



Spring Wetland Flora Inventory – Capitol Reef National Park

Survey Report



A wetland surveyed at Capitol Reef National Park.

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Spring wetland flora inventory – Capitol Reef National Park: Survey report

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Abstract

This report provides the results from the 2021 spring wetland flora inventory for Capitol Reef National Park (CARE). In total, seven National Park Service units 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 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 Capitol Reef National Park identified and inventoried 18 seeps/springs/hanging gardens at 31 survey sites. This report summarizes the results at the 18 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 state-level water rights agreements. Measuring the hydrology of these water sources can be difficult because they often have diffuse or 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 and 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 were 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 CARE. The priority survey sites were identified by CARE 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.

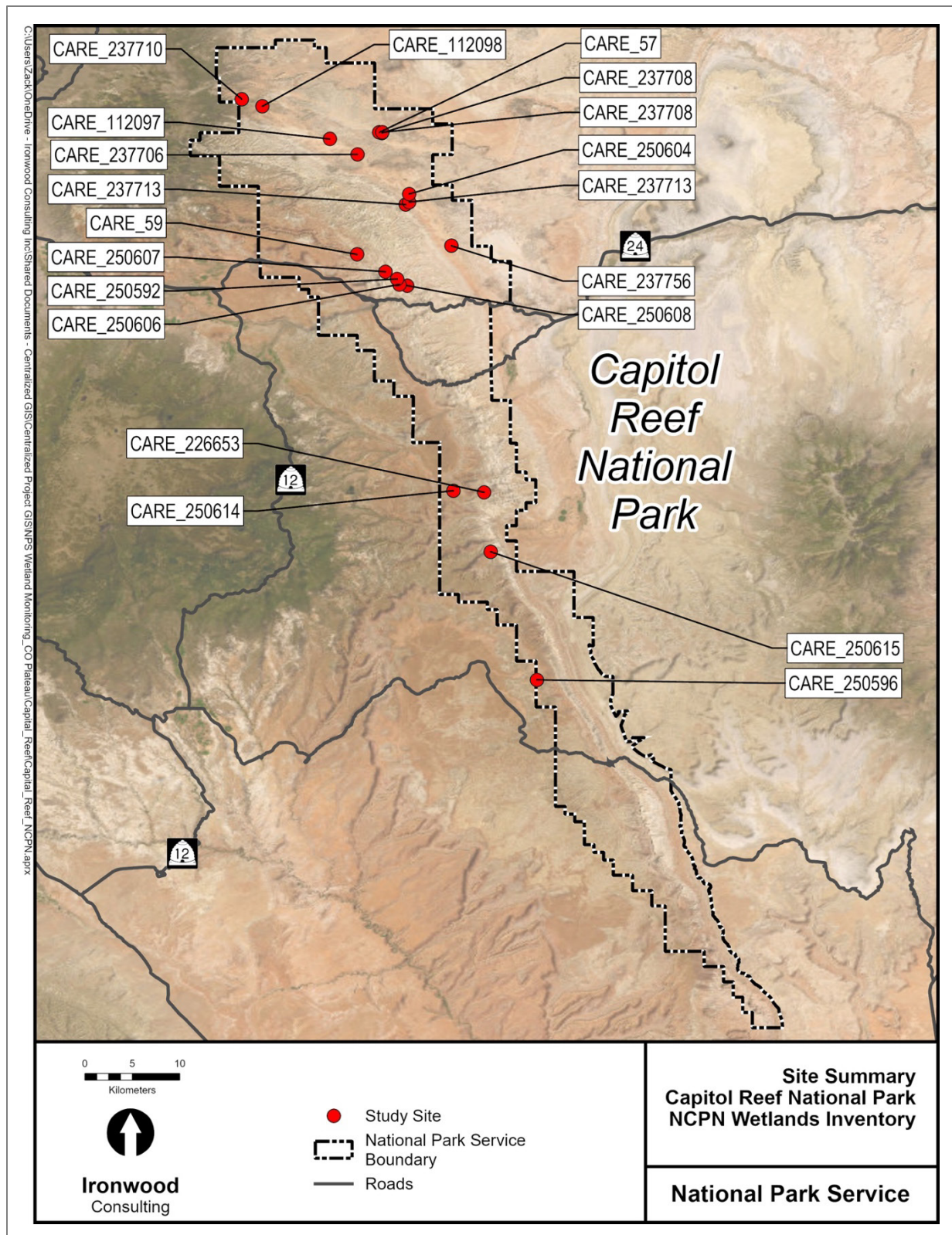


Figure 1. Capitol Reef National Park Overview with Priority Survey Areas.

Table 1. Capitol Reef National Park Priority Survey Sites.

Site ID	Site Name	Survey Priority
57	Ackland West	1
59	Canyon	1
112097	Ring Water	1
112098	South Desert	1
226653	Sheets Gulch	1
237706	Bull	1
237708	Ackland East	1
237709	Bitter	1
237712	Canyon Seep	1
237713	Willow Canyon Seep	1
237756	Deep Creek	1
250592	Lower Canyon 3	1
250604	Baker Post	1
250606	Lower Canyon 2	1
250607	Lower Canyon 4	1
250608	Lower Canyon 1	1
250614	Upper Sheets Gulch	1
112096	Notch Water	2
237710	Lone Pine	3
250596	Onion Flats Seep	3
250615	South Coleman Canyon	3
58	East Upper South Desert	Not specified
61	Between The Fins	Not specified
112090	78988126 NHD_ID	Not specified
112091	79208679 NHD_ID	Not specified
112092	79209079 NHD_ID	Not specified
112093	81170603 NHD_ID	Not specified
112094	81170623 NHD_ID	Not specified
112095	81170653 NHD_ID	Not specified
112099	Deep Creek	Not specified
250618	Between the Fins Seep	Not specified

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) plotted 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 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 the 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. A point at 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 magnetic 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 methodology.

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 1% cut-level was used when recording visual cover estimates at all surveyed sites except at Sheets Gulch (Site 226653), where a 3% cut-level was used. This means that plants within the quadrat with visually estimated cover below 1% were not recorded (or 3% at Sheets Gulch). 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 (quadrat distance) 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 CARE survey sites using this methodology ranged from 1 to 16, and the total number of quadrats at each site ranged from 2 to 18. Details about the number of transects and quadrats used at each GDE site are found in the CARE 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 in which to establish the GDE transects, which was typically the largest polygon, the most mesic polygon, and/or the polygon that included a spring orifice.

Hanging Garden Springs Monitoring Protocol Standard Operating Procedures (SOP) #4 and #6

The Northern Colorado Plateau Network developed a protocol for monitoring water and wetland resources unique to the park units for which they are responsible for providing inventory and monitoring data (NCPN and NPS 2016). The standard operating procedures selected for hanging garden GDEs during this project were #4, Site Map and Vegetation Characterization and #6 Site Condition and Repeat Photo points.

SOP #4 facilitates mapping of complex sites and those locations where receiving a GPS signal is difficult (e.g., alcoves and hanging gardens) by manually sketching a site map and assesses vegetation cover to scale, without site trampling. Mapping outputs are not intended to be shared or viewed in a GIS. Vegetation cover outputs are visually estimated for the mapped area. Woody vegetation is not measured nor estimated separately from herbaceous vegetation and ground cover classes are limited to algae and moss.

SOP#6 characterizes visitor disturbance, exotic and invasive species presence, and document the site with photographs; photo points established and photographs taken under this protocol are intended to be repeated through time.

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 Arid West 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. 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. The 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 ESRI Field Maps application was used to calculate the area (in square meters) and the length at the long axis of the wetland. The minimum mapping unit was 3 m². 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% perennial 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
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 perennial 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 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
- Description of photo
- Date of photo
- Project description

An example of a labeled photo is “CARE_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. Long and linear features were mapped by polyline. Spring development data were collected at all park units.

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

GDE Level II Surveys

Surveys took place between June 9 and 17, 2021 and July 15 and 16, 2021. Eighteen of the 31 surveyed areas were identified as GDE sites, with evidence of springs present (Table 4, Appendix A). One site was identified as a riparian area. This site was called Bitter with site ID 237709 and water flow at this site was assessed to primarily be runoff-based rather than groundwater-dependent. Further description follows in the site summary section.

Table 4. List of surveyed sites identifying site type and primary GDE type.

Site ID	Site Name	Site Type	Primary GDE Type
57	Ackland West	Seep	Helocrene
59	Canyon	Seep	Rheocrene
112097	Ring Water	Seep	Rheocrene
112098	South Desert	Spring	Rheocrene
226653	Sheets Gulch	Seep	Hanging Garden/Wet Wall
237706	Bull	Spring	Rheocrene
237708	Ackland East	Spring	Hypocrene
237709	Bitter	Riparian	Rheocrene
237712	Canyon Seep	Seep	Hanging Garden/Wet Wall
237713	Willow Canyon Seep	Seep	Hypocrene
237756	Deep Creek	Seep	Hypocrene
250592	Lower Canyon 3	Spring	Rheocrene
250596	Onion Flats Seep	Spring	Hypocrene
250604	Baker Post	Seep	Rheocrene
250606	Lower Canyon 2	Seep	Rheocrene
250608	Lower Canyon 1	Seep	Hypocrene
250614	Upper Sheets Gulch	Spring	Rheocrene
250615	South Coleman Canyon	Spring	Rheocrene
112096	Notch Water	Non-GDE	–
237710	Lone Pine	Non-GDE	–
250607	Lower Canyon 4	Non-GDE	–
58	East Upper South Desert	Not Surveyed	–
61	Between The Fins	Not Surveyed	–
112090	78988126 NHD_ID	Not Surveyed	–
112091	79208679 NHD_ID	Not Surveyed	–

Table 4 (continued). List of surveyed sites identifying site type and primary GDE type.

Site ID	Site Name	Site Type	Primary GDE Type
112092	79209079 NHD_ID	Not Surveyed	–
112093	81170603 NHD_ID	Not Surveyed	–
112094	81170623 NHD_ID	Not Surveyed	–
112095	81170653 NHD_ID	Not Surveyed	–
112099	Deep Creek	Not Surveyed	–
250618	Between the Fins Seep	Not Surveyed	–

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

Unresolved Taxonomy

We regularly encountered common reed (*Phragmites australis*) but this wetland plant has two published varieties in North America according to the Manual of Grasses for North America (Barkworth et al. 2007). One variety (var. *americanus*) is thought to be native to North America and the other (var. *australis*) from Eurasia. The Eurasian variety is an aggressive invader in the same habitat as the native variety and separating them should prove ecologically useful. However, the first day of this study we examined the Fruita Campground populations and used the Manual of Grasses for North America to establish the variety. We did not have conclusive results as the morphology of the plants was intermediate between the two varieties. Further investigation in the office suggested that this taxonomic problem is not yet resolved, and morphology cannot be presently used to separate the varieties. The published treatment in Flora of North America does not separate the species to variety although it recognizes that we have two genotypes in North America (Allred 2024). We thus report that the nativity status of the taxon is “unknown” in the following results.

Site 57 (Ackland West)

Site 57 (Ackland West) was located at an elevation of 1,806 m, with an overall south (170°) aspect and low slope variability across the site. Standing water and wetland vegetation provided evidence of groundwater at this site. A single seeping orifice with diffuse discharge was observed. The spring type was characterized as helocrene. This GDE site included a total wetland area and perimeter of 0.26 acre (1,070.6 m²) and 778.3 m, respectively (Figure 2, Appendix B).

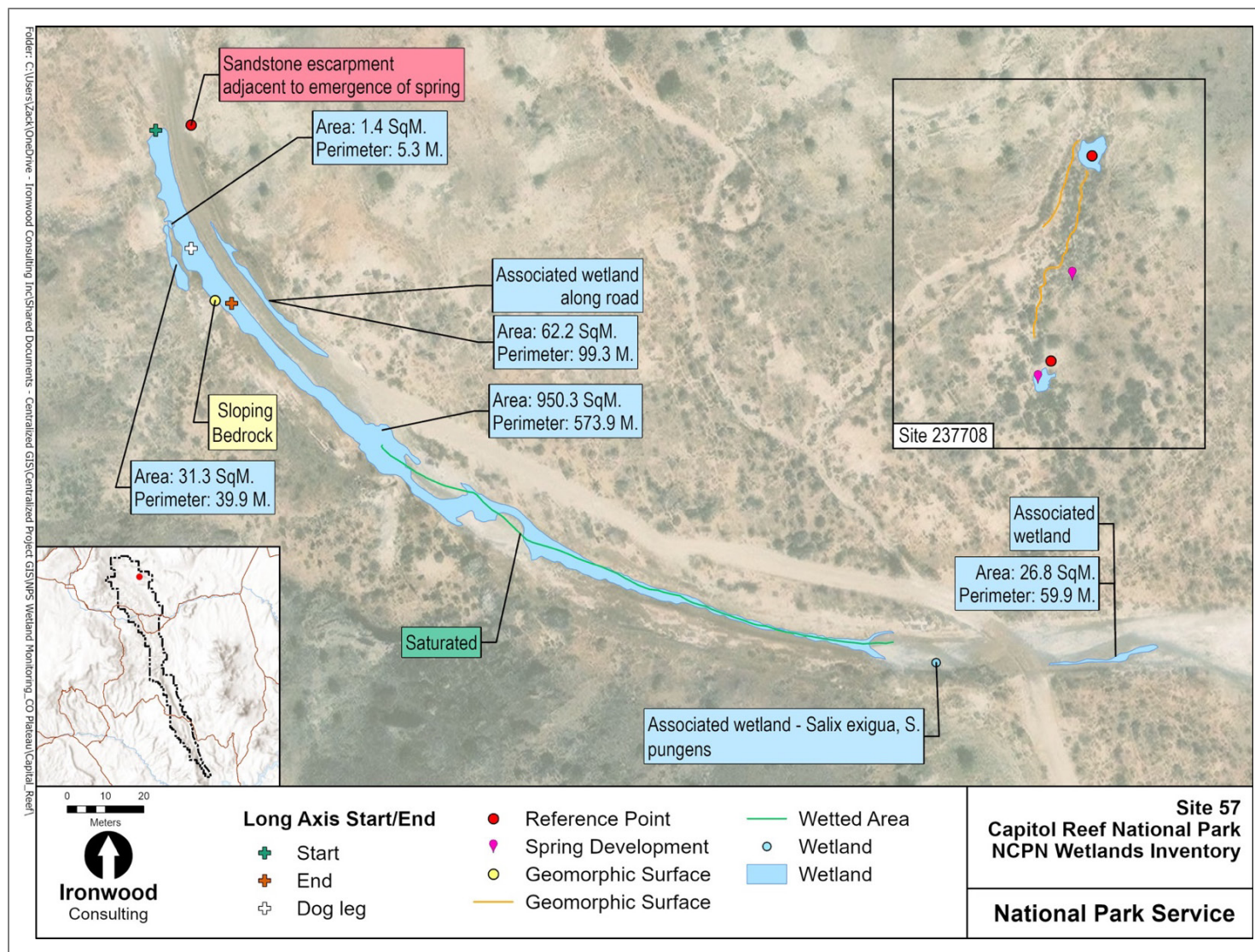


Figure 2. Wetland mapping for Site 57 (Ackland West) and 237708 (Ackland East).

Eleven plant taxa were encountered during the GDE Level II survey, including five taxa captured in herbaceous vegetation quadrats (Appendix D, Table 5). Total average herbaceous cover was 18.6%. The dominant herbaceous plants were desert saltgrass (*Distichlis spicata*) and common threesquare (*Schoenoplectus pungens*) with 13.2% and 4.8% average cover, respectively. Groundcover included litter, soil, and gravel with 50.0%, 45.8%, and 4.2% average corner hits, respectively (Table 6). There was no woody line intercept cover.

Table 5. Herbaceous vegetation quadrat data for Site 57 (Ackland West). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Distichlis spicata</i>	desert saltgrass	N	FAC	13.2	100
<i>Schoenoplectus pungens</i>	common threesquare	N	OBL	4.8	75
<i>Phragmites australis</i>	common reed	UNK	FACW	0.3	17
<i>Triglochin maritima</i>	seaside arrowgrass	N	OBL	0.2	8
<i>Bassia hyssopifolia</i>	five-horn smotherweed	I	FACU	0.1	8
Bryophytes	moss	–	–	–	–
Total	–	–	–	18.6	–
50% of Total	–	–	–	9.3	–
20% of Total	–	–	–	3.7	–

^A I - Introduced, N - Native, UNK – Unknown Status (subspecies uncertain), NOX - Utah Noxious Weed, (UDAF 2022; USDA and NRCS 2023).

Table 6. Groundcover quadrat data for Site 57 (Ackland West).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	4.2
Cobble	–
Stone	–
Boulder	–
Bedrock	–
Basal	–
Litter	50.0
Water	–
Wood	–
Soil	45.8
Total	100.0

The GDE level II herbaceous quadrat data does not pass the USACE Dominance Test when using the more rigorous standards for this project, where only perennial FACW and OBL plants were used to indicate wetland presence. However, of the five plant taxa captured in the vegetation quadrats, three (60%) of these are classified as FACW or OBL. Further, by USACE standards, both dominant taxa would qualify as wetland indicator species since FAC plants are also considered indicators of wetland vegetation.

The non-native plant species encountered included cheatgrass (*Bromus tectorum*) and five-horn smotherweed (*Bassia hyssopifolia*). The noxious weed five-stamen tamarisk (*Tamarix chinensis*) was also present.

Impacts observed at this site included a gravel road that runs across the spring source. No spring developments were observed. Bighorn sheep sign was observed with 25% frequency within the GDE quadrats (Appendix C). Deer and cow sign were observed outside of the quadrats.

Site 59 (Canyon)

Site 59 (Canyon) was located at an elevation of approximately 1,795 m, with an overall northeast (34°) aspect. Standing water and wetland vegetation provided evidence of groundwater at this site. A single seep with diffuse discharge was observed. The spring type was characterized as rheocrene. This GDE site included a total wetland area and perimeter of 0.04 ac (154.9 m²) and 112.1 m, respectively (Figure 3, Appendix B).

Fourteen plant taxa were encountered during the GDE Level II survey, including eight taxa captured in herbaceous vegetation quadrats (Appendix D, Table 7). Total average herbaceous cover was 13.4%. The dominant herbaceous plants were smooth scouring-rush (*Equisetum laevigatum*), Baltic rush (*Juncus balticus* var. *montanus*), and common threesquare, with 3.8%, 3.0%, and 2.5% average cover, respectively. Groundcover included gravel, litter, stone, and water with 38.5%, 34.6%, 13.5%, and 13.5% average corner hits, respectively (Table 8). There was no woody line intercept cover.

Recreational impact observed near this site included social trails (foot paths). There were no spring developments or wildlife sign observed (Appendix C).

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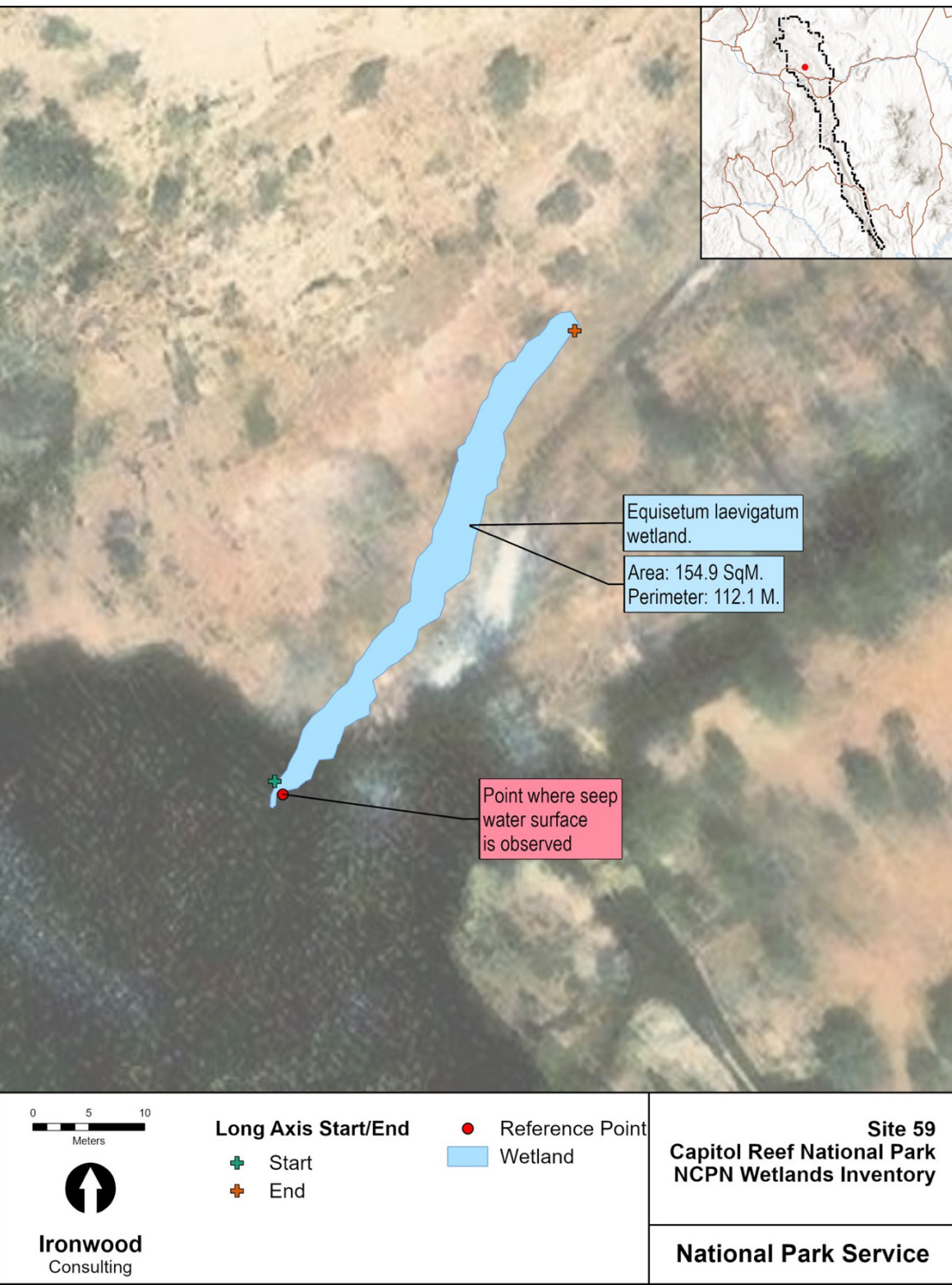


Figure 3. Wetland mapping for Site 59 (Canyon).

Table 7. Herbaceous vegetation quadrat data for Site 59 (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	3.8	62
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	3.0	31
<i>Schoenoplectus pungens</i>	common threesquare	N	OBL	2.5	23
<i>Distichlis spicata</i>	desert saltgrass	N	FAC	0.8	23
<i>Agrostis exarata</i>	spike bentgrass	N	FACW	0.5	15
<i>Phragmites australis</i>	common reed	UNK	FACW	0.5	8
<i>Asclepias speciosa</i>	showy milkweed	FAC	FAC	0.2	15
<i>Ericameria nauseosa</i>	rubber rabbitbrush	N	UPL	0.1	8
Bryophytes	moss	–	–	–	–
Total	–	–	–	11.3	–
50% of Total	–	–	–	5.7	–
20% of Total	–	–	–	2.3	–

^A I - Introduced, N - Native, UNK – Unknown Status (subspecies uncertain), NOX - Utah Noxious Weed (UDAF 2022; USDA and NRCS 2023).

Table 8. Groundcover quadrat data for Site 59 (Canyon).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	38.5
Cobble	–
Stone	13.5
Boulder	–
Bedrock	–
Basal	–
Litter	34.6
Water	13.5
Wood	–
Soil	–
Total	100.0

Site 112097 (Ring Water)

Site 112097 (Ring Water) site occurs at an elevation of approximately 1,789 m with an overall northwest (334°) aspect and low slope variability across the site. The primary spring type was characterized as rheocrene, and secondarily as hypocrene. Wetland vegetation provided evidence of

groundwater. This site included a total wetland area and perimeter length of 0.13 ac (514.8 m²) and 239.3 m, respectively (Figure 4, Appendix B).

A total of nine plant taxa were recorded at this site, including seven taxa captured by the herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 9, Table 10). Total herbaceous cover averaged 21.1%. The dominant plant was common threesquare with 10.7% average cover. The average groundcover included litter, soil, and basal with 60.7%, 35.7%, and 3.6% average corner hits, respectively (Table 11). Total woody line intercept cover was 3.7%, with five-stamen tamarisk as the only intercepted species.

The noxious weed observed at this site included five-stamen tamarisk.

No recreation impacts or spring developments were observed. Deer and cow sign were observed outside the GDE quadrats at this site (Appendix C).

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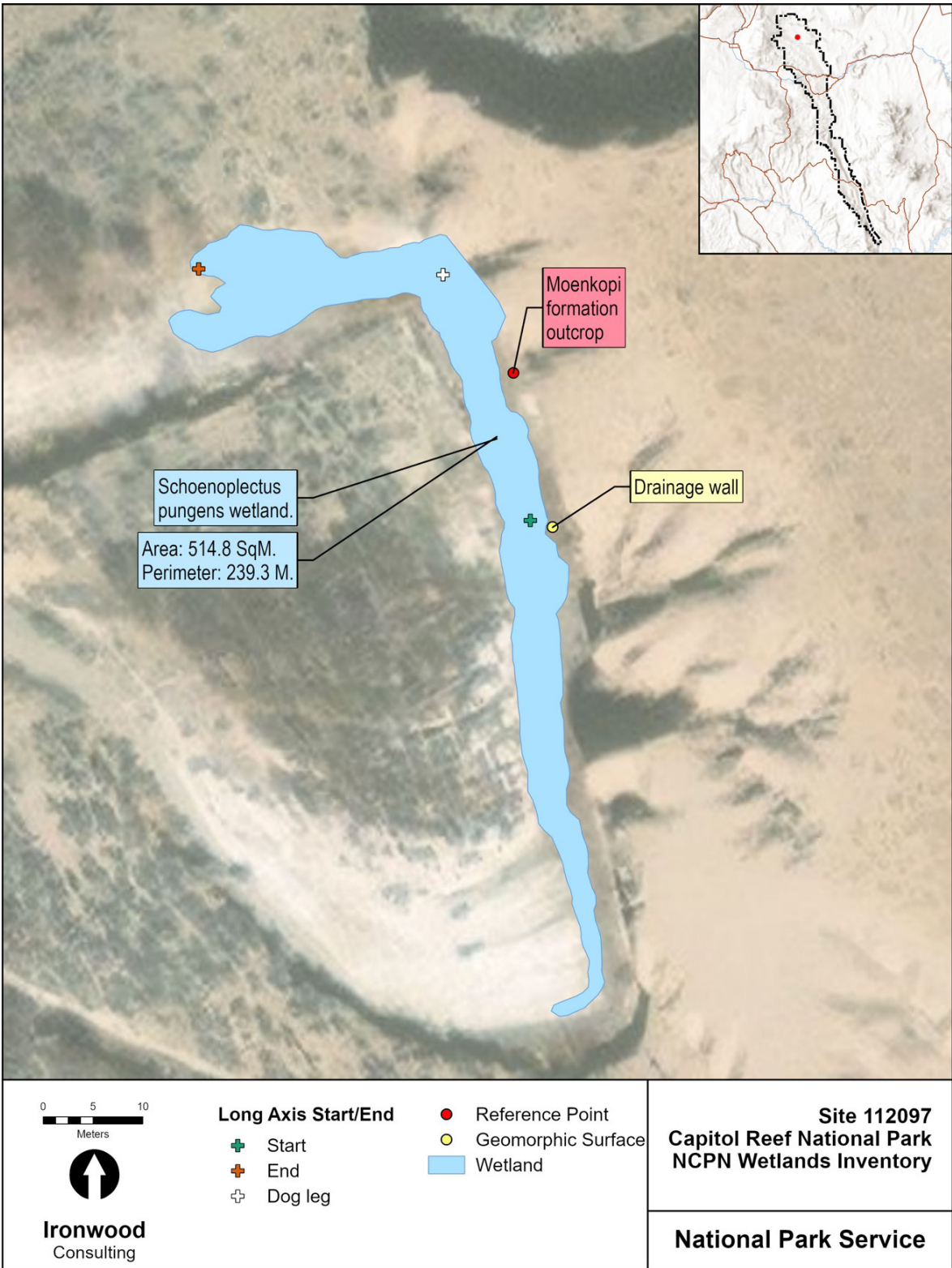


Figure 4. Wetland mapping for Site 112097 (Ring Water).

Table 9. Herbaceous vegetation quadrat data for Site 112097 (Ring Water). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Schoenoplectus pungens</i>	common threesquare	N	OBL	10.7	93
<i>Typha domingensis</i>	southern cattail	N	OBL	3.6	14
<i>Distichlis spicata</i>	desert saltgrass	N	FAC	2.7	29
<i>Phragmites australis</i>	common reed	UNK	FACW	1.5	29
<i>Tamarix chinensis</i>	five-stamen tamarisk	NOX	FAC	1.5	50
unknown forb	unknown forb	–	–	0.7	14
<i>Iva acerosa</i>	copperweed	N	FACU	0.3	14
Bryophytes	moss	–	–	–	–
Total	–	–	–	21.1	–
50% of Total	–	–	–	10.5	–
20% of Total	–	–	–	4.2	–

^A I - Introduced, N - Native, UNK – Unknown Status (subspecies uncertain), NOX - Utah Noxious Weed (UDAF 2022; USDA and NRCS 2023).

Table 10. Woody vegetation line intercept summary data for Site 112097 (Ring Water).

Species	Common name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Tamarix chinensis</i>	five-stamen tamarisk	NOX	FAC	3.7
Total	–	–	–	3.7

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

Table 11. Groundcover quadrat data for Site 112097 (Ring Water).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	–
Boulder	–
Bedrock	–
Basal	3.6
Litter	60.7
Water	–
Wood	–

Table 11 (continued). Groundcover quadrat data for Site 112097 (Ring Water).

Groundcover Type	Average Corner Hits (%)
Soil	35.7
Total	100.0

Site 112098 (South Desert)

Site 112098 (South Desert) was located at an elevation of approximately 1,999 m with an overall southeast (135°) aspect and medium slope variability across the site. Flow from a spring source 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 0.07 ac (267.3 m²) and 115.9 m, respectively (Figure 5, Appendix B).

Seventeen plant taxa were encountered during the GDE Level II survey, including 12 taxa captured in herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 12, Table 13). Total average herbaceous cover was 29.0%. The dominant herbaceous plant was redtop (*Agrostis stolonifera*) with 15.8% average cover. Groundcover included litter, basal, soil and boulder with 89.6%, 4.2%, 4.2%, and 2.1% average corner hits, respectively (Table 14). The total average woody line intercept cover was 24.6%. Russian olive (*Elaeagnus angustifolia*), water birch (*Betula occidentalis*), coyote willow (*Salix exigua*), skunkbush sumac (*Rhus trilobata*), and Woods' rose (*Rosa woodsii*) had average woody line intercept covers of 12.6%, 9.2%, 1.4%, 1.1%, and 0.4%, respectively.

The non-native plant species redtop was present at this site. The noxious species Russian olive was observed at this site.

No recreation impacts or spring developments were observed at this site. Badger and deer sign were each observed outside the GDE quadrats (Appendix C).

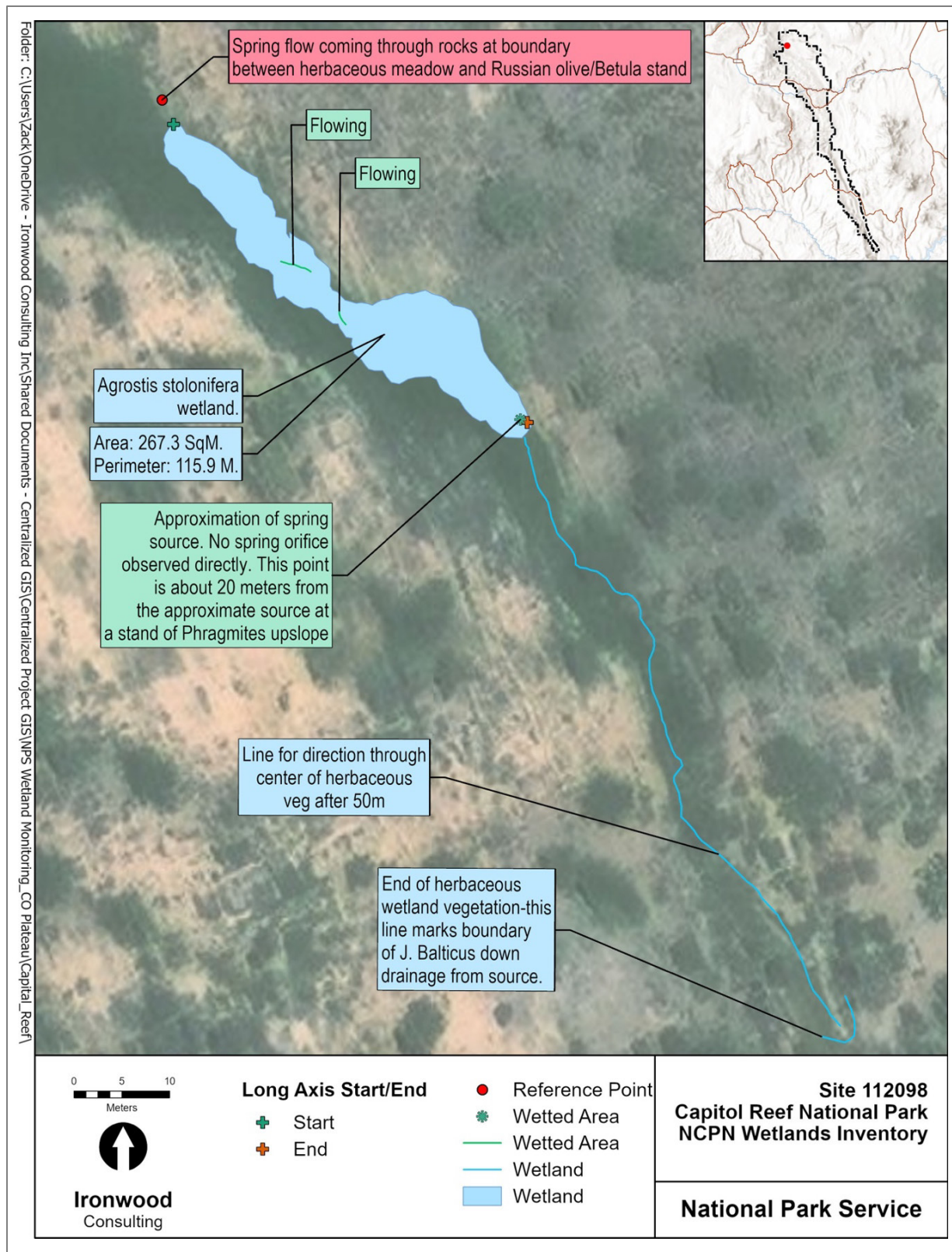


Figure 5. Wetland mapping for Site 112098 (South Desert).

Table 12. Herbaceous vegetation quadrat data for Site 112098 (South Desert). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Agrostis stolonifera</i>	redtop	I	FACW	15.8	92
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	4.8	58
<i>Eleocharis palustris</i>	common spikerush	N	OBL	2.2	42
<i>Equisetum laevigatum</i>	smooth scouring-rush	N	FACW	2.1	50
<i>Asclepias speciosa</i>	showy milkweed	N	FAC	2.0	25
<i>Maiathemum stellatum</i>	starry falso Solomon's-seal	N	FACU	1.8	25
<i>Schoenoplectus pungens</i>	common threesquare	N	OBL	0.4	25
Bryophytes	moss	–	–	–	–
Total	–	–	–	29.0	–
50% of Total	–	–	–	14.5	–
20% of Total	–	–	–	5.8	–

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

Table 13. Woody vegetation line intercept summary data for Site 112098 (South Desert).

Species	Common name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Elaeagnus angustifolia</i>	Russian olive	NOX	FAC	12.6
<i>Betula occidentalis</i>	water birch	N	FACW	9.2
<i>Salix exigua</i>	coyote willow	N	FACW	1.4
<i>Rhus trilobata</i>	skunkbush sumac	N	FACU	1.1
<i>Rosa woodsii</i>	Woods' rose	N	FACU	0.4
Total	–	–	–	24.6

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

Table 14. Groundcover quadrat data for Site 112098 (South Desert).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	–
Boulder	2.1
Bedrock	–

Table 14 (continued). Groundcover quadrat data for Site 112098 (South Desert).

Groundcover Type	Average Corner Hits (%)
Basal	4.2
Litter	89.6
Water	–
Wood	–
Soil	4.2
Total	100.0

Site 226653 (Sheets Gulch)

Site 226653 (Sheets Gulch) was located at an elevation of approximately 1,742 m with moderate slope variability across the site. Flow from a spring source, standing water, and wetland vegetation provided evidence of groundwater at this site; a single spring orifice was mapped. The primary spring type was characterized as hanging garden. This GDE site included a total wetland area and perimeter of 0.06 ac (253.2 m²) and 193.3 m, respectively (Figure 6, Appendix B).

Twelve plant taxa were encountered during the GDE Level II survey, including five taxa captured in herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 15, Table 16). Total average herbaceous cover was 75.2%. The dominant herbaceous plants were common reed and white virgin's-bower (*Clematis ligusticifolia*) with 34.0% and 15.0% average cover, respectively. Groundcover included litter, soil, water, stone, and wood with 72.4%, 15.8%, 7.9%, 2.6%, and 1.3% average corner hits, respectively (Table 17). The total average woody line intercept cover was 3.9%. Fremont cottonwood (*Populus fremontii*) and skunkbush sumac (*Rhus trilobata*) had 3.5% and 0.4% average covers, respectively.

The GDE level II vegetation cover data does not pass the USACE Dominance Test when using the more rigorous standards for this project, where only FACW and OBL plants were used to indicate wetland presence. However, by USACE standards, where FAC plants are also considered indicators of wetland vegetation, then both dominant species would be considered wetland indicators, and the mapped polygon would pass the dominance test.

The only recreation impact observed was the intentional arrangement of some rocks on a ledge. No spring developments were present. No animal sign was captured within the GDE quadrats; however, bobcat sign was observed outside of the quadrats (Appendix C).

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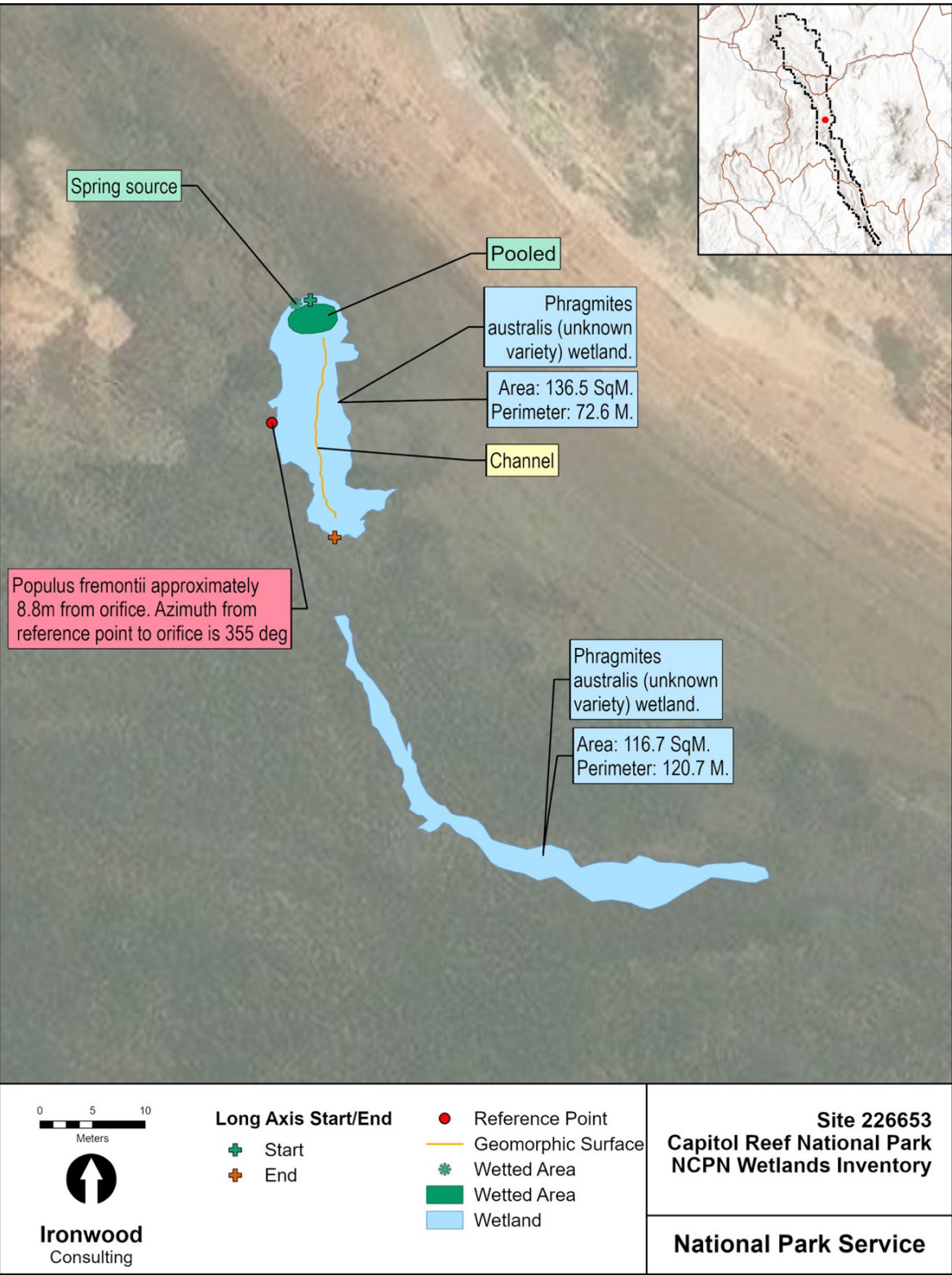


Figure 6. Wetland mapping for Site 226653 (Sheets Gulch).

Table 15. Herbaceous vegetation quadrat data for Site 226653 (Sheets Gulch). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Phragmites australis</i>	common reed	UNK	FACW	34.0	95
<i>Clematis ligusticifolia</i>	white virgin's-bower	N	FAC	15.0	42
<i>Equisetum arvense</i>	field horsetail	N	FAC	11.9	79
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	8.2	26
<i>Eurybia glauca</i>	blueleaf aster	N	UPL	2.1	21
Bryophytes	moss	–	–	–	–
Total	–	–	–	71.2	–
50% of Total	–	–	–	35.6	–
20% of Total	–	–	–	14.2	–

^A I - Introduced, N - Native, UNK – Unknown Status (subspecies uncertain), NOX - Utah Noxious Weed (UDAF 2022; USDA and NRCS 2023).

Table 16. Woody vegetation line intercept summary data for Site 226653 (Sheets Gulch).

Species	Common name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Populus fremontii</i>	Fremont cottonwood	N	FACW	3.5
<i>Rhus trilobata</i>	skunkbush sumac	N	FACU	0.4
Total	–	–	–	3.9

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

Table 17. Groundcover quadrat data for Site 226653 (Sheets Gulch).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	2.6
Boulder	–
Bedrock	–
Basal	–
Litter	72.4
Water	7.9
Wood	1.3

Table 17 (continued). Groundcover quadrat data for Site 226653 (Sheets Gulch).

Groundcover Type	Average Corner Hits (%)
Soil	15.8
Total	100.0

Site 237706 (Bull)

Site 237706 (Bull) was located at an elevation of approximately 1,744 m with an overall south aspect (180°) and low slope variability. Evidence of groundwater at this site included flow from a spring source, standing water, and wetland vegetation. The primary spring type was identified as rheocrene and the secondary spring type was helocrene. The site included a total wetland area and perimeter length of 0.02 ac (86.9 m²) and 58.0 m, respectively (Figure 7, Appendix B). The long axis end point mapping data was lost to technical failure; however, its approximate location was the northeastern tip of the mapped wetland.

A total of nine plant taxa were encountered, including three taxa captured in herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 18, Table 19). Total average herbaceous cover was 25.6%. The dominant herbaceous plants were common threesquare and lesser Indian paintbrush (*Castilleja minor*) with 18.9% and 6.5% average cover, respectively. Groundcover included litter, soil, water, bryophyte, and basal with 46.7%, 41.7%, 8.3%, 1.7%, and 1.7% average corner hits, respectively (Table 20). The woody line intercept cover was comprised of an unknown shrub with 0.4% average cover.

The noxious plant five-stamen tamarisk was recorded at this site.

No recreation impacts or spring developments were observed. No wildlife sign was observed within the GDE quadrats; however, bobcat, deer, and cow sign were observed outside of the quadrats (Appendix C).

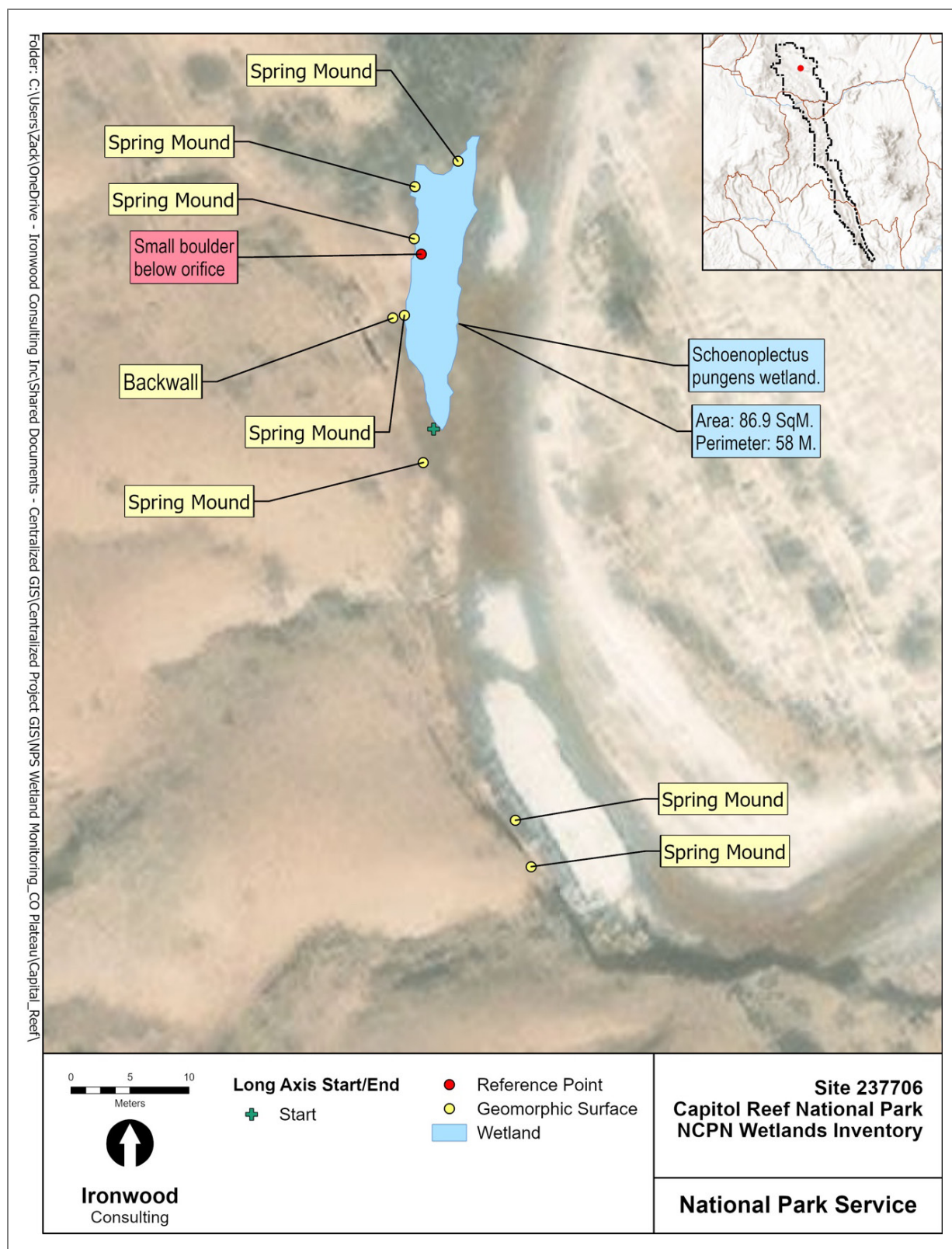


Figure 7. Wetland mapping for Site 237706 (Bull).

Table 18. Herbaceous vegetation quadrat data for Site 237706 (Bull). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Schoenoplectus pungens</i>	common threesquare	N	OBL	18.9	100
<i>Castilleja minor</i>	lesser Indian paintbrush	N	OBL	6.5	67
<i>Phragmites australis</i>	common reed	UNK	FACW	0.3	7
Bryophytes	moss	–	–	1.3	1
Total	–	–	–	25.6	–
50% of Total	–	–	–	12.8	–
20% of Total	–	–	–	5.1	–

^A I - Introduced, N - Native, UNK – Unknown Status (subspecies uncertain), NOX - Utah Noxious Weed (UDAF 2022; USDA and NRCS 2023).

Table 19. Woody vegetation line intercept summary data for Site 237706 (Bull).

Species	Common name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
Unknown shrub	Unknown shrub	–	–	0.4
Total	–	–	–	0.4

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

Table 20. Groundcover quadrat data for Site 237706 (Bull).

Groundcover Type	Average Corner Hits (%)
Bryophyte	1.7
Gravel	–
Cobble	–
Stone	–
Boulder	–
Bedrock	–
Basal	1.7
Litter	46.7
Water	8.3
Wood	–
Soil	41.7
Total	100.0

Site 237708 (Ackland East)

Site 237708 (Ackland East) occurs at an elevation of approximately 1,802 m with an overall southwest aspect (206°) and low slope variability. Wetland vegetation provided evidence of

groundwater at this site. The spring type was characterized as hypocrene. It included a total wetland area and perimeter length of 0.02 ac (64.4 m²) and 51.9 m, respectively (Figure 8, Appendix B). The long axis start and end point UTM coordinates at this site were lost due to technical failure, but these were in the northernmost wetland polygon and the long axis stretched from the southwest to northeast edge of the wetland polygon.

A total of 14 plant taxa were encountered during the GDE level II survey, including five taxa captured in herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 21, Table 22). Total herbaceous cover averaged 23.0%. The dominant herbaceous plant was copperweed (*Iva acerosa*) with 22.0% average cover. Groundcover included litter and soil with 68.8% and 31.3% average corner hits, respectively (Table 23). Total average woody line intercept cover was 55.3%, with coyote willow as the only intercepted species.

The herbaceous quadrat data does not pass either the standard USACE Dominance Test or the more rigorous version employed by this project, where only herbaceous FACW and OBL plants were used to indicate wetland presence. However, this site was dominated overall by coyote willow which has a wetland indicator status of FACW.

The non-native plants observed were cheatgrass and foxtail fescue (*Vulpia myuros*); the noxious weed five-stamen tamarisk was also recorded.

Social trails were observed nearby. Remnants of historic piping leading to an old trough were present. Cow and deer sign were observed outside of the GDE quadrats (Appendix C). Unidentified tadpoles were observed in the trough.

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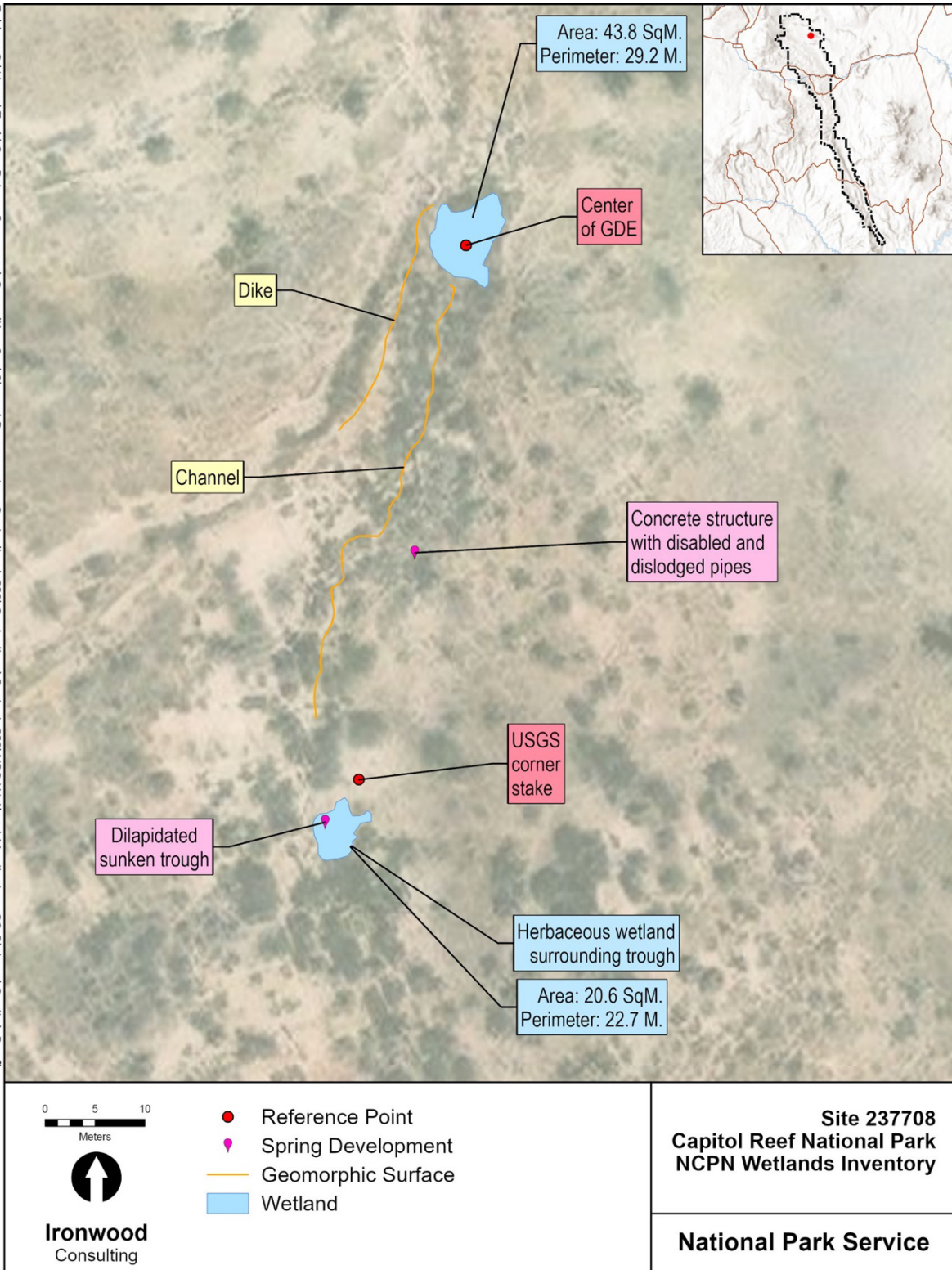


Figure 8. Wetland mapping for Site 237708 (Ackland East).

Table 21. Herbaceous vegetation quadrat data for Site 237708 (Ackland East). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Iva acerosa</i>	copperweed	N	FACU	22.0	75
<i>Distichlis spicata</i>	desert saltgrass	N	FAC	0.5	25
<i>Achnatherum hymenoides</i>	Indian ricegrass	N	UPL	0.3	25
<i>Elymus elymoides</i>	squirreltail	N	FACU	0.3	25
Bryophytes	moss	–	–	–	–
Total	–	–	–	23.0	–
50% of Total	–	–	–	11.5	–
20% of Total	–	–	–	4.6	–

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

Table 22. Woody vegetation line intercept summary data for Site 237708 (Ackland East).

Species	Common name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Salix exigua</i>	coyote willow	N	FACW	55.3
Total	–	–	–	55.3

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

Table 23. Groundcover quadrat data for Site 237708 (Ackland East).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	–
Boulder	–
Bedrock	–
Basal	–
Litter	68.8
Water	–
Wood	–
Soil	31.3
Total	100.0

Site 237709 (Bitter)

Site 237709 (Bitter) occurs at an elevation of approximately 1,596 m with an overall southwest (210°) aspect and low slope variability. Wetland vegetation and flowing water provided evidence of groundwater. No spring orifice was observed within 150 m of this site, despite the presence of channels with flowing water. The spring type was characterized as rheocrene, but the flowing channel was thought to result from mixed discharge with surface runoff contributing to the flow, which may have originated in the Henry Mountains. The site included a total wetland area and perimeter length of 0.05 ac (206.8 m²) and 128.3 m, respectively (Figure 9, Appendix B).

Fourteen plant taxa were encountered during the GDE level II survey, including eight taxa recorded within herbaceous vegetation quadrats and two on the woody line intercept transects (Appendix D, Table 24, Table 25). Total herbaceous cover averaged 18.1%. The dominant herbaceous plants were common threesquare, yellow sweetclover (*Melilotus officinalis*), and smooth scouring-rush (*Equisetum laevigatum*) with 6.5%, 5.9%, and 5.3% average cover, respectively. Groundcover included litter, water, and soil with 46.9%, 42.2%, and 10.9% average corner hits, respectively. The total average woody plant cover was 31.1%. Yellow willow (*Salix lutea*) and coyote willow (*Salix exigua*) had average covers of 28.8% and 2.3%, respectively.

Non-native plants encountered included cheatgrass, redtop, and yellow sweet-clover. The noxious weed five-stamen tamarisk was also present.

No recreation impacts or spring developments were observed. Cow sign and spadefoot toads were observed outside the GDE quadrats (Appendix C).

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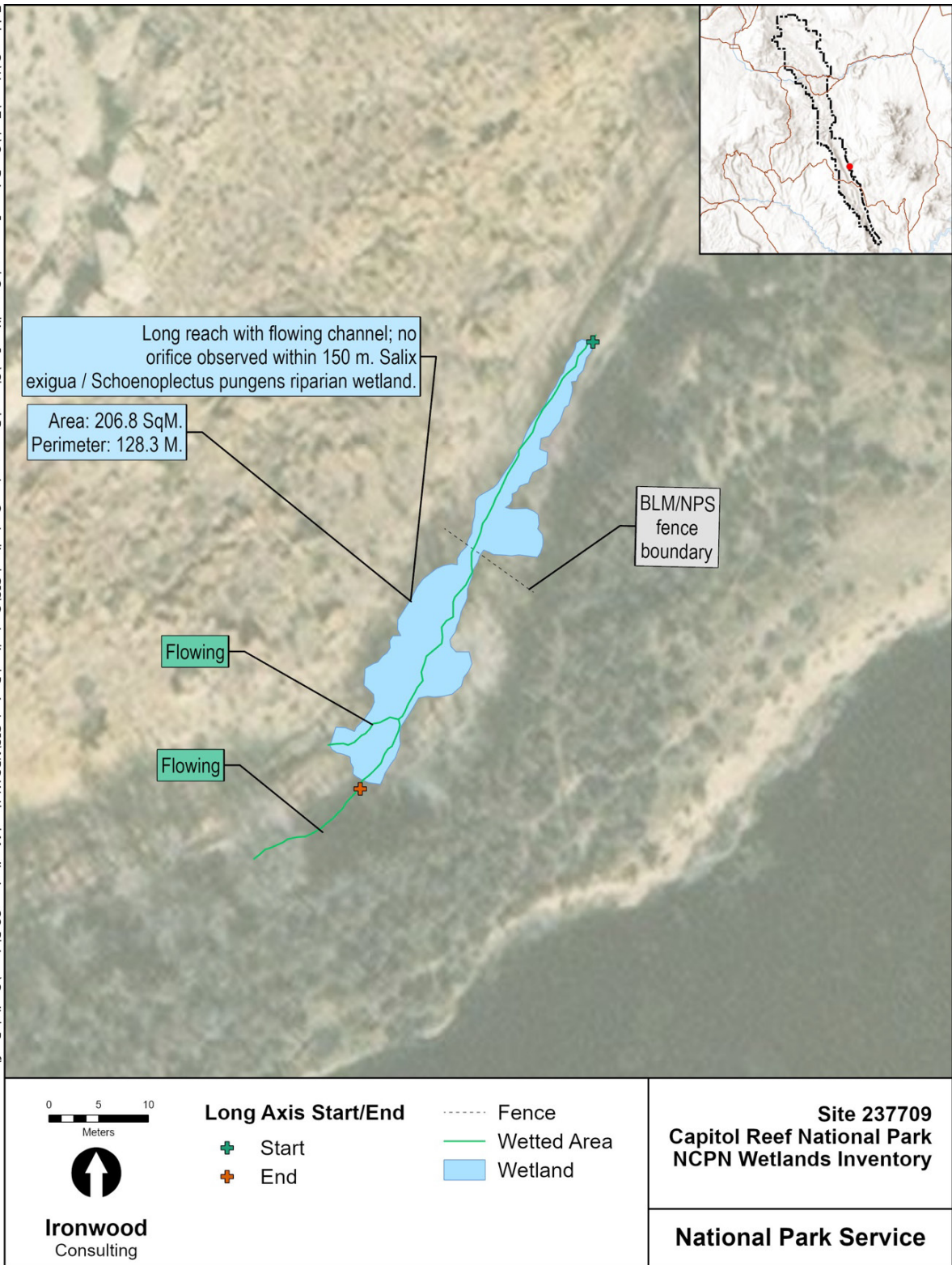


Figure 9. Wetland mapping for Site 237709 (Bitter).

Table 24. Herbaceous vegetation quadrat data for Site 237709 (Bitter). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Schoenoplectus pungens</i>	common threesquare	N	OBL	6.5	69
<i>Melilotus officinalis</i>	yellow sweet-clover	I	FACU	5.9	75
<i>Equisetum laevigatum</i>	smooth scouring-rush	N	FACW	5.3	100
<i>Typha domingensis</i>	southern cattail	N	OBL	0.2	13
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	0.1	13
<i>Agrostis stolonifera</i>	redtop	I	FACW	0.1	6
Bryophytes	moss	–	–	–	–
Total	–	–	–	18.1	–
50% of Total	–	–	–	9.0	–
20% of Total	–	–	–	3.6	–

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

Table 25. Woody vegetation line intercept summary data for Site 237709 (Bitter).

Species	Common name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Salix exigua</i>	coyote willow	N	FACW	28.8
<i>Salix lutea</i>	yellow willow	N	OBL	2.3
Total	–	–	–	31.1

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

Table 26. Groundcover quadrat data for Site 237709 (Bitter).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	–
Boulder	–
Bedrock	–
Basal	–
Litter	46.9
Water	42.2
Wood	–
Soil	10.9
Total	100.0

Site 237712 (Canyon Seep)

Site 237712 (Canyon Seep) occurs at an elevation of approximately 2,118 m with an overall southwest (154°) aspect and high slope variability. Flow from a spring source and wetland vegetation provided evidence of groundwater. The spring type was characterized as hanging garden and we applied the Springs Monitoring Protocol #4 and #6 reserved for this GDE type (NCPN-NPS 2016). The site included a total wetland area of 0.04 ac (169.0 m²; Figure 10, Appendix B). The backwall and sloping bedrock area immediately below the orifice were wet and covered with algae; this area summed to 0.1 ac (43.0 m²) with approximately 85% algal coverage.

The hanging garden SOP #4 and #6 protocols were applied at this site to minimize site trampling in adherence with National Park Service protocol for site etiquette and to provide a sketch map that describes some surfaces such as algae covered sloping bedrock. Although we encountered hanging garden GDE at other sites at CARE, it was determined that those sites could be sampled and mapped using the GDE Level II protocol without deleterious site disturbance.

Sixteen plant taxa were encountered during the survey; thirteen within the mapped wetland and three upland species in the colluvial slope immediately adjacent (Appendix D, Table 27). Total herbaceous cover in the mapped wetland was 130%. The dominant herbaceous plants were common reed, redtop, and Indianhemp (*Apocynum cannabinum*) with 55%, 27.5%, and 17.5% absolute cover, respectively.

Non-native plants encountered included cheatgrass and redtop; the noxious weed five-stamen tamarisk was also present.

Spring developments were not observed. Recreation impacts included a social trail that was observed adjacent to the wetland and signs of trampling near the spring orifice.

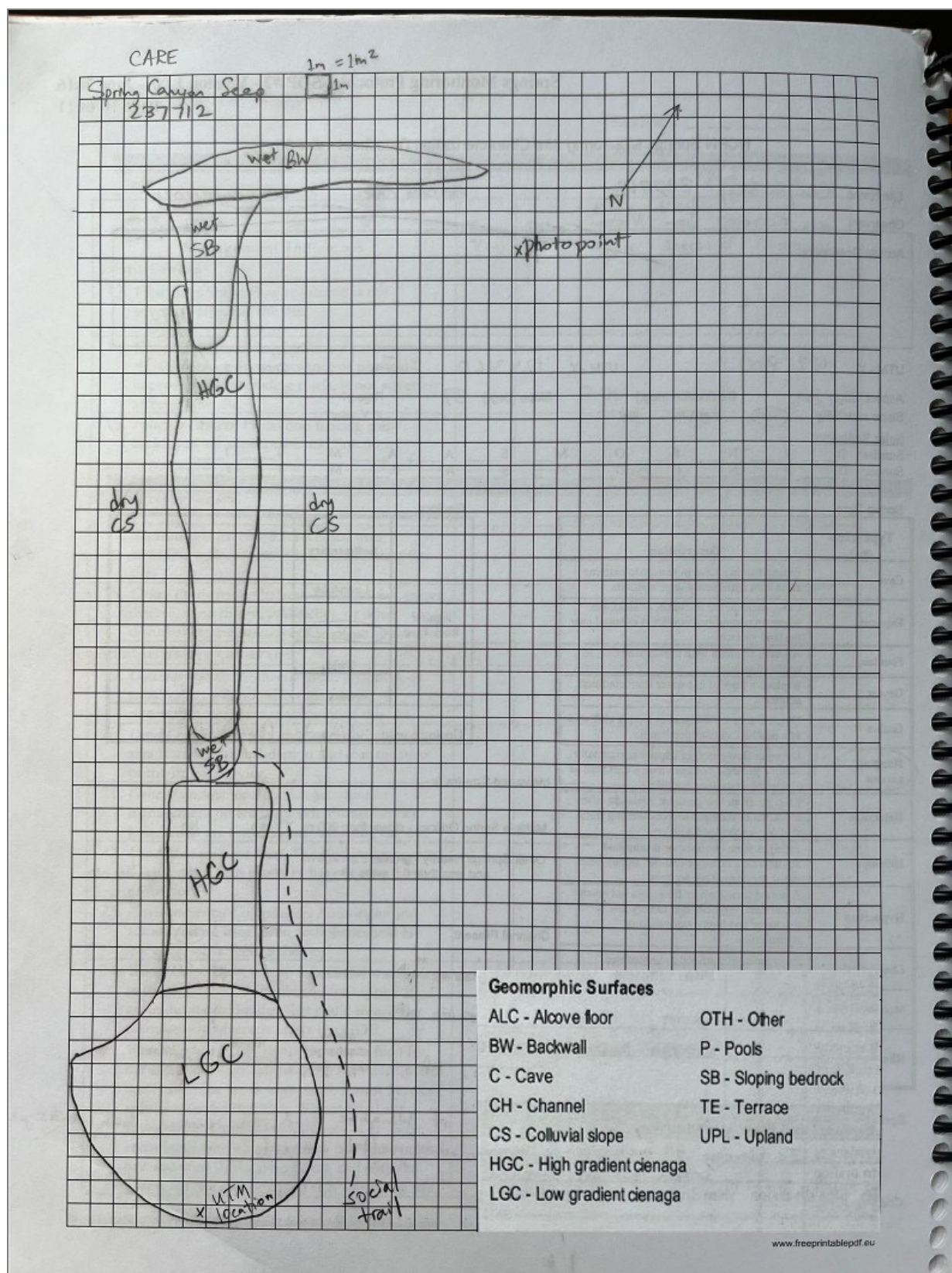


Figure 10. Wetland mapping for Site 237712 (Canyon Seep).

Table 27. Wetland Cover for Site 237712 (Canyon Seep). Bryophytes not included in totals.

Species	Common Name	Native Status^A	Wetland Code	Average Absolute Cover (%)
<i>Phragmites australis</i>	common reed	UNK	FACW	55
<i>Agrostis stolonifera</i>	redtop	I	FACW	27.5
<i>Apocynum cannabinum</i>	Indianhemp	N	FAC	17.5
<i>Maianthemum</i> sp.	mayflower	N	–	5
<i>Tamarix chinensis</i>	five-stamen tamarisk	NOX	FAC	5
<i>Carex aurea</i>	golden sedge	N	OBL	5
<i>Baccharis</i> sp.	baccharis	N	–	5
<i>Fraxinus anomala</i>	singleleaf ash	N	UPL	5
<i>Epipactis gigantea</i>	stream orchid	N	OBL	<1
<i>Cirsium</i> sp.	thistle	N	–	<1
<i>Clematis ligusticifolia</i>	white virgin's-bower	N	FAC	<1
<i>Juncus</i> sp.	rush	N	–	<1
<i>Equisetum laevigatum</i>	smooth scouring-rush	N	FACW	<1
Bryophytes	moss	–	–	–
Total	–	–	–	130.0
50% of Total	–	–	–	65.0
20% of Total	–	–	–	26.0

^A I - Introduced, N - Native, UNK – Unknown Status (subspecies uncertain), NOX - Utah Noxious Weed (UDAF 2022; USDA and NRCS 2023).

Site 237713 (Willow Canyon Seep)

Site 237713 (Willow Canyon Seep) occurs at an elevation of approximately 1,638 m with an overall northeast (30°) aspect and low slope variability. Evidence of groundwater included standing water and wetland vegetation. The primary spring type was characterized as hypocrene, with rheocrene as the secondary type. A small pool of standing water was observed where channel erosion had removed the surface soil that served as the substrate for the surrounding wetland vegetation. This eroded area revealed a shallow water table beneath the surface of the surrounding substrate. The site included a total wetland area and perimeter length of 0.06 ac (254.9 m²) and 226.0 m, respectively (Figure 11, Appendix B).

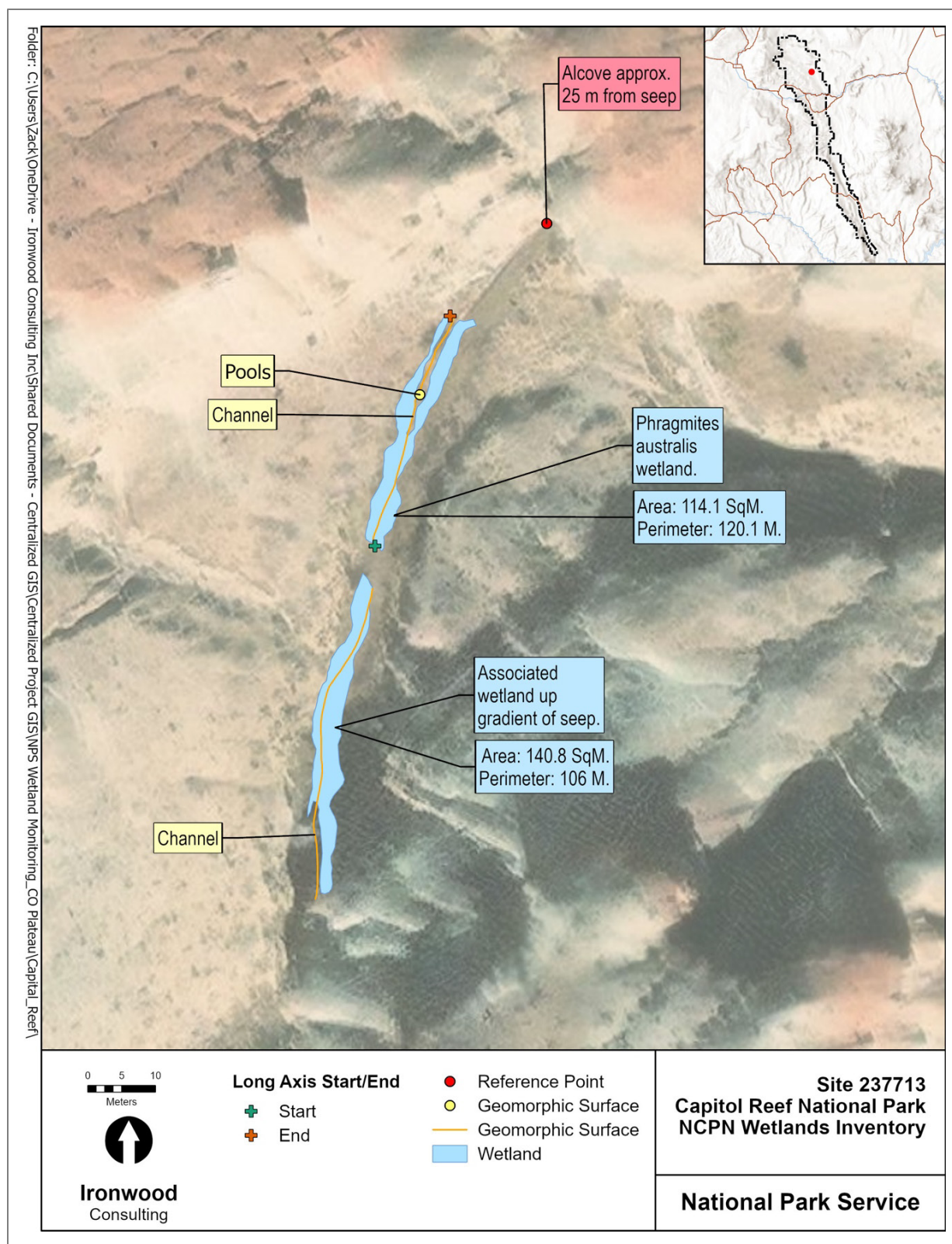


Figure 11. Wetland mapping for Site 237713 (Willow Canyon Seep).

Ten plant taxa were encountered during the GDE level II survey, including ten taxa recorded within herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 28, Table 29). Total herbaceous cover averaged 17.9%. The dominant herbaceous plants were common reed and copperweed with 6.2% and 3.7% average cover, respectively. Groundcover included soil, litter, and stone with 54.7%, 43.8%, and 1.6% average corner hits, respectively (Table 30). Groundcover included litter, water, and soil with 46.9%, 42.2%, and 10.9% average corner hits, respectively. The total average woody line intercept cover was 1.4%. Tamarisk (*Tamarix* sp.) and an unknown willow (*Salix* sp.) had 0.9% and 0.6% average cover, respectively.

Table 28. Herbaceous vegetation quadrat data for Site 237713 (Willow Canyon Seep). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Phragmites australis</i>	common reed	UNK	FACW	6.2	75
<i>Iva acerosa</i>	copperweed	N	FACU	3.7	56
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	2.6	25
<i>Schoenoplectus pungens</i>	common threesquare	N	OBL	2.2	69
<i>Muhlenbergia asperifolia</i>	scratchgrass	N	FACW	1.7	19
<i>Distichlis spicata</i>	desert saltgrass	N	FAC	0.9	38
<i>Sporobolus airoides</i>	alkali sacaton	N	FAC	0.6	31
<i>Tamarix chinensis</i>	five-stamen tamarisk	NOX	FAC	0.1	6
Bryophytes	moss	–	–	–	–
Total	–	–	–	17.9	–
50% of Total	–	–	–	9.0	–
20% of Total	–	–	–	3.6	–

^A I - Introduced, N - Native, UNK – Unknown Status (subspecies uncertain), NOX - Utah Noxious Weed (UDAF 2022; USDA and NRCS 2023).

Table 29. Woody vegetation line intercept summary data for Site 237713 (Willow Canyon Seep).

Species	Common name	Wetland Code	Average Woody Plant Cover (%)
<i>Tamarix</i> sp.	tamarisk	FAC	0.9
<i>Salix</i> sp.	willow	–	0.6
Total	–	–	1.4

Table 30. Groundcover quadrat data for Site 237713 (Willow Canyon Seep).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	1.6
Boulder	–
Bedrock	–
Basal	–
Litter	43.8
Water	–
Wood	–
Soil	54.7
Total	100.0

The non-native plant narrow-leaf cattail (*Typha angustifolia*) was present. The noxious weed five-stamen tamarisk was encountered at this site.

No recreational impacts or spring developments were observed. No wildlife sign was observed inside the vegetation quadrats; however, elk sign was recorded outside of the quadrats (Appendix C). Old livestock scat was also observed.

Site 237756 (Deep Creek)

Site 237756 (Deep Creek) site occurs at an elevation of approximately 1,579 m with an overall southeast (126°) aspect and low slope variability. Wetland vegetation provided evidence of groundwater. The spring type was characterized as hypocrene. It included a total wetland area and perimeter length of 0.18 ac (745.5 m²) and 437.9 m, respectively (Figure 12, Appendix B).

A total of eight plant taxa were encountered during the GDE level II survey, including five taxa recorded within the herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 31, Table 32). Total average herbaceous cover was 5.2%. The dominant herbaceous plant was alkali sacaton (*Sporobolus airoides*) with 3.2% average cover. Groundcover included litter, soil, and gravel with 47.5%, 45.0%, and 7.5% average corner hits, respectively (Table 33). The total average woody line intercept cover was 50.9%, with five-stamen tamarisk as the only intercepted species.

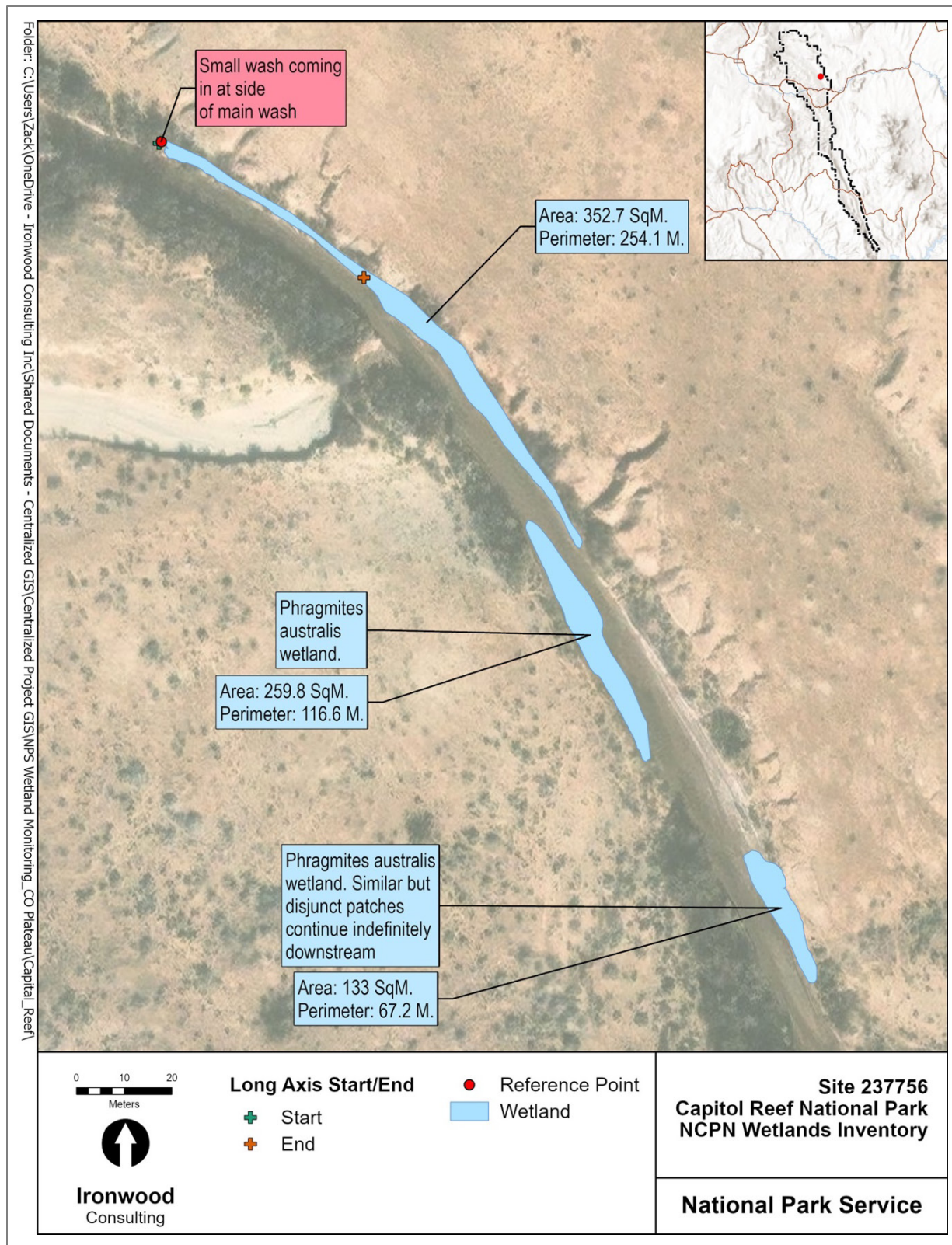


Figure 12. Wetland mapping for Site 237756 (Deep Creek).

Table 31. Herbaceous vegetation quadrat data for Site 237756 (Deep Creek). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Sporobolus airoides</i>	alkali sacaton	N	FAC	3.2	10
<i>Schoenoplectus pungens</i>	common threesquare	N	OBL	0.9	20
<i>Distichlis spicata</i>	desert saltgrass	N	FAC	0.8	20
<i>Muhlenbergia asperifolia</i>	scratchgrass	N	FACW	0.3	10
Bryophytes	moss	–	–	–	–
Total	–	–	–	5.2	–
50% of Total	–	–	–	2.6	–
20% of Total	–	–	–	1.0	–

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

Table 32. Woody vegetation line intercept summary data for Site 237756 (Deep Creek).

Species	Common name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Tamarix chinensis</i>	five-stamen tamarisk	NOX	FAC	50.9
Total	–	–	–	50.9

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

Table 33. Groundcover quadrat data for Site 237756 (Deep Creek).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	7.5
Cobble	–
Stone	–
Boulder	–
Bedrock	–
Basal	–
Litter	47.5
Water	–
Wood	–
Soil	45.5
Total	100.0

The GDE level II herbaceous quadrat data does not pass the USACE Dominance Test when using the more rigorous standards for this project, where only FACW and OBL plants were used to indicate

wetland presence. However, by USACE standards, where FAC plants are also considered indicators of wetland vegetation, 100% of the plants captured within the quadrats would be considered wetland indicators and the mapped polygon would pass the dominance test. Further, the associated wetlands that were mapped at this site were visually estimated to be dominated by common reed, which is a FACW plant.

The non-native plant saltlover (*Halogeton glomeratus*) was present as well as the noxious weed five-stamen tamarisk.

No recreation impacts or spring developments were observed. Bobcat sign was observed outside of the vegetation quadrats (Appendix C).

Site 250592 (Lower Canyon 3)

Site 250592 (Lower Canyon 3) occurs at an elevation of approximately 1,647 m with an overall southeast (98°) aspect and moderate slope variability. Flow from a single spring source (located at the Reference Point), standing water, and wetland vegetation provided evidence of groundwater. The spring type was characterized as rheocrene. It included a total wetland area and perimeter length of 0.0005 ac (1.9 m²) and 7.2 m, respectively (Figure 13, Appendix B).

Twenty 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, Table 34, Table 35). Total average herbaceous cover was 14.0%. The dominant herbaceous plant was white virgin's-bower (*Clematis ligusticifolia*) with 9.0% average cover. Groundcover included litter, stone, boulder, and soil with 37.5%, 37.5%, 12.5%, and 12.5% average corner hits, respectively (Table 36). The total woody line intercept cover was 46.2% with Rio Grande seepwillow (*Baccharis salicina*) as the only intercepted species.

The GDE long axis was placed in the wetland polygon in Figure 13, however poor GPS reception at the site prevented the long axis start and end points from being mapped. Poor GPS accuracy also resulted in the need to manually digitize site features based on a hand drawn map that was produced in the field.

The non-native plants cheatgrass and redtop (*Agrostis stolonifera*) were present as well as the noxious weed five-stamen tamarisk.

Recreation impacts included light social (foot) trails adjacent to the main trail. No spring developments were observed. Bighorn sheep sign was observed inside the vegetation quadrats at 100% frequency. Bighorn sheep and deer sign were present outside of the vegetation quadrats (Appendix C).

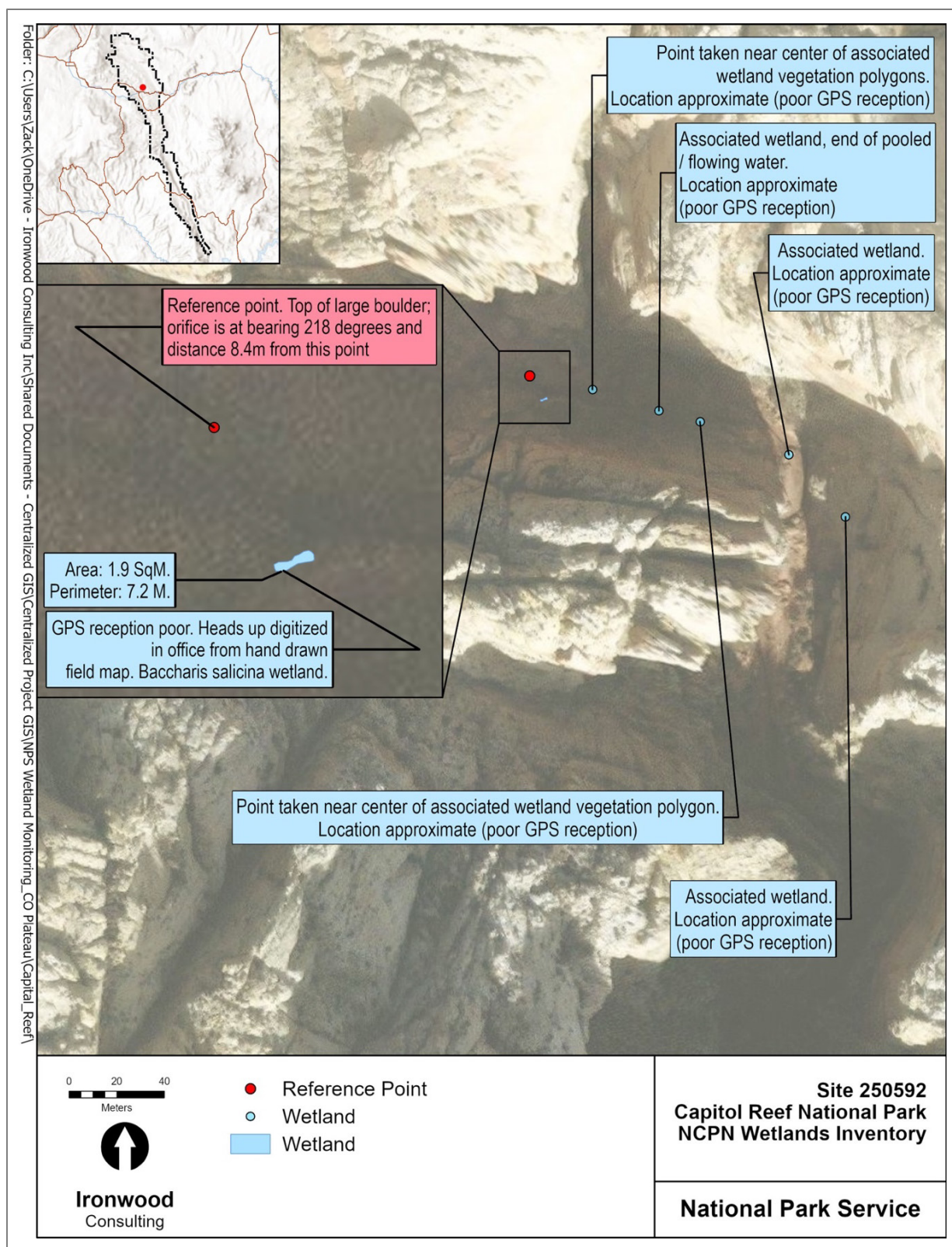


Figure 13. Wetland mapping for Site 250592 (Lower Canyon 3).

Table 34. Herbaceous vegetation quadrat data for Site 250592 (Lower Canyon 3). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Clematis ligusticifolia</i>	white virgin's-bower	N	FAC	9.0	100
<i>Artemisia ludoviciana</i>	Louisiana wormwood	N	FACU	2.0	50
<i>Taraxacum officinale</i>	common dandelion	I	FACU	1.5	50
<i>Elymus trachycaulus</i>	slender wheatgrass	N	FACU	1.0	50
<i>Bromus tectorum</i>	cheatgrass	I	UPL	0.5	50
Bryophytes	moss	–	–	–	–
Total	–	–	–	14.0	–
50% of Total	–	–	–	7.0	–
20% of Total	–	–	–	2.8	–

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

Table 35. Woody vegetation line intercept summary data for Site 250592 (Lower Canyon 3).

Species	Common name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Baccharis salicina</i>	Rio Grande seepwillow	N	FACW	46.2
Total	–	–	–	46.2

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

Table 36. Groundcover quadrat data for Site 250592 (Lower Canyon 3).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	37.5
Boulder	12.5
Bedrock	–
Basal	–
Litter	37.5
Water	–
Wood	–
Soil	12.5
Total	100.0

Site 250596 (Onion Flats Seep)

Site 250596 (Onion Flats Seep) occurs at an elevation of 2,010 m near the western boundary of CARE. Overall aspect was north (343°) with medium slope variability. Wetland vegetation was the key indicator of moisture availability, but it may not infer perennial groundwater; the site occupies a low gradient wash and an earthen dam system that is impounding seasonal runoff. The spring type that this site best fit was hypocrene, however, it is likely that the groundwater source is small, and recharge is limited to water catchment from the impounded area following precipitation events. It included mapped wetlands with an area and perimeter of 0.08 ac. (334.3 m²) and 314.2 m, respectively (Figure 14, Appendix B).

Five plant taxa were encountered during the GDE level II survey, all of which were captured within the herbaceous vegetation quadrats (Appendix D, Table 37). Total average herbaceous cover was 54.3%. There was a single dominant herbaceous plant: common spikerush (*Eleocharis palustris*) with 52.2% average cover. Groundcover included soil, litter, basal and wood with 37.5%, 45%, 15%, and 2.5% average corner hits, respectively (Table 38). There was no woody line intercept cover.

The hydrology at this site was assessed to be primarily driven by water catchment from surface runoff. The channelized site with human-made dam impoundments actively diverts and retains water seasonally and supports the existing wetland vegetation. When we visited in mid-July the main wetland plant, common spikerush, was mainly in a dormant state and many patches appeared to be dead. The wetland polygon we sampled included live cover of this species, however. There may be a historic seep at this location, but existing conditions made this difficult to determine.

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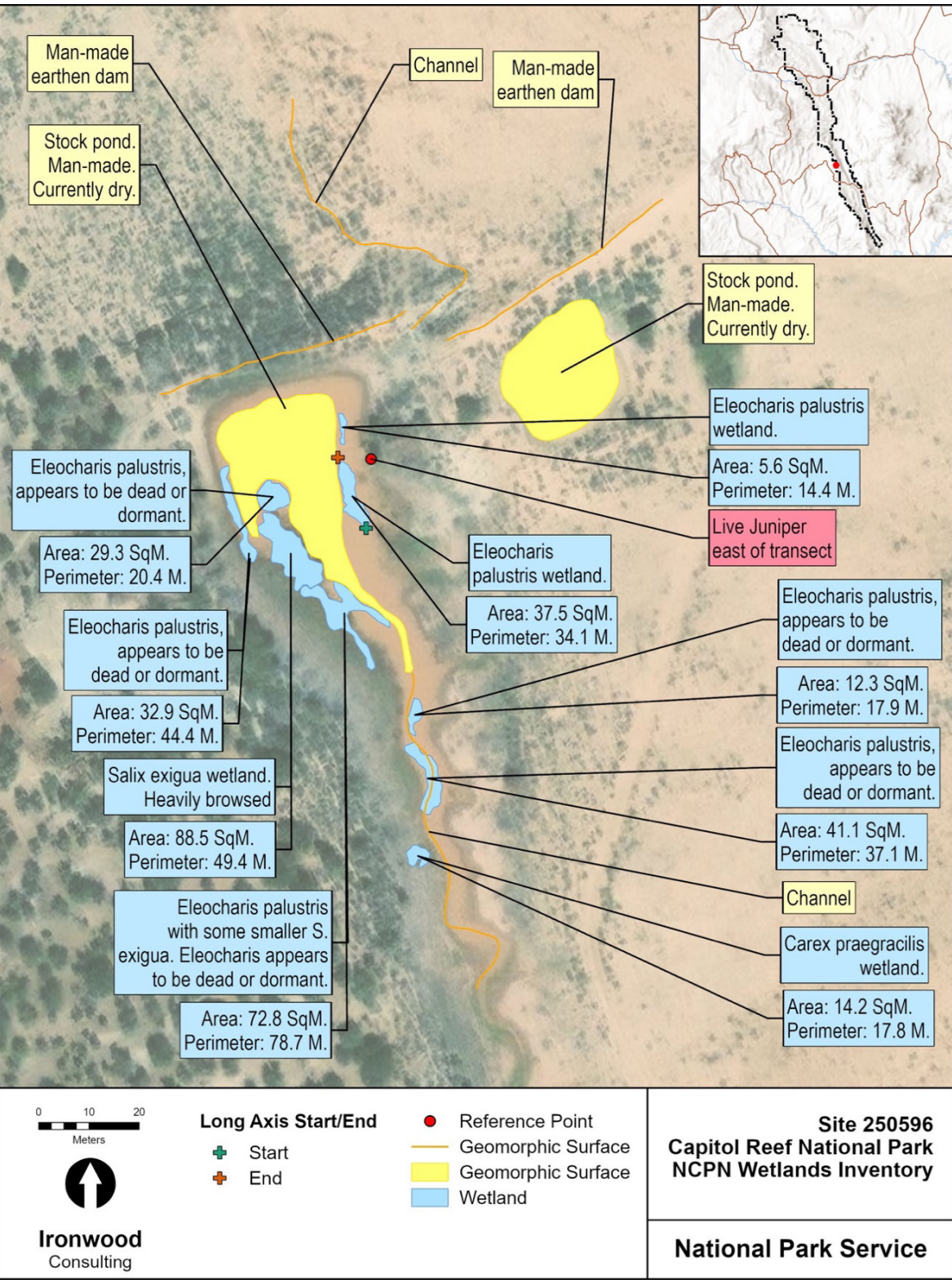


Figure 14. Wetland mapping for Site 250596 (Onion Flats Seep).

Table 37. Herbaceous vegetation quadrat data for Site 250596 (Onion Flats Seep). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Eleocharis palustris</i>	Common spikerush	N	OBL	52.2	100
<i>Melilotus officinalis</i>	Yellow sweet-clover	I	FACU	0.9	30
<i>Xanthium strumarium</i>	rough cocklebur	N	FAC	0.9	30
<i>Hordeum jubatum</i>	Foxtail barley	N	FAC	0.3	10
<i>Verbena bracteata</i>	Prostrate vervain	N	FAC	0.3	10
Bryophytes	moss	–	–	–	–
Total	–	–	–	54.3	–
50% of Total	–	–	–	27.15	–
20% of Total	–	–	–	10.86	–

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

Table 38. Groundcover quadrat data for Site 250596 (Onion Flats Seep).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	37.5
Boulder	12.5
Bedrock	–
Basal	15.0
Litter	45.0
Water	–
Wood	2.5
Soil	37.5
Total	100.0

Site 250604 (Baker Post)

Site 250604 (Baker Post) site occurs at an elevation of approximately 1,664 m with an overall northeast (29°) aspect and low slope variability. Peak/muck accumulation, two seep orifices, and wetland vegetation provided evidence of groundwater. The spring type was characterized as rheocrene. It included a total wetland area and perimeter length of 0.03 ac (116.5 m²) and 135.9 m, respectively (Figure 15, Appendix B).

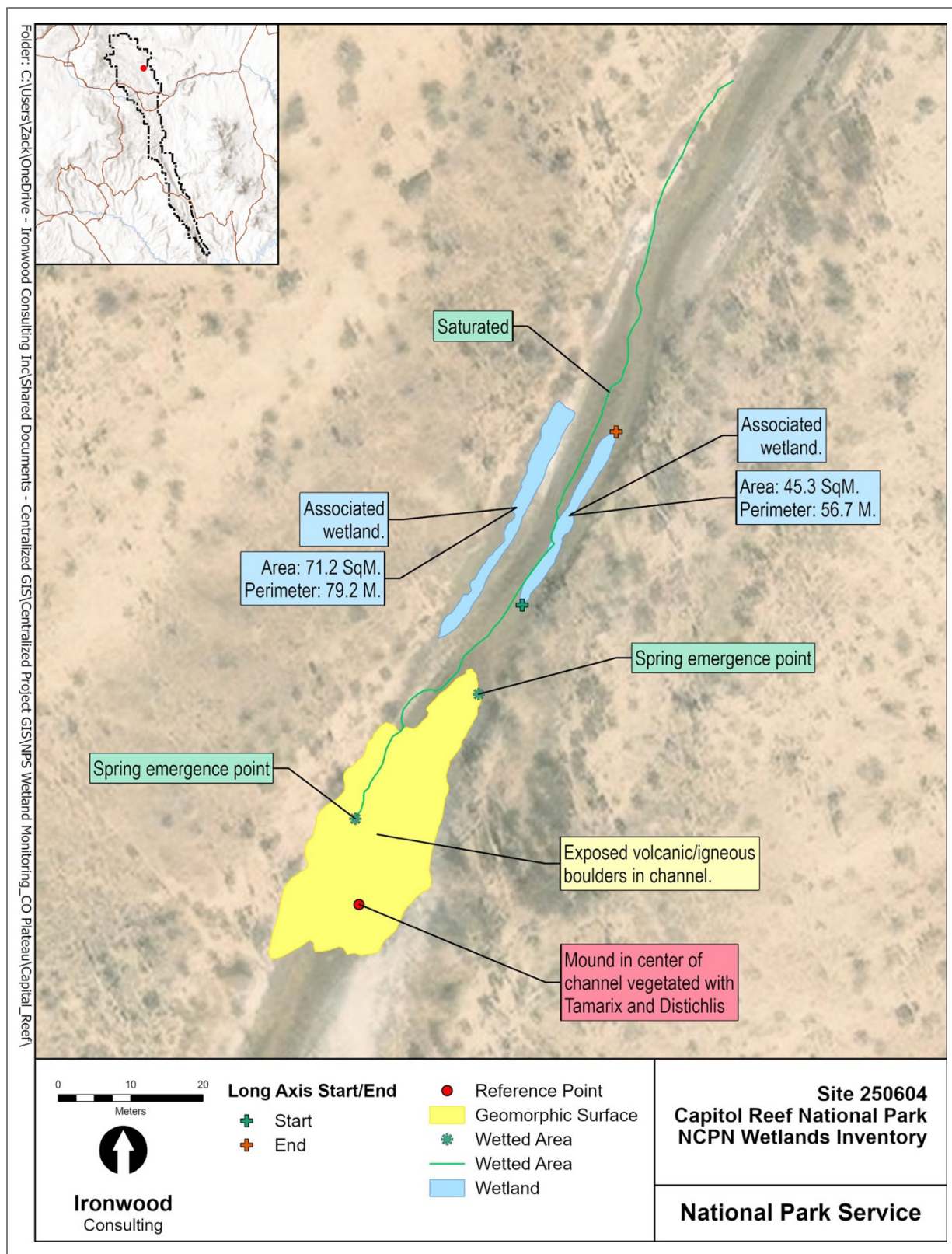


Figure 15. Wetland mapping for Site 250604 (Baker Post).

Five plant taxa were encountered during the GDE level II survey, all of which were captured within the herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 39, Table 40). Total average herbaceous cover was 11.0%. The dominant herbaceous plants were common threesquare and copperweed (*Iva acerosa*) with 5.0% and 4.4% average cover, respectively. Groundcover included soil, litter, stone, and basal with 77.8%, 16.7%, 2.8%, and 2.8% average corner hits, respectively (Table 41). The total average woody line intercept cover was 3.4%, with five-stamen tamarisk as the only intercepted species.

Table 39. Herbaceous vegetation quadrat data for Site 250604 (Baker Post). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Schoenoplectus pungens</i>	common threesquare	N	OBL	5.0	100
<i>Iva acerosa</i>	copperweed	N	FACU	4.4	11
<i>Distichlis spicata</i>	desert saltgrass	N	FAC	1.2	11
<i>Sporobolus airoides</i>	alkali sacaton	N	FAC	0.3	11
Bryophytes	moss	–	–	–	–
Total	–	–	–	11.0	–
50% of Total	–	–	–	5.5	–
20% of Total	–	–	–	2.2	–

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

Table 40. Woody vegetation line intercept summary data for Site 250604 (Baker Post).

Species	Common name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Tamarix chinensis</i>	five-stamen tamarisk	NOX	FAC	3.4
Total	–	–	–	3.4

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

Table 41. Groundcover quadrat data for Site 250604 (Baker Post).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	2.8
Boulder	–
Bedrock	–

Table 41 (continued). Groundcover quadrat data for Site 250604 (Baker Post).

Groundcover Type	Average Corner Hits (%)
Basal	2.8
Litter	16.7
Water	–
Wood	–
Soil	77.8
Total	100.0

The GDE Level II vegetation data does not pass the USACE Dominance Test. While other wetland indicators provide evidence for the presence of groundwater at this site, the sampled wetland did not include sufficient cover by FACW and OBL species to be classified as a wetland for the purposes of this project.

The noxious weed five-stamen tamarisk was present at this site.

No recreation impacts or spring developments were observed. Bobcat and cow sign were observed outside of the vegetation quadrats (Appendix C).

Site 250606 (Lower Canyon 2)

Site 250606 (Lower Canyon 2) occurs at an elevation of approximately 1,630 m with an overall southeast (169°) aspect. Standing water, a seeping orifice, and wetland vegetation provided evidence of groundwater. The spring type was characterized as rheocrene. It included a total wetland area and perimeter length of 0.07 ac (295.2 m²) and 89.2 m, respectively (Figure 16, Appendix B).

Twenty-one plant taxa were encountered during the GDE level II survey, including 15 taxa recorded within the herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 42, Table 43). Total average herbaceous cover was 7.8%. There was a single dominant herbaceous plant: redtop with 3.9% average cover. Groundcover included litter, soil, and gravel with 47.5%, 45.0%, and 7.5% average corner hits, respectively (Table 44). The total average woody line intercept cover was 3.0%. Fremont cottonwood, coyote willow, five-stamen tamarisk, and baccharis (*Baccharis* sp.) had average woody line intercept covers of 2.2%, 0.3%, 0.3%, and 0.2%, respectively.

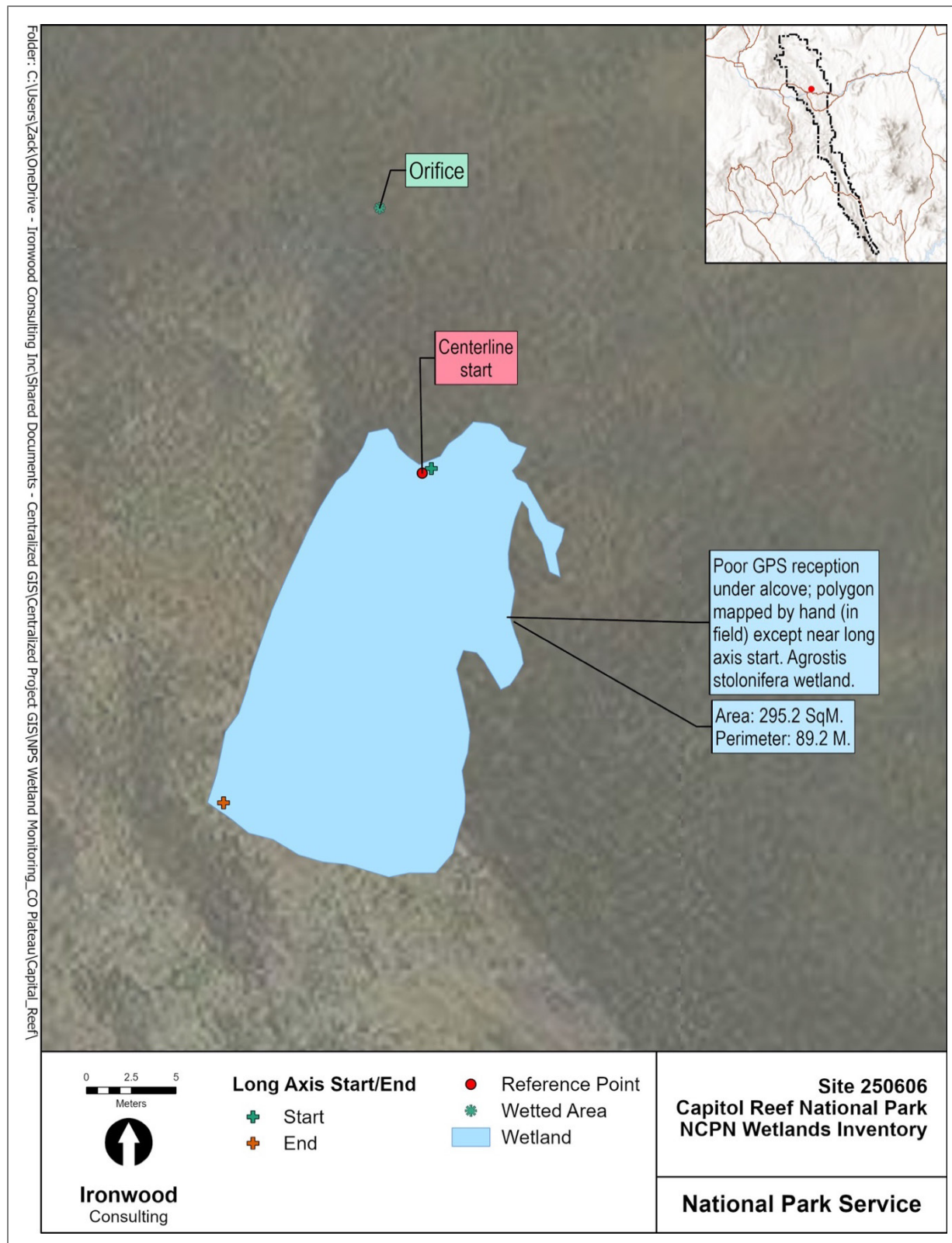


Figure 16. Wetland mapping for Site 250606 (Lower Canyon 2).

Table 42. Herbaceous vegetation quadrat data for Site 250606 (Lower Canyon 2). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Agrostis stolonifera</i>	redtop	I	FACW	3.9	41
<i>Artemisia ludoviciana</i>	Louisiana wormwood	N	FACU	0.9	41
<i>Bromus tectorum</i>	cheatgrass	I	UPL	0.6	35
unknown forb1	unknown forb1	–	–	0.5	12
<i>Elymus trachycaulus</i>	slender wheatgrass	N	FACU	0.5	18
unknown forb2	unknown forb2	–	–	0.5	35
Aster sp.	aster	–	–	0.4	12
<i>Conyza canadensis</i>	Canadian horseweed	N	FACU	0.3	12
<i>Veronica americana</i>	American brooklime	N	OBL	0.1	6
<i>Veronica anagallis-aquatica</i>	water speedwell	N	OBL	0.1	6
<i>Tamarix chinensis</i>	five-stamen tamarisk	NOX	–	0.1	6
<i>Vulpia octoflora</i>	six-weeks fescue	N	UPL	0.1	6
Bryophytes	moss	–	–	–	–
Total	–	–	–	7.8	–
50% of Total	–	–	–	3.9	–
20% of Total	–	–	–	1.6	–

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

Table 43. Woody vegetation line intercept summary data for Site 250606 (Lower Canyon 2).

Species	Common name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Populus fremontii</i>	Fremont cottonwood	N	FACW	2.2
<i>Salix exigua</i>	coyote willow	N	FACW	0.3
<i>Tamarix chinensis</i>	five-stamen tamarisk	NOX	FAC	0.3
<i>Baccharis</i> sp.	baccharis	N	–	0.2
Total	–	–	–	3.0

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

Table 44. Groundcover quadrat data for Site 250606 (Lower Canyon 2).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	38.5

Table 44 (continued). Groundcover quadrat data for Site 250606 (Lower Canyon 2).

Groundcover Type	Average Corner Hits (%)
Cobble	—
Stone	13.5
Boulder	—
Bedrock	—
Basal	—
Litter	34.6
Water	13.5
Wood	—
Soil	—
Total	100.0

Site 250606 (Lower Canyon 2) is a scoured GDE that is expected to change in size and extent due to the dynamic nature of the canyon bottom/channel site.

The non-native plants cheatgrass and redtop were present as well as the noxious weed five-stamen tamarisk.

No spring developments or wildlife sign were observed, but social (foot) trails were present (Appendix C) but are not impactful at this time due to the scoured nature of the site.

Site 250608 (Lower Canyon 1)

Site 250608 (Lower Canyon 1) occurs at an elevation of approximately 1,645 m with an overall east (80°) aspect. The presence of hydrophytic plants provided evidence of groundwater. The spring type was characterized as hypocrene. It included a total wetland area and perimeter length of 0.16 ac (637.5 m²) and 420.1 m, respectively (Figure 17, Appendix B).

Sixteen plant taxa were encountered during the GDE level II survey, including twelve taxa recorded within the herbaceous vegetation quadrats (Appendix D, Table 45). Total average herbaceous cover was 20.4%. The dominant herbaceous plants were scratchgrass and lemon scurfpea (*Psoralidium lanceolatum*) with 9.3% and 2.8% average cover, respectively. Groundcover included litter and gravel with 72.9% and 27.1% average corner hits, respectively (Table 46). There was no woody line intercept cover.

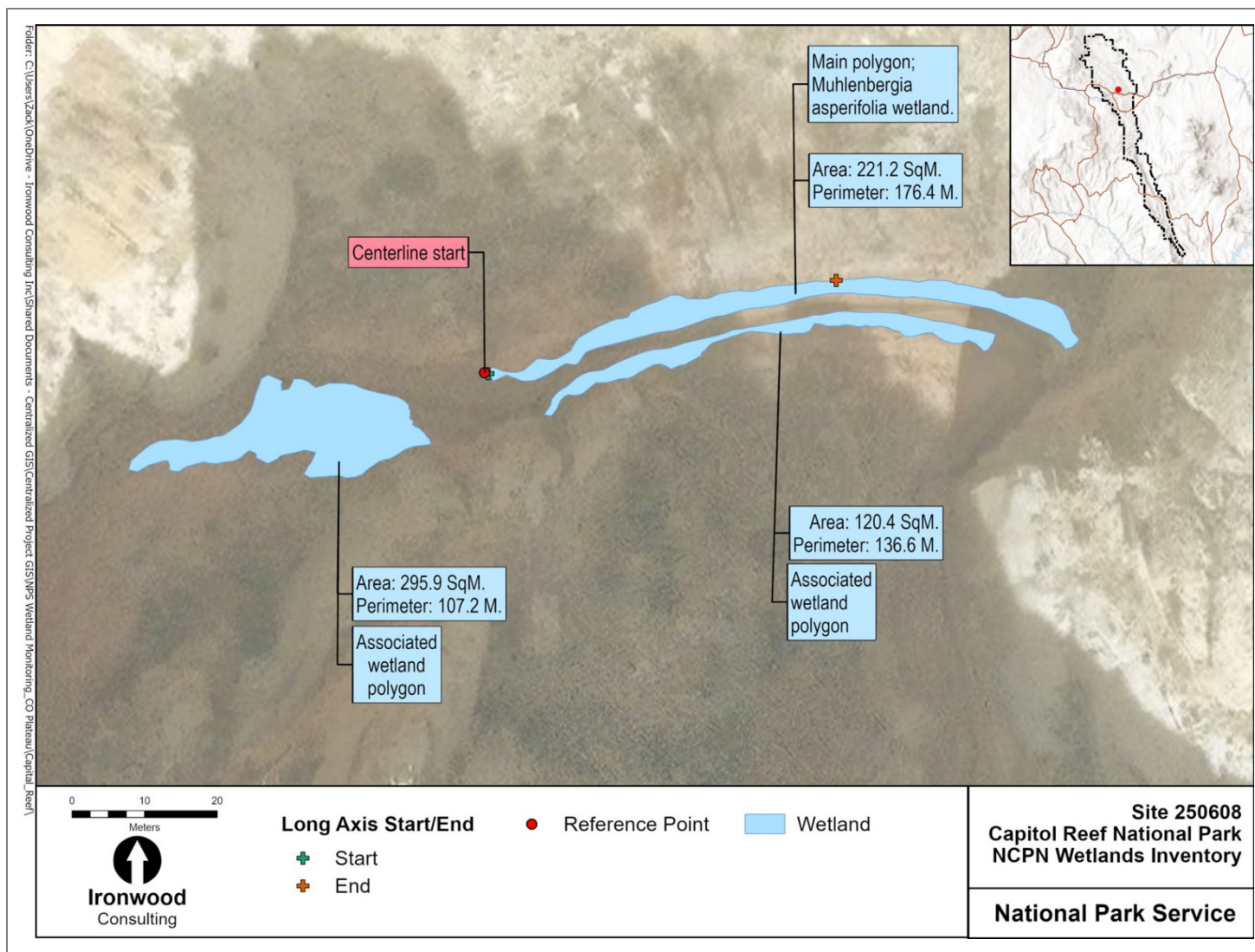


Figure 17. Wetland mapping for Site 250608 (Lower Canyon 1).

Table 45. Herbaceous vegetation quadrat data for Site 250608 (Lower Canyon 1). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Muhlenbergia asperifolia</i>	scratchgrass	N	FACW	9.3	92
<i>Psoraleidium lanceolatum</i>	lemon scurfpea	N	UPL	2.8	25
<i>Equisetum laevigatum</i>	smooth scouring-rush	N	FACW	2.1	75
<i>Eurybia glauca</i>	gray aster	N	UPL	1.9	17
<i>Schoenoplectus pungens</i>	common threesquare	N	OBL	1.3	25
<i>Agrostis stolonifera</i>	redtop	I	FACW	0.8	17
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	0.8	33
<i>Asclepias speciosa</i>	showy milkweed	N	FAC	0.5	17
<i>Clematis ligusticifolia</i>	white virgin's-bower	N	FAC	0.5	17
<i>Castilleja</i> sp.	Indian paintbrush	–	–	0.3	8
<i>Elymus trachycaulus</i>	slender wheatgrass	N	FACU	0.1	8
<i>Symphyotrichum welshii</i>	Welsh's aster	–	UNK ^B	0.1	8
Bryophytes	moss	–	–	–	–
Total	–	–	–	20.4	–
50% of Total	–	–	–	10.2	–
20% of Total	–	–	–	4.1	–

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

^B UNK – Unknown and species not assigned a wetland code by USACE, however occurrences typically found in moist habitats (e.g., hanging gardens and seeps).

Table 46. Groundcover quadrat data for Site 250608 (Lower Canyon 1).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	27.1
Cobble	–
Stone	–
Boulder	–
Bedrock	–
Basal	–
Litter	72.9
Water	–
Wood	–

Table 46 (continued). Groundcover quadrat data for Site 250608 (Lower Canyon 1).

Groundcover Type	Average Corner Hits (%)
Soil	—
Total	100.0

The GDE level II herbaceous quadrat data did not pass the USACE Dominance Test. However, of the 12 plant taxa captured in the herbaceous vegetation quadrats, five (42%) of these are classified as FACW or OBL. If FAC wetland status plants are also included as hydrophytic, then seven (58%) of the plants would indicate wetland presence. Further, while Welsh's aster (*Symphotrichum welshii*) was not assigned a wetland code by the USACE, this may be the result of how infrequently this plant is encountered during surveys. The habitat description of this suggests it is commonly found at the margins of seeps, in wet meadows, along stream banks, and in hanging gardens (NatureServe Explorer 2024), suggesting a hydrophytic status and increasing the proportion of hydrophytic plants captured within the quadrats to eight (67%). Future surveys may help refine wetland mapping at this site or identify if the spring is drying out.

The non-native plant redtop was present, but no noxious weeds were encountered.

A very faint social (foot) trail was present at this site. No spring developments or wildlife sign were observed (Appendix C).

Site 250614 (Upper Sheets Gulch)

Site 250614 (Upper Sheets Gulch) occurs at an elevation of approximately 1,830 m with an overall southeast (112°) aspect and low slope variability. Flow from a spring source, standing water, and wetland vegetation provided evidence of groundwater. The spring type was characterized as rheocrene. It included a total wetland area and perimeter length of 0.02 ac (92.3 m²) and 129.9 m, respectively (Figure 18, Appendix B).

Fourteen plant taxa were encountered during the GDE level II survey, including 12 taxa recorded within the herbaceous vegetation quadrats and woody line intercept transects (Appendix D, Table 47, Table 48). Total average herbaceous cover was 13.0%. The dominant herbaceous plants were scratchgrass and Baltic rush with 3.9% and 2.9% average cover, respectively. Groundcover included soil, litter, water, stone, boulder, and bryophyte with 40.6%, 23.4%, 12.5%, 10.9%, 10.9%, and 1.6% average corner hits, respectively (Table 49). The total average woody line intercept cover was 4.1%. Cliff-rose (*Purshia stansburiana*) and five-stamen tamarisk had average covers of 4.1% and 0.03%, respectively.

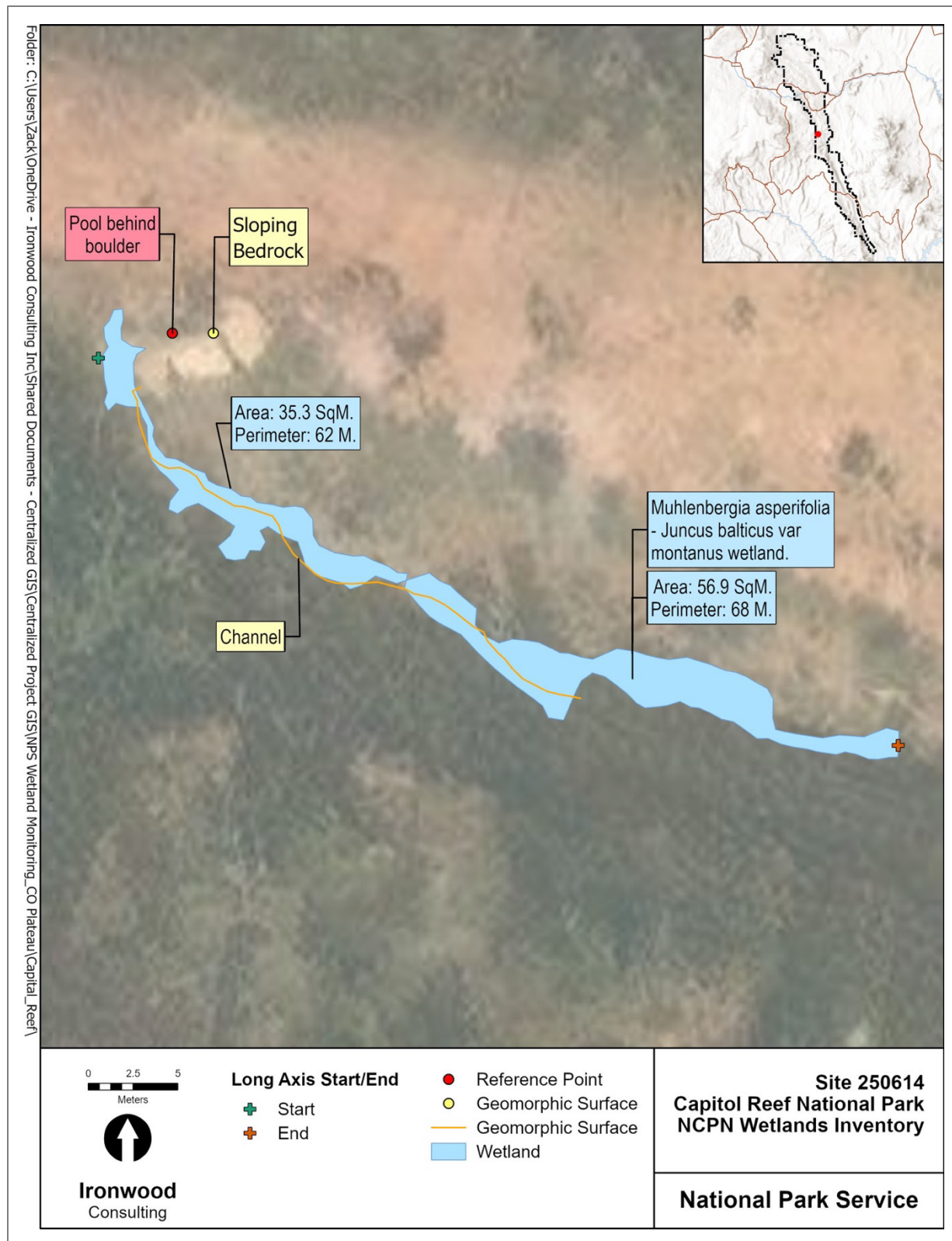


Figure 18. Wetland mapping for Site 250614 (Upper Sheets Gulch).

Table 47. Herbaceous vegetation quadrat data for Site 250614 (Upper Sheets Gulch). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Muhlenbergia asperifolia</i>	scratchgrass	N	FACW	3.9	38
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	N	FACW	2.9	38
<i>Iva acerosa</i>	copperweed	N	FACU	2.1	44
<i>Agrostis stolonifera</i>	redtop	I	FACW	1.8	25
<i>Typha domingensis</i>	southern cattail	N	OBL	0.8	6
<i>Melilotus officinalis</i>	yellow sweet-clover	I	FACU	0.6	38
<i>Cirsium calcareum</i>	Cainville thistle	N	FACU	0.3	6
<i>Symphyotrichum spathulatum</i>	western mountain aster	N	FAC	0.3	19
<i>Castilleja</i> sp.	Indian paintbrush	–	–	0.2	13
<i>Hedysarum occidentale</i>	western sweetvetch	N	UPL	0.1	6
Bryophytes	moss	–	–	–	–
Total	–	–	–	13.0	–
50% of Total	–	–	–	6.5	–
20% of Total	–	–	–	2.6	–

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

Table 48. Woody vegetation line intercept summary data for Site 250614 (Upper Sheets Gulch).

Species	Common name	Native Status ^A	Wetland Code	Average Woody Plant Cover (%)
<i>Purshia stansburiana</i>	cliff-rose	N	UPL	4.1
<i>Tamarix chinensis</i>	five-stamen tamarisk	NOX	FAC	0.03
Total	–	–	–	4.1

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

Table 49. Groundcover quadrat data for Site 250614 (Upper Sheets Gulch).

Groundcover Type	Average Corner Hits (%)
Bryophyte	1.6
Gravel	–
Cobble	–
Stone	10.9
Boulder	10.9

Table 49 (continued). Groundcover quadrat data for Site 250614 (Upper Sheets Gulch).

Groundcover Type	Average Corner Hits (%)
Bedrock	–
Basal	–
Litter	23.4
Water	12.5
Wood	–
Soil	40.6
Total	100.0

The non-native plants cheatgrass, redtop, and yellow sweet-clover were present as well as the noxious weed five-stamen tamarisk.

No recreation impacts or spring developments were observed. Bobcat and cow sign were observed outside of the vegetation quadrats (Appendix C). Unidentified tadpoles were present in the standing water.

Site 250615 (South Coleman Canyon)

Site 250615 (South Coleman Canyon) occurs at an elevation of approximately 1,741 m with an overall northeast (34°) aspect and high slope variability. Flow from a spring source and wetland vegetation provided evidence of groundwater. The spring type was characterized as rheocrene. It included a total wetland area of approximately 0.0004 ac (1.8 m²; Figure 19, Appendix B). Wetland patches were smaller than the minimum mapping unit, so the total wetland area was estimated.

Six plant taxa were encountered during the GDE level II survey, including one taxon recorded within the herbaceous vegetation quadrats (Appendix D, Table 50). Total average herbaceous cover was 0.3%. The dominant herbaceous plant was gray aster with 0.3% average cover. Groundcover included soil, stone, bedrock, water, and wood with 50.0%, 25.0%, 8.3%, 8.3%, and 8.3% average corner hits, respectively (Table 51). There was no woody line intercept cover.

The wetland at this site was immediately adjacent to a rheocrene spring but was too small to map, as it was smaller than the minimum mapping unit (3 m²) for this project. The wetland indicator plant located here was scratchgrass (*Muhlenbergia asperfolia*) and the patch was 1.8 m². We installed a negative transect array here and the layout of the plots failed to include scratchgrass and ultimately recorded a single upland species, gray aster. Another small (2.1 m²) patch of scratchgrass was mapped about 19 meters SSW of this point.

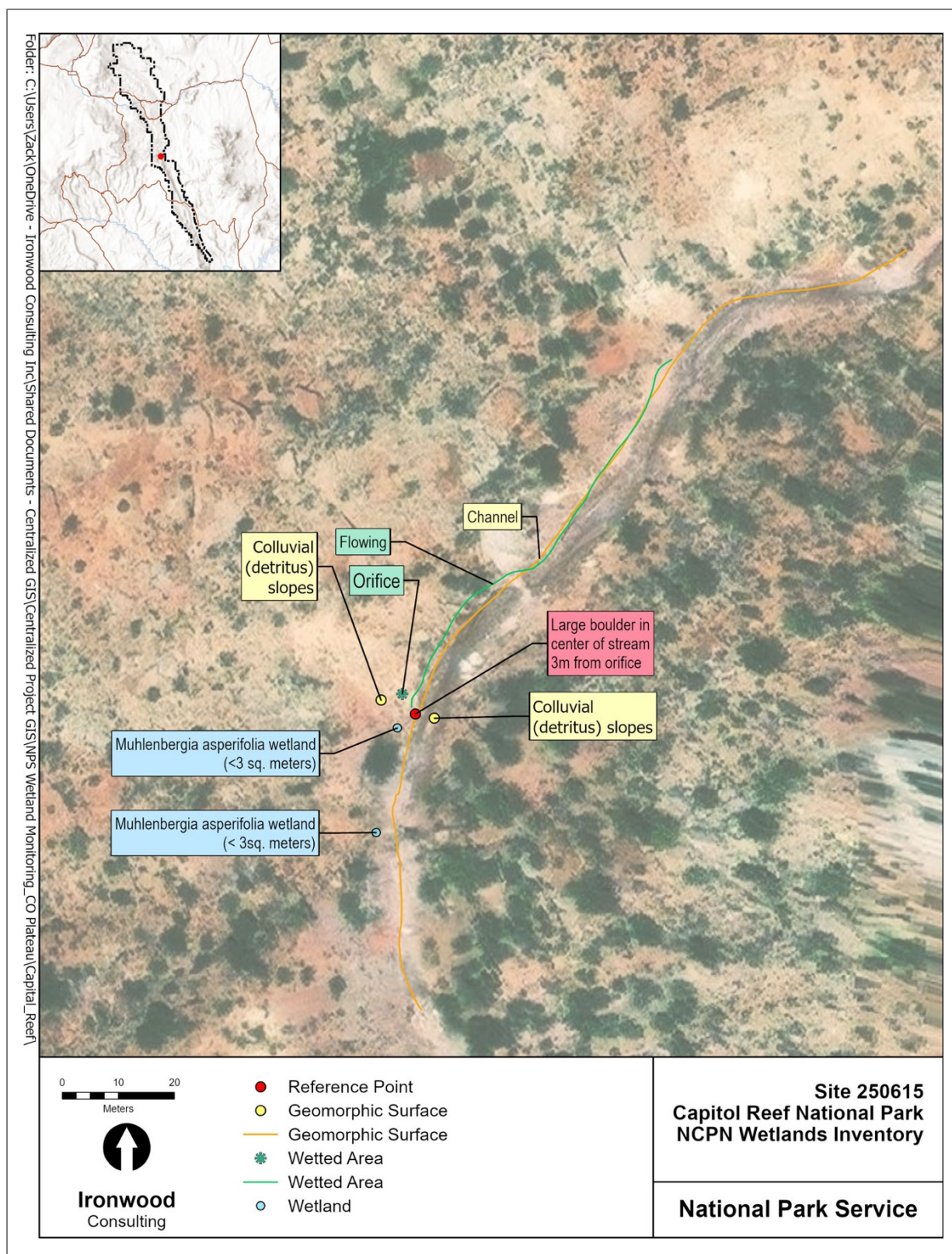


Figure 19. Wetland mapping for Site 250615 (South Coleman Canyon).

Table 50. Herbaceous vegetation quadrat data for Site 250615 (South Coleman Canyon). Bryophytes not included in totals.

Species	Common Name	Native Status ^A	Wetland Code	Average Absolute Cover (%)	Frequency (%)
<i>Eurybia glauca</i>	gray aster	N	UPL	0.3	100
Bryophytes	moss	–	–	–	–
Total	–	–	–	0.3	–
50% of Total	–	–	–	0.15	–
20% of Total	–	–	–	0.06	–

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

Table 51. Groundcover quadrat data for Site 250615 (South Coleman Canyon).

Groundcover Type	Average Corner Hits (%)
Bryophyte	–
Gravel	–
Cobble	–
Stone	25.0
Boulder	–
Bedrock	8.3
Basal	–
Litter	8.3
Water	8.3
Wood	–
Soil	50.0
Total	100.0

The non-native plant cheatgrass and the noxious weed five-stamen tamarisk were present.

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

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Appendix A: GDE Site Summary Table Locality Details (Table 52)

Table 52. GDE Site Summary Table Locality Details.

Site ID	Datum	UTM Zone	Long Axis Start Easting	Long Axis Start Northing	Long Axis End Easting	Long Axis End Northing	Dogleg Easting	Dogleg Northing	Reference Point Easting	Reference Point Northing	Aspect at Reference Point (°)	Elevation at Reference Point (m)	Reference Point/Dogleg Notes	Vegetation Quadrat Cut-level
57	NAD83	12	478686	4255424	478706	4255379	478695	4255393	478695	4255425	170	1806	Sandstone outcrop N side of road near start of transect	<1 percent not recorded
59	NAD83	12	476810	4242595	476837	4242635	—	—	476811	4242594	34	1795	Apparent point where seep emerges	<1 percent not recorded
112097	NAD83	12	474591	4254719	474582	4254744	474582	4254744	474589	4254734	334	1789	Reference point is sandstone mound. Dogleg occurs at 26.7 m along long axis.	<1 percent not recorded
112098	NAD83	12	469033	4258190	469070	4258159	—	—	469032	4258192	135	1999	Spring flow between rocks at boundary between shrub thicket and herbaceous wetland	<1 percent not recorded
226653	NAD83	12	487313	4217585	487315	4217563	—	—	487309	4217573	Missing	1742	Populus fremontii aprox 8m from spring source	<3 percent not recorded
237706	NAD83	12	476882	4253096	Missing	Missing	—	—	476881	4253111	180	1744	Small Boulder near center of wetland	<1 percent not recorded
237708	NAD83	12	Missing	Missing	Missing	Missing	—	—	478930	4255417	206	1802	Center of Salix exigua-dominated GDE mapped as reference point	<1 percent not recorded
237709	NAD83	12	497998	4196449	497975	4196404	—	—	497998	4196449	210	1596	Long Axis Start	<1 percent not recorded
237712	NAD83	12	N/A	N/A	N/A	N/A	—	—	475800	4243160	154	Missing	UTM coordinates at S end of low gradient cienega	All vegetation recorded
237713	NAD83	12	481121	4248037	481132	4248071	—	—	481146	4248084	30	1638	Overhanging cliff over alcove approximately 25m north of wetland area	<1 percent not recorded
237756	NAD83	12	484640	4243476	484683	4243448	—	—	484641	4243477	126	1579	Mouth of small wash entering Deep Creek at start of transect	<1 percent not recorded
250592	NAD83	12	Missing	Missing	Missing	Missing	—	—	480133	4240002	98	1647	Spring orifice is reference point	<1 percent not recorded
250596	NAD83	12	491649	4197830	491644	4197844	—	—	491650	4197844	343	2010	Medium sized juniper on the east side that overhangs pond when at high water level.	<1 percent not recorded
250604	NAD83	12	481175	4248982	481188	4249006	—	—	481152	4248941	29	1664	Vegetated island in the middle of igneous boulder field in channel. Dominated by distichlis, tamarix, and Sporobolus airoides	<1 percent not recorded
250606	NAD83	12	480321	4239431	480310	4239413	—	—	480321	4239431	169	1630	Long axis start - recorded at 0.75m accuracy. GPS accuracy declines in GDE under alcove cliffs	<1 percent not recorded
250608	NAD83	12	480950	4239309	480998	4239322	—	—	480950	4239309	80	1645	Beginning of transect	<1 percent not recorded
250614	NAD83	12	484740	4217743	484785	4217721	—	—	484744	4217744	112	1830	Orifice	<1 percent not recorded
250615	NAD83	12	N/A	N/A	N/A	N/A	—	—	487835	4211313	34	1741	Boulder in center of channel 3m from spring orifice	<1 percent not recorded

Appendix B: GDE Site Summary Table Wetland Feature (Table 53)

Table 53. 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	Length of Mapped Channel (m)	Mapped Channel Type (if observed)	Wetland/Channel Description	Total Wetted Area (ac)	Total Wetted Length (m)
57	GDE	Helocrene	–	0.26	1,072.0	778.2	–	1	146.9	Mixed discharge	Flowing channel present downstream but not near origin/orifice. Road replaces channel at origin/orifice.	–	146.9
59	GDE	Rheocrene	–	0.04	154.9	112.1	1	–	–	–	–	–	–
112097	GDE	Rheocrene	–	0.13	514.8	239.3	–	–	–	–	Runoff dominated channel present outside and adjacent to GDE	–	–
112098	GDE	Rheocrene	–	0.07	267.3	115.9	1+	1	5.0	Spring discharge dominated	Flowing channel emerges intermittently within wetland. Spring from fine sandy stratum in drainage above mapped polygon, within phragmites stand.	–	5.0
226653	GDE	Hanging garden or wet wall	Hypocrene	0.06	253.2	193.3	1	1	17.9	Spring discharge dominated	Channel starts below spring fed pond at spring source, continues approx 12 m down gradient; dry at time of visit.	10.5	–
237706	GDE	Rheocrene	Helocrene	0.02	86.9	58.0	8	–	–	–	Spring is discrete from channel, which appears to convey primarily runoff at site. Up gradient groundwater sources present approx 1km NW along Polk Creek.	–	–
237708	GDE	Hypocrene	–	0.02	64.4	51.9	–	2	74.9	Runoff dominated	Dry channel extends from edge of GDE southeast toward main drainage. Evidence that the main channel was diverted with a dike that is beached near GDE boundary	–	–
237709	GDE	Rheocrene	–	0.05	206.8	128.3	–	2	75.4	Runoff dominated	Flowing channel > 150 m; valley alluvium and water table form the flowing runoff channel.	–	75.4
237712	GDE	Hanging garden or wet wall	–	0.04	169.0	–	1	–	–	–	Horizontal emergence from base of Wingate Formation, running down hillslope 49m (slope distance) to deep sand where wetted soil ends. This flow is not confined to a channel.	–	–
237713	GDE	Hypocrene	Rheocrene	0.06	254.9	226.0	1	2	83.5	Runoff dominated	Dry channel with salt crust though site	–	–
237756	GDE	Hypocrene	–	0.18	745.5	437.9	–	–	–	–	Large wash (Deep Creek) but seep not causing channelization	–	–
250592	GDE	Rheocrene	–	0.0005	1.9	7.2	1	–	–	–	Main channel of Spring Canyon. Dry above spring orifice. Trickling water from spring extends and pools several hundred meters down gradient	–	–

Table 53 (continued). 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	Length of Mapped Channel (m)	Mapped Channel Type (if observed)	Wetland/Channel Description	Total Wetted Area (ac)	Total Wetted Length (m)
250596	GDE	Hypocrene	Non-GDE	0.08	334.3	314.2	–	2	148.0	Runoff dominated	Channels (dry) run north and south from dammed impoundment	–	–
250604	GDE	Rheocrene	–	0.03	116.5	135.9	2	1	120.3	Mixed discharge	Wetted channel down gradient of seep conveys intermittent flow from runoff and precipitation events.	–	120.3
250606	GDE	Rheocrene	–	0.07	295.2	89.2	1	–	–	–	–	–	–
250608	GDE	Hypocrene	–	0.16	637.5	420.1	–	–	–	–	–	–	–
250614	GDE	Rheocrene	Hypocrene	0.02	92.3	129.9	1	1	33.4	Mixed discharge	Low to medium gradient with boulders and small pools, and salt crust.	–	–
250615	GDE	Rheocrene	–	0.004	1.8	–	1	2	261.7	Runoff dominated	Small spring is not causing 4m wide channel. Current flow width approximately 20 cm. Wetland patches were smaller than the minimum mapping unit, so the total wetland area was estimated.	–	80.3

Appendix C: GDE Site Wildlife Summary Table (Table 54, Table 55)

Table 54. Percent frequency of scat or tracks found inside vegetation quadrats.

Animal Category	Animal Type	57	59	112097	112098	226653	237706	237708	237709	237712	237713	237756	250592	250596	250604	250606	250608	250614	250615	Total Sites Observed
Wildlife	Bighorn Sheep	25	–	–	–	–	–	–	–	–	–	–	100	–	–	–	–	–	–	2
Wildlife	Deer	–	–	–	–	–	–	–	–	–	–	–	–	20	–	–	–	–	–	1
Wildlife	Elk	–	–	–	–	–	–	–	–	–	–	–	–	50	–	–	–	–	–	1
Wildlife	Rabbit	–	–	–	–	–	–	–	–	–	–	–	–	20	–	–	–	–	–	1
Livestock	Cow	–	–	–	–	–	–	–	–	–	–	–	–	10	–	–	–	–	–	1

Table 55. Animal sign (scat or tracks) observed outside vegetation transects..

Animal Category	Animal Type	57 ^A	59 ^A	112097 ^A	112098 ^A	226653 ^A	237706 ^A	237708 ^A	237709 ^A	237712 ^A	237713 ^A	237756 ^A	250592 ^A	250596 ^A	250604 ^A	250606 ^A	250608 ^A	250614 ^A	250615 ^A	Total Sites Observed
Wildlife	Badger	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Wildlife	Bighorn Sheep	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	X	2
Wildlife	Bobcat	–	–	–	–	X	X	–	–	–	–	X	–	–	X	–	–	X	–	5
Wildlife	Deer	X	–	X	X	–	X	X	–	–	–	–	X	–	–	–	–	–	–	6
Wildlife	Elk	–	–	–	–	–	–	–	–	–	X	–	–	X	–	–	–	–	–	2
Wildlife	Spadefoot Toad	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	1
Wildlife	Tadpoles (Unidentified)	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	X	–	2
Livestock	Cow	X	–	X	–	–	X	X	X	–	–	–	–	–	X	–	–	X	–	7

^A An “X” indicates a presence.

Appendix D: GDE Site Vascular Plant Inventory List (Table 56)

Table 56. GDE Site Vascular Plant Inventory List.

Species	Common Name	Wetland Code ^A	Native Status ^B	57 ^C	59 ^C	112097 ^C	112098 ^C	226653 ^C	237706 ^C	237708 ^C	237709 ^C	237712 ^C	237713 ^C	237756 ^C	250592 ^C	250596 ^C	250604 ^C	250606 ^C	250608 ^C	250614 ^C	250615 ^C
<i>Acer negundo</i>	boxelder	FACW	N	–	–	–	–	X	–	–	–	–	–	–	X	–	–	–	–	–	–
<i>Achnatherum hymenoides</i>	Indian ricegrass	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Achnatherum speciosum</i>	desert needlegrass	UPL	N	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–
<i>Agrostis exarata</i>	spike bentgrass	FACW	N	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Agrostis stolonifera</i>	redtop	FACW	I	–	–	–	X	–	–	–	X	–	–	–	X	–	–	X	X	X	–
<i>Apocynum cannabinum</i>	Indianhemp	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Artemisia ludoviciana</i>	Louisiana wormwood	FACU	N	–	–	–	–	X	–	–	–	X	–	–	X	–	–	X	–	–	–
<i>Artemisia</i> sp.	sagebrush	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Asclepias speciosa</i>	showy milkweed	FAC	N	–	X	–	X	–	–	–	–	–	–	–	X	–	–	–	X	–	–
<i>Aster</i> sp.	aster	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–
<i>Baccharis salicina</i>	Rio Grande seepwillow	FACW	N	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
<i>Baccharis</i> sp.	baccharis	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	X	–	–	–
<i>Bassia hyssopifolia</i>	five-horn smotherweed	FACU	I	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Berberis fremontii</i>	Fremont's mahonia	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Betula occidentalis</i>	water birch	FACW	N	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Bromus tectorum</i>	cheatgrass	UPL	I	X	–	–	–	–	–	X	X	X	–	–	X	X	–	X	–	–	X
<i>Carex aurea</i>	golden sedge	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Castilleja minor</i>	lesser Indian paintbrush	OBL	N	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–
<i>Castilleja</i> sp.	Indian paintbrush	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Cirsium</i> sp.	thistle	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Cirsium calcareum</i>	Cainville thistle	FACU	N	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
<i>Cirsium vulgare</i>	bull thistle	FACU	I	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–
<i>Clematis ligusticifolia</i>	white virgin's-bower	FAC	N	–	–	–	–	X	–	–	–	X	–	–	X	–	–	X	X	–	–
<i>Conyza canadensis</i>	Canadian horseweed	FACU	N	–	–	–	–	–	–	–	–	–	–	–	X	–	–	X	–	–	–
<i>Distichlis spicata</i>	desert saltgrass	FAC	N	X	X	X	–	–	X	–	–	–	X	X	–	–	X	–	–	–	–
<i>Elaeagnus angustifolia</i>	Russian-olive	FAC	NOX	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Eleocharis palustris</i>	common spikerush	OBL	N	–	–	–	X	–	–	–	–	–	–	–	–	X	–	–	–	–	–
<i>Elymus elymoides</i>	squirreltail	FACU	N	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–

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^C An “X” indicates a presence

Table 56 (continued). GDE Site Vascular Plant Inventory List.

Species	Common Name	Wetland Code ^A	Native Status ^B	57 ^C	59 ^C	112097 ^C	112098 ^C	226653 ^C	237706 ^C	237708 ^C	237709 ^C	237712 ^C	237713 ^C	237756 ^C	250592 ^C	250596 ^C	250604 ^C	250606 ^C	250608 ^C	250614 ^C	250615 ^C
<i>Elymus trachycaulus</i>	slender wheatgrass	FACU	N	–	–	–	–	X	–	–	–	–	–	–	X	–	–	X	X	–	X
<i>Epipactis giganteus</i>	hellborine	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Equisetum arvense</i>	field horsetail	FAC	N	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Equisetum laevigatum</i>	smooth scouring-rush	FACW	N	–	X	–	X	–	–	–	X	X	–	–	X	–	–	–	X	–	–
<i>Ericameria linearifolia</i>	Mohave goldenbush	UPL	N	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–
<i>Ericameria nauseosa</i>	rubber rabbitbrush	UPL	N	–	X	–	–	X	–	X	–	–	–	X	–	–	–	–	X	–	X
<i>Eurybia glauca</i>	blueleaf aster	UPL	N	–	–	–	X	X	–	–	–	–	–	–	–	–	–	–	X	–	X
<i>Fraxinus anomala</i>	singleleaf ash	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Gutierrezia microcephala</i>	thread snakeweed	UPL	N	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–
<i>Gutierrezia sarothrae</i>	broom snakeweed	UPL	N	–	X	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–
<i>Habenaria sparsiflora</i>	sparse-flowered bog orchid	FACW	N	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Halogeton glomeratus</i>	saltlover	UPL	I	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–
<i>Hordeum jubatum</i>	foxtail barley	FAC	N	X	–	–	–	–	–	X	–	–	–	–	–	X	–	–	–	–	–
<i>Iva acerosa</i>	copperweed	FACU	N	X		X	X	–	X	X	X	–	X	X	–	–	X	–	–	X	–
<i>Iva axillaris</i>	poverty-weed	FACW	N	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–
<i>Juncus balticus</i> var. <i>montanus</i>	Baltic rush	FACW	N	–	X	–	X	X	–	X	X	–	X	–	X	–	–	X	X	X	–
<i>Juncus ensifolius</i>	swordleaf rush	FACW	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–
<i>Juncus</i> sp.	rush	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Juncus tenuis</i>	poverty rush	FACW	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–
<i>Maianthemum</i> sp.	mayflower	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Maianthemum stellatum</i>	starry false Solomon's-seal	FACU	N	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Melilotus officinalis</i>	yellow sweet-clover	FACU	I	–	–	–	–	–	–	–	X	–	–	–	–	X	–	–	–	X	–
<i>Muhlenbergia asperifolia</i>	scratchgrass	FACW	N	–	–	–	–	–	–	X	–	–	X	X	–	–	–	X	X	X	X
<i>Oenothera biennis</i>	biennial evening-primrose	FACU	N	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–
<i>Phragmites australis</i>	common reed	FACW	UNK	X	X	X	X	X	X	–	–	X	X	–	X	–	X	–	–	–	–
<i>Pinus edulis</i>	twoneedle pinyon	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
<i>Plantago patagonica</i>	woolly plantain	UPL	N	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
<i>Populus fremontii</i>	Fremont cottonwood	FAC	N	–	X	–	–	X	–	–	X	–	–	–	X	–	–	X	–	X	–

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Table 56 (continued). GDE Site Vascular Plant Inventory List.

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<i>Psoraleidium lanceolatum</i>	lemon scurfpea	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Purshia stansburiana</i>	cliff-rose	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–
<i>Rhus trilobata</i>	skunkbush sumac	FACU	N	–	–	–	X	X	–	–	X	–	–	–	–	–	–	–	–	–	–
<i>Rosa woodsii</i>	Woods' rose	FACU	N	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Salix eriocephala</i>	strapleaf willow	FACW	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–
<i>Salix exigua</i>	coyote willow	FACW	N	X	–	–	X	–	–	X	X	–	–	–	X	–	–	X	–	–	–
<i>Salix lutea</i>	yellow willow	OBL	N	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–
<i>Salix</i> sp.	willow	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–
<i>Sarcobatus vermiculatus</i>	greasewood	FACU	N	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–
<i>Schoenoplectus pungens</i>	common threesquare	OBL	N	X	X	X	X	–	X	X	X	–	X	X	X	–	X	–	X	X	–
<i>Scirpus</i> sp.	bulrush	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Sporobolus airoides</i>	alkali sacaton	FAC	N	X	–	X	X	–	–	X	–	–	X	X	–	–	–	–	–	–	–
<i>Stanleya pinnata</i>	prince's-plume	UPL	N	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Symphyotrichum spathulatum</i>	western mountain aster	FAC	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–
<i>Symphyotrichum welshii</i>	Welsh's aster	UNK	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–
<i>Tamarix chinensis</i>	five-stamen tamarisk	FAC	NOX	X		X	–	–	X	X	X	X	X	X	X	–	X	X	–	X	X
<i>Taraxacum officinale</i>	common dandelion	FACU	I	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
<i>Triglochin maritima</i>	seaside arrowgrass	OBL	N	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Typha angustifolia</i>	narrow-leaf cattail	OBL	I, N	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–
<i>Typha domingensis</i>	southern cattail	OBL	N			X	–	–	–	–	X	–	–	–	–	–	–	–	–	X	–
<i>Typha</i> sp.	cattail	OBL	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	X	–	–	–
<i>unknown forb</i>	unknown forb	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	X	X	–	–
<i>unknown perennial forb</i>	unknown perennial forb	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>unknown shrub</i>	unknown shrub	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–
<i>Verbena bracteata</i>	prostrate vervain	FAC	N	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–
<i>Veronica americana</i>	American brooklime	OBL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–
<i>Veronica anagallis-aquatica</i>	water speedwell	OBL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–
<i>Vulpia myuros</i>	foxtail fescue	FACU	I	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–

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<i>Vulpia octoflora</i>	six-weeks fescue	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–
<i>Xanthium strumarium</i>	rough cocklebur	FAC	N	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–

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^B I - Introduced, N - Native, UNK – Unknown, NOX - Noxious (USDA and NRCS 2023; UDAF 2022).

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