

SHOP CREEK WETLANDS  
POLLUTANT REDUCTION FACILITY  
WETLAND ASSESSMENT

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February 2007

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# SHOP CREEK WETLANDS POLLUTANT REDUCTION FACILITY WETLAND ASSESSMENT

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## 1. INTRODUCTION AND SITE DESCRIPTION

This Technical Memorandum summarizes our review of the Shop Creek Wetlands PRF. There is concern that water treatment performance of the Shop Creek Wetlands Pollutant Reduction Facility (PRF) may be declining. For example, the sampling data from 1990 to 1999 indicated that the average percent reduction in phosphorous concentration exhibited a slight downward trend during the monitoring period (47% reduction 1990-1994, 42% reduction 1995-1999). However, this slight downward trend was not observed in the measurements of total phosphorous loading. The purpose of this evaluation was to determine whether a decline in field conditions could be causing a decline in system performance. On the assumption that a properly functioning wetland system would provide water quality benefits, including nutrient removal, a site review was performed to assess the condition of the wetlands PRF and to provide an assessment on the health of the wetland system. The site visit occurred on October 3, 2006. The Bureau of Land Management's (BLM) Process for Assessing Proper Functioning Condition, was used as the method of determining whether the Shop Creek PRF is a healthy system. This methodology is less rigorous than other wetland assessment methods, but allows for a rapid assessment of general functioning condition of riparian/wetland systems.

The site is located in the NW  $\frac{1}{4}$  of the SW  $\frac{1}{4}$  of Section 7 and the NE  $\frac{1}{4}$  of the SE  $\frac{1}{4}$  of Section 12, Township 5 S, Range 66 W in Arapahoe County, Colorado at a latitude of 39° 37' 52" North and longitude of 104° 49' 43" West.

The PRF is located on Shop Creek and includes a pond and five soil cement drop structures, with wetlands above each drop structure. The PRF begins approximately at Parker Road and continues to the west to approximately Perimeter Road, inside Cherry Creek State Park. The pond was designed with a permanent pool volume equal to 0.10 inches of runoff from the entire watershed and a brim-full volume equal to 0.20 inches of runoff from the entire watershed. The pond bottom elevation was designed at 5,600 feet with a permanent pool water surface elevation of 5,604 feet. The design team recommended a permanent pool depth of at least 3.28 feet (1 meter), which was achieved with the design. The soil cement drop structures were designed to limit the flow velocity through the wetlands to less than 3 feet per second during the 100-year flow event and averaging less than 0.3 feet per second for the 1-year and less flow event.

## 2. METHODS

A wetland ecologist evaluated the health of the PRF with the BLM's *Process for Assessing Proper Functioning Condition* for riparian/wetland areas. Prior to the field review, pertinent background information was reviewed to understand the original design and purpose of the PRF. The PRF was divided into reaches and each reach was evaluated using the BLM's standard checklist. These checklists are found at the end of this memo. The drop structures served as the reach boundaries and were numbered sequentially, starting at the eastern end. Reach 1 is the pond near Parker Road, and each subsequent reach proceeds to the west. Photographs of each reach were taken.

A functional rating for each reach was determined. Following are the definitions of the functional categories included in the BLM methodology:

***Proper Functioning Condition*** – Riparian-wetland areas are functioning properly when adequate vegetation, landform or large woody debris is present to dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid in floodplain development; improve flood-water retention and ground-water recharge; develop root masses that stabilize streambanks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and support greater biodiversity. The functioning condition of riparian-wetland areas is a result of interaction among geology, soil, water, and vegetation.

This category is assigned when a riparian-wetland area exhibits field conditions consistent with a similar type natural system absent human induced impacts. This category represents a healthy riparian-wetland system

***Functional-At Risk*** – Riparian-wetland areas that are in functional condition but an existing soil, water, or vegetation attribute makes them susceptible to degradation.

This category is assigned when a riparian-wetland area exhibits field conditions that are mostly consistent with a similar type natural system, though certain features are degraded or are at risk for degradation.

***Nonfunctional*** – Riparian-wetland areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows and thus are not reducing erosion, improving water quality, etc., as listed above. The absence of certain physical attributes such as a floodplain where one should be are indicators of nonfunctioning conditions.

This category is assigned when a riparian-wetland area exhibits field conditions that are inconsistent with a similar type natural system. This category represents an unhealthy riparian-wetland system.

***Unknown*** – Riparian-wetland areas where sufficient information is lacking to make any form of determination.

### 3. RESULTS

#### 3.1 Pond - Reach 1



Photo 1 – Pond

The pond is the main aquatic feature of this reach. An approximately 10-foot wide cattail marsh wetland fringe was purposefully established around the pond shoreline, which appears to be expanding inward because of its irregular pond-side boundary. Some of the immediate watershed of the pond is maintained turf and residential development, which limits the habitat potential of the wetlands. However, waterfowl and fish were observed using the pond. Overall, Pond 1 is functioning- at risk. It is at risk in that the watershed and immediate surroundings are urbanized landscapes, which over time limit the functioning of the pond. This pond will likely always be functioning at-risk because of

the upstream watershed conditions and because it's purpose is to settle sediment and protect the downstream wetlands. The pond is meeting it's purpose of trapping sediment that would otherwise flow into the wetlands. However, sediment will accumulate over time, which would facilitate cattail encroachment and reduce the open water surface area and volume of the pond for sediment deposition.

#### 3.2 Wetlands - Reach 2-7

The wetland cells found downstream of the Pond (Reaches 2-7) are in a very similar condition to each other. The wetland plant community is dominated by cattail (*Typha latifolia*), soft-stem bulrush (*Schoenoplectus tabernaemontani*) and coyote willow (*Salix exigua*). Cattail vegetation is present in areas with persistent standing water or saturated conditions and coyote willow vegetation is present in drier areas adjacent to the cattail marsh. The vegetation exhibits high vigor and appears to have adequate hydrology for longer term plant community maintenance. Several non-native Russian olive (*Elaeagnus angustifolia*) and crack willow (*Salix fragilis*) trees were observed in the PRF. Waterfowl, fish, turtles and other wildlife were observed in the PRF. Overall, the wetland system is rated in Proper Functioning Condition, given it's purpose, design, watershed conditions and field observations. There is adequate vegetation and landform present to dissipate energy,



Photo 2 – Typical Wetlands

filter sediment, improve floodwater retention, develop adequate root masses, develop diverse ponding, and support biodiversity. There are reach-specific conditions that do create potential risks, but overall, the system is functioning properly. The plant community appears capable of withstanding high flows that would occur with the presence of the retention pond and significant erosion or vegetation destruction was not observed. The pond in Reach 1 and the soil cement drop structures limit high flows through the wetlands. The pond removes much of the sediment. These are likely the reasons for the condition of the wetland cells. The soil cement drop structures provide vertical channel stability, which allows the wetland areas to develop. These are essential features for the long-term health and maintenance of the wetlands.

The urbanized nature of the Shop Creek watershed will present potential water quality and runoff rate problems into the future. Cattails develop strong and dense root structure, but the surface plant structure is susceptible to destruction from high flows, compared to woody vegetation such as willows. However, evidence of destruction from high flows was not observed at the wetlands. In general, flow velocities do not appear to be impacting the establishment and success of the wetland cells.

High sediment loading of the wetland cells was not observed. In some Front Range wetland systems, sediment deposition can smother vegetation and alter plant communities by changing the surface elevation of the wetlands. Through visual observation, this type of deposition was not observed at the wetlands. Therefore, high sediment loading does not appear to be impacting the wetlands. However, it is key to maintain the sediment trapping capacity of the Pond in Reach 1 so that high sediment loads do not impact the wetlands in the future.



*Photo 3 – Typical Wetlands*

Several dead cottonwoods were observed within the PRF wetland cells. These deaths were likely the result of a rising water table as cottonwoods do not survive in constant inundation or surface saturation. These dead trees will provide wildlife habitat while standing and on the ground once they fall. The rise in water table may be caused by reduced or slowed flow through the wetland cells over time, which backs up water to a higher elevation than occurred when the wetland cells were first constructed. This reduced flow could be caused by sediment deposition. However, since we did not observe significant sediment deposition or buildup in the wetlands, it is more likely caused by the accumulation of cattail and other plant litter above the drop structures rather than high sediment loads. As the plant matter accumulates, flows are slowed, which could raise the water table. Under the saturated conditions above the drop structures, the accumulated plant matter is slow to break down and is likely increasing over time. The accumulation of plant matter in the wetlands is generally beneficial because the additional structure will help reduce flow velocities and aid in sediment removal. Another possible factor is that several of the base-flow culverts within the drop structures are plugged. This plugging has caused flows to overtop the drop, which could also cause a small water table rise.



Overall, the water spreads out horizontally above the drop structures and there is a relatively wide zone of saturated soil conditions. Channelization or shortcutting through the wetlands, which could reduce contact time and treatment effectiveness, was not observed.

Most of the immediate uplands surrounding the PRF are within Cherry Creek State Park and are thus well vegetated with a xeric plant community consisting of prickly pear (*Opuntia polyacantha*), western wheatgrass (*Pascopyrum smithii*), yucca (*Yucca glauca*), rubber rabbitbrush (*Chrysothamnus nauseosus*), sand dropseed (*Sporobolus cryptandrus*) and blue grama (*Bouteloa gracilis*). There are several non-native species also present in this plant community such as kochia (*Kochia scoparia*), mullein (*Verbascum thapsus*) and redroot pigweed (*Amaranthus retroflexus*). This condition stabilizes adjacent lands and reduces the inflow of sediment to the wetlands during precipitation. This condition also increases the habitat value as biodiversity tends to be greater at the edges between different plant communities.

## 4. CONCLUSIONS

The wetland system is a healthy riparian/marsh corridor that appears to be functioning properly overall. There are many factors that make up a properly functioning wetland system and a range of benefits that wetlands provide. Wetlands are dynamic landscape features that change over time. As these changes occur the PRF's treatment effectiveness may also vary. As indicated above, the accumulation of plant material over time should provide a benefit to the system through increased opportunities for sediment settling. Though this properly functioning wetland system is expected to have water quality and phosphorous removal benefits, it is reasonable to expect that healthy wetlands may not be optimized for maximized phosphorous removal. Such an optimized system may appear more like a vegetated treatment cell, than the natural appearance of the Shop Creek PRF. The current condition is a reasonable result for such a designed system and appears consistent with the intended pre-construction goals and considerations described in Wulliman, et al, 1988 and depicted in Figure 12 of this publication. Though in an urban watershed and manmade, the wetland/riparian area is functioning as a slow-moving marsh system should function along the Front Range. There do not appear to be significant issues at this time requiring extensive maintenance to improve wetland health.

## 5. RECOMMENDATIONS

It was concluded that significant wetland maintenance is not necessary. However, there are a few things that could be done to the system to improve it, with minimal impact to the existing wetlands.

It is recommended that the Pond receive periodic dredging to remove accumulated sediments. This pond appears to be a key sediment trap, which has prevented substantial sediment deposition in the downstream wetlands. As the pond fills, it will become a less effective sediment trap, which could

then degrade downstream wetlands. The 1999 Urban Drainage and Flood Control District's *Drainage Criteria Manual, Volume 3 – Maintenance Recommendations* indicates that accumulated sediment should be removed from retention ponds generally every 10-20 years, though the actual removal frequency should be based on inspection and individual watershed conditions (more frequent in developing basins and less frequent in built-out basins). The wetland system was constructed in 1989 and the pond was apparently maintained in 1999, when it was drained several times by the City of Aurora. Since the Shop Creek watershed is largely built-out, the interval between pond dredging can be longer than a developing basin. Since it has only been approximately 7 years since the pond was maintained, sediment removal should not be needed for at least three more years per the low end of the UDFCD recommended interval (10 years). When sediment removal is performed, the pond should be returned to its original design grades and elevations (bottom elevation of 5,600' per May 1988 Plan and Profile from Mueller Engineering Company, Inc.). Several survey shots of the bottom elevation at various locations in the pond would provide an indication of how far above elevation 5,600 the pond bottom is and will serve as a guide to decide how urgent pond cleanout is. The recommended depth of the permanent pool should be at least 1 meter (3.28 feet) deep, per the system design team (Wulliman, et al, 1988). The current pool depth was not measured during the site visit.

When sediment removal occurs, it is recommended that the pond cleanout occur in a manner that would maintain the existing 5-10 foot wide wetland fringe around the pond. Pond maintenance should be performed in the winter. The pond should be drained and inflows temporarily piped around the dam during cleanout. We are not aware that the pond is lined, so traditional excavation equipment can be used to clean out the pond. If the pond does have a liner, other dredging methods should be employed to protect the integrity of the liner. The plunge pools below each drop structure should be carefully cleaned out at the time the pond is cleaned out. The plunge pools are part of the soil cement drop structures so sediment removal in these pools should be done with adequate care to avoid damaging the soil cement and perhaps with hand tools.

Additionally, though we are not aware of their particular landscaping practices, we suggest communicating with the owner of the apartments north of the ponds to determine if their turf fertilization practices may be adding nutrients to the pond.

There are several drop structures where the base flow culvert is plugged, thus causing flow to overtop the drop structures. These should be un-plugged. There are several drop structures where crack willow and other woody vegetation has established within the drop structure. These plants should be eliminated to prevent root damage to the structure. A combination of mechanical removal of above-ground parts and careful application of herbicide to remaining trunks/stumps to kill sub-surface parts and prevent re-growth should be employed. Removal and stump treatment should occur during the early growing season. Mechanical removal of roots should not occur at the drop structures.

The Russian olives and crack willows should be removed from the PRF where they occur. These species are considered weeds and are undesirable. Crack willow can become a dominant riparian species and can overshadow native willow and wetland communities, causing a plant community change. Removal of these species would provide an ecological benefit to the wetland system.



## 6. REFERENCES

Mueller Engineering Company, Inc. 1988. *Shop Creek Drainage Outfall System – Plan and Profile, Sta. 25+50 to Sta. 40+50.*

Urban Drainage and Flood Control District. 1999 (revised 2005). Urban Drainage Criteria Manual – Vol. 3. Denver, CO.

Wulliman, James, T., Mark Maxwell, William E. Wenk, Ben Urbonas. 1988. *Multiple treatment system for phosphorous removal.* Potosi, MO. Paper published in Proceedings of Engineering Foundation Conference on Current Practice and Design Criteria for Urban Runoff Water Quality Control.

APPENDIX A  
STANDARD CHECKLISTS  
SHOP CREEK WETLAND PRF

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### Standard Checklist

Name of Riparian-Wetland Area: Shop Creek PRF

Date: 10/3/06 Segment/Reach ID: Reach 1 - Pond

Miles: \_\_\_\_\_ Acres: \_\_\_\_\_

ID Team Observers: C. Reichard

Yes	No	N/A	HYDROLOGY
		X	1) Floodplain above bankfull is inundated in "relatively frequent" events
		X	2) Where beaver dams are present they are active and stable
		X	3) Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)
X			4) Riparian-wetland area is widening or has achieved potential extent
	X		5) Upland watershed is not contributing to riparian-wetland degradation

Yes	No	N/A	VEGETATION
	X		6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)
	X		7) There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)
X			8) Species present indicate maintenance of riparian-wetland soil moisture characteristics
X			9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events
X			10) Riparian-wetland plants exhibit high vigor
X			11) Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows
X			12) Plant communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)

Yes	No	N/A	EROSION/DEPOSITION
X			13) Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy
		X	14) Point bars are revegetating with riparian-wetland vegetation
		X	15) Lateral stream movement is associated with natural sinuosity
X			16) System is vertically stable
X			17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)

(Revised 1998)

Remarks

Pond appears to flood above normal pool regularly.  
 Cattail fringe wetlands are expanding inward  
 Urban watershed will likely limit system health  
 Mostly cattail monoculture @ fringes of pond  
 Soil cement drop structure stabilizes the system  
 Pond appears to have adequate sediment capturing capacity

Pond serves to protect wetland cells from high  
 flows and sediment. It appears to be meeting  
 this purpose

Summary Determination

Functional Rating:

Proper Functioning Condition \_\_\_\_\_  
 Functional—At Risk \_\_\_\_\_ **X** \_\_\_\_\_  
 Nonfunctional \_\_\_\_\_  
 Unknown \_\_\_\_\_

Trend for Functional—At Risk:

Upward \_\_\_\_\_  
 Downward \_\_\_\_\_  
 Not Apparent \_\_\_\_\_ **X** \_\_\_\_\_

Are factors contributing to unacceptable conditions outside the control of the manager?

Yes \_\_\_\_\_ **X** \_\_\_\_\_  
 No \_\_\_\_\_

If yes, what are those factors?

\_\_\_\_\_ Flow regulations    \_\_\_\_\_ Mining activities    **X** Upstream channel conditions  
 \_\_\_\_\_ Channelization    **X** Road encroachment    \_\_\_\_\_ Oil field water discharge  
 \_\_\_\_\_ Augmented flows    **X** Other (specify) Urban watershed

### Standard Checklist

Name of Riparian-Wetland Area: Shup Creek PRF  
 Date: 10/3/06 Segment/Reach ID: Reach 2 - wetland  
 Miles: \_\_\_\_\_ Acres: \_\_\_\_\_  
 ID Team Observers: C. Reichard

Yes	No	N/A	HYDROLOGY
X			1) Floodplain above bankfull is inundated in "relatively frequent" events
		X	2) Where beaver dams are present they are active and stable
X			3) Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)
X			4) Riparian-wetland area is widening or has achieved potential extent
X			5) Upland watershed is not contributing to riparian-wetland degradation

Yes	No	N/A	VEGETATION
X			6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)
	X		7) There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)
X			8) Species present indicate maintenance of riparian-wetland soil moisture characteristics
X			9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events
X			10) Riparian-wetland plants exhibit high vigor
X			11) Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows
X			12) Plant communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)

Yes	No	N/A	EROSION/DEPOSITION
X			13) Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy
		X	14) Point bars are revegetating with riparian-wetland vegetation
		X	15) Lateral stream movement is associated with natural sinuosity
X			16) System is vertically stable
X			17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)

(Revised 1998)

Remarks

Primarily a cattail marsh with willows along side slopes. Well developed vegetation  
 Turtles, frogs, minnows observed

Debris lines observed above normal water levels.  
 Drop structures stabilize the system.  
 Immediate watershed is un-developed  
 Plant community could be more diverse - mostly cattail  
 Very little channel movement noted.  
 Pond traps most sediment

Summary Determination

Functional Rating:

Proper Functioning Condition   X    
 Functional—At Risk \_\_\_\_\_  
 Nonfunctional \_\_\_\_\_  
 Unknown \_\_\_\_\_

Trend for Functional—At Risk:

Upward \_\_\_\_\_  
 Downward \_\_\_\_\_  
 Not Apparent \_\_\_\_\_

Are factors contributing to unacceptable conditions outside the control of the manager?

Yes   X    
 No \_\_\_\_\_

If yes, what are those factors?

\_\_\_ Flow regulations    \_\_\_ Mining activities    \_\_\_ Upstream channel conditions  
 \_\_\_ Channelization    \_\_\_ Road encroachment    \_\_\_ Oil field water discharge  
 \_\_\_ Augmented flows      X   Other (specify)   Urban watershed



### Standard Checklist

Name of Riparian-Wetland Area: Shop Creek PRF

Date: 10-3-06 Segment/Reach ID: Reach 3 - Wetland

Miles: \_\_\_\_\_ Acres: \_\_\_\_\_

ID Team Observers: C. Reichard

Yes	No	N/A	HYDROLOGY
X			1) Floodplain above bankfull is inundated in "relatively frequent" events
		X	2) Where beaver dams are present they are active and stable
X			3) Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)
X			4) Riparian-wetland area is widening or has achieved potential extent
X			5) Upland watershed is not contributing to riparian-wetland degradation

Yes	No	N/A	VEGETATION
X			6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)
X			7) There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)
X			8) Species present indicate maintenance of riparian-wetland soil moisture characteristics
X			9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events
X			10) Riparian-wetland plants exhibit high vigor
X			11) Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows
X			12) Plant communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)

Yes	No	N/A	EROSION/DEPOSITION
X			13) Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy
		X	14) Point bars are revegetating with riparian-wetland vegetation
		X	15) Lateral stream movement is associated with natural sinuosity
X			16) System is vertically stable
X			17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)

(Revised 1998)

Remarks

Similar conditions as Reach 2.  
 A higher amount of woody vegetation  
 Several dead cottonwoods  
 Mostly a cattail marsh  
 Immediate upland watershed is well vegetated  
 Dead cottonwoods imply rising water table.  
 Drop structures stabilize system

Summary Determination

Functional Rating:

Proper Functioning Condition  \_\_\_\_\_  
 Functional—At Risk \_\_\_\_\_  
 Nonfunctional \_\_\_\_\_  
 Unknown \_\_\_\_\_

Trend for Functional—At Risk:

Upward \_\_\_\_\_  
 Downward \_\_\_\_\_  
 Not Apparent \_\_\_\_\_

Are factors contributing to unacceptable conditions outside the control of the manager?

Yes  \_\_\_\_\_  
 No \_\_\_\_\_

If yes, what are those factors?

\_\_\_\_ Flow regulations    \_\_\_\_ Mining activities    \_\_\_\_ Upstream channel conditions  
 \_\_\_\_ Channelization    \_\_\_\_ Road encroachment    \_\_\_\_ Oil field water discharge  
 \_\_\_\_ Augmented flows     Other (specify) Urban watershed

### Standard Checklist

Name of Riparian-Wetland Area: Shog Creek PRF

Date: 10-3-06 Segment/Reach ID: Reach 4 - wetland

Miles: \_\_\_\_\_ Acres: \_\_\_\_\_

ID Team Observers: C. Reichard

Yes	No	N/A	HYDROLOGY
X			1) Floodplain above bankfull is inundated in "relatively frequent" events
		X	2) Where beaver dams are present they are active and stable
X			3) Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)
X			4) Riparian-wetland area is widening or has achieved potential extent
X			5) Upland watershed is not contributing to riparian-wetland degradation

Yes	No	N/A	VEGETATION
X			6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)
	X		7) There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)
X			8) Species present indicate maintenance of riparian-wetland soil moisture characteristics
X			9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events
X			10) Riparian-wetland plants exhibit high vigor
X			11) Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows
X			12) Plant communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)

Yes	No	N/A	EROSION/DEPOSITION
X			13) Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy
		X	14) Point bars are revegetating with riparian-wetland vegetation
		X	15) Lateral stream movement is associated with natural sinuosity
X			16) System is vertically stable
X			17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)

(Revised 1998)

Remarks

Similar to other wetland reaches  
Flow overtopping drop - un-plug culvert  
Remove crack willows

Summary Determination

Functional Rating:

Proper Functioning Condition   X    
Functional—At Risk \_\_\_\_\_  
Nonfunctional \_\_\_\_\_  
Unknown \_\_\_\_\_

Trend for Functional—At Risk:

Upward \_\_\_\_\_  
Downward \_\_\_\_\_  
Not Apparent \_\_\_\_\_

Are factors contributing to unacceptable conditions outside the control of the manager?

Yes   X    
No \_\_\_\_\_

If yes, what are those factors?

\_\_\_\_ Flow regulations    \_\_\_\_ Mining activities    \_\_\_\_ Upstream channel conditions  
\_\_\_\_ Channelization    \_\_\_\_ Road encroachment    \_\_\_\_ Oil field water discharge  
\_\_\_\_ Augmented flows      X   Other (specify) Urban watershed

### Standard Checklist

Name of Riparian-Wetland Area: Shop Creek PRF

Date: 10-3-06 Segment/Reach ID: Reach 5 - wetland

Miles: \_\_\_\_\_ Acres: \_\_\_\_\_

ID Team Observers: C. Reichard

Yes	No	N/A	HYDROLOGY
X			1) Floodplain above bankfull is inundated in "relatively frequent" events
		X	2) Where beaver dams are present they are active and stable
			3) Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)
X			4) Riparian-wetland area is widening or has achieved potential extent
X			5) Upland watershed is not contributing to riparian-wetland degradation

Yes	No	N/A	VEGETATION
X			6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)
	X		7) There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)
X			8) Species present indicate maintenance of riparian-wetland soil moisture characteristics
X			9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events
X			10) Riparian-wetland plants exhibit high vigor
X			11) Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows
X			12) Plant communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)

Yes	No	N/A	EROSION/DEPOSITION
X			13) Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy
		X	14) Point bars are revegetating with riparian-wetland vegetation
		X	15) Lateral stream movement is associated with natural sinuosity
X			16) System is vertically stable
X			17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)

(Revised 1998)

Remarks

Very similar to upstream reaches  
Remove crack willows

Summary Determination

Functional Rating:

Proper Functioning Condition   
Functional—At Risk \_\_\_\_\_  
Nonfunctional \_\_\_\_\_  
Unknown \_\_\_\_\_

Trend for Functional—At Risk:

Upward \_\_\_\_\_  
Downward \_\_\_\_\_  
Not Apparent \_\_\_\_\_

Are factors contributing to unacceptable conditions outside the control of the manager?

Yes   
No \_\_\_\_\_

If yes, what are those factors?

\_\_\_\_ Flow regulations    \_\_\_\_ Mining activities    \_\_\_\_ Upstream channel conditions  
\_\_\_\_ Channelization    \_\_\_\_ Road encroachment    \_\_\_\_ Oil field water discharge  
\_\_\_\_ Augmented flows     Other (specify) Urban watershed



### Standard Checklist

Name of Riparian-Wetland Area: Shop Creek PRF

Date: 10-3-06 Segment/Reach ID: Reach 6 - wetland

Miles: \_\_\_\_\_ Acres: \_\_\_\_\_

ID Team Observers: C. Reichard

Yes	No	N/A	HYDROLOGY
X			1) Floodplain above bankfull is inundated in "relatively frequent" events
		X	2) Where beaver dams are present they are active and stable
X			3) Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)
X			4) Riparian-wetland area is widening or has achieved potential extent
X			5) Upland watershed is not contributing to riparian-wetland degradation

Yes	No	N/A	VEGETATION
X			6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)
X			7) There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)
X			8) Species present indicate maintenance of riparian-wetland soil moisture characteristics
X			9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events
X			10) Riparian-wetland plants exhibit high vigor
X			11) Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows
X			12) Plant communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)

Yes	No	N/A	EROSION/DEPOSITION
X			13) Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy
		X	14) Point bars are revegetating with riparian-wetland vegetation
		X	15) Lateral stream movement is associated with natural sinuosity
X			16) System is vertically stable
X			17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)

(Revised 1998)

Remarks

Similar to other reaches  
 Remove crack willows  
 Existing trail crossing has trampled vegetation  
 Drop is overtopped - culvert plugged

Summary Determination

Functional Rating:

Proper Functioning Condition  \_\_\_\_\_  
 Functional—At Risk \_\_\_\_\_  
 Nonfunctional \_\_\_\_\_  
 Unknown \_\_\_\_\_

Trend for Functional—At Risk:

Upward \_\_\_\_\_  
 Downward \_\_\_\_\_  
 Not Apparent \_\_\_\_\_

Are factors contributing to unacceptable conditions outside the control of the manager?

Yes  \_\_\_\_\_  
 No \_\_\_\_\_

If yes, what are those factors?

\_\_\_\_ Flow regulations    \_\_\_\_ Mining activities    \_\_\_\_ Upstream channel conditions  
 \_\_\_\_ Channelization    \_\_\_\_ Road encroachment    \_\_\_\_ Oil field water discharge  
 \_\_\_\_ Augmented flows     Other (specify) Urban watershed

### Standard Checklist

Name of Riparian-Wetland Area: Shop Creek PRF

Date: 10-3-06 Segment/Reach ID: Reach 7 - wetland

Miles: \_\_\_\_\_ Acres: \_\_\_\_\_

ID Team Observers: C. Reichard

Yes	No	N/A	HYDROLOGY
X			1) Floodplain above bankfull is inundated in "relatively frequent" events
		X	2) Where beaver dams are present they are active and stable
X			3) Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)
X			4) Riparian-wetland area is widening or has achieved potential extent
X			5) Upland watershed is not contributing to riparian-wetland degradation

Yes	No	N/A	VEGETATION
X			6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)
X			7) There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)
X			8) Species present indicate maintenance of riparian-wetland soil moisture characteristics
X			9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events
X			10) Riparian-wetland plants exhibit high vigor
X			11) Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows
X			12) Plant communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)

Yes	No	N/A	EROSION/DEPOSITION
X			13) Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy
		X	14) Point bars are revegetating with riparian-wetland vegetation
		X	15) Lateral stream movement is associated with natural sinuosity
X			16) System is vertically stable
X			17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)

(Revised 1998)

Remarks

Similar to other reaches  
Remove crack willow and Russian olive

Summary Determination

Functional Rating:

Proper Functioning Condition   
Functional—At Risk \_\_\_\_\_  
Nonfunctional \_\_\_\_\_  
Unknown \_\_\_\_\_

Trend for Functional—At Risk:

Upward \_\_\_\_\_  
Downward \_\_\_\_\_  
Not Apparent \_\_\_\_\_

Are factors contributing to unacceptable conditions outside the control of the manager?

Yes   
No \_\_\_\_\_

If yes, what are those factors?

\_\_\_ Flow regulations    \_\_\_ Mining activities    \_\_\_ Upstream channel conditions  
\_\_\_ Channelization    \_\_\_ Road encroachment    \_\_\_ Oil field water discharge  
\_\_\_ Augmented flows     Other (specify) Urban watershed