Keeyask Generation Project

Terrestrial Effects Monitoring Plan

Colonial Waterbird Habitat Effects Monitoring Report

TEMP-2019-08

KEEYASK

Manitoba Sustainable Development Client File 5550.00
Manitoba Environment Act Licence No. 3107

2018 -2019

KEEYASK GENERATION PROJECT

TERRESTRIAL EFFECTS MONITORING PLAN

REPORT #TEMP-2019-08

COLONIAL WATERBIRD HABITAT EFFECTS MONITORING

Prepared for

Manitoba Hydro

By

Wildlife Resource Consulting Service MB Inc.

June 2019

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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.

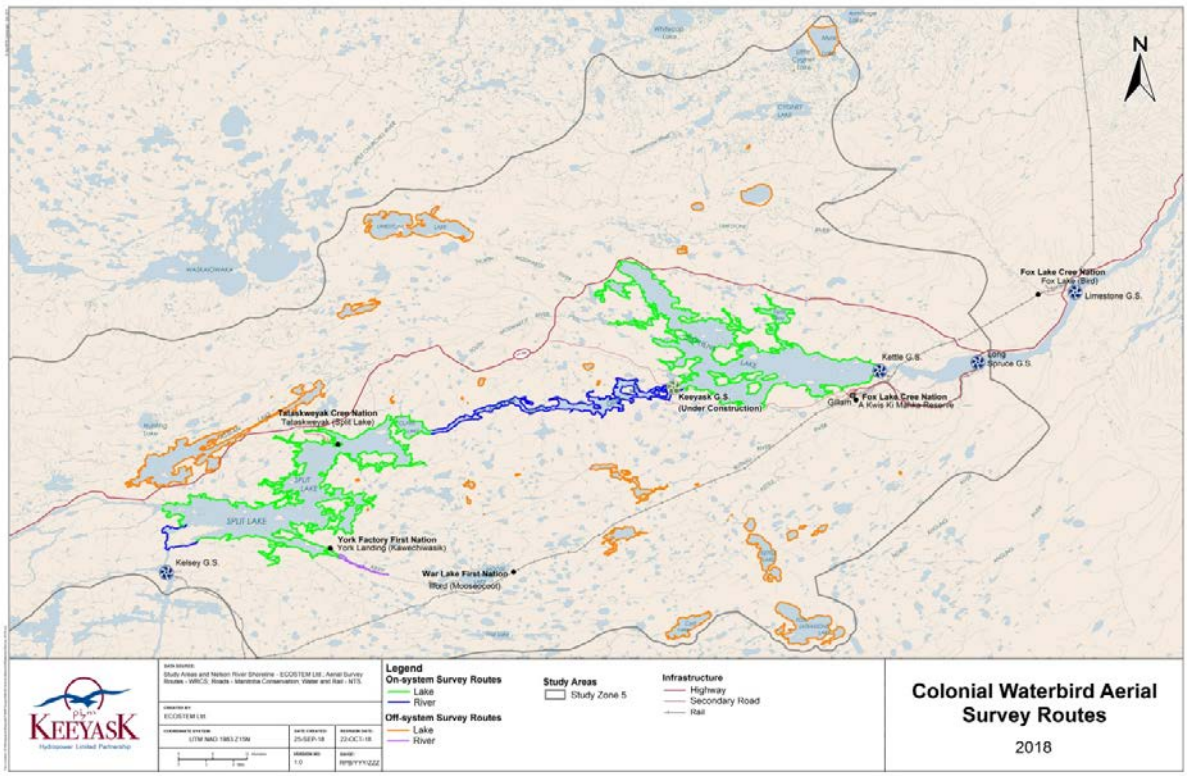
This report describes the results of colonial waterbird (gulls and terns) habitat effects monitoring conducted during the summer of 2018, the fifth summer of Project construction.

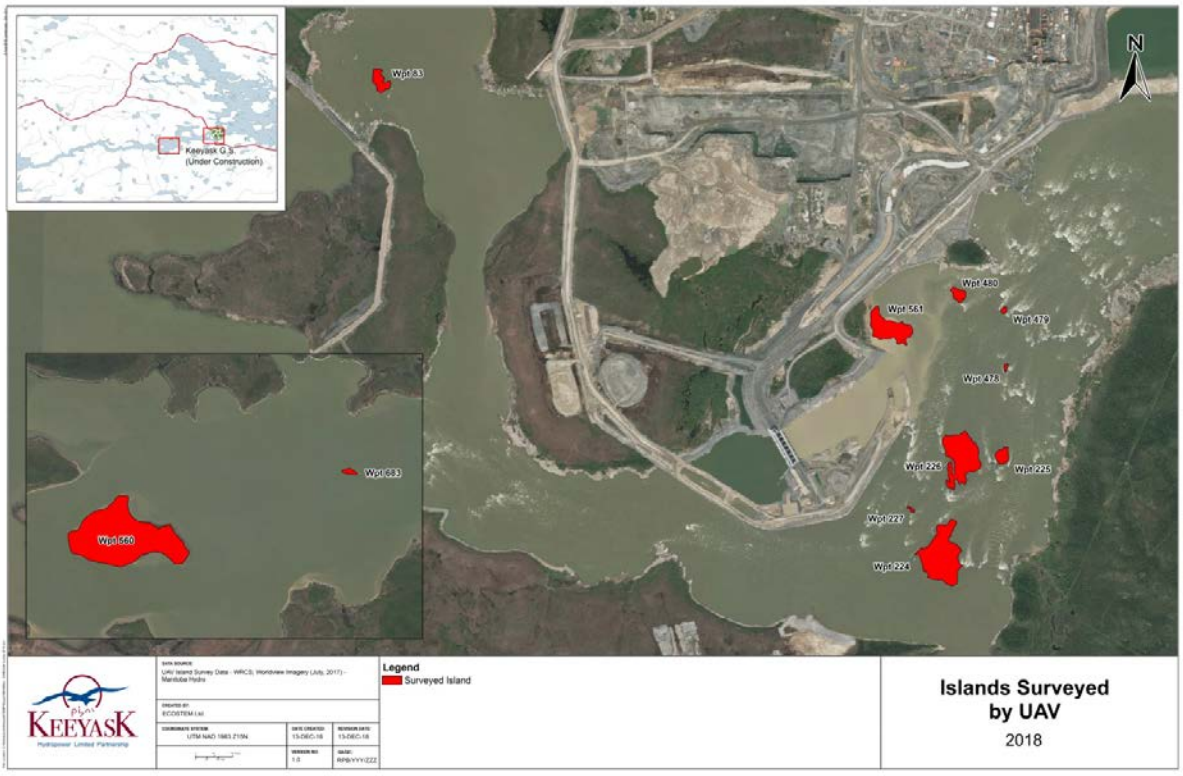
Why is the study being done?

The Project has the potential to affect gull and tern populations through alteration and loss of habitat, as well as noise and light disturbance from construction activities. Monitoring is being done to evaluate Project effects on the distribution and relative abundance of ring-billed gulls and common terns and their breeding habitats.

What was done?

Helicopter surveys of the bird study area (Study Zone 5) and unmanned aerial vehicle (UAV or drone) surveys focused on 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. UAV surveys allowed the observation of gull and tern nests and chicks, from which productivity (number of chicks produced per nest) could be determined. This is the fourth year of colonial waterbird habitat effects monitoring during the construction period; surveys were also conducted from 2015 to 2017.


N
Fox Lake Cree Nation
Fox Lake (Bird)
Limestone G.S.
Kettle G.S.
Long Spruce G.S.
Keeyask G.S.
(Under Construction)
Fox Lake Cree Nation
Gillam
A Kwis Ki Mahke Resorts
Tataskweyak Cree Nation
Tataskweyak (Split Lake)
SPLIT LAKE
York Factory First Nation
York Landing (Kawechiwasik)
Kelsey G.S.
War Lake First Nation
Ilford (Mooseocoot)
Legend
On-system Survey Routes
Lake
River
Off-system Survey Routes
Lake
River
Study Areas
Study Zone 5
Infrastructure
Highway
Secondary Road
Rail
Colonial Waterbird Aerial Survey Routes
2018


N
Keeyask G.S.
(Under Construction)
Wpt 83
Wpt 480
Wpt 561
Wpt 479
Wpt 473
Wpt 226
Wpt 225
Wpt 227
Wpt 224
Wpt 683
Wpt 560
Legend
Surveyed Island
Islands Surveyed by UAV
2018

What was found?

The UAV survey found that similar numbers of gulls and terns used habitat in Gull Rapids and successfully nested in 2018 compared to previous years (2015-2017). Project construction did not appear to disturb nesting colonial waterbirds.

One island (Wpt 225) supported fewer ring-billed gulls in 2018 compared to previous years. This was likely due to the substrate on the otherwise bare rock island, on which the gulls preferred to nest, being scoured away by high water levels in 2017.

The number of chicks observed at Gull Rapids in 2018 was lower than what was observed in 2016. The reason for this is unclear, but could be attributed to nest timing or food availability.

The number of other colonial nesting waterbirds and colonies in the bird study area (Study Zone 5) was relatively stable compared to previous years. The American white pelican appears to be increasing in numbers within the region, while Bonaparte's gulls appear to be decreasing.

UAV Photo of a Colony of Gulls on an Island in Gull Rapids

What does it mean?

The results of the UAV and helicopter surveys suggest that Project construction is not negatively affecting colonial waterbirds. The consistent number and locations of colonies of

colonial waterbirds observed in the Gull Rapids area suggests that Project construction is not discouraging the use of nearby traditional nesting islands.

What will be done next?

Aerial surveys will be conducted again in the spring and summer of 2019, 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 incorporated into an expert information 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. Megan Anger of Manitoba Hydro and Ron Bretecher of North/South Consultants Inc. are acknowledged for logistical 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
- Nicholas LaPorte, M.N.R.M., Survey personnel
- Kristian Bernjak, UAV photography
- Mike Connellan, UAV photography

TABLE OF CONTENTS

LIST OF TABLES

LIST OF MAPS

LIST OF FIGURES

LIST OF PHOTOS

LIST OF APPENDICES

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 and operation phases 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 waterbird - 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 2013-17 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) 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 are anticipated on the local colonial waterbird population. 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 at 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 fourth year (2018) of the Colonial Waterbird Habitat Effects study.

2.0 METHODS

2.1 UNMANNED AERIAL VEHICLE SURVEYS

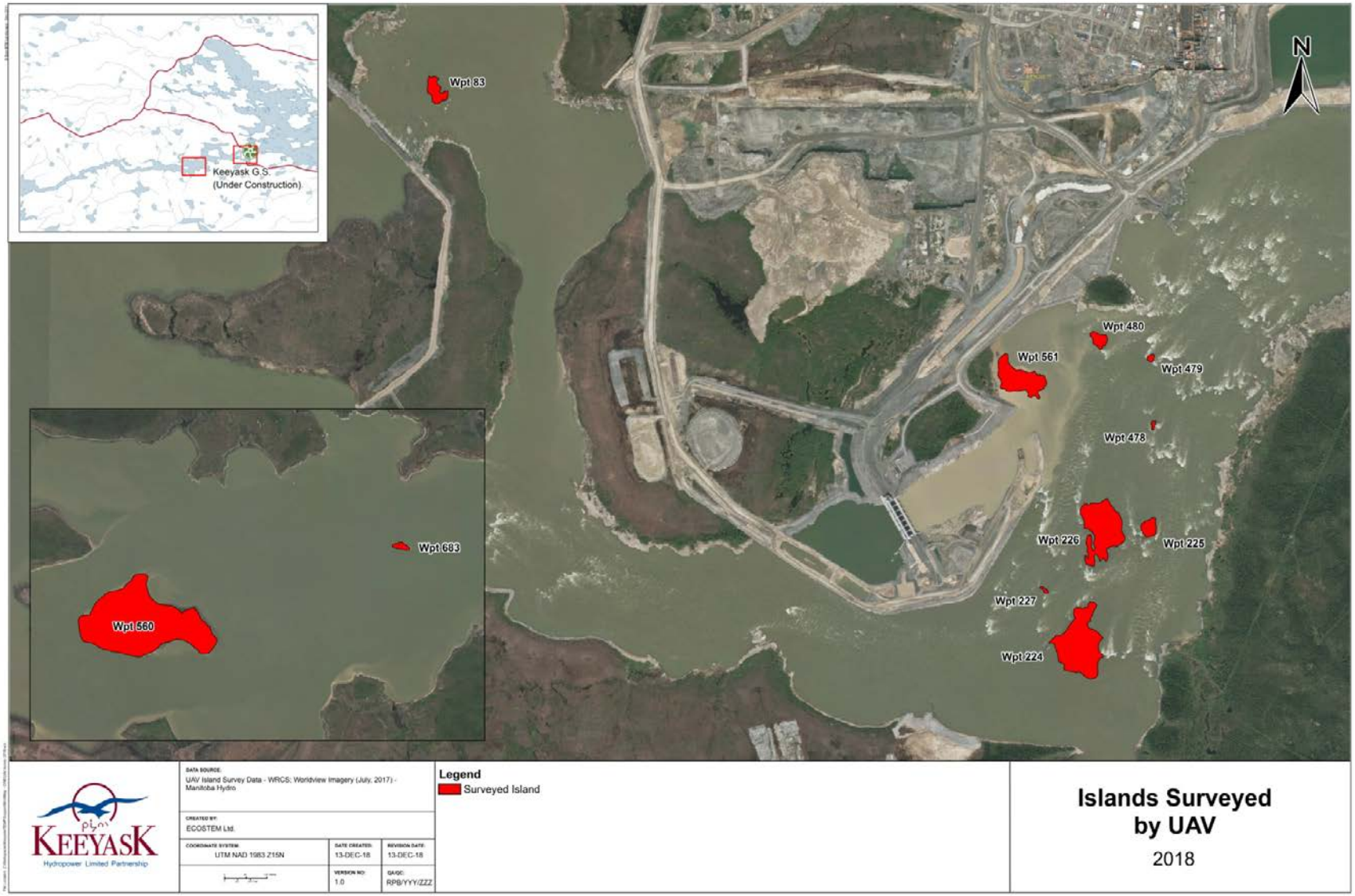
The distribution and abundance of colonial waterbirds at Gull Rapids was monitored using photographs taken from an Unmanned Aerial Vehicle (UAV or drone). Unmanned Aerial Imaging Solutions Inc. (UAIS) was contracted to conduct UAV flights and produce high-resolution images of colonial waterbird colonies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

UAIS deployed a DJI Phantom 3 Professional 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. Eight islands within the Gull Rapids area, known to support colonial waterbirds, and two islands immediately upstream in the Nelson River 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 2018: June 6, June 29, and July 20, 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 2018



Map 1: Islands Surveyed by UAV in Gull Rapids in 2018

2.2 HELICOPTER SURVEY

Helicopter surveys were conducted to monitor the abundance, distribution, and habitat use of colonial waterbirds in portions of the bird 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.

As per the study design, waterbodies that did not contain any colonial waterbird observations during the surveys conducted from 2015-2017 were removed from the 2018 survey. In all, 37 small lakes were dropped from the 2018 survey.

The first survey occurred between June 12-14, 2018 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 18-19.

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.

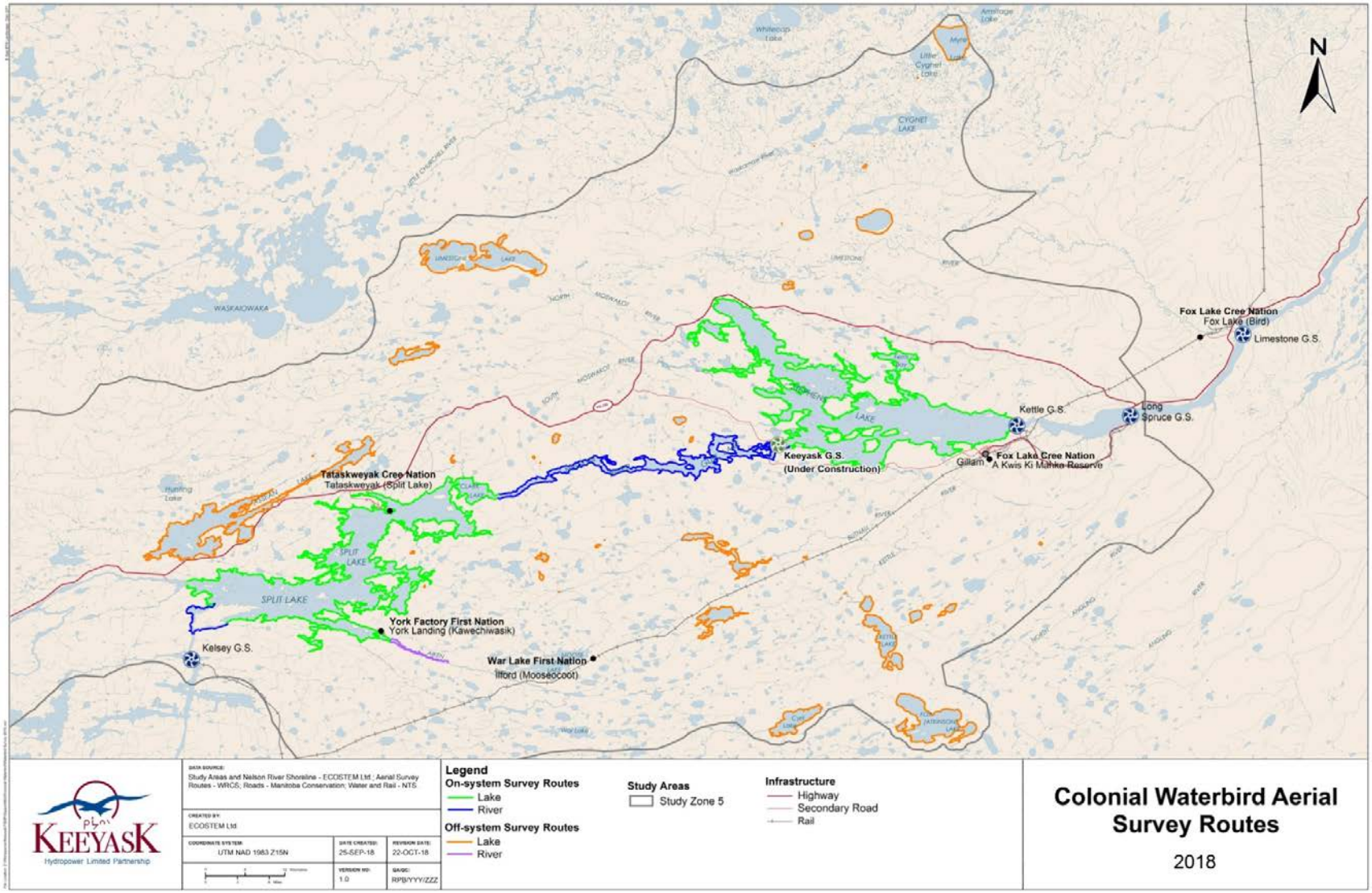
The aerial survey crew consisted of a single observer and the helicopter pilot. The observer was seated in the front left seat and was responsible for preliminary counts of colonial waterbirds and photographing congregations using a Nikon Coolpix Aw130, 16.0 megapixel camera. This differed from previous years (2015-2017) when three observers were used. It was decided that three observers were not required during the survey as large groups of birds were photographed and two independent counts of birds was redundant. 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 >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. Adults sitting tight are likely to be sitting on a nest, but may otherwise be loafing. 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: Colony of Ring-billed Gulls on an Island in Split Lake on June 13, 2018



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 (80% during the June 6 survey period), nests (83% during June 29), and chicks (86% during July 20) (Appendix A; Map 3). An increase of ring-billed gulls was observed from June 6 to July 20 in Gull Rapids. The greatest survey count in 2018 (7,030 ring-billed gulls) was observed on the afternoon of July 20 (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 (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). A relatively small number of ring-billed gull chicks were observed on June 29 (36 chicks), and peaked on July 20, when up to 1,009 chicks were observed (Table 1).

Common terns were observed on two islands in 2018 (Wpt 224 and Wpt 83; Map 3). However, only a relatively small number of common terns (10) were observed on Wpt 83 on a single occasion. Up to 105 common terns nests were observed on Wpt 224, but no common tern chicks were observed (Table 1; Map 4).

Herring gulls were relatively uncommon in the Gull Rapids area compared to ring-billed gulls. Herring gulls were observed on eight of the islands surveyed (Map 3). The greatest number of herring gulls observed in the Gull Rapids area was 64, which occurred during the July 20 survey (Table 1). Herring gull nests were observed on seven of the surveyed islands (Map 4), and up to 34 nests were observed during the June 6 survey period (Table 1). Herring gull chicks were observed on five islands (Map 5), and up to 24 chicks were observed on July 20 (Table 1).

Several flocks of American white pelicans were observed in Gull Rapids in 2018. No signs of nesting were observed and the greatest number (52) was observed during the July 20 survey (Table 1).

The total number of ring-billed gulls (adults and nesting birds) observed in 2018 was greater than the number observed in 2017 and 2015 during all periods, and greater than the number observed in the summer of 2016 (Figure 1). The number of ring-billed gulls observed during the early spring and late spring survey in 2016 was slightly higher than the number observed during the same period in 2018 (Figure 1).

Similar to previous years, the majority of ring-billed gulls were observed on the largest islands in Gull Rapids: Wpt 224, Wpt 225, and Wpt 226. However, the number of ring-billed gulls on Wpt 225 appeared to decrease in 2018 and the number of birds on Wpt 226 appeared to increase (Appendix A). No colonial waterbirds were observed on the two additional islands surveyed, upstream in the Nelson River – Wpt 560 and Wpt 683 (Appendix A).

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 2018 for Each Survey Period

Observation	June 6	June 29	July 20
Ring-billed Gull	1,565 (964)	1,288 (315)	7,030 (867)
Ring-billed Gull Chick	0 (0)	36 (21)	1,009 (26)
Ring-billed Gull w. Nest	2,909 (56)	3,171 (44)	0 (0)
Common Tern	3 (2)	60 (19)	49 (4)
Common Tern w. Nest	0 (0)	105 (20)	0 (0)
Herring Gull	25 (9)	33 (3)	64 (18)
Herring Gull Chick	0 (0)	24 (4)	24 (1)
Herring Gull w. Nest	34 (0)	8 (1)	0 (0)
American Pelican	0 (0)	23 (3)	52 (18)

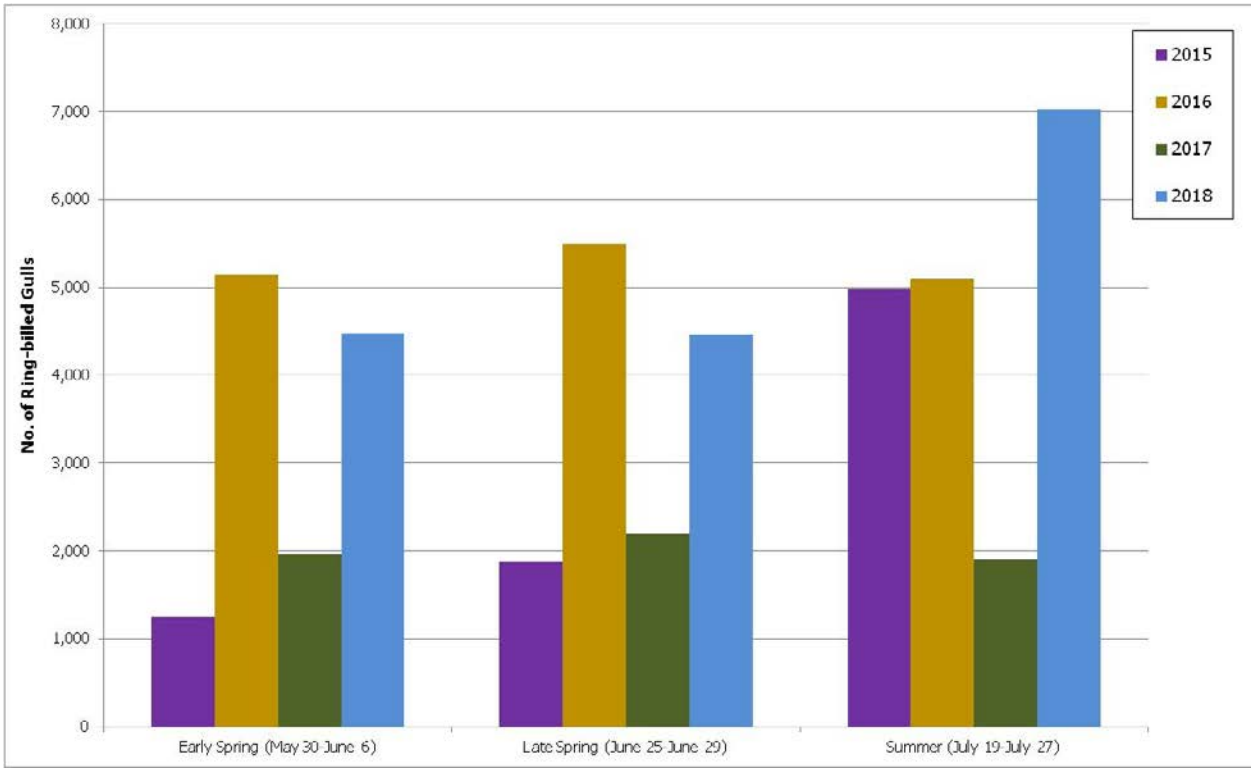
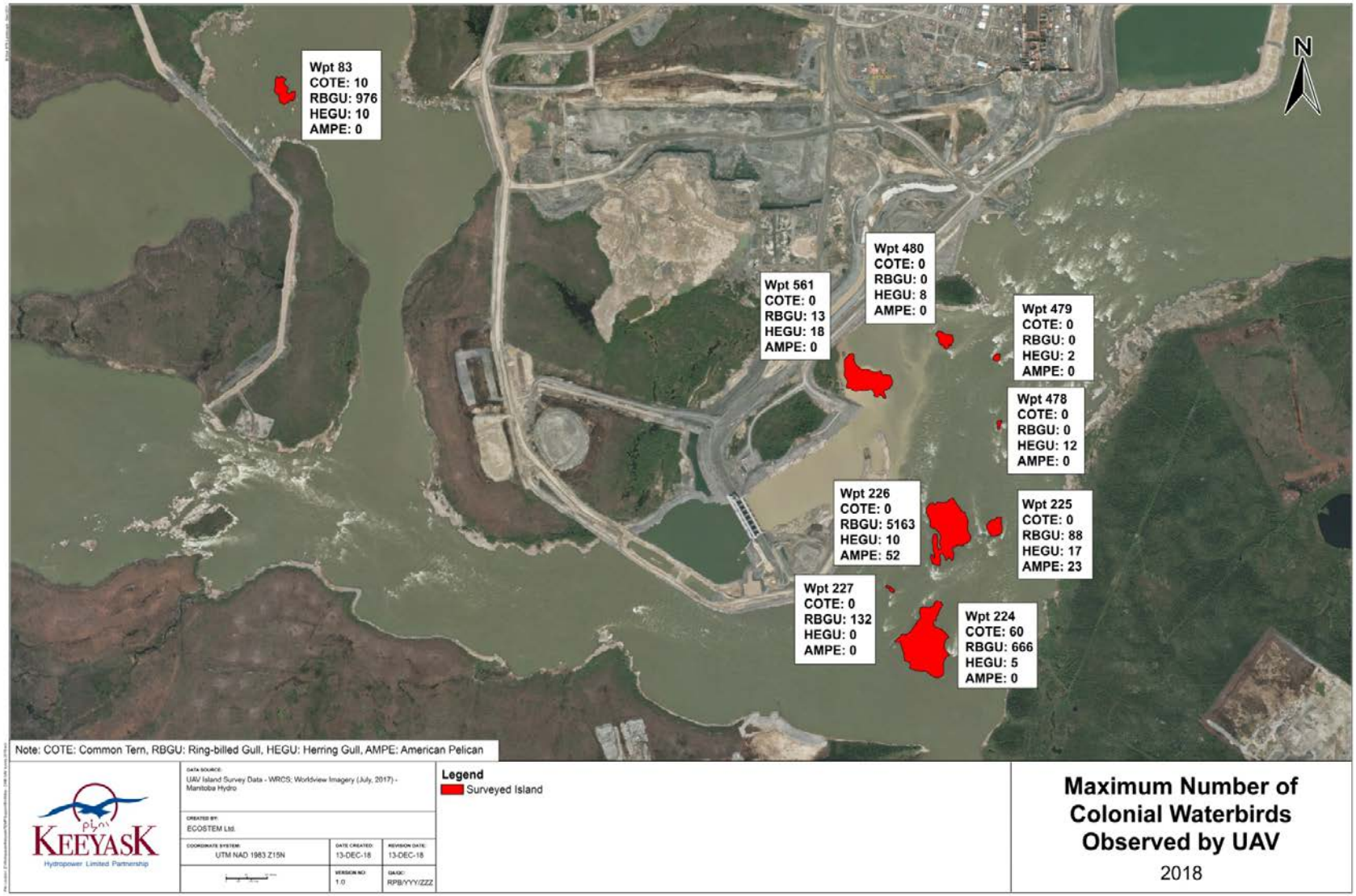
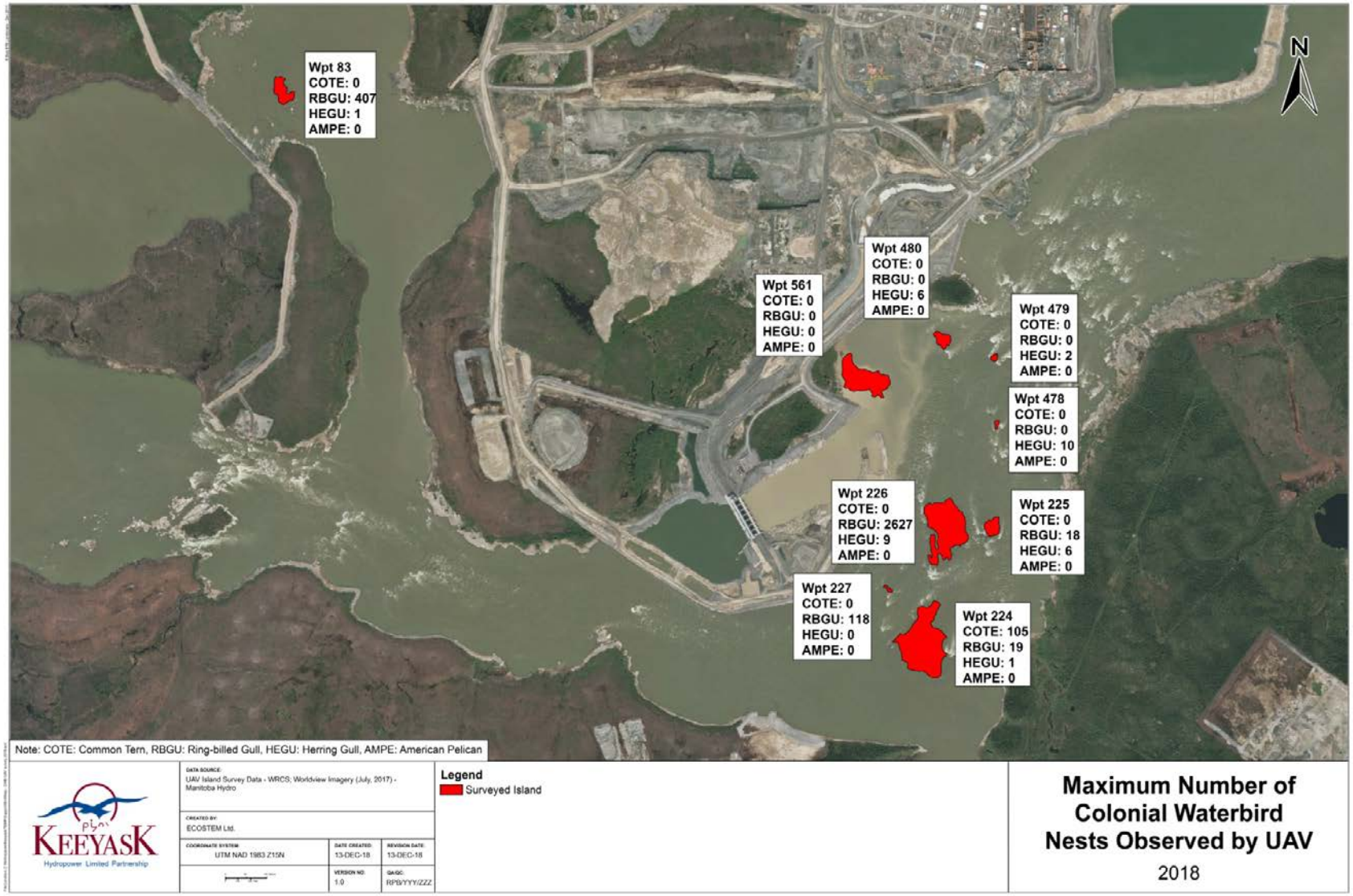


Figure 1: Total Number of Ring-billed Gulls Observed at Gull Rapids by UAV During Early Spring, Late Spring, and Summer Surveys from 2015-2018



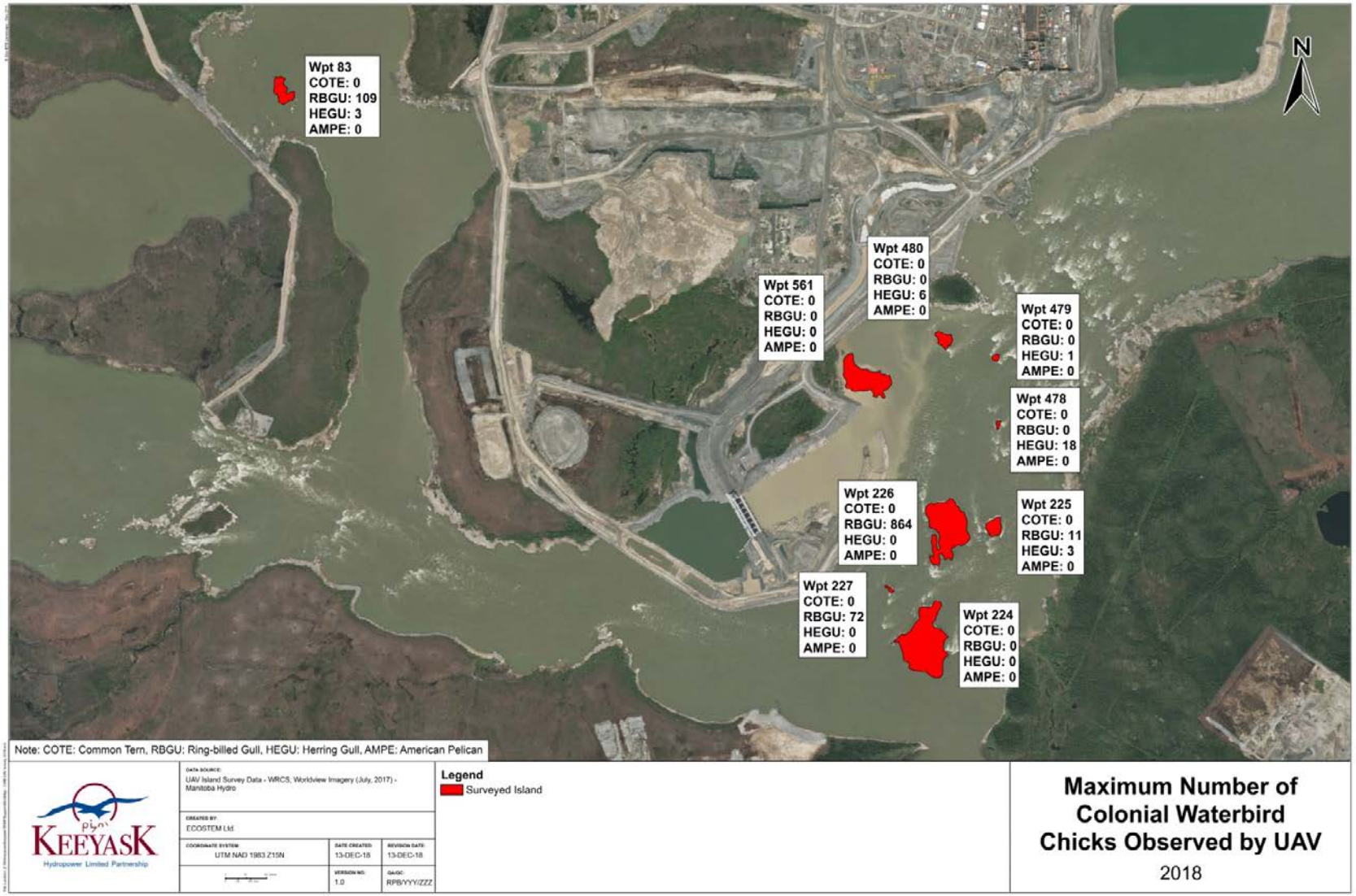
Note: the maximum number of colonial waterbirds was selected from pooled data from all survey periods (June 6, June 29, July 20) and morning/afternoon periods.

Map 3: Maximum Number of Colonial Waterbirds Observed on Each Island by the UAV in Gull Rapids in 2018



Note: the maximum number of colonial waterbird nests was selected from pooled data from all survey periods (June 6, June 29, July 20) and morning/afternoon periods.

Map 4: Maximum Number of Colonial Waterbird Nests Observed on Each Island by the UAV in Gull Rapids in 2018



Note: the maximum number of colonial waterbird chicks was selected from pooled data from all survey periods (June 6, June 29, July 20) and morning/afternoon periods.

Map 5: Maximum Number of Colonial Waterbird Chicks Observed on Each Island by the UAV in Gull Rapids in 2018

3.2 HELICOPTER SURVEY

Five species of colonial waterbirds were observed during the 2018 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 2017 (Appendix B). Black terns, which were observed in low numbers in 2016, were not observed in 2018.

Table 2: 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

3.2.1 RING-BILLED GULL

Ring-billed gulls were the most common species of colonial waterbird observed in 2018. The total number of ring-billed gulls increased from June to July in the 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 in 2016 and 2017 (Figure 2; Appendix B).

In June 2018, ring-billed gulls were observed congregating at 32 sites and nesting at six sites (Map 5). In July 2017, ring-billed gulls were observed congregating at 35 sites and nesting at four sites (Map 6). 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 study area (Table 3). In June and July, 36% and 63% 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 2018.

Ring-billed gull nests or probable nests were observed at 13 unique sites in the study area in June and July 2018 (Map 5; Map 6). Two of the largest nesting colonies were located within Gull Rapids and two other relatively large colonies were observed on the Nelson River, approximately 27 km upstream. Individual colonies were also observed in Stephens Lake, Split Lake, and Cyril Lake. There were fewer nesting sites in 2018 compared to 2015 and 2016 (19 and 18, respectively), but more than were observed in 2017 (9), the year with high water levels.

Of the 44 islands where ring-billed gulls were observed in June 2018, 33 (75%) were used at least once in previous years (2015-2017) (Table 4). In July, 34 islands (87%) were used at least once in previous years (2015-2017) (Table 4). The number of islands at which ring-billed gulls were observed increased from 2015 to 2018.

All but one congregation/colony of ring-billed gulls were observed on islands. Most of the islands used consisted of exposed bedrock or boulders, <0.1 ha or 0.1-0.9 ha in size, within on-system lakes or rivers (Table 4).

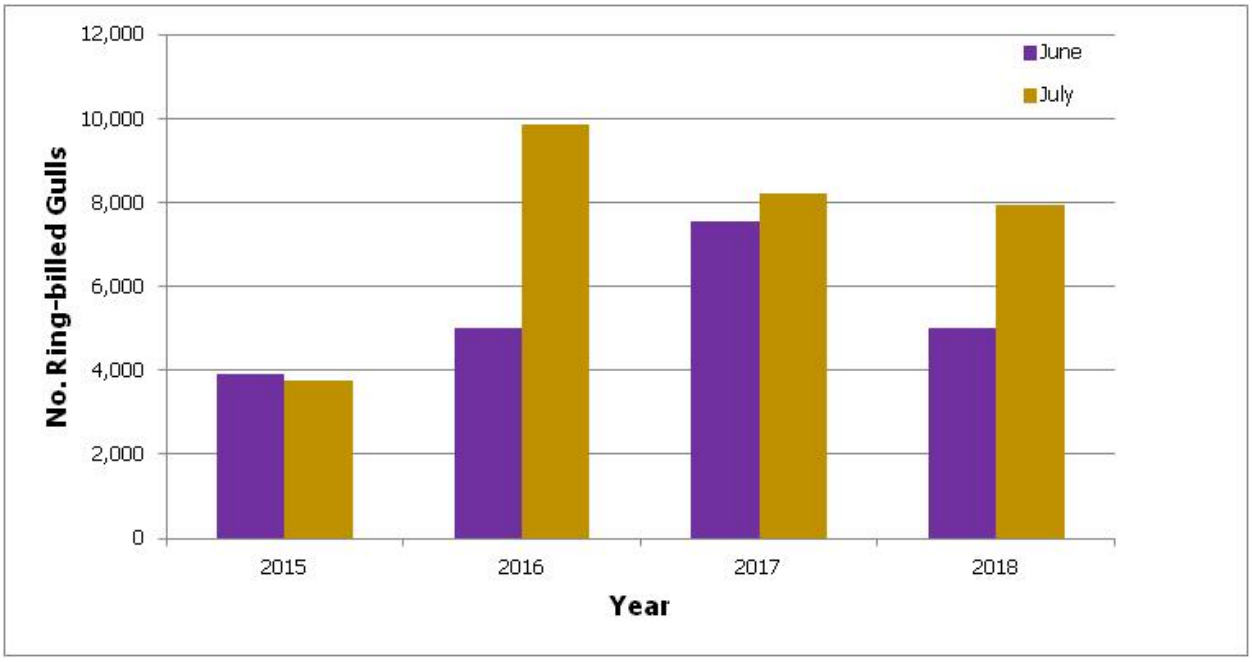
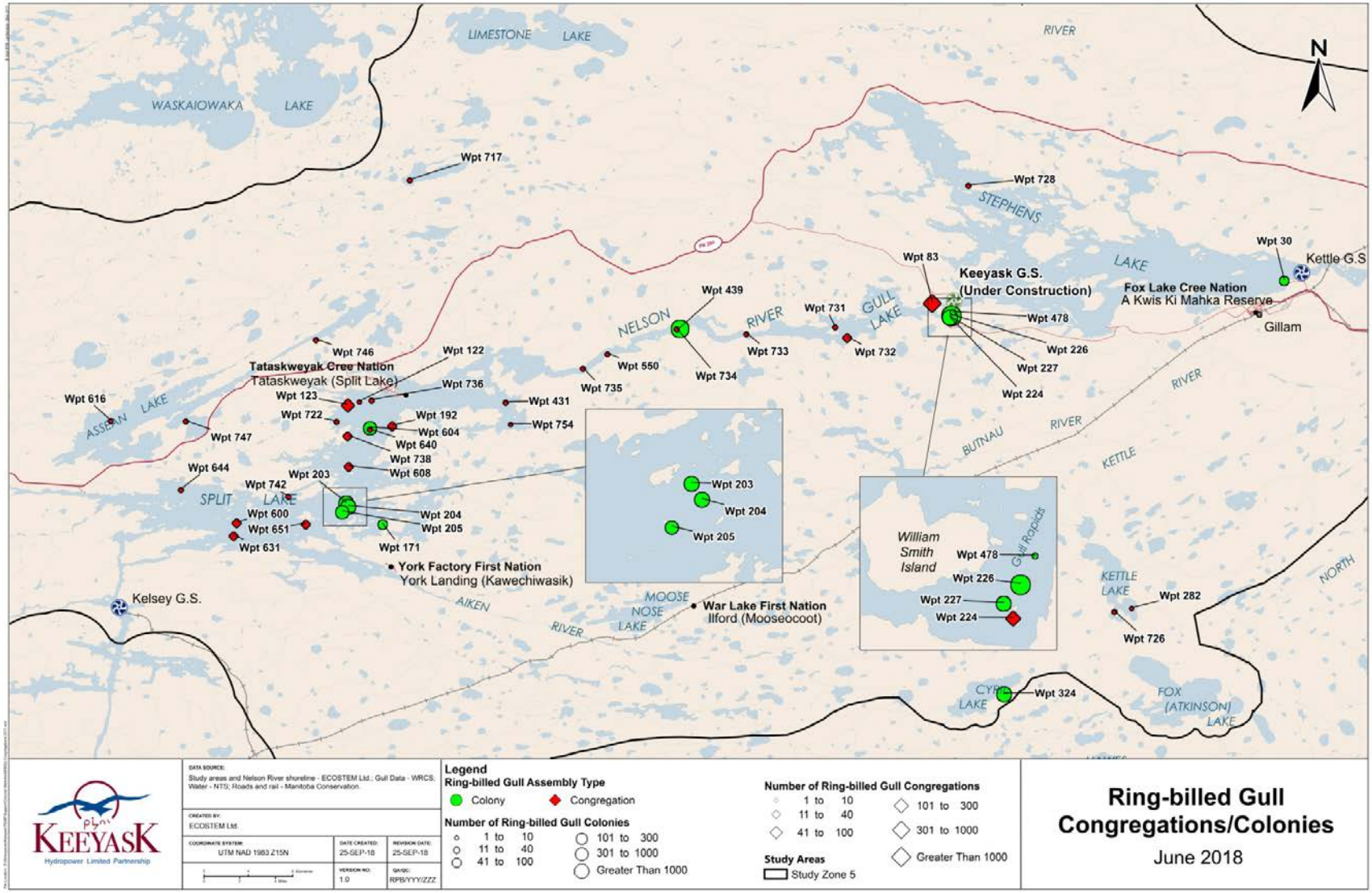
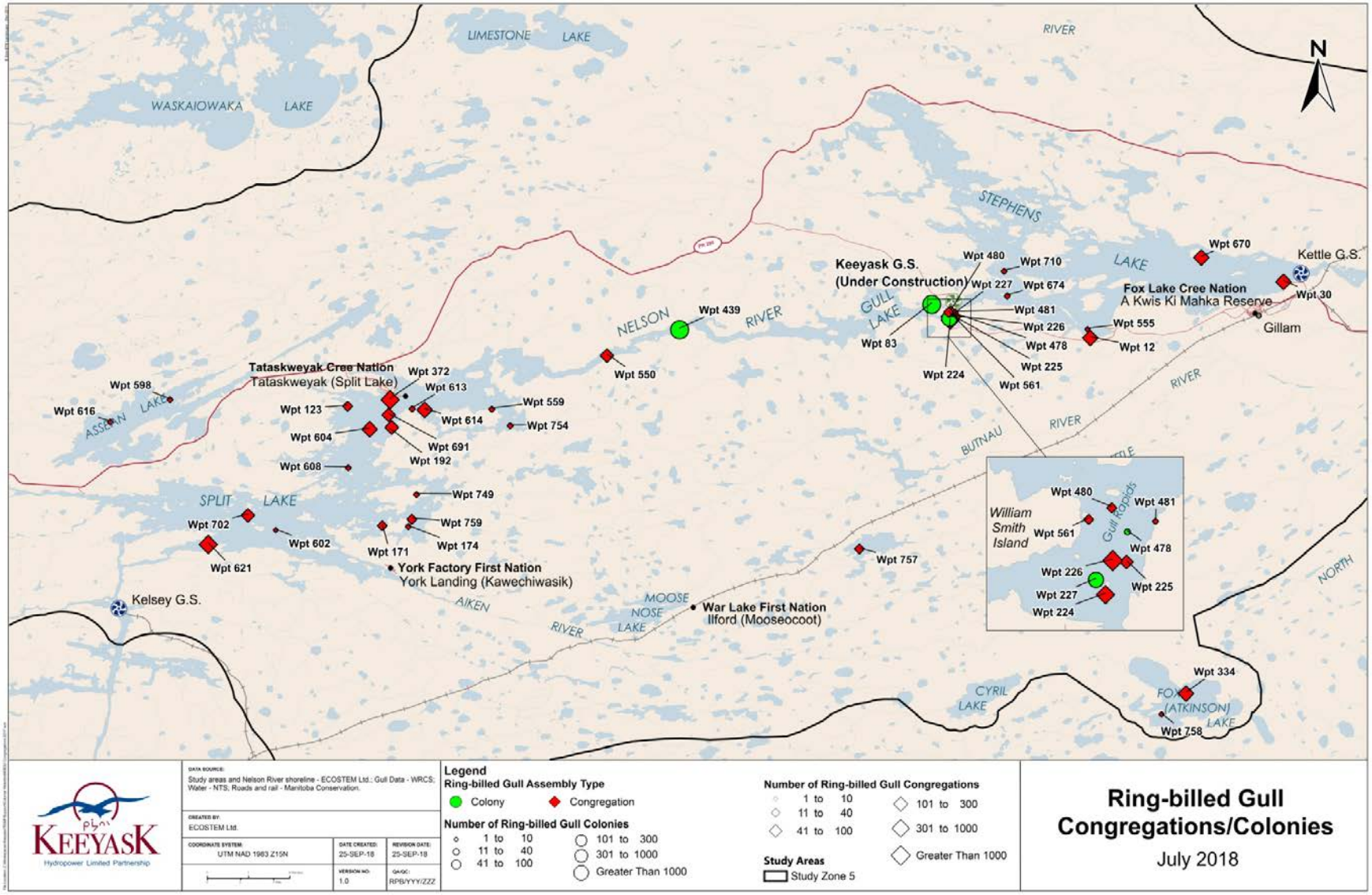


Figure 2: Number of Ring-billed Gulls Observed During Helicopter Surveys in June and July from 2015 to 2018



Map 6: Ring-billed Gull Colonies and Congregations Observed During Helicopter Surveys in June 2018



Map 7: Ring-billed Gull Colonies and Congregations Observed During Helicopter Surveys in July 2018

Table 3: Ring-billed Gull Congregations/Colonies Observed During the Helicopter Surveys in 2018

Waypoint	June					July				
	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks
12	0	0	0	0	0	0	0	260	260	0
30	0	5	20	25	0	0	0	112	112	0
83	0	0	522	522	0	0	25	771	796	0
122	0	0	40	40	0	0	0	0	0	0
123	0	0	97	97	0	0	0	13	13	0
171	0	16	16	32	0	0	0	13	13	0
174	0	0	0	0	0	0	0	2	2	0
192	0	0	32	32	0	0	0	94	94	0
203	0	135	126	261	0	0	0	0	0	0
204	0	76	102	178	0	0	0	0	0	0
205	0	25	39	64	0	0	0	0	0	0
224	0	0	116	116	0	0	0	336	336	0
225	0	0	0	0	0	0	0	69	69	0
226	0	4	1,933	1,937	0	0	0	3,797	3,797	0
227	0	44	99	143	0	0	42	101	143	0
282	0	0	10	10	0	0	0	0	0	0
324	0	90	90	180	0	0	0	0	0	0
334	0	0	0	0	0	0	0	110	110	0
362	0	78	151	229	0	0	0	0	0	0
372	0	0	0	0	0	0	0	432	432	0
431	0	0	1	1	0	0	0	0	0	0
439	0	131	338	469	0	0	5	544	549	0
459	0	0	1	1	0	0	0	0	0	0
478	0	7	0	7	0	0	3	5	8	0
480	0	0	0	0	0	0	0	12	12	0

Waypoint	June					July				
	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks
481	0	0	0	0	0	0	0	3	3	0
550	0	0	4	4	0	0	0	50	50	0
555	0	0	0	0	0	0	0	10	10	0
559	0	0	0	0	0	0	0	1	1	0
561	0	0	0	0	0	0	0	22	22	0
577	0	0	2	2	0	0	0	0	0	0
598	0	0	0	0	0	0	0	4	4	0
600	0	0	38	38	0	0	0	0	0	0
602	0	0	0	0	0	0	0	10	10	0
604	0	29	20	49	0	0	0	180	180	0
608	0	0	25	25	0	0	0	2	2	0
613	0	0	0	0	0	0	0	8	8	0
614	0	0	0	0	0	0	0	194	194	0
616	0	0	1	1	0	0	0	9	9	0
621	0	0	0	0	0	0	0	304	304	0
631	0	1	24	25	0	0	0	0	0	0
640	0	0	2	2	0	0	0	0	0	0
644	0	0	1	1	0	0	0	0	0	0
651	0	0	20	20	0	0	0	0	0	0
670	0	0	0	0	0	0	0	131	131	0
674	0	0	0	0	0	0	0	7	7	0
691	0	0	0	0	0	0	0	52	52	0
702	0	0	0	0	0	0	0	62	62	0
710	0	0	0	0	0	0	0	2	2	0
717	0	0	1	1	0	0	0	0	0	0
722	0	0	1	1	0	0	0	0	0	0

Waypoint	June					July				
	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks
726	0	0	8	8	0	0	0	0	0	0
728	0	0	2	2	0	0	0	0	0	0
731	0	0	9	9	0	0	0	0	0	0
732	0	0	25	25	0	0	0	0	0	0
733	0	0	7	7	0	0	0	0	0	0
734	0	0	1	1	0	0	0	0	0	0
735	0	0	1	1	0	0	0	0	0	0
736	0	0	1	1	0	0	0	0	0	0
738	0	0	15	15	0	0	0	0	0	0
742	0	0	2	2	0	0	0	0	0	0
746	0	0	1	1	0	0	0	0	0	0
747	0	0	2	2	0	0	0	0	0	0
749	0	0	0	0	0	0	0	2	2	0
754	0	0	10	10	0	0	0	2	2	0
757	0	0	0	0	0	0	0	12	12	0
758	0	0	0	0	0	0	0	100	100	0
759	0	0	0	0	0	0	0	30	30	0
Total	0	641	3,956	4,597	0	0	75	7,868	7,943	0

Table 4: Waterbody Classification and Island Use by Ring-billed Gulls in June and July 2018

Waypoint	Gathering Type	Month	System	Waterbody Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	Used in 2017?	Used in 2016?	Used in 2015?
30	Colony	June	On-system	Lake	>1,000	70% tree/shrub, 30% sand/gravel	1.0-1.9	Yes	Yes	Yes
171	Colony	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	Yes	Yes	Yes
203	Colony	June	On-system	Lake	>1,000	80% exposed bedrock, 20% gravel	0.1-0.9	No	No	Yes
204	Colony	June	On-system	Lake	>1,000	80% exposed bedrock, 20% boulders	<0.1	No	No	Yes
205	Colony	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
226	Colony	June	On-system	River	>1,000	50% rock, 45% shrub/deadfall, 55% treed	1.0-1.9	Yes	Yes	Yes
227	Colony	June	On-system	River	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
324	Colony	June	Off-system	Lake	>1,000	Boulders	<0.1	Yes	Yes	Yes
362	Colony	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	No	Yes
439	Colony	June	On-system	River	>1,000	50% bare rock, 50% grass	0.1-0.9	Yes	Yes	Yes
478	Colony	June	On-system	River	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
604	Colony	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	No
83	Congregation	June	On-system	River	>1,000	Exposed bedrock	0.1-0.9	Yes	Yes	Yes
122	Congregation	June	On-system	Lake	>1,000	90% exposed bedrock, 5% sand, 5% shrub	<0.1	No	No	Yes
123	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
192	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	No	Yes
224	Congregation	June	On-system	River	>1,000	40% exposed bedrock, 60% treed	1.0-1.9	Yes	Yes	Yes
282	Congregation	June	Off-system	Lake	>1,000	Boulders, 5% grass	0.1-0.9	Yes	Yes	Yes
431	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	Yes
459	Congregation	June	On-system	River	>1,000	90% treed, 10% exposed bedrock	3.0-3.9	No	No	Yes
550	Congregation	June	On-system	River	>1,000	Exposed bedrock	<0.1	Yes	Yes	No
577	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	Yes	Yes	No
600	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	No
608	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	No
616	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	No
631	Congregation	June	On-system	Lake	>1,000	Boulders	0.1-0.9	Yes	Yes	No

Waypoint	Gathering Type	Month	System	Waterbody Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	Used in 2017?	Used in 2016?	Used in 2015?
640	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	No
644	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	Yes	Yes	No
651	Congregation	June	On-system	Lake	>1,000	Exposed bedrock, 20% grass	0.1-0.9	No	Yes	No
717	Congregation	June	Off-system	Lake	101-1,000	Boulders	0.1-0.9	Yes	No	No
722	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	Yes	No	No
726	Congregation	June	Off-system	Lake	>1,000	Boulders	<0.1	Yes	No	No
728	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	Yes	No	No
731	Congregation	June	On-system	River	>1,000	Boulders	<0.1	No	No	No
732	Congregation	June	On-system	River	>1,000	Boulders	<0.1	No	No	No
733	Congregation	June	On-system	River	>1,000	Boulders	<0.1	No	No	No
734	Congregation	June	On-system	River	>1,000	Boulders	<0.1	No	No	No
735	Congregation	June	On-system	River	>1,000	Boulders	<0.1	No	No	No
736	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	1.0-1.9	No	No	No
738	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	No	No
742	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	No	No	No
746	Congregation	June	Off-system	Lake	>1,000	Boulders	<0.1	No	No	No
747	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	<0.1	No	No	No
754	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	No	No
1	Dispersed	June	Off-system	Lake	<1	NA	NA	No	No	No
2	Dispersed	June	Off-system	Lake	11-100	NA	NA	No	No	No
3	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
7	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
9	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
10	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
13	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
14	Dispersed	June	Off-system	Lake	11-100	NA	NA	No	No	No
17	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No

Waypoint	Gathering Type	Month	System	Waterbody Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	Used in 2017?	Used in 2016?	Used in 2015?
18	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
20	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
21	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
22	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
26	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
27	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
29	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
35	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
36	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
38	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
39	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
42	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
43	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
44	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
46	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
47	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
49	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
50	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
53	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
55	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
58	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
59	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
61	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
62	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
63	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
68	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
69	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No

Waypoint	Gathering Type	Month	System	Waterbody Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	Used in 2017?	Used in 2016?	Used in 2015?
75	Dispersed	June	Off-system	Lake	11-100	NA	NA	No	No	No
76	Dispersed	June	Off-system	Lake	101-1,000	NA	NA	No	No	No
77	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
78	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
82	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
88	Dispersed	June	On-system	River	101-1,000	NA	NA	No	No	No
89	Dispersed	June	On-system	River	101-1,000	NA	NA	No	No	No
94	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
95	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
96	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
97	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
104	Dispersed	June	Off-system	Lake	101-1,000	NA	NA	No	No	No
105	Dispersed	June	Off-system	Lake	101-1,000	NA	NA	No	No	No
106	Dispersed	June	Off-system	Lake	11-100	NA	NA	No	No	No
115	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
116	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
117	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
118	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
119	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
120	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
124	Dispersed	June	Off-system	Lake	101-1,000	NA	NA	No	No	No
125	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
83	Colony	July	On-system	River	>1,000	Exposed bedrock	0.1-0.9	Yes	Yes	Yes
227	Colony	July	On-system	River	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
439	Colony	July	On-system	River	>1,000	50% bare rock, 50% grass	0.1-0.9	Yes	Yes	Yes
478	Colony	July	On-system	River	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
12	Congregation	July	On-system	Lake	>1,000	100% gravel	<0.1	No	No	Yes

Waypoint	Gathering Type	Month	System	Waterbody Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	Used in 2017?	Used in 2016?	Used in 2015?
30	Congregation	July	On-system	Lake	>1,000	70% tree/shrub, 30% sand/gravel	1.0-1.9	Yes	Yes	Yes
123	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
171	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	Yes	Yes	Yes
174	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	Yes	Yes	Yes
192	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	No	Yes
224	Congregation	July	On-system	River	>1,000	40% exposed bedrock, 60% treed	1.0-1.9	Yes	Yes	Yes
225	Congregation	July	On-system	River	>1,000	Exposed bedrock	0.1-0.9	Yes	Yes	Yes
226	Congregation	July	On-system	River	>1,000	50% rock, 45% shrub/deadfall, 55% treed	1.0-1.9	Yes	Yes	Yes
334	Congregation	July	Off-system	Lake	>1,000	95% boulders, 5% grass	0.1-0.9	Yes	No	Yes
372	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	Yes	Yes	Yes
480	Congregation	July	On-system	River	>1,000	Exposed bedrock	0.1-0.9	No	Yes	Yes
481	Congregation	July	On-system	River	>1,000	Exposed bedrock	<0.1	No	No	Yes
550	Congregation	July	On-system	River	>1,000	Exposed bedrock	<0.1	Yes	Yes	No
555	Congregation	July	On-system	Lake	>1,000	80% tree/shrub, 20% sand/gravel	0.1-0.9	No	Yes	No
559	Congregation	July	On-system	Lake	>1,000	Boulders/gravel	0.1-0.9	No	Yes	No
561	Congregation	July	On-system	River	>1,000	Exposed bedrock	1.0-1.9	Yes	Yes	No
598	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	No
602	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	Yes	Yes	No
604	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	No
608	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	No
613	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	No
614	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	No
616	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	No
621	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	No
670	Congregation	July	On-system	Lake	>1,000	70% tree/shrub, 30% sand/gravel	0.1-0.9	Yes	No	No
674	Congregation	July	On-system	Lake	>1,000	Boulders	0.1-0.9	Yes	No	No
691	Congregation	July	On-system	Lake	>1,000	80% tree/shrub, 20% sand/gravel	0.1-0.9	Yes	No	No

Waypoint	Gathering Type	Month	System	Waterbody Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	Used in 2017?	Used in 2016?	Used in 2015?
702	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	Yes	No	No
710	Congregation	July	On-system	Lake	>1,000	Boulders	0.1-0.9	Yes	No	No
749	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	No	No	No
754	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	No	No
757	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	<0.1	No	No	No
758	Congregation	July	Off-system	Lake	>1,000	50% shrub, 50% gravel	<0.1	No	No	No
759	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	No	No
107	Dispersed	July	Off-system	Lake	1-10	NA	NA	No	No	No

3.2.2 COMMON TERN

Common terns were the second most abundant species of colonial waterbird observed in the study area in 2018 (Table 2). The total number of common terns counted decreased from June (1,052) to July (391) (Figure 3; Table 5). The number of common terns observed in June 2018 was lower than the number observed in 2017, but consistent with the numbers observed in 2015 and 2016 (Figure 3). The number observed in July 2018 was lower than observed during all previous surveys, but the trend of decreasing numbers from June to July was consistent with previous survey years.

In June, common terns were observed congregating at 47 sites, but no nesting was observed (Table 5; Map 7). The largest congregation was observed downstream of Gull Rapids in Stephens Lake and supported 19% of all common terns observed in June (Map 7). In July, 27 common tern congregations were observed and no colonies were observed (Map 8). The largest congregation of common terns was observed on Split Lake and supported 26% of all common tern observations in June (Map 8).

In June 2018, 36 of 48 islands (75%) where common terns were observed were used at least once in previous years (2015-2017) (Table 6). In July 2018, 20 of 27 islands (74%) where common terns were observed were used at least once in previous years (2015-2017) (Table 6).

All congregations were observed on islands. Most of the islands used consisted of boulders or exposed bedrock, either <0.1 ha or 0.1-0.9 ha in size, within large, on-system lakes or rivers (Table 6).

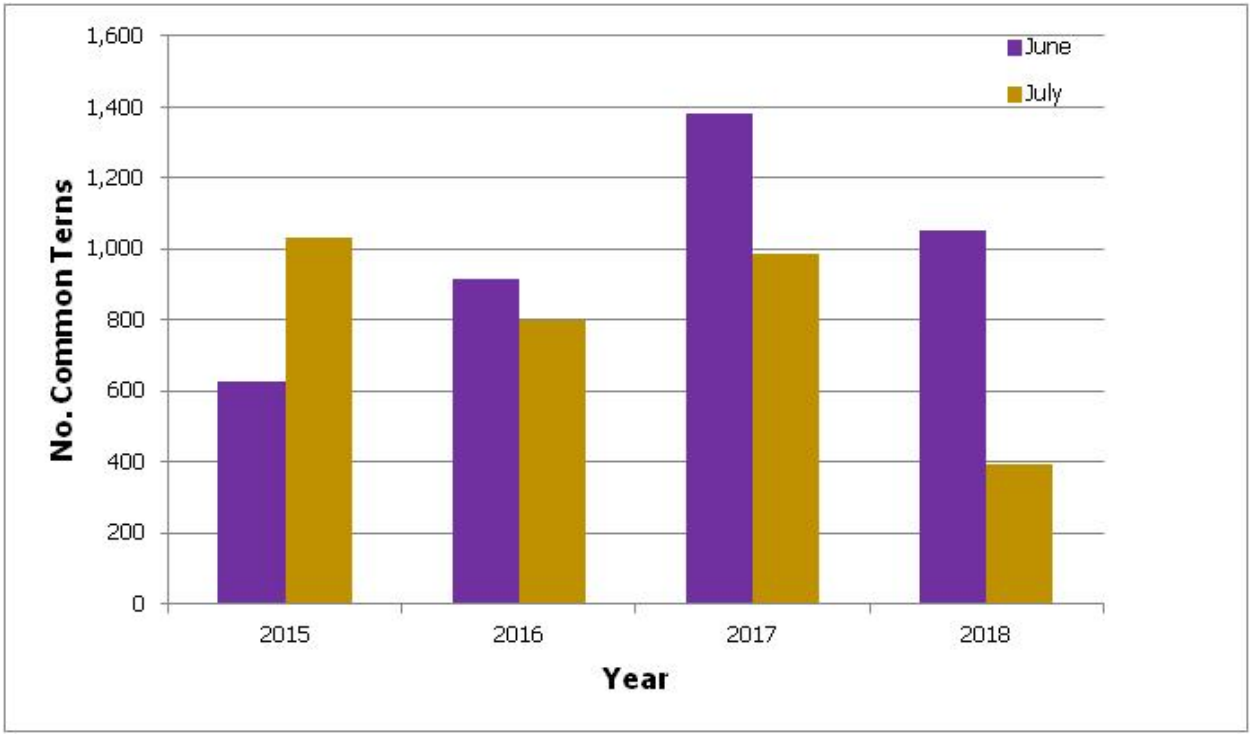
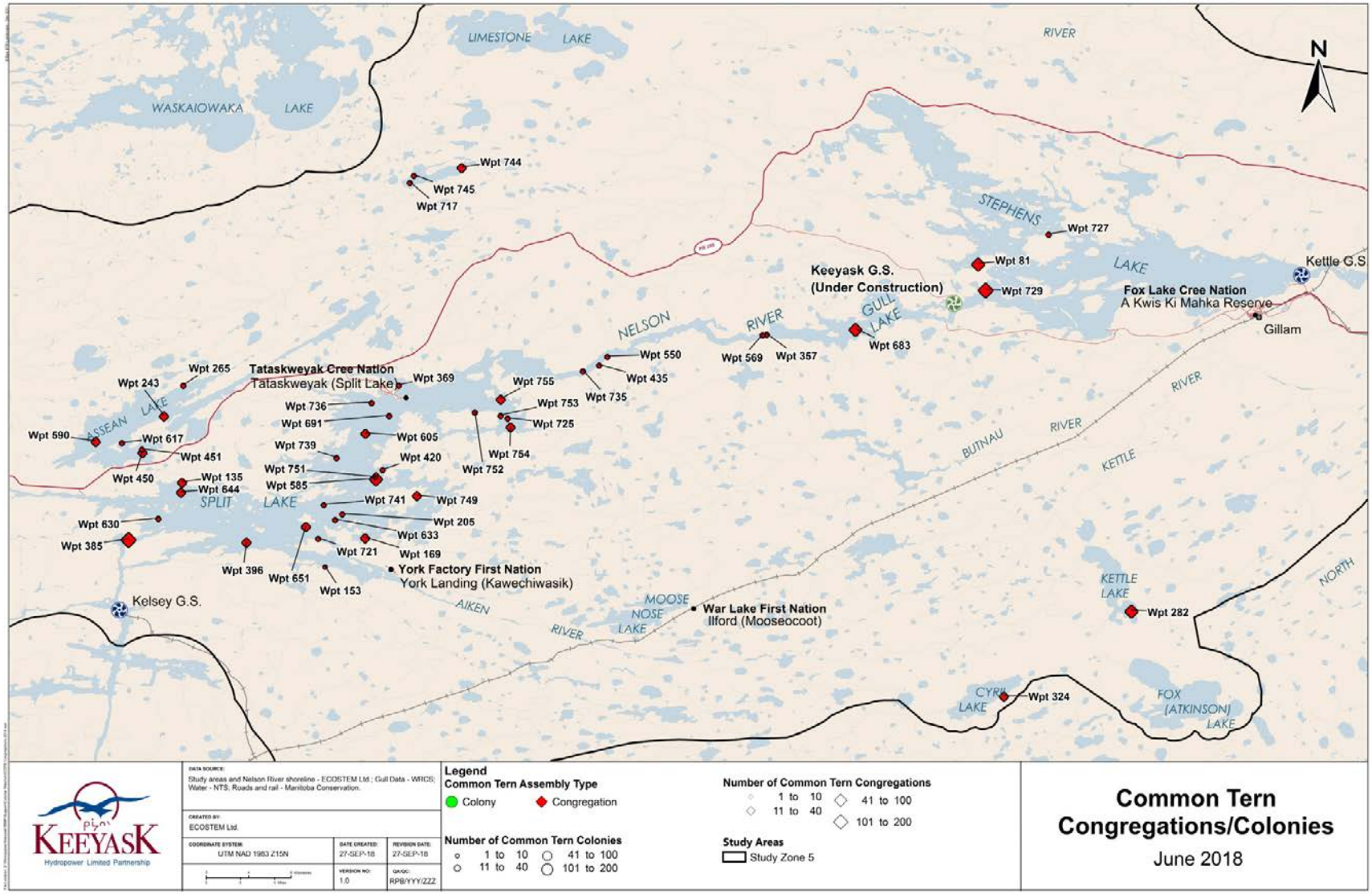
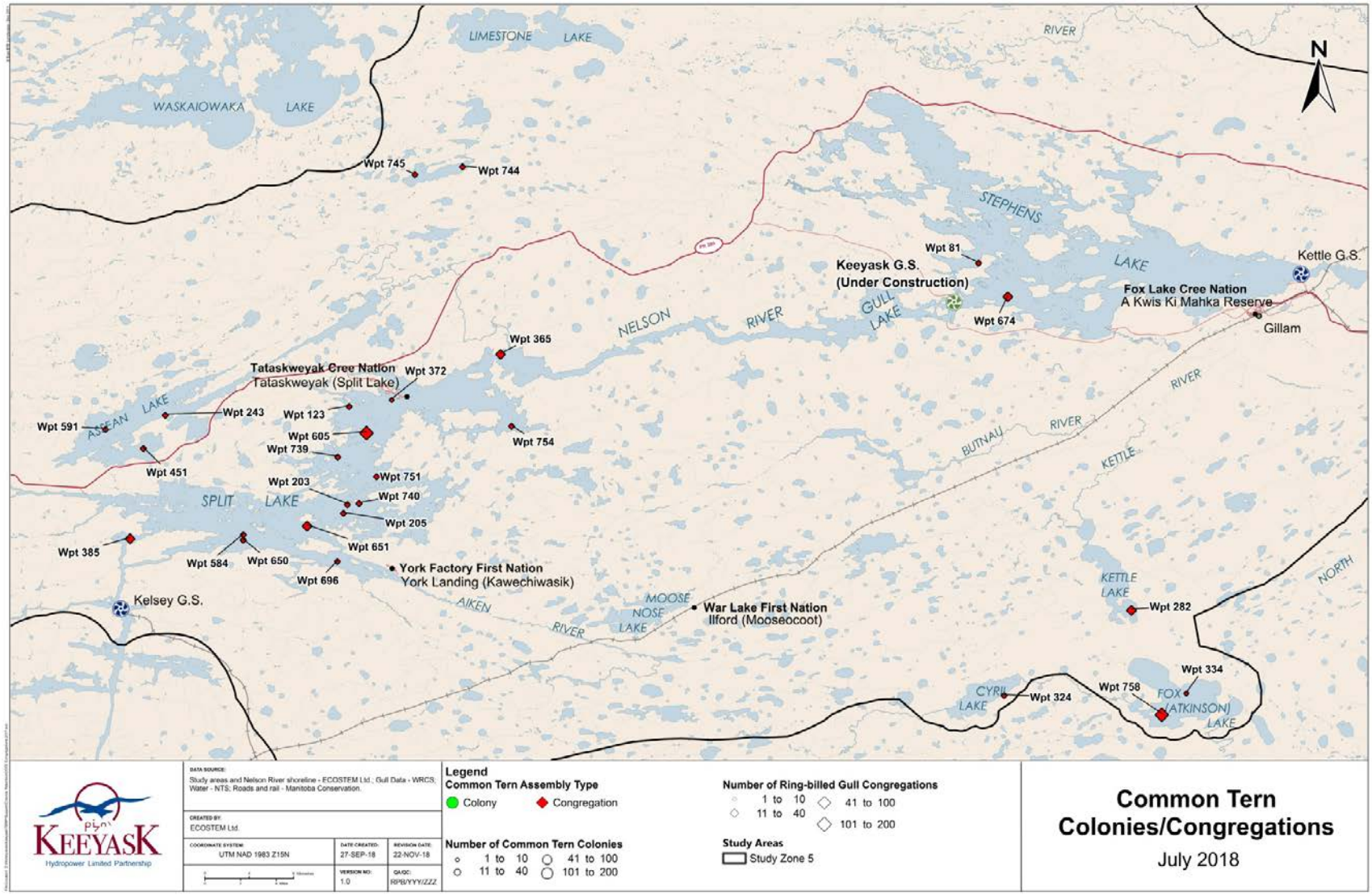


Figure 3: Number of Common Terns Observed During Helicopter Surveys in June and July from 2015 to 2018



Map 8: Common Tern Colonies and Congregations Observed During Helicopter Surveys in June 2018



Map 9: Common Tern Colonies and Congregations Observed During Helicopter Surveys in July 2018

Table 5: Common Tern Congregations/Colonies Observed During the Helicopter Surveys in 2018

Waypoint	June					July				
	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks
81	0	0	60	60	0	0	0	3	3	0
123	0	0	0	0	0	0	0	1	1	0
135	0	0	11	11	0	0	0	0	0	0
153	0	0	40	40	0	0	0	0	0	0
169	0	0	15	15	0	0	0	0	0	0
203	0	0	0	0	0	0	0	2	2	0
205	0	0	3	3	0	0	0	2	2	0
243	0	0	12	12	0	0	0	7	7	0
265	0	0	2	2	0	0	0	0	0	0
282	0	0	60	60	0	0	0	20	20	0
324	0	0	30	30	0	0	0	3	3	0
334	0	0	0	0	0	0	0	40	40	0
357	0	0	7	7	0	0	0	0	0	0
365	0	0	0	0	0	0	0	36	36	0
369	0	0	1	1	0	0	0	0	0	0
372	0	0	0	0	0	0	0	100	100	0
385	0	0	120	120	0	0	0	20	20	0
396	0	0	15	15	0	0	0	0	0	0
420	0	0	2	2	0	0	0	0	0	0
435	0	0	1	1	0	0	0	0	0	0
450	0	0	15	15	0	0	0	0	0	0
451	0	0	3	3	0	0	0	2	2	0
459	0	0	4	4	0	0	0	0	0	0
550	0	0	5	5	0	0	0	0	0	0

Waypoint	June					July				
	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks
569	0	0	7	7	0	0	0	0	0	0
584	0	0	0	0	0	0	0	2	2	0
585	0	0	80	80	0	0	0	0	0	0
590	0	0	20	20	0	0	0	0	0	0
591	0	0	0	0	0	0	0	2	2	0
605	0	0	17	17	0	0	0	50	50	0
617	0	0	1	1	0	0	0	0	0	0
630	0	0	1	1	0	0	0	0	0	0
633	0	0	1	1	0	0	0	0	0	0
644	0	0	17	17	0	0	0	0	0	0
650	0	0	0	0	0	0	0	2	2	0
651	0	0	30	30	0	0	0	12	12	0
674	0	0	0	0	0	0	0	14	14	0
683	0	0	60	60	0	0	0	0	0	0
691	0	0	1	1	0	0	0	0	0	0
696	0	0	0	0	0	0	0	2	2	0
717	0	0	3	3	0	0	0	0	0	0
721	0	0	2	2	0	0	0	0	0	0
725	0	0	7	7	0	0	0	0	0	0
727	0	0	5	5	0	0	0	0	0	0
729	0	0	200	200	0	0	0	0	0	0
735	0	0	1	1	0	0	0	0	0	0
736	0	0	1	1	0	0	0	0	0	0
739	0	0	5	5	0	0	0	4	4	0
740	0	0	0	0	0	0	0	2	2	0

Waypoint	June					July				
	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks
741	0	0	7	7	0	0	0	0	0	0
744	0	0	35	35	0	0	0	2	2	0
745	0	0	1	1	0	0	0	2	2	0
749	0	0	14	14	0	0	0	0	0	0
751	0	0	40	40	0	0	0	5	5	0
752	0	0	2	2	0	0	0	0	0	0
753	0	0	2	2	0	0	0	0	0	0
754	0	0	25	25	0	0	0	6	6	0
755	0	0	15	15	0	0	0	0	0	0
758	0	0	0	0	0	0	0	50	50	0
Total	0	0	1,006	1,006	0	0	0	391	391	0

Table 6: Waterbody Classification and Island Use by Common Terns in 2018

Waypoint	Gathering Type	Month	System	Waterbody Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	Used in 2017?	Used in 2016?	Used in 2015?
81	Congregation	June	On-system	Lake	>1,000	100% grass	0.1-0.9	Yes	Yes	Yes
135	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	Yes	Yes	Yes
153	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
169	Congregation	June	On-system	Lake	>1,000	80% exposed bedrock, 20% sand	<0.1	No	No	Yes
205	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
243	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
265	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	<0.1	No	No	Yes
282	Congregation	June	Off-system	Lake	>1,000	Boulders, 5% grass	0.1-0.9	Yes	Yes	Yes
324	Congregation	June	Off-system	Lake	>1,000	Boulders	<0.1	Yes	Yes	Yes
357	Congregation	June	On-system	River	>1,000	Exposed bedrock	<0.1	No	No	Yes
369	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	No	Yes	Yes
385	Congregation	June	On-system	River	101-1,000	Boulders	0.1-0.9	No	Yes	Yes
396	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	Yes	Yes	Yes
420	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
435	Congregation	June	On-system	River	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
450	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	Yes
451	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	Yes
459	Congregation	June	On-system	River	>1,000	90% treed, 10% exposed bedrock	3.0-3.9	No	No	Yes
550	Congregation	June	On-system	River	>1,000	Exposed bedrock	<0.1	Yes	Yes	No
569	Congregation	June	On-system	River	>1,000	Exposed bedrock	<0.1	No	Yes	No
585	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	Yes	Yes	No
590	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	No
605	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	No
617	Congregation	June	Off-system	Lake	>1,000	Boulders, 50% grass	0.1-0.9	No	Yes	No
630	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	Yes	Yes	No
633	Congregation	June	On-system	Lake	>1,000	95% exposed bedrock, 5% tree/shrub	<0.1	No	Yes	No
644	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	Yes	Yes	No

Waypoint	Gathering Type	Month	System	Waterbody Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	Used in 2017?	Used in 2016?	Used in 2015?
651	Congregation	June	On-system	Lake	>1,000	80% exposed bedrock, 20% grass	0.1-0.9	No	Yes	No
683	Congregation	June	On-system	River	>1,000	Cleared island	0.1-0.9	Yes	No	No
691	Congregation	June	On-system	Lake	>1,000	80% tree/shrub, 20% sand/gravel	0.1-0.9	Yes	No	No
717	Congregation	June	Off-system	Lake	101-1,000	Boulders	0.1-0.9	Yes	No	No
721	Congregation	June	On-system	Lake	>1,000	Boulders, 10% shrub	0.1-0.9	Yes	No	No
725	Congregation	June	On-system	Lake	>1,000	20% exposed bedrock, 80% treed	0.1-0.9	Yes	No	No
727	Congregation	June	On-system	Lake	>1,000	Sandbar	<0.1	Yes	No	No
729	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	Yes	No	No
735	Congregation	June	On-system	River	>1,000	Boulders	<0.1	No	No	No
736	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	1.0-1.9	No	No	No
739	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	No	No	No
741	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	No	No	No
744	Congregation	June	Off-system	Lake	101-1,000	90% shrub, 10% gravel	0.1-0.9	No	No	No
745	Congregation	June	Off-system	Lake	101-1,000	Exposed bedrock	0.1-0.9	No	No	No
749	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	No	No	No
751	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	No	No
752	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	No	No	No
753	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	No	No	No
754	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	No	No
755	Congregation	June	On-system	Lake	>1,000	Gravel	<0.1	No	No	No
674	Dispersed	June	On-system	Lake	>1,000	Boulders	0.1-0.9	Yes	No	No
1	Dispersed	June	Off-system	Lake	<1	NA	NA	No	No	No
5	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
6	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
11	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
15	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
16	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
19	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No

Waypoint	Gathering Type	Month	System	Waterbody Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	Used in 2017?	Used in 2016?	Used in 2015?
23	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
24	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
28	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
32	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
56	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
58	Dispersed	June	On-system	River	>1,000	NA	NA	No	No	No
85	Dispersed	June	Off-system	Lake	>1,000	NA	NA	No	No	No
93	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
94	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
101	Dispersed	June	On-system	Lake	>1,000	NA	NA	No	No	No
81	Congregation	July	On-system	Lake	>1,000	100% grass	0.1-0.9	Yes	Yes	Yes
123	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
203	Congregation	July	On-system	Lake	>1,000	80% exposed bedrock, 20% gravel	0.1-0.9	No	No	Yes
205	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
243	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
282	Congregation	July	Off-system	Lake	>1,000	Boulders, 5% grass	0.1-0.9	Yes	Yes	Yes
324	Congregation	July	Off-system	Lake	>1,000	Boulders	<0.1	Yes	Yes	Yes
334	Congregation	July	Off-system	Lake	>1,000	95% boulders, 5% grass	0.1-0.9	Yes	No	Yes
365	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	No	Yes	Yes
372	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	Yes	Yes	Yes
385	Congregation	July	On-system	River	101-1,000	Boulders	0.1-0.9	No	Yes	Yes
451	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	Yes
584	Congregation	July	On-system	Lake	>1,000	Exposed bedrock, 1% grass	<0.1	No	Yes	No
591	Congregation	July	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	No
605	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	No
650	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	Yes	Yes	No
651	Congregation	July	On-system	Lake	>1,000	80% exposed bedrock, 20% grass	0.1-0.9	No	Yes	No
674	Congregation	July	On-system	Lake	>1,000	Boulders	0.1-0.9	Yes	No	No

Waypoint	Gathering Type	Month	System	Waterbody Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	Used in 2017?	Used in 2016?	Used in 2015?
674	Congregation	July	On-system	Lake	>1,000	Boulders	0.1-0.9	Yes	No	No
696	Congregation	July	On-system	Lake	>1,000	80% tree/shrub, 20% sand/gravel	0.1-0.9	Yes	No	No
739	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	No	No	No
740	Congregation	July	On-system	Lake	>1,000	Boulders	<0.1	No	No	No
744	Congregation	July	Off-system	Lake	101-1,000	90% shrub, 10% gravel	0.1-0.9	No	No	No
745	Congregation	July	Off-system	Lake	101-1,000	Exposed bedrock	0.1-0.9	No	No	No
751	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	No	No
754	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	No	No
758	Congregation	July	Off-system	Lake	>1,000	50% shrub, 50% gravel	<0.1	No	No	No

3.2.3 HERRING GULL

Relatively low numbers of herring gulls were observed in the study area in 2018 compared to ring-billed gulls (Table 2). More herring gulls were observed in June 2018 than during any of the previous survey years (Figure 4). The number of herring gulls decreased from June to July, which was consistent with the 2015 and 2016 surveys (Figure 4).

Herring gull nests or probable nests were observed at 34 sites in the study area (Table 7). The majority of the nesting sites (21) were located on Split Lake (Map 9). Other nesting sites included Stephens Lake, Assean Lake, Cyril Lake, and Crying Lake. One island supported five herring gull nests, another supported three, and several islands supported two herring gull nests.

In June 2018, 38 of 45 islands (84%) where herring gulls were observed were used at least once in previous years (2015-2017) (Table 8). In July 2018, all islands (100%) where herring gulls were observed were used at least once in previous years (2015-2017) (Table 8).

All herring gull nests observed were located on islands. Most islands used consisted of exposed bedrock or boulders, <0.1 ha or 0.1-0.9 ha in size, within large, on-system lakes or rivers (Table 8).

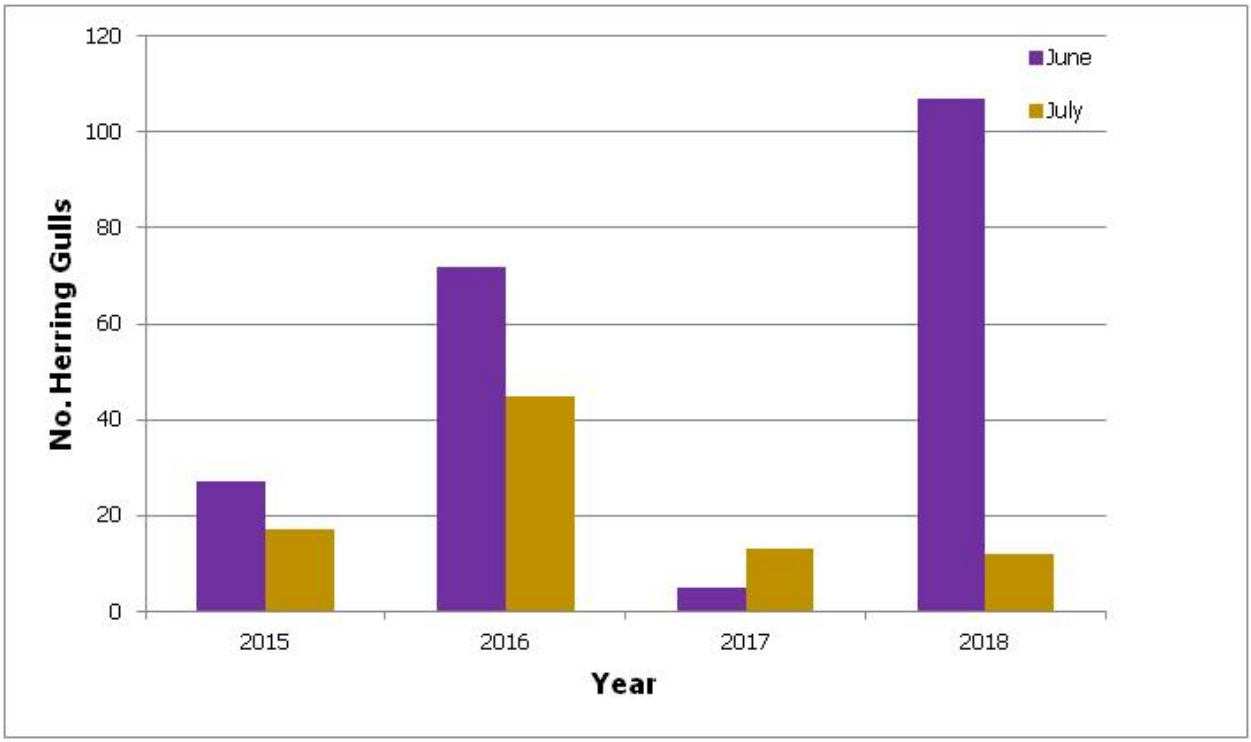
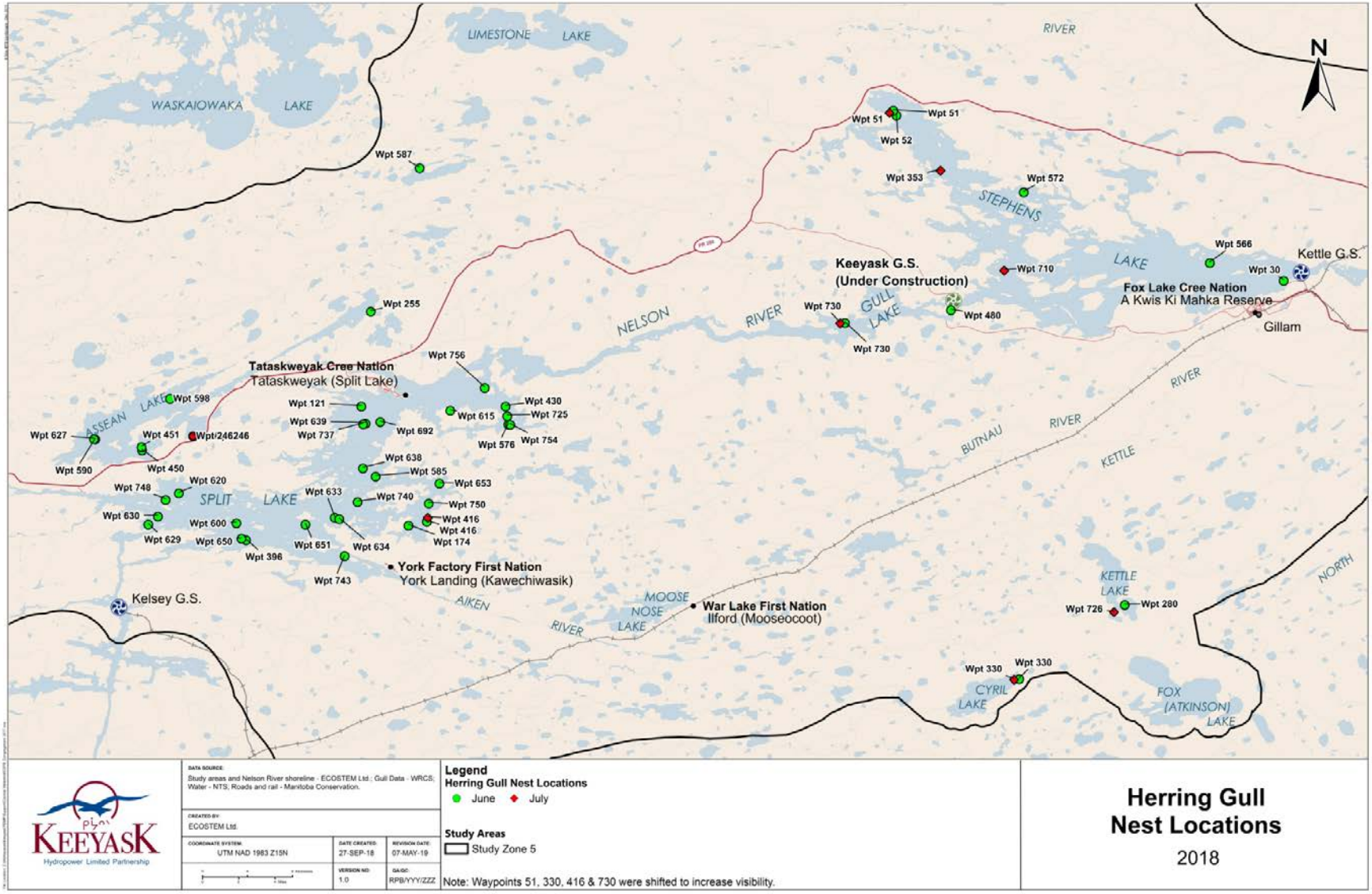


Figure 4: Number of Herring Gulls Observed During Helicopter Surveys in June and July from 2015 to 2018



Map 10: Herring Gull Nests Observed During Helicopter Surveys in 2018

Table 7: Herring Gulls and Nest Sites Observed During the Helicopter Surveys in 2018

Waypoint	June					July				
	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks
30	0	2	2	4	0	0	0	0	0	0
51	0	1	2	3	0	0	1	0	1	0
52	0	0	2	2	0	0	0	0	0	0
121	0	1	0	1	0	0	0	0	0	0
174	0	1	0	1	0	0	0	0	0	0
246	0	0	4	4	0	0	1	0	1	0
255	0	1	1	2	0	0	0	0	0	0
280	0	0	1	1	0	0	0	0	0	0
330	0	1	3	4	0	0	1	1	2	0
353	0	0	0	0	0	0	1	0	1	0
396	0	0	10	10	0	0	0	0	0	0
416	0	3	0	3	0	0	0	2	2	0
430	0	1	0	1	0	0	0	0	0	0
450	0	0	2	2	0	0	0	0	0	0
451	0	1	2	3	0	0	0	0	0	0
480	0	5	0	5	0	0	0	0	0	0
566	0	1	1	2	0	0	0	0	0	0
572	0	0	1	1	0	0	0	0	0	0
576	0	2	8	10	0	0	0	0	0	0
585	0	0	1	1	0	0	0	0	0	0
587	0	1	1	2	0	0	0	0	0	0
590	0	1	0	1	0	0	0	0	0	0
598	0	0	1	1	0	0	0	0	0	0
600	0	1	0	1	0	0	0	0	0	0
615	0	1	2	3	0	0	0	0	0	0

Waypoint	June					July				
	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks
620	0	1	2	3	0	0	0	0	0	0
627	0	0	1	1	0	0	0	0	0	0
629	0	1	1	2	0	0	0	0	0	0
630	0	1	0	1	0	0	0	0	0	0
633	0	0	2	2	0	0	0	0	0	0
634	0	2	6	8	0	0	0	0	0	0
638	0	1	1	2	0	0	0	0	0	0
639	0	1	1	2	0	0	0	0	0	0
650	0	0	2	2	0	0	0	0	0	0
651	0	1	0	1	0	0	0	0	0	0
653	0	1	0	1	0	0	0	0	0	0
692	0	1	0	1	0	0	0	0	0	0
710	0	0	0	0	0	0	1	1	2	0
725	0	1	0	1	0	0	0	0	0	0
726	0	0	0	0	0	0	0	2	2	0
730	0	1	1	2	0	0	1	0	1	0
737	0	1	0	1	0	0	0	0	0	0
740	0	1	1	2	0	0	0	0	0	0
743	0	0	2	2	0	0	0	0	0	0
748	0	1	1	2	0	0	0	0	0	0
750	0	0	1	1	0	0	0	0	0	0
754	0	0	1	1	0	0	0	0	0	0
756	0	1	0	1	0	0	0	0	0	0
Total	0	40	67	107	0	0	6	6	12	0

Table 8: Waterbody Classification and Island Use by Herring Gulls in 2018

Waypoint	Gathering Type	Month	System	Waterbody Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	Used in 2017?	Used in 2016?	Used in 2015?
52	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	Yes	Yes	Yes
246	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	Yes
280	Congregation	June	Off-system	Lake	>1,000	Boulders	<0.1	No	Yes	Yes
396	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	Yes	Yes	Yes
450	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	Yes
572	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	No	Yes	No
585	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	Yes	Yes	No
598	Congregation	June	Off-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	No
627	Congregation	June	Off-system	Lake	>1,000	Boulders, 10% shrub	<0.1	Yes	Yes	No
633	Congregation	June	On-system	Lake	>1,000	95% exposed bedrock, 5% tree/shrub	<0.1	No	Yes	No
650	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	Yes	Yes	No
743	Congregation	June	On-system	Lake	>1,000	Boulders	<0.1	No	No	No
750	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	No	No
754	Congregation	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	No	No
30	Nest	June	On-system	Lake	>1,000	70% tree/shrub, 30% sand/gravel	1.0-1.9	Yes	Yes	Yes
51	Nest	June	On-system	Lake	>1,000	Boulders	<0.1	Yes	Yes	Yes
121	Nest	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	Yes
174	Nest	June	On-system	Lake	>1,000	Boulders	<0.1	Yes	Yes	Yes
255	Nest	June	Off-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
330	Nest	June	Off-system	Lake	>1,000	Boulders	<0.1	Yes	Yes	Yes
416	Nest	June	On-system	Lake	>1,000	95% exposed bedrock, 5% grass	0.1-0.9	No	Yes	Yes
430	Nest	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	Yes
451	Nest	June	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	Yes
480	Nest	June	On-system	River	>1,000	Exposed bedrock	0.1-0.9	No	Yes	Yes
566	Nest	June	On-system	Lake	>1,000	Gravel	0.1-0.9	Yes	Yes	No
576	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	Yes	Yes	No
587	Nest	June	Off-system	Lake	101-1,000	Exposed bedrock	<0.1	No	Yes	No

Waypoint	Gathering Type	Month	System	Waterbody Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	Used in 2017?	Used in 2016?	Used in 2015?
590	Nest	June	Off-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	No
600	Nest	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	No
615	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	No
620	Nest	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	No
629	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	No
630	Nest	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	Yes	Yes	No
634	Nest	June	On-system	Lake	>1,000	95% exposed bedrock, 5% shrub	<0.1	Yes	Yes	No
638	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	No
639	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	No
651	Nest	June	On-system	Lake	>1,000	80% exposed bedrock, 20% grass	0.1-0.9	No	Yes	No
653	Nest	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	No
692	Nest	June	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	Yes	No	No
725	Nest	June	On-system	Lake	>1,000	20% exposed bedrock, 80% treed	0.1-0.9	Yes	No	No
730	Nest	June	On-system	River	>1,000	Boulders	<0.1	Yes	No	No
737	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	No	No
740	Nest	June	On-system	Lake	>1,000	Boulders	<0.1	No	No	No
748	Nest	June	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	No	No
756	Nest	June	On-system	Lake	>1,000	Gravel	0.1-0.9	No	No	No
416	Congregation	July	On-system	Lake	>1,000	95% exposed bedrock, 5% grass	0.1-0.9	No	Yes	Yes
726	Congregation	July	Off-system	Lake	>1,000	Boulders	<0.1	Yes	No	No
51	Nest	July	On-system	Lake	>1,000	Boulders	<0.1	Yes	Yes	Yes
246	Nest	July	Off-system	Lake	>1,000	Exposed bedrock	0.1-0.9	No	Yes	Yes
330	Nest	July	Off-system	Lake	>1,000	Boulders	<0.1	Yes	Yes	Yes
353	Nest	July	On-system	Lake	>1,000	Exposed bedrock	<0.1	No	Yes	Yes
710	Nest	July	On-system	Lake	>1,000	Boulders	0.1-0.9	Yes	No	No
730	Nest	July	On-system	River	>1,000	Boulders	<0.1	Yes	No	No

3.2.4 BONAPARTE'S GULL

Bonaparte's gulls were relatively uncommon in the study area in 2018, and it was the fewest observed compared to other survey years (Figure 5). Bonaparte's gulls were observed congregating at one location in 2018. At this location, Bonaparte's gulls were congregating at a small sandbar and nearby, along the shore of Limestone Lake, a single Bonaparte's gull nest was observed (Map 10; Table 9). This site is consistently used by Bonaparte's gulls and nesting activity has been observed at this site previously (Table 10). The remaining observations of Bonaparte's gulls consisted of dispersed birds (Table 10; Map 10*).*

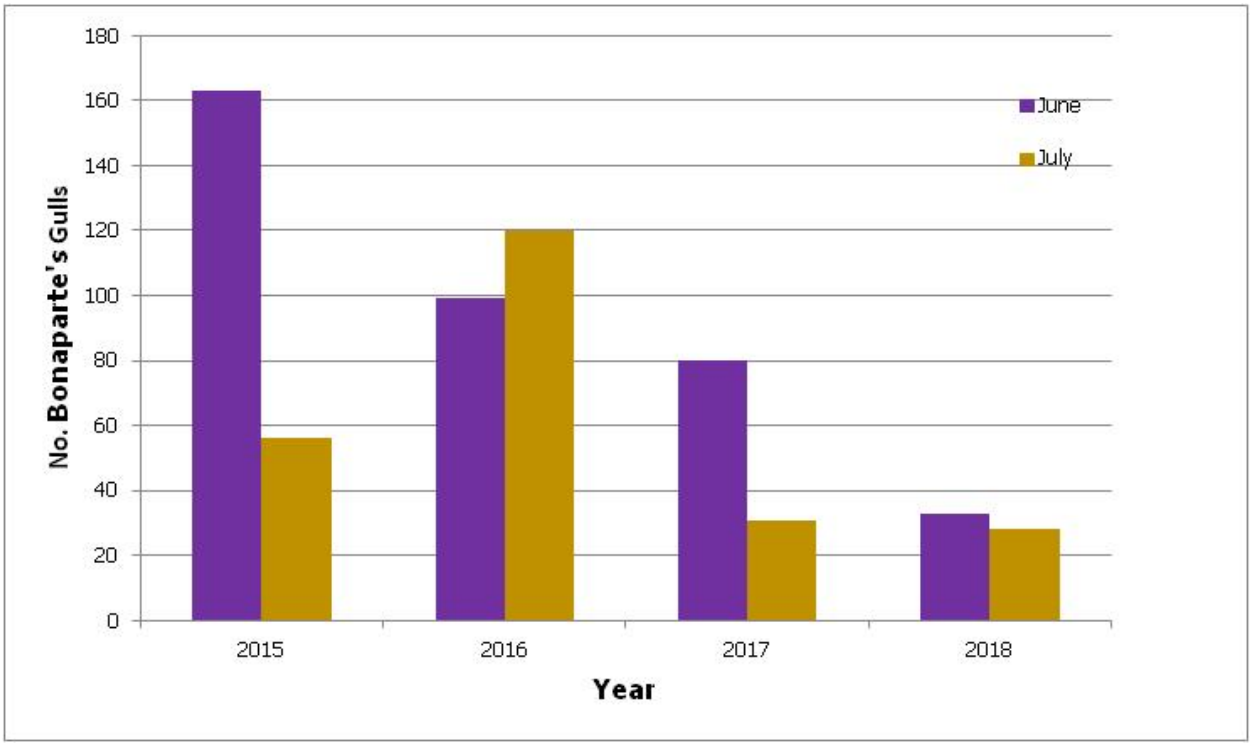


Figure 5: Number of Bonaparte's Gulls Observed During Helicopter Surveys in June and July from 2015 to 2018

Map 11: Bonaparte's Gull Congregations and Nest Sites Observed During Helicopter Surveys in June and July 2018

Table 9: Bonaparte's Gull Congregations and Nest Sites Observed during the Helicopter Surveys in 2018

Waypoint	June					July				
	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks
457	0	0	10	10	0	0	0	0	0	0
460	0	1	11	12	0	0	0	16	16	0
514	0	0	3	3	0	0	0	0	0	0
74	0	0	8	8	0	0	0	0	0	0
108	0	0	0	0	0	0	0	5	5	0
109	0	0	0	0	0	0	0	4	4	0
112	0	0	0	0	0	0	0	1	1	0
113	0	0	0	0	0	0	0	2	2	0
Total	0	1	32	33	0	0	0	28	28	0

Table 10: Waterbody Classification and Island Use by Bonaparte's Gulls in 2018

Waypoint	Gathering Type	Month	System	Waterbody Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	Used in 2017?	Used in 2016?	Used in 2015?
460	Congregation/Nest Site	June	Off-system	Lake	>1,000	Sandbar	0.1-0.9	No	Yes	Yes
457	Dispersed	June	Off-system	Lake	1-10	Burned black spruce forest	NA	Yes	Yes	Yes
514	Dispersed	June	Off-system	Lake	<1	Burned black spruce forest	NA	Yes	Yes	Yes
74	Dispersed	June	Off-system	Lake	1-10	NA	NA	No	No	No
460	Congregation	July	Off-system	Lake	>1,000	Sandbar	0.1-0.9	No	Yes	Yes
108	Dispersed	July	Off-system	Lake	101-1,000	NA	NA	No	No	No
109	Dispersed	July	Off-system	Lake	11-100	NA	NA	No	No	No
112	Dispersed	July	Off-system	Lake	1-10	NA	NA	No	No	No
113	Dispersed	July	Off-system	Lake	11-100	NA	NA	No	No	No

3.2.5 AMERICAN WHITE PELICAN

In 2018, American white pelicans increased in abundance in from June to July (Table 2). This observation was consistent with previous survey years (Figure 6). The largest concentration of American white pelicans was observed in the tailrace of the Kelsey Generating Station (Map 11). 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 was observed on Atkinson Lake (Table 11; Table 12). American white pelicans were observed congregating at Gull Rapids in both the June and July 2018 surveys (Table 11; Map 11). No American white pelicans were observed nesting in the study area in 2018. These findings are consistent with the observations made during previous surveys.

In June 2018, all five islands where American white pelicans were observed were used at least once in previous years (2015-2017) (Table 12). In July 2018, seven of nine islands (78%) where American white pelicans were observed were used at least once in previous years (2015-2017) (Table 12).

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

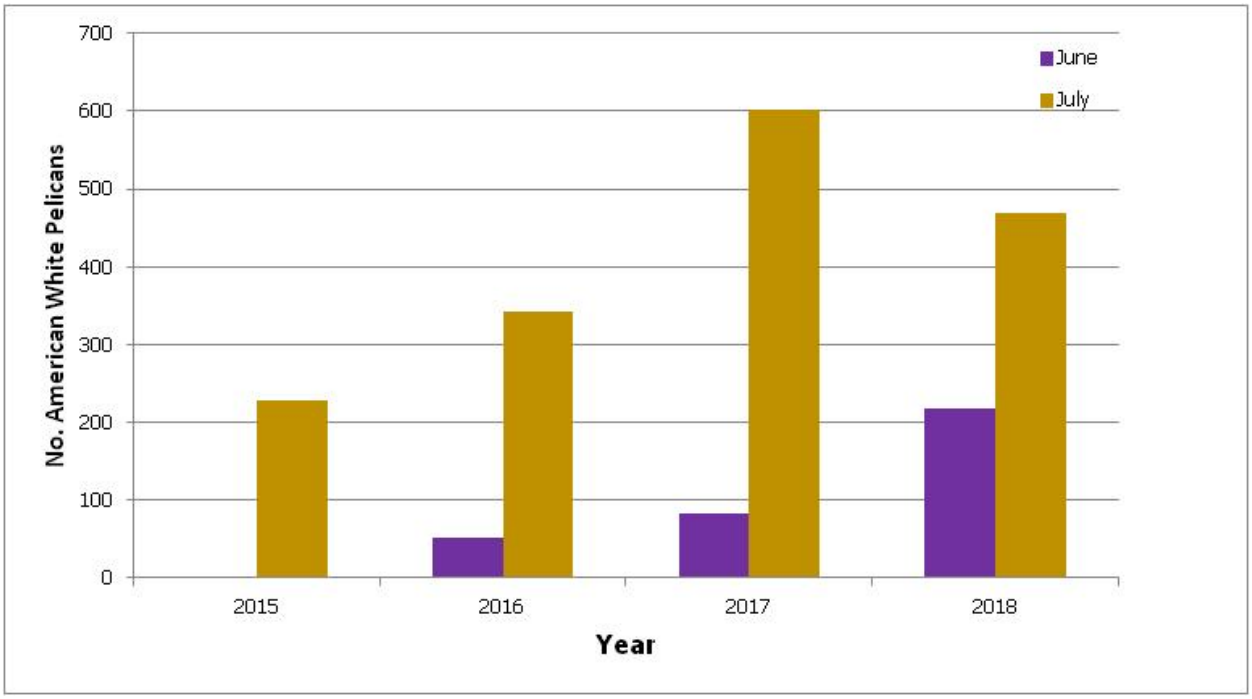
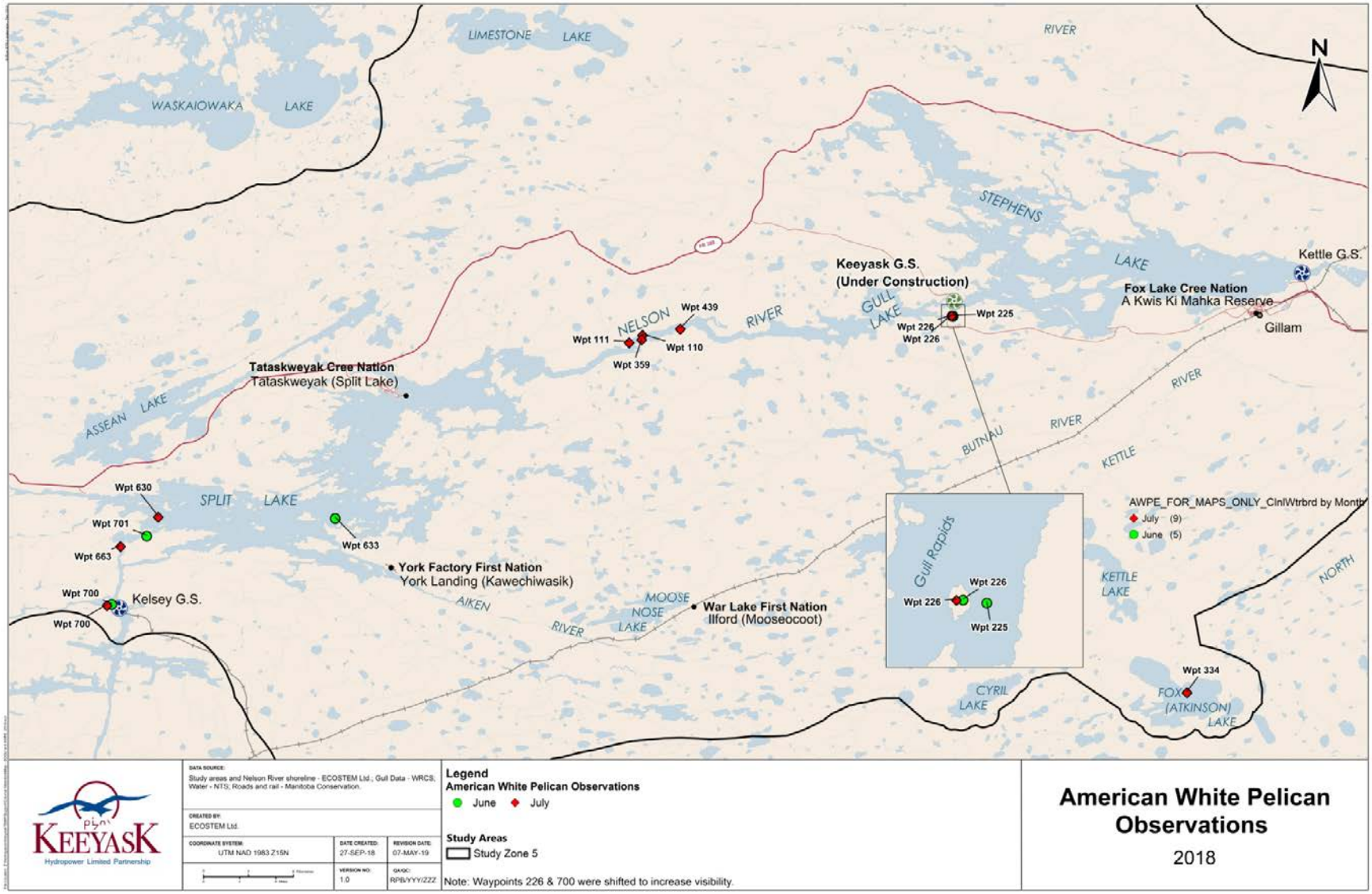


Figure 6: Number of American White Pelicans Observed During Helicopter Surveys in June and July from 2015 to 2018



Map 12: American White Pelican Observations Made During the Helicopter Surveys in 2018

Table 11: American White Pelican Observations Made During the Helicopter Surveys in 2018

Waypoint	June					July				
	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks	Unoccupied Nests	Occupied Nests	Adults (No Nest)	Total Adults	Total Chicks
225	0	0	24	24	0	0	0	0	0	0
226	0	0	54	54	0	0	0	78	78	0
334	0	0	0	0	0	0	0	5	5	0
359	0	0	0	0	0	0	0	13	13	0
439	0	0	0	0	0	0	0	120	120	0
630	0	0	0	0	0	0	0	2	2	0
633	0	0	3	3	0	0	0	0	0	0
663	0	0	0	0	0	0	0	7	7	0
700	0	0	135	135	0	0	0	200	200	0
701	0	0	2	2	0	0	0	0	0	0
110	0	0	0	0	0	0	0	36	36	0
111	0	0	0	0	0	0	0	8	8	0
Total	0	0	218	218	0	0	0	469	469	0

Table 12: Waterbody Classification and Island Use by American White Pelicans in 2018

Waypoint	Gathering Type	Month	System	Waterbody Type	Waterbody Size Class (ha)	Island Habitat	Island Size Class (ha)	Used in 2017?	Used in 2016?	Used in 2015?
226	Congregation	June	On-system	River	>1,000	50% rock, 45% shrub/deadfall, 55% treed	1.0-1.9	Yes	Yes	Yes
633	Congregation	June	On-system	Lake	>1,000	95% exposed bedrock, 5% tree/shrub	<0.1	No	Yes	No
700	Congregation	June	On-system	River	101-1,000	Exposed bedrock	0.1-0.9	Yes	No	No
701	Congregation	June	On-system	River	101-1,000	Boulders	0.1-0.9	Yes	No	No
225	Dispersed	June	On-system	River	>1,000	Exposed bedrock	0.1-0.9	Yes	Yes	Yes
226	Congregation	July	On-system	River	>1,000	50% rock, 45% shrub/deadfall, 5% treed	1.0-1.9	Yes	Yes	Yes
334	Congregation	July	Off-system	Lake	>1,000	95% boulders, 5% grass	0.1-0.9	Yes	No	Yes
359	Congregation	July	On-system	River	>1,000	90% treed, 10% exposed bedrock	3.0-3.9	No	No	Yes
439	Congregation	July	On-system	River	>1,000	50% bare rock, 50% grass	0.1-0.9	Yes	Yes	Yes
630	Congregation	July	On-system	Lake	>1,000	Exposed bedrock	0.1-0.9	Yes	Yes	No
663	Congregation	July	On-system	River	101-1,000	Exposed bedrock	0.1-0.9	Yes	Yes	No
700	Congregation	July	On-system	River	101-1,000	Exposed bedrock	0.1-0.9	Yes	No	No
110	Dispersed	July	On-system	River	>1,000	NA	NA	No	No	No
111	Dispersed	July	On-system	River	>1,000	NA	NA	No	No	No

4.0 DISCUSSION

The number of breeding ring-billed gulls observed at Gull Rapids in 2018 was similar to that observed in previous years during construction (2014-2017), and during the pre-construction period between 2001-2013 (KHLP 2012; Stantec 2015; WRCS 2016). The number of common terns observed was also consistent with the number observed during previous construction and pre-construction years (KHLP 2012; Stantec 2015; WRCS 2016). The stability in the number of colonial waterbirds observed in the Gull Rapids area during Project construction suggests that disturbance is not negatively affecting the abundance of colonial waterbirds or the use of island habitat in the area.

Colonial waterbirds nested on similar islands between 2015 and 2018, suggesting that they are not being dissuaded from nesting on islands near active construction areas. One island - Wpt 225, showed a decrease in ring-billed gull nests in 2018. As surrounding islands did not show a decrease in use, it is unlikely that this was due to sensory disturbance. It appears that the high water levels in 2017 scoured the substrate that had accumulated on the otherwise bare-rock island, where the gulls preferred to nest (Appendix C). As a result, ring-billed nests were limited to the small amounts of substrate that remained in 2018 and fewer nests were observed compared to 2016.

Despite an apparent increase in nesting effort among ring-billed gulls in Gull Rapids in 2018, fewer chicks were observed in 2018 (1,009 chicks) compared to 2016 (1,774 chicks). The reason for this is not clear and may be a result of several factors. Several studies have shown that human disturbance, defined as human investigators walking through the colony, can increase chick mortality and lower productivity (Fetterolf 1983; Brown and Morris 1995). However, it is unlikely that Project construction would cause the same reaction by nesting adults or chicks (*i.e.,* fleeing the nest) as an observer physically entering the colony. Audible disturbance, such as noise generated from Project construction, is often ineffective at deterring gulls and may become habituated to (Nisbet 2000; Cook *et al.* 2008; Soldatini *et al*. 2008). Other factors, including nest timing and food availability have been shown to affect chick mortality (Hunt and Hunt 1976; Bukacinska *et al.* 1996) and may have attributed to the lower productivity observed in 2018. However, data are not available to support these findings.

No colonial waterbirds were observed by UAV on the two additional islands that were surveyed in 2018 - Wpt 560 and Wpt 683. These islands were used by relatively large numbers of colonial waterbirds in 2017, due to the high water reducing the amount of habitat in Gull Rapids. Water levels did not reduce the amount of habitat available in Gull Rapids in 2018, resulting in islands Wpt 560 and Wpt 683 not being used by any species of colonial nesting waterbird.

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.

American white pelicans appear to be increasing in Study Zone 5, which were again observed in Gull Rapids in 2018. American white pelicans have increased in numbers in the region since the start of construction surveys, and the steady increase observed in the June surveys suggests they may be arriving earlier each year. The apparent increase is likely a result of the growing North American population and range expansion (King and Anderson 2005).

Alternatively, Bonaparte's gulls have shown a decrease in numbers within Study Zone 5 since the start of construction monitoring, 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 2019. 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 2018 did not appear to disturb colonial nesting waterbirds. Similar numbers of gulls and used habitat in the Gull Rapids area and successfully nested in 2018 compared to the pre-construction period.

One island - Wpt 225 showed a decrease in the number of ring-billed gulls it supported in 2018. This was likely due to the substrate on which the gulls preferred to nest being scoured away by the high water levels in 2017.

The number of chicks observed at Gull Rapids in 2018 was lower than what was observed in 2016. The reason for this is unclear, but could be attributed to nest timing or food availability.

The number of colonial nesting waterbirds and colonies in Study Zone 5 was relatively stable compared to previous years of Project construction surveys (2015-2017). The American white pelican appears to be increasing in numbers within the region, while Bonaparte's gulls appear to be decreasing.

Aerial surveys will be conducted in the spring and summer of 2019, 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 A-1: Colonial Waterbirds Enumerated from Images of Islands in Gull Rapids taken by a UAV in 2018

Island	Observation	6-Jun-18		29-Jun-18		20-Jul-18	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
Wpt 83	American Pelican	0	0	0	0	0	0
	Common Tern	0	0	0	0	0	10
	Common Tern w. Nest	0	0	0	0	0	0
	Common Tern Chick	0	0	0	0	0	0
	Herring Gull	1	1	1	1	1	10
	Herring Gull w. Nest	1	1	0	0	0	0
	Herring Gull Chick	0	0	0	0	0	3
	Ring-billed Gull	224	19	127	87	799	976
	Ring-billed Gull w. Nest	309	337	407	392	0	0
	Ring-billed Gull Chick	0	0	0	3	109	87
Wpt 224	American Pelican	0	0	0	0	0	0
	Common Tern	3	0	60	33	44	39
	Common Tern w. Nest	0	0	105	77	0	0
	Common Tern Chick	0	0	0	0	0	0
	Herring Gull	0	0	0	5	0	0
	Herring Gull w. Nest	1	1	0	0	0	0
	Herring Gull Chick	0	0	0	0	0	0
	Ring-billed Gull	22	5	22	37	249	666
	Ring-billed Gull w. Nest	0	0	19	5	0	0
	Ring-billed Gull Chick	0	0	0	0	0	0
Wpt 225	American Pelican	0	0	23	0	0	0
	Common Tern	0	0	0	0	0	0
	Common Tern w. Nest	0	0	0	0	0	0
	Common Tern Chick	0	0	0	0	0	0
	Herring Gull	5	0	4	2	5	17
	Herring Gull w. Nest	6	6	4	2	0	0
	Herring Gull Chick	0	0	0	0	3	3
	Ring-billed Gull	31	0	0	0	57	88
	Ring-billed Gull w. Nest	18	16	12	12	0	0
	Ring-billed Gull Chick	0	0	0	0	6	11
Wpt 226	American Pelican	0	0	0	19	27	52
	Common Tern	0	0	0	0	0	0
	Common Tern w. Nest	0	0	0	0	0	0
	Common Tern Chick	0	0	0	0	0	0
	Herring Gull	10	3	5	7	6	3
	Herring Gull w. Nest	9	8	2	3	0	0
	Herring Gull Chick	0	0	0	0	0	0

Island	Observation	6-Jun-18		29-Jun-18		20-Jul-18	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
	Ring-billed Gull	1,251	178	1,105	692	4,567	5,163
	Ring-billed Gull w. Nest	2,390	2,438	2,627	2,590	0	0
	Ring-billed Gull Chick	0	0	0	0	455	864
Wpt 227	American Pelican	0	0	0	0	0	0
	Common Tern	0	0	0	0	0	0
	Common Tern w. Nest	0	0	0	0	0	0
	Common Tern Chick	0	0	0	0	0	0
	Herring Gull	0	0	0	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	37	0	34	26	132	124
	Ring-billed Gull w. Nest	113	118	106	110	0	0
	Ring-billed Gull Chick	0	0	7	33	72	47
Wpt 478	American Pelican	0	0	0	0	0	0
	Common Tern	0	0	0	0	0	0
	Common Tern w. Nest	0	0	0	0	0	0
	Common Tern Chick	0	0	0	0	0	0
	Herring Gull	5	5	10	11	12	9
	Herring Gull w. Nest	10	10	2	2	0	0
	Herring Gull Chick	0	0	13	18	17	15
	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 Pelican	0	0	0	0	0	0
	Common Tern	0	0	0	0	0	0
	Common Tern w. Nest	0	0	0	0	0	0
	Common Tern Chick	0	0	0	0	0	0
	Herring Gull	0	0	1	1	2	1
	Herring Gull w. Nest	1	2	0	0	0	0
	Herring Gull Chick	0	0	1	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 Pelican	0	0	0	0	0	0
	Common Tern	0	0	0	0	0	0
	Common Tern w. Nest	0	0	0	0	0	0
	Common Tern Chick	0	0	0	0	0	0
	Herring Gull	4	3	8	6	5	6

Island	Observation	6-Jun-18		29-Jun-18		20-Jul-18	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
	Herring Gull w. Nest	6	6	0	0	0	0
	Herring Gull Chick	0	0	4	6	2	2
	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 560	American Pelican	0	0	NA	0	NA	NA
	Common Tern	0	0	NA	0	NA	NA
	Common Tern w. Nest	0	0	NA	0	NA	NA
	Common Tern Chick	0	0	NA	0	NA	NA
	Herring Gull	0	0	NA	0	NA	NA
	Herring Gull w. Nest	0	0	NA	0	NA	NA
	Herring Gull Chick	0	0	NA	0	NA	NA
	Ring-billed Gull	0	0	NA	0	NA	NA
	Ring-billed Gull w. Nest	0	0	NA	0	NA	NA
	Ring-billed Gull Chick	0	0	NA	0	NA	NA
Wpt 561	American Pelican	0	0	0	0	0	0
	Common Tern	0	0	0	0	0	0
	Common Tern w. Nest	0	0	0	0	0	0
	Common Tern Chick	0	0	0	0	0	0
	Herring Gull	0	0	0	0	8	18
	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	0	13
	Ring-billed Gull w. Nest	0	0	0	0	0	0
	Ring-billed Gull Chick	0	0	0	0	0	0
Wpt 683	American Pelican	0	0	NA	0	NA	NA
	Common Tern	0	0	NA	0	NA	NA
	Common Tern w. Nest	0	0	NA	0	NA	NA
	Common Tern Chick	0	0	NA	0	NA	NA
	Herring Gull	0	0	NA	0	NA	NA
	Herring Gull w. Nest	0	0	NA	0	NA	NA
	Herring Gull Chick	0	0	NA	0	NA	NA
	Ring-billed Gull	0	0	NA	0	NA	NA
	Ring-billed Gull w. Nest	0	0	NA	0	NA	NA
	Ring-billed Gull Chick	0	0	NA	0	NA	NA
Total		4,460	3,160	4,712	4,183	6,581	8,230

APPENDIX B:
COLONIAL WATERBIRD ABUNDANCE OBSERVED DURING HELICOPTER SURVEYS 2015-2017

Table B-1: 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 B-2: 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 B-3: 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:
HIGH WATER EFFECTS ON ISLAND WPT 225

Figure C-1: Island Wpt 225 on June 26, 2016. Note: numerous ring-billed gulls nesting on the accumulated substrate in several large patches

Figure C-2: Island Wpt 225 during High Water on May 31, 2017

Figure C-3: Island Wpt 225 on June 28, 2018. Note: ring-billed gull nesting is mostly limited to the few, small remaining patches of accumulated substrate

APPENDIX D:
UAV MISSION SUMMARY 2018

UAIS MISSION SUMMARY 2018

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 plastic body. All other electrical components are either custom made or custom selected by UAIS. All Wildlife Resource Consulting Service (WRCS) missions flown in 2018 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 side-lap.

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 as well as 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 based on the latitude and longitude of where each image was taken 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: “Wpt 83, Wpt 224, Wpt 225, Wpt 226, Wpt 227, Wpt 478, Wpt 479, Wpt 480, Wpt 560, Wpt 561, Wpt 683, Gull Habitat Enhancement Area, and Bank Swallow Habitat. (refer to Appendix 2 – Mission Area for images of the mission areas).”

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 a total of three times either early morning or late evening. Flying the missions are these times provided the greatest shadow relief of the ground nesting birds and aided in more accurately identifying bird populations and ultimately a more accurate bird count. Once all identified nesting areas were flown and all data captured, the mission was considered complete.

The flight paths over the nesting areas were all flown at 100 feet above ground or higher, and in a grid pattern. The same flight plan for each mission area was used for every flight of the mission areas. A 90-degree camera down orientation was used when flying all the mission areas (refer to appendix 2 – sample images).

Mission 1 (June 5th – June 6th)

Data acquisition of mission areas: “Wpt 83, Wpt 224, Wpt 225, Wpt 226, Wpt 227, Wpt 478, Wpt 479, Wpt 480, Wpt 560, Wpt 561, Wpt 683, Gull Habitat Enhancement Area, and Bank Swallow Habitat” commenced late evening Tuesday, June 5th. The sky condition was overcast and the winds were light (less than 5 knots or 10 kmph). The UAV captured 548 images of the proposed mission area successfully with a total flight time of 208 minutes. All phases of flight were uneventful.

Data acquisition of mission areas: “Wpt 83, Wpt 224, Wpt 225, Wpt 226, Wpt 227, Wpt 478, Wpt 479, Wpt 480, Wpt 560, Wpt 561, Wpt 683, commenced early morning and in the evening Wednesday, June 6th. The sky condition was overcast and the winds were light (less than 5 knots or 10 kmph). The UAV captured 608 images of the proposed mission areas successfully with a total flight time of 223 minutes. All phases of flight were uneventful.

Mission 2 (June 28th – June 29th)

June 28th data acquisition of morning mission areas: “Wpt 83, Wpt 224, Wpt 225, Wpt 226, Wpt 227, Wpt 478, Wpt 479, Wpt 480, Wpt 560, Wpt 561, Wpt 683, commenced early morning Wednesday, June 28th and were completed successfully late evening on Thursday June 28th. The sky condition was overcast and the winds were light to moderate with sporadic showers. Some missions were not completed due to rain showers. The UAV captured 386 images of the proposed mission areas successfully with a total flight time of 146 minutes. All phases of flight were uneventful.

June 29th data acquisition of evening mission areas: “Wpt 83, Wpt 224, Wpt 225, Wpt 226, Wpt 227, Wpt 478, Wpt 479, Wpt 480, Wpt 560, Wpt 561, Wpt 683 commenced early morning Friday, June 29th. The sky condition was overcast and the winds were moderate. The UAV

captured 591 images of the proposed mission areas successfully with a total flight time of 244 minutes. All phases of flight were uneventful.

Mission 3 (July 19th – July 20st)

July 19th data acquisition of mission areas: “Wpt 83, Wpt 224, Wpt 225, Wpt 226, Wpt 227, Wpt 478, Wpt 479, Wpt 480, Wpt 561, Gull Habitat Enhancement Area, and Bank Swallow Habitat commenced early morning Wednesday, June 28th and were completed successfully late evening on Thursday, July 19th. Due to unavailability of the boat, Wpt 560 and Wpt 683 could not be flown. The sky condition was scattered to broken and the winds were light to moderate. The UAV captured 280 images of the proposed mission areas successfully with a total flight time of 125 minutes. All phases of flight were uneventful.

July 20th data acquisition of mission areas: “Wpt 83, Wpt 224, Wpt 225, Wpt 226, Wpt 227, Wpt 478, Wpt 479, Wpt 480, Wpt 560, Wpt 561, Wpt 683, commenced early morning Friday, July 20th. The sky condition was scattered to broken and the winds were light to moderate. The UAV captured 492 images of the proposed mission areas successfully with a total flight time of 209 minutes. All phases of flight were uneventful.

APPENDIX 1 – MISSION AREA

APPENDIX 2 – SAMPLE IMAGES

Top Down Image Wpt 226 Morning July 19th

Top Down Image Wpt 83 Morning June 28th

Top Down Image Wpt 225 Afternoon June 5th