Appendix J– Miry Creek

Site MC – 1 looking east

Site MC - 1 looking west

Site MC – 2 looking north

Site MC – 3 looking south

Site MC – 4 hanging culvert

Site MC – 4 looking south

Headwaters of Miry Creek (no visible creek)

Headwaters of Miry Creek (creek area seeded)

4. DISCUSSION

Efforts to produce food for a growing population, advances in agricultural technology and urban expansion have encroached on tributaries and impacted their ecological health. In addition, economic pressures to expand land production and use have resulted in removing riparian areas and draining of wetlands, thereby increasing the amount of arable land. Consequently, ecological conditions within streams, creeks, and rivers, many of which pass through agricultural land, have been severely impacted by agricultural, residential and urban management practices within these tributary watersheds. Although other stressors were identified throughout this study i.e. stormwater management, beaver and human dams, invasive plant species, hyper-saline soils, oil and gas development, and human traffic-crossings, many of these issues are specific to only one or two creeks. The close proximity of cultivation to the creeks edge, and disturbance of both the creek-bank and creek-bed by cattle and other livestock are widespread within the South Saskatchewan River watershed and are the top two impacts on the watershed's tributaries and fish habitat.

Riparian areas surrounded by cultivation are often removed in favor of increasing arable land. In doing so, the buffer zone between cultivation and the creek is reduced or removed altogether. This buffer zone, when intact, helps protect nearby streams by trapping sediment, fertilizers and pesticides, and by preventing erosion of the stream bank (Huel, 1998). Without adequate buffer zones between cultivation and the creek, water quality suffers and wildlife habitat is lost (Huel, 1998; Agriculture Canada, 2004). Currently, producers are not required to maintain a buffer zone between cropland and creeks in Saskatchewan, although a buffer size of 30 m is recommended for providing water quality protection, forage for livestock, and habitat for wildlife. The placement and shape of buffers can be designed specifically to intercept overland

flow (Stewart et al., 2010). Ensuring that these buffer zones are maintained will undoubtedly benefit producers through the various ecological services they provide.

Creeks often flow through or around agricultural areas, carrying rain water or snow-melt on a meandering course across the landscape. This naturally-occurring source of water provides easily accessible drinking water for livestock and wildlife. However, high density of livestock and frequent visits to creeks can reduce vegetation cover and damage areas around the creek through trampling. Wastes from livestock are frequently deposited in the creek or washed in by run-off, leading to increased nutrients within the creek. Excess nutrients in the creek can in turn lead to algal blooms which can release toxins into the water, thereby decreasing water quality for livestock, wildlife, and human consumption (Huel, 1998; Agriculture Canada, 2004). Good water quality ensures people and livestock consuming the water are healthy and parasite-free. Preventing livestock from impacting the creek can be achieved through fencing of the creek perimeter and the use of off-site watering for livestock.

Maintenance of riparian health by adopting best management practices within our agricultural and urban landscape will contribute to the betterment of the South Saskatchewan River's ecological services, water quality, fish populations and its residents.

5. MITIGATION AND REMEDIATION

Based on the results presented in this study, several impediments or issues, were identified, within each tributary that warrant remediation or habitat improvement. In this section, we have identified 10 sites (one per tributary) that will be the focus of future habitat restoration projects (see Table 5.1). The proposed restoration projects will be a collaborative effort between the SSWRSI, producers, regional managers, environmental groups, and volunteers. The goals of these projects include:

- enhancing/improving/creating habitat for fish and wildlife
- improving water quality for humans, wildlife, and fish
- providing benefits to farmers, ranchers, rural and urban municipalities
- providing recreational, economic, and tourism opportunities

Best Management Practice Recommendation # 1:

Riparian Area Grazing Management/Fencing/Off-site Watering

- Brightwater Creek: Site 3 is almost entirely pastureland. This area has extensive pugging/hummocking from livestock walking along/through both sides of the creek to access drinking water. This has lead to a large portion of bare ground adjacent to the creek and there is minimal vegetation present.
- Coteau Creek: Sites 1 and 2 both have livestock disturbance within the riparian area. There is a significant amount of pugging/hummocking on both sides of the creek along with trailing leading to a high percentage of bare ground. There were also salt patches observed at these two sites.
- Aiktow Creek: Site 4 has a considerable amount of livestock impact. Both sides of the creek show signs of bare ground caused by cattle walking along/through the creek causing a net loss of stabilizing vegetation.
- Miry Creek: Site 1 has moderate cattle disturbance. There is evidence of some pugging/hummocking on both sides of the creek. Oil and gas wells were observed as well in the area.

Best Management Practice Recommendation # 2:

Stream Crossing Improvement

- Snakebite Creek: Site 4 has a low-level crossing running through the creek that connects a farm/land access road. The creek/riparian area in this location has very little cattle disturbance and displays alot of vegetation/shrubbery.

Best Management Practice Recommendation # 3:

Protecting High Risk Erodible and Saline Soils

- Summit Creek: Water quality at Site 3 was very poor. It displayed high salinity, high pH, and high conductivity. The stream bank and riparian area had no vegetation growing on it.

Best Management Practice Recommendation # 4:

Man-made Dam Removal and Enhancement

- Opimihaw Creek: Near site 2 on the north side of Penner road is a man-made rock dam with a bridge constructed right beside it. The bridge has asphalt on top of it and the dam is slowing down water and impeding fish movement. The dam could be re-constructed to allow fish to pass or a fish ladder can be installed.

Best Management Practice Recommendation # 5:

Beaver Management

- Red Deer Creek: Site 4 and the surrounding area have a large population of beavers. There are numerous dams which slow the natural water flow down and

causes flooding in the spring. Approximately 5-10 meters of the riparian area here is removed to try and slow down the growth of the beaver population. However, a beaver management plan should be implemented instead of removing natural vegetation.

Best Management Practice Recommendation # 6:

Demonstration Creek to Promote Improved Management Practices

- Fish Creek: The entire creek except for the area around site 1 needs significant habitat improvement. Therefore, we suggest that it be used as a demonstration creek. Illustrating to the public what improper land use practices will do to a natural waterway and how intensive agriculture and ranching can change natural drainage patterns and reduce water quality. We hope with this approach that it will help educate people and provide improved management practices so that we can bring this system back to its natural state.

Table 5.1 Recommended Best Management Practices for Specific Tributary Locations

Remediation Program	Red Deer	Fish	Opimihaw	Brightwater	Coteau	Aiktow	Summit	Sage	Snakebite	Miry
Riparian Area Grazing Management/ Off-site Watering	X	-	X	X	X	X	X	-	X	X
Native Plant Establishment/ Buffer Zone Restoration	X	X	X	X	X	X	X	-	X	X
Stream Crossing Improvement	-	-	-	-	X	X	-	-	X	X
Protecting High Risk Erodible and Saline Soils	X	-	-	-	-	-	X	-	-	-
Man-made Dam Removal/ Enhancement	-	-	X	X	-	X	-	-	-	-
Beaver Management	X	X	-	X	-	-	-	-	-	-
Stormwater Retention Pond	-	-	X	-	-	-	-	-	-	-
Controlled Irrigation	-	-	-	X	-	X	-	-	-	-
Demonstration Creek to Promote Improved Management Practices	-	X	-	-	-	-	-	-	-	-

Literature Cited

Agriculture and Agri-Food Canada. (2004). *Beneficial management practices for riparian zones in atlantic canada.* Island Nature Trust, 52p.

Hickey, M. B. G., and Doran, B. (2004). *A review of the efficiency of buffer strips for the maintenance and enhancement of riparian ecosystems*. Water Quality Research Journal of Canada, 39(3), 311-317.

Huel, D. (1998). *Streambank stewardship: your guide to caring for riparian areas in saskatchewan*. Saskatchewan Wetland Conservation Corporation, 43p.

Saskatchewan PCAP Greencover Committee (2008). *Riparian health assessment: lakes, sloughs, and wetlands.* Prairie Conservation Action plan, 108p.

SSRWSI (2007). *South saskatchewan river watershed stewards inc.* URL: http://www.southsaskriverstewards.ca/.

SSRWSI (2012). *Fish habitat study of tributary creeks to the south saskatchewan river.* South Saskatchewan River Watershed Stewards Inc., 66p.

Stewart, A., Reedyk, S., Franz, B., Fomradas, K., Hilliard, C., and Hall, S. (2010). *Field manual on buffer design for the canadian prairies*. Canada: Agri-Environmental Services Branch, Agriculture and Agri-Food Canada.

Wenger, S. (1999*). A review of the scientific literature on riparian buffer width, extent and vegetation.* Institute of Ecology, University of Georgia, Athens, Georgia, USA. Office of Public Service & Outreach.59pp.

Appendix K – Data and Fact Sheets

RIPARIAN HEALTH ASSESSMENT - FIELD SHEET

Landowner:_____ **Date:**_____ **Reach No.:**_____

Wetland/Slough/Lake:_____

Site Description:_____

				Scores or N/A	
				Actual	*Possible*
1. Vegetative Cover of Riparian Area					
6	***4***	***2***	***0***		
2. Invasive Plant Species					
Canopy Cover					
3	***2***	***1***	***0***		
Density Distribution					
3	***2***	***1***	***0***		
3. Disturbance-Caused Undesirable Herbaceous Species					
3	***2***	***1***	***0***		
4. Preferred Tree and Shrub Establishment and Regeneration					
6	***4***	***2***	***0***		
5. Utilization of Preferred Trees and Shrubs					
3	***2***	***1***	***0***		
6. Human Alteration of Riparian Area - Vegetation					
6	***4***	***2***	***0***		
7. Human Alteration of Riparian Area - Physical					
12	***8***	***4***	***0***		
8. Human-Caused Bare Ground					
6	***4***	***2***	***0***		
9. Degree of Artificial Addition/Removal of Water					
9	***6***	***3***	***0***		
			TOTAL		

Health Score = Total actual score/Total possible score = _____

%	0-59	60-79	80-100
	Unhealthy	Healthy With Problems	Healthy

RIPARIAN HEALTH ASSESSMENT - FIELD SHEET

Comments

1. Vegetative Cover of Riparian Area

2. Invasive Plant Species

Canopy Cover

Density Distribution

3. Disturbance - Caused Undesirable Herbaceous Species

4. Preferred Tree and Shrub Establishment and Regeneration

5. Utilization of Preferred Trees and Shrubs

6. Human Alteration of Riparian Area - Vegetation

7. Human Alteration of Riparian Area - Physical

8. Human - caused Bare Ground

9. Degree of Artifical Addition/Removal of Water

Sketch riparian area here

Show photo locations

Fish Collection Data Sheet

Date: _____
Time:_____
Creek name:
_____
Project:
_____

Gear: Type_____
Size_____
Number _____

GPS Waypoint #:_____

Location (UTM): _____

Effort: Elapsed Time _____
Distance/Area_____

Collector (s): _____

Comments_____

Water: Temp./Depth_____/_____
Transparency/colour _____

D.O:_____pH:_____Velocity:_____

Weather: Air Temp:_____°C Wind:_____
Precipitation/cloud cover:_____

Habitat type: *Run* *Riffle* *Pool*

Species	Total Length	Weight	Sex	Anomalies

Species	Total Length	Weight	Sex	Anomalies

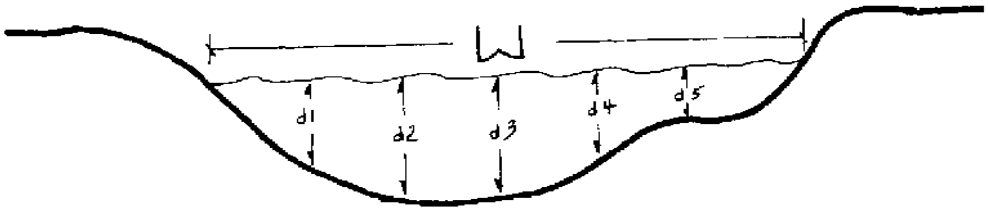
Creek Habitat Assessment

Date:_____Creek Name:_____Time _____
Location/UTM Coordinates:_____GPS Waypoint #:_____
Weather:_____Wind:_____Precipitation:_____Air temp:____
Water Temp:_____(°C) D.O._____pH:_____Water Color: _____
Turbidity *(clear, cloudy, murky)*_____Velocity (cf/s)_____
Visual indicators of water quality *(algal growth, surface scum, odor, foam on surface, etc.)*
_____
Upland Zone Land Use: _____

Channel Habitat Features

Channel Features	Depth (m)	Velocity		
		0.2 X D	0.6 X D	0.8 X D
Left Bank				
Left Centre				
Centre				
Right Centre				
Right Bank				
Stream Width (m)				
Segment Length (m)				

Substrate Composition	%	Embeddedness %
Silt, clay,mud		
sand < 2mm		
gravel 2-64 mm		
cobble 64-256 mm		
boulder > 256 mm		
solid bedrock		
organic		



Cover	Abundant >50%	Moderate 25-50%	Sparse 10-25%	None
Large Woody Debris (>7cm) (*fallen trees, large limbs/logs, root wad)*				
Terrestrial Vegetation (*overhanging)*				
Boudlers *(256mm or 10")*				
Small Organic Debris *(leaf litter, small branches/twigs)*				
Aquatic Vegetation				

Habitat Type	%
Riffle	
Run	
Scour Pool	
Dammed Pool	

Continued on next page

Riparian Zone

Exposed Mineral Soil			
Left Bank		**Right Bank**	
<25%		<25%	
25-50%		25-50%	
50-75%		50-75%	
>75%		>75%	

Bank Slope			
Left Bank		**Right Bank**	
>45 deg.		>45 deg.	
15-45 deg.		15-45 deg.	
<15 deg.		<15 deg.	

Riparian Vegetation Type			
Left Back (meters)		**Right Bank (meters)**	
Tree			
Shrub			
Grass/ Sedge			

Bank Stability			
Left Bank		**Right Bank**	
Stable		Stable	
Unstable		Unstable	

Overhead Canopy (Crown Closure) >0.5 m above water			
Left Bank		**Right Bank**	
0-25%		0-25%	
25-50%		25-50%	
50-75%		50-75%	
75-100%		75-100%	

Notes:

South Saskatchewan River Watershed Stewards

Protection of Your South Saskatchewan River Creeks

What are creeks?

There are many names given for free flowing water through a drainage area into larger river or lake. It has been called a stream, tributary, brook or creek. In Saskatchewan, the majority of them are called creeks. There are approximately 25 creeks in the South Saskatchewan River drainage watershed. These creeks all feed into the Saskatchewan River and eventually feed into Lake Winnipeg. The South Saskatchewan River creeks are very important areas and must be respected and protected.

Why are they important?

Creeks are places of great biodiversity. They help prevent flooding and improve the quality of water before it flows into the South Saskatchewan River. Preserving creeks helps fight climate change by storing carbon. Creeks are home to many animals and provide them with resting, nesting, and feeding places. Plants that grow within and on the edges of creeks strain silt and debris from water and absorb pollutants. Overall, creeks are important for healthy fish populations, and maintaining water quality of the South Saskatchewan River for agriculture use, human consumption, and recreational use.

The creeks and tributaries of the South Saskatchewan River have suitable conditions to support life processes of various fish species. Fish species such as northern pike, walleye, white sucker, yellow perch, and sticklebacks utilize these creeks for spawning and rearing. The health of these fish is in turn dependent on the health of the creeks. Some factors that negatively impact fish habitats in creeks are overhanging culverts, human-modified stream channels, damming, storm water runoff, and soil erosion. Fish are not only important for maintaining a healthy creek ecosystem, but also provide benefits to humans as food sources and recreation.

Water quality within the creeks is important for the many fish species that inhabit these waters and also for the health of plant species along creek vegetation zones. Drinking water has the highest quality when it is free from microbiological, chemical, and physical factors that pollute the streams. Parasites can be transferred into the water through human or animal wastes which also decrease the water quality for human and animal consumption. The quality of water can also be reduced by the unintentional addition of chemicals to the creeks. Runoff of chemicals such as gasoline, oil, pesticides, and waste products may be harmful to both humans and animals that utilize the water for drinking. Physical changes in water quality include changes in color, taste, and odor which can be caused by toxins from blue-green algae (cyanobacteria).

The South Saskatchewan River creeks are important for agriculture uses. Farmers use the creeks and river for irrigation, drinking water for livestock, and recreation. Runoff from fields can affect the water quality of creeks by washing pesticides and fertilizers into the creek from the surrounding field crops.

How to protect them:

There are many ways to protect our creeks and tributaries from the environmental impacts of agricultural practices, landfills, creek impediments, and storm water management. Overhanging culverts interfere with the flow of these creeks and tributaries so it is beneficial to properly install culverts and account for normal fluctuations in water flow. Nutrient loading from runoff into the creek can cause algal blooms to form which can be toxic and reduce water quality. In order to maintain good health of the stream while still applying chemicals to fields, it is important to have a riparian buffer zone. A riparian buffer zone is a vegetated area along the edge of the stream that separates the agricultural zone and the creek. Riparian buffer zones are good for deterring agricultural chemicals and erosion sediment runoff because they physically trap and absorb these pollutants before they enter the stream. Excessive erosion is a concern for creeks because it can destroy the creek bank and add unwanted sediment to the stream.

One method to help reduce erosion, destruction of the stream bank, and unwanted animal wastes from entering the creek is off-site watering. Livestock producers can establish remote watering sites and riparian fencing to encourage their livestock from degrading the creek banks and negatively impacting the water quality.

Landfills can have a significant impact on creeks and tributaries. Water can get released from these sites which can affect the quantity of water that is in the creek as well as the chemical composition of the water. Rain runoff from landfills can also contaminate creeks by transporting chemicals and pollutants into the creek. Waste from landfills can also infiltrate into the groundwater through precipitation and contaminated water. Landowners and farmers can participate in waste management BMPs provided by several agricultural programs.

Buffer zones also help reduce the impacts of storm water on creeks. Stormwater washes a variety of pollutants into creeks and can also cause flooding when the amount of water exceeds what the creek can support. Buffer zones help filter pollutants from runoff and also slow water and increase absorption which helps reduce the risk of flooding.

Agricultural producers, homeowners and urban residents can preserve and protect the creeks by adopting best management practices, such as the ones mentioned above. The South Saskatchewan River creeks are yours to enjoy and protect.

For more creek protection information, please contact:

South Saskatchewan River Watershed Stewards

99A - 2236 Avenue C North

Saskatoon, Saskatchewan

S7L 5X5

Phone: (306)–343-9549

Email: info@southsaskriverstewards.ca

Funding support from the Environment Canada’s Habitat Stewardship Contribution Program