Wetland Delineation and Soil Analysis

Carbondale Nature Park

Carbondale, Colorado

Prepared by

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Wetland Soils 556

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1. Introduction

Ryan Sparhawk contacted Jeff Jackel, Director of Recreation and Facilities, with the Town of Carbondale, Colorado, to conduct a wetland delineation, soil survey and report as part of requirements for graduate course work. The final report is part of requirements for completing a course on Wetland Soils from North Carolina State University (Wetland Soils - SSC 570). Mr. Jackel suggested conducting wetland studies at the Carbondale Nature Park (Delaney Property) where wetland delineations had previously occurred, and update wetland boundaries with the intention of expanding available parking on the site. The following report details findings of the wetland delineation and soils survey conducted at the Carbondale Nature Park (Survey Area).

1.1 Study Objectives

The purpose of this wetland study was to describe soils and determine if and where wetlands occur at the Survey Area based on the U.S. Army Corp of Engineer's (USACE). The USACE definition for wetlands is stated as "those areas that are inundated or saturated by surface or groundwater, at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions". Identification of wetlands is based on three determining factors – presence of hydrophytic vegetation, hydric soils, and wetland hydrology.

1.2 Study Area

The Carbondale Nature Park is a 33.3 acre parcel located at the northeast corner of the town of Carbondale, Garfield County, Colorado (Figure 1). The Survey Area is located in the southern portion of the Nature Park and comprises approximately 1.6 acres (Figure 2, 3). The property is currently used as a nature/dog walking area.

Flood irrigation had taken place throughout the property until approximately 2010 and previous wetland delineations had categorized much of the property as wetlands. One aspect of this wetland delineation is to compare previously mapped boundaries to updated boundaries and determine if wetland boundaries had increased, remained the same, or decreased from previous delineations.

The Survey Area is geographically associated with flood plains and low terraces linked with the Roaring Fork River watershed. One irrigation ditch/stream feature is located in the southwestern portion of the Survey Area and drains north to the Roaring Fork River.

2. Wetland Delineation Methods

The methods used to delineate wetlands occurring within the Survey Area are described within subsections 2.1 through 2.2.

2.1 Literature Review

Prior to conducting field investigations at the Survey Area, information regarding the area was reviewed. This included aerial photography, historical reports, and relevant technical literature including;

- U.S Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), *Web Soil Survey of Aspen-Gypsum Area, Colorado, Parts of Eagle, Garfield and Pitkin Counties* (2015),
- USDA, NRCS, *Keys to Soil Taxonomy* (USDA, 2014),
- USDA, NRCS, *Field Book for Describing and Sampling Soils* (USDA, 2012),
- USDA, NRCS, *Field Indicators of Hydric Soils in the United States, A Guide for Identifying and Delineating Hydric Soils,* Version 7.0 (2010),
- U.S. Fish and Wildlife Service (USFWS), National Wetland Inventory (NWI), online *Wetlands Mapper* (2015) tool,
- U.S. Army Corps of Engineers (USACE*), Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (2010),
- Rocky Mountain Ecological Services, Inc., *Delaney Property Ecological Conditions Report* (2007).

2.2 Delineation Methods

The wetland delineation for the Survey Area was conducted on August 1st, 2015 by Ryan Sparhawk. This wetland delineation was conducted in accordance with methodology set forth in the *Corps of Engineers Wetland Delineation Manual* (USACE, 1987) and the USACE *Regional Supplement to the Corps of Engineers Wetland Delineation Manual for the Western Mountains, Valleys, and Coast Region (Version 2.0)* (USACE, 2010).

Potential wetland boundaries were initially determined by visual observation for presence of hydrophytic vegetation and hydrology. Once a preliminary boundary was established, a more detailed investigation of soils, vegetation and hydrology was conducted to determine the wetland boundary. The detailed study included use of a set of paired sample plots; one in a wetland setting, and the other in upland location. Data were collected from each of these sample plots and they are provided in Appendix A. Based upon field investigations of the three wetland indicators (hydric soils, hydrophytic vegetation, and wetland hydrology), a wetland boundary was established and then mapped.

2.2.1 Vegetation

Hydrophytic vegetation is defined by plant life that occurs in areas where inundation or soil saturation is either permanent or of sufficient frequency and duration to influence plant species distribution (USACE, 2010). Hydrophytic plant species have the ability to persist in anaerobic conditions. Analysis for hydrophytes and non-hydrophytes involved evaluation of plant

dominance at each of the sample plots for each of four vegetative strata (herbaceous, shrub, tree, and woody vine). The wetland indicator status for each dominant plant species (i.e., likelihood of the plant occurring in wetlands) was then determined. Designations for hydrophytic vegetation indicator status are:

- Obligate Wetland (OBL): Almost always occurs in wetlands (>99%).
- Facultative Wetland (FACW): Usually occurs in wetlands, but may occur in non-wetlands (67-99%).
- Facultative (FAC): Occur in wetlands and non-wetlands (34-66%).
- Facultative Upland (FACU): Usually occur in non-wetlands, but may occur in wetlands (1-33%).
- Obligate Upland (UPL): Almost never occur in wetlands (<1%).
- No Indicator (NI): Reviewed, but insufficient information available to determine indicator status.

Generally, hydrophytes dominate a sample plot when greater than 50 percent of the species occurring are OBL, FACW, and/or FAC. The sample plot is then determined to have hydrophytic vegetation, and meets the USACE criteria for wetland status. Sample plots are considered non-wetland when it is dominated by upland plant species - FACU, UPL, and NI. Dominance and locations of wetland vegetation were used in delineating the wetland boundaries at the Survey Area.

The common and scientific plant names and indicator status used in this report are based on *Field Guide to Colorado's Wetland Plants* (Culver, Lemly, 2013).

2.2.2 Soils

Hydric soils are defined as "soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (USACE, 2010). Soils are not considered to be hydric solely based on saturation. Saturated soils can still contain oxygen and not develop indicators associated with anaerobic chemical reactions. Hydric soils will have features that anaerobic conditions were present and oxidation-reduction reactions have occurred. Common features or "hydric soil field indicators" associated with soils occurring in saturated and anaerobic conditions, occurring at the Study Area, are loss or accumulation of iron, and/or accumulation of organic matter.

In the field, soil pedons were described at the two sample plots by manually excavating a pit using a shovel to at least 20 inches below ground surface (bgs), or until refusal, whichever was encountered first. The following characteristics were recorded in the field at each soil sample site (Appendix B):

- Drainage class
- Slope range
- Structure
- Color

- Parent material
- Vegetation and land use
- Topography and position
- Aspect
- Permeability
- Redoximorphic Features
- Kind, thickness and horizon arrangement
- Texture
- Coarse fragment content
- Carbonates
- Clay films
- Effervescence

Profile descriptions from the two soil pits in the Study Area were used to classify soils to family level and then correlated to official NRCS soil series (Appendix C). Representative photographs of the soil profiles and sample sites are presented in Appendix D.

2.2.3 Hydrology

Wetland Hydrology is the "constant or recurrent, shallow inundation or saturation at or near the surface of the soil" and is the controlling factor of wetland development. The timing and duration of inundation is what maintains wetlands and what characterizes each type (Culver and Lemly, 2013). Soils must be saturated or inundated to at least 12 inches below soil surface for approximately 14 consecutive days of the growing season, and be anaerobic, in order to influence hydrophytic vegetative growth and development of hydric soils.

There are twenty primary indicators and nine secondary wetland hydrology indicators occurring in the Western Mountain Region (USACE, 2010). These hydrological characteristics were assessed at the sample plots to determine presence of wetland hydrology.

3. Results

This section describes findings from the wetland investigations conducted at the Survey Area in the southwest portion of the Carbondale Nature Park during August 2015. Results from both Upland Plot SP-1 and Wetland Plot SP-2, and descriptions of findings for vegetation, soils and hydrology are presented and described. Photos of the general landscape and survey plots are presented in Appendix D.

3.1 Vegetation

Dominant vegetative species found Upland Plot SP-1 and Wetland Plot SP-2 are presented below:

SP-1 (Upland)

Species	Dominant	Wetland Indicator Status
Poa pratensis	Yes	FACU
Juncus confusus	Yes	FAC

Pseudoroegneria spicata	Yes	UPL
Trifolium pratense	No	FACU
Cirsium arvense	No	FAC

SP-2 (Wetland)

Species	Dominant	Wetland Indicator Status
Phalaris arundinacea	Yes	FACW
Carex aquatilis	Yes	OBL
Juncus balticus	No	FACW

Field investigations for vegetation at Upland Plot SP-1 found less than 50 percent of the dominant species in the plot were OBL, FACW, or FAC, thus failing the USACE dominance test for wetland vegetation. Upland Plot SP-1 also failed the prevalence index for hydrophytic vegetation and no other hydrophytic vegetation indicators were observed. Based on these findings, Upland Plot SP-1 does not meet criteria for having hydrophytic vegetation (Appendix A).

Wetland Plot SP-2 does pass the dominance test for hydrophytic vegetation (100% percent of dominant species were OBL, FACW, or FAC) and, therefore, it meets criteria for USACE wetland vegetation.

3.3 Soils

According to the *Soil Survey of Aspen-Gypsum Area, Colorado, Parts of Eagle, Garfield and Pitkin Counties* (NRCS, 2015), two soil map units occur within the Study Area – Redrob Loam, 1 to 6 percent slopes and Dahlquist-Southace Complex, 25 to 50 percent slopes (Appendix C). Neither of these soil map units occur on the National Hydric Soil List.

Redrob loam, 1 to 6 percent slopes

Redrob soils are very deep, somewhat poorly drained soils with moderate permeability in the solum and rapid permeability in substratum, and a depth to gravel which is moderately deep. These soils formed in mixed alluvium located on low terraces and flood plains. Typically, the surface layer is a dark grayish brown loam about 14 inches thick with textures ranging from stony loam to stony and cobbly loamy sand and sand to 60 inches. Taxonomic class of the Redrob series is; Fine-loamy over sandy or sandy skeletal, mixed, superactive, calcareous, frigid Fluvaquentic Endoaquolls (NRCS, 2015).

Dahlquist-Southace Complex, 25 to 50 percent slopes

This map unit occurs on alluvial fans, terraces, and terrace side slopes. Average annual precipitation is 12 to 16 inches and average annual air temperature is 42 to 46 degrees F. This unit is about 40 percent Dahlquist soil and 35 percent Southace soil (NRCS, 2015).

Dahlquist soils are very deep, well drained soils with moderate permeability formed in calcareous, cobbly, and gravelly alluvium located on piedmonts, fan aprons, and footslopes. Typically, the surface layer is brown cobbly sandy loam about 6 inches thick, with very cobbly sandy loams to a depth of 60 inches. Taxonomic class of the Dahlquist series is; Loamy-skeletal, mixed, superacative, frigid Ustic Calciargids (NRCS, 2015).

Southace soils are deep, well drained soils with moderate to moderately rapid permeability formed in calcareous gravelly slope alluvium derived from red sedimentary rocks located on upper fan aprons, terrace slopes, and mountain or hill slopes. Typically, the surface layer is brown very stony sandy loam about 3 inches thick and textures ranging from very stony sandy loam to extremely stony loamy coarse sand to 60 inches. Taxonomic class of the Southace soils is; Loamy-skeletal, mixed, superactive, calcareous, frigid Ustic Torriorthents (NRCS, 2015).

Upland Plot SP-1 was dug to depth of 34 inches before reaching refusal defined by a high course fragment content. A full profile description was conducted and the soil classifies out as a Fluvaquentic Endoaquoll, which is what is mapped by the NRCS and has similarities to the Redrob series (Appendix B). Table 1 details soil horizons and redoximorphic features observed.

Table 1. SP-1, Upland Plot, Soil Horizons

Depth (in)	Matrix		Redox Features				Texture
	Color (moist)	%	Color (moist)	%	Type	Location	
0-5	10YR 2/2	100	-	-	-	-	Loam
5-12	10YR 2/2	90	10YR 5/2	10	Depletion	Matrix	Silt Loam
12-22	10YR 3/2	88	10YR 5/1	10	Depletion	Matrix	Clay Loam
12-22	-	-	10YR 4/6	2	Concentrations	Matrix	-
22-34	10YR 4/3	45	10YR 6/2	40	Depletions	Matrix	Silt Loam/Clay Loam
22-34	-	-	10YR 4/6	5	Concentrations	Matrix	-

SP-1 has very dark brown (10YR 2/2) to very dark grayish brown (10YR 3/2) soil colors in the upper horizons and redox features present (iron depletions and concentrations) in the matrix, but does not meet indicator A12 (Thick Dark Surface) or indicator F7 (Depleted Dark Surface), for hydric soils (NRCS, 2010). Soil color chroma is not dark enough in the upper horizons to meet indicator A12, and chroma is not dark enough and percent of depletions in the 5-12 inch

horizon are not above 20% and does not meet indicator F7. Based on these findings, hydric soil is not present based on USACE requirements.

Wetland Plot SP-2 was dug to a depth of 20 inches before reaching refusal due to high course fragment content. This soil also classifies as a Fluvaquentic Endoaquoll and is similar to the Redrob series described by the NRCS (Appendix B, C). This soil meets the criteria for Hydric soil Indicator A12 (Thick Dark Surface) – A layer at least 6 inches thick with a depleted matrix that has 60% or more chroma 2 or less starting below 12 inches from the surface (NRCS, 2010). Plot SP-2 meets requirements for hydric soils and is considered wetland soils. Table 2 details soil horizons and textures observed.

Table 2. SP-2, Wetland Plot, Soil Horizons

Depth (in)	Matrix		Redox Features				Texture
	Color (moist)	%	Color (moist)	%	Type	Location	
0-14	10YR 2/1	100	-	-	-	-	Loam
14-20	7.5YR 5/1	100	-	-	-	-	Silt Loam

3.4 Hydrology

The primary source of hydrology at the Survey Area is groundwater and the irrigation ditch/stream feature occurring on the western edge of the Study Area. Groundwater was encountered at 28 inches bgs at Upland Plot SP-1 with soil saturation occurring at 24 inches bgs (Appendix B). Depth to groundwater at SP-2 was 10 inches bgs and soil saturation occurring at two inches bgs. SP-1 is topographically higher than SP-2 and is evident by depth to groundwater and hydrologic indicators.

Although groundwater was encountered in Upland plot SP-1, there was no evidence that saturation occurred a depth as shallow as 12 inches bgs as required by the Army Corp of Engineers to meet wetland hydrology. No other wetland hydrology indicators were observed, and thus does not meet wetland hydrology as set forth by the USACE.

Wetland Pit SP-2, is located at a lower elevation occurring near the irrigation ditch/stream feature and did have wetland hydrology indicators present. Indicators included high water table (depth to groundwater ten inches bgs), saturation (two to ten inches bgs), aquatic invertebrates (1/4 inch snails), and geomorphic position. Based on these indicators, SP-2 meets the USACE requirements for wetland hydrology.

3.5 Wetland Description

No wetland indicators were met at Upland Plot SP-1 and it was determined that the area is not a wetland based on USACE requirements. Although the area had previously been mapped as a wetland, it is believed that hydrophytic vegetation, hydric soils and hydrology found in previous studies were influenced by past irrigation practices. As observed, soils nearly meet hydric status requirements and may contain relict hydric soil indicators. Further hydrologic investigations, including groundwater monitoring wells or piezometers, would be recommended to determine groundwater depths and effects on hydric soil development.

All three wetland criteria (hydrophytic vegetation, hydric soils, and wetland hydrology) were met at Wetland Plot SP-2. Based on these data, it was determined that wetlands were present and they were mapped based upon field observations of dominant hydrophytic vegetation and geographic position. Of the 1.6 acres occurring in the overall Study Area, 0.4 acres are a palustrine wetland with primarily emergent vegetation (USFWS, 2015) occurring along the irrigation ditch/stream feature. This palustrine emergent wetland defines the western margin of the Survey Area (Figure 3).

4. References

Culver, D. R., Lemly, J. M. 2013. *Field Guide to Colorado's Wetland Plants, Identification, Ecology and Conservation.* Fort Collins, Colorado: Warner College of Natural History, Colorado State University.

Natural Resources Conservation Services (NRCS). 2015. *Soil Survey of Aspen-Gypsum Area, Colorado, Parts of Eagle, Garfield and Pitkin Counties.* Web Soil Survey, available at: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

_____. 2012. *Field Indicators of Hydric Soils in the United States, A Guide for Identifying and Delineating Hydric Soils,* Version 7.0.

U.S. Army Corp of Engineers (USACE). 1987. *Corps of Engineers Wetlands Delineation Manual.* Technical Report Y-87-1. U.S. Army Engineers Waterways Experiment Station, Vicksburg, MS.

_____. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0).* Ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-08-13. U.S. Army Engineers Waterways Experiment Station, Vicksburg, MS.

U.S Fish and Wildlife Services (USFWS). (2015). National Wetland Inventory: Classification of Wetlands and Deepwater Habitats of the United States. Available at: http://www.fws.gov/wetlands/

Appendix A

Wetland Delineation Forms

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Carbondale Nature Park City/County: Garfield Sampling Date: 08-01-15

Applicant/Owner: — State: CO Sampling Point: SP-1 upland

Investigator(s): Ryan Sparhawk Section, Township, Range: —

Landform (hillslope, terrace, etc.): Flood Plain/terrace Local relief (concave, convex, none): Concave Slope (%): 2-5%

Subregion (LRR): LRR E Lat: 39° 24' 14.66" N Long: 107° 12' 37.32" W Datum: —

Soil Map Unit Name: Redrob NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: —)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: —)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: —)			
1. Poa pratensis	40%	Y	FACU
2. Juncus confusus	10%	N	FAC
3. Pseudoroegneria spicata	10%	N	UPL
4. Trifolium pratense	2%	N	FACU
5. Cirsium Arvense	1%	N	FAC
6.			
7.			
8.			
9.			
10.			
11.			
	= Total Cover		
Woody Vine Stratum (Plot size: —)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 5%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	11	x 3 =	3
FACU species	42	x 4 =	168
UPL species	10	x 5 =	5
Column Totals:	251 (A)		63 (B)

Prevalence Index = B/A = 3.94

Hydrophytic Vegetation Indicators:

__ 1 - Rapid Test for Hydrophytic Vegetation

__ 2 - Dominance Test is >50%

__ 3 - Prevalence Index is ≤3.0[1]

__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ 5 - Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 2/2	100%					Loam	
5-12	10YR 2/2	90%	10YR 5/2	10%	D	M	Silt loam	
12-22	10YR 3/2	88%	10YR 5/1	10%	D	m	Clay loam	
			10YR 4/6	2%	C	m		
22-34	10YR 4/3	45%	10YR 6/2	40%	D	m	Silt loam/Clay loam	
			10YR 4/6	5%	C	m		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: High percentage of coarse frags

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches): _____

Water Table Present? Yes X No _____ Depth (inches): 28 in

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): 24 in

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available: none

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Carbondale Nature Park City/County: Garfield Sampling Date: 08-01-15

Applicant/Owner: — State: _____ Sampling Point: SP-2 wetland

Investigator(s): Ryan Sparhawk Section, Township, Range: —

Landform (hillslope, terrace, etc.): low stream terrace Local relief (concave, convex, none): Convex Slope (%): 2-5%

Subregion (LRR): LRR E Lat: 39° 24' 13.92" N Long: 107° 12' 38.19" W Datum: —

Soil Map Unit Name: Redrob NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No _____	Is the Sampled Area within a Wetland? Yes X No _____
Hydric Soil Present?	Yes X No _____	
Wetland Hydrology Present?	Yes X No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: —)	Absolute % Cover	Dominant Species?	Indicator Status
1. —			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: —)			
1. —			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: _____)			
1. Phalaris arundinacea	98%	Y	FACW
2. Juncus balticus	1%	N	FACW
3. Carex aquatilis	1%	Y	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	= Total Cover		
Woody Vine Stratum (Plot size: _____)			
1. —			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Remarks:

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR 2/1	100%					Loam	
14-20	7.5YR 5/1	100%					Silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- X Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: High coarse frag content at 20"

Depth (inches): _____

Hydric Soil Present? Yes X No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- X Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): _____

Water Table Present? Yes X No ___ Depth (inches): 10"

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 2"

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available: —

Remarks:

1/4" snails present from 0 - 10 inches

Appendix B

Soil Profile Forms

Full Profile Description Data Sheet

Site ID: SP-1 (upland plot)
Parent Material: Alluvium
Slope: 0-2%
Aspect: North
Permeability: Moderate
Drainage: Somewhat Poorly
Topographic Position: Flood Plain / Terrace
Epipedon: Mollic
Control Texture: Fine loamy
Vegetation:

Date: 08-01-15
Time: 0900
Latitude/Northing 39° 24' 14.66" N
Longtitude/Easting: 107° 12' 37.32" W
T-R-S:

NOTES: Depth to water = 28 inches Soil Does not meet any Hydric Soil Indicators
NRCS Map Unit = Redrop Series - Frigid Fluvaquentic Endoaquolls

	Horizon	Depth (inches)			Color Dry*	Color Moist	Texture	Clay %	Structure (grade, size, Class)	HCl (eff)	Clay Films (Y/N)	pH	C.F. % by Vol (note size)	Notes
1	A	0	-	5		10YR 2/2	L	18%	2FGR	ST	N	—	0%	
2	A_2	5	-	12		10YR 3/2	SiL	20%	2FSBK	ST	VF,F Peds	—	0%	10% 10YR 5/2 Depletions in Matrix - Distinct
3	A_3	12	-	22		10YR 3/2	CL	30%	3MSBK	ST	F,D peds	—	0%	10% 10YR 5/1 depletions in matrix 2% 10YR 4/6 Concentrations - D
4	AC	22	-	34		10YR 4/3 / 10YR 6/2	SiL / CL	25-30%	2MSBK	VE	F,D Peds	—	5% grv	Intermixed bodies of A & Cg. 5% 10YR 4/6 concentrations
5		34	-											Increased coarse frag content prevented further digging
6			-											

Full Profile Description Data Sheet

Site ID: SP-2 (wetland Plot)
Parent Material: Alluvium
Slope: 2-5%
Aspect: Southeast
Permeability: Poor
Drainage: Poorly Drained
Topographic Position: low stream Terrace
Epipedon: Mollic
Control Texture: Fine loamy
Vegetation: Reed Canary - 95%,

Date: 08-01-15
Time: 1030
Latitude/Northing 39°24'13.92"N
Longtitude/Easting: 107° 12' 38.19" W
T-R-S:

NOTES: Depth to water = 10 inches Meet Hydric Soil Indicator - A12 Thick Dark Surface
NRCS map unit = Redrob series - Frigid Fluvaquentic Endoaquolls

Horizon		Depth (inches)			Color Dry*	Color Moist	Texture	Clay %	Structure (grade, size, Class)	HCl (eff)	Clay Films (Y/N)	pH	C.F. % by Vol (note size)	Notes
1	A	0	-	14		10YR 2/1	L	20%	2MSBK	ST	N	—	5% grv	Moist at 2". Small (1/8") snails throughout profile.
2	C	14	-	20		7.5YR 5/1	SiL	22%	Massive	ST	N	—	10% grv	
3		20	-	+										Increased coarse frag content prevented further digging
4			-											
5			-											
6			-											

Appendix C

NRCS Official Soil Descriptions

LOCATION DAHLQUIST WY+UT

Established Series
Rev. PSD/MCS
06/2002

DAHLQUIST SERIES

The Dahlquist series consists of very deep, well drained soils that formed in calcareous, cobbly, and gravelly alluvium. Dahlquist soils are on fan piedmonts, fan aprons, and footslopes. Slopes are 0 to 50 percent. The mean annual precipitation is about 11 inches, and the mean annual temperature is about 41 degrees F.

TAXONOMIC CLASS: Loamy-skeletal, mixed, superactive, frigid Ustic Calciargids

TYPICAL PEDON: Dahlquist cobbly sandy loam-rangeland. (Colors are for dry soil unless otherwise stated.)

A--0 to 4 inches; pinkish gray (7.5YR 6/2) cobbly sandy loam, brown (7.5YR 4/2) moist; weak fine and very fine granular structure; soft, very friable; many very fine, fine and medium roots and common coarse roots; 15 percent cobbles, 15 percent pebbles; slightly alkaline (pH 7.6); clear smooth boundary. (3 to 5 inches thick)

Bw--4 to 7 inches; pinkish gray (7.5YR 6/2) very cobbly sandy loam, brown (7.5YR 4/2) moist; weak medium subangular blocky structure that parts to moderate fine granular; slightly hard, very friable; many very fine, fine, and medium and common coarse roots; 20 percent cobbles, 20 percent pebbles; slightly alkaline (pH 7.6); clear smooth boundary. (2 to 4 inches thick)

Bt--7 to 14 inches; brown (7.5YR 5/3) very cobbly sandy clay loam, brown (7.5YR 4/3) moist; moderate medium prismatic structure that parts to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; many fine and medium, few coarse roots; common thin clay films on faces of peds, clay bridging between sand gains and clay coatings on rock fragments; 20 percent cobbles, 20 percent pebbles; slightly alkaline (pH 7.8); clear smooth boundary. (6 to 15 inches thick)

Btk--14 to 20 inches; brown (7.5YR 5/4) cobbly sandy clay loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and few medium roots; common thin clay films on faces of peds; strongly effervescent, common fine and medium soft masses and threads and as coatings on underside of rock fragments; 30 percent cobbles, 25 percent pebbles; moderately alkaline (pH 8.4); clear wavy boundary. (4 to 6 inches thick)

Bk--20 to 60 inches; light brown (7.5YR 6/4) extremely cobbly sandy loam that grades to very cobbly loamy sand with increasing depth, brown (7.5YR 5/4) moist; massive grading to single grained in the lower part; soft, very friable, few fine roots to 28 inches; strongly effervescent,

common fine and medium soft masses, seams, and coatings on all sides of rock fragments; 40 percent cobbles, 30 percent pebbles, and few stones; moderately alkaline (pH 8.4).

TYPE LOCATION: Uinta County, Wyoming; 130 feet east of the first power pole north of the SW corner of sec. 7, T. 15 N., R. 114 W.

RANGE IN CHARACTERISTICS: Depth to base of the argillic horizon is 15 to 30 inches. Depth to continuous horizons of secondary calcium carbonate accumulation is 10 to 24 inches. The mean annual soil temperature is about 40 to 47 degrees F. The mean summer soil temperature is about 59 to 66 degrees F.

The A horizon has hue of 10YR or 7.5YR, value of 5 or 6 dry, 3 through 5 moist, and chroma of 2 or 3. It has 10 to 25 percent cobbles and 10 to 20 percent gravel. This horizon is neutral or mildly alkaline.

The Bt horizon has hue of 10YR through 5YR, value of 5 or 6 dry, 4 or 5 moist, and chroma of 2 through 4. The fine earth fraction is clay loam or sandy clay loam and averages 20 to 35 percent clay and more than 35 percent fine sand or coarser. Rock fragments are greater than 35 percent and are 10 to 25 percent cobbles, 10 to 35 percent gravel, and 0 to 25 percent stones. It is neutral through moderately alkaline.

The Btk horizon has hue of 10YR through 5YR, value of 5 or 6 dry, 4 or 5 moist, and chroma of 2 through 4. The fine earth fraction is loam or sandy loam and averages 5 to 18 percent clay. Rock fragments are greater than 35 percent and are 10 to 50 percent cobbles, 10 to 45 percent gravel, and 0 to 25 percent stones.

The Bk horizon has hue of 10YR or 7.5YR, value of 5 through 7 dry, 4 through 6 moist, and chroma of 2 through 6. Accumulated calcium carbonate ranges from 5 to 14 percent. The upper part of this horizon is very cobbly sandy loam or loam, but it grades to extremely cobbly loamy sand or cobble and sand in the lower part. This horizon is 5 to 18 percent clay in the upper part and 0 to 5 percent in the lower part. It has 10 to 60 percent cobbles, 25 to 45 percent pebbles, and 0 to 15 percent stones. It is moderately or strongly alkaline. C horizons are common in many pedons in the lower part of the 30 to 60 inches of the profile.

COMPETING SERIES: These are the Amalia, Lupinto, and Twocabin series. Amalia soils lack cobble and receive their precipitation in the summer and autumn. Lupinto soils have the base of the argillic horizon at 10 inches or less. Twocabin soils have a calcic horizon with more than 15 percent calcium carbonate equivalent..

GEOGRAPHIC SETTING: Dahlquist soils are on fan piedmonts, alluvial fans, or footslopes. Slopes are 0 to 50 percent. The soils formed in calcareous cobbly and gravelly alluvium. Elevation is 5,500 to 7,500 feet. The mean annual precipitation is about 10 to 14 inches and occurs mainly in the winter and spring. The mean annual temperature is about 39 to 45 degrees F., and the mean summer temperature is 58 to 65 degrees F. The frost-free season is 85 to 120 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Alcova, Bosler, and Millburne soils and the Michelson soils. Michelson soils are cryic.

DRAINAGE AND PERMEABILITY: Well drained. Under irrigation these soils are saturated at times from excessive use of irrigation water. Slow runoff; moderate over rapid permeability.

USE AND VEGETATION: These soils are used principally for range. Large areas are irrigated for the production of hay and pasture. Vegetation is big sagebrush, bluegrass, and clover.

DISTRIBUTION AND EXTENT: Southern Wyoming and north-central Colorado. The series is of small extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Bozeman, Montana

SERIES ESTABLISHED: Grand County, Colorado; 1977.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon--0 to 2 inches (A)

Argillic horizon--5 to 20 inches (Bt and Btk)

Calcic horizon-- 14 to 60 inches (Btk and Bk)

These soils have a frigid temperature regime and an aridic moisture regime that borders on an ustic regime

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National Cooperative Soil Survey
U.S.A.

LOCATION REDROB CO+WY

Established Series
Rev.GB/JPP
03/2003

REDROB SERIES

The Redrob series consists of very deep, somewhat poorly drained soils moderately deep to gravel. Redrob soils formed in mixed alluvium on low terraces and flood plains and have slopes of 0 to 6 percent. Mean annual temperature is about 40 degrees F., and mean annual precipitation is about 16 inches.

TAXONOMIC CLASS: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, frigid Fluvaquentic Endoaquolls

TYPICAL PEDON: Redrob loam in native range and scattered stands of cottonwood trees. (Colors are for dry soil unless otherwise stated.)

A1--0 to 4 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; weak coarse platy structure parting to moderate fine subangular blocky; slightly hard, very friable, slightly sticky; common very fine and fine roots; few very fine tubular pores; slightly effervescent; slightly alkaline; abrupt smooth boundary. (2 to 6 inches thick)

A2--4 to 17 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly plastic; common very fine and fine roots; few very fine tubular pores; strongly effervescent; slightly alkaline; clear wavy boundary. (6 to 14 inches thick)

ACg--17 to 35 inches; light brownish gray (10YR 6/2) stratified loam, sandy loam and loamy sand, grayish brown (10YR 5/2) moist; faint variegated very dark gray and dark brown strata (10YR 3/1 and 3/3) moist; common fine and medium distinct redox features of strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) moist; massive; slightly hard and soft, very friable; few fine and medium roots; strongly effervescent; slightly alkaline; clear wavy boundary. (10 to 20 inches thick)

2C--35 to 60 inches; brown (10YR 4/3) very gravelly loamy sand and sand, dark grayish brown (10YR 4/2) moist; few medium distinct redox features of strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) moist; 45 percent coarse pebbles; neutral.

TYPE LOCATION: Rio Blanco County, Colorado; 150 feet south and 730 feet east of the NW corner of Sec. 29, T. 1 N., R. 93 W. U.S.G.S. Rattlesnake Mesa quad.; Lat. 40 degrees, 01 minutes, 59 seconds N., and Long. 107 degrees, 51 minutes, 17 seconds W.

RANGE IN CHARACTERISTICS: Mean annual soil temperature ranges from 40 to 46 degrees F. The solum ranges from 15 to 40 inches thick over the 2C horizon. The mollic epipedon is 8 to 20 inches thick. Depth to calcareous material ranges from 0 to 6 inches. Mottles range from few to many, fine to large, and distinct or prominent above 40 inches. Rock fragments in the solum range from 0 to 25 percent, and in some pedons they may have enough rock fragments to be a gravelly type. The upper part of the particle-size control section ranges from 18 to 27 percent clay, with fine sand and coarser ranging from 15 to 45 percent. A water table fluctuates within the 2C horizon and rises to within one foot of the surface during peak spring runoff.

The A horizon has hue of 7.5YR through 2.5Y, value of 4 or 5 dry, 2 or 3 moist, and chroma of 1 or 2. It is slightly alkaline or moderately alkaline.

The AC horizon has hue of 10YR or 2.5Y, value of 3 through 6 dry, and 2 through 5 moist. It is stratified loam, sandy loam and loamy sand. This horizon is slightly alkaline or moderately alkaline.

The 2C horizon has hue of 10YR through 5Y. Rock fragments range from 35 to 70 percent and are mainly pebbles but include some cobbles and a few stones. This horizon is neutral through moderately alkaline.

COMPETING SERIES: There are no competing series in this subgroup and family at present.

GEOGRAPHIC SETTING: Redrob soils are on low terraces and flood plains and have slope gradients of 0 to 6 percent. The soils formed in mixed alluvium from a variety of sources. The mean annual temperature ranges from 38 to 44 degrees F., and the mean annual precipitation ranges from 14 to 18 inches. Elevation ranges from 5,800 to 7,800 feet. The frost-free period is 80 to 105 days. In Wyoming annual precipitation ranges down to 12 inches.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Shawa, Straw, and Vanda soils. Shawa and Straw soils are well drained soils on higher terrace and fan positions and lack a sandy and gravelly 2C horizon within the particle-size control section. Vanda soils lack a mollic epipedon and a have a fine particle-size control section.

DRAINAGE AND PERMEABILITY: Somewhat poorly drained; slow or medium runoff; moderate permeability in the solum and rapid in the substratum.

USE AND VEGETATION: The soil is used mainly for hay production, livestock grazing and pasture. Small areas are used for wildlife habitat. The vegetation is cottonwood trees and an understory of western wheatgrass, sedges, basin wildrye, slender wheatgrass, redtop, roses, rushes and willows.

DISTRIBUTION AND EXTENT: Redrob soils are of small extent along major drainages in northwestern Colorado and adjacent parts of Wyoming.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Bozeman, Montana

SERIES ESTABLISHED: Rio Blanco County, Colorado, 1979.

REMARKS: This revision updates the classification from a Fluvaquentic Haplaquoll to a Fluvaquentic Endoaquoll. (1992 Keys to Soil Taxonomy.) Diagnostic features include a mollic epipedon from 0 to 17 inches and sandy-skeletal material at 35 inches. It has stratification in the 17 to 35 inch layer, redox features in all layers below 17 inches; an irregular decrease in organic carbon below 17 inches; an aquic moisture regime; and a frigid temperature regime. Last revised by the state on 4/95.

The superactive cation exchange activity class was added in 03/2003 to the taxonomic classification by the National Soil Survey Center on request of the Lakewood MLRA office, without review of the soil series property data. The remainder of this document has not been updated.

National Cooperative Soil Survey
U.S.A.

LOCATION SOUTHACE WY

Established Series
Rev. PSD
03/2003

SOUTHACE SERIES

The Southace series consists of deep, well drained soils on upper fan aprons, terrace slopes, and mountain or hill slopes. They formed in calcareous gravelly slope alluvium derived from red sedimentary rocks. Slopes are 1 to 65 percent. The mean annual precipitation is about 14 inches, and the mean annual temperature is about 43 degrees F.

TAXONOMIC CLASS: Loamy-skeletal, mixed, superactive, calcareous, frigid Ustic Torriorthents

TYPICAL PEDON: Southace gravelly loam-rangeland. (Colors are for dry soil unless otherwise stated.)

A--0 to 4 inches; brown (7.5YR 4/4) gravelly loam, dark brown (7.5YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; few fine roots; slightly effervescent, lime disseminated; 15 percent pebbles and 5 percent cobbles; moderately alkaline (pH 8.4); clear smooth boundary. (2 to 6 inches thick)

C1--4 to 9 inches; reddish brown (5YR 4/4) very gravelly loam, dark reddish brown (5YR 3/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; violently effervescent, lime disseminated and as common soft masses and filaments; 25 percent pebbles and 10 percent cobble; strongly alkaline (pH 8.6); gradual wavy boundary. (4 to 15 inches thick)

C2--9 to 40 inches; reddish brown (5YR 5/4) very gravelly loam, reddish brown (5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; violently effervescent, lime disseminated and as common soft masses and filaments; 35 percent pebbles and 10 percent cobbles; strongly alkaline (pH 8.6); gradual wavy boundary. (20 to 40 inches thick)

C3--40 to 60 inches; reddish brown (5YR 5/4) very cobbly loam, reddish brown (5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; violently effervescent, lime disseminated and as common soft masses; 30 percent pebbles and 25 percent cobbles; strongly alkaline (pH 8.6).

TYPE LOCATION: Sweetwater County, Wyoming; 500 feet south of the center of sec. 17, T. 12 N., R. 104 W.

RANGE IN CHARACTERISTICS: The mean annual soil temperature is 41 to 46 degrees F., and the mean summer temperature is 59 to 63

degrees F. These soils are typically calcareous to the surface, but some pedons are leached a few inches in the surface horizon. The particle-size control section has a matrix texture of loam or sandy loam with 10 to 27 percent clay. Coarse fragments are highly variable and range from 35 to 80 percent pebbles, cobbles, and stones. Either class may dominate or be uniformly mixed.

The A horizon has hue of 10YR through 5YR, value of 4 through 6 dry, 3 or 4 moist, and chroma of 3 through 6. It is mildly alkaline or moderately alkaline.

The C horizon has hue of 7.5YR or 5YR, value of 4 through 6 dry, 3 through 5 moist, and chroma of 2 through 6. Carbonates range from 4 to 14 percent. The segregations of carbonate appear to be a result of the wetting cycles involved when the material was laid down and not a result of pedogenetic development. It is moderately alkaline or strongly alkaline.

COMPETING SERIES: These are the Armells, Colhill, Grobutte, and Grotte series. The Armells soils formed in materials weathered from baked shale. The Colhill, Grobutte, and Grotte soils have hue of 10YR or 2.5Y throughout the control section.

GEOGRAPHIC SETTING: Southace soils are on upper fan aprons, terrace slopes, and mountain or hill slopes. They formed in skeletal, calcareous slope alluvium and sediments derived from red sedimentary rock. Slopes are 1 to 65 percent. Elevations range from 7,300 to 8,500 feet. The mean annual precipitation ranges from 10 to 16 inches of which about half falls as snow or rain in April, May, and early June. The mean annual temperature is about 40 to 45 degrees F. The frost-free season is about 60 to 90 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Dahlquist, Teemat, and the competing Grobutte series. Dahlquist soils have argillic horizons. The Teemat soils have mollic epipedons, are cooler, and occur on more north facing slopes.

DRAINAGE AND PERMEABILITY: Well drained; medium to rapid runoff; moderately rapid or moderate permeability.

USE AND VEGETATION: Rangeland and wildlife habitat. Native vegetation consists of bluebunch wheatgrass, big sagebrush, western or thickspike wheatgrass, serviceberry, and black sagebrush.

DISTRIBUTION AND EXTENT: Southwestern Wyoming and northwestern Colorado. The series is of limited extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Bozeman, Montana

SERIES ESTABLISHED: Aspen-Gypsum Area, Colorado; 1982.

REMARKS:
The superactive cation exchange activity class was added in 03/2003 to the taxonomic classification by the National Soil Survey Center on request of the Reno MLRA office, without review of the soil series property data. The remainder of this document has not been updated.

National Cooperative Soil Survey

U.S.A.

Appendix D

Photos

Photographic Documentation
Carbondale Nature Park Wetland Delineation
Garfield County, Colorado

Photo: 1 **Description:** Photo looking Southeast showing upland and wetland transition.	

Photo: 2 **Description:** View of upland plot looking North.	

Ryan Sparhawk
North Carolina State University
Wetland Soils SSC 570

Photographic Documentation
Carbondale Nature Park Wetland Delineation
Garfield County, Colorado

Photo: 3 **Description:** View of Upland plot looking Southwest.	

Photo: 4 **Description:** Photo of upland soils pit and groundwater table at 28 inches below soil surface.	

Photographic Documentation
Carbondale Nature Park Wetland Delineation
Garfield County, Colorado

Photo: 5 **Description:** View of wetlands area looking Southwest.	

Photo: 6 **Description:** View of wetlands plot in Phalaris arundinacea (reed canarygrass).	

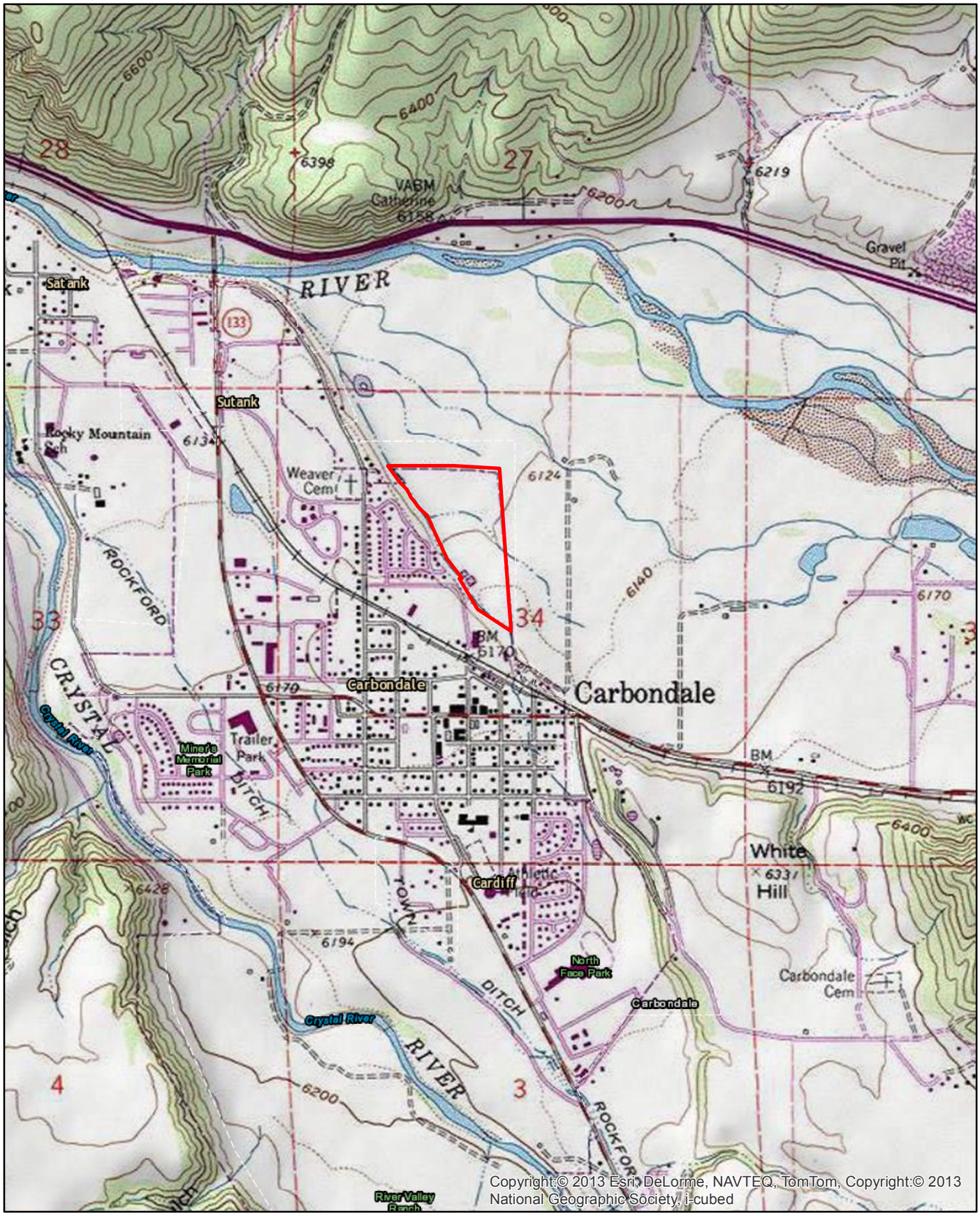
Photographic Documentation
Carbondale Nature Park Wetland Delineation
Garfield County, Colorado

Photo: 7 **Description:** Photo of wetland soils pit.	

Ryan Sparhawk
North Carolina State University
Wetland Soils SSC 570

Figure 1

Carbondale Nature Park
Site Overview Map



filepath & data & user

N
W E
S

0 0.25 0.5 1 Miles

Nature Park Boundary

November 2015

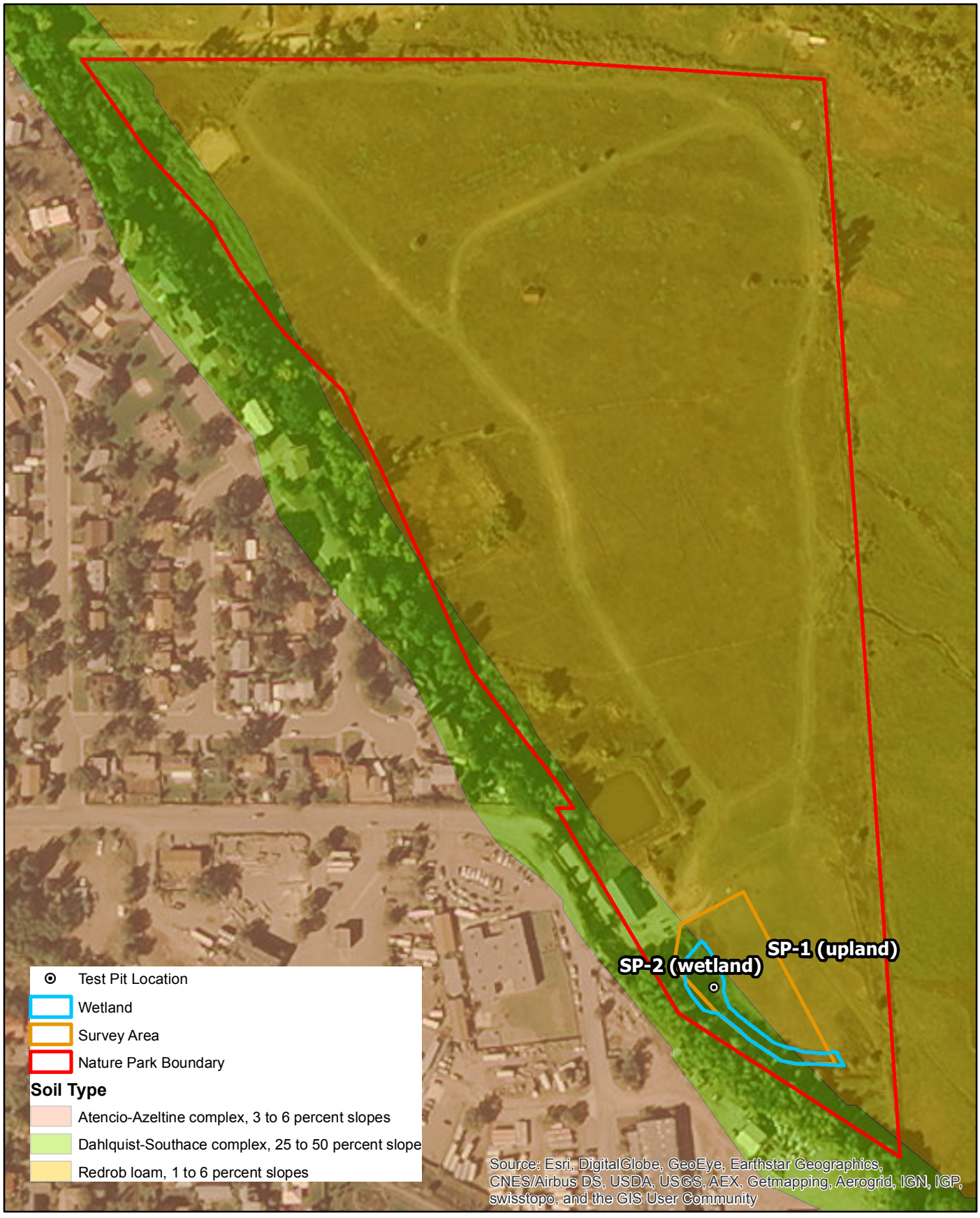
Figure 1

Site Overview Map

Carbondale Nature Park

Figure 2

NRCS Soil Survey Map



November 2015

Figure 2

Soil Map

Carbondale Nature Park

Figure 3

Wetland Delineation Map

N
W E
S

0 25 50 100 Feet

Test Pit Location
Wetland
Survey Area
Nature Park Boundary

November 2015

Figure 3

Wetlands Map

Carbondale Nature Park