National Park Service
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Natural Resource Stewardship and Science

Vegetation Inventory Project

Lake Roosevelt National Recreation Area

Natural Resource Report NPS/UCBN/NRR—2011//434



ON THE COVER
Lake Roosevelt National Recreation Area: View from Grand Coulee Dam
Photograph by: Cogan Technology, Inc.

Vegetation Inventory Project

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Natural Resource Report NPS/UCBN/NRR—2011/434

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Executive Summary

Lake Roosevelt National Recreation Area (LARO) encompasses a portion of Lake Roosevelt; a large reservoir formed by the Grand Coulee Dam and associated uplands in northeast Washington State. The reservoir, which inundates portions of the Columbia River, the Spokane River, and other rivers and streams encompasses about 100,585 acres (40,705 ha) stretching northwards from the dam to almost the Canadian border. The National Park Service (NPS) manages long, predominately linear strips of land along the north, east and southern portions of the reservoir. Contained in these lands are many significant cultural and recreational resources in addition to a unique mix of native and semi-native vegetation.

Trending from north to south, LARO marks a transition zone between the desert-like Columbia Basin Plateau to the south and the slightly wetter Okanogan Highlands to the north. The vegetation follows this pattern with wetter conifer forest prevalent in the north gradually giving way to drier shrub-steppe vegetation in the south. Intermixed are distinctive riparian and shoreline shrub and woodlands and stands of non-native plant species. To better understand the plant community distribution at LARO, the NPS Vegetation Inventory Program (NVIP) funded an effort, beginning in 2006, to inventory and document (map) the vegetation. The Upper Columbia Basin Inventory and Monitoring Network (UCBN) coordinated the LARO vegetation inventory effort as part of a network-wide project.

A four-year, four-phase program was initiated to complete the tasks of sampling, classifying, and mapping the vegetation types within LARO. Phase-one, directed by UCBN staff in conjunction with Northwest Management Incorporated (NMI) and the Idaho Conservation Data Center (ICDC) resulted in the plant association and alliance classification using the National Vegetation Classification System (NVCS). Classification was based on new, 2007 sampling efforts resulting in 431 representative classification plots and 47 observation points located within LARO. Analysis of the classification plot data by ICDC ecologists occurred in late 2008. Through this process 81 distinct plant associations were identified. Vegetation descriptions and a field key for each association are included as appendices to this report.

Phase-two, directed by NMI and Cogan Technology, Inc. (CTI) resulted in the digital vegetation map and geodatabase. Mapping was conducted primarily on 2009 National Aerial Imagery Program (NAIP) products supplemented by 2002 imagery obtained from the Bureau of Reclamation (BOR). Interpreting the vegetation-specific signatures from the new imagery, CTI reliably discerned 33 vegetation, 18 land use/land cover, and five geology/sparse vegetation map units. The mapping process used primarily manual digitizing of the homogenous photo-signatures supported by on-site verification. All interpreted data were converted to Geographic Information System (GIS) databases using ArcGIS© software. The final map layer contains vegetation, land-use, and geologic exposure polygons with corresponding map class, NVC, and modifier attributes.

Draft maps were printed, field tested, reviewed, and revised. Following verification, edits were applied to create the final vegetation map product for accuracy assessment (AA). In Phase-three the AA was conducted by NMI ecologists in 2009 by placing 709 random point locations throughout the study area based on frequency and abundance of the vegetation map units. AA locations were accessed by NMI field crews, the vegetation at the targets was keyed to the proper association, and representative photographs of each location were acquired. The field data were compared to the electronic vegetation map and following the final assessment revealed an overall thematic accuracy of 82%.

Completion of the project in Phase-four included producing the standard project deliverables as described and presented in this report and the accompanying DVD. Deliverables include:

- The *Final Report* that includes keys to the vegetation types and imagery signatures, AA information, and a summary of all the methods and results;
- A *Spatial GIS Database* containing spatial data for the vegetation, plots, and AA points;
- *Digital Photos* from sample plots and miscellaneous park views;
- *Metadata* for all spatial data [Federal Geographic Data Committee (FGDC)-compliant];
- *Vegetation Descriptions and Photo Signature Key* to the map classes and associations/alliances.

A Summary of the projects statistics is included below:

Field Work:

- 2007 Plot Sampling = 431 Classification Plots:
  2007 Observation Point Collection = 47 Observation Points
- 2009 Accuracy Assessment = 709 Points

Classification:

- 81 NVC Plant Associations

GIS Database:

- Project Size = 411,680 acres
  - Lake Roosevelt National Recreation Area = 60,367 acres (based on the GIS layer)
    - 15,852acres Upland (includes draw-down areas below full-pool level)
    - 44,515 acres Reservoir (based on reservoir level in summer of 2009)
  - Environs = 351,313 acres
- Base Imagery =
  - BOR-supplied 2002, True-color, 3-band, 1-meter, 1:12,000-scale ortho-image
  - NAIP 2009, True-color, 3-band, 1-meter, 1:12,000-scale ortho-image

- 56 Map Units = 33 Vegetated, 5 Geology/Sparse Vegetation, & 18 Land-use/Land-cover
- Minimum Mapping Unit = ½ hectare, modified to ¼ acre for wetlands and riparian polygons
- Total Size = 33,601 Polygons
- Average Polygon Size = 12 acres

Overall Thematic Accuracy = 82%

Acknowledgments

This unique vegetation inventory project required the enthusiasm and energy of several individuals over three years to complete. The dedication of everyone participating helped to produce the product described herein that we, the authors, thankfully acknowledge.

Foremost, we thank Lisa Garrett and the Upper Columbia Basin Inventory and Monitoring Network (UCNB) staff (including Tom Rodhouse and Gordon Dicus) who provided contracting, data management, and technical review through all aspects of this project. Special recognition is also credited to Karl Brown and Tammy Cook with the NPS Vegetation Inventory Program for prioritizing this project and providing funding. Without the financial support from the NPS Vegetation Inventory Program this project would not have been possible.

The Lake Roosevelt National Recreation Area (LARO or Lake Roosevelt NRA) vegetation inventory project benefited greatly from the planning and ecological expertise contributed by Steve Rust (Idaho Conservation Data Center) and Rex Crawford (Washington Natural Heritage Program). We would like to especially acknowledge all of the long days and hard work put in by our field crew members including ecologists and botanists from Northwest Management staff.

We could not have asked for a better partner on this project than the staff at LARO. Debbie Bird (Superintendent), Jerald Weaver (Chief of Compliance, Natural and Cultural Resources and Interpretation and Resource Education Management) and his replacement Ken Hyde went out of their way to assist the field crews, answer questions and review all of the draft deliverables. They were always timely, professional and extremely helpful throughout the process.

Introduction

Background

In 1994, the U.S. Geological Survey (USGS) and National Park Service (NPS) formed the USGS-NPS Vegetation Mapping Program to cooperatively inventory and map the vegetation in the system of National Parks. Presently managed as the National Vegetation Inventory Program (NVIP) by the NPS Natural Resource Program Center, Biological Resource Management Division, program goals are to provide baseline ecological data for park resource managers, obtain data that can be examined in a regional and national context, and provide opportunities for future inventory, monitoring, and research activities (FGDC 1997, 2008 Grossman et al. 1998).

Also in 1994, the NVIP adopted the U.S. National Vegetation Classification (USNVC) (The Nature Conservancy and Environmental Systems Research Institute 1994a, Grossman et al. 1998) as a basis for the *a priori* definition of vegetation units to be inventoried. The Federal Geographic Data Committee (FGDC) adopted a modified version of the upper (physiognomic) levels as a federal standard (FGDC-STD-005) (FGDC 1997, 2008). This standard was hereafter termed the National Vegetation Classification Standard (NVCS). The NVCS established a federal standard for a complete taxonomic treatment of vegetation in the U.S. at eight physiognomic levels, they are: (1) Formation Class, (2) Formation Subclass, (3) Formation, (4) Division, (5) Macrogroup, (6) Group, (7) Alliance, and (8) Association, with the finest level being the plant association. Alliances are usually aggregations of associations that are physiognomically uniform and share one or more characteristic or diagnostic species. An association is defined as a plant community or type with a consistent species composition, uniform physiognomy, and homogenous habitat conditions (Flahault and Schroter 1910). The plant association or community type is determined by environmental patterns and disturbance processes.

The NVCS established conceptual taxonomic levels for the floristic units of alliance and association, largely following the USNVC, but did not offer a taxonomic treatment for the floristic levels because of the immense scope of establishing robust floristic units for the entire U.S. The FGDC standard requires that federally funded vegetation classification efforts collect data in a manner that enables crosswalking the data to the NVCS (i.e., the physiognomic levels) and sharing between agencies, but does not require use of that standard by agencies for internal mission needs. NatureServe (2006) maintains a treatment of floristic units (alliances and associations), which, though not a federal standard, are used as classification and mapping units by the NVIP whenever feasible. For purposes of this document, the federal standard (FGDC 1997, 2008) is denoted as the NVCS; the USNVC will refer exclusively to the NatureServe treatment for vegetation floristic units (alliances and associations only).

Use of the NVCS as the standard vegetation classification system is central to fulfilling the goals of the NVIP because it:

- is vegetation based;
- uses a systematic approach to classify a continuum;
- emphasizes natural and existing vegetation;
- uses a combined physiognomic-floristic hierarchy;
- identifies vegetation units based on both qualitative and quantitative data; and
- is appropriate for mapping at multiple scales.

The use of the NVCS and the NVIP vegetation inventory protocols facilitate effective resource stewardship by ensuring compatibility and widespread use of the information throughout the NPS and by other federal and state agencies. The vegetation maps and associated information support a wide variety of resource assessment, park management, and planning needs. In addition they can be used to provide a structure for framing and answering critical scientific questions about vegetation communities and their relationship to environmental conditions and ecological processes across the landscape.

The NVCS has primarily been developed and implemented by The Nature Conservancy (TNC) and the network of State Natural Heritage Programs over the past forty years (TNC 1994a; Grossman et al. 1998). The NCVS is currently supported and endorsed by multiple federal agencies, the FGDC, NatureServe, State Heritage Programs, and the Ecological Society of America. Refinements to the classification occur in the process of application, which lead to ongoing revisions that are reviewed both locally and nationally. TNC and NatureServe have made available a two-volume publication presenting the standardized classification, providing a thorough introduction to the classification, its structure, and the list of vegetation types occurring within the U.S. as of April 1997 (Grossman et al. 1998). *Volume I: The National Vegetation Classification Standard* can be accessed electronically on the Internet at: http://www.natureserve.org/publications/library.jsp. NatureServe has since superseded *Volume II* of the publication (the classification listing), providing regular updates to ecological communities in the U.S. and Canada. This online database server, NatureServe Explorer®, can be accessed electronically on the Internet at: http://www.natureserve.org/explorer (2009).

NPS Vegetation Inventory Program

The Director of the NPS approved the Natural Resource Challenge (NRC) in 1999 to encourage the NPS to focus on the preservation of the nation's natural heritage through science, natural resource inventories, and expanded resource monitoring (NPS 1999). The NRC provided funding for 12 baseline inventories to be completed in each of 270 parks with significant natural resources. The vegetation inventory and mapping is considered one of the 12 baseline inventories. Through the NRC, 270 units managed under the NPS were organized into 32 networks for the purpose of accomplishing natural resource inventory and monitoring projects.

The NVIP is a cooperative effort between the NPS and the USGS to classify, describe, and map vegetation communities in more than 270 national park units across the United States. The scope of this effort is large and implementation is complex due to the fact that vegetation species and communities can be unique from park-to-park. However, when the NVIP is completed the final products have been shown to: 1) greatly assist park managers identify and conserve plant biodiversity, 2) help them better understand resources and processes including wildlife habitat relationships and wildland fires, and 3) provide the necessary tools to better manage challenge issues such as exotic species invasions, insect effects, and diseases.

The primary objective of the NVIP is to produce high-quality, standardized maps and associated data sets of vegetation and other land cover occurring within parks and selected adjacent environments (environs). This information fills data gaps and complements a wide variety of resource assessments, park management, and conservation needs. For example, in Sequoia and Kings Canyon National Parks, the 2007 vegetation map and digital database provided tools to better manage the foxtail pine (*Pinus balfouriana* ssp. *austrina*), an endemic species to the southern Sierra Nevada Mountains that can live for more than 1,000 years.
.
The NVIP uses well-established procedures that are compatible with other agencies and organizations including the NVCS, a system that is integrated with the major scientific efforts in the taxonomic classification of vegetation, and is a FGDC standard. In addition, stringent quality control procedures ensure the reliability of the vegetation data and encourage the use of resulting maps, reports, and databases at multiple scales.

A complete vegetation mapping project for an NPS unit includes the following products, at a minimum:

- Detailed vegetation report
- Digital vegetation map
- Vegetation plot data
- Accuracy assessment data & analysis
- Dichotomous vegetation key
- Photo-interpretation key

Maps are produced in Universal Transverse Mercator (UTM) coordinates (NAD 83) with a 1:24,000 scale and a minimum mapping unit of 0.5 hectares (1.24 acres). The vegetation maps must meet the National Map Accuracy Standards for positional accuracy, and the minimum class accuracy goal across all vegetation and land cover classes of 80 percent.

Upper Columbia Basin Network

The specific decision to classify and map the vegetation of LARO was made in response to guidelines set forth by the NPS Natural Resources Inventory and Monitoring Program and implemented by the Upper Columbia Basin Network (UCBN), which includes nine NPS units located in four states of the inland Northwest (Figure 1). The UCBN was organized to inventory and monitor status and trends for selected natural resources (network organization facilitates collaboration, information sharing, and economies of scale in natural resource monitoring). The inventory and monitoring information is used by NPS and park unit resource managers to guide management decisions, to inform scientific research, and to provide public education. One goal of the NPS service-wide monitoring program is to collect and serve data to better understand the dynamic nature and condition of park-managed ecosystems and to provide reference points for comparisons with other management types and possibly with altered environments. The development of a vegetation classification to the plant association level and associated GIS map and database for each park is viewed as a high priority in reaching this goal.

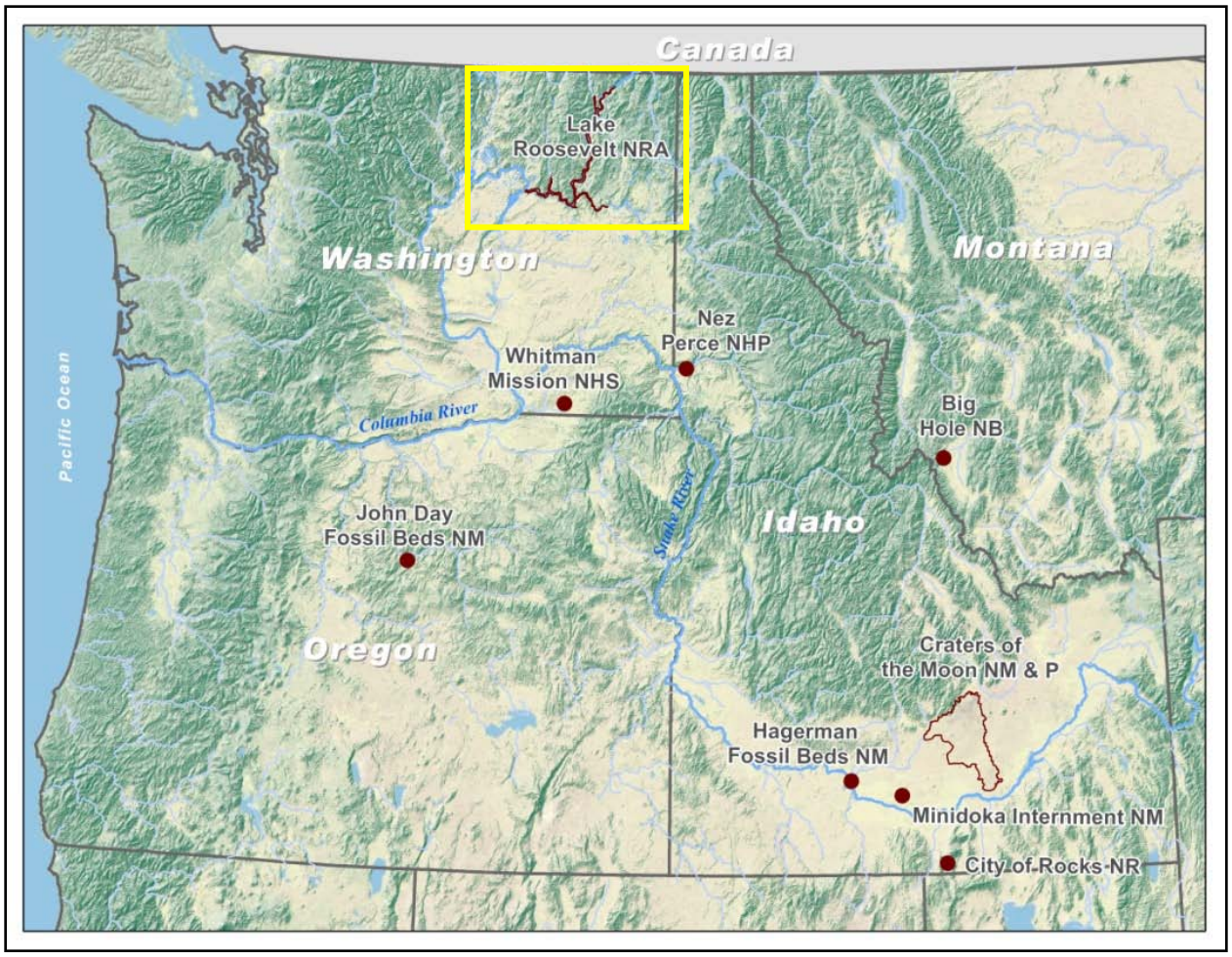


Figure 1. Map of UCBN showing the location of LARO and all the park units in the network.

Lake Roosevelt National Recreation Area

Lake Roosevelt or the Franklin D. Roosevelt Lake is a large reservoir in northeast Washington State formed by the creation of Grand Coulee Dam (Figure 2) in 1942. The reservoir inundates portions of the Columbia River, the Spokane River, and associated tributaries. The entire reservoir stretches 154 miles from the town of Coulee Dam in northwest Washington to near the Canadian border (Figure 3). Lake Roosevelt National Recreation Area (LARO) was established in 1946 following the Secretary of Interior's approval of a Tri-Party Agreement among the National Park Service (NPS), Bureau of Reclamation, and Bureau of Indian Affairs. On April 5, 1990 the management of Lake Roosevelt reservoir was expanded in the Lake Roosevelt Cooperative Management Agreement to include the Confederated Tribes of the Colville Reservation and Spokane Tribe of Indians (NPS 2005).

Lake Roosevelt includes federal lands purchased at or below the 1,310 foot contour level of the reservoir and associated "freeboard" lands above this line. The total area of Lake Roosevelt includes approximately 100,585 acres (40,705 ha) with the NPS managing: 1) approximately 47,438 acres of the 81,389 acres of total water surface, 2) associated shoreline that can vary with reservoir levels, and 3) 12,936 acres of the 19,196 acres of total freeboard land. Under the 1990 agreement the Colville Confederated Tribe and the Spokane Tribe of Indians manage the remaining water surface and freeboard lands, which fall within their reservation land boundary (NPS 2000).

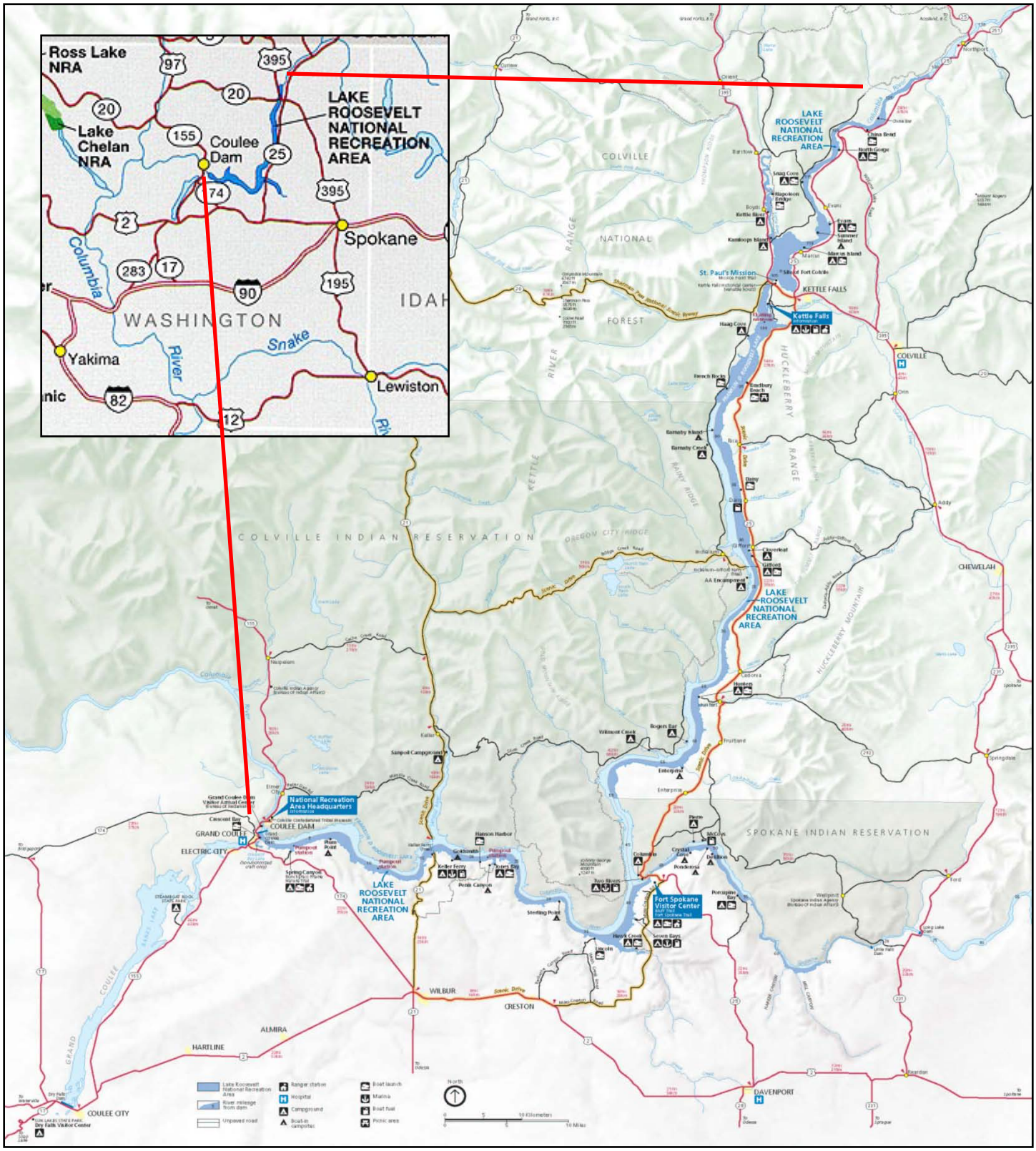
Lake Roosevelt lands include a narrow band of shoreline and associated facility sites (i.e. campgrounds, boat ramps, etc…) around the reservoir associated with the 1310 foot elevation line which the Bureau of Reclamation was required to purchase prior to the reservoir filling. The NPS portion of the reservoir occurs primarily along the north, southwest and east shores. The southeast portion of Lake Roosevelt is managed by the Spokane Tribe and the western shores are located in the Colville Confederated Tribal lands (Figure 4).

The management of LARO as defined in the 2000 General Management Plan is focused on:

- Providing opportunities for diverse, safe, quality, outdoor recreational experiences for the public.
- Preserving, conserving, and protecting the integrity of natural, cultural, and scenic resources.
- Providing opportunities to enhance public appreciation and understanding about the area's significant resources.

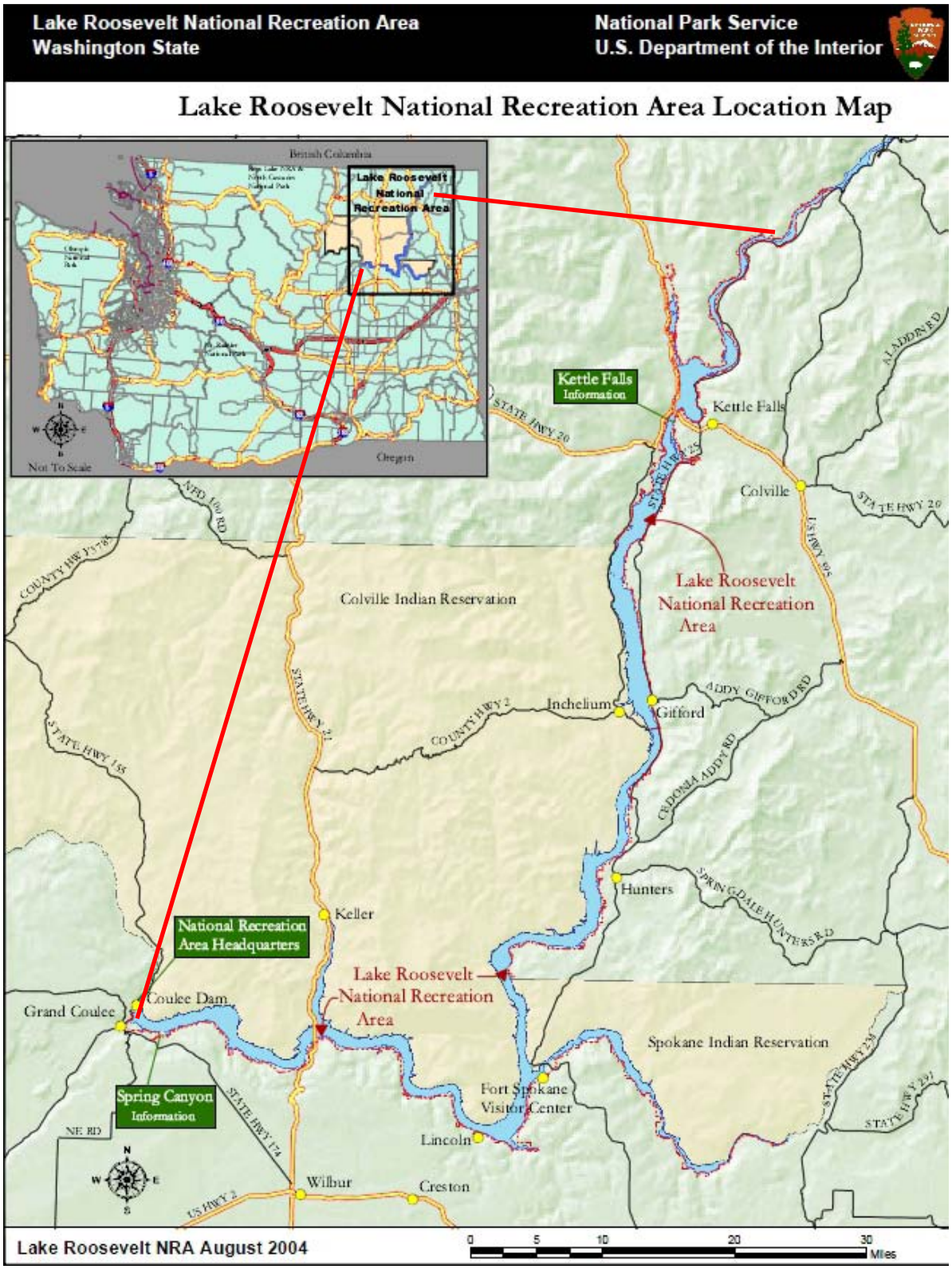


Figure 2. Grand Coulee Dam.



(Source:www.nps.gov/laro 2010)

Figure 3. Lake Roovelt Nation Recreation Area Location Maps.



(Source: NPS 2005)

Figure 4. Map of LARO and surrounding land ownership.

Natural Setting

LARO lies in between the Cascade and Rocky Mountains and is characterized by a semi-arid climate consisting of hot summers that can reach 32°C (90°F) and cold winters averaging -7°C (20°F) in January. Due to LARO's long reach, the climate can vary greatly from the more mesic north end compared to the hotter and drier south. Precipitation near the dam in the south averages about 10 inches annually with areas in the north receiving 17 inches a year in Colville, Washington and 20 inches annually near the Canadian border. Precipitation can also fluctuate with elevation with the higher elevations receiving more snowfall and rain.

LARO is part of the upper Columbia River gorge and spans three distinct physiographic provinces: the Okanogan Highlands, the Kootenay Arc, and the Columbia Plateau (NPS 2000). Lake Roosevelt marks a transition zone between the desert-like Columbia Basin Plateau to the south and the slightly wetter Okanogan Highland to the north. In the southern portion, lava flows and Ice Age Flood events have shaped sheer basalt cliffs that can rise nearly one thousand feet above the lake surface. The mountains in the northern portion are largely comprised of metamorphic rock and Pleistocene sedimentary features, and limestone cliffs rise above the lake as it narrows near LARO's northern boundary. Intermixed throughout is the Kootenay Arc area representing a subduction zone with folded metamorphic rock. All of the geology and landforms in and around LARO are complexes consisting of long, deep-walled trenches or coulees, thin soiled scablands, and basalt outcrops. The geologic layers and rugged landscape bear witness to the many geologic forces such as uplift, erosion and cataclysmic events that helped shaped this scenery over time.

Another relatively recent contributor to the LARO landscape is the large man-made reservoir and its fluctuating shoreline. The Grand Coulee Dam is one of the largest concrete structures in the world effectively raising the historic Columbia River over 380 feet. Water stored behind this structure is dependent primarily on run-off from the Northern Rocky Mountains. As a result water levels can widely fluctuate seasonally and between years. The maximum storage water level managed for is a surface elevation of 1,290 feet above sea level. Periodic drought can reduce the water level to below 1,260 feet even during the summer months as recorded in 2007 (Bureau of Reclamation 2010). Because Grand Coulee Dam is a key feature in the downstream flood water management, large drawdowns occur each winter and spring in relation to the amount of snowpack in the headwaters of the river, These drawdowns can range from 1,250 feet to as low as 1,208 feet (NPS 2010) and can extend from February into June depending on when the run-off occurs to refill the reservoir. The 50+ foot change in elevation greatly impacts the LARO shoreline by creating a bath-tub like ring when normally inundated lands are exposed. It is very difficult for riparian or wetland plants to establish under this annual wet and dry cycle. Continued cycles of inundation and drying can also result in landslides and hillside slumps that can impact large upland areas (Figure 5). These are common occurrences in the unconsolidated alluvial fans left behind by the Ice Age related Missoula floods. Theses fans can be hundreds of feet thick above the 1,290' elevation of the reservoir and few plants can establish on the steep slopes of deposited gravels and sands.



Figure 5. Example of landslide and shoreline at LARO.

Vegetation

The general vegetation pattern for LARO follows closely to the moisture gradient, trending from mesic conifer and quaking aspen (*Populus tremuloides*) forests and woodlands in the north to semi-arid steppe and irrigated agricultural lands in the south (Figure 6). A transition area forms roughly in the center of LARO where southern antelope bitterbrush (*Purshia tridentata*) and sagebrush (*Artemisia* spp.) flats give way to steeper slopes of ponderosa pine (*Pinus ponderosa*) woodlands. Local species variation is also based on topographic position with wet drainages containing paper birch (*Betula papyrifera*), willow (*Salix* spp.) and other tall deciduous shrubs, mesic north-facing slopes and cool valleys supporting extensive Douglas fir (*Pseudotsuga menziesii*) stands, dry slopes and flats are dominated by ponderosa pine, antelope bitterbrush and sagebrush, and the shorelines contain stands of black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), willow and various graminoid species along with a sparse lacustrine zone (i.e. draw-down zone) (Figure 7).

Conifer forests comprised of ponderosa pine and Douglas fir dominate the native vegetation in the northern half of LARO, extending down to the higher elevations in the south. Typically the largest Douglas fir stands are in the north on steep slopes and valleys. In the central and south, Douglas fir is restricted to mesic valleys and north-facing slopes along the shoreline. Ponderosa pine gradually replaces Douglas fir as the dominant tree starting in the center of LARO and extending throughout the south. It is not uncommon to find areas where both species of conifer intermix and in some sites Douglas fir actually forms stands of trees co-dominated with deciduous species such as aspen, birch and cottonwood.

Both Douglas fir and ponderosa pine form many different associations with the same mix of shrubs and grasses depending on moisture and topographic position. On drier sites, mixed grasses are common in the understory with bluebunch wheatgrass (*Pseudoroegneria spicata*) and Idaho fescue (*Festuca idahoensis*) among the most prevalent. In disturbed areas, such as regenerating woodlands disturbed by former logging or homestead activities, or stands next to

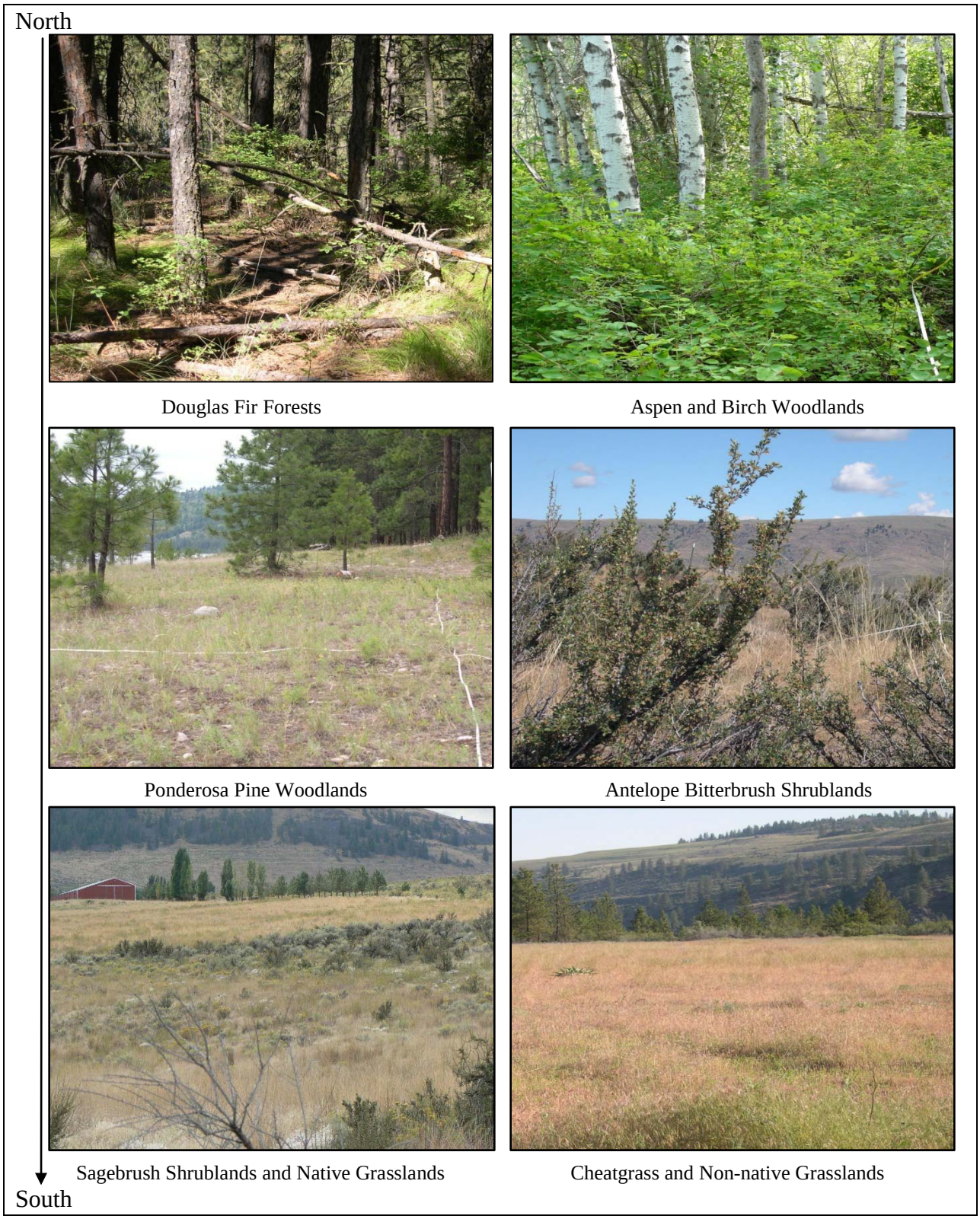


Figure 6. Common LARO Vegetation types by geography.

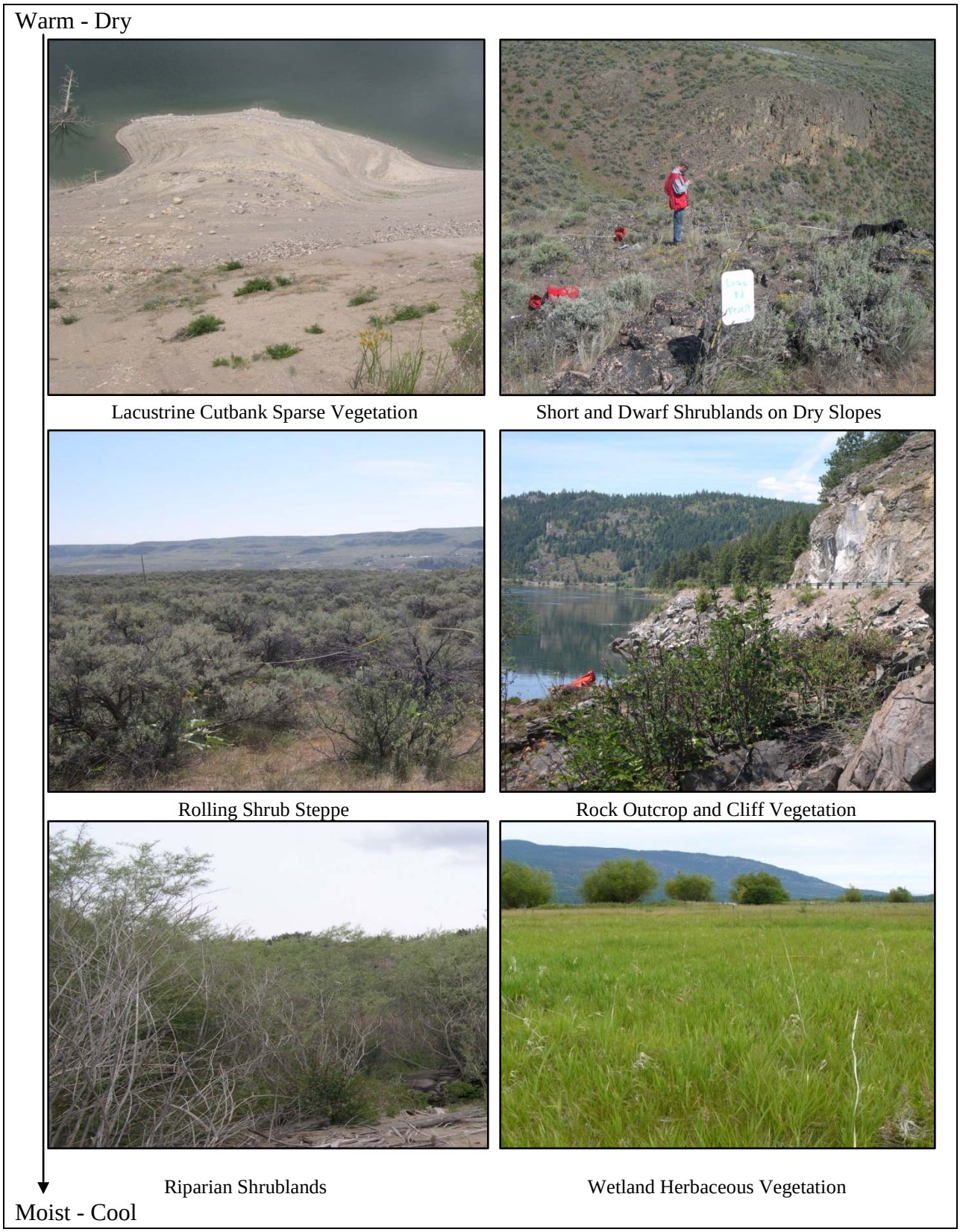


Figure 7. Common LARO Vegetation types by topography.

urban and agricultural areas, non-native grasses including cheatgrass (*Bromus tectorum*) and crested wheatgrass along with invasive forbs are more common. As moisture increases short shrubs such as common snowberry (*Symphoricarpos albus*) mixed with grasses become more pronounced and high moisture sites see an increase in tall shrub species such as Saskatoon serviceberry (*Amelanchier alnifolia*) and Rocky Mountain maple (*Acer glabrum*).

Density of the conifer tree stands can vary greatly ranging from very sparse woodlands on exposed rock, talus and cliff faces to solid stands of either young doghair or mature trees with a high duff layer and little understory. For the sparse situations, Rocky Mountain juniper (*Juniperus scopulorum*), Lewis' mock orange (*Philadelphus lewisii*) and other stunted shrubs are common. In the dense stands short shrubs such as common snowberry, hollyleaved barberry (*Mahonia aquifolium*), and creeping barberry (*Mahonia repens*) are the main understory components.

Deciduous forests and woodlands are rare at LARO, mainly limited to mesic riparian, north-facing slopes and along the reservoir shoreline. The main native tree species found in this study include quaking aspen, paper birch and black cottonwood. Quaking aspen stands are primarily limited to the northern half of LARO whereas the paper birch and black cottonwood tended to be scattered throughout the entire project area. All three species form associations with deciduous shrubs such as narrowleaf willow (*Salix exigua*) and common snowberry. Some cottonwood stands in the south however have drier grasses and shrubs as associates likely a result of past flooding events. In addition to the native deciduous tree species other non-native and planted trees are found at LARO. The non-natives include Norway maple (*Acer platanoides*), American elm (*Ulmus americana*) and black locust (*Robinia pseudoacacia*). These three non-natives in addition to various others that weren't documented in and around urban settings are likely either planted, remnants from past plantings, or represent escaped species. Of particular concern to the park is black locust which has the ability to naturalize and spread both by seed and clonal root sprouting. The Locust Grove area near the Kettle Falls Campground is a good example of where this species has increased from a few trees left in the historic town site of Kettle Falls to over 30 acres of a well established, non-native black locust forest.

Shrublands are common throughout LARO, again trending from more mesic, deciduous species in the north to drier, evergreen shrubs in the south. Starting in the north, small pockets comprised of a mix of Saskatoon serviceberry, smooth sumac (*Rhus glabra*), rose (*Rosa* spp.), and common snowberry can be found in forest canopy openings and in minor drainages. As moisture increases in riparian settings other tall shrubs dominate including alder (*Alnus* spp.), water birch (*Betula occidentalis*, and hawthorn (*Crataegus douglasii*). In the wettest areas along the reservoir shoreline and in major drainages willows become more prevalent. In the southern portion of the project area moist sites next to rock outcrops and drainageways support pockets of chokecherry (*Prunus virginiana*) and Lewis' mock orange.

Starting close to the center of LARO and extending throughout the south, antelope bitter brush slopes and flats are common. In these large antelope bitterbrush areas can range in size from dwarf shrubs on scablands and poor soil conditions to tall shrubs on more developed soils. Sagebrush and rabbitbrush stands become more common towards the southwest corner of LARO starting with slopes of Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*) on

developed soils and the shorter three-tip sagebrush (*Artemisia tripartita* ssp. *tripartita*) on rockier sites. Stands of short statured yellow rabbitbrush (*Chrysothamnus viscidiflorus*) and rubber rabbitbrush (*Ericameria nauseosa*) are also common in these areas. In disturbed sites next to roads and developed areas taller rubberbrush shrubs can also be found. Finally in the southwest corner of LARO, deeper soils support basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) stands. All of the evergreen shrubs form associations with both native grasses such as Idaho fescue and bluebunch wheatgrass and with cheatgrass on more disturbed sites.

Herbaceous vegetation at LARO is comprised of wetlands, plains, benches and hillslopes supporting either a mix of native graminoids or monotypic stands of non-native grasses. In undisturbed wetland sites mesic sedges, rushes, and grasses are widespread with the most common being Baltic rush (*Juncus balticus*), foxsedge (*Carex vulpinoidea*), saltgrass (*Distichlis spicata*), and (reed canarygrass (*Phalaris arundinaceae*). Reed canary grass is especially prevalent around the 1290 foot stage of the reservoir dominating large shallow bays and shoreline marshes. On drier sites throughout the project area the wetland species are replaced with a mix of native grasses including Idaho fescue, needle and thread, and bluebunch wheatgrass. A common associate in these areas is the forb balsamroot (*Balsamorhiza sagittata*) characterized by large leaves and yellow flowers.

Non-native grasslands are also widespread in LARO and the surrounding lands consisting of seeded fields, planted lawns, and disturbed sites. The most common grass is cheatgrass, forming both lush monotypic stands and sites where cheatgrass is gradually displacing the native vegetation due to fire or grazing activities or it's fall germination and aggressive growth habits. In addition to cheatgrass, crested wheatgrass (*Agropyron cristatum*), intermediate wheatgrass (*Thinopyrum intermedium*), and cereal rye (*Secale cereale*) are other non-natives that have formed monotypic stands that are likely a result of past pasture seedings. Urban and developed sites in and around LARO contain areas covered by Kentucky bluegrass (*Poa pratensis*), and smooth brome (*Bromus inermis*), also a result of past seedings and naturalization of these species. Other heavily disturbed sites associated with logging or agricultural activity can support a mix of weedy vegetation locally dominated by non-native thistles (*Cirsium* spp.), diffuse knapweed (*Centaurea diffusa*), orchardgrass (*Dactylis glomerata*), or a host of other non-native and invasive species.

In addition to the upland, riparian and wetland environments the LARO project area also contains many unique and rare habitats. For instance the large reservoir shoreline includes areas that are submerged for the majority of the summer allowing aquatic plants to thrive. Various species of native pondweeds (*Potamogeton* spp.) are abundant. Invasive Eurasian water milfoil (*Miriophyllum aquaticum*) is common in a few areas, but still only occurs in less than 10% of the suitable habitats. During the spring drawdown, various annuals can be found in the lacustrine cut banks and gravel bars including popcornflower (*Plagiobothrys*) and diminutive annuals in the mustard family (Sytsma and Miller 2008). In the south central portion of LARO are sandy dunes supporting dwarf shrubs and sparse grasses consisting of buckwheats (*Eriogonum* spp.) and short bitterbrush and rabbitbrush shrubs. Another unique feature of LARO is the extensive amount of bare rock and talus occurring on steep slopes, ridges and cliff faces. These areas are mainly devoid of vegetation although quite a few sites contain sparse vegetation (<10% cover) consisting of short and stunted trees and shrubs growing cracks and soil pockets. An array of mosses and lichens can also be found growing on these rocky outcroppings and talus sites.

Lake Roosevelt Vegetation Inventory Project

LARO is one of nine NPS units served by the UCBN Inventory & Monitoring Program. The UCBN initiated a vegetation mapping inventory for LARO in the fall of 2006 as part of a larger effort to complete vegetation inventory maps for the network. An initial multi-year work plan was developed for the UCBN by Cogan Technology, Inc. (CTI). This work plan provided recommendations for completing the plant community classification, digital database, and map products for each of the nine UCBN parks; it received approval from the Washington Area Service Office (WASO) Inventory Coordinator in May 2006.

Once approved, UCBN staff contracted with NMI to complete vegetation plot field data collection during the summer of 2007. The Idaho Conservation Data Center (IDCDC) was retained to provide the preliminary and final vegetation classification as part of a cooperative agreement with the UCBN. In September 2007, the UCBN entered into a contract with NMI to provide all of the vegetation mapping services designated by the work plan and to administer and coordinate the UCBN vegetation mapping projects for all 9 park units. Subsequently, CTI was retained by NMI as a sub-contractor to assist on the project.

The classification and mapping team objectives were to secure or create the following:

Spatial Data

- Aerial and ortho-photography
- Map classification based on LARO-specific requirements
- Map classification description and key
- Spatial database of vegetation communities of LARO vegetation
- Digital and hardcopy maps of vegetation communities
- Metadata for spatial databases
- Complete accuracy assessment of spatial data

Vegetation Information

- Vegetation classification
- Dichotomous field key of vegetation classes
- Formal description for each vegetation class
- Ground photos of vegetation classes
- Field data in database format

Scope of Work

The vegetation inventory for LARO occurred within an approximate 411,662 acre project area, encompassing the boundary of LARO (as provided by UCBN), the remaining portions of the reservoir shoreline managed by the two Tribes, and a general 2-km environ radius (Figure 8). The final project area determination was based on management needs, financial constraints, and time limitations. The 2-km environs area was used in this project for inventory and monitoring purposes and to capture various management considerations such as exotic weed dispersal. Also the size of the environs corresponded to the size proposed in the work plan and matches the other vegetation mapping protocols in the UCBN.

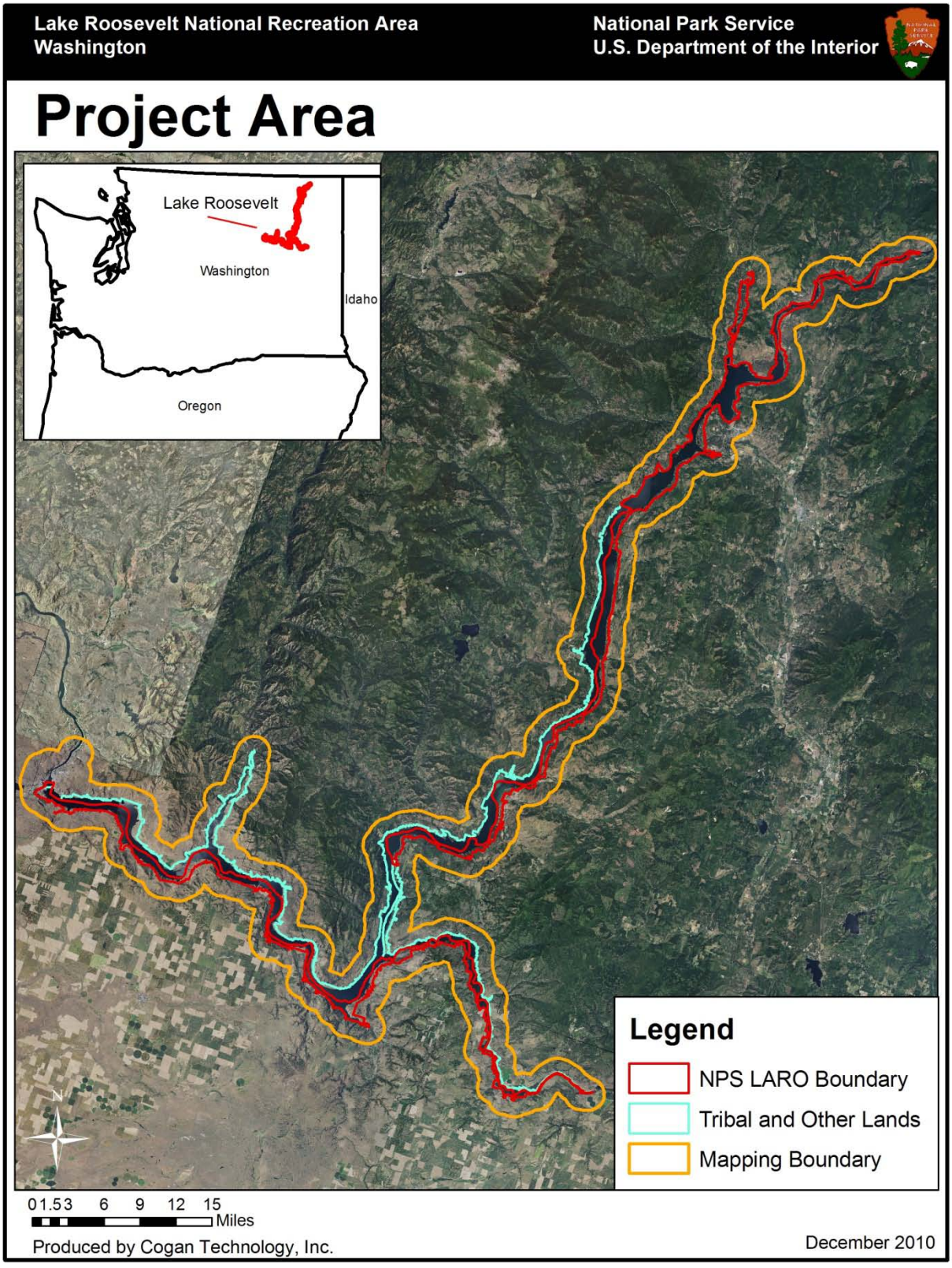


Figure 8. Map of the vegetation project boundary and land boundary.

Methods

The vegetation mapping project at LARO was considered to be in the "large park" category based on the overall size of the project area (TNC 1994b). As such, the standard methodology is to use a gradsect approach that stratifies the park into biophysical units based on environmental variables. However, for LARO, since much of the NPS lands were linear and accessible no formal gradsect was conducted, instead current aerial photos were used to create field maps and unique vegetation signatures were highlighted for potential sampling. In this way all of LARO was systematically visited throughout the summer of 2007. Based on this approach the assignment of responsibilities was divided into five major steps following the flowchart of major steps produced for the national program by the USGS (Appendix A). These responsibilities included the following:

1. Plan, gather data, and coordinate tasks;
2. Survey LARO to understand and sample the vegetation;
3. Classify the vegetation using the field data to NVCS standard associations and alliances and crosswalk these to recognizable map units;
4. Acquire current digital imagery and interpret the vegetation from this using the classification scheme and NVCS crosswalk;
5. Assess the accuracy of the final map product; and
6. Create the final project deliverables

All protocols for this project as outlined in the following sections can be found in documents produced by The Nature Conservancy (1994a, 1994b, and 1994c) for the USGS-NPS Vegetation Mapping Program and are found at this website: http://biology.usgs.gov/npsveg.

Planning, Data Gathering and Coordination

Based on the workplan and the contract commitments by UCBN, a series of preliminary project conference calls were held in 2005 and 2006 culminating in a scoping meeting at the Bureau of Reclamation's (BOR) Office at Grand Coulee Dam in September, 2006. This meeting was attended by representatives from the principle team members (including CTI, UCBN, IDCDC, NatureServe, Washington Heritage, Colville Confederated Tribe, and LARO staff) along with many other interested neighbors and potential cooperators. Representatives from the Spokane tribe were also invited but could not attend the scoping meeting. The goals of the scoping meeting were to 1) provide an overview of National Vegetation Inventory Program, 2) learn about LARO's management issues and concerns, 3) discuss availability of existing data, 4) develop a schedule, 5) discuss procedural issues and data, (6) define potential cooperators, and 7) finalize the scope of the project.

From this meeting, participants learned that the Lake Roosevelt reservoir area is a diverse and complicated place with 312 miles of shoreline just within LARO. Resource managers were interested in the presence and location of non-native plants, threatened and rare plant communities and forest health issues related to bug-infestations and fire. Also the mapping of the wildland-urban interface was deemed vital for future planning and management of encroaching developments. Interest in the project was high among the neighbors and most wanted copies of the final report and data.

The 2-km environs was approved as the project boundary and review of the existing vegetation data and imagery yielded the following datasets to review 1) 1991 black/white ortho-photography, 2) 2002 digital true color, 1-meter resolution ortho-photography, 3) 1974 scanned contour maps, oblique photos, 4) DVD movies of the entire shoreline, and 5) 1984 color infrared aerial photography at 1:24,000 scale. A reasonable schedule was set with the project completion scheduled for the end 2010 (Table 1).

Table 1. Project timeline for the LARO Vegetation Inventory Project.

	2006				2007				2008				2009				2010			
Planning and Scoping																				
Acquire Aerial Imagery																				
Field Data Collection																				
Image Interpretation																				
Vegetation Classification																				
Local & Global Descriptions																				
Spatial Database																				
Plant Association Field Key																				
Accuracy Assessment																				
Final Report and Products																				

Specific work responsibilities were assigned to the following participants:

LARO-UCBN-NPS Responsibilities

- Provide oversight and project funding;
- Provide LARO plant list;
- Supply digital boundary files and ancillary data files;
- Assist with fieldwork and logistical considerations;
- Work with Idaho Conservation Data Center to develop the vegetation classification;
- Compile, review, and update drafts of the vegetation map, classification and report;
- Accept the final products and close the project.

NMI Responsibilities

- Provide project management,
- Coordinate the field work with LARO;
- Collect representative plot data;
- Collect less detailed observations about the draft vegetation map;
- Write descriptions of the vegetation types found at LARO;
- Write a field key to the vegetation types found at LARO;
- Collect accuracy assessment data;
- Provide a final report describing all aspects of the project;
- Create a DVD with reports, metadata, guides, vegetation classification, plot data, spatial data, vegetation database (map), graphics, and ground photos.

Idaho Conservation Data Center (ICDC)

- Work with NPS to develop a vegetation classification for the study area based on the NVCS using quantitative analysis and ecological interpretation of the field data;
- Provide guidance regarding the crosswalk of vegetation types to map units;
- Review the local vegetation descriptions and field key;
- Review the final database containing the field data.

CTI Responsibilities

- Help with overall project facilitation and coordination;
- Verify vegetation and land use/land cover signatures on the imagery;
- Develop map units linked to the NVCS;
- Provide field maps and GIS support to the field crews;
- Interpret and delineate the final vegetation and land use types;
- Transfer and automate interpreted data to a digital spatial database;
- Produce spatial layers of plot and accuracy assessment site locations;
- Assist with the accuracy assessment by picking the stratified random target points, creating field maps and providing GIS support;
- Provide final report sections describing the mapping aspects of the project;
- Provide a visual guide to the photo signatures of each map unit;
- Document FGDC-compliant metadata for all vegetation data (FGDC 1998);
- Assist in creating the project DVD.

Field Surveys

Field methods used in this project followed NVMP standards (e.g., TNC 1994a, 1994b, 1994c). Data gathered during this project contributed to understanding vegetation relationships across broader landscapes beyond the boundaries of LARO. The plot dataset was enhanced by collecting observation point data, whose primary purpose was to support digital image interpretation and provide additional data about widespread plant associations. In addition to the basic vegetation data collected at each plot, the UCBN and LARO staff defined summary data fields and made suggestions for including additional information on the forms. Plot forms and individual data field descriptions appear in Appendix B.

The sampling area included all of LARO in addition to other public lands in the environs. Private lands in the environs as well as any private in-holdings within LARO were not visited. Because the project area was large, somewhat complex, and access could be difficult, general areas to be sampled were selected in advance of the 2007 field season. The sampling design was based on accessing roads and trails wherever possible and using the aerial photography to inform the sampling. Sampling was scheduled to begin in the southern half of LARO and precede to the north half as work was completed.

Field crews were trained and led by ecologists with experience sampling plant communities in national parks and other landscapes. The list of ecological systems, vegetation alliances, and component plant associations prepared by NatureServe provided a starting point for naming plant associations sampled in the field. The sampling goal was to collect between three and five classification plots in every vegetation alliance/association within the LARO project area.

However, some common associations were sampled more often and some rare types were sampled less often. 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.

Once a stand of vegetation was located that appeared to be representative of the plant communities in the area, a Relevé macroplot was laid out to capture its characteristics. In this manner, transitional areas such as ecotones were avoided. Highly disturbed areas were also avoided unless they supported a distinct plant community. Classification plots were generally located in stands exceeding the minimum mapping unit (MMU) of 0.5 hectares. A few classification plots were sampled in smaller patches of distinctive vegetation or communities of rare species. Plot size and shape requirements were consistent with National Vegetation Mapping Program guidelines (TNC and ESRI 1994a). Classification plot size was determined by the physiognomy of the community being sampled (Table 2) and measuring tapes were used to outline the sampling area. LARO plot shape was adjusted as needed to sample linear bands of vegetation in drainage bottoms or other confined sites. Plot size and shape were recorded for all plots.

Table 2. Plot sizes used for classification sampling at LARO.

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

After a plot was laid out environmental data was first recorded. These included: elevation, slope, aspect, landform, topographic position, soil texture and drainage, hydrologic (flooding) regime, and evidence of disturbance or wildlife use. The unvegetated surface was recorded as percent cover of each of the following: bedrock, litter and duff, wood, bare soil, large rocks (>10 cm), small rocks (0.2-10 cm), sand (0.1-2 mm), lichens, mosses, and fungi.

Next vegetation was visually divided into strata, with the height and canopy cover of vegetation estimated for each stratum. Physiognomic class, leaf phenology, and type of dominant stratum were recorded. The species of each stratum were then listed and percent canopy cover estimated using a twelve-point cover scale (e.g. <1%, 1-5%, >5-15% …) (Daubenmire 1959). Additional species within the vegetation unit that occurred outside of sampled plots were listed separately. No attempt was made to identify individual non-vascular plant species. Species that were not identifiable in the field were collected for later identification. Species were recorded by scientific epithet familiar to researchers. Finally, a provisional vegetation type was assigned to the plot.

Field staff collected the information for each of the vegetation plots in two ways. First, a species list was developed and recorded on field forms by the team botanist. GPS coordinates, field notes header information (Identifiers/Locators), environmental descriptions and a plot map were recorded on this form. All other field data was collected with mobile Archer Field PCs.
After all the physiognomic and environmental information was collected, researchers used a Garmin GPS 76CSX receiver to record the southeast corner of the plot (no permanent markers

were used). UTM NAD83 X-Y coordinates and elevation were recorded both manually on the plot forms and stored as waypoints in the GPS unit. Finally, four representative photos were taken facing the four cardinal directions (N, E, S, and W) from the edge of the quadrant facing plot center.

In addition to vegetation plots, field crews collected vegetation and environmental data at 47 observation points. Data collected at observation points reflected the vegetation of a loosely undefined area around the point (the "stand") rather than a measured plot, and were less detailed (Appendix B). Overall conditions at each observation point were documented by one or more digital 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 the environs outside the LARO boundary
- The vegetation was highly disturbed, ecotonal, or otherwise anomalous and therefore unlikely to be classified under the NVC
- Project photointerpreters requested documentation of a specific photo signature or area
- They wished to document special features as requested by LARO staff such as fuels concentrations or weed patches
- They wanted to document a vegetation type that consistently occurred in stands smaller than the 0.5 ha (1.24 acres) minimum mapping unit (MMU).

The data collection was conducted between May and July, 2006. Four hundred and thirty-one vegetation plots and 47 observation points were sampled (Figure 9).

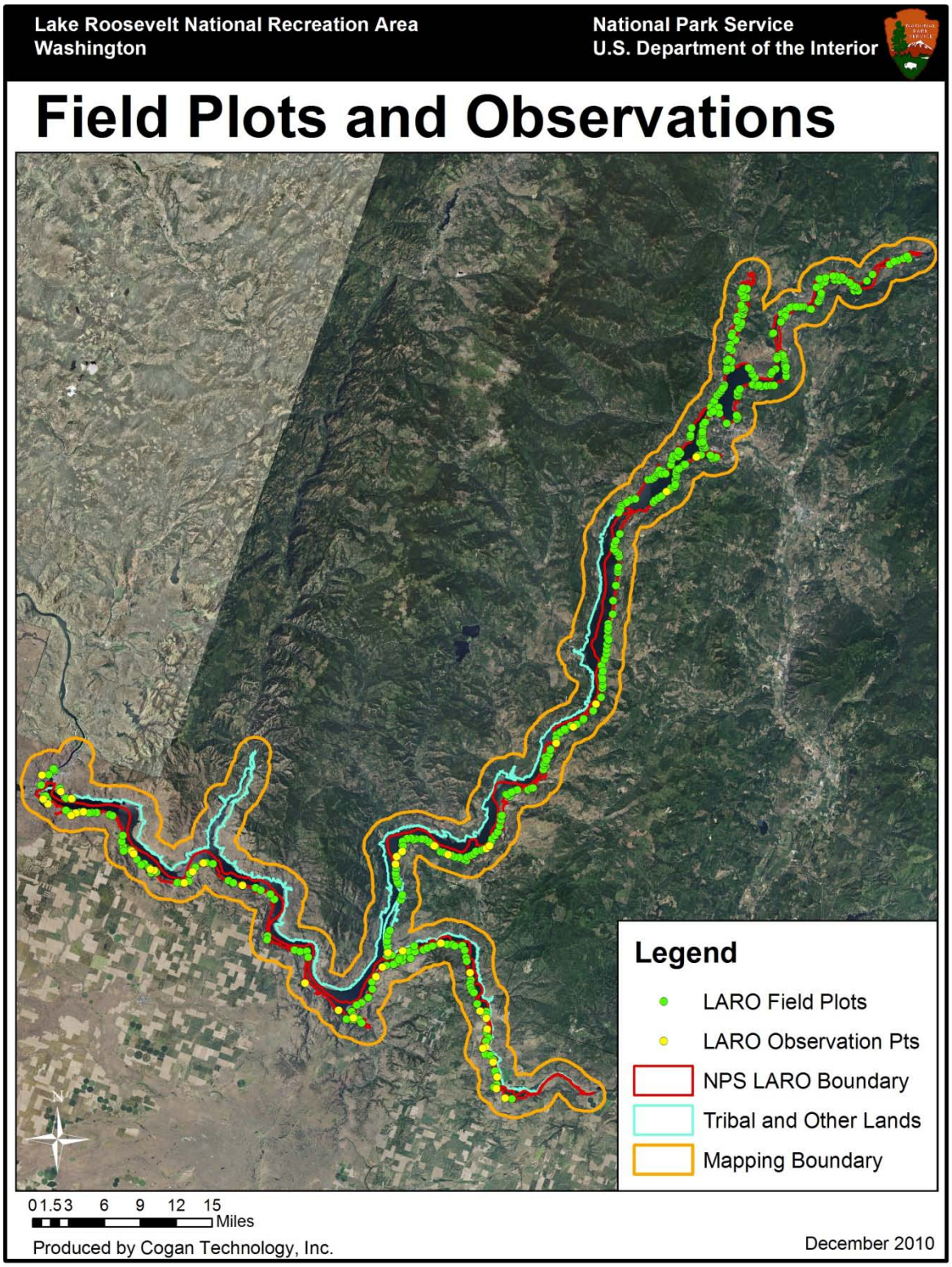


Figure 9. Vegetation plot and observation point locations at Lake Roovelt Nation Recreation Area

Vegetation Classification

Field data was collected on Archer Field PC's with Windows Mobile 5.0 operating systems using DataPlus software. All data from these units was transferred and managed in a Microsoft Access database. Electronic data was transferred directly from the data recorders (NMI created data dictionaries as needed) into Database Files (DBF). DBF files were reviewed by field crews for accuracy each night, then converted and stored in the appropriate database on a laptop computer. All additional field data not recorded electronically (such as field notes) was entered manually into the database for this project. Separate databases were established as necessary. Upon completion of field surveys, all recorded data were entered into a MS Access relational database. The database is a modified PLOTS2 database initially developed specifically for the NPS vegetation and mapping program, so that the electronic data entry fields mirrored the standard field form. Data entry was facilitated by utilizing drop down menus for each plant scientific name. Scientific names were updated according to the vascular plant list provided to the crews on the date of sampling found on the UCBN website: http://science.nature.nps.gov/im/units/ucbn/inventory/index.cfm#table and in Appendix E.

After data entry, checking was performed to minimize errors associated with duplicate entries or erroneously selected plant names. Problems regarding unknown species, especially those with high cover, were resolved, as were other taxonomic issues such as grouping subspecies and varieties judged to be ecologically similar. Data was regularly compiled and at the completion of the field work the final database was supplied to IDCDC for quantitative analysis. A GIS data layer was also developed at this time to document classification plot and observation point locations.

Quantitative analysis of the vegetation included preparing the LARO data for use in analytical programs by the conducting the following steps:

1). Standardize strata for certain taxa. Some taxa are listed in different strata in different plots even though they should all be the same, especially if there are multiple field crews. For example, cacti may sometimes be listed as shrubs and sometimes listed as herbaceous;

2). Create "pseudospecies" for each taxon by appending the stratum in which it was found in each plot to a code for the taxon.

3) The species lists were updated to include changes in the scientific names.

4). Remove plots with grossly incomplete or missing data.

Analytical methods were employed in a manner consistent with the objective of identifying natural associations of existing vegetation (The Nature Conservancy and Environmental Systems Research Institute 1994b; Tart *et al*. 2005; Jennings *et al*. 2006). Multivariate statistical analyses were conducted using PC-ORD (McCune and Mefford 1999). Initial plant community groups were identified using hierarchical cluster analysis. Plant community groups were successively partitioned to optimize within-group homogeneity, between-group difference, and the number of groups. These three factors were evaluated using statistics generated by indicator species

analysis (the mean p-value and number of significant [$p<0.05$] indicator species) and multi-response permutation procedures (T, a measure of separation between groups; the chance-corrected within-group agreement [A], a measure of within-group homogeneity; and the compositional similarity of samples within a group [as measured by average relative Sorensen distance]). Environmental relations, within-group homogeneity, and between-group difference were evaluated graphically using indirect gradient analysis through detrended correspondence analysis (McCune and Grace 2002). Final decisions regarding the naming of plant associations were informed by cross-walking candidate community groupings to the NVCS (NatureServe 2009). Classification and regression tree analysis (recursive partitioning) was employed in the development of dichotomous keys and the evaluation of classification results using the rpart package in R Development Core Team (2007).

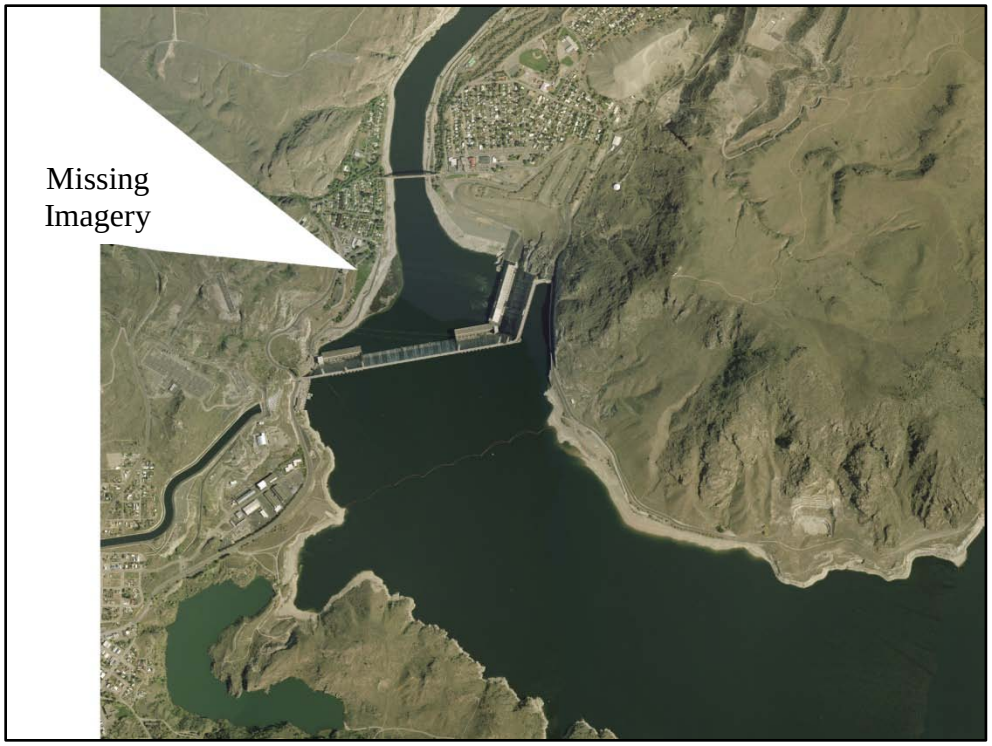
Plant nomenclature of the Integrated Taxonomic Information System (ITIS) as reflected by the PLANTS Database (USDA -NRCS 2007) was employed in the naming of plant associations. This was the National Vegetation Classification Standard and is necessary to discriminate differences among associations currently reported within the NVCS (Rust 2008).

LARO plant associations were named for the indicator (dominant or diagnostic) species of the vegetative strata present. The indicator species of the upper strata was listed first, followed by successively lower strata. Species that occurred in the same strata (or were the same lifeform) are separated by a hyphen (-). Indicator species that occurred in different strata (or are a different lifeform) were separated by a slash (/). Alliance names were concluded with the word "Alliance" to differentiate them from association names. Plant association names incorporated the physiognomic class in which the association was classified (e.g., Forest, Woodland, or Herbaceous (FGDC 1997, 2008 and in Rust 2008).

The final product of the classification stage was the creation of a field key and local descriptions. The dichotomous field key to LARO's plant associations was developed to assist users in identifying vegetation associations in the field (Appendix C). The local descriptions were based on the field data and provide LARO characteristics for each association (Appendix D).

Digital Imagery and Interpretation

Since LARO represented a large area, existing sources of imagery were evaluated and the 2002 digital ortho-photography provide by the BOR was found to be adequate to begin mapping. The 2002 imagery was originally used to begin the delineation of obvious land-use and physiognomic boundaries. Upon further examination of the 2002 imagery, areas in the environs were found to be missing imagery coverage. The lack of complete coverage coupled with the seven year lag in time from image acquisition to mapping prompted a search for a more complete and current supplemental basemap. In 2009, the National Agriculture Imagery Program (NAIP) acquired new 1-meter resolution (true-color format) for the entire state of Washington. After review, the NAIP imagery was deemed superior for this project and future mapping switched from the 2002 imagery to the 2009 product (Figure 10). All previous lines were updated and the final product is based solely on the 2009 NAIP ortho-imagery.



BOR-provided 2002 True-color 1-meter resolution imagery



NAIP 2009 True-color 1-meter resolution imagery

Figure 10. Examples of the 2002 and 2009 base-map imagery for LARO.

Mapping and interpretation at LARO involved a four step process consisting of: 1) field reconnaissance, 2) map class development, 3) image processing and interpretation, and 4) spatial database development. First, field reconnaissance was initiated by CTI and NMI staff during the field portion of the scoping meeting. The goal of this step was to quickly familiarize the photointerpreters with the vegetation patterns and distribution at LARO. Then as the plot data collection progressed in 2007, feedback on the dominate vegetation was solicited from the field crews as they traveled to unique areas of the LARO.

All of the ground information obtained in 2007 was documented and summarized to apply to the NAIP ortho-imagery and the final list of NVC associations for LARO in 2008 and 2009. CTI created preliminary map classes based on the ORNHIC preliminary list of plant associations developed from previous projects and all developed areas, roads, streams, badlands exposures, and other obvious features were manually digitized and incorporated with the project boundary into a draft GIS layer.

In the fall of 2009, CTI compared the initial map classes to both the new NAIP imagery and a draft of the classification. Emphasis was placed on the ability to accurately delineate homogenous polygons from the base ortho-imagery. In general, the level of detail possible in a vegetation map is limited by the imagery, the skill and experience of the interpreter and mapper, and the availability of supporting information. The relationships between the map classes and plant associations are complex. In most cases, the LARO map classes were derived on a 1 association or alliance to 1 map class basis. However due to the limitations of the imagery some of the associations could not be recognized consistently. This issue was addressed by either scaling up the NVCS to the alliance level or combining similar associations/alliances into complexes or mosaics. Complexes were used when associations/alliances could not be discerned from each other. Conversely, mosaics were used when associations/alliances could be discerned but were so small and intertwined that mapping would prove to be impractical.

All of the resulting map classes were reviewed by UCBN and LARO staff. Based on their recommendations some additional park-specific or “Park Specials” were defined. These included:

- Wetlands and riparian stands below the minimum mapping unit (mmu) (e.g. birch, willow, cottonwood, etc);
- Weedy and non-native areas separated into multiple map units;
- Rock, talus and other sparse or unvegetated sites;

In some cases, new NVCS associations/alliances were later matched to these park special map units. In addition to the map classes, LARO staff also wanted emphasis placed on noting burned/logged areas and delineating areas with cheatgrass, crested wheatgrass, and other non-native species. To round-out the mapping scheme, map classes were created for land use types based on a mapping system developed by Anderson et al. (1976). This included areas not covered by the NVCS, such as roads, facilities, and agricultural fields.

Mapping began in earnest in 2007 by re-sampling the 2002 imagery to a 3-meter pixel resolution and then segmenting it using eCognition software. Initial segments were created to delineate obvious landforms (e.g. open water and fields) and physiognomic features (e.g. grasslands versus woodlands). The objective of the segmentation was to create a system of lines with as coarse a scale as possible without omitting most of the small, important and obvious land cover patches. By incrementally increasing segmentation size within the program, small image objects (i.e. preliminary polygons) were continuously merged into larger ones. Completion of the segmentation was based on visual judgment of the analyst when obvious, distinct features were lost. At this point in the process, the previous segmentation was adopted as the final treatment.

Following segmentation, the lines were exported as ArcInfo shapefiles and converted to ArcInfo coverages. The resulting coverages were run through a series of smoothing routines until no obvious artificial or relict breaks in the lines were visible. Following smoothing, the line-work was manually cleaned to remove extraneous lines, small polygons, and polygons that obviously split a homogenous stand of vegetation.

The cleaned lines were then overlain on the new 2009 NAIP imagery and visually inspected for completeness. At this stage the mapping switched from an automated process to a manual interpretation effort. Using plot data, field notes and ancillary GIS data polygons were edited, split, and merged through on-screen digitizing to create consistent, homogenous polygons that matched the mapping scheme. Mapping work progressed by first completing all of the lands inside LARO in anticipation of the accuracy assessment in 2009. Then work continued in the much larger environs relying heavily on the mapping and field data conducted within the recreation area.

When the interpretation effort was considered complete, topology for the final polygon layer was built and attributed and then imported into a spatial database (geodatabase). Each polygon was attributed with its own appropriate map unit name, code, and modifier. Polygon specific modifiers included additional data on the height, density, and patterns of the dominate vegetation. Also disturbed polygons were identified in a comments field along with any notable locally dominate plant species. Finally other map class data such as the NVCS crosswalk and the land-use classes were added (Table 3).

Table 3. Polygon attribute items and descriptions used in the LARO vegetation map GIS coverage.

ATTRIBUTE	DESCRIPTION
AREA*	Surface area of the polygon in meters squared
PERIMETER*	Perimeter of the polygon in meters
LARO_VEG#*	Unique code for each polygon
LARO_VEG-ID*	Unique identification code for each polygon
VEG_CODE	Final Map Unit Codes – Project specific
MAP_DESC	Map Unit Common Description Name – Project specific
DENS_MOD	Modifier - Percent cover of the upper stratum layer in the polygon Percent cover classes: Very Sparse **<10%**, Sparse **10 - 25%,** Open **25 - 60%,** Discontinuous - Closed **> 60%**
PTRN_MOD	Modifier - Vegetation pattern within the polygon Vegetation pattern classes: Evenly Dispersed **= Homogeneous** Grouped Stands of Vegetation = **Bunched / Clumped,** String of Vegetation **= Linear**
HT_MOD	Modifier - Height range of the dominant vegetation layer Height classes: **< 1, 1-5, 5-15, 15-30 & >30 meters**
CES_CODE	Ecological Systems Code – NVCS derived (NatureServe)
CES_NAME	Ecological Systems Name – NVCS derived (NatureServe)
NVC_ELCODE	Corresponding Association Code – NVCS derived (NatureServe) Association **=** Community Element Global Code – Elcode link to the NVCS
ASSN_NAME	Project Community Name - NVCS Association(s)
ASSN_CNAME	Project Common Community Name - synonym name of Association(s)
NVCS_CODE	NVCS Code - to NVCS Formation level
ALL_CODE	Alliance Name Code – NVCS derived (NatureServe) Alliance = Alliance Global Code – Alliance Link to the NVCS
ALL_NAME	Project Alliance Name = NVCS Alliance(s)
ALL_CNAME	Project Common Alliance Name = NVCS Alliance(s)
FORMATION	NVCS Formation = Formation name NVCS Code – Formation name
SUBGROUP	NVCS Formation Subgroup = NVCS Code – Subgroup name
GROUP	NVCS Formation Group = NVCS Code – Group name
SUBCLASS	NVCS Formation Subclass = NVCS Code – Subclass name
CLASS	Formation Class = NVCS Code – Class name
LUC_II_GEN	General Land Use and Land Cover Classification System Name Project specific based on Level I or II of Anderson et al. (1976)
LUC_II	Specific Land Use and Land Cover Classification System Name Project specific Level II or Level III of Anderson et al. (1976)
COMMENTS	Additional Comments about the Vegetation in Individual Polygons
ACRES	Surface area of the polygon in acres

(*****ArcInfo© default items)

Accuracy Assessment

Once the mapping was completed and finalized inside LARO the accuracy assessment (AA) was conducted. AA is a statistical test of how well the vegetation map represents vegetation on the ground. The AA compares field observations with the map class assignment. 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 or that it was confused with other map units and not sufficiently delineated. Conversely, low producer's accuracy combined with high user's accuracy indicates that a type is over-mapped or that more of this type was mapped than actually occurs on the ground.

The thematic accuracy of the vegetation map was assessed using the methodology following the standards provided by the national program's Accuracy Assessment Procedures manual (TNC 1994c). This methodology included a four step process consisting of a sample design, sample site selection, data collection, and data analysis. The design of the AA process followed the five possible scenarios provided in the field manual with stratified random targets placed in each map class based on their respective frequency and abundance. The AA included most vegetation map classes and was limited to lands within the NPS LARO boundary; private inholdings, tribal lands, and private lands outside of LARO were not included in the accuracy evaluation. Sample sizes for each evaluated map class were selected using the NVMP guidelines (TNC et al. 1994b). The design of the AA process followed the five possible scenarios provided in the guidelines with stratified random targets placed in each map class based on their respective frequency and abundance (Table 4).

All AA parameters were loaded into a custom GIS program along with the vegetation layer. After some reformatting of the data the program automatically picked the various random target locations, buffered them 10 meters away from any polygon boundary, and 50 meters away from any other point. Being able to choose minimum distance to polygon boundaries helped to minimize confusion and accounted for the horizontal error typically encountered in common GPS receivers (±5 m). The resulting target locations were restricted to only within the boundaries of LARO due to private land access constraints. Eighteen land-use and geologic map classes and four sparse vegetation map units (Talus, Dune, Gravel Bar, and Rock Outcrop) were excluded because they are essentially unvegetated or all known sites were already sampled. In addition two vegetation map classes (Rocky Mountain juniper woodland and ponderosa pine / sparse understory woodlands) were also excluded since they occurred outside of the recreation area boundary.

Table 4. Sampling protocol for AA points.

Scenario	Description	# Polygons	Area (ac)	Recommended # of Samples
A	The class is abundant. It covers more than 50 hectares of the total area and consists of at least 30 polygons. In this case, the recommended sample size is 30.	> 30	> 125	30
B	The class is relatively abundant. It covers more than 50 hectares of the total area but consists of fewer than 30 polygons. In this case, 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.	< 30	> 125	20
C	The class is relatively rare. It covers less than 50 hectares of the total area but consists of more than 30 polygons. In this case, 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.	> 30	< 125	20
D	The class is rare. It has more than 5 but fewer than 30 polygons and covers less than 50 hectares of the area. In this case, the recommended number of samples is 5. 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 5 sample sites will therefore probably result in multiple sample sites within the same (small) polygon. Collecting 5 sample sites will allow an accuracy estimate to be computed, although it will not be very precise.	5-30	< 125	5
E	The class is very rare. It has fewer than 5 polygons and occupies less than 50 hectares of the total area. In this case, it is recommended that the existence of the class be confirmed by a visit to each sample site. The rationale for the recommendation is that with fewer than 5 sample sites (assuming 1 site per polygon) no estimate of level of confidence can be established for the sample (the existence of the class can only be confirmed through field checking).	< 5	< 125	Visit all and confirm

Accuracy assessment point data were collected at LARO during the 2009 field season. Once the target locations were selected, ecologists were provided with draft field maps, overview maps, map unit definitions, the field key to the associations (Appendix C), and digital GPS files containing the location of the AA targets. The ecologists traveled to the AA target sites and determined the vegetation association using the field key. At each target they recorded the primary, secondary or tertiary associations that occurred within a roughly 50-meter radius. They also recorded height and cover of vegetative strata, environmental data, and percent canopy cover of the major species (see field form Appendix B). Other nearby vegetation types outside the 50-meter radius and any recent disturbance were also recorded. To better assist the analysis 4 photographs were taken at each AA point, in the sequence of cardinal directions, N-E-S-W.

Data from the 709 sampled AA sites were imported from the database into a GIS layer (Figure 11) where they were visually compared in two stages to the vegetation map. The first step was to compare the AA points to the original target locations to check for erroneous points and remove these from further analysis. General errors in the data were recorded at this time, including documenting points that had GPS and location errors. The most common GPS receiver error included transposing two UTM coordinate numbers. Location errors involved having the final AA point occur in the wrong target polygon either due to bad GPS satellite positioning or the point occurred too close to a polygon boundary. This initial review led to the removal of seven AA sites that were either collected in the wrong target polygon or had erroneous UTM coordinates. Nomenclature standards and other data management procedures were the same as for the classification plot data.

The second review step involved deciding between the primary and secondary call for the plant association as recorded by the field crew. In larger vegetation mapping projects such as Rocky Mountain National Park (Salas et al. 2004), AA analysis has involved fuzzy logic which assigns different levels of accuracy based on the primary, secondary and tertiary calls. However due to the confusion that fuzzy logic can cause, a simple binary assessment was conducted. CTI assigned a final map unit for every point by choosing between the primary and secondary calls. This was accomplished by first adding a new attribute to the point layer labeled “Final_Code and then by comparing the assigned field names of the point with its corresponding location on the digital imagery. In most cases the primary vegetation map unit name assigned by the field crew was used. However some points were assigned their secondary field call based on one of the following reasons: 1) it appeared that the second call was the better choice due to the overhead perspective (e.g. a stand judged to be sparse woodland on the imagery vs. herbaceous vegetation in the field), 2) the data were actually recorded in a stand that was too small (i.e. inclusion), or 3) the second call better matched the ecological context (e.g. riparian woodland located next to a stream vs. upland woodland located next to a stream).

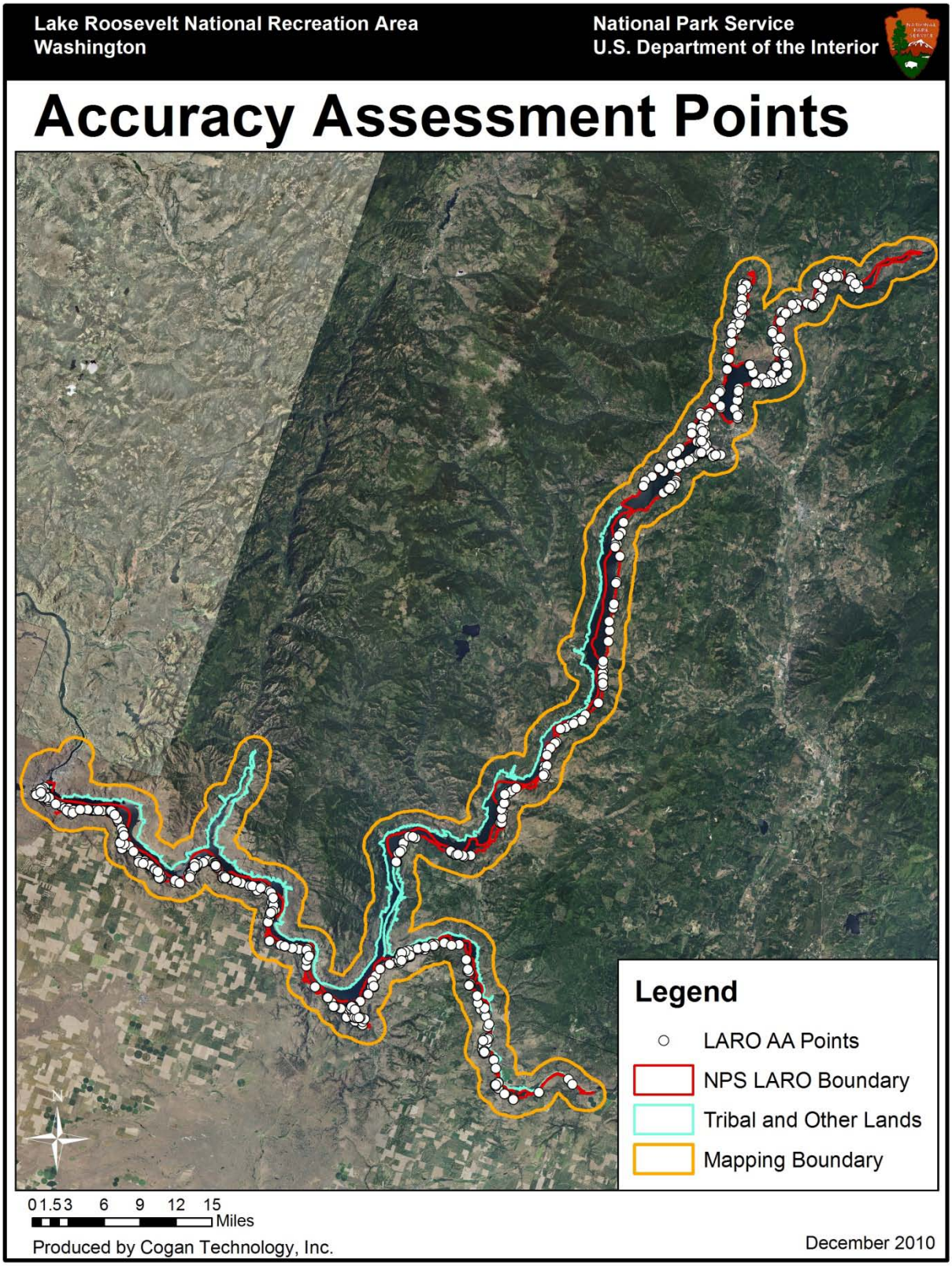


Figure 11. Location of the accuracy assessment (AA) points in Lake Roovelt Nation Recreation Area.

Once the data were reviewed the accuracy analysis was conducted. In the case of LARO, the process was streamlined using methods developed from previous studies at Rocky Mountain National Park (Salas et al. 2004) and Wupatki National Monument (Hansen et al. 2004). Specifically many of the in-house GIS programs developed for these projects were used to compare the AA data, generate confidence intervals, Kappa statistics, and error matrices (contingency tables). Through this automated process, the final map units in the AA layer were compared to the map unit designations for their corresponding polygons. All of the statistics and calculations used to analyze these data are described at length in the program manuals (TNC 1994c) and are summarized in Table 5. Final assessments for each point were recorded using an error matrix.

Table 5. Statistics used in AA analysis.

Statistic	Formula	Description
User's - accuracy:	$\frac{n_{ii}}{n_{i+}}$	Where *i* is the land cover type, n_{ii} is the number of matches between map and reference data and n_{i+} is the total number of samples of *i* in the map. This formula is the number of "correct" observations divided by the sum of the row.
Producer's accuracy	$\frac{n_{ii}}{n_{+i}}$	Where n_{+i} = total number of sample of *i* in the reference data. This formula is the number of "correct" observations divided by the sum of the column.
Confidence Interval	$\hat{p} \pm \left\{ z_{\alpha} \sqrt{\frac{\hat{p}(1-\hat{p})}{n} + \frac{1}{(2n)}} \right\}$	Where $z_{\alpha =}$ 1.645 (this comes from a table of the z-distribution at the significance level for a two-sided limit with a 90% confidence interval). The term 1/ (2n) is the correction for continuity. The correction should be applied to account for the fact the binomial distribution describes discrete populations $\hat{P}$ = the sample accuracy (0 -1.0), *n* = the number of sites sampled.
Kappa Index	$k = \frac{N\sum_{i=1}^{r} x_{ii} - \sum_{i=1}^{r}(x_{i+} \mathrm{x}\, x_{+i})}{N^2 - \sum(x_{i+} \mathrm{x}\, x_{+i})}$	Where *N* is the total number of sites in the matrix, *r* is the number of rows in the matrix, x_{ii} is the number in row *i* and column *i*, x_{+i} is the total for row *i*, and x_{i+} is the total for column *I*.

Results

Vegetation Classification

Seven hundred and forty-nine individual plant species were documented during the course of the field data collection (Appendix E). Based on the dominate plant species and other factors the vegetation was further classified into 81 community types occurring within LARO (Rust 2008) and two additional communities that occur in the surrounding environs (Table 6). Fifty-nine percent of associations identified within the national recreation area are currently listed in the NVC. Associations described but not recognized by the NVC include 12 semi-natural vegetation associations and 21 plant associations that have not been described previously at the association level. Distinctive plant associations that should be considered for inclusion in the NVC include: *Pinus ponderosa / Shepherdia canadensis* Woodland, *Purshia tridentata - Salvia dorrii / Pseudoroegneria spicata* Dwarf-shrubland, and *Rhus glabra / Hesperostipa comata* Shrubland. Associations that appear unique, are not listed in the National Vegetation Classification (NatureServe 2009), but require further regional review include: *Carex vulpinoidea - Phalaris arundinacea* Herbaceous Vegetation, *Crataegus douglasii /* Mesic Graminoids Shrub Herbaceous Vegetation, *Ericameria nauseosa / Achnatherum hymenoides* Sparse Vegetation, *Hesperostipa comata* Herbaceous Vegetation, and *Philadelphus lewisii / Pseudoroegneria spicata* Shrubland. Table 6 lists all associations by scientific name, common name, code, and number of plots/association. They are ordered by physiognomy: forests and woodlands, shrublands, herbaceous, and sparse vegetation.

Forest and Woodland Associations

Conifer woodlands and forests were prevalent at LARO. Douglas fir and ponderosa pine were the clear dominates with some rare Rocky Mountain juniper stands. Deciduous trees were limited to mesic stands of aspen, cottonwood and paper birch. Non-native deciduous trees such as American elm, black locust, and Norway maple were common in and around developed areas.

Shrubland Associations

Shrublands were also extensive with deciduous shrub communities common in the north and dry, xeric-steppe shrub associations more common in the south. Common deciduous shrubs include alder, snowberry, sumac and hawthorn. Widespread xeric shrubs include antelope bitter brush, various sagebrush species and rabbitbrush.

Herbaceous Associations

Grass and forb associations were common in forest openings, hillslopes and benches. Common natives included bluebunch wheatgrass and Idaho fescue. Non-native grasses were extensive in the environs and include monotypic stands of cheatgrass, crested wheatgrass, and intermediate wheatgrass and pasture plantings of smooth brome, Kentucky bluegrass and cereal rye. Weedy sites are rare but locally common in and around disturbed logging and agricultural sites.

Riparian and Wetland Forest and Woodland Associations

Mesic riparian woodlands were common along the reservoir shoreline and in major drainages. Dominates included black cottonwood and paper birch

Table 6. List of plant associations for LARO.

Scientific Name	Common Name	Code	Elcode	N
Forest and Woodland				
Pseudotsuga menziesii / *Acer glabrum* Forest	Douglas-fir / Rocky Mountain maple Forest	PSME/ACGL	CEGL000418	9
Pseudotsuga menziesii / *Physocarpus malvaceus* Forest	Douglas-fir / mallow ninebark Forest	PSME/PHMA5	CEGL000447	17
Pseudotsuga menziesii / *Pseudoroegneria spicata* Woodland	Douglas-fir / Bluebunch wheatgrass Woodland	PSME/PSSP6	CEGL000908	5
Pseudotsuga menziesii / *Symphoricarpos albus* Forest	Douglas-fir / Common snowberry Forest	PSME/SYAL	CEGL000459	16
Pinus ponderosa / *Mahonia aquifolium* Woodland	Ponderosa pine / Hollyleaved barberry Woodland	PIPO/MAAQ2		4
Pinus ponderosa / *Mahonia repens* Woodland	Ponderosa pine / Creeping barberry Woodland	PIPO/MARE11	CEGL000187	5
Pinus ponderosa / *Amelanchier alnifolia* Woodland	Ponderosa pine / Saskatoon serviceberry Woodland	PIPO/AMAL2	CEGL000840	25
Pinus ponderosa / *Bromus tectorum* Woodland	Ponderosa pine / Cheatgrass Woodland	PIPO/BRTE		22
Pinus ponderosa / *Crataegus douglasii* Woodland	Ponderosa pine / Black Hawthorn Woodland	PIPO/CRDO2	CEGL000855	1
Pinus ponderosa / *Festuca idahoensis* Woodland	Ponderosa pine / Idaho fescue Woodland	PIPO/FEID	CEGL000857	1
Pinus ponderosa / *Hesperostipa comata* Woodland	Ponderosa pine / Needle and thread Woodland	PIPO/HECO26	CEGL000879	3
Pinus ponderosa / *Pseudoroegneria spicata* Woodland	Ponderosa pine / Bluebunch wheatgrass Woodland	PIPO/PSSP6	CEGL000865	11
Pinus ponderosa / *Purshia tridentata* Woodland	Ponderosa pine / Antelope bitterbrush Woodland	PIPO/PUTR2	CEGL000867	34
Pinus ponderosa / *Shepherdia canadensis* Woodland	Ponderosa pine / Russet buffaloberry Woodland	PIPO/SHCA		7

Scientific Name	Common Name	Code	Elcode	N
Pinus ponderosa / *Symphoricarpos albus* Forest	Ponderosa pine / Common snowberry Woodland	PIPO/SYAL	CEGL000203	92
Juniperus scopulorum Woodland	Rocky Mountain juniper Woodland	JUSC2	CEGL003550	1
Populus balsamifera ssp. trichocarpa / *Symphoricarpos albus* Woodland	Black cottonwood / Common snowberry Woodland	POBAT/SYAL		5
Populus balsamifera ssp. *trichocarpa* / Mixed Herbs Forest	Black cottonwood / Mixed forbs Forest	POBAT/MIXED FORBS	CEGL000675	1
Populus balsamifera ssp. *trichocarpa* / *Salix exigua* Forest	Black cottonwood / Narrowleaf willow Forest	POBAT/SAEX	CEGL000676	1
Populus tremuloides / *Symphoricarpos albus* Forest	Quaking aspen / Common snowberry Forest	POTR5/SYAL	CEGL000609	2
Acer platanoides Planted Woodland	Norway maple Planted Woodland	ACPL	CEGL006407	1
Betula papyrifera Forest	Paper birch Forest	BEPA	CEGL000520	2
Robinia pseudoacacia Semi-natural Forest	Black locust Semi-natural Forest	ROPS		2
Ulmus americana / *Bromus tectorum* Semi-natural Woodland	American elm / Cheatgrass	ULAM/BRTE		1
Shrubland				
Amelanchier alnifolia / *Pseudoroegneria spicata* Shrubland	Saskatoon serviceberry / Bluebunch wheatgrass Shrubland	AMAL2/PSSP6	CEGL001065	5
Alnus incana / Mesic Forbs Shrubland	Gray alder / Mesic forbs Shrubland	ALIN2/MESIC FORBS	CEGL001147	1
Alnus viridis ssp. sinuata / Mesic Forbs Shrubland	Sitka alder / Mesic forbs Shrubland	ALVIS/MESIC FORBS	CEGL002633	1
Artemisia tridentata / *Bromus tectorum* Semi-natural Shrubland	Big sagebrush / Cheatgrass Shrubland	ARTR2/BRTE		1

Scientific Name	Common Name	Code	Elcode	N
Artemisia tridentata / *Festuca idahoensis* Shrub Herbaceous Vegetation	Big sagebrush / Idaho fescue Shrub Herbaceous Vegetation	ARTR2/FEID	CEGL001530	2
Artemisia tridentata / *Leymus cinereus* Shrub Herbaceous Vegetation	Big sagebrush / Basin wildrye Shrub Herbaceous Vegetation	ARTR2/LECI4	CEGL001458	2
Artemisia tridentata ssp. wyomingensis / *Hesperostipa comata* Shrubland	Wyoming big sagebrush / Needle and thread Shrubland	ARTRW8/HECO26	CEGL001051	5
Artemisia tridentata ssp. wyomingensis / *Pseudoroegneria spicata* Shrubland	Wyoming big sagebrush / Bluebunch wheatgrass Shrubland	ARTRW8/PSSP6	CEGL001009	6
Artemisia tripartita ssp. *tripartita* / *Poa secunda* Shrubland	Threetip sagebrush / Sandberg bluegrass Shrubland	ARTRT2/POSE		2
Betula occidentalis / *Cornus sericea* Shrubland	Water birch / Redosier dogwood Shrubland	BEOC2/COSE16	CEGL001161	1
Chrysothamnus viscidiflorus / *Bromus tectorum* Semi-natural Shrub Herbaceous Vegetation	Yellow rabbitbrush / Cheatgrass Semi-natural Shrub Herbaceous Vegetation	CHVI8/BRTE		1
Crataegus douglasii / *Mesic Graminoids* Shrub Herbaceous Vegetation	Black hawthorn / Mesic graminoids Shrub Herbaceous Vegetation	CRDO2/MESIC		3
Ericameria nauseosa / *Bromus tectorum* Semi-natural Shrubland	Rubber rabbitbrush / Cheatgrass Semi-natural Shrubland	ERNA10/BRTE	CEGL002937	7
Eriogonum niveum / *Bromus tectorum* Dwarf-shrub Herbaceous Vegetation	Snow buckwheat / Cheatgrass Dwarf-shrub Herbaceous Vegetation	ERNI2/BRTE		3
Philadelphus lewisii / *Pseudoroegneria spicata* Shrubland	Lewis' mock orange / Bluebunch wheatgrass Shrubland	PHLE4/PSSP6		1
Prunus virginiana Shrubland	Chokecherry Shrubland	PRVI		2
Purshia tridentata - Salvia dorrii / *Pseudoroegneria spicata ssp. spicata* Dwarf-shrubland	Antelope bitterbrush - purple sage / Bluebunch wheatgrass Dwarf-shrubland	PUTR2-SADO4/PSSP6		2

Scientific Name	Common Name	Code	Elcode	N
Purshia tridentata / *Achnatherum hymenoides* Shrubland	Antelope bitterbrush / Indian ricegrass Shrubland	PUTR2/ACHY	CEGL001058	1
Purshia tridentata / *Bromus tectorum* Semi-natural Shrubland	Antelope bitterbrush / Cheatgrass Semi-natural Shrubland	PUTR2/BRTE		16
Purshia tridentata / *Festuca idahoensis* Shrub Herbaceous Vegetation	Antelope bitterbrush / Idaho fescue Shrub Herbaceous Vegetation	PUTR2/FEID	CEGL002674	4
Purshia tridentata / *Hesperostipa comata* Shrub Herbaceous Vegetation	Antelope bitterbrush / Needle and thread Shrub Herbaceous Vegetation	PUTR2/HECO26	CEGL001498	12
Purshia tridentata / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation	Antelope bitterbrush / Bluebunch wheatgrass	PUTR2/PSSP6	CEGL001495	7
Rhus glabra / *Hesperostipa comata* Shrubland	Smooth sumac / Needle and thread Shrubland	RHGL/HECO26		3
Rosa gymnocarpa Shrubland	Dwarf rose Shrubland	ROGY 1		1
Rosa woodsii Shrubland	Woods' rose Shrubland	ROWO	CEGL001126	2
Salix alba / *Poa pratensis* Semi-natural Shrubland	White willow / Kentucky bluegrass Semi-natural Shrubland	SAAL2/POPR		1
Salix exigua / Barren Shrubland	Narrowleaf willow / Barren Shrubland	SAEX/BARREN	CEGL001200	4
Salix exigua / *Equisetum arvense* Shrubland	Narrowleaf willow / Field horsetail Shrubland	SAEX/EQAR	CEGL001201	1
Symphoricarpos albus Shrubland	Common snowberry Shrubland	SYAL	CEGL005890	15
Symphoricarpos albus / *Bromus tectorum* Semi-natural Shrubland	Common snowberry / Cheatgrass Semi-natural Shrubland			
Herbaceous Vegetation				
Agropyron cristatum Semi-natural Herbaceous Vegetation	Crested wheatgrass Semi-natural Herbaceous Vegetation	AGCR		1
Bromus inermis Semi-natural Herbaceous Vegetation	Smooth brome Semi-natural Herbaceous Vegetation	BRIN2		2
Bromus tectorum Semi-natural Herbaceous Vegetation	Cheatgrass Semi-natural Herbaceous Vegetation	BRTE	CEGL003019	19

Scientific Name	Common Name	Code	Elcode	N
Carex vulpinoidea - Phalaris arundinacea Herbaceous Vegetation	Fox sedge - Reed canarygrass Herbaceous Vegetation	CAVU2-PHAR3		4
Centaurea diffusa Semi-natural Herbaceous Vegetation	Diffuse Knapweed Semi-natural Herbaceous Vegetation	CEDI3		1
Dactylis glomerata Semi-natural Herbaceous Vegetation	Orchardgrass Semi-natural Herbaceous Vegetation	DAGL		1
Dichanthelium oligosanthes var. *scribnerianum* Herbaceous Vegetation	Scribner's rosette grass Herbaceous Vegetation	DIOLS		6
Distichlis spicata Herbaceous Vegetation	Saltgrass Herbaceous Vegetation	DISP	CEGL001770	1
Eriogonum compositum / *Poa secunda* Dwarf-shrub Herbaceous Vegetation	Arrowleaf buckwheat / Sandberg bluegrass Dwarf-shrub Herbaceous Vegetation	ERCO12/POSE	CEGL001784	1
Festuca idahoensis Herbaceous Vegetation	Idaho fescue Herbaceous Vegetation	FEID	CEGL001897	2
Festuca ovina Semi-natural Herbaceous Vegetation	Sheep fescue Semi-natural Herbaceous Vegetation	FEOV		4
Gravel Bar Herbaceous Vegetation	Gravel bar Herbaceous Vegetation	GRAVEL BAR		2
Hesperostipa comata ssp. comata Herbaceous Vegetation	Needle and thread Herbaceous Vegetation	HECO26		5
Juncus balticus Herbaceous Vegetation	Baltic rush Herbaceous Vegetation	JUBA	CEGL001838	3
Leymus cinereus Herbaceous Vegetation	Basin wildrye Herbaceous Vegetation	LECI4	CEGL001479	1
Phalaris arundinacea Western Herbaceous Vegetation	Reed canarygrass Herbaceous Vegetation	PHAR3	CEGL001474	8
Poa pratensis Semi-natural Herbaceous Vegetation	Kentucky bluegrass Semi-natural Herbaceous Vegetation	POPR		7

Scientific Name	Common Name	Code	Elcode	N
Pseudoroegneria spicata - Poa secunda / Balsamorhiza sagittata Herbaceous Vegetation	Bluebunch wheatgrass - Sandberg bluegrass / Arrowleaf balsamroot Herbaceous Vegetation	PSSP6-POSE/BASA3	CEGL001662	4
Pseudoroegneria spicata / Eriogonum heracleoides Herbaceous Vegetation	Bluebunch wheatgrass / Parsnipflower buckwheat Herbaceous Vegetation	PSSP6/ERHE2	CEGL001668	1
Puccinellia nuttalliana Herbaceous Vegetation	Nuttall's Alkali Grass Herbaceous Vegetation	PUNU	CEGL001799	
Schoenoplectus acutus Herbaceous Vegetation	Hardstem bulrush Herbaceous Vegetation	SCAC3	CEGL001840	1
Secale cereale Planted Herbaceous Vegetation	Cereal rye Herbaceous Vegetation	SECE	CEGL004382	1
Schoenoplectus acutus Herbaceous Vegetation	Hardstem Bulrush Herbaceous Vegetation	SCAC	CEGL001840	
Sporobolus cryptandrus Shrub Herbaceous Vegetation	Sand dropseed Shrub Herbaceous Vegetation	SPCR	CEGL001514	1
Thinopyrum intermedium Semi-natural Herbaceous Vegetation	Intermediate wheatgrass Semi-natural Herbaceous Vegetation	THIN6	CEGL002935	9
Sparse Vegetation				
Ericameria nauseosa / Achnatherum hymenoides Sparse Vegetation	Rubber rabbitbrush / Indian ricegrass Sparse Vegetation	ERNA10/ACHY		1
Lacustrine Cut Bank Sparse Vegetation	Lacustrine Cut Bank Sparse Vegetation	LACUSTRINE CUT BANK		3
Philadelphus lewisii / Pseudoroegneria spicata Rock Outcrop Sparse Vegetation	Lewis' mock orange / Bluebunch wheatgrass Rock Outcrop Sparse Vegetation	PHLE4/PSSP6 ROCK		2
Pseudotsuga menziesii / Philadelphus lewisii Talus Sparse Wooded Vegetation	Douglas-fir / Lewis' mock orange Talus Sparse Wooded Vegetation	PSME/PHLE4 TALUS		2

Riparian and Wetland Shrubland Associations
Mesic riparian and wetland shrub communities were found in minor drainages and along the reservoir shoreline. Plant associations of willows, alders, and water birch were among the most common.

Riparian and Wetland Herbaceous Associations
Mesic riparian and wetland herbaceous associations were common in mesic forest openings, around seeps and springs and in the shoreline margins. Common species included Baltic rush, reed canarygrass, foxtail sedge.

All of the plant associations were placed into an ecological system to provide a broader more landscape perspective. The ecological system classification only addresses natural landscapes and land-use categories used to identify developed areas were not included. Twenty-one ecological systems were found to occur within the LARO vegetation mapping project area (Rust 2008) (Table 7).

Table 7. List of ecological systems found in LARO.

Ecological System	NVC Code
Columbia Basin Foothill Riparian Woodland and Shrubland	CES304.768
Columbia Plateau Scabland Shrubland	CES304.770
Columbia Plateau Steppe and Grassland	CES304.083
Developed Open-space	[Provisional Type]
Inter-Mountain Basins Active and Stabilized Dune	CES304.775
Inter-Mountain Basins Big Sagebrush Shrubland	CES304.777
Inter-Mountain Basins Big Sagebrush Steppe	CES304.778
Introduced Upland Vegetation - Annual and Biennial Forbland	[Provisional Type]
Introduced Upland Vegetation - Annual Grassland	[Provisional Type]
Introduced Upland Vegetation - Perennial Grassland and Forbland	[Provisional Type]
Introduced Upland Vegetation - Treed	[Provisional Type]
North American Arid West Emergent Marsh	CES300.729
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest	CES306.805
Northern Rocky Mountain Foothill Conifer Wooded Steppe	CES306.958
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland	CES306.804
Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland	CES306.040
Northern Rocky Mountain Montane-Foothill Deciduous Shrubland	CES306.994
Northern Rocky Mountain Ponderosa Pine Woodland and Savanna	CES306.030
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

Digital Imagery and Interpretation

For LARO, 56 map units (33 vegetated, 5 geology/sparse vegetation, and 18 land-use/land-cover) were developed. The final list of map classes/units was directly cross-walked or matched to corresponding plant associations and land use classes (Table 8). LARO map classes represent a compromise between the detail of the NVCS, the needs for monument management, and the limitations of the imagery. As a result, the mapping legend does not exactly match the NVCS. When the NVCS link was not feasible, descriptive local map units or park specials were created.

The following types represent the possible map scenarios that were encountered in the LARO project:

1. **One-to-one relationship** = When a plant association or vegetation alliance had a unique photo signature and could be readily delineated on the imagery, the map unit adopted the plant association/alliance name or similar synonym.
2. **One-to-many relationship** = When related plant associations shared the same signature and could not be distinguished on the imagery, several plant associations were combined into a single complex.
3. **Park Specials** = When unique stands of vegetation did not have a corresponding NVCS plant association or vegetation alliance.
4. **Land Use – Land Cover** = Non-vegetated areas and vegetation types not recognized by the NVCS received Anderson et al. (1976, updated 2002) map unit designations.

Please reference Appendix F for detailed descriptions and representative photographs for all vegetation map units.

Table 8. Assignment of map classes and relationships to plant associations and other maps units.

Map Class #	Map Class Name	Description or Associations Assigned to Map Class (or Map Unit Description)	Relationship
PSME	*Pseudotsuga menziesii* / Mixed Shrub Forest Complex	*Pseudotsuga menziesii* / *Symphoricarpos albus* Woodland *Pseudotsuga menziesii* / *Acer glabrum* Forest *Pseudotsuga menziesii* / *Physocarpus malvaceus* Forest	1 : Many
PSME/PSSP	*Pseudotsuga menziesii* / *Pseudoroegneria spicata* Woodland	*Pseudotsuga menziesii* / *Pseudoroegneria spicata* Woodland	1 : 1
PSME/SPRS	*Pseudotsuga menziesii* / *Philadelphus lewisii* Talus Sparse Wooded Vegetation	*Pseudotsuga menziesii* / *Philadelphus lewisii* Talus Sparse Wooded Vegetation	1 : 1
PIPO	*Pinus ponderosa* Closed Canopy Forest Complex	*Pinus ponderosa* / *Mahonia aquifolium* Woodland *Pinus ponderosa* / *Mahonia repens* Woodland *Pinus ponderosa* / *Symphoricarpos albus* Forest	1 : Many
PIPO/PUTR	*Pinus ponderosa* / *Purshia tridentata* Woodland	*Pinus ponderosa* / *Purshia tridentata* Woodland	1 : 1
PIPO/SPRS	*Pinus ponderosa* Sparse Understory Woodland Stand	N/A	Park Special
PIPO/HERB	*Pinus ponderosa* Mixed Herbaceous Woodland Complex	*Pinus ponderosa* / *Festuca idahoensis* Woodland *Pinus ponderosa* / *Hesperostipa comata* Woodland *Pinus ponderosa* / *Pseudoroegneria spicata* Woodland	1 : Many
PIPO/BRTE	*Pinus ponderosa* / *Bromus tectorum* Woodland	*Pinus ponderosa* / *Bromus tectorum* Woodland	1 : 1
PIPO/MX	*Pinus ponderosa* / Mixed Shrub Woodland Complex	*Pinus ponderosa* / *Shepherdia canadensis* Woodland *Pinus ponderosa* / *Symphoricarpos albus* Forest *Pinus ponderosa* / *Amelanchier alnifolia* Woodland *Pinus ponderosa* / *Crataegus douglasii* Woodland	1 : Many
JUSC	*Juniperus scopulorum* Woodland	*Juniperus scopulorum* Woodland	1 : 1
POBA	*Populus balsamifera ssp. trichocarpa* Temporarily Flooded Forest Alliance	*Populus balsamifera ssp. trichocarpa* / *Symphoricarpos albus* Woodland *Populus balsamifera* ssp. *trichocarpa* / Mixed Herbs Forest *Populus balsamifera* ssp. *trichocarpa* / *Salix exigua* Forest	1 : Many
POTR	*Populus tremuloides* / *Symphoricarpos albus* Forest	*Populus tremuloides* / *Symphoricarpos albus* Forest	1 : 1
ACPL	*Acer platanoides* Planted Woodland	*Acer platanoides* Planted Woodland	1 : 1
BEPA	*Betula papyrifera* Forest	*Betula papyrifera* Forest	1 : 1

Map Class #	Map Class Name	Description or Associations Assigned to Map Class (or Map Unit Description)	Relationship
MXWD	Mixed Planted and Semi-natural Woodland Complex	*Ulmus americana* / *Bromus tectorum* Semi-natural Woodland *Robinia pseudoacacia* Semi-natural Forest	1 : Many
ARTR	*Artemisia tridentata* Shrub Herbaceous Alliance	*Artemisia tridentata* / *Festuca idahoensis* Shrub Herbaceous Vegetation *Artemisia tridentata* / *Leymus cinereus* Shrub Herbaceous Vegetation	1 : Many
ARTR/BRTE	*Artemisia tridentata* / *Bromus tectorum* Semi-natural Shrubland	*Artemisia tridentata* / *Bromus tectorum* Semi-natural Shrubland	1 : 1
ARTRW	*Artemisia tridentata ssp. wyomingensis* Shrubland Alliance	*Artemisia tridentata ssp. wyomingensis* / *Hesperostipa comata* Shrubland *Artemisia tridentata ssp. wyomingensis* / *Pseudoroegneria spicata* Shrubland	1 : Many
ARTRIP	*Artemisia tripartita ssp. tripartita* / *Poa secunda* Shrubland	*Artemisia tripartita ssp. tripartita* / *Poa secunda* Shrubland	1 : 1
ERNA	*Ericameria - (Chrysothamnus)* spp. Shrubland Complex	*Chrysothamnus viscidiflorus* / *Bromus tectorum* Semi-natural Shrub Herbaceous Vegetation *Ericameria nauseosa* / *Bromus tectorum* Semi-natural Shrubland	1 : Many
MXFLD	Mixed Temporarily Flooded Shrubland Complex	*Betula occidentalis* / *Cornus sericea* Shrubland *Crataegus douglasii* / Mesic Graminoids Shrub Herbaceous Vegetation *Alnus incana* / Mesic Forbs Shrubland *Alnus viridis ssp. sinuata* / Mesic Forbs Shrubland	1 : Many
MXMTN	Mixed Mountain Foothill Shrubland Complex	*Amelanchier alnifolia* / *Pseudoroegneria spicata* - Bunchgrass Shrubland *Symphoricarpos albus* Shrubland *Symphoricarpos albus* / *Bromus tectorum* Semi-natural Shrubland *Rhus glabra* / *Hesperostipa comata* Shrubland *Rosa gymnocarpa* Shrubland *Rosa woodsii* Shrubland	1 : Many
PHLE/PSSP	*Philadelphus lewisii* / *Pseudoroegneria spicata* Shrubland	*Philadelphus lewisii* / *Pseudoroegneria spicata* Shrubland	1 : 1
PRVI	*Prunus virginiana* Shrubland	*Prunus virginiana* Shrubland	1 : 1
PUTR	*Purshia tridentata* Shrub Herbaceous Alliance	*Purshia tridentata* / *Achnatherum hymenoides* Shrubland *Purshia tridentata - Salvia dorrii* / *Pseudoroegneria spicata ssp. spicata* Dwarf-shrubland *Purshia tridentata* / *Festuca idahoensis* Shrub Herbaceous Vegetation *Purshia tridentata* / *Hesperostipa comata* Shrub Herbaceous Vegetation *Purshia tridentata* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation	1 : Many
PUTR/BRTE	*Purshia tridentata* / *Bromus tectorum* Semi-natural Shrubland	*Purshia tridentata* / *Bromus tectorum* Semi-natural Shrubland	1 : 1

Map Class #	Map Class Name	Description or Associations Assigned to Map Class (or Map Unit Description)	Relationship
SALX	*Salix alba - Salix exigua* Shrubland Complex	*Salix alba / Poa pratensis* Semi-natural Shrubland *Salix exigua* / Barren Shrubland *Salix exigua / Equisetum arvense* Shrubland	1 : Many
DRYM	Dry Mixed Herbaceous Vegetation Complex	*Dichanthelium oligosanthes* var. *scribnerianum* Herbaceous Vegetation *Festuca idahoensis* Herbaceous Vegetation *Festuca ovina* Semi-natural Herbaceous Vegetation *Hesperostipa comata ssp. comata* Herbaceous Vegetation *Pseudoroegneria spicata - Poa secunda / Balsamorhiza sagittata* Herbaceous Vegetation *Pseudoroegneria spicata / Eriogonum heracleoides* Herbaceous Vegetation *Sporobolus cryptandrus* Shrub Herbaceous Vegetation	1 : Many
WETM	Mesic Mixed Herbaceous Vegetation Complex	*Carex vulpinoidea - Phalaris arundinacea* Herbaceous Vegetation *Distichlis spicata* Herbaceous Vegetation *Juncus balticus* Herbaceous Vegetation *Leymus cinereus* Herbaceous Vegetation *Phalaris arundinacea* Western Herbaceous Vegetation *Puccinellia nuttalliana* Herbaceous Vegetation *Schoenoplectus acutus* Herbaceous Vegetation	1 : Many
MXGRS	Mixed Planted and Semi-natural Grassland Complex	*Agropyron cristatum* Semi-natural Herbaceous Vegetation *Secale cereale* Planted Herbaceous Vegetation *Thinopyrum intermedium* Semi-natural Herbaceous Vegetation	1 : Many
BRTE	*Bromus tectorum* Semi-natural Herbaceous Vegetation	*Bromus tectorum* Semi-natural Herbaceous Vegetation	1 : 1
BRIN/POPR	*Bromus inermis - Poa pratensis* Mixed Semi-natural Herbaceous Vegetation Complex	*Bromus inermis* Semi-natural Herbaceous Vegetation *Poa pratensis* Semi-natural Herbaceous Vegetation	1 : Many
WEED	Mixed Weedy Semi-natural Herbaceous Vegetation Complex	*Centaurea diffusa* Semi-natural Herbaceous Vegetation *Dactylis glomerata* Semi-natural Herbaceous Vegetation	1 : 1
CUTB	Lacustrine Cut Bank Sparse Vegetation	Lacustrine Cut Bank Sparse Vegetation	1 : 1
GBAR	Gravel Bar Herbaceous Vegetation	Gravel Bar Herbaceous Vegetation	1 : 1
DUNE	Active Dune Herbaceous Vegetation	*Eriogonum compositum* / *Poa secunda* Dwarf-shrub Herbaceous Vegetation *Eriogonum niveum* / *Bromus tectorum* Dwarf-shrub Herbaceous Vegetation *Ericameria nauseosa* / *Achnatherum hymenoides* Sparse Vegetation	1 : Many
TALS	Talus Sparse Vegetation	*Pseudotsuga menziesii* / *Philadelphus lewisii* Talus Sparse Wooded Vegetation	Park Special
ROCK	Rock Outcrop Sparse Vegetation	*Philadelphus lewisii* / *Pseudoroegneria spicata* Rock Outcrop Sparse Vegetation	Park Special

Map Class #	Map Class Name	Description or Associations Assigned to Map Class (or Map Unit Description)	Relationship
STRM	Stream / River	Natural linear drainage features	N/A
CANL	Canal / Ditch	Man-made linear water conveyance systems	N/A
POND	Lake / Pond	Natural and small human-made water impoundments	N/A
RESV	Reservoir	Large human-made water impoundments	N/A
RESD	Residential	Single-family housing	N/A
LIND	Commercial / Light Industry	Businesses and surrounding lands in environs	
HIND	Heavy Industry	Factories, lumber Mills, etc…	N/A
COMM	Communications and Utilities	Power lines, dams and water towers	
AGRI	Agricultural Business	Ranch and farm facilities	N/A
ROAD	Transportation	Paved and earthen roads	N/A
RECR	Entertainment / Recreation	Golf Course, Parks, schools, etc…	N/A
URBN	Mixed Urban	Developed land with both residential homes and businesses	N/A
TRANS	Transitional	Previously developed land, fallow land, roadsides, slash piles, etc…	N/A
MINE	Quarries / Strip Mines / Gravel Pits	Sites disturbed by humans to extract sand, gravel, rock or other minerals	N/A
BARE	Bare Rock / Sand / Other Bare Ground	Unvegetated rock, cleared land, etc…	N/A
FILD	Planted / Cultivated	Tilled and cropped agricultural fields	N/A
ORCH	Orchards, Groves, Vineyards, Nurseries, and Horticultural Areas	Planted woody vegetation used for fruit production	N/A
NPS	NPS Facilities	Visitor center, Headquarters, Housing, Maintenance yard, etc.	N/A

Vegetation Map

The final LARO vegetation map (Appendix G) consisted of 33,601 polygons totaling 411,680 acres (Table 9). Average polygon size was 12 acres, which includes adjacent polygons that have the same map code but different density or height attributes. Lands within the supplied LARO boundary totaled 60,367 acres (slightly below the established LARO size of 60,374 acres due to reduced GIS precision in the supplied boundary layer) or 15% of the total project area. After removing the reservoir surface water the LARO lands (total area - reservoir) totaled 15,852 acres The LARO land amount is likely higher than normal due to the inclusion of draw-down zones in the area calculation. The draw-down zone for LARO includes many different map units consisting of the Lacustrine Cut Bank Sparse Vegetation, Gravel Bar Herbaceous Vegetation, and portions of other vegetated and non-vegetated map classes. Of the total polygons (68%) represented natural or semi-natural vegetation map classes, 2% were geology or sparse vegetation and 30% were land use classes (including 19% of open water). The most common vegetation map class at LARO in terms of both acreage and number of polygons was the *Pseudotsuga menziesii* / Mixed Shrub Forest Complex.

Table 9. Summary statistics for the LARO map class polygons.

Map Code	Map Unit Description	NPS Lands			Total Project Area		
		# of Polygons	Acres	Hectares	# of Polygons	Acres	Hectares
PSME	*Pseudotsuga menziesii* / Mixed Shrub Forest Complex	318	1503.5	608.9	2,286	51,787.3	20,922.1
PSME/PSSP	*Pseudotsuga menziesii* / *Pseudoroegneria spicata* Woodland	70	154.7	62.7	806	10,951.5	4424.4
PSME/SPRS	*Pseudotsuga menziesii* / *Philadelphus lewisii* Talus Sparse Wooded Vegetation	24	57.2	23.2	151	1,505.2	608.1
PIPO	*Pinus ponderosa* Closed Canopy Forest Complex	166	981.6	397.5	639	13,551.4	5,474.8
PIPO/PUTR	*Pinus ponderosa* / *Purshia tridentata* Woodland	388	1727.4	699.6	2040	24,376.1	9,847.9
PIPO/SPRS	*Pinus ponderosa* Sparse Understory Woodland Stand	1	0.1	0.1	131	2,254.9	911.0
PIPO/HERB	*Pinus ponderosa* Mixed Herbaceous Woodland Complex	252	772.3	312.8	1646	20,874.9	8,433.5
PIPO/BRTE	*Pinus ponderosa* / *Bromus tectorum* Woodland	404	1,327.0	537.4	1605	12,846.1	5,189.8
PIPO/MX	*Pinus ponderosa* / Mixed Shrub Woodland Complex	497	2,075.1	840.4	2040	34,119.1	13,784.1
JUSC	*Juniperus scopulorum* Woodland	0	0	0	67	853.0	344.6
POBA	*Populus balsamifera ssp. trichocarpa* Temporarily Flooded Forest Alliance	122	105.5	42.7	535	574.0	231.9
POTR	*Populus tremuloides* / *Symphoricarpos albus* Forest	28	99.6	40.3	542	3671.9	1483.4
ACPL	*Acer platanoides* Planted Woodland	7	7.9	3.2	38	117.4	47.4
BEPA	*Betula papyrifera* Forest	22	32.2	13.0	119	507.7	205.1
MXWD	Mixed Planted and Semi-natural Woodland Complex	19	8.3	3.4	26	16.1	6.5
ARTR	*Artemisia tridentata* Shrub Herbaceous Alliance	24	35.0	14.2	34	93.7	37.9
ARTR/BRTE	*Artemisia tridentata* / *Bromus tectorum* Semi-natural Shrubland	31	95.4	38.6	255	2,282.5	922.1
ARTRW	*Artemisia tridentata ssp. wyomingensis* Shrubland Alliance	49	215.7	87.4	363	5,916.2	2390.1
ARTRIP	*Artemisia tripartita ssp. tripartita* / *Poa secunda* Shrubland	33	49.7	20.1	129	676.6	273.3
ERNA	*Ericameria - (Chrysothamnus)* spp. Shrubland Complex	160	309.7	125.4	806	7,201.1	2,909.2
MXFLD	Mixed Temporarily Flooded Shrubland Complex	39	59.1	23.9	567	1,487.5	601.0
MXMTN	Mixed Mountain Foothill Shrubland Complex	330	348.6	141.2	2280	11,155.3	4,506.7
PHLE/PSSP	*Philadelphus lewisii* / *Pseudoroegneria spicata* Shrubland	16	21.0	8.5	123	559.5	226.0
PRVI	*Prunus virginiana* Shrubland	18	16.2	6.6	492	691.0	279.2
PUTR	*Purshia tridentata* Shrub Herbaceous Alliance	240	640.0	259.2	1238	9,631.6	3,891.2
PUTR/BRTE	*Purshia tridentata* / *Bromus tectorum* Semi-natural Shrubland	377	894.7	362.4	1325	10,921.8	4,412.4

Map Code	Map Unit Description	NPS Lands			Total Project Area		
		# of Polygons	Acres	Hectares	# of Polygons	Acres	Hectares
SALX	*Salix alba* - *Salix exigua* Shrubland Complex	80	47.7	19.3	262	302.3	122.1
DRYM	Dry Mixed Herbaceous Vegetation Complex	132	310.5	125.8	1533	16,517.1	6,672.9
WETM	Mesic Mixed Herbaceous Vegetation Complex	79	807.6	327.1	313	1,520.7	614.4
MXGRS	Mixed Planted and Semi-natural Grassland Complex	59	172.5	69.9	465	8,321.8	3,362.0
BRTE	*Bromus tectorum* Semi-natural Herbaceous Vegetation	426	716.7	290.3	2125	18,469.9	7,461.8
BRIN/POPR	*Bromus inermis* - *Poa pratensis* Mixed Semi-natural Herbaceous Vegetation Complex	222	494.1	200.1	771	5,844.6	2,361.2
WEED	Mixed Weedy Semi-natural Herbaceous Vegetation Complex	6	10.2	4.1	62	722.2	291.8
CUTB	Lacustrine Cut Bank Sparse Vegetation	468	752.2	304.6	769	1,705.5	689.0
GBAR	Gravel Bar Herbaceous Vegetation	12	9.9	4.0	33	97.0	39.2
DUNE	Active Dune Herbaceous Vegetation	23	23.4	9.5	58	98.2	39.7
TALS	Talus Sparse Vegetation	74	63.6	25.8	846	1790.1	723.2
ROCK	Rock Outcrop Sparse Vegetation	203	245.3	99.3	1531	5,933.5	2,397.1
STRM	Stream / River	7	37.8	15.3	26	622.3	251.4
CANL	Canal / Ditch	1	1.9	0.8	4	25.7	10.4
POND	Lake / Pond	12	112.0	45.4	192	437.1	176.6
RESV	Reservoir	8	44,514.7	18,028.5	16	78,282.5	31,626.1
RESD	Residential	240	33.1	13.4	1805	3,450.7	1,394.1
LIND	Commercial / Light Industry	10	1.8	0.7	99	330.5	133.5
HIND	Heavy Industry	6	1.0	0.4	28	199.6	80.6
COMM	Communications and Utilities	12	2.9	1.2	28	108.5	43.8
AGRI	Agricultural Business	47	8.6	3.5	907	1,966.8	794.6
ROAD	Transportation	354	350.0	141.8	123	5,692.0	2,299.6
RECR	Entertainment / Recreation	9	4.5	1.8	50	218.0	88.1
URBN	Mixed Urban	1	1.2	0.5	41	103.0	41.6
TRANS	Transitional	22	15.1	6.1	194	843.0	340.6
MINE	Quarries / Strip Mines / Gravel Pits	3	3.8	1.5	68	430.5	173.9

BARE	Bare Rock / Sand / Other Bare Ground	5	8.7	3.5	23	32.0	12.9
FILD	Planted / Cultivated	79	58.5	23.7	825	28,702.2	11,595.7
ORCH	Orchards, Groves, Vineyards, Nurseries, and Horticultural Areas	9	0.8	0.3	77	264.3	106.8
NPS	NPS Facilities	41	19.3	7.8	44	25.1	10.1
	Total Vegetation	4,639	14,097	57,09	25,814	280,322	1132,50
	Total Barren Geology	780	1,094	443	3,237	9,624	3,888
	Total Land Use / Land Cover	866	45,176	18,296	4,550	121,734	49,181
	Totals	6,285	60,367	24,449	3,3601	411,680	166,319

Normally the standard minimum mapping unit for NPS vegetation mapping projects is defined as 0.5 hectare. However, this is a nominal unit and due to the resolution of the imagery, it was reduced to ¼ acre for wetland and other rare classes. This size allowed for more detail in the mapping and allowed for better delineation of sites deemed important for LARO management. This ability to recognize small patches of vegetation is reflected in the high number of polygons created and the average size of the polygons for some of the rarer types.

The LARO vegetation map should more appropriately be considered a spatial database that also contains many additional polygon attributes not presented in the preceding table (i.e. density, height, and pattern). All of this data is hard to convey in a table or a two-dimensional map, but it should be noted that these different attributes can be combined in many different ways and at different scales and resolutions to produce other products representing the full spectrum of the vegetative diversity. For example, older, more mature stands of conifer trees can quickly be located by querying the GIS vegetation layer for the specific vegetation type and then reselecting only those polygons with high density (>60%) and the tallest height class (5-15 and > 30 meters).

Figure 12 is an example of a fine scale (1:6,000-scale) LARO vegetation map created from the GIS spatial database with the 2009 NAIP imagery as the background.



Figure 12. Example of the LARO vegetation map layer.

Accuracy Assessment

The 2009 accuracy assessment effort yielded 709 points distributed throughout LARO. Initial analysis revealed 7 points that were sampled either in the wrong polygon or had erroneous UTM coordinates likely due to bad receptions. These 7 points were removed from further analysis. Also the Rocky mountain juniper and ponderosa pine map units were located just outside of the LARO boundary and did not receive any AA points due to access limitations. After the points were collected some of the data was also used to help update the classification and to revise the local descriptions. These data helped strengthen the classification for LARO and added to the global perspective of the individual types.

Actual analysis of the AA points involved a point-by-point review in two stages. During stage one, an AA GIS point file was created from the AA point coordinates recorded in the field. These were then overlaid on the vegetation map and a comparison of the final AA field call versus the vegetation polygon label was conducted by CTI staff. This resulted in a preliminary error matrix that was reviewed by NMI and CTI. Adjustments were made to the field calls at this time based on the actual cover values recorded taking into account some errors in the field key. After these changes were made, results were presented to UCBN and LARO staff and recommendations were made on how to improve the accuracy of the map.

Stage two involved re-running the accuracy assessment and creating a final error matrix (Table 10) that included any correct alternate second or third field calls. In most cases, the correct second and third calls were very closely related to the incorrect primary call. For example, mixed stands containing equal levels of sagebrush and antelope bitterbrush often had both listed as first and second calls. The final assessment revealed an overall accuracy of 82%.

Examination of the final error matrix showed concentrations of error among the different following map classes and likely reasons for this error are presented:

1) Douglas fir map units (PSME/SPRS and PSME/PSSP) – likely caused by difficulty in seeing the understory species on the imagery. Also inclusions with shrub understories may have been inadvertently sampled;
2) PIPO/HERB map unit – this type was confused with the PIPO/BRTE map unit, likely a result of seeing the understory on the imagery and presence of locally abundant stands of cheatgrass in large wooded polygons;
3) Mixed planted woodlands (MXWD) – this type was only sampled twice and one polygon was found to be dominated by black cottonwood. All of the deciduous tree signatures were similar and may have resulted in this confusion;
4) Basin big sagebrush shrublands (ARTE) – this map unit was confused with the Wyoming big sagebrush either due to similar signatures on the aerial imagery or the likelihood that these sub-species may hybridize causing identification issues;
5) Lewis' mock orange shrublands (PHLE) – Lewis' mock orange was a common understory species with Douglas fir and inclusion may have been mapped. Also mock orange was a common component in the mixed shrubland types and this overlap in species likely reflects the difficulty in accurately separating similar shrub species from an overhead perspective.
6) Herbaceous vegetation (WEED and CUTB) - These trends likely reflect mapped inclusions or small areas that were accessed that had different dominate species.

General trends in the AA reveal the difficulty in getting sufficient numbers of AA points for very rare or small stands. Having only a handful of AA points decreases the confidence levels and makes it difficult to assume the accuracy of these classes with any certainty. Also the differences between the woodland and shrubland types can likely be explained by the difficulty in resolving the difference in scale and perspective between viewing the vegetation on the imagery and assessing it on the ground. For example, sampling could have occurred in inclusions or canopy openings that were a part of a larger woodland/shrubland polygon.

Table 10. Final Contingency Table for LARO.

		Observed AA Point (Reference AA Ground Data)																																									
	Map Class	PSME	PSME/ SPRS	PSME/ PSSP	PIPO	PIPO/ PUTR	PIPO/ HERB	PIPO/ BRTE	PIPO/ MT	PUBA	POTR	ACPL	BEPA	MXWD	ELAN	ARTR	ARTR/ BRTE	ARTRW	ARTR	ERNA	PUTR	PUTR/ BRTE	PHLE	MXMTN	MXFLD	PRVI	SALX	MEDW	WETM	MXGRS	BRTE	BRIN/ POPR	WEED	CUTB	Total	Users Accuracy	90% Conf. Interval -	90% Conf. Interval +
	PSME	62	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	67	93%	87%	99%
	PSME/SPRS	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	33%	0	95%
	PSME/PSSP	5	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	64%	40%	89%
	PIPO	2	0	0	35	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	90%	80%	99%
	PIPO/PUTR	1	0	0	0	35	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	39	90%	80%	99%
P	PIPO/HERB	1	0	0	0	0	13	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	68%	48%	89%
r	PIPO/BRTE	2	0	0	0	0	3	33	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	40	83%	71%	94%
e	PIPO/MT	0	0	0	1	2	1	2	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	46	83%	72%	93%
d	PUBA	2	0	0	1	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	25	84%	70%	98%
i	POTR	0	0	0	0	0	0	0	1	1	10	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	71%	48%	95%
c	ACPL	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	100%	75%	100%
t	BEPA	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	100%	75%	100%
d	MXWD	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	50%	0	100%
	ELAN	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	100%	50%	100%
M	ARTR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	50%	0	100%
a	ARTR/BRTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	16	81%	62%	100%
p	ARTRW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	95%	87%	100%
	ARTR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	89%	66%	100%
C	ERNA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	1	0	0	0	0	0	0	0	0	2	0	0	0	31	90%	80%	100%
l	PUTR	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	30	8	1	0	0	0	0	0	0	0	0	0	0	0	41	73%	59%	84%
a	PUTR/BRTE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	5	22	0	0	0	0	0	0	0	0	0	0	0	0	31	71%	56%	86%
s	PHLE	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	2	0	0	0	0	0	0	0	0	0	8	50%	15%	85%
s	MXMTN	2	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	27	0	0	0	0	0	0	0	0	0	0	33	82%	69%	94%
	MXFLD	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	8	88%	62%	100%
	PRVI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	4	75%	27%	100%
	SALX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	100%	87%	95%
	MEDW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0	3	0	0	0	27	2	0	0	0	0	0	36	75%	62%	88%
	WETM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0	0	1	0	0	30	97%	90%	100%
	MXGRS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	17	0	0	0	0	20	85%	69%	100%
	BRTE	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	2	0	2	37	1	0	0	47	79%	68%	90%
	BRIN/POPR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	15	0	0	18	83%	66%	100%
	WEED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	50%	0	100%
	CUTB	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	50%	0	100%
	Total	80	1	11	40	39	18	41	47	23	11	2	4	1	1	3	16	44	10	31	36	31	5	34	9	4	4	33	33	20	44	17	1	1	82% Overall Accuracy			
	Producers Accuracy	78%	100%	82%	88%	90%	72%	80%	81%	91%	91%	100%	50%	100%	100%	67%	81%	82%	80%	90%	83%	71%	80%	79%	78%	75%	100%	82%	88%	85%	84%	88%	100%	100%	702 Total Points		80%	82%
	90% Conf. -	69%	50%	58%	78%	80%	52%	69%	70%	79%	72%	75%	0	50%	50%	5%	62%	71%	54%	80%	72%	56%	41%	67%	49%	27%	88%	69%	77%	69%	74%	72%	50%	50%	574 Correct Points		Overall 90% Conf.	
	Level +	86%	100%	100%	97%	99%	92%	92%	91%	100%	100%	100%	100%	100%	100%	100%	100%	93%	100%	100%	95%	86%	100%	92%	100%	100%	100%	94%	99%	100%	94%	100%	100%	100%	81% Kappa Index		Intervals	

Notes: Seven points were removed from analysis due to bad UTM locations. Map units JUOC and PIPO/SPRS were located outside of LARO and were not accessed.

Instruction on Using the Accuracy Assessment Contingency Table: The contingency table or error matrix found above presents an array of numbers set out in rows and columns corresponding to a particular vegetation map unit relative to the actual vegetation type as verified on the ground. The column headings represent the vegetation classification as determined in the field and the row headings represent the vegetation classification taken from the vegetation map. The highlighted diagonal indicates the number of points assessed in the field that agree with the map label. Conversely, the inaccuracies of each map unit are described as both errors of inclusion (user's or commission errors) and errors of exclusion (producer's or omission errors). By reading across this table (i.e., rows) one can calculate the percent error of commission, or how many polygons for each map unit were incorrectly labeled when compared to the field data. By reading down the table (i.e., columns) one can calculate the percent error of omission, or how many polygons for that type were left off the map. Numbers "on the diagonal" tell the user how well the map unit was interpreted and how confident they can be in using it. Numbers "off the diagonal" yield important information about the deficiencies of the map including which types were: 1) over- mapped - commission errors on the right –more of this type was mapped than occurs at the site or 2) under-mapped - omission errors on the bottom – some of this type was mapped as other map units.

Discussion

Lake Roosevelt National Recreation Area located in the upper Columbia River gorge, features an immense reservoir surrounded by a broad shrub steppe, ponderosa pine hills, and steep mountains covered with Douglas fir. Neighboring the long, linear recreation area is a mix of towns, ranches, fields and wilderness. The multiple geologic exposures, soil development patterns, and varied land use resulted in many challenges to the classification and mapping effort. These included demanding logistical considerations for field work due to working on exposed cliff faces, steep slopes, and negotiating around the lake. The inventory process described in this report although largely successful, revealed opportunities for improvement that are discussed below.

Approaches that worked well: Field data and local descriptions of the associations provided by project ecologists were extremely important ancillary data sources used by the GIS contractor to delineate map classes. High-quality plot and observation point data, as well as thorough local descriptions helped provide information for direct image interpretation. LARO had a high density of vegetation plots that provided a stronger basis for conducting the interpretation and mapping. Timely and high resolution base imagery is also essential to produce detailed and accurate maps. For mapping, the 2009 NAIP imagery was truly a boon to this project as it provided a timelier, high resolution base product that made the final map much more up-to-date and likely increased the overall accuracy.

Areas for Improvement: Inherent to all vegetation mapping projects is the need to produce both a consistent vegetation classification and a comprehensive set of map units. Typically, the systems are very similar, but when using a national classification such as the NVCS there is usually not a strict 1:1 correspondence. Nonconformity is due to the remote sensing nature of the interpretation and its ability to delineate map units based only on photo signatures. Subtle vegetation characteristics that can be seen on the ground are not necessarily the same as those apparent on the imagery. Canopy closure, shadows, soil reflections and the timing of the imagery acquisition can all impact the vegetation signatures. In the future if a more detailed map or classification is needed, especially for the complex sparse woodland and shrub types, more field-based classification and mapping work could be concentrated just in these units. Similarly, if more precision is needed for the delineation of the non-native vs. native grass types new imagery could be acquired at specific times to capture the highest degree of contrast between these types (i.e. cheatgrass' orange/yellow phase).

Field Survey

The vegetation classification data presented in this project should be used as the baseline from which to begin future vegetation studies. New survey work in a judicious timeframe would improve both the classification (plant association descriptions) and mapping (refined linework) efforts. Using the accuracy assessment as a guide, map classes with lower accuracy could be further surveyed and boundaries delineated in the field to create a more accurate GIS layer. While it may appear that there are a large number of plant associations and vegetation alliances described for the study area, some were only minimally sampled likely due to access limitations. For example, some of the herbaceous types could be examined throughout the growing season to document both the cool and warm season species in order to refine their composition. Also,

accessing neighboring private lands would allow new plot samples to be obtained increasing the confidence in these types, thereby strengthening the classification.

Classification

In addition to private lands access the other main classification challenge at LARO is documenting changes to plant life caused by drought, wildfire, erosion of geologic features by wind,water, and land slumping associated with the fluctuating reservoir levels, prescribed burns, agricultural pressures (grazing, non-native plantings), logging, and other anthropogenic disturbance. Changes can include reduction of tree and shrub cover or outright removal and spread of invasive plant species. At all times, but especially after these events, new data should be collected to document vegetation changes over time. Overall, more specialized and targeted data collection in affected areas would help to document any changes and would greatly increase the understanding of the landscape in general.

Of special consideration for future LARO classification refinement would be the complex mix of native graminoids, non-native grasses, and deciduous shrubs. All three types form intricate associations with much species overlap among the dominants. From a management perspective it is likely that broader groupings are desirable since the main species in each type exhibit similar growth patterns and would respond similarly to preservation and control efforts. On the other hand, the complex nature of these types makes it difficult to accurately classify the dominants into discrete and meaningful associations. More classification work concentrating on abiotic and environmental aspects such as characteristic soil types, habitats and disturbance patterns may improve the ability to determine when single species should form separate associations and when they should be grouped with other similar species.

Digital Imagery and Mapping

The vegetation map for LARO was based primarily on the 2009 NAIP ortho-imagery. Therefore, all of the resulting mapping products correspond to the summer of 2009 timing of the image acquisition (i.e. snapshot in time). As the data are used, it should be remembered that fires, logging, new developments, and changes in the reservoir level management since 2009 are not included in this product. In the future it might be beneficial to update the map with newer imagery and GPS coordinates (perimeters) for major events (e.g. wildfire perimeters, major land slumps, etc.), and as needed, by incorporating known reservoir contours (i.e. full pool vs. various draw-down levels).

Accuracy Assessment

An important and necessary aspect of this project is the accuracy assessment; collecting independent ground data determines the usefulness of the vegetation map. As such, users of this product should remember that the GIS mapping and the classification portions of this project were conducted separately from both the plot and AA field data collection. Employing divisions in completing tasks created some challenges related to communication among the teams, including: 1) adequately conveying changes to the vegetation classification based on finding potentially new vegetation types during the field portion of the AA, 2) thoroughly testing and adjusting the field key to remove confusing splits among similar types, 3) insuring that adequate sample sizes are collected for rare and infrequent types, and 4) avoiding having to collect more than the estimated 30 data points for common types.

Actual errors in the mapping likely stemmed from the limitations of the ortho-photography as previously described, natural changes in the vegetation between sampling and the acquisition date of the imagery, errors in the field key, or the difficulty in establishing an overhead perspective to exactly match the ground view. Although the accuracy for LARO appears moderate to high, improvements can be made and users should fully explore and understand the sources of error as presented in the error matrix.

It is also important for users to remember that since the mapping portion of this project is primarily a remotely sensed exercise and the field work was conducted on site, all resulting products are scale dependent. In general the mapping portions should be viewed as a broader overview and the field data as more site specific. Although one can zoom in further than 1:12,000-scale using GIS software, the actual mapping was conducted at this scale. As such, any work performed with this product at a finer scale could lead to some uncertainty. In contrast, the field work was conducted at individual locations at one specific time and any extrapolation from these locations to out-lying areas or using them to determine what is there at different times is less reliable. Future users should fully appreciate these scale limitations and balance their efforts accordingly.

Future Recommendations

This project represents the best efforts put forth by a multi-disciplinary team over a short time period. In order to create the best possible "long-term" vegetation classification for LARO and the most accurate and detailed GIS layer, this project should be viewed as a place to start rather than an end product. In other words, present and future NPS staff should be encouraged to scrutinize this project, building from its strengths and bolstering its weaknesses. One way would be to periodically perform field checking by examining the map in the field by qualified NPS or contract staff, documenting any changes, and incorporating these into newer versions. By keeping in mind that this project represents just a snapshot in time, future efforts can help complete the understanding of the vegetation in and around LARO and how it changes. It is the hope of the producers that the products presented here will help direct future efforts, as follows:

1. The diversity of plant species and dynamic nature of the recreation area with respect to reservoir levels, grazing, erosion, outside influences, and fire warrants periodic **field surveys** by experienced ecologists. Further, the inaccessibility of the private lands in the environs should be addressed by seeking permission to sample and verify the vegetation. In this way new plant associations could be discovered, existing types could be updated, and integrated pest management strategies could be expanded. All new information could be used to update both the GIS map layer (i.e. better delineation) and the classification (i.e. new associations).

2. Remote sensing does not replace on-the-ground knowledge provided by GPS-linked plots, observations, photographs, and ground verification. Time, topographic features, and funding limitations curtailed the amount of map **ground-truthing** performed. As research opportunities arise, maps should be examined in the field by experienced crews. Also GPS receiver data and other GIS layers (such as soils and geology) should be used to improve and update the spatial data. Data could be collected on a standard field form, stored, and then used to update the GIS layer on an annual basis. The vegetation map layer should not be viewed as static but should be updated with more current and accurate information.

3. To better understand the limitations of the map, the **accuracy assessment** data presented in the error matrices should be thoroughly reviewed by NPS staff. Map classes with low accuracy should be examined to see if they could be improved with future studies using ground-truthing or other remote-sensing formats (i.e. fine-scale imagery, hyperspectral, etc). Also, landscape modeling may help to tease out the location of specific types based on specific habitat information. Finally for some applications it may make sense to combine map classes into higher units, such as alliances or ecological systems to improve their accuracy**.**

4. For monitoring purposes, **change over time** could be addressed by similar remote sensing projects. New imagery acquired at regular intervals could be used to create up-to-date vegetation layers that could be overlain on this vegetation layer. Any changes between the two layers could be extracted and analyzed. Also periodically and immediately following events causing vegetation change, new data should be collected and analyzed. New vegetation map layers should be prepared as the base map becomes out-dated over time. Overall more specialized and targeted data collection in affected areas would help to document any changes.

5. In the future, resource management personnel could link the habitat for **species of concern** to specific associations and map units. These map units could then be used to help locate potential sites of rare, endangered, or threatened species and communities in the field or identify areas for non-native plant removal or treatment. Known populations and individual species of concern can be overlain using point or small polygon layers.

Research Opportunities

Having an accurate and current vegetation classification and map presents many new and exciting research opportunities. Research could include expanding or linking the GIS layer to derive other information including fire models, habitat monitoring locations, guides for rare plant surveys, wildlife habitat structural analyses, and inventorying areas that are likely vectors for invasive species. The map could also be enhanced by overlaying other existing GIS layers including geology, hydrology, elevation, and soils. In this manner complex interactions between these layers could be examined and yield important information about growth rates, regeneration after disturbance, biomass distribution, and stream morphology. Finally, through innovative analyses the vegetation layer could possibly be used as a springboard for other ecological studies including examining how the vegetation interacts with soil chemistry, pollution, paleontological/archeological sites, weather patterns, etc.

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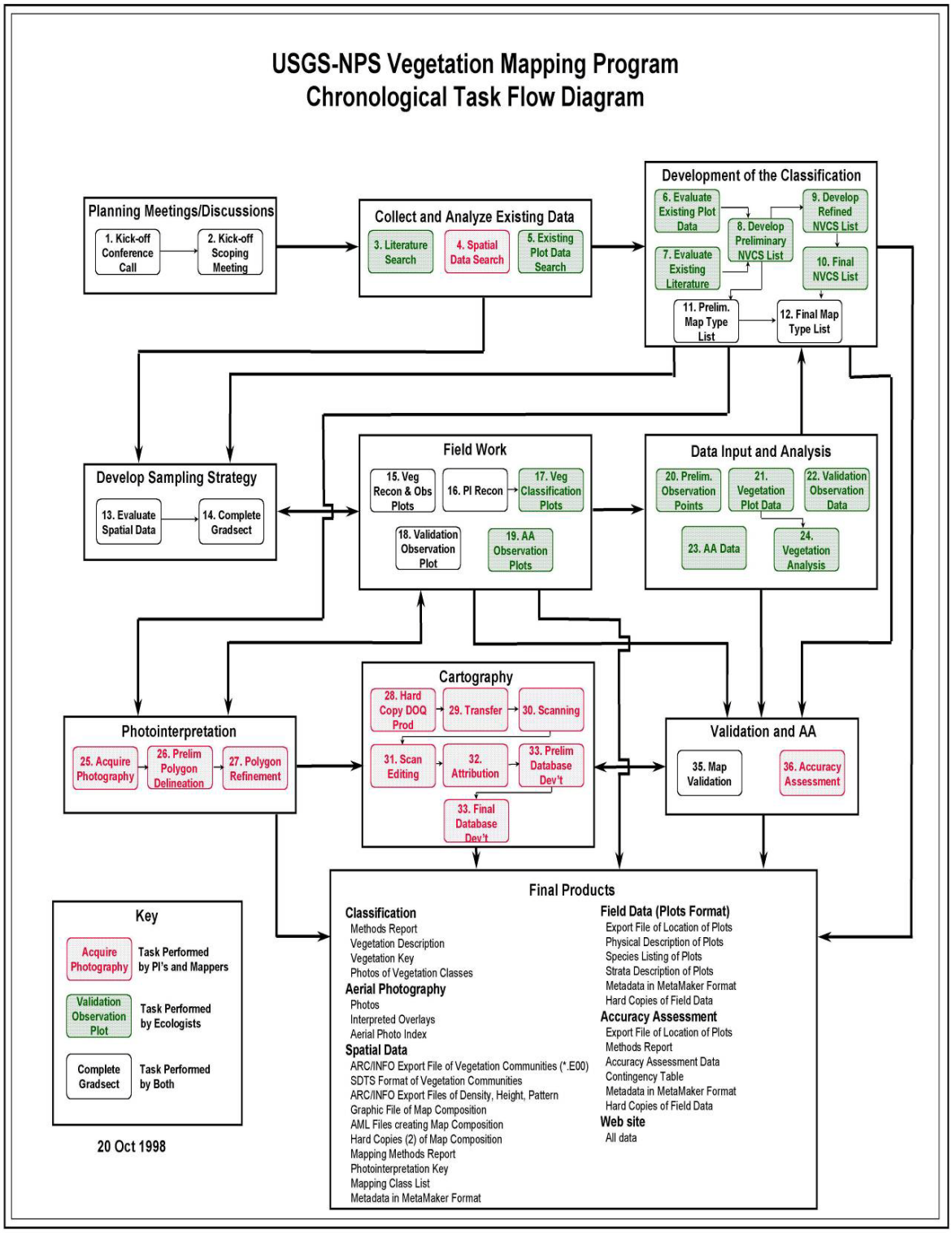
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Appendix A: Components and Flow Diagram of the Vegetation Classification and Mapping Program



Appendix B: Field Data Forms and Instructions

IDENTIFIERS/LOCATORS

Plot Code
Code indicating the specific plot within the vegetation polygon.

Surveyors
Names of surveyors, with principal surveyor listed first.

Date
Date the survey was taken; year, month andday.

BPU Code
The biophysical unit identified.

Provisional Community Name
Using the provisional classification of the park that was provided, assign the name of the vegetation type which most closely resembles this type. Enter the finest level of the classification possible. If it's a new type, name it based on the two or three most dominant species in the plot.

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

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 map.

GPS Rover File
Record the number of the file from the GPS unit.

Field UTM X
Use GPS; do not estimate. If you can't get a GPS reading, estimate coordinates from a topo map and note on the form that this method was used.

Field UTM Y
Use GPS; do not estimate. If you can't get a GPS reading, estimate coordinates from a topo map and note on the form that this method was used.

Error
Error is recorded from the GPS unit.

Plot Length and Plot Width
Enter 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	20 m x 20 m	400 m^2
Woodland	20 m x 20 m	400 m^2
Shrubland	20 m x 20 m	400 m^2
Dwarf-shrubland (heath)	10 m x 10 m	100 m^2
Herbaceous	10 m x 10 m	100 m^2
Nonvascular	5 m x 5 m	25 m^2

Photo numbers
If photos of the plot have been taken at the time of sampling, indicate their numbers from the ones the camera assigns.

Plot Permanent
Note if the plot has been permanently marked.

Plot Representativeness
Does this plot represent the full variability of the polygon? If not, were additional plots taken? 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 obtained from the GPS

Slope
Measure the slope in percent using a clinometer.

Aspect
Measure the aspect using a compass (be sure compass is set to correct for the magnetic declination).

Topographic Position
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.

SHOULDER (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.

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

FOOTSLOPE (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 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.

TERRACE Valley floor or shoreline representing the former position of an alluvial plain, lake, or shore.

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

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

Describe Topographic Position (Optional)
Give more details here, if needed.

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

- Riverine: Below the high water mark on a moving water system (a creek bed). A community of *Eleocharis* on a sand bar would be in this category.
- Palustrine: In the riparian zone. Plants regularly have wet roots through much of the summer. A community of willows and sedges would be in this category.
- Lacustrine: Below the high water mark of a lake. The marshy debris on the edge of a lake would be in this category.

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

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

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 and 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 floodplain 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.

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

Unvegetated Surface
Estimate the approximate percentage of the *total* surface area covered by each category.

Soil Texture
Using the key below, assess average soil texture.

Simplified Key to Soil Texture
Soil does not remain in a ball when squeezed.....sand
Soil remains in a ball when squeezed.....2

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

2. Soil makes no ribbon.....loamy sand
2. Soil makes a ribbon (may be very short).....3

3. Ribbon extends less than 1 inch before breaking.....4

Add excess water to small amount of soil:

4. Soil feels smooth.....silt loam
4. Soil feels at least slightly gritty.....5

Squeeze a moistened ball:

5. Cast is formed which can be handled CAREFULLY without breaking..... sandy loam
5. Cast is formed which can be handled FREELY without breaking..... loam

3. Ribbon extends 1 inch or more before breaking.....6

5. Soil makes a ribbon that breaks when 1 to 2 inches long; cracks if bent into a ring.....7

Add excess water to small amount of soil:

7. Soil feels at least slightly gritty.....clay loam
7. Soil feels smooth.....silt

6. Soil makes a ribbon 2+ inches long; does NOT crack when bent into a ring..... 8

Add excess water to a small amount of soil:

8. Soil feels at least slightly gritty.....clay
8. Soil feels smooth.....silty clay

In the field, soil texture is determined by the feel of a moist soil when it is rubbed between the thumb and fingers. While sand particles feel gritty, silt particles have a smooth velvety feel and clay is both sticky and plastic, an estimate of the relative proportions of the separates may be made. This procedure, of course, will not give the exact percentage of sand, silt, and clay, but, with a little practice on samples of known composition, the relative proportions of the individual separates can be closely estimated. Practice with known samples is the only way to acquire this knowledge.

The outstanding physical characteristics of the main textural grades as determined by the feel of the soil are described below.

1. Sandy Soil. A sandy soil is loose and single grained. The individual grains can be seen readily or felt. Squeezed in the hand when dry, it will fall apart when pressure is released. Squeezed when moist, it will form a cast, but will crumble when touched.

2. Sandy Loam Soil. A sandy loam soil contains much sand, but has enough silt and clay to make it somewhat coherent. Individual sand grains can be easily seen and felt. Squeezed when dry, it will form a cast which will readily fall apart; but if squeezed when moist a cast can be formed which will bear careful handling without breaking.

3. Loam Soil. A loam soil is about an equal mixture of the sand and silt with the clay content being between 7 and 27 percent. A loam is mellow with a somewhat sandy feel, yet fairly smooth and slightly plastic. Squeezed when moist, it will form a cast which can be handled freely without breaking.

4. Silt Loam Soil. A silt loam soil, when dry, may appear cloddy, but lumps are readily broken, and when pulverized, it feels soft and floury. When wet, the soil readily runs together. Either dry or moist, it will form casts which can be handled freely without breaking, but when moistened and extruded between the thumb and fingers, it will not form a ribbon, but will give a broken appearance.

5. Clay Loam Soil. A clay loam soil is fine-textured and usually breaks into clods or lumps that are hard when dry. When moist and extruded between the thumb and fingers, it will form a thin "ribbon" which will break readily, barely sustaining its own weight. The moist soil is plastic and will form a cast that will bear much handling. When kneaded in the hand, it does not crumble readily, but tends to work into a heavy, compact mass.

6. Clay Soil. A clay soil is fine-textured and usually forms very hard lumps or clods when dry and is plastic and sticky when wet. When the moist soil is ribboned out between the thumb and fingers, it will form a long flexible strip. A clay soil leaves a "slick’ surface on the thumb and fingers when rubbed together and tends to hold the thumb and fingers together due to the stickiness of the clay.

The characteristics described above are suggestive only, and will only apply to a group of similar soils. The characteristics of clay vary with the kind of clay mineral. For this reason, textural grades may exhibit different properties from region to region. For instance, clays of the montmorillonite group are very sticky and plastic; those of the oxide group are plastic and waxy with relatively little stickiness.

The preceding discussion has been directed to those soil particles whose diameters are less than 2 millimeters--the sands, silts, and clays. Soils may also contain larger sized particles that may be collectively called coarse fragments. These large particles may on occasion exceed the smaller soil particles in volume.

Soil Drainage

The soil drainage classes are defined in terms of (1) 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.

> 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.
>
> MODERATELY WELL DRAINED - The soil moisture content is in excess of field capacity for a small but significant period of the year.
>
> POORLY DRAINED - The soil moisture content is in excess of field capacity in all horizons for a large part of the year.

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 are mixed.

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

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

Leaf Type
Select the 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).

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. (Ferns)

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.

Shrubland: Shrubs generally greater than 2.5 feet 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.

Dwarf-Shrubland: Low-growing shrubs usually under 2.5 feet 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.

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.

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.

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, Height Class, Cover Class, 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 15 feet in height or greater at maturity and under optimal growing conditions. Shrubs are defined as multiple-stemmed woody plants generally less than 15 feet in height at maturity and under optimal growing conditions.

List the dominant species in each stratum.

Animal Use Evidence

Comment on any evidence of wildlife (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.

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

Other Comments

Any miscellaneous comments.

Species/Strata/Percent Cover Table

The main use of the strata information is to categorize the plots by life form, in order to subset the data into forest, woodland, shrublands, and herbaceous plots for analysis. It is imperative that things be called the same throughout the data set.

Starting with the uppermost stratum, list all the species present and their cover class using the scale provided below. If a species is in the tree layer (single-stemmed woody plants, generally 15 feet in height or greater at maturity), list whether it is T1 (emergent tree), T2 (tree canopy), or T3 (tree sub-canopy). If a species is in the shrub layer, note if S1 (tall shrub), or S2 (short shrub), or S3 (dwarf shrub). If in the ground layer, note if H (herbaceous) or N (nonvascular). Some species will be in more than one layer. For example, Cottonwoods might have one or two especially tall specimens, which would be in the T1 (emergent tree) layer. Then the majority of the mature trees would be in T2 (tree canopy). The saplings that are coming up in the understory would be in the T3.

Seedlings are defined as trees less than “breast height” or less than 4.5 feet tall. Seedlings between knee height and breast height should be labeled as being in the short shrub layer (S2), and those below knee height should be labeled as being in the dwarf shrub layer (S3).

<u>Cover Scale for Species Percent Cover</u>

Use the cover scales provided on the forms.

NATIONAL PARK VEGETATION MAPPING PROGRAM: PLOT SURVEY FORM

IDENTIFIERS/LOCATORS

Plot Code_____ Polygon Code_____
Provisional Community Name_____
State ___ Park Name_____ Park Site Name_____
Quad Name_____ Quad Code_____
GPS file name_____ Field UTMX___ ___ ___ ___ ___ ___ m E Field UTM Y___ ___ ___ ___ ___ ___ ___ m N Error +/-_____ m *please do not complete the following information when in the field* Corrected UTMX___ ___ ___ ___ ___ ___ m E Corrected UTM Y___ ___ ___ ___ ___ ___ ___ m N UTM Zone_____
Survey Date_____ Surveyors_____
Directions to Plot
Plot length_____ Plot width_____ Plot Photos (y/n) ___ Roll Number _____ Frame Number _____ Plot Permanent (y/n) ____
Plot representativeness

ENVIRONMENTAL DESCRIPTION

Elevation _____ Slope _____ Aspect_____
Topographic Position
Landform
Surficial Geology

Cowardian System ___Upland ___Riverine ___Palustrine ___Lacustrine	Non-Tidal ___Permanently Flooded ___Semipermanetly Flooded ___Seasonally/Temporarily Flooded	___Saturated ___Seasonally Flooded/Saturated ___Intermittently Flooded	

Environmental Comments:	Soil Taxon/Description
	Unvegetated Surface: *(please use the cover scale on next page)* ___ Bedrock ___ Litter, duff ___ Wood (> 1 cm) ___ Large rocks (cobbles, boulders > 10 cm) ___ Small rocks (gravel, 0.2-10 cm) ___ Sand (0.1-2 mm) ___ Bare soil ___ Other:_____
Soil Texture ___ sand ___ loamy sand ___ sandy loam ___ loam ___ silt loam ___ silt ___ clay loam ___ silty clay ___ clay ___ peat ___ muck	Soil Drainage ___ Rapidly drained ___ Well drained ___ Moderately well drained ___ Somewhat poorly drained ___ Poorly drained ___ Very poorly drained

VEGETATION DESCRIPTION

Leaf phenology (of dominant stratum)	Leaf Type (of dominant stratum)	Physiognomic class	Cover Scale for Strata & Unvegetated Surface		Height Scale for Strata	
Trees and Shrubs		___Forest				
___Evergreen	___Broad-leaved	___Woodland	01	5%	01	<0.5 m
___Cold-deciduous	___Needle-leaved	___Shrubland	02	10%	02	0.5-1m
___Drought-deciduous	___Microphyllous	___Dwarf Shrubland	03	20%	03	1-2 m
___Mixed evergreen - cold-deciduous	___Graminoid	___Herbaceous	04	30%	04	2-5 m
	___Forb	___Nonvascular	05	40%	05	5-10 m
___Mixed evergreen - drought-deciduous	___Pteridophyte	___Sparsely Vegetated	06	50%	06	10-15 m
			07	60%	07	15-20 m
Herbs			08	70%	08	20-35 m
___Annual			09	80%	09	35 - 50 m
___Perennial			10	90%	10	>50 m
			11	100%		

Strata	Height Class	Cover Class	Diagnostic species (if known)
T1 Emergent			
T2 Canopy			
T3 Sub-canopy			
S1 Tall shrub			
S2 Short Shrub			
H Herbaceous			
N Non-vascular			
V Vine/liana			
E Epiphyte			

please see above table for height and cover scales

Animal Use Evidence

Natural and Anthropogenic Disturbance Comments

Other Comments

Plot Code_____

Species/percent cover: Starting with the uppermost stratum, list all species with % cover for each species in the stratum. For each tree species estimate seedling, sapling, mature and total cover indicating stratum. Also for forests and woodlands, on a separate page or line below each tree species, list the DBH of all trees above 5 cm diameter. Separate measurements with a comma (note if measurements are from multi-stemmed tree). Put an asterisk next to any species that are known diagnostics for a particular community in the classification. **Also list species outside the plot at the end of the table or designate with a 0 in Cover Class column.**

Stratum	Species Name	Cover Class	Stratum	Species Name	Cover Class	Stratum	Species Name	Cover Class

Cover Class Scale

T = >0-1%	5 = >45-55%
P = >1-5%	6 = >55-65%
1 = >5-15%	7 = >65-75%
2 = >15-25%	8 = >75-85%
3 = >25-35%	9 = >85-95%
4 = >35-45%	10 = >95%

2009 ACCURACY ASSESSMENT POINT FORM – LAKE ROOSEVELT NATIONAL RECREATION AREA
UPPER COLUBIA BASIN NETWORK VEGETATION MAPPING PROJECT

IDENTIFIERS/LOCATORS

AA Plot Number: **LARO-AA.** __ __ __ __ AA Point Shape: circle other

Park Site Name Lake Roosevelt National Recreation Area

Survey Date _____ Surveyor(s)_____

GPS Unit: Garmin Map 76 Datum NAD 83 UTM Zone: 11 Error +/-: _____ m

Camera Name and Model (circle one): Olympus Stylus FF-210 Other:_____

Camera #	Frame #	Photographer	Direction/Comments

PLANT ASSOCIATION INFORMATION

ASSOCIATIONS AT AA POINT	MAP UNIT AT AA POINT	New?	OTHER ASSOCIATIONS WITHIN 50 M OF AA POINT
Primary Name/Code	Map Code		1.
Secondary Name/Code			2.
Tertiary Name/Code			3.

Representativeness of point within polygon: Good Fair Poor Unk .....of association to description: Good Fair Poor

Classification Comments: (complications, uncertainties, explanation of fair/poor representativeness)

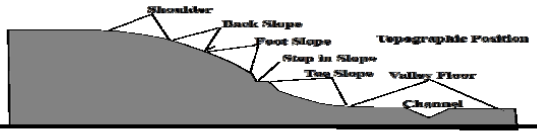
ENVIRONMENTAL DESCRIPTION

Elevation _____ m / f t From: GPS | Slope _____ Aspect_____

Topographic Position: **Circle One**

Interfluve Shoulder Backslope Footslope Toeslope Step in slope Valley floor Terrace Channel

Environmental Comments:



Unvegetated Surface Cover+: *(please use the cover scale below)*

_____ Bedrock	_____ Large rocks (cobbles, boulders > 10 cm)	_____ Sand (0.1-2 mm)
_____ Litter, duff	_____ Small rocks (gravel, 0.2-10 cm)	_____ Bare soil
_____ Wood (> 1 cm)	_____ Nonvascular	_____ Other:_____

May 2009 – LARO AA Form

2009 ACCURACY ASSESSMENT POINT FORM – LAKE ROOSEVELT NATIONAL RECREATION AREA
UPPER COLUBIA BASIN NETWORK VEGETATION MAPPING PROJECT

VEGETATION DESCRIPTION

Leaf phenology (dominant stratum)	Leaf Type (of dominant stratum)	Physiognomic Class	Height Class (m)	Cover Class
Trees and Shrubs _____ Evergreen _____ Deciduous _____ Mixed evergreen - deciduous Herbs _____ Perennial _____ Annual	_____ Broad-leaved _____ Needle-leaved _____ Graminoid _____ Forb _____ Pteridophyte _____ Non Vascular _____ Mixed	Pick one ___ Forest ___ Woodland ___ Shrubland ___ Dwarf shrubland ___ Herbaceous ___ Nonvascular ___ Sparsely vegetated	T <1ft. 01 1-5ft. 05 5-15ft. 15 15-30ft. 30 >30FT	t < 0.5% T 0.5- 0.99% 01 1-1.9% 02 2-4.9% 05 5-9.9% 10 10-14% 15 15-24% 25 25-34% 35 35-49% 50 50-74% 75 75-94% 95 >95%

Strata	Height Class	Cover Class	2 - Dominant species (mark any known diagnostic species with a *)	Individual Species Cover
T1 Emergent	____	____	_____	____
T2 Canopy	____	____	_____	____
			_____	____
			_____	____
T3 Sub-canopy	____	____	_____	____
			_____	____
S1 Tall shrub	____	____	_____	____
			_____	____
			_____	____
S2 Short Shrub	____	____	_____	____
			_____	____
			_____	____
			_____	____
S3 Dwarf-shrub	____	____	_____	____
			_____	____
H Herbaceous	____	____	_____	____
			_____	____
			_____	____
			_____	____
N Non-vascular	____	____	_____	____

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)

May 2009 – LARO AA Form

Appendix C: Dichotomous Key to LARO Plant Associations

Dichotomous Key to the Classification

The field key to plant communities of the national recreation area follows. The key is structured into physiognomic classes (or lifeform groups). These classes do not constraint the classification *per se*, rather they are employed to assist in applying the classification. In the field, different expressions of a given plant association may occur as different physiognomic classes. Given this, associations may be found through multiple pathways within the key.

Use of the Key

To use the field key most effectively, identify a representative, homogeneous stand of vegetation. Work through the entire hierarchy of the key, beginning with *Key to Lifeform Groups,* to each sequential dichotomous lead. Estimate plant cover on an area of approximately 405 m^2. If a satisfactory determination is not made in stands with low total cover consider adjusting diagnostic species cover break-points downward. Assignment of individual species to lifeform follows USDA, NRCS (2007).

In the key the term *relative cover* is used. In this context relative cover refers to the proportional abundance of the given species (or group of species) with respect to the total abundance of the associated group. The value is calculated by dividing the percent cover of the species under consideration by the total cover of the respective group of species. For example, the relative cover of native graminoid species is calculated as follows: (sum of native graminoid species cover within the sample) / (total cover of all graminoids within the sample) = (relative native graminoid composition).

The dichotomous key refers to shrub indicator species. These species include: *Symphoricarpos albus, Amelanchier alnifolia, Artemisia tridentata, Mahonia aquifolium, Mahonia repens, Purshia tridentata,* and *Shepherdia canadensis*.

Betula occidentalis is considered a tree species following USDA, NRCS (2007). For this reason the *Betula occidentalis / Cornus sericea* (BEOC2/COSE16) association appears in Part A of the following key, though it is classified as shrubland (following NatureServe 2007 and see Table 1).

Key to Lifeform Groups

1a) Tree canopy cover (alone or combined) ≥10%, **Part A: Forest, Woodland, and Savannah**, lead 4a.
1b) Tree canopy cover <10%, lead 2a.
    2a) Shrub canopy cover ≥10%, **Part B: Shrublands and Shrub-Steppe**, lead 23a.
    2b) Shrub canopy cover <10%, lead 3a.
        3a) Herbaceous canopy cover ≥10%, **Part C: Herbaceous Vegetation**, lead 46a.
        3b) Herbaceous canopy cover <10%, **Part D: Sparse Vegetation**, lead 66a.

Part A: Forest, Woodland, and Savannah

4a) *Pseudotsuga menziesii* <7% cover, lead 5a.

5a) *Pinus ponderosa* ≥7% cover, lead 6a.

6a) *Populus balsamifera* spp. *trichocarpa* is more abundant than *Pinus ponderosa*, lead 7a.

7a) *Symphoricarpos albus* or *Cornus sericeus* ≥10% cover, **POBAT/SYAL**.

7b) *Symphoricarpos albus* or *Cornus sericeus* <10% cover, **POBAT/SAEX**.

6b) *Populus balsamifera* spp. *trichocarpa* is less abundant than *Pinus ponderosa*, lead 8a.

8a) Total shrub cover ≥6%, lead 9a.

9a) *Crataegus douglasii* ≥5% cover, **PIPO/CRDO2**.

9b) *Crataegus douglasii* <5% cover, lead 10a.

10a) *Symphoricarpos albus* ≥50% relative to the total cover of indicator shrub species or the most abundant shrub indicator species (see the list of species above), **PIPO/SYAL**.

10b) *Symphoricarpos albus* <50% relative to the total cover of indicator shrub species and is less abundant than other shrub indicator species, lead 11a.

11a) *Purshia tridentata* ≥50% relative to the total cover of indicator shrub species , **PIPO/PUTR2**.

11b) *Purshia tridentata* <50% relative to the total cover of indicator shrub species, lead 12a.

12a) *Amelanchier alnifolia* ≥50% relative to the total cover of indicator shrub species or the most abundant shrub indicator species, **PIPO/AMAL2**.

12b) *Amelanchier alnifolia* <50% relative to the total cover of indicator shrub species, lead 13a.

13a) *Shepherdia canadensis* ≥50% relative to the total cover of indicator shrub species or the most abundant shrub indicator species, **PIPO/SHCA**.

13b) *Shepherdia canadensis* <50% relative to the total cover of indicator shrub species, lead 14a.

14a) *Mahonia repens* ≥2% cover, **PIPO/MARE11**.

14b) *Mahonia repens* <2% cover, **PIPO/MAAQ2**.

8b) Total shrub cover <6%, lead 15a.

15a) Native graminoid composition <50% relative cover, **PIPO/BRTE**.

15b) Native graminoid composition ≥50% relative cover, lead 16a.

16a) *Hesperostipa comata* ≥3% cover, **PIPO/HECO26**.

16b) *Hesperostipa comata* <3% cover, lead 17a.

17a) *Festuca idahoensis* ≥3% cover, **PIPO/FEID**.

17b) *Festuca idahoensis* <3% cover, lead 18a.

18a) *Pseudoroegneria spicata* ≥1% cover, **PIPO/PSSP6**.

18b) *Pseudoroegneria spicata* <1% cover, **PIPO/AMAL2**.

5b) *Pinus ponderosa* <7% cover, minor forest and woodland associations and cover

types (represented on ≤2 sample plots) including POTR5/SYAL, BEOC2/COSE16, BEPA, JUSC2, ACPL, PYCO/SYAL, ROPS and ULAM/BRTE. Determination of these associations and cover types is based on the dominant tree species in the following order: POTR5>BEOC2>BEPA>JUSC2>ACPL>ULAM>PYCO>ROPS.

4b) *Pseudotsuga menziesii* ≥7% cover, lead 19a.

19a) *Pinus ponderosa* ≥7% cover, lead 7a.

19b) *Pinus ponderosa* <7% cover, lead 20a.

20a) *Holodiscus discolor* or *Physocarpus malvaceus* (alone or in combination) ≥6% cover or greater then the combined cover of *Acer glabrum* and *Corylus cornuta*, **PSME/PHMA5**.

20b) *Holodiscus discolor* or *Physocarpus malvaceus* (alone or in combination) <6%, lead 21a.

21a) *Acer glabrum* or *Corylus cornuta* (alone on in combination) ≥4% cover, **PSME/ACGL**.

21b) *Acer glabrum* and *Corylus cornuta* (in combination) <4% cover, lead 22a.

22a) *Symphoricarpos albus* ≥3% cover, **PSME/SYAL**.

22b) *Symphoricarpos albus* <3% cover, **PSME/PSSP6**.

Part B: Shrublands and Shrub-Steppe

23a) *Artemisia tridentata* ≥7 % cover or ≥ *Purshia tridentata*, lead 24a.

24a) *Festuca idahoensis* ≥3% cover, **ARTR2/FEID**.

24b) *Festuca idahoensis* <3% cover, lead 25a.

25a) *Pseudoroegneria spicata* ≥3% cover, **ARTRW8/PSSP6**.

25b) *Pseudoroegneria spicata* <3% cover, lead 26a.

26a) *Leymus cinereus* ≥4% cover, **ARTR2/LECI4**.

26b) *Leymus cinereus* <4% cover, lead 27a.

27a) *Hesperostipa comata* is present, **ARTRW8/HECO26**.

27b) *Hesperostipa comata* is absent, **ARTR2/BRTE**.

23b) *Artemisia tridentata* <7 % cover, lead 28a.

28a) *Purshia tridentata* <7% cover, lead 29a.

29a) *Artemisia tripartita* spp. *tripartita* ≥7% cover, **ARTRT2/POSE**.

29b) *Artemisia tripartita* spp. *tripartita* <7% cover, lead 30a.

30a) *Alnus viridis* ssp. *sinuata* ≥25% cover, **ALVIS/MESIC FORBS**.

30b) *Alnus viridis* ssp. *sinuata* <25% cover, lead 31a.

31a) *Alnus incana* ≥25% cover, **ALIN2/MESIC FORBS**.

31b) *Alnus incana* <25% cover, lead 32a.

32a) *Crataegus douglasii* ≥7% cover, **CRDO2/MESIC GRAMINOIDS**.

32b) *Crataegus douglasii* <7% cover, lead 33a.

33a) *Prunus virginiana* ≥25% cover, **PRVI**.

33b) *Prunus virginiana* <25% cover, lead 34a.

34a) *Ericameria nauseosa* ≥5% cover, **ERNA10/BRTE**.

34b) *Ericameria nauseosa* <5% cover, lead 35a.

35a) *Salix exigua* ≥10% cover, lead 36a.

36a) *Equisetum arvense* ≥10% cover, **SAEX/EQAR**.
36b) *Equisetum arvense* <10% cover, **SAEX/BARREN**.

35b) *Salix exigua* <10% cover, lead 37a.
37a) *Rosa woodsii* ≥7% cover, **ROWO**.
37b) *Rosa woodsii* <7% cover, lead 38a.
38a) *Symphoricarpos albus* ≥7% cover, **SYAL**.
38b) *Symphoricarpos albus* <7% cover, lead 39a.
39a) *Amalanchier alnifolia* ≥7% cover, **AMAL2/PSSP6**.
39b) *Amalanchier alnifolia* <7% cover, lead 40a.
40a) *Philadelphus lewisii* ≥3% cover, **PHLE4/PSSP6**.
40b) *Philadelphus lewisii* <3% cover and *Rhus glabra* present, **RHGL/HECO26**.

28b) *Purshia tridentata* ≥7% cover, lead 40a.
41a) *Festuca idahoensis* ≥3% cover, **PUTR2/FEID**.
41b) *Festuca idahoensis* <3% cover, lead 42a.
42a) *Pseudoroegneria spicata* ≥3% cover, **PUTR2/PSSP6**.
42b) *Pseudoroegneria spicata* <3% cover, lead 43a.
43a) *Salvia dorrii* ≥3% cover, **PUTR2-SADO4/PSSP6**.
43b) *Salvia dorrii* <3% cover, lead 44a.
44a) *Hesperostipa comata* ≥1% cover, **PUTR2/HECO26**.
44b) *Hesperostipa comata* <1% cover, lead 45a.
45a) *Achnatherum hymenoides* ≥1% cover, **PUTR2/ACHY**.
45b) *Achnatherum hymenoides* <1% cover, **PUTR2/BRTE**.

Part C: Herbaceous Vegetation

46a) Tree species ≥7% cover (alone on in combination), lead 4a.
46b) Tree species <7% cover, lead 47a.
47a) Shrub species ≥7% cover, lead 23a.
47b) Shrub species <7% cover, lead 48a.
48a) *Phalaris arundinacea*, *Juncus balticus*, or *Schoenoplectus acutus* ≥2% cover, lead 49a.
49a) *Schoenoplectus acutus* ≥25% cover, **SCAC3**.
49b) *Schoenoplectus acutus* <25% cover, lead 50a.
50a) *Carex vulpinoidea* ≥10% cover, **CAVU2-PHAR3**.
50b) *Carex vulpinoidea* <10% cover, lead 51a.
51a) *Juncus balticus* ≥10% cover, **JUBA**.
51b) *Juncus balticus* <10% cover, lead 52a.
52a) *Distichlis spicata* ≥25% cover, **DISP**.
52b) *Distichlis spicata* <25% cover, **PHAR3**.
48b) *Phalaris arundinacea*, *Juncus balticus*, and *Schoenoplectus acutus* <2% cover, lead 53a.
53a) Mixed composition of hydrophytic or mesic species occur on seasonally

flooded lacustrine or riverine gravel deposits, **GRAVEL BAR**.

53b) Various vegetation compositions not occurring on seasonally flooded lacustrine or riverine gravel deposits, lead 54a.

54a) Open vegetation occurring on drifting sand, **HERBACEOUS ACTIVE DUNE**.

54a) Drifting sand is not present lead 55a.

55a) Total graminoid composition <20% native, lead 56a.

56a) *Eriogonum niveum* present, **ERNI2/BRTE**.

56b) *Eriogonum niveum* absent, lead 57a.

57a) Exotic perennial grass species ≥10%, **Introduced Upland Vegetation - Perennial Grassland and Forbland** (known dominance types include: **AGCR**, **BRIN**, **DAGL**, **FEOV**, **POPR**, **SECE**, and **THIN**).

57b) Exotic perennial grass species <10%, **Introduced Upland Vegetation - Annual Grassland** or **Introduced Upland Vegetation - Annual and Biennial Forbland** (known dominance types include: **BRTE** and **CEDI3**).

55b) Total graminoid composition ≥20% native, lead 58a.

58a) *Hesperostipa comata* <3% cover, lead 59a.

59a) *Eriogonum compositum* ≥5% cover, **ERCO12/POSE**.

59b) *Eriogonum compositum* <5% cover, lead 60a.

60a) *Leymus cinereus* ≥5% cover, **LECI4**.

60b) *Leymus cinereus* <5% cover, lead 61a.

61a) *Festuca idahoensis* ≥3% cover, **FEID**.

61b) *Festuca idahoensis* <3% cover, lead 62a.

62a) *Pseudoroegneria spicata* ≥3% cover, lead 63a.

63a) *Eriogonum heracleoides* ≥2% cover, **PSSP6/ERHE2**.

63b) *Eriogonum heracleoides* <2% cover, **PSSP6-POSE/BASA3**.

62b) *Pseudoroegneria spicata* <3% cover, lead 64a.

64a) *Sporobolus cryptandrus* ≥10% cover, **SPCR**.

64b) *Sporobolus cryptandrus* <10% cover, lead 65a.

65a) Total graminoid composition ≥40% native, **DIOLS**.

65b) Total graminoid composition <40% native, **Introduced Upland Vegetation**.

58b) *Hesperostipa comata* ≥3% cover, **HECO26**.

Part D: Sparse Vegetation.

66a) Bedrock or large rock (≥10 cm diameter) is the dominate surface substrate, lead 67a.

67a) Bedrock is the dominant substrate, **PHLE4/PSSPS ROCK**.

67b) Large rock is the dominant substrate, **PSME/PHLE4 TALUS**.

66a) Bedrock or large rock (≥10 cm diameter) is not the dominate surface substrate, lead

68a.

68a) Steep to very steep lacustrine shoreline slopes derived in gravel, clay, or loam soils, **LACUSTRINE CUT BANK**.

68b) Gentle to steep slopes derived in sandy soil, lead 69a.

69a) *Ericameria nauseosa* is present with *Achnatherum hymenoides*, **ERNA10/ACHY**.

69a) *Ericameria nauseosa* and *Achnatherum hymenoides* are not present, lead 70a.

70a) Sparse vegetation is present on drifting sand, **HERBACEOUS ACTIVE DUNE**.

70a) Sparse vegetation on other substrates, unclassified sparse vegetation.

Appendix D: LARO Plant Association Descriptions

A1 *Acer platanoides* Planted Woodland

Norway Maple Developed Open Space



Description: The vegetation in this Assocation is characterized by open space with the tree canopy dominated by *Acer platanoides*. Tree canopy cover values are more than 5%, but are typically less than 20%, and canopy height is usually 10-20 m. No shrub component is present in this Assocation. Heavy herbaceous layer is dominated by *Poa pratensis* and other introduced graminiods such as *Elymus repens*. Associated forb species may include *Trifolium repens* and *Medicago lupulina,* as well as other perennials and/or annual species. Forb cover is generally low and varies annually depending on precipitation.

Conservation Rank: N/A	**Database Code:** ACPL	**Elcode:** N/A

Characteristic Species: (n=1, AA=1)

Tree

Acer platanoides (Norway maple) V10, *Pseudotsuga menziesii* (Douglas-fir) V5

Shrub

N/A

Dwarf-shrub

N/A

Graminiod

*Poa pratensis (*Kentucky bluegrass*)* V75, *Elymus repens* (quackgrass) V2

Forb

Trifolium repens (white clover) V5, *Medicago lupulina* (black medick) V2

Range:

Lake Roosevelt National Recreation Area

This Assocation is located sporadically around disturbed areas such as parking lots and structures.

Global

Acer platanoides (Norway maple) is considered invasive in much of the northeastern United States and in the upper Midwest.The Assocation has the potential to occur throughout the range of the Intermountain region and Pacific Northwest.

Comments:

Acer platanoides (Norway maple*)* is considered an invasive species in much of the United States. This Assocation is present in the park like settings found in the northern part of Lake Roosevelt National Recreation Area.

This Assocation was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A2

Betula papyrifera Woodland

Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland



Description: Riparian woodland and shrubland consisting of deciduous, coniferous, and mixed conifer-deciduous forests. The vegetation in this Assocation is characterized by *Betula papyrifera*. Tree canopy cover values are more than 5%, but are typically less than 15%, and canopy height is usually 5-10 m. The shrub component consists of *Artemisia tridentata, Cornus sericea* and *Crataegus douglasii* from 25 to 50% cover in this Assocation. Herbaceous layer is dominated by *Phalaris arundinacea, Bromus tectorum* and *Poa pratensis*. Associated forb species may include *Smilacina racemosa,* as well as other perennials and/or annual species. Forb cover is generally low and varies annually depending on precipitation.

Conservation Rank: G4	**Database Code:** BEPA	**Elcode:** CEGL000520

Characteristic Species: (n=2, AA=2)

Tree

Betula papyrifera (paper birch) V15

Shrub

Crataegus douglasii (black hawthorn) V15, *Cornus sericea* (western dogwood) V10

Dwarf-shrub

N/A

Graminiod

Phalaris arundinacea (reed canarygrass) V5, *Bromus tectorum* (cheatgrass) V2

Forb

Smilacina racemosa (feathery false lily of the valley) V10, *Iris pseudacorus* (paleyellow iris) V2

Range:

Lake Roosevelt National Recreation Area

This Assocation is spread intermintently throughout the park in small concentrations.

Global

Linear system which occurs in the northern Rocky Mountains and the east slopes of the Cascades.

Comments:

This Association occurs within moist forests, or adjacent to riparian areas, seeps and springs.

A3 *Betula occidentalis/Cornus sericea* shrubland

Rocky Mountain Subalpine- Montane Riparian Shrubland



Description: Montane to subalpine riparian shrublands occurring as narrow bands or large expanses of shrubs lining streambanks and alluvial terraces. The vegetation in this Assocation is characterized by *Betula papyrifera*. Tree canopy cover values are more than 2%, but are typically less than 15%, and canopy height is usually 5-10 m. The shrub component consists of *Artemisia tridentata*, *Crateaegus douglasii* or *Cornus sericea* from 10 to 25% cover in this Assocation. Herbaceous layer is dominated by *Poa pratensis* and other graminiods such as *Phalaris arundinacea*. Associated forb species may include *Smilacina racemosa*, as well as other perennials and/or annual species. Forb cover is generally low and varies annually depending on precipitation.

Conservation Rank: G2	**Database Code:** BEOC2/COSE16	**Elcode:** CEGL001161

Characteristic Species: (n=1, AA=1)

Tree
Betula occidentalis (water birch) V25, *Populus tremuloides* (quaking aspen) V10

Shrub
Cornus sericea (western dogwood) V50, *Symphoricarpus albus* (common snowberry) V25

Dwarf-shrub
N/A

Graminiod
Dactylis glomerata (orchard grass) V2, *Elymus glaucus* (blue wildrye) V2

Forb
Smilacina racemosa (feathery false lily of the valley) V5, *Maianthemum stellatum* (starry false lily of the valley) V2

Range:

Lake Roosevelt National Recreation Area

This Association is present throughout the park with fewer concentrations in the northern areas.

Global

Betual occidentalis/Cornus sericea shrubland is found throughout the Rocky Mountains from New Mexico north to the Canadian border and the Intermountain Region and Colorado plateaus.

Comments:

Betula occidentalis/Cornus sericea shrubland is found in narrow bands along stream banks and alluvial terraces. The dominant shrub species will vary based on the elevational position of the stand and the occurrences of seeps, fens and springs. This Association often occurs as a mosaic of multiple communities with varying degrees of herbaceous vegetation.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A4 *Juniperus scopulorum* Woodland

Northern Rocky Mountain Foothill Conifer Wooded Steppe



Description: This Assocation is characterized by an open tree canopy dominated by *Juniperus scopulorum*. Tree canopy cover values are more than 5%, but typically less than 20%, and canopy height is usually 2-10 m. Shrubs such as *Mahonia aquifolium* or *Rhus glabra*, occur regularly in the shrub stratum but generally with very low cover. The herbaceous layer is dominated by graminoids such as *Poa bulbosa* and the winter annual *Bromus tectorum*. Associated forbs may include *Trifolium repens* and *Sisymbrium altissimum* with the total forb cover between 10 to 35%.

Conservation Rank: N/A	**Database Code:** JUSC2	**Elcode:** CEGL003550

Characteristic Species: (n=3, AA=2)

Tree
Juniperus scopulorum (Rocky Mountain juniper) V15, *Pinus ponderosa* (ponderosa pine) V10

Shrub
Rhus glabra (smooth sumac) V5, *Mahonia repens* (creeping barberry) V2

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V25, *Poa bulbosa* (bulbous bluegrass) V10

Forb
Trifolium repens (white clover) V15, *Sisymbrium altissimum* (tall tumblemustard) V10

Range:

Lake Roosevelt National Recreation Area
This Assocation is spread intermintently throughout the park adjacent to the park boundary.

Global

Juniperus scopulorum (Rocky Mountain Juniper) is common in the northern and central rocky mountains east through the plains and on some high elevation plateaus in Colorado. The Assocation has the potential to occur throughout the range of the Intermountain region and Pacific Northwest.

Comments:

At the upper elevational limit, *Juniperus scopulorum* communities may merge with woodlands and forests dominated by *Pinus* species.

This Assocation is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A5 *Pinus ponderosa/ Symphoricarpos albus* Forest

Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest



Description: These woodlands and savannas are, or at least historically were, fire-maintained and occurring at the lower treeline/ecotone between grasslands or shrublands and more mesic coniferous forest. *Pinus ponderosa is* the predominant conifer; *Pseudotsuga menziesii* may be present in the tree canopy but is sometomes absent. The understory can be shrubby, with *Physocarpus malvaceus*, *Mahonia aquifolium*, *Symphoricarpos albus*, *Prunus virginiana*, *Amelanchier alnifolia*, and *Spiraea betulifolia* being common. Understory vegetation in the true savanna is predominantly fire-resistant grasses and forbs that resprout following surface fires and shrubs, understory trees and downed logs are uncommon in these areas. These more open stands support grasses such as *Pseudoroegneria spicata* and *Festuca idahoensis*. The more mesic portions of this system may include *Calamagrostis rubescens*.

Conservation Rank: G4	**Database Code:** PIPO/SYAL	**Elcode:** CEGL000840

Characteristic Species: (n=92, AA=81)

Tree

Pinus ponderosa (ponderosa pine) V10, *Pseudotsuga menziesii* (Douglas-fir) V2

Shrub

Symphoricarpos albus (common snowberry) V20, *Purshia tridentata* (antelope bitterbrush) V15

Dwarf-shrub

N/A

Graminiod

Bromus tectorum (cheatgrass) V10, *Pseudoroegneria spicata* (bluebunch wheatgrass) V5

Forb

Lupinus sericeus (silky lupine) V5, *Balsamorhiza sagittata* (arrowleaf balsamroot) V5

Range:

Lake Roosevelt National Recreation Area
This Association is present throughout the park in high concentrations.

Global
Matrix system which occurs in the foothills of the northern Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and eastern Cascades into southern interior British Columbia.

Comments:
This Association is common throughout the park unit.

This Assocation is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A6 *Populus balsamifera trichocarpa/ Symphoricarpos albus* Shrubland

North Pacific Lowland Riparian Forest and Shrubland



Description: Forests and tall shrublands that is linear in character, occurring on low-elevations. This Assocation is characterized by an open tree canopy dominated by *Populus balsamifera trichocarpa* with *Pinus ponderosa* present in the understory. Tree canopy cover values are more than 25%, but typically less than 75%, and canopy height is usually 8-15 m. Shrubs such as *Mahonia aquifolium* or *Symphoricarpos albus*, occur regularly in the shrub stratum at moderate levels of cover. The herbaceous layer is dominated by graminoids such as *Poa pratensis* and *Elymus glaucus*. Associated forbs may include *Maianthemum stellatum* and *Vicia villosa*.

Conservation Rank: G3G4	**Database Code:** POBAT/SYAL	**Elcode: N/A**

Characteristic Species: (n=5, AA=19)

Tree

Poplulus balsamifera.trichocapa (Black cottonwood) V25, *Pinus ponderosa* (ponderosa pine) V5

Shrub

Symphoricarpos albus (common snowberry) V35, *Mahonia aquifolium* (hollyleaved barberry) V15

Dwarf-shrub

N/A

Graminiod

Poa pratensis (Kentucky bluegrass) V2, *Elymus glaucus* (blue wildrye) V2

Forb

Maianthemum stellatum (starry false lily of the valley) V5, *Vicia villosa* (winter vetch) V2

Range:

Lake Roosevelt National Recreation Area

This Assocation is present throughout the majority of the park area with the highest concentrations found in the northern and central portions of the park.

Global

This Assocation has been documented from Washington south to northern California and eastward to Idaho and all of Montana west of the Continental Divide, as well as central Montana.

Comments:

Populus balsamifera trichocarpa is a pioneering species that requires moist, barren newly deposited alluvium exposed to full sunlight for regeneration. In the absence of fluvial disturbance, succession continues to a variety of conifer dominated habitat types such as *Pinus ponderosa, Pseudotsuga menziesii, Abies grandis, Picea* spp., *Thuja plicata, Tsuga heterophylla, Abies lasiocarpa,* or *Juniperus scopulorum.* If conifers are absent, shrubs and herbaceous species that formed the former undergrowth may persist.

A7 *Populus balsamifera trichocarpa/* Mixed Herbaceous Shrubland

North Pacific Lowland Riparian forest and Shrubland



Description: This Assocation is characterized by an open tree canopy dominated by *Populus balsamifera trichocarpa* with *Pinus ponderosa* present in the understory. Tree canopy cover values are more than 25%, but typically less than 75%, and canopy height is usually 8-15 m. The shrub component is variable with *Mahonia aquifolium* or *Symphoricarpos albus* occurring regularly at moderate levels of cover. The herbaceous layer is variable with graminoids such as *Elymus glaucus, Phalaris arundinacea, Juncus balticus* and *Poa pratensis*. Associated forbs may include *Maianthemum stellatum, Vicia villosa, Medicago lupulina* and *Equisetum laevigatum*.

Conservation Rank: G3	**Database Code:** POBAT/MIXED FORB	**Elcode:** CEGL000675

Characteristic Species: (n=1, AA)

Tree

Poplulus balsamifera trichocapa (Black cottonwood) V15, *Pinus ponderosa* (ponderosa pine) V5

Shrub

Symphoricarpos albus (common snowberry) V50, *Cornus stolonifera* (western dogwood) V50

Dwarf-shrub

N/A

Graminiod

Elymus glaucus (blue wildrye) V10, *Phalaris arundinacea* (reed canarygrass) V5

Forb

Maianthemum stellatum (starry false lily of the valley) V5, *Vicia villosa* (winter vetch) V2

Range:

Lake Roosevelt National Recreation Area

This Assocation is present throughout the majority of the park area with the highest concentrations found in the northern and central portions of the park.

Global

This Association is found on the periphery of the northern Rockies in the Columbia River Basin, along major tributaries and the main stem of the Columbia at relatively low elevations.

Comments:

Populus balsamifera trichocarpa is a pioneering species that requires moist, barren newly deposited alluvium exposed to full sunlight for regeneration. In the absence of fluvial disturbance, succession continues to a variety of conifer dominated habitat types such as *Pinus ponderosa, Pseudotsuga menziesii, Abies grandis, Picea* spp., *Thuja plicata, Tsuga heterophylla, Abies lasiocarpa,* or *Juniperus scopulorum.* If conifers are absent, shrubs and herbaceous species that formed the former undergrowth may persist.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A8 *Poplulus balsamifera trichocarpa/ Salix exigua* Shrubland

Columbia Basin Foothill Riparian Woodland and Shrubland



Description: Low-elevation riparian system found along the main stem of the Columbia River and associated major tributaries on the periphery of the mountains surrounding the Columbia River Basin at and below lower tree line. This Assocation is characterized by an open tree canopy dominated by *Populus balsamifera trichocarpa*. Tree canopy cover values are more than 35%, but typically less than 75%, and canopy height is usually 5-15 m. The shrub component is variable with *Salix exigua* at 2 to 5% cover. The herbaceous layer is dominated with invader species graminoids such as *Bromus tectorum* and *Poa bulbosa*. Associated forbs may include *Centaurea biebersteinii* and *Verbascum thapsus.*

Conservation Rank: G4	**Database Code:** POBAT/SAEX	**Elcode:** CEGL000676

Characteristic Species: (n=1, AA)

Tree
Poplulus balsamifera trichocapa (Black cottonwood) V35

Shrub
Salix exiga (narrowleaf willow) V2

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V2, *Poa bulbosa* (bulbous bluegrass) V1

Forb
Centaurea biebersteinii (Spotted knapweed) V1, *Verbascum thapsus* (common mullein) V1

Range:

Lake Roosevelt National Recreation Area
This Assocation is scattered throughout the park area. Typically concentrations of this Assocation

are very low except for in the southwestern portion of the park where a higher level is present.

Global

Linear system found on the periphery of the northern Rockies in the Columbia River Basin, along major tributaries and the main stem of the Columbia at relatively low elevations.

Comments:

This Assocation generally comprises a mosaic multiple communities that are tree-dominated with a diverse shrub component. It is dependent on a natural hydrologic regime with annual to episodic flooding, so it is usually found within the flood zone of rivers, on islands, sand or cobble bars, and along streambanks. It 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. In some locations, occurrences extend into moderately high intermountain basins where the adjacent vegetation is sage steppe.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A9 *Populus tremuloides / Symphoricarpos albus* Woodland

Rocky Mountain Aspen Forest and Woodland



Description: Aspen forests and woodlands are a minor type found on the east side of the North Cascades and in the Okanogan. This Assocation is characterized by a partially open tree canopy dominated by *Populus tremuloides*. Tree canopy cover values are more than 10%, but typically less than 75%, and canopy height is usually 10-15 m. The shrub component is variable with *Symphoricarpos albus* and *Mohonia aquifolium* at 25 to 75% cover. The herbaceous layer is dominated with invader species graminoids such as *Bromus inermis* and *Elymus glaucus*. Associated forbs may include *Vicia villosa* and *Arctium minus.*

Conservation Rank: G4	**Database Code: POTR5/SYAL**	**Elcode:** CEGL000609

Characteristic Species: (n=2, AA=10)

Tree
Populus tremuloides (quaking aspen) V15

Shrub
Symphoricarpos albus (common snowberry) V75, *Mahonia aquifolium* (hollyleaved barberry) V5

Dwarf-shrub
N/A

Graminiod
Bromus inermis (smooth brome) V50, *Elymus glaucus* (blue wildrye) V1

Forb
Vicia villosa (winter vetch) V2

Range:
Lake Roosevelt National Recreation Area

This Assocation is present throughout the majority of the park area with the highest concentrations found in the northern and central portions of the park.

Global

Widespread, large patch system which is very 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.

Comments:

This Association is found in small to large stands in cool, moist habitats. It is often either adjacent to wetlands or riparian areas or a component within a forest habitat.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A10 *Robinia pseudoacacia* Semi-natural Forest

Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland



Description: *Robinia pseudoacacia* is the predominant tree present in the tree canopy. *Pinus ponderosa* is present in some areas in low numbers. The canopy height is 8-15 m. The shrub component is mostly absent; however *Mahonia aquifolium* and *Symphoricarpos albus* are sometimes present. Understory vegetation is predominantly grasses with some forbs. The stands support grasses such as *Elymus repens* and *Poa pratensis*. *Galium aparine* and *Vicia villosa* are the most common forbs.

Conservation Rank: G4	**Database Code: ROPS**	**Elcode:** N/A

Characteristic Species: (n=2, AA)

Tree
Robinia pseudoacacia (black locust) V50, *Pinus ponderosa* (ponderosa pine) V1

Shrub
Mahonia aquifolium (hollyleaved barberry) V2, *Symphoricarpos albus* (common snowberry) V1

Dwarf-shrub
N/A

Graminiod
Elymus repens (quackgrass) V35, *Poa pratensis* (Kentucky bluegrass) V5

Forb
Galium aparine (sticky willy) V2, *Vicia villosa* (winter vetch) V1

Range:

Lake Roosevelt National Recreation Area
This Association is very infrequent, but can be found in isolated pockets throughout the central and southwestern regions of the park.

Global

Centered in the Appalachian Mountains and ranges from central Pennsylvania and southern Ohio, south to northeastern Alabama, northern Georgia, and northwestern South Carolina. The western section includes the Ozark Plateau of southern Missouri, northern Arkansas, and northeastern Oklahoma, and the Ouachita Mountains of central Arkansas and southeastern Oklahoma. Outlying populations appear in southern Indiana and Illinois, Kentucky, Alabama, and Georgia. Black locust has been planted widely and has become naturalized throughout the United States, southern Canada, and parts of Europe and Asia.

Comments:

This Association is often found in dense patches and can tolerate some shading from adjacent tree canopy.

This Assocaition is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011), in its natural habitat.

A11 *Ulmus americana / Bromus tectorum* Semi-natural Woodland

Columbia Basin Foothill Riparian Woodland and Shrubland



Description: The vegetation in this semi-natural association is dominated by the introduced tree *Ulmus americana.* Tree canopy cover values are more than 10%, but typically less than 25%, and canopy height is usually 10-15 m. The shrub component is under 5% cover and the most common species include *Atremisia tridentata* and *Purshia tridentata*. Understory vegetation is predominantly introduced grasses typically *Bromus tectorum* and *Poa pratensis*. The forbs most commonly observed include *Achillea millefolium* and *Lupinus sericeus.*

Conservation Rank: N/A	**Database Code: ULAM/BRTE**	**Elcode:** N/A

Characteristic Species: (n=1, AA)

Tree
Ulmus americana (American elm) V10

Shrub
Atremisia tridentata (big sagebrush)V1, *Purshia tridentata* (Antelope bitterbrush) V1

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V15, *Poa pratensis* (Kentucky bluegrass) V10

Forb
Achillea millefolium (common yarrow) V1, *Lupinus sericeus* (silky lupine) V1

Range:

Lake Roosevelt National Recreation Area

This Association is very infrequent, but can be found in isolated pockets throughout the central and southwestern regions of the park.

Global

This Assocation is likely uncommon, with a few small patches across the western U.S., occurring only where *Ulmus americana* has been planted or has spread from a planting and disturbance has facilitated the dominance of *Bromus tectorum* in the understory.

Comments:

American elm was introduced into this area as a landscape tree. It is not thought to be invasive and competitive with native species. Cheatgrass is invasive and widespread throughout the west.

This Association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A12 *Amelanchier alnifolia / Pseudoroegneria spicata* Shrubland

Northern Rocky Mountain Lower Montane-Foothill Shrubland



Description: The shrub layer is dominated by *Amelanchier alnifolia* whose cover often exceeds 25%. Other shrubs consistently present, though not exhibiting coverages in excess of 5%, are *Symphoricarpos albus, Acer glabrum, Philadelphus lewisii* and *Holodiscus discolor*. The herbaceous layer is dominated by graminoids such as *Pseudoroegneria spicata* and *Leymus cinereus*. Associated forbs may include *Lupinus sericeus* and *Balsamorhiza sagittata.*

Conservation Rank: G2	**Database Code: AMAL2/PSSP6**	**Elcode: CEGL001065**

Characteristic Species: (n=5, AA=6)

Tree
N/A

Shrub
Amelanchier alnifolia (Saskatoon serviceberry) V10, *Symphoricarpos albus* (common snowberry) V5

Dwarf-shrub
N/A

Graminiod
Pseudoroegneria spicata (bluebunch wheatgrass) V10, *Leymus cinereus* (basin wildrye) V5

Forb
Lupinus sericeus (silky lupine) V10, *Balsomarhiza sagittata* (arrowleaf balsamroot) V5

Range:

Lake Roosevelt National Recreation Area
This Association is present in significant amounts throughout the park with the greatest abundance being found in the northern, central, and south-central portions.

Global

Located throughout the western U.S and most of Canada.

Comments:

Amelanchier alnifolia is considered a fair to good browse species and can be an important wildlife food source in the winter. It also provides cover and nesting habitat for various bird species.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011), in its natural habitat.

A13 *Alnus incana* / Mesic Forbs Shrubland

Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland



Description: This Association is a common montane to subalpine riparian shrubland occurring as narrow bands or large expanses of shrubs lining streambanks and alluvial terraces in narrow to wide, low-gradient valley bottoms and floodplains with sinuous stream channels. The vegetation in this Association is dominated by a shrub component of 15% to 35% cover and the most common species include *Alnus incana* and *Salix exigua*. The herbaceous vegetation is predominantly introduced grasses typically *Phalaris arundinacea, Bromus tectorum* and *Poa pratensis*. The forbs most commonly observed include *Heracleum maximum* and *Dipsacus sylvestris*.

Conservation Rank: G3	**Database Code: ALIN2/MESIC FORBS**	**Elcode: CEGL001147**

Characteristic Species: (n=1, AA)

Tree
N/A

Shrub
Alnus incana (gray alder) V25, *Salix exigua* (narrowleaf willow) V1

Dwarf-shrub
N/A

Graminiod
Phalaris arundinacea (reed canarygrass) V25, *Bromus tectorum* (cheatgrass) V5

Forb
Heracleum maximum (common cowparsnip) V10, *Dipsacus sylvestris* (Fuller's teasel) V1.

Range:
Lake Roosevelt National Recreation Area

This Association is present in significant amounts throughout the park with the greatest abundance being found in the northern, central, and south-central portions.

Global

Linear system found throughout the Rocky Mountain corridor from New Mexico north into Montana, and also occurs in mountainous areas of the Intermountain region and Colorado Plateau.

Comments:

Alnus incana is often a colonizing species after a disturbance and will normally persist in the understory of a forest or woodland. This is a common component along riparian areas.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011), in its natural habitat.

A14 *Alnus viridis sinuata* Shrubland

Columbia Basin Foothill Riparian Woodland and Shrubland



Description: This Association is found in the low-elevation riparian system along the main stem of the Columbia River and associated major tributaries on the periphery of the mountains surrounding the Columbia River Basin at and below lower tree line. Important and diagnostic trees include *Populus balsamifera trichocarpa, Alnus rhombifolia, Populus tremuloides, Celtis laevigata reticulata, Betula occidentalis,* or *Pinus ponderosa*. The vegetation in this Association is dominated by the shrub component which is over 50% cover. The most common species include *Alnus viridis sinuata, Acer glabrum* and *Prunus virginiana.* Herbaceous vegetation is predominantly lightly scattered grasses and forbs. The most common grass was typically *Festuca ovina*. The forbs most commonly observed include *Rubus parviflorus* and *Glycyrrhiza lepidota*.

Conservation Rank:	**Database Code: ALVIS/MESIC FORBS**	**Elcode: CEGL002633**

Characteristic Species: (n==1, AA)

Tree
N/A

Shrub
Alnus viridis sinuata (Sitka alder) V50, *Acer glabrum* (Rocky Mountain maple) V25

Dwarf-shrub
N/A

Graminiod
Festuca ovina (sheep fescue) V1

Forb
Rubus parviflorus (thimbleberry) V1, *Glycyrrhiza lepidota* (American licorice) V1

Range:
Lake Roosevelt National Recreation Area

This Association is present throughout the park with fewer concentrations near the southwestern edge.

Global

Linear system found on the periphery of the northern Rockies in the Columbia River Basin, along major tributaries and the main stem of the Columbia at relatively low elevations.

Comments:

Alnus viridis sinuata is often a colonizing species after a disturbance and will normally persist in the understory of a forest or woodland. This is a common component along riparian areas, but also extends into upland areas where sufficient sub-surface moisture is present.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011), in its natural habitat.

A15 *Artemisia tridentata /Bromus tectorum* Semi-natural Shrubland

Inter-Mountain Basins Big Sagebrush Shrubland



Description: *Artemisia tridentata tridentata* dominates the canopy of this shrubland Assocation. The canopy structure can range from open to nearly closed. Additional species occurring in the shrub overstory include *Chrysothamnus nauseosus,* which is frequently present as scattered individuals. The herbaceous understory is generally sparse to moderate cover with *Bromus tectorum* and *Bromus japonicus* dominant. Additional native and non-native grass and forb species often occur in this vegetation type, but tend to be sparse in terms of cover and variable in terms of species composition.

Conservation Rank: N/A	**Database Code: ARTR2/BRTE**	**Elcode:** N/A

Characteristic Species: (n=1, AA=14)

Tree
N/A

Shrub
Artemisia tridentata tridentata (big sagebrush) V10, *Chrysothamnus nauseosus* (rubber rabbitbrush) V5

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V15, *Bromus japonicus* (filed brome) V1

Forb
Hypericum perforatum (St. Johnswort) V2, *Achillea millefolium* (common yarrow) V1

Range:

Lake Roosevelt National Recreation Area

This Association is most abundant in the southwestern portion of the park area, although small concentrations can be found in the central and eastern portions.

Global

This shrubland Assocation has the potential to occur throughout the interior western U.S. from Washington to Montana south to Utah and Nevada. It may also occur in Oregon, California, and British Columbia, Canada.

Comments:

Artemisia tridentata tridentata is found in more mesic, well drained soils than many of the related sub-species. *Bromus tectorum* has to a large extent replaced the native rhizominous and bunch grasses.

This Association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A16 *Artemisia tridentata /Festuca idahoensis* Shrubland

Inter-Mountain Basins Big Sagebrush Shrubland



Description: This Association is a sagebrush shrublands, with more than 15% and less than 50% cover of herbaceous species, occurring throughout the Columbia Basin dominated by *Artemisia tridentata tridentata.* Other shrub species include *Artemisia tripartita* and *Chysothamnus nauseosus.* The typical shrub cover is 15 to 35%. Perennial herbaceous cover is typically 15 to 50%. Common graminoid species can include *Festuca idahoensis*, *Poa pratensis* or *Pseudoroegneria spicata*. Common forb species include *Lupinus sericeus* and some invader species.

Conservation Rank: G5	**Database Code: ARTR2/FEID**	**Elcode: CEGL001530**

Characteristic Species: (n=2, AA=5)

Tree
N/A

Shrub
Artemisia tridentata tridentata (big sagebrush) V20, *Artemisia tripartita* (threetip sagebrush) V2

Dwarf-shrub
N/A

Graminiod
Festuca idahoensis (Idaho fescue) V25 *Poa pratensis* (Kentucky bluegrass) V10

Forb
Lupinus sericeus (silky lupine)V5, *Eriogonum heracleoides* (St. Johnswort) V1

Range:

Lake Roosevelt National Recreation Area
This Association is most abundant in the southwestern portion of the park area, although a few concentrations can also be found in the central and eastern portions.

Global

This is a wide-ranging Assocation, known throughout the northwestern U.S. It occurs in eastern Oregon, Nevada, Utah, Colorado, Wyoming, Montana, Idaho, and possibly further north into Alberta and British Columbia. It may also occur in eastern California.

Comments:

This Association is well established in the dry, rocky southwestern areas. Sagebrush is important for a variety of wildlife species as food and shelter.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011), in its natural habitat.

A17 *Artemisia tridentata /Leymus cinereus* Shrubland

Inter-Mountain Basins Big Sagebrush Shrubland



Description: Sagebrush shrublands, with 25% cover of herbaceous species, occurring throughout the Columbia Basin. This association is dominated by *Artemisia tridentata tridentata*. Other shrub species respented in the association include *Crataegus douglasii* and *Symphoricarpus albus*. The typical shrub cover is 10 to 25%. Perennial herbaceous cover is typically between 25-35%. Common graminoid species can include *Bromus japonicus, Leymus cinereus* and *Bromus tectorum*. The most comon forb species includes *Balsamhoriza sagittata* and *Epilobium brachycarpum.*

Conservation Rank: G2	**Database Code: ARTR2/LEC14**	**Elcode: CEGL001458**

Characteristic Species: (n=2, AA=1)

Tree
N/A

Shrub
Artemisia tridentata tridentata (big sagebrush) V25, *Crataegus douglasii* (black hawthorn) V5

Dwarf-shrub
N/A

Graminiod
Bromus japonicus (field brome) V10, *Leymus cinereus* (basin wildrye) V5

Forb
Balsamhoriza sagittata (arrowleaf balsamroot) V15, *Epilobium brachycarpum* (tall annual willow herb) V2

Range:

Lake Roosevelt National Recreation Area

This Association is most abundant in the southwestern portion of the park area, although a few

concentrations can also be found in the central and eastern portions.

Global

This was formerly a widespread Assocation in the western United States. Today it is known from California to Washington and east to Montana and Colorado.

Comments:

This Association is generally found in mesic sites such as around seeps, swales, or seasonally flooded washes. It is also often associated with greasewood (*Sarcobatus vermiculatus*) indicating a salty bias.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011), in its natural habitat.

A18 *Artemisia tridentata wyomingensis/ Hesperostipa comata* Shrubland

Inter-Mountain Basins Big Sagebrush Shrubland



Description: Sagebrush shrublands, with 25% cover of herbaceous species, occurring throughout the Columbia Basin. The association is dominated by *Artemisia tridentata wyomingensis* and *Artemisia tripartita*. The typical cover of the shrub componenet is 25 to 50%. Perennial herbaceous cover is typically near 25%. Common graminoid species can include *Hesperostipa comate* and *Pseudoroegneria spicata*. *Bromus tectorum* is often present in the graminiod layer of this association. The common forbs include *Balsamhoriza sagittata, Lomatium dissectum eatonii and Lupinus sericeus.*

Conservation Rank: G2	**Database Code: ARTRW8/HECO26**	**Elcode: CEGL001051**

Characteristic Species: (n=5, AA=16)

Tree
N/A

Shrub
Artemisia tridentata wyomingensis (Wyoming big sage) V25, *Artemisia tripartita* (threetip sagebrush) V5

Dwarf-shrub
N/A

Graminiod
Hesperostipa comata (needle and thread) V15, *Pseudoroegneria spicata* (bluebunch wheatgrass) V2

Forb
Balsamhoriza sagittata (arrowleaf balsamroot) V5, *Lomatium dissectum eatonii* (fernleaf biscuitroot) V2

Range:

Lake Roosevelt National Recreation Area
This Association is most abundant in the southwestern portion of the park area, although a few concentrations can also be found in the central and eastern portions.

Global

This Assocation occurs within the Columbia River Basin of Oregon and Washington (Columbia Basin and western portion of the Okanogan Highlands ecoregional sections) and the Snake River Plain (Owyhee Uplands and Snake River Basalts ecoregional sections) in Idaho.

Comments:

The number, condition, and size of stands of this relatively wide-ranging plant Association have declined significantly due to land conversion to cultivation, intensive range management, introduction of exotic species, and alteration of fire disturbance regimes.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011), in its natural habitat.

A19 *Artemisia tridentata wyomingensis/ Psedoroegneria spicata* Shrubland

Inter-mountain Basins Big Sagebrush Steppe



Description: This system is grassland with shrubs. Shrubs are dominated by *Artemisia tridentata wyomingensis* and *Purshia tridentata* in an open to moderately dense (10-40%) cover. The perennial cover is greater than 25% with the associated graminoids including *Pseudoroegneria spicata* and *Hesperostipa comata*. Common forbs are *Lupinus sericeus* and *Balsamhoriza sagittata.*

Conservation Rank: G5	**Database Code: ARTRW8/PSSP6**	**Elcode: CEGL001009**

Characteristic Species: (n=6, AA=27)

Tree
N/A

Shrub
Artemisia tridentata wyomingensis (Wyoming big sage) V25, *Purshia tridentata* (antelope bitterbrush) V5

Dwarf-shrub
N/A

Graminiod
Psedoroegneria spicata (bluebunch wheatgrass) V15, *Hesperostipa comata* (needle and thread) V10

Forb
Lupinus sericeus (silky lupine)V5, *Balsamhoriza sagittata* (arrowleaf balsamroot) V2

Range:

Lake Roosevelt National Recreation Area

This Association is most abundant in the southwestern portion of the park area, although a few concentrations can also be found in the central and eastern portions.

Global

Large patch system which occurs throughout much of the Columbia Plateau and northern Great Basin, east into the Wyoming Basins, central Montana, and north and east onto the western fringe of the Great Plains in Montana and South Dakota.

Comments:

This is a common and widespread Association throughout its range.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011), in its natural habitat.

A20 *Artemisia tripartita / Poa secunda* Shrubland

Inter-Mountain Basins Big Sagebrush Shrubland



Description: A*rtemisia tripartita* dominates an open to nearly closed canopy. Shrubs are dominated by *Artemisia tripartita* and *Artemisia tridentata* in an open to dense (10-50%) cover. The perennial cover is less than 25%. The understory is often diverse, but is generally dominated by *Poa secunda* and *Pseudoroegneria spicata*. The winter annual, *Bromus tectorum* is sometimes common in this association. Common forbs include the invader species *Leptodactylon pungens* and *Lithospermum ruderale.*

Conservation Rank: G2	**Database Code: ARTRT2/POSE**	**Elcode: A1528**

Characteristic Species: (n=2, AA)

Tree
N/A

Shrub
Artemisia tripartita (threetip sagebrush) V25, *Artemisia tridentata* (big sagebrush) V5

Dwarf-shrub
N/A

Graminiod
Poa secunda (Sandberg bluegrass) V10, *Psedoroegneria spicata* (bluebunch wheatgrass) V5

Forb
Leptodactylon pungens (granite prickly phlox) V2, *Lithospermum ruderale* (western stoneseed) V1

Range:

Lake Roosevelt National Recreation Area
This Association is present in small patches in the southwestern portion of the park

Global

The *Artemisia tripartita* Shrub Herbaceous Association occurs from eastern Washington and British Columbia, across the upper Columbia Basin to dry habitats of the Rocky Mountains of Montana, Wyoming, and Colorado. The *Artemisia tripartita / Poa secunda* Shrubland Assocation is likely found sporadically wherever environmental conditions are appropriate throughout the entire range of the greater Association.

Comments:

Poa secunda is wide spread and persistant in much of these sagebrush grasslands and is often the dominant graminoid.

This Association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A21 *Chrysothamnus viscidiflorus / Bromus tectorum* Semi-natural Shrub Herbaceous Vegetation

Inter-Mountain Basins Big Sagebrush Steppe



Description: Total vegetation cover of this plant community is generally low to moderate and the Assocation is characterized by an open shrub canopy dominated by *Chrysothamnus viscidiflorus. Chrysothamnus nauseosus* and *Artemisia tridentata wyomingensis* commonly occur in this association in low numbers. The typical shub cover is 5-15%. Cover of the herbaceous layer is low to moderate and occasionally approaches levels equal to those of the shrub stratum. The introduced annual grass, *Bromus tectorum* generally dominates the understory and *Poa secunda* is nearly always present but at low cover values. Forbs composition is diverse but contributes very little total cover.

Conservation Rank: N/A	**Database Code: CVHI8/BRTE**	**Elcode:** N/A

Characteristic Species: (n=1, AA)

Tree

Pinus ponderosa (ponderosa pine) V1

Shrub

Chrysothamnus viscidiflorus (yellow rabbitbrush) V5, *Chrysothamnus nauseosus* (rubber rabbitbrush) V2

Dwarf-shrub

N/A

Graminiod

Bromus tectorum (cheatgrass) V25, *Poa bulbosa* (bulbous bluegrass) V 2

Forb

Eriogonum heracleoide (St. Johnswort) V1, *Lithophragma glabrum* (bulbous woodland-star) V1

Range:

Lake Roosevelt National Recreation Area

This Association is present throughout the park with fewer concentrations near the southwestern edge.

Global

Vegetation in the *Chrysothamnus viscidiflorus* Shrubland Association has been documented to occur in western Colorado, Utah and the Snake River Plain of southern Idaho. It likely occurs throughout the interior West in disturbed areas that normally support sagebrush shrublands. The *Chrysothamnus viscidiflorus / Bromus tectorum* Shrubland Assocation likely occurs sporadically through the range of the greater Association where *Bromus tectorum* has had the opportunity to invade the understory, particularly on or around disturbed sites.

Comments:

This Association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A22

Crataegus douglasii /Mesic Graminoids Shrubland Vegetation

Northern Rocky Mountain Montane-Foothills Deciduous Shrubland



Description: Total vegetation cover of this plant association is generally low to moderate and is characterized by an open shrub canopy dominated by *Crataegus douglasii.* Other common shrubs found include *Prunus domestica* and *Prunus virginiana*. The typical shub cover is 10-25%. Cover of the herbaceous layer is high ranging from 25-50%. The common graminoids include *Thinopyrum intermedium, Poa pratensis* and *Psedoroegneria spicata.* Forbs composition is diverse but contributes very little total cover. *Pinus ponderosa* regeneration can occur in this association although in low numbers.

Conservation Rank: N/A	**Database Code: CRDO2/MESIC**	**Elcode: N/A**

Characteristic Species: (n=3, AA=10)

Tree
Pinus ponderosa (ponderosa pine) V1

Shrub
Crataegus douglasii (black hawthorn) V5, *Prunus virginiana* (chokecherry) V1

Dwarf-shrub
N/A

Graminiod
Thinopyrum intermedium (intermediate wheatgrass) V50, *Poa pratensis* (Kentucky bluegrass) V 2

Forb
Vicia americana (American vetch) V2, *Sisymbrium altissimum* (tall tumblemustard) V1

Range:

Lake Roosevelt National Recreation Area

This Association is present throughout the park with fewer concentrations near the southwestern edge.

Global

This shrubland system is found in the lower montane and foothill regions in the Rocky Mountains, into the Columbia Basin to the western Great Plains.

Comments:

The native *Crataegus douglasii* is often found with an assemblage of non-native vegetation.

This Alliance was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A23 *Ericameria nauseosa /Bromus tectorum* Semi-natural Shrubland

Inter-Mountain Basins Big Sagebrush Shrubland



Description: Total vegetation cover of this Assocation is generally low to moderate and the plant community is characterized by an open shrub canopy dominated by either *Ericameria nauseosa*, *Chrysothamnus viscidiflorus* or a combination of both. Other shrubs may occur sporadically in the overstory, although species composition is variable and cover is sparse. Cover of the shrub component is between 10 and 25%. Cover of the herbaceous layer is low to moderate and occasionally approaches cover levels equal to those of the shrub stratum. *Psedoroegneria spicata* generally dominates the patchy understory and *Bromus tectorum* is always present and occasionally co-dominates the herbaceous layer at low to moderate cover values (5-25%). Forbs tend to be sparse and variable and often include both introduced and native species.

Conservation Rank:	**Database Code: ERNA10/BRTE**	**Elcode: CEGL002937**

Characteristic Species: (n=7, AA=33)

Tree

N/A

Shrub

Ericameria nauseosa (rubber rabbitbrush)V25, *Chrysothamnus viscidiflorus* (yellow rabbitbrush) V10

Dwarf-shrub

N/A

Graminiod

Bromus tectorum (cheatgrass) V25, *Psedoroegneria spicata* (bluebunch wheatgrass) V5

Forb

Lupinus sericeus (silky lupine)V5, *Balsamhoriza sagittata* (arrowleaf balsamroot) V2

Range:

Lake Roosevelt National Recreation Area

This Association is present throughout the central and souther portions of the park, with the heaviest

concentrations found in the southern and southwestern portions.

Global

This Assocation likely occurs as isolated patches throughout the western U.S. as all of the diagnostic species are common and widespread. The range of this Assocation is probably restricted to areas that have been impacted by disturbance as indicated by the abundance of cheatgrass and the absence of non-resprouting shrubs.

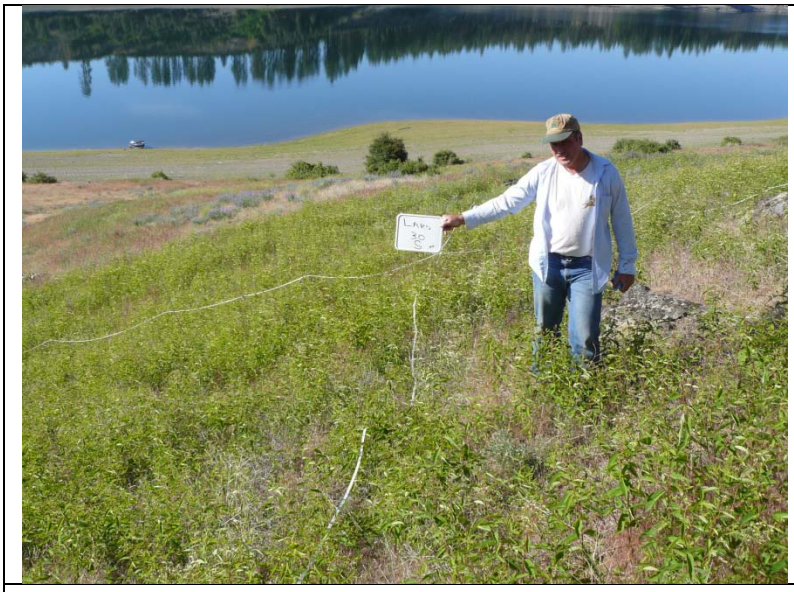
Comments:

This Association may be increasing with the expansion of *Bromus tectorum*.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011), in its semi-natural habitat.

A24 *Eriogonum niveum /Bromus tectorum* Dwarf-shrub Herbaceous Vegetation

Inter-Mountain Basins Big Sagebrush Shrubland



Description: Total vegetation cover of this plant community is generally low to moderate and the Assocation is characterized by an open dwarf shrub canopy dominated by *Eriogonum niveum* **.** The typical shub cover is 5-15%. Cover of the herbaceous layer is moderate and exceeds levels of the shrub stratum. Annual graminoids dominate the herbaceous layer. These include *Bromus tectorum* and *Poa bulbosa*. Forbs composition is diverse and contributes to the total cover. The most common forbs are *Balsamhoriza sagittata* and *Apocynum androsaemifolium*.

Conservation Rank:	**Database Code: ERNI2/BRTE**	**Elcode: CEGL002937**

Characteristic Species: (n=3, AA)

Tree
N/A

Shrub
N/A

Dwarf-shrub
Eriogonum niveum (snow buckwheat) V5

Graminiod
Bromus tectorum (cheatgrass) V25, *Poa bulbosa* (bulbous bluegrass) V15

Forb
Balsamhoriza sagittata (arrowleaf balsamroot) V25, *Apocynum androsaemifolium* (spreading dogbane) V25

Range:

Lake Roosevelt National Recreation Area
This Association is present throughout the park with fewer concentrations near the southwestern edge.

Global
This Association is found in disturbed areas throughout the northwest US.

Comments:
This Association may have replaced the native *Eriogonum niveum / Poa secunda* Dwarf-shrub Herbaceous Vegetation.

This Association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A25 *Philadelphus lewisii /Pseudoroegneria spicata* Shrubland

Columbia Basin Foothill Riparian Woodland and Shrubland



Description: This Assocation has an open shrub canopy and may occasionally have a sparse tree canopy resulting from scattered *Pinus ponderosa* individuals. The shrub stratum is dominated by *Philadelphus lewisii* and *Purshia tridentata.* Other shrubs such as *Symphoricarpos albus* and *Artemisia tridentata,* may also be present. The total shrub cover is 10-25%. The herbaceous layer is dominated by the graminoids *Bromus tectorum* and *Psedoroegneria spicata*. Forb cover is sparse in this plant community, but *Balsamhoriza sagittata* and *Lupinus sericeus* are usually present. The herbaceous cover can be as high as 25%.

Conservation Rank: N/A	**Database Code: PHLE4/PSSP6**	**Elcode: N/A**

Characteristic Species: (n=1, AA=7)

Tree
N/A

Shrub
Philadelphus lewisii (Lewis' mock orange) V10, *Symphoricarpos albus* (common snowberry) V2

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V25, *Psedoroegneria spicata* (bluebunch wheatgrass) V10

Forb
Balsamorhiza sagittata (arrowleaf balsamroot) V5, *Lupinus sericeus* (silky lupine)V2

Range:

Lake Roosevelt National Recreation Area

This Assocation is located in the sourthern portion of the park except for a small isolated pocket in the central portion.

Global

This Assocation occurs in the Intermountain western U.S. and is limited on the drier climates to barren and sparsely vegetated areas.

Comments:

Philadelphus lewisii most often occurs with other shrubs and a mixed herbaceous understory. It is also found in the understory of an open tree canopy.

This Association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A26 *Prunus virginiana* Shrubland

Northern Rocky Mountain Montane-Foothill Deciduous Shrubland



Description: Deciduous shrublands of lower montane and foothill elevations occurring around the fringes of the Columbia Basin. The dominant shrubs are *Prunus virginiana* and *Acer glabrum* with *Amelanchier alnifolia, Symphoricarpos albus* and *Artemisia* spp. present. The canopy is moderate to dense ranging from 50 to 75% cover. The herbaceous layer consists of *Bromus tectorum*, *Poa pratensis* and *Elymus glaucus*. Forbs tend to be sparse and variable and often include both introduced and native species.

Conservation Rank: G4	**Database Code: PRVI**	**Elcode:** N/A

Characteristic Species: (n=2, AA=1)

Tree
N/A

Shrub
Prunus virginiana (chokecherry) V50, *Symphoricarpos albus* (common snowberry) V25

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V2, *Poa pratensis* (Kentucky bluegrass) V1

Forb
Triteleia grandiflora (largeflower triteleia) V2, *Clematis ligusticifolia* (western white clematis) V1

Range:

Lake Roosevelt National Recreation Area
This Assocation is present in the south-central and southern portions of the park, with the highest concentrations found in the park's southwestern corner.

Global

Large patch system found in the lower montane and foothill regions around the Columbia Basin, and north and east into the northern Rockies.

Comments:

This Alliance is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011), in its semi-natural habitat.

A27 *Purshia tridentata – Salvia dorri /Pseudoroegneria spicata* Shrubland

Inter-Mountain Basins Big Sagebrush Steppe



Description: Relatively open stands of *Purshia tridentata* occur with *Pseudoroegneria spicata* conspicuous in the understory of this shrub herbaceous vegetation type. The shrub cover is generally 5-10%. *Pseudoroegneria spicata* is generally abundant to nearly codominant. Additional shrub species may be present but sparse. Component graminoid and forb species may also be diverse and variable. The herbaceous layer is between 5-10% cover.

Conservation Rank: G3	**Database Code: PUTR2-SADO4/PSSP6**	**Elcode: N/A**

Characteristic Species: (n=2, AA)

Tree
N/A

Shrub
Purisha tridentata (antelope bitterbrush)V10, *Salvia dorri* (purple sage) V1

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V5, *Psedoroegneria spicata* (bluebunch wheatgrass) V5

Forb
Balsamorhiza sagittata (arrowleaf balsamroot) V5, *Eriogonum elatum* (tall woolly buckwheat) V2

Range:

Lake Roosevelt National Recreation Area
This Association is present throughout the park with fewer concentrations near the southwestern edge.

Global

This relatively widespread plant Assocation occurs on sites in the Eastern Cascades, Blue Mountains, and Bitterroot Valley ecoregional sections. Stands are also reported from the southwestern portion of the Idaho Batholith section and the Upper Snake River Plain and Great Rift regions of southeast and south-central Idaho. Stands are clustered in discrete centers of occurrence.

Comments:

This Association often has substantial cover of *Purshia tridentata*.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A28 *Purshia tridentata /Achnatherum hymenoides* Shrubland

Inter-Mountain Basins Active and Stabilized Dune



Description: This association is unvegetated to moderately vegetated (<10-30%) .The shrub comoponent is dominated by *Purshia tridentata* and Salvia *dorri.* Cover is between 5-15%. The herbaceous layer is dominated by *Bromus tectorum* and *Achnatherum hymenoides.* Forbs tend to be sparse and variable and often include both introduced and native species.

Conservation Rank: G1	**Database Code: PUTR2/ACHY**	**Elcode: CEGL001058**

Characteristic Species: (n=1, AA)

Tree
N/A

Shrub
Purshia tridentata (antelope bitterbrush) V5, *Salvia dorri* (purple sage) V2

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V5, *Achnatherum hymenoides* (Indian ricegrass) V2

Forb
Eriogonum elatum (tall woolly buckwheat) V2, *Phacelia hastata* (silverleaf phacelia) V1

Range:

Lake Roosevelt National Recreation Area
This Association is present throughout the park with fewer concentrations near the southwestern edge.

Global
Large patch system which occurs in intermountain basins of the western U.S.

Comments:
This is an uncommon Association across its range.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A29 *Purshia tridentata /Bromus tectorum* Semi-natural Shrubland

Inter-Mountain Basins Big Sagebrush Steppe



Description: This Assocation is characterized by open stands of *Purshia tridentata* with *Ericameria nauseosa* and other mixed shrub species. The shrub component is 25-50% cover in this association. The herbaceous layer is variable with graminoids such as *Poa secunda*, *Psedoroegneria spicata*, *Bromus tectorum* and *Poa bulbosa*. Associated forbs may include *Balsamorhiza sagittata* and *Lupinus sericeus*.

Conservation Rank: G1	**Database Code: PUTR2/BRTE**	**Elcode:** N/A

Characteristic Species: (n=16, AA=30)

Tree
N/A

Shrub
Purshia tridentata (antelope bitterbrush) V15, *Ericameria nauseosa* (rubber rabbitbrush)V25

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V10, *Poa bulbosa* (bulbous bluegrass) V2

Forb
Balsamorhiza sagittata (arrowleaf balsamroot) V10, *Lupinus sericeus* (silky lupine) V2

Range:

Lake Roosevelt National Recreation Area
This Association is most abundant in the southern portion of the park, although a few infrequent and scattered patches are present in the central portion as well.

Global
This relatively widespread plant Assocation occurs on sites in the Eastern Cascades, Blue Mountains, and

Bitterroot Valley ecoregional sections. Stands are also reported from the southwestern portion of the Idaho Batholith section and the Upper Snake River Plain and Great Rift regions of southeast and south-central Idaho. Stands are clustered in discrete centers of occurrence.

Comments:

This Association has taken the place of a native bunchgrass co-dominant.

This Association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A30 *Purshia tridentata /Festuca idahoensis* Shrub Herbaceous Vegetation

Inter-Mountain Basins Big Sagebrush Steppe



Description: This system is grassland with shrubs. Shrubs are dominated by *Purshia tridentata* in an open (5-25% cover) shrub layer and with at least 25% total perennial herbaceous cover. The herbaceous layer is variable with graminoids such as *Hesperostipa comata*, *Psedoroegneria spicata*, *Bromus tectorum*, *Festuca idahoensis* and *Poa bulbosa*. Associated forbs may include *Eriogonum heracleoides* and *Eriogonum elatum*.

Conservation Rank: G3G%	**Database Code: PUTR2/FEID**	**Elcode: CEGL002674**

Characteristic Species: (n=4, AA=7)

Tree
N/A

Shrub
Purshia tridentata (antelope bitterbrush) V10, *Amelanchier alnifolia* (serviceberry) V5

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V25, *Festuca idahoensis* (Idaho fescue) V10

Forb
Eriogonum heracleoides (parsnipflower buckwheat) V5, *Eriogonum elatum* (tall woolly buckwheat) V2

Range:

Lake Roosevelt National Recreation Area
This Association is present throughout the park with fewer concentrations near the southwestern edge.

Global

Large patch system which occurs throughout much of the Columbia Plateau and northern Great Basin, east into the Wyoming Basins, central Montana, and north and east onto the western fringe of the Great Plains in Montana and South Dakota.

Comments:

The decrease of the perennial bunchgrass component and an increase in exotic annual grasses has put this Association into decline in both quality and abundance.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A31

Purshia tridentata /Hesperostipa comata Shrub Herbaceous Vegetation

Inter-Mountain Basins Big Sagebrush Steppe



Description: This system is grassland with shrubs. Shrubs are dominated by *Purshia tridentata* in an open to moderately dense (5-40% cover) shrub layer and with at least 25% total perennial herbaceous cover. The herbaceous layer is variable with graminoids such as *Hesperostipa comata, Poa secunda, Bromus tectorum, Festuca idahoensis* and *Poa bulbosa*. Associated forbs may include *Eriogonum heracleoide, Eriogonum elatum, Balsamorhiza sagittata* and *Lupinus sericeus.*

Conservation Rank: G2	**Database Code: PUTR2/HECO26**	**Elcode: CEGL001498**

Characteristic Species: (n=12, AA=8)

Tree
N/A

Shrub
Purshia tridentata (antelope bitterbrush) V25, *Ericameria nauseosa* (rubber rabbitbrush)V10

Dwarf-shrub
N/A

Graminiod
Hesperostipa comata (needle and thread) V15, *Bromus tectorum* (cheatgrass) V10

Forb
Eriogonum heracleoides (parsnipflower buckwheat) V5, *Eriogonum elatum* (tall woolly buckwheat) V2

Range:

Lake Roosevelt National Recreation Area
This Association is present throughout the park with fewer concentrations near the southwestern edge.

Global

Large patch system which occurs throughout much of the Columbia Plateau and northern Great Basin, east into the Wyoming Basins, central Montana, and north and east onto the western fringe of the Great Plains in Montana and South Dakota.

Comments:

The decrease of the perennial bunchgrass component and an increase in exotic annual grasses has put this Association into decline in both quality and abundance.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A32 *Purshia tridentata /Pseudoroegneria spicata* Shrub Herbaceous Vegetation Inter-Mountain Basins Big Sagebrush Steppe



Description: This system is a grassland with shrubs. Shrubs are dominated by *Purshia tridentata* in an open to moderately dense (5-40% cover) shrub layer and with at least 25% total perennial herbaceous cover. The herbaceous layer is variable with graminoids such as *Bromus tectorum* and *Pseudoroegneria spicata*. Associated forbs may include *Balsamorhiza sagittata, Lomatium dissectum, Eriogonum heracleoide, Eriogonum elatum,* and *Eriogonum niveum.*

Conservation Rank: G3	**Database Code: PUTR2/PSSP6**	**Elcode: CEGL001495**

Characteristic Species: (n=7, AA=20)

Tree
N/A

Shrub
Purshia tridentata (antelope bitterbrush) V15, *Symphoricarpos albus* (common snowberry) V10

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V15, *Psedoroegneria spicata* (bluebunch wheatgrass) V10

Forb
Balsamorhiza sagittata (arrowleaf balsamroot) V5, *Lomatium dissectum* (fernleaf biscuitroot) V2

Range:

Lake Roosevelt National Recreation Area

This Association is most abundant in the southern portion of the park, although a few infrequent and scattered patches are present in the central portion as well.

Global

Large patch system which occurs throughout much of the Columbia Plateau and northern Great Basin, east into the Wyoming Basins, central Montana, and north and east onto the western fringe of the Great Plains in Montana and South Dakota.

Comments:

The decrease of the perennial bunchgrass component and an increase in exotic annual grasses has put this Association into decline in both quality and abundance.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A33 *Rhus glabra / Hesperostipa comata* Shrubland

Northern Rocky Mountain Montane-Foothill Deciduous Shrubland



Description: This Assocation is characterized by open stands of *Rhus glabra* with *Acer rubrum* and *Rhus radican*. The shrub component is 10-25% cover in this Association. The herbaceous layer is variable with graminoids such as *Hesperostipa comata*, *Psedoroegneria spicata*, *Bromus tectorum* and *Dichanthelium leibergii*. Associated forbs may include *Balsamorhiza sagittata*, *Lotus purshianus*, *Vicia villosas* and *Lupinus sericeus*.

Conservation Rank: N/A	**Database Code: RHGL/HECO26**	**Elcode:** N/A

Characteristic Species: (n=3, AA=8)

Tree
N/A

Shrub
Rhus glabra (smooth sumac) V25, *Acer rubrum* (red maple) V10

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V5, *Hesperostipa comata* (needle and thread) V2

Forb
Balsamorhiza sagittata (arrowleaf balsamroot) V2, *Lotus purshianus* (birdsfoot trefoil) V1

Range:

Lake Roosevelt National Recreation Area
This Association is present throughout the park with fewer concentrations near the southwestern edge.

Global
This Association is common from the Columbia Basin to the Great Plains.

Comments:
This Association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A34 *Rosa gymnocarpa* Shrubland

Northern Rocky Mountain Montane-Foothill Deciduos Shrubland



Description: This Assocation is characterized by moderate to dense stands of *Rosa gymnocarpa* with *Ericameria nauseosa*. The shrub component is 50-90% cover in this association. The herbaceous layer is sparse with graminoids such as *Bromus tectorum* and *Poa bulbosa*. Forbs tend to be sparse and variable and often include both introduced and native species.

Conservation Rank: N/A	**Database Code:** **ROGY 1**	**Elcode:** N/A

Characteristic Species: (n=1, AA)

Tree
N/A

Shrub
Rosa gymnocarpa (Dwarf rose) V75, *Ericameria nauseosa* (rubber rabbitbrush) V10

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V2, *Poa bulbosa* (bulbous bluegrass) V1

Forb
Lactuca serriola (prickly lettuce) V, *Verbascum thapsus* (common mullein) V1

Range:

Lake Roosevelt National Recreation Area

This Association is present throughout the park with fewer concentrations near the southwestern edge

Global

This Association is present widespread in throughout the inland west from California to British Columbia.

Comments:
This shrub Association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A35 *Rosa woodsii* Shrubland

Northern Rocky Mountain Lower Montane-Foothill Deciduous Shrubland



Description: Wood's rose is a native perennial shrub, usually forming dense thickets. This Assocation is characterized by moderate to dense stands of *Rosa woodsii* with *Symphoricarpos albus* and *Holodiscus discolor*. The shrub component is 25-50% cover in this association. The herbaceous layer is sparse with graminoids such as *Bromus tectorum* and *Psedoroegneria spicata*. Forbs tend to be sparse and variable and often include both introduced and native species.

Conservation Rank:	**Database Code: ROWO**	**Elcode: CGL001126**

Characteristic Species: (n=2, AA=4)

Tree

Pinus ponderosa (ponderosa pine) V1

Shrub

Rosa woodsii (Wood's rose) V25, *Symphoricarpos albus* (common snowberry) V2

Dwarf-shrub

N\A

Graminiod

Psedoroegneria spicata (bluebunch wheatgrass) V10, *Bromus tectorum* (cheatgrass) V5

Forb

Heuchera cylindrical (roundleaf alumroot) V2, *Hypericum perforatum* (common St. Johnswort) V1

Range:

Lake Roosevelt National Recreation Area

This Association is present throughout the park with fewer concentrations near the southwestern edge.

Global

Wood's rose has a contiguous distribution. *Rosa woodsii* var. *woodsii* occurs from Arizona north to Alaska, east to Ontario, and south Wisconsin and Texas.

Comments:

This shrub Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A36 *Salix alba / Poa pratensis* Semi-natural Shrubland

Northern Rocky Mountain Lower Montane-Foothill Deciduous Shrubland



Description: This Association is found in areas of repreated disturbance and is an early seral Association. This Assocation is characterized by low to moderate stands of *Salix alba* with few other shrub species present. The shrub component is 5-25% cover in this Association. The herbaceous layer is sparse with graminoids such as *Panicum scribnerianum* and *Eleocharis palustris.* Forbs tend to be sparse and include *Amaranthus blitoides* and *Equisetum laevigatum*.

Conservation Rank:	**Database Code: SAAL2/POPR**	**Elcode:** N/A

Characteristic Species: (n=1, AA)

Tree
N/A

Shrub
Salix alba (white willow) V2

Dwarf-shrub
N/A

Graminiod
Panicum scribnerianum (Scribner's rosette grass) V1, *Eleocharis palustris* (common spikebrush) V1

Forb
Amaranthus blitoides (mat amaranth) V1, *Equisetum laevigatum* (smooth horsetail) V1

Range:

Lake Roosevelt National Recreation Area

This Assocation is intermittently present in small clumps throughout the park area.

Global
This Association is widespread in the US.

Comments:
Salix alba has been used as a landscape tree and can naturalize.

This Association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A37 *Salix exigua* Barren Shrubland

Northern Rocky Mountain Lower Montane Riparian Shrubland



Description: This Assocation is characterized by low to moderate stands of *Salix exigua* with *Rosa woodsii* and sometimes *Crataegus douglasii* and *Purshia tridentata* present. The shrub component is 10-50% cover in this association. The herbaceous layer is moderate to dense with graminoids such as *Phalaris arundinacea, Elymus repens* and *Bromus tectorum*. Forbs tend to be sparse and may include *Amaranthus blitoides* and *Equisetum laevigatum* as well as some other native and invader species.

Conservation Rank: G5	**Database Code: SAEX/BARREN**	**Elcode: CEGL001200**

Characteristic Species: (n=4, AA=2)

Tree
N/A

Shrub
Salix exigua (narrowleaf willow) V25

Dwarf-shrub
N/A

Graminiod
Phalaris arundinacea (reed canarygrass) V35, *Bromus tectorum* (cheatgrass) V25

Forb
Amaranthus blitoides (mat amaranth) V1, *Equisetum laevigatum* (smooth horsetail) V1

Range:

Lake Roosevelt National Recreation Area
This Assocation is intermittently present in small clumps throughout the park area.

Global

Linear system which occurs in the northern Rocky Mountains and the east slopes of the Cascades.

Comments:

This Association requires scouring from moving water to maintain its habitat.

This shrub Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A38

Salix exigua / Equisetum arvense Barren Shrubland

Northern Rocky Mountain Lower Montane Riparian Shrubland



Description: This Assocation is characterized by low to moderate stands of *Salix exigua* with occasionally other shrub species present. The shrub component is 25-50% cover in this Association. The herbaceous layer is moderate to dense with graminoids such as *Poa pratensis* and *Bromus inermis.* The forbs tend to be *Equisetum arvense*.

Conservation Rank:	**Database Code: SAEX/EQAR**	**Elcode: CEGL001201**

Characteristic Species: (n=1, AA)

Tree
N/A

Shrub
Salix exigua (narrowleaf willow) V25, *Amelanchier alnifolia* (serviceberry) V5

Dwarf-shrub
N/A

Graminiod
Poa pratensis (Kentucky bluegrass) V10, *Bromus inermis* (smooth brome) V5

Forb
Equisetum arvense (field horsetail) V5

Range:

Lake Roosevelt National Recreation Area
This Assocation is spread intermintently throughout the park in small concentrations.

Global
Linear system which occurs in the northern Rocky Mountains and the east slopes of the Cascades.

Comments:
This shrub Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A39 *Symphoricarpos albus* Shrubland

Northern Rocky Mountain Lower Montane-Foothill Deciduous Shrubland



Description: This Assocation is characterized by open stands of *Pinus ponderosa* with less than 5% cover. The shrub component is 25-50% cover in this Association. The dominant shrub species include *Symphoricarpos albus* and *Amelanchier alnifolia* although numerious other species may be present. The herbaceous layer is variable with graminoids such as *Poa pratensis, Bromus tectorum* and *Poa bulbosa* being the most common. Associated forbs include abundant stands of *Balsamorhiza sagittata* and *Lupinus sericeus*.

Conservation Rank:	**Database Code: SYAL**	**Elcode: CEGL005890**

Characteristic Species: (n=15, AA=11)

Tree
Pinus ponderosa (ponderosa pine) V1

Shrub
Symphoricarpos albus (common snowberry) V15, *Amelanchier alnifolia* (Saskatoon serviceberry) V2

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V15, *Poa pratensis* (Kentucky bluegrass) V5

Forb
Balsamorhiza sagittata (arrowleaf balsamroot) V15, *Lupinus sericeus* (silky lupine) V5

Range:

Lake Roosevelt National Recreation Area

This Assocation is intermittently present in small clumps throughout the park area

Global

This Association is found from California and east to North Carolina and from southern Alaska south to California.

Comments:

This shrub Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A40 *Symphoricarpos albus / Bromus tectorum* Semi-natural Shrubland

Northern Rocky Mountain Lower Montane-Foothill Deciduous Shrubland



Description: This Assocation is characterized by widely scattered *Pinus ponderosa* stands with less than 5% cover. The shrub component is 25-50% cover in this Association. The dominant shrub species include *Symphoricarpos albus* and *Amelanchier alnifolia* although numerous other species may be present. The herbaceous layer is dominated by *Bromus tectorum* and *Poa bulbosa*. Associated forbs include *Balsamorhiza sagittata* and *Lupinus sericeus*.

Conservation Rank: N/A	**Database Code:**	**Elcode:** N/A

Characteristic Species: (n=5, AA)

Tree

Pinus ponderosa (ponderosa pine) V1

Shrub

Symphoricarpos albus (Common snowberry) V15, *Amelanchier alnifolia* (Saskatoon serviceberry) V2

Dwarf-shrub

N/A

Graminiod

Bromus tectorum (cheatgrass) V25, *Poa bulbosa* (bulbous bluegrass) V5

Forb

Balsamorhiza sagittata (arrowleaf balsamroot) V10, *Lupinus sericeus* (silky lupine) V5

Range:

Lake Roosevelt National Recreation Area

This Assocation is intermittently present in small clumps throughout the park area.

Global

This Association is found from California and east to North Carolina and from southern Alaska south to California.

Comments:

This Association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A41 *Agropyron cristatum* Semi-natural Herbaceous Vegetation

Introduced Upland Vegetation - Perennial Grassland and Forbland



Description: This herbaceous plant community is characterized by an abundance of introduced grass species. The vegetation in this Assocation is dominated by *Agropyron cristatum*, a perennial bunchgrass, *Bromus mollis* an annual grass, or a combination of both species. This Assocation often occurs on or near sites that have been disturbed. Native species persist in some stands, however cover and diversity are typically low, and component native species can be quite variable depending on the plant community that was present prior to the conversion to introduced grasses. Several native perennial and annual forb species may also be sparse and variable across stands of this type. Non-native forb species are common, but again, species composition is variable.

Conservation Rank: N/A	**Database Code: AGCR**	**Elcode: A3563**

Characteristic Species: (n=1, AA)

Tree
N/A

Shrub
N/A

Dwarf-shrub
N/A

Graminiod
Agropyron cristatum (crested wheatgrass) 25, *Bromus mollis* (soft brome) V1

Forb
Vicia villosa (winter vetch) V5, *Balsamorhiza sagittata* (arrowleaf balsamroot) V1

Range:

Lake Roosevelt National Recreation Area
This Association is present throughout the entire park.

Global

The distribution of this Assocation coincides with the range the *Bromus tectorum* Semi-natural Herbaceous Association, which occurs throughout much of western North America from the western Great Plains to the intermountain and southwestern U.S.

Comments:

Agropyron cristatum has been planted for years to improve grazing pastures as well as in revegetation efforts.

This grassland Alliance is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A42 *Bromus inermis* Semi-natural Herbaceous Vegetation

Introduced Upland Vegetation - Perennial Grassland and Forbland



Description: This herbaceous plant community is characterized by an abundance of introduced grass species. The vegetation in this Assocation is dominated by *Bromus mollis* and *Bromus tectorum*. This Assocation often occurs on or near sites that have been disturbed. Native species persist in some stands, however cover and diversity are typically low, and component native species can be quite variable depending on the plant community that was present prior to the conversion to introduced grasses. Several native perennial and annual forb species may also be sparse and variable across stands of this type. Non-native forb species are common, but again, species composition is variable. Some shrub species may exist in this Association but in low numbers.

Conservation Rank: N/A	**Database Code: BRIN2**	**Elcode: A3561**

Characteristic Species: (n=2, AA)

Tree
N/A

Shrub
Symphoricarpos albus (common snowberry) V1

Dwarf-shrub
N/A

Graminiod
Bromus inermis (smooth brome) V25, *Bromus tectorum* (cheatgrass) V5

Forb
Vicia villosa (winter vetch) V2, *Achillea millefolium* (western yarrow) V2

Range:

Lake Roosevelt National Recreation Area
This Association is scattered throughout the park with the southwest area having a higher density.

Global
This Association is widespread in the US.

Comments:
Bromus inermis has been planted to improve pasture productivity and is an aggressive colonizer into native grasslands.

This grassland Alliance is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A43 *Bromus tectorum* Semi-natural Herbaceous Vegetation

Introduced Upland Vegetation-Annual Grassland



Description: The vegetation in this Assocation has several shrub species represented albeit in low numbers less than 2% cover. The dominant species in this Association is *Bromus tectorum*, an introduced annual grass species. Native species persist in some stands, however cover and diversity are typically low, and component native species can be quite variable depending on the plant community that was present prior to the conversion to introduced grasses. Native shrubs may occur sporadically with low densities. *Chrysothamnus viscidiflorus* is the most constant native shrub in this Assocation and *Poa secunda* is the most frequently occurring and abundant native grass. Several native perennial and annual forb species may also be sparse and variable across stands of this type. Non-native forb species are common, but again, species composition is variable.

Conservation Rank: N/A	**Database Code: BRTE**	**Elcode: CEGL003019**

Characteristic Species: (n=19, AA==43)

Tree
N/A

Shrub
Chrysothamnus viscidiflorus (yellow rabbitbrush) V1

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V50, *Bromus mollis* (soft brome) V5

Forb
Vicia villosa (winter vetch) V10, *Sisymbrium altissimum* (tall tumblemustard) V5

Range:

Lake Roosevelt National Recreation Area
This Association is found in disturbed areas throughout the park unit.

Global

The distribution of this Assocation coincides with the range the *Bromus tectorum* Semi-natural Herbaceous Association, which occurs throughout much of western North America from the western Great Plains to the intermountain and southwestern U.S.

Comments:

This grassland Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A44 *Carex vulpinoidea – Phalaris arundinacea* Herbaceous Vegetation

Northern Rocky Mountain Lower Montane Riparian Shrubland



Description: This herbaceous plant community is characterized by graminiod species. The vegetation in this Association is dominated *Carex vulpinoidea* and *Juncus balticus.* Cover in the graminiod component is 25-50%. This Association will sometimes have widely scattered individual shrubs primarily *Rosa woodsii,* usually less than 2%. Forb species can be variable, but *Amaranthus blitoides* and *Vicia villosa* are the most abundant.

Conservation Rank: N/A	**Database Code: CAVU2-PHAR3**	**Elcode: N/A**

Characteristic Species: (n=4, AA)

Tree
N/A

Shrub
Rosa woodsii (Woods' rose) V1

Dwarf-shrub
N/A

Graminiod
Carex vulpinoidea (fox sedge) V50, *Juncus balticus* (Baltic rush) V5

Forb
Amaranthus blitoides (mat amaranth) V2, *Vicia villosa* (winter vetch) V1

Range:

Lake Roosevelt National Recreation Area
This Association is found in isolate areas within Lake Roosevelt.

Global

This is found in seasonally flooded areas throughout the U.S.

Comments:

This Association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A45

Centaurea diffusa Semi-natural Herbaceous Vegetation

Introduced Upland Vegetation - Annual and Biennial Forbland



Description: Diffuse knapweed is an early successional species that establishes best on disturbed ground. This Association is characterized by nonnative and invasive species on highly disturbed sites. The most common graminiod is *Bromus briziformis*. Reminent species are present in some stands. *Centaurea diffusa* is the most common forb on these sites.

Conservation Rank: N/A	**Database Code:** **CEDI3**	**Elcode:** N/A

Characteristic Species: (n=1, AA)

Tree
N/A

Shrub
N/A

Dwarf-shrub
N/A

Graminiod
Bromus briziformis (rattlesnake brome) V5, *Carex geyeri* (Geyer's sedge) V2

Forb
Centaurea diffusa (diffuse knapweed) V25, *Sisymbrium altissimum* (tall tumblemustard) V5

Range:

Lake Roosevelt National Recreation Area
This Assocation is intermittently present in small clumps throughout the park area.

Global

Currently found from Yukon in the north, throughout most of western Canada, east to Ontario. In the United States, the primary range of diffuse knapweed is the western states, from Washington, Idaho, and Montana south to New Mexico and Arizona.

Comments:

This Association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A46 *Dactylis glomerata* Semi-natural Herbaceous Vegetation

Introduced Upland Vegetation



Description: This herbaceous plant community is characterized by graminiod species. The vegetation in this Association is dominated *Dactylis glomerata* and *Bromus tectorum*. Cover in the graminiod component is 35-50%. Forb species can be variable, but *Amaranthus blitoides* and *Vicia villosa* are the most abundant.

Conservation Rank: N/A	**Database Code: DAGL**	**Elcode:** N/A

Characteristic Species: (n=1, AA)

Tree
N/A

Shrub
N/A

Dwarf-shrub
N/A

Graminiod
Dactylis glomerata (orchard grass) V5, *Bromus tectorum* (cheatgrass) V2

Forb
Maianthemum stellatum (starry false lily of the valley) V10, *Potentilla glandulosa* (sticky cinquefoil) V10

Range:

Lake Roosevelt National Recreation Area
This Assocation is intermittently present in small clumps throughout the park area.

Global
Orchardgrass was introduced to the eastern United States from Europe in 1760. It

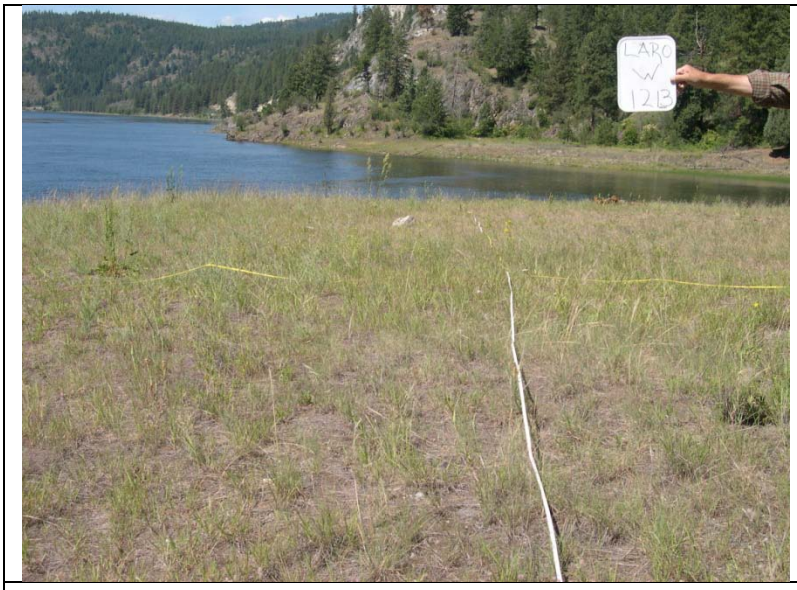
is widely planted in the United States and Canada, and is found from Nova Scotia south to the Carolinas, west to central California, and north to coastal British Columbia.

Comments:

This Association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A47 *Dichanthelium oligosanthes scribnerianum* Herbaceous Vegetation

Northern Rocky Mountain Lower Montane Grassland



Description: This herbaceous plant community is characterized by graminiod species. The vegetation in this Association is dominated *Bromus tectorum* and *Panicum scribnerianum*. Cover in the graminiod component is 10-25%. Forb species can be variable, but *Balsamorhiza sagittata* and *Lupinus sericeus* are the most abundant native species.

Conservation Rank: N/A	**Database Code: DIOLS**	**Elcode: N/A**

Characteristic Species: (n=6, AA)

Tree

Pinus ponderosa (ponderosa pine) V1

Shrub

Symphoricarpos albus (common snowberry) V1, *Purshia tridentata* (antelope bitterbrush) V1

Dwarf-shrub

N/A

Graminiod

Bromus tectorum (Cheatgrass) V25, *Panicum scribnerianum* (Scribner's rosette grass) V10

Forb

Balsamorhiza sagittata (arrowleaf balsamroot) V5, *Lupinus sericeus* (silky lupine) V5

Range:

Lake Roosevelt National Recreation Area

This Assocation is intermittently present in small clumps throughout the park area.

Global

This Association can be found across most of North America.

Comments:

This Association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A48 *Distichlis spicata* Herbaceous Vegetation

Inter-Mountain Basins Grassland



Description: Sparsely vegetated streambanks in which the component vegetation is distinct from vegetation in surrounding uplands. This herbaceous plant community is characterized by graminiod species. The vegetation in this Association is dominated by *Distichlis spicata* and *Juncus balticus*. Cover in the graminiod component is 25-50%. Forb species can be variable, but *Typha latifolia* and *Rhus radicans* are the most abundant native species.

Conservation Rank: N/A	**Database Code: DISP**	**Elcode: CEGL001770**

Characteristic Species: (n=1, AA)

Tree

Ulmus americana (Amercian elm) V1

Shrub

Ribes cereum (wax currant) V1

Dwarf-shrub

N/A

Graminiod

Distichlis spicata (saltgrass) V25, *Juncus balticus* (Baltic rush) V2

Forb

Rhus radicans (western poison ivy) V10, *Typha latifolia* (broadleaf cattail) V1

Range:

Lake Roosevelt National Recreation Area

This Assocation is intermittently present in small clumps throughout the park area.

Global

Linear system which occurs throughout the Intermountain western U.S. extending east into the western Great Plains.

Comments:

This Association is found in seasonally flooded areas.

This grassland Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A49 *Eriogonum compositum /Poa secunda* Herbaceous Vegetation

Columbia Plateau Herbaceous Scabland



Description: This low, xeric shrublands Association has *Salvia dorrii and Purshi tridentata* in low numbers. *Eriogonum compositum* and *Eriogonum niveum* are common in this association. Low cover of perennial bunchgrasses, such as *Psedoroegneria spicata and Poa secunda* is expected in this association. *Bromus tectorum*, an invasive winter annual is usually present in this community. Scattered forbs are present with 1 to 5% cover. Annuals may be seasonally abundant.

Conservation Rank: N/A	**Database Code: ERCO12/POSE**	**Elcode: CEGL001784**

Characteristic Species: (n=1, AA)

Tree
N/A

Shrub
Salvia dorrii (purple sage) V1, *Purshia tridentata* (antelope bitterbrush) V1

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V5, *Psedoroegneria spicata* (bluebunch wheatgrass) V2

Forb
Eriogonum compositum (arrowleaf buckwheat) V5, *Eriogonum niveum* (snow buckwheat) V1

Range:

Lake Roosevelt National Recreation Area
This Assocation is intermittently present in small clumps throughout the park area.

Global

Matrix system which occurs in the Columbia Plateau region of southern Idaho, eastern Oregon and Eastern Washington and extreme northern Nevada.

Comments:

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A50 *Festuca idahoensis* Herbaceous Vegetation

Northern Rocky Mountain Lower Montane Grassland



Description: This grassland is characterized by the dominance of *Festuca idahoensis*. Cover may occur within a wide range of variability, but 10-35% is common. Shrubs and trees are often present sporadically and are widely scattered within this plant community. The shrub species often include *Symphoricarpos albus, Amelanchier alnifolia* and *Rosa woodsii* at or less than 5% cover. *Pinus ponderosa* is sometimes present as individuals or in scattered pockets. Forb species composition varies, depending on aspect and geographic distribution. Invasive, non-native species are also likely to be present and even abundant in heavily disturbed stands.

Conservation Rank: G4	**Database Code: FEID**	**Elcode: CEGL001897**

Characteristic Species: (n=2, AA)

Tree
Pinus ponderosa (ponderosa pine) V1

Shrub
Symphoricarpos albus (common snowberry) V1, *Amelanchier alnifolia* (Saskatoon serviceberry) V1

Dwarf-shrub
N/A

Graminiod
Festuca idahoensis (Idaho fescue) V25, *Panicum scribnerianum* (Scribner's rosette grass) V10

Forb
Lupinus sericeus (silky lupine) V5, *Eriogonum heracleoides* (parsnipflower buckwheat) V1

Range:

Lake Roosevelt National Recreation Area

This Assocation is intermittently present in large concentrations throughout the park area.

Global

Large patch system found throughout the northern Rocky Mountains at lower montane to foothill elevations in the mountains and large valleys of northeastern Wyoming and western Montana, west through Idaho into the Blue Mountains of Oregon, and north into the Okanagan and Fraser plateaus of British Columbia and the Canadian Rockies.

Comments:

NatureServe did not extend the range for this Association into Washington State.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A51 *Festuca ovina* Semi-natural Herbaceous Vegetation

Northern Rocky Mountain Foothill Conifer Wooded Steppe



Description: This grassland is characterized by the dominance of *Festuca ovina*. Cover is 25-50% for the graminiod species. Tree species are often present sporadically and are widely scattered within this plant community. *Pinus ponderosa* and *Robinia pseudo-acacia* are sometimes present as individuals within this association. Forb species composition varies, depending on aspect and geographic distribution. Invasive, non-native species are also likely to be present and even abundant in heavily disturbed stands.

Conservation Rank: N/A	**Database Code:** **FEOV**	**Elcode:** N/A

Characteristic Species: (n=4, AA)

Tree

Pinus ponderosa (ponderosa pine) V2, *Robinia pseudo-acacia* (black locust) V1

Shrub

N/A

Dwarf-shrub

N/A

Graminiod

Festuca ovina (sheep fescue) V35, *Bromus tectorum* (cheatgrass) V5

Forb

Vicia villosa (winter vetch) V2, *Plantago lanceolata* (narrowleaf plantain) V2

Range:

Lake Roosevelt National Recreation Area

This Association is present throughout the entire park.

Global

This Association is widespread from Washington to Nevada.

Comments:

This is a cultivar commonly seeded for restoration purposes and can be competitive in native grasslands.

This Association was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A52 *Hesperostipa comata* Herbaceous Vegetation

Northern Rocky Mountain Lower Montane Grassland



Description: This is a moderate to dense herbaceous vegetation type with most of its total cover from bunchgrasses. *Hesperostipa comata* dominates the herbaceous layer. Shrubs are common at low cover values and *Purshia tridentata* and *Mahonia aquifolium* occur frequently in this plant community. Additional shrubs are variable and sparse. Several grass species may also occur as minor components of this Assocation, but no one species occurs with regularity. Some grass species, like *Panicum scribnerianum*, may occasionally be locally abundant where they occur. *Balsamorhiza sagittata* and *Vicia villosa* occurs with some constancy at low to moderate cover values. Otherwise, forbs typically contribute little cover to the plant

Conservation Rank: N/A	**Database Code: HECO26**	**Elcode: A1270**

Characteristic Species: (n=5, AA=3)

Tree
N/A

Shrub
Purshia tridentata (antelope bitterbrush) V1, *Mahonia aquifolium* (hollyleaved barberry) V1

Dwarf-shrub
N/A

Graminiod
Hesperostipa comata (needle and thread) V10, *Panicum scribnerianum* (Scribner's rosette grass) V10

Forb
Vicia villosa (winter vetch) V2, *Balsamorhiza sagittata* (arrowleaf balsamroot) V2

Range:

Lake Roosevelt National Recreation Area
This Assocation is intermittently present in large concentrations throughout the park area.

Global

Historically, this Assocation was thought to be endemic to the Palouse Prairie region of Oregon and Washington. It has since been documented to occur on the Hanford Monument in Washington and the Boardman RNA in Oregon, as well as in Montana and Idaho.

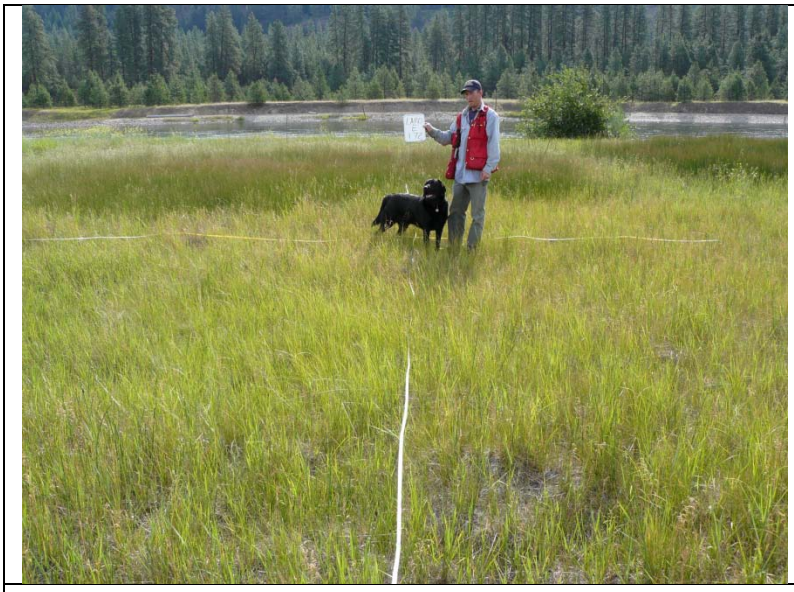
Comments:

This is a widespread Alliance, occuring over much of the western U.S.

This Alliance is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A53 *Juncus balticus* Herbaceous Vegetation

North American Arid West Emergent Marsh



Description: This broadly defined association is characterized open to moderate graminoid layer dominated by the rhizomatous perennial *Juncus balticus. Carex* species are often present at low cover. Other graminoids are common and species composition is variable and highly dependent on annual/seasonal precipitation. Forb cover is generally low but may include *Vicia villosa, Asclepias speciosa, Equisetum laevigatum,* and amoung others. Shrubs are not common, but occasional.

Conservation Rank: G5	**Database Code: JUBA**	**Elcode: CEGL001838**

Characteristic Species: (n=3, AA=4)

Tree
N/A

Shrub
Symphoricarpos albus (common snowberry) V1

Dwarf-shrub
N/A

Graminiod
Juncus balticus (Baltic rush) V50, *Poa pratensis* (Kentucky bluegrass) V5

Forb
Vicia villosa (winter vetch) V1, *Asclepias speciosa* (showy milkweed) V1

Range:

Lake Roosevelt National Recreation Area

This Association is found in small patches near waters edge.

Global

Small patch system which occurs throughout much of the arid and semi-arid regions of western North America.

Comments:

This is a widespread Association, occuring over much of the western U.S.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A54 *Leymus cinereus* Herbaceous Vegetation

Inter-Mountain Basins Shrubland



Description: This Association is characterized by open to moderate graminoid layer dominated by *Leymus cinereus. Bromus tectorum* is present at low to moderate cover. Other native graminoids are common in low numbers but species composition can be variable. Forb cover is generally low and may include *Lactuca serriola, Asclepias speciosa,* amoung others. Shrubs are not common, but occasionally do occur in this Association.

Conservation Rank: G2	**Database Code: LECI4**	**Elcode: CEGL001479**

Characteristic Species: (n=1, AA=8)

Tree
N/A

Shrub
Ericameria nauseosa (rubber rabbitbrush) V1

Dwarf-shrub
N/A

Graminiod
Leymus cinereus (basin wildrye) V25, *Bromus tectorum* (cheatgrass) V2

Forb
Cynoglossum occidentale (western hound's togue) V1, *Lactuca serriola* (prickly lettuce) V1

Range:

Lake Roosevelt National Recreation Area
This Association is present throughout the entire park.

Global

Large patch system which occurs throughout much of the western U.S. in Intermountain basins and extends into the western Great Plains and into central Montana.

Comments:

This Association is limited to areas with adequate sub surface moisture and is widespread but not common.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A55 *Phalaris arundinacea* Western Herbaceous Vegetation

Northern Rocky Mountain Alpine-Monatae Wet Meadow



Description: This Association is characterized open to moderate graminoid layer dominated by *Phalaris arundinacea*. *Bromus tectorum* and *Carex* spp. are present at low cover. Other native graminoids may be present in very low cover. Forb cover is variable and generally low cover. The forb component may have invasive species, native or non- native species. Shrubs are not common, but occasionally do occur in this association. The most common shrub species include *Salix exigua* and *Rosa woodsii.*

Conservation Rank: G2	**Database Code: PHAR3**	**Elcode: CEGL001474**

Characteristic Species: (n=8, AA=17)

Tree
N/A

Shrub
Salix exigua (narrowleaf willow) V1, *Rosa woodsii* (Wood's rose) V1

Dwarf-shrub
N/A

Graminiod
Phalaris arundinacea (reed canarygrass) V50, *Bromus tectorum* (cheatgrass) V2

Forb
Cirsium arvense (Canada thistle) V1, *Rorippa curvisiliqua* (curvedpod yellowcress) V1

Range:

Lake Roosevelt National Recreation Area
This Assocation is intermittently present in small clumps throughout the park area.

Global
Widespread throughout the U.S.

Comments:
This Association can form near monocultures, especially in seasonally flooded areas.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A56 *Poa pratensis* Semi-natural Herbaceous Vegetation Alliance

Introduced Upland Vegetation



Description: This Alliance is characterized open to moderate graminoid layer dominated by the *Leymus cinereus*. *Bromus tectorum* is present at low to moderate cover. Other native graminoids are common in low numbers but species composition can be variable. Forb cover is generally low and may include *Lactuca serriola, Asclepias speciosa,* amoung others. Shrubs are not common, but occasionally do occur in this Alliance.

Conservation Rank: N/A	**Database Code: POPR**	**Elcode: A3562**

Characteristic Species: (n=7, AA=17)

Tree

Pinus ponderosa (ponderosa pine) V1

Shrub

Symphoricarpos albus (common snowberry) V1, *Rosa woodsii* (Wood's rose) V1

Dwarf-shrub

N/A

Graminiod

Poa pratensis (Kentucky bluegrass) V50, *Bromus tectorum* (cheatgrass) V10

Forb

Vicia villosa (winter vetch) V15, *Vicia americana* (American vetch) V10

Range:

Lake Roosevelt National Recreation Area

This Alliance is present throughout the entire park.

Global

Kentucky bluegrass is widely distributed across North America growing in every state and Canadian province. It is adapted for growth in cool, humid climates, and is most prevalent in the northern half of the United States and the southern half of Canada. It is not common in the Gulf States nor in desert regions of the Southwest

Comments:

This Alliance can form near monocultures, especially in seasonally flooded areas. IS THIS RIGHT?

This Alliance is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A57 Gravel Bar Herbaceous Vegetation

Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland



Description: This seasonally flooded association is characterized by open gravelly bar with low vegetation cover. The graminoid layer is dominated by the *Leymus cinereus*. *Bromus tectorum* is present at low to moderate cover. Other native graminoids are common in low numbers but species composition can be variable. Forb cover is generally low and may include *Lactuca serriola, Asclepias speciosa,* amoung others. Shrubs are not common, but occasionally do occur in this Association.

Conservation Rank: N/A	**Database Code: GRAVEL BAR**	**Elcode: N/A**

Characteristic Species: (n=2, AA)

Tree
N/A

Shrub
Salix alba (white willow) V1, *Symphoricarpos albus* (common snowberry) V1

Dwarf-shrub

Graminiod
Phalaris arundinacea (reed canarygrass) V1, *Panicum scribnerianum* (Scribner's rosette grass) V1

Forb
Amaranthus blitoides (mat amaranth) V1, *Equisetum laevigatum* (smooth horsetail) V1

Range:

Lake Roosevelt National Recreation Area
This Association is present primarily on the banks of Lake Roosevelt in the southern and northern portions

of the park. *Global*
Comments:

A58 *Pseudoroegneria spicata - Balsamorhiza sagittata - Poa secunda* Herbaceous Vegetation

Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland



Description: A once-extensive grassland system, characterized by rolling topography is now limited to small patches in Washington. Characteristic species are *Pseudoroegneria spicata* and *Poa secunda* with *Hesperostipa comata, Leymus cinereus* or *Festuca idahoensis*. Shrubs commonly found include *Purshia tridentata, Rosa* spp., *Ericameria nauseosa, Symphoricarpos albus*, and *Artemisia* spp. The forb component includes *Balsamorhiza sagittata, Lupinus sericeus, Eriogonum sphaeroce* and *Phlox longifolia.*

Conservation Rank: G2	**Database Code: PSSP6-PSOE/BASA3**	**Elcode: CEGL001662**

Characteristic Species: (n=4, AA=34)

Tree
N/A

Shrub
Purshia tridentata (antelope bitterbrush) V1, *Ericameria nauseosa* (rubber rabbitbrush) V1

Dwarf-shrub

Graminiod
Pseudoroegneria spicata (bluebunch wheatgrass) V5, *Poa secunda* (Sandberg bluegrass) V2

Forb
Balsamorhiza sagittata (arrowleaf balsamroot) V5, *Lupinus sericeus* (silky lupine) V5

Range:

Lake Roosevelt National Recreation Area
This Assocation is intermittently present in large concentrations throughout the park area.

Global

Large patch system which occurs in eastern Washington and Oregon, and west-central Idaho, though in very small patches there.

Comments:

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A59 *Pseudoroegneria spicata /Eriogonum heracleoides* Herbaceous Vegetation

Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland



Description: This plant Assocation is characterized by a relatively open, tall bunchgrass layer dominated by *Pseudoroegneria spicata*. *Poa secunda* is consistently present but cover may range from low to moderate. *Balsamorhiza sagittata* is conspicuous in this plant community and cover often approaches moderate levels. Scattered shrubs are occasionally present but component species are variable. Additional grass species may also occur but are sparse and variable. Annual *Bromus* spp. are occasionally present and may occur with abundance in degraded stands. Associated forbs are variable but common in this plant community.

Conservation Rank: G2	**Database Code: PSSP6/ERHE2**	**Elcode: CEGL001668**

Characteristic Species: (n=1, AA=1)

Tree

N/A

Shrub

Artemisia tripartita (threetip sagebrush) V1, *Rhus glabra* (smooth sumac) V1

Dwarf-shrub

N/A

Graminiod

Pseudoroegneria spicata (bluebunch wheatgrass) V10, *Poa secunda* (Sandberg bluegrass) V5

Forb

Vicia villosa (winter vetch) V5, *Eriogonum heracleoides* (parsnipflower buckwheat) V1

Range:

Lake Roosevelt National Recreation Area

This Assocation is intermittently present in large concentrations throughout the park area.

Global

The Assocation appears to be known primarily from the eastern and western portions,

respectively, of the Blue Mountains and Idaho Batholith ecoregional sections, with an isolated stand reported from the Grand Teton Mountains of northwestern Wyoming.

Comments:

This Association is not presently described for the state of Washington.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A60 *Schoenoplectus acutus* Herbaceous Vegetation

Rocky Mountain Alpine-Montane Wet Meadow



Description: This Association is characterized open to moderate to heavy graminoid layer dominated by the *Scirpus acutus*. *Phalaris arundinacea* is present at low to moderate cover. Other native graminoids are present in low numbers and species composition can be variable. Forb cover is generally low and may include *Polygonum hydropiper, Rorippa curvisiliqua*, amoung others. Shrubs are not common.

Conservation Rank: G5	**Database Code: SCAC3**	**Elcode: CEGL001840**

Characteristic Species: (n=1, AA)

Tree

N/A

Shrub

N/A

Dwarf-shrub

N/A

Graminiod

Scirpus acutus (hardstem bulrush) V50, *Phalaris arundinacea* (reed canarygrass) V10

Forb

Polygonum hydropiper (marshpepper knotweed) V1, *Rorippa curvisiliqua* (curvepod yellowcress) V1

Range:

Lake Roosevelt National Recreation Area

This Association is mostly in the northern part of the park unit.

Global

This Association is a common emergent herbaceous wetland found mostly in the interior western U.S. ranging from the Puget Sound of Washington to Montana. Stands occur along low-gradient, meandering, usually perennial streams, river floodplain basins, and around the margins of ponds and shallow lakes

especially in backwater areas.

Comments:

This Association is not presently described for the state of Washington.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A61 *Secale cereale* Planted Herbaceous Vegetation

Northern Rocky Mountain Lower Montane Riparian Shrubland



Description: This Association is characterized by open to moderate graminoid layer dominated by *Secale cereale*. *Bromus tectorum* is present at low to moderate cover. Other native graminoids are common in low numbers but species composition can be variable. Forb cover is generally low and may include *Vicia villosa*, amoung others. Shrubs are not common.

Conservation Rank:	**Database Code: SECE**	**Elcode: CEGL004382**

Characteristic Species: (n=1, AA)

Tree
N/A

Shrub
N/A

Dwarf-shrub
N/A

Graminiod
Secale cereale (cereal rye) V50, *Bromus tectorum* (cheatgrass) V10

Forb
Vicia villosa (winter vetch) V2, *Lactuca serriola* (prickly lettuce) V1

Range:

Lake Roosevelt National Recreation Area
This Assocation is intermittently present in small clumps throughout the park area.

Global
This Association is wide spread.

Comments:
This grain species is sometimes planted as a cover crop and has naturalized over a large range.

This Alliance was not recognized in the National Vegetation Classification (NVC) and had not been documented or described by NatureServe (2011) at the time this document was produced. Therefore, the plant community description is based on data from Lake Roosevelt and on related plant communities that have been previously described. The description provided herein may vary slightly from similar plant communities found elsewhere due to the local scale at which data were collected and the lack of a published standard in the NVC.

A62 *Sporobolus cryptandrus* Shrub Herbaceous Vegetation

Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland



Description: This Association is characterized by open to moderate graminoid layer dominated by *Sporobolus cryptandrus. Bromus tectorum* is present at low to moderate cover. Other native graminoids are common in low numbers but species composition can be variable. Forb cover is generally low and may include *Vicia villosa,* amoung others. Shrubs are not common.

Conservation Rank: G4	**Database Code: SPCR**	**Elcode: CEGL001514**

Characteristic Species: (n=1, AA)

Tree
N/A

Shrub
N/A

Dwarf-shrub
N/A

Graminiod
Sporobolus cryptandrus (sand dropseed) V25, *Bromus tectorum* (cheatgrass) V2

Forb
Vicia villosa (winter vetch) V2, *Conyza Canadensis* (Canadian horseweed) V1

Range:

Lake Roosevelt National Recreation Area
This Assocation is intermittently present in small clumps throughout the park area.

Global

The number of occurrences is unknown. The community is reported from Colorado to California (SP). The community is found on slightly to moderately saline, nearly level bottomland and terraces with alluvial silty clay soils.

Comments:

This Association is not presently described for the state of Washington.

This Association is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A63 *Thinopyrum intermedium* Semi-natural Herbaceous Vegetation

Introduced Upland Vegetation - Perennial Grassland and Forbland



Description: This Association is characterized by moderate graminoid layer dominated by the *Thinopyrum intermedium*. *Bromus tectorum* is present at low to moderate cover. Graminiod cover is 50-75%. Other native graminoids are common in low numbers. Forb cover is generally low and includes *Vicia villosa*, amoung other species, both native and non-native. Shrubs can be present in lower numbers.

Conservation Rank: N/A	**Database Code: THIN6**	**Elcode: CEGL002935**

Characteristic Species: (n=9, AA=7)

Tree
N/A

Shrub
Purshia tridentata (antelope bitterbrush) V1, *Rosa woodsii* (Woods' rose) V1

Dwarf-shrub
N/A

Graminiod
Thinopyrum intermedium (intermediate wheatgrass) V15, *Bromus tectorum* (cheatgrass) V2

Forb
Vicia villosa (winter vetch) V5, *Lactuca serriola* (prickly lettuce) V1

Range:

Lake Roosevelt National Recreation Area
This Association is present throughout the park.

Global
This association is common in planted areas.

Comments:
This Alliance is not presently described for the state of Washington. This grass has been widely used to increase production in pastures.

This Alliance is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A64 *Ericameria nauseosa / Achnatherum hymenoides* Sparse Vegetation

Northern Rocky Mountain Lower Montane Riparian Shrubland



Description: Total vegetation cover of this Assocation is generally low and the plant community is characterized by an open shrub canopy dominated by either *Ericameria nauseosa, Chrysothamnus viscidiflorus* or a combination of both. Cover of the herbaceous layer is low to moderate and occasionally approaches cover levels equal to those of the shrub stratum. *Achnatherum hymenoides* generally dominates the patchy understory and *Bromus tectorum* is always present and occasionally co-dominates the herbaceous layer at low to moderate cover values. Forbs tend to be sparse and variable and often include both introduced and native species.

Conservation Rank: N/A	**Database Code: ERNA10/ACHY**	**Elcode: A835**

Characteristic Species: (n=1, AA)

Tree
N/A

Shrub
Ericameria nauseosa (rubber rabbitbrush) V1

Dwarf-shrub
N/A

Graminiod
Achnatherum hymenoides (Indian ricegrass) V1, *Bromus tectorum* (cheatgrass) V1

Forb
Eriogonum niveum (snow buckwheat) V1

Range:

Lake Roosevelt National Recreation Area
This Association is found near the Little Spokane River in the southeast areas of the park.

Global

This Assocation likely occurs as isolated patches throughout the western U.S. as all of the diagnostic species are common and widespread. The range of this Assocation is probably restricted to areas that have been impacted by disturbance as indicated by the abundance of cheatgrass and the absence of non-resprouting shrubs.

Comments:

This Alliance is not presently described for the state of Washington.

This Alliance is recognized in the National Vegetation Classification (NVC) and has been documented or described by NatureServe (2011).

A65 *Philadelphus lewisii / Pseudoroegneria spicata* Rock Outcrop Sparse Vegetation

Rocky Mountain Cliff, Canyon and Massive Bedrock



Description: This Association is characterized *by Philadelphus lewisii* with low cover. The graminoid layer is variable but always contains *Bromus tectorum* and usually some native species in low numbers. Forbs are generally low and includes contain both native and non-native species.

Conservation Rank: N/A	**Database Code: PHLE4/PSSP6ROCK**	**Elcode: N/A**

Characteristic Species: (n=2, AA)

Tree
N/A

Shrub
Philadelphus lewisii (Lewis' mock orange) V5, *Symphoricarpos albus* (common snowberry) V1

Dwarf-shrub
N/A

Graminiod
Bromus tectorum (cheatgrass) V5, *Bromus mollis* (soft brome) V5

Forb
Verbascum thapsus (common mullein) V1, *Calochortus macrocarpus* (sagebrush mariposa lily) V1

Range:

Lake Roosevelt National Recreation

Area Association located primarily in the southern area of the park.

Global
Comments:

A66 *Pseudotsuga menziesii / Philadelphus lewisii* Talus Sparse Wooded Vegetation
Rocky Mountain Cliff, Canyon and Massive Rock



Description: This Association is characterized by *Pseudotsuga menziesii* overstory and *Philadelphus lewisii* with low cover. The graminoid layer is variable but always contains *Pseudoroegneria spicata* and *Bromus* spp. in low numbers. Forbs are generally low and include both native and non-native species.

Conservation Rank: G5	**Database Code: PSME/PHLE4TALUS**	**Elcode:** N/A

Characteristic Species: (n=2, AA)

Tree
Pseudotsuga menziesii (Douglas-fir) V2

Shrub
Philadelphus lewisii (Lewis' mock orange) V5, *Mahonia aquifolium* (hollyleaved barberry) V2

Dwarf-shrub
N/A

Graminiod
Pseudoroegneria spicata (bluebunch wheatgrass) V5, *Bromus japonicus* (field brome) V2

Forb
Eriogonum heracleoides (parsnipflower buckwheat) V5, *Linaria dalmatica* (dalmatian toadflax) V1

Range:

Lake Roosevelt National Recreation Area
This Assocation is located in the sourthern portion of the park except for a small isolated pocket in the central portion.

Global
This Association occurs in the northwestern United States and southern Canada. It occurs from extreme

southern British Columbia south to California, and east to north and central Idaho, western Montana, and southwestern Alberta
Comments:

Appendix E: Species List

Lake Roosevelt NRA Vascular Plants						
TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
28742	Aceraceae	Acer glabrum	Rocky Mountain maple, california mountain maple, douglas maple, dwarf maple, mountain maple, new mexico maple, sierra maple	Present in Park	Native	Common
28745	Aceraceae	Acer glabrum ssp. douglasii	No data	Present in Park	Native	Unknown
183678	Aceraceae	Acer glabrum var. douglasii	Douglas maple, Douglas' maple	Present in Park	Native	Rare
28748	Aceraceae	Acer macrophyllum	bigleaf maple	Present in Park	Native	Rare
28749	Aceraceae	Acer negundo	ashleaf maple, box elder, boxelder, boxelder maple, california boxelder, manitoba maple, western boxelder	Present in Park	Native	Uncommon
28755	Aceraceae	Acer platanoides	Norway maple	Present in Park	Non-Native	Rare
28728	Aceraceae	Acer rubrum	red maple	Present in Park	Non-Native	Rare
28757	Aceraceae	Acer saccharinum	silver maple	Present in Park	Non-Native	Rare
28731	Aceraceae	Acer saccharum	sugar maple	Present in Park	Non-Native	Rare
38894	Alismataceae	Alisma plantago-aquatica	American waterplantain	Present in Park	Native	Rare
38917	Alismataceae	Sagittaria cuneata	arum-leaf arrowhead, arumleaf arrowhead, northern arrowhead, wapato	Present in Park	Native	Unknown
-9748333	Alismataceae	Sagittaria wallacei	No data	Present in Park	Unknown	Unknown
20719	Amaranthaceae	Amaranthus albus	pigweed, pigweed amaranth, prostrate pigweed, tumble pigweed, tumbleweed, white pigweed	Present in Park	Native	Unknown
20723	Amaranthaceae	Amaranthus blitoides	mat amaranth, prostrate amaranth, prostrate pigweed	Present in Park	Native	Unknown
20730	Amaranthaceae	Amaranthus cruentus	red amaranth	Present in Park	Native	Unknown
20742	Amaranthaceae	Amaranthus powellii	Powell amaranth, Powell pigweed, Powell's amaranth	Present in Park	Native	Unknown

Lake Roosevelt NRA Vascular Plants						
TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
20745	Amaranthaceae	Amaranthus retroflexus	Pigweed, careless weed, red-root amaranth, redroot amaranth, redroot pigweed, rough pigweed	Present in Park	Native	Unknown
28782	Anacardiaceae	Rhus glabra	smooth sumac	Present in Park	Native	Common
28776	Anacardiaceae	Rhus radicans	poison ivy	Present in Park	Native	Uncommon
28821	Anacardiaceae	Toxicodendron radicans	eastern poison ivy, poison ivy, poisonivy	Present in Park	Native	Unknown
182184	Apiaceae	Apium graveolens	wild celery	Present in Park	Non-Native	Unknown
510308	Apiaceae	Carum gairdneri	No data	Present in Park	Native	Unknown
511934	Apiaceae	Cymopterus terebinthinus	No data	Present in Park	Native	Unknown
502953	Apiaceae	Heracleum maximum	common cowparsnip, cow parsnip, cowparsnip	Present in Park	Native	Unknown
503531	Apiaceae	Lomatium ambiguum	Wyeth biscuitroot	Present in Park	Native	Unknown
-9748329	Apiaceae	Lomatium aridus	No data	Present in Park	Unknown	Unknown
516084	Apiaceae	Lomatium brevifolium	No data	Present in Park	Native	Unknown
503534	Apiaceae	Lomatium dissectum	chocolate-tips, desert parsley, fernleaf biscuitroot	Present in Park	Native	Unknown
29707	Apiaceae	Lomatium grayi	Gray's biscuitroot	Present in Park	Native	Unknown
29719	Apiaceae	Lomatium macrocarpum	bigseed biscuitroot, bigseed lomatium, large-fruit desert-parsley, largefruit biscuitroot, long mamma	Present in Park	Native	Unknown
-9748330	Apiaceae	Lomatium pursillus	No data	Present in Park	Unknown	Unknown
29754	Apiaceae	Lomatium triternatum	nineleaf biscuitroot	Present in Park	Native	Unknown
507093	Apiaceae	Osmorhiza berteroi	mountain sweetroot, sweet cicely, sweetcicely	Present in Park	Native	Unknown
30156	Apocynaceae	Apocynum androsaemifolium	bitterroot, flytrap dogbane, spreading dogbane	Present in Park	Native	Common

Lake Roosevelt NRA Vascular Plants						
TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
30157	Apocynaceae	Apocynum cannabinum	Indian hemp, Indian-hemp, Indianhemp, common dogbane, dogbane, hemp dogbane, prairie dogbane	Present in Park	Native	Unknown
18354	Aristolochiaceae	Asarum caudatum	British Columbia wildginger	Present in Park	Native	Unknown
30304	Asclepiadaceae	Asclepias speciosa	showy milkweed	Present in Park	Native	Unknown
35423	Asteraceae	Achillea millefolium	bloodwort, carpenter's weed, common yarrow, hierba de las cortaduras, milfoil, plumajillo, western yarrow, yarrow (common)	Present in Park	Native	Common
526856	Asteraceae	Achillea millefolium var. occidentalis	common yarrow, western yarrow	Present in Park	Native	Common
36459	Asteraceae	Acroptilon repens	Russian knapweed, Turestan thistle, hardheads	Present in Park	Non-Native	Unknown
182409	Asteraceae	Agoseris glauca var. dasycephala	pale agoseris, pale goat-chicory	Present in Park	Native	Unknown
182412	Asteraceae	Agoseris heterophylla var. heterophylla	annual agoseris	Present in Park	Native	Unknown
36496	Asteraceae	Ambrosia artemisiifolia	Roman wormwood, annual ragweed, common ragweed, low ragweed, ragweed, short ragweed, small ragweed	Present in Park	Native	Unknown
36516	Asteraceae	Ambrosia psilostachya	Cuman ragweed, perennial ragweed, western ragweed	Present in Park	Native	Unknown
36529	Asteraceae	Anaphalis margaritacea	common pearleverlasting, pearly everlasting, pearly-everlasting, western pearly everlasting, western pearlyeverlasting	Present in Park	Native	Uncommon
36727	Asteraceae	Antennaria dimorpha	low everlasting, low pussytoes	Present in Park	Native	Uncommon
36738	Asteraceae	Antennaria luzuloides	rush pussytoes	Present in Park	Native	Unknown

Lake Roosevelt NRA Vascular Plants						
TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
185162	Asteraceae	Antennaria microphylla	Rocky Mountain pussytoes, littleleaf pussytoes, small leaf everlasting, smallleaf pussytoes	Present in Park	Native	Unknown
36745	Asteraceae	Antennaria neglecta	field pussytoes	Present in Park	Native	Unknown
36749	Asteraceae	Antennaria parvifolia	Rocky Mountain pussytoes, little-leaf pussytoes, small leaf pussytoes, small-leaf pussytoes, smalleaf pussytoes, smallleaf pussytoes	Present in Park	Native	Unknown
36752	Asteraceae	Antennaria racemosa	raceme pussytoes	Present in Park	Native	Unknown
36754	Asteraceae	Antennaria rosea	rose pussytoes, rosy pussy-toes, rosy pussytoes	Present in Park	Native	Unknown
-501939	Asteraceae	Aplopappus stenophyllus	No data	Present in Park	Native	Unknown
36546	Asteraceae	Arctium minus	bardane, beggar's button, burdock, common burdock, lesser burdock, lesser burrdock, small burdock, smaller burdock, wild burdock, wild rhubarb	Present in Park	Non-Native	Unknown
36561	Asteraceae	Arnica cordifolia	heart-leaf leopardbane, heartleaf arnica	Present in Park	Native	Uncommon
-501958	Asteraceae	Arnica cordifolia var. cordifolia	No data	Present in Park	Native	Unknown
36576	Asteraceae	Arnica sororia	twin arnica	Present in Park	Native	Unknown
35445	Asteraceae	Artemisia absinthium	absinth sagewort, absinth wormwood, absinthium, common sagewort	Present in Park	Native	Unknown
35454	Asteraceae	Artemisia cana	silver sagebrush	Present in Park	Native	Rare
35462	Asteraceae	Artemisia dracunculus	false tarragon, green sagewort, silky wormwood, tarragon, wormwood	Present in Park	Native	Rare
35498	Asteraceae	Artemisia tridentata	big sagebrush, big sagebush	Present in Park	Native	Common
35502	Asteraceae	Artemisia tripartita	threetip sagebrush	Present in Park	Native	Uncommon

Lake Roosevelt NRA Vascular Plants						
TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
509265	Asteraceae	Aster canescens	No data	Present in Park	Native	Unknown
35599	Asteraceae	Aster laevis	smooth aster	Present in Park	Native	Unknown
35616	Asteraceae	Aster occidentalis	western aster	Present in Park	Native	Unknown
36807	Asteraceae	Balsamorhiza careyana	Carey's balsamroot	Present in Park	Native	Unknown
36817	Asteraceae	Balsamorhiza rosea	rosy balsamroot	Present in Park	Native	Unknown
36818	Asteraceae	Balsamorhiza sagittata	arrowleaf balsamroot	Present in Park	Native	Common
35710	Asteraceae	Bidens cernua	bur marigold, nodding beggartick, nodding beggarticks, nodding bur marigold, nodding burmarigold, nodding burr-marigold, sticktight	Present in Park	Native	Unknown
500995	Asteraceae	Bidens vulgata	big devils beggartick, tall beggarticks, western sticktight	Present in Park	Native	Unknown
501347	Asteraceae	Centaurea biebersteinii	spotted knapweed	Present in Park	Non-Native	Uncommon
36954	Asteraceae	Centaurea cyanus	bachelor's button, cornflower, garden cornflower	Present in Park	Non-Native	Uncommon
36958	Asteraceae	Centaurea diffusa	diffuse knapweed, diffuse knaweed, white knapweed	Present in Park	Non-Native	Uncommon
36972	Asteraceae	Centaurea solstitialis	yellow star thistle, yellow star-thistle, yellow starthistle	Present in Park	Non-Native	Uncommon
36987	Asteraceae	Chaenactis douglasii	Douglas dustymaiden, Douglas' dustymaiden, Douglas' pincushion, dusty maiden, dusty-maiden	Present in Park	Native	Unknown
527250	Asteraceae	Chaenactis douglasii var. douglasii	Douglas dustymaiden, Douglas' dustymaiden, dusty-maiden	Present in Park	Native	Unknown
37029	Asteraceae	Chondrilla juncea	hogbite, rush skeletonweed, skeletonweed	Present in Park	Non-Native	Rare
510957	Asteraceae	Chrysopsis hispida	No data	Present in Park	Native	Unknown
510984	Asteraceae	Chrysopsis villosa	No data	Present in Park	Native	Unknown

Lake Roosevelt NRA Vascular Plants						
TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
37055	Asteraceae	Chrysothamnus nauseosus	gray rabbitbrush	Present in Park	Native	Rare
523860	Asteraceae	Chrysothamnus nauseosus ssp. nauseosus	rubber rabbitbrush	Present in Park	Native	Uncommon
37090	Asteraceae	Chrysothamnus viscidiflorus	Douglas rabbitbrush, Douglas' rabbitbrush, green rabbitbrush, yellow rabbitbrush	Present in Park	Native	Uncommon
533581	Asteraceae	Chrysothamnus viscidiflorus var. lanceolatus	No data	Present in Park	Native	Unknown
36763	Asteraceae	Cichorium intybus	Common chicory, blue sailors, chicory, coffeeweed, succory	Present in Park	Non-Native	Unknown
36335	Asteraceae	Cirsium arvense	Californian thistle, Canada thistle, Canadian thistle, creeping thistle, field thistle	Present in Park	Non-Native	Rare
36366	Asteraceae	Cirsium edule	edible thistle	Present in Park	Native	Unknown
36423	Asteraceae	Cirsium undulatum	gray thistle, wavy-leaf thistle, wavyleaf thistle	Present in Park	Native	Unknown
36428	Asteraceae	Cirsium vulgare	bull thistle, common thistle, spear thistle	Present in Park	Non-Native	Unknown
37113	Asteraceae	Conyza canadensis	Canada horseweed, Canadian horseweed, horseweed fleabane, mares tail, marestail	Present in Park	Native	Unknown
511378	Asteraceae	Coreopsis atkinsoniana	No data	Present in Park	Native	Unknown
37169	Asteraceae	Crepis acuminata	long-leaf hawksbeard, longleaf hawksbeard, tapertip hawksbeard	Present in Park	Native	Unknown
37172	Asteraceae	Crepis atribarba	hawksbeard, slender hawksbeard	Present in Park	Native	Unknown
37217	Asteraceae	Crocidium multicaule	common spring-gold	Present in Park	Native	Unknown
196266	Asteraceae	Erigeron canadensis	No data	Present in Park	Native	Unknown
502385	Asteraceae	Erigeron concinnus	Navajo fleabane, hairy daisy	Present in Park	Native	Unknown
-502322	Asteraceae	Erigeron curvifolius	No data	Present in Park	Non-Native	Unknown
35863	Asteraceae	Erigeron filifolius	threadleaf daisy, threadleaf fleabane	Present in Park	Native	Unknown

Lake Roosevelt NRA Vascular Plants						
TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
527937	Asteraceae	Erigeron filifolius var. filifolius	threadleaf daisy, threadleaf fleabane	Present in Park	Native	Unknown
35894	Asteraceae	Erigeron linearis	desert yellow fleabane, linearleaf daisy	Present in Park	Native	Unknown
35930	Asteraceae	Erigeron poliospermus	purple cushion fleabane	Present in Park	Native	Unknown
35953	Asteraceae	Erigeron subtrinervis	three-nerve fleabane, threenerve fleabane, threeveined fleabane	Present in Park	Native	Unknown
37334	Asteraceae	Eriophyllum lanatum	common woolly sunflower, woody eriophyllum, woolly eriophyllum, wooly daisy	Present in Park	Native	Unknown
513439	Asteraceae	Eurybia conspicua	eastern showy aster	Present in Park	Native	Unknown
37356	Asteraceae	Euthamia occidentalis	western goldenrod, western goldentop	Present in Park	Native	Unknown
37398	Asteraceae	Gaillardia aristata	common gaillardia, gaillardia, great blanket-flower	Present in Park	Native	Common
37472	Asteraceae	Grindelia squarrosa	Curleycup gumweed, curlycup gumweed, curlytop gumweed, gumweed, rosinweed, tarweed	Present in Park	Native	Unknown
-502427	Asteraceae	Helianthella douglasii	No data	Present in Park	Unknown	Unknown
36616	Asteraceae	Helianthus annuus	annual sunflower, common sunflower, sunflower, wild sunflower	Present in Park	Native	Unknown
531216	Asteraceae	Heterotheca villosa var. minor	hairy false goldenaster	Present in Park	Native	Unknown
37693	Asteraceae	Hieracium albiflorum	white hawkweed, whiteflower hawkweed	Present in Park	Native	Unknown
37704	Asteraceae	Hieracium cynoglossoides	houndstongue hawkweed	Present in Park	Native	Unknown
37709	Asteraceae	Hieracium gracile	slender hawkweed	Present in Park	Native	Unknown
37733	Asteraceae	Hieracium unbellatum	No data	Present in Park	Native	Unknown
37766	Asteraceae	Hymenopappus filifolius	cutleaf, fine-leaf woollywhite, fineleaf hymenopappus	Present in Park	Native	Unknown
36608	Asteraceae	Lactuca serriola	China lettuce, prickly lettuce, wild lettuce	Present in Park	Non-Native	Unknown
37903	Asteraceae	Leucanthemum vulgare	ox-eye daisy, oxeye daisy, oxeye-daisy,	Present in Park	Non-Native	Unknown

Lake Roosevelt NRA Vascular Plants						
TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
			oxeyedaisy			
37956	Asteraceae	Logfia arvensis	field cottonrose	Present in Park	Non-Native	Unknown
37984	Asteraceae	Machaeranthera canescens	hoary aster, hoary goldenweed, hoary machaeranthera, hoary tansy-aster, hoary tansyaster, purple aster	Present in Park	Native	Unknown
38030	Asteraceae	Madia gracilis	grassy tarweed, slender tarweed	Present in Park	Native	Unknown
501470	Asteraceae	Matricaria discoidea	disc mayweed, pineapple weed, pineappleweed	Present in Park	Native	Unknown
38134	Asteraceae	Nothocalais troximoides	false agoseris, weevil prairie-dandelion	Present in Park	Native	Unknown
38140	Asteraceae	Onopordum acanthium	Scotch cotton thistle, Scotch cottonthistle, Scotch thistle, cotton thistle, heraldic thistle	Present in Park	Non-Native	Rare
518155	Asteraceae	Packera paupercula	balsam groundsel	Present in Park	Native	Unknown
518158	Asteraceae	Packera streptanthifolia	Rocky Mountain groundsel	Present in Park	Native	Unknown
36765	Asteraceae	Rudbeckia hirta	blackeyed Susan, blackeyedsusan	Present in Park	Native	Uncommon
-9748334	Asteraceae	Senecio flavoripens	No data	Present in Park	Unknown	Unknown
36144	Asteraceae	Senecio hydrophilus	alkali marsh groundsel, water groundsel, water ragwort	Present in Park	Native	Unknown
36148	Asteraceae	Senecio integerrimus	lamb-tongue ragwort, lambstongue groundsel, lambstongue ragwort	Present in Park	Native	Unknown
530321	Asteraceae	Senecio integerrimus var. ochroleucus	paleyellow ragwort	Present in Park	Native	Unknown
36194	Asteraceae	Senecio vulgaris	common groundsel, old-man-in-the-Spring	Present in Park	Non-Native	Unknown
36251	Asteraceae	Solidago elongata	No data	Present in Park	Native	Unknown
36259	Asteraceae	Solidago gigantea	giant goldenrod	Present in Park	Native	Unknown
36277	Asteraceae	Solidago missouriensis	Missouri goldenrod, prairie goldenrod	Present in Park	Native	Unknown
530454	Asteraceae	Solidago missouriensis var. fasciculata	Missouri goldenrod	Present in Park	Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
38455	Asteraceae	Stephanomeria tenuifolia	narrowleaf wirelettuce	Present in Park	Native	Unknown
565552	Asteraceae	Symphyotrichum eatonii	Eaton's aster	Present in Park	Native	Unknown
36328	Asteraceae	Tanacetum vulgare	common tansy, garden tansy, tansy	Present in Park	Non-Native	Unknown
36210	Asteraceae	Taraxacum laevigatum	red-seed dandelion, rock dandelion, rock dandylion	Present in Park	Non-Native	Unknown
36213	Asteraceae	Taraxacum officinale	blowball, common dandelion, dandelion, faceclock	Present in Park	Unknown	Unknown
38494	Asteraceae	Tetradymia canescens	gray horsebrush, spineless horsebrush	Present in Park	Native	Unknown
38544	Asteraceae	Townsendia florifera	showy Townsend daisy, showy townsendia	Present in Park	Native	Unknown
38564	Asteraceae	Tragopogon dubius	Western goat's beard, common salsify, goat's beard, goatsbeard, meadow goat's-beard, salsifis majeur, salsify, western salsify, wild oysterplant, yellow goat's beard, yellow salsify	Present in Park	Non-Native	Rare
523491	Asteraceae	Xanthium italicum	No data	Present in Park	Native	Unknown
38691	Asteraceae	Xanthium spinosum	Bathurst burr, cocklebur, spiny cocklebur, spiny cockleburr, spiny colklebur	Present in Park	Non-Native	Unknown
38692	Asteraceae	Xanthium strumarium	cocklebur, cockleburr, common cocklebur, rough cocklebur, rough cockleburr	Present in Park	Native	Unknown
29182	Balsaminaceae	Impatiens capensis	jewelweed, spotted touch-me-not	Present in Park	Native	Unknown
29186	Balsaminaceae	Impatiens ecalcarata	spurless touch-me-not	Present in Park	Native	Unknown
195030	Berberidaceae	Mahonia aquifolium	hollyleaved barberry	Present in Park	Native	Unknown
195045	Berberidaceae	Mahonia repens	Oregongrape, creeping barberry, creeping mahonia, oregon grape, trunkee barberry	Present in Park	Native	Unknown
181887	Betulaceae	Alnus incana	gray alder, mountain alder, speckled alder	Present in Park	Native	Uncommon

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
19473	Betulaceae	Alnus rhombifolia	rhombie leaf alder, white alder	Present in Park	Native	Rare
19476	Betulaceae	Alnus sinuata	No data	Present in Park	Native	Unknown
19477	Betulaceae	Alnus tenuifolia	mountain alder	Present in Park	Native	Uncommon
19488	Betulaceae	Betula occidentalis	water birch	Present in Park	Native	Unknown
-502021	Betulaceae	Betula occidentalis var. occidentalis	No data	Present in Park	Native	Unknown
19489	Betulaceae	Betula papyrifera	paper birch	Present in Park	Native	Uncommon
532505	Betulaceae	Betula papyrifera var. occidentalis	No data	Present in Park	Native	Unknown
511460	Betulaceae	Corylus californica	No data	Present in Park	Native	Unknown
19507	Betulaceae	Corylus cornuta	beaked hazel, beaked hazelnut, western hazel	Present in Park	Native	Unknown
527499	Betulaceae	Corylus cornuta var. californica	California hazel, California hazelnut	Present in Park	Native	Unknown
34315	Bignoniaceae	Catalpa speciosa	northern catalpa	Present in Park	Non-Native	Unknown
31723	Boraginaceae	Asperugo procumbens	German mugwort, German-madwort, madwort	Present in Park	Non-Native	Unknown
501090	Boraginaceae	Buglossoides arvensis	corn gromwell, corn-gromwell, field gromwell	Present in Park	Non-Native	Unknown
31793	Boraginaceae	Cryptantha circumscissa	cushion catseye, cushion cryptantha, matted cryptantha	Present in Park	Native	Unknown
31889	Boraginaceae	Cynoglossum occidentale	western hound's tongue	Present in Park	Non-Native	Uncommon
503330	Boraginaceae	Lappula squarrosa	European stickseed, bristly sheepburr	Present in Park	Non-Native	Unknown
31953	Boraginaceae	Lithospermum ruderale	western gromwell, western stoneseed, white stoneseed	Present in Park	Native	Unknown
-502586	Boraginaceae	Mertensia foliosa	No data	Present in Park	Unknown	Unknown
31671	Boraginaceae	Mertensia longiflora	longflower bluebell, small bluebells	Present in Park	Native	Unknown
31683	Boraginaceae	Mertensia oblongifolia	languid-lady, oblongleaf bluebells	Present in Park	Native	Unknown
31691	Boraginaceae	Myosotis laxa	bay forget-me-not	Present in Park	Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
22724	Brassicaceae	Arabis puberula	Blue Mountain rockcress, silver rockcress	Present in Park	Native	Unknown
22735	Brassicaceae	Arabis sparsiflora	fewleaf rockcress, sicklepod rockcress	Present in Park	Native	Unknown
23052	Brassicaceae	Berteroa incana	hoary alyssum, hoary false alyssum, hoary false madwort	Present in Park	Non-Native	Unknown
23055	Brassicaceae	Brassica campestris	No data	Present in Park	Non-Native	Unknown
22766	Brassicaceae	Capsella bursa-pastoris	shepardspurse, shepherd's purse, shepherd's-purse, shepherdspurse	Present in Park	Non-Native	Unknown
22772	Brassicaceae	Cardamine pensylvanica	Pennsylvania bittercress, Quaker bittercress	Present in Park	Native	Unknown
22826	Brassicaceae	Descurainia pinnata	green tansymustard, pinnate tansy mustard, pinnate tansymustard, tansymustard, western tansymustard	Present in Park	Native	Unknown
22843	Brassicaceae	Descurainia sophia	flaxweed tansymustard, flixweed, flixweed tansymustard, herb sophia, herb-sophia, pinnate tansymustard, tansymustard	Present in Park	Non-Native	Unknown
22923	Brassicaceae	Draba verna	spring Whitlowgrass, spring draba	Present in Park	Non-Native	Unknown
22931	Brassicaceae	Erysimum asperum	No data	Present in Park	Native	Unknown
22945	Brassicaceae	Erysimum occidentale	pale wallflower, western wallflower	Present in Park	Native	Unknown
503093	Brassicaceae	Hutchinsia procumbens	ovalpurse, prostrate hutchinsia	Present in Park	Native	Unknown
-502511	Brassicaceae	Lepidium apetalum	No data	Present in Park	Unknown	Unknown
22961	Brassicaceae	Lepidium dictyotum	alkali pepperweed, net pepperweed	Present in Park	Native	Unknown
22974	Brassicaceae	Lepidium perfoliatum	clasping pepperweed, clasping pepperwort, claspingleaf pepperweed	Present in Park	Native	Unknown
23178	Brassicaceae	Lesquerella douglasii	Douglas' bladderpod	Present in Park	Native	Unknown
23001	Brassicaceae	Rorippa curvisiliqua	curvepod yellowcress	Present in Park	Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
22993	Brassicaceae	Rorippa nasturtium-aquaticum	watercress	Present in Park	Native	Unknown
23006	Brassicaceae	Rorippa palustris	bog marshcress, bog yellowcress, common yellowcress, marsh yellowcress, marshcress, yellow watercress	Present in Park	Native	Unknown
23312	Brassicaceae	Sisymbrium altissimum	Jim Hill mustard, tall hedge-mustard, tall mustard, tall tumblemustard, tumble mustard, tumblemustard, tumbleweed mustard	Present in Park	Non-Native	Uncommon
-502928	Brassicaceae	Sisymbrium hartwegianum	No data	Present in Park	Unknown	Unknown
23422	Brassicaceae	Thlaspi arvense	Frenchweed, fanweed, field pennycress, pennycress, stinkweed	Present in Park	Non-Native	Unknown
19707	Cactaceae	Opuntia fragilis	brittle cactus, brittle pricklypear, fragile cactus, jumping cactus, little pricklypear, little pricklypear cactus	Present in Park	Native	Uncommon
19726	Cactaceae	Opuntia polyacantha	plains pricklypear	Present in Park	Native	Uncommon
-502631	Cactaceae	Opuntia X polycantha	No data	Present in Park	Native	Unknown
32057	Callitrichaceae	Callitriche hermaphroditica	autumn water starwort, autumn water-starwort, northern water-starwort, northern waterstarwort, scarlet waterstarwort	Present in Park	Native	Unknown
501143	Callitrichaceae	Callitriche palustris	spiny waterstarwort, spring waterstarwort, vernal water starwort, vernal water-starwort, vernal waterstarwort	Present in Park	Native	Unknown
34497	Campanulaceae	Campanula rotundifolia	bluebell, bluebell bellflower, bluebell-of-Scotland, roundleaf harebell	Present in Park	Native	Unknown
34525	Campanulaceae	Lobelia kalmii	Ontario lobelia, brook lobelia	Present in Park	Native	Unknown
35320	Caprifoliaceae	Sambucus cerulea	blue elder	Present in Park	Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
530235	Caprifoliaceae	Sambucus cerulea var. cerulea	blue elderberry	Present in Park	Native	Common
35322	Caprifoliaceae	Sambucus melanocarpa	No data	Present in Park	Native	Unknown
35332	Caprifoliaceae	Symphoricarpos albus	common snowberry, snowberry (common)	Present in Park	Native	Common
530605	Caprifoliaceae	Symphoricarpos albus var. laevigatus	common snowberry	Present in Park	Native	Unknown
20252	Caryophyllaceae	Arenaria kingii	King's sandwort	Present in Park	Native	Unknown
20270	Caryophyllaceae	Arenaria serpyllifolia	thymeleaf sandwort	Present in Park	Non-Native	Unknown
19947	Caryophyllaceae	Cerastium arvense	field chickweed, field mouse-ear chickweed, starry chickweed	Present in Park	Native	Rare
19958	Caryophyllaceae	Cerastium nutans	common chickweed, longstem chickweed, nodding chickweed, nodding mouse-ear chickweed	Present in Park	Native	Unknown
20276	Caryophyllaceae	Dianthus armeria	Deptford pink, Deptford's pink	Present in Park	Non-Native	Unknown
507001	Caryophyllaceae	Gypsophila acorzonerifolia	babysbreath	Present in Park	Unknown	Unknown
20293	Caryophyllaceae	Gypsophila paniculata	baby's breath, babysbreath, babysbreath gypsophila, bachelor's button, perfoliate baby'sbreath	Present in Park	Non-Native	Unknown
20065	Caryophyllaceae	Silene douglasii	Douglas' campion, seabluff catchfly	Present in Park	Native	Unknown
20083	Caryophyllaceae	Silene menziesii	Menzies' campion, white catchfly	Present in Park	Native	Unknown
566803	Caryophyllaceae	Silene menziesii var. menziesii	Menzies' campion	Present in Park	Native	Unknown
20168	Caryophyllaceae	Stellaria longipes	long-stalk starwort, longstalk starwort	Present in Park	Native	Unknown
20169	Caryophyllaceae	Stellaria media	chickweed, common chickweed, nodding chickweed	Present in Park	Native	Unknown
504149	Celastraceae	Paxistima myrsinites	Mountain lover, Oregon boxleaf, boxleaf, boxleaf myrtle	Present in Park	Native	Unknown
18403	Ceratophyllaceae	Ceratophyllum demersum	common hornwort, coon's tail, coon's-tail, coontail, hornwort	Present in Park	Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
20509	Chenopodiaceae	Atriplex patula	halberd-leaf orache, spear saltbush, spear saltweed	Present in Park	Native	Unknown
20563	Chenopodiaceae	Atriplex rosea	redscale saltbush, redscale saltweed, tumbling orache, tumbling saltweed	Present in Park	Native	Unknown
20575	Chenopodiaceae	Atriplex truncata	wedgescale saltbush	Present in Park	Native	Unknown
20592	Chenopodiaceae	Chenopodium album	common lambsquarters, lambsquarters, lambsquarters goosefoot, white goosefoot	Present in Park	Native	Uncommon
20616	Chenopodiaceae	Chenopodium leptophyllum	narrowleaf goosefoot, narrowleaf lambsquarters, narrowleaved goosefoot, slimleaf goosefoot, slimleaf lambsquarters	Present in Park	Native	Unknown
20690	Chenopodiaceae	Grayia spinosa	spiny hopsage	Present in Park	Native	Unknown
20695	Chenopodiaceae	Kochia californica	Mojave kochia, rusty molly	Present in Park	Native	Unknown
503290	Chenopodiaceae	Krascheninnikovia lanata	winterfat	Present in Park	Native	Unknown
20655	Chenopodiaceae	Salsola kali	Russian thistle, prickly Russian thistle, tumbleweed	Present in Park	Non-Native	Uncommon
20707	Chenopodiaceae	Sarcobatus vermiculatus	black greasewood, greasewood	Present in Park	Native	Unknown
505402	Chenopodiaceae	Suaeda calceoliformis	Paiuteweed, Pursh seepweed, western seepweed	Present in Park	Native	Unknown
21454	Clusiaceae	Hypericum perforatum	Klamath weed, Klamathweed, St. John's wort, St. Johnswort, common St Johnswort, common St. John's wort, common St. Johnswort	Present in Park	Non-Native	Uncommon
30705	Convolvulaceae	Convolvulus arvensis	European bindweed, creeping jenny, field bindweed, morningglory, perennial morningglory, smallflowered morning glory	Present in Park	Non-Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
27818	Cornaceae	Cornus stolonifera	red-osier dogwood	Present in Park	Native	Uncommon
24099	Crassulaceae	Crassula aquatica	common pigmyweed, water pygmyweed	Present in Park	Native	Unknown
24126	Crassulaceae	Sedum lanceolatum	lance-leaf stonecrop, lanceleaf stonecrop, spearleaf stonecrop	Present in Park	Native	Unknown
24177	Crassulaceae	Sedum stenopetalum	wormleaf stonecrop, yellow stonecrop	Present in Park	Native	Unknown
194820	Cupressaceae	Juniperus communis	common juniper, dwarf juniper	Present in Park	Native	Unknown
194855	Cupressaceae	Juniperus occidentalis	western juniper	Present in Park	Native	Unknown
194872	Cupressaceae	Juniperus scopulorum	Rocky Mountain juniper	Present in Park	Native	Unknown
18044	Cupressaceae	Thuja plicata	western red cedar, western redcedar	Present in Park	Native	Uncommon
39493	Cyperaceae	Carex amplifolia	bigleaf sedge	Present in Park	Native	Unknown
501205	Cyperaceae	Carex athrostachya	slender-beak sedge, slenderbeak sedge	Present in Park	Native	Unknown
39578	Cyperaceae	Carex douglasii	Douglas sedge, Douglas' sedge	Present in Park	Native	Unknown
39613	Cyperaceae	Carex geyeri	Geyer's sedge, elk sedge	Present in Park	Native	Unknown
39642	Cyperaceae	Carex hoodii	Hood's sedge, hood sedge	Present in Park	Native	Unknown
39786	Cyperaceae	Carex rossii	Ross sedge, Ross' sedge, Ross's sedge, shortstemmed sedge	Present in Park	Native	Unknown
39800	Cyperaceae	Carex scopulorum	Holm's Rocky Mountain sedge, mountain sedge	Present in Park	Native	Unknown
40019	Cyperaceae	Eleocharis palustris	common spikerush, creeping spikerush, spikesedge	Present in Park	Native	Unknown
507797	Cyperaceae	Schoenoplectus tabernaemontani	great bulrush, soft-stem bulrush, softstem bulrush	Present in Park	Native	Unknown
40240	Cyperaceae	Scirpus acutus	hardstem bulrush	Present in Park	Native	Unknown
40269	Cyperaceae	Scirpus nevadensis	Nevada bulrush	Present in Park	Native	Unknown
17224	Dennstaedtiaceae	Pteridium aquilinum	bracken, bracken fern, brackenfern, northern bracken fern, western brackenfern	Present in Park	Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
35406	Dipsacaceae	Dipsacus sylvestris	Fuller's teasel, common teasel	Present in Park	Native	Unknown
27770	Elaeagnaceae	Elaeagnus angustifolia	Russian olive, Russian-olive, oleaster	Present in Park	Non-Native	Rare
27779	Elaeagnaceae	Shepherdia canadensis	russet buffalo-berry, russet buffaloberry	Present in Park	Native	Unknown
17152	Equisetaceae	Equisetum arvense	field horsetail, scouring rush, western horsetail	Present in Park	Native	Unknown
17154	Equisetaceae	Equisetum hyemale	horsetail, scouring horsetail, scouringrush, scouringrush horsetail, tall scouring-rush, western scouringrush	Present in Park	Native	Unknown
17156	Equisetaceae	Equisetum laevigatum	horsetail, smooth horsetail, smooth scouring-rush, smooth scouringrush	Present in Park	Native	Unknown
23530	Ericaceae	Arctostaphylos uva-ursi	bearberry, bearberry manzanita, kinnikinnick, mealberry	Present in Park	Native	Common
28061	Euphorbiaceae	Euphorbia cyparissias	cypress spurge	Present in Park	Non-Native	Unknown
28134	Euphorbiaceae	Euphorbia serpyllifolia	No data	Present in Park	Native	Unknown
25543	Fabaceae	Astragalus inflexus	bent milkvetch	Present in Park	Native	Unknown
25584	Fabaceae	Astragalus miser	timber milkvetch, weedy milkvetch	Present in Park	Native	Unknown
192621	Fabaceae	Astragalus miser var. miser	timber milkvetch	Present in Park	Native	Unknown
25648	Fabaceae	Astragalus purshii	Pursh loco, Pursh's milk-vetch, Pursh's milkvetch, woollypod milkvetch	Present in Park	Native	Unknown
192727	Fabaceae	Astragalus purshii var. tinctus	woollypod milkvetch	Present in Park	Native	Unknown
25694	Fabaceae	Astragalus succumbens	Columbia milkvetch	Present in Park	Native	Unknown
26714	Fabaceae	Gleditsia triacanthos	Honey locust, common honeylocust, honey-locust, honeylocust, honeylocusts	Present in Park	Non-Native	Rare
26719	Fabaceae	Glycyrrhiza lepidota	American licorice, licorice, wild licorice	Present in Park	Native	Unknown
503557	Fabaceae	Lotus nevadensis	Nevada bird's-foot trefoil, Nevada trefoil	Present in Park	Native	Unknown
26398	Fabaceae	Lotus purshianus	No data	Present in Park	Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
25952	Fabaceae	Lupinus aridus	arid lupine, desert lupine	Present in Park	Native	Unknown
537106	Fabaceae	Lupinus lepidus var. aridus	No data	Present in Park	Native	Unknown
26112	Fabaceae	Lupinus sericeus	Pursh's silky lupine, silky lupine	Present in Park	Native	Common
26145	Fabaceae	Lupinus wyethi	No data	Present in Park	Native	Unknown
503721	Fabaceae	Medicago lupulina	black medic, black medic clover, black medick, hop clover, hop medic, nonesuch, yellow trefoil	Present in Park	Non-Native	Unknown
183623	Fabaceae	Medicago sativa	alfalfa	Present in Park	Native	Unknown
26149	Fabaceae	Melilotus alba	white sweetclover	Present in Park	Non-Native	Uncommon
26150	Fabaceae	Melilotus officinalis	yellow sweet-clover, yellow sweetclover	Present in Park	Non-Native	Uncommon
518095	Fabaceae	Oxytropis columbiana	No data	Present in Park	Native	Unknown
504645	Fabaceae	Psoralidium lanceolatum	dune scurfpea, lemmon scurfpea, lemon scurfpea, wild lemonweed	Present in Park	Native	Unknown
26185	Fabaceae	Robinia pseudo-acacia	black locust	Present in Park	Native	Unknown
531365	Fabaceae	Thermopsis gracilis var. ovata	bigleaf thermopsis, slender goldenbanner, thermopsis	Present in Park	Native	Unknown
508158	Fabaceae	Thermopsis montana	mountain goldenbanner	Present in Park	Native	Unknown
26313	Fabaceae	Trifolium pratense	red clover	Present in Park	Non-Native	Unknown
26206	Fabaceae	Trifolium repens	Dutch clover, ladino clover, white clover	Present in Park	Non-Native	Unknown
26331	Fabaceae	Vicia americana	American deervetch, American vetch, american purple vetch	Present in Park	Native	Unknown
-503036	Fabaceae	Vicia cillosa	No data	Present in Park	Unknown	Unknown
26335	Fabaceae	Vicia cracca	bird vetch, cow vetch	Present in Park	Non-Native	Unknown
26360	Fabaceae	Vicia villosa	hairy vetch, winter vetch, woolly vetch, wooly vetch	Present in Park	Non-Native	Unknown
19454	Fagaceae	Castanea dentata	American chestnut	Present in Park	Non-Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
19281	Fagaceae	Quercus palustris	pin oak	Present in Park	Non-Native	Rare
502649	Gentianaceae	Frasera albicaulis	whitestem elkweed, whitestem frasera	Present in Park	Native	Unknown
30108	Gentianaceae	Swertia albicaulis	No data	Present in Park	Native	Unknown
29147	Geraniaceae	Erodium cicutarium	California filaree, alfilaree, alfilaria, cutleaf filaree, filaree, red-stem stork's-bill, redstem, redstem filaree, redstem stork's bill, stork's bill, storksbill	Present in Park	Native	Unknown
29115	Geraniaceae	Geranium pusillum	small geranium, small-flower crane's-bill	Present in Park	Non-Native	Unknown
29125	Geraniaceae	Geranium viscosissimum	sticky geranium, sticky purple geranium	Present in Park	Native	Unknown
24452	Grossulariaceae	Ribes aureum	golden currant	Present in Park	Native	Unknown
24457	Grossulariaceae	Ribes cereum	wax currant, wax current	Present in Park	Native	Uncommon
24490	Grossulariaceae	Ribes odoratum	No data	Present in Park	Non-Native	Unknown
503906	Haloragaceae	Myriophyllum sibiricum	American watermilfoil, Siberian water-milfoil, milfoil, shortspike watermilfoil	Present in Park	Native	Unknown
27039	Haloragaceae	Myriophyllum spicatum	Eurasian water-milfoil, Eurasian watermilfoil, myriophylle en epi, spike watermilfoil, spiked water milfoil	Present in Park	Non-Native	Unknown
24430	Hydrangeaceae	Philadelphus lewisii	Lewis' mock orange	Present in Park	Native	Uncommon
38937	Hydrocharitaceae	Elodea canadensis	Canada waterweed, Canadian waterweed, broad waterweed	Present in Park	Native	Unknown
31391	Hydrophyllaceae	Hydrophyllum capitatum	ballhead waterleaf	Present in Park	Native	Unknown
528508	Hydrophyllaceae	Hydrophyllum capitatum var. capitatum	ballhead waterleaf	Present in Park	Native	Unknown
31529	Hydrophyllaceae	Phacelia hastata	silver-leaf scorpion-weed, silverleaf phacelia, spearhead phacelia	Present in Park	Native	Unknown
31514	Hydrophyllaceae	Phacelia linearis	linearleaf phacelia, threadleaf phacelia	Present in Park	Native	Unknown

Lake Roosevelt NRA Vascular Plants						
TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
43221	Iridaceae	Iris missouriensis	Rocky Mountain iris, western blue flag, wild iris, wildiris	Present in Park	Native	Unknown
43194	Iridaceae	Iris pseudacorus	paleyellow iris, yellow flag	Present in Park	Non-Native	Unknown
43240	Iridaceae	Sisyrinchium angustifolium	blue eyegrass, blue-eyed grass, common blue eyedgrass, common blue-eyedgrass, narrowleaf blue-eyed grass	Present in Park	Native	Unknown
19254	Juglandaceae	Juglans nigra	black walnut	Present in Park	Non-Native	Unknown
503244	Juglandaceae	Juglans regia	English walnut	Present in Park	Non-Native	Unknown
39223	Juncaceae	Juncus balticus	Baltic rush	Present in Park	Native	Unknown
39299	Juncaceae	Juncus orthophyllus	straightleaf rush	Present in Park	Native	Unknown
32435	Lamiaceae	Agastache occidentalis	western giant hyssop	Present in Park	Native	Unknown
32450	Lamiaceae	Agastache urticifolia	horsemint giant hyssop, nettleleaf giant hyssop	Present in Park	Native	Rare
32539	Lamiaceae	Lamium amplexicaule	common henbit, giraffehead, henbit, henbit deadnettle	Present in Park	Non-Native	Unknown
565302	Lamiaceae	Mentha arvensis	field mint, wild mint	Present in Park	Native	Uncommon
537472	Lamiaceae	Mentha arvensis var. canadensis	No data	Present in Park	Native	Unknown
537473	Lamiaceae	Mentha arvensis var. glabrata	No data	Present in Park	Native	Unknown
32381	Lamiaceae	Prunella vulgaris	common selfheal, heal all, healall, selfheal	Present in Park	Native	Unknown
520952	Lamiaceae	Salvia carnosa	No data	Present in Park	Native	Unknown
32683	Lamiaceae	Salvia dorrii	grayball sage, purple sage	Present in Park	Native	Unknown
32783	Lamiaceae	Scutellaria angustifolia	narrowleaf skullcap	Present in Park	Native	Unknown
42590	Lemnaceae	Lemna minor	common duckweed, least duckweed, lesser duckweed	Present in Park	Native	Unknown
42707	Liliaceae	Allium acuminatum	taper-tip onion, tapertip onion	Present in Park	Native	Unknown
42721	Liliaceae	Allium cernuum	nodding onion	Present in Park	Native	Uncommon

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
42643	Liliaceae	Allium geyeri	Geyer onion, Geyer's onion	Present in Park	Native	Unknown
42683	Liliaceae	Allium macrum	rock onion	Present in Park	Native	Unknown
42658	Liliaceae	Allium pleianthum	manyflower onion	Present in Park	Native	Unknown
42636	Liliaceae	Allium schoenoprasum	wild chive, wild chives	Present in Park	Non-Native	Unknown
42784	Liliaceae	Asparagus officinalis	asparagus, garden asparagus, garden-asparagus	Present in Park	Non-Native	Uncommon
509730	Liliaceae	Brodiaea douglasii	No data	Present in Park	Native	Unknown
42858	Liliaceae	Calochortus macrocarpus	greenband mariposa lily, sagebrush mariposa lily	Present in Park	Native	Uncommon
42883	Liliaceae	Camassia quamash	common camas, small camas	Present in Park	Native	Rare
42905	Liliaceae	Clintonia uniflora	bride's bonnet	Present in Park	Native	Unknown
42923	Liliaceae	Disporum trachycarpum	rough-fruit fairybells, roughfruit fairybells, wartberry fairybells	Present in Park	Native	Unknown
42936	Liliaceae	Fritillaria pudica	yellow bells, yellow fritillary, yellow missionbells, yellowbells	Present in Park	Native	Unknown
503452	Liliaceae	Lilium columbianum	Columbian lily	Present in Park	Native	Unknown
503656	Liliaceae	Maianthemum stellatum	Starry false solomon's-seal, false Solomons seal, starry Solomon's-seal, starry false Solomon's seal, starry false lily of the vally	Present in Park	Native	Unknown
43036	Liliaceae	Smilacina racemosa	No data	Present in Park	Native	Unknown
43098	Liliaceae	Triteleia hyacinthina	white brodiaea, wild hyacinth	Present in Park	Native	Unknown
43167	Liliaceae	Zigadenus paniculatus	foothill deathcamas, sand-corn	Present in Park	Native	Unknown
43168	Liliaceae	Zigadenus venenosus	death camas, meadow deathcamas	Present in Park	Native	Unknown
530912	Liliaceae	Zigadenus venenosus var. venenosus	meadow deathcamas	Present in Park	Native	Unknown
503779	Loasaceae	Mentzelia laevicaulis	blazingstar mentzelia, smoothstem blazingstar	Present in Park	Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
21836	Malvaceae	Malva neglecta	buttonweed, cheeseplant, cheeseweed, common mallow, dwarf mallow, roundleaf mallow	Present in Park	Non-Native	Unknown
23787	Monotropaceae	Pterospora andromedea	giant pinedrops, woodland pinedrops	Present in Park	Native	Unknown
19070	Moraceae	Morus rubra	red mulberry	Present in Park	Non-Native	Unknown
38996	Najadaceae	Najas flexilis	nodding waternymph, slender niad, wavy waternymph	Present in Park	Native	Unknown
32931	Oleaceae	Fraxinus americana	white ash	Present in Park	Non-Native	Rare
502663	Oleaceae	Fraxinus excelsior	European ash	Present in Park	Non-Native	Rare
32929	Oleaceae	Fraxinus pennsylvanica	green ash	Present in Park	Non-Native	Rare
27616	Onagraceae	Clarkia pulchella	pinkfairies	Present in Park	Native	Unknown
27284	Onagraceae	Epilobium angustifolium	blooming sally, fireweed	Present in Park	Native	Unknown
27288	Onagraceae	Epilobium brachycarpum	autumn willowherb, autumn willowweed, tall annual willowherb	Present in Park	Native	Unknown
27671	Onagraceae	Gayophytum diffusum	bigflower groundsmoke, spreading groundsmoke	Present in Park	Native	Unknown
27436	Onagraceae	Oenothera pallida	pale evening primrose, pale evening-primrose, pale eveningprimrose	Present in Park	Native	Unknown
517740	Onagraceae	Oenothera strigosa	No data	Present in Park	Native	Unknown
43508	Orchidaceae	Calypso bulbosa	fairy slipper, fairy-slipper orchid, fairyslipper, fairyslipper orchid	Present in Park	Native	Rare
43523	Orchidaceae	Corallorrhiza maculata	spotted coralroot, summer coralroot	Present in Park	Native	Unknown
514359	Orchidaceae	Habenaria elegans	No data	Present in Park	Native	Unknown
43473	Orchidaceae	Spiranthes romanzoffiana	hooded ladies'-tresses, hooded ladiestresses, hooded lady's tresses	Present in Park	Native	Unknown
-502959	Orchidaceae	Spiranthes romanzoffiana var. romanzoffiana	No data	Present in Park	Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
34290	Orobanchaceae	Orobanche fasciculata	clustered broom-rape, clustered broomrape, purple broomrape, tufted broomrape	Present in Park	Native	Unknown
538085	Orobanchaceae	Orobanche uniflora var. purpurea	No data	Present in Park	Native	Unknown
183284	Pinaceae	Abies grandis	giant fir, grand fir, lowland white fir, silver fir, white fir, yellow fir	Present in Park	Native	Rare
183416	Pinaceae	Larix lyallii	subalpine larch, tamarack, timberline larch	Present in Park	Non-Native	Rare
183417	Pinaceae	Larix occidentalis	hackmatack, montana larch, mountain larch, western larch, western tamarack	Present in Park	Native	Common
183291	Pinaceae	Picea engelmannii	Engelmann spruce, Engelmann's spruce, columbian spruce, mountain spruce, silver spruce, white spruce	Present in Park	Native	Rare
183311	Pinaceae	Pinus albicaulis	scrub pine, white pine, whitebark pine	Present in Park	Non-Native	Rare
183319	Pinaceae	Pinus banksiana	black pine, gray pine, hudson bay pine, jack pine, scrub pine	Present in Park	Non-Native	Rare
183327	Pinaceae	Pinus contorta	lodgepole pine, scrub pine, shore pine, tamarack pine	Present in Park	Native	Abundant
529673	Pinaceae	Pinus contorta var. latifolia	lodgepole pine, tall lodgepole pine	Present in Park	Native	Abundant
183356	Pinaceae	Pinus monticola	idaho white pine, mountain white pine, silver pine, western white pine	Present in Park	Native	Rare
183364	Pinaceae	Pinus nigra	Austrian pine, australian pine, european black pine	Present in Park	Non-Native	Rare
183365	Pinaceae	Pinus ponderosa	blackjack pine, bull pine, pinabete, ponderosa pine, rock pine, western yellow pine	Present in Park	Native	Abundant
183424	Pinaceae	Pseudotsuga menziesii	Douglas fir, Douglas-fir, douglas spruce, oregon pine, red fir	Present in Park	Native	Common
519677	Pinaceae	Pseudotsuga taxifolia	No data	Present in Park	Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
32874	Plantaginaceae	Plantago lanceolata	English plantain, buckhorn plantain, lanceleaf Indianwheat, lanceleaf plantain, narrowleaf plantain, ribgrass, ribwort	Present in Park	Non-Native	Unknown
529707	Plantaginaceae	Plantago major var. major	common plantain	Present in Park	Native	Unknown
32907	Plantaginaceae	Plantago patagonica	woolly Indianwheat, woolly plantain, woolly plantian, wooly Indianwheat, wooly plantain	Present in Park	Native	Unknown
19021	Platanaceae	Platanus hybrida	London planetree	Present in Park	Non-Native	Rare
507943	Poaceae	Achnatherum hymenoides	Indian ricegrass	Present in Park	Native	Uncommon
507955	Poaceae	Achnatherum richardsonii	Richardson needlegrass, Richardson's needlegrass	Present in Park	Native	Unknown
507961	Poaceae	Achnatherum thurberianum	Thurber's needlegrass	Present in Park	Native	Unknown
182478	Poaceae	Agropyron cristatum	crested wheat grass, crested wheatgrass	Present in Park	Native	Common
40364	Poaceae	Agropyron dasystachyum	No data	Present in Park	Native	Unknown
40386	Poaceae	Agropyron spicatum	No data	Present in Park	Native	Common
40414	Poaceae	Agrostis gigantea	black bent, redtop, water bentgrass	Present in Park	Non-Native	Unknown
40436	Poaceae	Alopecurus aequalis	short foxtail, short-awn meadow-foxtail, shortawn foxtail	Present in Park	Native	Unknown
40438	Poaceae	Alopecurus pratensis	field meadow-foxtail, meadow foxtail	Present in Park	Non-Native	Unknown
41443	Poaceae	Arrhenatherum elatius	tall oatgrass	Present in Park	Non-Native	Unknown
40495	Poaceae	Bromus briziformis	rattlesnake brome	Present in Park	Non-Native	Unknown
40481	Poaceae	Bromus carinatus	California brome, mountain brome	Present in Park	Native	Unknown
40502	Poaceae	Bromus inermis	awnless brome, smooth brome	Present in Park	Unknown	Unknown
40479	Poaceae	Bromus japonicus	Japanese brome, Japanese bromegrass, Japanese chess	Present in Park	Non-Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
40508	Poaceae	Bromus mollis	soft brome, soft cheat, soft chess	Present in Park	Non-Native	Unknown
40519	Poaceae	Bromus secalinus	bromegrass, cheat, chess, chess brome, rye brome, ryebrome	Present in Park	Non-Native	Unknown
40524	Poaceae	Bromus tectorum	cheat grass, cheatgrass, downy brome, early chess, military grass, wild oats	Present in Park	Non-Native	Common
40540	Poaceae	Calamagrostis rubescens	pinegrass	Present in Park	Native	Unknown
41628	Poaceae	Dactylus glomerata	No data	Present in Park	Native	Unknown
41642	Poaceae	Danthonia spicata	poverty danthonia, poverty oatgrass, poverty wild oat grass	Present in Park	Native	Unknown
40662	Poaceae	Distichlis spicata	desert saltgrass, inland saltgrass, marsh spikegrass, saltgrass, seashore saltgrass	Present in Park	Native	Unknown
40684	Poaceae	Elymus glaucus	blue wild rye, blue wildrye	Present in Park	Native	Unknown
502271	Poaceae	Elymus multisetus	big squirreltail, big wild rye	Present in Park	Native	Unknown
512839	Poaceae	Elymus repens	quackgrass	Present in Park	Non-Native	Unknown
40719	Poaceae	Eragrostis cilianensis	candy grass, lovegrass, stink grass, stinkgrass, strongscented lovegrass	Present in Park	Non-Native	Unknown
40808	Poaceae	Festuca altaica	Altai fescue, rough fescue	Present in Park	Native	Unknown
40816	Poaceae	Festuca idahoensis	Idaho fescue	Present in Park	Native	Uncommon
40820	Poaceae	Festuca occidentalis	western fescue	Present in Park	Native	Unknown
513551	Poaceae	Festuca octoflora	No data	Present in Park	Native	Unknown
40804	Poaceae	Festuca ovina	sheep fescue	Present in Park	Native	Unknown
40833	Poaceae	Glyceria striata	fowl manna grass, fowl mannagrass	Present in Park	Native	Unknown
503284	Poaceae	Koeleria macrantha	junegrass, prairie Junegrass	Present in Park	Native	Unknown
503433	Poaceae	Leymus cinereus	basin wildrye	Present in Park	Native	Uncommon
503434	Poaceae	Leymus condensatus	giant wildrye	Present in Park	Native	Uncommon

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
507086	Poaceae	Nassella viridula	green needlegrass	Present in Park	Native	Unknown
40914	Poaceae	Panicum capillare	annual witchgrass, common panic grass, common witchgrass, panicgrass, ticklegrass, tumble panic, tumbleweed grass, witches hair, witchgrass	Present in Park	Native	Unknown
40922	Poaceae	Panicum occidentale	No data	Present in Park	Native	Unknown
518376	Poaceae	Panicum scribnerianum	No data	Present in Park	Native	Unknown
41335	Poaceae	Phalaris arundinacea	reed canary grass, reed canarygrass	Present in Park	Non-Native	Common
41062	Poaceae	Phleum pratense	common timothy, timothy	Present in Park	Non-Native	Uncommon
41116	Poaceae	Poa bulbosa	bulbous blue grass, bulbous bluegrass	Present in Park	Native	Common
41082	Poaceae	Poa compressa	Canada bluegrass, flat-stem blue grass	Present in Park	Native	Unknown
41121	Poaceae	Poa cusickii	Cusick's bluegrass	Present in Park	Native	Unknown
539002	Poaceae	Poa nervosa var. wheeleri	No data	Present in Park	Native	Unknown
41088	Poaceae	Poa pratensis	Kentucky bluegrass	Present in Park	Non-Native	Common
41103	Poaceae	Poa secunda	Sandberg bluegrass, Sandberg's bluegrass, big bluegrass	Present in Park	Native	Uncommon
504637	Poaceae	Pseudoroegneria spicata	bluebunch wheatgrass, bluebunch-wheat grass	Present in Park	Native	Unknown
41200	Poaceae	Puccinellia nuttalliana	Nuttall alkaligrass, Nuttall's alkaligrass	Present in Park	Native	Unknown
42090	Poaceae	Secale cereale	Cultivated annual rye, cereal rye, common rye, cultivated rye, rye	Present in Park	Non-Native	Unknown
41231	Poaceae	Setaria viridis	bottle grass, green bristle grass, green bristlegrass, green foxtail, pigeongrass, wild millet	Present in Park	Non-Native	Unknown
42097	Poaceae	Sitanion hystrix	No data	Present in Park	Native	Unknown
42132	Poaceae	Sporobolus cryptandrus	sand dropseed	Present in Park	Native	Unknown
42172	Poaceae	Stipa comata	No data	Present in Park	Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
541007	Poaceae	Stipa comata var. intermedia	No data	Present in Park	Native	Unknown
42186	Poaceae	Stipa occidentalis	No data	Present in Park	Native	Unknown
522540	Poaceae	Thinopyrum intermedium	intermediate wheatgrass	Present in Park	Non-Native	Unknown
522927	Poaceae	Trisetum canescens	tall trisetum	Present in Park	Native	Unknown
42261	Poaceae	Vulpia bromoides	brome fescue, brome six-weeks grass, desert fescue	Present in Park	Non-Native	Unknown
42264	Poaceae	Vulpia octoflora	eight-flower six-weeks grass, pullout grass, sixweeks fescue, sixweeks grass	Present in Park	Native	Unknown
31037	Polemoniaceae	Collomia grandiflora	grand collomia, largeflowered collomia	Present in Park	Native	Unknown
31041	Polemoniaceae	Collomia linearis	narrow-leaf mountain-trumpet, narrowleaf mountaintrumpet, slenderleaf collomia, tiny trumpet	Present in Park	Native	Unknown
514011	Polemoniaceae	Gilia aggregata	No data	Present in Park	Native	Common
-502395	Polemoniaceae	Gilia aggregata var. aggregata	No data	Present in Park	Native	Unknown
514033	Polemoniaceae	Gilia gracilis	No data	Present in Park	Native	Unknown
31127	Polemoniaceae	Gilia inconspicua	shy gilia, shy gily-flower	Present in Park	Native	Unknown
31150	Polemoniaceae	Gilia leptomeria	sand gilia, sand gily-flower, slender gilia	Present in Park	Native	Unknown
31233	Polemoniaceae	Leptodactylon pungens	common pricklygilia, granite gilia, granite prickly gilia, granite prickly phlox, granite pricklygilia	Present in Park	Native	Unknown
515964	Polemoniaceae	Linanthus pharnaceoides	No data	Present in Park	Native	Unknown
31309	Polemoniaceae	Microsteris gracilis	No data	Present in Park	Native	Unknown
30913	Polemoniaceae	Phlox austromontana	desert mountain phlox, desert phlox, mountain phlox	Present in Park	Native	Unknown
30948	Polemoniaceae	Phlox hoodii	Hood's phlox, spiny phlox	Present in Park	Native	Unknown
31017	Polemoniaceae	Polemonium micranthum	annual jacob's-ladder, annual polemonium, liitlebell Jacob's-ladder	Present in Park	Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
31018	Polemoniaceae	Polemonium occidentale	western Jacob's-ladder, western polemonium	Present in Park	Native	Unknown
31023	Polemoniaceae	Polemonium pulcherrimum	Jacob's-ladder, pretty Jacob's-ladder, skunkleaf polemonium	Present in Park	Native	Unknown
21086	Polygonaceae	Eriogonum caespitosum	mat buckwheat, mat eriogonum, matted buckwheat, matted wild buckwheat	Present in Park	Native	Unknown
21097	Polygonaceae	Eriogonum compositum	arrowleaf buckwheat	Present in Park	Native	Unknown
21118	Polygonaceae	Eriogonum douglasii	Douglas' buckwheat	Present in Park	Native	Unknown
21122	Polygonaceae	Eriogonum elatum	rush buckwheat, tall woolly buckwheat	Present in Park	Native	Unknown
21150	Polygonaceae	Eriogonum heracleoides	Wyeth eriogonum, Wyeth's buckwheat, parsnipflower buckwheat	Present in Park	Native	Unknown
21203	Polygonaceae	Eriogonum niveum	snow buckwheat	Present in Park	Native	Unknown
21249	Polygonaceae	Eriogonum sphaerocephalum	rock buckwheat, spurry buckwheat	Present in Park	Native	Unknown
21259	Polygonaceae	Eriogonum thymoides	thymeleaf buckwheat	Present in Park	Native	Unknown
21271	Polygonaceae	Eriogonum vimineum	broom buckwheat, wickerstem buckwheat	Present in Park	Native	Unknown
20865	Polygonaceae	Polygonum amphibium	water knotweed, water smartweed	Present in Park	Native	Unknown
20876	Polygonaceae	Polygonum aviculare	prostrate knotweed, yard knotweed	Present in Park	Non-Native	Unknown
20866	Polygonaceae	Polygonum coccineum	longroot smartweed	Present in Park	Native	Unknown
20853	Polygonaceae	Polygonum convolvulus	black bindweed, black-bindweed, climbing buckwheat, climbing knotweed, cornbind, dullseed cornbind, pink smartweed, wild buckwheat	Present in Park	Non-Native	Unknown
20891	Polygonaceae	Polygonum douglasii	Douglas knotweed, Douglas' knotweed	Present in Park	Native	Unknown
20856	Polygonaceae	Polygonum hydropiper	annual smartweed, marshpepper knotweed, mild water-pepper	Present in Park	Non-Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
20860	Polygonaceae	Polygonum lapathifolium	curltop ladysthumb, curlytop knotweed, curlytop smartweed, dock-leaf smartweed, nodding smartweed, pale smartweed, smartweed	Present in Park	Native	Unknown
20915	Polygonaceae	Polygonum persicaria	lady's-thumb, ladysthumb, ladysthumb smartweed, smartweed, spotted knotweed, spotted ladysthumb, spotted smartweed	Present in Park	Non-Native	Unknown
504901	Polygonaceae	Rumex acetosa	garden sorrel	Present in Park	Non-Native	Unknown
20934	Polygonaceae	Rumex acetosella	common sheep sorrel, field sorrel, red (or sheep) sorrel, red sorrel, sheep sorrel	Present in Park	Non-Native	Unknown
20937	Polygonaceae	Rumex crispus	Curley dock, curly dock, narrowleaf dock, sour dock, yellow dock	Present in Park	Non-Native	Unknown
20980	Polygonaceae	Rumex venosus	veiny dock	Present in Park	Native	Unknown
17235	Polypodiaceae	Polypodium hesperium	western polypody	Present in Park	Native	Unknown
20390	Portulacaceae	Claytonia lanceolata	lanceleaf springbeauty	Present in Park	Native	Unknown
527402	Portulacaceae	Claytonia lanceolata var. lanceolata	lanceleaf springbeauty	Present in Park	Native	Unknown
20490	Portulacaceae	Lewisia rediviva	Oregon bitter-root, bitter root, bitterroot	Present in Park	Native	Unknown
20413	Portulacaceae	Montia linearis	narrowleaf Indianlettuce, narrowleaf miner'slettuce, narrowleaf minerslettuce	Present in Park	Native	Unknown
517308	Portulacaceae	Montia perfoliata	miner's lettuce	Present in Park	Native	Unknown
20422	Portulacaceae	Portulaca oleracea	akulikuli-kula, common purslane, duckweed, garden purslane, little hogweed, little-hogweed, purslane, pursley, pusley, wild portulaca	Present in Park	Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
39020	Potamogetonaceae	Potamogeton alpinus	alpine pondweed	Present in Park	Native	Unknown
39007	Potamogetonaceae	Potamogeton crispus	curly pondweed, curly-leaved pondweed	Present in Park	Native	Unknown
39027	Potamogetonaceae	Potamogeton epihydrus	ribbonleaf pondweed	Present in Park	Native	Unknown
39019	Potamogetonaceae	Potamogeton foliosus	leafy pondweed	Present in Park	Native	Unknown
39032	Potamogetonaceae	Potamogeton gramineus	grassy pondweed, variableleaf pondweed	Present in Park	Native	Unknown
529807	Potamogetonaceae	Potamogeton pusillus var. tenuissimus	small pondweed	Present in Park	Native	Unknown
504558	Potamogetonaceae	Potamogeton richardsonii	Richardson pondweed, Richardson's pondweed, red-head pondweed	Present in Park	Native	Unknown
504559	Potamogetonaceae	Potamogeton robbinsii	Robbins pondweed, Robbins' pondweed	Present in Park	Native	Unknown
565547	Potamogetonaceae	Stuckenia pectinatus	sago pondweed	Present in Park	Native	Unknown
565549	Potamogetonaceae	Stuckenia vaginatus	sheathed pondweed	Present in Park	Native	Unknown
23957	Primulaceae	Dodecatheon conjugens	Bonneville shootingstar	Present in Park	Native	Unknown
534515	Primulaceae	Dodecatheon conjugens var. viscidum	No data	Present in Park	Native	Unknown
23958	Primulaceae	Dodecatheon cusickii	No data	Present in Park	Native	Unknown
23984	Primulaceae	Lysimachia ciliata	fringed loosestrife, fringed yellow-loosestrife	Present in Park	Native	Unknown
24021	Primulaceae	Primula cusickiana	Cusick's primrose	Present in Park	Native	Unknown
23769	Pyrolaceae	Chimaphila umbellata	common pipsissewa, pipsissewa	Present in Park	Native	Unknown
504066	Pyrolaceae	Orthilia secunda	oneside wintergreen, sidebells, sidebells wintergreen	Present in Park	Native	Unknown
18738	Ranunculaceae	Aquilegia formosa	crimson columbine, western columbine	Present in Park	Native	Uncommon
18693	Ranunculaceae	Clematis columbiana	Columbian virgin's-bower, rock clematis	Present in Park	Native	Unknown
527419	Ranunculaceae	Clematis columbiana var. columbiana	Columbian virginsbower, rock clematis	Present in Park	Native	Unknown

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TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
18702	Ranunculaceae	Clematis ligusticifolia	virgin'sbower, virgins bower, virginsbower, western white clematis	Present in Park	Native	Unknown
-502223	Ranunculaceae	Delphinium columbianum	No data	Present in Park	Unknown	Unknown
18552	Ranunculaceae	Delphinium depauperatum	slim larkspur, wand larkspur	Present in Park	Native	Unknown
18478	Ranunculaceae	Delphinium menziesii	Menzies' larkspur	Present in Park	Native	Unknown
18483	Ranunculaceae	Delphinium nuttallianum	Nuttal's larkspur, Nuttall larkspur, Nuttall's larkspur, low larkspur, two-lobe larkspur, twolobe larkspur	Present in Park	Native	Unknown
517393	Ranunculaceae	Myosurus apetalus	bristly mousetail	Present in Park	Native	Unknown
18783	Ranunculaceae	Myosurus aristatus	bristle mousetail	Present in Park	Native	Unknown
18786	Ranunculaceae	Myosurus minimus	No data	Present in Park	Native	Unknown
18581	Ranunculaceae	Ranunculus aquatilis	water buttercup, whitewater crowfoot	Present in Park	Native	Unknown
18600	Ranunculaceae	Ranunculus cymbalaria	alkali buttercup, shore buttercup	Present in Park	Native	Unknown
18606	Ranunculaceae	Ranunculus glaberrimus	sagebrush buttercup	Present in Park	Native	Unknown
529968	Ranunculaceae	Ranunculus glaberrimus var. glaberrimus	sagebrush buttercup	Present in Park	Native	Unknown
18642	Ranunculaceae	Ranunculus repens	creeping buttercup	Present in Park	Native	Unknown
-9748332	Ranunculaceae	Ranunculus repens var. sceleratus	No data	Present in Park	Non-Native	Unknown
28506	Rhamnaceae	Ceanothus sanguineus	redstem ceanothus	Present in Park	Native	Uncommon
28517	Rhamnaceae	Ceanothus velutinus	snowbrush ceanothus, snowbush	Present in Park	Native	Common
506987	Rhamnaceae	Frangula purshiana	Pursh's buckthorn, cascara buckthorn	Present in Park	Native	Unknown
25109	Rosaceae	Amelanchier alnifolia	Saskatoon serviceberry, juneberry, pacific serviceberry, western serviceberry, western shadbush	Present in Park	Native	Common
182034	Rosaceae	Amelanchier alnifolia var. cusickii	Cusick's serviceberry	Present in Park	Native	Unknown

Lake Roosevelt NRA Vascular Plants						
TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
25121	Rosaceae	Amelanchier utahensis	Utah serviceberry, serviceberry (Utah), utah shadberry, western serviceberry	Present in Park	Native	Common
24551	Rosaceae	Crataegus columbiana	columbia hawthorn	Present in Park	Native	Unknown
24555	Rosaceae	Crataegus dilatata	a hawthorn, black hawthorn, broadleaf hawthorn	Present in Park	Native	Unknown
24557	Rosaceae	Crataegus douglasii	black hawthorn, river hawthorn	Present in Park	Native	Common
527518	Rosaceae	Crataegus douglasii var. douglasii	Douglas' hawthorn, black hawthorn	Present in Park	Native	Unknown
24634	Rosaceae	Fragaria vesca	woodland strawberry	Present in Park	Native	Uncommon
24639	Rosaceae	Fragaria virginiana	Virginia strawberry, thickleaved wild strawberry, wild strawberry	Present in Park	Native	Unknown
535518	Rosaceae	Fragaria virginiana var. platypetala	No data	Present in Park	Native	Unknown
24662	Rosaceae	Geum triflorum	old man's whiskers, prairie smoke, prairiesmoke	Present in Park	Native	Unknown
195841	Rosaceae	Geum triflorum var. ciliatum	old man's whiskers	Present in Park	Native	Unknown
25177	Rosaceae	Holodiscus discolor	creambush oceanspray, hillside oceanspray, oceanspray	Present in Park	Native	Common
25264	Rosaceae	Malus sylvestris	European crabapple	Present in Park	Non-Native	Rare
25280	Rosaceae	Physocarpus malvaceus	mallow ninebark	Present in Park	Native	Uncommon
24692	Rosaceae	Potentilla arguta	tall cinquefoil	Present in Park	Native	Unknown
24713	Rosaceae	Potentilla glandulosa	gland cinquefoil, sticky cinquefoil	Present in Park	Native	Unknown
24714	Rosaceae	Potentilla gracilis	graceful cinquefoil, northwest cinquefoil, slender cinquefoil	Present in Park	Native	Uncommon
24724	Rosaceae	Potentilla millegrana	No data	Present in Park	Native	Unknown
-9748331	Rosaceae	Potentilla oridescens	No data	Present in Park	Unknown	Unknown
24742	Rosaceae	Potentilla recta	roughfruit cinquefoil, sulfur (or erect) cinquefoil, sulfur	Present in Park	Non-Native	Rare

Lake Roosevelt NRA Vascular Plants						
TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
			cinquefoil, sulphur cinquefoil			
24770	Rosaceae	Prunus avium	sweet cherry	Present in Park	Non-Native	Unknown
24774	Rosaceae	Prunus domestica	European plum	Present in Park	Non-Native	Unknown
24776	Rosaceae	Prunus emarginata	bitter cherry, bittercherry	Present in Park	Native	Unknown
24806	Rosaceae	Prunus virginiana	Virginia chokecherry, chokecherry, chokecherry (common), common chokecherry	Present in Park	Native	Common
529893	Rosaceae	Prunus virginiana var. demissa	western chokecherry	Present in Park	Native	Unknown
529894	Rosaceae	Prunus virginiana var. melanocarpa	black chokecherry, choke cherry	Present in Park	Native	Uncommon
25290	Rosaceae	Purshia tridentata	antelope bitterbrush	Present in Park	Native	Abundant
25295	Rosaceae	Pyrus communis	common pear, pear	Present in Park	Non-Native	Unknown
24828	Rosaceae	Rosa gymnocarpa	dwarf rose	Present in Park	Native	Unknown
24835	Rosaceae	Rosa nutkana	Nootka rose	Present in Park	Native	Common
530117	Rosaceae	Rosa nutkana var. hispida	bristly Nootka rose	Present in Park	Native	Unknown
24847	Rosaceae	Rosa woodsii	Wood's rose, Woods' rose, woods rose	Present in Park	Native	Common
530129	Rosaceae	Rosa woodsii var. ultramontana	Woods' rose	Present in Park	Native	Common
24852	Rosaceae	Rubus discolor	Himalaya blackberry, Himalayan blackberry	Present in Park	Non-Native	Unknown
24853	Rosaceae	Rubus laciniatus	cut-leaved blackberry, cutleaf blackberry	Present in Park	Non-Native	Unknown
24968	Rosaceae	Rubus leucodermis	western rasberry, western raspberry, whitebark raspberry	Present in Park	Native	Unknown
25007	Rosaceae	Rubus parviflorus	thimbleberry, western thimbleberry	Present in Park	Native	Unknown
25331	Rosaceae	Spiraea betulifolia	white spirea	Present in Park	Native	Unknown
25334	Rosaceae	Spiraea douglasii	rose spirea	Present in Park	Native	Unknown
34797	Rubiaceae	Galium aparine	bedstraw, catchweed bedstraw, cleavers, cleaverwort, goose	Present in Park	Native	Unknown

Lake Roosevelt NRA Vascular Plants						
TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
			grass, scarthgrass, sticky-willy, stickywilly, white hedge			
535587	Rubiaceae	Galium aparine var. echinospermum	No data	Present in Park	Native	Unknown
513771	Rubiaceae	Galium asperrimum	No data	Present in Park	Native	Unknown
34828	Rubiaceae	Galium boreale	northern bedstraw	Present in Park	Native	Unknown
34888	Rubiaceae	Galium mexicanum ssp. asperrimum	Mexican bedstraw	Present in Park	Native	Unknown
34905	Rubiaceae	Galium parisiense	wall bedstraw	Present in Park	Non-Native	Unknown
22451	Salicaceae	Populus alba	white poplar	Present in Park	Native	Uncommon
22455	Salicaceae	Populus balsamifera ssp. trichocarpa	balsam poplar, black cottonwood	Present in Park	Native	Uncommon
22475	Salicaceae	Populus tremula ssp. tremuloides	No data	Present in Park	Native	Unknown
195773	Salicaceae	Populus tremuloides	quaking aspen	Present in Park	Native	Common
195774	Salicaceae	Populus tremuloides var. aurea	No data	Present in Park	Native	Uncommon
195735	Salicaceae	Populus trichocarpa	No data	Present in Park	Native	Common
195770	Salicaceae	Populus X berolinensis	poplar	Present in Park	Native	Uncommon
565478	Salicaceae	Salix alba	golden willow, white willow	Present in Park	Non-Native	Rare
22499	Salicaceae	Salix amygdaloides	peach-leaf willow, peachleaf willow	Present in Park	Native	Unknown
22507	Salicaceae	Salix bebbiana	Bebb willow, Bebb's willow, gray willow	Present in Park	Native	Unknown
22514	Salicaceae	Salix candida	sage willow, sageleaf willow	Present in Park	Native	Unknown
22529	Salicaceae	Salix exigua	coyote willow, desert willow, narrowleaf willow, sandbar willow	Present in Park	Native	Unknown
504980	Salicaceae	Salix scouleriana	Scouler willow, Scouler's willow	Present in Park	Native	Unknown
504981	Salicaceae	Salix X sepulcralis	weeping willow	Present in Park	Non-Native	Unknown

Lake Roosevelt NRA Vascular Plants						
TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
24347	Saxifragaceae	Heuchera cylindrica	roundleaf alumroot	Present in Park	Native	Unknown
528404	Saxifragaceae	Heuchera cylindrica var. cylindrica	roundleaf alumroot	Present in Park	Native	Unknown
24361	Saxifragaceae	Heuchera micrantha	crevice alumroot	Present in Park	Native	Unknown
24395	Saxifragaceae	Lithophragma glabrum	bulbous woodland-star, bulbous woodlandstar, smooth woodlandstar	Present in Park	Native	Unknown
24398	Saxifragaceae	Lithophragma parviflorum	smallflower woodland-star, smallflower woodlandstar	Present in Park	Native	Uncommon
24278	Saxifragaceae	Saxifraga integrifolia	wholeleaf saxifrage	Present in Park	Native	Unknown
530252	Saxifragaceae	Saxifraga nidifica var. nidifica	peak saxifrage	Present in Park	Native	Unknown
33500	Scrophulariaceae	Besseya rubra	red besseya, red kittentail	Present in Park	Native	Unknown
33056	Scrophulariaceae	Castilleja cervina	deer Indian paintbrush	Present in Park	Native	Unknown
33063	Scrophulariaceae	Castilleja hispida	harsh Indian paintbrush	Present in Park	Native	Unknown
-502115	Scrophulariaceae	Castilleja hispida var. hispida	No data	Present in Park	Native	Unknown
33075	Scrophulariaceae	Castilleja pallescens	pale Indian paintbrush, pale paintbrush	Present in Park	Native	Unknown
33534	Scrophulariaceae	Collinsia parviflora	blue-eyed Mary, littleflower collinsia, maiden blue eyed Mary, small-flower blue-eyed mary, smallflower blue eyed Mary	Present in Park	Native	Uncommon
33207	Scrophulariaceae	Limosella aquatica	awl-leaf mudwort, awlleaf mudwort, northern mudwort, water mudwort	Present in Park	Native	Unknown
503474	Scrophulariaceae	Linaria dalmatica	Dalmatian toadflax, Dalmation toadflax	Present in Park	Non-Native	Uncommon
33216	Scrophulariaceae	Linaria vulgaris	Jacob's ladder, butter and eggs, butterandeggs, flaxweed, greater butter-and-eggs, ramsted, wild snapdragon, yellow toadflax	Present in Park	Native	Unknown

Lake Roosevelt NRA Vascular Plants						
TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
33311	Scrophulariaceae	Mimulus floribundus	floriferous monkeyflower, manyflowered monkeyflower, purplestem monkeyflower	Present in Park	Native	Unknown
33236	Scrophulariaceae	Mimulus guttatus	common monkeyflower, seep monkeyflower	Present in Park	Native	Unknown
33238	Scrophulariaceae	Mimulus guttatus guttatus	No data	Present in Park	Native	Unknown
33260	Scrophulariaceae	Mimulus lewisii	Lewis monkeyflower, Lewis' monkeyflower, purple monkeyflower	Present in Park	Native	Unknown
33278	Scrophulariaceae	Mimulus washingtonensis	Washington monkeyflower	Present in Park	Native	Unknown
33799	Scrophulariaceae	Penstemon acuminatus	sharpleaf penstemon	Present in Park	Native	Unknown
33856	Scrophulariaceae	Penstemon confertus	yellow penstemon	Present in Park	Native	Unknown
33896	Scrophulariaceae	Penstemon fruticosus	bush penstemon	Present in Park	Native	Unknown
33720	Scrophulariaceae	Penstemon laxus	tufted penstemon	Present in Park	Native	Unknown
33982	Scrophulariaceae	Penstemon pruinosus	Chilean beardtongue	Present in Park	Native	Unknown
34061	Scrophulariaceae	Synthyris pinnatifida	featherleaf kittentails	Present in Park	Native	Unknown
33389	Scrophulariaceae	Verbascum blattaria	moth mullein, white moth mullein	Present in Park	Native	Rare
33394	Scrophulariaceae	Verbascum thapsus	big taper, common mullein, flannel mullein, flannel plant, great mullein, mullein, velvet dock, velvet plant, woolly mullein	Present in Park	Non-Native	Uncommon
33399	Scrophulariaceae	Veronica americana	American speedwell, brooklime	Present in Park	Native	Unknown
503599	Solanaceae	Lycium barbarum	common matrimonyvine, matrimony vine, matrimony-vine, matrimonyvine	Present in Park	Non-Native	Unknown
30571	Solanaceae	Nicotiana attenuata	coyote tabacco, coyote tobacco	Present in Park	Native	Unknown
30414	Solanaceae	Solanum dulcamara	European bittersweet, bitter nightshade, bittersweet nightshade, blue nightshade,	Present in Park	Non-Native	Uncommon

Lake Roosevelt NRA Vascular Plants						
TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
			climbing nightshade, fellenwort, woody nightshade			
505268	Solanaceae	Solanum physalifolium	ground-cherry nightshade, hairy nightshade, hoe nightshade	Present in Park	Native	Unknown
505270	Solanaceae	Solanum ptychanthum	West Indian nightshade, black nightshade, eastern black nightshade, nightshade	Present in Park	Non-Native	Unknown
30461	Solanaceae	Solanum triflorum	cut-leaf nightshade, cutleaf nightshade	Present in Park	Native	Unknown
194884	Taxaceae	Taxus brevifolia	Pacific yew	Present in Park	Native	Unknown
21536	Tiliaceae	Tilia americana	American basswood	Present in Park	Non-Native	Rare
42326	Typhaceae	Typha latifolia	broadleaf cattail, cattail, cattail (common), common cattail	Present in Park	Native	Unknown
510507	Ulmaceae	Celtis douglasii	No data	Present in Park	Native	Unknown
19049	Ulmaceae	Ulmus americana	American elm	Present in Park	Non-Native	Unknown
19152	Urticaceae	Urtica dioica	California nettle, slender nettle, stinging nettle, tall nettle	Present in Park	Native	Rare
541529	Urticaceae	Urtica dioica var. lyallii	No data	Present in Park	Native	Unknown
22032	Violaceae	Viola adunca	blue violet, hook violet, hookedspur violet	Present in Park	Native	Unknown
22033	Violaceae	Viola adunca var. adunca	hook-spur violet, hookedspur violet	Present in Park	Native	Unknown
22120	Violaceae	Viola nuttallii	Nuttall violet, Nuttall's violet, yellow prairie violet	Present in Park	Native	Unknown
22177	Violaceae	Viola trinervata	Rainier violet	Present in Park	Native	Unknown
28602	Vitaceae	Parthenocissus quinquefolia	American ivy, Virginia creeper, fiveleaved ivy, woodbine	Present in Park	Non-Native	Unknown
39068	Zannichelliaceae	Zannichellia palustris	horned pondweed, horned poolmat, horned-pondweed	Present in Park	Native	Unknown
29057	Zygophyllaceae	Tribulus terrestris	Mexican sandbur, Texas sandbur, bullhead, caltrop,	Present in Park	Non-Native	Unknown

Lake Roosevelt NRA Vascular Plants						
TSN	**Family**	**Standard Scientific Name**	**Standard Common Name**	**Park-Status**	**Nativity**	**Abundance**
			goathead, puncture vine, puncturevine			

Appendix F: Photo Interpretation Mapping Conventions and Visual Key

Lake Roosevelt National Recreation Area- Map Units

This appendix describes the map units for the Lake Roosevelt National Recreation Area (LARO) Vegetation Inventory Project. Its purpose is to:

- Describe the vegetation of each map unit;
- Provide a representative ground photograph/image for each map unit;
- Describe the link between each map unit and the revised U.S. National Vegetation Classification System (NVCS);
- Provide visual examples of each map unit with digital overhead images and delineated overlays.

The map units for LARO were based on a combination of NVCS plant associations, local requests (i.e. Park Specials), the limitations of the digital imagery, and land use / land cover classes. The vegetation described in this section reflects the classification designed specifically for this project. Non-vegetated and land-use map units are not described in this key. For more information on the development of the mapping scheme for LARO please reference the mapping sections of this report and the digital information (i.e. lookup tables, metadata) included on the project DVD.

This key follows the physiognomic grouping of each map unit starting with forest and woodland types. Each map unit is fully described by a variety of characteristics and features. First the NVCS crosswalk (if applicable) to associations and the common plant species for each association is presented. Next is a description of the mapping concept and a representative ground photograph. A map of the distribution for each mapping unit across the study area follows along with an example of the 2009 National Agriculture Imagery Program (NAIP) digital basemap ortho-imagery (true-color format). The imagery snapshot examples also include representative polygon outlines that highlight the map unit signatures. Many of the map unit descriptions rely heavily on the vegetation plot data collected in 2008. The sample ground photographs were taken during the 2008 plot data collection or during the 2009 accuracy assessment by Northwest Management staff.

Forests and Woodlands

Map Code	***Pseudotsuga menziesii* / Mixed Shrub Forest Complex**
PSME	**Douglas-fir Forest / Mixed Shrub Forest Complex**

Representative Ground Photo



Common Species

Pseudotsuga menziesii, Pinus ponderosa, Symphoricarpos albus, Acer glabrum, Physocarpus malvaceus, Mahonia repens, Mahonia aquifolium, Purshia tridentata

NVCS Associations

- *Pseudotsuga menziesii / Symphoricarpos albus* Woodland
-*Pseudotsuga menziesii / Acer glabrum* Forest
-*Pseudotsuga menziesii / Physocarpus malvaceus* Forest

Description

Douglas-fir with mixed shrub understory was a very common map unit in the northern portion of LARO and in higher elevations within the environs. This map unit was characterized by mesic conditions, typically north-facing slopes or drainage bottoms, supporting moderate to thick stands of Douglas fir trees. Dense stands of this type supported low understory diversity whereas moderate to sparse overstories contained a mix of deciduous shrubs with varying species composition. The Douglas fir trees expressed a dark green, coarse-pebbly photo signature on the true color imagery. Open stands supported high understory cover with a resulting photo signature of dark green trees against a bright green (shrub) background color. Stands of this type may have been confused with the other Douglas fir map units or with the ponderosa pine closed canopy map unit when the two conifer tree species intermixed.

Range and Distribution

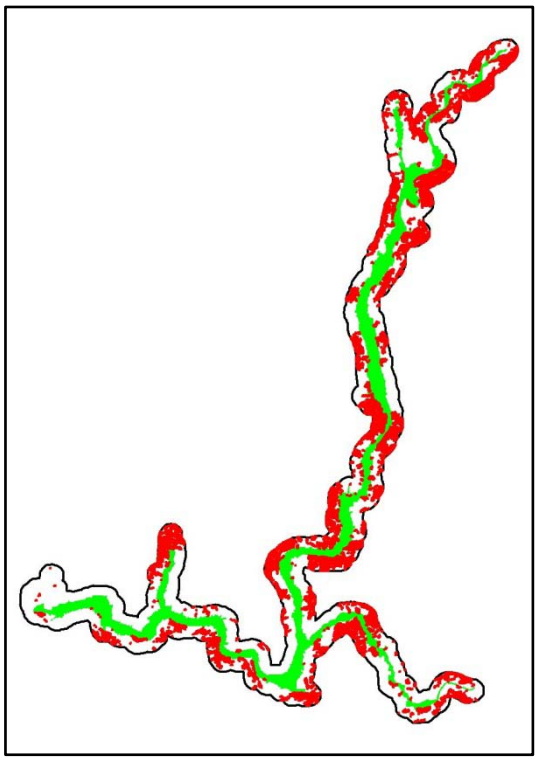
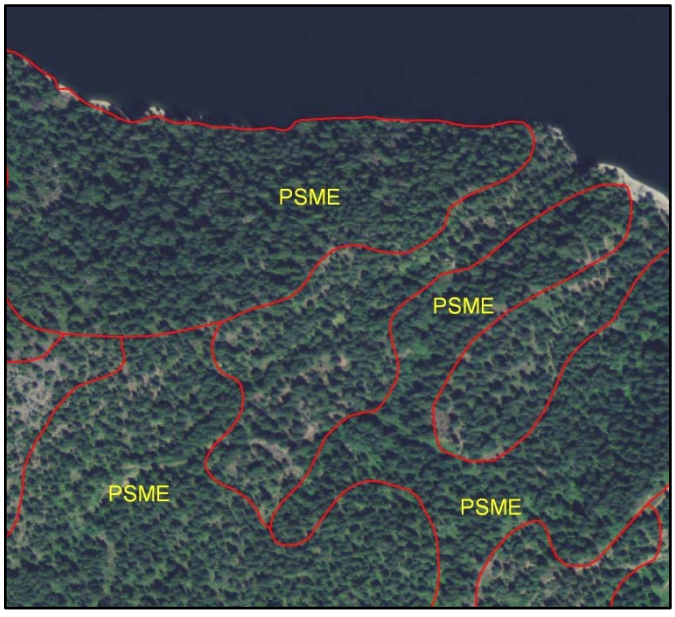


Photo Signature Example



Map Code ***Pseudotsuga menziesii* / *Philadelphus lewisii* Talus Sparse Wooded**
PSME/SPRS **Douglas-fir Forest / Lewis' mock orange Talus Sparse Wooded**

Common Species

Pseudotsuga menziesii, Pinus ponderosa, Philadelphus lewisii,

Representative Ground Photo



NVCS Association

- Pseudotsuga menziesii / Philadelphus lewisii Talus Sparse Wooded Vegetation

Description

Douglas-fir with Lewis' mock orange was a rare type occurring on talus and rocky slopes. This map unit usually had a moderate density of conifer types as compared to the Talus Sparse Vegetation map unit that was primarily sparse or devoid of trees. Stands of this type supported low understory diversity due to the high cover of bare rock. This map unit was expressed as a dark green, coarse and pebbly photo signature, with apparent individual trees against a grey (rock) or black (basalt) background color. The Douglas-fir / Lewis' mock orange map unit may have been confused with the other Douglas fir types or with the ponderosa pine sparse understory woodland stand map unit.

Range and Distribution

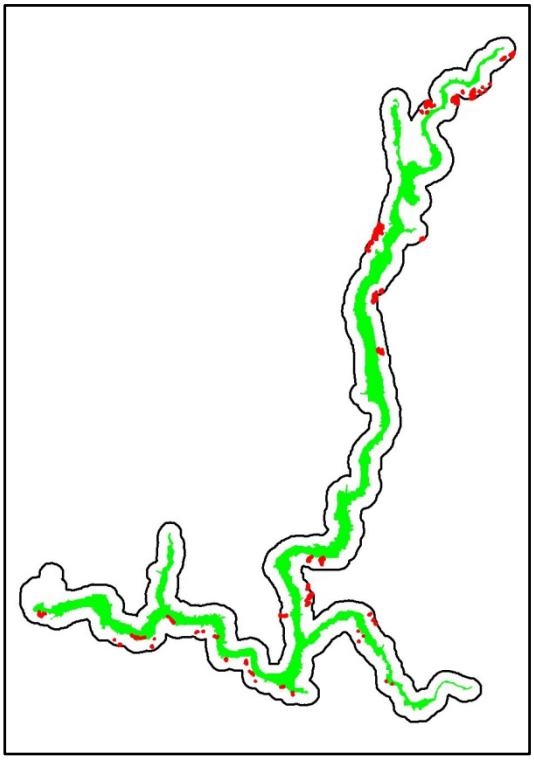
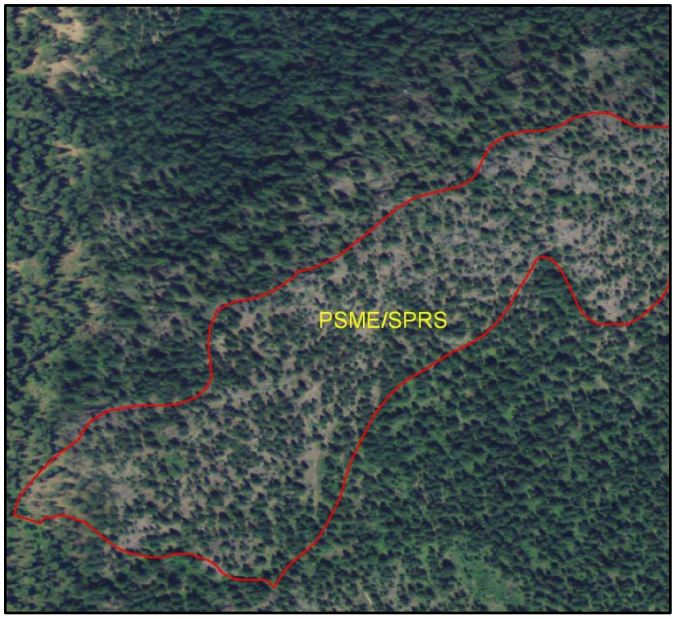


Photo Signature Example



Map Code ***Pseudotsuga menziesii / Pseudoroegneria spicata*** **Woodland**
PSME/PSSP Douglas-fir / Bluebunch wheatgrass Woodland

Common Species

Pseudotsuga menziesii, Pinus ponderosa, Pseudoroegneria spicata, Chrysothamnus viscidiflorus,

Representative Ground Photo



NVCS Association

- *Pseudotsuga menziesii / Pseudoroegneria spicata* Woodland

Description

The Douglas-fir bluebunch wheatgrass type was a common map unit used to delineate polygons that contained Douglas fir trees with a graminoid understory. Depending upon location, polygons of this type could also include other dominate native grasses or sedges (such as needle and thread or Idaho fescue) in the understory. Stands of this map unit usually occurred on moderate hillslopes and flats adjacent to the reservoir. The Douglas fir trees were expressed as a dark green, sparse-pebbly photo signature against a light tan or brown background. Stands of this type may have been confused with the Douglas fir map units or with the ponderosa pine mixed herbaceous complex map unit when the two species of conifer trees intermixed.

Range and Distribution

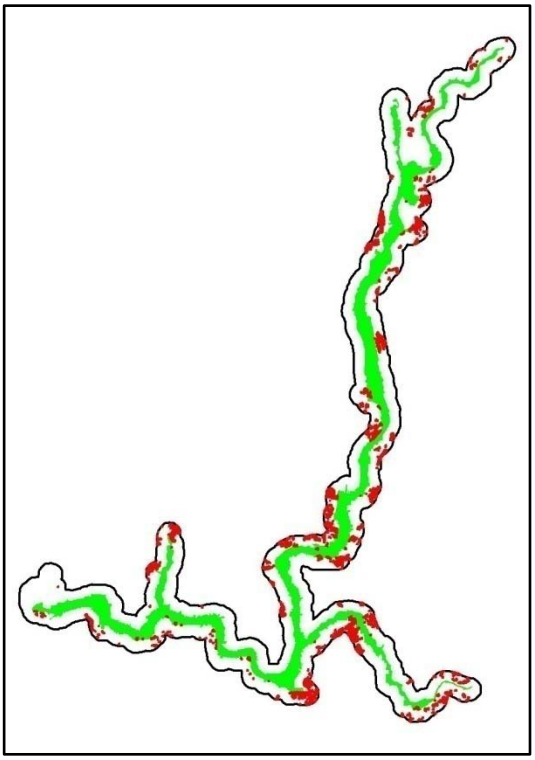
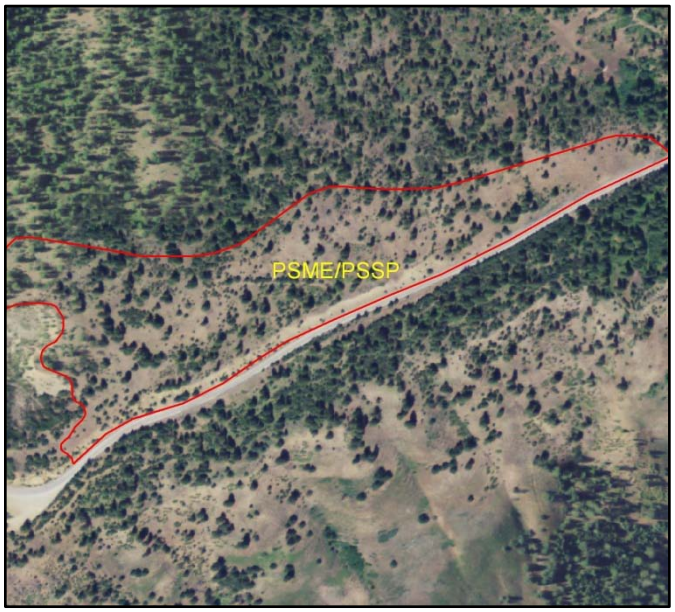


Photo Signature Example



Map Code	***Pinus ponderosa* Closed Canopy Forest Complex**
PIPO	**Ponderosa Pine Closed Canopy Forest Complex**

Common Species

Pinus ponderosa, Mahonia aquifolium, Poa secunda, Mahonia repens

NVCS Association

- *Pinus ponderosa / Mahonia aquifolium* Woodland
-*Pinus ponderosa / Mahonia repens* Woodland
-*Pinus ponderosa / Symphoricarpos albus* Forest

Representative Ground Photo



Description

Ponderosa pine trees were common throughout LARO occurring predominately in the north and southeast. When ponderosa pine trees formed dense stands (> 60% cover), this map unit was used for delineation and attribution. Stands of this type usually occurred on mesic sites such as drainageways or on north-facing slopes. In these habitats the ponderosa pine trees appeared as a solid, dark green, coarse-pebbly photo signature. Understory diversity was usually low (if any) consisting of primarily short deciduous shrubs. Other conifers, especially Douglas-fir may have been confused with this type during the mapping.

Range and Distribution

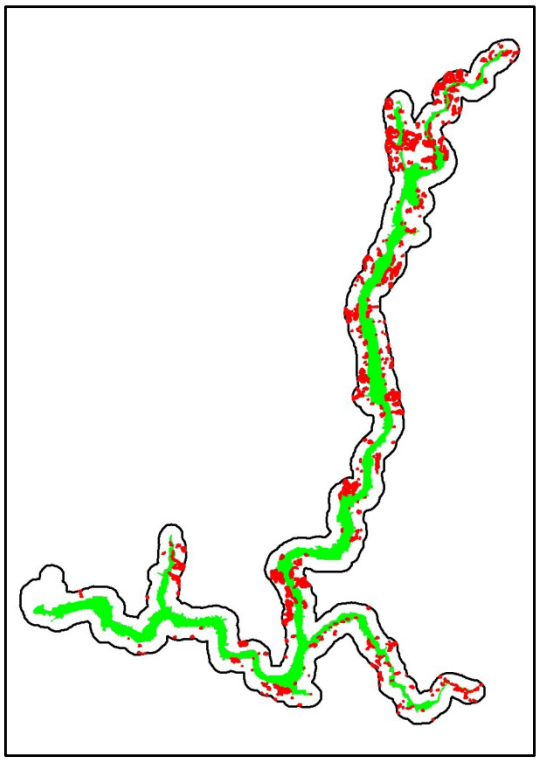
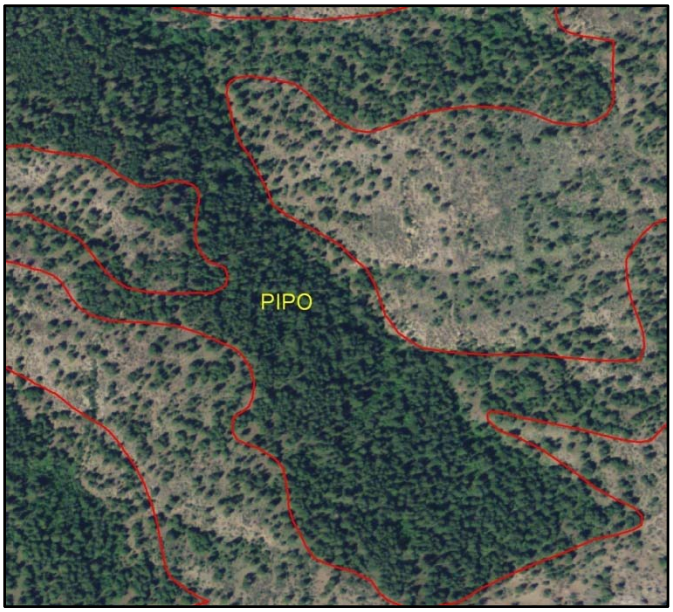


Photo Signature Example



Map Unit ***Pinus ponderosa / Purshia tridentata*** **Woodland**
PIPO/PUTR **Ponderosa Pine / Antelope Bitterbrush Woodland**

Common Species

Pinus ponderosa, Purshia tridentata, Pseudotsuga menziesii, Artemisia tridentata, Pseudoroegneria spicata

NVCS Association

- *Pinus ponderosa / Purshia tridentata* Woodland

Representative Ground Photo



Description

This mapping unit was used to define large areas in the center of the project area that supported sparse to moderate cover of ponderosa pine trees with a shrub understory dominated by antelope bitterbrush. Bitterbrush understory density tended to vary depending moisture levels and other shrub species such big sagebrush and rubber rabbitbrush may be locally abundant. The photo signature was similar to the other ponderosa pine map units (dark green trees) but the bitterbrush shrubs stood out as small dark gray splotches. When the bitterbrush was sparse this type may have been confused with the ponderosa pine mixed herbaceous map unit.

Range and Distribution

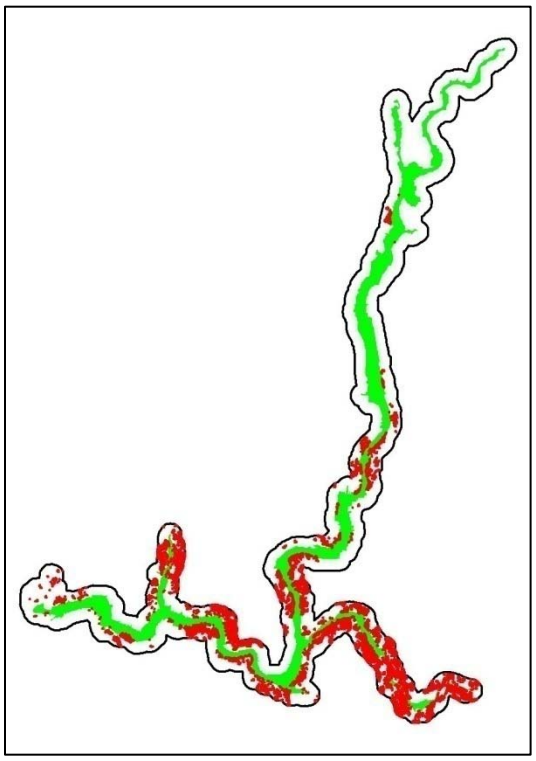


Photo Signature Example



Map Code	***Pinus ponderosa* Sparse Understory Woodland Stand**
PIPO/SPRS	**Pinus ponderosa Sparse Understory Woodland Stand**

Common Species

NVCS Association
-[No Association – Park Special]

Representative Ground Photo



Description

Sparse ponderosa pine with no dominate understory species was created as a park special map unit to describe ponderosa pine growing on bare rock and talus. Polygons of this type were mostly sparse and the trees widely spaced with either rock/talus or needles/duff occurring in the canopy openings. This type was expressed on the imagery as dark colored trees (raised green dots) on a gray (rock/talus) or tan (duff) background. Other conifers, including Douglas-fir and Rocky Mountain juniper may have been confused with this type during the mapping.

Range and Distribution

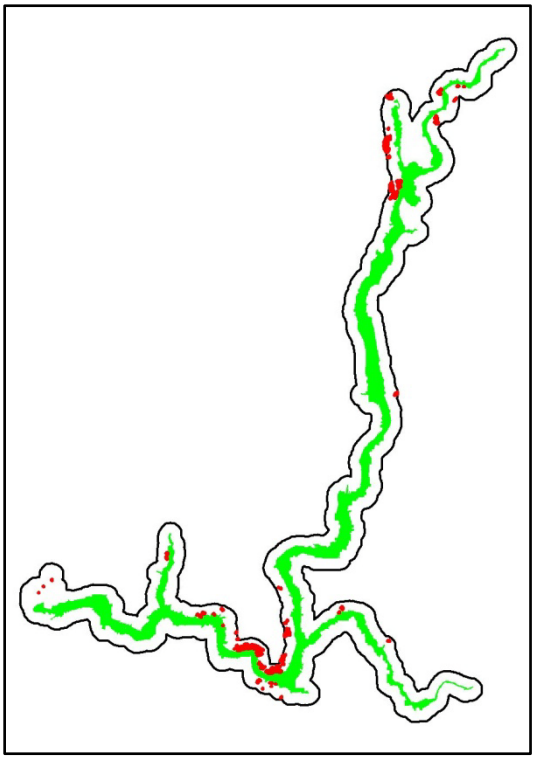
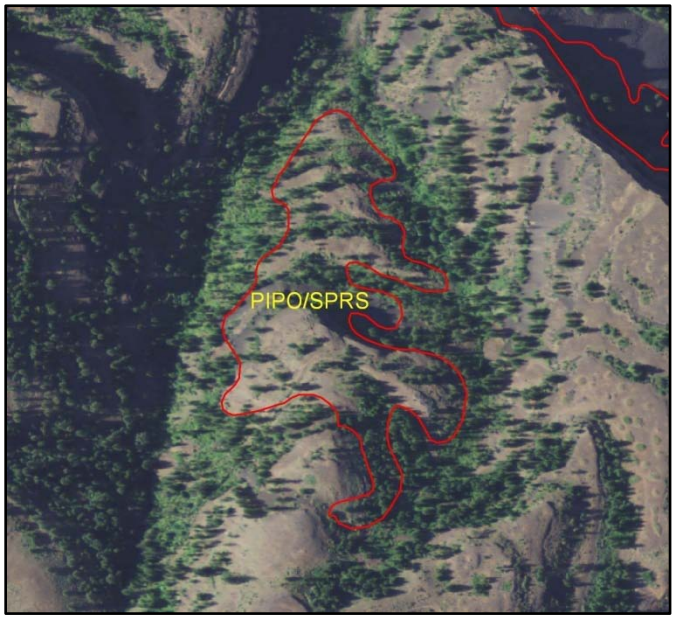


Photo Signature Example



Map Unit ***Pinus ponderosa*** **Mixed Herbaceous Woodland Complex**
PIPO/HERB **Ponderosa pine Mixed Herbaceous Woodland Complex**

Common Species

Pinus ponderosa, Festuca idahoensis, Hesperostipa comata, Pseudoroegneria spicata, Festuca ovina, Poa pratensis, Elymus repens, Bromus tectorum

Representative Ground Photo



NVCS Associations

- *Pinus ponderosa / Festuca idahoensis* Woodland
-*Pinus ponderosa / Hesperostipa comata* Woodland
-*Pinus ponderosa / Pseudoroegneria spicata* Woodland

Description

Ponderosa pine with a mixed herbaceous understoryoccured throughout the project area on broad benches, hillsides or flats. Polygons representing this unit were mostly sparse and the trees widely spaced. Understory species tended to vary depending on moisture levels, disturbance and locations. Some of the more dominant understory grasses included bluebunch wheatgrass, needle and thread and Idaho fescue. On the ortho-imagery this signature appeared as raised, dark green spots (pine trees) interspersed with tan or brown splotches (grasses) in the canopy openings. The other conifer map units may have been confused with this type during the mapping, especially the Douglas fir bluebunch wheatgrass type.

Range and Distribution

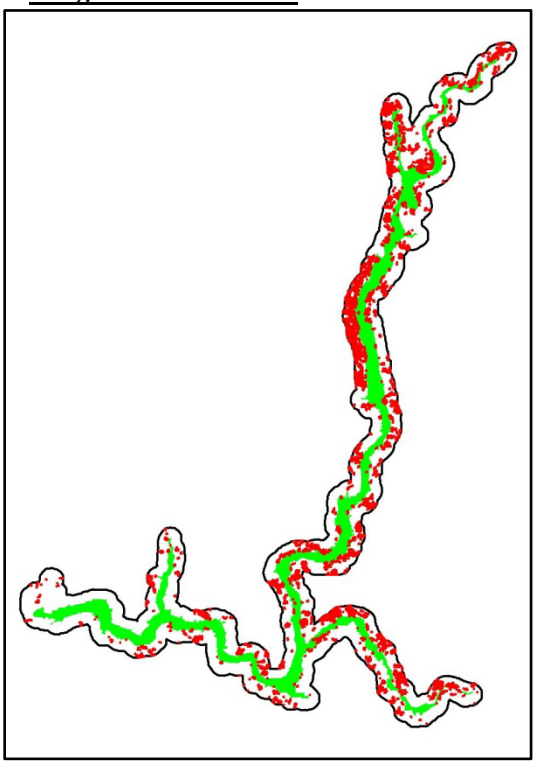


Photo Signature Example



Map Unit ***Pinus ponderosa / Bromus tectorum*** **Woodland**
PIPO/BRTE **Ponderosa pine / Cheatgrass Woodland**

Common Species

Pinus ponderosa, Bromus tectorum, Philadelphus lewisii, Symphoricarpos albus, Bromus spp.

NVCS Association

- *Pinus ponderosa / Bromus tectorum* Woodland

Representative Ground Photo



Description

Ponderosa pine with cheatgrass was a common woodland type found in disturbed areas in and around LARO. This type was characterized by sparse to moderate density of ponderosa pine trees with a weedy understory. Cheatgrass was usually the dominant understory species but other non-native grasses and forbs were locally abundant. Ponderosa pine trees were fairly obvious as rounded, dark green spots on the true color NAIP imagery and the associated cheatgrass was usually apparent as bright orange-brown background color. The amount of cheatgrass in the understory varied considerably allowing for some confusion in the mapping of this type versus the ponderosa pine mixed herbaceous (native grass) map unit.

Range and Distribution

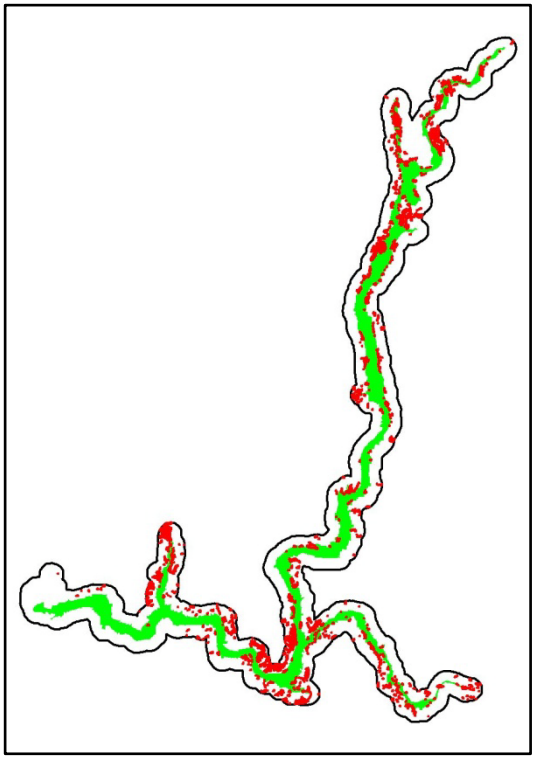
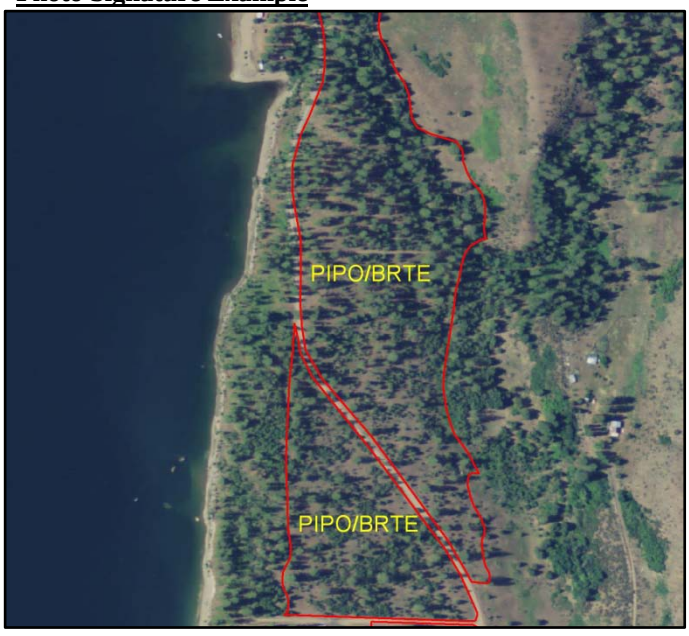


Photo Signature Example



Map Unit ***Pinus ponderosa*** **/ Mixed Shrub Woodland Complex**
PIPO/MX **Ponderosa pine / Mixed Shrub Woodland Complex**

Common Species

Pinus ponderosa, Pseudotsuga menziesii, Shepherdia canadensis, Symphoricarpos albus, Amelanchier alnifolia, Crataegus douglasii, Festuca idahoensis, Balsamorhiza sagittata

NVCS Associations

- *Pinus ponderosa / Shepherdia canadensis* Woodland
-*Pinus ponderosa / Symphoricarpos albus* Forest
-*Pinus ponderosa / Amelanchier alnifolia* Woodland
-*Pinus ponderosa / Crataegus douglasii* Woodland

Representative Ground Photo



Description

Ponderosa pine growing with a mixture of deciduouis shrubs was common throughout LARO. Polygons of this type were usually moderate to dense in cover occurring on hillslopes and benches. Taller shrubs were common in the understory varying in composition and density by location. Common snowberry, serviceberry, and black hawthorn were some of the most prevalent understory species. This map unit differed from the ponderosa pine closed canopy forest complex in that the understory shrub component was evident on the imagery as a bright green background color. The ponderosa pine trees appeared as a solid, dark green, coarse-pebbly photo signature. Other conifers, especially Douglas-fir may have been confused with this type during the mapping.

Range and Distribution

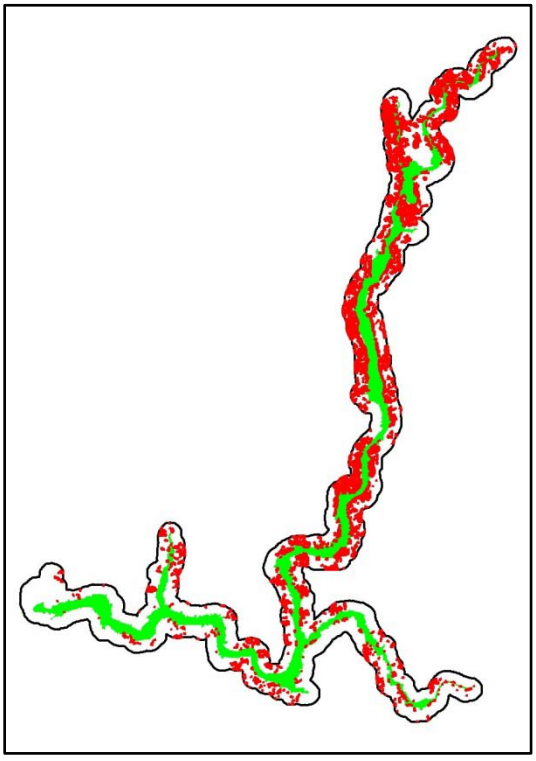
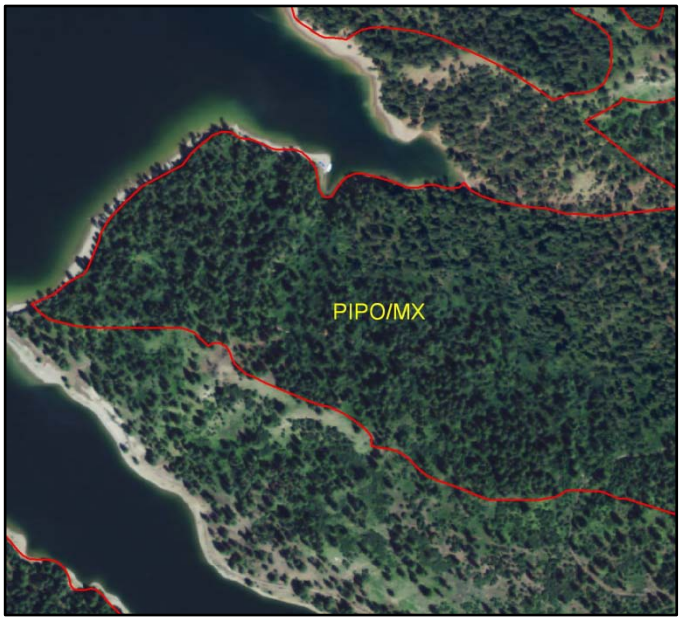


Photo Signature Example



Map Unit ***Juniperus scopulorum*** **Woodland**
JUSC **Rocky Mountain Juniper Woodland**

Common Species

Juniperus scopulorum, Rhus glabra, Pinus ponderosa, Mahonia aquifolium, Bromus tectorum, Poa bulbosa

Representative Ground Photo



NVCS Association

- *Juniperus scopulorum* Woodland

Description

Stands of rocky mountain juniper that were large enough to map were rare at LARO, only occuring in the project environs . When they did occur this type was characterized by having sparse, low growing junipers associated with grasses and short shrubs. Common species include sumac, barberry and a mix of non-native grasses such as cheatgrass. The juniper trees appeared on the true color imagery as raised, dark green spots with a tan or brown background color (grasses). Juniper trees had a similar appearance to young ponderosa pine trees and some confusion may have occurred between these two during the mapping.

Range and Distribution

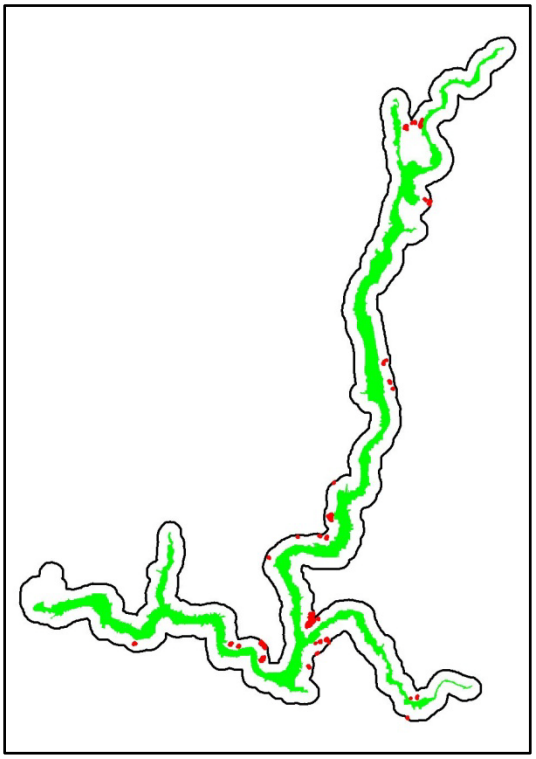
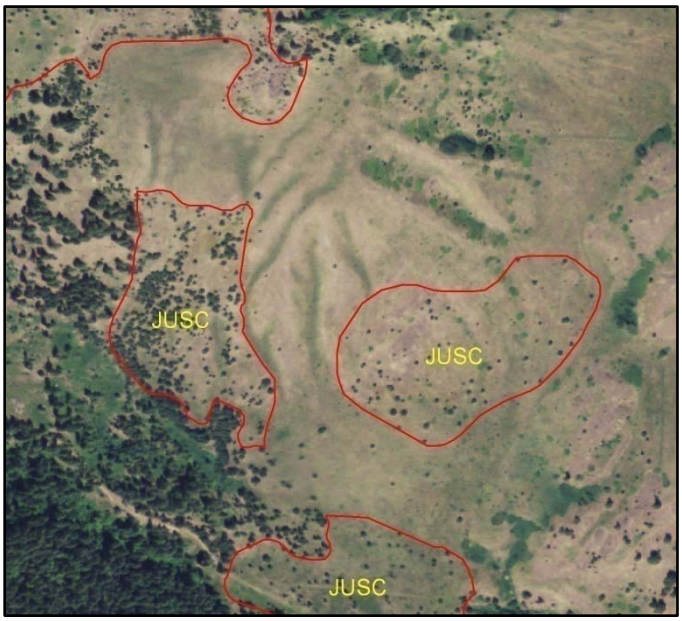


Photo Signature Example



Map Unit	***Populus balsamifera ssp. trichocarpa* Temporarily Flooded Forest Alliance**
POBA	**Black Cottonwood Temporarily Flooded Forest Alliance**

Common Species

Populus balsamifera ssp. *trichocarpa*, *Pseudotsuga menziesii, Salix exigua, Artemisia tridentata, Prunus virginiana, Symphoricarpos albus, Purshia tridentata,*

Representative Ground Photo



NVCS Associations

- *Populus balsamifera ssp. trichocarpa / Symphoricarpos albus* Woodland
-*Populus balsamifera* ssp. *trichocarpa /* Mixed Herbs Forest
-*Populus balsamifera* ssp. *trichocarpa / Salix exigua* Forest

Description

Black cottonwood woodlands and forests were small in size but fairly common in the mapping area occurring along the shoreline, in drainages, and in planted or landscaped settings. The mapping signature for this class includes large cottonwood trees appearing as light green spots and a tan background. Understory composition varied by location with willow and rose common in mesic settings and sagebrush, mixed grasses and bitterbrush more common in dry areas. In some drainages Douglas fir was common component of the canopy and some confusion may have occurred between these types and the other deciduous woodland map units. This map unit was also used to attribute larger more mature trees located in and around the agricultural lands and developed urban areas. In these areas the individual black cottonwood trees appeared as large green spots and the understory signature was typically lacking. It is likely that in these settings this map unit may have also inadvertently been used to delineate other planted deciduous trees.

Range and Distribution

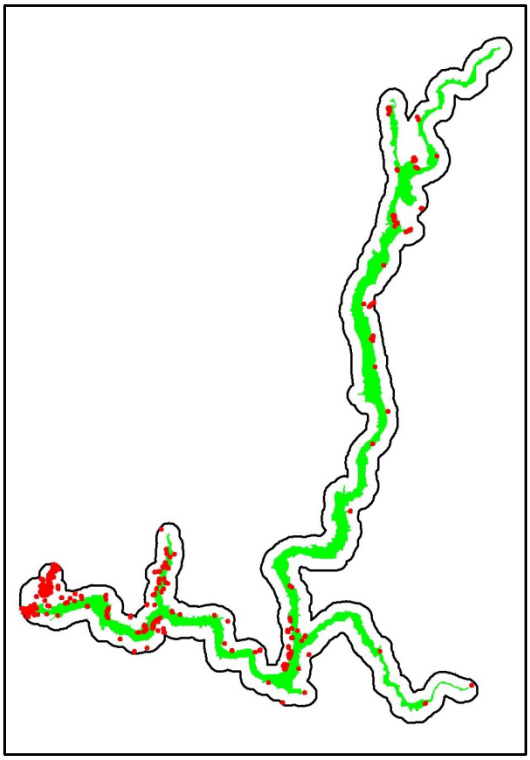


Photo Signature Example



Map Unit ***Populus tremuloides*** **/ Symphoricarpos albus Forest**
POTR **Quaking Aspen / Common Snowberry Forest**

Common Species

Populus tremuloides, Symphoricarpos albus, Prunus virginiana, Betula occidentalis, Crataegus douglasii, Corylus cornuta, Elymus glaucus

NVCS Association

- *Populus tremuloides / Symphoricarpos albus* Forest

Representative Ground Photo



Description

Aspen trees occurred at higher elevations throughout the LARO project area and were prevalent in the northern environs. In these locations, aspens tended to grow on mesic slopes, valley bottoms and drainage ways. Polygons representing this map unit exhibited the characteristic dark green color, with white specks (tree limbs and trunks) of quaking aspen in the overstory. The presence of dense deciduous shrubs in the understory filled in the canopy openings with a diagnostic coarse bright green color. The similar texture and color of quaking aspen trees to birch and the other deciduous map units may have resulted in some misclassification and the larger polygons of this type may also have inclusions of tall shrub stands like alder, birch and chokecherry.

Range and Distribution

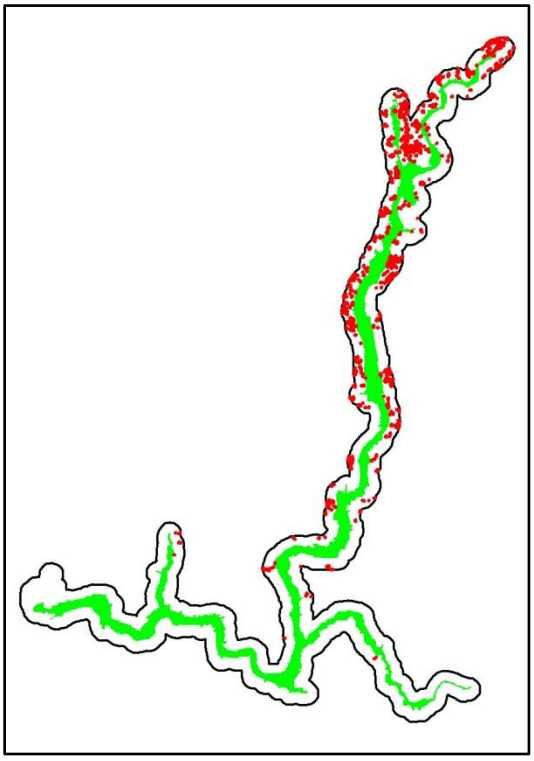


Photo Signature Example



Map Unit ***Acer platanoides*** **Planted Woodland**
ACPL **Norway Maple Planted Woodland**

Common Species

Acer platanoides, Pseudotsuga menziesii, Poa pratensis, Elymus repens

NVCS Association

- *Acer platanoides* Planted Woodland

Representative Ground Photo



Description

Deciduous trees at LARO were rare and an emphasis was placed on trying to map individual stands with various dominates such as Norway maple. For this map class, mapping was based primarily on where it was known to occur and where it was obvious that the maple trees were planted (i.e. rows, fields, etc…). On the imagery, maple trees had a dark green smooth signature with some grass and short shrubs evident in the understory. It is likely that some confusion exists in the mapping between this type and the black cottonwood and mixed planted woodland map units.

Range and Distribution

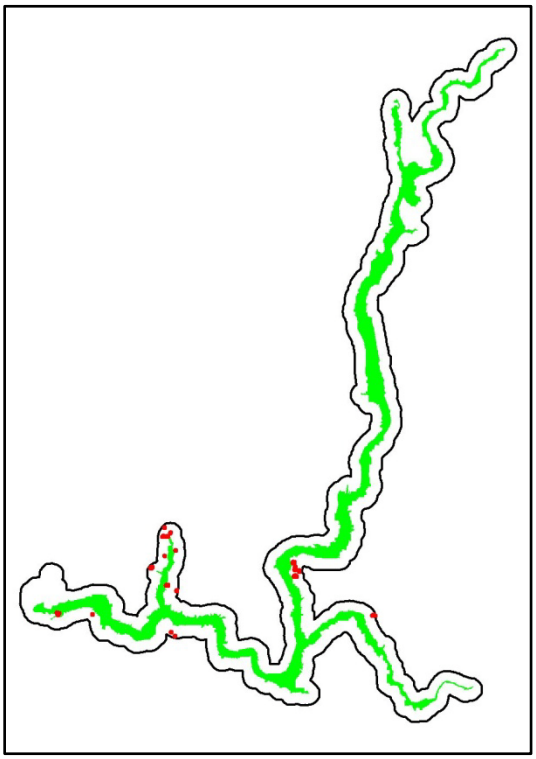


Photo Signature Example



Map Unit ***Betula papyrifera*** **Forest Alliance**
BEPA **Paper Birch Forest Alliance**

Common Species

Betula papyrifera, Artemisia tridentata, Crataegus douglasii, Cornus stolonifera Bromus tectorum, Poa pratensis, Smilacina racemosa, Phalaris arundinacea

NVCS Alliance

- *Betula papyrifera* Forest Alliance

Representative Ground Photo



Description

Paper birch trees were fairly rare in the project area occurring primarily in drainages, riparian corridors and other mesic locations. Due to the high moisture levels common to these sites the understory of this type was usually lush consisting of deciduous shrubs such as hawthorn and dogwood. Birch trees had a similar appearance to cottonwood and aspen trees and some confusion likely occurred between these map units. The combination of deciduous trees and shrubs presented itself as a bright green, coarse signature on the ortho-imagery.

Range and Distribution

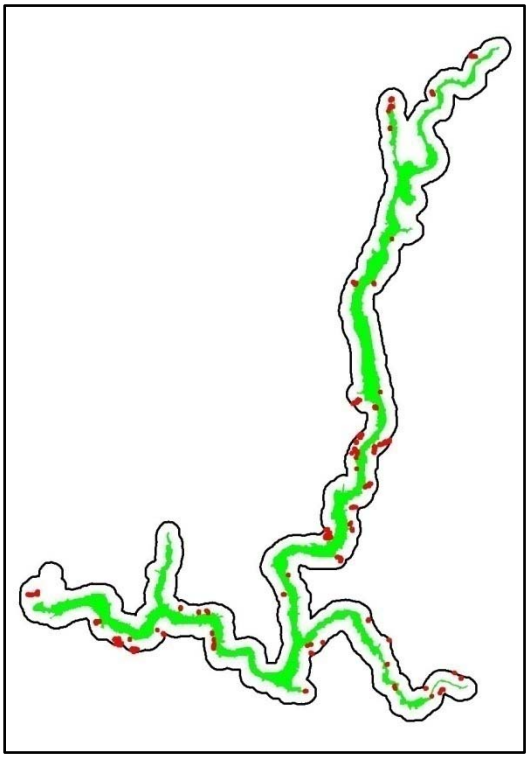
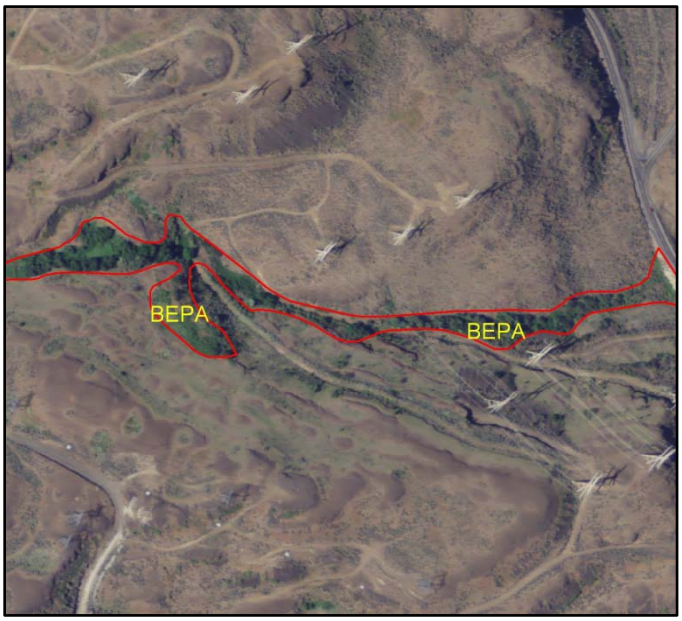


Photo Signature Example



Map Unit MXWD — Mixed Planted and Semi-natural Woodland Complex

Common Species

Ulmus Americana, Robinia pseudoacacia, Pinus ponderosa, Bromus tectorum, Amelanchier alnifolia, Symphoricarpos albus, Agropyron spicatum

NVCS Associations

- *Ulmus americana / Bromus tectorum* Semi-natural Woodland
-*Robinia pseudoacacia* Semi-natural Forest

Representative Ground Photo



Description

Planted and escaped deciduous trees were found throughout the LARO project area in and around urban and developed areas. In these settings the deciduous trees were mapped from known locations and by their obvious photo signature consisting of a smooth, bright green color that differed from the native deciduous trees. Since the composition of the dominate species varied by location this map unit was used as a catch-all in an effort to provide more detail. Common species included elm, black locust, and other non-sampled and undocumented species. It is likely that some confusion exists in the mapping between this type and the black cottonwood and Norway maple woodland map units. More ground-truthing would greatly improve the accuracy and distribution of this type.

Range and Distribution

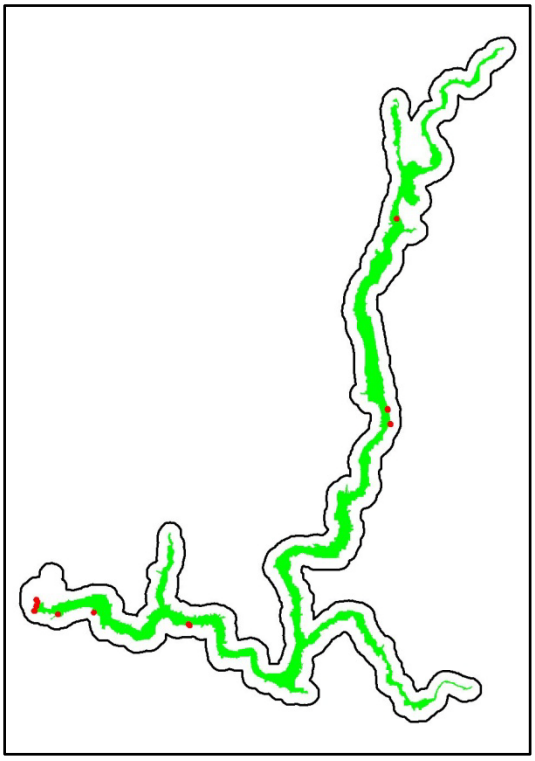


Photo Signature Example



Shrublands

Map Unit	***Artemisia tridentata* Shrub Herbaceous Alliance**
ARTR	**Basin Big Sagebrush Shrub Herbaceous Alliance**

Common Species

Artemisia tridentata ssp. *tridentata*, *Artemisia tridentata ssp. wyomingensis*, *Artemisia tripartita*, *Purshia tridentata*, *Tetradymia canescens*, *Chrysothamnus viscidiflorus*, *Pseudoroegneria spicata*, *Leymus cinereus*, *Festuca idahoensis*, *Bromus tectorum*

NVCS Associations

-*Artemisia tridentata / Festuca idahoensis* Shrub Herbaceous Vegetation
-*Artemisia tridentata / Leymus cinereus* Shrub Herbaceous Vegetation

Representative Ground Photo



Description

Basin big sagebrush has a scattered distribution on deep floodplain soils in primarily the southern portions of the project area. In these locations, basin big sagebrush often intermixed with Wyoming big sagebrush and three-tip sagebrush and the possible hybridization between these species may have resulted in some confusion in interpretation, delineation, and plant identification. This map unit appeared to have robust shrubs yielding a very characteristic mottled or broken signature. This signature often included patches of brown representing grass-dominated patches and green specks indicating scattered trees and deciduous shrubs. This type often contained cheatgrass in the understory along with similar species found in the other sagebrush map units.

Range and Distribution

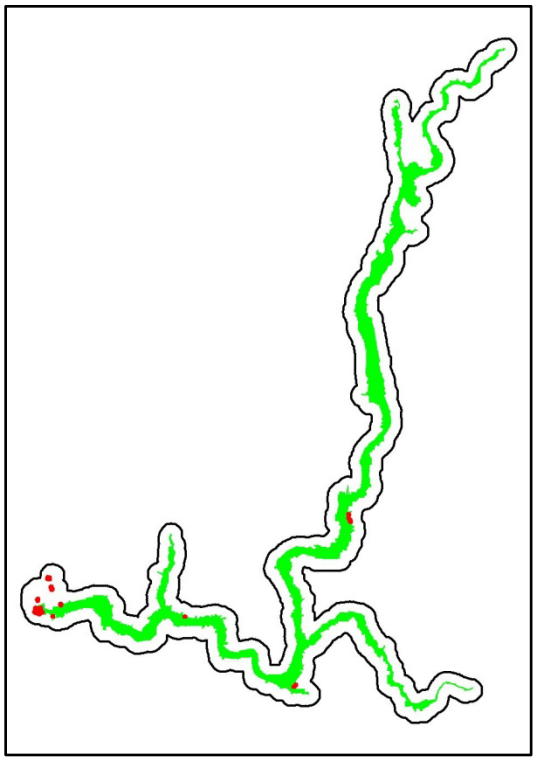
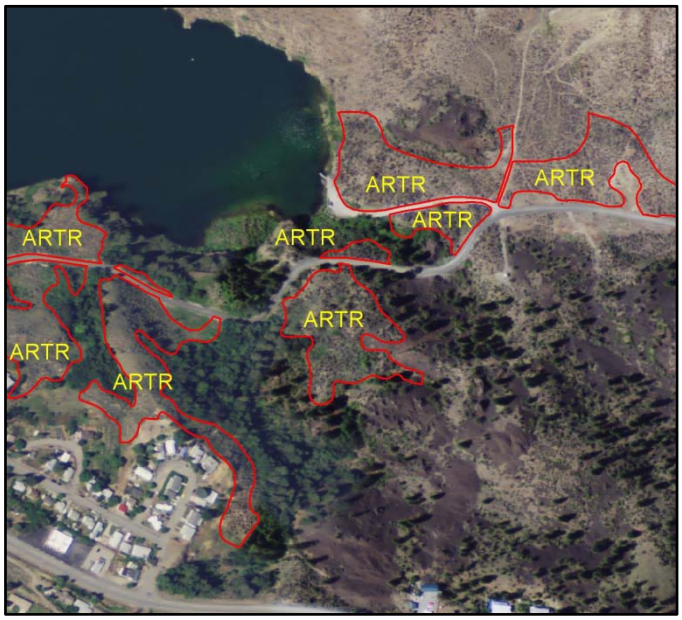


Photo Signature Example



Map Unit ***Artemisia tridentata / Bromus tectorum*** **Semi-natural Shrubland**
ARTR/BRTE **Big Sagebrush / Cheatgrass Semi-natural Shrubland**

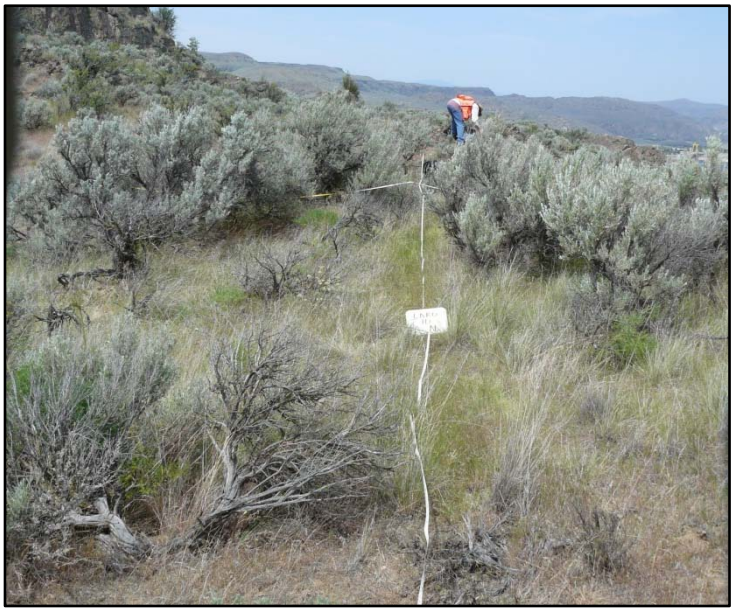
Common Species

Artemisia tridentata ssp. *tridentata*, *Artemisia tridentata ssp. wyomingensis*, *Artemisia tripartita*, *Purshia tridentata* *Bromus tectorum*, *Poa bulbosa*, *Pseudoroegneria spicata*

NVCS Association

- *Artemisia tridentata / Bromus tectorum* Semi-natural Shrubland

Representative Ground Photo



Description

Big sagebrush with a cheatgrass understory was widely scattered throughout the southern portion of the project area, occurring on benches, flats and on deep soils in the upland environs. The high cover of cheatgrass in the understory distinguished it from the other big sagebrush map units. On some sites, the basin big sagebrush appeared nearly dead due to fire, drought, or insect infestations. On the ortho-imagery this map unit typically supported shrubs that appeared larger than the other common sagebrush species (i.e. bigger grey dots) however the cheatgrass background color was very similar to the other cheatgrass map units (orange-brown). Since this map unit included many of the same understory species as the other sagebrush map units, some confusion likely occurred during interpretation and delineation.

Range and Distribution

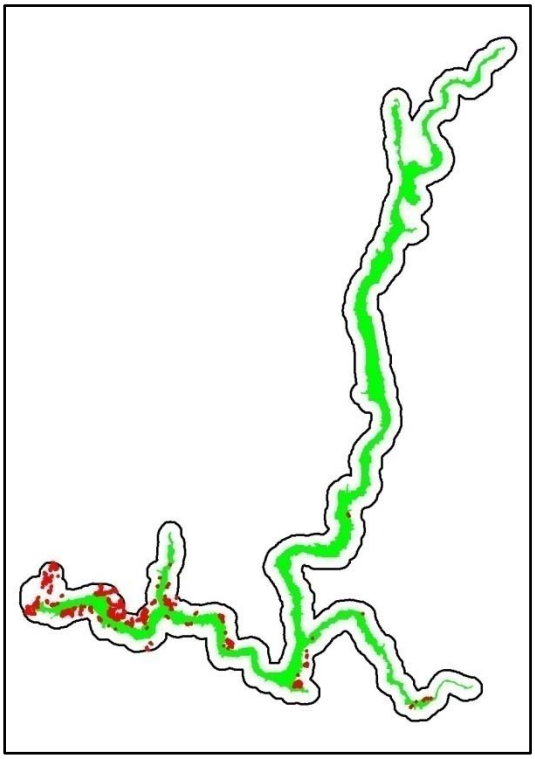


Photo Signature Example



Map Unit ***Artemisia tridentata ssp. wyomingensis*** **Shrubland Alliance**
ARTRW **Wyoming Big Sagebrush Shrubland Alliance**

Common Species

Artemisia tridentata ssp. *wyomingensis, Purshia tridentata, Hesperostipa comata, Bromus tectorum, Pseudoroegneria spicata*

Representative Ground Photo



NVCS Associations

- *Artemisia tridentata ssp. wyomingensis / Hesperostipa comata* Shrubland
-*Artemisia tridentata ssp. wyomingensis / Pseudoroegneria spicata* Shrubland

Description

Wyoming big sagebrush was very common across the upland plains, slopes, and terraces in the southern portion of the project area. Native grasses, varying in composition and density were common in the understory. On the NAIP imagery this map unit varied in appearance from dispersed medium-sized gray dots against a white or gray background to a homogenous gray mottled texture on a light tan background. Due to its similarity in size, shape, and color to bitterbrush and the other sagebrush species this map unit may have been confused with these types during delineation.

Range and Distribution

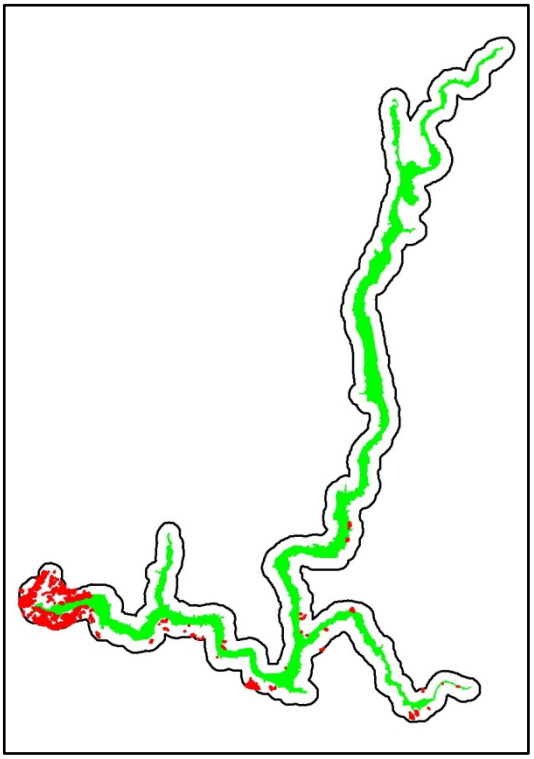
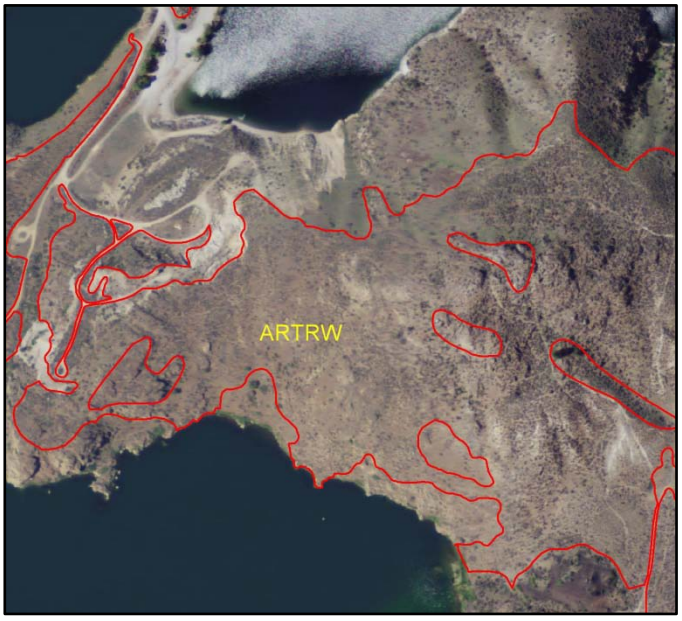
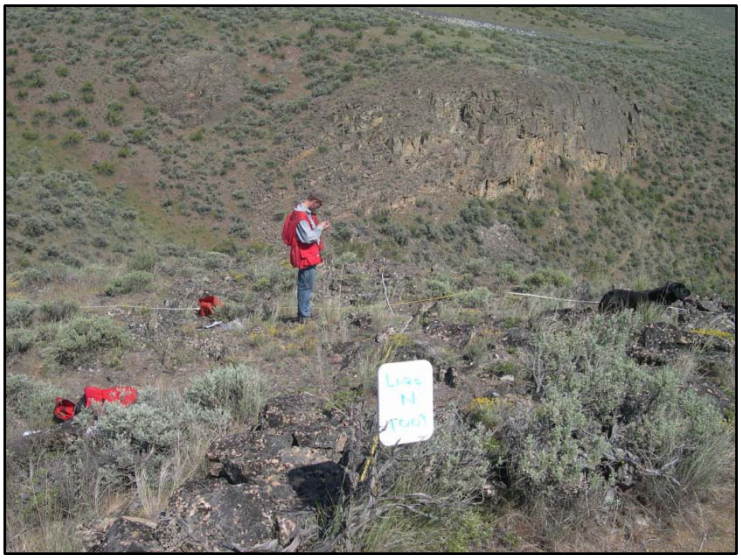


Photo Signature Example



Map Unit ***Artemisia tripartita ssp. tripartita / Poa secunda*** **Shrubland**
ARTRIP **Threetip Sagebrush / Sandberg Bluegrass Shrubland**

Representative Ground Photo



Common Species

Artemisia tripartita ssp. *tripartita*, *Poa secunda*, *Festuca idahoensis*, *Pseudoroegneria spicata*

NVCS Association

- *Artemisia tripartita ssp. tripartita / Poa secunda* Shrubland

Description

Threetip sagebrush with a native grass understory was a common map unit occurring on upland slopes, benches, and terraces primarily in southwestern corner of the project area. Threetip sagebrush also occurred as sparse pockets on some of the rocky slopes. Although cheatgrass was usually present, it did not dominate the understory instead native bunch grasses and dwarf shrubs were common. On the ortho-imagery this type varied in appearance from dispersed small grey dots against a brown or tan background (sparse situations) to a more homogenous grey mottled texture (dense stands). Due to the similarity in color and intermixing with other sagebrush species this type may have been confused with these map units during the mapping.

Range and Distribution

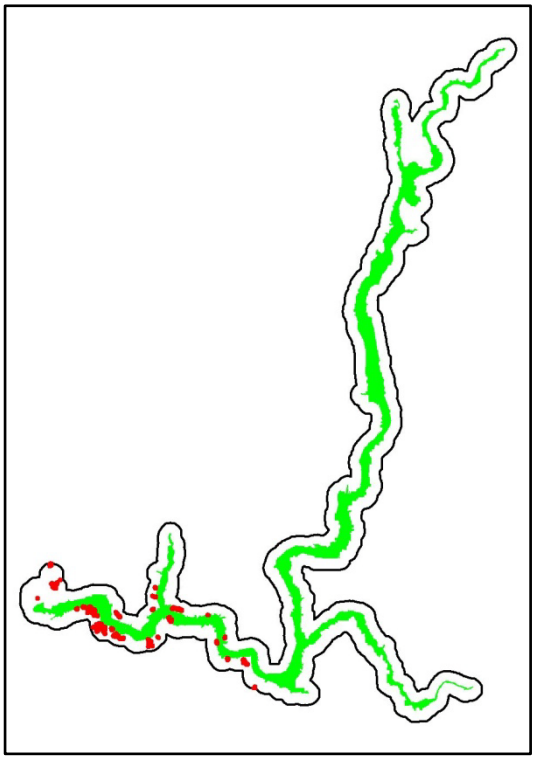
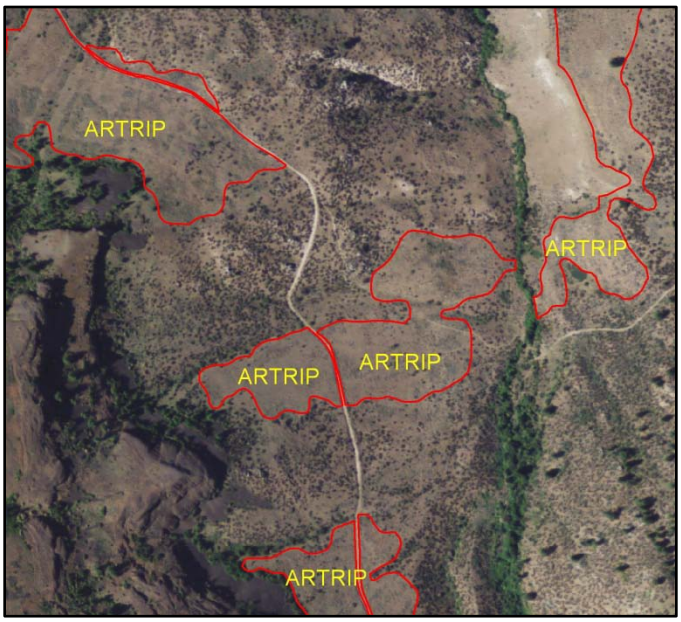


Photo Signature Example



Map Unit ***Ericameria (Chrysothamnus)*** **spp. Shrubland Complex**
ERNA **Rabbitbrush Shrubland Complex**

Common Species

Ericameria nauseosa, Chrysothamnus viscidiflorus, Bromus tectorum, Hesperostipa comata, Artemisia tridentata ssp. *wyomingensis, Pseudoroegneria spicata, Poa secunda*

Representative Ground Photo



NVCS Associations

- *Chrysothamnus viscidiflorus / Bromus tectorum* Semi-natural Shrub Herbaceous Vegetation
-*Ericameria nauseosa / Bromus tectorum* Semi-natural Shrubland

Description

Stands of rabbitbrush were common throughout the southern half of the project area with rubber rabbitbrush occurring on disturbed, flat uplands and green rabbitbrush occurring on rolling hills and gentle slopes. This map unit often intermixed with the sagebrush map units and often contained similar associated species including cheatgrass (as indicated in the comments field). On the ortho-imagery, rabbitbrush exhibited a characteristic smooth olive-green signature that varied from a solid green color in dense stands to a light green color with a tan or brown background in sparser sites.

Range and Distribution

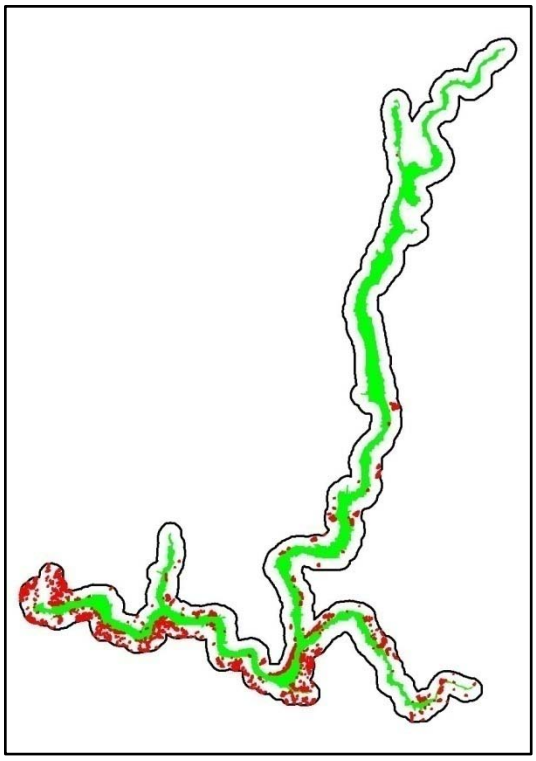
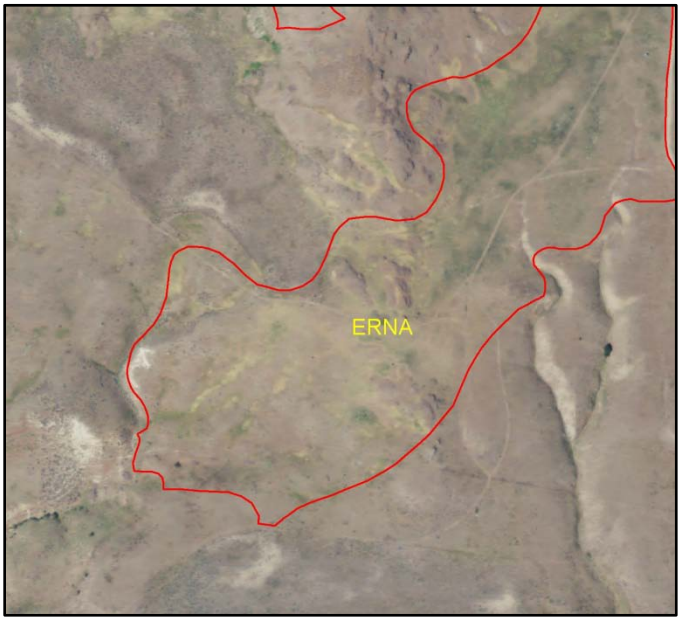


Photo Signature Example



Map Unit MXFLD **Mixed Temporarily Flooded Shrubland Complex**

Common Species

Betula occidentalis, Crataegus douglasii, Cornus sericea, Prunus virginiana, Alnus incana, Alnus viridis ssp. sinuata, Populus tremuloides, Symphoricarpos albus, Poa compressa, Carex brevior

NVCS Associations

-*Betula occidentalis / Cornus sericea* Shrubland
-*Crataegus douglasii* / Mesic Graminoids Shrub Herbaceous Vegetation
-*Alnus incana* / Mesic Forbs Shrubland
-*Alnus viridis ssp. sinuata* / Mesic Forbs Shrubland

Representative Ground Photos



Description

Small stands of tall deciduous shrubs occurred in riparian and mesic sites throughout the entire project area. The tall shrubs often intermixed or occurred adjacent to aspen, birch, and chokecherry map units. This map unit is characterized by small to medium-size shrubs. When small, the deciduous shrubs exhibited a smooth dark green signature changing to a coarser green signature when larger shrubs occurred on the ortho-imagery. Due to the close similarity of signatures and intermixing of common species, this map unit may have been confused with the aspen birch, chokecherry, or mixed mountain foothill shrubland map units.

Range and Distribution

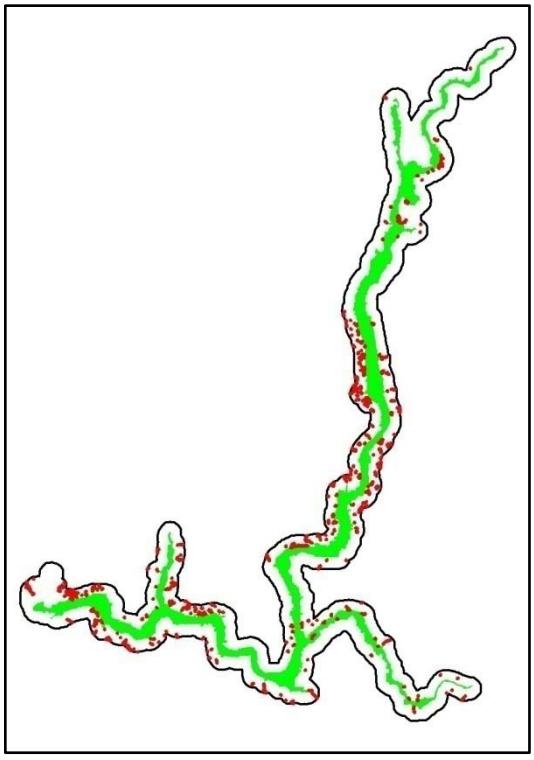
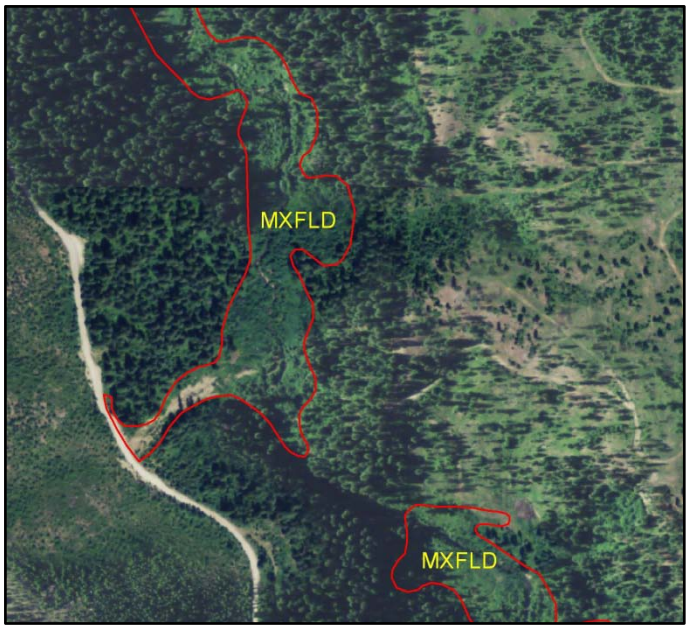


Photo Signature Example



Map Unit MXMTN — Mixed Mountain Foothill Shrubland Complex

Common Species

Amelanchier alnifolia, Pseudoroegneria spicata, Symphoricarpos albus, Bromus tectorum, Rhus glabra, Hesperostipa comata, Rosa gymnocarpa, Rosa woodsii, Alnus incana, Prunus virginiana, Purshia tridentata, Populus tremuloides

NVCS Associations

-*Amelanchier alnifolia / Pseudoroegneria spicata* - Bunchgrass Shrubland
-*Symphoricarpos albus* Shrubland
-*Symphoricarpos albus / Bromus tectorum* Semi-natural Shrubland
-*Rhus glabra / Hesperostipa comata* Shrubland
-*Rosa gymnocarpa* Shrubland
-*Rosa woodsii* Shrubland

Representative Ground Photos



Description

Mixed stands of upland deciduous shrubs occurred throughout the project area. Common dominants included snowberry, sumac, serviceberry and rose with a mix of native forbs and grasses in the understory. This map unit was characterized by small to medium-size shrubs. When small, the deciduous shrubs exhibited a smooth dark green signature changing to a coarser green signature when larger shrubs occurred on the ortho-imagery. Due to the close similarity of signatures and intermixing of common species, this map unit may have been confused with the chokecherry and Lewis' mock orange map units.

Range and Distribution

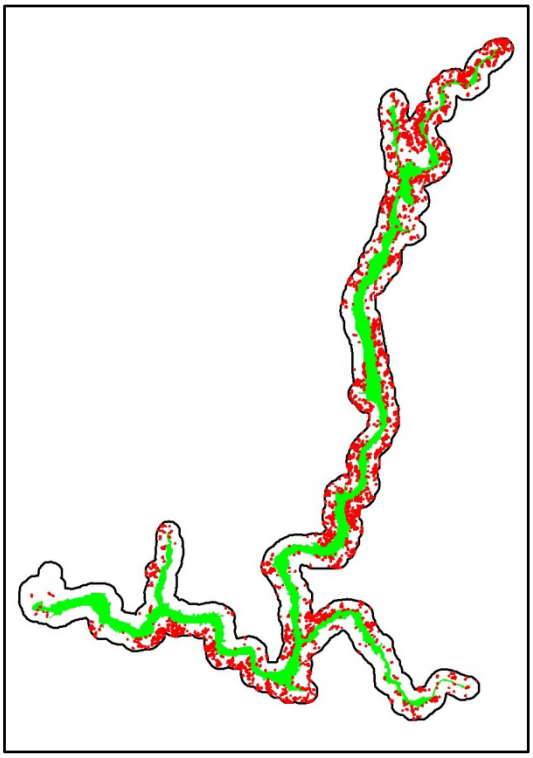
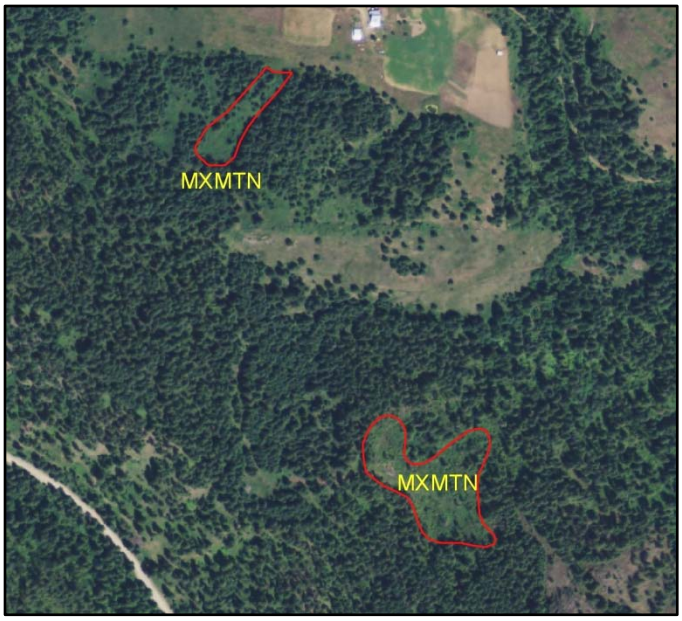


Photo Signature Example



Map Unit ***Philadelphus lewisii / Pseudoroegneria spicata* Shrubland**
PHLE/PSSP **Lewis' mock orange / Bluebunch wheatgrass Shrubland**

Common Species

Philadelphus lewisii, Symphoricarpos albus, Pseudoroegneria spicata, Bromus tectorum, Prunus virginiana, Chrysothamnus viscidiflorus, Balsamorhiza sagittata, Ericameria nauseosa, Purshia tridentata

NVCS Association

- *Philadelphus lewisii / Pseudoroegneria spicata* Shrubland

Representative Ground Photos



Description

Lewis mock orange was a common shrub species occurring in the southern portion of the study area on mesic rocky and talus slopes and in minor drainages. This map unit was used to delineate stands that had over 10% cover of Lewis' mock orange and the talus sparse vegetation map unit was used when the cover was less than 10%. Understory species varied for this type although cheatgrass and common snowberry were prevalent along with a mix of native grasses. Lewis' mock orange often intermixed or occurred adjacent to the other deciduous shrub map units and some confusion may have occurred. This map unit is characterized by small to medium-size shrubs exhibiting a smooth olive-green signature.

Range and Distribution

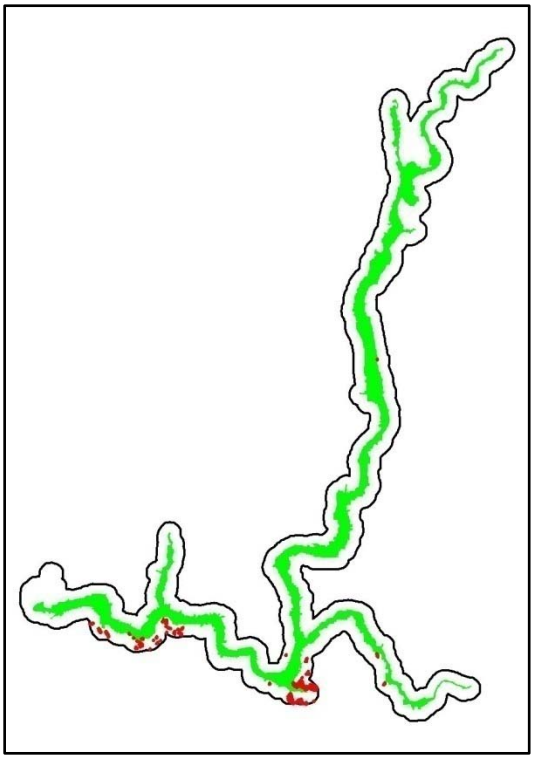
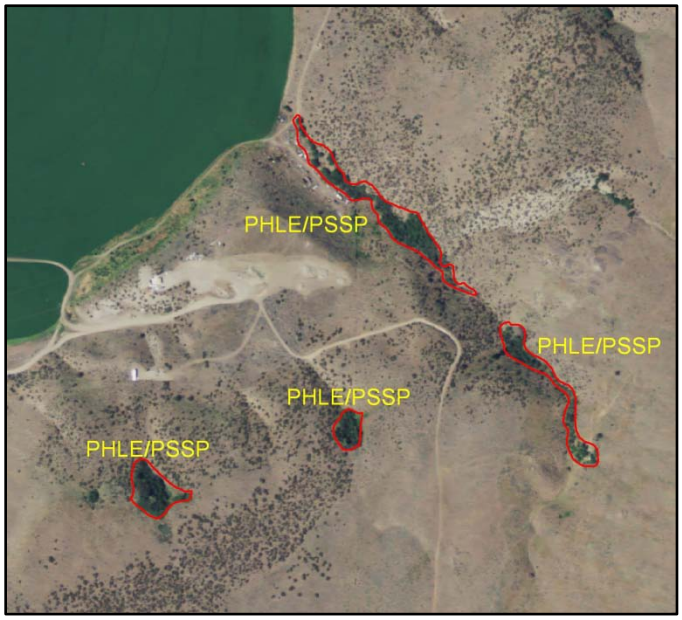


Photo Signature Example



Map Unit ***Prunus virginiana*** **Shrubland**
PRVI **Chokecherry Shrubland**

Common Species

Prunus virginiana, Symphoricarpos albus, Pseudoroegneria spicata, Poa pratensis, Acer glabrum, Clematis ligusticifolia

NVCS Association

- *Prunus virginiana* Shrubland

Representative Ground Photo



Description

Small stands of chokecherry shrubs were observed in mesic drainages, small valleys and at the base of rock formations in the southwestern portion of the study area. Chokecherry shrubs were also likely present in the riparian corridors but were never found to be the dominate species. The chokecherry map unit was characterized by small to medium-sized shrubs occurring in thick, dense stands with few associated species. On the ortho-imagery this map unit appeared as a light green color with a smooth-texture when small in stature and as a coarser olive-green when the shrubs were taller. Due to the close similarity of signatures and intermixing of common species, this map unit may have been confused with the mixed foothill shrub complex and the Lewis' mock orange map units.

Range and Distribution

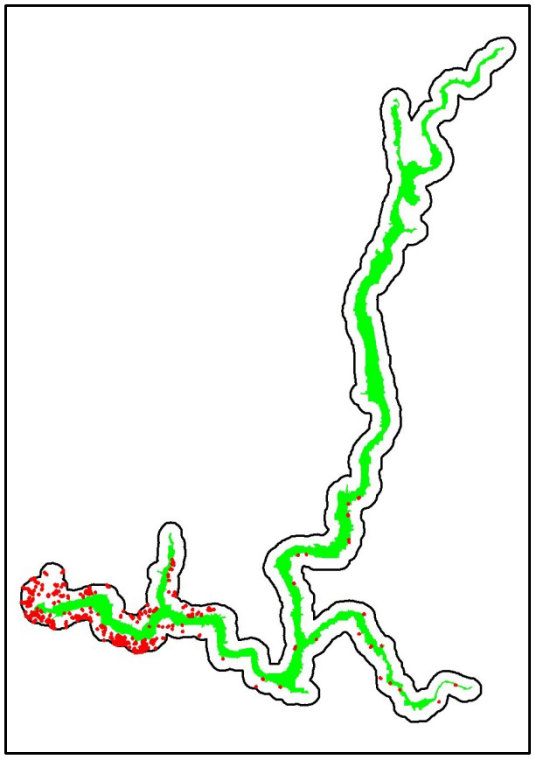
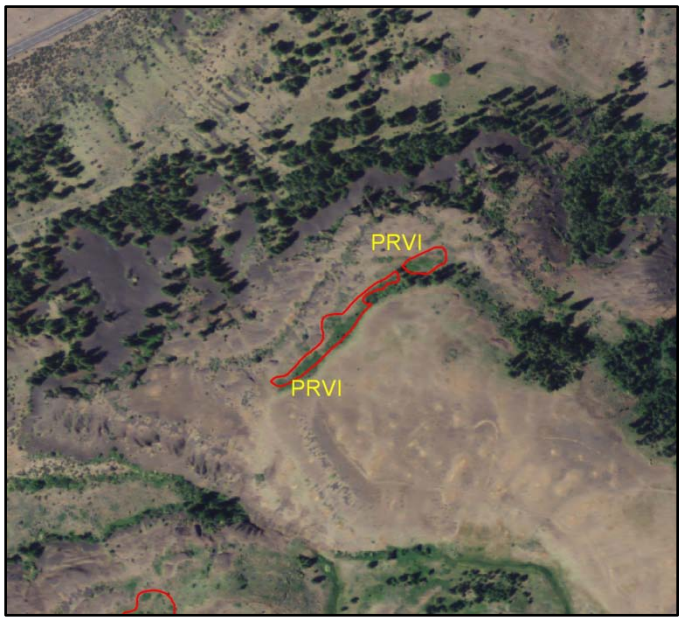


Photo Signature Example



Map Unit	***Purshia tridentata* Shrub Herbaceous Alliance**
PUTR	**Bitterbrush Shrub Herbaceous Alliance**

Common Species

Purshia tridentata, Achnatherum hymenoides, Pseudoroegneria spicata ssp. spicata, Festuca idahoensis, Hesperostipa comata, Bromus tectorum, Artemisia tridentata ssp. *wyomingensis*

NVCS Associations

-*Purshia tridentata / Achnatherum hymenoides* Shrubland
-*Purshia tridentata - Salvia dorrii / Pseudoroegneria spicata ssp. spicata* Dwarf-shrubland
-*Purshia tridentata / Festuca idahoensis* Shrub Herbaceous Vegetation
-*Purshia tridentata / Hesperostipa comata* Shrub Herbaceous Vegetation
-*Purshia tridentata / Pseudoroegneria spicata* Shrub Herbaceous Vegetation

Representative Ground Photo



Description

Bitterbrush occurs throughout the southern half of the project area forming large, dense stands on dry slopes, benches and uplands. Bitterbrush also occurred as smaller dwarf shrubs on sandier and rocky soils. Understory species varied by location consisting of a mix of native grasses and other shrubs. Cheatgrass and other non-native greases were common but did not dominate. Bitterbrush was often associated with the various sagebrush species and in some cases its close proximity and signature may have led to some mapping confusion. On the ortho-imagery, this map unit was characterized by small to medium-sized shrubs that appeared as dark grey circles. Where it was dense, the bitterbrush had a mottled to smooth appearance and when it was sparse it had a tan or grey background.

Range and Distribution

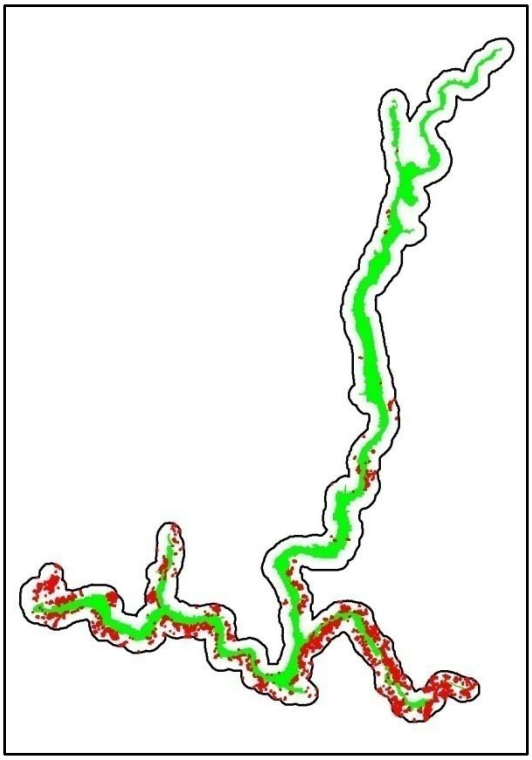
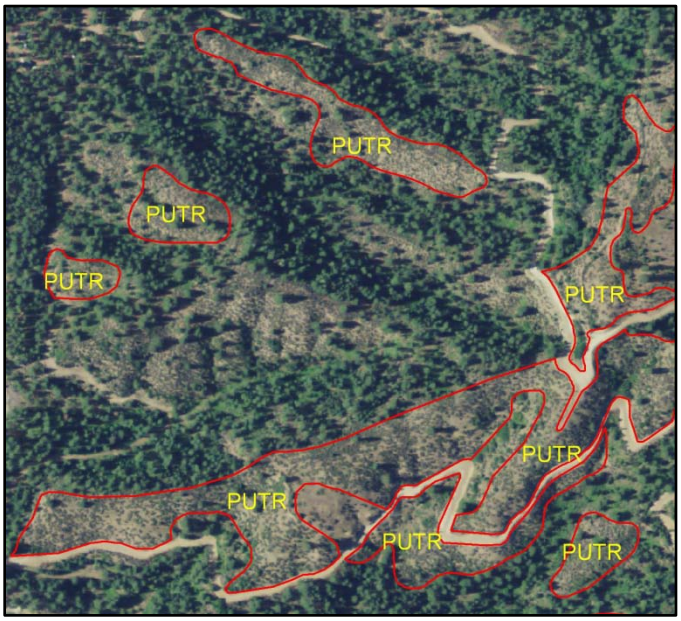


Photo Signature Example



Map Unit ***Purshia tridentata* / *Bromus tectorum* Semi-natural Shrubland**
PUTR/BRTE **Bitterbrush Shrub / Cheatgrass Semi-natural Shrubland**

Common Species

Purshia tridentata, Ericameria nauseosa, Bromus tectorum, Symphoricarpos albus, Balsamorhiza sagittata, Artemisia tridentata ssp. *wyomingensis, Pseudoroegneria spicata, Balsamorhiza sagittata*

NVCS Associations

- *Purshia tridentata / Bromus tectorum* Semi-natural Shrubland

Representative Ground Photo



Description

Bitterbrush with a dominant cheatgrass understory occurs throughout the southern half of the project area. In these locations most of the native understory has been displaced by cheatgrass likely due to fire, clearing or other disturbance. On the ortho-imagery bitterbrush is clearly evident as large grey circles and the cheatgrass has a characteristic orange-brown signature. Bitterbrush was often associated with various sagebrush species and in some cases its close proximity and signature may have led to some mapping confusion.

Range and Distribution

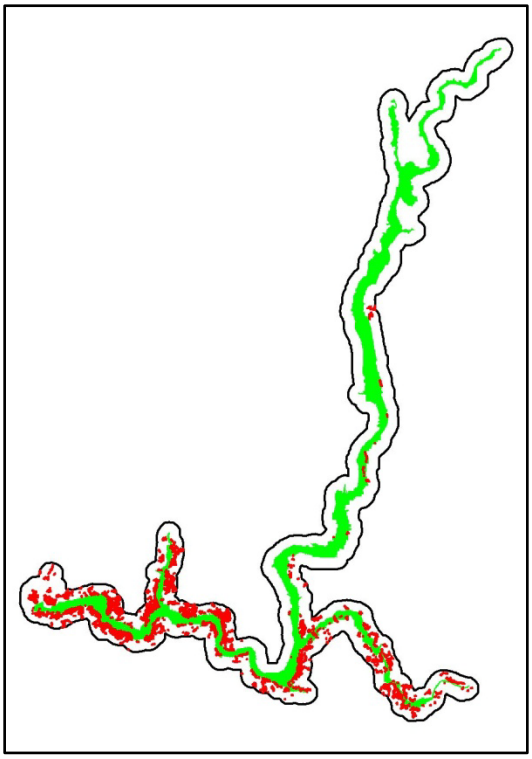
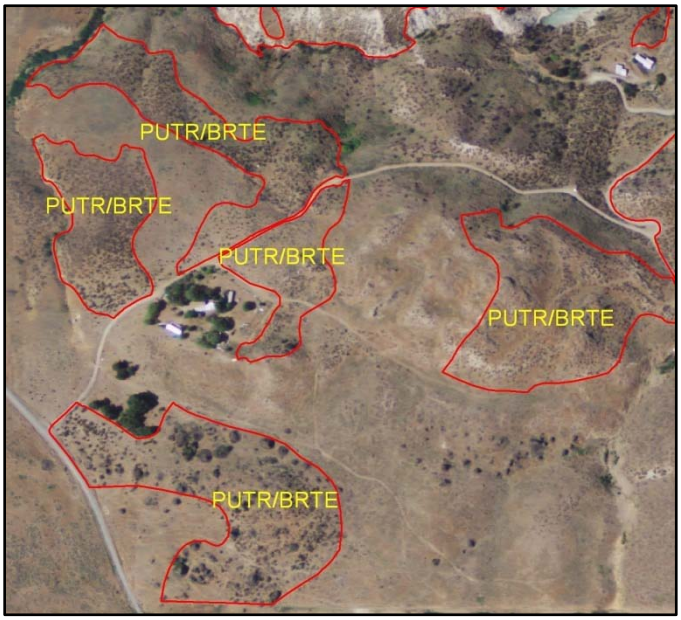


Photo Signature Example



Map Unit ***Salix alba* - *Salix exigua* Shrubland Complex**
SALX **White Willow - Narrowleaf Willow Shrubland Complex**

Common Species

Salix alba, Salix exigua, Rosa woodsii, Poa pratensis, Equisetum arvense, Populus balsamifera ssp. *trichocarpa, Typha* spp., *Phalaris arundinacea*

Representative Ground Photo



NVCS Associations

-*Salix alba / Poa pratensis* Semi-natural Shrubland
-*Salix exigua* / Barren Shrubland
-*Salix exigua / Equisetum arvense* Shrubland

Description

Pockets and bands of coyote and white willow were observed in riparian, shoreline and mesic sites throughout the project area. Willows often intermixed or occurred adjacent to the cottonwood and birch map units likely leading to some confusion in the mapping. This type is characterized by having small to medium-sized willow shrubs often with associated trees. When the willows were small they appeared as a slightly mottled to smooth light green signature changing to a more dark green when the willows became taller..

Range and Distribution

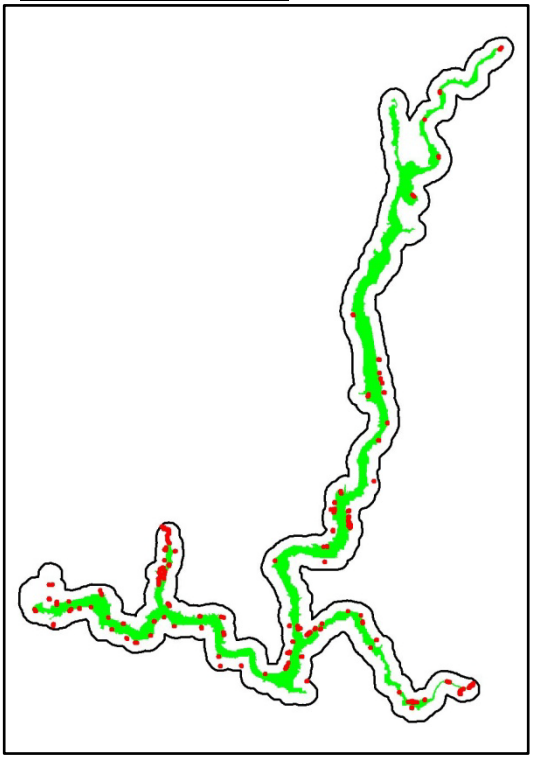


Photo Signature Example



Herbaceous Vegetation

Map Unit DRYM **Dry Mixed Herbaceous Vegetation Mosaic**

Common Species

Festuca idahoensis, Festuca ovina, Hesperostipa comata ssp. comata, Pseudoroegneria spicata, Poa secunda, Balsamorhiza sagittata, Eriogonum heracleoides, Sporobolus cryptandrus

Representative Ground Photo



NVCS Association

-*Dichanthelium oligosanthes* var. *scribnerianum* Herbaceous Vegetation
-*Festuca idahoensis* Herbaceous Vegetation
-*Festuca ovina* Semi-natural H. V.
-*Hesperostipa comata ssp. comata* Herbaceous Vegetation
--*Pseudoroegneria spicata - Poa secunda / Balsamorhiza sagittata* Herbaceous Vegetation
Pseudoroegneria spicata / Eriogonum heracleoides Herbaceous Vegetation
-*Sporobolus cryptandrus* Shrub H. V.

Description

The dry meadow map unit represents grasslands with moderate to high cover of native grasses. Bluebunch wheatgrass, Idaho fescue, needle and thread and other native grass species occurred on large flat terraces, benches rolling meadows, and as pockets in forest openings. Although non-native cheatgrass was sometimes present it did not form the monotypic stands as occur elsewhere in the mapping area. The density of native grasses varied greatly from sparse communities on sandy soils to denser stands on loams and other established soil types. On the ortho-imagery this map unit appeared as a mottled, smooth signature due to the lack of shrubs and varied in color from brown to light tan.

Range and Distribution

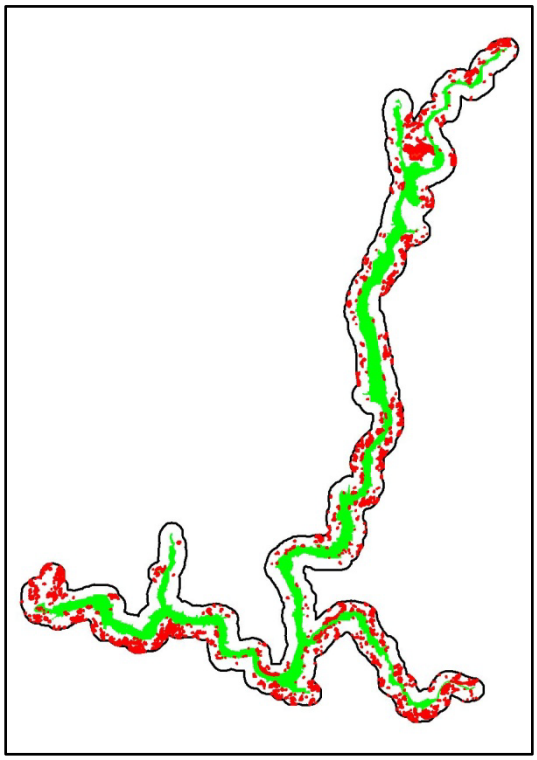
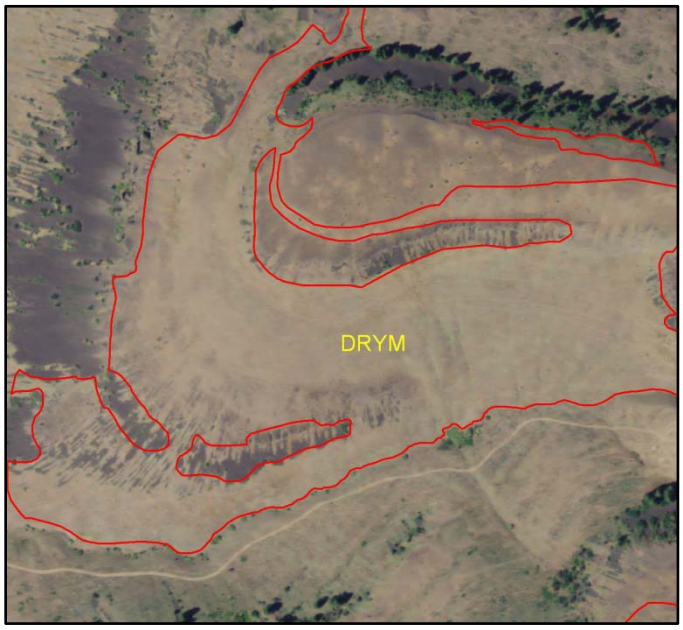


Photo Signature Example



Map Unit WETM — Mesic Mixed Herbaceous Vegetation Complex

Common Species

Carex vulpinoidea, Phalaris arundinacea, Distichlis spicata, Juncus balticus, Leymus cinereus, Puccinellia nuttalliana, Schoenoplectus acutus, Typha latifolia, Typha angustifolia

Representative Ground Photo



NVCS Associations

-*Carex vulpinoidea - Phalaris arundinacea* Herbaceous Vegetation
-*Distichlis spicata* Herbaceous Vegetation
-*Juncus balticus* Herbaceous Vegetation
-*Leymus cinereus* Herbaceous Vegetation
-*Phalaris arundinacea* Western Herbaceous Vegetation
-*Puccinellia nuttalliana* Herbaceous Vegetation
-*Schoenoplectus acutus* Herbaceous Vegetation

Description

This herbaceous wetland type was common at LARO in mesic drainage bottoms and along the edges of the reservoir. Polygons of this type typically contained pure stands of graminoids and/or solid stands of reeds. Stands of all the associations included in this map unit were fairly indistinguishable from one another on the imagery and appeared to often intermix. On the NAIP imagery this type was mapped partially by its landscape position in drainage bottoms and along shorelines and partially by its characteristic smooth, light green color with blue streaks (water).

Range and Distribution

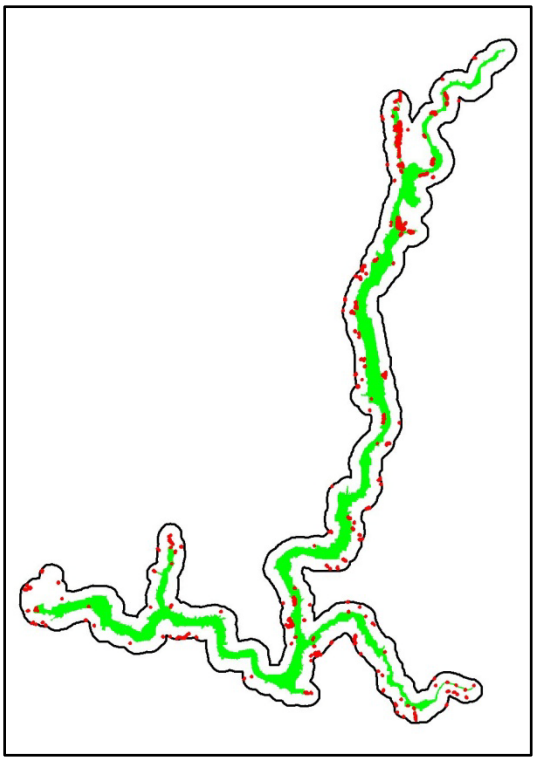
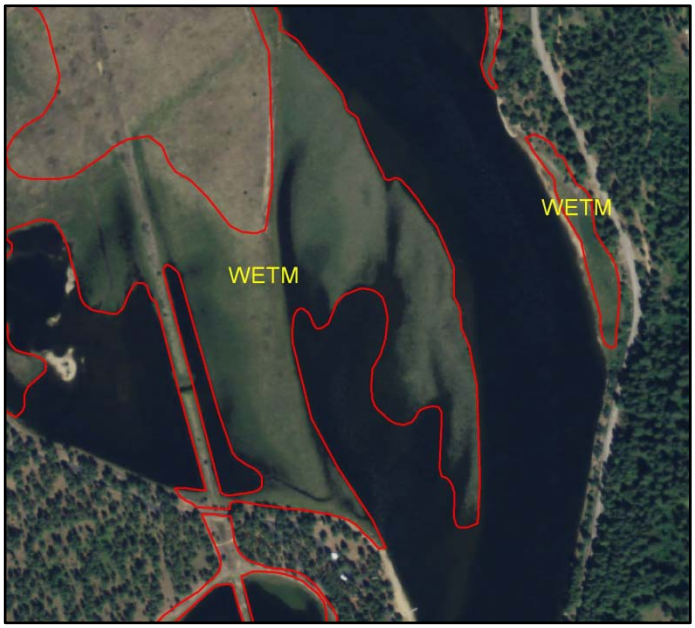


Photo Signature Example



Map Unit MXGRS — Mixed Planted and Semi-natural Grassland Complex

Common Species

Agropyron cristatum, Thinopyrum intermedium, Secale cereale
Bromus tectorum, Poa pratensis

NVCS Association

-*Agropyron cristatum* Semi-natural Herbaceous Vegetation
-*Secale cereale* Planted Herbaceous Vegetation
-*Thinopyrum intermedium* Semi-natural Herbaceous Vegetation

Representative Ground Photo



Description

This map unit represents previously planted pastures and cultivated lands that were probably seeded at one time with non-native grasses. Planted stands occurred along the floodplain reservoir and on upland terraces and gentle slopes. The presence of crested wheatgrass usually exhibited a dark brown-tan (mocha) color and the rye and intermediate wheatgrass had a slightly lighter brown color. Old agricultural tillage and irrigation lines were sometimes apparent. Polygons of this map unit likely include areas with high cheatgrass cover and possibly some pockets of native grasses. Other areas with these non-native species likely exist in the study area but were not recognizable on the imagery. More ground-truthing would greatly improve the accuracy and distribution of this type.

Range and Distribution

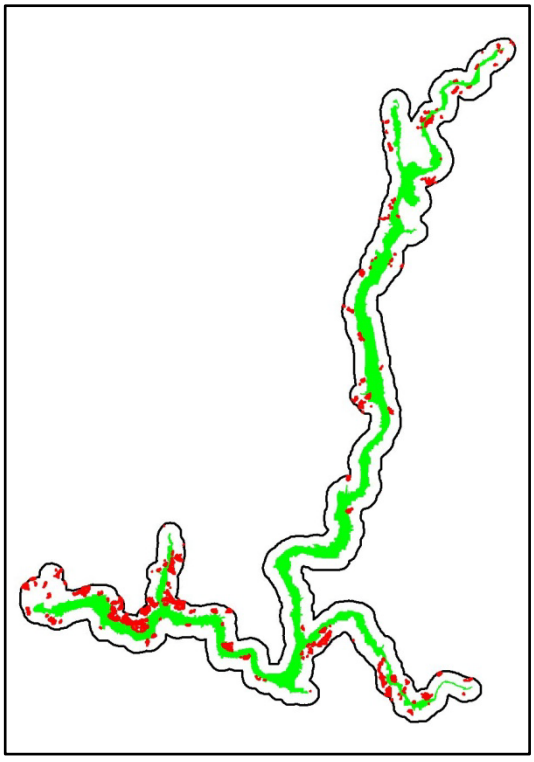
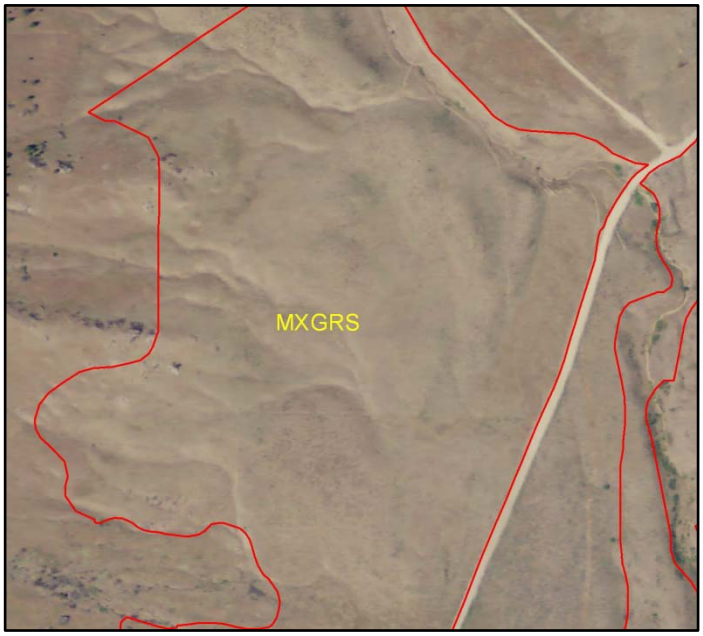


Photo Signature Example



Map Unit	***Bromus tectorum* Semi-natural Herbaceous Vegetation**
BRTE	**Cheatgrass Semi-natural Herbaceous Vegetation**

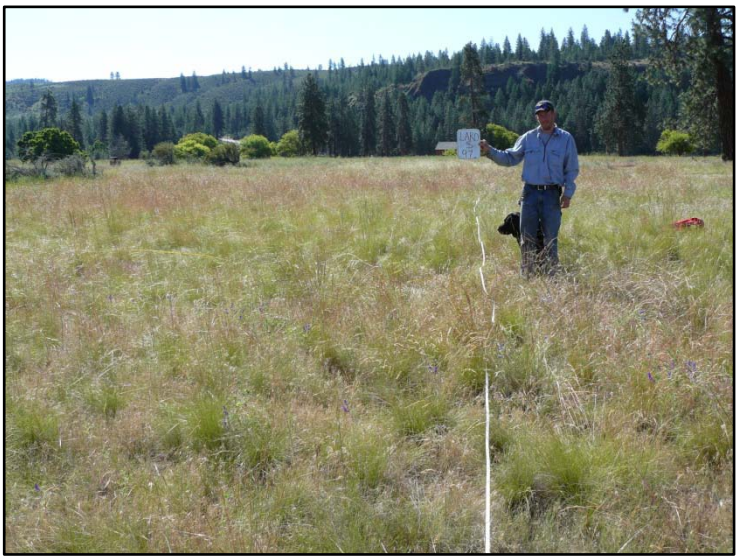
Common Species

Bromus tectorum, Poa pratensis

NVCS Alliance

-*Bromus tectorum* Semi-natural Herbaceous Alliance

Representative Ground Photo



Description

Cheatgrass along with other non-native annual grasses occurred in nearly monotypic stands across broad plains, intermixed with other non-native grass and forb species in old pastures and occurred on rolling hills and slopes. Cheatgrass was fairly common in the southern half of the LARO mapping area and this map unit was used to map large areas that were likely disturbed in the past from fire or agricultural activity. Stands of cheatgrass ranged from thick, lush stands on floodplains to sparser arid areas within valleys, alluvial fans, and on hillslopes. On the NAIP imagery stands of cheatgrass with sufficient cover (>20%) had a characteristic smooth, orange-tan color.

Range and Distribution

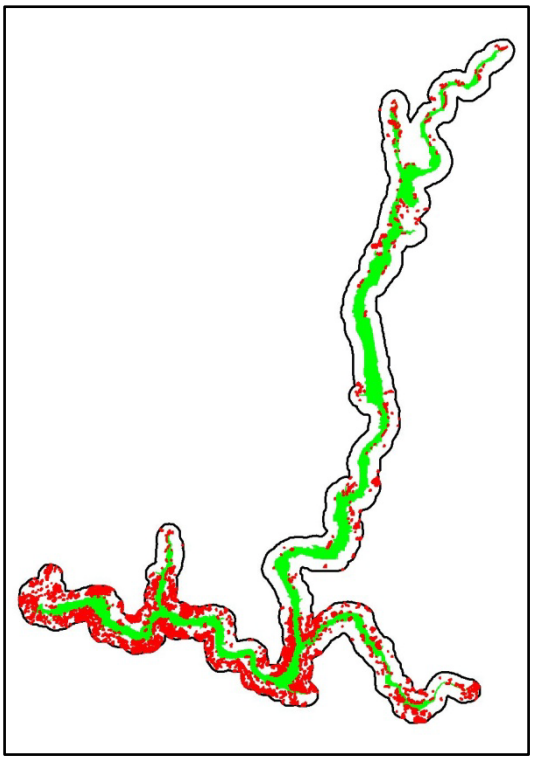
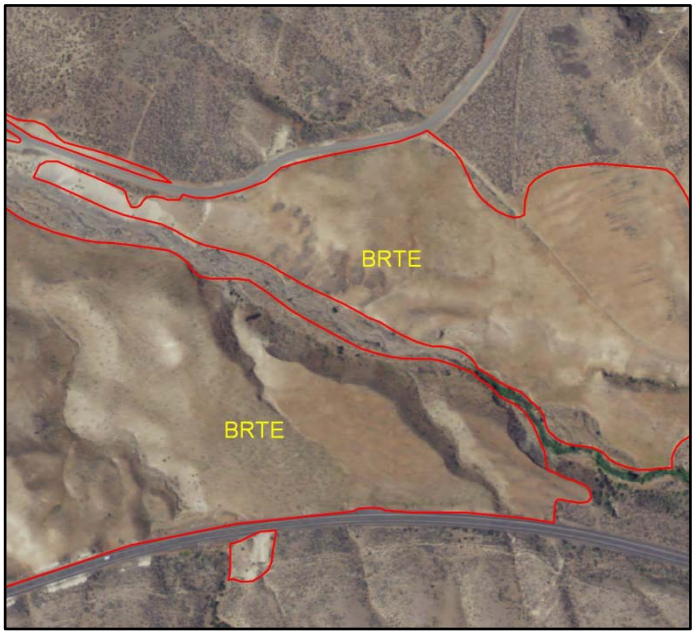


Photo Signature Example



Map Unit ***Bromus inermis* - *Poa pratensis* Semi-natural Herbaceous Complex**
BRIN/POPR **Smooth Brome - Kentucky Bluegrass Semi-natural Herbaceous Complex**

Common Species

Bromus inermis, Poa pratensis
Bromus tectorum

NVCS Association

-*Bromus inermis* Semi-natural Herbaceous Vegetation
-*Poa pratensis* Semi-natural Herbaceous Vegetation

Representative Ground Photo



Description

The smooth brome, Kentucky bluegrass map unit represents scattered small grassland stands found throughout LARO. These polygons likely represent sites that were either once seeded with smooth brome/Kentucky bluegrass following development and agricultural activities or are escaped stands that have invaded native grasslands. Other small patches or pockets of this type likely occur in the project area but were either not large or recognizable enough to interpret. On the ortho-imagery this map unit was characterized by a smooth, light green to tan signature similar to those of the native grasses. Polygons of smooth brome stands may include small inclusions of other grassland and herbaceous types.

Range and Distribution

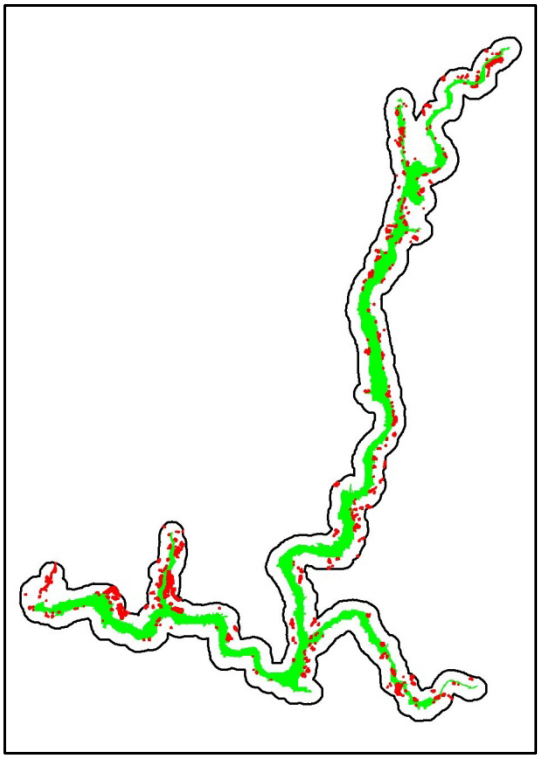


Photo Signature Example



Map Unit WEED **Mixed Weedy Semi-natural Herbaceous Vegetation Complex**

Common Species

Bromus tectorum, Centaurea diffusa, Dactylis glomerata, Cirsium arvense

NVCS Associations

-*Centaurea diffusa* Semi-natural Herbaceous Vegetation
-*Dactylis glomerata* Semi-natural Herbaceous Vegetation

Representative Ground Photo



Description

The mixed weedy map unit represents a broad grouping of disturbed herbaceous sites occurring throughout the project area. This map unit was primarily used to map obvious disturbed sites associated with logging, clearing and agricultural activities. Species composition for these polygons varies greatly from sites with monotypic stands of thistle and orchard grass to mixed areas contained different species of invasive forbs. It is likely that this type greatly overlaps with the other non-native grassland map units (cheatgrass, smooth brome, created wheatgrass etc…) and future ground-truthing efforts may warrant the combing of all four map units. On the ortho-imagery, stands of this type varied in color from tan to green but signs of disturbance (logging, clearing, and field margins) were always apparent.

Range and Distribution

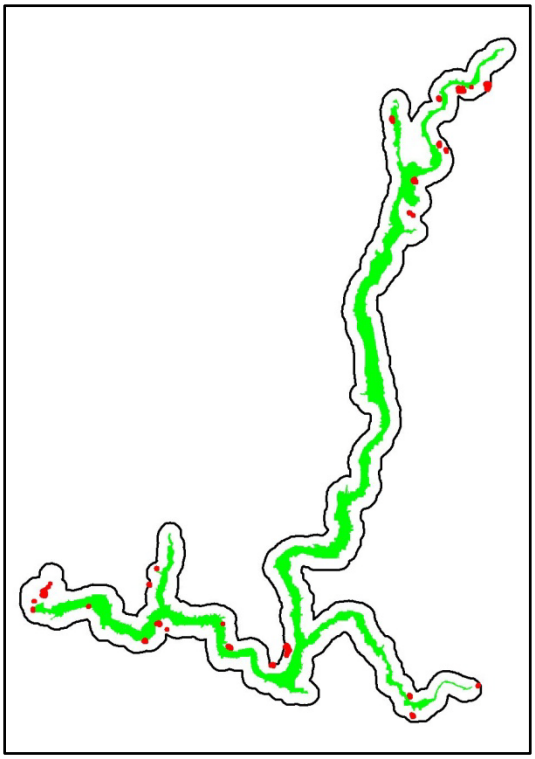
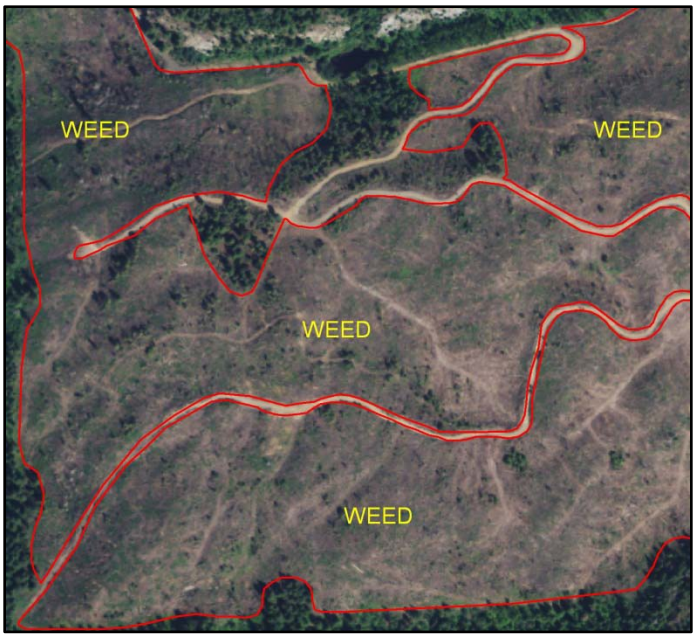


Photo Signature Example



Map Unit CUTB — Lacustrine Cut Bank Sparse Vegetation

Common Species
(Various annual species)

NVCS Association
- Lacustrine Cut Bank Sparse Vegetation

Representative Ground Photo



Description
The lacustrine cut bank map unit was used to delineate the draw-done zone of the reservoir as it appeared on the 2009 NAIP imagery. Polygons of this type appeared as a bath-tub ring representing the high water mark of the reservoir continuing down to the current water level. It is likely that most of the polygons in this map unit are barren but some annual herbaceous vegetation may occur. On the imagery the cut bank was observed as primarily a smooth white signature with some texture due to exposed rock formations

Range and Distribution

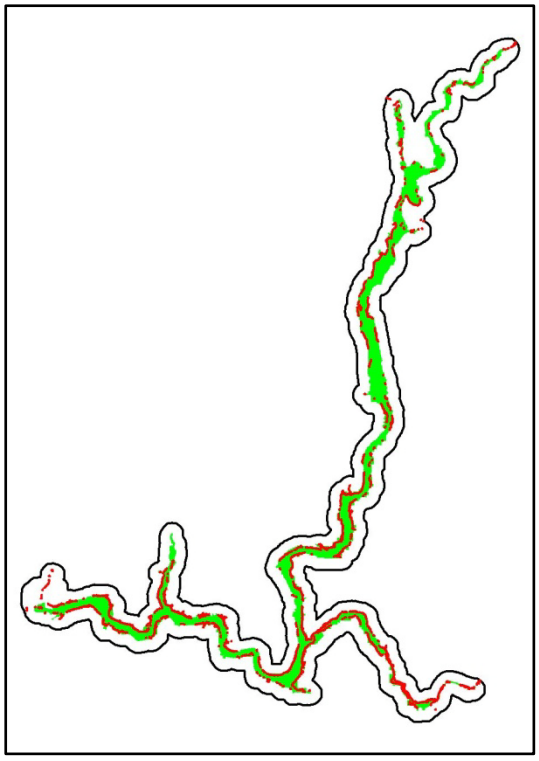
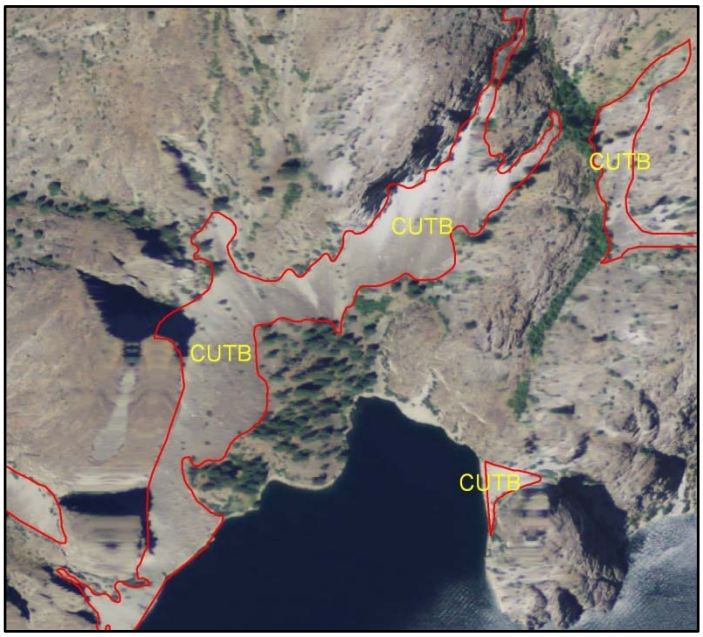


Photo Signature Example



Map Unit GBAR — Gravel Bar Herbaceous Vegetation

Common Species
(Various annual species)

NVCS Association
-Gravel Bar Herbaceous Vegetation

Representative Ground Photo



Description
The gravel bar map unit was a rare type at LARO, used to delineate areas of either exposed gravel or shoreline areas below Grand Coulee Dam that were filled with rip-rap. In most cases polygons of this type were unvegetated but it is likely that with continued exposure some annual herbaceous species may become established. On the ortho-imagery this type appeared as a coarse, white to grey color.

Range and Distribution

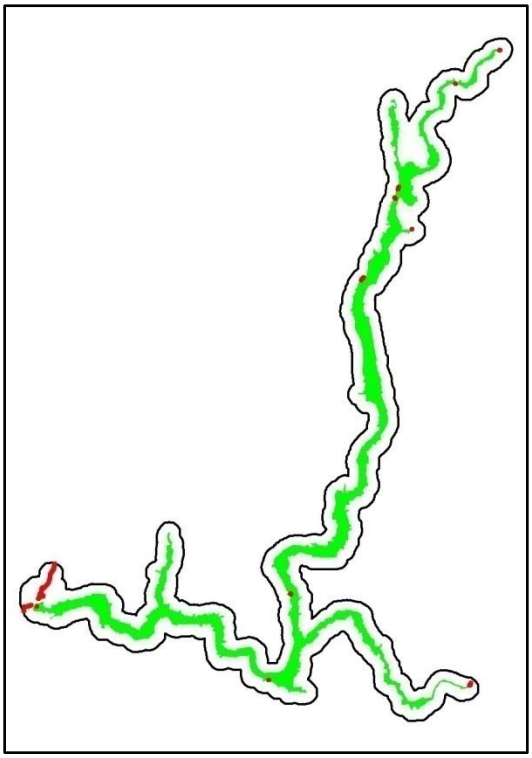


Photo Signature Example



Map Unit **Active Dune Herbaceous Vegetation**
DUNE

Common Species

Eriogonum compositum, Poa secunda, Eriogonum niveum, Bromus tectorum, Ericameria nauseosa, Achnatherum hymenoides

Photo Signature Example



NVCS Associations

-Eriogonum compositum / Poa secunda Dwarf-shrub Herbaceous Vegetation
-Eriogonum niveum / Bromus tectorum Dwarf-shrub Herbaceous Vegetation
-Ericameria nauseosa / Achnatherum hymenoides Sparse Vegetation

Description

Herbaceous and dwarf-shrub vegetation occurring on sandy soils were fairly rare at LARO, occurring at only a few known sites in the southern half of the project area. This map class combined multiple associations and likely includes many other locally dominate grasses and forbs such as bluebunch wheatgrass and curly bluegrass. On the NAIP imagery this type exhibited a smooth white or tan color with some gray haze representing the herbaceous vegetation.

Range and Distribution

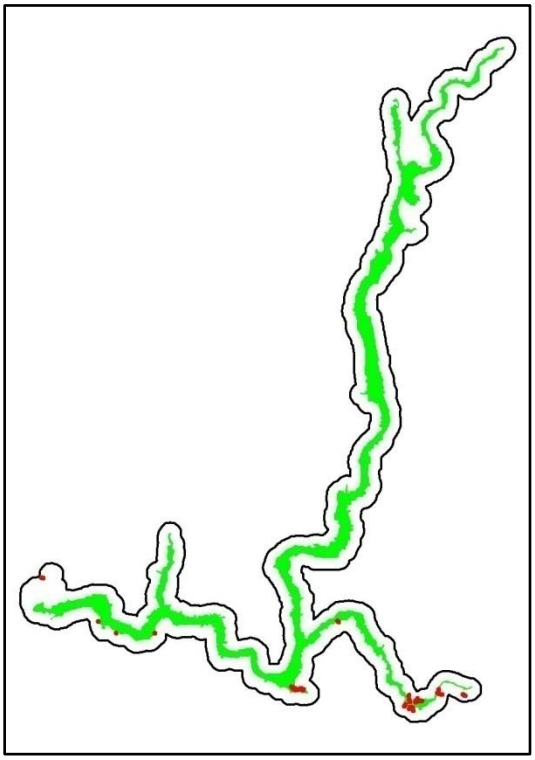


Photo Signature Example



Map Unit TALS — Talus Sparse Vegetation

Common Species
Pseudotsuga menziesii, Philadelphus lewisii

NVCS Associations
-Pseudotsuga menziesii / Philadelphus lewisii
Talus Sparse Wooded Vegetation

Photo Signature Example



Description
Talus slopes were common in the southern half of the LARO project area and were also scattered throughout the northern half. Polygons of this type exhibited a coarse, dark grey or black signature due to the piles of cobbles and rocks. Most of the polygons in this map class likely represent barren or unvegetated sites although some likely have less than 10% cover of vegetation. When vegetation does occur common species likely include Lewis' mock orange shrubs and ponderosa pine/Douglas fir saplings. Other rocky and talus sites that contained more mature trees were mapped as part of the ponderosa pine or Douglas fir sparse woodland types or the Lewis' mock orange map unit.

Range and Distribution

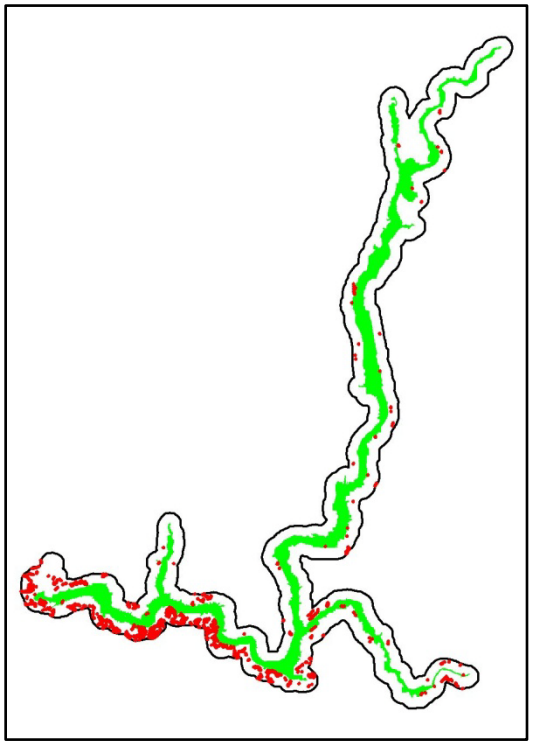
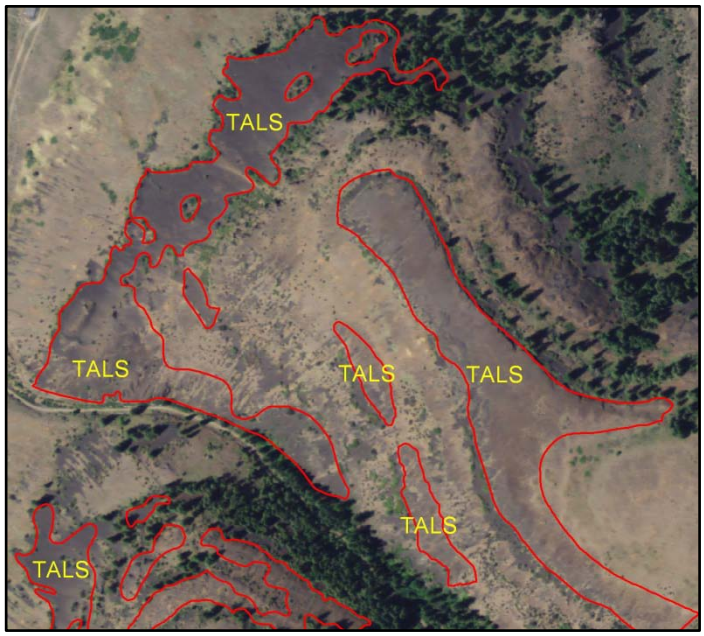


Photo Signature Example



Map Unit ROCK Rock Outcrop Sparse Vegetation

Common Species
Philadelphus lewisii, Pseudoroegneria spicata

NVCS Associations
-Philadelphus lewisii / Pseudoroegneria spicata Rock Outcrop Sparse Vegetation

Photo Signature Example



Description
Rock outcrops were common throughout the project area, representing natural exposed bedrock and cliff formations. In contrast the Bare Rock / Sand / Other Bare Ground map class was used to delineate barren areas that were artificially cleared or quarried in the past. Vegetation cover for this map unit varied greatly depending on the weathering of the rock and the presence of cracks and benches to support soil formation. In most cases the vegetation cover was below 10% although small inclusions with greater cover may occur. Vegetation on these rock outcrops also varied with ponderosa pine, Douglas fir, and Lewis' mock orange probably the most prevalent. When vegetation cover of these species consistently reached 10% or greater other map classes were used for the delineation and attribution. On the ortho-imagery this type usually had a light grey or tan color representing the exposed bedrock.

Range and Distribution

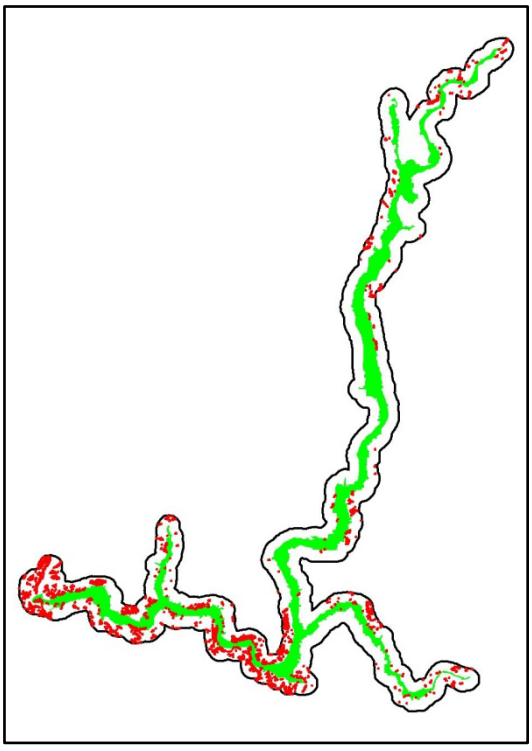
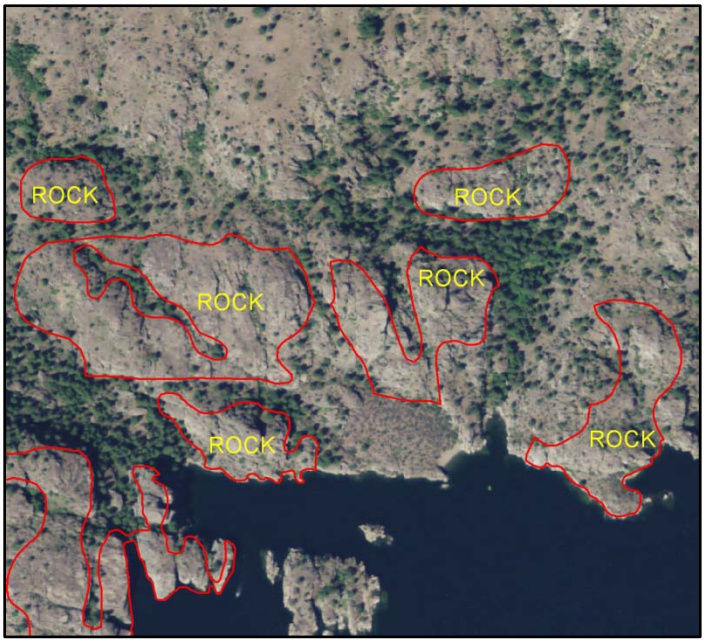
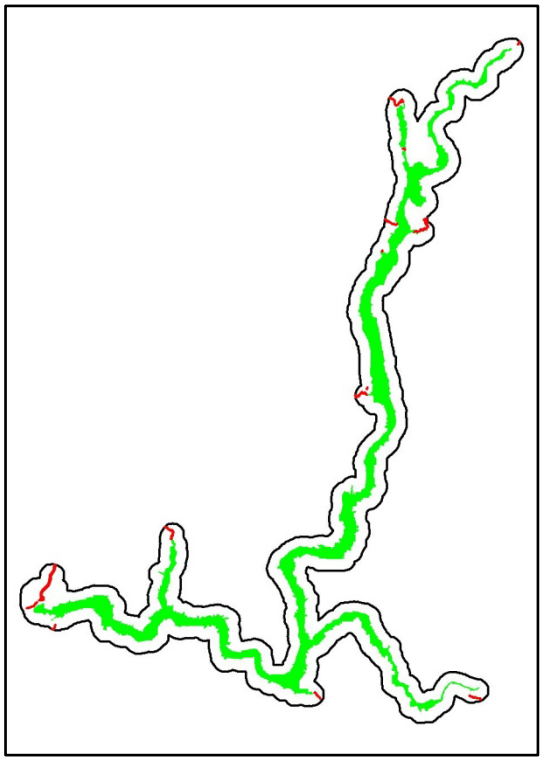


Photo Signature Example

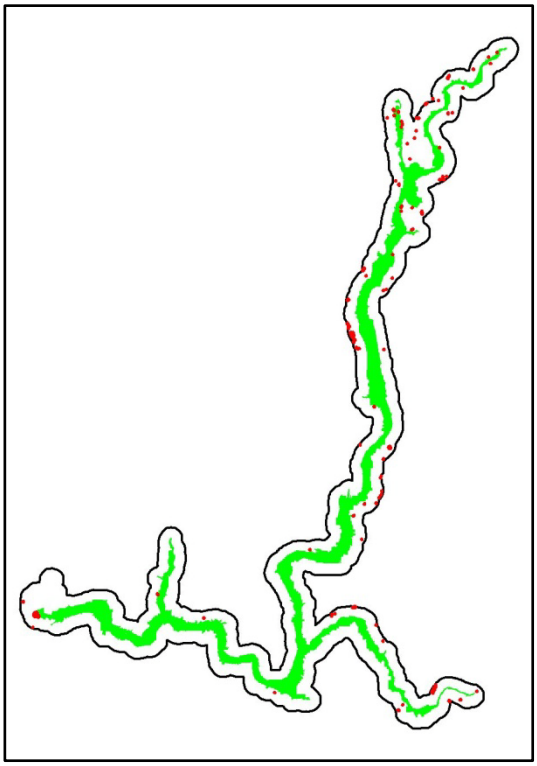


LAND COVER – LAND USE

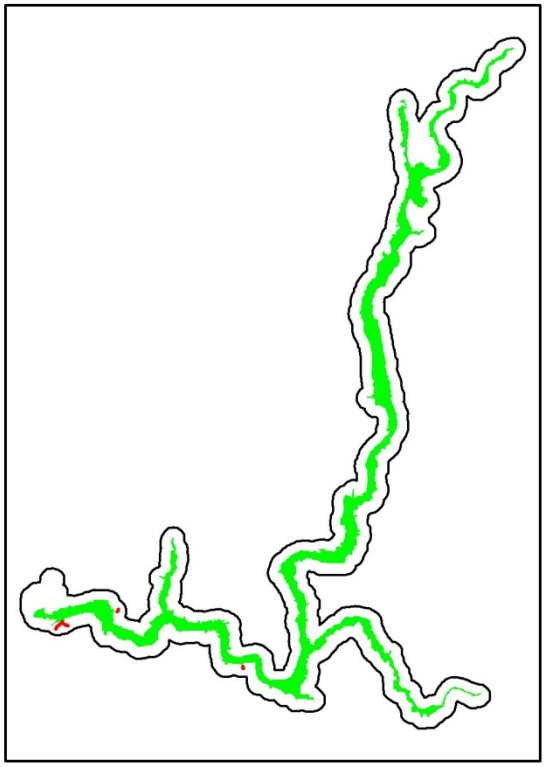
MAP CODE **Stream / River**
STRM



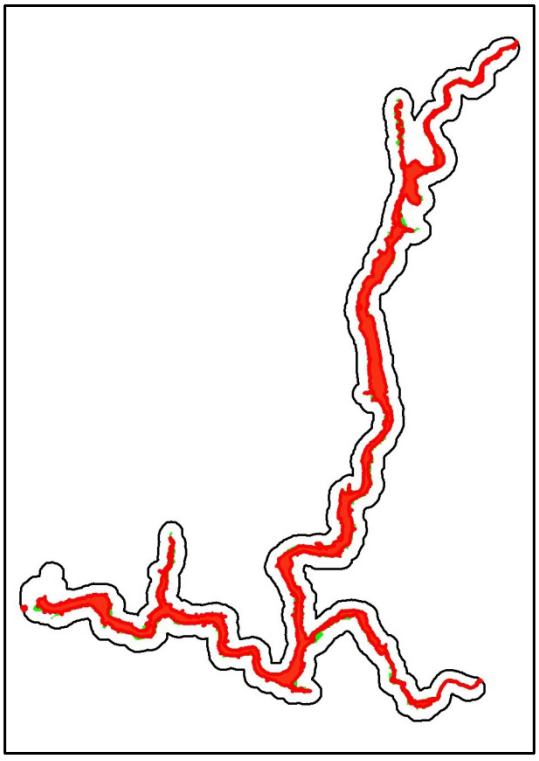
MAP CODE **Lake / Pond**
POND



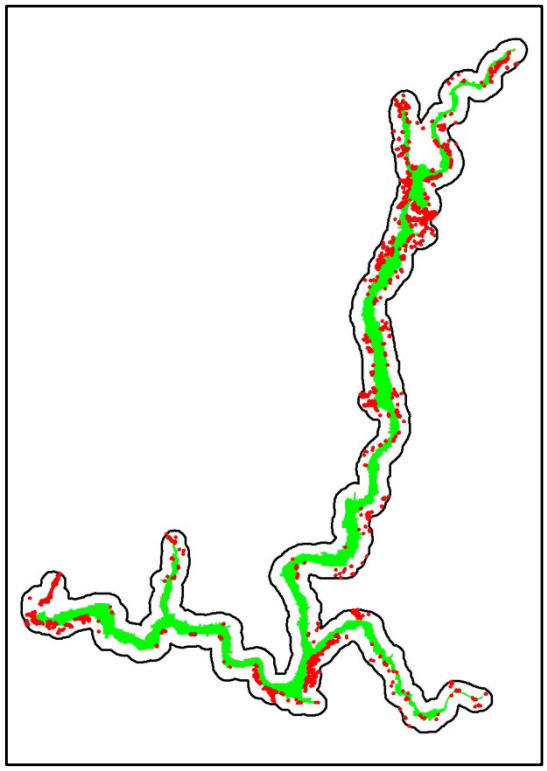
MAP CODE **Canal / Ditch**
CANL



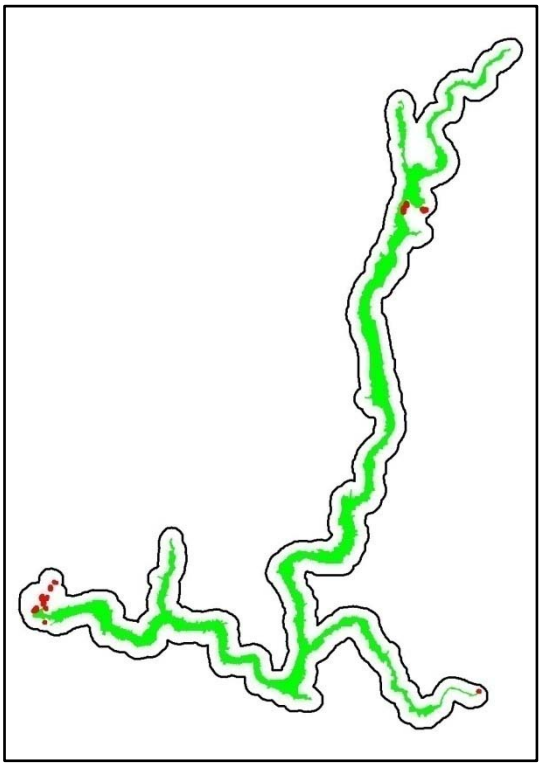
MAP CODE **Reservoir**
RESV



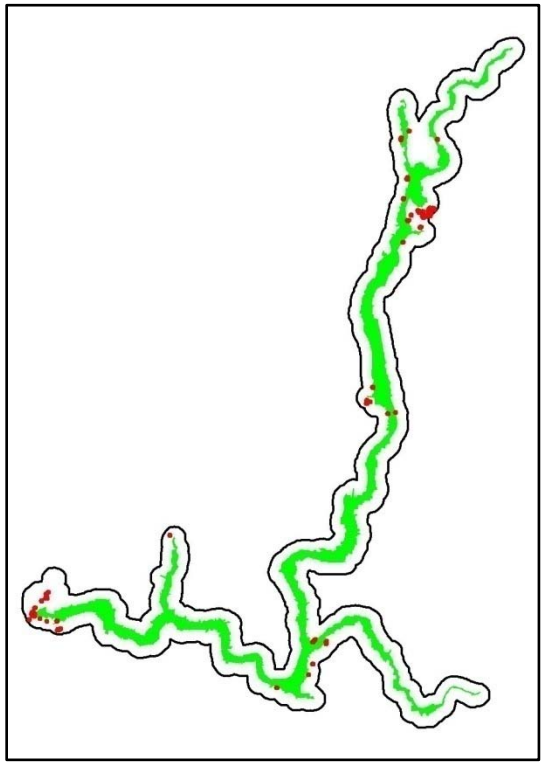
MAP CODE RESD **Residential**



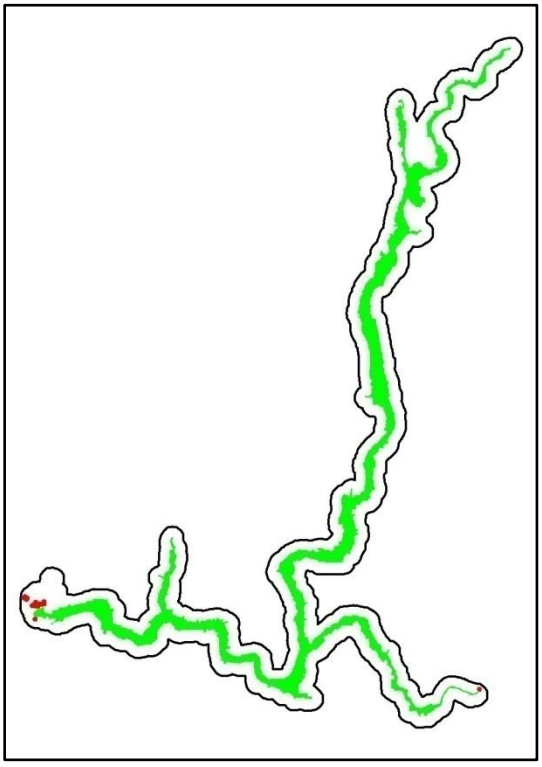
MAP CODE HIND **Heavy Industry**



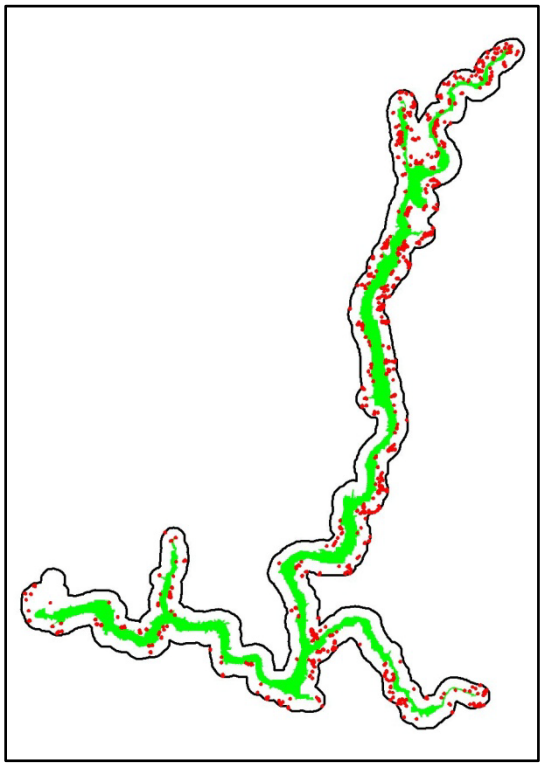
MAP CODE LIND **Commercial Light Industry**



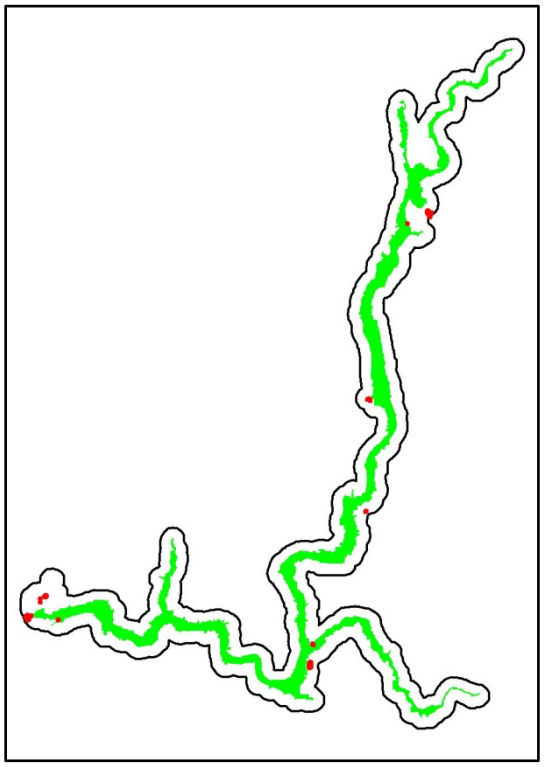
MAP CODE COMM **Communications & Utilities**



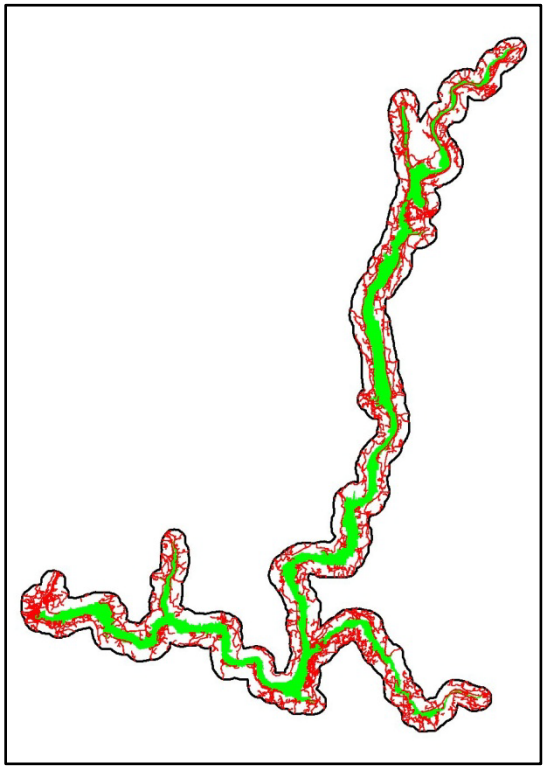
MAP CODE **Agricultural**
AGRI **Business**



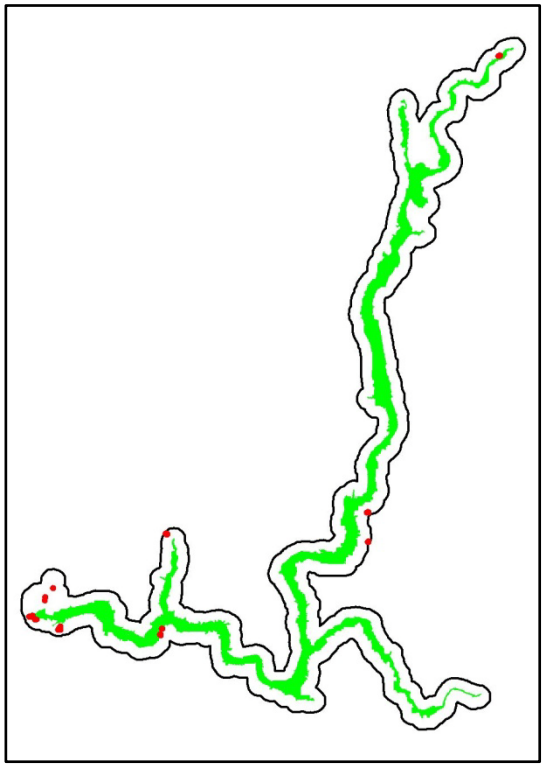
MAP CODE **Entertainment / Recreation**
RECR



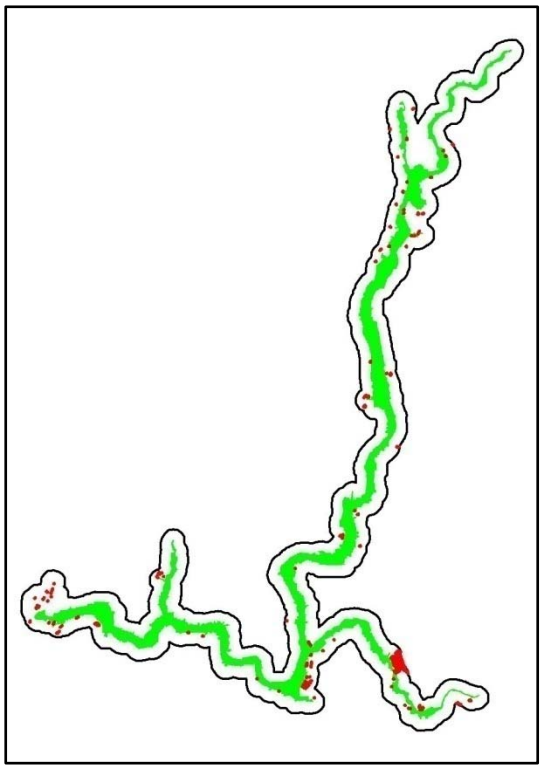
MAP CODE **Transportation**
ROAD



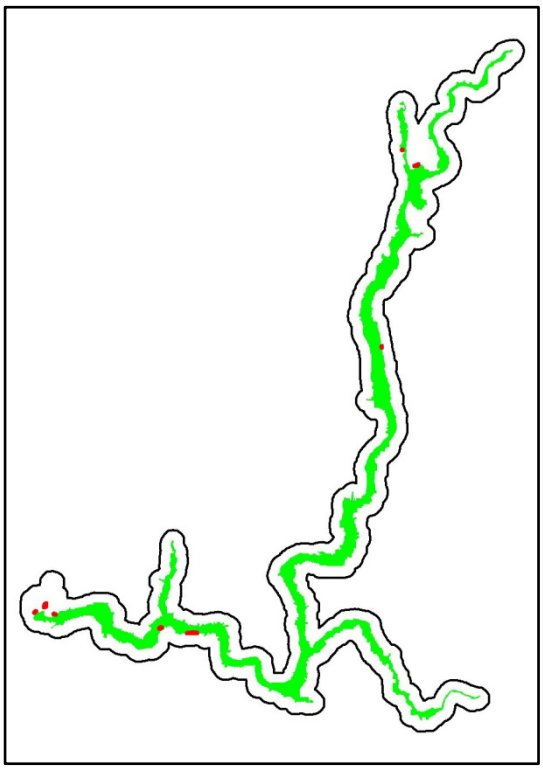
MAP CODE **Mixed Urban**
URBN



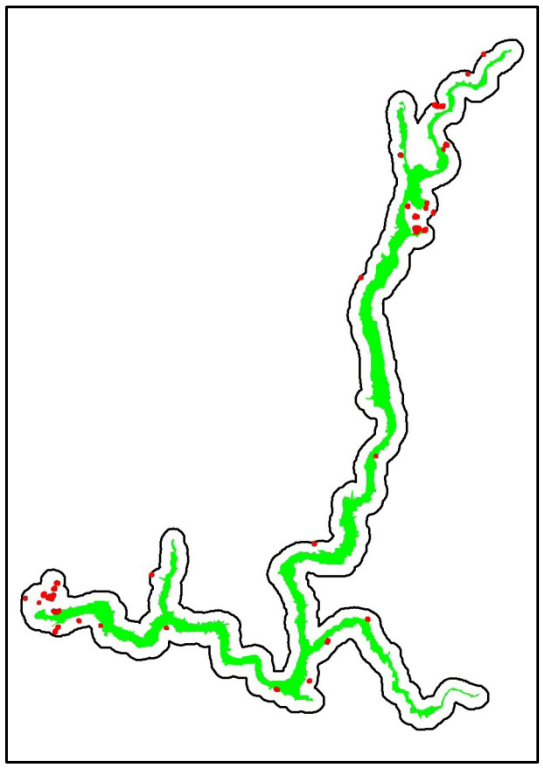
MAP CODE **Transitional**
TRANS



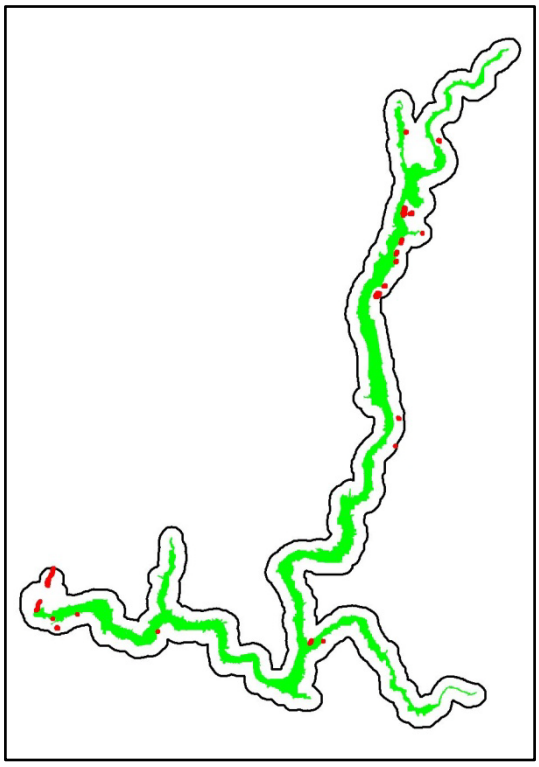
MAP CODE **Bare Rock / Sand / Other**
BARE **Bare Ground**



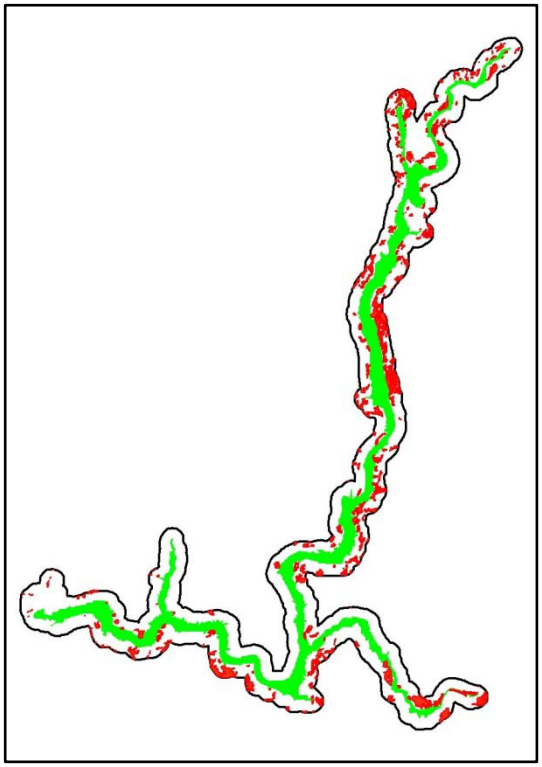
MAP CODE **Quarries / Strip**
MINE **Mines / Gravel Pits**



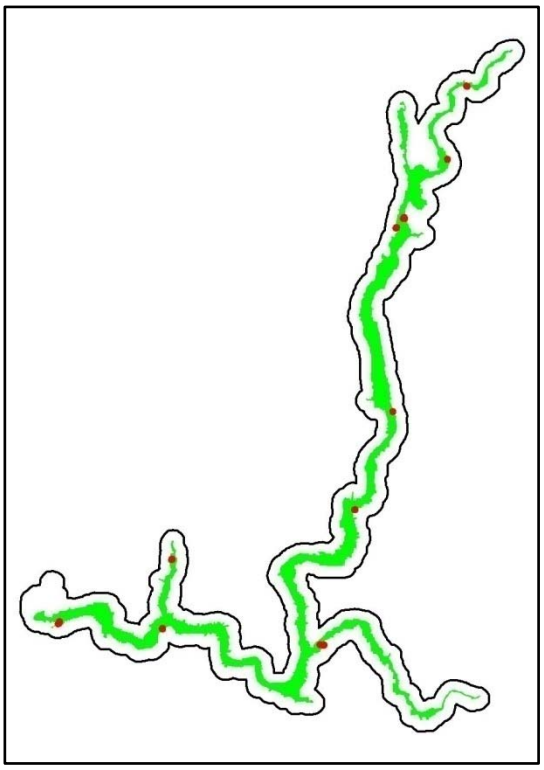
MAP CODE **Orchards, Groves**
ORCH **Vineyards, Nurseries, and**
Horticultural Areas



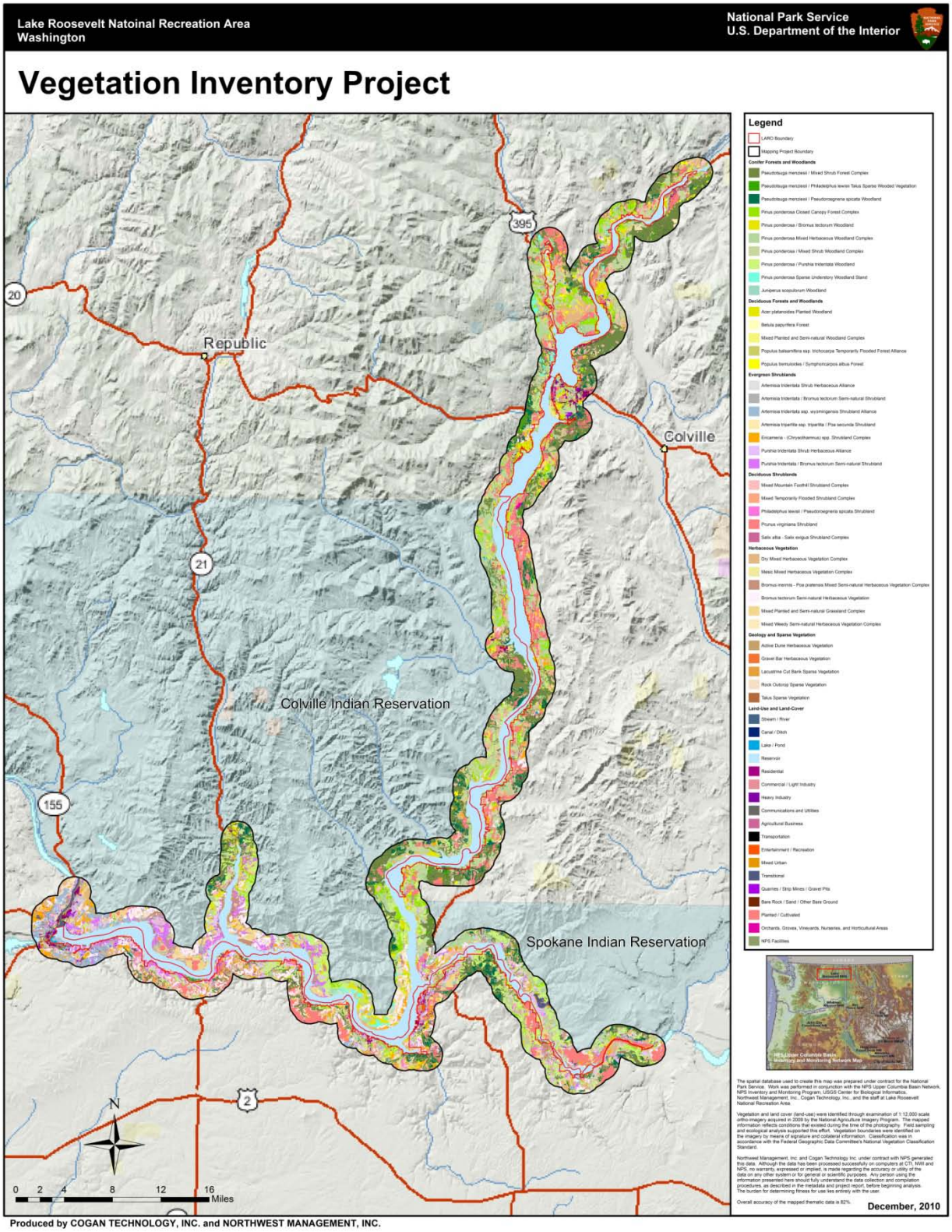
MAP CODE FILD **Planted / Cultivated**



MAP CODE NPS **NPS Facilities**



Appendix G: Final LARO Vegetation Map



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 606/109093, August 2011

National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science
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