Attraction to the Doris Project

The WMMP evaluates attraction of raptors to the Doris Project as a possible nesting site by monitoring Doris Project infrastructure and quarry pit walls for nesting raptors since 2006. There have been no reported incidents to date involving raptors species being attracted to prey on the Doris Project site or to Doris Project infrastructure such as buildings or quarry walls for nesting (Golder 2007, 2008a, 2009; Rescan 2010, 2011c, 2011f, 2013e; ERM Rescan 2014a; ERM 2015b, 2016a). Note that there are no open pits as part of the Doris Project, thereby eliminating the major attractant for raptors and the quarries have been shallow and so relatively poor nesting habitat for raptors. These results indicate that there has been no effect of attraction on raptors due to the Doris Project (Golder 2007, 2008a, 2009; Rescan 2010, 2011c, 2011f, 2013e; ERM Rescan 2014a; ERM 2015b, 2016a).

Direct Mortality

Any wildlife mortality, including raptors that have been observed by onsite personnel were reported immediately to the ESR Department and in the annual WMMP report. Mortality of VECs or larger fauna, or mortality resulting from potential interaction with Doris Project activity is reported directly to GN DOE and KIA, as necessary (ERM 2016c).

In the years that personnel have been at the Doris Project site (2006-2016), there have been no reports of any raptor morality of any sort, including from vehicle and aircraft strikes. Vehicle-raptor collisions are related to locations, traffic volume, and speed (Jalkotzy, Ross, and Nasserden 1997). Higher vehicle speeds increase the chance of mortality and/or injury to raptors. For example, it has been documented that speeds in excess of 80 km/hour may increase owl-vehicle collisions (Whittington and Allen 2008). The on-site speed limits for vehicles is a maximum of 50 km/h, thereby limiting the chance for direct mortality to raptors.

Bird strikes with aircraft must be reported to the Canadian aviation authority due to safety concerns. No bird strikes have been reported at the Doris site due to aircraft. These results indicate that there has been no effect of direct mortality on raptors due to the Doris Project (Golder 2007, 2008a, 2009; Rescan 2010, 2011c, 2011f, 2013e; ERM Rescan 2014a; ERM 2015b, 2016a).

Environmental Media Quality

The human health and ecological risk assessment (Volume 6, Section 5) evaluated potential changes in the quality of environmental media (e.g., soil, vegetation, and water) due to the Doris Project. This assessment determined that effects of the Doris Project on environmental media quality were negligible, thus there is no potential increase in risk of adverse health effects on raptors due to Doris Project activities.

9.2.11 Characterization of Baseline Conditions for Waterbirds

9.2.11.1 Introduction

For the purposes of this assessment, waterbirds are defined as birds that primarily forage and/or nest within freshwater waterbodies. Seabirds, birds that predominantly forage and/or nest in/near marine waterbodies, are discussed in Volume 5, Section 11. The Arctic waterbird community is comprised of geese and the tundra swan, several species of dabbling and diving ducks, gulls, Arctic tern, four species of loons, and the sandhill crane. Some species of waterbirds are important food sources to Inuit communities, including eiders, geese, loons, ducks, mergansers, shorebirds, gulls and jaegers (Banci and Spicker 2016). Some waterbird species such as greater scaup also use marine habitats during some portion of the breeding season.

A total of 31 waterbird species have the potential to occur in the RSA (Table 9.2-51). Of these species, 19 waterbird species were identified as species that regularly occur within the RSA during the breeding season or during migration (Golder 2007, 2008a, 2009; Rescan 2010, 2011c, 2011f, 2013e; ERM Rescan 2014a; ERM 2015b, 2016a). No waterbirds in the RSA are listed as species of conservation concern under the federal *Species at Risk Act* (SARA; 2002). Several waterbird species in the RSA are designated as Sensitive in Nunavut by the Canadian Endangered Species Conservation Council (CESCC), including the Arctic tern, glaucous gull, Thayer's gull, northern pintail, common eider, king eider, and long-tailed duck (CESCC 2010).

Population Trends and Conservation

Migratory birds and their nests are protected by the federal *Migratory Birds Convention Act* (1994b), which prohibits killing migratory birds and their eggs, taking their nests, and deposition of harmful substances in waters or areas frequented by migratory birds. In addition, migratory birds and ptarmigan in Nunavut are protected under the Nunavut *Wildlife Act* (2003), which prohibits destruction of bird nests when these are being used by birds, and prohibits disturbance to a "substantial number" of birds, such as to flocks of waterbirds during spring and fall staging.

Arctic populations of geese and the tundra swan have generally remained stable or have increased in abundance (CWS 2011). Five waterbird species that occur in the RSA show declining population trends: lesser scaup, northern pintail, long-tailed duck, red-throated loon, and the Arctic tern (Kushlan et al. 2002; NAWMP 2004; Conant, Roetker, and Groves 2006).

Many breeding areas and adjacent marine areas in Nunavut used by waterbirds during the breeding season or post-breeding for staging and moulting are identified as Key Terrestrial Habitat Sites (KTHSs) and Key Marine Habitat Sites (KMHSs) by the Canadian Wildlife Service (Mallory and Fontaine 2004; Latour et al. 2008). Other areas are designated as Important Bird Areas (IBAs) by a partnership of conservation organizations including Bird Studies Canada, Nature Canada, and Birdlife International (IBA 2012b). In addition, areas of national importance to migratory birds are designated as Migratory Bird Sanctuaries (MBS) by Environment Canada under the *Migratory Birds Convention Act* (1994b). The selection criteria for MBS and IBAs are similar; as both identify habitats that are important to species of conservation concern, to large congregations of migratory birds, and to species that are limited by range or habitat (IBA 2012b; Environment Canada 2013). However, only MBS are protected under legislation. Key Habitat Sites (Terrestrial and Marine) are areas that support at least 1% of the Canadian population of at least one migratory species (Mallory and Fontaine 2004; Latour et al. 2008). Key Habitat Sites for Nunavut are included within the 2014 Draft Nunavut Land Use Plan as "Key Migratory Bird Habitat Sites" (NPC 2014b).

The Queen Maud Gulf Migratory Bird Sanctuary (QMGMBS) is the closest MBS to the Hope Bay Project, located roughly 50 km to the east of the Hope Bay Project; this area is also recognized as an IBA, and a Key Migratory Bird Habitat Site under the Draft Nunavut Land Use Plan (NPC 2014b). In addition, the Bathurst Inlet and Elu Inlet Key Migratory Bird Habitat Site identified within the 2016 Nunavut Land Use Plan encompasses Melville Sound and the northern third of Bathurst Inlet and encompasses the marine wildlife RSA (see Volume 5, Section 11). No other Key Migratory Bird Habitat Sites occur near the Hope Bay Project.

Table 9.2-51. Waterbird Species Potentially Occurring in the Regional Study Area and their Regularity and Timing of Occurrence and Conservation Status

Common Name	Scientific Name	Regularity of Occurrence	Detected during Baseline Studies[1]	Timing of Occurrence	Conservation Status				
					CESCC[2]	COSEWIC[3]	SARA[4]	Global Rank[5]	IUCN Red List[6]
Geese, Swans, and Cranes									
Brant	*Branta bernicla*	Regular	Y	Migrant	Secure	-	-	G5	Least Concern
Canada Goose	*Branta canadensis*	Regular	Y	Breeding	Secure	-	-	G5	Least Concern
Greater White-fronted Goose	*Anser albifrons*	Regular	Y	Breeding	Secure	-	-	G5	Least Concern
Ross's Goose	*Chen rossii*	Rare	Y	Breeding	Secure	-	-	G5	Least Concern
Sandhill Crane	*Grus canadensis*	Regular	Y	Breeding	Secure	-	-	G5	Least Concern
Snow Goose	*Chen caerulescens*	Regular	Y	Migrant	Secure	-	-	G5	Least Concern
Tundra Swan	*Cygnus columbianus*	Regular	Y	Breeding	Secure	-	-	G5	Least Concern
Dabbling Ducks									
American Green-winged Teal	*Anas crecca*	Regular	Y	Breeding	Undetermined	-	-	G5	Least Concern
American Wigeon	*Anser rossii*	Accidental	Y	Breeding	Undetermined	-	-	G5	Least Concern
Gadwall	*Anas strepera*	Rare	Y	Breeding	Accidental	-	-	G5	Least Concern
Mallard	*Anas platyrhynchos*	Rare	Y	Breeding	Undetermined	-	-	G5	Least Concern
Northern Pintail	*Anas acuta*	Regular	Y	Breeding	Sensitive	-	-	G5	Least Concern
Northern Shoveler	*Anas clypeata*	Rare	Y	Breeding	Undetermined	-	-	G5	Least Concern
Diving Ducks									
Black (American) Scoter	*Melanitta americana*	Rare	N	Migrant	Undetermined	-	-	G5	Least Concern
Common Eider	*Somateria mollissima*	Regular	Y	Breeding	Sensitive	-	-	G5	Near Threatened
Common Merganser	*Mergus merganser*	Rare	Y	Breeding	Undetermined	-	-	G5	Least Concern
Greater Scaup	*Aythya marila*	Regular	Y	Breeding	Secure	-	-	G5	Least Concern
King Eider	*Somateria spectabilis*	Regular	Y	Breeding	Sensitive	-	-	G5	Least Concern

Common Name	Scientific Name	Regularity of Occurrence	Detected during Baseline Studies[1]	Timing of Occurrence	Conservation Status				
					CESCC[2]	COSEWIC[3]	SARA[4]	Global Rank[5]	IUCN Red List[6]
Lesser Scaup	*Aythya affinis*	Rare	Y	Breeding	Undetermined	-	-	G5	Least Concern
Long-tailed Duck	*Clangula hyemalis*	Regular	Y	Breeding	Sensitive	-	-	G5	Least Concern
Red-breasted Merganser	*Mergus serrator*	Regular	Y	Breeding	Secure	-	-	G5	Least Concern
Ring-necked Duck	*Anthya collaris*	Accidental	Y	Breeding	Undetermined	-	-	G5	Least concern
Surf Scoter	*Melanitta perspicillata*	Rare	Y	Migrant	Undetermined	-	-	G5	Least Concern
White-winged Scoter	*Melanitta fusca*	Rare	Y	Migrant	Undetermined	-	-	G5	Least Concern
Gulls and Terns									
Arctic Tern	*Sterna paradisaea*	Regular	Y	Breeding	Sensitive	-	-	G5	Least Concern
Glaucous Gull	*Larus hyperboreus*	Regular	Y	Breeding	Sensitive	-	-	G5	Least Concern
Herring Gull	*Larus argentatus*	Regular	Y	Breeding	Secure	-	-	G5	Least Concern
Thayer's Gull	*Larus thayeri*	Rare	Y	Breeding	Sensitive	-	-	G5	Least Concern
Loons									
Pacific Loon	*Gavia pacifica*	Regular	Y	Breeding	Secure	-	-	G5	Least Concern
Red-throated Loon	*Gavia stellata*	Regular	Y	Breeding	Secure	-	-	G5	Least Concern
Yellow-billed Loon	*Gavia adamsii*	Regular	Y	Breeding	Secure	Not at Risk	-	G4	Least Concern

1: Detected or observed incidentally during baseline studies.
2: CESCC = Canadian Endangered Species Conservation Council.
3: COSEWIC = Committee on the Status of Endangered Wildlife in Canada.
4: SARA = Species At Risk Act (2002).
5: Global Rank = NatureServe Conservation status ranks are based on a one to five scale, ranging from critically imperiled (G1) to demonstrably secure (G5). Status is assessed and documented at three distinct geographic scales-global (G), national (N), and state/province (S).
6: IUCN Red List = The IUCN Red List of Threatened Species.

Distribution and Migration Patterns

The majority of bird species that breed in the Arctic migrate long distances between their summer range on the tundra, and their winter ranges at southern latitudes. Migratory waterbirds arrive on the Arctic tundra from early to late May and depart in late August and throughout September. Migration occurs through a series of relatively rapid movements between staging areas, where birds spend days to several weeks foraging prior to moving to the next staging area (Mallory et al. 2006). Spring arrival at Arctic breeding grounds is earlier (early to mid-May) for the larger-bodied waterbirds, an observation that is consistent with Inuit TK of the Kitikmeot region (Banci and Spicker 2016). The smaller-bodied waterbirds, like loons and ducks arrive in late May to early June.

Breeding for all waterbird species occurs soon after the birds arrive on the tundra and brooding of young occurs from late June to mid-September.

During the breeding season, waterbirds tend to be patchily distributed across the Arctic tundra, concentrating at productive waterbodies and wetlands (Conkin and Alisauskas 2013). Inuit TK reports that Arctic waterbirds nest at higher densities near the Arctic coast (Banci and Spicker 2016). Some waterbird species such as long-tailed ducks, yellow-billed loons, Canada and greater white-fronted geese nest in greater density on inland waterbodies and wetlands across the Arctic tundra, while other species such as the red-throated loon are found at highest densities along coastlines (Derksen, Rothe, and Eldridge 1981; Conkin and Alisauskas 2013).

Waterbirds can spend up to 50% of the year migrating between wintering and breeding areas, and up to 95% of that time staging in areas prior to and following breeding. Waterbirds occur in greater densities within staging areas relative to breeding areas. Birds typically congregate at fall staging sites prior to southward migration, though these are typically smaller congregations than those that occur during spring migration (Dickson and Gilchrist 2002).

Habitat Use

The Arctic provides breeding habitat for one-third of the world's waterbird population, including two-thirds of all geese (Zöckler 1998). Waterbirds typically nest in habitat that provides protection from predators, and thus often nest within approximately 100 m of water, and on small mid-water islands since these offer protection from terrestrial predators (Sovada, Anthony, and Batt 2001). Inuit TK of the Kitikmeot region includes observations of waterbirds nesting on mid-stream islands and on cliffs (Banci and Spicker 2016). Geese nest in flooded wetlands adjacent to large water bodies, which provide escape from terrestrial predators (Bart and Earnst 1991; Stickney et al. 2002). Some waterbird species, especially geese, nest on cliffs near nesting raptors where they receive protection from mutual nest predators (Bety et al. 2001). Loons are unable to walk on land and always nest in emergent vegetation within 1 to 2 m of water. Individuals of many species of waterbirds exhibit year-to-year fidelity to nest sites and territories (Anderson, Rhymer, and Rohwer 1992).

Most waterbird species moult their breeding plumage during or just after breeding in staging areas. The timing of moulting varies across species, gender, and reproductive status. Typically, waterbirds that are not engaged in the care of eggs or young — males of uniparental species, non-breeders, and failed breeders — congregate to moult during the incubation stage and onward (Johnson and Richardson 1982). Dabbling ducks gather in local wetlands near nesting sites, but geese, swans, seaducks and scaup usually migrate to traditional moulting areas, sometimes up to hundreds of kilometers from breeding sites (Derksen, Rothe, and Eldridge 1981; Reed et al. 2003; Larned, Stehn, and Platte 2012). Greater scaup use shallow, non-turbid, wind and wave sheltered coastal areas with abundant forage, such as lagoons and bays (Dickson and Gilchrist 2002; Fischer and Larned 2004). Species such as the

long-tailed duck and red-breasted merganser, all of the loon species, and the glaucous gull stage at coastal sites on the ocean that become ice-free early in the spring (Dickson and Gilchrist 2002).

Birds are flightless for several weeks while moulting but are capable of swimming more than 15 km between coastal moulting sites (Flint et al. 2004). Thus staging areas are considered key habitats necessary to sustain populations (Petrie and Wilcox 2003). These sites were important waterbird hunting areas for Inuit (Banci and Spicker 2016). Both scientific and Inuit TK show that early ice-free areas are important staging areas for waterbirds during the spring. Such areas include coastal areas, shallow and small lakes and ponds, and rivers with fast-flowing water.

9.2.11.2 Baseline Data for Waterbirds

Baseline surveys for waterbirds were conducted in the LSA and RSA to document species presence (especially species of conservation concern), the seasonal abundance and distribution of waterbirds and to identify important waterbird habitats (e.g., breeding sites, migratory staging areas) and include:

1. waterbird aerial surveys by helicopter during breeding periods to document evidence of breeding near and surrounding the LSA; and
2. waterbird aerial surveys by helicopter during spring and fall staging periods (2014) to document important staging areas around the Boston Property.

In addition, observations of waterbirds were reported incidentally by field staff during other studies conducted in the RSA and by TMAC personnel.

Waterbird Aerial Surveys

Methods

Aerial surveys for waterbirds were conducted annually from 2006 to 2015 in four survey blocks. These survey blocks were designed to both monitor effects of the Doris Project and to collect baseline for the Phase 2 development. Survey blocks were located over Roberts Bay, Doris, Boston and approximately midway between Boston and Doris (Figure 9.2-34). Two surveys were conducted each year at each block; a pair survey during the northern migration/establishment of nesting territories in late June to early July, and a brood survey in late July to early August (Table 9.2-52). These surveys were not conducted in the Boston block after 2011.

Each survey block covered a 15 km x 16 km area and contained six, 16 km long east to west transects spaced 2 km apart. Aerial surveys were flown by helicopter along each transect. Surveyors recorded waterfowl within 400 m on either side of the aircraft (800 m belt transect) during the pair surveys and within 200 m on either side of the aircraft (400 m belt transect) during the brood surveys. Detailed rationale, methodology, data analyses and results for the waterbird baseline surveys is provided in the annual WMMP Reports for the Doris Project (Golder 2007, 2008a; Rescan 2010, 2011c, 2011f, 2013e; ERM Rescan 2014a; ERM 2015b, 2016a).

Separate targeted spring and fall staging surveys were conducted in 2014 at the Boston block as well as along the proposed Phase 2 road alignment between Madrid and Boston Table 9.2-52; Figure 9.2-34). Staging transects followed the methodology of other waterbird aerial surveys except that transect width was 500 m on either side of the aircraft (for 1 km transect width). Groups of waterbirds were mapped to identify potential staging areas. Groups were classified as small (11 to 24 birds), medium (25 to 49), medium-large (50 to 100), and large flocks (>100).

Figure 9.2-34
Waterbird Aerial Survey Transects during Pair, Brood, and Staging Surveys, 2006 to 2015

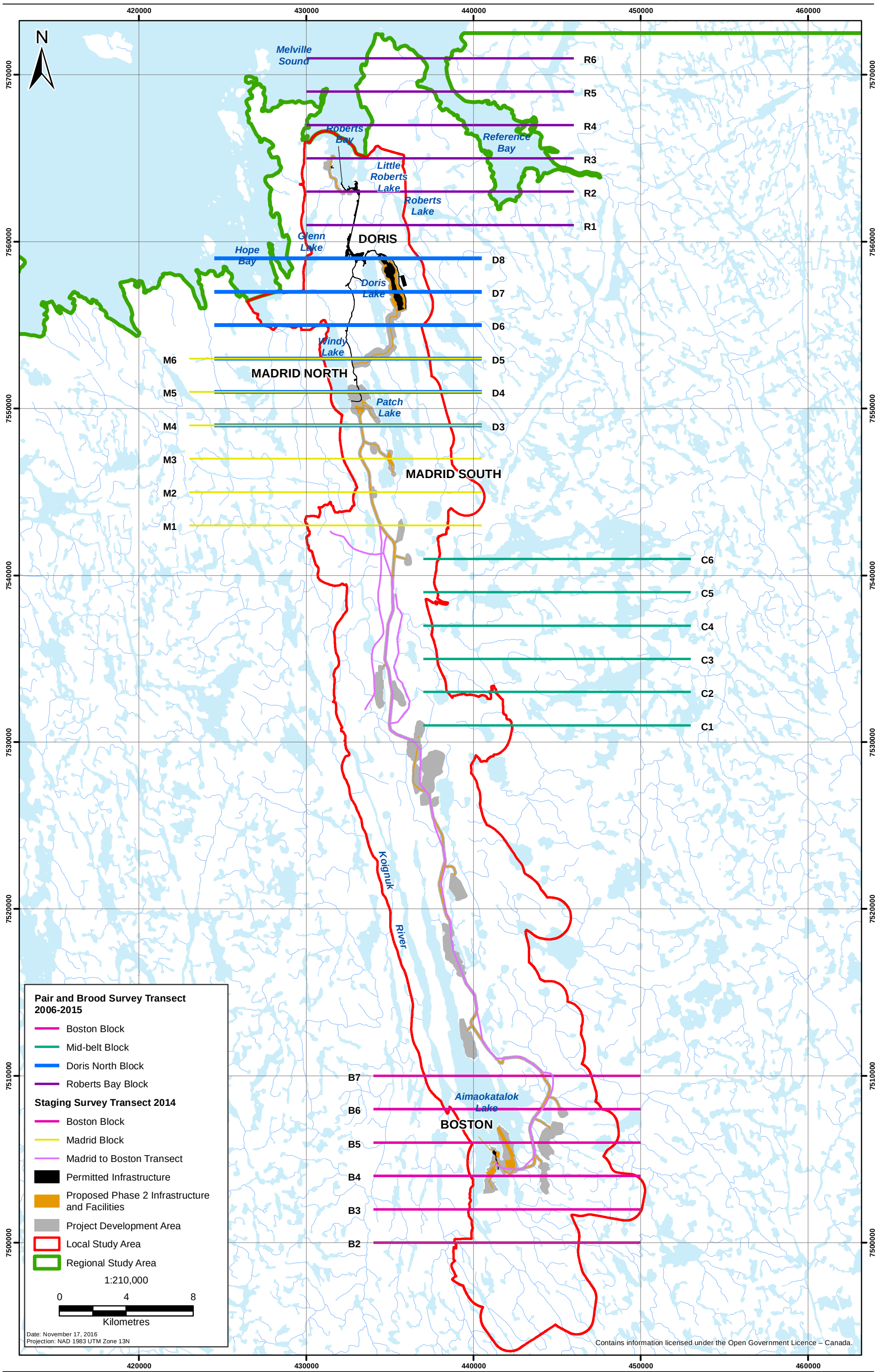


Table 9.2-52. Timing of Waterbird Aerial Surveys, 2006 to 2015

Survey Period	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Pair Survey	June 21-28	June 27	July 5	July 7	June 29 – July 6	June 24 – July 7	June 22	June 12-22	June 21	June 24-25
Brood Survey	August 9	August 6	July 29-30	July 27-28	July 24-28	July 24-27	August 4	August 4-5	July 27-28	August 4-5
Spring Staging Survey									June 5	
Fall Staging Survey									August 23	

Results

During waterbird aerial surveys, a total of 30 waterbird species were observed during the breeding season within the RSA (Table 9.2-51). Brant goose, Thayer's gull, and surf scoter were the only species not detected during aerial surveys, however these species were detected incidentally in the RSA during other baseline studies.

Across all years of the waterbird aerial surveys, Canada geese were the most commonly detected species, followed by greater white-fronted geese. Tundra swan, long-tailed duck, greater scaup, red-breasted merganser, and northern pintail were also commonly detected in most surveys and years. Of the loon species, Pacific loons were most commonly detected across survey types, areas and years. A number of species were infrequently detected in terrestrial areas during the waterbird aerial surveys, including American wigeon, mallard, white-winged scoter, and Arctic tern.

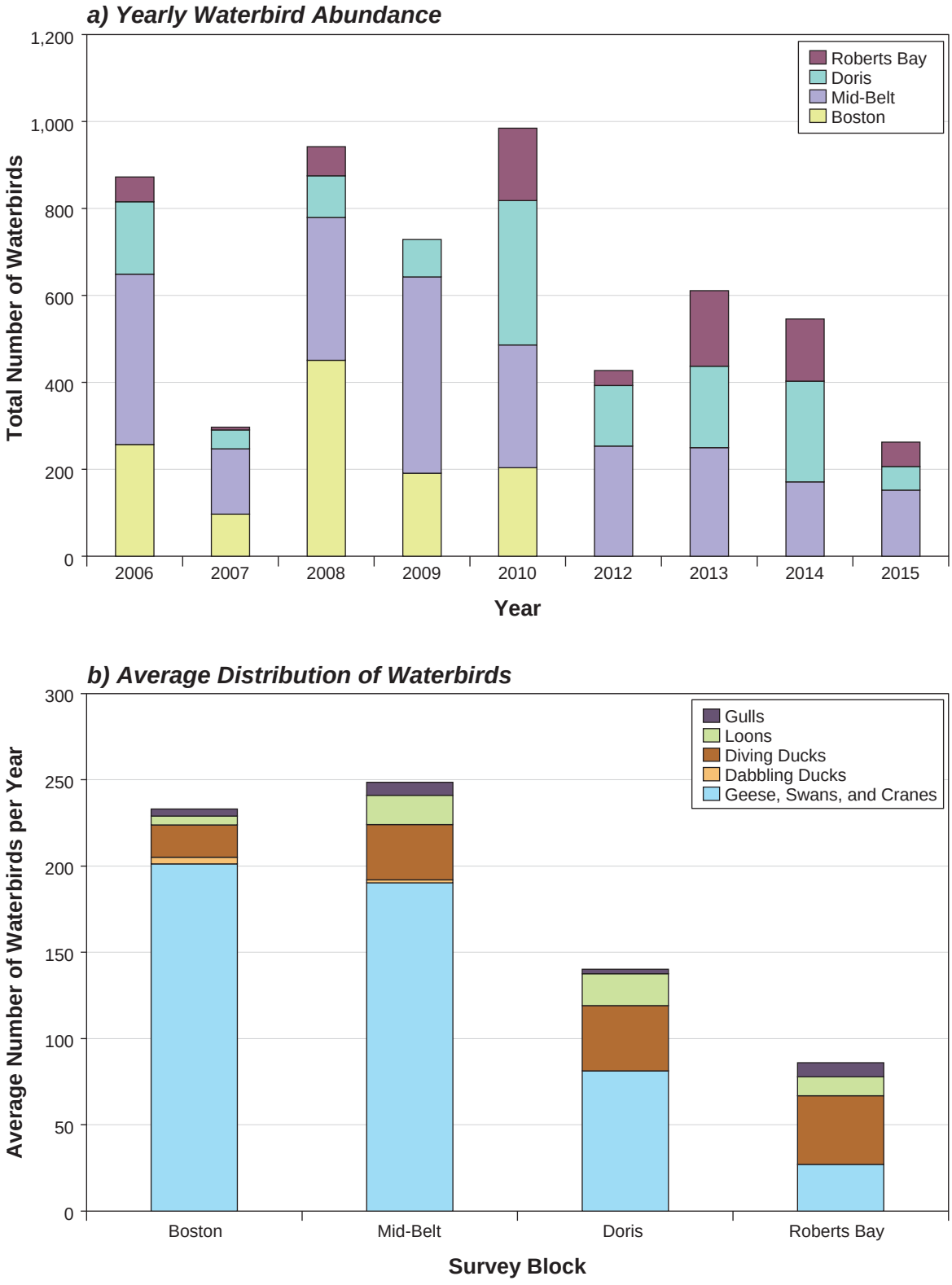
Six species listed as Sensitive by CESCC in Nunavut (CESCC 2010) were observed in the RSA during waterbird baseline studies (Table 9.2-51), including the Arctic tern, glaucous gull, long-tailed duck, northern pintail, common eider and king eider. Both the common and king eider were only detected in the Doris and Roberts Bay blocks during aerial surveys, likely due to the common and king eider's preference for marine areas. Arctic tern were detected only in the Boston and Mid-belt blocks. Long-tailed duck, northern pintail and glaucous gull were detected in all four survey blocks during waterbird surveys.

Pair Surveys

Waterbird pair surveys were conducted during the early breeding season from 2006 to 2015, with the exception of 2011 to 2015 at the Boston block, in 2011 at the Mid-belt and Doris blocks, and 2009 and 2011 at the Roberts Bay block. Abundance of waterbirds varied by year (Figure 9.2-35a) and was greatest in 2010 and lowest in 2007 relative to other years when all four survey blocks were surveyed. In years where all blocks except Boston block were surveyed, waterbird abundance was greatest in 2013 and lowest in 2015.

In general, abundance of waterbirds was highest in the Mid-belt block, followed by the Boston block and lowest in the Roberts Bay block (Figure 9.2-35a). Geese and swans were the most commonly detected waterbird species group in all blocks (65%, n = 5,669), primarily consisting of Canada geese (51%, n = 5,669); however, these species were more abundant in the Boston and Mid-belt blocks and the southern portion of the Doris block relative to the Roberts Bay block (Figure 9.2-35a).

Flocks of waterbirds were consistently observed in the Mid-belt block and in the Boston block in years surveyed, with fewer congregations of waterbirds were observed in the Doris and Roberts Bay blocks (Figure 9.2-35b). The majority of flocks consisted of less than 50 birds (Figure 9.2-35b). A few medium-large flocks of waterbirds (50 to 100 individuals) were observed in the wetlands and lakes located on the southeast side of the Mid-belt block in 2009, in a river system south of Hope Bay in the Doris block (in 2010 and 2014) and in the wetlands surrounding the Boston exploration camp with a few large flocks (greater than 100 birds) observed south of Boston camp in 2009 (Figure 9.2-35b). All flocks greater than 50 individuals consisted of Canadian geese.


a) Yearly Waterbird Abundance
Total Number of Waterbirds
1,200
1,000
800
600
400
200
0
Roberts Bay
Doris
Mid-Belt
Boston
2006
2007
2008
2009
2010
2012
2013
2014
2015
Year
b) Average Distribution of Waterbirds
Average Number of Waterbirds per Year
300
250
200
150
100
50
0
Gulls
Loons
Diving Ducks
Dabbling Ducks
Geese, Swans, and Cranes
Boston
Mid-Belt
Doris
Roberts Bay
Survey Block

Brood Surveys

During waterbird brood surveys in late July or early August from 2006 to 2015 (with the exception of 2012 to 2015 in the Boston block), abundance of waterbirds varied by year (Figure 9.2-36) and was greatest in 2010 and lowest in 2006. In years where all blocks except Boston block were surveyed, waterbird abundance was greatest in 2012 and lowest in 2015. Similar to pair surveys, abundance of waterbirds was highest in the Mid-belt block, followed by the Boston block and lowest in the Roberts Bay block. Geese and swans were the most commonly detected waterbird species group in all survey blocks. Canada geese were the most commonly recorded species (54, n = 9,832%) followed by greater-white fronted geese (8%, n = 9,832). Greater scaup and long-tailed duck were also commonly recorded during the brood surveys in all areas, and northern pintail were commonly seen in the Mid-belt block. Red-breasted mergansers were most abundant in the Roberts Bay and Doris blocks as these blocks are the closest to marine habitat.

Flocks of waterbirds were observed in all survey blocks with the majority of flocks occurring in the Mid-belt block and the Boston block and the fewest flocks observed in the terrestrial areas in the Roberts Bay block (Figure 9.2-36). The majority (95%, n = 334) of flocks consisted of less than 50 individuals (Figure 9.2-36). Medium-large flocks (50 to 100 individuals) were consistently observed in the Mid-belt block in a small wetland area near the center of the block and were observed in 2007, 2009 and 2011 in the Boston block, with one medium-large flock observed in each of the Doris and Roberts Bay blocks. Large flocks of waterbirds (greater than 100 individuals) were only observed in 2011 and were located in a wetland on the west side of the Boston block and in a lake just north of the Boston block. Most medium-large and large flocks consisted of Canada geese, although three medium-large flocks of northern pintail were observed (two in the Mid-belt block in 2010 and 2012 and one in the Boston block in 2011) and one medium-large flock of red-breasted merganser was observed in 2013 on a river system on the southeast side of Reference Bay (in the Roberts Bay block).

Across survey years, a total of 224 broods were detected belonging to 18 waterbird species (Figure 9.2-37). Of the species detected with broods, long-tailed duck is listed as Sensitive in Nunavut (CESCC 2010). The greatest number of broods observed belonged to greater white-fronted geese, followed by Canada geese (Figure 9.2-37). Other commonly detected species with broods included tundra swan, long-tailed duck and scaup species (most likely belonging to greater scaup). After accounting for survey effort, the highest number of broods was detected in the Mid-belt block followed by the Boston block, then the Doris block and the fewest number of broods was observed in the Roberts Bay block (Figure 9.2-37). The number of broods varied annually, with more broods observed in 2008, and between 2010 and 2013. Seasonal weather may account for some of the differences in brood numbers observed amongst years.

Staging Surveys

During the staging surveys conducted at the Boston block, the Madrid block and along the proposed all weather road in 2014, the density of waterbirds was higher during spring staging than fall staging in all areas surveyed. The most commonly detected species groups were geese and swans, including Canada geese, greater white-fronted geese, snow geese, and tundra swan (Table 9.2-53). Northern pintail and greater scaup were also commonly detected during spring staging surveys.

Canada geese comprised the majority of observations during both staging periods (64.9% during spring and 24.6% during fall; Table 9.2-53). Other species with notable detection during the spring staging period were northern pintail (8.0%), greater white-fronted goose (7.6%), snow goose (5.2%), greater scaup (3.9%), and tundra swan (3.9%) and during the fall staging period were pacific loon (24.6%) and tundra swan (17.8%). Overall, species richness was higher during spring staging (14 species) relative to fall staging (10 species), but within the Madrid block species richness was higher during the fall staging period (9 species) relative to the spring staging period (7 species; Table 9.2-53).

Figure 9.2-35b
Flocks of Waterbirds Observed in the Regional Study Area during Pair Surveys, 2006 to 2015

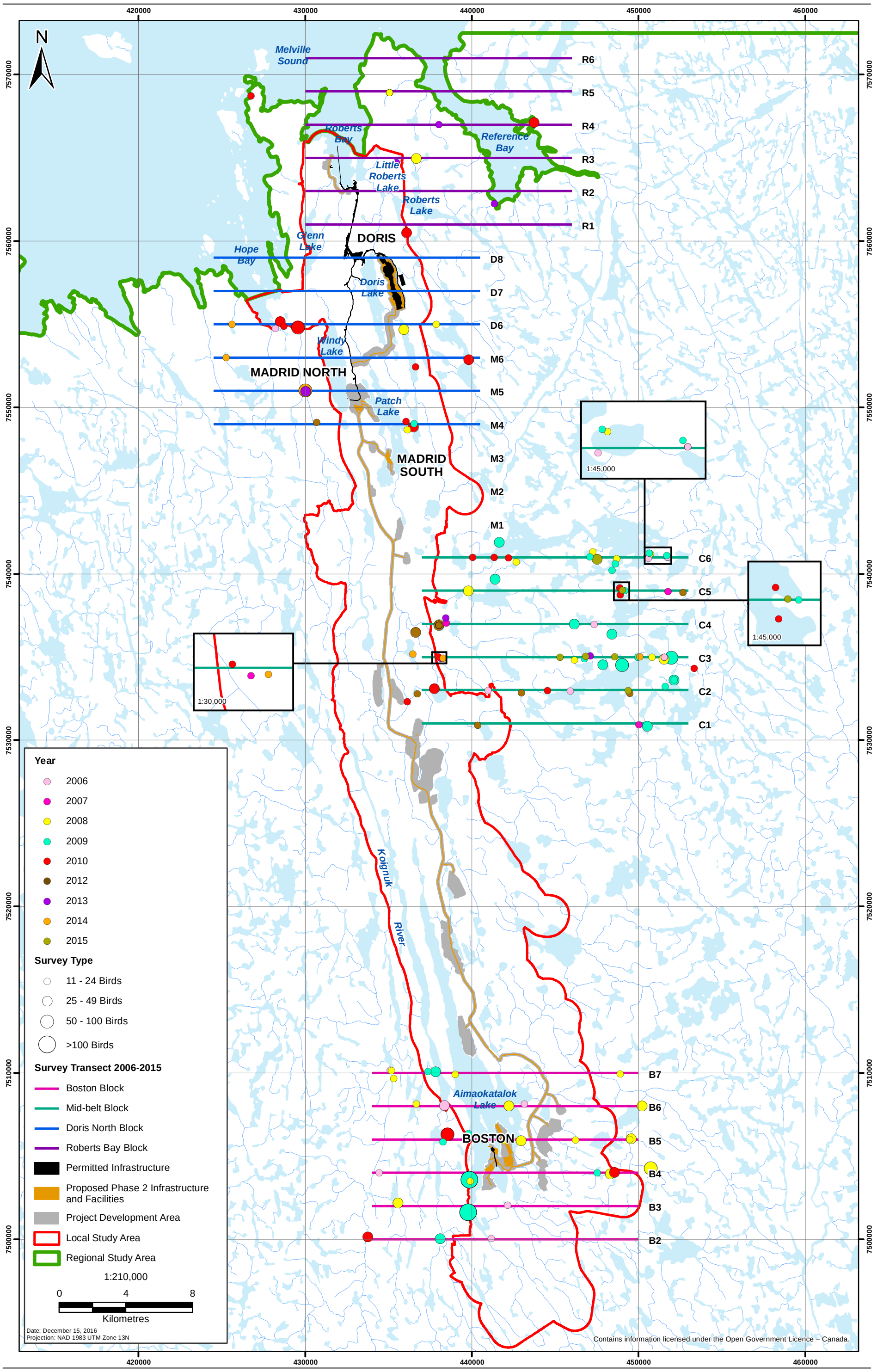


Figure 9.2-36
Flocks of Waterbirds Observed in the Regional Study Area during Brood Surveys, 2006 to 2015

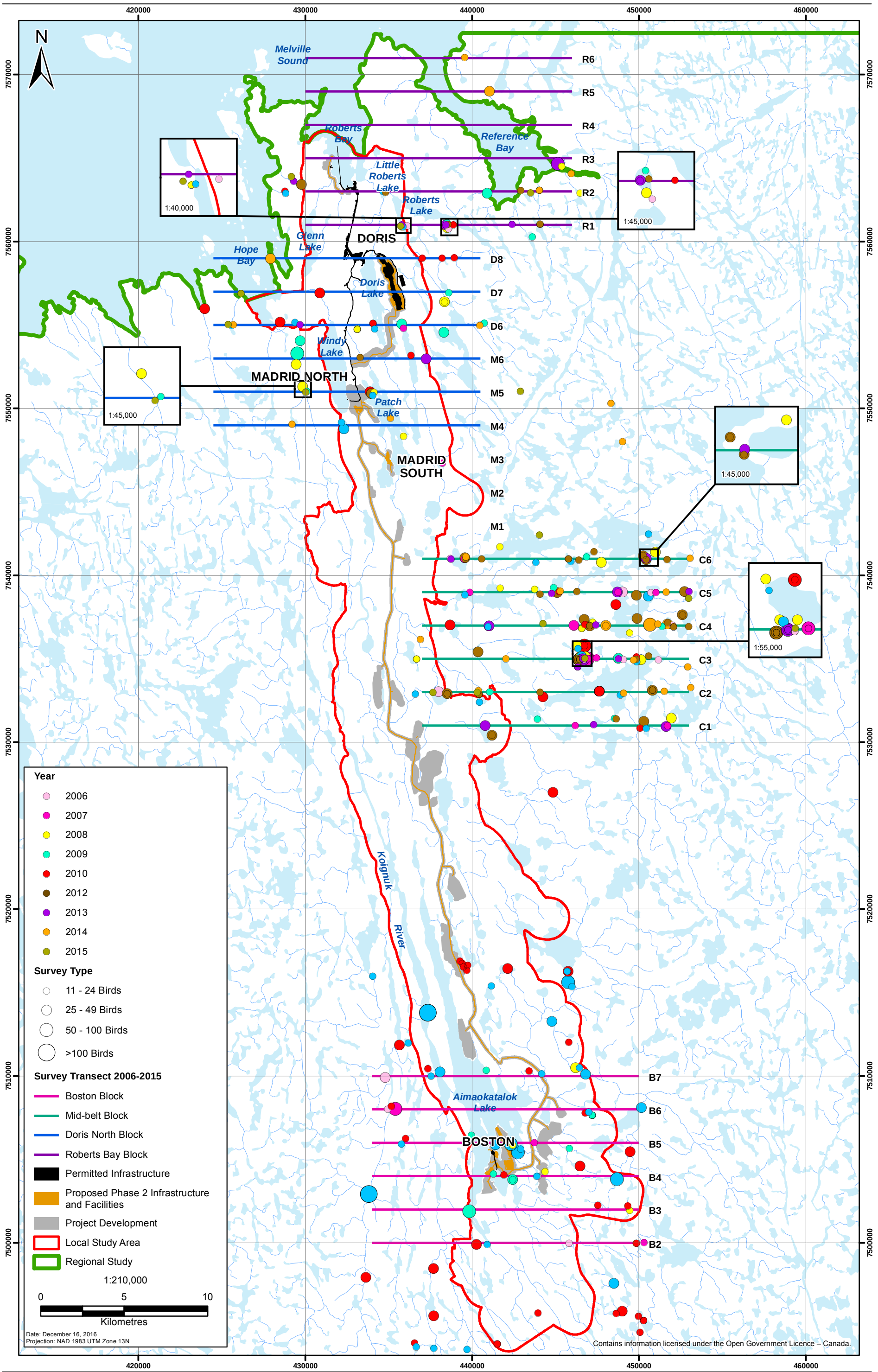


Figure 9.2-37

Abundance and Distribution of Waterbird Broods Observed in the Regional Study Area during Brood Surveys, 2006 to 2015

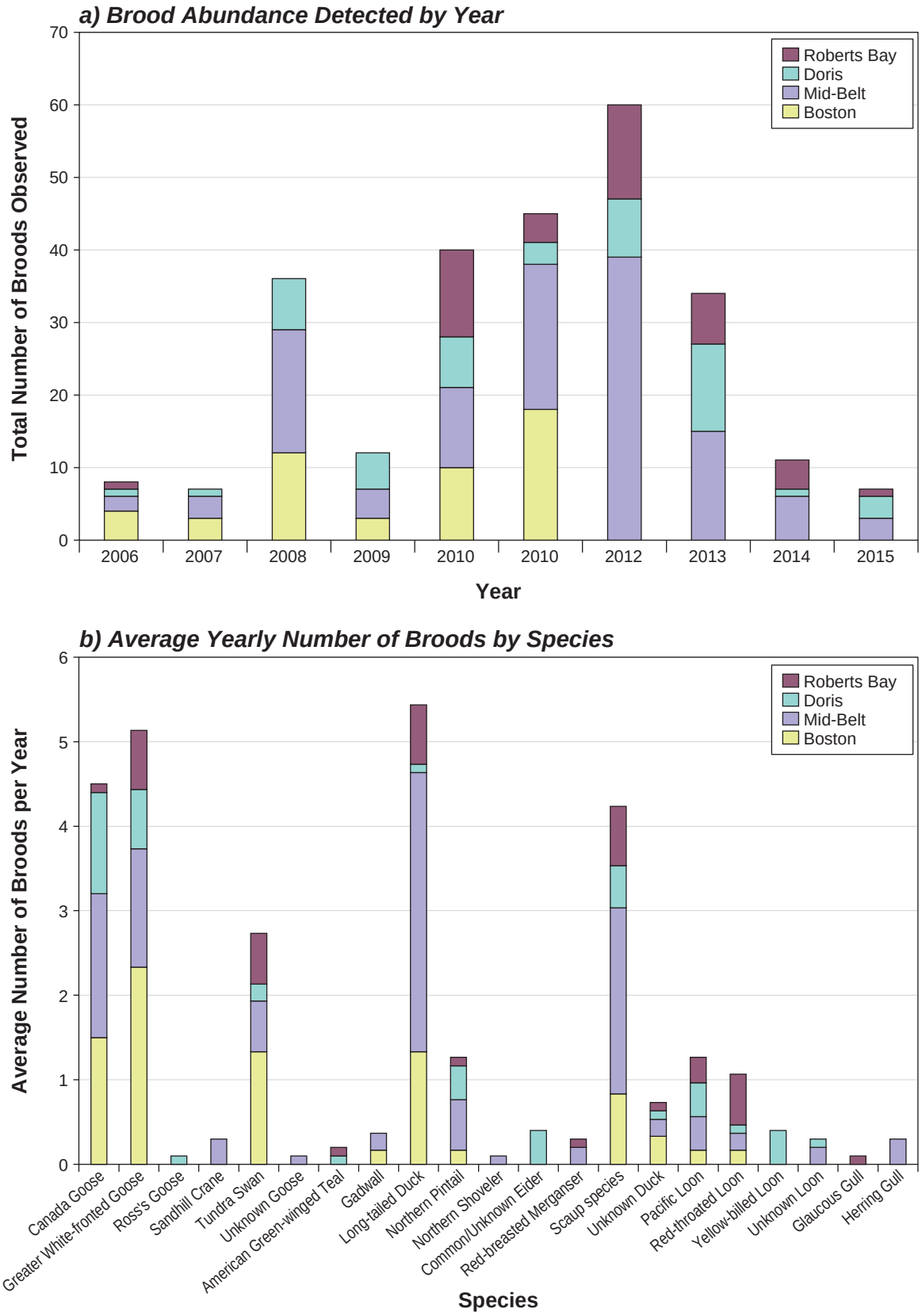


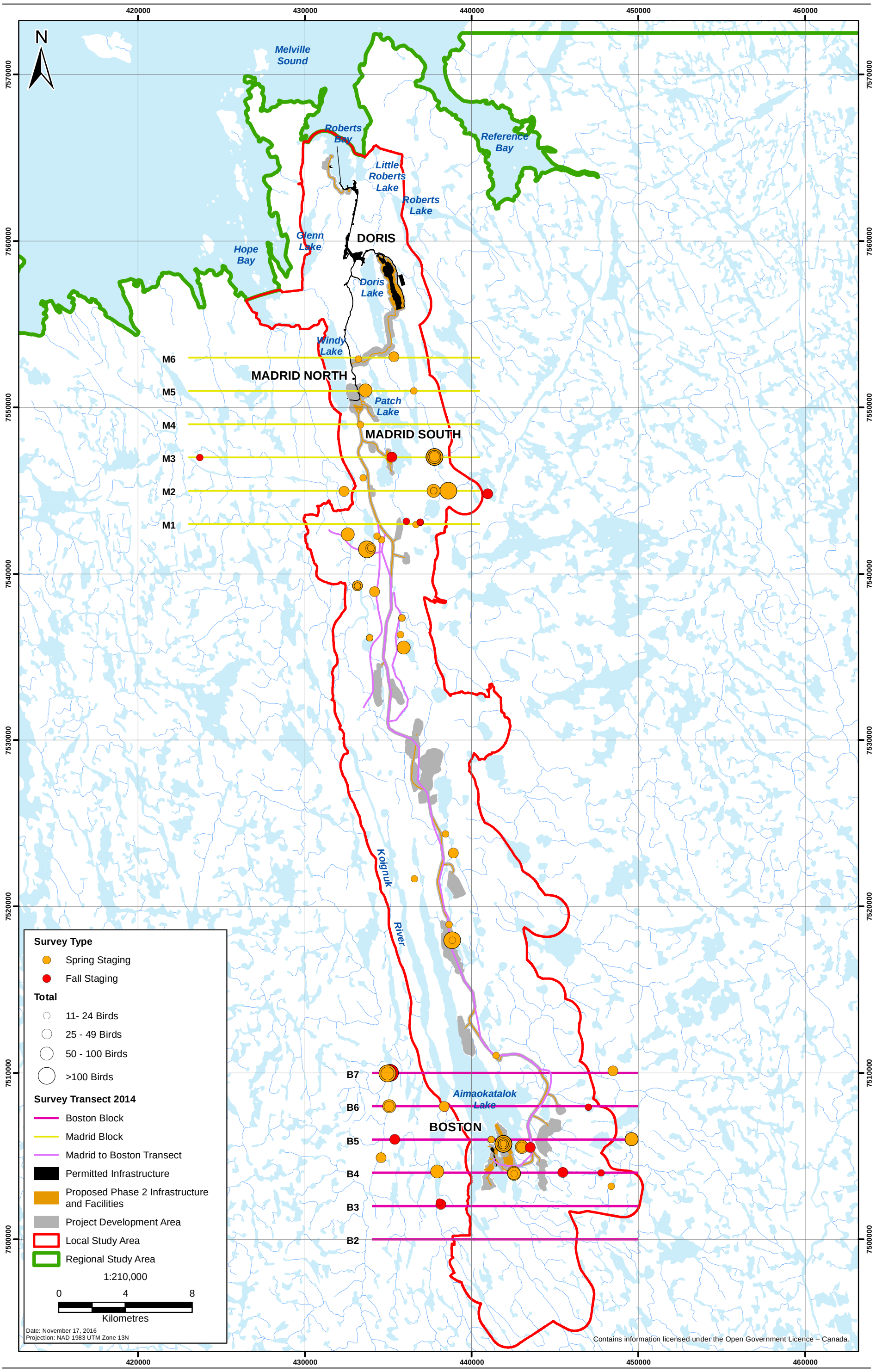
Table 9.2-53. Waterbird Survey Observations, Species Richness and Density during Staging Surveys, 2014

Species Group	Species	Boston		Madrid		Proposed All-weather Road		Areas Combined	
		Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
Geese, Swans and Cranes									
	Canada Goose	521	11	205	5	1307	2	2,033	18
	Greater White-fronted Goose	46	-	-	1	192	-	238	1
	Sandhill Crane	2	-	1	1	6	-	9	1
	Snow Goose	87	-	-	-	75	-	162	-
	Tundra Swan	26	3	55	6	41	4	122	13
	Unknown Goose	-	-	150	-	-	-	150	-
Dabbling and Diving Ducks									
	American Green-winged Teal	1	-	-	-	2	-	3	-
	American Wigeon	-	-	-	-	2	-	2	-
	Greater Scaup	74	-	-	-	49	-	123	-
	Long-tailed Duck[1]	-	1	-	4	2	1	2	6
	Northern Pintail[1]	20	-	50	-	180	-	250	-
	Red-breasted Merganser	-	-	-	2	-	-	-	2
	Unknown Duck	2	2	-	2	-	-	2	4
Loons									
	Pacific Loon	14	3	6	7	-	8	20	18
	Red-throated Loon	1	-	-	1	-	1	1	2
	Yellow-billed Loon	-	-	-	-	-	1	-	1
	Unknown Loon	-	1	-	-	-	-	-	1
Gulls and Terns									
	Glaucous Gull[1]	1	-	2	-	4	-	7	-
	Herring Gull	4	4	3	1	3	-	10	5
	Unknown Gull	-	-	-	-	-	1	-	1
	Total[2]	799	25	472	30	1,863	18	3,134	73
	Species Richness[3]	12	5	7	9	12	7	14	10
	Density (individuals/km^2)	31.2	0.7	12.3	0.8	97.5	0.9		

[1] *Species listed as Sensitive in Nunavut (CESCC 2010)*
[2] *Includes unknown species*
[3] *Does not include unknown species, unless no counts of the species group were observed during any given survey block*

Flocks of staging geese, swans, and ducks were noted in particular locations within the staging survey blocks; along open and flowing streams and rivers, and within shallow, partially open wetlands (Figure 9.2-38). Most flocks were observed during the spring staging surveys with fewer flocks observed in the fall staging surveys. Flocks greater than 50 individuals were only observed during the spring survey.

Figure 9.2-38
Flocks of Waterbirds Observed in the Regional Study Area during Staging Surveys, 2014



During the spring staging survey, eight large flocks of over 100 individuals were observed primarily along the proposed all-weather road with two large flocks observed in the Madrid block and one large flock observed in the Boston block (Figure 9.2-38). The largest group of waterbirds observed during the spring staging survey was in the small stream leading into Aimaokatalok Lake located roughly 350 m to the east of Boston camp and airstrip, composed of roughly 900 individuals of seven different species (American green-winged teal, Canada goose, glaucous gull, greater scaup, greater white-fronted goose, northern pintail, and tundra swan; Figure 9.2-38). The main species recorded at this location east of Boston camp and airstrip was Canada goose, with a flock of 600 individuals.

The areas that provide the most important habitat for waterbirds during the spring staging period were well documented during surveys (i.e., streams, rivers, and shallow wetlands). Therefore, it is expected that areas that were not surveyed within the southern portion of the Boston block that contain these types of habitat would also be used by waterbirds during the spring staging period.

Incidental Observations of Waterbirds

Methods

Methods for incidental observations of wildlife are identical to those for caribou and are discussed in Section 9.2.6.2. Incidental observations of waterbirds were recorded when:

1. observed by project personnel near the Doris Project Site from 2009 and 2015 and recorded in the Wildlife Sighting Log; and
2. observed by environmental personnel and wildlife biologists when conducting baseline and monitoring program surveys in the RSA between 2006 and 2015, which includes observations collected spatially or temporally outside of targeted VEC studies.

These incidental observations were reviewed to identify species that were not detected on formal waterbird surveys to provide a comprehensive view of species diversity in the RSA.

Results

Incidental Observations of Waterbirds by Mine Site Personnel

There were no waterbird species recorded in the Doris Wildlife Sightings Log that had not already been documented on aerial waterbird surveys. In general, larger waterbird species, such as geese species, tundra swan, and sandhill crane were the most commonly recorded species in the log, with records in every year from 2009 to 2015.

Incidental Observations of Waterbirds by Field Personnel

Four waterbird species were recorded incidentally that were not recorded during formal waterbird surveys: brant (goose), common goldeneye, Thayer's gull, and white-winged scoter. For the most part, all of these four species were recorded in more recent years. Brant was observed in 2009, Thayer's gull was recorded in 2014, common goldeneye was observed in 2015, and white-winged scoter was observed in 2014 and 2015. Of these four species, one is considered a species of territorial conservation concern: Thayer's gull is designated as Sensitive in Nunavut by the Canadian Endangered Species Conservation Council (CESCC 2010).

The RSA is within the known ranges of Brant and Thayer's gull, with the breeding grounds of Brant occurring along the coasts of the Arctic mainland (including the RSA) and in coastal areas of the Arctic islands, and Thayer's gull breeding areas on Arctic islands (Snell 2002; Lewis et al. 2013). Thus, both species could pass through the RSA during migration, and Brant are a possible breeder in the area.

However, numerous surveys have been conducted during the breeding period from 2006-2015 and there has been no documentation of Brant despite survey effort across a large amount of suitable breeding habitats for Arctic waterbirds (ERM 2016a). This evidence suggests that Brant are not breeding within the RSA and are a seasonal migrant (Table 9.2-51).

The seasonal ranges of common goldeneye and white-winged scoter do not overlap the RSA, with the northern extent of these two species breeding range generally occurring at the treeline (Eadie, Mallory, and Lumsden 1995; Brown and Fredrickson 1997). Therefore, these species are expected to be rare and uncommon in the RSA (Table 9.2-51).

Habitat Suitability Modelling

Methods

Habitat suitability modeling was conducted in the LSA and RSA for waterbirds. The waterbird model was produced specifically for the EIS and is thus not included within the Hope Bay Project Wildlife Habitat Suitability Study (Appendix V4-9A). The process for identifying suitable habitat followed similar procedures as outlined in detail in Section 9.2.6.2 and used similar datasets for the LSA (EM) and RSA (WKSS ecosystem mapping).

Suitable habitat for waterbird nesting habitat, was considered to be all wetlands, waterbodies, and suitable terrestrial ecosystems within 100 m of waterbodies and wetlands. The use of a 100 m buffer reflects Environment Canada's avoidance guideline recommendation of 50 m for waterfowl nests plus a 50 m buffer to provide a conservative estimate (Mallory 2016).

Results

A total of 39,476 ha of suitable waterbird habitat was mapped within in the LSA (70.1% of LSA). Within the RSA, a total of 343,935 ha (70.1% of RSA) of suitable habitat was mapped. These results indicate that suitable waterbird that may be used for nesting is widely distributed across the LSA and RSA. More details regarding waterbird habitat and potential effects is presented in Section 9.8.3.1.

9.2.11.3 The Doris Project

The Doris Project was issued a project certificate in 2006. As part of the WMMP monitoring of waterbirds included habitat loss, possible sensory disturbance and avoidance of the Doris Project site, attraction to the Doris Project site, and any direct mortality due to collisions with vehicles or aircraft. Changes to environmental media quality due to the Doris Project were also modeled as part of the EIS. Surveying and monitoring has occurred during the Pre-construction, Construction, and Care and Maintenance phases since 2006, as part of the ongoing WMMP. This section summarizes the results of these monitoring activities for muskox.

Habitat Loss

Habitat loss for waterbirds within the Doris footprint has been measured since 2009 when major construction started (Table 9.2-13). The total habitat loss was measured in 2015 as 78.1 ha, or 2.5% of the LSA. The majority of habitat loss occurred in habitat types rated as moderate or low for waterbirds (Miramar 2005): heath tundra (32.0 ha), tussock/hummock (27.3 ha), and heath bedrock (3.9 ha), rather than those classified as high suitability (all terrestrial habitats within 50 m of deep or shallow water) (Miramar 2005) (Table 9.2-14). Of the 78.1 ha of habitat lost, 21.6 ha of habitat lost was classified as suitable waterbird habit. This represents an actual loss of 2.7% of the total suitable habitat identified for waterbirds within the LSA (Table 9.2-54).

Table 9.2-54. Area of Suitable Habitat Disturbed for Waterbirds

Species	Season / Sex	Amount of Suitable[2] Habitat in LSA[3]		Actual Disturbed Suitable Habitat	
		Total (ha)	% of LSA[3]	Total (ha)	% of LSA[4]
Waterbirds[1]	N/A	787	25.3	21.6	3.7

[1] Waterbirds were referred to as waterfowl in the Doris Project FEIS habitat loss assessment
[2] Suitable Habitat does not include Nil-rated habitat in study area.
[3] Calculations based on: LSA area of 3,116 ha for all bird species
[4] Calculations based on total amount of suitable habitat in LSA

Sensory Disturbance

The WMMP evaluated the potential for disturbances to cause waterbirds to avoid the Doris Project site, resulting in changes in abundance or species richness or density near the Doris Project compared to a greater distance away.

To assess potential sensory disturbance effects on waterbird species, aerial surveys were conducted during the nesting and brood rearing periods in the Boston block, Mid-belt and Doris blocks, and at the Roberts Bay blocks since 1996; protocols were formalized in 2006 (Miramar 2006). Data analysis compared the density and diversity of waterbirds near the Doris Project site with areas of the same survey grid at a greater distance from the Doris Project to investigate whether a ZOI is detectible surrounding the Doris Project site and/or during project development years. An extensive exploratory analysis conducted to assess trends in waterbird species abundance and richness based on 10 years (2006 to 2015) of data found no significant differences in the proportion of birds near and far from infrastructure areas (within 300 m, 1,000 m, or 1,800 m of infrastructure), or differences in species richness (ERM 2016a). These results indicate that there has been no effect of sensory disturbance on waterbirds due to the Doris Project (Golder 2007, 2008a, 2009; Rescan 2010, 2011c, 2011f, 2013e; ERM Rescan 2014a; ERM 2015b, 2016a).

Attraction to the Project

Within the Doris Project area, there have been no reported incidents of waterbird species using Doris Project-related infrastructure as nesting habitat. No permanent waterbodies have been created as a result of Doris Project-related activities, and there have been no incidents of waterbirds being attracted to artificial waterbodies at the Doris Project. Based on a comprehensive statistical analysis of 10 years of aerial survey data (2006 to 2015), there is no evidence to suggest that waterbird abundance or waterbird species richness has significantly increased near infrastructure at the Doris Project during waterbird pair or brood life stages (ERM 2016a).

Direct Mortality

Any wildlife mortality, including waterbirds that have been observed by onsite personnel were reported immediately to the ESR Department and in the annual WMMP report. Mortality of VECs or larger fauna, or mortality resulting from potential interaction with Doris Project activity is reported directly to GN DOE, Environment Canada, and KIA, as necessary.

In the years that personnel have been at the Doris Project site (2006-2016), there have been no reports of any waterbird mortality due to vehicle or aircraft strikes (Golder 2007, 2008a, 2009; Rescan 2010, 2011c, 2011f, 2013e; ERM Rescan 2014a; ERM 2015b, 2016a). Vehicle-waterbird collisions are related to locations, traffic volume, and speed (Jalkotzy, Ross, and Nasserden 1997). Higher vehicle speeds increase the chance of mortality and/or injury to waterbirds. The on-site speed limits for vehicles is a maximum of 50 km/h, thereby limiting the chance for direct mortality to waterbirds. Bird strikes with

aircraft must be reported to the Canadian aviation authority due to safety concerns. No bird strikes have been reported at the Doris site due to aircraft.

During the years of waterbird monitoring at Doris Project site, there have been two reports of a non-vehicle/aircraft related mortality. During the Tail Lake fish-out in 2011, four long-tailed ducks and one northern pintail were caught in gill nets and consequently drowned (Rescan 2011f). One loon was caught in a fishing net on Reference Bay but was rescued and set free (Rescan 2011f). Additionally, one gull was discovered dead from unknown causes in November, 2011 (Rescan 2011f). The low frequency of waterbird mortalities at the Doris Project indicates that there has been no effect of direct mortality on waterbirds.

Environmental Media Quality

The human health and ecological risk assessment (Volume 6, Section 5) evaluated potential changes in the quality of environmental media (e.g., soil, vegetation, and water) due to the Doris Project. This assessment determined that effects of the Doris Project on environmental media quality were negligible, thus there is no potential increase in risk of adverse health effects on waterbirds due to Doris Project activities.

9.2.12 Characterization of Baseline Conditions for Upland Birds

9.2.12.1 Introduction

For the purposes of this assessment, upland birds are defined as migratory birds that primarily forage and nest in upland areas (i.e., not waterbirds). The Arctic upland bird community is comprised of songbirds, shorebirds, ptarmigan, and jaegers.

A total of 38 upland bird species have the potential to occur in the RSA (Table 9.2-55). Of these species, 28 upland bird species were identified as species that regularly occur within the RSA during migration or the breeding season (Golder 2007, 2008a, 2009; Rescan 2010, 2011c, 2011f, 2013e; ERM Rescan 2014a; ERM 2015b, 2016a). Ptarmigan, although not migratory, are included in this assessment because ptarmigan and their eggs are an important food source to Inuit communities (Banci and Spicker 2016).

Population Trends and Conservation

Migratory birds and their nests are protected by the federal *Migratory Birds Convention Act* (1994b), which prohibits killing migratory birds and their eggs, taking their nests, and deposition of harmful substances in waters or areas frequented by migratory birds. In addition, migratory birds and ptarmigan in Nunavut are protected under the Nunavut *Wildlife Act (2003)*, which prohibits destruction of bird nests when these are being used by birds, and prohibits disturbance to a “substantial number” of birds, such as stating areas used by flocks of shorebirds during migration.

At local scales, populations of upland birds naturally fluctuate due to food availability, weather, and predation rates (White et al. 2002; Latour, Machtans, and Beyersbergen 2005; Samelius et al. 2007; Barichello and Mossop 2011; Obst 2011; McKinnon et al. 2013). Heavy snow cover late into the season can result in poor breeding (Latour, Machtans, and Beyersbergen 2005). Upland birds and their eggs and young are prey for raptors, especially the gyrfalcon and peregrine falcon, and for mammals, especially red and Arctic foxes (White et al. 2002; Samelius et al. 2007; Barichello and Mossop 2011). Upland bird’s eggs also appear to be an alternative prey for red and Arctic foxes in years when the 3-4 year lemming cycle abundance is low (McKinnon L., Berteaux D., and Bety J. 2014).

Table 9.2-55. Upland Breeding Bird Species Potentially Occurring in the Wildlife RSA and their Regularity and Timing of Occurrence and Conservation Status

						Conservation Status				
Common Name	Scientific Name	Group	Regularity of Occurrence	Detected during Baseline Studies	Timing of Occurrence	CESCC	COSEWIC	SARA	Global Rank	IUCN Red List
American Golden-Plover	*Pluvialis dominica*	Shorebird	Regular	Y	Breeding	Sensitive			G5	Least Concern
Semipalmated Plover	*Charadrius semipalmatus*	Shorebird	Regular	Y	Breeding	Secure			G5	Least Concern
Least Sandpiper	*Calidris minutilla*	Shorebird	Regular	Y	Breeding	Sensitive			G5	Least Concern
Semipalmated Sandpiper	*Calidris pusilla*	Shorebird	Regular	Y	Breeding	Sensitive			G5	Least Concern
Red-necked Phalarope	*Phalaropus lobatus*	Shorebird	Regular	Y	Breeding	Sensitive	Special Concern		G4G5	Least Concern
Wilson's Snipe	*Gallinago delicata*	Shorebird	Regular	Y	Breeding	Undetermined			G5	Least Concern
Pectoral Sandpiper	*Calidris melanotos*	Shorebird	Regular	Y	Breeding	Secure			G5	Least Concern
Stilt Sandpiper	*Calidris himantopus*	Shorebird	Regular	Y	Breeding	Secure			G5	Least Concern
Long-tailed Jaeger	*Stercorarius longicaudus*	Jaeger	Regular	Y	Breeding	Secure			G5	Least Concern
Parasitic Jaeger	*Stercorarius parasiticus*	Jaeger	Regular	Y	Breeding	Secure			G5	Least Concern
White-rumped Sandpiper	*Calidris fuscicollis*	Shorebird	Regular	N	Migrant	Secure			G5	Least Concern
Buff-breasted Sandpiper	*Tryngites subruficollis*	Shorebird	Regular	N	Migrant	Sensitive	Special Concern		G4	Near Threatened
Baird's Sandpiper[1]	*Calidris bairdii*	Shorebird	Regular	Y	Breeding	Secure			G5	Least Concern
Red Phalarope	*Phalaropus fulicaria*	Shorebird	Rare	N	Migrant	Sensitive			G5	Least Concern
Lesser Yellowlegs	*Tringa flavipes*	Shorebird	Rare	N	Breeding	Undetermined			G5	Least Concern
Long-billed Dowitcher	*Limnodromus scolopaceus*	Shorebird	Rare	Y	Breeding	Not Ranked			G5	Least Concern
Ruddy Turnstone	*Arenaria interpres*	Shorebird	Rare	N	Migrant	Sensitive			G5	Least Concern
Red Knot	*Calidris canutus*	Shorebird	Rare	N	Migrant	At Risk	EN/SC		G4	Least Concern

Common Name	Scientific Name	Group	Regularity of Occurrence	Detected during Baseline Studies	Timing of Occurrence	Conservation Status				
						CESCC	COSEWIC	SARA	Global Rank	IUCN Red List
Sanderling	*Calidris alba*	Shorebird	Rare	N	Migrant	Sensitive			G5	Least Concern
Pomarine Jaeger	*Stercorarius pomarinus*	Jaeger	Rare	N	Migrant	Secure			G5	Least Concern
Horned Lark	*Eremophila alpestris*	Songbird	Regular	Y	Breeding	Secure			G5	Least Concern
Gray-cheeked Thrush	*Catharus minimus*	Songbird	Regular	Y	Breeding	Undetermined			G5	Least Concern
American Pipit	*Anthus rubescens*	Songbird	Regular	Y	Breeding	Sensitive			G5	Least Concern
American Tree Sparrow	*Spizella arborea*	Songbird	Regular	Y	Breeding	Sensitive			G5	Least Concern
Savannah Sparrow	*Passerculus sandwichensis*	Songbird	Regular	Y	Breeding	Secure			G5	Least Concern
White-crowned Sparrow	*Zonotrichia leucophrys*	Songbird	Regular	Y	Breeding	Sensitive			G5	Least Concern
Harris's Sparrow[1]	*Zonotrichia querula*	Songbird	Regular	Y	Breeding	Sensitive			G5	Least Concern
Lapland Longspur	*Calcarius lapponicus*	Songbird	Regular	Y	Breeding	Secure			G5	Least Concern
Lincoln's Sparrow	*Melospiza lincolnii*	Songbird	Regular	Y	Breeding	Undetermined			G5	Least Concern
Snow Bunting	*Plectrophenax nivalis*	Songbird	Regular	Y	Breeding	Sensitive			G5	Least Concern
Common Redpoll	*Carduelis flammea*	Songbird	Regular	Y	Breeding	Secure			G5	Least Concern
Hoary Redpoll	*Carduelis hornemanni*	Songbird	Regular	Y	Breeding	Sensitive			G5	Least Concern
Yellow Warbler	*Setophaga petechia*	Songbird	Regular	Y	Breeding	Undetermined			G5	Least Concern
Willow Ptarmigan	*Lagopus lagopus*	Game Bird	Regular	Y	Resident	Secure			G5	Least Concern
Rock Ptarmigan	*Lagopus muta*	Game Bird	Regular	Y	Resident	Secure			G5	Least Concern
Smith's Longspur	*Calcarius pictus*	Songbird	Rare	Y	Breeding	Secure			G5	Least Concern
American Robin[1]	*Turdus migratorius*	Songbird	Rare	Y	Breeding	Secure			G5	Least Concern
Cliff Swallow	*Petrochelidon phyrrhonota*	Songbird	Rare	N	Breeding	Undetermined			G5	Least Concern

[1] *Species recorded incidentally during baseline studies and monitoring activities for the Doris Project. 'EN' means Endangered, 'SC' means Special Concern.*

Of the 12 shorebird species that regularly occur within the RSA, data suggest a declining global population for all species except the semipalmated plover and stilt sandpiper (Morrison et al. 2006). Of the 13 songbird species that regularly breed in the RSA, data show large scale population decline for two species: Harris's sparrow and horned lark (Berlanga et al. 2010) The breeding range of the Harris's sparrow is small and restricted entirely to Canada.

Only one species potentially in the RSA, the red knot, is listed as a species of conservation concern under the federal *Species at Risk Act* (SARA; 2002). The red knot subspecies *rufa* is listed on Schedule 1 of SARA as Endangered. This species has not been recorded in the RSA during baseline surveys or incidentally. The red-necked phalarope and buff-breasted sandpiper are not listed under SARA but were assessed by the COSEWIC as a species of Special Concern (Table 9.2-55; COSEWIC 2012b; COSEWIC 2014a). Nine upland bird species that regularly occur in the wildlife RSA are listed as Sensitive under the CESCC designations for Nunavut (Table 9.2-55).

Distribution and Migration Patterns

With the exception of ptarmigan, upland birds breeding in the Kitikmeot region migrate long distances between their summer range on the tundra, and their winter ranges at southern latitudes extending from the treeline to the southern tip of South America. The willow and rock ptarmigans make short local migrations depending on weather conditions, but are otherwise resident species that overwinter on the tundra (Hannon, Eason, and Martin 1998; Montgomerie and Holder 2008; Banci and Spicker 2015, 2016).

Upland bird species begin to arrive on the Arctic tundra to breed in late May, coincident with the emergence of insects. The exceptions to this timing include the seed-eating horned lark and hoary redpoll which arrive in early to mid-May. By mid-September most upland birds have migrated south and by October all migratory birds except ptarmigan have left the tundra (Obst 2011). Migration occurs through a series of relatively rapid movements between staging areas, where birds spend days to several weeks foraging prior to moving to the next staging area (Mallory et al. 2006).

During the breeding season from May to October, the upland bird community is broadly distributed across the Arctic such that almost every hectare of tundra supports at least one individual. The upland bird community in most Arctic regions is dominated by songbirds, which are up to six times more abundant than shorebirds (Andres 2006). Across several studies conducted in the Canadian Arctic that measured upland bird abundance, the Lapland longspur was the most common upland bird, occurring up to three times more abundant than other upland bird species (Johnson, Gratto-Trevor, and Pepper 2000; Latour, Machtans, and Beyersbergen 2005; Andres 2006; Rescan 2013c).

Habitat Use

Across the Arctic, upland birds are more abundant and diverse in lowlands, which are usually dominated by moist to wet sedge meadows (Johnson, Gratto-Trevor, and Pepper 2000; Latour, Machtans, and Beyersbergen 2005; Liebezeit, White, and Zack 2011). Most shorebird species prefer to use moist to wet lowland sites for breeding and foraging (Brown et al. 2007; Liebezeit, White, and Zack 2011). There are some exceptions, such as the American golden-plover that predominately uses drier upland habitat for nesting (Latour, Machtans, and Beyersbergen 2005; Rescan 2013c). Some species are generally only found within wetland areas, such as red-necked phalarope, but in most cases, upland birds do not confine their use of habitats to only wet or only dry areas (Johnson and Connors 2010). Though lowlands typically support more species of upland birds, the upland bird community uses a mosaic of habitat types across the full moisture regime from dry to wet.

Species associated with dry upland heath and rocky tundra include: American pipit, Harris's sparrow, horned lark, American golden plover, and rock ptarmigan (Latour, Machtans, and Beyersbergen 2005;

Brown et al. 2007; Liebezeit, White, and Zack 2011). The Lapland longspur is unique in using both wet and dry habitats. Rock ptarmigan prefer dry heath tundra during breeding, whereas willow ptarmigan tend to select sites in moist areas with dense shrubs (Wilson and Martin 2008).

In addition to the moisture regime, the height of tundra vegetation influences habitat selection of upland birds. Tall riparian shrubs are rare on the tundra, but their occurrence provides habitat for a diverse bird community. The LSA contains 1,229 ha (2.2%) of riparian shrubs (i.e., willow and dwarf birch), which are distributed along major rivers (such as along the Koignuk River) and surrounding waterbodies.

9.2.12.2 Baseline Data for Upland Birds

Two types of studies were used to document the diversity and populations of upland birds in the RSA:

1. point count surveys; and
2. Program for Regional and International Shorebird Monitoring (PRISM) plot surveys.

In addition, incidental observations of wildlife, including upland birds, were collected during all aspects of baseline data collected for the Hope Bay Project.

Methods

Point Count Surveys

Point count surveys were conducted to document breeding activity and abundance, and to relate species to habitat. Point counts were conducted during the breeding seasons of 2006 -2010 and 2013-2015 at 313 point count stations (Table 9.2-56; Figures 9.2-39 and 40). Point count surveys were not conducted in 2011 and 2012. Surveys were conducted for 5 minute durations using standard methods consistent with the North American Breeding Bird Survey (BBS; Ralph et al. 1993; Environment Canada 2004). From 2006 to 2010, the radius of point count surveys was 50 m. From 2013 to 2015, the radius of point count surveys was extended to 100 m. Detailed methods are described in the WMMP reports for the Hope Bay Doris (Golder 2007, 2008a; Rescan 2010, 2011c; ERM Rescan 2014a; ERM 2015b, 2016a).

Table 9.2-56. Annual Survey Effort for Point Count and PRISM Plot Surveys of Upland Breeding Birds Conducted in the Wildlife Regional Study Area

Year	Point Count			PRISM		
	Number of Stations	Survey Dates	Number of Survey Days	Number of Stations	Survey Dates	Number of Survey Days
2006	261	June 14 – July 2	10	9	June 15 – July 3	5
2007	261	June 20 – June 27	8	9	June 23 – June 27	4
2009	74	June 27 – July 4	6	-	-	-
2010	229	June 19 – July 5	10	9	June 23 – July 7	4
2011	-	-	-	32	June 22 – July 14	18
2012	-	-	-	57	June 21 – July 1	10
2013	133	June 13 – June 27	8	10	June 13 – June 27	4
2014	108	June 15 – June 23	8	17	June 15 – June 23	8
2015	80	June 10 – June 30	8	14	June 10 – June 30	8
Total	**313**		**58**	**50**		**61**

Note: The PRISM plots that were surveyed in 2006 were repeated again in 2010; all other PRISM plots were surveyed in only one year. A new set of PRSIM plots were selected in 2011.

Figure 9.2-39
Upland Breeding Bird Point Count Survey Locations in the Northern Portion of the Regional Study Area, 2006 to 2015

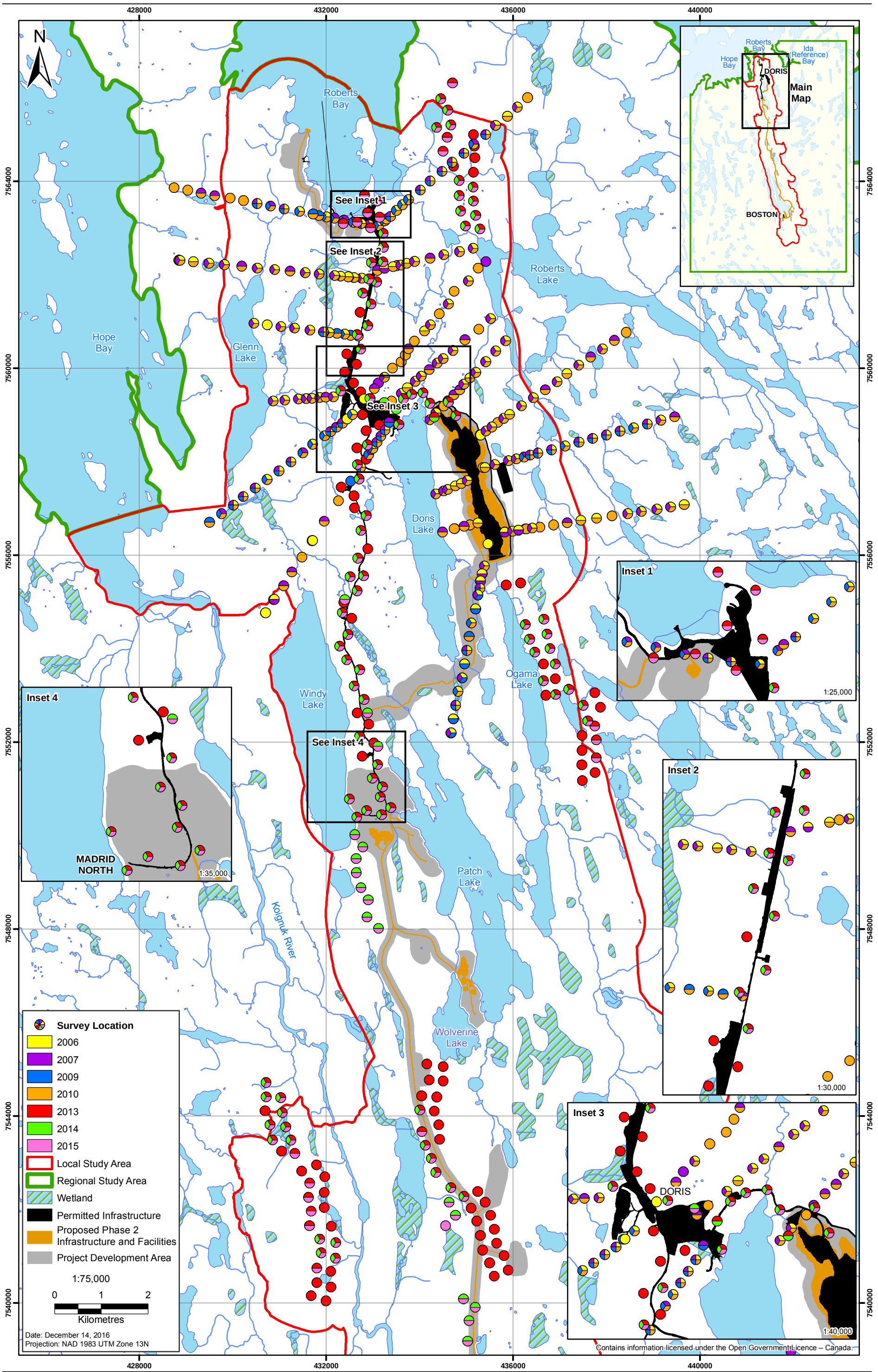
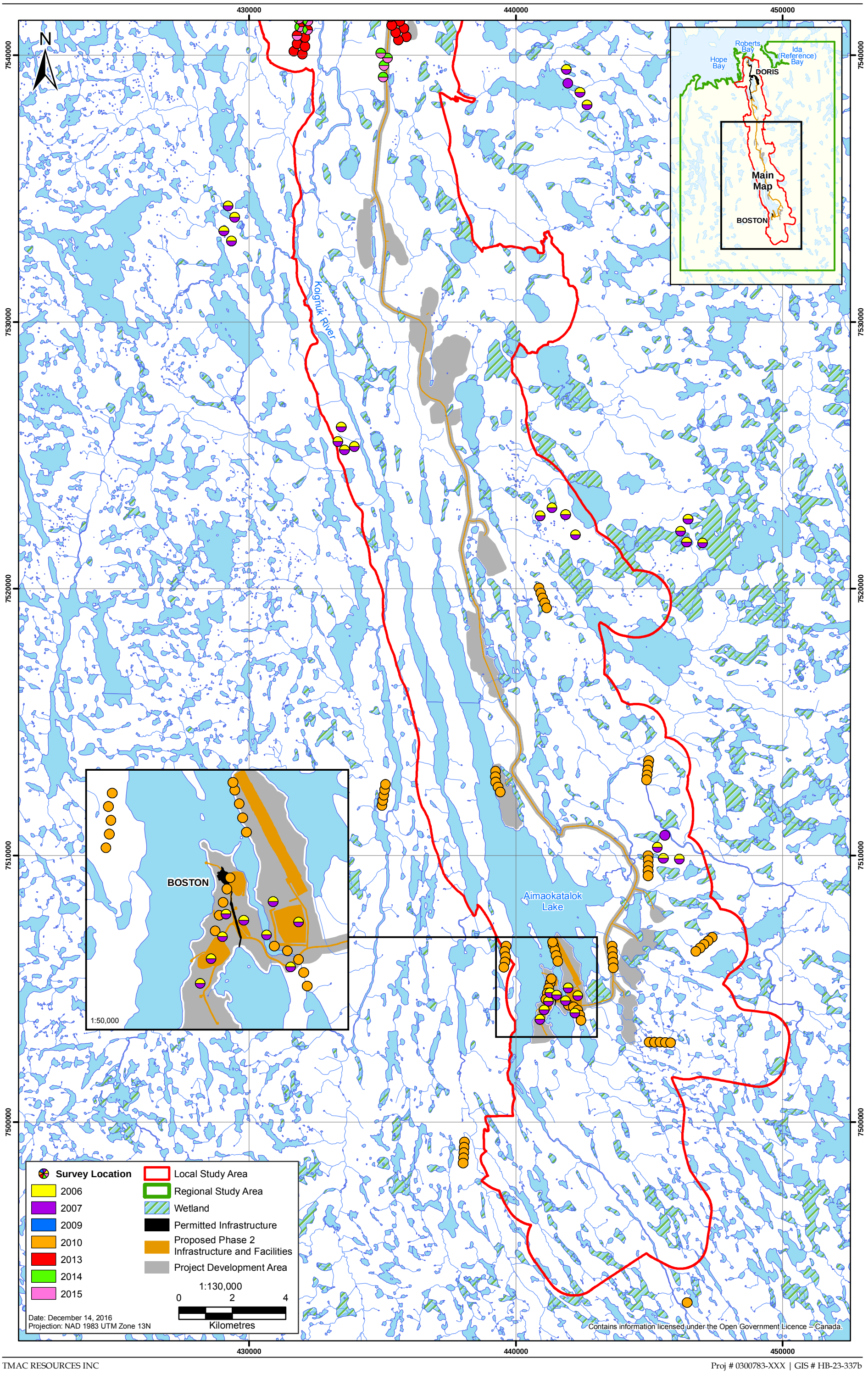


Figure 9.2-40
Upland Breeding Bird Point Count Survey Locations in the Southern Portion of the Regional Study Area, 2006 to 2015



PRISM Plots

The Program for Regional and International Shorebird Monitoring (PRISM) is a comprehensive approach to monitor shorebirds in the United States and Canada (Latour, Machtans, and Beyersbergen 2005; Andres 2006; Brown et al. 2007). At the request of the Canadian Wildlife Service (CWS) PRISM plots were established in the RSA as part of an Arctic initiative to monitor shorebird populations.

PRISM plots (300 x 400 m, 12 ha) were surveyed in 2006, 2007, and from 2010 to 2015 (Table 9.2-56; Figure 9.2-41) to estimate species composition and abundance. These plots were chosen using a stratified random sampling approach designed by CWS staff in 2006 and in 2009. Satellite imagery was used by CWS to delineate high, medium, and low quality habitats for shorebirds, and plots were randomly assigned to each habitat quality stratum within the study area. In consultation with CWS, ten new PRISM plots were added in the RSA in 2013 and an additional seven plots were added in 2014. These plots were positioned close to the Doris infrastructure as part of the effects monitoring program for the Doris Project. The plots were surveyed once per year by systematically walking through the plots along transects (Golder 2007, 2008a; Rescan 2011c, 2011f, 2013e; ERM Rescan 2014a; ERM 2015b, 2016a).

Results

Upland bird species that regularly occur within the RSA were identified from species range maps, and the timing and frequency of detections during baseline surveys. In total, 26 upland bird species were detected during baseline studies, including 25 species that regularly occur in the RSA and one species that rarely occurs: long-billed dowitcher (Tables 9.2-57 and 9.2-58). Three additional species were recorded incidentally (Table 9.2-57); including one which are considered to be rarely occurring (American robin) and two that are expected to be regularly occurring (Baird's sandpiper and Harris's sparrow; ERM 2016a). Two additional species identified as regularly occurring within the RSA; buff-breasted sandpiper and white-rumped sandpiper; were not detected during baseline surveys or incidentally, likely because these are migrants that probably do not breed in the RSA.

Table 9.2-57. Summary of Upland Breeding Bird Abundance Recorded by Species during Point Count and PRISM Surveys

		Abundance Recorded during Surveys[1]			
		Point Count		PRISM	
Group	Species	No. Individuals	% of Total	No. Individuals	% of Total
Shorebird					
	American Golden-plover	4	0.1	14	0.6
	Least Sandpiper	29	1.0	73	3.3
	Long-billed Dowitcher	0	0	1	0.04
	Pectoral Sandpiper	3	0.1	41	1.8
	Red-necked Phalarope	1	0.0	84	3.8
	Semipalmated Plover	4	0.1	21	0.9
	Semipalmated Sandpiper	1	0.04	7	0.3
	Stilt Sandpiper	0	0	6	0.3
	Wilson's Snipe	1	0.04	19	0.9
	Unknown Shorebird	2	0.1	12	0.5
Ptarmigan					
	Rock Ptarmigan	14	0.5	7	0.3

Group	Species	Abundance Recorded during Surveys[1]			
		Point Count		PRISM	
		No. Individuals	% of Total	No. Individuals	% of Total
	Willow Ptarmigan	11	0.4	15	0.7
	Unknown Ptarmigan	1	0.04	1	0.04
Songbird					
	American Pipit	79	2.8	26	1.2
	American Tree Sparrow	249	8.7	126	5.6
	Common Redpoll	100	3.5	116	5.2
	Gray-cheeked Thrush	0	0	1	0.04
	Hoary Redpoll	155	5.4	109	4.9
	Horned Lark	251	8.8	130	5.8
	Lapland Longspur	731	25.6	592	26.5
	Lincoln's Sparrow	1	0.04	1	0.04
	Redpoll sp.	148	5.2	190	8.5
	Savannah Sparrow	885	31.0	594	26.6
	Smith's Longspur	2	0.1	1	0.04
	Snow Bunting	0	0	2	0.1
	White-crowned Sparrow	175	6.1	36	1.6
	Yellow Warbler	5	0.2	0	0
	Unknown Songbird	5	0.2	3	0.1
Jaeger					
	Long-tailed Jaeger	0	0	2	0.1
	Parasitic Jaeger	0	0	1	0.04
Total		**2,857**		**2,231**	

[1] Counts do not include incidental observations (i.e., birds recorded outside of the point count survey area (50 m radius for 2006, 2007, 2009, and 2010, and 100 m radius in 2013 - 2015) or PRISM survey area (12 ha plot)), before or after surveys, and flying over survey areas.

Table 9.2-58. Summary of Upland Breeding Bird Abundance Recorded by Species Group during Point Count and PRISM Surveys

Group	Abundance Recorded during Surveys[1]			
	Point Count		PRISM	
	No. Individuals	% of Total	No. Individuals	% of Total
Shorebird	45	1.6	278	12.5
Ptarmigan	26	0.9	23	1.0
Songbird	2,786	97.5	1,927	86.4
Jaeger	0	0.0	3	0.1
Total	**2,857**		**2,231**	

[1] Counts do not include incidental observations (i.e., birds recorded outside of the point count survey area (50 m radius for 2006, 2007, 2009, and 2010, and 100 m radius in 2013 - 2015) or PRISM survey area (12 ha plot)), before or after surveys, and flying over survey areas.