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[REDACTED]
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Re: Morrin Bridge-Red Deer River Wildlife Investigations

Introduction

The Morrin Bridge, which spans the Red Deer River along Highway 27 approximately 25 km northwest of Drumheller, is scheduled for replacement. Currently, it is undecided whether the entire bridge structure (piers and bridge deck) will be replaced or if the existing piers will support a new bridge deck. If new piers are required, then the new bridge structure will be built approximately 30 m upstream of the current bridge location.

As part of the permitting requirements for this construction project, Spencer Environmental Management Services Ltd. conducted wildlife surveys in the Red Deer River valley in an area centered on the bridge site. Those surveys concentrated on avian and amphibian surveys, large mammal movement corridors and wildlife-habitat relationships. This work is being done in conjunction with the fisheries surveys and relevant water/fish-based permitting requirements being carried out at the same site by Pisces Environmental Consulting Services Ltd.

Study Objectives

The objectives of this environmental assessment were to:

- Review existing environmental information as well as recent aerial photographs of the study area.
- Review wildlife collision data for the Morrin Bridge area.
- Conduct wildlife investigations, focusing on available habitat, habitat use and regional wildlife movement corridors.

- Determine if there are any wildlife species listed under the federal government's *Species at-Risk Act* that could be affected by the project through a review of the Fish and Wildlife Management Information System.
- Prepare a draft report which will map and describe existing conditions, potential impacts associated with bridge design and construction, appropriate mitigation measures for any potential environmental impacts and identify any environmental permitting requirements.

Study Area

A study area was chosen to reflect the diversity of wildlife habitats in the region immediately surrounding the Morrin Bridge. The study area is approximately 423 m long and 284 m wide and covers an area 12.0 ha (29.6 acres) in size along both sides of the Red Deer River.

The study area is located within the Northern Fescue Natural Subregion of the Grassland Natural Region (Natural Regions Committee 2006). It is a region which serves as a transition between the warmer and drier Dry Mixedgrass Natural Subregion and the cooler and wetter Central Parkland Natural Subregion.

The river valley surrounding the study area is characterized by a mix of natural and anthropogenic features. The natural features include the 90 m wide Red Deer River, the steep badland topography which forms the walls of the river valley and the flat lands between these two features, either alluvial terraces or flood plain terraces. The human features include the Morrin Bridge, Highway 27 which crosses the river valley at the bridge site, the Starland Recreation Area (for picnicking), two gravel roads and two informal but well-used truck tracks.

Assessment Methods

Aerial Photograph Analysis

Air photos were used for delineation of the study area boundaries, habitat mapping and analysis of ecological connectivity and wildlife corridors. The main air photo used to produce the wildlife habitat map was a black and white, 1:5000 photo taken on 22 May 2000 (Photo ID: AS5104, #303).

Review of Existing Information

A literature review was done for existing information on the Red Deer River, Tolman badlands, and riparian ecosystems of central Alberta. Wildlife collision data were obtained from Alberta Infrastructure and Transportation.

Site Investigations

Two trips were made to the Morrin Bridge site. The first was on 10 May 2007, for the purpose of doing evening amphibian surveys and general site reconnaissance. A second trip was made on 5 June 2007, to do early morning breeding bird surveys, habitat mapping, record wildlife tracks and take photos of the site.

Amphibian Surveys

Breeding amphibian surveys conducted on the evening of 26 April 2007 following standard Alberta Volunteer Amphibian Monitoring Program protocol (Alberta Conservation Association 2006).

- Surveys were begun no earlier than approximately 30 minutes after sunset.
- Surveys were not conducted when wind speeds are higher than level 3 on the Beaufort wind scale and temperatures are at least 5-10°C at the time of the survey.
- All individual frogs and toads heard calling during a five minutes period were recorded.
- A time period of at least two minutes was permitted to elapse between arrival at the survey location and the beginning of the survey, to allow the animals to resume their normal behaviour after being potentially disrupted by the arrival of the surveyor.

Breeding Bird Surveys

Breeding bird surveys were done according to widely accepted protocols for point count surveys:

- Surveys were conducted between one half hour before sunrise and 10:00 a.m. from late May to the end of June and surveys were done only during periods of good weather with low winds.
- All birds within a 100m radius count circle were recorded during an eight minute count period.
- All birds heard or seen within the count circle were recorded on data sheets, with locations marked so as to minimize the possibility of counting one individual multiple times.

Additional information was recorded while walking through the study area while doing habitat mapping and taking photos. This included informal wildlife observations, looking for wildlife tracks, pellets, nests and evidence of browsing activity.

Study Limitations

Site investigations were restricted to two visits. Additional visits during the early spring and the late spring/early summer seasons may have provided additional information regarding amphibian and bird populations.

Existing Conditions

Regionally Sensitive Natural Features

The study area lies within Tolman Badlands, which are a significant environmental area of provincial importance (Sweetgrass Consultants 1997). It is considered a significant natural area for the following reasons:

- The badlands are part of the most spectacular canyon in the Aspen Parkland/Fescue Grassland natural regions of Alberta.
- It includes some of the most diverse valley habitats in Alberta.
- The very diverse valley habitats range from badlands, grasslands, sagebrush flats and shrub communities to riparian poplar woods.
- There is a high diversity of breeding birds.
- Several rare or uncommon avian species can be found within the Tolman Badlands, including Black-and-White Warblers, Brewer's Sparrows, Pileated Woodpeckers and Loggerhead Shrikes.
- The badlands are prime nesting habitats for several birds of prey, including the Turkey Vulture, Merlin, Ferruginous Hawk and Prairie Falcon (and the latter two are COSEWIC Species of Concern).
- There is important habitat for ungulates such as Mule Deer and Pronghorn.
- Historically, the Tolman Badlands were a Peregrine Falcon nesting area.

It is believed that, due to cattle grazing and cultivation on river valley bottomlands, that riparian habitats within semi-arid regions of the world will become extinct by the end of the 21st century (Wallis 1991).

Wildlife Habitats

Wildlife habitats around the Morrin Bridge were delineated according to a slightly modified version of the plant communities described for the Lower Red Deer River by Marken (1993). Seven main habitat types were found within the study area (Figure 1). (Plant names are provided in Appendix A)

Sandbar Willow/Mixed Grass

This is a very dense shrub community comprised mainly of sandbar willow (1.5 m – 2.0 m tall) found along the Red Deer River shoreline (Plate 1). Other shrubs found in this habitat include small numbers of silverberry, snowberry, rose and other willow species. Grasses form a significant component of this habitat, including slender wheatgrass, foxtail barley, awnless brome and bluejoint. There are very few forbs in this habitat due to the annual flooding of the river which deposits a layer of silt during every snowmelt season.

Plains Cottonwood/Willow

This tree/tall shrub community is found parallel to the river, adjacent to the Sandbar Willow-Mixed Grass community (Plate 2). The tree strata is dominated by a relatively open canopy of plains cottonwood 10 m to 12 m tall. The very dense tall (2 m – 3 m) shrub layer is composed of a variety of willow species, principally sandbar willow. The low shrub layer (0.5 m to 1.5 m) is composed of dense patches of red-osier dogwood with some patches of rose, snowberry and silverberry.

(The tree canopy in the riparian forests along this stretch of the Red Deer River valley are most likely hybrid poplars: Plains Cottonwood (*Populus deltoides*) X Balsam Poplar (*P. balsamifera*) (Kondla 1977). They will be referred to hereafter as Plains Cottonwood).

Chokecherry/Snowberry

This habitat is a transitional plant community between the Plains Cottonwood/Willow community on lower areas closer to the river and the Dry Grassland community further from the river. It is characterized by an extremely dense shrub layer composed of tall chokecherry (1.0 m to 2.0 m) and snowberry and smaller numbers of rose, silverberry and willow (Plate 3). Scattered dense patches of grasses in this habitat, where there openings exist in the shrub layer, include slender wheatgrass and awnless brome.

Dry Grassland

This habitat is located on dry, level ground as a transitional vegetation zone between the Chokecherry/Snowberry community and the extreme badland topography further from the river (Plate 4). It is dominated by grasses (slender wheatgrass, rough fescue, bluegrass) with a low forb layer of avens, antennaria, field mouse-ear chickweed, yarrow, creamy peavine, rose and pasture sagewort.

Mesic Grassland

This habitat is located in two main areas: along the top of the escarpment on the west side of the river and in the large open field to the east of the river. On the eastern side of the river, this habitat is dominated by a dense layer of grasses (mainly bluejoint and june grass) and scattered thick patches of low (0.5 m to 1.0 m) snowberry (Plate 5). There are occasional tall pin cherry shrubs and pasture sage and a few low forbs such as creamy peavine, currant and yarrow. On the western side, it is a narrow habitat that is dominated by very dense grass (bluejoint and june grass) with some tall carragana shrubs and a few 6 m tall Manitoba maple trees (Plate 6).

Non-native Grassland

This is a planted community found on the roadside berms (see Plate 3). On the north-facing berms, there is a dense layer of grass (mainly marsh reed grass) with some forbs; dandelion, clover.

Agricultural Field

The agricultural fields on the west side of the river have either been planted to clover, with a significant component of weed species such as dandelion, or have been left fallow from the crops planted the previous year (Plate 7). The clover field forms a dense vegetative cover while the fallow field is open with patches of invasive grasses and scattered tall weeds, such as stinkweed and dandelion.

Three other habitats are found within, or adjacent to, the study area.

Incised Stream

There is one small, deeply incised stream which drains from the badlands into the Red Deer River adjacent to the bridge. It varies in width from 1.0 – 2.5 m and in depth from 0.5 – 2.5 m (Plate 8). By early June, there was still flowing water in the stream but it probably dries up by late summer.

There is very little vegetation within the stream channel as the sides and bottom of the channel are composed of highly erodable clays and glacial till.

River Shoreline

The shoreline of the Red Deer River is under water during the spring season and while drier during the summer months, would be covered by a fairly dense layer of common scouring-rush and grass.

Badlands

The badland topography at this site was described by Wells and Bentz (1993) as an assemblage of very steep (45-100%), dissected landforms interspersed with small areas of almost level (2-5%) slopes on rapidly drained orthic regosols and rego dark-brown chernozems (Plates 9 and 10). Vegetation on this landform is sparse and composed of slender wheatgrass, rough fescue, pasture sagewort and cushion cactus.

Wildlife

Herpetofauna

At Site A1 (see Figure 1), 10 Boreal Chorus Frogs and 1 Canadian Toad were recorded during the Amphibian Surveys but all of them were located in a small wet area at the base of the badlands topography approximately 230 m west of the survey site. No amphibians were recorded near Sites A1 or A2 during formal survey periods nor were any amphibians heard anywhere else in or near the study area site during either site visit.

The incised stream habitat does not have any aquatic vegetation or any deep pools so it is unlikely that it is suitable habitat for any amphibian species. The Northern Leopard Frog was previously present throughout the entire Red Deer River valley but is now only rarely found upstream of Drumheller (PBRERC 2000).

There are no other wetlands within or adjacent to the study area although some small remnant wet areas are present in the Sandbar Willow/Mixed Grass habitat immediately following spring melt water floods. The amphibian surveys were conducted during the time of floodwater recession and no amphibians were recorded in this habitat.

One Wandering Garter Snake was observed in the Chokecherry/Snowberry habitat.

A list of all herpetofauna which could potentially be found in the study area is listed in Appendix B.

Avifauna

Forty species of birds were recorded in and around the study area, during both breeding bird surveys and while other field work was being done. The breeding bird surveys (Table 1) indicate that the highest levels of avian densities were around surveys sites 1 and 2 (see Figure 1). Both of these sites were located on the east side of the river in areas where five different habitat types were located within the 100 m count circle. It was not possible to have a single habitat within the count circle owing to the narrow nature of the

habitats along the river. However, this also indicates that the high levels of avian biodiversity are achieved in the relatively undisturbed riparian habitats.

Table 1. Breeding bird densities (pairs/ha) in the study area

Common Name	Site 1	Site 2	Site 3
American Crow	1 (0.3)*		
American Goldfinch		1 (0.3)	
American Robin		1 (0.3)	
Baltimore Oriole	1 (0.3)		
Black-billed Magpie			1 (0.3)
Brown Thrasher		1 (0.3)	
Brown-headed Cowbird			1 (0.3)
Clay-colored Sparrow	1 (0.6)	1 (0.3)	2 (0.6)
Common Yellowthroat	1 (0.3)		
Eastern Kingbird	1 (0.6)	1 (0.3)	
European Starling	2 (0.6)	2 (0.6)	2 (0.6)
Gray Catbird	1 (0.3)	1 (0.3)	
Least Flycatcher	1 (0.3)	3 (0.9)	
Northern Flicker	1 (0.3)		
Red-eyed Vireo	1 (0.3)	1 (0.3)	
Spotted Towhee	1 (0.3)	1 (0.3)	
Tree Swallow	1 (0.3)		
Veery	1 (0.3)		
Western Meadowlark			1 (0.3)
Yellow Warbler	3 (0.9)	5 (1.6)	1 (0.3)
Total	19 (6.0)	18 (5.7)	8 (2.5)

* = numbers are number of singing males recorded within count circle and, in brackets, breeding density.

Survey site 3 (on the west side of the river) was also located near several undisturbed habitat types but the count circle was dominated by the agricultural fields. Breeding bird densities at this site were less than half the densities recorded on the east side of the river.

The habitat with the highest bird diversity was the Plains Cottonwood/Willow habitat with 25 species (Appendix C). This is due to that habitat having the most physiognomically complex vegetation structure, with medium and tall shrub layers as well as a tall tree canopy. The next most important habitat in terms of avian diversity was the Chokecherry/Snowberry community (with 12 species), a habitat with very dense shrub cover for both feeding and nesting. Bird diversity among the remaining habitat types varied between 4 and 8 species.

Because only one site visit was possible during the breeding season, an analysis was done of existing information to determine which other bird species should be present in the

study area. There are 36 additional bird species which may be found in the area around the Morrin Bridge, and these species and their likely habitat affiliations are provided in Appendix D. This analysis re-emphasizes the importance of the Plains Cottonwood/Willow habitat (with 14 additional species) but also illustrates the higher number of species likely found in the Dry Grassland habitat (17 additional species).

Combining the total of recorded and expected bird species indicates that the most important habitats in the study area are the Plains Cottonwood/Willow (39 species), Dry Grassland (25 species) and Chokecherry/Snowberry (21 species) habitats.

The wide variety of habitats within the Red Deer River valley are highly productive for breeding and migrating birds, with approximately three-quarters of the bird species in the Grassland Natural Region of Alberta using riparian habitats during some part of their life-cycle (Wallis 1982).

In addition, the tall/medium shrub habitats and tree habitats along the river valley comprise important winter cover for game birds such as Sharp-tailed Grouse, Ring-necked Pheasant and Grey Partridge (PBRERC 2000).

Conservation of the diverse bird populations will require preserving a mosaic of upland and riparian habitats, especially in areas that are also used for agriculture (Kantrud and Kologiski 1982). This is especially true for some of the threatened or rare species that have traditionally been found in the Red Deer River valley, eg., Ferruginous Hawk, Burrowing Owl and Baird's Sparrow (Wallis 1991).

Two raptor species which were not recorded in the study area but possibly might be present include the Turkey Vulture, which nests in Dry Island Buffalo Jump Provincial Park 32 km north of the Morrin Bridge, and the Peregrine Falcon, a Schedule 1 (Threatened) species under the Species At Risk Act, which was being re-introduced to the Red Deer River valley around the Content and Morrin Bridges (PBRERC 2000).

Mammals

Only three identified mammal species were recorded in the study area. Mule Deer were seen feeding in the grasslands and agricultural fields and it is likely the tracks of this species that were recorded along the river bank, under the bridge. Beaver were seen swimming in the river around the bridge and beaver sign, in the form of old and recent cut trees and shrubs as well as log drags, were found along both sides of the river. And Nuttall's Cottontail rabbits are common in the Chokecherry/Snowberry habitat, especially near the Starland Recreation site.

Other mammals that were recorded but not identified to species included bats, which were flying over the open grasslands and along the river, ground squirrels, which were heard calling in the denser patches of vegetation in the dry and mesic grasslands, and canid species, whose tracks were common along the riverbank, under the bridge and along the badlands adjacent to the dry grasslands. Judging by the size of the canid tracks, both Coyotes and Red Fox are present in the study area.

The most numerous furbearers in the Red Deer River valley in this region are beavers and coyotes (PBRERC 2000.)

According to Pattie and Fisher (1999), there are 45 mammal species which may occur within the study area (Appendix E), a list which includes 19 small mammals, 8 bats, 4 ungulates and 8 predatory species.

The most important habitats for mammals in the study area, based on published habitat preferences, are the Plains Cottonwood/Willow, Dry Grassland and Mesic Grassland habitats (Appendix E) with between 23 and 27 species. The two grassland habitats provide suitable habitat for a combined 30 species, which represents 67% of all mammal species potentially occurring in and around the study area.

The diversity of habitats within the Red Deer River valley is important for a number of mammal species. Deer and Pronghorn use the river valley as wintering habitat (Wallis 1991) with Mule Deer having higher densities (18 deer/mi²) in this region of the Red Deer River than White-tailed Deer (at 0.5 deer/mi²) (PBRERC 2000).

Fish and Wildlife Management Information System (FWMIS)

A search of the FWMIS database resulted in no records of rare or sensitive wildlife specific to the project site (FWMIS 2007). However, there are several older records of Prairie Falcons nesting in the general vicinity of the study area (Ed Hofman, *pers. comm.*).

Special Status Species

The population status of the Canadian Toad in Alberta is currently “Data Deficient” because there is not enough information to accurately assess its status in the province. However, this species was widespread in the eastern half of Alberta with some records for the Morrin Bridge region prior to 1970 (Hamilton et. al. 1998). No Canadian Toads have been reported in the region since 1970 although information on this species in Alberta is scarce (Hamilton et. al. 1998).

No Northern Leopard Frogs were recorded in the study area. This species, which has been designated as a threatened species by Alberta's Endangered Species Conservation Committee (i.e., a species which is likely to become endangered if limiting factors are not reversed) was recorded in the Drumheller region prior to 1981 (Alberta Sustainable Resource Development 2003). However, the 2000-2001 Alberta Northern Leopard Frog Inventory found no individuals in the Morrin Bridge region or along the Red Deer River upstream of Drumheller (Kendell 2002).

The Prairie Rattlesnake has been recorded twice in the Red Deer River valley in central Alberta: near the bridge in Drumheller (1957) and near Trochu (1943) (Watson and Russell 1997). Designated as a May be At Risk species under the Alberta Wildlife Act, the Prairie Rattlesnake has not been recorded in the region of the Morrin Bridge in the last 50 years although there is suitable habitat within and around the study area.

Seven bird species have been designated as Special Status Species. Under Alberta Provincial Status, the Baltimore Oriole, Least Flycatcher, Northern Harrier and Prairie Falcon have been designated as Sensitive Species. In addition, the Prairie Falcon has also been designated a species of Special Concern, through according to COSEWIC, is not currently an At Risk species.

A single Prairie Falcon flew over the study area during one of the site visits. The badlands surrounding the Morrin Bridge site contain several instances of near-vertical topography, which indicates that there is a high probability of suitable nesting habitat in the near vicinity.

The other three Special Status bird species are the European Starling, Ring-necked Pheasant and Rock Pigeon, all of which are non-native, exotic species.

Eight mammal species have been designated as Special Status Species. Under Alberta Provincial Status, the Western Small-footed Bat, Silver-haired Bat, Red Bat, Hoary Bat, American Badger and Pronghorn have been designated as Sensitive Species. In addition, the Northern Bat and Long-tailed Weasel have been designated as species which may be at risk.

Wildlife Collisions

Only two vehicle-wildlife collisions have been reported for the Morrin Bridge area (T. Peters, *pers. comm.*). The first occurred on 30 Nov 2002, approximately 100 m west of the west end of the bridge. The second occurred on 14 June 2005, approximately 200 m west of the west end of the bridge. The numerous deer tracks and other deer signs recorded in the Red Deer River valley around the Morrin Bridge, coupled with the low number of reported wildlife collisions in that area, likely indicate that the current bridge structure is amenable to wildlife passage along the valley. This supposition is reinforced by the large number of deer tracks recorded along the riverbank underneath the bridge.

Ecological Connectivity

Ecological connectivity/linkages are important for several reasons. They allow for nutrient circulation between ecosystems, genetic exchange for animals and plants and animal movement between patches of required habitat. Wide-ranging species that would be common in the Morrin Bridge area, such as Mule Deer (*Odocoileus hemionus*) and Coyotes (*Canis latrans*), need functional linkages between essential habitats to satisfy all life-stage requirements including food, cover, shelter and reproduction (i.e., access to potential mates). Smaller, but still highly-mobile animals like songbirds, utilize such corridors to move between areas of suitable habitat. Fragmented landscapes with large open areas and extensively developed lands are deterrents to many of these species, limiting their ability to move from one habitat patch to the next. For plants, proximity and the presence of the appropriate seed dispersal vectors are important to functional ecological linkages and connectivity.

Ecological corridors can be evaluated from the perspective of how they function to facilitate wildlife movement or how they facilitate maintenance of ecological function at

the habitat patches they connect. The following addresses both aspects of the environment around the Morrin Bridge site.

We qualitatively evaluated both the physical and functional aspects of connectivity between the bridge site and the surrounding habitat and river valley, based on physical proximity and consideration of existing and future barriers. We defined a major wildlife corridor as one which was capable of supporting ecological functions in general and could be used for movement by a broad suite of wildlife species. This latter characteristic was evaluated on the basis of:

- the presence of sufficient cover in the form of vegetation or terrain to provide security cover for larger species;
- being sufficiently wide and continuous to offer security and other life requirements (e.g., food, water, shelter) for mid- to large animals while moving through them; or
- the presence of a consistent hydrological linkage.

We defined minor corridors as those that offered cover and continuity as above, but to a limited degree. Minor corridors support ecological function but support movement for a smaller suite of wildlife species, typically smaller animals.

Major wildlife corridors around the study area can be viewed at two different scales. On a large scale, the Red Deer River valley itself is a regionally important wildlife corridor. The land surrounding the river valley is a mosaic of croplands which are heavily disturbed areas that do not function well as wildlife habitat, especially for many bird species and for smaller mammals. The relatively undisturbed nature of much of the river valley, coupled with a lack of fencing, permits easy movement for all wildlife species, the only significant barrier being the river itself.

On a smaller scale, the variety of habitats surrounding the study area support relatively unrestricted wildlife movement within the river valley. As indicated in Figure 2, tree- and shrub-dominated habitats are found adjacent to the river with grassland and open field habitats further back from the river. These habitats are fairly contiguous, ending where the Red Deer River comes into contact with the badland topography along the valley sides.

The main barrier to movement along the river valley would be Highway 27, which crosses the entire valley. For some species, the very steep terrain of the badlands which form the valley walls (see Plates 9 and 10) would be a topographic barrier inhibiting movement in and out of the river valley and would serve to restrict those species along the valley bottom.

Although the environment within the study area (a natural/agricultural landscape) is partially fragmented, the current habitat matrix of the site is relatively permeable to wildlife. Vegetation cover in the treed and shrubby habitats is continuous except where it is broken by the highway. This habitat break is 29 m wide on the east side of the river and

22 m wide on the west side and is thus, not a significant habitat break for highly mobile species such as birds.

The number of deer and coyote tracks along the highway embankment indicate that Highway 27 is not a significant barrier to the movement of some mammal species. And the presence of fairly continuous Sandbar Willow/Mixed Grass habitat under the Morrin Bridge is conducive to wildlife movement as evidenced by the number of cervid and canid tracks under that structure.

Under the east end of the bridge, the natural habitat has been fragmented by informal vehicle trails (see Plate 11) although some habitat remains which connects the undisturbed habitat both upstream and downstream of the bridge (see Plate 12). The Sandbar Willow/Mixed Grass habitat is continuous beneath the west end of the bridge (Plate 13) and is well connected to habitats upstream and downstream of the bridge (Plate 14).

Impacts

Geotechnical impacts

Impact: Potential slope failure

The riverbank on the west side of the Red Deer River is a near vertical slope approximately six metres in height. Any disturbance that would lead this slope to fail would be undesirable. It could potentially lead to movement of soil down the slope. This soil movement could lead to habitat loss as well as making it difficult for wildlife to move through riparian habitats.

Mitigation measures for potential slope failure

Appropriate slope stabilization measures will need to be employed, both during and immediately after construction. And slope stabilization and re-vegetation will be required to ensure long-term slope stability.

Habitat Impacts

1. Impact: Loss of terrestrial wildlife habitat

Moving the proposed bridge to a new location (in lieu of using the existing piers) will require clearing the natural vegetation, thereby removing wildlife habitat. Using the existing bridge and highway berm as an indicator, a new bridge will require a 45 m right-of-way. This will increase the size of the habitat breaks at the bridge site from the current 25 to 30 m to a probable maximum of 75 m.

Mitigation measures for loss of terrestrial wildlife habitat

Minimize the footprint of the impact by clearing only the areas required for construction and bridge assembly, and using the agricultural field on the west side of the river, and the Starland Recreation Area on the east side, as equipment parking and staging areas. Reclamation of cleared areas should be done through planting of native species. Those native trees and shrubs planted at the entrances of the new bridge underpass will provide wildlife with the security and cover that will induce them to use the bridge underpass.

2. Impact: Introduction of weedy species

Removing existing vegetation and exposing the surface soils during construction activities will increase the spread of weed species into the natural habitats. This is especially true along the west side of the river where the agricultural fields are a significant source of a wide variety of invasive weed species.

Mitigation measure for the introduction of weedy species

Precautions, such as cleaning construction equipment and vehicles used in weedy areas before moving into new construction areas, will help reduce the potential transfer and spread of weedy species. All exposed soil should be reclaimed as soon as construction activities affecting the ground surface are complete, i.e., sodding. Some weed-control may be required until desired vegetation becomes established, but the need for such measures can be assessed through monitoring.

Wildlife Impacts

1. Impact: habitat alienation during construction activities

The activity and noise associated with construction can prevent sensitive wildlife species from using adjacent habitat or traveling through wildlife movement corridors. This habitat alienation effect reduces the amount of habitat available to individuals and could impede movement for large- and medium-sized animals, although in the case of construction, the impact will be temporary.

The area beneath the proposed bridge may be blocked during construction, forcing large- and medium-sized animals to detour around the construction area, potentially across Highway 27 thereby increasing the potential for wildlife-vehicle collisions.

Mitigation Measures for habitat alienation during construction activities

To mitigate the effect of disturbance and habitat alienation, particularly on species that are sensitive to disturbance, night shifts should be minimized and the length of the construction period should be kept to a minimum. Maintaining wildlife passage under the new and existing bridge during construction would allow wildlife to move through the area along the Red Deer River rather than detouring around the construction area and crossing the highway. Undisturbed natural habitat should remain in abundance in areas adjacent to the proposed bridge site, providing alienated individuals with alternate areas of suitable habitat.

2. Impact: wildlife mortality caused by clearing of vegetation

Clearing of natural vegetation can cause wildlife mortality, particularly during the spring breeding season when the mobility of many species is restricted. At these times, adults remain close to dens and nest sites, and young are not yet able to move long distances. If mortality is high during spring, local populations may suffer short-term declines. This effect is even more dramatic in populations already at low levels, as is the case for some special status species. Migratory bird nests are protected under the federal *Migratory Birds Convention Act (MBCA)*, which state that nests cannot be disturbed or removed

during the breeding season. There are also legal implications for mortality caused by clearing. Both the federal *Migratory Birds Convention Act* (MBCA) and the Alberta *Wildlife Act* prohibit activities that will lead to the destruction or disturbance of nesting sites of migratory birds. A recent amendment to the *MBCA* further protects disturbance to individual migratory birds. Direct mortality and nest site disturbance resulting from construction activity and clearing would contravene those Acts.

Construction involving vegetation clearing during the breeding period (15 April to 31 July) has the potential to impact many species, particularly birds, as both adults of nesting individuals may care for young reducing their ability to escape, which in turn makes them vulnerable to injury or mortality during clearing activities. Mortality may also result later in the breeding season when fledgling (feathered young that are not yet able to fly) depend on vegetative cover for protection until they are able to fly.

Mitigation measures for wildlife mortality caused by clearing of vegetation

Clearing should be scheduled in the fall or winter months to avoid the spring breeding period (15 April to 31 July), minimizing the potential for mortality. By fall, most species would be mobile and could easily evade construction equipment. In winter, many migratory species will not be present, further reducing the risk. In addition avoiding clearing during the spring, clearing limits should be marked with highly visible flagging or fencing to minimize accidental removal of habitat and the associated risk of wildlife mortality.

3. Impact: disturbance to, or loss of, Special Status species

Clearing of native vegetation for a new bridge site will impact several Special Status species. The Baltimore Oriole and Least Flycatcher are both dependant on the Plains Cottonwood/Willow habitat, through which the new bridge and associated right-of-way would be constructed. The open grassland habitats are used by the Northern Harrier and Prairie Falcon as foraging areas. And although all three Special Status bird species which are non-native, exotic species (European Starling, Ring-necked Pheasant, Rock Pigeon) will be adversely affected by habitat clearing activities, they are also habitat generalists and will be able to easily move to nearby similar habitats.

For the Special Status mammals, the various bat species which may be present in the study area would be impacted by clearing of tall Plains Cottonwood trees as they are often used as roosts. The Badger and Long-tailed Weasel both require open grasslands, a habitat type which is abundant in the region around the study area.

Although some clearing of native habitat is expected to occur if a new location for the proposed bridge is required, similar habitats are present along the Red Deer River upstream and downstream of the bridge site. Unless clearing occurs during the breeding season, it is unlikely that construction activities have the potential to directly impact most of the special status species known or suspected to use habitat in the regional area. Construction may, however, alienate some special status species that use the area.

Mitigation Measures for disturbance to, or loss of, Special Status species

Avoid vegetation clearing during the breeding bird season (15 April to 31 July) and keep the extent of clearing activities to a minimum.

4. Impact: disruption to wildlife movements during and after bridge construction

The Red Deer River valley is an important wildlife movement corridor providing a continuous habitat link within the Central Parkland and Northern Fescue Grassland natural regions in central Alberta. Large- and medium-sized mammals such as deer and coyotes commonly move between habitats using linear patches of trees and shrubs such as those found along the Red Deer River. Smaller animals such as amphibians, shrews, mice, voles and squirrels also use those sheltered strips as dispersal corridors.

The existing Morrin Bridge appears to be successful at allowing relatively unrestricted wildlife movement along the Red Deer River corridor due to several factors:

- There is considerable open space between the shoreline and the end-piers (5-6 m) and between those piers and the embankments at each end of the bridge (4-5 m).
- There is approximately 5 m of open space between the ground surface at the base of the pier and the bottom of the bridge deck.
- Although the vegetative cover of the Sandbar Willow/Mixed Grass community and the Plains Cottonwood/Willow community is not continuous underneath the bridge, there is some shrubby vegetation cover still present.

Wildlife movement in the river valley at the proposed bridge location is mainly located at the top-of-bank and along the river shoreline. The proposed bridge renovation has the potential to interrupt existing local and regional movement patterns. If the bridge were to function as a barrier to animal movement the upstream valley reach would be effectively isolated from the downstream reaches and the remainder of the valley system. If that were to occur, animals such as deer may be forced to cross over Highway 27, creating the potential for increased vehicle/animal collisions.

Mitigation measures for disruption to wildlife movement

Bridge design guidelines for large- to medium-sized animals have been developed which are consistent with the current literature on the subject of wildlife movement corridors. Those guidelines are as follows (Spencer Environmental 2007):

- A bridge with minimum valley-intruding abutments is preferred as it affords animals more movement choices.
- Provide for animal passage on both sides of the river.
- Overhead clearance at the underpass should be a minimum height of 4 m (which will accommodate large ungulates and account for snow depth).
- At the underpass, if the terrain is steeply sloped, a path should be graded to provide a nearly level surface with a minimum width of 4 m. The path should

have a substrate composed of softer earth or organic material. These two measures will encourage deer and other species to use the underpass. Hard surfaces will deter deer.

- Parallel, shade-tolerant shrub communities should be planted in borders along the sides of the wildlife path in order to provide animals with security and encourage path use. This planting strategy assumes that construction under the bridge will result in disturbance of the existing vegetation or that shade provided by the bridge will result in loss of some existing plant communities.
- Where the wildlife path parallels the river there should be a minimum of 6 m of vegetation maintained between the river bank and the wildlife path. If this is not naturally present, the vegetation should be established through plantings.
- The distance between vegetation belts on either side of the crossing should be no further than 60 m.

To further encourage ungulates to use the underpass and minimize the potential for vehicle/animal collisions, fencing will be used during the construction period to direct animals under the bridge and it should extend a minimum of 0.8 km past frequently used areas. Fencing should be at least 2.7 m high, jump outs should be included and mesh with 50 to 150 mm openings should be securely installed along the bottom to prevent passage by small animals. The mesh should be installed on the inside of the posts (i.e., the side furthest from the highway) and fencing should be regularly maintained, as any weak areas will be exploited.

Night shift work at the bridge site will be minimized to provide opportunities for wildlife to pass through the area without disturbance. Workers will be instructed not to harass wildlife observed in the construction zone.

Wildfire Impacts

Impact: wildfires caused by construction equipment

Construction activities will occur within a densely vegetated area in a region that is historically very dry during the summer months (i.e., the badlands). In these dry conditions, grasses and woody vegetation may present a fuel load for wildfires. During dry periods, an accidental fire ignited by sparks from machinery, construction materials or workers' cigarettes could spread quickly.

Mitigation measures for wildfires caused by construction equipment

The following measures will help reduce the potential for construction activities, vehicles or personnel to initiate a wildfire:

- Fire fighting equipment will be available near any flammable storage sites, including fuels, lubricants and other petroleum projects.
- Smoking on the construction site will be prohibited, particularly near fuel storage areas or in treed areas. A designated smoking area will also be established.

- A procedure for on-site fire response will be developed and communicated to all site personnel. That plan will include contact information for the nearest fire and emergency departments (i.e., Morrin, Three Hills, Drumheller).

Environmental Permitting Requirements

This review of pertinent environmental permitting pertains only to wildlife and does not cover fisheries and water issues.

Federal Government

Migratory Birds Convention Act (MBCA) and Species at Risk Act (SARA)

Environment Canada administers the MBCA and the SARA. Those Acts provide guidelines for enforcement only; neither the MBCA nor the SARA requires permitting or approvals specific to the proposed project. And although no approvals are required, violation of those Acts may result in penalties. This ESR provides information that enables the proponents to comply with those Acts.

Provincial Government

Alberta Public Lands Act

The bed and shore of waterbodies are owned by the province under the *Public Lands Act*. The proposed project (e.g. bridge pier construction, slope stabilization activities) could potentially require temporary disturbance of the existing bed and shores of the Red Deer River, necessitating an approval under that Act. In addition, a License of Occupation will be required under the *Public Lands Act* for all new structures (e.g., bridge piers) constructed on the bed and shores of waterbodies.

Alberta Wildlife Act

The Alberta *Wildlife Act* prohibits disturbance to a nest or den of prescribed wildlife species. Although permitting is not required under that Act, violations may result in fines.

Conclusions

The area around the Morrin Bridge has traditionally been used for agriculture and recreation.

The site is located within the provincially significant Tolman Badlands landscape.

Amphibians species present in the Red Deer River valley near the study area but none were recorded within the study area.

There are no wetlands in the study area except for the Red Deer River and the small incised stream.

The most important habitats in terms of avian diversity are the Plains Cottonwood/Willow, Chokecherry/Snowberry and Dry Grassland habitats, which together form a significant component of the vegetation within the river valley.

The most important habitats in terms of mammal diversity are Dry Grassland, Mesic Grassland and Plains Cottonwood/Willow habitats.

The Red Deer River valley is an important regional wildlife corridor. It appears that the highway and the current bridge structure do not inhibit wildlife movement along the river. The dense riverside vegetation and the open grasslands serve as wildlife movement corridors and are important within the larger valley context.

There is some fragmentation of the habitats within and around the study area, due to the highway, the Starland Recreation Area and a now-closed river access road near the east end of the bridge.

Recommendations

Following are our recommendations:

- To comply with the *Migratory Birds Convention Act* and the *Species At Risk Act*, project site clearing activities should occur before 15 April or after 31 July.
- Apply for project authorization under Alberta's *Environmental Protection and Enhancement Act* if storm water management facilities are required.
- Undertake surface erosion control measures on the site.
- Apply for a License of Occupation as required under Alberta's *Public Lands Act*.
- Prepare the necessary documentation for a *Canadian Environmental Assessment Act* environmental review.
- Ensure that adequate natural habitat is located around, and under, the proposed bridge to facilitate wildlife movement along the river.

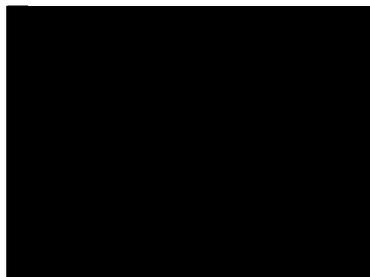
We trust this wildlife assessment of the Morrin Bridge study area provides the information required by your organization. If you have any comments regarding this report, please contact the undersigned.

Sincerely,

Spencer Environmental
Management Services Ltd.



Andre M. Legris, M.Sc.
Environmental Scientist



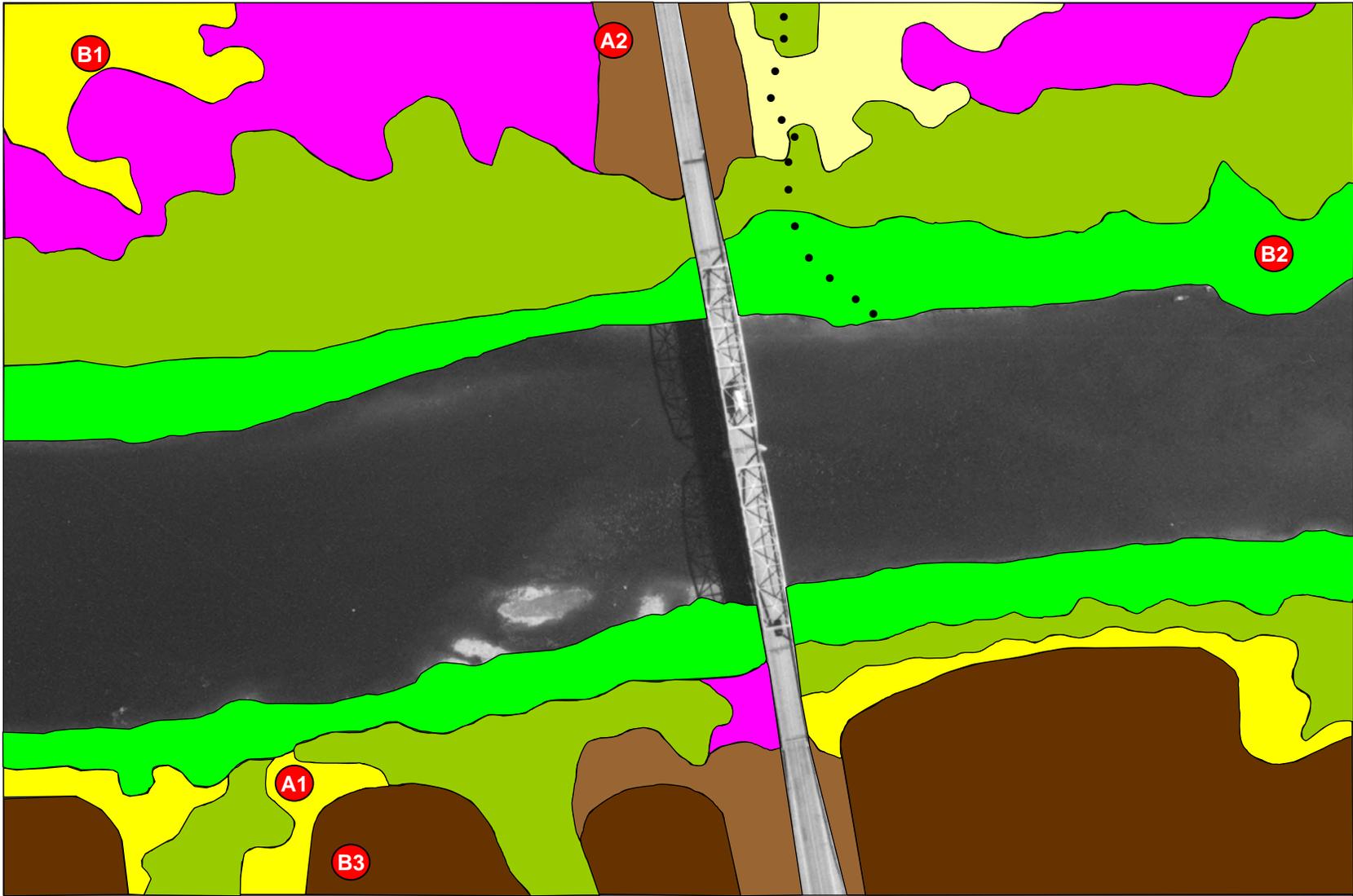
Literature Cited

- Alberta Conservation Association and Alberta Sustainable Resource Development. 2006. Alberta Volunteer Amphibian Monitoring Program - Participants' Manual. Alberta Conservation Association, Edmonton, AB. 46pp.
- Alberta Sustainable Resource Development. 2003. Status of the Northern Leopard Frog (*Rana pipiens*) in Alberta: Update 2003. Alberta Sustainable Resource Development, Fish and Wildlife Division, and Alberta Conservation Association. Wildlife Status Report No. 9 (Update 2003). Edmonton, AB. 61 pp.
- Fisher, C. and J. Acorn. 1998. Birds of Alberta. Lone Pine Publishing. Edmonton, Alberta.
- FWMIS. 2007. Fisheries and Wildlife Management Information System, Alberta Sustainable Resource Development. Accessed 16 May, 2007.
- Hamilton, I.M., J.L. Skilnick, H. Troughton, A.P. Russell and G.L. Powell. 1998. Status of the Canadian Toad (*Bufo hemiophrys*) in Alberta. Alberta Environmental Protection, Wildlife Management Division, and the Alberta Conservation Association. Wildlife Status Report No. 12. Edmonton, AB. 30 pp.
- Kantrud, H. and R. Kologiski. 1982. Effects of soils and grazing on breeding birds of uncultivated upland grasslands of the northern Great Plains. US Department of the Interior Fish and Wildlife Service. Wildlife Research Report 15. Washington, D.C.
- Kendell, K. 2002. Alberta inventory for the northern leopard frog (200/2001). Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species At Risk Report No. 44. Edmonton, AB. 29 pp.
- Kondla, N. 1977. A preliminary assessment of the proposed Drumheller provincial park. Prep. for Parks Planning and Design Branch, Alberta Recreation, Parks and Wildlife. Edmonton, Alberta.
- Marken, S. L. 1993. Plains cottonwood and riparian plant communities on the lower Red Deer River. Unpubl. M.Sc. thesis, Department of Geography, University of Calgary. Calgary, Alberta. 173p.
- Natural Regions Committee 2006. Natural Regions and Subregions of Alberta. Compiled by D.J. Downing and W.W. Pettapiece. Government of Alberta. Pub. No. T/852.
- PBRERC [Parkland and Bow Region Environmental Resource Committees]. 2000. Red Deer River corridor integrated management plan. Prep. for Alberta Environmental Protection. Pub. No. T/529. Edmonton, AB. 94 pp. + appen.

- Pattie, D. and C. Fisher. 1999. Mammals of Alberta. Lone Pine Publishing. Edmonton, AB.
- Russell, A.P. and A.M. Bauer. 2000. The Amphibians and Reptiles of Alberta. University of Calgary Press. Calgary, AB. 279p.
- Semenchuk, G.P. 1992. The Atlas of Breeding Birds of Alberta. Federation of Alberta Naturalists. Edmonton, AB.
- Spencer Environmental Management Services Ltd. 2007. North Leg - Anthony Henday Drive Environmental Impact Assessment. Vol. 1 of 2. Prep. for Alberta Infrastructure and Transportation, Edmonton, Alberta. EP-263. 230 pp.
- Sweetgrass Consultants Ltd. 1997. Environmentally Significant Areas of Alberta. Volume 2. Prep. for Resource Data Division, Alberta Environmental Protection. Edmonton, Alberta. Prep. by Sweetgrass Consultants Ltd., Calgary, Alberta. 580 pp.
- Wallis, C. 1982. An overview of the Mixed Grasslands of North America. Pp. 195-208 in "Grassland ecology and classification symposium proceedings". May, 1983. Kamloops, British Columbia. British Columbia Ministry of Forests, Victoria, B.C.
- Wallis, C. 1991. Environmentally significant areas of the lower Red Deer River. Prep. by Cottonwood Consultants Ltd. for Alberta Forestry, Lands and Wildlife, Edmonton, AB. 70p.
- Wells, R.E. and J. Bentz. 1993. Integrated resource inventory of the Red Deer River corridor study area. Resource Information Division, Alberta Environmental Protection. Edmonton, Alberta. Pub. No. T/220. 92 pp + appen.
- Watson, S.M. and A.P. Russell. 1997. Status of the Prairie Rattlesnake (*Crotalus viridis viridis*) in Alberta. Alberta Environmental Protection, Wildlife Management Division. Wildlife Status Report No. 6. Edmonton, AB. 26 pp.

Personal Communications

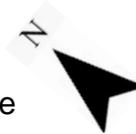
- Ed Hofman. 23 May, 2007. Senior Wildlife Biologist, Fish & Wildlife Division, Alberta Sustainable Resource Development. Drumheller, Alberta.
- Tara Peters. 16 July 2007. Office of Traffic Safety, Alberta Infrastructure and Transportation.



- Sandbar Willow/Mixed Grass
- Plains Cottonwood/Willow
- Chokecherry/Snowberry
- Mesic Grassland
- Dry Grassland
- Agricultural Field
- Non-native Grassland

Figure 1. Morrin Bridge - Wildlife Habitat Map

- Incised Stream
- A1 Amphibian Survey Site
- B1 Breeding Bird Survey Site



Scale 1:1,847

Source: 2000 air photo
Original Scale 1:5,000



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-  Tree and shrub habitats
-  Badland habitats
-  Grassland and field habitats



Figure 2. Wildlife Corridor Map

Scale 1:5,037

Source: 2000 air photo
Original Scale 1:5,000



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Appendix A. Study area plant list

Physiognomic Layer	Common Name	Scientific name
Tree	Plains Cottonwood	<i>Populus deltoides</i> X <i>balsamifera</i>
	Manitoba Maple	<i>Acer nigundo</i>
Shrub	Sandbar Willow	<i>Salix exigua</i>
	Willow	<i>Salix sp.</i>
	Silverberry	<i>Eleagneaus commutata</i>
	Snowberry	<i>Symphoricarpos occidentalis</i>
	Rose	<i>Rosa woodsii</i>
	Red-osier Dogwood	<i>Cornus stolonifera</i>
	Chokecherry	<i>Prunus virginiana</i>
	Currant	<i>Ribes sp.</i>
	Caragana	<i>Caragana arborescens</i>
Forb	Dandelion	<i>Taraxacum officinale</i>
	Clover	<i>Trifolium sp.</i>
	Common Scouring-rush	<i>Equisetum hyemale</i>
	Stinkweed	<i>Thlapsi arvense</i>
	Avens	<i>Geum sp.</i>
	Pussytoes	<i>Antennaria sp.</i>
	Yarrow	<i>Achillea sp.</i>
	Pasture Sagewort	<i>Artemesia frigida</i>
	Field Mouse-ear Chickweed	<i>Cerastium arvense</i>
	Creamy peavine	<i>Lathyrus ochroleucus</i>
	Cushion Cactus	<i>Coryphantha vivipara</i>
Grass	Slender Wheatgrass	<i>Elymus trachycaulus</i>
	Foxtail Barley	<i>Hordeum jubatum</i>
	Awnless Brome	<i>Bromus inermis</i>
	Bluejoint	<i>Calamagrostis canadensis</i>
	Rough Fescue	<i>Festuca altaica</i>
	June Grass	<i>Koeleria macrantha</i>

Appendix B. Amphibian and reptiles species which may occur in the study area

Information used to produce this table was obtained from Russell and Bauer (2000).

Common name	Scientific name	Remarks	Habitat
Prairie Rattlesnake	<i>Crotalus viridus</i>	One record from Drumheller and another from Dry Island Buffalo Jump	Dry grasslands and in badlands
Canadian Toad	<i>Bufo hemiophrys</i>	Large population declines in Alberta since the 1970's	Moist meadows
Northern Leopard Frog	<i>Rana pipiens</i>	No recent records (see section on Special Status Species)	Springs, streams and permanent waterbodies
Boreal Chorus Frog	<i>Pseudacris maculata</i>	Several recorded in Red Deer River valley	Almost any kind of waterbody
Bullsnake	<i>Pituophis catenifer</i>	One record from Morrin Bridge region	Dry grasslands and sagebrush
Wandering Garter Snake	<i>Thamnophis elegans</i>	One recorded in study area	Close proximity to water
Plains Garter Snake	<i>Thamnophis radix</i>		Likely found in all habitat types
Red-sided Garter Snake	<i>Thamnophis sirtalis</i>		Likely found near river and in Plains Cottonwood forest

Appendix C. Status and habitat affiliations of bird species in the study area

Common Name	Scientific name	SW/MG*	PC/W	C/S	DG	MG	AF	River	Status in Study Area
American Crow	<i>Corvus brachyrhynchos</i>		X				X		Common; suspected nests in large Cottonwood trees
American Goldfinch	<i>Carduelis tristis</i>		X	X					Occasional in treed habitat
American Kestrel	<i>Falco sparverius</i>		X						One pair mating in Cottonwood trees
American Robin	<i>Turdus migratorius</i>		X	X	X				Common in all areas
American Wigeon	<i>Anas americana</i>							X	Occasional along river
Baltimore Oriole	<i>Icterus galbula</i>		X						Occasional
Belted Kingfisher	<i>Ceryle alcyon</i>		X					X	Occasional along river
Bank Swallow	<i>Riparia riparia</i>							X	Common along river
Black-billed Magpie	<i>Pica hudsonia</i>		X			X	X		Abundant
Brown Thrasher	<i>Toxostoma rufum</i>		X						One indivisual recorded
Brown-headed Cowbird	<i>Molothrus ater</i>		X			X	X		Common
Canada Goose	<i>Branta canadensis</i>						X	X	Common in open fields
Clay-colored Sparrow	<i>Spizella pallida</i>		X	X	X	X			Abundant in almost all habitats
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>							X	Nests present on nearby badland cliffs
Common	<i>Geothypis trichas</i>	X							Occasional in thick

Common Name	Scientific name	SW/MG*	PC/W	C/S	DG	MG	AF	River	Status in Study Area
Yellowthroat									shrubs along river
Eastern Kingbird	<i>Tyrannus tyrannus</i>		X	X	X	X	X		Common
European Starling	<i>Sturnus vulgaris</i>		X	X	X				Abundant; many nesting pairs in Cottonwood trees
Gray Catbird	<i>Dumetella carolinensis</i>	X	X	X					Common in dense shrubs
Hairy Woodpecker	<i>Picoides villosus</i>		X						One individual recorded
Horned Lark	<i>Eremophila alpestris</i>					X			Uncommon in adjacent badland habitat
House Wren	<i>Troglodytes aedon</i>	X	X	X					Occasional
Least Flycatcher	<i>Empidonax minimus</i>		X						Common in trees areas
Mallard	<i>Anas platyrhynchos</i>							X	Several males recorded along river
Mourning Dove	<i>Zenaida macroura</i>		X						Common
Northern Flicker	<i>Colaptes auratus</i>		X			X			Nesting in Cottonwood snags
Northern Harrier	<i>Circus cyaneus</i>								One individual flew over study area
Prairie Falcon	<i>Falco mexicanus</i>					X	X	X	One individual flew over study area
Red-eyed Vireo	<i>Vireo olivaceus</i>		X						Several individuals in Cottonwood groves
Ring-billed Gull	<i>Larus delawarensis</i>							X	Several recorded flying over river
Ring-necked	<i>Phansianus</i>						X		Commonly heard in

Common Name	Scientific name	SW/MG*	PC/W	C/S	DG	MG	AF	River	Status in Study Area
Pheasant	<i>colchicus</i>								agricultural fields
Rock Pigeon	<i>Columba livia</i>				X		X		Common in badlands and fields; use the bridge as a perching site
Savannah Sparrow	<i>Passerculus sandwichensis</i>		X	X	X				Occasional
Song Sparrow	<i>Melospiza melodia</i>		X	X					Occasional
Spotted Sandpiper	<i>Actitis macularia</i>							X	Several recorded along river
Spotted Towhee	<i>Pipilo maculatus</i>		X	X					Common
Tree Swallow	<i>Tachycineta bicolor</i>						X		Common flying over fields
Veery	<i>Catharus fuscescens</i>		X						Occasional in Cottonwood groves
Western Meadowlark	<i>Sturnella neglecta</i>					X			Common in fields
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>		X	X					One recorded in May; migrant
Yellow Warbler	<i>Dendroica petechia</i>	X	X	X					Abundant in shrub and treed habitats

Total no. of species	4	25	12	8	5	8	8
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* SW/MG – Sandbar Willow/Mixed Grass
PC/W – Plains Cottonwood/Willow
C/S – Chokecherry/Snowberry
DG – Dry Grassland

MG – Mesic Grassland
AF – Agricultural Field
River – along the Red Deer River shoreline

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Appendix D. Habitat affiliations of additional bird species which are likely found in the study area

Existing information used to produce this table was obtained from Semenchuk (1992) and Fisher and Acorn (1998).

Common Name	Scientific Name	Habitat(s) where species would likely be recorded *						
		SW/MG	PC/W	C/S	DG	MG	AF	River
Alder Flycatcher	<i>Empidonax alnorum</i>	X						
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>		X		X	X	X	X
California Gull	<i>Larus californicus</i>							X
Cedar Waxwing	<i>Bombycilla cedrorum</i>		X	X				
Chipping Sparrow	<i>Spizella passerina</i>	X	X	X	X			
Common Goldeneye	<i>Bucephala clangula</i>							X
Common Grackle	<i>Quiscalus quiscula</i>				X		X	
Downy Woodpecker	<i>Picoides pubescens</i>		X					
Eastern Phoebe	<i>Sayornis phoebe</i>		X	X				
Ferruginous Hawk	<i>Buteo regalis</i>				X	X		
Franklin's Gull	<i>Larus pipixcan</i>							X
Gray Partridge	<i>Perdix perdix</i>				X		X	

Common Name	Scientific Name	Habitat(s) where species would likely be recorded *						
		SW/MG	PC/W	C/S	DG	MG	AF	River
Great Blue Heron	<i>Ardea herodias</i>							X
Great Horned Owl	<i>Bubo virginianus</i>		X					
Killdeer	<i>Charadrius vociferous</i>				X	X	X	
Lark Sparrow	<i>Chondestes grammacus</i>			X	X			
Le Conte's Sparrow	<i>Ammodramus leconteii</i>	X		X				
Lincoln's Sparrow	<i>Melospiza lincolnii</i>	X	X			X		
Loggerhead Shrike	<i>Lanius ludovicianus exubitorides</i>			X	X	X	X	
Merlin	<i>Falco columbarius</i>		X			X	X	
Mountain Bluebird	<i>Sialia currucoides</i>				X	X	X	
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>							X
Osprey	<i>Pandion haliaetus</i>							X
Red-tailed Hawk	<i>Buteo jamaicensis</i>				X	X		
Rock Wren	<i>Salpinctes</i>				X			

Common Name	Scientific Name	Habitat(s) where species would likely be recorded *						
		SW/MG	PC/W	C/S	DG	MG	AF	River
	<i>obsoletus</i>							
Sharp-tailed grouse	<i>Tympanuchus phasianellus</i>			X	X	X	X	
Swainson's Hawk	<i>Buteo swainsoni</i>		X		X	X	X	
Turkey Vulture	<i>Cathartes aura</i>				X		X	
Vesper Sparrow	<i>Pooecetes gramineus</i>				X	X	X	
Warbling Vireo	<i>Vireo gilvus</i>		X					
Western Kingbird	<i>Tyrannus verticalis</i>	X	X		X	X	X	
Western Wood-pewee	<i>Contopus sordidulus</i>		X					
White-throated Sparrow	<i>Zonotrichia albicollis</i>		X	X				
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>		X	X				
Barn Swallow	<i>Hirundo rustica</i>				X	X	X	
Lesser Yellowlegs	<i>Tringa flavipes</i>							X
Total no. of species		5	14	9	17	13	13	8

* SW/MG – Sandbar Willow/Mixed Grass
PC/W – Plains Cottonwood/Willow
C/S – Chokecherry/Snowberry
DG – Dry Grassland
MG – Mesic Grassland
AF – Agricultural Field
River – along the Red Deer River shoreline

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Appendix E. Mammal species and habitat associations in the study area

Existing information used to produce this table was obtained from Pattie and Fisher (1999).

Common Name	Scientific name	Recorded during site surveys	SW/MG	PC/W	C/S	DG	MG	AF	River
Red Squirrel	<i>Tamiasciurus hudsonicus</i>			X					
Masked Shrew	<i>Sorex cinereus</i>		X	X	X		X		
Hayden's Shrew/Prarie Shrew	<i>Sorex haydeni</i>					X	X		
Water Shrew	<i>Sorex palustris</i>		X						
Arctic Shrew	<i>Sorex arcticus</i>		X	X					
Pygmy Shrew	<i>Sorex hoyi</i>			X	X	X			
Little Brown Bat	<i>Myotis lucifugus</i>					X	X	X	X
Northern Bat	<i>Myotis septentrionalis</i>			X		X	X		X
Long-eared Bat	<i>Myotis evotis</i>			X		X			
Western Small-footed Bat	<i>Myotis ciliolabrum</i>					X	X	X	X
Silver-haired Bat	<i>Lasiurus noctivagans</i>			X					
Big Brown Bat	<i>Eptesicus fuscus</i>			X					
Red Bat	<i>Lasiurus borealis</i>			X		X	X	X	
Hoary Bat	<i>Lasiurus cinereus</i>					X	X	X	
Nuttall's/ Mountain Cottontail	<i>Sylvilagus nuttallii</i>	√	X	X	X				

Common Name	Scientific name	Recorded during site surveys	SW/MG	PC/W	C/S	DG	MG	AF	River
Snowshoe Hare	<i>Lepus americanus</i>		X	X	X				
White-tailed Jack Rabbit	<i>Lepus townsendii</i>					X	X	X	
Least Chipmunk	<i>Tamias minimus</i>			X		X			
Woodchuck	<i>Marmota monax</i>					X	X		
Richardson's Ground Squirrel	<i>Spermophilus richardsonii</i>					X	X	X	
Thirteen-lined Ground Squirrel	<i>Spermophilus tridecemlineatus</i>					X	X		
Northern Flying Squirrel	<i>Glaucomys sabrinus</i>								
Northern Pocket Gopher	<i>Thomomys talpoides</i>				X	X	X	X	
American Beaver	<i>Castor canadensis</i>	√	X	X					X
Deer Mouse	<i>Peromyscus maniculatus</i>		X	X	X	X	X		
Southern Red-backed Vole	<i>Clethrionomys gapperi</i>			X	X				
Meadow Vole	<i>Microtus pennsylvanicus</i>		X	X	X	X	X	X	
Prairie Vole	<i>Microtus ochrogaster</i>					X			
Sagebrush Vole	<i>Lemmiscus curtatus</i>					X			
Muskrat	<i>Ondatra</i>								X

Common Name	Scientific name	Recorded during site surveys	SW/MG	PC/W	C/S	DG	MG	AF	River
	<i>zibethicus</i>								
Meadow Jumping Mouse	<i>Zapus hudsonius</i>			X	X		X		
Western Jumping Mouse	<i>Zapus princeps</i>						X		
Common Porcupine	<i>Erethizon dorsatum</i>			X	X				
Coyote	<i>Canis latrans</i>		X	X	X	X	X	X	X
Red Fox	<i>Vulpes vulpes</i>					X	X	X	
Long-tailed Weasel	<i>Mustela frenata</i>					X	X	X	
Ermine	<i>Mustela erminea</i>		X	X					
Least Weasel	<i>Mustela nivalis</i>			X	X	X	X		
Mink	<i>Mustela vison</i>		X						X
American Badger	<i>Taxidea taxus taxus</i>					X	X	X	
Striped Skunk	<i>Mephitis mephitis</i>		X	X	X	X	X	X	X
Moose	<i>Alces alces</i>		X						X
Mule Deer	<i>Odocoileus hemionus</i>	√	X			X	X	X	X
White-tailed Deer	<i>Odocoileus virginianus</i>		X	X		X	X	X	X
Pronghorn	<i>Antilocapra americana</i>					X	X	X	
Total no. of Species		3	15	23	13	27	25	16	11



Plate 1. Sandbar Willow/Mixed Grass habitat.



Plate 2. Plains Cottonwood/Willow habitat.



Plate 3. Chokecherry/Snowberry habitat. The Non-native Grassland habitat is along the road berm on the left side of the photo.



Plate 4. Dry Grassland habitat.



Plate 5. Mesic grassland along east side of the Red Deer River.



Plate 6. Mesic grassland along west side of the Red Deer River.



Plate 7. Agricultural field



Plate 8. Incised stream



Plate 9. Badlands adjacent to the Dry Grassland habitat.



Plate 10. The steep badland topography along the side wall of the river valley.



Plate 11. Disturbed wildlife habitat beneath the east end of the Morrin Bridge.



Plate 12. Wildlife habitat along the shoreline around the east end of the Morrin Bridge.



Plate 13. Sandbar Willow/Mixed Grass habitat beneath the west end of the bridge.



Plate 14. Vegetation around the west end of the bridge