National Park Service
U.S. Department of the Interior

Science Report NPS/SR—2024/130
https://doi.org/10.36967/2303818

Spring Wetland Flora Inventory — Dinosaur National Monument

Survey Report (Revised)



A Spring surveyed in Dinosaur National Monument.
NPS/IRONWOOD

Spring wetland flora inventory — Dinosaur National Monument: Survey report (revised)

Science Report NPS/SR—2024/130

Wendy McBride, Dave Tacheeni Kesonie, Emily Thorn

Ironwood Consulting
307 Alabama Street, Suite A
Redlands, CA 92373

Please cite this publication as:

McBride, W., D. T. Kesonie, and E. Thorn. 2024. Spring wetland flora inventory — Dinosaur National Monument: Survey report (revised). Science Report NPS/SR—2024/130. National Park Service, Fort Collins, Colorado. https://doi.org/10.36967/2303818

NPS 122/192044A, June 2024

The National Park Service Science Report Series disseminates information, analysis, and results of scientific studies and related topics concerning resources and lands managed by the National Park Service. The series supports the advancement of science, informed decisionmaking, and the achievement of the National Park Service mission.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible and technically accurate.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Government.

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

This report is available in digital format from the National Park Service DataStore and the Natural Resource Publications Management website. If you have difficulty accessing information in this publication, particularly if using assistive technology, please email irma@nps.gov.

Contents

Page

Figures....vi

Tables....viii

Appendices....xi

Abstract....xii

List of Terms....xiii

Acknowledgements....xiv

Introduction....1

Project Background....1

Project Objective, Goals, and Parameters....1

Project Locations....2

Methods and Materials....7

Pre-Survey Geospatial Analysis and Preparation....7

Goal 1: Documenting Wetland Species....7

Groundwater-Dependent Ecosystem Level II Methodology....7

Goal 2: Mapping Springs and Wetlands....10

Non-wetland Negative Data....12

GPS Settings and Accuracy....13

Goal 3: Representative Photos....13

Other Park Specific Metrics....13

Wildlife and Livestock Usage Metric....13

Recreation Impacts Metric....13

Spring Development Metric....14

DINO Specific Metrics....14

Data Management....14

Spatial Data....14

Tabular Data....15

Contents (continued)

Page

Data Accuracy and Quality 15

Results 16

Big Draw Spring (Site 45-1406a and Site 45-1406b) 18

Jones Hole Creek (Site 45-1534) 21

Unnamed Spring (Site 45-1535) 23

Ely Creek (Site 45-1537) 26

Sage Creek (Site 45-1540) 30

Red Wash (Site 45-1541) 33

Garden Creek (Site 45-1550) 38

McKee Springs (Site 45-1563) 41

Red Spring (Site 45-1578) 44

Red Wash Spring (Site 45-1582) 47

Quarry East Spring (Site 45-2775) 50

West Boundary Spring (Site 45-2816) 53

Ainge Spring (Site 45-3120) 56

Hanging Spring (Site DINO 27) 60

Hidden Forest Spring (Site DINO 29) 62

Juniper Spring (Site DINO 36) 64

Mid-Joint Spring (Site DINO 50) 68

Quarry West Spring (Site DINO 62) 72

Snow Ranch Spring (Site DINO 74) 75

Valley View Spring (Site DINO 85) 78

Split Mountain Warm Spring (Site DINO 86) 81

Sage Creek Seep (Site DINO 173) 84

Seep (Island Park Red Wash; Site DINO 192) 87

Little Rainbow Seep 1 (Site DINO 196) 90

Contents (continued)

Page

Little Rainbow Seep 2 (Site DINO 197) 93

Literature Cited 96

Figures

Page

Figure 1. Dinosaur National Monument West Overview with Priority Wetlands and Waters. 3

Figure 2. Dinosaur National Monument East Overview with Priority Wetlands and Waters. 4

Figure 3. Wetland mapping for site 45-1406-A and 45-1406-B (BC1). 9

Figure 4. Wetland mapping for site 45-1534. 22

Figure 5. Wetland mapping for site 45-1535. 24

Figure 6. Wetland mapping for site 45-1537. 29

Figure 7. Wetland mapping for site 45-1540. 31

Figure 8. Wetland mapping for site 45-1534 (South). 34

Figure 9. Wetland mapping for site 45-1541; (North). 35

Figure 10. Wetland mapping for site 45-1534 (Reach). 36

Figure 11. Wetland mapping for site 45-1550. 39

Figure 12. Wetland mapping for site 45-1563. 42

Figure 13. Wetland mapping for site 45-1578. 45

Figure 14. Wetland mapping for site 45-1582. 48

Figure 15. Wetland mapping for site 45-2775. 51

Figure 16. Wetland mapping for site 45-2816. 54

Figure 17. Wetland mapping for site 45-3120. 57

Figure 18. Wetland mapping for sites 62 and 45-3120. 58

Figure 19. Wetland mapping for DINO 27. 61

Figure 20. Wetland mapping for DINO 29. 63

Figure 21. Wetland mapping for DINO 36 (Overview). 65

Figure 22. Wetland mapping for DINO 36 (GDE Site). 66

Figure 23. Wetland mapping for DINO 50 (Overview). 69

Figure 24. Wetland mapping for DINO 50 (GDE Site). 70

Figures (continued)

Page

Figure 25. Wetland mapping for DINO 62. 73

Figure 26. Wetland mapping for DINO 74. 76

Figure 27. Wetland mapping for DINO 85. 79

Figure 28. Wetland mapping for DINO 86. 82

Figure 29. Wetland mapping for DINO 173. 85

Figure 30. Wetland mapping for DINO 192. 88

Figure 31. Wetland mapping for DINO 196. 91

Figure 32. Wetland mapping for DINO 197. 94

Tables

Page

Table 1. Dinosaur National Monument Priority Survey Sites. 5

Table 2. Criteria for Determining Quadrat Number and Interval using GDE Level II. 10

Table 3. GPS Settings and Accuracy Parameters. 12

Table 4. List of surveyed sites identifying whether each was identified as a GDE or non-GDE. 16

Table 5. Herbaceous vegetation quadrat data for Site 45-1406-A. 18

Table 6. Groundcover quadrat data for Site 45-1406-A. 19

Table 7. Woody vegetation line intercept summary data for Site 45-1406-A. 19

Table 8. Herbaceous vegetation quadrat data for Site 45-1406-B. 20

Table 9. Groundcover quadrat data for Site 45-1406-B. 20

Table 10. Woody vegetation line intercept summary data for Site 45-1406-B. 21

Table 11. Herbaceous vegetation quadrat data for Site 45-1535. 25

Table 12. Groundcover quadrat data for Site 45-1535. 26

Table 13. Woody vegetation line intercept summary data for Site 45-1535. 26

Table 14. Herbaceous vegetation quadrat data for Site 45-1537. 27

Table 15. Groundcover quadrat data for Site 45-1537. 27

Table 16. Woody vegetation line intercept summary data for Site 45-1537. 28

Table 17. Herbaceous vegetation quadrat data for Site 45-1540. 32

Table 18. Groundcover quadrat data for Site 45-1540. 32

Table 19. Woody vegetation line intercept summary data for Site 45-1540. 33

Table 20. Herbaceous vegetation quadrat data for Site 45-1541. 37

Table 21. Groundcover quadrat data for Site 45-1541. 37

Table 22. Woody vegetation line intercept summary data for Site 45-1541. 38

Table 23. Herbaceous vegetation quadrat data for Site 45-1550. 40

Table 24. Groundcover quadrat data for Site 45-1550. 41

Table 25. Woody vegetation line intercept summary data for Site 45-1550. 41

Tables (continued)

Page

Table 26. Herbaceous vegetation quadrat data for Site 45-1563.....43
Table 27. Groundcover quadrat data for Site 45-1563.....44
Table 28. Woody vegetation line intercept summary data for Site 45-1563.....44
Table 29. Herbaceous vegetation quadrat data for Site 45-1578.....46
Table 30. Groundcover quadrat data for Site 45-1578.....46
Table 31. Woody vegetation line intercept summary data for Site 45-1578.....47
Table 32. Herbaceous vegetation and groundcover quadrat data for Site 45-1582.....49
Table 33. Groundcover quadrat data for Site 45-1582.....50
Table 34. Woody vegetation line intercept summary data for Site 45-1582.....50
Table 35. Herbaceous vegetation quadrat data for Site 45-2775.....52
Table 36. Groundcover quadrat data for Site 45-2775.....53
Table 37. Woody vegetation line intercept data for Site 45-2775.....53
Table 38. Herbaceous vegetation quadrat data for Site 45-2816.....55
Table 39. Groundcover quadrat data for Site 45-2816.....56
Table 40. Woody vegetation line intercept data for Site 45-2816.....56
Table 41. Herbaceous vegetation quadrat data for Site 45-3120.....59
Table 42. Groundcover quadrat data for Site 45-3120.....59
Table 43. Woody vegetation line intercept data for Site 45-3120.....60
Table 44. Herbaceous vegetation quadrat data for DINO 36.....67
Table 45. Groundcover quadrat data for DINO 36.....67
Table 46. Woody vegetation line intercept data for DINO 36.....68
Table 47. Herbaceous vegetation quadrat data for DINO 50.....71
Table 48. Groundcover quadrat data for DINO 50.....71
Table 49. Woody vegetation line intercept data for DINO 50.....72
Table 50. Herbaceous vegetation quadrat data for DINO 62.....74
Table 51. Groundcover quadrat data for DINO 62.....75

Tables (continued)

Page

Table 52. Woody vegetation line intercept data for DINO 62. 75
Table 53. Herbaceous vegetation and groundcover quadrat data for DINO 74. 77
Table 54. Groundcover quadrat data for DINO 74. 78
Table 55. Woody vegetation line intercept data for DINO 74. 78
Table 56. Herbaceous vegetation quadrat data for DINO 85. 80
Table 57. Groundcover quadrat data for DINO 85. 80
Table 58. Woody vegetation line intercept data for DINO 85. 81
Table 59. Herbaceous vegetation and groundcover quadrat data for DINO 86. 83
Table 60. Groundcover quadrat data for DINO 86. 84
Table 61. Woody vegetation line intercept data for DINO 86. 84
Table 62. Herbaceous vegetation quadrat data for DINO 173. 86
Table 63. Groundcover quadrat data for DINO 173. 87
Table 64. Woody vegetation line intercept data for DINO 173. 87
Table 65. Herbaceous vegetation quadrat data for DINO 192. 89
Table 66. Groundcover quadrat data for DINO 192. 90
Table 67. Woody vegetation line intercept data for DINO 192. 90
Table 68. Herbaceous vegetation quadrat data for DINO 196. 92
Table 69. Groundcover quadrat data for DINO 196. 92
Table 70. Woody vegetation line intercept data for DINO 196. 93
Table 71. Herbaceous vegetation quadrat data for DINO 197. 95
Table 72. Groundcover quadrat data for DINO 197. 95
Table 73. GDE Site Summary Table Locality Details. 97
Table 74. GDE Site Summary Table Wetland Feature. 99
Table 75. Frequency of scat or tracks found inside vegetation quadrats in percent. 102
Table 76. Animal sign (scat or tracks) observed outside vegetation quadrats. 102
Table 77. GDE Site Vascular Plant Inventory List. 103

Appendices

Page

Appendix A: GDE Site Summary Table Locality Details 97

Appendix B: GDE Site Summary Table Wetland Feature 99

Appendix C: GDE Site Wildlife Summary Table 102

Appendix D: GDE Site Vascular Plant Inventory List 103

Abstract

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

Survey results at Dinosaur National Monument identified and inventoried springs at 26 of 58 survey sites. This report summarizes the results at the 26 sites, including spring type identification, dominant herbaceous plant species present, average plant cover, wildlife sign frequency and observation, and wetland feature map figures.

List of Terms

°: degrees

%: percent

ac: acre

BLCA: Black Canyon of the Gunnison National Park

BRCA: Bryce Canyon National Park

CARE: Capitol Reef National Park

CEBR: Cedar Breaks National Monument

cm: centimeters

COLM: Colorado National Monument

CURE: Curecanti National Recreation Area

DINO: Dinosaur National Monument

FACW: facultative wetland

ft: feet

GDE: Groundwater-Dependent Ecosystem

GPS: Global Positioning System

m: meter

NCPN: Northern Colorado Plateau Network

NPS: National Park Service

OBL: obligate

m^2: square meter

USACE: U.S. Army Corps of Engineers

USDA: U.S. Department of Agriculture

Acknowledgements

This project was made possible through the support from the National Park Service Inventory and Monitoring Division.

Introduction

Project Background

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

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

Project Objective, Goals, and Parameters

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

The project's goals included:

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 have included rematches of historic photos.

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

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

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

Project Locations

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

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

This report describes the approach and summarizes and summarizes the results of mapping and surveys at the DINO. The priority survey sites identified by DINO staff occur on the Utah side of DINO and most require verification to inform the potential for adjudication of diligence rights on their sources. The priority sites are found in Figures 1 and 2, and Table 1.

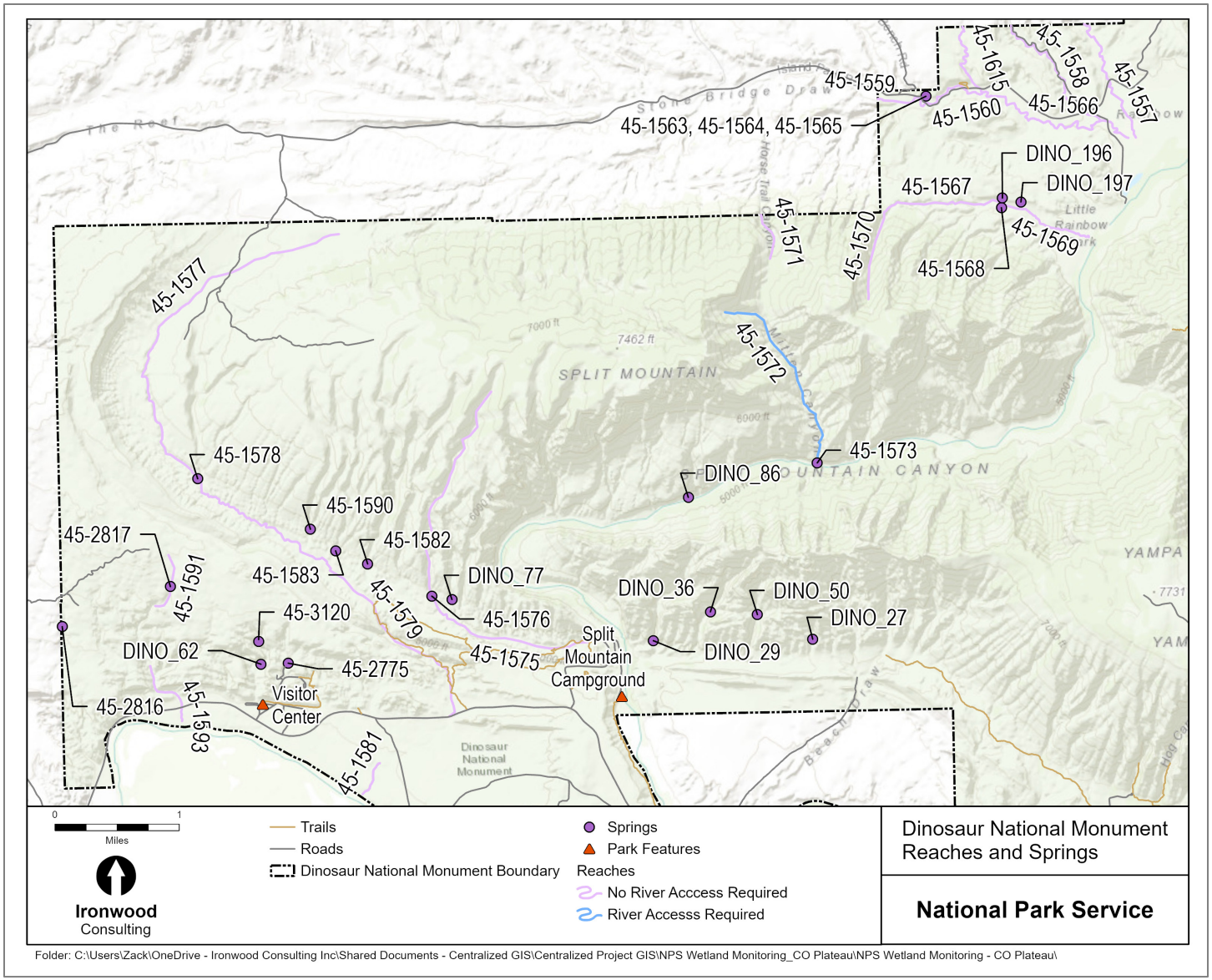


Figure 1. Dinosaur National Monument West Overview with Priority Wetlands and Waters.

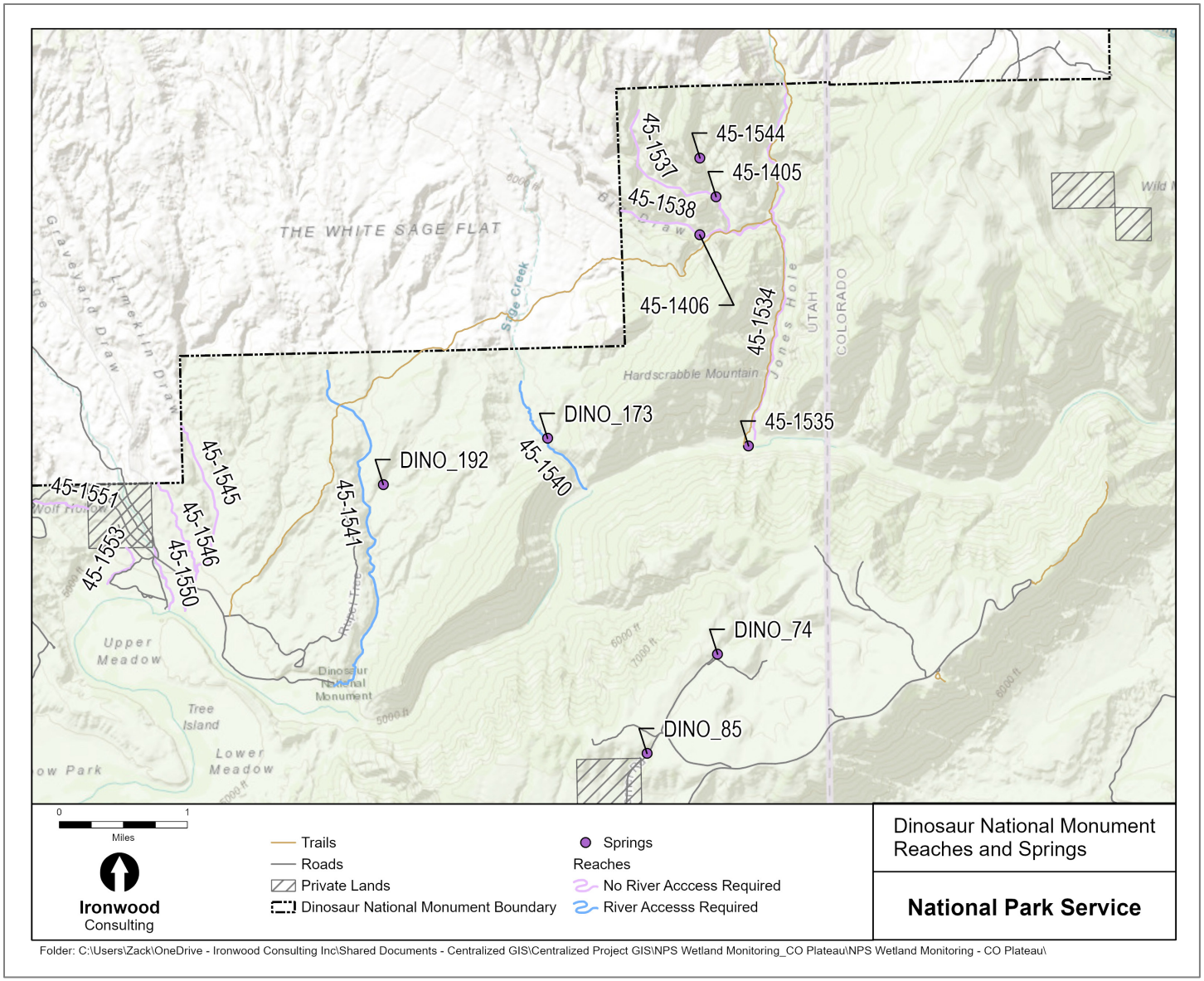


Figure 2. Dinosaur National Monument East Overview with Priority Wetlands and Waters.

Table 1. Dinosaur National Monument Priority Survey Sites.

Site Name	Water Right Claim Number	Priority for Survey	Type	Length (km) *
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	High	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	–
Big Draw Spring	45-1406	High	Spring	–
Unnamed Spring	45-1535	High	Spring	–
Spring (Labyrinths)	45-1544	High	Spring	–
McKee Springs	45-1563	High	Seep	–
Indian Spring	45-1568	High	Spring	–
Mitten Canyon Warm Spring	45-1573	High	Spring	–
Cottonwood Spring (Skanky Seep)	45-1576	High	Spring	–

* Kilometer (km).

Table 1 (continued). Dinosaur National Monument Priority Survey Sites.

Site Name	Water Right Claim Number	Priority for Survey	Type	Length (km) *
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	High	Spring	–
Hanging Spring (DINO 27)	None	High	Spring	–
Hidden Forest Spring (DINO 29)	None	High	Spring	–
Juniper Spring (DINO 36)	None	High	Spring	–
Little Rainbow Seep 1 (DINO 196)	None	High	Seep	–
Little Rainbow Seep 2 (DINO 197)	None	High	Seep	–
Mid-Joint Spring (DINO 50)	None	High	Spring	–
Quarry West Spring (DINO 62)	None	High	Spring	–
Sage Creek Seep (DINO 173)	None	High	Seep	–
Seep (Island Park Red Wash; (DINO 192)	None	High	Seep	–
Snow Ranch Spring (DINO 74)	None	High	Spring	–
Split Mountain Warm Spring (DINO 86)	None	High	Spring	–
Tamarisk Spring (DINO 77)	None	High	Spring	–
Valley View Spring (DINO 85)	None	High	Spring	–

* Kilometer (km).

Methods and Materials

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

Pre-Survey Geospatial Analysis and Preparation

Geographic Information Systems (GIS) data provided by NPS was used to analyze the location, number, and if possible, the rough size of seeps, springs, and wetlands to be mapped and evaluated (Figures 1 and 2, Table 1). Each survey site was assigned a unique general identification code.

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

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

Goal 1: Documenting Wetland Species

At each survey site, a modified version of the U.S. Department of Agriculture (USDA) Groundwater-Dependent Ecosystem (GDE) Level II Methodology (USDA 2012) was used as the field protocol to document wetland species (when a groundwater-dependent wetland was present). The full protocol, with non-applicable text redlined, is available in the Ironwood Work Plan (Ironwood 2021b); modifications are described in Section 2.2.1.

Groundwater-Dependent Ecosystem Level II Methodology

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

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

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

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

The wetland perimeter was mapped (see Goal 2: Mapping Springs and Wetlands), and the area and long axis of the wetland were determined. Each end of the long axis was marked using a sub-meter GPS and labeled "Long axis start" and "Long axis end." Next, a measuring tape was run between these two points, with the origin at the Long axis start. Transects were oriented perpendicular to the bearing of long axis, with the transect origin placed on the left side of the long axis, as determined when standing at the Long axis start and facing the Long axis end. Compass bearings were determined at all sites using a declination of 10 degrees [°] east. The first transect began near the Long axis start and was placed perpendicular to the long axis line. Quadrats were then placed at regular intervals along each transect. Transect and quadrat intervals are outlined in Figure 3.

In each quadrat, visual cover was measured for each plant species using a 0.5-square meter (m^2) quadrat at a quantity and interval determined by the area of the wetland after mapping the wetland boundary (Table 2). A cut-level was used when recording visual cover estimates. Plants within the quadrat with visually estimated cover below the cut-level were not recorded. The typical cut-level for sites was 1%, and the largest cut-level used was 3%. Only a single GDE site at DINO (DINO 74) used a cut-level other than 1%, and this site documented all plant species regardless of cover due to its small size and lack of diversity. Quadrats were placed along the left side of the perpendicular transect tape, as determined by looking down the transect from its origin. A random number generator was used to determine a value between 0.0 m and the quadrat interval distance (minus 0.5 m) when placing the first quadrat. The quadrat started at the point corresponding to the distance number along the transect and extended 0.5 m beyond this point. After the first quadrat was randomly located, the set interval was used for all subsequent quadrats until the entire quadrat could no longer fit inside the wetland boundary along that transect. This process was repeated for each transect. The total number of transects at a DINO using this methodology ranged from 1 to 13, and the total number of quadrats at each site ranged from 3 to 25. Details about the number of transects and quadrats used at each GDE site are found in the DINO data deliverable.

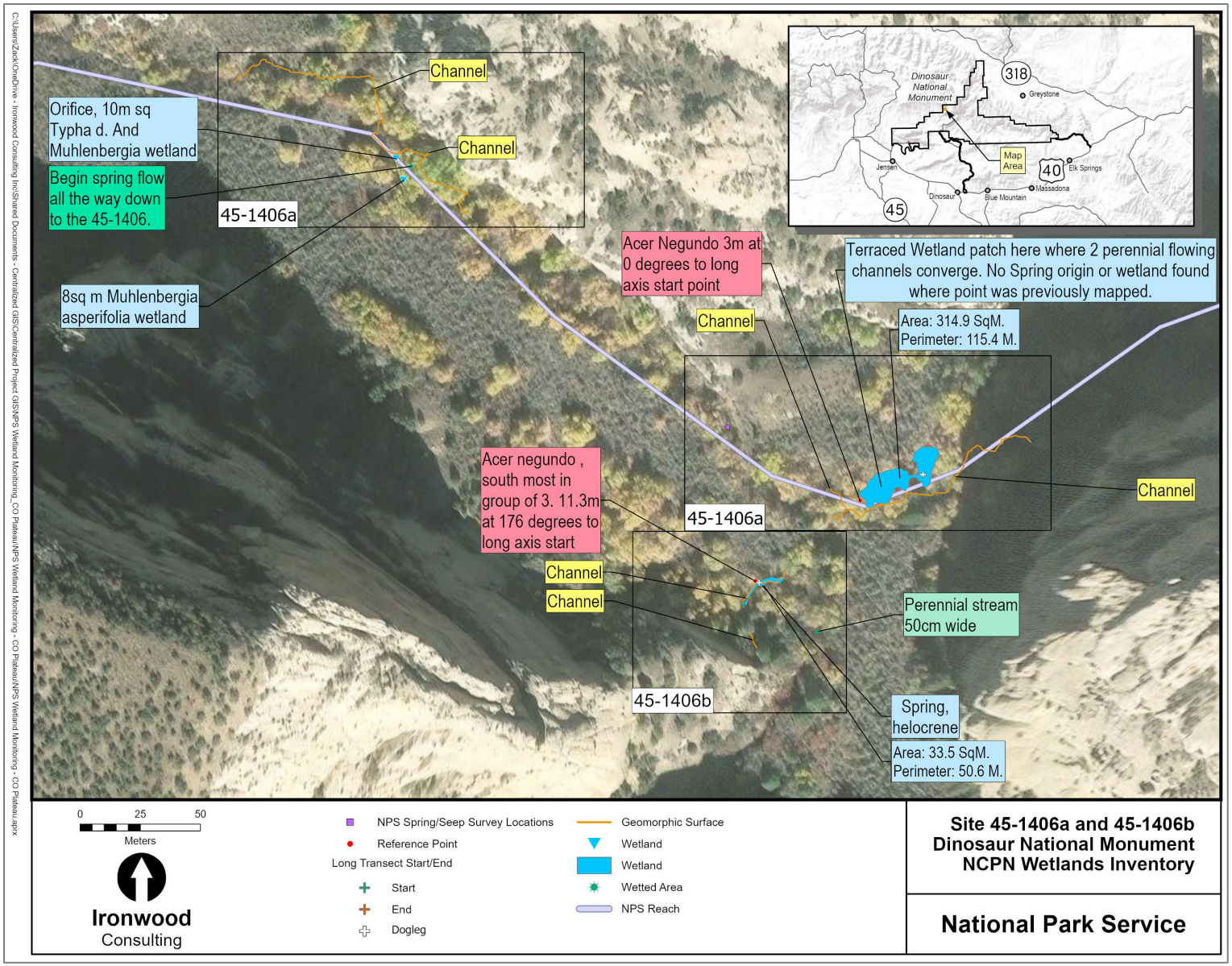


Figure 3. Wetland mapping for site 45-1406-A and 45-1406-B (BC1).

Table 2. Criteria for Determining Quadrat Number and Interval using GDE Level II.

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 to250	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 4,00	12.0	10.0
4,00 to 6,00	16.0	12.0
6,00 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 m^2 required too many quadrats to sample during a single day. Depending on the purpose of the inventory, these sites may need to be divided to facilitate inventory.

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

Goal 2: Mapping Springs and Wetlands

To meet Goal 2, wetland boundaries were mapped using the vegetation section of the U.S. Army Corps of Engineers (USACE) Wetland Vegetation Dominance Test (USACE 2008).

The data form provides a rubric for determining if hydrophytic vegetation (defined as having a wetland indicator status of OBL and/or FACW according to the 2020 USACE Wetland Indicator Status [USACE 2020]) meets or surpasses the absolute cover threshold to be considered a wetland through a quantitative dominance test. The dominance test was used to determine where hydrophytic vegetation transitioned to upland vegetation cover that identified the boundary of the wetland. All

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

The following guidelines were observed when mapping wetlands:

- The site was assessed upon arrival to determine how to minimize damage to soils, plants, and hydrologic processes during the survey. If necessary, an approach to collecting data was devised to avoid damaging soils.
- Upon arrival at each site, a polygon was mapped with sub-meter accuracy (when possible) within ESRI Field Maps along the boundary between the wetland and upland vegetation communities using the USACE Dominance Test. Where wetland areas were represented by having greater than 50% OBL and/or FACW absolute plant cover and upland areas included greater than 50% FAC, FACU, and/or UPL absolute plant cover.
- Each crew mapped the wetland boundary using an EOS Arrow 100 sub-meter GPS receiver connected to a Bluetooth-enabled device to input field data into the data dictionary. The ESRI Field Maps app was used to determine the area and the length at the longest axis of the wetland. This determined the perpendicular transect locations and microplot quantity and placement using the USDA Forest Service GDE Level II protocol. The polygon also served as the delineation deliverable required of all sampled seeps/springs/wetlands under this contract.
- If a site failed the USACE Dominance Test (i.e., less than 50% OBL and/or FACW absolute plant cover) and no wetland characteristics were observed, a walk-thru with photos and a single transect with three microplots using the GDE Level II Protocol through the most mesic part of the feature were collected; no delineation was conducted.
- At CEBR and BRCA, each end of the long axis of the polygon determined where the capped aluminum conduit permanent plot pins were set. Additional monuments were added if the long axis distance exceeded 100 m or if there were distinct bends (“doglegs”). An additional monument was added for every additional 100 m the transect extended, and/or when the long axis trajectory changed at the bend. Each conduit cap was scribed with the site name. The depth of the monument below ground was between 12 and 18 inches. The height of the monument above ground did not exceed 12 inches.
- At all other parks (BLCA, CARE, COLM, CURE, and DINO), no permanent monuments were used at sites. Sub-meter GPS data was collected according to the specifications at each end of the long axis (in Table 3). Additional points were taken if the long axis exceeded 100 m, or if there were distinct doglegs.

Table 3. GPS Settings and Accuracy Parameters.

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

Non-wetland Negative Data

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

If neither wetland characteristics nor other evidence of a spring was present, then the site was documented as negative data and no GDE Level II survey occurred. Instead, field staff took photos facing each cardinal direction standing at the center of the site where negative data was collected. At non-GDE point locations that were identified for survey as potential springs, a single transect was placed running through the most mesic part of the site. Three 0.5-m^2 quadrats were spaced evenly along the transect and herbaceous cover data was visually estimated within each quadrat. No wetland delineation was conducted.

At non-GDE sites that were characterized as a point-to-point reach, and drainage channels were likely dominated by intermittent or ephemeral surface flow after precipitation events, the entire reach was walked to determine if any wetlands or spring sources were present. If no spring source was observed, the dominant species (if any) along the reach were recorded in lieu of a transect with three plots. This approach was used to 1) expediently confirm the presence or absence of springs along each reach and 2) attempt to characterize the vegetation along the entirety of the reach (which typically varied across large distances) rather than use a single discrete point location to summarize the entire reach.

GPS Settings and Accuracy

Sub-meter GPS mapping was acquired for mapped wetlands whenever adequate satellite reception was available, with a few exceptions. The GPS parameters listed below (Table 3) were used to ensure accurate and consistent boundary mapping. EOS Arrow 100 receivers were used to achieve sub-meter accuracy whenever possible. The mapping interface was the ESRI Field Maps app with the data parameter setting options as seen below. When difficult satellite constellation or topography (e.g., narrow canyon) precluded sub-meter data collection, an accuracy setting requirement was modified, as necessary. In these instances, a less accurate polyline or point was achieved.

Goal 3: Representative Photos

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

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

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

An example of the photo label is “DINO_ID123_MMDD2021.jpeg.”

Other Park Specific Metrics

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

Wildlife and Livestock Usage Metric

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

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

Recreation Impacts Metric

Any campsites, vehicle tracks, human footpaths (social trails) within 100 ft (30.5 m) of the site were also noted. After the site was evaluated, qualitative management indicator tools for recreation impacts were used to assess the site.

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

Spring Development Metric

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

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 was observed, was documented using a line or point, and dominant vegetation were characterized.

If a wetland area less than 5 m^2 was encountered, a single quadrat was completed to estimate cover composition, and point data was collected at the approximate center of the wetland area.

Hydrological data was collected at DINO concurrently with spring or wetland mapping by an NPS intern that is not included in this report. The protocol for this data collection was outside the scope of this project.

Data Management

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

Spatial Data

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

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

Tabular Data

Tabular data included species lists, photo lists, and geospatial metadata. Tabular data included all fields necessary so the data is broadly useful, including dates, UTMs, descriptions, associated files, data type, observer, survey site, species, etc. All plant species lists included USDA PLANTS database codes (USDA and NRCS 2023 tabular data was compiled after the field data collection was completed from digital data forms.

Data Accuracy and Quality

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

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

Results

Surveys took place between August 23 and September 9 and September 13 and 14, 2021. Twenty-six of the 58 surveyed locations were identified as GDE sites, with evidence of springs or seeps present (Table 4, Appendix A). The dominant herbaceous species reported in the GDE herbaceous vegetation quadrat summary tables were determined using the USACE Dominance Test. Only OBL and FACW plants were considered vegetative wetland indicators for this project.

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

Name	Site ID	Water Right Claim Number	Site Type	Primary GDE Type
Jones Hole Creek	45-1534	45-1534	Seep	Helocrene
Unnamed Spring	45-1535	45-1535	Seep	Helocrene
Big Draw Spring-A	45-1406a	45-1406	Spring	Hypocrene
Big Draw Spring-B	45-1406b (BC1)	45-1406	Spring	Helocrene
Ely Creek	45-1537	45-1537	Spring	Rheocrene
Sage Creek	45-1540	45-1540	Spring	Rheocrene
Red Wash	45-1541	45-1541	Spring	Rheocrene
Garden Creek	45-1550	45-1550	Spring	Hypocrene
McKee Springs	45-1563	45-1563	Spring	Helocrene
Red Spring	45-1578	45-1578	Spring	Hypocrene
Red Wash Spring 1	45-1582	45-1582	Spring	Rheocrene
Quarry East Spring	45-2775	45-2775	Spring	Rheocrene
Spring (West Boundary)	45-2816	45-2816	Spring	Hypocrene
Ainge Spring	45-3120	45-3120	Spring	Hillslope
Hanging Spring	DINO_27	–	Spring	Rheocrene
Hidden Forest Spring	DINO_29	–	Spring	Rheocrene
Juniper Spring	DINO_36	–	Spring	Limnocene
Mid-Joint Spring	DINO_50	–	Spring	Rheocrene
Quarry West Spring	DINO_62	–	Spring	Rheocrene
Snow Ranch Spring	DINO_74	–	Spring	Rheocrene
Valley View Spring	DINO_85	–	Spring	Rheocrene
Split Mountain Warm Spring	DINO_86	–	Spring	Rheocrene
Sage Creek Seep	DINO_173	–	Seep	Rheocrene
Seep (Island Park Red Wash)	DINO_192	–	Spring	Hypocrene
Little Rainbow Seep 1	DINO_196	–	Spring	Rheocrene
Little Rainbow Seep 2	DINO_197	–	Seep	Hypocrene
Ely Spring	45-1405	45-1405	Non-GDE	–
Big Draw	45-1538	45-1538	Non-GDE	–

Table 4 (continued). List of surveyed sites identifying whether each was identified as a GDE or non-GDE.

Name	Site ID	Water Right Claim Number	Site Type	Primary GDE Type
Spring (Labyrinths)	45-1544	45-1544	Non-GDE	–
Limekiln Draw	45-1545	45-1545	Non-GDE	–
Graveyard Draw	45-1546	45-1546	Non-GDE	–
Wolf Hollow	45-1551	45-1551	Non-GDE	–
Wolf Hollow	45-1553	45-1553	Non-GDE	–
Rainbow Draw	45-1557	45-1557	Non-GDE	–
Gorge Draw	45-1558	45-1558	Non-GDE	–
Stone Bridge Draw	45-1559	45-1559	Non-GDE	–
Stone Bridge Draw	45-1560	45-1560	Non-GDE	–
Stone Bridge Draw	45-1566	45-1566	Non-GDE	–
Indian Draw	45-1567	45-1567	Non-GDE	–
Indian Spring	45-1568	45-1568	Non-GDE	–
Indian Draw	45-1569	45-1569	Non-GDE	–
Indian Draw	45-1570	45-1570	Non-GDE	–
Horse Trail Canyon Creek	45-1571	45-1571	Non-GDE	–
Mitten Canyon Creek	45-1572	45-1572	Non-GDE	–
Mitten Canyon Warm Spring	45-1573	45-1573	Non-GDE	–
Cottonwood Wash	45-1575	45-1575	Non-GDE	–
Cottonwood Spring (Skanky Seep)	45-1576	45-1576	Non-GDE	–
Red Wash	45-1577	45-1577	Non-GDE	–
Red Wash	45-1579	45-1579	Non-GDE	–
Red Wash	45-1581	45-1581	Non-GDE	–
Red Wash Spring 1	45-1582	45-1582	Non-GDE	–
Red Wash Spring 2	45-1583	45-1583	Non-GDE	–
Red Wash Spring 3	45-1590	45-1590	Non-GDE	–
Orchard Draw	45-1591	45-1591	Non-GDE	–
Orchard Draw	45-1593	45-1593	Non-GDE	–
West Gorge Draw	45-1615	45-1615	Non-GDE	–
Unnamed spring	45-2817	45-2817	Non-GDE	–
Tamarisk Spring	DINO_77	–	Non-GDE	–

Big Draw Spring (Site 45-1406a and Site 45-1406b)

Big Draw Spring was divided into two separate GDE level II survey sites, Big Draw Spring-A (45-1406a) and Big Draw Spring-B (45-1406b, BC1).

The Big Draw Spring-A GDE site was located at an elevation of approximately 1,670 m with an overall southeast (102°) aspect and low slope variability across the site. Wetland vegetation provided evidence of groundwater at this site. The spring type was characterized as hypocrene. This GDE site included a total wetland area and perimeter of 0.08 acre (ac; 314.9 m^2) and 115.4 m, respectively (Appendix B).

Ten plant taxa were encountered during the GDE Level II survey, including eight taxa captured in vegetation quadrats and line intercept transects (Appendix D, Tables 5–7). Total average herbaceous cover was 78.8%. The dominant herbaceous wetland plants were smooth scouring-rush (*Equisetum laevigatum*) and blackcreeper sedge (*Carex praegracilis*) with 45% and 26% average cover, respectively. Groundcover included litter and basal with 92.9% and 7.1% average corner hits, respectively. Boxelder (*Acer negundo*) and Woods' rose (*Rosa woodsii*) had average woody line intercepts covers of 0.4% and 0.2%, respectively (Table 7).

Table 5. Herbaceous vegetation quadrat data for Site 45-1406-A. Bryophytes not included in totals.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Equisetum laevigatum	smooth scouring-rush	FACW	45.0	100
Carex praegracilis	blackcreeper sedge	FACW	26.0	100
Lactuca tatarica var. *pulchella*	blue lettuce	FAC	2.6	36
Cirsium arvense *	Canada thistle	FACU	2.4	29
Maianthemum stellatum	starry false Solomon's-seal	FACU	1.9	29
Poa pratensis	Kentucky bluegrass	FAC	1.0	36
Bryophytes	moss	–	0.0	0.0
Total	**–**	**–**	**78.9**	**–**
50% of Total	**–**	**–**	**39.4**	**–**
20% of Total	**–**	**–**	**15.8**	**–**

* Listed as a noxious weed in Utah (UDAF 2023).

Table 6. Groundcover quadrat data for Site 45-1406-A.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	7.1
Litter	92.9
Water	0.0
Wood	0.0
Soil	0.0
Total	100.0

Table 7. Woody vegetation line intercept summary data for Site 45-1406-A.

Species	Common name	Wetland Code	Average Woody Plant Cover (%)
Acer negundo	boxelder	FACW	0.4
Rosa woodsii	Woods' rose	FACU	0.2
Total	**–**	**–**	**0.6**

* Listed as a noxious weed in Utah (UDAF 2023).

The non-native plant species encountered included Kentucky bluegrass (*Poa pratensis*) and marsh sow-thistle (*Sonchus arvensis* ssp. *uliginosus*). The noxious species Canada thistle (*Cirsium arvense*) was also present.

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

The Big Draw Spring-B GDE site was located 30 m southwest and uphill of Big Draw Spring-A GDE site. This site sits at approximately 1,668 m, with an overall northeast (20°) aspect and low slope variability across the site. Evidence of groundwater included flow from a single spring orifice, standing water, and wetland vegetation. The spring type at this site was characterized as helocrene. This GDE site included a total wetland area and perimeter of 0.008 ac (33.5 m^2) and 50.6 m, respectively; see Figure 3 and Appendix B.

Twelve plant taxa were encountered during the GDE level II survey, including nine taxa captured in vegetation quadrats and line intercept transects (Appendix D, Tables 8–10). The total average herbaceous cover was 94.5%. The dominant herbaceous wetland plants were woolly sedge (*Carex*

pellita) and Nebraska sedge (*Carex nebrascensis*) with 55.6% and 20.8% cover, respectively. Groundcover included water, litter, wood, and soil with 77.1%, 18.8%, 2.1%, and 2.1% average corner hits, respectively. Western poison ivy (*Toxicodendron rydbergii*) had an average woody line intercept cover of 0.8%.

Table 8. Herbaceous vegetation quadrat data for Site 45-1406-B.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Carex pellita	woolly sedge	OBL	55.6	100
Carex nebrascensis	Nebraska sedge	OBL	20.8	92
Rorippa nasturtium-aquaticum	watercress	OBL	12.0	83
Sonchus arvensis ssp. *uliginosus*	marsh sow-thistle	FACU	2.1	25
Euthamia occidentalis	western goldenrod	FACW	1.7	8
Maianthemum stellatum	starry false Solomon's-seal	FACU	0.7	8
Mentha arvensis	field mint	FACW	0.7	17
Agrostis stolonifera	redtop	FACW	0.4	17
Toxicodendron rydbergii	western poison ivy	FACU	0.4	8
Veronica americana	American brooklime	OBL	0.2	8
Bryophytes	Moss	–	2.2	25
Total	**–**	**–**	**94.6**	**–**
50% of Total	**–**	**–**	**47.3**	**–**
20% of Total	**–**	**–**	**18.9**	**–**

* Listed as a noxious weed in Utah (UDAF 2023).

Table 9. Groundcover quadrat data for Site 45-1406-B.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	0.0
Litter	18.8
Water	77.1
Wood	2.1
Soil	2.1
Total	**100.1**

Table 10. Woody vegetation line intercept summary data for Site 45-1406-B.

Species	Common name	Wetland Code	Average Woody Plant Cover (%)
Toxicodendron rydbergii	western poison ivy	FACU	0.8
Total	**–**	**–**	**0.8**

The non-native plants encountered included bull thistle (*Cirsium vulgare*), Kentucky bluegrass, marsh sow-thistle, redtop (*Agrostis stolonifera*), and watercress (*Rorippa nasturtium-aquaticum*). No noxious species were recorded.

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

Jones Hole Creek (Site 45-1534)

The Jones Hole Creek reach includes the area adjacent to Jones Hole Creek from the north Dinosaur National Monument Boundary until its confluence with the Green River. The north end of the reach had a spring orifice with an associated wetland area of less than 10 m^2 and a short flowing channel (Figure 4). This small area was dominated by horsetail species (*Equisetum* spp.) along with mixed upland plants. However, no quadrat data was collected at this site. The orifice was noted to flow for approximately 5 m before dissipating beneath the soil at the Jones Hole trail. The adjacent side drainages to the east of this reach were explored for approximately 300 m, and no additional orifices were encountered.

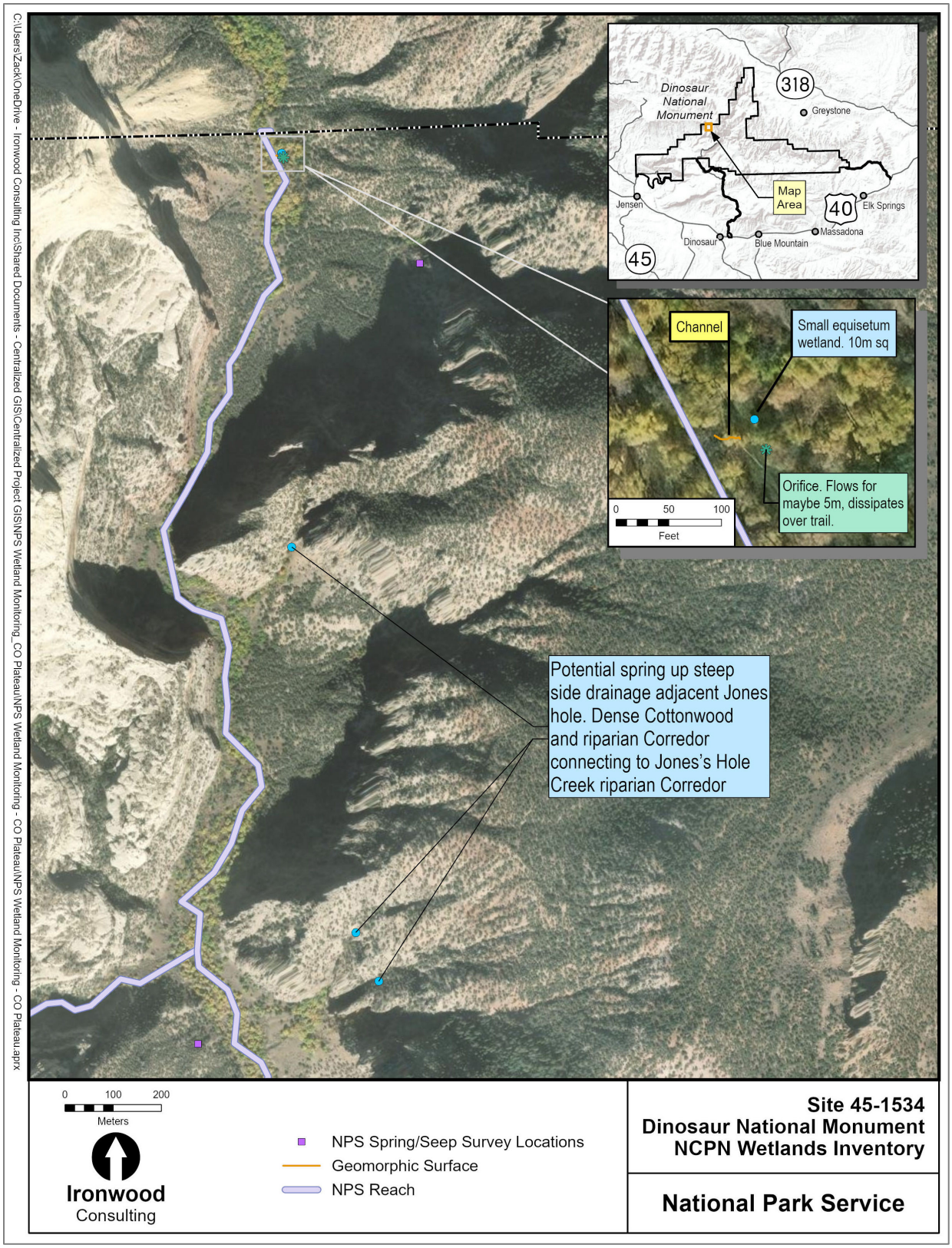


Figure 4. Wetland mapping for site 45-1534.

Unnamed Spring (Site 45-1535)

The Unnamed Spring GDE site occurs at an elevation of approximately 1,517 m with an overall northwest (330°) aspect. The spring type was identified as a helocrene seep. The evidence of groundwater included both standing and flowing water and wetland vegetation. The mapped wetland occurs near the confluence of Jones Hole Creek and the Green River. It included a section of pooled water and a narrow flowing channel within the wetland and running to the Green River; however, a portion of this channel was obscured by a dense stand of common reed (*Phragmites australis*). A flowing orifice was mapped on the southern edge of the wetland. Adjacent to both sides of this orifice was a long stretch of seeping water running parallel to the Green river for approximately 89.8 m. Unnamed Spring included a total wetland area and perimeter length of 0.6 ac (2,349.2 m^2) and 312.5 m, respectively (Figure 5, Appendix B).

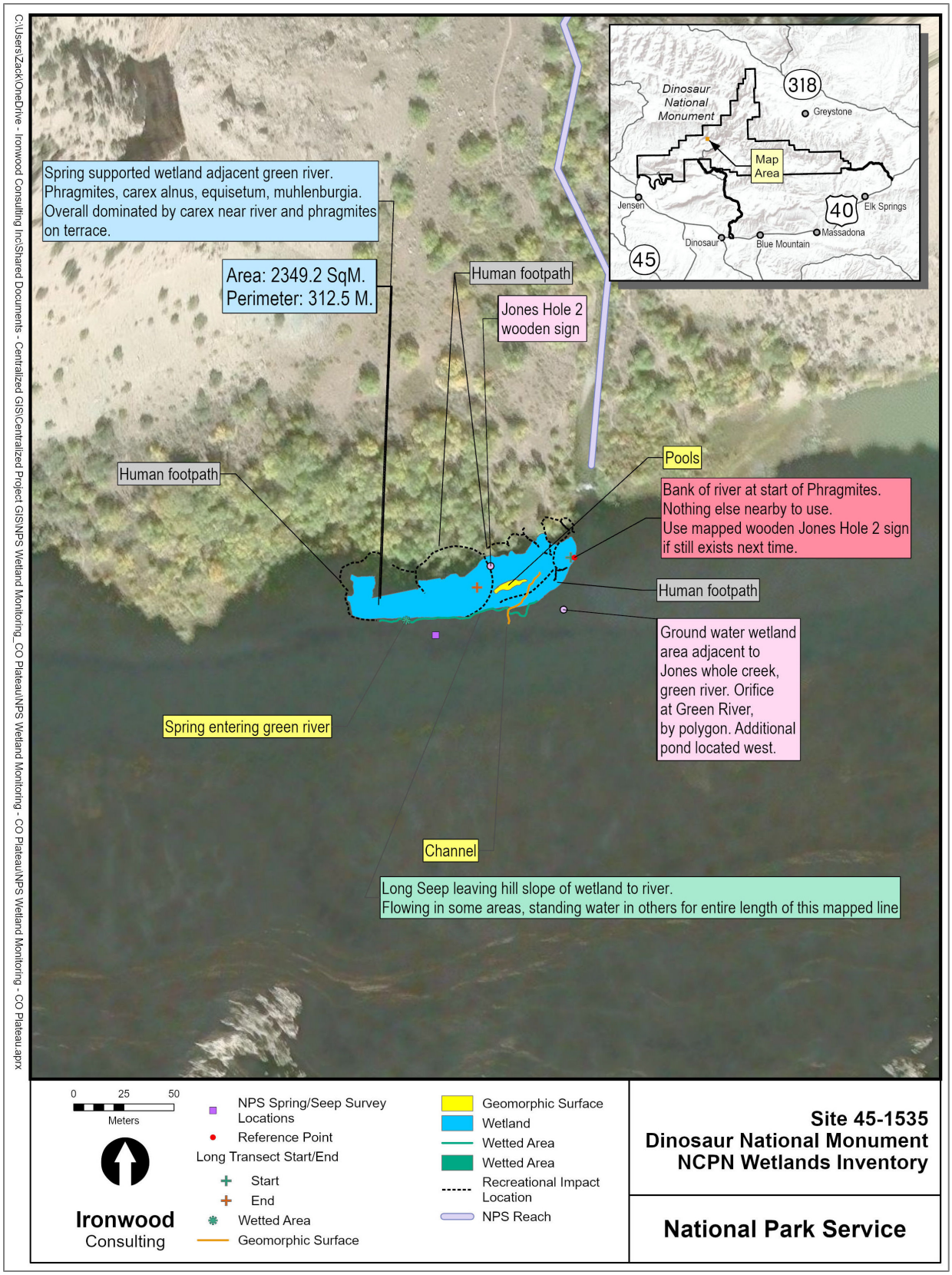


Figure 5. Wetland mapping for site 45-1535.

A total of 27 plant taxa were recorded at this site, including 16 taxa captured by the vegetation quadrats and line intercept transects (Appendix D, Tables 11–13). Total herbaceous cover averaged 75.6%. The dominant herbaceous wetland plants were Nebraska sedge (*Carex nebrascensis*), redtop (*Agrostis stolonifera*), and Baltic rush (*Juncus balticus* var. *montanus*), with 20.0%, 16.2%, and 7.5% average cover, respectively. The average groundcover was primarily litter (91.1%), with some water (3.6%), soil (3.6%), and basal (1.8%) corner hits. Eastern cottonwood (*Populus deltoides*) had an average woody line intercept cover of 0.1%.

Table 11. Herbaceous vegetation quadrat data for Site 45-1535.

Species	Common Name	Wetland Code	Average Cover (%)	Frequency (%)
Carex nebrascensis	Nebraska sedge	OBL	20.0	71
Agrostis stolonifera	redtop	FACW	16.2	86
Juncus balticus var. *montanus*	Baltic rush	FACW	7.5	21
Schoenoplectus pungens	common threesquare	OBL	7.1	57
Apocynum cannabinum	common dogbane	FAC	5.9	43
Equisetum variegatum	northern scouring-rush	FACW	5.8	43
Phragmites australis *	common reed	FACW	5.3	21
Carex pellita	woolly sedge	OBL	1.8	7
Equisetum hyemale	scouringrush horsetail	FACW	1.8	43
Lycopus asper	rough bugleweed	OBL	1.4	7
Helenium autumnale	common sneezeweed	FACW	1.2	21
Euthamia occidentalis	western goldenrod	OBL	0.9	7
Asclepias speciosa	showy milkweed	FACW	0.4	7
Equisetum arvense	field horsetail	FAC	0.2	7
Eleocharis sp.	spikerush	OBL	0.1	7
Bryophytes	moss	–	5.8	4
Total	**–**	**–**	**75.6**	**–**
50% of Total	**–**	**–**	**37.8**	**–**
20% of Total	**–**	**–**	**15.1**	**–**

Table 12. Groundcover quadrat data for Site 45-1535.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	1.8
Litter	91.1
Water	3.6
Wood	0.0
Soil	3.6
Total	**100.0**

* Listed as a noxious weed in Utah (UDAF 2023).

Table 13. Woody vegetation line intercept summary data for Site 45-1535.

Woody Species	Common Name	Wetland Code	Average Line Intercept Cover (%)
Populus deltoides	eastern cottonwood	FAC	0.1
Total	**–**	**–**	**0.1**

* Listed as a noxious weed in Utah (UDA 2023).

Non-native plant species encountered at this site included Himalayan blackberry (*Rubus discolor*), redtop, smooth brome (*Bromus inermis*), watercress (*Rorippa nasturtium-aquaticum*). Common reed (*Phragmites australis*) was the only noxious weed observed at this site.

Recreation impacts to the wetland included several interconnected footpaths originating from the adjacent Jones Hole 3 campground. However, the campground itself does not occur within the wetland boundary.
No spring developments or recent wildlife sign were observed (Appendix C).

Ely Creek (Site 45-1537)

Ely Creek occurs at an elevation of approximately 1,651 m with an overall southeast aspect (156°) and moderate slope variability across the site. Evidence of groundwater included four flowing rheocrene spring orifices at Ely Creek and one seep with no appreciable pooling. Additional evidence of groundwater included three sections of flowing channels originating at the spring orifices with a combined length of 558.9 m (Appendix B). These channels receive mixed discharge from both the spring orifices and surface runoff from precipitation events. While the FACW herbaceous plant species redtop was present, no wetlands were mapped at this site due to a lack of dominant cover by FACW and OBL plants. Quadrat data was collected in the most mesic portion of the site, a small area

of approximately 4 m^2 dominated by Kentucky bluegrass and redtop with 3.3% and 7.3 average cover, respectively (Tables 14–16, Figure 6). Non-native plant species encountered at this site included alfalfa (*Medicago sativa*), common dandelion, Kentucky bluegrass, and redtop.

Table 14. Herbaceous vegetation quadrat data for Site 45-1537.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Agrostis stolonifera	redtop	FACW	7.3	67
Poa pratensis	Kentucky bluegrass	FAC	3.3	33
Apocynum cannabinum	common dogbane	FAC	3.0	67
Taraxacum officinale	common dandelion	FACU	3.0	67
Medicago sativa	alfalfa	UPL	1.7	33
Elymus trachycaulus	common dandelion	FACU	0.7	33
unknown perennial forb	unknown perennial forb	–	0.3	33
Bryophytes	moss	–	0.0	0
Total	**–**	**–**	**19.3**	**–**
50% of Total	**–**	**–**	**9.7**	**–**
20% of Total	**–**	**–**	**3.9**	**–**

Table 15. Groundcover quadrat data for Site 45-1537.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	0.0
Litter	91.7
Water	0.0
Wood	0.0
Soil	8.3
Total	**100.0**

* Listed as a noxious weed in Utah (UDAF 2023).

Table 16. Woody vegetation line intercept summary data for Site 45-1537.

Species	Common Name	Wetland Code	Average Woody Plant Cover (%)
None	–	–	0
Total	**–**	**–**	**0**

No noxious species were observed.

No recreation impacts or spring developments were observed. Bear tracks were observed outside of the vegetation quadrats (Appendix C).

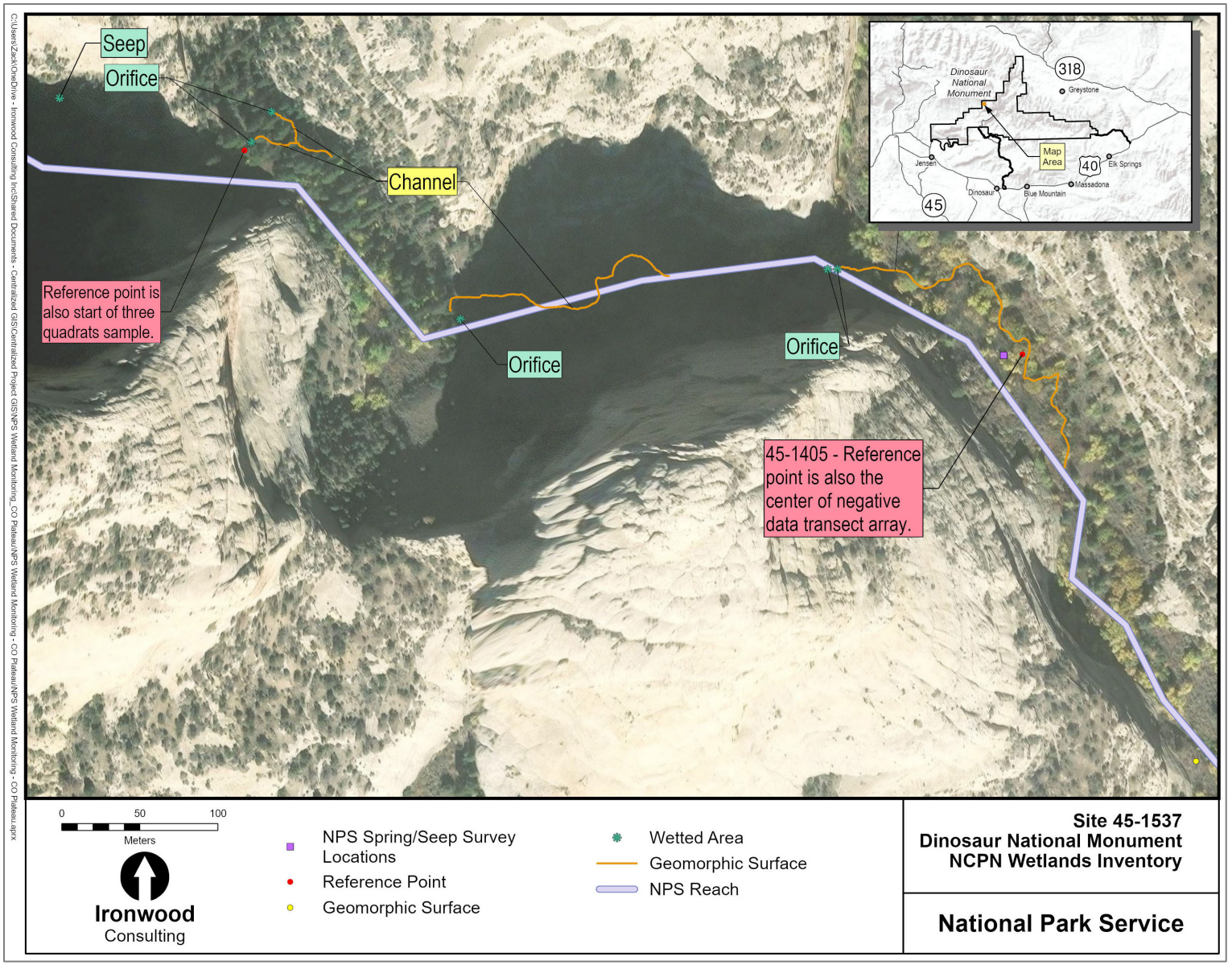


Figure 6. Wetland mapping for site 45-1537.

Sage Creek (Site 45-1540)

Sage Creek sits at an elevation of approximately 1,586 m with an overall southeast aspect (172°) with high slope variability across the site. Evidence of groundwater included a spring orifice flowing into a channel, a beaver pond, and wetland vegetation. The spring type was characterized as rheocrene since the channel receives mixed discharge from the spring orifice and surface runoff. This site was surveyed during a river trip, and due to a limited time frame, the wetland was mapped using abbreviated methods. These methods were discussed with and approved by Emily Spencer during the survey. The north-south extent of the wetland was mapped along the drainage using sub-meter accuracy; however, the mapping feature was a line rather than a polygon. Therefore, the total area of this wetland was approximated by buffering the mapped line by 5 m on either side. The estimated total wetland area is 0.29 ac (1,174 m^2; see Figure 7, Appendix B).

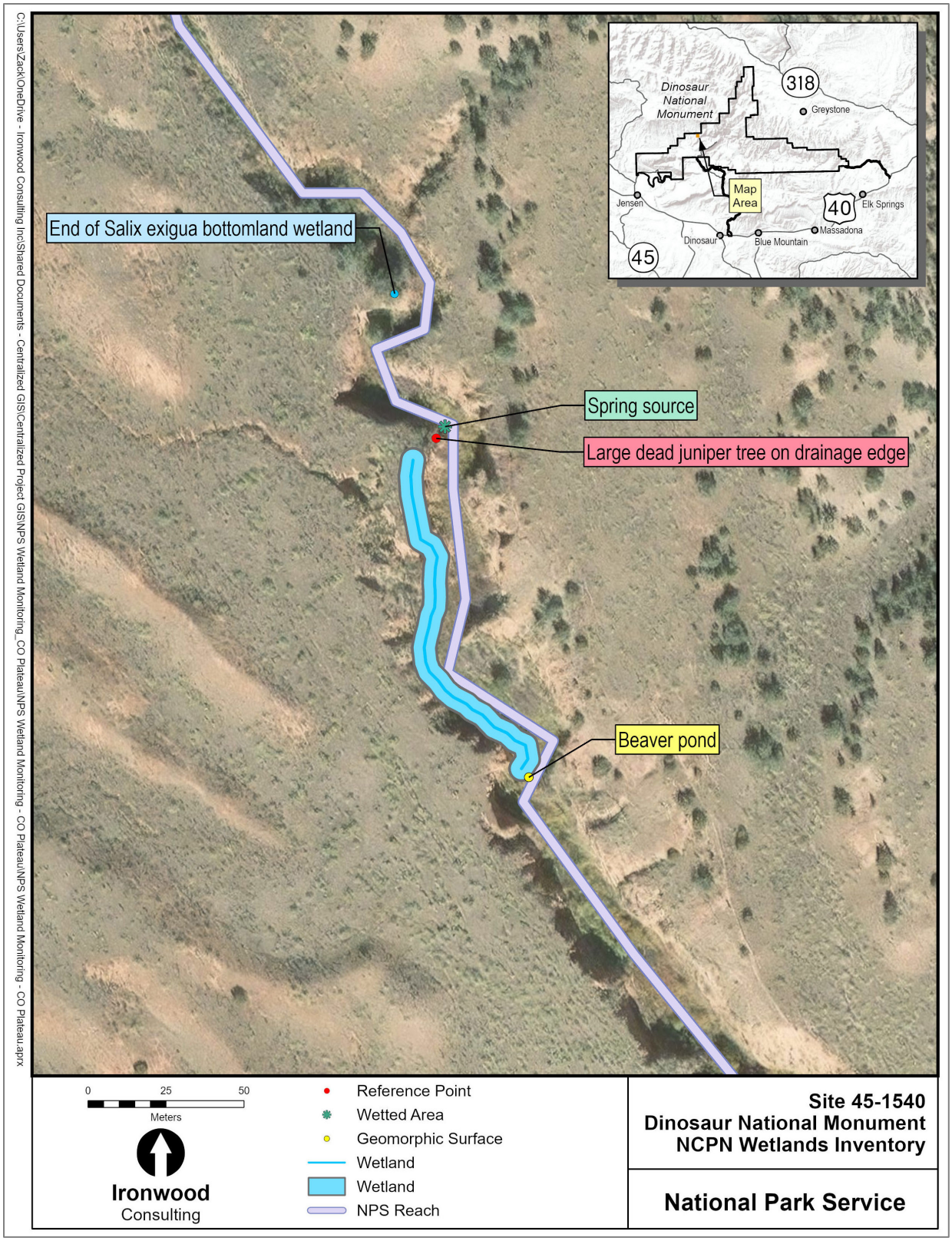


Figure 7. Wetland mapping for site 45-1540.

A total of 17 plant taxa were encountered, including nine taxa captured in the vegetation quadrats (Appendix D, Tables 17–19). Total herbaceous vegetation cover averaged 27.6% across all quadrats. The dominant herbaceous wetland plant was broad-leaved cattail (*Typha latifolia*) with 14.6% average cover. Groundcover included litter, water, soil, and basal with 55.0%, 25.0%, 10.0%, and 5.0% average corner hits, respectively. There was no woody line intercept cover.

Table 17. Herbaceous vegetation quadrat data for Site 45-1540.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Typha latifolia	broad-leaved cattail	OBL	14.6	80
Scirpus pallidus	pale bulrush	OBL	4.2	60
Eleocharis palustris	common spikerush	OBL	2.8	80
Agrostis stolonifera	redtop	FACW	1.6	60
Epilobium ciliatum	fringed willowherb	FACW	1.4	40
Sonchus arvensis ssp. *uliginosus*	marsh sow-thistle	FACU	1.4	20
Euthamia occidentalis	western goldenrod	FACW	0.6	20
Schoenoplectus tabernaemontani	soft-stem bulrush	OBL	0.6	20
Mentha arvensis	field mint	FACW	0.4	20
Bryophytes	moss	–	7.0	100
Total	**–**	**–**	**27.6**	**–**
50% of Total	**–**	**–**	**13.8**	**–**
20% of Total	**–**	**–**	**5.5**	**–**

Table 18. Groundcover quadrat data for Site 45-1540.

Groundcover Type	Average Corner Hits (%)
Bryophyte	5.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	5.0
Litter	55.0
Water	25.0
Wood	0.0
Soil	10.0
Total	**100.0**

* Listed as a noxious weed in Utah (UDAF 2023)

Table 19. Woody vegetation line intercept summary data for Site 45-1540.

Species	Common Name	Wetland Code	Average Woody Plant Cover (%)
None	–	–	0
Total	**–**	**–**	**0**

* Listed as a noxious weed in Utah (UDAF 2023).

Non-native plant species encountered included marsh sow-thistle (*Sonchus arvensis* ssp. *uliginosus*) and redtop. The noxious plant five-stamen tamarisk was present at this site.

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

Red Wash (Site 45-1541)

The Red Wash GDE survey site was located at an elevation of approximately 1,592 m with an overall southwest aspect (195°) and moderate slope variability. Evidence of groundwater at this site included flow from a spring source, standing water, and wetland vegetation. The spring type was characterized as rheocrene. The main GDE site (Site 45-1541 South) included a total wetland area and perimeter length of 0.035 ac (145.1 m^2 and 89.9 m, respectively; see Figure 8). A single flowing orifice was mapped at the GDE site. Two other small wetlands occurring approximately 500 m northwest were mapped with sub-meter accuracy for an additional wetland area and perimeter length of 0.04 ac (156.1 m^2) and 117.2 m, respectively (Figure 9, Appendix B). A series of other small wetlands along the reach were coarsely mapped in addition to sub-meter mapping of two additional spring orifices and small sections of flowing water within the main channel along this drainage (Figure 10).

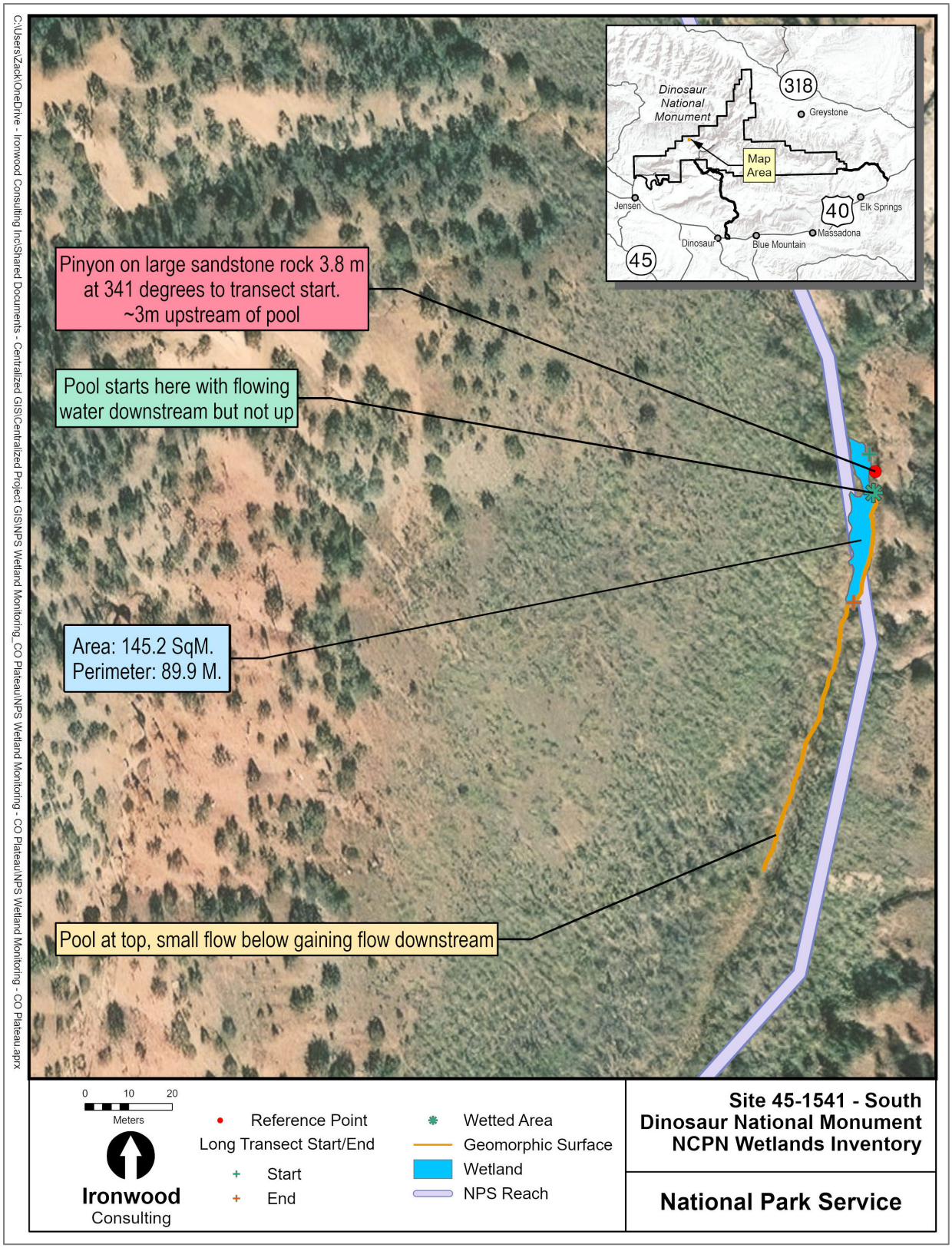


Figure 8. Wetland mapping for site 45-1534 (South).

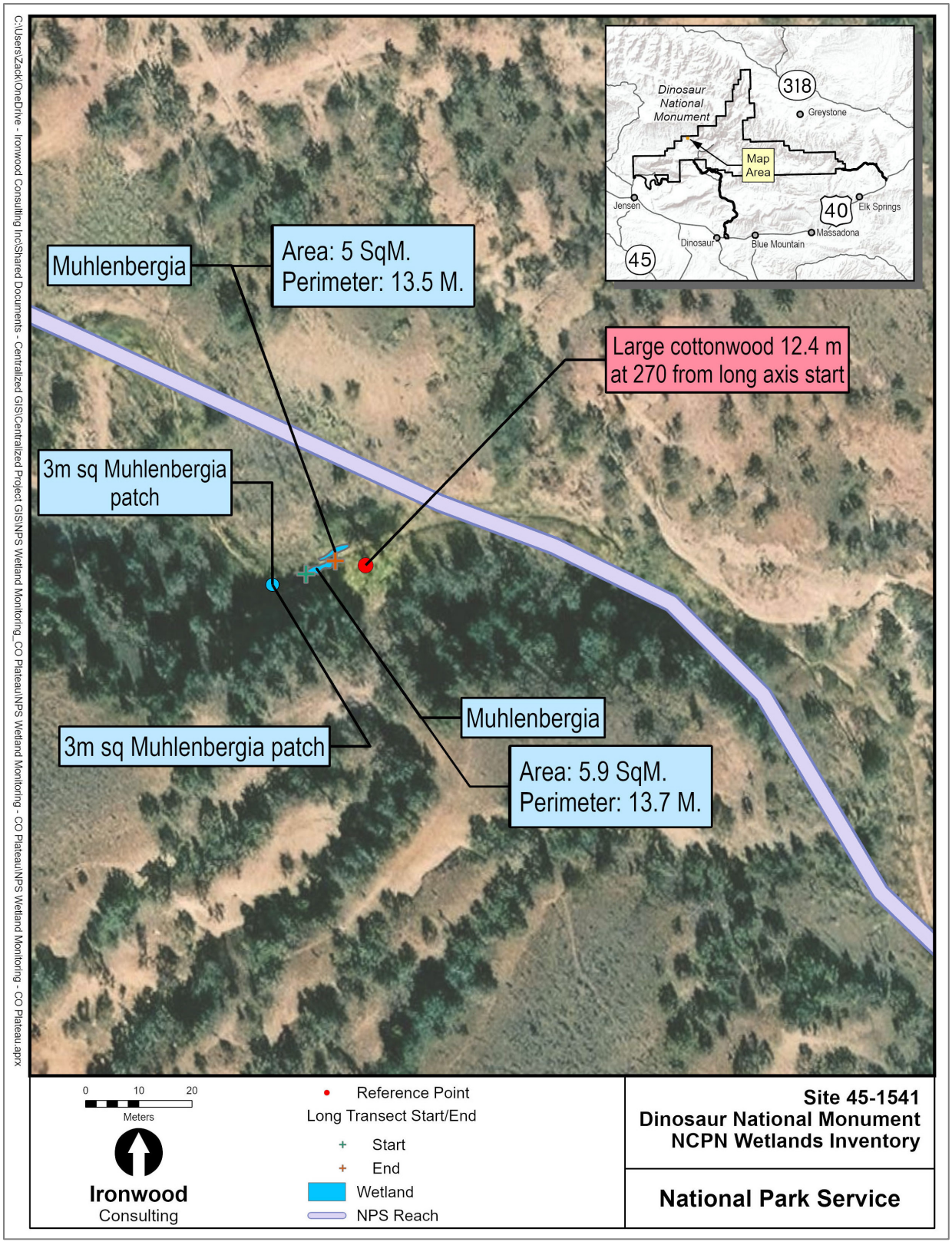


Figure 9. Wetland mapping for site 45-1541; (North).

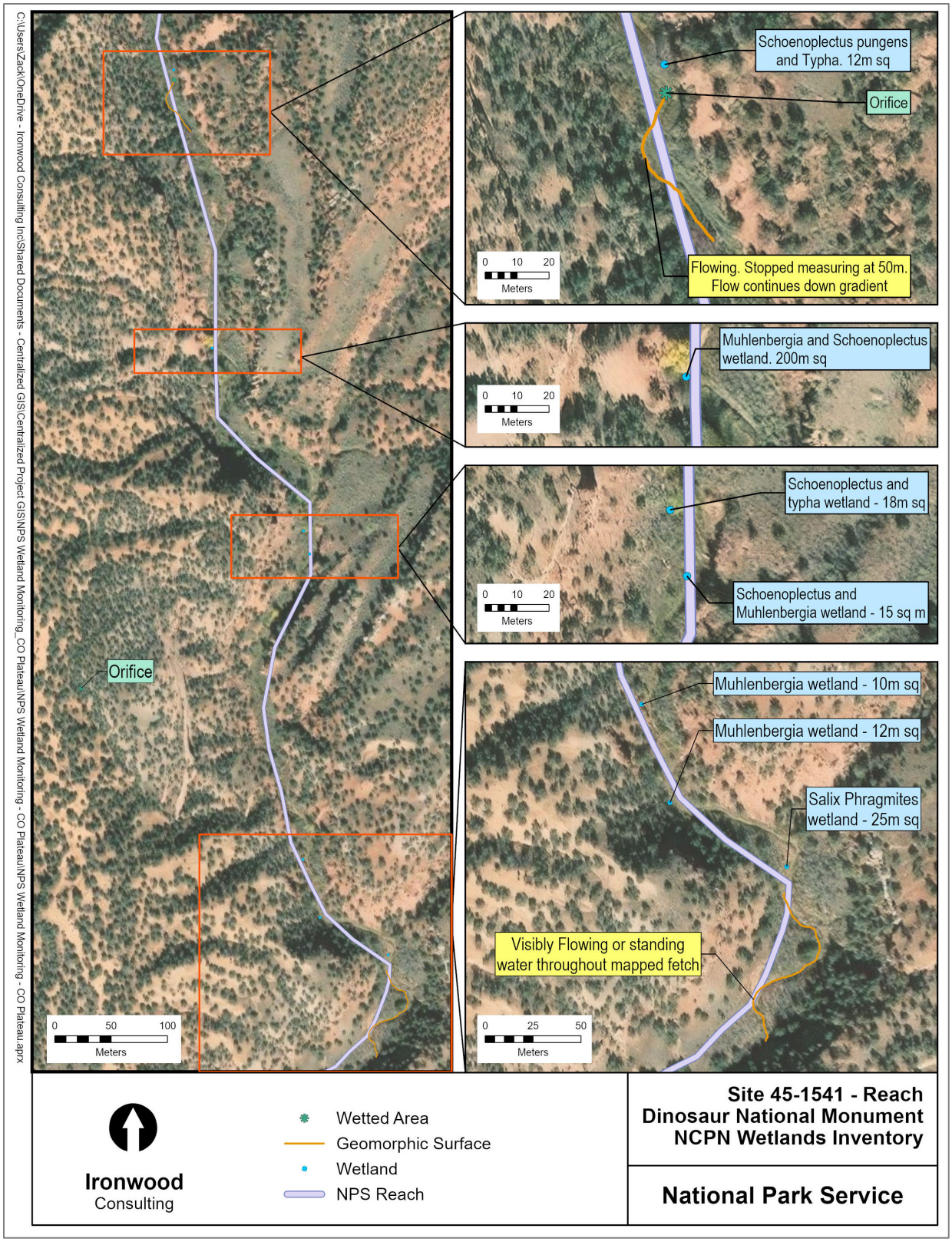


Figure 10. Wetland mapping for site 45-1534 (Reach).

A total of seven plant taxa were encountered during the GDE Level II survey at the main wetland site along this reach, including six taxa captured in vegetation quadrats and line intercept transects (Appendix D, Tables 20–22). Total average herbaceous cover was 15.6%. The dominant herbaceous wetland plant was common reed with 14.4% average cover. Groundcover included litter, soil, and basal with 70.5%, 23.9%, and 5.7% average corner hits, respectively. Coyote willow, big sagebrush, and five-stamen tamarisk had an average woody line intercept cover of 15.1%, 0.3%, and 0.2%, respectively.

Table 20. Herbaceous vegetation quadrat data for Site 45-1541.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Phragmites australis *	common reed	FACW	14.4	88
Sonchus arvensis ssp. *uliginosus*	marsh sow-thistle	FACU	1.1	20
Iva axillaris	poverty-weed	FACW	0.2	12
Bryophytes	moss	–	0.0	0
Total	**–**	**–**	**15.6**	**–**
50% of Total	**–**	**–**	**7.8**	**–**
20% of Total	**–**	**–**	**3.1**	**–**

Table 21. Groundcover quadrat data for Site 45-1541.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	5.7
Litter	70.5
Water	0.0
Wood	0.0
Soil	23.9
Total	**100.0**

* Listed as a noxious weed in Utah (UDAF 2023).

Table 22. Woody vegetation line intercept summary data for Site 45-1541.

Species	Common Name	Wetland Code	Average Line Intercept Cover (%)
Salix exigua	coyote willow	FACW	15.1
Artemisia tridentata	big sagebrush	UPL	0.3
Tamarix chinensis	five-stamen tamarisk	FAC	0.2
Total	**–**	**–**	**15.6**

* Listed as a noxious weed in Utah (UDAF 2023).

Non-native plant species encountered included marsh sow-thistle. The noxious plants common reed and five-stamen tamarisk (*Tamarix chinensis*) also occurred at this site.

No recreation impacts or spring developments were observed. Elk and rabbit signs were observed with 5% frequency within the GDE quadrats (Appendix C). Elk sign was also observed outside of the quadrats.

Garden Creek (Site 45-1550)

The Garden Creek GDE site occurs at an elevation of approximately 1,517 m with an overall southeast aspect (148°) and moderate slope variability. Wetland vegetation provided evidence of groundwater and two separate wetland areas were mapped. The spring type was characterized primarily as hypocrene and secondarily as rheocrene. It included a total wetland area and perimeter length of 0.04 ac (160.7 m^2) and 121.8 m, respectively; see Figure 11, Appendix B.

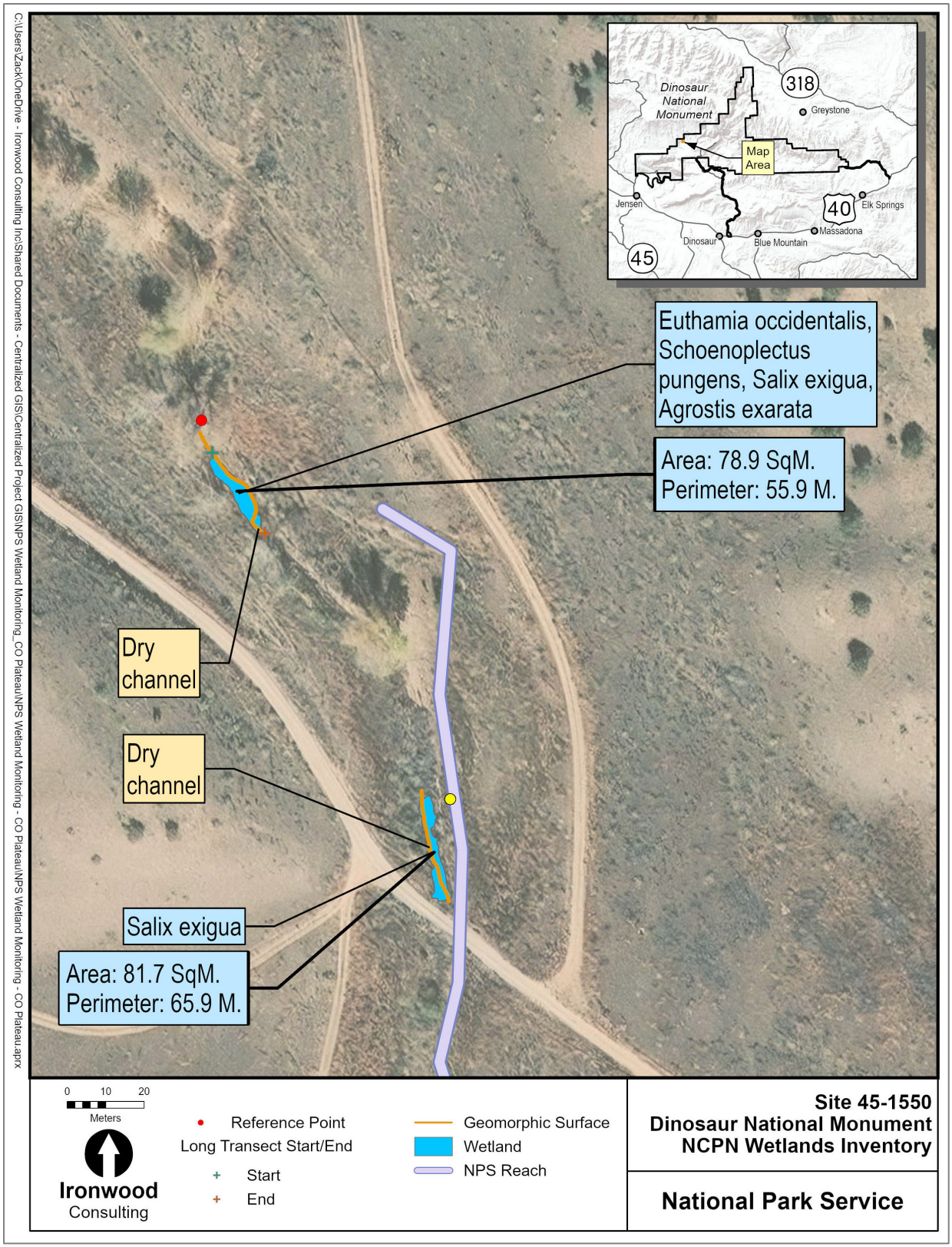


Figure 11. Wetland mapping for site 45-1550.

A total of 22 plant taxa were encountered during the GDE level II survey, including 13 taxa captured in vegetation quadrats and line intercept transects (Appendix D, Tables 23–25). Total herbaceous cover averaged 42.8%. The dominant herbaceous wetland plant was common threesquare (*Schoenoplectus pungens*) with 25.6% average cover. The groundcover included litter, soil, basal, and wood with 60.7%, 35.7%, 1.8%, and 1.8% average corner hits, respectively. Coyote willow had an average woody line intercept cover of 20.3%.

Table 23. Herbaceous vegetation quadrat data for Site 45-1550.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Schoenoplectus pungens	common threesquare	OBL	25.6	21
Euthamia occidentalis	western goldenrod	FACW	8.3	50
Agrostis stolonifera	redtop	FACW	2.4	7
Sonchus asper	spiny-leaf sow-thistle	FAC	1.4	7
Lolium arundinaceum	tall fescue	FACU	1.1	36
Bromus inermis	smooth brome	FACU	1.0	7
Agrostis exarata	spike bentgrass	FACW	0.9	7
Melilotus officinalis	yellow sweet clover	FACU	0.9	29
Scirpus pallidus	pale bulrush	OBL	0.6	64
Juncus saximontanus	mountain rush	FACW	0.3	7
Taraxacum officinale	common dandelion	FACU	0.2	36
Ambrosia acanthicarpa	bur ragweed	UPL	0.1	7
Bryophytes	moss	–	0.0	0
Total	**–**	**–**	**42.8**	**–**
50% of Total	**–**	**–**	**21.4**	**–**
20% of Total	**–**	**–**	**8.6**	**–**

Table 24. Groundcover quadrat data for Site 45-1550.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	1.8
Litter	60.7
Water	0.0
Wood	1.8
Soil	35.7
Total	**100.0**

* Listed as a noxious weed in Utah (UDAF 2023).

Table 25. Woody vegetation line intercept summary data for Site 45-1550.

Species	Common Name	Wetland Code	Average Line Intercept Cover (%)
Salix exigua	coyote willow	FACW	20.3
Total	**–**	**–**	**20.3**

Non-native plants encountered included cheatgrass (*Bromus tectorum*), Kentucky bluegrass, redtop, Russian thistle (*Salsola tragus*), smooth brome (*Bromus inermis*), tall fescue (*Lolium arundinaceum*), and yellow sweetclover (*Melilotus officinalis*). Five-stamen tamarisk was the noxious plant observed at this site.

No recreation impacts or spring developments were observed. Deer tracks and scat were observed outside of the vegetation quadrats (Appendix C).

McKee Springs (Site 45-1563)

The McKee Springs GDE site occurs at an elevation of approximately 1,560 m with an overall southeast (153°) aspect and low slope variability. Evidence of groundwater included diffuse flow from a seeping orifice, standing water, and wetland vegetation. The spring type was characterized as helocrene. It included a total wetland area and perimeter length of 0.2 ac (740.1 m^2) and 559.1 m, respectively; see Figure 12, Appendix B.

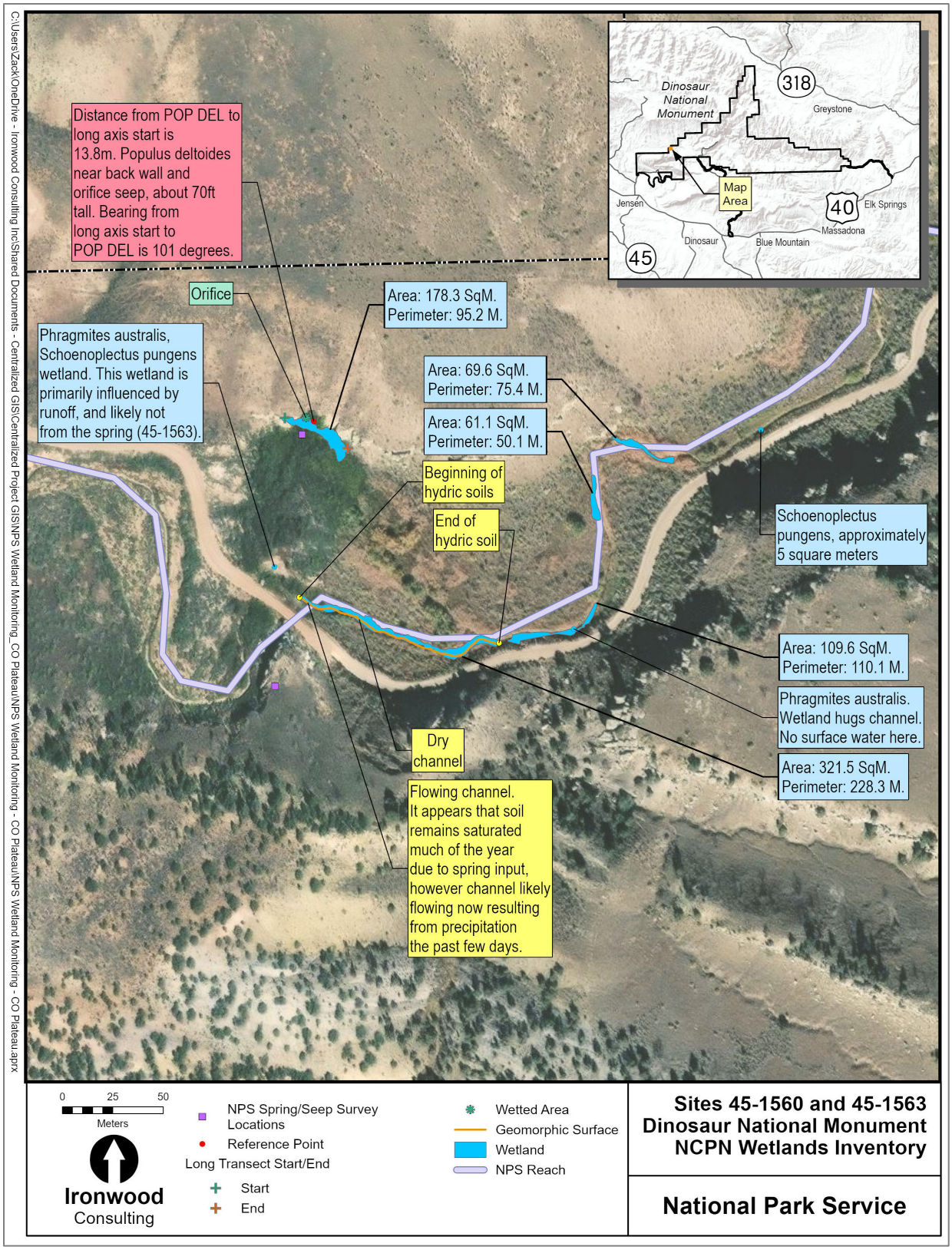


Figure 12. Wetland mapping for site 45-1563.

A total of 19 plant taxa were encountered during the GDE level II survey, including 12 taxa recorded within vegetation quadrats and line intercept transects (Appendix D, Tables 26–28). Total herbaceous cover averaged 81.1%. The dominant herbaceous wetland plants were common reed and southern cattail (*Typha domingensis*) with 38.4% and 15.1% average cover, respectively. Groundcover included litter, soil, basal, stone, and water with 60.7%, 32.1%, 3.6%, 1.8%, and 1.8% average corner hits, respectively. Coyote willow had an average woody line intercept cover of 12.6%.

Table 26. Herbaceous vegetation quadrat data for Site 45-1563.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Phragmites australis *	common reed	FACW	38.4	25
Typha domingensis	southern cattail	OBL	15.1	42
Carex nebrascensis	Nebraska sedge	OBL	10.3	8
Cirsium arvense *	Canada thistle	FACU	4.9	8
Ranunculus cymbalaria	marsh buttercup	OBL	4.1	42
Lepidium latifolium *	broad-leaf pepperwort	FAC	2.9	83
Polypogon monspeliensis	rabbitfoot-grass	FACW	2.7	33
Sonchus arvensis ssp. *uliginosus*	marsh sow-thistle	FACU	1.5	17
Cirsium vulgare	bull thistle	FACU	0.5	17
Veronica anagallis-aquatica	water speedwell	OBL	0.5	33
Euthamia occidentalis	western goldenrod	FACW	0.2	8
Bryophytes	moss	–	0.0	0
Total	**–**	**–**	**81.1**	**–**
50% of Total	**–**	**–**	**40.5**	**–**
20% of Total	**–**	**–**	**16.2**	**–**

Table 27. Groundcover quadrat data for Site 45-1563.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	1.8
Boulder	0.0
Bedrock	0.0
Basal	3.6
Litter	60.7
Water	1.8
Wood	0.0
Soil	32.1
Total	**100.0**

Table 28. Woody vegetation line intercept summary data for Site 45-1563.

Species	Common Name	Wetland Code	Average Line Intercept Cover (%)
Salix exigua	coyote willow	FACW	12.6
Total	**–**	**–**	**12.6**

Non-native plants encountered included bull thistle (*Cirsium vulgare*), marsh sow-thistle and rabbitfoot-grass (*Polypogon monspeliensis*). The noxious plants broad-leaf pepperwork (*Lepidium latifolium*), Canada thistle (*Cirsium arvense*), common reed, and five-stamen tamarisk were observed at this site. An interesting note is that if Canada thistle was removed from this site, the area dominated by wetland plants would increase.

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

Red Spring (Site 45-1578)

The Red Spring GDE site occurs at an elevation of approximately 1,595 m with an overall southeast (160°) aspect. Wetland vegetation provided evidence of groundwater. The spring type was characterized as hypocrene. It included a total wetland area and perimeter length of 0.01 ac (40.7 m^2) and 72.2 m, respectively; see Figure 13, Appendix B.

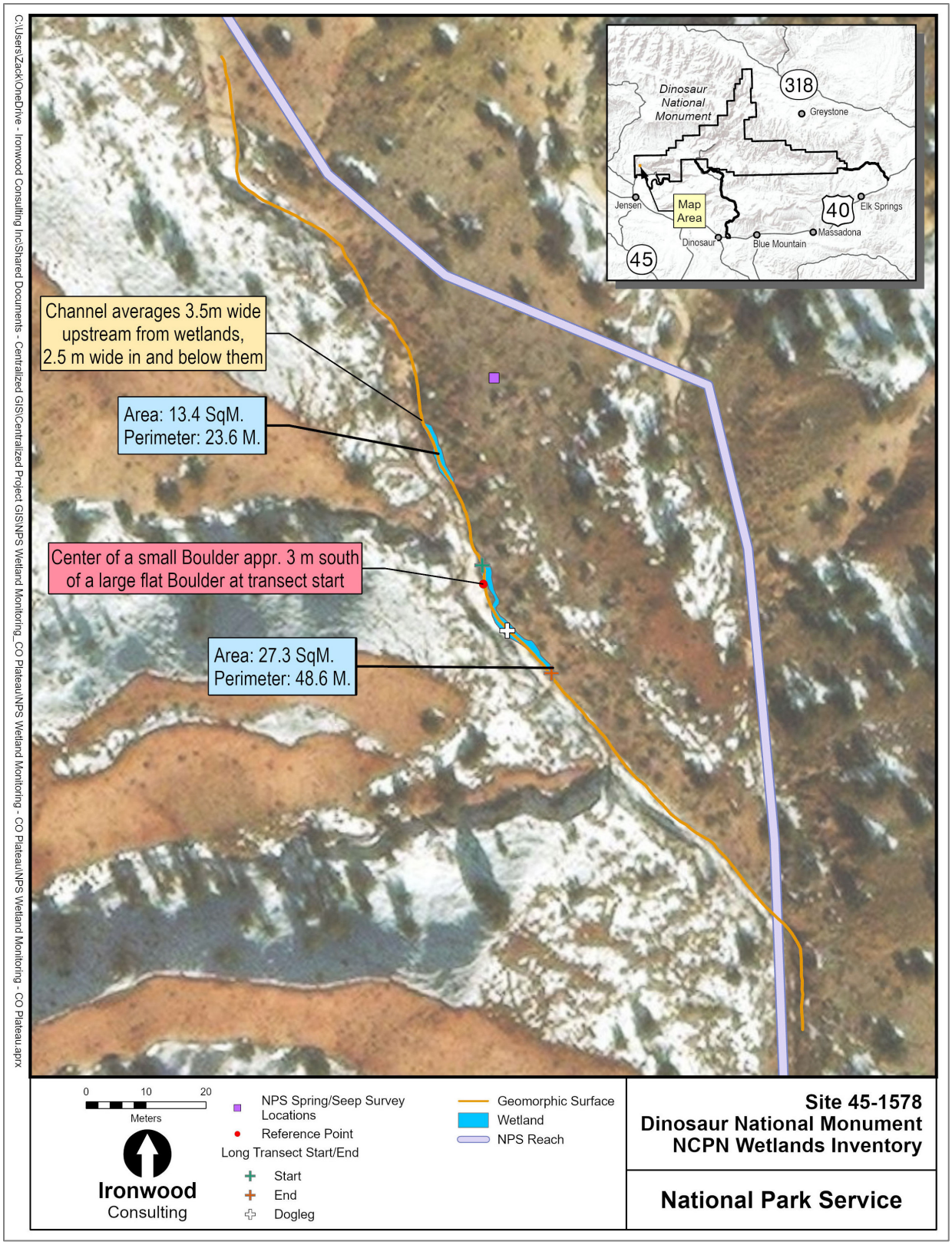


Figure 13. Wetland mapping for site 45-1578.

A total of 15 plant taxa were encountered during the GDE level II survey, including nine taxa recorded within vegetation quadrats and line intercept transects (Appendix D, Tables 29–31). Total herbaceous cover averaged 10%. The dominant herbaceous wetland plants were common threesquare and desert saltgrass (*Distichlis spicata*), each with 4% average cover. Groundcover included soil, litter, basal, and water with 68.2%, 27.3%, 2.3%, and 2.3% average corner hits, respectively. Five-stamen tamarisk and spearleaf rabbitbrush (*Chrysothamnus linifolius*) had an average woody line intercept cover of 7% and 2%, respectively.

Table 29. Herbaceous vegetation quadrat data for Site 45-1578.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Schoenoplectus pungens	common threesquare	OBL	4.5	82
Distichlis spicata	desert saltgrass	FAC	3.7	64
Muhlenbergia asperifolia	scratchgrass	FACW	0.8	18
Polypogon monspeliensis	rabbitfoot-grass	FACW	0.4	27
Iva axillaris	poverty-weed	FACW	0.3	18
Ranunculus cymbalaria	marsh buttercup	OBL	0.3	9
unknown annual forb	unknown annual forb	–	0.1	9
Bryophytes	moss	–	0.0	0
Total	**–**	**–**	**10.0**	**–**
50% of Total	**–**	**–**	**5.0**	**–**
20% of Total	**–**	**–**	**2.0**	**–**

Table 30. Groundcover quadrat data for Site 45-1578.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	2.3
Litter	27.3
Water	2.3
Wood	0.0
Soil	68.2
Total	**100.0**

Table 31. Woody vegetation line intercept summary data for Site 45-1578.

Species	Common Name	Wetland Code	Average Line Intercept Cover (%)
Tamarix chinensis	five-stamen tamarisk	FAC	7.3
Chrysothamnus linifolius	spearleaf rabbitbrush	FAC	1.9
Total	**–**	**–**	**9.2**

The GDE level II quadrat data does not pass the USACE Dominance Test when using the more rigorous standards for this project, where only FACW and OBL plants are used to indicate wetland presence. However, of the seven plant taxa captured in the vegetation quadrats, five (71%) of these are classified as FACW or OBL. Further, by USACE standards, both dominant taxa would qualify as wetland indicator species since FAC plants are also indicators of wetland vegetation.

Non-native plants included prickly lettuce (*Lactuca serriola*), rabbitfoot-grass (*Polypogon monspeliensis*), and smooth brome (*Bromus inermis*). The noxious plants broad-leaf pepperwort, five-stamen tamarisk and Russian olive (*Elaeagnus angustifolia*) occurred at this site.

No recreation impacts or spring developments were observed. Elk tracks and scat were observed inside the vegetation quadrats at a 45% frequency as well as outside of the vegetation quadrats (Appendix C).

Red Wash Spring (Site 45-1582)

The Red Wash Spring GDE site occurs at an elevation of approximately 1,545 m with an overall southwest (206°) aspect and low slope variability. Evidence of groundwater included flow from a single spring source, standing water, and wetland vegetation. The spring type was characterized as rheocrene. It included a total wetland area and perimeter length of 0.05 ac (183.2 m^2) and 102.0 m, respectively; see Figure 14, Appendix B.

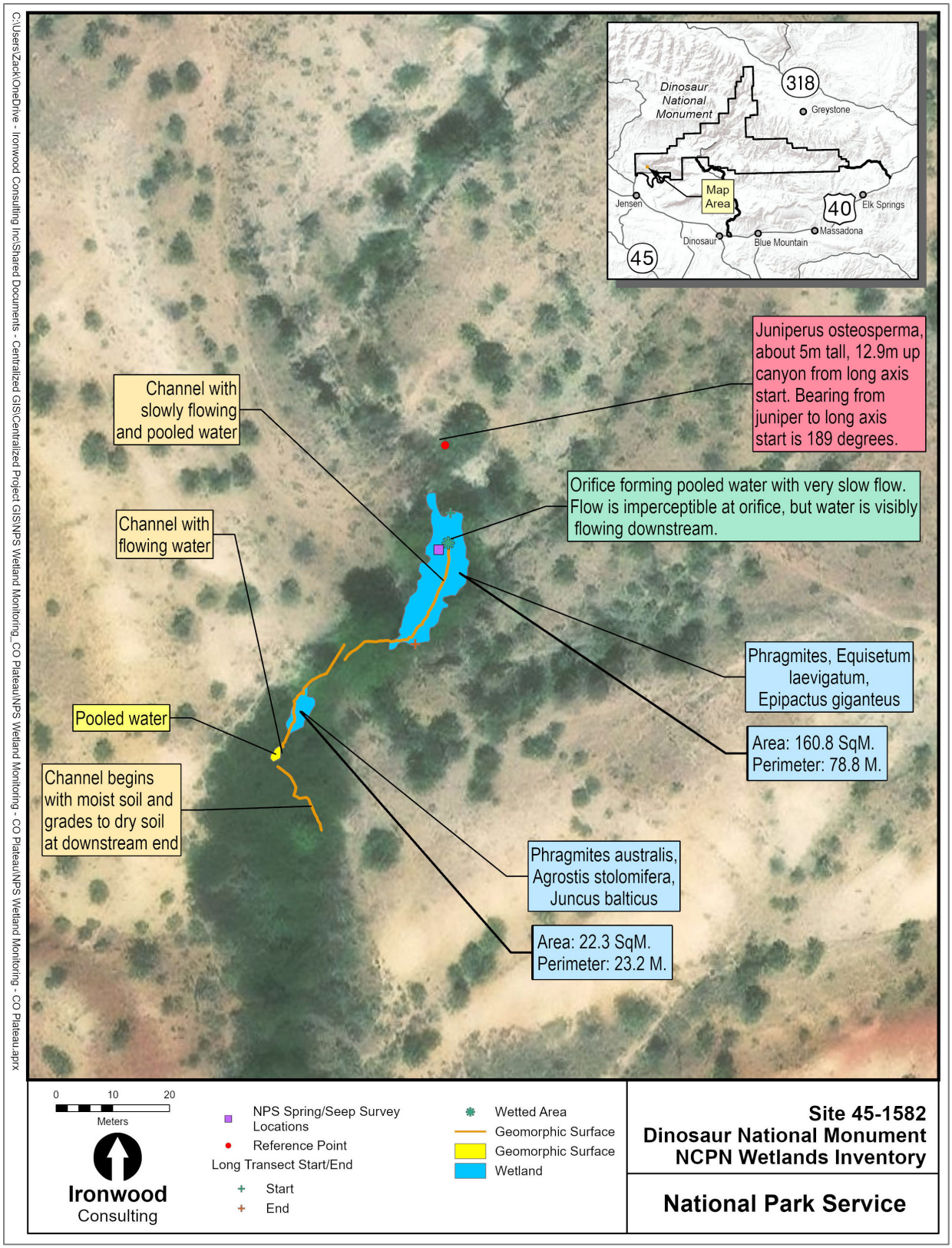


Figure 14. Wetland mapping for site 45-1582.

A total of 19 plant taxa were encountered during the GDE level II survey, including 14 taxa recorded within vegetation quadrats and line intercept transects (Appendix D, Tables 32–34). Total average herbaceous cover was 84.9%. The dominant herbaceous wetland plants were common reed and smooth scouring-rush with 31.7% and 30.5% average cover, respectively. Groundcover included litter, water, and soil with 86.5%, 7.7%, and 5.8% average corner hits, respectively. Skunkbush sumac (*Rhus trilobata*) and five-stamen tamarisk had average woody line intercept covers of 0.2% and 0.05%, respectively.

Table 32. Herbaceous vegetation and groundcover quadrat data for Site 45-1582.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Phragmites australis *	common reed	FACW	31.7	85
Equisetum laevigatum	smooth scouring-rush	FACW	30.5	92
Epipactis gigantea	giant helleborine	OBL	13.6	77
Carex sp.	sedge	–	2.7	31
Agrostis stolonifera	redtop	FACW	2.5	31
Juncus balticus var. *montanus*	Baltic rush	FACW	1.5	38
Carex parryana	Parry's sedge	FAC	0.8	8
Glycyrrhiza lepidota	Nuttall's licorice	FAC	0.5	8
Typha sp.	cattail	OBL	0.4	8
Euthamia occidentalis	western goldenrod	FACW	0.3	8
Asclepias speciosa	showy milkweed	FAC	0.2	8
Symphyotrichum lanceolatum	white panicle aster	OBL	0.2	8
Bryophytes	moss	–	0.0	0
Total	**–**	**–**	**84.9**	**–**
50% of Total	**–**	**–**	**42.5**	**–**
20% of Total	**–**	**–**	**17.0**	**–**

Table 33. Groundcover quadrat data for Site 45-1582.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	0.0
Litter	86.5
Water	7.7
Wood	0.0
Soil	5.8
Total	**100.0**

* Listed as a noxious weed in Utah (UDAF 2023).

Table 34. Woody vegetation line intercept summary data for Site 45-1582.

Species	Common Name	Wetland Code	Average Woody Plant Cover (%)
Rhus trilobata	skunkbush sumac	FACU	0.2
Tamarix chinensis	five-stamen tamarisk	FAC	0.05
Total	**–**	**–**	**0.2**

Non-native plants included bull thistle, Kentucky bluegrass, redtop, and yellow salsify (*Tragopogon dubius*). The noxious plants common reed, five-stamen tamarisk, and Russian olive occurred at this site.

No recreation impacts or spring developments were observed. Elk tracks and scat were observed inside the vegetation quadrats at a 23% frequency (Appendix C). Deer and elk signs were observed outside of the vegetation quadrats.

Quarry East Spring (Site 45-2775)

The Quarry East Spring GDE site occurs at an elevation of approximately 1,494 m with an overall southwest (200°) aspect and moderate slope variability across the site. Evidence of groundwater included flow from two spring orifices and wetland vegetation. The spring type was characterized as rheocrene. It included a total wetland area and perimeter length of 0.2 ac (811.1 m^2) and 404.2 m, respectively; see Figure 15, Appendix B.

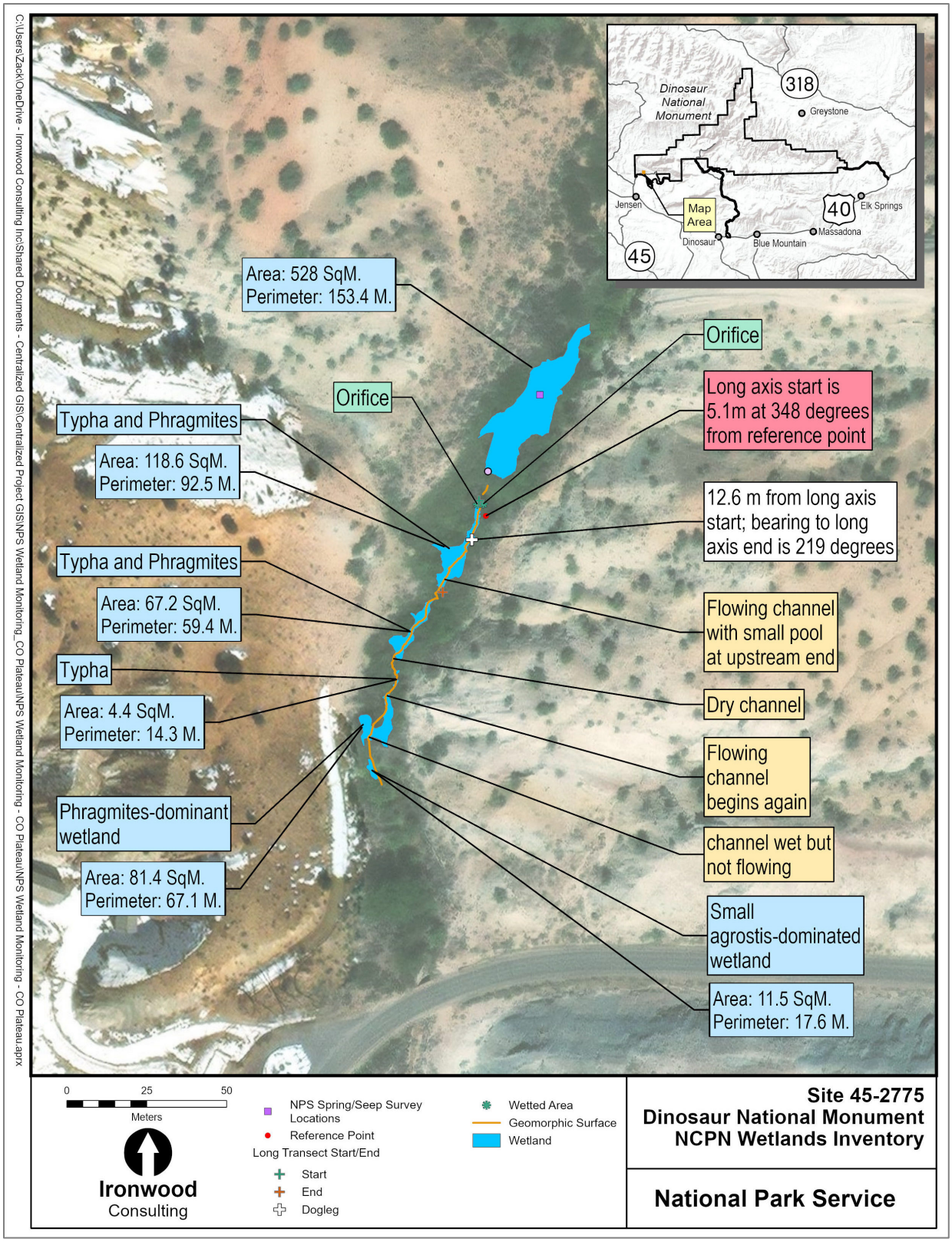


Figure 15. Wetland mapping for site 45-2775.

A total of 20 plant taxa were encountered during the GDE level II survey, including 13 taxa recorded within vegetation quadrats (Appendix D, Tables 35–37). Total average herbaceous cover was 44.9%. The dominant herbaceous wetland plants were broad-leaved cattail and giant helleborine (*Epipactis gigantea*) with 19.5% and 6.8% average cover, respectively. Groundcover included litter, water, soil, and wood with 73.0%, 12.0%, 7.0%, and 1.0% average corner hits, respectively. There were no woody plants encountered on the line intercept transects.

Table 35. Herbaceous vegetation quadrat data for Site 45-2775.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Typha latifolia	broad-leaved cattail	OBL	19.5	92
Epipactis gigantea	giant helleborine	OBL	6.8	24
Agrostis stolonifera	redtop	FACW	5.8	28
Phragmites australis *	common reed	FACW	4.1	56
Euthamia occidentalis	western goldenrod	FACW	3.4	32
Lepidium latifolium *	broad-leaf pepperwort	FAC	1.6	28
Maianthemum stellatum	starry false Solomon's-seal	FACU	1.1	16
Melilotus alba	White sweet clover	FACU	0.7	12
Sonchus arvensis ssp. *uliginosus*	marsh sow-thistle	FACU	0.6	8
Epilobium ciliatum ssp. *glandulosum*	glandular willowherb	FACW	0.4	16
Asclepias speciosa	showy milkweed	FAC	0.3	4
Solidago canadensis	Canada goldenrod	UPL	0.3	4
Cirsium arvense *	Canada thistle	FACU	0.3	4
Bryophytes	moss	–	1.0	16
Total	**–**	**–**	**44.9**	**–**
50% of Total	**–**	**–**	**22.5**	**–**
20% of Total	**–**	**–**	**9.0**	**–**

Table 36. Groundcover quadrat data for Site 45-2775.

Groundcover Type	Average Corner Hits (%)
Bryophyte	1.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	6.0
Litter	73.0
Water	12.0
Wood	1.0
Soil	7.0
Total	**100.0**

* Listed as a noxious weed in Utah (UDAF 2023).

Table 37. Woody vegetation line intercept data for Site 45-2775.

Species	Common Name	Wetland Code	Average Woody Plant Cover (%)
None	–	–	0
Total	**–**	**–**	**0**

Non-native plants occurring at this site included marsh sow-thistle, redtop, and white sweet-clover (*Melilotus albus*). The noxious plants broad-leaf pepperwort, Canada thistle, and common reed also occurred.

No recreation impacts were observed. Spring developments included an inactive pipe that appeared to historically channel water from the spring source. Elk tracks and scat were observed inside the vegetation quadrats at a 23% frequency (Appendix C). Deer and elk signs were observed outside of the vegetation quadrats.

West Boundary Spring (Site 45-2816)

The West Boundary Spring GDE site occurs at an elevation of approximately 1,574 m with an overall southeast (150°) aspect and moderate slope variability across the site. Wetland vegetation provided evidence for groundwater. The primary spring type was determined as hypocrene with rheocrene as the secondary type. It included a total wetland area and perimeter length of 0.001 ac (5.2 m^2) and 14.1 m, respectively; see Figure 16, Appendix B.

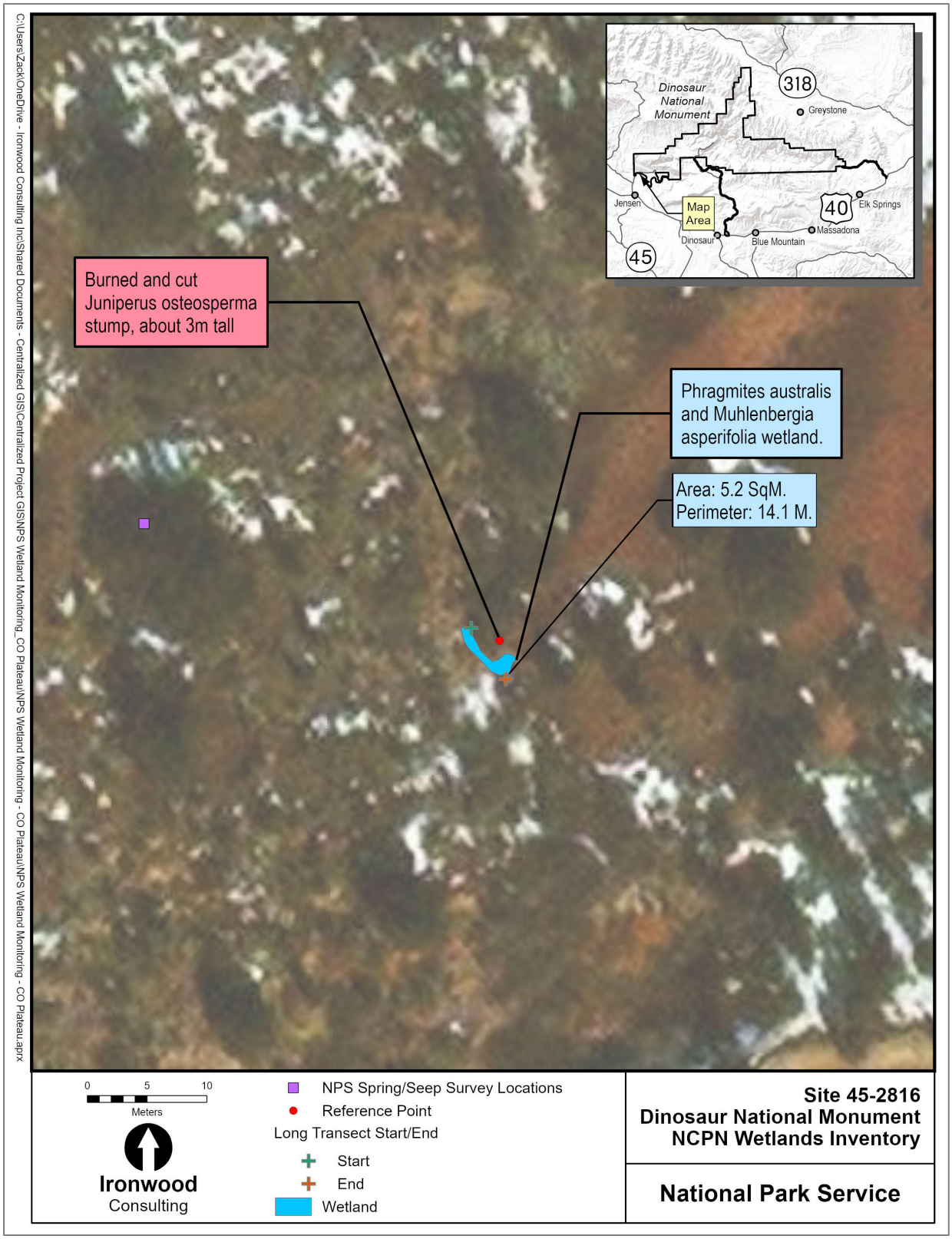


Figure 16. Wetland mapping for site 45-2816.

A total of 16 plant taxa were encountered during the GDE level II survey, including 10 taxa recorded within vegetation quadrats and woody line intercept transects (Appendix B, Tables 38–40). The total average herbaceous cover was 82.2%. The dominant herbaceous wetland plants were scratchgrass (*Muhlenbergia asperifolia*) and common reed with 38.6% and 18.4% average cover, respectively. Groundcover included litter and soil with 65.0% and 35.0% average corner hits, respectively. Shadscale saltbush (*Atriplex confertifolia*) had an average woody line intercept cover of 1%.

Table 38. Herbaceous vegetation quadrat data for Site 45-2816.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Muhlenbergia asperifolia	scratchgrass	FACW	38.6	100
Phragmites australis *	common reed	FACW	18.4	80
Cirsium vulgare	bull thistle	FAC	15.0	40
Juncus saximontanus	mountain rush	FACW	4.2	40
Gutierrezia sarothrae	broom snakeweed	UPL	3.6	40
Clematis ligusticifolia	white virgin's-bower	FAC	1.4	20
Asclepias speciosa	showy milkweed	FAC	0.4	20
Thelypodium integrifolium	entireleaved thelypody	FACW	0.4	20
Taraxacum officinale	common dandelion	FACU	0.2	20
Bryophytes	moss	–	2.0	20
Total	**–**	**–**	**82.2**	**–**
50% of Total	**–**	**–**	**41.1**	**–**
20% of Total	**–**	**–**	**16.4**	**–**

Table 39. Groundcover quadrat data for Site 45-2816.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	0.0
Litter	65.0
Water	0.0
Wood	0.0
Soil	35.0
Total	**100.0**

* Listed as a noxious weed in Utah (UDAF 2023).

Table 40. Woody vegetation line intercept data for Site 45-2816.

Species	Common Name	Wetland Code	Average Woody Plant Cover (%)
Atriplex confertifolia	shadscale saltbush	UPL	1
Total	**–**	**–**	**1**

* Listed as a noxious weed in Utah (UDAF 2023).

Non-native plants occurring at this site included bull thistle, cheatgrass, common dandelion, prickly lettuce. The noxious plant common reed was also observed.

No recreation impacts or spring developments were observed. Deer and rabbit signs were recorded inside the vegetation quadrats at 20% and 40% frequency, respectively. Deer and elk signs were encountered outside of the vegetation quadrats.

Ainge Spring (Site 45-3120)

The Ainge Spring GDE site occurs at an elevation of approximately 1,523 m with an overall west (272°) aspect and moderate slope variability across the site. Evidence of groundwater included flow from three spring orifices and wetland vegetation. The spring type was characterized as hillslope. It included a total wetland area and perimeter length of 0.06 ac (256.2 m^2 and 133.4 m, respectively; see Figures 17 and 18, Appendix B).

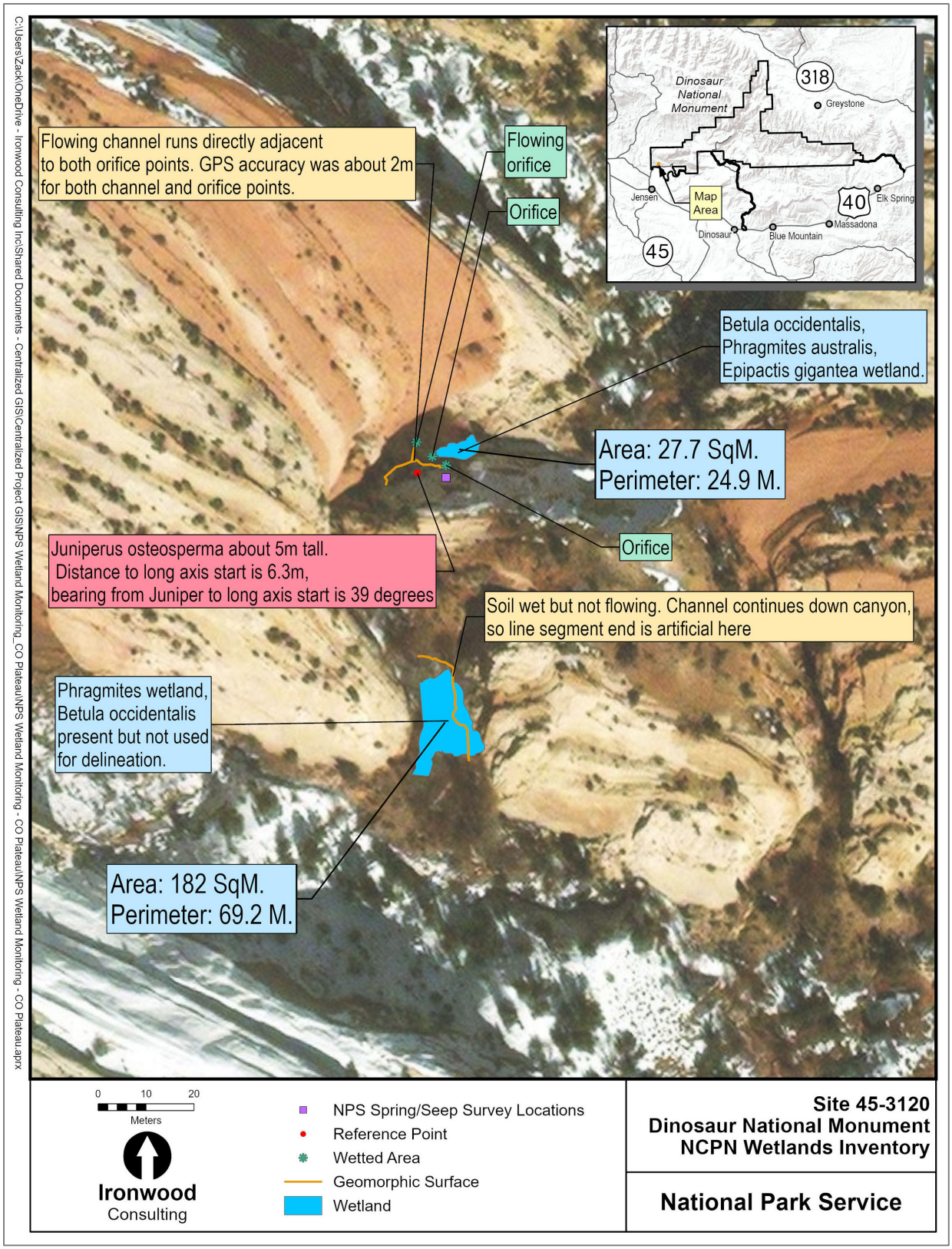


Figure 17. Wetland mapping for site 45-3120.

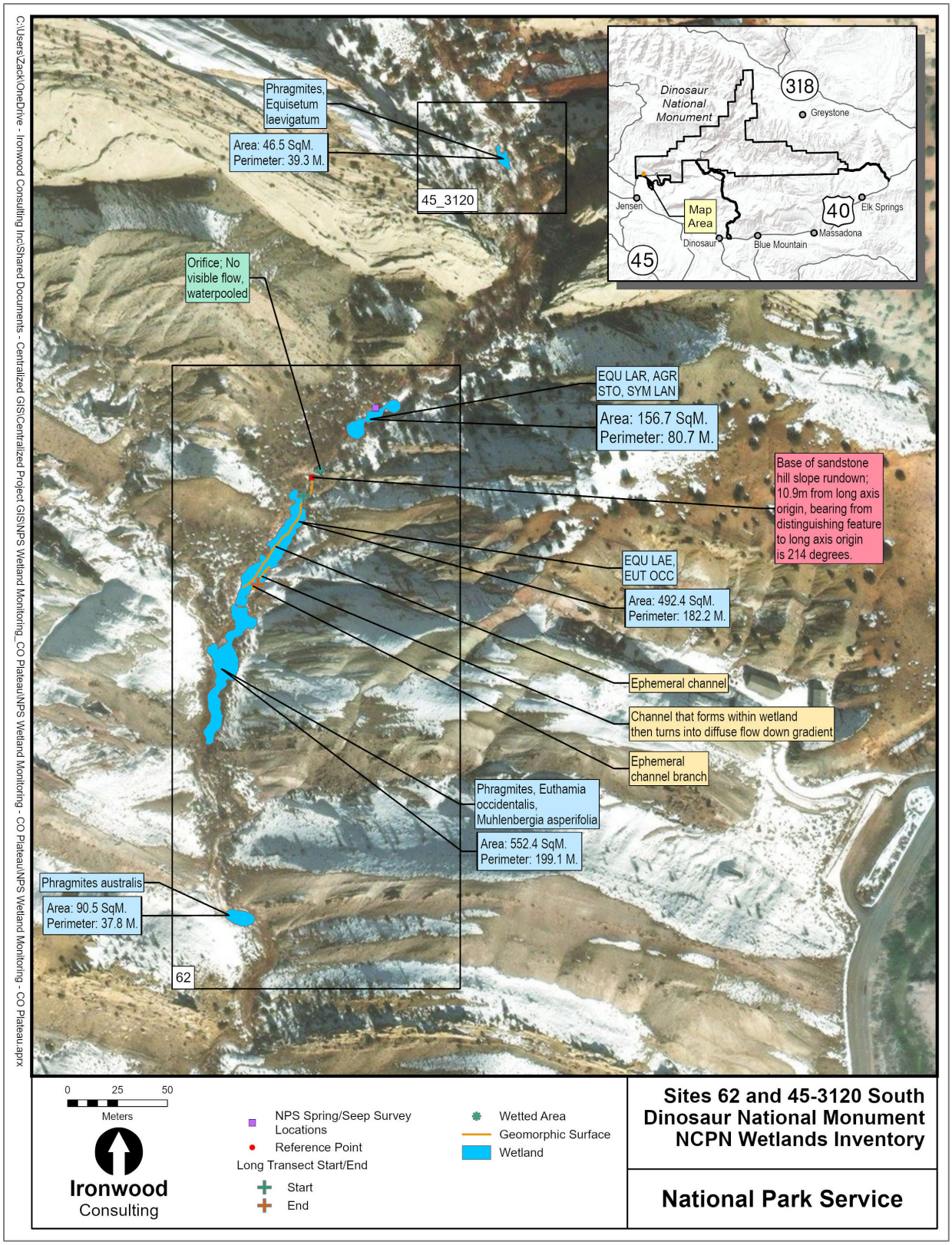


Figure 18. Wetland mapping for sites 62 and 45-3120.

A total of 10 plant taxa were encountered during the GDE level II survey, including four taxa recorded within the vegetation quadrats (Appendix D, Tables 41–43). Total average herbaceous cover was 48.8%. The dominant herbaceous wetland plants were common reed and giant helleborine with 24.6% and 19.0% average cover, respectively. Groundcover included litter and soil with 97.2% and 2.8% average corner hits, respectively. There were no woody plants encountered on the line intercept transects. Due to technical difficulties in the field, the long axis start and end points were not mapped. However, these locations can be reasonably reestablished for future surveys by using the reference point notes and wetland polygon boundary.

Table 41. Herbaceous vegetation quadrat data for Site 45-3120.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Phragmites australis *	common reed	FACW	24.6	89
Epipactis gigantea	giant helleborine	OBL	19.0	67
Solidago canadensis	Canada goldenrod	UPL	3.8	22
Clematis ligusticifolia	white virgin's-bower	FAC	1.4	22
Bryophytes	moss	–	0.0	0.0
Total	**–**	**–**	**48.8**	**–**
50% of Total	**–**	**–**	**24.4**	**–**
20% of Total	**–**	**–**	**9.8**	**–**

Table 42. Groundcover quadrat data for Site 45-3120.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	0.0
Litter	97.2
Water	0.0
Wood	0.0
Soil	2.8
Total	**100.0**

* Listed as a noxious weed in Utah (UDAF 2023).

Table 43. Woody vegetation line intercept data for Site 45-3120.

Species	Common Name	Wetland Code	Average Woody Plant Cover (%)
None	–	–	0
Total	**–**	**–**	**0**

The non-native plants bull thistle and cheatgrass and the noxious weeds Canada thistle and common reed occurred at this site. No recreation impacts, spring developments, or wildlife sign were observed (Appendix C).

Hanging Spring (Site DINO 27)

The designated Hanging Spring survey location was inaccessible during field surveys due to technical terrain when approaching from the canyon to the south. A tall pour-off prevented access via the main channel and no bypass was discovered. Consequently, no GDE level II survey was completed for this site; however, sub-meter wetland mapping was completed below the pour off. Evidence of groundwater below the pour off included water dripping from the pour off, flow from a spring source, peat/muck accumulation, and wetland vegetation. A standing pool of water occurred in the main channel. However, no visible flow was detected, and it was unclear whether the pool originated from a spring source or surface discharge following a recent precipitation event. The total mapped wetland area and perimeter length were 0.04 ac (180.1 m^2) and 147.6 m, respectively; see Figure 19, Appendix B. The spring type at the mapped location was characterized as rheocrene.

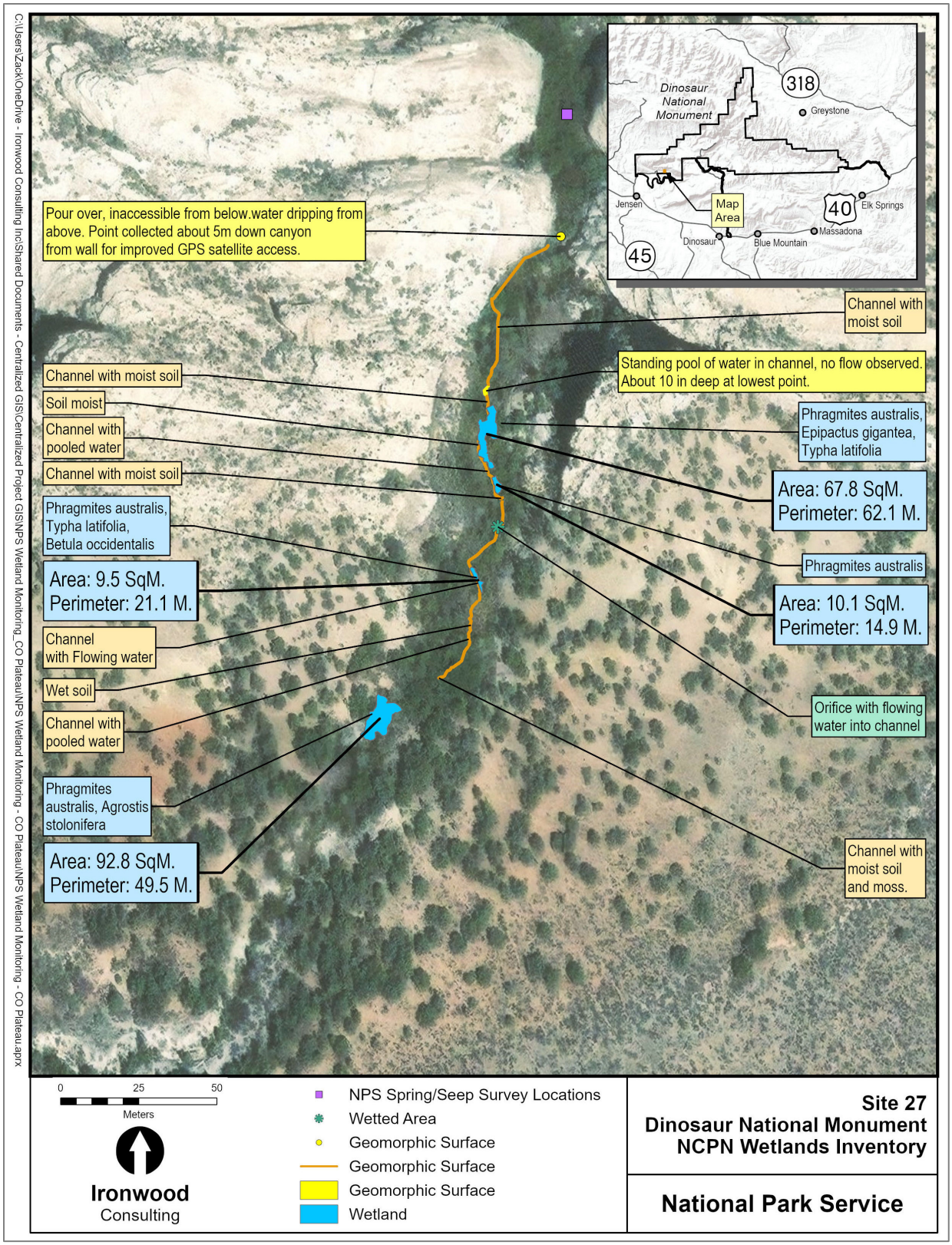


Figure 19. Wetland mapping for DINO 27.

No GDE Level II protocol was completed at this site since the main spring was inaccessible. However, a total of seven plant taxa were noted during wetland mapping, including broad-leaved cattail, common reed, giant helleborine, water birch (*Betula occidentalis*), and western poison ivy (*Toxicodendron rydbergii*). The non-native plant marsh sow-thistle was observed, and the noxious plant common reed was also present.

Recreation impacts include one spring orifice that had been impounded with a recreation soaking pool and nearby social trails. No wildlife sign was observed (Appendix C).

Hidden Forest Spring (Site DINO 29)

The Hidden Forest GDE site occurs at an elevation of approximately 1,461 m with an overall southeast (167°) aspect. Evidence of groundwater included flow from a spring source, standing water, and wetland vegetation. The spring type was characterized as rheocrene. Although a spring orifice and flowing channel were mapped and wetland vegetation was present, the extent of the wetland vegetation patches were less than 5 m^2; therefore, no GDE level II survey was completed (Figure 20).

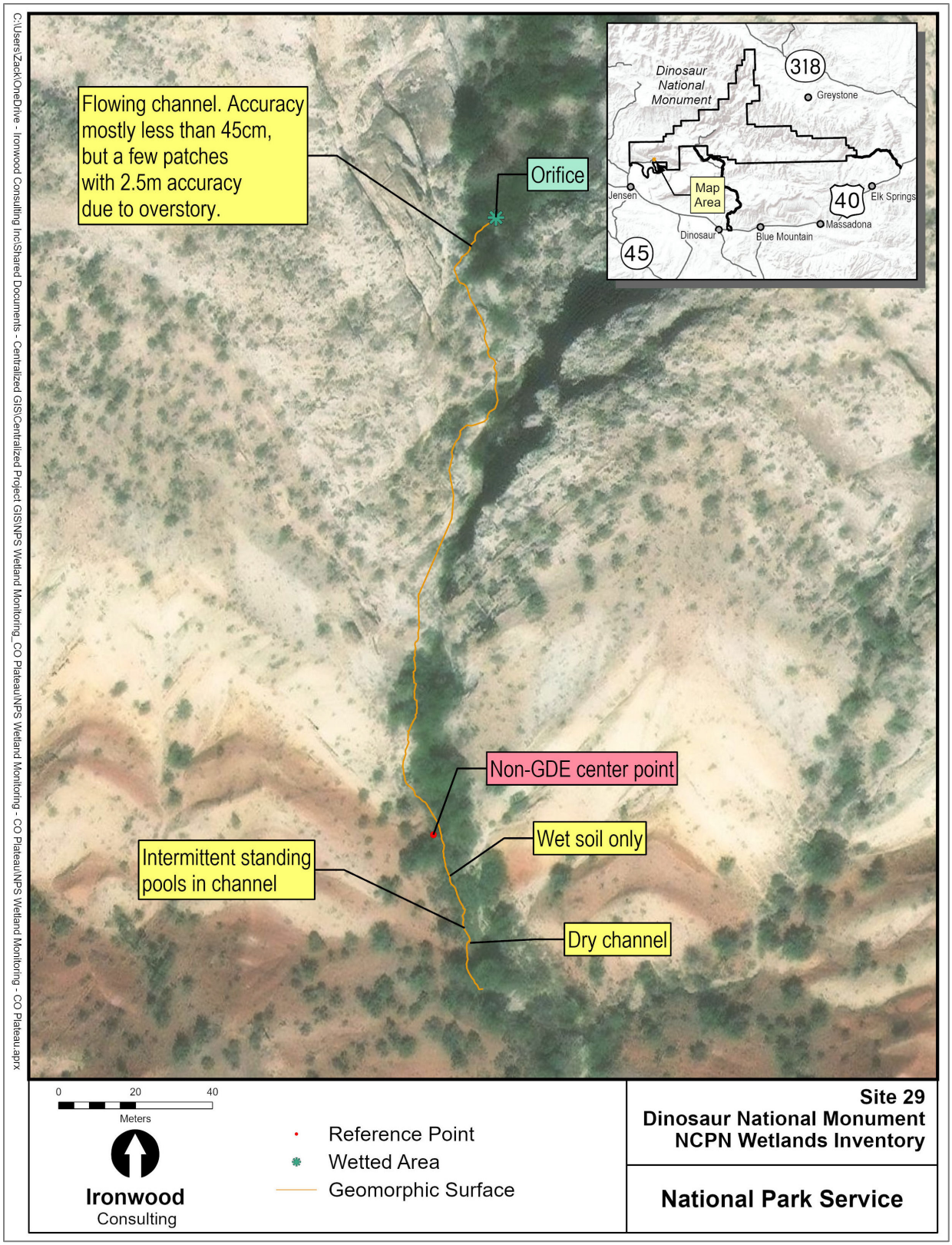


Figure 20. Wetland mapping for DINO 29.

The non-native plants recorded at this site included common dandelion and redtop (Appendix D). The noxious species Russian thistle and five-stamen tamarisk were also present.

No recreation impacts or spring developments were observed. Deer scat was found at this site (Appendix C).

Juniper Spring (Site DINO 36)

The Juniper Spring GDE site occurs at an elevation of approximately 1,558 m with an overall southwest (208°) aspect and high slope variability across the site. Groundwater evidence included flow from two mapped spring sources, standing water, and wetland vegetation. This primary spring type was characterized as limnocrene and secondary type as rheocrene. It included a total wetland area and perimeter length of 0.002 ac (7.3 m^2) and 14.3 m, respectively; see Figures 21 and 22, Appendix B.

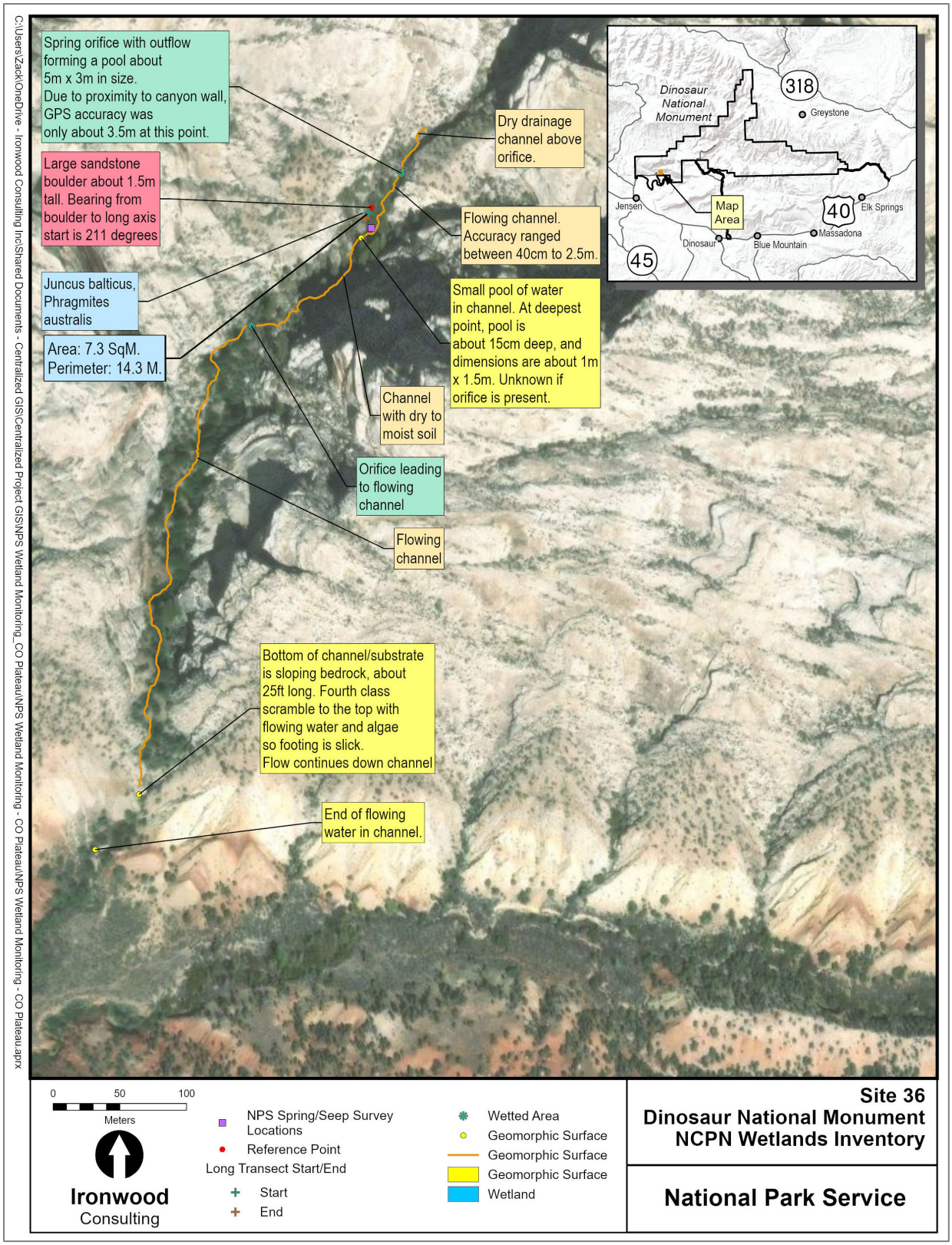


Figure 21. Wetland mapping for DINO 36 (Overview).

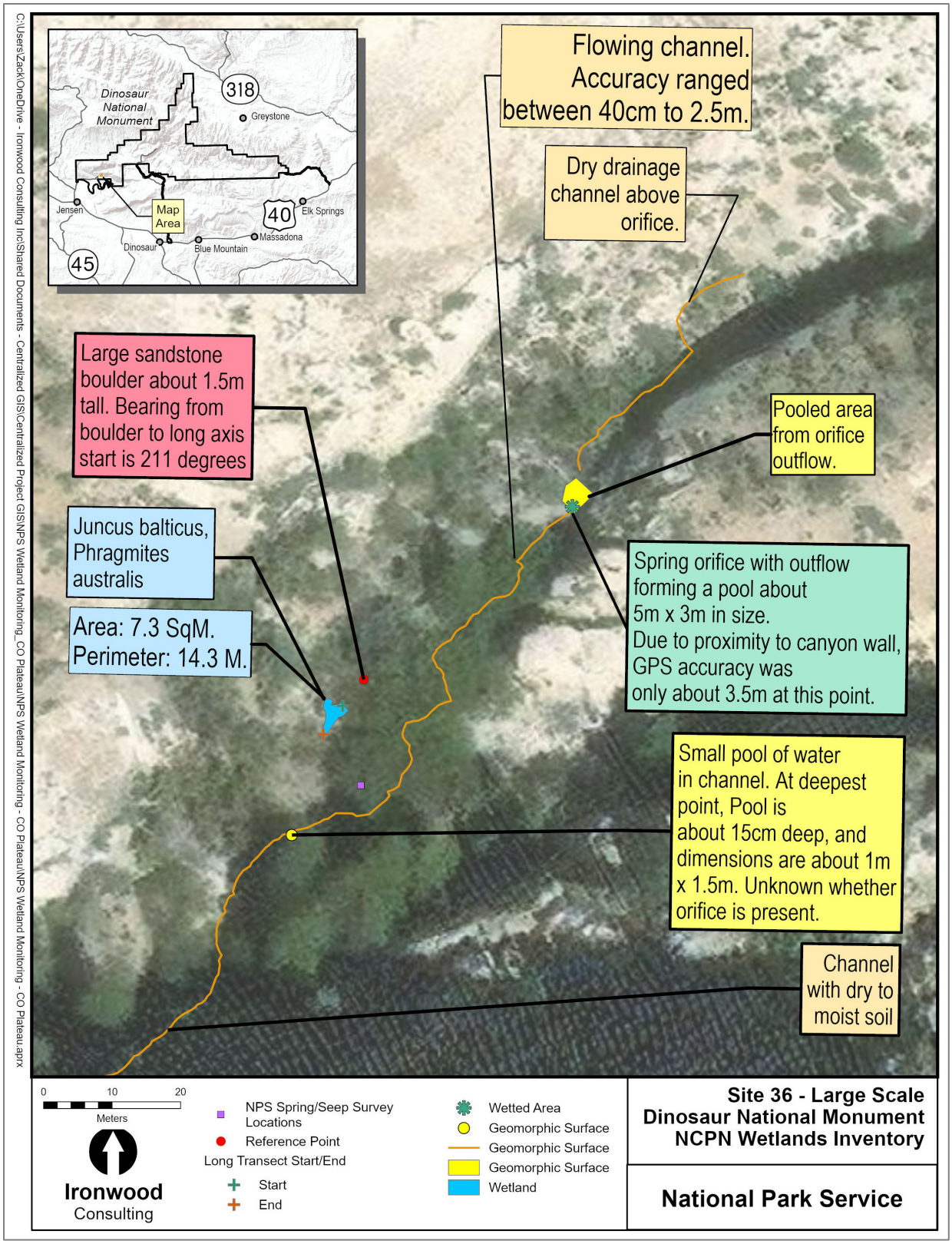


Figure 22. Wetland mapping for DINO 36 (GDE Site).

A total of 10 plant taxa were encountered during the GDE level II survey, including seven taxa recorded within vegetation quadrats and woody line intercept transects (Appendix D, Tables 44–46). The total average herbaceous cover was 7.6%. The dominant herbaceous wetland plant was Baltic rush (*Juncus balticus* var. *montanus*) with 4.6% average cover. Groundcover included litter, soil, and bryophytes with 40.0%, 35.0%, and 25.0% average corner hits, respectively. Green ephedra (*Ephedra viridis*) had an average woody line intercept cover of 9.4%.

Table 44. Herbaceous vegetation quadrat data for DINO 36.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Juncus balticus var. *montanus*	Baltic rush	FACW	4.6	100
Echinocereus sp.	hedgehog cactus	UPL	1.0	20
Carex geophila	white Mountain sedge	UPL	0.8	40
Phragmites australis	common reed	FACW	0.6	20
Machaeranthera canescens	hoary aster	UPL	0.4	20
Hesperostipa comata	needle-and-thread	UPL	0.2	20
Bryophytes	moss	–	19.0	100
Total	**–**	**–**	**7.6**	**–**
50% of Total	**–**	**–**	**3.8**	**–**
20% of Total	**–**	**–**	**1.5**	**–**

Table 45. Groundcover quadrat data for DINO 36.

Groundcover Type	Average Corner Hits (%)
Bryophyte	25.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	0.0
Litter	40.0
Water	0.0
Wood	0.0
Soil	35.0
Total	**100.0**

Table 46. Woody vegetation line intercept data for DINO 36.

Species	Common Name	Wetland Code	Average Woody Plant Cover (%)
Ephedra viridis	green ephedra	UPL	9.4
Total	**–**	**–**	**9.4**

The noxious plant common reed was present at this site.

No recreation impacts or spring developments were observed. Deer and rabbit signs were recorded inside the vegetation quadrats at 20% and 100% frequency, respectively (Appendix C). Deer and elk signs were encountered outside of the vegetation quadrats.

Mid-Joint Spring (Site DINO 50)

The Mid-Joint Spring GDE site occurs at an elevation of approximately 1,551 m with an overall southwest (186°) aspect. Groundwater evidence included flow from four spring orifices, standing water, and wetland vegetation. The spring type was characterized as rheocrene. It included a total wetland area and perimeter length of 0.003 ac (11.9 m^2) and 26.0 m, respectively; see Figures 23 and 24, Appendix B.

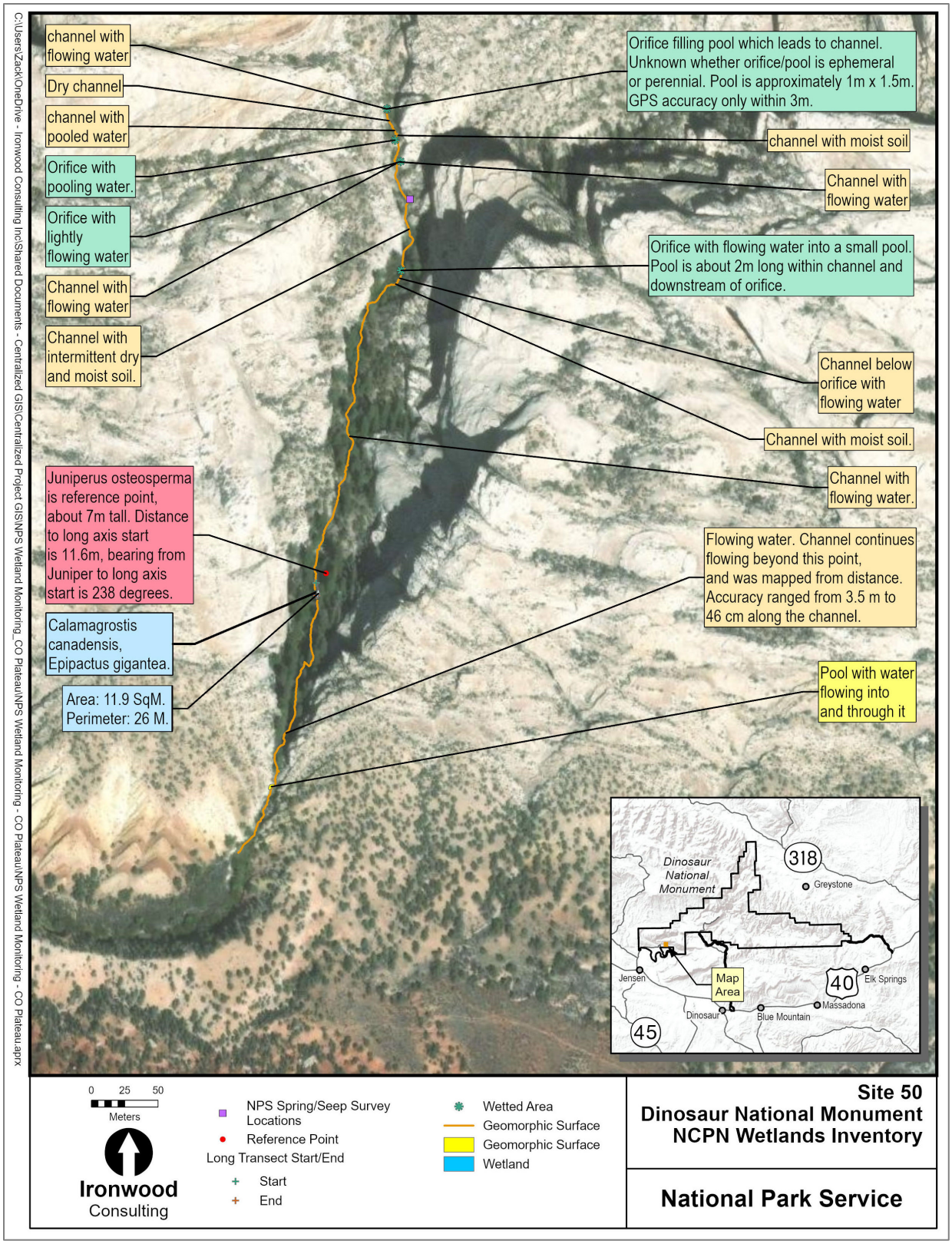


Figure 23. Wetland mapping for DINO 50 (Overview).

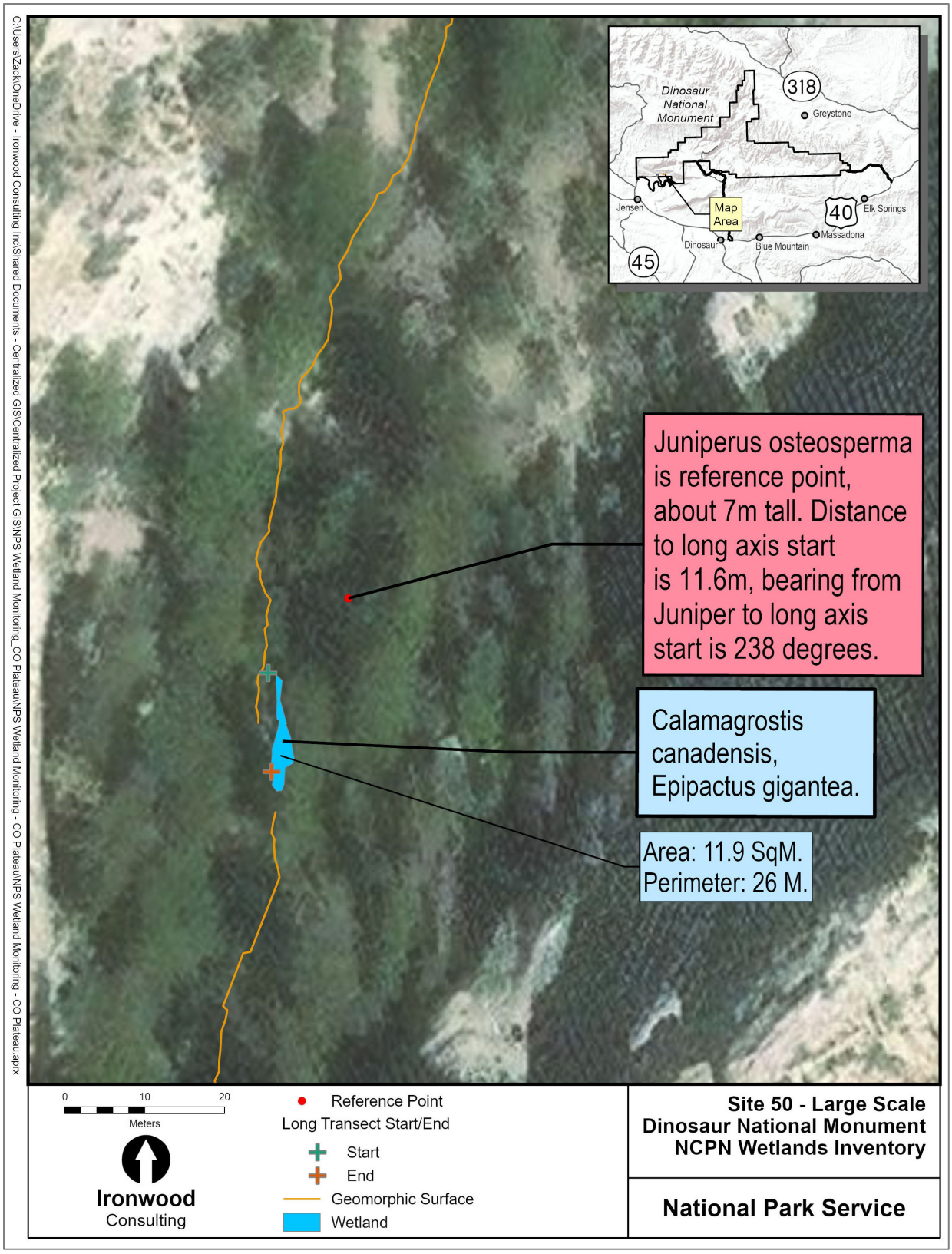


Figure 24. Wetland mapping for DINO 50 (GDE Site).

A total of nine plant taxa were encountered during the GDE level II survey, including six taxa recorded in the vegetation quadrats and woody line intercept transects (Appendix D, Tables 47–49). The total average herbaceous cover was 87.7%. The dominant herbaceous wetland plants were bluejoint reedgrass (*Calamagrostis canadensis*) and giant helleborine with 52.3% and 17.7% average cover, respectively. Groundcover included litter and basal with 95.8% and 4.2% average corner hits, respectively. There were no woody plants encountered on the line intercept transects.

Table 47. Herbaceous vegetation quadrat data for DINO 50.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Calamagrostis canadensis	bluejoint reedgrass	FACW	52.3	100
Epipactis gigantea	giant helleborine	OBL	17.7	100
Maianthemum stellatum	starry false Solomon's-seal	FACU	12.7	100
Solidago canadensis	Canada goldenrod	UPL	3.2	33
Apocynum cannabinum	common dogbane	FAC	1.7	17
Sonchus arvensis ssp. *uliginosus*	marsh sow-thistle	FACU	0.2	17
Bryophytes	moss	–	0.0	0.0
Total	**–**	**–**	**87.7**	**–**
50% of Total	**–**	**–**	**43.8**	**–**
20% of Total	**–**	**–**	**17.5**	**–**

Table 48. Groundcover quadrat data for DINO 50.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	4.2
Litter	95.8
Water	0.0
Wood	0.0
Soil	0.0
Total	**100.0**

Table 49. Woody vegetation line intercept data for DINO 50.

Species	Common Name	Wetland Code	Average Woody Plant Cover (%)
None	–	–	0
Total	**–**	**–**	**0**

Non-native plants present were marsh sow-thistle. There were no noxious plants encountered. No recreation impacts, spring developments, or wildlife sign was observed (Appendix C).

Quarry West Spring (Site DINO 62)

The Quarry West Spring GDE site occurs at an elevation of approximately 1,471 m with an overall southwest (212°) aspect and moderate slope variability across the site. Groundwater evidence included water pooling from a spring orifice and wetland vegetation. The spring type was characterized as rheocrene. It included a total wetland area and perimeter length of 0.3 ac (1,292.0 m^2) and 499.8 m, respectively; see Figure 25, Appendix B.

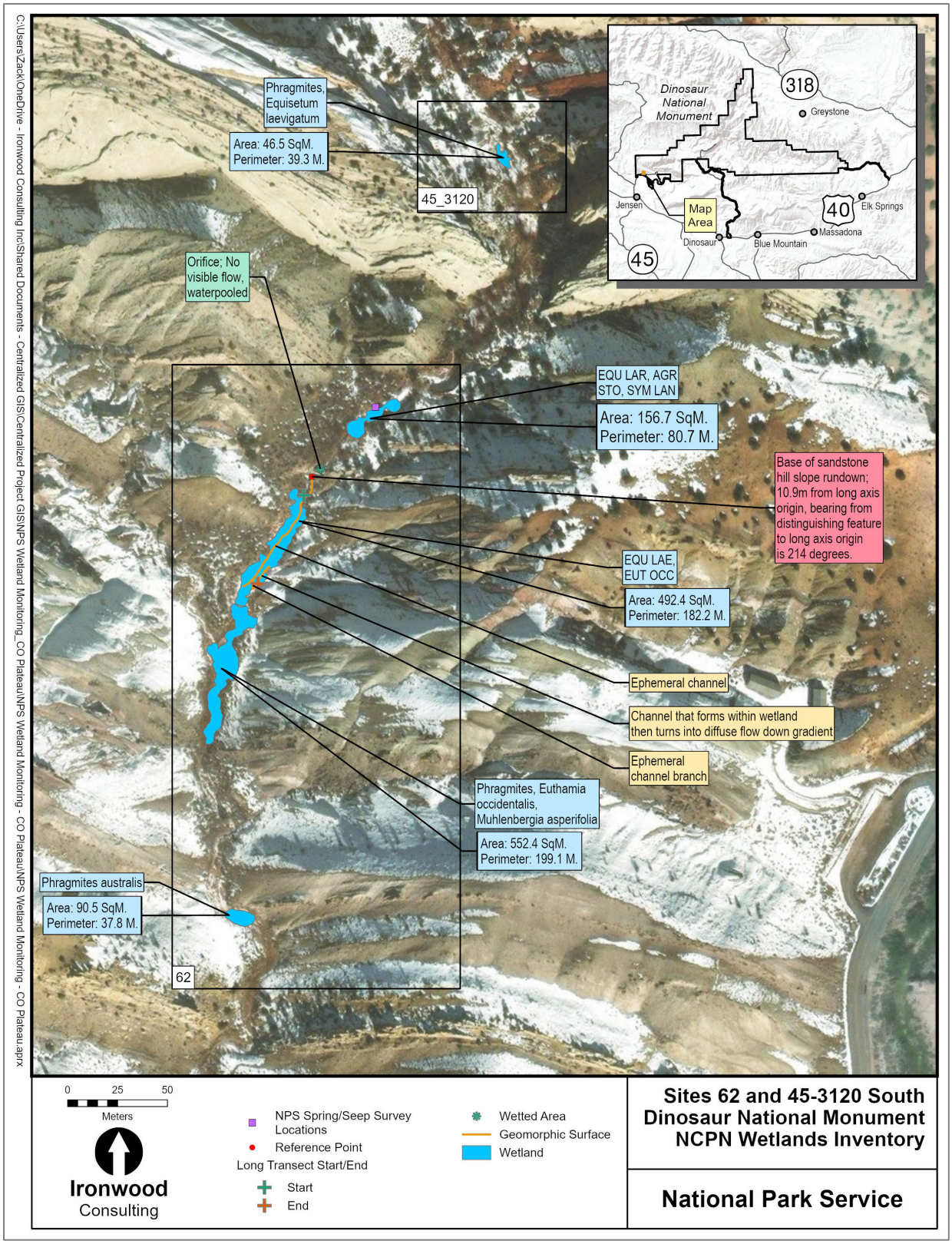


Figure 25. Wetland mapping for DINO 62.

A total of 22 plant taxa were encountered during the GDE level II survey, including 16 taxa occurring within the vegetation quadrats and line intercept transects (Appendix D, Tables 50–52). The total average herbaceous cover was 47.3%. The dominant herbaceous wetland plants were smooth scouring-rush (*Equisetum laevigatum*), western goldenrod (*Euthamia occidentalis*), and scratchgrass with 15.8%, 12.1%, and 10.0% average cover, respectively. Groundcover included litter, soil, and basal with 51.4%, 47.2%, and 1.4% average corner hits, respectively. Big sagebrush (*Artemisia tridentata*) spearleaf rabbitbrush, greasewood (*Sarcobatus vermiculatus*), and five-stamen tamarisk had an average woody line intercept cover of 3.7%, 2.9%, 0.9%, and 0.2%, respectively.

Table 50. Herbaceous vegetation quadrat data for DINO 62.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Equisetum laevigatum	smooth scouring-rush	FACW	15.8	94
Euthamia occidentalis	western goldenrod	FACW	12.1	61
Muhlenbergia asperifolia	scratchgrass	FACW	10.0	67
Asclepias speciosa	showy milkweed	FAC	3.9	17
Lepidium latifolium	broad-leaf pepperwort	FAC	2.9	50
Lactuca serriola	prickly lettuce	FACU	0.7	17
Xanthium strumarium	rough cocklebur	FAC	0.7	17
Calamagrostis stricta	slimstem reedgrass	FACW	0.4	6
Sonchus arvensis ssp. *uliginosus*	marsh sow-thistle	FACU	0.4	11
Agrostis stolonifera	redtop	FACW	0.2	6
unknown perennial graminoid	unknown perennial graminoid	–	0.2	6
Bromus tectorum	cheatgrass	UPL	0.1	6
Bryophytes	moss	–	0.0	0
Total	**–**	**–**	**47.3**	**–**
50% of Total	**–**	**–**	**23.7**	**–**
20% of Total	**–**	**–**	**9.5**	**–**

Table 51. Groundcover quadrat data for DINO 62.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	1.4
Litter	51.4
Water	0.0
Wood	0.0
Soil	47.2
Total	**100.0**

Table 52. Woody vegetation line intercept data for DINO 62.

Species	Common Name	Wetland Code	Average Woody Plant Cover (%)
Chrysothamnus linifolius	spearleaf rabbitbrush	FAC	3.7
Tamarix chinensis	five-stamen tamarisk *	FAC	2.9
Sarcobatus vermiculatus	greasewood	FACU	0.9
Artemisia tridentata	big sagebrush	UPL	0.2
Total	**–**	**–**	**7.6**

* Listed as a noxious weed in Utah (UDAF 2023)

Non-native plants present were cheatgrass, marsh sow-thistle, prickly lettuce, and redtop. Noxious plants included broad-leaf pepperwort, five-stamen tamarisk, and Russian olive.

No recreation impacts or spring developments were observed. Deer and rabbit signs were recorded inside the vegetation quadrats at 17% and 22% frequency, respectively (Appendix C). Deer sign was also encountered outside of the vegetation quadrats.

Snow Ranch Spring (Site DINO 74)

The Snow Ranch Spring GDE site occurs at an elevation of approximately 2,251 m with an overall northeast (56°) aspect and moderate slope variability. Wetland vegetation served as evidence for groundwater. The primary spring type was characterized as rheocrene and the secondary type as hypocrene. It included a total wetland area and perimeter length of 0.04 ac (144.2 m^2) and 53.0 m, respectively (Figure 26, Appendix B).

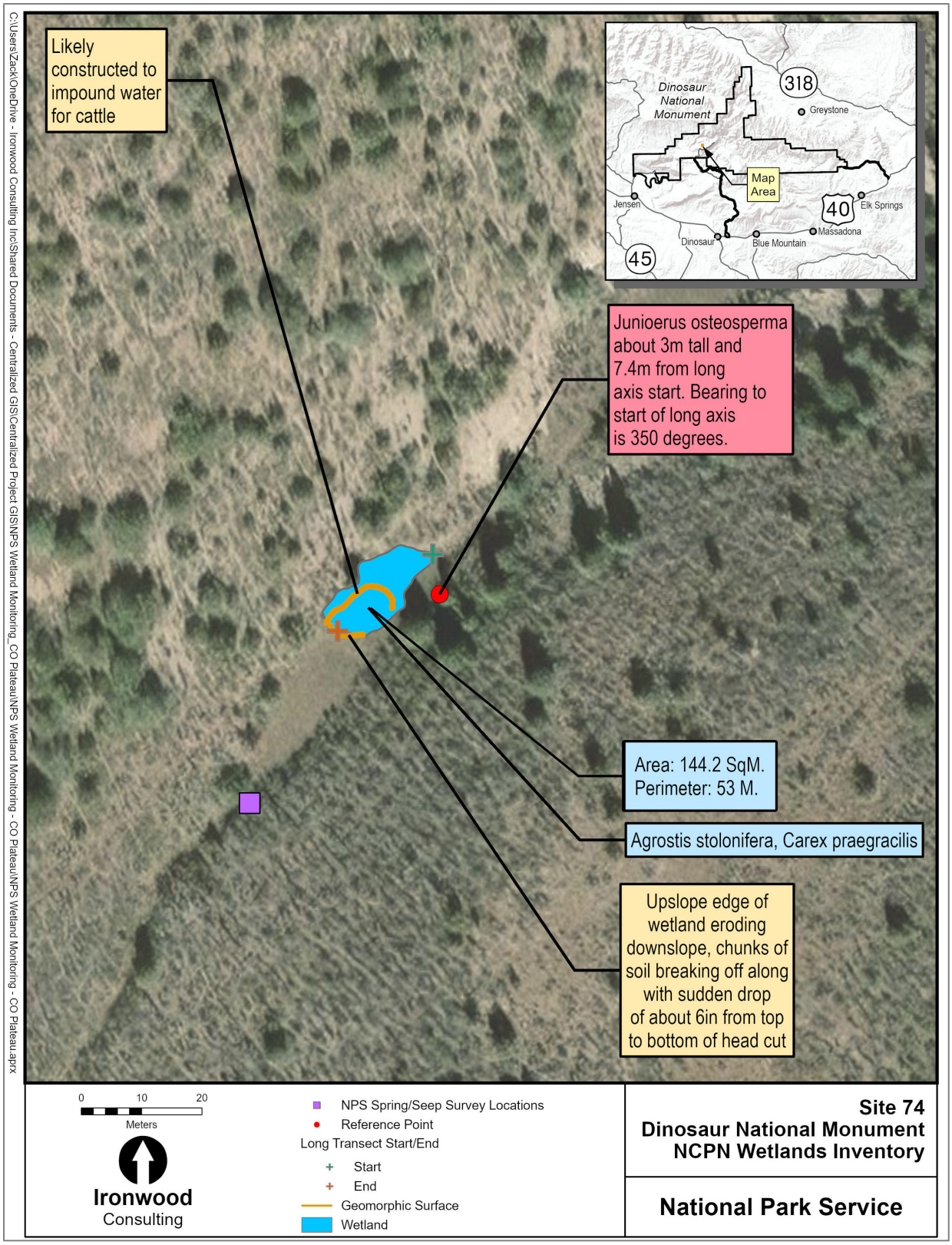


Figure 26. Wetland mapping for DINO 74.

A total of 17 plant taxa were encountered during the GDE level II survey, including 13 taxa occurring within the vegetation quadrats (Appendix D, Tables 53–55). Total average herbaceous cover was 29.3%. The dominant herbaceous wetland plant was redtop with 15.3% average cover. Groundcover included soil, litter, basal, bryophyte, gravel, cobble, stone, and wood with 72.6%, 15.5%, 1.2%, 1.2%, 1.2%, 1.2%, and 1.2% cover, respectively. There were no woody plants encountered on the line intercept transects.

Table 53. Herbaceous vegetation and groundcover quadrat data for DINO 74.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Agrostis stolonifera	redtop	FACW	15.3	90
Carex praegracilis	blackcreeper sedge	FACW	3.1	24
Eleocharis sp.	spikerush	–	3.1	33
Artemisia biennis	biennial wormwood	FACW	2.4	38
Juncus bufonius	toad rush	FACW	1.7	38
Poa pratensis	Kentucky bluegrass	FAC	1.0	43
Symphyotrichum ascendens	Pacific aster	FAC	0.8	14
Hordeum brachyantherum	meadow barley	FACW	0.8	14
Polygonum aviculare	yard knotweed	FAC	0.3	19
Taraxacum officinale	common dandelion	FACU	0.3	14
Rumex salicifolius	willow dock	FACW	0.1	10
Erigeron lonchophyllus	longleaf daisy	FACW	0.1	5
Rorippa sp.	yellowcress	–	0.1	10
Bryophytes	moss	–	1.4	24
Total	**–**	**–**	**29.3**	**–**
50% of Total	**–**	**–**	**14.6**	**–**
20% of Total	**–**	**–**	**5.9**	**–**

Table 54. Groundcover quadrat data for DINO 74.

Groundcover Type	Average Corner Hits (%)
Bryophyte	1.2
Gravel	1.2
Cobble	1.2
Stone	1.2
Boulder	0.0
Bedrock	0.0
Basal	6.0
Litter	15.5
Water	0.0
Wood	1.2
Soil	72.6
Total	**100.0**

Table 55. Woody vegetation line intercept data for DINO 74.

Species	Common Name	Wetland Code	Average Woody Plant Cover (%)
None	–	–	0
Total	**–**	**–**	**0**

Non-native plants present were common biennial wormwood (*Artemisia biennis*), dandelion, Kentucky bluegrass, redtop, and yard knotweed (*Polygonum aviculare*). No noxious plants were observed.

No recreation impacts were observed. There was a line of old logs that appear to have been historically used to impound water. Rabbit sign was recorded inside the vegetation quadrats at 57% frequency. Deer sign was also encountered outside of the vegetation quadrats.

Valley View Spring (Site DINO 85)

The Valley View Spring GDE site occurs at an elevation of approximately 2,287 m with an overall southwest (217°) aspect and moderate slope variability across the site. During field surveys, it was difficult to determine whether sufficient wetland vegetation was present because of recent, heavy grazing. Consequently, the survey team completed a GDE Level II survey protocol so the data could be reviewed later in the office for final determination. In the field, the primary spring type was characterized as rheocrene and the secondary spring type as hypocrene. This site included a total mapped wetland area and perimeter length of 0.01 ac (51.2 m^2) and 55.7 m, respectively; see Figure 27, Appendix B.

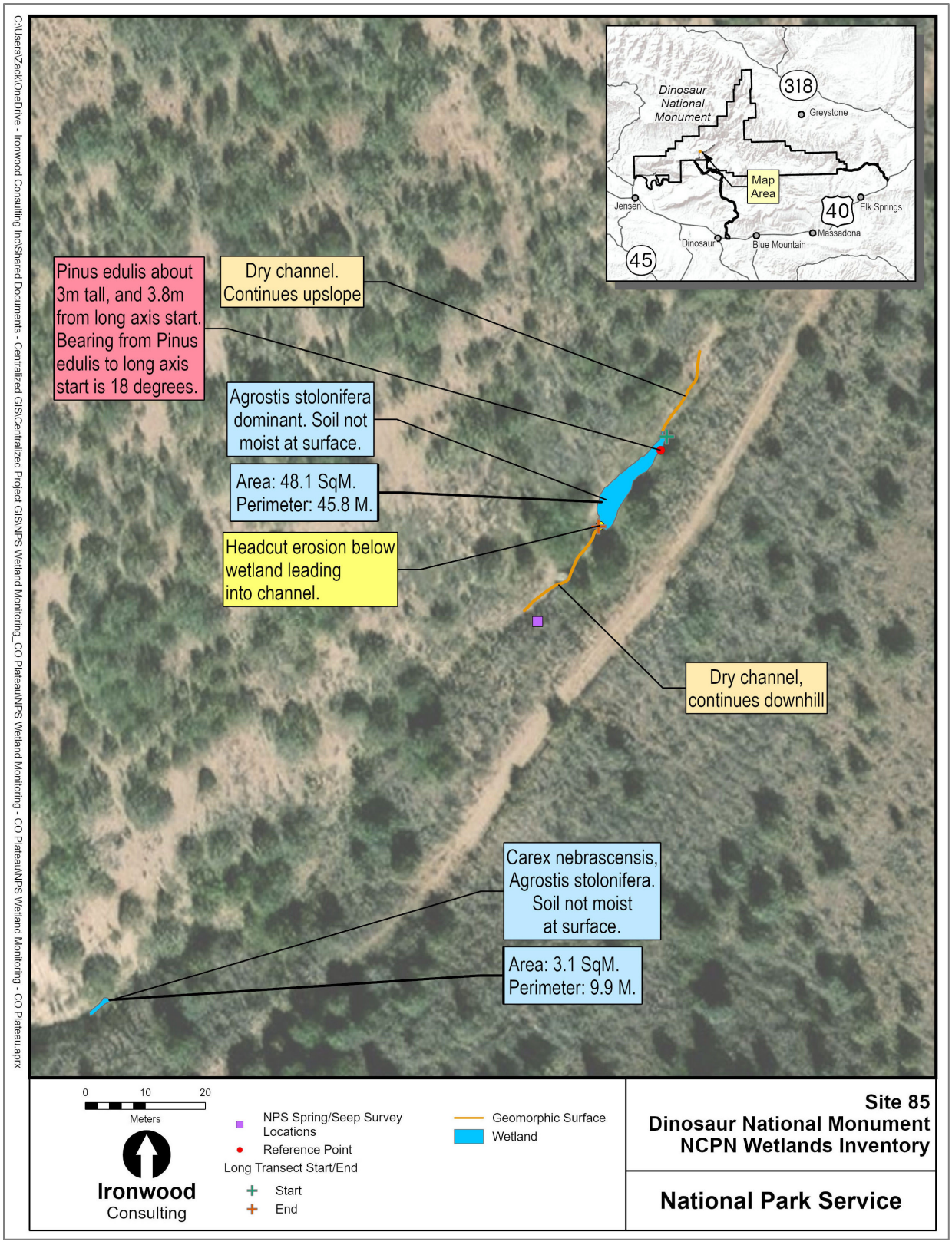


Figure 27. Wetland mapping for DINO 85.

A total of 16 plant taxa were encountered during the GDE level II survey, including eight taxa occurring within the vegetation quadrats and line intercept transects (Appendix D, Tables 56–58). Total average herbaceous cover was 59.9%. The dominant herbaceous wetland plants were redtop and Kentucky bluegrass with average cover values of 31.3% and 15.8%, respectively. Groundcover included litter, soil, and stone with 44.4%, 44.4%, and 2.8% average corner hits, respectively. Big sagebrush had an average woody line intercept of 1.6%.

Table 56. Herbaceous vegetation quadrat data for DINO 85.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Agrostis stolonifera	redtop	FACW	31.3	100
Poa pratensis	Kentucky bluegrass	FAC	15.8	100
Taraxacum officinale	common dandelion	FACU	5.3	78
Carex praegracilis	blackcreeper sedge	FACW	5.0	33
Symphyotrichum ascendens	Pacific aster	FAC	2.0	56
Equisetum laevigatum	smooth scouring-rush	FACW	0.3	22
Ranunculus cymbalaria	marsh buttercup	OBL	0.1	11
Bryophytes	moss	–	1.0	22
Total	**–**	**–**	**59.9**	**–**
50% of Total	**–**	**–**	**29.9**	**–**
20% of Total	**–**	**–**	**12.0**	**–**

Table 57. Groundcover quadrat data for DINO 85.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	2.8
Boulder	0.0
Bedrock	0.0
Basal	8.3
Litter	44.4
Water	0.0
Wood	0.0
Soil	44.4
Total	**100.0**

Table 58. Woody vegetation line intercept data for DINO 85.

Species	Common Name	Wetland Code	Average Woody Plant Cover (%)
Artemisia tridentata	big sagebrush	UPL	1.6
Total	**–**	**–**	**1.6**

While the wetland indicator status of redtop is FACW, Kentucky bluegrass is FAC. Because these were the only dominant species at the DINO 85 site, the mapped wetland does not pass the dominance test according to the standards outlined in this report. Furthermore, surveyors noted that site was so heavily grazed at the time of sampling that it was difficult to confidently identify the plants within the quadrats. Thus, another survey may be required when plants are not grazed so heavily to determine whether the mapped area passes the wetland vegetation standards.

Non-native plants present were bull thistle, common dandelion, Kentucky bluegrass, and redtop. The noxious plant Canada thistle also occurred at this site.

No recreation impacts or spring developments were observed. Signs of recent cattle grazing included tracks, scat, and recently grazed vegetation occurring across all sampled quadrats (Appendix C. Deer tracks and scat were also observed outside of the quadrats.

Split Mountain Warm Spring (Site DINO 86)

The Split Mountain Warm Spring GDE site sits adjacent to the Green River at an elevation of approximately 1,458 m with an overall southwest (251°) aspect and moderate slope variability across the site. Groundwater evidence included 15 flowing or seeping spring orifices, peak/muck accumulation, and wetland vegetation. An additional 14 spring and seep orifices were mapped within 150 m southwest of the mapped wetland. The primary spring type at was characterized as rheocrene. This site included a total wetland area and perimeter length of 0.29 ac (1,170.8 m^2) and 511.3 m, respectively; see Figure 28, Appendix B).

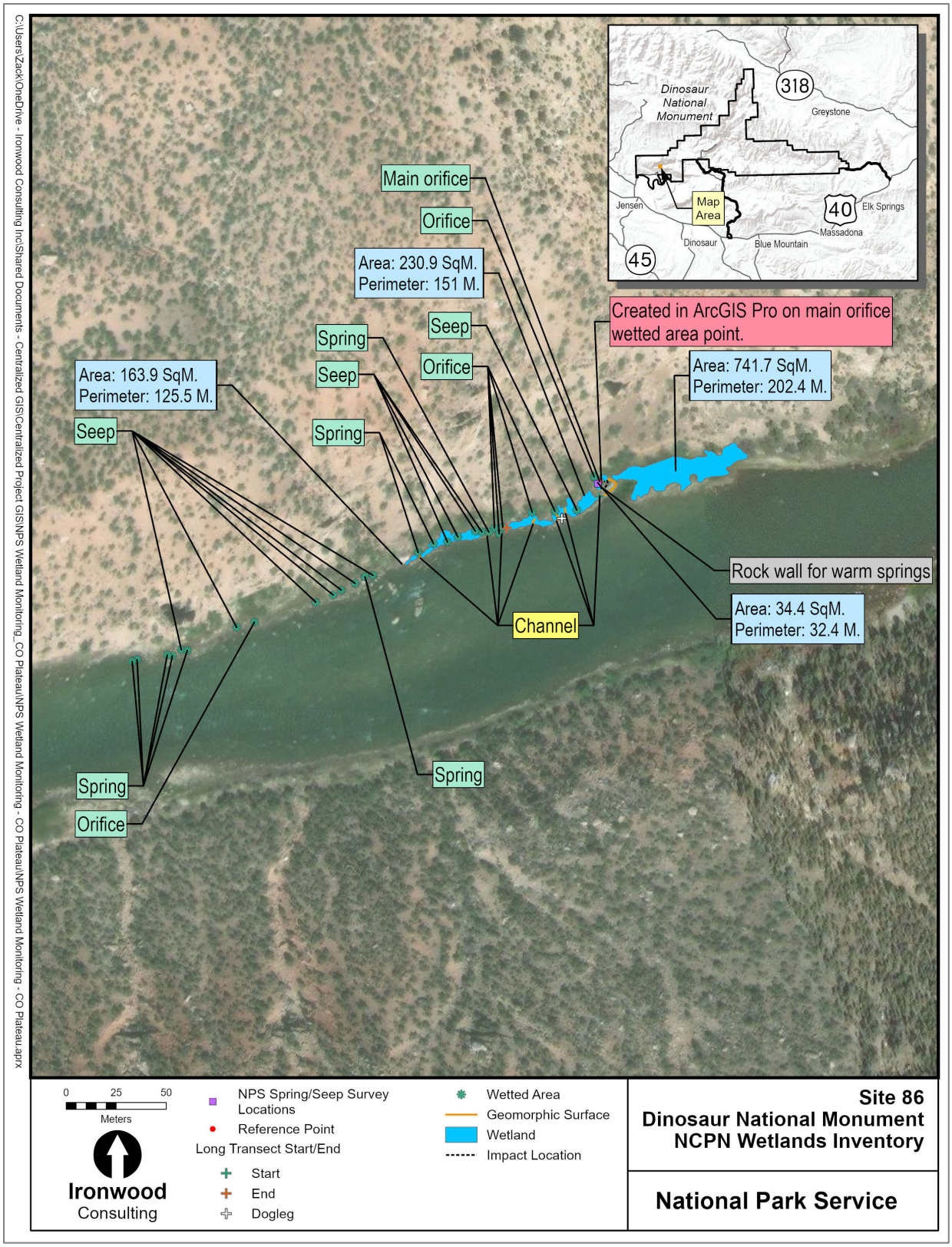


Figure 28. Wetland mapping for DINO 86.

A total of 23 plant taxa were encountered during the GDE level II survey, including 15 taxa within the vegetation quadrats and line intercept transects (Appendix D, Tables 59–61). Total average herbaceous cover was 37.1%. The dominant herbaceous wetland plants were common reed and common spikerush with 15.0% and 7.1% average cover, respectively. Groundcover included litter, boulder, soil, water, cobble, stone, and basal with 32.3%, 20.8%, 20.8%, 7.3%, 6.3%, 6.3%, and 6.3% average corner hits, respectively. Five-stamen tamarisk had an average line intercept cover of 0.2%.

Table 59. Herbaceous vegetation and groundcover quadrat data for DINO 86.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Phragmites australis *	common reed	FACW	15.0	42
Eleocharis palustris	common spikerush	OBL	7.1	21
Schoenoplectus pungens	common threesquare	OBL	3.6	46
Euthamia occidentalis	western goldenrod	FACW	2.9	29
Muhlenbergia asperifolia	scratchgrass	FACW	1.9	17
Equisetum laevigatum	smooth scouring-rush	FACW	1.8	25
Apocynum cannabinum	common dogbane	FAC	1.3	21
Triglochin sp.	arrowgrass	OBL	1.2	21
Juncus compressus	compressed rush	OBL	0.8	4
Distichlis spicata	desert saltgrass	FAC	0.6	13
Helenium autumnale	common sneezeweed	FACW	0.3	4
Symphyotrichum eatonii	Eaton's aster	FAC	0.2	4
Veronica americana	American brooklime	OBL	0.2	4
Carex sp.	sedge	–	0.0	4
Bryophytes	moss	–	0.0	0.0
Total	**–**	**–**	**37.1**	**–**
50% of Total	**–**	**–**	**18.5**	**–**
20% of Total	**–**	**–**	**7.4**	**–**

Table 60. Groundcover quadrat data for DINO 86.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	6.3
Stone	6.3
Boulder	20.8
Bedrock	0.0
Basal	6.3
Litter	32.3
Water	7.3
Wood	0.0
Soil	20.8
Total	**100.0**

* Listed as a noxious weed in Utah (UDAF 2023).

Table 61. Woody vegetation line intercept data for DINO 86.

Species	Common Name	Wetland Code	Average Woody Plant Cover (%)
Tamarix chinensis *	five-stamen tamarisk	FAC	0.2
Total	**–**	**–**	**0.2**

* Listed as a noxious weed in Utah (UDAF 2023).

Non-native plants included compressed rush (*Juncus compressus*), marsh sow-thistle, rabbitfoot-grass, and red goosefoot (*Chenopodium rubrum*). Noxious plants present included common reed and five-stamen tamarisk.

Recreation impacts were observed in the form of social (foot) trails and a soaking pool built up with rocks adjacent to the Green River. There was no ungulate wildlife sign encountered at this site; however, an unidentified amphibian (frog or toad) was encountered during the survey (Appendix C). No photos of the amphibian were captured.

Sage Creek Seep (Site DINO 173)

The Sage Creek Seep GDE site occurs at an elevation of approximately 1,572 m with an overall southeast (127°) aspect and high slope variability. Groundwater evidence included flow from four spring orifices and wetland vegetation. The spring type was characterized as a rheocrene seep. This site included a total wetland area and perimeter length of 0.13 ac (539.0 m^2) and 260.5 m, respectively; see Figure 29, Appendix B.

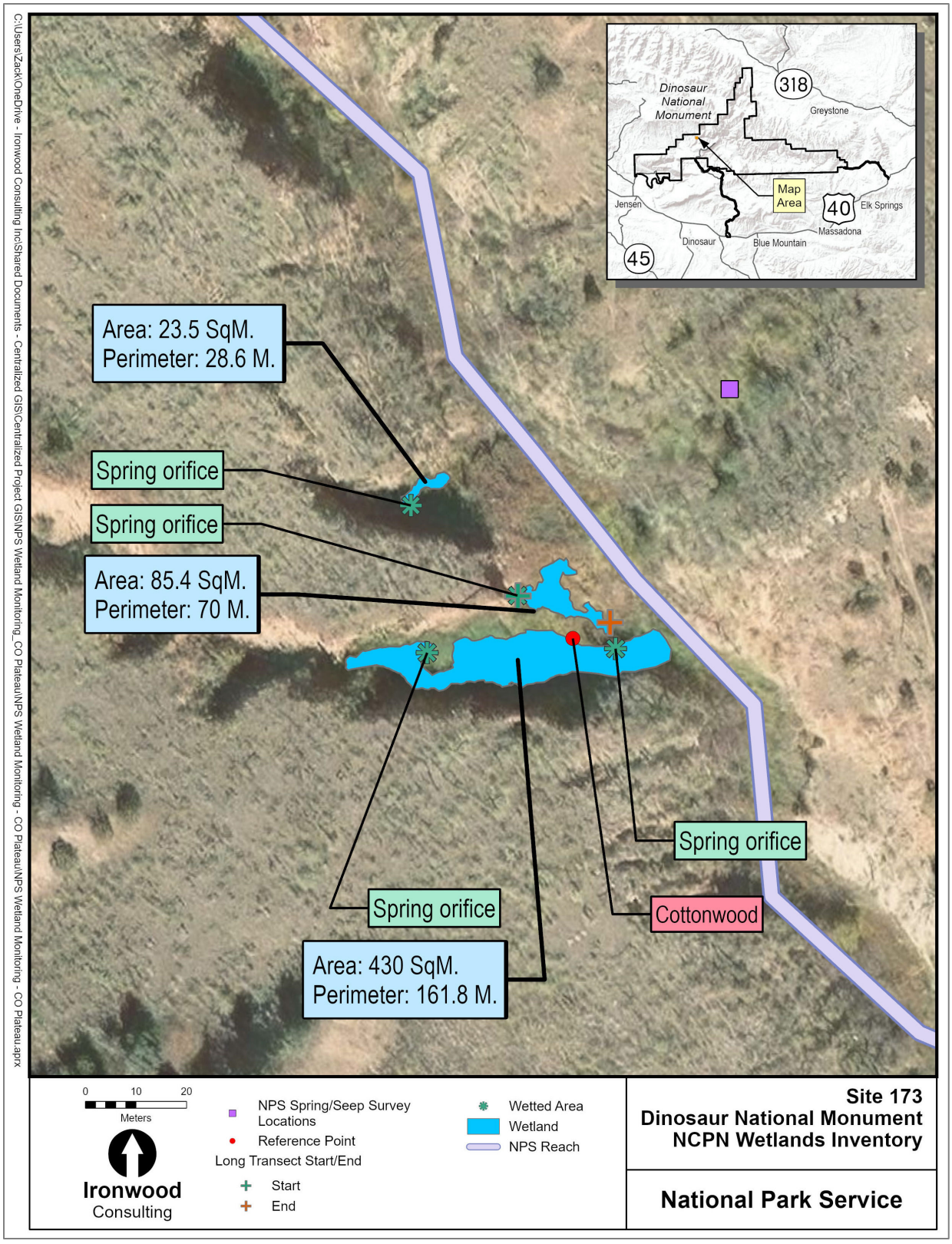


Figure 29. Wetland mapping for DINO 173.

A total of 14 plant taxa were encountered during the GDE level II survey, including 11 taxa within the vegetation quadrats and line intercept transects (Appendix D, Tables 62–64). Total average herbaceous cover was 35.8%. The dominant herbaceous wetland plant was broad-leaved cattail with 23.4% average cover. The estimated visual cover of 10% for FACW species coyote willow also factored into the USACE Dominance Test for wetland status during field surveys. Groundcover included soil, litter, water, basal, bryophytes and stone with 71.7%, 15.0%, 6.7%, 3.3%, 1.7%, and 1.7% average corner hits, respectively. Coyote willow, five-stamen tamarisk, and currant had an average line intercept cover of 6.7%, 6.7%, and 0.7%, respectively.

Table 62. Herbaceous vegetation quadrat data for DINO 173.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Typha latifolia	broad-leaved cattail	OBL	23.4	100
Equisetum arvense	field horsetail	FAC	6.9	53
Cycloloma atriplicifolium	winged pigweed	FACU	2.3	33
Bassia hyssopifolia	five-horn smotherweed	FACU	1.5	27
Sonchus arvensis ssp. *uliginosus*	marsh sow-thistle	FACU	1.2	27
Oenothera villosa	hairy evening primrose	FAC	0.4	7
Cirsium arvense *	Canada thistle	FACU	0.1	7
Poa secunda	Sandberg's bluegrass	FACU	0.1	7
Bryophytes	moss	–	0.5	13
Total	**–**	**–**	**35.8**	**–**
50% of Total	**–**	**–**	**17.9**	**–**
20% of Total	**–**	**–**	**7.2**	**–**

Table 63. Groundcover quadrat data for DINO 173.

Groundcover Type	Average Corner Hits (%)
Bryophyte	1.7
Gravel	0.0
Cobble	0.0
Stone	1.7
Boulder	0.0
Bedrock	0.0
Basal	3.3
Litter	15.0
Water	6.7
Wood	0.0
Soil	71.7
Total	**100.0**

* Listed as a noxious weed in Utah (UDAF 2023).

Table 64. Woody vegetation line intercept data for DINO 173.

Species	Common Name	Wetland Code	Average Woody Plant Cover (%)
Salix exigua	coyote willow	FACW	6.7
Tamarix chinensis *	five-stamen tamarisk	FAC	6.7
Ribes sp.	currant	–	0.7
Total	**–**	**–**	**14.0**

* Listed as a noxious weed in Utah (UDAF 2023).

Non-native plants present were five-horn smotherweed (*Bassia hyssopifolia*), marsh sow-thistle, prickly lettuce. Noxious plants included Canada thistle and five-stamen tamarisk.

Relatively high levels of erosion were observed in the moderate gradient channel. No recreation impacts or spring developments were observed. Bear and elk signs were recorded inside the vegetation quadrats at 7% and 13% frequency, respectively (Appendix C). Mountain lion tracks were observed outside of the quadrats.

Seep (Island Park Red Wash; Site DINO 192)

The Island Park Red Wash Seep occurs at an elevation of approximately 1,584 m with an overall southwest (220°) aspect and moderate slope variability. The presence of groundwater was evidenced by wetland vegetation. The primary spring type was characterized as hypocrene and the secondary spring type was rheocrene. This site included a total wetland area and perimeter length of 0.1 ac (397.9 m^2) and 263.9 m, respectively; see Figure 30, Appendix B.

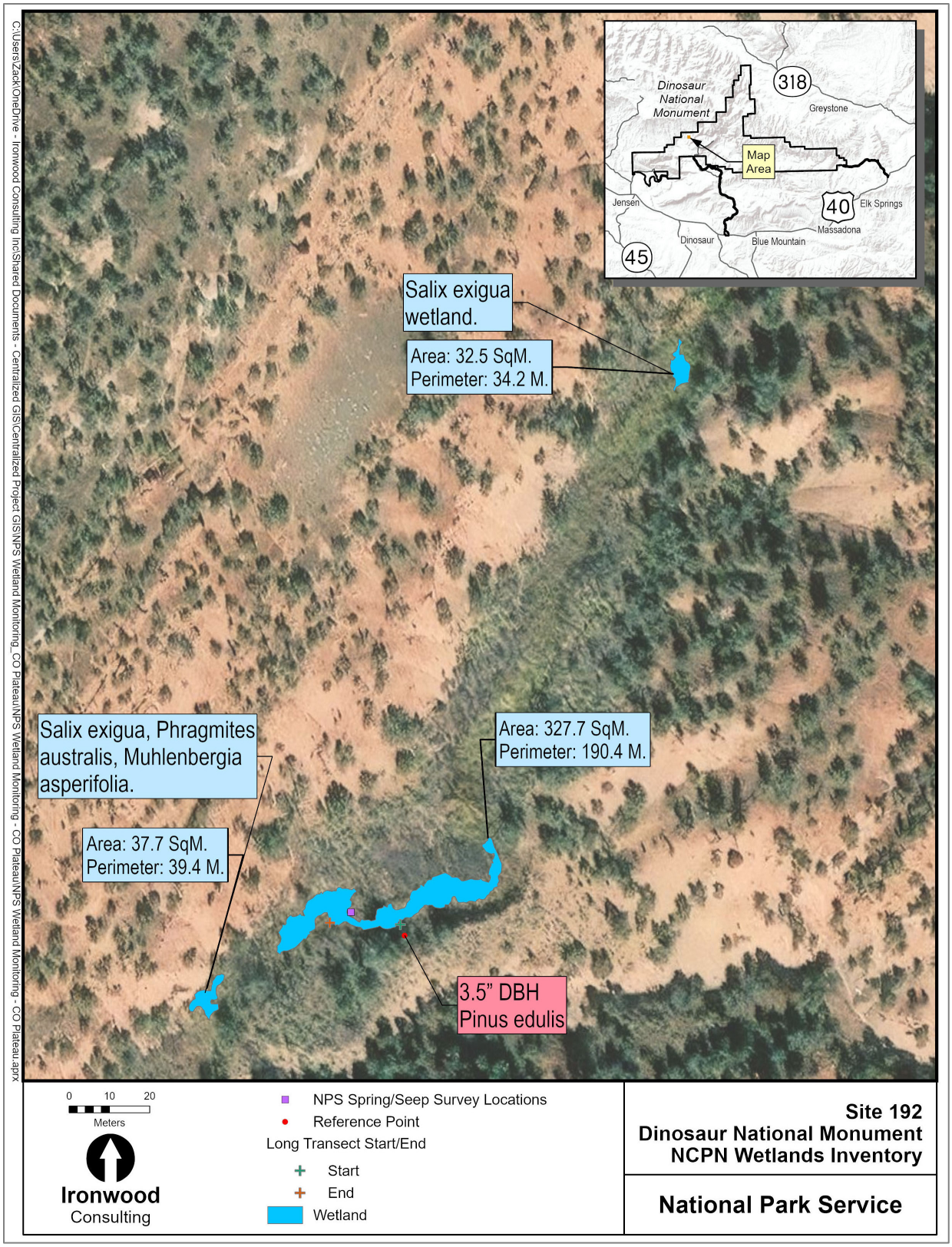


Figure 30. Wetland mapping for DINO 192.

A total of 20 plant taxa were encountered during the GDE level II survey, including 11 taxa within the vegetation quadrats and line intercept transects (Appendix D, Tables 65–67). Total average herbaceous cover was 46.6%. The dominant herbaceous wetland plants were marsh sow-thistle, common reed, and scratchgrass with 16.8%, 12.7%, and 9.9% average cover, respectively. The groundcover included litter, soil, and basal with 89.7%, 8.8%, and 1.5% average corner hits, respectively. Coyote willow, Woods' rose, and skunkbrush sumac had average line intercept cover values of 27.6%, 1.8%, and 0.5%, respectively.

Table 65. Herbaceous vegetation quadrat data for DINO 192.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Sonchus arvensis ssp. *uliginosus*	marsh sow-thistle	FACU	16.8	76
Phragmites australis *	common reed	FACW	12.7	100
Muhlenbergia asperifolia	scratchgrass	FACW	9.9	53
Carex nebrascensis	Nebraska sedge	OBL	4.2	24
Apocynum cannabinum	common dogbane	FAC	1.2	12
Euthamia occidentalis	Western goldenrod	FACW	0.7	6
Maianthemum stellatum	starry false Solomon's-seal	FACU	0.5	24
Polypogon monspeliensis	rabbitfoot-grass	FACW	0.5	18
Bryophytes	moss	–	0.4	6
Total	**–**	**–**	**46.6**	**–**
50% of Total	**–**	**–**	**23.3**	**–**
20% of Total	**–**	**–**	**9.3**	**–**

Table 66. Groundcover quadrat data for DINO 192.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	1.5
Litter	89.7
Water	0.0
Wood	0.0
Soil	8.8
Total	**100.0**

* Listed as a noxious weed in Utah (UDAF 2023).

Table 67. Woody vegetation line intercept data for DINO 192.

Species	Common Name	Wetland Code	Average Woody Plant Cover (%)
Salix exigua	coyote willow	FACW	27.6
Rosa woodsii	Woods' rose	FACU	1.8
Rhus trilobata	skunkbush sumac	FACU	0.5
Total	**–**	**–**	**29.9**

Non-native plants present included common dandelion, Kentucky bluegrass, marsh sow-thistle, rabbitfoot-grass. Noxious plants were Canada thistle, common reed, and five-stamen tamarisk.

No recreation impacts or spring developments were observed. Elk and rabbit signs were recorded inside the vegetation quadrats with 12% and 29% frequency, respectively (Appendix C). Elk tracks and scat were also observed outside of the quadrats.

Little Rainbow Seep 1 (Site DINO 196)

The Little Rainbow Seep 1 GDE side occurs at an elevation of approximately 1,549 m with an overall southeast (136°) aspect and low slope variabililty. Evidence of groundwater included flow from a single spring orifice, standing water, and the presence of wetland vegetation (which did not pass the USACE Dominance Test). The primary spring type was characterized as rheocrene. This site included a total wetland area and perimeter length of 0.008 ac (30.8 m^2) and 28.8 m, respectively; see Figure 31, Appendix B.

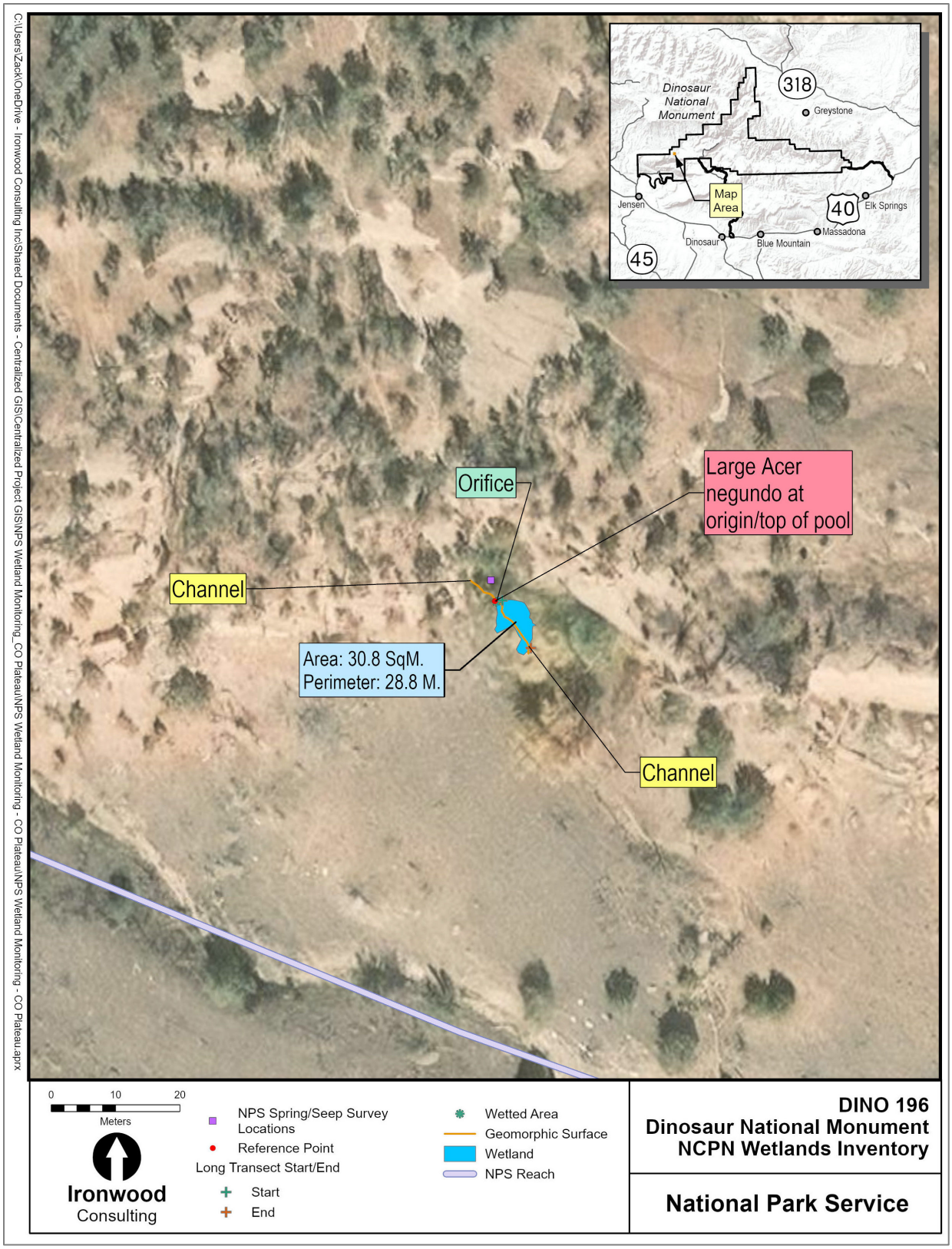


Figure 31. Wetland mapping for DINO 196.

A total of 16 plant taxa were encountered during the GDE level II survey, including five taxa within the vegetation quadrats and line intercept transects (Appendix D, Tables 68–70). Total average herbaceous cover was 71.3%. The dominant herbaceous wetland plants were common reed, common dogbane, and starry false Solomon's-seal with 24.0%, 18.7%, and 14.7% average cover, respectively. Groundcover included soil, litter, and water with 57.1%, 32.1%, and 10.7% average corner hits, respectively. Skunkbush sumac had an average line intercept cover value of 0.6%.

Table 68. Herbaceous vegetation quadrat data for DINO 196.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Phragmites australis *	common reed	FACW	24.0	100
Apocynum cannabinum	common dogbane	FAC	18.7	67
Maianthemum stellatum	starry false Solomon's-seal	FAC	14.7	100
Clematis ligusticifolia	white virgin's-bower	FACU	14.0	100
Bryophytes	moss	–	0.0	0
Total	**–**	**–**	**71.3**	**–**
50% of Total	**–**	**–**	**35.7**	**–**
20% of Total	**–**	**–**	**14.3**	**–**

Table 69. Groundcover quadrat data for DINO 196.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	0.0
Litter	32.1
Water	10.7
Wood	0.0
Soil	57.1
Total	**100.0**

* Listed as a noxious weed in Utah (UDAF 2023).

Table 70. Woody vegetation line intercept data for DINO 196.

Species	Common Name	Wetland Code	Average Woody Plant Cover (%)
Rhus trilobata	skunkbush sumac	FACU	0.6
Total	**–**	**–**	**0.6**

The GDE level II quadrat data does not pass the USACE Dominance Test when using the more rigorous standards for this project, where only FACW and OBL plants are used to indicate wetland presence. However, by USACE standards, the three dominant taxa are sufficient for delineating this site as a wetland since FAC plants are also indicators of wetland vegetation.

Non-native plants present included burdock (*Arctium* sp.), prickly lettuce, rabbitfoot-grass. Noxious plants included broad-leaf pepperwort and common reed.

No recreation impacts or spring developments were observed. Deer sign was recorded inside the vegetation quadrats with a frequency of 14% (Appendix C). Deer scat was also observed outside of the quadrats.

Little Rainbow Seep 2 (Site DINO 197)

The Little Rainbow Seep 2 GDE site occurs at an elevation of approximately 1,543 m with an overall southeast (151°) aspect. The only evidence of groundwater was moist soil occurring where the bedrock wall meets the soil surface, resulting from a seep and intermittent dripping from an old pipe. No wetland was mapped at this site because the dominant vegetation did not pass the USACE Dominance Test, which uses only OBL and FACW plants as wetland indicators (Figure 32). This site would pass the USACE's traditional Dominance Test, however, where FAC plants also qualify as wetland indicators.

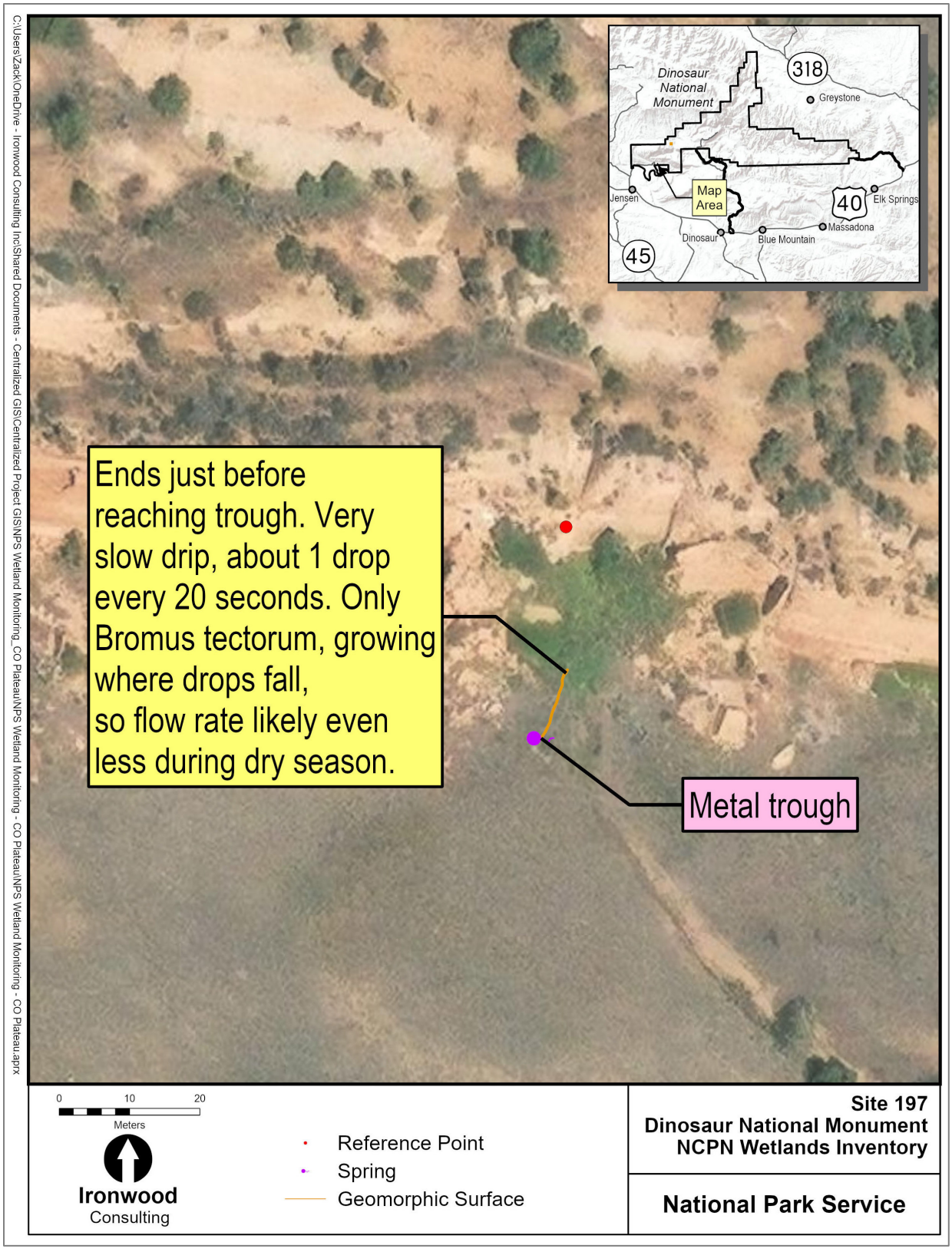


Figure 32. Wetland mapping for DINO 197.

A total of six plant taxa were encountered at this site (Appendix D). A transect was run across the most mesic portion of the site and three herbaceous vegetation quadrats were sampled (Tables 71 and 72). The dominant plants were common reed, common dogbane, and starry false Solomon's-seal with 24.0%, 18.7%, and 14.7% average cover, respectively. Non-native plants present were cheatgrass in addition to the noxious species broad-leaf pepperwort and common reed.

Table 71. Herbaceous vegetation quadrat data for DINO 197.

Species	Common Name	Wetland Code	Average Absolute Cover (%)	Frequency (%)
Phragmites australis *	common reed	FACW	24.0	100
Apocynum cannabinum	common dogbane	FAC	18.7	67
Maianthemum stellatum	starry false Solomon's-seal	FACU	14.7	100
Clematis ligusticifolia	white virgin's-bower	FAC	14.0	100
Bryophytes	moss	–	0.0	0
Total	**–**	**–**	**71.3**	**–**
50% of Total	**–**	**–**	**35.7**	**–**
20% of Total	**–**	**–**	**14.3**	**–**

Table 72. Groundcover quadrat data for DINO 197.

Groundcover Type	Average Corner Hits (%)
Bryophyte	0.0
Gravel	0.0
Cobble	0.0
Stone	0.0
Boulder	0.0
Bedrock	0.0
Basal	0.0
Litter	75.0
Water	0.0
Wood	25.0
Soil	0.0
Total	**100.0**

* Listed as a noxious weed in Utah (UDAF 2023).

No recreation impacts were observed. A metal stock trough was present at the base of the hill below the seep; however, it was dry and no longer functional. An old PVC pipe was also present, which ran downhill from the seep toward the trough. This pipe had a slow drip of about one drop per 20 seconds. Deer scat was observed outside of the quadrats (Appendix C).

Literature Cited

Ironwood Consulting Inc (Ironwood). 2021a. *Draft Work Plan: Spring Wetland Flora Inventory at Seven Intermountain Parks in Utah and Colorado.* (Prepared for National Park Service, Northern Colorado Plateau Network).

Ironwood Consulting Inc (Ironwood). 2021b. *Spring Wetland Flora Inventory at Seven Intermountain Parks in Utah and Colorado.* Prepared for the National Park Service-Northern Colorado Plateau Network.

Stevens, L. E., E. R. Schenk, and A. E. Springer. 2021. "Springs ecosystem classification." 21, no. e002218. 10.1002/eap.2218 (1).

U. S. Department of Agriculture (USDA). March 2012. *Groundwater-Dependent Ecosystems: Level II Inventory Field Guide: Inventory Methods for Project Design and Analysis.* Gen. Tech Report WO-86b. https://www.fs.usda.gov/sites/default/files/GDE_Level_II_FG_final_March2012_web.pdf

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0).* Environmental Laboratory - Wetlands Regulatory Assistance Program (Vicksburg, MS). ERDC/EL TR-08-28. https://usace.contentdm.oclc.org/utils/getfile/collection/p266001coll1/id/7627

U.S. Army Corps of Engineers (USACE). 2020. "NWPL - National Wetland Plant List." https://wetland-plants.usace.army.mil/nwpl_static/v34/home/home.html

United States Department of Agriculture (USDA), and Natural Resources Conservation Service (NRCS). 2023. "PLANTS Database: Plant List of Attributes, Taxonomy, and Symbols." https://plants.sc.egov.usda.gov/home

Utah Department of Agriculture and Food (UDAF). 2023. "State of Utah Noxious Weed List." Utah Department of Agriculture and Food. Last Modified June 23, 2022. Accessed June 2023. https://ag.utah.gov/farmers/plants-industry/noxious-weed-control-resources/state-of-utah-noxious-weed-list/

Appendix A: GDE Site Summary Table Locality Details

Table 73 shows the details from each site.

Table 73. GDE Site Summary Table Locality Details.

Site Name	Long Axis Start Easting	Long Axis Start Northing	Long Axis End Easting	Long Axis End Northing	Reference Point Easting	Reference Point Northing	Aspect at Reference Point	Elevation at Reference Point (m)	Reference Point Notes	Dogleg in Long Axis?	Dogleg Easting	Dogleg Northing	Vegetation Quadrat Cut-level
45-1406a	663626	4492121	663655	4492140	663627	4492117	93	1,670	Acer Negundo 3m at 0 degrees to long axis start point	Yes	663653	4492128	<1 percent not recorded
45-1406b (BC1)	663578	4492074	663596	4492086	663583	4492084	49	1,668	Acer negundo, south most in group of 3. 11.3m at 176 degrees to long axis start	Yes	663585	4492083	<1 percent not recorded
45-1534	NA*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
45-1535	664254	4489535	664207	4489520	664255	4489535	157	1,517	Bank of river at start of Phragmites. Nothing else nearby to use. Use mapped wooden Jones Hole 2 sign if still exists next time.	No	–	–	<1 percent not recorded
45-1537	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
45-1540	NA	NA	NA	NA	661441	4489898	238	1,586	Dead juniper snag to West; 36.5 m at 40 degrees to long axis start.	No	NA	NA	<1 percent not recorded
45-1541	659441	4489540	659438	4489506	659443	4489536	125	1,592	Pinyon on large sandstone rock 3.8 m at 341 degrees to long axis start. ~3m upstream of pool	No	NA	NA	<1 percent not recorded
45-1550	656669	4488222	656682	4488201	656666	4488230	126	1,517	Populus deltoides, about 70ft tall, and 8.5m from long axis start. Bearing from POP DEL to long axis start is 163 degrees.	No	NA	NA	<1 percent not recorded
45-1563	652156	4485641	652187	4485626	652170	4485640	190	1,560	Distance from POP DEL to long axis start is 13.8m. Populus deltoides near back wall and orifice seep, about 70ft tall. Bearing from long axis start to POP DEL is 101 degrees.	No	NA	NA	<1 percent not recorded
45-1578	642735	4480654	642747	4480636	642735	4480651	96	1,595	Reference point is a small sandstone boulder in center of channel. Long axis start is 3 m to north of this rock.	Yes	642739	4480643	<1 percent not recorded
45-1582	644939	4479590	644933	4479567	644938	4479602	229	1,545	Juniperus osteosperma, about 5m tall, 12.9m up canyon from long axis start. Bearing from juniper to long axis start is 189 degrees.	No	NA	NA	<1 percent not recorded
45-2775	643889	4478267	643877	4478238	643891	4478262	225	1,494	Bearing from long axis start to reference point is 158. Large cottonwood 5.1 m SE of upper pool, appr. 25 DBH. Distance from long axis start to regency point is about 5.5m.	Dogleg	643886	4478255	<1 percent not recorded
45-2816	641011	4478763	641013	4478759	641013	4478762	195	1,574	Cut Juniper stump, about 3m tall and 3.1m from long axis start. Bearing to long axis start from stump is 282 degrees.	No	NA	NA	<1 percent not recorded

* Not applicable (NA).

Table 73 (continued). GDE Site Summary Table Locality Details.

Site Name	Long Axis Start Easting	Long Axis Start Northing	Long Axis End Easting	Long Axis End Northing	Reference Point Easting	Reference Point Northing	Aspect at Reference Point	Elevation at Reference Point (m)	Reference Point Notes	Dogleg in Long Axis?	Dogleg Easting	Dogleg Northing	Vegetation Quadrat Cut-level
45-3120	Missing	Missing	Missing	Missing	643519	4478583	171	1,523	Juniperus osteosperma about 5m tall. Distance to long axis start is 6.3m, bearing from Juniper to long axis start is 39 degrees.	No	NA	NA	<1 percent not recorded
DINO_27	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DINO_29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DINO_36	649372	4478976	649369	4478971	649374	4478980	295	1,558	Large boulder. Long axis start is 4.3m at 219 degrees from boulder.	No	NA	NA	<1 percent not recorded
DINO_50	649913	4478640	649913	4478631	649920	4478647	293	1,551	Juniperus osteosperma is reference point, about 7m tall. Distance to long axis start is 11.6m, bearing from Juniper to long axis start is 238 degrees.	No	NA	NA	<1 percent not recorded
DINO_62	643520	4478242	643497	4478198	643524	4478252	183	1,471	Base of sandstone hillslope run-down. Long axis start is 10.9m at 214 degrees from Reference Point.	No	NA	NA	<1 percent not recorded
DINO_74	663828	4486920	663812	4486908	663829	4486914	108	2,251	Juniperus osteosperma about 3m tall and 7.4m from long axis start. Bearing to start of long axis is 350 degrees.	No	NA	NA	Complete — all species
DINO_85	662931	4485664	662920	4485649	662930	4485662	204	2,287	Pinus edulis about 3m tall, and 3.8m from long axis start. Bearing from Pinus edulis to long axis start is 18 degrees.	No	NA	NA	<1 percent not recorded
DINO_86	649089	4480439	649042	4480423	649089	4480446	160	1,458	Reference point is a recreational soaking pool, built up with rocks.	Yes	649070	4480428	<1 percent not recorded
DINO_173	661618	4489550	661637	4489545	661629	4489542	79	1,572	Reference point is a cottonwood tree 4 in. DBH. Long axis start is 15.2m (slope distance) at 311 degrees from reference tree.	No	NA	NA	<1 percent not recorded
DINO_192	659607	4489008	659589	4489008	659608	4489005	176	1,584	Reference point is a 3.5 in DBH pinyon pine; long axis start is 3.3 m at 344 degrees from the reference point.	No	NA	NA	<1 percent not recorded
DINO_196	653157	4484314	653161	4484306	653155	4484314	188	1,549	Acer negundo (with three main trunks) immediately upgradient of pool and orifice.	No	NA	NA	<1 percent not recorded
DINO_197	NA	NA	NA	NA	653393	4484273	178	1,543	Sandstone backwall, this is also where soil is moist from seep where backwall meets sandy soil below.	NA	NA	NA	<1 percent not recorded

* Not applicable (NA).

Appendix B: GDE Site Summary Table Wetland Feature

Table 74 shows the wetland features from each site.

Table 74. GDE Site Summary Table Wetland Feature.

Site Name	Site Type	Primary GDE Type	Secondary GDE Type	Total Wetland Area (ac)	Total Wetland Area (m^2)	Total Wetland Perimeter Length (m)	Number of Orifices	Number of Mapped Channels	Length of Mapped Channel (m)	Mapped Channel Type (if observed)	Wetland/Channel Description	Total Wetted Area (ac)	Total Wetted Length (m)
45-1406a	Spring	Hypocrene	–	0.0778	314.9	115.43	0	0	0.0	Spring discharge dominated	–	0.00	0.00
45-1406b (BC1)	Spring	Helocrene	–	0.0083	33.5	50.62	1	1	32.8	Spring discharge dominated	Flowing for 50m, then disappears underground.	0.00	0.00
45-1534	Seep	Helocrene	–	0.0024	10.0	na	1	1	8.1	Spring discharge dominated	Small section of flow. Equisetum with many upland plants mixed in.	0.00	0.00
45-1535	Seep	Helocrene	–	0.5805	2,349.2	312.50	1	1	32.6	Spring discharge dominated	Narrow Flowing channel, frequently not visible under wetland veg. Origin uncertain, somewhere in Phragmites mess. Clearly visible flow starts at NE corner of mapped line.	0.01	89.78
45-1537	Spring	Rheocrene	–	0.0000	0.0	0.00	5	3	558.8	Mixed discharge	Semi-scoured with some coarse woody debris.	0.00	0.00
45-1540	Spring	Rheocrene	–	0.29 (est.)	1,188 (est.)	–	1	0	0.0	Mixed discharge	Heavily vegetated with perennial wetland plants.	0.00	0.00
45-1541	Spring	Rheocrene	–	0.0386	156.1	117.23	3	1	256.1	Spring discharge dominated	Channel over 100 m in length.	0.00	0.00
45-1550	Spring	Hypocrene	Rheocrene	0.0397	160.7	121.81	0	1	63.3	Mixed discharge	Dry sandy channel runs through center of wetland polygon.	0.00	0.00
45-1563	Spring	Helocrene	–	0.1829	740.1	559.12	1	0	108.8	Runoff dominated	No channel, but seep water is pooled near orifice with no apparent flow. Soil near orifice is mucky with strong anoxic (rotten egg) smell where water pooled at surface.	0.00	0.00
45-1578	Spring	Hypocrene	–	0.0101	40.7	72.20	0	1	199.1	Runoff dominated	Scoured with steep walls; heavily vegetated to sparsely vegetated.	0.00	0.00
45-1582	Spring	Rheocrene	–	0.0453	183.2	101.98	1	1	68.8	Mixed discharge	Channel is pooled/flowing near orifice and becomes drier moving downstream. Channel receives moisture from spring orifice as well as runoff down the drainage.	0.00	0.00
45-2775	Spring	Rheocrene	–	0.2004	811.1	404.22	2	1	111.4	Mixed discharge	Upper portion of channel near orifices is flowing, flow ends about 61m downstream of orifices.	0.00	0.00

Table 74 (continued). GDE Site Summary Table Wetland Feature.

Site Name	Site Type	Primary GDE Type	Secondary GDE Type	Total Wetland Area (ac)	Total Wetland Area (m^2)	Total Wetland Perimeter Length (m)	Number of Orifices	Number of Mapped Channels	Length of Mapped Channel (m)	Mapped Channel Type (if observed)	Wetland/Channel Description	Total Wetted Area (ac)	Total Wetted Length (m)
45-2816	Spring	Hypocrene	Rheocrene	0.0013	5.2	14.15	0	0	0.0	Runoff dominated	No orifice or water at the surface. Soil is moist and cool just below the surface and wetland vegetation suggests shallow groundwater. This area occurs along a drainage channel so secondary spring type is likely rheocrene. Unknown whether during wet years.	0.00	0.00
45-3120	Spring	Hillslope	–	0.0633	256.2	133.37	3	1	49.6	Mixed discharge	Channel serves to catch water flow from spring orifices in addition to runoff during precipitation events. Flowing channel at least 100m. After the initial 16.4m it continues below a long stretch with alcove overhead where GPS accuracy is reduced to < 20.	0.00	0.00
DINO_27	Spring	Rheocrene	–	0.0445	180.1	147.65	1	1	159.7	Spring discharge dominated	One orifice is impounded with a recreation soaking pool, otherwise low to medium gradient and rocky.	0.00	0.00
DINO_29	Spring	Rheocrene	–	0.0000	0.0	0.00	1	1	225.1	Mixed discharge	Flowing channel. Accuracy mostly less than 45 cm, but a few patches with 2.5 m accuracy due to overstory.	0.00	0.00
DINO_36	Spring	Limnocene	Rheocrene	0.0018	7.3	14.33	2	1	642.9	Mixed discharge	Scoured channel sometimes fringed with a narrow strip of wetland vegetation.	0.00	0.00
DINO_50	Spring	Rheocrene	–	0.0029	11.9	25.98	4	1	639.4	Mixed discharge	Channel flows intermittently until lowermost spring orifice. After this channel flows continuously.	0.00	0.00
DINO_62	Spring	Rheocrene	–	0.3193	1,292.0	499.76	1	1	86.3	Mixed discharge	Nonvegetated to well-vegetated channel. Gradient is low, except for short hillslope run-down. There are a few very minor channels — at least one is mapped.	0.00	0.00
DINO_74	Spring	Rheocrene	Hypocrene	0.0356	144.2	53.01	0	0	0.0	Runoff dominated	Mapped wetland doesn't have a channel, but is rather a depression. Dry channel occurs both above and below wetland but channel disappears in mapped wetland. Historic wood cabin occurring nearby, see map. Pedistals (approximately 3dm tall) are believed to be caused by cattle.	0.00	0.00

Table 74 (continued). GDE Site Summary Table Wetland Feature.

Site Name	Site Type	Primary GDE Type	Secondary GDE Type	Total Wetland Area (ac)	Total Wetland Area (m^2)	Total Wetland Perimeter Length (m)	Number of Orifices	Number of Mapped Channels	Length of Mapped Channel (m)	Mapped Channel Type (if observed)	Wetland/Channel Description	Total Wetted Area (ac)	Total Wetted Length (m)
DINO_85	Spring	Rheocrene	Hypocrene	0.0126	51.2	55.68	0	1	34.4	Runoff dominated	Wetland area occurs within a dry drainage. Clear dry channel above and below GDE-sampled wetland, however channel disappears within wetland area and ground is fairly flat with a slight overall downslope.	0.00	0.00
DINO_86	Spring	Rheocrene	–	0.2893	1,170.8	511.26	29	7	40.3	Spring discharge dominated	One orifice is impounded with a recreation soaking pool, otherwise low to medium gradient and rocky.	0.00	0.00
DINO_173	Seep	Rheocrene	–	0.1332	539.0	260.46	4	0	0.0	Mixed discharge	Moderate gradient channel with slumping and high amounts of erosion.	0.00	0.00
DINO_192	Spring	Hypocrene	Rheocrene	0.0983	397.9	263.87	0	0	0.0	Mixed discharge	Low gradient and heavily vegetated with wetland plant and non-wetland vegetation.	0.00	0.00
DINO_196	Spring	Rheocrene	–	0.0076	30.8	28.77	1	1	15.5	Spring discharge dominated	20cm wetted for about 3m below pool. After that, becomes more diffuse.	0.00	0.00
DINO_197	Seep	Hypocrene	–	0.0000	0.0	0.00	0	0	0.0	na	No channel.	0.00	0.00

Appendix C: GDE Site Wildlife Summary Table

Tables 75 and 76 show the wildlife summaries for each site.

Table 75. Frequency of scat or tracks found inside vegetation quadrats in percent.

Animal category	Animal type	45-1406a	45-1406b	45-1534	45-1535	45-1537	45-1540	45-1541	45-1550	45-1563	45-1578	45-1582	45-2775	45-2816	45-3120	DINO 36	DINO 50	DINO 62	DINO 74	DINO 85	DINO 86	DINO 173	DINO 192	DINO 196	DINO 197	Total Sites Observed
Wildlife	Bear	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	1
Wildlife	Coyote	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Wildlife	Deer	0	0	0	0	0	0	0	0	0	0	8	0	20	0	20	0	17	0	0	0	0	0	14	0	5
Wildlife	Elk	0	0	0	0	0	0	5	0	0	45	23	0	0	0	0	0	0	0	0	0	13	12	0	0	5
Wildlife	Rabbit	0	0	0	0	0	0	5	0	0	0	0	0	40	0	100	0	22	57	0	0	0	29	0	0	6
Livestock	Cow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	11	0	0	0	0	0	2

Table 76. Animal sign (scat or tracks) observed outside vegetation quadrats. An “X” indicates a presence.

Animal category	Animal type	45-1406a	45-1406b	45-1534	45-1535	45-1537	45-1540	45-1541	45-1550	45-1563	45-1578	45-1582	45-2775	45-2816	45-3120	DINO 36	DINO 50	DINO 62	DINO 74	DINO 85	DINO 86	DINO 173	DINO 192	DINO 196	DINO 197	Total Sites Observed
Wildlife	Bear	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Wildlife	Coyote	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
Wildlife	Deer	–	–	–	–	–	–	–	X	–	–	X	X	X	–	X	–	X	X	X	–	–	–	X	X	10
Wildlife	Elk	X	–	–	–	–	–	X	–	X	X	X	–	X	–	X	–	–	–	–	–	–	X	–	–	8
Wildlife	Mountain Lion	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	1
Wildlife	Rabbit	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0
Livestock	Cow	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1

Appendix D: GDE Site Vascular Plant Inventory List

Table 77 shows the vascular plant list from all sites.

Table 77. GDE Site Vascular Plant Inventory List. An “X” indicates a presence.

Species	Common Name	Wetland Code	Native Status *	45-1406a	45-1406b	45-1534	45-1535	45-1537	45-1540	45-1541	45-1550	45-1563	45-1578	45-1582	45-2775	45-2816	45-3120	DINO 27	DINO 29	DINO 36	DINO 50	DINO 62	DINO 74	DINO 85	DINO 86	DINO 173	DINO 192	DINO 196	DINO 197
Acer negundo	boxelder	FACW	N	X	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	X	–
Achillea millefolium	common yarrow	FACU	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
Agrostis exarata	Spike bentgrass	FACW	N	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
Agrostis stolonifera	Redtop	FACW	I	–	X	X	X	X	X	–	X	–	–	X	X	–	–	X	X	–	–	X	X	X	–	–	–	–	–
Ambrosia acanthicarpa	Bur ragweed	UPL	N	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Apocynum cannabinum	Common dogbane	FAC	N	–	–	X	X	X	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	X	–	X	X	X
Arctium sp.	burdock	–	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–
Artemisia biennis	biennial wormwood	FACW	I, N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
Artemisia tridentata	big sagebrush	UPL	N	X	–	–	–	–	–	X	X	–	X	–	–	–	–	–	–	–	–	X	–	X	–	–	–	–	–
Asclepias speciosa	Showy milkweed	FAC	N	–	–	X	X	–	–	–	X	X	–	X	X	X	–	–	–	–	–	X	–	–	–	–	–	–	–
Astragalus chloodes	Grass milkvetch	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–
Atriplex confertifolia	shadscale saltbush	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–
Bassia hyssopifolia	Five-horn smotherweed	FACU	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–
Bassia sp.	smotherweed	–	I, N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Betula occidentalis	Water birch	FACW	N	–	–	–	–	–	–	–	–	–	–	–	X	–	–	X	–	–	–	X	–	–	–	–	–	–	–
Brickellia microphylla	littleleaf brickellbush	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–
Bromus inermis	smooth brome	FACU	I	–	–	X	X	–	–	–	X	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bromus tectorum	Cheatgrass	UPL	I	–	–	–	–	–	–	–	X	–	–	–	–	X	X	–	–	–	–	X	–	–	–	–	–	–	X
Calamagrostis canadensis	Bluejoint reedgrass	FACW	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–
Calamagrostis stricta	Slimstem reedgrass	FACW	N	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–

* I – Introduced, N – Native, NOX – Noxious.

Table 77 (continued). GDE Site Vascular Plant Inventory List. An “X” indicates a presence.

Species	Common Name	Wetland Code	Native Status *	45-1406a	45-1406b	45-1534	45-1535	45-1537	45-1540	45-1541	45-1550	45-1563	45-1578	45-1582	45-2775	45-2816	45-3120	DINO 27	DINO 29	DINO 36	DINO 50	DINO 62	DINO 74	DINO 85	DINO 86	DINO 173	DINO 192	DINO 196	DINO 197
Carex geophila	White Mountain sedge	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
Carex hystericina	Bottlebrush sedge	OBL	N	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Carex nebrascensis	Nebraska sedge	OBL	N	–	X	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	X	–	–
Carex parryana	Parry’s sedge	FAC	N	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Carex pellita	Woolly sedge	OBL	N	–	X	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Carex praegracilis	Blackcreeper sedge	FACW	N	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	X	–	–	–	–	–
Carex sp.	sedge	–	N	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	X	–	X	–	–
Centaurium exaltatum	Great Basin centaury	FACW	N	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Chenopodium rubrum	Red goosefoot	FACW	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–
Chrysothamnus linifolius	spearleaf rabbitbrush	FAC	N	–	–	–	–	–	–	–	X	–	X	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–
Cirsium arvense	Canada thistle	FACU	NOX	X	–	–	–	–	–	–	–	X	–	–	X	–	X	–	–	–	–	–	–	X	–	X	X	–	–
Cirsium undulatum	wavyleaf thistle	FACU	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–
Cirsium vulgare	Bull thistle	FACU	I	–	X	–	–	–	–	–	–	X	–	X	–	X	X	–	–	–	–	–	–	X	–	–	–	–	–
Clematis ligusticifolia	White virgin’s-bower	FAC	N	–	–	–	–	–	–	–	–	–	–	–	–	X	X	–	–	X	–	–	–	–	–	–	–	X	X
Conyza canadensis	Canadian horseweed	FACU	N	–	–	–	–	–	–	–	X	–	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	X	–
Conyza sp.	horseweed	–	I, N	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cycloloma atriplicifolium	Winged pigweed	FACU	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–
Distichlis spicata	Desert saltgrass	FAC	N	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	X	–	–	X	–	–	–	–
Dodecatheon sp.	shootingstar	–	N	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Echinocereus sp.	hedgehog cactus	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
Elaeagnus angustifolia	Russian-olive	FAC	NOX	–	–	–	–	–	–	–	–	–	X	X	X	–	–	–	X	–	–	X	–	–	–	–	–	–	–
Eleocharis palustris	Common spikerush	OBL	N	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–
Eleocharis sp.	spikerush	–	I, N	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–

* I – Introduced, N – Native, NOX – Noxious.

Table 77 (continued). GDE Site Vascular Plant Inventory List. An “X” indicates a presence.

Species	Common Name	Wetland Code	Native Status *	45-1406a	45-1406b	45-1534	45-1535	45-1537	45-1540	45-1541	45-1550	45-1563	45-1578	45-1582	45-2775	45-2816	45-3120	DINO 27	DINO 29	DINO 36	DINO 50	DINO 62	DINO 74	DINO 85	DINO 86	DINO 173	DINO 192	DINO 196	DINO 197
Elymus trachycaulus	slender wheatgrass	FACU	N	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ephedra viridis	Green ephedra	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
Epilobium ciliatum	fringed willowherb	FACW	N	–	–	–	–	–	X	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Epilobium ciliatum ssp. *glandulosum*	Glandular willow-herb	FACW	N	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Epipactis gigantea	Giant helleborine	OBL	N	–	–	–	–	–	–	–	–	–	–	X	X	–	X	X	–	–	X	–	–	–	–	–	–	–	–
Equisetum arvense	Field horsetail	FAC	N	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–
Equisetum hyemale	scouringrush horsetail	FACW	N	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Equisetum laevigatum	Smooth scouring-rush	FACW	N	X	–	–	–	–	–	–	–	–	–	X	–	–	–	–	X	X	X	X	–	X	X	–	–	–	–
Equisetum variegatum	Northern scouring-rush	FACW	N	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Eragrostis hypnoides	Teal lovegrass	OBL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–
Ericameria nauseosa	rabbitbrush (sp).	UPL	N	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Erigeron lonchophyllus	Longleaf daisy	FACW	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
Euthamia occidentalis	Western goldenrod	FACW	N	–	X	X	X	–	X	–	X	X	–	X	X	–	–	–	–	–	–	X	–	–	X	X	X	–	–
Glyceria striata	Fowl mannagrass	OBL	N	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–
Glycyrrhiza lepidota	Nuttall’s licorice	FAC	N	–	–	–	–	–	X	–	–	X	X	X	–	X	–	–	–	–	–	–	–	–	–	X	–	–	–
Gnaphalium stramineum	cottonbatting plant	FAC	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–
Gutierrezia sarothrae	Broom snakeweed	UPL	N	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	X	–	–	–	–	–
Helenium autumnale	common sneezeweed	FACW	N	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–
Hesperostipa comata	Needle-and-thread	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
Hordeum brachyantherum	Meadow barley	FACW	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–

* I – Introduced, N – Native, NOX – Noxious.

Table 77 (continued). GDE Site Vascular Plant Inventory List. An “X” indicates a presence.

Species	Common Name	Wetland Code	Native Status *	45-1406a	45-1406b	45-1534	45-1535	45-1537	45-1540	45-1541	45-1550	45-1563	45-1578	45-1582	45-2775	45-2816	45-3120	DINO 27	DINO 29	DINO 36	DINO 50	DINO 62	DINO 74	DINO 85	DINO 86	DINO 173	DINO 192	DINO 196	DINO 197
Iva axillaris	marsh elder	FACU	N	–	–	–	–	–	–	X	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Juncus balticus var. *montanus*	Baltic rush	FACW	N	–	–	X	X	–	–	–	–	–	–	X	–	X	–	–	–	X	–	–	–	–	–	–	–	–	–
Juncus bufonius	Toad rush	FACW	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	X	–	–	–	–	–
Juncus compressus	Compressed rush	OBL	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–
Juncus longistylis	Longstyle rush	FACW	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
Juncus nodosus	Knotted rush	OBL	N	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Juncus saximontanus	Mountain rush	FACW	N	–	–	–	–	–	–	–	X	–	–	–	–	X	–	–	–	–	–	–	X	X	–	–	–	–	–
Juniperus osteosperma	Utah juniper	UPL	N	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Lactuca serriola	Prickly lettuce	FACU	I	–	–	–	–	–	–	–	–	–	X	–	–	X	–	–	–	–	–	X	–	–	–	X	–	X	–
Lactuca tatarica var. *pulchella*	Blue lettuce	FAC	N	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Lepidium latifolium	Broad-leaf pepperwort	FAC	NOX	–	–	–	–	–	–	–	–	X	–	–	X	–	–	–	–	–	–	X	–	–	–	–	–	X	X
Lolium arundinaceum	Tall fescue	FACU	I	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Lycopus asper	Rough bugleweed	OBL	N	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Machaeranthera canescens	Hoary aster	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–
Mahonia repens	Oregon-grape	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–
Maianthemum stellatum	Starry false Solomon’s-seal	FACU	N	X	X	–	–	–	–	–	–	–	–	–	X	–	X	–	–	X	X	–	–	–	–	–	X	X	X
Medicago sativa	alfalfa	UPL	I	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Melilotus alba	White sweet-clover	FACU	I	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Melilotus officinalis	Yellow sweet-clover	FACU	I	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mentha arvensis	Field mint	FACW	N	–	X	X	X	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Muhlenbergia andina	foxtail muhly	FAC	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–
Muhlenbergia asperifolia	Scratchgrass	FACW	N	–	–	–	–	–	–	–	–	–	X	–	–	X	–	–	X	–	–	X	–	–	X	–	X	X	–
Oenothera villosa	hairy evening primrose	FAC	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	X	–	–	–

* I – Introduced, N – Native, NOX – Noxious.

Table 77 (continued). GDE Site Vascular Plant Inventory List. An “X” indicates a presence.

Species	Common Name	Wetland Code	Native Status *	45-1406a	45-1406b	45-1534	45-1535	45-1537	45-1540	45-1541	45-1550	45-1563	45-1578	45-1582	45-2775	45-2816	45-3120	DINO 27	DINO 29	DINO 36	DINO 50	DINO 62	DINO 74	DINO 85	DINO 86	DINO 173	DINO 192	DINO 196	DINO 197
Phragmites australis	Common reed	FACW	N, NOX	–	–	X	X	–	–	X	–	X	–	X	X	X	X	X	X	X	–	X	–	–	X	–	X	X	X
Poa pratensis	Kentucky bluegrass	FAC	I, N	X	X	X	X	X	–	–	X	–	–	X	–	–	–	–	–	–	–	–	X	X	–	–	X	–	–
Poa secunda	Sandberg’s bluegrass	FACU	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–
Polygonum aviculare	Yard knotweed	FAC	I	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
Polypogon monspeliensis	Rabbitfoot-grass	FACW	I	–	–	–	–	–	–	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	X	–	X	X	–
Populus deltoides	eastern cottonwood	FAC	N	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Primula sp.	primrose	–	N	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Purshia tridentata	Antelope bitterbrush	UPL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–
Ranunculus cymbalaria	Marsh buttercup	OBL	N	–	–	–	–	–	–	–	–	X	X	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–
Rhus glabra	Smooth sumac	UPL	N	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	X	–	–
Rhus sp.	sumac	–	I, N	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Rhus trilobata	skunkbush sumac	FACU	N	–	–	–	–	–	–	–	–	X	–	X	–	–	–	–	–	–	–	–	–	–	–	–	X	X	–
Ribes aureum	golden currant	FAC	N	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ribes sp.	currant	–	I, N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	X	–	–
Rorippa nasturtium-aquaticum	Watercress	OBL	I	–	X	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Rorippa sp.	yellowcress	–	I, N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
Rosa woodsii	Woods’ rose	FACU	N	X	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	X	–
Rubus discolor	Himalayan blackberry	FAC	I	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Rumex salicifolius	willow dock	FACW	N	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–
Salix exigua	coyote willow	FACW	N	–	–	–	–	–	X	X	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	X	X	–	–
Salsola tragus	Russian-thistle	FACU	I	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Sarcobatus vermiculatus	Greasewood	FACU	N	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–

* I – Introduced, N – Native, NOX – Noxious.

Table 77 (continued). GDE Site Vascular Plant Inventory List. An “X” indicates a presence.

Species	Common Name	Wetland Code	Native Status *	45-1406a	45-1406b	45-1534	45-1535	45-1537	45-1540	45-1541	45-1550	45-1563	45-1578	45-1582	45-2775	45-2816	45-3120	DINO 27	DINO 29	DINO 36	DINO 50	DINO 62	DINO 74	DINO 85	DINO 86	DINO 173	DINO 192	DINO 196	DINO 197
Schoenoplectus americanus	American bulrush	OBL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–
Schoenoplectus pungens	common threesquare	OBL	N	–	–	X	X	–	–	–	X	–	X	–	–	X	–	–	–	–	–	–	–	–	X	–	–	–	–
Schoenoplectus tabernaemontani	Soft-stem bulrush	OBL	N	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Scirpus pallidus	Pale bulrush	OBL	N	–	–	–	–	–	X	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Solidago canadensis	Canada goldenrod	UPL	N	–	–	–	–	–	X	–	–	–	–	–	X	–	X	–	X	–	X	–	–	–	–	–	–	–	–
Solidago gigantea	Late goldenrod	FACW	N	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Sonchus arvensis ssp. *uliginosus*	Marsh sow-thistle	FACU	I	X	X	–	–	–	X	X	–	X	–	–	X	–	–	X	–	–	X	X	–	–	X	X	X	–	–
Sonchus asper	Spiny-leaf sow-thistle	FAC	I	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Symphyotrichum ascendens	Pacific aster	FAC	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	X	–	–	X	–	–
Symphyotrichum eatonii	Eaton’s aster	FAC	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–
Symphyotrichum lanceolatum	white panicle aster	OBL	N	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–
Symphyotrichum spathulatum	western mountain aster	FAC	N	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tamarix chinensis	five-stamen tamarisk	FAC	NOX	–	–	–	–	–	X	X	X	X	X	X	–	–	–	–	X	–	–	X	–	–	X	X	X	–	–
Taraxacum officinale	Common dandelion	FACU	I	–	–	–	–	X	–	–	X	–	–	–	–	X	–	–	X	–	–	–	X	X	–	–	X	–	–
Thelypodium integrifolium	entireleaved thelypody	FACW	N	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–
Toxicodendron rydbergii	Western poison ivy	FACU	N	–	X	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	X	–	–	X	–
Tragopogon dubius	Yellow salsify	UPL	I	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Triglochin sp.	arrowgrass	OBL	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–
Typha domingensis	Southern cattail	OBL	N	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Typha latifolia	Broad-leaved cattail	OBL	N	–	–	–	–	–	X	–	–	–	–	–	X	–	–	X	–	–	–	–	–	–	X	X	–	–	–
Typha sp.	cattail	OBL	N	–	–	–	–	–	–	–	–	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	X	–	–

* I – Introduced, N – Native, NOX – Noxious.

Table 77 (continued). GDE Site Vascular Plant Inventory List. An “X” indicates a presence.

Species	Common Name	Wetland Code	Native Status *	45-1406a	45-1406b	45-1534	45-1535	45-1537	45-1540	45-1541	45-1550	45-1563	45-1578	45-1582	45-2775	45-2816	45-3120	DINO 27	DINO 29	DINO 36	DINO 50	DINO 62	DINO 74	DINO 85	DINO 86	DINO 173	DINO 192	DINO 196	DINO 197
unknown annual forb	unknown annual forb	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
unknown perennial forb	unknown perennial forb	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
unknown perennial graminoid	unknown perennial graminoid	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–
unknown shrub	unknown shrub	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Veronica americana	American brooklime	OBL	N	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	–	–
Veronica anagallis-aquatica	Water speedwell	OBL	N	–	–	X	X	–	–	–	–	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Xanthium strumarium	rough cocklebur	FAC	N	–	–	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	X	–	–	–	–
Total	**–**	**–**	**–**	**10**	**12**	**28**	**28**	**9**	**17**	**7**	**22**	**19**	**15**	**19**	**20**	**16**	**10**	**7**	**9**	**10**	**9**	**22**	**17**	**16**	**23**	**14**	**20**	**16**	**6**

* I – Introduced, N – Native, NOX – Noxious.

National Park Service
U.S. Department of the Interior

Science Report NPS/SR—2024/130
https://doi.org/10.36967/2303818



Natural Resource Stewardship and Science
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

NPS 122/192044A, June 2024