

**Southern Lakes
Terrestrial Environment Baseline Studies
2010 Aquatic and Wetland Bird Surveys**



(Photo: F. I. Doyle)

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May 2012

May 14, 2012

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Dear Travis:

Project No: 60146345 – Task 2.4.8.4

Regarding: Marsh Lake Fall-Winter Storage Concept – 2010 Aquatic and Wetland Bird Surveys

Please find attached the above noted report prepared by Ardea Biological Consulting on behalf of AECOM.

We trust this report meets your current needs. If you have any questions regarding this report, or if we can be of further assistance, please do not hesitate to contact the undersigned.

Sincerely,
AECOM Canada Ltd.



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OM:om
Encl.
cc:

Executive Summary

Throughout the Southern Lakes in 2010, a range of standardised bird survey techniques were used to determine the bird species using the area, their likely status (breeding versus migrants and level of abundance), and general bird habitat associations. These surveys were focused on identifying any COSEWIC listed species that may be present, as well as those species that breed, feed or rest in areas that may be influenced by the proposed Marsh Lake Storage Concept.

A total of 130 species were observed, or are known to regularly use the Southern Lakes Study Area during migration, and/or to breed along the lake shore or closely associated wetlands, rivers and creeks. During spring and fall migration several focal waterfowl and shorebird areas were identified (Lewes Marsh, south and west sides of Marsh Lake, McClintock Bay, Nares Lake, Tagish River and Talaha Bay,) which supported both a large number of birds and species.

Of the species observed and known to use the area, the Barn Swallow, Common Nighthawk and Olive-sided Flycatcher are listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as **Threatened** and the Horned Grebe and Rusty Blackbird as species of **Special Concern**. In addition, a further 6 are identified as **Candidate** COSEWIC listed species. The BC Conservation Data Centre lists 8 species as Blue listed, and in the Yukon, Environment Canada lists 2 species as **At Risk**, 3 species **May be at Risk**, and 21 species as **Sensitive**.

In spring 2010, a peak in bird numbers was seen on aerial surveys in May, with goldeneye, mallard, mergansers, teal, wigeon, and swans being the most frequently observed birds. On a per area basis, highest counts (per survey flight) in early spring were observed in ice free areas at Lewes Marsh, M'Clintock Bay, Tagish River and on the Yukon River (Lewes Marsh to Whitehorse). In late spring, the highest numbers of birds were observed at Lewes Marsh, M'Clintock Bay, and on Marsh and Tagish Lakes. From a species diversity perspective during aerial waterfowl surveys, the highest number of species was observed at Lewes Marsh and along the southern and western shores of Marsh Lake.

During summer, relatively few breeding waterfowl (38 broods) or broods of geese (5 broods, including groups with multiple broods) were observed, during either ground or aerial surveys. The greatest number of individual broods (primarily Red-Breasted Mergansers), were seen at Nares Lake. A total of 25 separate Herring and Mew Gull colonies were located on small isolated rocky islands, primarily in Tagish Lake, along with 3 Arctic Tern colonies and 2 potential Double-crested Cormorant nest sites were also found. There was little evidence of breeding shorebirds in any of the focal wetland survey areas. Two Least Sandpiper nests were found, one at Nares Lake and one at 6 Mile Marsh on Marsh Lake and one potential Spotted Sandpiper nest site (Lewes Marsh), was identified based on the adult behaviour. No nests of COSEWIC listed species were located, although an unconfirmed sighting of juvenile Rusty Blackbirds at the southern end of Marsh Lake suggests they may be breeding in the area.

In the fall, a peak in bird numbers was seen on aerial surveys in October, with Bufflehead, swans and goldeneye the most frequently observed species, and lower numbers of scaup, Mallard, mergansers and wigeon. On a per area basis, highest counts (per survey flight) were made at Lewes Marsh, Marsh Lake and on the Yukon River. In early fall, dabbling ducks were the most frequently observed species, with the greatest numbers seen at Lewes Marsh. By the middle of fall, diving ducks were the most abundant species group observed, and the largest number of birds was observed at Lewes Marsh. Swans were present at many of the focal wetland areas in mid fall, the highest numbers observed along the Yukon River (Marsh Lake to Whitehorse). No shorebirds were observed in the focal wetland areas during the fall surveys.



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Disclaimer

This report has been prepared by the authors under the direction of Ardea Biological Consulting Ltd. (Ardea) for Yukon Energy Corporation and AECOM Canada Ltd. (the Clients) to provide baseline ecological information for the Marsh Lake Water Storage Concept. The information contained in this report has been obtained and prepared in accordance with generally accepted biological survey standards and is intended for the exclusive use of the Clients. The information contained in this report is dependent on the conditions at the time and any recommendations or conclusions are based on the authors' best judgement at the time of preparation. The Clients acknowledge that ecological conditions can change over time and that the conclusions and recommendations outlined in this report are time sensitive.

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INTRODUCTION

Yukon Energy Corporation (YEC) has engaged AECOM Canada Ltd. (AECOM) to assist with implementation of key energy development and enhancement projects as identified in YEC's 20-Year Resource Plan. One of the proposed projects is the Marsh Lake Storage Concept, which proposes to apply to the Yukon Water Board to increase the winter full supply level by 0.3 m and lower the low supply level by 0.1 m to increase winter flows downstream to the Whitehorse Rapids Generating Station. The concept would use the existing Lewes Dam control structure to release water from November to early May, which would be the same as the current release regime.

Ardea Biological Consulting Ltd. (Ardea) was contracted by AECOM to complete terrestrial baseline studies within Marsh Lake, Tagish Lake, Nares Lake and Bennett Lake, which comprise the Southern Lakes area. As part of the terrestrial baseline environment studies, aerial bird surveys were initiated in late winter of 2010 for aquatic birds. In the late spring and early summer of 2010, additional surveys were conducted for aquatic and breeding terrestrial birds using a combination of aerial, boat-based and ground-based survey techniques. The main purpose of this work was to determine which aquatic and terrestrial bird species were using the area and identify critical habitats used by the birds. Surveys and observations were carried out by Frank Doyle (Wildlife Dynamics Consulting), Laurence Turney (Ardea), Anne Macleod (Sialia Biological Consulting), Anne-Marie Roberts (A. Roberts Ecological Consulting) and Lis Rach (TerraNiche Environmental Solutions). Technical assistance during the summer field program was provided by Gareth Doyle, Graeme Turney and Joel MacFabe.

STUDY AREA

The Southern Lakes Study Area for the 2010 field studies is situated within the Yukon River watershed and extends along the Yukon River south of Whitehorse, into Marsh Lake, Tagish Lake and Bennett Lake, but does not extend into Atlin Lake. It includes the shorelines and major adjacent wetlands in both the Yukon and Northern British Columbia that are influenced by the fluctuating water levels found in these water bodies (Figure 1).

The Southern Lakes Study Area is located largely within the Yukon Southern Lakes Ecoregion; however, southern portions of the study area also overlap the Yukon-Stikine Highlands Ecoregion (YEWG 2004) and the Boreal Mountains and Plateaus Ecoregion of British Columbia (Demarchi 1995). The majority of the study area is located within the rain shadow of the St. Elias and Coast Mountains and is therefore a relatively dry region with precipitation averaging 200 to 325 mm annually (YEWG 2004). Mean annual temperatures are -1°C to -2°C across most of this area, with mean temperatures in July ranging from 12°C to 14°C and mean temperatures in January averaging about -21°C (YEWG 2004). The south-western section of the study area around Carcross and Bennett Lake is within the Yukon Stikine Highlands Ecoregion and the southern portions of Tagish Lake, which is within the BC Boreal Mountain and Plateaus Ecoregion and is heavily influenced by Pacific maritime weather systems. This southern area receives moderate levels of precipitation and slightly cooler annual temperatures than the rest of the study area. Average annual rainfall reported for Atlin, east of Tagish Lake, is 192.5 mm and average snowfall is 154.8 cm. Summer day temperatures average 13°C to 17°C and winter temperatures range between -10°C and -20°C (Environment Canada 2010).

The study area is characterized by broad glacial valleys with several large lakes and rivers traversing the valley floors. It lies in a sporadic discontinuous permafrost zone, where permafrost underlies less than 25% of the landscape. Soils tend to be alkaline and wetlands are mainly fens (YEWG 2004). Vegetation within this area is dominated by coniferous forests of



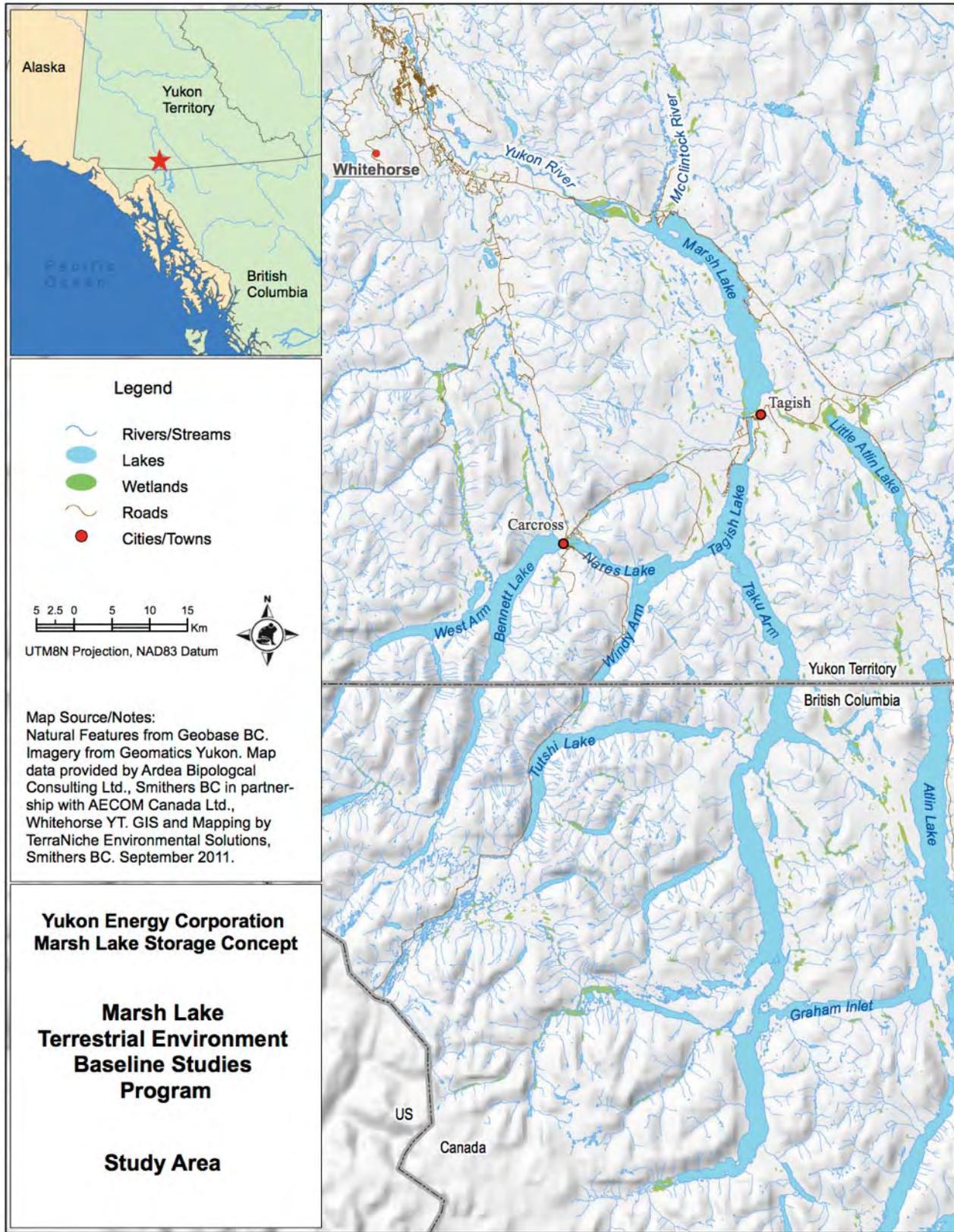


Figure 1. Location of Southern Lakes survey areas.



white spruce (*Picea glauca*) and lodgepole pine (*Pinus contorta*). Portions of the study area also encompass large wetlands dominated by willows and/or sedges.

FOCAL BIRD SPECIES

Focal species for survey effort was based on a number of factors including regulatory requirements to manage their populations and/or specific habitats, identification of species that may be affected by limiting factors or threats, and a review of the proposed Marsh Lake Storage Concept and how it may affect the habitats and populations of bird species.

In the Yukon and British Columbia individual bird species have been identified at risk under three separate processes.

- The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses wildlife species and assigns status rankings for species as **Endangered, Threatened or Special Concern**. The *Species at Risk Act* (2003) provides for legal protection of wildlife species that are listed by COSEWIC.
- In addition to those species listed by COSEWIC, many species in Canada have not yet been assessed by COSEWIC, but are suspected of being at some risk of extinction or extirpation. These species, referred to as **Candidate Wildlife Species** are identified by the Species Specialist Subcommittees (SSCs) or by the Aboriginal Traditional Knowledge (ATK) Subcommittee of COSEWIC as candidates for detailed status assessment. Candidates may also include wildlife species already assessed by COSEWIC as **Not at Risk** or **Data Deficient**, but where new information suggests they may be at risk. Species on the SSC candidate lists are ranked into three priority groups by the SSCs as **Low, Medium or High** to reflect the relative urgency with which each wildlife species should receive a COSEWIC assessment.”
- At a Territorial level, Environment Canada with the assistance of regional experts assesses the conservation ranking of all vertebrate species (Vertebrates of Conservation Concern) every 5 years. Species are ranked as: **At Risk**: Species for which a formal detailed assessment has identified as Endangered or threatened; **May be At Risk**: May be Endangered or threatened but for which no formal assessment has been completed; and **Sensitive**: Species that may require special attention or protection to prevent them from becoming at risk.
- In British Columbia, species and ecological communities are assigned to the **Red** (Threatened), or **Blue** (Special Concern) lists on the basis of the provincial Conservation Status Rank assigned by the Conservation Data Centre. Red-listed species and sub-species may be legally designated as, or may be considered candidates for legal designation as Extirpated, Endangered or Threatened under the Wildlife Act (see <http://www.env.gov.bc.ca/wld/faq.htm#2>).
- At a regional scale, species have also been identified by the Canadian Landbird Conservation Program, which selects focal species by grouping priority species according to potential limiting factors or threats (e.g. habitat loss, changes in fire regime, etc.) within each habitat category. Within each region the species thought to be most sensitive to, or having the most stringent ecological requirements for the particular factor, is usually identified as the focal species. The Southern Lakes area is within the Northwestern Interior Forest (Bird Conservation Region #4).

Based on the proposed development and operation of the Marsh Lake Storage Concept, the focal species list was refined to concentrate on those species that breed or extensively feed in lakeshore and wetland habitats within the Southern Lakes. This refinement helped define the

types of surveys and survey areas that would be assessed for baseline information. It was recognized that this refinement was not an assessment of potential effects, but simply a method to stratify the survey effort within the Southern Lakes Study Area. Table 1 outlines a list of the Focal Species that are expected in the Southern Lakes Study Area.

Table 1. Focal bird species and their status in the Southern Lakes Study Area.

Species	COSEWIC Status ¹	COSEWIC Candidate Species ²	Yukon Status ³	BC Status ⁴	Landbird Conservation Species ⁵
Alder Flycatcher					Yes
American Dipper					Yes
American Golden Plover			Sensitive	Blue	
American Kestrel		Medium	May be at Risk		
American Wigeon			Sensitive		
Bank Swallow		Status Report in prep			Yes
Barn Swallow	Threatened		Sensitive		
Belted Kingfisher		High			
Blackpoll Warbler					Yes
Bohemian Waxwing					Yes
Boreal Chickadee		Low			Yes
Boreal Owl					Yes
Brewer's Sparrow			Sensitive		
Bufflehead			Sensitive		
Common Nighthawk	Threatened		At Risk		
Double-crested Cormorant			May be at Risk	Blue	
Golden Eagle			Sensitive		
Greater Yellowlegs			Sensitive		
Gyrfalcon				Blue	Yes
Harlequin Duck			Sensitive		
Hooded Merganser			Sensitive		
Horned Grebe	Special Concern				
Lesser Scaup		Low	Sensitive		
Long-tailed Duck			Sensitive	Blue	
Northern Goshawk					Yes
Northern Pintail			Sensitive		
Northern Rough-winged Swallow			Sensitive		
Northern Waterthrush					Yes
Olive-sided Flycatcher	Threatened		At Risk	Blue	Yes
Osprey			Sensitive		
Pine Grosbeak					Yes
Red-necked Phalarope		High	Sensitive	Blue	
Rusty Blackbird	Special Concern		Sensitive	Blue	Yes



Species	COSEWIC Status ¹	COSEWIC Candidate Species ²	Yukon Status ³	BC Status ⁴	Landbird Conservation Species ⁵
Short-billed Dowitcher			May be at Risk	Blue	
Snow Goose			Sensitive		
Spruce Grouse					Yes
Surf Scoter			Sensitive	Blue	
Swainson's Thrush					Yes
Trumpeter Swan			Sensitive		
Tundra Swan			Sensitive	Blue	
Varied Thrush					Yes
White-crowned Sparrow					Yes
White-winged Scoter			Sensitive		
Wilson's Warbler					Yes
Yellow Warbler					Yes

¹ COSEWIC (2010); ² COSEWIC (2011); ³ Cannings and Jung (2010); ⁴ BC CDC (2010); ⁵ Partners in Flight (2006).

In addition to the Focal Species listed above in Table 1, most migratory birds are also protected under the Migratory Birds Convention Act (MBCA) of 1917, which is administered by Environment Canada in cooperation with provincial and territorial governments. Waterfowl, gulls, terns, shorebirds and riparian associated migratory birds (e.g. warblers, swallows, etc.) were also considered as focal species for survey effort and stratification.

METHODS

To establish which species of birds were using the area, which birds were migrants versus breeding birds, and in particular where birds were breeding and foraging, a range of standardized survey techniques were employed. Multiple aerial surveys through the year were conducted to determine which aquatic birds (e.g. waterfowl and shorebirds) were using the area, and their habitats. Encounter Ground Transects and Wildlife Habitat Assessments were all used to determine which terrestrial species are present, and their habitats. In addition all opportunistic observations of birds were also recorded by all personnel working in the field, to ensure as wide a coverage as possible of species distribution in the focal project area.

Aerial Surveys

Aerial surveys of the Southern Lakes area were conducted using an R-44 helicopter following standards outlined by the B.C. Resource Inventory Standards Committee for waterfowl and riverine birds (RIC 1998 and RIC 1999b). The helicopter was flown at speeds of 60 to 90 km/h at a height of 75 to 100 m above the water. A minimum of two observers were present along with the pilot to search for waterfowl or other birds on or adjacent to the helicopter flight path. Whenever birds were observed, their location was marked with a GPS and information was collected on the species, number, age group, sex, activity and habitat type.

Surveys were conducted to minimize disturbance, therefore detailed counts of males vs. females and identification of closely related species with similar markings, e.g. goldeneye's (Barrow's and Common), swans (Tundra and Trumpeter), scaup (Lesser and Greater), etc., were only obtained when disturbance could be minimized.



Ground and Water Based Surveys

A number of ground and water based survey techniques were used in conjunction with the aerial surveys to provide additional information on bird use during the breeding season within selected wetland complexes in Marsh and Tagish Lakes. These surveys were aimed at identifying shorebird, passerine and other smaller bird species that would not be possible to detect during the aerial surveys. The intent was also to determine, where possible, nesting species and areas of use by waterfowl and other species raising young in these wetland areas.

Wildlife Habitat Assessments

Wildlife Habitat assessments in the Southern Lakes area were conducted in 2010 to identify wildlife habitat use patterns and identify important wildlife habitats. These plots were conducted across a range of representative wetland habitats including deltas, shallow bays and gravel beaches. During these assessments all birds and bird sign (pellets, feathers, tracks, etc.) were recorded as per the standards outlined in the *Field Manual for Describing Terrestrial Ecosystems* (MOELP and MOF 1998).

Ground and Water Transects

In addition to the Wildlife Habitat Assessment plots, wildlife encounter transects (RIC 1999a) were also conducted within representative wetland and shoreline habitats. These transects were conducted by boat (canoe or zodiac) or by foot. During these transects all birds and bird sign were recorded; their location was marked with a GPS and information was collected on the species, number, age group, sex, activity and habitat type.

Other Bird Observations

Incidental observations of birds species were made while traveling to wetland areas by boat, car or by foot, or while conducting other dedicated assessments (e.g. wetland vegetation mapping). All incidental observations of any birds encountered during other aspects of the fieldwork included recording the species observed, the number and sex of individuals, a UTM location, the date observed and any activity or behavioural information.

RESULTS

Aerial Surveys

Survey Timing and Extents

In 2010, seven aerial aquatic bird survey flights were conducted between March and October (Table 2). Marsh Lake, northern Tagish Lake and Nares Lake were surveyed in all survey periods to provide seasonal comparison data, while other portions of the Southern Lakes were surveyed during the majority of the survey periods when weather and time constraints allowed (Figure 2, Figure 3 and Table 3).

Table 2. Timing, observers and length of aerial aquatic bird survey flights.

Survey Date	Observers	Start Time	End Time	Survey Length
24-Mar-10	L. Turney, F. Doyle	09:20	13:00	483 km
27-Apr-10	L. Turney, F. Doyle	09:25	15:00	543 km
14-May-10	L. Turney, F. Doyle, AM Roberts	08:42	14:55	494 km
8-Jun-10	L. Turney, L. Rach, AM Roberts	06:20	11:06	289 km
23-Jul-10	L. Turney, F. Doyle, AM Roberts	09:25	12:20	269 km
23-Sep-10	L. Turney, AM Roberts	11:55	16:18	369 km



Survey Date	Observers	Start Time	End Time	Survey Length
18-Oct-10	L. Turney, F. Doyle	09:25	14:55	521 km

Table 3. Aerial aquatic bird survey areas in 2010.

Survey Area	Survey Section	Mar. 24	Apr. 27	May 14	Jun. 08	Jul. 23	Sep. 23	Oct. 18
Yukon River	Yukon River							
Lewes Marsh	Lewes Marsh							
Lewes River	Yukon River - Lewes							
M'Clintock	M'Clintock Bay							
M'Clintock	M'Clintock River							
Marsh Lake	North Marsh Lake							
Marsh Lake	North Marsh Lake East							
Marsh Lake	North Marsh Lake West							
Marsh Lake	Mid-Marsh Lake East							
Marsh Lake	Mid-Marsh Lake West							
Marsh Lake	South Marsh Lake							
Tagish River	Tagish River							
Tagish Lake	Tagish Lake - North							
Tagish Lake	Taku Arm - North							
Tagish Lake	Talaha Bay							
Tagish Lake	Taku Arm - Middle							
Tagish Lake	Taku Arm - Deep Bay							
Graham Inlet	Graham Inlet							
Tagish Lake	Taku Arm - South							
Tagish Lake	Tagish Lake - West							
Tagish Lake	Windy Arm							
Nares Lake	Nares Lake							
Bennett Lake	Bennett Lake							

Species Composition

A total of 14,829 birds were observed on the seven aerial survey flights completed in 2010 (Table 4). Waterfowl were observed on all flights, and were by far the dominant observed species group, with a peak in numbers in May and October (Figure 4). Gulls and Terns were observed primarily from April to July, with a small number in October, while Shorebirds were observed in high numbers in May, with small numbers in June and July. Low numbers of raptors and passerines were seen on all flights; however, the observations must be considered as incidental as the survey technique is inappropriate to monitor these species groupings. During the aerial surveys only Common Mergansers and Bald Eagles were the only bird species observed on every flight.

The abundance of different waterfowl species was observed to change throughout 2010 (Figure 5). During early spring migration, goldeneye and swans were the most frequently observed species, while during the breeding season in late spring-summer wigeon, mallards, mergansers and teal were abundant. During the fall migration large numbers of Bufflehead were observed,



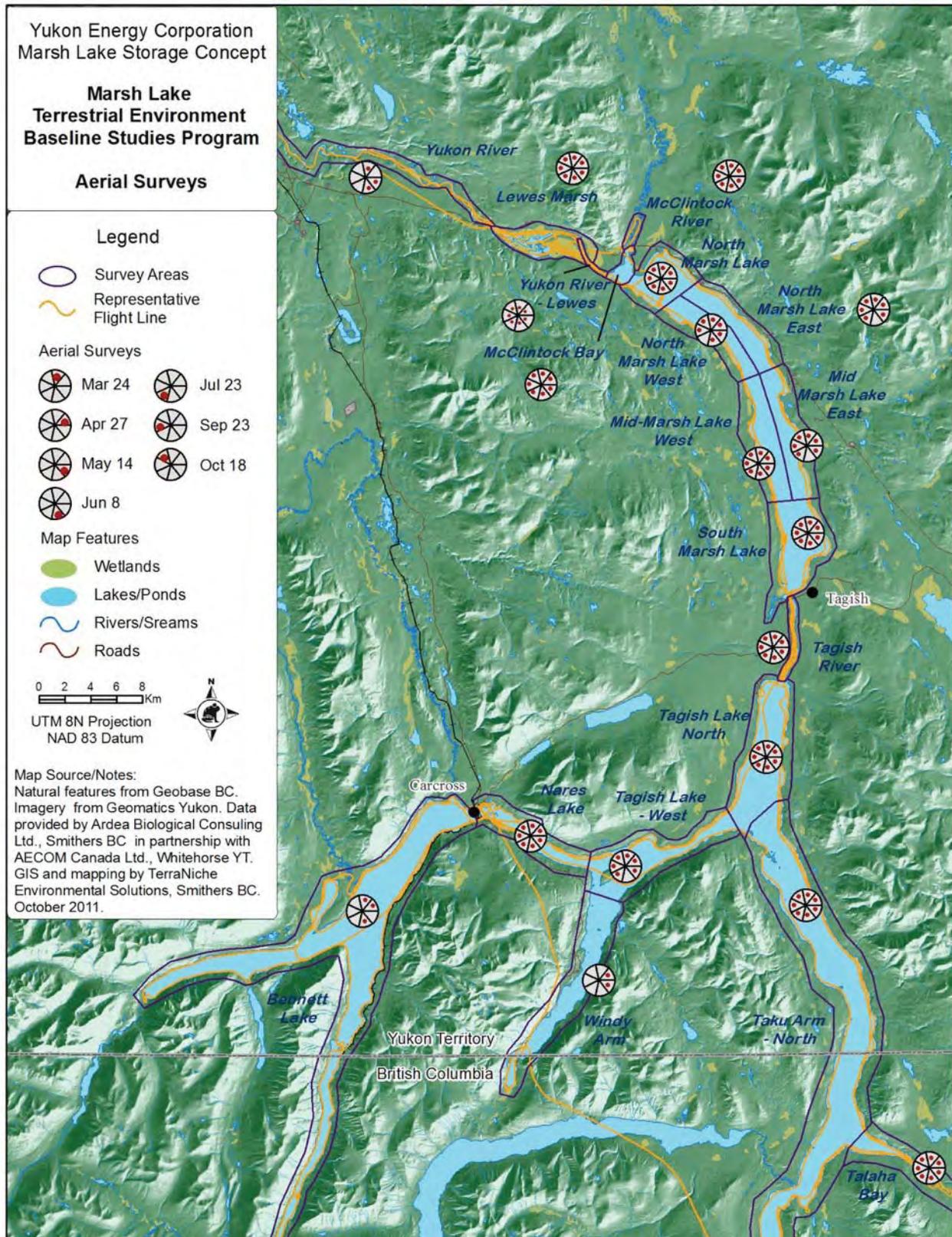


Figure 2. Representative aerial survey flight lines and survey timing, northern portion of study area.





Figure 3. Representative aerial survey flight lines and survey timing, southern portion of study area.



Table 4. Birds species observed in the Southern Lakes Area during the 2010 aerial surveys.

Common Name	Mar. 24	Apr. 27	May 14	Jun. 8	Jul. 23	Sep. 23	Oct. 18	Total
<i>Waterfowl & Seabirds</i>								
American Wigeon		501	469	233	6	325	26	1560
Barrow's Goldeneye	30	41	2					73
Bufflehead	5		10	12	4	128	2377	2536
Canada Goose		11	57	156	281			505
Canvasback			40			4		44
Common Goldeneye			2		4	3		9
Common Loon			36	2	24	7	7	76
Common Merganser	7	12	104	203	112	49	203	690
Double-crested Cormorant					5			5
Greater Scaup					11			11
Greater White-fronted Goose			36					36
Green-winged Teal		54	620	58	11	20	7	770
Hooded Merganser			2					2
Lesser Scaup				49				49
Mallard		378	500	566	47	239	252	1982
Northern Pintail		146	90	27				263
Northern Shoveler		94	254	20		1		369
Pacific Loon				1				1
Red-breasted Merganser	3		39	14	12	143		211
Red-necked Grebe						4	1	5
Ring-necked Duck		56	31	9	9	456	160	721
Snow Goose			20					20
Surf Scoter			40	6	23	79		148
Trumpeter Swan				1				1
Unspecified Dabbling Duck		100	4		12		5	121
Unspecified Diving Duck			1			3		4
Unspecified Duck				2		1		3
Unspecified Goldeneye	45		42	7	12	42	511	659
Unspecified Grebe			12					12
Unspecified Loon			20				3	23
Unspecified Merganser			2		30	4		36
Unspecified Scaup		45	62	90	28	323	173	721
Unspecified Scoter						1	16	17
Unspecified Swan	31	163	7				786	987
White-winged Scoter				7		4		11
<i>Total Waterfowl & Seabirds</i>	<i>121</i>	<i>1601</i>	<i>2502</i>	<i>1463</i>	<i>631</i>	<i>1836</i>	<i>4527</i>	<i>12681</i>



Common Name	Mar. 24	Apr. 27	May 14	Jun. 8	Jul. 23	Sep. 23	Oct. 18	Total
<i>Shorebirds</i>								
Lesser Yellowlegs		2						2
Sandhill Crane			5					5
Spotted Sandpiper					1			1
Unspecified Shorebird			493	10				503
Unspecified Yellowlegs			102	10	11			123
Wilson's Snipe		1						1
<i>Total Shorebirds</i>	0	3	600	20	12	0	0	635
<i>Gulls & Terns</i>								
Arctic Tern			1	76	72			149
Bonaparte's Gull			66	7	4			77
California Gull			1					1
Herring Gull			28	1	227		9	265
Mew Gull		237	43	72	139			491
Unspecified Gull			188	22	16			226
Unspecified Tern			57					57
<i>Total Gulls & Terns</i>	0	237	384	178	458	0	9	1266
<i>Raptors and Others</i>								
Bald Eagle	3	5	12	15	16	12	6	69
Belted Kingfisher					1			1
Lapland Longspur			90					90
Northern Harrier		3	3			3	3	12
Osprey							1	1
Red-tailed Hawk							1	1
Snow Bunting							7	7
Unspecified Blackbird						6		6
Unspecified Longspur			60					60
<i>Total Raptors & Others</i>	3	8	165	15	17	21	18	247
Total All Birds	124	1849	3651	1676	1118	1857	4554	14829

and we also observed increasing numbers of goldeneye, scaup and swans. It should be noted that Figure 5 only portrays the species that made up greater than 10% of the total observations during any given survey.

Species Distribution

In addition to the number of birds observed, we also reviewed the total number of species associated with the different survey areas in the Southern Lakes, to see if particular areas support a greater diversity of species. Although not all areas were covered equally due to weather and other constraints, certain patterns did emerge (Figure 6). Based on our surveys, the south end of Marsh Lake had the greatest diversity of species (37 species), while Lewes Marsh had 26 species, and a number of areas had between 20 and 24 species including Nares



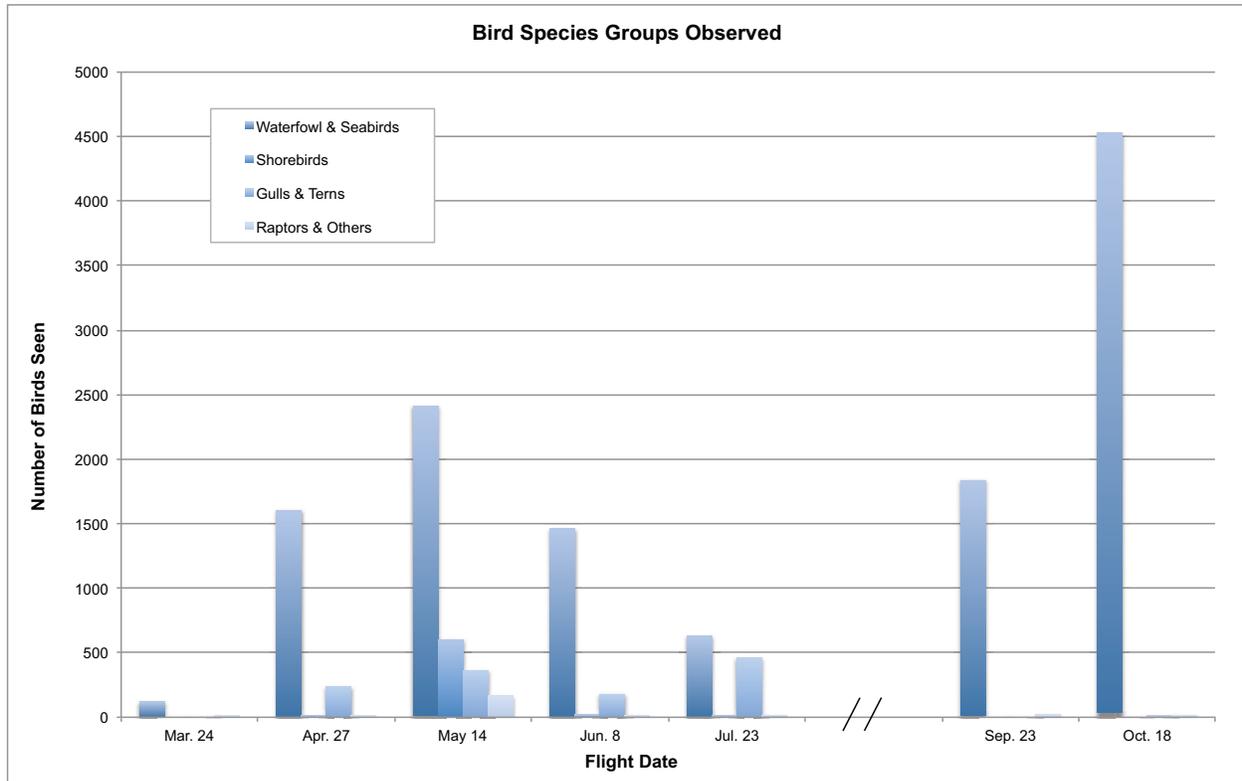


Figure 4. Observations of bird species groups during 2010 aerial surveys.

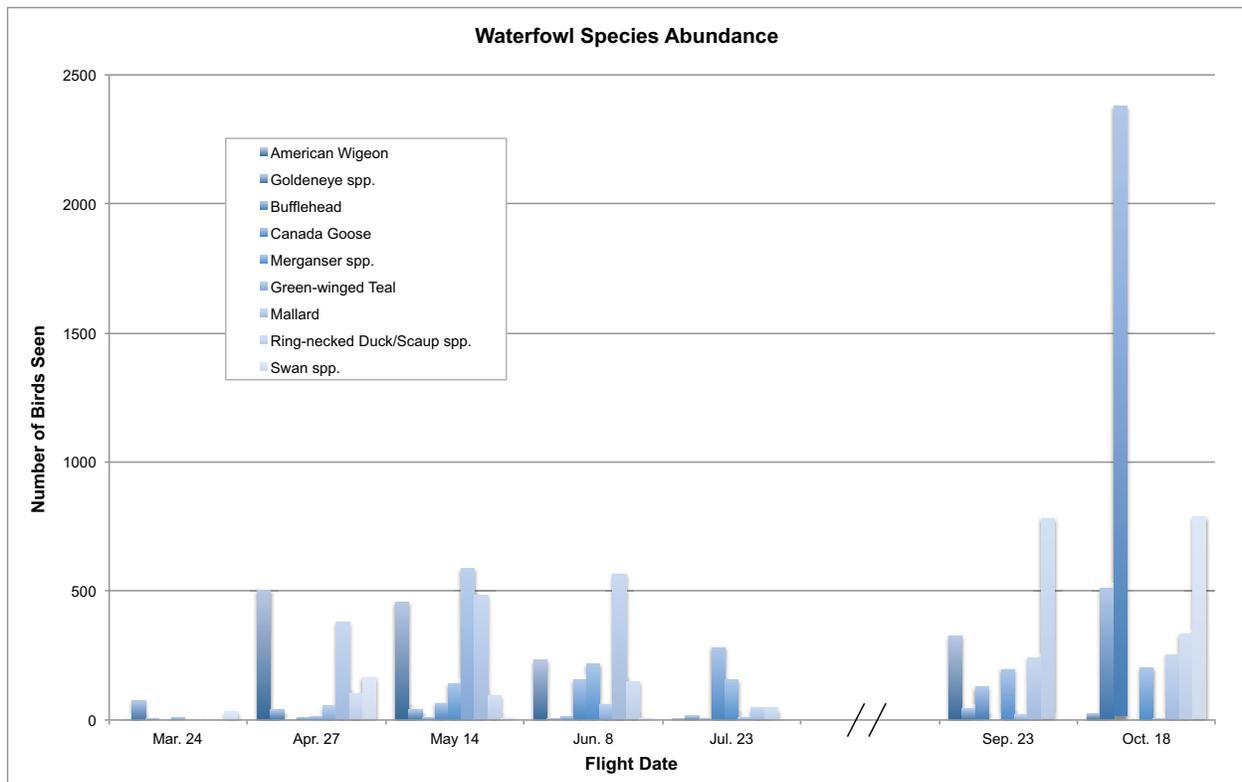


Figure 5. Changes in waterfowl species abundance during aerial surveys conducted in 2010.



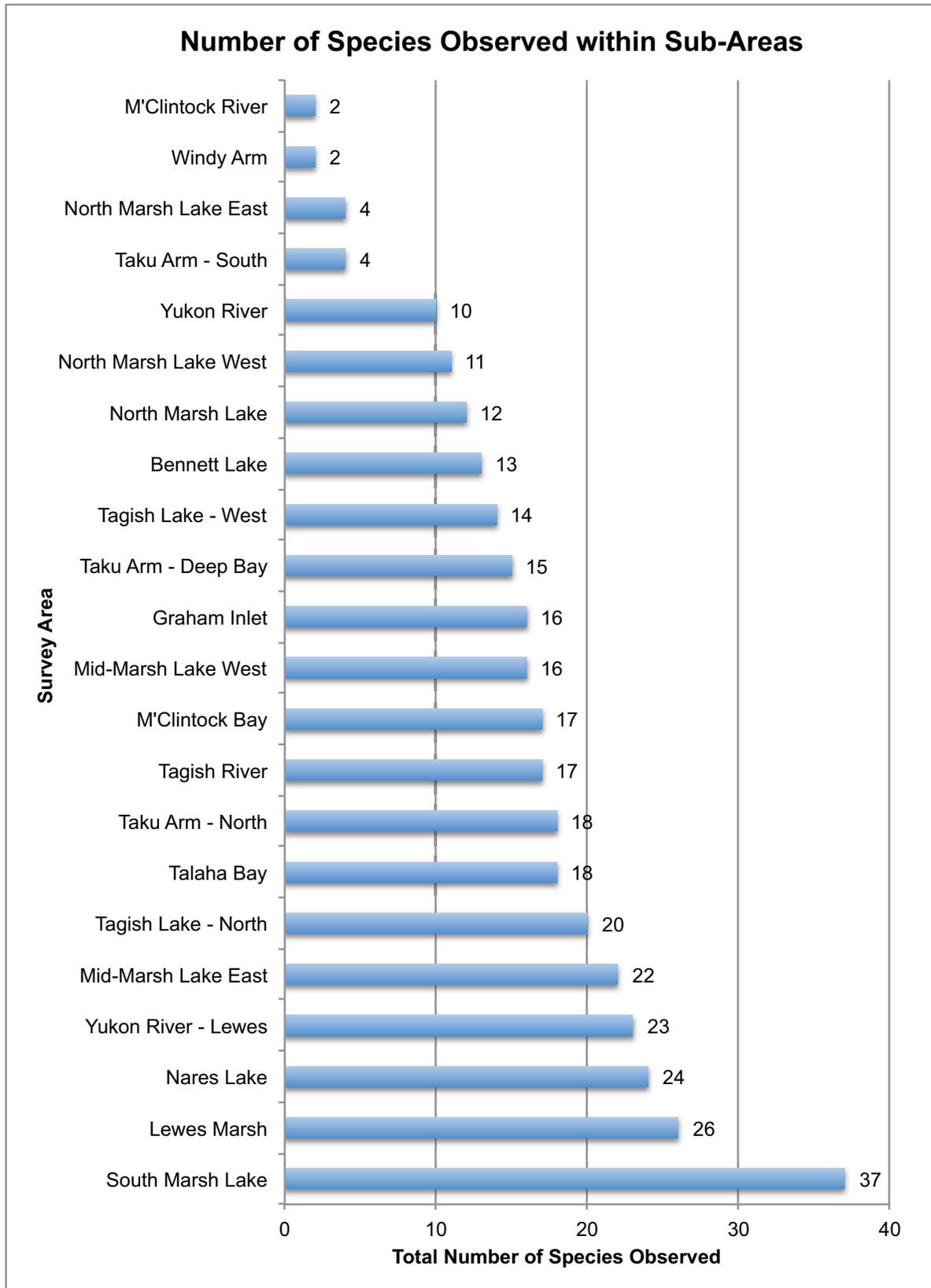


Figure 6. Number of species observed during the 2010 aerial surveys within sub-areas of the Southern Lakes.



Lake, the Yukon River between Lewes Marsh and M'Clintock Bay, Mid-Marsh Lake (east side) and Tagish Lake (north). In addition, the surveys also highlighted the patchy distribution of species within Marsh and Tagish Lakes, with the northern portions of Marsh Lake having a relatively low species diversity.

Ground and Water Based Surveys

Wildlife Habitat Assessment Bird Observations

We completed a total of 30 WHA plots within the Southern Lakes Study Area during July 2010. Most of these plots were conducted in wetland habitats; however, a few were located in terrestrial habitats adjacent to focal wetlands (Appendix B). A total of 18 bird species were seen or heard, or we observed evidence of their use of the area (e.g. feathers) in or adjacent to 11 of these plots. All of the species encountered were typical of the birds associated with these habitats (Appendix C).

Ground, Water Transects and Incidental Observations

We completed 31 boat-based and 55 ground-based transects, which totalled approximately 62.3 km and 41.8 km respectively during May, June and July 2010 surveys within the focal wetlands in the study area (Appendix B). We obtained information on 2896 individual birds, observing different 83 species, obtaining visual evidence of use for 11 species and hearing 25 species for an aggregate of 93 different species identified.

Waterfowl were the most commonly observed wetland-lake species (38% of observations) followed by passerines (32% of observations), shorebirds (24% of observations), and gulls and terns (5% of observations).

Nesting and Breeding Observations

Evidence of breeding within the Southern Lakes Area was observed during the aerial surveys through direct observations of nests and nest colonies, and through observations of adults with young broods. We recognize that only conspicuous nests such as eagle nests or colonies of gulls or terns were likely to be observed during the aerial surveys and that most other nest sites would be missed. The observations however did provide some indication of the species that are breeding in the area and their nest locations.

Bald Eagles

A total of 9 Bald Eagle nests were observed during the aerial surveys during 2010, with locations within the Yukon River, Lewes Marsh (2 nests), North Marsh Lake, Mid-Marsh Lake East (2 nests), South Marsh Lake, Nares Lake and Graham Inlet sub areas (Figure 7 and Figure 8). There was evidence of young hatched at 5 nests for a total of 7 young hatched. We observed 2 young at the nest at Nares Lake, 2 young at the nest in South Marsh Lake, and 1 young each at the 2 nests in Lewes Marsh and at Mid-Marsh Lake West (Figure 9). It should be noted that to reduce disturbance, a thorough survey of breeding success of Bald Eagles was not attempted and these results are not considered comprehensive.

Gulls/Terns/Cormorants

A number of gull and tern colonies on rocky islets within the Marsh, Tagish and Bennett Lakes were observed during the aerial surveys. At two of the sites, Double-Crested Cormorants were also observed in July, which could indicate breeding on the islets, or possibly post-breeding dispersal from other areas. Table 5, Figure 7 and Figure 8, outline where nesting colonies were identified. To prevent disturbance to breeding birds, we did not overfly the colonies, or circle more than once, and so did not distinguish between Herring and Mew Gulls, although both

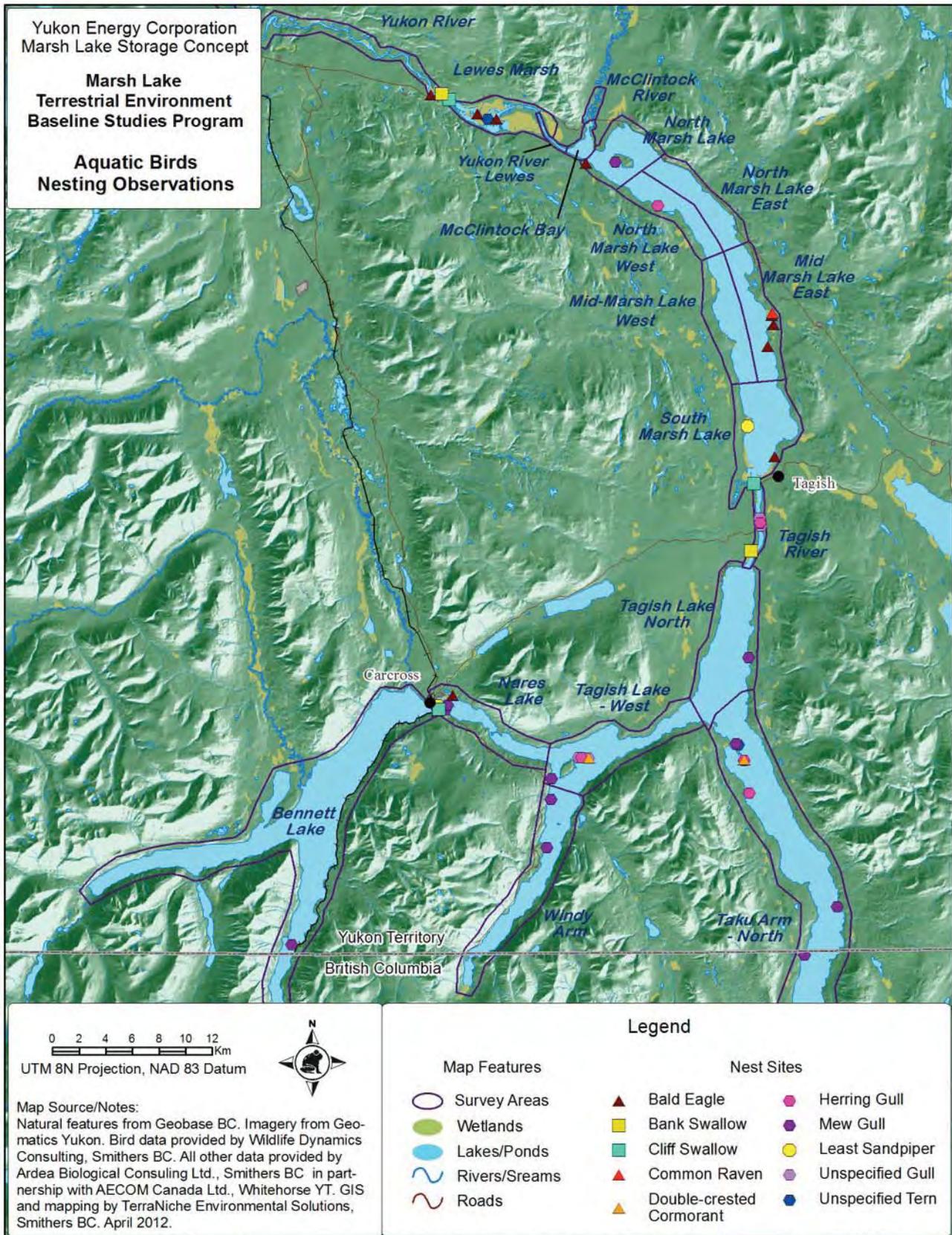


Figure 7. Observations of nests within the northern portion of the Southern Lakes Study Area.



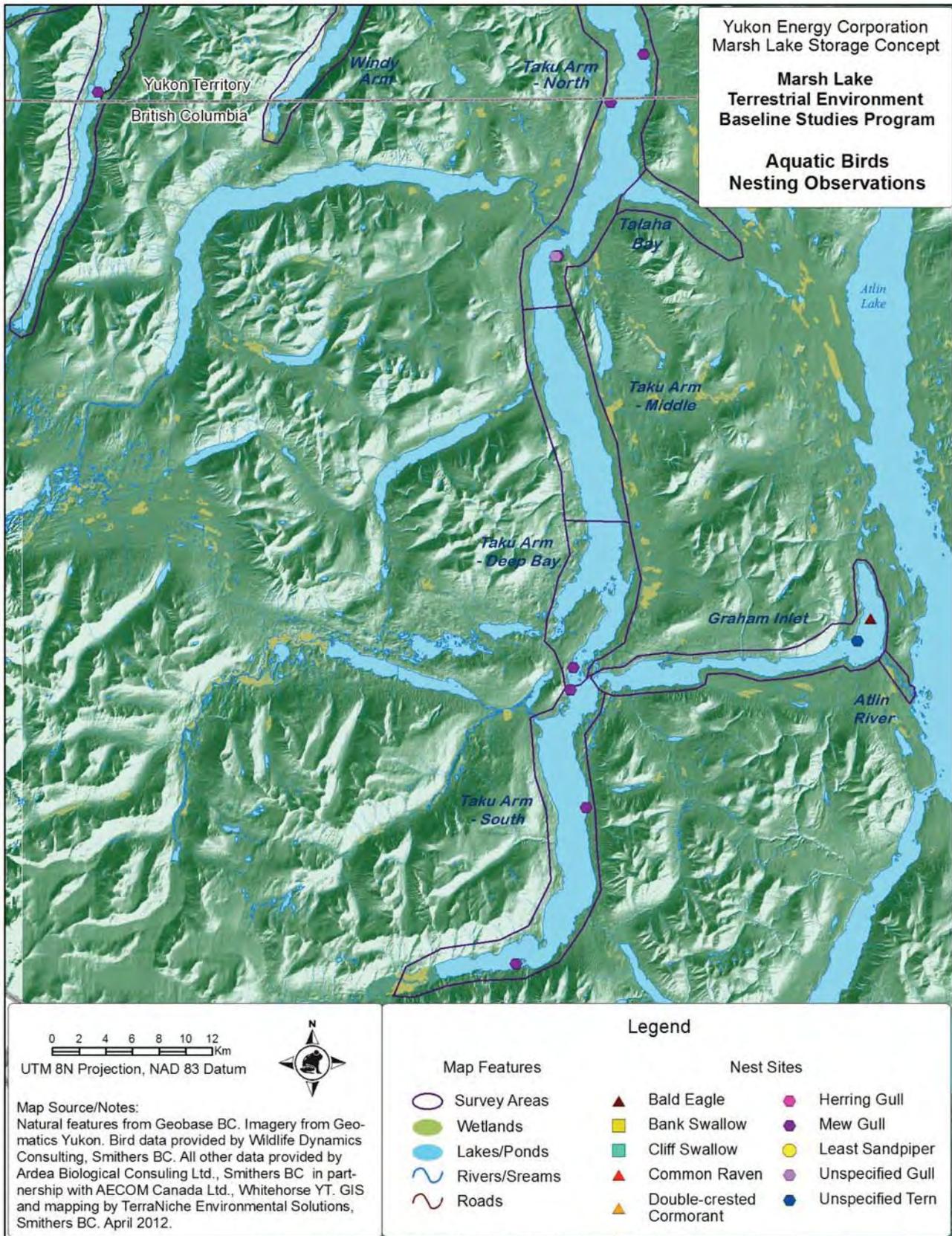


Figure 8. Observations of nests within the southern portion of the Southern Lakes Study Area.



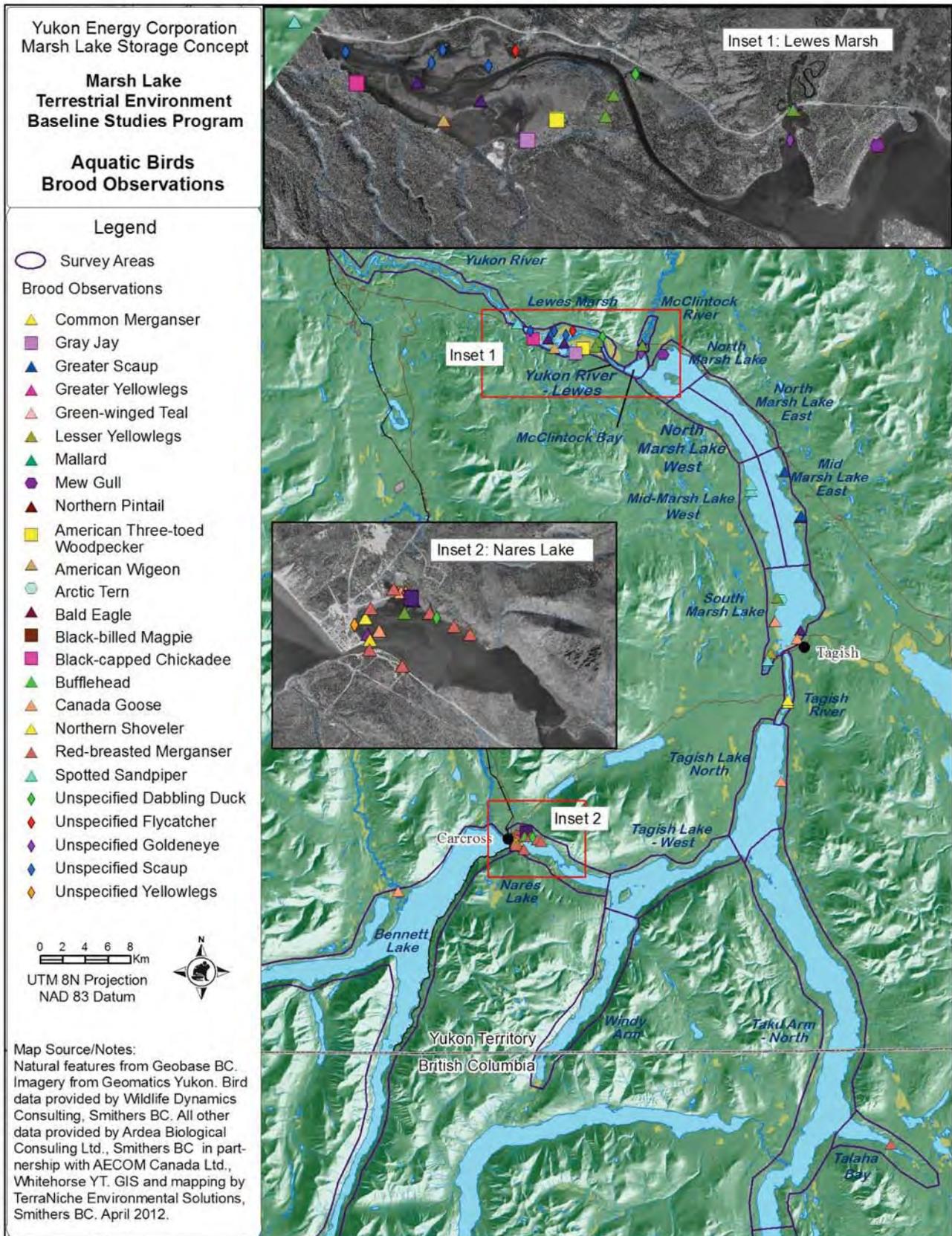


Figure 9. Observations of broods within the Southern Lakes Study Area.



species are known to breed on these rocky islets (Sinclair *et al.* 2003). A total of 28 nest areas consisting of 25 gull colonies and 3 Arctic Tern colonies were identified from the air, primarily in Tagish Lake. Additional evidence of gull breeding was observed in Nares Lake wetland where 2 Mew gull nests were found.

Table 5. Location and number of gull and tern colonies and potential cormorant nest sites observed during 2010 aerial surveys.

Survey Area	Gull Colonies	Tern Colonies	Double Crested Cormorants
Bennett Lake	1		
Graham Inlet	1	1	
Lewes Marsh		1	
North Marsh Lake	1		
North Marsh Lake West	1		
Tagish Lake - North	1		
Tagish Lake - West	4		1
Tagish River	3		
Taku Arm - Deep Bay	1		
Taku Arm - North	7	1	1
Taku Arm - South	3		
Windy Arm	2		
Totals	25	3	2

Waterfowl

Waterfowl species with young (broods) were recorded during the surveys in a number of areas of the Southern Lakes during the June and July surveys. A total of 45 waterfowl broods were observed during the aerial and ground surveys and included evidence of breeding for American Wigeon, Mallard, Green-winged Teal, Northern Pintail, Northern Shoveler, Bufflehead, Scaup spp., Goldeneye spp., Greater Scaup, Canada Goose, Common Merganser, and Red-breasted Merganser (Table 6 and Figure 9).

Table 6. Waterfowl with young observed during 2010 aerial and ground surveys.

Survey Area	Survey Type	Common Name	Survey Date	Group Size	# Young
Bennett Lake	Aerial	Canada Goose	Jun. 8, 2010	7	5
Lewes Marsh	Aerial	Mallard	Jun. 8, 2010	13	12
Lewes Marsh	Aerial	Mallard	Jun. 8, 2010	9	8
Lewes Marsh	Ground	Unknown Dabbling Duck	Jul. 21, 2010	4	3
Lewes Marsh	Ground	Bufflehead	Jul. 21, 2010	5	4
Lewes Marsh	Ground	American Wigeon	Jul. 22, 2010	6	5
Lewes Marsh	Ground	Unknown Scaup	Jul. 22, 2010	3	2
Lewes Marsh	Ground	Unknown Scaup	Jul. 22, 2010	6	5
Lewes Marsh	Ground	Unknown Scaup	Jul. 22, 2010	5	4
Lewes Marsh	Ground	Unknown Scaup	Jul. 22, 2010	3	2
M'Clintock Bay	Aerial	Unknown Goldeneye	Jul. 23, 2010	12	5



Survey Area	Survey Type	Common Name	Survey Date	Group Size	# Young
M'Clintock Bay	Ground	Mallard	Jul. 21, 2010	5	4
M'Clintock Bay	Ground	Unknown Goldeneye	Jul. 21, 2010	5	4
M'Clintock Bay	Ground	Mallard	Jul. 21, 2010	4	3
Mid-Marsh Lake East	Aerial	Greater Scaup	Jul. 23, 2010	7	6
Mid-Marsh Lake East	Aerial	Greater Scaup	Jul. 23, 2010	4	3
Nares Lake	Ground	Northern Pintail	Jul. 19, 2010	9	8
Nares Lake	Ground	Red-breasted Merganser	Jul. 19, 2010	20	19
Nares Lake	Ground	Northern Shoveler	Jul. 19, 2010	4	3
Nares Lake	Ground	Canada Goose	Jul. 19, 2010	28	22
Nares Lake	Ground	Red-breasted Merganser	Jul. 19, 2010	19	18
Nares Lake	Ground	Mallard	Jul. 19, 2010	5	4
Nares Lake	Ground	Red-Breasted Merganser	Jul. 19, 2010	17	16
Nares Lake	Ground	Unknown Dabbling Duck	Jul. 19, 2010	7	6
Nares Lake	Ground	Red-breasted Merganser	Jul. 19, 2010	10	9
Nares Lake	Ground	Red-breasted Merganser	Jul. 19, 2010	6	5
Nares Lake	Ground	Red-breasted Merganser	Jul. 19, 2010	8	7
Nares Lake	Ground	Red-breasted Merganser	Jul. 19, 2010	11	10
Nares Lake	Ground	Canada Goose	Jul. 19, 2010	108	8
Nares Lake	Ground	Red-breasted Merganser	Jul. 19, 2010	15	14
Nares Lake	Ground	Red-breasted Merganser	Jul. 19, 2010	25	24
Nares Lake	Aerial	Canada Goose	Jul. 23, 2010	81	5
Nares Lake	Aerial	Common Merganser	Jul. 23, 2010	15	9
South Marsh Lake	Ground	Mallard	Jul. 20, 2010	6	5
South Marsh Lake	Ground	Green-winged Teal	Jul. 20, 2010	5	4
South Marsh Lake	Ground	Mallard	Jul. 20, 2010	5	4
South Marsh Lake	Aerial	Canada Goose	Jul. 23, 2010	33	6
South Marsh Lake	Aerial	Canada Goose	Jul. 23, 2010	43	27
South Marsh Lake	Aerial	Mallard	Jul. 23, 2010	5	4
Tagish Lake - North	Aerial	Canada Goose	Jul. 23, 2010	49	19
Tagish River	Aerial	Common Merganser	Jul. 23, 2010	19	18
Tagish River	Aerial	Common Merganser	Jul. 23, 2010	4	3
Talaha Bay	Aerial	Red-breasted Merganser	Jul. 23, 2010	9	8

Shorebirds

Evidence of breeding by shorebirds within the Southern Lakes Study Area was primarily obtained from observations of adult and juvenile groups (Table 7 and Figure 9). Evidence of nesting was observed twice, with 2 Least Sandpiper nests found, one at 6 mile wetland and one at Nares Lake wetland, both discovered in early June with eggs in the nest. A suspected Spotted Sandpiper nest, based on adult behaviour was noted in Lewes Marsh was also noted.



Table 7. Shorebirds with young observed during 2010 aerial and ground surveys.

Survey Area	Survey Type	Common Name	Survey Date	Group Size	# Young
Mid-Marsh Lake East	Ground	Spotted Sandpiper	Jul. 23, 2010	3	1
Mid-Marsh Lake East	Ground	Spotted Sandpiper	Jul. 23, 2010	2	1
Nares Lake	Ground	Unknown Yellowlegs	Jul. 19, 2010	3	3
Nares Lake	Ground	Unknown Yellowlegs	Jul. 19, 2010	2	2
South Marsh Lake	Ground	Spotted Sandpiper	Jul. 20, 2010	3	1
South Marsh Lake	Ground	Greater Yellowlegs	Jul. 20, 2010	2	2
South Marsh Lake	Ground	Lesser Yellowlegs	Jul. 20, 2010	4	2
South Marsh Lake	Ground	Spotted Sandpiper	Jul. 20, 2010	3	2
Yukon River	Ground	Spotted Sandpiper	Jul. 21, 2010	2	1

Other Species

Evidence of breeding was noted for a number of other bird species (Figure 9) and included observations of nesting Cliff Swallows on the bridges at the downstream end of Lewes Marsh, at the entrance of Marsh Lake at the Tagish River and at Nares Lake. Bank swallow colonies were noted in sandy cutbanks downstream of the Marsh Lake control structure and along the Tagish River. The only other nesting observation was of a Common Raven nest in the wetlands below the Judas Creek subdivision.

Several bird species were observed with juveniles during the wetland ground surveys in July and included American Three-toed Woodpecker, Black-capped Chickadee, Gray Jay, Black-billed Magpies and an unidentified Flycatcher (Figure 9). An unconfirmed sighting of juvenile Rusty Blackbirds was made at the south end of Marsh Lake.

Predicted Bird Species

Several of the more common birds that have been previously observed within the Southern Lakes Study Area but not observed during the field work in 2010 were added to Appendix B and included duck species such as Blue-winged Teal and Harlequin Duck, which may be expected to breed, or migrate through the Southern Lakes Study Area.

Focal Species Observed

We observed 26 of the 46 (43%) focal species identified as potentially being within the Southern Lakes Study Area (Table 8). Some species such as Horned Grebe, Rusty Blackbird, Short-billed Dowitcher and Tundra Swan are difficult to distinguish between similar species, especially during aerial surveys, and may have been within the Study Area, but were classified as Unknown.

Table 8. Observations of focal species during 2010 aerial and ground surveys.

Species	Observations
Alder Flycatcher	1 heard
American Dipper	Expected
American Golden Plover	40 observed at Monkey Beach in early spring
American Kestrel	1 heard at Lewes Marsh in July
American Widgeon	Common (1599 observed in aerial and ground surveys)
Bank Swallow	Breeding colonies observed on Tagish and Yukon Rivers



Species	Observations
Barn Swallow	Expected
Belted Kingfisher	12 observed/heard around Marsh Lake
Blackpoll Warbler	1 heard
Bohemian Waxwing	30 observed during ground surveys (Possibly more within 162 Unknown Waxwings observed)
Boreal Chickadee	2 heard during ground surveys
Boreal Owl	Expected
Brewer's Sparrow	1 observed at Nares Lake wetland
Bufflehead	Common in Fall (2377 observed during Sept. aerial surveys)
Common Nighthawk	3 observed above Lewes Marsh in July
Double-crested Cormorant	5 observed (1 Taku Arm, 2 Marsh Lake, 2 Tagish Lake)
Golden Eagle	Expected
Greater Yellowlegs	9 observed at in wetlands in Marsh Lake (Possibly more within 145 Unknown Yellowlegs observed)
Gyrfalcon	Expected
Harlequin Duck	Expected
Hooded Merganser	2 observed on Marsh Lake in May aerial survey
Horned Grebe	Expected (Possibly within 12 Unknown Grebe observed)
Lesser Scaup	115 observed in May and June surveys (Possibly more within 739 Unknown Scaup observed)
Long-tailed Duck	Expected
Northern Goshawk	Expected
Northern Pintail	277 observed in aerial and ground surveys
Northern Rough-winged Swallow	Expected
Northern Waterthrush	Expected
Olive-sided Flycatcher	Expected
Osprey	1 observed in fall aerial survey
Pine Grosbeak	Expected
Red-necked Phalarope	Expected
Rusty Blackbird	Expected (Possibly within 54 Unknown Blackbird observed)
Short-billed Dowitcher	Expected (Possibly within 5 Unknown Dowitcher observed)
Snow Goose	20 observed on Marsh Lake in May aerial survey
Spruce Grouse	1 observed during ground surveys
Surf Scoter	148 observed during May to September aerial surveys
Swainson's Thrush	Expected
Trumpeter Swan	211 observed in spring at various locations, 786 observed in fall on Yukon River (Likely additional Trumpeter Swans within 997 Unknown Swans observed)
Tundra Swan	Expected (Likely within 997 Unknown Swan observed)
Varied Thrush	Expected



Species	Observations
White-crowned Sparrow	3 observed/heard
White-winged Scoter	11 birds seen. Tagish and Marsh Lake.
Wilson's Warbler	Expected
Yellow Warbler	1 observed

DISCUSSION

Bird Distribution Patterns During 2010

The location of focal migration stopover sites where birds will spend some time both to rest and to put on enough energy reserves to continue with their journey and breeding habitats are important information for the assessment of potential effects from the proposed Marsh Lake Storage Concept. As well, an understanding of the timing of use by specific bird species is also important as different species will have different timing and habitat needs for feeding, nesting and resting. The following outlines results obtained from the aerial surveys that provide seasonal distribution patterns within the Southern Lakes Study Area for waterfowl and other observed species during 2010.

During the March 24 survey, we surveyed the entire lakes system and found that most of the study area was still ice covered, except for the Yukon River from Whitehorse to Marsh Lake (including parts of Lewes Marsh), the Tagish River (from the Tagish Narrows through to the north end of Tagish Lake), and at Nares/Carcross (Figure 10). Where it was ice-free, several bird species were found, although in relatively low numbers (.). The highest number of birds was seen at Tagish River, followed by M'Clintock Bay and the small area of open water on the Yukon River as it flowed through Lewes Marsh.

In early spring, bird surveys were conducted on April 27, 2010 throughout the Southern Lakes, except at M'Clintock Bay and the north end of Marsh Lake, which were avoided to limit disturbing the large congregations of waterfowl at Swan Haven. Portions of the Study Area had large ice-free sections, although the larger lakes were still ice-covered with thinning ice (Figure 12). The highest bird count was in Tagish Lake with most birds in large flocks (> 100) in ice free areas at the north end of the lake, in an area adjacent to Deep Bay, and at Talaha Bay on the east side of Taku Arm (Figure 13).

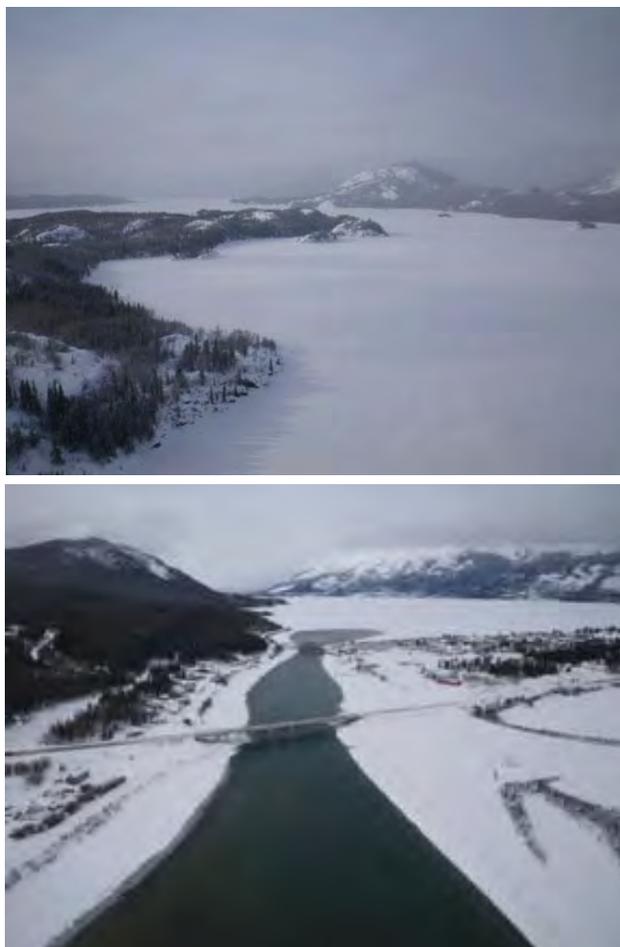


Figure 10. Late winter conditions in the Southern Lakes Study Area on March 24, 2010, showing ice cover on Tagish Lake (Top) and open water at Carcross (Bottom).



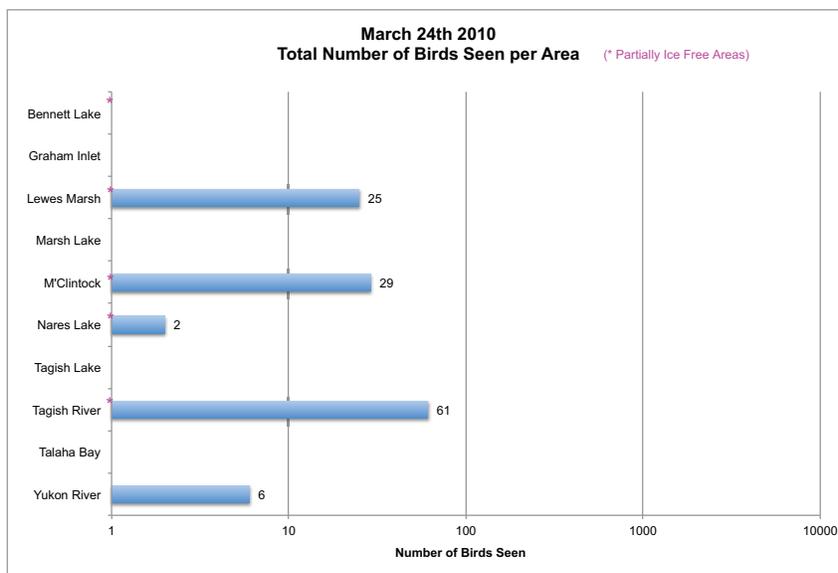


Figure 11. Number of birds seen per survey area on March 24, 2010.

The May 14, 2010 survey found that ice was largely absent from all areas, except for some pans of ice floating on the larger lakes, and we surveyed all of the focal lakes within the study area except Bennett Lake. Results from the survey showed that the largest number of birds were found in wetland and lake shore areas associated with Marsh Lake, Lewes Marsh and Tagish Lakes (Figure 14).

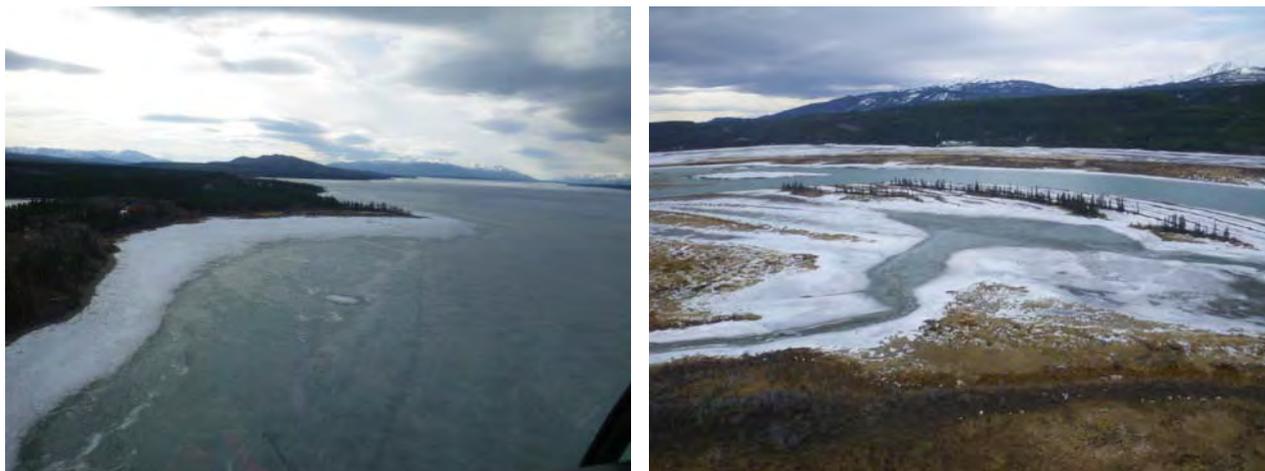


Figure 12. Early spring ice conditions in the Southern Lakes Study Area on April 27, 2010, showing Marsh Lake (Left) and Lewes Marsh (Right).

During the breeding season in late Spring and early Summer (June and July), aerial surveys were focused on areas where the highest number of breeding birds were expected based on the presence of shallow water, wetlands or protected islands that may be expected to provide foraging and breeding opportunities. Overall, the highest numbers of birds were seen on Marsh and Tagish Lakes, Lewes Marsh and Nares Lake (Figure 15 and Figure 16).

Within the fall migration period, Marsh Lake and Lewes Marsh continued to be a focal area for waterfowl in September (Figure 17). In the October survey, birds were distributed throughout the Southern Lakes, including a large number of birds seen on the Yukon River from Marsh Lake-Whitehorse (Figure 18).



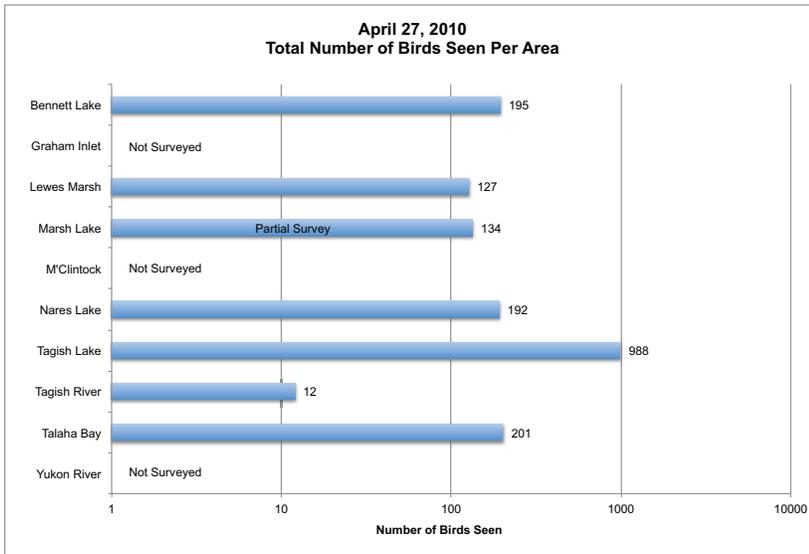


Figure 13. Number of birds seen per survey area on April 27, 2010.

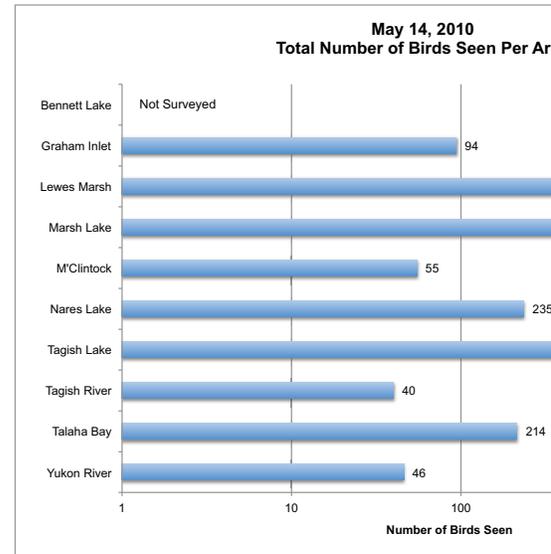


Figure 14. Number of birds seen per survey area on May 14, 2010.

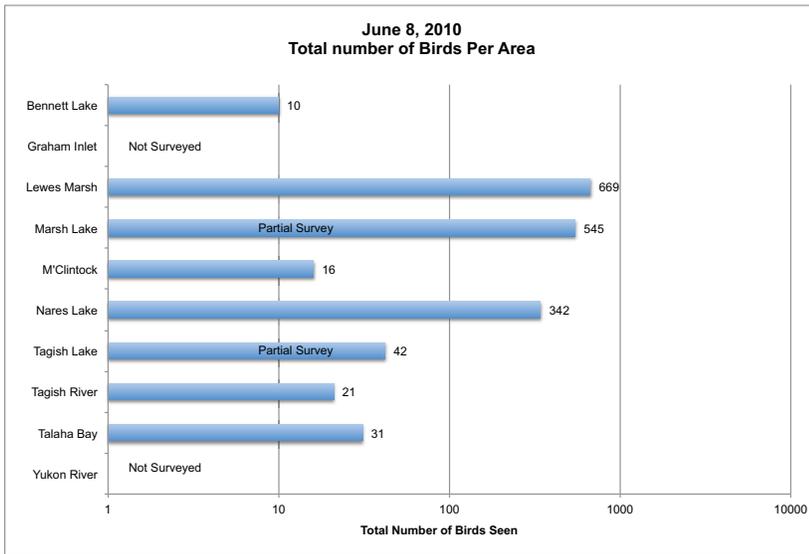


Figure 15. Number of birds seen per survey area on June 8, 2010.

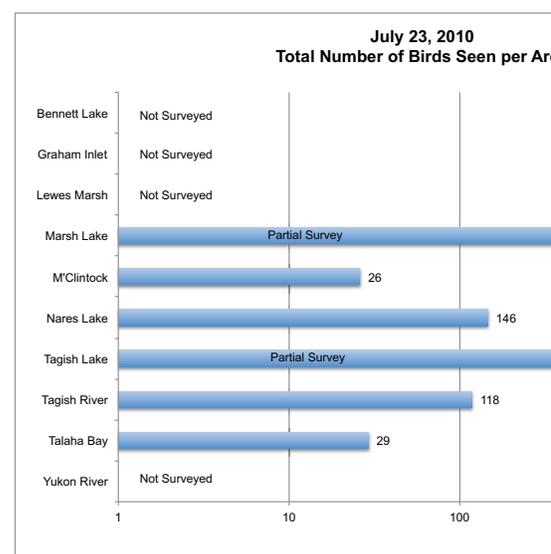


Figure 16. Number of birds seen per survey area on July 23, 2010.



Focal Bird Species Timing and Habitat Use Areas

We reviewed the information obtained on timing and distribution of focal bird species from our aerial and ground-based surveys to better understand habitat use patterns. Our objective was to determine if patterns could be found regarding breeding or feeding habitats that would be helpful in future assessment work.

Lewes Marsh

Waterfowl were the most frequently encountered species group using Lewes Marsh, with a peak in the number of birds seen in spring (May and June) and fall migrations (September and October) (Figure 19). Shorebirds had their highest numbers in May, while gulls and terns were most numerous in June with a flock of Arctic Terns (20-30 birds) observed on an island in the main river channel in May and June. Raptor and other bird species observations were limited throughout the year, although there were 3 bald eagle nests identified in the area, and passerine observations increased significantly during the July ground surveys.

During the nesting season in May and June, ground nesting birds such as Mallard, wigeon, teal, Canada Geese, Arctic Terns and yellowlegs were the most frequently observed (Figure 20). As ground nesting species, nesting sites and egg-laying timing would be important factors for successful breeding due the existing dynamic water levels that occur within the system. It is likely that some years would provide better breeding success than others. It is unknown how 2010 compared to other years for breeding success in Lewes Marsh, although some species were successful. For example, species such as American Wigeon, Mallard and scaup were observed with broods (Table 6), but the proportion of broods compared to the number of

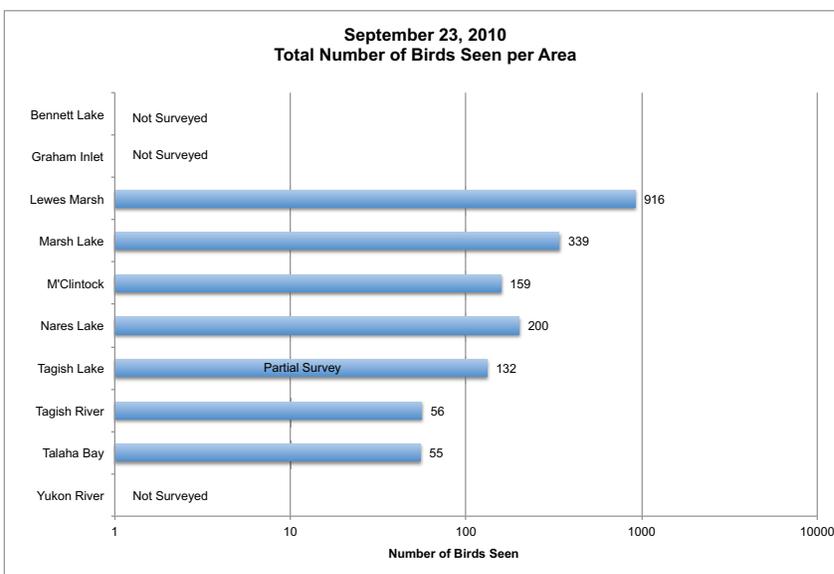


Figure 17. Number of birds seen per survey area on September 23, 2010.

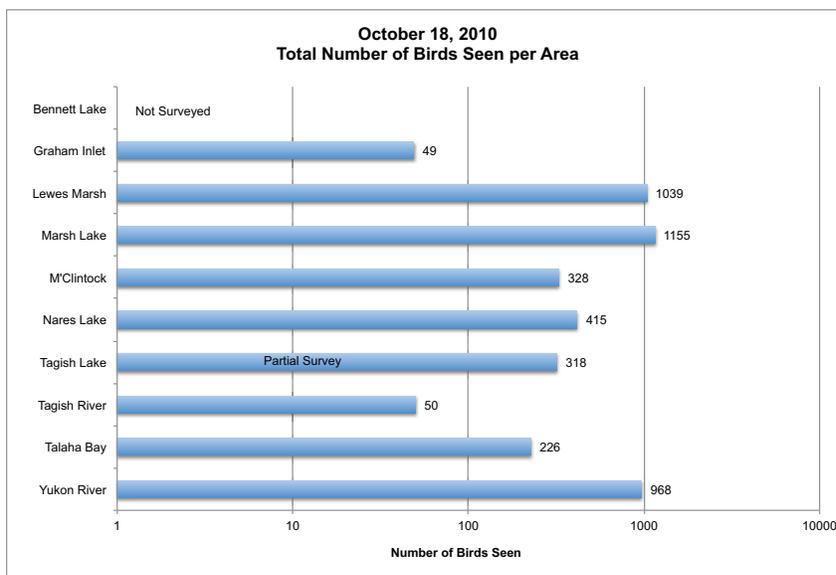


Figure 18. Number of birds seen per survey area on October 18, 2010.



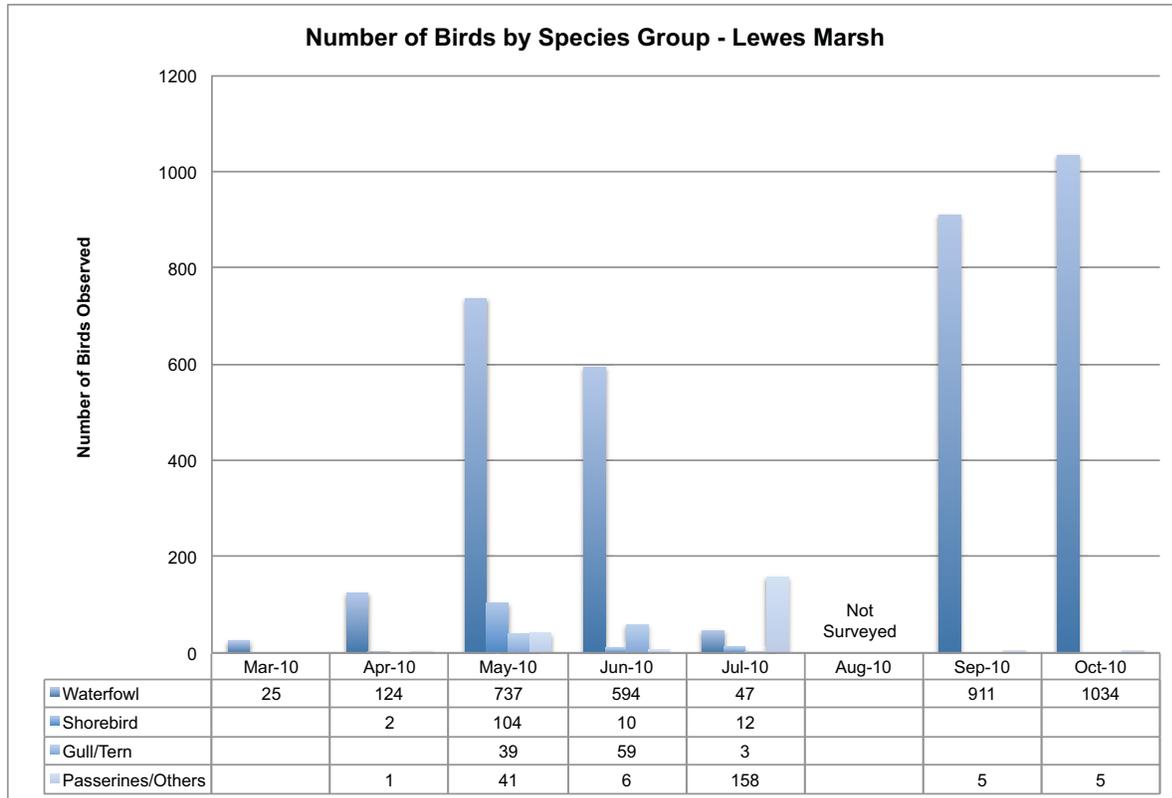


Figure 19. Number of birds observed by species group in Lewes Marsh during 2010.

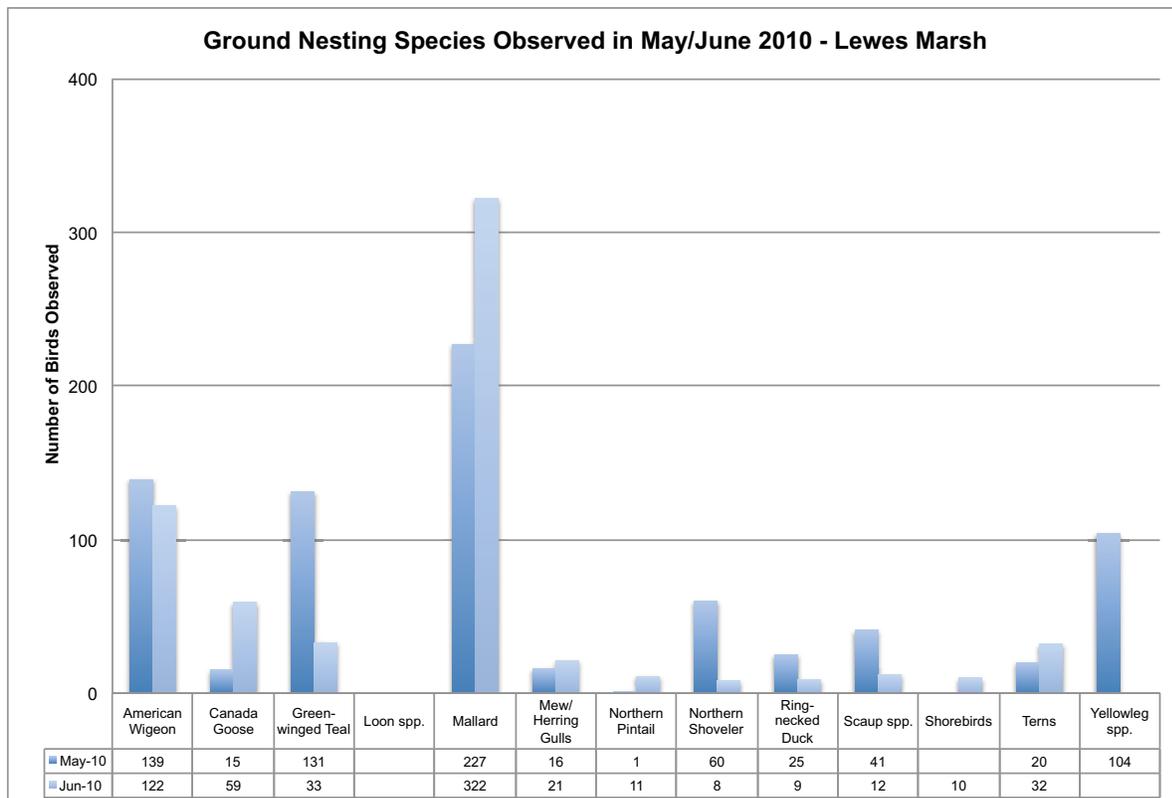


Figure 20. Ground nesting species observed in Lewes Marsh during May and June, 2010.



observed birds was relatively low for American Wigeon (1 brood and 122-139 birds), Green-winged Teal (0 broods and 33-131 birds), and Mallard (2 broods and 227-322 birds), but relatively high for scaup (4 broods and 12-41 birds). For other ground nesting species such as yellowlegs spp., gulls, terns and shorebirds, there was no evidence of broods observed in Lewes Marsh.

During surveys in Lewes Marsh, birds were observed primarily in two main habitat types, within the main river channel or within pond/wetland habitats off of the main channel (Figure 21). Use of pond/wetland habitats peaked in May and was extensive in the fall surveys (September and October). Main river channel use also peaked in May and in the fall, during the spring and fall migrations.

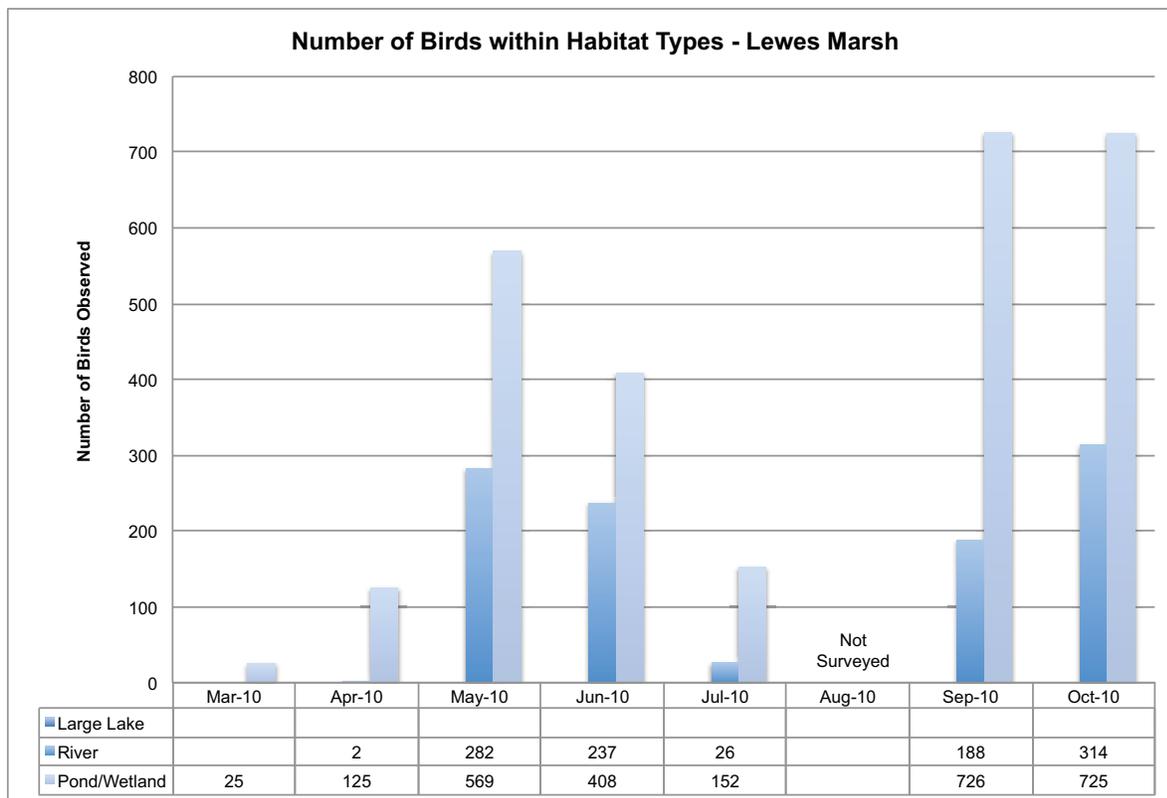


Figure 21. Number of birds observed in main habitat types in Lewes Marsh during 2010.

M'Clintock Bay

Our initial survey in March, 2010 observed 21 swans and goldeneye within the M'Clintock Bay area and we avoided surveying the M'Clintock Bay area during April, to reduce disturbance to the waterfowl feeding and resting there (Figure 22). During our survey in May, we observed over 200 waterfowl and over 200 shorebirds in M'Clintock Bay, along with small numbers of passerines and raptors. Small numbers of waterfowl were observed during the summer, with increasing waterfowl numbers observed in September and October during the fall migration.

Except for a large group of shorebirds observed during ground surveys in May, only a few ground nesting species were seen during May and June within the M'Clintock Bay area (Figure 23). Mallard and American Wigeon were the most common waterfowl seen, although the total numbers were relatively low. Several broods of Mallard and goldeneye were observed in M'Clintock Bay, however, suggesting that breeding did occur in the area (Table 6).

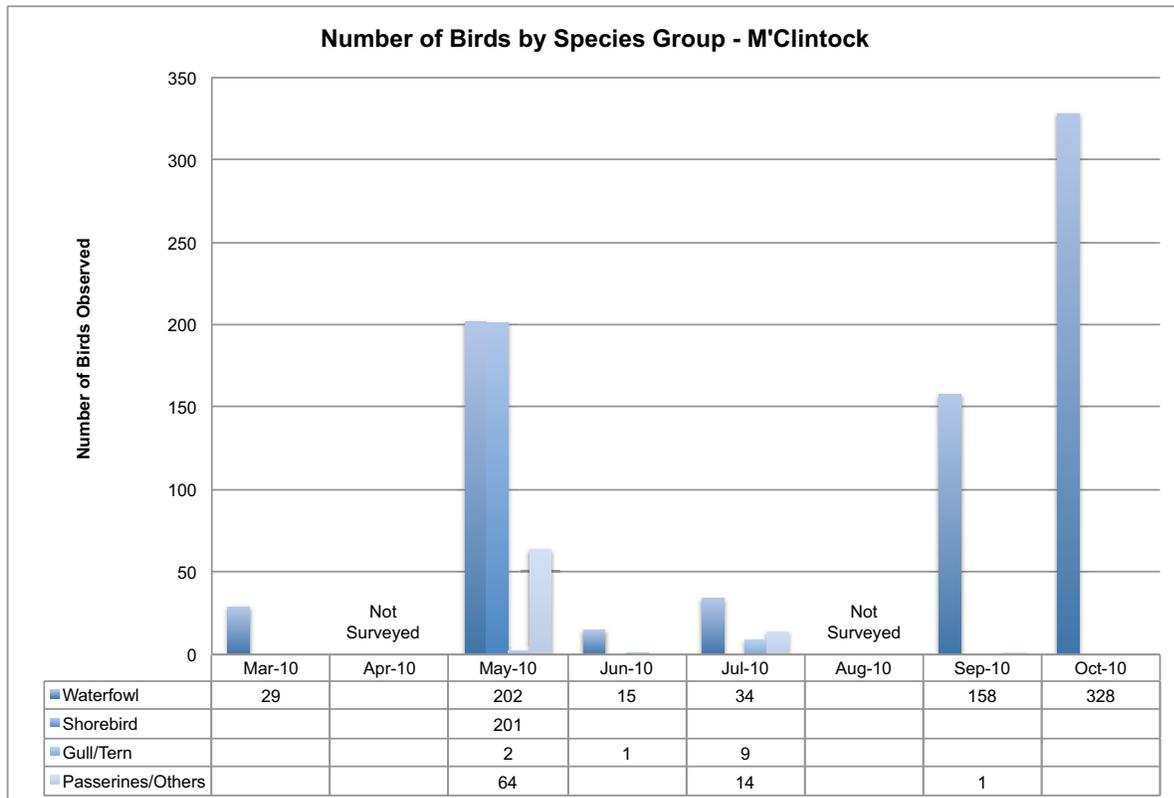


Figure 22. Number of birds observed by species group in M'Clintock Bay area during 2010.

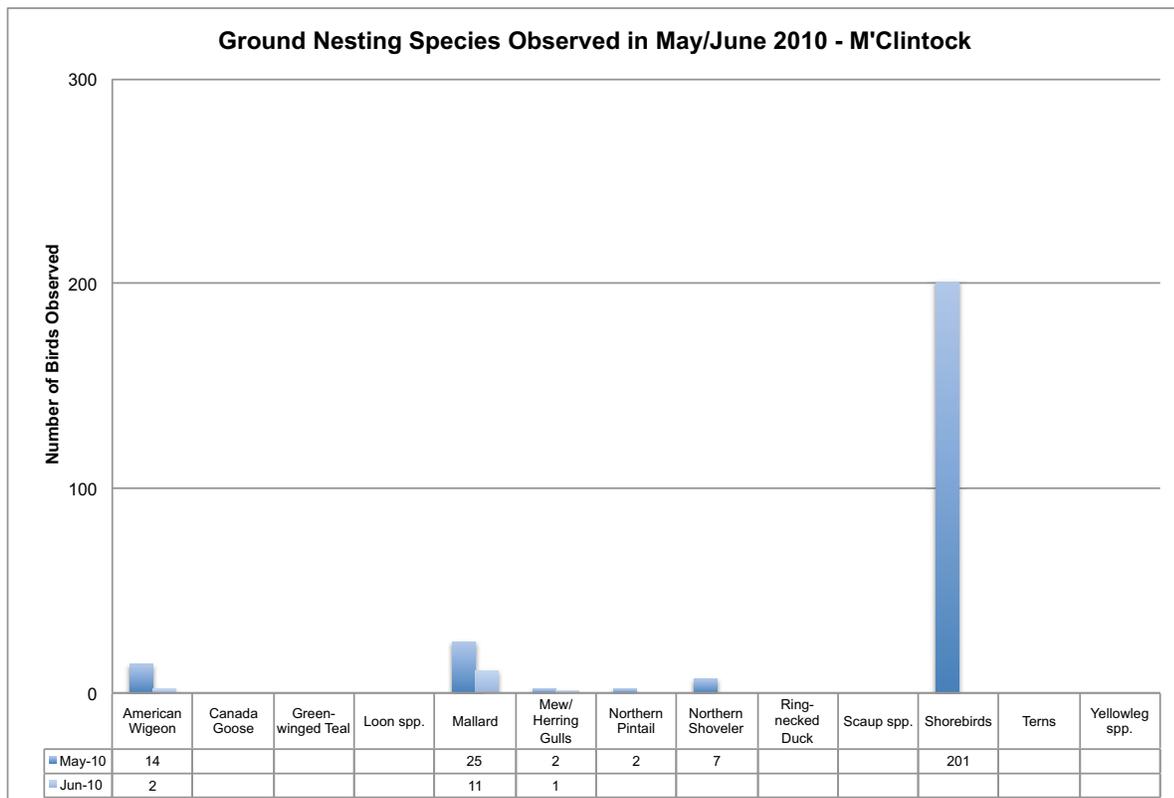


Figure 23. Ground nesting species observed in M'Clintock Bay area during May and June, 2010.



The habitats within the M'Clintock Bay area are limited, with extensive mudflats available at low water levels from March to May, but as water levels rise during June, the area becomes extensive open water. This is reflected in the habitat use patterns observed during the surveys conducted in 2010, where much of the use in March and May was within mudflat and river habitats (Figure 24). In June and July, the limited number of birds observed were using the open water of M'Clintock Bay and M'Clintock River, with increasing numbers of birds using those same habitats into the fall.

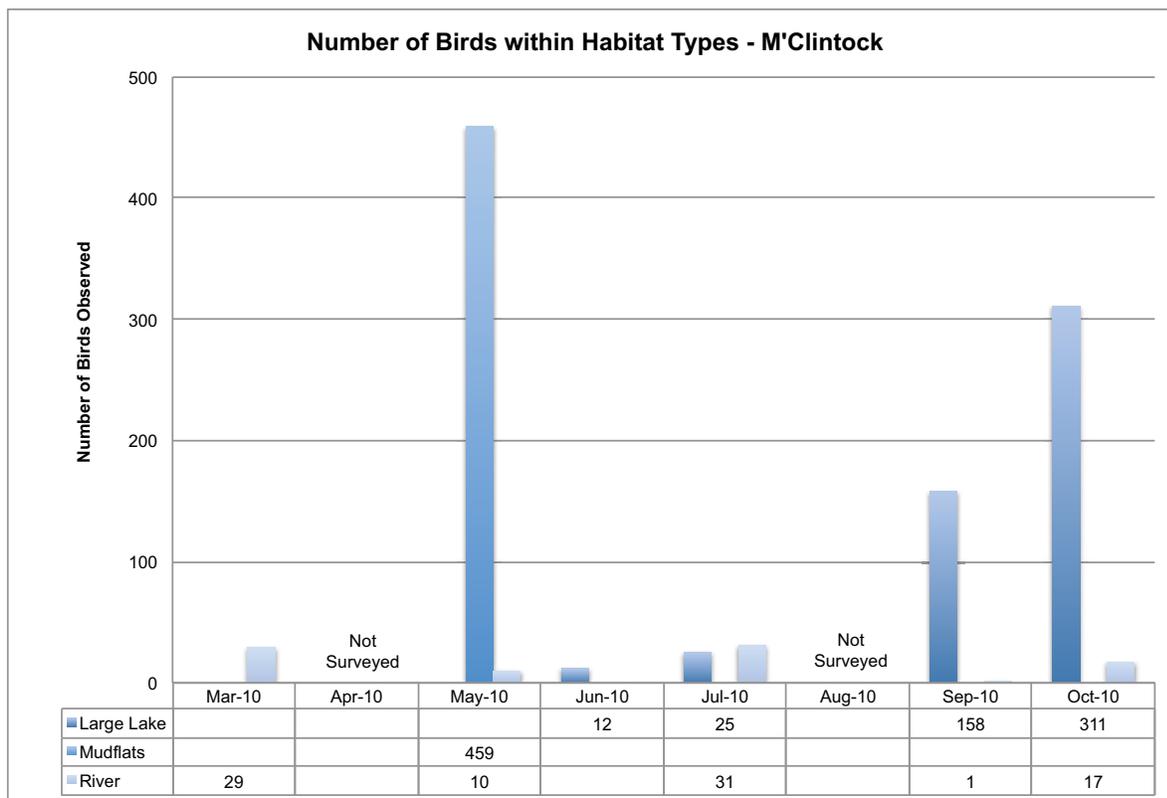


Figure 24. Number of birds observed in main habitat types in M'Clintock Bay area during 2010.

Nares Lake

Waterfowl were the most common species group observed during the surveys conducted at Nares Lake during 2010, with the numbers increasing throughout the spring and into the summer (Figure 25). Large numbers of shorebirds were only observed during May, while the numbers of gulls and terns stayed relatively constant during May and June, with an increase in July. The large number of passerines/other species observed in July was primarily due to approximately 100 Cliff Swallows observed nesting at the Carcross bridge.

A variety of ground nesting waterfowl were observed at Nares Lake during May and June, with large numbers of Mallard and scaup observed in June (Figure 26). Large groups of shorebirds were seen in May, but were likely on migration as they were not observed in large numbers in later surveys in June. Based on observations of broods in July, ground nesting species such as Mallard, Canada Goose, Northern Pintail, and Northern Shoveler were successful in raising young in the area (Table 6). Yellowlegs broods were also observed in July at Nares Lake with 2 groups of 3 and 2 young seen during the ground surveys (Table 7).



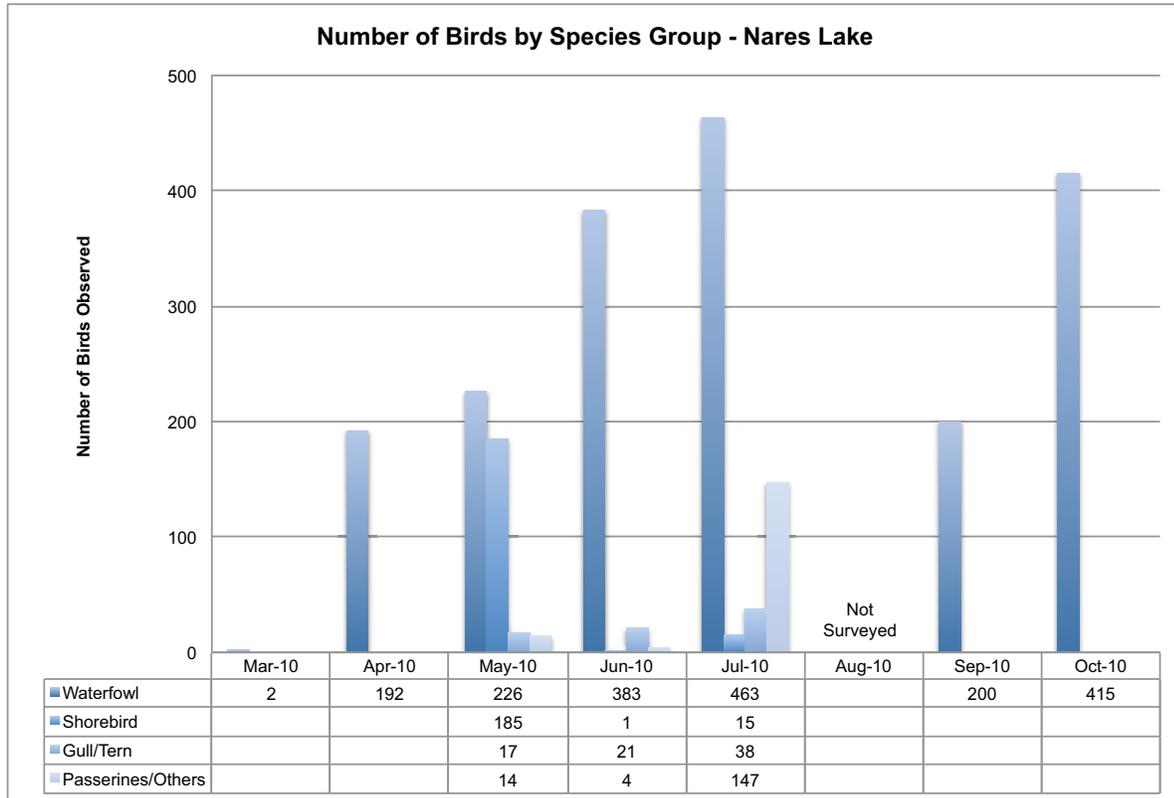


Figure 25. Number of birds observed by species group in Nares Lake during 2010.

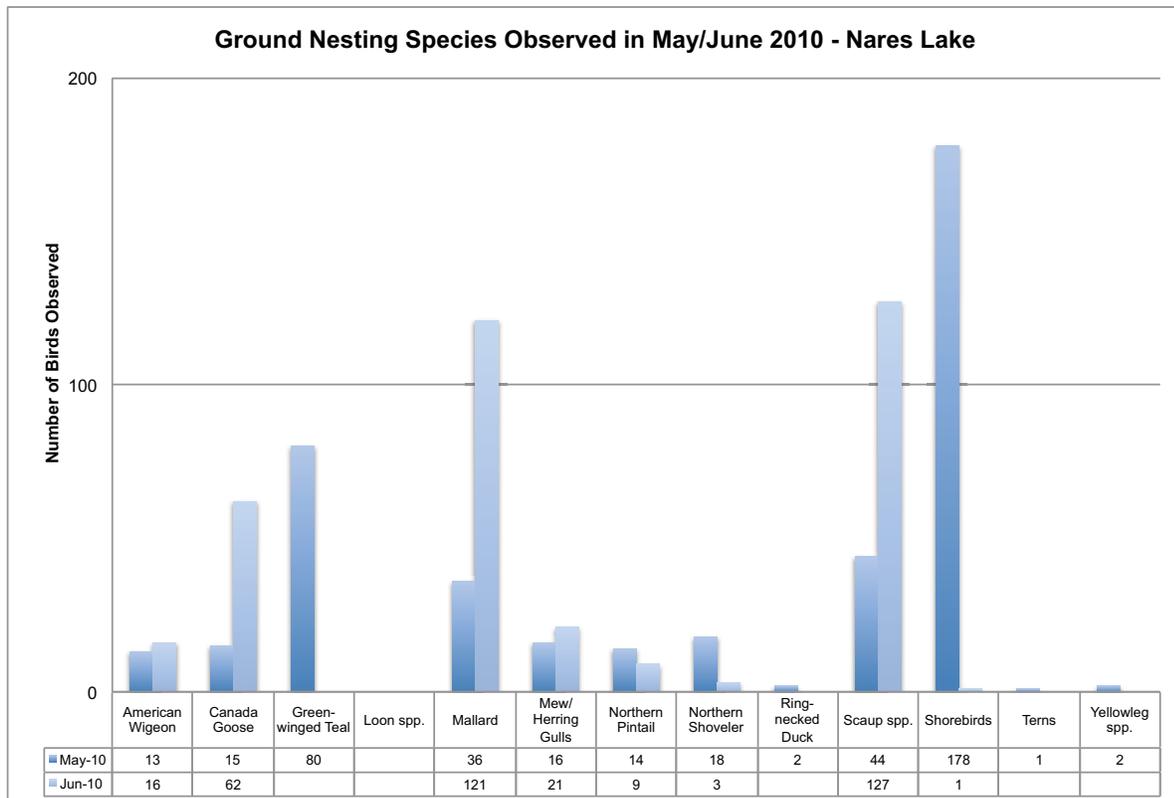


Figure 26. Ground nesting species observed in Nares Lake during May and June, 2010.



Nares Lake provides a range of habitats, including moving and still waters (rivers and ponds), mudflat, sedge fens, shrubs and forested edges. The number of birds using these habitats is varied, with the large open water areas being used throughout the year, but peaking in July (Figure 27). Observations of birds using pond and wetland habitats increased from April to June, falling off in July and into the fall as water levels rose and those habitats became inundated and essentially classed as open water lake habitats. Bird use of river habitats showed a similar pattern, with increased use from May to July, but fewer observations in the fall when water levels were higher and the river essentially became open water lake habitat.

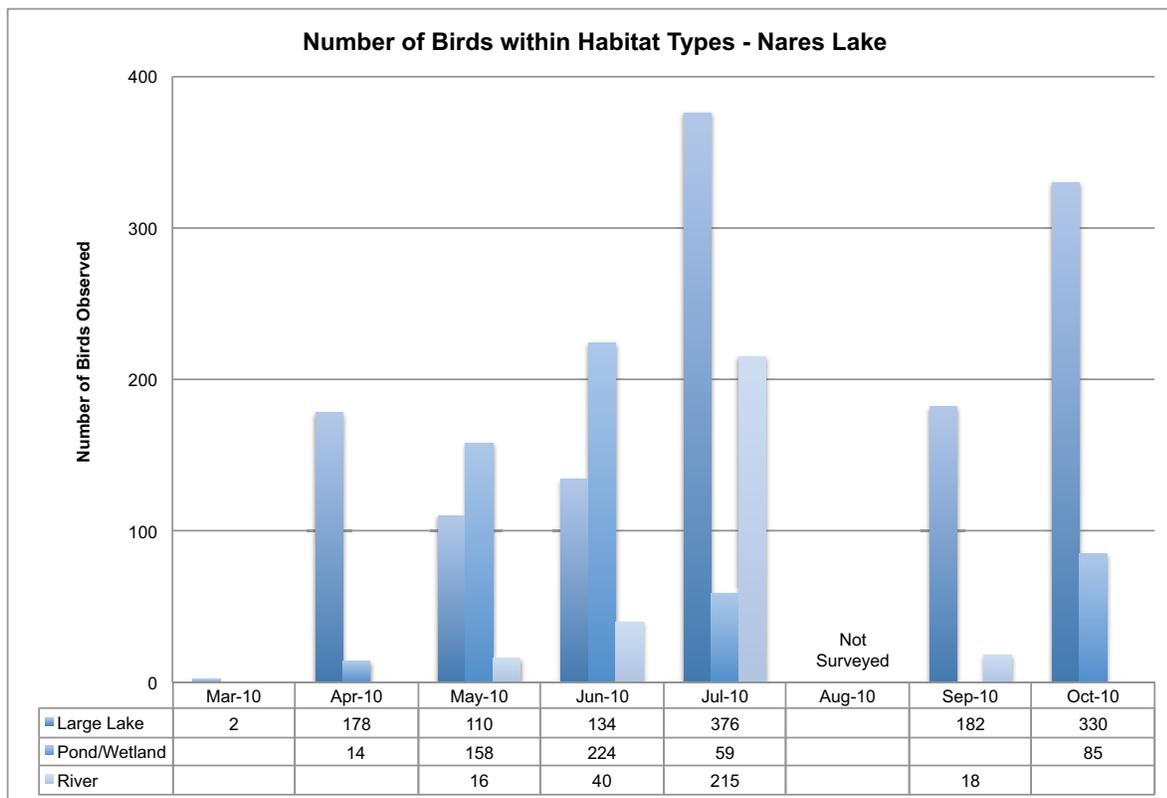


Figure 27. Number of birds observed in main habitat types in Nares Lake during 2010.

Tagish River

Waterfowl were the most common species group observed during surveys conducted at Tagish River during 2010, although gulls and terns numbers increased in the spring and into the summer, along with passerines in July (Figure 28). Gull colonies on the small islands within Tagish River were noted during the surveys from May to July and a colony of at least 40 Bank Swallows was noted along the sandy cutbanks along the west bank at the south end of Tagish River.

There were few ground nesting species observed at Tagish River during May and June, with Mew and Herring Gulls predominating in May and June, and a small number of Canada Geese in May (Figure 29). No observations of broods from the ground nesting birds were noted during July in Tagish River, but we did not conduct ground work near the islets and avoided overflying them or circling to reduce disturbance.

As expected, the majority of observations of birds in the Tagish River area was within river habitats, although gulls and other species were using the Island/Islet habitats within the river (Figure 30).

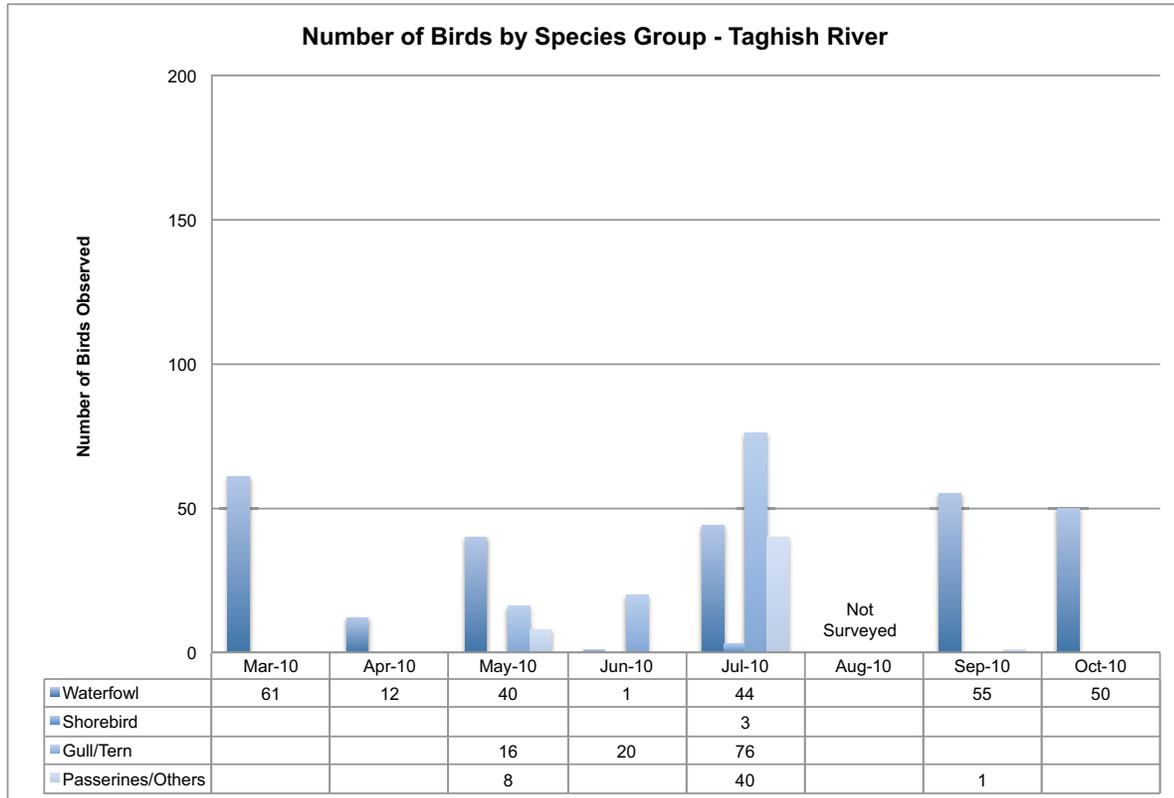


Figure 28. Number of birds observed by species group in Tagish River during 2010.

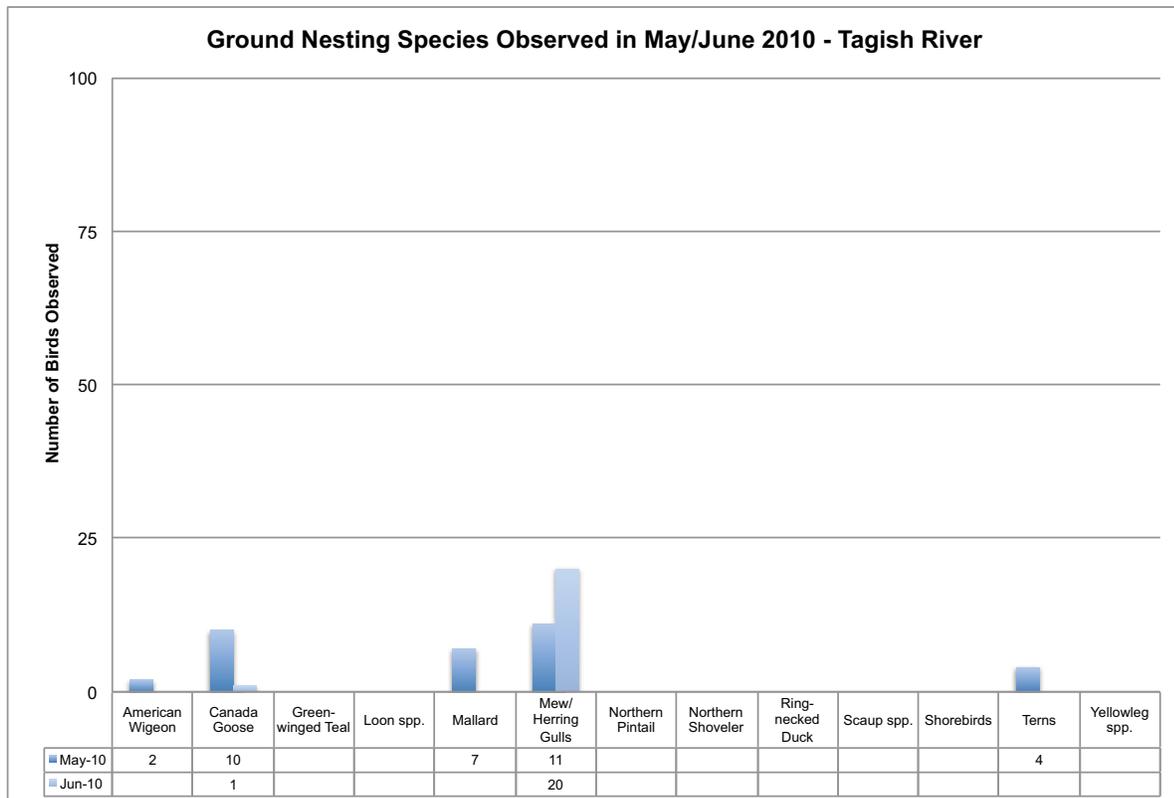


Figure 29. Ground nesting species observed in Tagish River during May and June, 2010.



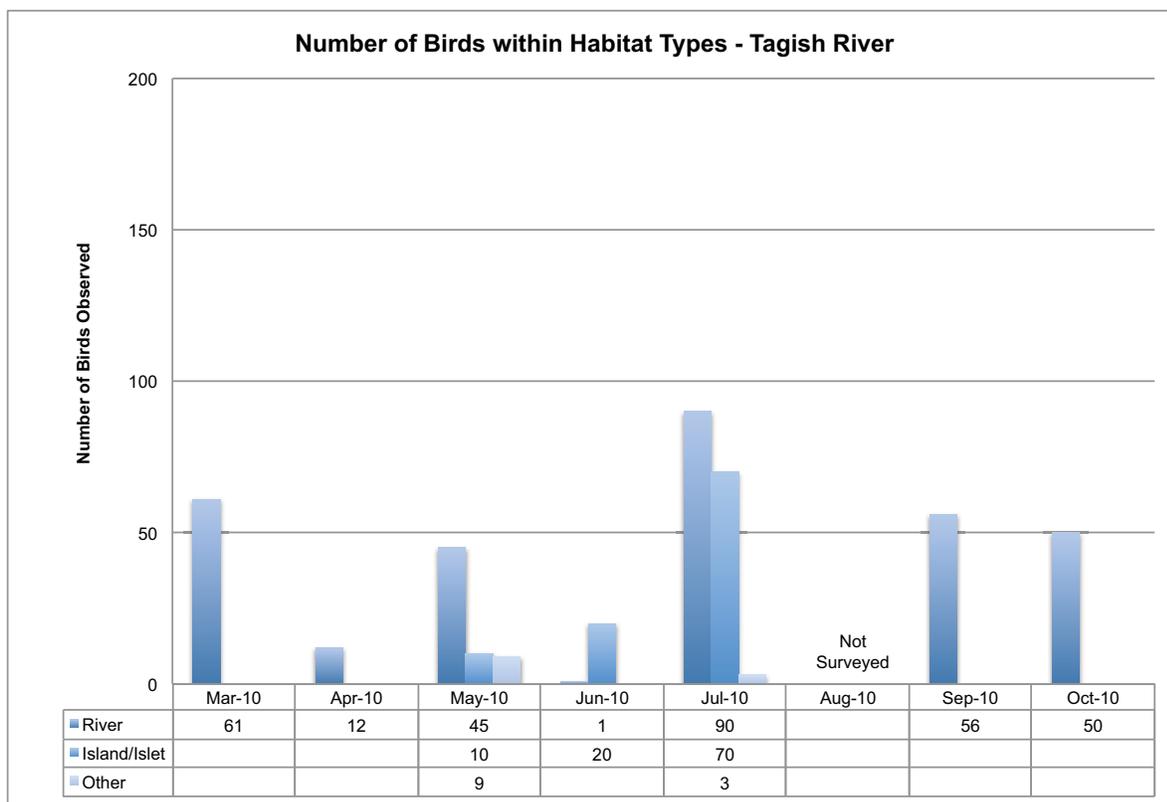


Figure 30. Number of birds observed in main habitat types in Tagish River during 2010.

South Marsh Lake

As in many other areas, waterfowl numbers were greatest during all surveys in the South Marsh Lake area during 2010, although the numbers peaked in May and decreased from June to July and then increased again in September and October (Figure 31). Shorebirds, gulls/terns and passerines/others were primarily only observed in May to July, with large flocks of shorebirds and passerines seen in May and July.

Many of the ground nesting species identified as potentially nesting within the Southern Lakes Study Area were observed within the South Marsh Lake area and included large numbers of American Wigeon, Green-winged Teal, Northern Pintail, Northern Shoveler, and shorebirds, especially in May (Figure 32). The number of Mallards observed increased in June, but species like Northern Pintail, Northern Shoveler and shorebirds decreased significantly. Based on observations of broods in July, ground nesting species such as Mallard, Green-winged Teal, and Canada Goose were successful in raising young in the area (Table 6). Both Lesser and Greater Yellowlegs broods were also observed in July, along with Spotted Sandpiper broods (Table 7).

Within the South Marsh Lake area, several large wetland complexes provide extensive wetland and small pond habitats along with the open water habitats found within Marsh Lake itself. Large numbers of birds were observed within Marsh Lake (Large Lake habitat), with peak numbers occurring during spring migration in May, decreasing through to July and increasing again during September and October (Figure 33). Observations of birds using Pond habitats was greatest in April, when Marsh Lake was still mostly frozen and was high again in July. Wetland habitats were used primarily in May and July, with limited use in May and in October.



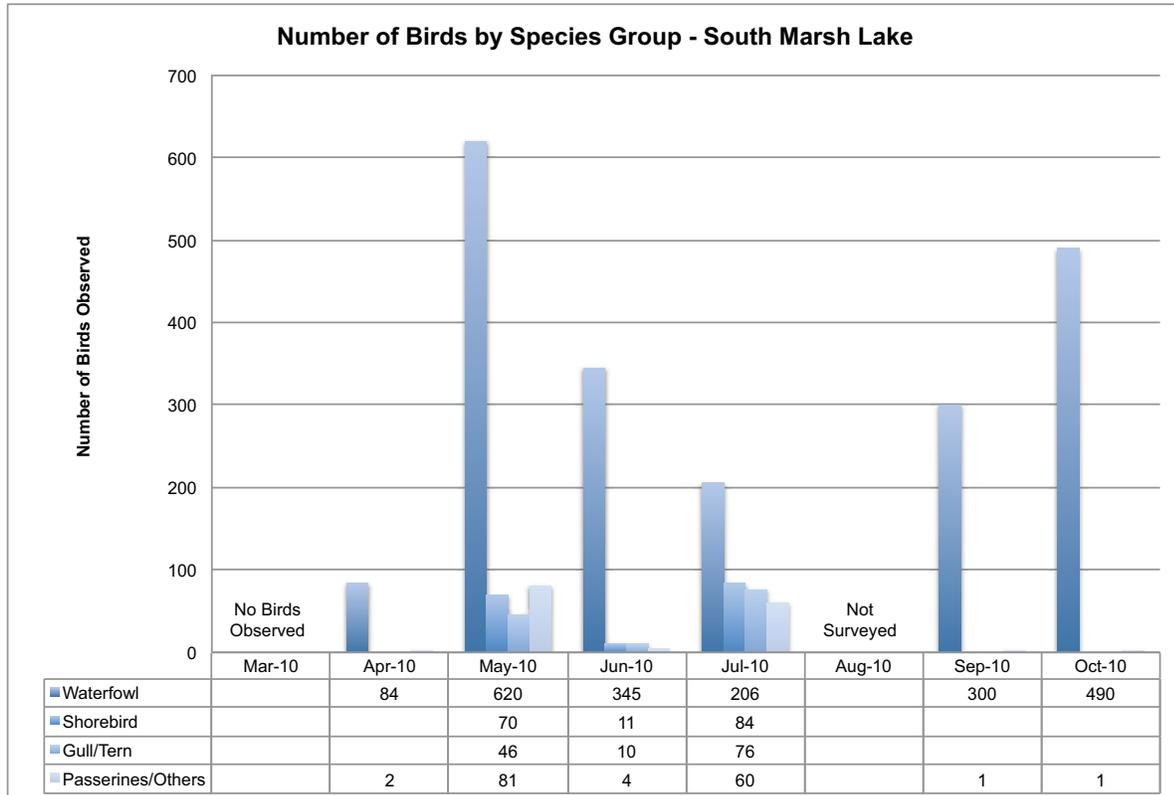


Figure 31. Number of birds observed by species group in South Marsh Lake during 2010.

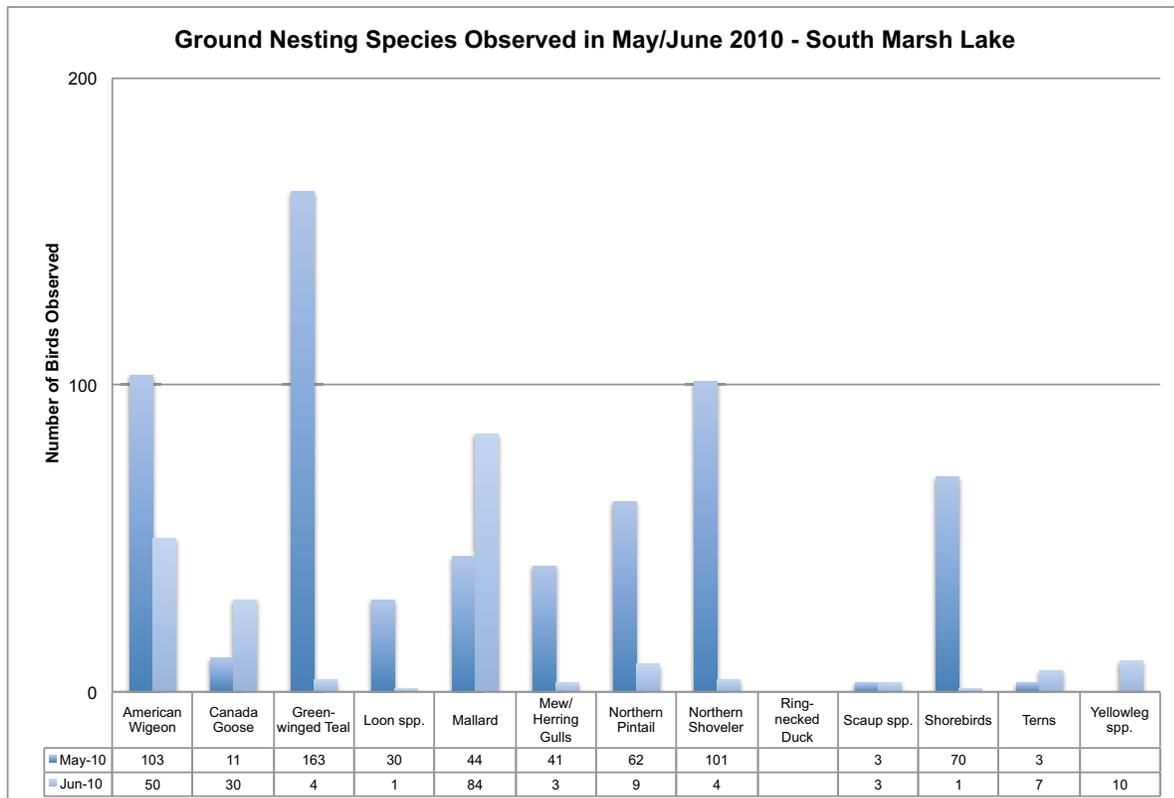


Figure 32. Ground nesting species observed in South Marsh Lake during May and June, 2010.



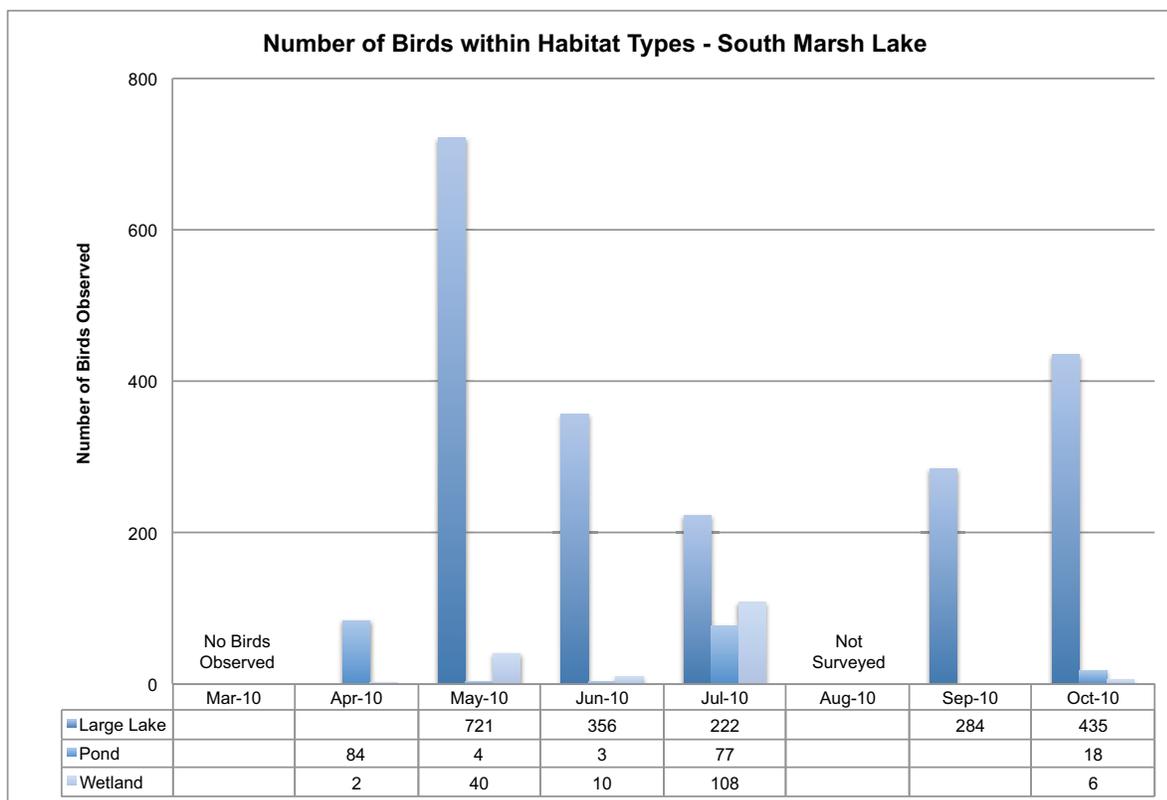


Figure 33. Number of birds observed in main habitat types in South Marsh Lake during 2010.

CONCLUSIONS

A total of 95 identified and 21 unidentified bird species were observed during aerial and ground based surveys conducted within the Southern Lakes Study Area during 2010. Evidence of nesting was obtained for 7 species and successful breeding within the study area was found for 28 species. Several focal waterfowl and shorebird areas were identified (Lewes Marsh, south and west sides of Marsh Lake, M'Clintock Bay, Nares Lake, and Tagish River) all of which support a rich diversity and a large number of birds during spring and fall migration. As well, a number of gull and tern colonies were observed on islands and islets in the study area.

Several species found in the study area are COSEWIC listed or Candidate listing species, and many more are also identified as focal species in northern British Columbia and the Yukon. Of the listed species that were observed or assumed to be within the Southern Lakes Study Area, the Rusty Blackbird (a COSEWIC listed **Species of Concern**) was likely observed at the south end of Marsh Lake and due to its nesting in low shrubs within wetlands, has the potential to be affected by the proposed storage concept. Other COSEWIC listed or candidate species observed within the Southern Lakes Study Area include Common Nighthawk, Bank Swallow, Belted Kingfisher, American Kestrel, Boreal Chickadee and Lesser Scaup. A total of 17 species listed as vertebrates of concern within the Yukon were also observed during the 2010 surveys, along with 6 species listed by the BC Conservation Data Centre (Table 8).

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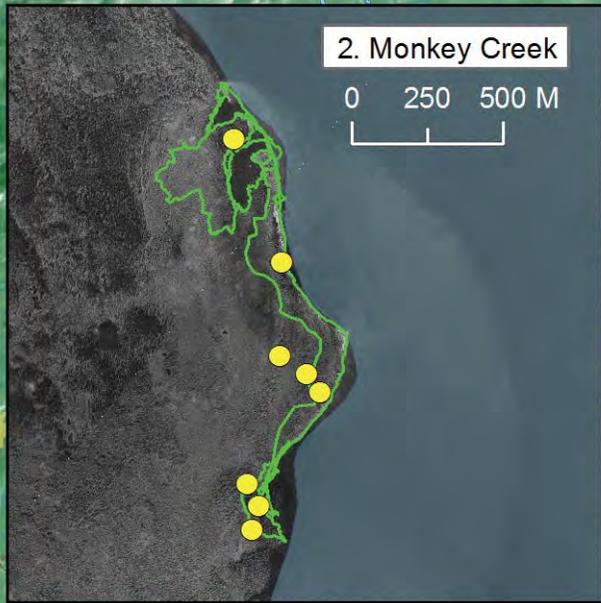
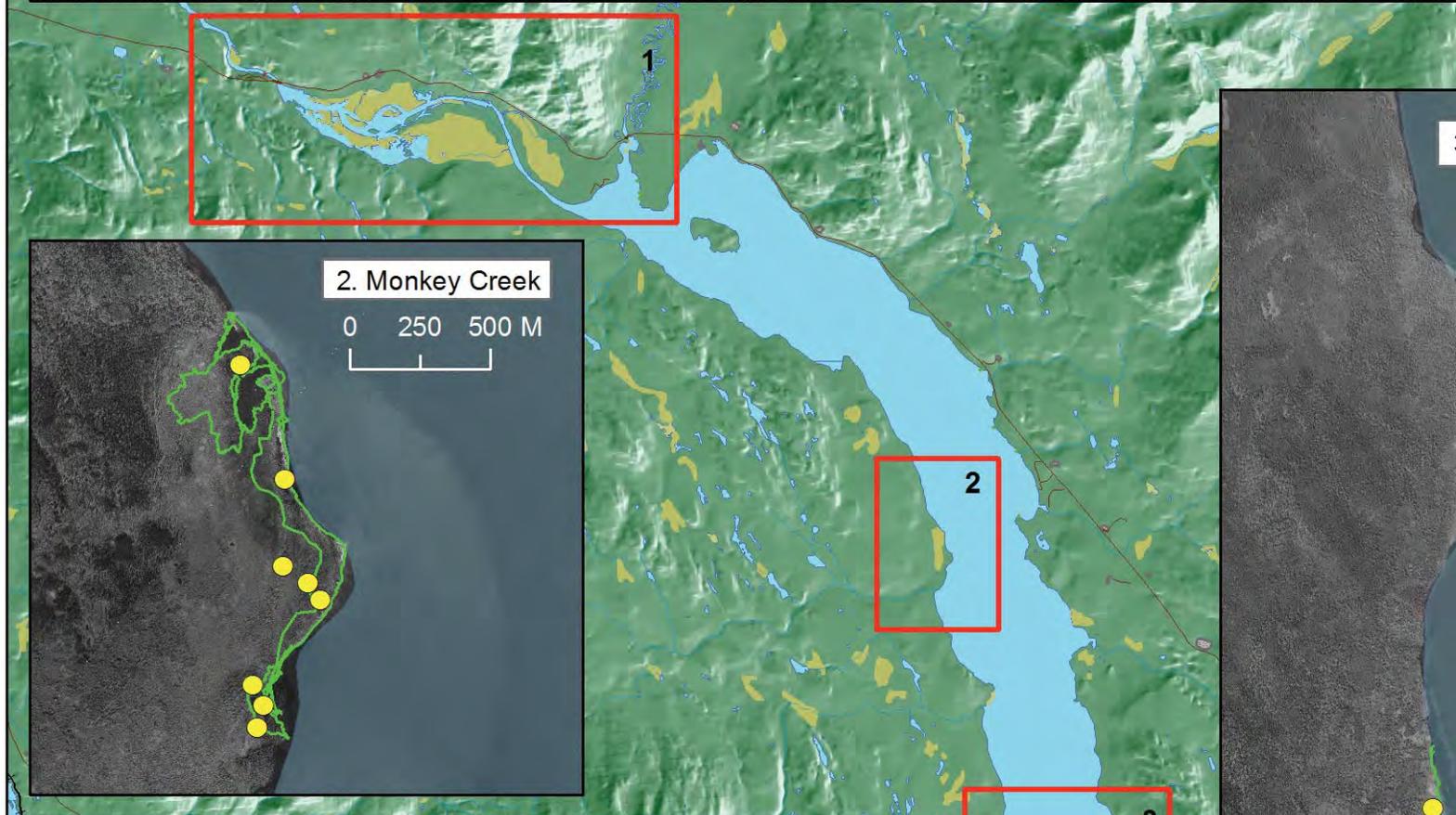
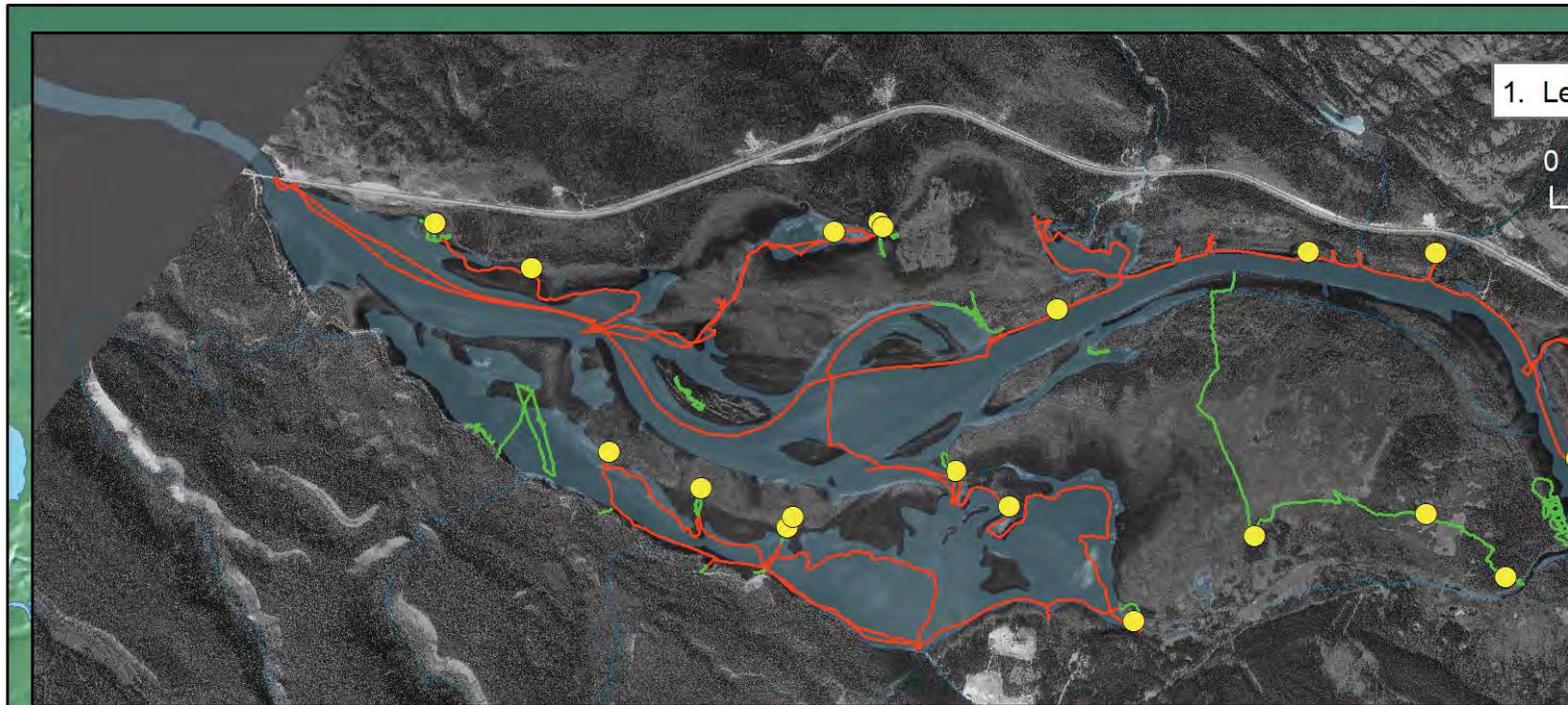
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APPENDIX A: MAP OF GROUND SURVEY LOCATIONS





APPENDIX B: BIRDS DETECTED AND EXPECTED TO BREED IN THE SOUTHERN LAKES STUDY AREA.

Species Detected

Status					
	Known to Breed in the Area		Possibly Migrant Only		
	Potentially Breeding		Status Unknown		
*	Focal Bird Species				
Survey Type					
GBS	Ground Based Survey	AWS	Aerial Waterfowl Surveys		
WHA	Wildlife Habitat Assessments	EXP	Expected but Not Observed		
Common Name	Species Name	Survey Type			
		GBS	WHA	AWS	EXP
Alder Flycatcher*	<i>Empidonax alnorum</i>	X			
American Golden Plover*	<i>Pluvialis dominica</i>	X			
American Kestrel*	<i>Falco sparverius</i>	X			
American Pipit	<i>Anthus rubescens</i>	X			
American Redstart	<i>Setophaga ruticilla</i>				X
American Robin	<i>Turdus migratorius</i>	X	X		
American Three-toed Woodpecker	<i>Picoides tridactylus</i>		X		
American Wigeon	<i>Anas americana</i>	X		X	
Arctic Tern	<i>Sterna paradisaea</i>	X		X	
Bald Eagle	<i>Haliaeetus leucocephalus</i>	X	X	X	
Bank Swallow*	<i>Riparia riparia</i>	X		X	
Barrow's Goldeneye	<i>Bucephala islandica</i>			X	
Belted Kingfisher*	<i>Ceryle alcyon</i>	X		X	
Black Scoter	<i>Melanitta nigra</i>				X
Black-billed Magpie	<i>Pica hudsonia</i>	X			
Black-capped Chickadee	<i>Poecile atricapillus</i>	X			
Blackpoll Warbler*	<i>Dendroica striata</i>	X			
Bohemian Waxwing*	<i>Bombycilla garrulus</i>		X		
Bonaparte's Gull	<i>Larus philadelphia</i>	X		X	
Boreal Chickadee*	<i>Poecile hudsonica</i>	X	X		
Boreal Owl*	<i>Aegolius funereus</i>				X
Bufflehead	<i>Bucephala albeola</i>	X		X	
Canada Goose	<i>Branta canadensis</i>	X	X	X	
Chipping Sparrow	<i>Spizella passerina</i>	X			
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	X			
Common Goldeneye	<i>Bucephala clangula</i>	X		X	
Common Loon	<i>Gavia immer</i>	X		X	
Common Merganser	<i>Mergus merganser</i>	X		X	
Common Nighthawk*	<i>Chordeiles minor</i>	X			
Common Raven	<i>Corvus corax</i>	X			
Common Yellowthroat	<i>Geothlypis trichas</i>	X	X		
Dark-eyed Junco	<i>Junco hyemalis</i>	X			
Double-crested Cormorant	<i>Phalacrocorax auritus</i>			X	



Status					
	Known to Breed in the Area		Possibly Migrant Only		
	Potentially Breeding		Status Unknown		
*	Focal Bird Species				
Survey Type					
GBS	Ground Based Survey	AWS	Aerial Waterfowl Surveys		
WHA	Wildlife Habitat Assessments	EXP	Expected but Not Observed		
Common Name	Species Name	Survey Type			
		GBS	WHA	AWS	EXP
Downy Woodpecker	<i>Picoides pubescens</i>				X
Fox Sparrow	<i>Passerella iliaca</i>	X			
Glaucous Gull	<i>Larus hyperboreus</i>				X
Golden Eagle	<i>Aquila chrysaetos</i>				X
Gray Jay	<i>Perisoreus canadensis</i>	X	X		
Great-horned Owl	<i>Bubo virginianus</i>				X
Greater Scaup	<i>Aythya marila</i>	X		X	
Greater White-fronted Goose	<i>Anser albifrons</i>	X		X	
Greater Yellowlegs	<i>Tringa melanoleuca</i>	X			
Green-winged Teal	<i>Anas crecca</i>	X		X	
Gyr Falcon*	<i>Falco rusticolus</i>				X
Hairy Woodpecker	<i>Picoides villosus</i>				X
Hammond's Flycatcher	<i>Empidonax hammondii</i>	X			
Hermit Thrush	<i>Catharus guttatus</i>				X
Herring Gull	<i>Larus argentatus</i>	X		X	
Hooded Merganser	<i>Lophodytes cucullatus</i>			X	
Killdeer*	<i>Charadrius vociferous</i>	X			
Lapland Longspur	<i>Calcarius lapponicus</i>	X		X	
Least Sandpiper	<i>Calidris minutilla</i>	X			
Lesser Scaup*	<i>Aythya affinis</i>	X		X	
Lesser Yellowlegs	<i>Tringa flavipes</i>	X		X	
Lincoln's Sparrow	<i>Melospiza lincolni</i>	X	X		
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	X			
Long-tailed Duck	<i>Changula hyemalis</i>				X
Mallard	<i>Anas platyrhynchos</i>	X		X	
Merlin	<i>Falco columbarius</i>	X			
Mew Gull	<i>Larus canus</i>	X		X	
Northern Flicker	<i>Colaptes auratus</i>	X			
Northern Goshawk	<i>Accipiter gentilis</i>	X			
Northern Harrier	<i>Circus cyaneus</i>	X	X	X	
Northern Pintail	<i>Anas acuta</i>	X		X	
Northern Shoveler	<i>Anas clypeata</i>	X		X	
Northern Water Thrush*	<i>Seiurus noveboracensis</i>				X
Olive-sided Flycatcher*	<i>Contopus borealis</i>				X
Orange-crowned Warbler	<i>Vermivora celata</i>	X			
Osprey	<i>Pandion haliaetus</i>			X	
Pacific Loon	<i>Gavia pacifica</i>			X	



Status					
	Known to Breed in the Area		Possibly Migrant Only		
	Potentially Breeding		Status Unknown		
*	Focal Bird Species				
Survey Type					
GBS	Ground Based Survey	AWS	Aerial Waterfowl Surveys		
WHA	Wildlife Habitat Assessments	EXP	Expected but Not Observed		
Common Name	Species Name	Survey Type			
		GBS	WHA	AWS	EXP
Pectoral Sandpiper	<i>Calidris melanotos</i>	X			
Pine Grosbeak*	<i>Pinicola enucleator</i>				X
Pine Siskin	<i>Carduelis pinus</i>	X			
Red-breasted Merganser	<i>Mergus serrator</i>	X		X	
Red-breasted Nuthatch	<i>Sitta canadensis</i>	X			
Red-necked Grebe	<i>Podiceps grisegena</i>			X	
Red-necked Phalarope*	<i>Phalaropus lobatus</i>				X
Red-tailed Hawk	<i>Buteo jamaicensis</i>			X	
Red-throated Loon	<i>Gavia stellata</i>				X
Ring-necked Duck	<i>Aythya collaris</i>	X		X	
Ruby-crowned Kinglet	<i>Regulus calendula</i>	X			
Ruffed Grouse	<i>Bonasa umbellus</i>		X		
Rusty Blackbird*	<i>Euphagus carolinus</i>				X
Sandhill Crane	<i>Grus canadensis</i>	X		X	
Savannah Sparrow	<i>Passerculus sandwichensis</i>	X			
Semipalmated Plover	<i>Charadrius semipalmatus</i>	X			
Semipalmated Sandpiper	<i>Calidris pusilla</i>	X			
Short-billed Dowitcher*	<i>Limnodromus griseus</i>				X
Snow Bunting	<i>Plectrophenax nivalis</i>			X	
Snow Goose	<i>Dendragapus fuliginosus</i>			X	
Solitary Sandpiper	<i>Tringa solitaria</i>	X			
Song Sparrow	<i>Melospiza melodia</i>	X			
Sora	<i>Porzana carolina</i>	X			
Spotted Sandpiper	<i>Actitis macularia</i>	X	X	X	
Spruce Grouse*	<i>Dendroica canadensis</i>		X		
Surf Scoter*	<i>Melanitta perspicillata</i>			X	
Swainson's Thrush*	<i>Catharus ustulatus</i>				X
Tree Swallow	<i>Tachycineta bicolor</i>	X			
Trumpeter Swan	<i>Cygnus buccinator</i>			X	
Tundra Swan*	<i>Cygnus colombianus</i>				X
Unspecified Blackbird	Order Passeriformes	X		X	
Unspecified Dabbling Duck	Order Anseriformes	X		X	
Unspecified Diving Duck	Order Anseriformes			X	
Unspecified Dowitcher	Order Charadriiformes	X			
Unspecified Flycatcher	Order Passeriformes	X			
Unspecified Goldeneye	Order Anseriformes	X		X	
Unspecified Grebe	Order Podicipediformes			X	



Status					
	Known to Breed in the Area		Possibly Migrant Only		
	Potentially Breeding		Status Unknown		
*	Focal Bird Species				
Survey Type					
GBS	Ground Based Survey	AWS	Aerial Waterfowl Surveys		
WHA	Wildlife Habitat Assessments	EXP	Expected but Not Observed		
Common Name	Species Name	Survey Type			
		GBS	WHA	AWS	EXP
Unspecified Grouse	<i>Order Galliformes</i>		X		
Unspecified Gull	<i>Order Charadriiformes</i>	X		X	
Unspecified Longspur	<i>Order Passeriformes</i>			X	
Unspecified Loon	<i>Order Gaviiformes</i>			X	
Unspecified Merganser	<i>Order Ansiriformes</i>	X		X	
Unspecified Scaup	<i>Order Ansiriformes</i>	X		X	
Unspecified Scoter	<i>Order Ansiriformes</i>			X	
Unspecified Shorebird	<i>Order Charadriiformes</i>	X		X	
Unspecified Sparrow	<i>Order Passeriformes</i>	X			
Unspecified Swan	<i>Order Ansiriformes</i>	X		X	
Unspecified Tern	<i>Order Charadriiformes</i>	X		X	
Unspecified Waxwing	<i>Order Passeriformes</i>	X			
Unspecified Yellowlegs	<i>Order Charadriiformes</i>	X		X	
Varied Thrush*	<i>Ixoreus naevius</i>				X
Violet-green Swallow	<i>Tachycineta thalassina</i>	X			
Warbling Vireo	<i>Vireo gilvus</i>				X
Western Wood-pewee	<i>Contopus sordidulus</i>	X	X		
White-crowned Sparrow*	<i>Zonotrichia leucophrys</i>	X			
White-winged Crossbill*	<i>Loxia leucoptera</i>	X	X		
White-winged Scoter	<i>Melanitta fusca</i>			X	
Wilson's Snipe*	<i>Gallinago gallinago</i>	X	X	X	
Wilson's Warbler	<i>Wilsonia pusilla</i>				X
Winter Wren	<i>Troglodytes troglodytes</i>				X
Yellow Warbler*	<i>Dendroica petechia</i>	X			
Yellow-rumped Warbler	<i>Dendroica coronata</i>	X			



APPENDIX C: PRIMARY HABITAT ASSOCIATIONS OF SPECIES IN THE SOUTHERN LAKES STUDY AREA.

Bird Name	Migrant (M) or known Breeder (B) in the Area*	Primary Habitat Associations			
		Lake	River	Riparian	Wetland
American Wigeon	B	X			X
Arctic Tern	B	X			
Bald Eagle	B	X	X		X
Bank Swallow	B		X		
Barrow's Goldeneye	B	X	X	X	X
Belted Kingfisher	B	X	X		X
Black Scoter	M	X			
Blackpoll Warbler	B			X	
Bonaparte's Gull	B	X			X
Bufflehead	B	X			X
Canada Goose	B	X			X
Common Goldeneye	B	X	X	X	X
Common Loon	B	X			
Common Merganser	B	X	X		
Common Yellowthroat	B			X	X
Downy Woodpecker	B			X	X
Great Yellowlegs	B	X			X
Green-winged Teal	B	X	X		X
Hermit Thrush	B			X	
Herring Gull	B	X			
Killdeer	B	X			X
Least Sandpiper	M	X			X
Lesser Scaup	B	X			X
Lesser Yellowlegs	B				X
Lincoln's Sparrow	B			X	X
Long-tailed Duck	M	X			
Mallard	B	X	X		X
Mew Gull	B	X			
Northern Pintail	B	X			X
Northern Shoveler	B				X
Northern Waterthrush	B			X	
Orange-crowned Warbler	B			X	X
Osprey	B	X			
Pacific Loon	B	X			



Bird Name	Migrant (M) or known Breeder (B) in the Area*	Primary Habitat Associations			
		Lake	River	Riparian	Wetland
Red-breasted Merganser	B	X	X		
Red-necked Grebe	B	X			X
Red-throated Loon	M	X			
Ring-necked Duck	B	X			X
Rusty Blackbird	B				X
Savannah Sparrow	B				X
Semipalmated Plover	M	X			X
Solitary Sandpiper	B		X	X	
Sora	B				X
Song Sparrow	B			X	X
Spotted Sandpiper	B	X			
Surf Scoter	M	X			
Swainson Thrush	B			X	
Trumpeter Swans	M	X			X
Tundra Swans	M	X			X
Unspecified Dowitcher	M	X			
Unspecified Phalarope	M	X			X
White-winged Surf Scoter	B	X			
Wilson's Snipe	B				X
Wilson's Warbler	B			X	X
Yellow Warbler	B			X	X
Yellow-rumped Warbler	B			X	X
Total # of Species	M = 10, B = 46	36	10	16	35

