Keeyask Generation Project

Terrestrial Effects Monitoring Plan

Bald Eagle Habitat Effects Monitoring Report

TEMP-2018-10

KEEYASK

Manitoba Sustainable Development Client File 5550.00
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KEEYASK GENERATION PROJECT

TERRESTRIAL EFFECTS MONITORING PLAN

REPORT #TEMP-2018-10

BALD EAGLE HABITAT EFFECTS MONITORING 2017

Prepared for

Manitoba Hydro

By

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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, including bald eagle. 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 will affect bald eagles, and whether or not more needs to be done to reduce potentially harmful effects.

Approximately 13 bald eagle nests were identified in the Keeyask Region during studies for the Project environmental impact statement. Between 2001 and 2011, the average density of bald eagles between and including Split Lake and Kettle Generating Station was 0.8 birds/km². Overall, the highest average bald eagle densities occurred between and including Split Lake and Birthday Rapids (1.1 birds/km²). Approximately 11 active nests have more recently been identified on the Nelson River between Birthday Rapids and Gull Rapids. Some of these nests were expected to be removed during Project clearing. Artificial nesting platforms are installed to mitigate the loss of active nests removed by the Project.

This report describes the results of bald eagle habitat effects monitoring conducted during the summer of 2017, the fourth summer of Project construction. Surveys for bald eagle nests occurred along the shorelines of the Nelson River from the Kelsey Generating Station downstream to the Limestone Generating Station, including Split Lake and Stephens Lake, and along waterbodies off the Nelson River system.

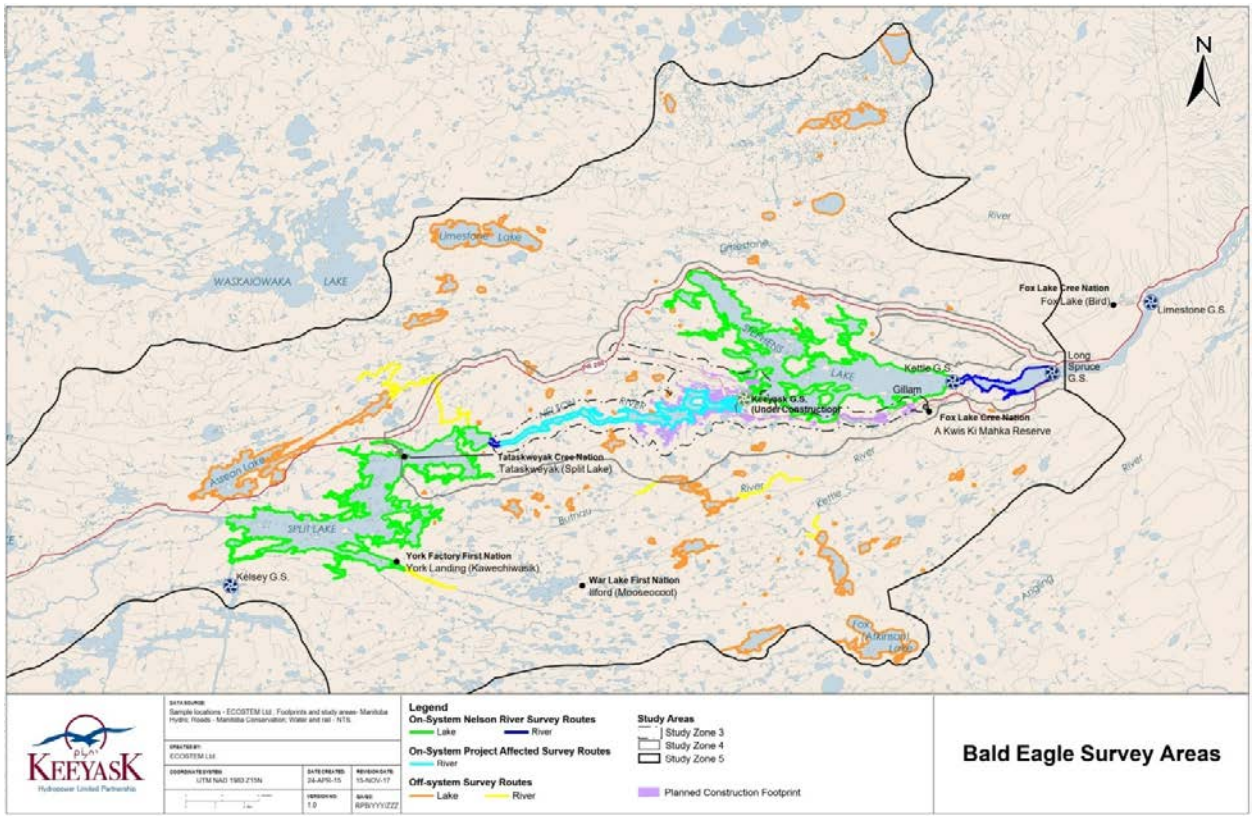
Bald Eagle on Nest in May 2017

Why is the study being done?

Bald eagle habitat effects monitoring is being done to evaluate Project effects on the distribution and relative abundance of bald eagles and their breeding habitats. Data collected also provides information for the habitat enhancement study, which identifies nest locations that are potentially affected by Project clearing activities.

What was done?

Helicopter-based aerial surveys took place in May, June, and July 2017 to determine the abundance, distribution and habitat use of bald eagles in Project-affected areas and in reference areas. Bald eagle nests were also monitored for eggs and nestlings.



Shorelines Surveyed for Bald Eagles and Nests in 2017

What was found?

A total of 97 bald eagle nests were identified and monitored in 2017, along the surveyed shorelines. Nests were mostly found in large spruce and aspen trees near shorelines. Of the 97 nests identified, 55 were occupied by a breeding pair of bald eagles and 36 nests successfully produced 52 late-stage nestlings. Breeding pairs produced an average of 0.96 late stage nestlings per nest and successful nests produced an average of 1.44 late stage nestlings.

In the Project-affected hydraulic zone (all areas within 200 m of the actual Project footprint at the time of the survey), five active nests identified in 2015 were no longer present in 2017, and

one new nest was observed. However, the number of active nests overall remained greater than before Project construction began and only decreased by one nest compared to 2015. Furthermore, nesting success rates in the Project-affected hydraulic zone were higher and produced more young per nest compared to reference areas.

What does it mean?

The bald eagle population in the Project-affected hydraulic zone appears to be stable and sustainable, while the population in the overall study area is increasing. Greater rates of productivity in the Project-affected hydraulic zone suggests that food continues to be easily accessed, but may also reflect natural variation in bald eagle reproductive efforts among years.

What will be done next?

Additional aerial surveys will be conducted during the construction phase to continue monitoring the distribution and relative abundance of bald eagles and their breeding habitats. Habitat association data for bald eagle nests in 2015, 2017, and in future years, will be used to update the existing bald eagle habitat quality model after construction phase data collection is complete. Since the conditions created within the future Keeyask reservoir may create new breeding habitat types, the habitat quality model will also be confirmed during the operation phase of the Project.

STUDY TEAM

We would like to thank Ben Hofer of Custom Helicopters, Sherrie Mason and Rachel Boone of Manitoba Hydro, and Ron Bretecher of North/South Consultants Inc., for logistical assistance in the field. We would also like to thank Dr. James Ehnes, of ECOSTEM Ltd. for GIS supported study design and cartography.

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

- Robert Berger, M.N.R.M., Design, analysis, and reporting
- Nicholas LaPorte, M.N.R.M., Survey personnel, analysis, and reporting
- Mark Baschuk, M.Sc., Survey personnel
- Jackie Verstege, M.Sc., Survey personnel
- Morgan Zaretski, B.Sc. Survey personnel
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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* (the EIS), 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* (TE SV). 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, bald eagle (*Haliaeetus leucocephalus)* habitat effects monitoring, for the construction and operation phases of the Project.

Bald eagles receive protection under the Manitoba *Wildlife Act*. The availability of nesting habitat is the driver expected to have the greatest impact on bald eagle abundance and distribution in the Keeyask Region. The loss of habitat within the Project construction area and loss of effective habitat near the construction area may cause changes in bald eagle distribution and/or result in reduced abundances. Other factors that may affect abundance and distribution to a lesser degree include:

- accidental mortality resulting from vehicle collisions, collision with towers, etc.;
- disease and parasites;
- predation of nests and young; and,
- mortality resulting from extreme weather events.

The effects of collisions and predation are expected to be very low. Extreme weather events, and disease and parasites, which are not monitored under the TEMP, may have an intermediate effect on bald eagle populations.

The bald eagle is a generalized predator and scavenger adapted to aquatic habitats (Buehler 2000). Bald eagles have only one brood per season, lay one to three eggs, two to four days apart (Stalmaster 1987), and require approximately 35 days of incubation to hatch (Buehler 2000). Egg laying is fairly synchronous, with 90% of breeding pairs laying within a 10 day period in mid-April in north-central Saskatchewan (Gerrard and Bortolotti 1988). On average, juvenile male bald eagles in Saskatchewan depart from their nests at 78 days and females at 82 days (Bortolotti 1986). During their potentially long lifespan in the wild (up to 28 years; Schempf 1997), bald eagles typically produce one or two young each year and occasionally three. It is also common for pairs to not breed in some years (Buehler 2000).

Bald eagles use tall trees along large waterbodies for nesting, roosting, and perching (Buehler 2000). Trees are required to be a minimum of 25 cm in diameter and bald eagle habitat must contain at least six trees per hectare (ha) that are 40 cm in diameter or greater (Ontario Woodlot Association 2006). These large trees serve as platforms for nests, and provide perching sites to allow good visibility and easy flight access (Livingston *et al.* 1990).

In the years preceding Project construction, approximately 11 active bald eagle nests were present annually along Nelson River shorelines in between Split Lake and Gull Rapids. Some of the nests located between Birthday Rapids and Gull Rapids were anticipated to be removed during Project development (KHLP 2012). To mitigate this loss of nests, artificial nesting platforms were installed to offer alternative nesting locations near the future reservoir shoreline (KHLP 2015a). These nesting platforms, installed in February 2016, were monitored in 2017 to verify use and nesting success.

Habitat classification carried out for the Project EIS indicated approximately 34,354 ha of bald eagle breeding and perching habitat within Study Zone 5. Within this area, an average density of 0.8 bald eagles/km^2 was found along the Nelson River between Split Lake and the Kettle GS (KHLP 2012).

The goal of this monitoring study is to evaluate how the Project changes the amount and location of bald eagle nesting habitats. The first year of the Bald Eagle Habitat Effects monitoring was conducted in 2015. This report provides the results of the second year of monitoring for the Bald Eagle Habitat Effects study, carried out in 2017.

2.0 METHODS

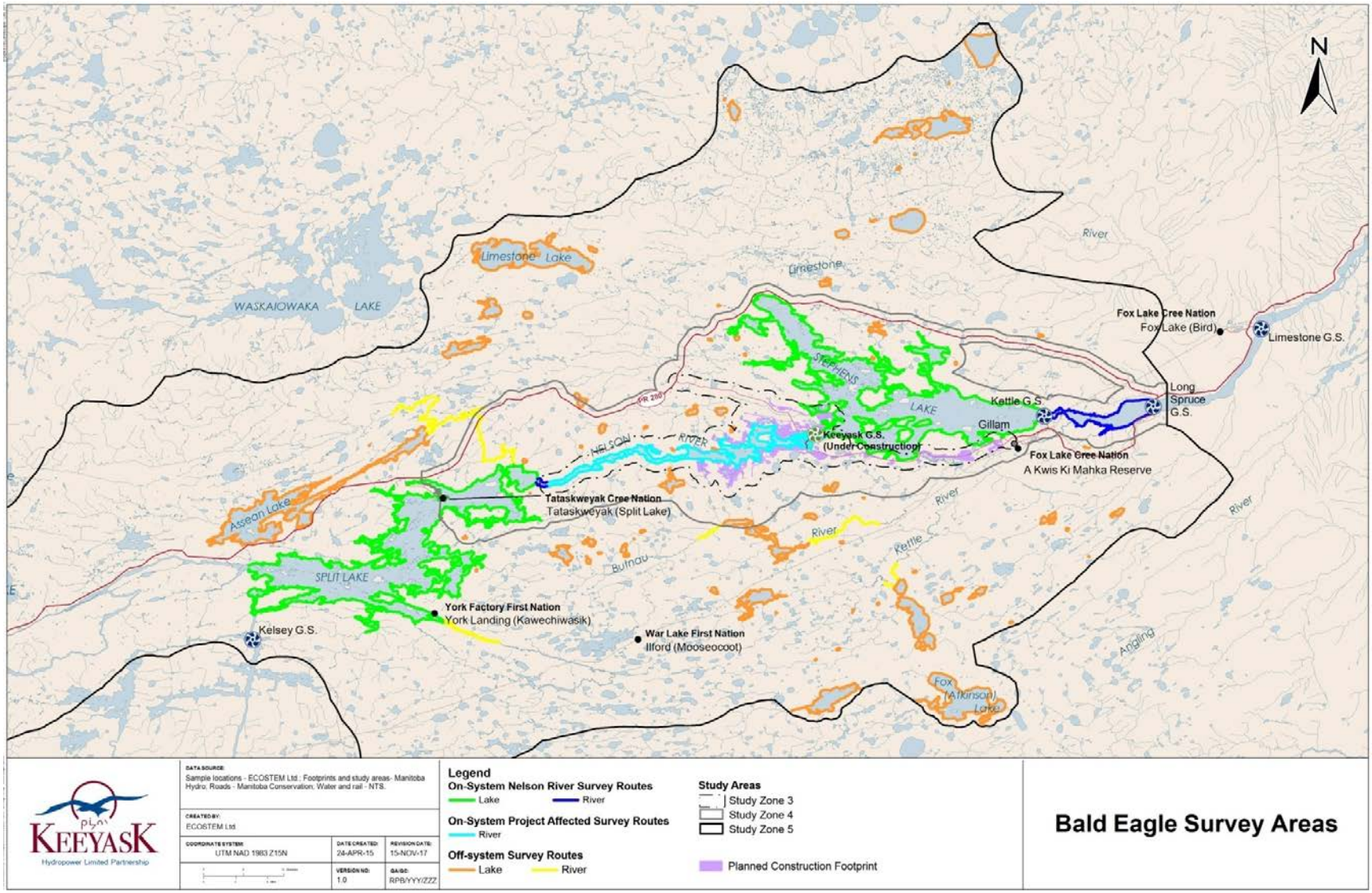
2.1 DATA COLLECTION

Helicopter-based aerial surveys were conducted to monitor the abundance, distribution, reproductive success, and habitat attributes of nesting locations of bald eagle in portions of Study Zone 5 during the breeding season (Map 2-1). A random, stratified design was used to select waterbodies to be surveyed. Stratified random sampling is a method of sampling that involves the division of a population into smaller groups. These smaller groups (strata) are formed based on shared characterisitics such as size and shoreline length. Waterbodies were classified broadly into either on-system (including Project-affected and Nelson River) or off-system hydraulic zones of influence, grouped into two basic categories (lake or river), and grouped into different size classes (0-10, >10-100, >100-1,000, >1,000-10,000, >10,000-100,000 ha). The Project-affected hydraulic zone includes all areas within 200 m of the actual Project footprint at the time of the survey (KHLP 2015b). The Nelson River zone included other reaches of the regulated Nelson River system from the Kelsey GS downstream to the Limestone GS, but outside of the Project footprint. The Off-system zone included randomly selected waterways and waterbodies off the Nelson River system that are unaffected by hydroelectric development. The total shoreline lengths and distribution of waterbodies are presented in Table 2-1 and Map 2-1.

Table 2-1: Shoreline Length (km) and Size Class (ha) of Waterbody Types Surveyed in 2017

Hydraulic Zone	Waterbody Type	Waterbody Size Class (ha)					Total Shoreline Length (km)
		>0-10	>10-100	>100-1000	>1,000-10,000	>10,000-100,000	
Project-affected	River	3	0	0	245	0	248
Nelson River	Lake	0	0	0	34	1,789	1,823
	River	0	0	56	87	0	142
Off-system	Lake	6	52	213	598	0	871
	River	0	133	122	0	0	255
Total		9	185	390	963	1,789	3,338

Aerial surveys followed protocols adapted from methods employed by the United States Fish and Wildlife Service (Jurek 1990, Jackman 2004) and the British Columbia Ministry of Environment (BCME 2013). 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 or nests. The survey



Map 2-1: Shorelines Surveyed for Bald Eagles and Nests in 2017

was flown at approximately 100 km/h and at elevations greater than 100 m above ground level (agl) to minimize disturbance to nesting bald eagles and avoid collisions with flying birds.

The aerial survey crew consisted of three observers, and the helicopter pilot. In order to maximize detection of all birds and nests along the helicopter flight path, two observers were positioned on opposite sides of the helicopter (one in the front left seat, adjacent to the pilot and one in the rear right seat, behind the pilot). The front observer dictated all observations detected on the left side of the helicopter (including areas immediately below the helicopter) to a third crew member seated in the left rear seat. The crew member seated in the rear right seat observed all nests and birds detected along the right side of the helicopter.

The helicopter flew between 50 m and 100 m from shorelines such that when surveying the area, the front seat observer had a clear view of the trees along the shoreline, while the second observer was able to view the open water habitat. Where the waterbodies narrowed, the second observer had a clear view of the opposite shoreline. The third crew member, seated in the rear left seat, was responsible for recording observations and photographing nests using a Nikon Coolpix Aw130 16.0 megapixel camera.

During the surveys, bird of prey observations and large stick nests were recorded along with their locations. Nests were named with an ID number ending with the year the nest was first observed (*e.g.*, 14-2015, 105-2017). Tree species, nest height and tree heights were estimated using professional judgement and were verified using photography. All observations were georeferenced with a Garmin GPS 64. When a nest was observed, the helicopter slowed and circled the site once to georeference the nest and photograph the nest. Consequently, the precision of the UTM coordinates for nests is estimated at $^{\pm}$200 m. Photography was conducted quickly to minimize disturbing birds and observers retreated if the eagles displayed agitated behaviour. Photographs were reviewed in the laboratory to confirm occupancy, and to verify nest contents.

The first survey of nests occurred from May 16 to 20, 2017 and was conducted to locate initial nests and determine occupancy. A nest was considered occupied if at least one adult bald eagle was present at a nest. The second survey in mid-nesting season occurred from June 13 to 17 to determine the contents (*e.g.,* perched adult, incubating adult, nestlings, empty) of nests located in May and to locate any additional nests that were not detected during the first survey. The third and final survey, occurred between July 15 and 19, and determined the number of nestlings near the fledgling stage of development and to document any nests that were not detected in the previous surveys.

Data collected during the 2015 bald eagle nest surveys was used to determine the number of artificial nesting platforms required. Artificial nesting platforms were installed for any nests that were classified as *Active* and had been or would be removed by Project construction. Five artificial nesting platforms were installed in February 2016, to replace three *Active* nests known to be affected by Project development, as well as two additonal artificial nesting platforms to mitigate the potential removal of future nests by Project construction. These artificial nesting platforms were also surveyed during the bald eagle habitat effects monitoring survey in 2017.

Bald eagle nest trees located in 2015 that were absent or removed in subsequent breeding seasons were noted. Bald eagle nests located off the survey route while ferrying between refueling stops were recorded as incidental and excluded from the final productivity analysis. Other bird of prey species and large stick nests observed during the survey were recorded as incidental.

2.2 DATA ANALYSIS

Based on the results of the surveys, accepted standard methods (Jurek 1990, Jackman 2004), and professional judgement, occupancy determinations were made for each monitored nest as follows.

- ***Active***: Nests were defined as *Active* if there were two sexually mature bald eagle present on or near a nest, or there was at least one bald eagle in incubating posture on a nest (Steenhof and Newton 2007) during any of the three survey visits. Bald eagle are capable of breeding in their fifth year and are unmistakable with their completely white head and tail (McCollough 1989). Nests defined as *Active* were further categorized as:
    - ***Active, Successful***: A nest with at least one late-stage nestling (dark plumage, no down) or as a fledged juvenile observed near the nest (Steenhof and Newton 2007).
    - ***Active, Not Successful***: An *Active* nest with two sexually mature bald eagles and where no incubating adult or nestlings were observed.
    - ***Active, Abandoned***: An *Active* nest containing an incubating adult, eggs or nestlings, where the adults ceased to attend the nest and did not successfully raise nestlings to the near fledging stage.
    - ***Active, Success Unknown*:** An *Active* nest containing an incubating adult, eggs or nestlings, that was not sufficiently monitored to determine reproductive success (*i.e., Active* nests observed in May or June and not observed in July).
- ***Inactive***: Nests were defined as *Inactive* when only one or zero sexually mature bald eagles were observed near a sufficiently monitored nest (*i.e.,* nests observed in May and *Active* nests first observed in June).
- ***Status Unknown***: Nests were defined as *Status Unknown* when an *Inactive* nest was not sufficiently monitored to determine reproductive success (*i.e., Inactive* nests only observed in June or July).

Percentage of *Active* nests is calculated as:

$$\%\ Active\ nests\ = \frac{\text{Total \#}\ Active\ \text{nests}}{\#\ Active\ \text{nests}\ +\ \#\ Inactive\ \text{nests}}$$

Percentage of *Successful* nests is calculated as:

$$\%\ Successful\ nests\ = \frac{\text{Total \# } Active, Successful \text{ nests}}{\text{\# } Active \text{ nests}}$$

Reproductive success was calculated as the number of nestlings per bald eagle breeding pair (*i.e.*, per *Active* nests) and the number of nestlings per successful bald eagle breeding pair. Nest assessed as *Active, Success Unknown* (*n* = 2) were not included in reproductive success calculations as the number of late stage nestlings in these nests was undetermined. The number of nestlings observed in nests in July was used as the numerator for both calculations.

$$\text{\# Nestlings/Pair}\ = \frac{\text{Total \# late stage nestlings in } Active \text{ nests}}{\text{\# } Active \text{ nests}}$$

$$\text{\# Nestlings/Successful pair}\ = \frac{\text{Total \# late stage nestlings in } Active, Successful \text{ nests}}{\text{\# } Active, Successful \text{ nests}}$$

Because the incubation period for bald eagle eggs is 35 days (Buehler 2000), nests observed to contain nestlings between June 13 and 17 were either *Active* in May but not detected by the survey team, or became active shortly after the May survey. Thus, *Active* nests first observed in June were not excluded from occupancy determinations. *Inactive* nests observed for the first time in June were deemed *Status Unknown* and were not included in the total number of *Active* nests because, without an observation earlier in the nesting season, there was no way to determine if the nest was used earlier in the season (*i.e.,* it was not known whether a nesting attempt had failed). *Inactive* nests that were only observed during the July survey were also designated as *Status Unknown* and were omitted from occupancy determinations. Nests that did not contain nestlings in July but contained nestlings in June that were less than 10 weeks old, were assessed as *Abandoned*; it is confidently assumed that such nestlings did not survive to the point when they would fledge from the nest.

Productivity statisitics were compared between nests in the Project-affected zone and reference areas (Nelson River and off-system zones). Fisher's exact test (Sokal and Rohlf 2001) was used to compare nest success rates. Mann-Whitney U tests were used to examine differences in the number of late stage nestlings produced per nest (Sokal and Rohlf 2001). To detect possible differences between zones, an alpha level of 0.05 was used in all statistical tests.

To examine conspecific interactions and its potential influence on bald eagle productivity in the Project-affected zone, distance to the nearest *Active* nest was measured in Google Earth Pro v.7.1.5 for each *Active* nest, including incidental *Active* nests. Because all of the shorelines of waterbodies in reference areas were not surveyed, nearest neighbour distances were not measured for nests in reference areas. Measurements of distances between nests in reference areas would exclude nests potentially located on unsurveyed waterbodies, resulting in overestimated distances among these nests.

3.0 RESULTS

A total of 97 bald eagle nests were found and monitored on the shorelines of surveyed waterbodies in the 2017 breeding season (Map 3-1). Of the monitored nests, 23 were in the Project-affected zone, 43 were in the Nelson River zone, and 31 were observed in the Off-system zone (Appendix A). At Off-system waterbodies south of the Nelson River, 14 bald eagle nests were observed whereas 17 were observed at Off-system waterbodies north of the Nelson River (Appendix A).

In the Project-affected hydraulic zone, five *Active* nests identified in 2015 were no longer present in 2017, and one new nest was observed. The new nest (2-2017) was located on the edge of borrow area N-5, one km dowstream of Gull Rapids (Map 3-1). Although no further clearing was planned in this borrow area, a buffer was established around the nest to prevent disturbance.

In May 2017, 76 nests were located, of which 50 were occupied (Appendix B). Of the occupied nests, five nests were *Inactive* (*i.e.*, single adults perched near a nest) while 45 were *Active*; 43 nests contained incubating adults and two nests were empty but had two adults perched nearby (Appendix B). Two *Active* nests were observed containing one egg during the May survey (Appendix B). At nest-sites in May, a total of 57 adult bald eagles were observed.

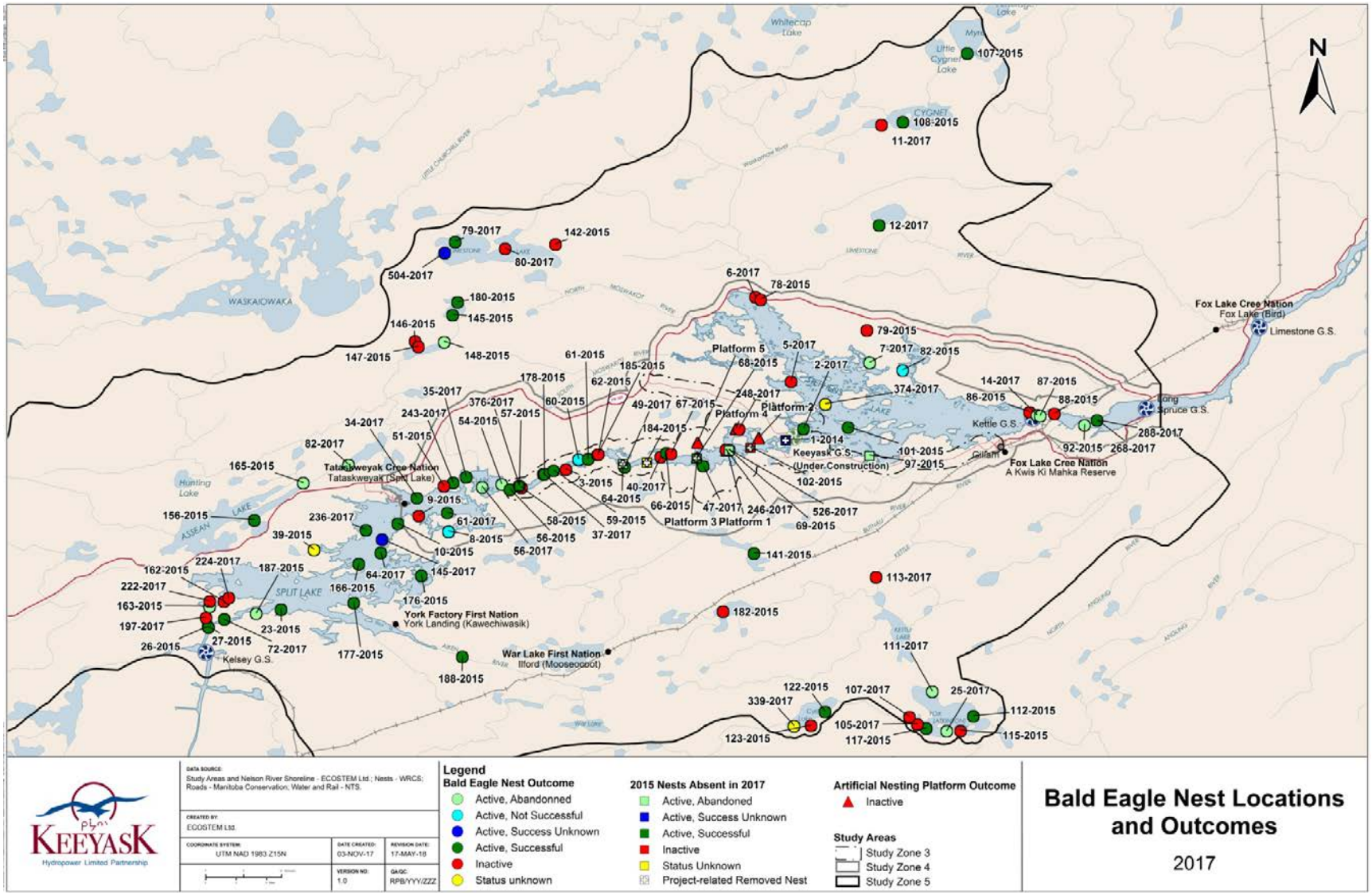
At nest-sites in June 2017, 53 adults and 41 nestlings were observed (Appendix B). With four additional *Active* nests and 12 additional *Inactive* nests observed in June, a total of 92 nests were monitored of which 46 were occupied (Appendix B). Of the occupied nests, 40 were *Active* and six *Inactive* nest were empty but had one adult perched nearby (Appendix B). Of the 45 nests categorized as *Active* in May, eleven were observed to be *Abandoned* during the June survey. A total of 41 nestlings were observed in 26 nests in June (Appendix B). Incubating adults were observed in thirteen nests during the June survey (Appendix B).

During the July 2017 survey, 46 adults and 52 nestlings were observed at nest-sites (Appendix B). Two additional *Active* nests and three additional *Inactive* nests were observed in July, for a total of 97 bald eagle nests situated along the survey route. In July, 38 *Active* nests were observed (Appendix B). Of the 40 *Active* nests in June, nine were *Abandoned* by the July survey and one nest was not surveyed and was therefore categorized as *Success Unknown* (Appendix B).

Over the 2017 breeding season, 55 (56.7%) of the 97 nests observed along the survey route were assessed as *Active,* 38 (39.2%) were *Inactive*, and four nests (4.1%) were assessed as *Status Unknown* (Table 3-1; Map 3-1). Of the 55 *Active* nests, 36 (65.5%) were *Successful*, 14 nests (25.5%) were *Abandoned*, three (5.5%) were *Not Successful*, and two nests (3.6%) were *Success Unknown* (Table 3-1; Map 3-1).

In 2017, 18 *Active* bald eagle nests failed to produce late-stage nestlings with three nests assessed as *Not Successful*, 14 categorized as *Nest Abandoned*, and one categorized as *Success Unknown*. Of the *Active*, *Not Successful* nests, one nest was *Active* in all three

surveys, one was *Active* only in May and June, and the third was only *Active* in June (Appendix B). Of the 14 nests categorized as *Active*, *Nest Abandoned*, eleven contained an incubating adult in May but did not contain any nestlings during the June survey, two nests contained two nestlings, and one contained one nestling (Appendix B). By the July survey, all 14 of the *Active*,



Map 3-1. Bald Eagle Nest Locations and Outcomes on Surveyed Waterbodies in 2017

Table 3-1. Number and Outcomes of Bald Eagle Nests During the 2015 and 2017 Breeding Season.

Nest Outcome	Number of Bald Eagle Nests	
	2015	2017
Active, Successful	25	36
Active, Not Successful	4	3
Active, Nest Abandoned	13	14
Active, Succes Unknown	0	2
Inactive	18	38
Status Unknown	4	4
Total	**64**	**97**

Nest Abandoned nests were unoccupied except for two nests where one adult continued to roost (Appendix B). Of the *Active* nests categorized as *Success Unknown*, one was not surveyed in July, and the other was only observed in July and had two roosting adults but no nestlings (Appendix B).

Inactive nests were unoccupied throughout the breeding season, except for nine *Inactive* nests that had a single adult perched on, or near, the nest (Appendix B). Of the four nests categorized as *Status Unknown*, one was not observed in May and was unoccupied in June and July, one was only observed as unoccupied in July, and two were only observed in July with one perched adult each (Appendix B).

A total of 52 nestlings were observed in 36 *Active, Successful* nests in July 2017 (Table 3-2; Appendix B). Nests contained one to three late-stage nestlings, with 21 nests containing one nestling, 14 containing two nestlings, and one nest containing three nestlings (Photo 3-1) (Appendix B). *Active* bald eagle nests observed during the 2017 breeding season produced 0.96 of a nestling per breeding pair (*Active* nests), and 1.44 nestlings per *Successful* nest (Table 3-2).

Bald eagle productivity differed among hydraulic zones of influence in 2017 though the differences were not statistically significant (Table 3-2). The proportion of *Active* nests in the Project-affected zone that successfully produced at least one late stage nestling was greater, but not significantly different than nests in the Nelson River zone (p = 0.4463, Fisher's Exact), or nests in the Off-system zone (p = 0.6758, Fisher's Exact) (Table 3-2). *Active* nests in the Project-affected zone produced more late stage nestlings per nest, but was not statistically significant than nests in the Nelson River zone (U = 99.5, p = 0.42952), or nests in the Off-system zone (U = 58.5, p = 0.25848) (Table 3-2). Furthermore, *Successful* nests in the Project-affected zone produced more late stage nestlings per nest, though the difference was not statistically significant, than *Successful* nests in the Nelson River zone (U = 55.5, p = 0.82588), or in the Off-system zone (U = 28.5, p = 0.27134) (Table 3-2).

Table 3-2: Productivity of Bald Eagle Nests During the 2015 and 2017 Breeding Seasons

	2015				2017			
	Project-affected	**Nelson River**	**Off-system**	**Study Zone 5 (All areas)**	**Project-affected**	**Nelson River**	**Off-system**	**Study Zone 5 (All areas)**
# Nests surveyed	16	26	22	64	23	43	31	97
# Active nests	10	16	16	42	9	28	18	55*
# Active, Successful nests	3	12	10	25	7	17	12	36
% Active, Successful nests	30.0	75.0	62.5	59.5	77.8	60.7	66.7	66.7
# Late stage nestlings	6	20	16	42	11	26	15	52
# Late stage nestlings/ *Active* nests	0.60	1.25	1.00	1.00	1.22	0.93	0.83	0.96
# Late stage nestlings/ *Active*, *Successful* nests	2.00	1.67	1.60	1.68	1.57	1.53	1.25	1.44

*One *Active* nest (145-2017) was not surveyed in July and not included in productivity calculations

Photo 3-1: Three Late-Stage Nestlings Observed in Nest 35-2017 on July 17, 2017

Bald eagle productivity also differed between 2015 and 2017 though the differences were not statistically significant. More *Active* and *Successful* nests, were found in 2017 than in 2015 (Table 3-2). The percentage of *Active* nests that were *Successful* was also greater in 2017 than in 2015 (Table 3-2), though the difference was not significant (p = 0.671904, Fisher's exact test). The number of late stage nestlings per *Active* nest was less in 2017 compared to the previous study year (Table 3-2), though the difference was not significant (U = 1125, p = 0.95216). The number of late stage nestlings per *Successful* nest was lower in 2017 than in 2015 (Table 3-2), but was not significant (U = 360, p = 0.1902).

Bald eagle productivity also differed among hydraulic zones of influence between 2015 and 2017, though the differences were again not statistically significant. In the Project-affected zone, one less *Active* nest was found in 2017 than in 2015. The percentage of *Active* nests in the Project-affected zone that were *Successful* was greater in 2017 than in 2015 (Table 3-2), though the difference was not significant (p = 0.0698, Fisher's exact test). The number of late stage nestlings per *Active* nest in the Project-affected zone was greater in 2017 compared to 2015 (Table 3-2), though the difference was not significant (U = 28, p = 0.17702). Conversely, the number of late stage nestlings per *Successful* nest in the Project-affected zone was lower in 2017 than in 2015 (Table 3-2), however statistical significance could not be determined due to small sample sizes.

In the Project-affected hydraulic zone the number of *Active* bald eagle nests increased in 2015 and 2017 from the pre-construction period. Prior to the commencement of Project reservoir clearing activities, eight *Active* bald eagle nests were present in the Project-affected zone in both 2011 (Stantec 2013) and 2013 (Stantec 2014). Since reservoir clearing activities began in

winter 2015/16, the number of *Active* bald eagle nests increased to 10 in 2015 and nine in 2017. There are no pre-construction productivity values to compare with.

In Nelson River areas, fewer *Active* nests and *Successful* nests were found in 2015 than in 2017. In Nelson River areas the percentage of *Active* nests that were *Successful* was greater in 2015 than in 2017 (Table 3-2), though the difference was not significant (p = 0.5101, Fisher's exact test). The number of late stage nestlings per *Active* nest in the Nelson River zone was less in 2017 compared to 2015 (Table 3-2), though the difference was not significant (U = 304, p = 0.40654). The number of late stage nestlings per *Successful* nest in the Nelson River zone was lower in 2017 than in 2015 (Table 3-2), though the difference was not significant (U = 90, p = 0.61006).

In the Off-system zone, fewer *Active* nests and *Successful* nests were found in 2015 than in 2017. In the Off-system zone the percentage of *Active* nests that were *Successful* was greater in 2017 than in 2015 (Table 3-2), though the difference was not significant (p = 1, Fisher's exact test). The number of late stage nestlings per *Active* nest in the Off-system zone was less in 2017 compared to 2015 (Table 3-2), though the difference was not significant (U = 133.5, p = 0.72634). The number of late stage nestlings per *Successful* nest in the Off-system zone was lower in 2017 than in 2015 (Table 3-2), though the difference was not significant (U = 76.5, p = 0.37886).

In 2017, average nearest neighbour distances between *Active* bald eagle nests in the Project-affected zone was 3.21 km (*S.E.* = 0.61). Although *Active* nests in the Project-affected zone were further apart from one another than in 2015, when nearest neighbour distances were 2.91 km (*S.E.* = 0.47), the difference was not significant (t (23) = 0.3964, p = 0.6954).

The linear density of all *Active* bald eagle nests along suveyed shorelines in 2017 differed between hydraulic zones and between waterbodies of different size classes (Table 3-3). *Active* nest density was greatest along shorelines of >1,000-10,000 ha lakes in the Nelson River hydraulic zone and lowest along shorelines of rivers >100-1,000 ha in the Off-system hydraulic zone (Table 3-3). In the Project-affected hydraulic zone, the density of *Active* bald eagle nests was 3.68/100 km.

Table 3-3: Linear Density (nests/100 km) of *Active* Bald Eagle Nests Within Study Zone 5 in 2017

Hydraulic Zone	Waterbody Type	Waterbody Size Class (ha)					Total Density
		>0-10	>10-100	>100-1000	>1,000-10,000	>10,000-100,000	
Project-affected	River	NA	NA	NA	3.68	NA	3.63
Nelson River	Lake	NA	NA	NA	8.83	1.01	1.15
	River	NA	NA	5.39	4.62	NA	4.92
Off-system	Lake	NA	NA	1.41	2.34	NA	1.95
	River	NA	NA	0.82	NA	NA	0.39
Total		NA	NA	1.79	3.11	1.01	1.65

Bald eagle nests in 2017 were situated in spruce (*Picea* spp.), poplar (*Populus spp.*), white birch (*Betula papyrifera*), and jack pine (*Pinus banksiana*) trees. Spruce and poplar trees were the most frequently selected nest-trees, whereas only five nests were situated in jack pine and two in birch trees (Appendix A). Not all nest-trees were living; six dead spruce, five dead poplar, and one dead jack pine tree were used as nesting structures (Appendix A). Most nests were approximately between 8 m and 20 m agl (Appendix A). Photographs of nests and nest trees are provided in Appendix D.

During an aerial survey for waterfowl on May 20, 2017, a bald eagle nest (526-2017) was observed on the surface of the frozen Nelson River where the river meets Gull Lake (Map 3-2). The stick nest was approximately 5 m from land and 300 m from artificial nesting platform 1. The nest contained one adult (Photo 3-2) with another adult bald eagle perched 20 m away on a dead spruce tree. This nest was not observed when the area was previously surveyed for bald eagle nests on May 17, 2017. On May 21 and 22, this nest was observed to be empty with two adult bald eagles perched in nearby trees (Photo 3-3). By May 31, this section of the Nelson River had thawed and the nest had washed away.

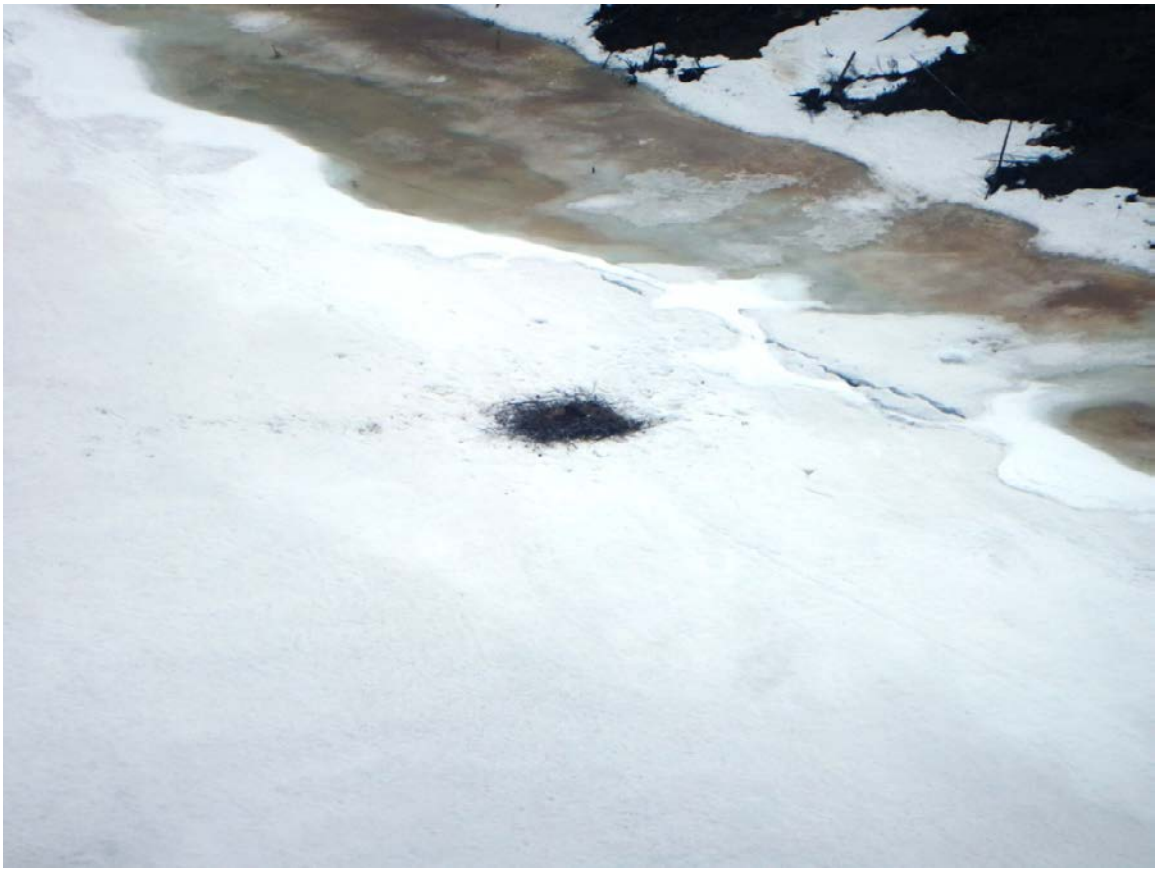
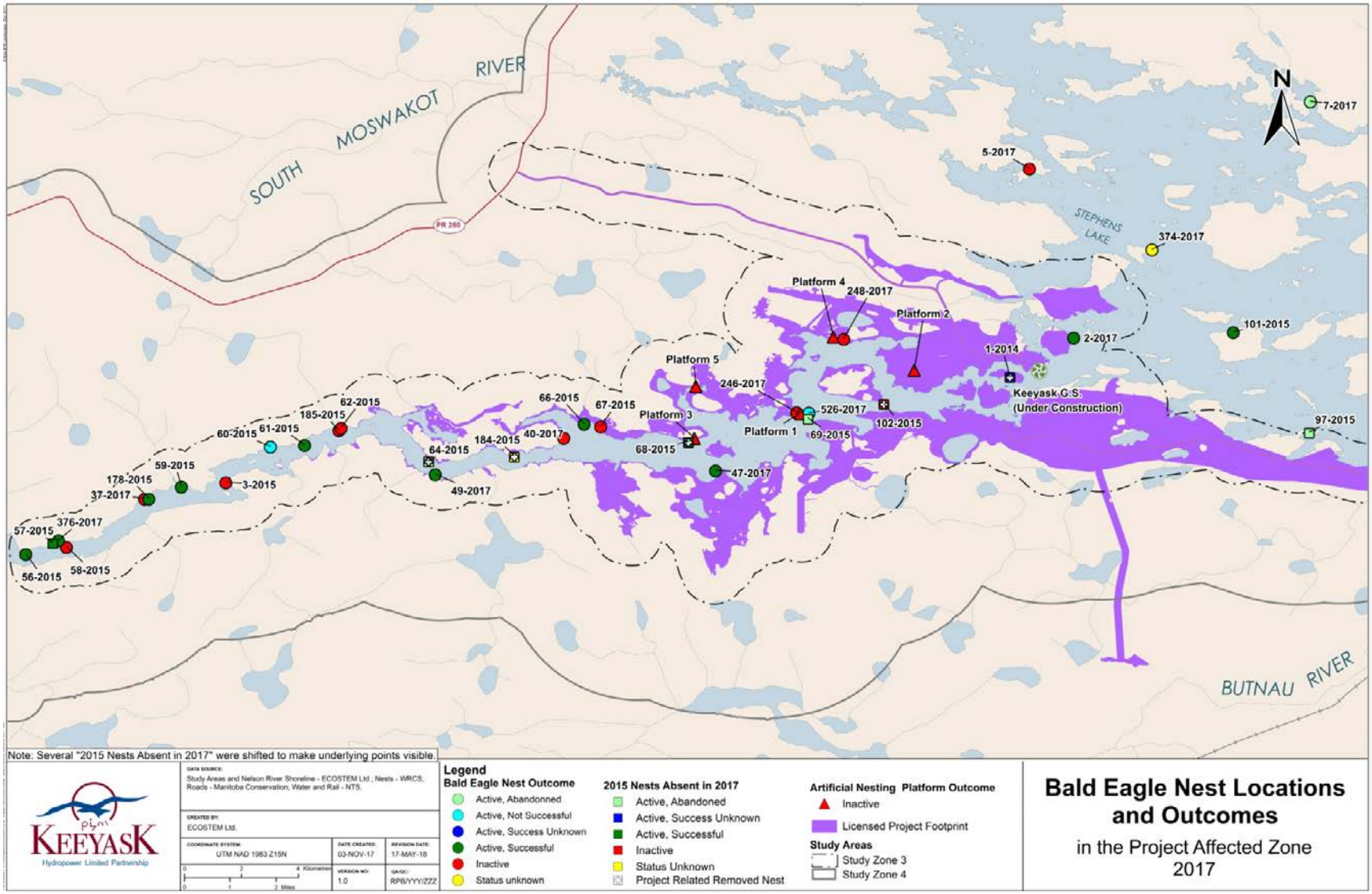


Photo 3-2. *Active* Bald Eagle Nest on the Surface of the Frozen Nelson River on May 20, 2017

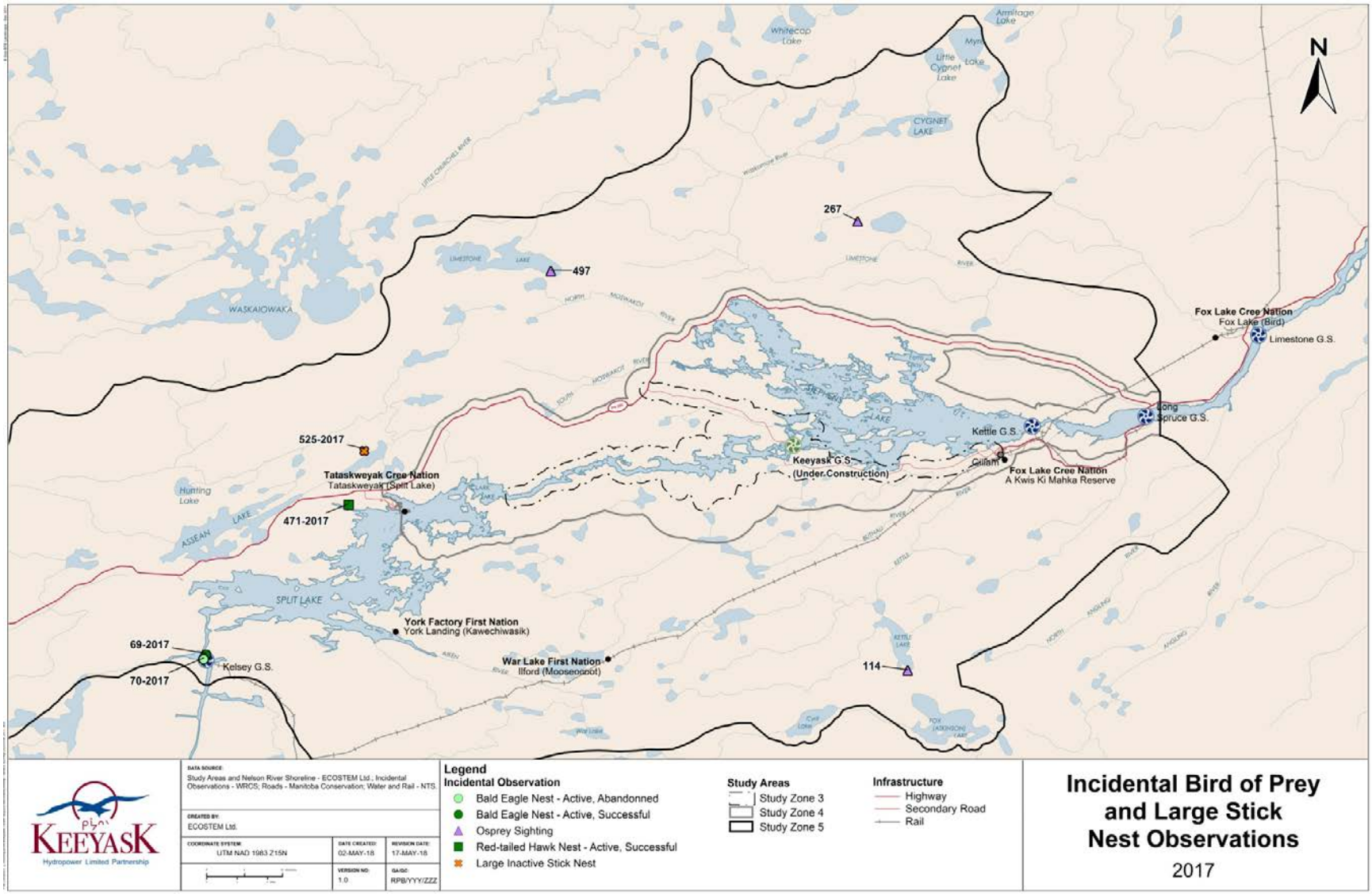


Map 3-2: Bald Eagle Nest Locations and Outcomes in the Project-Affected Hydraulic Zone in 2017

Photo 3-3: ***Active, Not Successful* Bald Eagle Nest on the Frozen River With Two Adults Perched Nearby on May 21, 2017**

Incidental observations during the 2017 surveys included bald eagle nests observed off the survey route while ferrying between fuel-ups, a large stick nest, a red-tailed hawk (*Buteo Jamaicensis*) nest, and three osprey (*Pandion haliaetus*) sightings (Appendix C). While ferrying off the survey route, two bald eagle nests were observed downstream of and near the Kelsey GS (Map 3-3). These two nests were both *Active* in May; one was abandoned prior to the June survey and the other produced two late-stage nestlings in July. A large *Inactive* stick nest was only observed in July on a small pond 500 m north of Assean Lake (Map 3-3). The red-tailed hawk nest was on the northern shore of Split Lake and contained two late-stage nestlings in July (Map 3-3). Single osprey were observed at Kettle Lake on June 13, 2 km west of Little Limestone Lake on July 15, and at Limestone Lake on July 18 (Map 3-3).

Twelve bald eagle nests that were present along the survey routes in 2015 were not observed during the 2017 aerial surveys. In reference areas, five bald eagle nests observed in 2015 were absent in 2017. In 2015, two of these nests were *Active, Abandoned*, two were *Inactive*, and one was *Status Unknown*. For two of the nests absent from reference areas, their respective nest tree had fallen to the ground, with one apparently removed by beaver activity, leaving a large tree stump. The remaining three nests most likely disintegrated due to natural factors (*i.e.*, wind).



Map 3-3: Incidental Bird of Prey and Large Stick Nests observed in 201

Table 3-4: Bald eagle nests removed or absent from Project-affected zone

Nest ID	UTM Coordinates	Removed by Construction	Outcomes	Nest Replaced*
1-2014	15 V 363349 6246996	Y	*Active,Success Unknown*	Yes
57-2015	15 V 324875 6240385	N	*Active, Successful*	NA
64-2015	15 V 339841 6243588	Y	*Active, Abandoned*	Yes
184-2015	15 V 343305 6243781	Y	*Status unknown*	Yes
69-2015	15 V 355162 6245526	N	*Active, Abandoned*	NA
68-2015	15 V 350493 6244390	Y	*Active, Successful*	Yes
97-2015	15 V 375453 6244747	N	*Active, Abandoned*	NA
102-2015	15 V 358250 6245906	Y	*Inactive*	Yes

*For *Active* nests removed by the Project. Nesting platforms were installed for any nests that were classified as *Active* and had been or would be removed by Project construction. Three nesting platforms were installed in February 2016 to replace three *Active* nests known to be affected by Project development, and an additional two nesting platforms were also installed to mitigate the potential removal of future nests by Project construction. *NA* = Not Applicable.

In total, five bald eagle nests (three of which were *Active*) were removed during Project construction between 2014 and 2017 (Table 3-4). One nest was removed from the north shore of the Nelson River at Gull Rapids in October 2014 (Table 3-4). Four nests were removed by Project construction activities from fall 2015 to winter 2017 (Table 3-4). In the same period, three additional nests were lost due to natural factors (Table 3-4). All nests were removed outside of the breeding season when the nests were unoccupied.

To mitigate the loss of the recently active bald eagle nests that will be affected by Project development, five artificial nesting platforms have been installed to date to offer bald eagles alternative nesting locations along the future reservoir shoreline (Map 3-2). Though none of the nesting platforms were occupied by bald eagles in 2017, Platform 4 was observed to contain a small amount of nesting material (Photo 3-4) with a common raven observed near the platform on May 17.

Photo 3-4: Nesting Material in Artificial Nesting Platform 4 on June 17, 2017

4.0 DISCUSSION

Regionally, the results of the 2017 nest surveys demonstrate that the breeding bald eagle population in the study area is increasing and sustainable. Within the Project-affected zone, where nearly all trees have been removed, reservoir clearing activities have not reduced the overall number of *Active* bald eagle nests in the area. Although not statistically significant, a biologically meaningful positive effect on bald eagle productivity in the Project-affected zone was observed, with nearly double the number of late-stage nestlings produced in 2017 compared to 2015.

For a bald eagle population to be sustainable, more than 50% of nests are required to be successful and 0.7 young must be fledged per breeding pair annually (Sprunt *et al.* 1973, Elliott *et al.* 1998). With 66.7% of *Active* nests along surveyed shorelines successfully producing an average of 0.96 late-stage nestlings in 2017, the regional bald eagle population can be considered sustainable and similar to other populations in Canada's boreal forest. Productivity in 2017 was similar to the results of the 2015 survey and to the results of a long-term bald eagle study in a comparable boreal ecosystem in central Saskatchewan. Gerrard *et al*. (1992) determined the outcomes of over 500 nesting attempts over 44 years (1968-2012), with nesting success fluctuating around a mean of 68% (min = 42%, max = 88%), and an average of one fledged young per successful nest. Furthermore, when productivity is examined in each hydraulic zones of influence, bald eagle populations are considered stable and sustainable regardless of hydraulic zone.

Although Project construction has removed a total of five bald eagle nests (three of which were *Active* in 2015), the total number of breeding bald eagle pairs has not decreased in the Project-affected zone since 2011. Since reservoir clearing activities began in winter 2015/16, the number of *Active* bald eagle nests increased from eight *Active* nests in both 2011 (Stantec 2013) and 2013 (Stantec 2014), to 10 in 2015 and nine in 2017. There are no pre-construction productivity values to compare with. Additionally, in 2015, 2017 and the pre-construction period, bald eagles selected similar nest tree species and of similar heights.

Compared to 2015, productivity in the Project-affected zone was not significantly changed in 2017. However, the increase in the proportion of *Active* nests that were *Successful* and the increase in the number of late-stage nestlings produced in the Project-affected zone may be interpreted as biologically meaningful. Even with five *Active* nests identified in the 2015 survey being absent from the Project-affected zone in 2017, the overall number of *Active* nests in the Project-affected zone only decreased from 10 in 2015 to nine in 2017. This suggests that there remains adequate nesting habitat in the area surrounding the Project site, with breeding pairs selecting alternate nest trees in the Project-affected zone. High nest-site fidelity in bald eagles (Buehler 2000) suggests that breeding pairs that lost their nest are unlikely to have relocated elsewhere in the region but are likely to have constructed a new new nest in their original territory. Alternately, some breeding pairs may have migrated into the Project-affected zone from other areas. Migration into the Project-affected zone is possible as the increase in the

number of *Active* nests in reference areas suggests an increasing and productive bald eagle population in the region. These increases may in part be a reflection of natural variation of eagle reproductive efforts among years, or the unprecedented recovery of bald eagle populations across their range since the 1970s (National Audubon Society 2010). Furthermore, along with the number of *Successful* nests in the Project-affected zone increasing from three in 2015 to seven in 2017, the number of late-stage nestlings produced in the Project -affected zone nearly doubled from six in 2015 to 11 in 2017.

Bald eagle nests are commonly lost due to natural causes. For example, one nest in the Reference areas was absent in 2017 because a beaver felled the nest tree. Furthermore, in a study conducted in northern Saskatchewan, half of all bald eagle nests (n = 48) were still present after six years of study (Gerrard *et al*. 1983). Breeding pairs of bald eagles returning to the Project-affected zone, that found their nests to be absent, appear to have constructed new nests at natural nest-sites even when nearby artifical nesting platforms were available. For example, approximately 100 m from Platform 4 a new *Inactive* nest (248-2017) was observed in 2017. In other studies, artifical nesting platforms have remained unoccupied for many years before attracting a nesting pair of bald eagles (Hunter *et al*. 1997, Bortolotti *et al*. 1988). Although bald eagles may select natural nest-sites over artificial platforms, if a natural nest is destroyed, artificial platforms are important backups (Hunter et al. 1997). Installed artifical nesting platforms are located on the future reservoir shoreline. The suitability of these sites to breeding bald eagles is expected to improve when the artificial nests are closer to water and after the reservoir is impounded.

The observation on May 21 of an *Active* bald eagle nest (526-2017) on the surface of the frozen Nelson River was highly unusual. Due to the large size of the nest and that no nest was observed at this location on May 17, construction of this nest probably began on May 17 or 18 as bald eagles can construct a nest in as little as 4 days (Herrick 1933). It is likely that this nest was abandoned before eggs were laid, as the nest had only existed for a few days before it was observed to be empty of adults and eggs on May 21 and 22.

Ground nesting is rare throughout the bald eagle breeding range other than in tree-less regions (*e.g.*, far north, or islands along the Califonian coast) (Buehler 2000). No mention of bald eagles nesting on frozen waterbody surfaces was found in the literature. Due to high fidelity to nesting territories in bald eagles, the pair that constructed this nest likely nested in the same territory in previous years. Nest 526-2017 was located approximately 300 m from where nest 69 was in 2015. Nest 69-2015, which was situated approximately 2 m above ground level in a fallen spruce tree on a peninsula, was observed as occupied by an adult in incubating posture in May 2015, and had been abandoned by the June survey (KHLP 2016). Although an artificial nesting platform had been installed close to this site, it was not selected over the frozen surface of the Nelson River. Why this pair selected a frozen river surface to nest upon is unknown but may reflect the tenacity of this breeding pair to remain in their original nesting territory.

When this unique situation was identified, discussions regarding what, if any, actions could be taken were immediatley initiated between the Project's wildlife biologist consultant and Manitoba Hydro. Whether the nest could be safely removed from the ice and placed on the nearby

artificial nesting platform was considered. No examples of active bald eagle nests being succsessfully relocated during the breeding season could be found in the literature. It was determined that risks to human safety from venturing onto the rapidly melting river surface outweighed the low likelihood of the nest being reoccupied should it be moved to land.

5.0 SUMMARY AND CONCLUSIONS

Monitoring conducted during the 2017 bald eagle breeding season provided important information regarding bald eagle nest abundance, distribution, habitats and reproductive success in Study Zone 5. This information was collected to evaluate the effects of Project construction, as well as outcomes of mitigation measures.

In 2017, 55 pairs of bald eagle nested along surveyed shorelines in Study Zone 5. Of the 55 *Active* nests, 36 were *Successful,* producing a total of 52 late stage nestlings, with an average of 0.96 late-stage nestling per *Active* nest and 1.44 late-stage nestlings per *Successful* nest. With 59.5% of *Active* nests along the survey routes successfully producing an average of one late-stage nestling, the breeding bald eagle population in the study area is increasing and continues to be sustainable.

Project construction activities have not decreased the overall number of *Active* bald eagle nests in the Project-affected zone since construction began. Even with the loss of six *Active* nests from the Project-affected zone since 2014, the number of *Active* nests in 2017 increased to nine from eight identified in 2011 and 2013. Because the number of *Active* nests in the Project-affected zone and Reference areas in 2015 and 2017 was greater than before construction activities commenced, it is unlikely that breeding pairs shifted to reference areas. These local and regional increases may in part be a reflection of natural variation of bald eagle reproductive efforts among years, or the unprecedented recovery of bald eagle populations across their range since the 1970s (National Audubon Society 2010). Furthermore, along with the number of *Successful* nests in the Project-affected zone increasing from three in 2015 to seven in 2017, the number of late-stage nestlings produced nearly doubled from six in 2015 to 11 in 2017.

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APPENDIX A: Bald Eagle Nest-Tree Types, Nest Heights, and Location

Nest ID	Nest tree	Nest Height (m)	Location	UTM Coordinates	Tree height
2-2017	Spruce	10	Nelson River, Gull Rapids	15 V 365925 6248579	10
5-2017	Spruce	11	Stephens Lake, West shore	15 V 364137 6255410	12
6-2017	Poplar	22	Stephens Lake, north shore	15 V 358992 6267594	25
78-2015	Spruce	25	Stephens Lake, north shore	15 V 359754 6267214	25
7-2017	Spruce	12	Stephens Lake, north shore	15 V 375497 6258124	12
82-2015	Spruce	12	Stephens Lake, Ferris Bay	15 V 380258 6257024	12
107-2015	Spruce	15	Myre Lake	15 V 389576 6302740	17
108-2015	Birch	10	Cygnet Lake	15 V 380285 6292840	10
12-2017	Jack Pine	14	Little Limestone Lake	15 V 376852 6277951	15
79-2015	Spruce	15	Small Unnamed Lake 5 km North of Stephens Lake	15 V 375092 6262797	15
86-2015	Spruce	16	Nelson River, Kettle GS	15 V 398575 6251005	18
14-2017	Jack Pine	22	Nelson River, Kettle GS	15 V 399645 6250540	24
87-2015	Spruce	24	Nelson River, Kettle GS	15 V 400116 6250446	24
88-2015	Spruce	14	Nelson River, Hudson Bay Rail line bridge	15 V 402168 6250772	14
92-2015	Spruce	17	Nelson River, downstream of Kettle GS	15 V 406512 6249126	20
101-2015	Dead jack pine	19	Large island in Stephens Lake	15 V 372382 6248801	19
112-2015	Poplar	20	Atkinson lake	15 U 390457 6207143	25
115-2015	Poplar	20	Atkinson lake	15 U 388615 6205028	25
25-2017	Dead Poplar	10	Atkinson lake	15 U 386619 6204992	10
117-2015	Spruce	20	Atkinson lake	15 U 383657 6205374	20
122-2015	Poplar	5	Cyril Lake	15 U 369056 6207762	5
123-2015	Poplar	12	Cyril Lake	15 U 367020 6205782	9
182-2015	Birch	8	Little Kettle Lake	15 V 354313 6222229	4
188-2015	Dead Spruce	15	Aiken River	15 V 316664 6215705	15
163-2015	Jack pine	15	Split Lake	14 V 653325 6220053	20
166-2015	Spruce	15	Split Lake	14 V 674252 6228053	15
39-2015	Dead Spruce	10	Split Lake	14 V 667629 6229508	10
34-2017	Spruce	21	Split Lake	14 V 681770 6238255	21
51-2015	Poplar	10	Split Lake	14 V 685521 6240306	10

Nest ID	Nest tree	Nest Height (m)	Location	UTM Coordinates	Tree height
35-2017	Spruce	15	Split Lake	15 V 317212 6241628	15
54-2015	Dead Poplar	12	Clark Lake	15 V 322349 6240593	12
56-2015	Dead Poplar	10	Nelson River, Upstream of Birthday Rapids	15 V 323549 6239831	8
58-2015	Spruce	18	Nelson River, Upstream of Birthday Rapids	15 V 325197 6240112	18
37-2017	Poplar	15	Nelson River, Upstream of Birthday Rapids	15 V 328354 6242062	15
178-2015	Dead Poplar	17	Nelson River, Upstream of Birthday Rapids	15 V 328526 6242067	17
59-2015	Poplar	16	Nelson River, Upstream of Birthday Rapids	15 V 329844 6242552	18
60-2015	Poplar	8	Nelson River, Between Birthday Rapids and Gull Rapids	15 V 333446 6244174	15
61-2015	Poplar	15	Nelson River, Between Birthday Rapids and Gull Rapids	15 V 334824 6244237	15
185-2015	Jack Pine	15	Nelson River, Between Birthday Rapids and Gull Rapids	15 V 336215 6244835	18
64-2015	Spruce	11	Nelson River, Between Birthday Rapids and Gull Rapids	15 V 339841 6243588	11
40-2017	Poplar	17	Nelson River, Between Birthday Rapids and Gull Rapids	15 V 345304 6244528	18
66-2015	Poplar	15	Nelson River, Between Birthday Rapids and Gull Rapids	15 V 346127 6245093	15
67-2015	Dead Poplar	15	Nelson River, Between Birthday Rapids and Gull Rapids	15 V 346801 6244985	15
141-2015	Spruce	13	Butnau lake	15 V 358779 6230619	15
47-2017	Poplar	14	Nelson River, Between Birthday Rapids and Gull Rapids	15 V 351445 6243203	15
49-2017	Poplar	9	Nelson River, Between Birthday Rapids and Gull Rapids	15 V 340109 6243052	14
3-2015	Poplar	15	Nelson River, Birthday Rapids	15 V 331641 6242723	17
176-2015	Spruce	12	Split Lake	14 V 683394 6227162	15
56-2017	Dead Spruce	12	Clark Lake	15 V 319533 6240179	17
61-2017	Poplar	17	Split Lake	15 V 314487 6236484	24
10-2015	Dead Spruce	20	Split Lake	14 V 679360 6234319	22
64-2017	Spruce	15	Split Lake	14 V 677278 6229912	15
177-2015	Spruce	18	Split Lake	14 V 674006 6222384	18
23-2015	Spruce	20	Split Lake	14 V 663637 6220535	20
187-2015	Poplar	10	Split Lake	14 V 660109 6219634	15
26-2015	Spruce	15	Split Lake	14 V 653366 6217145	15
27-2015	Spruce	15	Split Lake	14 V 653440 6217072	15
162-2015	Spruce	15	Split Lake	14 V 655326 6220966	16

Nest ID	Nest tree	Nest Height (m)	Location	UTM Coordinates	Tree height
72-2017	Poplar	17	Split Lake	14 V 655601 6218442	20
79-2017	Spruce	15	Limestone Lake	14 V 684075 6275539	19
80-2017	Poplar	12	Limestone Lake	15 V 322843 6274575	16
142-2015	Poplar	18	Small unnamed Lake 1 km north of Limestone Lake	15 V 330110 6275193	18
145-2015	Poplar	19	Small unnamed Lake 1 km north of Limestone Lake	14 V 684631 6265003	25
180-2015	Spruce	17	Small unnamed Lake 1 km north of Limestone Lake	15 V 315988 6266846	21
146-2015	Spruce	16	Crying Lake	14 V 679545 6260751	16
147-2015	Spruce	18	Crying Lake	14 V 680095 6260012	12
148-2015	Birch	8	Crying Lake	14 V 683759 6261009	15
82-2017	Poplar	10	Assean Lake	14 V 671533 6242141	15
156-2015	Spruce	17	Assean Lake	14 V 658679 6233014	20
165-2015	Dead Poplar	20	Assean Lake	14 V 665242 6238986	23
526-2017	Ice	NA	Frozen surface of Nelson River	15 V 355220 6245543	NA
105-2017	Spruce	8	Atkinson lake	15 U 382377 6205968	8
107-2017	Spruce	14	Cyril River	15 U 381233 6207043	14
111-2017	Spruce	8	Atkinson lake	15 V 384522 6210702	8
113-2017	poplar	10	Kettle River	15 V 376412 6227215	12
145-2017	Jack Pine	17	Split Lake	14 V 677292 6231851	10
8-2015	Poplar	8	Split Lake	15 V 314662 6233772	8
9-2015	Poplar	12	Split Lake	14 V 682285 6235713	12
197-2017	Jack Pine	9	Nelson River, downstream of Kelsey GS	14 V 652945 6218418	11
222-2017	Jack Pine	15	Nelson River, downstream of Kelsey GS	14 V 653284 6220827	10
224-2017	Spruce	14	Split Lake	14 V 655978 6221554	12
243-2017	Spruce	12	Split Lake	15 V 315328 6240802	12
62-2015	Spruce	13	Nelson River, Between Birthday Rapids and Gull Rapids	15 V 336305 6244925	9
246-2017	Dead spruce	8	Nelson River, Between Birthday Rapids and Gull Rapids	15 V 354728 6245557	12
248-2017	Poplar	6	Gull Lake	15 V 356628 6248524	12
83-2015	Spruce	12	Stephens Lake	15 V 381120 6256686	12
288-2017	Dead Spruce	15	Nelson River, downstream of Kettle GS	15 V 408327 6249812	15

Nest ID	Nest tree	Nest Height (m)	Location	UTM Coordinates	Tree height
339-2017	Spruce	14	Cyril Lake	15 U 364556 6205708	14

APPENDIX B: Nest Contents and Outcomes of Bald Eagle Nests during the 2015 and 2017 Breeding Seasons

Nest ID	Hydraulic Zone	May 16-20		June 13-17			July 15-19		Nest Outcome
		# Adults	# Eggs	# Adults	# Eggs	# Young	# Adults	# Young	
2-2017	Nelson River	1	0	0	0	0	1	1	*Active, Successful*
5-2017	Nelson River	0	0	0	0	0	0	0	*Inactive*
6-2017	Nelson River	0	0	0	0	0	0	0	*Inactive*
78-2015	Nelson River	0	0	0	0	0	0	0	*Inactive*
7-2017	Nelson River	2*	Unk.	0	0	0	1	0	*Active, Abandoned*
82-2015	Nelson River	2	0	2	0	0	0	0	*Active, Not Successful*
107-2015	Off-system	1*	0	1*	Unk.	0	1	1	*Active, Successful*
108-2015	Off-system	1*	Unk.	1*	Unk.	0	0	1	*Active, Successful*
11-2017	Off-system	0	0	0	0	0	0		*Inactive*
12-2017	Off-system	1*	Unk.	1	0	1	1	2	*Active, Successful*
79-2015	Off-system	0	0	0	0	0	0	0	*Inactive*
86-2015	Nelson River	0	0	0	0	0	0		*Inactive*
14-2017	Nelson River	2*	1	0	0	0	0	0	*Active, Abandoned*
87-2015	Nelson River	2*	Unk.	1	0	2	1	0	*Active, Abandoned*
88-2015	Nelson River	0	0	1	0	0	1	0	*Inactive*
92-2015	Nelson River	1*	Unk.	1	0	1	0	0	*Active, Abandoned*
101-2015	Nelson River	1*	Unk.	1*	Unk.	2	0	1	*Active, Successful*
112-2015	Off-system	1*	Unk.	0	0	0	2	2	*Active, Successful*
115-2015	Off-system	1	0	0	0	0	1	0	*Inactive*
25-2017	Off-system	1*	Unk.	0	0	0	0	0	*Active, Abandoned*
117-2015	Off-system	1	0	1*	Unk.	0	1	1	*Active, Successful*
122-2015	Off-system	1*	Unk.	1*	Unk.	0	1	2	*Active, Successful*
123-2015	Off-system	0	0	0	0	0	1	0	*Inactive*
182-2015	Off-system	0	0	0	0	0	0	0	*Inactive*
188-2015	Off-system	1*	Unk.	2*	Unk.	1	0	1	*Active, Successful*
163-2015	Nelson River	1*	Unk.	2	0	0	0	0	*Active, Abandoned*
166-2015	Nelson River	1*	Unk.	1	0	2	1	2	*Active, Successful*

Nest ID	Hydraulic Zone	May 16-20		June 13-17			July 15-19		Nest Outcome
		# Adults	# Eggs	# Adults	# Eggs	# Young	# Adults	# Young	
39-2015	Nelson River	-	-	0	0	0	0	0	*Status Unknown*
34-2017	Nelson River	1*	Unk.	1	0	2	0	2	*Active, Successful*
51-2015	Nelson River	0	0	0	0	0	0	0	*Inactive*
35-2017	Nelson River	1	0	1	0	3	1	3	*Active, Successful*
54-2015	Nelson River	1*	Unk.	1	0	2	0	0	*Active, Abandoned*
56-2015	Nelson River	1*	Unk.	1	0	1	2	1	*Active, Successful*
58-2015	Project-affected	0	0	0	0	0	0	0	*Inactive*
376-2017	Project-affected	1*	Unk.	2	0	1	1	1	*Active, Successful*
37-2017	Project-affected	0	0	0	0	0	0	0	*Inactive*
178-2015	Project-affected	2*	1	1	0	2	1	2	*Active, Successful*
59-2015	Project-affected	1*	Unk.	1	0	2	1	2	*Active, Successful*
60-2015	Project-affected	2	0	2	0	0	2	0	*Active, Not Successful*
61-2015	Project-affected	1*	Unk.	1*	Unk.	0	2	1	*Active, Successful*
185-2015	Project-affected	0	0	0	0	0	0	0	*Inactive*
40-2017	Project-affected	0	0	0	0	0	0	0	*Inactive*
66-2015	Project-affected	1*	Unk.	1	0	2	1	2	*Active, Successful*
67-2015	Project-affected	0	0	0	0	0	1	0	*Inactive*
Platform 3	Project-affected	0	0	0	0	0	0	0	*Inactive*
Platform 5	Project-affected	0	0	0	0	0	0	0	*Inactive*
Platform 1	Project-affected	0	0	0	0	0	0	0	*Inactive*
Platform 4	Project-affected	0	0	0	0	0	0	0	*Inactive*
Platform 2	Project-affected	0	0	0	0	0	0	0	*Inactive*
141-2015	Off-system	1*	Unk.	1	0	1	1	1	*Active, Successful*
47-2017	Project-affected	1*	Unk.	2	0	0	2	2	*Active, Successful*
49-2017	Project-affected	1*	Unk.	1	0	1	0	1	*Active, Successful*
3-2015	Project-affected	1	0	0	0	0	0	0	*Inactive*
176-2015	Nelson River	1*	Unk.	1	0	1	0	1	*Active, Successful*

Nest ID	Hydraulic Zone	May 16-20		June 13-17			July 15-19		Nest Outcome
		# Adults	# Eggs	# Adults	# Eggs	# Young	# Adults	# Young	
56-2017	Nelson River	1*	Unk.	0	0	0	0	0	*Active, Abandoned*
61-2017	Nelson River	1*	Unk.	1	0	0	1	1	*Active, Successful*
10-2015	Nelson River	1*	Unk.	1	0	2	0	2	*Active, Successful*
64-2017	Nelson River	1*	Unk.	1*	Unk.	0	1	1	*Active, Successful*
177-2015	Nelson River	1*	Unk.	1	0	2	0	2	*Active, Successful*
23-2015	Nelson River	1*	Unk.	1*	Unk.	0	2	1	*Active, Successful*
187-2015	Nelson River	1*	Unk.	0	0	0	0	0	*Active, Abandoned*
26-2015	Nelson River	0	0	0	0	0	0	0	*Inactive*
27-2015	Nelson River	1*	Unk.	1	0	2	2	2	*Active, Successful*
162-2015	Nelson River	0	0	0	0	0	0	0	*Inactive*
72-2017	Nelson River	1*	0	1*	Unk.	1	1	2	*Active, Successful*
79-2017	Off-system	1*	Unk.	1	0	0	0	1	*Active, Successful*
80-2017	Off-system	0	0	0	0	0	1	0	*Inactive*
142-2015	Off-system	0	0	0	0	0	0	0	*Inactive*
145-2015	Off-system	1*	Unk.	1	0	2	1	1	*Active, Successful*
180-2015	Off-system	1*	Unk.	1*	Unk.	1	0	1	*Active, Successful*
146-2015	Off-system	0	0	0	0	0	0	0	*Inactive*
147-2015	Off-system	0	0	0	0	0	0	0	*Inactive*
148-2015	Off-system	1*	Unk.	1*	Unk.	0	0	0	*Active, Abandoned*
82-2017	Off-system	1*	Unk.	1	0	0	0	0	*Active, Abandoned*
156-2015	Off-system	1*	Unk.	1	0	1	0	1	*Active, Successful*
165-2015	Off-system	1*	Unk.	0	0	0	0	0	*Active, Abandoned*
526-2017	Project-affected	2*	0	0	0	0	0	0	*Active, Abandoned*
105-2017	Off-system	-	-	0	0	0	0	0	*Inactive*
107-2017	Off-system	-	-	0	0	0	0	0	*Inactive*
111-2017	Off-system	-	-	1*	Unk.	0	0	0	*Active, Abandoned*
113-2017	Off-system	-	-	0	0	0	1	0	*Inactive*

Nest ID	Hydraulic Zone	May 16-20		June 13-17			July 15-19		Nest Outcome
		# Adults	# Eggs	# Adults	# Eggs	# Young	# Adults	# Young	
145-2017	Nelson River	-	-	1	0	2	-	-	*Active, Success Unknown*
8-2015	Nelson River	-	-	2	0	0	1	0	*Active, Not Successful*
9-2015	Nelson River	-	-	0	0	0	1	0	*Inactive*
197-2017	Nelson River	-	-	0	0	0	0	0	*Inactive*
222-2017	Nelson River	-	-	1	0	0	0	0	*Inactive*
224-2017	Nelson River	-	-	0	0	0	0	0	*Inactive*
236-2017	Nelson River	-	-	1	0	0	0	1	*Active, Successful*
243-2017	Nelson River	-	-	1	0	1	1	1	*Active, Successful*
62-2015	Project-affected	-	-	0	0	0	0	0	*Inactive*
246-2017	Project-affected	-	-	0	0	0	0	0	*Inactive*
248-2017	Project-affected	-	-	0	0	0	0	0	*Inactive*
268-2017	Nelson River	-	-	-	-	-	1	0	*Status Unknown*
288-2017	Nelson River	-	-	-	-	-	1	2	*Active, Successful*
339-2017	Off-system	-	-	-	-	-	1	0	*Status Unknown*
374-2017	Nelson River	-	-	-	-	-	0	0	*Status Unknown*
504-2017	Off-system	-	-	-	-	-	2	0	*Active, Success Unknown*

*Adult in incubating posture.

APPENDIX C: Incidental Bird of Prey and Large Stick Nest Observations

Wpt.	UTM Coordinates	Item	Location	Nest Outcome
69-2017	14 V 653250 6214233	BAEA nest	Kelsey G.S.	*Active, Successful*
70-2017	14 V 652989 6213564	BAEA nest	Kelsey G.S.	*Active, Abandonned*
114	15 V 381003 6214818	OSPR sighting	Kettle Lake	NA
267	15 V 373782 6279685	OSPR sighting	2 km west of Little Limestone Lake	NA
471-2017	14 V 671930 6237600	RTHA nest	Split Lake	*Active, Successful*
497	15 V 329432 6272527	OSPR sighting	Limestone Lake	NA
525-2017	14 V 673474 6245684	Unk. Nest	500 m north of Assean Lake	*Inactive*

APPENDIX D: Photographs

Photo D-4: Bald eagle nest #27-2015 (*Active, Successful*) on July 17, 2017

Photo D-5: Bald eagle nest #72-2017 (*Active, Successful*) on July 17, 2017

Photo D-6: Bald eagle nest #156-2015 (*Active, Successful*) on June 17, 2017

Photo D-7: Bald eagle nest #187-2015 (*Active,* Abandoned) on July 17, 2017

Photo D-8: Bald eagle nest #23-2015 (*Active, Successful*) on July 17, 2017

Photo D-9: Bald eagle nest #34-2017 (*Active, Successful*) on July 17, 2017

Photo D-10: Bald eagle nest #176-2015 (*Active, Successful*) on July 17, 2017

Photo D-11 Bald eagle nest #79-2017 (*Active, Successful*) on May 19, 2017

Photo D-12: Bald eagle nest #122-2015 (*Active, Successful*) on July 16, 2017

Photo D-13: Bald eagle nest #112-2015 (*Active, Successful*) on July 16, 2017

Photo D-14: Bald eagle nest #243-2017 (*Active, Succesful*) on July 17, 2017

Photo D-15: Bald eagle nest #180-2015 (*Active, Successful*) on July 17, 2017

Photo D-16: Bald eagle nest #188-2015 (*Active, Successful*) on June 15, 2017

Photo D-17: Bald eagle nest #56-2017 (*Active, Abandoned*) on July 17, 2017

Photo D-18: Bald eagle nest #54-2015 (*Active, Abandoned*) on June 17, 2017

Photo D-19: Bald eagle nest #56-2015 (*Active, Successful*) on July 17, 2017

Photo D-20: Bald eagle nest #178-2015 (*Active, Successful*) on June 17, 2017

Photo D-21: Bald eagle nest #59-2015 (*Active,* Successful) on July 17, 2017

Photo D-22: Bald eagle nest #61-2015 (*Active, Successful*) on July 17, 2017

Photo D-23: Bald eagle nest #49-2017 (*Active, Successful*) on July 17, 2017

Photo D-24: Bald eagle nest #66-2015 (*Active, Successful*) on July 17, 2017

Photo D-25: Bald eagle nest #47-2017 (*Active, Successful*) on July 17, 2017

Photo D-26. Bald eagle nest #141-2015 (*Active, Successful*) on July 16, 2017

Photo D-27: Bald eagle nest #2-2017 (*Active, Successful*) on July 16, 2017

Photo D-28: Bald eagle nest #101-2015 (*Active, Successful*) on July 16, 2017

Photo D-29: Bald eagle nest #12-2017 (*Active, Successful*) on July 15, 2017

Photo D-30: Bald eagle nest #108-2015 (*Active, Successful*) on July 15, 2017

Photo D-31: Bald eagle nest #111-2017 (*Active, Abandoned*) on July 15, 2017

Photo D-32: Bald eagle nest #107-2015 (*Active, Successful*) on July 15, 2017

Photo D-33: Bald eagle nest #14-2017 (*Successful, Abandoned*) on July 15, 2017

Photo D-34: Bald eagle nest #87-2015 (*Active, Abandoned*) on June 13, 2017

Photo D-35: Bald eagle nest #288-2017 (*Active, Successful*) on July 17, 2017