Cows and Fish Report

The Influence of Grazing on Bird Populations along a Prairie Creek in Southern Alberta

Cows and Fish
Alberta Riparian Habitat Management Program Report No. 010

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About Cows and Fish

Riparian areas are those areas along rivers, streams, lakes, wetlands, springs, and ponds that are strongly influenced by water and are recognized by water-loving vegetation. Cows and Fish is striving to foster a better understanding of how riparian areas function and how improvements in management strategies in riparian areas can enhance landscape health and productivity for the benefit of livestock producers, their communities and others who value these landscapes.

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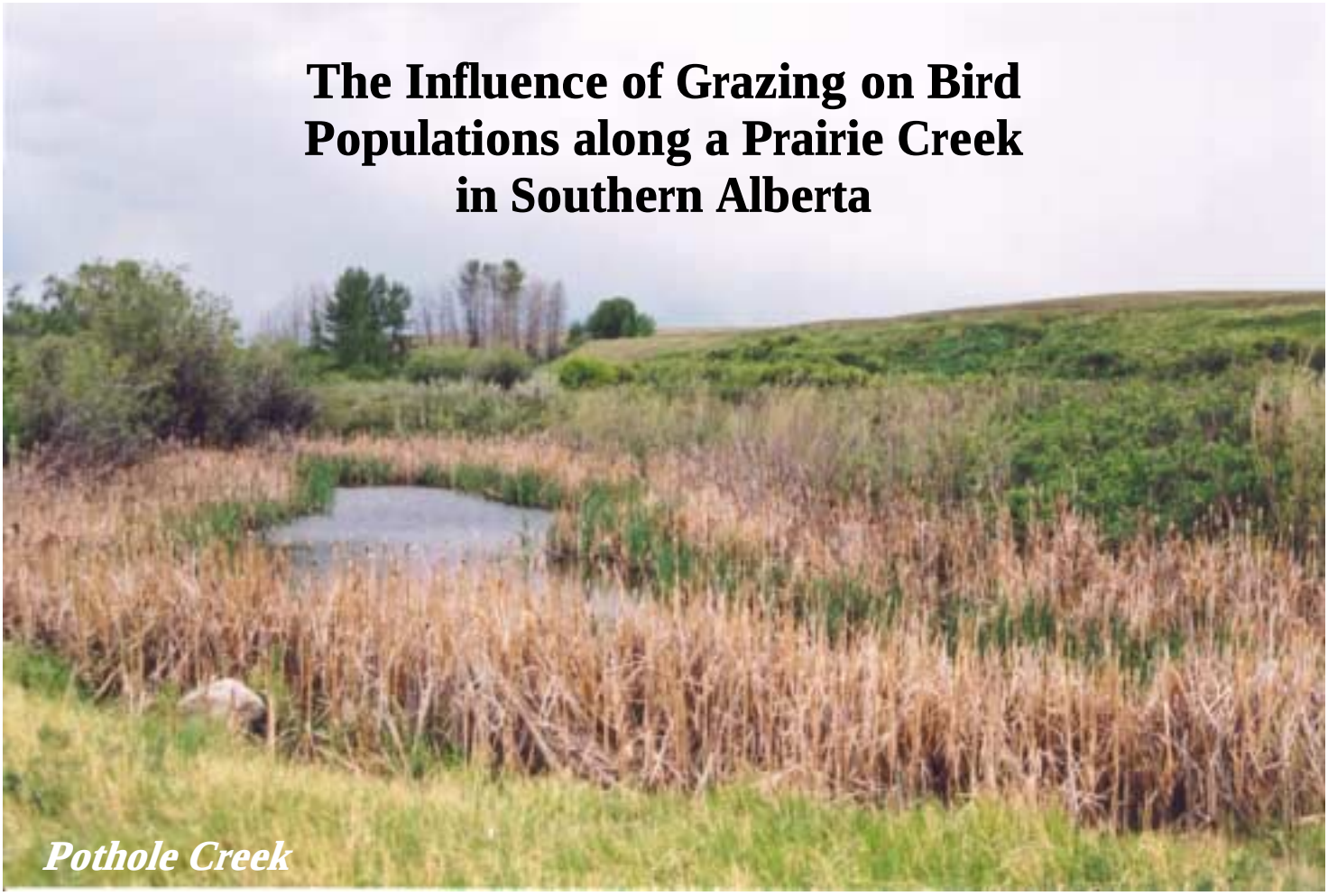

Pothole Creek

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Alberta Environment

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Introduction

Several studies across Northern America have investigated the influence of cattle grazing on birds and vegetation in riparian habitats (Bock et al 1999, Medin and Clary 1991). In southern Alberta such research has been done primarily along larger water bodies such as the Oldman River (Hurly and Saunders 1998, Saunders and Hurly 2000) and Pekisko Creek (Wershler and Smith, 1995). Those studies found that increases in grazing intensity resulted in changes to the vegetation, which in turn caused reduced numbers and species of birds. The purpose of this study was to determine whether the same effect occurs along smaller prairie creeks.

Pothole Creek is a small prairie creek in southern Alberta that flows from the Jensen Reservoir (south of Magrath) northwards into the St. Mary River. The creek valley is classified as an environmentally significant area of regional significance (Cottonwood Consultants 1987). There is a considerable variability in the vegetation along the creek, which is likely a result of both differential human disturbance and changes in geomorphology over the course of the creek. Because of this variability, the study area focused on the southern reach of Pothole Creek, between Highway 5 and the Jensen Reservior (Figure 1).

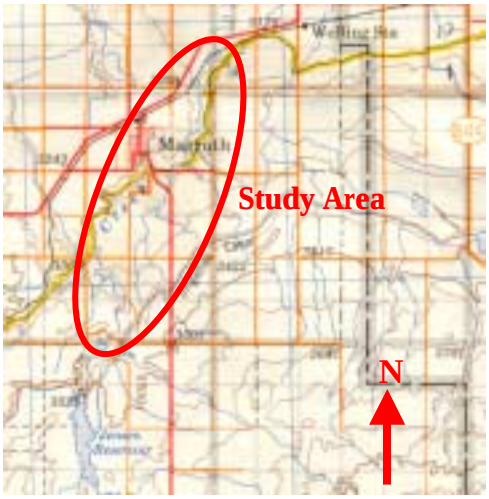


Figure 1: Pothole Creek Study Area

The vegetation along this reach of Pothole Creek is characterized by diverse shrub communities and small woodlands. The dominant shrubs are willow (*Salix* sp.), wolfwillow (*Elaeganus commutata*), wild rose (*Rosa woodsii*), chokecherry (*Prunus virginiana*) and snowberry (*Symphoricarpos occidentalis*). The woodlands are comprised primarily of balsam poplar (*Populus balsamifer*), plains cottonwood (*Populus deltoides*), narrow-leaf cottonwood (*Populus augustifolia*), green ash (*Fraxinus pennsylvanica*), aspen (*Populus tremuloides*) and Manitoba maple (*Acer negundo*). Also within the riparian zone are many small cattail wetlands. The creek itself is lined with sedges, rushes, grasses and cattails.

Within the study area, nine sampling sites were selected. Of these nine sites, three have been ungrazed for at least 30 years, three have been moderately grazed and three have been heavily grazed. The moderately grazed sites are used by relatively small numbers of cattle and/or horses for

only part of the growing season. The heavily grazed sites are used by larger numbers of cattle, on a year round basis. Appendix 1 has a more detailed description of each of the sampling sites. Figure 2 shows the locations of the sampling sites.

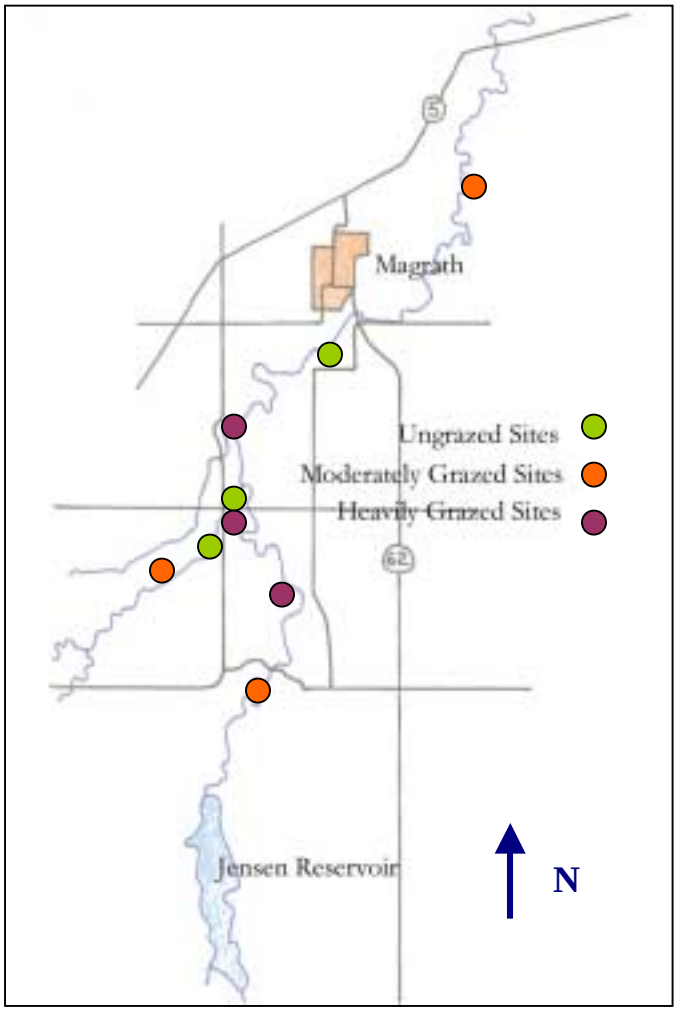


Figure 2: Location of Sampling Sites

Methods

In each site we established two point count circles one hundred meters in diameter. This was the maximum size of count circles considering the width of the riparian habitats along Pothole Creek. Breeding bird surveys were conducted by standing in the middle of a count circle and recording all birds seen and heard during a fifteen minute period. Each count circle was surveyed twice during the breeding season (once during the period June 14th – 16 and once during the period June 22 -June 24th, 2000).

For analysis we took each count circle and examined the data from the two different sampling days and determined the maximum possible number of species and the maximum number of individuals in that circle. That is, if 3 individuals of species A were seen on one day and 5 individuals on the other day, then we counted 5 individuals for species A at that count circle. We then calculated the total number of species and individuals in each count circle. Finally, we calculated the average number of species and average number of individuals across these two circles to represent the value for the site. The non-native species house Sparrows and European starlings were excluded from analysis. Ring-necked pheasants, another non-native species, were included because of their status as an important game species.

To compare the influence of grazing on bird numbers and species richness, we used a one-way ANOVA. Each grazing category, Nil, Moderate and High had 3 replicates (sites). Data are presented as mean ±SE per count circle.

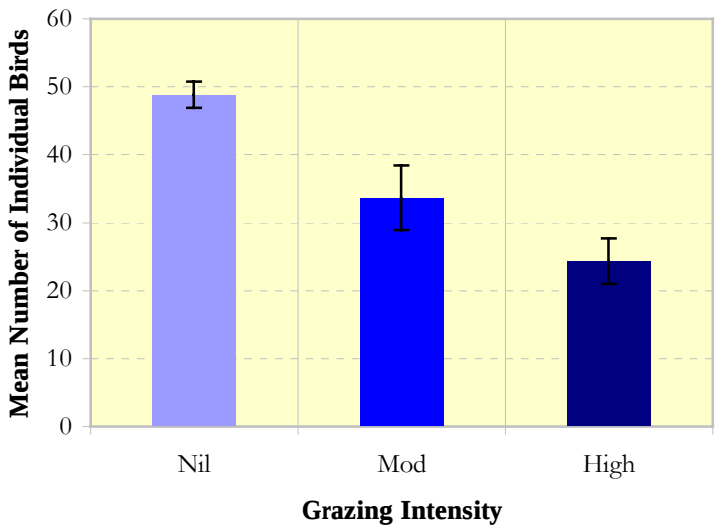
Results

A summary of the bird data by species is given in Appendix 2. A total of 45 species and 668 individual birds was recorded.

Numbers of Birds

We found that the number of individual birds decreased with increased grazing intensity ($F_{2,6}$=12.232, p=0.0076; Figure 3). The ungrazed sites had the highest numbers of birds (48.8 ±1.9 per site). The moderately grazed sites had fewer birds (33.7 ±4.8 per site) and the heavily used sites had fewer still (24.3 ±3.3 per site).

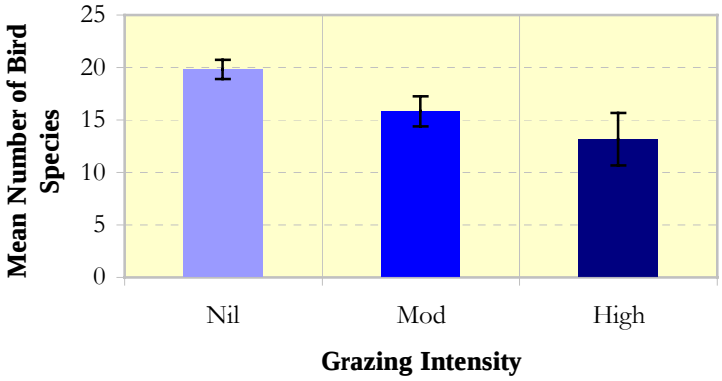
Figure 3: The Number of Individual Birds Decreased with an Increase in Grazing Intensity



Number of Species

The number of species also decreased with intensity of grazing, however the overall analysis is not statistically significant ($F_{2,6}$=3.719, p=0.0890; Figure 4). There was a statistically significant difference between the ungrazed sites and the heavily grazed sites (Fisher's PLSD, p=0.035).

Figure 4: The Number of Species Decreased with an Increase in Grazing Intensity



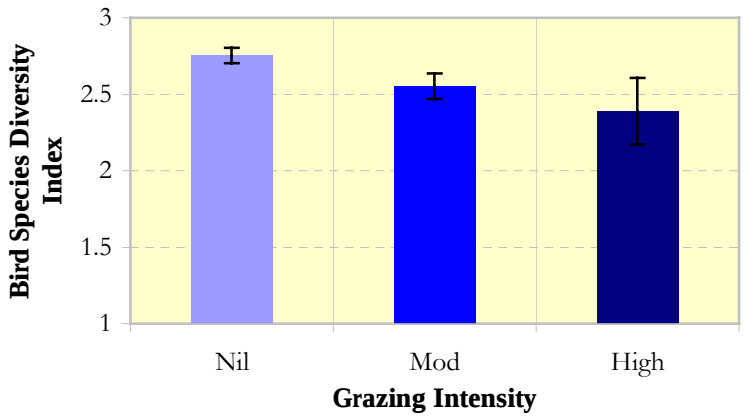
We also examined bird species diversity using the Shannon-Wiener Index:

$$\text{Diversity} = \sum_{I=1}^{N} {}_i p_i \log_e p_i$$

Where N is the number of species and p_i is the proportion of individuals of the i^{th} species.

Again, we found that although the species diversity decreased with intensity of grazing, the overall analysis is not statistically significant ($F_{2,6}$=1.731, p=0.255; Figure 5), probably because of the high variation between the high grazing sites.

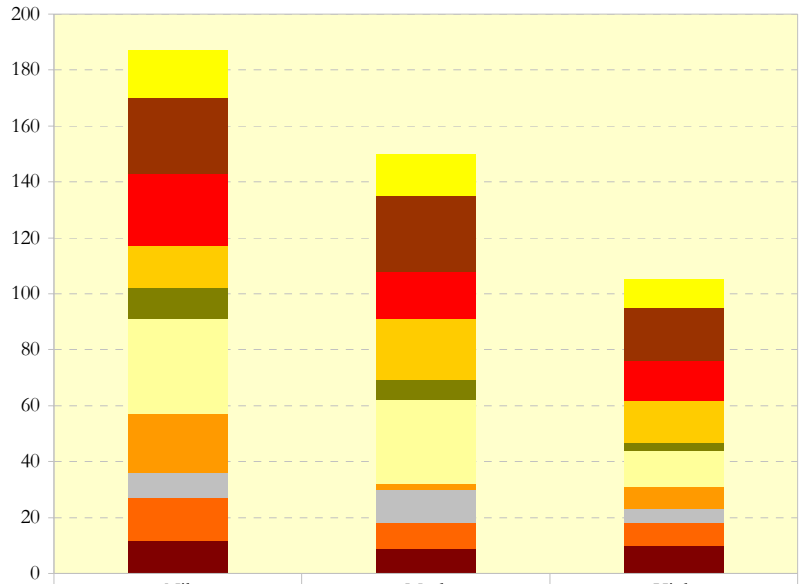
Figure 5: Bird Species Diversity Decreased with an Increase in Grazing Intensity



Native Bird Species

The ten most common native birds species (represented by over 20 individuals) in order of abundance were; yellow warbler, brown-headed cowbird, red-winged blackbird, clay-coloured sparrow, American goldfinch, American robin, cedar waxwing, house wren, gray catbird, and common yellowthroat. Figure 6 shows how these common species varied with grazing intensity.

Figure 6: Results for the Ten Most Common Native Bird Species



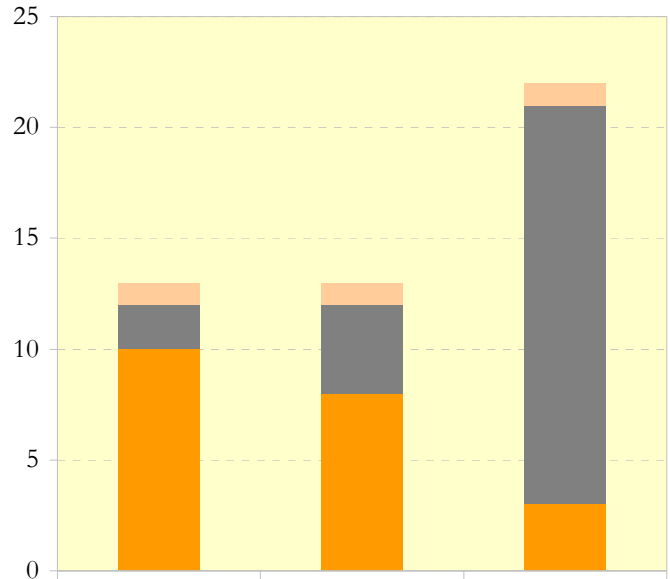
	Nil	Mod	High
American Goldfinch	17	15	10
Brown-headed Cowbird	27	27	19
Red-winged Blackbird	26	17	14
Clay-coloured Sparrow	15	22	15
Common Yellowthroat	11	7	3
Yellow Warbler	34	30	13
Cedar Waxwing	21	2	8
Gray Catbird	9	12	5
American Robin	15	9	8
House Wren	12	9	10

Of these ten common species, those that seemed to decrease in numbers with increased grazing intensity were the American robin, cedar waxwing, yellow warbler, common yellowthroat, red-winged blackbird and American goldfinch. The gray catbird and clay-coloured sparrow were greatest in number in the moderately grazed sites.

Non-native bird species

Non-native birds species recorded in the study were ring-necked pheasant, European starling and House Sparrow. The results for these three species are shown in Figure 7.

Figure 7: Results for Non-native Bird Species



	Nil	Mod	High
House Sparrow	1	1	1
European Starling	2	4	18
Ring-necked Pheasant	10	8	3

As Figure 7 shows, the numbers of ring-necked pheasants decreased with grazing intensity. Very few house sparrows were recorded, only one in each grazing level. Starlings were low in numbers in the ungrazed and moderately grazed sites, but were present in much larger numbers in the heavily used sites.

Discussion and Conclusion

Overall we found that as grazing intensity increased, there was a decrease in both the number of birds using the riparian zone along Pothole Creek and the number of species. Similar to findings along the Oldman River (Hurly and Saunders, 1998) heavily used sites supported about half as many breeding birds as ungrazed sites, with moderately grazed sites falling in between. Although we did not sample vegetation in this study, it is most likely that the differences in bird numbers and species can be explained by vegetation differences caused by cattle grazing.

There were other similarities found between the Oldman River study and the Pothole Creek study. Some bird species reacted in very similar ways to increases in grazing pressure. For example, yellow warblers, western wood pewees and American goldfinches decreased with increase grazing levels in both studies. In addition, the song sparrow, red-winged blackbird, common yellowthroat and tree swallow also appear to be quite sensitive to increased grazing pressure along Pothole Creek. These species were not present in high enough numbers in the Oldman River study to make any comparisons. Another species which appears to be sensitive to grazing pressure is the ring-necked pheasant. The most pheasants were found in the ungrazed sites, slightly fewer in the moderately grazed sites and less than a third as many in the heavily used sites. The results may be of interest to upland game bird managers.

Unlike the Oldman River study, there were no species that were present in large numbers in ungrazed sites but were absent from heavily grazed sites. In the Oldman River study, both the gray catbird and black-capped chickadee were absent from heavily grazed sites. Interestingly, along Pothole Creek there were slightly more catbirds in the moderately grazed sites (12) than the ungrazed sites (9).

Because of the great variability in vegetation along Pothole Creek, some of the recorded differences in sites may relate to the presence or absence of trees. Some sites had quite large groves of trees while others had just a few scattered trees. Two of the heavily used sites had a significant number of trees, despite the trees being heavily browsed. This may explain why some more tree-dependant species were fairly high in numbers in the heavily used sites (e.g. least flycatcher and house wren).

Although there was no vegetation analysis done, casual observation suggests that the vegetation along Pothole Creek is perhaps somewhat more resilient than the cottonwood forest communities along the Oldman River. The heavily grazed sites along Pothole Creek still maintain some shrub cover, small thickets and cattail marshes. The cottonwood forest communities along the Oldman River that were heavily grazed had few, if any, shrubs. It was also observed that where grazed sites contained both upland and riparian areas, the upland areas seemed to be impacted by cattle grazing to a greater degree than the riparian areas. This is possibly because the last few years have been dry, resulting in greater impacts in the drier parts of the range.

Not surprisingly, the areas most heavily impacted by grazing along Pothole Creek were relatively small parcels of land (one quarter section or less). The moderately grazed sites tended to be owned by landowners who owned more extensive tracts of land (a section or more). Presumably in the latter case, the landowner has more opportunities for moving cattle, spreading them out, responding to weather conditions and incorporating rest-rotations into their grazing management.

The ungrazed sites in this study were quite remarkable in their lack of human disturbance and overall riparian health. This was especially true of the two privately owned sites (owned by the same individual). As the photos in Appendix 1 show, in these areas Pothole Creek is lined with cattails, sedges and overhanging grasses. The riparian vegetation is a tangle of shrub thickets, including many willows and other shrub species. These sites not only supported large numbers of breeding birds, but also contained some of the more unusual species such as the sora, alder flycatcher, olive-sided flycatcher and red-eyed vireo.

As an aside, the majority of the beaver activity was seen in the heavily used sites. Very little evidence of beaver was observed in the ungrazed sites. Because the creekside vegetation is so dense, presumably it is much easier for beaver to access trees and move logs in a site where the understory has been removed by cattle grazing.

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Appendix 1 – Descriptions and photos of sites

Ungrazed Sites

1. BMid

This area has not been grazed for at least 30 years. It is not fenced from the road or the surrounding cultivated land. It appears as if there has been no significant human disturbance at this site currently or historically. The site is characterized by many dense willows, other shrubs, clumps of poplar trees and cattail marshes. The western point count circle was in a very wet area with standing water, sedges and willows.

2. BSouth

This area too has not been grazed for at least 30 years, although there was some evidence that a horse had escaped into here from the adjacent land. The site is characterized by thick willows, other shrubs, some poplars and a few cattail marshes.

3. RG

Owned by the Magrath Rod and Gun Club, this site has not been grazed for at least 30 years. There are many dense shrub communities of wolfwillow, chokecherry, snowberry and willow as well as some stands of poplar trees. There is quite a bit of tame grass (primarily smooth brome) at this site and there has been considerable historical disturbance in this area as evidenced by old dumps, building foundations and domestic plants such as caragana and apple. There is a small cattail marsh in the east point count circle.

Moderately Grazed Sites

1. RI

This site is grazed by approximately 24 steers in the spring and summer. The steers have access to an entire half section. A pair of horses is kept in this area year round, but is supplemented with hay. Interestingly, the upland areas look more heavily used than the riparian areas. As well as the creek, cattle also have access to water at a canal and a pond. There are cattle trails through the riparian areas, but there are still many shrubs present (primarily wolfwillow, chokecherry, Saskatoon, golden currant and willows).

2. TH

This site is moderately to lightly grazed by cattle and horses, primarily in the fall. Again, the upland areas look to have been impacted by grazing more than the riparian areas. There are dense shrub communities of willow, wolfwillow, Saskatoon and others as well as some poplars and green ash. There are no cattail marshes at this site compared to those further upstream.

3. TA

Used for spring calving, this site appears moderately grazed. The cattle had been moved out of the area by early June. As the cows are supplemented with hay, there was a heavily impacted area where they are fed and the impact was considerably lower in the rest of the site. There are quite a few shrubs at this site, primarily wolfwillow, willows and rose.

Heavily Grazed Sites

1. ST

This site is about 100 acres in total and is grazed year round by approximately 30 cattle. Most of the 100 acres is riparian. There are obvious impacts such as eroding creek banks and few shrubs. There are quite a few poplar groves at this site, but there is no shrub understorey. This land is used by a renter, not the landowner.

2. SB

This site too is used by cattle almost year-round. This spring there were approximately 30 cow-calf pairs using the site. The cattle have access to about 80 acres including both riparian and upland areas. The riparian and upland areas are heavily impacted by grazing, but it looks as if the grazing intensity has increased over the past few years. There are quite a few poplar trees, but they are heavily browsed and the shrub understory is limited. Surprisingly, the cattail marshes appear relatively undisturbed by cattle.

3. ZS

This site has been heavily grazed in the past, to the point of removing most of the trees and shrubs. It is now primarily dominated by tame grasses with some wolfwillow thickets and the occasional heavily browsed willow.

Appendix 2 – Bird Results

	Nil	Mod	High	Total
Mallard	0	1	0	1
Blue-winged Teal	1	1	0	2
Northern Harrier	1	1	0	2
Swainson's Hawk	0	0	0	0
Red-tailed Hawk	1	0	1	2
American Kestrel	1	1	0	2
Ring-necked Pheasant	10	8	3	21
Spotted Sandpiper	2	2	1	5
Common Snipe	5	1	2	8
Sora	1	0	0	1
Mourning Dove	9	3	4	16
Downy Woodpecker	0	0	1	1
Northern Flicker	1	0	0	1
Alder Flycatcher	1	1	0	2
Olive-sided Flycatcher	1	0	0	1
Western Wood Pewee	8	3	3	14
Least Flycatcher	11	1	6	18
Western Kingbird	2	0	0	2
Eastern Kingbird	7	7	4	18
Tree Swallow	11	1	3	15
N. Rough-winged Swallow	2	0	0	2
Barn Swallow	1	0	0	1
Black-billed Magpie	6	7	3	16
American Crow	0	5	0	5
Black-capped Chickadee	0	0	2	2
House Wren	12	9	10	31
American Robin	15	9	8	32
Gray Catbird	9	12	5	26
Brown Thrasher	1	1	0	2
Cedar Waxwing	21	2	8	31
European Starling	2	4	18	24
Warbling Vireo	3	1	3	7
Red-eyed Vireo	1	0	0	1
Yellow Warbler	34	30	13	77
Common Yellowthroat	11	7	3	21
Clay-coloured Sparrow	15	22	15	52
Vesper Sparrow	0	0	1	1
Song Sparrow	8	4	1	13
Red-winged Blackbird	26	17	14	57
Yellow-headed Blackbird	7	0	2	9
Western Meadowlark	1	0	0	1
Brown-headed Cowbird	27	27	19	73
Baltimore Oriole	3	3	1	7
American Goldfinch	17	15	10	42
House Sparrow	1	1	1	3
Total Individuals	296	207	165	668
Total Species	39	31	29	45