

Chapter 6

Wildlife and Wildlife Habitat

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6. Wildlife and Wildlife Habitat

6.1 Introduction

This chapter forms part of a Comprehensive Study (CS) of the Parallel Runway Project (PRP) at the Calgary International Airport (YYC). The process for preparing the CS shadows the Environmental Assessment (EA) process under CEAA and this chapter summarizes the potential effects of the PRP on wildlife and wildlife habitat. The PRP consists of a 14,000 ft (4,267 m) runway and associated infrastructure. The project components are described in further detail in Volume II, Chapter 7 of the CS.

The PRP may require substantial alteration to the existing environment. The environmental effects assessment identifies potential effects of the Project on the natural resources in the local and regional area. Project effects are changes to the biophysical or human environment caused by activities arising solely from the PRP. Effects may be direct or indirect. A direct effect is one in which the cause-effect relationship has no intermediary effects, and an indirect effect is one in which the cause-effect relationship between a Project effect and the ultimate effect on a valued component (VC) has intermediary effects (Canadian Environmental Assessment Agency 1999).

The environmental effects assessment not only examines potential direct and indirect environmental effects that might result from the PRP, but also examines ways in which effect levels can be reduced through mitigation, and estimates residual effects following the implementation of mitigation measures. The general organization of this assessment of the potential effects of the PRP is as follows:

- Scoping;
- Baseline studies;
- Analysis of effects;
- Mitigation;
- Residual effects;
- Evaluation of significance;
- Cumulative effects; and
- Follow-up.

6.2 Scoping the Assessment

Scoping the assessment involves the identification of key issues of concern (and VCs), thereby ensuring that the assessment remains focused and the analysis remains manageable and practical (Hegmann et al 1999). The assessment framework used for the PRP followed four tasks that must be done in scoping: issue identification, selection of VCs, setting of boundaries, and initial identification of potential effects.

An issue-based approach was used to focus the baseline data collection program and effects assessment. All issues raised by the public, stakeholders, and government agencies were recorded and tabulated in Volume IV, Item 1. Analysis of, and responses, to the issues related to wildlife and wildlife habitat are dealt with in this chapter.

6.2.1 Scenarios

Six scenarios were considered and compared in conducting the assessment:

- pre-construction (baseline) conditions;
- construction conditions;
- conditions in 2015 with the runway in place;
- conditions in 2015 without the new runway;
- conditions in 2025 with the new runway in place; and
- conditions in 2025 without the new runway.

There should be little to no change to wildlife and wildlife habitat on airport lands if no runway is built, although there will be changes north and east of the airport as municipal development proceeds. If the runway is built, the conditions on YYC lands pertaining to wildlife and wildlife populations are unlikely to differ between 2015 and 2025. Therefore, only three scenarios were addressed: 1) pre-construction; 2) conditions during construction; and 3) conditions with runway in place in 2015 or 2025. YYC's operations during pre-construction include such regular activities as pavement maintenance and rehabilitation, snow removal, foreign object detection, spills management, lighting, environmental monitoring, noise abatement, grass cutting and vegetation and wildlife management (e.g., bird strike prevention measures), and operation and maintenance of stormwater control systems.

Construction activities associated with the PRP include mobilization and demobilization of equipment and personnel, topsoil stripping and stockpiling, delineation of the working area and provision of a security and safety fence, construction of storage areas for materials and equipment, and construction of the field office and vehicle parking area. These are described in more detail in Volume II, Chapter 7.

The operations and maintenance activities associated with the new runway and facilities will not be different from those that are being employed for existing runways, facilities and lands, although they will be extended to the new runway.

6.2.2 Issues Identification

There are large areas of natural and managed vegetation on the airport site which are restricted from public access. These lands provide a varied habitat for birds, mammals and herpetiles. The PRP has the potential to affect the existing environment. During construction, proposed physical works include the grading, excavation and filling or paving of an extensive area. The proposed physical works may affect wildlife through habitat loss or a change in habitat, mortality or a disturbance during sensitive periods. Potential effects of the project include:

- loss of and/or fragmentation of wildlife habitat;
- disruption to wildlife due to changes in noise, air quality and physical activities (particularly migration breeding, nesting, hibernation activities); and
- loss of species due to mortality from physical activities (e.g., road kills, collisions), particularly the loss of uncommon, rare, vulnerable, threatened or endangered species, migratory birds and species critical to other wildlife.

An interaction matrix (Volume III, Chapter 1, Table 1-1) was used to identify the potential effects for the PRP as a whole.

The potential wildlife and wildlife habitat issues that could be associated with the PRP were identified during the initial round of public consultation. Issues related to wildlife can be summarized as to whether project activities will result in:

- direct and functional habitat loss;
- changes in abundance, distribution, and behaviour of wildlife as related to distance from disturbance;
- changes in migration routes; and
- changes in population mortality factors, directly through interaction with the PRP.

6.2.3 Effects Hypotheses

Wildlife and wildlife habitat issues were identified through the methods outlined in Volume III, Chapter 1 and public consultation. Effects hypotheses were developed that corresponded to those issues and describe the kind of effect that could occur as a result of the PRP. The hypotheses used for this assessment are:

1. *Project infrastructure and activities due to the construction and operation of the PRP remove existing habitat for wildlife and the presence of infrastructure and sensory disturbance (auditory, olfactory, visual) during construction, operation, closure, and post-closure may cause direct and indirect (functional) loss of habitat available for wildlife in the Project area which may have an effect on their behaviour, distribution, and abundance.*
2. *Project infrastructure and activities during construction and operation may result in direct mortality to wildlife through collisions.*

6.2.4 Relevant Legislation

A number of federal and provincial acts include provisions for protection of wildlife and wildlife habitat. Their requirements have to be taken into account in selecting VCs.

Wildlife and plants that inhabit the PRP are subject to a number of protective regulations. Federal regulations governing biotic resources and wildlife management include the *Migratory Birds Convention Act* and the *Species At Risk Act*. On the provincial level, the protection of imperilled species is administered by the Alberta *Wildlife Act*, which protects wildlife that is listed as threatened, endangered, or as a species of special concern.

6.2.4.1 Migratory Birds Convention Act (MBCA)

The federal *Migratory Birds Convention Act (MBCA)* affords protection to all migratory birds, except hawks and owls, and prohibits any damage, destruction, removal or disturbance of active migratory birds or their active nests. Under the authority of Section 28 (1) of the Migratory Birds Regulations, a Federal Airport Kill Permit allows airport personnel exemption from this Act to harass or kill migratory birds that are considered to be a danger to aircraft operating at the airport. However, the permit is not valid for the killing of endangered, threatened or rare species.

6.2.4.2 Species At Risk Act (SARA)

With the coming into force of the federal *Species At Risk Act (SARA)* in June 2003, Schedule 1 became the initial List of Wildlife Species at Risk. Once a species is added to Schedule 1, it benefits from all the legal protection afforded, and the mandatory recovery plan, required under SARA. Under SARA, wildlife species that are listed on Schedules 2 and 3 follow the same process for assessment and classification as Schedule 1, but are not included on the official list.

To ensure the protection of species at risk, SARA contains prohibitions that make it an offence to kill, harm, harass, capture, take, buy, sell or trade one or more individuals of a species listed in Schedule 1 of SARA as endangered, threatened or extirpated.

The federal SARA protects listed wildlife species and their critical habitats on federal lands, but does not apply to lands held by the Province of Alberta unless “the laws of Alberta do not effectively protect the species or the residences of its individuals”. While Schedule 1 lists endangered, threatened and extirpated species, as well as species of special concern, the prohibitions do not apply to species of special concern. However, species at risk in Canada may also be protected by provincial or territorial laws (e.g., Alberta *Wildlife Act*, etc.). By way of an order, SARA can also protect a wildlife species not listed under SARA that occurs on federal lands if the species is designated as endangered or threatened by a provincial or territorial government. These provisions only apply to the species, residences and habitats targeted.

6.2.4.3 Alberta Wildlife Act

Any species that is designated as Endangered or Threatened becomes legally protected under Alberta’s *Wildlife Act* [R.S.A 2000, c.W-10]. This legal designation prohibits the disturbance, killing or trafficking of these species, and provides immediate protection of nests and den sites. Any species that is designated as “Sensitive” after a general assessment or as “Special Concern” after a detailed assessment becomes eligible for special management actions designed to prevent the species from becoming “At Risk”.

Other species of interest within the mandate of the Alberta Sustainable Resources Department (ASRD) include game species managed under hunting, trapping and fishing regulations, and watchable wildlife (birds). Albertans enjoy seeing wildlife in wild places, city parks, and/or backyards and value its presence in our landscapes. Some Albertans hunt game animals as the main source of meat for their families (subsistence hunters). Many others (recreational hunters) hunt to reconnect with the land and supplement their families’ food. Additionally, ASRD is a key participant in the North American Waterfowl Management Plan, which works to conserve and enhance wetlands for waterfowl and other species. However, some of these species present a risk to aviation safety. High risk species are those that are most frequently involved in strikes (e.g., waterfowl) and those species (e.g., deer, coyotes) that have the potential to cause the greatest damage to aircraft (Folk-Blagbrough 2008). Recognizing the potential hazards wildlife poses to aviation safety, Transport Canada requires all airports to develop, implement and maintain an Airport Wildlife Management Plan (AWMP) to reduce wildlife hazards and to comply with Section 303 (Wildlife Control) of the Canadian Aviation Regulations.

6.2.5 Spatial and Temporal Boundaries

6.2.5.1 Local Study Area

The Local Study Area (LSA) is intended to represent the range of terrain and soil resources within the PRP footprint and immediate vicinity, and covers an area within which all direct and some indirect effects of project activities (surface disturbance and dewatering) are likely to occur.

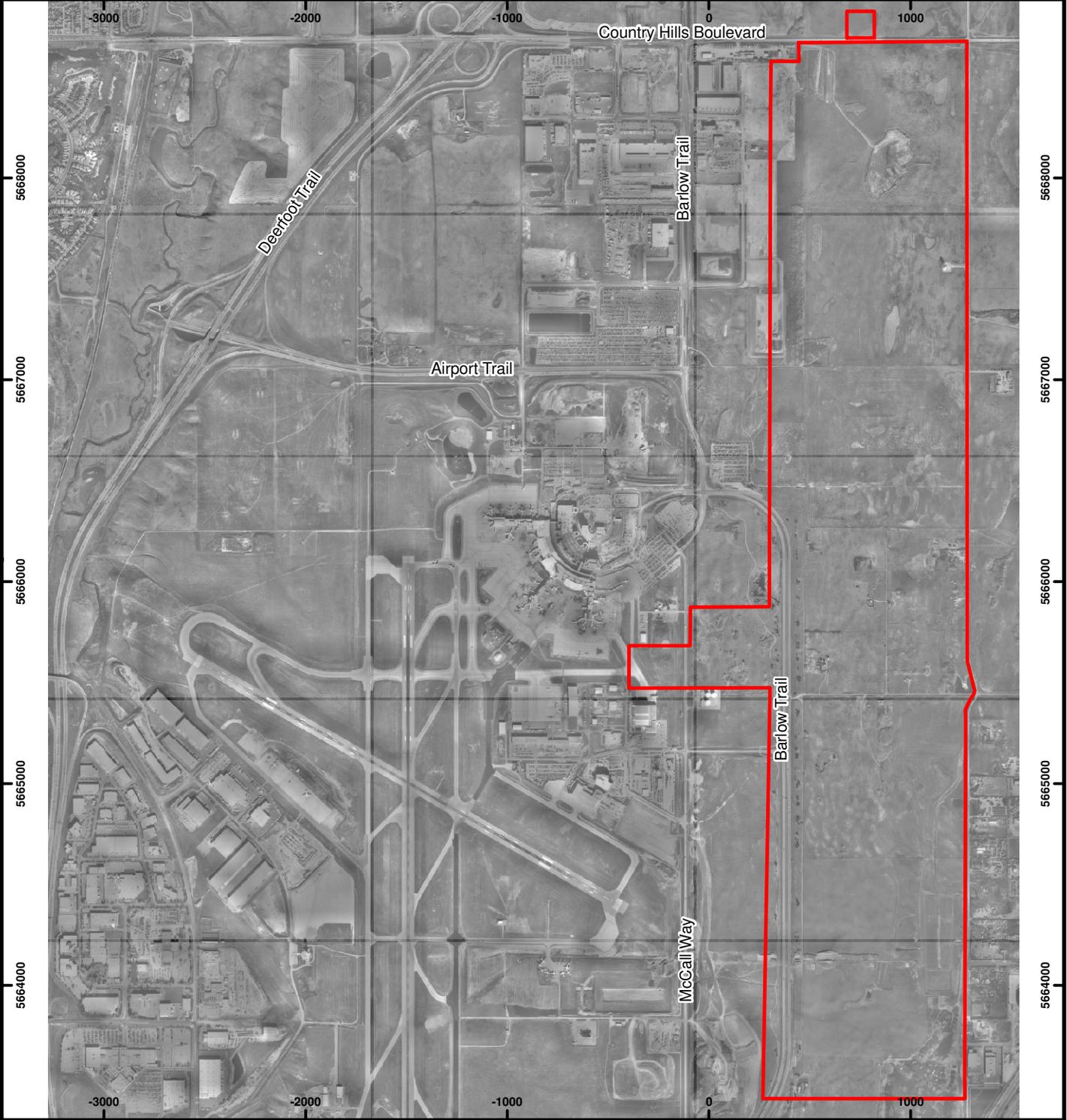
The YYC property totals approximately 2,137 ha and is comprised of two areas: Airside or the controlled area of the airfield which includes the terminal building, runway and taxiway; and Groundside or the remaining Government of Canada lands outside of the controlled area. The LSA for this baseline study will encompass some four sections of relatively undeveloped federal lands (Groundside) directly east of the existing YYC infrastructure and was defined based on the extent of the PRP footprint to include an area bounded by Country Hills Boulevard to the north, Calgary Airport Park on the south, 36 Street NE to the east, and on the west by McCall Way (Figure 6-1). Direct project effects beyond these limits are not anticipated.

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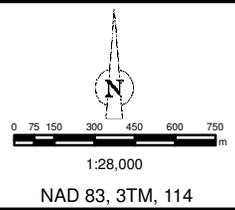
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 Orthophotography from Calgary
 Airport Authority.

 Study Area



YYC CALGARY
 AIRPORT
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The Calgary Airport Authority
 Runway Development Program
 Parallel Runway Project

AECOM

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Local Study Area

Figure 6-1

A highly modified landscape significantly altered by surrounding land use development, the LSA is dominated by agricultural (cultivated, fallow and pasture) lands under private lease, with extensive areas of existing anthropogenic disturbance (existing rural residences, municipal development, light industry, and infrastructure (access roads, railway, trails, pipelines, power lines, etc.) occurring throughout. Surveys of the LSA were restricted to areas of limited disturbance (agricultural lands), with disturbed or inaccessible areas of airport lands not considered in the soil survey, including:

- airside lands contained within the security fence;
- the airport's stormwater settling ponds situated in the southeastern part of the LSA;
- the Calgary Airport golf course located in the south; and
- existing infrastructure.

Notwithstanding routine airfield maintenance practices that reduce the quality of the habitats (such as mowing, cutting, and vegetation removal), the airport lands provide breeding and foraging areas for a variety of wildlife species. Common wildlife species in the area include mule deer (*Odocoileus hemionus*) and white-tailed deer (*O. virginianus*), coyote (*Canis latrans*), badgers (*Taxidea taxus*), Richardson's ground squirrels (*Spermophilus richardsonii*), and migratory birds.

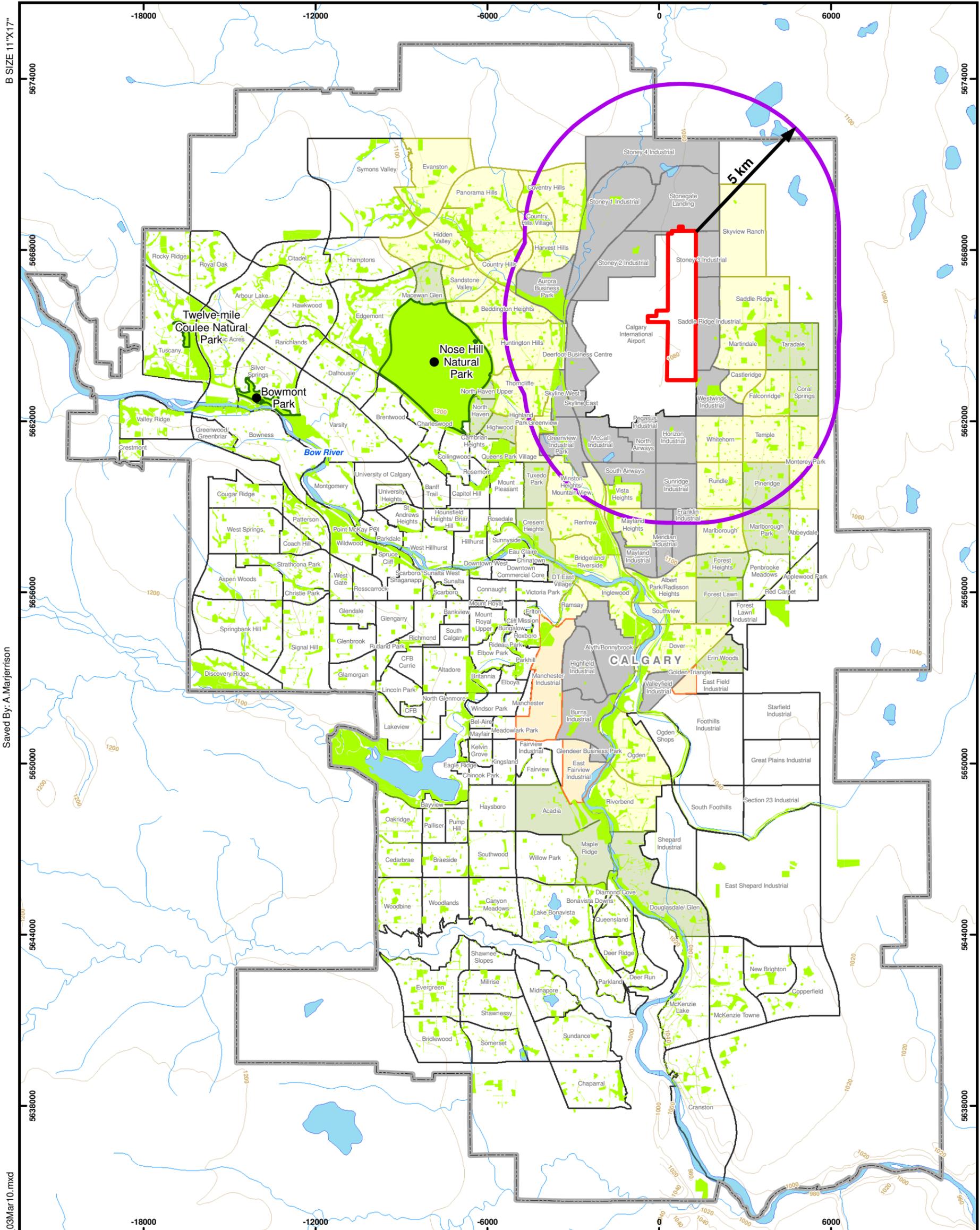
6.2.5.2 Regional Study Area

The Regional Study Area extends 5 km from the LSA and includes agricultural crop and pasture fields to the northeast surrounding a few parks and natural areas and balance being urban development. The boundary of the RSA was established to examine alternative wildlife habitat in the vicinity of the PRP area, particularly remnant patches of natural ecosystems available for wildlife. Beyond the RSA but within the region of the PRP are three large natural areas: Nose Hill Natural Park, Bowmont Park and 12 Mile Coulee Natural Park (Figure 6-2).

YYC is located within the Fescue Grasslands Ecozone of the Prairie Ecozone as described by the Ecological Stratification Working Group (1996). In Alberta, it is classified into the Foothills Fescue Natural Subregion of the Grassland Natural Region (Natural Regions Committee 2006). Vegetation in its native form is characterized by prairie grasses, with shrublands occurring on north-facing slopes and water receiving areas, and narrow, predominantly deciduous forests along river valleys. Extensive cultivation of the highly productive prairie soils has removed vast areas of native vegetation, with only remnant patches remaining. Remnant parcels of native vegetation within the Foothills Fescue Natural Subregion occur typically on moderately dry, south and west facing upland sites characterized by mountain rough fescue (*Festuca campestris*) and Parry oat grass (*Danthonia parryi*), with forbs comprised of silvery perennial lupin (*Lupinus argenteus*), pasture sagewort (*Artemisia frigida*), three-flowered avens (*Geum triflorum*) and golden bean (*Thermopsis rhombifolia*). Willow (*Salix* spp.), sedge (*Carex* spp.) and tufted hair grass (*Deschampsia caespitosa*) commonly occur on Humic Gleysols in poorly drained, wetted depressions (Natural Regions Committee 2006).

6.2.5.3 Temporal Boundaries

The Authority completed the Calgary International Airport Master Plan in 2004 to provide the framework for development of the facility over the next 20 years. The biophysical environment can potentially be disturbed during any time throughout the life of the development project. Construction of the PRP is to begin by 2011 and to be completed by the end of 2014. Predicted conditions in 2015 and 2025 with and without the new runway are considered in the assessment as described in Section 5.6.2.1 above. YYC was Canada's fourth busiest airport in 2008 and is a hub for domestic, transborder (United States) and international passengers and air cargo. It is highly unlikely that the PRP will be decommissioned within the foreseeable future.



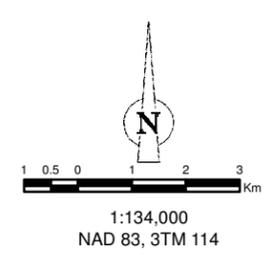
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 Basemapping from NTDB 1:250,000.
 Communities provided by Calgary Airport Authority.

- | | |
|---------------------------|-------------------------|
| Communities | Local Study Area |
| Other | Regional Study Area |
| AVPA Communities | Municipal Boundary |
| AVPA Adjacent Communities | Parks and Natural Areas |
| AVPA Industrial | Waterbody |
| AVPA Adjacent Industrial | Watercourse |
| AVPA Commercial | Elevation (m) |



The Calgary Airport Authority
 Runway Development Program
 Parallel Runway Project



Regional Study Area and Natural Areas

Figure 6-2

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6.2.6 Valued Components (VCs)

VCs are used to focus the environmental assessment and include environmental attributes that are unique to an area, or valued by the public (stakeholders). VCs are the final recipients of effects from a project activity, which means environmental components must be clearly linked to project activities. For the purpose of the EA, VCs representing the wildlife component fall within two broad categories, Wildlife and Wildlife Habitat, in an effort to be consistent with end land use objectives.

VCs were identified based on project objectives, consistent with applicable legislation and guiding documents, a review of existing reports, input from stakeholders (public information sessions), and the professional judgement of the project team.

6.2.6.1 Wildlife

VCs for this project were developed by incorporating information from and considering a number of sources:

- the level of risk or concern for species at the federal and provincial levels (Committee on the Status of Endangered Wildlife in Canada [COSEWIC] 2004a, *Species at Risk Act* [SARA], Government of Alberta ranking system for species in Alberta [ASRD 2005]);
- concerns of communities and regulators;
- VCs chosen for previous environmental assessments and current wildlife monitoring programs in the region; and
- the professional judgment of the project team.

VC1a: Schedule 1 SARA Species. Schedule 1 of the *Species at Risk Act* is the official list of wildlife species at risk in Canada. It includes species that are extirpated (extinct in Canada), endangered, threatened, and of special concern. These species are requiring the most protection due to the fragility of their populations and/or distributions and are protected by the federal act.

VC1b: Other Species at Risk. Other Species at risk refers to those officially designated as of either federal or provincial concern by ASRD (*Alberta Wildlife Act*) or by the Federal Government through the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and those listed in Schedule 2 and 3 of the *Species at Risk Act* (SARA).

VC2: Migratory Birds. The *Migratory Birds Convention Act (MBCA)* prohibits any damage, destruction, removal or disturbance of breeding migratory birds or their active nests. Under the authority of Section 28 (1) of the Migratory Birds Regulations, a Federal Airport Kill Permit allows airport personnel exemption from this *Act* to harass or kill migratory birds that are considered to be a danger to aircraft operating at the Airport. However, the permit is not valid for the killing of endangered, threatened or rare species.

VC3: Small Mammals. Mice, voles, ground squirrels, and shrews are small herbivores present in the LSA and RSA that influence the trophic dynamics of the ecosystem. Small mammals are found throughout the area and are a recognized part of the food chain in supporting larger wildlife species. Weasels, foxes, badgers, coyotes, and raptors depend on mammals as prey species throughout the year.

White-tailed deer and mule deer occur in the LSA and RSA, and they are managed as big game animals and have significant socio-economic value. They were not selected as a VC because neither of these species are listed either federally by COSEWIC or provincially by ASRD (2005), and are generally considered the highest risk species at airports (Folk-Blagbrough 2008) (see Section 2.4).

6.2.6.2 Wildlife Habitat

The *Species At Risk Act* also contains a prohibition against the damage or destruction of critical habitat, i.e., residences (nest or den) of listed wildlife species.

VC4: Critical habitat. Section 38 of the Alberta *Wildlife Act* assists in defining critical habitat; it states that without authorization, a person shall not wilfully “molest, disturb or destroy a house, nest or den of prescribed wildlife or a beaver dam in prescribed areas or at prescribed times”. The Authority holds permits from Alberta Environment and Environment Canada allowing it to remove or destroy wildlife to protect airport safety. “Prescribed wildlife” is defined as:

- wildlife animals that are endangered animals, throughout Alberta and throughout the year;
- migratory birds as defined in the *Migratory Birds Convention Act* (Canada) throughout Alberta and throughout the year;
- snakes and bats, throughout Alberta and from 1 September 1 to 30 April;
- houses and dens of beaver on any land that is not privately owned;
- houses, nests and dens of all wildlife in a wildlife or game bird sanctuary; and
- hibernacula of prairie rattlesnake throughout Alberta and throughout the year.

Critical habitat is, therefore, the habitat that is necessary for the survival or recovery of a listed wildlife species and includes habitat that listed wildlife species need to live, feed, breed, and raise their young. Four wetlands totalling 8.2 ha are the main form of potential critical habitat observed within the LSA (Volume III, Chapter 4, Figures 4-2a - 4-2c). These provide potential critical habitat for northern leopard frog (*Rana pipiens*) and the Canadian toad (*Bufo hemiophrys*). An effects assessment of wetlands is addressed separately within Volume III, Chapter 4 of the CS.

6.2.6.3 Indicators

Indicators are used to measure effects on VCs. Appropriate indicators were chosen for each wildlife and wildlife habitat VC. Table 6-1 outlines the issues for wildlife and wildlife habitat, and provides examples of indicators used in the effects assessment.

Table 6-1 Issues, VCs and Indicators

Issue	VC	Indicator
<ul style="list-style-type: none"> • Direct/indirect habitat loss • Disturbance during sensitive periods (breeding, nesting) • Direct mortality through collisions or removals through control action 	Species of Concern as designated by COSEWIC, SARA and the Alberta <i>Wildlife Act</i>	<ul style="list-style-type: none"> • Amount of suitable habitat • Critical habitat, i.e., houses, dens and nests of prescribed wildlife • Change in behaviour, distribution and relative abundance of listed species (e.g. long-tailed weasel, short-eared owl) • Number of collisions
<ul style="list-style-type: none"> • Direct/indirect habitat loss • Disturbance during sensitive periods (breeding, nesting) • Direct mortality through collisions or removals through control action 	Migratory Birds	<ul style="list-style-type: none"> • Amount of suitable habitat • Critical habitat, i.e., houses, dens and nests of prescribed wildlife • Change in behaviour, distribution and relative abundance • Number of collisions
<ul style="list-style-type: none"> • Direct/indirect habitat loss • Direct mortality through collisions or removals through control action 	Small Mammals	<ul style="list-style-type: none"> • Change in relative abundance
<ul style="list-style-type: none"> • Direct/indirect habitat loss 	Critical Habitat	<ul style="list-style-type: none"> • Amount of suitable habitat • Critical habitat, i.e., houses, dens and nests of prescribed wildlife

6.3 Baseline Conditions

The development of the PRP will result effects on the ecological resources such as wildlife and on its habitats that occur within the LSA and RSA. In order to be able to predict what the effects of the project on the local distribution of wildlife populations and their habitat would be, it is important to understand what their status was prior to commencement of the project. To accomplish these goals and objectives, a baseline survey to document wildlife presence, abundance and habitat use and availability was conducted. A baseline report was prepared in 2009 by AECOM to describe the existing environmental conditions and status of wildlife and habitat for the PRP, the LSA and by extension the RSA prior to its development.

As part of the baseline study, a literature review was conducted to determine which wildlife species could occur in the area. This review was also used to identify any wildlife species that might be found in the LSA that may be protected under various regulatory frameworks. Assessment surveys were then conducted to document whether those species that could be found in the area and are deemed to be of federal and provincial conservation concern were actually present.

Historically, the Authority has taken environmental management steps aimed at minimizing the risk to aviation that could result from interactions with wildlife. Management actions have included the infilling of wetlands. This is being done to reduce and alter habitat suitability especially for large birds such as waterfowl that can pose a significant safety risk to planes during takeoff and landing. Other management measures are also used by the Authority to discourage large birds from visiting the airport lands. Projects and management activities used by the Authority to control wildlife also form part of the documentation completed to describe baseline conditions for wildlife and the availability and quality of existing wildlife habitat within the LSA and the PRP footprint.

Following the completion of the literature review, field surveys and data assessments were undertaken to confirm the status of wildlife and wildlife habitat within the LSA. The baseline surveys and data collection that were completed as part of the baseline assessment of the PRP were conducted over several days during the months of March, June, July, and September 2009. The wildlife and habitat field surveys and assessments focused on the groundside portions of airport lands for the PRP. Restricted access to the airside portions of airport lands for safety purposes effectively prevented the completion of surveys in these areas. Access to airside areas of airport lands was only allowed when researchers were escorted onto the airfield by airport staff. Presence/not detected wildlife surveys were used to determine the occurrence of a species in a specific surveyed area and their habitat associations. These surveys were also used to determine and confirm whether any wildlife species or ecosystem components of significance to wildlife were present. The type of presence/not detected wildlife surveys included as part of the baseline data collection were:

- breeding bird (point count) surveys;
- amphibian auditory and systematic surveys;
- mammal (sightings and live trapping) surveys; and
- snow-tracking surveys to document winter-active species.

The findings of the baseline report for wildlife and wildlife habitat can be found in Volume V, Item 5 of the CS.

6.3.1 Wildlife

6.3.1.1 Species At Risk

Wildlife species of concern that have the potential to be found in the LSA, PSA and greater Calgary region have been documented in studies completed by Troughton (1996), Folk and Revel (2004), Folk-Blagbrough (2008), and range distributions found in Semenchuk (1992), Smith (1993), and Russell and Bauer (2008). Wildlife species of potential concern in the Calgary area compiled from these sources are shown in Table 6-2.

Table 6-2 Wildlife Species of Potential Concern in the Calgary Area

Common name	Genus species	ASRD	COSEWIC	SARA	Schedule
Avian Species					
American bittern	<i>Botaurus lentiginosus</i>	Sensitive	N/A	N/A	N/A
American green-winged teal ¹	<i>Anas crecca</i>	Sensitive	N/A	N/A	N/A
American white pelican	<i>Pelecanus erythrorhynchos</i>	Sensitive	Not At Risk	N/A	N/A
Baird's sparrow ^{1,2}	<i>Ammodramus bairdii</i>	May Be At Risk	Not At Risk	N/A	N/A
bald eagle	<i>Haliaeetus leucocephalus</i>	Sensitive	Not At Risk	N/A	N/A
Baltimore oriole	<i>Icterus galbula</i>	Sensitive	N/A	N/A	N/A
barn swallow ^{1,2}	<i>Hirundo rustica</i>	Sensitive	N/A	N/A	N/A
black tern	<i>Chlidonias niger</i>	Sensitive	Not At Risk	N/A	N/A
black-necked stilt ^{1,2}	<i>Himantopus mexicanus</i>	Sensitive	N/A	N/A	N/A
black-crowned night-heron	<i>Nycticorax nycticorax</i>	Sensitive	N/A	N/A	N/A
bobolink ^{1,2}	<i>Dolichonyx oryzivorus</i>	Sensitive	N/A	N/A	N/A
Brewer's sparrow ^{1,2}	<i>Spizella breweri</i>	Sensitive	N/A	N/A	N/A
broad-winged hawk ^{1,2}	<i>Buteo platypterus</i>	Sensitive	N/A	N/A	N/A
burrowing owl ⁴	<i>Athene cunicularia</i>	At Risk	Endangered	Endangered	1
common nighthawk	<i>Chordeiles minor</i>	Sensitive	Threatened	No Status	N/A
common yellowthroat ³	<i>Geothlypis trichas</i>	Sensitive	N/A	N/A	N/A
eastern phoebe	<i>Sayornis phoebe</i>	Sensitive	N/A	N/A	N/A
ferruginous hawk ^{1,2}	<i>Buteo regalis</i>	At Risk	Threatened	Special Concern	3
Forster's tern	<i>Sterna forsteri</i>	Sensitive	N/A	N/A	N/A
golden eagle ^{1,2}	<i>Aquila chrysaetos</i>	N/A	Not At Risk	N/A	N/A
great blue heron ^{1,2}	<i>Ardea herodias</i>	Sensitive	N/A	N/A	N/A
horned grebe ³	<i>Podiceps auritus</i>	Sensitive	Special Concern	No Status	N/A
least flycatcher ^{1,2}	<i>Empidonax minimus</i>	Sensitive	N/A	N/A	N/A
lesser scaup ^{1,2}	<i>Aythya affinis</i>	Sensitive	N/A	N/A	N/A
loggerhead shrike	<i>Lanius ludovicianus excubitoroides</i>	Sensitive	Threatened	Threatened	1
long-billed curlew ²	<i>Numenius americanus</i>	Sensitive	Special Concern	Special Concern	1
northern goshawk ³	<i>Accipiter gentilis</i>	Sensitive	Not At Risk	N/A	
northern harrier ^{1,2}	<i>Circus cyaneus</i>	Sensitive	N/A	N/A	N/A
northern pintail ^{1,2}	<i>Anas acuta</i>	Sensitive	N/A	N/A	N/A
olive-sided flycatcher	<i>Contopus borealis</i>	Secure	Threatened	No Status	
osprey	<i>Pandion haliaetus</i>	Sensitive	N/A	N/A	N/A
peregrine falcon ^{1,2,4}	<i>Falco peregrinus</i>	At Risk	Non-Active	Threatened	1
pied-billed grebe	<i>Podilymbus podiceps</i>	Sensitive	N/A	N/A	N/A
piping plover	<i>Charadrius melodus</i>	At Risk	Endangered	Endangered	1
prairie falcon ^{1,2}	<i>Falco mexicanus</i>	Sensitive	Not At Risk	N/A	N/A
rusty blackbird ³	<i>Euphagus carolinus</i>	Sensitive	Special Concern	Special Concern	1
sharp-tailed grouse ¹	<i>Tympanuchus phasianellus</i>	Sensitive	N/A	N/A	N/A
short-eared owl ^{1,2}	<i>Asio flammeus</i>	May Be At Risk	Special Concern	Special Concern	3
sora ^{1,2}	<i>Porzana carolina</i>	Sensitive	N/A	N/A	N/A
Sprague's pipit ¹	<i>Anthus spragueii</i>	Sensitive	Threatened	Threatened	1
Swainson's hawk	<i>Buteo swainsoni</i>	Sensitive	N/A	N/A	N/A

Common name	Genus species	ASRD	COSEWIC	SARA	Schedule
trumpeter swan	<i>Cygnus buccinator</i>	At Risk	Not At Risk	N/A	
upland sandpiper	<i>Bartramia longicauda</i>	Sensitive	N/A	N/A	N/A
western grebe	<i>Aechmophorus occidentalis</i>	Sensitive	N/A	N/A	N/A
white-winged scoter	<i>Melanitta fusca</i>	Sensitive	N/A	N/A	N/A
Herpetiles					
bullsnake	<i>Pituophis catenifer</i>	Sensitive	N/A	N/A	N/A
Canadian toad ⁵	<i>Bufo hemiophrys</i>	May Be At Risk	Not At Risk	N/A	
northern leopard frog ^{2,4,5}	<i>Rana pipiens</i>	At Risk	Special Concern	Special Concern	1
plains garter snake	<i>Thamnophis radix</i>	Sensitive	N/A	N/A	N/A
red-sided garter snake	<i>Thamnophis sirtalis</i>	Sensitive	N/A	N/A	N/A
wandering garter snake	<i>Thamnophis elegans</i>	Sensitive	N/A	N/A	N/A
Mammals					
American badger ^{1,2}	<i>Taxidea taxus</i>	Sensitive	Not At Risk	N/A	N/A
long-tailed weasel ^{1,2}	<i>Mustela frenata</i>	May Be At Risk	Not At Risk	N/A	N/A
hoary bat	<i>Lasiurus cinereus</i>	Sensitive	N/A	N/A	N/A
silver-haired bat	<i>Lasiorycteris noctivagans</i>	Sensitive	N/A	N/A	N/A

Sources: ¹ Folk and Revel 2004; ² Folk-Blagbrough 2008; ³ Troughton 1996; ⁴ ANHIC 2009; ⁵ ASRD 2009.

Of these species, the effects assessment will focus on those listed under SARA Schedule 1 “Special Concern”, “Threatened” or “Endangered”. The following species therefore with the potential to occur in the region are considered under VC1a for this assessment were: burrowing owl (*Athene cunicularia*), loggerhead shrike (*Lanius ludovicianus excubitoroides*), long billed curlew (*Numenius americanus*), peregrine falcon (*Falco peregrinus*), piping plover (*Charadrius melodus*), rusty blackbird (*Euphagus carolinus*), Sprague’s pipit (*Anthus spragueii*), and northern leopard frog (*Rana pipiens*).

6.3.1.2 Snow Tracking Surveys

Tracks of ten wildlife species were observed and documented by snow-tracking surveys completed as part of the baseline field survey program for the LSA. Species identified as using the LSA as a result of these surveys included the red fox (*Vulpes vulpes*), coyote (*Canis latrans*), long-tailed weasel (*Mustela frenata*), an unknown rodent species, gray partridge (*Perdix perdix*), Richardson’s ground squirrel (*Spermophilus richardsonii*), white-tailed jackrabbit (*Lepus townsendii*), an unknown vole species, mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), and the American crow (*Corvus brachyrhynchos*). Of the species identified by the snow tracking surveys, the long-tailed weasel is listed provincially as a species that is listed as one that “May Be At Risk”.

6.3.1.3 Amphibian Survey

The northern leopard frog (*Rana pipiens*) is a listed species that has the potential to occur in the LSA (COSEWIC: Special Concern; SARA: Special Concern, Sch. 1; *Wildlife Act*: At Risk). The Canadian toad (*Bufo hemiophrys*) is listed under the Alberta *Wildlife Protection Act*, but not by other agencies (COSEWIC: not at risk; SARA: NA; *Wildlife Act*: May Be At Risk) and has also been documented to occur in the Calgary area in the past (P. Young, personal communication). Play-back call surveys were conducted on 25 June, 2009 at two wetland locations within the LSA that are adjacent to Barlow Trail to detect whether either of these two amphibian species could be detected. No northern leopard frogs or Canadian toads were seen or heard during these surveys. The larger wetland of the two surveyed, based on its area and the availability of deep pools suitable for overwintering, had good potential for northern leopard frog breeding habitat. Although the two listed amphibian species were not detected during the call back surveys, Boreal chorus frogs (*Pseudacris maculata*) were heard and assumed to use this location and habitat.

6.3.1.4 Migratory Birds

Thirty six species of breeding birds were recorded during baseline breeding bird surveys. Surveys to determine breeding bird usage in the LSA were conducted on 25-26 June and 17 July, 2009 (Table 6-3). Four of the breeding species observed during these surveys: the bald eagle (*Haliaeetus leucocephalus*), lesser scaup (*Aythya affinis*), Swainson's hawk (*Buteo swainsoni*), and sora (*Porzana carolina*) are listed provincially as *Sensitive*. The short-eared owl (*Asio flammeus*) was also observed and recorded as being present and breeding in the LSA during spring soil surveys on 19-22 May, 2009. The short-eared owl is listed provincially as a species that *May Be At Risk* and by SARA as a species of *Special Concern*. Two red-tailed hawk (*Buteo jamaicensis*) nests and one Swainson's hawk nest were observed in the LSA and their nests were documented as being active during both breeding bird survey sessions. The Swainson's hawk nest was still active in September.

The observation that the short eared owl, which is a highly migratory and nomadic species, appears to utilize the LSA for breeding purposes and is of particular interest and potential concern with respect to the development of the PRP. This owl has small nesting territories and home ranges, which can vary from between 15 to 200 ha. Resident Owls will defend winter foraging territories as small as approximately 6 ha. They feed on small mammals and are a species of "*Special Concern under Schedule 3*" of the SARA. The short-eared owl breeds between March and June with the peak of the breeding season for the species in April.

**Table 6-3 Bird Species (Classified as Migratory Under the MBCA)
Observed During Survey Sessions at YYC**

Common Name	Scientific Name
American coot	<i>Fulica americana</i>
American crow	<i>Corvus brachyrhynchos</i>
American robin	<i>Turdus migratorius</i>
bald eagle	<i>Haliaeetus leucocephalus</i>
black-billed magpie	<i>Pica hudsonia</i>
black-capped chickadee	<i>Poecile atricapillus</i>
blue-winged teal	<i>Anas discors</i>
brown-headed cowbird	<i>Molothrus ater</i>
Canada goose	<i>Branta canadensis</i>
clay-coloured sparrow	<i>Spizella pallida</i>
common snipe	<i>Gallinago gallinago</i>
eastern kingbird	<i>Tyrannus tyrannus</i>
gadwall	<i>Anas strepera</i>
gray partridge	<i>Perdix perdix</i>
house wren	<i>Troglodytes aedon</i>
killdeer	<i>Charadrius vociferous</i>
Le Conte's sparrow	<i>Ammodramus leconteii</i>
lesser scaup	<i>Aythya affinis</i>
mallard	<i>Anas platyrhynchos</i>
northern shoveler	<i>Anas clypeata</i>
red-breasted nuthatch	<i>Sitta canadensis</i>
redhead	<i>Aythya americana</i>
red-tailed hawk	<i>Buteo jamaicensis</i>
red-winged blackbird	<i>Agelaius phoeniceus</i>
rock dove	<i>Columba livia</i>
ruddy duck	<i>Oxyura jamaicensis</i>
Swainson's hawk	<i>Buteo swainsoni</i>
savannah sparrow	<i>Passerculus sandwichensis</i>

Common Name	Scientific Name
short-eared owl	<i>Asio flammeus</i>
song sparrow	<i>Melospiza melodia</i>
sora	<i>Porzana carolina</i>
tree swallow	<i>Tachycineta bicolor</i>
vesper sparrow	<i>Pooecetes gramineus</i>
yellow warbler	<i>Dendroica petechia</i>
yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>
yellow-rumped warbler	<i>Dendroica coronata</i>

It should be noted that some of the bird species listed in Table 6-3 do not represent species of concern in terms of the effects assessment and, as a result, may not have been assessed under the VC Migratory Birds. The effects assessment for the PRP is focused on those birds that have been documented to occur within the LSA that are migratory, nest within the wetlands or semi-native vegetation communities within the assessment area or have provincial or federal significance. For example, the effects that the development of the PRP could potentially have on bird species such as the black billed magpie was not considered, but effects that the project could have on migratory species such as sora or blue-winged teal were.

6.3.1.5 Small Mammals

A variety of small mammal species utilize habitat that is available within the LSA. Small mammals are a recognized part of the food chain that supports larger wildlife species, such as weasels, foxes, badgers, coyotes, and raptors. Three small mammal species were captured during the live trapping program conducted as part of the baseline wildlife assessment in 2009. Species trapped during these programs were four southern red-backed vole (*Clethrionomys gapperi*), 24 deer mouse (*Peromyscus maniculatus*), and a solitary unknown shrew (*Sorex* sp.) species. The most common small mammal species found within the LSA is the Richardson's ground squirrel and it was observed on all sections of land within the groundside airport lands where vegetation cover is sparse. Numerous badger burrows were also observed during baseline wildlife field surveys conducted in tame pastures within the LSA on land parcels located at NE 9-25-29 and SE 16-25-29 W4M parcels.

6.3.2 Wildlife Habitat

Vegetation communities identified in the LSA as part of the baseline investigations are reflective of the dominant land use within and in proximity to the study areas. A highly modified, agricultural (cultivated)/ urban landscape, with extensive areas of existing anthropogenic disturbance (pasture, mowed grass and altered grasslands) were the common types of vegetation communities around the airport. Native vegetation communities were uncommon in the LSA and RSA. Coarse scale vegetation assemblages (landscape units) identified during baseline studies are outlined in Volume III, Chapter 4, Figures 4-2a to 4-2c and Table 6-4.

Table 6-4 Vegetation Assemblages at the Calgary International Airport PRP

Landscape Unit	Sub-Units	Extent (ha)	Percent of Project Area
Natural Landscape Unit	Semi-Native Prairie	62.02	11.62
	Semi-Native Aspen Stand	3.69	0.68
Wetland Landscape Unit	Temporary Pond (Class II)	12.00	2.2
	Seasonal Pond (Class III)	2.05	0.38
	Semi-Permanent Pond (Class IV)	7.29	1.4
Agricultural Landscape Unit	Cultivated	129.62	24.16
	Fallow	61.84	11.52
	Tame Pasture	82.99	15.47
Anthropogenic Landscape Unit	Disturbed	50.16	9.35
	Hedgerow	8.31	1.54
	Infill Wetland	49.35	9.20
	Stripped	66.98	12.48
TOTAL		536.30	100

6.3.2.1 Semi-Native Prairie

The semi-native prairie landscape unit is found on lands in the central portion of the LSA and was characterized by a modified grassland community surrounding semi-rural residences (Central Acreages) and situated between 36 Street to the east and Barlow Trail to the west. The vegetation of the landscape unit was dominated by smooth brome (*Bromus inermis*) and Kentucky bluegrass (*Poa pratensis*), with scattered occurrences of native shrub species such as prickly rose (*Rosa acicularis*) and pasture sagewort (*Artemisia frigida*). Wildlife species that were observed to occur in this habitat type in the LSA included several species of sparrow (clay-coloured, savannah, vesper).

6.3.2.2 Semi-Native Aspen Stand

The semi-native aspen stand landscape unit identified on lands in the LSA was characterized by a relatively small, remnant stand of deciduous forest aspen (*Populus tremuloides*), with a mix of balsam poplar (*Populus balsamifera*) in low-lying depressions on imperfectly drained soils in the area. The shrub layer found in association with this landscape unit in the LSA consisted of willow. Groundcover vegetation on lands occupied by the semi-native aspen stand landscape in the LSA were dominated by invasive agronomic species such as smooth brome with native fowl bluegrass (*Poa palustris*) and wire rush (*Juncus balticus*) in limited abundance. The noxious weed, Canada thistle (*Cirsium arvense*), was also observed to be abundant throughout the stand. Wildlife species present during baseline wildlife surveys of the landscape unit included American robin (*Turdus migratorius*), bald eagle (*Haliaeetus leucocephalus*), black-billed magpie (*Pica hudsonia*), black-capped chickadee (*Poecile atricapillus*), clay-coloured sparrows (*Spizella pallida*), common raven (*Corvus corax*), eastern kingbird (*Tyrannus tyrannus*), house wren (*Troglodytes aedon*), red-breasted nuthatch (*Sitta canadensis*), and yellow-rumped warbler (*Dendroica coronata*). The bald eagle which was observed and included in the assemblage noted is a species that is listed provincially as being Sensitive.

6.3.2.3 Agriculture

Cultivated lands, primarily used for the production of alfalfa crops, were the predominant land use on the majority of lands within the LSA and belonged to the agriculture landscape unit. The tame pasture sub-unit of the agriculture landscape unit includes all lands that are presently, or have been historically, used for pasture within the LSA. These lands were dominated in terms of their vegetation by Kentucky bluegrass, yellow sweet clover (*Melilotus officinalis*), smooth brome, and dandelion (*Taraxacum*

officinale). Wildlife species observed in the habitat type provided in the agricultural landscape and its tame pasture sub-unit included gray partridge, red-tailed hawk, Swainson's hawk, mule and white-tailed deer, long-tailed weasel, Richardson's ground squirrel, badger, and coyote. Of the species found to occur within the agricultural landscape during the baseline assessment of the LSA, the long-tailed weasel is listed provincially as a species that *May Be At Risk*, and Swainson's hawk and badger are both listed as species that are Sensitive.

6.3.2.4 Wetlands

Temporary, seasonal and semi-permanent wetlands occur in the LSA and provide habitat that is used by a wide variety of waterfowl. These LSA wetlands are also providing suitable habitat which could potentially be used during migration for staging and resting areas for larger waterfowl, including Canada and snow geese. Wildlife species observed during the baseline surveys that utilized the habitats provided by the wetlands that occur in the LSA included red-winged blackbirds (*Agelaius phoeniceus*), yellow-headed blackbirds (*Xanthocephalus xanthocephalus*), Canada goose (*Branta canadensis*), and numerous other waterfowl species such as the common snipe (*Gallinago Gallinago*), killdeer (*Charadrius vociferus*) and sora (*Porzana carolina*). Four wetlands that are labelled and shown on Figures 4-2a and 4-2b in Volume III, Chapter 4 are considered to be representative of Critical Wildlife Habitat as defined by VC4. The total area of Critical Habitat that is provided by these LSA wetlands has been determined to be 8.2 ha. The depth of pools found within these wetlands has the potential to provide critical habitat in terms of overwintering opportunities for the northern leopard frog and the Canadian toad, two listed species that might be found in the study area.

6.3.2.5 Disturbed Land

Disturbed lands included in this landscape unit were those areas within the LSA presently occupied by existing rural residences, municipal road rights-of-way, railway lines, transmission line corridors, and other industrial uses. This landscape unit included much of the Central Acreages area in the LSA which at the time of assessment contained occupied rural residences, farmyards and supporting infrastructure (roads, power line rights-of-way, etc.). Wildlife species observed to occur in this landscape unit included American robin, black-billed magpie, black-capped chickadee, clay-coloured sparrows, common raven, eastern kingbird, house wren, red-breasted nuthatch, and the yellow-rumped warbler.

6.3.2.6 Hedgerow

The lands in the LSA that are defined by the hedgerow landscape unit include a former/abandoned homestead and its associated narrow hedgerow. The hedgerow is comprised of planted plains cottonwood (*Populus deltoides*). The understory vegetation is comprised of smooth brome/invasive plant species including Canada thistle, perennial sow thistle (*Sonchus arvensis*) and dandelion. Wildlife species observed during the baseline assessment of the LSA that occurred in the habitat type the hedgerow provides included a good diversity of birds such as American robin, black-billed magpie, black-capped chickadee, clay-coloured sparrows, common raven, eastern kingbird, house wren, red-breasted nuthatch, yellow-rumped warbler, red-tailed hawk, Swainson's hawk. Mule and white-tailed deer were also noted during the baseline surveys to also utilize the hedgerow landscape in the LSA.

6.4 Effects Assessment

6.4.1 Effects Assessment Methodology

The purpose of the assessment of effects on wildlife and wildlife habitat was to identify and describe any such effects that may occur as a result of the construction, operation and reclamation of the PRP.

The effects assessment applies relevant effects hypotheses to each VC selected as representative of the resources under consideration and identifies potential effects that may occur to them as a result of the development, construction and operation of the PRP. The effects hypotheses used for this assessment are:

1. *Project infrastructure and activities due to the construction and operation of the PRP will cause the removal of existing habitat that is utilized by wildlife. Additionally, the presence of infrastructure and sensory disturbance (auditory, olfactory, visual) that will result during the construction, operation, closure, and post-closure of the PRP may cause direct and indirect (functional) loss of habitat that is presently available for the use of wildlife that occur in the Project area and which as a result may affect their behaviour, distribution, and abundance locally in the LSA, or regionally in the RSA;*
2. *Project infrastructure and activities that occur during its construction and operation may result in direct mortality to wildlife as a result of collisions with vehicles or in the worst case with planes.*

Potential environmental effects on wildlife and wildlife habitat were identified and evaluated for each phase of the PRP development and eventual operation. Effects were determined by predicting how project related activities were likely to interact with the wildlife and wildlife habitat VCs within the LSA. Factors used in the determination and analyses of potential environmental effects included:

- evaluation of project design and construction specifications;
- suitability of mitigation measures/Best Management Practices (BMPs), including the identification of project specific constraints (i.e. timing of activities in relation to local conditions and/or environmental conditions);
- potential residual effects that remain following the application of mitigation techniques and/or BMPs, and
- the significance of the potential residual effects that may remain.

Potential environmental effects for the PRP on the selected wildlife and wildlife habitat VCs are described in terms of their relative or absolute significance, where possible, and were determined through an assessment of the following characteristics:

- magnitude
- nature
- direction
- duration
- timing
- frequency
- scope
- reversibility

These characteristics were adapted from characteristics developed by the Canadian Environmental Assessment Agency (2006). Table 6-5 provides a definition of these and other terms applied in this report.

Table 6-5 Definition of Effects Assessment Terms

Term	Explanation
Project Phase	Refers to the phase of the project as construction, operation, or reclamation of the proposed PRP.
Potential Effect	Classification of the type of effects anticipated during a specific project phase.
Magnitude	Refers to the estimated percentage of population or resource that may be affected by activities associated with the construction, operation, or reclamation of the PRP. Where possible and practical, the population or resource base has been defined in quantitative or ordinal terms (e.g., units of habitat, hectares of soil types, etc.). Effect magnitude has been classified as less than (<) 1%, 1 to 10%, or greater than (>) 10% of the population or resource base. Where the magnitude of an effect has been defined as virtually immeasurable and represents a non-significant change from background in the population or resource, the effect is considered negligible.
Nature	Refers to whether an effect is directly related or indirectly related to the action that caused the effect. It also refers to if an effect will produce a cumulative effect by combining with another project, whether the project occurred in the past, present or future.
Direction	Refers to whether an effect on a population or a resource is considered to be beneficial, adverse or neutral.
Duration	Refers to the time it takes a population or resource to recover from the effect. If quantitative information was lacking, duration was identified as short-term (<2 years), moderate term (2 to 10 years) and long term (>10 years).
Timing	Refers to when the effect occurs. The effect can occur during a life stage of the project, such as construction, operation, or reclamation. The effect can also be seasonal, while the effect could also occur immediately or could be delayed.
Frequency	Refers to the number of times an activity occurs over the project phase, and is identified as once, rare, intermittent, or continuous.
Scope	Refers to the geographical area potentially affected by the effect and was rated as local, regional and beyond regional. Where possible, quantitative estimates of the resource affected by the effect were provided.
Reversibility	Refers to the extent an adverse effect is reversible or irreversible over a 10-year period.
Residual Effect	A subjective estimate of the residual effect remaining after employing mitigation measures in reducing the magnitude and/or the duration of the identified effects on the environment.

The selection of mitigation measures that are proposed to offset identified adverse effects on the wildlife and wildlife habitat resources of the LSA were based on the magnitude of the effect identified, as well as the direction, duration, frequency, and timing of the effect. Project effects that were determined as likely to have negligible effects were considered mitigated and no further corrective measures were proposed to reduce the effects. For other identified project effects, where mitigation measures, if applied, would reduce effects to a negligible level, or where they would result in a beneficial effect, they were selected. Mitigation selection was made taking into account the unique nature of the PRP without compromising the safe operation of the airport (Section 6.5).

Effects that remained following implementation of mitigation measures were classified as residual effects. The likelihood of an adverse significant residual effect occurring was evaluated following the Canadian Environmental Assessment Agency's *Reference Guide: Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects* (Canadian Environmental Assessment Agency 2003). Following this guide, the significance and adversity of the residual effect was determined based on the characteristics described in Table 6-6, including its magnitude, duration, scope, and reversibility. The likelihood of the effect occurring and the level of scientific uncertainty were considered. If there was a high likelihood of effects occurring, then the effect was considered significant. If there was no likelihood of the effect occurring, the effect was not considered significant. For the remaining effects, professional judgment was used to determine if the effect will be considered significant or not.

Table 6-6 Residual Effects Rating Criteria

Criteria	Rating	Definition
Direction	Beneficial	Beneficial change.
	Neutral	No change.
	Adverse	Adverse change.
Geographic Extent	Local	Effect is limited to the LSA.
	Regional	Effect extends beyond the boundaries of the LSA.
	Beyond Regional	Effect extends beyond the boundaries of the Lower Foothills Natural Region.
Duration	Short Term	Effects are reversible at the end of project construction.
	Medium Term	Effects are reversible at project closure.
	Long Term	Effects are reversible within a defined time beyond project closure.
Frequency	Once	Effect occurs once during construction, operations or closure.
	Intermittent	Effect occurs occasionally or periodically during construction, operations or closure.
	Continuous	Effect occurs continuously during construction, operations or closure.
Reversibility	Reversible	Effect is reversed after the activity ceases.
	Partially Reversible	Effect is partially reserved after the activity ceases.
	Non-Reversible	Effect will not be reversed when activity ceases.
Magnitude	Negligible	No measurable effects.
	Low	Effect results in a change of less than 1% of the regional resource.
	Moderate	Effect results in a change of 1 to 10% of the regional resource.
	High	Effect results in a change of more than 10% of the regional resource.

Significance of residual effects was determined using the significance rating criteria in Table 6-7. The degree of confidence in the baseline data used in completing the wildlife and wildlife habitat assessment for the PRP and professional judgement and experience were also taken into account in determining the significance of residual effects.

Table 6-7 Significance Rating Criteria

Effect Magnitude	Geographic Extent	Duration	Significance
Negligible	Any geographic extent	Any duration	Not Significant
Low	Any geographic extent	Any duration	Not Significant
Moderate	Local	Any duration	Not Significant
	Regional	Short term	Not Significant
	Regional	Medium term	Significant
	Regional	Long term	Significant
	Beyond Regional	Short term	Not Significant
	Beyond Regional	Medium term	Significant
	Beyond Regional	Long term	Significant
High	Local	Short term	Not Significant
	Local	Medium term	Not Significant
	Local	Long term	Significant
	Regional	Any duration	Significant
	Beyond Regional	Any duration	Significant

6.4.2 Wildlife

6.4.2.1 VC1a: Schedule 1 SARA Species & VC1b: Other Species at Risk

Construction

The construction of the PRP will have adverse effects on other “Species at Risk” that have been recorded as nesting or occurring within the LSA. These effects are predicted to occur as a result of the potential for direct mortality during this project phase. Further, PRP construction activities will result in direct and indirect effects to listed wildlife species by causing existing available habitat function in the LSA to be reduced in some instances and some of their existing habitat to be removed.

The activities expected to occur during the construction phase of the PRP are outlined in Volume II, Section 7 of the CS. Briefly, the entire LSA is proposed to be graded and the wetlands and semi-native vegetation communities that are present will, as a result, be removed. Following grading and landscape stripping, the area will be paved for the completion of the runways and the taxiways that make up the project. Paving and the loss of vegetative cover from the LSA will result in the generation of adverse effects on wildlife and particularly on those listed as being “Species at Risk”. Specifically, as a result of the grading of the site, all existing viable nesting habitat will be removed from the LSA. Given that the most likely area for these species to nest is within the semi-native or wetland vegetation assemblages, a total of 87.05 ha of habitat will be lost. This represents approximately 16.28% of the land area within the LSA.

An increase in vehicular activity is also anticipated and expected to occur during the construction phase of the PRP. Increased traffic has the potential to cause direct mortality to individual or nesting migratory birds. These would be a permanent and irreversible project effect to wildlife in the LSA. Other activities expected to occur during the construction of the PRP have the potential to cause the mortality of individual wildlife. For example, the accidental release of contaminants during construction may cause toxic materials that can then be absorbed, ingested or inhaled by resident wildlife to be released to the environment. If not mitigated, the chemicals may cause an adverse effect on individual animals and depending on the characteristics and amount of materials released, could also affect their abundance within the LSA and RSA. Examples of some types of materials of particular concern are hydrocarbons, antifreeze and oils used by construction equipment that could be spilled in the area.

The development of the PRP may also result in the generation of temporary auditory, visual and olfactory disturbance to individual animals and within habitat utilized by migratory birds present within the RSA and LSA. These types of disturbances have the potential to cause adverse effects to the functionality of habitat in areas within the RSA. These types of effects are predicted to be temporary and will only last as long as the construction phase of the PRP is ongoing.

Operation

The operation of the PRP will be conducted to be consistent with the Authority’s Wetland Strategy for Reducing the Risk of Bird Strikes. This management strategy provides guidelines that the Authority will use to reduce the amount of habitat present for nesting bird species. The Authority’s primary duty is for the care of passengers and their implicit guarantee of safe airport operation. To achieve their primary safety objectives, the Authority finds it is necessary to reduce the presence of birds in the immediate vicinity of YYC operations, particularly for large birds such as hawks and waterfowl some of which are listed as being species that are “At Risk”.

The Authority has the responsibility and mandate that allows it to remove wildlife species which may present a risk to aircraft. However, the primary focus of the Authority's management strategy aimed at achieving this net result is to act proactively by reducing the presence of species by selectively removing or altering and making the habitats that they utilize in the LSA less attractive to their continued use.

The operation of the airport will increase vehicular traffic and broaden the distribution of noise within the RSA. As a result, the operation of the PRP has the potential to increase auditory, olfactory and visual disturbance to wildlife species and individuals and/or their habitat in the RSA.

The auditory effects of the PRP and YYC will be ongoing throughout the operational phase of the airport. These effects can be mitigated to a degree by changes to flight patterns, but the most significant mitigation will result from further noise reduction at the source; in other words, quieter aircraft.

6.4.2.2 VC2: Migratory Birds

Construction

The construction phase of the PRP can have adverse effects on migratory birds through the increased potential for direct mortality. Direct and indirect effects on existing habitat functionality and the removal of existing habitat used by migratory birds within the LSA will occur as a result of the construction of the PRP.

Actions that will occur during the construction phase of the PRP are outlined in Volume II, Section 7 of the CS. In summary, the entire LSA is will be graded and in the process existing wetlands and semi-native vegetation communities will be removed. Following grading, parts of the cleared areas will be paved to create runways and taxiways of the PRP. These construction activities will have an adverse effect on migratory birds. As a result of the grading of the site, all viable nesting habitat that presently exists will be removed from the LSA. Based on the assessment results obtained from the baseline migratory bird surveys, the most likely area for these species to nest is within the existing semi-native or wetland vegetation assemblages present in the LSA. The area represented by this type of habitat that is estimated to be lost as a result of the construction of the PRP is 87.05 ha. This represents approximately 16.28% of the land base within the LSA.

An increase in vehicular activity is expected to occur during the construction phase of the PRP. Increased traffic has the potential to cause direct mortality to individual or nesting migratory birds. Increased mortality from these causes would be a permanent and irreversible project effect. The potential exists for other activities that occur during the construction of projects such as the PRP to result in mortality to wildlife. For example, a release of contaminants that may be absorbed, ingested or inhaled by individual animals may cause adverse effects to them and may also cause a reduction in the abundance of species and wildlife in general within the LSA and RSA. Adverse effects of this type may occur as a direct result of the accidental release of toxic chemicals such as hydrocarbons, antifreeze, lubricating oils, hydraulic fluids, etc. Mitigation measures and BMPs that will be employed during the project construction phase will counter and reduce the potential for these types of adverse effects to occur.

The development of the PRP may also result in the generation of temporary auditory, visual and olfactory disturbances to individual animals and to the functionality and, as a result, its availability for use of the existing habitat for migratory birds within the LSA and RSA. These types of sensory disturbance effects would be temporary in duration and would cease following project completion.

Operation

The operation of the project will be consistent with the Authority's Wetland Strategy for Reducing the Risk of Bird Strikes which provides guidelines for reducing the amount of habitat present for nesting bird species. The Authority's primary duty is for the care of passengers and to guarantee safe airport operation. As a result, it is necessary to reduce the presence of birds, particularly large birds such as hawks and waterfowl which are listed as migratory.

The Authority has the responsibility to remove species which may present a risk to the operation of the airport. The primary focus of the Authority's strategy is to reduce the presence of these species by removing habitat and thus discouraging them from occurring within the YYC lands.

6.4.2.3 VC3: Small Mammals

Construction

The construction phase of the PRP is predicted to result in the generation of adverse effects on the populations of small mammals that currently reside within the YYC lands. Small mammals are often adaptable to changes in physical environment and persevere within both semi-native and cultivated vegetation assemblages. It is anticipated that based on the results obtained from baseline trapping surveys that there is a moderate distribution and population of small mammals throughout the entire LSA.

The grading and clearing of the LSA in preparation for construction of the PRP will result in direct mortalities of small mammals. The habitat which currently supports these populations will be removed and replaced with paved areas and infrastructure. This will invariably have an adverse effect on the available habitat within the site and will result in a reduction to the present abundance of small mammals within the LSA. Other activities that will occur during the construction of the PRP are also predicted to result in direct mortality to individual small mammal or to species groups. For example, an accidental release of toxic contaminants could occur from equipment used during construction. These materials have the potential to be absorbed, ingested or inhaled by small mammals. Without the deployment of appropriate mitigation and BMPs, this type of contamination may result in an adverse effect to individual animals or if the spill is large enough, the material's toxicity is high or its effects are persistent, it could cause the local populations and abundance of small mammals within the LSA and RSA to be reduced.

It is unlikely that the construction phase of the PRP will result or cause any adverse effects to small mammal habitat or abundance within the RSA.

Operation

The operation of the PRP is unlikely to have any adverse effects on small mammal populations that persevere beyond the construction phase. These species are less likely to be adversely affected through disturbance of habitat through olfactory, auditory or visual disturbances that may occur as a result of the activities resulting from the operation of the PRP. Most small mammals nest in burrows and are highly adaptable to a change from semi-native prairie/cultivated agricultural habitat to those grassed areas that will exist at the airport. Common species like Richardson's ground squirrel, deer mouse and voles are likely to survive in moderate populations during the operation of the runway given that there will be broad grassed areas outside of the paved runway and taxiway areas.

6.4.3 Wildlife Habitat

6.4.3.1 VC4: Critical Habitat

Construction

The construction activities for the PRP are outlined in Volume II, Chapter 7. These activities include clearing and grading the entire LSA and filling of all existing natural wetlands. These activities will result in the loss of semi-native vegetation assemblages and habitat available in existing natural wetlands in the LSA. Both wetlands and semi-native vegetation assemblages presently exist within the LSA; however, only the wetlands provide “critical habitat” for wildlife use.

In summary, the entire LSA is proposed to be graded and wetlands and semi-native vegetation communities that presently exist in the area will be removed in the process of the PRP’s development. The lands on which the semi-native vegetation assemblages and the wetlands occur in the LSA covers approximately 21.43 ha of which 8.2 ha is classed as being critical wildlife habitat. The construction of the PRP will result in a net loss of all 8.2 ha of this habitat class.

Other activities associated with construction, including heavy machinery movements, increased vehicular traffic and paving and grading activities could result in the disturbance of critical habitat areas within the RSA. This may lead to a temporary reduction in the function of wetlands within the RSA for wildlife.

Operation

The operation of the PRP is unlikely to have any further adverse effects on critical habitat within the LSA as it is anticipated that all existing habitat will be removed. The potential exists for increases in vehicular traffic, increases in aircraft movements and the general broader scope of activities related to the increase in YYC lands that may contribute to some adverse effects to the function of critical habitat within the RSA. This would occur as a result of an increase in olfactory, auditory and visual disturbances in relation to the ongoing operation of the PRP.

6.5 Mitigation Measures

6.5.1 Wildlife

6.5.1.1 VC1a: Schedule 1 SARA Species

SARA is intended to protect certain species considered by the Government of Canada to be at risk of extinction in Canada. Schedule 1 species are those most at risk. Federal agencies are required by the *Act* to put in place action plans to protect them. Most such plans are still under development. Persons encountering resident SARA Schedule 1 species are expected to contact the Canadian Wildlife Service (CWS) to determine the appropriate course of action. The following outlines mitigation to ensure this objective is achieved for the PRP.

Pre-construction

Ideally, the most successful form of mitigation for pre-construction activities is to minimize activities in areas where the species occur. This is not practicable in the development of the PRP where broad scale clearing of the entire LSA is to occur.

The PRP site will be prepared prior to the initiation of the breeding season for Schedule 1 Threatened or Endangered SARA species that may occur in the LSA. This phase of the PRP project will involve the grading and clearing of all existing vegetation from within the LSA. The intent of this pre-project action is to discourage any further nesting or other use of the land by Schedule 1 Threatened or Endangered SARA species as construction activities for the PRP proceed. Pre-construction site preparation will occur

between August and March and will, therefore, exclude the primary nesting and breeding months for many species of April to July. This mitigation strategy should effectively limit the potential for Schedule 1 Threatened or Endangered SARA species to be present when PRP construction activities commence.

If resident or non-transient SARA species are observed within peripheral habitat outside the LSA that could be affected as part of the PRP pre-construction activity phase, setbacks that are in line with species protection guidelines and recommendations will be followed and provided to the greatest extent possible. However, such protective actions must be applied in such a manner as to not compromise the Authority's duty to provide safe operations of the airport. In the case that setbacks cannot be provided, the Authority's wildlife officer will work in cooperation with the relevant regulatory authority to identify alternate mitigative actions which may include the removal and relocation of the identified nest and/or animal.

Construction

Prior to construction, monitoring will be done for known Schedule 1 Threatened or Endangered SARA species. This monitoring will continue during all stages of construction. If an observation of a Schedule 1 Threatened or Endangered SARA species occurs, the area will be immediately flagged off and stop work imposed. The federal guidelines will be followed for the management of that species. This will be done in cooperation between the Authority and the regulatory authority (EC). A permit is required to disturb or remove SARA Schedule 1 species.

Operation

The existing practices will be continued by the Authority. Although there have been no encounters with residents of non-transient Schedule 1 Threatened or Endangered SARA species on YYC lands historically, should the unlikely event occur, the procedure will be to contact EC and undertake a species specific management strategy in cooperation between CWS and the Authority. This practice will continue for all YYC lands including the LSA.

6.5.1.2 VC1b: Other Species at Risk ("Listed Species")

Listed species includes SARA Schedules 2 and 3 species and species listed by COSEWIC or the Alberta Government.

Pre-construction

Ideally, the most successful form of mitigation for pre-construction activities is to minimize activities in areas where species at risk occur. This is not practicable in the development of the PRP where broad scale clearing of the entire LSA is required.

Prior to the commencement of PRP related pre-construction activities, a qualified biologist will survey the site flagging any nests or dens that were identified during baseline studies or are otherwise known to be present in the LSA of listed species. Any observations of listed wildlife species or their nests or dens will be recorded and the biologist will notify the Authority's wildlife officer of their presence in the activity area. Actions will then be taken to mitigate the potential threat to these species and locations that are consistent with the ECO Plan (Volume V, Item 14). Mitigation contained in the plan calls for the animals at potential risk to be removed and relocated from the area.

The PRP site will be prepared prior to the initiation of the breeding season for listed species that occur in the LSA. This phase of the PRP project will involve the clearing and grading of all existing vegetation from within the LSA. The intent of this pre-project action is to discourage any further nesting of listed species from occurring as construction activities for the PRP proceed. Pre-construction site preparation will occur

between August and March and will, therefore, exclude the primary nesting and breeding months of April to July. This mitigation strategy should effectively limit the potential for listed species to be present when PRP construction activities commence.

Short-eared owls and their nests are listed under SARA as Schedule 3 Special Concern. They should be protected and disturbance to individuals or their habitat should be avoided and nest protected if possible. Breeding individuals of this species were detected in the LSA during baseline studies conducted as part of this assessment. With the site preparation plan described above, this species and its habitat should be appropriately protected. However, a complete level of protection for listed species may not always be feasible and may actually be in conflict with the Authority's mandate, particularly where the future planning for the successful development of the PRP and safety of passengers is concerned. The Fish & Wildlife Division of ASRD provides guidelines to provide for the effective management for selected wildlife species that have been identified as at risk of extirpation, or that may be at risk of extirpation, or those that are sensitive and require special attention (ASRD 2001). These guidelines will be consulted and followed under the guidance of a qualified biologist to reduce the potential for effects on short-eared owls at this preliminary stage of the PRP development. Further, ASRD specialists will be consulted before removal or relocation is attempted. Following the pre-construction phase of the project, suitable habitat for the species will no longer exist in the LSA; however, alternate habitat is available within the region within the three natural areas evaluated as part of the baseline review.

The American Badger is considered *sensitive*, the Long Tailed Weasel is listed as *may be at risk* under the Alberta Wildlife Act, and both have been observed on YYC lands. Although these are sensitive species of interest they are not protected under the Alberta Wildlife Act or under SARA. These species breed in spring and their young are mobile and leave the den in mid to late summer. Earthworks should occur after the young are mobile and there should always be a safe escape route maintained for any resident animals attempting to move away from disturbance.

In mitigating effects on these animals, it is proposed to limit activities that occur between March and August within the LSA. It is during this period that these species will be rearing young within dens in the LSA. If works are required to be undertaken during this period, an approach similar to that for migratory birds will be undertaken. A wildlife biologist will survey the site prior to any activities occurring during these periods which may disturb nesting animals. If the biologist identifies active dens they will be flagged. Advice on how to proceed with the activity will be sought from ASRD.

Construction

Should a den or nest be found to be occupied at the commencement of construction for the PRP, the Authority's wildlife officer will be immediately notified. For listed species, appropriate action will be taken in cooperation with the relevant regulatory authority to remove or relocate the animal. In developing and restoring wetland function in the lands acquired by the Authority, efforts will be made to restore habitat and nesting resources for listed species as long as these efforts are consistent with the Authority's overall wildlife management policy and do not result in an increased risk to safety.

Short-eared owls and their nests are listed under SARA which requires that their nests not be destroyed or their habitat disrupted. Vegetation in the LSA that could potentially be used by this species will be cleared outside of the breeding period of the short-eared owl. Although it will disturb the potential habitat that the species uses during breeding, these actions will reduce nesting habitat within the development footprint which should act to discourage short-eared owls from nesting within the proposed area of disturbance in the future. Prior to construction, the area cleared will be re-examined by a qualified biologist to ensure there are no active short-eared owl nests present (see Volume V, Item 14).

Operation

The operation of the runway will be conducted in a manner consistent with the Authority's Wetland Strategy for Reducing the Risk of Bird Strikes. This strategy aims at discouraging birds from nesting on YYC lands. The actions that can and are taken by the Authority in carrying out their mandate range from disturbing and harassing individuals to killing them if all other management strategies fail.

Should species at risk be encountered during the operational phase of the PRP, they will be protected from airport operations to the greatest extent possible. Protection measures taken must, however, be reasonable and practicable and not compromise the Authority's duty to provide a safe aviation environment. Based on the general lack of available habitat that will remain following the PRP's construction and the wetland management strategies that are being employed by the Authority, the level of risk posed by the operational phase of the PRP to listed species should be minimal.

6.5.1.3 VC2: Migratory Birds

Pre-construction

Prior to the commencement of activities, a suitably qualified biologist will survey the PRP site to flag any nests of migratory bird species (Table 6-3). Flagging will allow contractors to be aware of where these wildlife features are located in relation to the clearing activities. Any observations of migratory birds made will be recorded and reported to the Authority's wildlife officer. Actions will then be taken to protect the nests that are consistent with the ECO Plan (Volume V, Item 14) which call for them to be removed and relocated. Removal and relocation will be done in cooperation with the relevant regulatory authority (ASRD).

Construction

The initial ground disturbance (topsoil removal/stripping) for the area covered by the PRP footprint will occur outside the breeding bird season (April 15 to July 31). By restricting the initiation of clearing to periods outside the main breeding season, the potential for effects on migratory birds to occur will be greatly reduced, but may not be totally eliminated. Should nests of migratory birds be flagged prior to the commencement of construction, they will be monitored by a suitable qualified biologist and should any individuals be found nesting, appropriate actions will be taken to mitigate the situation. These actions will be taken in accordance with the Authority's Wildlife Control Plan and in cooperation with the appropriate regulatory authority. Actions would consist of the removal or relocation of the identified individuals.

Several semi-native vegetation assemblages exist across the site including a number of small aspen stands. The PRP would result in the loss of these stands which provide habitat for migratory birds. If avoidance is not an option, the following recommendations should reduce the potential for the project causing an adverse effect to occur to migratory birds that occupy this habitat: (1) cut trees outside of the breeding bird season (April 15 to July 31); and (2) incorporate species within landscaped areas or other conservation initiatives that the Authority contributes to, to offset the loss of trees and to provide alternate habitat availability to the disturbed species.

Operation

The operation of the PRP will follow the guidelines set out in the Authority's Wildlife Control Plan. The Authority has a responsibility to ensure the safe operation of the runway. The Authority and its contractors will attempt wherever possible to avoid causing any harm to migratory bird nests that are located within their management area. The primary focus of the strategy that the Authority follows on their lands is to discourage birds from frequenting and utilizing the YYC lands.

6.5.1.4 VC3: Small Mammals

Pre-construction and Construction

Although small mammals such as Richardson's ground squirrel, voles and mice are important as food for predators, they are abundant in the LSA and the RSA. Effects on listed species such as badgers and long-tailed weasel will be mitigated, but effects on common small mammals will not. None of the species in the LSA that are recognized by wildlife biologists as small mammals are listed.

Operation

It is anticipated that small mammals will persist within the airport lands following the construction of the PRP. Small mammal species found in the LSA are highly adaptive and cope well within urban areas. Where off-site wetland restoration is to occur and in landscaping the site, efforts will be made to supplement habitat for small mammals wherever possible and without compromising the Authority's duty to provide safe operation of the airport for the passengers.

6.5.2 Wildlife Habitat

6.5.2.1 VC4: Critical Habitat

Pre-construction

Prior to the commencement of activities, a qualified biologist will survey the site flagging any critical habitat areas that are located within peripheral areas of the LSA. Additionally, those areas in the RSA which may be adversely affected through increased traffic will also be identified. Flagging will allow contractors to be aware of where these critical habitat features are located. Where possible and without compromising the Authority's responsibility to ensure the safe operation of the existing and proposed runways, these areas will not be disturbed. Presently, it is anticipated that the entire site will be graded with all areas of wetland being filled. An adaptive approach would be preferred; however, this will likely neither be practical or possible. As a result, some critical wildlife habitat within the zone of grading, infilling and stripping will unavoidably be lost.

Construction

Construction effects related to the development of the PRP will be reduced by controlling or eliminating unnecessary access to off-site areas and by the conservation of sensitive wildlife habitats. Sensitive wildlife habitats found in peripheral areas of the LSA or within the RSA will be off-limits to ground disturbing construction activities or will be restricted as much as possible. Staff and construction contractors will be trained by a qualified biologist with respect to the importance of protecting critically sensitive habitats and how to follow the prescribed mitigation measures to maximize their protection. Access to any retained areas located at the periphery of the PRP footprint but within the LSA that contain critical wildlife habitat will be prohibited. If it is not possible to avoid critical habitat for species at risk that occur within the project footprint area, the Authority will consult with the appropriate regulatory authorities (Environment Canada, ASRD) to develop alternative mitigation measures to afford the appropriate level of protection to these species and their habitats.

Operation

The Minister of Transport has created a policy that requires airports to establish wildlife control programs. The *Aeronautics Act* also gives power to the Minister of Transport to make regulations regarding wildlife management programs. To decrease the aircraft incidences with avian species at risk, or other wildlife species, YYC developed a Wildlife Management Plan. The Wildlife Management Plan includes habitat management, resource management and reactive strategies to keep wildlife from the airfield. The continuation of the Wildlife Management Plan is an effective mitigative technique to decrease wildlife strikes.

Ongoing landscaping and conservation initiatives by the Authority may incorporate vegetation species that provide for future habitat for listed species or migratory birds that will be disturbed or eliminated in terms of their future access and use of YYC lands as a direct result of the development of the PRP. In addition, the Authority is working with regulatory agencies and interested parties to design measures to replace wetland functions in the RSA.

The Federal Wetland Conservation Strategy calls for the conservation of wetland function while Transport Canada's airport wildlife management regulation has a strong focus on habitat modification to minimize bird strike risk. The Authority's Wetland Strategy for Reducing Bird Strike Risk is consistent with both the Federal Wetland Strategy and Transport Canada's wildlife regulation. To that end, the Authority has purchased 35 ha of land adjacent to existing airport lands but outside of the normal flight paths followed, west of Deerfoot Trail at Airport Trail NE. The purchased land could be used to restore and replace wetland function and to support Alberta's Water for Life Strategy. The Authority has established a stakeholder consultation group as a part of their wetland strategy that includes the City of Calgary, AE, DU, and other stakeholders. The purpose of the group is to discuss conservation measures that should be implemented on the purchased land to compensate for the unavoidable wildlife habitat losses that will accrue as a direct result of the development of the PRP.

It is anticipated that once completed, these new wetland areas will assist in maintaining or improving the overall functionality, diversity and habitat availability offered by existing wetlands within the LSA and RSA.

6.6 Sustainability Measures

"Biological diversity" is defined by the U.N. Convention on Biodiversity as "*the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems*" (U.N. Convention on Biodiversity, Article 2).

Natural regions and the biodiversity they contain are affected by human activities and disturbances, including urban growth, large-scale industrial activity, and natural disturbances or alterations such as climate change. By understanding what contributes to biodiversity and how it is maintained, we can better determine which types of species are most likely to decline under different circumstances and how best to protect them from extinction.

There are four levels of biodiversity that are commonly interpreted: 1) genetic diversity; 2) species diversity; 3) landscape diversity; and 4) ecosystem diversity. Each of these levels of biodiversity was used as a framework to describe the baseline biodiversity assessment and in determining the effects of the PRP on them. The environmental sustainability of a site may be supported by implementing measures (mitigation, enhancement, compensation, etc.) to maintain or increase the biodiversity it is capable of harbouring in perpetuity.

6.6.1 Genetic Diversity

Genetic diversity refers to the amount of genetic information that is contained among and within the individuals of a species, population, assemblage or community. It is a reflection of the sharing and flow of genes among populations, and includes changes to the gene pool that occur as a result of adaptation and genetic mutations that have given rise to distinct species. In general, the genetic diversity found within a population of a given species provides that species with an innate ability to adapt to changes in the environment (Abe et al 1997).

The gene pool of a particular area includes all the genes in all of the living organisms that occur there. Losing genes from the genetic pool naturally decreases diversity by resulting in a reduction of the collective genetic potential of the organisms to respond to real or potential changes to its environment. Therefore, maintaining the full complement of the existing gene pool in an area contributes to its sustainability. Since no rare species or segregated populations will be removed or eliminated from the gene pool as a direct result of the development of the PRP, in this respect, the project is considered sustainable.

Protected areas, landscapes and their habitats have emerged as a key wildlife management tool that is used in efforts to preserve biodiversity and maintain genetic diversity in an area. For example, within the City of Calgary, several areas have been set aside as park or conservation areas specifically to protect the existing genetic biodiversity of the region from ecosystem damage caused by resource development and human activities. These proactive and protective policies not only protect biological diversity they also serve to protect areas that are significant for cultural, spiritual, historical, traditional or economic reasons which in a sense is another form of diversity. Examples within the Calgary Region of these protected area policies in action are Nose Hill Park, Bowmont and 12 Mile Coulee Natural Areas (Calgary Parks and Recreation 1994). The PRP as a result of its development will not undermine any measures that are presently in place to protect the genetic diversity within the City of Calgary or the Province of Alberta and in the case of its new wetland development, may serve to enhance the overall sustainability of the area for wildlife although this will not be the case in the area of the PRP footprint.

6.6.2 Species Diversity

Species are distinct units of diversity, and species diversity is generally the number of different species within an area, and the relative abundance of each of those species in a community or ecosystem. Each species can be considered to have a particular role in the ecosystem, and the addition or loss of a species may have consequences to the ecosystem as a whole. Species in an ecosystem can be functionally similar (i.e., have similar niches), and can be grouped as species guilds (e.g. herbivores, large carnivores, raptors). Several functionally equivalent wildlife species guilds presently occur on the lands within the boundaries of the RSA including the following:

- small carnivores: coyotes, badgers, foxes, weasels;
- large herbivores: deer;
- small herbivores: rabbits and hares, ground squirrels, mice, and voles;
- raptors: eagles, hawks and owls;
- waterfowl: ducks, geese, swans, shorebirds; and
- upland breeding birds: songbirds.

Mitigation and sustainability measures that will be implemented by the Authority in response to the development of the PRP are aimed at maintaining wildlife populations within the greater region. The wildlife management measures that will be employed also manage the activity of animals that may cause risk to the operations of the airport in an appropriate manner. As such, the primary objective of the Authority with respect to sustainability measures for wildlife and their population and species diversity is to provide off-site mitigation measures such as wetland compensation and habitat conservation activities within the RSA. Given the wildlife species that are known to utilize the LSA, the availability of habitat within the RSA, the mitigation measures that are being undertaken and committed to by the Authority are considered adequate to maintain existing wildlife species diversity in these spatial regions.

6.6.3 Landscape Diversity

Presently, the LSA is characterized by a landscape whose diversity reflects the fact that these lands have been previously disturbed. There are few existing natural vegetation assemblages present in the LSA and those that do remain have suffered from considerable and prolonged disturbance that resulted from past agricultural, residential and industrial developments.

The LSA topography is characterized by near-level to gently sloping terrain with slopes in the area typically being less than 5%. Generally, the lands in the LSA are gently sloped from north to south. Where steeper areas do occur, they are characterized by drainage pathways that lead to various small wetlands that contain standing water during some parts of the year. There is no surface runoff from the LSA (Volume V, Item 3). The vegetation assemblages found throughout the LSA and in the wetlands are described in detail in Volume III, Chapter 4.

In general, the diversity of landscapes that presently occur in the LSA will be reduced as a result of the construction of the PRP. The topography is already generally flat, and whatever relief is present will be reduced following grading and subsequently by paving. Those wetlands that do occur with the footprint of the PRP will be infilled. Wetlands lost in this process which initially will reduce the diversity of the landscape will be replaced within the RSA by the creation of a new wetland as described previously. Other landscape features presently exist within conservation areas that are located within the RSA are several orders of magnitude larger than the extent of disturbance that the PRP will cause within the LSA. As such, although overall landscape diversity will be reduced as a result of the development of the PRP, these changes are considered minimal on a regional scale. The Authority will also undertake landscaping as part of its overall reclamation process following the completion of the PRP and through this process may be able to compensate further to the area's landscape diversity in the future.

It can be concluded that the development of the PRP will not have an adverse effect on the landscape diversity within the RSA,

6.6.4 Ecosystem Diversity

The term "ecosystem" refers to the dynamic complex of plant, animal and microorganism communities and their non-living environment interacting as a functional unit in a specific place. Ecosystem diversity refers to the number, variety and extent of ecosystems that occur and interact within a given geographic area. The RSA occurs within the Foothills Fescue Natural Subregion of the Grassland Natural Region (Natural Regions Committee 2006). Vegetation in its native form in this subregion is characterized by prairie grasses, scrublands and deciduous forests. Relatively few permanent standing water habitats (wetlands) remain within the subregion. Extensive cultivation of the highly productive prairie soils that underlay the subregion has resulted in the removal of vast areas of native vegetation, with remnant patches that remain undisturbed within the subregion providing critical habitat to some 25% of Alberta's rare vascular plant species (Natural Regions Committee 2006).

Characteristic species of wildlife that are found in these grasslands include the Richardson's ground squirrel and a host of predators that feed on it such as coyotes, badgers, foxes, weasel, and various raptors. Moist, moderately well drained sites that are found within the subregion grasslands often support shrub communities. Balsam poplar (*Populus balsamifera*), trembling aspen (*Populus tremuloides*) and plains cottonwood (*Populus. Sargentii*) stands occur on lower terraces and along rivers within the subregion with hybrids of balsam poplar and plains cottonwood also being found. Planted western cottonwood (*Populus deltoides*) trees also exist in some hedgerows found in the area associated with past or current agricultural practices. Characteristic wildlife species of tall shrub and woodland

communities found in the subregion also include numerous bird species, deer mice, mule deer, and white-tailed deer. Characteristic wildlife species found in wetlands in the subregion include muskrat (*Ondatra zibethicus*), geese, and numerous species of dabbling ducks, as well as red-winged and yellow-headed blackbirds, and chorus frogs.

If habitats are significantly altered by human activities, there is the potential for certain wildlife species that are either more resistant to change, or better suited to the newly altered habitat, to expand their range. The movement of non-native invasive species, either intentionally through reclamation programs, accidentally (e.g. weed species attached to transport vehicles) or through natural range expansion, can have an effect on biodiversity. An essential element of promoting biodiversity is the protection of vulnerable species and their habitats. Several species of wildlife and vegetation considered At Risk, either under SARA, COSEWIC or by the Government of Alberta were identified in this chapter or in Chapter 2 of this Volume.

For the PRP to exert environmental effects on biodiversity at the ecosystem level, construction and operations would have to significantly fragment habitat patches or alter natural succession. This is unlikely to occur given the relatively small footprint of the PRP, the already fragmented landscape that is present in the LSA and the prediction that the effects of the PRP on landscape biodiversity will likely be negligible.

6.7 Residual Effects and Evaluation of Significance

Residual project effects on wildlife and wildlife habitat are those effects that are predicted to persist after all prescribed mitigation measures that have been designed to offset the effects of the development of the PRP have been implemented. Criteria were established to characterize the residual effects for each project phase based on:

- direction: the ultimate long term trend of the environmental effect (e.g., positive, neutral or negative);
- geographic extent: the geographic area within which an environmental effect of a defined magnitude occurs (local, regional, beyond regional);
- duration: this is typically defined in terms of the period of time that is required until the VC or indicator (measurable parameter) returns to its baseline condition or the environmental effect can no longer be measured or otherwise perceived (i.e., short term, medium term, long term);
- frequency: the number of times during a project or a specific project phase that an environmental effect may occur (i.e., once, intermittent, continuous);
- reversibility: the likelihood that an indicator (measurable parameter) will recover from an environmental effect (i.e., reversible, partially reversible, non reversible); and
- magnitude: the amount of change that is predicted to occur in a measurable parameter or variable relative to the baseline case. Of all of the criteria used to rate potential residual effects after mitigation, magnitude most accurately reflects the degree of an effect. Magnitude refers to the intensity or severity of an effect and is the best indicator of the amount of change in a measurable parameter compared with baseline conditions (negligible, low, moderate or high).

6.7.1 Wildlife

6.7.1.1 VC1a: Schedule 1 SARA Species

It would not be acceptable for the PRP to have such residual adverse effects on Schedule 1 SARA species. Mitigation in place (Section 6.5.1.1 of this chapter) for this species is a legal requirement. On this basis, there are no anticipated residual effects on this VC resulting from the construction and operation of the PRP.

Significance of the Effects of the PRP on Schedule 1 SARA Species

Based on the above, the effects of the development of the PRP on Schedule 1 SARA wildlife species within the LSA and RSA cannot be considered significant as there are no anticipated residual effects.

6.7.1.2 VC1b: Other Species at Risk

The PRP will have adverse residual effects on “Species at Risk”. A number of “Species at Risk” based on a review of the scientific literature, the results obtained from baseline surveys and professional opinion are considered likely to occur within the LSA. Clearing in preparation for the development of the PRP is to be undertaken during periods when those species deemed to be most at risk are not active, nesting or breeding within the LSA. If this is not possible or practicable, then the area to be cleared will be surveyed by a qualified biologist before and after the breeding period (April 15 to July 31) and any migratory birds or other identified wildlife “Species at Risk” will be discouraged from settling there by means of direct disturbance to their habitats. Those species that occur within the LSA are also likely to exist within the RSA given habitat availability and functionality within this area. Species now present in the LSA that could be displaced as a result of the development of the PRP are expected to shift to these areas in the RSA since the existing habitat found in the area appears to provide better integrity and habitat quality or value. A reduction in the amount of viable migratory bird habitat, roosts or roosting purchases used during nesting as a direct result of the development of the PRP will have long term adverse effects within the LSA. However, these effects on migratory birds will not extend into the RSA. The adverse effects on migratory birds and especially on “Species at Risk” that presently occupy portions of the LSA will not have a high magnitude effect. As a result, threats to and effects on local or provincial populations of these species will not be sufficient to create a potential extinction event for a species.

The residual effects of the PRP on “Species at Risk” can, therefore, be considered adverse in direction, local in extent, long term, occurring only once, non-reversible, and low in magnitude.

Significance of the Effects of the PRP on At Risk Species

The mitigation of effects in place (Section 6.5.1.2 of this chapter) allows residual effects for this VC to be considered adverse in direction, local in extent, long term, occurring only once, non-reversible, and low in magnitude.

The number of individual wildlife that could be killed as a result of the development of the PRP has been greatly reduced as a result of the mitigation measures adopted. For example, as a result of the clearing of native and agricultural vegetation that is being completed during the pre-construction phase of the project and which is being done outside the breeding and nesting periods of species known or suspected to occupy portions of the LSA, adverse wildlife interactions will be reduced. Further, the operation of the PRP will involve the ongoing management of wildlife to discourage their presence within YYC lands. It is anticipated that at the time of construction, very few “Species at Risk” will be present on the YYC lands; those that are observed will be relocated or removed with the cooperation of the Authority and the relevant regulatory authority(s). As a result of these proactive measures, the construction and operation of the PRP is not likely to have any significant effect on “Species at Risk” populations within the RSA and would not lead to any local or regional extinction events for such species in the future.

Habitat for “Species at Risk” will be lost because of the construction and operation of the PRP. This existing habitat, however, already displays various levels of disturbance. In most cases, available remaining wildlife habitats found in the LSA have been substantially altered from what would have been their natural conditions. Similar habitat exists in a more natural state within permanent conservation areas within the region of the LSA. These areas represent wildlife habitat that exhibits better integrity and is of greater ecological value than that present within the LSA. The Authority’s wildlife and wildlife habitat management strategies that will continue to be followed after completion of the PRP will not adversely affect ongoing or planned City and provincial conservation efforts within the RSA. The construction and operation of the PRP would only have intermittent effects on the availability of this type of habitat in the RSA.

Where wetlands are lost, the Authority has acquired a parcel of land which is intended to restore wetland function. This area will include various measures to assist in the recovery of lost habitat for “Species at Risk”. The Authority has established a stakeholder consultation group as a part of its wetland strategy which includes the City of Calgary, AE, DU, and others. The purpose of this group is to collectively discuss conservation measures that will be implemented by the Authority on the purchased land to compensate for the loss of wetlands within the LSA.

On the basis of this assessment, the effects of the development of the PRP on “At Risk” wildlife species within the LSA and RSA are not considered significant.

6.7.1.3 VC2: Migratory Birds

The construction and operation of the PRP will have adverse residual effects on migratory birds. The infilling of wetlands and the clearing of semi-native vegetation will reduce the available habitat in the LSA that is used by migratory birds for nesting, roosting and to obtain food resources. These effects will occur across the entire LSA as a result of the development of the PRP; however, they are not anticipated to have permanent adverse effects within the RSA. The implementation of a wetland replacement strategy by the Authority will mitigate this adverse effect within the LSA.

The operation of the airport will result in the continued use of the Authority’s existing wildlife management practices which can include harassing or killing of birds that may pose a risk to the safe operations of the airport. Therefore, within the LSA, there may be ongoing intermittent adverse effects as a result of the development of the PRP to migratory birds that utilize the area. The RSA supports conservation areas with higher habitat quality than is present in the LSA. Those areas are used by the same migratory bird species and there is significantly more area available for their use in the RSA. Therefore, the effects of the PRP will not extend beyond the LSA.

Undertaking vegetation clearing activities during the winter months and outside the breeding period for migratory birds means that it is unlikely that development of the PRP will cause any direct mortality to migratory birds during this phase of the project.

The residual effects of the PRP on migratory birds can, therefore, be considered adverse in direction, local in extent, long term, intermittent in duration, partly reversible, and low in magnitude.

Significance of the Effects of the PRP on Migratory Birds

The residual effects from the construction and operation of the PRP on migratory birds is considered adverse in direction, local in extent, long term, intermittent in duration, partly reversible, and low in magnitude.

The direct mortality of migratory birds as a result of the development of the PRP will be greatly reduced by undertaking construction activities outside the breeding and nesting periods of the species known to occur or having the potential to be found on lands within its footprint. The operation of the PRP will continue the use of the Authority's Wildlife Control Plan which, through the removal of habitat or as a result of direct disturbance, discourages migratory birds from frequenting YYC lands.

Although migratory bird habitat will be permanently removed by the development of the PRP, it is anticipated that there will be some recovery of habitat within the parcel of land acquired by the Authority for the purpose of restoring wetland function. In addition, the existing habitat is substantially disturbed and within the region of the PRP and LSA, conservation areas exist that support wetland and native habitat. The migratory bird habitat that is available in these conservation areas represents better quality habitat that exhibits a higher level of ecological integrity and value than the habitat areas to be removed from the LSA during construction of the PRP.

Taking into consideration the above reasoning, it was concluded that the effects of the PRP on migratory birds will not be significant or lead to a substantial reduction in the population of these species in the municipality or province.

6.7.1.4 VC3: Small Mammals

The PRP will have limited adverse residual effects on small mammals. Small mammals found in the LSA are highly adaptable to urban areas and changes in their environment. The nature of the PRP will maintain habitable areas for small mammals in the form of grasslands and landscaped areas.

There is a likelihood of direct mortality to small mammal species especially during the pre-construction and construction phases of the PRP. These animals tend to dwell in the ground and, as a result, are generally unable to rapidly relocate in the presence of disturbance or danger such as that arising from construction activities associated with the PRP.

It is unlikely that the PRP would have any adverse effects on small mammals beyond the extent of the LSA. There exists similar habitat with better integrity and higher ecological value for these animals within the RSA.

Individual small mammals within the footprint of the PRP may be killed as a result of the increase in air and vehicular traffic that will result from its completion. As well, the standard wildlife and pest management practices followed by the Authority may also contribute to some limited mortality to small mammals.

Therefore, the residual effects of the PRP on small mammals was determined to be adverse in direction, local in extent, long term in duration, intermittent, partially reversible, and low in magnitude.

Significance of the Effects of the PRP on Small Mammals

The residual effects of the PRP on small mammals is adverse in direction, local in extent, long term in duration, intermittent, partially reversible, and moderate in magnitude. Small mammals exist in both cultivated/agricultural landscape units and semi-native landscape units. The habitat for these animals will be removed across 361.5 ha of the LSA and replaced with the runway and associated infrastructure. The paved areas will not be reclaimed in the foreseeable future. However, it is likely that a portion of the LSA outside the paved areas and infrastructure will continue to provide marginal habitat for these highly adaptive animals.

It is anticipated that construction of the PRP and the ongoing use of the Authority's Wildlife Control Plan will have a moderate adverse effect on the population of small mammals within the LSA. However, this group of animals is generally highly adaptable and often perseveres in urbanized areas and it is not anticipated that there will be any adverse effects on the abundance or species diversity of small mammals within the RSA. Effects will be least where ample habitat with better integrity and higher ecological value than that found on YYC lands exists within the RSA in close proximity to the lands that will be affected by the PRP. Small mammals are able to migrate to such habitat.

The loss of habitat to small mammal populations as a result of the development of the PRP is partially reversible, and despite the implementation of the Wildlife Control Plan, it is likely that small pocket populations of small mammals will persevere within grassed areas during the project's operation phase. The Authority has also purchased 35 ha of land adjacent to existing airport lands, west of Deerfoot Trail at Airport Trail NE. The land could be used to restore and replace wetland functions that will be lost from the LSA as a result of the construction of the PRP and to support Alberta's Water for Life Strategy. The Authority has established a stakeholder consultation group as a part of its wetland strategy that includes the City of Calgary, AE, DU, and other stakeholders. The consultation group will be used to discuss the types of conservation measures that will be implemented on the purchased land to most effectively achieve the level of habitat compensation required. It is likely that within this area, small mammal populations that are displaced from the LSA may move to this area. In addition, landscaped areas that will also form part of the PRP at the operational stage will also provide pockets of habitat for small mammals.

In summary, while the development of the PRP will result in long term adverse effects within the LSA on small mammals, this effect will not extend into habitat that exists in the RSA. Since the extent of the adverse effect is local and restricted to the footprint of the PRP, in spite of the magnitude, direction and duration of the effect, it must be considered regionally insignificant.

6.7.2 Wildlife Habitat

6.7.2.1 VC4: Critical Habitat

Wetlands within the LSA provide the only critical wildlife habitat which will be removed as a result of the construction of the PRP. These habitat affects will be confined to the LSA. Wetland habitat provides important nesting, feeding and roosting resources for "At Risk" wildlife species. This habitat will be removed during clearing for the PRP. The construction of the PRP will be scheduled to occur only outside the breeding periods of species that rely on these critical habitats and this mitigation measure should effectively eliminate any direct mortality to these species. However, the loss of wetland habitat that will occur in the LSA may have long term adverse effects to populations. Similar habitats exist within the RSA that have higher ecological integrity and are of greater value to affected species. Because of their proximity to the PRP footprint, they may be used by species displaced by the development of the PRP. On the basis of this assessment, the residual effects of the PRP on critical wildlife habitat are considered to be restricted to habitats in the LSA and not those in the RSA. The residual effects are also considered partially reversible as it is proposed to incorporate similar vegetation species within land that acquired by the Authority to replace the functions served by the existing wetlands within the LSA that will be lost during project development.

Therefore, the residual effects that the development of the PRP will cause to critical wildlife habitat were determined to be adverse in direction, local in extent, long term, occurring once, and partially reversible with a moderate magnitude.

Significance of the Effects of the PRP on Critical Wildlife Habitat

The Authority has purchased 35 ha of land adjacent to existing airport lands. This land parcel is located west of Deerfoot Trail at Airport Trail NE and outside the airport's normal flight paths. The land could be used to restore and replace the wetland functionality that will be lost as part of the development of the PRP, a part of the Authority's wetland mitigation plan and policy, and finally to support Alberta's Water for Life Strategy. The Authority has established a stakeholder consultation group as a part of its wetland strategy that includes the City of Calgary, AE, DU, and others. This group will assist the Authority and provide them with input and advice regarding the direction with respect to the conservation measures that should and will be implemented on the purchased land to meet the desired management objectives.

With implementation of the outlined mitigation measures to offset adverse effects that will result from the development of the PRP, the residual effects on Critical Wildlife Habitat within the LSA that will remain are considered to be long term and of moderate magnitude. The existing wetlands in the LSA where the majority of critical wildlife habitat is found will be infilled as part of the construction and operation of the PRP. Therefore, the effect of the PRP will be to remove critical wildlife habitat that is presently available. The effect of this wetland habitat loss can be mitigated but not within the LSA. Therefore, the residual effects would be adverse in direction, local in extent, long term, occurring once. Effects to critical wildlife habitat can be partially reversible and were determined to have a moderate magnitude of effect.

The semi-native vegetation communities that presently occur in the LSA will be removed in their entirety with the development of the PRP. These effects also cannot be completely mitigated within the LSA. Effects on critical wildlife habitat that occur in this habitat can be partly reversible through landscaping efforts that the Authority will undertake once the PRP is completed. However, in the interim, residual effects were determined to be adverse in direction, local in extent, long term, but occurring once and of moderate magnitude.

Ongoing disturbance to wetlands or vegetation communities that may attract birds to YYC lands will occur as part of the Authority's Wildlife Control Plan which has been developed in response to its responsibility to ensure safety for passengers in the operation of the airport.

In addition, the Authority will seed and landscape those areas outside the paved footprint of the PRP. Landscaping will include species that are native and may contribute to a partial restoration of lost habitat functionality within the LSA. However, the landscaping that is completed must not compromise the Authority's responsibility to ensure safe travel for passengers. Because of the limitations imposed on landscaping to meet wildlife management objectives, it will only be able to provide a marginal response to the loss of habitat within the LSA.

Although there is critical habitat lost within the LSA, this habitat has already suffered substantial levels of anthropogenic disturbance. Within the area encompassed by the RSA, several conservation areas currently exist where similar critical wildlife habitat is available. The habitat available to wildlife in these conservation areas tends to have higher ecological integrity and value than the habitat that will be lost from the LSA as a result of the development of the PRP. In addition, these conservation areas are far larger than those that will be lost from within the LSA. The construction and operation of the PRP will not generate adverse effects on these existing conservation areas. The loss of critical wildlife habitat within the LSA will not lead to any local or regional extinction of any At Risk wildlife species, nor will there be any significant reduction in the amount of available critical wildlife habitat in the region.

On this basis, the adverse effects of the construction and operation of the PRP on critical wildlife habitat were determined to be local only and are not considered significant.

6.8 Cumulative Effects

Cumulative effects are defined as changes to the environment that are caused by an action in combination with other past, present and future human actions (Hegmann et al 1999). A cumulative effects assessment is conducted to determine and assess any cumulative environmental effects over a “regional” area that are likely to result from the development of the PRP in combination with other projects and activities that have been or will be carried out.

Within the RSA, the limited direct and indirect effects that have resulted from past development projects that have taken place on YYC lands and in their immediate vicinity, when considered in addition to other existing and foreseeable projects including the PRP, are not expected to lead to a substantial increase to cumulative effects on natural habitats, wildlife and protected species of plants and animals. The PRP and other existing development projects (see Volume II, Chapter 7) will or have resulted in substantial modifications to the existing landscape within the RSA and these changes have caused effects on the wildlife and protected species that occupy these lands. The landscape that is present within the RSA and will be covered beneath the footprint of the PRP has been previously disturbed and is primarily under agricultural use. The foreseeable projects that were evaluated as part of the cumulative assessment are, therefore, not expected to generate substantial changes to this already substantively altered environment. As a result, there will be little cumulative effects on natural wildlife habitats or listed species that utilize the RSA.

Construction activities that may contribute to the generation of cumulative effects on wildlife and wildlife habitat include land clearing, grading, stockpiling, and roadway and building construction. Effects of these practices include increased noise from construction operations, temporary increases in water turbidity, temporary increases in air emissions, and an increase in the disposal and management of construction and/or demolition wastes, as well as destruction of habitat.

The existing land use classification for those vacant and undeveloped properties present within the boundaries of the RSA suggest that the long term planning goals for regional development are for further residential, commercial and industrial development. These planning objectives for the RSA are outlined in more detail in the Land Use Baseline Report (Volume V, Item 7). Based on the types of projects that are planned for the area, and the fact that the PRP is planned to be built in an area that has undergone previous disturbance and development, future projects in combination with the PRP would likely result in additional and significant cumulative effects on land use. Implementation of the projects envisaged for the RSA in the future would also not result in the conversion of substantial quantities of natural, undeveloped lands in the RSA or beneath the PRP. As stated throughout the assessment, little existing natural habitat is available in the RSA and the majority of lands have been previously developed. Future plans call for an expansion of the existing urban landscape. Properties that are located to the north and east of the PRP are currently used for agriculture and most of the large tracts of undeveloped land in the RSA are associated with parks. Many of the projects that in combination with the PRP have the potential to cause cumulative environmental effects will be subject to federal, provincial and/or municipal environmental reviews. These review processes will require these projects to provide for the conservation of environmentally significant areas within the region. Conservation will be achieved by requiring any future project to specifically consider the ecological value and importance of such areas within the project’s assessment of effects and through the application of rigorous standards for environmental management.

In summary, those wildlife habitat features that provide important nesting and foraging resources for significant species within the RSA are primarily found in existing conservation areas. Conservation areas that currently exist are not anticipated to be removed as a result of the development of any existing or proposed projects that are envisaged for the RSA in the future. The primary land use classification for the

area around the airport has been in place since 1978. It is anticipated that those areas within the RSA that are developable will be developed for urban purposes which will consist of industrial, commercial and residential projects. Undeveloped land other than the conservation areas and recreational parks within the RSA are those that are earmarked for substantial urban development and currently support landscape and habitat features consistent with the LSA's substantially disturbed features. Given that any existing and future developments are regulated by federal, provincial and municipal environment practices, it was concluded that there would be no significant additional cumulative effects generated that would affect wildlife habitat or wildlife populations in the RSA.

6.9 Follow-up and Monitoring

Once environmental effects have been assessed and the effects have been mitigated appropriately, a follow-up program or monitoring program is usually considered necessary. Follow-up is defined as “a program that is used to verify the accuracy of the identification of probable effects that were determined by the environmental assessment of a project and to determine the effectiveness of measures taken to mitigate the identified adverse environmental effects of the project” (Canadian Environmental Assessment Agency 2002).

Follow-up programs might be warranted when:

- a. there is a need to address project-related issues of public concern;
- b. there is a need to verify that mitigation measures were effective or successful;
- c. environmental effects of a project were assessed using new or unproven analyses or modelling; and
- d. there is limited experience implementing the type of project being proposed in the environmental setting under consideration; or scientific knowledge used to predict the environmental effects of the proposed project is limited (Canadian Environmental Assessment Agency 2002).

Follow-up programs can be time and resource intensive, and are only required where there is an identified need for a program based on the criteria set out above. In some instances, a monitoring program might adequately address environmental issues and ensure the environment is protected. Monitoring typically refers to a program designed to:

- a. confirm the effectiveness of a broad range of approved mitigation techniques;
- b. determine whether increased or different approved mitigation techniques are required to achieve mitigation or reclamation goals;
- c. identify and address effects experienced that were not predicted; and
- d. follow-up and monitoring programs are identified for specific disciplines in the following assessment.

Wildlife species at risk that are found on YYC properties including those that will comprise the PRP should be monitored. Currently, YYC conducts avian monitoring by observation on a weekly basis to determine the numbers and types of bird species that are utilizing lands under their management and in particular in relation to the active airfield. Observation can be an effective means of determining whether or not avian species at risk are frequenting the airport. Frequent observation is also an effective monitoring technique that can also be used as a means for the Authority to remain current with respect to the status of all wildlife species that exist and could potentially exist on their land. Any monitoring or follow-up program to be undertaken would be integrated with the Authority's ongoing practices.

6.10 Conclusions

Five wildlife and wildlife habitat VCs were selected as representative of the effects that the PRP could cause to this environmental component: wildlife Schedule 1 SARA species, other species at risk, migratory birds, small mammals, and critical wildlife habitat. The types of potential effects on the selected wildlife VCs that were assessed included

- a) changes to habitat availability resulting directly from vegetation clearing;
- b) indirectly from habitat avoidance caused by an increase in sensory disturbances; and
- c) increased wildlife mortality resulting directly from wildlife-project interactions.

The assessment of wildlife and wildlife habitat effects in relation to the development of the PRP were completed for three project phases: 1) pre-construction, 2) construction, and 3) operations.

The PRP has been planned to avoid sensitive wildlife habitats and periods, to the extent practicable. During construction and operations phases of the project, effects on wildlife habitat availability are predicted to be too localized to represent threats to the overall wildlife diversity at the RSA scale. During project construction and operations, effects on wildlife mortality for species of management concern are predicted to be too localized to represent threats to wildlife diversity at a regional scale.

Taking into account the Authority's commitment to mitigation, it is concluded that the PRP will not significantly affect wildlife or wildlife habitat in the LSA or the RSA either individually or in combination with other projects.

6.11 Response to Issues Raised by the Public and the Stakeholders

Issue: The potential effects of project activities on migratory birds and wildlife.

Response: The Authority is legally bound to maintain the safe operation of the airport, which includes management of wildlife issues and habitat (Transport Canada 2003). The Authority prescribes management techniques that aim to reduce or eliminate attractive wildlife habitat such as grass cutting and vegetation management. Under *SARA*, species at risk inhabiting federal land are protected. The Authority will continue to manage migratory birds and their habitat to reduce the risk of bird strikes on aircraft. At the same time, the Authority will take steps to protect rare species and their habitats if and when they are encountered in a manner consistent with maintaining safe aircraft operations.

Issue: The potential loss of wildlife habitat (i.e., wetlands) due to the project.

Response: Wetlands are not a compatible land use in and around airports and many wetlands have been infilled to reduce habitat for large birds and as an added measure to discourage large birds from visiting the airport lands. The Authority has taken the first steps to implementing work to maintain wetland function consistent with the Federal Wetland Conservation Strategy by purchasing a parcel of land between Deerfoot Trail and Nose Creek for that purpose.

Issue: How many ducks are you going to kill?

Response: The Authority's bird control measures are designed to discourage ducks from using airport lands, rather than shooting them.