



Spring Wetland Flora Inventory – Bryce Canyon National Park

Survey Report



A wetland surveyed at Bryce Canyon National Park.

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Spring wetland flora inventory – Bryce Canyon National Park: Survey report

Science Report NPS/SR—2024/129

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Please cite this publication as:

McBride, W., D. T. Kesonie, and E. Thorn. 2024. Report title: Spring wetland flora inventory – Bryce Canyon National Park: Survey report. Science Report NPS/SR—2024/129. National Park Service, Fort Collins, Colorado. <https://doi.org/10.36967/2303819>

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Abstract

This report provides the results from the 2021 and 2022 spring wetland flora inventory at Bryce Canyon National Park. 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 Bryce Canyon National Park identified and inventoried springs and wetlands at 13 of 20 survey sites. This report summarizes the results at these 13 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

COLM: Colorado National Monument

CURE: Curecanti National Recreation Area

DINO: Dinosaur National Monument

FAC: facultative plant

FACW: facultative wetland plant

FACU: facultative upland 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 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. 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 condition 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 a baseline 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 would be excluded from the perimeter.
- In spring systems feeding an extensive stream-type riparian area, the area would be 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 would be 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. Specimens, when collected, 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 does 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 BRCA. The priority survey sites were identified by BRCA staff, and most require verification to inform the potential for adjudication of diligence rights on their sources. The priority sites are found in Figure 1 and Table 1.

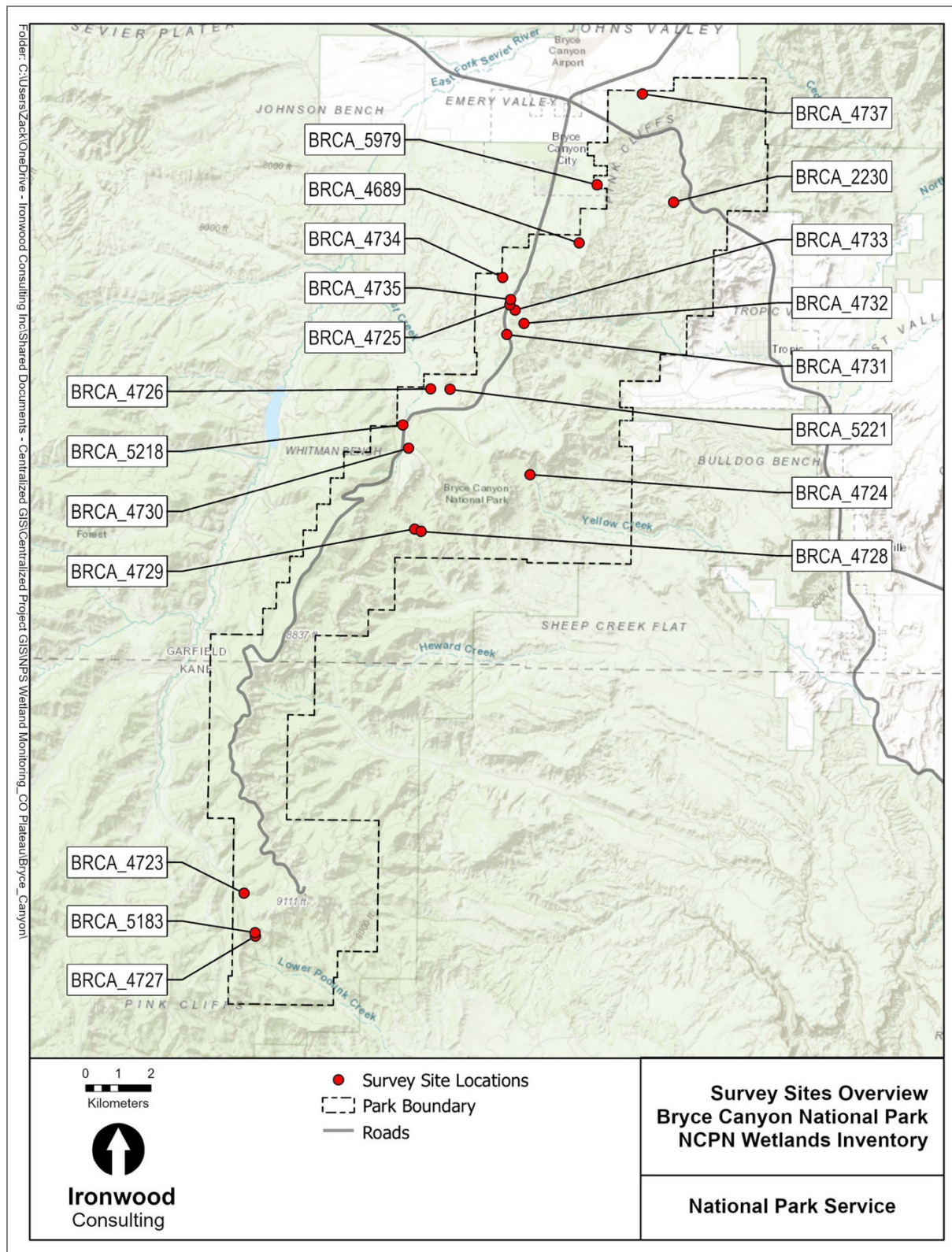


Figure 1. Bryce Canyon National Park Overview with Priority Survey Areas.

Table 1. Bryce Canyon National Park Priority Survey Sites.

Site Name	Area (hectares)	Area (acres)
BRCA 2230	0.38	0.94
BRCA 4689	4.77	11.79
BRCA 4723	4.05	10.02
BRCA 4724	0.97	2.39
BRCA 4725	1.17	2.89
BRCA 4726	12.12	29.95
BRCA 4727	0.14	0.36
BRCA 4728	0.74	1.83
BRCA 4729	1.00	2.47
BRCA 4730	2.48	6.12
BRCA 4731	1.98	4.90
BRCA 4732	0.30	0.73
BRCA 4733	0.31	0.77
BRCA 4734	0.48	1.18
BRCA 4735	2.43	6.01
BRCA 4736	0.003	0.01
BRCA 4737	0.54	1.34
BRCA 5183	0.18	0.44
BRCA 5218	4.78	11.80
BRCA 5221	1.78	4.40
BRCA 5979	2.21	5.45

Methods and Materials

Ironwood completed a project work plan (Ironwood 2021a) that detailed the survey methods, including project locations, staffing roles, project schedule, 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 NPS was 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 wetland/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, and roads, and included recent aerial photograph backgrounds. Large (24-inch by 36-inch) printed maps were provided to field staff for navigation and field planning. Digital maps were also created in ESRI Field Maps.

Ironwood created a data collection interface using ESRI Field Maps and Pendragon that was compatible with cell phones and tablets in the field for all data fields 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 within floodplains of surface water bodies.

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 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 GDE Level II.

Size of GDE (m ²) ^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 (m²) 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 BRCA survey sites using this methodology ranged from 1 to 11, and the total number of quadrats at each site ranged from 7 to 29. Details about the number of transects and quadrats used at each GDE site are found in the CEBR 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 to a cut-off height of four feet (ft) 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) was recorded using a spherical densiometer at three 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 3) 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 present 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 provides 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) meets or surpasses 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 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 m² 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 ESRI Field Maps along the boundary between the wetland and upland vegetation communities using the USACE Dominance Test. Where wetland areas were represented by having greater than 50% OBL and/or FACW absolute plant cover and upland areas included greater than 50% facultative (FAC), facultative upland (FACU), and/or upland (UPL) absolute plant cover.
- 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 ESRI Field Maps application was used to calculate the area (in square meters) and the length at 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-thru 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

Table 3 (continued). GPS Settings and Accuracy Parameters.

Parameter	Setting
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, then field staff did not complete the GDE Level II survey protocol. If hydrologic features were present (e.g., spring orifice or flowing channel), these features were mapped; however, no wetland delineation was conducted.

If neither wetland characteristics nor other evidence of a spring was 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 where negative data were collected. At non-GDE sites that were identified for survey 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 below (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 was the ESRI Field Maps app with the data parameter setting options as seen below. When difficult satellite constellation or topography (e.g., 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 provides a georeferenced copy of each photo with 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
- Date of photo

An example of a labeled photo is “BRCA_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 include moose, elk, deer, sheep, bear, mountain lion, bison, and recent cattle sign. 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, 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, 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.

BRCA Specific Metrics

Within BRCA, wetted surface areas associated with springs were documented and categorized as flowing, pooled, or saturated. Surface soils that were classified as wetted were glistening in natural light. The perimeter of the wetted area was mapped using a sub-meter GPS unit. If a wetted area was less than 5 m², point data were taken at the approximate center point.

Data Management

All data were recorded electronically on the application interface designed for the project using ESRI Field Maps and Pendragon on field tablets. Data were uploaded to the 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 is capable of a 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:** ESRI Field Maps was used to collect spatial data and transfer it to a cloud storage. A data collection 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 the 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 type, observer, survey site, 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 PM was in the field for all data collection to help ensure that the workplan was followed and the data documentation followed 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 PM and/or Assistant PM, and the data were corrected and re-reviewed by the GIS/Data Lead.

Results

Surveys took place between August 10 and 14, 2021, and August 16 and 20, 2022. Twelve of the 20 surveyed areas were identified as GDE sites, with evidence of springs present (Table 4, Appendix A: GDE Site Summary Table Locality Details). A single site (BRCA 4728) was characterized as a riparian site, with the potential of a hypocrene spring also being present.

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

Site Name	Site Type	Primary GDE Type
BRCA 2230	GDE	Rheocrene
BRCA 4689	GDE	Helocrene
BRCA 4723	GDE	Rheocrene
BRCA 4724	GDE	Rheocrene
BRCA 4725	GDE	Hypocrene
BRCA 4727	GDE	Rheocrene
BRCA 4728	GDE	Hypocrene
BRCA 4729	GDE	Hypocrene
BRCA 4733	GDE	Hypocrene
BRCA 4735	GDE	Hypocrene
BRCA 4737	GDE	Rheocrene
BRCA 5183	GDE	Rheocrene
BRCA 5218	GDE	Hypocrene
BRCA 5979	GDE	Helocrene
BRCA 4726	Non-GDE	–
BRCA 4730	Non-GDE	–
BRCA 4731	Non-GDE	–
BRCA 4732	Non-GDE	–
BRCA 4734	Non-GDE	–
BRCA 5221	Non-GDE	–
BRCA 4736	Did Not Survey	–

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.

A single priority site (BRCA 4736) was not surveyed due to difficult access from washed out roads.

BRCA 2230

The BRCA 2230 GDE site was located at an elevation of approximately 2,112 m with an overall northeast (75°) aspect and high slope variability across the site. Flow from spring sources, standing

water, and wetland vegetation provided evidence of groundwater. A total of seven orifices were mapped. The spring type was characterized as rheocrene. This GDE site included a total wetland area of 0.02 acre (ac; 75.2 m²) and 70.5 m of wetland perimeter (Figure 2, Appendix B: GDE Site Summary Table Wetland Feature).

Eleven plant taxa were recorded during the GDE Level II survey, including seven taxa captured in herbaceous vegetation quadrats and woody line intercept transects (Table 5, Table 6, Appendix D: GDE Site Vascular Plant Inventory List). Total average herbaceous cover was 21.2%. The dominant herbaceous wetland plants were Baltic rush (*Juncus balticus* var. *montanus*) and golden sedge (*Carex aurea*) with 9.3% and 7.6% average cover, respectively. Ground cover included bryophyte, litter, water, stone, gravel, basal, and wood with 27.1%, 22.9%, 16.7%, 10.4%, 8.3%, 8.3%, and 6.3% average corner hits, respectively (Table 7). Shrubby cinquefoil (*Dasiphora floribunda*) had an average woody line intercept cover of 0.5% (Table 6).

Table 5. Herbaceous vegetation quadrat data for BRCA 2230. Bryophytes not included in totals.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	FACW	9.3	100
<i>Carex aurea</i>	golden sedge	FACW	7.6	75
<i>Symphyotrichum eatonii</i>	Eaton's aster	FAC	1.9	50
<i>Carex interior</i>	inland sedge	OBL	1.3	17
<i>Platanthera sparsiflora</i>	sparse-flowered bog orchid	FACW	0.6	8
<i>Carex</i> sp.	sedge	–	0.5	25
Bryophytes	moss	–	21.9	58
Total	–	–	21.2	–
50% of Total	–	–	10.6	–
20% of Total	–	–	4.2	–

Table 6. Woody vegetation line intercept summary data for BRCA 2230.

Species	Common name	Wetland Code	Average Woody Plant Cover (%)
<i>Dasiphora floribunda</i>	shrubby cinquefoil	FAC	0.5
Total	–	–	0.5

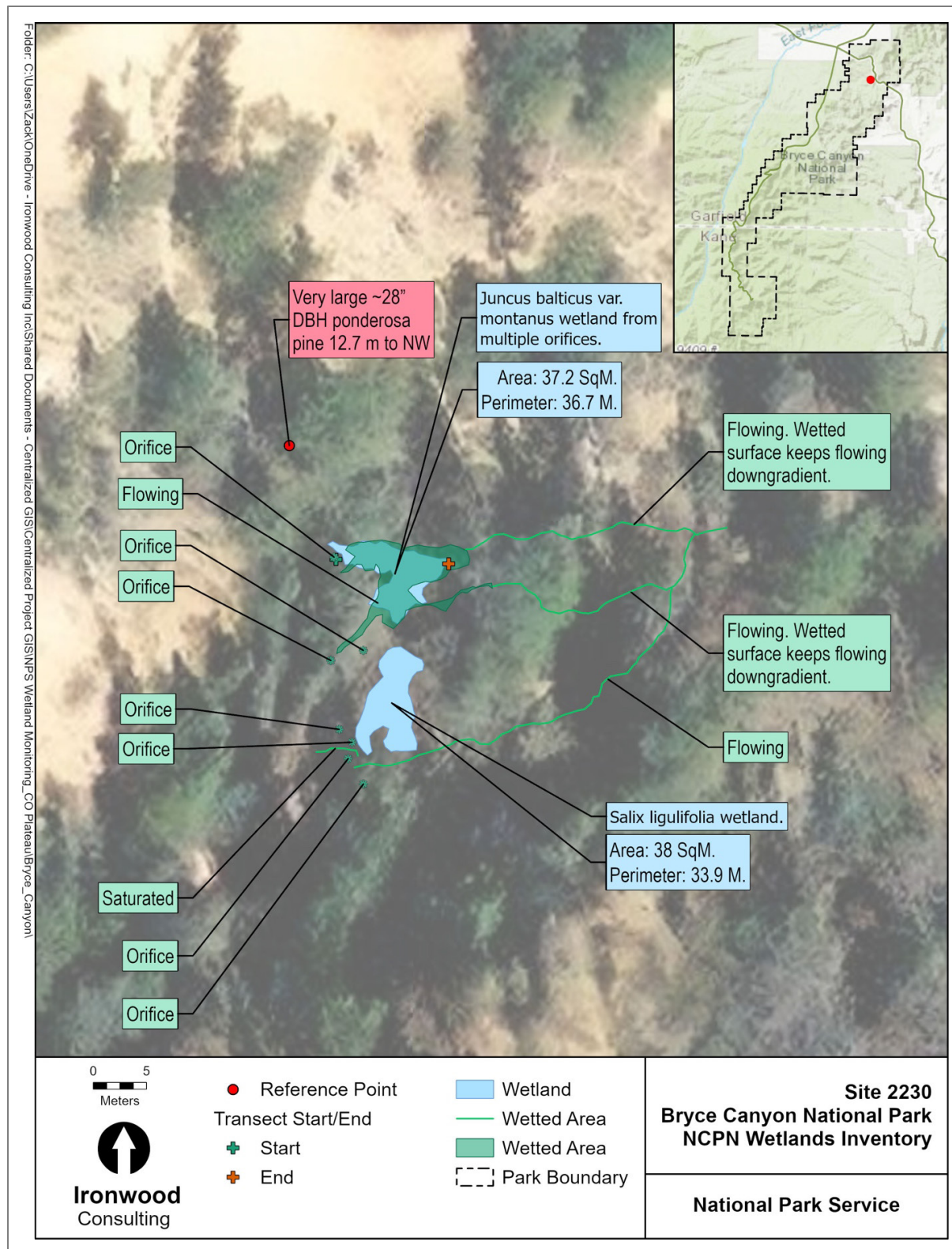


Figure 2. Wetland mapping for BRCA 2230.

Table 7. Groundcover quadrat data for BRCA 2230.

Groundcover Type	Average Corner Hits (%)
Bryophyte	27.1
Gravel	8.3
Cobble	0.0
Stone	10.4
Boulder	0.0
Bedrock	0.0
Basal	8.3
Litter	22.9
Water	16.7
Wood	6.3
Soil	0.0
Total	100.0

BRCA 4689

The BRCA 4689 GDE site was located at an elevation of approximately 2,353 m, with an overall northeast (38°) aspect and low slope variability across the site. Wetland vegetation provided evidence of groundwater at this site. The spring type was characterized as helocrene. This GDE site included a total wetland area and perimeter of 0.02 ac (73.9 m²) and 84.2 m, respectively (Figure 3, Appendix B: GDE Site Summary Table Wetland Feature).

Eight plant taxa were encountered during the GDE Level II survey, including five taxa captured in herbaceous vegetation quadrats (Appendix D: GDE Site Vascular Plant Inventory List, Table 8). The total average herbaceous cover was 17.7%. The dominant herbaceous wetland plant was blackcreeper sedge (*Carex praegracilis*) with 16.6% average cover. Groundcover included litter, soil, and basal with 89.3%, 7.1%, and 3.6% average corner hits, respectively (Table 9). There was no woody line intercept cover.

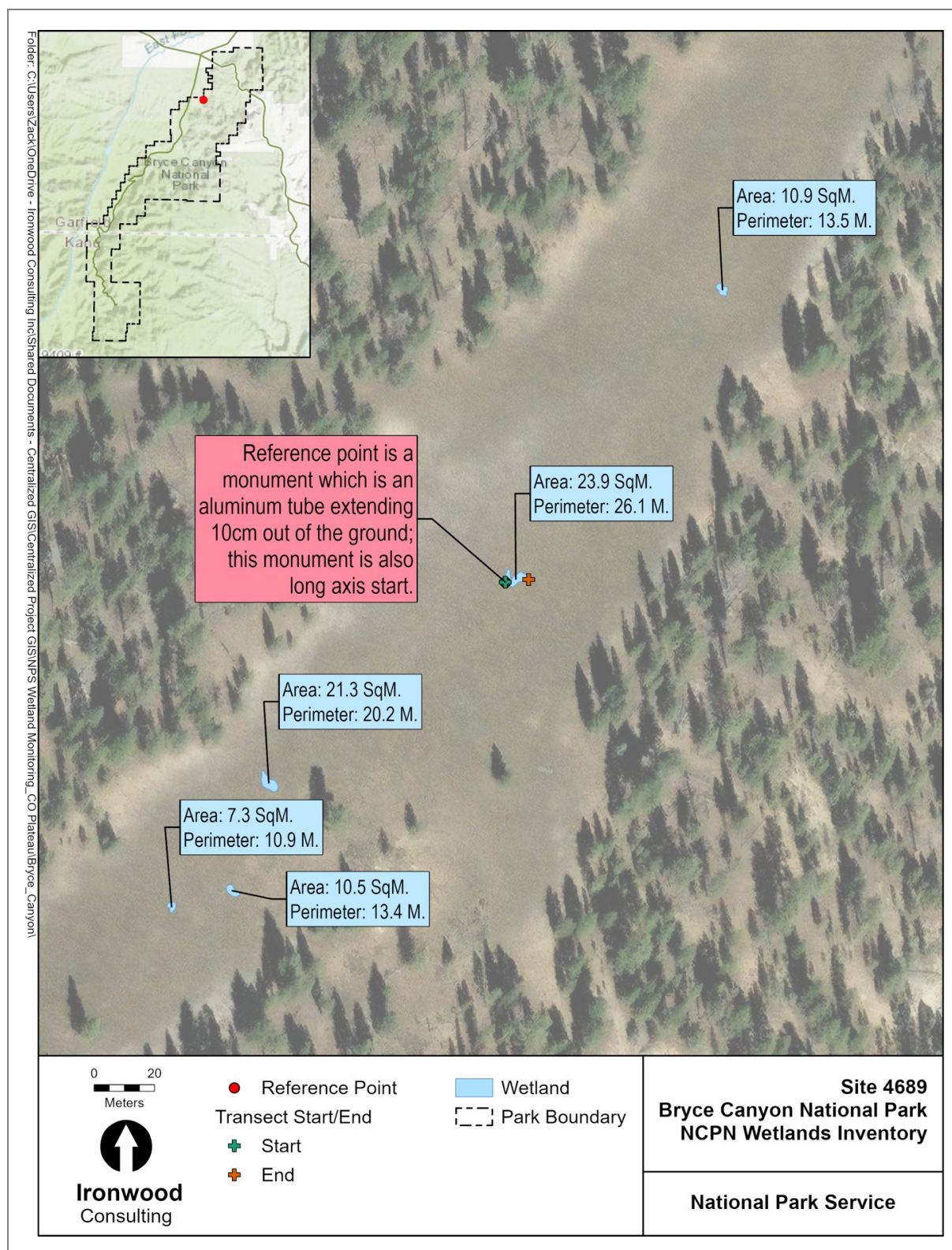


Figure 3. Wetland mapping for BRCA 4689.

Table 8. Herbaceous vegetation quadrat data for BRCA 4689. Bryophytes not included in totals.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Carex praeegracilis</i>	blackcreeper sedge	FACW	16.6	100
<i>Lappula occidentalis</i>	western stickseed	UPL	0.7	29
<i>Astragalus</i> sp.	milkvetch	–	0.1	14
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	FACW	0.1	14
<i>Poa pratensis</i>	Kentucky bluegrass	FAC	0.1	14
Bryophytes	moss	–	0.0	0
Total	–	–	17.7	–
50% of Total	–	–	8.9	–
20% of Total	–	–	3.5	–

Table 9. Groundcover quadrat data for BRCA 4689.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	3.6
Litter	89.3
Water	0.0
Wood	0.0
Soil	7.1
Total	100.0

The only non-native plant detected was Kentucky bluegrass (*Poa pratensis*).

No recreational impacts or spring developments were observed. Deer and elk sign were both observed with 29% frequency within the herbaceous quadrats (Appendix C: GDE Site Wildlife Summary Table). Deer, elk, and turkey sign were also observed outside of the quadrats at this site.

BRCA 4723

The BRCA 4723 GDE site occurs at an elevation of approximately 2,504 m with an overall northwest (306°) aspect and moderate slope variability across the site. Evidence of groundwater

included flow from spring sources, peak/muck accumulation, standing water, and wetland vegetation. The spring type was characterized as rheocrene. Four spring orifices were mapped at this site. This site included a total wetland area and perimeter length of 5.7 ac (23,093.7 m²) and 1,997.7 m, respectively (Figure 4, Appendix B: GDE Site Summary Table Wetland Feature). Mapped wetlands and wetted areas abut adjacent National Forest lands and these features were artificially cut off at the Forest boundary during mapping.

A total of 22 plant taxa were documented, including 14 taxa captured by the herbaceous vegetation quadrats and woody line intercept transects (Appendix D: GDE Site Vascular Plant Inventory List, Table 10, Table 11). Total herbaceous cover averaged 32.0%. The dominant wetland plants were water sedge (*Carex aquatilis*) and Baltic rush with 14.8% and 9.7% average cover, respectively. The average groundcover included litter, basal, bryophyte, and soil with 90.4%, 5.8%, 1.9%, and 1.9% average corner hits, respectively (Table 12). Grayleaf willow (*Salix glauca*) had an average woody line intercept cover of 6.5%.

Table 10. Herbaceous vegetation quadrat data for BRCA 4723. Bryophytes not included in totals.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Carex aquatilis</i>	water sedge	OBL	14.8	77
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic sedge	FACW	9.7	77
<i>Symphyotrichum welshii</i>	Welsh's aster	UPL	2.5	31
<i>Symphyotrichum foliaceum</i>	alpine leafybract aster	FACU	1.0	12
<i>Argentina anserina</i>	silverweed	OBL	0.8	8
<i>Poa pratensis</i>	Kentucky bluegrass	FAC	0.8	12
<i>Epilobium ciliatum</i>	glandular willow-herb	FACW	0.7	12
<i>Carex vesicaria</i>	blister sedge	OBL	0.7	8
<i>Muhlenbergia richardsonis</i>	mat muhly	FAC	0.4	8
<i>Potentilla gracilis</i>	slender cinquefoil	FAC	0.3	4
<i>Carex</i> sp.	sedge	–	0.2	8
<i>Erigeron lonchophyllus</i>	longleaf daisy	FACW	0.2	4
<i>Ranunculus cymbalaria</i>	marsh buttercup	OBL	0.1	4
Bryophytes	moss	–	1.7	27
Total	–	–	32.0	–
50% of Total	–	–	16.0	–
20% of Total	–	–	6.4	–

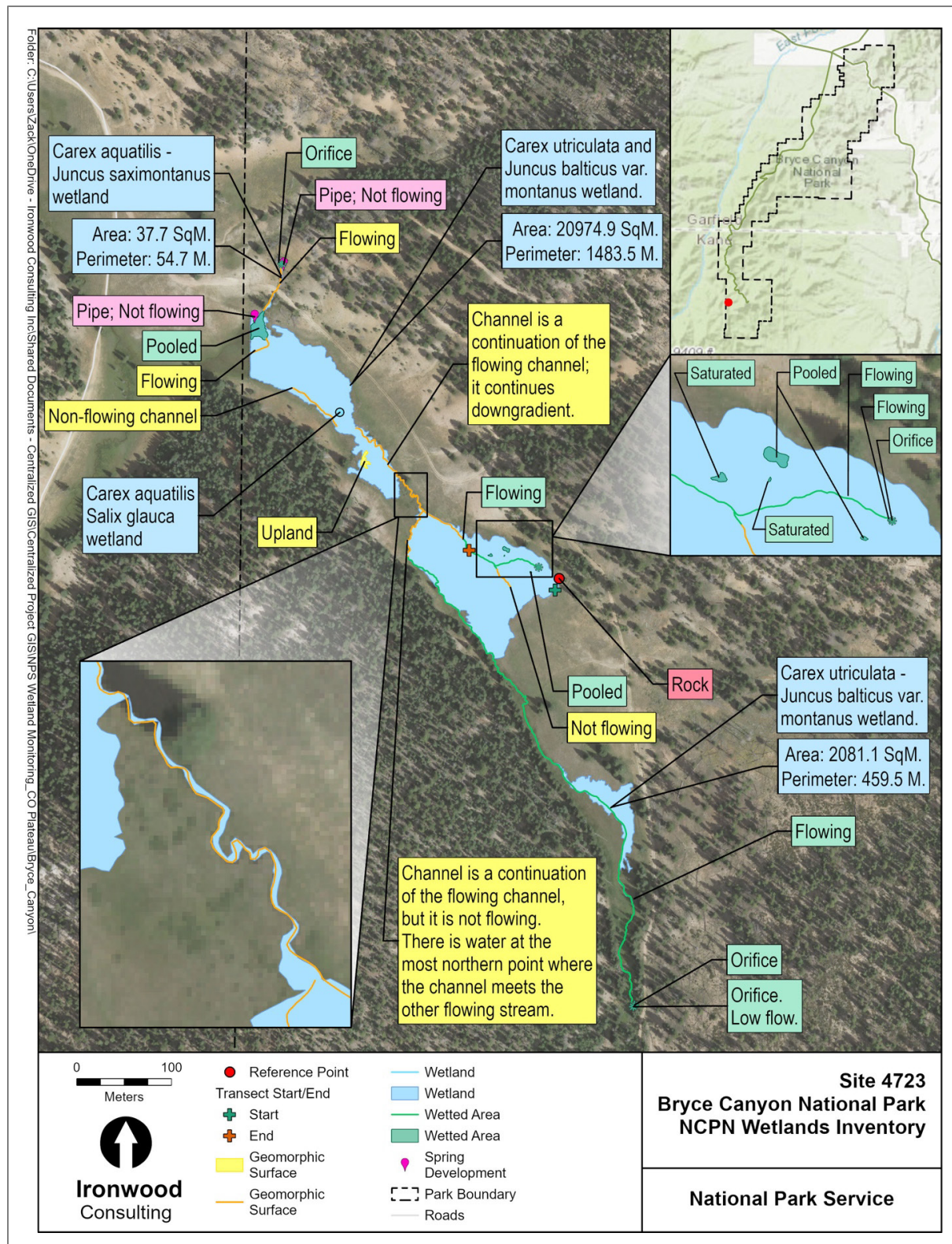


Figure 4. Wetland mapping for BRCA 4723.

Table 11. Woody vegetation line intercept summary data for BRCA 4723.

Species	Common name	Wetland Code	Average Woody Plant Cover (%)
<i>Salix glauca</i>	grayleaf willow	FACW	6.5
Total	–	–	6.5

Table 12. Groundcover quadrat data for BRCA 4723.

Groundcover Type	Average Corner Hits (%)
Bryophyte	1.9
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	5.8
Litter	90.4
Water	0.0
Wood	0.0
Soil	1.9
Total	100.0

The only non-native plant species detected at this site was Kentucky bluegrass. A botanical novelty, little green sedge (*Carex viridula*) was observed in the vicinity of the vegetation transects, just outside of a measured quadrat.

No recreation impacts or spring developments were observed. Deer and historic cow sign were observed within the herbaceous quadrats, with 8% and 15% frequency, respectively (Appendix C: GDE Site Wildlife Summary Table). Deer and elk sign were also noted outside of the quadrats.

BRCA 4724

The BRCA 4724 GDE site was located at an elevation of approximately 2,185 m with an overall south (180°) aspect and moderate slope variability across the site. Flow from spring sources, peat/muck accumulation, standing water, and wetland vegetation provided evidence of groundwater. Two spring orifices were mapped at this site, with below-surface travertine plates forming downgradient of the orifice. The spring type was characterized as rheocrene. This GDE site included a total wetland area and perimeter of 2.69 ac (10,900.4 m²) and 815.9 m, respectively (Figure 5, Appendix B: GDE Site Summary Table Wetland Feature).

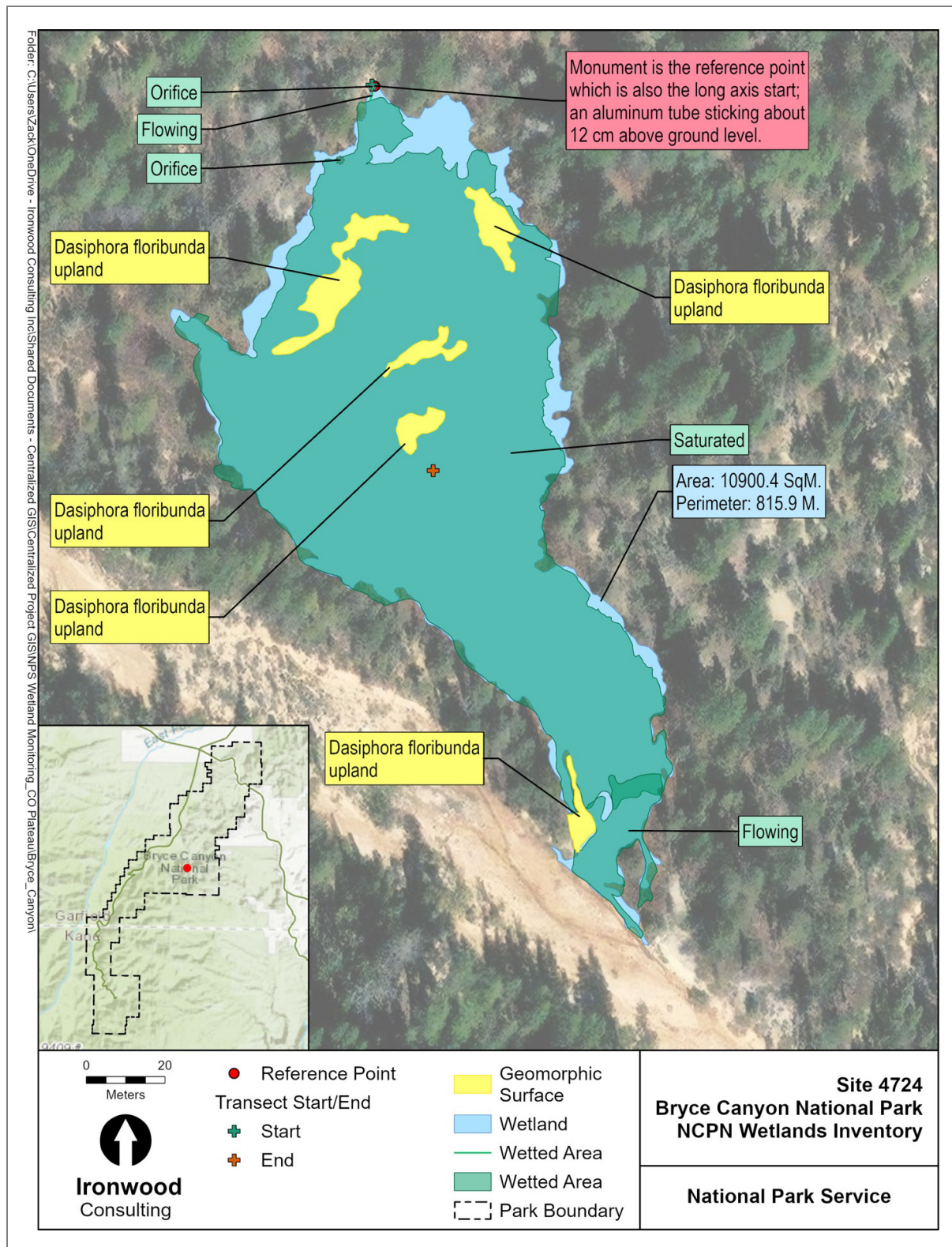


Figure 5. Wetland mapping for BRCA 4724.

Nineteen plant taxa were documented during the GDE Level II survey, including 17 taxa captured in herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 13, Table 14). Total average herbaceous cover was 67.6%. The dominant herbaceous wetland plant was beaked spikerush (*Eleocharis rostellata*) with 51.1% average cover. Groundcover included water, litter, basal, bryophyte, wood, soil, gravel, stone, bedrock, and cobble with 57.8%, 12.9%, 11.2%, 3.4%, 3.4%, 2.6%, 2.6%, 1.7%, and 0.9% average corner hits, respectively (Table 15). The total average woody line intercept cover was 16.3%. Shrubby cinquefoil, redosier dogwood (*Cornus sericea*), water birch (*Betula occidentalis*), Rocky Mountain juniper (*Juniperus scopulorum*), Woods' rose (*Rosa woodsii*), and mountain willow (*Salix monticola*) had average woody line intercept covers of 6.9%, 5.1%, 3.1%, 0.7%, 0.3%, and 0.2% respectively.

Table 13. Herbaceous vegetation quadrat data for BRCA 4724. Bryophytes not included in totals.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Eleocharis rostellata</i>	beaked spikerush	OBL	51.1	93
<i>Carex hystericina</i>	bottlebrush sedge	OBL	8.2	28
<i>Deschampsia caespitosa</i>	tufted hairgrass	FACW	2.7	31
<i>Berula erecta</i>	cutleaf water-parsnip	OBL	1.6	7
<i>Platanthera</i> sp.	fringed orchid	–	1.6	7
<i>Carex interior</i>	inland sedge	OBL	1.1	17
<i>Symphyotrichum</i> sp.	aster	–	0.9	34
<i>Muhlenbergia andina</i>	foxtail muhly	FAC	0.1	3
<i>Phragmites australis</i>	common reed	FACW	0.1	3
<i>Epilobium ciliatum</i>	fringed willowherb	FACW	0.1	10
<i>Parnassia palustris</i>	marsh grass of Parnassus	OBL	0.1	7
Bryophytes	moss	–	3.8	41
Total	–	–	67.6	–
50% of Total	–	–	33.8	–
20% of Total	–	–	13.5	–

Table 14. Woody vegetation line intercept summary data for BRCA 4724.

Species	Common name	Wetland Code	Average Woody Plant Cover (%)
<i>Dasiphora floribunda</i>	shrubby cinquefoil	FAC	6.9
<i>Cornus sericea</i>	redosier dogwood	FACW	5.1
<i>Betula occidentalis</i>	water birch	FACW	3.1

Table 14 (continued). Woody vegetation line intercept summary data for BRCA 4724.

Species	Common name	Wetland Code	Average Woody Plant Cover (%)
<i>Juniperus scopulorum</i>	Rocky Mountain juniper	UPL	0.7
<i>Rosa woodsii</i>	Woods' rose	FACU	0.3
<i>Salix monticola</i>	mountain willow	OBL	0.2
Total	—	—	16.3

Table 15. Groundcover quadrat data for BRCA 4724.

Groundcover Type	Average Corner Hits (%)
Bryophyte	3.4
Gravel	2.6
Cobble	0.9
Stone	2.6
Boulder	0.0
Bedrock	1.7
Basal	11.2
Litter	12.9
Water	57.8
Wood	3.4
Soil	3.4
Total	100.0

The only non-native plant species detected at this site was the noxious weed common reed (*Phragmites australis*).

Recreation impacts included camp sites and a fire ring. No spring developments were observed. Historic cattle scat was observed with 3% frequency within the vegetation quadrats (Appendix C: GDE Site Wildlife Summary Table). Deer and elk sign were observed outside of the quadrats.

BRCA 4725

The BRCA 4725 GDE site was located at an elevation of approximately 2,381 m with an overall northeast (39°) aspect and low slope variability across the site. 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 of 0.17 ac (668.2 m²) and 310.8 m, respectively (Figure 6, Appendix B: GDE Site Summary Table Wetland Feature).

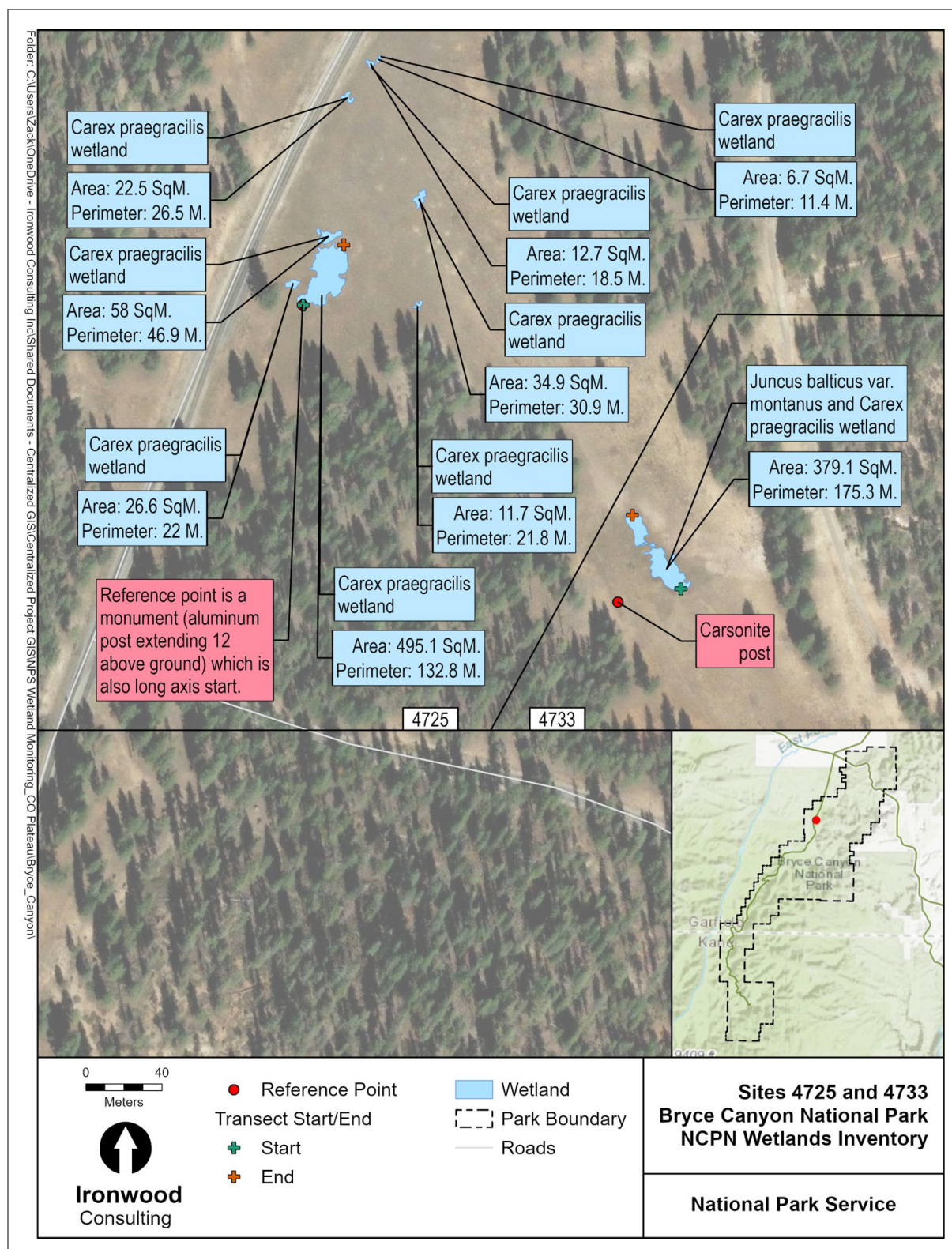


Figure 6. Wetland mapping for BRCA 4725 and 4733.

Fourteen plant taxa were recorded during the GDE Level II survey, including 11 taxa captured in herbaceous vegetation quadrats (Appendix D: GDE Site Vascular Plant Inventory List, Table 16). Total average herbaceous cover was 65.9%. The dominant herbaceous wetland plant was blackcreeper sedge with 62.6% average cover. Groundcover included litter, soil, and basal with 90.2%, 7.6%, and 2.2% average corner hits, respectively (Table 17). There was no woody line intercept cover.

Table 16. Herbaceous vegetation quadrat data for BRCA 4725. Bryophytes not included in totals.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Carex praeegracilis</i>	blackcreeper sedge	FACW	62.6	96
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	FACW	1.3	30
<i>Elymus trachycaulus</i>	slender wheatgrass	FAC	0.7	22
<i>Artemisia frigida</i>	fringed sagebrush	UPL	0.3	9
<i>Senecio spartioides</i>	broom-like ragwort	UPL	0.3	4
<i>Muhlenbergia richardsonis</i>	mat muhly	FAC	0.2	4
<i>Descurainia pinnata</i>	western tansymustard	UPL	0.2	4
<i>Koeleria macrantha</i>	junegrass	UPL	0.1	4
<i>Poa pratensis</i>	Kentucky bluegrass	FAC	0.1	4
<i>Androsace septentrionalis</i>	pygmy-flower rock-jasmine	FACU	0.04	4
<i>Erigeron flagellaris</i>	trailing daisy	FACU	0.04	4
Bryophytes	moss	–	0.0	0
Total	–	–	65.9	–
50% of Total	–	–	33.0	–
20% of Total	–	–	13.2	–

Table 17. Groundcover quadrat data for BRCA 4725.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	2.2

Table 17 (continued). Groundcover quadrat data for BRCA 4725.

Groundcover Type	Average Corner Hits (%)
Litter	90.2
Water	0.0
Wood	0.0
Soil	7.6
Total	100.0

The only non-native plant species detected was Kentucky bluegrass.

No recreation impact or spring developments were observed. Deer and elk sign were captured within the herbaceous quadrats, with 9% and 22% frequency, respectively (Appendix C: GDE Site Wildlife Summary Table). Both sign types were also observed outside of the quadrats.

BRCA 4727

The BRCA 4727 survey site was located at an elevation of approximately 2,447 m with an overall southwest aspect (200°) and high slope variability across the site. Evidence of groundwater included flow from a single spring orifice and standing water. The spring type was characterized as rheocrene. No wetlands were present (Figure 7, Table 18, Appendix B).

Table 18. Continued legend for Figure 7, BRCA 4727 and 5183.

ID	Comments	Area (m ²)	Perimeter (m.)
1	<i>Juncus balticus</i> var. <i>montanus</i> and <i>Carex aurea</i> wetland.	31.6	30.7
2	<i>Juncus balticus</i> var. <i>montanus</i> and <i>Carex aurea</i> wetland.	3.6	12.1
3	<i>Juncus balticus</i> var. <i>montanus</i> and <i>Carex aurea</i> wetland.	65.7	75.9
4	<i>Juncus balticus</i> var. <i>montanus</i> and <i>Carex aurea</i> wetland.	7.3	15
5	<i>Juncus balticus</i> var. <i>montanus</i> – <i>Juncus ensifolius</i> wetland.	15.3	18.1
6	<i>Juncus ensifolius</i> - <i>Deschampsia caespitosa</i> - <i>Carex aurea</i> wetland.	22.8	35.9
7	<i>Carex aquatilis</i> - <i>Deschampsia caespitosa</i> wetland.	3.5	9.5
8	<i>Juncus ensifolius</i> - <i>Carex</i> wetland.	13.6	29.6
9	<i>Juncus ensifolius</i> wetland.	5.1	10.2

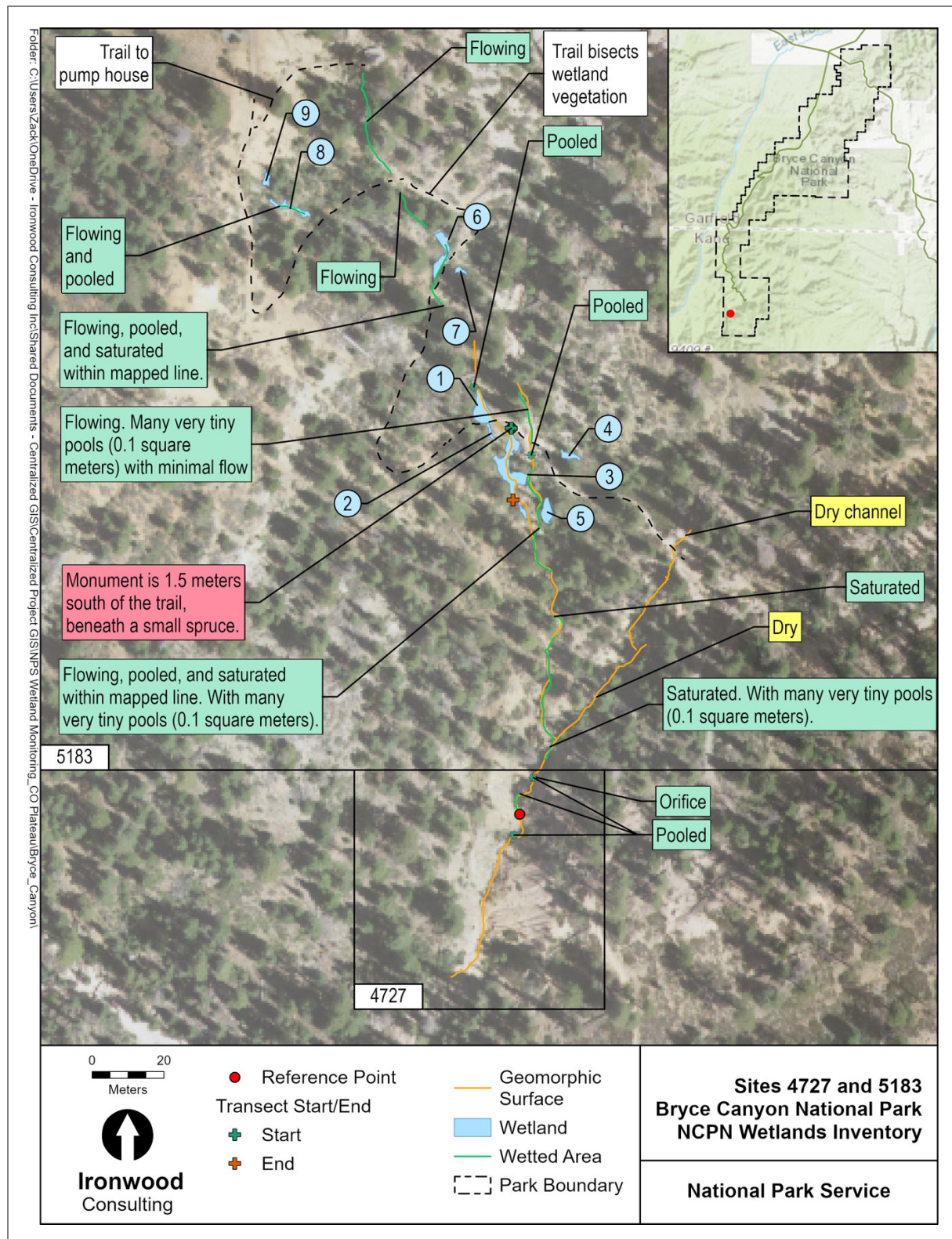


Figure 7. Wetland mapping for BRCA 4727 and 5183. Legend continues in Table 18.

While the FACW herbaceous plant species Baltic rush was present, no wetlands were mapped due to a lack of dominant cover by FACW and/or OBL plants. A single transect was run across the most mesic portion of the site and three herbaceous vegetation quadrats were sampled. The dominant plants were Jones' reedgrass (*Calamagrostis scopulorum*) and blueleaf aster (*Eurybia glauca*), with 4.0% and 2.0% average cover, respectively (Table 19). Groundcover included stone, gravel, and soil with 50.0%, 41.7%, and 8.3% average corner hits, respectively (Table 20). There was no woody line intercept cover.

Table 19. Herbaceous vegetation quadrat data for BRCA 4727. Bryophytes not included in totals.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Calamagrostis scopulorum</i>	Jones' reedgrass	FAC	4.0	33
<i>Eurybia glauca</i>	blueleaf aster	UPL	2.0	67
<i>Achnatherum hymenoides</i>	Indian ricegrass	UPL	0.3	33
<i>Ipomopsis aggregata</i>	scarlet gilia	UPL	0.3	33
Bryophytes	moss	–	0.0	0
Total	–	–	6.7	–
50% of Total	–	–	3.3	–
20% of Total	–	–	1.3	–

Table 20. Groundcover quadrat data for BRCA 4727.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	41.7
Cobble	0.0
Stone	50.0
Boulder	0.0
Bedrock	0.0
Basal	0.0
Litter	0.0
Water	0.0
Wood	0.0
Soil	8.3
Total	100.0

There were no non-native or noxious plant species detected at this site.

There were no recreation impacts or spring developments observed. Deer sign and historic cattle scat were observed outside of the herbaceous cover quadrats (Appendix C: GDE Site Wildlife Summary Table).

BRCA 4728

The BRCA 4728 GDE site occurs at an elevation of approximately 2,199 m with an overall southeast aspect (135°) and low slope variability. Wetland vegetation provided evidence of groundwater. The spring type was characterized as hypocrene. This site included a total wetland area and perimeter length of 0.04 ac (170.5 m²) and 123.2 m, respectively (Figure 8, Appendix B: GDE Site Summary Table Wetland Feature).

Fifteen plant taxa were documented during the GDE level II survey, including 12 taxa captured in herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 21, Table 22). Total herbaceous cover averaged 63.7%. The dominant herbaceous wetland plants were silverweed (*Argentina anserina*) and Baltic rush with 26.1% and 21.6% average cover, respectively. Groundcover included litter, soil, and basal with 91.7%, 6.9%, and 1.4% average corner hits, respectively (Table 23). The total average woody line intercept cover was 3.7%. Woods' rose (*Rosa woodsii*) and narrowleaf willow (*Salix exigua*) had average woody line intercept covers of 2.6% and 1.1%, respectively.

Table 21. Herbaceous vegetation quadrat data for BRCA 4728. Bryophytes not included in totals.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Argentina anserina</i>	silverweed	OBL	26.1	72
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	FACW	21.6	100
<i>Carex praegracilis</i>	blackcreeper sedge	FACW	6.8	61
<i>Iris missouriensis</i>	Rocky Mountain iris	FACW	2.9	11
<i>Senecio hydrophilus</i>	water groundsel	OBL	2.7	39
<i>Elymus trachycaulus</i>	slender wheatgrass	FAC	2.1	44
<i>Cirsium vulgare</i>	bull thistle	FACU	0.6	6
<i>Agrostis stolonifera</i>	redtop	FAC	0.4	17
<i>Symphyotrichum welshii</i>	Welsh's aster	UPL	0.3	22
<i>Muhlenbergia asperifolia</i>	scratchgrass	FACW	0.1	6
Bryophytes	moss	–	0.0	0
Total	–	–	63.7	–
50% of Total	–	–	31.9	–
20% of Total	–	–	12.7	–

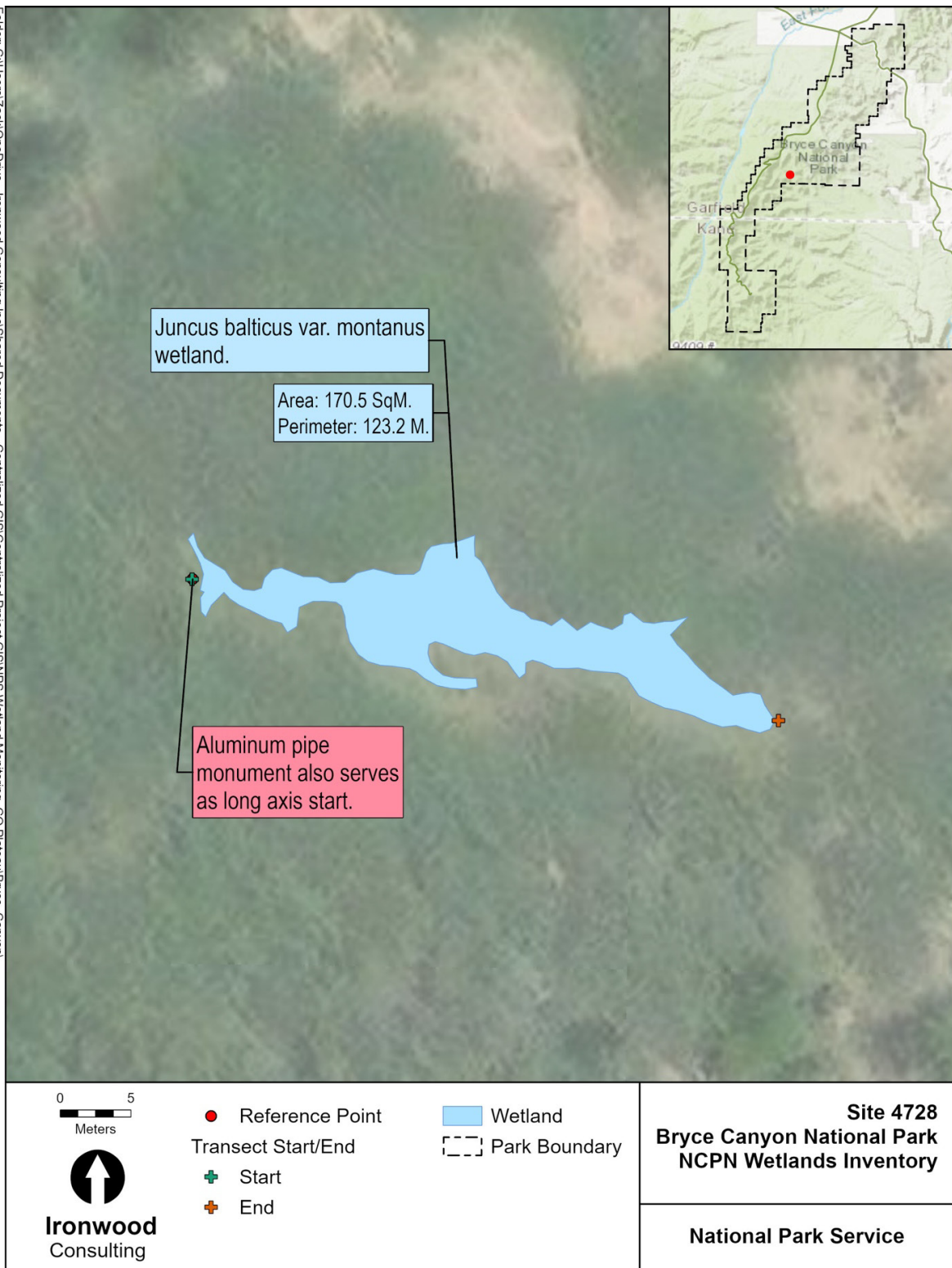


Figure 8. Wetland mapping for BRCA 4728.

Table 22. Woody vegetation line intercept summary data for BRCA 4728.

Species	Common name	Wetland Code	Average Woody Plant Cover (%)
<i>Rosa woodsii</i>	Woods' rose	FACU	2.6
<i>Salix exigua</i>	narrowleaf willow	FACW	1.1
Total	–	–	3.7

Table 23. Groundcover quadrat data for BRCA 4728.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	1.4
Litter	91.7
Water	0.0
Wood	0.0
Soil	6.9
Total	100.0

Non-native plants at this site included bull thistle (*Cirsium vulgare*), prickly lettuce (*Lactuca serriola*), and redtop (*Agrostis stolonifera*).

No recreation impacts or spring developments were observed. Rabbit sign was observed with 28% frequency within the vegetation quadrats (Appendix C: GDE Site Wildlife Summary Table). Deer sign was observed outside of the quadrats.

BRCA 4729

The BRCA 4729 GDE site occurs in a diverse and complex riparian bottomland. Wetland and riparian vegetation provided evidence of groundwater and the spring type was characterized as hypocrene. This site included a total wetland area and perimeter length of 0.02 ac (73.9 m²) and 40.7 m, respectively (Figure 9; Appendix B: GDE Site Summary Table Wetland Feature). The full wetland and/or riparian GDE protocol was not conducted here because of the unique assemblage of woody riparian species with minor wetland understory. The small-scale occurrence of water birch

(*Betula occidentalis*) and park willow (*Salix monticola*) overstory was a tall shrub (approaching tree height) riparian assemblage growing extremely dense, but only in exceedingly small patches and only one polygon was mapped. The assemblage had a wetland understory of Baltic rush, but it was not able to be sampled due to the extremely dense birch and willow overstory. Because the immediately adjacent vegetation did not qualify as wetland or riparian, these micro-islands of water birch-park willow riparian vegetation were not sampled.

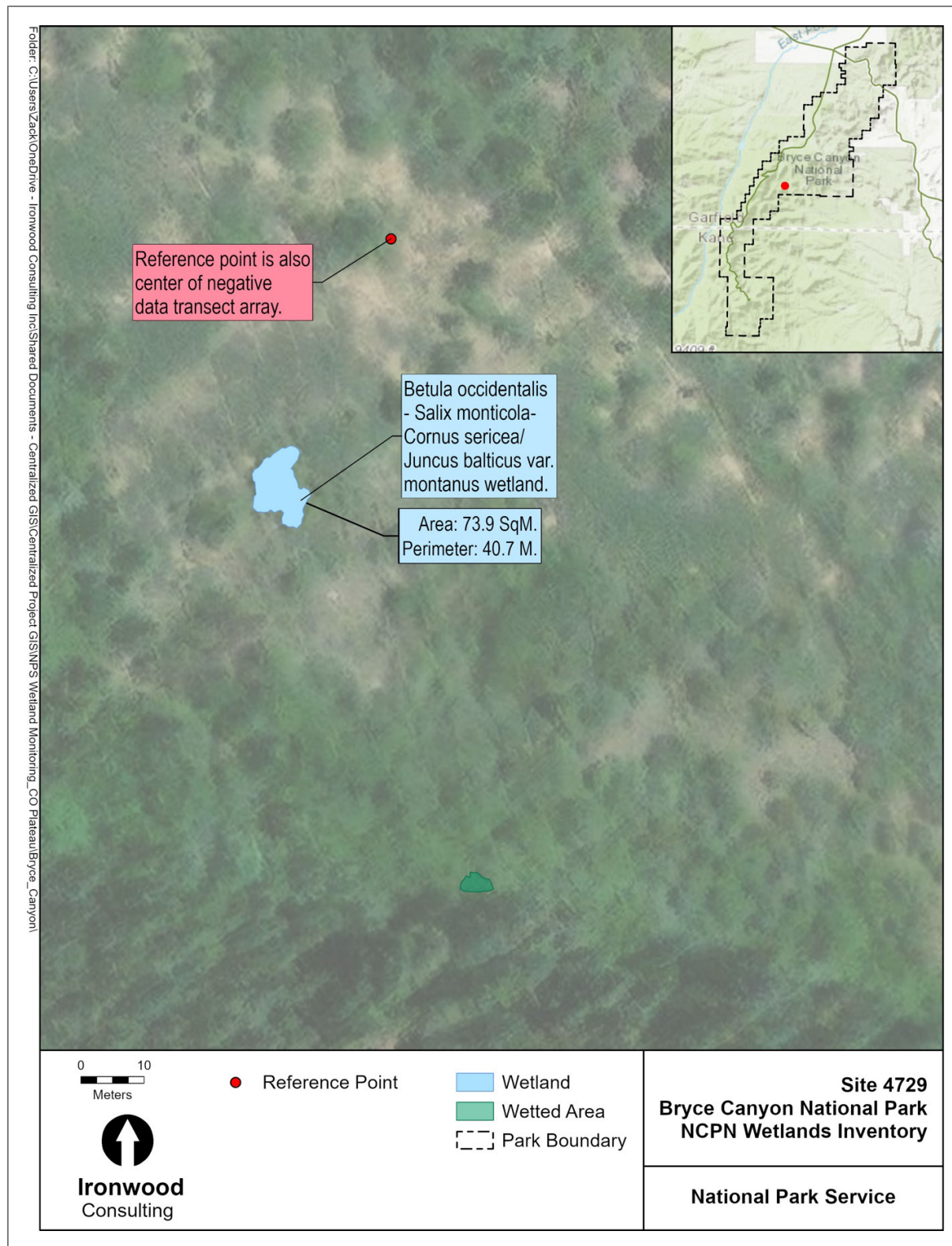


Figure 9. Wetland mapping for BRCA 4729.

BRCA 4733

The BRCA 4733 GDE site occurs at an elevation of approximately 2,384 m with an overall northwest (312°) aspect and low slope variability. Wetland vegetation provided evidence of groundwater. The spring type was characterized as hypocrene. The site included a total wetland area and perimeter length of 0.09 ac (379.1 m²) and 175.3 m, respectively (Figure 10, Appendix B: GDE Site Summary Table Wetland Feature).

Eight plant taxa were encountered during the GDE level II survey, including six taxa recorded within herbaceous vegetation quadrats and woody line intercept transects (Appendix D: GDE Site Vascular Plant Inventory List, Table 24, Table 25). Total herbaceous cover averaged 39.4%. The dominant herbaceous wetland plants were Baltic rush and blackcreeper sedge with 23.8% and 9.8% average cover, respectively. Groundcover included litter and soil, each with 80.6% and 19.4% average corner hits, respectively (Table 26). Rubber rabbitbrush (*Ericameria nauseosa*) had an average woody line intercept cover of 0.2%.

Table 24. Herbaceous vegetation quadrat data for BRCA 4733. Bryophytes not included in totals.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	FACW	23.8	89
<i>Carex praeegracilis</i>	blackcreeper sedge	FACW	9.8	100
<i>Astragalus bodinii</i>	Bodin's milkvetch	FACW	4.4	22
<i>Muhlenbergia richardsonis</i>	mat muhly	FAC	1.1	22
<i>Artemisia frigida</i>	fringed sagebrush	UPL	0.3	11
Bryophytes	moss	–	0.0	0
Total	–	–	39.4	–
50% of Total	–	–	19.7	–
20% of Total	–	–	7.9	–

Table 25. Woody vegetation line intercept summary data for BRCA 4733.

Species	Common name	Wetland Code	Average Woody Plant Cover (%)
<i>Ericameria nauseosa</i>	rubber rabbitbrush	UPL	0.2
Total	–	–	0.2

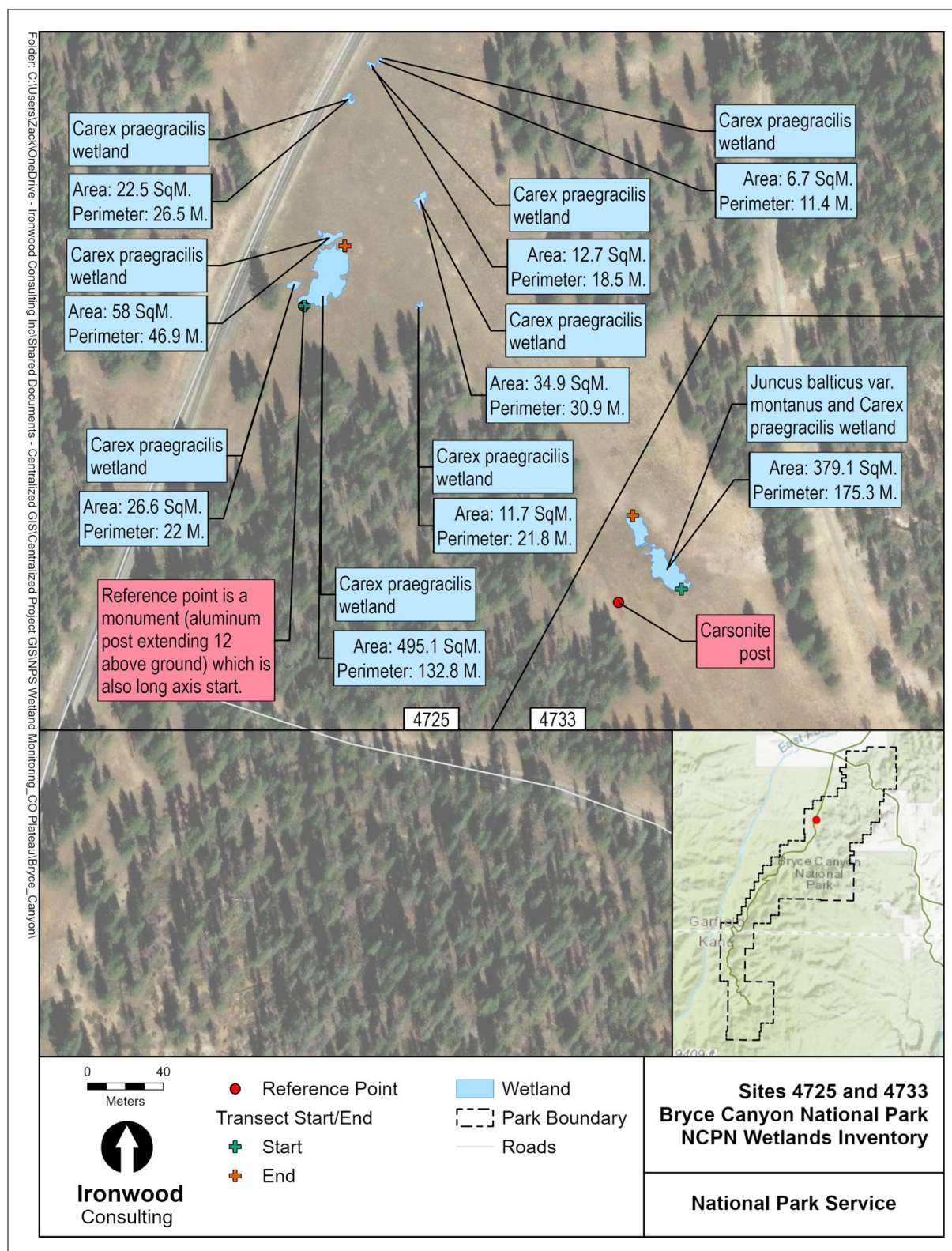


Figure 10. Wetland mapping for BRCA 4725 and 4733.

Table 26. Groundcover quadrat data for BRCA 4733.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	0.0
Litter	80.6
Water	0.0
Wood	0.0
Soil	19.4
Total	100.0

Kentucky bluegrass was the only non-native plant detected.

No recreation impacts or spring developments were observed. Prairie dog, deer, bighorn sheep, and rabbit sign were observed inside the vegetation quadrats with 56%, 22%, 11%, and 11% frequency, respectively (Appendix C: GDE Site Wildlife Summary Table). Deer sign was also observed outside of the quadrats.

BRCA 4735

The BRCA 4735 GDE site occurs at an elevation of approximately 2,378 m with an overall northeast (9°) aspect and low slope variability. Wetland vegetation provided evidence of groundwater. The spring type was characterized as hypocrene. The site included a total wetland area and perimeter length of 0.01 ac (30.2 m²) and 48.2 m, respectively (Figure 11, Appendix B: GDE Site Summary Table Wetland Feature).

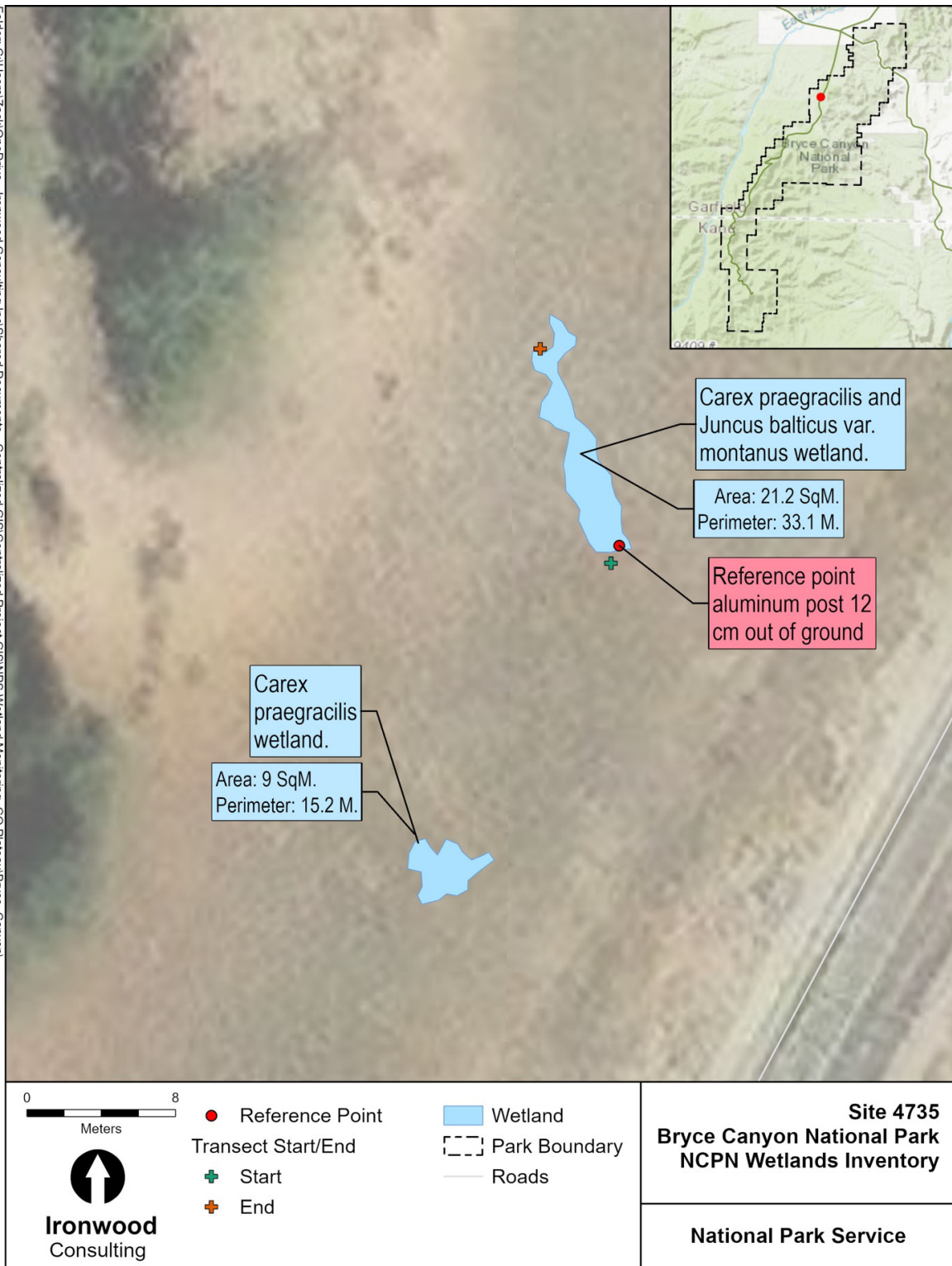


Figure 11. Wetland mapping for BRCA 4735.

Twelve plant taxa were documented during the GDE level II survey, including seven taxa recorded within herbaceous vegetation quadrats (Table 27, Appendix D: GDE Site Vascular Plant Inventory List). Total herbaceous cover averaged 9.7%. The dominant herbaceous wetland plant was blackcreeper sedge with 7.2% average cover. Groundcover included litter and soil, each with 50.0% average corner hits (Table 28). There was no woody line intercept cover.

Table 27. Herbaceous vegetation quadrat data for BRCA 4735.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Carex praegracilis</i>	blackcreeper sedge	FACW	7.2	100
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	FACW	0.9	50
<i>Pascopyrum smithii</i>	western wheatgrass	FACU	0.6	30
<i>Artemisia frigida</i>	fringed sagebrush	UPL	0.3	10
<i>Muhlenbergia richardsonis</i>	mat muhly	FAC	0.3	20
<i>Lepidium densiflorum</i>	prairie pepperwort	FACU	0.2	20
<i>Symphyotrichum welshii</i>	Welsh's aster	UPL	0.2	20
Bryophytes	moss	–	0.0	0
Total	–	–	9.7	–
50% of Total	–	–	4.9	–
20% of Total	–	–	1.9	–

Table 28. Groundcover quadrat data for BRCA 4735.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	0.0
Litter	50.0
Water	0.0
Wood	0.0
Soil	50.0
Total	100.0

Non-native plants encountered included Kentucky bluegrass and prairie pepperwort (*Lepidium densiflorum*).

No recreation impacts or spring developments were observed. Deer and elk sign were observed inside the vegetation quadrats with 50% and 20% frequency, respectively (Appendix C: GDE Site Wildlife Summary Table). Deer sign was also observed outside of the quadrats.

BRCA 4737

The BRCA 4737 GDE site occurs at an elevation of approximately 2,303 m with an overall northwest (326°) aspect and low slope variability. Wetland vegetation provided evidence of groundwater. The spring type was characterized as rheocrene. The site included a total wetland area and perimeter length of 0.17 ac (697.1 m²) and 243.6 m, respectively (Figure 12, Appendix B: GDE Site Summary Table Wetland Feature).

Twenty plant taxa were encountered during the GDE level II survey, including 14 taxa recorded within the herbaceous vegetation quadrats and woody line intercept transects (Appendix D: GDE Site Vascular Plant Inventory List, Table 29). Total herbaceous cover averaged 43.9%. The dominant herbaceous wetland plant was blackcreeper sedge with 28.0% average cover. Groundcover included litter, basal, soil, and bryophyte with 82.5%, 7.5%, 6.3%, and 3.8% average corner hits, respectively (Table 30). There was no woody line intercept cover.

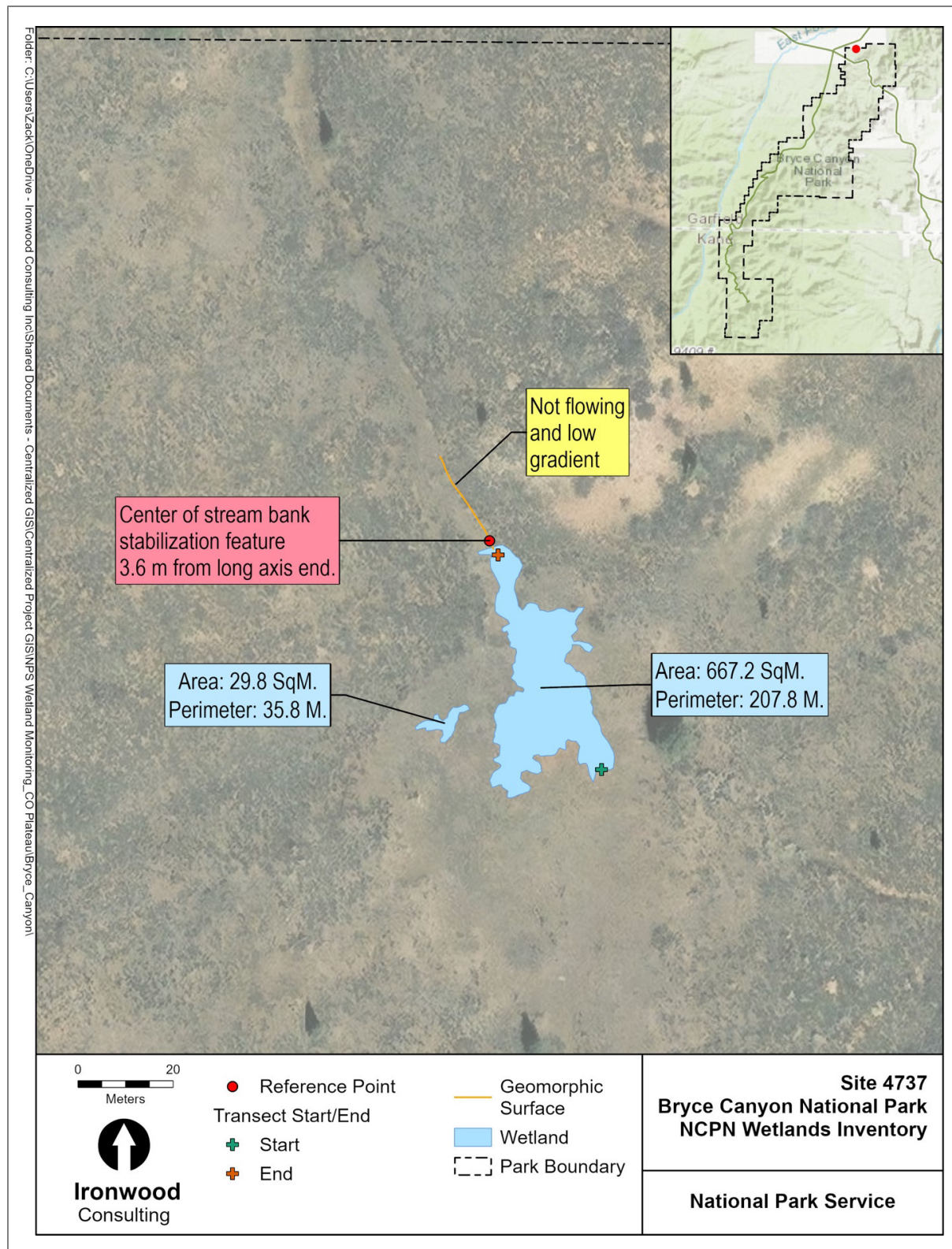


Figure 12. Wetland mapping for BRCA 4737.

Table 29. Herbaceous vegetation quadrat data for BRCA 4737. Bryophytes not included in totals.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Carex praeegracilis</i>	blackcreeper sedge	FACW	28.0	95
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	FACW	7.0	50
<i>Poa pratensis</i>	Kentucky bluegrass	FAC	3.7	50
<i>Thelypodium sagittatum</i>	arrow thelypody	FACW	1.4	25
<i>Elymus trachycaulus</i>	slender wheatgrass	FAC	1.0	20
<i>Equisetum laevigatum</i>	smooth scouring-rush	FACW	0.8	30
<i>Astragalus bodinii</i>	Bodin's milkvetch	FACW	0.7	25
<i>Agoseris glauca</i>	pale agoseris	FAC	0.5	15
<i>Campanula parryi</i>	Parry's harebell	FAC	0.3	15
<i>Symphyotrichum welshii</i>	Welsh's aster	UPL	0.3	5
<i>Cirsium wheeleri</i>	Wheeler's thistle	UPL	0.2	5
<i>Pascopyrum smithii</i>	western wheatgrass	FACU	0.1	10
<i>Argentina anserina</i>	silverweed	OBL	0.1	5
<i>Muhlenbergia richardsonis</i>	mat muhly	FAC	0.1	5
Bryophytes	moss	–	0.8	10
Total	–	–	43.9	–
50% of Total	–	–	22.0	–
20% of Total	–	–	8.8	–

Table 30. Groundcover quadrat data for BRCA 4737.

Groundcover Type	Average Corner Hits (%)
Bryophyte	3.8
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	7.5
Litter	82.5
Water	0.0
Wood	0.0
Soil	6.3
Total	100.0

Non-native plants encountered included Kentucky bluegrass and smooth brome (*Bromus inermis*). There were no noxious weeds detected.

No recreational impacts or spring developments were observed. Coyote and deer sign were observed inside the vegetation quadrats at 5% and 20% frequency, respectively (Appendix C: GDE Site Wildlife Summary Table). Deer scat and historic cattle scat were also found outside of the quadrats.

BRCA 5183

The BRCA 5183 GDE site occurs at an elevation of approximately 2,477 m with an overall southeast (164°) aspect and moderate slope variability. Evidence of groundwater included flow from a single spring orifice and wetland vegetation. The spring type was characterized as rheocrene. It included a total wetland area and perimeter length of 0.04 ac (168.6 m²) and 237.0 m, respectively (Figure 13, Table 31, Appendix B: GDE Site Summary Table Wetland Feature).

Table 31. Continued legend for Figure 13, BRCA 4727 and 5183.

ID	Comments	Area (m ²)	Perimeter (m.)
1	<i>Juncus balticus</i> var. <i>montanus</i> and <i>Carex aurea</i> wetland.	31.6	30.7
2	<i>Juncus balticus</i> var. <i>montanus</i> and <i>Carex aurea</i> wetland.	3.6	12.1
3	<i>Juncus balticus</i> var. <i>montanus</i> and <i>Carex aurea</i> wetland.	65.7	75.9
4	<i>Juncus balticus</i> var. <i>montanus</i> and <i>Carex aurea</i> wetland.	7.3	15
5	<i>Juncus balticus</i> var. <i>montanus</i> – <i>Juncus ensifolius</i> wetland.	15.3	18.1
6	<i>Juncus ensifolius</i> - <i>Deschampsia caespitosa</i> - <i>Carex aurea</i> wetland.	22.8	35.9
7	<i>Carex aquatilis</i> - <i>Deschampsia caespitosa</i> wetland.	3.5	9.5
8	<i>Juncus ensifolius</i> - <i>Carex</i> wetland.	13.6	29.6
9	<i>Juncus ensifolius</i> wetland.	5.1	10.2

Thirteen plant taxa were encountered during the GDE level II survey, including six taxa recorded within the herbaceous vegetation quadrats and woody line intercept transects (Appendix D: GDE Site Vascular Plant Inventory List, Table 32, Table 33). Total average herbaceous cover was 38.0%. The dominant herbaceous wetland plant was Baltic rush with 31.8% average cover. Groundcover included litter, soil, stone, gravel, basal, and wood with 59.1%, 15.9%, 9.1%, 6.8%, 4.5%, and 4.5% average corner hits, respectively (Table 34). Total average woody line intercept cover was 5.4%. Woods' rose and shrubby cinquefoil had average woody line intercept covers of 3.7% and 1.7%, respectively.

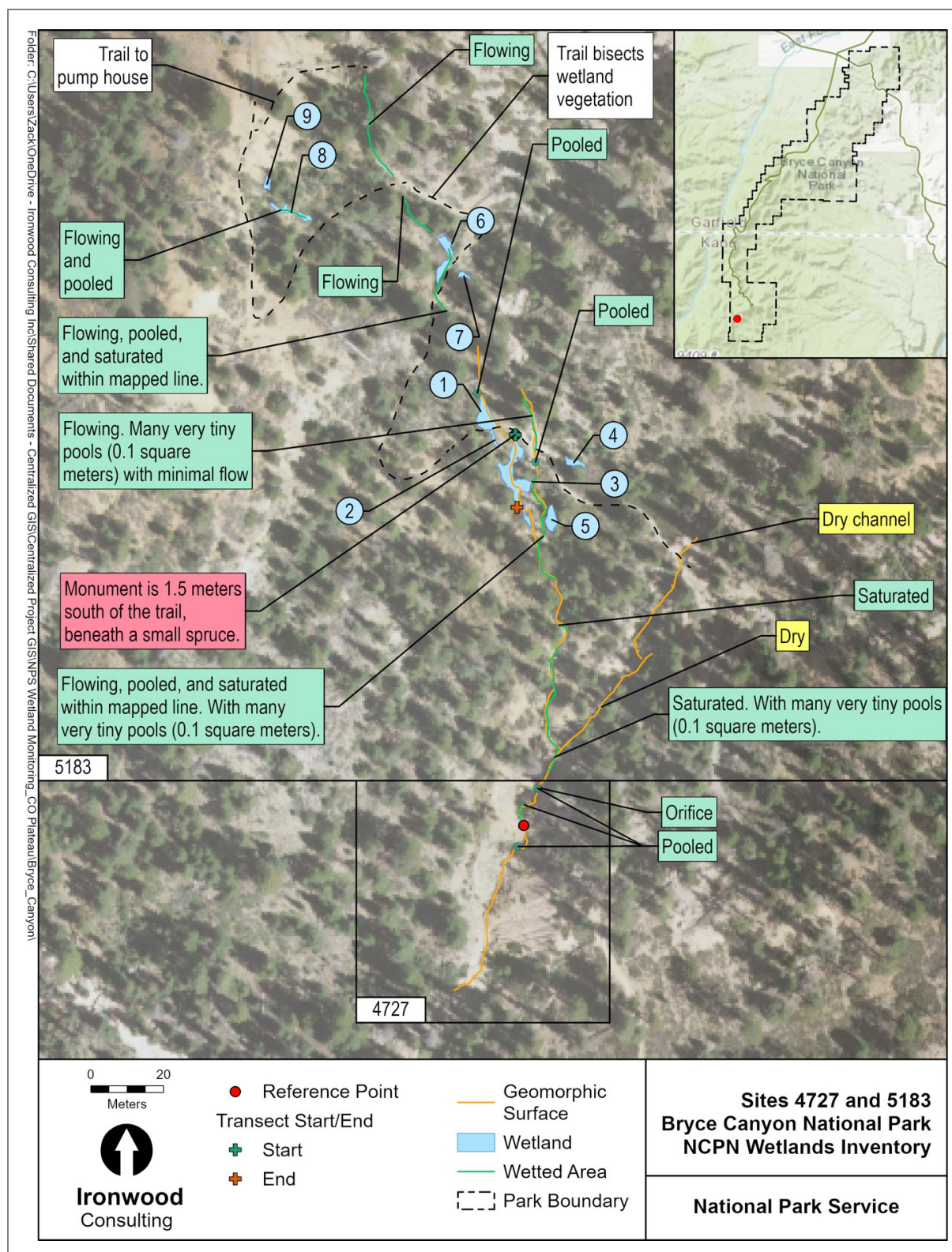


Figure 13. Wetland mapping for BRCA 4727 and 5183. Legend continues in Table 31.

Table 32. Herbaceous vegetation quadrat data for BRCA 5183.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	FACW	31.8	82
<i>Juncus ensifolius</i>	mountain rush	FACW	5.1	27
<i>Agrostis stolonifera</i>	redtop	FAC	0.6	36
<i>Deschampsia caespitosa</i>	tufted hairgrass	FACW	0.5	9
Bryophytes	moss	–	0.0	0
Total	–	–	38.0	–
50% of Total	–	–	19.0	–
20% of Total	–	–	7.6	–

Table 33. Woody vegetation line intercept summary data for BRCA 5183.

Species	Common name	Wetland Code	Average Woody Plant Cover (%)
<i>Rosa woodsii</i>	Woods' rose	FACU	3.7
<i>Dasophora floribunda</i>	shrubby cinquefoil	FAC	1.7
Total	–	–	5.4

Table 34. Groundcover quadrat data for BRCA 5183.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	6.8
Cobble	0.0
Stone	9.1
Boulder	0.0
Bedrock	0.0
Basal	4.5
Litter	59.1
Water	0.0
Wood	4.5
Soil	15.9
Total	100.0

Non-native plants present included common dandelion (*Taraxacum officinale*), Kentucky bluegrass, and redtop.

Recreation impacts included a trail to the pump house (unmapped) which appeared to be an old roadbed. Surveyors were unable to determine whether the feature identified as an orifice was an intermittent stream originating from the pump house infrastructure. Spring developments observed included pipes, pump house, and spring boxes. Deer and elk sign were observed within the vegetation quadrats, each at 9% frequency (Appendix C). Deer tracks and historic cow scat were observed outside of the vegetation quadrats.

BRCA 5218

The BRCA 5218 GDE site occurs at an elevation of approximately 1,700 m with an overall northwest (300°) aspect and low slope variability across the site. Wetland vegetation provided evidence for groundwater. The spring type was characterized as hypocrene. It included a total wetland area and perimeter length of 0.001 ac (5.9 m²) and 12.1 m, respectively (Figure 14, Appendix B: GDE Site Summary Table Wetland Feature).

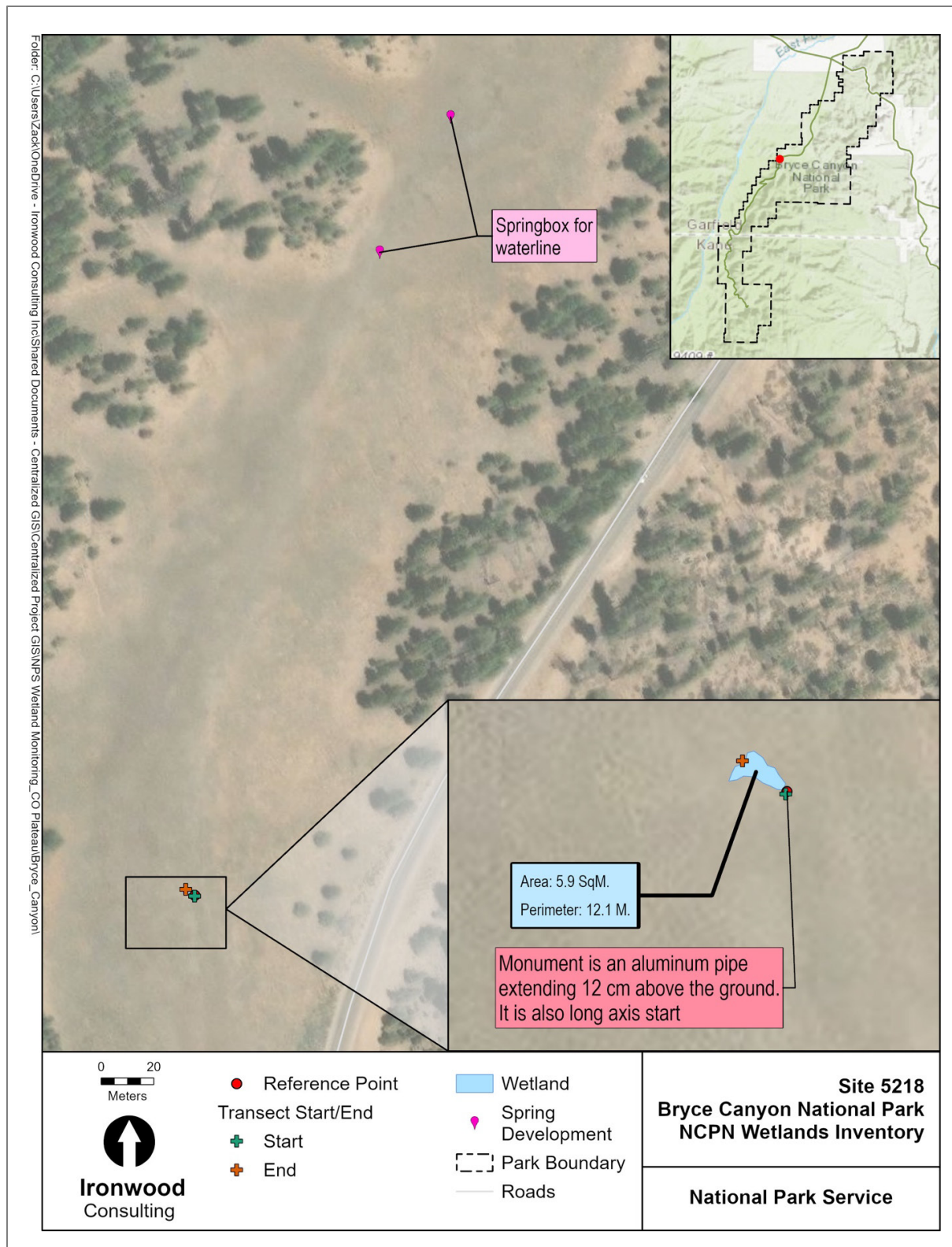


Figure 14. Wetland mapping for BRCA 5218.

Due to technical failure, the herbaceous quadrat data were lost for this site. There was no woody line intercept cover.

Kentucky bluegrass was the only non-native plant species detected.

No recreation impacts or spring developments were observed. Signs of cattle grazing were also present at this site (Appendix C).

BRCA 5979

The BRCA 5979 GDE site occurs at an elevation of approximately 2,313 m with an overall northwest (343°) aspect and low slope variability across the site. Wetland vegetation provided evidence for groundwater. The spring type was characterized as helocrene. It included a total wetland area and perimeter length of 1.47 ac (5,935.7 m²) and 1,375.1 m, respectively (Figure 15, Appendix B: GDE Site Summary Table Wetland Feature).

Seven plant taxa were encountered during the GDE level II survey, including five taxa recorded within the herbaceous vegetation quadrats (Appendix D: GDE Site Vascular Plant Inventory List, Table 35). The total average herbaceous cover was 38.9%. The dominant herbaceous wetland plants were Baltic rush and blackcreeper sedge with 16.8% and 15.6% average cover, respectively. Groundcover included litter, bryophyte, and basal with 75.0%, 17.9%, and 7.1% average corner hits, respectively (Table 36). There was no woody line intercept cover.

Table 35. Herbaceous vegetation quadrat data for BRCA 5979. Bryophytes not included in totals.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	FACW	16.8	100
<i>Carex praegracilis</i>	blackcreeper sedge	FACW	15.6	100
<i>Poa pratensis</i>	Kentucky bluegrass	FAC	5.7	86
<i>Iris missouriensis</i>	Rocky Mountain iris	FACW	0.5	7
<i>Pascopyrum smithii</i>	western wheatgrass	FACU	0.3	21
Bryophytes	moss	–	5.4	93
Total	–	–	38.9	–
50% of Total	–	–	19.5	–
20% of Total	–	–	7.8	–

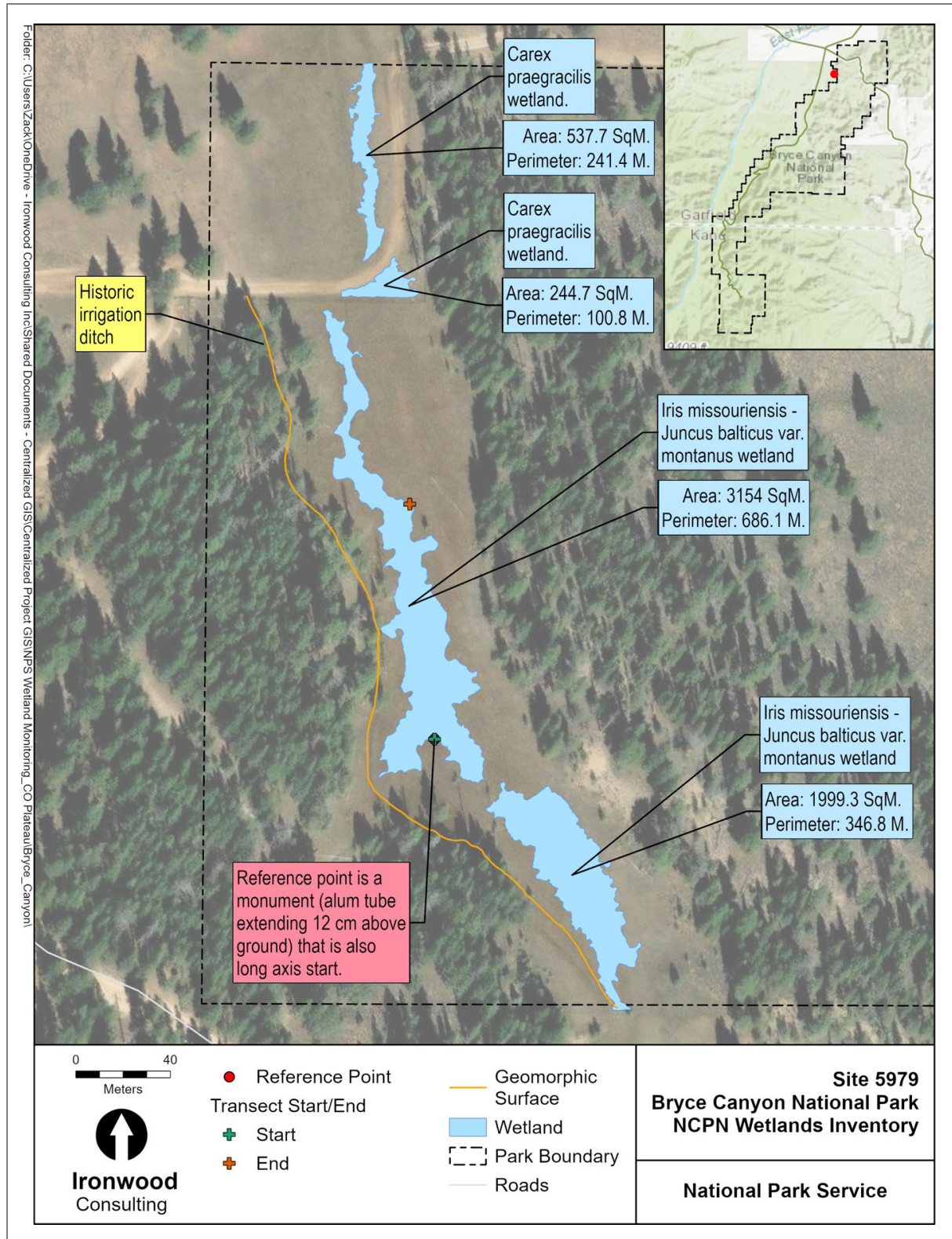


Figure 15. Wetland mapping for BRCA 5979.

Table 36. Groundcover quadrat data for BRCA 5979.

Groundcover Type	Average Corner Hits (%)
Bryophyte	17.9
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	7.1
Litter	75.0
Water	0.0
Wood	0.0
Soil	0.0
Total	100.0

The only non-native plant detected at this site was Kentucky bluegrass.

ATV tracks and a dry historic irrigation ditch were observed at this site. Deer sign was recorded inside the vegetation quadrats with 14% frequency (Appendix C: GDE Site Wildlife Summary Table).

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Appendix A: GDE Site Summary Table Locality Details

Table 37 shows the details from each site.

Table 37. 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	Aspect at Reference Point (°)	Elevation at Reference Point (m)	Reference Point Notes	Dogleg in Long Axis?	Vegetation Quadrat Cut-level
2230	NAD83	12	401610	4169206	401621	4169205	401606	4169216	75	2,112	Very large (about 27 in DBH) Pinus ponderosa 12.7 m from long axis start, generally toward the north	No	< 1% Not Recorded
4689	NAD83	12	398720	4167965	398727	4167965	398720	4167965	38	2,353	Monument is aluminum pipe of long axis start stick up 12 cm out of the ground	No	< 1% Not Recorded
4723	NAD83	12	388477	4148046	388386	4148088	388481	4148058	306	2,504	Rock	No	< 1% Not Recorded
4724	NAD83	12	397218	4160875	397234	4160777	397219	4160874	180	2,185	Aluminum pipe sticking 12 cm out of ground . Close to orifice	No	< 1% Not Recorded
4725	NAD83	12	396605	4166069	396626	4166101	396604	4166069	39	2,381	Monumented by aluminum pipe 12 cm above ground	No	< 1% Not Recorded
4727	NAD83	12	NA	NA	NA	NA	388826	4146744	200	2,447	Reference point is also center of negative data transect array (due to no mappable wetlands present). It is in center of channel.	No	< 1% Not Recorded
4728	NAD83	12	393886	4159132	393928	4159122	393886	4159132	135	2,199	–	No	< 1% Not Recorded
4733	NAD83	12	396803	4165920	396778	4165959	396770	4165913	213	2,384	Carsonite post to west of polygon.	No	< 1% Not Recorded
4735	NAD83	12	396619	4166235	396615	4166246	396619	4166235	9	2,378	Reference point is a monument of aluminum pipe exposed 10 cm above ground level. This is also the long axis start.	No	< 1% Not Recorded

Table 37 (continued). 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	Aspect at Reference Point (°)	Elevation at Reference Point (m)	Reference Point Notes	Dogleg in Long Axis?	Vegetation Quadrat Cut-level
4737	NAD83	12	400670	4172478	400648	4172524	400646	4172527	326	2,303	Reference point is Middle of bank stabilization downstream 3.6m of long axis end.	No	< 1% Not Recorded
5183	NAD83	12	388824	4146852	388824	4146832	388824	4146852	164	2,477	Reference point is also long axis start. A 1-in diameter aluminum pipe partially hidden by the lower branches of a small spruce. The monument is about 1.5 m to south of trail.	No	< 1% Not Recorded
5218	NAD83	12	393333	4162399	393330	4162401	337778	33827277	300	1,700	Aluminum monument with cap marked long axis start.	No	< 1% Not Recorded
5979	NAD83	12	399266	4169746	399255	4169846	399266	4169746	343	2,313	Monument: Aluminum pipe of long axis start sticking 12 inches above ground	No	< 1% Not Recorded

Appendix B: GDE Site Summary Table Wetland Feature

Table 38 shows the wetland features from each site.

Table 38. GDE Site Summary Table Wetland Feature.

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	Mapped Channel Type (if observed)	Wetland/Channel Description	Total Wetted Area (ac)	Total Wetted Area (m²)	Total Wetted Length (m)
2230	Spring	Rheocrene	–	0.02	75.2	70.5	7	3	Spring discharge dominated	Flowing water in all mapped channels that are low-gradient near orifices and become steep and highly eroded or vegetated.	0.01	50.2	–
4689	Seep	Helocrene	–	0.02	73.9	84.2	–	–	–	–	–	–	–
4723	Spring	Rheocrene	–	5.71	23,093.7	1,997.7	4	4	Spring discharge dominated	Channels are narrow, 30 cm and rarely up to 120 cm on lower gradient with water dispersing through Carex.	0.09	368.4	725.2
4724	Spring	Rheocrene	–	2.69	10,900.4	815.9	2	–	–	–	2.56	10,374.8	–
4725	Seep	Hypocrene	–	0.17	668.2	310.8	–	–	–	–	–	–	–
4727	Spring	Rheocrene	–	-	-	-	1	1	Mixed discharge	Rocky, with steep sides. Apparently eroding at a fast rate. Very small amounts of pooling water.	–	–	–
4728	Riparian	Riparian or Hypocrene	–	0.04	170.5	123.2	–	–	Runoff dominated	–	–	–	–
4733	Spring	Hypocrene	–	0.09	379.1	175.3	–	–	Runoff dominated	–	–	–	–
4735	Seep	Hypocrene	–	0.01	30.2	48.2	–	–	–	–	–	–	–

Table 38 (continued). GDE Site Summary Table Wetland Feature.

Site Name	Site Type	Primary GDE Type	Secondary GDE Type	Total Wetland Area (ac)	Total Wetland Area (m ²)	Total Wetland Perimeter Length (m)	Total Orifices	Number of Mapped Channels	Mapped Channel Type (if observed)	Wetland/Channel Description	Total Wetted Area (ac)	Total Wetted Area (m ²)	Total Wetted Length (m)
4737	Spring	Rheocrene	–	0.17	697.0	243.6	–	1	Runoff dominated	Channel is low-gradient, mostly vegetated, and with bank stabilization perpendicular to flow direction. The bank stabilization is composed of rocks, logs, and supported by metal and rebar and soil formed into small earthen dams.	–	–	–
5183	Spring	Rheocrene	–	0.04	168.6	237.0	1	3	Mixed discharge	Steep gradient, mostly rocky. Heavily vegetated to sparse.	–	–	–
5218	Spring	Hypocrene	–	0.001	5.9	12.1	–	–	–	–	–	–	–
5979	Seep	Helocrene	–	1.47	5,935.7	1,375.1	–	1	Mixed discharge	Historic irrigation ditch	–	–	–

Appendix C: GDE Site Wildlife Summary Table

Tables 39 and 40 show the wildlife summaries for each site.

Table 39. Percent frequency of scat or tracks found inside vegetation quadrats.

Animal Category	Animal Type	2230	4689	4723	4724	4725	4727	4728	4733	4735	4737	5183	5218	5979	Total Sites Observed
Wildlife	Bighorn Sheep	–	–	–	–	–	–	–	11	–	–	–	–	–	1
Wildlife	Coyote	–	–	–	–	–	–	–	–	–	5	–	–	–	1
Wildlife	Deer	–	29	8	–	9	–	–	22	50	20	9	–	14	8
Wildlife	Elk	–	29	–	–	22	–	–	–	20	–	9	–	–	4
Wildlife	Prairie Dog	–	–	–	–	–	–	–	56	–	–	–	–	–	1
Wildlife	Rabbit	–	–	–	–	–	–	28	11	–	–	–	–	–	2
Livestock	Cow	–	–	15	3	–	–	–	–	–	–	–	–	–	2

Table 40. Animal sign (scat or tracks) observed outside vegetation transects.

Animal Category	Animal Type	2230*	4689*	4723*	4724*	4725*	4727*	4728*	4733*	4735*	4737*	5183*	5218*	5979*	Total Sites Observed
Wildlife	Deer	–	X	X	X	X	X	X	X	X	X	X	–	–	10
Wildlife	Elk	–	X	X	X	X	–	–	–	–	–	–	–	–	4
Wildlife	Turkey	–	X	–	–	–	–	–	–	–	–	–	–	–	1
Livestock	Cow	–	–	–	–	–	–	–	–	–	X	X	X	–	3

* An “X” indicates a presence.

Appendix D: GDE Site Vascular Plant Inventory List

Table 41 shows the vascular plant list from all sites.

Table 41. GDE Site Vascular Plant Inventory List.

Species	Common Name	Wetland Code	Native Status ^A	2230 ^B	4689 ^B	4723 ^B	4724 ^B	4725 ^B	4727 ^B	4728 ^B	4733 ^B	4735 ^B	4737 ^B	5183 ^B	5218 ^B	5979 ^B
<i>Abies concolor</i>	white fir	UPL	N	–	–	–	–	–	X	–	–	–	–	–	–	–
<i>Achillea millefolium</i>	common yarrow	FACU	N	–	X	X	–	–	–	–	–	–	–	X	X	X
<i>Achnatherum hymenoides</i>	Indian ricegrass	UPL	N	–	–	–	–	–	X	–	–	–	–	–	–	–
<i>Agoseris aurantiaca</i>	orange agoseris	FACU	N	–	–	–	–	–	–	–	–	–	X	–	–	–
<i>Agoseris glauca</i>	pale agoseris	FAC	N	–	–	–	–	–	–	–	–	–	X	–	–	–
<i>Agrostis stolonifera</i>	redtop	FAC	I	–	–	–	–	–	–	X	–	–	–	X	–	–
<i>Androsace septentrionalis</i>	pygmy-flower rock-jasmine	FACU	N	–	–	–	–	X	–	–	–	–	–	–	–	–
<i>Argentina anserina</i>	Silverweed	OBL	N	–	–	X	–	–	–	X	–	–	X	–	–	–
<i>Artemisia frigida</i>	fringed sagebrush	UPL	N	–	–	–	–	X	–	–	X	X	–	–	–	–
<i>Artemisia nova</i>	black sagebrush	UPL	N	–	–	–	–	–	–	–	–	–	X	–	–	–
<i>Astragalus bodinii</i>	Bodin's milkvetch	FACW	N	–	–	–	–	–	–	–	X	–	X	–	–	–
<i>Astragalus humistratus</i>	groundcover milkvetch	UPL	N	–	–	–	–	X	–	–	–	–	–	–	–	–
<i>Astragalus</i> sp.	milkvetch	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–
<i>Berula erecta</i>	cutleaf water-parsnip	OBL	N	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Betula occidentalis</i>	water birch	FACW	N	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Bromus inermis</i>	smooth brome	UPL	I	–	–	–	–	X	–	–	–	–	X	–	–	–
<i>Calamagrostis scopulorum</i>	Jones' reedgrass	FAC	N	–	–	–	–	–	X	–	–	–	–	X	–	–
<i>Campanula parryi</i>	Parry's harebell	FAC	N	–	–	X	–	–	–	–	–	–	X	–	–	–
<i>Carex aquatilis</i>	water sedge	OBL	N	–	–	X	–	–	–	–	–	–	–	–	–	–

A I - Introduced, N - Native, NOX - Noxious (USDA and NRCS 2023; UDAF 2022).

B An “X” indicates a presence.

Table 41 (continued). GDE Site Vascular Plant Inventory List.

Species	Common Name	Wetland Code	Native Status ^A	2230 ^B	4689 ^B	4723 ^B	4724 ^B	4725 ^B	4727 ^B	4728 ^B	4733 ^B	4735 ^B	4737 ^B	5183 ^B	5218 ^B	5979 ^B
<i>Carex aurea</i>	golden sedge	FACW	N	X	–	–	–	–	–	–	–	–	–	X	–	–
<i>Carex hystericina</i>	bottlebrush sedge	OBL	N	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Carex interior</i>	inland sedge	OBL	N	X	–	–	X	–	–	–	–	–	–	–	–	–
<i>Carex nebrascensis</i>	Nebraska sedge	OBL	N	–	–	X	–	–	–	–	–	–	–	–	–	–
<i>Carex praegracilis</i>	blackcreeper sedge	FACW	N	–	X	–	–	X	–	X	X	X	X	–	X	X
<i>Carex</i> sp.	sedge	–	–	X	–	X	–	–	–	–	–	–	–	–	–	–
<i>Carex utriculata</i>	beaked sedge	OBL	N	–	–	X	–	–	–	–	–	–	–	–	–	–
<i>Carex vesicaria</i>	blister sedge	OBL	N	–	–	X	–	–	–	–	–	–	–	–	–	–
<i>Carex viridula</i>	little green sedge	OBL	N	–	–	X	–	–	–	–	–	–	–	–	–	–
<i>Cirsium arizonicum</i>	Arizona thistle	FAC	N	X	–	–	–	–	–	–	–	–	–	–	–	–
<i>Cirsium scariosum</i>	meadow thistle	FAC	N	–	–	–	–	–	–	–	–	–	X	–	–	–
<i>Cirsium</i> sp.	thistle	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Cirsium vulgare</i>	bull thistle	FACU	I	–	–	–	–	–	–	X	–	–	–	–	–	–
<i>Cirsium wheeleri</i>	Wheeler's thistle	UPL	N	–	–	–	–	–	–	–	–	–	X	–	–	–
<i>Cornus sericea</i>	redosier dogwood	FACW	N	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Dasiphora floribunda</i>	shrubby cinquefoil	FAC	N	X	–	–	X	–	–	–	–	–	–	X	–	–
<i>Deschampsia caespitosa</i>	tufted hairgrass	FACW	N	–	–	–	X	–	–	–	–	–	–	X	–	–
<i>Descurainia pinnata</i>	western tansymustard	UPL	N	–	X	–	–	X	–	–	–	–	–	–	–	–
<i>Eleocharis rostellata</i>	beaked spikerush	OBL	N	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Elymus elymoides</i>	squirreltail	FACU	N	–	–	–	–	–	–	–	–	X	–	–	–	–
<i>Elymus trachycaulus</i>	slender wheatgrass	FAC	N	–	X	–	–	X	–	X	–	X	X	–	–	–
<i>Epilobium ciliatum</i>	fringed willowherb	FACW	N	–	–	X	X	–	–	–	–	–	–	–	–	–
<i>Equisetum laevigatum</i>	smooth scouring-rush	FACW	N	–	–	–	–	–	–	–	–	–	X	–	–	–

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Table 41 (continued). GDE Site Vascular Plant Inventory List.

Species	Common Name	Wetland Code	Native Status ^A	2230 ^B	4689 ^B	4723 ^B	4724 ^B	4725 ^B	4727 ^B	4728 ^B	4733 ^B	4735 ^B	4737 ^B	5183 ^B	5218 ^B	5979 ^B
<i>Ericameria nauseosa</i>	rubber rabbitbrush	UPL	N	–	–	–	–	–	–	–	X	–	–	–	–	–
<i>Erigeron flagellaris</i>	trailing daisy	FACU	N	–	–	–	–	X	–	–	–	–	–	–	–	–
<i>Erigeron lonchophyllus</i>	longleaf daisy	FACW	N	–	–	X	–	–	–	–	–	–	–	–	–	–
<i>Eurybia glauca</i>	blueleaf aster	UPL	N	–	–	–	–	–	X	–	–	–	–	–	–	–
<i>Gentiana parryi</i>	Parry's gentian	FAC	N	–	–	X	–	–	–	–	–	–	–	–	–	–
<i>Gentianella tortuosa</i>	Jones' gentian	UPL	N	–	–	–	–	–	X	–	–	–	–	–	–	–
<i>Gutierrezia sarothrae</i>	broom snakeweed	UPL	N	–	–	–	–	–	–	–	–	X	–	–	–	–
<i>Hordeum brachyantherum</i>	meadow barley	FACW	N	–	–	–	–	–	–	–	–	–	X	–	–	–
<i>Ipomopsis aggregata</i>	scarlet gilia	UPL	N	–	–	–	–	–	X	–	–	–	–	–	–	–
<i>Iris missouriensis</i>	Rocky Mountain iris	FACW	N	–	–	–	–	–	–	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	X
<i>Juncus ensifolius</i>	swordleaf rush	FACW	N	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Juniperus scopulorum</i>	Rocky Mountain juniper	UPL	N	–	–	–	X	–	X	–	–	–	–	–	–	–
<i>Koeleria macrantha</i>	junegrass	UPL	N	–	–	–	–	X	–	–	–	X	–	–	–	–
<i>Lactuca serriola</i>	prickly lettuce	FACU	I	–	–	–	–	–	–	X	–	–	–	–	–	–
<i>Lappula occidentalis</i>	western stickseed	UPL	N	–	X	–	–	X	–	–	–	–	–	–	–	–
<i>Lepidium densiflorum</i>	prairie pepperwort	FACU	I, N	–	–	–	–	–	–	–	–	X	–	–	–	–
<i>Maianthemum stellatum</i>	starry false Solomon's-seal	FAC	N	X	–	–	–	–	–	–	–	–	–	–	–	–
<i>Muhlenbergia andina</i>	muhly	FAC	N	X	–	–	X	–	–	–	–	–	–	–	–	–
<i>Muhlenbergia asperifolia</i>	scratchgrass	FACW	N	–	–	–	–	–	–	X	–	–	–	–	–	–
<i>Muhlenbergia richardsonis</i>	mat muhly	FAC	N	–	–	X	–	X	–	X	X	X	X	–	–	–
<i>Oenothera flava</i>	yellow evening-primrose	FAC	N	–	–	–	–	–	–	–	–	–	X	–	–	–
<i>Parnassia palustris</i>	marsh grass of Parnassus	OBL	N	–	–	–	X	–	–	–	–	–	–	–	–	–

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Table 41 (continued). GDE Site Vascular Plant Inventory List.

Species	Common Name	Wetland Code	Native Status ^A	2230 ^B	4689 ^B	4723 ^B	4724 ^B	4725 ^B	4727 ^B	4728 ^B	4733 ^B	4735 ^B	4737 ^B	5183 ^B	5218 ^B	5979 ^B
<i>Pascopyrum smithii</i>	western wheatgrass	FACU	N	–	–	–	–	–	–	–	–	X	X	–	–	X
<i>Phragmites australis</i>	common reed	FACW	N, NOX	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Pinus ponderosa</i>	ponderosa pine	FACU	N	X	–	–	–	–	–	–	–	–	–	–	–	–
<i>Platanthera</i> sp.	fringed orchid	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Platanthera sparsiflora</i>	sparse-flowered bog orchid	FACW	N	X	–	–	–	–	–	–	–	–	–	–	–	–
<i>Poa pratensis</i>	Kentucky bluegrass	FAC	I, N	–	X	X	–	X	–	–	X	X	X	X	X	X
<i>Polemonium occidentale</i>	western Jacob's-ladder	FACW	N	–	–	X	–	–	–	–	–	–	–	–	–	–
<i>Populus angustifolia</i>	narrow-leaved cottonwood	FACW	N	–	–	–	–	–	–	X	–	–	–	–	–	–
<i>Populus tremuloides</i>	quaking aspen	FACU	N	–	–	X	–	–	X	–	–	–	–	–	–	–
<i>Potentilla gracilis</i>	slender cinquefoil	FAC	N	–	–	X	–	–	–	–	–	–	–	–	–	–
<i>Potentilla pensylvanica</i>	Pennsylvania cinquefoil	UPL	N	–	–	–	–	–	–	–	X	–	–	–	–	–
<i>Purshia tridentata</i>	antelope bitterbrush	UPL	N	–	–	–	–	–	X	–	–	–	–	–	–	–
<i>Pyrrocoma lanceolata</i>	lanceleaf goldenweed	FAC	N	–	–	–	–	–	–	–	–	–	–	–	–	X
<i>Ranunculus cymbalaria</i>	marsh buttercup	OBL	N	–	–	X	–	–	–	–	–	–	–	–	–	–
<i>Rhus</i> sp.	sumac	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Rosa woodsii</i>	Woods' rose	FACU	N	–	–	–	X	–	X	X	–	–	–	X	–	–
<i>Salix exigua</i>	narrowleaf willow	FACW	N	–	–	–	–	–	–	X	–	–	–	–	–	–
<i>Salix glauca</i>	grayleaf willow	FACW	N	–	–	X	–	–	–	–	–	–	–	–	–	–
<i>Salix monticola</i>	mountain willow	OBL	N	–	–	–	X	–	–	X	–	–	–	–	–	–
<i>Senecio hydrophilus</i>	water groundsel	OBL	N	–	–	–	–	–	–	X	–	–	–	–	–	–
<i>Senecio spartioides</i>	broom-like ragwort	UPL	N	–	–	–	–	X	–	–	–	–	–	–	–	–
<i>Symphoricarpos</i> sp.	snowberry	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Symphyotrichum eatonii</i>	Eaton's aster	FAC	N	X	–	–	–	–	–	–	–	–	–	–	–	–

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Table 41 (continued). GDE Site Vascular Plant Inventory List.

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<i>Symphyotrichum ericoides</i>	white heath aster	FAC	N	–	–	–	–	–	–	–	–	–	–	–	X	–
<i>Symphyotrichum foliaceum</i>	alpine leafybract aster	FACU	N	–	–	X	–	–	–	–	–	–	–	–	–	–
<i>Symphyotrichum</i> sp.	aster	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Symphyotrichum welshii</i>	Welsh's aster	UPL	N	–	–	X	–	–	–	–	–	X	X	–	–	–
<i>Taraxacum officinale</i>	common dandelion	FACU	I	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Thelypodium sagittatum</i>	arrow thelypody	FACW	N	–	–	–	–	–	–	–	–	–	X	–	–	–

^A I - Introduced, N - Native, NOX - Noxious (USDA and NRCS 2023; UDAF 2022).

^B An “X” indicates a presence.

National Park Service
U.S. Department of the Interior



Science Report NPS/SR—2024/129
<https://doi.org/10.36967/2303819>

Natural Resource Stewardship and Science

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