



Spring Wetland Flora Inventory—Colorado National Monument Survey Report



A wetland surveyed at Colorado National Monument.

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Spring wetland flora inventory—Colorado National Monument survey report

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Abstract

This report provides the results from the 2021 spring wetland flora inventory at Colorado National Monument. In total, seven National Park Service units within the Northern Colorado Plateau Network determined the need to evaluate and map spring and wetland condition based on the presence/absence of perennial obligate and facultative wetland plant species known to occur in the parks. Mapping spring and wetland areas for each park provides a baseline measure of areas sensitive to drying that can be used to monitor change over time. The overall objective of the project was to establish a baseline for the area and condition of wetlands, seeps, and springs to provide supporting evidence for any future claims of impairment resulting from groundwater management actions.

Survey results at Colorado National Monument identified and inventoried springs and wetlands at 14 of 17 surveyed sites. This report summarizes the results at these 14 sites, including spring type identification, dominant herbaceous plant species present, average plant cover, wildlife sign frequency and observation, and wetland feature map figures.

List of Terms or Acronyms

°: degrees

%: percent

ac: acre

BLCA: Black Canyon of the Gunnison National Park

BRCA: Bryce Canyon National Park

CARE: Capitol Reef National Park

CEBR: Cedar Breaks National Monument

cm: centimeters

CNHP: Colorado Natural Heritage Program

COLM: Colorado National Monument

CURE: Curecanti National Recreation Area

DINO: Dinosaur National Monument

FAC: facultative plant

FACU: facultative upland plant

FACW: facultative wetland plant

ft: feet

GDE: Groundwater-Dependent Ecosystem

GIS: Geographic Information Systems

GPS: Global Positioning System

m: meter

NCPN: Northern Colorado Plateau Network

NPS: National Park Service

OBL: obligate wetland plant

m²: square meter

UDAF: Utah Department of Agriculture and Food

UPL: upland plant

USACE: U.S. Army Corps of Engineers

USDA: U.S. Department of Agriculture

Introduction

Project Background

Small water sources, such as springs and wetlands in intermountain parks, are often of resource management concern. This is because they provide unique resources and habitat for plants and wildlife, and they may be vulnerable to developments outside of park boundaries and to climate change. Some of these resources also have or could have special protections through water rights agreements with states. However, measuring the hydrology of these water sources can be difficult because they often have diffuse to low flow.

Seven National Park Service (NPS) units (or parks) within the Northern Colorado Plateau Network (NCPN) determined the need to evaluate and map spring and wetland conditions based on the presence/absence of perennial obligate (OBL) and facultative wetland (FACW) plant species known to occur in the parks. Mapping spring and wetland areas for each park provides a baseline measurement of areas sensitive to drying that can be used to monitor change over time.

Project Objective, Goals, and Parameters

The overall objective of the project was to establish baseline conditions for the area and condition of wetlands, seeps, and springs to provide supporting evidence for future water rights filings and/or claims of impairment resulting from groundwater management actions. While impairment is determined by state engineers, establishing a baseline where decreases in OBL and FACW species can be measured will help the NPS and its co-managers document impairment. The approach used during the surveys described in this report was developed as an indicator of impairment in coordination with the NPS Water Resources Division.

The project's goals included:

- Document the presence/absence of wetland vascular plant species (OBL and FACW) within seven NCPN parks.
- Map spring and wetland areas defined as those with more than 50 percent (%) perennial wetland (OBL and FACW) herbaceous and shrub plant cover.
- Take representative photos of the spring and wetland areas. When provided by the parks, these may have included rematches of historic photos.

Project parameters that defined the scope of the work and specified criteria for data collection and deliverables included:

- Conducting standardized fixed-area surveys for target species using standard sampling techniques that sufficiently detected target species and measured percent cover.
- Sampling ensured all prioritized sites were investigated.
- Plot placement included replication and was sufficient to detect the presence of targeted wetland species and determine the perimeter of wetlands as defined by >50% cover of target species.

- When conditions allowed, the perimeter of the area with greater than 50% perennial wetland (OBL and FACW) herbaceous and shrub plant cover was mapped with sub-meter accuracy. However, there were areas in canyons that did not have sufficient sky view to receive a satellite signal for sub-meter accuracy, and these were mapped using the best Global Positioning System (GPS) accuracy available.
- Cover of wetland trees, such as cottonwoods without underlying wetland herbs and shrubs, was excluded from the perimeter.
- In spring systems feeding an extensive stream-type riparian area, the survey area was capped at 50 meters (m) downstream from the spring orifice for the purposes of this inventory.
- For sites too large to sample effectively or efficiently, or if more than one wetland polygon was present at a site, only a portion of the site was selected for sampling. This was typically the largest wetland polygon, the most mesic polygon, and/or the polygon that included a spring orifice.
- Observation data were summarized and reported by site (i.e., wetland area, perimeter length, and wetland species diversity).
- Specimens were not collected, unless necessary to verify plant species identification. When collected, they were destroyed during analysis.
- Ancillary data at each site were related to specific park needs (determined prior to commencing field work). Some of the parks requested additional simple metrics be collected at a site that did not require additional expertise and were not expected to require a significant amount of additional time to record. The NCPN identified three preliminary data categories to be included in the data collection: (a) presence of animal use at sites; (b) impacts from recreation; and (c) presence of spring development structures.

Project Locations

Mapping took place at seven parks and national monuments in Utah and Colorado served by the NCPN, including:

- Black Canyon of the Gunnison National Park (BLCA)
- Bryce Canyon National Park (BRCA)
- Capitol Reef National Park (CARE)
- Cedar Breaks National Monument (CEBR)
- Colorado National Monument (COLM)
- Curecanti National Recreation Area (CURE)
- Dinosaur National Monument (DINO)

This report describes the approach and summarizes the results of mapping and surveys at COLM. The priority survey sites were identified by COLM staff, and most required verification to inform the

potential for adjudication of diligence rights on their sources. The priority sites are found in Table 1 and Figure 1.

Table 1. Colorado National Monument priority survey sites.

Site ID	Area/Name	Priority	Area (ac)
COLM 1	MC-12A Phrag Seep	1	2.5
COLM 2	Echo Canyon	1	19.8
COLM 4	Slip n Slide Seeps	1	0.9
COLM 5	Trail to Box Canyon	1	7.8
COLM 7	N/A	1	3.1
COLM 10	Suction Point	1	0.2
COLM 13	Alpine Veg	1	11.4
COLM 3	Willow Warrior	2	5.6
COLM 12	To the W	2	48.2
COLM 14	1 st Waterfall to 2 nd Waterfall	2	18.0
COLM 15	1 st Pool to 1 st Waterfall	2	13.5
COLM 6	Tall Hippo Spring	3	5.7
COLM 8	Precambrian Outcrop	3	1.6
COLM 9	Waterfall	3	2.0
COLM 11	East Tunnel Wash-orchids	3	9.3
COLM 16	Ivy Park Seep	3	5.0
COLM 17	Globe Willow Seep	3	2.9

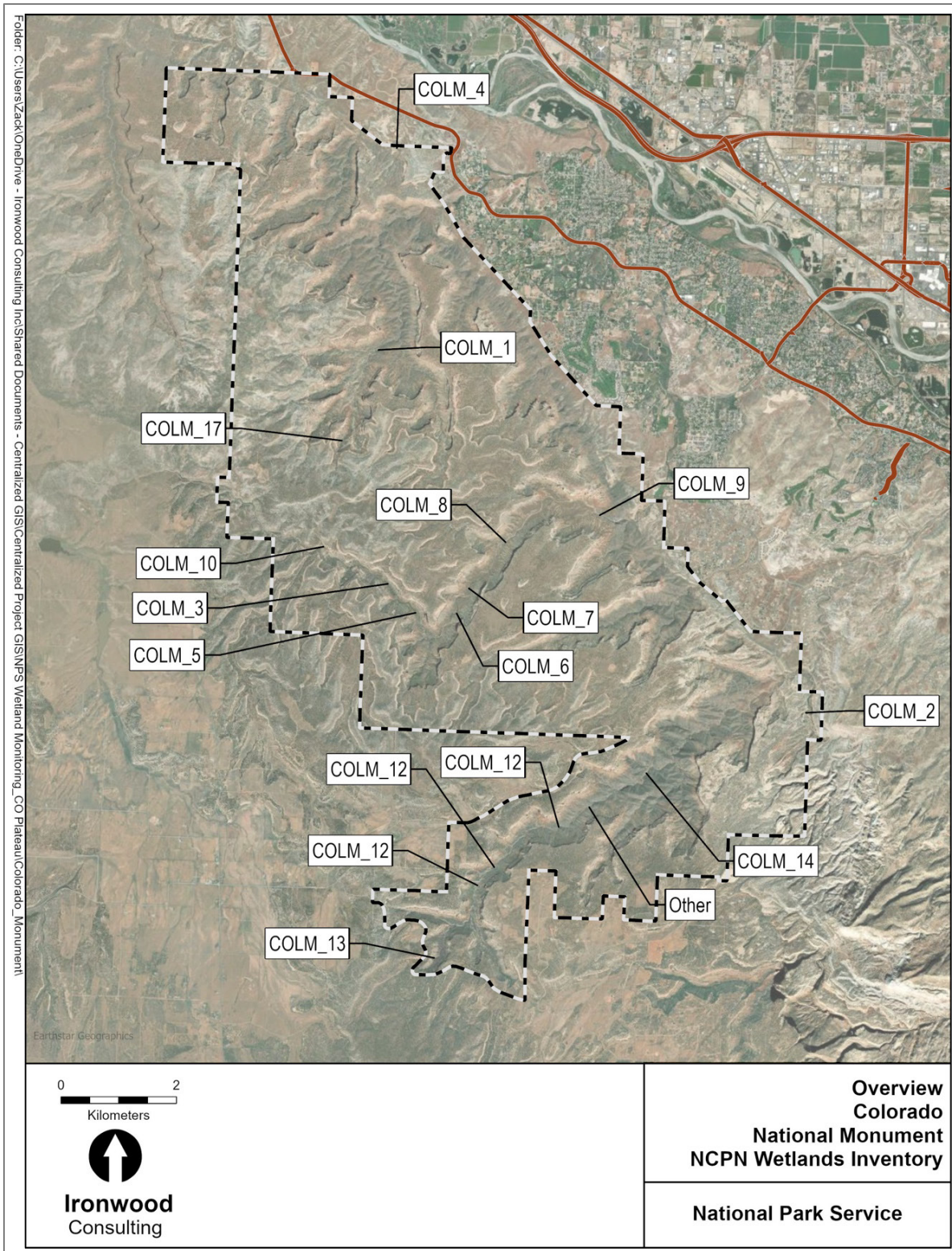


Figure 1. Colorado National Monument overview with priority survey areas.

Methods and Materials

Ironwood completed a project work plan (Ironwood 2021a) that detailed the survey methods, including project locations, staffing roles, project schedules, equipment and materials, pre-field coordination and geospatial analyses, data management protocols, and injury and illness prevention plans. Field methods, data management practices, and analysis methods are outlined below.

Pre-Survey Geospatial Analysis and Preparation

Geographic information systems (GIS) data provided by the NPS were used to analyze the location, number, and, if possible, the rough size of seeps, springs, and wetlands to be mapped and evaluated (Figure 1, Table 1). Each survey site was assigned a unique general identification code.

Prior to field work, project maps and tables identifying priority wetlands/springs were prepared using GIS data provided by the NPS. Maps were prepared at a scale of 1:1000 and included topographic lines, labels for prominent landmarks and geographic features, waterbodies, roads, and recent aerial photograph backgrounds. Large (24 inch x 36 inch) printed maps were provided to field staff for navigation and field planning. Digital maps were also created in ArcGIS Field Maps.

Ironwood created a data collection interface using ArcGIS Field Maps and Pendragon that was compatible with cell phones and tablets in the field for all data points outlined in the Data Management Section of this report. Field crews used tablets in the field that stored data locally and connected to cloud storage when in cellular service, so data were regularly backed-up and available for initial review and quality assurance/quality control.

Goal 1: Documenting Wetland Species

The field procedure for documenting wetland species at each survey site was a modified version of the U.S. Department of Agriculture (USDA) Groundwater-Dependent Ecosystem (GDE) Level II Methodology (used whenever a groundwater-dependent wetland was present; USDA and USFS 2012). The protocol was intended to describe a site's general condition, monitor major changes over time, and make comparisons among sites of a certain type or within a specific region. The protocol was not intended for evaluating certain wetlands within the floodplains of surface water bodies, such as hanging gardens and riparian areas.

The full protocol, with redlined non-applicable text, is available in the Ironwood Work Plan (Ironwood 2021a); modifications are described below.

Groundwater-Dependent Ecosystem Level II Methodology

The vegetation components of the GDE Level II protocol were used when collecting associated vegetation data for sites identified as groundwater-dependent wetlands.

During the site evaluation, collected data included location, slope, aspect, elevation, surrounding (non-wetland) vegetation, geologic setting, surface material (no soil samples were taken), groundwater source characterization, and plant species composition. The GDE type was determined using the dichotomous key from Stevens et al. 2021. Photos of the site were taken per the GDE Level

II protocol, and a detailed, scaled map of the wetland was subsequently completed in the office using sub-meter GPS data collected in the field.

Transects to evaluate species composition were established following the methods outlined in the GDE Level II protocol, with modifications described below.

The wetland perimeter was mapped (see Goal 2: Mapping Springs and Wetlands) and the area and long axis of the wetland were determined. Each end of the long axis was marked using a sub-meter GPS and labeled “Long Axis Start” and “Long Axis End.” A fiberglass measuring tape was run between these two points, with the origin at the Long Axis Start. Transects were oriented perpendicular to the bearing of the long axis, with the transect origin placed on the left side of the long axis, as viewed from standing at the Long Axis Start and facing the Long Axis End. Compass bearings were determined at all sites using a declination of 10 degrees (°) east. The first transect began near the Long Axis Start and was placed perpendicular to the long axis line. Quadrats were then placed at regular intervals along each transect. Transect and quadrat intervals are outlined in Table 2.

Table 2. Criteria for determining quadrat number and interval using the GDE Level II protocol.

Size of GDE (m²) ^A	Transect Interval (m)	Quadrat Interval (m)
< 20	1.5	1.0
20 to 40	2.0	2.0
40 to 80	3.0	2.0
80 to 150	3.0	2.0
150 to 250	4.0	3.0
250 to 500	5.0	4.0
500 to 750	6.0	5.0
750 to 1,000	7.0	6.0
1,000 to 1,500	8.0	7.0
1,500 to 2,500	10.0	9.0
2,500 to 4,000	12.0	10.0
4,000 to 6,000	16.0	12.0
6,000 to 8,000	18.0	14.0
8,000 to 10,000	20.0	16.0
> 10,000 ^B	—	Divide into smaller units

^A Square meter (m²)

^B Sites larger than 10,000 m² required too many quadrats to sample during a single day. Depending on the purpose of the inventory, these sites may need to be divided to facilitate inventory.

In each quadrat, visual cover was measured for each plant species using a 0.5 square meter (m^2) quadrat at a quantity and interval determined by the area of the wetland after mapping the wetland boundary (Table 2). A cut-level was used when recording visual cover estimates. Plants within the quadrat with visually estimated cover below the 1% cut-level were not recorded. Quadrats were placed along the left side of the perpendicular transect tape, as determined by looking down the transect from its origin. A random number generator was used to determine a value between 0.0 m and the quadrat interval distance (minus 0.5 m) when placing the first quadrat. The quadrat started at the point corresponding to the distance number along the transect and extended 0.5 m beyond this point. After the first quadrat was randomly located, the set interval was used for all subsequent quadrats until the entire quadrat could no longer fit inside the wetland boundary along that transect. This process was repeated for each transect. The total number of transects at COLM survey sites using this methodology ranged from 1 to 11, and the total number of quadrats at each site ranged from 4 to 15. Details about the number of transects and quadrats used at each GDE site are found in the COLM data deliverable.

A combination of line intercept and spherical densiometer methods were implemented to determine woody species cover and composition. When present, live woody plant cover was collected using line intercept sampling along each transect as described in the GDE Level II protocol. Overstory cover of live and dead woody plants greater than 4 ft in height and other cover (e.g., canyon walls) were recorded using a spherical densiometer at 3 locations along each transect: 1) at the transect origin, 2) at the transect end, and 3) at the center quadrat of the transect for transects longer than 15 m, or in the center of the transect line for transects less than 15 m. Non-plant groundcover was visually estimated within the quadrat. Additional plant species observed within the wetland that were not captured in the quadrats or the line intercept were noted on the data form. If more than one wetland polygon was mapped at a site, a single polygon was selected to establish a GDE transect, which was typically the largest polygon, the most mesic polygon, and/or the polygon that included a spring orifice.

Goal 2: Mapping Springs and Wetlands

To meet Goal 2, wetland boundaries were mapped using the vegetation section of the U.S. Army Corps of Engineers (USACE) Wetland Vegetation Dominance Test (USACE 2008). The data form provided a rubric for determining if hydrophytic vegetation (defined as having a wetland indicator status of OBL and/or FACW according to the 2020 USACE Wetland Indicator Status [USACE 2020] for the Western Mountains, Valleys, and Coast Region) met or surpassed the absolute cover threshold to be considered a wetland through a quantitative dominance test.

The dominance test was used to determine where hydrophytic vegetation transitioned to upland vegetation cover, and thus to identify the boundary of the wetland. Wetland and upland species at the wetland boundaries were identified, and absolute cover composition was quantitatively determined in the field. If more than one wetland polygon was present at a site, each was mapped separately. A gap in wetland vegetation cover greater than 5 m^2 was used to determine when a wetland ended, and another began.

The following guidelines were observed when mapping wetlands:

- The site was assessed upon arrival to determine how to minimize damage to soils, plants, and hydrologic processes during the survey. If necessary, an approach to collecting data was devised to avoid damaging soils.
- Upon arrival at each site, a polygon was mapped with sub-meter accuracy (when possible) within ArcGIS Field Maps along the boundary between the wetland and upland vegetation communities using the USACE Dominance Test. Wetland areas were represented by having greater than 50% OBL and/or FACW absolute plant cover by herbaceous and shrub species. Upland areas included greater than 50% facultative (FAC), facultative upland (FACU), and/or upland (UPL) absolute plant cover. Cover of wetland trees such as cottonwoods without underlying wetland herbs and shrubs were excluded from the perimeter.
- Each crew mapped the wetland boundary using an Eos Arrow 100 sub-meter GPS receiver connected to a Bluetooth-enabled device to input field data into the data dictionary. The ArcGIS Field Maps application was used to calculate the area (in m²) and the length of the long axis of the wetland. This determined the perpendicular transect locations and microplot quantity and placement using the USDA Forest Service GDE Level II protocol. The polygon also served as the wetland delineation deliverable required of all sampled seeps/springs/wetlands under this contract.
- If a site failed the USACE Dominance Test (i.e., less than or equal to 50% OBL and/or FACW absolute plant cover) and no wetland characteristics were observed, a walk-through of the site with photos was conducted. In addition, a single transect with three herbaceous vegetation cover quadrats using the modified GDE Level II Protocol through the most mesic part of the feature was carried out; no delineation was performed.
- At CEBR and BRCA, each end of the long axis of the polygon determined where the capped aluminum conduit permanent plot pins were set. Additional monuments were added if the long axis distance exceeded 100 m or if there were distinct bends (“doglegs”). An additional monument was added for every additional 100 m the transect extended and/or when the long axis trajectory changed at the bend. Each aluminum conduit cap was scribed with the site name. The depth of the monument below ground was between 12 and 18 inches. The height of the monument above ground did not exceed 12 inches.
- At all other parks (BLCA, CARE, COLM, CURE, and DINO), no permanent monuments were used at the sites. Sub-meter GPS data were collected according to the specifications at each end of the long axis (Table 3). Additional points were taken if the long axis exceeded 100 m, or if there were distinct doglegs.

Table 3. GPS settings and accuracy parameters.

Parameter	Setting
Accuracy	75 centimeters (cm)
GPS Averaging	OFF; (If averaging a non-monumented point, turn ON and average 30 points)
95% Confidence	OFF
Streaming	46 cm
Photo Upload Size	Large
Related Type	Filtered; Show Related Type set to "OFF"
Offset	None
Snapping	OFF
Provider	EOS Positioning Systems # 1830#### (series specific to the device)
Antenna Ht.	1.5 m
Profile	Default (GCS WGS 1984)
Units	Metric
Coordinates	UTM
Distance	Meters
Area	Square meters

Non-wetland Negative Data

At sites where the absolute plant cover of OBL or FACW species was less than 50% and wetland characteristics were not present, field staff did not complete the GDE Level II survey protocol. If hydrologic features were present (e.g., spring orifices or flowing channels), these features were mapped; however, no wetland delineation was conducted.

If neither wetland characteristics nor other evidence of a spring were present, then the site was documented as negative data and no GDE Level II survey occurred. Instead, field staff took photos facing each cardinal direction standing at the center of the site. At non-GDE sites that were identified as potential springs, a single transect was placed running through the most mesic part of the site. Three 0.5-m² quadrats were spaced evenly along the transect and herbaceous cover data were visually estimated within each quadrat. No wetland delineation was conducted.

GPS Settings and Accuracy

Sub-meter GPS mapping was acquired for mapped wetlands whenever adequate satellite reception was available, with a few exceptions. The GPS parameters listed in Table 3 were used to ensure accurate and consistent boundary mapping. Eos Arrow 100 receivers were used to achieve sub-meter accuracy whenever possible. The mapping interface used was the ArcGIS Field Maps app with the data parameter setting options indicated in Table 3. When difficult satellite constellation or topography (e.g., a narrow canyon) precluded sub-meter data collection, an accuracy setting

requirement was modified, as necessary. In these instances, a less accurate polyline or point was achieved.

Goal 3: Representative Photos

As part of the methods discussed above, multiple photos were taken at each wetland following guidance outlined in the respective methods found in the GDE Level II protocol (Ironwood 2021b). Additional photos may have included overall landscape context photos and a representative photo along the wetland boundary. All photos were taken using the geo-referencing application Solocator, which provided a copy of each photo with Universal Transverse Mercator (UTM) location, aspect, elevation, date, time, project name, and a brief description. The description field described anything notable about the subject of the photo.

All photos were saved in jpeg format, labeled, and backed up each evening. Photo labels included:

- Park abbreviation
- Survey site name abbreviation
- Description of photo
- Date of photo
- Project description

An example of a labeled photo is “COLM_ID123_Description_MMDD2021_NCPN Seeps and Springs Inventory.jpeg.”

Other Park-specific Metrics

In addition to completing one of the methodologies previously described, this section includes the metrics that were evaluated and the data that were collected during the site visits.

Wildlife and Livestock Usage Metric

The presence of target animal scat and/or tracks observed within the quadrats was recorded and the frequency of each type was calculated. Target animal species included moose, elk, deer, sheep, bear, mountain lion, bison, and recent cattle signs. Incidental observations of target species, humans, and aquatic vertebrates were noted.

Wildlife usage data were collected at all six park units using the methodology in the work plan (Ironwood 2021a).

Recreation Impacts Metric

Any campsites, vehicle tracks, and human footpaths (social trails) within 100 ft of the site were also noted. After the site was evaluated, qualitative management indicator tools for recreation impacts were used to assess the site.

Recreation impact data were collected using the qualitative management indicator tool for recreation outlined in the GDE Level II protocol in the work plan (Ironwood 2021a).

Spring Development Metric

The data collection methods included categorical data for spring development, if present. Categories included fences, tanks, pipes, dams, windmills, pumps, spring boxes, trenches and ditches, and others (described). Point data were taken at the approximate center point for each structure or development encountered. Spring development data were collected at all park units.

COLM Specific Metrics

Within COLM, data for cottonwood seedlings within the wetland, seep, or spring perimeter were collected using the following methods. Cottonwood seedlings were:

- Counted within the wetland perimeter.
- Searched for and recorded within the greater cottonwood canopy area associated with the wetland.

Cottonwood seedlings were identified as having small but discernably cottonwood-shaped leaves and lacked evidence of sprouting from a mature individual.

Data Management

All data were recorded electronically on the application interface designed for the project using ArcGIS Field Maps and Pendragon on field tablets. Data were uploaded to cloud storage at the end of the workday or when cellular or internet service was available. All photos were saved, labeled, and backed-up each evening.

Spatial Data

Spatial data collected during the surveys included wetland boundary mapping, site evaluations, and photos. Spatial field data collection equipment included:

- **Recreational-grade GPS units:** Each crew member carried a GPS unit that was capable of 5 m or greater accuracy, such as a handheld Garmin unit or smartphone GPS application, that was used to navigate to sites and collect tracks.
- **Sub-meter GPS units:** Each team had an Eos Arrow 100 sub-meter GPS receiver that was used with a Bluetooth-enabled device to input field data into the data dictionary. The Eos Arrow 100 is a mapping-grade GPS unit that can achieve accuracy at the sub-meter scale.
- **Data collection interface:** ArcGIS Field Maps was used to collect spatial data and transfer it to cloud storage. An interface was created for cell phones and tablets in the field for all data collection. The data collection interface was available offline when cell service was not available, and data were uploaded to cloud storage upon re-entering cell service.

Tabular Data

Tabular data included species lists, photo lists, and geospatial metadata. Tabular data included all fields necessary, so data were broadly useful, including dates, UTM coordinates, descriptions, associated files, data types, observers, survey sites, species, etc. All plant species lists included USDA PLANTS database codes (USDA and NRCS 2023). Tabular data were compiled after the field data collection was completed from digital data forms.

Data Accuracy and Quality

To ensure data were collected accurately, all botanists and botany technicians were trained in data collection methodology. A botanist or botany technician was assigned the role of Data Collection Lead for each team. This person was tasked with reviewing the data fields for accuracy and completeness. A different crew member was assigned the role of filling out and keeping the species list.

The Project Manager and/or the Assistant Project Manager was present in the field during all data collection activities to help ensure that the workplan was followed and that data documentation adhered to the NPS requirements. At the end of each field day, data were reviewed in the field by the Project Manager or Assistant Project Manager to ensure completeness, accuracy, and quality. If data errors were detected, the GIS/Data Lead contacted the Project Manager and/or Assistant Project Manager, and the data were corrected and re-reviewed by the GIS/Data Lead.

Results

Surveys took place between July 7 and July 14, 2021, and on October 7, 2021. All priority 1, 2, and 3 sites were surveyed. Fourteen of the 17 surveyed areas were identified as GDE sites, with evidence of springs present (Table 4, Appendix A).

Table 4. List of surveyed sites identifying whether each was described as a GDE or non-GDE.

Site ID	Site Name	Site Type	Primary GDE Type
COLM 1	MC-12A Phrag Seep	GDE	Hypocrene
COLM 2	Echo Canyon	GDE	Rheocrene
COLM 3	Willow Warrior	GDE	Hypocrene
COLM 4	Slip n Slide Seeps	GDE	Hypocrene
COLM 5	Trail to Box Canyon	GDE	Hypocrene
COLM 6	Tall Hippo Spring	GDE	Hypocrene
COLM 7	N/A	GDE	Hypocrene
COLM 8	Precambrian Outcrop	GDE	Hypocrene
COLM 9	Waterfall	GDE	Hypocrene
COLM 12	To the W	GDE	Hypocrene
COLM 13	Alpine Veg	GDE	Hillslope
COLM 14	1 st Waterfall to 2 nd Waterfall	GDE	Hypocrene
COLM 15	1 st Pool to 1 st Waterfall	GDE	Hypocrene
COLM 17	Globe Willow Seep	GDE	Hypocrene
COLM 10	Suction Point	Non-GDE	–
COLM 11	East Tunnel Wash-orchids	Non-GDE	–
COLM 16	Ivy Park Seep	Non-GDE	–

The dominant herbaceous species reported in the GDE herbaceous vegetation quadrat summary tables were determined using the USACE Dominance Test. Only OBL and FACW plants were considered vegetative wetland indicators for this project.

COLM 1 (MC-12A Phrag Seep)

COLM 1 (MC-12A Phrag Seep) was located at an elevation of approximately 1,616 m with an overall northeast (23°) aspect and low slope variability across the site. Wetland vegetation, a spring orifice, and wetted soil surfaces provided evidence of groundwater. The spring type was characterized as hypocrene. This GDE site included a total wetland area of 0.48 acre (ac; 1,962.6 m²) and 590.2 m of wetland perimeter (Appendix B, Figure 2).

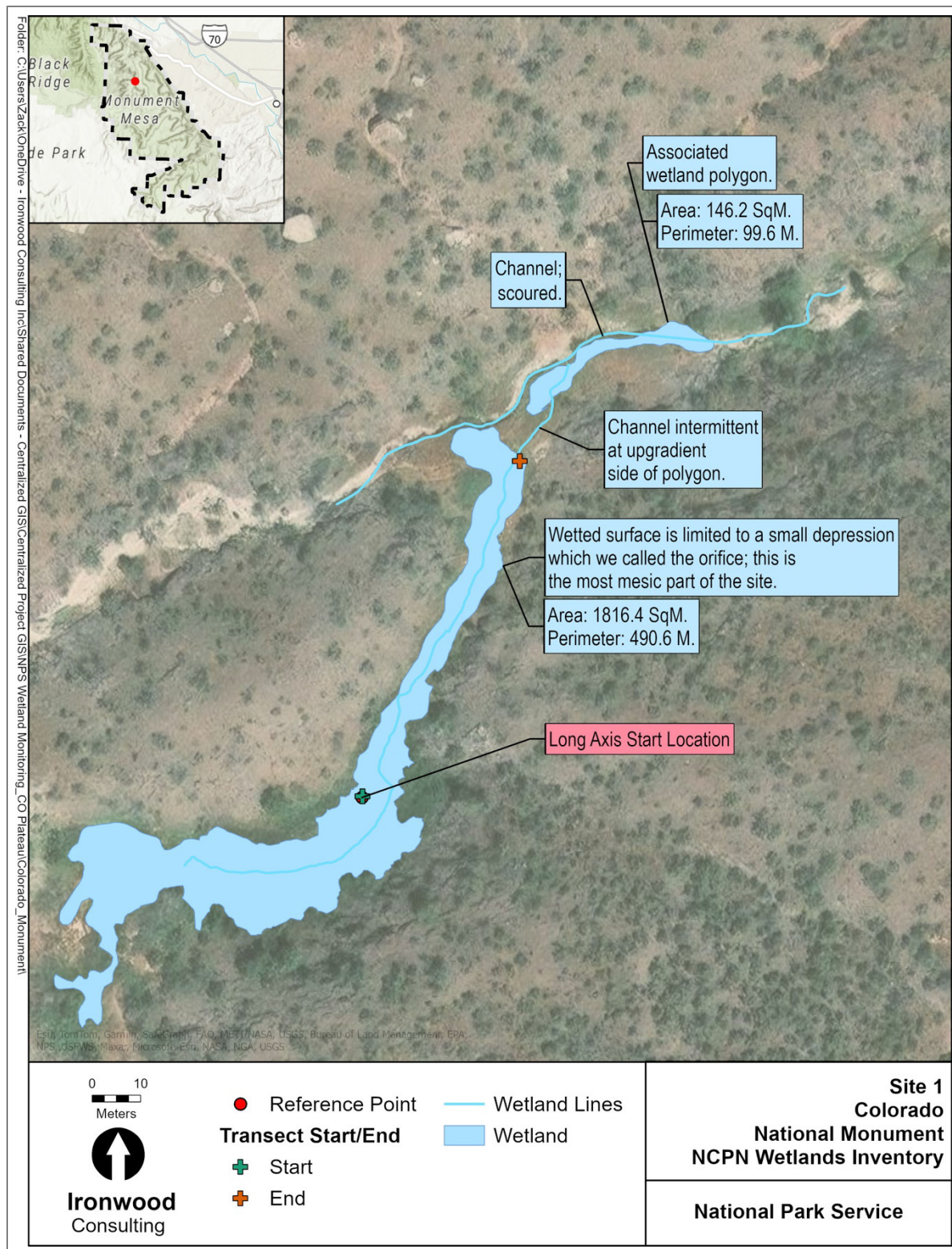


Figure 2. Wetland mapping for COLM 1 (MC-12A Phrag Seep).

Sixteen plant taxa were recorded during the GDE Level II survey, including 13 taxa captured in herbaceous vegetation quadrats (Appendix D, Table 5). Total average herbaceous cover was 50.9%. The dominant herbaceous plants were Baltic rush (*Juncus balticus* var. *montanus*), white panicle aster (*Symphyotrichum lanceolatum*), and cheatgrass (*Bromus tectorum*) with 15.8%, 9.4%, and 6.6% average absolute cover, respectively. Litter was the only ground cover hit in the herbaceous vegetation quadrats (Table 6). There was no woody line intercept cover.

The non-native plants common reed (*Phragmites australis*), prickly lettuce (*Lactuca serriola*), and ripgut brome (*Bromus diandrus*) were present at this site. The noxious weed cheatgrass was also present.

No recreation impacts or spring developments were observed. Bighorn sheep and deer sign were observed outside of the herbaceous vegetation quadrats (Appendix C).

Table 5. Herbaceous vegetation quadrat data for COLM 1 (MC-12A Phrag Seep). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	15.8	100
<i>Symphyotrichum lanceolatum</i>	white panicle aster	N	OBL	9.4	50
<i>Bromus tectorum</i>	cheatgrass	NOX	UPL	6.6	63
<i>Muhlenbergia asperifolia</i>	scratchgrass	N	FACW	5.6	13
<i>Distichlis spicata</i>	desert saltgrass	N	FAC	5.1	50
<i>Phragmites australis</i>	common reed	I, N	FACW	4.9	25
<i>Crepis runcinata</i>	fiddleleaf hawksbeard	N	FACU	1.3	13
<i>Sporobolus airoides</i>	alkali sacaton	N	FAC	0.8	13
<i>Equisetum laevigatum</i>	smooth scouring-rush	N	FACW	0.6	13
<i>Bromus diandrus</i>	ripgut brome	I	UPL	0.3	13
<i>Clematis ligusticifolia</i>	white virgin's-bower	N	FAC	0.3	13
<i>Lactuca serriola</i>	prickly lettuce	I	FACU	0.3	25
<i>Pascopyrum smithii</i>	western wheatgrass	N	FAC	0.1	13
Bryophytes	moss	–	–	–	–
Total	–	–	–	50.9	–
50% of Total	–	–	–	25.4	–
20% of Total	–	–	–	10.2	–

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 6. Groundcover quadrat data for COLM 1 (MC-12A Phrag Seep).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	–
Boulder	–
Bedrock	–
Basal	–
Litter	100.0
Water	–
Wood	–
Soil	–
Total	100.0

COLM 2 (Echo Canyon)

COLM 2 (Echo Canyon) was located at an elevation of approximately 1,501 m, with an overall northeast (28°) aspect and low slope variability across the site. Channel flow, spring orifices, standing water, and wetland vegetation provided evidence of groundwater at this site. The spring type was characterized as rheocrene. This GDE site included a total wetland area and perimeter of 0.28 ac (1,148.9 m²) and 550.3 m, respectively (Appendix B, Figure 3).

Seventeen plant taxa were encountered during the GDE Level II survey, including 15 taxa captured in herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 7, Table 8). The total average herbaceous cover was 21.8%. The dominant herbaceous plant was smooth scouring-rush (*Equisetum laevigatum*) with 16.0% average absolute cover. Groundcover included litter, soil, water, boulder, stone, and basal with 71.2%, 9.6%, 7.7%, 5.8%, 3.8%, and 1.9% average corner hits, respectively (Table 9). The total average woody line intercept cover was 17.8%. Coyote willow (*Salix exigua*), narrow-leaved cottonwood (*Populus angustifolia*), spear-leaf rabbitbrush (*Chrysothamnus linifolius*), strapleaf willow (*Salix ligulifolia*), skunkbush sumac (*Rhus trilobata*), and eastern cottonwood (*Populus deltoides*) had average woody line intercept covers of 10.4%, 4.3%, 1.5%, 0.8%, 0.5%, and 0.3%, respectively.

The non-native plant recorded at this site was redtop (*Agrostis stolonifera*). The noxious weed cheatgrass was also present.

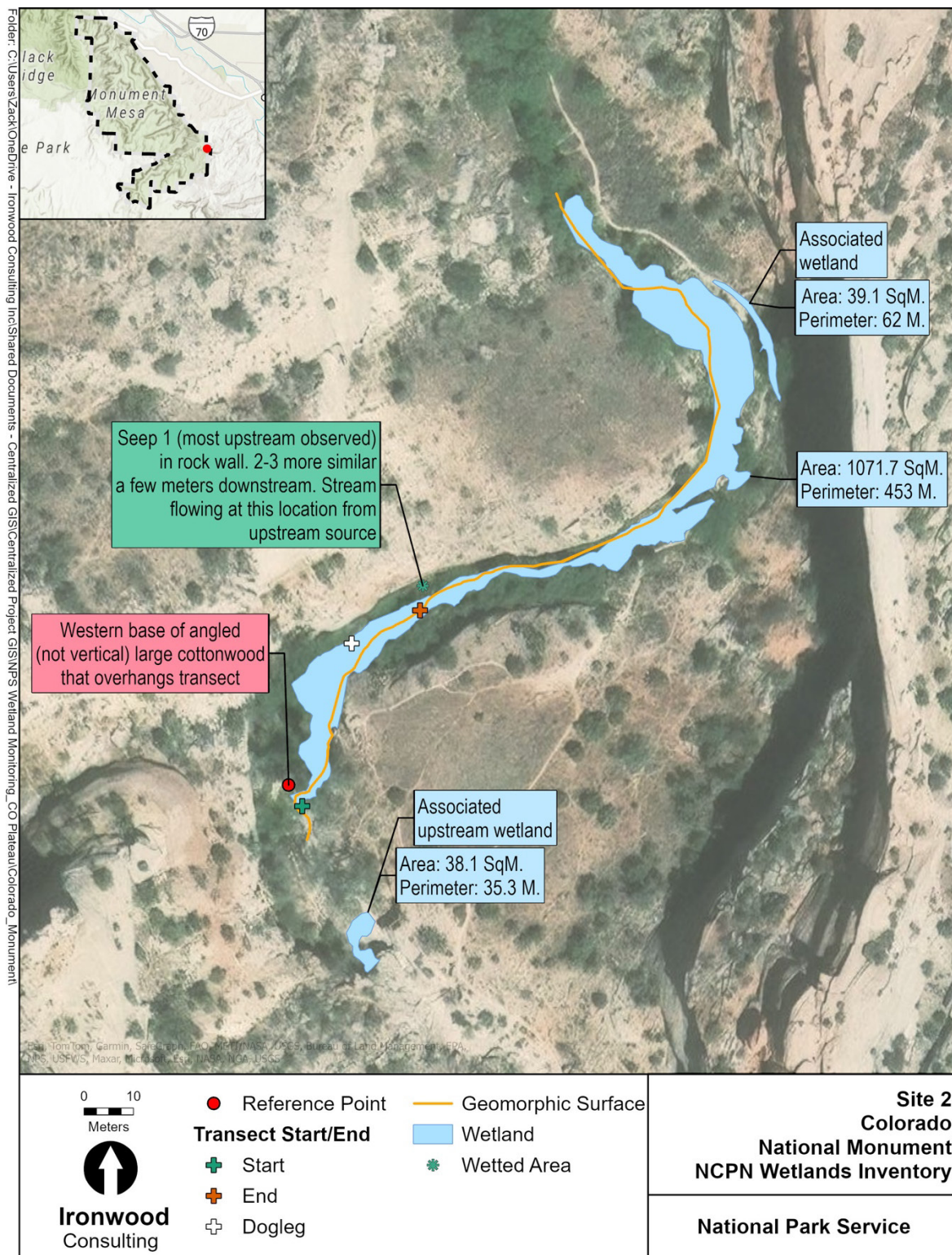


Figure 3. Wetland mapping for COLM 2 (Echo Canyon).

Table 7. Herbaceous vegetation quadrat data for COLM 2 (Echo Canyon). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Equisetum laevigatum</i>	smooth scouring-rush	N	FACW	16.0	85
<i>Typha domingensis</i>	southern cattail	N	OBL	1.4	31
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	0.9	23
<i>Chrysothamnus linifolius</i>	spear-leaf rabbitbrush	N	FAC	0.8	15
<i>Agrostis stolonifera</i>	redtop	I	FACW	0.8	46
<i>Populus deltoides</i>	eastern cottonwood	N	FAC	0.6	8
<i>Schoenoplectus pungens</i>	common threesquare	N	OBL	0.5	31
<i>Populus angustifolia</i>	narrow-leaved cottonwood	N	FACW	0.4	8
<i>Cirsium arizonicum</i>	Arizona thistle	N	FACU	0.2	8
<i>Clematis ligusticifolia</i>	white virgin's-bower	N	FAC	0.2	8
<i>Grindelia fastigiata</i>	erect gumweed	N	UPL	0.1	8
Bryophytes	moss	–	–	–	–
Total	–	–	–	21.8	–
50% of Total	–	–	–	10.9	–
20% of Total	–	–	–	4.4	–

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 8. Woody vegetation line intercept summary data for COLM 2 (Echo Canyon).

Species	Common Name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Salix exigua</i>	coyote willow	N	FACW	10.4
<i>Populus angustifolia</i>	narrow-leaved willow	N	FACW	4.3

Table 8 (continued). Woody vegetation line intercept summary data for COLM 2 (Echo Canyon).

Species	Common Name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Chrysothamnus linifolius</i>	spear-leaf rabbitbrush	N	FAC	1.5
<i>Salix ligulifolia</i>	strapleaf willow	N	FACW	0.8
<i>Rhus trilobata</i>	skunkbush sumac	N	FACU	0.5
<i>Populus deltoides</i>	eastern cottonwood	N	FAC	0.3
Total	–	–	–	17.8

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 9. Groundcover quadrat data for COLM 2 (Echo Canyon).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	3.8
Boulder	5.8
Bedrock	–
Basal	1.9
Litter	71.2
Water	7.7
Wood	–
Soil	9.6
Total	100.0

Recreational impacts included foot trails nearby. No spring developments were observed. Bighorn sheep sign occurred within the herbaceous vegetation quadrats with 8% frequency (Appendix C). Bighorn sheep sign and an unidentified toad were also observed outside the herbaceous quadrats.

COLM 3 (Willow Warrior)

COLM 3 (Willow Warrior) was located at an elevation of approximately 1,815 m, with an overall southeast (134°) aspect and low slope variability across the site. Moist soil and wetland vegetation provided evidence of groundwater at this site. The spring type was characterized as hypocrene. This GDE site included a total wetland area and perimeter 2.47 ac (10,005.1 m²) and 1,045.3 m, respectively (Appendix B, Figure 4).

Sixteen plant taxa were encountered during the GDE Level II survey, including 10 taxa captured in herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 10, Table 11). The total average herbaceous cover was 7.7%. The dominant herbaceous plants were slender wheatgrass (*Elymus trachycaulus*), and tall fescue (*Lolium arundinaceum*) with 3.4% and 2.3% average absolute cover, respectively. Groundcover included litter and soil with 98.3% and 1.7% average corner hits, respectively (Table 12). The total average woody line intercept cover was 62.9%. Coyote willow and greenleaf willow (*Salix lasiandra*) had average woody line intercept covers of 59.7% and 3.1%, respectively. Therefore, this wetland was dominated by FACW shrubs with a relatively sparse underlayer of herbaceous plants.

The non-native plants recorded at this site were alyssum (*Alyssum simplex*), common reed, Kentucky bluegrass (*Poa pratensis*), narrowleaf plantain (*Plantago lanceolata*), orchard grass (*Dactylis glomerata*), prickly lettuce, and tall fescue. The noxious weeds Canada thistle (*Cirsium arvense*) and cheatgrass were also present.

No recreational impacts or spring developments were observed. Bear and deer sign occurred within the herbaceous vegetation quadrats, each with 7% frequency (Appendix C). Both sign types were also observed outside the herbaceous quadrats.

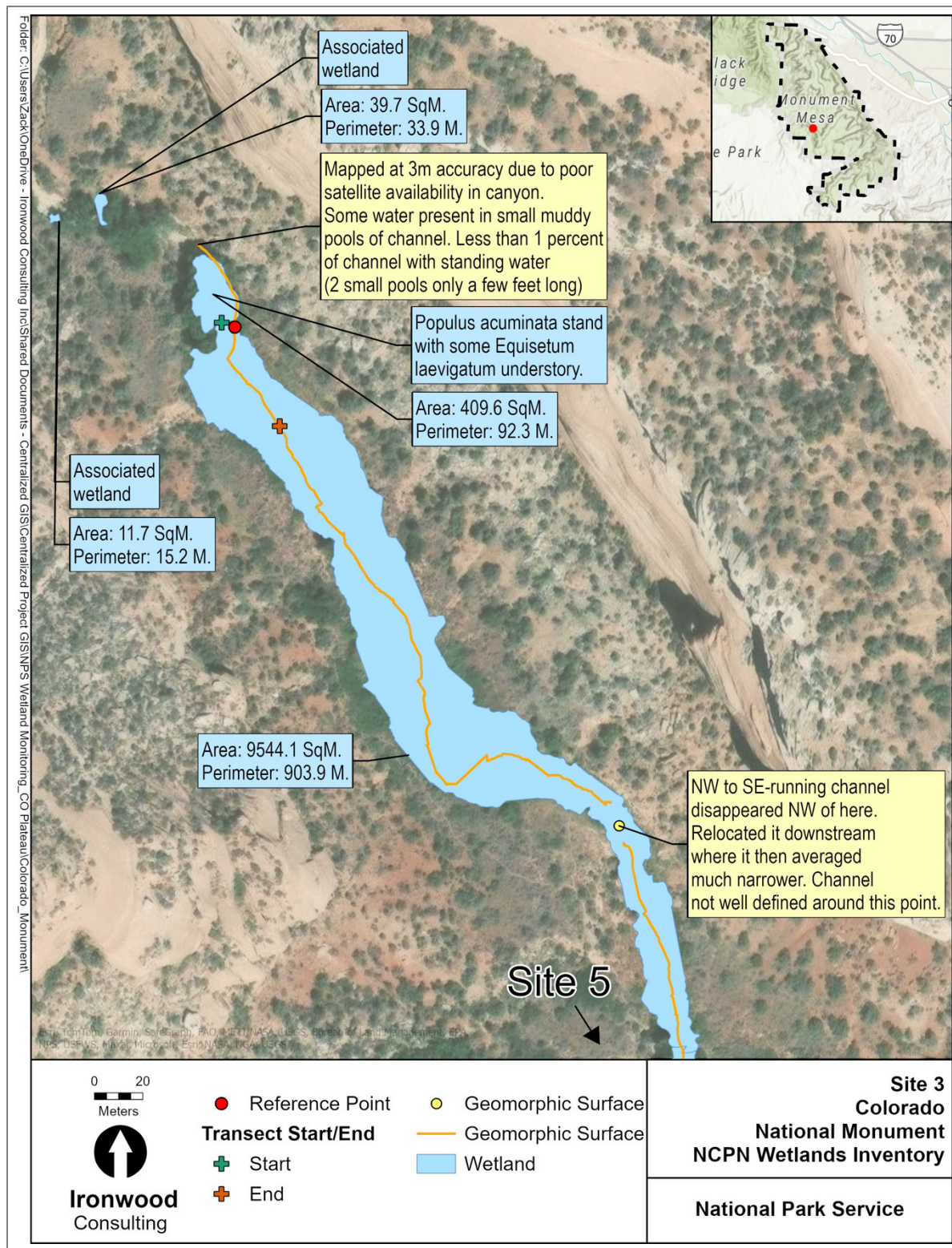


Figure 4. Wetland mapping for COLM 3 (Willow Warrior).

Table 10. Herbaceous vegetation quadrat data for COLM 3 (Willow Warrior). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Elymus trachycaulus</i>	slender wheatgrass	N	FACU	3.4	53
<i>Lolium arundinaceum</i>	tall fescue	I	FACU	2.3	13
<i>Equisetum laevigatum</i>	smooth scouring-rush	N	FACW	0.9	67
<i>Dactylis glomerata</i>	orchard grass	I	FACU	0.5	7
<i>Poa pratensis</i>	Kentucky bluegrass	I, N	FAC	0.3	7
<i>Bromus tectorum</i>	cheatgrass	NOX	UPL	0.1	13
<i>Lactuca serriola</i>	prickly lettuce	I	FACU	0.1	7
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	0.1	7
Bryophytes	moss	–	–	–	–
Total	–	–	–	7.7	–
50% of Total	–	–	–	3.9	–
20% of Total	–	–	–	1.5	–

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 11. Woody vegetation line intercept summary data for COLM 3 (Willow Warrior).

Species	Common Name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Salix exigua</i>	coyote willow	N	FACW	59.7
<i>Salix lasiandra</i>	greenleaf willow	N	FACW	3.1
Total	–	–	–	62.9

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 12. Groundcover quadrat data for COLM 3 (Willow Warrior).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	–
Boulder	–
Bedrock	–
Basal	–
Litter	98.3
Water	–
Wood	–
Soil	1.7
Total	100.0

COLM 4 (Slip n Slide Seeps)

COLM 4 (Slip n Slide Seeps) occurs at an elevation of approximately 1,408 m with an overall northeast (46°) aspect and low slope variability across the site. Calcareous soil deposits and wetland vegetation provided evidence of groundwater. The spring type was characterized as hypocrene. This site included a total wetland area and perimeter length of 0.03 ac (113.9 m²) and 131.0 m, respectively (Appendix B, Figure 5).

Ten plant taxa were documented, including 14 taxa captured by the herbaceous vegetation quadrats (Appendix D, Table 13). Total herbaceous cover averaged 19.0%. The dominant herbaceous plants were seaside arrowgrass (*Triglochin maritima*) and Baltic rush with 9.2% and 3.5% average absolute cover. The average groundcover included soil, litter, and basal with 63.5%, 34.6%, and 1.9% average corner hits, respectively (Table 14). There was no woody line intercept cover.

The non-native plant species common reed (*Phragmites australis*) and the noxious weed cheatgrass occurred at this site.

No recreation impacts or spring developments were observed. Bighorn sheep and rabbit sign occurred with 8% and 15% frequency in the herbaceous vegetation quadrats (Appendix C). Bighorn sheep sign was also observed outside of the vegetation quadrats.

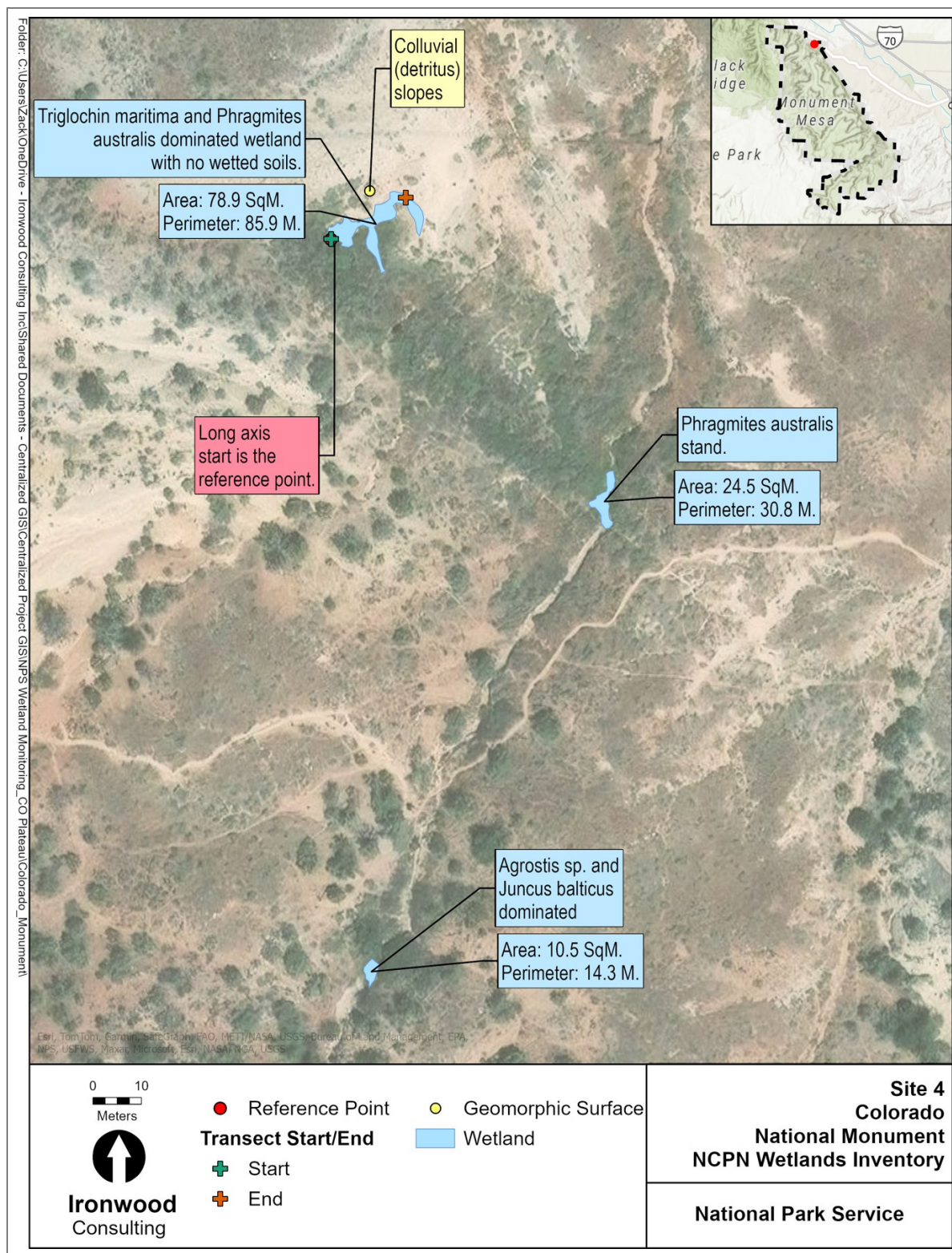


Figure 5. Wetland mapping for COLM 4 (Slip n Slide Seeps).

Table 13. Herbaceous vegetation quadrat data for COLM 4 (Slip n Slide Seeps). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Triglochin maritima</i>	seaside arrowgrass	N	OBL	9.2	62
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	3.5	23
<i>Phragmites australis</i>	common reed	I, N	FACW	1.9	15
<i>Distichlis spicata</i>	desert saltgrass	N	FAC	1.6	15
<i>Sporobolus airoides</i>	alkali sacaton	N	FAC	1.4	15
<i>Glycyrrhiza lepidota</i>	Nuttall's licorice	N	FAC	1.1	8
<i>Bromus tectorum</i>	cheatgrass	NOX	UPL	0.2	8
unknown annual forb	unknown annual forb	–	–	0.2	8
Bryophytes	moss	–	–	0.7	12
Total	–	–	–	19.0	–
50% of Total	–	–	–	9.5	–
20% of Total	–	–	–	3.8	–

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 14. Groundcover quadrat data for COLM 4 (Slip n Slide Seeps).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	–
Boulder	5.9
Bedrock	1.5
Basal	2.9
Litter	82.4
Water	–
Wood	7.4
Soil	–
Total	100.0

COLM 5 (Trail to Box Canyon)

COLM 5 (Trail to Box Canyon) was located at an elevation of approximately 1,794 m, with an overall southeast (158°) aspect and low slope variability across the site. Wetland vegetation and moist soil provided evidence of groundwater at this site. The spring type was characterized as hypocrene. This GDE site included a total wetland area and perimeter of 1.5 ac (6,149.2 m²) and 1,947.0 m, respectively (Appendix B, Figure 6, Figure 7).

Fifteen plant taxa were encountered during the GDE Level II survey, including nine taxa captured in herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 15, Table 16). The total average herbaceous cover was 26.7%. The dominant herbaceous plant was Baltic rush with 18.2% average absolute cover. Groundcover included litter, soil, and boulder with 80.8%, 15.4%, and 3.8% average corner hits, respectively (Table 17). The total average woody line intercept cover was 20.6% with coyote willow as the only intercepted species.

The non-native plants recorded at this site were black bent (*Agrostis gigantea*), meadow fescue (*Lolium pratense*), redtop, smooth brome, and tall fescue. The noxious weeds field bindweed (*Convolvulus arvensis*) and saltcedar (*Tamarix chinensis*) were also present.

There were foot trails present at this site. No spring developments were observed. Bear sign was observed outside the herbaceous quadrats (Appendix C).

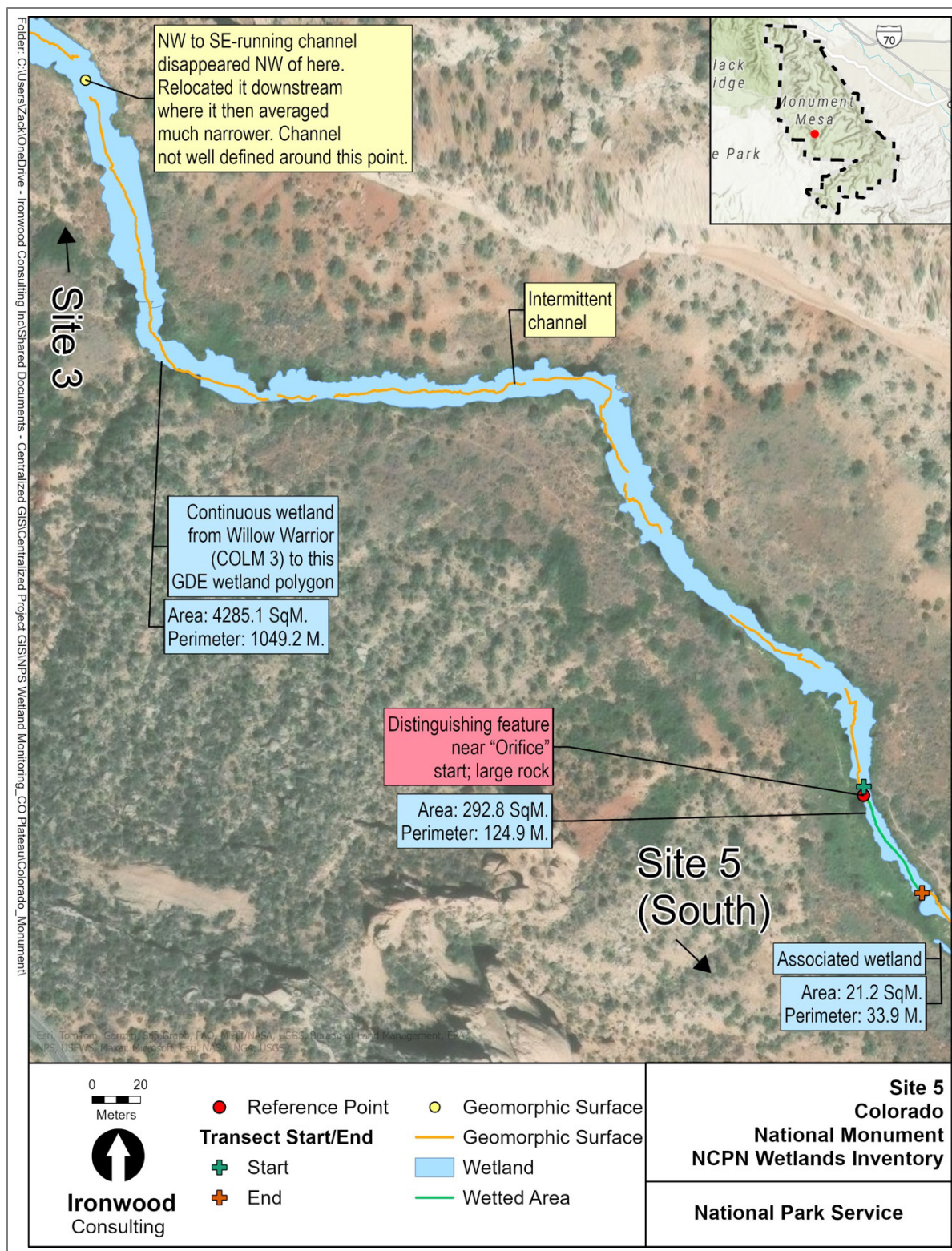


Figure 6. Wetland mapping for COLM 5 North (Trail to Box Canyon).

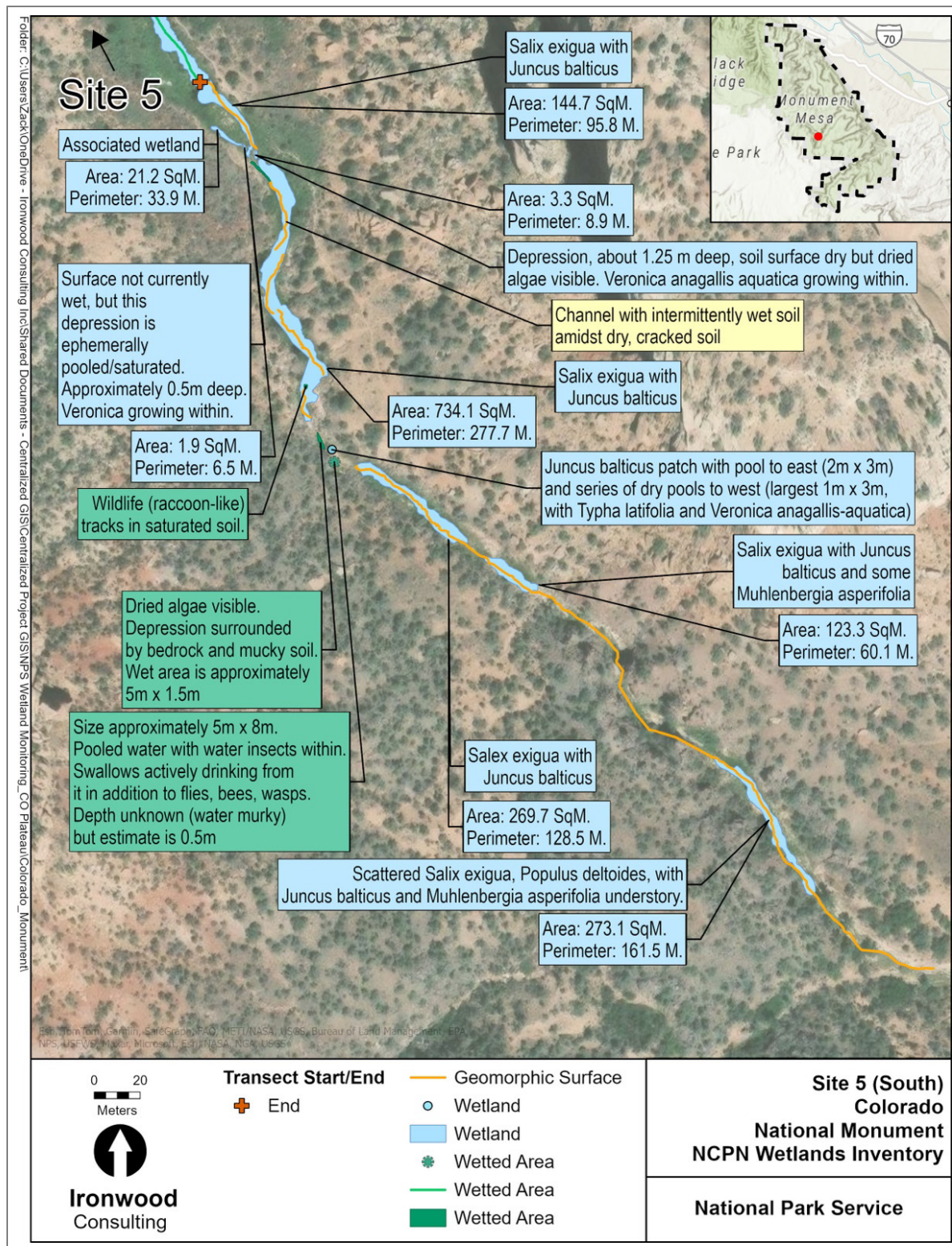


Figure 7. Wetland mapping for COLM 5 South (Trail to Box Canyon).

Table 15. Herbaceous vegetation quadrat data for COLM 5 (Trail to Box Canyon). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	18.2	85
<i>Muhlenbergia asperifolia</i>	scratchgrass	N	FACW	4.7	38
<i>Lolium pratense</i>	meadow fescue	I	FACU	2.0	31
<i>Elymus trachycaulus</i>	slender wheatgrass	N	FACU	1.0	15
<i>Lolium arundinaceum</i>	tall fescue	I	FACU	0.5	15
<i>Rumex</i> sp.	dock	–	–	0.2	8
<i>Agrostis stolonifera</i>	redtop	I	FACW	0.1	8
<i>Eleocharis</i> sp.	spikerush	–	OBL	0.1	8
Bryophytes	moss	–	–	–	–
Total	–	–	–	26.7	–
50% of Total	–	–	–	13.3	–
20% of Total	–	–	–	5.3	–

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 16. Woody vegetation line intercept summary data for COLM 5 (Trail to Box Canyon).

Species	Common Name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Salix exigua</i>	coyote willow	N	FACW	20.6
Total	–	–	–	20.6

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 17. Groundcover quadrat data for COLM 5 (Trail to Box Canyon).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	–
Boulder	3.8
Bedrock	–
Basal	–
Litter	80.8
Water	–
Wood	–
Soil	15.4
Total	100.0

COLM 6 (Tall Hippo Spring)

COLM 6 (Tall Hippo Spring) was located at an elevation of approximately 1,748 m with an overall northeast (61°) aspect and moderate slope variability across the site. Wetland vegetation provided evidence of groundwater. The spring type was characterized as hypocrene. This GDE site included a total wetland area and perimeter of 0.7 ac (2,775.8 m²) and 1,315.0 m, respectively (Appendix B, Figure 8).

Fifty-one plant taxa were documented during the GDE Level II survey, including 36 taxa captured in herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 18, Table 19). Total average herbaceous cover was 15.3%. The dominant herbaceous plants were smooth scouring-rush and Baltic rush with 7.1% and 4.2% average absolute cover, respectively. Groundcover included litter and soil with 95.0% and 5.0% average corner hits, respectively (Table 20). The total average woody line intercept cover was 7.1%. Coyote willow, greenleaf willow, and green rabbitbrush (*Chrysothamnus viscidiflorus*) had average woody line intercept covers of 6.4%, 0.5%, and 0.2% respectively.

The non-native plant species detected at this site included Japanese chess (*Bromus japonicus*), Kentucky bluegrass (*Poa pratensis*), redtop, and tall fescue (*Lolium arundinaceum*). The noxious plant cheatgrass was also present.

No recreation impacts or spring developments were observed. Bear and deer sign were observed outside the vegetation quadrats (Appendix C).

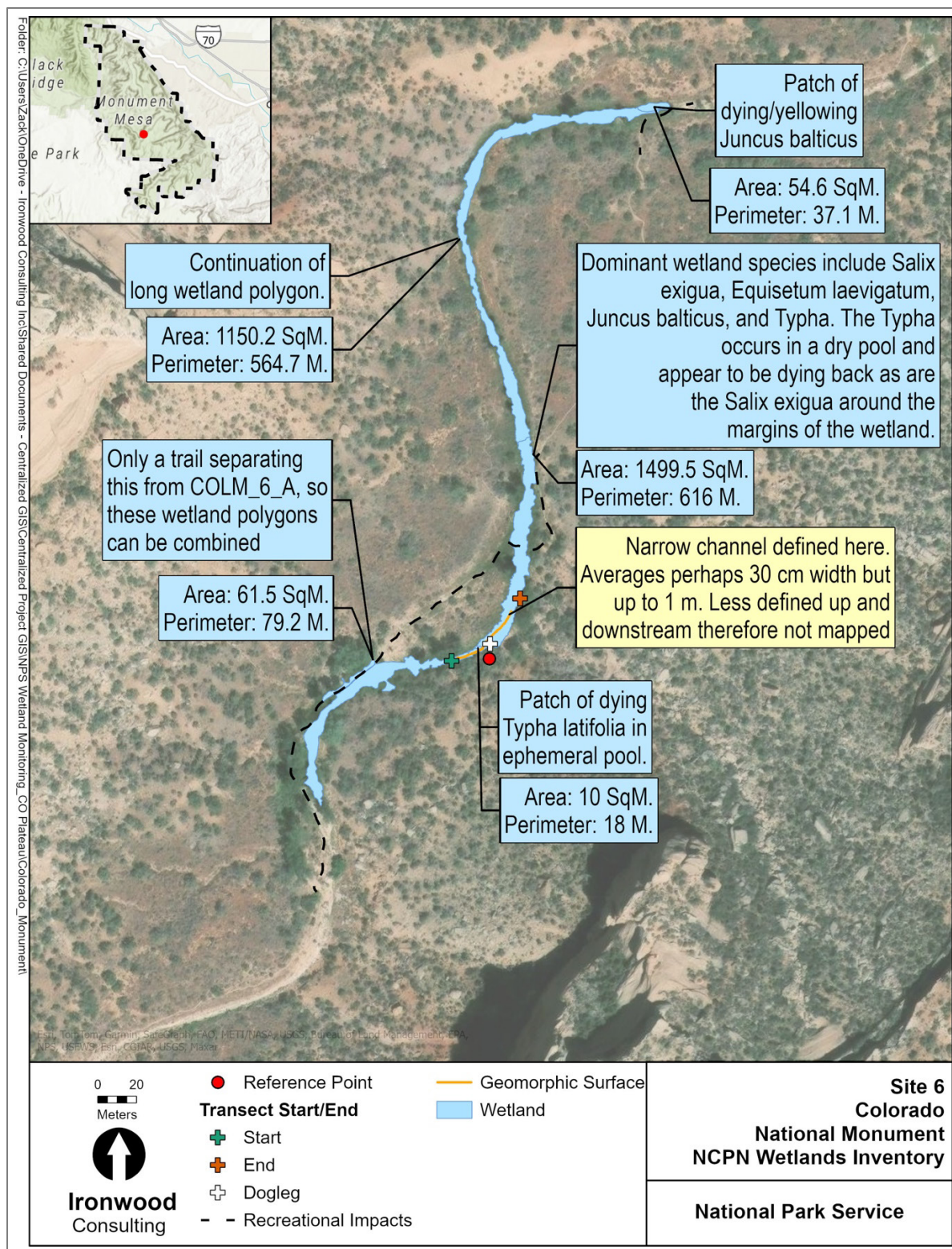


Figure 8. Wetland mapping for COLM 6 (Tall Hippo Spring).

Table 18. Herbaceous vegetation quadrat data for COLM 6 (Tall Hippo Spring). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Equisetum laevigatum</i>	smooth scouring-rush	N	FACW	7.1	80
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	4.2	80
<i>Lolium arundinaceum</i>	tall fescue	I	FACU	2.4	40
<i>Salix exigua</i>	coyote willow	N	FACW	1.0	30
<i>Poa pratensis</i>	Kentucky bluegrass	I, N	FAC	0.5	10
<i>Elymus trachycaulus</i>	slender wheatgrass	N	FACU	0.1	10
Bryophytes	moss	–	–	–	–
Total	–	–	–	15.3	–
50% of Total	–	–	–	7.7	–
20% of Total	–	–	–	3.1	–

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 19. Woody vegetation line intercept summary data for COLM 6 (Tall Hippo Spring).

Species	Common Name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Salix exigua</i>	coyote willow	N	FACW	6.4
<i>Salix lasiandra</i>	greenleaf willow	N	FACW	0.5
<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	N	UPL	0.2
Total	–	–	–	7.1

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 20. Groundcover quadrat data for COLM 6 (Tall Hippo Spring).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	–
Boulder	–
Bedrock	–
Basal	–
Litter	95.0
Water	–
Wood	–
Soil	5.0
Total	100.0

COLM 7

COLM 7 was located at an elevation of approximately 1,739 m with an overall northeast (42°) aspect and low slope variability across the site. Wetland vegetation provided evidence of groundwater. The spring type was characterized as hypocrene. This GDE site included a total wetland area and perimeter of 0.6 ac (2,220.1 m²) and 724.5 m, respectively (Appendix B, Figure 9).

Eighteen plant taxa were documented during the GDE Level II survey, including six taxa captured in herbaceous vegetation quadrats (Appendix D, Table 21). Total average herbaceous cover was 10.0%. The dominant herbaceous plant was Baltic rush with 6.4% average absolute cover. The total average woody line intercept cover was 1.4%, with coyote willow as the only intercepted species (Table 22). Litter was the only groundcover hit with 100% average corner hits (Table 23).

The non-native plant Kentucky bluegrass and the noxious weeds cheatgrass and saltcedar (*Tamarix chinensis*) were also observed.

Recreation impacts include a designated trail that runs through the wetland. There were no spring developments or wildlife sign observed (Appendix C).

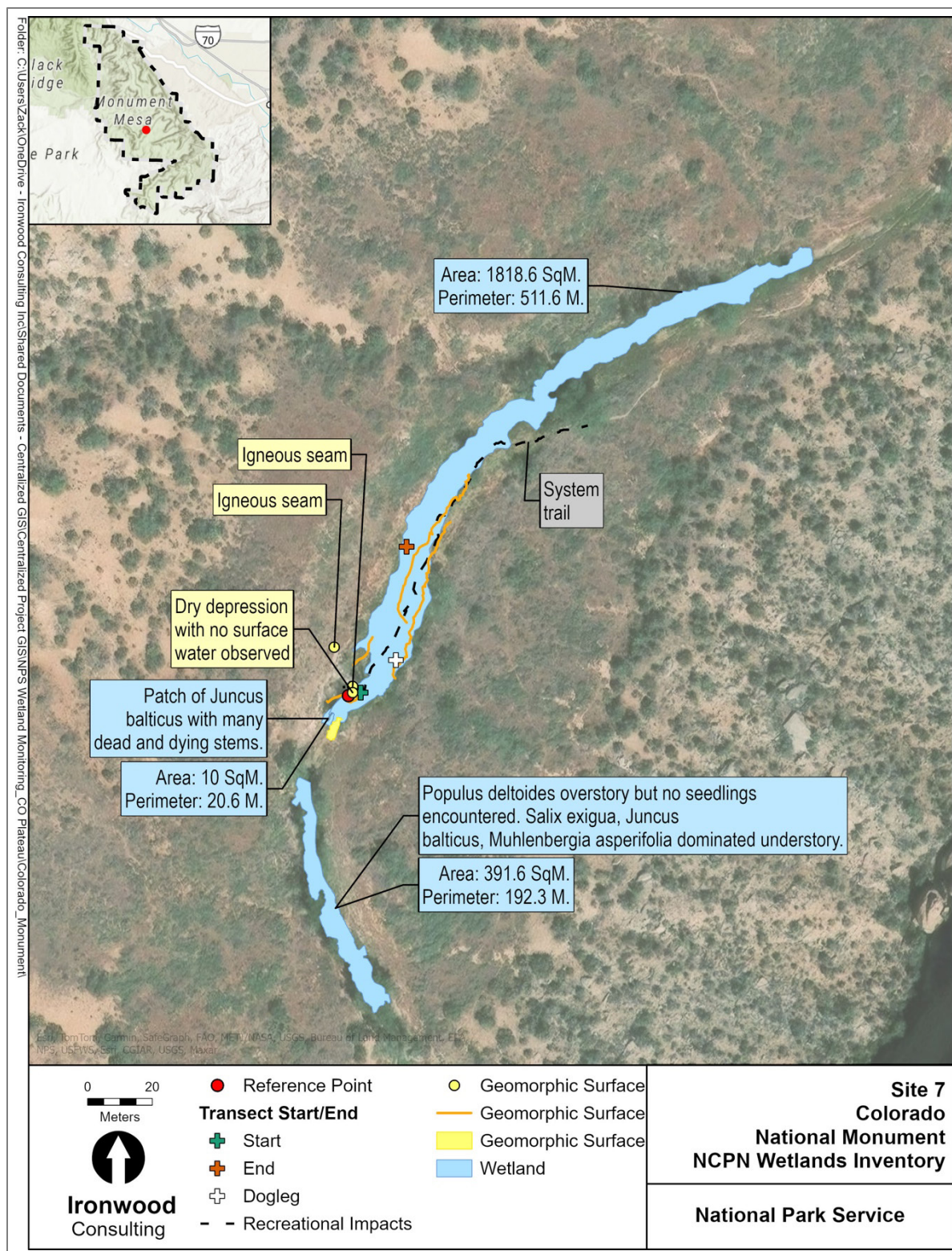


Figure 9. Wetland mapping for COLM 7.

Table 21. Herbaceous vegetation quadrat data for COLM 7. Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	6.4	100
<i>Elymus trachycaulus</i>	slender wheatgrass	N	FACU	2.0	20
unknown annual graminoid	unknown annual graminoid	–	–	1.0	20
<i>Equisetum hyemale</i>	scouringrush horsetail	N	FACW	0.4	20
unknown graminoid	unknown graminoid	–	–	0.2	20
Bryophytes	moss	–	–	–	–
Total	–	–	–	10.0	–
50% of Total	–	–	–	5.0	–
20% of Total	–	–	–	2.0	–

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 22. Woody vegetation line intercept summary data for COLM 7.

Species	Common Name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Salix exigua</i>	coyote willow	N	FACW	1.4
Total	–	–	–	1.4

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 23. Groundcover quadrat data for COLM 7.

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	–
Boulder	–
Bedrock	–
Basal	–
Litter	100.0
Water	–
Wood	–
Soil	–
Total	100.0

COLM 8 (Precambrian Outcrop)

COLM 8 (Precambrian Outcrop) was located at an elevation of approximately 1,618 m with an overall northeast (44°) aspect and moderate slope variability across the site. Wetland vegetation provided evidence of groundwater. The spring type was characterized as hypocrene. This GDE site included a total wetland area and perimeter of 0.1 ac (436.6 m²) and 349.3 m, respectively (Appendix B, Figure 10).

Seventeen plant taxa were documented during the GDE Level II survey, including eight taxa captured in herbaceous vegetation quadrats (Appendix D, Table 24). Total average herbaceous cover was 7.7%. The dominant herbaceous plants were Baltic rush and narrow-leaf cattail (*Typha angustifolia*) with 3.1% and 1.5% average absolute cover, respectively. Total woody line intercept cover was 2.3% with coyote willow as the only intercepted species (Table 25). Groundcover included litter, soil, boulder, and basal with 83.9%, 7.1%, 5.4%, and 3.6% average corner hits, respectively (Table 26).

The non-native plant species detected at this site included alyssum (*Alyssum simplex*), rabbitfoot-grass (*Polypogon monspeliensis*), and yellow sweet-clover (*Melilotus officinalis*). The noxious plant cheatgrass was also present.

Social trails were noted at this site. No spring developments were observed. Bighorn sheep sign was observed outside the vegetation quadrats (Appendix C).

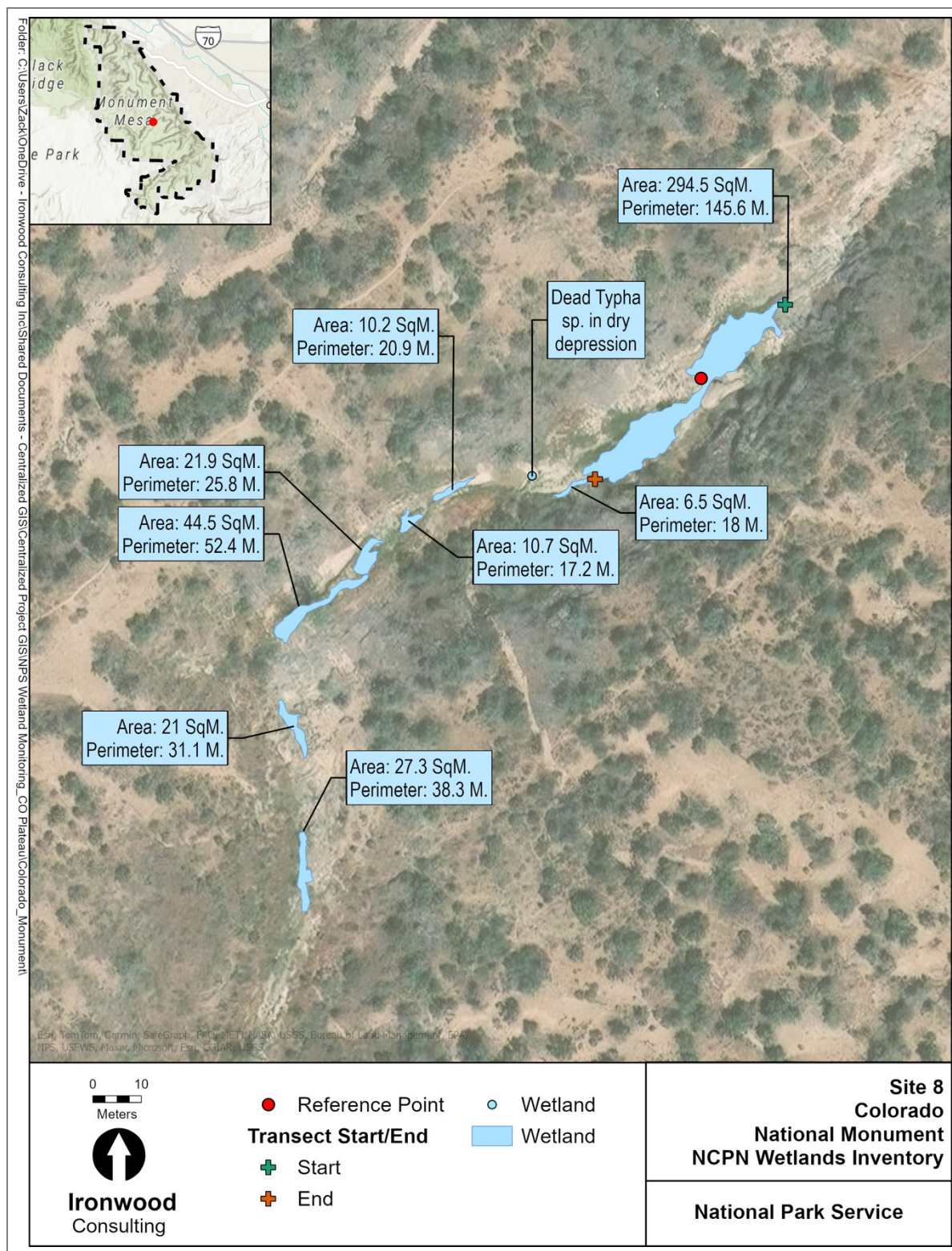


Figure 10. Wetland mapping for COLM 8 (Precambrian Outcrop).

Table 24. Herbaceous vegetation quadrat data for COLM 8 (Precambrian Outcrop). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	3.1	79
<i>Typha angustifolia</i>	narrow-leaf cattail	I, N	OBL	1.5	14
<i>Elymus trachycaulus</i>	slender wheatgrass	N	FACU	1.0	21
<i>Distichlis spicata</i>	desert saltgrass	N	FAC	0.9	29
<i>Salix exigua</i>	coyote willow	N	FACW	0.6	14
<i>Hordeum jubatum</i>	foxtail barley	N	FAC	0.4	7
<i>Bromus tectorum</i>	cheatgrass	NOX	UPL	0.2	7
<i>Elymus lanceolatus</i>	thickspike wheatgrass	N	UPL	0.1	7
Bryophytes	moss	–	–	–	–
Total	–	–	–	7.7	–
50% of Total	–	–	–	3.9	–
20% of Total	–	–	–	1.5	–

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 25. Woody vegetation line intercept summary data for COLM 8 (Precambrian Outcrop).

Species	Common Name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Salix exigua</i>	coyote willow	N	FACW	2.3
Total	–	–	–	2.3

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 26. Groundcover quadrat data for COLM 8 (Precambrian Outcrop).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	–
Boulder	5.4
Bedrock	–
Basal	3.6
Litter	83.9
Water	–
Wood	–
Soil	7.1
Total	100.0

COLM 9 (Waterfall)

COLM 9 (Waterfall) was located at an elevation of approximately 1,675 m with an overall southeast (99°) aspect. Standing water and wetland vegetation provided evidence of groundwater. The spring type was characterized as hypocrene. This GDE site included a total wetland area and perimeter of 0.01 ac (37.2 m²) and 56.9 m, respectively (Appendix B, Figure 11).

Nine plant taxa were documented during the GDE Level II survey, including three taxa captured in herbaceous vegetation quadrats (Appendix D, Table 27). Total average herbaceous cover was 35.5%. The dominant herbaceous plant was Baltic rush with 34.3% average absolute cover. Groundcover included litter and basal with 93.8% and 6.3% average corner hits, respectively (Table 28). There was no woody line intercept cover.

The non-native plants meadow fescue (*Lolium pratense*) and rabbitfoot grass (*Polypogon monspeliensis*) were detected at this site. The noxious plant cheatgrass was also present.

Social foot trails occurred at this site. No spring developments were observed. Bighorn sheep sign occurred inside the herbaceous vegetation quadrats with 25% frequency and was also observed outside the vegetation quadrats (Appendix C).

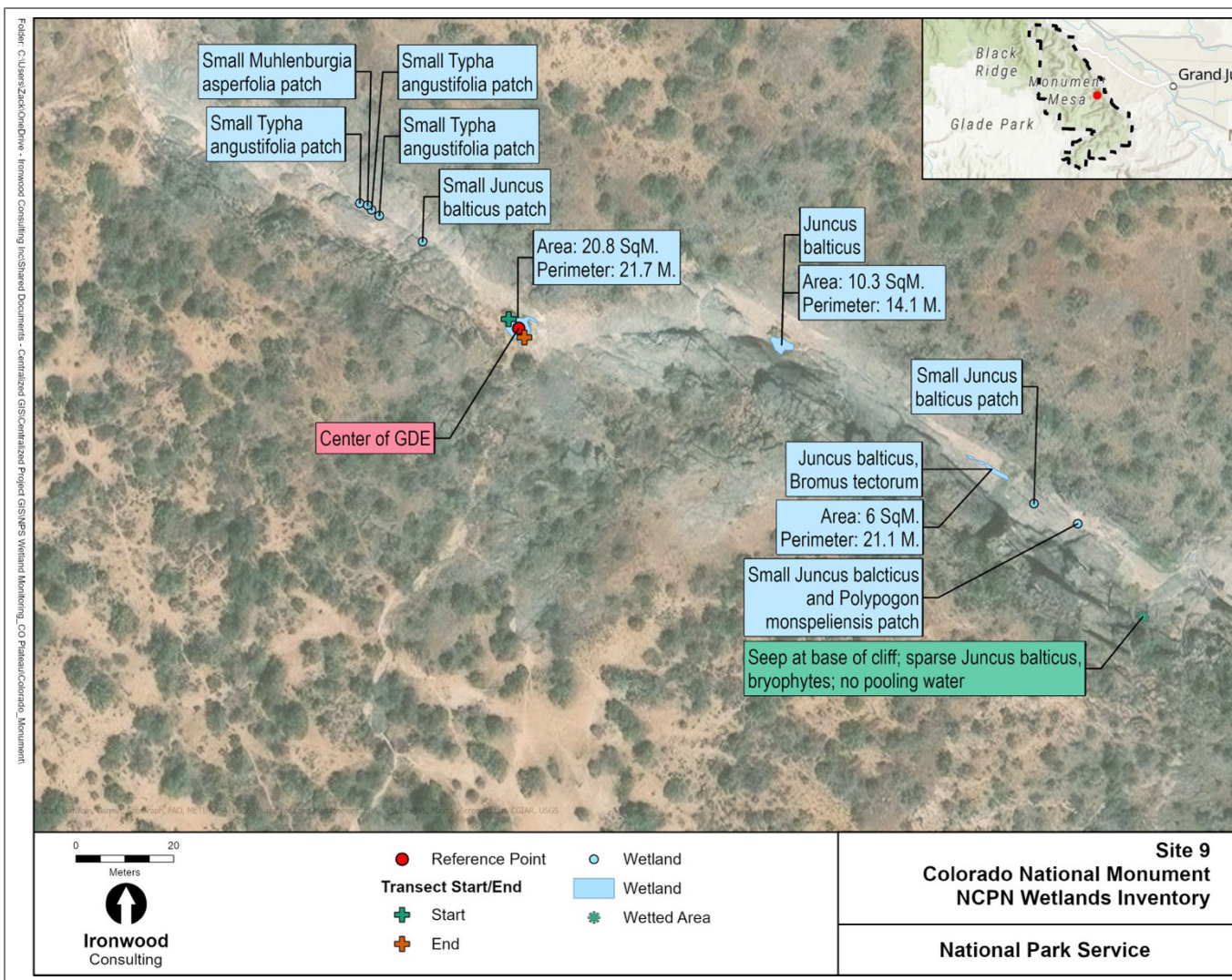


Figure 11. Wetland mapping for COLM 9 (Waterfall).

Table 27. Herbaceous vegetation quadrat data for COLM 9 (Waterfall). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	34.3	100
<i>Distichlis spicata</i>	desert saltgrass	N	FAC	1.0	25
<i>Lolium pratense</i>	meadow fescue	I	FACU	0.3	25
Bryophytes	moss	–	–	–	–
Total	–	–	–	35.5	–
50% of Total	–	–	–	17.8	–
20% of Total	–	–	–	7.1	–

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 28. Groundcover quadrat data for COLM 9 (Waterfall).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	–
Boulder	–
Bedrock	–
Basal	6.3
Litter	93.8
Water	–
Wood	–
Soil	–
Total	100.0

COLM 12 (To the W)

COLM 12 (To the W) was located at an elevation of approximately 1,912 m with an overall northeast (63°) aspect and high slope variability. Wetland vegetation provided evidence of groundwater. The spring type was characterized as hypocrene. This GDE site included a total wetland area and perimeter of 0.04 ac (180.5 m²) and 75.2 m, respectively (Appendix B, Figure 12, Figure 13).

Six plant taxa were documented during the GDE Level II survey, including three taxa captured in herbaceous woody line intercept transects (Appendix D, Table 29). There was no plant cover recorded in the herbaceous vegetation quadrats. Groundcover included water, soil, litter, and wood with 70.0%, 20.0%, 5.0%, and 5.0% average corner hits, respectively (Table 30). The total average woody line intercept cover was 56.2%. Coyote willow, strappleaf willow, and park willow (*Salix monticola*) had 31.0%, 24.2%, and 1.1% average line intercept covers, respectively.

The non-native plant species Kentucky bluegrass, redtop, and yellow salsify were detected at this site. No noxious weeds were encountered.

No recreation impacts, spring developments, or wildlife sign were observed (Appendix C).

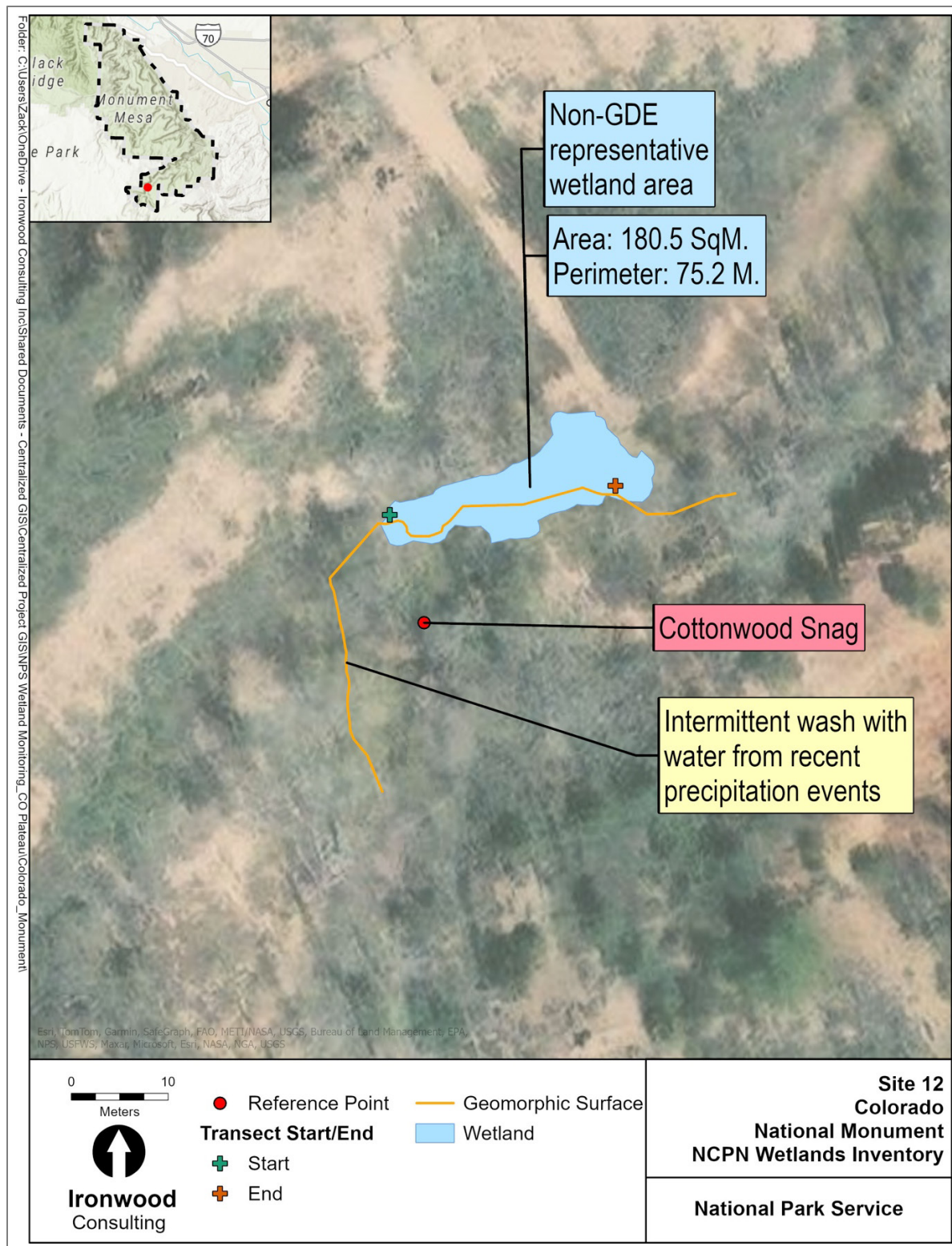


Figure 12. Wetland mapping for COLM 12 (To the W).

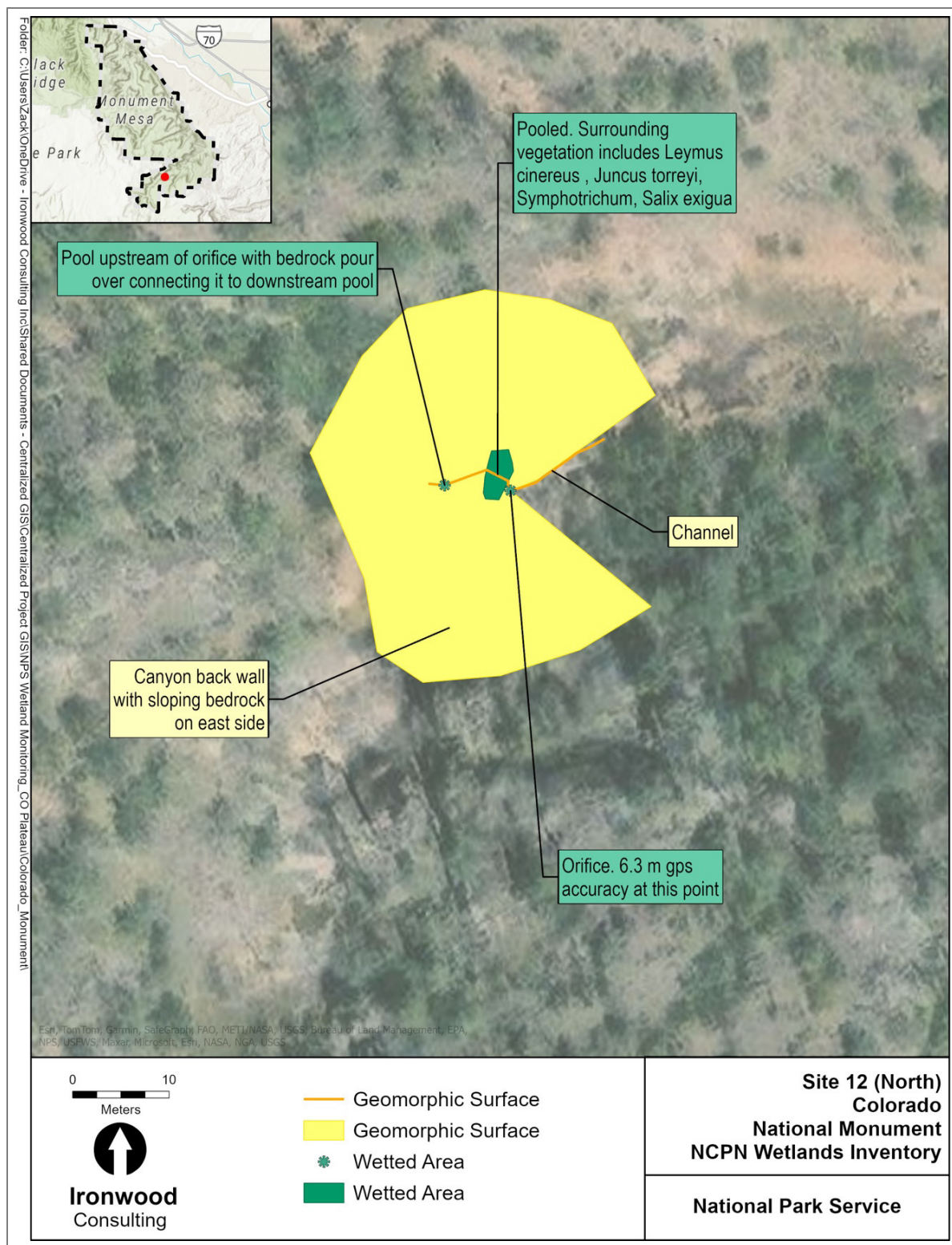


Figure 13. Wetland mapping for COLM 12 North (To the W).

Table 29. Woody vegetation line intercept summary data for COLM 12 (To the W).

Species	Common Name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Salix exigua</i>	coyote willow	N	FACW	31.0
<i>Salix ligulifolia</i>	strapleaf willow	N	FACW	24.2
<i>Salix monticola</i>	park willow	N	OBL	1.1
Total	–	–	–	56.2

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 30. Groundcover quadrat data for COLM 12 (To the W).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	–
Boulder	–
Bedrock	–
Basal	–
Litter	5.0
Water	70.0
Wood	5.0
Soil	20.0
Total	100.0

COLM 13 (Alpine Veg)

COLM 13 (Alpine Veg) was located at an elevation of approximately 1,983 m with an overall northeast (82°) aspect. Flow from a spring source, standing water, and wetland vegetation provided evidence of groundwater. The spring type was characterized as hillslope. This GDE site included a total wetland area and perimeter of 0.07 ac (283.9 m²) and 123.3 m, respectively (Appendix B, Figure 14).

Twenty-seven plant taxa were documented during the GDE Level II survey, including seven taxa captured in herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 31, Table 32). Total average herbaceous cover was 45.1%. Redtop, fringed willowherb (*Epilobium ciliatum*), and fowl mannagrass were the dominant herbaceous species with 12.5%, 9.8%, and 5.8% average absolute cover, respectively. Groundcover included litter, soils, and cobble with 56.3%, 42.5%, and 1.3% average corner hits, respectively (Table 33). The total average woody line intercept cover was 17.3%. Strapleaf willow, coyote willow, and saltcedar (*Tamarix chinensis*) had 12.3%, 4.7%, and 0.3% average line intercept covers, respectively.

The non-native plant species black bent (*Agrostis gigantea*), Kentucky bluegrass, orchard grass, and redtop were detected at this site. The noxious weed saltcedar was also present.

No recreation impacts, spring developments, or wildlife sign were observed (Appendix C).

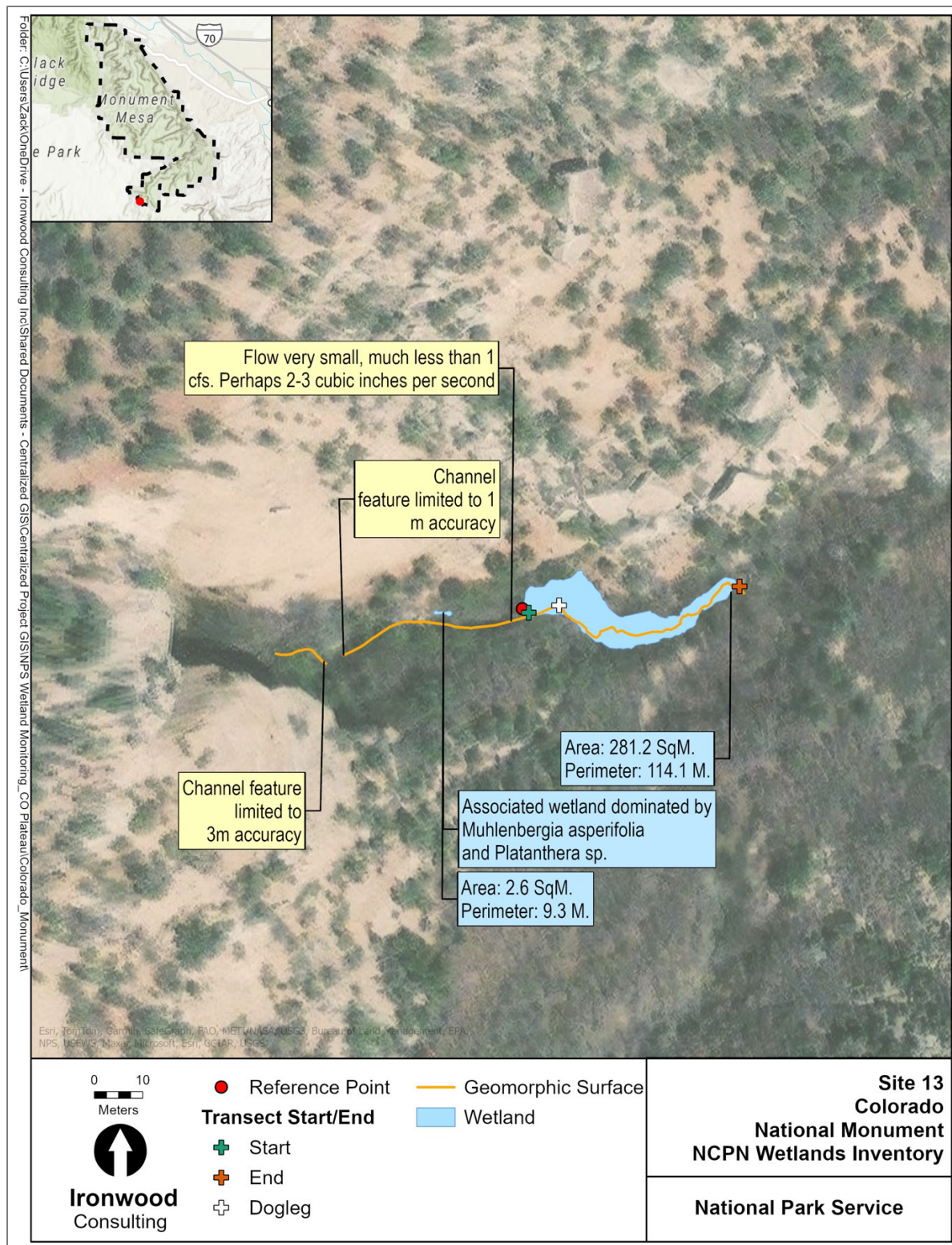


Figure 14. Wetland mapping for COLM 13 (Alpine Veg).

Table 31. Herbaceous vegetation quadrat data for COLM 13 (Alpine Veg). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Agrostis stolonifera</i>	redtop	I	FACW	12.5	35
<i>Epilobium ciliatum</i>	fringed willowherb	N	FAC	9.8	75
<i>Glyceria striata</i>	fowl mannagrass	N	OBL	5.8	35
<i>Equisetum laevigatum</i>	smooth scouring-rush	N	FACW	4.1	75
<i>Maianthemum stellatum</i>	starry false Solomon's-seal	N	FAC	3.8	15
<i>Dactylis glomerata</i>	orchard grass	I	FACU	2.7	35
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	2.7	15
<i>Carex nebrascensis</i>	Nebraska sedge	N	OBL	1.9	25
<i>Elymus trachycaulus</i>	slender wheatgrass	N	FACU	1.4	40
<i>Typha latifolia</i>	broad-leaved cattail	N	OBL	0.3	5
<i>Conyza canadensis</i>	Canadian horseweed	N	FACW	0.2	15
<i>Poa pratensis</i>	Kentucky bluegrass	I, N	FACU	0.2	10
Bryophytes	moss	–	–	–	–
Total	–	–	–	45.1	–
50% of Total	–	–	–	22.5	–
20% of Total	–	–	–	9.0	–

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 32. Woody vegetation line intercept summary data for COLM 13 (Alpine Veg).

Species	Common Name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
Salix ligulifolia	strapleaf willow	N	FACW	12.3
Salix exigua	coyote willow	N	FACW	4.7
Tamarix chinensis	saltcedar	NOX	FAC	0.3
Total	–	–	–	17.3

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 33. Groundcover quadrat data for COLM 13 (Alpine Veg).

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	1.3
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	0.0
Litter	56.3
Water	0.0
Wood	0.0
Soil	42.5
Total	100.0

COLM 14 (1st Waterfall to 2nd Waterfall) and COLM 15 (1st Pool to 1st Waterfall)

The COLM 14 (1st Waterfall to 2nd Waterfall) and COLM 15 (1st Pool to 1st Waterfall) sites were surveyed as a single unit due to being situated immediately adjacent to each other with similar conditions at each site. Both sites were comprised of scattered, small herbaceous- or willow-dominant wetland patches within a largely dry canyon bottom. They were located across an elevation range of approximately 1,846 m to 1,868 m with aspect mainly ranging between south and west. Standing water, moist soil, and wetland vegetation provided evidence of groundwater. The spring types were primarily characterized as hypocrene (although a seeping hanging garden was observed on the canyon wall beyond reach). This GDE site included a total wetland area and perimeter of 0.3 ac (1,137.4 m²) and 843.2 m, respectively (Appendix B, Figure 15, Figure 16, Figure 17, Figure 18, Figure 19).

Sixteen plant taxa were documented during the GDE Level II survey, including seven taxa captured in herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 34, Table 35). Total average absolute herbaceous cover was 19.7%. The dominant herbaceous plant was Baltic rush with 17.7% average cover. Groundcover included litter, bedrock, wood, and soil with average corner hits of 90.0%, 5.0%, 2.5%, and 2.5%, respectively (Table 36). The total average woody line intercept cover was 20.7%. Coyote willow and Wood's rose had 20.7% and 2.6% average line intercept cover, respectively.

The non-native plant species black bent, Japanese chess, redtop, and smooth brome were detected at this site. The noxious weed cheatgrass was also present.

Recreation impacts observed included two burned logs lying under an overhang which appeared to have been burned for a campfire. No spring developments were observed. Bighorn sheep sign was observed outside the vegetation quadrats (Appendix C). Additionally, unidentified fish and tadpoles were observed at these sites.

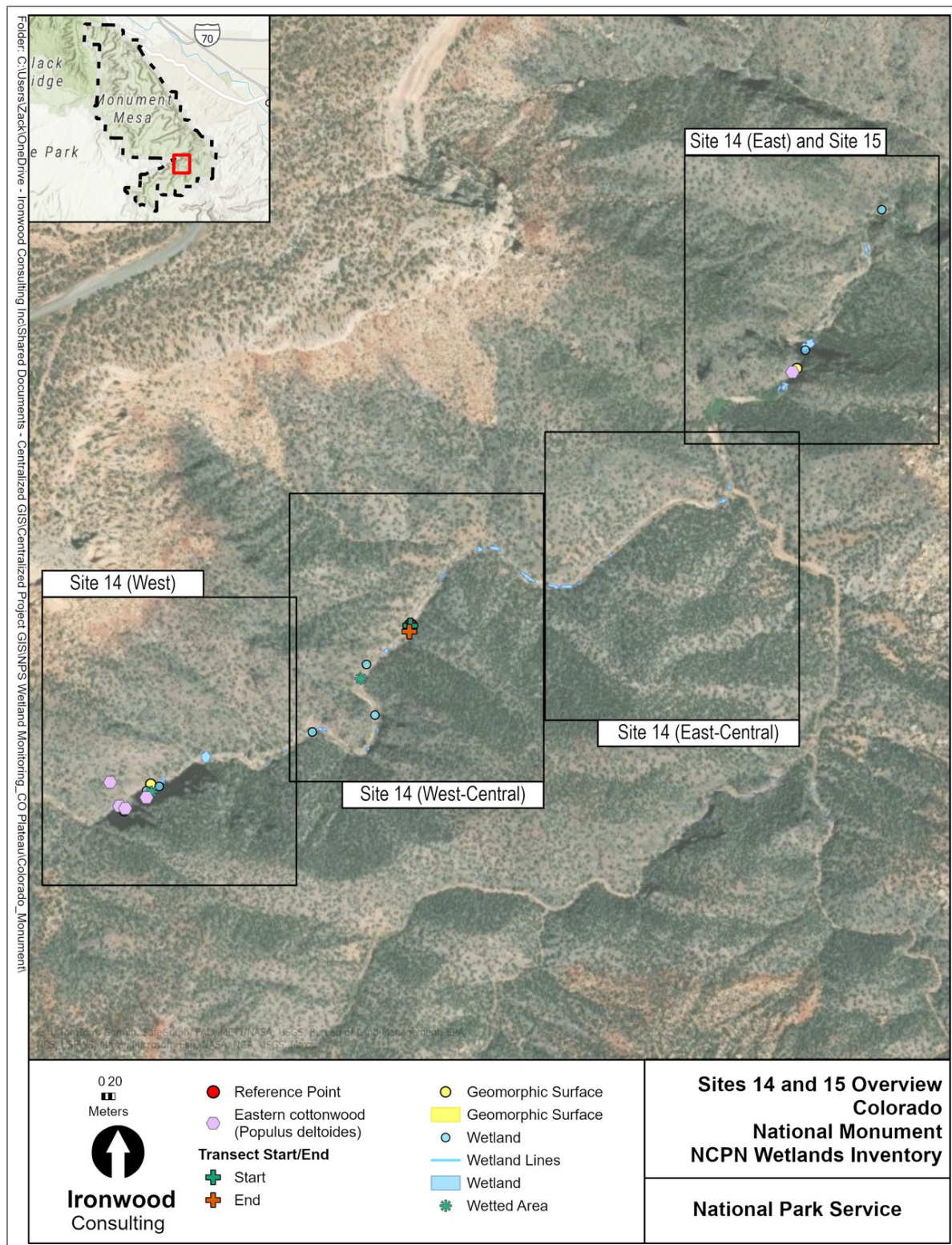


Figure 15. Wetland mapping overview for COLM 14 (1st Waterfall to 2nd Waterfall) and COLM 15 (1st Pool to 1st Waterfall).

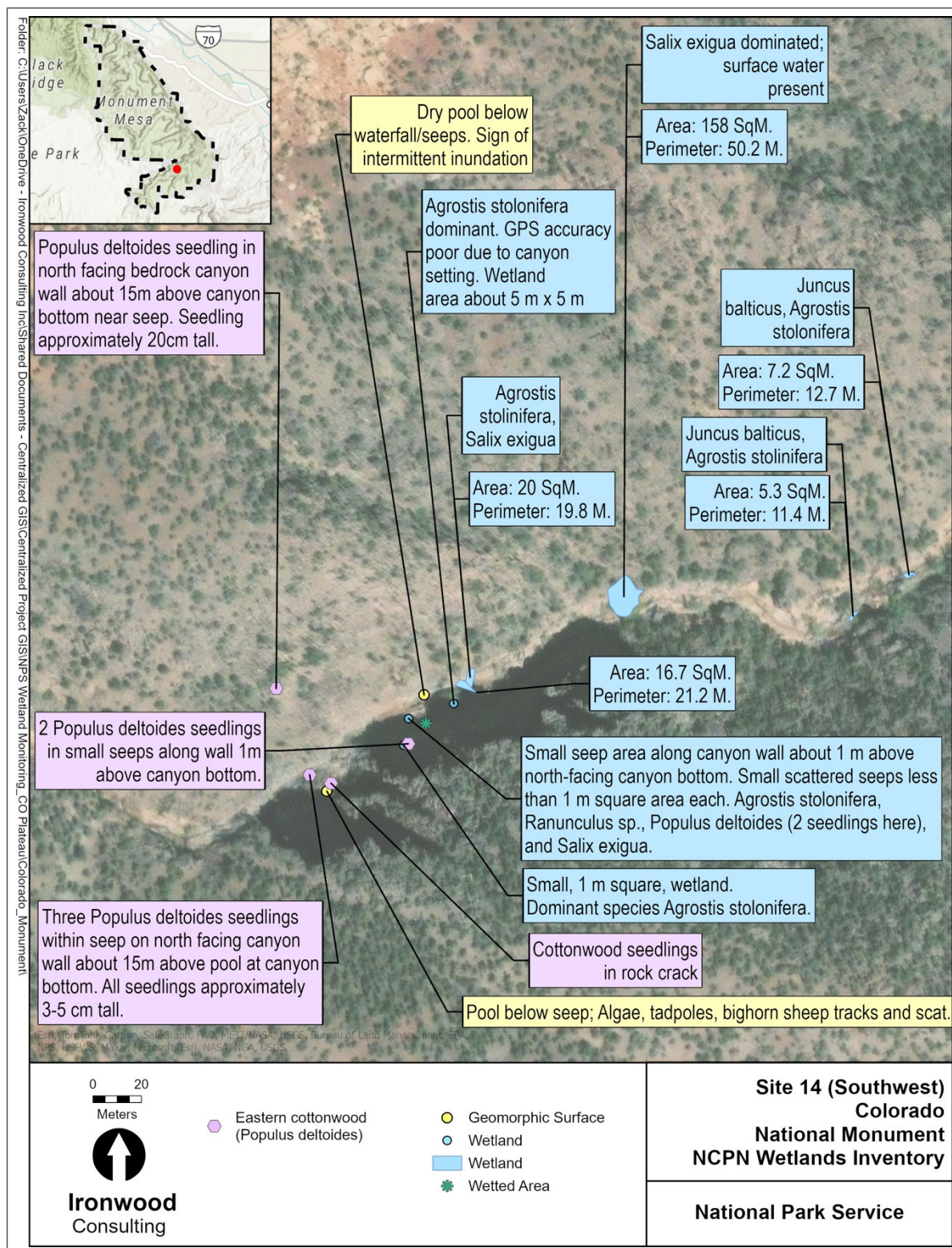


Figure 16. Wetland mapping for COLM 14 Southwest (1st Waterfall to 2nd Waterfall).

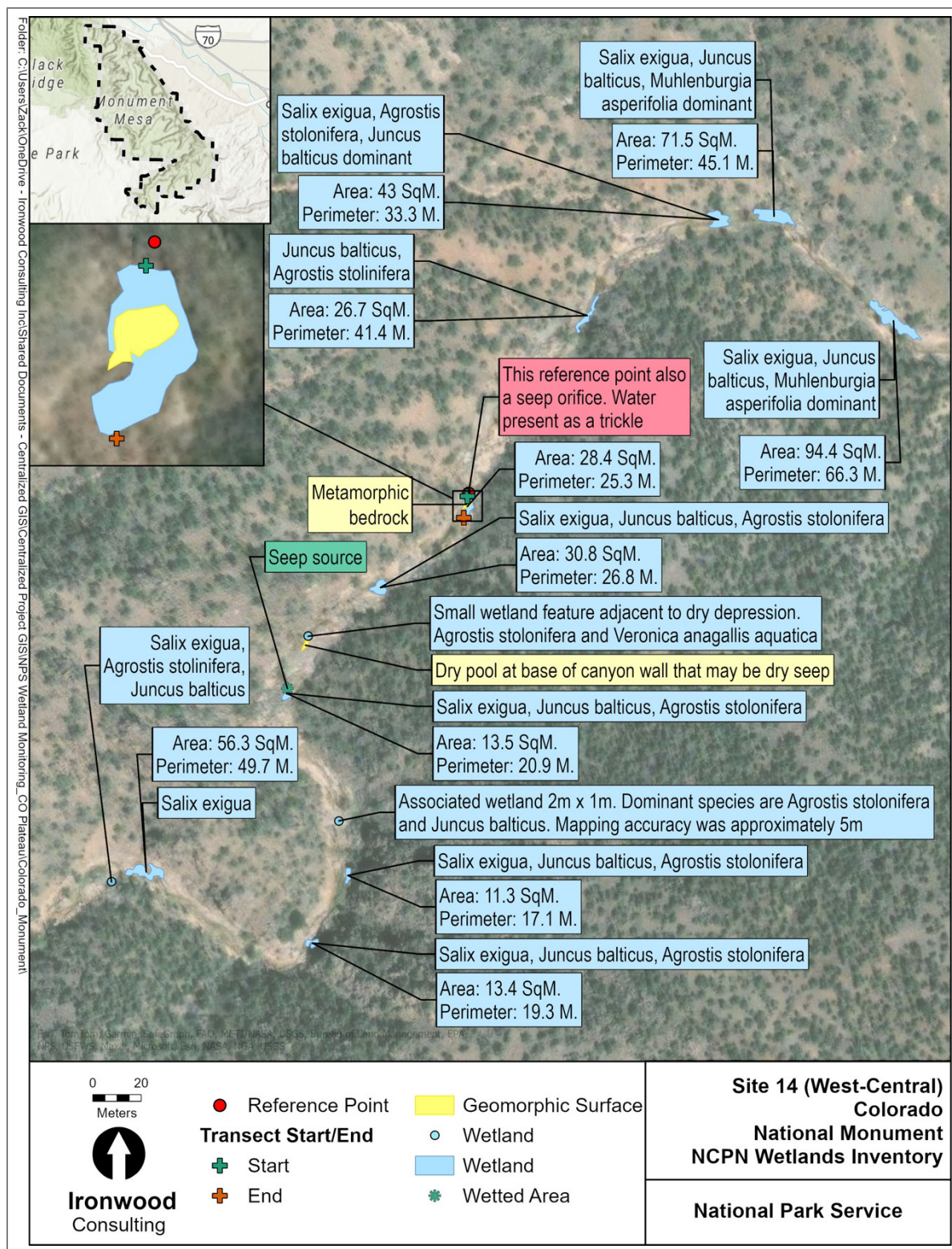


Figure 17. Wetland mapping for COLM 14 West-Central (1st Waterfall to 2nd Waterfall).

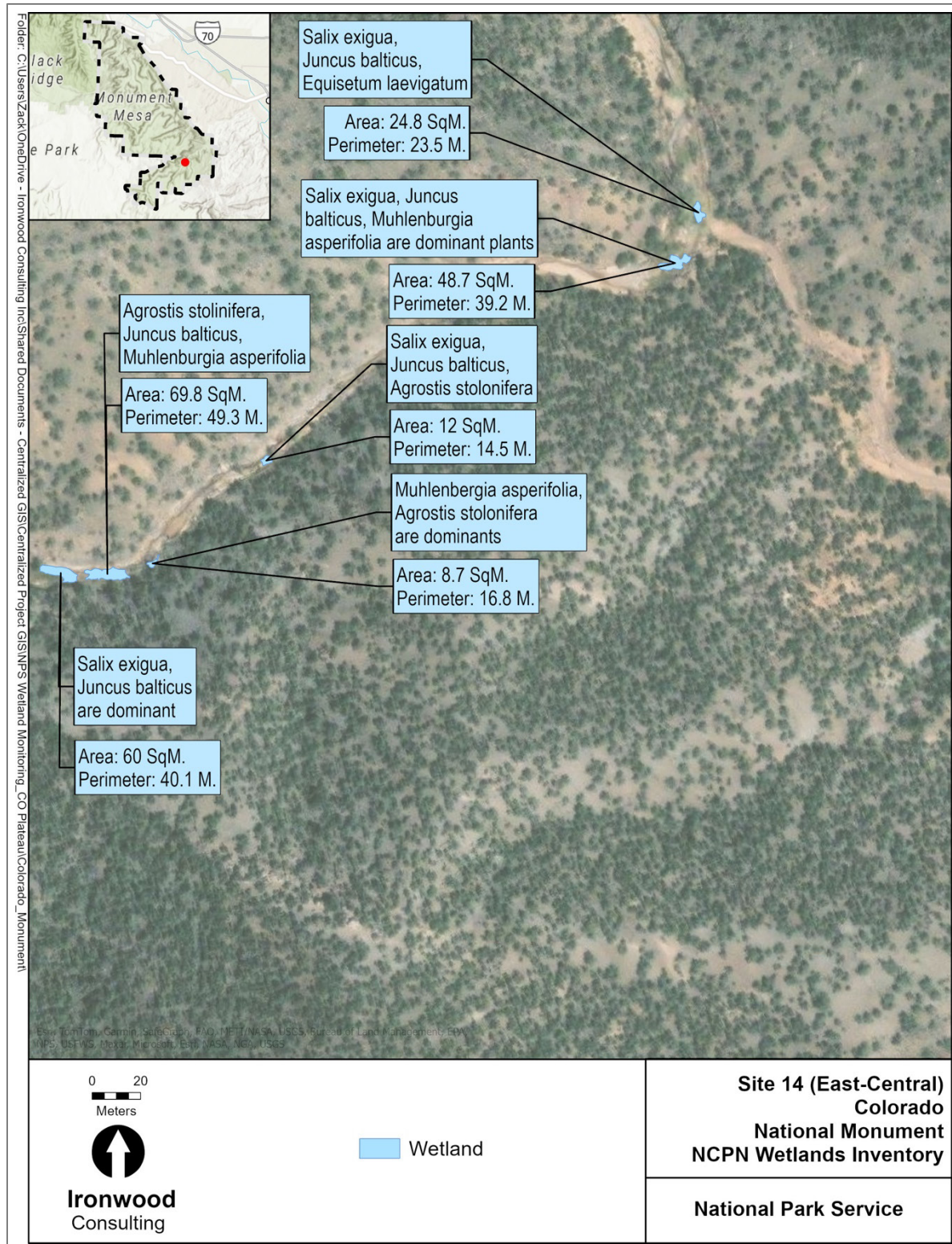


Figure 18. Wetland mapping for COLM 14 East-Central (1st Waterfall to 2nd Waterfall).

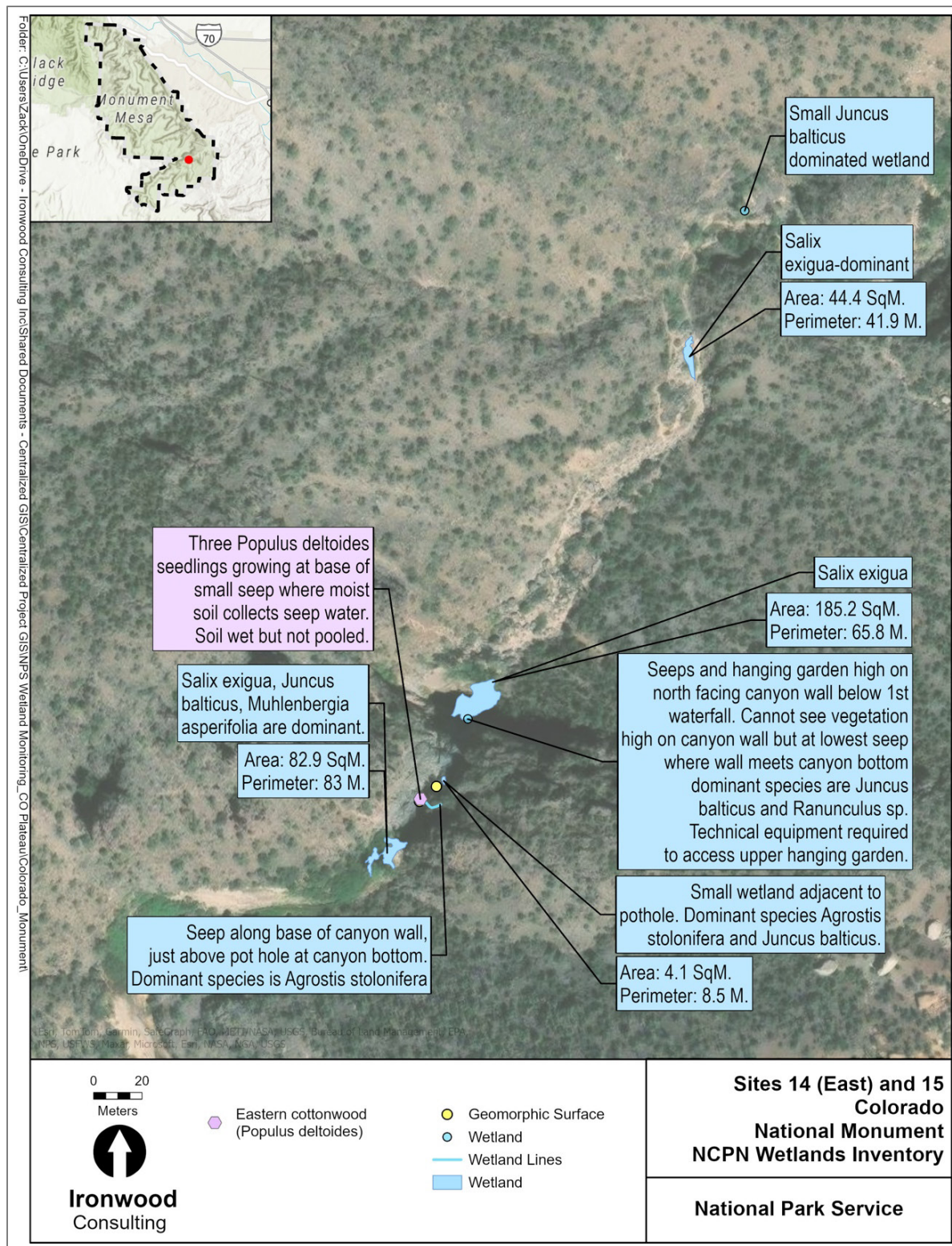


Figure 19. Wetland mapping for COLM 14 East (1st Waterfall to 2nd Waterfall) and Site 15 (1st Pool to 1st Waterfall).

Table 34. Herbaceous vegetation quadrat data for COLM 14 (1st Waterfall to 2nd Waterfall) and COLM 15 (1st Pool to 1st Waterfall). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	17.7	100
<i>Muhlenbergia asperifolia</i>	scratchgrass	N	FACW	1.3	20
<i>Agrostis stolonifera</i>	redtop	I	FACW	0.5	10
<i>Bromus japonicus</i>	Japanese chess	I	UPL	0.1	10
<i>Hordeum jubatum</i>	foxtail barley	N	FAC	0.1	10
Bryophytes	moss	–	–	5.0	25
Total	–	–	–	19.7	–
50% of Total	–	–	–	9.9	–
20% of Total	–	–	–	3.9	–

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 35. Woody vegetation line intercept summary data for COLM 14 (1st Waterfall to 2nd Waterfall) and COLM 15 (1st Pool to 1st Waterfall).

Species	Common Name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Salix exigua</i>	coyote willow	N	FACW	20.7
<i>Rosa woodsii</i>	Woods' rose	N	FACU	2.6
Total	–	–	–	23.3

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 36. Groundcover quadrat data for COLM 14 (1st Waterfall to 2nd Waterfall) and COLM 15 (1st Pool to 1st Waterfall).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	–
Boulder	–
Bedrock	5.0
Basal	–
Litter	90.0
Water	–
Wood	2.5
Soil	2.5
Total	100.0

COLM 17 (Globe Willow Seep)

COLM 17 (Globe Willow Seep) was located at an elevation of approximately 1,732 m with an overall northeast (32°) aspect. Flow from a spring source, standing water, and wetland vegetation provided evidence of groundwater. The spring type was characterized as hypocrene. This GDE site included a total wetland area and perimeter of 0.02 ac (84.5 m²) and 72.0 m, respectively (Appendix B, Figure 20).

Fifteen plant taxa were documented during the GDE Level II survey, including seven taxa captured in herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 37, Table 38). Total average herbaceous cover was 3.0%. The dominant herbaceous plants were white panicle aster and Utah sweetvetch (*Hedysarum boreale*) with 1.0% and 0.8% average absolute cover, respectively. Groundcover included litter, boulder, and soil with 75.0%, 15.0%, and 10.0% average corner hits, respectively (Table 39). The total average woody line intercept cover was 56.1% with strappleaf willow as the only intercepted species.

The non-native plant species detected at this site included common dandelion (*Taraxacum officinale*) and redtop. The noxious weed saltcedar was also present.

No recreation impacts, spring developments, or wildlife sign were detected (Appendix C).

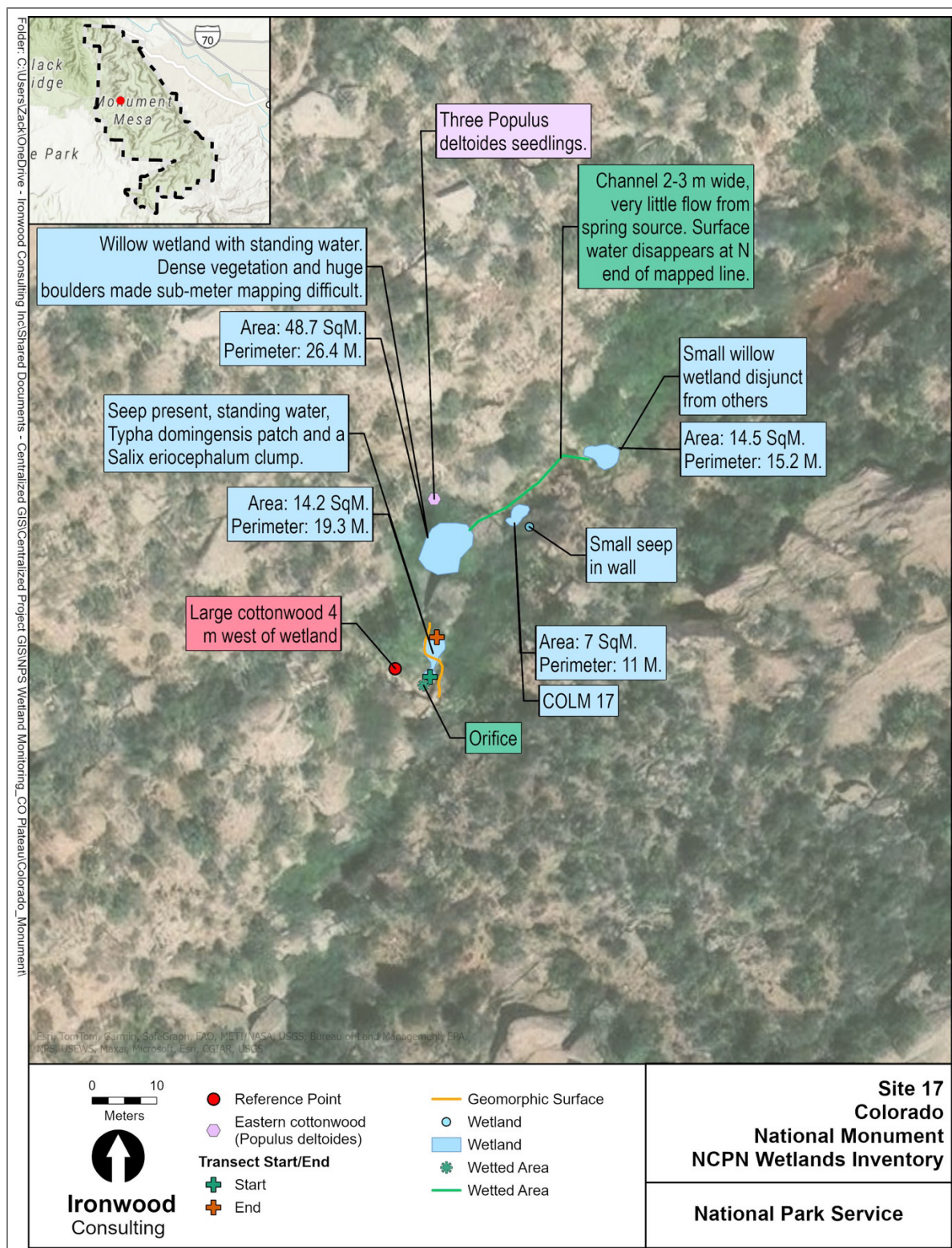


Figure 20. Wetland mapping for COLM 17 (Globe Willow Seep).

Table 37. Herbaceous vegetation quadrat data for COLM 17 (Globe Willow Seep). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Symphyotrichum lanceolatum</i>	white panicle aster	N	OBL	1.0	20
<i>Hedysarum boreale</i>	Utah sweetvetch	N	UPL	0.8	20
<i>Clematis ligusticifolia</i>	white virgin's-bower	N	FAC	0.4	20
<i>Taraxacum officinale</i>	common dandelion	I	FACU	0.4	20
<i>Packera multilobata</i>	basin groundsel	N	UPL	0.2	20
<i>Typha domingensis</i>	southern cattail	N	OBL	0.2	20
Bryophytes	moss	–	–	1.5	8
Total	–	–	–	3.0	–
50% of Total	–	–	–	1.5	–
20% of Total	–	–	–	0.6	–

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 38. Woody vegetation line intercept summary data for COLM 17 (Globe Willow Seep).

Species	Common Name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Salix ligulifolia</i>	strapleaf willow	N	FACW	56.1
Total	–	–	–	56.1

^A I - Introduced, N - Native, NOX - Colorado Noxious Weed (CDA 2024; USDA and NRCS 2023).

Table 39. Groundcover quadrat data for COLM 17 (Globe Willow Seep).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	–
Boulder	15.0
Bedrock	–
Basal	–
Litter	75.0
Water	–
Wood	–
Soil	10.0
Total	100.0

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Appendix A: GDE Site Summary Table Locality Details

Table 40 shows the site summary table locality details.

Table 40. GDE site summary table locality details.

Site Name	Datum	UTM Zone	Long Axis Start Easting	Long Axis Start Northing	Long Axis End Easting	Long Axis End Northing	Reference Point Easting	Reference Point Northing	Long Axis Dogleg Easting	Long Axis Dogleg Westing	Aspect at Reference Point (°)	Elevation at Reference Point (m)	Reference Point Notes	Vegetation Quadrat Cut- level
1	NAD83	12	697856	4327930	697884	4328001	697856	4327930	–	–	23	1,616	Same position as long axis start.	<1 percent not recorded
2	NAD83	12	705629	4322097	705650	4322138	705626	4322101	705637	4322131	28	1,501	Western base of Large angled cottonwood hanging over transect	<1 percent not recorded
3	NAD83	12	698259	4323895	698285	4323854	698264	4323894	–	–	134	1,815	Tip of Large Boulder, upland side of Channel	<1 percent not recorded
4	NAD83	12	697963	4331441	697978	4331451	697954	4331448	–	–	46	1,408	Long axis start is reference point.	<1 percent not recorded
5	NAD83	12	698774	4323425	698800	4323383	698774	4323425	–	–	158	1,794	Large rock 3.7 m at 10 degrees from start	<1 percent not recorded
6	NAD83	12	699466	4323451	699500	4323485	699466	4323451	699486	4323461	61	1,748	Center of small dry channel coming from east	<1 percent not recorded
7	NAD83	12	699672	4323901	699684	4323947	699669	4323900	699683	4323912	42	1,739	Igneous seam on ground	<1 percent not recorded
8	NAD83	12	700271	4324755	700234	4324716	700254	4324738	–	–	44	1,618	Very large rock in the center of Largest polygon.	<1 percent not recorded
9	NAD83	12	701854	4325305	701858	4325302	701857	4325304	–	–	99	1,675	Middle of largest wetland polygon.	<1 percent not recorded
12	NAD83	12	700125	4318782	700148	4318786	700129	4318771	–	–	63	1,912	Downed cottonwood snag	<1 percent not recorded
13	NAD83	12	699457	4317471	699500	4317479	699455	4317471	699463	4317472	82	1,983	Western tip of large rock that comes about 2 m N of start of transect	<1 percent not recorded
14 & 15	NAD83	12	702931	4320887	702930	4320878	701986	4320238	–	–	60	1,846	Rock	<1 percent not recorded
17	NAD83	12	697324	4326322	697325	4326328	697318	4326323	–	–	32	1,732	Tall cottonwood 4 m west of wetland	Complete - all species

Appendix B: GDE Site Summary Table Wetland Feature

Table 41 shows the site summary table wetland features.

Table 41. GDE site summary table wetland features.

Site Name	Site Type	Primary GDE Type	Secondary GDE Type	Total Wetland Area (ac)	Total Wetland Area (m²)	Total Wetland Perimeter Length (m)	Total Orifices	Number of Mapped Channels	Length of Mapped Channel (m)	Mapped Channel Type (if observed)	Wetland/Channel Description	Total Wetted Area (ac)	Total Wetted Length (m)
1	GDE	Hypocrene	–	0.48	1,962.6	590.2	–	2	279.9	Runoff dominated	Intermittent channel. Some wetted soils only, no visible discharge. Some dead Phragmites at site. We called the most mesic depression the orifice - this was mid polygon.	–	–
2	GDE	Rheocrene	Hypocrene	0.28	1,148.9	550.3	3–4	1	205.8	Spring discharge dominated	Flowing stream fed by spring. Seeps below transect start add to flow slightly. Clearly dominated by FACW and OBL plants.	–	–
3	GDE	Hypocrene	–	2.47	10,005.1	1,045.3	–	1	462.2	Runoff dominated	Storm channel in valley bottom. Populus acuminata is FAC and outside boundary.	–	–
4	GDE	Hypocrene	–	0.03	113.9	131.0	–	–	–	–	–	–	–
5	GDE	Hypocrene	–	1.52	6,149.2	1,947.0	–	1	902.7	Runoff dominated	Not flowing; moist at surface. No orifice and no wetted soils. Desert bighorn on-site.	0.01	50.8
6	GDE	Hypocrene	–	0.69	2,775.8	1,315.0	–	1	38.8	Runoff dominated	Not flowing, no standing water. Wetland likely mainly fed by runoff with high water table.	–	–
7	GDE	Hypocrene	–	0.55	2,220.1	724.5	–	4	141.2	Mixed discharge	Dry channels up and down gradient of dry pools with FACW vegetation present. Volcanic seam apparent with two areas where pooling may occur or where seep may emerge. Both were dry at time of visit. Schedonorus arundinaceus also present. FACW dominated wetland area with no apparent water orifice; dense Salix in areas, Populus overstory	–	–
8	GDE	Hypocrene	–	0.11	436.6	349.3	–	–	–	Runoff dominated	Densely to sparsely vegetated with some cutbanks. Intermittent wetland with disjunct polygons. Mature cottonwood on-site but no seedlings observed.	–	–
9	GDE	Hypocrene	–	0.01	37.2	56.9	1	–	–	Runoff dominated	Scoured channel with evidence of frequent pooling in low spots and rock tinajas. Seep at northern extent of surveyed area, sparse wetlands in proximity. Most of the wetland vegetation at site is surface water dependent or alluvial. Intermittent precipitation dependent wetland; some wetland vegetation patches are smaller than the minimum mapping unit and are GPSd with points.	–	–
12	GDE	Hypocrene	–	0.04	180.5	75.2	–	1	92.4	Runoff dominated	Channel with water from recent storm events; low gradient; semi-scoured. Cottonwood gallery understory.	–	–
13	GDE	Hillslope	Hanging garden	0.07	283.9	123.3	–	1	108.5	Runoff dominated	Small flow from spring, much of scour likely from runoff events. Spring orifice upstream in alcove. Previously mapped with poor location: Several seeping walls with bryophytes. Other wetland plants begin below debris toe slope. Spring orifice at base of rocks at a Typha patch. Flow begins here over impermeable surface.	–	–

Table 41 (continued). GDE site summary table wetland features.

Site Name	Site Type	Primary GDE Type	Secondary GDE Type	Total Wetland Area (ac)	Total Wetland Area (m²)	Total Wetland Perimeter Length (m)	Total Orifices	Number of Mapped Channels	Length of Mapped Channel (m)	Mapped Channel Type (if observed)	Wetland/Channel Description	Total Wetted Area (ac)	Total Wetted Length (m)
14	GDE	Hypocrene	–	0.27	1,093.0	801.3	2	–	–	Runoff dominated	–	–	–
15	GDE	Hypocrene	–	0.01	44.4	41.9	–	–	–	Runoff dominated	Channel is downslope of the hanging garden. Orifices observed as fissures in bedrock wall	–	–
17	GDE	Hypocrene	–	0.02	84.5	72.0	1	2	13.1	Runoff dominated	Flowing channel short but lies within longer runoff channel. Orifice at base of rocks at a Typha patch. Flow begins here over an impermeable surface.	–	22.7

Appendix C: GDE Site Wildlife Summary Tables

Tables 42 and 43 show a summary of wildlife signs found during surveys.

Table 42. Percent frequency of scat or tracks found inside vegetation quadrats.

Animal Category	Animal Type	1	2	3	4	5	6	7	8	9	12	13	14 & 15	16	17	Total Sites Observed
Wildlife	Bear	–	–	7	–	–	–	–	–	–	–	–	–	–	–	1
Wildlife	Bighorn Sheep	–	8	–	8	–	–	–	–	25	–	–	30	–	–	4
Wildlife	Deer	–	–	7	–	–	–	–	–	–	–	–	–	–	–	1
Wildlife	Rabbit	–	–	–	15	–	–	–	–	–	–	–	–	–	–	1

Table 43. Animal sign (scat or tracks) observed outside vegetation transects. X indicates a presence.

Animal Category	Animal Type	1	2	3	4	5	6	7	8	9	12	13	14 & 15	16	17	Total Sites Observed
Wildlife	Bear	–	–	X	–	X	X	–	–	–	–	–	–	–	–	3
Wildlife	Bighorn Sheep	X	X	–	X	–	–	–	X	X	–	–	X	–	–	6
Wildlife	Deer	X	–	X	–	–	X	–	–	–	–	–	–	–	–	3
Wildlife	Fish (Unidentified)	–	–	–	–	–	–	–	–	–	–	–	X	–	–	1
Wildlife	Toad (Unidentified)	–	X	–	–	–	–	–	–	–	–	–	–	–	–	1
Wildlife	Tadpoles (Unidentified)	–	–	–	–	–	–	–	–	–	–	–	X	–	–	1

Appendix D: GDE Site Vascular Plant Inventory List

Table 44 shows the vascular plant inventory list resulting from the survey.

Table 44. GDE site vascular plant inventory list. X indicates a presence.

Species	Common Name	Wetland Code	Native Status ^A	1	2	3	4	5	6	7	8	9	12	13	14 & 15	17
<i>Agrostis gigantea</i>	black bent	FACW	I	–	–	–	–	X	–	–	–	–	–	X	X	–
<i>Agrostis stolonifera</i>	redtop	FACW	I	–	X	–	–	X	X	–	–	–	X	X	X	X
<i>Alyssum simplex</i>	alyssum	UPL	I	–	–	X	–	–	–	–	X	–	–	–	–	–
<i>Amelanchier utahensis</i>	Utah serviceberry	FACU	N	–	–	–	–	–	–	–	–	–	–	–	–	X
<i>Artemisia ludoviciana</i>	Louisiana wormwood	FACU	N	–	–	–	–	–	–	–	X	–	–	–	–	–
<i>Artemisia tridentata</i>	big sagebrush	UPL	N	X	–	X	–	–	–	X	–	–	–	–	–	–
<i>Betula occidentalis</i>	water birch	FACW	N	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Bromus diandrus</i>	ripgut brome	UPL	I	X	–	–	–	–	–	–	–	–	–	–	–	–
<i>Bromus inermis</i>	smooth brome	UPL	I	–	–	–	–	X	–	–	–	–	–	–	X	–
<i>Bromus japonicus</i>	Japanese chess	UPL	I	–	–	–	–	–	X	–	–	–	–	–	X	–
<i>Bromus tectorum</i>	cheatgrass	UPL	NOX-C	X	–	X	X	–	X	X	X	X	–	–	X	–
<i>Carex nebrascensis</i>	Nebraska sedge	OBL	N	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Carex simulata</i>	analogue sedge	OBL	N	–	–	–	–	–	–	–	–	–	–	–	X	–
<i>Cercocarpus montanus</i>	alder-leaf mountain mahogany	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	X
<i>Chrysothamnus linifolius</i>	spear-leaf rabbitbrush	FAC	N	–	X	–	–	–	–	–	–	–	–	–	–	X
<i>Chrysothamnus viscidiflorus</i>	green rabbitbrush	UPL	N	–	–	–	–	–	X	X	–	–	–	–	–	–
<i>Cirsium arizonicum</i>	Arizona thistle	FACU	N	–	X	–	–	–	–	–	–	–	–	X	–	X
<i>Cirsium arvense</i>	Canada thistle	FACU	NOX-B	–	–	X	–	–	–	–	–	–	–	–	–	–
<i>Clematis ligusticifolia</i>	white virgin's-bower	FAC	N	X	X	–	–	–	–	–	–	–	–	X	–	X
<i>Convolvulus arvensis</i>	field bindweed	UPL	NOX-C	–	–	–	–	X	–	–	–	–	–	–	–	–
<i>Conyza canadensis</i>	Canadian horseweed	UPL	N	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Crepis runcinata</i>	fiddleleaf hawksbeard	FACU	N	X	–	–	X	–	–	–	–	–	–	–	–	–
<i>Dactylis glomerata</i>	orchard grass	FACU	I	–	–	X		–	–	–	–	–	–	X	–	–
<i>Distichlis spicata</i>	desert saltgrass	FAC	N	X	–	–	X	–	–	–	X	X	–	–	–	–
<i>Eleocharis</i> sp.	spikerush	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–
<i>Elymus lanceolatus</i>	thickspike wheatgrass	UPL	N	–	–	–	–	–	–	–	X	–	–	–	–	–
<i>Elymus trachycaulus</i>	slender wheatgrass	FACU	N	–	–	X	–	X	X	X	X	–	–	X	–	–
<i>Ephedra viridis</i>	green ephedra	UPL	N	–	–	–	–	–	–	–	–	X	–	–	–	–
<i>Epilobium ciliatum</i>	finged willowherb	FACW	N	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Equisetum hyemale</i>	scouringrush horsetail	FACW	N	–	–	–	–	–	–	X	–	–	–	X	–	–
<i>Equisetum laevigatum</i>	smooth scouring-rush	FACW	N	X	X	X	–	–	X	–	–	–	–	X	–	–

^A I - Introduced, N - Native, NOX-B - Colorado Noxious Weed List B, NOX-C - Colorado Noxious Weed List C (CDA 2024;USDA and NRCS 2023).

Table 44 (continued). GDE site vascular plant inventory list. X indicates a presence.

Species	Common Name	Wetland Code	Native Status ^A	1	2	3	4	5	6	7	8	9	12	13	14 & 15	17
<i>Ericameria nauseosa</i>	rubber rabbitbrush	UPL	N	–	–	–	–	–	–	X	–	–	–	–	X	–
<i>Glyceria striata</i>	fowl mannagrass	OBL	N	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Glycyrrhiza lepidota</i>	Nuttall's licorice	FAC	N	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Grindelia fastigiata</i>	erect gumweed	UPL	N	–	X	–	–	–	–	X	X	–	–	–	–	X
<i>Gutierrezia sarothrae</i>	broom snakeweed	UPL	N	–	–	–	–	–	–	–	–	X	–	–	–	–
<i>Hedysarum boreale</i>	Utah sweetvetch	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	X
<i>Heterotheca villosa</i>	hairy false goldenaster	UPL	N	–	–	–	–	–	–	X	–	–	–	–	–	–
<i>Hordeum jubatum</i>	foxtail barley	FAC	N	–	–	–	–	–	–	X	X	–	–	–	X	–
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	FACW	N	X	X	X	X	X	X	X	X	X	–	X	X	X
<i>Juncus torreyi</i>	Torrey's rush	FACW	N	–	–	–	–	–	–	–	–	–	–	–	X	–
<i>Juniperus osteosperma</i>	Utah juniper	UPL	N	–	–	X	–	–	–	–	X	–	–	–	–	–
<i>Lactuca serriola</i>	prickly lettuce	FACU	I	X	–	X	–	–	–	–	–	–	–	–	–	–
<i>Leymus cinereus</i>	Great Basin wildrye	FAC	N	–	–	–	–	–	–	–	–	–	–	–	X	–
<i>Lolium arundinaceum</i>	tall fescue	FACU	I	–	–	X	–	X	X	–	–	–	–	–	–	–
<i>Lolium pratense</i>	meadow fescue	FACU	I	–	–	–	–	X	–	–	–	X	–	–	–	–
<i>Maianthemum racemosum</i>	feathery false lily of the valley	FAC	N	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Maianthemum stellatum</i>	starry false Solomon's-seal	FACU	N	–	–	–	–	–	–	–	–	–	–	X	X	–
<i>Melilotus officinalis</i>	yellow sweet-clover	FACU	I	–	–	–	–	–	–	–	X	–	–	–	–	–
<i>Muhlenbergia andina</i>	foxtail muhly	FAC	N	–	X	–	–	–	–	–	–	–	–	–	–	–
<i>Muhlenbergia asperifolia</i>	scratchgrass	FACW	N	X	–	–	–	X	X	X	X	X	–	–	X	–
<i>Packera multilobata</i>	basin groundsel	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	X
<i>Pascopyrum smithii</i>	western wheatgrass	FAC	N	X	–	–	–	–	–	–	–	–	–	–	–	–
<i>Phragmites australis</i>	common reed	FACW	I, N	X	–	X	X	–	–	–	–	–	–	–	–	–
<i>Plantago lanceolata</i>	narrowleaf plantain	FAC	I	–	–	X	–	–	–	–	–	–	–	–	–	–
<i>Platanthera</i> sp.	fringed orchid	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Poa pratensis</i>	Kentucky bluegrass	FAC	I, N	–	–	X	–	–	X	X	–	–	X	X	–	–
<i>Polypogon monspeliensis</i>	rabbitfoot-grass	FACW	I	–	–	–	–	–	–	–	X	X	–	–	–	–
<i>Populus angustifolia</i>	narrow-leaved cottonwood	FACW	N	–	X	–	–	–	–	–	–	–	–	–	–	–
<i>Populus deltoides</i>	eastern cottonwood	FAC	N	–	X	–	–	X	X	–	–	–	–	–	–	–
<i>Populus fremontii</i>	Fremont cottonwood	FAC	N	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Prunus virginiana</i>	chokecherry	FAC	N	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Quercus gambelii</i>	Gambel oak	UPL	N	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Ranunculus cymbalaria</i>	marsh buttercup	OBL	N	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Rhus glabra</i>	smooth sumac	UPL	N	X	–	–	–	–	–	–	–	–	–	–	–	–
<i>Rhus trilobata</i>	skunkbush sumac	FACU	N	–	X	–	–	–	–	–	–	–	–	X	–	–

^A I - Introduced, N - Native, NOX-B - Colorado Noxious Weed List B, NOX-C - Colorado Noxious Weed List C (CDA 2024;USDA and NRCS 2023).

Table 44 (continued). GDE site vascular plant inventory list. X indicates a presence.

Species	Common Name	Wetland Code	Native Status ^A	1	2	3	4	5	6	7	8	9	12	13	14 & 15	17
<i>Rosa woodsii</i>	Woods' rose	FACU	N	–	–	–	–	–	–	–	–	–	–	X	X	–
<i>Rumex</i> sp.	dock	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–
<i>Rumex triangulivalvis</i>	Mexican dock	FACW	N	–	–	–	–	–	–	–	X	–	–	–	–	–
<i>Salix exigua</i>	coyote willow	FACW	N	–	X	X	–	X	X	X	X	–	X	X	X	
<i>Salix lasiandra</i>	greenleaf willow	FACW	N	–	–	X	–	–	X	–	–	–	–	–	–	–
<i>Salix ligulifolia</i>	strapleaf willow	FACW	N	–	X	–	–	–	–	–	–	–	X	X	–	X
<i>Salix monticola</i>	park willow	OBL	N	–	–	–	–	–	–	–	–	–	X	–	–	–
<i>Sarcobatus vermiculatus</i>	greasewood	FACU	N	X	–	–	X	–	–	–	–	–	–	–	–	–
<i>Schoenoplectus pungens</i>	common threesquare	OBL	N	–	X	–	–	–	–	–	–	–	–	–	–	–
<i>Sporobolus airoides</i>	alkali sacaton	FAC	N	X	–	–	X	–	–	–	–	–	–	–	–	–
<i>Symphyotrichum lanceolatum</i>	white panicle aster	OBL	N	X	–	–	–	–	–	–	–	–	–	–	X	X
<i>Symphyotrichum spathulatum</i>	western mountain aster	FAC	N	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Tamarix chinensis</i>	saltcedar	FAC	NOX-B	–	–	–	–	X	–	X	–	–	–	X	–	X
<i>Taraxacum officinale</i>	common dandelion	FACU	I	–	–	–	–	–	–	–	–	–	–	–	–	X
<i>Tragopogon dubius</i>	yellow salsify	FAC	I	–	–	–	–	–	–	X	–	–	X	–	–	–
<i>Triglochin maritima</i>	seaside arrowgrass	OBL	N	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Typha angustifolia</i>	narrow-leaf cattail	OBL	N	–	–	–	–	–	–	–	X	X	–	–	–	–
<i>Typha domingensis</i>	southern cattail	OBL	N	–	X	–	–	–	–	–	–	–	–	–	–	X
<i>Typha latifolia</i>	broad-leaved cattail	OBL	N	–	X	–	–	–	X	–	–	–	–	X	–	–
unknown annual forb	unknown annual forb	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
unknown annual graminoid	unknown annual graminoid	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
unknown graminoid	unknown graminoid	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
<i>Verbascum thapsus</i>	woolly mullein	FACU	I	–	–	–	–	–	–	X	–	–	–	–	–	–
<i>Veronica anagallis-aquatica</i>	water speedwell	OBL	N	–	X	–	–	X	–	–	–	–	–	–	–	–
<i>Xanthium strumarium</i>	rough cocklebur	FAC	N	–	–	–	–	–	–	–	X	–	–	–	–	–

^A I - Introduced, N - Native, NOX-B - Colorado Noxious Weed List B, NOX-C - Colorado Noxious Weed List C (CDA 2024;USDA and NRCS 2023).

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