Appendix C:
Wetland Delineation Report and FACWET

SOUTH BRIDGE PROJECT

Garfield County, Colorado

WETLAND DELINEATION REPORT

January 8, 2009

Prepared for submittal to:

US Army Corps of Engineers
Western Colorado Regulatory Branch

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I. Introduction

Jacobs Engineering Group Inc. (JEG) retained Claffey Ecological Consulting, Inc. (CEC) to delineate and evaluate wetland resources for the South Bridge Project in Garfield County, Colorado. The City of Glenwood Springs and the Colorado Department of Transportation propose the South Bridge Project to address an identified need for secondary access connecting residents, public uses, and businesses south of Glenwood Springs and west of the Roaring Fork River to State Highway 82 (SH-82), particularly for wildfire evacuation needs of areas west of the river. This report concerns identification of waters of the United States including adjacent wetlands at the project site; and, specifically requests a jurisdiction determination from the Corps of Engineers.

II. Applicant and Site Information

Applicant:
City of Glenwood Springs
101 West 8th Street
Glenwood Springs, Colorado 81601

Site Information
Sections 26 and 27, Township 6 South, Range 89 West, Garfield County, Colorado
Latitude: 039° 30' 8.67", Longitude: 107° 18' 15.39"

III. Project Area

The project area is located approximately 3 miles south of Glenwood Springs along the Roaring Fork River corridor. The project area was specifically defined as Alternative B on maps provided by Jacobs Engineering. Figure 1 depicts the project location in the valley, and Figure 2 depicts the specific project area on an orthophotograph (2005 NAIP for Garfield County).

The project is located in the lower montane shrubland ecosystem and also includes montane riparian habitats. The area is at 5,960 feet above msl. The majority of the project area contains disturbed habitats with the Glenwood Springs airport occupying the bulk of the area west of the river and pastures and structures are present east of the river. The river corridor, from top of bank of the upper terraces down, is a native, relatively undisturbed habitat. The Roaring Fork is well incised at this point in the valley.

On the west bank, the upland slope to the river is a native montane shrubland community. Dominant species include big sagebrush (*Artemesia tridentata*), serviceberry (*Amelanchier alnifolia*), scrub oak (*Quercus gambelii*), juniper (*Juniperus scopulorum*), and antelope bitterbrush (*Purshia tridentata*). On the east bank, the slope to the river is a riparian cottonwood forest with a service berry and scrub oak understory. On both upper terraces, remnant pockets of native vegetation including cottonwood on the east and sagebrush on the west exist but the areas are predominately disturbed. On the east side, the project area on the upper terrace is an irrigated pasture, with no evidence of hydrophytic plant communities. Adjacent to Highway 82 and the bike trail is a dense stand of serviceberry and scrub oak. Asphalt of the runways and access roads as well as airport structures comprise the terrace on the west side of the river.

III. Methods

Michael Claffey of CEC completed the wetland delineation for this project. CEC retained Brad Johnson of Johnson Environmental Consulting (JEC) to complete a functional assessment and GPS survey the boundary. I first visited the site on September 25, 2008 to delineate wetlands.
I had to return on November 6, 2008 to complete the delineation with Brad Johnson and his GPS unit as the property owner would not allow the placement of flagging. CEC met on site on November 13, 2008 with Mark Gilfillan of the Corps to review the wetland boundaries.

Since the east side of the project area is private property, CEC arranged for access with the property owners on each occasion. Ms. Sandy Jackson owner of the majority of the eastern portion of the project area attended each site visit. Holy Cross Electric owns a portion of the east side of the project area. The City of Glenwood Springs owns the west side of the project area which is the airport property.

All wetlands were delineated in accordance with the Corps of Engineers 1987 Wetland Delineation Manual (Environmental Lab 1987) and the 2008 Western Mountains, Valleys and Coast Region Supplement (Corps 2008). Information on soils, hydrology and plant species was recorded on September 25th as well as determination of the wetland boundary. The actual delineation was performed on November 6th and the boundary flagged, GPS surveyed and the flagging removed.
A routine determination was completed due to the obvious wetland boundary. Five sample points were recorded (enclosed).

JEC provided the boundary and sample points as an ARC-GIS shape file, and the shape file placed on the 2005 NAIP orthophotograph in an ARC-GIS database. The wetland boundary is shown on Figures 2 and 3. Figure 2 depicts the entire project area and Figure 3 provides a larger scale view of the wetland. The only waters of the U.S. in the project area were the Roaring Fork River and its adjacent wetlands as shown on Figure 2.

IV. Wetland Description

The wetlands on each side of the river vary considerably. Under the Hydrogeomorphic classification system (Brinson et al 1995), the wetland on the east side of the river is a slope wetland and the wetland on the west shore is a riverine wetland.

East Side

The east shore wetland is a slope wetland as it is supported primarily by uni-directional groundwater flow. A defined spring is present in the approximate center with an outlet channel that flows to the river. Seeps are present along or just down gradient of the wetland boundary throughout the entire system. The system contained saturated soils and shallow inundation in some locations even in late September when discharge in the river was well below a bankfull flow. Only the river edge of the wetland would possibly be considered riverine as both overbank flows and subsurface connections to the river support hydrology; however, groundwater still supports this riverine edge. In the adjacent upland, wetland hydrology was not present in sample pits, nor were there any secondary indicators. The hydrology for the bulk of the wetland was not derived from the river.

The wetland has the appearance of fen including landscape position and a "quaking" surface in locations. However, numerous soil samples failed to locate any organic soils or a histic epipedon. The soils were silty clay loams in the upper horizons to loamy clays at 12 to 18 inches. Soils were obviously hydric due to low chroma matrices and redoximorphic features. By contrast soils in the adjacent uplands were silty loams with a high chroma matrix and no redoximorphic features. Cobble was very close to the surface in the uplands.

The plant community in the eastern wetland was primarily an emergent system with a few shrubs including sandbar willow (*Salix exigua*), dogwood (*Cornus stolonifera*) and alder (*Alnus tenuifolia*). The herbaceous community was diverse and Table 1 provides a list of species observed. The dominants varied by location with water sedge (*Carex aquatilis*) and beaked sedge (*Carex utriculata*) and a mixture of grasses, sedges and forbs in other locations. The channel of the main spring is dominated by dense stand of water cress (*Nasturtium officinale*). The dominants were either Facultative wet or obligate species.

The adjacent upland appears as a riparian forest with an overstory of narrowleaf cottonwood (*Populus angustifolia*) and a fairly dense shrub layer of hawthorne (*Crataegus sp.*), scrub oak, cottonwood saplings and serviceberry. The understory was comprised of orchard grass (*Dactylus glomerata*), mountain brome (*Bromus marginatus*), Kentucky bluegrass (*Poa pratensis*), and common burdock (*Artium minus*).

Table 1. List of species found in the eastern wetland

Beaked sedge	*Carex utriculata*
Water sedge	*Carex aquatilis*
Nebraska sedge	*Carex nebrascensis*
Swordleaf rush	*Juncus ensifolius*
Redtop	*Agrostis alba*
Tall mannagrass	*Glyceria elata*
White clover	*Trifolium repens*
Fowl bluegrass	*Poa palustris*
Spike rush	*Eleocharis palustris*
Canada bluegrass	*Poa compressa*
Canada thistle	*Cirsium arvense*
Field mint	*Mentha arvensis*
Scour rush	*Equisetum laevigatum*
Field horsetail	*Equisetum arvense*
Fireweed	*Epilobium angustifolium*
Marsh willow herb	*Epilobium palustre*
Sandbar willow	*Salix exigua*
Alder	*Alnus tenuifolia*
Red osier dogwood	*Cornus stolonifera*
Hawthorne	*Crataegus sp.*
Woods rose	*Rosa woodsii*

The wetland boundary on the east side of the river was obvious with FACW and OBL dominated plant communities abruptly changing to upland communities of orchard grass, scrub oak, and serviceberry. Although the overstory included narrowleaf cottonwood, a FAC species; the plant community was not hydrophytic, the soils were obviously upland and wetland hydrology was absent.

West Side

The wetland system on the west side is entirely different than the east side wetland. This riverine wetland occupies a band along the river on cobble substrate. The vegetative cover is sparse and includes a narrow band of sandbar willow near the river's edge. The ordinary high water mark was used to place the line although along a majority of the boundary a hydrophytic plant community existed up to the boundary.

Hydrology is derived from bankfull flows, and for the wetlands closer to the low water elevation from a subsurface connection. Evidence of hydrology was present in the form of saturated soils near the river in September, and a rack line of debris along the ordinary high water mark.

Soils were sparse and consisted of large gravel and small cobble below 4 inches. Only the upper 4 to 6 inches was available as soil which was silty loam with low chroma and redoximorphic features. Refusal from large cobble prevented deeper soil investigations.

The plant community was primarily an emergent system with a narrow band of willow in some locations. The aerial coverage of vegetation averaged only 50% vegetation as large cobble was present throughout the system. The dominants were redtop, reed canary grass (*Phalaris arundinacea*), scour rush, sandbar willow and in some locations an unidentifiable *Carex* (no inflorescence).

The jurisdictional boundary was obvious on the west side. The wetland/ordinary high water line was bordered by a xeric pant community of juniper with a few piñon pine (*Pinus edulis*), scrub oak, service berry and sagebrush. Soils in the upland were obviously non hydric and no evidence of wetland hydrology was present.

V. Jurisdictional Status

The wetlands delineated are adjacent and abutting to the Roaring Fork River, assumed to be considered a Traditional Navigable Water (TNW) by the Corps. If not a TNW, the Roaring Fork is at the least a Reasonably Permanent Water (RPW), and again the wetlands are adjacent to, and abutting the river. There is an unbroken surface connection from the outermost limits of the wetland boundary to the river. The wetlands would be considered jurisdictional in accordance with the December 2, 2008 agency guidance on jurisdiction.

VI. Conclusion

All wetlands in the project area were delineated in accordance with the Corps Delineation Manual and Supplement. The wetland boundary was surveyed, and Figures 2 and 3 are an accurate depiction of the wetland boundary flagged in the field. No other wetlands were located within the project area.

References

Brinson, M. M., Hauer, F. R., Lee, L. C., Nutter, W. L., Rheinhardt, R. D., Smith, R. D., and Whigham, D. (1995). "A guidebook for application of hydrogeomorphic assessments to riverine wetlands," Technical Report WRP-DE-11, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Corps of Engineers. 2008. *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region*, ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-08-13. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

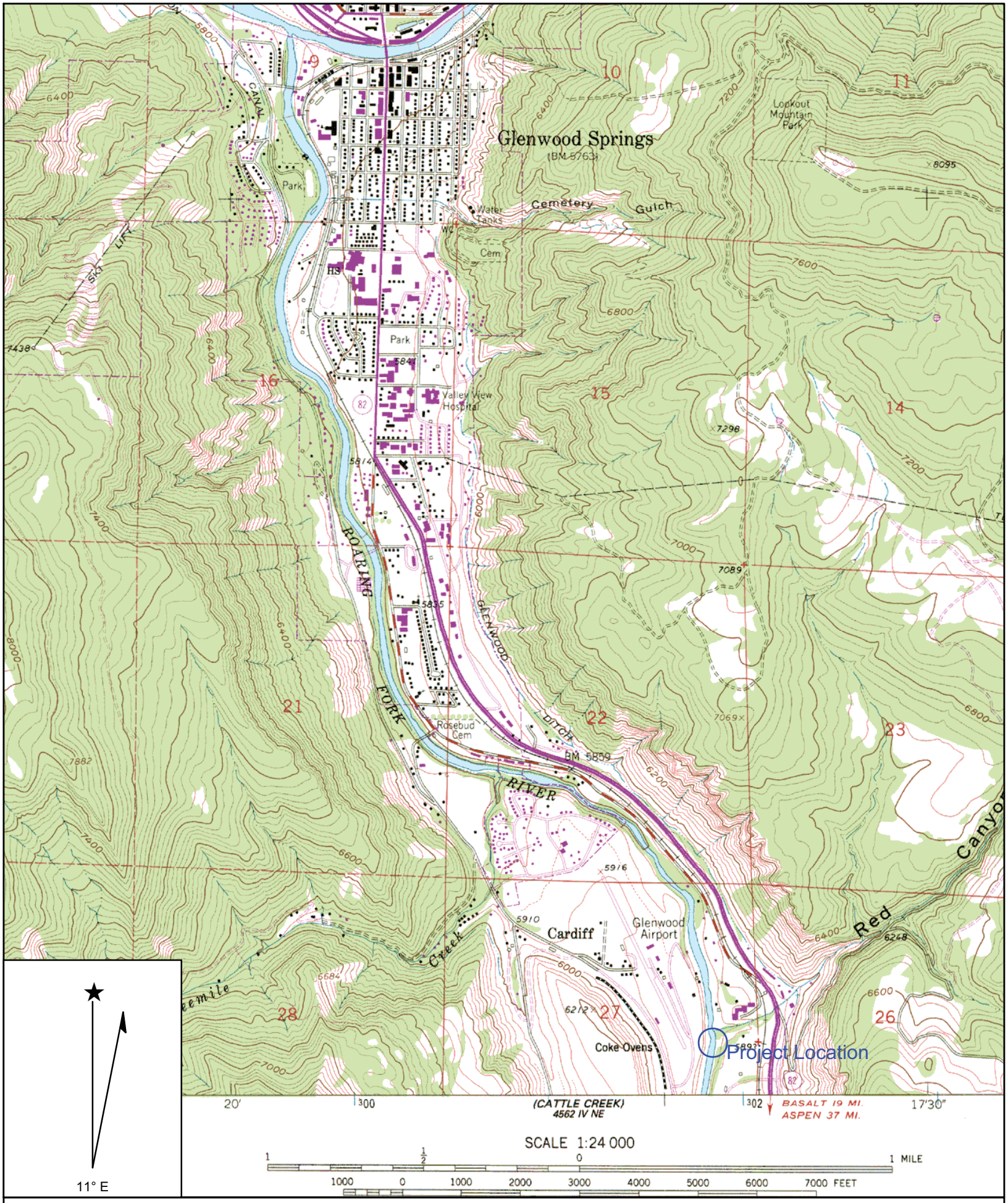
Environmental Laboratory. 1987. *Corps of Engineers wetlands delineation manual*. Technical Report Y-87-1. Vicksburg, MS: U.S. Army Engineer Waterways Experiment Station.

Eastern wetland as viewed from the west bank.

Outlet channel for main spring in eastern wetland

Eastern wetland looking north

Western wetland looking south



Name: GLENWOOD SPRINGS
Date: 1/9/2009
Scale: 1 inch equals 2000 feet

Location: 039° 31' 22.6" N 107° 19' 01.1" W
Caption: FIGURE 1
Southbridge Project
Project Location

Copyright (C) 1997, Maptech, Inc.

N

January 2009

South Bridge Project

City of Glenwood Springs

Project Area

300 150 0 300 Feet

1 Inch = 300 Feet

Datum: NAD_1983_UTM_Zone_13N

Source: NAIP 2005 Aerial

GIS Prepared by S.Claffey

Claffey Ecological Consulting, Inc.

Legend

Wetland Boundary

South Bridge Wetland Pts NAD_83_UTM

South Bridge Points

Sample Points

Project Area Boundary

Figure 2

N

January 2009

South Bridge Project

City of Glenwood Springs

Wetland Boundary

100 50 0 100 Feet

1 Inch = 100 Feet

Datum: NAD_1983_UTM_Zone_13N

Source: NAIP 2005 Aerial

GIS Prepared by S.Claffey

Claffey Ecological Consulting, Inc.

Legend

Wetland Boundary

South Bridge Wetland Pts NAD_83_UTM

South Bridge Points

Sample Points

Figure 3

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Southbridge Jackson City/County: Garfield Sampling Date: 11/6

Applicant/Owner: City of GSL State: CO Sampling Point: SP 1

Investigator(s): [illegible] Section, Township, Range: _____

Landform (hillslope, terrace, etc.): hillslope above [illegible] Local relief (concave, convex, none): convex Slope (%): 8%

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

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

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

Are Vegetation NO, Soil NO, or Hydrology NO 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 _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. Agrostis alba	70	Y	FACW
2. Carex nebrascensis	10		OBL
3. ~~[illegible]~~ Nasturtium officinale	7		OBL
4. Poa palustris	5		FACW
5. Carex aquatilis	10		OBL
6. Epilobium ciliatum	5		OBL
7. Poa compressa	1		FACU
8.			
Total Cover:	103		
Woody Vine Stratum			
1.			
2.			
Total Cover:			

% Bare Ground in Herb Stratum <1% % Cover of Biotic Crust _____

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% of dom (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:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks:

Due to rock - large boulder

→ Large stand of [illegible] on [illegible] channel [illegible]

SOIL

Sampling Point: SP1

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/1	100%					silty clay loam	with high organic content
6-12	10YR 4/1	70%	10YR 6/1	20	D	M		
			7.5YR 4/6	10	D	RC	silty clay loam	
12-18	10YR 3/1	80%	7.5YR 4/6	20	D	M	~~silty clay loam~~ Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

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

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ 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)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): 1/2

Water Table Present? Yes ✓ No ___ Depth (inches): surf

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): surf

Wetland Hydrology Present? Yes ✓ No ___

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

Remarks:

obvious wetl hydrology

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

Project/Site: Southridge Junction City/County: GAR Sampling Date: 11/6

Applicant/Owner: City of GS State: CO Sampling Point: [illegible]

Investigator(s): Cliffy Section, Township, Range: _____

Landform (hillslope, terrace, etc.): hillslope above well Local relief (concave, convex, none): convex Slope (%): 8%

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

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

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

Are Vegetation N, Soil N, or Hydrology N 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 ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks: — 12' upslope of Flag 13

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 20' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus angustifolia	20%	~~30%~~	FAC
2.			
3.			
4.			
	20% = Total Cover		

Sapling/Shrub Stratum (Plot size: 20' r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Oreotrophus succulentus (Web	30%		FACU
2. Populus angustifolia	10%		FAC
3. Woods rose	2%		
4.			
5.			
	42 = Total Cover		

Herb Stratum (Plot size: 1 m radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Dactylus glomerata	50%		FACU
2. Bromus marginatus	10%		FACU
3. Poa pratensis	10%		FACU
4. Burdock	20%		UPL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	25 = Total Cover		

Woody Vine Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 20%

Dominance Test worksheet:

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

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species	30	x 3 = 90
FACU species	100	x 4 = 400
UPL species	20	x 5 = 100
Column Totals:	150 (A)	690 (B)

Prevalence Index = B/A = 4.6

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 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 ✓

Remarks: ↳ ground + cobble

SOIL

Sampling Point: SP2

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3	5YR 4/4	100%					silt loam	
3-12	2.5YR 4/6	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)
- ___ 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)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

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 ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

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

Remarks: on hillside 6' elev above well. ↳ elevation

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

Project/Site: Southbrook – Jackson Pr City/County: GAR Sampling Date: 11/6

Applicant/Owner: City of G State: CO Sampling Point: SP 3

Investigator(s): Claffey Section, Township, Range: _____

Landform (hillslope, terrace, etc.): hillslope above gp Local relief (concave, convex, none): convex Slope (%): 5%

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

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

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

Are Vegetation N, Soil N, or Hydrology N 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 ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks: → 10' above flow pt about centerline of road.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30' rad)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus angust	20%		FAC
2. Quercus gambelii	20%		UPL
3.			
4.			
	40 = Total Cover		

Sapling/Shrub Stratum (Plot size: 20' rad)	Absolute % Cover	Dominant Species?	Indicator Status
1. Amelanchier alnifolia	20%		FACU
2. Populus angustifolia	20%		FAC
3.			
4.			
5.			
	40 = Total Cover		

Herb Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Burdock – ARTIUM MINUS	50%		UPL
2. Nightshade Solanum americanum	20%		UPL
3. UK – 1	5%		
4. Dactylis glomerata	10%		FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	85 = Total Cover		

Woody Vine Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 15%

Dominance Test worksheet:

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

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 20 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species	40	x 3 = 120
FACU species	20	x 4 = 80
UPL species	90	x 5 = 450
Column Totals:	150 (A)	650 (B)

Prevalence Index = B/A = 4.3

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 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 ✓

Remarks: → soil & boulders

SOIL

Sampling Point: SP3

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	5YR 4/4	100%					silty loam	
								refusal 6 to 6"

[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)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if present):

Type: boulder

Depth (inches): 6"

Hydric Soil Present? Yes ___ No ✓

Remarks:

site is rock slope with minimum soil
boulders on surface ⇒ refusal even when below
Too well drained

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 ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ✓

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

– very dry

Remarks:

Site is obvious upland plant community despite cottonwood in overstory. Site is separate parent but in reality no as hydrology is groundwater not the river!

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

Project/Site: Southbridge – west side City/County: GAR WEST OF RIVER Sampling Date: 11/6/08

Applicant/Owner: City of GS State: CO Sampling Point: SP 4

Investigator(s): Clayton Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

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

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

Are Vegetation N, Soil N, or Hydrology N 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 _____	**Is the Sampled Area within a Wetland?** Yes _____ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	

Remarks: 50% of headwaters flow diverted to Twin Lakes but this is below Crystal, P. sagittata + Sqrus

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. Salix exigua	10%		OBL
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Deschampsia cespitosa	20		OBL
2. Redtop	20		FACW
3. Aster sp. v. known spp	10		
4. Scirpus sp.	5		FAC
5. Poa pratensis	2		FACU
6. Carex — No seedhd	5		
7. Danthonia californica	5		FAC-
8.			
9.			
10.			
11.			
	52 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum 50% → cobble

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	30	x 1 = 30
FACW species	10	x 2 = 20
FAC species	10	x 3 = 30
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	50 (A)	80 (B)

Prevalence Index = B/A = 1.6

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 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 _____

Remarks: substrate is river cobble 8" – 2'

SOIL

Sampling Point: SP4

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4"	10YR 4/2	95	10YR 5/6	5%	~~RM~~	PL	silt loam	→ substrate is gravel and cobble - refusal below 4"
	+ 1" gebbles							

[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)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if present):

Type: cobble - lay

Depth (inches): 4"

Hydric Soil Present? Yes ✓ No ___

Remarks: Entisol → substrate is gravel, a fluvial substrate

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 ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): surface

Wetland Hydrology Present? Yes ✓ No ___

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

Remarks: wet is below OHW line
Delineated based on OHW — some riparian habitat 1-2' wide included

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

Project/Site: Southridge wetland City/County: GAR Sampling Date: 11/6/08

Applicant/Owner: City of GS State: CO Sampling Point: SP3

Investigator(s): Cloffy Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

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

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

Are Vegetation N, Soil N, or Hydrology N 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 ✓	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Cedar	30		UPL
2.			
3.			
4.			
	30 = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1. Scrub oak	40		UPL
2. Pinyon pine	1		UPL
3.			
4.			
5.			
	41 = Total Cover		
Herb Stratum (Plot size: _____)			
1. Poa pratensis	30		FACU
2. Bromus ciliatum	30		FACU
3. Mahonia repens	2%		UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	62 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum ~40% → rock

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (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:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 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 _____

Remarks:

SOIL

Sampling Point: SP5

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/3	100					silty clay	
	refusal below							

[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)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if present):

Type: Rock

Depth (inches): 6"

Hydric Soil Present? Yes _____ No _____

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 ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

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

Remarks:

Xeric plant community

JOHNSON ENVIRONMENTAL CONSULTING, LLC

South Bridge Project Wetland Functional Assessment, Garfield County, Colorado

Submitted to:
Claffey Ecological Consulting, Inc.
1371 17 Road
Fruita, CO 81521

December 3, 2008

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Introduction

The South Bridge Project involves the proposed construction of a road crossing over the Roaring Fork River a few miles south of the Town of Glenwood Springs in Garfield County, Colorado. Of the potential alignments, only Alternative B was considered in this evaluation (Fig. 1). Under this alternative, the new road coming from State Highway 82 would cross private land and could potentially impact jurisdictional wetland habitats. At the east Roaring Fork River terrace scarp, a bridge would be constructed that would span the incised channel valley reaching the upper terrace surface on the west side of the river, adjacent to the Glenwood Springs Airport. Property on the west side of the river is owned by the city.

Wetlands were known to exist within the proposed alignment adjacent to the river. As part of the project's environmental assessment, wetlands within the alignment were to be delineated and then evaluated using the Colorado Department of Transportation's Functional Assessment of Colorado Wetlands (FACWet) methodology (Johnson et al. 2008). Johnson Environmental Consulting, LLC (JEC) was subcontracted by Claffey Ecological Consulting, Inc. (CEC) to perform the FACWet evaluation. CEC performed the wetland delineation concurrently with the functional assessment.

Methods

The functional assessment and delineation occurred on November 6, 2008. The FACWet was carried out according to the procedure detailed in the user guide (http://rydberg.biology.colostate.edu/FACWet/index_files/Page387.htm). The assessment was completed in two parts, first considering the wetland area on the east side of the river and then west side.

The east wetland assessment area (AA) boundary was primarily based on the extent of jurisdictional wetland, except at its northern end which was set to follow the edge of an incised channel that originates in Red Canyon to the east. Although contiguous wetland habitat does exist beyond the Red Canyon channel, there is a marked break in its ecological character. The boundary is also more than 40 m from the predicted extent of project impacts, which exceeds the requirements of the FACWet.

The limits of the western AA were defined to the east and west by the width of the jurisdictional wetland habitat. Because this habitat is more or less continuous along the river, its northern and southern ends were made consistent with the eastern assessment area.

Results

The FACWet datasheets completed during the evaluation follow the text of this report. Datasheets are presented as the primary vehicle of reporting the results of the assessment. What

follows is a brief narrative summarizing the findings of the assessment.

Eastern Assessment Area

This wetland is an interesting example of a groundwater driven wetland that very much resembles a fen, but lacks organic soils (Figs 2 – 8). Located at a slope break on a terrace scarp of the Roaring Fork River, this site receives water from one rather productive spring, as well as a number of smaller seeps and springs located along the entire upper boundary of the AA (Fig. 5). Discharged water runs down the wetland toward the river as channelized, sheet, and subsurface flow. One substantial channel leads from the main spring straight down to the river (Fig. 6). Other smaller channels chart more sinuous paths.

Soils in the upper reaches of the site are soft and often quaking – another characteristic shared with fens. Towards the toe of the wetland and on the lateral fringes soils become shallower, more firm and often rocky.

Vegetation is typical of slope wetlands, although species composition was not considered in any detail owing to both the season and the goal of this assessment. The herbaceous layer is dominated by grasses and sedges, except in the vicinity of the main spring which is nearly a monoculture of watercress (Fig. 5). Willows are scattered throughout the site, but are never common enough to form a cohesive shrub canopy.

Essentially no alterations to the character and functioning of this site were detected during the evaluation. A few small log piles were found on the edges of the wetland (Fig. 8). The vegetation under the piles was no doubt killed, but that appears to be the extent of the effects. A primitive road grade leads down to the AA from the upper terrace surface. This road grade ceases shortly after crossing the wetland boundary, and appears to have a negligible effect on wetland functioning. It appears that a few trees may have been removed from the road grade as well. Lastly, there are some faint cross-slope trails which appear to have been created by cattle. Again, the effects of these trails appear trivial.

The main impacts to wetland functioning are related to surrounding land use changes and the impairment of the AA's ability to interact with adjacent wetland and riparian habitats.

The results of the FACWet analysis indicates that the condition of this site is at the lower end of the highest, reference standard, functional category (Composite Functional Capacity Index = 0.93).

Western Assessment Area

The Western AA lies at the base of a high, steep terrace scarp. The AA is comprised of a narrow strip of riverine wetland located in the active floodplain of the Roaring Fork River. This wetland appears typical of those found along strongly confined reaches along the river. The hydrology of this wetland is wholly dependent on overbank flows from the river. Essentially the entire wetland is covered by cobbles armoring the sandy soil below. Vegetation is characteristically sparse, with scattered forbs and grasses in the herbaceous layer and a more substantial shrub layer dominated by Coyote Willow.

No on-site impacts were observed, however, the Roaring Fork is known to have a somewhat altered hydrograph owing to diversions (e.g., the Lincoln Tunnel) and other water management features. Moreover, it is predicted that there has been some degradation of the wetland's source water quality since the Roaring Fork runs through urban settings.

The minor issues with water quality and quantity, along with surrounding land use changes were judged to result in minor functional impairment. Overall this site scored an FCI of 0.92, which like the east AA, ranks it at the lower end of the reference standard category.

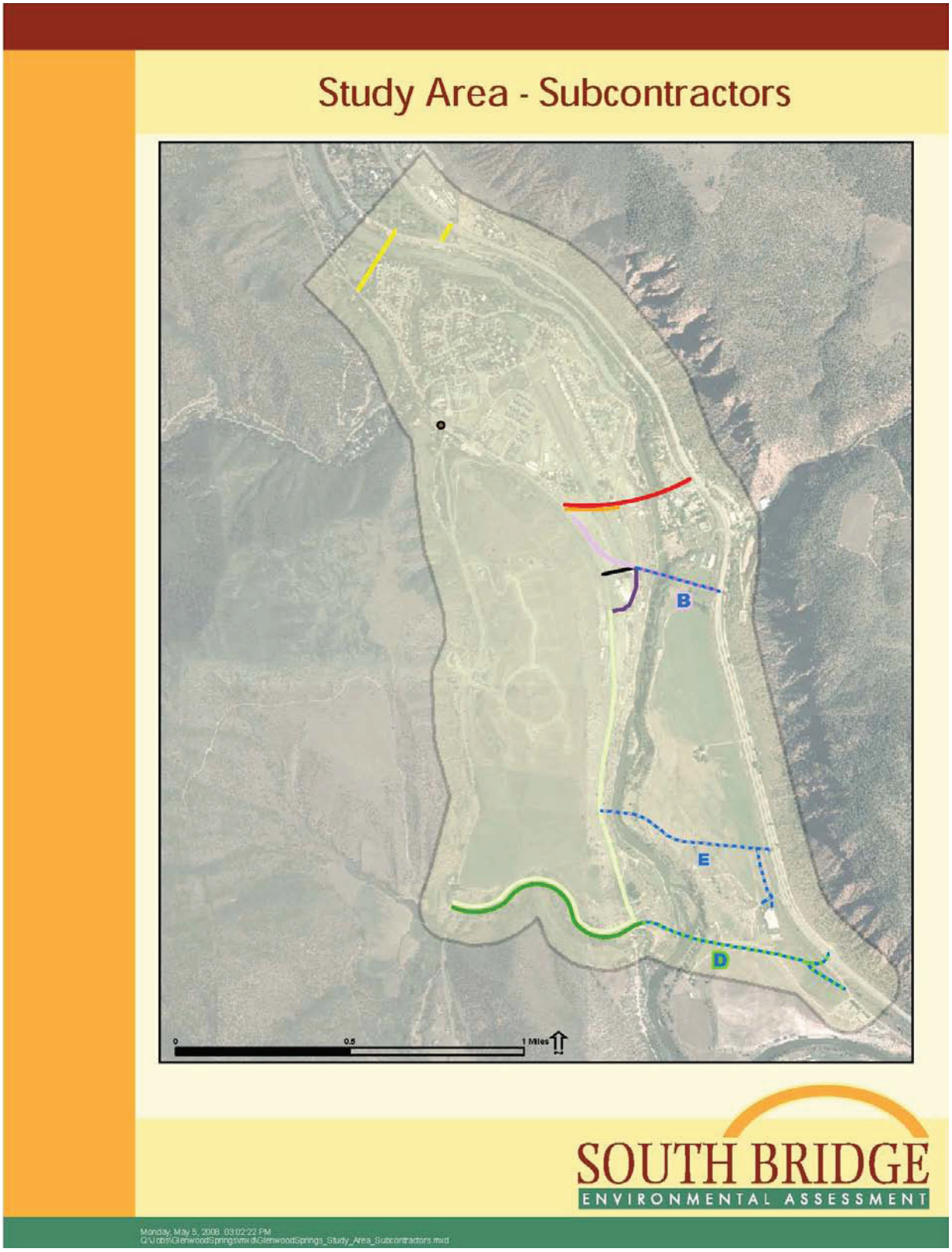

Fig. 1. Area map showing the location of alternative road alignments. Alternative B was considered in this evaluation. Glenwood Springs is just out of frame to the north. The obvious major Road is CO Highway 82

Fig. 2. Overview of the east AA. The spring and its outlet channel can be seen as the greener track running down the middle of the site towards the channel.

Fig. 3 and 4. Views north and south (above and below, respectively) within the east AA.

Fig. 5 and 6. The photograph above shows the main spring and it covering of watercress. Below is the outlet channel for that spring.

Figs. 7 and 8. View north across the east AA (above). A few piles of cut logs constitute one of the few minor impacts to the site (below).

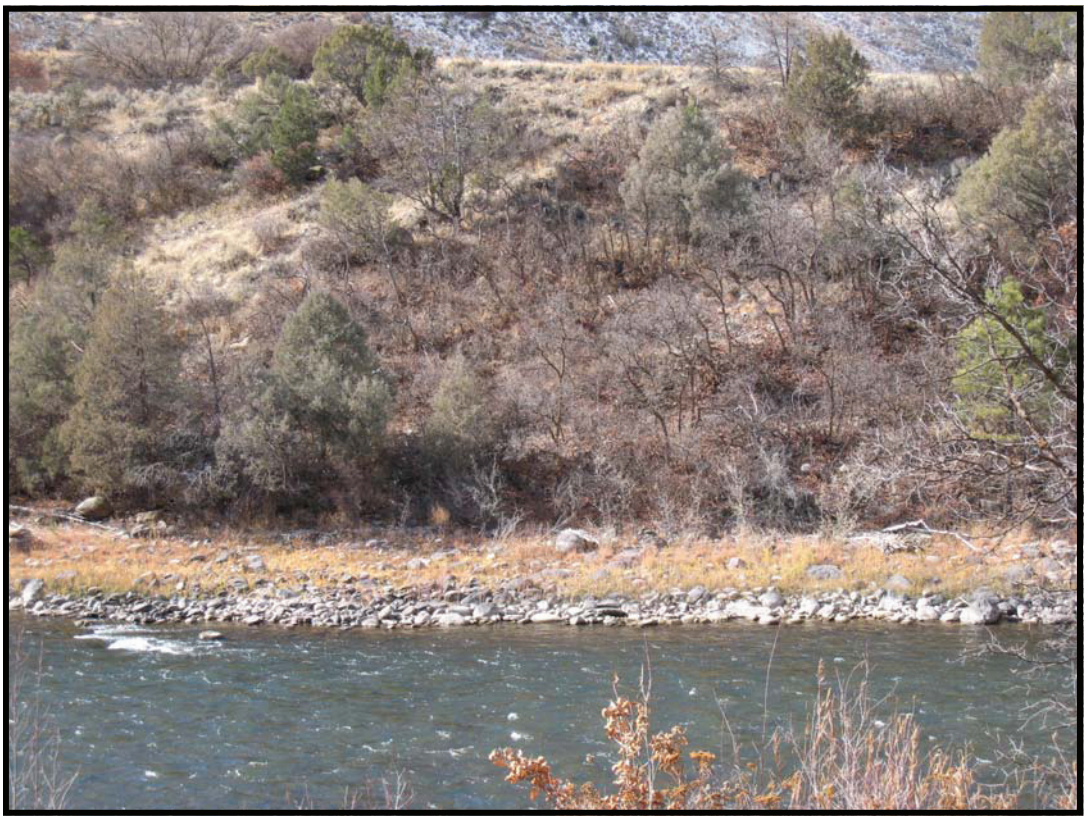

Fig. 9 and 10. Overview of the west AA (above). View south along the AA showing the general character of the site (below).

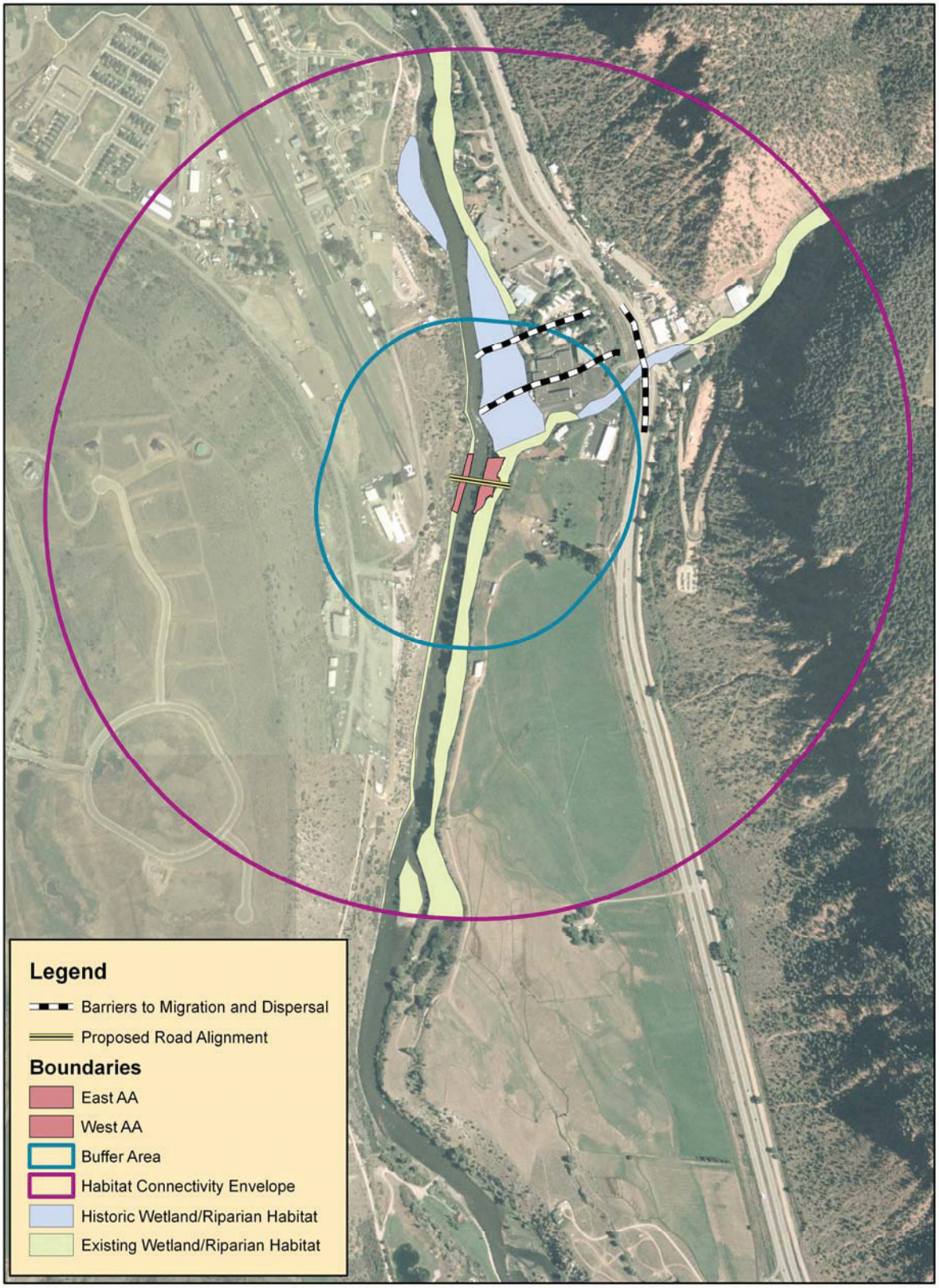

Fig. 11. Aerial photograph of the assessment areas along with the buffer, habitat connectivity envelope, existing and historical wetland/riparian habitat, and barriers to migration and dispersal used to score variables 1—3.

ADMINISTRATIVE CHARACTERIZATION

General Information			
		Date of Evaluation:	11/6/2008
Site Name or ID:	East Bank of Roaring Fork	Project Name:	South Bridge
404 or Other Permit Application #:		Applicant Name:	City of Glennwood Springs
Evaluator Name(s):	Brad Johnson, Ph.D., P.W.S.	Evaluator's professional position and organization:	Senior Ecologist, Johnson Environmental Consulting, LLC

Location Information:			
Site Location (Lat./Long. or UTM):	301782, 4375018	Geographic Datum Used (NAD 83	NAD 83
Site is located below the Glenwood Springs Airport.			
USGS Quadrangle Map:	Glenwood Springs	Map Scale: (Circle one)	(1:24,000) 1:100,000 Other 1:
Sub basin Name (8 digit HUC):	Roaring Fork	Wetland Ownership:	Private

Project Information:			
This evaluation is being performed at: *(Check applicable box)*	[X] *Project Wetland* [ ] *Mitigation Site*	Purpose of Evaluation (check all applicable):	[X] *Potentially Impacted Wetlands* [ ] *Mitigation; Pre-construction* [ ] *Mitigation; Post-construction* [ ] *Monitoring* [ ] *Other (Describe)*

Intent of Project: *(Check all applicable)* [ ] Restortation [ ] Enhancement [ ] Creation

Total Size of Wetland Involved: (Record Area, Check and Describe Measurement Method Used)	0.25 ac.	[X] Measured					
		[ ] Estimated					
Assessment Area (AA) Size (Record Area, check appropriate box. Additional spaces are used to record acreage when more than one AA is included in a single assessment)	0.25 ac.	[X] Measured	ac.	ac.	ac.	ac.	
		[ ] Estimated	ac.	ac.	ac.	ac.	
Characteristics or Method used for AA boundary determination:	The jurisdicational boundary was used, ending at a surface channel to the north and baseflow level towards the channel.						

Notes:	AA is the site of a proposed highway bridge. Wetland may or may not be directly impacted under the evaluated alternative.

ECOLOGICAL DESCRIPTION 1

Special Concerns

Check all that apply

- [ ] Organic soils including Histosols or Histic Epipedons are present in the AA (i.e., AA includes core fen habitat).
- [ ] Project will directly impact organic soil portions of the AA including areas possessing either Histosol soils or histic epipedons.
- [ ] Organic soils are known to occur anywhere within the contiguous wetland of which the AA is part.
- [ ] The wetland is a habitat oasis in an otherwise dry or urbanized landscape?
- [ ] Federally threatened or endangered species are **KNOWN** to occur in the AA? List Below.

_____

_____

- [ ] Federally threatened or endangered species are **SUSPECTED** to occur in the AA?

_____

_____

_____

- [ ] Species of concern according to the Colorado Natural Heritage (CNHP) are known to occur in the AA?
- [ ] The site is located within a potential conservation area or element occurrence buffer area as determined by CNHP?
- [ ] Other special concerns (please describe)

_____

HYDROGEOMORPHIC SETTING

- [x] AA wetland maintains its fundamental natural hydrogeomorphic characteristics
- [ ] AA wetland has been subject to change in HGM classes as a result of anthropogenic modification
  If the above is checked, please describe the original wetland type if discernable using the table below.
- [ ] AA wetland was created from an upland setting.

	Historical Conditions				
Previous wetland typology	**Water source**	Surface flow	Groundwater	Precipitation	Unknown
	Hydrodynamics	Unidirectional	Vertical		
	Geomorphic Setting (Narrative Description)				
	Previous HGM Class	Riverine	Slope	Depressional	Lacustrine

Current Conditions

Describe the hydrogeomorphic setting of the wetland by circling all conditions that apply.

HGM Setting	**Water source**	Surface flow	Groundwater	Precipitation	Unknown	
	Hydrodynamics	Unidirectional	Vertical			
	Wetland Gradient	0 - 2%	2-4%	4-10%	>10%	
	# Surface Inlets	Over-bank	0	1	2	3	>3
	# Surface Outlets	0	1	2	3	>3
	Geomorphic Setting (Narrative Description)	Site is on a sloping terrace above the Roaring Fork. It begins at a slope break mid-way down the main terrace scarp. Springs are ~30' above channel.				
	HGM class	Riverine	Slope	Depressional	Lacustrine	

Notes (include information on charcteristics used to formulate reference standard): The site is interesting and somewhat unusual. Hydrology is supported by one major spring and a number of minor seeps and springs. It is very remnicent of fen, but lacks organic soils, apparently because of the soil temperature regime. Outllets include one main channel from the biggest spring, along with a number of rivuletts that empty into the Roaring Fork.

ECOLOGICAL DESCRIPTION 2

Vegetation Habitat Description

*US FWS habitat classification according as reported in Cowardin et. al (1979) - See also Appendix *** of FACWet User Guide.*

System	Subsystem	Class	Subclass	Water Regime	Other Modifiers	% AA
Pal	Pal	EM	herbaceous	B	n	85
Pal	Pal	SS	BL decid.	B	n	5
Pal	Pal	FO	BL decid.	B	n	10
Lacustrine	Littoral; Limnoral	Rock Bot. (RB) Uncon Bottom(UB) Aquatic Bed(AB) Rocky Shore(RS) Uncon Shore(US) Emergent(EM) Shrub-scrub(SS) Forested (FO)	Floating vascular; Rooted vascular; Algal; Persistent; Non-Persistent; Broad-leaved deciduous; Needle-leaved evergreen; Cobble - gravel; Sand; Mud; Organic	**Examples** Temporarily flooded(A); Saturated(B); Seasonally flooded(C); Seas.-flood./sat.(E); Perm. flooded(F); Intermittently Flooded(G); Artificially Flooded(K); Sat./semiperm./Seas. (Y); Int. exposed/permenant(Z)	Hypersaline(7) ; Eusaline(8); Mixosaline(9); Fresh(0); Acid(a); Circumneutral(c); Alkaline/calcareous(i); Organic(g); Mineral(n); Beaver(b); Partially Drained/ditched(d); Farmed(f); Diked/impounded(h); Artificial Substrate(r); Spoil(s); Excavated(x)	
Palustrine	Palustrine					
Riverine	Lower perennial; Upper perennial; Intermittent					

Site Map

Scale: 1 sq. =

Draw a sketch map of the site including relevant portions of the wetland, AA boundary, structures, habitat classes, and other significant features.

Variable 1: Habitat Connectivity - Neighboring Wetland Habitat Loss

This variable is a measure of how isolated from other naturally-occurring wetland or riparian habitat the AA has become as a result of the loss of that habitat. To score this variable, estimate the percent of naturally- occurring wetland/riparian habitat that has been lost (by filling, draining, development, or whatever means) within a 500-meter-wide belt surrounding the AA. This surrounding area is called the Habitat Connectivity Envelope (HCE). Historical photographs and NWI maps can be helpful in scoring this variable. In most cases the evaluator must use best professional judgment in estimating the amount of natural wetland loss. Evaluation of landforms and habitat patterns in the context of perceivable land use change should be used to steer estimates of the amount of wetland loss within the HCE. This variable is not meant to penalize AAs that are naturally isolated, or unique to the landscape. Rather, it should measure the degree to which natural habitat connectivity has been lost.

Rules for Scoring:

1. On the aerial photo outline the area that is within 500 meters of the AA.
2. Identify obvious natural barriers within 500 m of the AA boundary.
   - *Natural barriers include continuous cliff bands, deep open water, etc.*
3. Draw the **Habitat Connectivity Envelope**(HCE) on the aerial image.
   - *The HCE is all the area within 500 meters of the AA that is not separated from it by a natural barrier.*
4. Outline the current extent of naturally occurring wetland and riparian habitat. Then outline areas where the habitats appear to have historically occurred.
   - *Use your knowledge of the history of the area and evident land use change. Additional research could be utilized to increase the accuracy of this estimate including consideratation of floodplain maps, historical aerials, etc.*

Variable Score	Condition Category	Scoring Guidelines
1.0 - 0.9	*Reference Standard*	*Wetland losses are absent or negligible or there is no evidence to suggest the native landscape within the HCE historically contained other wetland habitats*
<0.9 - 0.8	*Highly Functioning*	*More than 80% of historical wetland habitat area within the HCE is still present (less than 20% historical wetland habitat area lost).*
<0.8 - 0.7	*Functioning*	*80 to 60% of historical wetland habitat area within the HCE is still present (20% to 40% historical wetland habitat area lost).*
<0.7 - 0.6	*Functioning Impaired*	*Less than 60 to 30% of historical wetland habitat area within the HCE is still present (more than 30 to 70% historical wetland habitat area lost).*
<0.6	*Non-functioning*	*Less than 30% of the historical wetland habitat area from within the HCE is now no longer in existence (more than 70% historical wetland habitat area lost).*

Variable 1 Score 0.7

Notes: A total of 24.2 acres of wetland/riparian habitat are estimated to have existed within the HCE historically. Of these 9.5 acres have been destroyed and 14.7 acres remain. That is 49% of the historical habitat has been lost.

Variable 2: Habitat Connectivity - Migration/Dispersal Barriers

This variable is intended to rate the degree to which the AA has become isolated from existing neighboring wetland and riparian habitat by artificial barriers that inhibit migration or dispersal of organisms. On the aerial photograph, identify the man-made barriers within the HCE that intercede between the AA and surrounding wetlands and riparian areas, and identify them by type on the stressor list. Score this variable based on the barriers' impermeability to migration and dispersal and the amount of surrounding wetland/riparian habitat they affect.

Rules for Scoring:

1. On the aerial photo, outline all existing wetland and riparian habitat areas (WHAs) within the HCE.

2. Identify artificial barriers to dispersal and migration of organisms within the HCE that intercede between the AA and surrounding habitats. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.

3. Considering the composite effect of all of identified barriers to migration and dispersal (i.e., stressors), assign an overall variable score using the scoring guidelines.

Stressors = artificial barriers	✔	Stressors	Comments/description
	x	Major Highway	
		Secondary Highway	
		Tertiary Roadway	
		Railroad	
		Bike Path	
	x	Urban Development	
		Agricultural Development	
		Artificial Water Body	
		Fence	
		Ditch or Aqueduct	
		Aquatic Organism Barriers	

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	*Reference Standard*	No appreciable barriers exist between the AA and other wetland and riparian habitats in the HCE; or there are no other wetland and riparian areas in the HCE.
<0.9 - 0.8	*Highly Functioning*	Barriers impeding migration/dispersal between the AA and up to 33% of surrounding WHA highly permeable and easily passed by most organisms. Examples could include gravel roads, minor levees, ditches or barbed-wire fences. More significant barriers (see "functioning category below) could affect migration to up to 10% of surrounding WHA.
<0.8 - 0.7	*Functioning*	Barriers to migration and dispersal retard the ability of many organisms/propagules to pass between the AA and up to 66% of WHA. Passage of organisms and propagules through such barriers is still possible, but it may be constrained to certain times of day, be slow, dangerous or require additional travel. Busy two-lane roads, culverted areas, small to medium artificial water bodies or small earthen dams would commonly rate a score in this range. More significant barriers (see "functioning impaired" category below) could affect migration to up to 10% of surrounding WHA.
<0.7 - 0.6	*Functioning Impaired*	Barriers to migration and dispersal preclude the passage of some types of organisms/propagules between the AA and up to 66% of surrounding WHA. Travel of those animals which can potential negotiate the barrier are strongly restricted and may include a high chance of mortality. Up to 33% of surrounding WHA could be functionally isolated from the AA.
<0.6	*Non-functioning*	AA is essentially isolated from surrounding WHA by impermeable migration and dispersal barriers. An interstate highway or concrete-lined water conveyance canal are examples of barriers which would generally create functional isolation between the AA and a WHA.

Variable 2 Score 0.73

Variable 3: Buffer Capacity

The buffer area is defined as a 250-meter-wide belt surrounding the perimeter of the AA. This variable is a measure of the capacity of that area to function as an effective buffer for the wetland against the deleterious effects of surrounding land use change. To score the variable, assume that the AA is 100% buffered except where land use changes inside the buffer area have diminished this quality. Identify these land use types as specific stressors in the list. For each stressor, rate severity and extent within the buffer area; then use this list to make an overall rating for the buffer's departure from reference conditions. When rating buffer capacity, consider both the intensity of the impact and the proximity of the stressor to the AA.

Rules for Scoring:

1. On the aerial photograph, outline the buffer area as the zone within 250 meters of the outer boundary of the AA.
2. Use the stressor list to record land use changes that affect buffering capacity within the buffer area. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.
3. Considering all of the identified stressors, their overall severity, extent and proximity to the AA assign an overall variable score using the scoring guidelines.

Stressors = Land Use Changes	✔	Stressors	Comments/description
	x	Industrial/commercial	
	x	Urban	
	x	Residential	
	x	Rural	
	x	Dryland Farming	
		Intensive Agriculture	
		Orchards or Nurseries	
		Livestock Grazing	
	x	Transportation Corridor	
		Urban Parklands	
		Dams/impoundments	
		Artificial Water body	
		Physical Resource Extraction	
		Biological Resource Extraction	

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	*Reference Standard*	No appreciable land use change has been imposed within the TBA and it provides the full buffering capacity.
<0.9 - 0.8	*Highly Functioning*	Some land use change has occurred in the BA, but such changes little impair the area's ability to provide a buffering function, either because land use is not intensive, for example haying, light grazing, or nurseries, or more substantial changes occur in approximately less than 10% of the BA.
<0.8 - 0.7	*Functioning*	BA has been subjected to a marked shift in land use, however, the land retains much of its original buffering capacity. Moderate-intensity land uses such as dry-land farming, urban "green" corridors, or moderate cattle grazing would commonly be placed within this scoring range.
<0.7 - 0.6	*Functioning Impaired*	Land use within the BA has been substantial including the a moderate to high coverage (up to 50%) of impermeable surfaces, bare soil, or other artificial surface; considerable in-flow urban runoff or fertilizer-rich waters common. While, the buffering capacity of the land has been greatly diminished it is not extinguished. Intensively logged areas, low-density urban developments, some urban parklands and some cropping situations would commonly rate a score within this range.
<0.6	*Non-functioning*	The area within the BA provides essentially no buffering capacity. Many Commercial developments or highly urban landscapes would rate a score of less than 0.6.

Variable 3 score 0.75

Variable 4: Water Source

This variable is concerned with up-gradient hydrologic connectivity. It is a measure of the impacts to the AA's water source, including the ability of source water to perform work such as sediment transport, erosion, soil pore flushing, etc. To score this variable, identify stressors that alter the source of water to the AA, and record their presence on the stressor list. Stressors can impact water source by depletion, augmentation, or alteration of inflow timing or hydrodynamics. For riverine systems, this variable is primarily concerned with the connection of the channel to the floodplain.This variable is designed to assess water quantity, power and timing, not water quality. Water quality will be evaluated in Variable 7.

Scoring rules:

1. Use the stressor list and knowledge of the watershed to catalog type-specific impairments of the AA's water source. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.

2. Considering the composite effect of stressors on the water source, rate the condition of this variable with the aid of the scoring guidelines.

✔	Stressors	Comments/description
	Ditches or Drains (tile, etc.)	
	Dams	
	Diversions	
	Groundwater pumping	
	Draw-downs	
	Culverts or Constrictions	
	Point Source (urban, ind., ag.)	
	Non-point Source	
	Increased Drainage Area	
	Storm Drain/Urban Runoff	
	Impermeable Surface Runoff	
×	Irrigation Return Flows	Probably minor. Sprinkler irrigation in pastures above site
	Mining/Natural Gas Extraction	
	Transbasin Diversion	
	Actively Managed Hydrology	

Variable Score	Condition Class	Depletion	Augmentation
1.0 - 0.9	*Reference Standard*	Unnatural drawdown events minor, rare or non-existent, very slight uniform depletion, or trivial alteration of hydrodynamics.	Unnatural high-water events minor, rare or non-existent, slight uniform increase in amount of inflow, or trivial alteration of hydrodynamics.
<0.9 - 0.8	*Highly Functioning*	Unnatural drawdown events occasional, short duration and/or mild; or uniform depletion up to 20%; or mild to moderate reduction of peak flows or natural capacity of water to perform work.	Occasional unnatural high-water events, short in duration and/or mild in intensity; or uniform augmentation up to 20%; or mild to moderate increase of peak flows or natural capacity of water to perform work.
<0.8 - 0.7	*Functioning*	Unnatural drawdown events common and of mild to moderate intensity and/or duration; or uniform depletion up to 50%; or moderate to substantial reduction of peak flows or natural capacity of water to perform work.	Common occurrence of unnatural high-water events, of a mild to moderate intensity and/or duration; or uniform augmentation up to 50%; or moderate to substantial reduction of peak flows or natural capacity of water to perform work.
<0.7 - 0.6	*Functioning Impaired*	Unnatural drawdown events occur frequently with a moderate to high intensity and/or duration; or uniform depletion up to 75%; or substantial reduction of peak flows or natural capacity of water to perform work. **Wetlands with actively managed or wholly artificial hydrology will usually score in this range or lower.**	Common occurrence of unnatural high-water events, some of which may be severe in nature or exist for a substantial portion of the growing season; or uniform augmentation more than 50% or natural capacity of water to perform work. **Wetlands with actively managed or wholly artificial hydrology will usually score in this range or lower.**
<0.6	*Non-functioning*	Water source diminished enough to threaten jurisdictional classification of the AA.	Frequency, duration or magnitude of unnaturally high-water great enough to change the fundamental characteristics of the wetland.

Variable 4 Score 0.95

Variable 5: Water Distribution

This variable is concerned with hydrologic connectivity within the AA. It is a measure of alteration to the spatial distribution of surface and groundwater within the AA. These alterations are manifested as local changes to the hydrograph and generally ***result*** *from geomorphic modifications. To score this variable, identify stressors that alter flow patterns and impact the hydrograph within portions of the AA, including localized increases or decreases to the depth or duration of the water table or surface water. In naturally confined rivers (i.e. canyons and gullies) floodplain width is generally very small, so these systems will tend to score high for this variable unless some gross stressor is present.*

Scoring rules:

1. Identify impacts to the natural distribution of water throughout the AA and catalog them in the stressor table.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines.

✔	Stressors	Comments/description
	Ditches	
	Ponding/Impoundment	
	Culverts	
	Road Grades	
	Channel Incision/Entrenchment	
	Hardened/Engineered Channel	
	Enlarged Channel	
	Artificial Banks/Shoreline	
	Weirs	
	Dikes/Levees/Berms	
	Diversions	
	Sediment/Fill Accumulation	

Variable Score	Condition Class	Non-riverine	Riverine
1.0 - 0.9	*Reference Standard*	Little or no alteration has been made to the way in which water is distributed throughout the wetland.	Natural active floodplain areas flood on a normal recurrence interval. No evidence of alteration of flooding and subirrigation duration and intensity.
<0.9 - 0.8	*Highly Functioning*	Less than 10% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in less than a 2 in. (5 cm) change in mean growing season water table elevation.	Channel-adjacent areas have occasional unnatural periods of drying or flooding; or uniform shift in the hydrograph less than typical root depth.
<0.8 - 0.7	*Functioning*	Between 10 and 33% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in a 4 in. (5 cm) or less change in mean growing season water table elevation.	In channel-adjacent area, periods of drying or flooding are common; or uniform shift in the hydrograph near root depth.
<0.7 - 0.6	*Functioning Impaired*	33 to 66% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in a 6 in. (15 cm) or less change in mean growing season water table elevation. Water table behavior must still meet jurisdictional criteria to merit this rating.	Adjacent to the channel, unnatural periods of drying or flooding are the norm; or uniform shift in the hydrograph greater than root depth.
<0.6	*Non-functioning*	More than 66% of the AA is affected by hydrologic alteration which changes the fundamental functioning of the wetland system	Historical active floodplain areas are almost never wetted from overbank flooding, and/or groundwater infiltration is effectively cut off.

Variable 5 Score 1

Variable 6: Water Outflow

This variable is concerned with down-gradient hydrologic connectivity and the flow of water (transporting materials and energy) out of the AA. It is a measure of impacts that affect the hydrologic outflow of water including the passage of water through its normal low- and high-flow surface outlets, and infiltration/groundwater recharge. In some cases, alteration of evapotranspiration rates may be significant enough of a factor to consider in scoring. Score this variable by identifying stressors that impact the means by which water is exported from the AA. In Variable 5, the stressors were evaluated in light of their impact on water distribution within the AA. To evaluate this variable focus on how water, energy and associated materials are exported out of the AA.

Scoring rules:

1. Identify impacts to the natural outflow of water from the AA and catalog them in the stressor table.

2.Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. Take in to account the cumulative effect of stressors on the wetland's ability to export water and water-borne materials

✓	Stressors	Comments/description
	Ditches	
	Dikes/Levees	
	Road Grades	
	Culverts	
	Diversions	
	Constrictions	
	Channel Incision/Entrenchment	
	Hardened/Engineered Channel	
	Artificial Stream Banks	
	Weirs	
	Confined Bridge Openings	

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	*Reference Standard*	Stressors have little to no effect on the magnitude, timing or hydrodynamics of the AA water outflow regime.
<0.9 - 0.8	*Highly Functioning*	High- or low-water outflows are mildly to moderately affected, but at intermediate ("normal") levels flow continues essentially unaltered in quantity or character.
<0.8 - 0.7	*Functioning*	High- or low-water outflows are moderately affected, mild alteration of intermediate level outflow occurs; or hydrodynamics mildly to moderately affected.
<0.7 - 0.6	*Functioning Impaired*	Outflow at all stages is moderately impaired resulting in persistent flooding of portions of the AA or unnatural drainage; or outflow hydrodynamics significantly disrupted.
<0.6	*Non-functioning*	The natural outflow regime is severely disrupted. Down-gradient hydrologic connection severed or nearly so. Alterations may cause widespread unnatural persistent flooding or dewatering of the wetland system.

Variable 6 Score 1

Variable 7: Water and Soil Chemical Environment

This variable concerns the chemical environment of the soil and water media within the AA, including pollutants and water quality. The origin of pollutants may be in the AA or delivered from up-gradient or surrounding areas. Score this variable by listing indicators of chemical stress in the AA. Consider point source and non-point sources of pollution, as well as mechanical or hydrologic changes that alter the chemical environment. Because water quality frequently cannot be inferred directly, the presence of many stressors is identified via indirect indicators.

Scoring rules:

1. Stressors are grouped into categories which have a similar signature or set of causes.
2. Use the indicator list to identify each stressor impacting the chemical environment of the AA.
3. For each stressor category, determine the sub-variable score using the scoring guideline table provided on the second page of the scoring sheet.
   -If the AA is part of a water body that is recognized as impaired or recommended for TMDL development for one of the factors, then score that sub-variable 0.65 or lower.
4. Transcribe sub-variable scores to the following variable scoring page and compute the sum.
5. Determine the variable score by following the scoring guidelines.

Stressor Category	Stressor Indicator	✓	Comments	Sub-variable Score
Nutrient Enrichment/ Eutrophication/ Oxygen (D.O.)	Livestock			0.95
	Agricultural Runoff			
	Septic/Sewage			
	Excessive Algae or Aquatic Veg.			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
Sedimentation/ Turbidity	Excessive Erosion			1.00
	Excessive Deposition			
	Fine Sediment Plumes			
	Agricultural Runoff			
	Excessive Turbidity			
	Nearby Construction Site			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
Toxic contamination/ pH	Recent Chemical Spills			1.00
	Nearby Industrial Sites			
	Road Drainage/Runoff			
	Livestock			
	Agricultural Runoff			
	Storm Water Runoff			
	Fish/Wildlife Impacts			
	Vegetation Impacts			
	Cumulative Watershed NPS			
	Acid Mine Drainage			
	Point Source Discharge			
	CDPHE Impairment/TMDL List			
Temperature	Excessive Temperature Regime			1.00
	Lack of Shading			
	Reservoir/Power Plant Discharge			
	Industrial Discharge			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
Soil chemistry/ Redox potential	Unnatural Saturation/Desaturation			1.00
	Mechanical Soil Disturbance			
	Dumping/introduced Soil			
	CDPHE Impairment/TMDL List			

Variable 7: Water and Soil Chemical Environment

Sub-variable Scoring Guidelines

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	*Reference Standard*	Stress indicators not present or trivial.
<0.9 - 0.8	*Highly Functioning*	Stress indicators scarcely present and mild, or otherwise not occurring in more than 10% of the AA.
<0.8 - 0.7	*Functioning*	Stress indicators present at mild to moderate levels, or otherwise not occurring in more than 33% of the AA.
<0.7 - 0.6	*Functioning Impaired*	Stress indicators present at moderate to high levels, or otherwise not occurring in more than 66% of the AA
<0.6	*Non-functioning*	Stress indicators strongly evident throughout the AA at levels which apparently alter the fundamental chemical environment of the wetland system

Input each factor score from the stressor list and calculate the sum.

Nutrient enrichment/ Eutrophication/ Oxygen (D.O.)		Sedimentation/ Turbidity		Toxic contamination/ pH		Temperature		Soil chemistry/ Redox potential		Sum of Sub-variable Scores
0.95	+	1.00	+	1.00	+	1.00	+	1.00	=	4.95

Use the table to score the Chemical Environment Variable circling the applicable scoring rules.

Variable Score	Condition Class	Scoring Rules		
		Single Factor		**Composite Score**
1.0 - 0.9	*Reference Standard*	No single factor scores < 0.9	or	The factor scores sum > 4.5
<0.9 - 0.8	*Highly Functioning*	Any single factor scores ≥ 0.8 but < 0.9	or	The factor scores sum >4.0 but ≤4.5
<0.8 - 0.7	*Functioning*	Any single factor scores ≥ 7.0 but < 0.8	or	The factor scores sum >3.5 but ≤ 4.0
<0.7 - 0.6	*Functioning Impaired*	Any single factor scores ≥ 0.6 but <0.7	or	The factor scores sum >3.0 but ≤3.5
< 0.6	*Non-functioning*	Any single factor scores < 0.6	or	The factor scores sum < 3.0

Variable 7 Score 0.95

Variable 8: Geomorphology

This variable is a measure of the degree to which the geomorphic setting has been altered within the AA. Changes to the surface configuration and natural topography constitute stressors. Such stressors may be observed in the form of fill, excavation, diking, sedimentation due to absence of flushing floods, etc. In riverine systems geomorphic changes to stream channel should be considered if the channel is within the AA. Alterations may include bed surface changes (embeddedness or morphology changes), stream bank instability, and stream channel reconfiguration. Geomorphic changes are usually ultimately manifested as changes to wetland hydrology and water relations with vegetation. Geomorphic alteration can also directly affect soil properties, such as near-surface texture, and the wetland chemical environment, such as the redox state or nutrient composition in the rooting zone. In rating this variable, do not include these resultant effects of geomorphic change; rather focus on the physical impacts within the footprint of the alteration. The effects of geomorphic change are addressed by other variables. All alterations to the geomorphology should be evaluated including small-scale impacts such as pugging, hoof sheer, and sedimentation which can be significant, but not immediately apparent, impacts.

Scoring Rules:

1. Identify impacts to geomorphological setting and topography within the AA and record them on the stressor checklist.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines.

✓		Stressors	Comments
	General	Dredging/Excavation/Mining	
×	General	Fill, including dikes, road grades, etc.	
×	General	Grading	Looks like a faint road grade could enter into the wetland
	General	Compaction	
	General	Plowing/Disking	
	General	Excessive Sedimentation	
	General	Dumping	
	General	Hoof Shear/Pugging	
	General	Aggregate or Mineral Mining	
	General	Sand Accumulation	
	Channels Only	Channel Instability/Over Widening	
	Channels Only	Excessive Bank Erosion	
	Channels Only	Channelization	
	Channels Only	Reconfigured Stream Channels	
	Channels Only	Artificial Banks/Shoreline	
	Channels Only	Beaver Dam Removal	
	Channels Only	Substrate Embeddedness	
	Channels Only	Lack or Excess of Woody Debris	
×		Trails, terraces	Cross-slope terraced trails

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	*Reference Standard*	Topography essentially unaltered from the natural state, or alterations don't appear to have a minimal effect on wetland functioning and condition. Patch or microtopographic complexity may be slightly altered, but native plant communities are still supported.
<0.9 - 0.8	*Highly Functioning*	Alterations to topography result in small but detectable changes to habitat conditions throughout all or most of the AA; or changes causing more significant impacts but affecting less than 10% of the AA.
<0.8 - 0.7	*Functioning*	Changes to AA topography may be pervasive but generally mild. May include patches of more significant habitat alteration; or more significant alteration affecting less than 20 % of the AA.
<0.7 - 0.6	*Functioning Impaired*	At least one important surface type or landform has been eliminated or created; microtopography has been moderately altered throughout most or all of the AA, or more severe alterations affect less than 50% AA. Evidence that widespread diminishment or alteration of native plant community exist due to physical habitat alterations. Most incidentally created wetland habitat such as that created by roadside ditches and the like would score in this range or lower.
<0.6	*Non-functioning*	Geomorphic alterations have rendered the AA essentially unusable by *characteristic* wildlife species, or the physical setting no longer supports native plant communities.

Variable 8 Score 0.95

Variable 9: Vegetation Structure and Complexity

This variable is a measure of the condition of the wetland's vegetation relative to its native state. It is particularly relevant to the wetland's ability to perform higher-order functions such as support of wildlife populations, although it also affects primary functions such as flood-flow attenuation. Score this variable by listing stressors that have affected the diversity, composition and cover of each vegetation cover class that would normally be present for the wetland type being assessed. For this variable, stressor severity is a measure of how much each vegetation stratum differs functionally from its natural condition.

Rules for Scoring:

1. Determine the number and types of vegetation layers present within the AA. Make a judgment as to whether additional layers were historically present using direct evidence such as stumps, root wads or historical photographs. Indirect evidence such as local knowledge and expert opinion can also be used in this determination. Check each present or suspected vegetation layer in the third row of the table.

2. Do not score vegetation layers that would not normally be present in the wetland type being assessed.

3. Estimate the percent coverage of each vegetation layer. Aerial photographs can be helpful for this but are not required.

4. Enter the percent cover values as decimals in the row of the stressor table labeled "Percent Cover of Layer". Note, percentages will often sum to more than 100% (1.0).

5. Determine the severity of stressors acting on each individual canopy layers, indicating their presence with checks in the appropriate boxes of the stressor table.

6. Determine the sub-variable score for each valid vegetation layer using the scoring guidelines on the second page of the scoring sheet. Enter each sub-variable score in the appropriate cell of the row labeled "Veg. Layer Sub-variable Score".

7. Add the "Veg. Layer Sub-variable Scores" and enter the sum in the labled cell to the right of the individual scores. Follow this same process for the "Percent Cover of Layer".

8. Divide the sum of "Veg. Layer Sub-variable Scores" by the total coverage of all layers scored. This product is the Variable 9 score. Enter this number in the labeled box at the bottom of this page.

	Vegetation Layers				
Layers Scored *(check boxes to right to indicate scored layers)*	x	x	x		
Stressor	**Tree**	**Shrub**	**Herb**	**Aquatic**	**Comments**
Noxious Weeds			x		Some small thistle patches
Exotic/Invasive spp.			x		Redtop is one of the dominants
Tree Harvest	x				Small area of removal @ road leading to site
Brush Cutting/Shrub Removal					
Livestock Grazing					
Excessive Herbivory					
Mowing/Haying					
Herbicide					
Loss of Zonation/Homogenization					
Dewatering					
Over Saturation					
Log fill				x	Small piles burying veg.

Percent Cover of Layer	0.10	+	0.05	+	0.90	+	0.00	=	1.05
	x		x		x		x		
Veg. Layer Sub-variable Score	0.95		1		0.9		0	÷	
	=		=		=		=		
Weighted Sub-variable Score	0.10	+	0.05	+	0.81	+		=	0.955

See sub-variable scoring guidelines on following page

Variable 9 Score 0.91

Sub-variable 9 Scoring Guidelines

Based on the list of stressors identified above, rate the severity of their cumulative effect on vegetation structure and complexity for each vegetation layer.

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	*Reference Standard*	Stressors not present or with an intensity low enough as to not detectably affect the structure, diversity or composition of the vegetation layer.
<0.9 - 0.8	*Highly Functioning*	Stressors present at an intensity levels sufficient to cause detectable, but minor, changes in layer composition. Stress related change should generally be less than 10% for any given attribute (e.g., 10% cover of invasive, 10% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 33% if stressors are confined to patches comprising less than 10% of the wetland.
<0.8 - 0.7	*Functioning*	Stressors present with enough intensity to cause significant changes in the character of vegetation, including alteration of layer coverage, structure complexity and species composition. The vegetation layer retains its essential character though. AA's with a high proportion of non-native grasses will commonly fall in this class. Stress related change should generally be less than 33% for any given attribute (e.g., 33% cover of invasive, 33% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 66% if stressors are confined to patches comprising less than 25% of the wetland.
<0.7 - 0.6	*Functioning Impaired*	Stressor intensity severe enough to cause profound changes to the fundamental character of the vegetation layer. Stress-related change should generally be less than 66% for any given attribute (e.g., 66% cover of invasive, 66% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 80% if stressors are confined to patches comprising less than 50% of the wetland.
<0.6	*Non-functioning*	Vegetation layer has been completely removed or altered to the extent that is no longer comparable to the natural structure, diversity and composition.

FACWet Score Card

Scoring Procedure:

1. Transcribe variable scores from each variable data sheet to the corresponding cell in the variable score table.
2. In each Functional Capacity Index (FCI) equation, enter the corresponding variable scores in the equation cells. Do not enter values in the crossed cells lacking labels.
3. Add the variable scores to calculate the total functional points achieved for each function.
4. Divide the total functional points achieved by the functional points possible. The typical number of total points possible is provided, howe if a variable is added or subtracted to FCI equation the total possible points must be adjusted
5. Calculate the Composite FCI, by adding the FCI scores and dividing by the total number of functions scored (usually 7).
6. If scoring is done directly in the Excel spreadsheet, all values will be transferred and calculated automatically.

VARIABLE SCORE TABLE

Buffer & Landscape Context	Variable 1:	Habitat Connectivity - Neighboring Wetland Habitat Loss	0.70
	Variable 2:	Habitat Connectivity - Migration/Dispersal Barriers	0.73
	Variable 3:	Buffer Capacity	0.75
Hydrology	Variable 4:	Water Source	0.95
	Variable 5:	Water Distribution	1.00
	Variable 6:	Water Outflow	1.00
Abiotic and Biotic Habitat	Variable 7:	Chemical Environment	0.95
	Variable 8:	Geomorphology	0.95
	Variable 9:	Vegetation Structure and Complexity	0.91

Functional Capacity Indices

Function	Equation	Total Functional Points	Functional Capacity Index
Function 1 -- Support of Characteristic Wildlife Habitat	$V1_{wetloss}$ + $V2_{barriers}$ + $V3_{buffer}$ + (2 x $V9_{veg}$)		
	0.70 + 0.73 + 0.75 + 1.82 + + =	4.00	÷ 5 = 0.80
Function 2 -- Support of Characteristic Fish/aquatic Habitat	(3 x $V4_{source}$) + (2 x $V5_{dist}$) + 2 x $V6_{outflow}$ + $V7_{chem}$ + $V8_{geom}$		
	2.85 + 2.00 + 2.00 + 0.95 + 0.95 + =	8.75	÷ 9 = 0.97
Function 3 -- Flood Attenuation	$V3_{buffer}$ + (2 x $V4_{source}$ + (2 x $V5_{dist}$) + 2 x $V6_{outflow}$ + $V8_{geom}$ + $V9_{veg}$		
	0.75 + 1.90 + 2.00 + 2.00 + 0.95 + 0.91 =	8.51	÷ 9 = 0.95
Function 4 -- Short- and Long-term Water Storage	V_{source} + (2 x $V5_{dist}$) + 2 x $V6_{outflow}$) $V8_{geom}$		
	0.95 + 2.00 + 2.00 + 0.95 + + =	5.90	÷ 6 = 0.98
Function 5 -- Nutrient/Toxicant Removal	(2 x $V5_{dist}$) + $V7_{chem}$ + $V8_{geom}$		
	2.00 + 0.95 + 0.95 + + + =	3.90	÷ 4 = 0.98
Function 6 -- Sediment Retention/Shoreline Stabilization	$V3_{buffer}$ + (2 x $V8_{geo}$) + (2 x $V9_{veg}$)		
	0.75 + 1.90 + 1.82 + + + =	4.47	÷ 5 = 0.89
Function 7 -- Production Export/Food Chain Support	$V1_{wetloss}$ + (2 x $V6_{outflow}$ + $V7_{chem}$ + $V8_{geo}$ + (2 x $V9_{veg}$)		
	0.70 + 2.00 + 0.95 + 0.95 + 1.82 + =	6.42	÷ 7 = 0.92

Sum of Individual FCI Scores **6.49**

Divide by the Number of Functions Scored (usually 7) **÷ 7**

Composite FCI Score **0.93**

ADMINISTRATIVE CHARACTERIZATION

General Information			
		Date of Evaluation:	11/6/2008
Site Name or ID:	West Bank of Roaring Fork	Project Name:	South Bridge
404 or Other Permit Application #:		Applicant Name:	City of Glennwood Springs
Evaluator Name(s):	Brad Johnson, Ph.D., P.W.S.	Evaluator's professional position and organization:	Senior Ecologist, Johnson Environmental Consulting, LLC

Location Information:			
Site Location (Lat./Long. or UTM):	301782, 4375018	Geographic Datum Used (NAD 83	NAD 83
Site is located below the Glenwood Springs Airport.			
USGS Quadrangle Map:	Glenwood Springs	Map Scale: (Circle one)	(1:24,000) 1:100,000 Other 1:
Sub basin Name (8 digit HUC):	Roaring Fork	Wetland Ownership:	State

Project Information:			
This evaluation is being performed at: *(Check applicable box)*	[X] *Project Wetland* [ ] *Mitigation Site*	Purpose of Evaluation (check all applicable):	[X] *Potentially Impacted Wetlands* [ ] *Mitigation; Pre-construction* [ ] *Mitigation; Post-construction* [ ] *Monitoring* [ ] *Other (Describe)*

Intent of Project: *(Check all applicable)* Preservation [ ] Restortation [ ] Enhancement [ ] Creation

Total Size of Wetland Involved: (Record Area, Check and Describe Measurement Method Used)	0.12 ac.	[X] Measured [ ] Estimated					
Assessment Area (AA) Size (Record Area, check appropriate box. Additional spaces are used to record acreage when more than one AA is included in a single assessment)	0.12 ac.	[X] Measured	ac.	ac.	ac.	ac.
		[ ] Estimated	ac.	ac.	ac.	ac.

Characteristics or Method used for AA boundary determination:	The jurisdicational boundary was used, or to the point approximately perpendicular to the AA end on the east side.

Notes:	AA is the site of a proposed highway bridge. Wetland may or may not be directly impacted under the evaluated alternative.

ECOLOGICAL DESCRIPTION 1

Special Concerns

Check all that apply

- [ ] Organic soils including Histosols or Histic Epipedons are present in the AA (i.e., AA includes core fen habitat).
- [ ] Project will directly impact organic soil portions of the AA including areas possessing either Histosol soils or histic epipedons.
- [ ] Organic soils are known to occur anywhere within the contiguous wetland of which the AA is part.
- [ ] The wetland is a habitat oasis in an otherwise dry or urbanized landscape?
- [ ] Federally threatened or endangered species are **KNOWN** to occur in the AA? List Below.

_____

_____

- [ ] Federally threatened or endangered species are **SUSPECTED** to occur in the AA?

_____

_____

_____

- [ ] Species of concern according to the Colorado Natural Heritage (CNHP) are known to occur in the AA?
- [ ] The site is located within a potential conservation area or element occurrence buffer area as determined by CNHP?
- [ ] Other special concerns (please describe)

_____

HYDROGEOMORPHIC SETTING

- [X] AA wetland maintains its fundamental natural hydrogeomorphic characteristics
- [ ] AA wetland has been subject to change in HGM classes as a result of anthropogenic modification
  If the above is checked, please describe the original wetland type if discernable using the table below.
- [ ] AA wetland was created from an upland setting.

	Historical Conditions				
Previous wetland typology	**Water source**	Surface flow	Groundwater	Precipitation	Unknown
	Hydrodynamics	Unidirectional	Vertical		
	Geomorphic Setting (Narrative Description)				
	Previous HGM Class	Riverine	Slope	Depressional	Lacustrine

Current Conditions

Describe the hydrogeomorphic setting of the wetland by circling all conditions that apply.

HGM Setting	**Water source**	Surface flow	Groundwater	Precipitation		Unknown
	Hydrodynamics	Unidirectional	Vertical			
	Wetland Gradient	0 - 2%	2-4%	4-10%	>10%	
	# Surface Inlets	Over-bank	0	1	2	3	>3
	# Surface Outlets	0	1	2	3	>3
	Geomorphic Setting (Narrative Description)	AA is a thin strip of riparian/wetland habitat in the active floodplain of the Roaring Fork. This reach is strongly confined.				
	HGM class	Riverine	Slope	Depressional		Lacustrine

Notes (include information on charcteristics used to formulate reference standard) This site appears very typical of riverine wetlands found in confined reaches of the RF valley.

ECOLOGICAL DESCRIPTION 2

Vegetation Habitat Description

*US FWS habitat classification according as reported in Cowardin et. al (1979) - See also Appendix *** of FACWet User Guide.*

System	Subsystem	Class	Subclass	Water Regime	Other Modifiers	% AA
Pal	Pal	EM	herbaceous	c/g	n	40
Pal	Pal	SS	BL decid.	c/g	n	60
Lacustrine	Littoral; Limnoral	Rock Bot. (RB) Uncon Bottom(UB) Aquatic Bed(AB) Rocky Shore(RS) Uncon Shore(US) Emergent(EM) Shrub-scrub(SS) Forested (FO)	Floating vascular; Rooted vascular; Algal; Persistent; Non-Persistent; Broad-leaved deciduous; Needle-leaved evergreen; Cobble - gravel; Sand; Mud; Organic	**Examples** Temporarily flooded(A); Saturated(B); Seasonally flooded(C); Seas.-flood./sat.(E); Perm. flooded(F); Intermittently Flooded(G); Artificially Flooded(K); Sat./semiperm./Seas. (Y); Int. exposed/permenant(Z)	Hypersaline(7) ; Eusaline(8); Mixosaline(9); Fresh(0); Acid(a); Circumneutral(c); Alkaline/calcareous(i); Organic(g); Mineral(n); Beaver(b); Partially Drained/ditched(d); Farmed(f); Diked/impounded(h); Artificial Substrate(r); Spoil(s); Excavated(x)	
Palustrine	Palustrine					
Riverine	Lower perennial; Upper perennial; Intermittent					

Site Map

Scale: 1 sq. =

Draw a sketch map of the site including relevant portions of the wetland, AA boundary, structures, habitat classes, and other significant features.

Variable 1: Habitat Connectivity - Neighboring Wetland Habitat Loss

This variable is a measure of how isolated from other naturally-occurring wetland or riparian habitat the AA has become as a result of the loss of that habitat. To score this variable, estimate the percent of naturally- occurring wetland/riparian habitat that has been lost (by filling, draining, development, or whatever means) within a 500-meter-wide belt surrounding the AA. This surrounding area is called the Habitat Connectivity Envelope (HCE). Historical photographs and NWI maps can be helpful in scoring this variable. In most cases the evaluator must use best professional judgment in estimating the amount of natural wetland loss. Evaluation of landforms and habitat patterns in the context of perceivable land use change should be used to steer estimates of the amount of wetland loss within the HCE. This variable is not meant to penalize AAs that are naturally isolated, or unique to the landscape. Rather, it should measure the degree to which natural habitat connectivity has been lost.

Rules for Scoring:

1. On the aerial photo outline the area that is within 500 meters of the AA.
2. Identify obvious natural barriers within 500 m of the AA boundary.
   - *Natural barriers include continuous cliff bands, deep open water, etc.*
3. Draw the **Habitat Connectivity Envelope**(HCE) on the aerial image.
   - *The HCE is all the area within 500 meters of the AA that is not separated from it by a natural barrier.*
4. Outline the current extent of naturally occurring wetland and riparian habitat. Then outline areas where the habitats appear to have historically occurred.
   - *Use your knowledge of the history of the area and evident land use change. Additional research could be utilized to increase the accuracy of this estimate including consideratation of floodplain maps, historical aerials, etc.*

Variable Score	Condition Category	Scoring Guidelines
1.0 - 0.9	*Reference Standard*	*Wetland losses are absent or negligible or there is no evidence to suggest the native landscape within the HCE historically contained other wetland habitats*
<0.9 - 0.8	*Highly Functioning*	*More than 80% of historical wetland habitat area within the HCE is still present (less than 20% historical wetland habitat area lost).*
<0.8 - 0.7	*Functioning*	*80 to 60% of historical wetland habitat area within the HCE is still present (20% to 40% historical wetland habitat area lost).*
<0.7 - 0.6	*Functioning Impaired*	*Less than 60 to 30% of historical wetland habitat area within the HCE is still present (more than 30 to 70% historical wetland habitat area lost).*
<0.6	*Non-functioning*	*Less than 30% of the historical wetland habitat area from within the HCE is now no longer in existence (more than 70% historical wetland habitat area lost).*

Variable 1 Score 0.7

Notes: A total of 24.2 acres of wetland/riparian habitat are estimated to have existed within the HCE historically. Of these 9.5 acres have been destroyed and 14.7 acres remain. That is 49% of the historical habitat has been lost.

Variable 2: Habitat Connectivity - Migration/Dispersal Barriers

This variable is intended to rate the degree to which the AA has become isolated from existing neighboring wetland and riparian habitat by artificial barriers that inhibit migration or dispersal of organisms. On the aerial photograph, identify the man-made barriers within the HCE that intercede between the AA and surrounding wetlands and riparian areas, and identify them by type on the stressor list. Score this variable based on the barriers' impermeability to migration and dispersal and the amount of surrounding wetland/riparian habitat they affect.

Rules for Scoring:

1. On the aerial photo, outline all existing wetland and riparian habitat areas (WHAs) within the HCE.

2. Identify artificial barriers to dispersal and migration of organisms within the HCE that intercede between the AA and surrounding habitats. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.

3. Considering the composite effect of all of identified barriers to migration and dispersal (i.e., stressors), assign an overall variable score using the scoring guidelines.

Stressors = artificial barriers	✔	Stressors	Comments/description
	x	Major Highway	
		Secondary Highway	
		Tertiary Roadway	
		Railroad	
		Bike Path	
	x	Urban Development	
		Agricultural Development	
		Artificial Water Body	
		Fence	
		Ditch or Aqueduct	
		Aquatic Organism Barriers	

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	*Reference Standard*	No appreciable barriers exist between the AA and other wetland and riparian habitats in the HCE; or there are no other wetland and riparian areas in the HCE.
<0.9 - 0.8	*Highly Functioning*	Barriers impeding migration/dispersal between the AA and up to 33% of surrounding WHA highly permeable and easily passed by most organisms. Examples could include gravel roads, minor levees, ditches or barbed-wire fences. More significant barriers (see "functioning category below) could affect migration to up to 10% of surrounding WHA.
<0.8 - 0.7	*Functioning*	Barriers to migration and dispersal retard the ability of many organisms/propagules to pass between the AA and up to 66% of WHA. Passage of organisms and propagules through such barriers is still possible, but it may be constrained to certain times of day, be slow, dangerous or require additional travel. Busy two-lane roads, culverted areas, small to medium artificial water bodies or small earthen dams would commonly rate a score in this range. More significant barriers (see "functioning impaired" category below) could affect migration to up to 10% of surrounding WHA.
<0.7 - 0.6	*Functioning Impaired*	Barriers to migration and dispersal preclude the passage of some types of organisms/propagules between the AA and up to 66% of surrounding WHA. Travel of those animals which can potential negotiate the barrier are strongly restricted and may include a high chance of mortality. Up to 33% of surrounding WHA could be functionally isolated from the AA.
<0.6	*Non-functioning*	AA is essentially isolated from surrounding WHA by impermeable migration and dispersal barriers. An interstate highway or concrete-lined water conveyance canal are examples of barriers which would generally create functional isolation between the AA and a WHA.

Variable 2 Score 0.73

Variable 3: Buffer Capacity

The buffer area is defined as a 250-meter-wide belt surrounding the perimeter of the AA. This variable is a measure of the capacity of that area to function as an effective buffer for the wetland against the deleterious effects of surrounding land use change. To score the variable, assume that the AA is 100% buffered except where land use changes inside the buffer area have diminished this quality. Identify these land use types as specific stressors in the list. For each stressor, rate severity and extent within the buffer area; then use this list to make an overall rating for the buffer's departure from reference conditions. When rating buffer capacity, consider both the intensity of the impact and the proximity of the stressor to the AA.

Rules for Scoring:

1. On the aerial photograph, outline the buffer area as the zone within 250 meters of the outer boundary of the AA.
2. Use the stressor list to record land use changes that affect buffering capacity within the buffer area. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.
3. Considering all of the identified stressors, their overall severity, extent and proximity to the AA assign an overall variable score using the scoring guidelines.

Stressors = Land Use Changes	✔	Stressors	Comments/description
	x	Industrial/commercial	
	x	Urban	
	x	Residential	
	x	Rural	
	x	Dryland Farming	
		Intensive Agriculture	
		Orchards or Nurseries	
		Livestock Grazing	
	x	Transportation Corridor	
		Urban Parklands	
		Dams/impoundments	
		Artificial Water body	
		Physical Resource Extraction	
		Biological Resource Extraction	

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	*Reference Standard*	No appreciable land use change has been imposed within the TBA and it provides the full buffering capacity.
<0.9 - 0.8	*Highly Functioning*	Some land use change has occurred in the BA, but such changes little impair the area's ability to provide a buffering function, either because land use is not intensive, for example haying, light grazing, or nurseries, or more substantial changes occur in approximately less than 10% of the BA.
<0.8 - 0.7	*Functioning*	BA has been subjected to a marked shift in land use, however, the land retains much of its original buffering capacity. Moderate-intensity land uses such as dry-land farming, urban "green" corridors, or moderate cattle grazing would commonly be placed within this scoring range.
<0.7 - 0.6	*Functioning Impaired*	Land use within the BA has been substantial including the a moderate to high coverage (up to 50%) of impermeable surfaces, bare soil, or other artificial surface; considerable in-flow urban runoff or fertilizer-rich waters common. While, the buffering capacity of the land has been greatly diminished it is not extinguished. Intensively logged areas, low-density urban developments, some urban parklands and some cropping situations would commonly rate a score within this range.
<0.6	*Non-functioning*	The area within the BA provides essentially no buffering capacity. Many Commercial developments or highly urban landscapes would rate a score of less than 0.6.

Variable 3 score 0.75

Variable 4: Water Source

This variable is concerned with up-gradient hydrologic connectivity. It is a measure of the impacts to the AA's water source, including the ability of source water to perform work such as sediment transport, erosion, soil pore flushing, etc. To score this variable, identify stressors that alter the source of water to the AA, and record their presence on the stressor list. Stressors can impact water source by depletion, augmentation, or alteration of inflow timing or hydrodynamics. For riverine systems, this variable is primarily concerned with the connection of the channel to the floodplain.This variable is designed to assess water quantity, power and timing, not water quality. Water quality will be evaluated in Variable 7.

Scoring rules:

1. Use the stressor list and knowledge of the watershed to catalog type-specific impairments of the AA's water source. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.

2. Considering the composite effect of stressors on the water source, rate the condition of this variable with the aid of the scoring guidelines.

✔	Stressors	Comments/description
×	Ditches or Drains (tile, etc.)	Probable
	Dams	
×	Diversions	
	Groundwater pumping	
	Draw-downs	
	Culverts or Constrictions	
×	Point Source (urban, ind., ag.)	Minor
	Non-point Source	Minor
	Increased Drainage Area	
	Storm Drain/Urban Runoff	
	Impermeable Surface Runoff	
	Irrigation Return Flows	
	Mining/Natural Gas Extraction	
×	Transbasin Diversion	Lincoln Tunnel is a major upstream diversion
	Actively Managed Hydrology	

Variable Score	Condition Class	Depletion	Augmentation
1.0 - 0.9	*Reference Standard*	Unnatural drawdown events minor, rare or non-existent, very slight uniform depletion, or trivial alteration of hydrodynamics.	Unnatural high-water events minor, rare or non-existent, slight uniform increase in amount of inflow, or trivial alteration of hydrodynamics.
<0.9 - 0.8	*Highly Functioning*	Unnatural drawdown events occasional, short duration and/or mild; or uniform depletion up to 20%; or mild to moderate reduction of peak flows or natural capacity of water to perform work.	Occasional unnatural high-water events, short in duration and/or mild in intensity; or uniform augmentation up to 20%; or mild to moderate increase of peak flows or natural capacity of water to perform work.
<0.8 - 0.7	*Functioning*	Unnatural drawdown events common and of mild to moderate intensity and/or duration; or uniform depletion up to 50%; or moderate to substantial reduction of peak flows or natural capacity of water to perform work.	Common occurrence of unnatural high-water events, of a mild to moderate intensity and/or duration; or uniform augmentation up to 50%; or moderate to substantial reduction of peak flows or natural capacity of water to perform work.
<0.7 - 0.6	*Functioning Impaired*	Unnatural drawdown events occur frequently with a moderate to high intensity and/or duration; or uniform depletion up to 75%; or substantial reduction of peak flows or natural capacity of water to perform work. **Wetlands with actively managed or wholly artificial hydrology will usually score in this range or lower.**	Common occurrence of unnatural high-water events, some of which may be severe in nature or exist for a substantial portion of the growing season; or uniform augmentation more than 50% or natural capacity of water to perform work. **Wetlands with actively managed or wholly artificial hydrology will usually score in this range or lower.**
<0.6	*Non-functioning*	Water source diminished enough to threaten jurisdictional classification of the AA.	Frequency, duration or magnitude of unnaturally high-water great enough to change the fundamental characteristics of the wetland.

Variable 4 Score 0.85

Variable 5: Water Distribution

This variable is concerned with hydrologic connectivity within the AA. It is a measure of alteration to the spatial distribution of surface and groundwater within the AA. These alterations are manifested as local changes to the hydrograph and generally ***result*** *from geomorphic modifications. To score this variable, identify stressors that alter flow patterns and impact the hydrograph within portions of the AA, including localized increases or decreases to the depth or duration of the water table or surface water. In naturally confined rivers (i.e. canyons and gullies) floodplain width is generally very small, so these systems will tend to score high for this variable unless some gross stressor is present.*

Scoring rules:

1. Identify impacts to the natural distribution of water throughout the AA and catalog them in the stressor table.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines.

✔	Stressors	Comments/description
	Ditches	
	Ponding/Impoundment	
	Culverts	
	Road Grades	
	Channel Incision/Entrenchment	
	Hardened/Engineered Channel	
	Enlarged Channel	
	Artificial Banks/Shoreline	
	Weirs	
	Dikes/Levees/Berms	
	Diversions	
	Sediment/Fill Accumulation	

Variable Score	Condition Class	Non-riverine	Riverine
1.0 - 0.9	*Reference Standard*	Little or no alteration has been made to the way in which water is distributed throughout the wetland.	Natural active floodplain areas flood on a normal recurrence interval. No evidence of alteration of flooding and subirrigation duration and intensity.
<0.9 - 0.8	*Highly Functioning*	Less than 10% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in less than a 2 in. (5 cm) change in mean growing season water table elevation.	Channel-adjacent areas have occasional unnatural periods of drying or flooding; or uniform shift in the hydrograph less than typical root depth.
<0.8 - 0.7	*Functioning*	Between 10 and 33% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in a 4 in. (5 cm) or less change in mean growing season water table elevation.	In channel-adjacent area, periods of drying or flooding are common; or uniform shift in the hydrograph near root depth.
<0.7 - 0.6	*Functioning Impaired*	33 to 66% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in a 6 in. (15 cm) or less change in mean growing season water table elevation. Water table behavior must still meet jurisdictional criteria to merit this rating.	Adjacent to the channel, unnatural periods of drying or flooding are the norm; or uniform shift in the hydrograph greater than root depth.
<0.6	*Non-functioning*	More than 66% of the AA is affected by hydrologic alteration which changes the fundamental functioning of the wetland system	Historical active floodplain areas are almost never wetted from overbank flooding, and/or groundwater infiltration is effectively cut off.

Variable 5 Score 1.00

Variable 6: Water Outflow

This variable is concerned with down-gradient hydrologic connectivity and the flow of water (transporting materials and energy) out of the AA. It is a measure of impacts that affect the hydrologic outflow of water including the passage of water through its normal low- and high-flow surface outlets, and infiltration/groundwater recharge. In some cases, alteration of evapotranspiration rates may be significant enough of a factor to consider in scoring. Score this variable by identifying stressors that impact the means by which water is exported from the AA. In Variable 5, the stressors were evaluated in light of their impact on water distribution within the AA. To evaluate this variable focus on how water, energy and associated materials are exported out of the AA.

Scoring rules:

1. Identify impacts to the natural outflow of water from the AA and catalog them in the stressor table.

2.Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. Take in to account the cumulative effect of stressors on the wetland's ability to export water and water-borne materials

✓	Stressors	Comments/description
	Ditches	
	Dikes/Levees	
	Road Grades	
	Culverts	
	Diversions	
	Constrictions	
	Channel Incision/Entrenchment	
	Hardened/Engineered Channel	
	Artificial Stream Banks	
	Weirs	
	Confined Bridge Openings	

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	*Reference Standard*	Stressors have little to no effect on the magnitude, timing or hydrodynamics of the AA water outflow regime.
<0.9 - 0.8	*Highly Functioning*	High- or low-water outflows are mildly to moderately affected, but at intermediate ("normal") levels flow continues essentially unaltered in quantity or character.
<0.8 - 0.7	*Functioning*	High- or low-water outflows are moderately affected, mild alteration of intermediate level outflow occurs; or hydrodynamics mildly to moderately affected.
<0.7 - 0.6	*Functioning Impaired*	Outflow at all stages is moderately impaired resulting in persistent flooding of portions of the AA or unnatural drainage; or outflow hydrodynamics significantly disrupted.
<0.6	*Non-functioning*	The natural outflow regime is severely disrupted. Down-gradient hydrologic connection severed or nearly so. Alterations may cause widespread unnatural persistent flooding or dewatering of the wetland system.

Variable 6 Score 1.00

Variable 7: Water and Soil Chemical Environment

This variable concerns the chemical environment of the soil and water media within the AA, including pollutants and water quality. The origin of pollutants may be in the AA or delivered from up-gradient or surrounding areas. Score this variable by listing indicators of chemical stress in the AA. Consider point source and non-point sources of pollution, as well as mechanical or hydrologic changes that alter the chemical environment. Because water quality frequently cannot be inferred directly, the presence of many stressors is identified via indirect indicators.

Scoring rules:

1. Stressors are grouped into categories which have a similar signature or set of causes.
2. Use the indicator list to identify each stressor impacting the chemical environment of the AA.
3. For each stressor category, determine the sub-variable score using the scoring guideline table provided on the second page of the scoring sheet.
   -If the AA is part of a water body that is recognized as impaired or recommended for TMDL development for one of the factors, then score that sub-variable 0.65 or lower.
4. Transcribe sub-variable scores to the following variable scoring page and compute the sum.
5. Determine the variable score by following the scoring guidelines.

Stressor Category	Stressor Indicator	✓	Comments	Sub-variable Score
Nutrient Enrichment/ Eutrophication/ Oxygen (D.O.)	Livestock			0.85
	Agricultural Runoff	x		
	Septic/Sewage	x		
	Excessive Algae or Aquatic Veg.			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
Sedimentation/ Turbidity	Excessive Erosion			1.00
	Excessive Deposition			
	Fine Sediment Plumes			
	Agricultural Runoff			
	Excessive Turbidity			
	Nearby Construction Site			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
Toxic contamination/ pH	Recent Chemical Spills			0.85
	Nearby Industrial Sites	x	Airport is above site on terrace	
	Road Drainage/Runoff			
	Livestock			
	Agricultural Runoff			
	Storm Water Runoff	x		
	Fish/Wildlife Impacts			
	Vegetation Impacts			
	Cumulative Watershed NPS	x		
	Acid Mine Drainage			
	Point Source Discharge			
	CDPHE Impairment/TMDL List			
Temperature	Excessive Temperature Regime			0.90
	Lack of Shading	x	Upstream alterations, minor	
	Reservoir/Power Plant Discharge			
	Industrial Discharge			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
Soil chemistry/ Redox potential	Unnatural Saturation/Desaturation			1.00
	Mechanical Soil Disturbance			
	Dumping/introduced Soil			
	CDPHE Impairment/TMDL List			

Variable 7: Water and Soil Chemical Environment

Sub-variable Scoring Guidelines

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	*Reference Standard*	Stress indicators not present or trivial.
<0.9 - 0.8	*Highly Functioning*	Stress indicators scarcely present and mild, or otherwise not occurring in more than 10% of the AA.
<0.8 - 0.7	*Functioning*	Stress indicators present at mild to moderate levels, or otherwise not occurring in more than 33% of the AA.
<0.7 - 0.6	*Functioning Impaired*	Stress indicators present at moderate to high levels, or otherwise not occurring in more than 66% of the AA
<0.6	*Non-functioning*	Stress indicators strongly evident throughout the AA at levels which apparently alter the fundamental chemical environment of the wetland system

Input each factor score from the stressor list and calculate the sum.

Nutrient enrichment/ Eutrophication/ Oxygen (D.O.)		Sedimentation/ Turbidity		Toxic contamination/ pH		Temperature		Soil chemistry/ Redox potential		Sum of Sub-variable Scores
0.85	+	1.00	+	0.85	+	0.90	+	1.00	=	4.60

Use the table to score the Chemical Environment Variable circling the applicable scoring rules.

Variable Score	Condition Class	Scoring Rules		
		Single Factor		**Composite Score**
1.0 - 0.9	*Reference Standard*	No single factor scores < 0.9	or	The factor scores sum > 4.5
<0.9 - 0.8	*Highly Functioning*	Any single factor scores ≥ 0.8 but < 0.9	or	The factor scores sum >4.0 but ≤4.5
<0.8 - 0.7	*Functioning*	Any single factor scores ≥ 7.0 but < 0.8	or	The factor scores sum >3.5 but ≤ 4.0
<0.7 - 0.6	*Functioning Impaired*	Any single factor scores ≥ 0.6 but <0.7	or	The factor scores sum >3.0 but ≤3.5
< 0.6	*Non-functioning*	Any single factor scores < 0.6	or	The factor scores sum < 3.0

Variable 7 Score 0.9

Variable 8: Geomorphology

This variable is a measure of the degree to which the geomorphic setting has been altered within the AA. Changes to the surface configuration and natural topography constitute stressors. Such stressors may be observed in the form of fill, excavation, diking, sedimentation due to absence of flushing floods, etc. In riverine systems geomorphic changes to stream channel should be considered if the channel is within the AA. Alterations may include bed surface changes (embeddedness or morphology changes), stream bank instability, and stream channel reconfiguration. Geomorphic changes are usually ultimately manifested as changes to wetland hydrology and water relations with vegetation. Geomorphic alteration can also directly affect soil properties, such as near-surface texture, and the wetland chemical environment, such as the redox state or nutrient composition in the rooting zone. In rating this variable, do not include these resultant effects of geomorphic change; rather focus on the physical impacts within the footprint of the alteration. The effects of geomorphic change are addressed by other variables. All alterations to the geomorphology should be evaluated including small-scale impacts such as pugging, hoof sheer, and sedimentation which can be significant, but not immediately apparent, impacts.

Scoring Rules:

1. Identify impacts to geomorphological setting and topography within the AA and record them on the stressor checklist.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines.

✓		Stressors	Comments
	General	Dredging/Excavation/Mining	
	General	Fill, including dikes, road grades, etc.	
	General	Grading	
	General	Compaction	
	General	Plowing/Disking	
	General	Excessive Sedimentation	
	General	Dumping	
	General	Hoof Shear/Pugging	
	General	Aggregate or Mineral Mining	
	General	Sand Accumulation	
	Channels Only	Channel Instability/Over Widening	
	Channels Only	Excessive Bank Erosion	
	Channels Only	Channelization	
	Channels Only	Reconfigured Stream Channels	
	Channels Only	Artificial Banks/Shoreline	
	Channels Only	Beaver Dam Removal	
	Channels Only	Substrate Embeddedness	
	Channels Only	Lack or Excess of Woody Debris	
×		Trails, terraces	Cross-slope terraced trails

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	*Reference Standard*	Topography essentially unaltered from the natural state, or alterations don't appear to have a minimal effect on wetland functioning and condition. Patch or microtopographic complexity may be slightly altered, but native plant communities are still supported.
<0.9 - 0.8	*Highly Functioning*	Alterations to topography result in small but detectable changes to habitat conditions throughout all or most of the AA; or changes causing more significant impacts but affecting less than 10% of the AA.
<0.8 - 0.7	*Functioning*	Changes to AA topography may be pervasive but generally mild. May include patches of more significant habitat alteration; or more significant alteration affecting less than 20 % of the AA.
<0.7 - 0.6	*Functioning Impaired*	At least one important surface type or landform has been eliminated or created; microtopography has been moderately altered throughout most or all of the AA, or more severe alterations affect less than 50% AA. Evidence that widespread diminishment or alteration of native plant community exist due to physical habitat alterations. Most incidentally created wetland habitat such as that created by roadside ditches and the like would score in this range or lower.
<0.6	*Non-functioning*	Geomorphic alterations have rendered the AA essentially unusable by *characteristic* wildlife species, or the physical setting no longer supports native plant communities.

Variable 8 Score 1

Variable 9: Vegetation Structure and Complexity

This variable is a measure of the condition of the wetland's vegetation relative to its native state. It is particularly relevant to the wetland's ability to perform higher-order functions such as support of wildlife populations, although it also affects primary functions such as flood-flow attenuation. Score this variable by listing stressors that have affected the diversity, composition and cover of each vegetation cover class that would normally be present for the wetland type being assessed. For this variable, stressor severity is a measure of how much each vegetation stratum differs functionally from its natural condition.

Rules for Scoring:

1. Determine the number and types of vegetation layers present within the AA. Make a judgment as to whether additional layers were historically present using direct evidence such as stumps, root wads or historical photographs. Indirect evidence such as local knowledge and expert opinion can also be used in this determination. Check each present or suspected vegetation layer in the third row of the table.

2. Do not score vegetation layers that would not normally be present in the wetland type being assessed.

3. Estimate the percent coverage of each vegetation layer. Aerial photographs can be helpful for this but are not required.

4. Enter the percent cover values as decimals in the row of the stressor table labeled "Percent Cover of Layer". Note, percentages will often sum to more than 100% (1.0).

5. Determine the severity of stressors acting on each individual canopy layers, indicating their presence with checks in the appropriate boxes of the stressor table.

6. Determine the sub-variable score for each valid vegetation layer using the scoring guidelines on the second page of the scoring sheet. Enter each sub-variable score in the appropriate cell of the row labeled "Veg. Layer Sub-variable Score".

7. Add the "Veg. Layer Sub-variable Scores" and enter the sum in the labled cell to the right of the individual scores. Follow this same process for the "Percent Cover of Layer".

8. Divide the sum of "Veg. Layer Sub-variable Scores" by the total coverage of all layers scored. This product is the Variable 9 score. Enter this number in the labeled box at the bottom of this page.

	Vegetation Layers				
Layers Scored *(check boxes to right to indicate scored layers)*		x	x		
Stressor	**Tree**	**Shrub**	**Herb**	**Aquatic**	**Comments**
Noxious Weeds					
Exotic/Invasive spp.			x		Some Reed Canary Grass
Tree Harvest					
Brush Cutting/Shrub Removal					
Livestock Grazing					
Excessive Herbivory					
Mowing/Haying					
Herbicide					
Loss of Zonation/Homogenization					
Dewatering					
Over Saturation					
Log fill					

Percent Cover of Layer		+	0.30	+	0.65	+		=	0.95
	x		x		x		x		
Veg. Layer Sub-variable Score			1		0.9			÷	
	=		=		=		=		
Weighted Sub-variable Score		+	0.30	+	0.59	+		=	0.885

See sub-variable scoring guidelines on following page

Variable 9 Score 0.93

Sub-variable 9 Scoring Guidelines

Based on the list of stressors identified above, rate the severity of their cumulative effect on vegetation structure and complexity for each vegetation layer.

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	*Reference Standard*	Stressors not present or with an intensity low enough as to not detectably affect the structure, diversity or composition of the vegetation layer.
<0.9 - 0.8	*Highly Functioning*	Stressors present at an intensity levels sufficient to cause detectable, but minor, changes in layer composition. Stress related change should generally be less than 10% for any given attribute (e.g., 10% cover of invasive, 10% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 33% if stressors are confined to patches comprising less than 10% of the wetland.
<0.8 - 0.7	*Functioning*	Stressors present with enough intensity to cause significant changes in the character of vegetation, including alteration of layer coverage, structure complexity and species composition. The vegetation layer retains its essential character though. AA's with a high proportion of non-native grasses will commonly fall in this class. Stress related change should generally be less than 33% for any given attribute (e.g., 33% cover of invasive, 33% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 66% if stressors are confined to patches comprising less than 25% of the wetland.
<0.7 - 0.6	*Functioning Impaired*	Stressor intensity severe enough to cause profound changes to the fundamental character of the vegetation layer. Stress-related change should generally be less than 66% for any given attribute (e.g., 66% cover of invasive, 66% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 80% if stressors are confined to patches comprising less than 50% of the wetland.
<0.6	*Non-functioning*	Vegetation layer has been completely removed or altered to the extent that is no longer comparable to the natural structure, diversity and composition.

FACWet Score Card

Scoring Procedure:

1. Transcribe variable scores from each variable data sheet to the corresponding cell in the variable score table.
2. In each Functional Capacity Index (FCI) equation, enter the corresponding variable scores in the equation cells. Do not enter values in the crossed cells lacking labels.
3. Add the variable scores to calculate the total functional points achieved for each function.
4. Divide the total functional points achieved by the functional points possible. The typical number of total points possible is provided, howe if a variable is added or subtracted to FCI equation the total possible points must be adjusted
5. Calculate the Composite FCI, by adding the FCI scores and dividing by the total number of functions scored (usually 7).
6. If scoring is done directly in the Excel spreadsheet, all values will be transferred and calculated automatically.

VARIABLE SCORE TABLE

Buffer & Landscape Context	Variable 1:	Habitat Connectivity - Neighboring Wetland Habitat Loss	0.70
	Variable 2:	Habitat Connectivity - Migration/Dispersal Barriers	0.73
	Variable 3:	Buffer Capacity	0.75
Hydrology	Variable 4:	Water Source	0.85
	Variable 5:	Water Distribution	1.00
	Variable 6:	Water Outflow	1.00
Abiotic and Biotic Habitat	Variable 7:	Chemical Environment	0.90
	Variable 8:	Geomorphology	1.00
	Variable 9:	Vegetation Structure and Complexity	0.93

Functional Capacity Indices

Function	Equation	Total Functional Points	Functional Capacity Index
Function 1 -- Support of Characteristic Wildlife Habitat	$V1_{wetloss}$ + $V2_{barriers}$ + $V3_{buffer}$ + (2 x $V9_{veg}$)		
	0.70 + 0.73 + 0.75 + 1.86 + + =	4.04	÷ 5 = 0.81
Function 2 -- Support of Characteristic Fish/aquatic Habitat	(3 x $V4_{source}$) + (2 x $V5_{dist}$) + 2 x $V6_{outflow}$ + $V7_{chem}$ + $V8_{geom}$		
	2.55 + 2.00 + 2.00 + 0.90 + 1.00 + =	8.45	÷ 9 = 0.94
Function 3 -- Flood Attenuation	$V3_{buffer}$ + (2 x $V4_{source}$ + (2 x $V5_{dist}$) + 2 x $V6_{outflow}$ + $V8_{geom}$ + $V9_{veg}$		
	0.75 + 1.70 + 2.00 + 2.00 + 1.00 + 0.93 =	8.38	÷ 9 = 0.93
Function 4 -- Short- and Long-term Water Storage	V_{source} + (2 x $V5_{dist}$) + 2 x $V6_{outflow}$) $V8_{geom}$		
	0.85 + 2.00 + 2.00 + 1.00 + + =	5.85	÷ 6 = 0.98
Function 5 -- Nutrient/Toxicant Removal	(2 x $V5_{dist}$) + $V7_{chem}$ + $V8_{geom}$		
	2.00 + 0.90 + 1.00 + + + =	3.90	÷ 4 = 0.98
Function 6 -- Sediment Retention/Shoreline Stabilization	$V3_{buffer}$ + (2 x $V8_{geo}$) + (2 x $V9_{veg}$)		
	0.75 + 2.00 + 1.86 + + + =	4.61	÷ 5 = 0.92
Function 7 -- Production Export/Food Chain Support	$V1_{wetloss}$ + (2 x $V6_{outflow}$ + $V7_{chem}$ + $V8_{geo}$ + (2 x $V9_{veg}$)		
	0.70 + 2.00 + 0.90 + 1.00 + 1.86 + =	6.46	÷ 7 = 0.92

Sum of Individual FCI Scores 6.47

Divide by the Number of Functions Scored (usually 7) ÷ 7

Composite FCI Score 0.92