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Pearson Ecological Inc.

Consulting for Conservation

Memorandum

To: Boundary Alliance

From: Mike Pearson

Subject: Habitat assessments of stream and wetland sites in the Gilpin Grasslands, Eholt Creek and the Kettle River

Date: April 27, 2015

Boundary Alliance Members,

On April 9 and 10, 2015 I visited several stream and wetland sites in the Grand Forks and Greenwood areas with some of you to assess current habitat conditions and make recommendations regarding improvements that could be made.

1. Eholt Creek beside Highway 3
2. Kettle River at Spraggett Road
3. Spring on Nature Trust property, Gilpin Grasslands
4. Lost Lake, Gilpin Grasslands
5. Spring/Dugout in Gilpin Grasslands
6. Gilpin Creek at Highway 3

The dominant issues identified are livestock access to the water and immediate riparian areas, lack of native riparian vegetation, and/or manure entering the water. In the case of Gilpin Creek, there is also a concern about fish access to the creek and of a lack of habitat complexity in the channel. Site specific issues will be discussed in the sections (below) that detail each site. To avoid repetition, however, a more general discussion of impacts of livestock access and the importance of a functional riparian zone are discussed briefly first.

The Importance of Riparian Vegetation

Intact riparian habitat with native vegetation maintains the health and integrity of adjacent aquatic habitat. Loss of riparian vegetation contributes to bank erosion, siltation, water temperature elevation, and nutrient inputs, all of which directly degrade instream habitat. In open landscapes, such natural grasslands and agricultural fields, woody vegetation in riparian reserve areas will collect windblown insects (Whitaker et al. 2000). Such insects, falling from riparian vegetation into the water constitute an important food source for drift-feeding fishes in headwater streams (Schlosser 1991; Allan et al. 2003).

Widths of riparian reserve areas required to protect aquatic habitats varies among sites depending upon waterbody type and size, slope and adjacent land use. Reserves must be sufficient to control sediment entry to the stream from overland flow, to prevent excessive bank erosion and to buffer stream temperatures. Reserve areas will also remove significant amounts of nitrate and phosphorous from groundwater, although their efficacy depends strongly on hydrogeologic

conditions (Martin et al. 1999; Wigington et al. 2003; Puckett 2004). The effectiveness of a riparian reserve in preventing materials (sediment, nutrients, toxins, etc.) from entering a stream depends strongly on its longitudinal continuity and its lateral width (Weller et al. 1998; Baker et al. 2006). Consequently, riparian reserves should be continuous and sufficiently wide.

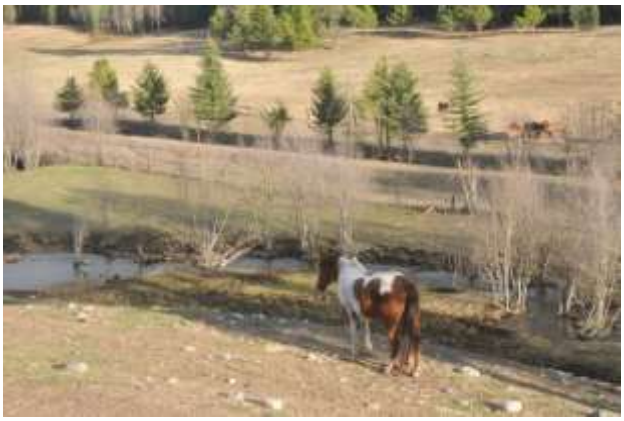
More than 30 m of riparian vegetation may be required for full mitigation of warming (Brown & Krygier 1970; Lynch et al. 1984; Castelle et al. 1994), and siltation (Moring 1982; Davies & Nelson 1994; Kiffney et al. 2003), and for long-term maintenance of channel morphology (Murphy & Koski 1989; Gurnell et al. 2002). At least 10 m are required to maintain levels of terrestrial carbon (i.e., leaf) and food (invertebrate) inputs similar to those of forested landscapes (Culp & Davies 1983). Reserves as narrow as 5 m provide significant protection from bank erosion and sediment deposition from overland flow (Lee et al. 2003; McKergow et al. 2003).

Failure to maintain an adequate riparian reserve is likely to cause population-level impacts for fish, amphibians and other species. In habitats lacking sufficient flow or groundwater, absence of shade may increase water temperatures to harmful levels. Increased erosion due to poorer bank stability will cause sediment deposition in riffles, and impair spawning and incubation. Sediment deposition will also reduce benthic invertebrate production, limiting food availability to fish. Nutrient loading is likely to be higher in reaches without adequate riparian vegetation(Martin et al. 1999; Dhondt et al. 2002) and may contribute to hypoxia (low dissolved oxygen levels) through eutrophication. Solar radiation in nutrient rich reaches lacking adequate riparian shading (Kiffney et al. 2003) will also contribute to eutrophication and hypoxia.

Impacts of Livestock Access

Livestock access to riparian and aquatic area degrades habitat by physically disturbing and compacting soils, by damaging native riparian vegetation, and by nutrient loading through manure deposition (Armour et al. 1991; Platts 1991). These impacts result in increased bank erosion, which results in elevated suspended sediments in the water and deposition on the substrate (Hook 2003; Tufekcioglu et al. 2012). Pools may be filled in and gravel riffles clogged with sediment. Riparian vegetation is typically damaged or destroyed by trampling and grazing, which exacerbates erosion and impairs stream health as described in the preceding section. Manure entry to waterbodies causes eutrophication, an overgrowth of plant material which leads to impaired water quality due to depleted oxygen levels, high nitrate concentrations and high fecal coliform counts (Sunohara et al. 2011).

Site 1: Eholt Creek beside Highway 3



Eholt Creek is a tributary to the Kettle River. The Provincial Fisheries Information Summary System database contains no data on the creek beyond assigning it a watershed code (320-407300-34400). The stream has a natural meander pattern, gravel substrate and perennial flows and the reach would be expected to support trout and a variety of other native fish species, assuming the reach is fish accessible.

Livestock have access to the creek for over 1 km on the property and have caused extensive damage to the banks and riparian area. Some riparian trees and shrubs have survived. The riparian area would likely recover quite quickly if the livestock were fenced out of the creek through its length. Recovery of the aquatic habitat would take longer, but would occur. Recovery would consist of natural flushing of sediment from the gravel bed, deep pool formation as streamflow interacted with accumulated logs and woody debris in the channel and tree-root- stabilized banks.

Recommendations:

1. Install a wildlife friendly fence a minimum of 5 m from the top of each bank for the entire length of the reach. In practice, due to the meander pattern, this will require a corridor of 25-30 m.
2. Install off-channel watering facilities for livestock.
3. Plant the riparian area densely with native trees and shrubs. Pioneer species should be used. These include willows (*Salix* spp.), black cottonwood (*Populus tricocarpa*), red osier dogwood, (*Cornus serice)a*, Oceanspray *(Holodiscus discolor*) blue elderberry (*Sambucus caerulea*).

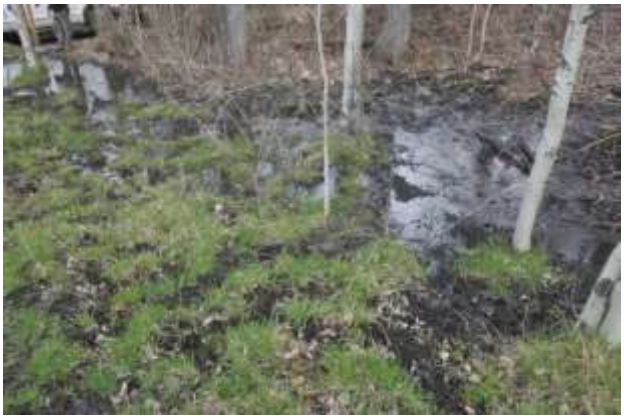
Site 2: Kettle River at Spraggett Road


This site is an unfenced floodplain pasture immediately adjacent to the main stem of the Kettle River. Windrows of uncovered manure piles are located within meters of the top of bank. Manure and nutrients will be entering the river through overland runoff and leaching of nutrients into groundwater. Significant bank erosion is also evident at the site.

Recommendations:

1. Remove all manure piles at least 20 m from the top of bank and tarp them to avoid leaching.
2. If livestock are to be grazed on the field, install a wildlife-friendly fence at least 10 m from the top of bank.
3. Plant native trees and shrubs outside the fence at a density of approximately 4 plants per 10 square meters of area to re-establish a functional riparian area.

Site 3: Spring on Nature Trust property, Gilpin Grasslands

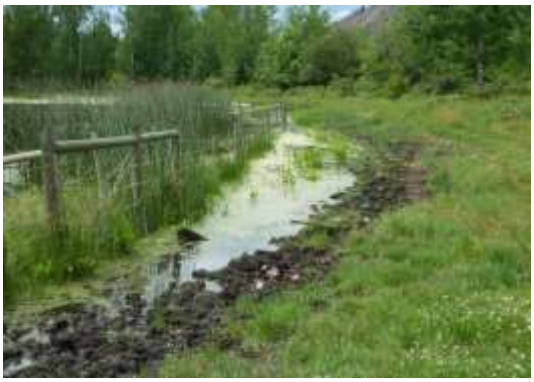
The Nature Trust of BC acquired almost 200 ha of south facing grassland and woodland habitat on the edge of the town of Grand Forks in the early 1970s to preserve important winter range for ungulates. Their land is contiguous with Gilpin Grasslands Provincial Park (est. May 2007)and is managed by the BC Ministry of Forests, Lands, and Natural Resource Operations. Most of the park remains within active range tenure (BC Parks, 2009), and cattle are on typically on the land from May through October.

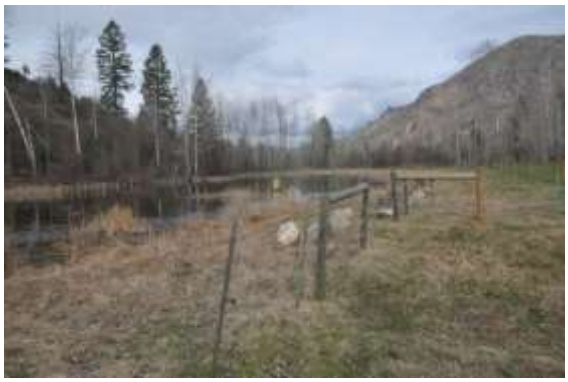
The site of the spring and its outflow channel on the Nature Trust property has been heavily impacted by cattle and off-road vehicle use. Vegetation has been trampled and significant erosion and sediment release has occurred. A small area has been fenced around the actual spring, but the fence is not wildlife-friendly, is compromised by deadfalls, and encircles only a small portion of the wetted area and adjacent riparian zone. Local stewards are working with Nature Trust staff to expand the fencing to enclose the entire riparian area this summer. The area can be expected to recover without much intervention beyond the fencing, as native woody vegetation remains intact. Little, if any planting of riparian trees and shrubs will be necessary.

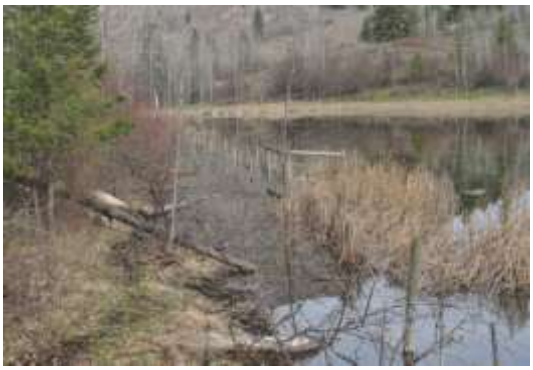
Recommendations:

1. Fence the spring and outflow channel with a setback of at least 5 m from the high water mark, where possible. The proximity of the access road will reduce the distance possible in places.

Site 4: Lost Lake, Gilpin Grasslands







Lost Lake Fencing: As originally installed (left) and with the increased setback (above).

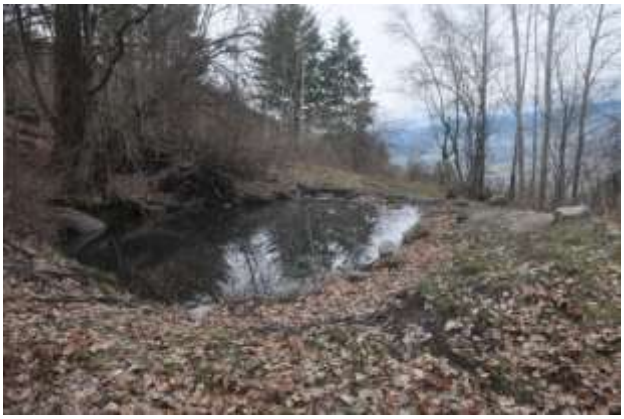
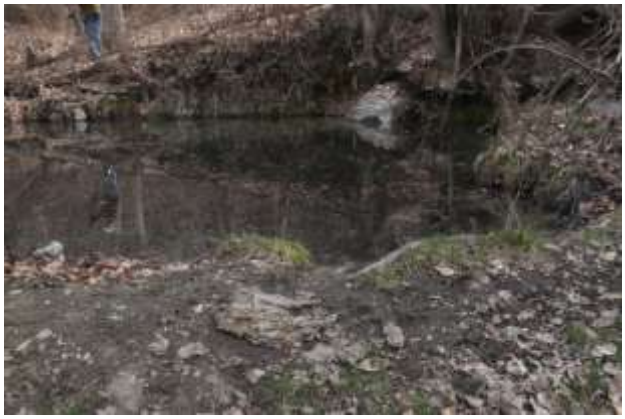
Lost Lake is a perched wetland within the proposed Wildlife Management Area of the Gilpin Grasslands. It was heavily impacted by off-road vehicle 'mud-bogging' and livestock access. The mud-bogging had punched though the clay layer than sealed the wetland, causing it to dewater completely. The substrate was resealed using Bentonite, a livestock fence was installed, and a watering tank for livestock was installed outside the fenced perimeter. Unfortunately the fence is not wildlife-friendly and was located within the wetted perimeter of Lost Lake rather than providing a riparian setback. Local volunteers have replaced part of the fence to increase the setback and facilitate wildlife passage, greatly improving the wetland's

habitat. They hope to move the remainder of the fence out of the water in the future, as continued cattle access is damaging the riparian and shore areas.

Recommendations:

1. Move the remainder of the fence back a minimum of 5 m from the high water mark.
2. Maintain and use the new livestock watering station located outside the fenced perimeter.

Site 5: Cattle Dugout, Gilpin Grasslands

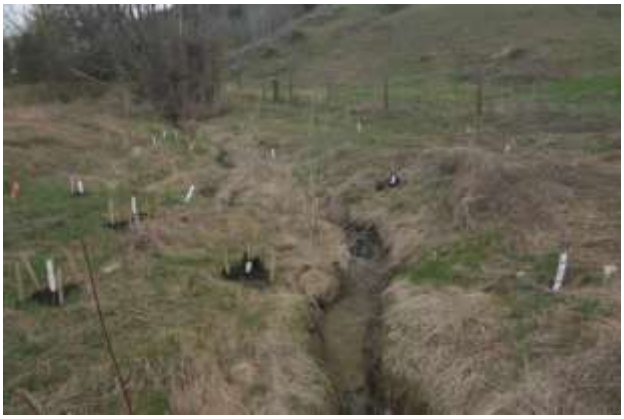
A small pond was created by digging out a spring and using the spoil to create a downslope berm. The riparian area largely denuded of vegetation by cattle and water quality is reportedly severely impaired by fecal contamination the summer months.

Natural water sources are relatively rare in the grassland ecosystem during the dry season and the spring is undoubtedly an important water source for local wildlife.

Recommendations

1. Install wildlife-friendly fencing a minimum of 5 m from the high water mark.
2. Install a gravity-fed livestock watering station downslope of the dugout and outside the fence perimeter.

Site 6: Gilpin Creek at Highway 3



Gilpin Creek drains part of the Provincial Park exiting a steep ravine to flow across a meadow at the original Gilpin Ranch site before crossing under Highway 3 and descending a steep embankment to enter the Kettle River. The Provincial Fisheries Information Summary System database contains no data on the creek beyond assigning it a watershed code (320-192200). Fish are not documented from the creek, but may be present. In general salmonids can negotiate stream slope of up to 20 percent, which is very close to steepest section of channel between Highway 3 and the Kettle River. The culvert under the Highway appears easily passable at the moderate flows observed on April 10, 2015. A second culvert, under the trans-Canada trail is slightly perched and may form a barrier to access.

Upstream of the Highway the stream is of lower gradient, but is confined to a very narrow, fast flowing channel through a meadow. The riparian area here is securely fenced and part of it has been recently planted, primarily with black cottonwood and red osier dogwood. Upstream of the meadow, the creek is unfenced and livestock access has clearly damaged banks and the riparian area. The damage extends through the fenced portion as fine sediments clogging the gravel riffles.

Recommendations

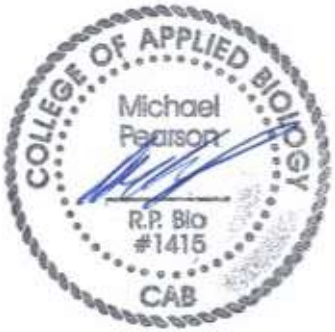
1. Confirm fish presence/absence in Gilpin Creek.
2. If fish are absent, improve fish access by backwatering the perched culvert under the trail. If necessary channel slope in the short distance between the downstream end of the trail culvert and the Kettle River could be reduced by re-aligning the channel to cut across the slope. This will require an engineered design.
3. Improve in-stream fish habitat in the fenced meadow area. This could easily be accomplished by using a very small excavator widen the channel (without deepening it) and by installing logs and other large wood to produce more habitat complexity and cause scouring of deeper pools. One or two small off-channel alcove pools would also benefit fish. A detailed design would need to be developed by a qualified biologist.
4. Extend the fencing to exclude cattle from the full length of the creek.

Conclusions

Six sites, including Eholt Creek, the Kettle River, Gilpin Creek and three wetlands within the Gilpin Grasslands were visited on April 9 and10, 2015. All sites were degraded by livestock access and would benefit greatly from the installation or expansion of wildlife friendly fencing. In some cases remedial riparian planting is also recommended. Provision of water troughs outside the fenced riparian area is recommended for two sites. The fencing will also prevent access from off-road vehicles to the wetland sites. Gilpin Creek has high potential to support salmonids, but fish access from the Kettle River may need to be improved. Enhancement to increase the area and quality of habitat upstream of Highway 3 is also recommended.

Sincerely,

Mike Pearson PhD, RPBio



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