grass *Pleuraphis jamesii* – ***Artemisia tridentata* / *Pleuraphis jamesii* (Big Sagebrush / James' Galleta) Shrubland [Map Class 31]**





38a (36) *Artemisia tridentata* ssp. *vaseyana* associated with the genera *Achnatherum, Balsamorhiza, Carex, Festuca, Hesperostipa, Holodiscus, Pascopyrum, Piptatherum,* or *Poa* **(39)**

38b *Artemisia tridentata* ssp. *wyomingensis* associated with *Amelanchier utahensis* or with the grass genera *Achnatherum, Agropyron, Bouteloua, Hesperostipa, Poa* or with a sparsely vegetated understory **(49)**

39a (38) Shrub herbaceous association occurring on xeric ridgetops; characterized by the sedge *Carex geyeri* and the short shrubs *Artemisia tridentata* ssp. *vaseyana* and *Purshia tridentata* – ***Artemisia tridentata* ssp. *vaseyana* / *Carex geyeri* (Mountain Big Sagebrush / Geyer's Sedge) Shrub Herbaceous Vegetation [Map Class 33]**



39b *Artemisia tridentata* ssp. *vaseyana* associated with the grass, forb and shrub genera, *Achnatherum, Balsamorhiza, Festuca, Hesperostipa, Holodiscus, Pascopyrum, Piptatherum,* or *Poa* **(40)**

40a (39) Artemisia tridentata ssp. vaseyana growing on more gentle slopes in association with the forb *Balsamorhiza sagittata* – ***Artemisia tridentata* ssp. *vaseyana* / *Balsamorhiza sagittata* (Mountain Big Sagebrush / Arrowleaf Balsamroot) Shrubland [Map Class 33]**



40b *Artemisia tridentata* ssp. *vaseyana* associated with the grass and shrub genera *Achnatherum, Festuca, Hesperostipa, Holodiscus, Pascopyrum, Piptatherum,* or *Poa* **(41)**

41a (40) *Artemisia tridentata* ssp. *vaseyana* growing on steep slopes in association with the short shrub *Holodiscus dumosus* – ***Artemisia tridentata* ssp. *vaseyana* – *Holodiscus dumosus* (Mountain Big Sagebrush – Rockspirea) Shrubland [Map Class 93]**





41b *Artemisia tridentata* ssp. *vaseyana* associated with the grass genera *Achnatherum, Festuca, Hesperostipa, Pascopyrum, Piptatherum,* or *Poa* **(42)**

42a (41) *Artemisia tridentata* ssp. *vaseyana* growing on mild, mesic slopes in association with the rhizomatous grass *Pascopyrum smithii* – ***Artemisia tridentata* ssp. *vaseyana* / *Pascopyrum smithii* (Mountain Big Sagebrush / Western Wheatgrass) Shrubland [Map Class 33]**



42b *Artemisia tridentata* ssp. *vaseyana* associated with the grass genera *Achnatherum Festuca, Hesperostipa, Piptatherum* or *Poa* **(43)**

43a (42) *Artemisia tridentata* ssp. *vaseyana* growing on cool, north facing slopes in association with the bunchgrass *Piptatherum micranthum*– ***Artemisia tridentata* ssp. *vaseyana* / *Piptatherum micranthum* (Mountain Big Sagebrush / Littleseed Ricegrass) Shrubland [Map Class 33]**



43b *Artemisia tridentata* ssp. *vaseyana* associated with the grass genera *Achnatherum, Festuca, Hesperostipa,* or *Poa* **(44)**

44a (43) Shrub herbaceous association of *Artemisia tridentata* ssp. *vaseyana* and *Festuca thurberi* – ***Artemisia tridentata* ssp. *vaseyana* / *Festuca thurberi* (Mountain Big Sagebrush / Thurber's fescue) Shrubland [Map Class 33]**





44b *Artemisia tridentata* ssp. *vaseyana* associated with the grass genera *Achnatherum*, *Hesperostipa*, or *Poa* **(45)**

45a (44) Grassland / shrub herbaceous association composed of *Hesperostipa comata* – ***Artemisia tridentata* ssp. *vaseyana* / *Hesperostipa comata* (Mountain Big Sagebrush / Needle-and-Thread) Shrubland [Map Class 33]**





45b *Artemisia tridentata* ssp. *vaseyana* associated with the grass genera *Achnatherum* or *Poa* **(46)**

46a (45) *Artemisia tridentata* ssp. *vaseyana* associated with the grass genera *Achnatherum* **(47)**

46a *Artemisia tridentata* ssp. *vaseyana* associated with the grass genera *Poa* **(48)**

47a (46) Shrub herbaceous association composed of *Artemisia tridentata* ssp. *vaseyana* and *Achnatherum pinetorum* – ***Artemisia tridentata* ssp. *vaseyana* / *Achnatherum pinetorum* (Mountain Big Sagebrush / Pine Needlegrass) Shrubland [Map Class 33]**




47b Shrub herbaceous association composed of *Artemisia tridentata* ssp. *vaseyana* and *Achnatherum hymenoides* – ***Artemisia tridentata* ssp. *vaseyana* / *Achnatherum hymenoides* (Mountain Big Sagebrush / Indian Ricegrass) Shrubland [Map Class 33]**




48a (46) *Artemisia tridentata* ssp. *vaseyana* growing on slopes, ridges, and mesas in association with the short bunchgrass *Poa fendleriana* – ***Artemisia tridentata* ssp. *vaseyana* / *Poa fendleriana* (Mountain Big Sagebrush / Muttongrass) Shrubland [Map Class 33]**




48b Shrub herbaceous association of shallowly sloping habitats characterized by *Artemisia tridentata* ssp. *vaseyana* and the rhizomatous graminoid species *Poa pratensis* and *Poa compressa* –

***Artemisia tridentata* ssp. *vaseyana* / *Poa* (*pratensis, compressa*) (Mountain Big Sagebrush / Bluegrass (Kentucky, Canada)) Semi-natural Shrub Herbaceous Vegetation [Map Class 33]**



49a (38) *Artemisia tridentata* (ssp. *vaseyana*, ssp. *wyomingensis*) and *Amelanchier utahensis* mixed mountain shrublands, often with a variety of other tall and short shrubs in the overstory and a well-developed herbaceous layer in the understory – ***Artemisia tridentata* (ssp. *vaseyana*, ssp. *wyomingensis*) – *Amelanchier utahensis* ((Mountain Big Sagebrush, Wyoming Big Sagebrush) – Utah Serviceberry) Shrubland [Map Class 41]**

See Previous Photo for Type

49b *Artemisia tridentata* ssp. *wyomingensis* shrublands with *Amelanchier utahensis* absent in shrub layer. Understory is variable **(50)**

50a (49) *Artemisia tridentata* ssp. *wyomingensis* shrubland with sparse understory (less 5% cover of forbs and graminoids) often occurring on sandy substrates – ***Artemisia tridentata* ssp. *wyomingensis* (Wyoming Big Sagebrush) / Sparse Understory Shrubland [Map Class 31]**



50b *Artemisia tridentata* ssp. *wyomingensis* shrublands with 5% of more cover of forbs and graminoids **(51)**

51a (50) *Artemisia tridentata* ssp. *wyomingensis* shrubland with greater than 1% cover by the exotic bunchgrass *Agropyron cristatum* with ***Artemisia tridentata* ssp. *wyomingensis* / *(Agropyron cristatum, Elymus junceus)* (Wyoming Big Sagebrush / Crested Wheatgrass) Seeded Grasses Semi-natural Shrubland [Map Class 31]**





51b *Artemisia tridentata* ssp. *wyomingensis* characterized by the native grasses *Achnatherum hymenoides, Achnatherum pinetorum, Bouteloua gracilis, Hesperostipa comata,* or *Poa fendleriana*. If present *Agropyron cristatum* has 1% or less cover **(52)**

52a (51) *Artemisia tridentata* ssp. *wyomingensis* associated with *Achnatherum hymenoides* – ***Artemisia tridentata* ssp. *wyomingensis* / *Achnatherum hymenoides* (Wyoming Big Sagebrush / Indian Ricegrass) Shrubland [Map Class 31]**





52b *Artemisia tridentata* ssp. *wyomingensis* with high grass cover by the species *Achnatherum pinetorum, Hesperostipa comata Poa fendleriana* or *Bouteloua gracilis* (appearing as a shrub herbaceous type) and typically occurring on xeric slopes **(53)**

53a (52) *Artemisia tridentata* ssp. *wyomingensis* associated with *Achnatherum pinetorum* – ***Artemisia tridentata* ssp. *wyomingensis* / *Achnatherum pinetorum* (Wyoming Big Sagebrush / Pine needlegrass) Shrubland [Map Class 31]**





53b *Artemisia tridentata* ssp. *wyomingensis* with high grass cover by the species *Hesperostipa comata* or *Bouteloua gracilis* (appearing as a shrub herbaceous type) and typically occurring on xeric slopes **(54)**

54a (53) *Artemisia tridentata* ssp. *wyomingensis* associated with *Poa fendleriana* – ***Artemisia tridentata* ssp. *wyomingensis* / *Poa fendleriana* (Wyoming Big Sagebrush / Muttongrass) Shrubland [Map Class 31]**





54b *Artemisia tridentata* ssp. *wyomingensis* with high grass cover by the species *Hesperostipa comata* or *Bouteloua gracilis* (appearing as a shrub herbaceous type sometimes with low (5%) cover of shrubs and typically occurring on xeric slopes **(55)**

55a (54) Shrubland or shrub herbaceous vegetation of xeric, shallow to steeply sloping habitats characterized by the short shrub *Artemisia tridentata* ssp. *wyomingensis* and the bunch grass *Hesperostipa comata* – ***Artemisia tridentata* ssp. *wyomingensis* / *Hesperostipa comata* (Wyoming Big Sagebrush / Needle-and-Thread) Shrubland [Map Class 31]**





55b Shrubland or shrub herbaceous vegetation occurring on xeric, shallow to steeply sloping habitats; slopes may be actively eroding; characterized by the short shrub *Artemisia tridentata* ssp. *wyomingensis* and the drought tolerant grass *Bouteloua gracilis* – ***Artemisia tridentata* ssp. *wyomingensis* / *Bouteloua gracilis* (Wyoming Big Sagebrush / Blue Grama) Shrubland [Map Class 31]**



Key IV: Herbaceous Vegetation

1a Forb associations of mesic to xeric sites including the genera *Artemisia, Cirsium, Conyza, or Erodium* **(20)**

1b Graminoid associations of mesic to xeric sites **(2)**

2a (2) Graminoid associations of mesic to xeric non-grass species including the genera *Carex, Juncus,* or *Hordeum* **(3)**

2b Graminoid associations of mesic to xeric grass species including the genera *Achnatherum, Agrostis, Bromus, Elymus, Hesperostipa, Leymus, Pascopyrum, Phalaris, Pleuraphis, Poa,* or *Thinopyrum* **(6)**

3a (2) Graminoid associations of mesic or xeric sites characterized by the genus *Carex* **(4)**

3b Graminoid associations of mesic to saturated sites characterized by the genera *Juncus* and *Hordeum* **(5)**

4a (4) *Carex duriuscula* association occurring on xeric mesa tops – ***Carex duriuscula*** **(Needleleaf Sedge) Herbaceous Vegetation [Map Class 90]**



4b *Carex utriculata* association of saturated high-flow channels and point bars – ***Carex utriculata*** **(Northwest Territory Sedge) Herbaceous Vegetation [Map Class 14]**





5a (3) Graminoid association of mesic to saturated habitats; sometimes persisting on abandoned irrigated hay meadows; characterized by the rush *Juncus balticus,* sometimes with high cover of Canada thistle – ***Juncus balticus*** **(Baltic Rush) Herbaceous Vegetation [Map Class 14]**





5b Graminoid association of saturated to inundated habitats; characterized by the bunchgrass *Hordeum jubatum* – ***Hordeum jubatum*** **(Foxtail Barley) Herbaceous Vegetation [Map Class 17]**



6a (2) Grassland associations occurring in mesic to xeric habitats and composed of native species; characteristic genera include *Achnatherum*, *Hesperostipa*, *Leymus*, *Pascopyrum*, *Pleuraphis*, or *Poa* **(7)**

6b Grassland associations occurring in mesic to xeric habitats and composed of exotic species; characteristic genera include *Agrostis*, *Bromus*, *Elymus*, *Phalaris*, *Poa* or *Thinopyrum* **(14)**

7a (6) Grassland associations of mesic swales or saturated soils; composed of bunch and rhizomatous species including the genera *Leymus* or *Pascopyrum* **(8)**

7b Grassland associations of mesic slopes or xeric habitats characterized by bunch grass genera including *Achnatherum*, *Hesperostipa*, *Pleuraphis*, or *Poa* **(9)**

8a (7) Grassland association of the tall, coarse bunch grass *Leymus cinereus* – ***Leymus cinereus*** **(Basin Wildrye) Herbaceous Vegetation [Map Class 20]**





8b Grassland association of the medium-tall, rhizomatous grass, *Pascopyrum smithii* – ***Pascopyrum smithii*** **(Western Wheatgrass) Herbaceous Vegetation [Map Class 20]**





9a (7) Grassland association occurring on the steep slopes of ridges and characterized by the short stature bunchgrass *Achnatherum hymenoides* – ***Achnatherum hymenoides*** **(Indian Ricegrass) Shale Barren Herbaceous Vegetation [Map Class 20]**





9b Grassland associations of sparse to moderate foliar cover composed of perennial bunchgrasses growing on a variety of soils; characterized by the genera *Hesperostipa*, *Pleuraphis*, or *Poa* **(10)**

10a (9) Grassland associations of short stature bunchgrasses occurring on a variety of slope and mesa top habitats and in swales; characterized by the genus *Poa* **(11)**

10b Grassland associations of medium stature bunchgrasses occurring on a variety of slope, ridge and terrace habitats; characterized by the genera *Hesperostipa* and *Pleuraphis* **(12)**

11a (10) *Poa secunda* grassland occurring in swales – ***Poa secunda*** **(Sandberg bluegrass) Herbaceous Vegetation [Map Class 20]**



11b Grassland association of shallow to steep slopes characterized by *Poa fendleriana* – ***Poa fendleriana*** **(Muttongrass) Herbaceous Vegetation [Map Class 20]**




12a (10) Grassland association of *Hesperostipa comata* occurring on slopes with minor to moderate foliar cover provided by other grass species, including *Bouteloua gracilis* or *Pleuraphis jamesii* – ***Hesperostipa comata*** **(Needle-and-thread) Great Basin Herbaceous Vegetation [Map Class 20]**




12b Grassland associations of *Pleuraphis jamesii* or *Hesperostipa comata* in association with *Achnatherum hymenoides* **(13)**

13a (12) *Hesperostipa comata* grassland in association with *Achnatherum hymenoides* – ***Hesperostipa comata – Achnatherum hymenoides*** **(Needle-and-thread – Indian Ricegrass) Herbaceous Vegetation [Map Class 20]**




13b Grassland association of shallow to steep slopes characterized by *Pleuraphis jamesii* – ***Pleuraphis jamesii*** **(James' galleta) Herbaceous Vegetation [Map Class 20]**





14a (6) Grassland associations of xeric, exotic, annual or perennial bunchgrass species, characterized by the genera *Bromus* or *Thinopyrum* **(15)**

14b Grassland associations of mesic, exotic, rhizomatous species, characterized by the genera *Agrostis*, *Bromus*, *Elymus*, *Phalaris*, or *Poa* **(16)**

15a (14) Grassland association often occurring on burned sites and composed of the exotic annual *Bromus tectorum* – ***Bromus tectorum*** **(Cheatgrass) Semi-natural Herbaceous Vegetation [Map Class 20]**



15b Grassland association occurring on sites recovering from disturbance and composed of the exotic, perennial bunchgrass *Thinopyrum intermedium* – ***Thinopyrum intermedium*** **(Intermediate Wheatgrass) Semi-natural Herbaceous Vegetation [Map Class 20]**



16a (14) Grassland association of mesic to saturated soils usually confined to drainage channels; characterized by the tall, coarse grass *Phalaris arundinacea* – ***Phalaris arundinacea*** **(Reed Canarygrass) Western Herbaceous Vegetation [Map Class 5]**



16b Grassland associations of mesic soils; characterized by the rhizomatous species *Bromus*, *Elymus*, or *Poa* **(17)**

17a (16) Grassland association of saturated soils on point bars and in high flow channels; characterized by *Agrostis stolonifera* **– *Agrostis (gigantea, stolonifera)*** **(Creeping Bentgrass) Herbaceous Vegetation [Map Class 20]**



17b Grassland associations occurring on floodplains and mesic terraces along streams and rivers; characterized by the genera *Bromus*, *Elymus* or *Poa* **(18)**

18a (17) Grassland association occurring on mesic terraces adjacent to small streams; characterized by *Elymus repens* – ***Elymus repens*** **(Quackgrass) Semi-natural Herbaceous Vegetation [Map Class 20]**



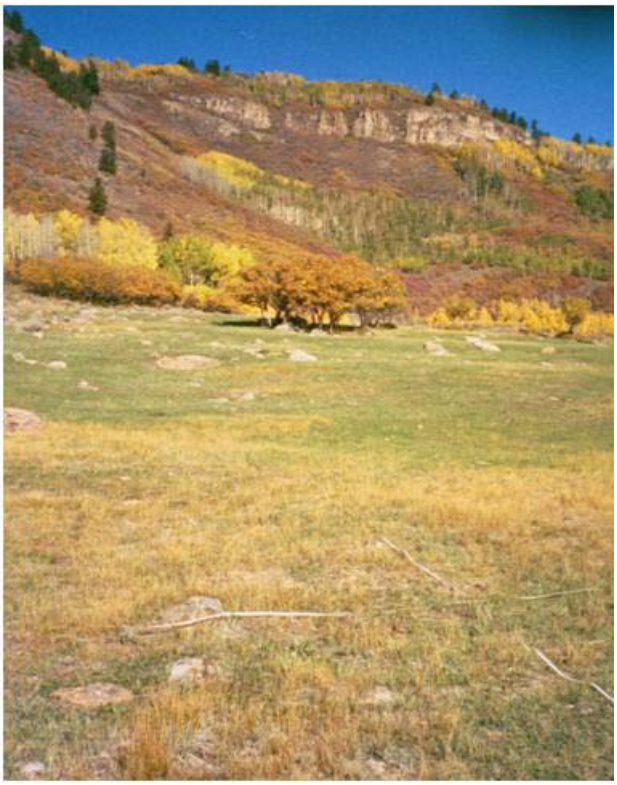
18b Grassland associations occurring on floodplains and mesic terraces along streams and rivers; characterized by the genera *Bromus* or *Poa* **(19)**

19a (18) Grassland association occurring on low terraces associated with the floodplain of the Gunnison River; characterized by *Bromus inermis* – ***Bromus inermis – (Pascopyrum smithii)*** **(Smooth Brome – (Western Wheatgrass)) Semi-natural Herbaceous Vegetation [Map Class 14]**





19b Grassland association occurring on high terraces adjacent to creeks; characterized by *Poa pratensis* – ***Poa pratensis*** **- (*Pascopyrum smithii*) (Kentucky Bluegrass - (Western Wheatgrass)) Semi-natural Herbaceous Vegetation [Map Class 20]**



20a (1) Vegetation association characterized by xeric, native perennial species growing on upland habitats; characterized by *Artemisia frigida.* May have *Poa fendleriana* in place of *Poa secunda* in the understory **- *Artemisia frigida / (Bouteloua gracilis – Achnatherum hymenoides – Poa***

***secunda*) (Prairie Sagewort / (Blue Grama – Indian Ricegrass – Sandberg Bluegrass) – Lichens Rocky Mesa Herbaceous Vegetation [Map Class 90]**





20b Vegetation associations of exotic forbs characterized by the genera *Chenopodium*, *Cirsium*, or *Conyza* **(21)**

21a (20) Vegetation of tall, coarse forbs growing on mesic, disturbed valley sites; associated with reservoir draw-down zones, shorelines, and coves; characterized by *Conyza canadensis* and *Chenopodium album* **– *Conyza canadensis* (Canadian Horseweed) Herbaceous Vegetation [Map Class 17]**





21b Vegetation of tall, coarse forbs growing on mesic, disturbed valley sites; associated with reservoir draw-down zones, shorelines, and coves; characterized by *Cirsium arvense* and other weedy forbs such as *Cirsium eatonii*, *Hackelia floribunda*, *Helianthella uniflora*, *Melilotus officinalis*, *Mentha arvensis*, *Rumex crispus*, and *Sisymbrium altissimum* **– *Cirsium arvense* - Weedy Forbs Great Plains Herbaceous Vegetation [Map Class 14]**


A 63
N+S

Additional vegetation types documented in the NRA:

Alnus incana / Mesic Forbs Shrubland
Artemisia nova / Hesperostipa comata Shrubland
Artemisia nova Shrubland
Artemisia tridentata ssp. *vaseyana / Leymus cinereus* Shrubland
Artemisia tridentata ssp. *vaseyana / Pseudoroegneria spicata* Shrubland
Artemisia tridentata ssp. *wyomingensis / Elymus elymoides* Shrubland
Artemisia tridentata ssp. *wyomingensis / Pascopyrum smithii* Shrub Herbaceous Vegetation
Artemisia tridentata ssp. *wyomingensis / Pleuraphis jamesii* Shrubland
Atriplex canescens - Krascheninnikovia lanata Shrubland
Cercocarpus montanus - Rhus trilobata var. *trilobata* Shrubland
Chenopodium glaucum Herbaceous Vegetation
Dasiphora fruticosa ssp. *floribunda* Temporarily Flooded Shrubland Alliance
Disturbed Shoreline Herbaceous Vegetation
Hippuris vulgaris Herbaceous Vegetation
Juniperus osteosperma / Artemisia tridentata ssp. *wyomingensis* Woodland
Juniperus scopulorum / Alnus incana Woodland
Krascheninnikovia lanata Dwarf-shrubland
Muhlenbergia montana Rocky Outcrop Herbaceous Vegetation
Philadelphus microphyllus - Artemisia frigida Shrubland
Picea pungens / Ribes lacustre Woodland
Pinus ponderosa / Artemisia tridentata ssp. *vaseyana* Woodland
Pinus ponderosa / Juniperus communis Woodland
Populus tremuloides / Acer glabrum Forest
Populus tremuloides / Alnus incana Forest
Populus tremuloides / Athyrium filix-femina Forest
Populus tremuloides / Bromus anomalus Forest
Populus tremuloides / Cornus sericea Forest
Populus tremuloides / Festuca thurberi Forest
Pseudoroegneria spicata Herbaceous Vegetation
Pseudotsuga menziesii / Cornus sericea Woodland
Pseudotsuga menziesii / Prunus virginiana Forest
Quercus gambelii - Ribes cereum Shrubland
Quercus gambelii / Achnatherum lettermanii Shrubland
Quercus gambelii / Cirsium arvense Shrubland
Quercus gambelii / Hesperostipa comata Shrubland [Provisional]
Quercus gambelii / Muhlenbergia montana Shrubland
Quercus gambelii / Sparse Understory Shrubland
Quercus gambelii Shrubland
Salsola spp. Herbaceous Vegetation
Saxifraga bronchialis Sparsely Vegetated Alliance
Scirpus microcarpus Herbaceous Vegetation
Solidago canadensis Herbaceous Alliance
Symphoricarpos oreophilus Shrubland
Thlaspi arvense Praire Dog Town

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Populus tremuloides (Quaking Aspen) / Invasive Perennial Grasses Forest..... 631
Populus tremuloides (Quaking Aspen) / Tall Forbs Forest 630
Populus tremuloides / *Amelanchier alnifolia - Symphoricarpos oreophilus* / *Calamagrostis rubescens* (Quaking Aspen / Saskatoon Serviceberry - Mountain Snowberry / Pinegrass) Forest..... 636
Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Mixed Graminoid (Quaking Aspen / Saskatoon Serviceberry - Mountain Snowberry / Mixed Graminoid) Forest..... 635
Populus tremuloides / *Amelanchier alnifolia – Symphoricarpos oreophilus* / *Thalictrum fendleri* Forest (Quaking Aspen / Saskatoon Serviceberry – Mountain Snowberry / Fendler's Meadow-rue) Forest . 635
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Populus tremuloides / *Ceanothus velutinus* (Quaking Aspen / Snowbrush Ceanothus) Forest..... 632
Populus tremuloides / *Juniperus communis* / *Carex geyeri* (Quaking Aspen / Common Juniper / Geyer's Sedge) Forest..... 632
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Populus tremuloides / *Quercus gambelii* / *Symphoricarpos oreophilus* (Quaking Aspen / Mountain Snowberry) Forest 636
Populus tremuloides / *Symphoricarpos oreophilus* (Quaking Aspen / Mountain Snowberry) Forest..... 638

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Pseudotsuga menziesii / *Carex geyeri* (Douglas-fir / Geyer's Sedge) Forest 612
Pseudotsuga menziesii / *Holodiscus dumosus* (Douglas-fir / Rockspirea) Woodland 614
Pseudotsuga menziesii / *Mahonia repens* (Douglas-fir / Creeping Barberry) Forest 615
Pseudotsuga menziesii / *Poa fendleriana* (Douglas-fir / Muttongrass) Forest 613
Pseudotsuga menziesii / *Prunus virginiana* (Douglas-fir / Choke Cherry) Forest 615
Pseudotsuga menziesii / *Quercus gambelii* (Douglas-fir / Gambel Oak) Forest 616
Pseudotsuga menziesii / *Symphoricarpos oreophilus* (Douglas-fir / Mountain Snowberry) Forest 617
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Quercus gambelii / *Poa fendleriana* (Gambel Oak / Muttongrass) Shrubland 645
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Appendix H. Modified Anderson Land Use/Land Cover Classification

This classification was used as the primary attribute for areas of developed land within and around Black Canyon of the Gunnison National Park. Every polygon was assigned an Anderson Land Use or Land Cover code in addition to its vegetation attributes.

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
1.0 Water	1.1 Open Water	1.11 Stream/river			
		1.12 Canal/ditch	1.121 Lined canal/ditch		
			1.122 Unlined canal/ditch		
		1.13 Lake/pond			
		1.14 Reservoir			
		1.15 Bay/estuary			
		1.16 Sea/ocean			
	1.2 Perennial Ice/Snow	1.21 Snowfield			
		1.22 Glacier			
2.0 Developed	2.1 Residential	2.11 Single-family residential			
		2.12 Multi-family residential			
	2.2 Non-residential Developed	2.21 Commercial/Light Industry	2.211 Major Retail		
			2.212 Mixed/Minor Retail and Services		
			2.213 Office		
			2.214 Light industry		
		2.22 Heavy Industry	2.221 Petro-chemical Refinery		
		2.23 Communications and Utilities			
		2.24 Institutional	2.241 Schools		
			2.242 Cemeteries		
		2.25 Agricultural Business	2.251 Aquiculture		
			2.252 Confined feeding		
		2.26 Transportation	2.261 Airport		
		2.27 Entertainment/ Recreation	2.271 Golf Course		
			2.272 Urban Parks		
	2.3 Mixed Urban				
3.0 Bare	3.1 Transitional				
	3.2 Quarries/Strip mines/Gravel pits				
	3.3 Bare Rock/Sand				

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
	3.4 Flats				
	3.5 Disposal				
4.0 Vegetated	4.1 Woody	4.11 Forested	4.111 Deciduous		
			4.112 Evergreen		
			4.113 Mixed		
		4.12 Shrub land	4.121 Deciduous		
			4.122 Evergreen		
			4.123 Mixed		
			4.124 Desert scrub		
		4.13 Orchards/vineyards/ groves	4.131 Irrigated Orchard/ vineyards/groves		
			4.132 Citrus		
			4.133 Non-managed Citrus		
		4.14 Mixed Forest/Shrub			
	4.2 Herbaceous	4.21 Natural Herbaceous	4.211 Natural Grassland		
		4.22 Planted/cultivated	4.221 Fallow/Bare Fields		
			4.222 Small Grains	4.2221 Irrigated small grains	
			4.223 Row Crops	4.2231 Irrigated row crops	
				4.2232 Sugar Cane	
			4.224 Planted grasses	4.2241 Pasture/ hay	4.22411 Irrigated Pasture/hay
				4.2242 Other grass	4.22421 Irrigated Other grass
			4.225 Irrigated Planted/ cultivated		
	4.3 Wetlands	4.31 Woody wetlands			
		4.32 Emergent wetlands			

Classification Definitions

1.0 WATER - area covered by water, snow, or ice with less than 25% vegetated or developed cover, unless specifically included in another category.

1.1 Open Water - all areas of open water with less than 25% vegetative or developed cover

1.11 Stream/river - a natural body of flowing water. Includes streams and rivers that

have been channelized in order to control flooding or erosion or to maintain flow for navigation.

1.12 Canal/ditch - a man-made open waterway constructed to transport water, to irrigate or drain land, to connect two or more bodies of water, or to serve as a waterway for watercraft. Collection should include the right of ways and associated dikes and levees.

1.121 Lined canal/ditch - a canal or ditch lined with concrete or other impervious material preventing passage of water into underlying strata.

1.122 Unlined canal/ditch - a canal or ditch constructed with dirt or other porous material allowing water to drain.

1.13 Lake/pond - a non-flowing, naturally-existing, body of water. Includes water impounded by natural occurrences and artificially regulated natural lakes. The delineation of a lake is based on the areal extent of water at the time the imagery was acquired.

1.14 Reservoir - any artificial body of water, unless specifically included in another category. It can lie in a natural basin or a man-constructed basin. The delineation of a reservoir is based on the areal extent of water at the time the imagery was acquired. (The water control structures are classified as Communications/Utilities).

2.0 DEVELOPED - Areas of the earth that have been improved by man. Includes all "built-up" and urban areas of the landscape. Does NOT include mining lands, croplands, or waste-disposal areas (dumps). This land use category takes precedence over a land cover category when the criteria for more than one category are met.

2.1 Residential - lands containing structures used for human habitation

2.11 Single-family Residential - Lands used for housing residents in single-family dwelling units. Includes trailer parks, mobile home parks, and entire "farmsteads" when there is a home in the complex. (If no home is in the complex, it should be classified as Agricultural Business.) Single-family residential buildings located within another category, such as military family housing, should be identified in this category.

2.12 Multi-family Residential - All lands devoted to housing more than one family on a permanent or semi-permanent basis, group living situations, and their associated grounds. Includes apartments, apartment complexes, duplexes, triplexes, attached row houses, condominiums, retirement homes, nursing homes, and residential hotels. Residential buildings located within another category, such as barracks and dormitories, should be identified in this category when possible, (except residential buildings within convents and monasteries - include these with Institutional).

2.2 Non-residential Developed - Any "developed" area or feature that is used for a purpose other than habitation.

2.21 Commercial/Light Industry - structures and associated grounds used for the sale of products and services, for business, or for light industrial activities. Includes all retail and wholesale operations. Include "industrial parks" and other features that cannot be clearly classified as either a retail service or light industry, such as heavy equipment yards, machinery repair, and junkyards.

2.211 Major Retail - This category includes shopping malls, retail "outlet centers," and "superstores" that draw clientele from a regional area. Major retail centers consist of extremely large single buildings or a complex of large buildings and their

parking lots. Malls usually house one or two major department stores and numerous small retail stores. Includes outlet centers, “superstores”, multi-plex movie theaters, and huge warehouse-type stores. The structures themselves are often several acres in size and have extensive parking lots.

2.212 Mixed/Minor Retail and Services - Includes individual stores and services of various sizes and associated grounds and parking. Includes neighborhood strip malls and shopping centers, veterinarian services, small movie theaters, gas stations and auto repair shops, garden centers, motels, small auto dealerships, public parking lots, lumber yards, art galleries, farm supply stores, flea-markets, bars and restaurants, grocery stores, and commercial “truck stops”. Many small office buildings will have no features to distinguish them from retail stores and will fall in this category.

2.213 Office - structures and their associated grounds and parking, that provide financial, professional, administrative, and informational type services. Includes administrative government offices (e.g., IRS and State Motor Vehicles offices) trade schools, professional medical office complexes, research facilities/centers, and banks. Usually only office buildings in office complexes or in downtown areas will be distinguishable as offices. Small, single-story office buildings may blend in with minor retail.

2.214 Light industry - structures and their associated grounds and facilities that are used primarily to produce or process some finished product; or as a wholesale distribution center. Activities include design, assembly, finishing, packaging, warehousing or shipping of products rather than processing raw materials. The materials used in light industry have generally been processed at least once. They are generally “clean” industries that do not produce lots of waste materials. Use this category as a default for those facilities with semi-truck and trailer activity around loading docks, but that cannot be classified as either retail services or heavy industry. Includes electronic firms, clothing and furniture manufacture, grain elevators, printing plants, commercial bakeries, shipping and distribution centers, sand/gravel sorting facilities, secondary buildings associated with a mining or quarrying site, and generic warehouses.

2.22 Heavy Industry - structures and their associated grounds used for heavy fabrication, manufacturing and assembling parts that are, in themselves, large and heavy; or for processing raw materials such as iron ore, timber, and animal products. Accumulated raw materials are subject to treatment by mechanical, chemical, or heat processing to render them suitable for further processing, or to produce materials from that finished products are created. Heavy industries generally require large amounts of energy and raw materials and produce a significant amount of waste products. Indicators of heavy industry may be stockpiles of raw materials, energy producing sources and fuels, waste disposal areas and ponds, transportation facilities capable of handling heavy materials, smokestacks, furnaces, tanks, and extremely large buildings that are complex in outline and roof structure. Include associated waste piles and waste ponds. Heavy industry is usually located away from residential areas. Includes steel mills, paper mills, lumber mills, cotton gins, chemical plants, cement and brick plants, smelters, rock crushing machinery, and ore-processing facilities associated with mining.

2.23 Communications and Utilities - structures or facilities and associated grounds

used for the generation of power and communications, the treatment or storage of drinking water, waste management, flood control, or the distribution and storage of gas and oil not associated with a unique feature. Includes pumping stations (oil, gas, or water), tank farms, power plants, electric substations, sewage treatment facilities and ponds, garbage collection facilities (not the final dumping ground - these are included in Bare), dams, levees, and spillways of appropriate dimensions, filtration plants, and heavy concentrations of antennas or satellite dishes; along with the related operational buildings.

2.24 Institutional - specialized government or private features that meet the educational, religious, medical, governmental, protective, and correctional needs of the public. Parking lots and associated grounds are included with these features. Includes public and private schools (not day care), state capitols, city halls, courthouses, libraries, churches, convents, monasteries, hospitals and training hospitals, post offices, police and fire departments, prisons, and military bases. Only the military-business areas of a military base are classified here; residential, airport, athletic fields, and vegetated areas are classified in the appropriate category.

2.241 Schools/Universities - public and private schools, seminaries, university campuses, and associated lands. Include the entire "core campus" area, along with athletic fields and vegetated areas. This category does not include day care centers or commercial trade schools, both of that are commercial uses.

2.242 Cemeteries - structures and lands devoted to burial of the dead. Includes mausoleums, service areas, and parking lots.

2.25 Agricultural Business - structures and all associated grounds used for raising plants or animals for food or fiber. Includes fish farms and hatcheries, feedlots, poultry farms, dairy farms, temporary shipping and holding pens, animal breeding or training facilities, and greenhouses. (Farmsteads including a dwelling are classified as residential, not agricultural business.)

2.251 Aquiculture site - a set of pools of water and related structures used for producing fish, shellfish, or aquatic plants.

2.252 Confined feeding operation - structures and associated pens, storage facilities, waste areas, and ponds that are used for raising meat and dairy cattle, hogs, poultry, or other animals. These features must have a relatively permanent and high animal population density. Temporary holding pens and thoroughbred horse farms usually do not qualify.

2.26 Transportation - Roads, railroads, airports, port facilities, and their associated lands. Roads and railroads include the right-of-way, interchanges, and median strips. Category includes railroad stations, railroad yards, bus stations, highway maintenance yards, school bus parking and service yards, and park-and-ride lots. Port facilities include loading and unloading facilities, docks, locks and, temporary storage areas. Associated warehousing and transfer stations for truck or rail are included only if they appear to be an integral part of the airport or port facility. Nearby but separate warehouses will be classified as light industry.

2.27 Entertainment and Recreational - areas and structures used predominantly for athletic or artistic events, or for leisure activities, and all associated lands and developed parking areas. Includes outdoor amphitheaters, drive-in theaters, campgrounds, zoos, sports arenas (including indoor arenas), developed parks and playgrounds, community

recreation centers, museums, amusement parks, public swimming pools, fairgrounds, and ski complexes (not the ski slopes). Marinas with over 25% of water surface covered by docks and boats are included here.

2.271 Golf Course - structures, associated grounds, driving ranges, and interspersed natural areas used for the game of golf.

2.272 Urban Parks - designated open space in urban settings used for outdoor recreation. Include grass fields and associated structures, parking lots, and facilities. Includes city parks, "green-belt" urban parks, and athletic fields not associated with a school. Does not include undeveloped "open space" on the periphery of urban areas or undeveloped regional, state, or national park areas.

2.3 Mixed Urban - developed areas that have such a mixture of residential and non-residential features where no single feature meets the minimum mapping unit specification. This category is used when more than one-third of the features in an area do not fit into a single category. Often applicable in the central, urban-core area of cities.

3.0 BARE - undeveloped areas of the earth not covered by water that exhibit less than 25% vegetative cover or less than 5% vegetative cover if in an arid area. The earth's surface may be composed of bare soil, rock, sand, gravel, salt deposits, or mud.

3.1 Transitional Bare - areas dynamically changing from one land cover/land use to another, often because of land use activities. Includes all construction areas, areas transitioning between forest and agricultural land, and urban renewal areas that are in a state of transition.

3.2 Quarries/Strip Mines/Gravel Pits - areas of extractive mining activities with significant surface disturbance. Vegetative cover and overburden are removed for the extraction of deposits such as coal, iron ore, limestone, copper, sand and gravel, or building and decorative stone. Current mining activity does not need to be identifiable. Inactive or unreclaimed mines and pits are included in this category until another land cover or land use has been established. Includes strip mines, open-pit mines, quarries, borrow pits, oil and gas drilling sites, and gravel pits with their associated structures, waste dumps, and stockpiles.

3.3 Bare Rock/Sand - includes bare bedrock, natural sand beaches, sand bars, deserts, desert pavement, scarps, talus, slides, lava, and glacial debris.

3.4 Flats - A level landform composed of unconsolidated sediments of mud, sand, gravel, or salt deposits. Includes coastal tidal flats and interior desert basin flats and playas.

3.5 Disposal - designated areas where refuse is dumped or exists, such as landfills, trash dumps, or hazardous-waste disposal sites. Reclaimed disposal areas or those covered with vegetation do not qualify.

4.0 VEGETATED - areas having generally 25% or more of the land or water with vegetation. Arid or semi-arid areas may have as little as 5% vegetation cover.

4.1 Woody Vegetation - land with at least 25% tree and (or) shrub canopy cover.

4.11 Forested - land where trees form at least 25% of the canopy cover.

4.111 Deciduous Forest - area dominated by trees where 75% or more of the canopy cover can be determined to be trees that loose all their leaves for a specific season of the year.

4.112 Evergreen Forest - area dominated by trees where 75% or more of the canopy cover can be determined to be trees that maintain their leaves all year.

4.113 Mixed Forest - areas dominated by trees where neither deciduous nor evergreen species represent more than 75% of the canopy cover.

4.12 Shrub land - areas where trees have less than 25% canopy cover and the existing vegetation is dominated by plants that have persistent woody stems, a relatively low growth habit, and that generally produce several basal shoots instead of a single shoot. Includes true shrubs, trees that are small or stunted because of environmental conditions, desert scrub, and chaparral. In the eastern US, include former cropland or pasture lands that are now covered by brush to the extent that they are no longer identifiable or usable as cropland or pasture. Clear-cut areas will exhibit a stage of shrub cover during the regrowth cycle. Some common species that would be classified as shrub land are mountain mahogany, sagebrush, and scrub oaks.

4.121 Deciduous Shrub land - areas where 75% or more of the land cover can be determined to be shrubs that lose all their leaves for a specific season of the year.

4.122 Evergreen Shrub land - areas where 75% or more of the land cover can be determined to be shrubs that keep their leaves year round.

4.123 Mixed Shrub land - areas dominated by shrubs where neither deciduous nor evergreen species represent more than 75% of the land cover.

4.124 Desert Scrub - land areas predominantly in arid and semi-arid portions of the southwestern U.S. Existing vegetation is sparse and often covers only 5-25% of the land. Example species include sagebrush, creosotebush, saltbush, black greasewood, and cactus.

4.13 Planted/Cultivated Woody (Orchards/Vineyards/Groves) - areas containing plantings of evenly spaced trees, shrubs, bushes, or other cultivated climbing plants usually supported and arranged evenly in rows. Includes orchards, groves, vineyards, cranberry bogs, berry vines, and hops. Includes tree plantations planted for the production of fruit, nuts, Christmas tree farms, and commercial tree nurseries. Exclude pine plantations and other lumber or pulp wood plantings that will be classified as Forest.

4.131 Irrigated Planted/Cultivated Woody - orchards, groves, or vineyards where a visible irrigation system is in place to supply water.

4.14 Mixed Forest/Shrub – areas dominated by forest and shrub where neither species represent more than 75% of the canopy cover.

4.2 Herbaceous Vegetation - areas dominated by non-woody plants such as grasses, forbs, ferns and weeds, either native, naturalized, or planted. Trees must account for less than 25% canopy cover while herbaceous plants dominate all existing vegetation.

4.21 Natural Herbaceous - areas dominated by native or naturalized grasses, forbs, ferns and weeds. It can be managed, maintained, or improved for ecological purposes such as weed/brush control or soil erosion. Includes vegetated vacant lots and areas where it cannot be determined whether the vegetation was planted or cultivated such as in areas of dispersed grazing by feral or domesticated animals. Includes landscapes dominated by grass-like plants such as bunch grasses, Palouse grass, palmetto prairie areas, and tundra vegetation, as well as true prairie grasses.

4.211 Natural Grasslands - natural areas dominated by true grasses. Includes undisturbed tall-grass and short-grass prairie in the Great Plains of the U.S.

4.22 Planted/Cultivated Herbaceous - areas of herbaceous vegetation planted and/or cultivated by humans for agronomic purposes in developed settings. The majority of

vegetation in these areas is planted and/or maintained for the production of food, feed, fiber, pasture, or seed. Temporarily flooded are included in this category. Do not include harvested areas of naturally occurring plants such as wild rice and cattails.

4.221 Fallow/Bare Fields - areas within planted or cultivated regions that have been tilled or plowed and do not exhibit any visible vegetation cover.

4.222 Small Grains - areas used for the production of grain crops such as wheat, oats, barley, graham, and rice. Category is difficult to distinguish from cultivated grasses grown for hay and pasture. Indicators of small grains may be a less than 10% slope, annual plowing and seeding, distinctive field patterns and sizes, different timing of green-up and harvest, different harvesting practices, a very "even" texture and tone, or regional variations discovered during field checks.

4.223 Row Crops - areas used for the production of crops or plants such as corn, soybeans, vegetables, tobacco, flowers and cotton. Fields that exhibit characteristics similar to row crops, but that do not have any other distinguishing features for a more specific category may be included.

4.2231 Irrigated Row Crops - areas used for the production of row crops where a visible irrigation system is in place to supply water.

4.224 Cultivated grasses - areas of herbaceous vegetation, including perennial grasses, legumes, or grass-legume mixtures that are planted by humans and used for erosion control, for seed or hay crops, for grazing animals, or for landscaping purposes.

4.2241 Pasture/Hay - areas of cultivated perennial grasses and/or legumes (e.g., alfalfa) used for grazing livestock or for seed or hay crops. Pasturelands can have a wide range of cultivation levels. It can be managed by seeding, fertilizing, application of herbicides, plowing, mowing, or baling. Pastureland has often been cleared of trees and shrubs, is generally on steeper slopes than cropland, is intended to graze animals at a higher density than open rangeland, and is often fenced and divided into smaller parcels than rangeland or cropland. Hay fields may be more mottled than small grain fields as they are not plowed annually and may be harvested and baled two or three times a year in some locations.

4.22411 Irrigated Pasture/Hay - areas used as pasture or hay fields where a visible irrigation system is in place to supply water.

4.2242 Other planted grasses - areas of other cultivated grass such as turf and sod farms.

4.22421 Irrigated other grasses - areas of other cultivated grasses where a visible irrigation system is in place to supply water.

4.225 Irrigated Planted Herbaceous - land that is growing some indistinguishable crop or grass, but is obviously irrigated.

4.3 Vegetated Wetland - areas where the water table is at, near, or above the land surface for a significant part of most years and vegetation indicative of this covers more than 25% of the land surface. Wetlands can include marshes, swamps situated on the shallow margins of bays, lakes, ponds, streams, or reservoirs; wet meadows or perched bogs in high mountain valleys, or seasonally wet or flooded low spots or basins. Do not include agricultural land that is flooded for cultivation purposes.

4.31 Woody Wetland - areas dominated by woody vegetation. Includes seasonally

flooded bottomland, mangrove swamps, shrub swamps, and wooded swamps including those around bogs. Wooded swamps and southern flood plains contain primarily cypress, tupelo, oaks, and red maple. Central and northern flood plains are dominated by cottonwoods, ash, alder, and willow. Flood plains of the Southwest may be dominated by mesquite, saltcedar, seepwillow, and arrowweed. Northern bogs typically contain tamarack or larch, black spruce, and heath shrubs. Shrub swamp vegetation includes alder, willow, and buttonbush.

4.32 Emergent Herbaceous Wetlands - areas dominated by wetland herbaceous vegetation that is present for most of the growing season. Includes fresh-water, brackish-water, and salt-water marshes, tidal marshes, mountain meadows, wet prairies, and bogs

Appendix I. Accuracy Assessment Analysis Results

Introduction

This appendix contains the results of the analysis of accuracy assessment (AA) field data. Each of the 1,037 AA field plots sampled at CURE in 2005 was compared with the polygon in which it was located. If the field data matched the polygon label, the plot was deemed correct. If it did not, it was marked incorrect and underwent further analysis as to the type and pattern of error, and the best way to resolve the error.

We approached the error analysis with the idea that error can enter a map and into a data set from many sources, most of which are out of the photointerpreter's control. These sources of error include:

- Transcription error by the technician who created the digital mapping database
- Locational error in the field (e.g. canyons or dense forests where GPS doesn't work, OR small or narrow polygons, so sample is taken in a different polygon than was intended)
- Transcription error by persons entering AA data into the relational database
- Transcription error by persons creating the AA contingency table
- Field key is difficult to use (fault may lie with key or with classification)
- Field key does not include all plant associations present within the park
- Field crew error, either by mis-identifying diagnostic species in the field, or by not reading the key carefully, resulting in a bad call when the map is actually good
- Point falls within an ecotone, which is impossible to classify but which still has to get mapped as something
- The AA point falls in an inclusion of a different vegetation type that is too small to map as a separate polygon; the mapper chose the dominant type to label the polygon
- The photos were flown and/or the plot data collected in a year or season either much drier or much wetter than the year/season in which AA is done

These types of error may affect the accuracy of a map even when the map concepts are good. We therefore felt justified in making post-AA adjustments to the map class definitions, the association-map class crosswalk, field key, and in a few cases, the map polygon labels to account for what we considered to be "false" (i.e., not in control of the mapper) errors.

The initial (uncorrected) accuracy of the CURE vegetation map was 30%. We therefore inspected the original AA plot data, plot photographs, and aerial imagery for approximately 1,032 plots of accuracy assessment field data to create the table that follows (five plots were omitted because they fell in roadways). We identified the patterns of error for every map class that failed to meet the

program standard of 80% user's and producer's accuracy and suggested one or more potential solutions in each case. The final step in the process was to present the table in March, 2006 to CURE natural resources staff and ask for their input for solutions we would apply to the final map. Park staff could choose from our suggestions or offer other solutions. In some cases, staff chose "none of the above" and opted instead to retain a map class with lower accuracy because it represented a vegetation type that was important to management.

Original Map Class	Final Map Class	Original Map Class Name	Final Map Class Name	Map Class Concept	Problem	Proposed Solution	Final Decision
2	2	Geyer's Willow Seeps and Springs Shrubland	Geyer's Willow Seeps and Springs Shrubland	Upland spring sites	Rare class that is confused with MC 7, based on the difficulty of distinguishing tall willow from tall cottonwood canopies	None needed	
4	5	Box Elder / Gambel Oak Woodland	Canyon Bottom Mosaic	Unstable rocky river banks dominated by Box Elder and Gambel Oak	This type does not occur east of Crystal dam; it is restricted almost entirely to BLCA. Confused with Gambel oak shrubland map units (42 and 48)	Combine MU's 4, 5 and 16 into a Canyon Bottom Mosaic. This would acknowledge that separation was not practical, and that realistically we don't have a complete sampling of the canyon and it is probable that other communities are present.	Combine MUs 4, 5 and 16 into Canyon Bottom Mosaic (5)
5	5	Box Elder / Disturbed Understory Woodland	Canyon Bottom Mosaic	Box Elder riparian woodlands	In general in the highly mosaicked bottoms it is difficult to distinguish types and difficult or impossible to separate spatially.	Combine MU's 4, 5 and 16 into a Canyon Bottom Mosaic. This would acknowledge that separation was not practical, and that realistically we don't have a complete sampling of the canyon and it is probable that other communities are present.	Combine MUs 4, 5 and 16 into Canyon Bottom Mosaic (5)
16	5	Reed Canary Grass Western Herbaceous Vegetation	Canyon Bottom Mosaic	Springs, seeps, and stream margins; also along river banks	In general in the highly mosaicked bottoms it is difficult to distinguish types and difficult or impossible to separate spatially. Most examples of this type are too small or too mashed in with other riparian types to be pulled out separately.	Combine MU's 4, 5 and 16 into a Canyon Bottom Mosaic. This would acknowledge that separation was not practical, and that realistically we don't have a complete sampling of the canyon and it is probable that other communities are present.	Combine MUs 5 and 16 into Canyon Bottom Mosaic (5)

Original Map Class	Final Map Class	Original Map Class Name	Final Map Class Name	Map Class Concept	Problem	Proposed Solution	Final Decision
1	7	Mixed Willows Riparian Shrubland	Narrowleaf Cottonwood - (Alder, Coyote Willow) Riparian Woodland	Garbage can map class for all mixed willow shrublands (mostly coyote willow)	Confused with MC 7, especially in young cottonwood stands	Combine with MC 7	Combine with MC 7
6	7	Narrowleaf Cottonwood - Rocky Mtn. Juniper Woodland	Narrowleaf Cottonwood - (Alder, Coyote Willow) Riparian Woodland	Occurs in ravines along intermittent streams	Side canyon cottonwood stands. Mostly confused with MU40 because most of the AA points fell into two mis-mapped ARTR-QUGA polygons (MU40).	Relabel mislabeled polygons (should be MU40). Inspect remaining polygons for similar errors. Combine remaining MU6 and MU8 and MU9 into a side-canyon POAN-conifer MU.	Separating side canyon stands with possible conifer mixed in didn't improve accuracy enough, so this was combined with MC 7
7	7	Narrowleaf Cottonwood - (Alder, Coyote Willow) Riparian Woodland	Narrowleaf Cottonwood - (Alder, Coyote Willow) Riparian Woodland	Closed canopies make it difficult to distinguish understory composition: coyote willow understory associated with young stands on recent point bars and other shrub understories associated with mature stands. Exotic graminoid understories typical along the edges of hay meadows.	No problems mapping this cottonwood gallery forest along the main stem of the Gunnison River.	None needed	
8	7	Narrowleaf Cottonwood / Blue Spruce / Thinleaf Alder Woodland	Narrowleaf Cottonwood - (Alder, Coyote Willow) Riparian Woodland	Mixed canopy (cottonwood-spruce-alder) stands of side canyons	Major confusion is with stands that have tall oak or aspen, not cottonwood as the deciduous element	Combine MU6 and 8, 9 into a side-canyon cottonwood type. Broaden MC concept to include side canyon aspens that fill the same niche in these rocky, small stream sites as POAN. Accuracy is still likely to be a little lower than the standard.	Separating side canyon stands with possible conifer mixed in didn't improve accuracy enough, so this was combined with MC 7

Original Map Class	Final Map Class	Original Map Class Name	Final Map Class Name	Map Class Concept	Problem	Proposed Solution	Final Decision
9	9	Blue Spruce Riparian Woodland Alliance	Blue Spruce Riparian Woodland Alliance	Mapped in deep ravines on N-facing, mesic slopes of the Gunnison River gorge	Confused with Douglas-fir stands in gullies/ravines. Very rare type that is often inaccessible to field sampling, and other than a few polys near the boundary with BLCA, it was only mapped where known to occur	None needed	
10	14	Beaked Sedge Riparian Vegetation	Baltic Rush and Sedges Herbaceous Vegetation	Grows in old oxbows	Only mapped once in CURE - turned out to be Phalaris/Canada thistle. Many plots sampled by AA crews were given this code as one of the field calls. These stands are all much smaller than the MMC and could not be mapped.	Lump this MC with MU14	Combine with MC 14
14	14	Baltic Rush Herbaceous Vegetation	Baltic Rush and Sedges Herbaceous Vegetation	Disturbed wet sites, such as old irrigated fields	Mapped well	None needed	
18	14	Smooth Brome Semi-natural Herbaceous Vegetation	Baltic Rush and Sedges Herbaceous Vegetation	Mesic grasslands of the rhizomatous, perennial ,exotic grass *Bromus inermis*	Confused with the mesic grassland map class 14	Combine with MC 14	Combine with MC 14
17	17	Reservoir Drawdown Semi-natural Herbaceous Vegetation	Reservoir Drawdown Semi-natural Herbaceous Vegetation	Weedy communities that grow in disturbed sites along the edge of the reservoir	Mapped well	None needed	

Original Map Class	Final Map Class	Original Map Class Name	Final Map Class Name	Map Class Concept	Problem	Proposed Solution	Final Decision
24	17	Cheatgrass Semi-natural Herbaceous Vegetation	Reservoir Drawdown Semi-natural Herbaceous Vegetation	Weedy communities of the exotic, annual grass *Bromus tectorum*	Very rare and confused with the other herbaceous map classes (17 and 20)	Combine with MC 20 or 17	Combine with MC 20
15	20	Kentucky Bluegrass Semi-natural Herbaceous Vegetation	Mixed Upland Grasslands	Xeric grasslands of the rhizomatous, perennial exotic grass *Poa pratensis*	Confused with the other herbaceous map classes (17 and 20)	Combine with MC 20	Combine with MC 20
19	20	Quackgrass Grasslands	Mixed Upland Grasslands	Xeric grasslands of the rhizomatous, perennial ,exotic grass *Elymus repens*	Very rare and confused with the herbaceous map class 20	Combine with MC 20	Combine with MC 20
20	20	Mixed Upland Grasslands	Mixed Upland Grasslands	Smooth photo signature assumed to be grass-dominated and found in openings of sagebrush shrublands or other shrublands or woodlands or on windswept ridges	Significant confusion with sagebrush shrublands. In many cases, the polygons where AA points fell were a mosaic of sage and grassy openings, or on windswept sites with sparse or dwarfed shrubs that have an herbaceous signature. Undersampled due to the nature of small grasslands mosaicked with other communities.	Most polygons fit the redefined MU32 of a sparse, windswept, rocky dwarfed shrubland or sagebrushes or related shrubs. Most of the true grasslands (classification plots) were inclusions in this type anyway. Inspect all polys MU20 and reassign weedy/non-windswept types as appropriate - all others are folded into surrounding polys.	See Solution
21	20	Muttongrass Herbaceous Vegetation	Mixed Upland Grasslands	Rare type	Distinguishing herbaceous types was largely guess-work without direct field knowledge	Combine all grassland associations into one big grassland map unit	Combine with MC 20

Original Map Class	Final Map Class	Original Map Class Name	Final Map Class Name	Map Class Concept	Problem	Proposed Solution	Final Decision
28	28	Parry's Rabbitbrush Shrubland	Roadcut Sparse Shrubland	Road-fill, talus/scree. Often very weedy with sparse ERIPAR or ERINAU shrub cover	Handful of polygons on boundary with BLCA, but no AA points in this type.	N/A	Not Accuracy Assessed
27	31	Viscid Rabbitbrush Shrubland	Wyoming Big Sagebrush Shrubland	Small shrublands of mixed *Chrysothamnus viscidiflorus, Artemisia tridentata* and a variety of grasses including *Hesperostipa comata*	Confused with the big sage map class 31	Combine with MC 31	Combine with MC 31
29	31	Rubber Rabbitbrush – Big Sage Shrubland	Wyoming Big Sagebrush Shrubland	Mixed shrublands of *Ericameria nauseosa* and *Artemisia tridentata*	Confused with a variety of other map classes	Remap some polygons of this type and combine the remaining polygons with MC 31	See Solution
31	31	Wyoming Big Sagebrush Shrubland	Wyoming Big Sagebrush Shrubland	Difficult to distinguish Wyoming from Mountain big sagebrush because of intermixing/hybridization, but mapped at lower elevations and mostly on eastern half of CURE	Confused with Mountain Big Sagebrush and Black Sagebrush	Revise map unit description to be for open sagebrush stands only with sparse understory and poor soils, and absorb polygons of black sagebrush	See Solution. This map class became the "garbage can" for all shrub associations that didn't AA well: rabbitbrush (3 sp.) and black sagebrush

Original Map Class	Final Map Class	Original Map Class Name	Final Map Class Name	Map Class Concept	Problem	Proposed Solution	Final Decision
32	31	Black Sagebrush Shrub Herbaceous Vegetation	Wyoming Big Sagebrush Shrubland	It is there, but lacks a consistent signature and apparently is spotty and not common as an overstory or understory. Windswept slopes and ridge tops.	Very rare type, too difficult to pull out separately from Wyo. sage in lowlands and basins.	Lumping with Wyoming sagebrush shrublands would improve accuracy	Combine with MC 31, but retain a “b” modifier on all polys originally mapped as this
86	31	Big Sagebrush / Galleta Grass Shrubland	Wyoming Big Sagebrush Shrubland	Based off of one plot near park boundary where active grazing was still occurring and galleta grass was the dominant understory.	Very rare type, too difficult to pull out separately. Not common enough to map as its own type.	Combine with MC 31	Combine with MC 31
94	31	Wyoming Big Sagebrush / Seeded Grasses Semi-natural Shrubland	Wyoming Big Sagebrush Shrubland	Disturbed Wyoming sagebrush shrublands with seeded grasses in the understory	Too difficult to pull out separately from the other Wyoming sagebrush shrublands	Merge with MC 31 and use an “I” modifier	See solution
35	31	Basin Big Sagebrush / Western Wheatgrass Shrubland	Wyoming Big Sagebrush Shrubland	Basin Big Sagebrush in altered, grazed sites with a western wheatgrass dominated understory	Big Sagebrush was not mapped separately in BLCA. Is there Basin Big Sage or is it just really tall Wyoming Big Sage???	Combine with MC 31	Combine with MC 31

Original Map Class	Final Map Class	Original Map Class Name	Final Map Class Name	Map Class Concept	Problem	Proposed Solution	Final Decision
33	33	Mountain Big Sagebrush Shrub Herbaceous Vegetation	Mountain Big Sagebrush Shrubland	Difficult to distinguish Wyoming from Mountain big sagebrush because of intermixing/hybridization, but mapped at higher elevations throughout CURE	Some confusion with Wyoming big sagebrush shrublands (probably hybrid stands)	None needed	
36	33	Mountain Big Sagebrush / Muttongrass Shrubland	Mountain Big Sagebrush Shrubland	Higher elevation mountain big sagebrush shrublands with muttongrass in the understory	The Mtn. sagebrush associations targeted didn't have high accuracy of separation, but at alliance level accuracy is very acceptable	Combine all grassy understories together into one mountain big sagebrush alliance	Combine with MC 33
38	33	Mountain Big Sagebrush / Arrowleaf Balsamroot Shrubland	Mountain Big Sagebrush Shrubland	Higher elevation mountain big sagebrush shrublands with arrowleaf balsamroot in the understory	The Mtn. sagebrush associations targeted didn't have high accuracy of separation, but at alliance level accuracy is very acceptable	Combine all grassy understories together into one mountain big sagebrush alliance	Combine with MC 33
40	41	Gambel Oak / Big Sagebrush Shrubland Mosaic	(Rocky Mountain Juniper) / Big Sagebrush – Mixed Montane Shrubs Mosaic	A matrix of oak mots and sagebrush, where oak mots grow too close together to be pulled out separately from the sagebrush. A lot of CURE is a mosaic of oak and sagebrush tightly interfingered.	Confused with other oak types, sagebrush types and sagebrush mixed with mountain mahogany, serviceberry and/or juniper	Absorb polygons of MC 79 and expand concept to include big sagebrush mixed with other montane shrubs besides oak	See Solution

Original Map Class	Final Map Class	Original Map Class Name	Final Map Class Name	Map Class Concept	Problem	Proposed Solution	Final Decision
79	41	Rocky Mountain Juniper / Big Sagebrush Woodland	(Rocky Mountain Juniper) / Big Sagebrush – Mixed Montane Shrubs Mosaic	Wooded shrublands of big sagebrush with low cover by Rocky Mountain juniper	Confusion mostly with MU41. Mapper had a hard time distinguishing juniper crowns from oak shrubs in the sagebrush mosaic. Some polys were mapped MU79 when the JUSC was just too sparse to register in most plots (<1% total cover in poly) and so got called MU31. Would have been better to map this type more tightly around the areas with trees.	Eliminate this map class and relabel all polygons as MC 41	See Solution
42	42	Gambel Oak / Mixed Montane Shrubland Complex	Gambel Oak / Mixed Montane Shrubland Complex	Mixed montane shrublands with Gambel oak, serviceberry and mountain mahogany as co-dominants. Oak and serviceberry do look different in rather pure stands and do not really form a community as much as compete (oak will win eventually) in a mosaic.	Confusion mostly with the two other oak map classes (40 and 43). This map class was slightly undermapped and found to be more common by crews in the field.	Could combine with MC 43 to improve accuracy to above 80% but would lose the pure oak vs. mixed oak difference between the two. Or can retain this map class with slightly lower accuracy.	Retain this map class with lower accuracy because it is unique from the pure oak shrublands and from the oak-sagebrush mosaic shrublands
45	42	Serviceberry - Mixed Shrub / Elk Sedge Shrubland	Gambel Oak / Mixed Montane Shrubland Complex	MC 45 was mapped by attempting to delineate areas with apparent matrix dominance of serviceberry.	Serviceberry typically mixed with oak and Mtn. mahogany such that boundaries were problematic.	Combine with Gambel oak – mixed montane shrubland complex to improve accuracy	Combine with MC 42
43	43	Gambel Oak Woodlands	Gambel Oak Woodlands	MC 43 was separated from MC 42 largely to acknowledge tree form oak communities. These are more mesic sites and/or older stands.	This unit seems to split understory/co-dominance floristics with MC 42, where canopies are thicker	Relabel polygons of MC 42 which have a dense, nearly continuous oak canopy as MC 43 to improve accuracy	See Solution

Original Map Class	Final Map Class	Original Map Class Name	Final Map Class Name	Map Class Concept	Problem	Proposed Solution	Final Decision
47	43	Oak- Saskatoon Serviceberry	Gambel Oak Woodlands	This MC was tentatively separated based on a fairly distinct pattern signature of large oak mots with serviceberry mosaicked in.	Difficult to tell Saskatoon from Utah serviceberry in oak stands, but stands of MC 43 should be much thicker.	Based on AA and potential usefulness it should be merged with 43 or to a broad oak-serviceberry complex	Combine with MC 43
44	46	Mountain Mahogany Shale Shrubland	Mountain Mahogany Shale Shrubland	MC 46 was an attempt to separate CERMON dominated steep slopes. There are just a few polygons.	The major confusion is with sagebrush, lesser confusion with MU40. Could not consistently recognize the signature of CEMO.	Reassign most polygons to sagebrush map classes that are the closest neighbors and retain the few polygons with AA points in them and those nearby that match in signature and location on the landscape.	See Solution
48	48	Gambel Oak / Rockspirea Shrubland	Gambel Oak / Rockspirea Scree Shrubland	The mapping model was steep, (scree and crag dominated) canyon slopes that come down to the edge of the water. The key agreement is steep slopes with scree, etc.	There is overlap with MU92 and confusion is with other oak classes (MC 40, 42 and 43). Because this unit is mostly on steep, inaccessible slopes, the less-characteristic level/gentle slopes were all that was left for sampling after the steep sites were masked out, as a result this class was undersampled and the sites sampled were less representative.	I would like to keep the unit but rename. Separate associations in the key based on unstable talus vs. stable uplands.	Add “Scree” to map class name and retain map class
50	52	Quaking Aspen / Tall Forbs Forest	Quaking Aspen / Tall Shrubs Forest	Aspen woodlands with a mixture of forbs dominant in the understory	Some confusion with really tall oak woodlands in MC 43. Separating quaking aspen woodlands/forests by diagnostic understory species did not turn out well, but combining all aspen types improves the accuracy greatly.	Combine all aspen types into a generic aspen map class	See Solution

Original Map Class	Final Map Class	Original Map Class Name	Final Map Class Name	Map Class Concept	Problem	Proposed Solution	Final Decision
51	52	Quaking Aspen / Kentucky Blue Grass Forest	Quaking Aspen / Tall Shrubs Forest	Aspen woodlands with the rhizomatous, exotic, perennial grass *Poa pratensis* dominant in the understory	Some confusion with really tall oak woodlands in MC 43. Separating quaking aspen woodlands/forests by diagnostic understory species did not turn out well, but combining all aspen types improves the accuracy greatly.	Combine all aspen types into a generic aspen map class	See Solution
52	52	Quaking Aspen / Tall Shrubs Forest	Quaking Aspen / Tall Shrubs Forest	All aspen stands in CURE; widespread, but most common in higher elevation areas on the western half of CURE	Some confusion with really tall oak woodlands in MC 43. Separating quaking aspen woodlands/forests by diagnostic understory species did not turn out well, but combining all aspen types improves the accuracy greatly.	Combine all aspen types into a generic aspen map class	See Solution
53	52	Quaking Aspen / Common Juniper Forest	Quaking Aspen / Tall Shrubs Forest	Aspen woodlands with common juniper in the understory	Some confusion with really tall oak woodlands in MC 43. Separating quaking aspen woodlands/forests by diagnostic understory species did not turn out well, but combining all aspen types improves the accuracy greatly.	Combine all aspen types into a generic aspen map class	Combine with map class 52
55	52	Quaking Aspen - Douglas-fir / Saskatoon Serviceberry Forest	Quaking Aspen / Tall Shrubs Forest	Concept is a mixed canopy of conifers and aspen with a tall shrub understory	Most polygons have only a few very scattered conifers - less than 2% cover when averaged throughout the polygon. Confusion with other aspen types w/o conifers and with tall oak shrublands.	Combine all aspen types into a generic aspen map class	Combine with MC 52, but add a “f” modifier for “fir” on all polys originally mapped as this

Original Map Class	Final Map Class	Original Map Class Name	Final Map Class Name	Map Class Concept	Problem	Proposed Solution	Final Decision
60	60	Douglas-fir / Rockspirea Scree Woodland	Douglas-fir / Rockspirea Scree Woodland	Sparse Doug-fir canopy, P-J subcanopy and mixed shrub (incl. HOLDUM) understory on steep and/or scree slopes. Mapping includes a lot of outcrop and/or scree in some polygons.	Many of the AA sites are oak understory (MC 62), suggesting that the PI did a poor job consistently pulling out oak in the understory. Other confusion was with the other rock spirea types on scree slopes. Mostly, the issues are due to undersampling of this type because of the inaccessibility of the steep slopes it occurs on.	Have PI relabel polygons with an oak understory (either visible on the imagery or documented from AA pts) to MC 62. This map unit should not have an oak understory. Relabel polygons without a clear or consistent Doug-fir signature to MC 93. Remove rockspirea from the name, because there may be a variety of shrubs in the understory.	See Solution
61	61	Douglas-fir / Rocky Slope Open Woodland	Douglas-fir / Sagebrush – Muttongrass Open Woodland	Rocky slopes with open Doug-fir woodlands on drier sites	Major confusion is with shrub map units 40 and 31. Polygons mostly too coarse, include large areas of just ARTRW on west-facing slopes - Doug-fir is in gullies, below rims and on sheltered slopes. Most stands should be on Tertiary volcanic substrates.	Can remap as suggested for MU60; would negate AA but would improve map detail. To improve accuracy without remapping, could redefine MU as a broad mosaic with matrix of ARTRW and patches of DF woodlands with various understories but mostly sagebrush.	Pull out areas with little to no Doug-fir as sagebrush shrublands and remap (and rename) with the concept being a Doug-fir/sage/grass wooded shrubland
62	62	Douglas-fir Forest	Douglas-fir Forest	Doug-fir stands generally not with P-J in the subcanopy (and generally of more stable and mesic sites) with mixed shrubs in the understory (usually incl. oak)	Mapped well	None needed	

Original Map Class	Final Map Class	Original Map Class Name	Final Map Class Name	Map Class Concept	Problem	Proposed Solution	Final Decision
63	62	Douglas-fir / Gambel Oak Forest	Douglas-fir Forest	Doug-fir woodlands of mesic sites with a nearly closed canopy and an understory dominated by Gambel oak	Confused mostly with MC 62 because Gambel oak could not be consistently pulled out in the understory from other mesic, tall shrubs	Combining with MC 62 will improve accuracy greatly	Combine with MC 62
67	67	Ponderosa Pine / Gambel Oak Woodland	Ponderosa Pine / Gambel Oak Woodland	Very open woodlands of ponderosa pine with oak or bitterbrush common in the understory, often occurs on the margins of big sagebrush shrublands	Major confusion is with MC40	Retain this map unit as a park special only, where classification plots or AA points confirm its presence. Relabel or dissolve all other polygons of this MU.	See Solution
68	67	Ponderosa Pine / Bitterbrush Woodland	Ponderosa Pine / Gambel Oak Woodland	Concept is an open canopy on canyon rim or plateau	Confusion is with MU40 and with Doug-fir woodlands.	Can maintain as a park special and retain polygons with plots and/or AA points in them, or can collapse this MU into the amalgamation of xeric DF units (MU60 and MU61).	Dissolve this map class and add the association to the crosswalk for MC 67
69	69	Pinyon Pine – Juniper / Greasebush Woodland	PJ / Sparse Mixed Shrubs Scree Woodland	Based on two sites and a simple model: Very sparse P-J, little apparent understory, and Morrison Formation south to west facing scarps. But it morphed into sparse P-J woodlands occupying the steep slopes of the inner Black Canyon.	Handful of polygons on boundary with BLCA, but no AA points in this type.	N/A	Not Accuracy Assessed
70	69	PJ / Rock Spirea Woodland	PJ / Sparse Mixed Shrubs Scree Woodland	PJ / Holodiscus based on two sites from CURE and the association may not be widespread in BLCA.	Like the other units with HOLDUM in the name, the AA sampling turned up CERMON and some of the other understory species.	Fits well with the revised concept for MC 69.	Combine with MC 69

Original Map Class	Final Map Class	Original Map Class Name	Final Map Class Name	Map Class Concept	Problem	Proposed Solution	Final Decision
71	71	PJ / Gambel Oak Woodland	PJ / Gambel Oak Woodland	Dense P-J woodlands or appearing so due to tall oak shrubs with high cover mixed in.	Significant confusion with MU74 (PJ/Mxd Mtn Shrub) some confusion with MU 42 (oak shrublands).	Consider adding this MU to the MU72/74/75/77 combo. It's not an ecological stretch to combine PJ/oak to PJ/mxd mtn shrubs that usually include oak or remap where there is a consistent and strong, visible oak signature.	Relabel polys called P-J/oak by field crews to MC 71 since this map unit was found to be more common than it was mapped and remap only where oak signature is visible, otherwise relabel polys as MC 74.
72	74	PJ / Sagebrush Species Woodland	PJ / Mixed Shrubs and Grasses Woodland	Woodlands on drier sites with deep alluvial soils. This does not exist in CURE, only in BLCA.	This unit had moderate signature recognition combined with flatter slopes, possibly deeper soils.	Re-label all CURE polygons to the MU74 agglomeration.	See Solution
74	74	PJ / Mixed Shrubs and Grasses Woodland	PJ / Mixed Shrubs and Grasses Woodland	Concept is a hodgepodge of PJ/mxd mtn shrub woodlands and a number of PJ types with grassy understories. Major confusion is with MU77 and MU71, lesser confusion with MU62. Occurs as dry, open, generally steep-sloped woodlands.	While this is named mixed shrubs and grasses, by far the most prevalent association is PJ / CERMON. Other included communities may represent less than 25% of the total, based on AA sampling and would be both uncertain and spatially difficult to map.	Combine all P-J types with mixed shrubs or grasses in the understory that did not have high enough accuracy (72, 75 and 77) into this one large P-J type.	See Solution

Original Map Class	Final Map Class	Original Map Class Name	Final Map Class Name	Map Class Concept	Problem	Proposed Solution	Final Decision
75	74	Pinyon Pine / Muttongrass Woodland	PJ / Mixed Shrubs and Grasses Woodland	Denser, more mesic woodlands with deeper soils. My theory was that POAFEN was more associated with harder rocks, Dakota or Pc and LEYSAL with Morrison. Nice theory not borne out by AA.	The mapping model/signature that I tried to separate was not much different than MC 77. All represent fairly mature, nearly closed canopy woodlands/forests. There is considerable confusion between units 74, 75 and 77.	Combine all P-J types with mixed shrubs or grasses in the understory that did not have high enough accuracy into this one large P-J type	Combine with MC 74
77	74	Pinyon Pine – Juniper / Sparse Understory Woodland	PJ / Mixed Shrubs and Grasses Woodland	MC 77 was based on one training site (in BLCA) and a concept model based on signature (nearly closed canopy PJ)	Not reliably or consistently pulled out by the PI; accuracy would be improved by combining with the larger suite of P-J / mixed shrubs and grasses	Combine all P-J types with mixed shrubs or grasses in the understory that did not have high enough accuracy into this one large P-J type	Combine with MC 74
81	81	Shale Barren Mixed Vegetation	Shale Barrens Sparse Shrublands	The original concept is barren, sparsely vegetated Mancos shale slopes with sparse ATRCAN/KRALAN/ACHHYM.	Many polygons came out MU46 because of the presence of sparse mixed mountain shrubland community dominated by CERMON growing on Morrison Fm. Final accuracy may be inflated because most polys are in the unsampled environs area of the NRA.	Broaden the concept of the map unit to include any sparse shrubby type occurring on barrens of either Morrison or Mancos shales.	See Solution
90	90	Fringed Sagebrush / Lichens Rocky Mesa	Fringed Sagebrush / Lichens Rocky Mesa	Very sparse vegetation (dominated by lichens) growing on windswept, gravelly ridge tops	Mapped well	None needed	

Original Map Class	Final Map Class	Original Map Class Name	Final Map Class Name	Map Class Concept	Problem	Proposed Solution	Final Decision
92	93	Mountain Big Sagebrush - Rockspirea Rock Outcrop Shrubland	Rockspirea Sparsely Vegetated Rock Outcrop	This MC was based on one or two CURE sites	Very rare type that was poorly mapped and does not merit the existence of its own map unit	Have PI dissolve map unit into best fit of neighboring polygons. MC 93 is the closest match and is most likely what the majority of polygons will be relabeled as.	See Solution
93	93	Rockspirea Sparsely Vegetated Rock Outcrop	Rockspirea Sparsely Vegetated Rock Outcrop	This MC was based on the CURE model (6 sites) which suggested that low cover of PJ was "normal" to the MC concept.	This type is undersampled because of accessibility issues on the very steep scree slopes it occupies and was most often confused with MC 48 because the PI did not reliably pull out oak cover	Retain map class with lower accuracy because it represents the majority of the sparsely vegetated canyon slopes and vertical walls of the Black Canyon. Relabel polys with noticeable oak cover as MC 48	Retain map class even with lower accuracy

Appendix J. Map Class Descriptions for Curecanti National Recreation Area

Introduction

This document provides a visual guide and description of the vegetation map classes for the Curecanti National Recreation Area Vegetation Mapping Project. Twenty-seven map classes are described in this guide. Fifteen land use classes are not included.

Each of the map classes included in this guide is documented by:

- ground photographs (if available)
- a list of component NVC associations and ecological systems
- common plant species
- examples of each map class signature taken from the ortho imagery with delineated polygons
- descriptions of the photo signature
- a description of the ecology and distribution of the map class within the mapping area
- a graphic showing distribution of the map class throughout the mapping area
- polygon statistics report (polygon number, size, and area)
- accuracy assessment results for each map class

This guide does not attempt to show all variations within each vegetation map class; only the most common or significant representations are included. These should be sufficient to give the user an understanding of the relationships among the vegetation classification, the imagery, and mapping concepts.

VEGETATED MAP CLASSES OF CURECANTI NATIONAL RECREATION AREA

Upland Forest and Woodland 711
Blue Spruce Woodland Alliance (W-PICE) 711
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Upland Forest and Woodland

Map Class 9
Blue Spruce Woodland Alliance (W-PICE)





Photo credits: NPS

Associations
Picea pungens / Alnus incana Woodland
Picea pungens / Cornus sericea Woodland
Picea pungens / Mahonia repens Forest

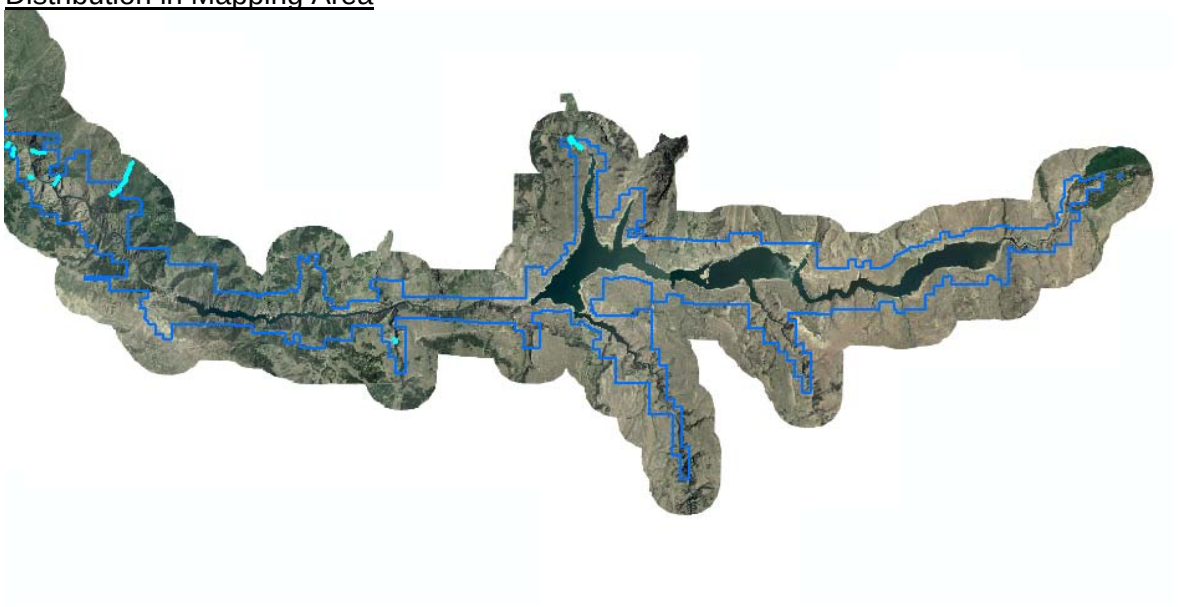
Common species
- *Picea pungens*
- *Cornus sericea*
- *Rosa woodsii*
- *Mahonia repens*
- *Alnus incana*
- *Quercus gambelii*

W-PICE Map Class Statistics

Type: Complex of associations
Frequency: 11 total polygons
9 total polygons in CURE
2 total polygons in the environs
Average Polygon Size: 2.1 hectares / 5.2 acres

Total project area: 23 hectares / 57 acres (0 %)
16 hectares / 40 acres in CURE
7 hectares / 17 acres in the environs
Producer's accuracy: 83% ± 33%
User's accuracy: 100%

Distribution in Mapping Area

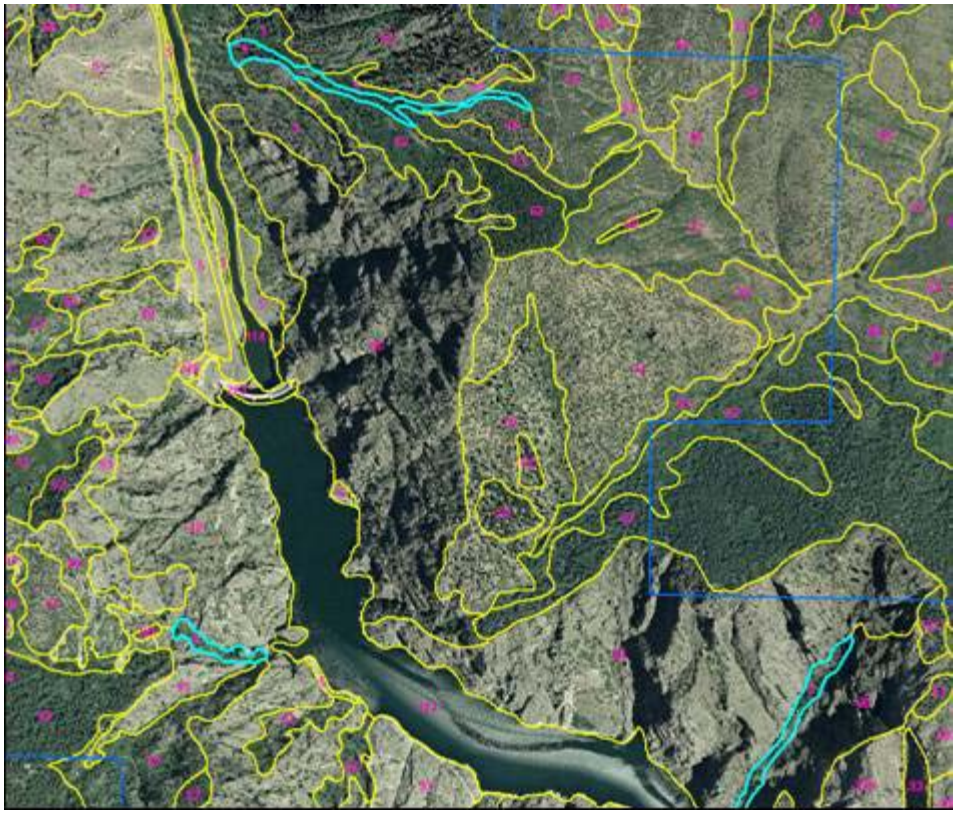


Distribution/Ecology/Composition

Map class 9 occurs largely in the main canyon of the Black Canyon of the Gunnison. The environment is characterized by intermittent or ephemeral water flow, long shadows, and cold air drainage. Soils are rocky and coarse-textured and may have seasonal water tables at variable depthse. Tree canopy cover of *Picea pungen*s varies from sparse to nearly closed canopy. *Acer negundo* and *Quercus gambelii* may dominate the understory along with *Alnus incana, Rosa woodsii, Mahonia repens,* and *Cornus sericea.*

Interpretation

This uncommon map class occurs in cold, narrow canyon ravine or toe slope environments, both in the main canyon as well as in some steep side canyons, and on both north- and south-facing slopes. Polygons are mostly small. The tall, dark, narrow crowns of *Picea pungens* are evident in the photo signature, as is the brighter green of the understory. Interpretation was based on the assumption that *Picea pungens* rather than *Pseudotsuga menziesii* would be expected in these canyon ravines, though there are few plots or accuracy points to test this assumption. Adjacent polygons may include those of map classes 93, 60 and 48.



Example of photo signature for map class W-PICE (#9).

Map Class 52
Quaking Aspen / Tall Shrubs Forest (F-POTR)




Photo credits: NPS

Associations

Ceanothus velutinus Shrubland
Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Calamagrostis rubescens Forest
Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Mixed Graminoid Forest
Populus tremuloides / Amelanchier alnifolia - Symphoricarpos oreophilus / Thalictrum fendleri Forest
Populus tremuloides / Carex geyeri Forest
Populus tremuloides / Ceanothus velutinus Forest
Populus tremuloides / Invasive Perennial Grasses Forest
Populus tremuloides / Juniperus communis / Carex geyeri Forest
Populus tremuloides / Juniperus communis / Lupinus argenteus Forest
Populus tremuloides / Mahonia repens Forest
Populus tremuloides / Prunus virginiana Forest
Populus tremuloides / Symphoricarpos oreophilus / Thalictrum fendleri Forest
Populus tremuloides / Symphoricarpos oreophilus Forest
Populus tremuloides / Quercus gambelii - Symphoricarpos oreophilus Forest
Populus tremuloides / Tall Forbs Forest
Populus tremuloides – Pseudotsuga menziesii / Amelanchier alnifolia Forest

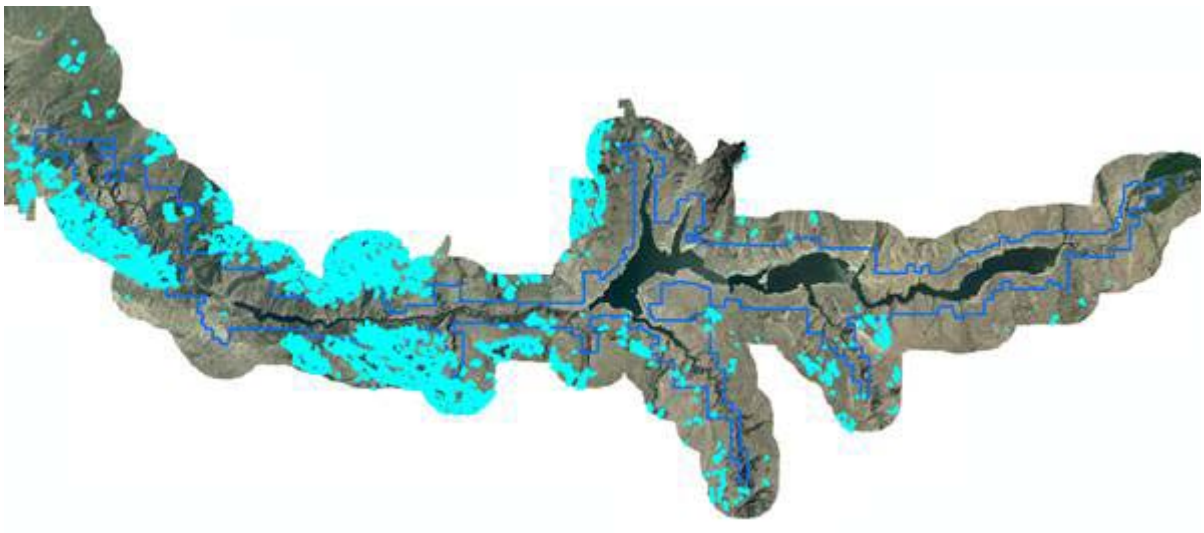
Common species

- *Populus tremuloides*
- *Symphoricarpos oreophilus*
- *Calamagrostis rubescens*
- *Juniperus communis*
- *Ceanothus velutinus*
- *Lupinus argenteus*
- *Prunus virginiana*
- *Pseudotsuga menziesii*
- *Quercus gambelii*
- *Thalictrum fendleri*
- *Amelanchier alnifolia*
- *Carex geyeri*
- *Mahonia repens*

F-POTR Map Class Statistics

Type:	Complex of association	**Total project area:**	3,641 hectares / 8,997 acres (7.5 %)
Frequency:	837 total polygons		343 hectares / 847 acres in CURE
	141 total polygons in CURE		3,298 hectares / 8,150 acres in the environs
	59 total polygons in the environs	**Producer's accuracy:**	91% ± 10%
Average Polygon Size:	4.4 hectares / 10.7 acres	**User's accuracy:**	88% ± 11%

Distribution in Mapping Area

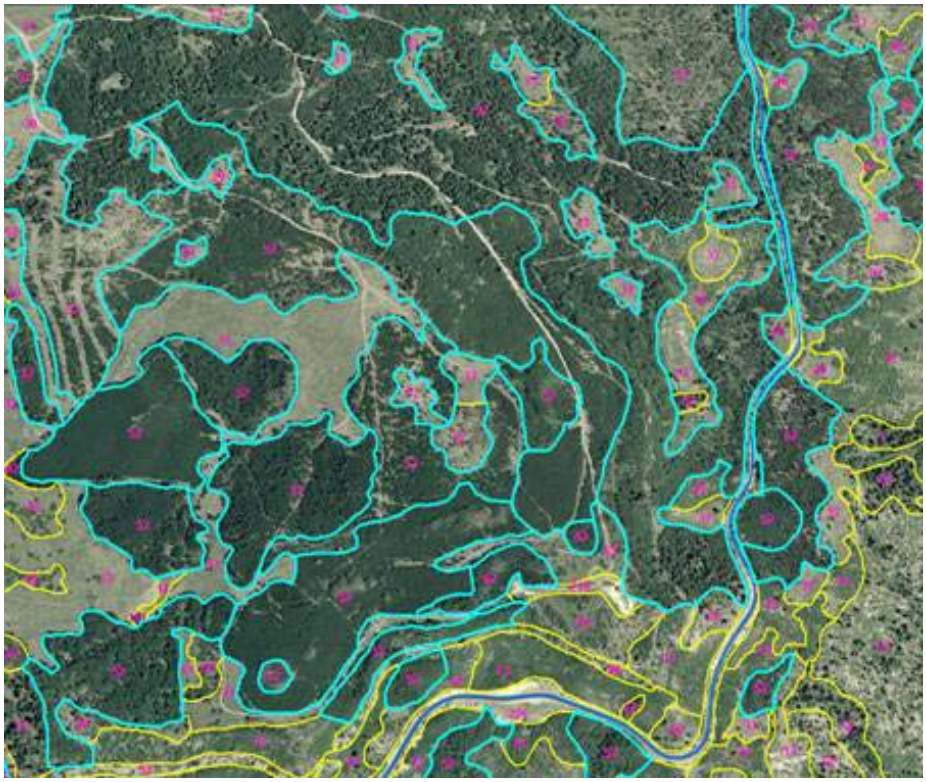


Distribution/Ecology/Composition

Persistent stands of *Populus tremuloides* occur on level to moderately steep slopes at higher elevations. Distribution on the landscape is limited by the need for relatively high soil moisture and fertility as well as cooler tempertatures. While aspect, elevation, and soil depth and texture all influence aspen presence or absence, no one factor can be singled out as independently critical. Soil fertility limits distribution but fire or avalanche history also play a role in *Populus tremuloides* establishment. Within the survey area, the slumped landscapes at the interface of volcanic plateaus and Mancos or Morrison shales are two of the favored landscapes for aspen forests. The subcanopy layer is variable, but tall shrubs and *Symphoricarpos oreophilus* are prevalent. Drier stands may have high grass cover in the understory.

Interpretation

This common map class occurs in small to medium, regular polygons at higher elevations on plateaus and in slumps, swales, and draws. Slopes are gentle to moderately steep and stands occur on all aspects. Most stands are nearly closed canopy and are recognizable with uniform canopy height, round crowns, and the relatively bright green color and tall stature of most stands. Short-stature stands have a similar appearance to *Quercus gambelii* stands and occur in similar landscapes. Adjacent polygons may include any of the montane woodland and shrubland map classes.



Example of photo signature for map class F-POTR (#52).

Map Class 60
Douglas-fir / Rockspirea Scree Woodlands (W-PSHO)



Photo credits: NPS

Associations
Pseudotsuga menziesii / *Holodiscus dumosus* Scree Woodland
Pseudotsuga menziesii Scree Woodland

Common species
- *Pseudotsuga menziesii*
- *Holodiscus dumosus*

W-PSHO Map Class Statistics

Type:	Alliance	**Total project area:**	575 hectares / 1,421 acres (1.2 %)
Frequency:	156 total polygons		435 hectares / 1076 acres in CURE
	97 total polygons in CURE		140 hectares / 345 acres in the environs
	59 total polygons in the environs	**Producer's accuracy:**	100%
Average Polygon Size:	3.7 hectares / 9.1 acres	**User's accuracy:**	80% ± 39%

Distribution in Mapping Area

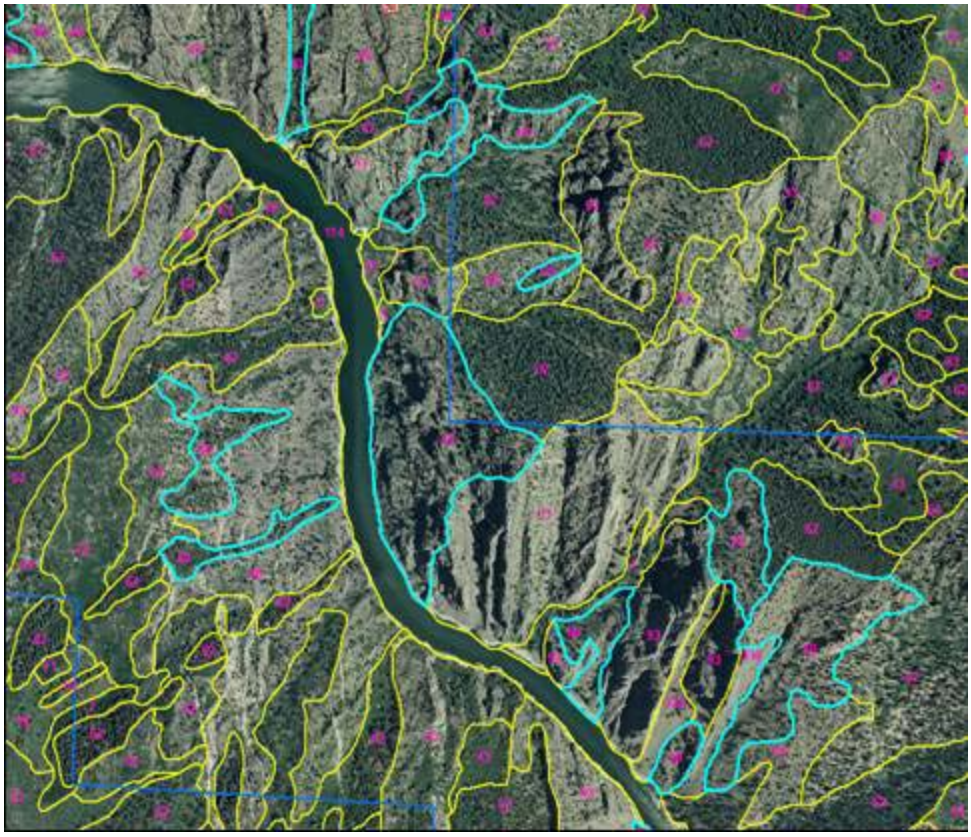


Distribution/Ecology/Composition

This map class occurs primarily on very steep slopes of the main Black Canyon and its tributaries, often on the lower canyon walls. Canopy closure ranges from open to nearly closed. *Pseudotsuga menziesii* is generally dominant, although it should be noted that this class was rarely sampled due to the extreme steepness and inaccessibility of the terrain.

Interpretation

Map class 60 appears as small to large, regular polygons on very steep canyon sides and associated talus slopes. North-facing aspects are most common; however, soil moisture and the presence of sheltered niches for trees, shadowing on the lower steep slopes, as well as cold air drainage may override aspect, so both aspects in the canyon are represented. This class includes Precambrian gneiss outcrops, crags and the edges of scree slopes, and Douglas-fir woodlands growing at the base of these outcrops. Photo identification of Douglas-fir is confirmed by tall-statured, conical crowns, though because of the similarities in crown shape and size, it is possible that *Picea pungens* is also present in this landscape. Typically these are very open stands on scree slopes or else limited to narrow openings between hard rock crags. Shadows often obscure steeper north and west facing slopes. Adjacent polygons include montane shrub, canyon wall, and riparian map classes.



Example of photo signature for map class W-PSHO (#60).

Map Class 61
Douglas-fir / Sagebrush – Muttongrass Open Woodland (W-PSSG)





Photo credits: NPS

Associations

Pseudotsuga menziesii / Artemisia tridentata (ssp. *vaseyana*, ssp. *wyomingensis*) Woodland
Pseudotsuga menziesii / Poa fendleriana Woodland

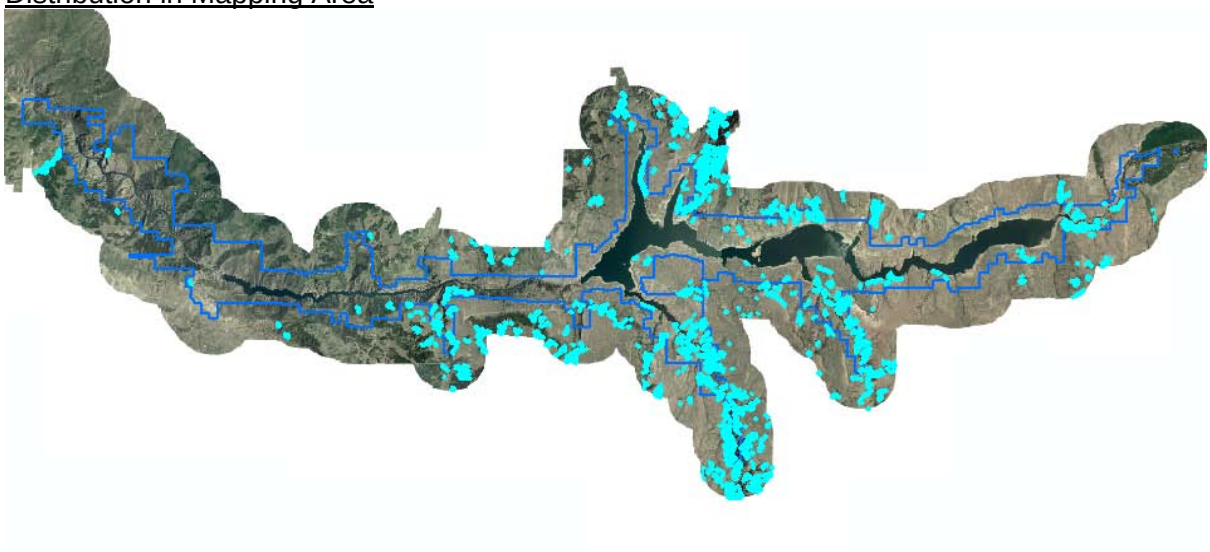
Common species

- *Pseudotsuga menziesii*
- *Poa fendleriana*
- *Artemisia tridentata*

W-PSSG Map Class Statistics

Type:	Alliance	**Total project area:**	1,268 hectares / 3,133 acres (2.6 %)
Frequency:	612 total polygons		401 hectares / 992 acres in CURE
	221 total polygons in CURE		867 hectares / 2,142 acres in the environs
	391 total polygons in the environs	**Producer's accuracy:**	87% ± 12%
Average Polygon Size:	2.1 hectares / 5.1 acres	**User's accuracy:**	87% ± 12%

Distribution in Mapping Area

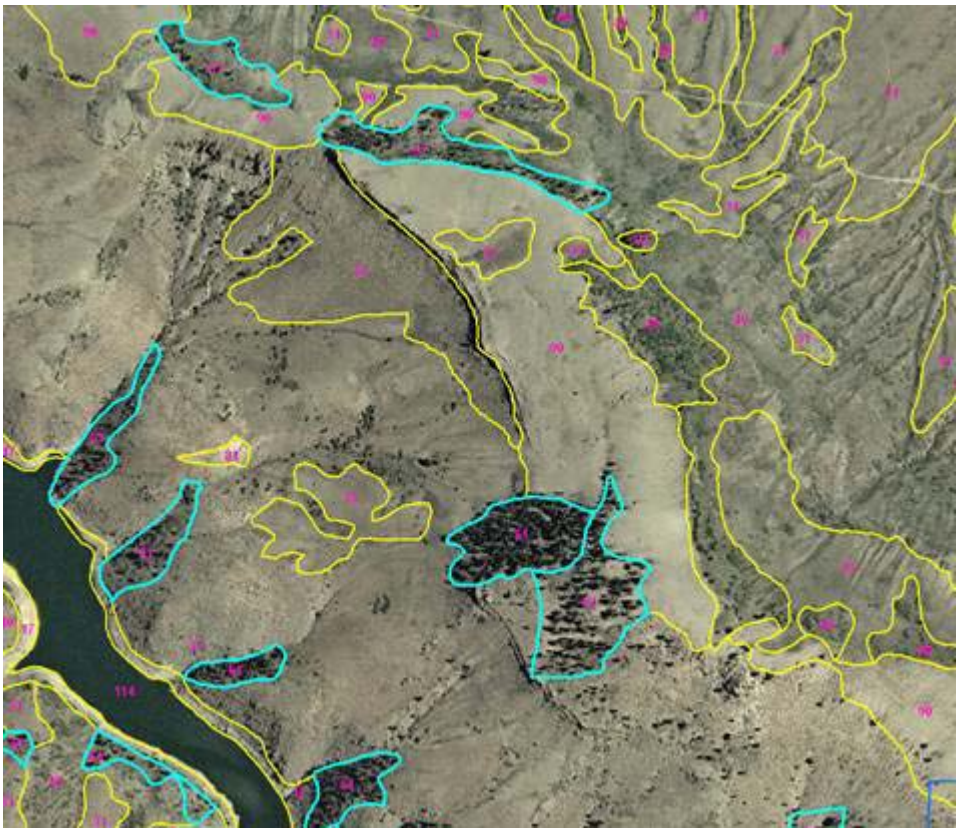


Distribution/Ecology/Composition

This map class occurs primarily on moderately steep to steep talus slopes on canyon sides and in ravines. Many stands are located on the margins and downslope areas of sagebrush shrublands occupying the nearby rolling mesa tops. This map class is characterized by an open canopy of *Pseudotsuga menziesii* and an open to moderately dense understory of *Artemisia tridentata (*ssp. *wyomingensis*, ssp. *vaseyana)* and/or *Poa fendleriana*. Soils are rapidly-drained, sandy-textured, rocky, and derived from gneiss talus and colluvium.

Interpretation

Map class 61 appears as small to large, regular polygons on canyon or valley side slopes and foot slopes. Slopes are generally steep and rocky. North-facing aspects are prevalent; however, soil moisture, shadowing, and cold air drainage may override the drying effects of south-facing aspects. The distinctive photo signature appears under magnification in the form of widely scattered (or more rarely regularly alternating), tall stature, conical crowns among a background of the mottled, light to medium gray green color representing sagebrush and grasses. Adjacent polygons include the other sagebrush map classes (31 and 33), mixed oak and sagebrush shrublands (41), and Douglas-fir woodlands (62).



Example of photo signature for map class W-PSSG (#61).

Map Class 62
Douglas-fir Forest (F-PSME)





Photo credits: NPS

Associations

Pseudotsuga menziesii / Acer glabrum Forest
Pseudotsuga menziesii / Amelanchier alnifolia Forest
Pseudotsuga menziesii / Carex geyeri Forest
Pseudotsuga menziesii / Mahonia repens Forest
Pseudotsuga menziesii / Prunus virginiana Forest
Pseudotsuga menziesii / Quercus gambelii Forest
Pseudotsuga menziesii / Symphoricarpos oreophilus Forest

Common species

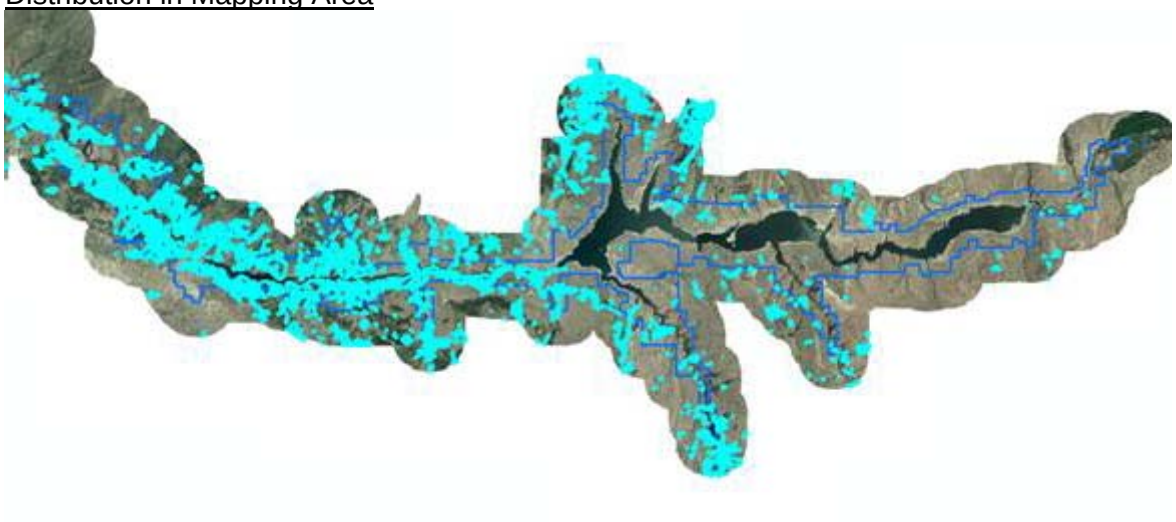
- *Pseudotsuga menziesii*
- *Acer glabrum*
- *Symphoricarpos oreophilus*
- *Carex geyeri*
- *Poa fendleriana*
- *Quercus gambelii*
- *Prunus virginiana*
- *Mahonia repens*
- *Amelanchier alnifolia*
- *Achnatherum lettermanii*

F-PSME Map Class Statistics

Type: Alliance
Frequency: 1,400 total polygons
557 total polygons in CURE
843 total polygons in the environs
Average Polygon Size: 2.7 hectares / 6.7 acres

Total project area: 3,783 hectares / 9,349 acres (7.8 %)
1931 hectares / 4772 acres in CURE
1,852 hectares / 4,577 acres in the environs
Producer's accuracy: 87% ± 7%
User's accuracy: 92% ± 6%

Distribution in Mapping Area

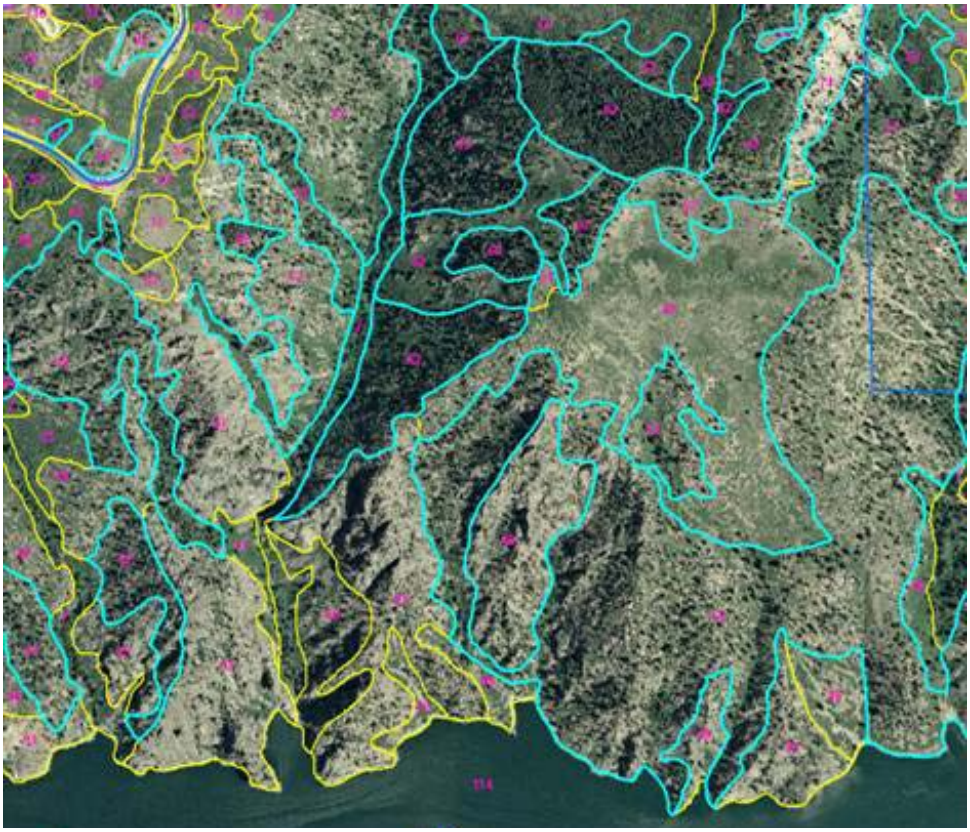


Distribution/Ecology/Composition

This map class occurs primarily on steep, mostly north-facing slopes below the rims of the main Black Canyon or on north-facing valley side slopes at higher elevations. Elevation range is dramatic, with the higher elevations having a classic decreased temperature influence and the canyon sides having a cold air drainage influence and deep shadows to reduce transpiration and evaporation. Canopy cover ranges from open to nearly closed. Drier, more open sites are typically on landscape positions such as shoulder slopes or knolls and may have understories of *Carex geyeri* or *Mahonia repens.* Denser stands on more mesic sites will have *Acer glabrum, Amelanchier alnifolia, Prunus virgniana, Quercus gambelii,* and/or *Symphoricarpos oreophilus* dominant in the understory. *Pseudotsuga menziesii* is dominant, but *Pinus ponderosa* may be co-dominant in some stands. Low tree densities with high shrub cover on very steep canyon sides may reflect an avalanche disturbance history.

Interpretation

Map class 62 is common in the mapping area, especially at higher elevations, and appears as small to large, regular polygons on canyon or valley side slopes and foot slopes. Slopes are generally steep and rugged. North-facing aspects are prevalent; however, soil moisture, shadowing, and cold air drainage may override the drying effects of south-facing aspects. This type is readily distinguishable with magnification, which reveals the fir's tall stature and conical crowns. Smaller dark forms may represent a reproductive layer or associated conifer species. Closed stands are a mottled dark green. Understories with high cover of *Quercus gambelii* will have a brighter green matrix with darker emergent trees. Adjacent polygons are represented by nearly every other map class (from sagebrush shrublands to aspen woodlands and rockspirea talus slopes to narrowleaf cottonwood woodlands).



Example of photo signature for map class F-PSME (#62).

Map Class 67
Ponderosa Pine / Gambel Oak Woodland (W-PPGO)




Photo credits: NPS

Associations
Pinus ponderosa / Purshia tridentata Woodland
Pinus ponderosa / Quercus gambelii Woodland

Common species
- *Pinus ponderosa*
- *Purshia tridentata*
- *Quercus gambelii*

W-PPGO Map Class Statistics

Type:	Alliance	**Total project area:**	16 hectares / 40 acres (< 0.1 %)
Frequency:	9 total polygons		8 hectares / 19 acres in CURE
	4 total polygons in CURE		9 hectares / 21 acres in the environs
	5 total polygons in the environs	**Producer's accuracy:**	100%
Average Polygon Size:	1.8 hectares / 4.5 acres	**User's accuracy:**	100%

Distribution in Mapping Area

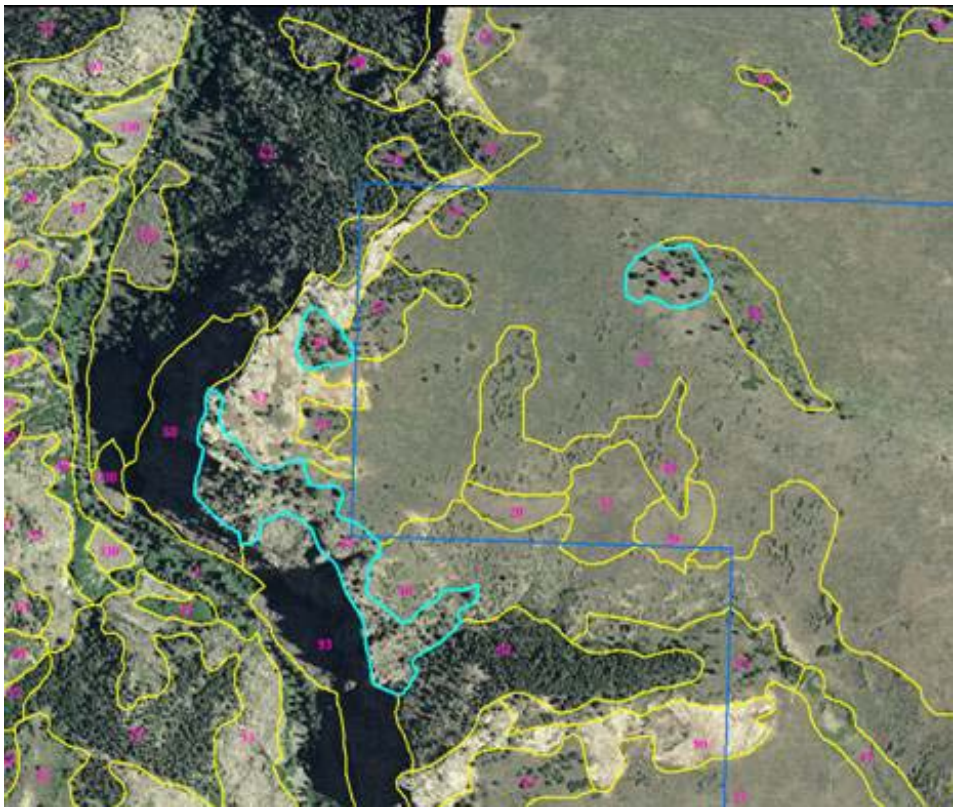


Distribution/Ecology/Composition

Map class 67 occurs at the heads of drainages and on the shoulders and midslopes of ridges and hills. Sites are moderately steep to and are mostly north-facing. Parent materials include metamorphic or granitic rocks and Quaternary alluvium. *Pseudotsuga menziesii* may be co-dominant in the generally open canopy with *Pinus ponderosa*. The subcanopy layer provides moderate cover and may include *Juniperus scopulorum, Pinus ponderosa, Pseudotsuga menziesii*, and *Populus tremuloides*. The shrub layer is diverse and provides moderate cover by tall, short and dwarf-shrubs, including *Purshia tridentata, Amelanchier* spp., *Quercus gambelii, Arctostaphylos uva-ursi, Artemisia tridentata, Mahonia repens*, and *Symphoricarpos rotundifolius*. The herbaceous layer is diverse and provides low to dense cover. These stands of taller trees are restricted to sites with deep soils that can retain moisture well into the growing season. Because they occur within an area that burns relatively frequently, they tend to consist of species that tolerate this type of disturbance. Some stands occupy rocky outcrops that are protected from most fires.

Interpretation

This map class is rare within the recreation area and appears as small, regular polygons on the edges of sagebrush shrublands on the shoulders and midslopes of hills and ridges. Photo identification is confirmed with magnification showing tall stature, broad, round crowns. Smaller dark forms may represent a reproductive layer or associated conifer species. Understories with moderate cover of *Quercus gambelii* will have a brighter green matrix with darker emergent trees. Adjacent polygons are most commonly sagebrush shrublands (31 and 33) and Douglas-fir woodlands (61 and 62).



Example of photo signature for map class W-PPGO (#67).

Map Class 69
Pinyon – Juniper / Sparse Mixed Shrubs Scree Woodland (W-PJSC)




Photo credits: NPS

Associations
Pinus edulis – (*Juniperus* spp.) / *Holodiscus dumosus* Woodland

Common species
- *Pinus edulis*
- *Holodiscus dumosus*
- *Juniperus osteosperma*
- *Achnatherum hymenoides*

W-PJSC Map Class Statistics

Type:	Association	**Total project area:**	8 hectares / 20 acres (<0.1 %)
Frequency:	5 total polygons		8 hectares / 20 acres in CURE
	5 total polygons in CURE		0 hectares / 0 acres in the environs
	0 total polygons in the environs	**Producer's accuracy:**	N/A
Average Polygon Size:	1.6 hectares / 4 acres	**User's accuracy:**	N/A

Distribution in Mapping Area

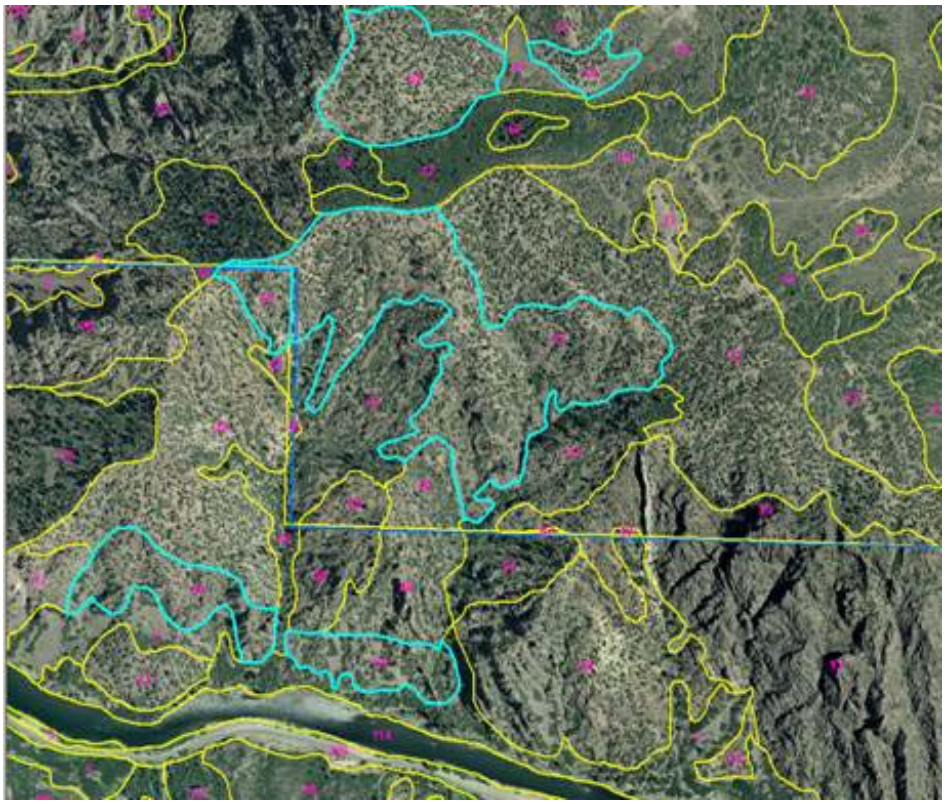


Distribution/Ecology/Composition

Map class 69 occurs on canyon slopes of various aspects. Soils are shallow and derived from hard granitic rock. Tree cover is sparse, generally less than 10%. The understory is also sparse and dominated by *Holodiscus dumosus.* Species of *Cercocarpus montanus, Quercus gambelii, Artemisia tridentata,* and *Philadelphus microphyllus* may also occur in the understory.

Interpretation

Polygons of this very rare map class are small to large, regular and occurring on southwest facing scarps of Precambrian rock substrate. Stands are very open on steep slopes. Trees are recognizable as small, dark green dots. Neighboring polygons are most commonly of map classes 93 and the geology class 330 (bedrock outcrops of gneiss).



Example of photo signature for map class W-PJSC (#69).

Map Class 71
Pinyon – Juniper / Gambel Oak Woodland (W-PJQU)




Photo credits: NPS

Associations
Juniperus scopulorum – Quercus gambelii Woodland
Pinus edulis - Juniperus spp. / *Quercus gambelii* Woodland

Common species
- *Pinus edulis*
- *Quercus gambelii*
- *Amelanchier utahensis*
- *Juniperus scopulorum*
- *Juniperus osteosperma*

W-PJQU Map Class Statistics

Type: Complex of associations
Frequency: 117 total polygons
36 total polygons in CURE
81 total polygons in the environs
Average Polygon Size: 3.9 hectares / 9.6 acres

Total project area: 455 hectares / 1,125 acres (0.9 %)
256 hectares / 631 acres in CURE
200 hectares / 494 acres in the environs
Producer's accuracy: 82% ± 13%
User's accuracy: 72% ± 13%

Distribution in Mapping Area

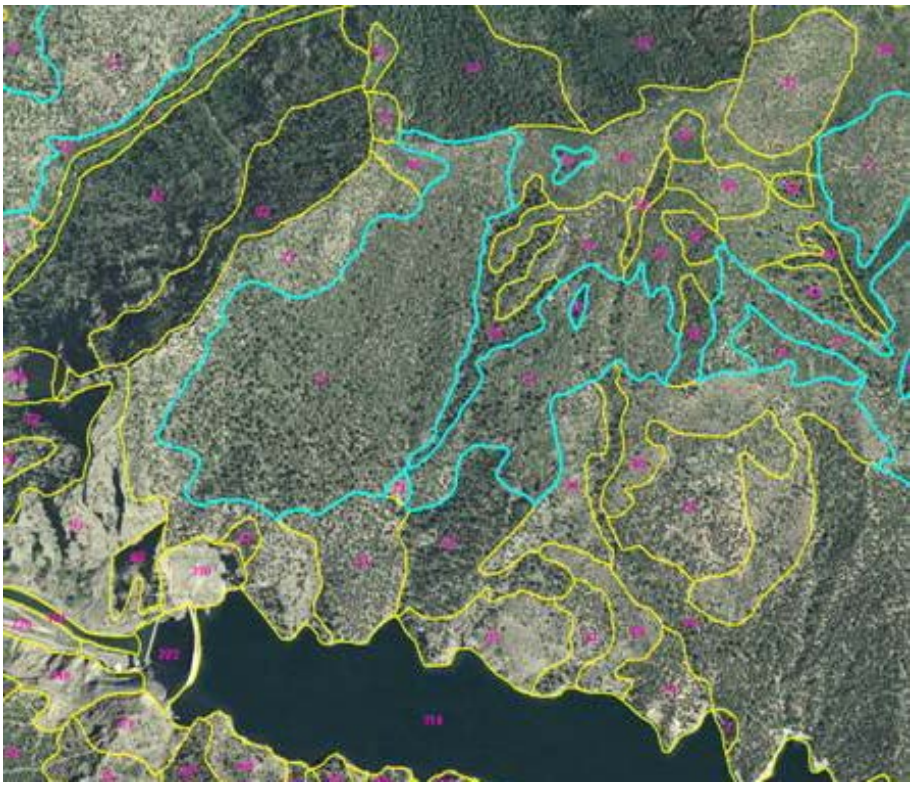


Distribution/Ecology/Composition

This map class is uncommon in the NRA, with much of it occurring at high elevations on or near the main plateaus and in bottomland swales where soil moisture is concentrated. Slopes range from gentle to steep and aspects are variable through the type. In addition to the named species, other montane tall shrubs may be present. This map class suggests the influence of fire history and may represent a mid or late seral stage.

Interpretation

Map class 71 typically has small to medium irregular polygons occurring on plateaus and slopes at mid to upper elevations. Signature of the trees is dark green circular dots with a brighter green matrix of oak beneath. Separation of the low tree cover woodlands with high cover of Gambel oak from the deep green of pure Gambel oak shrublands was problematic. Polygons of map class 71 occur in a matrix with polygons of Douglas-fir woodlands (62), other pinyon-juniper woodlands (69 and 74), and montane shrublands (41 and 42).



Example of photo signature for map class W-PJQU (#71).

Map Class 74
Pinyon – Juniper / Mixed Shrubs and Grasses Woodland (W-PJMX)



Photo credits: NPS

Associations
Juniperus osteosperma / Artemisia nova Woodland
Juniperus osteosperma / Mixed Shrubs Talus Woodland
Pinus edulis - Juniperus osteosperma / Sparse Understory Woodland
Pinus edulis - Juniperus spp. */ Artemisia tridentata* (ssp. *wyomingensis,* ssp. *vaseyana*) Woodland
Pinus edulis - Juniperus spp. */ Cercocarpus montanus* - Mixed Shrub Woodland
Pinus edulis - Juniperus spp. */ Poa fendleriana* Woodland

Common species
- *Pinus edulis*
- *Artemisia tridentata (*ssp. *wyomingensis,* ssp. *vaseyana*)
- *Amelanchier utahensis*
- *Poa fendleriana*
- *Juniperus osteosperma*
- *Artemisia nova*
- *Cercocarpus montanus*
- *Hesperostipa comata*

W-PJMX Map Class Statistics

Type:	Complex of associations	**Total project area:**	521 hectares / 1,286 acres (1.1 %)
Frequency:	149 total polygons		284 hectares / 702 acres in CURE
	74 total polygons in CURE		237 hectares / 585 acres in the environs
	75 total polygons in the environs	**Producer's accuracy:**	86% ± 9%
Average Polygon Size:	3.5 hectares / 8.6 acres	**User's accuracy:**	88% ± 9%

Distribution in Mapping Area

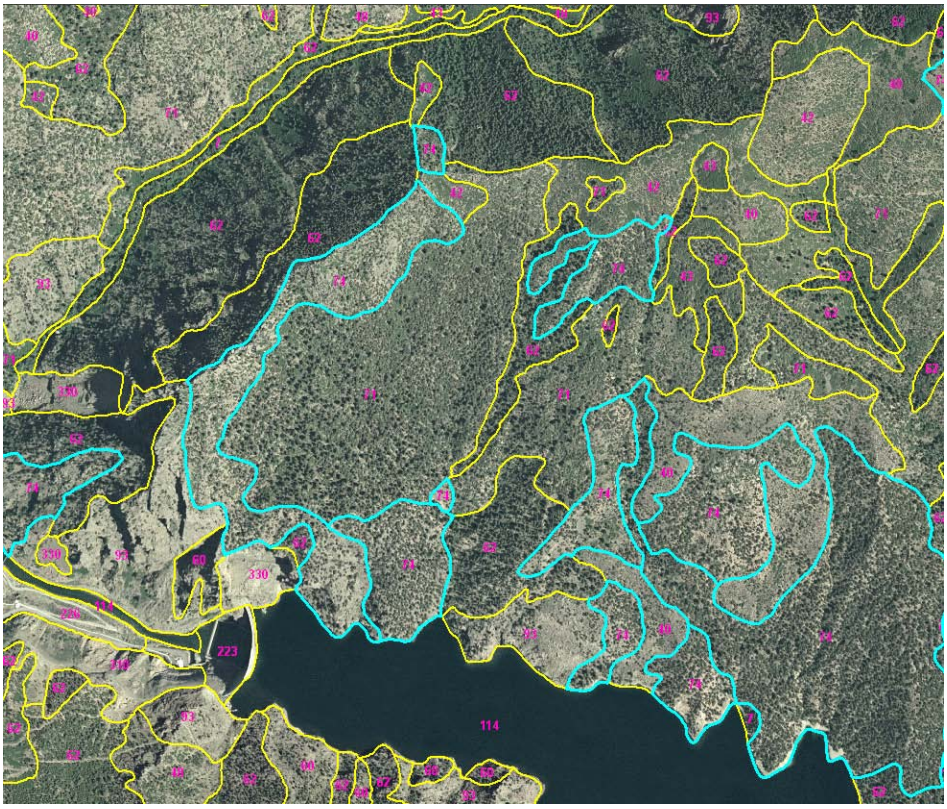


Distribution/Ecology/Composition

This uncommon map class occurs on plateaus and slopes throughout the mapping area, at elevations ranging from canyon bottoms to the plateaus. Slopes range from gentle to very steep. Substrate is variable but is mostly derived from Precambrian rock. Pinyon-juniper with *Cercocarpus montanus* and mixed shrubs in the understory is the most extensive of the associations covered by this map class. Sparse and herbaceous understories are usually associated with denser tree canopies and are less extensive on the landscape. These communities show some influence of fire history reflected in lower tree densities or in the presence of exotic annuals.

Interpretation

This map class represents several shrub and herbaceous understory associations that were not reliably distinguishable with photo interpretation. Polygons are small to frequently large, occurring on plateaus, valley side slopes, and canyon slopes. The trees are recognizable as dark green rounded crowns and the shrubs may appear as a gray to green textured color beneath. Shrub cover may be sparse (5%) to dense. Sparse stands require magnification to see the shrubs. Adjacent polygons include Douglas-fir woodlands (62), pinyon-juniper /oak woodlands (71), and montane shrublands (41 and 42).



Example of photo signature for map class W-PJMX (#74).

Upland Shrublands

Map Class 28
Roadcut Sparse Shrubland (S-ROAD)

No photos available

Associations
Ericameria nauseosa Shrubland
Ericameria parryi / *Achnatherum hymenoides* Shrubland

Common species
- *Ericameria parryi*
- *Ericameria nausesosa*
- *Achnatherum hymenoides*

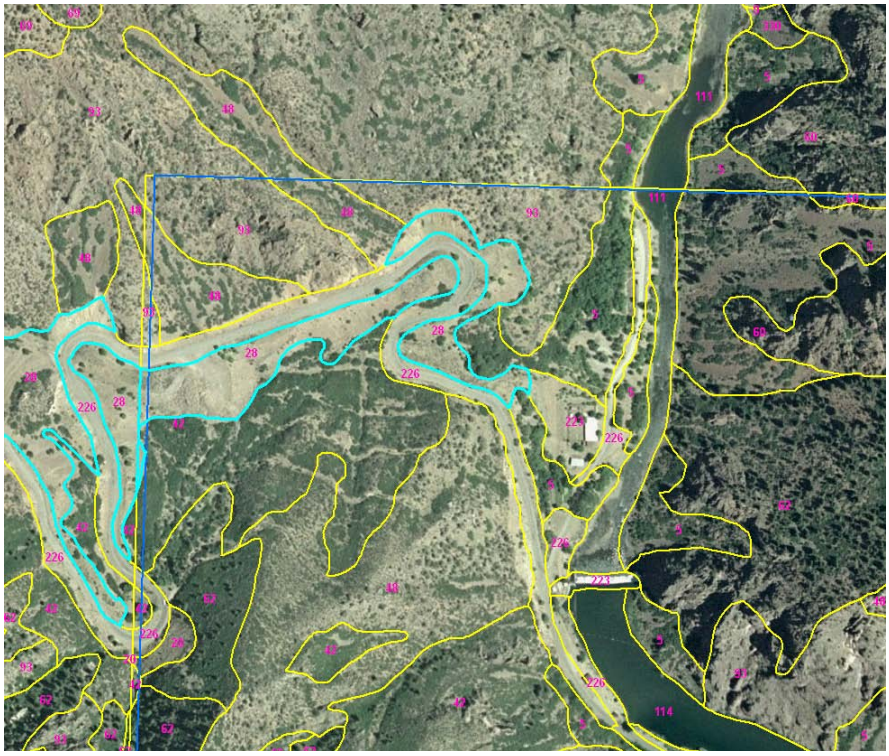
S-ROAD Map Class Statistics

Type:	Complex of associations	**Total project area:**	3 hectares / 7 acres (0 %)
Frequency:	2 total polygons		3 hectares / 7 acres in CURE
	2 total polygons in CURE		0 hectares / 0 acres in the environs
	0 total polygons in the environs	**Producer's accuracy:**	N/A
Average Polygon Size:	1.4 hectares / 3.5 acres	**User's accuracy:**	N/A

Distribution in Mapping Area


Distribution/Ecology/Composition
This extremely rare map class occurs on scree slopes alongs roads (road-fill) that are often weedy and sparsely vegetated. The distrubance-tolerant shrubs *Ericameria nauseosa* and *E. parryi* may be dominant to co-dominant in some stands.

Interpretation
The few polygons of this map class follow the main park road approaching Crystal Dam near the boundary with Black Canyon of the Gunnison NP. The signature is steep, scree slopes of road fill that are a smooth, whitish-gray color.



Example of photo signature for map class S-ROAD (#28).

Map Class 31
Wyoming Big Sagebrush Shrubland (S-ARWY)



Photo credits: NPS

Associations

Artemisia nova / Poa fendleriana Shrubland
Artemisia nova / Poa secunda Shrubland
Artemisia tridentata / Pleuraphis jamesii Shrubland
Artemisia tridentata ssp. *tridentata / Pascopyrum smithii – (Elymus lanceolatus)* Shrubland
Artemisia tridentata ssp. *wyomingensis / (Agropyron cristatum, Elymus junceus)* Seeded Grasses Semi-natural Shrubland
Artemisia tridentata ssp. *wyomingensis / Achnatherum hymenoides* Shrubland
Artemisia tridentata ssp. *wyomingensis / Achnatherum pinetorum* Shrubland
Artemisia tridentata ssp. *wyomingensis / Bouteloua gracilis* Shrubland
Artemisia tridentata ssp. *wyomingensis /* Disturbed Understory Semi-natural Shrubland
Artemisia tridentata ssp. *wyomingensis / Hesperostipa comata* Colorado Plateau Shrubland
Artemisia tridentata ssp. *wyomingensis / Poa fendleriana* Shrubland
Artemisia tridentata ssp. *wyomingensis /* Sparse Understory Shrubland
Chrysothamnus viscidiflorus / Hesperostipa comata Shrubland
Chrysothamnus viscidiflorus / Poa pratensis Semi-natural Shrub Herbaceous Vegetation
Ericameria parryi / Achnatherum hymenoides Shrubland
Ericameria nauseosa Shrubland

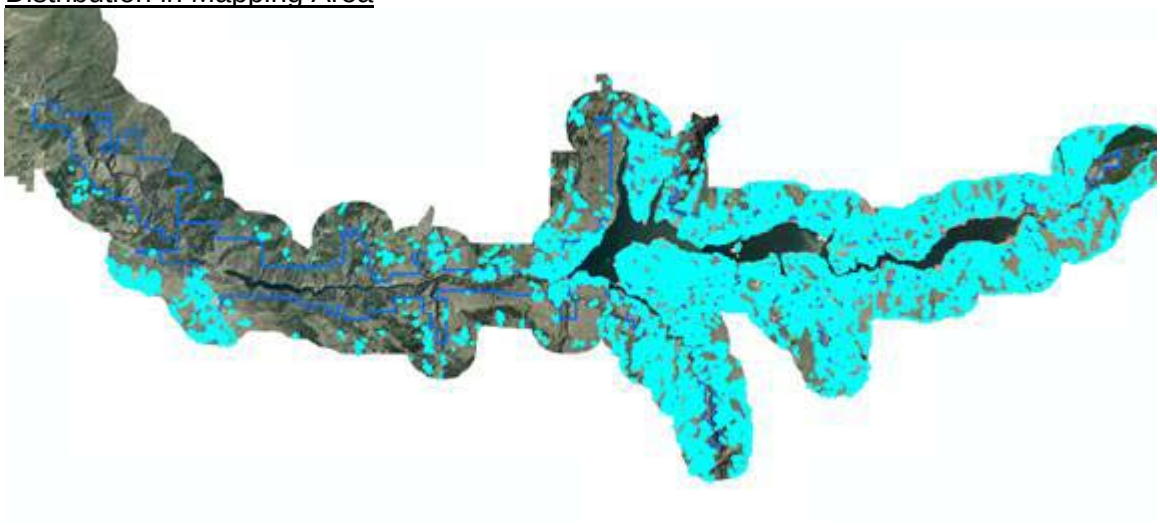
Common species

- *Artemisia tridentata* ssp. *wyomingensis*
- *Ericameria parryi*
- *Chrysothamnus viscidiflorus*
- *Elymus junceus*
- *Poa fendleriana*
- *Pleuraphis jamesii*
- *Achnatherum pinetorum*
- *Pascopyrum smithii*
- *Artemisia nova*
- *Ericameria nauseosa*
- *Agropyron cristatum*
- *Hesperostipa comata*
- *Poa secunda*
- *Achnatherum hymenoides*
- *Bouteloua gracilis*

S-ARWY Map Class Statistics

Type:	Complex of associations	**Total project area:**	10,870 hectares / 26,861 acres (22.3 %)
Frequency:	1,640 total polygons		3421 hectares / 8453 acres in CURE
	597 total polygons in CURE		7,450 hectares / 18,408 acres in the environs
	1,043 total polygons in the environs	**Producer's accuracy:**	93% ± 3%
Average Polygon Size:	6.6 hectares / 16.4 acres	**User's accuracy:**	94% ± 3%

Distribution in Mapping Area



Distribution/Ecology/Composition

Map class 31 is one of the dominant vegetation types in the mapping area and occurs at lower elevations on level to moderate slopes with shallow to deep soils. At the lowest elevations, it may appear on north or east-facing aspects on the Mancos Formation, but at the highest elevations it can appear on south-facing slopes. Wyoming sagebrush communities are common in areas of disturbance, including fire, prairie dog activity, and grazing, and often have disturbed, weedy understories of non-native grass species. Fires play a role in succession between grasses and sagebrush.

Interpretation

Polygons of this map class are medium to large, regular and occur on level to moderately sloping terrain. The matrix color is generally light to medium gray green (depending on the density of the herbaceous layer) with a speckled or mottled gray texture representing the sagebrush shrubs. Higher canopy densities have a darker gray color. Polygons may contain small inclusions of upland grasslands (20) that were smaller than the minimum mapping unit. Wyoming sagebrush shrublands are highly intergraded with

shrublands of Mountain sagebrush (33) and separation of the two subspecies was extremely difficult along a broad zone where there may be sub-species hybridization. Other common neighbors of this map class are polygons of sagebrush-Gambel oak mixed mountain shrublands (41).

Separation of ssp. *vaseyana* vs. ssp. *wyomingensis* was problematic within a zone of change between about 10 to 15 inches of annual precipitation gradients across the landscape. Separation of black sagebrush shrublands from Wyoming sagebrush was also problematic due to their very similar photo signatures and landscape positions, so shrublands of black sage were lumped with this map class. Rare types dominated by rabbitbrush species (generally with Wyoming sagebrush co-dominant) were also lumped here due to poor accuracy on their own.



Example of photo signature for map class S-ARWY (#31).

Map Class 33
Mountain Big Sagebrush Shrubland (S-ARVA)




Photo credits: NPS

Associations

Artemisia tridentata ssp. *vaseyana / Achnatherum hymenoides* Shrubland
Artemisia tridentata ssp. *vaseyana / Achnatherum pinetorum* Shrubland
Artemisia tridentata ssp. *vaseyana / Balsamorhiza sagittata* Shrubland
Artemisia tridentata ssp. *vaseyana / Carex geyeri* Shrub Herbaceous Vegetation
Artemisia tridentata ssp. *vaseyana / Festuca thurberi* Shrubland
Artemisia tridentata ssp. *vaseyana / Hesperostipa comata* Shrubland
Artemisia tridentata ssp. *vaseyana / Pascopyrum smithii* Shrubland
Artemisia tridentata ssp. *vaseyana / Piptatherum micranthum* Shrubland
Artemisia tridentata ssp. *vaseyana / Poa fendleriana* Shrubland
Artemisia tridentata ssp. *vaseyana / Poa* (*pratensis, compressa*) Semi-natural Shrub Herbaceous Vegetation

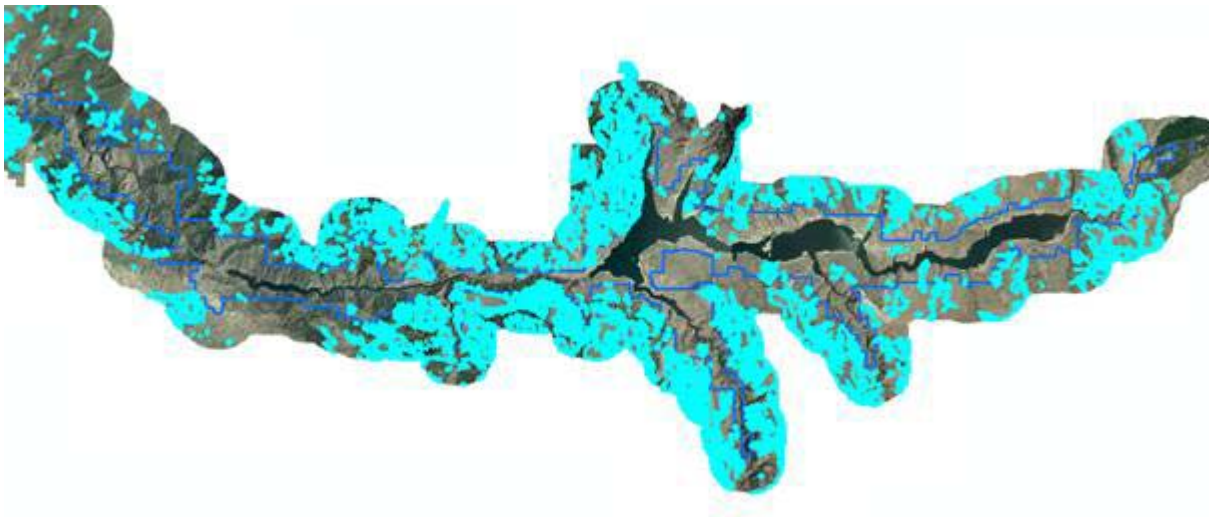
Common species

- *Artemisia tridentata* ssp. *vaseyana*
- *Achnatherum lettermanii*
- *Hesperostipa comata*
- *Poa fendleriana*
- *Balsamorhiza sagittata*
- *Achnatherum pinetorum*
- *Pascopyrum smithii*
- *Poa pratensis*

S-ARVA Map Class Statistics

Type:	Complex of associations	**Total project area:**	8,438 hectares / 20,851 acres (17.3 %)
Frequency:	1,090 total polygons		839 hectares / 2074 acres in CURE
	247 total polygons in CURE		7,599 hectares / 18,777 acres in the environs
	843 total polygons in the environs	**Producer's accuracy:**	87% ± 8%
Average Polygon Size:	7.7 hectares / 19.1 acres	**User's accuracy:**	77% ± 9%

Distribution in Mapping Area

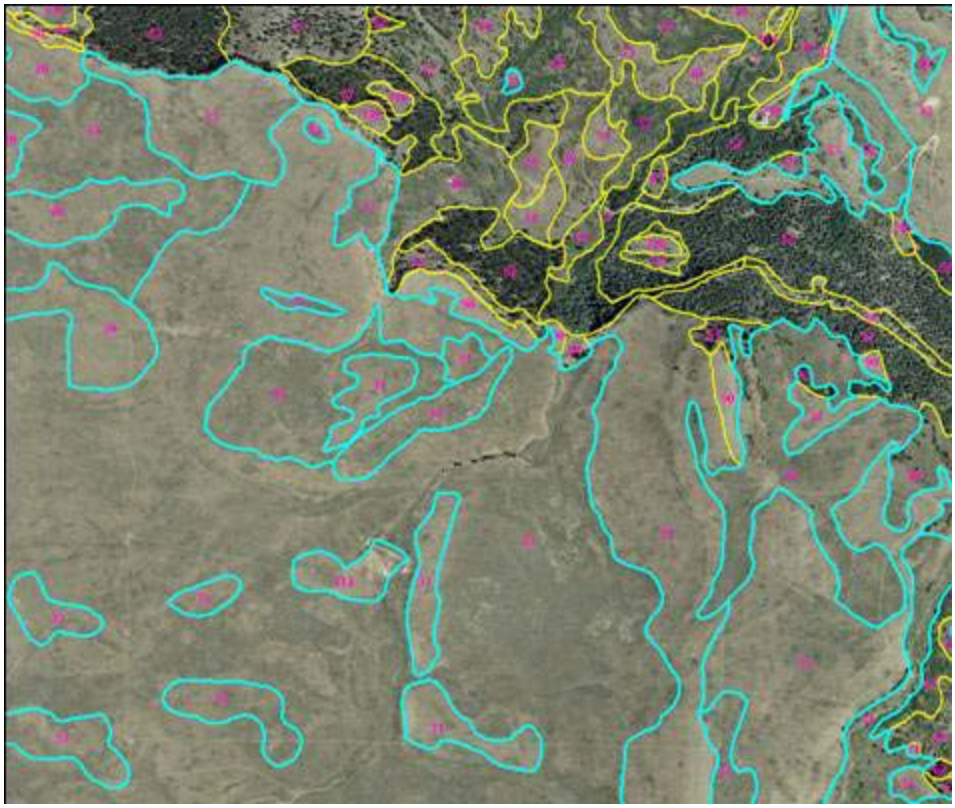


Distribution/Ecology/Composition

Map class 33 is one of the dominant types in the mapping area and occurs at higher elevations on gentle to steep slopes with moderately deep to deep soils over variable substrates. There is an active relationship between this group of associations and fire; burned stands generally convert to grasslands, with most succeeding back to sagebrush within 30 years. *Symphoricarpos oreophilus* is often present as a sub-dominant shrub at higher elevations. The dominant bunchgrasses in the understory respond to substrate, elevation, and grazing history. The herbaceous layer may contain a mix of species, often with high cover by *Balsamorhiza sagittata* where sagebrush cover is sporadic and patchy.

Interpretation

Polygons of this map class are small to large, regular, and light to medium gray green in color (depending on the density of the herbaceous layer) with an evenly speckled texture. Polygons may contain small inclusions of upland grasslands (20) that were too small to pull out as their own map class polygon. Wyoming sagebrush shrublands are highly intergraded with shrublands of Mountain sagebrush (33) and separation of the two subspecies was extremely difficult along a broad zone where there may be sub-species hybridization. Other common neighbors of this map class are polygons of sagebrush-Gambel oak mixed mountain shrublands(41). Separation of ssp. *vaseyana* vs. ssp. *wyomingensis* was problematic within a zone in which annual precipitation ranges between about 10 to 15 inches.



Example of photo signature for map class S-ARVA (#33).

Map Class 41
(Rocky Mountain Juniper) / Big Sagebrush – Mixed Montane Shrubs Mosaic (C-MIXS)



Photo credits: NPS

Associations

*Artemisia tridentata (*ssp. *vaseyana*, ssp. *wyomingensis) – Amelanchier utahensis* Shrubland
Cercocarpus montanus – Artemisia tridentata Shrubland
Juniperus scopulorum / Artemisia tridentata Woodland
Quercus gambelii / Artemisia tridentata Shrubland

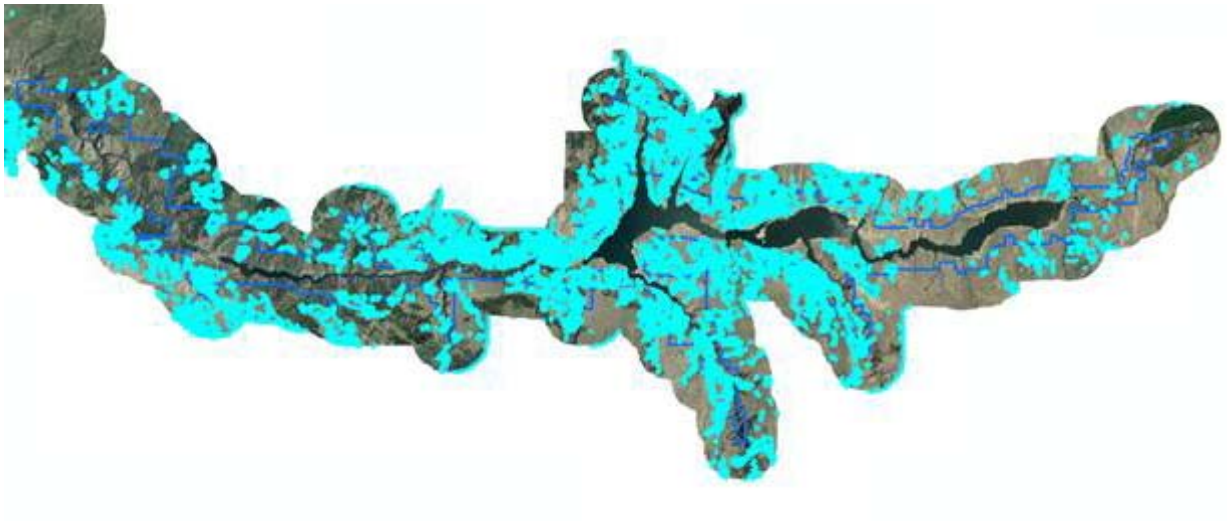
Common species

- *Quercus gambelii*
- *Amelanchier utahensis*
- *Juniperus scopulorum*
- *Artemisia tridentata*
- *Cercocarpus montanus*

C-MIXS Map Class Statistics

Type:	Complex of associations	**Total project area:**	6,311 hectares / 15,594 acres (13 %)
Frequency:	1,705 total polygons		1775 hectares / 4386 acres in CURE
	605 total polygons in CURE		4,536 hectares / 11,208 acres in the environs
	1,100 total polygons in the environs	**Producer's accuracy:**	90% ± 4%
Average Polygon Size:	3.7 hectares / 9.1 acres	**User's accuracy:**	92% ± 3%

Distribution in Mapping Area

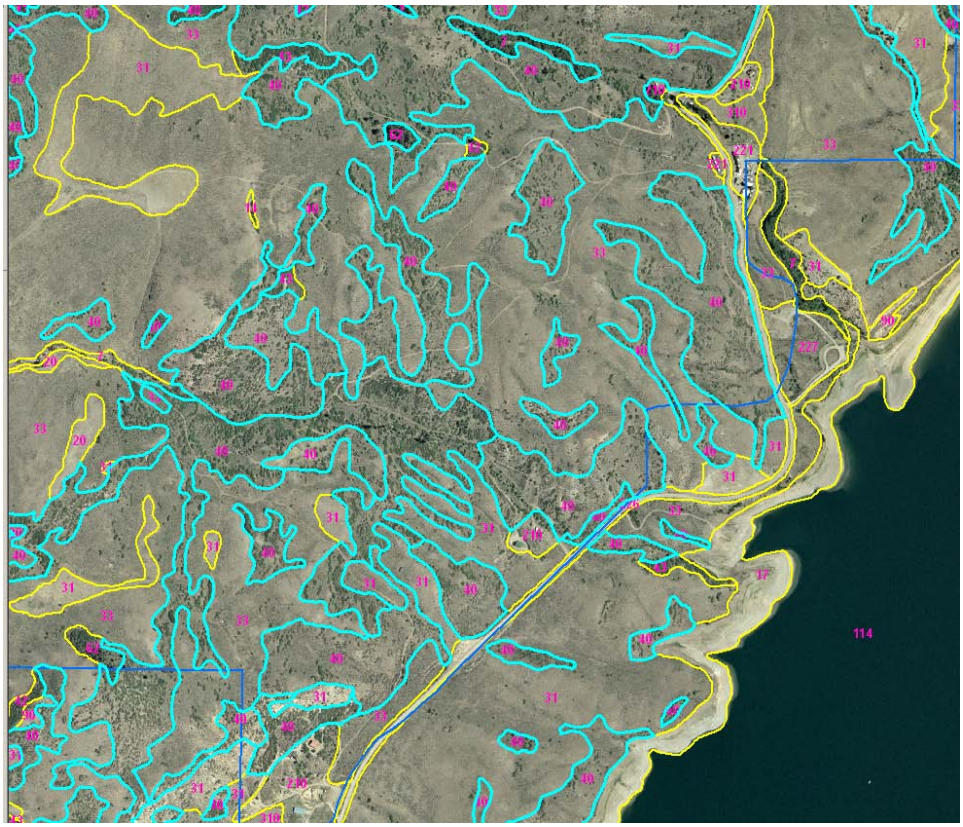


Distribution/Ecology/Composition

This map class represents moderately dense to dense stands of big sagebrush intermixed with Gambel oak mots or clumps of serviceberry, mountain mahogany or Rocky Mountain juniper that are too interwoven to map separately. Big sagebrush is generally dominant. This type encompasses the gradient of ecotonal mixed montane shrub communities that cover most of the rolling plateaus, ridges, mesas, and gulches within the recreation area. Slopes are rocky and moderately steep to very steep. The herbaceous layer is diverse but provides sparse to low cover.

Interpretation

Map class 41 is very common throughout the recreation area. The signature is a slightly mottled-textured, gray green background of sagebrush in a mosaic with small to large, rough-textured speckles of dark green. A variety of map classes occur adjacent to polygons of map class 41, but the most common neighbors are Wyoming big sagebrush (31) and mountain big sagebrush (33) shrublands.



Example of photo signature for map class C-MIXS (#41).

Map Class 42
Gambel Oak / Mixed Montane Shrubland (S-QUMX)




Photo credits: NPS

Associations
Amelanchier utahensis - Mixed Shrub / *Carex geyeri* Shrubland
Quercus gambelii / *Amelanchier utahensis* Shrubland
Quercus gambelii - *Cercocarpus montanus* / *(Carex geyeri)* Shrubland
Quercus gambelii / *Festuca thurberi* Shrubland
Quercus gambelii / *Poa fendleriana* Shrubland [Provisional]

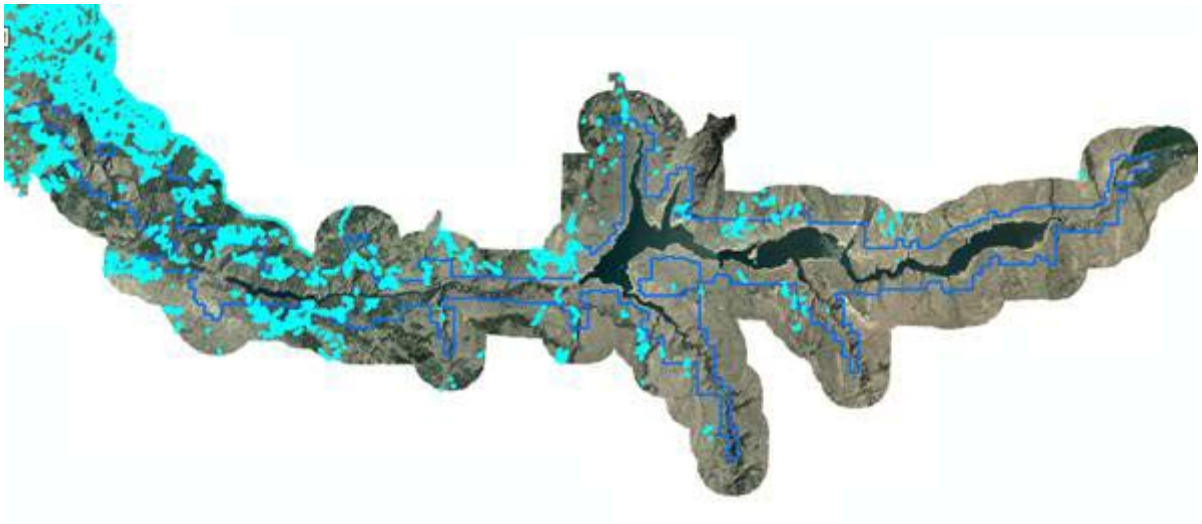
Common species
- *Quercus gambelii*
- *Cercocarpus montanus*
- *Poa fendleriana*
- *Amelanchier utahensis*
- *Carex geyeri*
- *Festuca thurberi*

S-QUMX Map Class Statistics

Type: Complex of associations
Frequency: 418 total polygons
141 total polygons in CURE
277 total polygons in the environs
Average Polygon Size: 4.3 hectares / 10.7 acres

Total project area: 1,804 hectares / 4,458 acres (3.7 %)
390 hectares / 965 acres in CURE
1,413 hectares / 3,493 acres in the environs
Producer's accuracy: 79% ± 13%
User's accuracy: 68% ± 14%

Distribution in Mapping Area

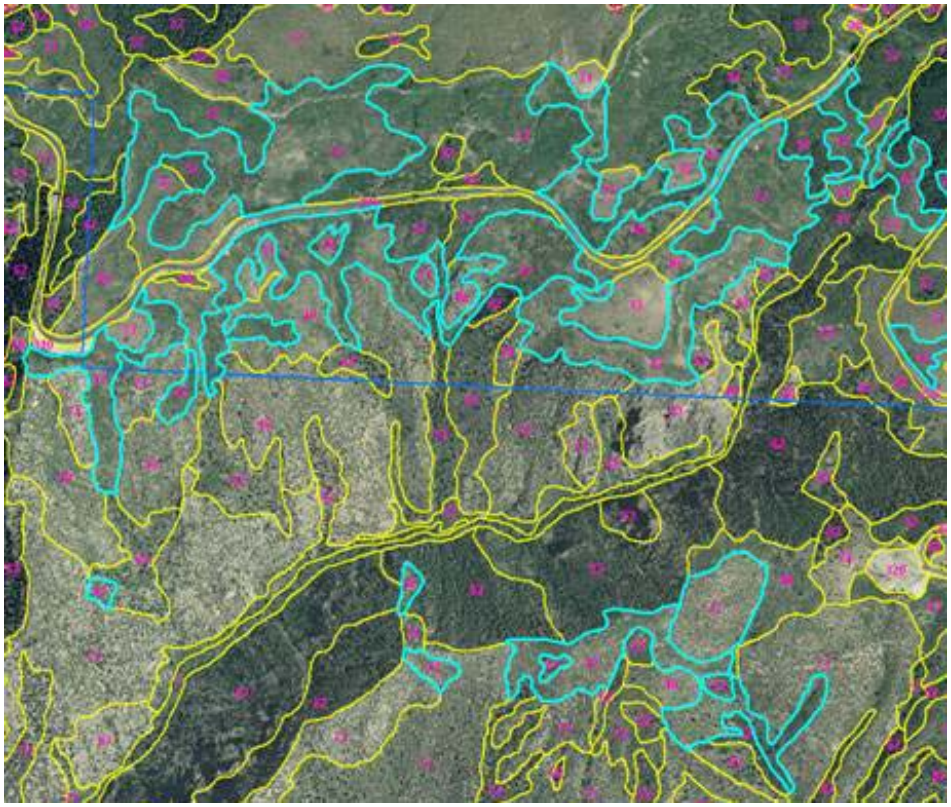


Distribution/Ecology/Composition

Dense thickets of *Quercus gambelii* and associated tall shrubs occur on plateaus, side slopes, and swales. Slopes may be gentle to steep and aspect is variable through the range of elevation and steepness. This map class is widely distributed, but most common in the western half of the NRA, west of Blue Mesa Reservoir. These mixed montane shrublands may be largely mid-seral communities that would succeed to conifer woodlands given a sufficient fire interval. While distribution of this map class is limited by soil moisture, fire is important to its establishment and persistence.

Interpretation

This map class typically has small to medium, regular polygons with a rough-textured, bright to dark green color. Separation of this map class from the other montane shrublands was more approximate than precise in the patchy and ecotonal landscapes. Greenness of the understory was the deciding factor in mapping. Separation of low tree cover pinyon-juniper woodlands with high cover Gambel oak was likewise problematic. *Populus tremuloides* stands may occur nearby, and are sometimes difficult to distinguish from taller stands of *Quercus gambelii* woodlands. The most common neighboring polygons are those of the other oak or mixed montane shrublands (41 and 43), pinyon-juniper woodlands (71 and 74), aspen woodlands (52), and Douglas-fir woodlands (62).



Example of photo signature for map class S-QUMX (#42).

Map Class 43
Gambel Oak Woodlands (S-QUSY)




Photo credits: NPS

Associations

Prunus virginiana – (Prunus americana) Shrubland
Quercus gambelii / Amelanchier alnifolia Shrubland
Quercus gambelii / Carex geyeri Shrubland
Quercus gambelii / Prunus virginiana Shrubland
Quercus gambelii / Rhus trilobata Shrubland
Quercus gambelii / Symphoricarpos oreophilus Shrubland

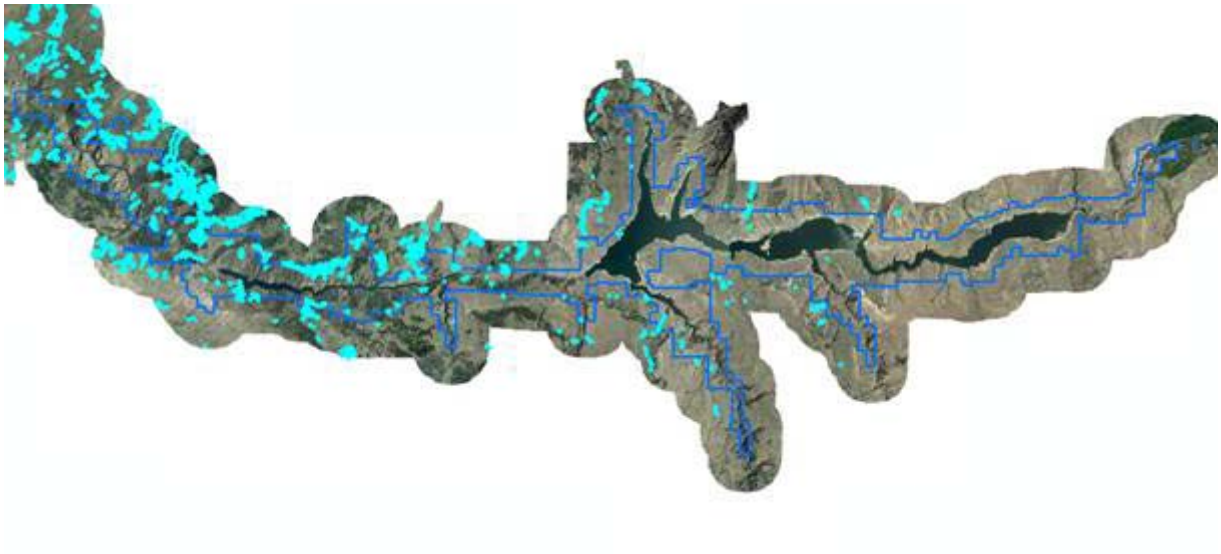
Common species

- *Quercus gambelii*
- *Carex geyeri*
- *Prunus virginiana*
- *Amelanchier alnifolia*
- *Symphoricarpos oreophilus*
- *Rhus trilobata*

S-QUSY Map Class Statistics

Type:	Complex of associations	**Total project area:**	837 hectares / 2,069 acres (1.7 %)
Frequency:	340 total polygons		247 hectares / 610 acres in CURE
	121 total polygons in CURE		591 hectares / 1,459 acres in the environs
	219 total polygons in the environs	**Producer's accuracy:**	85% ± 9%
Average Polygon Size:	2.5 hectares / 6.1 acres	**User's accuracy:**	79% ± 10%

Distribution in Mapping Area

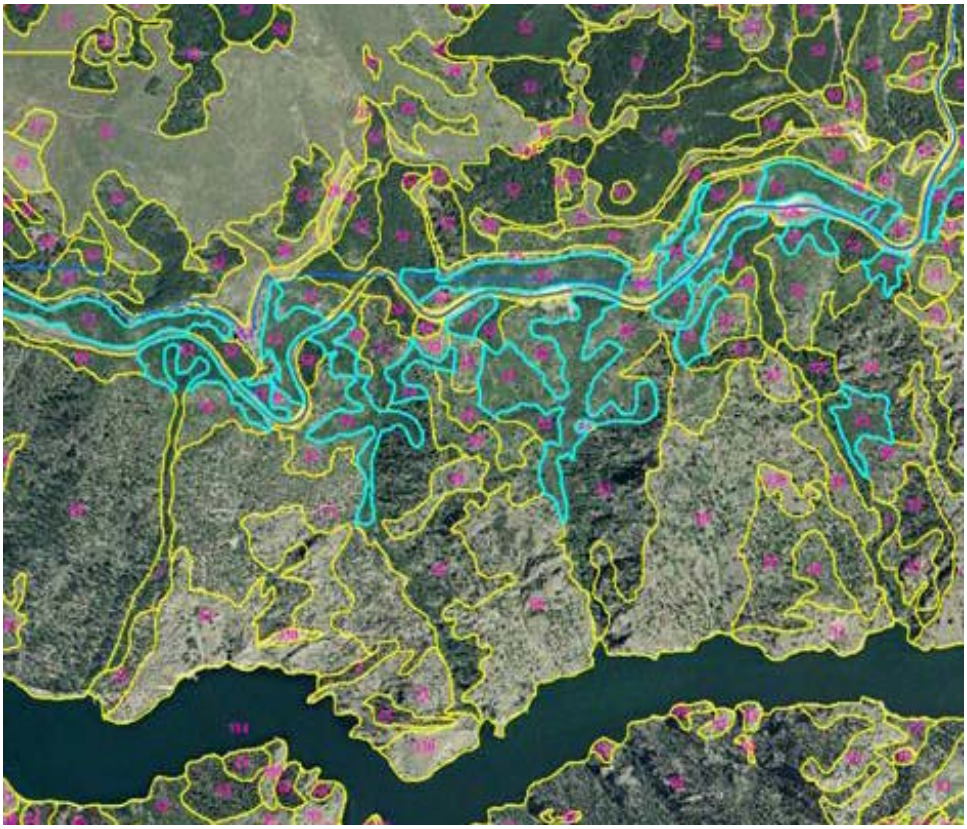


Distribution/Ecology/Composition

This map class was separated from map class 42 largely to acknowledge tree-form oak communities of more mesic sites. Stands tend to have high, continuous oak cover and sparse understory due to limited sunlight penetration through the stand. This map class is widely distributed, but most common in the western half of the NRA, west of Blue Mesa Reservoir.

Interpretation

Polygons of map class 43 tend to be small and narrow, generally occurring as dense thickets within larger, more open oak stands. Smooth-textured and dark green in color, they are easily distinguished from surrounding communities, which most commonly are the Gambel oak-mixed mountain shrub communities of map class 42. Other adjacent polygons may include big sage-mixed shrublands (41), aspen woodlands (52), and Douglas-fir woodlands (62).



Example of photo signature for map class S-QUSY (#43).

Map Class 46
Mountain Mahogany Shale Shrubland (S-CEMO)





Photo credits: NPS

Associations
Cercocarpus montanus Shale Shrubland

Common species
- *Cercocarpus montanus*

S-CEMO Map Class Statistics

Type:	Association	**Total project area:**	28 hectares / 69 acres (0.1 %)
Frequency:	6 total polygons		28 hectares / 69 acres in CURE
	4 total polygons in CURE		0 hectares / 0 acres in the environs
	2 total polygons in the environs	**Producer's accuracy:**	90% ± 21%
Average Polygon Size:	4.7 hectares / 11.5 acres	**User's accuracy:**	100%

Distribution in Mapping Area



Distribution/Ecology/Composition

This very rare map class occurs on steep, active, northwest-facing shale slopes of the Morrison Formation with high cover of large and small rocks. The shrub layer is dominated by mountain mahogany with sparse to moderate cover and the herbaceous layer is moderately diverse with low to moderate cover. This map class was only mapped where documented by field crews so it may be somewhat more common; however, because it has such specialized environmental requirements, it will have very limited extent in the recreation area.

Interpretation

Polygons of map class 46 tend be small and occur on steep shale slopes surrounding Blue Mesa Reservoir. The signature is the smooth, whitish-gray color of the shale substrate with a light to medium gray green, speckled or mottled texture representing the mountain mahogany shrubs.



Example of photo signature for map class S-CEMO (#46).

Map Class 48
Gambel Oak / Rockspirea Scree Shrubland (S-QUHO)




Photo credits: NPS

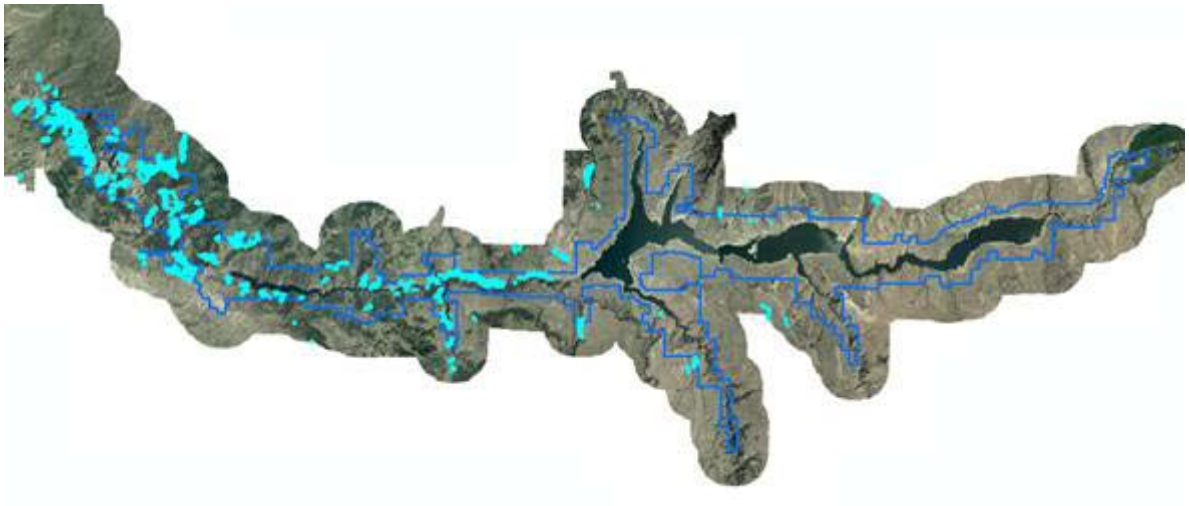
Associations
Quercus gambelii - Holodiscus dumosus Shrubland

Common species
- *Quercus gambelii*
- *Holodiscus dumosus*

S-QUHO Map Class Statistics

Type:	Association	**Total project area:**	661 hectares / 1,633 acres (1.4 %)
Frequency:	198 total polygons		516 hectares / 1275 acres in CURE
	127 total polygons in CURE		145 hectares / 358 acres in the environs
	71 total polygons in the environs	**Producer's accuracy:**	71% ± 24%
Average Polygon Size:	3.3 hectares / 8.2 acres	**User's accuracy:**	77% ± 23%

Distribution in Mapping Area

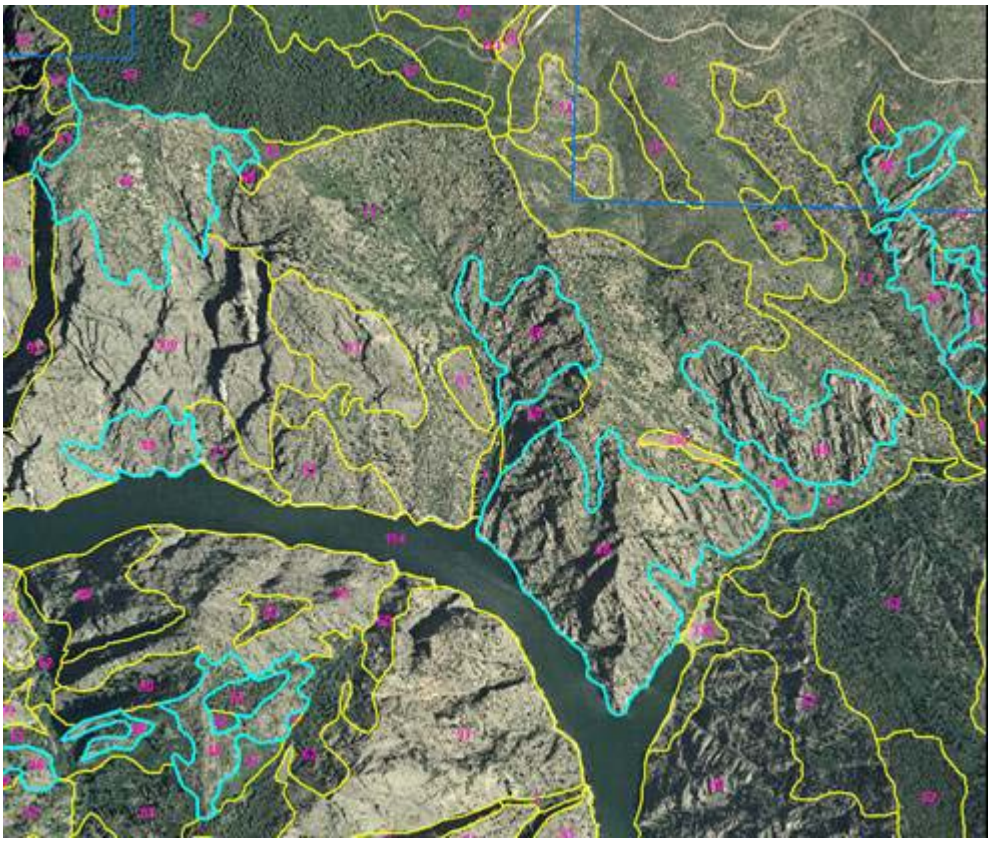


Distribution/Ecology/Composition

This map class occurs on moderately steep to steep slopes of hills, canyons, mesas, and landslides. Sites are most commonly the scree- and crag-dominated - slopes of the main Black Canyon of the Gunnison and its tributaries, with an underlying geology of Tertiary volcanic rocks, metamorphic, granitic rocks, and Quaternary landslide deposits. The *Holodiscus dumosus* component may or may not be the diagnostic species in the understory and a variety of other montane shrubs commonly occur in this map class.

Interpretation

Polygons of map class 48 are small to large, regularly shaped and occur on steep scree slopes of Black Canyon and its tributaries. The signature is similar to that of other oak map classes, but with generally lower total vegetation cover and differentiated by location and rocky substrate.



Example of photo signature for map class S-QUHO (#48).

Upland Herbaceous Communities

Map Class 17
Reservoir Drawdown Semi-natural Herbaceous Vegetation (H-RESE)





Photo credits: NPS

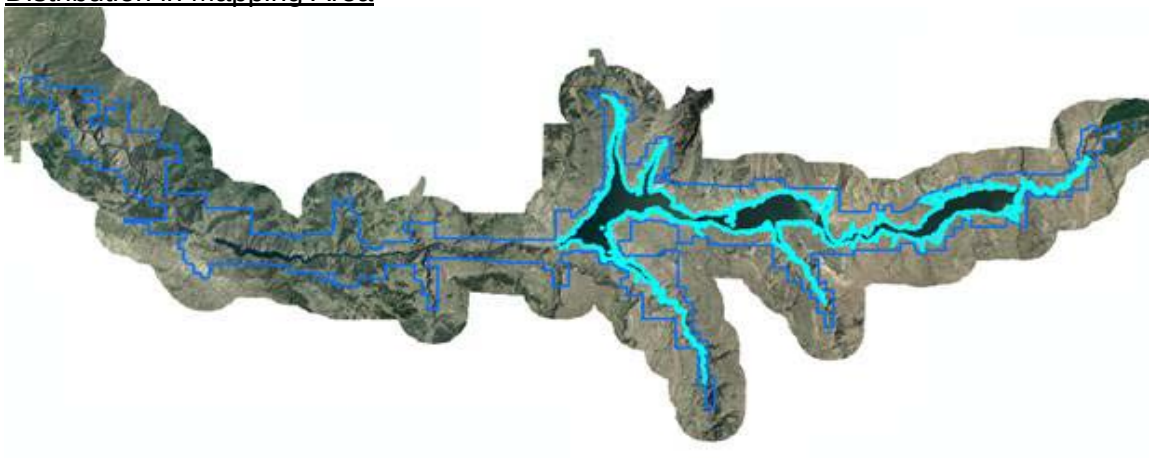
Associations
Conyza canadensis Semi-natural Herbaceous Vegetation
Hordeum jubatum Herbaceous Vegetation

Common species
- *Ericameria nauseosa*
- *Hordeum jubatum*
- *Conyza canadensis*

H-RESE Map Class Statistics

Type:	Complex of associations	**Total project area:**	838 hectares / 2,070 acres (1.7 %)
Frequency:	41 total polygons		838 hectares / 2070 acres in CURE
	40 total polygons in CURE		0 hectares / 0 acres in the environs
	1 total polygons in the environs	**Producer's accuracy:**	86% ± 11%
Average Polygon Size:	20.4 hectares / 50.5 acres	**User's accuracy:**	97% ± 7%

Distribution in Mapping Area



Distribution/Ecology/Composition

This map class occurs as a bathtub ring in the drawdown zone around the whole perimeter of Blue Mesa Reservoir on flat to moderately steep slopes. Exposure of bare ground is high and the substrate is dominated by cobble, gravel and sand. These sparsely vegetated, communities dominated by annual forbs emerge when lake levels drop (in drought years) but generally occur as a narrow band just about the normal high water line where they are frequently disturbed by flooding and drawdown cycles.

Interpretation

Polygons of map class 17 easy to distinguish as a smooth, whitish gray band bordering the entire length of Blue Mesa Reservoir. Polygons are long, narrow and sinuous weaving around the edge of the reservoir. Vegetation signatures were hard to pull out from the background of the substrate, due to the sparse cover and smooth signatures of the herbaceous layer. Adjacent polygons most commonly include sagbrush shrublands (map classes 31 and 33), sagebrush-mixed montane shrublands (41) and open reservoir (114).



Example of photo signature for map class H-RESE (#17).

Map Class 20
Mixed Upland Grasslands (H-MXHE)





Photo credits: NPS

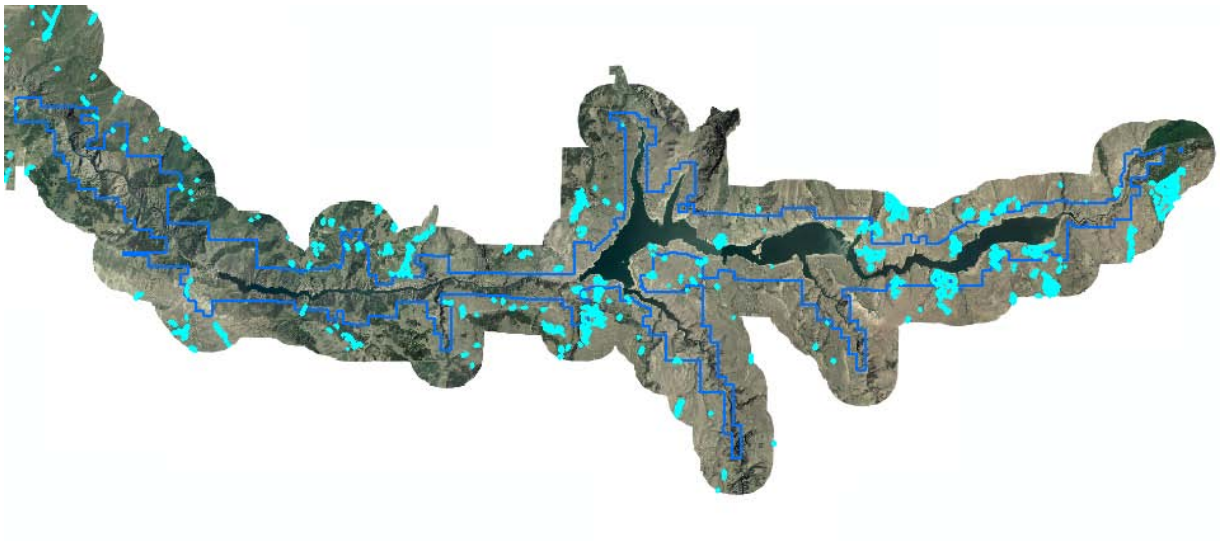
Associations
Achnatherum hymenoides Shale Barren Herbaceous Vegetation
Agrostis (gigantea, stolonifera) Semi-natural Herbaceous Vegetation
Bromus tectorum Semi-natural Herbaceous Vegetation
Elymus repens Semi-natural Herbaceous Vegetation
Hesperostipa comata Great Basin Herbaceous Vegetation
Hesperostipa comata – Achnatherum hymenoides Herbaceous Vegetation
Leymus cinereus Herbaceous Vegetation
Pascopyrum smithii Herbaceous Vegetation
Pleuraphis jamesii Herbaceous Vegetation
Poa secunda Herbaceous Vegetation
Poa fendleriana Herbaceous Vegetation
Poa pratensis - (Pascopyrum smithii) Semi-natural Herbaceous Vegetation
Thinopyrum intermedium Semi-natural Herbaceous Vegetation

Common species
- *Achnatherum hymenoides*
- *Elymus repens*
- *Hesperostipa comata*
- *Pleuraphis jamesii*
- *Poa pratensis*
- *Thinopyrum intermedium*
- *Agrostis stolonifera*
- *Leymus cinereus*
- *Pascopyrum smithii*
- *Poa fendleriana*
- *Poa secunda*
- *Bromus tectorum*

H-MXHE Map Class Statistics

Type:	Complex of associations	**Total project area:**	744 hectares / 1,837 acres (1.5 %)
Frequency:	278 total polygons		177 hectares / 438 acres in CURE
	70 total polygons in CURE		566 hectares / 1,399 acres in the environs
	208 total polygons in the environs	**Producer's accuracy:**	63% ± 34%
Average Polygon Size:	2.7 hectares / 6.6 acres	**User's accuracy:**	50% ± 31%

Distribution in Mapping Area

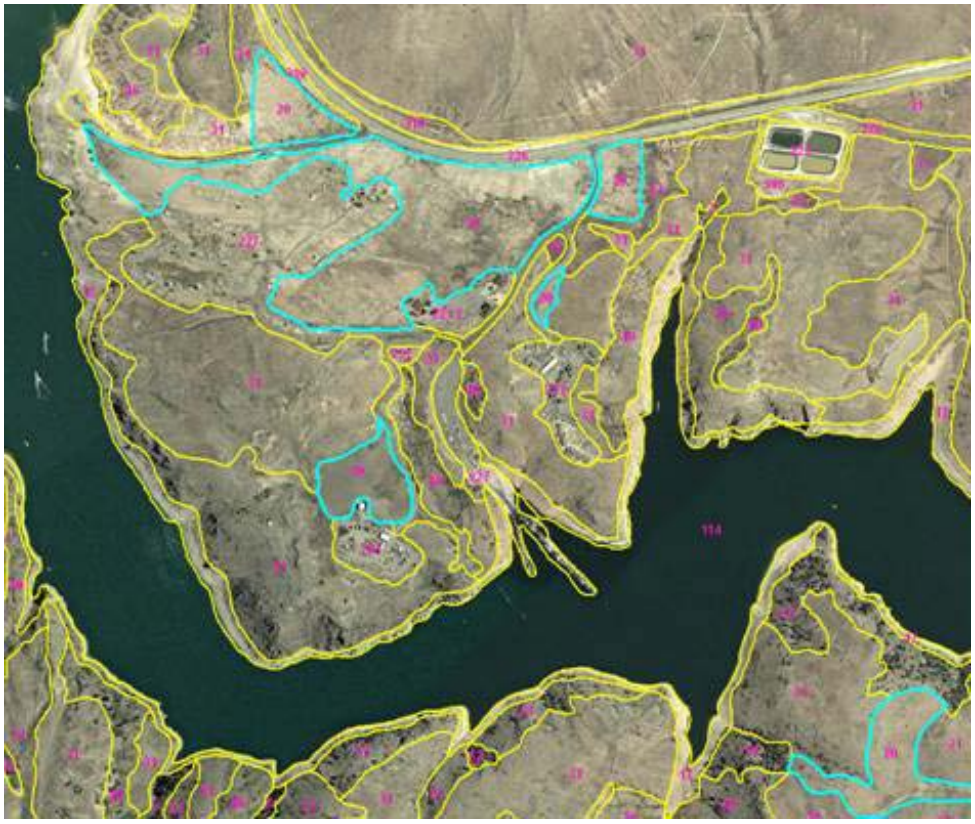


Distribution/Ecology/Composition

This map class includes burned or disturbed areas with exotic species, as well as sites dominated by native bunchgrasses. Some examples of this type are substrate controlled, but most are the result of fire. Substrates and soils are variable, and this class occurs on level to moderately steep slopes of all aspects on diverse landforms. Some polygons are grasslands that have replaced burned pinyon-juniper woodlands or burned sagebrush shrublands. Most polygons of this map class occur in the environs and most examples in the NRA were too small to pull out separately from adjacent shrublands or woodlands.

Interpretation

Polygons of map class 20 occur in all parts of the mapping area, in many different landscape positions and on many different geologic substrates. Polygons are small to medium, regularly shaped and characterized by a sometimes smooth or slightly textured grayish tan color. Larger polygons in burned areas may contain small inclusions of Wyoming sagebrush shrublands (31) or various pinyon-juniper woodlands. Adjacent polygons are most commonly sagebrush shrublands (31 and 33) and oak-mixed montane shrublands (42).



Example of photo signature for map class H-MXHE (#20).

Sparse Vegetation & Talus Slope Communities

Map Class 81
Shale Barrens Sparse Shrublands (S-SHBA)





Photo credits: NPS

Associations

Atriplex canescens / Achnatherum hymenoides Shrubland
Krascheninnikovia lanata / *Achnatherum hymenoides* Dwarf-shrubland

Common species

- *Atriplex canescens*
- *Achnatherum hymenoides*
- *Krascheninnikovia lanata*
- *Rhus trilobata*

S-SHBA Map Class Statistics

Type: Complex of associations
Frequency: 57 total polygons
30 total polygons in CURE
27 total polygons in the environs
Average Polygon Size: 2.4 hectares / 5.8 acres

Total project area: 135 hectares / 333 acres (0.3 %)
38 hectares / 94 acres in CURE
97 hectares / 239 acres in the environs
Producer's accuracy: 80% ± 26%
User's accuracy: 89% ± 23%

Distribution in Mapping Area

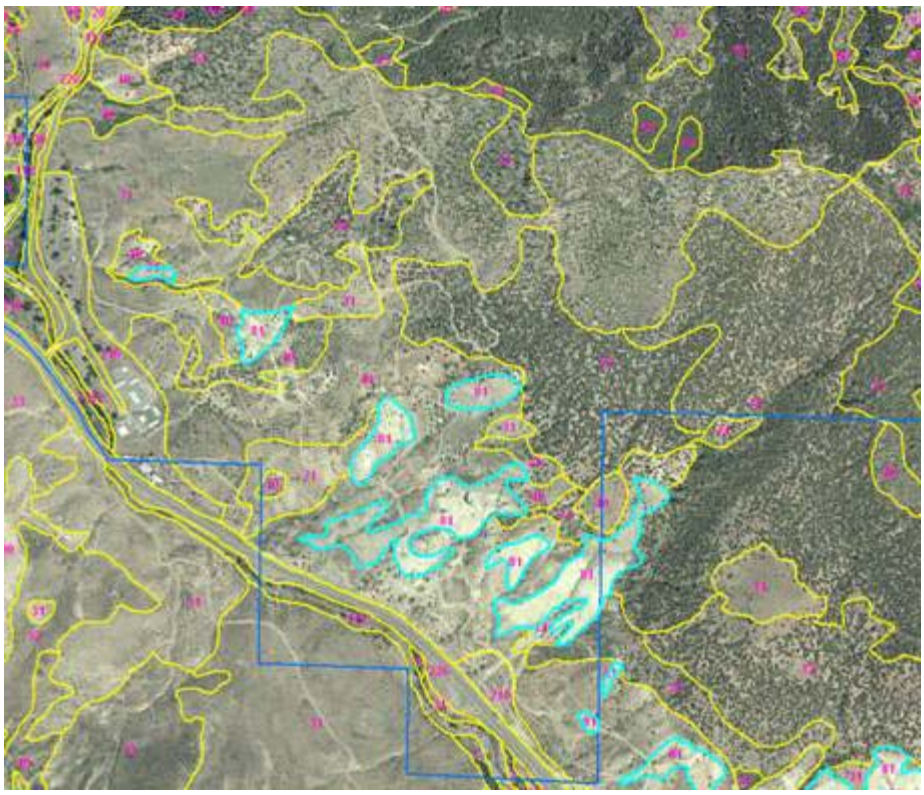


Distribution/Ecology/Composition

Map class 81 occurs on the south or west-facing slopes of steep-sided mesas or eroded ridges derived from the Morrison Formation, Tertiary volcanics or West Elk Breccia. Soils tend to be shallow and fine-textured. Total vegetation cover is generally less than 15%, and includes the shrubs *Atriplex canescens, Krashceninnikovia lanata, Rhus trilobata, Ericameria parryi* and *Grayia spinosa.* Herbaceous cover is low and dominated by *Achnatherum hymenoides*.

Interpretation

This rare map class occurs in medium to large, regular polygons on slopes, benches and hogbacks at the lower elevations of the Brushy Basin member of the Morrison Formation. Because of the high reflectance of the shale substrate, the minute texture provided by the shrubs is rarely visible; polygons have generally the same smooth gray or yellowish gray signature as the unvegetated shale. Polygons adjacent to shale badlands are most commonly pinyon-juniper woodlands of map classes 74 and 78 and sagebrush shrublands of map classes 31 and 33.



Example of photo signature for map class S-SHBA (#81).

Map Class 90
Fringed Sage / Lichens Rocky Mesa (S-ARFR)





Photo credits: NPS

Associations

Artemisia frigida - (Bouteloua gracilis, Achnatherum hymenoides, Poa secunda) - Lichens Rocky Mesa Dwarf-shrubland
Carex duriuscula Herbaceous Vegetation

Common species

- *Artemisia frigida*
- *Achnatherum hymenoides*
- *Carex duriuscula*
- *Bouteloua gracilis*
- *Poa secunda*
- *Poa fendleriana*

S-ARFR Map Class Statistics

Type:	Association	**Total project area:**	538 hectares / 1,329 acres (1.1 %)
Frequency:	391 total polygons		91 hectares / 225 acres in CURE
	90 total polygons in CURE		446 hectares / 1,103 acres in the environs
	301 total polygons in the environs	**Producer's accuracy:**	95% ± 10%
Average Polygon Size:	1.4 hectares / 3.4 acres	**User's accuracy:**	87% ± 14%

Distribution in Mapping Area

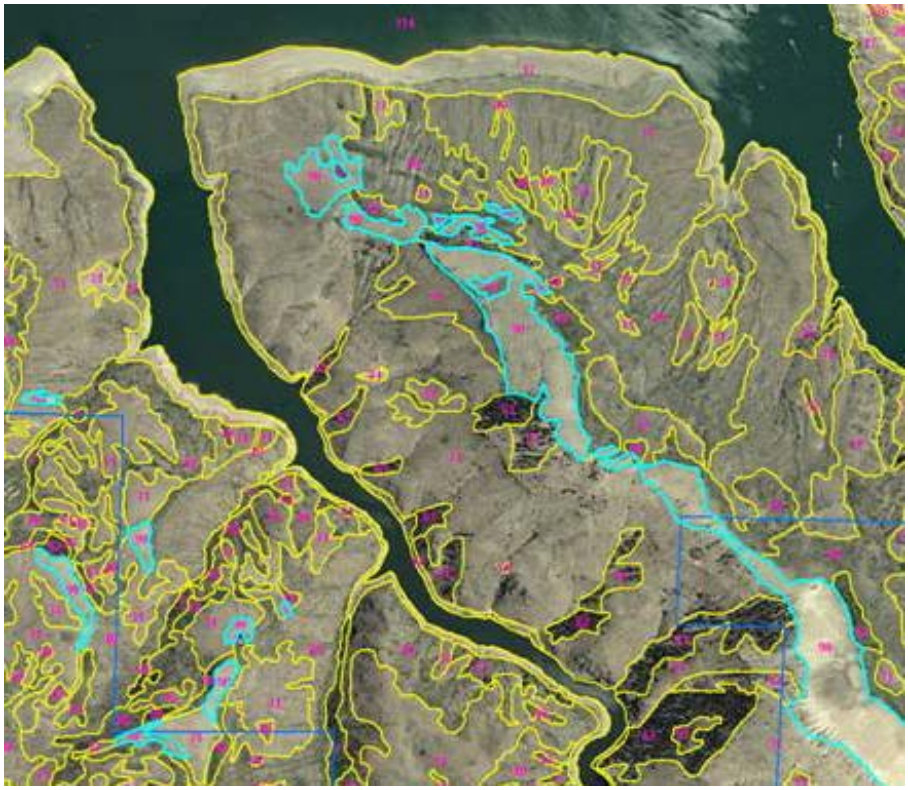


Distribution/Ecology/Composition

This unique herbaceous association is common on exposed, wind-blown sites within the NRA. This map class occurs on upper slopes, shoulders and tops of mesas, hills, and ridges and less commonly on active slopes. Sites are flat to moderately steep and include all aspects. Substrates are variable and include bedrock, cobble or thick gravel, landslide deposits or exposures of bare soil derived from Tertiary volcanic rocks or Mesozoic shales. The total vegetation cover is sparse to moderate, with the forb *Artemisia frigida* scattered within stands and a diverse herbaceous layer. Cryptogam cover, mostly in the form of crustose and foliose lichens, is variable, with some stands having very little, but occasionally cover can be as high as 55%. Winds keep these sites exposed throughout the winter and the shallow soils prevent accumulation of soil moisture, so that only the most drought-tolerant species survive.

Interpretation

Map class 90 occurs in small to large, mostly narrow and regularly-shaped polygons on windswept ridges, shoulder slopes and mesa tops. The minute texture provided by the sparse cover or forbs and grasses is rarely visible; so polygons have generally the same smooth or slightly textured gray or yellowish gray signature as the substrate. A variety of map classes border polygons of fringed sage, but the most common neighbors include sagebrush shrublands (31 and 33) and sagebrush – mixed montane shrublands (41).



Example of photo signature for map class S-ARFR (#90).

Map Class 91
Sparsely Vegetated Bedrock (G-SPAR)

No photos available

Associations
N/A

Common species
- *Cercocarpus montanus*
- *Amelanchier utahensis*

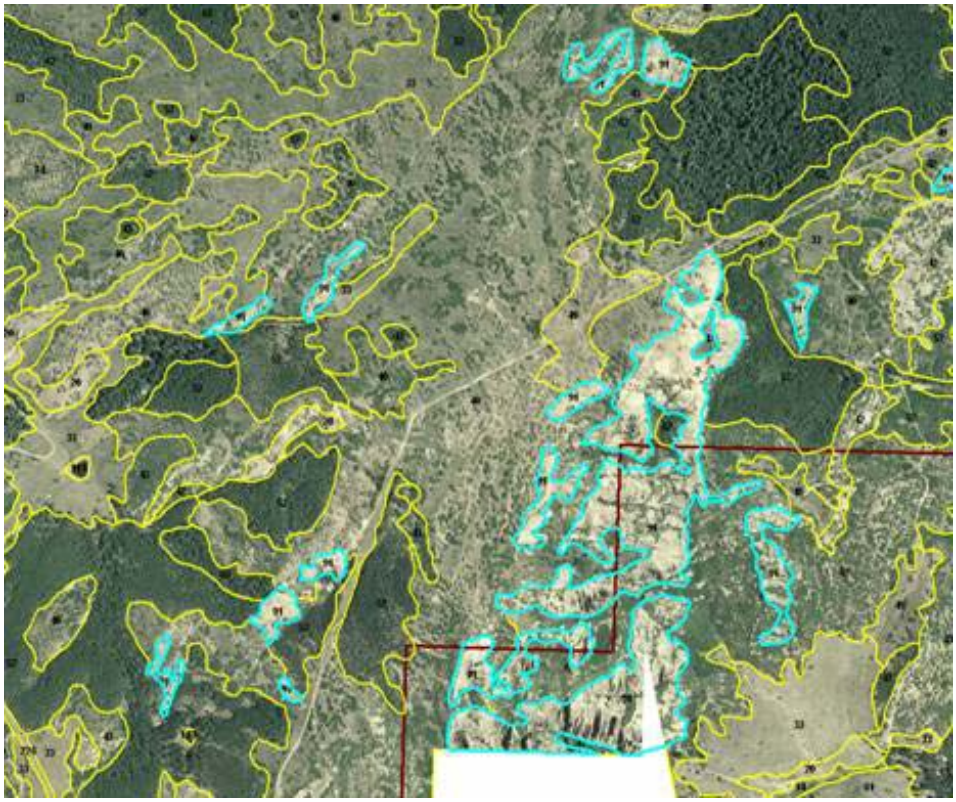
G-SPAR Map Class Statistics

Type:	N/A	**Total project area:**	9 hectares / 22 acres (<0.1 %)
Frequency:	8 total polygons		0 hectares / 0 acres in CURE
	0 total polygons in CURE		9 hectares / 22 acres in the environs
	8 total polygons in the environs	**Producer's accuracy:**	N/A
Average Polygon Size:	1.1 hectares / 2.7 acres	**User's accuracy:**	N/A

Distribution in Mapping Area


Distribution/Ecology/Composition
Map class 91 occurs on plateaus and shoulder slopes. Slopes are gentle to moderate. Most of the class consists of areas where erosion has exposed the underlying bedrock, with vegetation occurring in pockets or interstices between rock slabs. Shrubs such as *Amelanchier utahensis* and *Cercocarpus montanus* are the dominant vegetation. Herbaceous cover includes *Pseudoroegneria spicata* and other grasses on shallow soils. There was no sampling in this map class, so there is no data to assign relevant associations to the description.

Interpretation
This map class occurs in small polygons and is extremely uncommon and restricted to a few small patches of bedrock in the far southwest corner of the NRA, bordering Black Canyon of the Gunnison NP. The signature is mostly barren weathered bedrock, with patches of sparse shrubs and trees visible. Common neighbors of map class 91 include Gambel oak shrublands (42 and 43).



Example of photo signature for map class G-SPAR (#91).

Map Class 93
Rock Spirea Sparsely Vegetated Rock Outcrop (S-HODU)





Photo credits: NPS/ Lisa Lynch

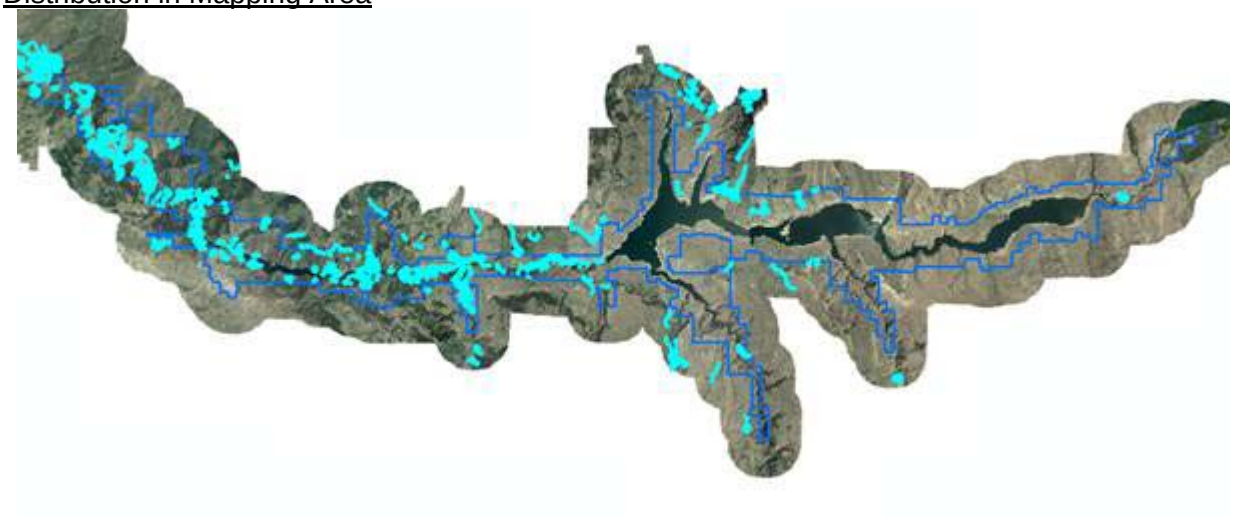
Associations
Artemisia tridentata ssp. *vaseyana* - *Holodiscus dumosus* Shrubland [Provisional]
Holodiscus dumosus Rock Outcrop Sparse Vegetation

Common species
- *Artemisia tridentata* ssp. *vaseyana*
- *Holodiscus dumosus*

S-HODU Map Class Statistics

Type:	Complex of associations	**Total project area:**	1,007 hectares / 2,488 acres (2.1 %)
Frequency:	321 total polygons		754 hectares / 1863 acres in CURE
	192 total polygons in CURE		253 hectares / 625 acres in the environs
	129 total polygons in the environs	**Producer's accuracy:**	47% ± 23%
Average Polygon Size:	3.1 hectares / 7.8 acres	**User's accuracy:**	62% ± 27%

Distribution in Mapping Area

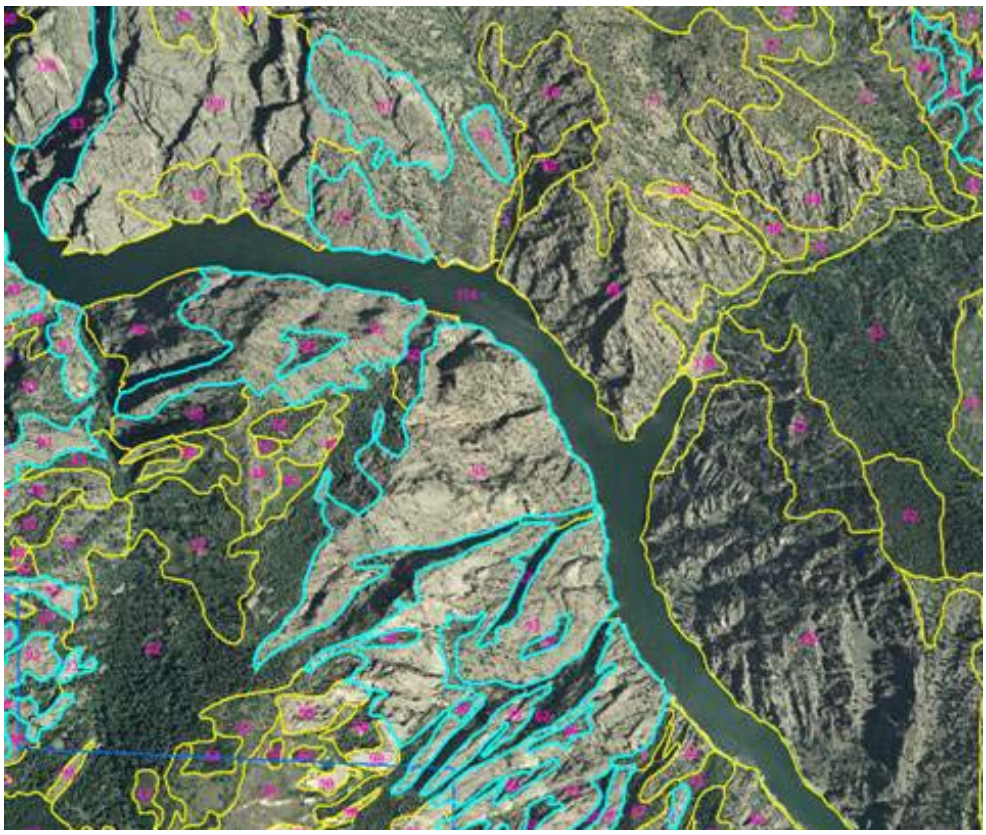


Distribution/Ecology/Composition

This map class occurs as cliff walls and talus slopes on the sides of the Black Canyon. Slopes are rugged and include near vertical cliffs. Most of the vegetation is sparse shrubs including *Artemisia tridentata*, *Cercocarpus montanus* and *Holodiscus dumosus*, but *Pinus edulis* and *Juniperus osteosperma* may have very low cover in some polygons. Sampling was very limited in this map class due to difficult terrain and poor access.

Interpretation

Map class 93 occurs in medium to large polygons and is restricted to the rugged canyon walls and talus slopes (all aspects) of the Black Canyon. The signature is dominated by barren bedrock and talus, with patches of sparse shrubs visible. A variety of map classes border polygons of map class 93, but the most common neighbors include riparian associations (5), barren bedrock (330) and pinyon-juniper sparse scree woodlands (69).



Example of photo signature for map class S-HODU (#93).

Riparian / Wetland Woodlands and Shrublands

Map Class 2
Geyer's Willow Seeps and Springs Shrubland (S-SALI)





Photo credits: NPS

Associations

Salix geyeriana / Mesic Forbs Shrubland
Salix geyeriana / Mesic Graminoids Shrubland

Common species

- *Salix geyeriana*
- *Ribes lacustre*
- *Juncus balticus*
- *Urtica dioica*
- *Rosa woodsii*
- *Poa pratensis*
- *Vicia americana*
- *Iris missouriensis*

S-SALI Map Class Statistics

Type:	Alliance
Frequency:	41 total polygons
	9 total polygons in CURE
	32 total polygons in the environs
Average Polygon Size:	0.6 hectares / 1.4 acres
Total project area:	23 hectares / 56 acres (0 %)
	4 hectares / 11 acres in CURE
	18 hectares / 45 acres in the environs
Producer's accuracy:	75% ± 48%
User's accuracy:	50% ± 19%

Distribution in Mapping Area

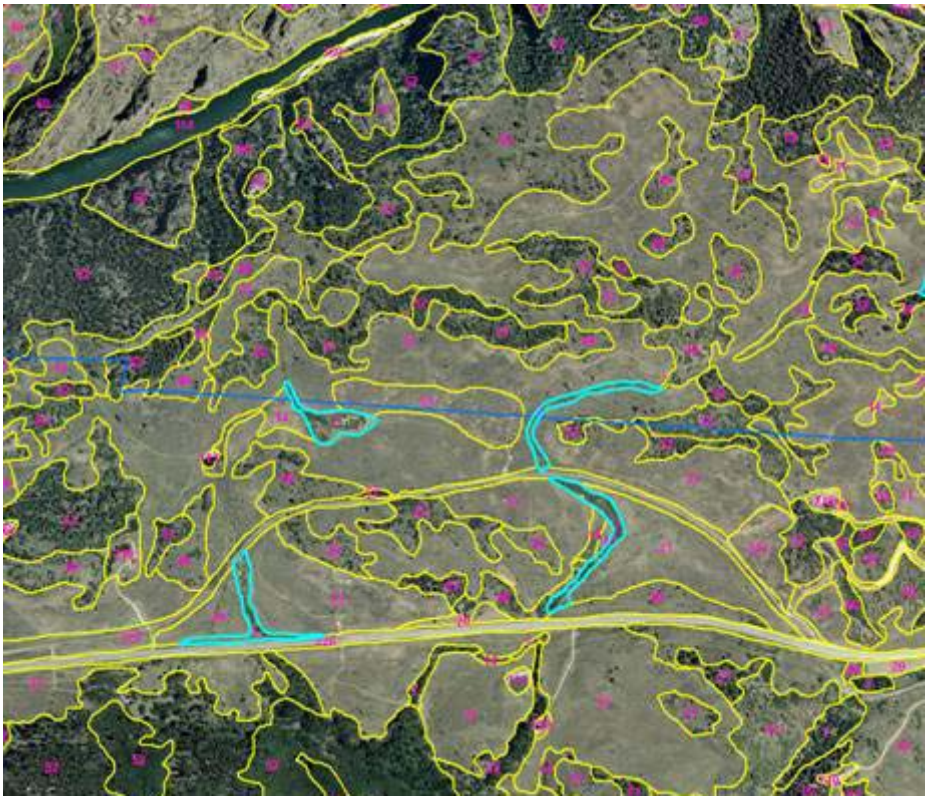


Distribution/Ecology/Composition

This map class occurs on floodplain terraces adjacent to North Willow Creek and in seeps within swales in basin bottoms. Sites are level to gently sloping. Soils are poorly-drained alluvium and there is high litter cover. *Salix geyeriana* cover is generally high with lesser cover by a variety of understory forbs and graminoids. This association is rare within the NRA.

Interpretation

Map class 2 is rare yet widely scattered in the NRA, generally occurring as small, narrow, sinuous polygons following seeps in swales and along the terraces of creeks. The signature is the medium gray green, rough-textured speckles of willow shrubs in a narrow band nestled among larger surrounding polygons of mountain sagebrush (33), sagebrush – mixed montane shrublands (41) or mesic herbaceous stands of rush and sedge (14).



Example of photo signature for map class S-SALI (#2).

Map Class 5
Canyon Bottom Mosaic (C-CANY)




Photo credits: NPS

Associations
Acer negundo / Cornus sericea Forest
Acer negundo / *Quercus gambelii* Woodland
Acer negundo / Disturbed Understory Woodland
Cornus sericea Shrubland
Phalaris arundinacea Western Herbaceous Vegetation

Common species
- *Acer negundo*
- *Phalaris arundinacea*
- *Prunus virginiana*
- *Quercus gambelii*
- *Cornus sericea*
- *Clematis ligusticifolia*

C-CANY Map Class Statistics

Type:	Complex of associations	**Total project area:**	47 hectares / 115 acres (0.1 %)
Frequency:	26 total polygons		45 hectares / 112 acres in CURE
	25 total polygons in CURE		1 hectares / 3 acres in the environs
	1 total polygons in the environs	**Producer's accuracy:**	100%
Average Polygon Size:	1.8 hectares / 4.4 acres	**User's accuracy:**	40% ± 46%

Distribution in Mapping Area

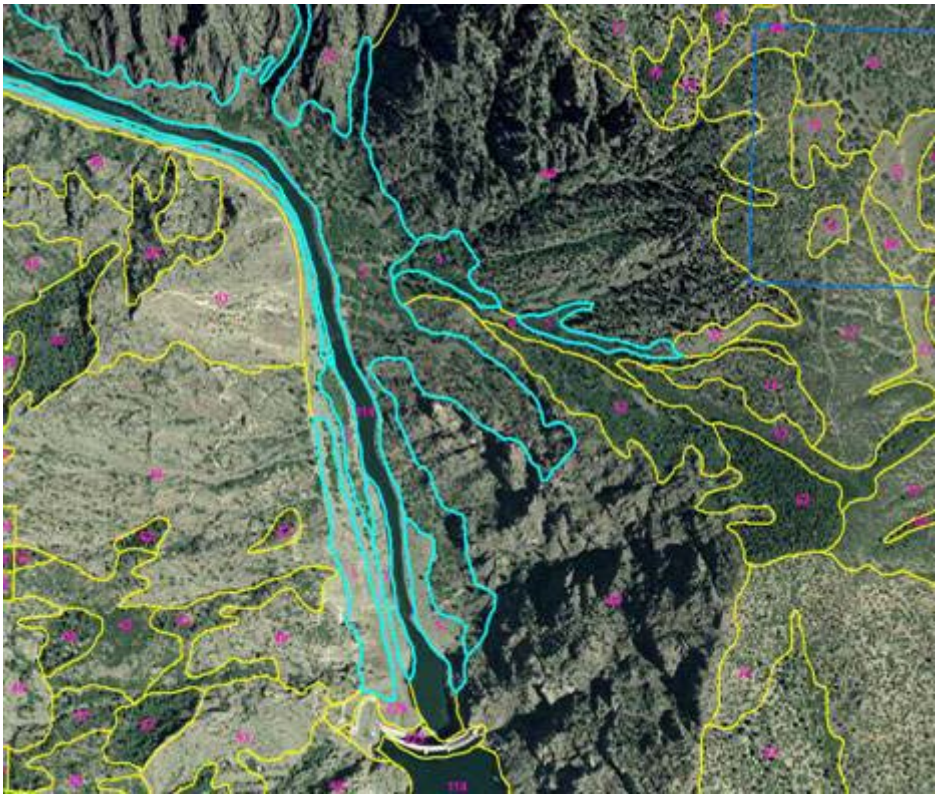


Distribution/Ecology/Composition

This map class is limited to the cold, narrow, main and tributary canyons of the Black Canyon, often occurring on unstable, rocky, river banks. *Acer negundo* may form an open canopy with *Quercus gambelii*. Although these stands are generally removed from flooding, the water table is high enough that the herbaceous layer includes a diversity of mesic species. Human activities have altered the stream bottom ecology both by controlling flood patterns, inundating some stream banks, and generally altering the periods and amount of flooding. Plant communities respond to moisture gradients both laterally across any part of the stream bottom (meaning narrow strips of different hydrologic regimes), while specific reaches of the stream also respond to changes in gradient, flooding frequency, soils, and other variables.

Interpretation

All polygons of map class 5 are linear and narrow and occur along the terrace, in the floodplain, or on the toeslopes of Black Canyon and its short, high gradient tributaries. The signature is shades of bright green mottled with darker green and inclusive of patchy scree dominated openings and other variations associated with periodic flooding. Separation of individual associations was not feasible due to the small scale of most occurrences, difficulty of distinguishing species on the aerial photos, and limited data from sampling in the canyon due to access difficulties/constraints. Shadows and the extreme topographic relief also tend to confound the use of magnification with stereoscopic lenses and make vegetation interpretation difficult in the narrow bottoms. Neighboring polygons include the reservoir (114), bedrock cliffs (330) and the vegetation types growing along the canyon slopes and walls (48, 60 and 93).



Example of photo signature for map class C-CANY (#5).

Map Class 7
Narrowleaf Cottonwood – (Alder, Coyote Willow) Riparian Woodland (W-POAN)






Photo credits: NPS

Associations

Alnus incana / Cornus sericea Shrubland
Alnus incana / Mesic Graminoids Shrubland
Populus angustifolia – Juniperus scopulorum Woodland
Populus angustifolia – Picea pungens / Alnus incana Woodland
Populus angustifolia / Alnus incana Woodland
Populus angustifolia / Cornus sericea Woodland
Populus angustifolia / Crataegus rivularis Woodland
Populus angustfolia / Invasive Perennial Grasses Woodland
Populus angustifolia / Prunus virginiana Woodland
Populus angustifolia / Quercus gambelii Woodland [Provisional]
Populus angustifolia / Rhus trilobata Woodland
Populus angustifolia / Rosa woodsii Forest
Populus angustifolia / Salix exigua Woodland
Salix exigua / Mesic Forbs Shrubland
Salix exigua / Mesic Graminoids Shrubland

Common species

- *Alnus incana*
- *Cornus sericea*
- *Crataegus rivularis*
- *Quercus gambelii*
- *Salix exigua*
- *Phalaris arundinaceae*
- *Populus angustifolia*
- *Juniperus scopulorum*
- *Prunus virginiana*
- *Rhus trilobata*
- *Rosa woodsii*
- *Carex geyeri*

W-POAN Map Class Statistics

Type: Complex of associations
Frequency: 466 total polygons
193 total polygons in CURE
273 total polygons in the environs
Average Polygon Size: 1.6 hectares / 3.9 acres

Total project area: 739 hectares / 1,825 acres (1.5 %)
249 hectares / 615 acres in CURE
490 hectares / 1,211 acres in the environs
Producer's accuracy: 81% ± 8%
User's accuracy: 96% ± 5%

Distribution in Mapping Area

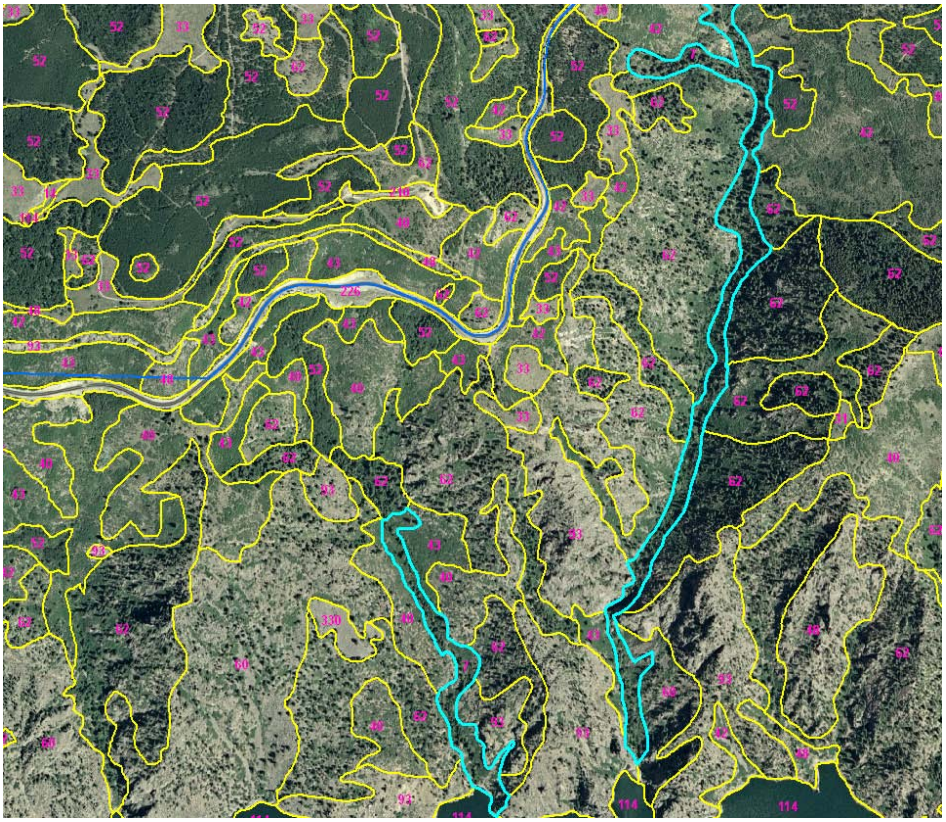


Distribution/Ecology/Composition

This widely distributed map class is limited to the mesic, narrow, drainage bottoms and terraces of the Gunnison River and its tributaries, outlining the locations of nearly every creek in the NRA. These stands occur in the active floodplain and where they are removed from it the water table is high enough to support riparian tree, shrub, forb and grass species. This map class is characterized by narrowleaf cottonwood woodlands, but encompasses a variety of other riparian shrubs as dominant to co-dominant species in the sub-canopy or understory and a diversity of grasses and forbs in the understory, both native and exotic species.

Interpretation

All polygons of map class 7 are linear and narrow and were mapped in and along drainages and floodplains of the Gunnison River and its tributaries. The signature is shades of bright green mottled with darker green. Neighboring polygons include the reservoir (114), and nearly every other map class, wherever a creek has cut through a vegetation community (from sagebrush shrublands to Douglas-fir woodlands).



Example of photo signature for map class W-POAN (#7).

Riparian / Wetland Herbaceous Communities

Map Class 14
Baltic Rush and Sedges Herbaceous Vegetation (H-RUSH)



Photo credits: NPS

Associations

Bromus inermis - *(Pascopyrum smithii)* Semi-natural Herbaceous Vegetation
Carex utriculata Herbaceous Vegetation
Cirsium arvense – Weedy Forbs Great Plains Herbaceous Vegetation
Juncus balticus Herbaceous Vegetation

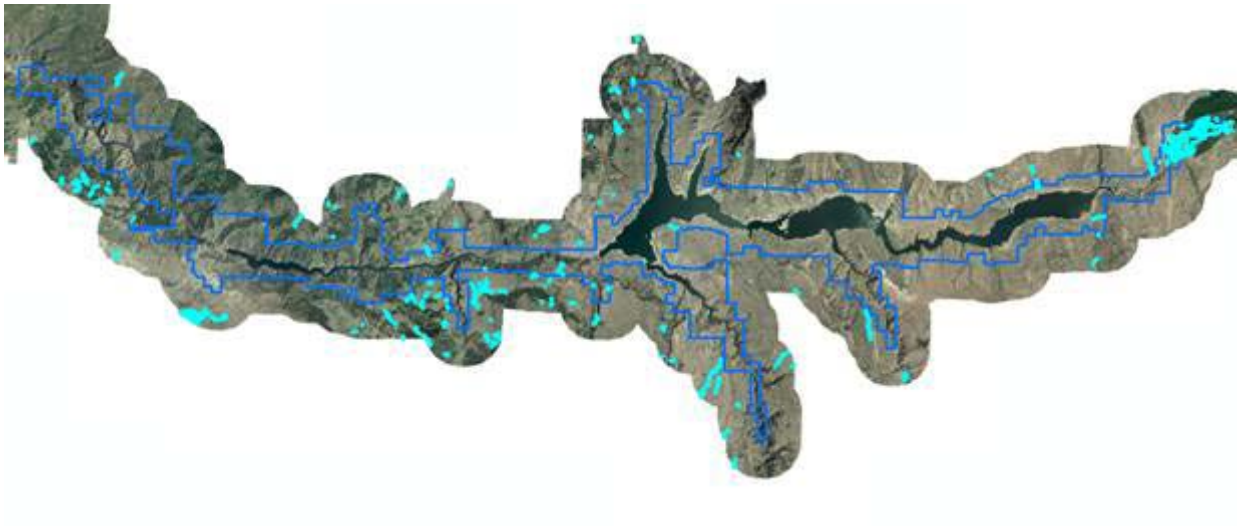
Common species

- *Juncus balticus*
- *Agrostis gigantea*
- *Bromus inermis*
- *Hordeum jubatum*
- *Phalaris arundinaceae*
- *Carex utriculata*
- *Cirsium arvense*
- *Pascopyrum smithii*
- *Poa pratensis*
- *Eleocharis palustris*

H-RUSH Map Class Statistics

Type:	Complex of associations	**Total project area:**	304 hectares / 751 acres (0.6 %)
Frequency:	196 total polygons		81 hectares / 200 acres in CURE
	39 total polygons in CURE		223 hectares / 551 acres in the environs
	157 total polygons in the environs	**Producer's accuracy:**	96% ± 8%
Average Polygon Size:	1.5 hectares / 3.8 acres	**User's accuracy:**	89% ± 12%

Distribution in Mapping Area

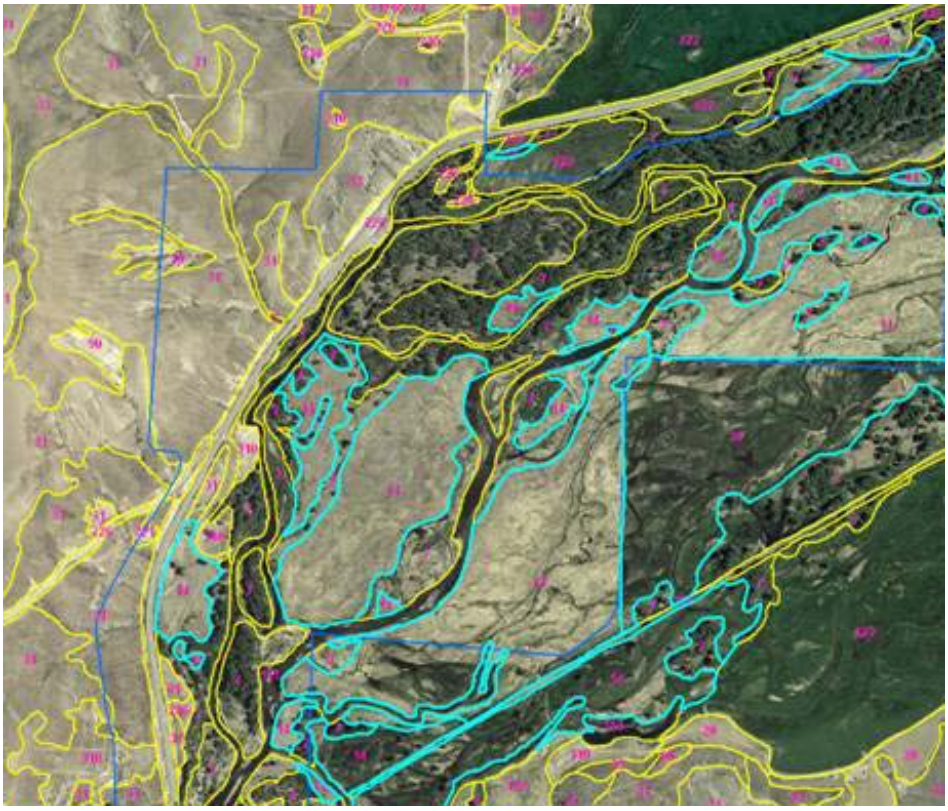


Distribution/Ecology/Composition

This widely distributed map class occurs in intermittently flooded to saturated sites, including floodplains and terraces of the Gunnison River and its tributary creeks and streams, in abandoned channels, on historically irrigated fields, and in mesic swales on mesa tops or basin bottoms. Sites are flat and have groundwater near the surface. Stands are densely vegetated and dominated by rushes, sedges, and rhizomatous, mesic grasses.

Interpretation

Polygons of map class 14 occur almost entirely in the environs and are generally small, linear and narrow, with some larger and irregularly-shaped. Polygons are smooth to slightly textured and range from a mottled gray and dark gray to a bright lime green color with occasional pockets of black where there is standing water at the surface. Polygons adjacent to this map class include sagebrush shrublands (31 and 33), sagebrush – mixed montane shrublands (41), grasslands (20), narrowleaf cottonwood woodlands (7) and aspen woodlands (52).



Example of photo signature for map class H-RUSH (#14).

The Department of the Interior protects and manages the nation’s natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 616/106154, December 2010

National Park Service
U.S. Department of the Interior

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