

TABLE OF CONTENTS

11	WILDLIFE	11-1
11.1	Introduction	11-1
11.2	Study Area	11-1
	11.2.1 Local Study Area	11-1
	11.2.2 Regional Study Area	11-1
11.3	Issues and Assessment Criteria	11-4
	11.3.1 Selection of Wildlife Species for Study	11-4
11.4	Methods	11-5
	11.4.1 Assessment Approach	11-5
	11.4.2 Existing Wildlife Information	11-6
	11.4.3 Field Surveys	11-7
	11.4.4 Modelling Methods	11-11
	11.4.5 Quality Assurance and Quality Control	11-11
11.5	Existing Conditions	11-19
	11.5.1 Existing Wildlife Information	11-19
	11.5.2 Field Survey Results	11-28
	11.5.3 Baseline Habitat Availability	11-39
11.6	Impact Assessment and Mitigative Measures	11-61
	11.6.1 Sensory Disturbance of Wildlife	11-61
	11.6.2 Loss and/or Alteration of Wildlife Habitat	11-65
	11.6.3 Wildlife Mortality	11-67
	11.6.4 Effects of Air Emissions on Wildlife Health	11-67
11.7	Cumulative Effects Assessment	11-68
	11.7.1 Sensory Disturbance of Wildlife	11-68
	11.7.2 Loss and/or Alteration of Wildlife Habitat	11-68
	11.7.3 Wildlife Mortality	11-70
	11.7.4 Effects of Air Emissions on Wildlife Health	11-70
11.8	Follow-up and Monitoring	11-72
11.9	Summary	11-72
11.10	Literature Cited	11-72
	11.10.1 Personal Communications	11-76

TABLES

Table 11.5-1	Potential Wildlife Species in the RSA	11-19
Table 11.5-2	Wildlife Species of Concern Potentially Associated with Habitats in the Local Study Area (Taxonomic Order)	11-25
Table 11.5-3	Winter Track- Frequencies (tracks/km/day) within the Upgrader Site in December 2006 ¹	11-29
Table 11.5-4	Comparison of Habitat Associations between the LSA and the Northwest of Bruderheim Natural Area	11-31
Table 11.5-5	Nocturnal Owls Detected During Surveys Conducted in the Study Area, March – April 2007	11-32
Table 11.5-6	Songbird Species Recorded in the LSA and RSA	11-35
Table 11.5-7	Most Common Songbird Species Recorded in the LSA and RSA	11-35
Table 11.5-8	Narrow-niche Songbird Species and Their Associated Habitat Type (excluding waterbirds)	11-36
Table 11.5-9	Results of the Fixed-Radius Breeding Bird Point Counts in the LSA and RSA	11-37
Table 11.5-10	Songbird Densities by Habitat Type within the LSA and RSA	11-38

Table 11.5-11	Bird Species Diversity (BSD) by Habitat Type in the Study Area	11-38
Table 11.5-12	Waterbird Species Observed within the LSA and RSA	11-39
Table 11.5-13	Habitat Suitability and Availability at Baseline and with Project Development in the LSA and RSA	11-40
Table 11.6-1	Summary of Potential Effects of Sensory Disturbance on Key Species	11-62
Table 11.6-2	Illuminance Levels of Selected Sources	11-64
Table 11.6-3	Habitat Suitability and Availability for Baseline and Application Cases in the LSA	11-66
Table 11.7-1	Existing and Planned Operations Contributing to Cumulative Effects on Wildlife	11-68
Table 11.7-2	Project Contribution to Regional Cumulative Effects on Habitat Availability	11-70

FIGURES

Figure 11.2-1	Wildlife Local Study Area	11-2
Figure 11.2-2	Wildlife Regional Study Area	11-3
Figure 11.4-1	Snow Tracking Transects in the Local Study Area	11-12
Figure 11.4-2	Snow Tracking Transects in the Regional Study Area	11-13
Figure 11.4-3	Owl Survey Stations, Detection Sites, and Owl Territories in the Regional Study Area	11-14
Figure 11.4-4	Amphibian Survey Points in the Local Study Area	11-15
Figure 11.4-5	Amphibian Survey Points in the Regional Study Area	11-16
Figure 11.4-6	Songbird Survey Points in the Local Study Area	11-17
Figure 11.4-7	Songbird Survey Points in the Regional Study Area	11-18
Figure 11.5-1	Landscape – Scale Wildlife Habitat Connectivity	11-45
Figure 11.5-2	Relative Abundance and Activity of Amphibians	11-46
Figure 11.5-3	Amphibian Abundance by Habitat	11-46
Figure 11.5-4	Availability of Deer Habitat within the Local Study Area	11-47
Figure 11.5-5	Availability of Deer Habitat within the Regional Study Area	11-48
Figure 11.5-6	Availability of Moose Habitat within the Local Study Area	11-49
Figure 11.5-7	Availability of Moose Habitat within the Regional Study Area	11-50
Figure 11.5-8	Availability of Coyote Habitat within the Local Study Area	11-51
Figure 11.5-9	Availability of Coyote Habitat within the Regional Study Area	11-52
Figure 11.5-10	Availability of Long-tailed Weasel Habitat within the Local Study Area	11-53
Figure 11.5-11	Availability of Long-tailed Weasel Habitat within the Regional Study Area	11-54
Figure 11.5-12	Availability of Great Horned Owl Breeding Habitat within the Local Study Area	11-55
Figure 11.5-13	Availability of Great Horned Owl Habitat within the Regional Study Area	11-56
Figure 11.5-14	Availability of Songbird Habitat within the Local Study Area	11-57
Figure 11.5-15	Availability of Songbird Habitat within the Regional Study Area	11-58
Figure 11.5-16	Availability of Amphibian Breeding Habitat within the Local Study Area	11-59
Figure 11.5-17	Availability of Amphibian Breeding Habitat within the Regional Study Area	11-60
Figure 11.7-1	Existing Disturbances and Planned Operations Contributing to Cumulative Effects on Wildlife	11-71

APPENDICES

Appendix 11A	Effects Assessment Summary of Potential Project Effects on Key Species
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11 WILDLIFE

11.1 Introduction

The objective of the wildlife component of the environmental assessment was to provide North American with the necessary wildlife information for its application for a bitumen upgrader in Strathcona County, Alberta. In accordance with [Section 4.9](#) of Alberta Environment's Final Terms of Reference (TOR) ([Volume 1, Appendix A](#)), existing wildlife information was reviewed, and baseline wildlife surveys (amphibians, reptiles, birds and mammals) were conducted within representative habitats as part of the wildlife assessment. The following report contains detailed information obtained from the information review, the baseline surveys and an assessment of the Upgrader development on local and regional wildlife.

11.2 Study Area

The North American Upgrader Project (the Project) is located in the Central Parkland Natural subregion of the Parkland Natural Region of Alberta (AEP, 1994). The Upgrader, which is situated near the transition zone between the Parkland Natural Region and the Boreal Forest Natural Region to the north, is located within the boundaries of Alberta's Industrial Heartland Area (AIH) in the northwestern portion of Strathcona County (AIH, 2002). This highly developed heavy industrial region is characterized by a landscape dominated by agriculture, and as a result, any remaining wildlife habitats are highly fragmented. Local and regional study areas were delineated to focus the scope of the wildlife assessment.

11.2.1 Local Study Area

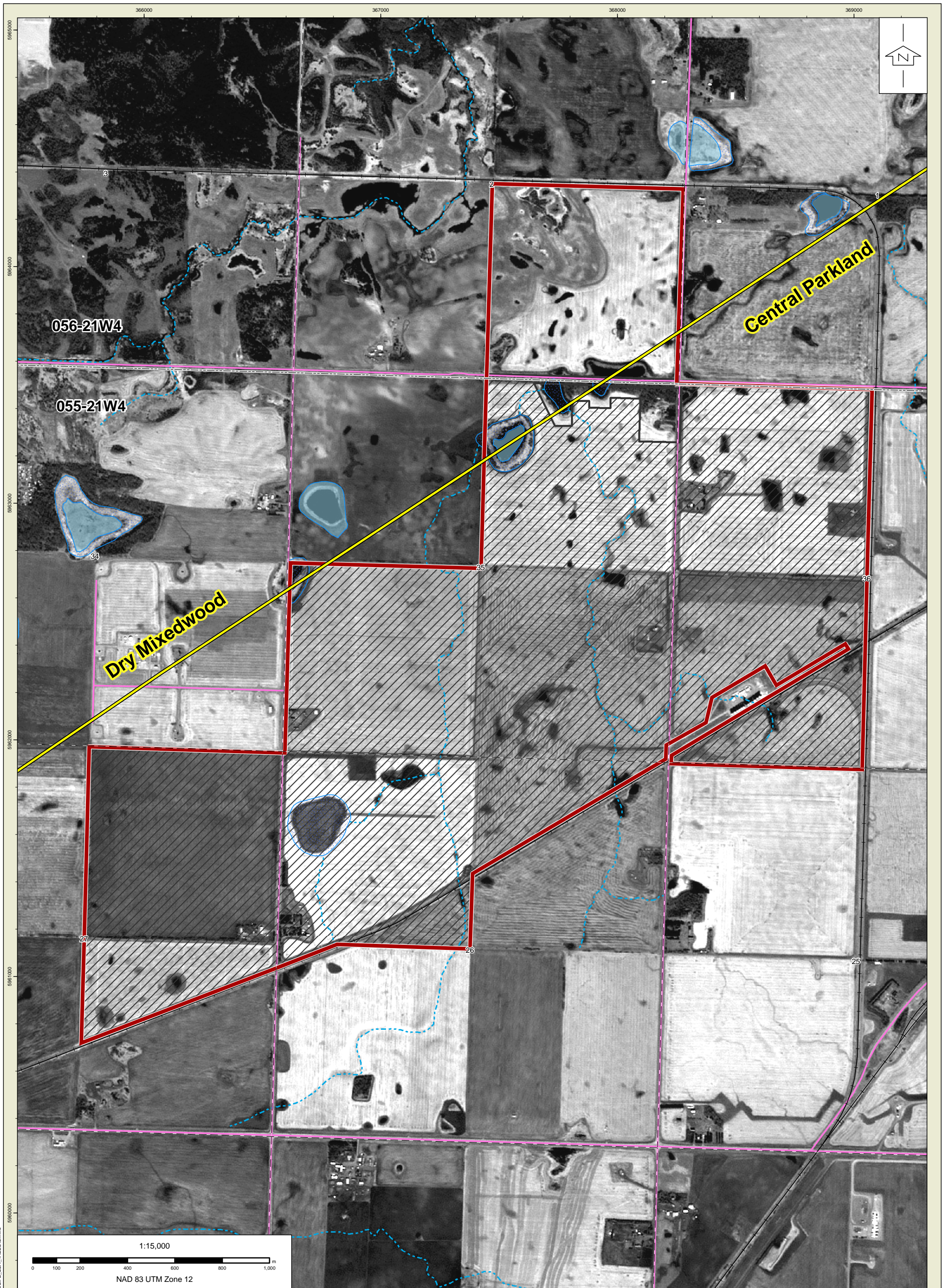
The wildlife Local Study Area (LSA) includes the area within North American's property boundaries, which is approximately 562 ha. The Project footprint is approximately 485 ha of land that would be temporarily or permanently altered by activities related to the construction and operation of the Project ([Figure 11.2-1](#)).

The LSA is within portions of Sections 26, 27, 35 and 36 Township 55 Range 21 W4M, and the SE¼ Section 2, Township 56, Range 21, W4M.

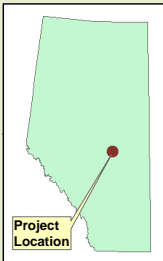
11.2.2 Regional Study Area

A larger wildlife Regional Study Area (RSA) ([Figure 11.2-2](#)) was used to evaluate Project effects within a regional context. The size and placement of the RSA around the Project were chosen based on the inclusion of wildlife habitat types that compared and/or contrasted with what was found in the LSA, and provide the means to evaluate regional wildlife habitat availability. The RSA was also used to evaluate regional and cumulative effects of the Project such as air emissions, sensory disturbance and plant lighting. The RSA occupies an area of 23,288 ha, and includes the entire LSA.

The RSA is defined by the following Legal Land Description: Sections 1 to 4, 9 to 16, and 21 to 28 Township 56 Range 21 W4M; Sections 1 to 4, 9 to 16, 21 to 28, and 33 to 36 Township 55 Range 21 W4M; Sections 3 to 10, 15 to 22, and 27 to 30 Township 56 Range 20 W4M; Sections 3 to 10, 15 to 22, and 27 to 34 Township 55 Range 20 W4M.



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Legend

- North American Upgrader Wildlife LSA
- Project Footprint
- Alberta Natural Subregion
- Waterbody
- Permanent
- Recurring
- Stream - Permanent
- Stream - Intermittent
- Alberta Township / Range
- ATS Section Line
- Road
- Railway

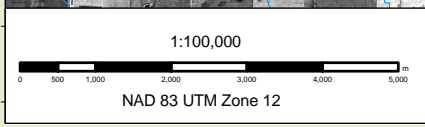
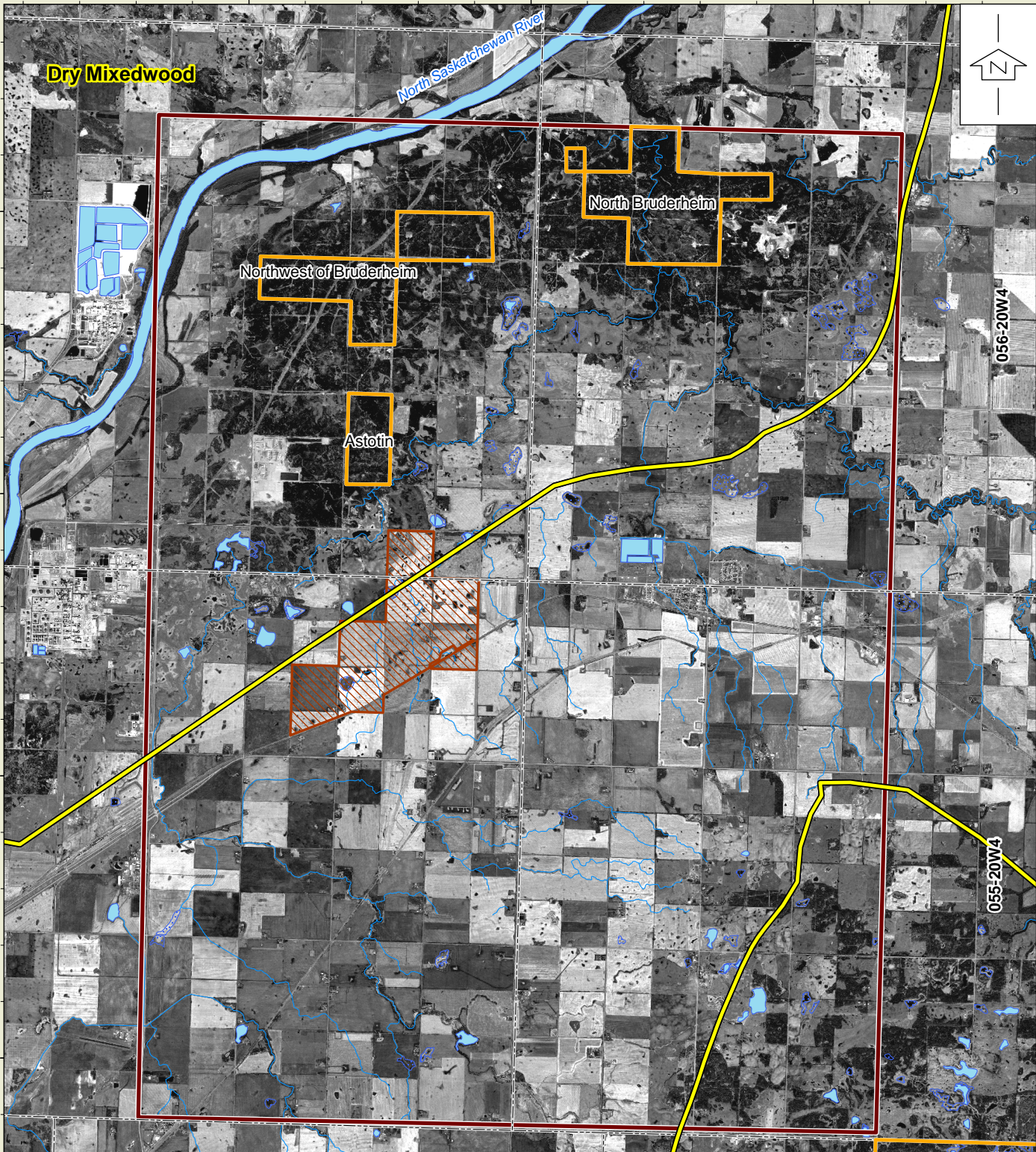
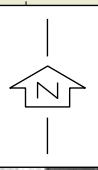
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**WILDLIFE
LOCAL STUDY AREA**

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Fig. No.: 11.2-1	

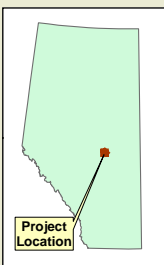
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054-21W4 **Central Parkland** **Dry Mixedwood** 055-20W4 056-20W4 Elk Island National Park

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Legend

- North American Upgrader Wildlife RSA
- North American Upgrader Wildlife LSA
- Alberta Natural Area
- Alberta Natural Subregion
- Waterbody - Permanent
- Waterbody - Recurring
- River/Stream
- Alberta Township/Range

Title:

**WILDLIFE
REGIONAL STUDY AREA**

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11.3 Issues and Assessment Criteria

Key Project-related issues or concerns for wildlife were identified through a screening process based on previous Environmental Impact Assessment (EIA) experience, Project-specific issues and consultation with provincial and federal agencies and stakeholders. Based on these criteria and the final TOR, the assessment was completed to address the following issues:

- Document and describe those species found within the study areas that are listed by the Alberta *Wildlife Act*, the General Status of Alberta Wild Species (ASRD, 2005) and in the federal *Species at Risk Act* (SARA) (2002).
- Describe and assess potential effects of the Project on wildlife both at a local and a regional scale, including:
 - The loss and/or alteration of wildlife habitat;
 - Wildlife mortality;
 - Sensory disturbance of wildlife; and
 - Effects of air emissions on wildlife health.
- Describe proposed strategies to minimize and/or mitigate Project effects on wildlife species and their habitats that are within the study areas.
- Identify and discuss proposed monitoring programs that will be implemented during various phases of the Project to evaluate the effectiveness of mitigation strategies to reduce impacts on wildlife species and their habitats.
- Identify and discuss wildlife studies in the study areas and the ways in which North American plans to adapt its operational and mitigation plans to incorporate the results of those studies.

11.3.1 Selection of Wildlife Species for Study

The key species were selected based on their ecological, scientific, cultural, socio-economic or aesthetic importance. There are over one hundred wildlife species that occur in the general area surrounding the Project. Since it is not feasible to evaluate impacts on all wildlife species that occur in the area, a smaller group of representative wildlife indicators was selected, based on the following criteria:

- Umbrella Species - those species that represent a suite of species inhabiting common habitats;
- Indicator Species - species or a community of species that would indicate environmental change;
- Species of Social and Economic Importance (game species); and/or
- Species of Concern as listed by federal or provincial wildlife agencies.

The selected wildlife species chosen for this assessment and the selection rationale for each species are provided below:

Mammals:

- White-tailed deer (*Odocoileus virginianus*) - Common in the study area and an important game species.
- Moose (*Alces alces*) - Present in the study region and an important game species.
- Coyote (*Canis latrans*) - Common in the study area and the largest mammalian predator in the region.

Birds of Prey:

- Great horned owl (*Bubo virginianus*) - Though a common bird of prey, it has limited habitat in the region and may be susceptible to habitat loss.

Songbirds:

- Songbirds are used as indicators of environmental change because of their sensitivity to habitat loss, and the ease of population surveying and detecting population change.

Amphibians:

- Amphibians are considered to be early indicators of environmental change. In Alberta, common amphibian species such as wood and boreal chorus frogs breed in a wide variety of aquatic habitats.

Species of Concern:

- The Project is in a region that falls within the breeding distribution of a number of wildlife species classified as At Risk, Endangered, Threatened or Of Concern by federal and provincial wildlife agencies. Species Of Concern that were selected for study included those federally listed or provincially classified as May Be at Risk. Species provincially classified as Sensitive are included in the general groups of indicators, such as songbirds and amphibians.

11.4 Methods

A combination of existing information reviews, field inventories and wildlife habitat modelling were used to estimate the baseline or existing conditions for wildlife in the study areas. The methods used in each of these approaches are provided in the following sections.

11.4.1 Assessment Approach

The effects of the Upgrader on wildlife were assessed by reviewing existing regional wildlife information and on field surveys conducted for the Project. The assessment is focused on the effects of the application case relative to the baseline case through the use of effects criteria. The effects are assessed with reference to designated key species or communities. The significance of Project effects were assessed using the following seven criteria:

- **Direction** describes if there is a net benefit, net loss or no change to wildlife as result of the Project development. The direction is classified as either a positive, neutral or negative effect.

- **Extent** describes the area within which wildlife is affected. The effects of the Project are classified as local if the effects on wildlife populations are site-specific; regional if wildlife beyond the LSA are affected; or beyond regional if the effects extend beyond the RSA.
- **Magnitude** describes the severity of the effect. Magnitude is classified as negligible (no discernible effect on wildlife population persistence), low (a measurable effect that will not lead to detectable changes in wildlife populations), medium (a measurable effect whereby the population will decline to a lower but stable size that is still likely viable) or high (a measurable effect that will lead to the exclusion of some wildlife populations from the study area).
- **Duration** describes how long the effect will occur. Duration is classified as short-term, medium-term or long-term. A short-term effect persists for the construction period only or less than one year following construction. A medium-term effect persists for construction and operation phase, but not beyond the life of the project. A long-term effect persists beyond decommissioning.
- **Frequency of occurrence** describes how often an effect occurs within a set time period. It is classified as isolated (occurs at a specific time), occasional (intermittent and sporadic), regular (occurs recurrently during the construction and operation phases) or continuous (occurs continually during the construction and operation phases).
- **Permanence** describes the potential for the recovery or reversibility of an effect. Permanence is classified as effects that are reversible in the short-term (within one year), reversible in the medium-term (one to ten years), reversible in the long-term (greater than ten years) or irreversible (permanent).
- **Prediction confidence** describes the certainty of the effect assessment, and considers data quality, rigour of the assessment/measurement approach and/or the certainty of prescribed mitigation measures. Prediction confidence is classified as low (poor understanding of cause-effect relationships and poor-quality data), medium (good understanding of cause-effect relationships and low-quality data, or high-quality data but poor understanding of cause-effect relationships) or high (good understanding of cause-effect relationships and high-quality data).

11.4.2 Existing Wildlife Information

Multiple databases were queried for potential occurrence of various wildlife species and sensitive habitat in the region of the Upgrader. Alberta's Fisheries and Wildlife Management Information System (FWMIS) and the Alberta Natural Heritage Information Centre database (ANHIC) were used to determine the potential occurrence of rare or sensitive wildlife species. Avian species are expected to be the most abundant wildlife group in the region. A list of potential breeding birds for the region was compiled from the following sources:

- The Federation of Alberta Naturalists' breeding bird observation database;
- North American Breeding Bird Surveys (USGS-CWS 2006); and
- Previously conducted EIAs in the region (Western Research and Development, 1980; Stantec, 2003; BA Energy, 2004; Shell, 2005).

An inventory of sensitive habitat in the region (Infotech, 1989) was consulted to determine if the site was situated in, or encroached upon, areas considered to contain sensitive habitat.

11.4.3 Field Surveys

11.4.3.1 Winter Track Count Survey

Systematic winter track count surveys were used to determine the winter distribution and habitat associations of medium- to large-sized mammals. The abundance of tracks of each species also provided an indication of which species were relatively more abundant in the LSA and RSA. Although winter track surveys cannot be used to estimate wildlife densities reliably, they can provide an indication of wildlife distribution and relative abundance. An early-winter survey was conducted on December 8 and 9, 2006, following a snowfall on December 6, 2006. A late-winter survey was proposed for February 2007; however, poor snow and weather conditions prevented completion of the second survey.

Within the LSA, 32 transects, ranging from 100 m to 1,000 m in length, were established in representative habitat types (Figure 11.4-1) for a total surveyed length of 17.5 km. Although attempts were made to locate transects in homogeneous habitat types, any changes in habitat that occurred along the length of transects were noted. The habitats sampled included open agricultural land and pasture, poplar (*Populus* spp.) woodlands, spruce-dominated woodlands, Class III and IV wetland edges (Stewart and Kantrud, 1971), vegetated agriculture edge (e.g., windrows) and willow (*Salix* spp.) shrublands.

In addition to the surveys within the LSA, two snow track surveys were conducted in the RSA. The first snow track survey was conducted in the relatively undisturbed habitat of the Northwest of Bruderheim Natural Area. The second regional snow track survey was a 17.6 km roadside survey conducted on Township Road 552, 4 km south of the LSA (Figure 11.4-2). The composition and relative abundance of species in the Bruderheim Natural Area provided a contrast to the survey results from the highly disturbed and fragmented LSA. The LSA is located between the pine-covered sand dune region to the northwest, and forested fragments associated with the Cooking Lake Moraine region to the southeast. While a single survey can provide limited conclusions about seasonal movements, the regional roadside transect survey was used to determine if and where large-scale wildlife movement corridors were located relative to the LSA and to the more forested regions to the north and south.

Wildlife tracks were identified to species or generic groups. Habitat types were noted and, where possible, the number of sets of tracks was recorded. In cases of well-used trails or runs, the number of sets of tracks was estimated. GPS waypoints were recorded to geo-reference the dataset to the landscape.

The survey was conducted over a two-day period approximately two or three days after snowfall. Moreover, the amount of effort for each survey differed due to varying transect lengths. To account for track accumulation and effort, the data were converted to a standardized measure as follows:

$$\text{Relative Track Density} = \frac{\text{Number of tracks recorded on a transect}}{\text{Transect length (m)} \times \text{Days since snowfall}}$$

11.4.3.2 Nocturnal Owl Surveys

Due to the highly fragmented forested habitat that exists within and surrounding the Project area, the availability of nesting habitat for owls is limited. However, the remaining habitat was predicted to be important to owl species such as great horned owls, commonly found in the area. Other owl species that have breeding ranges which include the RSA include the northern saw-whet owl (*Aegolius acadicus*), long-eared owl (*Asio otus*), short-eared owl (*Asio flammeus*), great gray owl (*Strix nebulosa*), barred owl (*Strix varia*) and northern hawk-owl (*Surnia ulula*) (Semechuck 1992). Northern pygmy owls (*Glaucidium gnoma*) and boreal owls (*Aegolius funereus*) are more commonly found in more spruce-dominated forests to the north and west of the RSA, but could potentially breed in the region. Of all the potential breeding species of owls, only the short-eared owl is classified under the federal *Species at Risk Act* as a Schedule 3 Species of Special Concern (SARA, 2002).

Nocturnal call playback surveys were used to determine the presence, distribution and relative abundance of owls in the study areas. Since owls can be drawn in from hundreds of metres away from their nesting area with call playback, only coarse-scale habitat associations can be assumed. Most owl species in this region of Alberta respond to recorded conspecific calls broadcast at night, as well as to the calls of other species. However, northern hawk owls and short-eared owls are diurnal and do not respond to nocturnal call playback. The potential occurrence of these species was recorded during daylight field surveys such as winter track surveys or spring-breeding bird surveys.

The survey protocol used was a modified version of the Alberta Nocturnal Owl Surveys as described in the Guidelines for Nocturnal Owl Monitoring in North America (Takats et al., 2001). The method is a highly efficient road-based survey that is initiated 30 minutes after sunset. Because some owl calls can be heard over a distance of 1 km, the broadcast stations were spaced at least at 1.6 km intervals. Since the RSA is in the Parkland Natural Region of Alberta but borders on the Boreal Forest Natural Region, the calls of both parkland and boreal owls were used during the surveys.

Digital recordings of owl calls spaced by listening periods were copied to a recording that was played on a portable stereo system. The call playback recording started with a two-minute silent listening period for detection of spontaneous calling. A series of six owl calls followed the initial silent period.

Each owl call lasted for 20 seconds and was followed by one minute of silent listening time. The species used for the playback recording were boreal owl, northern saw-whet owl, great gray owl, long-eared owl, barred owl and great horned owl. Because of the low likelihood of pygmy owls in the area, their call was not included during the broadcast survey. Northern pygmy owls can be detected either by spontaneous calls or in response to calls of other species (Piorecky and Prescott, 2004).

A series of 14 broadcast stations were chosen based on habitat availability. The LSA was covered by four stations, while five stations were set in the conifer forest region to the north of the LSA, and another five stations were set in a more agricultural setting (Figure 11.4-3) in the RSA. The stations outside of the Project area were located to provide a regional context to the survey results from the Project area. The conifer forest stations were used to compare owl densities in a relatively more natural setting with owl densities in the fragmented area of the Project site. The agricultural sites provided a comparison between geographic regions containing the same fragmented habitat availability.

Three rounds of owl surveys were conducted over a four-week period in March and April 2007. Each round of surveys began at different locations, and followed a unique order of stations to

control temporal sampling biases. In addition to the owl data, weather and incidental wildlife observation data were also recorded.

11.4.3.3 Amphibian Call Surveys

The presence and distribution of amphibians within the study areas were identified by auditory surveys. Most species of amphibians in this region of Alberta emit calls during the spring breeding season. The call surveys were conducted to determine the potential occurrence of sensitive species such as the northern leopard frog (*Rana pipiens*), western toad (*Bufo boreas*) and Canadian toad (*Bufo hemiophrys*) in the vicinity of the Project. Other common species that were expected in the region included wood frogs (*Rana sylvatica*) and boreal chorus frogs (*Pseudacris maculate*); neither of these species is listed by the Province of Alberta.

The prime vocalization period of various species can occur at different times during the spring-summer period (USGS, 2005). The USGS North American Amphibian Monitoring Program suggests 3 sampling periods to ensure that all species can be detected (USGS, 2005). Potential amphibian species that could occur in the RSA can call from the spring thaw in April and through the summer. Wood frogs will start calling as soon as the winter ice begins to melt, while Canadian toads can begin calling as late as early June (Hamilton et al., 1998, ASRD and ACA, 2001).

Amphibian species in the Parkland Natural Region of Alberta are crepuscular to nocturnal; therefore, surveys in the study areas were conducted during the prime vocalization period, from late evening to 0100 hours (Black and Brunson, 1971; Johnson and Batie, 1996; Hamilton et al., 1998; ASRD and ACA, 2001; Kendell, 2002; USGS, 2005). The surveys were conducted on April 25, May 9 and May 23, 2007. The date of the final survey was chosen to overlap with the early breeding season of yellow rails (Bazin and Baldwin, 2007). The nocturnal technique used to record amphibians allowed for the additional detection of calling yellow rails.

Based on the distribution of suitable habitat, 12 amphibian survey station locations were selected within the LSA (Figure 11.4-4). The RSA, which provided a regional context of amphibian presence, was sampled with an additional 18 stations (Figure 11.4-5). A five-minute listening period was used at each station. The relative abundance of each species was assessed based on four categories or ranks, as follows:

- Rank 0 – no amphibians heard calling;
- Rank 1 – individuals could be counted without overlapping calls;
- Rank 2 – numerous individuals were heard calling, with some calls overlapping; and
- Rank 3 – a large group of frogs or toads were present and calling in a chorus.

The wetland class and description, wind speed, temperature, level of ambient noise, amount of traffic, percentage of cloud cover and moon phase were also recorded.

11.4.3.4 Breeding Bird Surveys

Breeding bird surveys were conducted from early to mid-June 2007. Surveys followed standardized inventory methods in which birds are recorded by sight and sound from a stationary observation point (Bibby et al., 2000). Point counts with unlimited radius detection distances were used to compile overall breeding bird inventories for the study areas. A subset of bird data detected within a 50 m radius was used to examine population parameters and conduct habitat-

related analyses. Survey stations were placed at least 300 m apart, and included a 100 m buffer from the edge of the habitat type being sampled.

Point counts were conducted between 05:30 hours and 10:00 hours. Surveys were initiated following a one-minute settling period. At each survey point, both acoustic and visual records of birds were recorded during a five-minute period. While a longer survey time period may allow for the detection of one to three more species (Smith et al., 1998), the significant proportion of the species composition is detected within the first few minutes of a point count (Lynch, 1995; Shiu and Lee, 2003). A shorter survey time is more efficient, while a longer count period may introduce a density bias associated with birds moving into and out of the survey area (Granholm, 1983).

Singing male birds (considered territorial) and foraging females were considered representative of a breeding pair. Incidental bird observations were also recorded, and included birds observed or heard outside the 50 m point-count radius, birds flying through survey stations and birds observed during travel to another survey station. Incidental observations were used to compile a complete inventory of bird species. However, since observer bias and bird detectability rates become more variable beyond 50 m, only birds noted within the 50 m radius were used in habitat-related examinations, in analyses of species richness and diversity and determination of bird densities. Point counts were not conducted during adverse weather conditions (e.g., heavy rain, high winds), as these factors can affect both bird activity and the ability of the observer to detect birds (Bibby et. al., 2000).

Survey stations were selected prior to commencing field work using geo-referenced air photo maps of the study area to identify specific habitats for sampling (Figures 11.4-6 and 11.4-7). Twenty-four point-count stations were established in the Project study area, with the location of the stations split evenly between the LSA and RSA.

Within the LSA, survey locations were chosen based on the availability of habitat types: *Populus* spp. woodlands, conifer-dominated woodlands, *Salix* spp. shrubland riparian/wetlands, habitation and cropland. RSA survey locations were chosen to provide regional context to the Project site. Half of the RSA survey stations were placed in the relatively more continuous forest cover found in the Northwest of Bruderheim Natural Area to the north of the Project site. These stations were to provide a contrast to the more fragmented, agriculturally dominated land cover of the Project site. The remaining six RSA survey locations were placed south of the Project site in a region with a land cover similar to that of the Project site.

The locations of any active raptor nests were recorded during the breeding bird surveys. In addition, any other wildlife sightings (e.g., amphibians and mammals) and wildlife signs (e.g., tracks and scat) were also recorded.

Analyses

The 50 m fixed-radius point-count data was used to calculate bird species richness, species density and bird species diversity (BSD), as discussed below.

Species richness was calculated by determining the maximum number of species detected in each habitat type in the Project area. Species lists were a compilation of observations from three visits to multiple stations within each habitat type.

Prior to density and diversity calculations, the maximum number of individuals detected for each species was selected between the three visits to each station. Bird densities were determined by dividing the maximum number of individuals detected at each station by the 50 m point-count survey area (0.785 ha). Density values for each habitat type were calculated by dividing the

combined number of birds seen at each station within each of the habitat types by the total area of each habitat type surveyed.

The Bird Species Diversity (BSD) was measured for each habitat type through the use of the Shannon-Wiener (1949) Index (Shannon and Weaver, 1949):

$$BSD = - \sum_{i=1}^N p_i \ln(p_i)$$

where p is the relative abundance of each species relative to the number of birds of all species (N). The Shannon-Wiener Index takes into account the number of species within a habitat, as well as the relative abundance of each species in that same habitat. Therefore, relatively rare species receive a lower weight than species regularly observed. A high BSD value represents a habitat type with numerous individuals of multiple species. A low BSD value represents habitats with low densities of few species.

Comparisons of species richness and bird densities between multiple-habitat types were conducted through non-parametric Kruskal-Wallis tests (Zar, 1984). Mann-Whitney U tests were used for direct comparisons between two habitat types. Based on the metrics derived from the bird survey data for both the LSA and RSA, the suitability of the habitat within the LSA was rated, and the relative abundance of each habitat type at baseline was determined.

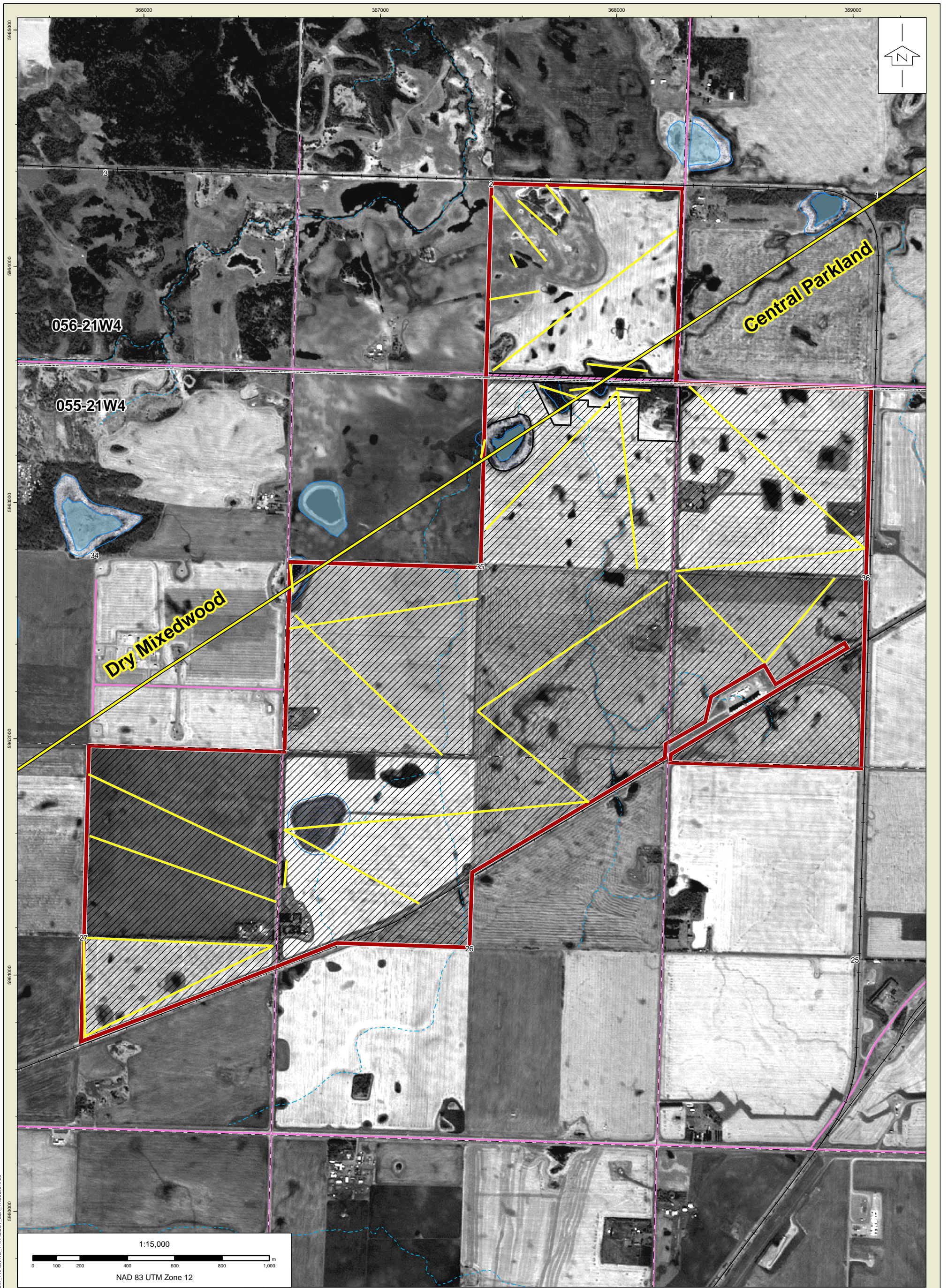
11.4.4 Modelling Methods

To assess the availability of habitat, a habitat model was employed. Based on the metrics derived from survey data, and knowledge of species habitat requirements, the vegetation land units within the LSA and RSA were rated for habitat quality among five species or species groups. Mapped polygons of vegetation land units were rated between 0 (nil) and 3 (high) with reference to habitat suitability for each of the five species or groups. All ratings were based on the assumptions that individuals of each species or species group would be found within each habitat type (as rated above) in similar abundances. It was also assumed that habitat conditions outside of the LSA are independent of habitat suitability within the LSA. Habitat suitability was modelled for the following:

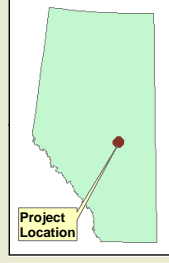
- white-tailed deer winter habitat;
- amphibians spring habitat;
- great horned owl breeding habitat;
- songbird breeding habitat; and
- Species of Concern: long-tailed weasel (*Mustela frenata*) year-round habitat.

11.4.5 Quality Assurance and Quality Control

Each survey type used to determine baseline conditions in the study areas is a universal, standard field survey (e.g., Bibby et al., 2000; Takats et al., 2001; USGS, 2005, Internet site). All personnel conducting the surveys were experienced wildlife biologists. All data collected were checked for accuracy during data entry. Data analysis methodologies and results were checked and verified during the senior technical review, as were conclusions drawn from the analyses.



I:\6198_514\MAPS\FIGURES\011_WILDLIFE\FIGURE_11.4-1_SNOW_TRACKING_TRANSECT_LSA_TABLOID.mxd



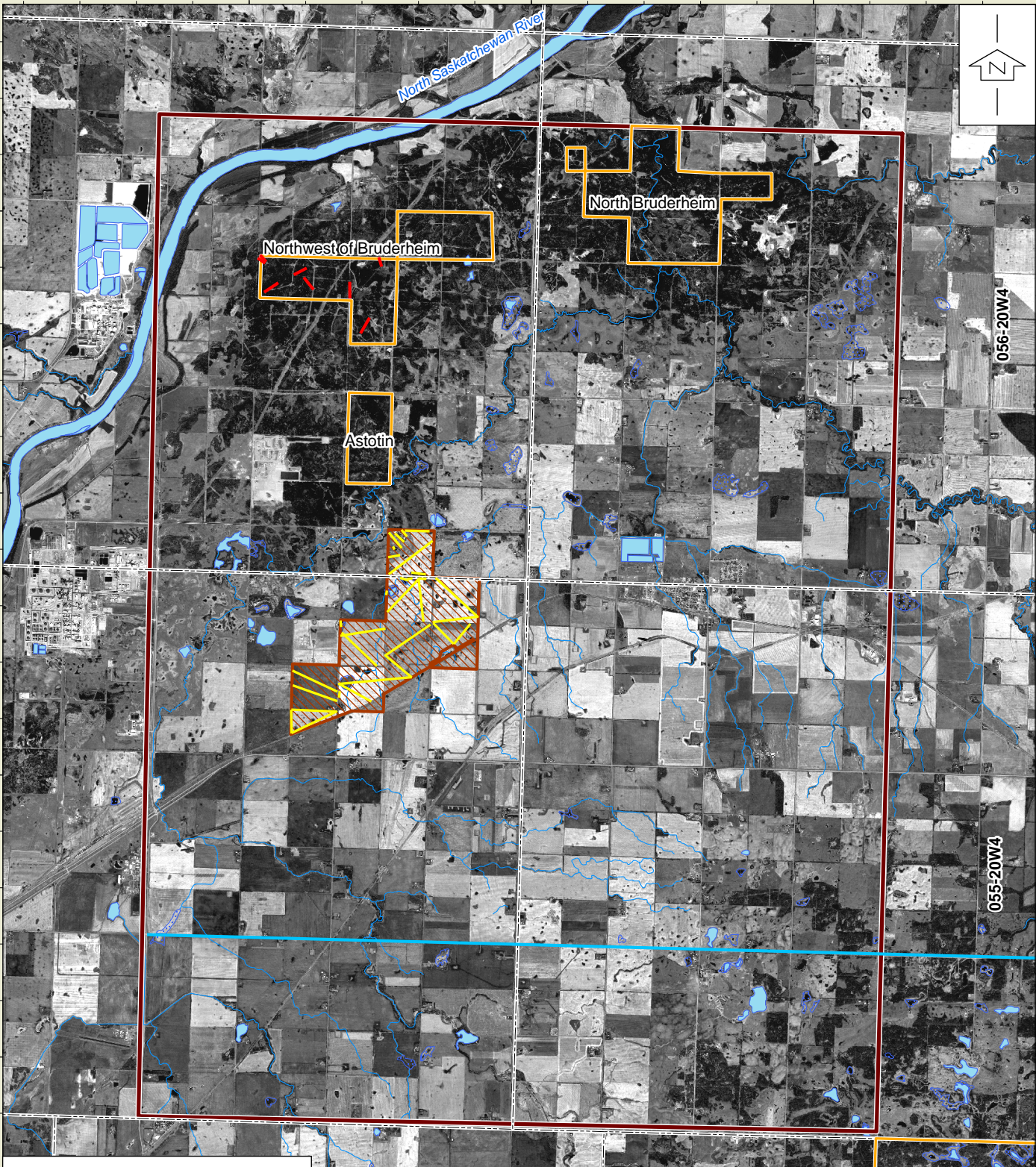
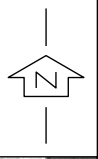
Legend	
	North American Upgrader Wildlife LSA
	Project Footprint
	Alberta Natural Subregion
	Waterbody
	Permanent
	Recurring
	Stream - Permanent
	Stream - Intermittent
	Alberta Township / Range
	ATS Section Line
	Road
	Railway
	LSA Transect

Title:

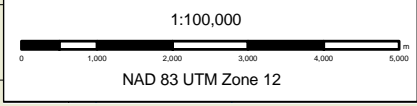
**SNOW TRACKING
TRANSECTS IN THE
LOCAL STUDY AREA**

Approved: BE	Revision Date: Nov.18, 2007
File: FIGURE_11.4-1_SNOW_TRACKING_TRANSECT_LSA_TABLOID.mxd	
Drawn by: LZ	Checked: JD
Fig. No.: 11.4-1	

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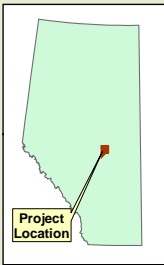


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Elk Island National Park

H:\198_514\MAPS\FIGURES\011_WILDLIFE\FIGURE_11.4-2_SNOW_TRACKING_TRANSECT_RSA.mxd



Legend

- North American Upgrader Wildlife RSA
- North American Upgrader Wildlife LSA
- Alberta Natural Area
- Waterbody - Permanent
- Waterbody - Intermittent
- River / Stream

Transects

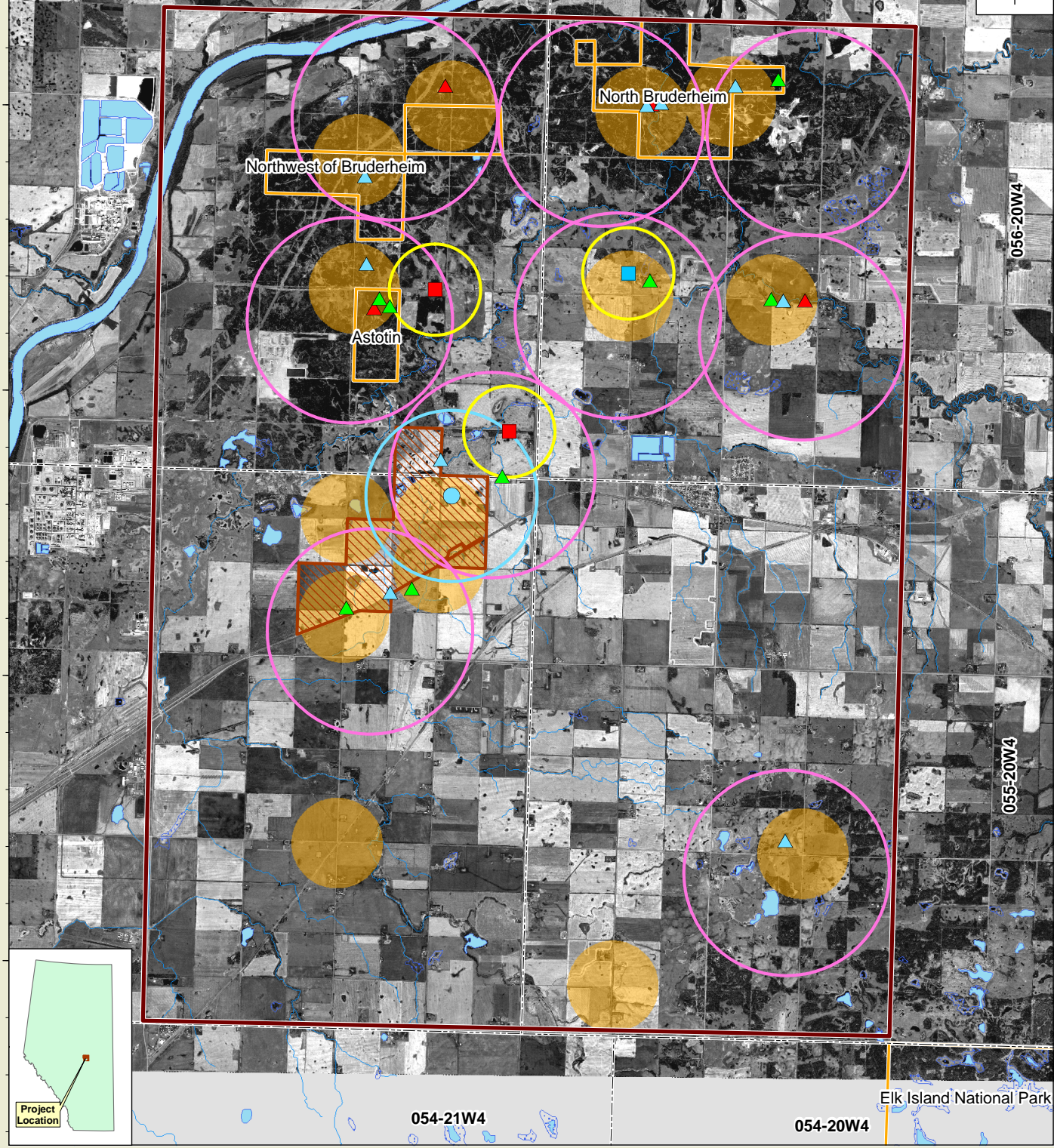
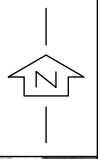
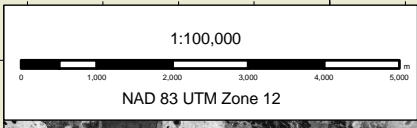
- RSA Transect
- LSA Transect
- Roadside Transect

Title:

**SNOW TRACKING
TRANSECTS IN THE
REGIONAL STUDY AREA**

Approved: JD	Revision Date: Oct 24, 2007
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Drawn by: TR	Checked: LZ/JD
Fig. No.: 11.4-2	

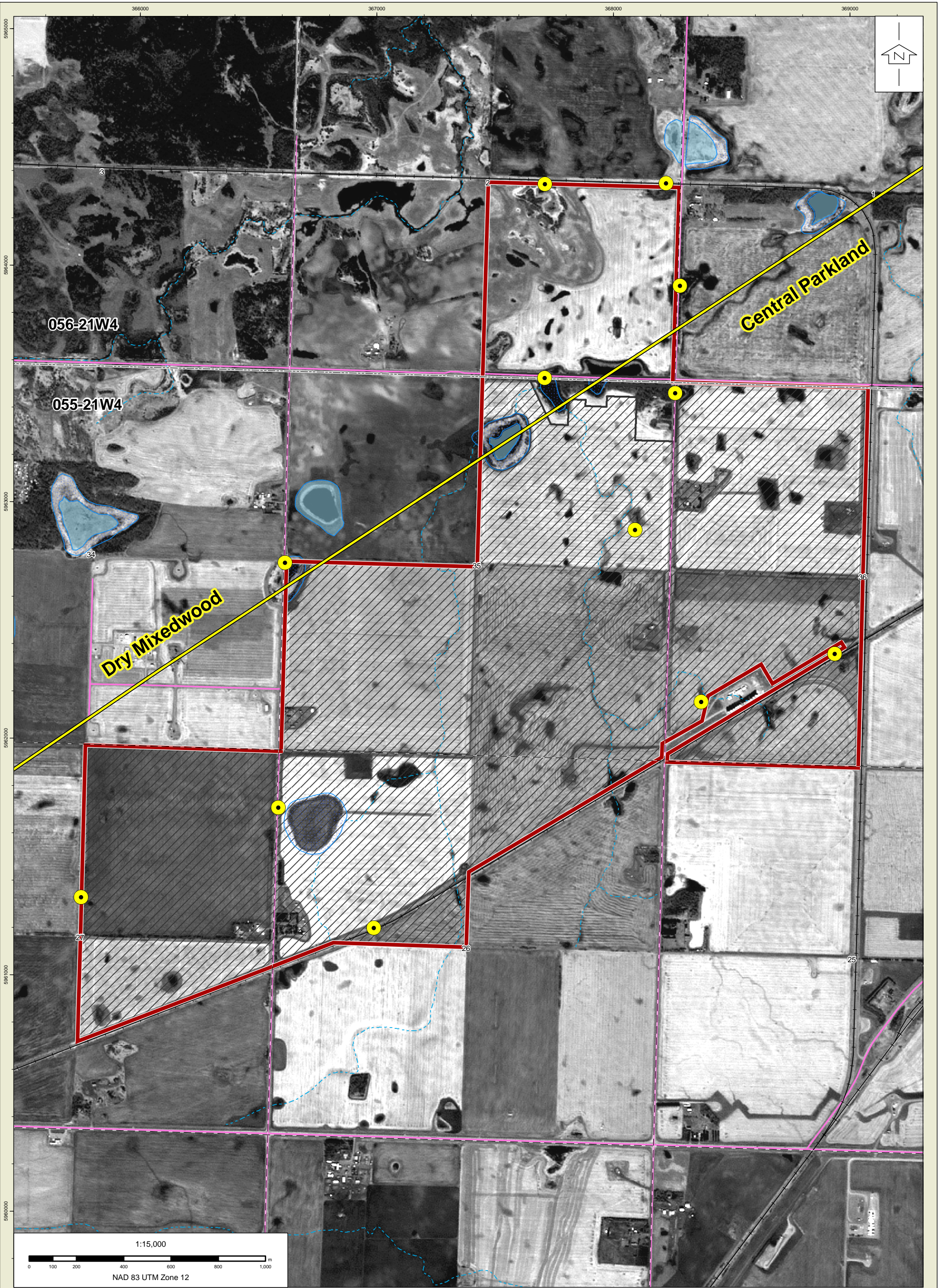
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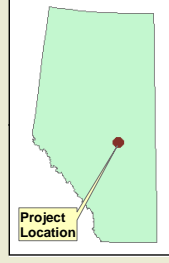
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	Northern-Saw-whet Owl, 2007/03/22		Great Horned Owl Territory
	Northern-Saw-whet Owl, 2007/03/28		Northern Saw-whet Owl Territory
	Great Horned Owl, 2007/04/03		Long-eared Owl Territory
	Great Horned Owl, 2007/03/22		North American Upgrader Wildlife RSA
	Great Horned Owl, 2007/03/27		North American Upgrader Wildlife LSA
			Alberta Natural Area
			Waterbody - Permanent
			Waterbody - Recurring
			River/Stream

Title:		
OWL SURVEY STATIONS, DETECTION SITES, AND OWL TERRITORIES IN THE REGIONAL STUDY AREA		
Approved:	Revision Date:	
BE	Oct 24, 2007	
File: FIGURE_11.4-03_OWL_SURVEY_STATIONS_OWL_DETECTION_POINTS.mxd		
Drawn by:	Checked:	Fig. No.:
TR	JD	11.4-3

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I:\6198_514\MAPS\FIGURES\01_WILDLIFE\FIGURE_11.4.4_AMPHIBIAN_SURVEY_POINTS_LSA_TABLOID.mxd



Legend	
	North American Upgrader Wildlife LSA
	Project Footprint
	Alberta Natural Subregion
Waterbody	
	Permanent
	Recurring
	Stream - Permanent
	Stream - Intermittent
	Alberta Township / Range
	ATS Section Line
	Road
	Railway
	Amphibian Survey Station

Title:

AMPHIBIAN SURVEY POINTS IN THE LOCAL STUDY AREA

Approved: BE	Revision Date: Nov.18, 2007
File: FIGURE_11.4.4_AMPHIBIAN_SURVEY_POINTS_LSA_TABLOID.mxd	
Drawn by: LZ	Checked: JD
Fig. No.: 11.4-4	

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North Saskatchewan River

North Bruderheim

Northwest of Bruderheim

Astotin

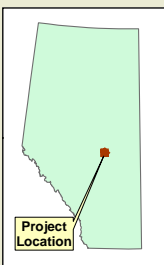
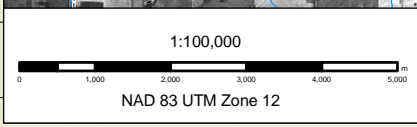
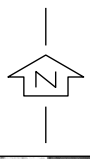
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Elk Island National Park



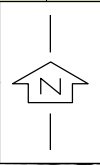
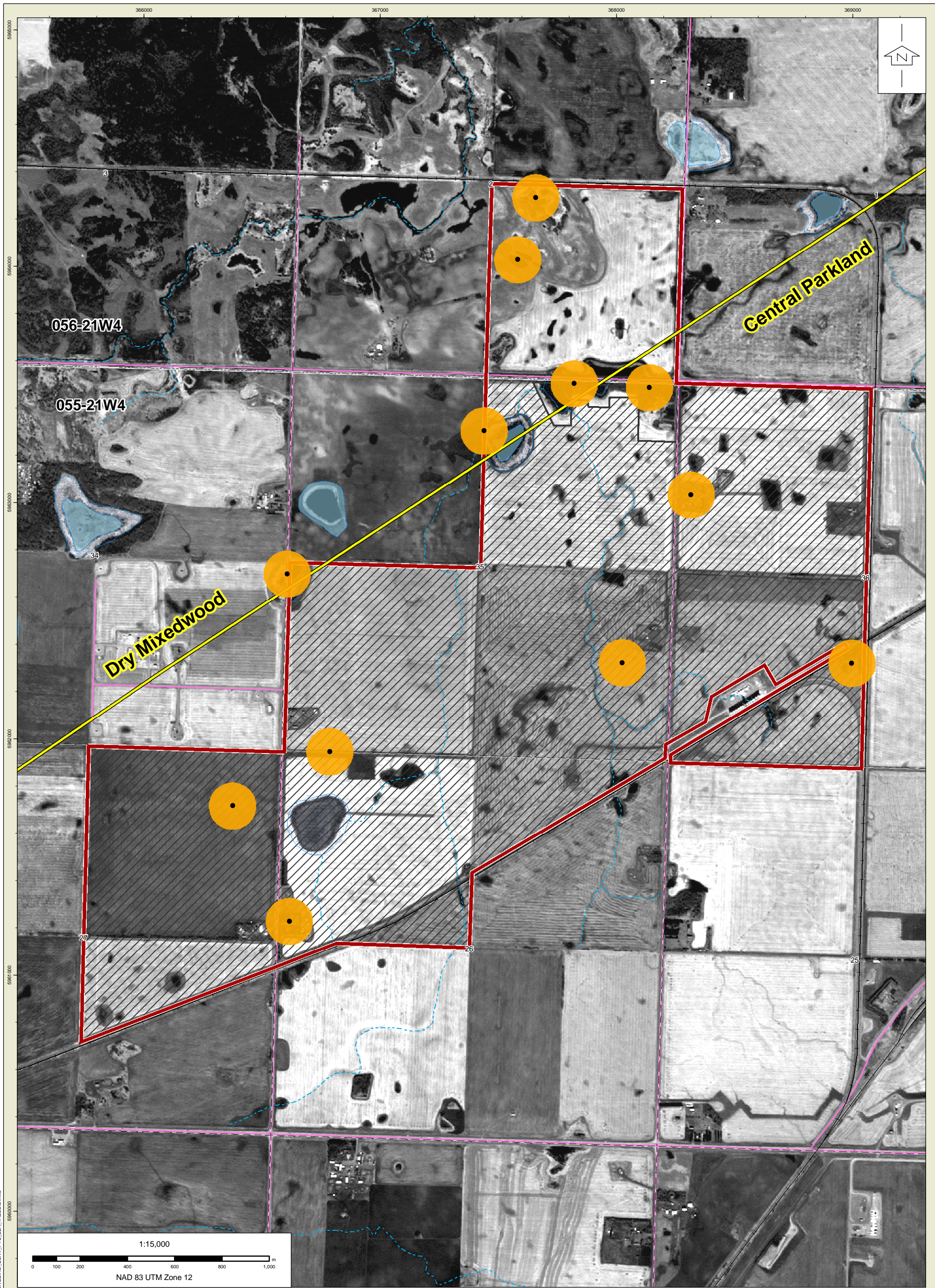
Legend	
	North American Upgrader Wildlife RSA
	North American Upgrader Wildlife LSA
	Alberta Natural Areas
Waterbody	
	Permanent
	Recurring
	Stream/River
	Amphibian Survey Station

Title:

AMPHIBIAN SURVEY POINTS IN THE REGIONAL STUDY AREA

Approved: JD	Revision Date: Oct 24, 2007
File: FIGURE_11.4-05_AMPHIBIAN_SURVEY_POINTS_RSA.mxd	
Drawn by: TR	Checked: LZ/JD
Fig. No.: 11.4-5	

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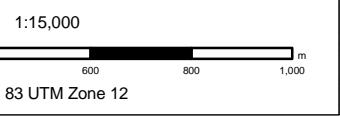


Dry Mixedwood

Central Parkland

056-21W4

055-21W4



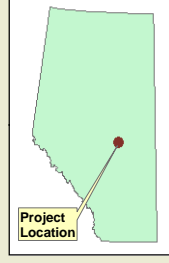
Legend					
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	Project Footprint		Stream - Intermittent		
	Alberta Natural Subregion		Alberta Township / Range		
	Waterbody		ATS Section Line		
	Permanent		Road		
	Recurring		Railway		

Title:

SONGBIRD SURVEY POINTS IN THE LOCAL STUDY AREA

Approved: BE	Revision Date: Nov.18, 2007
File: FIGURE_11.4-06_SONGBIRD_SURV_PTS_LSA_TABLOID.mxd	
Drawn by: LZ	Checked: JD
Fig. No.: 11.4-6	

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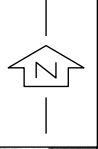


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North Saskatchewan River



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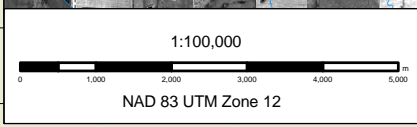
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Northwest of Bruderheim

North Bruderheim

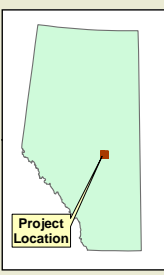
Astotin



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Elk Island National Park



Legend

- North American Upgrader Wildlife RSA
- North American Upgrader Wildlife LSA
- Alberta Natural Areas
- Stream/River
- Songbird Survey Station with 100 m Buffer
- Waterbody**
 - Permanent
 - Recurring

Title:

SONGBIRD SURVEY POINTS IN THE REGIONAL STUDY AREA

Approved: BE	Revision Date: Oct 24, 2007
File: FIGURE_11.4-07_SONGBIRD_SURV_PTS_RSA.mxd	
Drawn by: TR	Checked: JD
Fig. No.: 11.4-7	

\\1986_514\MAPS\FIGURES\011_WILDLIFE\FIGURE_11.4-07_SONGBIRD_SURV_PTS_RSA.mxd

11.5 Existing Conditions

11.5.1 Existing Wildlife Information

11.5.1.1 Existing Wildlife Data

Breeding bird databases and observations listed in EIAs previously conducted in the region indicate that 150 bird species could potentially breed and/or winter on or around the LSA (Table 11.5-1). Another 46 species of mammals could potentially occur in the vicinity of the Project, based on wildlife distribution maps (Pattie and Hoffman, 1990; Smith, 1993; Shell, 2005) (Table 11.5-1), although habitat for all of these wildlife species is not present within the LSA. Finally, six species of amphibians and reptiles are possible in the study region (Russell and Bauer, 1993) (Table 11.5-1). Canadian toads and northern leopard frogs have been noted as possibly present in the region (Western Research and Development, 1980; BA Energy, 2004, Shell, 2005).

11.5.1.2 Wildlife Species of Special Concern

The LSA falls within the potential breeding and/or wintering ranges of some federally and provincially listed sensitive species. Federally listed Species at Risk that have been documented in the Project study area or have breeding ranges that encompass the Project site include the peregrine falcon, Sprague's pipit, short-eared owl, yellow rail and western toad (SARA, 2002). In addition to the federally listed species, others categorized as sensitive within Alberta are also known to be in the area of the LSA or have breeding ranges that include the Upgrader site (Table 11.5-2).

Wildlife Species Occurring in the Area

While many listed species could potentially be observed in the LSA, based on known distribution, many species may not occur because of the effects of habitat fragmentation and limited habitat availability. Other species also have a low historical frequency of occurrence, and thus are less likely to occur. A desktop habitat evaluation of the LSA indicated that none of the federally listed species were likely to occur. However, the occurrence of some of the provincially listed species, especially those species recently classified as sensitive (ASRD, 2005) yet still numerous, was considered to be more probable.

The Canadian toad is rated as May Be at Risk in Alberta. Prior to its most recent listing in 2002, the Canadian toad was ranked as a red-listed species in Alberta because of a dramatic decline in its parkland distribution (Hamilton et al., 1998). In 2004, a single Canadian toad observation was made during amphibian surveys conducted for the Heartland Upgrader located approximately 3 km northwest of the Property (BA Energy, 2004). The sandy soils and greater availability of marshy floodplains and ponds in Strathcona County provide suitable habitat for the species (Infotech, 1989; Hamilton et al., 1998).

Table 11.5-1 Potential Wildlife Species in the RSA

Species	Scientific Name	Status		Detected in RSA during 2007 Surveys
		Provincial ¹	Federal ²	
Common Name	Scientific Name	Provincial ¹	Federal ²	
Alder Flycatcher	<i>Empidonax alnorum</i>	Secure		X
American Coot	<i>Fulica americana</i>	Secure		X

Species	Scientific Name	Status		Detected in RSA during 2007 Surveys
		Provincial ¹	Federal ²	
American Crow	<i>Corvus brachyrhynchos</i>	Secure		X
American Goldfinch	<i>Carduelis tristis</i>	Secure		X
American Kestrel	<i>Falco sparverius</i>	Secure		
American Redstart	<i>Setophaga ruticilla</i>	Secure		X
American Robin	<i>Turdus migratorius</i>	Secure		X
American Tree Sparrow	<i>Spizella arborea</i>	Secure		
American White Pelican	<i>Pelecanus erythrorhynchos</i>	Sensitive		
American Wigeon	<i>Anas Americana</i>	Secure		X
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Secure		
Baltimore Oriole	<i>Icterus galbula</i>	Sensitive		X
Barn Swallow	<i>Hirundo rustica</i>	Sensitive		X
Barred Owl	<i>Strix varia</i>	Sensitive		
Belted Kingfisher	<i>Ceryle alcyon</i>	Secure		
Black Tern	<i>Chlidonias niger</i>	Sensitive		X
Black-backed Woodpecker	<i>Picoides arcticus</i>	Sensitive		
Black-billed Magpie	<i>Pica hudsonia</i>	Secure		X
Black-capped Chickadee	<i>Poecile atricapilla</i>	Secure		X
Blue Jay	<i>Cyanocitta cristata</i>	Secure		
Blue-headed Vireo	<i>Vireo solitarius</i>	Secure		X
Blue-winged Teal	<i>Anas discors</i>	Secure		X
Bohemian Waxwing	<i>Bombycilla garrulus</i>	Secure		
Boreal Chickadee	<i>Poecile hudsonica</i>	Secure		
Boreal Owl	<i>Aegolius funereus</i>	Secure		
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	Secure		X
Broad-winged Hawk	<i>Buteo platypterus</i>	Sensitive		
Brown Creeper	<i>Certhia americana</i>	Sensitive		
Brown-headed Cowbird	<i>Molothrus ater</i>	Secure		X
Bufflehead	<i>Bucephala albeola</i>	Secure		
Canada Goose	<i>Branta canadensis</i>	Secure		X
Canada Warbler	<i>Wilsonia Canadensis</i>	Sensitive		
Cape May Warbler	<i>Dendroica tigrina</i>	Sensitive		
Cedar Waxwing	<i>Bombycilla cedrorum</i>	Secure		X
Chipping Sparrow	<i>Spizella passerina</i>	Secure		X
Chukar	<i>Alectoris chukar</i>	Secure		
Clay-colored Sparrow	<i>Spizella pallida</i>	Secure		X
Common Goldeneye	<i>Bucephala clangula</i>	Secure		
Common Loon	<i>Gavia immer</i>	Secure		
Common Merganser	<i>Mergus merganser</i>	Secure		
Common Nighthawk	<i>Chordeiles minor</i>	Sensitive		
Common Raven	<i>Corvus corax</i>	Secure		X
Common Redpoll	<i>Carduelis flammea</i>	Secure		
Common Tern	<i>Sterna hirundo</i>	Secure		
Common Yellowthroat	<i>Geothlypis trichas</i>	Sensitive		X
Cooper's Hawk	<i>Accipiter cooperii</i>	Secure		
Dark-eyed Junco	<i>Junco hyemalis</i>	Secure		X
Downy Woodpecker	<i>Picoides pubescens</i>	Secure		
Eared Grebe	<i>Podiceps nigricollis</i>	Secure		
Eastern Phoebe	<i>Sayornis phoebe</i>	Sensitive		X
European Starling	<i>Sturnus vulgaris</i>	Secure		X
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	Secure		

Species	Scientific Name	Status		Detected in RSA during 2007 Surveys
		Provincial ¹	Federal ²	
Franklin's Gull	<i>Larus pipixcan</i>	Secure		
Gadwall	<i>Anas strepera</i>	Secure		
Golden Eagle	<i>Aquila chrysaetos</i>	Secure		
Golden-crowned Kinglet	<i>Regulus satrapa</i>	Secure		
Gray Catbird	<i>Dumetella carolinensis</i>	Secure		
Gray Jay	<i>Perisoreus canadensis</i>	Secure		X
Gray Partridge	<i>Perdix perdix</i>	Secure		
Great Blue Heron	<i>Ardea herodias</i>	Sensitive		
Great Gray Owl	<i>Strix nebulosa</i>	Sensitive		
Great Horned Owl	<i>Bubo virginianus</i>	Secure		
Green-winged Teal	<i>Anas crecca</i>	Sensitive		X
Gyr Falcon	<i>Falco rusticolus</i>	Secure		
Hairy Woodpecker	<i>Picoides villosus</i>	Secure		
Harris' Sparrow	<i>Zonotrichia querula</i>	Secure		
Hermit Thrush	<i>Catharus guttatus</i>	Secure		X
Hoary Redpoll	<i>Carduelis hornemanni</i>	Secure		
Horned Grebe	<i>Podiceps auritus</i>	Sensitive		
House Sparrow	<i>Passer domesticus</i>	Secure		X
House Wren	<i>Troglodytes aedon</i>	Secure		X
Killdeer	<i>Charadrius vociferus</i>	Secure		X
Le Conte's Sparrow	<i>Ammodramus leconteii</i>	Secure		
Least Flycatcher	<i>Empidonax minimus</i>	Sensitive		X
Lesser Scaup	<i>Aythya affinis</i>	Sensitive		
Lincoln's Sparrow	<i>Melospiza lincolnii</i>	Secure		X
Mallard	<i>Anas platyrhynchos</i>	Secure		X
Marsh Wren	<i>Cistothorus palustris</i>	Secure		X
Merlin	<i>Falco columbarius</i>	Secure		
Mountain Bluebird	<i>Sialia currucoides</i>	Secure		X
Mountain Chickadee	<i>Poecile gambeli</i>	Secure		
Mourning Dove	<i>Zenaidura macroura</i>	Secure		
Northern Cardinal	<i>Cardinalis cardinalis</i>	Secure		
Northern Flicker	<i>Colaptes auratus</i>	Secure		X
Northern Goshawk	<i>Accipiter gentilis</i>	Sensitive		
Northern Harrier	<i>Circus cyaneus</i>	Sensitive		
Northern Hawk Owl	<i>Surnia ulula</i>	Secure		
Northern Pintail	<i>Anas acuta</i>	Sensitive		
Northern Saw-whet Owl	<i>Aegolius acadicus</i>	Secure		X
Northern Shoveler	<i>Anas clypeata</i>	Secure		X
Northern Shrike	<i>Lanius excubitor</i>	Secure		
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Secure		
Orange-crowned Warbler	<i>Vermivora celata</i>	Secure		X
Ovenbird	<i>Seiurus aurocapillus</i>	Secure		X
Peregrine Falcon	<i>Falco peregrinus</i>	At Risk	Threatened (SARA Schedule 1)	
Pied-billed Grebe	<i>Podilymbus podiceps</i>	Sensitive		
Pileated Woodpecker	<i>Dryocopus pileatus</i>	Sensitive		
Pine Grosbeak	<i>Pinicola enucleator</i>	Secure		
Pine Siskin	<i>Carduelis pinus</i>	Secure		X
Prairie Falcon	<i>Falco mexicanus</i>	Secure		
Purple Finch	<i>Carpodacus purpureus</i>	Secure		X
Purple Martin	<i>Progne subis</i>	Sensitive		
Red Crossbill	<i>Loxia curvirostra</i>	Secure		

Species	Scientific Name	Status		Detected in RSA during 2007 Surveys
		Provincial ¹	Federal ²	
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Secure		X
Red-eyed Vireo	<i>Vireo olivaceus</i>	Secure		X
Redhead	<i>Aythya americana</i>	Secure		
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Secure		X
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Secure		X
Ring-necked Pheasant	<i>Phasianus colchicus</i>	Secure		
Rock Pigeon	<i>Columba livia</i>	Secure		X
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	Secure		X
Rough-legged Hawk	<i>Buteo lagopus</i>	Secure		
Ruby-crowned Kinglet	<i>Regulus calendula</i>	Secure		
Ruddy Duck	<i>Oxyura jamaicensis</i>	Secure		X
Ruffed Grouse	<i>Bonasa umbellus</i>	Secure		
Rusty Blackbird	<i>Euphagus carolinus</i>	Secure		
Savannah Sparrow	<i>Passerculus sandwichensis</i>	Secure		X
Sharp-shinned Hawk	<i>Accipiter striatus</i>	Secure		
Sharp-tailed Grouse	<i>Tympanuchus phasianellus</i>	Sensitive		
Short-eared Owl	<i>Asio flammeus</i>	May Be at Risk	Special Concern (SARA Schedule 3)	
Snow Bunting	<i>Plectrophenax nivalis</i>	Secure		
Snowy Owl	<i>Nyctea scandiaca</i>	Secure		
Solitary Sandpiper	<i>Tringa solitaria</i>	Secure		
Song Sparrow	<i>Melospiza melodia</i>	Secure		X
Sora	<i>Porzana carolina</i>	Sensitive		X
Sprague's Pipit	<i>Anthus spragueii</i>	Sensitive	Threatened (SARA Schedule 1)	
Spruce Grouse	<i>Falcapennis canadensis</i>	Secure		
Swainson's Thrush	<i>Catharus ustulatus</i>	Secure		X
Swainson's Hawk	<i>Buteo swainsoni</i>	Sensitive		
Tennessee Warbler	<i>Vermivora peregrina</i>	Secure		X
Three-toed Woodpecker	<i>Picoides dorsalis</i>	Secure		
Townsend's Solitaire	<i>Myadestes townsendi</i>	Secure		
Tree Swallow	<i>Tachycineta bicolor</i>	Secure		X
Veery	<i>Catharus fuscescens</i>	Secure		
Vesper Sparrow	<i>Pooecetes gramineus</i>	Secure		X
Warbling Vireo	<i>Vireo gilvus</i>	Secure		X
Western Meadowlark	<i>Sturnella neglecta</i>	Secure		
Western Tanager	<i>Piranga ludoviciana</i>	Sensitive		X
Western Wood-Pewee	<i>Contopus sordidulus</i>	Secure		X
White-breasted Nuthatch	<i>Sitta carolinensis</i>	Secure		X
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	Secure		
White-throated Sparrow	<i>Zonotrichia albicollis</i>	Secure		X
White-winged Crossbill	<i>Loxia leucoptera</i>	Secure		
Willet	<i>Catoptrophorus semipalmatus</i>	Secure		X
Wilson's Snipe	<i>Gallinago delicata</i>	Secure		X
Yellow Rail	<i>Coturnicops noveboracensis</i>	Undetermined	Special Concern (SARA Schedule 1)	
Yellow Warbler	<i>Dendroica petechia</i>	Secure		X
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	Secure		
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	Secure		X

Species	Scientific Name	Status		Detected in RSA during 2007 Surveys
		Provincial ¹	Federal ²	
Yellow-rumped Warbler	<i>Dendroica coronata</i>	Secure		X
Mammals				
Masked Shrew	<i>Sorex cinereus</i>	Secure		
Prairie Shrew	<i>Sorex haydeni</i>	Secure		
Dusky Shrew	<i>Sorex monticolus</i>	Secure		
Water Shrew	<i>Sorex palustris</i>	Secure		
Arctic Shrew	<i>Sorex arcticus</i>	Secure		
Pygmy Shrew	<i>Sorex hoyi</i>	Secure		
Little Brown Myotis	<i>Myotis lucifugus</i>	Secure		
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	May Be at Risk		
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	Sensitive		
Big Brown Bat	<i>Eptesicus fuscus</i>	Secure		
Hoary Bat	<i>Lasiurus cinereus</i>	Sensitive		
Snowshoe Hare	<i>Lepus americanus</i>	Secure		X
White-tailed Jackrabbit	<i>Lepus townsendii</i>	Secure		
Least Chipmunk	<i>Tamias minimus</i>	Secure		
Woodchuck	<i>Marmota monax</i>	Secure		
Richardson's Ground Squirrel	<i>Spermophilus richardsonii</i>	Secure		
Thirteen-lined Ground Squirrel	<i>Spermophilus tridecemlineatus</i>	Undetermined		
Franklin's Ground Squirrel	<i>Spermophilus franklinii</i>	Undetermined		
Red Squirrel	<i>Tamiasciurus hudsonicus</i>	Secure		X
Northern Flying Squirrel	<i>Glaucomys sabrinus</i>	Secure		
Northern Pocket Gopher	<i>Thomomys talpoides</i>	Secure		
Beaver	<i>Castor canadensis</i>	Secure		
Deer Mouse	<i>Peromyscus maniculatus</i>	Secure		
Southern Red-backed Vole	<i>Clethrionomys gapperi</i>	Secure		
Meadow Vole	<i>Microtus pennsylvanicus</i>	Secure		
Heather Vole	<i>Phenacomys intermedius</i>	Secure		
Muskrat	<i>Ondatra zibethicus</i>	Secure		
Northern Bog Lemming	<i>Synaptomys borealis</i>	Secure		
House Mouse	<i>Mus musculus</i>	Secure		
Meadow Jumping Mouse	<i>Zapus hudsonius</i>	Secure		
Western Jumping Mouse	<i>Zapus princeps</i>	Secure		
Porcupine	<i>Erethizon dorsatum</i>	Secure		X
Coyote	<i>Canis latrans</i>	Secure		X
Red Fox	<i>Vulpes vulpes</i>	Secure		
Black Bear	<i>Ursus americanus</i>	Secure		
Raccoon	<i>Procyon lotor</i>	Secure		
Ermine	<i>Mustela erminea</i>	Secure		X
Long-tailed weasel	<i>Mustela frenata</i>	May Be at Risk	Not At Risk	X
Least Weasel	<i>Mustela nivalis</i>	Secure		X
Mink	<i>Mustela vison</i>	Secure		
American Badger	<i>Taxidea taxus</i>	Sensitive	Not At Risk	
Striped Skunk	<i>Mephitis mephitis</i>	Secure		
Canada Lynx	<i>Lynx canadensis</i>	Secure		
Mule Deer	<i>Odocoileus hemionus</i>	Secure		
White-tailed Deer	<i>Odocoileus virginianus</i>	Secure		X

Species	Scientific Name	Status		Detected in RSA during 2007 Surveys
		Provincial ¹	Federal ²	
Moose	<i>Alces alces</i>	Secure		X
Amphibian/Reptile Species				
Wood Frog	<i>Rana sylvatica</i>	Secure		X
Boreal Chorus Frog	<i>Pseudacris triseriata</i>	Secure		X
Western Toad	<i>Bufo boreas</i>	Sensitive	Special Concern (SARA Schedule 1)	
Canadian Toad	<i>Bufo hemiophrys</i>	May Be at Risk	Not At Risk	X
Tiger Salamander	<i>Ambystoma tigrinum</i>	Secure		
Red-sided Garter Snake	<i>Thamnophis sirtalis</i>	Sensitive		

Notes:

¹ASRD (2005)

At Risk: any species known to be At Risk after a formal detailed status assessment and designation as Endangered or Threatened in Alberta.

May Be at Risk: any species that May Be at Risk of extinction or extirpation and is therefore a candidate for detailed risk assessment.

Sensitive: any species that is not at risk of extinction or extirpation but might need special attention or protection to prevent it from becoming at risk.

Secure: a species that is not At Risk, May Be at Risk or Sensitive.

Undetermined: any species for which insufficient information, knowledge or data are available to reliably evaluate its general status.

Not Assessed: any species that has not been examined for this report.

Exotic or Alien: any species that has been introduced.

Extirpated or Extinct: any species no longer thought to be present in Alberta (Extirpated) or no longer believed to be present anywhere in the world (Extinct).

Accidental or Vagrant: any species occurring infrequently and unpredictably in Alberta, i.e., outside its usual range.

² SARA (2002)

Extinct: a wildlife species that no longer exists.

Extirpated: a wildlife species no longer existing in the wild in Canada, but occurring elsewhere.

Endangered: a wildlife species facing imminent extirpation or extinction.

Threatened: a wildlife species likely to become endangered if limiting factors are not reversed.

Special Concern: a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

Data Deficient: a category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.

Not At Risk: A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

The *Species at Risk Act* (SARA) establishes Schedule 1 as the official list of wildlife species at risk. Under SARA, wildlife species that are listed on Schedules 2 and 3 must be assessed by COSEWIC within a given timeframe before they can be considered for addition to Schedule 1 of SARA.

No federal status if blank.

Sources: Western Research and Development, 1980; AGRA, 1998; Stantec, 2003; BA Energy, 2004; Shell, 2005; USGS-CWS, 2006; NAS, 2007; Federation of Alberta Naturalists unpublished data

Table 11.5-2 Wildlife Species of Concern Potentially Associated with Habitats in the Local Study Area (Taxonomic Order)

Species		Associated Habitat Types in the LSA	Detected in RSA during 2007 Surveys
Common Name	Scientific Name		
Horned Grebe	<i>Podiceps auritus</i>	Class III and Class IV wetlands	
Pied-billed Grebe	<i>Podilymbus podiceps</i>	Class III and Class IV wetlands	
Great Blue Heron	<i>Ardea herodias</i>	Class III and Class IV wetlands	
Green-winged Teal	<i>Anas crecca</i>	Class I through IV wetlands, Ephemeral streams, <i>Populus spp.</i> woodland and <i>Salix spp.</i> Shrubland	X
Northern Pintail	<i>Anas acuta</i>	Class I through IV wetlands Tame Pasture	
Lesser Scaup	<i>Aythya affinis</i>	Class III and Class IV wetlands	
Northern Harrier	<i>Circus cyaneus</i>	Class I through IV wetlands Tame Pasture	
Northern Goshawk	<i>Accipiter genetilis</i>	<i>Populus spp.</i> woodland	
Broad-winged Hawk	<i>Buteo playpterus</i>	<i>Populus spp.</i> woodland	
Swainson's Hawk	<i>Buteo swainsonii</i>	<i>Populus spp.</i> woodland, Tame Pasture	
Sharp-tailed Grouse	<i>Tympanuchus phasianellus</i>	<i>Populus spp.</i> woodland, Tame Pasture, <i>Salix spp.</i> Shrubland	
Black Tern	<i>Chlidonias niger</i>	Class III and Class IV wetlands	X
Yellow Rail	<i>Cortunicops noveboracensis</i>	Class III and Class IV wetlands	
Sora	<i>Porzana carolina</i>	Class III and Class IV wetlands	X
Barred Owl	<i>Strix varia</i>	Spruce Dominated and <i>Populus spp.</i> Woodlands	
Short-eared Owl	<i>Asio flammeus</i>	Class I through IV wetlands Tame Pasture, Agricultural Lands	
Common Nighthawk	<i>Chordeiles minor</i>	Tame Pasture, Agricultural Lands, <i>Populus spp.</i> Woodland, Spruce Dominated Woodland, <i>Salix spp.</i> Shrubland	
Black-backed Woodpecker	<i>Picoides arcticus</i>	Spruce Dominated Woodland	
Pileated Woodpecker	<i>Dryocopus pileatus</i>	<i>Populus spp.</i> Woodland, Conifer Dominated Woodland	
Eastern Phoebe	<i>Sayornis phoebe</i>	<i>Populus spp.</i> Woodland, Habitation, <i>Salix spp.</i> Shrubland	X
Least Flycatcher	<i>Empidonax minimus</i>	<i>Populus spp.</i> Woodland	X
Purple Martin	<i>Progne subis</i>	Habitation	
Barn Swallow	<i>Hirundo rustica</i>	Habitation	X
Brown Creeper	<i>Certhia americana</i>	Conifer Dominated Woodland	
Sprague's Pipit	<i>Anthus spragueii</i>	Tame Pasture	
Common Yellowthroat	<i>Geothlypis trichas</i>	Class III and Class IV wetlands	X
Canada Warbler	<i>Wilsonia canadensis</i>	Conifer Dominated Woodland, <i>Salix spp.</i> Shrubland	
Western Tanager	<i>Piranga ludoviciana</i>	<i>Populus spp.</i> Woodland, Conifer Dominated Woodland	X
Bobolink	<i>Dolichonyx oryzivorus</i>	Tame Pasture, Agricultural Lands	
Baltimore Oriole	<i>Icterus galbula</i>	<i>Populus spp.</i> Woodland	X
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	Conifer Dominated Woodland	

Species		Associated Habitat Types in the LSA	Detected in RSA during 2007 Surveys
Common Name	Scientific Name		
Silver-haired Bat	<i>Lasiorycteris noctivagans</i>	<i>Populus spp.</i> Woodland, Conifer-dominated Woodland	
Hoary Bat	<i>Lasiurus cinereus</i>	<i>Populus spp.</i> Woodland, Conifer-dominated Woodland	
Thirteen-lined Ground Squirrel	<i>Spermophilus tridecemlineatus</i>	Tame Pasture, Agricultural Lands, <i>Salix spp.</i> Shrubland	
Prairie Long-tailed Weasel	<i>Mustela frenata</i>	Tame Pasture, Agricultural Lands, <i>Salix spp.</i> Shrubland, <i>Populus spp.</i> Woodland, Conifer Dominated Woodland	X
Franklin's Ground Squirrel	<i>Spermophilus franklinii</i>	Tame Pasture, Agricultural Lands, <i>Populus spp.</i> Woodland	
Prairie Vole	<i>Microtus ochrogaster</i>	Tame Pasture, Agricultural Lands	
American Badger	<i>Taxidea taxus</i>	Tame Pasture, Agricultural Lands, <i>Salix spp.</i> Shrubland	
Canadian Toad	<i>Bufo hemiophrys</i>	Class III and Class IV wetlands	X
Western Toad	(<i>Bufo boreas</i>)	Class III and Class IV wetlands	
Northern Leopard Frog	<i>Rana pipiens</i>	Class III and Class IV wetlands	
Plains Garter Snake	<i>Thamnophis radix</i>	Class I through IV wetlands, Ephemeral streams, Tame Pasture, Agricultural Lands, <i>Populus spp.</i> woodland and <i>Salix spp.</i> Shrubland	
Red-sided Garter Snake	<i>Thamnophis sirtalis</i>	Class I through IV wetlands, Ephemeral streams, Tame Pasture, Agricultural Lands, <i>Populus spp.</i> woodland and <i>Salix spp.</i> Shrubland	

With the LSA being located in the parkland–boreal forest intergrade, it is also theoretically possible for western toads to exist in the region. However, boreal forest land cover is not located in the LSA.

Most of the listed species associated with waterbodies have a greater affinity for permanent ponds and marshes than ephemeral wetlands. These types of waterbodies are limited in number and size inside the LSA. The LSA is within the breeding range of the yellow rail (Semenchuk, 1992). There are a few small patches of tall sedge within the LSA which could theoretically provide suitable habitat for the rail. The Class III and IV wetlands in the LSA are suitable habitat types for horned and pied-billed grebes, great blue herons, green-winged teals, lesser scaups, black terns and soras. Of the possible waterbird species, northern pintails were considered to be the most probable to occur, since they can be associated with more ephemeral wetlands in addition to permanent waterbodies.

Many of the upland forest dwelling species were not expected to occur due to the lack of large tracts of forest. Species such as northern goshawks, broad-winged hawks, barred owls, pileated woodpeckers and western tanagers were predicted not to occur due to the availability of only small woodlots. Species such as Cape May, bay-breasted, Canada and black-throated green warblers, black-backed woodpeckers and brown creepers were also not expected due to the small size and lack of a conifer component in the remaining woodlots. The breeding range of these latter four species is also found more to the north of the LSA (Semenchuk, 1992).

The short-eared owl is highly nomadic, and densities can fluctuate greatly between years, with relatively high densities in a given region in one year, and none the next year if prey availability dramatically decreases (Holt and Leasure, 1993). Unlike most nocturnal owls, the short-eared

owl is diurnal. The open areas of the LSA where crops are not planted may be suitable hunting and nesting areas for the short-eared owl.

Given the fragmented state of the landscape, the composition of vegetation that remains in the remnant patches and the high proportion of agricultural land use, only a few other listed bird species were expected. Barn swallows, purple martins and eastern phoebes are associated with human-built structures and could occur near farm buildings. The composition and size of what forest remains was also expected to be suitable for Swainson's hawks, least flycatchers and Baltimore orioles.

Habitat availability and documentation of sightings in the region indicated that both the American badger and long-tailed weasel are possible in the LSA. The LSA is located near the northern limit of the long-tailed weasel (Pattie and Hoffman, 1990), and is also well within the distribution range of American badgers (Pattie and Hoffman, 1990). The limited amount of forested cover and lack of coniferous vegetation was predicted to limit the occurrence of northern long-eared, silver-haired and hoary bats on the property (Pattie and Hoffman, 1990).

11.5.1.3 Environmentally Sensitive Areas

Although there are no protected areas or environmentally sensitive/significant areas located within the LSA, the provincially significant North Saskatchewan River (NSR) valley is located 5 km to the northwest (Infotech, 1989). The NSR is an inter-provincially important watercourse that is characterized by diverse riparian and valley habitats. The river valley is a key wintering area for ungulates, contains historical peregrine falcon nest sites (a threatened species under the Alberta provincial *Wildlife Act* and a Schedule 1 Species under the *Species at Risk Act*) and has high recreation value (Infotech, 1989). The regionally significant Astotin Natural Area is situated 800 m to the north of the Project site. The Northwest of Bruderheim Natural Area has been a provincial natural area since 1963, and is characterized by a mix of low-relief sand dunes and wetlands, and also by diverse vegetation patterns. The North Bruderheim Natural Area forms part of the Beaverhill Creek wildlife movement corridor (Infotech, 1989), and is located approximately 3.2 km to the north.

11.5.1.4 Regionally Important Wildlife Habitats

The Project is located in the vicinity of several important wildlife areas. According to Poston et al. (1990), who identified priority habitat for migratory aquatic birds within the prairie provinces, the LSA falls within the Lake Edmonton Plain. Poston et al. (1990) lists the Lake Edmonton Plain area as containing nationally significant duck-staging sites, regionally significant duck-staging and colonial bird-breeding sites and locally significant duck-breeding and colonial bird non-breeding sites. However, in the LSA, water bodies are limited to a few shallow ephemeral wetlands; therefore, significant numbers of staging and breeding ducks and colonial nesters are not expected to occur.

The Alberta Fish and Wildlife Division identified areas associated with the NSR valleys as key winter habitat for ungulates (AFWD, 1981). The NSR valley is considered to be an important wildlife movement corridor. Multiple possible wildlife movement corridors stem from the NSR (Westworth and Knapik, 1987; Infotech, 1989; BA Energy, 2004; Shell, 2005), including one that includes the wooded area in the northwest section of the LSA ([Figure 11.5-1](#)).

11.5.2 Field Survey Results

11.5.2.1 Winter Track Count Survey

Eleven species or generic groups of wildlife were recorded on transects within the LSA during the winter track surveys on December 8 and 9, 2006 (Table 11.5-3). Of the species recorded during the survey in the LSA, the long-tailed weasel is the only species listed by the province of Alberta as a species that May Be at Risk (ASRD, 2005). None of the species observed on the North American site are federally listed. Noticeably absent from the LSA were hare tracks.

Overall, deer, long-tailed weasels and coyote tracks were the most abundant in the LSA in December 2006, with a frequency of 18.31 tracks/km/day for deer, 10.18 tracks/km/day for long-tailed weasels and 8.13 tracks/km/day for coyotes (Table 11.5-3). The frequency of grouse and small rodent tracks (3.08 tracks/km/day and 2.21 tracks/km/day, respectively) was greater than for moose (0.36 tracks/km/day). The tracks of red squirrel, porcupines, ermines, least weasels and shrews were present but rare in the LSA.

Habitat associations of wildlife species in the LSA were based on the broad habitat categories used for transect placement. Deer, grouse and moose tracks were most common in *Populus* spp. woodlands (Table 11.5-3). The greatest number of coyote and long-tailed weasel tracks were found in the small lot of spruce-dominated forest, with the latter species also having a high abundance of tracks in the *Salix* spp. shrubland habitat. The agricultural lands and tame pasture areas contained a moderate number of deer tracks, but were relatively devoid of tracks from other animals (Table 11.5-3). Overall, the wooded habitats had the highest frequencies of tracks, while open and agricultural habitats had the lowest frequencies of tracks.

Table 11.5-3 Winter Track- Frequencies (tracks/km/day) within the Upgrader Site in December 2006¹

Habitat Type	Transect Length (km)	Deer sp.	Moose	Coyote	Red Squirrel	Porcupine	Ermine	Long-tailed Weasel	Least Weasel	Mouse sp.	Shrew sp.	Grouse sp.
<i>Populus</i> spp. Woodland	0.3	50.00	1.67	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	10.00
Spruce Dominated Woodland	0.1	0.00	0.00	45.00	0.00	0.00	0.00	45.00	0.00	5.00	0.00	0.00
Agricultural Land and Tame Pasture	13.75	8.00	0.18	1.42	0.00	0.00	0.00	0.07	0.11	0.22	0.04	0.00
Class III and IV Wetland Edge	1.55	14.84	0.32	0.97	0.32	0.00	0.32	0.00	0.00	1.29	0.00	0.00
Vegetated Edge in Open Agriculture	1.3	10.00	0.00	0.38	0.00	0.38	0.00	0.00	0.38	5.77	0.00	8.46
<i>Salix</i> spp. Shrubland	0.5	27.00	0.00	1.00	0.00	0.00	0.00	11.00	0.00	1.00	0.00	0.00
Mean Frequency		18.31	0.36	8.13	0.05	0.06	0.05	10.18	0.08	2.21	0.01	3.08

1. Greatest abundance of tracks for each species or groups is noted in bold text.

Regional Habitat Associations of Key Species

The results of the snow track surveys in the Northwest of Bruderheim Natural area indicate that deer were strongly associated with vegetative cover. Deciduous, coniferous, mixedwood and willow shrub habitats contained deer tracks, while the open agriculture, cleared areas and ponds did not contain deer tracks (Table 11.5-4). Of the habitat types available in the Northwest of Bruderheim Natural area, deer were found to be associated most with the coniferous-dominated forests. In contrast, the deer tracks in the LSA were found in areas that contained cover, as well as open areas. In general, deer tracks in both the property and the natural area were most strongly associated with forest cover. Relatively more deer tracks were detected along transects in the Project area than in the Natural Area.

Neither the LSA nor the Northwest of Bruderheim Natural Area contained high quantities of moose tracks. Though uncommon in all habitat types, the highest numbers of moose tracks were found in *Populus* spp. woodlots in both the LSA and the natural area (Table 11.5-4). Similar numbers of moose tracks were detected along transects in the LSA as were found in the Natural Area.

The coyote tracks found in both the LSA and natural area were mostly associated with vegetative cover. The highest abundance of tracks in the LSA was found in the spruce-dominated habitat, whereas the highest abundance of tracks in the natural area was found in *Populus* spp. woodlots (Table 11.5-4). However, the second-highest abundance of tracks in the LSA was associated with the open agricultural areas. In general, coyote tracks were not common in the Natural Area. Relatively more coyote tracks were detected along transects in the LSA than in the Natural Area.

The habitat association of the long-tailed weasels was similar to that of coyotes. The greatest abundance of long-tailed weasel tracks was associated with the spruce-dominated woodlot in the LSA and in *Populus* spp. forest in the natural area. Long-tailed weasel tracks were also found to be associated with *Salix* spp. shrubland in both the LSA and Natural Area.

Overall, the key species were all mostly associated with habitat that provided some sort of cover. Only deer and coyotes had more than one track per kilometre per day in the open agricultural or cleared areas. The tracks located in the open spaces were a small proportion of total number of tracks detected for both deer and coyotes.

The results of the regional roadside transect survey suggest that deer are more likely to remain closer to areas with greater cover than coyotes (Figure 11.5-1). The coyote tracks were located more evenly along the transect, without an apparent affinity to more forested areas. In contrast, deer tracks were found to be relatively more abundant in association with the more forested region of the Cooking Lake Moraine that includes Elk Island National Park. The LSA is situated between the forested area of the moraine to the southeast, and the forested regions of the NSR valley and other forested areas to the northwest. It may be that landscape-scale movements of animals such as white-tailed deer currently pass through or in the vicinity of the LSA.

Table 11.5-4 Comparison of Habitat Associations between the LSA and the Northwest of Bruderheim Natural Area

	LSA		Natural Area	
	Transect Length (km)	Track Abundance (tracks/km/day)	Transect Length (km)	Track Abundance (tracks/km/day)
Deer				
<i>Populus spp.</i> Woodland	0.3	50.0	0.2	5.0
<i>Salix spp.</i> Shrubland	0.5	27.0	0.5	2.7
Class III and IV Wetland Edge	1.6	14.8	0.0	0.0
Vegetated Edge in Open Agriculture	1.3	10.0	0.0	0.0
Agricultural Land and Tame Pasture	13.8	8.0	0.0	0.0
Spruce-dominated Woodland	0.1	0.0	0.5	4.7
Pure Coniferous	0.0	0.0	1.1	19.0
Moose				
<i>Populus spp.</i> Woodland	0.3	1.7	0.2	1.7
Class III and IV Wetland Edge	1.6	0.3	0.0	0.0
Agricultural Land and Tame Pasture	13.8	0.2	0.0	0.0
Spruce-dominated Woodland	0.1	0.0	0.5	0.0
Vegetated Edge in Open Agriculture	1.3	0.0	0.0	0.0
<i>Salix spp.</i> Shrubland	0.5	0.0	0.5	2.0
Pure Coniferous	0.0	0.0	1.1	0.3
Coyote				
Spruce-dominated Woodland	0.1	45.0	0.5	0.0
Agricultural Land and Tame Pasture	13.8	1.4	0.0	0.0
<i>Salix spp.</i> Shrubland	0.5	1.0	0.5	0.7
Class III and IV Wetland Edge	1.6	1.0	0.0	0.0
Vegetated Edge in Open Agriculture	1.3	0.4	0.0	0.0
<i>Populus spp.</i> Woodland	0.3	0.0	0.2	3.3
Pure Coniferous	0.0	0.0	1.1	0.0
Long-tailed Weasel				
Spruce-dominated Woodland	0.1	45.0	0.5	0.7
<i>Salix spp.</i> Shrubland	0.5	11.0	0.5	1.3
<i>Populus spp.</i> Woodland	0.3	5.0	0.2	1.7
Agricultural Land and Tame Pasture	13.8	0.1	0.0	0.0
Class III and IV Wetland Edge	1.6	0.0	0.0	0.0
Vegetated Edge in Open Agriculture	1.3	0.0	0.0	0.0
Pure Coniferous	0.0	0.0	1.1	0.0

11.5.2.2 Nocturnal Owls

Nocturnal owl surveys were conducted in the LSA and RSA on March 22, March 28 and April 3, 2007, between 2245 and 0100 hours. Twenty-five owl responses representing three different species (great horned owl, northern saw-whet owl and long-eared owl) were detected during the three surveys, with a mean detection of 8.3 owl responses per night (Table 11.5-5) (Figure 11.4-3). Owls were detected at 11 of the 14 stations, with potential pairs detected at two of the stations. Three owl species were recorded at Station 4.

With 21 occurrences, the great horned owl was the most common species recorded in the study area. Northern saw-whet owls were found calling on three occasions on two of the three survey

nights. Only one long-eared owl was recorded, with the occurrence noted on the first of the three survey nights.

Of the 21 detections of great horned owls, five of the responses were recorded from survey stations within the LSA (Figure 11.4-3). Three of the five great horned owl responses in the LSA occurred during one survey night, and two were recorded during a second survey night. One of the three northern saw-whet owl records and the long-eared owl were recorded from stations within the LSA.

Through a combination of occurrence rates, location and potential home-range size, the number of owl territories can be estimated for the study area. Based on other studies in similar habitat, the home range of great horned owls in fragmented landscapes such as the RSA would be approximately 1,500 ha (Houston et al., 1998). The habitat requirements for great horned owl are general. Great horned owls reuse hawk or corvid nests, and have a diet that can include rodents, lagomorphs and birds. Red-tailed hawks, crows and magpies are relatively numerous in the RSA, and would be sources of potential nest sites for great horned owls. Fragmented agricultural lands can be productive habitat for potential great horned owl prey. At one point during the three survey nights, great horned owls were detected in almost every woodlot surveyed in the RSA. Given the location of great horned owl responses and the number of nights during which they were recorded, nine great horned owl territories were estimated to occur in the study area (Figure 11.4-3). Of these nine territories, two are estimated to occur on the LSA (Figure 11.4-3).

Based on the location of northern saw-whet owl detections and typical home-range size (150 ha; Cannings, 1993), three territorial pairs were estimated to be nesting in the study area in 2007 (Figure 11.4-3). One of the three pairs was located adjacent to the LSA, and two were located closer to the more forested area to the north of the LSA. No northern saw-whet owls were found within the LSA. The habitat requirements for northern saw-whet include mature trees that are large enough for cavity-nesting species. This habitat is very limited in the LSA.

Table 11.5-5 Nocturnal Owls Detected During Surveys Conducted in the Study Area, March – April 2007

Survey Station	Species	March 22	April 13	April 24	Individuals Detected
LSA					
1	Great Horned Owl	0	1	1	1
2	Great Horned Owl	0	1	0	1
3	None	0	0	0	0
4	Great Horned Owl	0	1	1	1
	Northern Saw-whet Owl	0	1	0	1
	Long-eared Owl	1	0	0	1
RSA					
5	Great Horned Owl	1	2	1	2
	Northern Saw-whet Owl	0	1	0	1
6	Great Horned Owl	0	0	1	1
7	Great Horned Owl	1	0	0	1
8	Great Horned Owl	1	0	2	2
9	Great Horned Owl	0	1	1	1
10	Great Horned Owl	0	1	0	1
	Northern Saw-whet Owl	1	0	0	1
11	Great Horned Owl	1	1	1	1
12	None	0	0	0	0
13	None	0	0	0	0
14	Great Horned Owl	0	0	1	1
Total Detections		6	10	9	17

The lone long-eared owl detection was recorded in the direction of the Providence Grain terminal. The owl was most likely hunting for mice in the complex, as nesting habitat for the species is extremely limited and the owl was only detected once, early in the spring. Long-eared owl home-range size has been documented at close to 1000 ha (Marks et al., 1994). Similar to great horned owls, long-eared owls can reuse the stick nests of hawks and corvids (Marks et al., 1994), and nesting habitat is located within the LSA near the survey location. However, given the fact that this species was only recorded during the first survey period and that the species is migratory, it may be possible that the individual did not set up a nesting territory in the study area.

The distribution ranges and coniferous habitat requirements for boreal and northern pygmy owls are found north and west of the LSA (Semenchuk, 1992; Hayward and Hayward, 1993). Within the LSA, spruce trees are very rare, and these species of owls are not expected to occur. The common nesting habitat of great gray owls in Canada is the taiga, with interspersed spruce bogs, muskeg and open hunting space (Bull and Duncan, 1993). The study area is within the breeding range of great gray owls in Alberta (Semenchuk, 1992); however, breeding occurrences are relatively rare in central Alberta, and there is a lack of suitable breeding habitat in the study area. Great gray, snowy and northern hawk owls are more commonly detected in the winter in the region. No incidental observations of these species were recorded during the winter track counts.

11.5.2.3 Amphibian Surveys

Amphibian surveys were conducted on April 25, May 5 and May 23, 2007. Three species of amphibians were detected in the study areas: the boreal chorus frog, wood frog and Canadian toad. The boreal chorus frog was the most widespread amphibian in the study area, having been detected at 28 (or 93%) of 30 stations. Boreal chorus frogs were detected at 10 (or 83%) of the 12 survey stations within the LSA. The wood frog was the second most widespread species. Wood frogs occurred at 26 survey stations (87%), with detections at 9 (or 75%) of 12 LSA survey stations. Canadian toads were detected at two survey stations (7%), neither of which was within the LSA. In general, the percentage of stations with amphibians was lower in the LSA relative to the RSA.

The peak of calling activity occurred at different times for the frog species ([Figure 11.5-2](#)). Wood frogs were more active during the first week of surveys, with the chorus frogs relatively more active during the second and third surveys. Canadian toads were heard calling only during the second and third survey periods. The activity of chorus frogs declined at a relatively slower rate than wood frogs, with wood frog activity dropping dramatically with time.

According to the abundance coding at each survey station, amphibians were most abundant in more permanent and deeper water bodies (Class III and IV wetlands), as well as flooded willows ([Figure 11.5-3](#)). More boreal chorus frogs than wood frogs were found in ephemeral and shallow wetlands (Class I and II Wetlands). Conversely, wood frogs were relatively more abundant in the more permanent and deeper waterbodies. Canadian toads were noted calling only in ephemeral wetlands.

Other than the North Wetland Complex in the LSA, amphibian habitat is limited to a few ephemeral wetlands, and consequently, amphibian diversity is low. The study area is within the breeding range of tiger salamanders, which are listed as Not at Risk by the Alberta Endangered Species Conservation Committee (AESCC) (AFWD, 2004). No incidental observations of tiger salamanders were made during the wildlife surveys conducted between April and May. Similarly, although the study area is within the distribution range of red-sided garter snakes, none were recorded incidentally during the 2007 surveys.

11.5.2.4 Songbird Surveys

Songbird surveys were conducted on June 7, 14, 20 and 21, 2007. Surveys were conducted at 12 point-count stations within the LSA and 12 point-count stations within the RSA within the general habitat types described in [Volume 4, Section 10](#), Vegetation and Wetlands.

The aggregate of the 50 m radius and all incidental observations included 371 individual records of 56 species of songbirds in the RSA, and 186 individuals of 38 species in the LSA ([Table 11.5-6](#)), for averages of 13.4 birds and 4.8 species per station in the LSA, and 23.2 birds and 6.0 species per station in the RSA. Standardized data from the fixed-radius observations indicate that the most common species by number of individuals were red-winged blackbirds, yellow warblers, least flycatchers, clay-colored sparrows and savannah sparrows ([Table 11.5-7](#)). The species with the greatest niche breadth, as measured by the number of habitat types in which they were detected, were clay-colored sparrows, found in all habitats, followed by brown-headed cowbirds and yellow warblers, found in seven of the eight habitat types surveyed ([Table 11.5-7](#)). Nineteen species were found in only one habitat type in the study area. Ten of these narrow-niche species were associated with mixedwood forests of the Natural Areas in the RSA, three were recorded near homesteads, two were observed in the Class IV wetland, two in a deciduous-dominated woodlot and one in an agricultural setting ([Table 11.5-8](#)).

The fixed-radius point-count data were used to determine species compositions within various habitat types. Species richness was highest in the mixedwood forests of the natural areas, at 30 species identified ([Table 11.5-9](#)). The overall difference in species richness between habitat types was significant (Kruskall-Wallis, $P=0.014$). Specifically, agricultural land had significantly fewer species than all habitat types (Mann-Whitney U-test, adjusted for ties $P<0.05$), except for early successional mixed shrubland and spruce-dominated woodland.

The *Salix* spp. shrubland habitat had the highest density, of 27.4 songbirds/ha ([Table 11.5-12](#)). Similar to species richness, agricultural land had the lowest density, of 9.9 songbirds/ha. *Populus* spp. woodlots, habitation, spruce-dominated woodlots and the Class IV wetland had similar densities, near 25 songbirds/ha ([Table 11.5-10](#)). There was a relatively large range in bird densities among habitat types in the study area, resulting in a significant difference in bird densities between habitat types (Kruskall-Wallis, $P=0.030$).

Of the 11 sensitive songbird species that have been noted in the region, six were observed in the RSA, and only five recorded in the LSA ([Table 11.5-6](#)). Sensitive songbird species were noted in all habitat types, except the early successional mixed shrubland ([Table 11.5-11](#)). Barn swallows were the only sensitive species recorded in agricultural land. However, this species is associated with manmade structures for nest sites and was likely foraging in the agricultural areas. The *Populus* spp. woodlands had the highest number of sensitive songbird species, with three, although only one (least flycatcher) of the three sensitive species recorded in the *Populus* spp. woodlands was noted in the LSA.

Table 11.5-6 Songbird Species Recorded in the LSA and RSA

Species ¹	LSA	RSA	Species	LSA	RSA
Alder Flycatcher	X	X	Lincoln's Sparrow	X	X
American Crow	X	X	Marsh Wren	X	X
American Goldfinch	X	X	Mountain Bluebird		X
American Redstart	X	X	Orange-crowned Warbler		X
American Robin	X	X	Ovenbird		X
Baltimore Oriole	X	X	Pine Siskin	X	X
Barn Swallow	X	X	Purple Finch	X	X
Black-and-white Warbler		X	Rose-breasted Grosbeak		X
Black-billed Magpie	X	X	Red-breasted Nuthatch		X
Black-capped Chickadee	X	X	Ruby-crowned Kinglet	X	X
Brown-headed Cowbird	X	X	Red-eyed Vireo	X	X
Blue-headed Vireo		X	Red-winged Blackbird	X	X
Brewer's Blackbird	X	X	Savannah Sparrow	X	X
Clay-colored Sparrow	X	X	Song Sparrow	X	X
Cedar Waxwing	X	X	Swainson's Thrush		X
Chipping Sparrow	X	X	Tennessee Warbler	X	X
Common Raven	X	X	Tree Swallow	X	X
Common Yellowthroat	X	X	Vesper Sparrow	X	X
Dark-eyed Junco		X	Warbling Vireo	X	X
Eastern Kingbird	X	X	White-breasted Nuthatch		X
Eastern Phoebe	X	X	Western Tanager		X
European Starling	X	X	White-throated Sparrow	X	X
Gray Jay		X	Western Wood-Pewee	X	X
Hermit Thrush		X	Yellow-headed Blackbird	X	X
Horned Lark	X	X	Yellow-rumped Warbler	X	X
House Sparrow	X	X	Yellow Warbler	X	X
House Wren	X	X			
LeConte's Sparrow	X	X			
Least Flycatcher	X	X			

1. Sensitive species in bold.

Table 11.5-7 Most Common Songbird Species Recorded in the LSA and RSA

Commonness by Number			Commonness by Habitat Association		
Species ¹	No.	Percent of Total (413)	Species	Number of Habitat Types	Percent of All 8 Habitat Types
Red-winged Blackbird	41	9.9	Clay-colored Sparrow	8	100
Yellow Warbler	29	7.0	Brown-headed Blackbird	7	87.5
Least Flycatcher	23	5.6	Yellow Warbler	7	87.5
Clay-colored Sparrow	22	5.3	House Wren	6	75.0
Savannah Sparrow	19	4.6	Song Sparrow	6	75.0
			American Robin	5	62.5
			Brewer's Blackbird	5	62.5
			Red-eyed Vireo	5	62.5
			Savannah Sparrow	5	62.5
			American Crow	4	50.0
			Cedar Waxwing	4	50.0
			Least Flycatcher	4	50.0
			Red-winged Blackbird	4	50.0

1. Sensitive species in bold.

Table 11.5-8 Narrow-niche Songbird Species and Their Associated Habitat Type (excluding waterbirds)

Habitat	Narrow Niche Species ¹
Mixedwood Forest of Natural Areas	Black-and-white Warbler
	Blue-headed Vireo
	Dark-eyed Junco
	Gray Jay
	Hermit Thrush
	Ovenbird
	Red-breasted Nuthatch
	Swainson's Thrush
	Western Wood-Pewee
	White-breasted Nuthatch
Class IV wetland	Marsh Wren
	Yellow-headed Blackbird
Habitation (homestead)	House Sparrow
	Pine Siskin
Populus spp. woodlot	Baltimore Oriole
	Western Tanager
Agricultural Land	European Starling

1. Sensitive species in bold.

Table 11.5-9 Results of the Fixed-Radius Breeding Bird Point Counts in the LSA and RSA

Mixedwood Forest of Natural Areas		Populus spp. Woodlot		Habitation		Salix spp. Shrubland		Spruce-dominated Woodlot		Agricultural Land		Class IV Wetland		Early Successional Mixed Shrubland	
Species ¹	No.	Species	No.	Species	No.	Species	No.	Species	No.	Species	No.	Species	No.	Species	No.
Least Flycatcher	10	Yellow Warbler	11	Cedar Waxwing	4	Red-winged Blackbird	11	Cedar Waxwing	4	Savannah Sparrow	13	Red-winged Blackbird	19	American Crow	2
Red-eyed Vireo	9	Red-winged Blackbird	10	Clay-colored Sparrow	4	Least Flycatcher	6	Tennessee Warbler	3	Brewer's Blackbird	7	Yellow-headed Blackbird	5	Brewer's Blackbird	2
White-throated Sparrow	9	American Robin	7	Song Sparrow	4	Yellow Warbler	4	American Robin	2	Brown-headed Cowbird	7	Clay-colored Sparrow	2	Brown-headed Cowbird	2
Yellow Warbler	8	House Wren	6	American Robin	3	Clay-colored Sparrow	3	Clay-colored Sparrow	2	Horned Lark	5	Lincoln's Sparrow	2	Savannah Sparrow	2
Tennessee Warbler	6	Song Sparrow	6	Barn Swallow	3	American Goldfinch	2	Least Flycatcher	2	American Crow	3	Marsh Wren	2	Clay-colored Sparrow	1
Yellow-rumped Warbler	5	Clay-colored Sparrow	5	House Wren	3	American Robin	2	American Goldfinch	1	Clay-colored Sparrow	3	Song Sparrow	2	Common Raven	1
Black-capped Chickadee	4	Least Flycatcher	5	Black-capped Chickadee	2	Black-capped Chickadee	2	Brown-headed Cowbird	1	Vesper Sparrow	3	Yellow Warbler	2	House Wren	1
Chipping Sparrow	4	Tree Swallow	4	Chipping Sparrow	2	Alder Flycatcher	1	Chipping Sparrow	1	Barn Swallow	2	American Crow	1	Song Sparrow	1
American Robin	3	Warbling Vireo	4	Eastern Phoebe	2	Brewer's Blackbird	1	House Wren	1	Common Raven	1	Black-billed Magpie	1	Yellow Warbler	1
Dark-eyed Junco	3	Baltimore Oriole	3	Pine Siskin	2	Brown-headed Cowbird	1	Red-eyed Vireo	1	Eastern Kingbird	1	Common Yellowthroat	1		
Alder Flycatcher	2	Black-billed Magpie	2	Yellow Warbler	2	House Wren	1	Song Sparrow	1	European Starling	1	Savannah Sparrow	1		
Brewer's Blackbird	2	Cedar Waxwing	2	American Crow	1	Lincoln's Sparrow	1	Yellow Warbler	1	Red-winged Blackbird	1				
Brown-headed Cowbird	2	Eastern Kingbird	2	American Goldfinch	1	Red-eyed Vireo	1								
Clay-colored Sparrow	2	Purple Finch	2	Brown-headed Cowbird	1	Rose-breasted Grosbeak	1								
Hermit Thrush	2	Savannah Sparrow	2	Horned Lark	1	Song Sparrow	1								
Ovenbird	2	White-throated Sparrow	2	House Sparrow	1	Tree Swallow	1								
Red-breasted Nuthatch	2	Yellow-rumped Warbler	2	Red-eyed Vireo	1	Warbling Vireo	1								
Swainson's Thrush	2	American Redstart	1	Savannah Sparrow	1	White-throated Sparrow	1								
White-breasted Nuthatch	2	Brewer's Blackbird	1	Vesper Sparrow	1										
American Redstart	1	Brown-headed Cowbird	1	Yellow-rumped Warbler	1										
Black-and-white Warbler	1	Red-eyed Vireo	1												
Blue-headed Vireo	1	Rose-breasted Grosbeak	1												
Cedar Waxwing	1	Ruby-crowned Kinglet	1												
Gray Jay	1	Western Tanager	1												
House Wren	1														
Orange-crowned Warbler	1														
Purple Finch	1														
Rose-breasted Grosbeak	1														
Ruby-crowned Kinglet	1														
Western Wood-pewee	1														
Total Species	30	Total Species	26	Total Species	21	Total Species	24	Total Species	13	Total Species	13	Total Species	17	Total Species	9
Total Individuals	90	Total Individuals	84	Total Individuals	43	Total Individuals	47	Total Individuals	21	Total Individuals	50	Total Individuals	65	Total Individuals	13

1. Sensitive species in bold.

Table 11.5-10 Songbird Densities by Habitat Type within the LSA and RSA

Habitat	Density per ha
<i>Salix</i> spp. Shrubland	27.39
<i>Populus</i> spp. Woodlot	26.43
Habitation	25.48
Spruce-dominated Woodlot	25.48
Class IV Wetland	24.20
Mixedwood	19.11
Early Successional Mixed Shrubland	16.56
Agricultural Land	9.98
Overall	19.85

Table 11.5-11 Bird Species Diversity (BSD) by Habitat Type in the Study Area

Habitat	ALL
Mixedwood Forest of Natural Areas	1.08
<i>Populus</i> spp. woodlot	0.98
<i>Salix</i> spp. shrubland	0.55
Agricultural Land	0.55
Habitation	0.54
Class IV Wetland	0.41
Spruce-dominated Woodlot	0.28
Early Successional Mixed Shrubland	0.19

Within the RSA, the mixedwood forests of the Natural Areas had the highest songbird species diversity index value, of 1.08, followed closely by *Populus* spp. woodlots at 0.98 (Table 11.5-11). These values indicate that most sites within inhabited areas and *Populus* spp. woodlots supported numerous individuals of many species. Conversely, habitats such as spruce-dominated woodlots and early successional mixed shrubland were represented by a few individuals of a few species.

Waterbirds

Waterbird surveys conducted in conjunction with the songbird and amphibian surveys resulted in a moderate number of observations (Table 11.5-12). A total of 14 species were recorded, including ducks, geese, shorebirds, rails and gulls. The most common species were blue-winged teals, ruddy ducks, ring-billed gulls and Canada geese. The Class IV wetland habitat supported the highest number of individuals, and a similar number of species as agricultural land (although most of these observations were likely associated with unmapped temporary waterbodies). Soras were observed in three habitat types, including *Populus* spp. woodlot, *Salix* spp. shrubland and Class IV wetland. It is likely that the sora detected in the woodlot were actually in a small wetland near the point-count station.

Table 11.5-12 Waterbird Species Observed within the LSA and RSA

Species	Habitat					Total
	<i>Populus</i> spp. Woodlot	<i>Salix</i> spp. shrubland	Class IV wetland	Agricultural Land	Mixedwood Forest of Natural Areas	
American Avocet				1		1
American Coot			1			1
Black Tern			1			1
Blue-winged Teal			10	7		17
Canada Goose					10	10
Green-winged Teal			1			1
Killdeer			1	3		4
Mallard			4	2		6
Northern Shoveler		1		4		5
Ring-billed Gull				10		10
Ruddy Duck			13			13
Sora	2	2	2			6
Willet				1		1
Wilson's Snipe	2	2				4
Total	4	5	33	28	10	80

11.5.3 Baseline Habitat Availability

11.5.3.1 Deer

LSA Baseline Habitat Availability

Based on winter track data and incidental observations, forest-shrub habitat is considered to be highly suitable for deer compared to other habitat types in the LSA (Figure 11.5-4). Of the 562 ha located within the LSA, only 5.6 ha (1.0%) have been classified as upland forest and shrubland (Table 11.5-13, Figure 11.5-4). The LSA also contained 35.5 ha (6.3%) of moderately suitable habitat such as tame pasture and wetlands with vegetated margins, which can be used for bedding and fawning sites. The majority of the LSA (491.9 ha, 87.6%) is considered relatively low-quality habitat for deer, with agricultural land and habitation dominant across the landscape. The 28.7 ha (5.1%) of ephemeral streams and wetlands, and transportation corridors found within the LSA were not considered suitable habitat for deer.

RSA Baseline Habitat Availability

Approximately 24% (5,613 ha) of the total 23,288 ha located within the wildlife RSA was considered high-quality habitat for deer (Table 11.5-13, Figure 11.5-5). Based on winter track data and incidental observations, forest-shrub habitat is considered to be highly suitable for deer compared to other habitat types in the RSA. The RSA also contains 2429 ha (10.4%) of moderate-quality habitat such as mixed grassland and wetlands, which provide forage for deer. The majority of the RSA (55%) is considered low-quality habitat for deer, and consisted of anthropogenic areas, lakes and streams and wet meadows. The 2,445.1 ha (10.5%) of transportation corridors, infrastructure and exposed soil is not considered to be suitable habitat for deer.

11.5.3.2 Moose

LSA Baseline Habitat Availability

The LSA contained very little moose activity. Within the LSA, 512.2 ha (91.2%) of the total 561.7 ha is considered unsuitable for moose (Pattie and Hoffman, 1990; Smith et al., 1993) (Figure 11.5-6). The LSA contains 5.6 ha (1.0%) of what may be high-quality moose habitat, which is typically upland forest and shrub (Pattie and Hoffman, 1990; Smith et al., 1993) (Table 11.5-13, Figure 11.5-6). Most of the high-quality habitat occurs in the northern end of the LSA, with several small patches in the southern end. The LSA also contained 16.2 ha (2.9%) of moderately suitable habitat such as ephemeral and seasonal wetlands. Based on the tracking surveys, the utilization of tame pasture and habitation (27.7 ha total area, or 4.9%) by moose is low.

RSA Baseline Habitat Availability

Based on winter track data and incidental observations, forest, shrub and wet meadow habitats were most preferred by moose compared to other habitat types within the RSA (Table 11.5-13, Figure 11.5-7). Of the 23,288 ha within the wildlife RSA boundary, 5,692 ha (24.4%) has been classified as forest, shrub or wet meadow. The RSA also provides 1,648 ha (7.1%) of moderate-quality habitats such as wetlands, lakes and streams and lichen bogs. Based on tracking surveys within the LSA and knowledge of moose habitat requirements, use of the 1,048 ha (4.5%) of mixed grassland and new burns is expected to be low. The 14,896 ha (64%) of anthropogenic features, agriculture and exposed soil is not considered to be suitable habitat for moose in this area.

Table 11.5-13 Habitat Suitability and Availability at Baseline and with Project Development in the LSA and RSA

Species Suitability Rating	LSA		RSA	
	Hectares	Percent of Total	Hectares	Percent of Total
Deer				
High	5.6	1.0	5,613.1	24.1
Moderate	35.5	6.3	2,428.7	10.4
Low	491.9	87.6	12,797.4	55.0
Nil	28.7	5.1	2,445.1	10.5
Unclassified	0.0	0.0	3.2	0.0
Totals	561.7	100.0	23,287.5	100.0
Moose				
High	5.6	1.0	5,691.8	24.4
Moderate	16.2	2.9	1,648.1	7.1
Low	27.7	4.9	1,048.6	4.5
Nil	512.2	91.2	14,895.8	64.0
Unclassified	0.0	0.0	3.2	0.0
Totals	561.7	100.0	23,287.5	100.0
Coyote				
High	4.1	0.7	3,861.5	16.6
Moderate	504.3	89.8	14,288.4	61.4
Low	11.0	2.0	2,689.4	11.5
Nil	42.2	7.5	2,445.1	10.5
Unclassified	0.0	0.0	3.2	0.0
Totals	561.7	100.0	23,287.5	100.0

Species Suitability Rating	LSA		RSA	
	Hectares	Percent of Total	Hectares	Percent of Total
Long-tailed Weasel				
High	5.6	1.0	4,401.9	18.9
Moderate	19.3	89.5	2,259.8	9.7
Low	499.6	2.9	14,161.1	60.8
Nil	37.1	6.6	2,461.5	10.6
Unclassified	0.0	0.0	3.2	0.0
Totals	561.7	100.0	23,287.5	100.0
Great-horned Owl				
High	12.5	2.2	3,479.0	14.9
Moderate	1.5	0.3	1,768.0	7.6
Low	502.8	89.5	15,592.3	67.0
Nil	44.9	8.0	2,445.0	10.5
Unclassified	0.0	0.0	3.2	0.0
Totals	561.7	100.0	23,287.5	100.0
Songbirds				
High	5.2	0.9	4,284.5	18.4
Moderate	39.2	7.0	3,836.1	16.5
Low	512.4	91.2	12,718.7	54.6
Nil	4.9	0.9	2,445.1	10.5
Unclassified	0.0	0.0	3.2	0.0
Totals	561.7	100.0	23,287.5	100.0
Amphibians				
High	16.2	2.9	2,532.4	10.9
Moderate	38.8	6.9	4,807.6	20.6
Low	491.9	87.6	13,499.3	58.0
Nil	15.0	2.7	2,445.1	10.5
Unclassified	0.0	0.0	3.2	0.0
Totals	561.7	100.0	23,287.5	100.0

11.5.3.3 Coyote

LSA Baseline Habitat Availability

Based on winter track data, mixedwood habitat is considered highly suitable for coyotes compared to the other habitat types within the LSA (Figure 11.5-8). Of the 562 ha located within the LSA, just 4.1 ha (0.7%) have been classified as upland deciduous or spruce-dominated woodlots (Table 11.5-13, Figure 11.5-8). The LSA also contained 504.3 ha (89.8%) of moderately suitable habitat such as shrubland, agricultural land and tame pasture, which may be used for foraging and travel. Based on the tracking surveys, the utilization of the deep marshes and unclassified wetlands (11.0 ha total area, or 2.0%) by coyotes is low. Ephemeral ponds and streams, and disturbed lands such as roads (42.2 ha total area, or 7.5%) in the LSA were not considered suitable habitat for coyotes, based on the track count surveys.

RSA Baseline Habitat Availability

Data from winter track surveys and incidental observations suggest that forest and shrub habitats are highly suitable for coyotes compared to other habitat types available in the RSA (Table 11.5-13, Figure 11.5-9). Of the 23,288 ha located within the wildlife RSA, 3,862 ha (16.6%) have been classified as upland forest or shrub. The majority of the RSA (14,288 ha, or 64%) is considered to be moderate-quality habitat for coyotes, and includes habitat such as agricultural land, wetlands and wet shrublands. The 2,689 ha (11.5%) of open habitat such as

mixed grassland and new burns, and wetland or riparian areas, were considered low-quality foraging habitat for coyotes.

11.5.3.4 Long-tailed Weasel

LSA Baseline Habitat Availability

Based on winter track data and incidental observations, the forest-shrub habitat is considered to be highly suitable for long-tailed weasel compared to other habitat types within the LSA (Figure 11.5-10). Of the 562 ha located within the LSA, only 5.6 ha (1.0%) were classified as upland forest and shrubland (Table 11.5-13, Figure 11.5-10). Based on tracking surveys, long-tailed weasels did not use the 499.6 ha (88.9%) of agricultural lands, Class III, Class IV and Unclassified wetland habitats. However, this type of habitat is occasionally used by long-tailed weasels (Pattie and Hoffman, 1990; Smith et al., 1993); therefore, these habitats were ranked as low as opposed to nil. The 19.3 ha (3.4%) of tame pasture is likely to be moderately used habitat (Pattie and Hoffman, 1990; Smith et al., 1993), although only a few tracks were detected in this habitat. The Class I/II and ephemeral wetlands, the inhabited areas and the transportation rights-of-way found within the LSA were not considered suitable habitat for long-tailed weasel based on track count results.

RSA Baseline Habitat Availability

Based on winter track data and incidental observations, the forest-shrub habitat is considered to be highly suitable for long-tailed weasel compared to other habitat types within the RSA (Table 11.5-13, Figure 11.5-11). Of the 23,288 ha within the wildlife RSA boundary, 4,402 ha (18.9%) has been classified as deciduous or spruce forest, or shrubby habitat. The majority of the RSA (60.8%) is composed of low-quality habitat, including open habitats such as grasslands, agriculture and new burns, and unproductive coniferous forest such as pine and black spruce bog. The use of mesic habitats such as wetlands, riparian, wet meadows and lichen meadows is also expected to be low (Pattie and Hoffman, 1990; Smith et al., 1993). The 2,462 ha (10.5%) of anthropogenic features and exposed soil were not considered suitable habitat for long-tailed weasel based on track data.

11.5.3.5 Great Horned Owl

LSA Baseline Habitat Availability

Based on published accounts of suitable breeding habitat (Houston et al., 1998) and the results of the nocturnal owl surveys, the forested portions of the LSA, including farmyards, represent the most suitable breeding habitat for owls (Table 11.5-14, Figure 11.5-12). Of the 562 ha located within the LSA, 12.5 ha (2.2%) have been classified as upland forested woodlot or habitation. The LSA also contains 1.5 ha (0.3%) of moderately suitable habitat such as upland shrub and willows that could provide both cover and potential prey. The 502.8 ha (89.5%) of open agricultural land and tame pasture are not considered suitable breeding habitat, but these areas retain some importance as foraging habitat. The 44.9 ha (8.0%) of wetlands, streams and transportation corridors are not considered to have high value for great horned owls.

RSA Baseline Habitat Availability

Baseline habitat availability for owls was calculated for the great horned owl within the RSA. Habitat availability was calculated for the RSA in addition to the LSA, because owls have home ranges that extend beyond the boundaries of the LSA. Moreover, developments within the LSA

have the potential to affect individuals in the greater RSA area by altering overall habitat availability and forcing owls to nest outside of the smaller LSA.

Of the total 23,288 ha located within the RSA boundaries, 3,479 ha (14.9%) have been classified as high-quality habitat for great horned owls ([Table 11.5-13](#), [Figure 11.5-13](#)). In the study area, high-quality habitat is defined as deciduous, coniferous or mixedwood forest, habitats which provide potential nesting trees and suitable habitat for prey. The RSA also provides 1,768 ha (7.6%) of moderate-quality habitat such as shrubby wetlands, black spruce bog and some urban areas, all of which provide some foraging opportunities. The majority of the RSA (15,592 ha, or 67%) is composed of open habitat such as mixed grassland, agricultural lands and wetlands, all of which provide low-quality habitat for great horned owl. The 2,445 ha (10.5%) of transportation corridors and exposed soil were not considered potential habitat for great horned owls.

11.5.3.6 Songbirds

LSA Baseline Habitat Availability

Songbirds are found in a variety of habitat types. The 2007 surveys indicate the most utilized habitat types in the LSA by songbirds as a group were the deciduous woodlots and *Salix* spp. shrublands. At baseline, 5.2 ha (0.9%) of these habitat types were located in the LSA ([Table 11.5-13](#), [Figure 11.5-12](#)). Based on a combination of density and diversity, the 39.2 ha (7.0%) of upland shrub, tame pasture, habitation and Class IV wetland are classified as moderately important songbird habitat. The Class IV wetland supports waterbirds in addition to terrestrial songbirds, and is therefore considered an important habitat type. The 512.4 ha (91.2%) of ephemeral and temporary wetlands and streams, transportation corridors and agricultural land are classified as having low suitability to songbirds as a group.

RSA Baseline Habitat Availability

Of the total 23,288 ha located within the RSA, 2,532 ha (18.4%) are considered high-quality habitat for songbird species based on overall species diversity and density ([Table 11.5-13](#), [Figure 11.5-13](#)). These high-quality habitat types include deciduous, coniferous and mixedwood forest, as well as shrubby wetlands, the latter of which support an abundance of species. The RSA also provides 3,836 ha (16.5%) of moderate-quality habitat, such as upland shrub, wetlands, bog and anthropogenic features. The majority of the RSA (12,718.7 ha, or 54.6%) is comprised of agricultural lands, urban features and lakes or streams, all of which are considered low-quality habitat for most songbird species. Transportation corridors and exposed soil are not considered potential habitat for any songbirds.

11.5.3.7 Amphibians

LSA Baseline Habitat Availability

Of the 562 ha located within the LSA, only 16.2 ha (2.9%) were classified as semi-permanent, temporary or seasonal marshes, the most suitable types of wetlands for amphibians within the LSA ([Table 11.5-13](#), [Figure 11.5-14](#)). Ephemeral wetlands provide early-spring courtship and breeding habitat, but are dry by summer. The forested and shrubland areas provide cover during non-breeding and wintering periods. There are 38.8 ha (6.9%) of ephemeral wetlands, forest-shrub areas and tame pasture habitat that are considered to be moderately suitable for amphibians in the LSA. The 15.0 ha (2.7%) of cultivated and disturbed lands such as transportation corridors were considered to have no value to amphibians.

RSA Baseline Habitat Availability

Baseline habitat availability in the RSA was calculated for amphibian species in general. Habitat availability was considered in the larger RSA, as well as the LSA, because effects of development may extend beyond the LSA boundaries.

Of the 23,288 ha within the RSA boundaries, 2,532 ha (10.9%) were considered high quality for amphibians, including wood frogs, boreal chorus frogs and Canadian toads ([Table 11.5-13](#), [Figure 11.5-15](#)). High-quality habitats include grassy and shrubby wetlands, open wetlands and lakes and streams. The RSA also provides 4,808 ha (20.6%) of moderate-quality habitat such as forest and shrub, which may be used by wood frogs outside of the breeding season. The majority (58%) of the habitat within the 13,499 ha RSA was rated low for amphibians, and includes habitat types such as mixed grassland, new burn, agricultural lands and anthropogenic features. Other habitats, like transportation corridors and exposed soil, are not considered potential amphibian habitat.