

Spring Wetland Flora Inventory at Seven Intermountain Parks in Utah and Colorado: Work Plan

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Table of Contents

1. INTRODUCTION.....	1
1.1 Project Background.....	1
1.2 Project Objective, Goals, and Parameters	1
1.3 Project Locations.....	2
2. PROJECT STAFF AND SCHEDULE	3
2.1 Project Staff, Roles, and Responsibilities	3
2.2 Project Schedule	4
3. METHODOLOGICAL APPROACH	6
3.1 Methodology Selection.....	6
3.2 Goal 1: Documenting Wetland Species.....	6
3.2.1 Groundwater Dependent Ecosystem (GDE) Level II Methodology.....	13
3.2.2 National Riparian Core Protocol (NRCP)	14
3.2.3 NCPN Hanging Garden SOP	15
3.3 Goal 2: Mapping Springs and Wetlands.....	15
3.3.1 Non-wetland Negative Data and Reporting	16
3.3.2 GPS Settings and Accuracy	16
3.4 Goal 3: Representative Photos	16
3.5 Other Park Specific Metrics	17
3.5.1 Wildlife and Livestock Usage Metric (BLCA, CARE, CEBR, CURE, BRCA, DINO).....	17
3.5.2 Recreation Impacts Metric (All Parks).....	17
3.5.3 Spring Development Metric (All Parks).....	17
3.5.4 BRCA and CEBR Metrics.....	17
3.5.5 CURE and BLCA Specific Methods	18
3.5.6 DINO Specific Metrics.....	19
3.5.7 COLM Specific Methods	19
4. FIELD DATA COLLECTION	ERROR! BOOKMARK NOT DEFINED.

4.1 Pre-Survey Geospatial Analysis and Preparation.....	20
4.2 Pre-field Preparation.....	20
4.3 Wetland Boundary Mapping.....	21
4.4 Wetland Evaluation Protocol Selection	22
5. DATA MANAGEMENT	24
5.1 Spatial Data	24
5.2 Paper Datasheets.....	24
5.3 Tabular Data.....	24
5.4 Photos	25
5.5 Quality Assurance/Quality Control (QA/QC)	25
6. DATA ANALYSIS AND REPORTING	26
6.1 Draft and Final Report.....	26
6.2 Data Deliverable.....	26
 APPENDIX A – MAPS AND PRIORITY SURVEY SITES AT EACH PARK OR MONUMENT.....	 1
APPENDIX B – NCPN TARGET SPECIES LIST	1
APPENDIX C – ANIMAL SIGN METHODOLOGY	1
APPENDIX D – FIELD GEAR LIST FOR COMPLETING NCPN SEEPS AND SPRINGS MAPPING	1

List of Tables

Table 1. NPS and Ironwood Staff Project Roles and Responsibilities.....	3
Table 2. Project Schedule	4
Table 3. Project Objective (row 1), Goals (rows 2, 3, and 4), and Parameters; and Corresponding Project Methodological Approaches	7
Table 4. GPS Settings and Accuracy Parameters	16
Table 5. Ranking system for Metric V1: Native Plant Species Cover (Relative)	18
Table 6. Ranking system for Metric V2: Invasive Nonnative Species Cover (Absolute)	18
Table 7. Three protocols to be used based on the determination using the GDP Level II Protocol.	23

List of Figures

Figure 1. Project Field Schedule, where * assumes average of maximum and minimum survey duration time to complete surveys based on Survey Duration Estimate and **assumes duration from start to finish; if maximum survey time is required, survey duration would be 21 weeks, accounting for overlapping survey periods.....	5
Figure 2. Criteria for Determining Quadrat Number and Interval using GRE Level II (from Brown et al. 2007).....	14
Figure 3. Transect layout along a riparian segment with points for vegetation sampling (from Manning et al. 2017).....	15
Figure 4. Cottonwood Seedling shows small but discernably cottonwood-shaped leaves and lack evidence of sprouting.....	19
Figure 5. Decision Tree for Identifying Groundwater -Dependent Wetlands, adapted from Brown et al. 2007...	22

List of Acronyms and Abbreviations

BLCA	Black Canyon of the Gunnison National Park
BRCA	Bryce Canyon National Park
CARE	Capitol Reef National Park
CEBR	Cedar Breaks National Monument
COLM	Colorado National Monument
CURE	Curecanti National Recreation Area
DINO	Dinosaur National Monument
DOI	Department of Interior
ESRI	Environmental Systems Research Institute, Inc.
ft	foot / feet
FACW	Facultative Wetland Plant
GDE	Groundwater Dependent Ecosystem
GIS	Geographic Information Systems
GPS	Geographic Positioning System
IIPP	Injury and Illness Prevention Plan
m	meter
NCPN	Northern Colorado Plateau Network
NPS	National Park Service
NRCP	National Riparian Core Protocol
NRM	Natural Resource Manager
NWI	National Wetland Inventory

OBL	Obligate Plant
QA/QC	Quality Assurance/Quality Control
SOP	Standard Operating Procedure
SOW	Statement of Work
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UTM	Universal Traverse Mercator

1. INTRODUCTION

1.1 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 park plants and wildlife, and they may be vulnerable to developments outside of park boundaries and to climate change. Some of these resources also have or could have special protections through water rights agreements with states. Measuring the hydrology of these water sources can be difficult because they often have diffuse to low flow.

Seven National Park Service (NPS) units (or parks) within the Northern Colorado Plateau Network (NCPN) have 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 in the targeted spatial frame for each park will provide a baseline measure of areas sensitive to drying that can be used to monitor change.

This work plan outlines the general project schedule and methods used to establish a baseline that will provide supporting evidence for any future claims of impairment to springs and wetlands within these NPS units. The NPS has contracted Ironwood Consulting (Ironwood), a woman-owned small business, to complete the baseline mapping and evaluation of seeps, springs, and wetlands described in this work plan.

1.2 Project Objective, Goals, and Parameters

The overall objective of the project is to establish a baseline for the area and condition of wetlands, seeps, and springs by which to provide supporting evidence for any future claims of impairment resulting from ground water management actions. While impairment is determined by the states' engineers, establishing a baseline by which decreases in OBL and FACW species can be measured will help the NPS and its co-managers to document impairment. This approach has been developed as an indicator of impairment in coordination with the NPS Water Resources Division.

The project's goals are to:

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

Project parameters that define the scope of the work and specify criteria for data collection and deliverables include:

1. Conduct standardized fixed-area surveys for target species using standard sampling techniques that will sufficiently detect target species and measure percent cover.
2. Sampling will be conducted in a way to ensure that all prioritized sites are sampled.

3. The placement of plots must include spatial replication sufficient to discern presence of all targeted wetland species and determine the perimeter of wetlands as defined by 50 percent cover of target species.
4. When conditions allow, map the perimeter of the area with greater than 50 percent perennial wetland (OBL and FACW) herbaceous and shrub plant cover with sub-meter accuracy. Some areas in canyons may not have sufficient sky view to receive a satellite signal for sub-meter.
5. Cover of wetland trees such as cottonwoods without underlying wetland herbs and shrubs should be excluded from the perimeter.
6. In spring systems that feed an extensive stream-type riparian area, the area for the purposes of this inventory may be capped at 50 meters (m) downstream from the spring orifice.
7. Observation data will be summarized by site: wetland area, perimeter length, and wetland species diversity metrics will be reported. This analysis will be described in detail sufficient for peer review and repetition by independent statisticians.
8. Specimens are not to be collected, unless necessary to verify plant species identification. Specimens, if collected, are assumed to be destroyed during analysis.
9. Ancillary data at each site related to specific park needs (to be determined prior to commencing field work). Each park may request additional simple metrics to be collected at a site that do not require additional expertise and are not to exceed 20 minutes of work. The NCPN has identified three preliminary data categories to be include in the data collection: (a) presence of animal use at sites; (b) impacts from recreation; and (c) presence of spring development structures.

1.3 Project Locations

Mapping will take 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).

Maps of each unit, showing the general location of the seeps, springs, and wetlands to be inventoried, are in Appendix A.

2. PROJECT STAFF AND SCHEDULE

2.1 Project Staff, Roles, and Responsibilities

Table 1 outlines the NPS, NCPN and Ironwood key staff that will be managing, coordinating, and carrying out the work described in this workplan. Ironwood staff may include additional qualified individuals and will submit resumes and/or qualifications to the NCPN upon request. All Ironwood staff will at minimum have a degree in natural sciences, and at least three years of direct experience with wetlands or botany. Junior staff will work under the direct supervision of highly qualified staff.

Table 1. NPS and Ironwood Staff Project Roles and Responsibilities

Org	Last Name	Project Role	Contact	Project Responsibilities
NPS	Tom Philippi	Project Lead	Tom_philippi@nps.gov	Project management
NPS	Tracy Ziegler	Project Co-Lead	Tracy_Ziegler@nps.gov	Project management
NPS	Rebecca Weissinger	Project Coordinator	Rebecca_Weissinger@nps.gov	POC for parks; project logistics and coordination
NPS	Joe DeVivo	Project Co-Lead	Joe_DeVivo@nps.gov	Project contract management
Park	Nicole Gibney	BLCA/CURE	Nicole_gibney@nps.gov	Park logistics, access, and park-specific data requirements
Park	Eric Vasquez	BRCA	Eric_vasquez@nps.gov	Park logistics, access, and park-specific data requirements
Park	Carolyn Livensperger	CARE	Carolyn_livensperger@nps.gov	Park logistics, access, and park-specific data requirements
Park	Jim Roach	CARE	Jim_roach@nps.gov	Park logistics, access, and park-specific data requirements
Park	Robyn Henderek	CEBR	Robyn_henderek@nps.gov	Park logistics, access, and park-specific data requirements
Park	Bryan Larsen	CEBR	Bryan_larsen@nps.gov	Park logistics, access, and park-specific data requirements
Park	Eric Shaver	COLM	Robert_Shaver@Nps.gov	Park logistics, access, and park-specific data requirements
Park	Emily Spencer	DINO	Emily_spencer@nps.gov	Park logistics, access, and park-specific data requirements
Ironwood	Emily Thorn	Principal/Project Manager	emily@ironwoodbio.com 505-228-2698	Project management and coordination, QA/QC, wetland expertise

Ironwood	Dave Kesonie	Assistant PM/Botanist	dave@ironwoodbio.com	Project coordination, survey lead, botany and wetland expertise
Ironwood	Wendy McBride	Field Lead/Botanist	wmcbride@ironwoodbio.com	Project coordination, survey lead, botany and wetland expertise
Ironwood	Karin Edwards	Botanist	kedwards@ironwoodbio.com	Wetland and botany expertise
Ironwood	Bob Sivinski	Botanist	rsivinski@ironwoodbio.com	Wetland and botany expertise
Ironwood	Samantha Nielsen	Staff Botanist/GIS Support	snielsen@ironwoodbio.com	Project support (coordination, GIS, reporting), wetland technician
Ironwood	Steve Ishii	Data Management Specialist	tech@ironwoodbio.com	Data management and QA/QC, ESRI Collector management, data backup

2.2 Project Schedule

Table 2 outlines the general project schedule, including project planning and coordination.

Table 2. Project Schedule

Deliverable or Milestone	Begin Date	End Date
Project Kick-off	–	January 7, 2021
Draft Work Plan	February 16, 2021	April 16, 2021
Final Work Plan	April 12, 2021	May 1, 2021
Pre-Field Coordination	May 1, 2021	May 30, 2021
Field Surveys	June 1, 2021	September 30, 2021
Data Deliverable	October 1, 2021	November 1, 2021
Final Report Deliverable	October 1, 2021	November 15, 2021

Figure 1 outlines the project field schedule, including maximum estimated times for mapping at each of the seven parks during the seasonally appropriate survey window. As part of the project planning and coordination for each park, Ironwood and the NCPN will confirm the fieldwork survey window is appropriate and may adjust if necessary.

*Figure 1. Project Field Schedule, where * assumes average of maximum and minimum survey duration time to complete surveys based on Survey Duration Estimate and **assumes duration from start to finish; if maximum survey time is required, survey duration would be 21 weeks, accounting for overlapping survey periods*

Unit	Person Days*	Survey Window**	June					July				August					September							
			1	6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	19	26				
CARE	35	Jun - Aug																						
COLM	25	15 Jun - 15 Sept																						
BLCA	15	Jun - Jul																						
CURE	35	Jun - Jul																						
BRCA	15	Jul - Aug																						
CEBR	10	15 Jul - 31 Aug																						
DINO	50	Jun - Sept																						
Total Duration	180	1 <u>Jun</u> - 30 Sept																						

3. METHODOLOGICAL APPROACH

3.1 Methodology Selection

In order to meet the objectives and goals of the project, a combination of methodologies will be applied depending on the circumstances present within each park and at each site. Table 3 outlines how each of these methodologies contributes to meeting the project's objective and outlines the goals and parameters that each methodology addresses.

Because evaluating spring and wetland condition is to be based on the presence/absence of herbaceous and shrub perennial OBL and FACW plant species, only the vegetation sections of these methodologies apply to the project. Hydrology, soils, and other factors will not be used to determine wetland presence, evaluate condition, or map wetland boundaries.

3.2 Goal 1: Documenting Wetland Species

Based on the project scope of work, most of the areas to be evaluated for wetland species cover will be seeps and springs and associated groundwater-dependent wetlands. However, it is likely that larger, low-energy floodplain wetland complexes associated with surface water bodies such as rivers and lakes, and/or precipitation-dependent riparian wetland complexes will also be encountered. Some sites may fit or possess characteristics of hanging gardens and will require a compatible methodology. For these reasons, three separate methodologies are proposed to meet this goal:

- U.S. Department of Agriculture (USDA) Groundwater Dependent Ecosystem (GDE) Level II Methodology¹
- USDA National Riparian Core Protocol²
- NPS Springs Monitoring Protocol for Park Units in the Northern Colorado Plateau Network SOP 7 (Hanging Gardens)³

Each of these methodologies is included in the corresponding appendix and annotated so that the parts not applicable to the project are crossed out using a red strike-through.

¹ Available at https://www.fs.fed.us/geology/GDE_Level_II_FG_final_March2012_rev1_s.pdf.

² Available at https://www.fs.fed.us/rm/pubs_series/rmrs/gtr/rmrs_gtr367.pdf.

³ Available at <https://irma.nps.gov/DataStore/DownloadFile/606922>.

Table 3. Project Objective (row 1), Goals (rows 2, 3, and 4), and Parameters; and Corresponding Project Methodological Approaches

Criteria	Wetland Perimeter Mapping	GDE Level II Protocol	USDA Core Riparian Protocol	NCPN Springs and Seeps SOP for Hanging Gardens
Establishes a baseline by which to provide supporting evidence for any future claims of impairment.	Reliable and accurate mapping of boundary will provide baseline for future monitoring.	The objectives of the protocol include assessing and disclosing environmental effects.	Similar in objectives to the GDE Level II, with sampling design specific to riparian corridors and long features with multiple bends associated in part with surface water bodies.	Characterized three-dimensional seep wetlands in their entirety.
1. Document the presence/ absence of wetland vascular plant species (obligate and facultative wetland) within seven Northern Colorado Plateau Network parks.	Data points estimating cover of OBL/FACW species and FAC/FACU/UPL species will be collected with sub-meter accuracy to characterize wetland boundaries.	Vegetation assessment is thorough and includes species identification and cover determination for each.	Vegetation assessment is thorough and includes species identification and cover determination for each.	Vegetation assessment is thorough and includes species identification and cover determination for each.
2. Map spring and wetland areas defined as those with more than 50 percent perennial wetland herbaceous and shrub plant cover.	Wetland boundaries mapped using 50 percent OBL and FACW species cover as criteria, per USACE dominance test.	N/A	N/A	N/A
3. Take representative photos of the spring/wetland area. When provided by the parks, these may include rematches of historic photos.	N/A	Representative photos and wetland diagrams outlined in protocol.	Representative photos and wetland diagrams as outlined in GDE protocol.	Representative photos and wetland diagrams outlined in protocol.

Criteria	Wetland Perimeter Mapping	GDE Level II Protocol	USDA Core Riparian Protocol	NCPN Springs and Seeps SOP for Hanging Gardens
1. Conduct standardized fixed-area surveys for target species using standard sampling techniques that will sufficiently detect target species and measure percent cover.	N/A	Yes, determined by area of wetland.	Yes, determined by area of wetland; applicable to long, bending surface water and precipitation-dependent wetlands.	Areas are likely to be small and inventoried completely.
2. Sampling will be conducted in a way to ensure that all sites are sampled.	Yes	Yes	Yes	Yes
3. The placement of plots must include spatial replication sufficient to discern presence of all targeted wetland species and determine the perimeter of wetlands as defined by 50 percent cover of target species.	The perimeter of the wetland will be mapped using the 50 percent OBL+FACW criteria. The boundary may be adjusted based on plot data during the delineation.	Plot placement and replication will follow the determined criteria in the protocol based on the area and the long axis of the wetland.	Plot placement and replication will follow the determined criteria in the protocol based on the area and the long axis of the wetland.	Areas are likely to be small and inventoried completely.

Criteria	Wetland Perimeter Mapping	GDE Level II Protocol	USDA Core Riparian Protocol	NCPN Springs and Seeps SOP for Hanging Gardens
4. When conditions allow, create a survey-grade (sub-foot accuracy) perimeter of the area with greater than 50 percent perennial wetland herbaceous and shrub plant cover. Some areas in canyons may not have sufficient skyview to receive a satellite signal.	TBD – sub-meter or sub-foot.	Plot location and transect location will be determined based on sub-meter mapping of wetland.	Plot location and transect location will be determined based on sub-meter mapping of wetland.	Possible issues with satellite reception and mapping.
5. Cover of wetland trees such as cottonwoods without underlying wetland herbs and shrubs should be excluded from the perimeter.	Wetland mapping will be based on perennial herbaceous, shrub, and tree cover, but will exclude areas with tree cover without underlying wetland herbs and shrubs.	Wetland sampling will include perennial herbaceous, shrub and tree cover. When requested for selected sites (e.g., CURE, DINO), sampling may include cover of cottonwoods and/or understory vegetation regardless of wetland status.	Wetland sampling will include perennial herbaceous, shrub and tree cover. When requested, for selected sites (e.g., CURE, DINO), sampling may include cover of cottonwoods and/or understory vegetation regardless of wetland status.	Wetland sampling will include perennial herbaceous cover

Criteria	Wetland Perimeter Mapping	GDE Level II Protocol	USDA Core Riparian Protocol	NCPN Springs and Seeps SOP for Hanging Gardens
6. In spring systems that feed an extensive stream-type riparian area, the area for the purposes of this inventory may be capped at 50 meters downstream from the spring orifice.	TBD	Protocol requires 20 m inventory; will be adapted for 50 m.	Protocol requires a down valley sampling distance of 20 times the active channel width.	Protocol will be followed. It is not likely that streams will exceed 50 m.
7. Observation data will be summarized by site: wetland area, perimeter length, and wetland species diversity metrics will be reported. This analysis will be described in detail sufficient for peer review and repetition by independent statisticians.	Will provide wetland area and perimeter length.	Will provide wetland species diversity.	Will provide wetland species diversity.	Will provide wetland species diversity.

Criteria	Wetland Perimeter Mapping	GDE Level II Protocol	USDA Core Riparian Protocol	NCPN Springs and Seeps SOP for Hanging Gardens
8. Specimens are not to be collected, unless necessary to verify plant species identification. Specimens, if collected, are assumed to be destroyed during analysis. No collections will be made if < 10 plants present. Whenever possible, collections will only include a sub-sample of the plant and its roots will not be disturbed.	No specimens will be collected except required for identification.	No specimens will be collected except required for identification.	No specimens will be collected except required for identification.	No specimens will be collected except required for identification.
9a. Additional metric: determining and quantifying animal use at site BLCA, BRCA, CEBR, CURE, CARE, DINO).	N/A	Will adapt to include scat counts and track identification by species within vegetation plots. At CEBR, visual estimations of sheep grazing impacts at and near the boundary between the park and the Dixie National Forest will be collected.	Will adapt to include scat counts and track identification by species within vegetation plots. At CEBR, visual estimations of sheep grazing impacts at and near the boundary between the park and the Dixie National Forest will be collected.	Will adapt to include scat counts and track identification by species within vegetation plots. At CEBR, visual estimations of sheep grazing impacts at and near the boundary between the park and the Dixie National Forest will be collected.
9b. Additional metric: determining impacts from recreation (COLM)	N/A	Qualitative Management Indicator Tool for recreation impacts.	Qualitative Management Indicator Tool for recreation impacts.	Qualitative Management Indicator Tool for recreation impacts.

Criteria	Wetland Perimeter Mapping	GDE Level II Protocol	USDA Core Riparian Protocol	NCPN Springs and Seeps SOP for Hanging Gardens
9c. Additional metric: wetted area (BRCA and CEBR)	N/A	Will adapt to include category to describe surface water as flowing, pooled, saturated soil, or not observed.	Will adapt to include category to describe surface water as flowing, pooled, saturated soil, or not observed.	Will adapt to include category to describe surface water as flowing, pooled, saturated soil, or not observed.
9d. Additional metric: spring development presence and functioning/ not functioning	N/A	Will include category to describe spring development presence as: fence, tank, pipe, dam, windmill, pump, springbox, trench/ditch, other (describe); and note whether each is functioning or not.	Will include category to describe spring development presence as: fence, tank, pipe, dam, windmill, pump, springbox, trench/ditch, other (describe); and note whether each is functioning or not.	Will include category to describe spring development presence as: fence, tank, pipe, dam, windmill, pump, springbox, trench/ditch, other (describe); and note whether each is functioning or not.
9e. Riparian gallery mapping and species composition evaluation (CURE only)	Mapping will be based on cottonwood and/or riparian tree canopy cover	25 50-m transects using line-point intercept methodology will be used to evaluate understory species composition. A spherical densitometer will be used to evaluate canopy cover.	25 50-m transects using line-point intercept methodology will be used to evaluate understory species composition. A spherical densitometer will be used to evaluate canopy cover.	25 50-m transects using line-point intercept methodology will be used to evaluate understory species composition. A spherical densitometer will be used to evaluate canopy cover.
9f. Cottonwood seedling dispersal (COLM only)	N/A	TBD	TBD	TBD

3.2.1 Groundwater Dependent Ecosystem (GDE) Level II Methodology

The vegetation components of the GDE Level II protocol will be the dominant methodology for the project, as it meets the objectives and goals and falls within the project parameters (Table 4). Most of the sites evaluated will meet the definition of groundwater-dependent ecosystems. Groundwater-dependent ecosystems are characterized as areas groundwater intersects the ground surface, and include springs, seeps, wet meadows, depressional wetlands, fens, and areas associated with but not entirely dependent on surface water bodies such as wetlands and riparian vegetation communities.

The Pre-Field Activities, Field Survey Activities, and Post-Field Survey Activities of this protocol would be used at most of the sites within the parks. This protocol is not intended to be used to evaluate certain wetlands including hanging gardens and riparian areas within floodplains of surface water bodies. The GDE Level II protocol is intended to describe a site's general condition, monitor major change over time, and make comparisons among sites of a certain type or within a specific region.

While developed for use on National Forest System lands, one of the GDE Level II protocol's major management uses meets the objective of the project: assess and disclose environmental effects associated with ongoing and proposed actions and activities, including using monitoring data to identify needed adjustments to management practices. During the site evaluation, data will include location, slope, aspect, elevation, surrounding (non-wetland) vegetation, geologic setting, surface material (no soil samples will be taken), ground water source characterization (if applicable), and species composition. Photos of the site will be taken and a detailed and scaled diagram of the wetland will be completed.

Transects to evaluate species composition will be established following the methods outlined in the protocol and briefly described below. The perimeter of the wetland will be mapped (see Section 3.3), and the area and long axis of the wetland will be determined and transects would be established. All transects will be oriented perpendicular to the long axis of the overall site. Quadrats would be placed at intervals along each transect. Transect and quadrat intervals are outlined in Figure 2.

For sites larger than 10,000 m², the site will be divided into 10 strata of equivalent size and a single 100 m transect will be randomly placed in each stratum. Quadrats will be placed every 20 m along each transect.

For each quadrat, visual cover will be measured for each species. A typical survey of a site would involve sampling the wetland area 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.

In general, a cut-level of 3 percent will be used when recording visual cover estimates. If a site has an abundance of plant species that occur at a low cover, the cut level will be adjusted in the field to a lower level to capture the diversity and character of the wetland.

A combination of line intercept and spherical densiometer methods will be implemented to determine woody species cover and composition. Shrub cover will be collected using line intercept sampling along each transect as described in the GDE Level II protocol. Overstory tree cover will be recorded using a spherical densiometer at three locations along each transect: 1) at the first quadrat, 2) at the last quadrat, and 3) at the center quadrat of the transect. If there are an even number of quadrats placed along the transect, then the spherical densiometer will be read between the two centermost quadrats. Overstory canopy cover may include trees rooted both inside and outside of the wetland boundary. Non-plant ground cover will be visually estimated. Additional species observed within the wetland that are not captured in the quadrats or line intercept will be noted on a datasheet.

Figure 2. Criteria for Determining Quadrat Number and Interval using GRE Level II (from Brown et al. 2007)

Size of GDE (m ²)	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 ¹	Divide into smaller units	

¹ Sites larger than 10,000 square meters require 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. Guidance for dividing large sites into smaller areas is addressed in box 2.

3.2.2 National Riparian Core Protocol (NRCP)

The Pre- and Post-Field Activities and Field Survey Activities of this protocol will apply to sites characterized by large, low-energy floodplain wetland complexes associated with surface water bodies such as channels, streams, rivers, and lakes. It complements existing agency protocols for monitoring riparian vegetation while allowing flexibility so that the survey layout can be tailored to a variety of riparian settings.

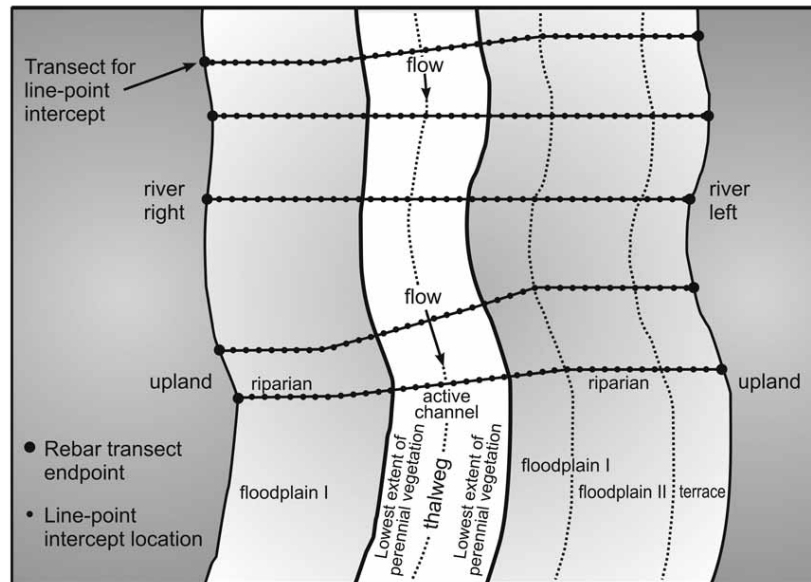
The methods outlined in the NRCP include using geospatial data to identify segments of riparian features for sampling prior to the initiation of field activities. The protocol will use 0.5 m² quadrats at a quantity and interval as determined by the GDE Level II protocol based on the size of the sampled area. Visual cover estimates of herbaceous cover and woody cover will be collected as described in Section 3.2.1.

The down-channel length of the riparian segment to be sampled is determined by measuring the active channel width and multiplying it by 20. The sampling layout at each survey site consists of systematically spaced transects which begin at the riparian edge and are oriented perpendicular to the valley or riparian bottom centerline. The transects extend across the entire riparian area, where transect endpoints identify its edges on either side of the channel (see Figure 3).

As for the GDE Level II protocol, the following data will be collected when using the NRCP protocol:

- Visual cover of riparian vegetation and non-plant ground cover.
- Woody species cover as described in Section 3.2.1.
- List of wetland species not otherwise captured.
- Qualitative assessments of wetland disturbance.
- Presence and frequency of target animal species' sign (scat and tracks).
- Incidental observations of target species, humans, and aquatic vertebrates.
- Notes on campsites, vehicle tracks, human footpaths within 100 feet of the site.

Figure 3. Transect layout along a riparian segment with points for vegetation sampling (from Manning et al. 2017)



During sampling, additional site evaluation data collected will include location, slope, bank angle, bank instability, aspect, elevation, surrounding (non-wetland) vegetation, geologic setting, surface material (no soil samples will be taken), and species composition. Photos of the site will be taken.

3.2.3 NCPN Hanging Garden SOP

The NCPN Standard Operating Procedures is intended to quantify seeps and springs that are arranged in three-dimensional space. This is useful for hanging gardens and hillslope seeps where groundwater meets impermeable geologic layers and water is forced to the surface. We do not anticipate hanging gardens in the workload but steep hillslope seeps may be encountered at our inventory targets; the NCPN SOP's inventory these situations well.

NCPN Standard Operating Procedures 3, 4, and 6 will be required. The project objectives of providing cover and composition data for OBL and FACW plants is achieved under SOP 4, Site Map and Vegetation Characterization; this method can be used for future change detection. The project objective of mapping the OBL / FACW boundary may or may not be feasible due to steepness of the feature, small community size, or community fragility. Photographic monitoring project objectives are met with SOP 6, Site Condition and Repeat Photo points. Likewise, SOP 6 documents visitor or wildlife impacts to spring resources.

3.3 Goal 2: Mapping Springs and Wetlands

In order to meet Goal 2, wetland boundaries will be mapped using the vegetation section of the U.S. Army Corps of Engineers (USACE) Wetland Vegetation Dominance Test for Arid West Region⁴.

The dataform provides a rubric for determining if hydrophytic vegetation (defined as OBL and/or FACW) meets or surpasses the cover threshold to be considered a wetland through a quantitative dominance test. The crew would use the dominance test to determine hydrophytic and upland vegetation cover at the boundary of the wetland area, and would use the characteristics at the boundary to map the extent of the wetland. All wetland and upland species at the wetland boundaries will be identified to species and cover composition will be

⁴ Available at <https://usace.contentdm.oclc.org/utils/getfile/collection/p266001coll1/id/7627>.

quantitatively determined in the field. Target species known to occur in the parks are in Appendix B; however additional wetland species may be present and will be added to the list and included as part of the cover criteria for mapping wetland boundaries. If more than one wetland vegetation community is present at a site, the communities will be mapped and characterized separately. Data included with the wetland polygons will be the wetland Cowardin Class.

3.3.1 Non-wetland Negative Data and Reporting

At sites where cover of OBL or FACW species is less than 50 percent, and therefore wetland characteristics are not present, field staff will document the site as negative data. Field staff will take photos facing each cardinal direction standing at the center of the site. A single transect will be placed running through the most mesic part of the site. Three 0.5 m² quadrats will be spaced evenly along the transect and herbaceous cover data will be visually estimated within each quadrat. No wetland delineation will be conducted. This negative data along with a brief written description about why the site was not delineated as a wetland will be included in the final report.

3.3.2 GPS Settings and Accuracy

Submeter GPS mapping is necessary for all mapped wetlands. The GPS parameters listed below will help to ensure the boundary is mapped accurately and consistently. The planned use of EOS Arrow 100 receivers can deliver a 30-40 cm horizontal accuracy with a clear view of the sky. The mapping interface is the ESRI Collector App and has the data parameter setting options as seen below. All settings will be programmed as indicated. It is important to note that the Accuracy setting requirement can be overridden at any time. This is desirable when difficult satellite constellation (e.g., narrow canyon) precludes any data collection - a less accurate polyline or point is undeniably better than no data generation at all.

Table 4. GPS Settings and Accuracy Parameters

Parameter	Setting
Accuracy	75 cm
GPS Averaging	OFF; (If averaging a non-monumented point, turn ON and wait for 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

3.4 Goal 3: Representative Photos

As part of the methods discussed above, multiple photos will be taken at each wetland following guidance outlined the respective methods found in the GDE Level II protocol. Additional photos may include overall

landscape context photos and at least one representative photo along the wetland boundary. All photos will be taken using the geo-referencing application Solocator⁵, which provides a georeferenced copy of each photo with UTM location, aspect, elevation, date, time, project name, and a brief description.

3.5 Other Park Specific Metrics

In addition to completing one of the methodologies above, the following metrics will be evaluated, and data collected during the site visits.

3.5.1 Wildlife and Livestock Usage Metric (BLCA, CARE, CEBR, CURE, BRCA, DINO)

Presence of target animal scat and/or tracks observed within the quadrats will be recorded and the frequency of each type will be calculated. Target animal species include moose, elk, deer, sheep, bear, mountain lion, bison, turkey (BLCA/CARE) and recent cattle sign. Incidental observations of target species, humans, and aquatic vertebrates will be noted.

Wildlife usage data will be collected at all six park units using the methodology in Appendix C. At CEBR, a visual estimation of livestock grazing at and near the boundary between the park and USFS lands will be completed at each plot.

3.5.2 Recreation Impacts Metric (All Parks)

Any campsites, vehicle tracks, human footpaths (social trails) within 100 ft (30.5 m) of the site will also be noted. The width of social trails will be noted. Point data may be taken to help identify the origin or terminus of social trails associated with the wetland areas beyond the 100 ft distance. After the site has been evaluated, qualitative management indicator tools for recreation impacts will be used to assess the site. Trails will be documented with photos.

At BRCA, some sites are located within proximity to old campsites that have been decommissioned and moved away from water sources. Sign of visitor use at these sites, if observed, will be noted, and documented with photos.

Recreation impact data will be collected at all park units using the qualitative management indicator tool for recreation outlined in the GDE Level II protocol.

3.5.3 Spring Development Metric (All Parks)

The data collection methods will include categorical data for spring development if present. Categories include fences, tanks, pipes, dams, windmills, pumps, springboxes, trenches and ditches, other (describe). Notes on each will be collected documenting if each is functioning or not. Point data will be taken at the approximate center point for each structure or development encountered. Spring development data will be collected at all park units.

3.5.4 BRCA and CEBR Metrics

Within BRCA and CEBR, wetted surface areas associated with springs will be documented and categorized as flowing, pooled, saturated, or not observed. The perimeter of the wetted area will be mapped using a sub-meter GPS unit. If a wetted area is less than 5 m², point data will be taken at the approximate center point.

⁵ Solocator application information is found at <https://solocator.com/>.

Photo re-takes from previous vegetation mapping efforts will be completed at BRCA and CEBR. The NCPN has provided spatial locations for each photo point.

At CEBR, grazing impacts at and near the park boundary with USFS land will be noted and documented using photo points and visual estimation of livestock grazing impacts, if observed. A USFS research permit may be required to complete mapping outside the CEBR boundary.

3.5.5 CURE and BLCA Specific Methods

BLCA and CURE have requested additional analysis of collected data. The Colorado Natural Heritage Program's Ecological Integrity Assessment for Colorado Wetlands Field Manual, Version 2.1 provides a ranking system for plot data that gives a quick look at wetland integrity. This protocol will be used to calculate two separate metrics, each producing a rank score that shows wetland integrity – they are shown in Tables 5 and 6.

- Metric V1: Native Plant Species Cover (Relative) – From plot data, this is simply calculated by dividing the total cover of native species by the total cover of all species.
- Metric V2: Invasive Nonnative Plant Species Cover (Absolute) – From plot data, this is simply calculated by summing the total cover of nonnative species in the sample unit.

Table 5. Ranking system for Metric V1: Native Plant Species Cover (Relative)

Rank	Score	State
Excellent (A)	4	Assessment area contains >99% relative cover of native plant species
Good (B)	3	Assessment area contains 95-99% relative cover of native plant species
Fair (C)	2	Assessment area contains 85-95% relative cover of native plant species
Fairly Poor (C-)	1.5	Assessment area contains 60-85% relative cover of native plant species
Poor (D)	1	Assessment area contains <60% relative cover of native plant species

Table 6. Ranking system for Metric V2: Invasive Nonnative Species Cover (Absolute)

Rank	Score	State
Excellent (A)	4	Invasive nonnative species are absent from all strata
Good (B)	3	Invasive nonnative species present, but sporadic (<4% absolute cover)
Fair (C)	2	Invasive nonnative species somewhat abundant (4-10% absolute cover)
Fairly Poor (C-)	1.5	Invasive nonnative species abundant (11-30% absolute cover)
Poor (D)	1	Invasive nonnative species very abundant (>30% absolute cover)

At CURE, large riparian cottonwood galleries are present at the eastern extent of the park. This area provides potential habitat for yellow-billed cuckoo and other riparian bird species, as well as riparian wetland species habitat. Because the extent of these wetland areas exceeds the thresholds for mapping under the Riparian Core protocol in an efficient manner, and the characteristics do not fit into the GDE Level II protocol, an adapted protocol will be used to efficiently map and characterize the area:

- The boundary of the cottonwood gallery will be mapped using the same methods outlines in Section 3.3.
- A total of 25 randomly placed 50 m transects will be completed within the galleries. Quadrat data estimating cover by species with the same parameters as the GDE Level II quadrat data collection will be collected at 10-m intervals along each transect.
- The transect locations and directions (in degrees) will be determined ahead of the field effort using GIS, as the footprint of the galleries will be easily approximated using aerial imagery. The transect location randomization will include a set of rules to reduce the likelihood that transect locations will fall outside

of the gallery footprint. Transect locations may be moved in the field if they are inaccessible due to standing water.

- Canopy cover will be assessed using a convex spherical densiometer at the beginning (0 m), center (25 m) and end (50 m) of each transect. A list of canopy species observed at each transect will be compiled.

3.5.6 DINO Specific Metrics

Within DINO, linear non-wetland and non-spring features such as a dry ephemeral or intermittent wash associated with a mapped spring point where no ground or surface water is observed, will be documented using a line or point, and vegetation will be characterized.

If a wetland area is encountered that is less than 5 m², one quadrat will be completed to estimate cover composition, and point data will be collected at the approximate center of the wetland area.

Hydrological data will be collected at DINO concurrently to spring or wetland mapping by an NPS staff or intern. The protocol for this data collection is outside the scope of this project.

3.5.7 COLM Specific Methods

Within COLM, data for cottonwood seedlings within the wetland, seep, or spring perimeter will be collected using the following methods:

- Count cottonwood seedlings within the wetland perimeter. Seedlings are anticipated to be rare, but if they are numerous, they could be counted in plots only or recorded as presence only in plots to give a frequency metric for the wetland.
- Search for and record the presence of seedlings within the greater cottonwood canopy area associated with the wetland.
- Record incidental sightings of seedlings when hiking to and from a site. These can be location notes or a waypoint using a recreational grade GPS unit.

Cottonwood seedlings will be identified as having small but discernably cottonwood-shaped leaves and lack evidence of sprouting (see Figure 4).

Figure 4. Cottonwood Seedling shows small but discernably cottonwood-shaped leaves and lack evidence of sprouting.



3.6 Pre-Survey Geospatial Analysis and Preparation

GIS data provided by NPS will be used to analyze the location, number, and if possible, rough size of seeps, springs, and wetlands to be mapped and evaluated. This desktop activity will help plan the project approach. The number and approximate acreage (if possible) of survey sites within a park will be estimated. Tables outlining this information will be used to inform the field planning process. During this exercise, each known area will be assigned a general identification code that indicates the park unit it is located within. If known, the code may include identifiers for type of feature (wetland, spring, etc.). If there are major discrepancies between the number and extent of sites identified in the project scope of work and the GIS data, Ironwood will work with the NPS staff to revise project priorities to fit within the budget and timeframe of the project.

Prior to field work, project maps and tables that identify priority wetlands/springs wetland/springs will be prepared using GIS data provided by the NPS. Maps will be prepared at a scale of 1:1000 and will include topographic lines, labels for prominent landmarks and geographic features, waterbodies, and roads; and will use recent aerial photograph backgrounds. Large plot (24 inch x 36 inch) paper maps will be provided to field staff for navigation and field planning. These or separate maps may also include soils and geology information. Digital maps for use in ESRI Collector and/or georeferenced PDF maps for use in Avenza will also be prepared.

Ironwood will create a data collection interface that uses ESRI Collector and Survey 123, that can be used on cell phones and tablets in the field for all data fields outlined in the methodologies (Appendices B, C, and D). Field crew will use tablets in the field that will store data locally, and connect to cloud storage when in cellular service, to provide accurate, real-time data for QA/QC and analysis. The data collection form interface will conform to NPS file structure and tracking tools, and will include all fields outlined in the field methodologies in Appendices B, C, and D and meet NPS data requirements and standards.

3.7 Pre-field Preparation

A field notebook for each field member will be prepared and will include with pertinent information:

- Project methodologies with project specific adaptations in a format that is easy to reference
- Paper data sheets (as backup in case electronic devices fail)
- Detailed maps of each park/site
- Field gear required to complete the mapping and wetland evaluations (Appendix D)
- Project Injury and Illness Prevention Program and Covid 19 Safety Plan

Prior to beginning data collection at each park, and before each site mapping and evaluation occurs, the project field staff will:

- Become familiarized with target plant list, including visits to herbarium, field visits to reference populations, and review of literature.
 - Review vegetation map polygons and query access routes from previous visits (if applicable). This source data is available on the DOI Teams Files page and will be included in the project notebooks.
 - For BRCA and CEBR-specific photo re-takes – gather data on re-take location and bring images into the field.
-

- Coordination with NCPN staff and other NPS staff to gather and review relevant site information and park logistics (e.g., survey site identifications, maps, remote sensing data, access, camping, special permits, river access at DINO, etc.).
- Review logistics and safety plan for specific park – this may require further safety planning for example, up-to-the minute weather tracking in flash flood prone canyons (see Section 4.3).
- While navigating to and approaching each site, the project field staff will utilize most efficient known travel route to wetland/spring feature. While en route, a recreational GPS will be running and collecting a track for backtracking. Where available, parks will provide GPS tracks from previous mapping or monitoring trips to specific sites.
- Identify what the wetland type for each site is assumed to be prior to the field visit. Sources for making preliminary determinations include U.S. Geological Survey maps, U.S. Fish and Wildlife Service National Wetlands Inventory (NWI), forest maps, previous inventories, photos, etc.

3.8 Wetland Boundary Mapping

- Assess the site upon arrival to determine how to minimize damage to the soils, plants, and hydrologic processes during the survey.
- Determine whether there are large or complex sites that may need to be divided into smaller sampling units. If the wetland is a large complex with multiple vegetation communities (i.e., a riparian wetland within an herbaceous wetland), these will need to be mapped and evaluated as components of the larger wetland complex.
- Upon arrival at each site, a submeter polygon will be mapped within ESRI Collector, along the boundary between wetland using the USACE Arid West Dominance Test (greater than 50 percent OBL and FACW species cover) dominant plant communities, and upland (greater than 50 percent FAC, FACU, UPL species cover) plant communities. This polygon may be adjusted during the site visit.
- Each crew will map the wetland boundary using an EOS Arrow 100 submeter GPS receiver connected to a Bluetooth-enabled device to input field data into the data dictionary. The ESRI Collector app will be used to determine the area and the length at the longest axis of the wetland. This will help determine transect location and microplot quantity and placement if USDA Forest Service GDE Level II protocol is used. The polygon also serves as the delineation deliverable required of all sampled seeps/springs/wetlands under this contract.
- In the case of no OBL or FACW species present, and therefore no wetland characteristics are observed, a walk-thru with photos and a single transect with 3 microplots using the GDE Level II Protocol through the most mesic part of the feature will be collected; no delineation will be conducted.
- At CEBR and BRCA only, each end of the long axis of the polygon directs where the capped aluminum conduit permanent plot pins are to be set. Additional monuments will be added if the long axis distance exceeds 100m or if there are distinct bends. An additional monument will be added for every additional 100-meters the transect extends, and/or when the long axis trajectory changes at the bend. Each conduit cap will be scribed with site/transect name.
- At all other parks (BLCA, CARE, COLM, CURE, and DINO), no permanent monuments will be used at sites. Sub-meter GPS data will be collected according to the specifications in Table 4 at each end of the long axis. Additional points may be taken if the long axis exceeds 100m if there are distinct bends.

3.9 Wetland Evaluation Protocol Selection

After the wetland boundary is mapped, field staff will determine which protocol to use at the site as follows:

- Utilize the Decision Tree for Identifying Groundwater-Dependent Wetlands (Figure 5; Brown et al. 2007 modified) in order to determine if the site is a groundwater-dependent system. Because no soil sampling will be conducted as part of the work, question 6 will be limited to evaluating the surface soil texture, if required.
- Using the final result of the tree, decide which protocol to use to sample vegetation and characterize the site. Proceed with one of the three protocols outlined in Table 3 and Table 7 and provided in the corresponding appendix for each.
- Each published protocol stands alone, and the guiding document can be referenced, however since our effort requires abbreviated and project-specific variants of each protocol, the data collecting interface is the best workflow prompter. This means that ESRI Collector will guide the surveyor to collect all required data fields and the general order of collection.

Figure 5. Decision Tree for Identifying Groundwater -Dependent Wetlands, adapted from Brown et al. 2007

Box 1

Decision Tree for Identifying Groundwater-Dependent Wetlands

(based on Brown et al. 2007, with modifications for this field guide)

Answer the questions in sequence. A **bold** answer indicates likely groundwater dependence, and subsequent questions need not be answered.

1. Is the wetland seasonal?
Yes—Low likelihood of groundwater dependence
No—Go to next question
2. Does the wetland occur in one of these landscape settings:
(a) slope break, (b) intersection of a confined aquifer with a slope,
(c) stratigraphic change, or (d) along a fault?
Yes—High likelihood of groundwater dependence
No—Go to next question
3. Is the wetland associated with a spring or seep?
Yes—High likelihood of groundwater dependence
No—Go to next question
4. Does the wetland have signs of surface inflow?
No—High likelihood of groundwater dependence
Yes—Go to next question
5. Are the wetland soils organic, muck, or peat?
Yes—High likelihood of groundwater dependence
No—Go to next question
6. Is the wetland saturated even after surface inputs become dry and during extended periods with no precipitation?
Yes—
Are the wetland soils clay, hardpan, or impermeable?
No—High likelihood of groundwater dependence
Yes—Low likelihood of groundwater dependence
No—Low likelihood of groundwater dependence

Table 7. Three protocols to be used based on the determination using the GDP Level II Protocol.

Methodology	Use When:	Frequency of Use	Special Equipment Required	Protocol and Datasheet Reference
USDA Forest Service Groundwater Dependent Ecosystems: Level II, abbreviated methods for this project.	For wetlands that have a high likelihood of groundwater dependence	Very often during NCPN wetland OBL/FACW mapping	Two pins required per polygon	Excerpt from USDA GDE Level II Methods
USDA Forest Service Riparian Core Protocol (RMRS -GTR-367)	Precipitation-dependent wetlands (streams and rivers). High or low gradient.	Occasional	Pre-field GIS planning recommended. Minimum ten pins required / reach. Convex spherical densiometer.	Excerpt from USDA Riparian Core Methods
NCPN Springs and Seeps Monitoring Protocol Version 1.0. Protocols 3,4,6. Abbreviated for this project	Hanging gardens and hillslope springs with steep bedrock only.	Occasional	Rangefinder	Excerpt from NCPN Springs and Seeps Methods

4. DATA MANAGEMENT

All data will be recorded electronically on the application interface designed for the project using ESRI Collector and Survey 123 on field tablets. Data will be uploaded to the cloud server at the end of the work day or when cellular or internet service is available. All photos will be saved and labeled and backed up each evening. If necessary, technical adjustments to the data collection interface will be made to ensure data quality and efficiency. All data and photos will be routinely backed-up from the cloud server.

Data will be reviewed at the end of each field day by the Project Manager and/or Assistant Project Manager to ensure completeness, accuracy, and quality. Inaccurate or incomplete data will be rectified within 24 hours of original data collection.

4.1 Spatial Data

All data collected during the surveys will be spatial in nature, including wetland boundary mapping, site evaluations, and photos. Spatial field data collection equipment includes:

- Recreational-grade GPS units – Each crew member will have a GPS unit that is capable of 5-meter or greater accuracy, such as a handheld Garmin unit or smartphone GPS application that will be used to navigate to sites and collect tracks.
- Sub-meter GPS units – Each team will have an EOS Arrow 100 submeter GPS receiver which will be 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 Collector will be used to collect spatial data and transfer to a cloud-based server. A data collection interface will be created that can be used on cell phones and tablets in the field for all data

It is anticipated that many if not most of the sites will be outside cellular service. ESRI Collector will be available for use offline, and data will be stored locally on field tablets each day. Data will be uploaded to a cloud server when cellular or internet service is available.

4.2 Paper Datasheets

In the unlikely event that Collector and/or Survey 123 are not viable ways to collect and store data, paper datasheets will be used that will include all of the fields outlined in the data dictionary. Ironwood does not anticipate this to be necessary but will have copies on hand in the event of a technology failure or other unforeseen circumstance.

After a survey of a site is completed, a digital copy of all pages any other paper datasheets will be made and sent to the PM and/or Assistant PM. The hard copy sheets will be given to the PM/Assistant PM. If a survey site requires more than one day to complete, a digital copy of any paper datasheets will be made at the end of each day and sent to the PM and/or Assistant PM. All datasheets will be reviewed for accuracy and completeness, digitized, cleaned up where required, and submitted digitally with the data deliverables.

4.3 Tabular Data

Tabular data may include species lists, photo lists and geospatial metadata. A relational database that links Event, Occurrence, and Taxon metadata. Tabular data will include all fields necessary so that the data is broadly useful, including dates, UTM's, descriptions, associated files, data type, observer, survey site, species, etc.

Tabular data will be compiled after the field data collection is completed, from both digital and paper data forms.

4.4 Photos

All photos will be taken using the geo-referencing application Solocator (<https://solocator.com/>), which provides a copy of the photo with UTM location, aspect, elevation, date, time, project name, and a brief description. Photos will include project name and survey location name. The description field will describe anything notable about the subject of the photo.

All photos will be saved and labeled and backed up each evening. If necessary, technical adjustments to the data collection interface will be made to ensure data quality and efficiency. All photos will be saved in jpeg format. All photos will be labeled to include:

- Park abbreviation
- Survey Site name abbreviation
- Date of photo

The final photo label will resemble:

- BRCA_ID123_MMDD2021.jpeg

All photos will be backed up to a cloud storage site. If internet or cellular connection is not immediately available, photos will be saved to an external hard drive and uploaded onto the cloud when internet is available.

4.5 Quality Assurance/Quality Control (QA/QC)

To ensure data is collected accurately, all botanists and botany technicians will be trained on data collection methodology. A botanist or botany technician will be assigned the role of data collection lead for each team. This person will be tasked with assuring that each data field is populated accurately and completely. One person on the crew will be assigned the role of filling out and keeping the species list, including making digital copies of each day and after each survey site is completed.

Data will be reviewed in the field at the end of each field day by the Project Manager and/or Assistant Project Manager to ensure completeness, accuracy, and quality. Inaccurate or incomplete data will be corrected within 24 hours of original data collection. The GIS/Data Lead will also review data collected by Collector each day to assure that all fields have been filled out correctly and there are no errors. If data errors are detected, the GIS/Data Lead will contact the PM and/or Assistant PM and the data will be corrected within 24 hours and re-reviewed by the GIS/Data Lead. The Project Manager and/or Assistant PM will be in the field for all data collection to ensure that the workplan is followed and data documentation follows NPS requirements.

5. DATA ANALYSIS AND REPORTING

This task includes the preparation of a report and data deliverables that summarizes the field methods and findings. This analysis will be described in detail sufficient for peer review and repetition by independent statisticians.

5.1 Draft and Final Report

Draft and final reports outlining the project background, methods, analysis, and findings will be prepared for the NPS. The following information will be analyzed and summarized in the report:

- Data will be summarized by site and will include analysis of wetland area, perimeter length, and wetland species diversity metrics to meet the objective and goals of the project.
- An introduction that outlines the purpose of the project, the acreage of the surveys and figures.
- Map figures using USGS 7.5-minute quadrangles with recent aerial photograph background, that show the survey findings.
- A detailed description of the methodology used to complete the surveys, including references to survey standards, GPS data accuracy, and data collection requirements. The methodology section will identify the timing and dates of the surveys, the botanists and their qualifications, size of the wetland area, and methodology for plant identification.
- A discussion of the survey area that includes descriptions of soils and geology, surface hydrology such as major drainages, and topographic features. Precipitation data for the region will be include in the discussion.
- Discussion of the survey findings that includes descriptions and sizes of mapped areas; vegetation communities; sensitive species occurrences locations (if any); the presence of noxious species; and human or animal disturbances encountered. The discussion will include the floristic inventory in table format and identify dominant species.
- A complete list of reference for literature cited, experts consulted, and herbaria visited. No voucher specimens will be collected as part of the field surveys.

Two rounds of comments and revisions will be necessary between the Draft Reports and the Final Reports. All draft and final deliverables will be submitted electronically over email or through a secure cloud-based sharing platform such as Microsoft SharePoint. No hard copies will be produced or provided.

5.2 Data Deliverable

The final data product will be packaged as a geodatabase, with all meta data and feature attributes included and labeled. All GIS data, databases, spreadsheets, datasheets, code, and any other pertinent data or data analysis resource will be provided to the NPS in a data deliverable package.

- Scientific and common species names; nativity/indigenoussness of species; Conservatism score (C-Score)⁶, invasiveness (I-rank)⁷, frequency, relative cover, and absolute cover.
- Taxonomic data may be contained in a relational database that meets the NCPN and NPS data standards and conforms to metadata requirements.
- Sites will be named using unique identifiers provided by the NPS in project GIS files.
- GIS shapefiles in UTM Zone 12 (Utah) and 13 (Colorado) north and NAD83 projection that is ArcMap compatible.
- Data will include tracks collected in the field during surveys; target species point and polygon occurrence data with all UNHP required metadata; point data where representative photographs were taken; and BLM, Utah, and Uintah County noxious weed point and polygon occurrences.
- GDE Level II data forms will be included in the data deliverable, including photographs for each site mapped and evaluated. Forms will be complete in the field using the Survey 123 form and checked for accuracy and completeness by the Project Manager and Assistant Project Manager before submittal.

⁶ Rocchio, J. 2007. Assessing ecological condition of headwater wetlands in the southern Rocky Mountains using a vegetation index of biotic integrity (Version 1.0). Colorado Natural Heritage Program, Colorado State University, Fort Collins, Colorado.

⁷ Morse, L. E., J. M. Randall, N. Benton, R. Hiebert, and S. Lu. 2004. An invasive species assessment protocol: evaluating nonnative plants for their impact on biodiversity. Version 1. All US Government Documents, Utah Regional Depository. Paper 537.

APPENDIX A – Maps and Priority Survey Sites at Each Park or Monument

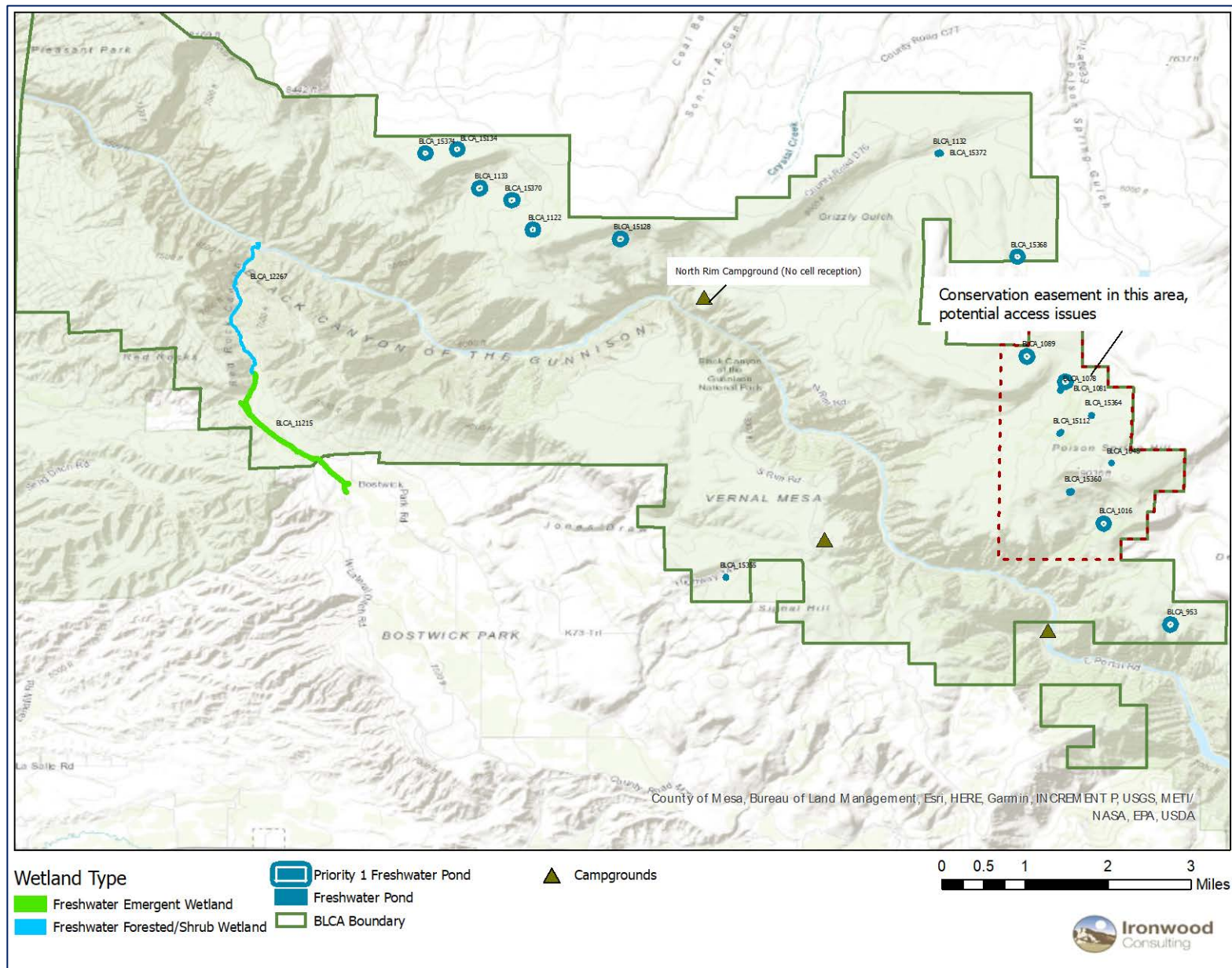


Figure A-1. Black Canyon Overview with Priority Wetlands and Waters

Table A-1. Black Canyon Priority Wetlands

Unique ID	Priority	ACRES	WETLAND TYPE	Cowardin Type
BLCA_15374	1	0.091185	Freshwater Pond	PUSCh
BLCA_1016	1	0.119199	Freshwater Pond	PABFh
BLCA_15134	1	0.119569	Freshwater Pond	PUSAh
BLCA_15368	1	0.122832	Freshwater Pond	PUSCh
BLCA_1122	1	0.159577	Freshwater Pond	PABFh
BLCA_1081	1	0.192073	Freshwater Pond	PABFh
BLCA_953	1	0.197574	Freshwater Pond	PABFh
BLCA_1089	1	0.20375	Freshwater Pond	PABFh
BLCA_15370	1	0.212515	Freshwater Pond	PUSCh
BLCA_1133	1	0.275274	Freshwater Pond	PABFh
BLCA_15128	1	0.276814	Freshwater Pond	PUSAh
BLCA_1048	2	0.148167	Freshwater Pond	PABFh
BLCA_15355	2	0.197219	Freshwater Pond	PUSCh
BLCA_15364	2	0.223583	Freshwater Pond	PUSCh
BLCA_1078	2	0.259435	Freshwater Pond	PABFh
BLCA_1132	2	0.275877	Freshwater Pond	PABFh
BLCA_15112	2	0.305861	Freshwater Pond	PUSAh
BLCA_15372	2	0.374953	Freshwater Pond	PUSCh
BLCA_15360	2	0.607009	Freshwater Pond	PUSCh
BLCA_12267	2	4.745648	Freshwater Forested/Shrub Wetland	PSSA
BLCA_11215	2	5.030776	Freshwater Emergent Wetland	PEM1Cx

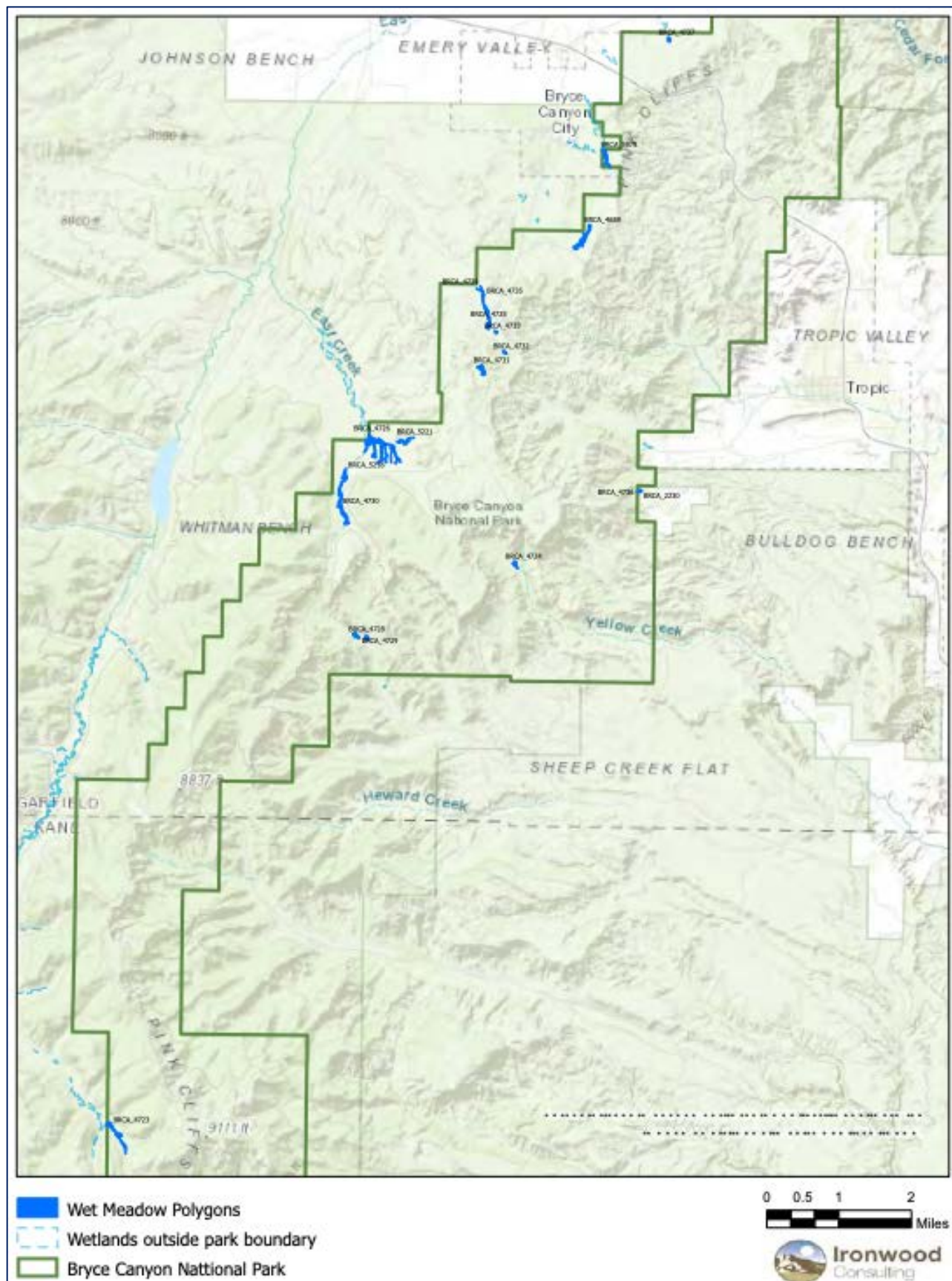
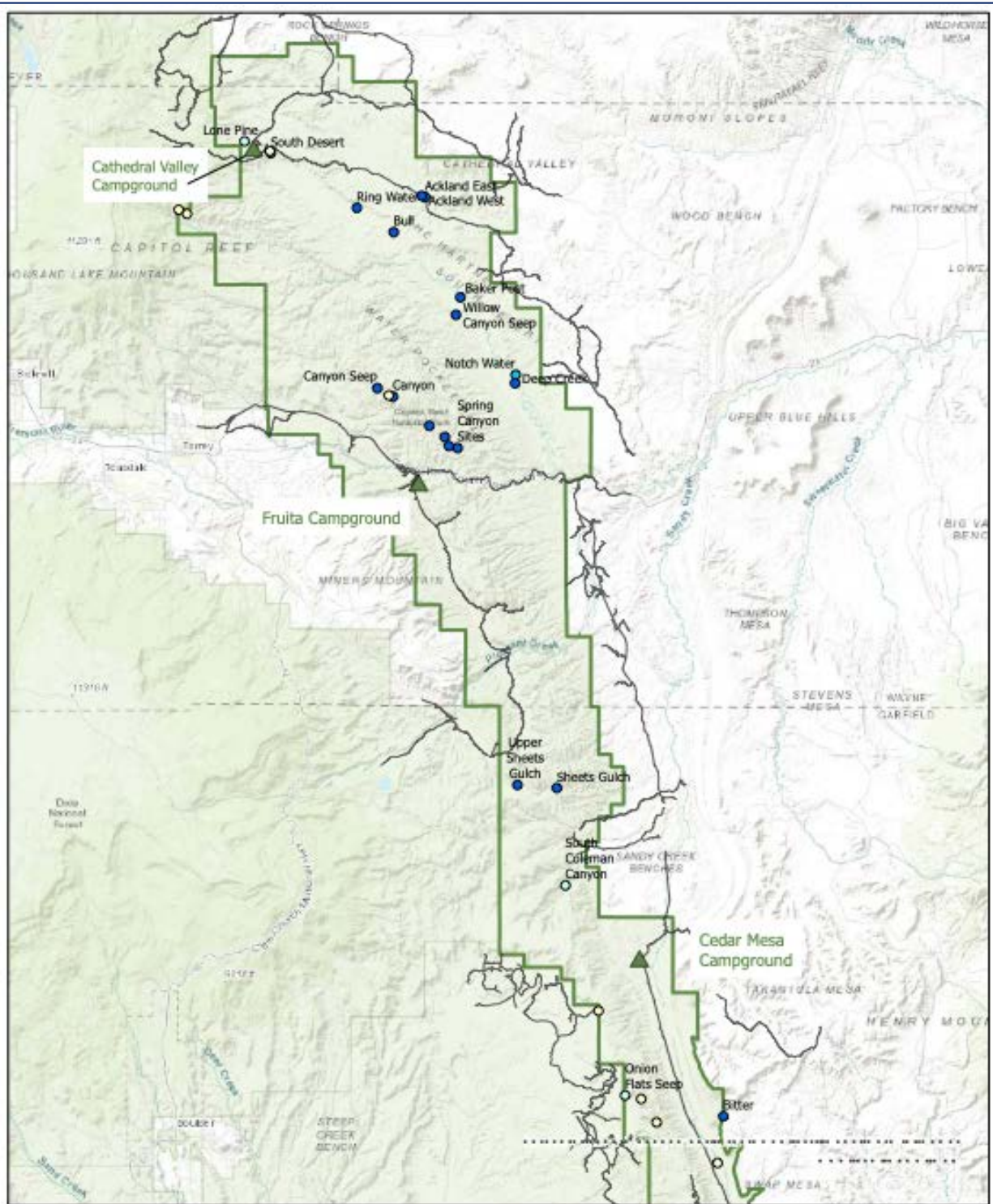


Figure A-2. Bryce Canyon Overview with Wetlands and Waters

Table A-2. Bryce Canyon Survey Sites

Unique ID	Hectares
BRCA_4726	12.12253603
BRCA_5218	4.77630702
BRCA_4689	4.772365868
BRCA_4723	4.054767253
BRCA_4730	2.475187577
BRCA_4735	2.432214673
BRCA_5979	2.206228614
BRCA_4731	1.982871802
BRCA_5221	1.779122433
BRCA_4725	1.167769678
BRCA_4729	1.00067331
BRCA_4724	0.965943874
BRCA_4728	0.741307367
BRCA_4737	0.540932444
BRCA_4734	0.479341346
BRCA_2230	0.378551841
BRCA_4733	0.311558382
BRCA_4732	0.29742762
BRCA_5183	0.176767224
BRCA_4727	0.144958103
BRCA_4736	0.003048159



Springs

- Priority 1
- Priority 2
- Priority 3
- Not Specified
- ▲ Campsites
- Roads

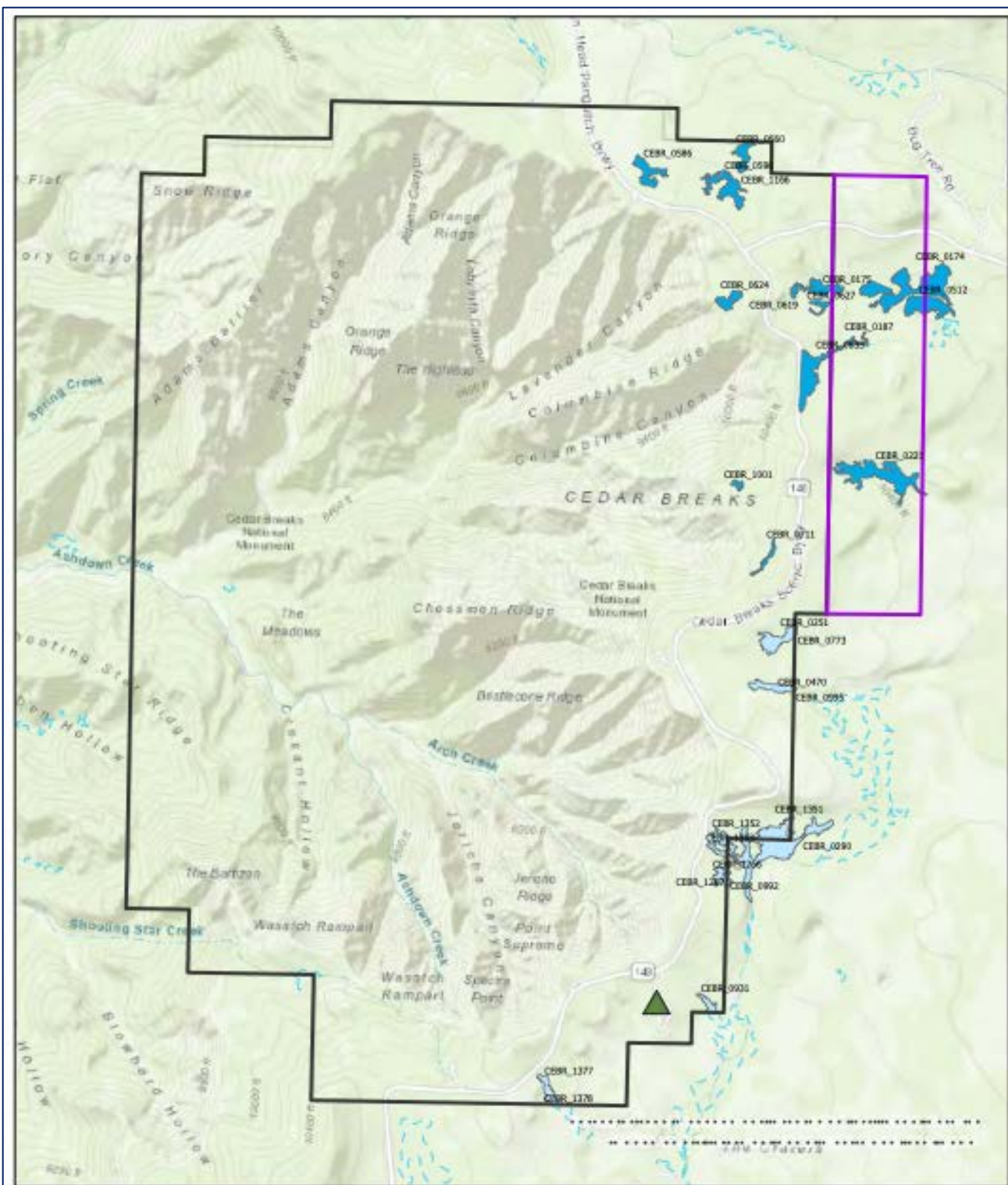
0 1 2 4 6 8
Miles



Figure A-3. Capital Reef Overview with Priority Wetlands and Waters

Table A-3. Capital Reef Priority Wetlands

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



Wet Meadow

Wet Meadow Polygons

- Priority 1
- Priority 2
- Wetlands outside park boundary

Boundaries

- National Monument
- Wetland Protection Area (Dixie National Forest)
- Campsites

0 0.25 0.5 1 Miles

Figure A-4. Cedar Breaks Overview with Priority Wetlands and Waters

Table A-4.Cedar Breaks Priority Wetlands

Site ID	Priority Area	Hectares
CEBR_0174	1	6.419725011
CEBR_0221	1	5.0682
CEBR_0635	1	3.12111184
CEBR_0512	1	2.682650811
CEBR_0590	1	2.431661007
CEBR_0586	1	1.65485
CEBR_0619	1	1.361726724
CEBR_1166	1	1.141357184
CEBR_0624	1	1.00755
CEBR_0711	1	0.4796
CEBR_0187	1	0.473588185
CEBR_0627	1	0.45085
CEBR_0175	1	0.285266644
CEBR_1001	1	0.279171644
CEBR_0560	1	0.000583909
CEBR_0290	2	8.096903023
CEBR_0773	2	1.878505729
CEBR_0995	2	1.202491863
CEBR_1377	2	0.946087879
CEBR_1352	2	0.71454844
CEBR_0992	2	0.681785559
CEBR_0931	2	0.574761395
CEBR_1353	2	0.393959818
CEBR_0918	2	0.336913607
CEBR_1159	2	0.180438007
CEBR_1267	2	0.079852387
CEBR_1351	2	0.059082448
CEBR_1266	2	0.037888143
CEBR_1246	2	0.030007093
CEBR_0251	2	0.028933121
CEBR_0470	2	0.014842195
CEBR_1378	2	0.003957827

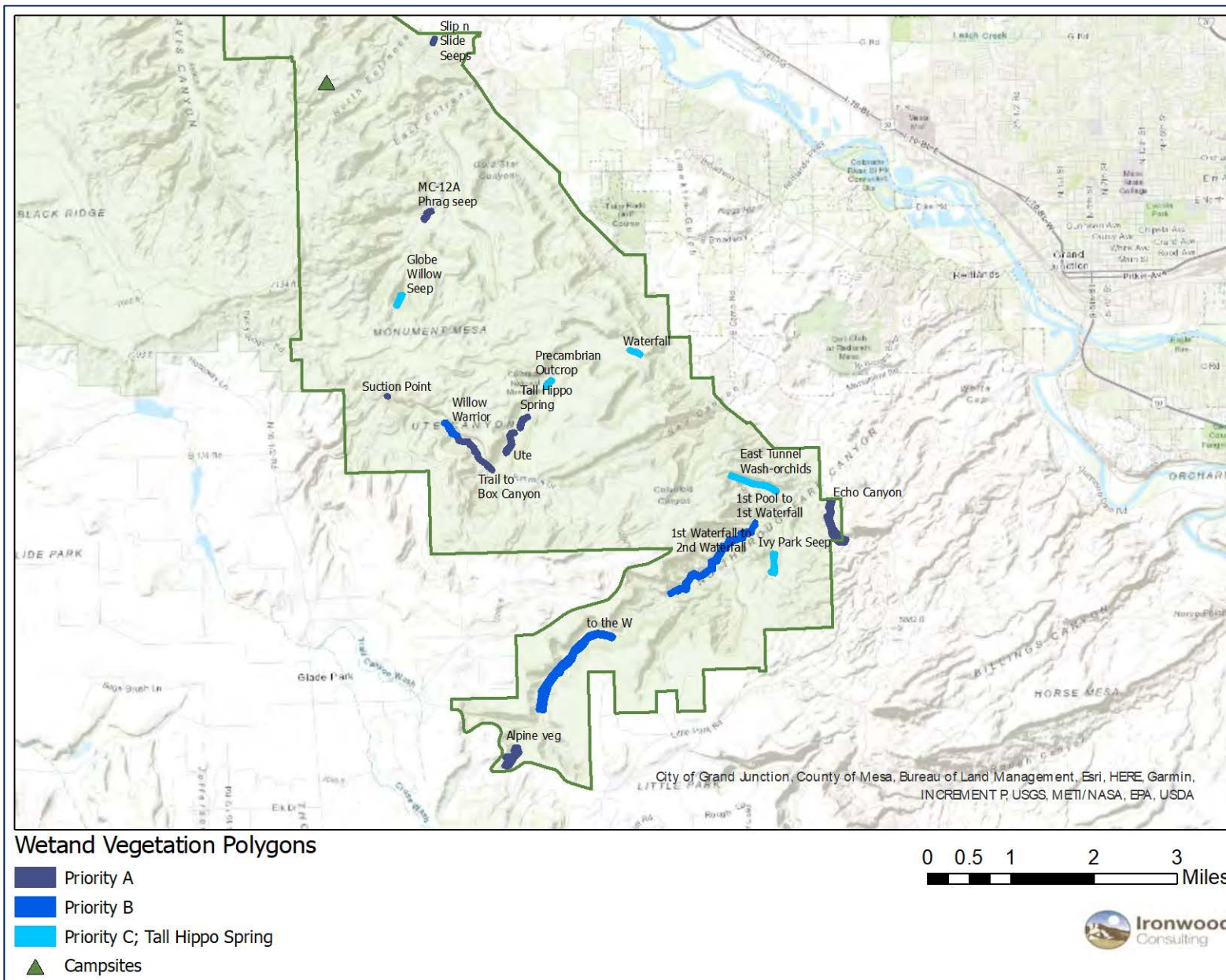


Figure A-5. Colorado National Monument Overview with Priority Wetlands and Waters

Table A-5. Colorado National Monument Priority Wetlands

Site ID	Name of Feature	Priority	Cottonwood Presence	Acres
COLM_10	Suction Point	A	No	0.18
COLM_4	Slip n Slide Seeps	A	Yes	0.86
COLM_1	MC-12A Phrag seep	A	Yes?	2.5
COLM_7	N/A	A	Yes	3.12
COLM_5	Trail to Box Canyon	A	Yes	7.78
COLM_13	Alpine veg	A	No	11.38
COLM_2	Echo Canyon	A	Yes	19.8
COLM_3	Willow Warrior	B	Yes	5.64
COLM_15	1st Pool to 1st Waterfall	B	Yes	13.5
COLM_14	1st Waterfall to 2nd Waterfall	B	Yes	18
COLM_12	to the W	B	Yes	48.21
COLM_8	Precambrian Outcrop	C	Yes	1.61
COLM_9	Waterfall	C	No	1.99
COLM_17	Globe Willow Seep	C	Yes	2.9
COLM_16	Ivy Park Seep	C	No	4.96
COLM_11	East Tunnel Wash-orchids	C	Yes	9.32
COLM_6	Ute	Tall Hippo Spring	Yes	5.72

Figure A-6. Curecanti Overview with Priority Wetlands and Waters

Table A-6. Curecanti Priority Wetlands

Site ID	Priority	Area/Name	WETLAND TYPE	Cowardin Class	ACRES
CURE_871	1	–	Freshwater Pond	PABFh	0.17
CURE_880	1	–	Freshwater Pond	PABFh	0.19
CURE_892	1	–	Freshwater Pond	PABFh	0.12
CURE_909	1	–	Freshwater Pond	PABFh	0.12
CURE_927	1	–	Freshwater Pond	PABFh	0.18
CURE_5723	1	–	Freshwater Emergent Wetland	PEM1A	1.72
CURE_5728	1	–	Freshwater Emergent Wetland	PEM1A	0.46
CURE_5729	1	–	Freshwater Emergent Wetland	PEM1A	0.64
CURE_5939	1	–	Freshwater Emergent Wetland	PEM1Ah	0.18
CURE_8547	1	–	Freshwater Emergent Wetland	PEM1B	0.08
CURE_8549	1	–	Freshwater Emergent Wetland	PEM1B	0.19
CURE_101	1	Curecanti Spring	Additional Seeps and Springs	–	Point
CURE_12006	1	Soap Creek #3	Additional Seeps and Springs	–	Point
CURE_8633	1	Soap Creek #2	Additional Seeps and Springs	–	Point
CURE_107	1	FS Road 720 Spring 2	Additional Seeps and Springs	–	Point
CURE_108	1	Dillon Pinnacles	Additional Seeps and Springs	–	Point
CURE_102	2	Hidden MP Falls	Additional Seeps and Springs	–	Point
CURE_103	2	Ponderosa Springs	Additional Seeps and Springs	–	Point
CURE_104	2	Pine Creek #1	Additional Seeps and Springs	–	Point
CURE_105	2	Crystal Spring 1	Additional Seeps and Springs	–	Point
CURE_106	2	Fitti Spring 1	Additional Seeps and Springs	–	Point
CURE_324	2	Neversink Cottonwood Gallery	Freshwater Pond	PABF	0.23
CURE_325	2	Neversink Cottonwood Gallery	Freshwater Pond	PABF	1.38
CURE_327	2	Neversink Cottonwood Gallery	Freshwater Pond	PABF	0.48
CURE_328	2	Neversink Cottonwood Gallery	Freshwater Pond	PABF	0.12
CURE_331	2	Neversink Cottonwood Gallery	Freshwater Pond	PABF	0.09
CURE_4471	2	Neversink Cottonwood Gallery	Freshwater Pond	PABGb	0.15
CURE_4472	2	Neversink Cottonwood Gallery	Freshwater Pond	PABGb	0.17

Site ID	Priority	Area/Name	WETLAND TYPE	Cowardin Class	ACRES
CURE_4473	2	Neversink Cottonwood Gallery	Freshwater Pond	PABGb	0.1
CURE_5737	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1A	21.89
CURE_10434	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1C	1.49
CURE_10436	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1C	4.43
CURE_10443	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1C	47.78
CURE_10445	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1C	3.26
CURE_10446	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1C	10.36
CURE_10448	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1C	84.47
CURE_10449	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1C	131.55
CURE_10450	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1C	14.01
CURE_10452	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1C	0.58
CURE_10457	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1C	8.76
CURE_11094	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1Ch	7.84
CURE_11183	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1Cx	1.11
CURE_11228	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1F	0.38
CURE_11229	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1F	0.22
CURE_11233	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1F	3.02
CURE_11234	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1F	0.8
CURE_11235	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1F	0.44
CURE_11237	2	Neversink Cottonwood Gallery	Freshwater Emergent Wetland	PEM1F	4.22
CURE_11292	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PFOA	4.33
CURE_11293	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PFOA	2.45
CURE_11294	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PFOA	2.64
CURE_11295	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PFOA	4.55
CURE_11296	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PFOA	0.6
CURE_11297	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PFOA	2.9
CURE_11298	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PFOA	3.67
CURE_11299	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PFOA	6.32
CURE_11300	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PFOA	1.58
CURE_11943	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PSSA	0.39
CURE_11944	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PSSA	0.41

Site ID	Priority	Area/Name	WETLAND TYPE	Cowardin Class	ACRES
CURE_11948	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PSSA	1.04
CURE_11956	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PSSA	0.19
CURE_11957	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PSSA	0.64
CURE_11959	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PSSA	2.22
CURE_11960	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PSSA	0.51
CURE_11963	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PSSA	1.44
CURE_12653	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PSSAh	0.68
CURE_12654	2	Neversink Cottonwood Gallery	Freshwater Forested/Shrub Wetland	PSSAh	0.38

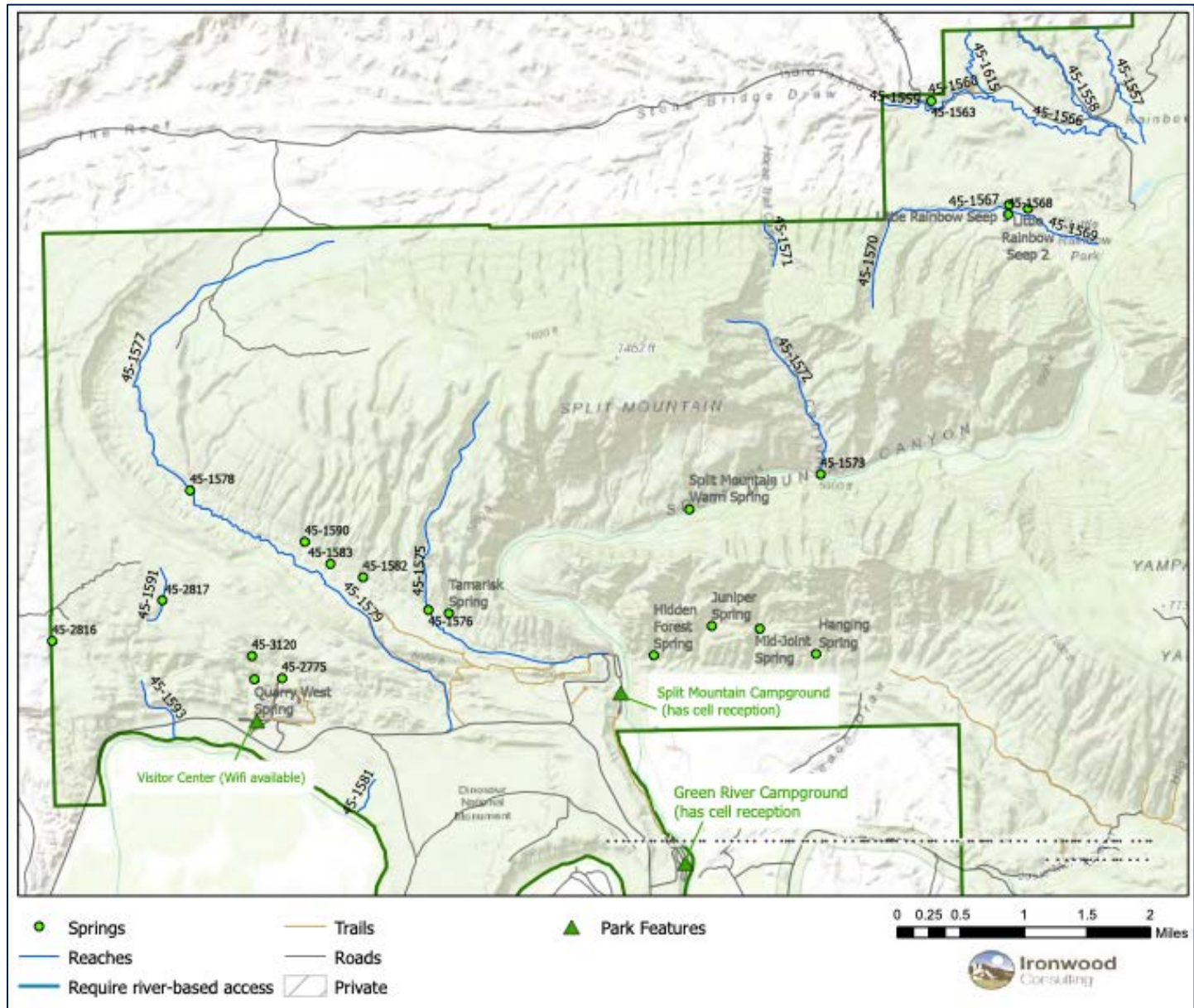


Figure A-7a. Dinosaur National Park East Overview with Priority Wetlands and Waters

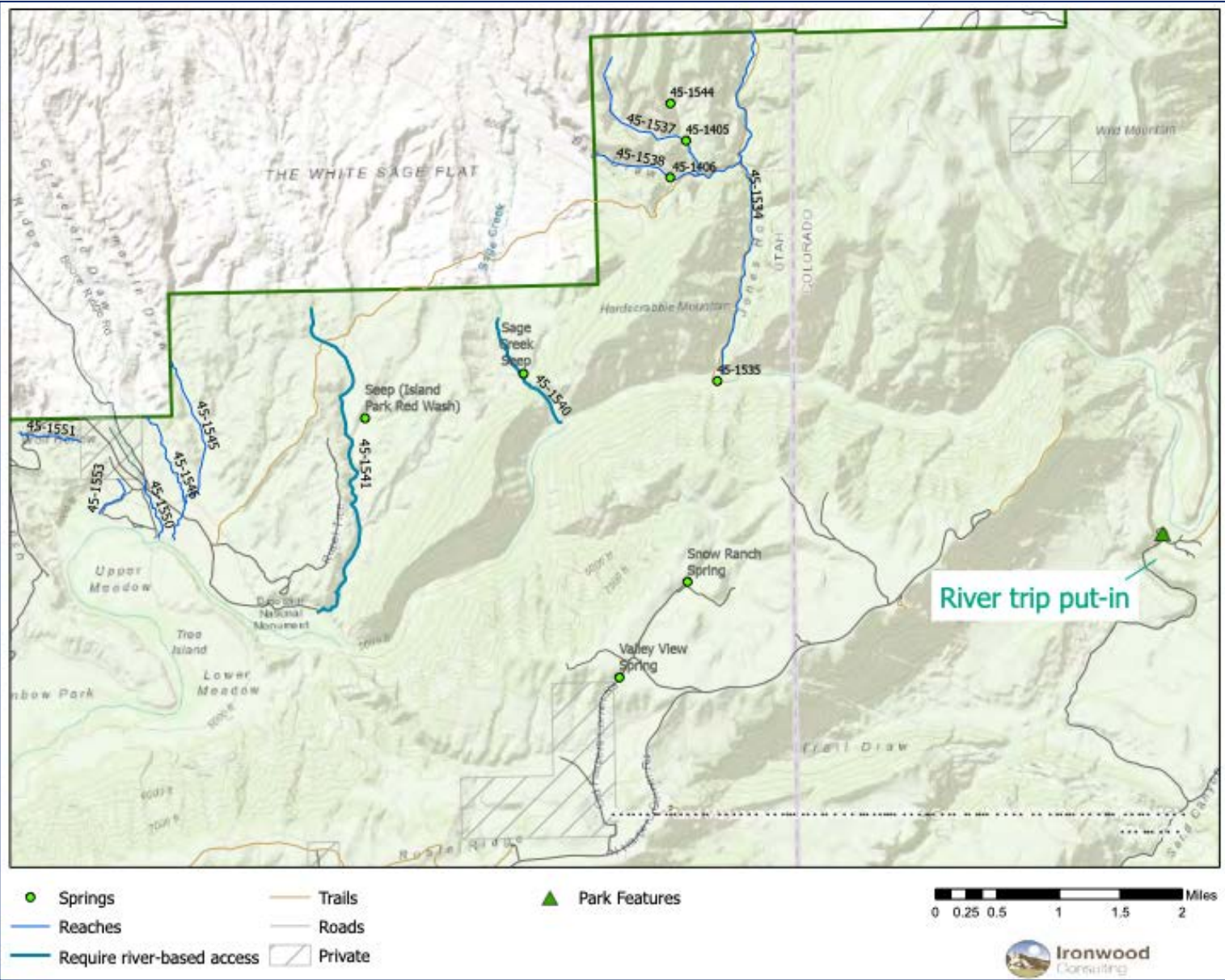


Figure A-7a. Dinosaur National Park East Overview with Priority Wetlands and Waters

Table A-7. Dinosaur National Park Priority Wetlands

Name	Water Right Claim Number	Priority for Survey	Type	Length Kilometers
Jones Hole Creek	45-1534	High	Point to Point Reach	4.97
Ely Creek	45-1537	High	Point to Point Reach	3.05
Big Draw	45-1538	High	Point to Point Reach	1.51
Sage Creek	45-1540	High	Point to Point Reach	1.75
Red Wash	45-1541	High	Point to Point Reach	4.87
Limekiln Draw	45-1545	High	Point to Point Reach	2.1
Graveyard Draw	45-1546	High	Point to Point Reach	1.97
Garden Creek	45-1550	High	Point to Point Reach	0.89
Wolf Hollow	45-1551	High	Point to Point Reach	0.91
Wolf Hollow	45-1553	High	Point to Point Reach	0.69
Rainbow Draw	45-1557	High	Point to Point Reach	1.95
Gorge Draw	45-1558	High	Point to Point Reach	2.61
Stone Bridge Draw	45-1559	High	Point to Point Reach	0.46
Stone Bridge Draw	45-1560	?	Point to Point Reach	1.28
Stone Bridge Draw	45-1566	High	Point to Point Reach	2.27
Indian Draw	45-1567	High	Point to Point Reach	1.67
Indian Draw	45-1569	High	Point to Point Reach	1.26
Indian Draw	45-1570	high	Point to Point Reach	1.16
Horse Trail Canyon Creek	45-1571	High	Point to Point Reach	0.63
Mitten Canyon Creek	45-1572	High	Point to Point Reach	2.6
Cottonwood Wash	45-1575	High	Point to Point Reach	5.6
Red Wash	45-1577	High	Point to Point Reach	6.16
Red Wash	45-1579	High	Point to Point Reach	4.23
Red Wash	45-1581	High	Point to Point Reach	0.5
Orchard Draw	45-1591	High	Point to Point Reach	0.82
Orchard Draw	45-1593	High	Point to Point Reach	0.98
West Gorge Draw	45-1615	High	Point to Point Reach	1.2
Ely Spring	45-1405	High	Spring	–

Name	Water Right Claim Number	Priority for Survey	Type	Length Kilometers
Big Draw Spring	45-1406	High	Spring	—
Unnamed Spring	45-1535	High	Spring	—
Spring (Labyrinths)	45-1544	High	Spring	—
McKee Springs	45-1563	?	Seep	—
Indian Spring	45-1568	High	Spring	—
Mitten Canyon Warm Spring	45-1573	High	Spring	—
Cottonwood Spring (Skanky Seep)	45-1576	High	Spring	—
Red Spring	45-1578	High	Spring	—
Red Wash Spring 1	45-1582	High	Spring	—
Red Wash Spring 2	45-1583	High	Seep	—
Red Wash Spring 3	45-1590	High	Spring	—
Quarry East Spring	45-2775	High	Spring	—
Spring (West Boundary)	45-2816	High	Spring	—
Unnamed spring	45-2817	High	Spring	—
Ainge Spring	45-3120	—	Spring	—
Hanging Spring	None	High	Spring	—
Hidden Forest Spring	None	High	Spring	—
Juniper Spring	None	High	Spring	—
Little Rainbow Seep 1	None	High	Seep	—
Little Rainbow Seep 2	None	High	Seep	—
Mid-Joint Spring	None	High	Spring	—
Quarry West Spring	None	High	Spring	—
Sage Creek Seep	None	High	Seep	—
Seep (Island Park Red Wash)	None	High	Seep	—
Snow Ranch Spring	None	High	Spring	—
Split Mountain Warm Spring	None	High	Spring	—
Tamarisk Spring	None	High	Spring	—
Valley View Spring	None	High	Spring	—

APPENDIX B – NCPN Target Species List

Table B-1. NCPN Wetland Target Species List

Family	Species	Lifeform	Nativity	Wetland Satus	BLCA	BRCA	CARE	CEBR	COLM	CURE	DINO
Adiantaceae	<i>Adiantum capillus-veneris</i>	Fern	Native	FACW	—	—	present	—	—	—	present
Alismataceae	<i>Alisma triviale</i>	Forb	Native	OBL	—	—	—	—	—	—	present
Alismataceae	<i>Sagittaria cuneata</i>	Forb	Native	OBL	—	—	present	—	—	—	—
Anacardiaceae	<i>Rhus trilobata</i>	Shrub	Native	FACW	—	present	present	—	—	—	present
Apiaceae	<i>Angelica ampla</i>	Forb	Native	FACW	—	—	—	—	—	present	—
Apiaceae	<i>Berula erecta</i>	Forb	Native	OBL	—	present	—	—	—	—	present
Apiaceae	<i>Cicuta maculata</i>	Forb	Native	OBL	—	—	present	—	—	present	—
Apiaceae	<i>Conioselinum scopulorum</i>	Forb	Native	FACW	—	—	—	—	—	present	—
Apiaceae	<i>Oxypolis fendleri</i>	Forb	Native	OBL	—	—	—	—	—	present	—
Apiaceae	<i>Sium suave</i>	Forb	Native	OBL	—	—	—	—	—	present	—
Asclepiadaceae	<i>Asclepias incarnata</i>	Forb	Native	OBL	—	—	—	—	—	—	present
Asclepiadaceae	<i>Asclepias speciosa</i>	Forb	Native	FACW	present	present	present	—	present	present	present
Asteraceae	<i>Acroptilon repens</i>	Forb	NonNative	FACW	present	present	present	—	present	present	present
Asteraceae	<i>Almutaster pauciflorus</i>	Forb	Native	FACW	—	—	present	—	—	—	—
Asteraceae	<i>Arnica chamissonis</i>	Forb	Native	FACW	—	present	—	—	—	present	—
Asteraceae	<i>Artemisia biennis</i>	Forb	Native	FACW	—	—	—	—	present	present	present
Asteraceae	<i>Baccharis salicina</i>	Shrub	Native	FACW	—	—	present	—	—	—	—
Asteraceae	<i>Brickellia longifolia</i>	Shrub	Native	FACW	present	—	present	—	present	—	—
Asteraceae	<i>Chrysothamnus linifolius</i>	Shrub	Native	FACW	—	present	present	—	—	—	present
Asteraceae	<i>Cirsium parryi</i>	Forb	Native	FACW	—	—	—	—	—	present	—
Asteraceae	<i>Cirsium scariosum</i>	Forb	Native	OBL	—	present	—	—	—	—	—
Asteraceae	<i>Crepis runcinata</i>	Forb	Native	FACW	—	present	present	—	—	—	present
Asteraceae	<i>Erigeron glabellus</i>	Forb	Native	FACW	—	—	—	—	—	present	present
Asteraceae	<i>Erigeron lonchophyllus</i>	Forb	Native	FACW	—	present	present	—	—	—	—
Asteraceae	<i>Erigeron peregrinus</i>	Forb	Native	FACW	—	—	—	present	—	—	—
Asteraceae	<i>Erigeron sionis</i>	Forb	Native	FACW	—	—	—	present	—	—	—
Asteraceae	<i>Eupatorium maculatum</i>	Forb	Native	OBL	—	—	—	—	—	—	present
Asteraceae	<i>Euthamia occidentalis</i>	Forb	Native	OBL	present	—	present	—	present	—	present
Asteraceae	<i>Helenium autumnale</i>	Forb	Native	FACW	—	—	—	—	—	—	present
Asteraceae	<i>Helianthus nuttallii</i>	Forb	Native	FACW	—	—	present	—	—	present	present
Asteraceae	<i>Iva axillaris</i>	Forb	Native	FACW	—	present	present	—	present	—	present
Asteraceae	<i>Packera pseud aurea</i>	Forb	Native	FACW	—	—	—	—	—	present	—
Asteraceae	<i>Senecio hydrophilus</i>	Forb	Native	OBL	—	present	—	—	—	—	—
Asteraceae	<i>Senecio triangularis</i>	Forb	Native	OBL	—	—	—	—	—	present	—

Family	Species	Lifeform	Nativity	Wetland Satus	BLCA	BRCA	CARE	CEBR	COLM	CURE	DINO
Asteraceae	<i>Solidago gigantea</i>	Forb	Native	FACW	—	—	—	—	—	—	present
Asteraceae	<i>Solidago missouriensis</i>	Forb	Native	FACW	—	—	—	—	—	—	present
Asteraceae	<i>Solidago nana</i>	Forb	Native	FACW	—	—	—	—	—	—	present
Asteraceae	<i>Symphyotrichum lanceolatum</i>	Forb	Native	OBL	—	present	—	—	present	present	present
Asteraceae	<i>Symphyotrichum welshii</i>	Forb	Native	OBL	—	—	present	present	—	—	—
Asteraceae	<i>Vernonia marginata</i>	Forb	Native	FACW	—	—	present	—	—	—	—
Betulaceae	<i>Alnus incana</i>	Shrub	Native	FACW	present	—	present	—	—	present	present
Betulaceae	<i>Betula occidentalis</i>	Tree	Native	FACW	—	present	present	present	present	present	present
Betulaceae	<i>Betula pendula</i>	Tree	NonNative	FACW	—	—	present	—	—	—	—
Betulaceae	<i>Ostrya knowltonii</i>	Tree	Native	FACW	—	—	present	—	—	—	—
Boraginaceae	<i>Mertensia arizonica</i>	Forb	Native	FACW	present	present	—	present	—	—	—
Boraginaceae	<i>Mertensia ciliata</i>	Forb	Native	OBL	present	—	—	—	—	present	—
Brassicaceae	<i>Barbarea orthoceras</i>	Forb	Native	OBL	—	—	—	—	—	present	—
Brassicaceae	<i>Cardamine cordifolia</i>	Forb	Native	FACW	—	—	—	present	—	present	—
Brassicaceae	<i>Rorippa curvipes</i>	Forb	Native	OBL	—	—	—	present	—	—	—
Brassicaceae	<i>Rorippa nasturtium-aquaticum</i>	Forb	NonNative	OBL	—	—	present	—	—	present	present
Brassicaceae	<i>Rorippa palustris</i>	Forb	Native	OBL	—	—	—	present	—	present	—
Brassicaceae	<i>Rorippa sinuata</i>	Forb	Native	FACW	—	—	—	—	—	present	—
Brassicaceae	<i>Rorippa teres</i>	Forb	Native	OBL	—	—	—	—	—	present	—
Campanulaceae	<i>Lobelia cardinalis</i>	Forb	Native	OBL	—	—	present	—	—	—	—
Caryophyllaceae	<i>Stellaria longifolia</i>	Forb	Native	FACW	—	—	—	—	—	present	—
Caryophyllaceae	<i>Stellaria longipes</i>	Forb	Native	FACW	—	present	present	present	—	—	—
Chenopodiaceae	<i>Allenrolfea occidentalis</i>	Shrub	Native	FACW	—	—	present	—	—	—	—
Cornaceae	<i>Cornus sericea</i>	Shrub	Native	FACW	present	present	present	present	—	present	present
Crassulaceae	<i>Rhodiola rhodantha</i>	Forb	Native	FACW	—	—	—	present	—	—	—
Cyperaceae	<i>Carex aquatilis</i>	Graminoid	Native	OBL	—	—	—	present	—	present	—
Cyperaceae	<i>Carex aurea</i>	Graminoid	Native	OBL	—	present	present	present	—	present	present
Cyperaceae	<i>Carex capillaris</i>	Graminoid	Native	FACW	—	—	—	present	—	—	—
Cyperaceae	<i>Carex curatorum</i>	Graminoid	Native	OBL	—	—	—	—	—	—	present
Cyperaceae	<i>Carex deweyana</i>	Graminoid	Native	FACW	—	—	—	—	—	present	—
Cyperaceae	<i>Carex gynocrates</i>	Graminoid	Native	OBL	—	—	—	present	—	—	—
Cyperaceae	<i>Carex hystericina</i>	Graminoid	Native	OBL	—	—	present	—	—	—	present
Cyperaceae	<i>Carex illota</i>	Graminoid	Native	OBL	—	—	—	—	—	—	present
Cyperaceae	<i>Carex interior</i>	Graminoid	Native	FACW	—	present	—	present	—	—	—
Cyperaceae	<i>Carex nebrascensis</i>	Graminoid	Native	OBL	—	present	present	—	present	present	present
Cyperaceae	<i>Carex norvegica</i>	Graminoid	Native	FACW	—	—	—	present	—	—	—
Cyperaceae	<i>Carex parryana</i>	Graminoid	Native	FACW	—	—	—	—	—	—	present
Cyperaceae	<i>Carex pellita</i>	Graminoid	Native	OBL	present	present	present	present	—	present	present

Family	Species	Lifeform	Nativity	Wetland Satus	BLCA	BRCA	CARE	CEBR	COLM	CURE	DINO
Cyperaceae	<i>Carex praeegracilis</i>	Graminoid	Native	FACW	present	present	present	—	—	—	present
Cyperaceae	<i>Carex saxatilis</i>	Graminoid	Native	OBL	—	—	—	present	—	—	—
Cyperaceae	<i>Carex simulata</i>	Graminoid	Native	OBL	—	present	—	—	—	—	—
Cyperaceae	<i>Carex utriculata</i>	Graminoid	Native	OBL	—	present	—	present	—	present	—
Cyperaceae	<i>Carex vesicaria</i>	Graminoid	Native	OBL	—	—	—	present	—	—	—
Cyperaceae	<i>Carex viridula</i>	Graminoid	Native	OBL	—	present	—	—	—	—	—
Cyperaceae	<i>Eleocharis acicularis</i>	Graminoid	Native	OBL	—	—	present	—	—	—	—
Cyperaceae	<i>Eleocharis bolanderi</i>	Graminoid	Native	FACW	present	—	—	—	—	—	—
Cyperaceae	<i>Eleocharis palustris</i>	Graminoid	Native	OBL	—	present	present	present	—	—	present
Cyperaceae	<i>Eleocharis quinqueflora</i>	Graminoid	Native	OBL	—	present	present	present	—	—	present
Cyperaceae	<i>Schoenoplectus acutus</i>	Graminoid	Native	OBL	—	—	present	—	—	—	present
Cyperaceae	<i>Schoenoplectus americanus</i>	Graminoid	Native	OBL	—	—	present	—	—	—	—
Cyperaceae	<i>Schoenoplectus lacustris</i>	Graminoid	Native	OBL	—	—	—	—	present	—	—
Cyperaceae	<i>Schoenoplectus maritimus</i>	Graminoid	Native	OBL	—	—	present	—	present	—	present
Cyperaceae	<i>Schoenoplectus pungens</i>	Graminoid	Native	OBL	—	present	present	—	present	—	present
Cyperaceae	<i>Schoenoplectus tabernaemontani</i>	Graminoid	Native	OBL	—	—	—	—	—	—	present
Cyperaceae	<i>Scirpus microcarpus</i>	Graminoid	Native	OBL	—	—	—	—	—	present	—
Cyperaceae	<i>Scirpus pallidus</i>	Graminoid	Native	OBL	—	—	—	—	—	—	present
Elaeagnaceae	<i>Shepherdia argentea</i>	Shrub	Native	FACW	—	present	present	—	present	—	—
Equisetaceae	<i>Equisetum hyemale</i>	Fern	Native	FACW	present	—	present	present	present	—	present
Equisetaceae	<i>Equisetum laevigatum</i>	Fern	Native	FACW	present	present	present	present	present	present	present
Equisetaceae	<i>Equisetum variegatum</i>	Fern	Native	FACW	—	—	—	present	—	—	—
Ericaceae	<i>Pyrola chlorantha</i>	Forb	Native	FACW	—	present	—	present	—	present	—
Fabaceae	<i>Trifolium fragiferum</i>	Forb	NonNative	FACW	—	—	present	—	—	—	—
Fumariaceae	<i>Corydalis caseana</i>	Forb	Native	FACW	—	—	—	—	—	present	—
Grossulariaceae	<i>Ribes aureum</i>	Shrub	Native	FACW	—	—	present	—	—	—	present
Grossulariaceae	<i>Ribes lacustre</i>	Shrub	Native	FACW	—	—	—	—	—	present	—
Hippuridaceae	<i>Hippuris vulgaris</i>	Forb	Native	OBL	—	—	present	—	—	present	—
Hydrocharitaceae	<i>Elodea canadensis</i>	Forb	Native	OBL	—	—	—	—	—	present	—
Hypericaceae	<i>Hypericum scouleri</i>	Forb	Native	FACW	present	present	—	—	—	present	—
Iridaceae	<i>Iris missouriensis</i>	Forb	Native	OBL	—	present	present	present	—	present	present
Iridaceae	<i>Sisyrinchium demissum</i>	Forb	Native	OBL	—	—	present	—	—	—	—
Iridaceae	<i>Sisyrinchium idahoense</i>	Forb	Native	OBL	—	present	—	—	—	present	present
Juncaceae	<i>Juncus alpinoarticulatus</i>	Graminoid	Native	OBL	—	—	present	—	—	—	—
Juncaceae	<i>Juncus balticus</i> var. <i>montanus</i>	Graminoid	Native	FACW	present	present	present	present	present	present	present
Juncaceae	<i>Juncus compressus</i>	Graminoid	NonNative	OBL	—	—	—	—	present	—	present
Juncaceae	<i>Juncus longistylis</i>	Graminoid	Native	FACW	present	present	present	present	present	present	present
Juncaceae	<i>Juncus mertensianus</i>	Graminoid	Native	OBL	—	—	—	present	—	—	—
Juncaceae	<i>Juncus nodosus</i>	Graminoid	Native	OBL	—	—	—	—	—	present	—

Family	Species	Lifeform	Nativity	Wetland Satus	BLCA	BRCA	CARE	CEBR	COLM	CURE	DINO
Juncaceae	<i>Juncus saximontanus</i>	Graminoid	Native	FACW	present	present	present	present	present	—	present
Juncaceae	<i>Juncus tenuis</i> var. <i>dudleyi</i>	Graminoid	Native	FACW	present	—	—	—	—	present	—
Juncaceae	<i>Juncus torreyi</i>	Graminoid	Native	FACW	—	present	present	—	present	—	—
Juncaceae	<i>Juncus tracyi</i>	Graminoid	Native	FACW	—	—	—	—	present	present	—
Juncaginaceae	<i>Triglochin concinna</i>	Graminoid	Native	OBL	—	present	—	—	—	—	—
Juncaginaceae	<i>Triglochin maritima</i>	Graminoid	Native	OBL	—	present	present	—	—	—	—
Juncaginaceae	<i>Triglochin palustris</i>	Graminoid	Native	OBL	—	present	—	—	—	—	—
Lamiaceae	<i>Lycopus americanus</i>	Forb	Native	OBL	—	—	—	—	—	—	present
Lamiaceae	<i>Lycopus asper</i>	Forb	Native	OBL	—	—	present	—	—	—	—
Lamiaceae	<i>Mentha arvensis</i>	Forb	Native	FACW	present	present	present	—	—	present	present
Lamiaceae	<i>Mentha spicata</i>	Forb	NonNative	FACW	—	—	present	—	—	—	—
Lamiaceae	<i>Mentha x piperita</i>	Forb	NonNative	OBL	—	—	present	—	—	—	—
Lamiaceae	<i>Scutellaria galericulata</i>	Forb	Native	OBL	—	—	present	—	—	present	present
Lamiaceae	<i>Stachys palustris</i>	Forb	Native	OBL	—	—	present	—	—	—	—
Lemnaceae	<i>Lemna minor</i>	Forb	Native	OBL	present	—	—	—	—	present	—
Lentibulariaceae	<i>Utricularia macrorhiza</i>	Forb	Native	OBL	—	—	present	—	—	present	—
Liliaceae	<i>Streptopus amplexifolius</i>	Forb	Native	FACW	—	—	—	—	—	present	—
Liliaceae	<i>Veratrum californicum</i>	Forb	Native	FACW	—	—	—	—	—	present	—
Liliaceae	<i>Zigadenus vaginatus</i>	Forb	Native	OBL	—	—	—	—	—	—	present
Malvaceae	<i>Sidalcea candida</i>	Forb	Native	FACW	—	—	—	—	—	present	—
Malvaceae	<i>Sidalcea neomexicana</i>	Forb	Native	FACW	—	—	—	—	—	present	—
Oleaceae	<i>Forestiera pubescens</i>	Shrub	Native	FACW	—	—	—	—	present	—	—
Oleaceae	<i>Fraxinus pennsylvanica</i>	Tree	Native	FACW	—	—	present	—	—	—	—
Onagraceae	<i>Epilobium hornemannii</i>	Forb	Native	FACW	—	—	present	present	—	—	—
Onagraceae	<i>Oenothera elata</i>	Forb	Native	FACW	—	—	—	—	—	present	present
Onagraceae	<i>Oenothera flava</i>	Forb	Native	FACW	—	present	—	present	—	present	present
Onagraceae	<i>Oenothera longissima</i>	Forb	Native	OBL	—	—	present	—	—	—	—
Ophioglossaceae	<i>Botrychium lunaria</i>	Fern	Native	FACW	—	—	—	present	—	—	—
Orchidaceae	<i>Epipactis gigantea</i>	Forb	Native	OBL	—	present	present	present	—	—	present
Orchidaceae	<i>Platanthera dilatata</i>	Forb	Native	FACW	—	—	—	present	—	—	—
Orchidaceae	<i>Platanthera hyperborea</i>	Forb	Native	FACW	—	—	present	present	—	—	—
Orchidaceae	<i>Platanthera sparsiflora</i>	Forb	Native	FACW	—	present	present	present	—	—	—
Orchidaceae	<i>Platanthera stricta</i>	Forb	Native	FACW	—	—	—	—	—	present	—
Orchidaceae	<i>Platanthera zothecina</i>	Forb	Native	OBL	—	—	present	—	—	—	present
Orchidaceae	<i>Spiranthes romanzoffiana</i>	Forb	Native	FACW	—	—	—	—	—	—	present
Poaceae	<i>Agrostis exarata</i>	Graminoid	Native	FACW	—	—	present	—	—	—	—
Poaceae	<i>Agrostis stolonifera</i>	Graminoid	NonNative	FACW	—	present	present	present	present	—	present
Poaceae	<i>Alopecurus aequalis</i>	Graminoid	Native	OBL	present	—	present	—	—	present	present

Family	Species	Lifeform	Nativity	Wetland Satus	BLCA	BRCA	CARE	CEBR	COLM	CURE	DINO
Poaceae	<i>Alopecurus pratensis</i>	Graminoid	NonNative	FACW	—	—	—	—	—	present	present
Poaceae	<i>Andropogon glomeratus</i>	Graminoid	Native	FACW	—	—	present	—	—	—	—
Poaceae	<i>Calamagrostis canadensis</i>	Graminoid	Native	OBL	—	—	—	—	—	present	—
Poaceae	<i>Calamagrostis stricta</i>	Graminoid	Native	FACW	present	present	present	present	—	present	—
Poaceae	<i>Catabrosa aquatica</i>	Graminoid	Native	OBL	—	—	—	—	—	present	present
Poaceae	<i>Dichanthelium acuminatum</i>	Graminoid	Native	FACW	—	—	present	—	—	—	present
Poaceae	<i>Glyceria borealis</i>	Graminoid	Native	OBL	—	—	—	—	—	present	—
Poaceae	<i>Glyceria elata</i>	Graminoid	Native	OBL	—	—	—	—	—	present	—
Poaceae	<i>Glyceria grandis</i>	Graminoid	Native	OBL	—	—	—	—	—	present	—
Poaceae	<i>Glyceria striata</i>	Graminoid	Native	OBL	—	present	present	present	present	present	present
Poaceae	<i>Hordeum brachyantherum</i>	Graminoid	Native	FACW	—	present	—	present	—	—	present
Poaceae	<i>Lolium arundinaceum</i>	Graminoid	NonNative	FACW	present	—	present	—	—	—	present
Poaceae	<i>Muhlenbergia andina</i>	Graminoid	Native	FACW	—	present	present	present	—	—	present
Poaceae	<i>Muhlenbergia asperifolia</i>	Graminoid	Native	FACW	present	present	present	—	present	—	present
Poaceae	<i>Phalaris arundinacea</i>	Graminoid	NonNative	OBL	present	present	present	—	—	present	present
Poaceae	<i>Phragmites australis</i>	Graminoid	Native	FACW	—	present	present	—	present	—	present
Poaceae	<i>Poa glaucifolia</i>	Graminoid	Native	FACW	present	—	—	—	—	—	—
Poaceae	<i>Poa palustris</i>	Graminoid	Native	FACW	—	—	present	—	—	present	—
Poaceae	<i>Polypogon viridis</i>	Graminoid	NonNative	OBL	—	—	present	—	—	—	—
Poaceae	<i>Puccinellia distans</i>	Graminoid	NonNative	OBL	—	—	present	—	—	—	—
Poaceae	<i>Puccinellia nuttalliana</i>	Graminoid	Native	OBL	—	present	present	—	present	—	—
Poaceae	<i>Spartina gracilis</i>	Graminoid	Native	FACW	—	present	present	—	—	—	—
Poaceae	<i>Spartina pectinata</i>	Graminoid	Native	OBL	—	—	—	—	present	—	present
Poaceae	<i>Sphenopholis obtusata</i>	Graminoid	Native	FACW	—	—	present	—	—	—	—
Polemoniaceae	<i>Polemonium occidentale</i>	Forb	Native	OBL	—	present	—	present	—	—	—
Polygonaceae	<i>Polygonum amphibium</i>	Forb	Native	OBL	—	—	—	—	—	present	—
Polygonaceae	<i>Polygonum amphibium</i> var. <i>emersum</i>	Forb	Native	OBL	—	—	—	—	—	present	—
Polygonaceae	<i>Rumex aquaticus</i> var. <i>fenestratus</i>	Forb	Native	OBL	—	present	—	present	—	present	—
Polygonaceae	<i>Rumex crispus</i>	Forb	NonNative	FACW	present	present	present	—	present	present	present
Potamogetonaceae	<i>Stuckenia filiformis</i>	Forb	Native	OBL	—	—	present	—	—	—	—
Primulaceae	<i>Dodecatheon pulchellum</i>	Forb	Native	FACW	—	present	—	present	—	present	present
Primulaceae	<i>Glaux maritima</i>	Forb	Native	OBL	—	—	present	—	—	—	—
Primulaceae	<i>Primula parryi</i>	Forb	Native	FACW	—	—	—	present	—	—	—
Primulaceae	<i>Primula specuicola</i>	Forb	Native	OBL	—	—	present	—	—	—	—
Ranunculaceae	<i>Aconitum columbianum</i>	Forb	Native	FACW	—	present	—	present	—	present	—
Ranunculaceae	<i>Aquilegia micrantha</i>	Forb	Native	OBL	present	—	present	—	present	—	present
Ranunculaceae	<i>Caltha leptosepala</i>	Forb	Native	OBL	—	—	—	present	—	—	—
Ranunculaceae	<i>Ranunculus alismifolius</i>	Forb	Native	FACW	—	—	—	present	—	—	—

Family	Species	Lifeform	Nativity	Wetland Satus	BLCA	BRCA	CARE	CEBR	COLM	CURE	DINO
Ranunculaceae	<i>Ranunculus cymbalaria</i>	Forb	Native	OBL	present	present	present	—	present	present	present
Ranunculaceae	<i>Ranunculus inamoenus</i>	Forb	Native	FACW	—	present	—	present	—	present	—
Ranunculaceae	<i>Ranunculus jovis</i>	Forb	Native	FACW	—	—	—	—	—	—	present
Ranunculaceae	<i>Ranunculus macounii</i>	Forb	Native	OBL	—	—	—	—	—	present	—
Rosaceae	<i>Argentina anserina</i>	Forb	Native	OBL	present	present	—	—	—	present	present
Rosaceae	<i>Dasiphora floribunda</i>	Shrub	Native	FACW	—	present	—	present	—	present	—
Rosaceae	<i>Geum macrophyllum</i>	Forb	Native	OBL	—	—	—	present	—	present	—
Rosaceae	<i>Potentilla plattensis</i>	Forb	Native	OBL	—	present	—	—	—	—	—
Rubiaceae	<i>Galium trifidum</i>	Vine	Native	OBL	—	present	—	—	—	—	—
Salicaceae	<i>Populus deltoides</i>	Tree	Native	FACW	present	—	—	—	present	present	—
Salicaceae	<i>Populus fremontii</i>	Tree	Native	FACW	—	present	present	—	—	—	present
Salicaceae	<i>Salix amygdaloides</i>	Tree	Native	FACW	—	—	present	—	present	—	present
Salicaceae	<i>Salix arizonica</i>	Shrub	Native	FACW	—	—	—	present	—	—	—
Salicaceae	<i>Salix bebbiana</i>	Shrub	Native	FACW	—	present	—	—	present	present	—
Salicaceae	<i>Salix boothii</i>	Shrub	Native	OBL	—	—	—	present	—	present	—
Salicaceae	<i>Salix brachycarpa</i>	Shrub	Native	FACW	—	present	—	present	—	—	—
Salicaceae	<i>Salix drummondiana</i>	Shrub	Native	FACW	—	—	—	—	—	present	—
Salicaceae	<i>Salix eriocephala</i>	Shrub	Native	OBL	—	present	present	—	—	—	present
Salicaceae	<i>Salix exigua</i>	Shrub	Native	OBL	—	present	present	present	—	—	present
Salicaceae	<i>Salix geyeriana</i>	Shrub	Native	FACW	—	present	—	—	—	present	—
Salicaceae	<i>Salix gooddingii</i>	Tree	Native	FACW	—	—	present	—	present	—	—
Salicaceae	<i>Salix lasiolepis</i>	Shrub	Native	FACW	—	—	present	—	—	—	—
Salicaceae	<i>Salix ligulifolia</i>	Shrub	Native	FACW	—	—	—	—	present	present	—
Salicaceae	<i>Salix lucida</i>	Shrub	Native	FACW	—	—	present	—	present	present	present
Salicaceae	<i>Salix lutea</i>	Shrub	Native	OBL	—	—	—	—	present	—	—
Salicaceae	<i>Salix monticola</i>	Shrub	Native	OBL	—	—	—	—	—	present	—
Saxifragaceae	<i>Parnassia palustris</i>	Forb	Native	OBL	—	present	present	present	—	—	present
Saxifragaceae	<i>Saxifraga odontoloma</i>	Forb	Native	FACW	—	—	—	present	—	present	—
Saxifragaceae	<i>Saxifraga rhomboidea</i>	Forb	Native	FACW	—	—	—	present	—	—	—
Saxifragaceae	<i>Sullivantia hapemanii</i>	Forb	Native	OBL	present	—	—	—	—	present	—
Scrophulariaceae	<i>Limosella aquatica</i>	Forb	Native	OBL	present	—	—	—	—	—	present
Scrophulariaceae	<i>Mimulus eastwoodiae</i>	Forb	Native	OBL	—	—	present	—	—	—	—
Scrophulariaceae	<i>Mimulus glabratus</i>	Forb	Native	OBL	—	—	present	—	present	present	—
Scrophulariaceae	<i>Mimulus guttatus</i>	Forb	Native	OBL	—	present	present	present	—	present	present
Scrophulariaceae	<i>Pedicularis groenlandica</i>	Forb	Native	OBL	—	—	—	present	—	—	—
Scrophulariaceae	<i>Veronica americana</i>	Forb	Native	OBL	present	present	present	present	—	present	present
Scrophulariaceae	<i>Veronica anagallis-aquatica</i>	Forb	Native	OBL	—	—	present	—	—	—	present
Scrophulariaceae	<i>Veronica catenata</i>	Forb	Native	OBL	present	—	—	—	present	present	—

Family	Species	Lifeform	Nativity	Wetland Satus	BLCA	BRCA	CARE	CEBR	COLM	CURE	DINO
Scrophulariaceae	<i>Veronica serpyllifolia</i>	Forb	Native	FACW	—	—	—	present	—	present	—
Tamaricaceae	<i>Tamarix chinensis</i>	Shrub	NonNative	FACW	present	present	present	present	present	present	present
Typhaceae	<i>Typha domingensis</i>	Forb	Native	OBL	—	—	present	—	—	—	—
Typhaceae	<i>Typha latifolia</i>	Forb	Native	OBL	present	present	present	—	present	present	present
Valerianaceae	<i>Valeriana edulis</i>	Forb	Native	FACW	—	present	—	present	—	present	—
Violaceae	<i>Viola nephrophylla</i>	Forb	Native	FACW	—	present	present	present	—	—	present
Zannichelliaceae	<i>Zannichellia palustris</i>	Forb	Native	OBL	present	—	present	—	—	—	—

APPENDIX C – Animal Sign Methodology

Animal use metric

Wetland veg inventory project, summer 2021

Target species: moose/elk, deer/sheep, bear, mountain lion, bison, recent cattle

- Record the presence of target species scat within vegetation quadrats. Calculate frequency at site.
- Record presence of target species scat or tracks noted during sampling. Turkey tracks are also of interest at BLCA/CURE. Presence will be noted by observation within the plots or within the boundary of the mapped wetland area.
- Record incidental observations of target species, turkeys, humans, and aquatic vertebrates (e.g., frogs, garter snakes, etc.).

Table C-8. Species presence indicators by Park

Species	BLCA	BRCA	CARE	CEBR	CURE	COLM	DINO
Black bear	x	x	x	x	X	X	X
Mountain lion	X	X	X	X	X	X	x
Moose	X	N/A	N/A	N/A	X	N/A	X
Elk	x	x	x	x	X	X	X
Mule deer	x	x	x	x	X	X	X
Bighorn sheep	x	X	x	N/A	X	X	X
Domestic sheep	Trespass	N/A	N/A	N/A	Active	N/A	Trespass (unlikely)
Cattle	Trespass	Trespass	Trespass/active	N/A	Trespass	N/A	Trespass
Bison	N/A	N/A	Southern springs (unlikely)	N/A	N/A	N/A	N/A

Distinguishing between moose, elk, deer, and sheep: Moose and elk scat is larger (Whoppers), and moose scat tends to have a shallow dish-shaped taper at one end. Deer and sheep scat are smaller in size (chocolate covered raisins), but sheep scat tends to have a peaked end, while deer scat is more rounded. Tracks may be difficult to distinguish, although again, moose and elk tracks are larger than deer or sheep. If these species can't be distinguished reliably, we can just use "ungulate" to incorporate all four or break into moose/elk and deer/sheep. It will be impossible to distinguish domestic sheep from bighorn sheep. See Figure G-1.

Bison vs cattle – Bison are very uncommon and only may occur at some springs in the southern section of Capitol Reef. According to a wildlife technician at Grand Canyon, bison manure more often occurs in "stacks" rather than the flatter manure "pies" common for cows. If you encounter any suspected bison manure at CARE, please document with a photograph. See Figure G-2.

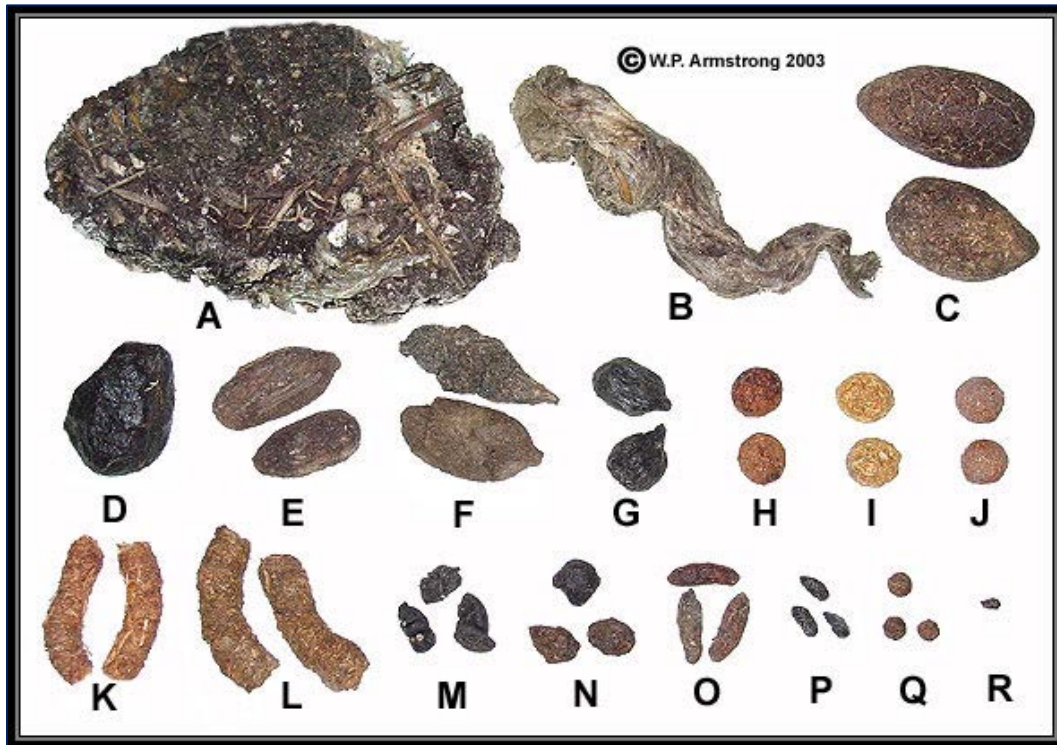


Figure C- 1. Scat of the Rocky Mountains from <https://www2.palomar.edu/users/warmstrong/scat.htm> accessed 2/16/2021. A = bear, B = mountain lion, C = moose, D = elk, E = mule deer, G = bighorn sheep.



Figure C- 2. Bison manure from North Rim Grand Canyon

APPENDIX D – Field Gear List for Completing NCPN Seeps and Springs Mapping

Table D-1. NCPN Wetland Target Species List

Type	Plot gear item
Non-expendable	50 m fiberglass tape
	spherical densiometer, convex model
	laser rangefinder
	tablet with software/digital work plan/protocols/maps/fws species lists/previous photos if retaking
	graph paper
	dominance test workup sheet
	GPS receiver on monopod
	recreational grade GPS
	0.5 m2 aluminum plot frame
	camera with Solocator software loaded
	satellite communicator device or sat phone
	first aid kit
	extra batteries
	1 gallon Ziploc bag
	appropriate flora
	hand lens
	bricklayers hammer
	Tungsten carbide tipped scribe for CEBR and BRCA only
	2-pound sledge for CEBR and BRCA only
Expendable plot gear for CEBR and BRCA only	aluminum round cap for 1 in. OD pipe
	aluminum 3/4" conduit pipe permanent marking pins (each is 1.6 ft. in length)