Keeyask Generation Project

Environmental Impact Statement

Supporting Volume

Terrestrial Environment

KEEYASK

Hydropower Limited Partnership

June 2012

SECTION 6

BIRDS

KEEYASK
Hydropower Limited Partnership

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6.0 BIRDS

6.1 INTRODUCTION

Birds are an important component of the boreal ecosystem, with key roles in seed dispersal, insect population control, as food for other animals (including people), and as indicators of forest and wetland health. The roles of some major bird groups in the boreal forest ecosystem food chain are illustrated in Appendix 6B, Figure 6B-1, Figure 6B-2, and Figure 6B-3. Some species, like the bald eagle, are highly valued by First Nations people. Other species including ducks, geese, and upland game birds (*e.g.*, grouse) are a source of food for local people.

Bird communities within the Bird Local and Regional Study Areas (Zones 3 and 4 respectively for most birds; Section 1, Map 1.7-1) consist predominantly of migratory species, most of which arrive on the boreal breeding grounds in early spring and return to southern wintering grounds (*e.g.*, South America, southern United States) in the fall. Over 300 species of birds breed in the Boreal Forest Region (Blancher and Wells 2005). Of the 178 species that potentially breed within or migrate through the Regional Study Area, 124 have been observed during environmental studies (Appendix 6B, Table 6B-1). Most species inhabiting the Regional Study Area breed within the forests, wetlands, riparian areas, rocky islands and islands located in inland lakes. Some of the most common birds found within the major habitat types in the Regional Study Area are listed in Appendix 6B, Table 6B-2 and Table 6B-3.

Other birds breed in areas north of the Regional Study Area, and use bays and creek mouths of Gull Lake and bays and open water areas in off-system (*i.e.*, not part of the Nelson River) inland lakes as stopover (*i.e.*, **staging**) sites during the migration seasons. Non-migratory species (*i.e.*, **residents**) include 23 species that utilize the boreal forests of the Local Study Area year-round.

The bird community in the Regional Study Area is comprised of a number of different groups (*e.g.*, waterbirds, **raptors**, shorebirds, passerines [songbirds], upland game birds, woodpeckers) that utilize a variety of habitats within both the terrestrial and aquatic environments. The terrestrial environment supports forest-dwelling species (*e.g.*, songbirds, woodpeckers, upland game birds, raptors, nighthawks), while the aquatic environment supports waterbirds (*i.e.*, ducks, geese, swans, grebes, cormorants, herons, bitterns, pelicans, gulls, terns), shorebirds (*e.g.*, sandpipers, yellowlegs), raptors (*e.g.*, owls, hawks, eagles) and other birds (*e.g.*, kingfishers). Raptors and shorebirds, along with various species of waterbirds, utilize both terrestrial and aquatic environments at Keeyask. Use of the study area by birds is predominantly dictated by seasonal needs (*e.g.*, breeding, migration). The largest concentration and diversity of birds using the Regional Study Area occurs during the spring breeding and fall migration seasons.

Bird community dynamics within the boreal forest are influenced by many factors including: fire, weather, disease, insect populations (*e.g.*, spruce budworm), human development, hunting, pollution and climate change (Niemi *et al* 1998; IPCC 2002; Crick 2004; Leech 2007). These factors are not limited to the boreal forest as they can also influence boreal birds in migration and on their wintering grounds. While part of the focus of this assessment is on describing the existing bird communities utilizing the Local and Regional Study Areas (Map 6-1) and the factors affecting those populations, factors that may

influence bird communities in the future if the Project is not developed are also discussed in Section 6.3.3 (*i.e.*, Current Trends).

A total of eight bird species at risk have the potential to occur within the bird regional study area. Species at risk are those birds listed as endangered, threatened or of special concern by the *Manitoba Endangered Species Act* (MESA), the *Species at Risk Act* (SARA) and/or the Committee on the Status of Endangered Species in Canada (COSWEIC). Five of the seven species at risk, (*i.e.*, olive-sided flycatcher, rusty blackbird, short-eared owl, horned grebe and common nighthawk) have been observed using the Regional Study Area (Section 6.3.2.4). No nationally, regionally, or locally important migratory bird habitat, as designated by the Canadian Wildlife Service and/or Bird Studies Canada, occurs within the Regional Study Area (Poston *et al.* 1990; IBA Canada 2012).

6.2 APPROACH AND METHODOLOGY

6.2.1 Overview to Approach

Environmental studies specific to the bird communities of the Regional Study Area were conducted from 2001 through 2011 to gather pertinent information in support of an environmental impact assessment for the proposed GS development. A combination of local and regional bird studies, published scientific literature, local knowledge and ATK were used to describe the existing environment as it relates to the bird community and to assess and make predictions of how a GS project would affect birds using the Regional Study Area.

6.2.2 Study Area

From 2001 through 2011, bird surveys occurred within the terrestrial and aquatic environments that make up the Bird Study Area (Map 6-1). Bird communities were studied in on-system areas (*i.e.*, the Nelson River, including Gull Lake, Stephens Lake, Clark Lake, Split Lake) and in off-system areas (inland lakes and creeks) occurring to the north and south of the Nelson River (Map 6-2).

Bird surveys were primarily focused on three areas that would potentially be most affected by the construction and operation of a generating station at Gull Rapids: Gull Lake, the Nelson River (between Gull Lake and Birthday Rapids), areas downstream of Gull Rapids (*i.e.*, Stephens Lake) and access road areas (Map 6-1).

Gull Lake is characterized by inlets, bays and creek mouths, treed islands, and sand and gravel shorelines, while riverine habitat surveyed between Clark Lake and Gull Lake is characterized by fast flowing waters, areas of rapids and a number of rocky islands. Just off the main river channel between Gull Lake and Clark Lake are a number of inlets, bays, and creek mouths that support calmer waters and, depending upon the seasonal water levels, an abundance of aquatic vegetation, exposed shorelines and mudflats. Upland forested habitat, including areas along the proposed south access road, consists predominantly of open to closed stands of needleleaf woodlands on peatland (dominant tree species is black spruce. The north access road area is predominantly comprised of open to closed stands of needleleaf forests on

peatland, young regeneration on mineral and peatland in burned areas, and areas of black spruce and jack pine on mineral soil (Section 2.3; Manitoba Hydro 2009).

Bird surveys also occurred at Stephens Lake, a former area of river and peatland that was impounded during creation of the Kettle reservoir approximately 40 years ago. Parts of Stephens Lake (*i.e.*, north arm) functioned as a proxy area for bird studies as well as for plant and mammal studies. This area (aquatic and riparian zones) was studied as a predictor of what the Gull Lake bird communities may resemble following decades of impoundment. Information on the bird communities using Clark Lake and the stretch of the Nelson River between Clark Lake and Birthday Rapids was used for comparison to other on-system areas potentially affected by the Project (*i.e.*, Gull Lake and the Nelson River between Birthday Rapids and Gull Lake).

A stretch of the Nelson River between Stephens Lake and 10 km downstream of the proposed Conawapa GS was also surveyed for comparison to other riverine areas (Map 6-2). Considered a proxy area for bird studies, this reach is currently influenced by three hydroelectric generating stations (*i.e.*, Kettle GS, Long Spruce GS and Limestone GS) and consists of three lake-like reservoirs and three fast-flowing, turbulent GS outflow areas.

Bird communities utilizing waterbodies located adjacent to Gull Lake and the Nelson River (*i.e.*, off-system) were studied for comparison to on-system areas. Off-system inland lakes and creeks include Assean Lake, Assean River and lakes and creeks to the north and south of Gull Lake (Map 6-2). With the exception of some small inland lakes and creeks, off-system aquatic waterbodies adjacent to Gull Lake and the Nelson River are not expected to be affected by the development of a generating station at Gull Rapids. The comparison of bird densities and the distribution of breeding and migrating birds between on-system and off-system areas provides information regarding the overall magnitude of bird use of the areas that would likely be affected by the Project and compares it to areas that would not be affected.

The bird survey area also includes terrestrial environments. Bird communities were surveyed in representative habitats located along riparian areas and in upland forests adjacent to the Nelson River (between Birthday Rapids and Gull Lake) and Gull Lake areas (Map 6-3), as well as in forest communities that corresponded with the north and proposed south access roads and borrow areas (Map 6-3). Bird communities in riparian and upland forest areas adjacent to Stephens Lake were also surveyed for comparison to forested habitats along Gull Lake.

For the assessment of Project effects on bird communities, the Local Study Area was used to assess local effects on birds and the Regional Study Area was used as a regional comparison area (Table 6.2-1).

Table 6.2-1: Local and Regional Study Areas Used in the Assessment of Project-Related Effects on Birds

Supporting Topic	Study Areas (from smallest to largest)*				
	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Mallard		L	R		
Canada goose			L	R	
Bald eagle			L	R	
Olive-sided flycatcher		L	R		
Rusty blackbird		L	R		
Common nighthawk		L	R		
Other priority birds		L	R		
Other birds		L	R		

Codes in the table indicate which of the study zones were used as the Local Study Area (L) and Regional Study Area (R)
*Study areas shown on Map 1.7-1 in Section 1

6.2.3 Information Sources

6.2.3.1 Aboriginal Traditional Knowledge

Aboriginal traditional knowledge (ATK) on birds was provided from members of the Keeyask Cree Nations (KCNs) partner communities in a formal, community-driven traditional knowledge gathering process. While most of this information is provided in the KCNs' Evaluation Reports, some of it has been incorporated, along with "western science," into the overall terrestrial environmental assessment.

6.2.3.2 Existing Published Information

Waterfowl studies are being conducted throughout northern Manitoba and Nunavut through a joint venture among Missouri Department of Conservation, the University of Minnesota, and US Fish and Wildlife Service (Raedeke *pers. comm.* 2007). The team is studying density and breeding trends of Canada geese (*Branta canadensis*) in the Eastern Prairie population, and has provided support and background information to augment the results of field studies in the Regional Study Area.

Manitoba Conservation, in conjunction with the Missouri Department of Conservation, conducts annual Canada goose banding along the Manitoba portion of Hudson Bay and rivers emptying into Hudson Bay. The goal of this banding is to assist in the management of the Eastern Prairie population. It is conducted between mid-July and mid-August. Manitoba Conservation has provided the field study team with data and perspectives on general waterfowl habitat use in the Regional Study Area (Missouri Department of Conservation 2008).

In 1991, field investigations related to an environmental assessment study associated with the proposed Conawapa Generating Station were conducted along the Nelson River downstream of the Regional Study Area. The results of this study were reported in the Conawapa EIS (ID Systems 1993). These studies were resumed in 2004 in preparation for the pending Conawapa Generating Station EIS. These ongoing studies are intended to update and augment previous data and involve similar techniques as those employed in the Regional Study Area. Data collected during these studies can help in developing a regional perspective of bird populations near the Regional Study Area.

EIS studies of the avian communities in the Regional Study Area have been ongoing since 2001, and have been compared with studies conducted in the Wuskwatim Lake area[1] from 1999 through 2007.

6.2.3.3 Environmental Impact Assessment Studies

Studies of bird populations, distribution and habitat use were focused primarily within the Regional and Local Study Areas (Map 6.2-1, Bird Survey Areas). Three survey methods were used to obtain data on relative bird abundance, distribution, diversity and habitat use within the Regional Study Area's terrestrial and aquatic environments. They include:

- Helicopter-based surveys (these occurred in the spring, summer and fall between 2001-2003, 2010 and 2011 (Map 6-1);
- Boat-based surveys (these occurred in the spring, summer and fall of 2001-2003, including 2011; Map 6-3); and
- Terrestrial breeding-bird surveys (these occurred in the spring of 2001-2007, including 2010 and 2011 (Map 6-4).

For a complete description of survey methods used to gather information on birds, see Appendix 6B.

6.2.4 Assessment Methods

The general approach with respect to the development and use of wildlife mathematical models is well established in the field of wildlife management. The Wildlife Society publication "Techniques for Wildlife Investigations and Management" and the more recent update entitled "Research and Management Techniques for Wildlife and Habitats" (Bookhout 1994) both provide detailed descriptions with respect to the application of computer-based wildlife models. The use of wildlife models are widespread and expanding with respect to national and international development/application and are being increasingly used as tools for environmental assessment (Storch 2002).

The bird habitat models employed in this assessment build upon an approach in which up to eleven years of avian data, gathered using established avian survey methodologies, and was grouped into the broad habitat types that comprise the Regional Study Area (Canadian Wildlife Service 2008). One of the models used was a spreadsheet analysis that extrapolates average total bird density and diversity estimates from

[1] Wuskwatim Generating Station is currently being developed on Wuskwatim Lake, approximately 45 km southwest of Thompson, Manitoba, and 218 km southwest of the Keeyask Biophysical Study Area).

each broad habitat type sampled to the total area of each broad habitat type affected by Project development (*i.e.*, land clearing and flooding). This analysis estimated the number of breeding pairs displaced from potentially affected terrestrial areas.

This approach has been demonstrated to effectively predict bird distribution (Schmiegelow and Beck 2001) and has been used in support of a number of Manitoba environmental assessments, including the Louisiana Pacific Forest Management Plan (Louisiana-Pacific 1995) and Wuskwatim Generating Station and Transmission Line Projects (Manitoba Hydro 2003). It can be used to estimate how bird groups (*e.g.*, passerines) and/or individual species (*e.g.*, VECs) may be affected by development (*e.g.*, habitat loss).

For VECs that require specific habitat parameters found within the fine habitat types of broad habitat types, a more detailed bird habitat model will be developed and used to refine predictions of potential effects on VECs. These habitat models will be provided in a supplemental filing following the submission of the EIS.

6.2.4.1 Basis for Thresholds

Specific criteria are used in this assessment to classify the effects of the Keeyask Project on the terrestrial environment including birds (Keeyask Generation Project: Response to EIS Guidelines, Chapter 5). One of the criteria used to assess environmental effects is magnitude. For birds, the determination of magnitude is based primarily on changes in the availability of bird habitat (although consideration is given to other factors that could affect bird populations including increased risk of mortality). Magnitude determination is best guided by an examination of whether Project activities would exceed environmental thresholds as defined by laws, policy commitments, recovery strategies and management plans or experts (Lynch-Stewart 2004). A Project or cumulative effect is considered high magnitude when it exceeds a threshold of what is considered acceptable. Three magnitude ratings have been defined (low, moderate or high) for each of the key questions based on definitions in Table 6.2-2.

Table 6.2-2: Magnitude of Effects Criterion for Birds

Species Listing	Magnitude Rating	Method of Determining Magnitude (Quantitative)[1] Habitat Availability[2]
Olive-sided flycatcher (VEC), Rusty blackbird (VEC), Common nighthawk (VEC) and other Species at Risk	Low	Measurable change in habitat availability but levels expected to remain with the range of natural variability[3]
	Moderate	Habitat availability levels expected to be <10% below lower 95% limit of the range of natural variability[3]
	High	Habitat availability levels expected to be >10% below lower 95% limit of the range of natural variability[3]
Bald eagle (VEC), Canada goose (VEC), Mallard (VEC), Supporting Topics and other birds	Low	Habitat availability levels expected to be <10% below lower 95% limit of the range of natural variability
	Moderate	Habitat availability levels expected to be 10-20% below lower 95% limit of the range of natural variability
	High	Habitat availability levels expected to be >20% below lower 95% limit of the range of natural variability

NOTES:
[1] For birds measureable parameters where the range of natural variability is defined, change is measured relative to the 95% lower confidence interval for natural variability
[2] Only moderate- and high-quality habitat were used to calculate magnitude as it was assumed these habitat classes would be the preferred habitat and therefore would have a greater effect on the long-term sustainability of the species
[3]Source: KAVIK-AXYS 2002

6.3 ENVIRONMENTAL SETTING

6.3.1 Historic Conditions

To understand the bird communities in the Keeyask area prior to hydroelectric development the EIS content and Evaluation Reports developed by CNP, FLCN and YFFN were reviewed. All Evaluation Reports indicated that there were abundant bird communities in the area prior to hydroelectric development (CNP Keeyask Environmental Evaluation Report, FLCN Environment Evaluation Report (Draft), (YFFN Evaluation Report [*Kipekiskwaywinan*]). There was always abundant food provided by the land (nature). The people hunted waterfowl (geese and ducks) in spring and fall and harvested ptarmigan, ruffed and spruce grouse all year (FLCN Environment Evaluation (Draft), CNP Keeyask Environmental Evaluation Report).

Prior to hydro development, the relatively uninterrupted Nelson River posed numerous natural threats and had a reputation for being fast flowing with a swift current (FLCN Environment Evaluation Report [Draft]). In light of these conditions, the river was not suitable habitat for most waterfowl species. At that time, people preferred to hunt in areas such as Cache Lake and the Butnau River. These areas are still described as preferred hunting sites (FLCN Environment Evaluation Report [Draft]). Similarly, the

spring goose hunt continues at the small lake drained by Gull Rapids creek (CNP Keeyask Environmental Evaluation Report).

Prior to hydroelectric development, the water of the Nelson River was clean and potable (FLCN Environment Evaluation Report [Draft]). Now the water quality has gone down (YFFN Evaluation Report [*Kipekiskwaywinan*]). The decline in water quality has been linked to poorer quality flesh in fish and mammals such as beaver and muskrat. This decline in flavor was not mentioned for waterfowl, perhaps because they only spend a portion of the year at Keeyask.

All volumes mentioned that the spring waterfowl hunt continues to be an important part of the communities' traditional pursuits (CNP Keeyask Environmental Evaluation Report, FLCN Environment Evaluation Report (Draft), (YFFN Evaluation Report [*Kipekiskwaywinan*]). It appears that the bird communities have remained healthy and important to the First Nations for food and for teaching traditional ways of life.

6.3.2 Existing Environmental Conditions

Of the more than 172 bird species that could potentially be affected by the Project, about 150 are migratory species (*e.g.,* most songbirds, waterfowl, shorebirds, gulls and terns) and the remainder are resident or overwintering species (*e.g.,* grouse, ptarmigan, owls and woodpeckers). Birds that utilize the Regional Study Area were grouped into two broad categories, waterbirds and landbirds. Waterbirds included groups of birds that rely heavily upon aquatic environments for food, nesting, brood-rearing, and/or roosting activities. Waterbirds included waterfowl (*e.g.*, ducks, geese, and swans), gulls, terns, rails, cranes, herons, loons, grebes, pelicans, cormorants, bitterns, shorebirds and kingfishers.

Landbirds included bird groups that rely heavily upon terrestrial environments for food, nesting, brood-rearing, and/or roosting activities. Some species, such as osprey, were grouped in with landbirds under the group 'raptors' despite their dependency upon aquatic food sources (*e.g.*, fish). Bird groups such as 'raptors' were classified as landbirds if a majority of species belonging to the group rely on terrestrial environments. Landbirds included songbirds (*e.g.*, warblers, sparrows), woodpeckers, raptors and upland game birds (*e.g.*, grouse).

The following section provides an overview of the bird community, first by bird group, and then by Valued Environmental Component (VEC) and supporting topic. Bird VECs were selected from a group of '**priority birds**' which is comprised of species highly sensitive to human developments (*e.g.,* rare species) and/or species valued by people. The six bird VECs include mallard (*Anas platyrhynchos*), Canada goose (*Branta Canadensis)*, bald eagle, olive-sided flycatcher (*Contopus cooper*), rusty blackbird (*Euphagus carolinus*), and common nighthawk (*Chordeiles minor*). A total of 21 other priority bird species (supporting topic) have been identified and are discussed within their respective bird groups.

6.3.2.1 Waterbirds

Waterbirds included ducks, geese, swans, gulls, terns, loons, grebes, pelicans, cormorants, herons, bitterns, shorebirds, cranes, and kingfishers. Waterfowl (primarily ducks), gulls, terns, and shorebirds

were generally the most common groups of waterbirds using the aquatic environments in the Regional Study Area.

Three years of helicopter survey data indicated that throughout spring, summer, and fall, the greatest concentrations of waterbirds consistently occurred within on-system aquatic areas (Figures 6B-4 to 6B-6 and Table 6B-3). High-use areas included Gull Lake and Clark Lake, although the Nelson River stretch between these lakes generally supported a relatively high abundance and diversity of birds, particularly fish-eating gulls, terns and mergansers.

In the spring and summer seasons, off-system lakes and creeks consistently supported lower bird densities than did on-system lakes and rivers. An increase in bird abundance on inland lakes was generally observed in the fall, when waterfowl concentrated and **staged** during their southward migration (Table 6B-4). Boat surveys produced comparable trends to helicopter surveys for areas where surveys overlapped, though helicopter surveys appeared to be a more effective way of gathering data over a larger area.

The use of inland lakes, including Assean Lake, appeared to be influenced by on-system (*i.e.*, Nelson River) water levels. During the fall of 2001, when water levels in the Nelson River System were high (*i.e.*, 153.12 m at Gull Lake), bird densities on off-system lakes and creeks were higher than on the on-system areas. This supports study team observations and information from local resource users that waterbirds were generally more abundant in Gull Lake during migration seasons when water levels in the system were low. An increase in the abundance of birds in off-system lakes suggests that birds used other areas (*i.e.*, other lakes) if traditionally used staging locations (*e.g.*, Gull Lake) were unsuitable (*e.g.*, exposed shore areas under water).

6.3.2.2 Waterfowl

The highest densities of waterfowl were observed in Gull Lake and Clark Lake during the spring and fall migration periods (Table 6B-4). The abundance of waterfowl on Gull Lake was likely due to the variety of available habitats including bays, inlets and creek mouths. Most of the waterfowl observed at Gull Lake occurred in bays and creek mouths. Waterfowl staging at Gull Lake in the fall were predominantly mallard, geese and common goldeneye. During migration, goldeneye move from small inland lakes to congregate on larger waterbodies, including parts of the Nelson River and Gull Lake. Large lakes with shallow bays and inlets like Gull Lake provided important food sources and shelter for this species during the fall staging period.

Of all lakes surveyed in the Regional Study Area during the fall, Gull Lake supported the highest abundance and diversity of waterfowl. These results suggested that within the Regional Study Area, Gull Lake is an important stopover site for migrant waterfowl. The degree to which Gull Lake and other on-system areas are used by waterfowl is variable and highly dependent upon water levels. During the years of 2001-2003, water levels on Gull Lake gradually decreased, exposing more of the shoreline, river bottoms, and shore zone wetland (*e.g.*, sedge flats) with each passing year (Figure 6B-7). In response, waterfowl abundance steadily increased over the period, reaching the highest densities on Gull Lake during the fall of 2003 (Figure 6B-7). This trend suggested that increased abundance of migratory waterfowl were likely related to low water levels in Gull Lake.

Off-system inland lakes provide important breeding habitat for many of the diving duck species, including ring-necked ducks, common goldeneye, and lesser scaup. Some of the larger inland lakes provide staging habitat for birds during the migration season, especially during years when on-system water levels are high. For example, duck densities on inland lakes, including Assean Lake, were highest during years when on-system river water levels were highest (*e.g.*, 2001) and lowest when on-system water levels were low (*e.g.*, 2003)(Appendix 6A, Table 6B-3). Of all the aquatic environments surveyed during the fall migration, Assean Lake supported the largest concentration of Canada goose and merganser. Small inland lakes supported the largest concentrations of ring-necked duck.

During the summer, Gull Lake supported groups of non-breeding Canada geese, mallard bachelor groups (*i.e.*, flocks of all males), American widgeon, common goldeneye, lesser scaup, common merganser and white-winged scoter. The abundance of these species during the summer was low compared to spring and fall migration seasons. Low bird abundance and the few broods observed during surveys suggested that Gull Lake and the Nelson River were not optimal waterfowl breeding areas. In most years, food, shelter and concealment cover needed for brood-rearing is limited within the Nelson River. These factors, along with the presence of predatory fish (*i.e.*, northern pike, *Esox lucius*) likely contribute to the low numbers of waterfowl and waterfowl broods observed using Gull Lake and other on-system areas.

Common goldeneye is an example of a waterfowl species that dives and sometimes dabbles along shallow shorelines of inland lakes and rivers. It is representative of other diving ducks including scoter, ring-necked duck, and bufflehead. Common goldeneye feed on crustaceans (*e.g.*, crabs, shrimps), molluscs (*e.g.*, mussels and snails) and aquatic invertebrates (*e.g.*, fly larvae; Anteau and Afton 2008). This species is dependent upon mature and/or dead trees as they use previously excavated woodpecker holes (or other tree cavities) for nesting purposes within the Regional Study Area. Common goldeneye breeds in proximity to small inland lakes that support and abundant aquatic invertebrate community and few fish competitors.

Waterfowl broods were more commonly observed using the small off-system inland lakes located north and south of the Nelson River. Species breeding on the off-system lakes and creeks included ring-necked duck, lesser scaup, bufflehead, mallard, American widgeon, gadwall and green-winged teal. Presence of food sources, shelter, cover and suitable nesting habitat are factors that contribute to the greater abundance of broods observed in inland waterbodies. Canada geese are considered uncommon breeders in the Regional Study Area. Suitable breeding habitat for this species occurs in areas further north and northeast near the coast of Hudson Bay. Section 6.3.2.4 provides further discussion on Canada geese and mallard (both are VECs).

Although not observed during studies, canvasback and redhead are two duck species that may occur within the Regional Study Area. These species, along with gadwall are at the edge of their breeding ranges relative to the Regional Study Area. As such, all three are considered priority birds and are discussed further in Section 6.3.2.5.

6.3.2.2.1 Colonial Waterbirds

Seven species of colonial waterbirds occur within the Regional Study Area: ring-billed gull (*Larus delawarensis*), herring gull (*Larus argentatus*), Bonaparte's gull (*Chroicocephalus philadelphia*), common tern

(*Sterna hirundo*), black tern (*Chlidonias niger*), Caspian tern (*Sterna caspia*), American white pelican (*Pelicanus erythrorhynchos*) and double-crested cormorant (*Phalacrocorax auritus*). Herring gull, ring-billed gull and common tern are the most abundant and widespread colonial waterbird species known to breed in the area (Map 6-5). These three species are priority birds due to their use of rare environmental features (*e.g.,* rocky reefs and islands) for breeding (Section 6.3.2.5). While less common than other gulls, Bonaparte's gull are also found along the Nelson River, often nesting alone or in small groups on the tops of spruce trees near the river and/or along the edges of inland lakes. Nesting habitat for this species is abundant and widespread throughout the Regional Study Area. Less common species include American white pelican, Caspian tern, black tern, and double-crested cormorant, all of which are discussed as other priority birds (Section 6.3.2.5) due to their range limitations.

6.3.2.2.2 Shorebirds

Twenty-one shorebird species are expected to breed within or migrate through the Regional Study Area. Of these 21 species, killdeer (*Charadrius vociferus*), greater and lesser yellowlegs (*Tringa melanoleuca* and *Tringa flavipes*), spotted sandpiper (*Actitis macularius*), solitary sandpiper *(Tringa solitaria)* and Wilson's snipe (*Gallinago delicata*) were the most commonly observed within the Regional Study Area (Table 6B-1).

Shorebirds were widely dispersed throughout the Regional Study Area. Most species forage on plants and insects and nest along the shore zones of lakes, creeks and rivers. During environmental studies, the majority of shorebirds, including spotted sandpiper, were most commonly observed using areas with gently sloping banks and exposed gravel, sand, and/or muddy shorelines. Lesser yellowlegs foraged along the shorelines, but nested among trees, and were often observed in inland forests during the breeding season.

During spring migration, shorebirds were sparsely distributed across the Regional Study Area with occasional concentrations along the shore zones of inland lakes. During the summer breeding season, spotted sandpipers and other shorebirds were frequently encountered along the shore zones of Gull Lake and the Nelson River between Birthday Rapids and Gull Lake. Shorebirds were also often observed using the gravely/sandy shore zones, including dykes located along parts of existing reservoirs between Stephens Lake and Limestone generating station.

Shorebird abundance in areas along the Nelson River is strongly influenced by changes in water levels. During high water years (*e.g.*, 2011), the abundance and diversity of shorebirds observed along the Nelson River was low and birds observed were unlikely to be nesting due to flooded habitat. During normal water years, when mineral shorelines were exposed along parts of the Nelson River, Gull Lake and areas upstream to Birthday Rapids appeared to provide the most suitable nesting habitat for shorebirds. The highest density of shorebirds observed during environmental studies occurred in the summer of 2003 (average of 7.8 birds/km^2). This high density corresponded with low water levels (151.5 masl) at Gull Lake. When put into context, an average of 7.8 shorebirds/km^2 is low compared with average breeding shorebird densities in other regions of Manitoba. Along the Lower Churchill River, a shallow reef-rich river to the north of the Regional Study Area, densities averaging 212 birds/km^2 were observed in July 1995 and 1996. Breeding shorebird densities ranging from 48.1 to 74.2 birds/km^2 were observed along Hudson Bay from 1984-2000 (summer 2001), and 78.3 birds/km^2 during the 2004-2009 surveys conducted for Conawapa GS (Tetr*ES* 2010). However, the 7.8 birds/km^2 observed in Gull Lake is higher

than observed densities further downstream on the Nelson River (2.2 birds/km^2 from 2004-2009), where steeply sloping banks limit the occurrence of suitable shorebird habitat.

Following the breeding season, shorebirds flock together and switch to feeding primarily on aquatic invertebrates along intertidal shorelines such as the Hudson Bay coast (Manitoba Naturalists Society 2003). Female and juvenile shorebirds usually migrated in August and early September in the Regional Study Area, while males departed as early as mid-July (Chartier 1994).

While not observed within the Regional Study Area, red knots have the potential to migrate through the Regional Study Area. As a species at risk, the red knot is discussed further in Section 6.3.2.5.

6.3.2.2.3 Rails and Cranes

The sora rail (*Porzana carolina*) and sandhill crane (*Grus canadensis*) have breeding ranges that include the Regional Study Area (Table 6B-1). Both species rely on wetland habitats for breeding purposes. In the boreal forest, soras breed in localized areas where densely vegetated shallow wetlands occur (Carey *et al.* 2003). Although more active at night, soras were heard calling from wetlands located within the Local Study Area during morning breeding bird surveys. Yellow rails, though not observed, also have a potential to breed within the Regional Study Area. As a listed species at risk, they are discussed further in Section 6.3.2.5.

The sandhill crane was common within the Regional Study Area, usually observed in small groups in or near shallow lakes, bogs and fens. Peterson (2002) recorded this species breeding in the Regional Study Area, with migration beginning prior to October. Cranes also used vegetated shallow inlets with slow-moving water (Tacha *et al.* 1992). These observations are consistent with records of sandhill cranes. They wade among emergent vegetation in shallow water, foraging for amphibians, insects, aquatic invertebrates, rodents, seeds, berries and aquatic vegetation (Tacha *et al.* 1992).

6.3.2.2.4 Kingfishers

The belted kingfisher (*Megaeeryle alcyon*) is a fish-eating bird that nests in earthen burrows, located in the banks of creeks and rivers, and forages for fish, aquatic invertebrates, insects, and small vertebrates in rivers and streams with clear water.

Belted kingfishers were encountered along lakes (including Gull Lake), rivers and creeks within the Local Study Area. Terrestrial breeding bird surveys conducted from 2001 through 2003 indicated that on average, one belted kingfisher was observed per 2 km^2 of surveyed terrestrial habitat. Densities may have been higher along riparian areas as a minimum of 1 km of stream (and immediately adjacent vegetation) typically comprises a defendable territory for one pair of breeding belted kingfishers (Hamas 1994). While the availability of streams and lakes is not a limiting factor for belted kingfisher populations throughout their breeding range, which includes the regional study area, the availability of earthen banks suitable for nesting are often a limiting factor (Ellison 1985). Given that the Local Study Area consisted largely of peatland and gently sloping shorelines, availability of suitable nesting sites in inland areas likely limited the occurrence of kingfishers in the area. Surveys indicated that a small population of belted kingfishers bred along the Nelson River and foraged in adjacent areas (*i.e.*, along creeks and other waterbodies that

contained less turbid water). Belted kingfishers will forage up to 1.6 km from a nest if calm, clear water for foraging is not readily available near the nest site (US EPA 2002).

6.3.2.3 Landbirds

Landbirds included passerines (*i.e.*, songbirds), woodpeckers, raptors (*e.g.*, owls, hawks) and upland gamebirds (*e.g.*, grouse). Passerines were the most diverse and abundant landbird group found within the Regional Study Area.

6.3.2.3.1 Songbirds

The most common and diverse group of birds inhabiting boreal habitats were passerines or songbirds (Erskine 1977). Although some boreal songbird species occurred year-round (*e.g.*, gray jay [*Perisoreus canadensis*]), most were migratory, overwintering in areas further south. Songbirds overwintering in Mexico, Central and/or South America (*e.g.*, all warbler species) are 'neotropical' migrants while those species that overwinter in parts of the United States are considered short-distance migrants (*e.g.*, dark-eyed juncos [*Junco hymalis*] and fox sparrow [*Passerella iliaca*]). Many species of songbirds, particularly neotropical migrants, have been experiencing population declines over the past several decades due to a variety of factors including habitat loss and/or habitat degradation on either or both their wintering or breeding areas (Neimi *et al.* 1998).

Different songbird species prefer different types of vegetative communities for feeding and breeding, although considerable overlap occurs. For example, yellow-rumped warblers are one of the most common songbird species of the boreal forest and can be found in almost any habitat within the boreal forest where some spruce trees occur (Kirk and Hobson 2001, Hunt and Flaspohler 1998).

Other songbird species are more dependent on certain features of the landscape or more strongly prefer a particular vegetative community type. Examples include the palm warbler (*Dendroica palmarum*), which is most often found in close association with bog habitat, and the northern waterthrush (*Parkesia novebaracensis*), which nests and forages near shorelines and other wet areas that support a well-developed shrub community (Godfrey 1986; Manitoba Naturalist Society 2003). Information on songbird species abundance and diversity in the Local Study Area was compiled from breeding bird survey data gathered between 2001 through 2011.

Ground-based point count surveys for songbirds occurred within common habitat types, including moist, spruce-dominated needleleaf forest on peatland as well as in needleleaf treed on mineral soil and young regeneration (*i.e.*, post-fire) habitat types (Map 6-4). Table 6B-2 lists those songbird species that were most common within the habitat types surveyed in the Local Study Area and Stephens Lake proxy area. The most common passerine species (*e.g.*, yellow-rumped warbler [*Dendroica coronata*] and ruby-crowned kinglet [*Regulus calendula*]) recorded in forest communities within the Gull Lake and Stephens Lake areas were also common within boreal forest habitat throughout Manitoba (Erskine 1977; Bezener and DeSmet 2000).

Less common species included those listed by MESA, SARA and/or COSEWIC (*e.g.*, olive-sided flycatcher and rusty black bird) and those at the edge of their range relative to the Regional Study Area

(*e.g.*, clay-colored sparrow, blue-headed vireo, and ruby-throated hummingbird). These species are all discussed further as 'other priority birds' in Section 6.3.2.5.

6.3.2.3.2 Woodpeckers

The Regional Study Area has the potential to support six woodpecker species (Table 6B-1). They include: hairy woodpecker (*Picoides villosus*), downy woodpecker (*Picoides pubescens*), three-toed woodpecker (*Picoides tridactylus*), black-backed woodpecker (*Picoides aroticus*), yellow-bellied sapsucker (*Sphyrapicus varius*) and northern flicker (*Colaples auratus*). Of these six, the yellow-bellied sapsucker and northern flicker are migrant breeders. Yellow-bellied sapsucker is at the northern limit of their breeding range relative to the Regional Study Area, and as such is discussed as a priority bird in Section 6.2.3.4. Carey *et al.* (2003) note that the black-backed woodpecker is a common year-round resident in some northern locations, while the hairy and three-toed woodpeckers are rare to uncommon permanent residents of northern Manitoba. The downy woodpecker is generally only present in the southern boreal forests, but may be present beyond the northern extent of its range. Most of the woodpeckers observed in the Regional Study Area (Table 6B-1) occurred in upland and regenerating forest (*i.e.*, burns) habitats.

Woodpeckers create cavities in trees to forage for wood-boring insects, or to create nesting cavities or escape refugia (Ontario Woodlot Association 2006). Some woodpeckers prefer live trees for creating cavities, while others, such as the downy woodpecker, prefer dead or dying trees (Ontario Woodlot Association 2006). To provide adequate space for nesting cavities, trees should be a minimum of 25 cm in diameter at breast height (dbh) (Ontario Woodlot Association 2006). After nesting cavities have been abandoned by the primary user, they become important to secondary cavity users such as owls (*e.g.*, boreal owl), tree-nesting ducks (*e.g.*, common goldeneye) and cavity nesting songbirds (*e.g.*, boreal chickadee and flycatchers).

6.3.2.3.3 Raptors

Nineteen **raptor** species (eagles, hawks, falcons, ospreys and owls) potentially occur within the Regional Study Area (Table 6B-1). Fifteen raptor species are expected to breed within the Regional Study Area, with four species migrating through the area. Raptors occurring, or potentially occurring, within the Regional Study Area can be split into three main groups, based on their ecology: **piscivorous** (fish-eating) raptors, owls, and other raptors (*e.g.*, hawks, falcons). While most raptors observed in the Regional Study Area were bald eagles (VEC; Section 6.3.2.4), red-tailed hawks, and northern harriers were frequently encountered (Map 6-6: Owls, Hawks and Falcons Observed within the Regional Study Area). Bald eagles are a VEC species, and are discussed further in Section 6.3.2.4.

The Regional Study Area has the potential to support seven owl species (Table 6B-1). All except for the snowy owl breed within the Regional Study Area. Species observed included: long-eared owl, short-eared owl, great-horned owl, northern hawk owl, boreal owl, and great grey owl. Owls observed in the Regional Study Area (Table 6B-1) were recorded during ground-based nocturnal owl surveys (April), breeding bird surveys (June), and/or during spring, summer and fall helicopter surveys (Map 6-6).

Long-eared owls (*Asio otus*) are nocturnal hunters, feeding on small mammals and sometimes birds. They hunt in open grassy areas or forest clearings, and nest or roost nearby in densely forested areas. They migrate to the Regional Study Area to breed, and nest in stick nests built by other birds (Manitoba

Naturalists Society 2003). On rare occasions, they may be found to nest in tree cavities (Marks *et al.* 1994). In the Local Study Area, long-eared owls were observed nesting along the proposed north access road route, and along the shores of Gull Lake (Map 6-6).

Great horned owls (*Bubo virginianus*) use similar habitat as long-eared owls, preferring a mixture of dense boreal forest and open clearings. Due to their larger size, great horned owls can feed on a wider variety of prey, such as rabbits, geese, and herons (Houston *et al.* 1998). Like long-eared owls, great horned owls are nocturnal hunters. Great horned owls also use nests built by other birds, and will often nest in tree cavities or broken treetops (Houston *et al.* 1998). Two great horned owls were observed near Gull Lake (Map 6-6).

Northern hawk owls (*Surnia ulula*) are year-round residents of the Regional Study Area. They feed on voles and other small mammals. Birds may also be taken as prey especially during the winter months. Northern hawk owls hunt nocturnally and diurnally (during the day), often using treetop perches as hunting posts (Duncan and Duncan 1998). Northern hawk owls are tree-cavity nesters. Like other boreal forest owls, they select habitats with a mixture of coniferous forest and open clearings (Duncan and Duncan 1998). Several northern hawk owls were observed both nesting and foraging along the shores of Gull Lake and the north access road route (Map 6-6).

Great gray owls (*Strix nebulosa*) were also year-round residents of the Regional Study Area. One great gray owl was observed along the railway ROW south of Stephens Lake (Map 6-6). They hunt day or night, and feed on small mammals, especially rodents (Bull and Duncan 1993). They typically nest on broad or damaged treetops or take over existing nests belonging to other birds. While the great gray owl was upgraded to "no longer a concern" in 1996 (COSEWIC 2007), their populations are still vulnerable to the adverse effects logging and clear-cutting have on their habitat (Bull and Duncan 1993).

Boreal owls (*Aegolius funereus*), also year-round residents, are strictly nocturnal cavity nesters that use coniferous and mixedwood stands. They hunt small mammals, birds, and insects from tree branch perches. They rely on mature trees for nests and are therefore sensitive to logging and fires (Hayward and Hayward 1993). They will use nests made by other birds, and/or make nests in broken tops of trees and tree cavities or even in the brooms of trees infected with dwarf mistletoe. Boreal owls are one of the more common owl species to inhabit the Regional Study Area (Map 6-6).

Snowy owls (*Bubo scandiacus*) are diurnal hunters that prefer open areas. They are known to migrate through the Regional Study Area during the fall and early spring. Preferred breeding habitat for this species occurs on the open tundra north of the boreal forest (Godfrey 1986).

Short-eared owl is listed as special concern by SARA (Schedule 3) and COSEWIC. It prefers open habitats that support small mammals (*e.g.*, voles, mice), few trees or low shrubs (Jehl 2004). While evidence of nesting has not been observed, short-eared owls are known to forage within the Regional Study Area. Further information on short-eared owl is discussed under other priority birds in Section 6.3.2.5.

Other raptors that were observed in the Regional Study Area include osprey (*Pandian haliaetus*), a fish-eating species, that prefers to forage in lakes, creeks and rivers with clear water. Most observations of osprey were in off-system areas where both water turbidity and competition with bald eagles (a direct

competitor) is lower (Map 6-7). During the 2001-2011 field studies, only two osprey nests were identified despite extensive ground and aerial based surveys. One occurred in an aspen tree north of Gull Lake (just south of Little Gull Lake) and the other was on a transmission line tower southwest of Gillam (Map 6-7).

Peregrine falcon, listed as endangered by MESA, threatened by SARA (Schedule 1) and special concern by COSEWIC, may occur within the Regional Study Area during migration as it breeds in areas further north. Although outside of the Regional Study Area, one peregrine falcon was observed in May 2007, along a roadside east of Gillam. This species is discussed further as a priority bird in Section 6.3.2.5.

6.3.2.3.4 Upland Gamebirds

Within the Regional Study Area, the bogs, forests, and shrub-dominated areas provide habitat for a variety of upland gamebird species (*e.g.*, grouse and ptarmigan). All three of the grouse species, ruffed grouse (*Bonsa umbellus*), spruce grouse (*Falcipennis canadensis*) and sharp-tailed grouse (*Tympanuchus phasianellus*) have been observed on nests or with broods during Project studies. Forage habitat (*e.g.*, black spruce treed on uplands and/or shallow peatland, and young regeneration on uplands) for grouse and winter resident willow ptarmigan (*Lagopus lagopus*) is widespread throughout the Regional Study Area. The distribution of upland game bird species is widespread throughout the Regional Study Area, with species inhabiting different plant communities depending upon their seasonal (*e.g.*, breeding) and dietary needs.

During field studies, spruce grouse were the most frequently encountered upland game bird species. Based on the availability of their suitable habitat (*i.e.*, spruce forest) spruce grouse is the most common upland game bird known to breed within the Regional Study Area. Spruce grouse breed and overwinter in coniferous forest stands (*i.e.*, needleleaf treed on peatland; Section 2; Map 2.3-3), muskeg and bogs, eating berries, leaves and insects in the summer, and feeding almost entirely on conifer needles in the winter (Boag and Schroeder 1992). While habitat for spruce grouse is not likely a limiting factor for populations within the Regional Study Area, predation pressure likely has a large influence on their populations (Krebs *et al.* 2001). Many natural predators of grouse, such as raptors (*e.g.*, owls, hawks), fox, wolf, and lynx, exist within the Regional Study Area.

Sharp-tailed grouse and ruffed grouse have a more limited distribution within the Regional Study Area as they are both at the edge of their range relative to the Regional Study Area. Suitable breeding habitats for these two species are not considered abundant or widespread throughout the area. As such, they are discussed as priority birds in Section 6.3.2.5.

Primarily a winter resident, willow ptarmigan also inhabit areas of the Regional Study Area, specifically habitats supporting willows (*e.g.*, in and along forest openings, edges of wetlands, riparian areas; Storch 2000). The willow ptarmigan is considered a priority bird due to its value as a winter food source for the KCNs (2012). Willows were an important habitat component for ptarmigan in the winter as they provided ptarmigan with both shelter and food (*e.g.*, willow buds). Willow ptarmigan overwintering within the Regional Study Area move north in early spring to breed on open tundra habitat. As for all species of grouse, populations of ptarmigan fluctuate substantially and are regionally cyclical (10-year cycles in North America; Storch 2000).

6.3.2.3.5 Nighthawk

Common nighthawk is the only species of nighthawk to breed in North America, including the Regional Study Area. As a listed species at risk (threatened under SARA [Schedule 1] and COSEWIC) and VEC, common nighthawks are discussed further in Section 6.3.2.4.

6.3.2.4 Valued Environmental Components

All bird species are considered to be important components of the environment as they all play important roles (*e.g.*, as seed disbursers, scavengers, food for other animals including humans) in maintaining healthy, functioning ecosystems. While over 200 species of birds could be affected by the Project, for many species the anticipated Project effects are expected to be very small and well within the range of natural variability. For this reason and because it is not practical to investigate and assess the possible effects of the Project on every bird species potentially inhabiting the Regional study area, the assessment focused on the issues of concern or key topics.

Key topics for birds consist of individual species grouped as 'priority birds'. A listing of priority birds was developed based on the following criteria:

- Species listed as rare by Manitoba Conservation Data Centre (MBCDC);
- Species listed under MESA, SARA and/or by COSEWIC;
- Species at the edge of their breeding range relative to the Regional Study Area;
- Species dependent upon rare environmental features (*e.g.,* rocky reefs, rocky islands); and
- Species valued by KCNs.

A total of 26 bird species were identified as priority birds. Six of the 26 priority birds met the criteria to be selected as Valued Environmental Components (VECs) (Appendix 1.8, TE SV) while the remaining 21 are discussed as 'other priority birds' (*i.e.*, key topic).

All six bird VECs are migratory: Two are waterfowl (mallard and Canada goose) one is a raptor (bald eagle), two are songbirds (olive-sided flycatcher, rusty blackbird), and one is a nighthawk (common nighthawk). The olive-sided flycatcher, rusty blackbird and common nighthawk have federal protection under SARA.

6.3.2.4.1 Canada Goose

General Life History

The Canada goose is a grazer of upland plants (*e.g.,* grasses) and occasional emergent (*e.g.,* sedges) and submergent plants and seeds (Prevett *et al.* 1985; Godfrey 1986). They migrate through the Regional Study Area in May, stopping over on Gull Lake and parts of the Nelson River before making their way northward to their preferred breeding grounds (*e.g.,* the Hudson Bay Lowlands). While some Canada geese breed in the bird Local Study Area (often on islands located in inland lakes supporting sedge), they are relatively uncommon during the breeding and brood-rearing period. Optimal Canada goose breeding habitat (*e.g.,* floating/anchored bog/fen) is rare in the Regional Study Area and availability of adequate

forage (*e.g.,* sedge) along the Nelson River is limited, especially in years when river water levels are above average.

Historical Conditions

The highest densities of breeding Canada geese in the province were recorded in the Hudson Bay Lowlands Ecoregion (Ryder 1973). Areas along the Hudson Bay have historically provided suitable breeding habitat for this species. Canada geese as a historically important game species that is traditionally hunted during the spring and fall migration periods by all of the KCNs (CNP Keeyask Environmental Evaluation Report, FLCN Environment Evaluation Report [Draft], (YFFN Evaluation Report [*Kipekiskwaywinan*]).

Abundance and Distribution

The Canada goose is most abundant along the Nelson River and Gull Lake during the spring and fall migration periods. During years with low water levels, the bays, inlets and creek mouths associated with these reaches can provide suitable forage, shelter and cover for large flocks of migrant geese. These bays and inlets are not only important to Canada geese but also to the KCNs Members and other local resource users that use them during the spring and fall goose hunts (CNP Keeyask Environmental Evaluation Report). Off-system lakes (*e.g.,* small lake south of Gull Rapids), creeks, and rivers are also used by geese during the migration period, especially in the spring when larger waterbodies are still ice covered and unavailable to geese. Many of these inland areas (*e.g.,* Cache Lake, Butnau River, Kettle River) are important hunting areas, and serve as traditional goose hunting sites used by the KCNs during the spring and fall bird migration periods (CNP Environment Evaluation Report 2011; FLCN Environment Evaluation Report [Draft]). Both the YFFN and FLCN also refer to Members hunting geese in the spring (YFFN Evaluation Report [*Kipekiskwaywinan*]); FLCN Environment Evaluation Report). The FLCN Environment Evaluation Report recognizes that waterfowl and other migratory birds use environments other than the Keeyask area; and are only present in the Keeyask area for a limited timeframe (*e.g.,* spring and fall migration) (FLCN Environment Evaluation Report [Draft]).

Canada geese used the food-rich bays, inlets and creek mouths of Gull Lake and the Nelson River throughout the spring (Figure 6B-8), summer (Appendix 6B, Figure 6.3-6) and fall (Figure 6B-10) breeding and migration seasons. Of all areas surveyed, the highest average abundance of geese occurred in the spring along the Nelson River west of Birthday Rapids. The abundance of geese observed in Clark Lake, Gull Lake, and parts of the Nelson River suggest this area is was valuable for goose staging during spring migration. Although some geese breed within the Regional Study Area, most geese observed during summer surveys were groups of non-breeders (Figure 6B-8 and Figure 6B-9). The results of three years of field studies suggest that Gull Lake and parts of the Nelson River have value as stopover sites for migrating geese but are of low-value as breeding areas for geese.

The quality of the on-system habitats as staging areas for Canada geese is dependent upon system water levels. During years with low water levels, the bays, inlets and creek mouths associated with these reaches can provide suitable forage, shelter and cover for large flocks of migrant geese. The relationship between bird abundance and water levels was observed in the fall of 2003 when on-system water levels at Gull

Lake were the lowest they had been in three years of monitoring (*i.e.*, 2001-2003) and fall Canada goose abundances were the highest (Figures 6B-7 and 6B-8).

Gull Lake provides suitable fall and spring staging habitat for Canada geese. However, from a regional perspective, even the highest densities of geese utilizing Gull Lake are small (*e.g.*, 11.8 birds/km^2 in September 2003) when compared to populations of Canada geese staging in coastal areas along Marsh Point during the fall migration period (*e.g.*, 383 birds/km^2 in September 2006).

6.3.2.4.2 Mallard

General Life History

Mallard (*Anas platyrhynchos*) are the most abundant duck species in the Gull Lake area. Although mallards feed on plant material (*e.g.*, pondweed, sedges) and aquatic insects (*e.g.* amphipods) in shallow water (Bartonek 1972; Bellrose 1976; Godfrey 1986), they are considered an upland-nesting species that uses creeks and creek mouths for brood-rearing and foraging. They are primarily a ground-nesting species that frequently nests away from water. In boreal habitats mallards generally nest within 270 m of water (Bellrose 1976; Godfrey 1986). However, mallards nest in the widest variety of habitats of any duck species and will also nest in marsh habitat over water (Bellrose 1976). Mallards are one of the earliest-nesting duck species in the Regional Study Area. Most breeding mallards arrive and initiate clutches in May (Townsend 1966; Bellrose 1976). Mallard hens brood their young primarily within marsh habitat and prefer deep marshes on larger lakes, creeks and ponds with stable water levels (Bellrose 1976).

In cases where the first nesting attempt fails, up to 50% of females will re-nest (Bellrose 1976). Mallards are **dabbling ducks**, and will forage in shallow water by tipping their bodies head-downward into the water. The diet of mallards is highly variable and often consists of the seeds of various aquatic plants including pondweed, sedges, and grasses (Bellrose 1976). The diet of mallards varies with **life stage** and can include a high animal matter content, primarily aquatic insects and **amphipods** (Bartonek 1972; Bellrose 1976; Godfrey 1986).

Historical Conditions

The historic distribution of mallards (*Anas platyrhychos*) extends throughout northern Manitoba, including as far north as Churchill. During formal and informal interviews, members of First Nation communities have identified mallards as being an important historic game species.

Abundance and Distribution

Of the aquatic environments surveyed within the Regional Study Area, Clark Lake consistently supported the highest average densities of mallards throughout the migration and breeding seasons (Figures 6B-8, 6B-9, and 6B-10). In the spring, average mallard densities were nearly two-fold higher on Clark Lake than on Gull Lake and the Nelson River area west of Birthday Rapids (and east of Clark Lake). By summer, mallard densities usually decreased in other areas surveyed (*e.g.*, Gull Lake), yet remained high on Clark Lake. While some mallards may breed at Gull Lake and along parts of the Nelson River to Birthday Rapids, the low populations and numbers of broods observed during summer surveys indicate that other areas in the region have more optimal breeding habitat (*e.g.*, Clark Lake). Although mallards used the

food-rich bays, inlets and creek mouths of Gull Lake and the Nelson River throughout the spring, the highest mallard densities at Gull Lake were associated with the fall migration period, especially during years with low water levels (Figure 6B-7 and 6B-9).

The results of field studies and ATK agree that water levels appear to have a large influence on the abundance and distribution of waterfowl along the Nelson River. YFFN has indicated fewer ducks in the Split Lake area "because the shoreline habitat that they use has been flooded and eroded (YFFN Evaluation Report [*Kipekiskwaywinan*]). FLCN states that "after hydro flooding and the loss of stable shorelines the number of nesting waterfowl declined" (FLCN Environment Evaluation Report [Draft]).

6.3.2.4.3 Bald Eagle

General Life History

The bald eagle (*Haliaeetus leucocephalus*) is a fish-eating bird that nests in trees along the shoreline of the Nelson River and some inland lakes. Previous studies conducted by Manitoba Conservation on bald eagles in the Nelson River System indicate the Nelson River is a regionally important area for breeding and migrating bald eagles due to its ample breeding and foraging opportunities (Koonz 1988). Migration of bald eagles to northern Manitoba generally begins in late April. In areas near generating stations, relatively early ice-break-up may draw bald eagles north even sooner (Carey *et al* 2003). Only one third of the population of bald eagles breed in any given year, with the remaining population being juveniles, failed breeders, or other non-breeders (Koonz 1988). Those bald eagles that are breeding generally return to the same nests year after year. These nests are built with sticks, generally atop broken conifers or on cliff-tops. They are generally located near foraging habitat (Godfrey 1986). **Fledging** occurs by August in most areas, after which newly fledged eagles and their parents come to the Nelson River from the surrounding area to feed and stage until they depart on a southward migration that begins as early as September.

Abundance and Distribution

Bald eagles are the most common and abundant raptor species to inhabit areas along the Nelson River. The highest densities observed within the Regional Study Area generally occurred in mid-July and mid-September, in areas between Birthday Rapids and Clark Lake, and in areas downstream of Kettle and Long Spruce generating stations.

Approximately 13 eagle nests occur within the Regional Study Area (Map 6-7). Five of these nests fall within the '**zone of influence'** between Birthday Rapids and Gull Rapids. The majority of the 13 nests are used annually by one nesting pair of adult bald eagles. Bald eagles breeding along the Nelson River typically raise two young that leave the nest by mid-August. All of the bald eagle nests identified within the Local Study Area occurred in riparian areas. Densities of bald eagles within the Local Study Area generally peaked in the summer months. Once birds fledge, both adults and young will move into areas that support an abundant food source (*e.g.*, Nelson River).

Between 2001 and 2011, the average density of bald eagles inhabiting the Nelson River (between and including Split Lake to Kettle Generating Station) was 0.8 birds/km^2. Eagle densities are similar to those observed in other boreal areas including along the Burntwood River near Wuskwatim Lake (*i.e.*, generally

<0.7 eagles/km^2; Manitoba Hydro and Nisichawayasihk Cree Nation 2003). Along the Nelson River, spring densities averaged 0.2 eagles/km^2, with most eagles observed being adults. Densities increased to 1.3 birds/ km^2 in July with the arrival of non-breeders comprised of both adult and immature eagles. Densities remained high through September (average of 1.0 eagles/km^2), declining in October with the onset of migration.

Overall, the highest average bald eagle densities occurred between and including Split Lake and Birthday Rapids (1.1. birds/km^2). Higher concentrations of bald eagles (up to 3 eagles/km^2) were observed in areas further downstream, below the Kettle and Long Spruce generating stations.

Examination of the demographics of the eagles observed during spring, summer and fall surveys support the hypothesis that large numbers of non-breeders (and possibly some failed breeders) from other regions travel to the Nelson River to forage and rest prior to fall migration. If all bald eagles observed within the Regional Study Area also nested along the Nelson River, one nest for every two breeding bald eagles would be expected. Since a third of the bald eagle population is presumed to be breeding at any given time (Koonz *pers. comm.* 2008), approximately 23 nests should occur within the Regional Study Area. However, since only 13 nests were observed, it is assumed that the Regional Study Area is not at carrying capacity for bald eagles, despite the abundant forage sources and availability of nesting habitat.

6.3.2.4.4 Olive-sided Flycatcher

General Life History

The olive-sided flycatcher is a neotropical migrant songbird listed as threatened by SARA (Schedule 1) and COSEWIC. In Canada, this insect-eating songbird arrives in its breeding ground mid-late May, or as soon as ambient air temperatures will support abundant insect prey. This species of flycatcher is **monogamous**, with some research indicating strong breeding site **fidelity** (Altman and Sallabanks 2000). Olive-sided flycatchers produce three eggs on average and generally raise only one brood. Birds begin fall migration in late July, with most birds travelling to the wintering grounds sometime between mid-August and early September.

Historical Records

Historic records of the olive-sided flycatcher in North America and Canada report a 4% annual decline in population through the latter half of the 20th century. This significant and widespread reduction in numbers may be a result of the loss or alteration of habitat on wintering grounds and along migratory flyways (Sauer *et al.* 2005).

Records of olive-sided flycatcher in Manitoba are not available. Likewise, data on species presence from any part of the northern boreal forest are sparse, making assessment of local and regional olive-sided flycatcher population densities and trends difficult (Dunn *et al.* 2005).

Abundance and Distribution

This species is associated with mature forest stands, with complex canopy structure. Preferred nest sites near forest edges, where a closed canopy lies adjacent to bogs or post-fire habitats, provide adults with

tall trees for perching as well as forest openings, where flying insects are more abundant (Altman and Sallabanks 2000). Although there is evidence that the olive-sided flycatcher may be attracted to and even prefer to nest near patches of burned forest (Hutto and Young 1999), there is evidence that nestling predation by **corvids** (jays, ravens) and squirrels is high enough to substantially decrease breeding success when nesting occurs in proximity to burns (Robertson and Hutto 2007).

In the Regional Study Area, primary and secondary breeding habitat for olive-sided flycatcher is widespread, occurring in areas where coniferous forest edge occurs (Map 6-8). The majority of olive-sided flycatchers observed during field studies occurred in areas supporting mature black spruce forest adjacent to beaver floods, creeks, lakes and regenerating forest (*i.e.*, burns). Although rare, this species was observed in its primary and secondary habitat located throughout the Local Study Area (Table 6B-5).

6.3.2.4.5 Rusty Blackbird

General Life History

The rusty blackbird is comparable in body size to an American robin and was listed as a species of special concern by SARA (Schedule 1) and COSEWIC. Rusty blackbirds breeding in the Regional Study Area return to their nesting grounds in Manitoba from the Mississippi Valley area in the central U.S.A. As a monogamous pair, rusty blackbirds build their nest in riparian vegetation near or above a body of water, and produce a clutch of three to six eggs. The nestlings generally remain in the nest for 11 to 13 days before fledging.

Historical Records

In northern boreal Saskatchewan in 1996-1997, the North American Breeding Bird Survey (BBS) data indicated that rusty blackbird densities ranged between two to 31 individuals/km^2 (Hobson *et al.* 2000). A Ducks Unlimited Survey of the same geographical area in 2003-2004 yielded only seven individuals in 150,000 km^2. By comparison, in the Hudson Bay lowlands of northern Manitoba, rusty blackbird densities were 20 individuals/km^2 (Gillespie 1982).

Abundance and Distribution

Rusty blackbird primary and secondary breeding habitat includes wet peatlands (*e.g.*, bogs) and wooded swamps that are widely available throughout the Regional Study Area (Map 6-9) (Table 6B-5). Within these habitats, rusty blackbirds will nest in young conifers located adjacent to wetlands or areas that pool water. Within the Regional Study Area, rusty blackbirds were observed using riparian habitat associated with inland lakes, creeks, the Nelson River and Gull Lake (Map 6-9). This species was detected throughout the Regional Study Area and was most often associated with creeks, inland lakes, Nelson River shorelines, and wet peatlands located in inland areas. During the breeding bird surveys, detection of this species was relatively uncommon. Within the Local Study Area, average breeding density of rusty blackbirds was between 0.01-0.02 birds/ha (or 1-2 birds/km^2).

6.3.2.4.6 Common Nighthawk

General Life History

The common nighthawk is a medium-sized, insect-eating bird listed as threatened by SARA (Schedule 1) and COSEWIC. They forage for flying insects at dusk and dawn, filling a niche similar to that of bats. The common nighthawk migrates from wintering grounds in South America and arrives on breeding ground in Canada in early May to mid-June. They nest on bare ground, sand or gravel substrates, and particularly favour recent burns. Female common nighthawks display a high degree of breeding site fidelity, with a high return to individual nest sites each spring. This species produces one clutch holding an average of two eggs per year. Eggs are laid on the ground and are often preyed upon by predators such as American crows, common ravens, and gulls. Nestlings remain in the nest from mid-June to late August and are fully developed after 6-7 weeks of growth.

Historical Records

Historical data on the common nighthawk in Manitoba come largely from local ornithological societies. The data show that the species was in decline (75%) between 1976 and 1997, although numbers did begin to increase again between 2000 and 2005. These data are based mainly on visual counts from the Pinawa, Manitoba area that are thought to represent numbers migrating through from the northern boreal forest, including the Regional Study Area (Taylor 1996).

Abundance and Distribution

Common nighthawks are listed as threatened by SARA (Schedule 1) and COSEWIC. Their habitats are mainly found in high, dry areas of the Regional Study Area. Rock outcrops, ridges, high banks, and eskers with bare ground, such as recent burns make up primary and secondary breeding habitat for this species (Map 6-10). Within the Regional Study Area, common nighthawks have been observed nesting and foraging in regenerating forests (burns) and in areas along the south access road route. Foraging activity has been detected in open habitats including at wetlands, inland lakes, along the Nelson River and inland creeks (Map 6-10).

Within the Regional Study Area, common nighthawks have been observed in regenerating forests (old burns), along the south access road route and in fens associated with creeks and inland lakes (Map 6-10). Habitat is not considered to be a factor limiting common nighthawk populations within the Regional Study Area as primary and secondary breeding habitat is widespread and abundant throughout the region (Map 6-10; Appendix 6B).

6.3.2.5 Other Priority Birds

Other priority species include those that are listed by the MESA, SARA, COSEWIC, and/or MBCDC (*i.e.*, species at risk), those at the edge of their known breeding range relative to the Regional Study Area (*e.g.*, ruffed grouse) and those that depend on rare environmental features potentially affected by the Project (*e.g.*, colonial waterbirds).

6.3.2.5.1 Species at Risk

Eight species at risk, protected by provincial and/or federal legislation and/or listed by COSEWIC have the potential to occur within the Regional Study Area (Table 6.3-1). All but yellow rail, horned grebe, red knot and peregrine falcon have been observed within the Regional study area.

Table 6.3-1: Species at Risk That May Occur within the Bird Regional Study Area

Species	Status	Legislation	Breeding Habitat	Relative Abundance[1]
Yellow rail (*Coturnicops noveboracensis*)	Special Concern	SARA (Schedule 1)	Low vegetation on wet peatland	None observed; quality of habitat fluctuates with precipitation levels
Horned Grebe	Special Concern	COSEWIC (no schedule yet listed)	Shallow ponds and lake margins	One bird observed- during spring migration period
Peregrine falcon (*Falco peregrinus*)	Threatened	SARA (Schedule 1)	Not found in bird Regional Study Area	None observed; may occur during migration
	Endangered	MESA		
Short-eared owl *(Asio flammeus)*	Special Concern	SARA (Schedule 3)	Open habitats including low vegetation on peatland	3 birds observed
Rusty blackbird *(Euphagus carolinus)*	Special Concern	SARA (Schedule 1)	Riparian areas in wet peatland	<2 birds/km^{2*}
Olive-sided flycatcher *(Contopus cooperi)*	Threatened	SARA (Schedule 1)	Mature coniferous forest adjacent to beaver floods and other forest openings (*e.g.*, burn)	<2 birds/km^{2*}
Common nighthawk *(Chordeiles minor)*	Threatened	SARA (Schedule 1)	Open habitats including rocky outcrops, eskers and ridges	<4 birds/km^{2}* (in primary and secondary habitat)
Red Knot (*Calidris canutus)*	Endangered	COSEWIC and SARA (no schedule yet listed)	Intertidal, marine habitats, especially near coastal inlets, estuaries, and bays.	None observed; may occur during migration

Note:
* estimated breeding density within the bird Regional Study Area
[1] Based on field data gathered between 2001-2011

Historical Records of Species at Risk

Due in part to the remoteness of the northern boreal region, historical records for species at risk in northern Manitoba, including the Regional Study Area, are limited. For example, historical information on rusty blackbirds indicates a high degree of variability and unpredictability in populations (Gillespie 1982).

While there are official records of only 26 breeding locations of yellow rails in Manitoba, spreading from the southern grasslands to the Hudson Plain, in reality it may be that there are hundreds of actual breeding sites with many simply inaccessible to most birders, and/or rarely visited at night during the peak breeding season (Duncan 1996). However, while their historical and current status in Manitoba is unknown, yellow rails are in decline due to habitat loss throughout many parts of their breeding range.

Records of horned grebes breeding in Manitoba predominantly describe nesting populations in the Prairies Ecozone. Although horned grebes are documented as nesting in more boreal and subarctic zones throughout the province, nesting records for northern Manitoba are generally limited to Churchill where international Breeding Bird Surveys occur on a yearly basis.

Abundance and Distribution of Species at Risk

Although yellow rails (listed as special concern by SARA Schedule 1) were not observed breeding within the Regional Study Area, small patches of their preferred breeding habitat (*i.e.*, low vegetation on wet peatland) occur within the Regional Study Area (Map 6-11). Within their known range, yellow rails are localized, breeding in areas that provide suitable breeding habitat and breeding conditions (*e.g.*, water levels; Carey *et al.* 2003).

Recognized as endangered by the Manitoba Government (MESA) and threatened under Schedule 1 of SARA, the peregrine falcon is the only MESA-listed species that may potentially occur within the Regional Study Area. While known breeding records for the peregrine falcon include areas north and south of the Regional Study Area, they have not been observed breeding within the Regional Study Area. Of the peregrine falcons observed in northern Manitoba, none were confirmed to have nested there, as preferred nesting habitat, *e.g.*, steep cliffs, is relatively uncommon in this region. Although not observed during environmental studies, it is possible that the peregrine falcon will utilize the Regional Study Area during migration.

Short-eared owls are listed by SARA (Schedule 3) and COSEWIC as a species of Special Concern (SARA 2010; COSEWIC 2010). They nest in large (>28 ha) open grassy areas, including large open fens and wet meadows (Herkert *et al.* 1999). In the Regional Study Area, primary breeding habitat for this species occurs as large areas of low vegetation on wet peatland (Map 6-12). Breeding pairs build ground nests or 'scrapes' in tall grass/sedge and often share territory with northern harriers (Holt and Leasure 1993). This arrangement works well as the harrier hunts during the day, while the short-eared owl hunts small mammals and birds at dawn and dusk. Although short-eared owl breeding habitat exists within the Regional Study Area, evidence of short-eared owl nesting has not been observed.

Short-eared owls are migratory, and usually migrate south for the winter after congregating in pre-migratory flocks (Alsop 2001). They return to their summer breeding grounds prior to the April/May breeding season. During field studies, short-eared owls were observed on three occasions. One was of an owl flying over low vegetation in an area north of Highway 280 near Crying Lake (Map 6-12). Another individual was observed in primary habitat (*i.e.*, low vegetation) located on the edge of the Regional Study Area, just north of the railway right-of-way (ROW). A third short-eared owl observation was made along a sedge-filled creek mouth (Effie Creek) located along the edge of Gull Lake.

Although the horned grebe has not yet received official status under SARA, COSEWIC has identified it as a species of Special Concern and has recommended it be listed under the Act. COSWEIC has determined that approximately 92% of the North American breeding range of the horned grebe is in Canada. It has experienced both long-term and short-term declines, with no evidence to suggest that this trend will be reversed in the near future. Threats include degradation of wetland breeding habitat, droughts and oil spills on their wintering grounds in the Pacific and Atlantic Oceans. The horned grebe species is ranked as vulnerable in Alberta, imperiled in South Dakota and Minnesota and critically imperiled in Ontario and Quebec. The species is protected under the Migratory Birds Convention Act, 1994. One horned grebe was observed in the spring of 2002 on a waterbody connecting Cache Lake to Stephens Lake, approximately 0.5 km south of the South Access Road.

The red knot (*Calidris canutus*) is an endangered shorebird that makes one of the longest yearly migrations of any bird, traveling 15,000 km (Map 6-12) from its Arctic breeding grounds to Tierra del Fuego in southern South America. The tendency of red knots to congregate en masse at traditional staging areas makes them vulnerable to pollution and loss of key resources, and as a result, their numbers appear to be decreasing (Harrington 2001). Although possible, it is unlikely for this species to occur in the area during migration as the limited availability of suitable shorebird habitat within the Regional Study Area.

6.3.2.5.2 Species at the Edge of Their Breeding Range

In an early synthesis of methods and approaches, Lesica and Allendorf (1995) explored the value of directed efforts to conserve species at the periphery of their range. They noted that "Geographically peripheral populations are more likely to be imperiled than central populations. They tend to occur in less suitable environments and are often isolated from more central and continuous populations". Thus, peripheral populations are often smaller and more prone to extirpation. Because these populations exist in habitats that may be substantially different than those at the centre of their range, these edge population may be more likely to evolve and adapt to these edge habitats in a way that adds diversity and genetic diversity to the species as a whole.

A total of thirteen species are considered priority birds due to their range limitations relative to the Regional Study Area. They include four species of colonial waterbirds, three waterfowl, four songbirds, and two upland game bird species (Table 6.3-2).

Table 6.3-2: Bird Species at the Edge of their Breeding Range within the Regional Study Area

Species	Observed within Regional Study Area	Location	Relative Abundance[1]
American white pelican	Yes	Stephens Lake; Nelson River near Birthday Rapids	Increasing in occurrence;
Double crested cormorant	Yes	Stephens Lake; Clark Lake	Uncommon
Caspian tern	Yes	Gull Lake, Nelson River	Observed in 2001 and 2003
Black tern	Yes	Inland lake south of Gull Lake	Rare; 1 observed during fall 2011 studies
Gadwall	Yes	Nelson River at creek mouth; creeks	Uncommon
Redhead	No	Not observed	-
Canvasback	No	Not observed	-
Ruby throated Hummingbird	No	Not observed	-
Clay-colored sparrow	Yes	Regenerating forest; grassy cut lines	0.2 birds/km^2
Pine siskin	No	Not observed	-
Blue-headed vireo	Yes	Mixedwood forest	4 birds/km^2
Yellow-bellied sapsucker	Yes	Deciduous forest	One bird observed in 2011
Ruffed grouse	Yes	Hardwood dominated forest	Occasionally in preferred breeding habitat
Sharp-tailed grouse	Yes	Regenerating forest	Uncommon; one observed during spring studies

[1] Based on 2001-2011 field observations

Waterbirds

Four species of waterbirds are considered priority birds due to their range limitations. American white pelican, double-crested cormorant, Caspian tern, and black tern occur at the northern extent of their range relative to the Regional Study Area. Although considered uncommon, all four species have been observed during field studies conducted within the Regional Study Area. With the exception of Caspian tern, there is no evidence to suggest that these species breed within the Regional Study Area. Breeding

populations of American white pelican, double-crested cormorant and Caspian tern have been noted as increasing in North America. The boreal population of American white pelican has been noted as increasing since 2003 (BSI 2007; Sauer *et al.* 2003; Canadian Wildlife Service 2009).

In the Local Study Area, the occurrence of American white pelican has been increasing since 2007. While none are known to breed within the area, small groups have been observed foraging near rapids along the Nelson River and downstream of generating stations. The occasional double-crested cormorant has also been observed foraging near rapids, including below generating stations. Two pairs of Caspian terns were observed nesting with common terns in 2002 and 2003. Black terns have occasionally been observed foraging below existing generating stations and in rapids of the Nelson River.

Waterfowl

Three species of waterfowl (gadwall, canvasback and redhead) are at the northern extent of their range relative to the Regional Study Area. Only gadwall has been observed within the Regional Study Area (Table 6B-5). In the late 1990's gadwall were reported to have had larger population increases than any other any other species (Leschack 1997). In the Local Study Area, gadwall use habitats shared by other dabbling ducks including mallard, green winged teal and American wigeon. Both gadwall and gadwall broods have been observed in inland creeks and creek mouths that occur along and adjacent to the Nelson River.

Passerines

Two of the four passerine species present at the northern extent of their range (clay-colored sparrow and blue-headed vireo) are known to breed within the Local Study Area (Table 6B-5). Clay-colored sparrows breed in grassy habitats that occur along cut-lines and roadsides. Blue-headed vireos utilize closed-canopy conifer forests (that may or may not include a birch or poplar component) with a shrub (*e.g.*, willow, alder) understory. Both the blue-headed vireo and clay-colored sparrow are noted to have experienced a population increase and range expansion respectively (James 1998; Knapton 1994).

Woodpeckers

Yellow-bellied Sapsucker

Yellow-bellied sapsuckers are the only woodpecker species detected during field surveys and known to be at the northern extent of their range within the Local Study Area. This medium-bodied woodpecker nests and forages in early-successional aspen, birch and maple, as well as in mixed-conifer forest stands along riparian zones. Unlike most woodpeckers that are influenced by availability of dead snags for nesting or feeding, Yellow-bellied Sapsucker has very specific habitat requirements for young forests (Eberhardt 1994). Trends measured by BBS data suggest no changes in population from North American data for the yellow-bellied sapsucker between 1966 and 2000. However, the Canadian Wildlife Service reports a mean annual percent change of 8.8% for this species in Manitoba (CWS 2009), suggesting considerable growth in the provincial population.

Upland Gamebirds

Sharp-tailed grouse and ruffed grouse are two upland gamebird species that are at the northern extent of their range relative to the Regional Study Area. Sharp-tailed grouse are year-round residents, with preference for open, treeless habitats including bogs and fens (Godfrey 1986). Sharp-tailed grouse are less common than other grouse species inhabiting the area due to the lack of available breeding habitat. In boreal regions, large open treeless bogs or fens with limited shrub growth provide suitable breeding habitat for this species.

Ruffed grouse require broadleaf forests with downed woody debris measuring 35-40 cm in diameter and high stem densities (18-20 thousand stems/acre) during the courting and brood-rearing period. These habitats are relatively uncommon in the Regional Study Area (Map 6-13, Map 6-14). During the early spring breeding season (*i.e.*, May), male ruffed grouse declare territories by drumming (beating their wings) while standing on raised structures like stumps or downed woody debris.

Ruffed grouse inhabit the understory of broadleaf and mixed-wood stands, feeding on buds and leaves of aspen, birch and alder in the spring and summer, and catkins and twigs during the winter (Rusch *et al.* 2000). Within the Regional Study Area, ruffed grouse obtain forage in habitats that contain a deciduous tree and/or shrub component. Some of these areas would include cutline trails (linear features that have opened forest habitat and allowed for the establishment of shrubs), small areas of aspen or white birch forest and young regenerating forests (*i.e.*, post-fire habitats). While foraging habitat for ruffed grouse appears to be widespread throughout the Regional Study Area, ruffed grouse breeding habitat is limited.

6.3.2.5.3 Colonial Waterbirds

Three species of colonial waterbirds (*i.e.*, ring-billed gull, herring gull, and common tern) are considered priority birds due to their use of landscape features (*e.g.*, nesting islands) that are vulnerable to Project effects.

Ring-billed gulls and herring gulls are the two most common waterbird species found within the Regional Study Area. In the summer, gulls feed primarily on fish, invertebrates (*e.g.*, aquatic insects, clams) and carrion along the Nelson River (Pierotti and Good 1994; Ryder 1993). They are opportunistic, stealing food from other animals and scavenging along shorelines. While ring-billed gulls are considered nuisance birds in some parts of their range, they can also play a positive role in the ecosystem by keeping certain insect populations under control (Environment Canada 2008a).

The common tern was the most commonly observed tern species using the Nelson River. They fed primarily on small fish and insects that occur just at or below the water's surface (Manitoba Naturalists Society 2003). Common terns are specific in their selection of colonial nesting sites (McMahon and Koonz 1991, Cuthbert and Wires 1999), preferring small islands and reefs that within the Local Study Area occur between Gull Rapids and Birthday Rapids (Map 6-5). Depending on water levels, Gull Rapids supports 50-100 common tern pairs; upstream islands typically support a total of 30-100 pairs of terns. Tern nesting colonies are generally located within 9 km of primary forage areas (*e.g.*, rapids or areas of fast flowing water; BirdLife International 2012).

In the summer, gulls were the most abundant waterbird observed using rapids, shorelines, and nesting islands within the Nelson River. Gull Lake, Gull Rapids, and parts of the Nelson River to Clark Lake provide both foraging and nesting opportunities for gulls. Ring-billed gulls are known to nest on a variety of substrates and travel up to 31 km from breeding colonies to foraging sites (Nisbit 2002; Baird 1976). Within the Local Study Area, gull colonies occur on the exposed ice-scoured rocky reefs at Gull Rapids, which have supported between 800-1,500 pairs of ring-billed gulls and herring gulls. Upstream areas including the rocky island near Birthday Rapids (Map 6-5, Photo A), has supported over 1,500 nesting pairs of gulls.

The Gull Rapids area is considered unique in the Regional Study Area. The presence of exposed rocky reefs and abundant forage source (*e.g.*, fish) provides suitable colonial waterbird breeding habitat for hundreds of gulls and terns. The reefs not only provide security against land predators (*e.g.*, foxes) but they are high enough to enable successful nesting despite fluctuating water levels.

The uniqueness of the Gull Rapids area and its relative importance to gulls within the Regional Study Area is illustrated by the observation that aside from the gull colony upstream near Birthday Rapids, no other area surveyed during field studies supported a gull colony similar in size to the colony at Gull Rapids. In July 2007, an aerial survey of 540 km of lakes and rivers focused specifically on identifying the presence of, and potential for, other gull or tern colonies (Map 6-15). This survey provides information on a larger area and augments the helicopter-based surveys (Map 6-2). Three small gull colonies were identified using rocky islands in areas north of Gull Rapids (Map 6-15). Approximately five pairs were observed on an island in the North Arm of Stephens Lake, 20 pairs were observed on an island in Bissett Lake and 40 pairs were observed on an island at the confluence of the Churchill River and Little Churchill River (Map 6-15). All nesting sites were located on rocky islands surrounded by what appeared to be deep water.

6.3.2.5.4 Willow ptarmigan

As a traditional prey species, the willow ptarmigan is of intrinsic value to KCNs. It is primarily a winter resident, and inhabits areas of the Regional Study Area capable of supporting willows (*e.g.*, in and along forest openings, edges of wetlands, riparian areas and cut-lines; Storch 2000). Willows are crucial for ptarmigan in the winter as they provided both shelter and food (*e.g.*, willow buds). Willow ptarmigan overwintering within the Regional Study Area move north in early spring to breed on the open tundra. As for all species of grouse, populations of ptarmigan fluctuate substantially and are regionally cyclical (10-year cycles in North America; Storch 2000). The bird enjoys a widespread abundant habitat and occurs throughout the Regional Study Area. As such, breeding populations are not thought to be significantly affected by the proposed development.

6.3.3 Current Trends

Bird habitats within the Regional Study Area are currently influenced by factors such as climate, human development, annual insect abundance, fire, and disease. These influences will continue to alter the existing bird environment, well into the future, with or without the Project. Without the Project, it is anticipated that the Keeyask Regional Study Area will continue to support productive habitat for birds in riparian areas, forests, woodlands, wetlands, reefs, islands, rapids, lakes, bays inlets, and creeks.

Although no large-scale forestry or exploration activity is planned if the Project does not occur (Holmes *pers. comm.* 2008), roads may be constructed for other reasons. Fragmentation of the forest would increase through the future development of exploration lines ('cut-line'), transmission lines (*e.g.*, Bipole III), and associated roads. Below is a summary of expected changes to the various bird groups without the Project.

6.3.3.1 Expected Changes to Waterbird Community Without the Project

6.3.3.1.1 Waterfowl

The Regional Study Area provides suitable staging and breeding habitat for several waterfowl species. The quality of these habitats can be altered by a number of factors including wildfire, weather, mining activities, timber cutting, alteration of hydrology (*e.g.*, hydroelectric generating stations) and road development.

Within the Regional Study Area, the rate of fire occurrence and mining exploration activities are not anticipated to change in the near future. Current timber harvesting activities are minimal and likely limited to cutting for domestic firewood. Timber harvest is not anticipated to increase in the future due to the marginal timber available and distance to markets (Holmes *pers. comm.* 2008).

Future road development may affect waterfowl through increase in bird harvest due to improved access opportunities. These changes would most likely affect the waterfowl species typically harvested (*e.g.*, mallard, Canada goose).

Some boreal breeding waterfowl species, such as lesser scaup and white-winged scoter, are currently experiencing population declines. Both species have declined markedly since the 1980s (Austin *et al.* 2000 in The Wildlife Society 2004). Although causes for the decline are difficult to assess, they are expected to continue with or without the Project (Afton and Anderson 2001 in The Wildlife Society 2004).

The decline in certain species may provide opportunities for increase in others (*e.g.*, common goldeneye and/or ring-necked ducks). In addition, due to habitat loss in prairie regions (*e.g.*, draining of wetlands), there could be increased use of the Regional Study Area by species such as mallards. Dry years in the Prairie Pothole Region (PPR) of North America (*e.g.*, spring of 2008) sent breeding ducks further north into the parklands and boreal forest where conditions were more favourable (Derksen and Eldridge 1980; Hildegunn *et al.* 2005).

6.3.3.1.2 Gulls and Terns

Although nearly extirpated in the 1800s, ring-billed gulls are now common, widespread, and increasing in their breeding range (Ryder 1992). Since 1967, pesticide poisoning has contributed to a 71% decline in North American common tern populations (Nisbet 2002). While common terns are beginning to rebound in numbers in some areas, they are still considered to be in decline by the Audubon Society, Nature Canada and the Boreal Songbird Initiative. Intense management of breeding colonies and habitat protection will be required to slow this rate of decline (Butcher and Niven 2007). Competition with ring-billed gulls for nesting sites is one of many factors hindering the ability of common terns to rebound in some areas of their range (Hyde 1997).

Without the Project, local populations of gulls are expected to continue to be influenced by changes in water levels caused by seasonal precipitation and the operation of upstream generating stations. Above or below average water levels may alter the abundance and distribution of local gull and tern populations, which could lead to changes in gull and tern productivity. Gulls are at a competitive advantage over terns as they arrive on the breeding grounds earlier than terns, giving them opportunity to colonize the most optimal breeding sites (*e.g.*, rocky islands or reefs). As a result, terns are forced to use suboptimal breeding habitat that may occur along the edges of rocky islands/reefs in cases where suitable nesting habitat is limited. Fluctuations in gull and tern distribution, abundance and productivity within the Regional Study Area are anticipated to continue with or without the Project.

6.3.3.1.3 Shorebirds

The quality and quantity of wetlands, shorelines/riparian areas and coastal/tidal zones are limiting factors in the ecology of shorebirds (Matthews *et al.* 2004). Suitable wetlands are already declining throughout much of the migratory path of shorebirds and other wading birds breeding in Manitoba due to land use practices in southern areas (on overwintering grounds and migration stop-over sites). As land use practices continue to reduce the number of suitable wetlands, this may limit shorebird numbers, or alter their migratory paths (United States Geological Survey 2007). Changes that affect the southern parts of the birds' migration habitats could have overall effects on shorebird numbers, including those birds using the boreal forest for breeding and staging.

6.3.3.1.4 Cranes

Wetland quality and quantity are limiting factors in the ecology of cranes (Matthews *et al.* 2004). Suitable wetlands continue to decline throughout much of the migratory path of wading birds breeding in northern Manitoba due to agricultural practices (*i.e.*, continued draining of wetlands). Continued loss of wetlands used for staging during the migration season may alter the migratory pathways of cranes. Altered migration routes may influence where cranes breed, which may potentially affect their distribution and abundance within the Regional Study Area.

6.3.3.1.5 Kingfishers

The belted kingfisher is an aquatic foraging species that nests in earthen banks (Cornwell 1963, Brooks and Davis 1987). Human activities, such as borrow-pit excavation may increase nesting opportunities for belted kingfishers by creating exposed earthen banks (Cornwell 1963). Even if the Project does not proceed, regular road maintenance will require the continued excavation of borrow-pits within the area thereby creating potential marginal nesting habitat for kingfishers. Breeding success for belted kingfisher nesting depends upon the level of human activity at borrow pits. Belted kingfishers are known to desert nests due to gravel truck and human activity in these areas (Cornwell 1963).

Populations of belted kingfishers are known to be declining in some parts of their range. This trend is expected to continue (Peterson 2002).

6.3.3.2 Expected Changes to Landbirds Without the Project

6.3.3.2.1 Songbirds

Without development of the Project, perching bird (songbird) community dynamics are expected to continue to change in response to alterations in habitat availability and/or structure. Within the Regional Study Area, fire, insect outbreaks, diseases, weather anomalies and future human developments (*e.g.*, transmission lines) are examples of phenomena that could alter habitat and potentially cause shifts in songbird species composition, reproductive success and population demographics.

The quality of passerine habitat in the boreal forest will likely continue to be influenced by forest and wetland succession, wildfire and human development. Encroachment of human activity into the boreal forest may reduce habitat size and quality in a variety of ways including through deforestation and forest fragmentation.

Fragmentation can be defined as decreases in patch size and increases in the amount of edge and patch isolation (Andrén 1994; Fahrig 1997). Fires, blowdown from windstorms or insect outbreaks (*e.g.*, sawfly, budworm, mite, and mould) are examples of natural disturbances that may increase patchiness, openings in crown closure and edge habitat within the Regional Study Area. These forest openings can have an effect on the structure of songbird communities by increasing nesting and foraging habitat for those species that prefer more open, younger **seral** plant stages, while decreasing habitat for birds that require high canopy closure and interior forest tree and understory vegetation as nesting and foraging habitat.

Human developments such as the creation of roads and transmission line ROWs can further increase the degree of forest fragmentation across a landscape. Road construction often results in habitat fragmentation, causing increased necessity to cross the ROWs thereby increasing the risk of traffic-related mortalities (Newton *et al.* 1997).

Although some species of songbirds spend a majority of their time in early successional plant communities associated with edge habitat (Yahner 1988; Schmeigelow and Monkkonen 2002) other species require plant assemblages and community structure found in interior boreal forest (Schmeigelow and Monkkonen 2002). As disturbance creates more openings in the interior forest, songbirds requiring large tracts of contiguous forest are exposed to predators and competition from wildlife associated with edge habitats (Laurence 1991). The resulting changes in habitat may have a adverse effect on reproductive success of birds breeding near forest edges. The landscape within the Regional Study Area is dominated by black spruce forest and woodland on peatlands and regenerating post-fire habitats. The mosaic of these habitats, wetlands, lakes and creeks naturally creates an abundance of forest edge throughout the region. None of the bird species known to breed within the Regional Study Area are dependent upon large contiguous forest tracts; instead the bird community is adapted to the mosaic of wetland and forest edge habitats that dominate the landscape. An increase in edge habitat may have a negative effect on songbirds breeding within 50 m of forest edges due to higher rates of predation associated with edge habitats (Paton 1994). Given that edge habitats are common and widespread throughout the Regional Study Area, increases in edge habitat resulting from future developments (*e.g.*, Bipole III Transmission Project) are not expected to have a measurable effect on songbird populations.

Tree-nesting and cavity-nesting passerines are particularly sensitive to changes in forest composition and structure. These changes may occur due to forestry activities or wildfire. Although forestry activity in the Regional Study Area is anticipated to be minimal, chances of wildfires are high. Wildfire can create forest openings, consume standing dead trees that are ideal for cavity nesting and may result in a switch from older, densely-treed forest stands to relatively open older stands or shrubby, post-fire plant communities. If perching/nesting trees are lost or the structure of the boreal forest is altered, the local passerine communities may also experience a shift in community structure (Schmeigelow and Monkkonen 2002). This shift would likely result in fewer species requiring older aged stands and more of those species preferring open or shrubby habitat (Drapeau *et al.* 2002;Vernier and Pearce 2005; Gandhi *et al.* 2008). Similarly, passerines such as brown creepers, kinglets and nuthatches that prey upon arboreal invertebrates in standing dead trees (snags) and birds that forage amongst woody debris on the ground (*e.g.*, sparrow species, Swainson's thrush) may experience increased availability in prey and associated increase in reproductive success as forest stands age and woody debris increases in the study area. Conversely, those species that require younger forest stands for nesting or foraging might experience in a shift in habitat availability as forest stands age or as wildfire opens new areas of the forest to regrowth.

In the absence of the Project, declines in the population of some songbird species (*e.g.*, olive-sided flycatcher) present in the Study Area are expected to continue. Changes to songbird wintering grounds and/or breeding habitats would continue to be influenced by a number of factors including human development, suppression of fire, forestry (*e.g.*, clear cutting), agriculture, disease, pollution, predators, competitors and parasites.

6.3.3.2.2 Raptors

The quality of raptor habitat in the boreal forest can be affected by habitat loss, degradation and fragmentation. Encroachment of human activity into the boreal forest may involve habitat fragmentation or deforestation, thereby reducing habitat size and quality. Road construction often results in habitat fragmentation, and may encourage some raptors, such as owls, to hunt along rights-of-way. Increased traffic and habitat fragmentation in this manner increases the likelihood of traffic-related mortalities (Newton *et al.* 1997).

Tree-nesting and cavity-nesting raptors are particularly sensitive to changes in forest composition and structure. These changes may occur due to forestry activities or fire. To serve as nesting, perching or roosting platforms for larger raptors (eagles, osprey, great horned owl, *etc.*), trees should be at least 25 cm in dbh and at least six trees per hectare should be as large as 40 cm dbh (Ontario Woodlot Association 2006). If the composition or structure of the boreal forest within the Regional Study Area is altered, the raptor species that use the study area may also change if perching/nesting trees are lost.

At present, no industrial logging is planned to occur within the study area due to the marginal allowable cut, difficult access and distance to market (Holmes *pers. comm.* 2008). However, it is possible that at some future date, small-scale local logging (300-10,000 m^3 per year) will occur (Holmes *pers. comm.* 2008). If the Project does not proceed, large-scale expansion of human habitation is unlikely; therefore, raptor habitat loss, degradation or fragmentation within the Regional Study Area is likely to be minimal.

Forests and woodlands will continue to experience frequent disturbances (*e.g.*, fire), which could lower the average age, and therefore average stem diameter of forest stands (Matthews *et al.* 2004). This could have adverse effects on all raptor species that rely on mature forests for nesting, roosting, foraging (*i.e.*, all species in Regional Study Area except short-eared owls, snowy owls and northern harriers) and/or overwintering. In addition, the resulting post-stabilization forest may have a higher ratio of deciduous species than currently occurs in the Regional Study Area. This may have adverse effects for species that generally prefer conifer-dominated forest stands, such as great-horned owls and northern hawk owls.

6.3.3.2.3 Upland Gamebirds

Future changes to the boreal forest can affect the upland gamebird species composition within the area by creating habitat that is more suited to a particular species. These changes can include an increase in abundance of young shrubs and young trees in deforested or burned areas, or change in forest-tree-species composition (*e.g.*, more hardwoods following forest disturbance).

Fire is a major factor that affects, and will continue to affect, upland gamebird populations within the Regional Study area. Fires have the ability to benefit each of the upland gamebird species by removing trees and allowing establishment of shrubs and other plant species consumed by grouse. Forest openings created by fire can also serve as nesting habitat for sharp-tailed grouse (Alaska Department of Fish and Game 2008).

This may favour ruffed grouse over spruce grouse, as the former species prefers some hardwood component to the forest structure. Over much of its range, the spruce grouse uses spruce- and pine-dominated seral stages following fire and other disturbances (Storch 2000).

An increase in human activity (other than GS development) within the Keeyask Regional Study Area may have adverse effects on some gamebird habitat quality and gamebird populations. For instance, road development creates forest openings that are quickly colonized by young shrubs and seedlings. This new growth provides attractive forage foods for grouse and ptarmigan that are lured to road ROWs by the source of grit (a digestion aid) that occurs along gravel roads and/or road shoulders (Alaska Department of Fish and Game 2008). Unfortunately, roadsides present a hazard for grouse as they can lead to vehicle-related mortality. Development of roads and/or trails can also lead to increased access for hunters seeking upland game birds. While road and trails may continue to be developed throughout the Regional Study Area, the effect of increased collision risk and/or increased harvest of local grouse and/or ptarmigan populations would likely be small.

6.3.3.2.4 Woodpeckers

Woodpeckers, as primary cavity users, are particularly sensitive to changes in forest composition and structure. Whether the project proceeds or not, forest structure within the Regional Study Area would continue to be affected by forest insects, disease, forest fires and human activities. Frequent wildlife disturbances could lower the average age, and therefore average stem diameter of forest stands. This would have adverse effects on all species of woodpeckers and as a result could have adverse effects on secondary cavity users that depend on woodpeckers to create initial cavities. Woodpeckers require mature trees a minimum of 25 cm (diameter at breast height [dbh]) to serve as nesting, feeding or roosting

cavities (Ontario Woodlot Association 2006). Woodpeckers can benefit from wildfire through increased insect abundance associated with dead and decaying trees.

6.3.3.3 Expected Changes to Valued Environmental Components Without the Project

Mallard and Canada Goose

Forest fire activity and mining exploration activities are not anticipated to change in the near future. Current timber harvesting activities are minimal and likely limited to cutting for domestic firewood.

Future road development may affect waterfowl (mallards and Canada geese) through increase in bird harvest due to improved access opportunities.

In addition, loss of habitat in prairie regions through draining of wetlands for agricultural purposes or as a result of climate change could increase use of the Regional Study Area by species such as mallards. Young (2009) noted that dry years in the Prairie Pothole Region (PPR) of North America were associated with increased numbers of breeding ducks further north into the parklands and boreal forest.

Mallards are notoriously adaptable and hardy, although the loss of breeding habitat across their range due to habitat removal and drought, and downward trends in population may continue, whether or not the Project proceeds. Canada geese have historically responded well to wildlife management techniques and are populations are expected to remain stable whether or not the Project proceeds.

Bald Eagle

As tree nesters, bald eagles are sensitive to changes in forest composition and structure. These changes may occur due to forestry activities or fire. To serve as nesting, perching or roosting platforms trees need to be at least 25 cm in diameter at breast height (dbh), with at least six trees per hectare at 40 cm dbh or greater (Ontario Woodlot Association 2006).

If the Project does not proceed, large-scale expansion of forestry development is unlikely. Therefore, bald eagle habitat loss, degradation or fragmentation within the Regional Study Area as a result of human activity is likely to be minimal.

Olive-sided Flycatcher

Within the Regional Study Area, olive-sided flycatcher is generally found where mature conifer forest occurs adjacent to beaver floods, creeks or wetlands that support dead standing trees (Murphy 1989). They will also use forests regenerating after wildfire. While the living conifers provide suitable nesting habitat, the dead standing trees provide suitable perches for the foraging flycatchers. Dead trees provide ideal perches as they permit 360 degree viewing of potential aerial insects (*e.g.*, bees, wasps), a preferred food source for flycatchers (Murphy 1989).

Olive-sided flycatchers have shown a widespread and consistent population decline over the last 30 years; the Canadian population is estimated to have declined by 79% from 1968 to 2006 and 29% from 1996 to 2006 (COSEWIC 2011). The Breeding Bird Survey results for Manitoba populations of olive-sided

flycatcher indicate a significant decline of this species throughout the province from 1989 to 2009 (CWS 2009). The causes of this decline are uncertain although habitat alteration and loss on migration and wintering grounds are likely contributing factors. Even without the Project, Canadian populations of olive-sided flycatcher are likely to continue to experience downward trends in populations.

Rusty Blackbird

Rusty blackbirds nest within treed peatlands and forage along riparian areas throughout the Regional Study Area. Historical data reveals a long-term decline in rusty blackbird populations dating back to the early 1900s. Breeding Bird Survey (BBS) data has reported a 90% decline in rusty blackbird populations over the past 40-50 years (Greenberg and Droege 1999). The decline is one of the most profound of all bird species, and yet the reason for it is not well understood.

Although they often roost with other blackbird species, rusty blackbirds are more specialized in their habitat requirements than other blackbird species, which are largely generalists. Rusty blackbirds are less adaptable to change than other blackbirds, which makes them more vulnerable to changing ecological conditions such as climate change and clear-cut logging. Rusty blackbirds tend to select previously disturbed habitats that have reverted to early- to mid-successional stages due to fire, and beaver activity (Spindler 1976; Ellison 1985). As a result, they are at risk of habitat loss due to fire suppression and human extermination of beavers in addition to acid rain (since rusty blackbirds inhabit areas with naturally high soil acidity, it is difficult to determine the real impact of acidification), peatland disintegration and draining of boreal forest swamps for development activities. On the wintering grounds, destruction of wooded wetlands and blackbird control programs are other factors contributing to global declines (Greenberg and Droege 1999).

Although rusty blackbird breeding and foraging habitat is widespread throughout the Regional Study Area, downward trends in rusty blackbird populations may continue over time, whether or not the Project proceeds.

Common Nighthawk

Common nighthawks thrive in recent burns, and large forest openings created by many factors including beaver floods, wetlands, human developments and diseased trees. They feed on aerial insects and nest on bare surfaces associated with open areas. With or without the Project, fire and disease are processes that will continue to shape forests within the Regional Study Area. Fire and/or disease will continue to create forest openings suitable for breeding and or foraging common nighthawks.

Common nighthawk populations are currently in decline in North America, including northern Manitoba. Reasons for their decline include use of pesticides on their wintering grounds and along migration corridors and loss of forest openings due to forest-fire suppression in southern wintering grounds (COSEWIC 2008). Downward trends in common nighthawk populations may continue over time, whether or not the Project proceeds.

6.3.3.4 Expected Changes to Other Priority Birds Without the Project

6.3.3.4.1 Species at Risk

Yellow Rail

Yellow rails breed within wet meadows and/or fens that support water levels <12 cm deep with dense grass or sedge cover for nesting and concealment (Goldade *et al.* 2002). Their use of the Regional Study Area is dependent upon seasonal water levels as too little or too much water can render fens unsuitable for breeding purposes. Without the Project, rails will continue to be influenced by seasonal water levels, occurring in suitable fen habitat located within the Regional Study Area during some years and nearly absent in others.

Horned Grebe

Horned grebes breeding in Manitoba tend to select small, open-water marshes and ponds or shallow bays on lake borders for nest sites. (Ferguson and Sealy 1983; COSEWIC 2009). These waterbodies are most often freshwater, though this species of grebe will sometimes nest in brackish water. Use of the Regional Study Area by horned grebes is likely to correspond to availability of wetlands with suitable water levels.

Without the Project, horned grebes are expected to be vulnerable to loss of wetlands during droughts or other hydrological fluctuations.

Short-eared Owl

Short-eared owls use open-country habitats including marshes, fens and shorelines where they prey upon small mammals such as mice, voles, rabbits and muskrats and occasionally small birds. Their populations are influenced by cyclical changes in the abundance of their prey base (*e.g.*, small mammals), with owl populations increasing in response to increases in small mammal populations. Short-eared owl populations have been in decline due in part to loss and alteration of grassland and coastal marsh overwintering habitat and prairie grassland breeding habitat. These habitats are disappearing due to wetland drainage, urban development and increased farm activity, including over-grazing in pastures. It is also believed that habitat fragmentation is contributing to higher levels of nest predation.

Without the development of the Project, short-eared owls will likely continue to utilize the Regional Study Area. Changes in their abundance will likely continue to be influenced by local cyclical changes in the population of their prey base as well as other factors including continued habitat loss on wintering and migration grounds.

Peregrine Falcon

Peregrine falcons are bird-eating raptors that occasionally eat small rodents and bats. They hunt at dawn and dusk when prey are most active, and during migration they may also hunt throughout the night, preying on nocturnal migrants. Peregrines nest on cliff edges and, in some cases, tall buildings. They usually select nest sites with an overhang or shelter from vegetation, nesting in a scrape directly on the ground.

Peregrine falcons are currently rebounding following a catastrophic population crash due to pesticide use in the 1950s, 1960s and 1970s. Captive breeding programs and legal protection are leading to a slow but steady increase in population (Rowell *et al.* 2003). They are known migrants through the Regional Study Area.

6.3.3.4.2 Species at the Edge of their Range

Birds at the edge of their known range are considered to be priority birds as they often occur in low numbers and are vulnerable to environmental change. Fourteen species are considered to be at the edge of their breeding range relative to the Regional Study Area. Four species are colonial waterbirds (*i.e.,* American white pelican, double-crested cormorant, Caspian tern and black tern), three are waterfowl (*i.e.,* gadwall, redhead, and canvasback), four are songbirds (ruby-throated hummingbird, clay-colored sparrow, blue-headed vireo, and pine siskin), one is a woodpecker (*i.e.,* yellow-bellied sapsucker) and two are upland gamebirds (*i.e.,* sharp-tailed grouse, ruffed grouse). All but redhead, canvasback, ruby-throated hummingbird and pine siskin have been observed within the Regional Study Area.

Only the following six of the 14 range-limited species are known to breed within the area:

- Gadwall, like mallard, breeds in upland cover and rears broods on sedge-filled creeks;
- Clay-colored sparrow is a ground nesting species that breeds in grassy areas found adjacent to roads and along cut-lines;
- Blue-headed vireo breeds in mixedwood forest with tall shrub understory;
- Yellow-bellied sapsucker breeds in mature aspen-dominated forests;
- Sharp-tailed grouse breed in sedge-dominated treeless bogs; and
- Ruffed grouse breed in aspen or birch dominated forest types that are not common or widespread within the Regional Study Area.

Overall, the six range-limited species observed occurred at very low densities. With the exception of blue-headed vireo and ruffed grouse, only a few individuals were detected over the course of the 10-year environmental baseline study period.

Without the Project, habitat availability for birds at the edge of their range is anticipated to continue to be influenced by fire, forest succession, linear developments and range expansion.

6.3.3.4.3 Colonial Waterbirds

Common terns are considered to be in decline by the Audubon Society, Nature Canada and the Boreal Songbird Initiative. Intense management of breeding colonies and habitat protection will be required to slow this rate of decline (Butcher and Niven 2007). Competition with ring-billed gulls for nesting sites is one of many factors hindering the ability of common terns to rebound in some areas of their range (Hyde 1997). Without the Project, distribution, abundance, and productivity of terns are expected to continue to be influenced by changes in water levels and resultant competition with gulls.

Ring-billed gulls are noted for their highly gregarious nesting in colonies from 20 to 70,000–80,000 pairs (Blokpoel and Tessier 1986). The Breeding Bird Survey (BBS) has recorded a substantial increase in western populations and distribution of ring-billed gulls from 1920s to 1980. The continent-wide trend reported by the BBS across the period 1999-2009 was reported as a 7.5% increase per year. This population growth is thought to be associated with human activity, particularly increased farm-based agricultural practices, construction of reservoirs (providing new island nest sites), and garbage dumps. Although large numbers of adults and fledged chicks have been documented at city garbage dumps (Vermeer 1970), the increased availability of insects, rodents, and grain is also expected to have played an important role in the 22-fold increase in ring-billed gull populations in western Canada in the 20th century.

Herring gulls breeding in Manitoba have experienced declines on the order of 6.8% of the provincial population from 1999 through 2009 (CWS 2009). Although herring gull numbers in Manitoba have stabilized, there is evidence that populations in eastern Canada New England experienced declines in the 1980s (Hebert 1989). Population increases in Manitoba noted in the 1980s are attributed mostly to southward range expansion (Andrews 1990).

6.3.3.4.4 Willow Ptarmigan

The production of shrubby habitats and forest edge through periodic wildfires can benefit willow ptarmigan, which prefer willow-dominated habitat (Storch 2000). Road development, although beneficial in creating forest openings for shrub development, present a hazard for ptarmigan as they can lead to increased risk of vehicle-related mortality (Alaska Department of Fish and Game 2008). Development of new roads and/or trails can also lead to increased access resulting in increased harvest of ptarmigan inhabiting the Regional Study Area.

Without the Project, future road and trail developments may lead to localized increases in the mortality of ptarmigan. Future wildfires are expected to continue to create ptarmigan overwintering habitat.

6.4 PROJECT EFFECTS, MITIGATION AND MONITORING

6.4.1 Valued Environmental Components

The following sections describe the assessment for the Valued Environmental Components (VECs, *i.e.*, Canada goose, mallard, bald eagle, olive-sided flycatcher, common nighthawk, and rusty blackbird) and other priority birds (*i.e.*, other species at risk, rare birds, colonial waterbirds, and species at the edge of their range).

6.4.1.1 Canada Goose

Project-related effects on Canada geese are associated with construction noise disturbance, increased mortality risk associated with increased access, and changes in the quality of staging habitat through the operation of the reservoir (*i.e.*, filling of the reservoir).

Construction

Habitat Change

Construction activities are not anticipated to result in the loss or alteration of Canada goose breeding habitat as optimal Canada goose breeding habitat does not occur within the Regional Study Area (Section 6.3.2.4).

Project-related Disturbances and Access Effects

During the construction phase, sensory disturbances (*e.g.,* noise from construction equipment and blasting) that occur near lakes and/or along the Nelson River, will indirectly result in a temporarily reduction of some goose staging habitat. Noise threshold for behavioural responses by waterfowl generally occur at 80 to 85 dBA (Goudie and Jones 2004). The upper range of expected noise levels for construction equipment will be 80-95 dBA and over 100 dBA for blasting (PD SV). Birds temporarily displaced by noise disturbance will seek alternate habitats available throughout the Regional Study Area.

During construction, land clearing activities and development of roads have the potential to increase accessibility to areas used by geese, including the Nelson River, creeks and inland lakes located within the Local Study Area. Increased access has the potential to lead to increased hunting pressure on geese staging (during spring and fall migration seasons) within the area.

The potential for spillage or leaks of petroleum products (*e.g.*, gasoline, diesel and heating oil) in terrestrial and aquatic habitats is associated with all phases of construction (*e.g.*, access road clearing and construction, development of the GS site, *etc.*). Spills or leaks have the potential to contaminate goose habitat, affecting water quality and food items (*e.g.* plants).

Mitigation

The following mitigation measures will be implemented to minimize or avoid potential effects of Project construction on Canada geese:

- 100 m vegetated buffers will be retained wherever practicable around lakes located adjacent to infrastructure sites to minimize noise-related disturbances to geese; and
- Increases in local waterfowl harvest will be minimized through implementation of a construction access management plan.

Residual Effects of Construction

The residual effects of Project construction on Canada geese include the indirect loss of some staging habitat in areas adjacent to active construction sites. Residual construction-related effects are expected to be adverse, small in magnitude, small in extent, and short-term.

Operation

Habitat Change

Filling of the reservoir will result in the long-term loss and degradation of potential Canada goose staging and foraging habitat that occurs in shallow bays, inlets and creek mouths of Gull Lake and parts of the Nelson River (between Gull Lake and Birthday Rapids). In low water years, these areas provide productive staging habitat for migrating geese and other species of waterfowl.

Higher water levels, shoreline erosion and peatland disintegration processes are factors that will hinder the reestablishment of aquatic vegetation (*e.g.*, sedge) within the reservoir. It is expected that the long-term loss of forage sources, along with reduced **loafing** (*i.e.,* resting) habitat (*e.g.*, mineral shorelines) will reduce Canada goose use of the reservoir for the long-term.

While alternate staging areas (*e.g.,* bays and inlets) occur within the Regional Study Area (*e.g.,* on Stephens Lake), they are considered to be of low quality due to their limited provision of suitable food, cover and shelter required by geese. It is expected that until suitable shoreline wetland vegetation re-establishes in the reservoir, geese use of the reservoir during the migration periods will be minimal during operation. Although some uncertainty exists, it is expected that geese will utilize other stop-over sites located in areas outside of the Local Study Area following reservoir impoundment.

During operation, there is a potential for increased harvest of mallard by local resource users due to increased access along new roads and trails. Increased access could potentially have an effect on the local populations of Canada geese using traditional waterfowl hunting areas that are important to the KCNs.

Project-related Disturbances and Access Effects

During the operation phase, increased traffic along the north and south access road may result in increased traffic-related goose mortality. This risk is greatest in areas where lakes or wetlands occur adjacent to the access road (*e.g.*, south access road). Leaving a 100 m buffer of trees between lakes, wetlands, creeks, rivers and the access road will help mitigate the risk of vehicle-related waterbird mortality as birds entering and leaving wetlands will gain height to fly over the buffer of trees, thereby avoiding potential collisions with vehicles.

Traffic along access roads may lead to a local increase in hunting pressure on Canada geese using nearby lakes. Since Canada goose use of the reservoir is anticipated to decline during the operation phase, increased hunter access in areas along the reservoir is not anticipated to have a notable effect on local waterfowl populations.

Mitigation

The following mitigation measure will be implemented to minimize potential effects of Project operation on Canada geese:

- Except for existing resource-use trails, Project-related cutlines and trails will be blocked where they intersect the Project Footprint, and the portions of these features within 100 m of the Project

Footprint will be revegetated to limit the potential for increased local goose harvest resulting from increased hunter access; and

- Mitigation for wetland function will benefit Canada geese through the development of wetlands in the Local Study Area and could offset some of the losses in habitat for geese.

Residual Effects of Operation

The residual effects of Project operation on Canada geese are associated with decreased quality of staging habitats along the Nelson River resulting in the reduced use of the area by geese. Residual operation-related effects are expected to be adverse, small in magnitude, medium in extent, and long-term.

Conclusion about Residual Effects on Canada Goose

The residual Project effects on Canada geese are associated with some noise disturbance during construction phase and a reduction in quality of staging habitats in Gull Lake and parts of the Nelson River. These effects are expected to be adverse, small in magnitude, medium in extent, and long-term.

The residual operation effects on Canada goose will overlap temporally and spatially with the future Bipole III Transmission Project and Keeyask Transmission Project (see discussion in Section 6.4.4).

Monitoring of local Canada goose populations staging within the Regional Study Area will occur during operation (Section 6.4.5, Table 6.4-1).

6.4.1.2 Mallard

Potential Project effects on mallard are associated with the loss of some breeding and staging habitat due to infrastructure and reservoir development and increased mortality risk resulting from increased access and vehicle traffic.

Construction

Habitat Change

Land clearing and site preparation for the development of Project footprints will result in the direct loss of 3% (1,840 ha) of the total amount of available mallard breeding and brood-rearing habitat within the Regional Study Area. Within the Regional Study Area, optimal mallard brood-rearing habitat occurs along sluggish, sedge-filled creeks and to a lesser degree along sedge-filled edges of inland lakes. In the boreal forest, mallards typically nest within 270 m of water (Ducks Unlimited 2010), which in the Regional Study Area includes areas adjacent to some of the inland lakes, wetlands and creeks.

Loss of nesting habitat for mallards in the Local Study Area is not anticipated to have any measurable effects on local populations as alternate nesting habitat occurs throughout the Regional Study Area.

Contamination of aquatic habitats through accidental spills could have adverse health effects on mallard using affected areas, especially during the brood rearing season when the young are flightless and less capable of moving into alternate habitats.

Project-related Disturbances and Access Effects

Noise disturbance from construction equipment and blasting may result in short-term habitat avoidance by mallards using wetlands, lakes and/or riverine habitat located adjacent to construction sites (*e.g.*, south access road). Avoidance of suitable habitat by mallards would result in a reduction of **effective habitat** that while not physically altered, has become unsuitable due to noise disturbance. The result is a temporarily reduction in the amount of habitat available for mallard nesting and foraging. Noise threshold for behavioural responses by waterfowl generally occur at 80 to 85 dBA (Goudie and Jones 2004). Since construction noise is anticipated to reach these levels (PD SV), mallards disturbed by heavy equipment noise and blasting are expected to seek alternate habitats in unaffected areas.

Depending upon the timing of shoreline clearing activities, noise generated during the clearing of the reservoir may cause waterfowl to avoid wetlands, bays, inlets, creeks and creek mouths located in affected areas. This potential adverse effect on waterfowl is anticipated to be small if the last phase of reservoir clearing occurred occurs during the winter (*i.e.*, November-April). The magnitude of this effect would increase if the last phase of reservoir clearing coincided with the spring or fall migration season. During the migration seasons, noise disturbance along riparian areas may displace mallards from bays, inlets and creek mouths that occur within Gull Lake and parts of the Nelson River to other, less optimal staging areas (*e.g.*, Stephens Lake). In years with high water levels, this effect would be small as the quality of staging habitat along the Nelson River decreases with increased water levels. Lower on-system water levels improve the quality of staging habitat for mallard and other waterfowl by exposing shorelines and enhancing the growth of aquatic plant and invertebrate food sources.

During construction, land clearing activities and development of roads, trails, and dykes have the potential to increase accessibility to previously remote wetlands, creeks and lakes that occur within the Local Study Area. Increased access may lead to local increases in the harvest of mallards using the Local Study Area.

The potential for spillage or leaks of petroleum products (*e.g.*, gasoline, diesel and heating oil) in terrestrial and aquatic habitats is associated with all phases of construction (*e.g.*, access road clearing and construction, development of the GS site, *etc.*). Spills or leaks have the potential to contaminate mallard habitat, affecting water quality and aquatic food items (*e.g.*, invertebrates). Contamination of aquatic habitats could have adverse health effects on mallards using those areas, especially during the brood rearing season when the young are flightless and therefore less likely to be moved into alternate habitats.

Mitigation

The following mitigation measures will be implemented to minimize or avoid potential effects of Project construction on mallards:

- 100 m vegetated buffers will be retained wherever practicable around lakes, wetlands and creeks located adjacent to infrastructure sites to minimize the loss of mallard upland nesting habitat, to limit noise-related disturbances to mallards and to minimize access;

- Land clearing activities will be undertaken outside of the sensitive breeding period (April 1-July 31) to the extent practicable to minimize disturbance to breeding birds;
- Increases in local waterfowl harvest will be minimized through implementation of a construction access management plan;
- Mitigation for wetland function will benefit mallard through the development of wetlands in the Local Study Area and could offset some of the losses in habitat for mallard; and
- Mallard nesting platforms will be installed in suitable wetlands in order to offset some of the losses in upland nesting cover.

Residual Effects of Construction

The residual effects of Project construction on mallard are associated with loss and degradation of 1,716 ha of upland nesting cover. Sensory disturbances near wetlands, creeks and lakes may reduce the amount of effective habitat available for staging, nesting and foraging, although the amount of nesting and foraging habitat impacted would be very small. Residual construction-related effects are expected to be adverse, small in magnitude, small in extent, and long-term.

Operation

Habitat Change

Reservoir filling during operations will have an adverse effect on mallards, as it will result in the long-term loss of the total available mallard habitat within the Regional Study Area. As the reservoir fills, inundation of inland lake and wetland areas will result in the long-term loss of approximately 3% (191 ha) of the total available mallard brood-rearing habitat (*e.g.,* sluggish, sedge-filled creeks and wetlands) within the Regional Study Area. Reservoir filling will also decrease the quality of staging habitats within Gull Lake and parts of the Nelson River. As described above, the quality of waterfowl staging habitat in Gull Lake is variable from one year to the next due to fluctuations in water levels. In years of low water (below average), the abundance of mallards and other waterfowl staging on Gull Lake is higher than during years when on-system water levels are high (above average). Lower on-system water levels improve the quality of staging habitat for mallard and other waterfowl by exposing shorelines and providing conditions conducive to the growth of aquatic plant and invertebrate food sources. The loss of shallow inlets, bays and creek mouths between Gull Rapids and Birthday Rapids will force mallards to seek more suitable staging habitat in off-system areas and/or in areas outside of the Local Study Area.

Filling of the reservoir will result in the loss of mineral shorelines, areas that provide loafing and foraging habitat for mallards. It is anticipated that the new shoreline associated with the future reservoir would consist of variable substrates including disintegrating peatland. In some areas, long-term shoreline erosion processes will eventually lead to the exposure of mineral substrates (PE SV). Since eroding peat shorelines are less optimal for waterfowl than mineral shorelines, it is anticipated that mallards would experience a long-term loss of shoreline loafing and foraging habitat in areas along the new reservoir.

Peatland disintegration is one factor that will adversely affect the rate in which emergent vegetation re-establishes along shorelines of the new reservoir (Section 2). Until mallard forage foods (*e.g.*, emergent vegetation) return to the reservoir area, this species will likely seek alternate forage areas (*e.g.*, upstream of the reservoir, off-system lakes, rivers and creeks). For this species, use of the reservoir during migration seasons is expected to be minimal for the long-term.

Due to similarities in the soils and vegetation that occur adjacent to both the north arm of Stephens Lake and Gull Lake, the north arm of Stephens Lake (part of the Kettle reservoir) was used as a proxy area for predicting how conditions within the future Keeyask reservoir would affect waterfowl if the Project was developed. Although Stephens Lake has inlets and bays, the ongoing dynamic peatland disintegration processes continue to affect shoreline stability and water quality. Aquatic vegetation (*e.g.*, sedge) is a rare occurrence in inlets and bays of the north arm of Stephens Lake. These factors, along with the presence of woody debris throughout many of the bays and inlets, appear to limit the lake's ability to attract and support mallards.

Associated with reservoir operations and peatland disintegration is the release of soil-bound mercury from flooded soils. Since mallards consume foods low on the food chain, foods such as plants and invertebrates that are capable of taking up or bioaccumulating only minute amounts of methylmercury, increased levels of mercury within the Keeyask reservoir are not anticipated to have any notable effects on the health of the local mallard populations. Section 8.1 discusses how an increase in the levels of methylmercury in the aquatic system will affect wildlife health while the SE SV discusses how increased methylmercury levels will influence human consumption of mallards harvested within the Local Study Area.

Project-related Disturbances and Access Effects

During operation, there is a potential for increased harvest of mallard by local resource users due to increased access along new roads, trails and dykes. Increased access near inland lakes, creeks and wetlands could potentially have an effect on the local populations of mallards that use these areas. Since waterfowl use of the new reservoir is anticipated to decline during the operation phase, increased hunter access in areas along the reservoir is not anticipated to have a notable effect on local mallard populations.

Mitigation

The following mitigation measures will be implemented to minimize potential effects of Project operation on mallards:

- Except for existing resource-use trails, Project-related cutlines and trails will be blocked where they intersect the Project Footprint, and the portions of these features within 100 m of the Project Footprint will be revegetated to limit the potential for increased local mallard harvest resulting from increased hunter access; and
- Mitigation for wetland function will benefit mallard through the development of wetlands in the Local Study Area and could offset some of the losses in breeding and staging habitat for mallards.

Residual Effects of Operation

The residual effects of Project operation on mallard are associated with habitat loss and degradation resulting from reservoir filling and increased mortality risk resulting from increased access to some inland lakes, creeks, and wetlands. Residual operation-related effects are expected to be within the natural variability of mallard populations in the Regional Study Area.

Conclusion about Residual Effects on Mallard

The residual effects of Project construction and operation on mallards are associated with temporary habitat avoidance due to construction noise, loss of some nesting and brood-rearing habitat and reduction in the quality of staging habitat due to reservoir development. The residual effects of Project construction and operation on mallards are associated with the loss of 3 % (1,908 ha) of mallard breeding habitat, a decrease in the availability and quality of staging habitat and a potential increase in local harvest associated with increased access. These effects are expected to be adverse, small in magnitude, medium in extent, and long-term.

Residual construction and operation effects on mallard will overlap temporally and spatially with the future Bipole III Transmission Project and Keeyask Transmission Project (See discussion in Section 6.4.4).

Monitoring of local mallard populations staging within the Regional Study Area will occur during operation (Section 6.4.5). The success of mallard nesting platforms and the need for adaptive management will also be monitored and assessed for a period following installation.

6.4.1.3 Bald Eagle

The potential Project-related effects on bald eagle are associated with habitat alteration, loss of nests and perching trees during reservoir clearing and noise disturbance during GS construction.

Construction

Habitat Change

Land clearing for the development of the reservoir, south access road and GS will result in the loss of trees used by bald eagles for perching and nesting. Most of the key perching and nesting trees for bald eagle occur immediately adjacent to the Nelson River shoreline. Removal of these trees will occur during the final stages of reservoir clearing and will result in the loss of up to five existing bald eagle nests currently located along the Nelson River between Split Lake and Gull Rapids (Map 6-15).

Project-related Disturbances and Access Effects

Within the Regional Study Area, bald eagles generally spend most of the spring, summer and fall seasons close to the Nelson River, where their main source of forage (*e.g.*, fish) is available. Thus, construction activities occurring near the Nelson River will have a greater effect on the local bald eagle population than inland activities (*e.g.*, road development, borrow area usage).

Noise disturbance during the construction phase (*e.g.*, operation of heavy equipment and blasting) may temporarily disrupt bald eagle foraging activities at Gull Rapids during the spring, summer and fall seasons. Changes in the water regime resulting from cofferdam construction are anticipated to have a greater effect on bald eagle use of the Gull Rapids area than noise disturbance generated by construction equipment. Studies have shown that increased visibility of a perceived threat has more of an effect on eagles than noise level (Ellis *et al.* 1991). While blasting may temporarily disrupt foraging activities within the Gull Rapids area, it is not expected to affect nesting bald eagles as the nearest bald eagle nest is over 12 km from the proposed GS site (where blasting is expected to occur). The effects of construction disturbance on bald eagles are expected to be adverse, small in magnitude, small in extent and short-term.

During the construction phase, accidental petroleum spillage and leaks may have an adverse, site-specific, short-term effect on bald eagles using the Local Study Area if events affect the health of the Nelson River aquatic food chain. Bald eagles have large home ranges (*i.e.*, between 7-40 km^2), and thus may avoid areas where events have occurred (Environment Canada 2008).

Mitigation

The following mitigation measures will be implemented to avoid or minimize potential effects of Project construction on bald eagles:

- Clearing will be undertaken outside of the sensitive breeding period (April 1–July 31) to the extent practicable to minimize disturbance to breeding birds; and
- Bald eagle nests removed as a result of reservoir clearing will be replaced by artificial nesting platforms located in suitable areas along the new reservoir shoreline.

Residual Effects of Construction

The potential residual construction-related effects on bald eagles are associated with temporary disruption of foraging activities in the Gull Rapids area due to construction noise (*e.g.,* blasting). The residual effects of Project construction on bald eagles are expected to be adverse, small in magnitude, small in extent, and short-term.

Operation

Habitat Change

As the generating station is developed and the reservoir fills, new shoreline will form, providing bald eagles with alternative suitable perching and nesting trees.

Development of the reservoir will alter the water regime, resulting in the loss of some fast-flowing riverine areas used by foraging bald eagles. The loss of these foraging areas will be offset by the creation of the tailrace. Some of the highest densities of bald eagles observed using the Nelson River occur in areas immediately downstream of generating stations where fish are scavenged by foraging eagles. During the summer months, these areas attract both breeding and non-breeding eagles from areas within and outside of the Regional Study Area.

A redistribution of the bald eagle population utilizing the Local Study Area is expected to occur as the GS becomes operational. Bald eagles that would have previously foraged between Birthday Rapids and Gull Rapids are expected to shift away from the reservoir to areas below the Keeyask GS. Here forage fish, including those stunned or killed after passing through the turbines, are expected to concentrate. While bald eagle density is expected to increase downstream of the GS, the local population of bald eagles is not expected to increase appreciably. Bald eagle nest counts in adjacent reaches of the Nelson River (n=11) do not reach the theoretical carrying capacity of 23 nests in the Regional Study Area (Koonz *pers. comm.* 2008). Local populations are not limited by breeding habitat nor forage availability.

Bald eagles are expected to concentrate below the Keeyask GS following reservoir filling. While predation on fish, including those stunned or killing following passage through the turbines is expected to increase in this area, measureable effects on fish populations are not expected. During baseline field studies, highest average densities of bald eagles observed below existing generating stations was 7 birds/km^2. Based on this density, in any given year bald eagles could consume up to 1,200 kg of fish from areas below generating stations. This conservative estimate is based on the assumption that bald eagles are feeding exclusively on fish (eagles often predate and scavenge on other foods including birds, small mammals and carrion). It also assumes the average daily intake of fish by bald eagles is between 250-550 g of fish/day (Todd *et al.* 1982). This volume of fish (*i.e.*, 1,200 kg) consumption is not expected to have an effect on local fish populations (MacDonell *pers comm.* 2011).

During operations, shoreline erosion and peatland disintegration in the reservoir area are anticipated to result in the long-term loss of some potential perching and nesting trees for bald eagles. Although adverse, the effect of tree loss for bald eagles using the Local Study Area is anticipated to be small as suitable perching and nesting trees will be available in areas along the new reservoir shorelines.

Project-related Disturbances and Access Effects

During the operation phase, the north and south access roads will become part of PR 280 and thus will support highway traffic to and from Gillam. Where the roads come in close proximity to the Nelson River and Stephens Lake, vehicle traffic will elevate the potential for bald eagle vehicle-related mortality. In these areas, scavenging bald eagles may be attracted to access roads if road-kill is frequently available. Less than one quarter of reported bald eagle deaths are due to collisions with passing vehicles (Wood *et al.* 1990).

Mitigation

The following mitigation measures will be implemented to minimize or avoid potential effects of Project operation on bald eagles:

- Bald eagle nests located in trees at risk to eroding into the reservoir will be removed during the fall or winter and replaced by artificial nest platforms located in an adjacent area not at risk to shoreline erosion; and
- The removal of road-killed mammals along access roads will mitigate the risk of vehicle-related bald eagle mortality.

Residual Effects of Operation

No residual effects of Project operation on bald eagle are expected.

Conclusion about Residual Effects on Bald Eagle

The residual Project effects on bald eagles are expected to be adverse, small in magnitude, small in extent, and short-term.

Residual effects of the Project on bald eagles will overlap temporally and spatially with the future Conawapa Generation Project (Section 6.4.4).

Construction and operation phase monitoring of natural and/or artificial eagle nest distribution within the Local Study Area will be conducted to assess the effectiveness of mitigation measures (*e.g.*, nest platforms), assess changes in the distribution and abundance of bald eagles and determine need for adaptive management (Section 6.4.5; Table 6.4-1).

6.4.1.4 Olive-sided Flycatcher

The potential Project-related effects on olive-sided flycatcher are associated with habitat loss and temporary reduction in habitat use due to noise disturbance from construction activities.

Construction

Habitat Change

As land is cleared in preparation for Project development (*e.g.,* reservoir, dykes, south access road and trails), approximately 4% (350 ha) of the regional olive-sided flycatcher breeding and foraging habitat will be lost or reduced in quality for the long-term. Olive-sided flycatchers breeding habitat includes coniferous forest adjacent to open areas (*e.g.*, wetlands and regenerating post-fire habitats) containing tall trees or snags (dead standing trees; COSEWIC 2007).

Project-related Disturbances and Access Effects

Construction–related noise from heavy equipment, blasting and other human activities may cause olive-sided flycatchers to avoid nesting within and adjacent to infrastructure zones. While land clearing activities may create some foraging habitat for olive-sided flycatchers, the use of equipment in those areas may render it unsuitable due to noise and human activity. Since flycatcher nesting-habitat (*i.e.*, tall trees adjacent to forest clearings) occurs in areas of the Regional Study Area along natural forest openings, and burns, a reduction in the amount of suitable nesting-habitat within and adjacent to infrastructure sites is unlikely to have any notable effect on regional olive-sided flycatcher populations.

Increased human access during the construction phase is not anticipated to have any effect on the local olive-sided flycatcher population. While construction traffic may present a collision risk to olive-sided flycatchers, the risk is negligible as flycatchers generally forage at heights (5-15 m) above vehicles (McCracken 2008).

Mitigation

The following mitigation measures will be implemented to minimize or avoid potential effects of Project construction on olive-sided flycatcher:

- Land clearing activities will be undertaken outside of the sensitive breeding period (April 1 - July 31) to the extent practicable to minimize disturbance to breeding birds.

Residual Effects of Construction

The residual effects of Project construction on olive-sided flycatcher are associated with creation of temporary foraging habitat and construction-related noise. Residual construction-related effects are expected to be adverse, moderate in magnitude, small in extent and long-term.

Operation

Habitat Change

Operation of the reservoir would result in the long-term loss of olive-sided flycatcher breeding and foraging habitat created by reservoir filling during the operation phase. Over time, peatland disintegration, shoreline erosion and changes to vegetation resulting from changes in groundwater will contribute to the loss of some additional olive-sided flycatcher habitat (potential loss of up to 120 ha or 1% of total available olive-sided flycatcher habitat within the Regional Study Area). The loss of flycatcher habitat is expected to have a small adverse effect on local olive-sided flycatcher populations. This effect is not anticipated to have a measureable effect on the regional flycatcher populations as other suitable sparsely-treed habitats (*e.g.*, burns) occur within the Regional Study Area.

Project-related Disturbances and Access Effects

Traffic along the north and south access roads may present a small collision risk to olive-sided flycatchers foraging within road ROWs. However, olive-sided flycatchers generally forage at heights between 5-15 m, thus danger of vehicle strikes is expected to be low (McCracken 2008).

Mitigation

The following mitigation measures will be implemented to minimize or avoid potential effects of Project operation on olive-sided flycatcher:

- Some of the treed areas located within the future reservoir back bays may be retained to offset some of the losses in olive-sided flycatcher habitat.

Residual Effects of Operation

The potential residual operation-related effects on olive-sided flycatchers are associated with habitat loss resulting from reservoir filling, shoreline erosion, and peatland disintegration processes. The residual effects of Project operation on olive-sided flycatchers are expected to be adverse, small in magnitude, small in extent, and long-term.

Conclusion about Residual Effects on Olive-sided Flycatcher

The residual effects of Project construction and operation on olive-sided flycatcher are expected to be adverse, moderate in magnitude, small in extent and long-term.

The residual construction and operational effects on olive-sided flycatcher will overlap temporally and spatially with the future Bipole III Transmission Project and Keeyask Transmission Project (see discussion in Section 6.4.4).

Ground-based monitoring of local olive-sided flycatcher populations will occur during construction and operation (Section 6.4.5, Table 6.4-1).

6.4.1.4.1 Common Nighthawk

Project-related effects on common nighthawk are associated with changes in habitat availability due to land clearing and reservoir and infrastructure development, and noise disturbance resulting in a reduction of effective habitat.

Construction

Habitat Change

As land is cleared in preparation for Project infrastructure (*e.g.,* dykes, borrow areas, south access road and trails), 925 ha of the available primary and secondary common nighthawk breeding habitat will be lost or reduced in quality. Approximately 3,689 ha will be temporarily created through reservoir clearing, resulting in a 15% net increase (2,764 ha) in common nighthawk breeding habitat within the Regional Study Area. Some of this cleared area will form primary and secondary habitat where mineral soils occur, and lower quality breeding habitat in peatland-dominate areas.

Creation of forest openings during reservoir and infrastructure clearing will increase the availability of foraging habitat, as common nighthawks forage in open habitats where flying insects are abundant. Foraging habitat for common nighthawk is not limited within the Regional Study Area, as forest openings (*e.g.*, lakes, wetlands, bogs, creeks, regenerating forest) are widespread and abundant.

Project-related Disturbances and Access Effects

Construction-related noise from heavy equipment, blasting and other human activities may cause common nighthawk to avoid using areas within and/or adjacent to Project footprints. In these areas, avoidance of breeding habitats will likely persist until disturbances have ceased. Birds displaced from breeding habitat will likely relocate to alternate available habitats not affected by construction disturbance. Since lights have the potential to attract flying insects (preferred forage food for nighthawks), floodlights used in camps, work areas, and for other infrastructure may enhance the quality of infrastructure sites as foraging habitats for common nighthawks. Since nighthawks are most active a dusk, construction activity is not anticipated to adversely affect foraging birds. However, if construction disturbance continues through the night, foraging birds may temporarily avoid construction sites altogether.

Increased human access during the construction phase is not anticipated to have any effect on the local common nighthawk population. While vehicle traffic may present a collision risk to nighthawks, the risk is negligible as nighthawks forage at heights well above vehicles (McCracken 2008).

Mitigation

The following mitigation measures will be implemented to minimize or avoid potential effects of Project construction on common nighthawk:

- Land clearing activities will be undertaken outside of the sensitive breeding period (April 1-July 31) to the extent practicable to minimize disturbance to breeding birds.

Residual Effects of Construction

Construction-related effects on common nighthawk include a net gain in foraging and breeding habitat. While long-term losses will occur where infrastructure development removes primary and secondary breeding habitat for the creation of roads, GS or other permanent Project-related infrastructure, short-term gains will occur following the clearing of large forested areas, such as within the reservoir footprint area. The residual effects of Project construction on common nighthawk are associated with a net increase in 2,764 ha (15% of the available common nighthawk breeding habitat within the Regional Study Area). This net gain in habitat would likely have only a small effect on local populations as it would be temporary in nature, lasting only until the reservoir fills.

The short-term residual effects of Project construction on common nighthawk are expected to be positive, high in magnitude, small in extent and short-term.

Operation

Habitat Change

Filling of the reservoir will result in the long-term loss of 4,210 ha (522 ha of pre-Project habitat plus the 3,688 ha created during reservoir clearing) of suitable common nighthawk breeding habitat. Ongoing shoreline erosion, peatland disintegration and changes to vegetation resulting from changes in groundwater are processes that could lead to an additional loss of up to 480 ha of common nighthawk habitat. Combined, upwards of 1,002 ha (or 5% of the available common nighthawk habitat within the Regional Study Area) could be lost during Project operations. While this loss is considered high, the changing dynamics of the boreal forest will alter the availability of common nighthawk habitat on a constant basis. Wildfire and forest succession will continue to alter the landscape, removing and replacing suitable common nighthawk habitat. Common nighthawk habitat is widespread throughout the region and not considered to be limited within the Regional Study Area.

Project-related Disturbances and Access Effects

Increased human access (*i.e.*, traffic) during the operation phase is not anticipated to have a notable effect on common nighthawk populations as this species forage at heights well above vehicles (McCracken 2008).

Mitigation

The following mitigation measures will be implemented to minimize potential effects of Project operation on common nighthawk:

- Portions of the decommissioned borrow areas may be left with patches of bare ground (*i.e.*, not rehabilitated) in order to provide suitable nesting habitat for common nighthawk.

Residual Effects of Operation

The residual effects of Project operation on common nighthawk are associated with a loss of the short-term habitat created through reservoir clearing (construction period) and the loss of up to 1,002 ha of pre-Project breeding habitat (5% of the available common nighthawk breeding habitat within the Regional Study Area) due to reservoir filling. The residual effects of Project operation on common nighthawk are associated with habitat loss. Residual operation-related effects are expected to be adverse, moderate in magnitude, small in extent and long-term.

Conclusion about Residual Effects on Common Nighthawk

Positive residual effects are expected during the construction phase as land clearing will increase the availability of nesting habitat (*i.e.*, open, bare ground) for common nighthawk. During operation, reservoir filling will result in the loss of habitat temporarily created during construction. Over time, shoreline erosion and peatland disintegration are process that will lead to the additional loss of some common nighthawk habitat. An overall total of 1,926 ha of pre-Project common nighthawk habitat (up to 10% of what is available within the Regional Study Area) will be lost due to Project development. The residual effects of the Project on common nighthawk are expected to be adverse, moderate in magnitude, small in extent and long-term.

The residual effects of construction and operation on common nighthawk will overlap temporally and spatially with the future Bipole III Transmission Project and Keeyask Transmission Project (Section 6.4.4).

Ground-based monitoring of local common nighthawk populations will occur during construction and operation (Section 6.4.5, Table 6.4-1).

6.4.1.4.2 Rusty Blackbird

Removal and degradation of some rusty blackbird breeding and foraging habitat is expected to occur following construction-related land clearing and increased access where rusty blackbird habitat occurs adjacent to roadways used during operation of the GS.

Construction

Habitat Change

Land clearing activities associated with the development of the reservoir, expansion of the construction camp, borrow areas and other infrastructure will result in the loss of a small amount of breeding and

foraging habitat for rusty blackbirds where suitable habitat falls within or adjacent to infrastructure zones. Rusty blackbirds nest in trees and shrubs in the riparian areas of sedge marshes and forest wetlands. They can often be found foraging along the floodplains of rivers and streams, and in the herbaceous vegetation of bogs and beaver floods (Sinclair *et al.* 2003). Land clearing associated with the development of the GS and south access road may also have an adverse effect on rusty blackbirds by reducing nesting and foraging habitat that is available for the long-term.

As land is cleared in preparation for Project development (*e.g.,* reservoir, dykes, south access road and trails), approximately 3% (547 ha) of the regional rusty blackbird breeding and foraging habitat will be lost or reduced in quality for the long-term. Suitable, alternate rusty blackbird breeding habitat (*e.g.,* treed wet peatland, riparian habitats) is widespread throughout the Regional Study Area (Map 6-9).

Project-related Disturbances and Access Effects

Construction-related noise from heavy equipment will be short-term and temporary. Although construction noise may reduce acoustical quality of bird song communication, reproductive success of rusty blackbirds is not expected to be adversely effected (Brumm 2004; Habib *et al.* 2007).

Increased human access during the construction phase will increase the collision risk for rusty blackbirds along areas of the north and south access roads where wetland habitat occurs. This collision risk is considered small and unlikely to affect local populations.

Mitigation

The following mitigation measures will be implemented to minimize or avoid potential effects of Project construction on rusty blackbird:

- Land clearing activities will be undertaken outside of the sensitive breeding period (April 1-July 31) to the extent practicable to minimize disturbance to breeding birds; and
- 100 m vegetated buffers will be retained wherever practicable around lakes, wetlands and creeks located adjacent to infrastructure sites to minimize the loss of rusty blackbird nesting habitat and limit noise-related disturbances to rusty blackbirds.

Residual Effects of Construction

During construction, land clearing activities will result in the removal and degradation of some rusty blackbird breeding and foraging habitat for the long-term. This loss is considered moderate in magnitude and measureable changes in rusty blackbird populations are not expected. Suitable alternate habitat for rusty blackbird is widespread throughout the Regional Study Area.

The residual effects of Project construction on rusty blackbirds are expected to be adverse, moderate in magnitude, small in extent and long-term.

Operation

Habitat Change

Rusty Blackbird populations could be negatively affected by the degradation of boreal forest wetland breeding habitat due to peatland disintegration (Sillett *et al.* 2000; Jones *et al.* 2003), and mercury contamination of boreal wetlands following reservoir clearing and subsequent filling (DesGranges *et al.* 1989; Garcia and Carignan 2000; Gerrard and St. Louis 2001).

Project-related Disturbances and Access Effects

Traffic along the north and south access roads may present a small collision risk to rusty blackbirds if suitable habitat occurs adjacent to roadways.

Mitigation

The following mitigation measures will be implemented to minimize potential effects of Project operation on rusty blackbirds:

- Mitigation for wetland function is being implemented through the development of wetlands in the Local Study Area. Some of these wetland developments may provide habitat for rusty blackbirds.

Residual Effects of Operation

The potential residual operation-related effects on rusty blackbirds are associated with the loss of up to 374 ha of additional breeding habitat resulting from long-term shoreline erosion and peatland disintegration processes. Increased access associated with the operation of the access roads is not anticipated to have a measurable effect on local rusty blackbird populations.

Potential effects of operation on rusty blackbirds are expected to be adverse, moderate in magnitude, small in extent and long-term.

Conclusion about Residual Effects on Rusty Blackbird

The residual effects of Project construction and operation on rusty blackbirds are associated with the loss of 921 ha of breeding habitat (6% of the available rusty blackbird habitat within the Regional Study Area). The residual effects of Project construction and operation on rusty blackbirds are associated with habitat loss. Residual effects are expected to be adverse, moderate in magnitude, small in extent and long-term.

The residual Project effects on rusty blackbird will overlap temporally and spatially with the future Bipole III Transmission Project and Keeyask Transmission Project (see discussion in Section 6.4.4).

Ground-based monitoring of local rusty blackbird populations will occur during construction and operation (Section 6.4.5, Table 6.4-1).

6.4.2 Other Priority Birds (Supporting Topics)

Other priority birds include native species that are rare and/or are highly sensitive to Project development features, and/or rely on rare environmental features (*e.g.*, rocky reefs). Birds are classified as rare if they have suffered population declines, are at the edge of their known breeding range or are expanding their breeding range (due to changes in environmental conditions). Rare birds include species at risk (species listed under the *Manitoba Endangered Species Act* [MESA] and/or Canada's *Species at Risk Act* [SARA] and/or COSEWIC).

6.4.2.1 Species at Risk

The effects of Project construction and operation on species at risk (olive-sided flycatcher, common nighthawk, rusty blackbird) are discussed under the bird VECs in Section 6.4.1. The only other species at risk to be affected by Project construction include yellow rail, short-eared owl, red knot and peregrine falcon. Potential construction-related effects on red knot and peregrine falcon are anticipated to be minimal given their use of the Local Study Area for migration alone. Similarly, operational effects on these are not anticipated due to these species' transient use of the area. Further assessment of Project construction and operational effects focuses on yellow rail and short-eared owl, as they are expected to inhabit the Local Study Area during the breeding season.

6.4.2.1.1 Yellow Rail

Potential Project-related effects on yellow rail are associated with changes in habitat availability due to land clearing, reservoir filling and construction-related noise disturbance. Increased human access during GS operation is also expected to lead to a reduction of suitable habitat.

Construction

Habitat Change

Land clearing activities associated with the development of the reservoir, expansion of the construction camp, borrow areas and other infrastructure are not anticipated to have notable effects on rail habitat as yellow rails utilize open fen habitats that generally lack trees. Yellow rails nest on the ground in sedge marshes and wet meadows, which often occur at the margins of larger waterbodies. They can often be found on the floodplains of rivers and streams, in the herbaceous vegetation of bogs (Alvo and Robert 1999). Land clearing associated with the development of the GS and south access road may also have a small, adverse effect on yellow rails by reducing foraging habitat that is available for the long-term. Loss of potential yellow rail habitat to development is not anticipated to have any measureable effect on any local populations, should they be present, as alternate yellow rail habitat (*e.g.*, sedge-dominated fens and creeks) occurs throughout the Local and Regional Study Areas.

Filling of the reservoir would result in long-term loss of approximately 4.7% of potential yellow rail breeding and foraging habitat (*e.g.*, low vegetation on peatland and other open sedge-dominated habitats). This loss of habitat is expected to have a small adverse effect on local yellow rail populations, should they

be present, as other large, open sedge-dominated habitats (approximately 1803 ha) occur within the Regional Study Area.

Overall, the effect of land clearing on yellow rail habitat is not anticipated to have any measureable effects on local populations, should they be present, as alternate suitable nesting and brood-rearing habitat is abundant and widespread throughout the Regional Study Area (Map 6-11).

Project-related Disturbances and Access Effects

Noise disturbance is expected to be of minimal impact on yellow rail as yellow rails have not been detected within the Local Study Area and most of the potential yellow rail habitat occurs outside of the Project Footprint. In areas where potential yellow rail habitat does come in close proximity to infrastructure sites, construction noise and activity may cause yellow rails (if present) to temporarily avoid wetlands or portions of affected wetlands.

Increased human access during the construction phase is not anticipated to have any effect on yellow rails.

Mitigation

The following mitigation measures will be implemented to minimize or avoid potential effects of noise disturbance and breeding habitat (wetland) avoidance associated with Project construction on yellow rail:

- Clearing will be undertaken outside of the sensitive breeding period (April 1–July 31) to the extent practicable to minimize disturbance to breeding birds; and
- Manual hand-clearing techniques will be used within 30 m of wetland areas to minimize degradation of yellow rail breeding habitat by heavy equipment (PD SV, Reservoir Clearing Plan).

Residual Effects of Construction

Clearing of the reservoir will result in the improvement of some marginal yellow rail breeding habitat (*e.g.*, low vegetation on peatland) through the removal of woody vegetation (*e.g.*, willows, tamarack).

Potential small effects that construction could have on yellow rails, if present, are expected to be short-term and occur within the range of natural variability for rails.

Operation

Habitat Change

Inundation of the reservoir, shoreline erosion and on-going peatland disintegration processes will effectively remove approximately 5% (230 ha) of the low vegetation on peatland identified as potential yellow rail habitat throughout the Regional Study Area. Although a 5% loss of breeding habitat would be considered moderate in magnitude for a listed species, the effect is anticipated to be small as there is no evidence to suggest the Regional Study Area supports a breeding population of yellow rails.

Project-related Disturbances and Access Effects

Increased human access (*e.g.*, traffic along the north and south access roads) is not anticipated to have an effect on yellow rail. Most of the potential yellow rail habitat occurs in remote areas and there is no evidence that rails either breed or migrate through areas potentially affected by the Project.

Mitigation

No mitigation measures are being proposed specifically for yellow rail as they have not been detected in the Project area to date, and alternate suitable nesting and brood-rearing habitat is abundant and widespread throughout the Regional Study Area.

Residual Effects of Operation

There is some potential that Project operation and associated long-term loss of yellow rail breeding habitat within the reservoir footprint may have an adverse effect on local yellow rail populations if rails breed or migrate through areas affected by the Project in the future.

Conclusion about Residual Effects on Yellow Rail

The residual effects of Project construction and operation on yellow rail, if present in the Project area, are associated with the loss of some habitat which could potentially be used by rails in the future. Without any evidence of yellow rails breeding or migrating through the Project area, the overall effect on rails is expected to be small.

As outlined in Chapter 5 of the Keeyask Generation Project: Response to EIS Guidelines, the cumulative effects assessment step that deals with future projects and activities focuses on VECs that are adversely affected by the Project and vulnerable to the effects of future projects and activities. As yellow rail is not a VEC, it is not covered in the cumulative effects assessment presented in Chapter 7 of the Keeyask Generation Project: Response to EIS Guidelines. A brief discussion on cumulative effects assessment for species at risk that are not VECs is presented in Section 6.4.4.

Ground-based monitoring of local species at risk populations will occur during construction and operation (Section 6.4.5, Table 6.4-1).

6.4.2.1.2 Short-eared Owl

Clearing associated with construction activities will provide previously non-existent hunting grounds for short-eared owls within the Local Study Area, and will therefore have a positive short-term effect on this species. Operational reservoir filing will, however, lead to the loss of these open hunting areas. In addition, access roads with higher traffic are expected to increase the potential for collisions with short-eared owls, leading to a low effect of operation.

Construction

Habitat Change

Short-eared owls nest in on the ground in open habitats such as grassy fens, bogs and sedge marshes (Jehl 2004). Evidence suggests that while some nests will occur in grassland parcels as small as 28 ha (Herkert *et al.* 1999) the extent of available suitable habitat needs to be larger than 100ha to be effective breeding and foraging habitats (Dechant *et al.* 2003). Project construction is not anticipated to have an effect on existing short-eared owl habitat as suitable breeding habitat does not occur within the Local Study Area (Map 6-12).

Land clearing for reservoir development is anticipated to temporarily increase the availability of habitat for short-eared owls by creating large forest openings. These newly cleared areas are expected to attract owls hunting for small mammals made vulnerable from the loss of escape and concealment cover. In wetland areas (*e.g.*, low vegetation on wet peatland), manual removal of woody vegetation is also expected to temporarily increase availability of short-eared owl foraging habitat.

This short-term positive effect will extend for the life of the construction period, and peak where early clearing is complete and openings lie dormant while construction progresses elsewhere in the Local Study Area. This positive effect is expected to occur within the natural variability of short-eared owl populations in the Regional Study Area.

Project-related Disturbances and Access Effects

Noise disturbance from construction equipment and blasting may result in the short-term avoidance of wetlands and other open areas (*e.g.*, roadsides) where these activities occur (*e.g.*, GS footprint). The effect of noise disturbance on short-eared owls is anticipated to be minimal as suitable habitat for this species does not occur within the Local Study Area.

Increased human access during the construction phase is anticipated to have a negligible effect on short-eared owls. While vehicle traffic along the north and south access roads may pose a mortality risk to short-eared owls during dusk and dawn hunting periods, the potential for this to occur is low given the low abundance of short-eared owls observed within the Local Study Area.

Mitigation

The following mitigation measures will be implemented to minimize or avoid potential effects of noise disturbance and habitat avoidance associated with Project construction on short-eared owl:

- Land clearing activities will be undertaken outside of the sensitive breeding period (April 1-July 31) to the extent practicable to minimize disturbance to breeding birds; and
- Manual hand-clearing techniques will be used within 30 m of wetlands to minimize degradation of wetland habitat (and food base) by heavy equipment (Reservoir Clearing Plan, PD SV).

Residual Effects of Construction

Potential effects of construction on short-eared owls are expected to occur within the natural variability of the population in the Regional Study Area.

Operation

Habitat Change

Since only marginal foraging and breeding habitat previously occurred within the Project Footprint, the prolonged loss of habitat due to reservoir filling, shoreline erosion and on-going peatland disintegration is expected to occur within the natural variability of the short-eared owl population in the Regional Study Area.

Project-related Disturbances and Access Effects

Short-eared owls often hover low above grassy areas, such as ROW ditches while stalking prey (Cadman and Page 1994). Collision with vehicle traffic along ROWs may pose a risk to short-eared owls during dusk and dawn hunting periods, particularly along the south access road where limited suitable habitat occurs adjacent to the proposed ROW.

Mitigation

Since Project operations are anticipated to have little effect on suitable short-eared owl breeding and foraging habitat, no mitigation measures are proposed to offset any adverse effects of Project operations on short-eared owls.

Residual Effects of Operation

Residual effects of operation on short-eared owls are associated with potential increased mortality risk along access roads. This risk is anticipated to be low due to lack of suitable habitat within the Local Study Area and the low abundance of short-eared owls observed during environmental studies. Potential adverse effects of operation on short-eared owls are expected to occur within the natural variability of the short-eared owl population in the Regional Study Area.

Conclusion about Residual Effects on Short-eared Owl

Positive residual effects are expected during the construction phase as land clearing will increase the availability of foraging habitat (*i.e.,* large open areas) for short-eared owl. During operation, reservoir filling will result in the loss of habitat temporarily created during construction. Increased traffic along the access roads will increase the potential collision risk for owls; however, this risk is anticipated to be small. The residual adverse effects of Project construction and operation on short-eared owl are expected occur within the natural variability of the population in the Regional Study Area.

As outlined in Chapter 5 of the Keeyask Generation Project: Response to EIS Guidelines, the cumulative effects assessment step that deals with future projects and activities focuses on VECs that are adversely

affected by the Project and vulnerable to the effects of future projects and activities. As short-eared owl is not a VEC, it is not covered in the cumulative effects assessment presented in Chapter 7 of the Keeyask Generation Project: Response to EIS Guidelines. A brief discussion on cumulative effects assessment for species at risk that are not VECs is presented in Section 6.4.4.

Ground-based monitoring of local species at risk populations will occur during construction and operation (Section 6.4.5).

6.4.2.2 Species at the Edge of Their Breeding Range

Thirteen bird species that have been observed during environmental field studies are at the edge of their range with respect to the Regional Study Area. The assessment of Project-related effects on species at the edge of their range focuses on two species that are representative of this group, the American white pelican and ruffed grouse. Pelicans are currently expanding their range into parts of Northern Manitoba where their primary food source (*i.e.*, fish) is abundant. Ruffed grouse is a resident game bird that breeds in deciduous-dominated forests that have limited distribution within the Regional Study Area.

Effects on range-limited landbirds (*e.g.*, blue-headed vireo, clay-colored sparrow, and sharp-tailed grouse) are represented by ruffed grouse, a terrestrial upland game bird known to breed within the Regional Study Area. Project-related effects on range-limited waterbirds are represented by American white pelican, a fish-eating bird that is known to occur within the Regional Study Area but not breed. Where potential Project-related effects on other range-limited species differ from these two species, a description of effects is provided.

While some of the available habitat for species at the edge of their range may be modified by the Project, loss of range-limited species from the Regional Study Area is not anticipated. For the American white pelican, residual Project effects are anticipated to be neutral. For ruffed grouse, the residual effects of the Project (*i.e.*, habitat loss and increased mortality risk) are expected to be adverse, moderate in magnitude, small in extent, and long-term.

As outlined in the Keeyask Generation Project: Response to EIS Guidelines (Chapter 5), the cumulative effects assessment step that deals with future projects and activities focuses on VECs that are adversely affected by the Project and vulnerable to the effects of future projects and activities. As the group 'species at the edge of their range' is not a VEC, it is not covered in the cumulative effects assessment presented in Chapter 7 of the Keeyask Generation Project: Response to EIS Guidelines. A brief discussion on cumulative effects assessment for priority species that are not VECs is presented in Section 6.4.4.

Monitoring the abundance and distribution of ruffed grouse populations within the Regional Study Area will occur during the construction and operation phases (Section 6.4.5).

6.4.2.2.1 American White Pelican

Project construction will alter potential pelican foraging habitat and deter feeding on rapidly flowing stretches of the Nelson River in the Local Study Area. Operational habitat loss above Gull Rapid will be offset by potential creation of foraging habitat in the GS tailrace and on any nesting platforms of island enhancements.

Construction

Habitat Change

There is currently no evidence of pelican nesting, or adequate breeding habitat, in the Local Study Area. The anticipated effects of construction on pelican foraging habitat are similar to those described for some fish-eating colonial waterbirds and eagles (Section 6.4.1). The quality and quantity of pelican foraging habitat (*e.g.*, fast flowing turbulent water) upstream of Gull Rapids will decline as construction of the GS alters river flows and changes the riverine environment into a more lacustrine environment.

Project-related Disturbances and Access Effects

Construction-related effects on pelicans include loss and alteration of some foraging habitat; and the potential for habitat avoidance due to noise disturbance from human activity and equipment.

There is currently no evidence of pelican nesting, or adequate breeding habitat, in the Local Study Area. The anticipated effects of construction on pelican foraging habitat are similar to those described below for some fish-eating colonial waterbirds (Section 6.4.2.3) and eagles (Section 6.4.1). Within the Gull Rapids area, changes in the water regime will cause a short-term decrease in the quantity of pelican foraging habitat. These changes, along with construction noise and human activity, are expected to temporarily deter pelicans from using the Gull Rapids area during construction.

Mitigation

The following mitigation measure will be implemented to minimize or avoid potential effects of Project construction on American white pelican:

- Land clearing activities will be undertaken outside of the sensitive breeding period (April 1–July 31) to the extent practicable.

Although pelicans are not expected to breed within the Project Footprint, timing restrictions on construction activity will reduce disturbance to non-breeding pelicans foraging in sections of the Nelson River where it passes through the Project Local Study Area. If clearing activities conducted outside this timeframe disturb non-breeding or foraging pelicans in this area, these individuals are expected to relocate to alternate suitable habitats up- or downstream of the Local Study Area.

Residual Effects of Construction

The residual effects of Project construction on American white pelicans are associated with deterrence from and/or alteration to potential foraging habitat, and are expected to occur within the natural variability of the population in the Regional Study Area.

Operation

Habitat Change

Operation of the Project is anticipated to have a positive effect on pelicans through creation of the tailrace immediately downstream of the GS. The tailrace is expected to create a foraging opportunity similar to that observed at the nearby Kelsey tailrace, as observed during refueling stops for Keeyask avian surveys in June 2011. This concentrated availability of forage fish may alter the distribution of pelicans in the bird Regional Study Area as pelicans are drawn to the area downstream of the GS. Additionally, plans for enhancement of existing islands and the creation of an artificial island(s) for other colonial waterbirds would also provide suitable nesting substrates for pelicans. While there is uncertainty as to whether pelican will nest in the Local Study Area in the future, the potential for nesting will increase as foraging and nesting opportunities are enhanced.

Project-related Disturbances and Access Effects

The quality and quantity of pelican foraging habitat (*e.g.*, fast flowing turbulent water) upstream of Gull Rapids will decline as construction of the GS alters river flows and changes the riverine environment into a more lacustrine environment.

Mitigation

Plans for the enhancement and/or creation of nesting islands for colonial waterbirds are also expected to benefit American white pelican.

Residual Effects of Operation

The residual effects of Project operation on American white pelican are associated with loss of foraging habitat upstream of the GS, creation of foraging habitat in the tailrace and creation suitable island nesting habitat. Residual operation-related effects are expected to be neutral.

Conclusion about Residual Effects on White Pelican

Residual project-related effect on American white pelican is associated with noise disturbance causing short-term avoidance of foraging habitat at Gull Rapids. This effect is expected to occur within the natural variability of the American white pelican population in the Regional Study Area.

6.4.2.2.2 Ruffed Grouse

Construction-related effects on ruffed grouse include short-term habitat avoidance due to noise disturbance, and loss and alteration of breeding, foraging and overwintering habitat. Increased human access is also anticipated to result in the increased mortality of ruffed grouse in area where suitable ruffed grouse habitat occurs.

Construction

Habitat Change

Land clearing and site preparation for the development of Project Footprint (*e.g.,* reservoir, dykes, borrow areas, access roads and trails) may result in the loss of up to 10% (70 ha) of the ruffed grouse breeding habitat (*e.g.,* mixedwood forest with dense shrub understory) available within the Regional Study Area. Land clearing activities may contribute to local ruffed grouse mortality as these year-round residents have a strong tendency to remain within their home ranges and are slow to flush from potential danger (Schroeder 1985; Schieck and Hannon 1989: Marjakangas and Kiviniemi 2005).

Project-related Disturbances and Access Effects

In areas adjacent to construction sites, short-term habitat avoidance by ruffed grouse may occur as a result of noise disturbances from heavy equipment, blasting, and other human activities. The effect of construction noise on ruffed grouse is anticipated to be short-term and site-specific, affecting only grouse using habitats located immediately adjacent to construction activity. Grouse are expected to return to these areas once construction activity ends.

During construction, access road traffic could increase the risk of local ruffed grouse mortality, as grouse are often attracted to roadsides in search for grit (*i.e.,* a digestion aid; Alaska Fish and Game 2008). Increased human access resulting from the creation of new roads and trails may also contribute to localised increases in the harvest of ruffed grouse.

Mitigation

During Project planning, measures were taken to minimize the loss of white birch forest communities, a regionally rare forest type that provides important habitat for ruffed grouse. Additional mitigation measures to minimize or avoid potential effects of Project construction on birds at the edge of their range will include:

- Land clearing activities will be undertaken outside of the sensitive breeding period (April 1–July 31) to the extent practicable.

Residual Effects of Construction

The residual effects of Project construction on ruffed grouse are associated with noise disturbance and habitat loss and/or alteration and are expected to occur within the natural variability of the population in the Regional Study Area.

Operation

Habitat change

Potential operational effects on ruffed grouse include habitat loss associated with shoreline erosion, ongoing peatland disintegration process, and changes in vegetation resulting from changes in

groundwater. Up to 8% (65 ha) of the bird Regional Study Area's ruffed grouse breeding habitat could be affected. It is expected that, over time, ruffed grouse habitat will form in some of the decommissioned borrow areas, camp areas and other infrastructure sites that are no longer required for the Project. These sites will likely eventually be colonized by plants (*e.g.*, shrubs), providing suitable forage habitat for ruffed grouse.

Project-related Disturbances and Access Effects

During operation, ruffed grouse may experience an increase in mortality risk due to increased hunter access and increased traffic levels along access roads. Increases in the harvest of ruffed grouse along roadsides are not anticipated to have a measureable effect on local populations.

Mitigation

The following mitigation measure will be implemented to minimize potential effects of Project operation on ruffed grouse:

- A construction access management plan (*e.g.*, prohibitions on personnel hunting and monitored gated entry along access roads) will be implemented to minimize the potential for increased harvest of local ruffed grouse populations.

Residual Effects of Operation

The residual effects of Project operation on ruffed grouse includes minimal increase in risk of traffic collisions on access roads, but is not expected to be a notable effect within the regional population.

Conclusions about Residual Effects on Ruffed Grouse

Residual Project-related effects for ruffed grouse are associated with habitat loss, noise disturbance causing temporary habitat avoidance, and increased human access resulting in an increase in mortality risk through hunting and collisions with vehicles using access roads. These effects are anticipated to occur within the natural variability of the ruffed grouse population in the Regional Study Area.

As outlined in the Keeyask Generation Project: Response to EIS Guidelines (Chapter 5), the cumulative effects assessment step that deals with future projects and activities focuses on VECs that are adversely affected by the Project and vulnerable to the effects of future projects and activities. As ruffed grouse is not a VEC, it is not covered in the cumulative effects assessment presented in Chapter 7 of the Keeyask Generation Project: Response to EIS Guidelines. A brief discussion on cumulative effects assessment for priority species that are not VECs is presented in Section 6.4.4.

Monitoring is planned for ruffed grouse during Project construction and operation (Section 6.5.4).

6.4.2.3 Colonial Waterbirds

Colonial waterbirds are represented by ring-billed gull, herring gull and common tern. All of these species breed on rocky islands and reefs within the Regional Study Area. Effects of Project construction are

mainly associated with sensory disturbance, whereas operational effects include removal and/or degradation of breeding and foraging habitat.

Construction

Habitat Changes

Development of cofferdams and inundation of islands, reefs and gravel shorelines during the construction of the GS (PD SV) would reduce the availability of nesting habitat for both gulls and terns. The most notable changes to nesting habitat would occur with the inundation of islands (located upstream of Gull Rapids) and dewatering of reefs that are utilized by approximately 30-100 breeding pairs of terns. Similar island habitat is scarce on the Nelson River and in other comparable rivers in the region. If forced to nest elsewhere than their preferred sparsely vegetated islands surrounded by deep water, gulls and terns will be vulnerable to land-based predators (Carey *et al.* 2003)

Because terns are small fish and invertebrate prey specialists, and prefer to forage within a radius of up to 6 km from their colony, the loss of nesting habitat on reefs at Gull Rapids may have a greater adverse effect on these predators (Burger and Gochfeld 1991). Additionally, terns are more specific in their breeding requirements, which make them less adaptable when suitable colonial breeding sites are lost or taken over by expanding gull populations (Burger and Gochfeld 1991). If forced to nest along the periphery of gull colonies, tern nests become highly vulnerable to the effects of fluctuating water levels (Burger and Gochfeld 1991). Thus, changes in the water regime at Gull Rapids during generating station development may potentially have a greater short-term adverse effect on local tern populations than on the local gull populations.

The loss of nesting islands/reefs for both gulls and terns at Gull Rapids may potentially be offset if GS operation results in changes in the Nelson River water regime that expose rocky reefs downstream of the GS and the newly exposed reefs are surrounded by flowing water. Implementation of nesting platforms is also expected to offset loss of nesting habitat following placement of coffer dams. Used successfully in Canada, the U.S. and the U.K (Techlow and Linde 1983), these platforms would function as alternate nesting habitat for tern colonies displaced by changes in the Nelson River water regime.

Predicting whether areas downstream of the GS would be suitable for gull and tern nesting is difficult due to the lack of bathymetry data for this area (due to the hazardous water conditions in this area, risk to human safety precluded the collection of bathymetry data in this reach of the river). Due to this uncertainty, islands upstream and potentially downstream of Gull Rapids will be enhanced to make them more suitable for colonial bird nesting. These efforts, along with deployment of tern nesting platforms, are expected to mitigate the losses of breeding habitats at Gull Rapids.

Project Associated Disturbances and Access Effects

Within the Project Footprint Study Area, blasting activities and equipment noise is expected to decrease foraging efficiency of gulls and terns using the generating station construction area. These species will avoid parts of Gull Rapids where disturbance is louder and/or more frequent (Barber *et al.* 2010). Blasting will also reduce reproductive success of gulls and terns that remain nesting on exposed reefs by

causing birds to flush from nests, leaving eggs or hatchlings vulnerable to predation and weather (Burger 1988). To the extent possible, blasting activities should occur outside of the sensitive breeding period (May to mid-July) when birds are established on their nests, incubating eggs or brooding young, as disturbance to breeding birds could result in the loss of offspring. To minimize impacts, blasting activities would follow guidelines set out in the EnvPP.

The potential for spillage or leaks of petroleum products (*e.g.*, gasoline, diesel and heating oil) is associated with all phases of construction (*e.g.*, access road clearing and construction, development of the GS site, *etc.*). Spills or leaks have the potential to contaminate aquatic areas where gulls and terns forage, nest and stage. While the effect on gulls and terns of accidental spills or leaks near or within inland lakes would generally be very small and site specific, spills and leaks of hazardous materials entering the Nelson River would have substantially more adverse effects. Adherence to measures outlined in the EnvPP (*e.g.*, proper containment and storage of fuels away from waterbodies and other potentially sensitive sites) would help guard against accidental spills having any adverse effects on gulls and terns.

Mitigation

The following mitigation measures will be implemented to minimize or avoid potential effects of Project construction on colonial waterbirds:

- Deployment of artificial gull and tern (*e.g.*, reef raft) nesting platforms, breeding habitat enhancements to existing islands, and/or development of artificial island(s), will be implemented to offset the loss of gull and tern nesting habitat at Gull Rapids and areas upstream; and
- Over the course of construction, if there is overlap of scheduled construction activities that could affect the breeding colonies at Gull Rapids with the bird breeding period (April 1-July 31), measures will also be taken to avoid or minimize disturbance to active nesting colonies to the extent possible.

Residual Effects of Construction

Gulls and terns foraging within the Gull Rapids area during GS construction will be sensitive to equipment noise and blasting disturbances. These disturbances are expected to affect gull and tern foraging efficiency by interrupting forage activities and/or forcing birds to avoid portions of Gull Rapids area where noise and blasting is most frequent and disruptive.

Effects of Project construction on gulls and terns are expected to be short-term and result in a change in the distribution of the populations, similar to what may naturally occur in some years.

Operation

Habitat Changes

During operations, gull and tern breeding and foraging habitat located at Gull Rapids, in Gull Lake and parts of the Nelson River upstream to Birthday Rapids would be flooded. Areas of the river that support fast flowing water and gull and tern foraging activities (between Gull Lake and Birthday Rapids) would be lost during the filling of the reservoir.

Operation of the GS will result in the removal and/or degradation of approximately 2.7 ha of potential gull and tern breeding habitat (*i.e.*, reefs; PD SV). Terns prefer to forage within a radius of up to 6 km from their colony. Without suitable breeding habitat located within the preferred 6 km radius of a colony (Burger and Gochfeld 1991), tern populations breeding within the Project footprint could be adversely affected by the loss of breeding habitat both at Gull Rapids and in areas upstream. However, if reefs or islands become exposed on the downstream side of the GS, and are colonized by terns, the effect of the loss of tern nesting at Gull Rapids would be negligible.

The flooding of shorelines and adjacent habitat would adversely affect gulls that forage and/or loaf along shoreline habitat (*e.g.*, ring-billed gulls). It is anticipated that the new shoreline associated with the future Keeyask reservoir would consist of various substrates including disintegrating peatland. Since peat shorelines are less optimal for gulls than mineral shorelines, it is anticipated that gulls would experience a loss of suitable shoreline habitat along the reservoir area.

Peatland disintegration and shoreline erosion brought about by filling of the reservoir is expected to increase water turbidity. Since terns require clear water within which to forage, increased water turbidity resulting from shoreline erosion and peatland disintegration may reduce foraging efficiency over the short-term. Over time, water clarity would eventually improve with the settling of suspended sediments. For terns, the effect of increased turbidity in the reservoir is likely to be offset by the foraging opportunity created in the tailrace area below the GS.

Project Associated Disturbances and Access Effects

During the operation phase, increased traffic along the north and south access roads is not anticipated to have any effect on terns using the Local Study Area. Both inland lakes and areas surrounding the GS provide habitat for gulls. Increased traffic during operations may result in increased traffic-related gull mortality among recently fledged birds, in areas where inland lakes occur adjacent to roads or in areas adjacent to the GS. Retention of a treed buffer between inland lakes and the access road will help encourage birds entering and leaving these areas to fly over the buffer of trees, thereby avoiding potential collisions with vehicles traveling along the north and south access roads.

Mitigation

Mitigation measures that will be implemented to minimize potential effects of Project operation on colonial waterbirds include the following:

- Traffic signage will be installed indicating reduced vehicle speed over the GS and at other potentially sensitive waterbody crossing sites; and
- Deployment of artificial gull and tern nesting platforms (*e.g.,* reef rafts), breeding habitat enhancements to existing islands (*e.g.,* predator fencing or placement of suitable surface substrate), and/or development of an artificial island, or a combination of these measures, will be implemented to offset the loss of gull and tern nesting habitat at Gull Rapids and areas upstream.

Residual Effects of Operation

Reservoir inundation, peatland disintegration and shoreline erosion during the operation phase are expected to result in a short-term increase in water turbidity and a long-term loss of some foraging habitat along mineral shorelines.

Many of the potential effects of Project operation on gulls and terns will be mitigated. Long-term changes in the number and distribution of gulls and terns are expected to occur within the natural variability of gull and tern population in the Regional Study Area.

Conclusions about Residual Effects on Colonial Waterbirds

Residual Project effects on colonial waterbirds are associated with short-term noise disturbances at Gull Rapids during the construction phase and the long-term loss of some foraging habitat along mineral shorelines during the operation phase. Following the implementation of the mitigation measures, residual Project effects are expected occur within the natural variability of gull and tern population in the Regional Study Area.

As outlined in Chapter 5 of the Keeyask Generation Project: Response to EIS Guidelines, the cumulative effects assessment step that deals with future projects and activities focuses on VECs that are adversely affected by the Project and vulnerable to the effects of future projects and activities. As the colonial waterbirds group is not a VEC, it is not covered in the cumulative effects assessment presented in Chapter 7 of the Keeyask Generation Project: Response to EIS Guidelines. A brief discussion on cumulative effects assessment for priority species that are not VECs is presented in Section 6.4.4.

The distribution of waterbirds will be monitored during Project construction and operation in order to assess the effectiveness of mitigation measures, determine the need for adaptive management and confirm the accuracy of EIS predictions (Section 6.4.5).

6.4.2.4 Willow Ptarmigan

Construction-related effects on willow ptarmigan are associated with the loss and alteration of some foraging and overwintering habitat due to land clearing activities, and short-term habitat avoidance due to noise disturbance from human activity and equipment. Effects on breeding habitat are not expected as suitable willow ptarmigan breeding habitat does not occur within the Local Study Area. Construction-related land clearing in the Project Footprint will thus result in the long-term loss of some foraging and overwintering habitat for willow ptarmigan. Noise disturbance from construction activities may cause some ptarmigan to avoid habitats within and adjacent to infrastructure sites.

Construction

Habitat Changes

Land clearing activities associated with the development of the reservoir and GS infrastructure will result in the long-term loss of some foraging and overwintering habitat for willow ptarmigan. This loss is considered small as shrubby habitat adjacent to forest cover (primarily coniferous forest; NWT 2012) is

abundant and widespread throughout the Regional Study Area (TE SV Section 2). It is anticipated that early successional species favoured as forage by willow ptarmigan (*e.g.*, willows) will proliferate along disturbed sites such as road rights-of way and borrow areas following initial land clearing. Winter clearing activities may result in the loss of some ptarmigan using forest edge and areas where sufficient food (*e.g.*, willow) and cover (*e.g.*, snow pack) occur.

While some ptarmigan habitat will be lost during construction of the south access road, over time, some marginal habitat will be created along the ROW. Recolonization of plants including shrubs and young tree species (*e.g.*, aspen, spruce) will provide suitable forage habitat for ptarmigan (Storch 2000; Maine IF&W 2008). Attraction of willow ptarmigan to recolonized areas adjacent to roadsides is likely to also attract predators such as owls and foxes to this new edge habitat. A small increase in predation pressure on local ptarmigan populations in these areas is expected.

Project Associated Disturbances and Access Effects

As willow ptarmigan are often attracted to roadsides in search for grit (*i.e.*, a digestion aid; Alaska Fish and Game 2008), increased construction traffic on the north and south access roads is anticipated to increase the risk of local ptarmigan mortality.

Increased hunter access along access roads is anticipated to have a roads and trails is expected to Increased hunter access along roads and trails is anticipated to increase local ptarmigan mortality, thus having a small, adverse effect on local ptarmigan populations.

Mitigation

The following mitigation measures will be implemented to avoid or minimize potential effects of Project construction on ptarmigan:

- Hand-clearing will occur within 30 m of wetlands, thus reducing the potential for mortality of ptarmigan using wetland edges; and
- A construction access management plan will be implemented to minimize the potential for increased harvest of local willow ptarmigan populations.

Residual Effects of Construction

Residual construction-related effects are associated with the loss of some overwintering habitat, and increased mortality risk from clearing equipment, increased vehicle, hunter and predator access. Construction noise is anticipated to cause some ptarmigan to avoid habitats adjacent to construction areas.

Effects of Project-related construction on ptarmigan are expected to occur within the natural variability of the population in the Regional Study Area.

Operation

Habitat Changes

During Project operations, filling of the reservoir will inundate previously cleared and degraded ptarmigan habitat. The result will be a long-term loss of some overwintering habitat. This incremental loss of winter habitat is not anticipated to have a measureable effect on local ptarmigan populations as wintering habitat is abundant and widespread throughout the Regional Study Area.

Project Associated Disturbances and Access Effects

During the operational phase, disturbances such as traffic noise and human activity along access roads and at permanent infrastructure sites are not anticipated to have any notable effect on ptarmigan populations utilizing adjacent habitats.

Access road traffic is expected to have an adverse effect on a small number of ptarmigan due to vehicle collisions. However, this loss is anticipated to be, sporadic and not measureable at the local population level. In addition, increased access along the north and south access roads has the potential to increase winter hunting pressure on ptarmigan using these areas during the operation phase.

Mitigation

The following mitigation measures will be implemented to avoid or minimize potential effects of Project operation on willow ptarmigan:

- Except for existing resource-use trails, Project-related cutlines and trails will be blocked where they intersect the Project Footprint, and the portions of these features within 100 m of the Project Footprint will be revegetated to minimize the risk of access-related effects.

Residual Effects of Operation

Residual effects of operation area associated with increased mortality risk due to increased access and associated hunter-related harvest and vehicular collisions along access roads. Aside from the periodic loss of willow ptarmigan in vehicular collisions along access roads, especially during juvenile grouse dispersal in early fall, the effect on populations of ptarmigan during the operational phase of the Project is expected to be minimal and local.

Effects of Project operations on willow ptarmigan are expected to occur within the natural variability of the population in the Regional Study Area.

Conclusion about Residual Effects on Willow Ptarmigan

Residual Project-related effects for willow ptarmigan are associated with habitat loss, noise disturbance causing temporary habitat avoidance, and increased human access resulting in an increase in mortality risk through hunting and collisions with vehicles using access roads. These small effects are anticipated to occur within the natural variability of the population in the Regional Study Area.

As outlined in the Keeyask Generation Project: Response to EIS Guidelines (Chapter 5), the cumulative effects assessment step that deals with future projects and activities focuses on VECs that are adversely affected by the Project and vulnerable to the effects of future projects and activities. As willow ptarmigan is not a VEC, it is not covered in the cumulative effects assessment presented in Chapter 7 of the Keeyask Generation Project: Response to EIS Guidelines. A brief discussion on cumulative effects assessment for priority species that are not VECs is presented in Section 6.4.4.

Monitoring is not planned for willow ptarmigan.

6.4.3 Other Birds

The following section describes the potential Project-related effects on birds have not been covered under previous discussions involving the bird VECs (Section 6.4.1) and/or other priority birds (Section 6.4.2).

6.4.3.1 Waterbirds

6.4.3.1.1 Waterfowl

Project-related effects on waterfowl, including dabbling ducks (*e.g.*, green-winged teal, American wigeon), diving ducks (*e.g.*, common goldeneye, lesser scaup) and mergansers are similar to those described for mallard (Section 6.4.1). Construction-related land clearing within the reservoir and infrastructure areas will result in the loss of some nesting cover in the form of riparian ground cover, shrubs, mature live trees and snags. Filling of the reservoir will result in the loss of some breeding and staging habitat (*e.g.*, inland lakes) and reduce the quality of staging habitat at Gull Lake for the long-term.and increased erosion, with associated reductions in availability of aquatic invertebrate prey items. Overall Project effects on waterfowl are expected to be small and occur within the natural variability of the population in the Regional Study Area.

Construction

Habitat Changes

Land clearing activities associated with the development of the reservoir, generating station, south access road, expansion of the construction camp, borrow areas and other infrastructure will result in the loss of some nesting cover (*e.g.*, tree cavities, shrubs) required by locally breeding waterfowl (*e.g.*, merganser, bufflehead, American widgeon). The loss of mature trees, including dying trees and snags adjacent to lakes and rivers could have an adverse effect on locally breeding cavity nesters (*e.g.*, merganser, bufflehead, and goldeneye). Loss or degradation of ground cover along or adjacent to riparian areas will adversely affect waterfowl that nest in riparian (*e.g.*, ring-necked duck) and/or upland habitat (*e.g.*, mallard; Section 6.4.1).

Since land clearing will be minimal in areas immediately adjacent to wetlands, creeks and lakes (PD SV, Reservoir Clearing Plan), effects on ducks (*e.g.*, ring-necked duck) that nest in wetland vegetation (*e.g.*, sedge, leatherleaf) are expected to be minimal. However the quality of wetlands and lakes used by ducks

will decrease with the removal of upland vegetation as increased erosion of soils are expected to degrade the quality of aquatic food sources (*e.g.*, aquatic invertebrates, crustaceans, and molluscs).

Project Associated Disturbances and Access Effects

The effects of noise disturbance from construction equipment and blasting on all species of waterfowl known to use the Local Study Area are similar to that described for Canada geese and mallard (Section 6.4.1). A short-term displacement of birds is expected in areas affected by construction noise and blasting.

The effects of accidental spills or leaks of petroleum products (*e.g.*, gasoline, diesel and heating oil) on waterfowl are similar to those described for Canada goose and mallard (Section 6.4.1).

Mitigation

The following mitigation measures will be implemented to minimize or avoid potential effects of Project construction on waterfowl:

- 100 m vegetated buffers will be retained wherever practicable around lakes, wetlands and creeks located adjacent to infrastructure sites to minimize the loss of waterfowl nesting habitat, to limit noise-related disturbances to waterfowl and to minimize access;
- Land clearing activities will be undertaken outside of the sensitive breeding period (April 1-July 31) to the extent practicable to minimize disturbance to breeding birds; and
- Increases in local waterfowl harvest will be minimized through implementation of a construction access management plan.

Residual Effects of Construction

Construction-related effects on waterfowl will include a temporary reduction in habitat availability and sensory disturbances (*e.g.*, equipment noise, blasting) in all or parts of wetlands, lakes, creeks or bays within the Local Study Area. The magnitude of this effect is small, affecting a small number of birds that could relocate to alternate suitable habitats located in other parts of the Local Study Area.

Clearing and filling of the reservoir will result in the loss or degradation of some waterfowl-breeding habitat (*e.g.*, riparian areas, uplands). Species most affected include cavity-nesting ducks and ground nesters. Similarly, loss of trees is expected to increase predation risk to birds nesting along wetland margins. Overall, these impacts are anticipated to have only a small adverse effect on waterfowl populations as suitable alternate waterfowl breeding habitat occurs throughout the Regional Study Area.

Effects of Project construction on waterfowl are expected to be minimal and occur within the natural variability of the population in the Regional Study Area.

Operation

Habitat Changes

During operation, some of the inland lakes, creeks and wetlands located within the reservoir footprint would be lost as the reservoir fills. Most waterfowl species that use the Regional Project Area during the breeding and migration periods would be adversely affected by the loss of these important breeding and staging habitats. There is uncertainty whether or not waterbirds will seek more optimal staging areas outside of the Regional Study Area, or if they will settle for suboptimal staging habitats that remain within the study area (*e.g.*, reservoirs, Stephens Lake). Follow-up long-term monitoring would be required to understand how waterbirds respond to the changes in bird habitat at Gull Lake.

Changes in the characteristics of Gull Lake, including changes in water quality, will alter the aquatic food resources depended upon by waterfowl. Higher water levels could have an adverse effect on some of the benthic organisms that function as important food sources for diving ducks (*e.g.*, common goldeneye, scoter) during the migration seasons. However, since benthic organisms are expected to eventually re-establish in more suitable regions of the reservoir, the effects on diving ducks would be moderate in term. Until suitable food sources return to the reservoir area, displaced migrants are expected to stage within other reservoirs and lakes within the region.

It is anticipated that the new shoreline associated with the future Keeyask reservoir would consist of variable substrates including disintegrating peatland. Along some portions of the reservoir, loss of some suitable shoreline will be a short-term event as erosion of organic material may lead to the exposure of new mineral shorelines.

Reservoirs are considered suboptimal for waterbird staging as they generally lack the habitat diversity necessary to support waterfowl (*i.e.*, sheltered shallow bays containing emergent vegetation for food and cover, mudflats and exposed mineral shorelines). Reservoirs consistently supported very few waterbirds during 2001-2003 spring and fall migration field studies. Although Stephens Lake has inlets and bays, the ongoing dynamic peatland disintegration processes continue to affect shoreline stability and water quality. Spring, summer and fall field studies within the north arm of Stephens Lake, an area containing a number of bays and inlets, consistently revealed the presence of very few waterfowl species using the lake between 2005 and 2007. Peatland disintegration, along with the presence of woody debris throughout many of the bays and inlets, appear to limit the lake reservoirs' ability to attract and support waterfowl. While a debris management program would be implemented in order to limit the amount of debris in the Keeyask reservoir, it is anticipated that the overall change in the characteristics of Gull Lake to reservoir would cause a reduction in the use of Gull Lake by waterfowl.

Overall, operation of the reservoir is expected to have an adverse effect on waterfowl that utilize Gull Lake and parts of the Nelson River. Average densities of waterfowl using Gull Lake are higher than all other areas surveyed within the Regional Study Area, yet lower when compared to other areas within the region (*e.g.*, coastal areas along Hudson Bay).

Project Associated Disturbances and Access Effects

If the north and south access roads function as a link between PR 280 and Gillam, increased human access would lead to an increase in hunting pressure at local wetlands and lakes that support waterfowl. This increased access and associated hunting pressure would result in the loss of some waterfowl.

Since waterfowl use of the new Keeyask reservoir is anticipated to decline during the operation phase, increased hunter access in areas along the reservoir is not anticipated to have an effect on local waterfowl populations.

Mitigation

In addition to measures outlined in the EnvPP, the following mitigation measures will be implemented to minimize or avoid potential effects of Project construction on waterfowl:

- Except for existing resource-use trails, Project-related cutlines and trails will be blocked where they intersect the Project Footprint, and the portions of these features within 100 m of the Project Footprint will be revegetated to minimize the risk of access-related effects; and
- Increases in local waterfowl harvest will be minimized through implementation of a construction access management plan.

Residual Effects of Operation

Residual effects of operation on waterfowl are associated with the loss of some breeding and staging habitat in the Local Study Area. The loss of breeding habitat for waterfowl would have a small adverse effect on populations of birds that use the Project area and adjacent areas for breeding purposes since alternate, suitable breeding habitat occurs throughout the Regional Study Area (*e.g.*, in inland lakes and creeks and creek mouths).

The loss of sedge-filled bays, inlets and creek mouths used for staging during the spring and fall migration will have a long-term adverse effect on the local and regional waterfowl populations. While alternate staging areas occur within the Regional Study Area, suitable food, cover and shelter required by waterfowl are limited.

The overall effects of Project-related habitat loss, disturbances (*e.g.*, vehicles) and increased human access on local waterfowl are expected to occur within the natural variability of the population in the Regional Study Area.

Conclusion about Residual Effects on Waterfowl

The residual effects of Project construction and operation on waterfowl are associated with temporary habitat avoidance due to construction noise, loss of some nesting, brood-rearing and staging habitat and reduction in the quality of staging habitat in Gull Lake and parts of the Nelson River due to reservoir development. These long-term effects are expected to occur within the natural variability of waterfowl population in the Regional Study Area.

6.4.3.1.2 Other Gulls

Project effects on ground-nesting gulls and terns are discussed previously under colonial waterbirds in 'other priority birds'. The adverse effects of Project construction and operation on tree nesting gulls (*i.e.*, Bonaparte's gull) include the loss of nesting habitat, are expected to be small and within the natural variability of those gull populations in the Regional Study Area.

Construction

Habitat Changes

Where inland lakes occur within or adjacent to the footprints of the reservoir, access roads and other infrastructure sites, clearing of spruce trees will result in the loss of some potential Bonaparte's gull nesting habitat. Bonaparte's gull is the only species of gull found within the Regional Study Area to nest on the tops of spruce trees. This species often nests in small colonies in forested areas located adjacent to small inland lakes. While no colonies have been identified within the Project Footprint Study Area, some individual birds have been observed nesting singly within the proposed reservoir footprint. Due to the low number of Bonaparte's gulls observed nesting within the Local Study Area and the abundance of alternate nesting habitat (*e.g.*, spruce trees near inland lakes) located throughout the Regional Study Area, the adverse effect of land clearing on local Bonaparte's gull populations are anticipated to be small.

During construction, clearing of spruce trees for the development of infrastructure sites is expected to result in the loss of some Bonaparte's gull nesting habitat in areas adjacent to inland lakes. Loss of nesting habitat for this species would have a small, long-term, adverse effect on a small number of the local breeding population. Alternate suitable Bonaparte's gull nesting habitat (*e.g.*, spruce trees adjacent to inland lakes) is widespread throughout the Regional Study Area.

Project-related Disturbances and Access Effects

Blasting activities and equipment noise associated with Project construction are expected to decrease foraging efficiency and reduce reproductive success of Bonaparte gulls nesting within the Local Study Area. In areas where disturbance is louder and/or more frequent, nesting gulls are anticipated to flush from nests, leaving eggs or hatchlings vulnerable to predation and weather (Burger 1988).

Mitigation

Mitigation measures to minimize or avoid potential effects of Project construction on Bonaparte's gull will include:

- Land clearing and blasting activities will be undertaken outside of the sensitive breeding period (April 1–July 31) to the extent practicable.

Residual Effects of Construction

Spruce trees within the reservoir footprint used as nesting habitat by Bonaparte's gulls will be lost during construction-related clearing activities. Due to the high availability of comparable black spruce stands

upstream and downstream of the reservoir footprint, only a small reduction in available breeding habitat is expected within the Local Study Area.

Effects of Project construction on tree-nesting gulls are expected to be adverse, small, long-term and occur within the natural variability of the population in the Regional Study Area.

Operation

Habitat Changes

During operations, shoreline erosion and peatland disintegration in the reservoir area are anticipated to result in the long-term loss of some potential nesting trees for this tree-nesting gull species. Although adverse, the effect of tree loss for Bonaparte's gull using the Local Study Area is anticipated to be small as suitable nesting trees will be present along the new reservoir shorelines. As there is no evidence of nest tree fidelity in this species (Burger and Gochfeld 2002), peatland disintegration, shoreline fluctuations and related loss of previously used spruce nest trees is unlikely to have an adverse effect on Bonaparte's gull reproductive success.

Project-related Disturbances and Access Effects

During the operation phase, increased traffic along the north and south access roads may result in increased traffic-related Bonaparte's gull mortality among recently fledged birds, in areas where roads lie adjacent to inland lakes or in to the near reservoir shoreline.

Mitigation

There are no specific mitigation measures planned to minimize or avoid potential effects of Project operation on Bonaparte's gull.

Residual Effects of Operation

Residual effects of operation on Bonaparte's gull are associated with increased mortality associated with the operation of the access roads. The potential for collision risk is considered low and not anticipated to have a measurable effect on local Bonaparte's gull populations utilizing nesting habitat within the Local Study Area.

The short-term effects of Project operation on Bonaparte's gull are expected to be minimal and occur within the natural variability of the population in the Regional Study Area.

Conclusion about Residual Effects on Other Gulls

Residual effects of the Project on Bonaparte's gull are associated with habitat loss during construction, construction noise causing short-term habitat avoidance and increased mortality associated with the operation of the access roads.

The short-term effects of Project operation on Bonaparte's gull are expected to be minimal and occur within the natural variability of the population in the Regional Study Area.

6.4.3.1.3 Shorebirds

Land clearing, dyke development and other alterations to the existing shoreline will result in the loss and degradation of nesting and foraging habitat for shorebird populations in the Project area.

Construction

Habitat Changes

Land clearing activities associated with the development of the reservoir, GS, south access road, expansion of the construction camp, borrow areas and other infrastructure are not anticipated to affect local shorebird populations. Of the shorebirds that utilize the Local Study Area, only greater yellowlegs, and lesser yellowlegs require wetlands located within conifer forest. Retention of vegetated buffers around wetlands will limit the amount of yellowlegs habitat lost or degraded as a result of infrastructure development. Although loss of some yellowlegs habitat is expected in the reservoir footprint, land clearing is not anticipated to have a population-level effect on yellowlegs species because their preferred breeding habitat (wetlands in treed peatland), is common and widespread throughout the Local and Regional Study Areas.

Land clearing adjacent to Gull Lake and parts of the Nelson River will result in the degradation of shoreline habitats for shorebirds. However, since clearing of the riparian vegetation prior to reservoir operations would occur during the winter period (PD SV, Reservoir Clearing Plan), the potential for adverse effects to shorebirds is expected to be negligible.

Development of dykes and associated alteration of the natural shoreline along the GS infrastructure site and areas of Gull Lake will result in the loss or degradation of shorebird breeding and foraging habitat. Although the creation of marginal forage and breeding habitat for shorebirds along reservoir dykes is expected to partially offset the loss of pre-construction habitat, dyke shorelines are suboptimal for shorebirds due to the size of cobbles used in dyke construction, steep sloping nature of dykes and the potential maintenance vehicle collision risk to shorebirds, nests and young. Loss of natural shoreline habitat due to GS and dyke development is expected to affect a very small proportion of the shorebird population that utilizes the Local Study Area. Land clearing and construction of dykes during the fall and winter months will minimize disturbance to shorebirds.

Final stages of reservoir land clearing are planned to occur along the Gull Lake shorelines prior to reservoir filling. Although scheduling of final reservoir land clearing to occur during the fall and/or winter months will minimize effect upon shorebirds, clearing will likely reduce the quality and suitability of the habitat to breeding shorebirds the following summer. However, low numbers of shorebirds using the impact area would lead to minimal adverse effect to the regional shorebird population.

Project Associated Disturbances and Access Effects

Construction noise and human activity will cause a short-term disturbance to a small number of shorebirds using the Project Footprint Area. During construction, equipment noise and blasting is expected to lead to avoidance of shorelines adjacent to the GS footprint by solitary sandpiper, spotted

sandpiper and killdeer. A small number of tree-nesting yellowlegs species are expected to be disturbed by noise and human activity in areas where wetlands occur adjacent to infrastructure development sites.

Appropriate seasonal and diurnal timing of blasting programs related to GS construction can be critical to shorebird breeding success. If blasting begins during the critical breeding period (May through June), when birds are established on their nests and incubating eggs or brooding young, nest abandonment could occur. This would mean the complete loss of eggs and/or hatchlings (DeLong and Steenhof 2004). Most shorebird species would experience fewer disturbances if blasting programs were scheduled early in the winter (early February at the latest). A conclusion of the blasting program by late April would allow disturbance-sensitive, early-breeding shorebird species to seek alternate habitat.

Mitigation

Mitigation measures to minimize or avoid potential effects of Project construction on shorebirds will include:

- Land clearing and blasting activities will be undertaken outside of the sensitive breeding period (April 1 - July 31) to the extent practicable.

Residual Effects of Construction

While some potential shorebird nesting habitat will be lost within the reservoir footprint zone during land clearing activities, retention of vegetated buffers around wetlands, ponds and inland lakes in all other infrastructure footprints would help minimize further losses of potential yellowlegs nesting cover. Suitable alternate nesting habitat (spruce trees located adjacent to peat bogs) is widespread and abundant within the black spruce peatland habitats of the Regional Study Area.

Construction of the GS will result in the loss and/or alteration of existing shoreline while dyke construction will result in the long-term alteration of shoreline. While dykes are used by shorebirds, they are not considered optimal for shorebird nesting or foraging activities.

It is anticipated that noise and activity disturbance associated with GS and dyke construction will cause short-term shorebird avoidance of these areas.

Final stages of reservoir land clearing are planned to occur along the Gull Lake shorelines prior to reservoir filling and will likely reduce the quality and suitability of the habitat to breeding shorebirds the following summer. However, low numbers of shorebirds using the impact area would lead to minimal adverse effect to the regional shorebird population.

The short-term effects of construction-related disturbance on shorebirds are anticipated to be minimal and occur within the natural variability of the population in the Regional Study Area.

Operation

Habitat Changes

Operation of the generating station will permanently inundate shallow bays, inlets and creek mouths of Gull Lake and parts of the Nelson River, resulting in the long-term loss of productive nesting, foraging and staging habitat for many species of shorebirds. The flooding of shorelines and adjacent habitat will adversely affect species of shorebirds (*e.g.*, sandpipers) that nest, forage and loaf in these areas (*e.g.*, yellowlegs). The most notable changes to nesting and foraging habitat will occur with the inundation of islands and gravel beaches and dewatering of reefs that are utilized by breeding shorebirds.

The loss of suitable shoreline for nesting and foraging shorebirds will be partially offset if changes in the Nelson River water regime expose rocky reefs and gravel beaches downstream of the GS (due to the lower water levels in the tailrace region). Due to hazardous water conditions in this area, risk to human safety precluded the collection of bathymetry data in this reach of the river. As a result, the character of shorelines likely to be exposed in the tailrace and downstream of the GS and potential for use of these areas by shorebirds remain unknown.

It is anticipated that the 304 km of new shoreline within the Project reservoir footprint would consist of a variety of substrates, including disintegrating peatland. Since peat shorelines are less optimal for shorebirds than sand or gravel shorelines, it is anticipated that shorebirds would experience a long-term loss of suitable shoreline habitat along the Project reservoir area. In some areas of the reservoir shoreline, long-term erosion of peat will expose mineral substrates and thereby provide more suitable shorebird foraging habitat.

It is anticipated that peatland disintegration and shoreline erosion resulting from reservoir flooding would increase water turbidity, which would in turn affect the abundance and diversity of aquatic invertebrates, a primary food source for many shorebird species. It is anticipated that changes in food availability and/or foraging efficiency as a result of peatland disintegration and shoreline erosion will cause some shorebirds to seek more suitable habitats located in alternate areas (*e.g.*, upstream of the reservoir, off-system lakes, rivers and creeks where suitable shorelines are available). Over time, with the settling of suspended sediments, water clarity is also expected to improve.

Project-related Disturbances and Access Effects

Increased traffic levels along access roads and occasional use of dykes by maintenance vehicles during Project operations will minimally increase risk of vehicle collisions with nesting shorebirds and/or fledglings. However, the majority of shorebird species breeding in the Local Study Area tend to select nest sites on shorelines where human activity is rare.

Residual Effects of Operation

Operation of the generation station would inundate shallow bays, inlets and creek mouths of Gull Lake and parts of the Nelson River, resulting in the long-term loss of productive nesting, foraging and staging habitat for many species of shorebirds. The most notable changes to nesting and foraging habitat will

occur with the inundation of islands and gravel beaches and dewatering of reefs that are utilized by breeding shorebirds.

Exposure of peat and peatland disintegration along reservoir shorelines will decrease the quantity and quality of suitable shorebird foraging habitat. This long-term loss of suitable shoreline foraging and nesting habitat along the Keeyask reservoir area is anticipated to be partially offset by the creation of some marginal shorebird habitat along gravel dykes located in portions of the reservoir. Although an uncertainty, suitable shorebird habitat may also be formed if water regime changes increase exposure of rocky reefs and gravel beaches in areas downstream of the proposed GS. Formation of these areas would help offset some of the long-term losses in shorebird habitat.

The long-term Project operation-related effects of on shorebirds are expected to be largely confined to the affected areas and adjacent sites and occur within the natural variability of the population in the Regional Study Area.

Conclusion about Residual Effects on Shorebirds

Residual effects on shorebirds are associated with long-term loss of breeding and foraging habitat due to reservoir creation and peatland disintegration. The minimal, long-term effects of the Project on shorebirds are anticipated to occur within the natural variability of the population in the Regional Study Area.

6.4.3.1.4 Cranes

Construction

Habitat Changes

Land clearing activities associated with the development of the reservoir, GS, south access road, expansion of the construction camp, borrow areas and other infrastructure will result in the loss and/or degradation of some sandhill crane breeding habitat (*e.g.*, well-vegetated wetland margins). To the extent possible, infrastructure development will avoid disturbing wetlands. However, loss and/or degradation of crane habitat at some infrastructure sites (*e.g.*, south access road) will be unavoidable. In order to limit disturbance to crane breeding habitat, retention of vegetative buffer zones around wetlands (*e.g.*, bogs) located within or adjacent to infrastructure footprints would help minimize the amount of crane nesting and foraging habitat degraded by land clearing activities (EnvPP).

Land clearing activities associated with the development of the reservoir will result in the removal of vegetation (*e.g.*, trees) which will cause some short-term degradation of adjacent wetland habitats (*e.g.*, due to erosion). The effect of reservoir land clearing on cranes would likely be small and is not anticipated to be measureable at the regional population level.

Loss of crane habitat is expected to have only a small adverse effect on local populations as alternate suitable crane breeding habitat occurs throughout the Regional Study Area.

Project Associated Disturbances and Access Effects

Noise from heavy equipment, human activity and blasting will cause some cranes to avoid wetland habitats located within or adjacent to infrastructure footprints. If these disturbances occur during the spring and summer months, the amount of effective habitat available for cranes may be reduced due to habitat avoidance. In the reservoir footprint, land clearing activities are not anticipated to disturb cranes, as most land clearing activity would likely occur during the fall and winter months when cranes are not using the region (EnvPP).

Construction-related traffic is not anticipated to have a measureable effect on local sandhill crane populations. While some cranes area expected to be at risk to vehicle collisions in areas where roads occur adjacent to bogs, fens or wetlands, retention of treed buffers between roads and wetlands (where possible) would help minimize this risk (EnvPP).

The potential for spillage or leaks of petroleum products (*e.g.*, gasoline, diesel and heating oil) is associated with all phase of construction (*e.g.*, access road clearing and construction, development of the GS site, *etc.*). Spills or leaks have the potential to contaminate waterbodies' aquatic and terrestrial vegetation in areas where cranes breed and forage. While the effect of such events on birds would generally be very small and site specific if occurring on terrestrial habitat, these effects have the potential to be larger if spills and leaks of hazardous materials enter a waterbody that supports aquatic foraging activities. The magnitude of the potential effects will be minimized through the implementation of measures outlined in the EnvPP (*e.g.*, proper containment and storage of fuels away from waterbodies and other potentially sensitive sites).

Mitigation

Mitigation measures to minimize or avoid potential effects of Project construction on cranes will include:

- Land clearing and blasting activities will be undertaken outside of the sensitive breeding period (April 1 - July 31) to the extent practicable; and
- 100 m vegetated buffers will be retained wherever practicable around adjacent to bogs, fens or wetlands located adjacent to infrastructure sites to minimize the loss of crane nesting habitat, to limit noise-related disturbances to cranes and to minimize access.

Residual Effects of Construction

Land clearing activities are anticipated to result in the loss and/or degradation of some sandhill crane habitat. Construction-related disturbances including equipment noise and human activity will cause some cranes to avoid temporarily breeding habitats in areas where construction activities occur. Birds displaced from the infrastructure sites would likely seek alternate suitable habitats located in other regions of the Regional Study Area.

Project construction-related effects on cranes are anticipated to be negligible, short-term and occur within the natural variability of the population in the Regional Study Area.

Operation

Habitat Changes

During Project operations, long-term use of the reservoir is anticipated to cause increases in the water table, which may lead to the development of new wetlands. Over time, as well-vegetated wetland margins develop, these wet areas are expected to provide cranes with suitable breeding and foraging habitat.

Project Associated Disturbances and Access Effects

During operations, traffic along the north and south access roads will put a small number of sandhill cranes at risk to collisions with vehicles. This risk would be greatest in areas of the south access road where peat bogs occur. Retention of vegetated buffers between bogs and roads would help minimize the potential risk of crane mortality due to traffic.

Mitigation

The following mitigation measures will be implemented to minimize potential effects of Project operation on cranes:

- Mitigation for wetland function is being implemented through the development of wetlands in the Local Study Area. Some of these wetland developments may provide habitat for cranes.
- These measures are expected to offset some of the losses in breeding and staging habitat for cranes.

Residual Effects of Operation

Operational effects on cranes include the long-term loss of some breeding and staging habitat located within the reservoir footprint area. Some loss of crane breeding habitat is expected to be offset if changes in the water table due to reservoir filling lead to the development of suitable crane breeding habitat (*e.g.*, wet peat bogs). Loss of crane breeding habitat is not anticipated to have measureable effects on the local populations as alternate suitable crane breeding habitat is widespread throughout the Regional Study Area.

Traffic along the north and south access roads is anticipated to increase vehicle-related mortality of sandhill cranes, especially where peat bogs intersect the roadway.

The long-term operation-related effects of the Project on cranes are anticipated to negligible and occur within the natural variability of the population in the Regional Study Area.

Conclusion about Residual Effects on Cranes

Residual effects on cranes are associated with long-term loss of breeding and foraging habitat due to reservoir creation and peatland disintegration. These effects are anticipated to be negligible and occur within the natural variability of the population in the Regional Study Area.

6.4.3.1.5 Kingfishers

Construction

Habitat Changes

The belted kingfisher relies upon an aquatic food source (*e.g.*, small fish, aquatic invertebrates) and earthen banks within which they burrow into for nesting purposes. Where infrastructure land clearing activities occur adjacent to riparian habitats (*e.g.*, creeks), retention of vegetative buffers would protect nesting and foraging habitat for belted kingfishers. Kingfishers displaced by changes to habitat would seek alternate suitable breeding habitat located in other areas of the Regional Study Area.

Within the reservoir footprint, land clearing activities are anticipated to remove all vegetation including riparian vegetation. This will have an adverse effect on the integrity of steep, earthen banks, rendering them unstable for nesting. Removal of vegetation is expected to increase rates of erosion, thereby increasing water turbidity and decreasing kingfisher visual foraging efficiency. The removal of riparian vegetation will also have an adverse effect on the effectiveness of foraging as kingfishers use trees located along creeks and lakeshores to perch on when hunting for fish and invertebrates.

Overall, infrastructure and reservoir land clearing activities will have a small effect that will be within the natural variability of the kingfisher population in the Regional Study Area.

Project-related Disturbances and Access Effects

Noise from heavy equipment, human activity and blasting will cause some kingfishers to avoid habitats where disturbances occur (*e.g.*, GS site).

Kingfishers forage on fish and aquatic invertebrates found within clear creeks, rivers and lakes. Where these areas occur near roads, retention of vegetated buffers between roads and kingfisher habitat would help reduce the risk of vehicle-related kingfisher morality. Increased traffic within the Local Study Area is not anticipated to have any measurable adverse effects on local kingfisher populations.

The potential for spillage or leaks of petroleum products (*e.g.*, gasoline, diesel and heating oil) is associated with all phase of construction (*e.g.*, access road clearing and construction, development of the GS site, *etc.*). Due, in part, to the larger home ranges of most birds as compared to the generally localized nature of events such as leaks or spills, effects of spills to most birds are expected to be minimal. Spills or leaks have the potential to contaminate aquatic environments where kingfishers forage. While the effect of such events on kingfisher would generally be very small and site specific if occurring on terrestrial habitat, these effects have the potential to be larger if spills and leaks of hazardous materials enter a waterbody that supports aquatic foraging activities. The magnitude of the potential effects will be minimized through the implementation of measures outlined in the EnvPP (*e.g.*, proper containment and storage of fuels away from waterbodies and other potentially sensitive sites).

Mitigation

The following mitigation measures will be implemented to minimize or avoid potential effects of Project construction on kingfishers:

- 100 m vegetated buffers will be retained wherever practicable around lakes, wetlands and creeks located adjacent to infrastructure sites to minimize the loss of riparian nesting habitat, to limit noise-related disturbances to kingfishers and to minimize access; and
- Land clearing activities will be undertaken outside of the sensitive breeding period (April 1-July 31) to the extent practicable to minimize disturbance to breeding birds.

Residual Effects of Construction

Land clearing during construction would result in the loss and/or degradation of some belted kingfisher habitat in areas of the reservoir footprint where creeks, lakes and rivers occur. Birds displaced by changes in breeding habitat within the reservoir footprint area are expected to seek alternate suitable nesting and foraging sites located within the Regional Study Area.

Kingfishers are anticipated to temporarily avoid habitats where construction noise and human activity disturb breeding and/or foraging activities.

The small, short-term Project-related construction effects on kingfishers are anticipated to occur within the natural variability of the kingfisher population in the Regional Study Area.

Operation

Habitat Changes

Belted kingfishers nest in creek banks and riverbanks where steep clay banks occur. Filling of the reservoir will result in the loss or degradation of some of the belted kingfisher breeding-habitat located between Gull Lake and Birthday Rapids. While most kingfisher habitat located within the reservoir zone would be completely inundated during reservoir filling, the embankments of the Nelson River upstream of Gull Lake are higher in elevation than banks downstream and therefore would be compromised by increased erosion associated with higher water levels.

Loss of more optimal kingfisher foraging habitat inland creeks and lakes due to reservoir operation could have a small, adverse effect on a proportion of the local kingfisher population. Displaced birds would likely seek alternate suitable habitats located in areas further upstream of the reservoir and/or in inland areas along lakes and creeks.

Water turbidity within the Nelson River and Gull Lake makes these areas suboptimal for belted kingfisher foraging activities, as these birds require clear water for foraging. Increased water turbidity associated with the operation of the GS is anticipated to further reduce the quality of habitat for belted kingfisher within the reservoir footprint. The effect of reservoir operations on local belted kingfisher populations is therefore anticipated to be negligible, as only marginal belted kingfisher habitat (*i.e.*, Gull Lake) would be affected.

Following Project operation, absence of belted kingfishers from the reservoir is expected to be short-term, as water turbidity would eventually decline with the settling of suspended sediments. However, while less turbid water may permit marginal foraging opportunities for this species, it is expected that nesting habitat (*i.e.*, stable earthen banks) along the reservoir would continue to remain unavailable during Project operations.

Project-related Disturbances and Access Effects

Belted kingfishers forage on fish and aquatic invertebrates found within clear creeks, rivers and lakes. Where these areas occur near roads, there would be some risk of vehicle-related kingfisher morality. However, increased traffic within the Local Study Area is not anticipated to have any measurable adverse effects on local belted kingfisher populations.

Mitigation

The following mitigation measure will be implemented to minimize or avoid potential effects of Project operation on kingfishers:

- 100 m vegetated buffers will be retained wherever practicable around lakes, wetlands and creeks located adjacent to access roads to minimize the risk of vehicle-related kingfisher mortality.

Residual Effects of Operation

Reservoir operations would result in the loss and degradation of some kingfisher breeding and foraging habitat. Since Gull Lake is considered suboptimal for belted kingfishers due to poor water clarity and general lack of earthen banks for nesting, the change from lake to reservoir is anticipated to have minimal effect on the belted kingfisher populations that use the Local Study Area.

Belted kingfishers that typically use the inland creeks and lakes located within the reservoir zone would likely relocate to other suitable breeding and foraging habitats within the Regional Study Area. Kingfishers using riverine habitats between Gull Lake and Birthday Rapids are expected to relocate to alternate suitable habitat in areas further upstream.

The negligible, long-term Project-related construction effects on kingfishers are anticipated to occur within the natural variability of the kingfisher population in the Regional Study Area.

Conclusion about Residual Effects on Kingfishers

Residual effects on belted kingfisher are associated with long-term loss and degradation of breeding and foraging habitat due to reservoir creation and development of other infrastructure. These long-term effects are anticipated to be negligible and occur within the natural variability of the kingfisher population in the Regional Study Area.

6.4.3.2 Landbirds

Landbirds are comprised of a number of bird groups that do not forage, breed, nest or raise young in the water. While some species rely on aquatic-based food, they are not equipped with the ability to wade or

swim in water like waterbirds. Landbirds are adapted to terrestrial habitats and include woodpeckers, raptors, upland game birds (*e.g.*, grouse) and songbirds (*e.g.*, sparrows).

6.4.3.2.1 Songbirds

Construction

Habitat Changes

Land clearing activities associated with the development of the reservoir, GS, south access road, expansion of the construction camp, borrow areas and other infrastructure will result in the long-term loss of breeding, foraging and overwintering habitat for many species of songbird. The loss of habitat will displace approximately 45,580 songbird pairs or 22% of the Local and 4% of the Regional Study Area's songbird population. While displaced songbirds are expected to move into areas of adjacent suitable habitat, it is uncertain whether or not these areas will be occupied by similar species and/or have enough resources (*e.g.*, space, food) to support additional breeding pairs. While a short-term increase in bird abundance is expected to occur in the Local Study Area, it is anticipated that displaced pairs will compete for resources and bird abundance will eventually decline over time as displaced pairs no longer have the necessary resources to breed.

Clearing of the reservoir will remove 4,513 ha of forest along the shores of Gull Lake that have been observed to support a density of 6.08 to 7.12 birds/ha nesting and foraging songbirds (Tetr*ES* 2001, 2002, 2003, 2007). Clearing activities would also disturb the soil and understory, affecting ground-nesting songbirds such as dark-eyed junco, hermit thrush, and fox sparrow. As a result, up to approximately 32,000 pairs of breeding songbirds are expected to be displaced within the proposed reservoir area. This is approximately 2.1% of an estimated 1,526,000 pairs of songbirds breeding within the Regional Study Area in any given year.

Along riparian areas, reservoir clearing activities are anticipated to result in the loss of breeding and foraging habitat for neotropical migrant songbirds (*e.g.*, palm warbler, northern waterthrush yellow warbler, song sparrow). These clearing activities will also disturb earthen banks, collapsing existing bank swallow nests and eroding suitable nesting sites for bank and shoreline nesting species.

Land clearing associated with the development of infrastructure sites (*e.g.*, roads) will degrade the quality of breeding habitat for some forest interior species by fragmenting habitat and increasing forest edge (Robinson and Wilcove 1994). Forest fragmentation has been associated with changes in forest vegetation structure and food availability, increased human presence and noise, shifts in bird community composition, increased competition with other birds, and nest predation by species better adapted to forest edges (Burke and Nol 1998; Hagan *et al.* 1996; Rodenhouse *et al.* 1995; Gates and Gysel 1978). An increase in forest edges will benefit some species of songbirds that utilized edge habitats. However, while forest edge habitats may support a higher density and diversity of songbirds, they have not consistently been correlated with high productivity (Gates and Gysel 1978; Hagan *et al.* 1996).

Land clearing would also result in the long-term displacement of songbirds from borrow sites. As outlined in the EnvPP, decommissioned borrow sites will be re-sloped and revegetated through spreading stockpiled organic material that contains woody and vegetative debris. Eventually, trees of a

size necessary for nesting and perching will re-establish in these areas. In the interim, small clearings and water-filled depressions will provide nesting and foraging opportunities for some songbird species.

Detrimental effects of construction-related clearing activities will be reduced through minimizing the amount of vegetation to be removed, implementation of hand-clearing techniques in sensitive areas and, to the extent feasible, retention of vegetated buffers of shrubs and trees near streams and other waterbodies. Retention of buffer zones will provide cover and nesting/perching trees for songbirds utilizing riparian habitat. Snags and fallen timber should also be allowed to remain, where feasible, in the forests adjacent to the access road, as this structure provides habitat for some bird species (*e.g.*, boreal chickadees) and many species of insect prey (*e.g.*, wood-boring beetle larvae).

Project-related Disturbances and Access Effects

Increased traffic and use of the access roads is expected to result in collision mortality to a small number of birds during the construction phase of the Project.

Blasting activities will have an adverse effect on songbirds breeding, foraging and overwintering within and immediately adjacent to the Local Study Area, and are expected to cause the short-term displacement of songbirds from blasting zones. Similarly, construction noise at infrastructure sites is expected to generally decrease density of breeding songbirds (Bayne *et al.* 2008),

If blasting activities are timed to occur within the critical timing window for breeding (May through June) when most songbirds are established on their nests, incubating eggs or brooding young, nest abandonment could occur, resulting in a loss of eggs and/or hatchlings (DeLong and Steenhof 2004). However, if the blasting program is initiated before most songbird species have established territories or initiated nest-building, construction activity is expected to discourage establishment of territories within areas where noise disturbance is planned, and will be less likely to result in an annual failure of multiple species' reproductive effort.

The potential for spillage or leaks of petroleum products (*e.g.*, gasoline, diesel and heating oil) is associated with all phases of construction (*e.g.*, access road clearing and construction, development of the GS site, *etc.*). Spills or leaks have the potential to contaminate waterbodies and terrestrial vegetation in areas where a variety of songbirds forage.

Effects of chemical spills or leaks on songbirds are expected to be minimal, as songbirds are highly mobile and capable of finding alternate areas within which to forage or nest. While the effect of such events on songbirds would generally be very small and site specific if occurring on terrestrial habitat, these effects have the potential to be larger if spills and leaks of hazardous materials enter a waterbody that supports important food sources for songbirds (*e.g.*, invertebrates). The magnitude of these effects will be minimized through the implementation of measures outlined in the EnvPP, *e.g.*, proper containment and storage of fuels away from waterbodies and other potentially sensitive sites.

Mitigation

The following mitigation measure will be implemented to minimize or avoid potential effects of Project construction on songbirds:

- Land clearing activities will be undertaken outside of the sensitive breeding period (April 1 - July 31) to the extent practicable to minimize disturbance to breeding birds.

Residual Effects of Construction

Land clearing for the development of the reservoir, access road, camp, GS and other infrastructure sites will result in the long-term loss of breeding and/or overwintering habitat for a number of songbirds. Long-term monitoring beginning during the construction period will help determine whether the broad vegetation types that occur within the Regional Study Area are at or near their carrying capacity for songbirds.

Project-related disturbances such as noise from equipment and blasting will have adverse effects on songbirds, particularly if disturbances occur during the breeding period. Equipment noise and blasting will cause some songbirds to avoid habitats located within and adjacent to infrastructure sites. A reduction in the amount of effective habitat surrounding infrastructure sites would likely be short-term, lasting only as long as the period of disturbance.

The long-term effects of Project-related construction on songbirds are expected to occur within the natural variability of the population in the Regional Study Area.

Operation

Habitat Changes

Continued, long-term losses of forest, woodland and wetland songbird habitat are anticipated to occur in areas of the reservoir due to changes in groundwater levels and subsequent peatland disintegration. Long-term loss of approximately 8 km^2 of shoreline areas through peatland disintegration processes (*i.e.*, erosion) is anticipated to have a small adverse effect on many boreal songbird species that breed and forage within peat-dominated habitats. However, alternate peat-dominated breeding and foraging areas are abundant and widespread throughout the Local and Regional Study Areas.

Project-related Disturbances and Access Effects

Operational traffic along the north and south access roads is expected to result in long-term (≥ 100 years) vehicle-related mortality of songbirds that breed and forage within black spruce dominated habitat along the south access road and songbirds that breed and forage within jack pine mixture and mixedwood forest habitats along the north access road. If the north and south access roads are utilized by traffic to and from Gillam, most of the songbird mortality along Highway 280 would likely occur along the access roads. The addition of GS operation–related vehicle traffic along the access roads will add to the collision risk for songbirds using the immediate areas however, it is not anticipated to have any notable effects on local songbird populations.

Noise caused by vehicle traffic along the north and south access roads is expected to cause initial displacement of songbirds using adjacent forest edge habitats as they avoid the novel disturbance. However, operational traffic noise is not anticipated to have a long-term effect on local songbird

populations as birds are capable of quickly habituating to sustained noise (*e.g.*, traffic; Hagan *et al.* 1996; Gates and Gysel 1978).

Mitigation

Despite the presence of suitable alternate habitat for songbirds in the Regional Study Area, it is uncertain that this habitat will be available due to competition with other songbird occupants and/or availability of resources necessary for reproductive success. Although no mitigation measures for offsetting operational effects on songbirds are proposed, monitoring programs scheduled concurrent to and following construction will be designed to detect Project-related changes in diversity and density of bird species in the Local Study Area.

Residual Effects of Operation

Songbird species that require shrubby riparian habitats will experience continued long-term loss of potential breeding habitat along the shoreline within the reservoir footprint. Until the reservoir shoreline stabilizes and shrubs re-establish, songbirds requiring well-developed riparian habitat will be displaced to comparable shrubby riparian habitat located along creeks, inland lakes and rivers located throughout the Regional Study Area.

The small, long-term effects of Project operation on songbirds are expected to occur within the natural variability of the population in the Regional Study Area. .

Conclusion about Residual Effects on Songbirds

Residual effects on songbirds are associated with long-term loss and degradation of breeding and foraging habitat due to reservoir creation and development of other Project infrastructure. These effects are anticipated to occur within the natural variability of the population in the Regional Study Area.

6.4.3.2.2 Woodpeckers

Construction

Habitat Changes

Land clearing activities within the Project Footprint will result in the loss of some breeding and foraging habitat for woodpeckers utilizing the Local Study Area (*e.g.*, black-backed woodpecker, hairy woodpecker). Since alternate suitable breeding and overwintering habitat for woodpeckers is widespread and abundant throughout the Local and Regional Study (*e.g.*, post-fires, young regenerating forests with standing dead trees; Section 2, Map 2.3-3), the loss of trees within infrastructure footprints is anticipated to have only a small adverse effect on local woodpecker populations.

Filling of the reservoir would result in the loss of woodpecker habitat. Although the effects of this habitat loss will be of adverse and long-term, they are not anticipated to have measurable effects on the local woodpecker populations.

Project-related Disturbances and Access Effects

Noise from heavy equipment, human activity and blasting will cause some woodpeckers to avoid habitats in areas within and adjacent to areas where disturbances occur.

Traffic associated with construction and use of the north and south access roads may cause mortality to a small number of woodpeckers (*e.g.*, northern flicker). As ground feeders, northern flickers are particularly susceptible to traffic-related mortality where roads bisect suitable foraging habitat, and especially during twilight hours (Seattle Audubon Society 2003). While construction-related traffic along the north access road is expected to contribute to some woodpecker mortality, it is not anticipated to have any notable effect on local woodpecker populations.

The potential for spillage or leaks of petroleum products (*e.g.*, gasoline, diesel and heating oil) is associated with all phases of construction (*e.g.*, access road clearing and construction, development of the GS site, *etc.*). The effect of such accidental events on woodpeckers is anticipated to be small as woodpeckers occupy large home ranges compared to the generally localized nature of most events such as leaks or spills. Following measures outlined in the EnvPP (*e.g.*, proper containment and storage of fuels away from waterbodies and other potentially sensitive sites will help keep potential adverse effects on woodpecker populations to a minimum).

Mitigation

The following mitigation measure will be implemented to minimize or avoid potential effects of Project construction on woodpeckers:

- Land clearing activities will be undertaken outside of the sensitive breeding period (April 1-July 31) to the extent practicable to minimize disturbance to breeding birds.

Residual Effects of Construction

For most species of woodpecker whose breeding range includes the Regional Study Area, suitable habitat is not limiting. While a portion of potential woodpecker habitat (includes all habitats that support trees, including dead standing trees) will be removed from the Local Study Area during land clearing activities (20% or 5,995ha), suitable alternate woodpecker habitat remains (23,645 ha). Estimates of potential losses and potential availability of woodpecker habitat are conservative, as not all treed habitat is considered optimal for woodpeckers. The amount of woodpecker habitat potentially lost during project development would therefore be lower than what is estimated above. For this assessment, it is assumed that all broad habitat types supporting trees provide woodpecker habitat, even if marginal or suboptimal in nature.

It is anticipated that of the 5,995 ha of woodpecker habitat potentially cleared, approximately 3,585 ha would be removed during reservoir clearing. Although land clearing will be limited to the extent possible at all other infrastructure sites, upwards of an additional 2,410ha of treed woodpecker habitat will also be removed during the construction period. While local losses in forest cover will have an adverse effect of moderate magnitude on local woodpecker populations, suitable alternate forest habitats (over 13,700 ha of treed land cover) occur in areas throughout the Regional Study Area. Therefore, at the regional level,

losses in tree cover from the Project Footprint Area would have a low in magnitude, adverse effect on woodpecker populations.

Filling of the reservoir will result in the loss of an additional 8 km^2 of woodpecker habitat. This is a conservative estimate as not all of the land potentially lost to peatland disintegration supports woodpecker habitat (*e.g.*, trees).

Woodpeckers flying across roads and/or using roadsides when foraging will be at risk to colliding with vehicle traffic during construction of the Project. This risk is expected to be greater where roads occur adjacent to regenerating post-fire habitats, areas of mature forest, and/or areas that support standing dead trees. While traffic is anticipated to contribute to some woodpecker mortality, it is not anticipated to have a measurable effect on the local population.

Project construction–related effects on woodpeckers are expected to occur within the natural variability of the population in the Regional Study Area.

Operation

Habitat Changes

Although dykes will help limit the amount of additional shoreline (*e.g.*, peatland) lost to long-term erosion (approximately 8 km^2) some areas of the reservoir will be subjected to peatland disintegration processes (*i.e.*, erosion) resulting in the loss of some woodpecker habitat. While this loss will have an adverse effect on many of the woodpecker species (*e.g.*, three-toed woodpecker, black-backed woodpecker), the magnitude of the effect will be low as alternate suitable woodpecker habitat occurs throughout the Local and Regional Study Areas.

Project-related Disturbances and Access Effects

Operation of the south access road during Project operations will result in vehicle-related mortality of a relatively small number of woodpeckers. If the north and south access roads are utilized by through-traffic to and from Gillam, most of the woodpecker mortality along Highway 280 would be offset to the access roads. The addition of GS operation–related vehicle traffic along the access roads is expected to add to the collision risk for some species of woodpeckers using the adjacent areas however, it is not anticipated to have any notable effects on local woodpecker populations.

Mitigation

No mitigation measures are proposed to offset the loss of woodpecker habitat associated with Project operation, as suitable woodpecker habitat is common and widespread throughout the Regional Study Area.

Residual Effects of Operation

Traffic along the north and south access roads will contribute to the mortality of some woodpeckers using the ROW and/or adjacent forested areas. However, vehicle–related mortality is not anticipated to have a measureable effect on local woodpecker populations.

Project operation–related effects on woodpeckers are expected to be small and occur within the natural variability of the population in the Regional Study Area.

Conclusions about Residual Effects on Woodpeckers

Residual effects on woodpeckers are associated with vehicle-related mortality and long-term loss and degradation of breeding and foraging habitat due to reservoir creation and development of other infrastructure. These effects are anticipated to occur within the natural variability of the population in the Regional Study Area.

6.4.3.2.3 Raptors

Construction

Habitat Changes

Land clearing activities associated with the development of the reservoir, GS, south access road, expansion of the construction camp, borrow areas and other infrastructure will result in the loss of nesting and over-wintering cover used by raptors (*e.g.*, hawks and owls). With the exception of short-eared owl and northern harrier (*e.g.*, open habitat ground-nesting species), loss of tree cover will have a long-term adverse effect on all raptor species that utilize the Local Study Area, including merlin, northern hawk owl, northern goshawk and long-eared owl (Holt and Leasure 1993; Bull and Duncan 1993; Marks *et al.* 1994; Duncan and Duncan 1998; Houston *et al.* 1998; Alsop 2001).

Loss of mature and dead standing trees will have a long-term adverse effect on the local population of raptors that return each year to breed within the Project Footprint (*e.g.*, northern hawk owl, great gray owl, osprey, red-tailed hawk). The removal of forest cover will also decrease availability of thermal cover required by raptor species that over-winter within the Project Footprint Study Area (*e.g.*, northern hawk owl, great gray owl).

Some raptor species, including members of the hawk (*Accipteridae*), falcon (*Falconidae*), and owl (*Strigidae*) families, will benefit from the creation of edge habitats associated with forest clearing at infrastructure sites (*e.g.*, roads, camps, borrow areas). For these species, foraging efficiency is often greater along forest edges due to the presence of perches (*e.g.*, trees), visibility of prey and abundance of prey (Widen 1994). For other species, fragmentation of contiguous forest will have an adverse effect on their abundance and distribution. Great gray owls can be adversely affected by forest clearing activities through increased competition with great horned owls, which benefit from the creation of edge habitats (Bull and Duncan 1993).

The effect of forest clearing on raptors could be reduced through minimizing the amount of clearing and by clearing in the winter, prior to the breeding season. As outlined in the EnvPP, 100 m buffers of shrubs and trees should be retained near streams and other waterbodies for retention of raptor cover and nesting/perching trees.

The effect of land clearing is anticipated to be of small magnitude due to the low density of raptors within the Project Footprint Study Area, the abundance of alternate forest cover located within the Local

and Regional Study Areas and the large home ranges typical of most raptor species affected by the Project.

Project-related Disturbances and Access Effects

During construction, noise from heavy equipment, blasting and human activity will cause short-term disturbances to some raptors breeding and/or over-wintering within the Project Footprint. While raptors can tolerate certain levels of construction noise, blasting is expected to interrupt nesting and brooding activities if nests occur in close proximity (<500 m) to blasting sites (DeLong and Steenhof 2004).

Along the north access road, construction traffic would increase the risk of traffic -related raptor mortality, especially for owls, as they tend to hunt low over roads and ditches at dawn and dusk. Studies indicate that nearly one-third of owl mortalities occur within 20 m of roads (MacGuire *pers. comm.* 2008). Traffic along the north access road during the construction phase of the Project is anticipated to have an adverse site-specific effect on local raptor populations.

Mitigation

The following mitigation measures will be implemented to avoid or minimize potential effects of Project construction on raptors:

- Land clearing activities will be undertaken outside of the sensitive breeding period (April 1-July 31) to the extent practicable to minimize disturbance to breeding birds; and
- 100 m vegetated buffers will be retained wherever practicable around streams and waterbodies located adjacent to infrastructure sites to minimize the loss of raptor roosting and nesting habitat.

Residual Effects of Construction

Land clearing associated with construction activities in the Project Footprint will result in a reduction of suitable breeding, foraging or overwintering raptor habitat. Although scheduling land clearing activities to occur outside sensitive seasonal breeding windows will minimize adverse effects of land clearing on breeding hawks and owls, clearing during the fall and winter will result in a reduction in the amount of available thermal cover (*e.g.*, trees) required by overwintering raptors.

Effects of Project-related construction on raptors are expected to occur within the natural variability of the population in the Regional Study Area.

Operation

Habitat Changes

Filling of the reservoir will result in the long-term loss of 11% (4,512 ha) of the potential raptor habitat that occurs within the Local Study Area (about 41,454 ha). For some species, the reservoir area would have previously been degraded during the construction phase, and rendered unsuitable for breeding, foraging and/or overwintering activities. However, for other species that prefer open areas (*e.g.*, harriers) the deforested reservoir footprint would have provided some suitable forage and/or nesting habitat.

Depending upon the length of time a cleared reservoir area had been decommissioned and available to foraging and nesting harriers, inundation of this habitat would have an adverse effect upon individuals breeding in that area.

Rehabilitation of borrow areas during the operation phase would enhance the ability of these areas to support birds (*e.g.*, grouse) and small mammals (*e.g.*, mice, voles) and other prey species consumed by raptors. Rehabilitation of borrow areas would have a positive effect on raptors that forage along forest edges (*e.g.*, great horned owl) and in open habitats (*e.g.*, short-eared owl).

Project Associated Disturbances and Access Effects

During the operation phase, traffic along the north and south access roads will cause mortality to a small number of raptors, especially owls. Studies have shown that traffic can have an adverse effect on owl populations and that these effects increase with increasing traffic volumes (Baudvin 1997; Newton *et al.* 1997). Owls are more susceptible to traffic-related mortality where roads bisect suitable foraging habitat (*e.g.*, forest clearings, areas with mature or tall trees), and especially during twilight hours.

Due to anticipated low traffic volumes during Project operation, increased human access during the operation phase is anticipated to have a minimal effect on raptors using the Local Study Area.

Mitigation

The following mitigation measures will be implemented to minimize or avoid potential effects of Project construction on raptors:

- Temporary Project footprints will be rehabilitated to provide enhanced prey availability to raptors inhabiting the Local Study Area; and
- Traffic signage will be installed indicating reduced vehicle speed over the GS, and near sensitive waterbodies where practicable.

Residual Effects of Operation

Once the reservoir is in operation, the potential for the reservoir zone to support raptors will be lost for the long-term. However, suitable alternate raptor breeding, foraging and overwintering habitat remains widespread throughout the surrounding areas of the Regional Study Area.

Limited raptor mortality resulting from vehicle collisions is expected to occur along the north access road.

Effects of Project operation on raptors are expected to be small, long-term and occur within the natural variability of the raptor populations in the Regional Study Area.

Conclusions about Residual Effects on Raptors

Residual effects on raptors are primarily associated with long-term loss and degradation of breeding and foraging habitat due to reservoir creation and development of other infrastructure and, to a lesser extent,

with vehicle-related mortality. These small, long-term effects are anticipated to occur within the natural variability of the raptor populations in the Regional Study Area.

6.4.3.2.4 Upland Gamebirds

Project effects on upland gamebirds are covered by discussions on 'other priority birds' including ruffed grouse (birds at the edge of their range) and willow ptarmigan (Section 6.3.2.5).

6.4.4 Cumulative Effects

6.4.4.1 Effects of Past and Current Projects and Activities

The terrestrial environment in the area to be affected by the Project has been substantially altered by past hydroelectric developments, linear developments (including transmission lines, highways and rail lines), forestry and mining exploration, and other agents of change, and continues to experience those effects today.

The following effects of past and current projects and activities, which relate to the Regional Study Area are presented below for each bird VEC and other priority birds (*i.e.*, species at risk, birds at the edge of their range, willow ptarmigan, colonial waterbirds).

6.4.4.1.1 Bird Valued Environmental Components

- **Mallard:** Effects on mallard of past and current projects include habitat loss or alteration and increased mortality from resource harvesting. Past and existing projects have contributed to increased water levels along the Nelson River, which has led to reduced availability of suitable mallard breeding and staging habitat in the back bays, inlets and creek mouths of the Nelson River. YFFN has indicated there are fewer geese and ducks in the Split Lake area because the shoreline habitat that they use has been flooded and eroded (YFFN Evaluation Report [*Kipekiskwaywinan*]). While mallard breeding and staging habitat is limited along the Nelson River, suitable habitat (*e.g.*, creeks, creek mouths, inland lakes with marsh habitat) is widespread and abundant throughout inland areas of the Bird Regional Study Area.

- **Canada goose:** Effects on Canada goose of past and current projects include habitat loss or alteration and increased mortality from resource harvesting. As for mallard, past and existing hydroelectric projects have contributed to increased water levels along the Nelson River, which has led to reduced availability of suitable Canada goose staging habitat in the back bays, inlets and creek mouths of the Nelson River. The availability and quality of potential Canada goose staging habitat is highly variable along the Nelson River. In some years, low water levels have resulted in increased abundance of Canada geese in shallow back bays, inlets and creek mouths where suitable forage is available. In high water years, the quality of these areas, along with goose abundance, is reduced due to lack of exposed shoreline and preferred forage sources.

- **Olive-sided flycatcher:** The primary effect on olive-sided flycatcher from past and current projects has been habitat loss or alteration. The clearing of roads (*e.g.*, PR 280 and north access road) and transmission right-of-ways (*e.g.*, KN 36), as well as cut lines, has reduced the availability of olive-sided

flycatcher breeding habitat in the Bird Regional Study area. Past and existing hydroelectric projects have caused short-term increases in the availability of suitable foraging habitat by flooding treed areas. For a brief period, these dead standing trees provide important perch sites for olive-sided flycatchers foraging on flying insects. Suitable olive-sided flycatcher breeding habitat (*e.g.*, forest edge adjacent to bogs, beaver floods and burns) is widespread throughout the Bird Regional Study Area.

- **Common nighthawk:** The primary effect on common nighthawk from past and current projects has been long-term habitat loss or alteration. Forest clearing for the development of transmission right-of-ways, borrow pits, cut lines and trails has created new common nighthawk nesting habitat and enhanced that which already existed (*e.g.*, open, bare ground) within the Bird Regional Study Area. Long-term losses in common nighthawk nesting habitat have resulted from the development of permanent infrastructure including roads (*e.g.*, PR 280) and buildings. While these developments have resulted in the loss of some breeding habitat, they have contributed to increases in foraging opportunities through the creation of forest openings. Common nighthawk habitat is widespread throughout the region and not considered limited within the Bird Regional Study Area.
- **Rusty blackbird:** The primary effect on rusty blackbird from past and current projects has been habitat loss or alteration. Past and existing hydroelectric projects have contributed to habitat loss for this species (due to flooding of riparian habitats including treed areas on wet peatland). Land clearing associated with road and transmission line development has also contributed to the loss of some rusty blackbird breeding habitat, although to a lesser extent. Suitable alternate rusty blackbird breeding habitat is widespread throughout the Bird Regional Study Area.

6.4.4.1.2 Other Priority Birds

The primary effect from past and current projects on other priority birds has been habitat loss or alteration. The clearing of roads (*e.g.*, PR 280 and north access road) and transmission right-of-ways (*e.g.*, KN 36), as well as cut lines, has reduced the availability of breeding habitat in the Bird Regional Study area for birds such as ruffed grouse that utilize terrestrial habitat. Past and existing hydroelectric projects have caused short-term increases in the availability of suitable foraging habitat by flooding treed areas for several species.

Regarding waterbirds, past and current projects appear to be associated with the increase in certain species at the edge of their range (*e.g.*, American white pelican) or species such as gulls that can benefit from enhanced foraging that results from the developments. More commonly, the alteration of water patterns in the study area appears to have resulted in reduction of several species reliant on shallow marshy shorelines and backbays (*e.g.*, mallard and gadwall).

6.4.4.2 Summary of Cumulative Effects of the Project with Past and Current Projects/Activities

The construction and operation of the Keeyask Generation Project was planned to minimize the effects to the terrestrial environment to the extent practicable.

The following effects of the Project, in combination with the effects of past and current projects and activities, are provided below for the bird VECs and other priority birds (*e.g.*, species at risk).

6.4.4.2.1 Bird Valued Environmental Components

- **Mallard:** The key residual Project effects on mallard in combination with past and current projects include the loss of some breeding habitat, decreased quality of staging habitats and increased mortality risk resulting from increased access. Breeding habitat for mallards is marginal along the Nelson River; optimal habitat occurs in inland areas (*e.g.*, lakes and creeks) where ponds, wetlands, shallow and creeks supporting emergent aquatic vegetation are available. Although these habitats are widespread throughout the Bird Regional Study Area, applied mitigation measures (*e.g.*, installation of artificial nest structures) will enhance these areas for breeding. Wetland enhancement measures will also benefit mallards by offsetting some of the losses in the quality of local staging habitats (*e.g.*, Gull Lake). The implementation of the Access Management Plan during the construction phase is expected to limit increases in hunter harvest due to increased access. In order to reduce access to the Nelson River and inland lakes during operations, trails no longer required for construction or operation activities will be decommissioned.

- **Canada goose:** The key potential Project effects on Canada goose in combination with past and current projects are similar to those described for mallard (see above) with the exception that Canada goose breeding habitat will not be affected by the Project.

- **Olive-sided flycatcher:** The key residual Project effects on olive-sided flycatcher in combination with past and current projects are associated with the long-term loss of some breeding habitat. While mitigation measures involving the retention of trees in select areas of the reservoir backbays may offset some of the losses in olive-sided flycatcher habitat, beaver activity and fire remain the main drivers of olive-sided flycatcher habitat creation in this area. Construction noise is expected to disturb some olive-sided flycatchers for the short-term; however, displacement of birds from their breeding territories is not expected due to their large home ranges.

- **Common nighthawk:** The key residual Project effects on common nighthawk in combination with past and current projects are associated with the long-term loss of some nesting habitat resulting from reservoir and infrastructure development. It is expected that non-rehabilitated areas in decommissioned borrow sites will offset some of the losses in nesting habitat resulting from the Project. Creation of forest openings at infrastructure sites may provide common nighthawk with foraging habitat, especially at infrastructure sites that use outdoor lighting (insect attractant). Foraging habitat (*e.g.*, forest openings including wetlands, lakes, burns) is widespread throughout the Bird Regional Study Area.

- **Rusty blackbird:** The key residual Project effects on rusty blackbird in combination with past and current projects are associated with the long-term loss of some nesting habitat resulting from reservoir and infrastructure development (*e.g.*, dykes or south access road). Construction noise may cause some blackbirds to avoid areas immediately adjacent to infrastructure sites for the short-term.

6.4.4.2.2 Other Priority Birds

The key residual Project effects associated with most priority birds in combination with past and current projects are associated with the long-term loss of some breeding habitat. The key Project effects on

waterfowl such as gadwall include the loss of some breeding habitat, decreased quality of staging habitats and increased mortality risk resulting from increased access. Breeding habitat for gadwall and many other waterfowl species is marginal along the Nelson River (most suitable nesting habitat is further inland).

6.4.4.3 Cumulative Effects of the Project including Future Projects/Activities

Based on the regulatory assessment, adverse effects of the Project are expected for all bird VECs other than bald eagle, and these adverse effects are also expected to overlap with the other future projects or activities.

One or more of the reasonably foreseeable future projects (*e.g.*, Keeyask Transmission Project) may have spatial and temporal overlap with all of the bird VECs. Details regarding these overlaps are discussed below.

6.4.4.3.1 Bird Valued Environmental Components

- **Mallard:** Residual Project effects on mallard are expected to overlap with the effects of reasonably foreseeable future projects in the Bird Regional Study Area. Construction-related cumulative effects of the Project on mallard include additional loss or alteration of some mallard upland nesting habitat in areas where future project infrastructure occurs near wetlands, creeks and inland lakes, as well as increased mortality risk due to increased hunter access and/or transmission line strikes. Loss of foraging and brood-rearing habitat (*e.g.,* wetlands, creeks) is not anticipated to occur with future projects.
    - Loss or alteration of mallard nesting cover for the development of future transmission projects is expected to be small and unlikely to have an effect on the local breeding population of mallard.
    - Increased human access resulting from the development of future transmission projects will increase the mortality risk to mallards through increased harvest. Although mallards are agile flyers and able to avoid obstacles, presence of transmission lines in areas where mallards concentrate will increase mallard mortality risk. It is expected that deflectors would be installed on lines where this risk would be elevated in order to minimize potential for bird mortality.
- **Canada goose:** Residual Project effects on Canada goose are expected to overlap with the effects of reasonably foreseeable future projects in the Bird Regional Study Area. Project-related cumulative effects of the Project on Canada geese are associated with increased mortality risk resulting from increased hunter access and presence of transmission lines near areas that concentrate geese. It is expected that deflectors would be installed on lines where this risk would be elevated in order to minimize potential for bird mortality. These cumulative effects are not expected to have measurable effects on the local Canada goose population. Geese use of the Bird Regional Study Area is largely limited to within the migration periods, at which time they occur on parts of the Nelson River, including the larger inland lakes that occur throughout the region.
- **Olive-sided flycatcher:** Residual Project effects on olive-sided flycatcher are expected to overlap with the effects of reasonably foreseeable future projects in the Bird Regional Study Area. It is

expected that the Project in combination with other future developments will result in the additional loss of some olive-sided flycatcher breeding habitat. Losses are expected to be minimal as land clearing will be minimized to the extent possible. The potential effects on olive-sided flycatcher of the Project in combination with other future projects will be minimized through the application of mitigation measures including clearing outside of the bird nesting season and retaining vegetation buffers around lakes, wetlands and creeks located adjacent to infrastructure sites (proposed for both the Keeyask Infrastructure Project and Bipole III Transmission Project and anticipated in the preliminary planning of the Keeyask Transmission Project).

- **Common nighthawk:** Residual Project effects on common nighthawk are expected to overlap with the effects of reasonably foreseeable future projects in the Bird Regional Study Area. A relatively small amount of additional habitat would be adversely affected by development of the transmission projects in combination with the Project. Suitable common nighthawk breeding habitat will be lost to infrastructure development (*e.g.*, substations), however some will be gained and maintained through land clearing and vegetation control associated with the transmission line ROWs. Moderate increases in foraging habitat will also result as land is cleared in preparation of the transmission line ROWs. The cumulative effects on the local common nighthawk population of the transmission line projects are therefore expected to be positive.
- **Rusty blackbird:** Residual Project effects on rusty blackbird are expected to overlap with the effects of reasonably foreseeable future projects in the Bird Regional Study Area. It is expected that future developments in combination with the Project will result in the additional loss of some rusty blackbird breeding habitat through land clearing. Losses are expected to be minimal as land clearing will be minimized to the extent possible. The potential effects on rusty blackbird of the Project in combination with other future projects will be minimized through the application of mitigation measures, including clearing outside of the bird nesting season and retaining vegetation buffers around lakes, wetlands and creeks located adjacent to infrastructure sites (proposed for both the Keeyask Infrastructure Project and Bipole III and anticipated in the preliminary planning of the Keeyask Transmission Project).

6.4.4.3.2 Other Priority Birds

Species at risk: Residual Project effects on yellow rail, peregrine falcon, short-eared owl, and horned grebe are expected to overlap with the effects of reasonably foreseeable projects in the Bird Regional Study Area. It is expected that future developments involving transmission lines (*e.g.*, Bipole III Transmission Project) will present a small increase in mortality risk to all birds inhabiting or moving through the Bird Regional Study Area. Future projects are not expected to contribute to habitat loss for any of the abovementioned species known to breed within the Bird Regional Study Area.

6.4.5 Environmental Monitoring and Follow-up

In addition to environmental protection planning measures to be implemented, construction and operation monitoring will be required to verify the long-term effects of the Project on birds, particularly in areas where scientific uncertainty exists. As illustrated in Table 6.4-1, the recommended monitoring

and follow-up relates primarily to VECs (*i.e.*, mallard, Canada goose, bald eagle, olive-sided flycatcher, rusty blackbird and common nighthawk) and other priority birds including colonial waterbirds, ruffed grouse and other listed species listed under the Manitoba *Endangered Species Act* (MES), federal *Species at Risk Act* (SARA), and/or the Committee on the Status of Endangered Species in Canada (COSEWIC). While this table provides a preliminary summary of the topics and species requiring monitoring, more information on the methods and procedures will be provided in the Terrestrial Effects Monitoring Plan.

Table 6.4-1: Monitoring and Follow-Up Program for Birds

Supporting Topic / VEC	Issue / Rationale	Monitoring	Timelines
Mallard and Canada Goose (VECs)	• To verify predicted effects of the Project on waterfowl.	• Monitor to assess abundance and distribution of waterfowl within the Regional Study Area.	Annually during the first three years of operation, and periodically until shoreline wetland habitat re-establishes.
	• To verify success of nesting platforms/boxes to enhance mallard breeding habitat in suitable wetlands.	• Monitor success of nesting platforms/boxes.	Annually during the first two years of deployment.
Bald Eagle (VEC)	• To verify predicted effects of the Project on bald eagle.	• Monitor to assess the distribution and abundance of bald eagles along the Nelson River.	Annually during the first three years of operation.
	• To verify success of any nesting platforms established to replace nests disturbed by the Project.	• Monitor to assess the effectiveness of any installed nesting platforms.	Annually for the first three years following platform installation.

Table 6.4-1: Monitoring and Follow-Up Program for Birds

Supporting Topic / VEC	Issue / Rationale	Monitoring	Timelines
Olive-sided Flycatcher (VEC), Rusty Blackbird (VEC), Common Nighthawk (VEC), and Other Species at Risk (Supporting Topic).	• To verify the predicted effects of the Project on bird species at risk.	• Monitor listed species' abundance and distribution within the Regional Study Area.	Annually during construction and for the first three years of operation.
Colonial waterbirds (Supporting Topic)	• To verify the predicted effects of the Project on colonial waterbirds.	• Monitor abundance and distribution of colonial waterbirds within the Regional Study Area.	Annually during the first three years of operation.
	• To verify the effectiveness of mitigation measures to offset losses in colonial waterbird breeding habitat.	• Monitor the effectiveness of mitigation measures implemented for colonial waterbirds.	Annually during the first three years of operation or until mitigation measures are deemed to be successful.

Table 6.4-1: Monitoring and Follow-Up Program for Birds

Supporting Topic / VEC	Issue / Rationale	Monitoring	Timelines
Ruffed grouse (Supporting Topic)	• To verify the predicted effects of the Project on ruffed grouse.	• Monitor ruffed grouse abundance and distribution along north and south access roads and in other suitable ruffed grouse habitat located within the Regional Study Area.	Annually during construction. Annually during the first three years of operation, and periodically until disturbed habitat re-establishes.

APPENDIX 6A
BIRD SURVEY METHODS

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6.5 APPENDIX 6A – BIRD SURVEY METHODS

Helicopter Surveys

Aerial surveys for waterbirds, shorebirds and raptors using aquatic environments were conducted by helicopter along the Nelson River system from Clark Lake, through the Gull Lake area, along the north arm and south shore of Stephens Lake, to areas 20 km upstream of the Limestone generating station (*i.e.*, aquatic environment survey area; Map 6.2-1, Bird Survey Areas). Helicopter surveys were also conducted along a representative sample of inland lakes and creeks located adjacent to, and outside the Nelson River system (Map 6.2-1, Bird Survey Areas). Referred to as 'off-system'; these inland lakes included Assean Lake, Assean River and several other waterbodies north and south of the Nelson River (Map 6.2-2, On-System and Off-System Bird Survey Areas).

By comparing the abundance and distribution of birds using the Nelson River system (on-system), to waterbodies adjacent to the Nelson River system (off-system), the relative importance of the Nelson River system for breeding and migrating waterbirds was put into perspective.

Spring, summer, and fall helicopter surveys followed similar survey routes during 2001 to 2003 surveys, thereby providing a three-year dataset for which the distribution and abundance of waterbirds, shorebirds and raptors could be compared. In 2005 through to 2007, helicopter surveys occurred within proxy areas located along the north arm of Stephens Lake to 20 km upstream of the Limestone generating station. Information on the bird communities utilizing these areas was used as a comparison to other on-system areas (*i.e.*, Nelson River between Birthday Rapids and Gull Rapids).

Aerial surveys were designed to assess the abundance and distribution of large birds including waterfowl, but also other waterbirds (*e.g.*, gulls and terns) and raptors (*e.g.*, eagles, osprey) using primarily aquatic and riparian environments. Passerines and shorebirds are underestimated by this survey method due to their small size. During the first three-years of baseline bird studies (2001-2003), the timing of aerial surveys coincided with the spring (May) and fall (September) waterfowl migration periods as well as the summer waterfowl brood-rearing season (July).

Two biologists, one on either side of the helicopter, recorded all birds observed within a viewing distance of approximate 200 m from the helicopter (200 m on both left and right sides of the helicopter). A third study team member assisted with sighting birds while navigating and informing the other biologists of their location along the survey route. The helicopter flew at a consistent height (30-40 m) and speed (~80 km/hr) to facilitate estimates of bird density along the survey routes. When encountered, care was taken to avoid disrupting nesting colonies of gulls, nesting raptors and other wildlife observed during aerial surveys (*e.g.*, caribou, moose and bear) to the extent possible. To achieve this, the helicopter proceeded straight along its survey path and did not circle or otherwise disturb the wildlife observed.

Boat-Based Surveys

Boat-based surveys were conducted within the area of the Nelson River that would experience the greatest change in terms of waterbird and shorebird habitat if the Keeyask GS was constructed. This area included

Gull Lake and parts of the Nelson River upstream of Gull Lake. Information gathered during boat-based surveys complimented the aerial-based helicopter surveys that occurred within the same area.

To obtain data on the approximate abundance, diversity, and habitat use of waterbirds, including waterfowl, shorebirds, raptors and other birds, bird surveys were conducted by boat during daylight hours along the shorelines of the Nelson River (between Birthday Rapids and Gull Lake) and Gull Lake (excluding the Gull Rapids area). Boat surveys occurred during the summer (July) and fall (September) in 2001, 2002 and 2003 to obtain data on the use of the Nelson River and Gull Lake by waterfowl broods and fall staging migrants. At each boat survey stop illustrated in Section 5 (Map 5.2-3), birds observed within an approximate 1-km^2 area were recorded.

Terrestrial Breeding-Bird Surveys

Methods used for conducting breeding-bird surveys were consistent with standard procedures and included using the point count method for sampling breeding-bird communities (Ralph *et al.* 1993; Walsh 1993; USGS 2001). Breeding-bird surveys coincided with peak songbird breeding activity, between late May and early July (USGS 2007). Within that timeframe, point count surveys occurred during the periods of peak morning singing activity, typically between sunrise and 1000 h. While this method primarily targeted passerines, other forest birds were also recorded when encountered (*e.g.*, woodpeckers, upland game birds, raptors, and shorebirds).

In 2001, the locations of potential breeding-bird transects were initially pre-selected using available Forest Resource Inventory (FRI) data, topographical mapping, and aerial photographs. The final selections occurred during helicopter overflights and ground-based reconnaissance to locate individual transects within habitats that were as homogeneous as possible. After 2004, additional breeding bird transects were selected in other parts of the Regional Study Area based in part on habitat information provided by ECOSTEM. All breeding-bird transects surveyed were located in a variety of land cover types situated in areas that could be potentially affected by the proposed Project as well as in areas potentially unaffected by the Project. Habitat descriptions at each transect stop were recorded during surveys to allow the correlation of bird survey results with specific land cover types.

In 2001 and 2003, terrestrial breeding-bird surveys were conducted during a period of approximately three-weeks, from late May to mid-June in the vicinity of the Nelson River, between Birthday Rapids and Gull Rapids (including Gull Lake; Section 5, Map 5.2-3). In 2002, access to the study area for fieldwork was delayed, and breeding-bird surveys commenced in mid-June and ended in early July.

Survey effort for breeding birds increased over the three-year sampling period (2001-2003). In 2001, surveys were conducted at 197 survey stops located along 32 pre-selected transects. In 2002, 226 stops along 35 transects were surveyed. As information on locations of potential borrow areas became available in 2003, sampling effort increased to include 337 stops along 59 transects. The majority of transect stops surveyed in 2001 were resurveyed in 2002 and 2003.

In 2004, survey effort was focused in the area of the potential routing for the north access road. In mid-June, 58 stops located along 11 transects were surveyed for breeding birds using the esker (site of the proposed north access road; Section 5, Map5.2-3). All transects were located in forest cover, avoiding extensive burn areas to the extent possible. In 2005, survey efforts expanded to include both the proposed north and south

access road areas. Transects established along the esker in 2004 were replicated in 2005. In June 2005, a total of 62 survey stops located along six transects were surveyed in the proposed south access road area.

In 2006, surveys occurred at 69 stops located along six transects situated in the proposed south access road area and at 49 stops located along two transects situated near the shore of the north arm of Stephens Lake. If the Project proceeds, the new or altered shorelines at Gull Lake may, over time, resemble existing shorelines within a few bays located along the northwestern portion of Stephens Lake. For comparative purposes, 2006 surveys at Stephens Lake occurred in riparian habitats similar to those found in the Gull Lake riparian area (*e.g.*, sparsely treed muskeg and black spruce forest). By 2007, survey effort along the north arm of Stephens Lake expanded to include 61 stops along four transects and 65 stops along 11 transects located in comparative areas adjacent to Gull Lake and the Nelson River (at transects surveyed previously in 2003; Section 5, Map5.2-3).

In June 2010 breeding bird surveys occurred in regenerating forest and mixed-wood forest types throughout the Local Study Area. In June 2010 and 2011, site-specific investigations for nocturnally active species at risk occurred in suitable habitats throughout the Local Study Area. Remote recording units were deployed in areas that could potentially support yellow rail (*e.g.*, low vegetation on wet peatland) and common nighthawk (*e.g.*, wetlands, regenerating forest). Units were programmed to monitor morning, early evening and night-time bird activity. Recordings of rusty blackbird, olive-sided flycatcher were also made.

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APPENDIX 6B
TABLES AND FIGURES

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6.6 APPENDIX 6B – TABLES AND FIGURES

Table 6B-4: Bird Species[1] Potentially Using the Bird Regional Study Area

Scientific Name	Common Name	Status[2]	Observed Using the Study Area
Loons			
Gavia pacifica	Pacific Loon	M	✓
Gavia immer	Common Loon	B	✓
Grebes			
Podilymbus podiceps	Pied-billed Grebe	B	
Podiceps auritus	Horned Grebe	B?	✓
Podiceps grisegena	Red-necked Grebe	B	✓
Pelicans and Cormorants			
Pelecanus erythrorhynchos	American White Pelican	B?,N	✓
Phalacrocorax auritus	Double-crested Cormorant	B,N	✓
Herons and Bitterns			
Botaurus lentiginosus	American Bittern	B	
Ardea herodias	Great Blue Heron	B	✓
Swans			
Cygnus columbianus	Tundra Swan	M	✓
Geese			
Anser albifrons	Greater White-fronted Goose	M	
Anser caerulescens	Snow Goose	M	✓
Anser rossii	Ross's Goose	M	
Branta canadensis	Canada Goose	B	✓
Ducks			
Anas crecca	Green-winged Teal	B	✓
Anas rubripes	American Black Duck	B	✓
Anas platyrhynchos	Mallard	B	✓
Anas acuta	Northern Pintail	B	✓
Anas discors	Blue-winged Teal	B	✓
Anas clypeata	Northern Shoveller	B	✓
Anas strepera	Gadwall	B,N	

Table 6B-4: Bird Species[1] Potentially Using the Bird Regional Study Area

Scientific Name	Common Name	Status[2]	Observed Using the Study Area
Anas americana	American Wigeon	B	✓
Aythya valisinerina	Canvasback	B?,N	
Aythya americana	Redhead	B?,N	
Aythya collaris	Ring-necked Duck	B	✓
Aythya marila	Greater Scaup	M	✓
Aythya affinis	Lesser Scaup	B	✓
Somateria mollissima	Common Eider	M	
Melanitta nigra	Black Scoter	M	✓
Melanitta perspicillata	Surf Scoter	M	✓
Melanitta fusca	White-winged Scoter	B	✓
Bucephala clangula	Common Goldeneye	B	✓
Bucephala albeola	Bufflehead	B	✓
Lophodytes cucullatus	Hooded Merganser	B	✓
Mergus merganser	Common Merganser	B	✓
Mergus serrator	Red-breasted Merganser	B	✓
Gulls and Terns			
Stercorarius parasiticus	Parasitic Jaeger	B?	
Larus philadelphis	Bonaparte's Gull	B	✓
Larus delawarensis	Ring-billed Gull	B	✓
Larus argentatus	Herring Gull	B	✓
Sterna caspia	Caspian Tern	B	✓
Sterna hirundo	CommonTern	B	✓
Sterna paradisaea	Arctic Tern	M	✓
Chlidonias niger	Black Tern	B	
Accipters (Hawks and Eagles)			
Pandion haliaetus	Osprey	B	✓
Haliaeetus leucocephalus	Bald Eagle	B	✓
Circus cyaneus	Northern Harrier	B	✓
Accipiter striatus	Sharp-shinned Hawk	B	✓
Accipiter gentilis	Northern Goshawk	P	✓
Buteo jamaicensis	Red-tailed Hawk	B	✓
Buteo lagopus	Rough-legged Hawk	M	
Aquila chrysaetos	Golden Eagle	B	

Table 6B-4: Bird Species[1] Potentially Using the Bird Regional Study Area

Scientific Name	Common Name	Status[2]	Observed Using the Study Area
Falcons			
Falco sparverius	American Kestrel	B	
Falco columbarius	Merlin	B	✓
Falco peregrinus anatum	Peregrine Falcon	M	
Falco rusticolus	Gyrfalcon	W?	
Owls			
Bubo virginianus	Great Horned Owl	P	✓
Nyctea scandiaca	Snowy Owl	M,W	✓
Surnia ulula	Northern Hawk-Owl	P	✓
Strix nebulosa	Great Gray Owl	P	✓
Asio otus	Long-eared Owl	B	✓
Asio flammeus	Short-eared Owl	B	✓
Aegolius funerus	Boreal Owl	P	✓
Upland Gamebirds			
Dendragapus canadensis	Spruce Grouse	P	✓
Lagopus lagopus	Willow Ptarmigan	W	✓
Bonasa umbellus	Ruffed Grouse	P	✓
Tympanuchus phasianellus	Sharp-tailed Grouse	P	✓
Rails and Cranes			
Coturnicops noveboracensis	Yellow Rail	B	
Porzana carolina	Sora	B	✓
Fulica americana	American Coot	B	
Grus canadensis	Sandhill Crane	B	✓
Shorebirds			
Pluvialis squatarola	Black-bellied plover	M	
Pluvialis dominica	Lesser golden-Plover	M	
Charadrius semipalmatus	Semipalmated Plover	M	
Charadrius vociferus	Killdeer	B	✓
Tringa melanoleuca	Greater Yellowlegs	B	✓
Tringa flavipes	Lesser Yellowlegs	B	✓
Tringa solitaria	Solitary Sandpiper	B	
Actitis macularia	Spotted Sandpiper	B	✓

Table 6B-4: Bird Species[1] Potentially Using the Bird Regional Study Area

Scientific Name	Common Name	Status[2]	Observed Using the Study Area
Limosa haemastica	Hudsonian Godwit	M	
Arenaria interpres	RuddyTurnstone	M	
Calidris conutus	Red Knot	M	
Calidris alba	Sanderling	M	
Calidris pusilla	Semipalmated Sandpiper	M	
Calidris minutilla	Least Sandpiper	M	
Calidris fuscicollis	White-rumped Sandpiper	M	
Calidris bairdii	Baird's Sandpiper	M	
Calidris melanotos	Pectoral Sandpiper	M	
Calidris alpina	Dunlin	M?	
Limnodromus griseus	Short-billed Dowitcher	B?	
Gallinago gallinago	Wilson's Snipe*	B	✓
Phalaropus lobatus	Red-necked Phalarope	M	
Nighthawks			
Chordeiles minor	Common Nighthawk	B	✓
Hummingbirds			
Archilochus colubris	Ruby-throated Hummingbird	B,N	
Kingfishers			
Cerlye alcyon	Belted Kingfisher	B	✓
Woodpeckers			
Sphyrapicus varius	Yellow-bellied Sapsucker	B	
Picoides pubescens	Downy Woodpecker	P	✓
Picoides villosus	Hairy Woodpecker	P	✓
Picoides tridactylus	Three-toed Woodpecker	P	✓
Picoides arcticus	Black-backed Woodpecker	P	✓
Colaptes auratus	Northern Flicker	B	✓
Dryocopus pileatus	Pileated Woodpecker	P	
Passerines			
Contopus borealis	Olive-sided Flycatcher	B	✓
Empidonax flaviventris	Yellow-bellied Flycatcher	B	✓
Empidonax alnorum	Alder Flycatcher	B	✓
Empidonax minimus	Least Flycatcher	B	✓

Table 6B-4: Bird Species[1] Potentially Using the Bird Regional Study Area

Scientific Name	Common Name	Status[2]	Observed Using the Study Area
Sayornis phoebe	Eastern Phoebe	B	
Tyrannus tyrannus	Eastern Kingbird	B	
Eremophila alpestris	Horned Lark	B?,W	
Tachycineta bicolor	Tree Swallow	B	✓
Riparia riparia	Bank Swallow	B	✓
Hirundo pyrrhonota	Cliff Swallow	B	✓
Hirundo rustica	Barn Swallow	B	
Perisoreus canadensis	Gray Jay	P	✓
Pica pica	Black-billed Magpie	P	
Corvus brachyrhynchos	American Crow	P	✓
Corvus corax	Common Raven	P	✓
Parus hudsonicus	Boreal Chickadee	P	✓
Sitta canadensis	Red-breasted Nuthatch	P	✓
Troglodytes troglodytes	Winter Wren	B	✓
Regulus satrapa	Golden-crowned Kinglet	B	✓
Regulus calendula	Ruby-crowned Kinglet	B	✓
Catharus minimus	Gray-cheeked Thrush	M	✓
Catharus ustulatus	Swainson's Thrush	B	✓
Catharus guttatus	Hermit Thrush	B	✓
Turdus migratorius	American Robin	B	✓
Anthus spinoletta	Water Pipit	M	✓
Bombycilla garrulus	Bohemian Waxwing	B	
Bombycilla cedrorum	Cedar Waxwing	B	✓
Lanius excubitor	Northern Shrike	M	
Moqueur roux	Brown Thrasher	B?	
Certhia americana	Brown Creeper	B	✓
Sturnus vulgaris	European Starling	B,I	
Vireo solitarius	Blue-headed Vireo	B	✓
Vireo philadelphicus	Philadelphia Vireo	B	
Vireo olivaceus	Red-eyed Vireo	B	✓
Vermivora peregrina	Tennessee Warbler	B	✓
Vermivora celata	Orange-crowned Warbler	B	✓
Dendroica petechia	Yellow Warbler	B	✓

Table 6B-4: Bird Species[1] Potentially Using the Bird Regional Study Area

Scientific Name	Common Name	Status[2]	Observed Using the Study Area
Dendroica magnolia	Magnolia Warbler	B	✓
Dendroica tigrina	Cape May Warbler	B	✓
Dendroica coronata	Yellow-rumped Warbler	B	✓
Dendroica fusca	Blackburnian Warbler	B	✓
Dendroica palmarum	Palm Warbler	B	✓
Dendroica castanea	Bay-breasted Warbler	B	✓
Dendroica striata	Blackpoll Warbler	B	✓
Mniotilta varia	Black-and-white Warbler	B	✓
Seiurus aurocapillus	Ovenbird	B	✓
Seiurus noveboracensis	Northern Waterthrush	B	✓
Wilsonia pusilla	Wilson's Warbler	B	✓
Pheucticus ludovicianus	Rose-breasted Grosbeak	B	✓
Spizella arborea	American Tree Sparrow	B	✓
Spizella passerina	Chipping Sparrow	B	✓
Spizella pallida	Clay-colored Sparrow	B?,N	✓
Pooecetes gramineus	Vesper Sparrow	B	
Passerculus sandwichensis	Savannah Sparrow	B	✓
Ammodramus leconteii	Le conte's Sparrow	B	✓
Passerella iliaca	Fox Sparrow	B	✓
Melospiza melodia	Song Sparrow	B	✓
Melospiza lincolnii	Lincoln's Sparrow	B	✓
Melospiza georgiana	Swamp Sparrow	B	✓
Zonotrichia albicollis	White-throated Sparrow	B	✓
Zonotrichia leucophrys	White-crowned Sparrow	B	✓
Zonotrichia querula	Harris's Sparrow	M	
Junco hyemalis	Dark-eyed Junco	B	✓
Calcarius lapponicus	Lapland Longspur	M	
Calcarius pictus	Smith's Longspur	M	
Plectophenax nivalis	Snow Bunting	M	✓
Agelaius phoeniceus	Red-Winged Blackbird	B	✓
Euphagus carolinus	Rusty Blackbird	B	✓
Quiscalus quiscula	Common Grackle	B	✓
Pinicola enucleator	Pine Grosbeak	P	✓

Table 6B-4: Bird Species[1] Potentially Using the Bird Regional Study Area

Scientific Name	Common Name	Status[2]	Observed Using the Study Area
Loxia curvirostra	Red Crossbill	P	✓
Loxia leucoptera	White-winged Crossbill	P	✓
Carduelis flammea	Common Redpoll	P	✓
Carduelis hornemanni	Hoary Redpoll	M,W	
Carduelis pinus	Pine Siskin	B?,N	
Passer domesticus	House Sparrow	B,I	
TOTAL SPECIES OBSERVED IN REGIONAL STUDY AREA			**124**

[1]Birds known or likely to occur within the study area

[2]Note: B = breeding, M = migrant, P = permanent resident, N = northern extent of range, W = winter range, I = introduced, ? = unknown; appropriate habitat uncertain

[3]Bird Surveys from 2001 to 2010

Source: Godfrey 1986; Manitoba Naturalists Society 2003

Table 6B-5: Most Common Songbird Species Observed Within the Gull Lake and Stephens Lake Areas

Most Common Songbirds Observed	Ranking[a] of the Five Most Common Songbirds Observed Within Habitat Groups Surveyed (2001-2007)[b]									
	Black Spruce Forest	Black Spruce Woodland	Sparsely Treed Black Spruce or Black Spruce / Tamarack Mixture	Spruce Mixture Forest	Spruce Mixture Woodland	Jack Pine Mixture Forest or Woodland	Jack Pine Forest or Woodland	Spruce Mixedwood Forest or Woodland	White Birch Mixedwood Forest or Woodland	Trembling Aspen Mixedwood Forest or Woodland
Ruby-crowned Kinglet	2	1	1	1	1	1	4	2	2	1
Yellow-rumped Warbler	1	2	2	2	2	3	2	1	1	2
Northern Waterthrush	4	3	3	4	5	4	4	-	-	-
Swainson's Thrush	5	4	-	5	4	-	1	3	5	-
White-throated Sparrow	-	-	-	3	5	2	-	5	-	-
American Robin	3	-	4	-	-	4	-	4	-	4
Blue-headed Vireo	-	-	-	-	-	-	-	-	3	3
Dark-eyed Junco	-	5	5	-	-	-	-	-	-	-
Magnolia Warbler	-	-	-	-	-	-	3	-	-	-
Tennessee Warbler	-	-	-	-	-	-	-	-	4	-

Table 6B-5: Most Common Songbird Species Observed Within the Gull Lake and Stephens Lake Areas

Most Common Songbirds Observed	Ranking[a] of the Five Most Common Songbirds Observed Within Habitat Groups Surveyed (2001-2007)[b]									
	Black Spruce Forest	Black Spruce Woodland	Sparsely Treed Black Spruce or Black Spruce / Tamarack Mixture	Spruce Mixture Forest	Spruce Mixture Woodland	Jack Pine Mixture Forest or Woodland	Jack Pine Forest or Woodland	Spruce Mixedwood Forest or Woodland	White Birch Mixedwood Forest or Woodland	Trembling Aspen Mixedwood Forest or Woodland
Winter Wren	-	-	-	-	-	-	4	-	-	-
Gray Jay	-	-	-	-	-	4	-	-	-	-
Yellow Warbler	-	-	-	-	-	-	-	-	-	5

[a] = Ranking: 1 = first most common bird species, to 5 = fifth most common bird species ('most common' = species observed at the most number of survey stops)
[b] = Refer to Section 2 for definitions of 'forest', 'woodland', 'mixture' and 'mixedwood'

Table 6B-6: Waterbird Densities

Year	Season	Assean Lake	Assean River	Clark Lake	Gull Lake	Gull Rapids	Inland Lakes North	Inland Lakes South	Kettle	Nelson River E of Birth-day Rapids	Nelson River E of Kettle	Nelson River E of Birth-day Rapids	Steph-ens Lake (south shore)	Steph-ens Lake (north arm)	Split Lake	Grand Total
2001	Spring	7.74		25.81	25.38		7.10	8.04		23.50	13.95	20.67	0.51			11.30
	Summer	6.92	12.88	2.76	3.62		5.66	2.40		12.23	13.98	4.17	4.31			6.00
	Fall	17.81	0.00	3.68	12.79		20.60	12.19		13.60	4.70	8.41	1.10			12.75
2001	*Total*	*10.87*	*5.74*	*10.23*	*12.84*		*11.72*	*7.99*		*16.36*	*10.92*	*11.22*	*2.00*			*10.13*
2002	Spring			15.14	38.63		10.94	11.53		29.38	31.24	57.00	18.85			21.24
	Summer	10.28	3.97	36.58	58.14		9.51	7.57		7.33	13.91	8.22	3.55			15.23
	Fall	20.36	20.08	45.38	21.53		15.76	16.29		28.49	9.18	17.92	11.24			16.88
2002	*Total*	*15.11*	*10.12*	*33.12*	*39.89*		*12.09*	*11.73*		*21.84*	*18.78*	*25.44*	*11.16*			*17.60*
2003	Spring	7.00	0.00	100.16	67.93	25.61	6.43	7.03	61.48	32.39	18.68	16.32				17.01
	Summer	10.59	0.00	27.69	33.86	17.38	4.59	4.79	65.57	31.28	14.29	64.98	3.27			12.89
	Fall	35.12	0.00	41.56	76.36	49.39	9.14	15.67	129.51	10.87	10.09	12.05	3.43			18.91
2003	*Total*	*16.61*	*0.00*	*55.97*	*58.82*	*30.79*	*6.73*	*9.08*	*85.52*	*25.47*	*14.36*	*31.18*	*3.66*			*16.24*
2011	Spring	7.12	12.23	53.32	94.68	76.37	8.33	10.41		38.34	43.53	22.29	8.07		22.63	29.37
	Summer	9.63	0.00	3.11	3.82	126.29	6.94	8.46		17.53	13.17	5.94	7.54	8.97	10.04	10.60
	Fall															
2011	*Total*	*9.04*	*8.46*	*19.85*	*40.39*	*109.58*	*7.32*	*9.02*		*30.06*	*23.37*	*11.39*	*7.65*	*8.97*	*15.29*	*16.54*
Grand	***Total***	***13.18***	***5.71***	***29.70***	***36.43***	***81.16***	***9.29***	***9.54***	***85.52***	***24.36***	***17.68***	***19.75***	***6.53***	***8.97***	***15.29***	***15.43***

Table 6B-7: Waterfowl Densities (ducks, geese, swans only)

Year	Season	Assean Lake	Assean River	Clark Lake	Gull Lake	Gull Rapids	Inland Lakes North	Inland Lakes South	Kettle	Nelson River E of Birth-day Rapids	Nelson River E of Kettle	Nelson River E of Birth-day Rapids	Steph-ens Lake (south shore)	Steph-ens Lake (north arm)	Split Lake	Grand Total
2001	Spring	4.95		24.03	19.83		4.27	5.56		19.43	9.61	18.33	0.30			8.27
	Summer	6.36	12.88	2.18	1.47		3.37	1.81		1.65	2.18	3.47	0.05			2.64
	Fall	17.46	0.00	2.94	12.48		20.39	11.92		13.26	4.50	6.19	0.60			12.41
2001	*Total*	*9.64*	*5.74*	*9.22*	*10.39*		*10.02*	*6.92*		*11.34*	*5.51*	*9.47*	*0.32*			*7.97*
2002	Spring			11.86	31.86		7.68	9.54		23.95	17.52	55.00	15.50			15.50
	Summer	9.69	3.50	32.57	6.30		7.90	6.56		1.48	1.46	3.83	2.10			6.07
	Fall	19.60	20.08	42.31	20.88		15.48	16.11		27.12	3.67	14.60	4.71			15.09
2002	*Total*	*14.44*	*9.83*	*29.63*	*18.70*		*10.42*	*10.67*		*17.59*	*7.80*	*22.11*	*7.44*			*11.92*
2003	Spring	4.54	0.00	89.94	32.77	11.28	5.09	5.21	31.15	13.74	7.52	14.27				9.93
	Summer	4.11	0.00	7.19	11.09	3.35	3.32	1.97	0.00	4.03	1.26	5.74	1.23			3.22
	Fall	32.83	0.00	31.72	57.80	28.66	9.03	15.62	0.00	5.90	4.18	7.32	1.61			14.53
2003	*Total*	*12.60*	*0.00*	*42.34*	*33.16*	*14.43*	*5.82*	*7.51*	*10.38*	*7.91*	*4.28*	*9.09*	*1.72*			*9.17*
2011	Spring	2.78	8.51	46.53	37.08	1.20	5.03	6.80		3.54	14.44	16.52	6.38		20.07	12.17
	Summer	3.38	0.00	1.23	0.44	5.43	5.94	7.34		1.12	0.86	1.64	0.61	0.86	3.52	3.88
	Fall															
2011	*Total*	*3.24*	*5.88*	*16.33*	*15.19*	*4.01*	*5.69*	*7.19*		*2.58*	*5.43*	*6.60*	*1.85*	*0.86*	*10.42*	*6.50*
Grand	***Total***	***10.31***	***5.31***	***24.44***	***18.46***	***7.77***	***7.83***	***8.14***	***10.38***	***9.02***	***5.80***	***11.66***	***3.23***	***0.86***	***10.42***	***8.85***

Table 6B-8: Primary and Secondary Habitat for Olive-sided Flycatcher, Rusty Blackbird and Common Nighthawk

VEC	Primary Habitat	Secondary Habitat
Olive-sided Flycatcher	Old and mature needle forest/woodland (spruce dominated) or late successional open and semi-open coniferous and or mixedwood forests within 50m of an edge - *e.g.*, burn that is between 5 and 15 years, Beaver ponds with snags; water; bogs; muskegs; open areas with snags and lakes with standing dead trees. Or adjacent to poor wooded fen, rich wooded fen and wooded swamp.	Young needle forest/woodland (spruce dominated) or late successional open and semi-open coniferous and or mixedwood forests within 50m of an edge
Rusty Blackbird	Needleleaf treed or tall shrub on deep wet peatland • Dominant species include Black Spruce and Tamarack Larch • Wet or deep peatland associated with horizontal or riparian fens	Mixed wood and needleleaf on shallow peatland • Needleleaf dominant with some bog birch • Ground ice present in peatland Associated with a collapse scar or peat plateau bog
Common Nighthawk	Any Outcrop; Dry Post-disturbance stages <20 years since burn with sparse veg for nesting (total shrub cover <20%, total tree cover <10%). Open, dry coniferous forest, forest clearings, forests with sparse ground cover on mineral	Early successional stage or shrub communities maintained by fire or clearing (cut-lines) or flooding (fen/marsh/wet meadow); seedlings and advance regeneration may be abundant; tree cover <10%; shrub cover <20% herb layer cover >20%; Coniferous forest (Jack Pine dominant - mature to old forest).

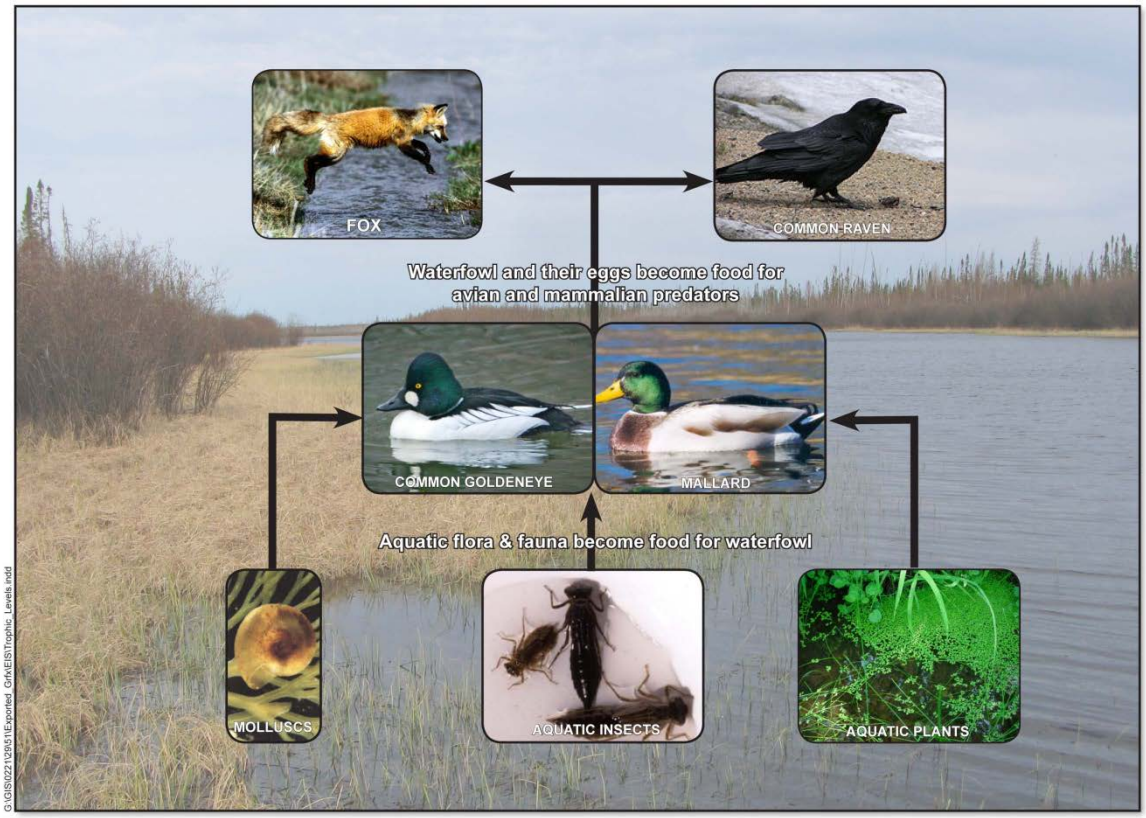

Figure 6B-1: The Role of Waterfowl in a Boreal Forest Food Chain

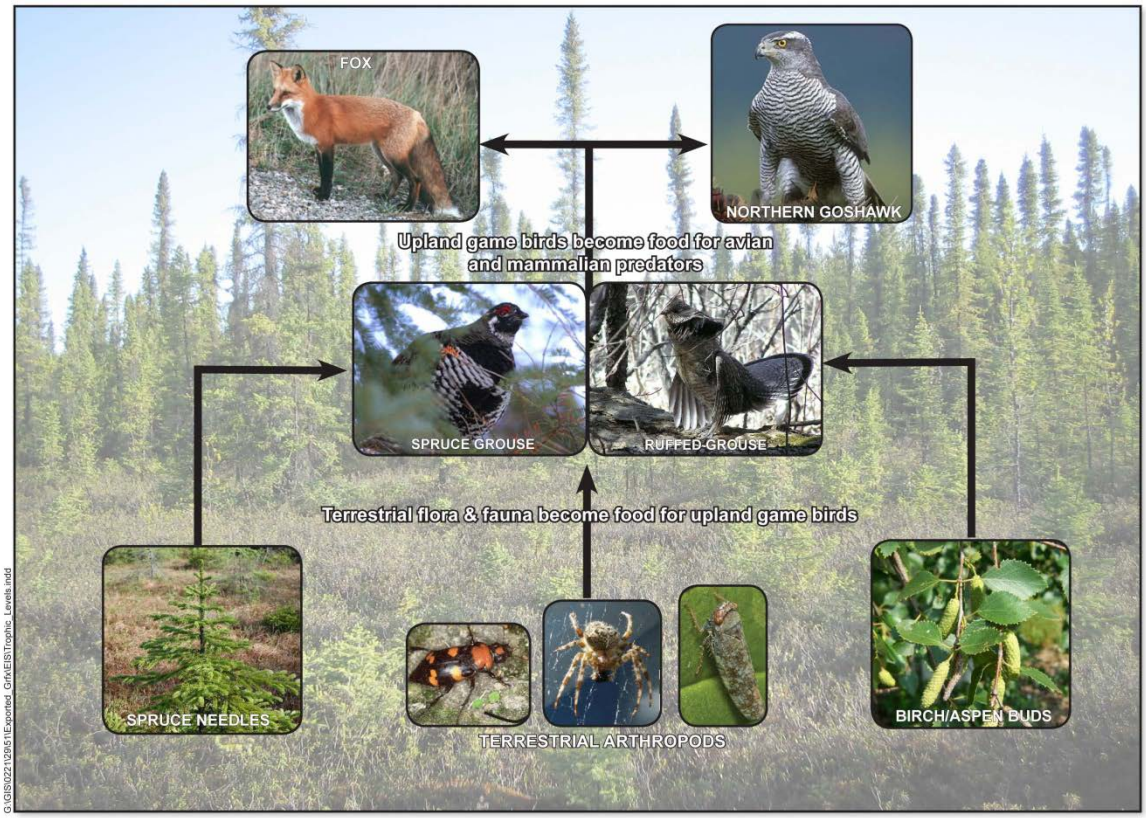

Figure 6B-2: The Role of Upland Game Birds in a Boreal Forest Food Chain

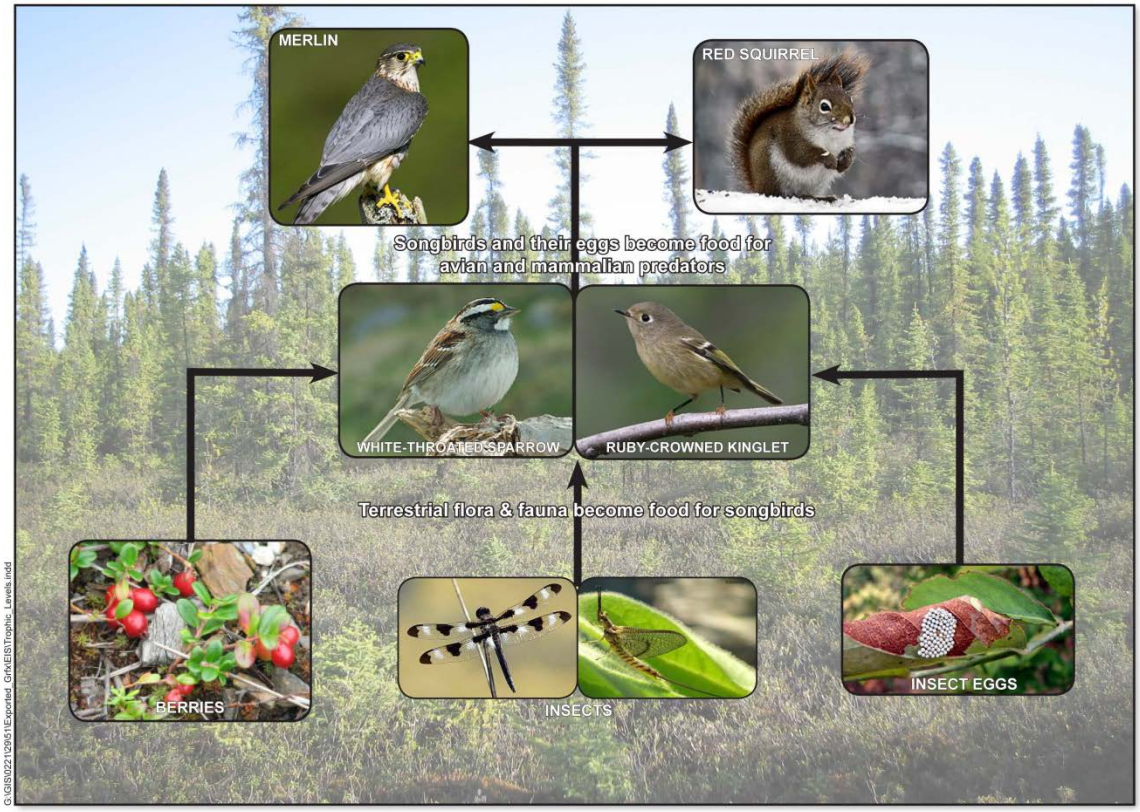

Figure 6B-3: The Role of Songbirds in a Boreal Forest Food Chain

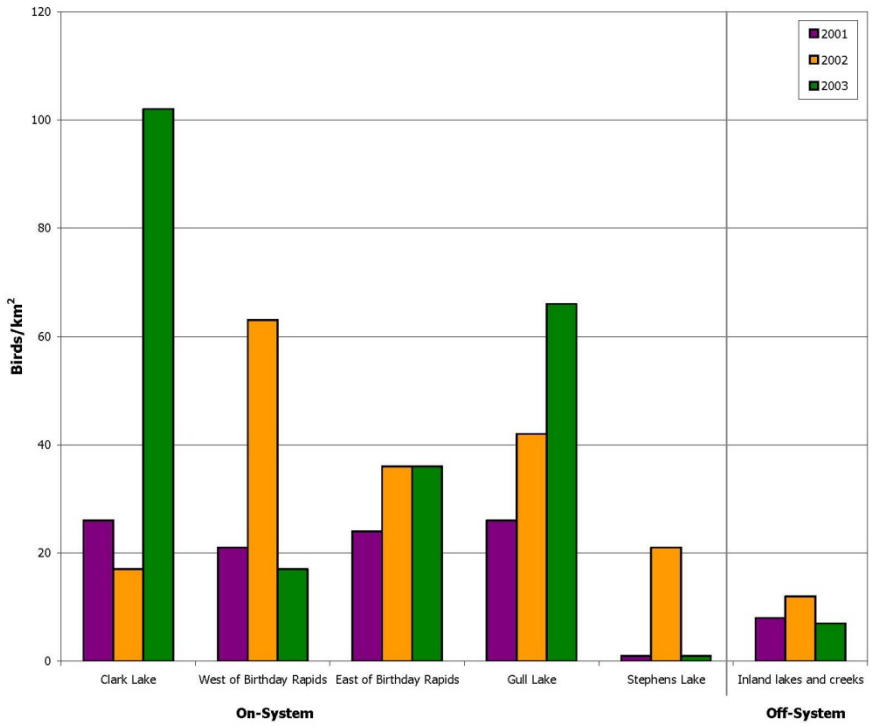

Figure 6B-4: Densities of Waterbirds Observed in the Keeyask Regional Study Area During Spring Helicopter Surveys 2001, 2002, 2003

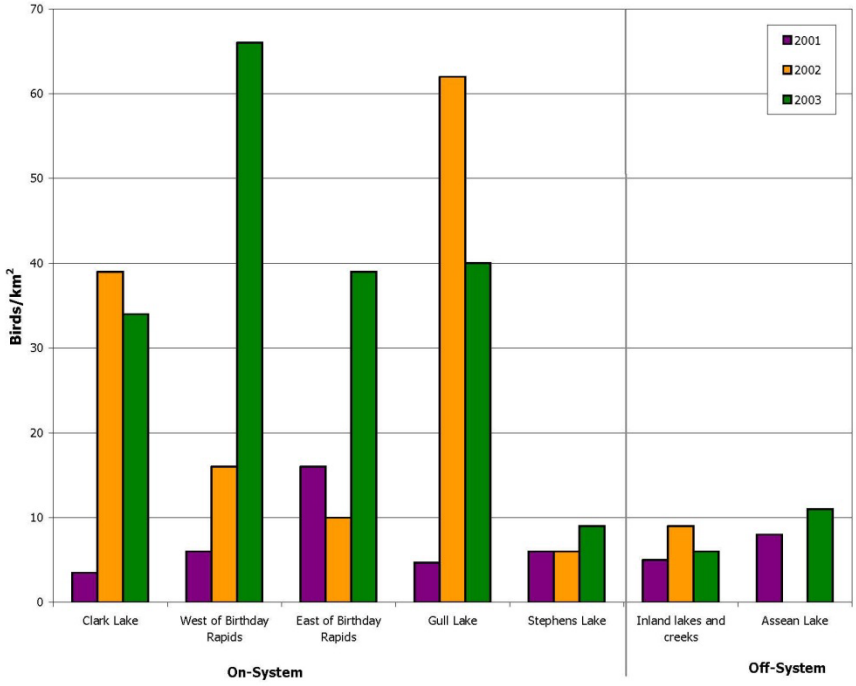

Figure 6B-5: Densities of Waterbirds Observed in the Keeyask Regional Study Area During Summer Helicopter Surveys 2001, 2002, 2003

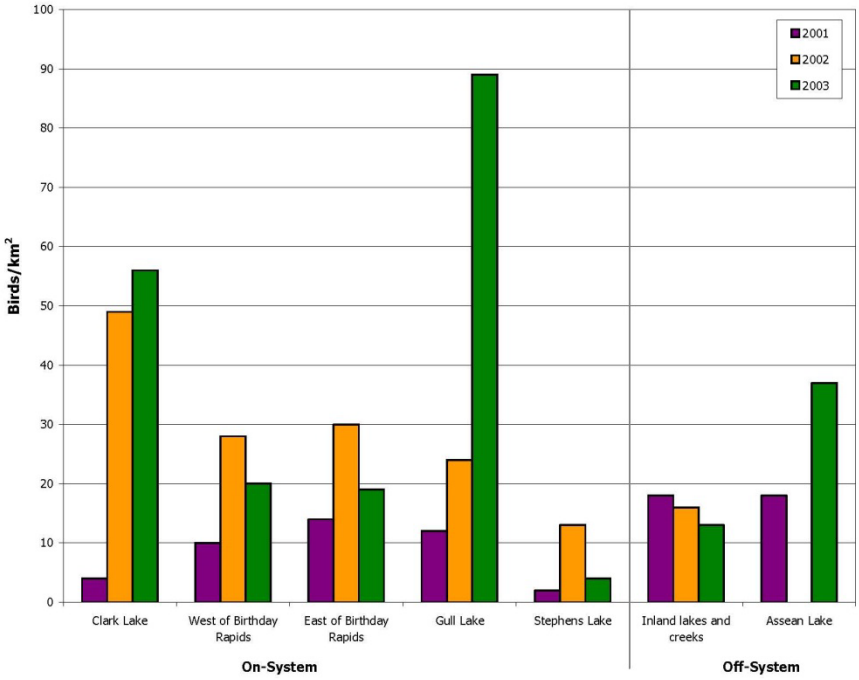

Figure 6B-6: Densities of Waterbirds Observed in the Keeyask Regional Study Area During Fall Helicopter Surveys 2001, 2002, 2003

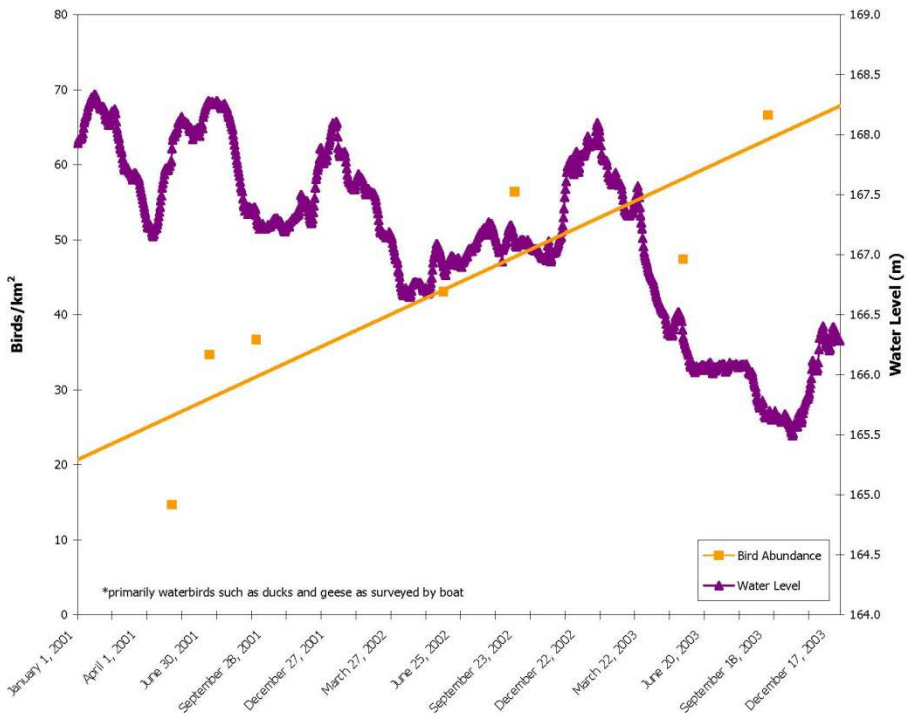

Figure 6B-7: Water Levels and Bird* Observations on Gull Lake and the Nelson River (between Birthday Rapids and Gull Lake) Between 2001-2003

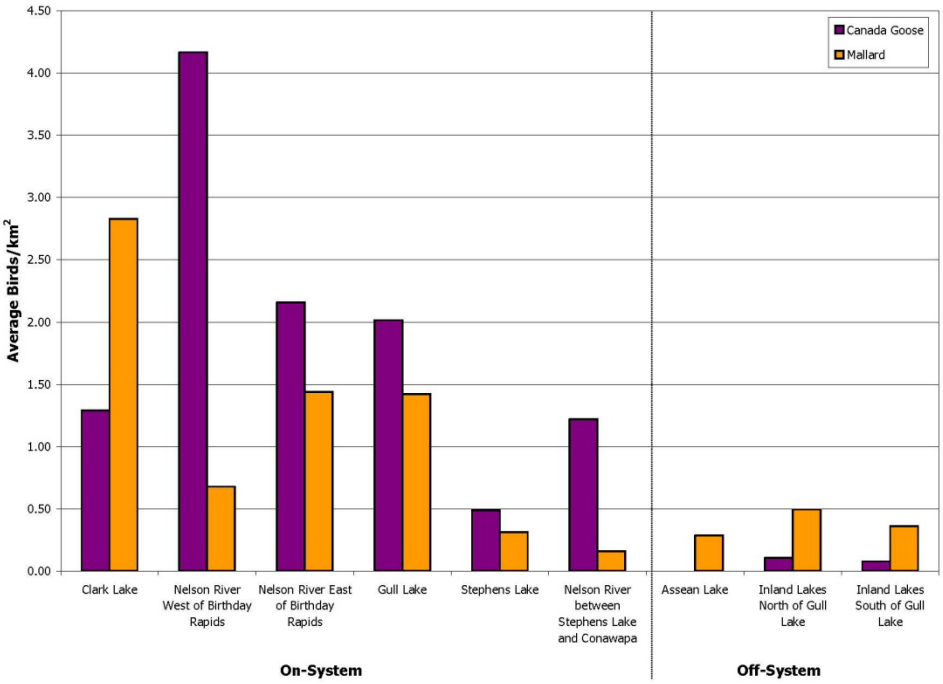

Figure 6B-8: Average Canada Goose and Mallard (VECs) Densities within the Keeyask Aquatic Environment During Spring Helicopter Surveys

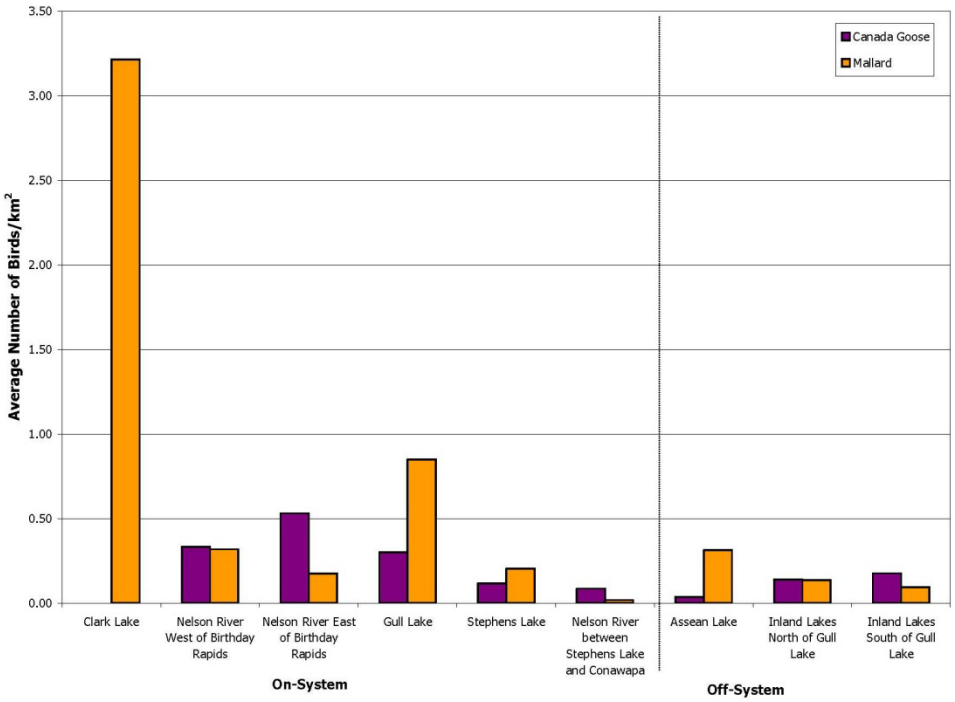

Figure 6B-9: Average Canada Goose and Mallard (VECs) Densities within the Keeyask Aquatic Environment During Summer Helicopter Surveys

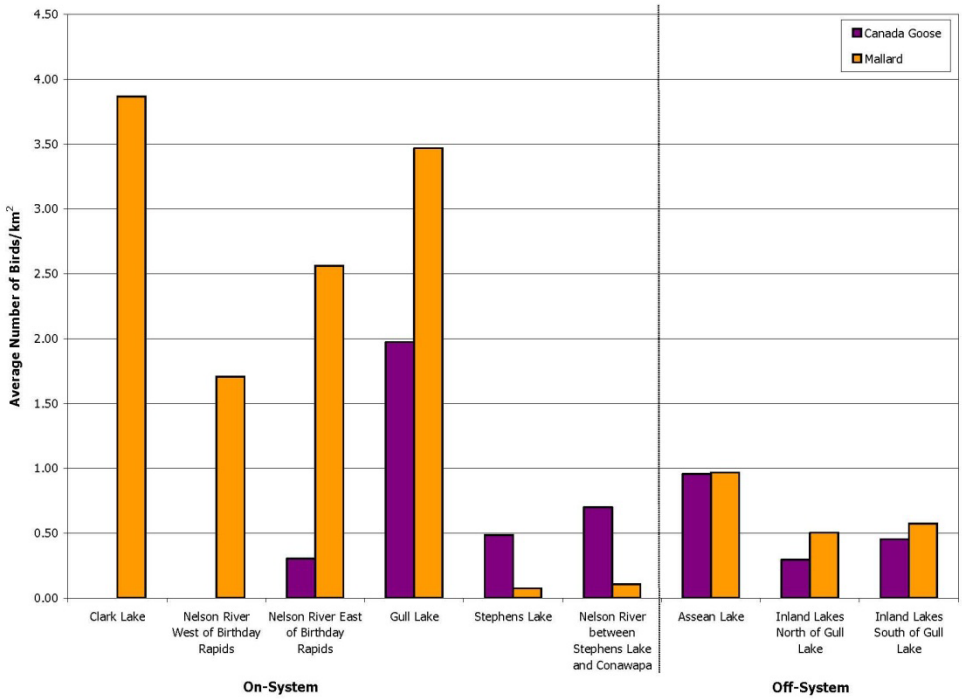

Figure 6B-10: Average Canada Goose and Mallard (VECs) Densities within the Keeyask Aquatic Environment During Fall Helicopter Surveys