Keeyask Generation Project

Terrestrial Effects Monitoring Plan

Colonial Waterbird Habitat Effects Monitoring Report

TEMP-2020-14

KEEYASK

Manitoba Conservation and Climate Client File 5550.00
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2019 -2020

KEEYASK GENERATION PROJECT

TERRESTRIAL EFFECTS MONITORING PLAN

REPORT #TEMP-2020-14

COLONIAL WATERBIRD HABITAT EFFECTS MONITORING 2019

Prepared for

Manitoba Hydro

By

Wildlife Resource Consulting Service MB Inc.

June 2020

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SUMMARY

Background

Construction of the Keeyask Generation Project (the Project) at Gull Rapids began in July 2014. The Keeyask Hydropower Limited Partnership (KHLP) was required to prepare a plan to monitor the effects of construction and operation of the generating station on the terrestrial environment. Monitoring results will help the KHLP, government regulators, members of local First Nation communities, and the general public understand how construction and operation of the generating station are affecting the environment, and whether or not more needs to be done to reduce harmful effects.

This report describes the results of colonial waterbird (gulls and terns) habitat effects monitoring conducted during the summer of 2019, the sixth summer of Project construction.

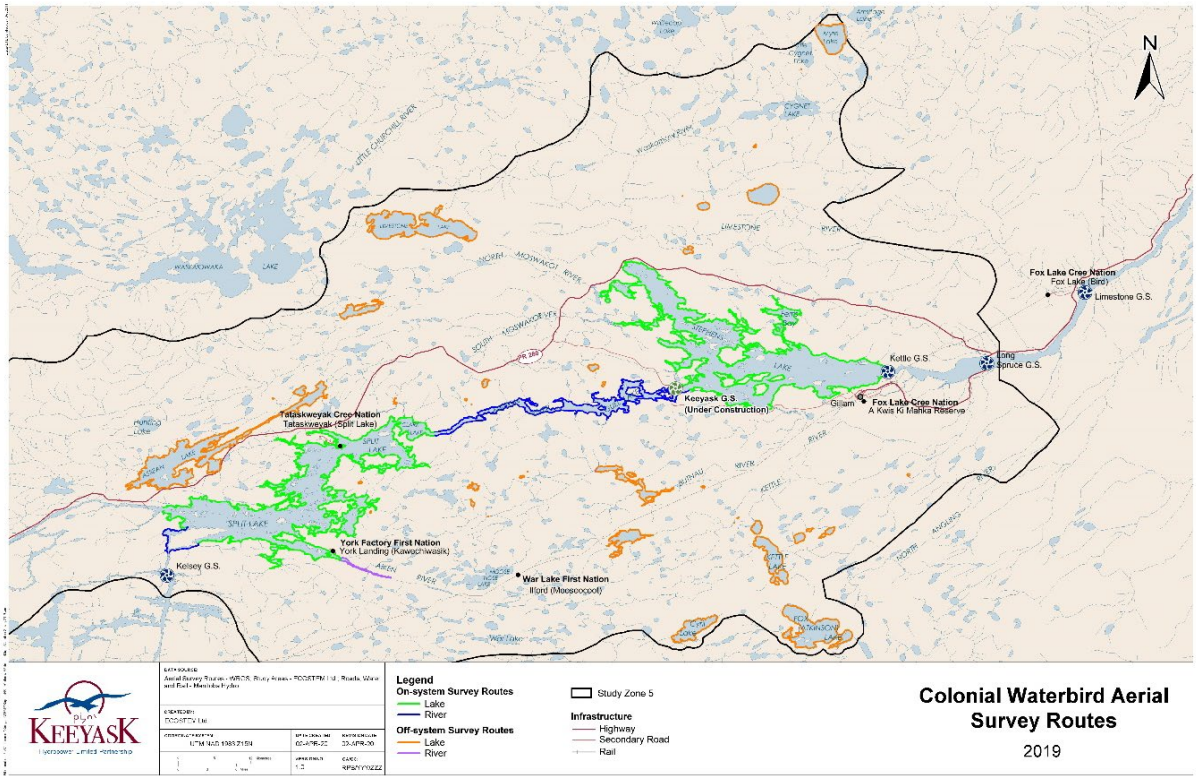
Why is the study being done?

Three species of colonial waterbirds - ring-billed gull, herring gull, and common tern - commonly nest on rocky islands and reefs in the Nelson River near the Project site. Previous surveys conducted between 2001 and 2018 have counted between 1,900-6,200 gulls and 10-200 common terns in the Gull Rapids area. Other colonial waterbirds that have been observed in the region include herring gull, Bonaparte's gull, Caspian tern, American white pelican, black tern, and double-crested cormorant.

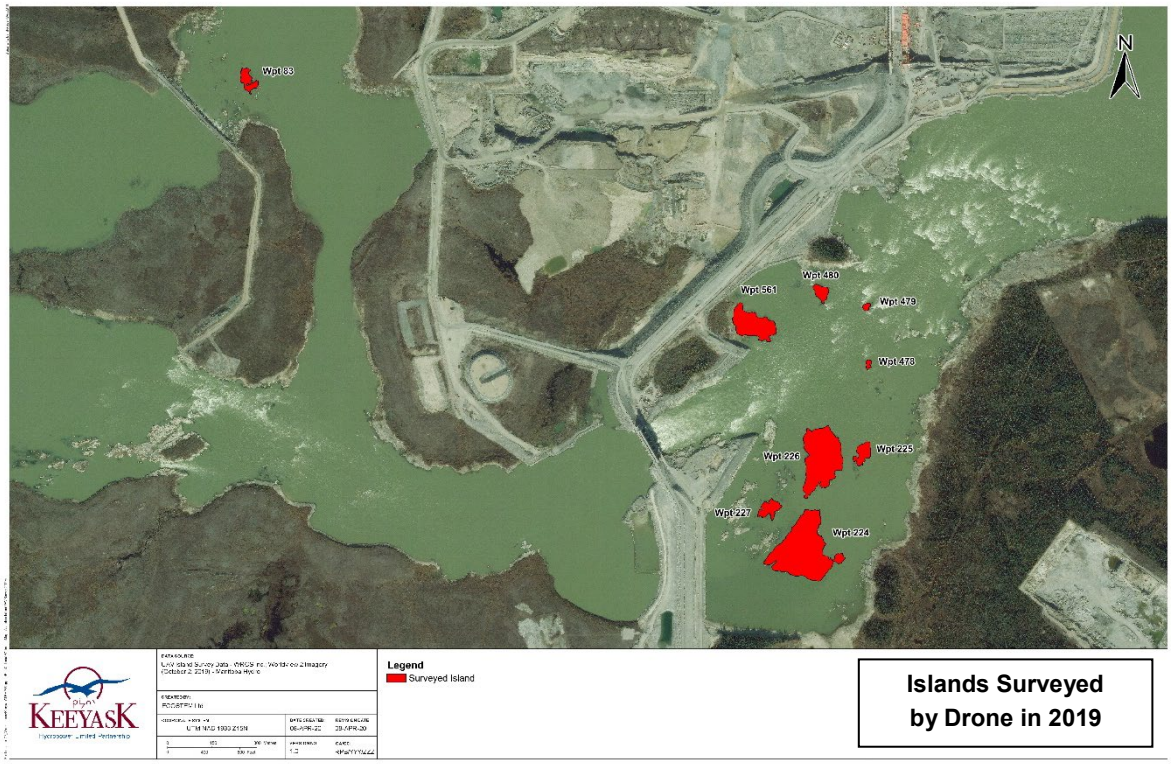
The Project has the potential to affect gull and tern populations through alteration and loss of habitat at Gull Rapids, as well as noise and light disturbance from construction activities. Monitoring is being done to evaluate Project effects on the number and location of ring-billed gulls and common terns and their breeding habitats. Other colonial waterbird populations (*e.g.*, American white pelican, Bonaparte's gull) are being monitored incidentally.

What was done?

Helicopter surveys of the bird regional study area (Study Zone 5) and drone surveys in the Gull Rapids area were conducted to determine the numbers of gulls and terns present, where they are found, and what kinds of habitat they are using – both in areas expected to be affected by the Project and in areas away from the Project. Surveys were carried out in June and July. Helicopter surveys counted individual birds present along shorelines in the survey area. Drone surveys allowed the observation of gull and tern nests and chicks on the islands in Gull Rapids, from which productivity (number of chicks produced per nest) could be determined. This is the fifth year of colonial waterbird habitat effects monitoring during the Project construction period; surveys were also conducted from 2015 to 2018.



Drone used to photograph islands in Gull Rapids area



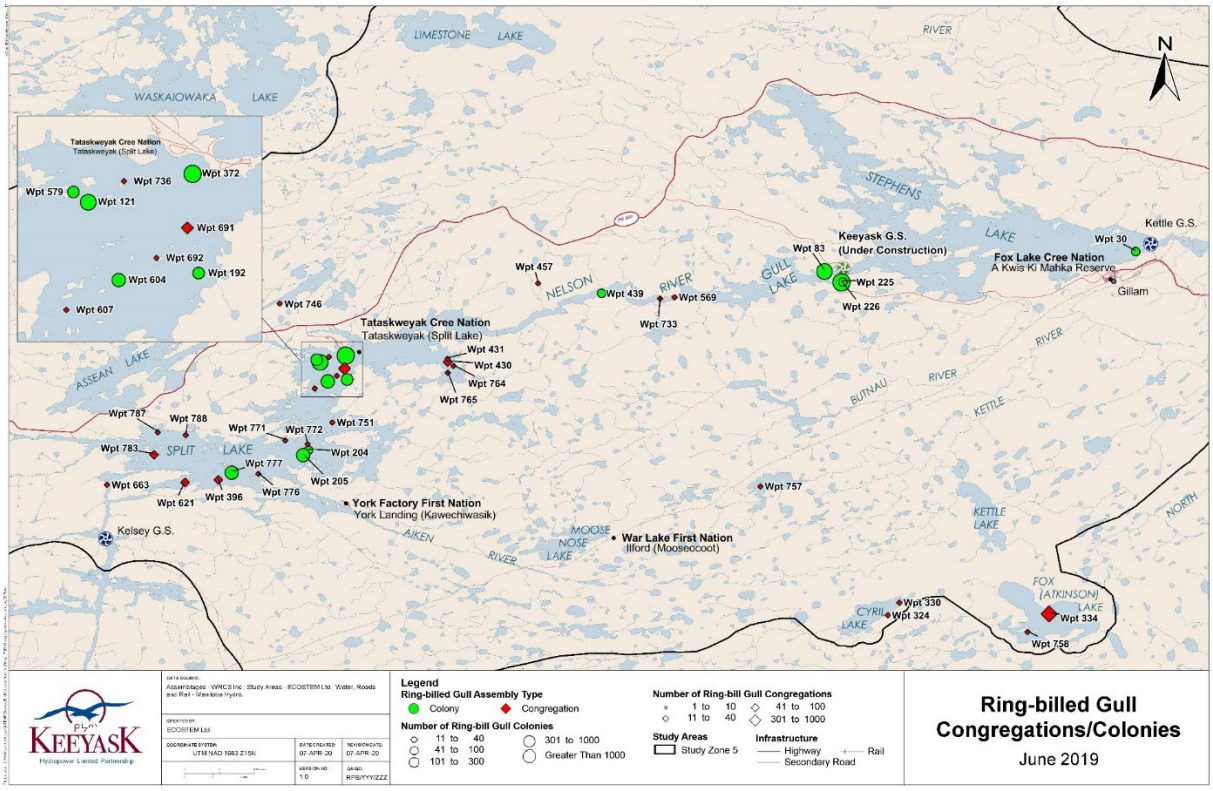
What was found?

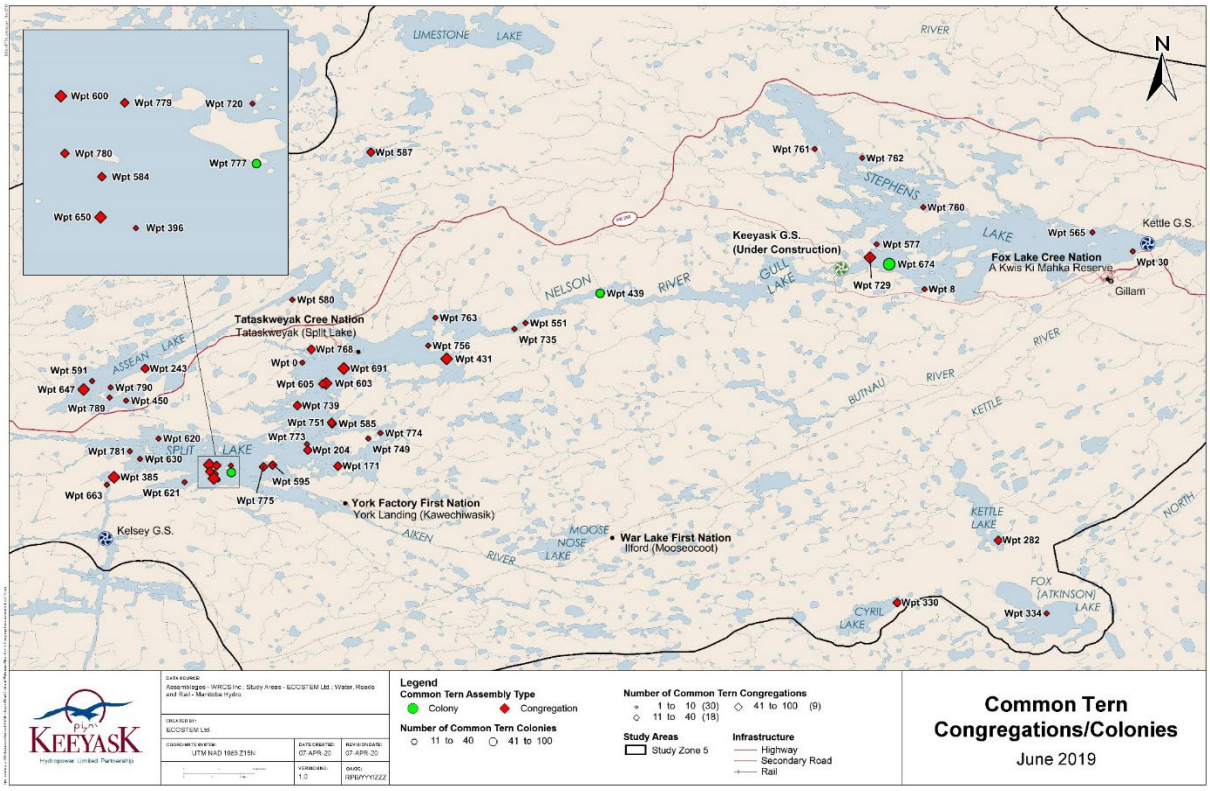
Construction activity in 2019 appeared to affect some colonial nesting waterbirds in the Gull Rapids area. Successful nesting occurred on most islands in Gull Rapids, but sensory disturbance and altered habitat appeared to limit the use of at least one island by colonial waterbirds, and productivity (number of chicks) of ring-billed gull appeared to decrease.

One island in Gull Rapids showed a decrease in the number of ring-billed gulls and common terns it supported in 2019. This was likely due to the construction of the South Dam across the Nelson River, which created sensory disturbances near the island and altered the water flow. Other islands in Gull Rapids supported an increased number of nesting ring-billed gulls, likely displaced from nearby disturbed islands.

The number of ring-billed gulls (7,595 adults in July), common terns (920 adults in July) and their colonies in the bird regional study area (Study Zone 5) was relatively stable compared to previous years. The number of herring gulls in the bird study area in 2019 (152 adults in July) appeared to increase and was the highest number observed to date. The numbers of other species, including the American white pelican and Bonaparte's gulls, appear to be slowly decreasing, likely as a result of natural population changes and not due to Project construction.

Drone photo of a colony of gulls on an island in Gull Rapids





What does it mean?

The results of the drone and helicopter surveys suggest that Project construction activities did have an effect on colonial waterbird nesting sites in the Gull Rapids area in 2019. These effects were limited to a small number of islands, and gulls appeared to adjust to the disturbance by finding nearby alternate habitat in Gull Rapids and elsewhere in the area. Fewer chicks were observed in the Gull Rapids area in 2019 as compared to other construction years, which may be due to disturbance or other natural factors.

What will be done next?

Aerial surveys will be conducted again in the spring and summer of 2020, to continue monitoring the number of gulls and terns, where they are found, and their breeding habitats. Data that describes the type of habitat chosen by gulls and terns during construction monitoring and in future years will be used to update the habitat model. The model can then be used to verify the amount of habitat disturbance as a result of the Project and its potential impact on colonial waterbird populations. Since the conditions created by the Project's reservoir impoundment and operations may create new breeding habitat types, the habitat model will be confirmed during operation.

STUDY TEAM

We would like to thank Sherrie Mason and Rachel Boone of Manitoba Hydro for reviewing the report. Derek Longley of Prairie Helicopters is acknowledged for assistance in the field. We would also like to thank Dr. James Ehnes, ECOSTEM Ltd., for GIS supported study design and cartography and Unmanned Aerial Imaging Solutions Inc. (UAIS) for the Unmanned Aerial Vehicle (UAV) operations and photography.

Biologists, technicians and other personnel who designed, participated in, and drafted the study results included:

- Robert Berger, M.N.R.M., Design, analysis, and reporting
- Mark Baschuk, M.Sc., Survey personnel
- Stefano Strapazzon, B.Env.Sc, Survey personnel
- Kristian Bernjak, UAV photography
- Mike Connellan, UAV photography

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1.0 INTRODUCTION

Construction of the Keeyask Generation Project (the Project), a 695-megawatt hydroelectric generating station (GS) and associated facilities, began in July 2014. The Project is located at Gull Rapids on the lower Nelson River in northern Manitoba where Gull Lake flows into Stephens Lake, 35 km upstream of the existing Kettle GS.

The *Keeyask Generation Project: Response to EIS Guidelines*, completed in June 2012, provides a summary of predicted effects and planned mitigation for the Project. Technical supporting information for the terrestrial environment, including a description of the environmental setting, effects and mitigation, and a summary of proposed monitoring and follow-up programs is provided in the *Keeyask Generation Project Environmental Impact Statement: Terrestrial Environment Supporting Volume* (TESV). The *Terrestrial Effects Monitoring Plan* (TEMP) was developed as part of the licensing process for the Project. Monitoring activities for various components of the terrestrial environment were described, including the focus of this report, colonial waterbird habitat effects monitoring, for the construction phase of the Project.

The Project has the potential to affect colonial waterbird populations through alteration and loss of habitat, as well as sensory disturbance. Three species of colonial waterbirds - ring-billed gull (*Larus delawarensis*), herring gull (*Larus argentatus*), and common tern (*Sterna hirundo*) - commonly breed on rocky islands and reefs in the Nelson River near the Project site. Previous colonial waterbird surveys, conducted in 2001-03, 2006, 2011, and 2013-18 have counted between 1,900-6,200 gulls and 10-200 common terns (KHLP 2012; Stantec 2014; Stantec 2015; WRCS 2016; WRCS 2017; WRCS 2018; WRCS 2019) in the Gull Rapids area. Other colonial waterbird species that have been observed to breed in the region include herring gull, Bonaparte's gull (*Chroicocephalus philadelphia*), and Caspian tern (*Sterna caspia*). Colonial waterbirds that occur in the region but for which there is no evidence of breeding include American white pelican (*Pelecanus erythrorhynchos*), black tern (*Chlidonias niger*), and double-crested cormorant (*Phalacrocorax auritus*) (KHLP 2012).

Colonial waterbirds are generally gregarious birds that congregate into conspecific or multi-species groups of nesting birds at colony sites; the congregation of nesting birds is the colony (Kushlan 1986). Waterbird colonies range from a few birds to many thousands; however, two breeding pairs nesting at a site qualify as a colony (Kushlan *et al*. 2002). If nesting is not taking place, the group of birds is a congregation. At such sites, if birds are sleeping or resting the site is referred to as a communal roost site. Often confused with roosting, loafing includes activities involved in comfort behaviour (preening, stretching) and digestion; such sites are referred to as loafing sites (Campbell and Lack 1985).

At Gull Rapids, the loss of foraging and breeding habitat, and habitat avoidance due to Project sensory disturbances were anticipated on the local colonial waterbird population during construction. Colonial waterbirds receive regulatory protection under the *Manitoba Wildlife Act* (2015) and the federal *Migratory Birds Convention Act* (1994). To avoid disturbing breeding colonial waterbirds near Project construction activities, avian control measures to deter colonial

waterbirds were implemented in areas affected by construction near Gull Rapids. Permitted control measures included active falconry, pyrotechnics, kites, and egg and/or nest removal. All of these measures are permitted annually by Environment and Climate Change Canada under Damage and Danger permits. To monitor potential Project construction effects on colonial waterbirds in the Gull Rapids area, an Unmanned Aerial Vehicle (UAV or drone) was used to determine abundance, distribution, and habitat use of colonial waterbirds.

The primary goal of the colonial waterbird habitat effects monitoring is to evaluate how ring-billed gull and common tern breeding habitat distribution and abundance change due to the Project. Secondly, this study will evaluate how ring-billed gull and common tern habitat effectiveness changes due to Project sensory disturbance, by measuring changes in the distribution and abundance of ring-billed gulls and common terns in the vicinity of Project disturbances. This report contains the results of the fifth year (2019) of the Colonial Waterbird Habitat Effects study.

2.0 METHODS

2.1 UNMANNED AERIAL VEHICLE SURVEYS

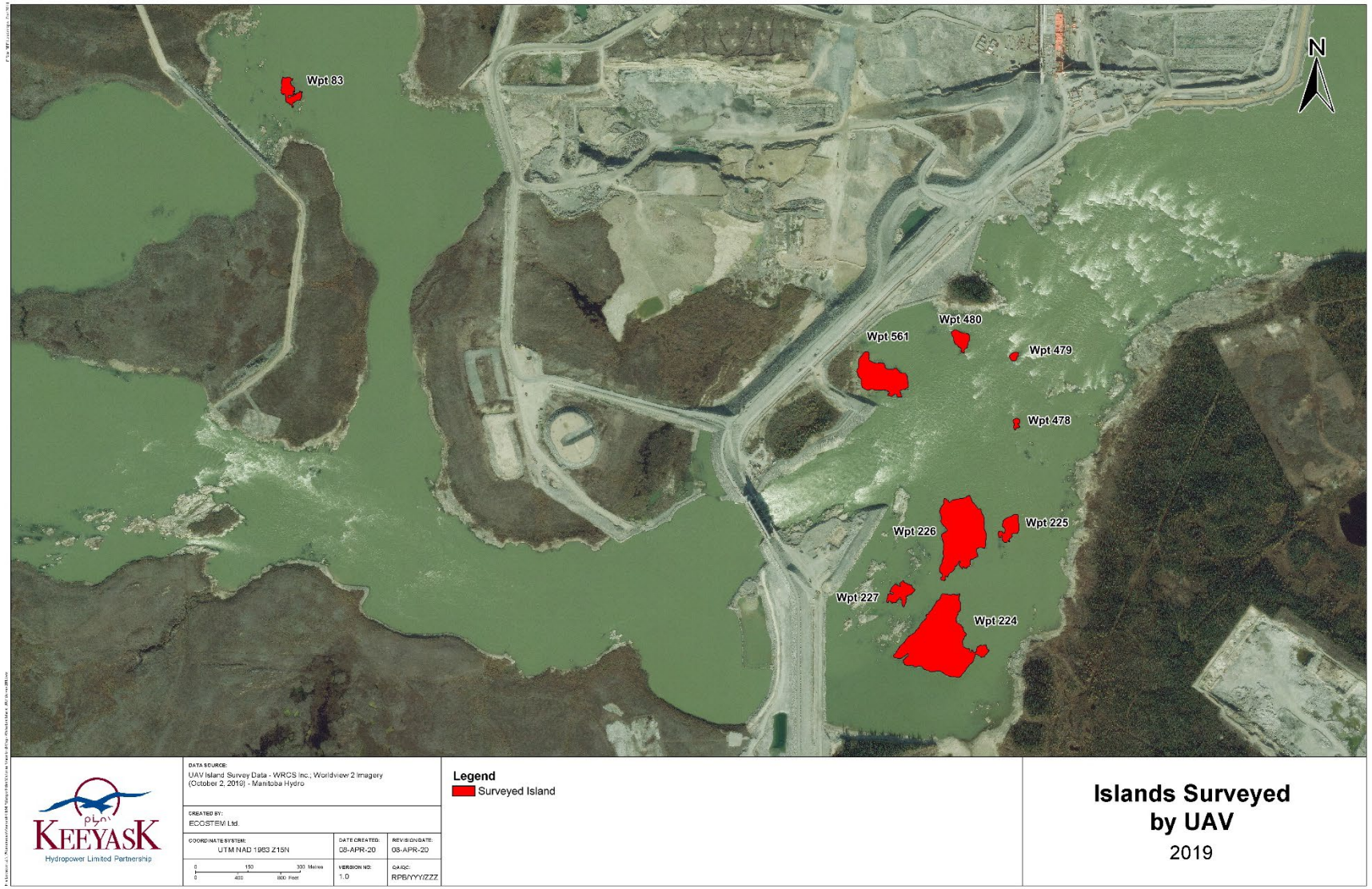
The distribution and abundance of colonial waterbirds at Gull Rapids was monitored using photographs taken from an Unmanned Aerial Vehicle (UAV or drone). Unmanned Aerial Imaging Solutions Inc. (UAIS) was contracted to conduct UAV flights and produce high-resolution images of colonial waterbird colonies and potential nesting areas in the Gull Rapids area.

UAIS deployed a DJI Phantom quad-copter equipped with a 12 mega-pixel camera to survey islands in Gull Rapids and immediately upstream in the Nelson River (Photo 1). Using the software Mission Planner, camera parameters, flight path, speed, and altitude were programmed into the UAV to guide it during each flight mission. Nine islands within the Gull Rapids area, known to support colonial waterbirds were photographed by the UAV platform in a grid pattern to produce overlapping photographs (Map 1). All flights were conducted at approximately 40 m above ground level (agl) to minimize disturbance to waterbird colonies.

UAV surveys were conducted during three periods in 2019: June 3-4, June 24-25, and July 23-25, in an attempt to capture the nesting and brood rearing periods. During each of these survey periods, islands were photographed during the morning (0600-1200 hours) and afternoon (1200-1700 hours). Photographs taken in the morning and afternoon for each survey period were examined to determine the number of colonial waterbirds, nests, hatch-year birds (chicks), and species present on each of the nesting islands in the Gull Rapids area. A single observer examined the photographs to maintain a consistent interpretation and reduce subjectivity.

The maximum number of birds/nests/chicks observed from the morning or afternoon photographs was used to determine the potential suitability of islands for nesting colonial waterbirds. To describe the difference between morning and afternoon bird abundances, the standard deviations of bird/nests/chicks were calculated using the morning and afternoon data from the same period.

Photo 1: UAV Used to Photograph Islands in Gull Rapids in 2019



Map 1: Islands Surveyed by UAV in Gull Rapids in 2019

2.2 HELICOPTER SURVEY

Helicopter surveys were conducted to monitor the abundance, distribution, and habitat use of colonial waterbirds in portions of the bird regional study area (Study Zone 5) during the breeding season (Map 2). A random, stratified design was used to select waterbodies to be surveyed. Waterbodies were classified broadly as either on-system (influenced by existing or future hydroelectric operations) or off-system (unaffected by hydroelectric operations), grouped into two basic waterbody types (lake or river), and grouped into five different size classes (<1, 1-10, 11-100, 101-1,000, >1,000 ha). Small watercourses (*e.g.*, creeks) were excluded from the design and selection as gulls and terns do not typically use these features as nesting habitat.

The first survey occurred between June 14-16, 2019 when gull and tern nests are typically initiated and most gulls and terns are incubating eggs, whereas the second survey occurred during the typical chick-rearing period on July 19-20.

Daily flights were conducted when wind speeds were below 25 km/h and when rain or fog did not restrict observers' ability to count birds. The survey was flown at approximately 100 km/h, at elevations no less than 150 m agl, and at distances no closer than 300 m to minimize disturbance to waterbird colonies and avoid collisions with flying birds.

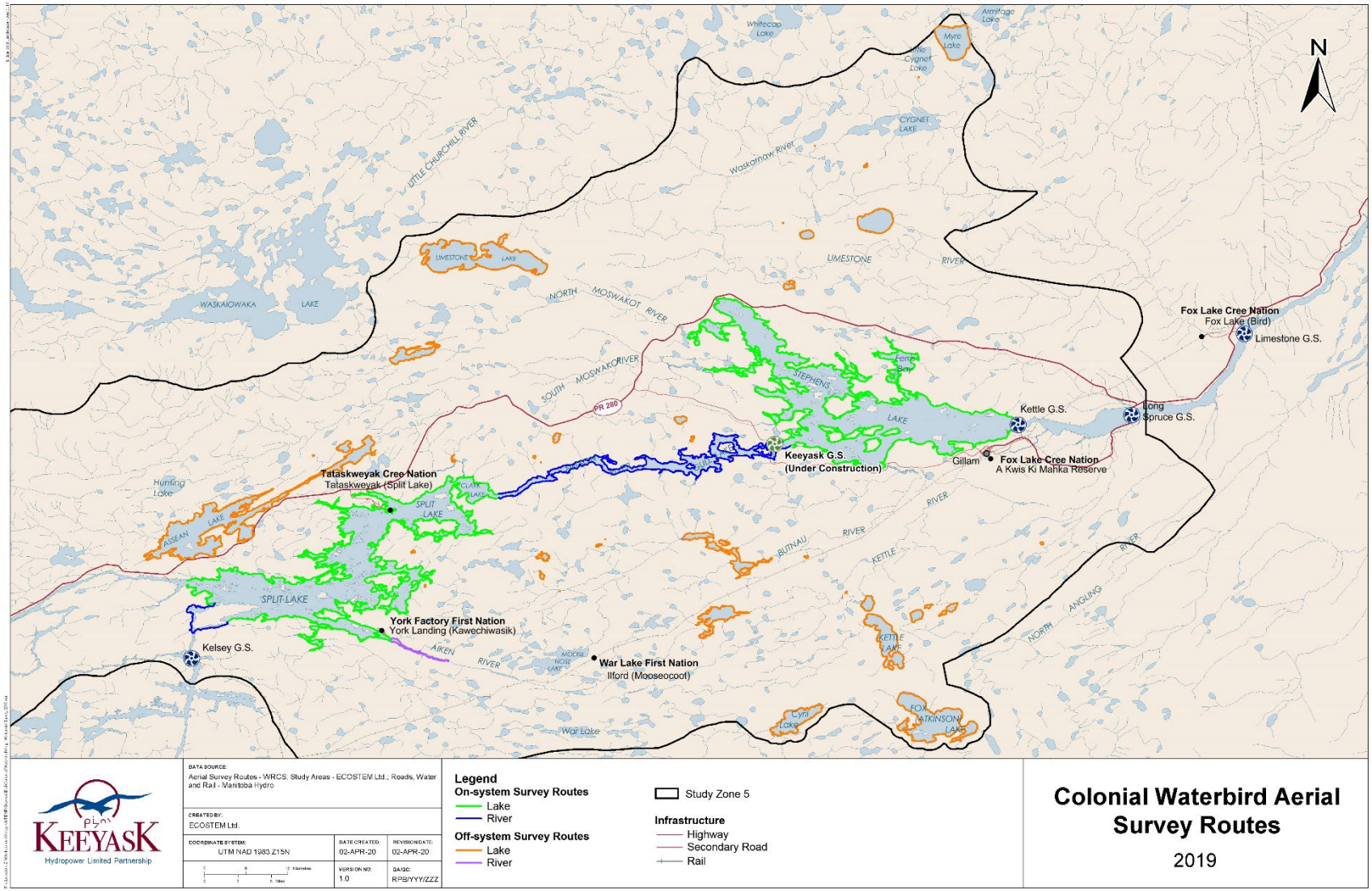
The aerial survey crew consisted of a single observer and the helicopter pilot. The observer was seated in the front left seat and was responsible for preliminary counts of colonial waterbirds and photographing congregations using a Canon Rebel T6i, 24.2-megapixel camera. The helicopter followed a shoreline transect with open water on the left and terrestrial habitat on the right. When colonial waterbirds were spotted on rocky reefs in open water areas, the helicopter departed from the shoreline transect to investigate.

During the survey, numbers of waterbirds at all colony and congregation sites (Photo 2), and all dispersed waterbirds were recorded along with their locations. Dispersed birds were single birds and flocks of waterbirds in flight. Congregated birds were groups of birds that showed no indication of nesting (*i.e.,* nests). A group of birds was considered a colony when there were at least two breeding pairs present and signs of nesting. When a congregation of waterbirds was observed the helicopter slowed and circled the site briefly for survey personnel to photograph and count individuals and nests. Preliminary abundance estimates were made by counting all nests and individuals. In-flight counts and photography were conducted quickly to minimize disturbing birds. All observations were georeferenced with a Garmin GPS 64 global positioning system (GPS). Notes on the terrestrial habitat of congregation sites were recorded and island size (ha) was determined from remotely-sensed data. Island sizes were classified as <0.1 ha, 0.1-0.9 ha, 1.0-1.9 ha, 2.0-2.9, 3.0-3.9 ha, and $\geq$4.0 ha.

Although individuals in small congregations of colonial waterbirds could be counted during the aerial survey, their numbers were determined with the in-flight photographs. Photographs were analysed to permit mark-up of the photo to facilitate the counting of adults sitting tight with no nest visible, birds flying, standing or swimming, and occupied and unoccupied nests in the photographs. Evidence of nesting included presence of visible nests, adults sitting tight, or chicks.

On a few occasions the in-flight photographs were of insufficient quality for birds to be counted, thus preliminary observer counts were included in lieu of photographic data in the final abundance estimates.

Photo 2: Congregation of Ring-billed Gulls on an Island in Split Lake on July 19, 2019



Map 2: Colonial Waterbird Helicopter Survey Routes and Waterbody Classification

3.0 RESULTS

3.1 UNMANNED AERIAL VEHICLE SURVEY

Ring-billed gulls were the most common species of colonial waterbird observed in the Gull Rapids area. Notably, one island – Wpt 226, supported the majority of adults (76% during the June 3 survey period), nests (77% during June 24), and chicks (65% during July 24) (Appendix A; Map 3). An increase of ring-billed gulls was observed from June 3 to July 24 in Gull Rapids. The greatest survey count in 2019 (7,227 ring-billed gulls) was observed on the afternoon of July 24 (Table 1). The presence of ring-billed gulls varied in the morning and afternoon and relatively large standard deviations of abundance were observed. Ring-billed gull nests were observed on five of the islands surveyed in Gull Rapids (Map 4), and up to 3,171 nests were observed on June 29. Ring-billed gull chicks were observed on four of the islands surveyed (Map 5). Nearly all ring-billed chicks were observed during the July 24 period, when up to 474 chicks were observed (Table 1). The number of chicks observed in 2019 was less than the number observed in 2018 (1,009) and 2016 (1,774), but greater than the number observed in 2017 (0) and 2015 (42).

The total number of ring-billed gulls (adults and nesting birds) observed in 2019 was similar to the number observed in 2018, and that observed during the early spring and late spring surveys in 2016 (Figure 1). In 2019, more ring-billed gulls were observed compared to 2017 and 2015 during all survey periods (Figure 1).

Similar to previous years, the majority of ring-billed gulls were observed on island Wpt 226. The number of gulls on islands Wpt 224 and Wpt 225 decreased further in 2019, while the number on Wpt 226 and Wpt 83 increased (Appendix A).

Herring gulls were relatively uncommon in the Gull Rapids area compared to ring-billed gulls, but were observed on all nine of the islands surveyed (Map 3). The greatest number of herring gulls observed in the Gull Rapids area was 47, which occurred during the July 24 survey (Table 1). Herring gull nests were observed on eight of the surveyed islands (Map 4), and up to 41 nests were observed during the June 3 survey period (Table 1). Herring gull chicks were observed on seven islands (Map 5), and up to 20 chicks were observed on July 24 (Table 1).

Several flocks of American white pelicans were observed in Gull Rapids in 2019. No signs of nesting were observed and the greatest number (69) was observed during the July 24 survey (Table 1).

No common terns were observed in the Gull Rapids area in 2019.

Table 1: Maximum Number (Standard Deviation) of Colonial Waterbirds, Nests, and Chicks Observed in the Morning/Afternoon on Islands in the Gull Rapids Area in 2019 for Each Survey Period

Observation	03-June-19	24-June-19	24-July-19
Ring-billed Gull	1,628 (276)	1,240 (106)	7,227 (1902)
Ring-billed Gull w. Nest	3,364 (263)	3,820 (132)	0 (0)
Ring-billed Gull Chick	0 (0)	1 (0)	474 (71)
Herring Gull	8 (1)	31 (8)	47 (11)
Herring Gull w. Nest	41 (2)	27 (3)	0 (0)
Herring Gull Chick	0 (0)	19 (0)	20 (4)
American White Pelican	1 (0)	0 (0)	69 (8)
Common Tern	0 (0)	0 (0)	0 (0)

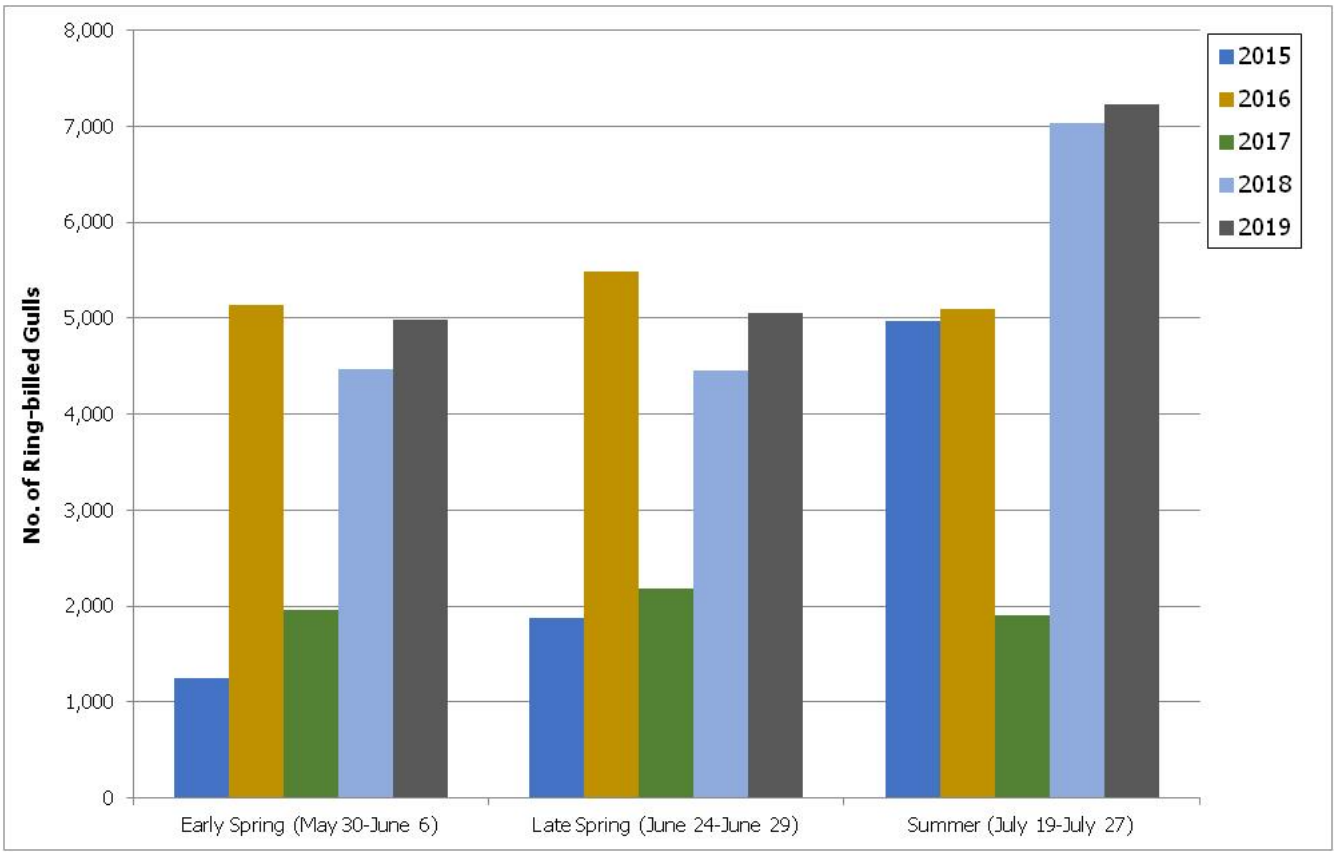
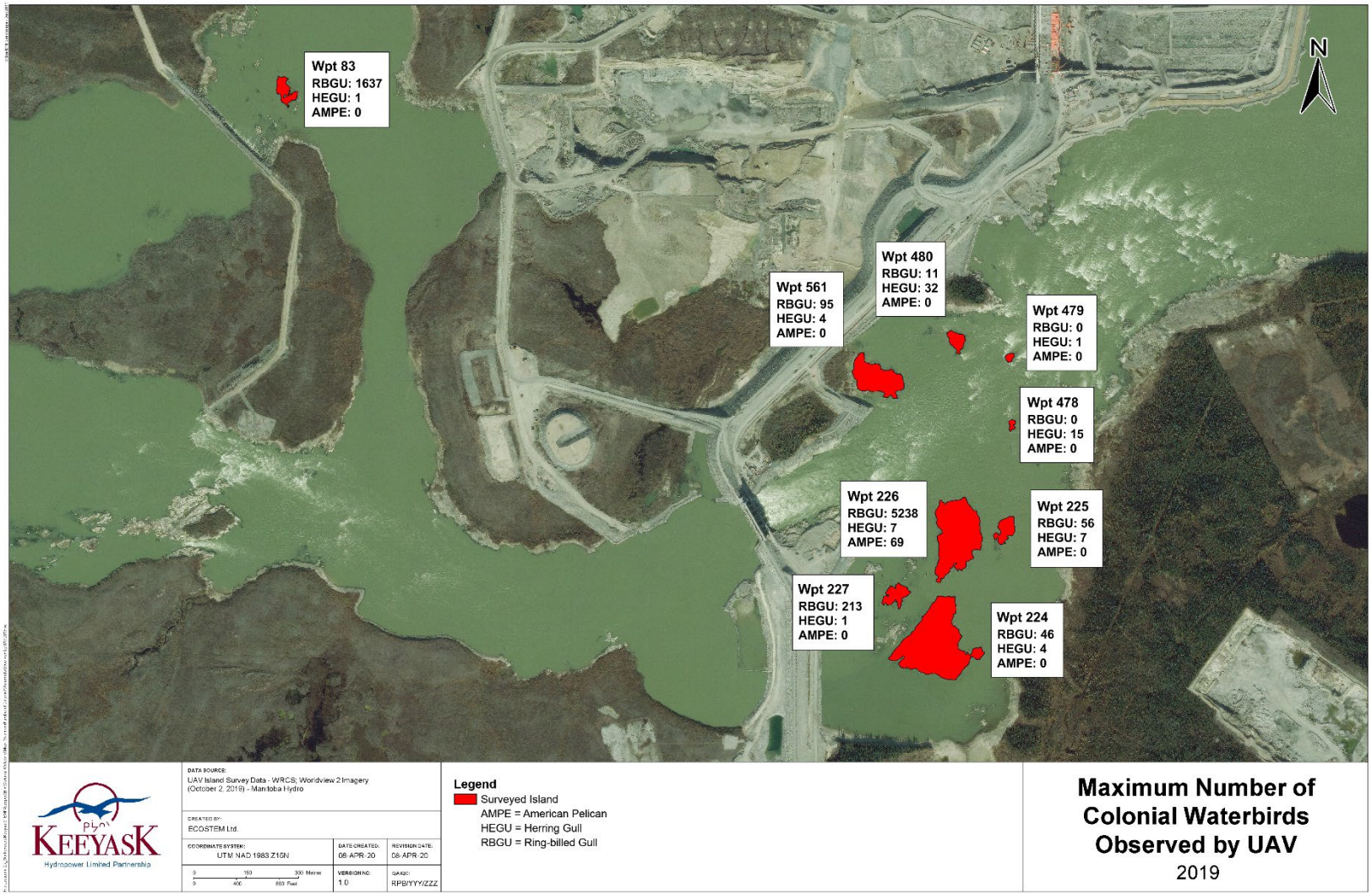
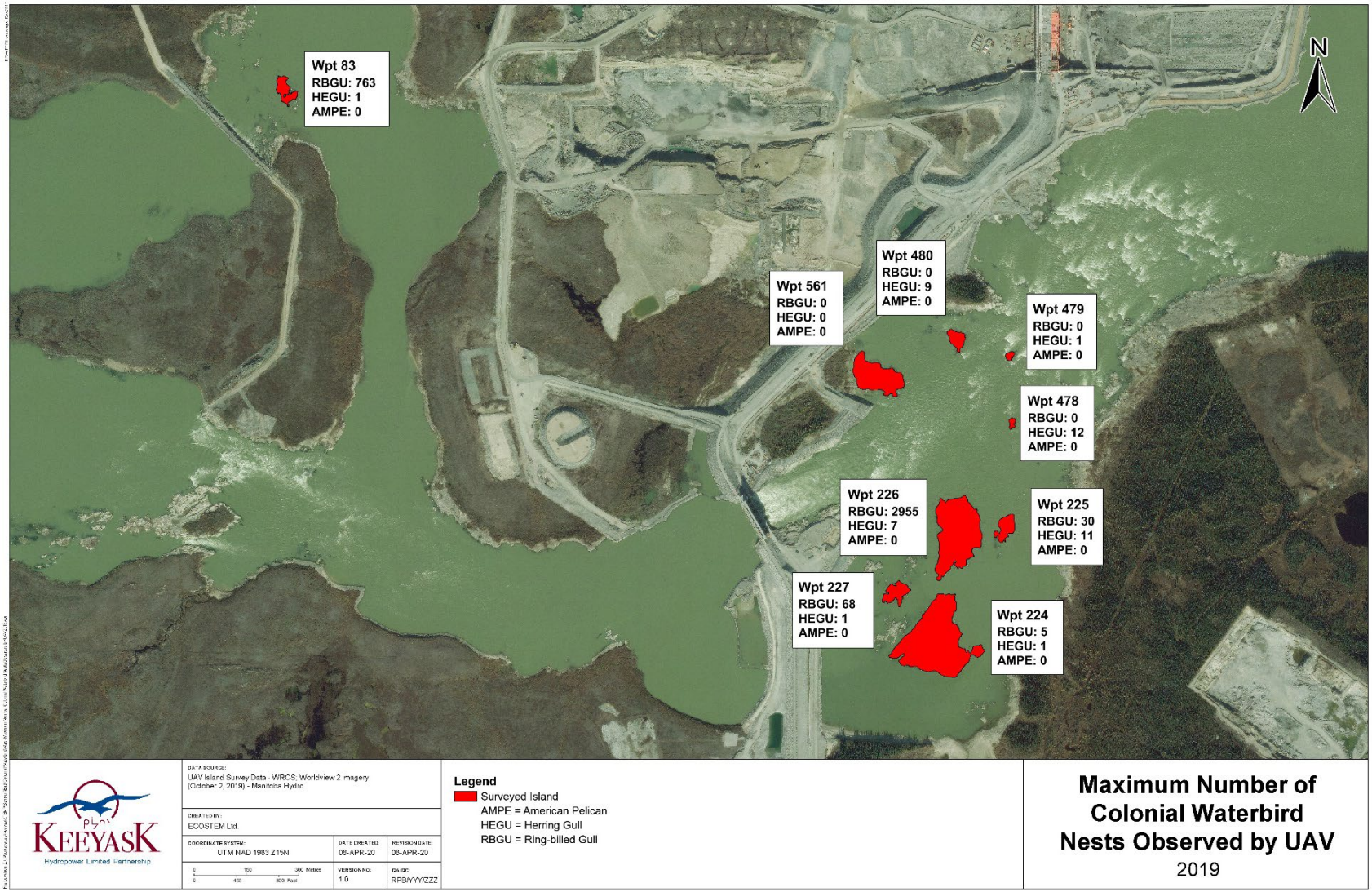


Figure 1: Total Number of Ring-billed Gulls Observed at Gull Rapids by UAV During Early Spring, Late Spring, and Summer Surveys from 2015-2019



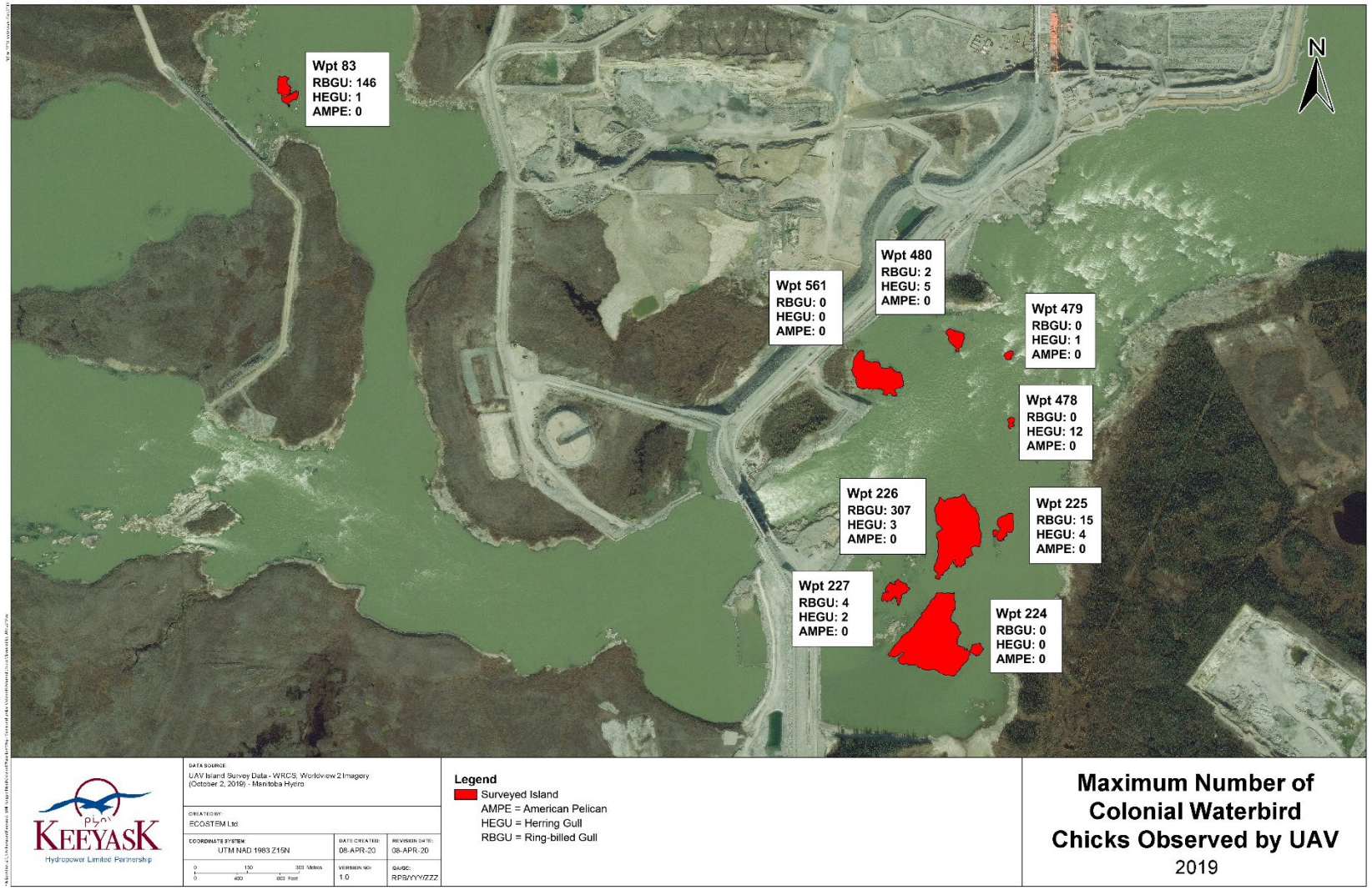
Note: the maximum number of colonial waterbirds was selected from pooled data from all survey periods (June 3, June 24, July 24) and morning/afternoon periods.

Map 3: Maximum Number of Colonial Waterbirds Observed on Each Island by the UAV in Gull Rapids in 2019



Note: the maximum number of colonial waterbird nests was selected from pooled data from all survey periods (June 3, June 24, July 24) and morning/afternoon periods.

Map 4: Maximum Number of Colonial Waterbird Nests Observed on Each Island by the UAV in Gull Rapids in 2019



Note: the maximum number of colonial waterbird chicks was selected from pooled data from all survey periods (June 3, June 24, July 24) and morning/afternoon periods.

Map 5: Maximum Number of Colonial Waterbird Chicks Observed on Each Island by the UAV in Gull Rapids in 2019

3.2 HELICOPTER SURVEY

Five species of colonial waterbirds were observed during the 2019 helicopter surveys (Table 2). During both helicopter surveys, in June and July, ring-billed gulls were the most abundant colonial waterbird, with common terns being the second most abundant (Table 2). Herring gull, Bonaparte's gull, and American white pelican were less abundant, which was consistent with the findings from previous construction surveys (Appendix B).

Table 2: Colonial Waterbird Abundance Observed During Helicopter Surveys in 2019

Species	June			July		
	Congregated Birds	Dispersed Birds	Total	Congregated Birds	Dispersed Birds	Total
Ring-billed Gull	5,513	103	5,616	7,685	199	7,884
Common Tern	1,072	67	1,139	920	8	928
Herring Gull	184	6	190	152	0	152
Bonaparte's Gull	16	9	25	18	6	24
American White Pelican	41	15	56	146	50	196
Total	6,826	200	7,026	8,921	263	9,184

3.2.1 RING-BILLED GULL

Ring-billed gulls were the most common species of colonial waterbird observed in 2019. The total number of ring-billed gulls increased from June to July in the regional study area (Figure 2; Table 3). The increase of ring-billed gulls from June to July is consistent with the findings of the surveys conducted from 2016-2018 (Figure 2; Appendix B).

In June 2019, ring-billed gulls were observed congregating at 27 sites and nesting at 13 sites (Map 6). In July 2019, ring-billed gulls were observed congregating at 64 sites and no nesting was observed (Map 7). Similar to past surveys, with the exception of 2017, which was conducted during high water levels in the Nelson River, the Gull Rapids area supported the majority of ring-billed gulls in the regional study area (Table 3). In June and July, 45% and 39% of all ring-billed gulls were observed in Gull Rapids, respectively. One island in particular in Gull Rapids (Wpt 226), supported the largest concentration of ring-billed gulls observed in 2019.

Ring-billed gull nests or probable nests were observed at 13 unique sites in the regional study area in June and July 2019 (Map 6; Map 7). Two of the largest nesting colonies were located within Gull Rapids (Wpt 226 and Wpt 83) and another relatively large colony was observed on Split Lake (Wpt 372). Individual colonies were also observed in Stephens Lake and the Nelson

River. There were the same number of nesting sites in comparison to 2018, but fewer than were observed in 2015 and 2016 (19 and 18, respectively), but more than were observed in 2017 (9), the construction year with the highest water levels.

Of the 41 islands where ring-billed gulls were observed in June 2019, 29 (71%) were used at least once in previous years (2015-2018) (Table 4). In July, of the 63 islands used, (59%) were used at least once in previous years (2015-2018) (Table 4). The number of islands at which ring-billed gulls were observed increased from 2015 to 2019.

All but one congregation/colony of ring-billed gulls were observed on islands. Most of the islands used consisted of exposed bedrock or boulders, were less than 1 ha in size, and were within on-system lakes or rivers (Table 4).

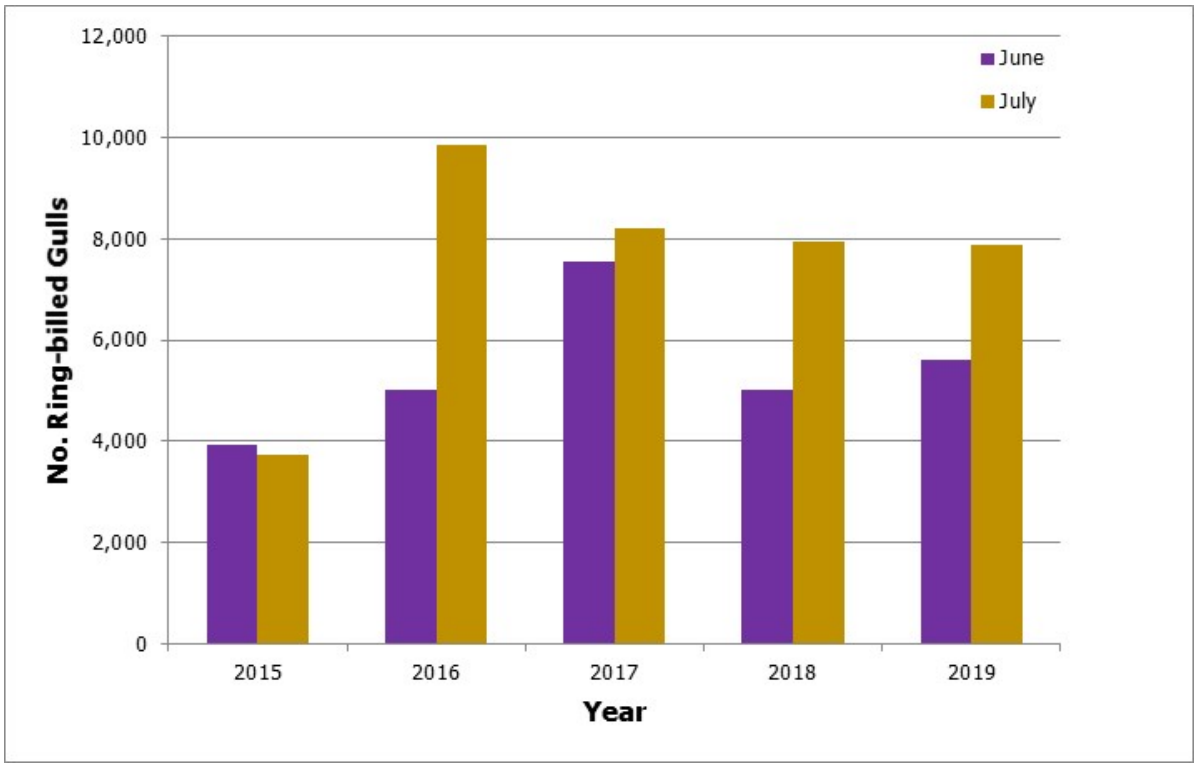
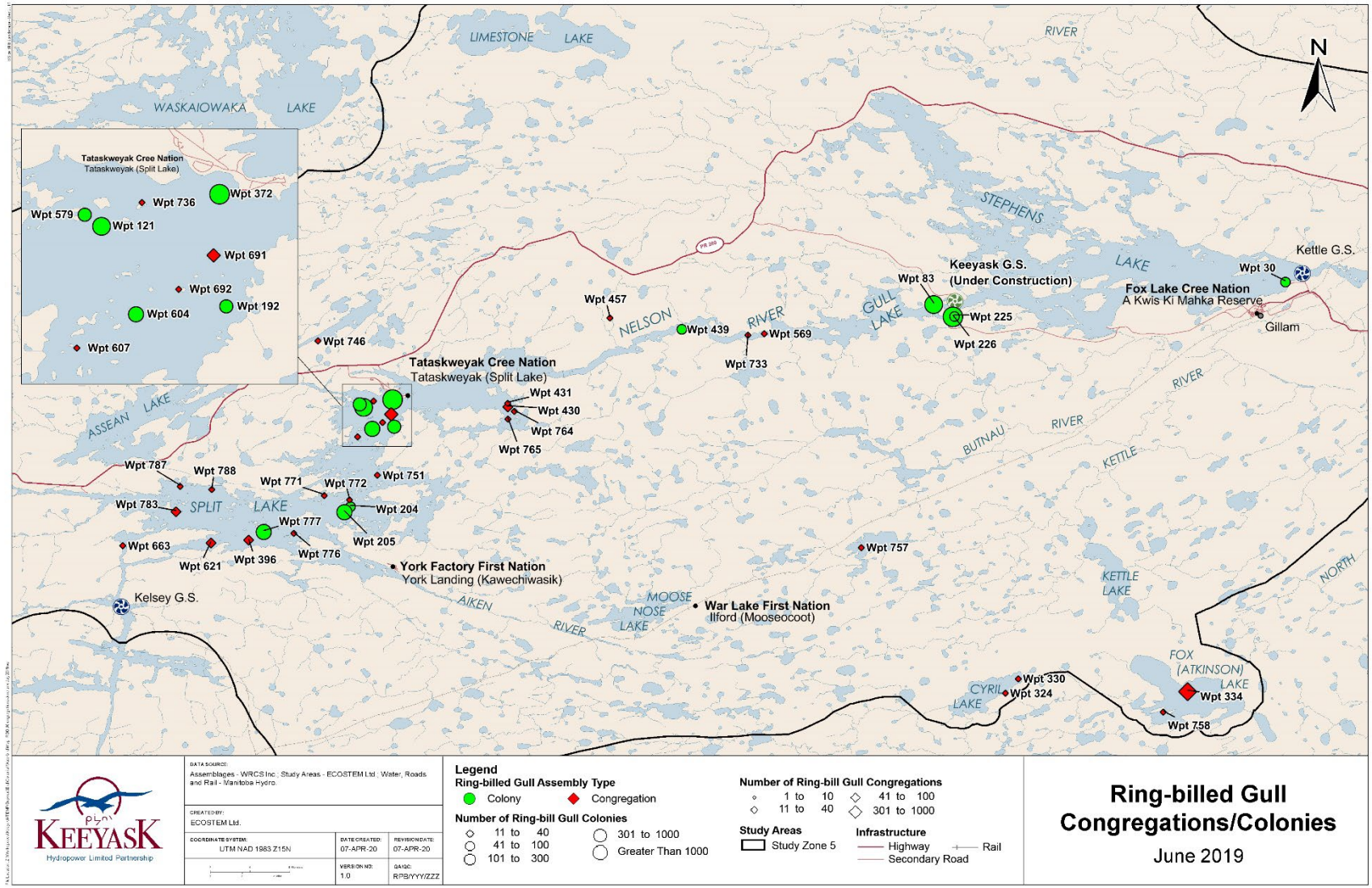
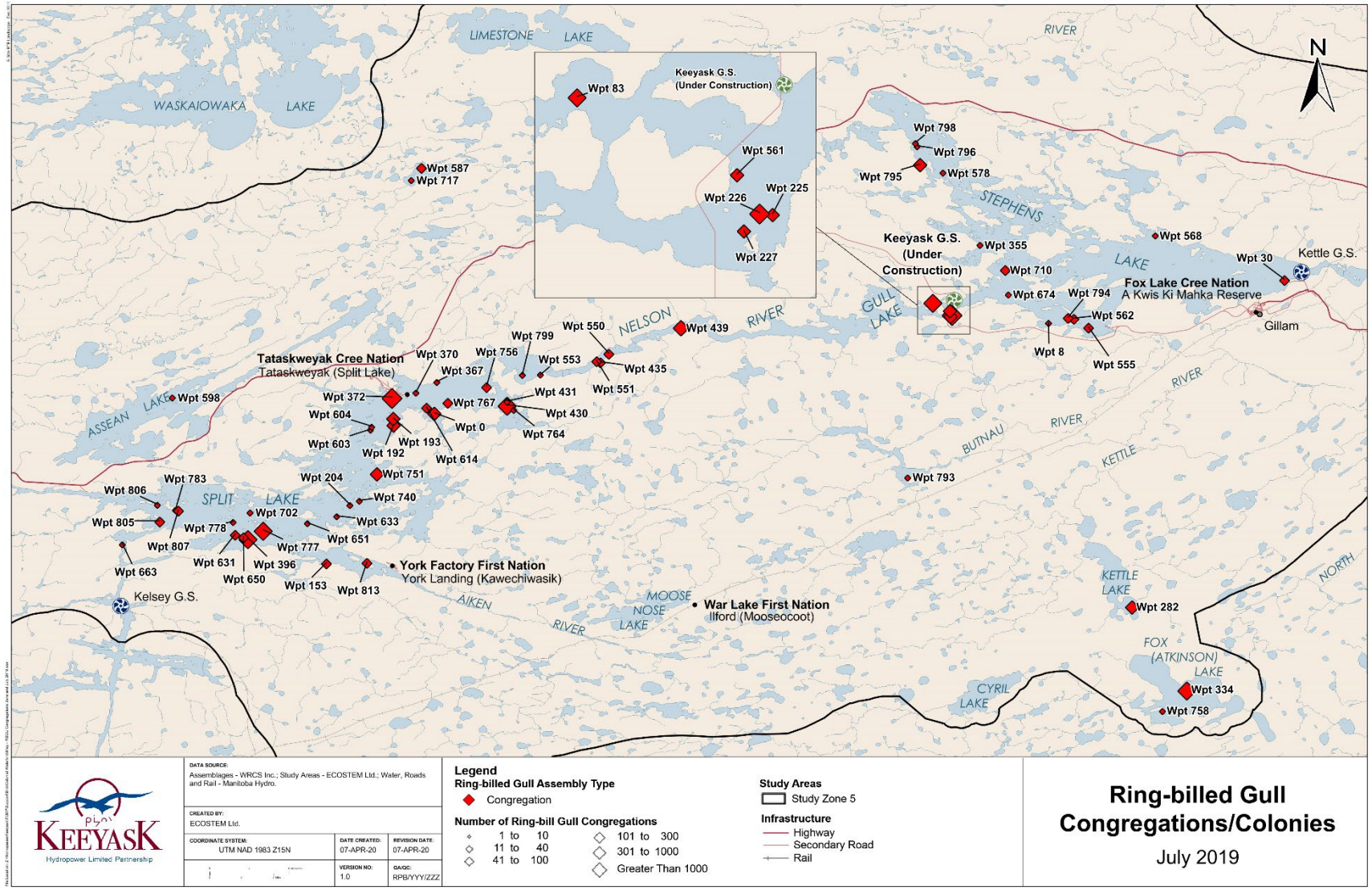


Figure 2: Number of Ring-billed Gulls Observed During Helicopter Surveys in June and July from 2015 to 2019



Map 6: Ring-billed Gull Colonies and Congregations Observed During Helicopter Surveys in June 2019



Map 7: Ring-billed Gull Colonies and Congregations Observed During Helicopter Surveys in July 2019

Table 3: Ring-billed Gull Congregations/Colonies Observed During the Helicopter Surveys in 2019

Waypoint	June				July			
	Adults (No Nests)	Occupied Nests	Total Adults	Total Chicks	Adults (No Nests)	Occupied Nests	Total Adults	Total Chicks
8	0	0	0	0	1	0	1	0
30	12	3	15	0	20	0	20	0
83	106	429	535	0	673	0	673	56
121	178	142	320	0	0	0	0	0
153	0	0	0	0	14	0	14	0
192	22	41	63	0	53	0	53	2
193	0	0	0	0	65	0	65	0
204	20	20	40	0	1	0	1	0
205	57	210	267	0	0	0	0	0
224	0	0	0	0	0	0	0	0
225	1	22	23	0	48	0	48	0
226	225	1,761	1,986	0	2,258	0	2,258	0
227	0	0	0	0	96	0	96	0
282	0	0	0	0	46	0	46	0
324	2	0	2	0	0	0	0	0
330	1	0	1	0	0	0	0	0
334	397	0	397	0	506	0	506	0
355	0	0	0	0	1	0	1	0
367	0	0	0	0	1	0	1	0
370	0	0	0	0	8	0	8	0
372	569	595	1,164	0	1,753	0	1,753	169
396	15	0	15	0	334	0	334	7
430	35	0	35	0	559	0	559	0
431	2	0	2	0	2	0	2	0

Waypoint	June				July			
	Adults (No Nests)	Occupied Nests	Total Adults	Total Chicks	Adults (No Nests)	Occupied Nests	Total Adults	Total Chicks
435	0	0	0	0	20	0	20	0
439	6	13	19	0	103	0	103	0
457	1	0	1	0	0	0	0	0
550	0	0	0	0	30	0	30	0
551	0	0	0	0	35	0	35	0
553	0	0	0	0	8	0	8	0
555	0	0	0	0	25	0	25	0
561	0	0	0	0	67	0	67	0
562	0	0	0	0	25	0	25	0
568	0	0	0	0	1	0	1	0
569	2	0	2	0	0	0	0	0
578	0	0	0	0	2	0	2	0
579	25	50	75	0	0	0	0	0
587	0	0	0	0	30	0	30	0
598	0	0	0	0	2	0	2	0
603	0	0	0	0	1	0	1	0
604	125	124	249	0	1	0	1	0
607	1	0	1	0	0	0	0	0
614	0	0	0	0	25	0	25	0
621	40	0	40	0	0	0	0	0
631	0	0	0	0	15	0	15	0
633	0	0	0	0	1	0	1	0
650	0	0	0	0	20	0	20	0
651	0	0	0	0	1	0	1	0
663	1	0	1	0	1	0	1	0
674	0	0	0	0	1	0	1	0

Waypoint	June				July			
	Adults (No Nests)	Occupied Nests	Total Adults	Total Chicks	Adults (No Nests)	Occupied Nests	Total Adults	Total Chicks
691	60	0	60	0	0	0	0	0
692	1	0	1	0	0	0	0	0
702	0	0	0	0	3	0	3	0
710	0	0	0	0	15	0	15	0
717	0	0	0	0	2	0	2	0
733	1	0	1	0	0	0	0	0
736	6	0	6	0	0	0	0	0
740	0	0	0	0	1	0	1	0
746	2	0	2	0	0	0	0	0
751	2	0	2	0	60	0	60	0
756	0	0	0	0	35	0	35	0
757	5	0	5	0	0	0	0	0
758	2	0	2	0	1	0	1	0
764	1	0	1	0	2	0	2	0
765	1	0	1	0	0	0	0	0
767	0	0	0	0	25	0	25	0
771	2	0	2	0	0	0	0	0
772	1	0	1	0	0	0	0	0
776	1	0	1	0	0	0	0	0
777	69	92	161	0	429	0	429	6
778	0	0	0	0	1	0	1	0
783	12	0	12	0	7	0	7	0
786	0	0	1	0	0	0	0	0
787	1	0	1	0	0	0	0	0
788	1	0	1	0	0	0	0	0
793	0	0	0	0	1	0	1	0

Waypoint	June				July			
	Adults (No Nests)	Occupied Nests	Total Adults	Total Chicks	Adults (No Nests)	Occupied Nests	Total Adults	Total Chicks
794	0	0	0	0	15	0	15	0
795	0	0	0	0	45	0	45	0
796	0	0	0	0	2	0	2	0
798	0	0	0	0	8	0	8	0
799	0	0	0	0	1	0	1	0
805	0	0	0	0	20	0	20	0
806	0	0	0	0	4	0	4	0
807	0	0	0	0	25	0	25	0
813	0	0	0	0	40	0	40	0
Total	2,011	3,502	5,514	0	7,595	0	7,595	240

Table 4: Waterbody Classification and Island Use by Ring-billed Gulls in June and July 2019

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
30	Colony	June	On-system	Lake	>1,000	70% tree/shrub, 30% sand/gravel	1.0-1.9	5
83	Colony	June	On-system	River	>1,000	Exposed bedrock	0.1-0.9	5
121	Colony	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
192	Colony	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
204	Colony	June	On-system	Lake	>1,000	80% exposed bedrock, 20% boulders	<0.1	3
205	Colony	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	4
225	Colony	June	On-system	River	>1,000	Exposed bedrock	0.1-0.9	5
226	Colony	June	On-system	River	>1,000	50% rock, 45% shrub/deadfall, 55% treed	1.0-1.9	5
372	Colony	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	5
439	Colony	June	On-system	River	>1,000	50% bare rock, 50% grass	0.1-0.9	5
579	Colony	June	On-system	Lake	>1,000	Boulders	<0.1	2
604	Colony	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	3
777	Colony	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
324	Congregation	June	Off-system	Lake	>1,000	Boulders	<0.1	5
330	Congregation	June	Off-system	Lake	>1,000	Boulders	<0.1	5
334	Congregation	June	Off-system	Lake	>1,000	95% boulders, 5% grass	0.1-0.9	4
396	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	5
430	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
431	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
457	Congregation	June	Off-system	Lake	10-100	Burned black spruce forest	NA	5
569	Congregation	June	On-system	River	>1,000	Exposed bedrock	<0.1	3
607	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
621	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
663	Congregation	June	On-system	River	>1,000	Exposed bedrock	0.1-0.9	4

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
691	Congregation	June	On-system	Lake	>1,000	80% tree/shrub, 20% sand/gravel	0.1-0.9	3
692	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
733	Congregation	June	On-system	River	>1,000	Boulders	<0.1	2
736	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	1.0-1.9	2
746	Congregation	June	Off-system	Lake	>1,000	Boulders	<0.1	2
751	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	2
757	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	<0.1	2
758	Congregation	June	Off-system	Lake	>1,000	50% shrub, 50% gravel	<0.1	2
764	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	1
765	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	1
771	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
772	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
776	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
783	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
787	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	1
788	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
2	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
3	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
10	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
13	Dispersed	June	On-system	River	>1,000	NA	NA	NA
15	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
16	Dispersed	June	On-system	River	>1,000	NA	NA	NA
16	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
17	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
17	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
28	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
50	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
53	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
60	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
61	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
62	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
63	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
79	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
84	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
99	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
100	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
101	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
102	Dispersed	June	Off-system	Lake	101-1,000	NA	NA	NA
104	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
105	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
106	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
107	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
786	Dispersed	June	On-system	Lake	>1,000	Boulders	<0.1	1
34	Congregation	July	On-system	Lake	>1,000	NA	NA	NA
8	Congregation	July	On-system	Lake	>1,000	Sandbar	<0.1	2
30	Congregation	July	On-system	Lake	>1,000	70% tree/shrub, 30% sand/gravel	1.0-1.9	5
83	Congregation	July	On-system	River	>1,000	Exposed bedrock	0.1-0.9	5
153	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	4
192	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
193	Congregation	July	On-system	Lake	>1,000	30% exposed bedrock, 50% sand, 20% tree/shrub	0.1-0.9	2
204	Congregation	July	On-system	Lake	>1,000	80% exposed bedrock, 20% boulders	<0.1	3
225	Congregation	July	On-system	River	>1,000	Exposed bedrock	0.1-0.9	5

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
226	Congregation	July	On-system	River	>1,000	50% rock, 45% shrub/deadfall, 55% treed	1.0-1.9	5
227	Congregation	July	On-system	River	>1,000	Exposed bedrock	<0.1	4
282	Congregation	July	Off-system	Lake	>1,000	95% boulders, 5% grass	0.1-0.9	5
334	Congregation	July	Off-system	Lake	>1,000	95% boulders, 5% grass	0.1-0.9	4
355	Congregation	July	On-system	Lake	>1,000	90% boulders, 10% driftwood	<0.1	2
367	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
370	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	2
372	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	5
396	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	5
430	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
431	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
435	Congregation	July	On-system	River	>1,000	Exposed bedrock	<0.1	4
439	Congregation	July	On-system	River	>1,000	50% bare rock, 50% grass	0.1-0.9	5
550	Congregation	July	On-system	River	>1,000	Exposed bedrock	<0.1	4
551	Congregation	July	On-system	River	>1,000	Exposed bedrock	<0.1	2
553	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	2
555	Congregation	July	On-system	Lake	>1,000	80% tree/shrub, 20% sand/gravel	0.1-0.9	3
561	Congregation	July	On-system	River	>1,000	Exposed bedrock	1.0-1.9	4
562	Congregation	July	On-system	Lake	>1,000	Sandbar	0.1-0.9	2
568	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	2
578	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
587	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	<0.1	3
598	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	<0.1	3
603	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
604	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	3
614	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	3

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
631	Congregation	July	On-system	Lake	>1,000	Boulders	0.1-0.9	4
633	Congregation	July	On-system	Lake	>1,000	95% exposed bedrock, 5% tree/shrub	<0.1	3
650	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
651	Congregation	July	On-system	Lake	>1,000	80% exposed bedrock, 20% grass	0.1-0.9	3
663	Congregation	July	On-system	River	>1,000	Exposed bedrock	0.1-0.9	4
674	Congregation	July	On-system	Lake	>1,000	Boulders	0.1-0.9	3
702	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
710	Congregation	July	On-system	Lake	>1,000	Boulders	0.1-0.9	3
717	Congregation	July	Off-system	Lake	>1,000	Boulders	0.1-0.9	3
740	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	2
751	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	2
756	Congregation	July	On-system	Lake	>1,000	Gravel	0.1-0.9	2
758	Congregation	July	Off-system	Lake	>1,000	50% shrub, 50% gravel	<0.1	2
764	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	1
767	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	1
777	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
778	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
783	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
793	Congregation	July	Off-system	Lake	>1,000	Boulders	<0.1	1
794	Congregation	July	On-system	Lake	>1,000	Sandbar	0.1-0.9	1
795	Congregation	July	On-system	Lake	>1,000	Treed/burned	1.0-1.9	1
796	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	1
798	Congregation	July	On-system	Lake	>1,000	Treed	1.0-1.9	1
799	Congregation	July	On-system	Lake	>1,000	Gravel	1.0-1.9	1
805	Congregation	July	On-system	Lake	>1,000	Boulders	1.0-1.9	1
806	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
807	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
813	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
2	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
2	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
4	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
5	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
5	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
6	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
6	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
7	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
7	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
8	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
8	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
9	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
9	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
10	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
10	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
11	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
11	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
12	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
13	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
14	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
15	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
16	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
16	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
17	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
17	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
18	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
18	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
19	Dispersed	July	On-system	River	>1,000	NA	NA	NA
19	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
20	Dispersed	July	On-system	River	>1,000	NA	NA	NA
21	Dispersed	July	On-system	River	>1,000	NA	NA	NA
21	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
23	Dispersed	July	On-system	River	>1,000	NA	NA	NA
23	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
24	Dispersed	July	On-system	River	>1,000	NA	NA	NA
24	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
25	Dispersed	July	On-system	River	>1,000	NA	NA	NA
25	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
26	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
27	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
28	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
29	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
30	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
31	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
32	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
33	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
35	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
36	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
36	Dispersed	July	Off-system	Lake	101-1,000	NA	NA	NA
37	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
39	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
40	Dispersed	July	Off-system	Lake	>1,000			NA

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
42	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
44	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
46	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
46	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
47	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
48	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
51	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
52	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
56	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
59	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
60	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
64	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA

3.2.2 COMMON TERN

Common terns were the second most abundant species of colonial waterbird observed in the regional study area in 2019 (Table 2). The total number of common terns counted decreased from June (1,139) to July (928) (Figure 3; Table 5). The number of common terns observed in June and July 2019 was consistent with the numbers observed during previous construction surveys (Figure 3).

In June, common terns were observed congregating at 54 sites and nesting at three sites (Table 5; Map 8). The two largest congregations were observed on Split Lake (Wpt 385, Wpt 431) and the largest colony was observed on an island, downstream of Gull Rapids in Stephens Lake (Wpt 674) (Map 8). In July, 52 common tern congregations and no colonies were observed (Map 9).

In June 2019, 32 of 56 islands (57%) where common terns were observed were used at least once in previous years (2015-2018) (Table 6). In July 2019, 30 of 52 islands (58%) where common terns were observed were used at least once in previous years (2015-2018) (Table 6).

All but one colony/congregations were observed on islands. Most of the islands used consisted of boulders or exposed bedrock, were less than 1 ha in size, and were within large, on-system lakes or rivers (Table 6).

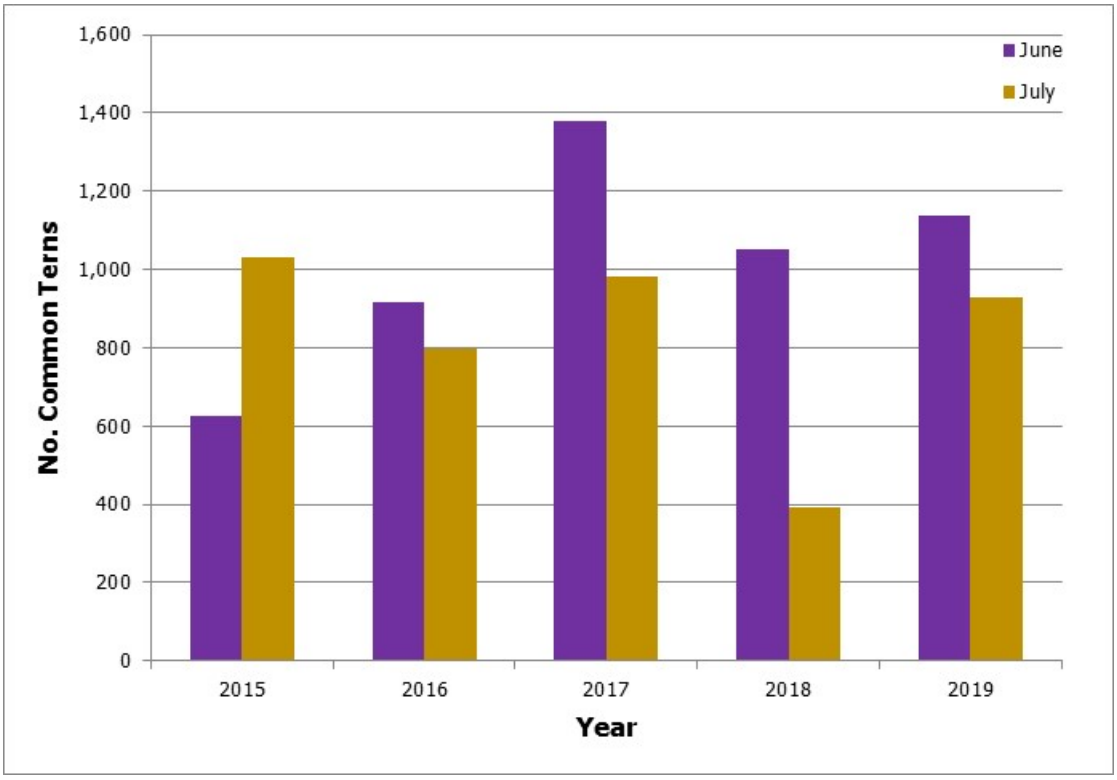
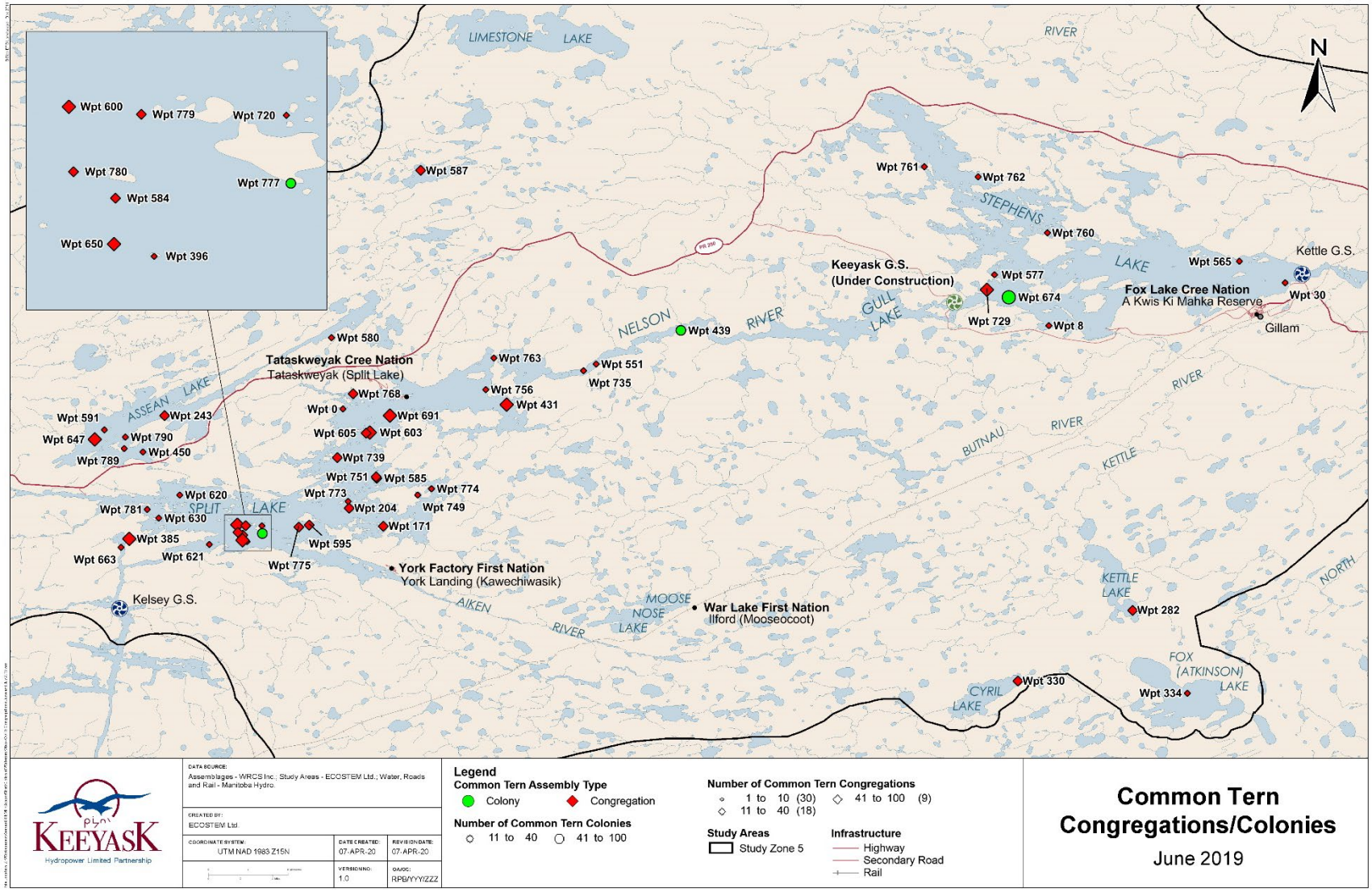
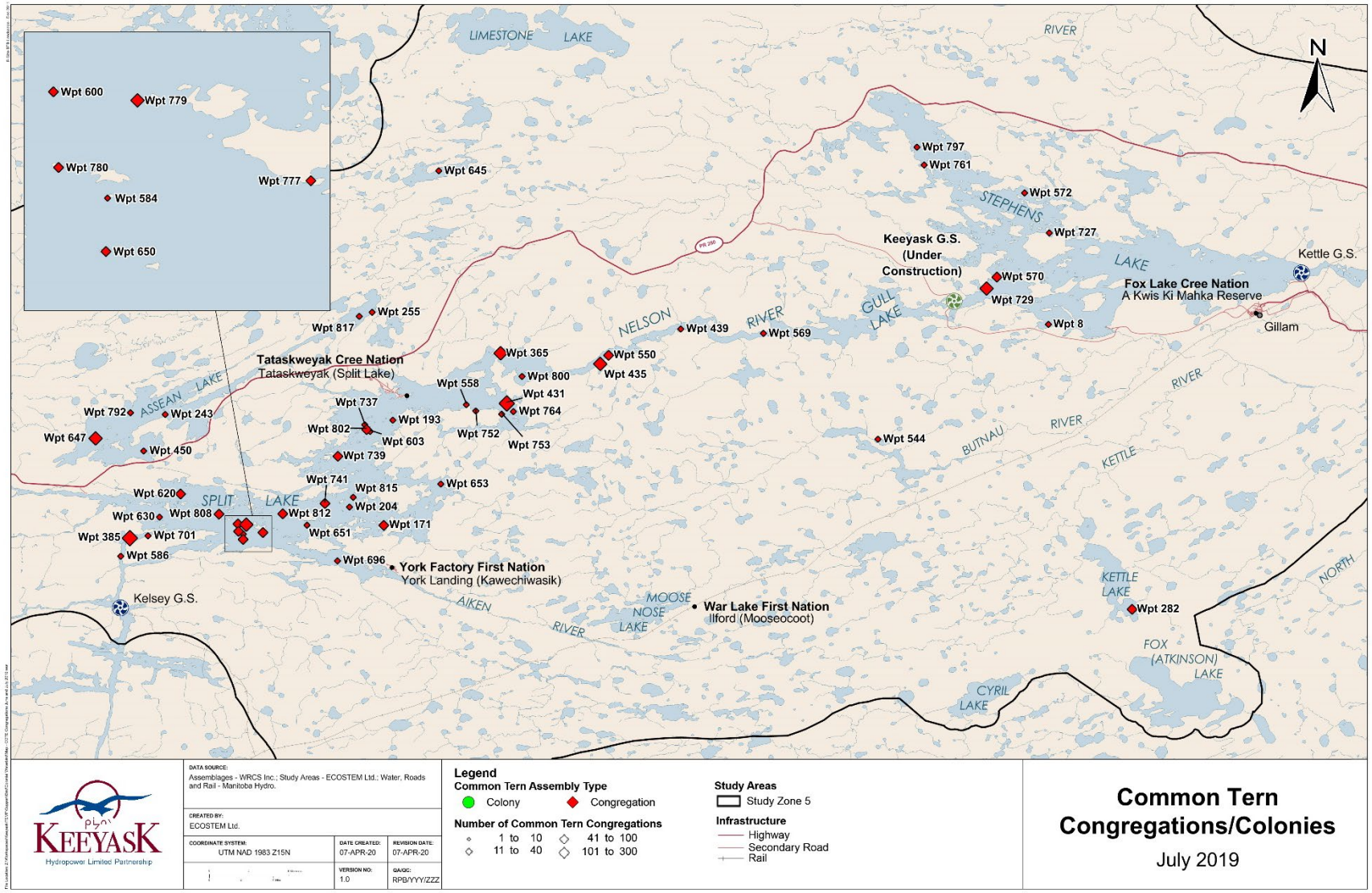


Figure 3: Number of Common Terns Observed During Helicopter Surveys in June and July from 2015 to 2019



Map 8: Common Tern Colonies and Congregations Observed During Helicopter Surveys in June 2019



Map 9: Common Tern Colonies and Congregations Observed During Helicopter Surveys in July 2019

Table 5: Common Tern Congregations/Colonies Observed During the Helicopter Surveys in 2019

Waypoint	June				July			
	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks
8	1	0	1	0	3	0	3	0
30	6	0	6	0	0	0	0	0
171	25	0	25	0	25	0	25	0
193	0	0	0	0	10	0	10	0
204	20	0	20	0	3	0	3	0
243	11	0	11	0	8	0	8	0
255	0	0	0	0	2	0	2	0
282	30	0	30	0	19	0	19	0
330	12	0	12	0	0	0	0	0
334	7	0	7	0	0	0	0	0
365	0	0	0	0	55	0	55	0
385	80	0	80	0	120	0	120	0
396	2	0	2	0	0	0	0	0
431	90	0	90	0	101	0	101	0
435	0	0	0	0	45	0	45	0
439	15	2	17	0	1	0	1	0
450	1	0	1	0	2	0	2	0
544	0	0	0	0	1	0	1	0
550	0	0	0	0	20	0	20	0
551	2	0	2	0	0	0	0	0
558	0	0	0	0	2	0	2	0
565	2	0	2	0	0	0	0	0
569	0	0	0	0	2	0	2	0
570	0	0	0	0	12	0	12	0

Waypoint	June				July			
	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks
572	0	0	0	0	3	0	3	0
577	1	0	1	0	0	0	0	0
580	1	0	1	0	0	0	0	0
584	15	0	15	0	1	0	1	0
585	35	0	35	0	0	0	0	0
586	0	0	0	0	1	0	1	0
587	25	0	25	0	0	0	0	0
591	1	0	1	0	0	0	0	0
595	35	0	35	0	0	0	0	0
600	45	0	45	0	30	0	30	0
603	45	0	45	0	8	0	8	0
605	40	0	40	0	0	0	0	0
620	10	0	10	0	12	0	12	0
621	8	0	8	0	0	0	0	0
630	2	0	2	0	5	0	5	0
645	0	0	0	0	1	0	1	0
647	50	0	50	0	100	0	100	0
650	50	0	50	0	20	0	20	0
651	0	0	0	0	10	0	10	0
653	0	0	0	0	2	0	2	0
663	3	0	3	0	0	0	0	0
674	29	34	63	0	0	0	0	0
691	80	0	80	0	0	0	0	0
696	0	0	0	0	1	0	1	0
701	0	0	0	0	1	0	1	0
720	1	0	1	0	0	0	0	0

Waypoint	June				July			
	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks
727	0	0	0	0	1	0	1	0
729	60	0	60	0	45	0	45	0
735	1	0	1	0	0	0	0	0
737	0	0	0	0	5	0	5	0
739	15	0	15	0	30	0	30	0
741	0	0	0	0	35	0	35	0
749	2	0	2	0	0	0	0	0
751	40	0	40	0	0	0	0	0
752	0	0	0	0	10	0	10	0
753	0	0	0	0	1	0	1	0
756	1	0	1	0	0	0	0	0
760	2	0	2	0	0	0	0	0
761	7	0	7	0	8	0	8	0
762	1	0	1	0	0	0	0	0
763	1	0	1	0	0	0	0	0
764	0	0	0	0	3	0	3	0
768	14	0	14	0	0	0	0	0
773	1	0	1	0	0	0	0	0
774	11	0	11	0	0	0	0	0
775	35	0	35	0	0	0	0	0
777	11	6	17	0	13	0	13	0
779	30	0	30	0	60	0	60	0
780	12	0	12	0	12	0	12	0
781	2	0	2	0	0	0	0	0
789	1	0	1	0	0	0	0	0
790	2	0	2	0	0	0	0	0

Waypoint	June				July			
	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks
792	0	0	0	0	2	0	2	0
797	0	0	0	0	2	0	2	0
800	0	0	0	0	1	0	1	0
802	0	0	0	0	25	0	25	0
808	0	0	0	0	12	0	12	0
812	0	0	0	0	25	0	25	0
815	0	0	0	0	2	0	2	0
817	0	0	0	0	2	0	2	0
Total	1,029	42	1,071	0	920	0	920	0

Table 6: Waterbody Classification and Island Use by Common Terns in 2019

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
439	Colony	June	On-system	River	>1,000	50% bare rock, 50% grass	0.1-0.9	5
674	Colony	June	On-system	Lake	>1,000	Boulders	0.1-0.9	3
777	Colony	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
38	Congregation	June	On-system	Lake	>1,000	NA	NA	NA
8	Congregation	June	On-system	Lake	>1,000	Sandbar	<0.1	2
30	Congregation	June	On-system	Lake	>1,000	70% tree/shrub, 30% sand/gravel	1.0-1.9	5
171	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	5
204	Congregation	June	On-system	Lake	>1,000	80% exposed bedrock, 20% boulders	<0.1	3
243	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	<0.1	4
282	Congregation	June	Off-system	Lake	>1,000	95% boulders, 5% grass	0.1-0.9	5
330	Congregation	June	Off-system	Lake	>1,000	Boulders	<0.1	5
334	Congregation	June	Off-system	Lake	>1,000	95% boulders, 5% grass	0.1-0.9	4
385	Congregation	June	On-system	River	>1,000	Boulders	0.1-0.9	4
396	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	5
431	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
450	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
551	Congregation	June	On-system	River	>1,000	Exposed bedrock	<0.1	2
565	Congregation	June	On-system	Lake	>1,000	Sandbar	1.0-1.9	2
577	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	4
580	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	2
584	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	3
585	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	4
587	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	<0.1	3
591	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
595	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	2

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
600	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
603	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
605	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	3
620	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
621	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
630	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
647	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	<0.1	2
650	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
663	Congregation	June	On-system	River	>1,000	Exposed bedrock	0.1-0.9	4
691	Congregation	June	On-system	Lake	>1,000	80% tree/shrub, 20% sand/gravel	0.1-0.9	3
720	Congregation	June	On-system	Lake	>1,000	80% tree/shrub, 20% debris	0.1-0.9	2
729	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	3
735	Congregation	June	On-system	River	>1,000	Boulders	<0.1	2
739	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	2
749	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	2
751	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	2
756	Congregation	June	On-system	Lake	>1,000	Gravel	0.1-0.9	2
760	Congregation	June	On-system	Lake	>1,000	Gravel	<0.1	1
761	Congregation	June	On-system	Lake	>1,000	Gravel	<0.1	1
762	Congregation	June	On-system	Lake	>1,000	Sandbar	<0.1	1
763	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
768	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	1
773	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
774	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
774	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
775	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
777	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
779	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
780	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
781	Congregation	June	On-system	Lake	>1,000	50% exposed bedrock, 50% gravel	<0.1	1
789	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	<0.1	1
790	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	<0.1	1
1	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
3	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
5	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
7	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
9	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
13	Dispersed	June	On-system	River	>1,000	NA	NA	NA
14	Dispersed	June	On-system	River	>1,000	NA	NA	NA
25	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
27	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
32	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
35	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
39	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
42	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
43	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
44	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
45	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
46	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
47	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
48	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
51	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
54	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
56	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
58	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
59	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
63	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
65	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
66	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
67	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
68	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
71	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
76	Dispersed	June	On-system	River	>1,000	NA	NA	NA
78	Dispersed	June	On-system	River	>1,000	NA	NA	NA
89	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
93	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
94	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
96	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
101	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
8	Congregation	July	On-system	Lake	>1,000	Sandbar	<0.1	2
171	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	5
193	Congregation	July	On-system	Lake	>1,000	30% exposed bedrock, 50% sand, 20% tree/shrub	0.1-0.9	2
204	Congregation	July	On-system	Lake	>1,000	80% exposed bedrock, 20% boulders	<0.1	3
243	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	<0.1	4
255	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	<0.1	4
282	Congregation	July	Off-system	Lake	>1,000	95% boulders, 5% grass	0.1-0.9	5
365	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	4
385	Congregation	July	On-system	River	>1,000	Boulders	0.1-0.9	4
431	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
435	Congregation	July	On-system	River	>1,000	Exposed bedrock	<0.1	4
439	Congregation	July	On-system	River	>1,000	50% bare rock, 50% grass	0.1-0.9	5
450	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
544	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	2
550	Congregation	July	On-system	River	>1,000	Exposed bedrock	<0.1	4
558	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
569	Congregation	July	On-system	River	>1,000	Exposed bedrock	<0.1	3
570	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	2
572	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	3
584	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	3
586	Congregation	July	On-system	River	>1,000	40% exposed bedrock, 60% shrub	0.1-0.9	2
600	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
603	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
620	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
630	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
645	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	2
647	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	<0.1	2
650	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
651	Congregation	July	On-system	Lake	>1,000	80% exposed bedrock, 20% grass	0.1-0.9	3
653	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
696	Congregation	July	On-system	Lake	>1,000	80% tree/shrub, 20% sand/gravel	0.1-0.9	3
701	Congregation	July	On-system	River	>1,000	Boulders	0.1-0.9	3
727	Congregation	July	On-system	Lake	>1,000	Sandbar	<0.1	3
729	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	3
737	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
739	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	2
741	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	2

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
752	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	2
753	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	2
761	Congregation	July	On-system	Lake	>1,000	Gravel	<0.1	1
764	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	1
777	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
779	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
780	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
792	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	<0.1	1
797	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	1
800	Congregation	July	On-system	Lake	>1,000	Gravel	1.0-1.9	1
802	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
808	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
812	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
815	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
817	Congregation	July	Off-system	Lake	>1,000	Boulders	<0.1	1
1	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
3	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
10	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
18	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
20	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
30	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
30	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
31	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
32	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
33	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
34	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
35	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
37	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
41	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
44	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
49	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
50	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
51	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
57	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA
60	Dispersed	July	On-system	Lake	>1,000	NA	NA	NA

3.2.3 HERRING GULL

Relatively low numbers of herring gulls were observed in the regional study area in 2019 compared to ring-billed gulls (Table 2). More herring gulls were observed in June and July 2019 than during any of the previous survey years (Figure 4). The number of herring gulls decreased from June to July, which was consistent with previous construction surveys (Figure 4).

Herring gull nests were observed at 50 sites in the regional study area (Table 7). The majority of the nesting sites (33) were located on Split Lake (Map 10). Other nesting sites included Stephens Lake, Assean Lake, and Butnau Lake. In Gull Rapids, islands Wpt 478 and Wpt 480 supported 12 and 13 herring gull nests, respectively. Another island in Split Lake (Wpt 602) supported a group of 14 herring gull nests.

In June 2019, 45 of 68 islands (66%) where herring gulls were observed were used at least once in previous years (2015-2018) (Table 8). In July 2019, 32 of 47 islands (68%) where herring gulls were observed were used at least once in previous years (2015-2018) (Table 8).

All herring gull nests observed were located on islands. Most islands used consisted of exposed bedrock or boulders, were less than 1 ha in size, are were within large, on-system lakes or rivers (Table 8).

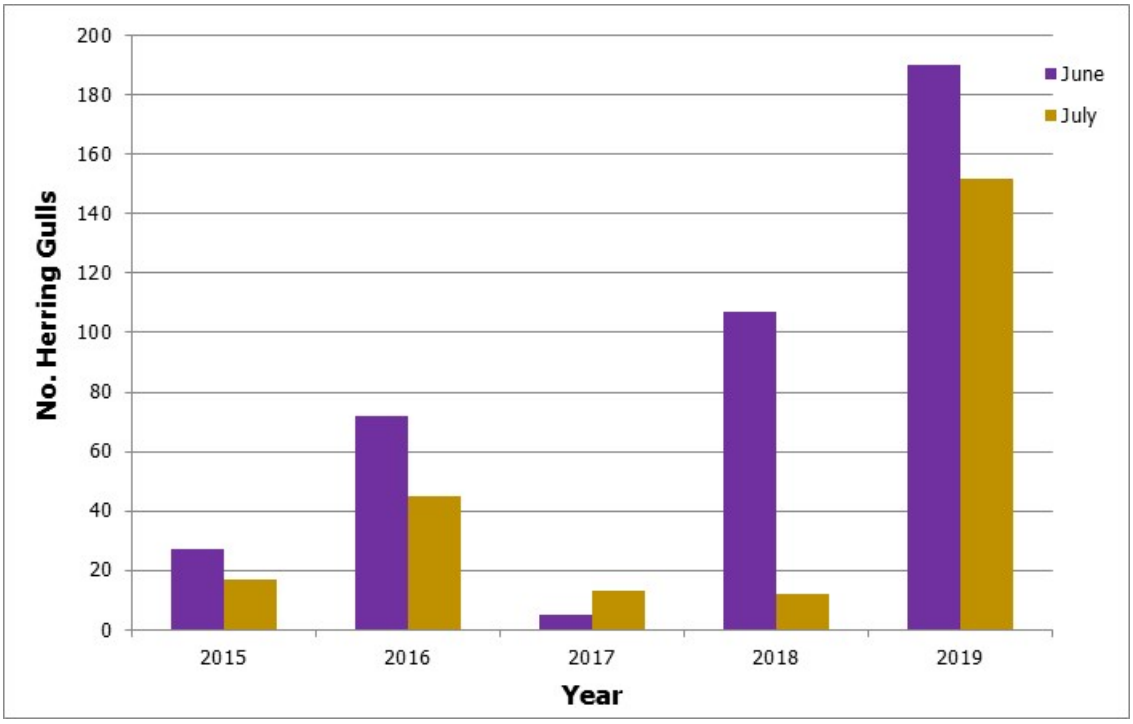
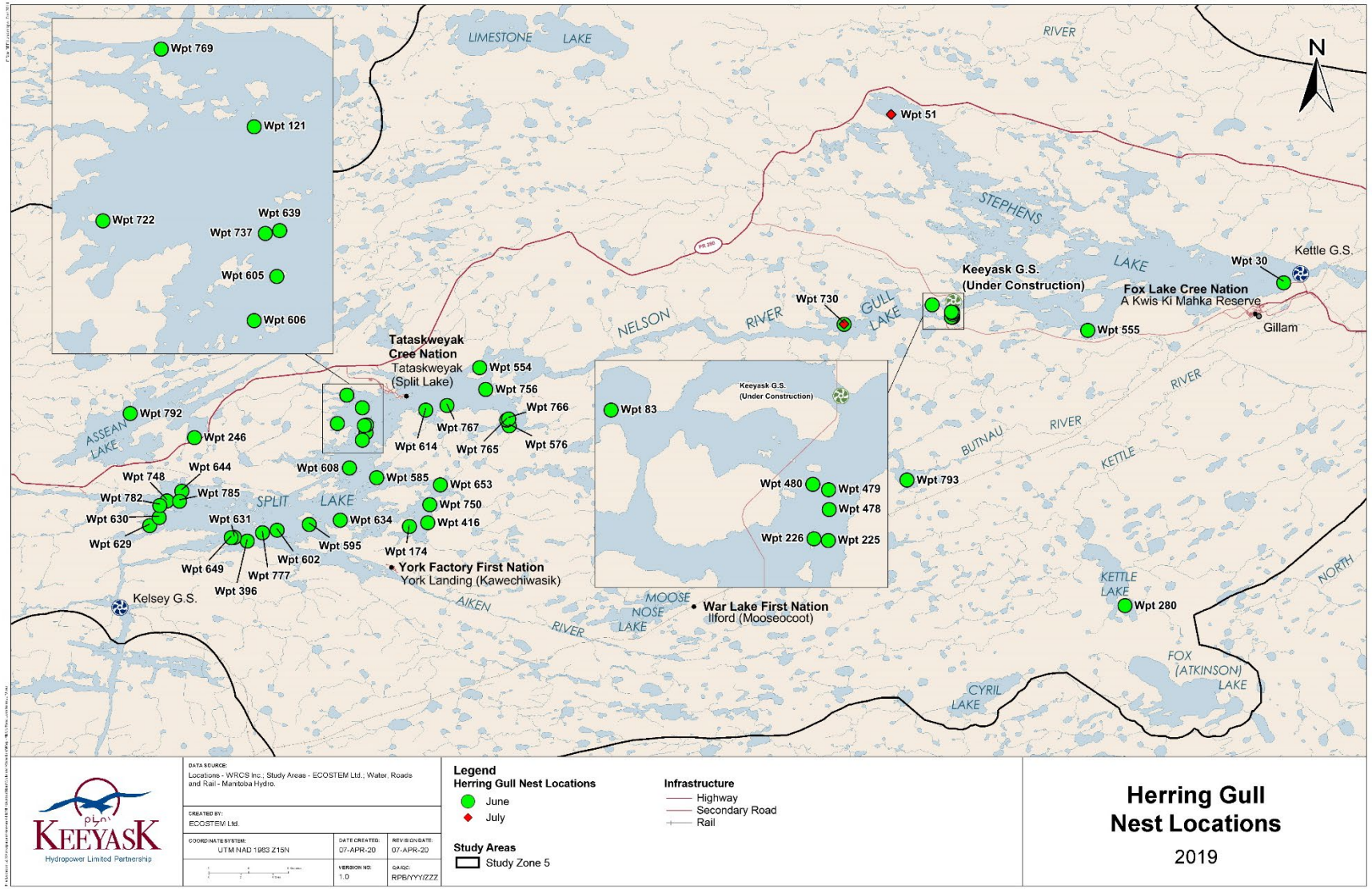


Figure 4: Number of Herring Gulls Observed During Helicopter Surveys in June and July from 2015 to 2019



Map 10: Herring Gull Nests Observed During Helicopter Surveys in 2019

Table 7: Herring Gulls and Nest Sites Observed During the Helicopter Surveys in 2019

Waypoint	June				July			
	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks
30	0	2	2	0	2	0	2	0
51	0	0	0	0	1	1	2	0
83	1	1	2	0	0	0	0	0
121	1	1	2	0	0	0	0	0
123	3	0	3	0	0	0	0	0
174	1	1	2	0	1	0	1	0
192	0	0	0	0	2	0	2	0
193	1	0	1	0	0	0	0	0
203	2	0	2	0	2	0	2	0
204	0	0	0	0	10	0	10	0
225	2	5	7	0	7	0	7	0
226	0	2	2	0	0	0	0	0
246	1	1	2	0	1	0	1	0
280	0	1	1	0	0	0	0	0
330	0	0	0	0	3	0	3	0
372	0	0	0	0	2	0	2	0
396	0	2	2	0	1	0	1	0
416	2	1	3	0	0	0	0	0
450	1	0	1	0	0	0	0	0
478	1	11	12	0	14	0	14	12
479	2	4	6	0	18	0	18	2
480	7	6	13	0	14	0	14	3
554	0	1	1	0	0	0	0	0
555	7	2	9	0	0	0	0	0

Waypoint	June				July			
	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks
561	0	0	0	0	0	0	0	0
566	2	0	2	0	0	0	0	0
576	3	1	4	0	6	0	6	0
585	0	1	1	0	4	0	4	0
591	0	0	0	0	1	0	1	0
595	0	1	1	0	0	0	0	0
600	0	0	0	0	1	0	1	0
602	9	5	14	0	4	0	4	0
605	1	1	2	0	0	0	0	0
606	1	1	2	0	1	0	1	1
608	1	1	2	0	2	0	2	0
613	1	0	1	0	2	0	2	0
614	0	1	1	0	0	0	0	0
627	0	0	0	0	2	0	2	0
629	0	1	1	0	0	0	0	0
630	0	1	1	0	2	0	2	2
631	5	2	7	0	1	0	1	0
634	2	2	4	0	6	0	6	0
638	1	0	1	0	1	0	1	0
639	1	1	2	0	0	0	0	0
644	1	1	2	0	2	0	2	1
645	2	0	2	0	2	0	2	0
647	1	0	1	0	0	0	0	0
649	0	1	1	0	0	0	0	0
650	3	0	3	0	0	0	0	0
653	1	1	2	0	1	0	1	1

Waypoint	June				July			
	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks
722	0	1	1	0	1	0	1	0
730	0	1	1	0	0	1	1	0
733	2	0	2	0	0	0	0	0
736	5	0	5	0	0	0	0	0
737	1	1	2	0	0	0	0	0
748	1	2	3	0	1	0	1	0
750	0	1	1	0	1	0	1	0
751	2	0	2	0	0	0	0	0
754	1	0	1	0	2	0	2	0
756	1	1	2	0	0	0	0	0
765	0	1	1	0	0	0	0	0
766	0	1	1	0	0	0	0	0
767	2	2	4	0	6	0	6	0
768	2	0	2	0	0	0	0	0
769	4	2	6	0	0	0	0	0
770	6	0	6	0	0	0	0	0
775	1	0	1	0	1	0	1	0
777	1	1	2	0	1	0	1	0
778	1	0	1	0	0	0	0	0
782	0	1	1	0	0	0	0	0
785	0	1	1	0	0	0	0	0
791	1	0	1	0	0	0	0	0
792	0	1	1	0	1	0	1	0
793	1	1	2	0	1	0	1	0
801	0	0	0	0	2	0	2	0
803	0	0	0	0	1	0	1	0

Waypoint	June				July			
	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks
804	0	0	0	0	1	0	1	0
809	0	0	0	0	1	0	1	0
810	0	0	0	0	4	0	4	0
811	0	0	0	0	6	0	6	0
816	0	0	0	0	4	0	4	0
Total	99	81	180	0	150	2	152	22

Table 8: Waterbody Classification and Island Use by Herring Gulls in 2019

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
30	Nest	June	On-system	Lake	>1,000	70% tree/shrub, 30% sand/gravel	1.0-1.9	5
83	Nest	June	On-system	River	>1,000	Exposed bedrock	0.1-0.9	5
121	Nest	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
174	Nest	June	On-system	Lake	>1,000	Boulders	<0.1	5
225	Nest	June	On-system	River	>1,000	Exposed bedrock	0.1-0.9	5
226	Nest	June	On-system	River	>1,000	50% rock, 45% shrub/deadfall, 55% treed	1.0-1.9	5
246	Nest	June	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
280	Nest	June	Off-system	Lake	>1,000	Boulders	<0.1	4
396	Nest	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	5
416	Nest	June	On-system	Lake	>1,000	Exposed bedrock, 5% grass	0.1-0.9	4
478	Nest	June	On-system	River	>1,000	Exposed bedrock	<0.1	4
479	Nest	June	On-system	River	>1,000	Exposed bedrock	<0.1	2
480	Nest	June	On-system	River	>1,000	Exposed bedrock	0.1-0.9	4
554	Nest	June	On-system	Lake	>1,000	Boulders	<0.1	2
555	Nest	June	On-system	Lake	>1,000	80% tree/shrub, 20% sand/gravel	0.1-0.9	3
576	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	4
585	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	4
595	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
602	Nest	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
605	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	3
606	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
608	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	3
614	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	3
629	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	3
630	Nest	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
631	Nest	June	On-system	Lake	>1,000	Boulders	0.1-0.9	4
634	Nest	June	On-system	Lake	>1,000	95% exposed bedrock, 5% tree/shrub	<0.1	4
639	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	3
644	Nest	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
649	Nest	June	On-system	Lake	>1,000	Boulders	<0.1	2
653	Nest	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
722	Nest	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
730	Nest	June	On-system	River	>1,000	Boulders	<0.1	3
737	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
748	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
748	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
750	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
756	Nest	June	On-system	Lake	>1,000	Gravel	0.1-0.9	2
765	Nest	June	On-system	Lake	>1,000	Boulders	<0.1	1
766	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
767	Nest	June	On-system	Lake	>1,000	Boulders	<0.1	1
769	Nest	June	On-system	Lake	>1,000	Boulders	<0.1	1
769	Nest	June	On-system	Lake	>1,000	Boulders	<0.1	1
777	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
782	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
785	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
792	Nest	June	Off-system	Lake	>1,000	Exposed bedrock	<0.1	1
793	Nest	June	Off-system	Lake	>1,000	Boulders	<0.1	1
38	Congregation	June	On-system	Lake	>1,000	NA	NA	NA
123	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	4
193	Congregation	June	On-system	Lake	>1,000	30% exposed bedrock, 50% sand, 20% tree/shrub	0.1-0.9	2

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
203	Congregation	June	On-system	Lake	>1,000	80% exposed bedrock, 20% gravel	0.1-0.9	3
450	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
561	Congregation	June	On-system	River	>1,000	Exposed bedrock	1.0-1.9	4
566	Congregation	June	On-system	Lake	>1,000	Gravel	0.1-0.9	4
613	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
638	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	3
645	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	2
647	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	<0.1	2
650	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
733	Congregation	June	On-system	River	>1,000	Boulders	<0.1	2
736	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	1.0-1.9	2
751	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	2
754	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
768	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	1
770	Congregation	June	On-system	Lake	>1,000	75% treed, 25% exposed bedrock	0.1-0.9	1
775	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
778	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
791	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	<0.1	1
15	Dispersed	June	On-system	River	>1,000	NA	NA	NA
34	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
40	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
55	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
72	Dispersed	June	On-system	Lake	>1,000	NA	NA	NA
51	Nest	July	On-system	Lake	>1,000	Boulders	<0.1	5
730	Nest	July	On-system	River	>1,000	Boulders	<0.1	3
30	Congregation	July	On-system	Lake	>1,000	70% tree/shrub, 30% sand/gravel	1.0-1.9	5

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
174	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	5
192	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
203	Congregation	July	On-system	Lake	>1,000	80% exposed bedrock, 20% gravel	0.1-0.9	3
204	Congregation	July	On-system	Lake	>1,000	80% exposed bedrock, 20% boulders	<0.1	3
225	Congregation	July	On-system	River	>1,000	Exposed bedrock	0.1-0.9	5
246	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
330	Congregation	July	Off-system	Lake	>1,000	Boulders	<0.1	5
372	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	5
396	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	5
478	Congregation	July	On-system	River	>1,000	Exposed bedrock	<0.1	4
479	Congregation	July	On-system	River	>1,000	Exposed bedrock	<0.1	2
480	Congregation	July	On-system	River	>1,000	Exposed bedrock	0.1-0.9	4
576	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	4
585	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	4
591	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
600	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
602	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
606	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
608	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	3
613	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
627	Congregation	July	Off-system	Lake	>1,000	90% boulders, 10% shrub	<0.1	4
630	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
631	Congregation	July	On-system	Lake	>1,000	Boulders	0.1-0.9	4
634	Congregation	July	On-system	Lake	>1,000	95% exposed bedrock, 5% tree/shrub	<0.1	4
638	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	3

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
644	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	4
645	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	2
653	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
722	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	3
748	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
750	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
754	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	2
767	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	1
775	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
777	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
792	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	<0.1	1
793	Congregation	July	Off-system	Lake	>1,000	Boulders	<0.1	1
801	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
803	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
804	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	1
809	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
810	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
811	Congregation	July	On-system	Lake	>1,000	80% boulders, 20% treed	1.0-1.9	1
816	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
46	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA

3.2.4 BONAPARTE'S GULL

Bonaparte's gulls were relatively uncommon in the regional study area in 2019, and it was the fewest observed compared to other survey years (Figure 5). Bonaparte's gulls were observed congregating at three locations and nesting at one location in 2019. The observed colony (Wpt 460), on the shore of Limestone Lake supported two nests in 2019 (Map 11; Map 12; Table 9). This location is consistently used by Bonaparte's gulls and has supported a colony in previous years (Table 10). In July 2019, ten Bonaparte's gull chicks were observed on a small pond at Wpt 514 (Table 10; Map 11; Map 12).

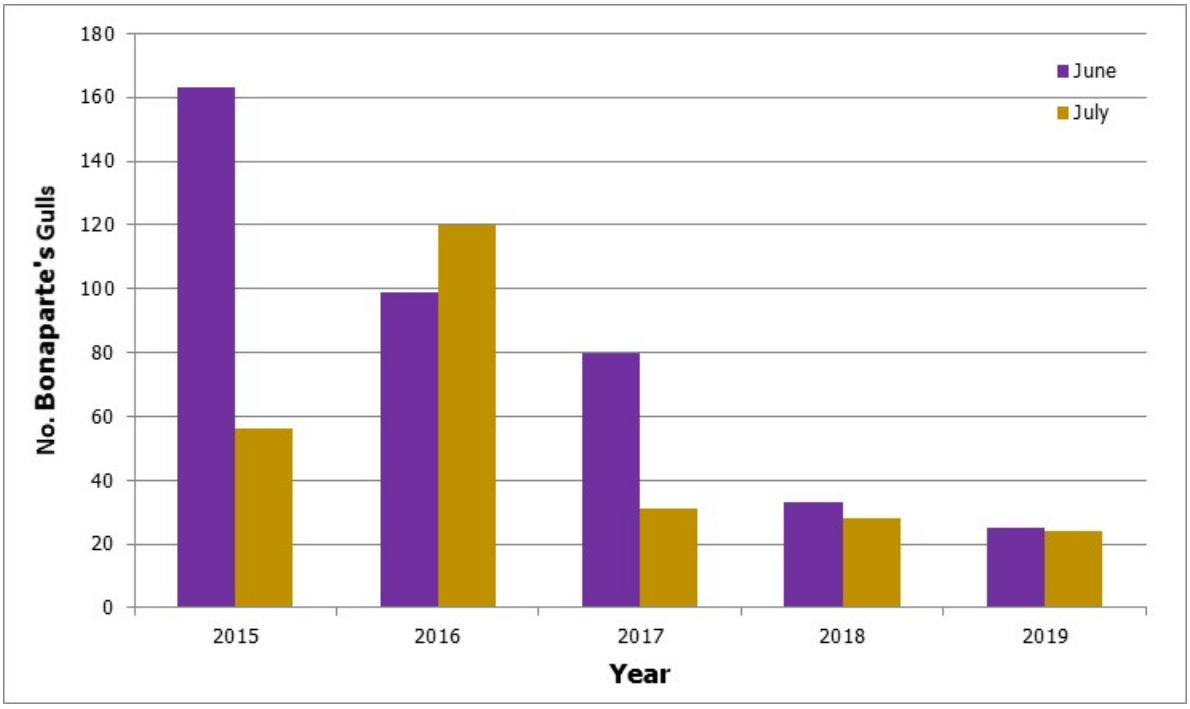
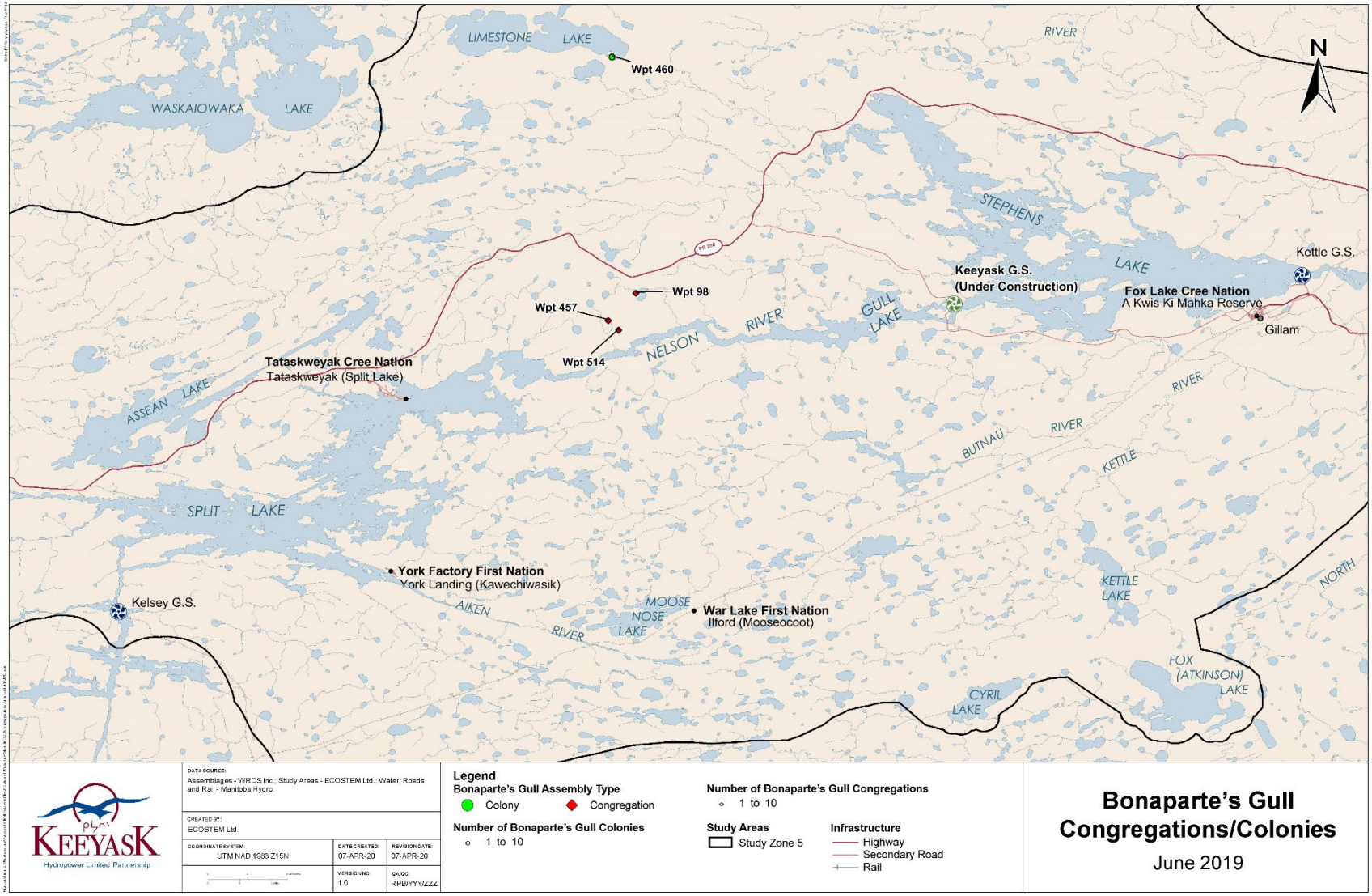
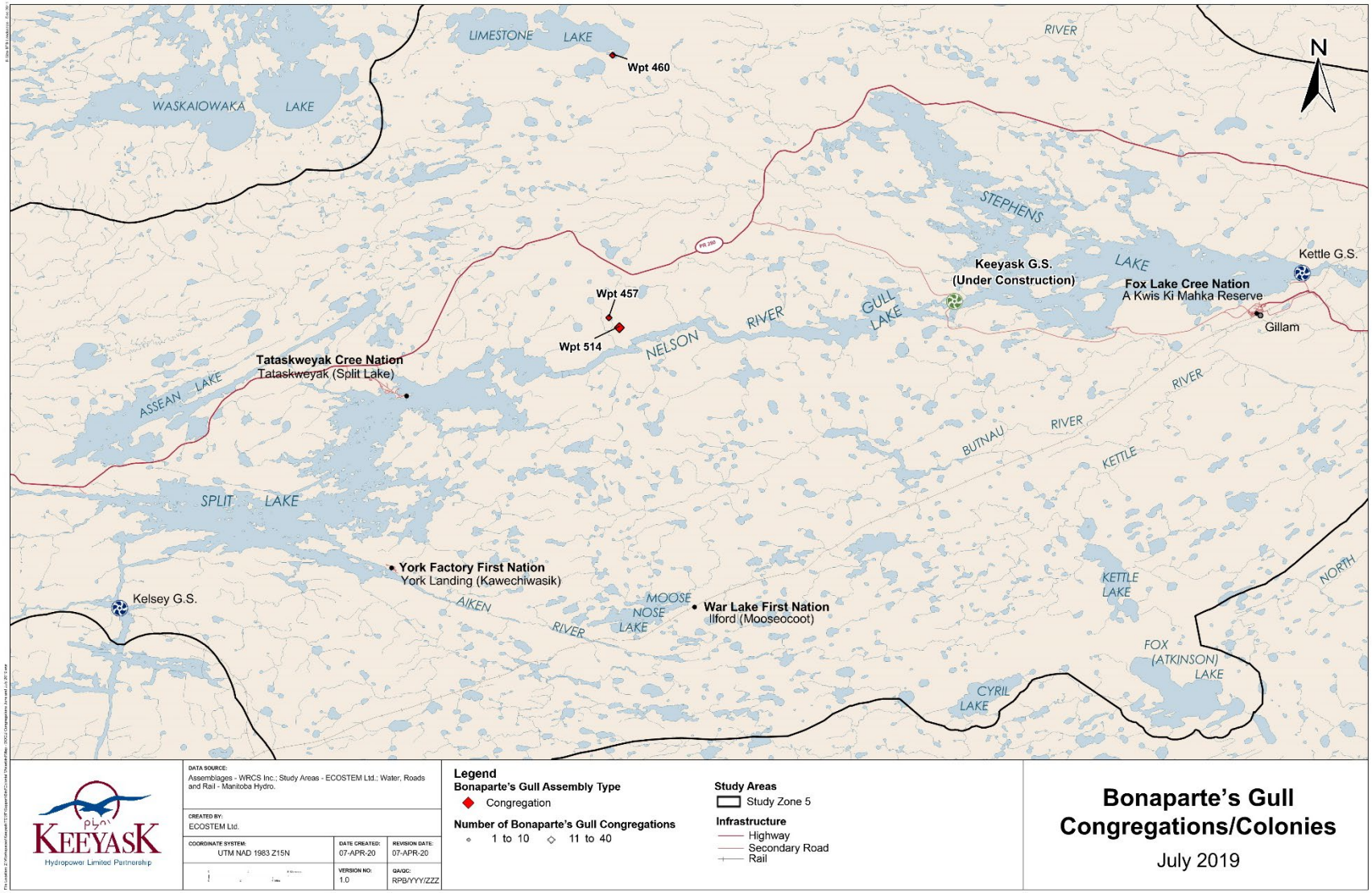


Figure 5: Number of Bonaparte's Gulls Observed During Helicopter Surveys in June and July from 2015 to 2019



Map 11: Bonaparte's Gull Congregations and Nest Sites Observed During Helicopter Surveys in June 2019



Map 12: Bonaparte's Gull Congregations and Nest Sites Observed During Helicopter Surveys in July 2019

Table 9: Bonaparte's Gull Congregations and Nest Sites Observed during the Helicopter Surveys in 2019

Waypoint	June				July			
	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks
98	2	0	2	0	0	0	0	0
457	5	0	5	0	3	0	3	0
460	5	2	7	0	4	0	4	0
514	2	0	2	0	11	0	11	10
Total	14	2	16	0	18	0	18	10

Photo 3: Group of Bonaparte's Gull Chicks Observed in an Off-system Lake on July 20, 2019

Table 10: Waterbody Classification and Island Use by Bonaparte's Gulls in 2019

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
460	Colony	June	Off-system	Lake	>1,000	Sandbar	0.1-0.9	4
98	Congregation	June	Off-system	Lake	>1,000	Burned black spruce forest	NA	2
457	Congregation	June	Off-system	Lake	10-100	Burned black spruce forest	NA	5
514	Congregation	June	Off-system	Lake	<1	Burned black spruce forest	NA	5
1	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
18	Dispersed	June	Off-system	Lake	>1,000	NA	NA	NA
19	Dispersed	June	Off-system	Lake	101-1,000	NA	NA	NA
457	Congregation	July	Off-system	Lake	10-100	Burned black spruce forest	NA	5
460	Congregation	July	Off-system	Lake	>1,000	Sandbar	0.1-0.9	4
514	Congregation	July	Off-system	Lake	<1	Burned black spruce forest	NA	5
1	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
9	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
22	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
37	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
38	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
39	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
42	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
43	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA

3.2.5 AMERICAN WHITE PELICAN

The number of American white pelicans observed in the regional study area in June 2019 was consistent with the number observed during previous construction surveys (Figure 6). In July 2019, the number of pelicans increased, but was the lowest number observed during any of the previous construction surveys (Figure 6). The largest concentration of American white pelicans was observed at Gull Rapids (Wtp 226), which differed from previous surveys (Map 13). The majority of American white pelicans observed were located on large, on-system lakes and rivers, typically between Split Lake and Gull Rapids; one congregation and a few dispersed pelicans were observed on Atkinson Lake (Table 11; Table 12). No American white pelicans were observed nesting in the study area in 2019. These findings are consistent with the observations made during previous surveys.

In June 2019, five of six islands (83%) where American white pelicans were observed were used at least once in previous years (2015-2018) (Table 12). In July 2019, five of seven islands (71%) where American white pelicans were observed were used at least once in previous years (2015-2018) (Table 12).

Islands used by American white pelicans were typically exposed bedrock, 0.1-0.9 ha in size, and located on on-system lakes or rivers (Table 12).

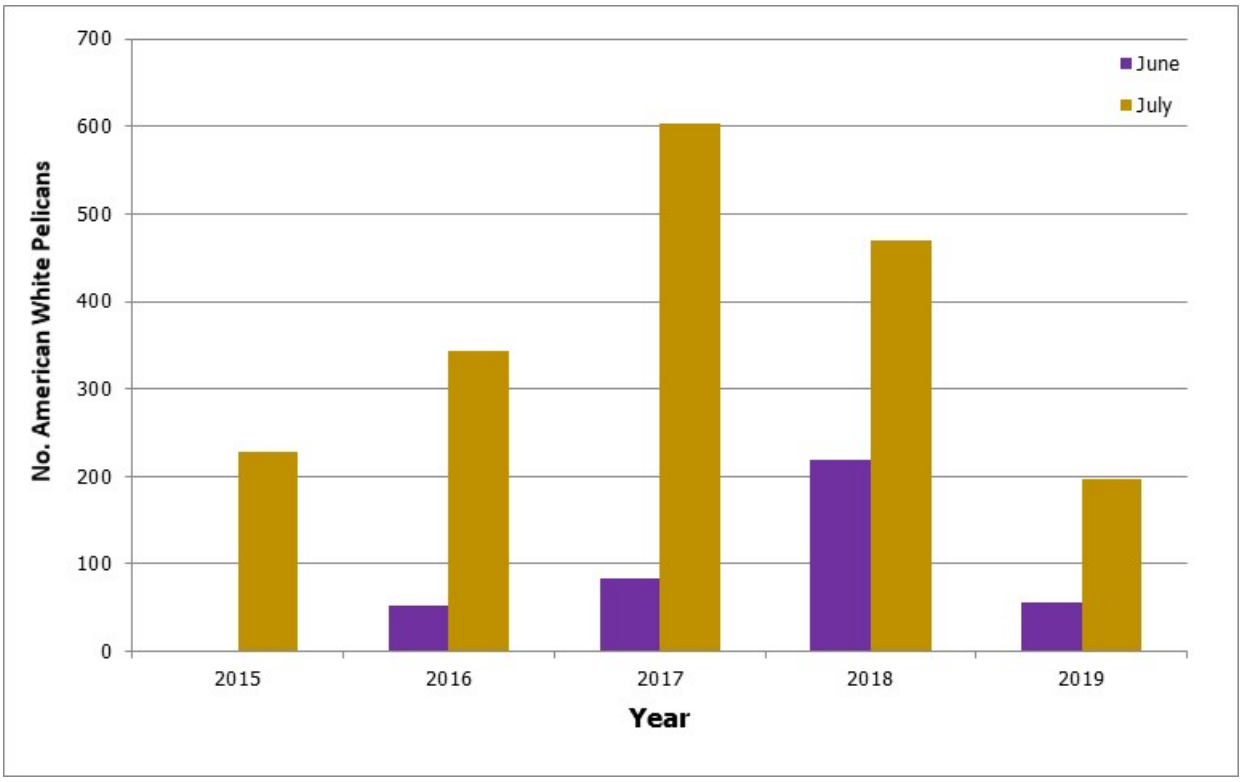
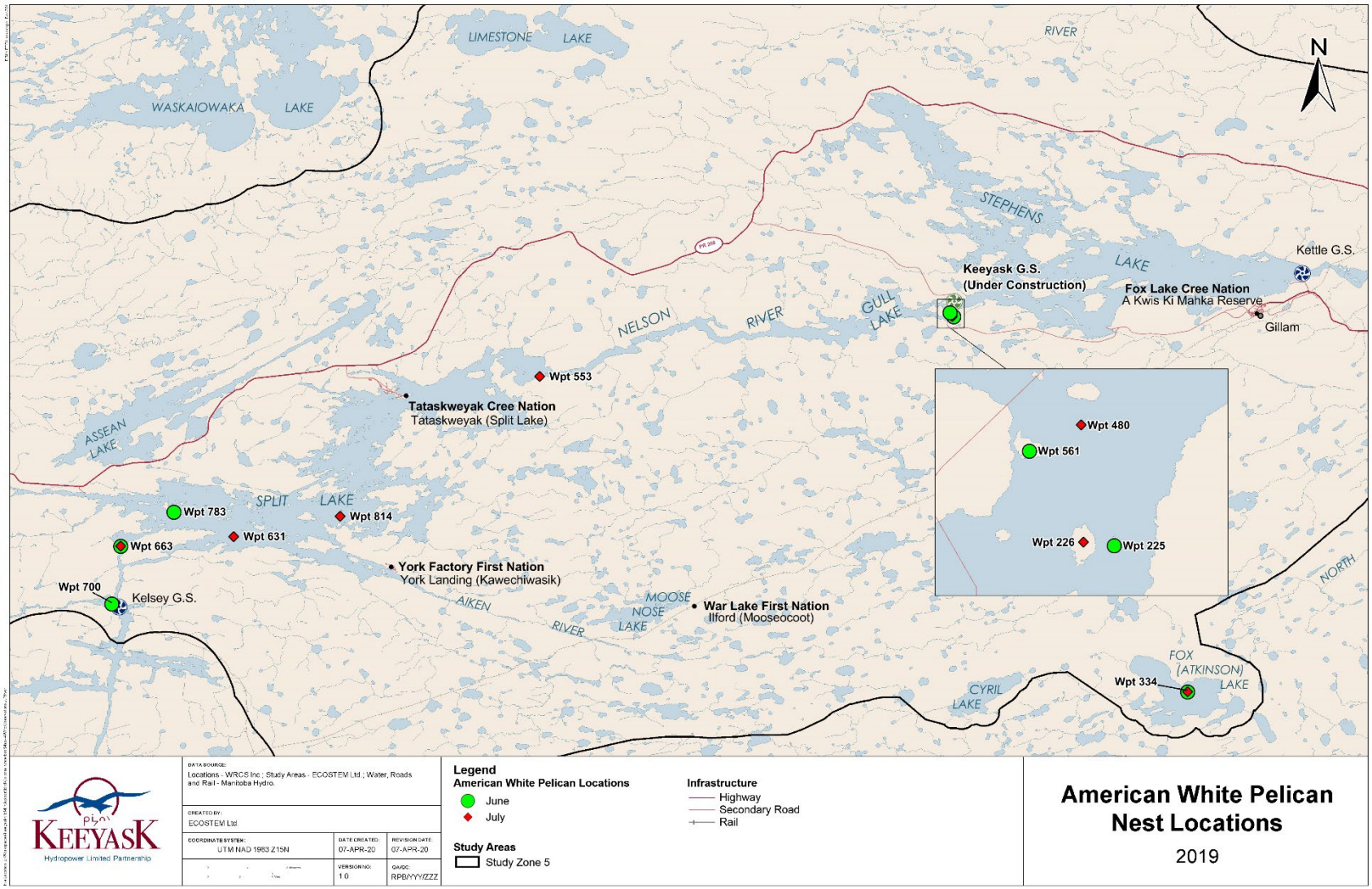


Figure 6: Number of American White Pelicans Observed During Helicopter Surveys in June and July from 2015 to 2019



Map 13: American White Pelican Observations Made During the Helicopter Surveys in 2019

Table 11: American White Pelican Observations Made During the Helicopter Surveys in 2019

Waypoint	June				July			
	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks	Adults (No Nest)	Occupied Nests	Total Adults	Total Chicks
225	18	0	18	0	0	0	0	0
226	0	0	0	0	72	0	72	0
334	2	0	2	0	14	0	14	0
480	0	0	0	0	24	0	24	0
553	0	0	0	0	1	0	1	0
561	12	0	12	0	0	0	0	0
631	0	0	0	0	3	0	3	0
663	7	0	7	0	30	0	30	0
700	1	0	1	0	0	0	0	0
783	1	0	1	0	0	0	0	0
814	0	0	0	0	2	0	2	0
Total	41	0	41	0	146	0	146	0

Table 12: Waterbody Classification and Island Use by American White Pelicans in 2019

Waypoint	Gathering Type	Month	Zone	Water Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	No. Years Used Since 2015
225	Congregation	June	On-system	River	>1,000	Exposed bedrock	0.1-0.9	5
334	Congregation	June	Off-system	Lake	>1,000	95% boulders, 5% grass	0.1-0.9	4
561	Congregation	June	On-system	River	>1,000	Exposed bedrock	1.0-1.9	4
663	Congregation	June	On-system	River	>1,000	Exposed bedrock	0.1-0.9	4
700	Congregation	June	On-system	River	>1,000	Exposed bedrock	0.1-0.9	3
783	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
77	Dispersed	June	On-system	River	>1,000	NA	NA	NA
226	Congregation	July	On-system	River	>1,000	50% rock, 45% shrub/deadfall, 55% treed	1.0-1.9	5
334	Congregation	July	Off-system	Lake	>1,000	95% boulders, 5% grass	0.1-0.9	4
480	Congregation	July	On-system	River	>1,000	Exposed bedrock	0.1-0.9	4
553	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	2
631	Congregation	July	On-system	Lake	>1,000	Boulders	0.1-0.9	4
663	Congregation	July	On-system	River	>1,000	Exposed bedrock	0.1-0.9	4
814	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	1
3	Dispersed	July	Off-system	Lake	>1,000	NA	NA	NA
22	Dispersed	July	On-system	River	>1,000	NA	NA	NA
26	Dispersed	July	On-system	River	>1,000	NA	NA	NA
27	Dispersed	July	On-system	River	>1,000	NA	NA	NA
28	Dispersed	July	On-system	River	>1,000	NA	NA	NA

4.0 DISCUSSION

The number of breeding ring-billed gulls observed at Gull Rapids in 2019 was similar to that observed during previous construction surveys conducted from 2015-2018, and during the pre-construction period between 2001-2013 (KHLP 2012; Stantec 2014; WRCS 2016; WRCS 2017; WRCS 2018; WRCS 2019). However, specific island use appeared to have changed during construction, likely in response to disturbance caused by construction and habitat alteration. Specifically, island Wpt 224 in 2019 supported relatively few (46) ring-billed gulls in comparison to previous years. The reason for the decline in gull use may have been caused by the extension of the South Dam across the Nelson River in 2019, which likely resulted in sensory disturbance and altered habitat due to a reduction/change in water flow around the island. The increased use of other islands in the regional study area and within Gull Rapids, including island Wpt 226 and Wpt 83 suggest that gulls found alternate, suitable habitat on nearby islands.

Island Wpt 225 also supported relatively few gulls in comparison to previous surveys, with the exception of 2018. Reduced gull numbers on this island were also noted in 2018 and it is believed to be a result of the high water levels in 2017 that scoured the accumulated substrate from the otherwise bare-rock island, where the gulls preferred to nest. As a result, ring-billed gull nests were limited to the small amounts of substrate that remained on the island and fewer nests were observed in 2018 and 2019 compared to earlier years.

Ring-billed gull productivity in Gull Rapids appeared to decline in 2019 as indicated by the number of chicks observed (474), compared to 2018 (1,009 chicks) and 2016 (1,774 chicks). This may be a result of construction disturbance or several confounding factors.

Human disturbance, defined as human investigators walking through the colony, can increase chick mortality and lower colonial waterbird productivity (Fetterolf 1983; Brown and Morris 1995). However, human disturbance in the Gull Rapids area is limited to audible disturbance, which is often ineffective at dissuading gulls and typically results in habituation (Nisbet 2000; Cook et al. 2008; Soldatini et al. 2008). Island Wpt 224 may have been sufficiently disturbed by the construction of the South Dam across the Nelson River and subsequent alteration of water flow, resulting in few ring-billed gulls using the island and the absence of common terns. Displaced ring-billed gulls may have nested on the nearby islands in Gull Rapids, including islands Wpt 226 and Wpt 83, which had an increase in nesting ring-billed gulls in 2019. The increased density of ring-billed gulls may have resulted in fewer successful nests due to competition for nesting space and/or available food. Other factors, including nest timing and food availability have also been shown to affect chick mortality (Hunt and Hunt 1976; Bukacinska et al. 1996) and may have attributed to the lower productivity observed in 2019. However, data are not available to support these findings.

No common terns were observed in the Gull Rapids area in 2019, but some were observed using an island just downstream in Stephens Lake where they have been observed previously. Common terns were previously observed nesting on island Wpt 224, as recently as 2018. Similar to ring-billed gulls, common terns may have been disturbed by construction activities and habitat

alteration from the extension of the South Dam across the Nelson River, causing them to find nearby, suitable habitat.

The number and locations of colonial waterbird colonies throughout Study Zone 5 remained relatively consistent with previous years of construction monitoring. The majority of colonies and congregations were located within large, on-system lakes and rivers, mainly Split Lake and the Nelson River, similar to previous construction surveys.

American white pelicans, which were observed to be increasing in Study Zone 5 from 2015-2018, likely due to the population and range expansion in North America (King and Anderson 2005), decreased in numbers in 2019. The reduction in American white pelicans may be a result of natural population fluctuations in the region and elsewhere. The decrease in the number of American white pelicans is not likely related to Project construction as most pelicans observed in 2019 were located in Gull Rapids, very close to construction activities; while in previous years most observations were made in the tailrace area of the Kelsey G.S., more than 80 km from the Project.

Bonaparte's gulls have shown a decrease in numbers within Study Zone 5 since the start of construction monitoring in 2015. While the cause of the apparent decrease is unknown, it is not likely related to Project construction as this species is typically observed using off-system habitat that is unaffected by Project construction.

Helicopter surveys and UAV surveys will continue in 2020. Data collected by these surveys will provide further insight into the potential effects of Project construction disturbance on colonial waterbird nesting, productivity, and population trends at Gull Rapids and within the broader study area.

5.0 SUMMARY AND CONCLUSIONS

Construction activity in 2019 appeared to affect some colonial nesting waterbirds in the Gull Rapids area. Successful nesting occurred on most islands in Gull Rapids, but sensory disturbance and altered habitat appeared to limit the use of at least one island by colonial waterbirds, and productivity (number of chicks) of ring-billed gulls appeared to decrease.

One island - Wpt 224 - showed a decrease in the number of ring-billed gulls and common terns it supported in 2019. This was likely due to the construction of the South Dam across the Nelson River, which created sensory disturbance near the island and altered the water flow. Other islands in Gull Rapids, including islands Wpt 226 and Wpt 83, supported an increased number of nesting ring-billed gulls, likely from nearby disturbed islands.

The number of colonial nesting waterbirds and colonies in Study Zone 5 was relatively stable compared to previous years of Project construction surveys (2015-2018). American white pelicans and Bonaparte's gulls decreased in Study Zone 5, which did not appear to be related to the Project.

Aerial surveys will be conducted in the spring and summer of 2020, to continue monitoring the distribution and relative abundance of colonial waterbirds and their breeding habitats.

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Appendix A: UAV Survey Results

Table 1: Colonial Waterbirds Enumerated from Images of Islands in Gull Rapids taken by a UAV in 2019

Island	Observation	03-June-19		24-June-19		24-July-19	
		Morning	Evening	Morning	Evening	Morning	Evening
Wpt 83	American White Pelican	0	0	0	0	0	0
	Herring Gull	1	0	0	0	0	0
	Herring Gull w. Nest	1	1	1	1	0	0
	Herring Gull Chick	0	0	1	1	0	0
	Ring-billed Gull	448	352	347	249	1,036	1,637
	Ring-billed Gull w. Nest	602	733	685	763	0	0
	Ring-billed Gull Chick	0	0	1	0	146	100
Wpt 224	American White Pelican	0	0	0	0	0	0
	Herring Gull	0	0	0	4	0	0
	Herring Gull w. Nest	0	0	0	1	0	0
	Herring Gull Chick	0	0	0	0	0	0
	Ring-billed Gull	0	0	14	46	0	0
	Ring-billed Gull w. Nest	0	0	0	5	0	0
	Ring-billed Gull Chick	0	0	0	0	0	0
Wpt 225	American White Pelican	0	0	0	0	0	0
	Herring Gull	5	0	4	4	7	6
	Herring Gull w. Nest	11	9	11	7	0	0
	Herring Gull Chick	0	0	0	4	1	2
	Ring-billed Gull	16	12	5	6	56	44
	Ring-billed Gull w. Nest	19	16	30	29	0	0
	Ring-billed Gull Chick	0	0	0	0	15	5
Wpt 226	American White Pelican	0	1	0	0	58	69
	Herring Gull	1	4	0	4	7	0
	Herring Gull w. Nest	7	5	2	2	0	0
	Herring Gull Chick	0	0	1	3	0	0
	Ring-billed Gull	768	1,252	713	927	3,261	5,238
	Ring-billed Gull w. Nest	2,313	2,552	2,854	2,955	0	0
	Ring-billed Gull Chick	0	0	0	0	307	268
Wpt 227	American White Pelican	0	0	0	0	0	0
	Herring Gull	0	1	1	1	0	0
	Herring Gull w. Nest	1	1	0	0	0	0
	Herring Gull Chick	0	0	2	0	0	0
	Ring-billed Gull	6	12	11	12	103	213
	Ring-billed Gull w. Nest	58	63	65	68	0	0
	Ring-billed Gull Chick	0	0	0	0	4	0

Island	Observation	03-June-19		24-June-19		24-July-19	
		Morning	Evening	Morning	Evening	Morning	Evening
Wpt 478	American White Pelican	0	0	0	0	0	0
	Herring Gull	0	2	7	0	15	8
	Herring Gull w. Nest	12	12	4	11	0	0
	Herring Gull Chick	0	0	11	9	11	12
	Ring-billed Gull	0	0	0	0	0	0
	Ring-billed Gull w. Nest	0	0	0	0	0	0
	Ring-billed Gull Chick	0	0	0	0	0	0
Wpt 479	American White Pelican	0	0	0	0	0	0
	Herring Gull	1	0	0	1	1	1
	Herring Gull w. Nest	1	1	1	1	0	0
	Herring Gull Chick	0	0	0	0	1	1
	Ring-billed Gull	0	0	0	0	0	0
	Ring-billed Gull w. Nest	0	0	0	0	0	0
	Ring-billed Gull Chick	0	0	0	0	0	0
Wpt 480	American White Pelican	0	0	0	0	0	0
	Herring Gull	0	0	15	5	1	32
	Herring Gull w. Nest	8	9	4	4	0	0
	Herring Gull Chick	0	0	4	2	1	5
	Ring-billed Gull	0	0	0	0	11	0
	Ring-billed Gull w. Nest	0	0	0	0	0	0
	Ring-billed Gull Chick	0	0	0	0	2	0
Wpt 561	American White Pelican	0	0	0	0	0	0
	Herring Gull	0	0	4	0	0	0
	Herring Gull w. Nest	0	0	0	0	0	0
	Herring Gull Chick	0	0	0	0	0	0
	Ring-billed Gull	0	0	0	0	70	95
	Ring-billed Gull w. Nest	0	0	0	0	0	0
	Ring-billed Gull Chick	0	0	0	0	0	0

Appendix B: Colonial Waterbird Abundance Observed during Helicopter Surveys 2015-2018

Table 1: Colonial Waterbird Abundance Observed During Helicopter Surveys in 2018

Species	June			July		
	Congregated Birds	Dispersed Birds	Total	Congregated Birds	Dispersed Birds	Total
Ring-billed Gull	4,597	417	5,014	7,943	3	7,946
Common Tern	1,006	46	1,052	391	0	391
Herring Gull	107	0	107	12	0	12
Bonaparte's Gull	12	21	33	16	12	28
American White Pelican	194	24	218	425	44	469

Table 2: Colonial Waterbird Abundance Observed During Helicopter Surveys in 2017

Species	June			July		
	Congregated Birds	Dispersed Birds	Total	Congregated Birds	Dispersed Birds	Total
Ring-billed Gull	5,835	1,708	7,543	7,780	422	8,202
Common Tern	1,377	4	1,381	979	5	984
Bonaparte's Gull	50	30	80	0	31	31
Herring Gull	5	0	5	13	0	13
American White Pelican	37	46	83	393	210	603

Table 3: Colonial Waterbird Abundance Observed During Helicopter Surveys in 2016

Species	June			July		
	Congregated Birds	Dispersed Birds	Total	Congregated Birds	Dispersed Birds	Total
Ring-billed Gull	5,217	359	5,576	12,087	1,229	13,316
Common Tern	861	54	915	579	218	797
Bonaparte's Gull	55	44	99	58	62	120
Herring Gull	67	5	72	42	3	45
American White Pelican	0	52	52	0	343	343
Black Tern	0	0	0	0	8	8

Table 4: Colonial Waterbird Abundance Observed During Helicopter Surveys in 2015

Species	June			July		
	Congregated Birds	Dispersed Birds	Total	Congregated Birds	Dispersed Birds	Total
Ring-billed Gull	3,026	894	3,925	3,439	302	3,741
Common Tern	451	173	624	572	461	1,033
Bonaparte's Gull	26	137	163	0	56	56
Herring Gull	23	4	27	9	8	17
American White Pelican	0	1	1	228	0	228

Appendix C: UAV Mission Summary 2019

Mission Description, Method, and Execution

Unmanned Aerial Imaging Solutions (UAIS) uses unmanned aerial vehicles (UAVs) which are controlled by remote control, computer software, or a combination of both. The type of UAV that UAIS utilizes is a combination of fixed wing (traditional aircraft type) Mini Talon X-UAV foam body, and rotary wing (helicopter type) DJI Phantom and DJI Mavic Pro plastic body. All other electrical components are either custom made or custom selected by UAIS. All Wildlife Resource Consulting Service MB Inc. (WRCS) missions flown in 2019 were accomplished using a DJI Phantom rotary wing. Using computer software (Mission Planner), the UAV operator creates a grid over a predetermined area and defines the speeds at which the UAV will fly, the altitude the UAV will fly, and boundaries that the UAV is not to penetrate (both horizontally and vertically). Once the flight plan is created, camera parameters specific to the onboard camera, are entered into the computer software and a grid pattern is created based on camera capability and desired image overlap and sidelap.

Launching of the UAV is accomplished using a small, clear, level and secure site to start the UAV while stationary on the ground and perform basic pre-start and pre-flight checks. The pre-start and pre-flight checks involve checking propeller response to remote control commands, GPS satellite status and acquisition condition and a final site check to ensure the safe launch of the UAV. Launch of the UAV is done in a relatively clear area for this purpose. Once the UAV operator takes control of the UAV, the flight plan is then initiated and the UAV is monitored using line of sight with secondary reference to UAV telemetry displayed on a personal computing device (iPad) mounted directly on the remote control. If at any time the UAV operator needs to terminate the flight plan, a “Return to Home” function immediately brings the UAV back to the mission launch location with no other required input from the UAV operator. The “Return to Home” route, altitude, and speed are part of the pre-start checks and are set prior to UAV engine start.

The landing site for the UAV requires a small and relatively clear, and flat area. The UAV operator will fly the UAV using the remote control into the approach phase, slowing the UAV down to landing speed and reducing the UAVs altitude in a controlled manner over the landing site. The UAV is landed on its landing gear in a controlled and stable manner. The data is then downloaded from the UAVs onboard memory and the camera memory card on to a computer and the data is then processed.

Data processing involves using the Mission Planner software to take the images and place “geo-referencing” meta-data into the images. Third party software can then be used to arrange the images in a sequential order and then another piece of third party software is used to “stitch” the images together into one large image. The final product is then delivered to the client.

The mission areas of interest were: “waypoint 83, 224, 225, 226, 227, 478, 479, 480, and waypoint 561 (refer to Appendix 1 – Mission Area for an image of the mission areas and their naming conventions).”

The initial plan for data acquisition of the mission areas is as follows: each aforementioned mission area was flown to assess and locate nesting areas to focus on. Once all nesting areas

were identified, the image acquisition plan was to fly each area three times per day at different times of day. Once all identified nesting areas were flown and all data captured at three different times of the day, the mission was considered complete. This would allow a much more accurate count as well as provide the greatest contrast in lighting and shadow contrast in the images.

The flight paths over the nesting areas were all flown at 100 feet above ground and in a grid pattern. The grid pattern was flown in either a south west to north east grid pattern or south east to north west grid pattern and a 90 degree straight down camera angle (refer to appendix 2 – sample images). Larger nesting areas with higher concentrations of bird and nesting activity required more flights to capture more images and videos.

Mission 1 (June 3rd – June 4th)

Data acquisition of mission areas: "waypoint 83, 224, 225, 226, 227, 478, 479, 480, and waypoint 561" commenced late evening Monday, June 3rd. The sky condition was clear and the winds were light (less than 5 knots or 10 kmph). The UAV captured 637 images of the proposed mission area successfully with a total flight time of 240 minutes. All phases of flight were uneventful.

Data acquisition of mission areas: "waypoint 83, 224, 225, 226, 227, 478, 479, 480, and waypoint 561" commenced early morning Tuesday June 4th. The sky condition was overcast and the winds were light (less than 5 knots or 10 kmph). The UAV captured 260 images of the proposed mission areas successfully with a total flight time of 104 minutes. All phases of flight were uneventful.

Mission 2 (June 23rd – June 24th)

June 23rd data acquisition of mission areas: "waypoint 83, 224, 225, 226, 227, 478, 479, 480, and waypoint 561" commenced early morning Sunday, June 23rd and were completed successfully late evening on Sunday June 23rd. The sky condition was overcast and the winds were light to moderate. The UAV captured 677 images of the proposed mission areas successfully with a total flight time of 225 minutes. All phases of flight were uneventful.

June 24th data acquisition of mission areas: "waypoint 83, 224, 225, 226, 227, 478, 479, 480, and waypoint 561" commenced early morning Monday, June 24th. The sky condition was overcast and the winds were moderate. The UAV captured 688 images of the proposed mission areas successfully with a total flight time of 243 minutes. All phases of flight were uneventful.

Mission 3 (July 23rd – July 24th)

July 23rd data acquisition of mission areas: "waypoint 83, 224, 225, 226, 227, 478, 479, 480, and waypoint 561" commenced early morning Tuesday, July 23rd and were completed successfully late evening on Tuesday, July 23rd. The sky condition was overcast and the winds were light to moderate. The UAV captured 655 images of the proposed mission areas successfully with a total flight time of 145 minutes. All phases of flight were uneventful.

July 24th data acquisition of mission areas: “waypoint 83, 224, 225, 226, 227, 478, 479, 480, and waypoint 561” commenced early morning Wednesday, July 24th. The sky condition was overcast and the winds were moderate. The UAV captured 281 images of the proposed mission areas successfully with a total flight time of 133 minutes. All phases of flight were uneventful.