Sensitive Species Inventory Guidelines

April 2013

Preface

Background

Effectively managing and conserving wild species and their habitats requires an understanding of species' distribution, population levels and habitat requirements, along with knowledge of the factors that may threaten their long-term survival. With protective measures for wild species established under Alberta's *Wildlife Act* and the federal *Species at Risk Act*, the provincial government is faced with a growing need to conserve and protect key habitat features for many wild species.

Of particular interest are "sensitive species", which, for the purposes of these guidelines, refers to the following: 1) those species legally listed as *Endangered* or *Threatened* under the provincial *Wildlife Act* or federal *Species at Risk Act (SARA)*; 2) those designated as a Species of Special Concern through the provincial detailed status assessment process or SARA; and 3) species ranked as *At Risk, May Be At Risk, or Sensitive* in Alberta by the general status assessment process and have been identified as being sensitive to human disturbance. These categories include species that are or may be at risk of extirpation or extinction and those that may require special attention or protection to prevent them from becoming at risk.

The number of pre-development surveys required to keep pace with the increasing scope of development activities in Alberta led to the development of standardized inventory guidelines for sensitive species. The use of standardized inventory methods offers the following benefits:

- Enables province-wide consistency and reliability in data collection;
- Facilitates comparison between surveys or studies;
- Minimizes biases related to sampling techniques;
- Ensures project planning meets required government standards.

Consistent use of standardized survey methods over time should provide data that more accurately reflect ecological patterns and landscape-level changes in distribution and population trends across the province.

These survey guidelines were developed by Environment and Sustainable Resource Development-Wildlife Management (ESRD-Wildlife Management) staff and other species experts in the province. Guidelines were developed in consultation with wildlife managers, additional species experts, and biologists from industry, government, and academia. The guidelines presented in this document will be modified as needed, based on field experience in the application of the guidelines and as new research becomes available. Similarly, new guidelines will be added. The long-term goal of this initiative is to expand the focus of this document to include a wider range of species throughout the province, particularly more species and landscapes from northern and central Alberta.

Best Practices

Each species survey guideline is uniquely designed based on the habitat requirements and biology of each species or species group. There are a number of best practices that are universally applicable to the survey planning process, field techniques, and data submission. Below are the recommended best practices that should be used during each and every wildlife survey within the province of Alberta.

Survey Planning

1. Surveys must be planned, and conducted by an experienced wildlife biologist or wildlife technician with experience in the survey methods and species targeted by the survey or inventory.
2. All guidelines relevant to the project area should be well and understood and the surveys planned in advance to ensure appropriate scheduling of surveys for each species. Important information including survey timing, weather restrictions, equipment required, and permit requirements are detailed in section titled *Survey Standards* in each individual guideline. This is important for dispositions approved under the Enhanced Approval Process (EAP), as conducting surveys under the appropriate conditions is a requirement of the EAP approval (Government of Alberta 2012)
3. A search of government databases should be completed for the proposed development area to determine if a sensitive species is likely to occur within that area. A review of the Fish and Wildlife Management Information System (FWMIS) database for occurrences of wildlife species is beneficial. Biological staff at the local ESRD- Wildlife Management office should be contacted well before surveys, and upon request, can provide a list occurrences of sensitive species previously recorded within the area of interest. Additionally, a review of the Alberta Conservation Information Management System (ACIMS) should be undertaken for occurrences of *Threatened* and *Endangered* plant species.
4. The use of available habitat tools (e.g., Habitat Suitability Index) to evaluate habitat values is another useful tool to evaluate potential for the occurrence of various species at risk. This information will help focus the survey and reduce the possibility of missing important species or their dens/nests.
5. Landowners and leaseholders must be contacted before a survey to arrange permission to access property.
6. Where required, research permits must be obtained prior to the initiation of the survey. Information on research permits is available on the ESRD website.

Conducting Surveys

1. Surveys must be conducted according to the methods outlined within this document. Specifically, survey requirements detailed in the *Survey Standards* in section of each

guideline must be strictly followed. All deviations from the described guidelines must be discussed and approved by the local ESRD-Wildlife Management office.

2. All efforts must be taken to limit disturbance to sensitive wildlife species. Sites should not be approached any closer than necessary to confirm site occupancy. Binoculars and spotting scopes must be used to limit the disturbance of the surveyors on wildlife.

3. When recording a georeferenced location, use Universal Transverse Mercator (UTM Nad 83, Zone 11 and/or 12) or Latitude/Longitude whenever possible (the Alberta Township System [ATS] is too general for location information).

Analysis and Reporting

1. Following the completion of wildlife surveys, all data for wildlife species must be submitted into the Fisheries and Wildlife Management Information System (FWMIS) database via load forms. Information on FWMIS and the load forms can be obtained at http://www.srd.alberta.ca/FishWildlife/FWMIS/WildlifeLoadforms.aspx

2. FWMIS submissions must include a detailed account of survey guidelines used, target species, date, weather conditions, ground conditions, observers, wildlife observed or not observed, and the details on important wildlife features or habitats (nest, den, colony, etc.). When possible, photos of the site, maps, and other pertinent information should be included in the FWMIS submission.

3. FWMIS data submissions must be completed within six months of the original survey date.

4. All projects approved under the Enhanced Approval Process must include the disposition number within the FWMIS load form under the Project Information field (Government of Alberta 2012)

Literature Cited

Government of Alberta. 2012. Integrated Standards and Guidelines, Enhanced Approval Process. Sustainable Resource Development, Lands Division. Edmonton, AB. [Online] http://srd.alberta.ca/FormsOnlineServices/EnhancedApprovalProcess/EAPManualsGuides/documents/EAP-IntegratedStandardsGuide-Jul16-2012.pdf. Accessed August 15th, 2012.

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1.0 Amphibians: Auditory Survey Guideline

1.1. Introduction

This guideline is designed to survey for amphibians that can be identified by their call. A separate survey guideline exists for long-toed salamanders (*Ambystoma macrodactylum*) and tiger salamanders (*Ambystoma tigrinum*) which can be found in Chapter 2.0 *Visual Amphibian Surveys*, of this document.

1.1.1 Species Status

Table 1.1 Alberta amphibian species detectable through auditory surveys, and their provincial and national status.

Species	**Alberta Designation** [1]	**Provincial General Status** (Alberta Sustainable Resource Development 2010)	**COSEWIC Status/ SARA Status** (COSEWIC 2011)
Boreal chorus frog (*Pseudacris maculata*)	N/A	Secure	N/A
Columbia spotted frog (*Rana luteiventris*)	N/A	Sensitive	Not at Risk
Northern leopard frog (*Lithobates pipiens*)	Threatened	At Risk	Special Concern (western boreal/prairie population)
Wood frog (*Lithobates sylvatica*)	N/A	Secure	N/A
Canadian toad (*Anaxyrus* [*Bufo*] *hemiophrys*)	N/A	May be at Risk	Not at Risk
Great plains toad (*Anaxyrus* [*Bufo*] *cognatus*)	N/A	May be at Risk	Special Concern
Plains spadefoot (*Spea bombifrons*)	N/A	May be at Risk	Not at Risk
Western toad (*Anaxyrus* [*Bufo*] *boreas*)	N/A	Sensitive	Special Concern

Over the past 50 years, many species of amphibians throughout the world have experienced population declines and in some cases have become extirpated or extinct. There is global concern about these declines, which take place even in undisturbed areas, however the extent of the declines are not well known because of limited information on populations (Collins and Storfer 2003). The annual population size for many species is quite variable and is especially evident for two irruptive species in Alberta; the Great Plains toad and the plains spadefoot. Historical records are vague for most species, but declines have been noted for northern leopard frogs, Canadian toads, and Great Plains toads in Alberta (ASRD

[1] As designated by the Minister of Alberta Environment and Sustainable Resource Development under the Alberta *Wildlife Act*.

2003, ASRD and ACA 2009, Browne 2009). Long-term monitoring is needed for all species in order to fully evaluate their population status.

Amphibians in Alberta are distributed throughout a variety of biomes, including representation in each of the natural regions that occur within the province (Russell and Bauer 1993). Most species are at the northern edge of their global range, with a few species (e.g., wood frogs) extending their distribution to the territories.

1.1.2 Biology

During their life cycle, amphibians develop from gilled larvae that are completely aquatic to, primarily terrestrial adults that breathe air. Their skin remains permeable, keeping them closely tied to water and leaving them susceptible to environmental contaminants. They are both ectothermic and poikilothermic (considerably variable internal temperature). Amphibians are small, primarily nocturnal, and are dispersed over wide areas for most of their active period, but do congregate at breeding and wintering sites. They are dormant throughout the winter, hibernating usually alone in protected terrestrial habitats, subterranean burrows, or mud at the bottom of standing or slow-flowing water. In Alberta, they will congregate for breeding from early April to June. An early breeding period allows larvae to take advantage of high algal productivity and if breeding in ephemeral waterbodies, to complete metamorphosis before they dry up (Table 1.2). Population sizes can fluctuate dramatically from year to year and may be weather dependant. Maturation is delayed for most species in Alberta; further amphibians can store resources internally, not breeding every year if conditions are poor.

Table 1.2 Description of amphibian breeding habitat in Alberta.

Species	**Breeding Habitat** (Russell and Bauer 1993, Fisher et al. 2007)
Boreal chorus frog	Can be found in almost any waterbody in Alberta. Located in grassy pools, lakes, marshes, flooded fields, tundra ponds, and roadside ditches during the breeding season.
Columbia spotted frog	Inhabits permanent waterbodies in mixed-coniferous and subalpine forests.
Northern leopard frog	Inhabits springs and permanent waterbodies with abundant vegetation. Generally found where sufficient ground cover from vegetation is available.
Wood frog	Primarily found in wooded areas, associated with open ponds. It can also be found in grassland or tundra regions.
Canadian toad	Associated with sandy soils. Can be found in shallow lakes, ponds, and ephemeral wetlands.
Great plains toad	Frequents sandy areas near irrigation canals, ephemeral ponds, dugouts, and flood plains. Identifiable during years of high precipitation.
Plains spadefoot	Primarily in native short-grass prairie, near permanent or temporary bodies of water (Class 2, 3 and 4 wetlands[2]; Stewart and Kantrud 1971). Usually in areas with soil that is suitable for burrowing - such as sand. Strongly associated with years of high precipitation.
Western toad	Typically found around lakes, streams, rivers, and ponds in coniferous forests.

[2] Class 2 wetland - temporary wetlands that are periodically covered by slow moving or standing water
Class 3 wetland - seasonal ponds and lakes that have shallow marsh vegetation at their deepest point
Class 4 wetland - semi-permanent ponds and lakes that have coarse emergent plants and submerged aquatics

Table 1.3. Call descriptions for Alberta amphibians.

Species	**Breeding Call Description** (Russell and Bauer 1993, Fisher et al. 2007)
Boreal chorus frog	Terminally inflected trill of short duration (1-5 seconds); may be strung together in continuous phrases; sounds like running a finger along a plastic comb
Columbia spotted frog	Series of rapid, low-pitched clicks, building in intensity; duration highly variable, but usually < 10 seconds
Northern leopard frog	Comparable to sound produced by rubbing wet finger on a well-inflated balloon to produce a low, snore-like sound; call begins with 3 or more of these, followed by interspersed grunting and chuckling sounds
Wood frog	Higher pitched, less intense and shorter than the northern leopard frog call, almost duck-like
Canadian toad	Short (1-5 seconds) but soft trill, repeated after about 20 - 30 seconds
Great plains toad	Repeated harsh clatter of great intensity and long duration (up to 50 seconds); males have release call if handled
Plains spadefoot	Short, duck-like squawk of 0.2-0.7 seconds, similar to snoring
Western toad	Repeated quiet peeping

1.2 SURVEY STANDARDS

1.2.1. Personnel

Surveyors must have considerable experience with identifying amphibians by call and by sight. They must also have the ability to estimate the approximate number of amphibians calling at one time and from what direction. Knowledge of specific amphibian biology, behaviour, and preferred habitat is also a desirable asset that would allow for more accurate results. Observers must have no hearing impairments.

An alternative to staffing personnel in the field is to explore using digital recording devices (e.g., http://www.wildlifeacoustics.com). These devices can be placed in appropriate locations to record calling amphibians for any length of time, up to an entire breeding season. Once recorded, a trained person can review the data using sophisticated software that can identify the calls recorded. It should be noted, however, that it may be more difficult to measure abundance of amphibians at a site with this method.

1.2.2 Time of Year

The time of year that call surveys can be conducted for amphibians is dependant on environmental conditions and the targeted species for a particular survey. Environmental factors such as snow pack, elevation where the species occurs, rain events, and habitat between overwintering sites and breeding ponds can all affect the start time for the breeding season. An early spring can result in early activity patterns for amphibians. For some species, calling will be initiated as soon as there are some areas of the water body that are ice-free. In general, surveys should be conducted between the second week of April and the second week of June. Each species has different triggers that may initiate the calling period. A rough estimate of calling period for the Alberta species is depicted in Figure 1.

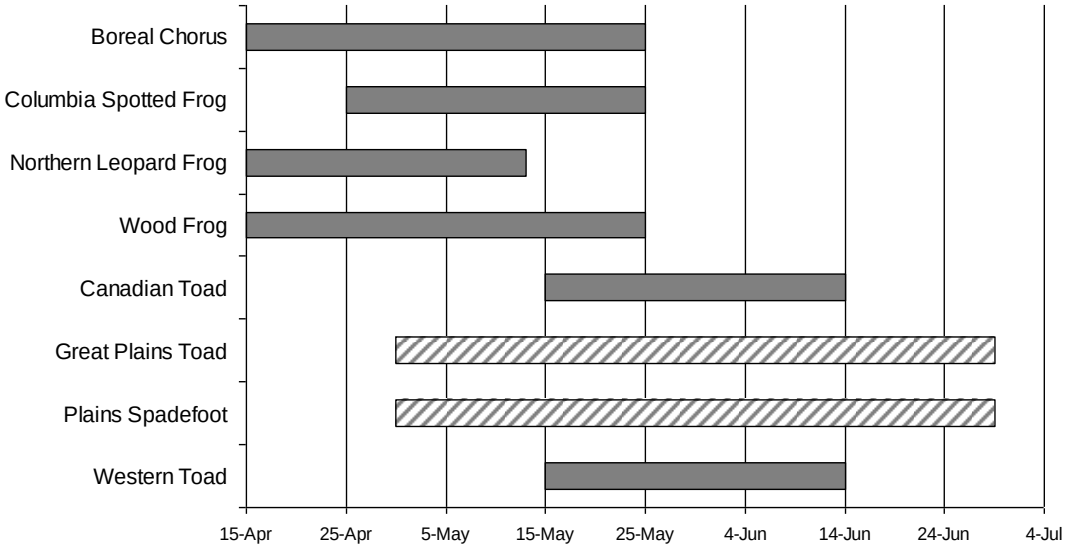

Figure 1.1. Approximate calling periods for Alberta amphibians. Note: the hatched bars represent species that are highly dependant on weather events and may call at any point of that period if the conditions

It is not appropriate to use call surveys outside of the breeding season. Various types of surveys can be conducted at different times of year, including egg mass searches and young-of-the-year searches. Although these types of searches provide evidence of successful breeding, they are more intrusive, time consuming, and difficult to perform. The guidelines for such surveys are beyond the scope of this document.

1.2.3 Time of Day

Call surveys should be conducted 30 minutes after sunset and must be completed no later than 01:00 (Kendell 2002, USGS 2010). After this time, the frequency of calling tends to decrease rapidly. Although most species exhibit nocturnal calling patterns, consistently cool temperatures during the spring evenings may stimulate diurnal, rather than nocturnal, calling behaviours. This should be considered when assessing the appropriate time of day to perform call surveys.

1.2.4 Weather/Conditions

Air and water temperatures must be at least 10^{o}C at the time of monitoring to optimize the survey efforts (Kendell 2002, Takats and Priestley 2002,). If multiple call surveys are being conducted in the same location during the season, cooler air temperatures would be acceptable. For example, in a season that includes three or four surveys of a particular site, the surveys may start earlier in the season when the air temperatures are around 5^{o}C and progressively get warmer during each subsequent survey (USGS 2010). Temperature is one of the most important factors in stimulating calling from amphibians (Heyer et al. 1994).

In order to minimize extraneous noise, the wind must not be higher than a Beaufort level 3 (ACA and ASRD 2010, USGS 2010; Appendix A). If the winds are approaching 20 km/h, it is preferable to survey downwind from a waterbody to allow the wind to carry the sounds of the calls to the surveyor (Kendell 2002).

Precipitation levels have a large influence on amphibian activity and reproductive cycles (Heyer et al. 1994). Although call surveys should not be conducted during heavy rain events, light rain may actually help to promote amphibian activities (Kendell 2002, USGS 2010) provided the sound of the rain hitting the water does not impede the ability to hear calling amphibians. Conditions following precipitation events are ideal for surveying for calling amphibians.

Additionally, if call surveys are conducted near busy roads, the sounds of calling amphibians may be drowned out by the traffic noises. Observers should be aware of this issue and all other outside distractions that may reduce the quality or success of their survey.

1.2.4.1 Required Conditions for Great Plains Toad and Plains Spadefoot Surveys

The Great Plains toad and plains spadefoot are irruptive breeders and may spend years underground waiting for ideal breeding conditions. Generally the plains spadefoot emerges after 50 mm of rainfall during a short precipitation event (1-5 day duration) (Taylor and Downey 2003). The Great Plains toad requires larger amounts of precipitation and generally emerges after a short period precipitation event with approximately 100 mm of rain.

1.2.5 Survey Effort

Call surveys should be conducted at least three times during the breeding season. If more visits are conducted, additional information regarding species composition and estimates on species numbers can

be obtained. For species compositions surveys, the number of surveys required may be dictated by what species are found during the first visit to the site. If all expected species are recorded, no further site visits are required.

Call surveys should be spread throughout the projected calling period (Figure 1.1), but it will be dependent on appropriate survey conditions and weather. The USGS (2010) suggested sampling rate is as follows:

Run 1: Minimum air temperature: 6^{o}C
Run 2: Minimum air temperature: 10^{o}C
Run 3: Minimum air temperature: 13^{o}C

Surveys may be conducted by one individual, but two would be preferred for both safety reasons and to confirm the identification of calling amphibians on site.

1.2.6 Permit Requirements

ESRD-Wildlife Management does not require a permit for the auditory amphibian surveys, if conducted using the guidelines outlined in this document. If the proposed survey methods differ from this guideline contact the local ESRD-Wildlife Management office to determine if a permit is required.

1.2.7 Equipment List

- GPS
- Recording device to record uncertain species for future clarification
- Headlamps/flashlights
- Disinfectant (20% bleach-to-water) to use on boots and nets if travelling to more than one site
- Pencil or indelible ink pen
- Watch or timer
- CD or digital recording of appropriate amphibian calls

1.3 Survey Protocol

1.3.1 Standard Survey Method

Upon arrival at a survey site, observers should report the time, cloud cover, precipitation, temperature, and level of wind, as per the Beaufort Scale (Appendix A). Any changes in the weather throughout the survey should also be recorded. The survey should last for at least 3 minutes (ACA and ASRD 2010).

Once the survey has begun, record all amphibian species that are calling during the 3- minute interval. Calls can be recorded using an index adapted from the widely accepted protocol developed by Mossman et al. (1998) (Table 1.4):

Table 1.4. Abundance index

Calling Index	Description
0	No amphibians of a given species calling
1	Individual calls, not overlapping (estimate of 1-5 individuals calling at a site)
2	Calls are overlapping, but individuals are still distinguishable (estimate of 6-10 individuals calling at a site)

3	Numerous calls can be heard; chorus is constant and overlapping (estimate of more than 10 individuals)

All information collected must be submitted to the Government of Alberta Fish and Wildlife Management Information System (FWMIS) database.

1.3.2 Industrial Development Survey Methods

Waterbodies whose bed and shore lie within 100 metres from the edge of a planned disturbance need to be surveyed using the protocol described in previous sections.
If the disturbance is linear (e.g., pipelines, cutlines, etc.), all waterbodies along the entire length of the disturbance must be surveyed. For non-linear disturbances (e.g., cutblocks, well sites, etc.), call surveys must be conducted for all waterbodies contained within the boundaries of the disturbance zone, and those that lie within 100 metres from the outside edge of the disturbance (Government of Alberta 2012, Government of Alberta 2011).

1.4 Additional Resources

Alberta Northern Leopard Frog Recovery Plan.

Status of the Plains Spadefoot *(Spea bombifrons)* in Alberta

Status of Canadian Toad in Alberta

Status of Plains Spadefoot in Alberta

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2.0 AMPHIBIANS: NON-ACOUSTIC SURVEY GUIDELINE

2.1 Introduction

2.1.1 Species Group

This protocol is designed to survey for amphibians which cannot be identified readily by their call using auditory surveys. Species included in this survey protocol include: long-toed salamander, tiger salamander, Columbia spotted frog, and northern leopard frog.

2.1.2 Species Status

Table 2.1 Amphibian Species Status

Species	Wildlife Act Category	Provincial General Status	COSEWIC Status/SARA Status
Long-toed salamander (*Ambystoma macrodactylum*)	Species of Special Concern	Sensitive	Not at risk
Tiger salamander (*Ambystom tigrinum*)	Non-game animal	Secure	Not at risk
Columbia spotted frog (*Rana luteiventris*)	Non-game animal	Sensitive	Not at risk
Northern leopard frog (*Lithobates pipiens*)	Threatened	At risk	Special Concern (western boreal/prairie population)

2.1.3 Species Distribution and Trends in Alberta

Table 2.2. Amphibian species distribution in Alberta.

Species	Distribution	Trends
Long-toed salamander (*Ambystoma macrodactylum*)	Rocky Mountains with isolated populations in the Peace River area	Most populations in Alberta appear to be persisting; however, human activity has resulted in local extirpations (Rocky Mountains); little data exist for populations around Peace River
Tiger salamander (*Ambystoma tigrinum*)	Parkland, Grasslands, and southern Alberta Foothills	Little data exist for population trends in Alberta; anecdotal information suggests they are less common in the southwest part of their range (i.e. Canmore – Calgary area)
Columbia spotted frog (*Rana luteiventris*)	Rocky Mountains	Little data exist for population trends in Alberta; suspected declines since 1970s
Northern leopard frog (*Lithobates pipiens*)	Primarily Grasslands, also Parkland, southern Alberta Foothills, and extreme northeast	Population has declined and distribution contracted since late 1970's; reintroductions appear to be successful about 40% of the time

2.1.4 Biology

Surveyors should be familiar with species biology. In general, these species travel to breeding ponds in spring, then return to primarily terrestrial habitat for the remainder of the season (Columbia spotted frogs are the most aquatic of these species). Larvae metamorphosize and disperse from ponds in late summer, although in the case of the Columbia spotted frog and tiger salamander, larvae may overwinter (Russell and Bauer 2000). Northern leopard frogs overwinter at the bottom of ponds, and the other three species use burrows in the ground.

Habitat requirements vary with species, but in general, waterbodies used for breeding lack fish and are permanent or semi-permanent. Terrestrial habitat must offer cover and moisture.

2.1.4.1 Long-toed Salamander

Salamanders are difficult to survey because they do not emit any sounds, and this species is small, cryptic, nocturnal, and usually fossorial. The long-toed salamander uses a variety of habitats throughout its range along the front range of the Rocky Mountains where it is usually associated with low mountain passes or river valleys (Graham and Powell 1999). It is also found around the Peace River area (Walsh 1998).

2.1.4.2 Tiger Salamander

Tiger salamanders are difficult to survey because they do not emit any sounds, and although they are larger and more visible than long-toed salamanders, they are difficult to find because they are nocturnal, and often fossorial. The tiger salamander is found in a variety of habitats, usually near water, in the Grassland, Parkland, Boreal, and Foothills Natural Regions (Russell and Bauer 2000).

2.1.4.3 Columbia Spotted Frog

This species of frog can be difficult to survey acoustically because the call is usually quiet and intermittent. The Columbia spotted frog is restricted to the Rocky Mountain Natural Region, at elevations between 995 m and 2150 m. It is usually found near water (James 1998) and typically breeds in small, permanent ponds.

2.1.4.4 Northern Leopard Frog

This species has a low-pitched call that can be difficult to detect. The northern leopard frog requires three distinct habitat types: shallow waterbodies with emergent vegetation for breeding; moist meadows, pastures, or scrublands for foraging; and deep, permanent waterbodies that do not freeze for overwintering (ASRD 2003). Found primarily in the Grasslands Natural Region.

2.2 Survey Standards

2.2.1 Personnel

Non-acoustic amphibian surveys should be conducted by a professional wildlife biologist and/or professional wildlife technician who is experienced with amphibian identification and survey methods. Familiarity with amphibian egg identification is necessary; Columbia spotted frog eggs masses are similar to wood frog egg masses, and salamander eggs can be difficult to observe because they are laid singly or in small clumps.

2.2.2 Time of Year

Surveys should be conducted between May and September. The specific timing varies with the type of survey method used, i.e., looking for eggs, larvae, or adults. Generally, the best method is egg surveys, which coincides with the breeding period of May (timing will vary slightly with location and timing of ice melt).

2.2.3 Time of Day

Surveys should be conducted during daylight hours.

2.2.4 Weather/Conditions

Visual survey methods are not suitable during rain, high wind (>4 on Beaufort scale, Appendix A), or heavy cloud because visibility at the water surface is limited. If the purpose of the survey is to identify species presence (not estimates of abundance), and eggs have been discovered, then the survey does not need to be repeated. Egg surveys can begin at temperatures as low as 4^{o}C, although breeding activity will increase with warmer temperatures.

2.2.5 Survey Effort

Surveys should be conducted at least twice during the appropriate survey period (see below for details). Surveys should usually be conducted between one and two weeks apart (may depend on stage of egg/larvae development at the time of the first survey). One person can conduct the surveys, although consideration needs to be given to safety (i.e., working alone in the wilderness). Teams of two or more people can be used, and surveyors need to make sure they are following protocol appropriately and recording data in a similar way.

2.2.6 Permit Requirements

ESRD-Wildlife Management require a Research Permit/Collection Licence for any amphibian survey that requires, capture or handling. The Alberta Wildlife Care Committee Class Protocol #011 is the permit applicable to this survey [available online]
http://srd.alberta.ca/FishWildlife/ResearchLicencesPermits/documents/WRClassProtocol011-Ground-basedWildlifeSurveys.pdf

2.2.7 Equipment List

- Safety equipment
- GPS
- Camera to record uncertain species for future clarification
- Rubber boots
- Disinfectant (20% bleach-to-water) to use on boots and nets if travelling to more than one site
- Pencil or indelible ink pen
- Data sheets

2.3 Survey Protocol

2.3.1 Standard Survey Method

2.3.1.1 Egg Searches

The primary survey method recommended is for locating eggs (and possibly adults and/or larvae) following standard protocol, i.e., walk slowly around the pond edge without disturbing the water surface and record all evidence of amphibian breeding activity (see Pretzlaw et al. 2002). Unfortunately, tiger salamanders may lay eggs far from the shoreline in shallow water, making detection difficult (D. Schock, pers. comm.). Consideration should be given to additional methods, listed further below. It is worth noting that searching under objects for salamanders is not an effective detection method for the two species included in this protocol.

Northern leopard frog eggs are rarely detected during egg searches because frogs are patchily distributed and eggs can be difficult to find (D. Prescott, pers. comm.). Egg searches are only recommended at known breeding ponds to confirm continued presence (although frogs may not breed at the same pond every year). The preferred method for finding this species is to conduct mid-day pond surveys in August (into early September), when young-of-the-year are dispersing (D. Prescott, pers. comm., Kendell 2002). Frogs are more likely to be active in warm, calm, sunny conditions, especially after a rain event (Kendell 2002). A new protocol for young-of-the-year surveys is under development, and will include details about the length of time and number of surveys required at a site but is currently not available.

2.3.2 Additional Survey Methods

The following more time intensive methods may be employed depending on the species and/or waterbodies of interest. A Research Permit and Collection Licence are required to conduct any of the following surveys (see 2.6) unless otherwise noted.

2.3.2.1 Pitfall Trapping

This method is recommended if there is a particular waterbody of interest, e.g., in an area proposed for development. Pitfall trapping involves encircling a pond with silt or drift fencing and placing embedded pots in the ground at 10 m intervals along both sides of the fence (Wilkinson and Berg 2004). Amphibians travelling to and from a breeding pond will come up against the fence, and walk along the edge until falling into a trap. Traps need to be checked regularly (not exceeding 3 days between checks; more often is preferable). This method is effective at capturing salamanders, but modifications are required to keep frogs from jumping out, such as deeper traps or a funnel on the mouth of the trap.

2.3.2.2 Seining

This method is effective for capturing tiger salamanders in dugouts and wetlands with limited vegetation (vegetation can impede the seine net and can squash salamanders caught in the net) (D. Schock, pers. comm.). Nets can be adapted to deeper water using poles with weights on the nets. If tiger salamanders are the species of primary interest, this method should be employed if waterbodies are suitable.

2.3.2.3 Minnow Traps

These traps can be used to capture larvae; however, there are several limitations. Firstly, adult salamanders may get captured and because they require regular access to air, they could drown if left too long in a submerged trap, so traps must be partially submerged or checked several times throughout the day. Secondly, minnow traps do not attract larvae but rather capture larvae that happen to swim in; therefore, they are not a thorough or reliable method on their own.

2.3.2.4 Baiting

Tiger salamanders have been successfully attracted to fresh calf liver suspended in water by a string. By doing this at night, when the liver is pulled to the surface after several minutes, tiger salamanders are visible by flashlight and can be captured with a dip net (D. Schock, pers. comm.). The concept of using

bait may be adapted to set up bait stations to see if salamanders are attracted to them; however, this method has not been tested. No formal protocol exists for using bait; this method was pioneered by Dana Schock, and could be considered if tiger salamanders are the primary species of interest.

2.4. Additional Resources

Alberta Northern Leopard Frog Recovery Plan

2.5. Literature Cited

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Wilkinson, L. and G. Berg. 2004. Researching Amphibian Numbers in Alberta (RANA): 2004 provincial summary. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Report No. 95. Edmonton, AB.

2.6 Personal Communication

David Prescott, Provincial Northern Leopard Frog Lead, Alberta Environment and Sustainable Resource Development.

Danna Schock, Instructor, Keyano College, Fort McMurray Alberta.

3.0 Short-Horned Lizard

(Phrynosoma hernandesi)

3.1 Introduction

3.1.1 Status

- *Wildlife Act* category: *Endangered*
- Provincial general status: *At Risk*
- COSEWIC status: *Endangered*
- Federal *Species at Risk Act* status: *Endangered*

The short-horned lizard *(Phrynosoma hernandesi)* is Alberta's only species of lizard. A few isolated populations of short-horned lizards occur in the extreme southeastern corner of the province (James 2002), which is at the northern extreme of the species' North American range. Although population sizes and trends have not been accurately assessed for the province, populations are small relative to adjacent populations in the western United States and it is believed that populations in Alberta declined over the 1980s (James et al. 1997).

Some areas that historically contained short-horned lizards have had the habitat destroyed by dams and the associated water reservoirs and agricultural development (James 2002). In addition, road kill could be a significant factor if roadways are constructed through prime lizard habitat.

3.1.2 Biology

Short-horned lizards are found on sparsely vegetated, south-facing slopes of canyons and coulees in the extreme southeastern parts of the province, with populations located in disjunct zones along the Milk and South Saskatchewan Rivers and around the Chin Coulee, 40-Mile Coulee, and Pakowki Lake drainages (James 2002). The native vegetation in these habitat types is generally mixedgrass prairie, and the species seems to require fine, friable soil into which individuals can burrow for overwintering. Many of the areas have a shrub component such as creeping juniper, sage, or greasewood. In the Manyberries area, short-horned lizards are found in juniper badlands/dunes habitat, whereas other populations are typically found in sparsely vegetated river breaks and badlands. The habitat types that short-horned lizards tend to occupy are limited in occurrence, but appear to be relatively stable.

Although female lizards may have relatively small summer home ranges, they may also shift home range areas repeatedly over the course of the active period. As well, it does not appear that there is much overlap between hibernation areas and summer home range areas. Overwintering areas may be some distance (perhaps up to 1 km) from the summer home range area. Males appear to have broad home ranges, and may move considerable distances, making them generally less predictable to find than females.

In Alberta, short-horned lizards overwinter in shallow burrows about 10 cm below the surface. They generally emerge in mid- to late April, but have been observed as early as April 1st, and remain active until around mid-September, but can be as late as early November if weather permits. They will shuttle between heat sources and heat sinks during the day to control their internal body temperature, but otherwise remain relatively inactive. Short-horned lizards rely on camouflage for predator evasion, and tend to move only when prey ventures close enough for them to dash out and grab it. Mating appears to occur in mid to late May in Alberta, and 6 to11 live young are born during a short period near the end of

July. Neonates weigh about 0.7 g and have a snout-vent length (SVL) of approximately 24 mm. Females remain at coulee rims after mating, whereas males disperse farther into adjacent habitats.

3.2 Survey Standards

Contact your local ESRD-Wildlife Management office for known locations of short-horned lizard habitat or associated habitat models in the proposed development area(s) and in the surrounding area(s).

3.2.1 Personnel

Short-horned lizard surveys should be conducted by (or under the supervision of) an experienced wildlife biologist. Due to the cryptic nature of the species they are often very difficult to detect. Thus surveyors should have previous experience in surveying for short-horned lizards with established search images and knowledge of the biology, behaviour, and preferred habitat of the species.

3.2.2 Time of Year

Surveys should ideally be conducted during the last two weeks of July and the first two weeks in August, immediately following the period when females give birth to their young.

3.2.3 Time of Day

Surveys should be conducted during daylight hours, generally from late morning to late afternoon, depending on appropriate ambient temperatures.

3.2.4 Weather/Conditions

Surveying is best in the middle of summer on calm, sunny days with temperatures at or above 15ºC. Short-horned lizards may be especially active after several days of inclement weather, particularly rain. Lizards will typically emerge mid-morning and can be observed until late afternoon or early evening if the ambient conditions are sufficiently warm.

3.2.5 Survey Effort

Between one to three days, depending on the size of the survey area, with appropriate weather conditions (some sun, at least 15ºC, no more than light winds) are often required for searching a location. Multiple-line transects are the recommended survey method for short-horned lizards. Therefore, a minimum of two observers are required to conduct the survey (James 2002).

3.2.6 Permit Requirements

ESRD-Wildlife Management require a Research Permit for short-horned lizard surveys. The Alberta Wildlife Animal Care Committee Class Protocol #011

3.2.6 Equipment List

- GPS unit
- Walking stick

3.3 Survey Protocol

Surveys conducted during the last two weeks of July and the first two weeks in August, immediately following the period when females give birth to their young should coincide with the highest lizard

population of the year. Neonates, although tiny (about 24 mm SVL), are more apt to flush when approached, and thus are conceivably more easily located than adults. Surveys may be conducted under suitable conditions outside of this timing window, however detectability will likely be reduced. Populations can undergo significant fluctuations from year to year thus detection rates may be extremely low at certain years. Overall, short-horned lizards are extremely difficult to locate and suitable habitats are often challenging to differentiate from surrounding areas.

Because the home range size is often relatively small (especially for females) and habitat requirements are specific, avoidance of all confirmed short horned lizard habitat should be strictly adhered to. Significant development has already occurred in key short-horned lizard habitats in Alberta and. preventing additional habitat loss is important to maintaining this species in Alberta.

3.3.1 Standard Survey Method

3.3.1.1 Multiple-Line Transect Surveys

This search technique consists of walking slowly back and forth across appropriate habitat during the day to flush the lizards. Each pass should be about 2 m from the last path taken. Searchers should work in pairs where possible, walking side-by-side and about 2 m apart. This technique enables each surveyor to cover a 2 m wide swath of habitat with each pass. Searchers can use a walking stick to gently probe clumps of vegetation, and should keep their eyes constantly on the ground, paying attention to the slightest movements, especially within their peripheral vision. Efforts should be made to disturb the ground as little as possible.

Location (georeferenced using a GPS unit, NAD 83 datum), number, and age (neonate vs. adult) of all lizards observed should be recorded. The following data should be recorded: vegetation type, slope, and aspect of the site (within 1 m^2 area), and a general vegetation description within a 10 m^2 area surrounding the observation site. General weather conditions and temperature should also be recorded.

Experienced searchers have found that it can take approximately three hours of searching, under appropriate conditions, per lizard identification made. Of course, this may vary significantly among sites. Sites at the northern margin of the species' range seem to be less densely populated and consequently it may take much longer to successfully find even a single animal. Weather can be critical in search success because of its effect on lizard activity. Generally, short-horned lizards are not affected by windy conditions or light clouds, but heavy cloud cover may cause them to seek cover for the day and become inactive, and high winds in well-vegetated areas make searches unfeasible. Cool temperatures are not as significant a detriment to activity as heavy cloud cover, because lizards may still manage to thermoregulate by basking if sun exposure is available.

Terrain near existing sites may also hold previously undocumented populations of this species, especially if the area contains suitable habitat. Locations between significant populations, such as those along the South Saskatchewan River, should also be searched. As with many amphibians and reptiles, short-horned lizards are small and cryptic, therefore, their presence is not as widely known as with some larger, more conspicuous species.

3.3.2 Industrial Development Survey Methods

Proponents are required to conduct pre-development surveys (i.e., Habitat Suitability Index [HSI] mapping in combination with field surveys) in areas of suitable/highly suitable habitat to determine the

foci for the setback guidelines. Determining the presence of the species will be key to proper siting of developments to reduce impacts to habitat. Proponents should be familiar with year round setback distances of 100 m for low and medium and 200 m for high disturbance activities, respectively, from all suitable/ highly suitable habitats in areas where short-horned lizards are known to occur. Additionally, there are year round setback distances of 100 m for low and medium and 200 m for high disturbance activities, respectively, from the crest of any coulee associated with riparian areas or unique geographical features like hummocky moraines.

Because the home range size is often relatively small (especially for females) and habitat requirements are specific, avoidance of all confirmed short horned lizard habitat should be strictly adhered to. Significant development has already occurred in key short-horned lizard habitats in Alberta. Preventing additional habitat loss will be important to maintaining this species in Alberta.

3.3.2.1 Linear Development Surveys

Linear developments should be surveyed in all areas where footprint intersects known or potential short-horned lizard habitat. Survey areas should include the recommended buffer distance (i.e. 100 or 200 m) from habitat intersected by the proposed development or activity (Government of Alberta 2012).

3.3.2.2 Non-linear Development Surveys/Area Surveys

Non-linear developments should be surveyed in all areas where industrial footprint falls within or adjacent to known or potential short-horned lizard habitat, including the recommended setback buffer distance (i.e. 100 or 200 m) from habitat .

3.4 Additional Resources

Alberta Short-horned Lizard Status Report

3.5 Literature Cited

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4.0 Snake Hibernacula Searches

4.1 Introduction

As with many prairie species, the main problems faced by snakes in Alberta are associated with loss of habitat. Direct mortality associated with human activities and intentional persecution (killing of snakes and vandalism or destruction of hibernacula (overwinter dens)) is a significant problem. The increased pace of oil and gas development and agricultural activities in southern Alberta have resulted in additional roads that intersect snake habitat, as well as a corresponding increase in traffic volumes. A large number of snakes are killed each year on roads in Alberta. Considering that snakes in Alberta are inactive for approximately half the year, industrial activity in snake habitat can often be timed to avoid the active season.

The congregation of snakes at hibernacula (especially in fall, winter and spring) as well as their high fidelity to den sites increases the vulnerability of snakes to disturbance at these sites. Incidents of direct mortality of snakes, as well as conflict between industrial development and snake hibernacula, have occurred in the recent past. The Alberta *Wildlife Act* protects hibernacula from destruction, however, effective management of hibernacula also requires protection of adjacent areas due to the high levels of snake activity occurring there. Industrial activity close to snake hibernacula (especially construction of roads) can be very detrimental to snake populations and should be avoided.

4.1.1 Inventory Group and Species Status

Table 4.1. Status of snakes in Alberta and Canada

Common Name	Scientific Name	Provincial General Status
Western hognose snake	*Heterodon nasicus*	*May Be At Risk*
Bullsnake	*Pituophis catenifer*	*Sensitive*
Wandering garter snake	*Thamnophis elegans*	*Sensitive*
Plains garter snake	*Thamnophis radix*	*Sensitive*
Red-sided garter snake	*Thamnophis sirtalis*	*Sensitive*
Prairie rattlesnake	*Crotalus viridis*	*May Be At Risk*

4.1.2 Biology

In Canada, snakes typically hibernate from October to April. Mating generally occurs at or near the dens in the spring or fall, depending on the species. However, some snakes mate in the summer months away from dens. Garter snakes and rattlesnakes give birth to live young in late summer or fall, where as bullsnakes and hognose snakes lay eggs that hatch in late summer or early fall. Most species in Alberta show delayed sexual maturation and most do not reproduce until they are 2-4 years old. Females may skip reproduction in some years if resources for reproduction are low. Snakes spend the summer months foraging for prey away from dens and return to hibernacula in late summer or early fall. These seasonal migrations may cover considerable distances, with individual sometimes travelling over 20 km from the den site.

The hibernaculum is the most critical, and often most limiting, habitat feature for snakes. The dens provide protection from predators and are crucial overwintering sites, sometimes containing thousands of individuals and multiple species. The presence of multiple species and individuals in a single hibernaculum may indicate that these sites are limited and as such the destruction of a single hibernaculum can have a significant impact on local snake populations. The hibernacula tend to be on south- or east-facing slopes or in locations where dens receive maximum solar insulation. They may be naturally occurring pits or crevices in rock outcrops or soil, abandoned mammal burrows, or found in artificial structures. Garter snakes are particularly well known for using artificial hibernation sites, and may hibernate around wells or foundations of old buildings. The hibernacula generally have multiple layers and several entrances and are located above the water table but below the frost line.

Garter snakes tend to be generalists and may occur in a variety of habitats including grassland, forested and riparian areas. Bullsnakes and rattlesnakes tend to rely mostly on small mammals and thus are typically found in grassland habitats adjacent to river or creek valleys. Bullsnakes and rattlesnakes may also be found around cultivated fields and around farm buildings where small mammal abundance may be high. Hognose snakes prey on amphibians, small mammals, and various invertebrates and tend to be found in areas with friable or sandy soils, generally with native vegetation.

4.2 Survey Standards

Contact your local ESRD-Wildlife Management office for known locations of snake hibernacula or associated habitat models in the proposed development area(s) and in the surrounding area(s).

4.2.1 Personnel

Snake surveys should be conducted by (or under the supervision of) an experienced wildlife biologist. Surveyors should be experienced in surveying for snakes and their hibernacula habitat, with established search images and knowledge of the biology, behaviour, and preferred habitat of the species of snakes targeted by the survey. Additionally, surveyors should be aware of general health and safety precautions for working in areas with prairie rattlesnakes.

4.2.2 Time of Year

Snakes are most easily surveyed at hibernacula sites in the spring (April 1st – June 15th) or fall (August 15th – October 31st), when large numbers of snakes congregate at these sites. Variability in activity due to weather conditions occurs from year to year, thus egress and ingress dates are variable. Survey schedules should take this variability into consideration. Visits to known hibernacula sites to assess levels of snake activity in the local area may be useful to gauge the timing of snake surveys.

4.2.3 Time of Day

Surveys should be conducted during daylight hours, however the time of day is not as important as time of year or ambient temperature. Generally, snakes are observed basking outside of dens when the ambient conditions are favourable (about 15ºC or warmer).

4.2.4 Weather/Conditions

Surveying is best in early spring or late fall (to count the largest number of snakes possible), on calm (in order to hear rattle of rattlesnakes), sunny days with temperatures at or above 15ºC At the dens, snakes

will typically emerge mid-morning and can be observed until late afternoon or early evening if the ambient conditions are mild.

4.2.5 Survey Effort

Snakes and their hibernacula are extremely difficult to locate. Time of day, ambient temperature, time of year, and weather conditions all influence how easily snakes can be detected. A minimum of two surveys should be conducted at each site. However, if a hibernaculum is detected during the first survey a second survey is not required. Additional visits to promising landscape features may be required at the appropriate time of year to confirm the presence of hibernacula if surveys occur outside the times when snakes may be present.

4.2.6 Permit Requirements

ESRD-Wildlife Management does not require a permit for the snake hibernacula surveys, when conducted using the protocols outlined in this document. If the survey methods differ from this protocol please contact the local ESRD-Wildlife Management office to determine if a permit is required.

4.2.7 Equipment List

- GPS unit
- Identification key
- Snake proof chaps or gaiters (recommended)

4.3 Survey Protocol

4.3.1 Standard Snake Hibernacula Survey Method

All known hibernaculum sites within 500 m of the proposed development should be surveyed, and surveyors should search for new hibernacula as described below. Surveyors should work in teams, and remain within visual contact of each other. If a snake is encountered, stop and identify the snake, scan for other snakes, document occurrence(s), and watch for the snake to move to an entrance of a hibernaculum.

Hibernacula will generally be found on low-grade or medium-grade stable slopes with a southern, southeastern, or eastern exposure that allows for direct sunlight. Look for dissected slopes that may allow access to underlying bedrock, slump zones, fissures, rock piles, boulder complexes, and mammal burrows (ground squirrel, coyote, badger) that may have multiple openings and ledges. Also consider anthropogenic structures like the bases of, or areas around, bridges, culverts, structures (such as abandoned farmsteads) with foundations, abandoned cisterns or septic tanks/fields, and piles of backfill. Watch for other signs of snakes, such as shed skins. When a hibernaculum is found, georeference its location using a GPS unit (NAD 83 datum). Also record the species present and estimate numbers of each species, as well as their activity. Photographs of the site should also be taken and submitted with the data to FWMIS.

4.3.2 Industrial Development Survey Methods

4.3.2.1 Linear Development Surveys

The entire length of proposed linear disturbance should be surveyed. Surveyers should walk the length of the disturbance at approximately 2 km/h, in a steady quiet manner, and record all snakes observed. Surveys should also target suitable habitat areas such as the rims of coulees or other potential structures. Potential hibernaculum sites within 500 m on either side of the transect should be investigated for the presence of snakes. The exact distance will depend on where in the province and which species of snakes are being surveyed (Alberta Fish and Wildlife Division 2011, Government of Alberta 2012).

4.3.2.2 Non-linear Development Surveys/Area Surveys

Non-linear development surveys should be conducted following the survey standards outlined in Section 4.2 and survey protocols outlined in Section 4.3. Potential hibernaculum sites within 500 m from the proposed development should be investigated for the presence of snakes. The exact distance will depend on where in the province and which species of snakes are being surveyed (Alberta Fish and Wildlife Division 2011, Government of Alberta 2012). Surveys should also concentrate on suitable habitat areas rather than a random sampling method in order to provide the greatest probability of detection.

4.4 Additional Resources

For individual species:

Bullsnakes (*Pituophis catenifer sayi*) in Alberta

Red-sided garter snake (*Thamnophis sirtalis parietalis*) relocation and education project - Final report.

Status of the prairie rattlesnake (*Crotalus viridis viridis*) in Alberta.

Status of the plains hognose snake (*Heterodon nasicus nasicus*) in Alberta.

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5.0 Burrowing Owl

(Athene cunicularia)

5.1. Introduction

5.1.1 Species Status and Distribution

- *Wildlife Act* category: *Endangered*
- Provincial general status: At Risk
- COSEWIC status: *Endangered*
- Federal *Species at Risk Act* status: *Endangered*

In Alberta the burrowing owl is found within the Grassland Natural Region; more specifically, its range spans from the Saskatchewan border west to Milk River, Lethbridge, and Strathmore, and north to the Drumheller, Hanna, and Youngstown areas (ESRD 2012).

5.1.2 Biology

Burrowing owls migrate from the southern United States and Mexico and arrive in Alberta around the 1st of April (ASRD and ACA 2005, COSEWIC 2006). The males then choose a nest burrow, advertise to attract females, and defend their territories. They can sometimes be seen perching conspicuously during the day at the entrance of their burrows or on a low post nearby. Their flight is low and undulating, and they often hover like a kestrel (ASRD and ACA 2005, COSEWIC 2006). The calls of the burrowing owl include a soft *coo-coooo* and a chattering series of *chack* notes; if disturbed in the burrow, the owl gives a rasping, rattlesnake-like alarm call.

Females begin laying eggs between late April and early May, and the first of 6-11 eggs hatch about 30 days later (early June). The young begin moving to nearby burrows around 30-35 days of age (late June) and can fly at 50 days of age (late July) (Corey Scobie pers. comm.). They become independent of the adults at about 65 days old (mid-August) and begin their southern migration by mid-October. Burrowing owls have shown fidelity to nest sites by coming back to the same burrow year after year and different individuals will reoccupy previously used burrows (ASRD and ACA 2005, COSEWIC 2006).

Burrowing owls occupy the Mixedgrass and Dry Mixedgrass Natural Subregions of Alberta (ASRD and ACA 2005, COSEWIC 2006). They prefer short vegetation (native grass prairie or tame pasture) on flat to rolling topography and nest primarily in badger burrows. They will occasionally use fox burrows and even ground squirrel burrows if the burrows are greater than 10 cm in diameter.

5.2 Survey Standards

Contact your local ESRD-Wildlife Management office for known locations of burrowing owl burrows or associated habitat models in the proposed development area and in the surrounding area.

5.2.1 Personnel

Burrowing owl surveys should be carried out by an experienced wildlife biologist or wildlife technician who is knowledgeable in survey procedures for burrowing owls (Fuller and Mosher 1987). Surveyors should have considerable experience specific to burrowing owls, with established search images and knowledge of the biology, behaviour, and preferred habitat of this species. Surveyors should be

competent in identifying burrowing owls by sight and sound in the wild. Additionally, they should be competent in identifying signs of recent nesting and roosting activity, as well as suitable nesting habitat for the species.

5.2.2 Time of Year

Call playback surveys (see Section 5.3.1.1) should be conducted between May 15th and July 15th (Scobie and Russell 2000, Stevens and Todd 2007).

Ground searches are most effective between May 15th and August 31st (Scobie and Russell 2000, Stevens and Todd 2007). Ground searches can be conducted outside of the recommended time period, however, if surveys are conducted outside of the recommended dates, all identified burrows should be considered an active burrowing owl nest and the appropriate setbacks and timing restraints should be adhered to (Government of Alberta 2012, Government of Alberta 2011).

5.2.3 Time of Day

Call playback surveys conducted between May 15th and July 31st should be performed between sunrise and 10:00 and 18:00 and sunset (Conway et al. 2008, Haug and Didiuk 1993). Ground searches can be completed anytime between sunrise and sunset.

5.2.4 Weather/Conditions

Surveying should not be conducted during adverse weather conditions, including rain, snow, or when winds are greater than 20 km/h or a level 3 on the Beaufort scale (Appendix A) (Scobie and Russell 2000, Stevens and Todd 2007). If conducting a survey using the ground search method, the ground must be clear of all snow.

5.2.5 Survey Effort

Surveys should be conducted at least once at each survey point. Ground searches (see Section 5.3.1.2) that are conducted outside of the recommended time period of May 15th -August 31st should be repeated a second time during the recommended time period (refer to Section 5.3.2) (Stevens and Todd 2008). A minimum of one observer is required to conduct the survey.

5.2.6 Permit Requirements

ESRD-Wildlife Management requires a Research Permit for all burrowing owl call playback surveys. The Alberta Wildlife Care Committee Class Protocol #011 is designed for the burrowing owl call playback survey [available online] http://srd.alberta.ca/FishWildlife/ResearchLicencesPermits/documents/WRClassProtocol011-Ground-basedWildlifeSurveys.pdf

5.2.7 Equipment List

- Binoculars
- Spotting scope and tripod
- Wildlife caller equipped with burrowing owl call
- GPS unit
- Approved permit for conducting a call playback survey for burrowing owls.

5.3 Survey Protocol

5.3.1 Standard Survey Methods

5.3.1.1 Call Playback Surveys

Call playbacks have shown to be an effective method for locating owls (Haug and Didiuk 1993, Conway and Simon 2003, Conway et al. 2008). Behavioural responses by breeding owls to broadcast calls can include flying, emerging from burrows and standing erect, alarm bobbing, and roosting on elevated structures (Schmutz and Wood 1992, Haug and Didiuk 1993). Since 1997, this methodology has been used in Alberta to conduct provincial owl surveys and trend block surveys, and to locate nest sites during pre-development surveys associated with various industrial developments (Scobie and Russell 2000, Stevens and Todd 2007). The survey protocol is highly structured to allow for future repeatability and comparison to other studies. This method is most successful when conducted by experienced field people who have established search images of burrowing owls and are familiar with their behaviour and habitat.

The call playbacks should be conducted between May 15th and July 15th. Surveying is not recommended on rainy days or when winds are greater than 20 km/h or a level 3 on the Beaufort scale (Appendix A). Call playback surveys conducted between May 15th and July 31st should be performed between sunrise and 10:00 and 18:00 and sunset.

Upon arriving at a site, the observer selects a suitable vantage point for conducting the survey. Elevated vantage points are recommended as it will allow for maximum survey coverage (Stevens and Todd 2008). The surveyor waits three minutes to allow owls to recover from any disturbance that may have occurred as a result of the observer travelling to the survey point (Scobie and Russell 2000, Stevens and Todd 2007). During this initial 3-minute period the surveyor should conduct a passive scan while making a 360 degree pan of the survey area. Call playback should not be played in the presence of potential predators (e.g. hawks, coyotes, foxes).

After the initial 3-minute period, the recorded primary song call (two-note *coo-cooo*) is played over another 3 -minute period using a wildlife caller[3]. The wildlife caller should be set to 80 dB at a distance of 1 meter from the speaker. The caller is rotated over 360° from a fixed point during the course of the five-minute call period, allowing calls to be broadcast around the entire circumference of the survey circle. The observer continues to scan the area for owls throughout the calling period.

After the 3-minute call playback period, the observer conducts a second 1-minute passive scan as described above. In total, each survey stop lasts 7 minutes.

Survey points should be no closer than 600 metres and not further than 800 metres apart (Ministry of Sustainable Resource Management 2001, Takats et al. 2001). In rolling terrain, the distance between survey points should be adjusted to ensure 100% visual coverage. Should an owl be observed while conducting the call playback, make a very brief check of the site to determine whether a nest is present, and if so, georeference the nest site using a GPS unit (UTM NAD 83; Zone 11 or 12). In addition, the number of adults, young of the year, and nest status should be recorded. Be sure to minimize disturbance to the nest while conducting the check. All information collected must be submitted to the Government of Alberta Fish and Wildlife Management Information System (FWMIS) database.

5.3.1.2 Ground Searches

The ground search method can be used in conjunction with the call playback method in order to find the exact location of a nest or roost burrow. Additionally, the ground search method can be used independently to identify potential burrowing owl nest sites. It is important to note that a ground search conducted outside of the recommended May 15th - July 15th time period will likely yield poor results. Surveyors using this method must be experienced and competent in identifying the signs of potential nest burrows. It is strongly recommended by ESRD-Wildlife Management that all ground searches be conducted between May 15th and July 15th in conjunction with a burrowing owl call playback survey. Surveys should not be conducted during adverse weather conditions or with any snow cover.

Ground searches require a comprehensive search of the entire survey area. Surveyors should start at the center of the survey area and walk in concentric circles, spaced 100 metres apart, to search for potential nest burrows. All burrows located with an entrance diameter of greater than 10 cm should be closely investigated for signs of use by burrowing owls. This may include feathers, pellets, whitewash, nest material such as dung, prey and their parts, or loose soil across the breadth of the burrow floor (Ministry of Sustainable Resource Management 2001). All potential nest burrow locations should be georeferenced using a GPS unit (UTM NAD 83, Zone 11 or 12). In addition, the number of adults, young of the year, nest status, and how the nest was deemed to be active (pellets, birds present, etc.) should be recorded. If ground searches are being conducted between April 1st and October 15th, care should be taken to limit time at the site and potential disturbances to burrowing owls. All information collected must be submitted to the Government of Alberta Fish and Wildlife Management Information System (FWMIS) database.

[3] Contact your local ESRD-Wildlife Management office for information on how to obtain a copy of this call or to ensure that the call to be used is the proper call

5.3.2 Industrial Development Survey Methods

Surveys along proposed linear developments should follow the survey protocols for both the call playback method (Section 5.3.1.1) and ground search method (Section 5.3.1.2).

Call playback surveys along proposed linear and non-linear developments should be spaced no closer than 600 metres and no further than 800 metres apart (Scobie and Russell 2000, Stevens and Todd 2007). Surveyors must ensure coverage of the entire length of the linear disturbance plus any recommended setbacks for the proposed development (Government of Alberta 2012, Government of Alberta 2012). In areas with visual or auditory interference (e.g., hills, coulees) survey points may need to be moved closer together to ensure adequate coverage of the site.

If operating outside of the May 15th –July 15th survey period, a ground search along the entire length of the proposed development, including setback areas, is required. Ground searches should be conducted by foot. The entire length of the proposed development plus the recommended setback area must be searched for potential burrows (Government of Alberta 2012, Government of Alberta 2012). All potential nest burrows are considered active burrowing owl nests and appropriate setbacks and timing restrictions will apply, unless an appropriate call playback survey is conducted using the methods described above.

5.4 Additional Resources

Alberta Burrowing Owl Recovery Plan

Recovery Strategy for the Burrowing Owl in Canada

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5.6 Personal Communication

Corey Scobie, University of Alberta, Department of Biological Science, Master of Science Student.

6.0 Short-Eared Owl

(Asio flammeus)

6.1 Introduction

6.1.1 Species Status

- *Wildlife Act* category: Not listed
- Provincial general status: May be at Risk
- COSEWIC status: *Special Concern*
- Federal *Species at Risk Act* status: *Special Concern*

The short-eared owl population in Alberta is unknown. Short-eared owls move widely in North America; consequently, the number in the province varies widely from year to year. Breeding Bird Surveys indicate a significant decline between 1968 and present (Clayton 2000, Wiggins 2008).

6.1.2 Biology

The short-eared owl is a medium-sized owl, weighing between 206 g and 475 g and measuring 34-42 cm in length. Adult colouration is a cryptic mix of brown, black, and white. Females are slightly larger and darker than males, but there is much overlap. The owls are most obvious when in flight, mostly near dusk. They have the typical large, rounded "owl" head and eyes, with a well defined facial disc, black around the eyes, and small inconspicuous ear tufts. They can sometimes be seen perching conspicuously during the day on fence posts.

Short-eared owl movements are erratic. Recent (2011) satellite telemetry indicates owls breeding in Alberta may winter here or move south from Montana to Kansas (G. L. Holroyd, pers. comm.). Short-eared owls that winter in Alberta could have bred as far north as Alaska the previous season (T. Booms, pers. comm.). The males advertise to attract females with an evening display involving steep descents and ascents interspersed with wing claps directly above or near the female (Wiggins et al. 2006). Females begin laying eggs between late April and early June, and the first of 3-11 eggs (average 7) hatch about 30 days later (early June). The young begin moving short distances away from the nest around 15 days of age, hiding in thick vegetation, presumably to avoid predators.

Short-eared owls occupy unforested habitats in all subregions of Alberta. They prefer medium to tall vegetation (native grass prairie or tame pasture) on flat to rolling topography where they will nest when microtine populations, particularly voles, are high.

6.2 Survey Standards

6.2.1 Personnel

Short-eared owl surveys should be carried out by an experienced wildlife biologist or wildlife technician who is knowledgeable in survey procedures for this species. Surveyors should have considerable experience specific to short-eared owls, with established search images and knowledge of the biology, behaviour, and preferred habitat of this species. Surveyors should have excellent hearing and eyesight, and should be competent in identifying short-eared owls by sight and sound, and be able to discriminate between short-eared owls and other birds that might be encountered.

6.2.2 Time of Year

Roadside/point count surveys (Section 6.3.1.1) should be conducted in May and June during the peak of the breeding season. Fledglings can be counted until August.
Ground searches should be conducted between April 1st and July 15th to locate short-eared owl nests.

6.2.3 Time of Day

Roadside/point count surveys (Section 6.3.1.1) should be conducted starting one hour before sunset and ending 30 minutes after sunset (i.e., for 90 minutes), as short-eared owls are primarily crepuscular and use this 90-minute time period for hunting and territorial display. Ground searches (Section 6.3.1.2) should be conducted during daylight hours.

6.2.4 Weather/Conditions

Weather conditions should be fair at the time of the survey. Do not proceed in rain or when winds are above level 3 on the Beaufort scale (>20 km/h).

6.2.5 Survey Effort

Surveys should be repeated at least three times during each season, as Keyes (2011) noted a single survey detection rate of just 31% in winter and during the breeding season.
One person is required to complete the surveys.

6.2.6 Permit Requirements

ESRD-Wildlife Management does not require a permit for short-eared owl surveys, when conducted using the protocols outlined in this document. If the survey methods differ from this protocol please contact the local ESRD-Wildlife Management office to determine if a permit is required.

6.2.7 Equipment List

- Binoculars
- GPS unit
- Stopwatch

6.3 Survey Protocol

6.3.1 Standard Survey Methods

6.3.1.1 Roadside/Point Count Surveys

(to be done in conjunction with, or before, ground searches)
The roadside/point count survey method is designed to determine presence/absence of short-eared owls during the breeding or non-breeding seasons. The recommended survey technique for short-eared owls presented here follows the format of the Breeding Bird Survey (http://www.mbr-pwrc.usgs.gov/bbs/) and includes other authors' suggestions (Wiggins 2004, Keyes 2011).

The survey should be conducted starting one hour before sunset and ending 30 minutes after sunset, i.e., for 90 minutes. Short-eared owls are primarily crepuscular, using this 90-minute period for hunting and territorial display. Each route is 9.5 km long, with a total of twenty stops located at 800 m intervals along the route and one minute to move between stops. A 3-minute point count is conducted at each stop, during which the observer records all owls seen within 400 m of the stop. Owls are large enough that they can be seen further than 400 m away, but these observations should be recorded separately from those within 400 m of the observer. The stop should be at a location with optimum visibility of the surrounding landscape and at a safe location for stopping when on a road.

Evening surveys in the summer for this species can be twinned efficiently with surveys for the common nighthawk (see Chapter 15.0 of this document)

The position of all individuals or residences (nests, burrows, dens, hibernacula) of *Endangered*, *Threatened*, Species of Special Concern, Data Deficient or Deferred species (see Appendix 1) observed during the surveys should be georeferenced using a GPS unit (UTM NAD 83; Zone 11 or 12) and submitted to Alberta Fish and Wildlife through a standard FWMIS data submission load form.

6.3.1.2 Ground Searches

(Conducted April-July for nests)

Should an owl be observed while conducting the point count, a ground search for a nest is required. To determine whether or not a nest is present, the surveyor should make a very brief check of all potential nesting habitat within a 400m radius from where the bird was observed. The surveyor should either walk in concentric circles approximately 10m apart around the detection point, or walk the area to be covered in a switchback pattern, with 10m between passes. Nests are generally bowls scraped out on the ground and lined with downy feathers and grasses, and can be found in grassland, grain stubble, hay fields, or low perennials (Wiggins et al. 2006). In addition to eggs, young, or the nest itself, additional sign that may indicate the presence of an active nest includes whitewash, pellets, prey pluckings, or a behavioural response from adult short-eared owls. If a nest is located, georeference the nest site using a GPS unit (UTM NAD 83; Zone 11 or 12).

Be sure to minimize disturbance to the nest while conducting the check.

6.3.2 Industrial Development Survey Methods

6.3.2.1 Linear Development Surveys

Linear development surveys are to be conducted following the roadside/point count and ground search methods described in Section 6.3. and survey standards described in Section 6.2. The entire length of the proposed linear development, plus 100 metres on either side, should be surveyed using the point count method. This will ensure full coverage of the proposed development site, including the recommended setback distance for short-eared owls (Government of Alberta 2011c, Government of Alberta 2012).

For linear disturbances: walk the entire line of the proposed development, as well as parallel transects spaced at 10 m intervals within 100 m of the disturbance line.

6.3.2.2 Non-linear Development Surveys

Non-linear development surveys are to be conducted following the roadside/point count and ground search methods described in Section 6.3. and survey standards described in Section 6.2. To appropriately survey for short-eared owls within a proposed non-linear development, the entire area of the proposed development should be surveyed, plus the area extending an additional 100 metres from the entire perimeter of the proposed development area. This ensures full coverage of the development site, including the recommended setback distance for short-eared owls (Government of Alberta 2012, Government of Alberta 2011c). The exact number of survey points required will depend on the size of the proposed development's footprint.

For non-linear disturbances: search outwards 100 m from the proposed development in concentric circles spaced 10 m apart if on foot, since breeding owls only flush at short distances from an intruder.

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7.0 Prairie Raptors

7.1. Introduction

7.1.1 Species Group

This protocol is designed to provide survey methods for selected diurnal raptors which nest within the Grassland and Parkland Natural Regions of Alberta; including ferruginous hawk (*Buteo regalis*), Swainson's hawk (*Buteo swainsoni*), red-tailed hawk (*Buteo jamaicensis*), prairie falcon (*Falco mexicanus*), peregrine falcon (*Falco peregrinus*), golden eagle (*Aquila chrysaetos*), and bald eagle (*Haliaeetus leucocephalus*).

7.1.2 Species Status

Table 7.1. Provincial and national Status of selected raptor species.

Species	*Wildlife Act* Category	Provincial General Status	COSEWIC Status/SARA Status
Ferruginous hawk	Endangered	At Risk	Threatened
Swainson's hawk	Bird of Prey	Sensitive	Not at risk
Red-tailed hawk	Bird of Prey	Secure	Not at risk
Peregrine falcon	Threatened	At Risk	Threatened
Golden eagle	Bird of Prey	Sensitive	Not at risk
Bald eagle	Bird of Prey	Sensitive	Not at risk
Prairie falcon	Special Concern	Sensitive	Not at risk

Prairie raptors are migratory, and return to Alberta in March (Semenchuk 1992). Large concentrations of raptors can be found along the foothills during the fall and spring migration. Nests are constructed between the end of March and the start of April. Incubation occurs between mid-April and the end of May, with young hatching between the end of May and mid-June, depending on the species. After the young fledge they typically remain close to the nest site. By the end of September the majority of prairie raptors have migrated out of Alberta; however, golden eagles often overwinter in southern Alberta.

7.2. Survey Standards

Contact your local ESRD-Wildlife Management office for known locations of sensitive raptor species or associated habitat models in the proposed development area(s) and in the surrounding area(s).

7.2.1 Personnel
Prairie raptor surveys should be carried out by an experienced wildlife biologist or wildlife technician. Surveyors should have considerable raptor survey experience and be competent in sight and sound identification of not only the species intended for census, but also for other species likely to be encountered. Further, they should be familiar with the biology, behaviour, and preferred habitat of those species. Additionally, surveyors should be competent in identifying signs of recent nesting activity.

7.2.2 Time of Year
Surveys should be conducted during the breeding season; May 1st - June 30th (Downey 2005).

If ferruginous hawk surveys are conducted outside of the recommended dates, all identified nest sites are to be considered an active ferruginous hawk nest and the appropriate setbacks and timing restraints should be adhered to (Government of Alberta 2012, Government of Alberta 2011). The ESRD-Wildlife Management definition of a ferruginous hawk nest is as follows:

"An active nest will retain the designation of an active nest during the winter following nesting activity, through a second year, and into a third year, with the "active" designation being dropped on June 1 of the second year of inactivity. For example, a nest used in 2007 will be considered active in 2008, even if there is no ferruginous hawk nesting in it. In 2009 it will still be considered active, even if there is no nesting, however, on June 1, 2009, if there has been no nesting occurring then the designation of that nest will be changed to "inactive" and it will, in effect, cease to be a nest. At that point the identified timing constraints and setbacks will no longer apply. An exception to this will occur when there are no other nesting structures within a 1 kilometre radius of the nest, in which case the nest will retain the active designation for an indeterminate period of time."

7.2.3 Time of Day
Raptors can be surveyed during daylight hours; a half hour after sunrise until a half hour before sunset.

7.2.4 Weather/Conditions
Surveys should not proceed when winds exceed level 5 on the Beaufort scale (Appendix A) or 40-50 km/h (Downey 2005). Surveys are not to be conducted during periods of snow or rain.

7.2.5 Survey Effort
Surveys should be conducted a minimum of once at each site during the nesting season (May 1st-June 30th). A minimum of one person is required to complete the survey.

7.2.6 Permit Requirements
Research permits are not required for general area searches for prairie raptors; however, if surveyors will be examining the nest a permit is required. This may include climbing to the nest, using mirrors to examine nest contents, or other invasive survey methods in and around the nest site. Permits can be obtained from ESRD-Wildlife Management.

7.2.7 Equipment List
- Binoculars
- Spotting scope & tripod or window mount
- GPS unit

- Bird identification books, CDs, or MP3s
- Datasheets, pens, pencils, etc.

7.3 Survey Protocol

7.3.1 Standard Survey Methods

7.3.1.1 Area Surveys

Prairie raptors are fairly conspicuous in nature, and often found using the "look and see" approach. The surveyor should ensure good coverage of the entire survey area, paying close attention to areas with potential nesting habitat (trees, cliffs, etc.). Ensuring adequate coverage of the area of interest will depend on the access and topography of the area.

Prairie raptors may be sensitive to human activity in and around the nest site. As a general rule nests should not be disturbed, especially during the egg laying and incubation stages as the raptors may abandon the site. Surveyors should leave the area immediately if birds are obviously being disturbed (flushing from nest site, swooping, aggressive behaviour, prolonged absence, etc.). Sites should not be approached any closer than necessary to confirm that the site is active and by which species and setback distances, as described in the Enhanced Approval Process, should be adhered to as much as possible (Government of Alberta 2012). Binoculars and spotting scopes should be used to limit the impact of the surveyors on the birds.

All potential nesting sites should be assessed to determine nesting activity and identify species. If birds are not observed at the nest site, and no birds are in the immediate area swooping, calling, or displaying aggressive behaviour (all of which would indicate nest occupancy), observers should fully investigate the nest to determine its status. Note that incubating birds not otherwise visible may flush from the nest as the observer approaches. In such cases, the nest should be considered active and the observer should leave the area immediately.

Signs that a nest is active include whitewash within and surrounding the nest, eggs, eggshell pieces, significant down and feathers in and around the nest, prey carcasses, and/or young of the year (alive or dead) (Schmutz 1987). Active nest sites should be marked on a map or aerial photo and a GPS coordinate (UTM NAD 83; Zone 11 or 12) should be recorded. Observers should leave the area immediately upon determining that the nest site is active. Nesting information including location, species, number of adults, and young (if visible) should be recorded and submitted to the Fish and Wildlife Management Information System (FWMIS) database. Climbing, or close examination of a nest site requires a research permit from ESRD-Wildlife Management as it requires significant disturbance to nesting birds and young of the year.

If surveys are conducted outside of the recommended dates, all identified nest sites should be considered an active ferruginous hawk nest and the appropriate setbacks and timing restraints should be adhered to (Government of Alberta 2012, Government of Alberta 2011).

7.3.2 Industrial Development Survey Methods

7.3.2.1 Linear Development Surveys

Prairie raptors depend on appropriate nesting structures for breeding. Therefore, it is as important to look for potential nesting sites as it is to look for individual birds. Prairie raptor nest surveys are to be conducted following the protocol outlined in Section 7.3 and the survey standards outlined in Section 7.2.

For linear developments, the entire length of the development should be should be surveyed in a quiet, steady manner and all raptor sightings or potential nest structures (e.g., trees or cliffs with stick nests present, holes in cliff) within 1000 m on either side of the proposed linear disturbance pathway should be recorded. Surveyors should survey around all obstacles within 1000 m of the proposed linear disturbance. This may mean completing multiple passes of the proposed linear disturbance at progressively larger distances (e.g., 200 m, 400 m, 600 m, 800 m) on either side of the proposed linear development. The exact distances will depend on the location of the proposed linear development and the topography and visual obstructions at the site. The surveyor must ensure that the entire area of the proposed development and recommended setbacks are surveyed (Government of Alberta 2012, Government of Alberta 2011).

7.3.2.2 Non-Linear Development Surveys

Prairie raptors depend on appropriate nesting structures for breeding. Therefore, it is as important to look for potential nesting sites as it is to look for individual birds. Surveys are to be conducted following the protocol outline in Section 7.3. and the survey standards outlined in Section 7.2.

The observer should stand at the center point of the proposed development and scan a 500 m area in a full circle of the development. The observer should then move out 500 m from the center point and conduct a second 500 m survey scan to the north, south, east, and west points surrounding the proposed development. If obstacles such as hills, tree bluffs, coulees, or similar obstacles obscure the line of sight, then the opposite side of the obstacle should also be surveyed up to 1000 m from the edge of the proposed disturbance. All potential nest sites should be marked on a map, a GPS coordinate should be recorded, and the site should be surveyed from an appropriate distance to avoid disturbance of the birds.

7.4 Additional Resources

The Alberta Ferruginous Hawk Recovery Plan

7.5 Literature Cited

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8.0 Boreal and Foothills Raptors

8.1 Introduction

The forests of the boreal and foothill areas of Alberta are home to a number of migratory and resident raptor species. Although found throughout the landscape, many species are found at low densities (Anderson 1987) and have specific summer breeding requirements which influence nest site choice. For instance, owls associate with old growth forests because of the availability of large nest site trees (Mazur et al. 1997). There have been concerns in recent years that some populations may be declining. Causes for the declines have been attributed to pollutants (such as DDT pesticides in the case of peregrine falcons), as well as habitat alteration.

Guidelines for diurnal raptors (hawks, falcons, etc.) exist for the southern portion of the province, but they are not applicable to the remainder of the province because of differences in habitats, especially in the amount of tree cover. This protocol for boreal/foothills raptors is designed to identify and protect the essential habitat features required for raptors which nest within the boreal and foothills forests of Alberta. Previous guidelines for owl inventory include call playback survey (Takats et al. 2001) and nest searches (Manley et. al., 2006). Recognizing that mitigation (application of an appropriate buffer to the nest site), only applies when a nest site is located, the probability of which is very low, an inventory of essential habitat features (e.g. large balsam poplars adjacent to spruce stands) along with nest searches ensures that more potential nesting trees are buffered. Modification of this protocol should be discussed with your local ESRD-Wildlife Management area biologist.

Although information on other non-target birds species may be gathered using this protocol, other more specific protocols should be used where they exist

8.1.1 Species Status

Although the survey protocol is not specifically designed to capture all species of boreal & foothills breeding raptors, the following is a list of raptor species and their associated status.

Table 8.1 Boreal Raptor Status

Species	Wildlife Act Category[4]	Provincial General Status[5]	COSEWIC Status/SARA Status[6]	Trends in Population
Barred owl (*Strix varia*)	Special Concern	Sensitive	N/A	Loss of mature forest habitat due to forestry and industrial development threatening population.
Boreal owl (*Aegolius funereus*)	Bird of Prey	Secure	Not at risk	No reliable source of long-term trends available.
Great grey owl (*Strix nebulosa*)	Bird of Prey	Sensitive	Not at risk	A naturally scarce species. Timber harvest poses a threat to habitat availability.

[4] ESCC 2010, ASRD 2011
[5] ASRD 2010
[6] COSEWIC 2009, SARA Registry 2011

Species	Wildlife Act Category[4]	Provincial General Status[5]	COSEWIC Status/SARA Status[6]	Trends in Population
Long-eared owl (*Asio otus*)	Bird of Prey	Secure	N/A	No reliable source of long-term trends available.
Great horned owl (*Bubo virginianus*)	Bird of Prey	Secure	N/A	Wide spread but thinly distributed.
Northern hawk owl (*Surnia ulula*)	Bird of Prey	Secure	Not at risk	No reliable source of long-term trends available.
Northern Saw-whet owl (*Aegolius acadicus*)	Bird of Prey	Secure	N/A	No reliable source of long-term trends available.
Northern pygmy owl (*Glaucidium gnoma*)	Bird of Prey	Sensitive	N/A	No reliable source of long-term trends available
Northern Goshawk (*Accipiter gentilis)*	Bird of Prey	Sensitive	Not at Risk	Loss of mature forest habitat due to forestry and industrial development threatening population.
Cooper's hawk (*Accipiter cooperii)*	Bird of Prey	Secure	Not at Risk	No reliable source of long-term trends available.
Broad-winged hawk (*Buteo platypterus)*	Bird of Prey	Sensitive	N/A	Loss of mature forest habitat may have impacts.
Sharp-shinned hawk (*Accipiter striatus)*	Bird of Prey	Secure	Not at Risk	No reliable source of long-term trends available.
Northern Harrier (*Circus cyaneus)*	Bird of Prey	Sensitive	Not at Risk	Habitat loss, especially wetlands & predator numbers in northern areas.
Red-tailed hawk (*Buteo jamaicensis)*	Bird of Prey	Secure	Not at Risk	No reliable source of long-term trends available but fairly ubiquitous in southern areas.
Swainson's hawk (*Buteo swainsoni)*	Bird of Prey	Sensitive	N/A	Southern boreal, northern extent of range.
Bald Eagle (*Haliaeetus leucocephalus)*	Bird of Prey	Sensitive	Not at Risk	No reliable source of long-term trends available. Loss of nesting habitat, secondary poisoning.
Golden Eagle (*Aquila chrysaetos)*	Bird of Prey	Sensitive	Not at Risk	No reliable source of long-term trends available.

Species	Wildlife Act Category[4]	Provincial General Status[5]	COSEWIC Status/SARA Status[6]	Trends in Population
Osprey (*Pandion haliaetus)*	Bird of Prey	Sensitive	N/A	No reliable source of long-term trends available. Loss of shoreline nesting or feeding habitat. Pesticide impacts in past.
Merlin (*Falco columbarius)*	Bird of Prey	Secure	Not at risk	No reliable source of long-term trends available.
American Kestrel (*Falco sparverius)*	Bird of Prey	Secure	Medium priority candidate species	No reliable source of long-term trends available. Lack of available cavities for nesting may have impacts.
Peregrine Falcon (*Falco peregrinus)*	Endangered Animals	Threatened	Special Concern	Recovering. Decline due to pesticide effects on eggs and hatching success.
Turkey Vulture (*Cathartes aura)*	Bird of Prey	Sensitive	N/A	Southern Boreal is northern extent of range.

Additional information on the general status of bird species in Alberta can be obtained at http://www.srd.alberta.ca/FishWildlife/SpeciesAtRisk/GeneralStatusOfAlbertaWildSpecies/GeneralStatusofAlbertaWildSpecies2010/Default.aspx

8.1.2 Biology

A keen sense of eyesight, coupled with exceptional manoeuvrability and speed, make raptor species an efficient predator of small mammals, amphibians, fish, insects and smaller birds. Raptors are considered top-predators and because of this are longer lived and fewer in number than other avian groups and many have specific habitat requirements. This makes them a good indicator of ecosystem health because they can be highly susceptible to changes in the landscape that effect their nesting and foraging habitat and that of numerous other species as well.

Due to size and foraging strategies, different species may have a tendency to use certain habitat types for feeding and nesting. For instance, northern harriers are more likely to be found hunting open habitats and most often nest on the ground. Other species prefer to use stick nests, while others often nest in cavities and some species show flexibility in their choice of nest site.

Table 8.2: Raptor habitat and physical description.

Species	Distribution and Habitat	Physical Description	Breeding & Nest Characteristics
Barred owl	Nocturnal, year-round resident; inhabits swamps and dense forest. Found in Boreal forest, Foothills and Rocky Mountain Natural Regions.	Large size; dark brown irises; grey facial disc with concentric circles around eyes; grey-brown barring of head, neck and breast feathers; lacks ear tufts.	Breed March to April. Nest in hollows created by broken branches and cavities in dead snags in large, old trees (dbh >36 cm); nest sites in areas with well-developed understory. Rarely make modification to existing structure.

Species	Distribution and Habitat	Physical Description	Breeding & Nest Characteristics
Boreal owl	Nocturnal, likely migratory/nomadic. Found in all regions of Alberta, except the grassland region and alpine sub-region.	Small sized; grey facial disc; grey-brown with white spots on forehead and crown, with larger spots on hind neck and wings.	Breed mid-February to mid-April. Nest in empty woodpecker holes, natural cavities, and nest boxes if area lacks mature stands. Nest cavity entrance approximately 100 mm.
Great grey owl	Crepuscular, most are year-round residents but also irruptive in winter; always in dense timber. Found in Boreal forest and northern Foothills Natural Region.	Largest owl in Alberta; large facial disc with dark grey circles surrounding eyes; dark grey streaked with lighter grey; lacks ear tufts.	Breed March to April. Rely on existing structures, usually snags, old raptor nests, human-made platforms, mistletoe brooms; no material added to nest. Nests are usually flat.
Long eared owl	Nocturnal, migratory, common but elusive because they don't flush from nests. Found in South and Central Natural Regions.	Medium, slender body; long ear tufts set close to middle of head; dark brown with speckles of white on back of head and barred with white on rest of body.	Breed late February to May. Typically use stick nests built by other birds, in clumps of trees; no material added to nest; nest cup averages 66 mm in depth
Great horned owl	Nocturnal, year-round resident; ranges throughout forests, open woods and river valleys. Found in all regions of Alberta.	Large and heavy body; large ear tufts; rusty-coloured facial disc; neck and back light brown, streaked and barred with black and white, undersides lightly coloured and heavily barred.	Breed February to May. Highly variable nest sites and characteristics; usually stick nests of other species, but also cavities in trees and snags, cliffs, artificial platforms, abandoned buildings; may or may not add material.
Northern hawk owl	Diurnal, nomadic and irruptive; found in bushy openings and muskeg in mature forest stands. Found in all regions of Alberta, except the grassland region and alpine sub-region.	Medium sized; lacks ear tufts; wide black borders around facial disc; speckled and streaked crown and hind neck; short pointed wings, long wedge-shaped tail and hawk-like flight and perching posture.	Breed early February to March. Nests in cavities of decayed trees and dead stumps, empty woodpecker nests; will use nest boxes. Doesn't add fresh material, lays eggs on floor of shallow hole.
Northern saw-whet owl	Nocturnal, migratory; always in forest habitat. Found mainly in Parkland, Foothills, and Rocky Mountain Natural Regions.	Small size; reddish-brown plumage streaked with white around face and splotched with white on neck; lacks ear tufts.	Breed late February to April. Rely on previously excavated cavities, usually from Northern Flicker or Pileated Woodpecker; will use nest boxes. Lay eggs directly on debris in cavity. Nest cavity entrance 60-90mm.
Northern pygmy owl	Crepuscular, year-round resident, irruptive in	Very small size; dark-grey plumage with	Breed February to April. Nest in cavities created

Species	Distribution and Habitat	Physical Description	Breeding & Nest Characteristics
	winter; inhabits old coniferous and mixed wood forest near edge of meadows or clearings. Found in Boreal forest, Foothills and Rocky Mountain Natural Regions.	streaked undersides; long barred tail; 2 black "eye spots" on back of head; lacks ear tufts.	by woodpeckers, fungal decay and insects.
Northern Goshawk	A variety of habitat types, especially mature forests. Summer resident only although return to breeding territory by early April.	Largest of tree accipiters. Above brown to dark gray. Below light gray with fine black streaks. Females are browner, often with coarser markings underneath. Tail dark above, banded below. Head with black 'cap' and light line above eye.	Especially mature forests with high canopy closure. Often nest trees are largest in area and most territories contain a number of alternate trees with nests. Nest construction may begin upon return to territory. Eggs usually laid early May.
Cooper's hawk	Widely distributed but secretive in habits. Found in mature stands, especially mixed wood. Southern Boreal is northern limit of breeding range.	Medium (crow) sized. Upper parts brown to blue-gray. Dark head with lighter nape. Barred red-brown under parts. Males brighter. Tail has 4 alternating bands of dark and light with white tip. Similar in appearance to Sharp-shinned.	Mature forests, especially mixed, with closed canopy. Nests in large trees. Eggs usually laid by mid May.
Broad-winged hawk	Central mixed wood northern and western limit of breeding range. Usually on breeding territory by late April.	Small and stocky. Brown back with lighter brown barring below. Lighter throat and band across middle. Tail is black with lighter band across middle and near base. Tail has broad black and white bands underneath.	Mature deciduous or mixed wood forests. Near openings and water. Eggs laid late May to early June. Nest usually in first main crotch of deciduous tree or on platform in coniferous tree. May used existing nests, including those of other species.
Sharp-shinned hawk	Boreal Breeding distribution. Prefers coniferous or mixed forests. Last accipiter to arrive on breeding range.	Small and slender. Male upper parts blue to dark gray and darker near head. Tail banded. Under parts light with heavy baring on breast. Under wings have black bands. Female upperparts more brown and less barring underneath. Eyes are red. Similar to Cooper's	Conifers preferred where available. Most often in dense stands. Nesting follows peak in primary food source, songbirds. Most nest location against trunk constructed with conifer twigs. Eggs laid late May to early June.

Species	Distribution and Habitat	Physical Description	Breeding & Nest Characteristics
		Hawk but smaller.	
Northern Harrier *	Wide distribution across Canada. Usually in open wetlands, meadows and riparian woodlands. Summer resident only	Slim body, long wings and tail. Adult males gray above, white below and black wing tips. Female Brown above and buff with brown streaks below. White rump patch at base of tail.	Usually on the ground in tall clumps of vegetation although range of vegetation varies. Proximity to water preferred. Eggs usually laid mid May to mid June.
Red-tailed hawk	Wide distribution across Canada. Common in Alberta. Use both deciduous and coniferous forests.	Distinguished by red tail (red above and light pink below) and a broken dark abdominal band. Many variations in plumage colour.	Stick nests are usually built close to the tops of prominent trees. Approximately 50-cm in diameter. Located where visibility is good, often on stand edges. Birds often quiet while incubating but vocal when chicks present.
Swainson's hawk	Found most often in open areas including meadows and mixed forests. Approaching northern breeding limit in southern boreal area	Dark brown head, back and primaries. White throat patch above dark bib and light abdomen. Barred tail with dark terminal band. Some variations in plumage colour exist.	Late nesters. Build stick nests in bushes or trees, usually near the top. Both coniferous and deciduous trees used.
Bald Eagle	Most commonly found in Alberta in mountain and northern regions of Alberta. Almost always found near water during the breeding season.	Very large bird, about 85 cm long, with a wingspan of up to 2.5m. Adults easily identified by brown body and white head and tail. Legs are orange/yellow. Head and beak appear large, while tail appears short. Immature birds sometimes confused with Golden Eagles because they are lacking the white head/tail.	Nests usually cup shaped platforms, built on the tops or crotch of large, tall trees. Most commonly found in coniferous forests near water but have been found in poplar, cliffs and on the ground where preferred habitat not available. Nests are added to annually and may be up to 2.5m in diameter. Eggs are often laid early in the season but young may remain near nest until early September.
Golden Eagle	Found predominantly in Alberta in mountain/foothill regions and to some degree in boreal areas. Usually found near	Very large bird, about 90 cm long, with a wing span of up to 2.3m. Adults are brown in colour with a gold cape on back of neck. Legs	Nest site usually found on cliff ledges but can be found in trees and caves. Nests large in size are made of large sticks lined with other

Species	Distribution and Habitat	Physical Description	Breeding & Nest Characteristics
	water.	are feathered.	material. Often used annually and area may contain many previously used nests. Eggs are often laid early but young may remain at nest site until late August.
Osprey	Provincial distribution. Almost always found near fish bearing waters except in grassland and alpine subregions.	Large raptor, over 50 cm long with a wingspan of up to 1.8m. Birds have a somewhat crested head, and have a dark brown back and white .under parts. Wings are long and fairly pointed and held with a crook at the wrist which is black. Wide eye stripe is characteristics and females may have some streaking on the breast.	Nests are large and often built on highest point of landscape. May be build on the tops of dead trees, rock pinnacles, telephone poles and artificial nesting platforms. Nests are reused new sticks added annually. Vocal near nest site, especially during courtship. Eggs are laid from April through mid July with fledglings present at the nest from late May through to September.
Merlin	Found throughout Alberta near wooded areas, especially mixed wood area in the north, and water. .	Small falcon, about 30 cm in size with long pointed wings and lack of facial markings. Tail has conspicuous black bars in males and dark brown in females. Males may be bluish gray on upper parts while females are brown. Light under parts with dark feather shafts. Males may have a red-brown tinge to legs	Usually nest in trees, often in old corvid stick nests. Eggs laid from April to early July. Fledglings may be present at the nest site from May until mid August. Often actively guard nest site but female tends to remain quiet on nest once eggs laid.
American Kestrel	Breeds throughout Alberta. Commonly seen on power lines. Use semi-open to open areas.	Small falcon, about 28 cm in size. Males reddish brown on tail and back and blue gray on head and wings. Black moustache marks and white cheeks are also apparent. Female is more drab - reddish brown on top with black barring.	Cavity nesting species. Uses natural cavities or old woodpecker nest holes. Nearby perch tree, usually tallest snag, may be identified by presence of pellets and whitewash. Eggs laid from April to mid June. Fledglings remain at the nest from May until late August.

Species	Distribution and Habitat	Physical Description	Breeding & Nest Characteristics
Peregrine Falcon*	Breeds throughout northern, central and western portions of the province where suitable nest sites found.	Larger falcon, about 45 cm in size. Slim profile with large heads and long (nearly reach the tip of the tail at rest) pointed wings. Have dark black 'moustache' with dark head and neck which appears 'helmet' like. Upper parts grey-blue. Throat & upper breast white to cream coloured grading into buff coloured abdomen with black markings.	Preferred nesting sites are cliffs near riparian areas. Many birds nest in urban areas, using buildings as a substitute for cliffs. May use cavities on occasion. Nest sites often reused annually.
Turkey Vulture *	Uncommon in Alberta. Approaching northern breeding limit in southern boreal areas.	Large dark raptor with long wings and an unfeathered head. Two-toned under wings can be seen while soaring and silhouette is distinguished by its V-shaped wing placement.	No nest built. Eggs laid on the ground near logs or in caves, cliffs and abandoned buildings. Eggs can be laid April through June.

* Survey protocols as outlined are not designed to provide specific information on species in this category. Information may however, be collected incidentally.
Source: ASRD, 2011: Wild Species , MRSM, 2001, Alsop, 2001

8. 2. Survey Standards

Contact your local ESRD-Wildlife Management office for known locations of sensitive raptor species or associated habitat models in the proposed development area(s) and in the surrounding area(s).

8.2.1 Personnel

Boreal/foothills raptor habitat inventory surveys should be conducted by a professional wildlife biologist or professional wildlife technician. Surveyors should be competent in identifying owls and essential owl habitat, and an ability to identify nests and nest signs is essential. Multiple surveyors of essential habitat are recommended to increase speed and efficiency.

8.2.2 Sampling Effort

Boreal/foothills raptor habitat inventory surveys should be conducted prior to application for development.

8.2.3 Time of year

Habitat inventory surveys can be conducted at any time of the year, provided appropriate weather conditions (see below). The ideal time to conduct surveys for owls is early summer (mid-May to late-June) and mid to late summer (mid-June to late-August) for hawk species when nests are occupied, as this will increase likelihood of identifying essential habitat and nest trees. If an aerial component is included to identify stick nests, it should be done during leaf-off conditions (late fall to late winter).

8.2.4 Time of Day

Surveys should be conducted during daylight hours when visibility and light conditions are highest, 30 minutes after sunrise to 30 minutes before sunset.

8.2.5 Weather/conditions

Surveys should be conducted at temperatures close to seasonal norms (MRSM 2001; RISC 2006), while winds are below 3 on the Beaufort scale (Appendix 3), and in the absence of precipitation.

8.2.6 Permit Requirements

Due to the potentially invasive nature of call surveys and nest searches, a Research Perit is required. For more information please see:
http://www.srd.alberta.ca/FishWildlife/ResearchLicencesPermits/Default.aspx

Those issued with a research permit are required to submit survey data for inclusion in to the FWMIS (Fish & Wildlife Management Information System) database. Existing FWMIS data and associated loadforms and be obtained from biologists at ESRD-Wildlife Management offices or from the following website: http://www.srd.alberta.ca/FishWildlife/FWMIS/Default.aspx

8.2.7 Equipment List

- Handheld GPS units
- Compass
- Soft/flexible measuring tape
- Binoculars
- Range finder
- Camera
- Flagging Tape
- Thermometer
- Field guide
- Feather Identification Key
- Nest Identification Key [7]
- Head protection (from swooping parents)

8.3. Survey Protocol

8.3.1 Stanadard Survey Methods

Surveys for raptors in forested areas can be difficult. Nests, especially cavity nests, can be difficult to see, particularly during the summer when trees are in full leaf. Call playback surveys are the most commonly used technique for owl inventory, with methods described in the 'Guidelines for nocturnal owl monitoring in North America' (Takats et al. 2001). Although this type of survey is useful for long-term monitoring of owl species, there are currently no mitigation applications if an owl is heard during a call playback survey. Call playback surveys have had limited success with diurnal raptor species.

Nest searches are also frequently performed to identify high quality habitat locations, but nest searches - which do have mitigation in place should they be located (Government of Alberta 2012, ASRD, 2011) -

[7] i.e. Szusba & Naylor (1998)

have a very low probability of success. Consequently, numerous important nest trees will not be protected from anthropogenic changes on the landscape if the previously accepted survey methods are the only ones being engaged.

Essential habitat surveys ensure the habitat features necessary for the suite of boreal/foothills raptor species described in this protocol are protected and buffered when new and existing disturbances are placed on the landscape. This type of survey combines the benefits of a nest search (i.e., a high percentage of the more obvious type of nests, such as stick nests, will still be located), with the additional benefit of identifying the habitat features that are most important for raptors in the forests of the boreal and foothills areas. The success of on-the-ground essential habitat surveys can be supplemented by incorporating an aerial component before the ground search during leaf off conditions. This is especially useful in areas covered by deciduous forests.

For each sampling area, note site characteristics such as general habitat type, disturbance type, time and weather conditions along with the position transect route and location of any raptors or associated features (see FWMIS loadform for more information). Geographic information (transects walked, nest site locations etc.) should be captured using a GPS and be recorded using UTM NAD 83 (Zone 11 or 12).

Observations of non-target birds, other sensitive species, and associated features made incidentally or en route to a transect location should be recorded but should be identified as such.

If rare or exceptional species are encountered, it is suggested that additional information be obtained to support the observation. See Appendix B of Breeding Bird Survey Training Module for further information: http://137.227.245.162/bbs/participate/training/appendixB.html

8.3.1.1 Aerial Surveys

Many raptor nests structures are quite large, which makes them easy to detect using low level aerial surveys during leaf off conditions. Depending on the project area, aerial surveys may be considered to identify potential nest location before commencing ground surveys. Although, at this time of year aerial surveys will not allow the observer to determine if a nest is active, in some cases the species (bald eagle, osprey, etc.) that built the nest may be determined. Where species can not be determined, the locations identified by aerial survey site should be visited during the breeding season to confirm species and occupancy.

If aerial surveys are included, plans should be discussed with the local ESRD-Wildlife area biologist. Multiple surveys over the same geographic area, especially in sensitive wildlife zones, may not be permitted. Additional timing and/or height restrictions may be imposed in sensitive areas. For instance, prescribed above ground heights over Bighorn Sheep and Mountain Goat Ranges and during critical time periods for Key Wildlife and Biodiversity and Caribou Zones are too high for adequately detecting nests and should be avoided.

8.3.1.2 Boat Surveys

For project areas with significant water features, a visual search of the perimeter by boat is recommended for osprey and bald eagles and their nests. See section 8.3.10 of the 'Inventory methods for forest raptors' (BCMRSM, 2001) for more information and recommendations. Please note that a significant water feature would include a lake, large pond, river or permanent creek.

8.3.1.3 Essential Habitat Surveys

Essential habitat surveys are labour-intensive. Prior to entering the field, personnel should delineate the project area and a series of transects spaced 50m apart running both North-South and East-West on the survey area. These transects should be uploaded into a GPS prior to commencing the survey. The survey area should include the project area plus a buffer on all sides. The buffer size would be dependant on the disturbance type (see Figure 8.1).

In some cases when in the field (i.e. thick forest cover or a high proportion of cavities) professional judgment should be used to determine if transect widths need to be reduced to 25m for adequate coverage.

If flagging tape is used to mark transect lines, it must be removed upon completion of the survey. Transect lines uploaded to a GPS may be sufficient for navigation but it may be helpful to enter waypoints at regular intervals along the line or turn the tracking option on to help keep track of progress.

Transects should be walked at a speed of 0.5 – 2 km/hr (MRSM 2001). The four most important features surveyors should be searching for are

1) nests structures, including large cavities and stick nests (see Szusba & Naylor (1998)
2) raptor sign, including raptor feathers (see USFWS, 2010), pellets, plucking posts and associated prey remains (see Reynolds, 1982 and Section 3.1.7 of BCMRSM, 2001 for more information)
3) mature dead or living balsam poplar (*Populus balsamifera*) adjacent to spruce (*Picea*) stands (Russell 2008)
4) large conifer trees (*Picea, Pinus, Abies*) in stands where conifer is rare.

Other habitat features of interest include:

- horizontal fallen debris
- complex and well-developed understory
- Northern Flicker and Pileated Woodpecker holes
- old stick nests of other bird species (may or may not be active)
- dead stumps
- broken-off limbs

If evidence (direct observation, especially associated with calling or aggressive behaviour) of breeding raptors is found, the area should be scoured to find the nest. In the absence of adult birds, nest identification keys can useful (see Szuba et.al. 1998), and shed feathers may be used as well (see USFW 2010). If a cavity or potential nest is identified, surveyors should attempt to determine if it is active by first scraping under the tree hole and then gently scratching a branch against the bark to see if a bird flushes. For larger cavities, hitting with tree with a large branch has flushed birds (Firth et al, 1997). Alternatively, surveyors can raise a mirror or Peep-cam to the cavity entrance and look inside. If a nest structure is not identifiable to species because birds or sign are not present, mark the nest as a ‘stick nest’ or ‘cavity nest’.

The following data should be recorded on survey datasheets:

- Location of essential habitat feature (use UTM NAD 83, Zone 11 or 12)
- Description of habitat surrounding identified tree (type of forest)
- Description of nesting tree (measure width of tree, estimate height)

- Observation of any woodpecker holes, cavities in trees
- Any incidental owl sightings, vocalizations and/or signs observed during survey (e.g., moulted feathers, whitewash on the ground, kill or plucking sites, etc; include location, duration, description of call or visual sighting)
- Environmental conditions (air temperature, wind speed, wind direction, rainfall, cloud type)
- Any incidental sightings or sign of other non-target sensitive species

Photograph or sketch all nest structures encountered and note whether they are active. A nest can be considered active by the presence of birds or if there is fresh sign apparent (see above). Observers should minimize time spent at active sites, remaining only as long as it takes to get the required information. This is especially important for ground nests, which are more susceptible to predation. If the status of the nest is not able to be confirmed, or if a nest is found outside of the breeding season, a buffer should be implemented until such a time as its status can be confirmed with the following exception. If a northern goshawk nest is suspected, but does not appear active, it is likely that an active one will be found nearby. Goshawks tend to rotate through a series of nearby nests, usually within a radius of 1.6km (A.Hubbs, pers.comm) and may use a different one each year. In the case of goshawks, the buffer should be applied to the nest complex, rather than individual nests.

8.3.2 Industrial Development Survey Methods

The habitat present in a given project area will influence what species of raptors could potentially nest there. Recommended setback/buffer distances related to disturbance type varies by time of disturbance and species (ESRD, 2012). The survey area should include a buffer area from the outer project edge. The following table (Table 8.3.) should be used to determine how big of an area outside of the project area should be surveyed.

Table 8.3. Determination of Survey Area Requirements

Will the disturbance occur between March 15th and July 15th of any given year?

Yes

Apply 1000m buffer to project area.

No

Is the project disturbance considered High?

See: Appendix E of the ESRD/EAP Integrated Standards and Guidelines **(**ESRD, 2012)

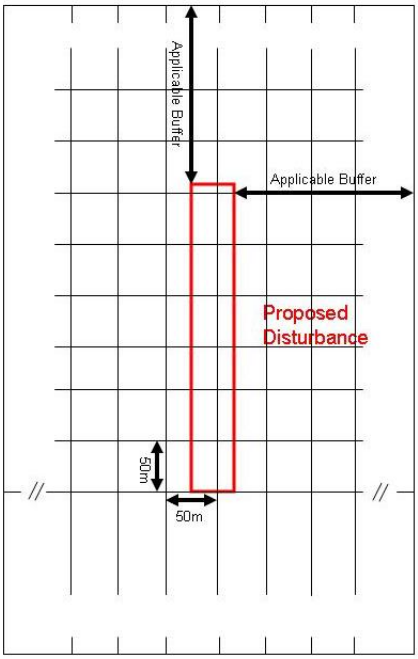
Yes

Apply 1000m buffer to project area.

No

Apply 100m buffer to project area.

Figure 8.1. Transect Layout for a proposed disturbance.



8.3.2.1 Project based disturbances

For a linear disturbance such as a road or pipeline, or non-linear sites, such as well sites or clearings, transects should laid out as per the illustration in Figure 8.1. and be extended beyond the boundaries of the disturbance as shown Figure 8.1. as per the disturbance type outlined in Figure 8.1.

8.3.2.2 Local study area investigations

If sampling is to be done over a larger area, for instance at a local study area level, transects should be employed across a random stratification of habitat types associated with the study area. The number of transect and associated sampling points should be determined using power analysis, and sufficient to inform an appropriate RSF or HSI model. A proposal outlining the appropriateness of the model and the number and length of transects should be submitted to the area ESRD-Wildlife Management biologist for review and approval prior to conducting the surveys. Aerial surveys of the study area are strongly recommended.

8.3.2.3 Guidelines for Best Practices

Upon completion of a habitat inventory, the following management actions for best practices are recommended:

1) All identified nest trees must be buffered and protected immediately. Refer to the ESRD/EAP Integrated Standards and Guidelines document, (ESRD, 2012) for guidelines on buffer distances.
2) Any mature, wide poplars (dead or living) should be buffered, regardless of whether a nest has been located in the tree.
3) New linear and non-linear disturbances should avoid complex, multi-story, mature mixed wood forest whenever possible. Young, single-species stands of trees should be selected as the alternative site for the disturbance if one exists nearby.

8.4. Additional Resources

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See Alberta status reports at:
http://www.srd.alberta.ca/FishWildlife/SpeciesAtRisk/DetailedStatus/Default.aspx

and Alberta Species at Risk reports at:
http://srd.alberta.ca/FishWildlife/SpeciesAtRisk/ProgramReports.aspx

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8.6 Personal Communication

Anne Hubbs, Senior Wildlife Biogogist, Rocky Mountain House Alberta, Environment and Sustainable Resource Development-Wildlife Management.

9.0 Grassland Birds

9.1 Introduction

9.1.1 Inventory Group

Grassland breeding birds are a large and diverse group that includes any bird that lives or breeds in the Grassland Natural Region of Alberta. It should be noted that a variety of birds may be found breeding within the Grassland Natural Region of Alberta; however, certain species require specific survey methods not covered by this survey protocol. Species that may be observed while following the Grassland Bird Survey method include, but are not limited to, the ferruginous hawk, burrowing owl, common nighthawk, sharp-tailed grouse, and greater sage grouse. Specific survey techniques for these species can be found within ESRD-Wildlife Management *Sensitive Species Survey Protocols*.

Information collected under this protocol is not sufficient to determine breeding status and nest locations of birds, therefore should not be used as a 'pre-disturbance' survey where an area is to be disturbed during the breeding season. If this is the intent, the Canadian Wildlife Service, Prairie and Northern region should be contacted for further direction regarding activities resulting in incidental take that may contravene the Migratory Birds Convention Act and Regulations.

9.1.2 Species Status

A list of species of specific management concern in Alberta and Canada can be found in the table below. This is not a comprehensive list. This list is subject to annual updates; for the most up to date information refer to the Alberta Sustainable Resource Development General Status Page and/or Detailed Status Page , Species At Risk Act Registry.

Table 9.1. The status of select grassland birds in Alberta.

Species	Wildlife Act Category	Provincial General Status	COSEWIC Status/SARA Status
Mountain plover (*Charadrius montanus*)	Endangered	At Risk	Endangered
Sprague's pipit *(Anthus spragueii*)	Species of Special Concern	Sensitive	Threatened
Long-billed curlew *(Numernius americanus*)	Species of Special Concern	Sensitive	Species of Special Concern
Chestnut-collared longspur (*Calcarius ornatus*)	Non-game	Sensitive	Threatened
Upland sandpiper (*Bartramia longicauda*)	Non-game	Sensitive	Not Assessed
Barn Swallow (*Hirundo rustica*)	Non-game	Sensitive	Threatened
Loggerhead shrike (*Lanius ludovicianus*)	Species of Special Concern	Sensitive	Threatened

Grassland birds in Alberta vary widely in distribution, taxonomy, and habitat use. Identification characteristics and habitat affiliations for grassland bird species are available from a number of

references including *The Atlas of Breeding Birds in Alberta*. Status reports and management plans summarize biological information for species and include useful references. http://srd.alberta.ca/FishWildlife/SpeciesAtRisk/DetailedStatus/Birds.aspx

9.2 Survey Standards

9.2.1 Personnel

Grassland bird surveys should be carried out by a professional wildlife biologist or wildlife technician who is experienced in survey procedures for grassland birds (Ralph et al. 1993, USGS 2010). Surveyors should have considerable experience specific to grassland birds, with established search images and knowledge of the biology, behaviour, and preferred habitat of the species' intended for census. Surveyors should be competent in identifying grassland birds by sight and sound. Due to the large variety of birds that inhabit the grassland, and the variation in dialects between regions, identification of grassland bird species requires rigorous training (Diefenbach et al. 2003.). Surveyors should have specific experience in identifying grassland birds in the province of Alberta (USGS 2010).

9.2.2 Time of Year

Surveys should be conducted in the spring and early summer, between May 15th and July 1st, as this is during the active breeding and calling period for most grassland bird species (Bibby and Burgess 1992, USGS 2010).

9.2.3 Time of Day

Surveys should be timed to begin one half hour before sunrise and end by 11:00 am (Ralph et al. 1993, USGS 2010).

9.2.4 Weather/Conditions

Surveys should not be performed under cold conditions which inhibit calling (less than 0^{o} C) or when there is anything greater than very light precipitation. Surveys should not be conducted when winds are greater than 20 km/h or over level 3 on the Beaufort scale (Appendix A) (Ralph et al. 1993, USGS 2010).

9.2.5 Survey Effort

Two surveys should be completed for each site. Repeat surveys should be timed to be 10-14 days apart. Due to the variety of species that can be identified using this protocol, there may be variation in nesting, hatching, and fledging dates (Ralph et al. 1993). Two surveys will ensure that all species are adequately searched for and identified.

9.2.6 Equipment List

- **Binoculars**
- Spotting scope
- GPS unit

9.3 Survey Protocol

9.3.1 Standard Point Count Survey Method

The Breeding Bird Survey (BBS) is a long-term, continental avian monitoring program that is used to determine population trends and status of the majority of North American birds (USGS 2010). The methodology behind the BBS has been used in a number of small and large scale avian surveys. These standardized survey methods have been adapted for use in Alberta.

Surveys should be conducted in the spring and early summer, between May 15th and July 1st, during the breeding period for most grassland bird species. Two surveys should be completed for each site, and repeat surveys should be timed 10-14 days after the first survey. Surveys are to begin one half hour before sunrise and end by 11:00 am. Surveys should not be performed under cold conditions which inhibit calling (less than 0ºC) or when winds are over level 3 on the Beaufort wind scale (>20 km/h) (Appendix A). Surveys should not be conducted during rain or snow.

Survey points should be spaced 400-800 metres apart. At each point, a 3 to 5 minute passive survey should be conducted from a clear vantage point (e.g., bed of a truck) (Ralph et al. 1993). If vehicles are being used to access the points, the vehicle should be turned off during and prior to the commencement of the survey. During the survey the observer should scan the entire point count area while listening for vocalizations; binoculars should be used to assist with the visual scan.

All birds heard or seen within the point count area should be recorded, and the distance from bird to the surveyor should be estimated. As distance estimates are difficult for grassland birds, it is recommended that distance categories be used instead (Ryan Fisher pers comm). If a bird cannot be identified, the surveyor should give a description of the species (e.g., unidentified sparrow, blackbird spp.). If the observer cannot identify to species the majority of the birds seen or heard during the point counts, the survey should be stopped and repeated by another observer with experience in the region. The time and weather conditions for each survey should be recorded, along with the position of the point count or transect route. Record the position of all species identified along the transect using a GPS unit (UTM NAD 83; Zone 11 or 12) and the estimated distance to the bird.

Point counts are a presence/not detected survey method and do not result in the identification of the exact nesting site for the majority of species. If the exact nesting location is required, contact your local ESRD-Wildlife Management office for recommended survey procedures and permit requirements.

9.3.2 Industrial Development Survey Methods

9.3.2.1 Linear Development Surveys

Linear development surveys are to be conducted following the point count method described in Section 9.3.1 and survey standards described in Section 9.2. For the purpose of identifying potential wildlife conflicts within a proposed development, the entire length of the proposed linear development, plus 100 metres on both sides, must be surveyed. This ensures full coverage of the entire area of the development site plus the recommended setback distance for grassland birds (Government of Alberta 2012, Government of Alberta 2011).

3.2.2 Non-linear Development Surveys/Area Surveys

Non-linear surveys are to be conducted following the point count method described in Section 9.3.1 and survey standards described in Section 9.2. To appropriately survey for grassland birds within a proposed non-linear development, the entire area of the proposed development should be surveyed, plus the area extending an additional 100 metres from the entire perimeter of the proposed development area. This

ensures full coverage of the development site plus the recommended setback distance for grassland birds (Government of Alberta 2012, Government of Alberta 2011).

9.4 Additional Resources

Sprague's Pipit Alberta Management Plan
Sprague's Pipit Canada Recovery Plan
Long-billed Curlew Alberta Management Plan

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9.6 Personal Communication

Ryan Fisher. Post-doctoral fellow, University of Alberta Department of Biological Sciences.

10.0 Boreal And Foothills Breeding Songbirds And Woodpeckers

10.1. Introduction

10.1.1 Inventory Group

The boreal forest in Canada provides breeding habitat for a large proportion of the world's land birds. For some species, including some listed as sensitive (e.g. the black-backed woodpecker, Connecticut warbler, Cape May warbler and bay-breasted warbler), over 80% of the global populations breed in Canada's boreal forest (Blancher 2003).

This protocol for breeding songbirds and woodpeckers follows point count methods similar to those used in the Breeding Bird Survey program as defined by Ralph et al. (1995). This type of survey collects data on the occupancy (presence/not-detected) of avian species.

By collecting some additional information, such as distance to observation, time interval and behaviour, some inferences on detection error, density and breeding status can be made (Buckland et al. 2001, Farnsworth et al. 2002, Handel et al. 2009, McKenzie et al. 2008). However, these methods would not result in the identification of nesting sites for the majority of species (Ralph et al. 1995).

Modifications of this protocol for other purposes (i.e. nest location, monitoring, determination of abundance, etc.) should be discussed with the local ESRD-Wildlife Management Area Biologist to determine if it is appropriate. Although information on other non-passerine birds species may be gathered using this protocol, more specific protocols should be used where they exist. Detailed protocols exist for surveys of sharp-tailed grouse (*Tympanuchus phasianellus*), piping plover (*Charadrius melodus*), common nighthawk (*Chordeiles minor*), colonial nesting species, sensitive raptor species, sensitive shorebird species and waterfowl.

Information collected under this protocol is not sufficient to determine breeding status and nest locations of birds, therefore should not be used as a 'pre-disturbance' survey where an area is to be disturbed during the breeding season. If this is the intent, the Canadian Wildlife Service, Prairie and Northern region should be contacted for further direction regarding activities resulting in incidental take that may contravene the Migratory Birds Convention Act and Regulations.

10.1.2 Status and Distribution

Due to numerous disturbances on the landscape in summer use habitats, a number of once abundant species have shown declining population trends (Blancher 2003). Although not all mechanisms for declines are understood, habitat loss and fragmentation are thought to play a large role. These surveys will help identify the songbird and woodpecker species occurring in the boreal and foothills natural regions. This information may be used to inform species status by providing information on distribution and habitat use, and could assist mitigation and planning processes for species potentially impacted by an industrial development project.

The following list of targeted avian (songbird/woodpecker) species found in boreal and foothills areas include those that are listed as *Species of Special Concern* as identified through the provincial detailed status assessment process:

Special Concern: Loggerhead shrike (*Lanius ludovicianus*), Black-throated green warbler (*Dendrocia virens*).

Also of interest are the following boreal/foothills species ranked by the general status assessment process as:

May Be At Risk: Olive-sided flycatcher (*Contopus cooperi*), Clark's nutcracker (*Nucifraga columbiana*).

Sensitive: Bay-breasted warbler (*Debdroica castanea*), blackburnian warbler (*Dendrocia fusca*), cape may warbler (*Dendrocia tigrina*), Canada warbler (*Wilsonia canadensis*), common yellowthroat (*Geothlypis trichas*), Western tanager (*Piranga ludoviciana*), baltimore oriole (*Icterus galbula*) , Western wood-pewee (*Contopus sordidulus*), Eastern phoebe (*Sayornis phoebe*), least flycatcher (*Empidonax minimus*), great-crested flycatcher (*Myiarchus crinitus*), brown creeper (*Certhia americana*), sedge wren(*Cistothorus platensis*), rusty blackbird (*Euphagus carolinus*), purple martin (*Progne subis*), barn swallow (*Hirundo rustica*), black-backed woodpecker (*Picoides arcticus*), pileated woodpecker (*dryocopus pileatus*), Lewis's woodpecker (*Malanerpes lewis*).

Undetermined Gray-cheeked thrush (*Catharus minimus*), black-billed cuckoo (*Coccyzus erythropthalmus*), Cassin's vireo (*Vireo cassinii*), pacific-slope flycatcher (*Empidonax difficilis*), yellow-bellied flycatcher (*Empidonax flaviventris*), red-naped sapsucker (*Sphyrapicus nuchalis*).

Several other species have been listed as candidate species for assessment under COSEWIC (COSEWIC 2010). There is currently a lack of information on the distribution and abundance of these species in Alberta. Information gathered from these surveys could be used in their assessment. Candidate species, other than those listed by the Province of Alberta, that breed in boreal/foothills areas that fall under this category include:

High priority: Evening grosbeak (*Coccothraustes vespertinus*).

Low priority: Connecticut warbler (*Oporornis agillis*), Eastern kingbird (*Tyrannus tyrannus*).

If any individuals or features associated with any listed species are encountered, whether on survey or incidentally, the location and details of encounter should be recorded and reported.

Additional information on the general status of bird species in Alberta can be obtained at: http://www.srd.alberta.ca/FishWildlife/SpeciesAtRisk/GeneralStatusOfAlbertaWildSpecies/GeneralStatusofAlbertaWildSpecies2010/Default.aspx

The Canadian portion of the Breeding Bird Survey (BBS) program is administered by Environment Canada and may provide data on a number of provincial species: http://www.ec.gc.ca/reom-mbs/default.asp?lang=En&n=0D74F35F-1

Additional information on boreal bird species, survey locations, and result standardization methods can be found on the Boreal Avian Monitoring (BAM) project website: http://www.borealbirds.ca/.

10.1.3 Biology

The boreal/foothills forests see an influx of avian neotropical migrants each spring that come to take advantage of the seed and insect resources that these habitats provide during the growing season. Most birds begin laying eggs and raising young soon after arriving. Pairing is typically initiated on the breeding ground in early May to June. Nesting follows and continues until late summer for most species. Many species will nest more than once during the season, depending on the success or failure of previous nests.

During the breeding season, males sing to attract mates and to defend territories. Females of some species also sing or call in response. Bird activity and calling varies throughout the day, but the latter, done in defence of a territory, peaks in most birds in the early morning hours and surveys are timed to coincide (Ralph et al. 1995).

Although the female members of songbird pairs are somewhat cryptic in appearance, the males are readily identifiable by sight if an unobstructed view is possible. However, auditory outputs greatly assist in the detection and identification of species in forested landscapes where visual detection through dense foliage can be difficult.

Woodpeckers occupy similar habitats and can also be identified by sight and sound. Males and females are distinguishable and both use identifiable patterns of drumming, in addition to calling, to communicate (Poole, 2012).

10.2. Survey Standards

10.2.1 Personnel

The need for experienced observers cannot be over-emphasized (see Section 1. of the Requirements of the Breeding Bird Survey instructions: http://ec.gc.ca/reom-mbs/default.asp?lang=En&n=5EE0ADBA-1 and Section 10.3.1.1 Personnel in BCMRSM 1999). Observers must have considerable avian experience with established search images of the species intended for census to be able to identify individuals both visually and by songs or calls. Familiarity with the biology, behaviour, and habitat of those species as well as an ability to estimate the distance to the bird are also essential requirements. Ralph et al. (1993) suggest that training and testing should generally continue throughout the field season (see http://137.227.245.162/bbs/participate/ for links to an assortment of training tools).

10.2.2 Survey Effort

Two surveys should be completed for each site and repeat surveys should be timed at least 10 days after the first survey. Surveys should be completed in the appropriate time frame and sampling conditions.

10.2.3 Time of year

Surveys should be conducted in the spring between June 1st and July 7th; this corresponds to the breeding period of most (but not all, including non-migratory, early migrants and short distance migrants) passerine species in Alberta. If these other species are of particular interest or in years where unusual weather occurs, this time frame may be adjusted if discussed with and agreed to by an Area Fish & Wildlife Biologist.

10.2.4 Time of Day

Surveys should be timed to begin one half hour before sunrise and end by 10:00 am.

10.2.5 Weather/Conditions

Surveys should not be performed under cold conditions which inhibit calling (less than 0ºC), when there is precipitation, or when winds are over level 3 (>20 km/h) on the Beaufort scale (Appendix A). Surveys should also be postponed if background noise hinders detection of birds (i.e. rustling of wind, industrial noise, etc.) until noise is reduced or wind direction is more favourable.

10.2.6 Research Permit

Passive surveys do not require a Research Permit. However, if deviations from this protocol are made, consult an Area Fish & Wildlife Biologist and refer to the Alberta Wildlife Animal Care Committee Class Protocol #011 for ground-based wildlife surveys:
http://www.srd.alberta.ca/FishWildlife/ResearchLicencesPermits/documents/WRClassProtocol011-Ground-basedWildlifeSurveys.pdf

10.2.7 Equipment List

- GPS and spare batteries
- Camera
- Compass
- Data sheets[8]
- Thermometer
- Watch
- Binoculars
- Range finder
- Recording equipment
- Call playback equipment
- Bird identification books, tapes/CDs
- Personal supplies/equipment such as water, rain gear, insect repellent, sunscreen, etc.

10.3 Survey Protocol

10.3.1 Standard Survey Methods

10.3.1.1 Point Counts

The pattern used for determining the distribution of survey points will depend on the planned activity/disturbance type; however, the process outlined below will apply to each survey point location. Visual and auditory observations will be recorded for each location.

If less experienced observers are used, a recording of bird songs should be made at each survey location (see section 10.3.1.2). These recordings should be reviewed by senior observers to confirm correct bird identification and consistency. Recordings are suggested for experienced observers as well as a means of back-up for cross checking uncertain observations and provides additional information on singing rates.

[8]please refer to FWMIS loadform to ensure appropriate information captured.
A blank mapping diagram is available on the ESRD website:
http://www.srd.alberta.ca/FishWildlife/WildlifeManagement/documents/PointCountSheet.pdf

Upon arriving at a survey location, immediately note any birds that flush from the area. These birds should be included in the count if they are not encountered later during the survey period. Take a minute to get organized and set up recording equipment. Note general site characteristics (Table 1) such as general habitat type, disturbance type, time, and weather conditions for each survey site (see FWMIS loadform for more information), time, weather & the GPS coordinates of the point count and transect route (i.e. record the point count location or position along the transect line). Data should be recorded using UTM NAD 83; Zone 11 or 12.

Remain still and quiet for two minutes prior to initiating the survey to allow birds to settle down. Point counts and recording should begin simultaneously and last for 10 minutes. The observer should listen for bird vocalizations and scan the area, with the aid of binoculars, for visual sightings. Record all species detected, the time at which they were first detected, the method of detection (i.e. visual, auditory or both), the direction from which they were detected, and the estimated distance the bird is from the survey point. The distance should be determined using a range finder rather than estimating. It is especially important that the observer be able to differentiate between birds located within 50 m of the survey location, birds that are 50-100 m away, 100-150m and those that are farther than 150 m away. Make note of any movement of birds in response to the observer (i.e. flying away, or attracted to) or other applicable information. This could include sex, age (adult vs. juvenile), presence of pairs, and presence of nests/nesting behaviour, behaviour associated with breeding (i.e. pairing, copulation, territory defence) or care of young (i.e. carrying food or fecal sacs). Observers should attempt to track individual birds and record each individual only once. Making a map of the point count site may be helpful (http://www.srd.alberta.ca/FishWildlife/WildlifeManagement/documents/PointCountSheet.pdf).

Observations made incidentally en route to a survey location, non-target birds, or other sensitive species should also be recorded but should be identified as incidental. Birds that fly over the sampling site while the survey is occurring should not be included in the observations from that point location but may be included as an incidental observation.

If rare or exceptional species are encountered, it is suggested that additional information be obtained to support the observation. See Appendix B of the Breeding Bird Survey Training Module for further information. http://137.227.245.162/bbs/participate/training/appendixB.html

10.3.1.2 Auditory Recordings

Auditory recordings of bird songs should be made as a back-up to confirm field observations and may provide additional useful information (Downes et al. 2000). For instance, singing rates can be estimated from analysis of bird detection relative to identified time intervals (Farnsworth et al. 2002). This can be used to better estimate detection rates.

Auditory recordings should coincide with the 10 minute point counts period. Methods for recording bird songs should follow those outlined in the Alberta Biodiversity Monitoring Institute (ABMI) Abridged Terrestrial Data Collection Protocols (2010) and are summarized in the following sections.

10.3.1.2.1 Recording Equipment

Use an omni-directional microphone and recording device to record bird vocalizations. Position the recording equipment in a north/south direction. With the right microphone on the east side, arrange the recording device and microphone as far apart as possible to ensure noise made by the observer is equally

delivered to both microphones. Consult the manual to determine the appropriate recoding level of the microphone being used.

10.3.1.2.2 Standardized Recording Procedure

Ensure recording levels are standardized to allow for comparisons and to reduce the chance of poor quality recordings. Recordings should be made at greater than or equal to 320 kbps. At the start of each recording, state the date, observer name, point count location, and time. Follow this with a tone standard delivered for at least 5 seconds. This will allow for standardization in the lab.

During the recording interval, minimize movement to reduce noise interference on the recording that could block bird vocalizations. The recording device can be used to record observations made by the observer as long as the information is relayed quickly and clearly in order to minimize obscuring bird vocalizations. Data can be transcribed on to a data sheet at the end of the day. Ensure the recordings are properly saved to the recorder and backed up at regular intervals (daily as a minimum) onto a computer.

10.3.2 Industrial Survey Methods

Industrial survey methods will follow those outlined in section 10.3.1 but the way the point counts are laid out and distributed will differ based on the type of project and related disturbance.

10.3.2.1 Linear Disturbances

The entire length of proposed linear disturbance should be surveyed by conducting point counts at regular intervals. It is very important to keep track of the distance and direction of bird observations to avoid counting the same birds twice. Walk or drive the length of the disturbance, stopping every 300 m to conduct a point count. At each survey location, stand quietly for two minutes before initiating the survey to allow birds to return to normal activities following the vehicular disturbance before starting sampling. Follow the procedures outlined in section 10.3.1 for each stop. Individual birds heard at one stop should not be recorded again at subsequent stops. Motorized vehicles should only be used where access is available and where potential for environmental damage is low. They should not be driven near or through wetlands or other sensitive areas.

10.3.2.2 Non-linear Disturbances

A box pattern of sampling points should be set up centered on the middle of the proposed disturbance. The first survey point will be at this central location. Follow the procedures outlined in section 3.1. Because the observer will be moving in a non-linear pattern, it is suggested that observations be mapped on a data sheet using standard breeding bird mapping symbols to reduce the likelihood of double counting a bird at another survey point. For a mapping example, see the Breeding Bird Survey Training Module: http://137.227.245.162/bbs/participate/training/15.html or the Alaska Land Bird Monitoring Survey: http://alaska.usgs.gov/science/biology/bpif/monitor/alms/ALMS_forms_2004.pdf.

Blank mapping data sheets are available on the SRD website:
http://www.srd.alberta.ca/FishWildlife/WildlifeManagement/documents/PointCountSheet.pdf

A series of point counts centered on the disturbance, spaced 300 m from adjacent count sites, and oriented to the four cardinal directions should be conducted with enough survey points to cover the entire project area. For example, for a project area of 600 m by 600 m additional sampling points would be as follows: From the center of the area (where first count was performed) travel to the south 300 m for the next sampling location, then 300 m east, then 300 m north, then another 300 m north, then 300 m west, another 300 m west, then 300 m south and another 300 m south for the remainder. The box and

associated center sampling points would look like the box shown in Figure 10.1 of the Alberta Biodiversity Monitoring Institute (ABMI) terrestrial protocols (ABMI 2010). Where a development area is an irregular shape or dimensions are not a multiple of 300 m, sampling points may be located outside of the development area to ensure adequate coverage of all parts of the project area. Record all birds seen or heard within the project area on the data sheet, with an effort made not to duplicate records.

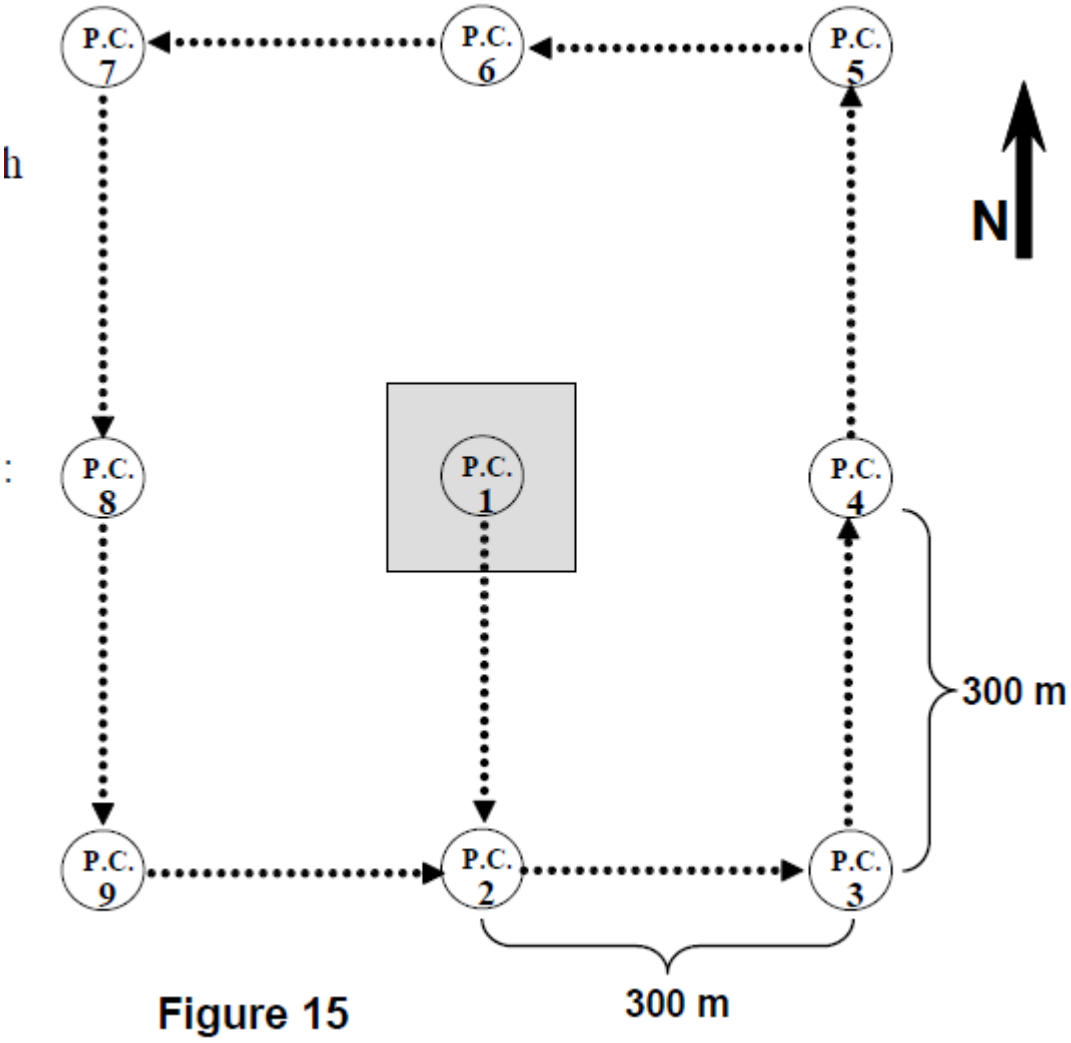

Figure 10.1. Figure 15 From AMBI Terrestrial Protocols. Section 3.6.

10.3.2.3 Local Study Area Investigations

If sampling is to be done over a larger area, for instance at a local study area level, regularly spaced point counts along transects across a random stratification of habitat types associated with the study area should be employed. The number of transects and associated sampling points should be determined using power analysis, and be sufficient to inform an appropriate RSF or HSI model. A proposal outlining the appropriateness of the model and the number and length of transects should be submitted to the Area Fish & Wildlife Biologist for review and approval prior to conducting the surveys.

10.4 Additional Resources

For individual species**:**

See Alberta status reports at:
http://www.srd.alberta.ca/FishWildlife/SpeciesAtRisk/DetailedStatus/Default.aspx

and, Alberta Species at Risk reports at:
http://srd.alberta.ca/FishWildlife/SpeciesAtRisk/ProgramReports.aspx

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11.0 Sharp-Tailed Grouse

(Tympanuchus phasianellus)

11.1 Introduction

11.1 Inventory Group or Species

This protocol is designed to survey for sharp-tailed grouse (with a focus on detection of leks) within Alberta.

11.1.1 Species Status

Wildlife Act category: *Upland Game Bird*
Provincial general status: *Sensitive*
COSEWIC status: not assessed

The sharp-tailed grouse is relatively common throughout the central and southern parts of its range in Alberta (Grassland Natural Region and Parkland Natural Region). The species is found in lower numbers elsewhere in the province, such as the Peace River parkland and in open, grassy areas in the boreal forest near Ft. McMurray. It is considered *Sensitive* because of the long-term effects of agriculture on the open grassland and shrubland habitats on which the species depends during its breeding season. In the Grassland and Parkland Natural Regions surveys indicate a relatively stable populations. Recent surveys in the Cold Lake, High Prairie, and Grande Prairie areas suggest a significant decrease in the number of active leks and number of birds at a lek when compared to historic accounts. The present distribution and status is much reduced from historical levels, resulting in hunting closures in many of central and northern Alberta WMU's in 2010.

11.1.3 Biology

The sharp-tailed grouse is found throughout Alberta in areas of suitable habitat (see below), from the prairies of southern Alberta through the boreal forest of central and northern Alberta and west into the foothills. It presently occurs in reasonable numbers only in the relatively few places where suitable grasslands or shrublands have not been converted to intensive cultivation or grazed too heavily. In prairie and parkland regions, sharp-tailed grouse numbers are very low and their distribution is sporadic. This is also the case in boreal areas where numbers have likely always been relatively low.

Individuals gather on leks (traditional dancing grounds) from mid-February to May, and peak breeding and territorial behaviour can be observed in April. Nesting takes place in April and May (with a later initiation date in more northern regions), up to 1.6 km from the lek site. Nests are concealed in a depression on the ground, in grass, or near shrubs. Eggs are laid from late April to mid-June, and hatch after 23-24 days. Sharp-tailed grouse typically remain near lek sites from spring to fall and gather in flocks in the fall.

Sharp-tailed grouse use open prairie, shrubby sandhills, coulees, and the margins of watercourses and farmland in grassland regions, and open woodland such as brush and aspen groves in parkland, and open muskeg or fen complexes in boreal regions. They are particularly dependent on open grassland and

shrubland habitats during the breeding season, and most will return to the same lek year after year. Leks tend to be on slight rises in more open areas, with good visibility of the nearby surroundings (for protection from predators). Small bushes or small trees may be interspersed in the lek or close by. During the winter, the preferred habitat consists of wooded areas where buds are available and grassy areas that supply seeds.

11.2 SAMPLING STANDARDS

Contact your local ESRD-Wildlife Management office for data collection sheets and known locations of sharp-tailed grouse within the proposed development area(s) and in the surrounding area(s).

11.2.1 Personnel

Surveys should be carried out by a professional wildlife biologist or wildlife technician competent in identification of Sharp-tailed grouse by sight and sound. In particular, the surveyor(s) should have a pre-developed search image of dancing males at lek sights, to assist in identification from afar. It is recommended that they have visited a sharp-tailed grouse lek at least once in the past (with an experienced observer) so they are confident in confirmation of active leks.

11.2.2 Sampling Effort

As not all sharp-tailed grouse lek locations are known, a two-step survey approach is required. The first step is a general area search to identify potential lek sites, and the second step is a survey at each lek identified in the area search or from FWMIS records. An area should be surveyed a minimum of two times (with a goal of three visits) during the lekking period (see section 11.2.3.) in order to ensure that leks are not missed due to unforeseen circumstances (for example, males can stop dancing for a period of time if a coyote or other predator walks through the lek area). Surveys can be completed with one or more observers.

11.2.3 Time of Year

Surveys must be conducted between mid-March to early/mid-May, depending on spring weather conditions. Peak activity on the leks begins in mid-April in Southern Alberta, and late-April in Northern Alberta.

11.2.4 Time of Day

Surveys must be conducted in the early morning hours when activity on the lek is at its peak. The birds usually start arriving at the dancing ground one hour before sunrise and stay until two or three hours after sunrise.

The general area search for active grounds can be conducted in the evenings, because males return to the lek site in the evening to display. Accurate counts cannot be conducted at this time, but evening surveys allow the surveyor to maximize use of the morning hours by visiting several leks to conduct counts.

11.2.5 Weather conditions

Under ideal weather conditions (e.g., no wind or precipitation), and in areas with no hills or trees, dancing behaviour can be heard at distances up to 1000 m. Surveys should be performed under cool conditions, with wind no stronger than 20 km/hr (Beaufort 3) (Appendix 3) and no precipitation.

11.2.6 Permit Requirements

ESRD-Wildlife Management requires a Research Permit for sharp-tailed grouse surveys. The Alberta Wildlife Animal Care Committee Class Protocol #011 is specifically designed for ground surveys.

11.2.6 Equipment List

- Spotting scope,
- Binoculars,
- Headlamp/flashlight,
- Thermometer,
- Wind meter,
- GPS unit.

11.3. Survey Protocol

11.3.1 General Survey Method (Lek Survey)

Historical and known leks (provided by ESRD-Wildlife Management), and "potential" leks identified during the general area survey should be ground surveyed. Leks should be surveyed in the early morning hours when activity on the lek is at its peak. Plan to arrive at the site at least 30 minutes before sunrise. The birds usually start arriving at the dancing ground one hour before sunrise and stay until two or three hours after sunrise. If possible, visit the site the evening before a morning count to see what the area looks like in daylight. This preliminary visit will make it easier to recognize the site before sunrise. Taking a GPS location (UTM NAD 27 or 83; Zone 11 or 12) of the site will also make it easier to find the dancing ground. A good count will require the use of binoculars. Start counting the birds after they have been dancing for a short while. Try to identify males by their dancing activities and females by their temporary visits and lack of dancing activity. It is important to count all of the males on the lek (this may take several minutes). Birds will flush if the observer(s) get too close to the lek site, so it is important for observers to keep their distance during the survey (a minimum of 100 metres from the lek site). Where possible observe from multiple vantage points, as birds often dance on opposite sides of mounds. To get an accurate count, the observer should spend a minimum of 15 minutes at any given site. The maximum number of birds observed at any one time should be the information that is recorded.

Systematically and closely scrutinize the area for evidence of a lek in case birds were flushed off the lek or absent during the survey period. Evidence could include signs of dancing (trampled grass, tracks in dirt), feathers, or droppings. Surveyors must avoid or minimize disturbance to the ground.

For each survey, record the date, start and end time, cloud cover, temperature, wind speed, precipitation, and location, When a lek, sharp-tailed grouse, or sign is detected, record the location of the lek (or sign), and the number of sharp-tailed grouse observed. Also, record incidental species and describe the habitat within a 500 m radius of the lek.

11.3.2 Industrial Survey Design

11.3.2.1 Linear Disturbances

The entire length of proposed linear disturbance must be surveyed using a line transect method. Walk the length of the disturbance at approximately 2 km/h in a steady, quiet manner, stopping every 100-200m to listen and look for grouse, and record all sharp-tailed grouse or leks heard or seen and estimate the distance from the location where the observation was made. For longer developments, other modes of travel can be considered. However, regular stops every 300 m should be made, with the vehicle turned off, and the observer standing outside and away from the vehicle, to ensure that the route is comprehensively surveyed. Motorized vehicles should not be driven near or through any encountered wetlands. When surveying, it is essential to search all hill tops and shoulders in the area, use of a spotting scope from a high point can be very helpful and birds can be located a km or more away by the white flashes of their tails when they display.

11.3.2.2 Non- linear Disturbances

Perform an area search that covers the proposed development area plus the setback distance for sharp-tailed grouse leks, 500 m or 100 m, added onto the edge of the disturbance boundary (Government of Alberta 2012, Government of Alberta 2011).

Once the survey area has been delineated, the observer should travel to the northeast corner of the survey area to begin the transect. Walk a westbound transect (as described above) the length of the survey area, 250 m south, then travel eastbound the length of survey area. Continue until the total area has been surveyed. Record and map all sharp-tailed grouse or leks seen or heard on a data sheet. Similar to the survey for linear disturbances, all hill tops and shoulders in the area should be searched thoroughly.

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12.0 Western Grebe

(*Aechmophorus occidentalis*)

12.1 Introduction

This protocol is designed for surveys of western grebes (*Aechmophorus occidentalis*), a piscivorous water bird that inhabits deep freshwater lakes.

12.1.1 Status and Distribution

Prior to the 1900's North American western grebe populations were decimated as they were harvested for their feathers (Storer and Nuechterlein 1992). Following protective legislation, populations of western grebes rebounded but biologists once again noted declines in the late 1950's when pesticides began to negatively impact piscivorous birds. Changes to pesticide regulations and high water levels in lakes by the early 1970's helped numbers rebound; however, shortly thereafter concerns were raised that habitat alteration on lakes at that time was beginning to negatively affect population size. Diminishing water levels since 1975 have caused further population declines as some lakes were no longer suitable as breeding sites. Currently, the estimate for the western grebe population in Alberta is approximately 10,700 mature individuals, representing about 10% of the North American (and the world) population (Kemper et al. 2008). Western grebes are designated as 'Sensitive' under the Alberta general status evaluation.

Western grebes are widely distributed in Alberta from Grande Prairie south to the United States border and east of the foothills to the Saskatchewan border. Historical data (from approximately the past 50 years) shows that fewer than 35 lakes in Alberta have ever supported large (>100 adults) colonies, while nesting by smaller numbers has been reported in fewer than 100 lakes in the province. Large colonies can usually be found on relatively few (i.e., <12) of the larger lakes such as Wabamun, Lac La Biche and Lesser Slave Lake. A full listing of current and historical nesting lakes can be found in ASRD and ACA (2012).

12.1.2 Biology

The western grebe is North America's largest and most gregarious grebe, measuring up to 64 cm long and weighing up to 1.8 kg. It has a long curved white neck that contrasts with its black back and black on the upper part of its head. It has a distinctive, high pitched "creek-creek, creek-creek" call.

The western grebe migrates from its wintering areas off the west coast, arriving in Alberta when the lakes are free of ice, in early May. A colonial nester, it returns to traditional nesting sites located on freshwater lakes. Following an elaborate courtship performance and pair bond, they begin building a nest within the colony. They lay 3-5 eggs and incubation takes place in about 23 days. The newly hatched young are brooded on the parent's back for the first week then accompany the adults in small groups as they hunt fish across the lake until fall migration.

12.1.3 Habitat

Western grebes require deep, fish-bearing lakes for foraging. The nesting habitat requirements are very specific – there must be at least 25 cm of water at the nest site (Forbes 1984 in ASRD and ACA 2006), however the requirement for abundant emergent vegetation implies an upper limit to water depth. Preferred vegetation for nesting is bulrush (*Scirpus* sp.) and to a lesser extent, cattail (*Typha* sp.); reed

grass (*Phragmites* sp.) may also be used. Dead carry-over vegetation from the previous year's growth is essential for early nest-building. As new growth appears, the birds utilize it for nesting material and shelter from the prevailing wind and wave action.

12.2 SURVEY STANDARDS

12.2.1 Personnel

Surveys must be conducted by an experienced wildlife biologist or wildlife technician. A minimum of one person is required to do this survey; however, a two-person crew in one boat may be more appropriate for logistical reasons and safety. The surveyor(s) should have excellent hearing and eyesight, and should be competent in identifying western grebes by sight and sound, and be able to discriminate between this species and other birds that might be encountered.

12.2.2 Time of Year

Surveys should take place in early to mid-June, with the first survey not before June 1.

12.2.3 Time of Day

Surveys should be completed in the early morning (before 10:00 am), when grebes are most active and the water is usually at its calmest. Commencing soon after sunrise is advisable.

12.2.4 Weather/Conditions

Surveys should be carried out on sunny, calm days where birds can be seen and heard from long distances. Surveys should not be carried out during rain or when wind is above 3 on the Beaufort scale (>20 km/h) (Appendix A), as the presence of whitecaps makes it difficult to locate grebes.

12.2.5 Survey Effort

This survey should be completed twice, approximately two weeks apart. If breeding is confirmed during the first survey, the second survey is not necessary.

12.2.6 Permit Requirements

A Research permit is not needed for this survey. However, if in rare circumstances the colony needs to be entered, one would be required.

12.2.7 Equipment List

- Power boat , or canoe, depending on the waterbody
- Fixed-wing airplane (if feasible)
- Personal floatation device(s)
- Binoculars/spotting scope
- GPS unit

12.3 SURVEY PROTOCOL

This protocol describes methods for determining occupancy of western grebes on lakes during the breeding season; this method may also be used to confirm the presence of breeding colonies, however nest counting is not required nor allowed without a permit.

Surveying a colonial species can, if not done properly, result in potentially dangerous disturbance to the nests. When an observer approaches, grebes move off of their nests leaving the eggs vulnerable to corvid or gull predation, and susceptible to cold or heat stress from exposure. Further, some nest colonies contain other avian species (e.g., Franklin's gulls, eared grebes, black terns, and Forster's terns) that have later hatching dates; any disturbance to the colony, even after western grebe nests have hatched out, put other nesting birds and their nests at risk. For these reasons these guidelines do not include protocol for nest counts of western grebes. If a nest count is required, a permit must be obtained, providing adequate justification and including appropriate precautions to minimize disturbance.

With the above in mind, if it is necessary to determine whether a western grebe colony is occupying a particular lake or portion of a lake, this can be done by air or by boat when the grebes are nesting. Large numbers of western grebes occupying a lake during the breeding season usually indicates presence of a nesting colony.

12.3.1 Standard Survey Methods

12.3.1.1 Air Surveys

If surveys are required on a very large lake, or large number of lakes, and if feasible, conduct an air survey during the first two weeks of June over potential habitat (shoreline vegetation as described above) using a fixed-wing aircraft. Fly over shoreline vegetation at a minimum of 300 ft., scanning for evidence of nests or nesting activity (several western grebes in the vegetation). Nests are fairly visible from the air, especially if air surveys are performed before the new vegetation has fully developed. If evidence of nest activity is suspected but not confirmed, proceed to the boat surveys as described below. If nest activity is confirmed, no further surveys are necessary.

12.3.1.2 Boat Surveys

On current and historical nesting lakes (see ASRD and ACA 2012), or those for which nesting is suspected following air surveys, a slow reconnaissance survey around all portions of the lake with suitable habitat, using a canoe (or powerboat if more appropriate) approximately 100-200 m from the boundary of the shoreline vegetation, should be conducted to locate potential western grebe colonies. Note that speed should be significantly reduced when passing shoreline vegetation; the boat should move at a slow crawl (no wake produced) such that the surveyor can feel confident that he or she can see well in to the vegetation (vegetation is relatively sparse in early June).

The presence of nesting grebes can be assessed using a three-step process: (1) Stop to scan the area in front of the shoreline vegetation with binoculars or a spotting scope from several hundred meters away. Nesting western grebes usually forage just outside of the colony early in the morning and are visible from a distance. (2) Slowly approach to about 100 m from the edge of the vegetation, turn off the boat and listen carefully; grebes on their nests are especially audible from a distance, and depending on the density of vegetation the nesting birds can be seen or heard at a distance far enough that presence can be confirmed without the birds being unduly disturbed. (3) If grebes are audible, move to the edge of the vegetation and carefully stand up in the boat to scan with binoculars into the vegetation; nests can usually be spotted if surveys are performed before the new growth has fully developed. Do not enter the colony without first obtaining a research permit. The presence of several western grebes in the vegetation usually signals nesting. Do not enter the nesting colony without a permit. It is imperative that step (3) be performed quietly and as swiftly as possible; the approach of the boat will likely cause the grebes nesting closest to the edge of the vegetation to slip off of their nests without the surveyors' knowledge; any time spent off the nest puts it at increased the risk of predation and exposure.

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13.0 Piping Plover

(Charadrius melodus)

13.1 Introduction

13.1.1 Species Status

- *Wildlife Act* category: *Endangered*
- Provincial general status: At Risk
- COSEWIC status: *Endangered*
- Federal *Species at Risk Act* status: *Endangered*

There are approximately 7000 piping plovers in North America. In Alberta, the species occurs on saline lakes in an area bounded by Lethbridge and Medicine Hat in the south, and Vegreville and Bonnyville in the north. Provincial populations fluctuate in response to habitat conditions and intensity of management, and have numbered between 130 and 290 breeding individuals in recent years. Because of relatively low population size, and historical declines in numbers, the species is considered to be "at risk" in all areas of its range.

13.1.2 Biology

The piping plover is bluebird-sized, with white underparts and pale, grey-brown back, head, and wings. A key field mark is the black stripe across the forehead, a long, white eye stripe, and a single black band across the chest (Elliott-Smith and Haig 2004). The species is sometimes confused with two other shorebirds that may share its habitat during the breeding season. The killdeer (*Charadrius vociferus*) is 50% larger than the piping plover, and has a double breast band. The spotted sandpiper (*Actitis macularius*) is about the same length as the piping plover, but is slimmer, and has prominent spots on the breast. The spotted sandpiper also bobs its tail when standing still. Numerous other shorebird species may occur in plover habitat in May and early June, as they migrate to northern breeding grounds. The semipalmated plover (*Charadrius semipalmatus*) is most similar in size and appearance to the piping plover, but has a darker brown back and more distinct facial markings. The piping plover is quite cryptic, and its call can be very helpful in detecting presence of the species. The *bee-boop* (or *peep-lo*) is the most frequently heard call, but a repetitive "piping" call is often encountered (usually as part of an aerial courtship display), as is a mournful whistle call (Sung et al. 2005).

Piping plovers migrate from their wintering grounds on the Gulf of Mexico to arrive in Alberta during late April or early May. Nesting occurs on gravel shorelines of large slightly saline, saline, and hyper-saline lakes in the Grassland and Parkland Natural Regions of Alberta. Preferred nesting beaches are usually wide (>30 m) and unvegetated, with patches of pea-sized gravel alternating with sand, silt, and occasional salt flats. The availability of suitable habitat for piping plovers is dependent on alternating periods of high water, which remove encroaching vegetation, and low water, which expose gravel substrates for nesting. The requirement for dynamic shorelines means that most habitat is found on shorelines with very shallow gradients, as well as on islands and peninsulas. Areas of ground water discharge (seeps) are important feeding areas for piping plovers, particularly in years of very low water levels. Migration to the wintering grounds can begin as early as the end of June, with most birds having departed by early August (Prescott 1997).

13.2 Survey Standards

13.2.1 Personnel

Piping plover surveys should be carried out by a professional wildlife biologist or wildlife technician who has considerable experience with the identification of shorebirds, and specific experience and knowledge of the biology, behaviour, and habitat preferences of this species. Surveyors should be familiar with the identification of piping plovers by sound, as initial detections are often made by auditory cues.

13.2.2 Time of Year

It is recommended that surveys be conducted between May 20th and June 15th as breeding habitat is most likely to be occupied at that time. Surveys as early as 12 May, and as late as 25 June are acceptable for determining the presence/absence of breeding birds, but should not be used to determine population size.

13.2.3 Time of Day

Piping plovers can be surveyed during daylight hours; a half hour after sunrise until a half hour before sunset.

13.2.4 Weather/Conditions

Surveys should not occur when winds exceed 20 km/hr or level 3 on the Beaufort scale (Appendix A) because of difficulties hearing the calls of birds. Surveys should also be avoided during periods of rain or snow, and caution should be exhibited in cool (<10^{o}C) or hot (>25^{o}C) weather so that disturbance does not keep nesting birds from tending to eggs. Hot weather also causes heat shimmer, which will reduce visibility, particularly through high-powered optical equipment.

13.2.5 Survey Effort

Piping plovers may occur in suitable habitat from May 1st and August 1st, but late settlement and early dispersal from failed nesting attempts mean that surveys are ideally conducted between 20 May and 15 June. Surveys should be conducted a minimum of twice at each site during this period.

13.2.6 Equipment List

- Binoculars
- Spotting scope and tripod
- GPS unit
- Bird identification books, tapes, CDs

13.3 SURVEY PROTOCOL

Piping plovers are extensively surveyed each year in Alberta, and many of the nesting areas are well known to ESRD-Wildlife Management biologists. Surveyors are encouraged to contact their local ESRD-Wildlife Management office before beginning surveys. This contact may reduce or eliminate the need for piping plover inventories on particular lakes, and will ensure that additional human traffic does not interfere with nesting or with ongoing management and recovery initiatives.

Piping plover habitat is fairly distinctive, and surveys should be conducted on any low-gradient, unvegetated, and relatively wide (>20 m) shorelines that have patchy gravel substrates that may be interspersed with silt, sand, or gravel. Piping plovers can have territories as large as 50 000 m^2, and often forage away from their nesting areas. Thus, surveys should be conducted if any suitable nesting habitat or groundwater discharge areas (seeps) exist within 2 km of potential disturbances or industrial developments. Piping plovers may be present between May 1st and August 1st, although birds may vacate habitats as early as mid-June if early breeding attempts fail. The ideal survey period is between May 20th and June 15th in Alberta.

13.3.1 Standard Survey Method

The survey technique is quite simple, and involves carefully walking along the upper beach at the interface of grassy vegetation with the open gravel/silt beach. Observers must be familiar with the calls of piping plovers, as most encounters with birds are first made from auditory cues. Surveyors should be equipped with good quality binoculars of at least 8x magnification, and a 20x or greater spotting scope with a sturdy tripod. Surveyors should be alert to the presence of sinkholes around many piping plover lakes. These (usually) elevated mounds of moist silt ("quicksand") can pose a significant safety hazard if stepped on. Working in pairs is advisable whenever possible.

Observers should walk at approximately 1 km/h, and stop every 100 m to scan the beach for plovers. Very often plovers will be seen feeding along the edge of the water, so particular emphasis should be placed on scanning these areas. If beaches are wider than 100 m, a second transect parallel to the shore should be walked at the midpoint of the exposed beach. However, extreme care must be taken to avoid walking on gravel patches, as nests are difficult to see and could be destroyed by the observer. Walk on silt, sand, or salt areas whenever possible. If the area consists of extensive areas of gravel and it is difficult to avoid walking on suitable nesting substrates, reduce the speed of travel, and scan gravel areas immediately in front of your feet when walking. Birds are typically detected when flushed (running) from a nest when the observer is 20-30 m away. These birds will usually stop frequently and look at the observer. If the observer is particularly close to the nest, or if recently hatched young are present, the adult(s) may perform a "broken wing" display. If any of these behaviours are witnessed, the observer should retreat to the vegetated upper beach to minimize disturbance to breeding birds. Observers are strongly discouraged from looking for nests. However, the presence of broods should be noted. Approximately 15-20% of adult piping plovers in Alberta have coloured leg bands (usually one metal band, a bicoloured plastic band, and one solid-colour plastic band). Surveyors should inspect from a distance all encountered birds for bands, and note the colour and position (upper or lower leg, left or right side) of bands whenever possible.

Sightings of birds (including colour band combinations), nests, or broods should be georeferenced using a GPS unit (UTM NAD 83; Zone 11 or 12) and reported immediately to biologists at local ESRD-

Wildlife Management offices. Other notes on habitat conditions, water level, threats to plover breeding (cattle presence, human disturbance, etc.) should be made as well. The position of all individuals or residences (nests) of *Endangered*, *Threatened*, *Species of Special Concern*, Data Deficient, or Deferred species observed during the surveys should be georeferenced (UTM NAD 83, Zone 11 or 12) and submitted to ESRD-Wildlife Management through a standard FWMIS load form.

13.3.2 Industrial Development Surveys

Piping plover population monitoring has been conducted extensively in Alberta since 1986, with annual inventories occurring since 2002. Through these inventories, ESRD-Wildlife Management has identified all of the piping plover lakes within Alberta. To assist industrial developers with pre-planning, all of these lakes have been identified with protective notations (Government of Alberta 2011c); the spatial information is available to industrial proponents through the Landscape Analysis Tool or the ASRD website).

Surveys are required when projects are proposed within the recommended 200 m setback of the bed and shore of an identified piping plover lake (Government of Alberta 2012, Government of Alberta 2011c). Surveys for industrial developments should follow the protocol and survey standards identified within this document (Sections 13.2. and 13.3.).

Surveyors are encouraged to contact their local ESRD-Wildlife Management office before beginning surveys. This contact may reduce or eliminate the need for piping plover inventories on particular lakes, and will ensure that additional human traffic does not interfere with nesting or with ongoing management and recovery initiatives.

13.4 Additional Resources

The Alberta Piping Plover Recovery Plan

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14.0 Yellow Rail

(*Coturnicops noveboracensis*)

14.1 Introduction

14.1.1 Status

- *Wildlife Act* category: *Non-game*
- Provincial general status: Undetermined
- Federal *Species at Risk Act* status: *Species of Special Concern*

14.1.2 Biology

The yellow rail is typically associated with permanent marsh, wetland complexes that are dominated by sedges and other emergent vegetation (COSEWIC 2009). The species can also be found along river/stream floodplains, wet meadows, and vegetated areas of bogs. The yellow rail is generally found in the shallow areas of these wetlands or in areas where there is limited standing water. Due to the nocturnal habits of the species and difficulty surveying marsh habitat the yellow rail is not commonly reported (Timmermans and McCracken 2003, Conway 2009, COSEWIC 2009). The species is occasionally detected during Breeding Bird Surveys (BBS); however these surveys are not concentrated in suitable habitat for the yellow rail and are conducted at an inappropriate time of day for species detection (Timmermans and McCracken 2003).

Yellow rails can be found throughout Alberta. Most current or historical records occur in the southern half of the province (Prescott et al. 2003), which probably reflects the distribution of observers rather than the true distribution of birds. Some recent inventories suggest that there may be substantial populations of yellow rails in some parts of northern Alberta (e.g., Hay-Zama), where past survey efforts have been limited (Prescott et al. 2003). A recent survey of 124 wetland sites in the Lower Athabasca Planning Region (LAPR) of northeast Alberta detected two yellow rail (Muhly et al. 2011). However, the survey did not focus on explicitly sampling yellow rail habitat, but rather a diversity of wetland types representative of the regions. Though there is limited data available, yet the yellow rail is believed to be declining (COSEWIC 2009).

14.2 Survey Standards

14.2.1 Personnel

Yellow rail surveys should be conducted by an experienced biologist or wildlife technician. Surveyors should be experienced in surveying for marsh birds, in particular the yellow rail, with established search images and knowledge of the biology, behaviour, and preferred habitat of the yellow rail (Ministry of Environment 1998, Timmermans and McCracken 2003). Surveyors must be able to identify the yellow rail by sound. Surveyors should be trained in distance sampling methods and show proficiency in evaluating distances between calling marsh birds and the survey point.

14.2.2 Time of Year

Call play back surveys should be conducted during the breeding season; the last week of May - the first week of July (Bazin and Baldwin 2007, Conway 2008).

14.2.3 Time of Day

The yellow rail is nocturnal and therefore all surveys should be conducted between one hour after sunset until just before sunrise and one hour before sunrise (Ministry of Environment 1998, Bazin and Baldwin 2007, Conway 2009). The species is most often heard calling after full darkness between 22:00 and 04:00 hours (Ministry of Environment 1998).

14.2.4 Weather/Conditions

Surveys should not be conducted when wind speeds are greater than 20 km/hr or above level 3 on the Beaufort scale (Appendix A) (Conway 2009, Bird Studies Canada 2010). Yellow rails do not call during cold temperatures; therefore surveys should not be conducted when ambient temperatures are below zero degrees Celsius (Ministry of Environment 1998). Surveys should not be conducted during fog, rain, or snow (Bazin and Baldwin 2007, Conway 2009). Rails have been found to increase frequency of calling during moonless conditions; when possible, surveys should be planned around moon phases or during cloudy conditions (Prescott et al. 2003).

14.2.5 Survey Effort

Detection of the yellow rail is reliant on a number of factors including time of year, time of day, ambient temperature, and whether or not surveys are timed to coincide with the peak calling period (Ministry of Environment 1998, Conway et al. 2008). Therefore, it is best to complete multiple call playback surveys at the same survey points. Two to three surveys should be completed, spaced 7 to 10 days apart, at each survey point.

14.2.6 Permit Requirements

ESRD-Wildlife Management require a Research Permit for all call playback surveys. The Alberta Wildlife Animal Care Committee Class Protocol #011 is specifically designed for call playback surveys.

14.2.7 Equipment List

- Canoe or kayak (if required)
- Game caller or MP3 player and speakers
- Waders
- GPS unit
- CD or digital calls for yellow rail

14.3 Survey Protocol

14.3.1 Call Playback Surveys

The yellow rail is a secretive, nocturnal bird that is rarely detected during general non-specific wildlife surveys (Timmermans and McCracken 2003). A concerted effort is required to locate the yellow rail. In recent years a number of regional, national, and continental surveys have been developed to focus on marsh birds, including the yellow rail, in hopes of increasing the amount of information on the species (Bazin and Baldwin 2007, Conway 2009, The Marsh Monitoring Program 2010). This protocol design is based on these larger programs, however, it is focused on the yellow rail and therefore some differences exist in regards to survey timing.

Detection of the yellow rail is increased with the use of a conspecific call playback survey. To use a call playback survey method in Alberta a permit is required and can be obtained from ESRD-Wildlife

Management. The yellow rail call can be obtained from a number of sources. The call that is to be used in all yellow rails surveys is the male attraction call. This call is characterized by the "click click", similar to two small stones being banged together.

Surveys should be concentrated in areas of suitable habitat for yellow rails, including marshes, wetlands, wet meadows, or floodplains with emergent vegetation. Survey points should be 250 to 400 meters apart depending on the size and layout of the wetland or waterbody being surveyed (Ministry of Environment 1998, Conway 2009). Surveys can be conducted by foot or non-motorized boat. Access and size of the marsh will dictate the most suitable mode of transportation. Survey points should be selected prior to the commencement of the survey and when possible should be marked so that they can easily be found in the dark. Immediately after arriving at the survey point the wildlife caller should be placed approximately 1 meter above the ground/water, pointed towards the center of the wetland or marsh (Conway 2009). The caller should not be moved or rotated once the survey begins.

The location of each survey point should be georeferenced using a GPS unit (UTM NAD 83; Zone 11 or 12). At each survey point a 5-minute passive survey should be conducted followed by three minutes of call playback, and then an additional 2 minutes of passive surveying (Conway and Nadeau 2010). The survey should be broken down as follows (Conway 2009):

- 5 minutes of passive silent surveying
- 3 minutes of call playback for the yellow rail, which includes:
  - 5 seconds of calling
  - 5 seconds of silence
  - Repeat the above patternfor the entire 3 minute interval
- 2 minutes of passive surveying
- Stop

During the survey all aural and visual marsh bird detections should be recorded. The surveyor should include the species of bird detected, time the bird was first detected in the survey hierarchy (e.g., first minute of the passive survey, first minute of the call playback), as well as the distance and direction from which the bird was heard. Surveys should be repeated a minimum of once 7 to 10 days after the initial survey (Bazin and Baldwin 2007). However, to fully ensure detection of the target species, three surveys are recommended.

14.3.2 Automated Bio-acoustic Call Recorders/Song Meters

Automated bio-acoustic call recorders, or song meters, are currently being tested for use in yellow rail surveys in the Lower Athabasca Region of Alberta (Muhly et al. 2011). These digital recorders offer several potential advantages including, the ability to record all night over several weeks, the creation of permanent records of all species detected and increased safety for field staff. As the technology is new and there are limited published methods for completing these surveys, ESRD-Wildlife Management recommends contacting the local office to determine appropriate field methods for these surveys.

14.3.2 Industrial Development Survey Methods

Linear and non-linear development surveys should be conducted following the survey standards in Section 14.2 and survey protocols outlined in Section 14.3. All suitable yellow rail habitats within 500 m along the entire length of the proposed linear development should be surveyed, including marshes,

wetlands, wet meadows, or floodplains with emergent vegetation (Conway 2009). Aerial photography should be used to identify areas of interest along the proposed linear development.

14.4 Additional Resources

COSEWIC Assessment and Status Report on the Yellow Rail *Coturnicops noveboracensis* in Canada.

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15.0 Common Nighthawk

(*Chordeiles minor)*

15.1 Introduction

15.1.1 Status

- *Wildlife Act* category: Not listed
- Provincial general status: Sensitive
- COSEWIC status: *Threatened*
- Federal *Species at Risk Act* status: *Threatened*

The population of common nighthawks in North America has shown a 3.1 to 12.5 % decline per year from 1996 to 2008 according to Breeding Bird Surveys (COSEWIC 2007, USGS 2011). Similar declines have been seen in the Canadian population, with estimated declines at 4.2% per year between 1968 and 2005 (COSEWIC 2007). In 2010, the common nighthawk was listed as Threatened under Canada's Species at Risk Act (SARA Registry 2011).

15.1.2 Biology

The common nighthawk is a medium-sized, crepuscular bird from the family Caprimulgidae (also called nightjars), weighing ~79 g (Brigham et al. 2011). Males have a white tail band, which the female lacks (Brigham et al. 2011), but size does not differ between the sexes (COSEWIC 2007). Individuals are well camouflaged; plumage is mottled black, dark and light brown with white. They have long, pointed wings, almost falcon like, with a broad white band across the primaries. They can sometimes be seen perching during the day on fences and trees in unforested habitats. Their flight is rapid and direct (Semanchuk 1992). The territorial call of the common nighthawk is a nasal 'peent' sound. Males have a diving territorial display that includes a 'booming' sound caused by the sudden downward flexing of the wings in the dive.

Nighthawks occur across the whole province in suitable habitat in the summer. Common nighthawks occupy all subregions of Alberta (Semanchuk 1992). They prefer short, sparse vegetation on flat to rolling topography for nest sites; these may include: sand dunes, beaches, burn areas, forest clearings, logged areas, pastures, open forests, bogs, marshes, gravelled areas, and rocky outcrops (COSEWIC 2007).

Common nighthawks migrate from South America and arrive in Alberta around late May. Females begin laying eggs between June and August (Brigham et al. 2011) Typically two eggs are laid on bare ground, gravel or flat rocks. The young begin moving as early as 2 days old, and regularly thereafter, and can fly at 18 days of age. They become independent of the adults at about 25 days old (mid-August) and begin their southern migration by mid-August through early September.

15.2 Survey Standards

15.2.1 Personnel

Common nighthawk surveys should be carried out by an experienced wildlife biologist or wildlife technician. Surveyors should have considerable experience in identifying birds by sight and sound and be familiar with the biology, behaviour, and preferred habitat of the common nighthawk.

15.2.2 Time of Year

Surveys in the Grassland and Parkland Natural Regions should be conducted between May 25th and June 30th (Ministry of Environment 1998, Hausleitner and Dulisse 2008). Common nighthawk surveys in the Boreal forest should be conducted between June 15th and July 31st (Janet Ng pers. comm.).

15.2.3 Time of Day

Surveys should be conducted starting one hour before sunset and ending 30 minutes after sunset (Hausleitner and Dulisse 2008). Common nighthawks are primarily crepuscular foragers using this 90-minute period for hunting and territorial display.

15.2.4 Weather/Conditions

Surveys should not be performed under cold conditions (less than 7ºC) as common nighthawk activity is reduced at cooler temperatures due to low insect activity rates (Hausleitner and Dulisse 2008). Surveys should not proceed when there is anything greater than very light precipitation or when winds are greater than 20 km/h (over level 3 on the Beaufort scale) (Appendix A).

The moon should be above the horizon and not obscured by clouds. Surveys should not be conducted during the "new moon" phase as common nighthawks call less frequently during these times (Ministry of Environment 1998).

15.2.5 Survey Effort

Nightjar activity is influenced by moon cycles, weather, insect emergences, time of nesting effort, and time of day (Mills 1986, Brigham and Barclay 1992). Nighthawks may not be detected on their home range because they will move between their nests and foraging grounds (Brigham et al. 2011). Their presence or activity in an area may not be characterized by one survey; therefore it is recommended that two surveys be conducted approximately 10 days apart.

Common nighthawks have been documented nesting later than June 30th in Alberta's boreal forest. Therefore it is recommended that wildlife sweeps be carried out prior to the initiation of work in suitable common nighthawk habitat in the boreal forest between July 1st and August 15th in addition to the preconstruction call playback survey (Janet Ng pers comm.).

15.2.6 Permit Requirements

ESRD-Wildlife Management requires a Research Permit for all call playback surveys. The Alberta Wildlife Animal Care Committee Class Protocol #011 is specifically designed for call playback surveys.

15.2.7 Equipment List

- Binoculars
- Flashlight/headlamp
- Maps
- GPS unit

- Wind/temperature meter

15.3 Survey Protocol

15.3.1 Standard Survey Method

15.3.1.1 Point Count With Call Playback

Declines in the number of sightings of common nighthawks and other similar species has led to the creation of national and regional survey protocols for the species (Center for Conservation Biology 2011). These surveys are generally focused on the long-term monitoring of common nighthawk populations. The survey methods recommended here are adapted from these larger monitoring programs and are intended to provide pre-development survey guidelines.

Common nighthawks are difficult to detect by sight and surveyors generally rely on call displays to identify the species (Ministry of Environment 1998, Center for Conservation Biology 2011). Surveys should be conducted starting one hour before sunset and ending 30 minutes after sunset, i.e., for 90 minutes. Common nighthawks are primarily crepuscular foragers using this 90-minute period for hunting and territorial display. Each route should be 9.5 km long, with a total of twenty stops located at 800 m intervals along the route, and one minute to move between stops. Surveys for breeding nighthawks are conducted during the peak of the nesting season:

- In the Grassland and Parkland Natural Regions between May 25th and June 30th
- In the Boreal Forest between June 15th and July 31st

Observers should turn off vehicle lights, headlamps, and flashlights, and avoid wearing clothing that rustles.

Roadside stops should be spaced 800 m apart. A 3-minute passive point count should be conducted at each stop, during which the observer records all nighthawks seen and heard within 400 m of the stop. At the end of the 3-minute passive count, a 3-minute call playback survey should be conducted (Ministry of Environment 1998, Hausleitner and Dulisse 2008). The call playback should include 30 seconds of the conspecific common nighthawk call followed by 30 seconds of silence or passive surveying, repeated for 3 minutes, i.e. three times. The total time spent at each survey point should be a minimum of 6 minutes.

All common nighthawks observed should be georeferenced using a GPS unit (UTM NAD 83; Zone 11 or 12). All information collected must be submitted to the Government of Alberta Fish and Wildlife Management Information System (FWMIS) database.

15.3.2 Industrial Development Survey Methods

15.3.2.1 Linear Development Surveys

Linear and non-linear development surveys are to be conducted following the point count with call playback method described in Section 15.3.1.1 and survey standards described in Section 15.2. To ensure full coverage of the proposed development site plus any recommended setbacks, the entire length of the proposed linear development plus 100 metres on either side must be surveyed (Government of Alberta 2012).

15.4 Additional Resources

Assessment and Status Report on the Common Nighthawk *Chordeiles minor* in Canada.

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15.6 Personal Communication

Janet Ng, University Of Alberta, Department of Biological Sciences, PhD student.

16.0 Bats

16.1 Survey Protocol

In Alberta, protocols for surveying and monitoring bats have been developed and should be followed (*Handbook of Inventory Methods and Standard Protocols for Surveying Bats in Alberta*, ASRD 2006).

For surveys related to pre- and post-construction of wind farms, specific protocols exist and should be followed, in consultation with a local ESRD-Wildlife Management biologist to confirm suitability of the proposed methods. The pre-construction protocol is Appendix 5 to the *Handbook of Inventory Methods and Standard Protocols for Surveying Bats in Alberta* (Lausen et al. 2008). The draft post-construction protocol is being finalized.

16.2 Literature Cited

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17.0 Swift Fox

(*Vulpes velox*)

17.1 Introduction

17.1.1 Status

- *Wildlife Act* category: *Endangered*
- Provincial general status: *At Risk*
- COSEWIC status: *Threatened*
- Federal *Species at Risk Act* status: *Endangered*

The swift fox was considered extirpated from Canada in the late 1930s, following drastic range-wide declines in the late 1800s and early 1900s. Extirpation was primarily due to habitat loss and predator control in the late 19th and early 20th centuries. As a result of intensive captive breeding and translocation programs, the swift fox is now re-established in Alberta and Saskatchewan and has expanded into northern Montana. Census results from 2006 indicate that a small but stable population of approximately 647 foxes has been established in Canada. Additionally, all foxes captured during the 2006 survey were unmarked, indicating that the populations are reproducing naturally (Moehrenschlager and Moehrenschlager 2006). Considering populations remain relatively small and vulnerable to decline, their ability to persist is still uncertain.

17.1.2 Distribution

Historically swift fox were found throughout prairie regions in southern Alberta (Russell and Scotter 1984, Cotterill 1997b). This range extended north to the 53rd parallel and east from the foothills to the Saskatchewan border. A small swift fox population has been re-established in south eastern Alberta and south western Saskatchewan as a result of an extensive reintroduction program beginning in 1983. The reintroduced population is concentrated south of the Cypress Hills, especially along the Alberta-Saskatchewan border, and extends west to the Manyberries - Pakowki Lake area with scattered occurrences farther west. Recent data suggests the swift fox population in Alberta is expanding its range into suitable grassland habitat adjacent to the identified core population areas. Additionally foxes have been documented undertaking significant dispersal events (190.9 km in one case) (Ausband and Moehrenschlager, 2009). Considering this, surveys are also warranted in habitat adjacent to the known core population area in SE AB.

17.1.3 Biology

Swift foxes live up to their name, being capable of reaching speeds of over 60 km/h. Their speed facilitates hunting and they are opportunistic nocturnal predators. It also grants them some protection from predators, but they rely heavily on their dens for predator avoidance, as well as for protection from the elements and for raising pups. Swift foxes are active throughout the year, but their nocturnal and fossorial nature makes them cryptic. Breeding begins in mid-February and pups are born in late April and early May. The pups remain in the den for the first month and are weaned at six to seven weeks old. Juveniles disperse at four to five months of age, in the late summer and autumn.

This species needs relatively flat, native grassland habitat with low ground cover to enhance mobility and visibility, and the presence of burrowing animals such as badgers and Richardson's ground squirrels for dens. Swift foxes will modify multiple dens and use them year-round for shelter, raising young, and as escape routes from predators.

17.2 Survey Standards

17.2.1 Personnel

Swift fox surveys should be carried out by, or under the supervision of, an experienced wildlife biologist. Surveyors should have considerable experience specific to swift foxes, with established search images and knowledge of the biology, behaviour, and preferred habitat of this species.

17.2.2 Survey Effort

Camera traps should be deployed at intervals throughout the project area. Arrangement of the traps will depend on the nature of the proposed development or structure of the survey area. Camera traps may be spaced at distances up to 1km apart, and should be deployed in areas proposed for development as well as adjacent habitats. Camaclang et al 2010 provides estimates of latency of detection, and graphs that show a cumulative proportion of swift fox sightings using scent posts. This work supports mitigation type monitoring should involve at least 5 days of successive camera trapping surveys to ensure adequate detection.

17.2.3 Time of Year

Winter is the preferred time period as swift fox home ranges expand considerably in the winter therefore detection will likely increase. Furthermore they are less confined to natal dens and are more likely to investigate food odours due to a scarcity of resources. Surveys during the breeding season (February 16th- July 31st) should be avoided. Surveys should start no earlier than September 1st and be completed no later than February 15th each year.

17.2.4 Time of Day

Swift foxes are largely nocturnal; therefore camera traps must be set up for detection during night time hours. Stations should be in place a minimum of 1 hour prior to sunset, and visited no earlier than 1 hour after sunrise. Considering this deployment strategy, camera equipment must have suitable infrared ability for clear night time photography, as well as cold tolerance to reliably function in extremely cold winter weather.

17.2.5 Weather/Conditions

Deployment during inclement weather may reduce activity at camera traps, therefore surveys should be extended if periods of rain, snow and/or high winds occur during the camera trap deployment. Camera traps should be periodically monitored to ensure scent lures have not been removed and that equipment is functioning properly, especially after inclement weather events.

17.2.6 Permit Requirements

A research permit or collection licence, which includes an animal care protocol agreement, will be required by ESRD-Wildlife Management for this survey because scent-posts alter fox behaviour.

Contact your local ESRD-Wildlife Management office and visit: http://www.srd.alberta.ca/ManagingPrograms/FishWildlifeManagement/ResearchLicencesPermits/Default.aspx.

17. 2.7 Equipment List

- Motion activated Camera with ability for quality night time photography and ability to function in cold temperatures (lithium batteries recommended).
- 5 cm x 5 cm Wood Lath.
- Absorbent Clay discs.
- Scent lure (strong-smelling oily bait such as mackerel oil or sardine oil).

17.3 Survey Protocol

17.3.1 Standard Survey Methods

17.3.1.1 Ground Searches

Ground searches can be conducted between September 1st and February 15th, unless snow cover is excessive and will not allow reliable detection of burrows. Inspect all burrows, particularly those with a "runway" to the entrance that is greater than 15 cm in diameter, within a 500-m radius of the proposed development for evidence of swift fox activity (tracks, scat, prey and their parts, or loose soil across the breadth of the burrow floor). Ground searches should not be conducted betweem February 16th and July 31st. Simply document the direction and distance from a reference GPS location (UTM NAD 83). Minimize audible and physical disturbance in the vicinity of potential dens.

17.3.1.2 Scent Post Camera Trap Surveys

These surveys may be used to determine the local occurrence of swift fox within a specified area. The smaller scale survey protocol described is not applicable to establishing habitat relationships or population size and structure, but could provide evidence of general trends if repeated in a systematic manner over a number of years.

Swift foxes prefer open spaces rather than shrub or tree cover, therefore, when selecting the sites for the camera trap, avoid shrubby or treed areas. As swift foxes habitually hunt and forage along fence lines, rock piles, and other topographic features, scent posts can be set up at these sites. Fence posts, especially corner posts, or along the fence lines are good sites, as are exposed hills and edges of trails through such areas.

17.3.1.2.1 Scent Post Camera Trap Survey Method

Camera trapping is a non-invasive survey technique that attracts an animal to a camera then takes a photograph of the visit (Vanak and Gompper 2007). For swift fox, scent posts (attractants) consist of a short piece of wooden lath driven into the ground with an absorbent clay disc coated with a strong smelling lure (mackerel oil, canned sardines or anchovies are suitable) attached to the stake. Mackerel oil is the preferred attractants as it is thought to be more powerful and long-lasting than other lures such as sardines. Plaster discs should be soaked in attractant at the time of the deployment. Discs should be attached to the stake approximately 5 cm from the top using a nail or screw. If the ground is frozen, a short piece of rebar may be driven into the ground and a wooden lath wired to it.

Cameras should be placed approximately three meters from scent posts and approximately 100-200 meters from the road. Cameras should be mounted on custom-made iron stakes and positioned approximately 40 cm from the ground facing the scent-post. Cameras should be set to capture visitation 24-hours a day, and if triggered multiple photographs should be taken. Video capability is available on many cameras, and may also be used to record visitation from wildlife.

Camera traps should be set up during the afternoon so that they are "set" for that night. Each camera station location must be recorded with a hand held Global Positioning System unit (UTM NAD 83) to facilitate relocation because animals can chew off stakes or remove them completely. Scent posts may be checked at any time the following day but must be "reset" before the next night. Bring extra lure and stakes when checking the scent posts as other predators and scavengers also visit these stations. Ground squirrels, rabbits, mice/voles, and ants have been known to clean up the bait, and cattle may knock over the lath if it is located in an active pasture. Records of daily camera trapping activities (i.e., dates each survey route was conducted, number and location of camera stations, description of habitat at each camera station, etc.) and the results of each trap night should be maintained. Prior to the start of the surveys it may be necessary to obtain permission from landholders to set camera stations.

Scent posts should be set up in native grassland areas, although foxes may use adjacent cultivated lands, and left up for a total of five consecutive good nights, as swift fox typically cover their home range once in approximately this time frame. If bad weather (e.g., rainfall, blizzards) that would inhibit activity occurs, the station cycle must start over.

Scent posts should be established approximately 1 km apart. If a specific site is being targeted, scent posts must effectively cover the area 3 km from the centre, radiating out from the centre in four directions to at least 3 km. If swift fox are confirmed or suspected in the area, night lighting or additional track surveys (e.g., snow tracking if conditions are appropriate) may be warranted (see supplemental surveys below).

17.3.1.2.2 Reporting

Record all activity, including non-target species, at each scent post for each of five nights, the dates of the survey, and the weather conditions. Also record the type of bait.

17.3.2 Supplemental Surveys

These survey methods can be used to supplement the results of scent post surveys, or to confirm the presence of swift fox in the area:

17.3.2.1 Snow Tracking Surveys

Snow tracking surveys can be used to supplement scent post information, either on an incidental basis by having observers watch for tracks in the snow while performing Camera trap surveys, or by performing separate surveys during the winter. In the latter case, each proposed development would be searched for tracks. Development corridors could be searched by truck, all-terrain vehicle, snowmobile, or on foot, and speeds should not exceed 10-15 km/h. If a vehicle is used, two observers should be present to cover both sides of the vehicle, and the vehicle should be stopped once any tracks are spotted, to allow the observers to identify the type of tracks on foot. Searches should be timed to occur shortly after fresh snowfalls. Refer to *chapter 19.0 Non-invasive Mammal Surveys-winter tracking and minerial licks* of this document for further details.

17.3.2.2 Spotlighting Surveys

Spotlighting surveys can be used to confirm the presence of swift fox in an area if tracks or scat have been found. The surveys should be initiated about one hour after sunset and end by about one hour before sunrise. Ideally, each development corridor or well pad should be surveyed at least once, and the surveys can be conducted on consecutive nights when weather permits (visibility should be at least 500 m). For development corridors, one observer should be spotlighting each side of the route, using a light of at least 35 000 candlepower (500 000 to 1 million candlepower is ideal), and binoculars can be used to aid in identification. If a vehicle is being used, the route should be driven at a maximum of 10-15 km/h, with stops allowed for confirmation of observations.

17.3.3 Industrial Survey Methods

Ground searches for swift fox dens are to be conducted in all cases. The scent post camera trap method (see Section 17.3.1.2 above) is to be used in addition to the ground search especially when two or more developments are planned more than 500 m apart or in the case of linear developments (seismic, pipeline, road, or transmission), that exceed 500 m in length. The supplemental surveys (see Section 17.3.2 above) are recommended but optional, and are only to be used for positive confirmation of potential swift fox sightings or signs from the first two surveys. Based on the poor reliability of these supplemental surveys, they alone cannot be used as evidence that swift foxes are not in the area.

17.4 Additional Resources

Alberta Swift Fox Recovery Plan 2006-2011

17.5 Literature Cited

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18.0 ORD'S KANGAROO RAT

(Dipodomys ordii)

18.1 Introduction

18.1.1 Status and Distribution

- *Wildlife Act* category: *Endangered*
- Provincial general status: At Risk
- COSEWIC status: *Endangered*
- Federal *Species at Risk Act* status: *Endangered*

The Alberta kangaroo rat population fluctuates significantly throughout the year making it difficult to determine population size, thus long-term trends have not yet been determined. In most years the Alberta population is reduced to less than 1000 individuals each spring following high overwinter mortality.

Although widespread in other parts of North America, the Ord's kangaroo rat is at the northern edge of its range in Canada. In Alberta, kangaroo rats occur in isolated patches of active sand dune habitats between the Red Deer and South Saskatchewan rivers, namely the Middle Sand Hills region and other immediately adjacent sand dune complexes. Much of this habitat falls within the eastern portion of Canadian Forces Base Suffield, particularly the Suffield National Wildlife Area. Recent surveys for kangaroo rats in other sandhill areas in southern Alberta (vicinities of Hilda, Manyberries/Pakowki Lake and Purple Springs) found no evidence of kangaroo rats, with the exception of one small area north of Hilda on the south side of the South Saskatchewan River.

18.1.2 Biology

Kangaroo rats are nocturnal, solitary animals adapted to living in desert environments and sandy habitats. They are named for their bipedal hopping-style of locomotion and long tail. Kangaroo rats are fossorial and very territorial. They excavate extensive burrow systems for food storage, predator evasion, and hibernation. Kangaroo rats breed when conditions are favourable, typically between April and August. Common predators include rattlesnakes, bullsnakes, owls, coyotes, weasels, red foxes, and badgers.

Natural kangaroo rat habitats are generally restricted to active sand dunes and blowout hollows, although they will sometimes occupy sparsely-vegetated, sandy soils in arid grassland and open scrubland. Kangaroo rats also inhabit anthropogenic habitat such as the margins of intensely grazed pastures, fallow fields, trails, roads, and fireguards. Natural kangaroo rat habitat is dispersed in spatially isolated patches. These patches experience high rates of local extirpation and re-colonization; as such, not all habitat patches are occupied at one time. Therefore, it is imperative that habitat patches remain intact even if kangaroo rats are not currently occupying them, to ensure long-term population persistence.

18.2 Survey Standards

18.2.1 Personnel

Given that the species is very cryptic and that its habitats can be difficult to identify, field crew personnel must be well-trained and experienced in identifying kangaroo rats and their habitat, tracks, and burrows. Kangaroo rat surveys should be conducted by a professional and expirenced wildlife biologist or wildlife technician. It is essential to have a thorough understanding of the biology and ecology of the kangaroo rat in order to conduct effective surveys for this species.

18.2.2 Time of Year

The most appropriate time of year to conduct surveys for kangaroo rats is typically mid-June to early September. During the colder months of the year, kangaroo rats typically remain in their burrows and are not active above ground. In the spring the population is small and often difficult to detect due to high overwinter mortality. Population densities normally increase dramatically during the late spring and summer.

18.2.3 Time of Day

Two types of surveys can be used to locate kangaroo rats: daytime burrow and track surveys or nocturnal animal surveys. Surveys for kangaroo rat burrows and tracks should be conducted in the early morning before the typical windy conditions of southern Alberta have the opportunity to blow away evidence of their tracks. Nocturnal surveys for kangaroo rats should start at dusk (after nautical twilight ends) and may continue until nautical twilight begins (use a sunrise/sunset calculator with nautical twilight such as http://www.nrc-cnrc.gc.ca/eng/services/sunrise/index.html to determine twilight periods).

18.2.4 Weather/Conditions

Kangaroo rats greatly reduce their above ground activity levels during bright, moonlit nights and inclement weather (strong winds, >5 on the Beaufort scale, or heavy precipitation). Therefore, surveys must be conducted during the new moon period or when night time ambient light is otherwise greatly diminished.

18.2.5 Survey Effort

If evidence of kangaroo rats is not detected during the first daytime survey, a nocturnal survey (direct observation) should follow. The daytime/nocturnal survey sets should be repeated every 3-4 weeks until three survey sets have been completed, or kangaroo rats are detected, whichever comes first. Surveys should be conducted by no less than a two person crew of qualified individuals, as defined above.

18.2.6 Permit Requirements

A Research permit is required to complete the direct observation (nocturnal) surveys since it disturbs the natural behaviour of the species and is considered an invasive procedure. Furthermore, most habitats in Alberta are designated as annual survey sites in the Ord's Kangaroo Rat Long-term Population Monitoring Program, and nocturnal surveys have potential to impact this monitoring work. The Alberta Wildlife Animal Care Committee Class Protocol #011 is designed for ground surveys.

18.2.7 Equipment List

- GPS unit
- Handheld spotlights (e.g., 12 V Brinkmann, one million candlepower)
- Bright headlamp or flashlight
- Digital camera
- Maps

- Animal track guide and/or mammal identification field guide
- Thermometer
- Wind meter

8.3 SURVEY PROTOCOL

(Modified from Bender et al. 2007)

18.3.1 Standard Survey Method

Methods for presence/not detected surveys for sign (preferred) and direct observation of kangaroo rats are provided below. Surveyors must conduct a daytime burrow/track survey first; if daytime surveys fail to detect presence of kangaroo rats, an additional nocturnal survey is required (note: a permit is required for nocturnal surveys, see Section 18.2.6 above). However, if daytime surveys confirm the presence of kangaroo rats, a nocturnal survey is not warranted.

18.3.1.1 Daytime Surveys

The most observable kangaroo rat sign are burrows and tracks. Burrow and track surveys must be conducted on foot. Walk slowly and quietly, scanning for footprints, burrows or kangaroo rats around burrows, runways and paths, and under vegetation. Kangaroo rat tracks are distinctive paired footprints with a tail drag. Burrow entrances are conspicuous and have "runways" (well-worn pathways approximately 7-10 cm in width that conspicuously lack vegetation) extending from the entrance and will often contain tracks. Kangaroo rat burrows have a 5-10 cm diameter opening and are typically located on the sides of sand dunes and blowouts, at the base of shrubs, or on side slopes (ditches) along sandy roads, trails, and fireguards.

For most industrial projects in the kangaroo rat's range, the use of appropriately planned, thorough, early morning track and burrow surveys should sufficiently delineate habitats that contain kangaroo rats and must be avoided by recommended setback distances.

18.3.1.2 Nocturnal Surveys

As noted above, nocturnal surveys are required only if kangaroo rat sign is not detected during daytime surveys.

Surveys for direct observations of kangaroo rats must be done by foot or vehicle depending on the location (only existing roads and trails may be surveyed by vehicle). If on foot, walk slowly and quietly with a bright headlamp and/or flashlight, scanning for footprints, tail-drags, burrows or active kangaroo rats around burrows, runways and paths, and under vegetation. Several thorough passes through one area may be necessary because kangaroo rats return to their burrows frequently throughout the night. Care must be taken to avoid stepping on a kangaroo rat as they are cryptic and often freeze if they detect danger. If a kangaroo rat is observed, record the sighting, but do not approach or attempt to capture the animal. Their nocturnal activity and bipedal, hopping mode of locomotion distinguishes them from other similarly-sized small mammals. When practical, a quality, handheld digital camera with a zoom lens can also be used to collect photographic evidence of the sighting, which can either be inspected by field crews at a later date or provided to species experts to confirm species identification.

Linear habitats such as established roads, trails, and fireguards may be surveyed from a vehicle while driving slowly (less than 15 km/h) with the headlights on. Two surveyors (driver and passenger) use

handheld spotlights to scan the roadway and along the edges of adjacent vegetation. Multiple passes should be completed from the road/trail to increase the likelihood of encountering a kangaroo rat on or near the road. The use of ATVs is not recommended. Exceptional care must be taken to avoid running over kangaroo rats during vehicle surveys.

The position of all individuals or residences (nests, burrows, dens, hibernacula) of *Endangered*, *Threatened*, *Species of Special Concern*, Data Deficient or Deferred species observed during the surveys should be recorded and georeferenced using a GPS unit (UTM NAD 83; Zone 11 or 12) and submitted to the provincial database, FWMIS.

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18.3.2 Industrial Development Survey Methods

18.3.2.1 Linear Development Surveys

The entire length of a proposed linear disturbance plus the setback distance (250 m, 100 m, or 50 m depending on the activity) on either side must be surveyed for kangaroo rats, sign, and potential habitat by using the foot or vehicle survey method (Government of Alberta 2012). Surveys by vehicle may only be conducted if there is an existing right-of-way.

When the disturbance is proposed along an existing right-of-way, the ROW may be surveyed by vehicle. However, the habitat adjacent to the ROW must be surveyed on foot; this can be accomplished by performing additional parallel transects to the ROW. Two observers should travel parallel to one another 10 m apart, effectively covering a width of 20 m (5 m on either side of each observer), up to the applicable setback distance to ensure adequate coverage of the area.

18.3.2.2 Non-linear Development Surveys

Perform an area search that covers the proposed development area plus the setback distance for Ord's kangaroo rat (250 m or 100 m), added onto the edge of the disturbance boundary (Government of Alberta 2012). For example, if the area disturbed is a 100 X 100 m high impact Mineral Surface Lease, the area surveyed is 600 X 600 m. The total area must be completely surveyed.

Once the survey area has been delineated, two observers will travel parallel to one another 10 m apart, effectively covering a width of 20 m (5 m on either side of each observer). The visibility/sight ability may vary along the transect so the distance apart may need to vary. Select a corner of the survey area as the starting point. One crew member will start 5 m from the "edge" with the second crew member spaced 10 m from the first. The survey crew will walk the entire length of the survey area. Then each observer moves 20 m in the required direction and begins the next transect. Repeat until the entire area is surveyed. Record and georeference all kangaroo rat features (individuals, sign, or habitat) observed in the area.

When one or more kangaroo rat features (e.g., individuals, tracks, runways, or burrows) are encountered during a survey, that specific area must be thoroughly searched to determine the extent of the area used by kangaroo rats to ensure that the setback distance is accurately applied.

The position of all individuals or residences (nests, burrows, dens, hibernacula) of *Endangered*, *Threatened*, *Species of Special Concern*, Data Deficient or Deferred species observed during the surveys should be georeferenced using a GPS unit (UTM NAD 83; Zone 11 or 12) and entered in FWMIS.

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19.0 Non-Invasive Mammal Surveys-Winter Tracking And Searched For Mineral Licks

19.1 Introduction

Many methods can be used to survey mammal species, including pellet/scat surveys, aerial surveys, photo/camera survey points, and snow tracking. However, snow tracking (as conditions allow) is recommended as the preferred survey method as it allows detection of numerous species while minimizing disturbance to mammals. Snow tracking identifies more species relative to alternative methods such as aerial surveys, cameras, and hair traps (Bayne et al. 2005), and has been adopted as the survey method used by the Alberta Biodiversity Monitoring Institute (ABMI 2010).

Snow tracking can inform on the presence of a wildlife species in a given area, however, it is not recommended for determining densities/abundance, nor can it be used to conclusively determine absence of a species in an area. Modifications of this protocol or use of other methods to survey for mammals should be discussed with your local ESRD- Wildlife Management area biologist to determine whether or not those modifications are appropriate.

Mineral licks are important features for ungulates as they provide necessary minerals during critical periods (such as antler development), and are believed to not only provide mineral supplementation, water, and soils to aid digestion, but also may serve as hubs for social gatherings. Mineral licks can be identified based on the high amount of use concentrated in a ground seepage area. Winter tracking can assist in detection of mineral licks if these areas are encountered during surveys.

19.1.1 Inventory Group or Species

Snow track surveys identify mammal species that are active during winter and leave obvious signs of their passage. Snow tracking generally focuses on four main groups of species:

Ungulates: Woodland caribou (*Rangifer tarandus caribou*), wood bison (*Bos bison athabascae*), moose (*Alces alces*), white-tailed deer (*Odocoeleus virginainus*), mule deer (*Odocoileus hemionus*), elk (*Cervis elaphus*), pronghorn (*Antilocapra americana*), mountain goat (*Oreamnos americanus*), and bighorn sheep (*Ovis canadensis*)

Large Carnivores: Canada lynx (*Lynx canadensis*), bobcat (*Lynx rufus*), American badger (*Taxidea taxus*), swift fox (*Vulpus velox*)[9], wolf (*Canidae*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), wolverine (*Gulo gulo*), grizzly bear (*Ursus arctos*), black bear (*Ursus americanus*), and cougar (*Puma concolor*)

Other Furbearers: Fisher (*Martes pennanti*), marten (*Martes americana*), long-tailed weasel (*Mustela frenata*), least weasel (*Mustela nivalis*), short-tailed weasel (*Mustela erminea*), mink (*Neovision vision*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), river otter (*Lontra canadensis*), red squirrel (*Tamiasciurus hudsonicus*), Northern flying squirrel (*Glaucomys sabrinus*), snowshoe hare (*Lepus americanus*)

[9] Swift fox can be detected through track surveys however this is not the recommended survey method for this species. If swift fox are the target species please refer to chapter 17.0 of this document.

Other Species: Porcupine (*Erethizon dorsatum*), raccoon (*Procyon lotor*), mice (*Muridae spp.*), and voles (*Arvicolinae spp.*)

19.1.1 Status And Distribution

During snow track and pellet/scat surveys, record all sightings and residence locations of the following *Threatened, Endangered,* and *Special Concern* mammalian species: (see section 3.1 for georeferencing methods):

Endangered	Swift Fox
Threatened	Wood Bison, Woodland Caribou
Special Concern	Grizzly Bear, Wolverine

Also of interest are the following species ranked by the general status assessment process as:

May Be At Risk	Long-tailed weasel
Sensitive	Fisher, Canada Lynx, Pronghorn, Bobcat, Badger

Information gathered from these surveys could be used in the re-assessment, and further knowledge base of the above listed species.

Additional information on the general status of mammalian species in Alberta can be obtained at: http://srd.alberta.ca/FishWildlife/SpeciesAtRisk/GeneralStatusOfAlbertaWildSpecies/Default.aspx.

In addition, the exact location of any mineral licks (determined based on the presence of numerous tracks focused around a ground seepage area) should be recorded including an exact location.

19.1.2 Biology

Many mammal species have large home ranges and are found at low densities. This coupled with what we perceive as elusive habits make encounters with them few and far between. As top predators, large carnivores can only be as numerous as the prey base allows, while larger ungulates are often limited by habitat conditions that influence food choices and movement. Smaller mammals, although often more numerous, follow similar patterns. How specialized a species is in regards to food and habitat requirements may also influence densities on the landscape.

Although the likelihood of seeing an individual animal at any given time in a specific location is small, they do leave behind evidence of their having occupied an area. Provided snow conditions are favourable, tracks are readily identifiable for many of the larger mammal species. Pellets or scat and other sign can also help identify what species have passed through an area.

19.2 Sampling Standards

Contact your local ESRD- Wildlife Management office for known locations of sensitive species in the proposed development area(s) and in the surrounding area(s). Wildlife Sensitivity Maps (available on

the ESRD website) and recognised range maps (from credible field guides and referencing existing ESRD status documents) should also be consulted for information on species of interest in the region.

19.2.1 Personnel

The need for experienced observers cannot be over-emphasized. Surveys should be conducted by a professional wildlife biologist and/or professional wildlife technician who is experienced with track and scat surveys. Observers must have considerable tracking/scat identification experience and familiarity with the biology, behaviour and habitat of species found within the survey area.

19.2.2 Time of Year

Track counts are to be conducted between December 1 and March 31, provided snow conditions are suitable.

19.2.3 Time of Day

Winter track surveys should be done during daylight hours. Periods within one hour of sunrise or sunset should be avoided due to poor quality of light.

19.2.4 Weather/conditions

Surveys should be done within 3 to 6 days of a snow obliterating event. A snow obliterating event is defined as a snowfall of 1 or more centimetres or an average daily wind speed of 30 km/hr or more (AMBI, 2010). This time frame allows several days before surveying for animals to make tracks and ends before tracks get too old to differentiate features. Periods of extreme cold (below minus 30^{O}C) during track accumulation should also be avoided (Linden et. al., 1996) as animal activity may be reduced and there are increased safety risks to staff. Surveys should not be conducted if weather conditions (temperature/wind chill) make it unsafe to do so.

19.2.5 Sampling Effort

At least one survey should be completed for a given area. If a survey is cancelled before completion, the survey lines in questions should be re-surveyed in their entirety.

19.2.6 Permit Requirements

Due to the relatively non-invasive nature of this protocol, a research permit and/or collection licence will not be required. However, ESRD-Wildlife Management strongly encourages that, following the completion of surveys, all data for wildlife species be submitted for the Fisheries and Wildlife Management Information System (FWMIS).

Information in FWMIS and load forms that are needed for this database can be obtained from biologists at ESRD-Wildlife Management offices or from the following website:
http://www.srd.alberta.ca/FishWildlife/FWMIS/Default.aspx.

19.2.7 Equipment List

- GPS
- Compass
- Thermometer
- Meter Stick
- Watch

- Binoculars
- Track identification guide
- Camera

Every reasonable effort should be made to avoid unnecessarily disturbing these species or their habitats.

19.3.1 General Survey Method

Prior to heading into the field, survey lines should be delineated on a map so that start and finish points are known.

Record general site characteristics such as (see AMBI 2010 for more information):

- general habitat type;
- disturbance type;
- general weather conditions (temperature, cloud cover, wind, precipitation);
- snow depth and snow conditions for each survey site;
- days since last snowfall (snow obliterating event); and
- time

Mark the location (position along the transect) of each observation using a GPS (UTM NAD 27 or 83; Zone 11 or 12. Record start and stop coordinates of each transect and/or segment and keep a record of the route by using the track log function. All incidental sightings of non-target species or other sensitive species should also be recorded.

The position of all individuals or residences (i.e. dens) of *Endangered, Threatened, Species of Special Concern, Data Deficient* or *Deferred* (see Appendix 1) species observed during the surveys should be georeferenced using a GPS unit (UTM NAD 27 or 83; Zone 11 or 12).

Transects may be done on skis or snowshoes and where practical (existing linear disturbance), snowmobiles may be used (should be driven at < 10km/hr while tracking). If using a snow machine, sled the entire line first (to pack it down) and count tracks on the return trip. If walking/skiing transect, only one pass is required. Make note of technique used. Transects should be 10km long. Divide the transect into 250m segments, stopping at the end of each segment to record data.

Identify each set of tracks that intersect the transect. Also record sightings, beds, middens, auditory observations, scat, scent posts etc. In addition, it will be important to record any mineral licks, with a precise location and (if a camera is available) a photograph for reference. For direct observations of animals, estimate the distance to the animal. Distinguish between trails and mats (where there is so many tracks it is hard to distinguish the number of sets). Old tracks can be recorded if they are identified as such.

If there are difficulties in identifying a track, follow it and look for other signs (scat etc). Take measurements of the stride, straddle, track depth and track dimensions. Take a picture (using something to demark scale) of a clear track, ensuring that there is enough contrast to make the track visible in a photograph. This should also be done for rarer species such as wolverine and cougar, or species outside their range such as raccoon, to confirm identification. In addition, following the tracks (back-tracking) to look for more visible tracks is encouraged. See Bayne et al. (2005) for more info on differentiating tracks, especially those of similar species. If in doubt, it is recommended to take a 'best guess' based on

the field information available, however, it is important to note that it is a guess, and to record all available information for that track (for follow-up with an expert to confirm or disprove the guess). Also note tracks of domestic species (horse, cow, dog, cat, etc.)

If it begins to snow while tracking, note when it started and the details on the survey conditions. Make sure to link this information with applicable observations. If conditions become impossible to continue (track identification or safety) make sure a GPS location is taken where tracking stopped.

19.3.2 Industrial Survey Methods

19.3.2.1 Linear disturbances:

Transects should follow the length of the proposed linear disturbance for a minimum of 10 km.

19.3.2.2 Non-linear disturbance:

Transects should be 10 km in length and as straight as possible. Transects should be done through the proposed disturbance area (i.e. centered on the area where activities are proposed). If the disturbance area proposed is large, several transects may be necessary in order to cover off adjacent habitats that may be indirectly impacted by the activity.

19.3.2.3 Local Study Area

For projects looking at impacts on the scale of a local study area (such as EIA monitoring sites), consideration should be given to the size of the study area relative to the objectives. A goal of a minimum of one 10 km of transects should be placed on the landscape, in discussions with the local ESRD-Wildlife Management biologist. Additional transects could be placed in the local study area or possibly beyond, depending on target densities and detection goals.

19.4 Additional Resources

For individual species:

See Alberta status reports at:
http://www.srd.alberta.ca/FishWildlife/SpeciesAtRisk/DetailedStatus/Default.aspx

and Alberta Species at Risk reports at:
http://srd.alberta.ca/FishWildlife/SpeciesAtRisk/ProgramReports.aspx

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20.0 Species At Risk Plant Surveys

20.1 Introduction

20.1.1 Status

This protocol is designed to assist with surveys for plant species designated as Endangered, Threatened, or Special Concern in Alberta and/or under the national *Species at Risk Act*. As of May 2012, plant species at risk in Alberta included the following:

- Bollander's quillwort (*Isoetes bolanderi)*
- Dwarf woolly-heads (*Psilocarphus brevissimus)*
- Haller's apple moss (*Bartramia halleriana)*
- Hare-footed locoweed (*Oxytropis lagopus)*
- Limber pine (*Pinus flexilis)*
- Porsild's bryum (*Bryum porsildii)*
- Slender mouse-ear-cress (*Halimolobos virgata)*
- Small-flowered sand-verbena (*Tripterocalyx micranthus)*
- Smooth goosefoot (*Chenopodium subglabrum)*
- Soapweed/yucca (*Yucca glauca)*
- Tiny cryptantha (*Cryptantha minima)*
- Western blue flag (*Iris missouriensis)*
- Western spiderwort (*Tradescantia occidentalis)*
- Whitebark pine (*Pinus albicaulis)*

A current list of plant species at risk in Alberta can be found in Schedule 6 of the *Wildlife Regulation* of Alberta's *Wildlife Act*, and by searching the Canadian Species at Risk Public Registry for species ranges in Alberta (Queens Printer 2012, Government of Canada 2012).

This protocol is also suitable for detecting other rare and potentially at-risk plant species in Alberta that have not yet been assessed by Alberta's Endangered Species Conservation Committee (ESCC) or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Contact Alberta Conservation Information Management System (ACMIS) for a list of rare plant species potentially occurring in an area.

20.1.2 Biology

Plant species at risk in Alberta vary widely in distribution, taxonomy, and habitat. As of 2012 most listed plants in Alberta were vascular plants from the Grassland Natural Region. Exceptions to that include limber pine, whitebark pine, and some bryophyte species from the Rocky Mountain Natural Region.

Identification characteristics and habitat affiliations for listed plant species are available from a number of references (e.g., Packer 1983; Kershaw et. al 2001; Flora of North America 2012). The status reports and recovery plans summarize biological information for species and include useful references. http://srd.alberta.ca/FishWildlife/SpeciesAtRisk/DetailedStatus/InvertebratesPlants.aspx

20.2. SURVEY STANDARDS

20.2.1 Personnel

The guidelines documents referenced in more detail below emphasize the importance in utilizing surveyors with significant experience with local flora, and this cannot be overstated (ANPC 2012; Henderson 2009). Alberta Native Plant Council (ANPC) guidelines suggest surveyors have at least 120 days of taxonomic field experience; further, some rare plant species and groups like bryophytes, lichens, and some more taxonomically complex vascular plant groups require considerably more than several months' experience to correctly search for, locate, and identify (ANPC 2012). Thus, qualifications of survey personnel should be appropriate for the target species. Prairie guidelines suggest that teams of surveyors, rather than individuals, are most efficient for maximizing detectability of endangered or threatened plants, and that the lead should have at least a decade of experience with local flora (Henderson 2009). These latter guidelines outline the ideal survey team for searching an area for plant species at risk.

20.2.2 Sampling Effort

Refer to "Number of Surveys" and "Survey Effort" in the ANPC guidelines (ANPC 2012), and section 2.0 of CWS guidelines (Henderson 2009) for general information on survey effort and timing.

20.2.3 Time of Year

Many rare plants are only detectable during a short period during the growing season. Table 20.1 describes the appropriate timing of surveys for select species.

Table 20.1: Survey Timing for rare plant species in Alberta, Adapted from Henderson 2009.

	Seasonal Timing	
Species	**Flowering**	**Fruiting**
Slender mouse-eared cress	late May-Jun	May-Jun
Western spiderwort	Late Jun-Jul	Jul
Tiny cryptantha	Jul-Sep	Jul-Sep
Small-flowered sand verbena	Jul-Aug	Jul-Aug
Soapweed (Yucca)	Jun-Jul	Year-round
Western blueflag	**Mid Jun-Jul**	N/A

20.2.4 Weather Conditions

Climatic conditions can strongly influence the detectability of many of Alberta's endangered and threatened plants. Dry or cold spring conditions may reduce the numbers of plants and significantly decrease the detectability of the species at a site (Henderson 2009; ANPC 2012). As such, extra effort may be required during cold and dry years. It is recommended that surveyors review regional weather conditions during the growing season.

20.2.5 Equipment List

- GPS unit
- Survey flags
- Survey poles
- ACMIS rare plant forms
- Camera

20.3 SURVEY PROTOCOL

20.3.1 Desktop Studies

At a course scale, species' range maps should first be reviewed through Landscape Analysis Tool (LAT); (Government of Alberta 2012) to determine potential species' range overlap with the proposed project area.

To check at a finer resolution if there are known occurrences of plant species at risk in an area, contact the area ESRD biologist as well as Alberta Conservation Information Management System (ACIMS) for records.

20.3.2 Survey Methods

Where suspected or known species' ranges overlap a proposed project area, on-the-ground surveys to determine species' presence must be carried out following guidelines referenced by this document. Failure to detect a plant species at risk during surveys is not considered definitive evidence that the species is absent from the area.

Both the Henderson and ANCP guidelines provide information regarding the different types of surveys that should be done for listed plant species (Henderson 2009; ANPC 2012). The Henderson guidelines provide study design principles for the smaller census areas typical of many environment site assessments (e.g., well pads, linear corridors) and for searching for species at risk over larger landscapes. These guidelines should be consulted when setting up a survey or assessment for prairie vascular plant species at risk (Henderson 2009). The ANCP guidelines also include sections on study design and type of survey and should be reviewed (ANCP 2010).

For bryophytes, lichens, trees, aquatic plants, and other plant groups not specifically addressed by the CWS guidelines, local ESRD biologists should be contacted to help locate the appropriate expertise and information for setting up a survey that will maximize detectability of plant species at risk in the search area.

Section 6.0 of the CWS guidelines emphasizes the importance of collecting and reporting on search effort even when no target plants are located (Henderson 2009).

Every reasonable effort should be made to avoid unnecessarily disturbing any plant species at risk and their habitats during surveys.

Methods within Canadian Wildlife Service (CWS) Prairie and Northern Region *Occupancy Survey Guidelines for Prairie Plant Species at Risk* and Alberta Native Plant Council (ANPC) *Guidelines for Rare Vascular Plant Surveys in Alberta* should be followed for conducting plant surveys (Henderson 2009; ANPC 2012).

20.4 Additional Resources

Alberta detailed status reports for plant species at risk

Alberta recovery plans for plant species at risk

20.5 Literature Cited

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21.0 Glossary

At Risk: As defined in the *General Status of Alberta Wild Species,* any species known to be 'At Risk' after formal detailed status assessment and legal designation as 'Endangered' or 'Threatened' in Alberta.

Biome: A complex biotic community characterized by distinctive plant and animal species and maintained under the climatic conditions of the region.

Blowout: A hallow formed in a region of shifting sands or light soil by the action of the wind; also referred to as buffalo wallow r sand pits.

Bog: A type of wetland, in which the vegetation shows the effects of a high water table and a general lack of nutrients. Bogs are acidic and fed primarily by rain water. Plant community dominated by cushion forming sphagnum mosses, ericaceous (require acidic soils) shrubs, and black spruce tress. The term 'muskeg' has been used to describe this wetland type, as well as fens and swamps.

Conspecific: An organism belonging to the same species.

Crepuscular: Most active between dusk and dawn.

Critical Habitat: As defined by Canada's *Species at Risk Act*; **Critical habitat** is the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species critical habitat in the recovery strategy or in an action plan for the species.

Data Deficient: As defined by the *General Status of Alberta Wildlife Species,* a species for which there is insufficient scientific information to support status designation.

Ectothermic: Of or relating to an organism that regulates its body temperature largely by exchanging heat with its surrounding environment.

Endangered: As defined by the Alberta *Wildlife Act* or Canada's *Species at Risk Act,* a wildlife species facing imminent extirpation or extinction.

Fossorial: Adapted for digging and burrowing.

Georeference: To define its existence in physical space. That is, establishing its location in terms of map projections or coordinate systems.

Hibernaculum: Shelter used by a hibernating animal or group of animals (i.e. snakes) during the winter months.

Key Wildlife Features: sites vital to a species during any stage of its life cycle, including, but not limited to, breeding, rearing young, or hibernation.

Lek: Traditional place where males (grouse) assemble during the mating season and engage in competitive displays to attract females.

May be at Risk: As defined in the *General Status of Alberta Wild Species*, any species that 'May be at Risk' of extinction or extirpation, and is therefore a candidate for detailed risk assessment.

Midden: An area which an individual rodent stores food. These often contain remnants of cones, nuts or shells and can be quite large.

Natural Region: Are the largest mapped ecological units in Alberta's classification system and are defined geographically based on the landscape patterns, vegetation, soils, environmentally features and physiographic features. There are 6 natural regions in Alberta. Refer to http://www.albertaparks.ca/media/2942026/nrsrcomplete_may_06.pdf. For more information

Natural Subregions: a subdivision of a region, in Alberta there are 21 divided based on environmental features, and conditions. (Refer to http://www.albertaparks.ca/media/2942026/nrsrcomplete_may_06.pdf. For more information

Piscivorous: Fish-eating species

Poikilothermic: An animal whose body temperature varies with the temperature of its surrounding environment; typically this term refers to amphibians, fish, and reptiles.

Rookery: a breeding or birthing place of animals. Within this document rookery is referring to the birthing place of snakes.

Sensitive: As defined by the *General Status of Alberta Wild Species*, any species that is not at risk of extinction or extirpation but may require special attention or protection to prevent it from becoming at risk.

"Sensitive Species": For the purpose of this document "sensitive species" refers to all species with a legislative status of "*Endangered*", "*Threatened*" or "*Species of Special Concern,*" or a general status ranking of "*At Risk*", or "*May be at Risk;*" as well as any species that have been identified as sensitive to human disturbance regardless of the species official status.

Species of Special Concern: As defined by the *General Status of Alberta Wild Species*, a species that warrants special concern because of characteristics that make it particularly sensitive to human activities or natural events.

Threatened: As defined by The Alberta *Wildlife Act* or Canada's *Species at Risk Act*, a wildlife species likely to become '*Endangered*' if limiting factors are not reversed.

Torpor: Also called temporary hibernation; a short-term dormancy or inactivity, with reduced metabolic rate.

Wildlife: All wild species including, but not limited to, mammals, amphibians, reptiles, fish, birds invertebrates, micro-organisms, and plants.

Wildlife Habitat: The terrestrial and aquatic environments and associated ecosystem elements that in combination provide the requirements of food, cover, and space needed to support self-sustaining populations of wildlife.

Wildlife Survey: A comprehensive survey for all Species at Risk and associated features (i.e., den, nest, burrow), as identified in the Landscape Analysis Tool, near a proposed area of a development, as defined by the protocols outlined in the *Sensitive Species Inventory Guidelines*.

Wildlife Sweep: A search of the immediate area of a proposed development for key wildlife features, including nests and dens.

Appendix A

Beaufort Scale

Wind Code	Wind Speed km/hr	Wind Description
0	Under 1	Calm. Smoke rises vertically
1	1-5	Light air, smoke drifts, weather vane inactive
2	6-12	Light breeze, leaves rustle, can feel wind on face
3	13-20	Gentle breeze, leaves and twigs move around, small flags extend
4	21-30	Moderate breeze, moves thin branches, raises loose papers
5	31-40	Fresh breeze, small trees begin to sway
6	40-50	Strong Breeze, large branches and trees are moving, flags are straight out, whitecaps are everywhere