Riparian & Wetland Habitat Assessment

Middle Boulder Creek

Town of Nederland
Boulder County, Colorado

prepared for:

Town of Nederland
PO Box 396, Nederland, CO 80466

prepared by:

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March 2016

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1.0 Introduction

The Middle Boulder Creek riparian corridor occurs within the heart of the Town of Nederland (Town) and provides important recreation, aesthetic, and environmental benefits. The Town's Downtown Development Authority (DDA) is currently updating their Master Plan document and requested a Riparian and Wetland Habitat Assessment in order to provide environmental guidance for future planning. This report summarizes the extent and functioning of the riparian and wetland ecosystem of the project area, provides guidance on minimizing adverse environmental impacts, lists recommendations for future restoration work to improve ecosystem functioning, and identifies any high-quality areas that would warrant special consideration or protection.

2.0 Environmental Setting

The 10 acre project area occurs along Middle Boulder Creek between Centennial Bank, located at 26 South Highway 119, and Barker Reservoir (Figure 1). The project site lies at an approximate elevation of 8,240 feet and includes a 2,000 foot long section of Middle Boulder Creek and a 300 foot long section of North Beaver Creek. The site is bordered on the north by First Street, which includes a commercial district along First Street, several residences and undeveloped land, and on the south by a hotel and a public park, Chipeta Park. There are also several developed trails within the project area.

3.0 Methods

The extent of the riparian habitat was mapped using aerial photography and field reconnaissance conducted on September 24, 2015 by Rea Orthner, botanist and ecologist with Western Ecological Resource, Inc. (Figure 2). A preliminary wetland delineation was also conducted using the same methodology and is based on vegetation and hydrology criteria of the 1987 U.S. Army Corps of Engineers (Corps) Wetland Delineation Manual and 2010 Regional Supplement. This preliminary wetland delineation is intended for general planning purposes only. In the future, a formal wetland delineation and a Clean Water Act Section 404 permit application would need to be prepared for any proposed wetland or stream impacts It should be noted that riparian habitats, outside of any wetland areas, are not under any federal or state jurisdiction. Hence, impacts to riparian areas fall under the sole discretion of the property owner.

In order to assess the functioning of the riparian and wetland habitats, the Proper Functioning Condition (PFC) methodology was used (USDA-NRCS 1998). The PFC assessment is a qualitative method based on hydrology, vegetation and soil/landform attributes that provides information on whether a riparian-wetland area is physically functioning in a manner that allows the habitat to be resilient to change, such as high flow events or other disturbances. The PFC is a useful tool for prioritizing restoration activities and would provide a consistent approach to examining the entire project reach. A copy of the PFC checklist is contained in Appendix A.

4.0 Results

Within the project area, a total of 4.7 acres of riparian habitat and 2.3 acres of wetland habitat occur along Middle Boulder Creek and North Beaver Creek. Overall, these two streams and the willow shrub riparian habitat along their banks provide several important ecological functions. For example, their floodplains provide space for flood flows and the vegetation on the floodplain slows the movement of water and reduces its erosive power. The shrubs along the creek function to stabilize the creek channel and prevent stream banks from eroding. Willows (*Salix* spp.) in particular are excellent at stabilizing stream banks due to their deep binding root masses, and the rhizomatous native rushes and sedges such as smallfruit bulrush, beaked sedge (*Carex utriculata*) and water sedge (*Carex aquatilis*) that are present provide similar functions. In addition, the

riparian corridor provides floodwater retention and peak flood reduction functions which are important in helping to mitigate flood runoff from snow melt and heavy precipitation events. The densely vegetated banks help to remove sediment and assimilate nutrients, which is important in maintaining water quality. Finally, the riparian habitat provides quality wildlife habitat because of the availability of water, shade, and the diversity of food and cover sources.

4.1 Middle Boulder Creek

4.1.1 Description

The riparian and wetland habitat along Middle Boulder Creek (Photo 1) is generally dominated by willows with occasional shrubs of alder (*Alnus incana* subsp. *tenuifolia*) and river birch (*Betula fontinalis*). Stands of aspen trees (*Populus tremuloides*) occur in the eastern portion of the project area. The riparian understory is variable depending on hydrologic regime and degree of shading. Common understory plants in the riparian-wetland areas include fowl bluegrass (*Poa palustris*), bluejoint reedgrass (*Calamagrostis canadensis*), water sedge (*Carex utriculata*), beaked sedge (*Carex utriculata*), and smallfruit bulrush (*Scirpus microcarpus*). In drier upland riparian areas, plants such as bush honeysuckle (*Distegia involucrata*), Woods' rose (*Rosa woodsii*), starry false Solomon's seal (*Maianthemum stellatum*), cow parsnip (*Heracleum sphondylium*), field horsetail (*Equisetum arvense*), and fireweed (*Epilobium angustifolium*) occur.

Non-native plants observed include redtop (*Agrostis gigantea*), reed canarygrass (*Phalaris arundinacea*) and noxious weeds such as Canada thistle (*Cirsium arvense*), ox-eye daisy (*Leucanthemum vulgare*) and scentless chamomile (*Matricaria perforata*).

4.1.2 High Quality Areas/Unique Habitats

One high-quality wetland area was observed just northeast of the Magnusson Hotel. This wetland is dominated by wetland graminoids including water sedge, bluejoint reedgrass and Baltic rush (*Juncus balticus*). The landform of this area suggests that it may support deep organic-rich soils, or peat, indicating it could be a fen. However, no fen assessment has been completed to date. In addition, this wetland has a small population of sweet coltsfoot (*Petasites frigidus* var. *saggitattus*), an uncommon wetland plant in Colorado (Ackerfield 2015). See Photo 2. This plant carries no legal protections, *per se*, however it is considered a Species of Local Concern by the U.S. Forest Service and the presence of sweet coltsfoot can indicate specialized wetlands that harbor other rare plants (Popovich 2015). A description of the plant follows.

Sweet coltsfoot (*Petasites frigidus* var. *sagittatus*)

> *Sweet coltsfoot earns its common name from the sweet scent of its flowers and the large, basal leaves. Coltsfoot begins flowering as early as February in cold, swampy wetlands across Alaska and northern Canada to Newfoundland and south to California, Colorado, South Dakota, Wisconsin, and New York. Often coltsfoot is the first wetland species to begin flowering. The plant's cluster of white to pinkish-purple flower heads is borne at the tip of a fleshy stem covered by clasping, scale-like leaves. The larger basal leaves (the ones that look like horse hooves) emerge later in the spring, often after the flower heads have been replaced by silvery-white seed heads. These leaves arise a short distance from the flowering stalk at the end of an underground rhizome.* (Fertig, 2015)

4.1.3 Functional Condition Rating

Overall, the riparian and wetland habitats along Middle Boulder Creek appear to be in Proper Functioning Condition (PFC). The floodplain above bankfull appears to be inundated in relatively frequent events, the sinuosity, width/depth ratio and gradient appear to be balanced with the landscape setting, the vegetation is relatively diverse and healthy, and the geomorphology appears to be stable. Appendix A contains the PFC checklist, which includes details on the assessment. However, this rating is threatened by inadequate shrubby vegetation along some of the stream banks which increases their susceptibility to erosion and reduces wildlife habitat and connectivity. In addition, numerous social trails are present throughout the riparian habitat and some of the

stream banks show extremely heavy human use. At least one home abutting the creek appears to have inadequate backfill materials along its foundation able to withstand the erosive forces of the creek when it is running at or above bankfull. Finally, the creek has an accumulation of gravel deposits and appears to be over-widened near its entrance into Barker Reservoir. However, this may simply be the result of a change in channel slope, the configuration of the weir bridge, or other factors which cause the water to slow and gravels to deposit.

4.2 North Beaver Creek

4.2.1 Description

North Beaver Creek is a small perennial stream, approximately 2 feet wide. The headwaters of North Beaver Creek are located in the Caribou Valley west of the Town of Nederland. Like Middle Boulder Creek, the riparian habitat along North Beaver Creek is comprised of willows with the occasional alder and river birch. In the understory, cow parsnip, redtop, Wood's rose, and starry false Solomon's seal are common. Canada thistle, a noxious weed, is quite common along portions of this stream. See Photo 3.

4.2.2 High Quality Areas/Unique Habitats

No high quality or unique riparian-wetland habitats were observed within the project area along North Beaver Creek.

4.2.3 Functional Condition Rating

Overall, the narrow riparian and wetland habitat along North Beaver Creek appears to be in Proper Functioning Condition (See Appendix A). The PFC rating is based on the general characteristics of this short segment, which show geomorphic stability, the presence of a diverse and healthy riparian community, and a functioning floodplain. However, there is room for improvement. For example, the western end of the creek is incised four to five feet below the Fisherman's parking lot to the south and there is no floodplain development in this area. This area also lacks well-developed willows which help stabilize stream banks. Finally, a metal fence across the creek at its eastern end accumulates debris and may inhibit natural streamflow characteristics in this area.

5.0 General Development Guidelines

The following general development guidelines should be utilized when planning activities within or adjacent to the project area.

1. Avoid impacts to the high-quality wetland area northeast of the Magnuson Hotel. Complete a more detailed floristic inventory this wetland with a focus on rare plant presence and also conduct a fen assessment. Fens are wetlands characterized by the accumulation of organic-rich soils and are primarily fed by groundwater sources. Because the rate of accumulation of peat in fens is so slow, these ecosystems are generally considered to be irreplaceable. Fen soils are Histosols, characterized by more than 40 cm (16 inches) of organic matter accumulation, commonly referred to as peat.
2. Minimize and avoid impacts to wetland areas to the most practicable extent possible. If impacts to wetlands are likely to occur, complete an official wetland delineation and Clean Water Act Section 404 permit application for the U.S. Army Corps of Engineers.
3. Consider developing a Management Plan. The Management Plan would provide a guiding vision for the Middle Boulder Creek and North Beaver Creek riparian/wetland habitat areas, describe the allowed uses as well as prohibited uses, and detail the proposed projects and programs for the preservation and community enjoyment of the area. Funding opportunities for improvement/restoration projects may be more easily obtainable when a Management Plan is in place.

4. Encourage local land owners to plant native riparian trees or shrubs on their properties which abut the creek.

6.0 Specific Recommendations

The following recommendations are for specific management actions to improve the health of the riparian and wetland ecosystem of the project area. The recommendations are grouped into three main categories: 1) social and educational; 2) vegetation; and 3) landform improvements. Social and educational recommendations are those which relate to the management of the habitat and would require little if any cost. The vegetation improvements include actions such as tree and shrub plantings and noxious weed control and would be fairly economical to implement. Finally, the landscape improvements would necessitate additional planning and possibly a greater capital expense. See Figure 3.

6.1 Social and Educational Recommendations

6.1.1 Social Trails & Human Use

The riparian and wetland habitats of the project area receive significant human use and numerous social trails were observed throughout the area (See Photo 4). The majority of these trails should be eliminated in order to preserve the ecological integrity of the area. Trails fragment habitat leading to increased human use and wildlife disturbance and are corridors for weed invasion. In addition, frequent trail use leads to soil compaction, trampling of vegetation, and lowered plant growth and reproduction. Trampling along the banks of Middle Boulder Creek was especially severe near the inlet to Barker Reservoir, just upstream of the bridge weir, where all vegetation had been eliminated and the stream banks showed evidence of erosion (See Photo 5). In addition, several trails appear to be frequented by people who leave trash and other debris, further threatening the environment. In order to eliminate social trails, signage should be posted in prime locations to dissuade people from utilizing these access points. Low-impact fencing (e.g. post and rail fencing) could also be erected across some of the social trails to prevent human use. If additional trails are needed within the project area, then the location of these trails should be closely analyzed in order to maximize public benefit while reducing environmental impacts. Finally, the old chain-link fence and trash should be removed from North Boulder Creek just upstream of where it enters Middle Boulder Creek.

6.1.2 Dogs

One of the greatest threats posed to the wildlife are off-leash dogs. Dogs can flush incubating birds from nests, leaving the eggs or young unattended for extended periods of time. Dogs chase wildlife and can kill small mammals. Off-leash dogs can also harass humans using trails. Other problems associated with dogs include their excrement and associated odors, as well as increasing soil nitrogen which non-native weeds often capitalize on. Signage should be posted to keep all dogs on-leash and for owners to pick up dog waste and dispose of it properly.

6.2 Vegetation Recommendations

6.2.1 Woody Riparian Plantings

Plant native willows and/or other shrubs along North Beaver Creek and Middle Boulder Creek in the areas identified in Figure 3. Native shrubs can either be purchased through native plant nurseries (min. 5-gallon size recommended) and planted similarly to landscape shrubs, or, for a more economical approach, we recommend sprigging willows from adjacent stands in early spring prior to leaf-out. Willows have adventitious buds and will root out if a cutting is placed in the appropriate habitat. The use of volunteers or local youth from Teens Inc. would further reduce costs. In addition, encourage private land owners abutting the creek to plant native trees and shrubs to enhance the structural and species diversity of the riparian habitat. Table 2 contains a list of native shrubs and trees appropriate for Nederland. See Photo 5.

6.2.2 Noxious Weed Control

Noxious weeds are extremely problematic in and around the project site as well as within the Town of Nederland. Noxious weeds decrease species diversity and the ecological integrity of habitats including riparian areas. In addition, weeds will continue to spread outside of the project site, and become established at local trailheads and elsewhere on National Forest Systems lands. We highly recommend that the Town implement an Integrated Weed Management Plan for the project area. Specific Colorado state-listed noxious weeds observed within and adjacent to the riparian and wetland habitats include Canada thistle, ox-eye daisy, and scentless chamomile. See Photo 6.

Before any ground-disturbing activities, ensure that the following occur:

- Survey project areas to document the presence of any pre-existing weed infestations. Treat infestations prior to ground-disturbing activities and remove all weed seed and propagules to prevent weed spread.
- Locate and use weed-free project staging areas. Where this is not possible, treat existing noxious weeds in these areas prior to the staging of any equipment.
- To minimize risk of noxious weed introduction and spread, require that all equipment used for ground-disturbing activities be clean, i.e., free of mud, dirt, plant parts, and seeds, or other debris that could contain or hold plant parts or seeds, prior to entering the project area, and prior to leaving a weed-infested project area.
- Use certified weed-free hay, straw or mulch. However, preference should be given to use of non-agricultural mulch products such as wood straw or bonded fiber matrix.
- Monitor revegetated areas for noxious weed invasion and treat infestations.

6.3 Landform Improvements

6.3.1 Floodplain/Riparian Habitat Restoration Activities

Four areas were identified as potential sites for floodplain/riparian habitat restoration (Figure 3). All four of these areas lack well developed wetlands or riparian habitats due to artificial fill. These areas include:

- North side of Middle Boulder Creek on the bank parcel. The slope below the Visitor's Center parking lot is extremely steep and limits the development of wetland and riparian habitat in this area. If the landform in this area cannot be changed due to excessive cost, additional plantings of willows or other riparian shrubs could occur on the bank in order to provide a continuous band of scrub-shrub habitat. See Photo 7.
- South side of Middle Boulder Creek adjacent to the Chipeta Park parking lot. The riparian habitat along the Chipeta Park parking area is extremely narrow and has been replaced by large boulders. The parking lot could be reconfigured to allow the same amount of parking with a smaller footprint. This would allow the riparian habitat to be widened along the south bank of the creek. (Photo 8).
- Fisherman's Parking Lot. There are two areas at Fisherman's parking lot that are constricting the riparian habitat development along Middle Boulder Creek and North Beaver Creek. The fill could be removed in these areas to restore the floodplain and additional riparian shrubs could be planted to restore the riparian habitat. (Photos 9 and 10).

6.3.2 Bank Stabilization

One or more homes along Middle Boulder Creek appear to have suffered the erosive forces of the creek in the recent past. The bank of the creek may need to be stabilized with larger materials so that the structural integrity of the building foundations is maintained. If possible, add larger

diameter willow stakes along with large cobble material to enhance the shrubby riparian habitat in this area. See Photo 11.

6.3.3 Instream Rock Structure

One instream rock structure is located in Middle Boulder Creek, just downstream of the homes identified in Section 6.3.2 above. This rock drop structure should be analyzed by a fluvial geomorphologist or a stream hydrologist to determine its effectiveness and its affect (if any) on the bank erosion adjacent to the upstream homes. See Photo 12.

6.3.4 Wetland Restoration (Trail Removal)

One high quality wetland area was identified just northeast of the Magnusson Hotel. A formal pedestrian trail currently bisects this wetland area. If desired, the trail could be removed and the area restored back to wetland. This would enhance both the hydrologic connectivity of the wetland with Middle Boulder Creek and the wildlife habitat connectivity.

6.3.5 Educational Nature Park

If possible, redevelop Fisherman's parking lot into a healthy riparian ecosystem that would benefit the vitality of this important area, namely the confluence of Middle Boulder Creek and North Beaver Creek. Ideally, any artificial fill would be removed, clean topsoil imported, and the area seeded and planted with native wetland and riparian plants. An educational component (signage) for this area could also be developed that would add to its important ecosystem benefits.

7.0 References

Ackerfield, J. 2015. Flora of Colorado. BRIT Press. 818 pp.

Fertig, W. 2015. Sweet coltsfoot. Plant of the Week. Available online at: http://www.fs.fed.us/wildflowers/plant-of-the-week/petasites_sagittatus.shtml

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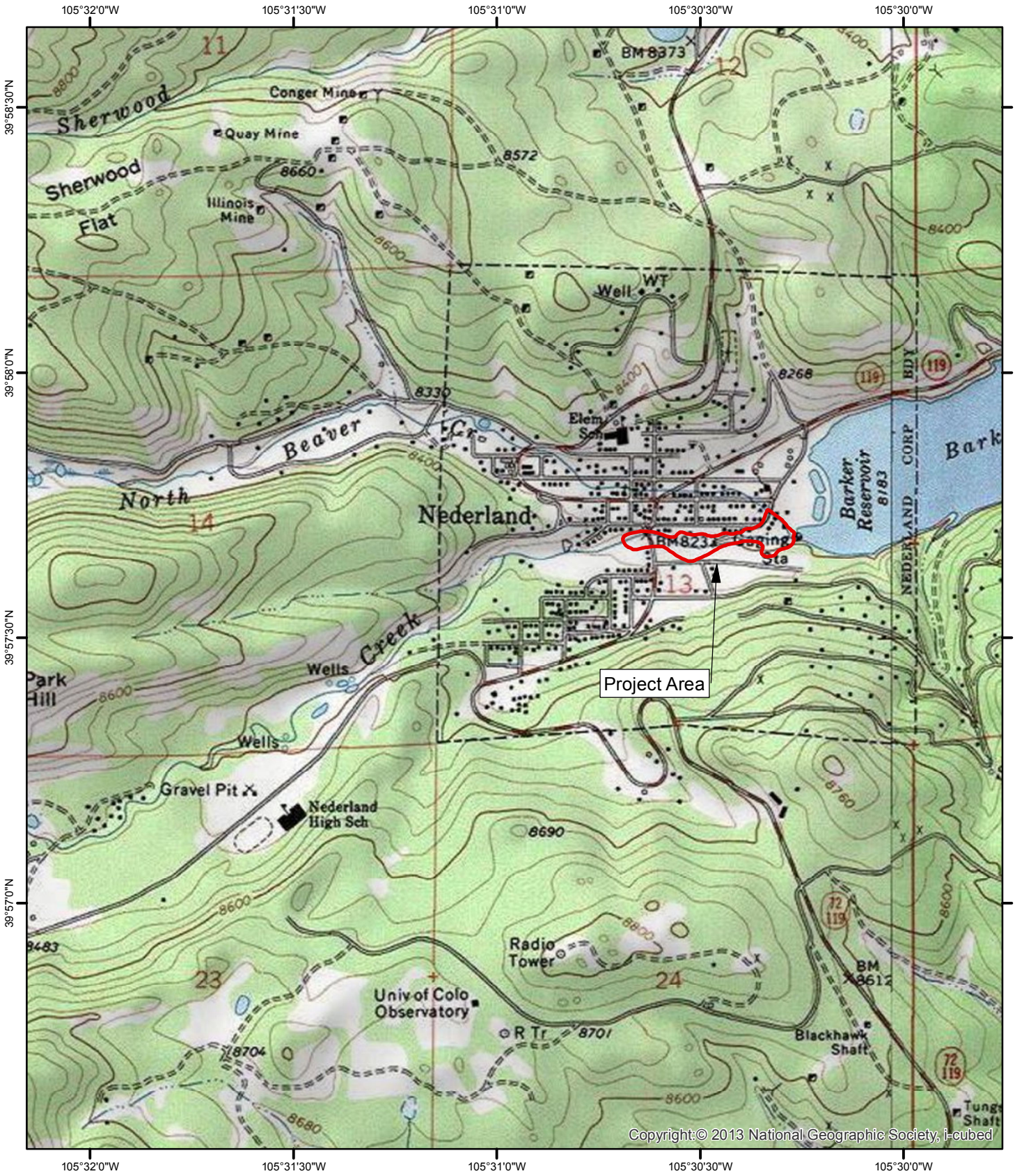
U.S. Army Corps of Engineers. 1987. Wetlands Delineation Manual, Technical Report Y-87-1. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS.

8.0 Figures



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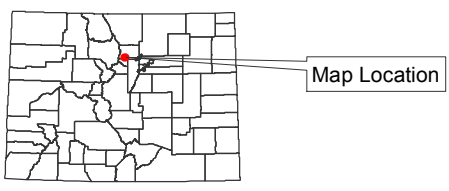
Grid Lat/Long WGS 1984

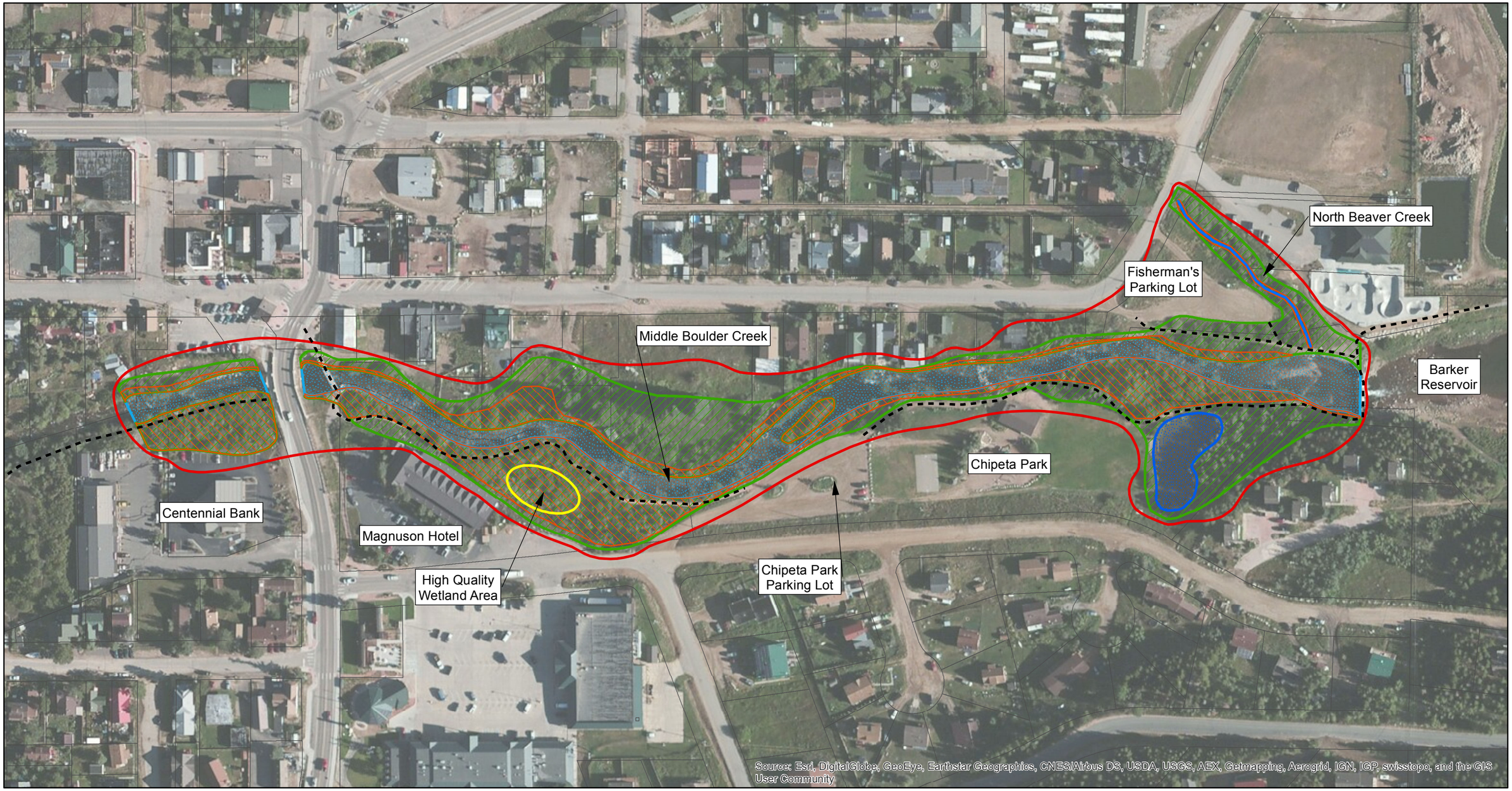


N

Scale: 1:24,000
1 inch = 2,000 feet

Figure 1. Project Location Map
Middle Boulder Creek Riparian Assessment
Town of Nederland, Boulder County, Colorado

Western Ecological Resource Inc.
711 Walnut Street
Boulder, CO 80302
303-449-9009



Legend

- *Project Area*
- *Parcel Boundaries*
- North Beaver Creek
- *Existing Trails*

Riparian/Wetland Habitat Type

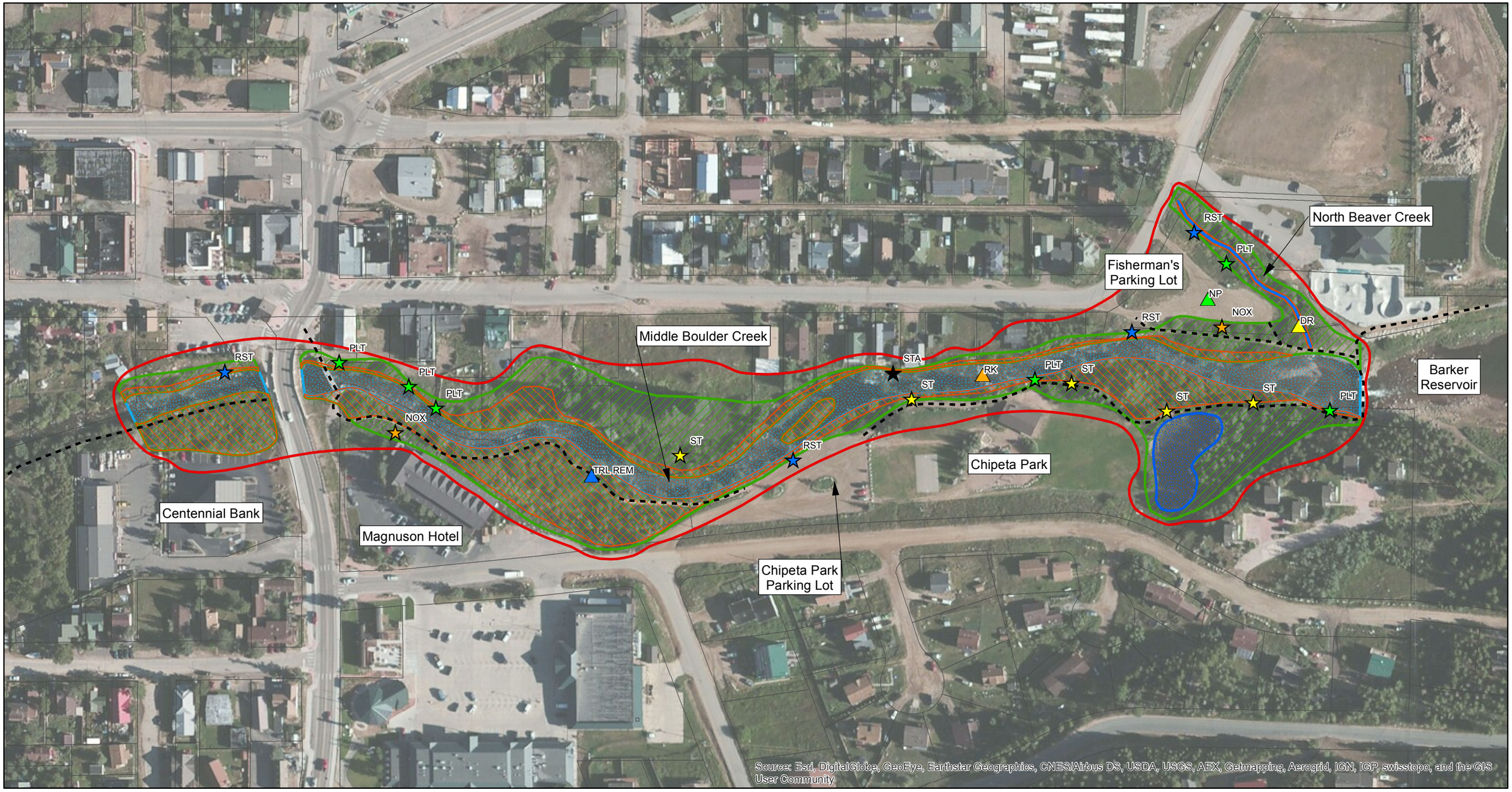
- *Wetland Habitat*
- *Pond*
- *Riparian Habitat*
- *Stream*

N

Scale: 1:1,800
1 inch = 150 feet
Date: December 2015

Figure 2. Wetland and Riparian Habitat Map
Middle Boulder Creek Riparian Assessment
Town of Nederland, Boulder County, Colorado

Western Ecological Resource Inc.
711 Walnut Street
Boulder, CO 80302
303-449-9009



Legend

- *Project Area*
- *Parcel Boundaries*
- *North Beaver Creek*
- *Existing Trails*

Restoration Enhancements

- *ST, Social Trail*
- *PLT, Woody Riparian Plantings*
- *NOX, Dense Stands Noxious Weeds*
- *RST, Floodplain/Riparian Habitat Restoration*
- *STA, Bank Stabilization*

Restoration Enhancements (con't)

- *DR, Debris Removal*
- *NP, Future Nature Park*
- *RK, Instream Rock Structure*
- *TRL REM, Wetland Restoration (Trail Removal)*

Figure 3. Proposed Riparian Restoration Map
Middle Boulder Creek Riparian Assessment
Town of Nederland, Boulder County, Colorado

N

Scale: 1:1,800
1 inch = 150 feet
Date: December 2015

Western Ecological Resource Inc.
711 Walnut Street
Boulder, CO 80302
303-449-9009

9.0 Tables

Table 1. Wetland and Riparian Plant Species List				
Scientific Name	Common Name	Family	Origin*	Wetland Status**
Trees				
Picea engelmannii	Engelmann spruce	Pinaceae	N	FAC
Picea pungens	Blue spruce	Pinaceae	N	FAC
Pinus contorta var. latifolia	Lodgepole pine	Pinaceae	N	FAC
Populus tremuloides	Quaking aspen	Salicaceae	N	FACU
Shrubs				
Alnus incana ssp. tenuifolia	Alder	Betulaceae	N	FACW
Betula occidentalis (B. fontinalis)	River birch	Betulaceae	N	FACW
Distegia involucrata (Lonicera)	Bush honeysuckle	Caprifoliaceae	N	FAC
Prunus virginiana var. melanocarpa	Native chokecherry	Rosaceae	N	FACU
Ribes cereum	Wax currant	Grossulariaceae	N	NL
Ribes inerme	Whitestem gooseberry	Grossulariaceae	N	FAC
Rosa woodsii	Wood rose	Rosaceae	N	FACU
Rubus idaeus spp. melanolasius	Red raspberry	Rosaceae	N	FACU
Salix bebbiana	Bebb willow	Salicaceae	N	FACW
Salix brachycarpa	Barrenground willow	Salicaceae	N	FACW
Salix lasiandra var. caudata	Whiplash willow	Salicaceae	N	FACW
Salix monticola	Mountain willow	Salicaceae	N	OBL
Perennial Graminoids				
Agrostis gigantea (alba)	Redtop	Poaceae	I	FAC
Bromus inermis	Smooth brome	Poaceae	I	FAC
Calamagrostis canadensis	Bluejoint reedgrass	Poaceae	N	FACW
Carex utriculata	Beaked sedge	Cyperaceae	N	OBL
Dactylis glomerata	Orchardgrass	Poaceae	I	FACU
Deschampsia cespitosa	Tufted hairgrass	Poaceae	N	FACW
Glyceria striata	Fowl mannagrass	Poaceae	N	OBL
Juncus arcticus subsp. ater (=J. balticus)	Baltic rush	Juncaceae	N	FACW
Juncus ensifolius	Swordleaf rush	Juncaceae	N	FACW
Phalaris arundinacea	Reed Canarygrass	Poaceae	I	FACW
Phleum pratense	Timothy	Poaceae	I	FAC
Poa palustris	Fowl bluegrass	Poaceae	N	FAC
Scirpus microcarpus	Smallfruit bulrush	Cyperaceae	N	OBL
Perennial Forbs				
Achillea lanulosa	Yarrow	Asteraceae	N	FACU
Cirsium arvense (Breea)	Canada thistle	Asteraceae	I+	FAC
Epilobium hornemannii	Hornemann willowherb	Onagraceae	N	FACW
Fragaria virginiana subsp. glauca	Mountain strawberry	Rosaceae	N	FACU
Geum macrophyllum var. perincisum	Largeleaf avens	Rosaceae	N	FAC
Leucanthemum vulgare (Crysanthemum leucanthemum)	Ox-eye daisy	Asteraceae	I+	FACU

Table 1. Wetland and Riparian Plant Species List				
Scientific Name	Common Name	Family	Origin*	Wetland Status**
Maianthemum amplexicaule	False Solomon's seal	Convallariaceae	N	FAC
Maianthemum stellatum (Smilacina stellata)	Starry false Solomon seal	Convallariaceae	N	FAC
Medicago sativa	Alfalfa	Fabaceae	I	UPL
Mentha arvensis	Field mint	Lamiaceae	N	FACW
Myosotis scorpioides	Forget-me-not	Boraginaceae	I	FACW
Petasites frigidus var. sagittatus	Sweet coltsfoot	Asteraceae	N	FACW
Platanthera huronensis	Green bog orchid	Orchidaceae	N	OBL
Pyrola rotundifolia ssp. asarifolia	Roundleaf wintergreen	Pyrolaceae	N	FACU
Senecio triangularis	Arrowleaf groundsel	Asteraceae	N	FACW
Sidalcea candida	Checker mallow	Malvaceae	N	FACW
Tanacetum vulgare	Common tansy	Asteraceae	I+	
Thalictrum sparsiflorum	Fewflower meadowrue	Thallictraceae	N	FAC
Ferns and Fern Allies				
Equisetum arvense	Field horsetail	Equisetaceae	N	FAC
Annual/Biennial Forbs				
Lactuca serriola	Prickly lettuce	Asteraceae	I	FACU
Matricaria perforata	Scentless chamomile	Asteraceae	I+	FACU

* Origin
N = Native
I = Introduced
I+ = Colorado State Noxious Weed

** Wetland Status
OBL = Obligate Wetland
FACW = Facultative Wetland
FAC = Facultative
FACU = Facultative Upland
UPL = Obligate Upland
NO/NL = No Status in this Region

Table 2. Recommended Native Tree & Shrub Plantings		
Scientific Name	**Common Name**	**Family**
Trees		
Picea engelmannii	Engelmann spruce	Pinaceae
Picea pungens	Blue spruce	Pinaceae
Populus tremuloides	Quaking aspen	Salicaceae
Populus angustifolia	Narrowleaf cottonwood	Salicaceae
Shrubs		
Amelanchier alnifolia	Serviceberry	Rosaceae
Cornus sericea (C. stolonifera)	Redosier dogwood	Cornaceae
Jamesia americana	American waxflower	Hydrangeaceae
Mahonia repens	Oregon grape	Berberidaceae
Oreobatus deliciosus	Boulder raspberry	Rosaceae
Pentaphylloides floribunda	Shrubby cinquefoil	Rosaceae
Physocarpus monogynus	Ninebark	Rosaceae
Prunus virginiana var. melanocarpa	Native chokecherry	Rosaceae
Ribes aureum	Yellow currant	Grossulariaceae
Ribes cereum	Wax currant	Grossulariaceae
Rosa woodsii	Wood rose	Rosaceae
Salix bebbiana	Bebb willow	Salicaceae
Salix exigua	Sandbar willow	Salicaceae
Salix monticola	Mountain willow	Salicaceae
Sambucus microbotrys	Red elderberry	Caprifoliaceae
Sorbus scopulina	Mountain ash	Rosaceae

10.0 Photographs

Photo 1. Middle Boulder Creek, looking downstream from the covered bridge.

Photo 2. Sweet coltsfoot. An uncommon plant found in the wetland northeast of the Magnuson Hotel.

Photo 3. North Beaver Creek.

Photo 4. Example of one of the many social trails in the riparian habitat.

Photo 5. Social use of this area along Middle Boulder Creek just upstream of the weir bridge has eliminated most riparian vegetation.

Photo 6. Dense stands of Canada thistle, a noxious weed, along the path behind the Magnuson Hotel.

Photo 7. Narrow bank of riparian vegetation on the north side of Middle Boulder Creek on the bank parcel.

Photo 8. Lack of riparian habitat along the Chipeta Park parking lot.

Photo 9. Elevated fill along North Beaver Creek at Fisherman's parking lot.

Photo 10. Elevated fill along Middle Boulder Creek at Fisherman's parking lot.

Photo 11. Bank instability along homes on north side of Middle Boulder Creek.

Photo 12. Rock check dam below homes pictured in Photo 11.

Appendix A. Proper Functioning Condition Worksheet

PFC Assessment Form (Lotic)

Name of Riparian-Wetland Area:	**Middle Boulder Creek**		
Date:	September 24, 2015	Segment/Reach ID:	
ID Team Observers:	*Rea Orthner, Western Ecological Resource Inc*		

Description of potential and rationale:
Hydrologic regime _____
Stream Type(s) ___*Perennial*_____
Plant communities _? *Willow (Scrub-Shrub)*_____
Other _____

Yes	No	N/A	HYDROLOGY
X			1) Floodplain inundated in "relatively frequent events" (1-3 years). **Notes:** *Evidence of frequent flooding is noticeable in the riparian habitat on the south side of MBC on the bank parcel as well as in some of the low-lying riparian habitats ust north of Chipeta Park.*
		X	2) Beaver dams are stable. **Notes:** *No beaver dams observed*
X			3) Width/depth ratio, sinuosity, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region). **Notes:** *Generally yes for this "high energy" stream. Stream is over-widened at east end near Barker Reservoir, but likely the result of change in channel slope or slowing of water velocity.*
X			4) Riparian-wetland area is expanding or has achieved potential extent. **Notes:** *R/W appears to have achieved max extent given existing landforms. Fill on north side of MBC on bank parcel and in one area of fisherman's parking lot are limiting R/W development in these areas.*
X			5) Riparian impairment from the upstream or upland watershed is absent. **Notes:** *None Noted*

Yes	No	N/A	VEGETATION
X			6) There is adequate diversity of stabilizing riparian vegetation for recovery/maintenance. **Notes:** (List plant species and note their abundance and location on the NV Riparian Plant Checklist) *Yes, there are at least a dozen native shrubs and perennial graminoids species that have stabilizing root masses*
X			7) There are adequate age class(es) of stabilizing riparian vegetation for recovery/maintenance **Notes:** *The site is dominated by mature willows, which are long-lived and readily resprout from the base when cut. A few saplings where present, which is adequate for this system.*
X			8) Species present indicate maintenance (or recovery) of riparian soil moisture characteristics. **Notes:** *Yes, a variety of wetland and riparian plants are present indicating that the R/W habitat is in good functioning condition. The noxious weed (Cirsium arvense) and invasive plant (Phalaris arundinacea) threatened biodiversity*
X			9) Stabilizing plant communities capable of withstanding moderately high streamflow events are present along the streambank. **Notes:** *The R/W plant community with willows, sedges and rushes have deep binding root masses that are able to withstand high streamflow events.*
X			10) Riparian plants exhibit high vigor. **Notes:** *In general all riparian plants are healthy and show high vigor*
X			11) Adequate amount of stabilizing riparian vegetative is present to protect banks and dissipate energy during moderately high flows. **Notes:** *Yes, in general adequate veg is present. However several areas could use addiitonal willow plantings to provide continuous riparian habtitat for wildlife and to help stabilize banks.*
X			12) Plant communities are an adequate source of woody material for maintenance/recovery. **Notes:** *These shrubby riparian-wetaldns do not produce as much woody material as forested r-w complexes, however there is an adequate source avialble*

Yes	No	N/A	GEOMORPHOLOGY
X			13) Floodplain and channel characteristics (i.e., rocks, woody material, vegetation, floodplain size, overflow channels) are adequate to dissipate energy. **Notes:** *Yes, in general the geomorphology is appropriate for this stream system. As mentioned in #8, the floodplain is lacking in a few areas due to fill. Overall, the stream appears to be fairly well amored with cobbles and rocks.*
		X	14) Point bars are revegetating with stabilizing riparian plants. **Notes:** *No point bars were observed*
X			15) Streambanks are laterally stable. **Notes:** *this section of MBC is fairly straight, and no lateral movement or potential was observed*
X			16) Stream system is vertically stable [not incising]. **Notes:** *No head-cuts or other indicators of a stream downcutting were observed*
X			17) Stream is in balance with the water and sediment that is being supplied by the drainage basin (i.e., no excessive erosion or deposition). **Notes:** *No excessive erosion/sed was observed. However, some of the homes on the North bank of MBC may be lacking appropriate fill material to withstand the erosive forces of the stream. In addition, sedimentation was observed near the confluence with Barker Reservoir; which may due to the slowing velocity of the water when in enters the res.*

SUMMARY DETERMINATION

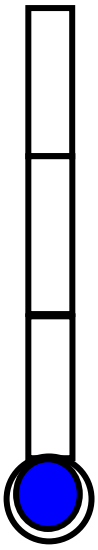
Functional Rating
X Proper Functioning Condition
___ Functional - At Risk
___ Nonfunctional
Rationale *MBC met all of criteria above*_____
_____
_____

Trend for Functional - At Risk:

Monitored	Apparent
___ Upward	___ Upward
___ Downward	___ Downward
___ Not Apparent	___ Not Apparent

Rationale _____
_____
_____

Are factors preventing achievement of PFC or affecting progress towards desired condition outside the control of the manager? Yes ___ No X



If yes, what are those factors?
___ Flow regulations
___ Mining activities
___ Upstream channel conditions
___ Channelization
___ Road encroachment
___ Oil field water discharge
___ Augmented flows
___ Other (specify) _____

Explain factors preventing achievement of PFC:_____
_____
_____
_____
_____
_____
_____
_____

(Revised 5/2015) (See Dickard et al. (2015) for reach information form & 6-page version with more room for notes)

A lotic riparian area is considered to be in PFC or "functioning properly when adequate vegetation, landform, or large woody debris is present to:

- dissipate stream energy associated with high waterflow, thereby reducing erosion & improving water quality;
- capture sediment and aid floodplain development;
- improve floodwater retention and ground-water recharge;
- develop root masses that stabilize streambanks against erosion;
- maintain channel characteristics.

PFC Assessment Form (Lotic)

Name of Riparian-Wetland Area:	North Beaver Creek		
Date:	September 24, 2015	Segment/Reach ID:	
ID Team Observers:	Rea Orthner, Western Ecological Resource Inc.		

Description of potential and rationale:
Hydrologic regime Saturated and Seasonally Flooded
Stream Type(s) Perennial
Plant communities Willow Scrub-Shrub
Other

Yes	No	N/A	HYDROLOGY
X			1) Floodplain inundated in "relatively frequent events" (1-3 years). **Notes:** The floodplain is relatively narrow along this section of N. Beaver Creek, but it does regularly flood. Floodplain is lacking on portions on south side adjacent to Fisherman's parking lot.
		X	2) Beaver dams are stable. **Notes:** No beaver dams occur here.
X			3) Width/depth ratio, sinuosity, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region). **Notes:** Given development contraints, yes the system seems to be in balance
	X		4) Riparian-wetland area is expanding or has achieved potential extent. **Notes:** R/W veg is lacking on south side of creek and could be improved with additional plantings.
X			5) Riparian impairment from the upstream or upland watershed is absent. **Notes:** None noted However, creek upstream traverses through highly developed areas of town.

Yes	No	N/A	VEGETATION
X			6) There is adequate diversity of stabilizing riparian vegetation for recovery/maintenance. **Notes:** (List plant species and note their abundance and location on the NV Riparian Plant Checklist) There are about half a dozen R/W shrubs and perennial graminoid species here.
X			7) There are adequate age class(es) of stabilizing riparian vegetation for recovery/maintenance **Notes:** The site is dominated by mature willow, which are long-lived and easily resprout from the base when cut. There was one mature river birch, which appeared to be dead or dying. No saplings were noted for this system, however very few would be expected. Overall this is adequate.
X			8) Species present indicate maintenance (or recovery) of riparian soil moisture characteristics. **Notes:** The variety of wetland and riparian plants present are appropriate.
X			9) Stabilizing plant communities capable of withstanding moderately high streamflow events are present along the streambank. **Notes:** The R/W plant community with willows, sedges and rushes have deep binding root masses that are able to withstand high streamflow events.
X			10) Riparian plants exhibit high vigor. **Notes:** Overall, the plants exhibit high vigor. One river birch was noted to be mostly dead or dying.
X			11) Adequate amount of stabilizing riparian vegetative is present to protect banks and dissipate energy during moderately high flows. **Notes:** In general, adequate veg is present, however additional plantings are recommended on the south side of the creek and the western eend.
X			12) Plant communities are an adequate source of woody material for maintenance/recovery. **Notes:** These shrubby RW communities do not produce as much large woody material as forested RW complexes, however, overall the amount is adequate.

Yes	No	N/A	GEOMORPHOLOGY
X			13) Floodplain and channel characteristics (i.e., rocks, woody material, vegetation, floodplain size, overflow channels) are adequate to dissipate energy. **Notes:** Yes, in general the geomorphology is adequate. As noted in #8, the floodplain is lacking in one area due to fill. However, the density of willows appers to able to withstand flood events.
		X	14) Point bars are revegetating with stabilizing riparian plants. **Notes:** No point bars are present.
X			15) Streambanks are laterally stable. **Notes:** Yes. No lateral movement was observed.
X			16) Stream system is vertically stable [not incising]. **Notes:** Yes, and no headcuts were observed.
X			17) Stream is in balance with the water and sediment that is being supplied by the drainage basin (i.e., no excessive erosion or deposition). **Notes:** Yes. No excessive erosion or deposition was observed.

SUMMARY DETERMINATION

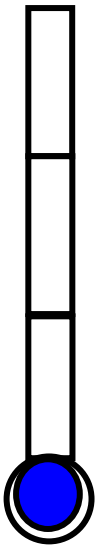
Functional Rating
_X_ Proper Functioning Condition
___ Functional - At Risk
___ Nonfunctional
Rationale _____
_____
_____

Trend for Functional - At Risk:

Monitored	Apparent
___ Upward	___ Upward
___ Downward	___ Downward
___ Not Apparent	___ Not Apparent

Rationale _____
_____
_____

Are factors preventing achievement of PFC or affecting progress towards desired condition outside the control of the manager? Yes ___ No _X_



If yes, what are those factors?
___ Flow regulations
___ Mining activities
___ Upstream channel conditions
___ Channelization
___ Road encroachment
___ Oil field water discharge
___ Augmented flows
___ Other (specify) _____

Explain factors preventing achievement of PFC:_____
_____
_____
_____
_____
_____
_____
_____

(Revised 5/2015) (See Dickard et al. (2015) for reach information form & 6-page version with more room for notes)

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