# Keeyask Generation Project

## Terrestrial Effects Monitoring Plan

# Priority Habitats Monitoring Report

**TEMP-2019-02**

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-2019-02

## PRIORITY HABITATS MONITORING

Prepared for

Manitoba Hydro

By

ECOSTEM Ltd.

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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 the priority habitat and other terrestrial sensitive site monitoring conducted during the fifth summer of Project construction.

## Why is the study being done?

The purpose of this study is to confirm the predicted Project effects on the terrestrial sensitive sites.

Some of the land habitat types in the Keeyask region are especially important for ecosystem health and/or to people. These include habitat types that are rare or uncommon, support more plant or animal species than other habitat types, or are very sensitive to disturbance from Project construction (called “priority habitat types”). Additional habitat types are included in the Project’s Environmental Protection Plans (EnvPPs) because they are very important to wildlife (e.g., caribou calving islands, vegetation along streams). The terrestrial sensitive sites monitored by this study include all of these habitat types.

## What was done?

This study monitors Project effects on terrestrial sensitive sites located within the licensed Project footprint and areas within 1.15 km from it. This monitoring area is much larger than where Project effects on terrestrial sensitive sites are expected to occur so that unanticipated effects, if there are any, can be found.

During construction, this study documents Project impacts (i.e., clearing or disturbance) on the monitored sensitive sites. A detailed evaluation of indirect as well as direct Project effects on these sites is scheduled for the year after construction completion.

The types of terrestrial sensitive sites being monitored by this study include priority habitat types, caribou calving and rearing habitat, off-system marsh wetlands and mammal riparian habitat. Some of the monitored sites include more than one type of sensitivity. For example, some areas are both caribou calving habitat and a priority habitat type. In total, approximately 6,684 ha of terrestrial sensitive sites are being monitored. The total monitored area was higher than in previous years due to the addition of sensitive sites in the vicinity of the recently cleared Ellis Esker.

A map of Project clearing or physical disturbance areas up to September 2018 was used to determine which and how much of each type of sensitive site was impacted. Ground surveys were also carried out at 16 sensitive sites because they were of special interest (e.g. beside streams) or they were already being visited for other studies.

### What was found?

As of September 2018, Project clearing or disturbance had impacted 215.7 ha, or 3.2%, of the total pre-Project sensitive site area (6,684 ha). This was an increase of 27.9 ha, or 0.4%, since September 2017. The percentage of sensitive area impacted has not increased since 2017 as the addition of sensitive sites along the Ellis Esker access road and borrow area increased the total area being monitoring. Clearing or disturbance outside of the approved Project areas impacted 0.1% of total sensitive site area. Most (93%) of the impacted sensitive site area was in priority habitat types.

### What does it mean?

So far, there are no major unanticipated Project effects on the terrestrial sensitive sites.

Project clearing or disturbance in terrestrial sensitive sites was very low as of September 2018, impacting only 3% of the total sensitive site area.

The clearing outside of the approved Project areas is not a major ecological concern for two reasons. There are no specialized concerns with the specific sensitive sites that were impacted. Also, 86% of the terrestrial sensitive site area within the licensed Project footprint had not been cleared or disturbed as of September 2018, and it is expected that most of this area will remain undisturbed as Project clearing is mostly complete.

While a higher proportion of priority habitat has been impacted compared with the other types of sensitive sites, this was expected for two reasons. Compared with the other types, there was much more priority habitat to start with. Also, many of the priority habitat types occur on areas with gravelly or sandy soils, which is a preferred location for Project borrow areas and roads. For the other types of sensitive sites, off-system marsh and mammal riparian habitat sites are found in wet and/or peaty areas.

### What will be done next?

Surveys to document the amount of priority habitat and other terrestrial sensitive sites affected by the Project will continue in summer 2019.

# ACKNOWLEDGEMENTS

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# STUDY TEAM

Dr. James Ehnes was the project manager and study designer.

Fieldwork in 2018 was conducted by Nathan Ricard and Brock Epp.

Data analysis and report writing in 2018 were completed by Brock Epp and James Ehnes. GIS analysis and cartography was completed by James Ehnes and Nathan Ricard.

# TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF MAPS



# 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* (the EIS), completed in June 2012, provides a summary of predicted effects and planned mitigation for the Project (KHLP 2012a). 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 Supporting Volume* (TE SV; KHLP 2012b). The *Terrestrial Effects Monitoring Plan* (TEMP) was developed as part of the licensing process for the Project (KHLP 2015). Monitoring activities for various components of the terrestrial environment were described, including the focus of this report, priority habitats, during the construction and operation phases.

Ecosystem diversity refers to the number of different ecosystem types, as well as their size and distribution, within a defined geographic area. The Project's ecosystem diversity monitoring program includes a single study, the Priority Habitats study, which evaluates changes to ecosystem diversity based on effects to the various priority habitat types. This study also monitors the sensitive terrestrial sites that are not being monitored by other TEMP studies.

Habitat composition and priority habitat types were the indicators for Project effects on ecosystem diversity in the EIS. Habitat composition provides an overall representation of ecosystem diversity. Priority habitat types are those native habitat types that are particularly important for ecological and/or social reasons. In this monitoring study, priority habitat types are the native habitat types in the Keeyask region that were rare or uncommon, highly diverse (i.e., species rich and/or structurally complex), highly sensitive to disturbance, had a high potential to support rare plants and/or were highly valued by people.

The goal of the Priority Habitats study is to determine the nature of Project effects on ecosystem diversity. The objectives of this study are to:

- Confirm that the N-6 priority habitat site identified for avoidance in the EIS is not disturbed;
- Determine the degree to which the other priority habitat types and other terrestrial sensitive sites identified in the EnvPP (excluding sites whose condition is being monitored by another program) are disturbed;
- Quantify and locate the amounts and locations of priority habitat types affected by the Project; and,
- Quantify and locate Project effects on ecosystem diversity.

Monitoring for this study has been conducted in 2015, 2016, 2017 and 2018. ECOSTEM (2016; 2017; 2018b) provides results for the priority habitat monitoring conducted in 2015, 2016 and 2017. The following presents the monitoring conducted during 2018.

# 2.0 METHODS

The terrestrial sensitive sites included in this study (Section 2.1) are monitored to meet the first and second objectives of this study. The remaining sensitive sites within Study Zone 3 (Map 2-1) are also monitored to meet the third and fourth objectives of this study. Reporting for the first and second objectives occurs annually during construction, and in the year following construction completion. Reporting for the third and fourth objectives occurs the year after construction ends, and then at years 3, 5, 10, 15 and 25 of operation.

Section 2.3.2 of the TEMP details the methods for this study. This section summarizes the activities conducted during 2018. The methods were the same as in 2017 (ECOSTEM 2018b).

In the terrestrial habitat, ecosystems and plant studies reports, clearing is defined as complete vegetation removal in a patch that was at least 400 $m^2$ in size. Disturbance is defined as either physical disturbance in an area of intact vegetation (e.g., machinery trail, test pits), or use of a pre-existing trail or a clearing smaller than 400 $m^2$. Also, an "impact" refers to what the Project does in terms of the physical impact (e.g., vegetation clearing), while an "effect" refers to the ecological consequences resulting from the physical impact (e.g., marsh habitat loss, reduced wetland function).

## 2.1 SENSITIVE SITES MONITORED

The general types of terrestrial sensitivities included in this monitoring are priority habitats, off-system marsh habitat, mammal riparian habitat and caribou calving and rearing habitat. Map 2-1 shows the terrestrial sensitive sites that are being monitored for this study, by general type of sensitivity. As shown on the map, a given sensitive site may include more than one of the four general types of sensitivities (see above).

Portions of sites within the planned Project footprint are not being monitored because we expect these areas will be lost to Project construction. Also, some individual sites that had a very small area are not being monitored. The primary reason for the occurrence of these very small sites is that the majority of the site has been removed by a permanent Project feature.

The total pre-Project area of sites being monitored was 6,684 ha. This total area included 2,878 individual sites (i.e., a spatially distinct area with one or more sensitivity) and 1,503 spatially distinct sensitive site areas (i.e., contiguous sites combined with each other).

One sensitive site, referred to as the "N-6 priority habitat to avoid" in the EIS, was of particular interest because it encompasses a priority habitat type (white birch dominant or mixed forest on mineral soil) that is very rare in the Keeyask region. Project mitigation includes avoiding clearing in this site or indirectly affecting it.

The number and total area of monitored sensitive sites was higher in 2018 than in 2017 because sites in the vicinity of the Ellis Esker access road and borrow area were now included.

The EIS had assumed that it was highly unlikely that the Ellis Esker borrow area would be used by the Project. However, clearing and use of the Ellis Esker access road and borrow area began during the winter of 2017/2018 because the actual amounts of suitable borrow material in the originally planned borrow areas was lower than anticipated. It is noted that the potential additional effects of this Project component were assessed separately in the EIS, and predicted cumulative effects were still not significant.

Inclusion of the Ellis Esker access road and borrow area altered the way the new sensitive sites were selected. Up to 2017, Study Zone 3 (Map 2-1) was used to select the terrestrial sensitive sites to include in this monitoring study. This was expanded in 2018 because the Ellis Esker access road and borrow area extend well outside of Study Zone 3. Similar to how all other terrestrial sensitive sites were selected, a 1.15 km buffer of the Ellis Esker footprint was used to select the new terrestrial sensitive sites to monitor. The addition of sensitive sites in the vicinity of the Ellis Esker and its access road added 424 new sites and 836 ha of monitored area.

## 2.2 PROJECT AREAS

In this study, four distinct Project areas (Map 2-2) are used when reporting on where Project clearing or disturbance in sensitive sites occurred. This is being done to facilitate future comparisons with EIS predictions.

The first two areas are a subdivision of the footprint licensed for Project use under the Project's *Environment Act* Licence (i.e., licensed Project footprint): the planned Project footprint and the possibly disturbed Project footprint. The planned Project footprint is largely comprised of permanent Project features. There is little to no opportunity to reduce Project impacts in these areas.

The possibly disturbed Project footprint provided for some of the unknown components of the Project design at the time the Project was being licensed (e.g., the actual volume of suitable material available in each borrow area, or the actual area needed for each of the Excavated Material Placement Areas (EMPAs)). There is some flexibility in locating clearing, disturbance or material placement within the possibly disturbed Project footprint. Project environmental protection plans (EnvPPs) include provisions to minimize clearing or disturbance within the possibly Project footprint, and the avoidance of environmentally sensitive sites to the extent feasible within this area.

After the Project was licensed, several additional areas (called "subsequently approved Project areas" in this report) were approved for Project use by Manitoba Conservation and Water Stewardship (now Manitoba Sustainable Development (MSD)). This is the third type of Project area. These subsequently approved areas primarily included the former Keeyask Infrastructure Project (KIP) start-up camp (which was originally planned as only a temporary camp for the KIP) and trails that were used to access reservoir clearing areas. The trails were evaluated for potential effects by terrestrial specialists prior to their submission to MSD, and their locations modified to alleviate any ecological concerns that were identified at that time. Given the

modifications recommended by terrestrial specialists, the subsequently approved areas were not a concern from the terrestrial ecosystem health perspective.

An important consideration for the evaluations of the subsequently approved areas was how these areas would alter predicted cumulative effects, which was largely related to the characteristics of the areas and the amount of the licensed Project footprint that was expected to remain undisturbed at the end of construction. It was expected that a large proportion of the licensed Project footprint would remain undisturbed because the EIS intentionally erred on the side of overestimating the amount of habitat loss and disturbance. As of September 2017, the majority (58%) of the licensed Project footprint had not been impacted by the Project (ECOSTEM 2018a).

This report refers to the licensed Project footprint and the subsequently approved areas as the "approved Project footprint".

The last type of Project area in this report is any areas cleared or disturbed outside the approved Project footprint. This includes all areas that are not part of the approved Project footprint.

## 2.3 IMPACT MAPPING

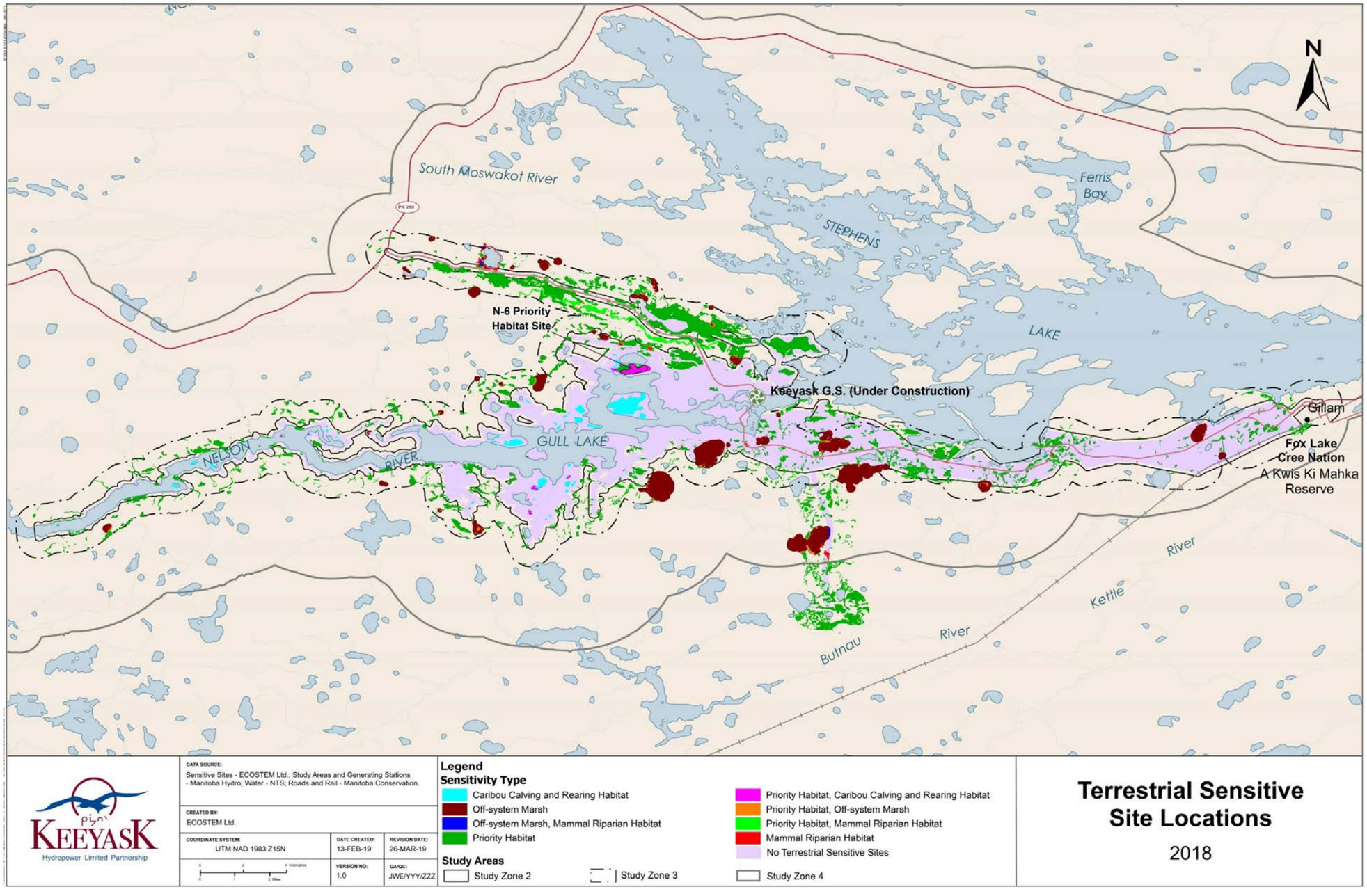
Initial site selection for the 2018 aerial surveys was based on sites surveyed in 2017, given that digital orthorectified imagery (DOI) showing clearing since September 2017 was not available. Aerial surveys conducted on September 17, 2018 were used to identify any other sensitive sites that may have been affected by recent clearing. The aerial surveys showed that, with the exception of Ellis Esker clearing south of the Nelson River, the footprint clearing boundaries had not substantially grown since September 2017.

Ground surveys were also carried out at 11 sensitive sites because they were of special interest or they were already being visited for other reasons. Four of the terrestrial sensitive sites along Looking Back Creek or at stream crossings along the south access road were surveyed because staff were already there conducting surveys for other TEMP monitoring studies. The remaining seven sites were surveyed as part of the Wetland Loss and Disturbance study, the results of which are provided in a separate report (ECOSTEM 2019b).

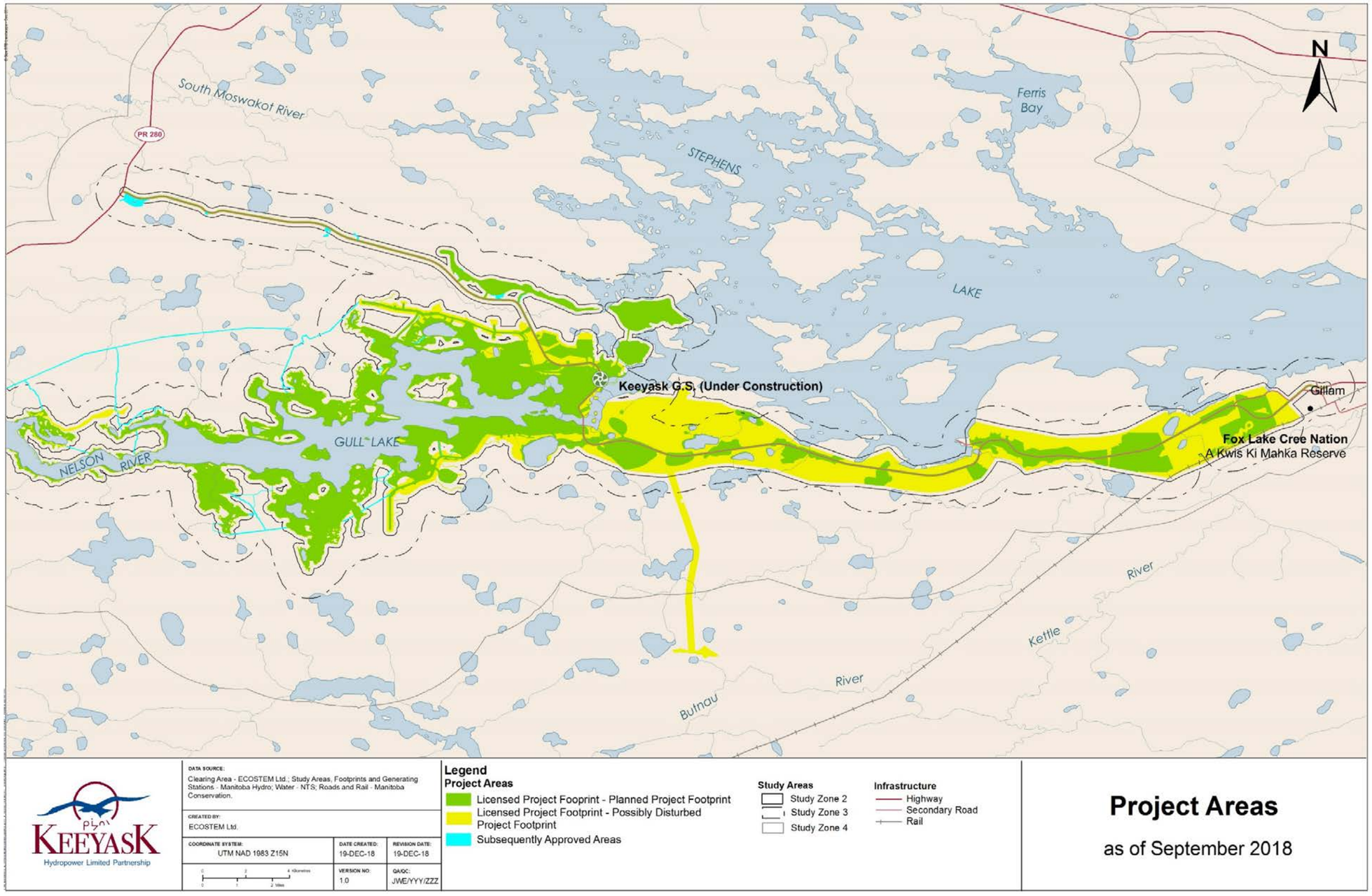
Ground surveys were not done at the "N-6 priority habitat to avoid" because low altitude aerial surveys in 2018 found that there had been no additional clearing or construction activity within or near this site since 2016. Ground surveys were conducted at this site in 2015 and 2016.

Ground sampling recorded conditions in the visited sensitive sites using reconnaissance surveys, geo-referenced photographs, marked-up maps and notes. Field data were mapped in a GIS using digital orthorectified imagery (DOI) as the base maps. The DOI was created from Worldview 2 imagery acquired on July 9, 2018.

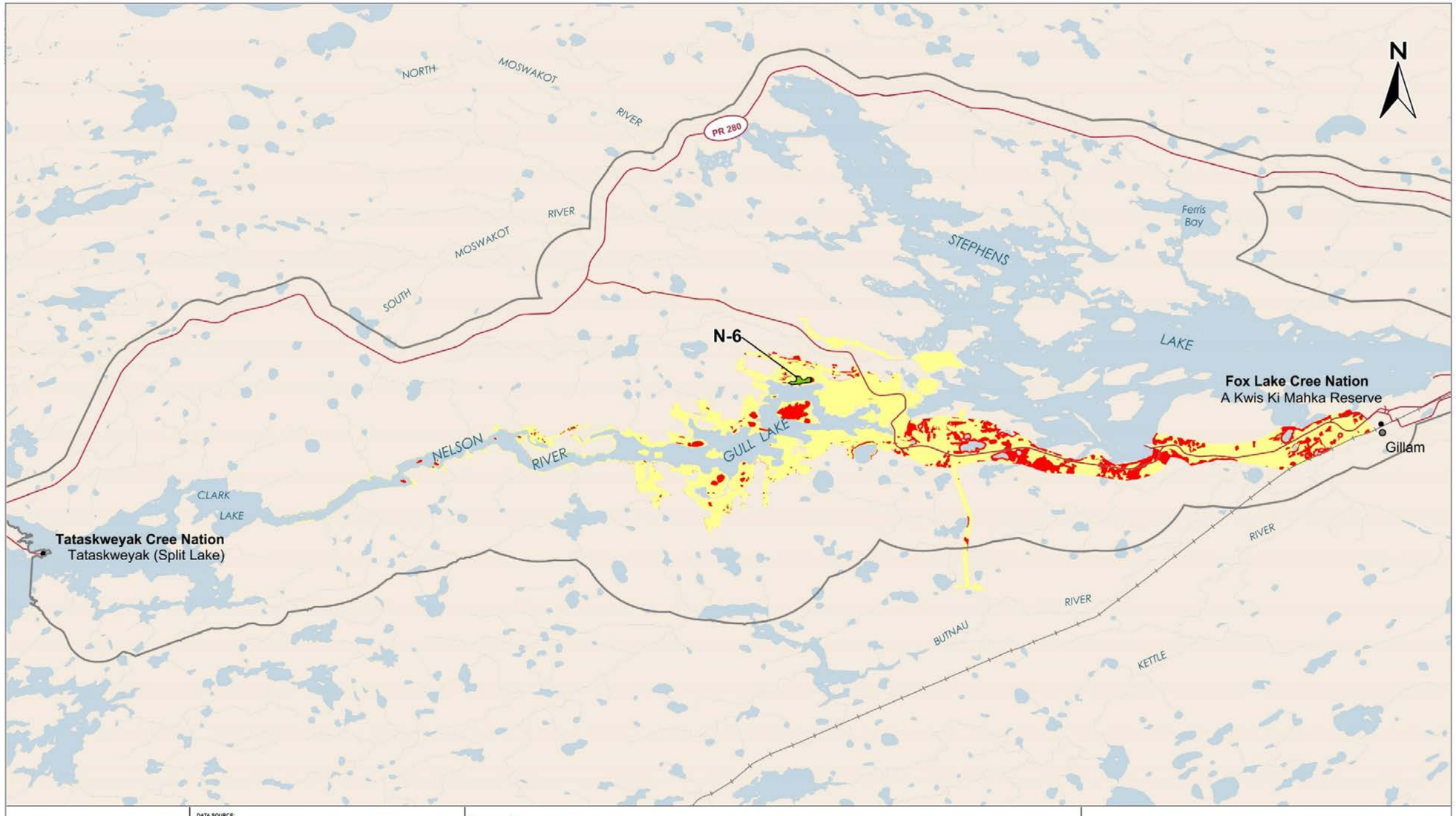
This study used the Project clearing or disturbance mapping produced by the Habitat Loss and Disturbance study (ECOSTEM 2019a) to quantify and locate the terrestrial sensitive sites that were impacted as of September 2018. Clearing or disturbance boundaries were overlaid on the sensitive sites map in a GIS, and then the boundaries were used to subdivide each sensitive site into cleared, disturbed or undisturbed.




**Map 2-1: Terrestrial sensitive sites included in the Priority Habitat study**




**Map 2-2: Project areas as of September 2018**




**Map 2-3: Terrestrial sensitive sites in the licensed Project footprint**

# 3.0 RESULTS

## 3.1 OVERALL IMPACTS ON SENSITIVE SITES

The 2,878 sensitive sites being monitored for this study covered 6,684 ha. This included the Ellis esker borrow area and access road area, which was not previously included in the 2017 monitoring area.

Map 3-1 and Map 3-2 show the sensitive sites that were cleared (see Photo 3-1 for an example) or disturbed (see Photo 3-2 for an example) by the Project as of September 2018 (see Section 2.0 for definitions of clearing and disturbance).

As of September 2018, Project impacts in the form of clearing or disturbance had affected 440 of the 2,878 sensitive sites. The total impacted area was 215.7 ha, or 3.2%, of total sensitive site area (Table 3-1).

The total amount of impacted sensitive site area increased by 27.9 ha from September 2017 to September 2018 (0.4% of total pre-Project sensitive site area).

**Table 3-1: Cumulative number and area of impacted sensitive sites as of September 2018**

| Parameter | Pre-Project | Project Impacts (cleared or disturbed) | | | | |
|---|---|---|---|---|---|---|
| | | 2015 | 2016 | 2017 | 2018 | Change from 2017 to 2018 |
| **Number of Sites** | | | | | | |
| Total number | 2,878 | 159 | 282 | 383 | 440 | 57 |
| Number of sites impacted as a percentage of pre-Project total[1] | 0.0 | 5.5 | 9.8 | 13.3 | 15.3 | 2.0 |
| **Area (ha)** | | | | | | |
| Total area | 6,684.4 | 131.1 | 167.6 | 187.8 | 215.7 | 27.9 |
| Area impacted as a percentage of pre-Project total[1] | 0.0 | 2.0 | 2.5 | 2.8 | 3.2 | 0.4 |

Notes: [1] Percentages differ from those reported in ECOSTEM (2018b) due to the addition of sensitive sites for Ellis Esker in 2018.

**Photo 3-1: Example of Project clearing in a priority habitat type (tamarack mixture vegetation on thin peatland)**

**Photo 3-2: Example of a Project disturbed area with machinery compaction in recently burned area that was a priority habitat type (jack pine dominant vegetation on mineral site)**

In September 2018, 94% of the terrestrial sensitive site area identified within the possibly disturbed Project footprint had not been cleared or disturbed. Additionally, 86% of the sensitive site area within the entire licensed Project footprint had not been cleared or disturbed.

Of the total sensitive site area cleared or disturbed as of 2018, 145.7 ha (or 68%) was located within the planned Project footprint (Table 3-2). This was a 1.4 ha increase over 2017 (Table 3-3).

Nearly 24% of the impacted sensitive site area was in the possibly disturbed Project footprint, or 50.9 ha of area. This was an increase of 25.7 ha over 2017.

Clearing or disturbance of sensitive sites within areas subsequently approved for Project use was 14.6 ha in 2018 (Table 3-2), which was unchanged from 2017 (Table 3-3).

As of September 2018, clearing or disturbance of terrestrial sensitive sites outside of the approved Project areas was 4.6 ha, or 2.1% of total impacted area, which was an increase of 0.8 ha over 2017. The vast majority of these increases were associated with the clearing of the Ellis Esker borrow area (E-1) and its access corridor.

**Table 3-2: Project clearing or disturbance in sensitive sites as of September 2018, by Project area**

| Project Area | Total Pre-Project Area (ha) | Clearing or Disturbance | | |
|---|---|---|---|---|
| | | Impacted Area (ha) | Percent of Pre-Project Area | Percent of Impacted Area |
| Within the planned Project footprint | 585.4 | 145.7 | 2.2 | 67.5 |
| Within the possibly disturbed Project footprint | 845.4 | 50.9 | 0.8 | 23.6 |
| Within subsequently approved Project areas | 14.6 | 14.6 | 0.2 | 6.8 |
| Outside of the approved Project footprint | - | 4.6 | 0.1 | 2.1 |
| All other area being monitored | 5,239.0 | - | - | - |
| **Total[1]** | **6,684.4** | **215.7** | **3.2** | **100.0** |

Notes: [1] Sum of numbers in table may not equal totals due to rounding.

**Table 3-3: Changes to Project clearing or disturbance in sensitive sites as of September 2017, by Project area**

| Project Area | Clearing or Disturbance (ha) | | | | |
|---|---|---|---|---|---|
| | 2015 | 2016 | 2017 | 2018 | Increase |
| Within the planned Project footprint | 117.3 | 134.6 | 144.3 | 145.7 | **1.4** |
| Within the possibly disturbed Project footprint | 1.8 | 16.6 | 25.2 | 50.9 | **25.7** |
| Within the subsequently approved Project areas | 10.6 | 13.2 | 14.6 | 14.6 | **-** |
| Outside of the approved Project footprint | 1.3 | 3.2 | 3.8 | 4.6 | **0.8** |
| **Total[1]** | **131.6** | **167.6** | **187.8** | **215.7** | **27.9** |

Notes: [1] Sum of numbers in table may not equal totals due to rounding.

Priority habitat, off-system marsh, mammal riparian habitat, or caribou calving and rearing habitat were the four types of sensitive sites included in this monitoring study (Section 2.1). Since a particular monitored site may include more than one terrestrial sensitivity, the rest of the tables in this sub-section report impacts in two ways. The top section of each table provides total areas for each general type of sensitivity while the bottom section provides totals for the various combinations of sensitivities found in sites. Adding the rows in the top half of a table yields a higher total than shown in the last row (e.g., 217.8 ha for total sensitive site area impacted) because some sites included more than one sensitivity, creating double or triple counting of the same area.

Priority habitat was the sensitivity with the highest total number of sites and total area before Project construction started (Table 3-4). The next most abundant types, in descending order by total area, were off-system marsh, caribou calving and rearing habitat and mammal riparian habitat. Note that off-system marsh sites include the waterbody containing marsh and marsh habitat, plus a 100 m buffer of the waterbody. Off-system marsh was the only type of sensitivity that included a buffer of the sensitive habitat area.

As of September 2018, priority habitat had the highest area impacted by clearing or disturbance (Table 3-4). Impacted priority habitat tended to be the areas with granular mineral material, which was a preferred substrate for Project borrow areas and roads. Caribou calving and rearing habitat had the second highest Project impacts with respect to number of sites and area, followed by off-system marsh. Mammal riparian habitat was impacted for the first time in 2018.

When considering the total number of sites and area of sensitive sites prior to Project construction, relative impacts were highest on caribou calving and rearing habitat (Table 3-5). Sixty-seven percent of its pre-Project sites, and 4% of its pre-Project area had clearing or disturbance as of September 2018. Priority habitat also had 4% of its pre-Project area impacted, but only in 14% of the sites. Only 1% of the pre-Project off-system marsh sites (0.1% of pre-Project area) had clearing or disturbance as of 2018. For mammal riparian habitat sites, one (3%) of the pre-Project and 0.2% of the total area had clearing or disturbance at the time of the 2018 surveys.

Priority habitat had the largest increase in impacted area from 2017 to 2018 (27.2 ha), mostly a result of clearing the Ellis Esker and its access corridor. Caribou calving and rearing habitat impacts increased an additional 0.5 ha since 2018, as clearing of the south reservoir area (an area with a large amount of caribou calving and rearing habitat) was completed the previous winter. The mammal riparian habitat site was impacted by the clearing of the Ellis Esker access corridor. No additional marsh habitat was impacted between 2017 and 2018.

**Table 3-4: Number and area of terrestrial sensitive sites with documented Project clearing or disturbance as of September 2018, by type of sensitivity**

| Sensitivity[1] | Number | | | | Area (ha) | | | |
|---|---|---|---|---|---|---|---|---|
| | Pre-Project | Project Impacts | | | Pre-Project | Project Impacts | | |
| | | 2017 | 2018 | Change | | 2017 | 2018 | Change |
| **Total Including Sites with More Than One Sensitivity[2]** | | | | | | | | |
| P | 2,703 | 333 | 388 | **55** | 4,864.3 | 172.4 | 199.6 | **27.2** |
| M | 276 | 4 | 4 | **-** | 1,564.7 | 1.1 | 1.1 | **-** |
| R | 35 | - | 1 | **1** | 227.2 | 0.0 | 0.5 | **0.5** |
| C | 99 | 64 | 66 | **2** | 392.9 | 16.2 | 16.7 | **0.5** |
| **All** | **2,878** | **383** | **440** | **57** | **6,684.4** | **187.8** | **215.7** | **27.9** |
| **Total by Combination of Sensitivities** | | | | | | | | |
| P | 2,481 | 315 | 369 | **54** | 4,528.8 | 170.5 | 197.4 | **26.9** |
| P, M | 172 | 1 | 1 | **-** | 79.0 | 0.0 | 0.0 | **0.0** |
| P, C | 34 | 17 | 18 | **1** | 78.3 | 1.9 | 2.1 | **0.3** |
| P, R | 10 | - | - | **-** | 161.0 | - | - | **-** |
| P, M, R | 6 | - | - | **-** | 17.2 | - | - | **-** |
| M | 91 | 3 | 3 | **-** | 1,456.4 | 1.1 | 1.1 | **0.0** |
| R | 12 | - | 1 | **1** | 37.0 | - | 0.5 | **0.5** |
| M, R | 7 | - | - | **-** | 12.1 | - | - | **-** |
| C | 65 | 47 | 48 | **1** | 314.7 | 14.3 | 14.6 | **0.3** |
| **All** | **2,878** | **383** | **440** | **57** | **6,684.4** | **187.8** | **215.7** | **27.9** |

Notes: a "-" indicates absence or no area, a 0 indicates an area less than 0.05 ha. [1] P = Priority Habitat, M = Off-system Marsh Habitat, R = Mammal Riparian Habitat, C = Caribou Calving and Rearing Habitat. [2] Sum of is greater than total number of sites or total area because some sites have more than one sensitivity.

**Table 3-5: Impacts on terrestrial sensitive sites, as a percentage of pre-Project totals, as of September 2018, by type of sensitivity**

| Sensitivity[1] | Number | | | Area | | |
|---|---|---|---|---|---|---|
| | Pre-Project | Percent Impacted | | Pre-Project (ha) | Percent Impacted | |
| | | 2017 | 2018 | | 2017 | 2018 |
| **Total Including Sites with More Than One Sensitivity[2]** | | | | | | |
| P | 2,703 | 12.3 | 14.4 | 4,864.3 | 3.5 | 4.1 |
| M | 276 | 1.4 | 1.4 | 1,564.7 | 0.1 | 0.1 |
| R | 35 | - | 2.9 | 227.2 | - | 0.2 |
| C | 99 | 64.6 | 66.7 | 392.9 | 4.1 | 4.2 |
| **Total by Combination of Sensitivities** | | | | | | |
| P | 2,481 | 12.7 | 14.9 | 4,528.8 | 3.8 | 4.4 |
| P, M | 172 | 0.6 | 0.6 | 79.0 | 0.0 | 0.0 |
| P, C | 34 | 50.0 | 52.9 | 78.3 | 2.4 | 2.7 |
| P, R | 10 | - | - | 161.0 | - | - |
| P, M, R | 6 | - | - | 17.2 | - | - |
| M | 91 | 3.3 | 3.3 | 1,456.4 | 0.1 | 0.1 |
| R | 12 | - | 8.3 | 37.0 | - | 1.4 |
| M, R | 7 | - | - | 12.1 | - | - |
| C | 65 | 72.3 | 73.8 | 314.7 | 4.5 | 4.6 |
| **All** | **2,878** | **13.3** | **15.3** | **6,684.4** | **2.8** | **3.2** |

Notes: a "-" indicates absence or no area, a 0 indicates a percentage less than 0.05 ha. [1] P = Priority Habitat, M = Off-system Marsh Habitat, R = Mammal Riparian Habitat, C = Caribou Calving and Rearing Habitat.

[2] Sum of is greater than total number of sites or total area because some sites have more than one sensitivity.

Of the sensitive sites impacted to date, priority habitat was the only type of sensitive site with Project disturbance (Table 3-6; see Section 2.0 for definitions of disturbance versus clearing). The 7.1 ha of priority habitat disturbance was low compared to the 192.4 ha of clearing that occurred in this type.

The planned Project footprint created 72% of the impacted area for priority habitat and 74% of the impacts for off-system marsh (Table 3-7). In contrast, most (88%) of the impacted caribou calving and rearing habitat, and the entire impacted mammal riparian habitat, was in the possibly disturbed Project footprint.

For priority habitat, clearing or disturbance in the possibly disturbed Project footprint increased by 25 ha since 2017 (Table 3-8). This is the largest increase since the Project began, and the increase was larger than the total cumulative area impacted up to September 2017.

Caribou calving and rearing habitat, and mammal riparian habitat clearing or disturbance in the possibly disturbed Project footprint increased by 0.5 ha each since 2017 (Table 3-8).

Clearing outside of the approved Project footprint in priority habitat increased by 0.8 ha since 2017, but there were no increases for any of the other types of sensitive habitat.

**Table 3-6: Area of terrestrial sensitive sites with documented Project impacts as of September 2018, by clearing or disturbance and by type of sensitivity**

| Sensitivity[1] | Pre-Project Area (ha) | Cleared or Disturbed Area (ha) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Disturbed 2017 | Disturbed 2018 | Change | Cleared 2017 | Cleared 2018 | Change |
| **Total Area, Including Sites with More Than One Sensitivity[2]** | | | | | | | |
| P | 4,864.3 | 7.1 | 7.1 | **-** | 165.2 | 192.4 | **27.2** |
| M | 1,564.7 | - | - | - | 1.1 | 1.1 | **-** |
| R | 227.2 | - | - | - | - | 0.5 | **0.5** |
| C | 392.9 | - | - | - | 16.2 | 16.7 | **0.5** |
| **Total Area by Combination of Sensitivities** | | | | | | | |
| P | 4,528.8 | 7.1 | 7.1 | **-** | 163.4 | 190.3 | **26.9** |
| P, M | 79.0 | - | - | **-** | 0.0 | 0.0 | **-** |
| P, C | 78.3 | - | - | **-** | 1.9 | 2.1 | **0.3** |
| P, R | 161.0 | - | - | **-** | - | - | **-** |
| P, M, R | 17.2 | - | - | **-** | - | - | **-** |
| M | 1,456.4 | - | - | **-** | 1.1 | 1.1 | **-** |
| R | 37.0 | - | - | **-** | - | 0.5 | **0.5** |
| M, R | 12.1 | - | - | **-** | - | - | **-** |
| C | 314.7 | - | - | **-** | 14.3 | 14.6 | **0.3** |
| **All** | **6,684.4** | **7.1** | **7.1** | **-** | **180.6** | **208.6** | **27.9** |

Notes: a "-" indicates no area, a 0 indicates an area less than 0.05 ha. [1] P = Priority Habitat, M = Off-system Marsh Habitat, R = Mammal Riparian Habitat, C = Caribou Calving and Rearing Habitat. [2] Sum of is greater than total number of sites or total area because some sites have more than one sensitivity.

**Table 3-7: Area of terrestrial sensitive sites impacted by the Project as of September 2018, by Project area**

| Sensitivity[1] | Pre-Project Area (ha) | Cleared or Disturbed Area (ha) | | | | |
|---|---|---|---|---|---|---|
| | | Planned Project Footprint | Possibly Disturbed Project Footprint | Subsequently Approved Project Areas | Outside the Approved Project Footprint | Total Area Impacted |
| **Total Area, Including Sites with More Than One Sensitivity[2]** | | | | | | |
| P | 4,864.3 | 144.6 | 36.6 | 14.3 | 4.1 | **199.6** |
| M | 1,564.7 | 0.8 | 0.3 | - | 0.0 | **1.1** |
| R | 227.2 | - | 0.5 | - | - | **0.5** |
| C | 392.9 | 0.4 | 14.7 | 0.6 | 1.0 | **16.7** |
| **Total Area by Combination of Sensitivities** | | | | | | |
| P | 4,528.8 | 144.5 | 35.4 | 14.0 | 3.6 | **197.4** |
| P, M | 79.0 | - | 0.0 | - | 0.0 | **0.0** |
| P, C | 78.3 | 0.1 | 1.2 | 0.3 | 0.5 | **2.1** |
| P, R | 161.0 | - | - | - | - | **-** |
| P, M, R | 17.2 | - | - | - | - | **-** |
| M | 1,456.4 | 0.8 | 0.3 | - | - | **1.1** |
| R | 37.0 | - | 0.5 | - | - | **0.5** |
| M,R | 12.1 | - | - | - | - | **-** |
| C | 314.7 | 0.2 | 13.5 | 0.3 | 0.5 | **14.6** |
| **All** | **6,684.4** | **145.7** | **50.9** | **14.6** | **4.6** | **215.7** |

Notes: a "-" indicates no area, a 0 indicates an area less than 0.05 ha. [1] P = Priority Habitat, M = Off-system Marsh Habitat, R = Mammal Riparian Habitat, C = Caribou Calving and Rearing Habitat. [2] Sum of is greater than total number of sites or total area because some sites have more than one sensitivity.

**Table 3-8: Change in area of sensitive sites impacted by the Project between September 2017 and 2018, by Project area and type of sensitivity**

| Sensitivity[1] | Pre-Project Area (ha) | Planned Project Footprint (ha) | | | Possibly Disturbed Project Footprint (ha) | | | Subsequently Approved Project Areas (ha) | | | Outside the Approved Project Footprint (ha) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2017 | 2018 | Change | 2017 | 2018 | Change | 2017 | 2018 | Change | 2017 | 2018 | Change |
| **Total Area, Including Sites with More Than One Sensitivity[2]** | | | | | | | | | | | | | |
| P | 4,864.3 | 143.2 | 144.6 | **1.4** | 11.6 | 36.8 | **25.0** | 14.3 | 14.3 | - | 3.3 | 4.1 | **0.8** |
| M | 1,564.7 | 0.8 | 0.8 | - | 0.3 | 0.3 | - | - | - | - | 0.0 | 0.0 | - |
| R | 227.2 | - | - | - | - | 0.5 | **0.5** | - | - | - | - | - | - |
| C | 392.9 | 0.4 | 0.4 | - | 14.2 | 14.7 | **0.5** | 0.6 | 0.6 | - | 1.0 | 1.0 | - |
| **Total Area by Combination of Sensitivities** | | | | | | | | | | | | | |
| P | 4,528.8 | 143.1 | 144.5 | **1.4** | 10.7 | 35.4 | **24.7** | 14.0 | 14.0 | - | 2.8 | 3.6 | **0.8** |
| P, M | 79.0 | - | - | - | 0.0 | 0.0 | - | - | - | - | 0.0 | 0.0 | - |
| P, C | 78.3 | 0.1 | 0.1 | - | 0.9 | 1.2 | **0.3** | 0.3 | 0.3 | - | 0.5 | 0.5 | - |
| P, R | 161.0 | - | - | - | - | - | - | - | - | - | - | - | - |
| P, M, R | 17.2 | - | - | - | - | - | - | - | - | - | - | - | - |
| M | 1,456.4 | 0.8 | 0.8 | - | 0.3 | 0.3 | - | - | - | - | - | - | - |
| R | 37.0 | - | - | - | - | 0.5 | **0.5** | - | - | - | - | - | - |
| M,R | 12.1 | - | - | - | - | - | - | - | - | - | - | - | - |
| C | 314.7 | 0.2 | 0.2 | - | 13.3 | 13.5 | **0.3** | 0.3 | 0.3 | - | 0.5 | 0.5 | - |
| **All** | **6,684.4** | **144.2** | **145.7** | **1.4** | **25.2** | **50.9** | **25.7** | **14.6** | **14.6** | - | **3.8** | **4.6** | **0.8** |

Notes: a "-" indicates no area, a 0 indicates an area less than 0.05 ha. [1] P = Priority Habitat, M = Off-system Marsh Habitat, R = Mammal Riparian Habitat, C = Caribou Calving and Rearing Habitat. [2] Sum of is greater than total number of sites or total area because some sites have more than one sensitivity.

## 3.2 IMPACTS ON MAMMAL RIPARIAN HABITAT SITES

Mammal riparian habitat made up a very small portion (3.4%) of pre-Project sensitive site area (Table 3-4).

Project clearing or disturbance occurred for the first time at one mammal riparian habitat site during the winter between 2017 and 2018. A small portion of the site was cleared for the Ellis Esker access corridor (Photo 3-3). The cleared area was within the possibly disturbed portion of the licensed Project footprint, and the Ellis Esker access road is only being used in winter.

Ground surveys at Looking Back Creek in 2016 and 2017 found that erosion from the north access road (NAR) shoulder was depositing sediment into natural waterbodies adjacent to the creek near the northeast corner of the NAR bridge (Photo 3-4). In 2017, sediment from a natural high-water event were deposited into the shrub and graminoid-dominated riparian area just downstream of the Looking Back Creek NAR crossing. Both of these disturbances covered a negligible area, and were not included in the mapped disturbed areas. Mitigation recommendations were not made for either of these situations as the sediment was still confined to the pool next to the road bank, and the source for the sediment in the high-water event appeared to be from upstream of the NAR.

Ground surveys in 2018 found that the spatial extent of the sediment deposition from the NAR appeared to be the same as in 2017 (Photo 3-4). Silt barriers, constructed from bundled logs, were installed at the base of the banks adjacent to Looking Back Creek (Photo 3-5). The fences had stopped the majority of the sediment moving down the road bank, although a small amount was bypassing them on the northeast side of the bridge. A further mitigation recommendation is not made at this time since the affected area was small, and it appeared that impacts were mostly contained.

**Photo 3-3: Mammal riparian habitat sensitive site in Ellis Esker access corridor. Clearing visible at left of photo just below midway**

**Photo 3-4: Erosion and sedimentation from the North Access Road into a natural waterbody adjacent to Looking Back Creek**

**Photo 3-5: "Bundled log" silt barrier in riparian zone near base of NAR bank**

## 3.3 IMPACTS ON OFF-SYSTEM MARSH SITES

This study focused on the off-system marsh sites included in the licensed Project footprint. Impacts on off-system marsh are also being studied in more detail by the Wetland Loss and Disturbance monitoring study (KHLP 2015; Section 2.5.2).

Of the three types of sensitive sites with Project impacts as of September 2017, off-system marsh was the least impacted, both in terms of total area (1.1 ha; Table 3-4) and as a percentage (0.1%; Table 3-5) of its pre-Project area.

As of September 2018, Project clearing had affected four of the off-system marsh sensitive sites included in the licensed Project footprint (unchanged from 2017), for a total of 1.1 ha (Table 3-4).

No off-system marsh site had Project disturbance as of September 2018 (Table 3-6).

The greatest proportion of cleared off-system marsh habitat (74%) was found within the planned Project footprint (where clearing was expected) and virtually all the remainder was found within the possibly disturbed Project footprint (Table 3-8).

See the Wetland Function annual report (ECOSTEM 2019a) for further details.

## 3.4 IMPACTS ON CARIBOU CALVING AND REARING HABITAT SITES

Of the four types of sensitive sites, caribou calving and rearing habitat was the second most impacted type as of September 2018 (Table 3-4). Caribou calving and rearing habitat impacts were solely in the reservoir area, and consisted of clearing which occurred during the winters prior to the 2016, 2017 and 2018 terrestrial sensitive site surveys.

About 16.7 ha of reservoir clearing impacted two-thirds of the total number of pre-Project caribou sensitive sites as of September 2018. Where these impacts occurred, they were generally a long, very narrow band along the boundaries of the sensitive sites.

The bulk of the impacted caribou calving and rearing habitat was within the possibly disturbed Project footprint, where 14.7 ha was cleared (Table 3-8). This project area was where all the new clearing in these sites occurred, increasing by 0.5 ha since 2017. The remaining impacted area was unchanged since 2017, and included only 0.4 ha of clearing in the planned Project footprint, 0.6 ha of clearing in subsequently approved Project areas, and an additional 1.0 ha of clearing occurred outside the approved Project footprint.

Of the four types of sensitive sites, caribou calving and rearing habitat had the second-largest area impacted (14.7 ha) within the possibly disturbed Project footprint in 2018 (Table 6-3).

## 3.5 IMPACTS ON PRIORITY HABITAT SITES

As of September 2018, 14.4% (388) of the 2,703 priority habitat sites being monitored were impacted (Table 3-4; Table 3-5). Impacts on total priority habitat area were much lower at 4.1% (199.6 ha) of total area (Table 3-4; Table 3-5).

The vast majority of impacted priority habitat (144.6 ha; 72%) was within the planned Project footprint (Table 3-7). Possibly disturbed Project footprint areas included the next highest amount of priority habitat (36.6 ha) cleared or disturbed, followed by the subsequently approved Project areas (14.3 ha) and areas outside the approved Project areas (4.1 ha).

Compared with September 2017, the amount of priority habitat area cleared by the Project increased by 27.2 ha (15.8%) in 2018, while there was no additional disturbed area (Table 3-6).

Most of the increased impacts on priority habitat from 2017 to 2018 (25.0 ha; 92%) were in the possibly disturbed Project footprint (Table 3-8). The amount of impacted priority habitat in the planned Project footprint increased by 1.4 ha. Clearing or disturbance within the subsequently approved areas was unchanged from 2017, while those outside the approved Project footprint increased by 0.8 ha.

For the “N-6 priority habitat site to avoid”, monitoring in 2016 found that some priority habitat adjacent to it was impacted by reservoir clearing to the southwest, and by geotechnical explorations for a potential fish egress channel location to the northwest (Photo 3-6). Aerial surveys in 2017 and 2018 found no evidence of additional activity in the already cleared areas near the N-6 site or in the site itself.

**Photo 3-6: Trails and reservoir clearing adjacent to the western and southern boundary of the “N-6 priority habitat site to avoid”**

Thirty-nine of the 50 priority habitat types monitored in 2018 (including those discussed in Sections 3.1 to 3.4) had been impacted by the Project (Table 3-9). For most priority habitat types, increases in area impacted between September of 2017 and 2018 were small (less than 1% of their pre-Project area).

Between the 2017 and 2018 surveys, the priority habitat types with the largest increase in impacts relative to their pre-Project area were black spruce dominant on mineral (37%), black spruce mixture on mineral (2%) and tamarack mixture on mineral (1%).

The priority habitat types with the highest Project impacts in absolute terms as of September 2018 (Table 3-9), were black spruce mixture vegetation on mineral ecosites (67.8 ha; 12.6% of pre-Project area) and jack pine dominant vegetation on mineral ecosites (35.2 ha; 9.2% of pre-Project area), respectively.

In relative terms, black spruce dominant vegetation on mineral had the highest impacts at 37% (19.8 ha) of the total pre-Project area being monitored, which was the largest increase for a

single habitat type, as nearly all this area was cleared between 2017 and 2018. None of the other habitat types had impacts on more than 13% of their total pre-Project area.

For Project disturbance, impacts were highest in the jack pine dominant vegetation on mineral priority habitat type, with 2.4 ha in 2016 (Table 6-2), which amounted to only 0.6% of the total pre-Project area. This was unchanged since 2016. There were no increases in Project disturbance to priority habitat between 2017 and 2018.

Table 6-3 provides the areas impacted by the Project as of September 2018 by habitat type and Project area. Black spruce mixture vegetation on mineral ecosites had the largest area impacted within the planned Project footprint (58.6 ha), followed by jack pine dominant vegetation on mineral ecosites (30.2 ha) and black spruce mixture vegetation on thin peatland (11.2 ha). Jack pine dominant vegetation on mineral ecosites had the highest increase in impacted area from 2017 to 2018 (1.0 ha).

Within the possibly disturbed Project footprint, black spruce dominant vegetation on mineral ecosites had the largest area impacted by far (19.0 ha; Table 6-3). The next highest impacts in this Project area were in black spruce mixture vegetation on mineral ecosites (3.7 ha) and tall shrub vegetation on thin peatland (2.2 ha).

Within the subsequently approved Project areas, the priority habitat type with the largest cleared or disturbed area in 2018 (Table 6-3) was Black spruce mixture vegetation on mineral ecosites (4.8 ha). Jack pine dominant vegetation on mineral ecosites and jack pine mixture vegetation on thin peatland ecosites were similarly impacted with 4.3 and 3.8 ha, respectively. These amounts were unchanged since 2017.

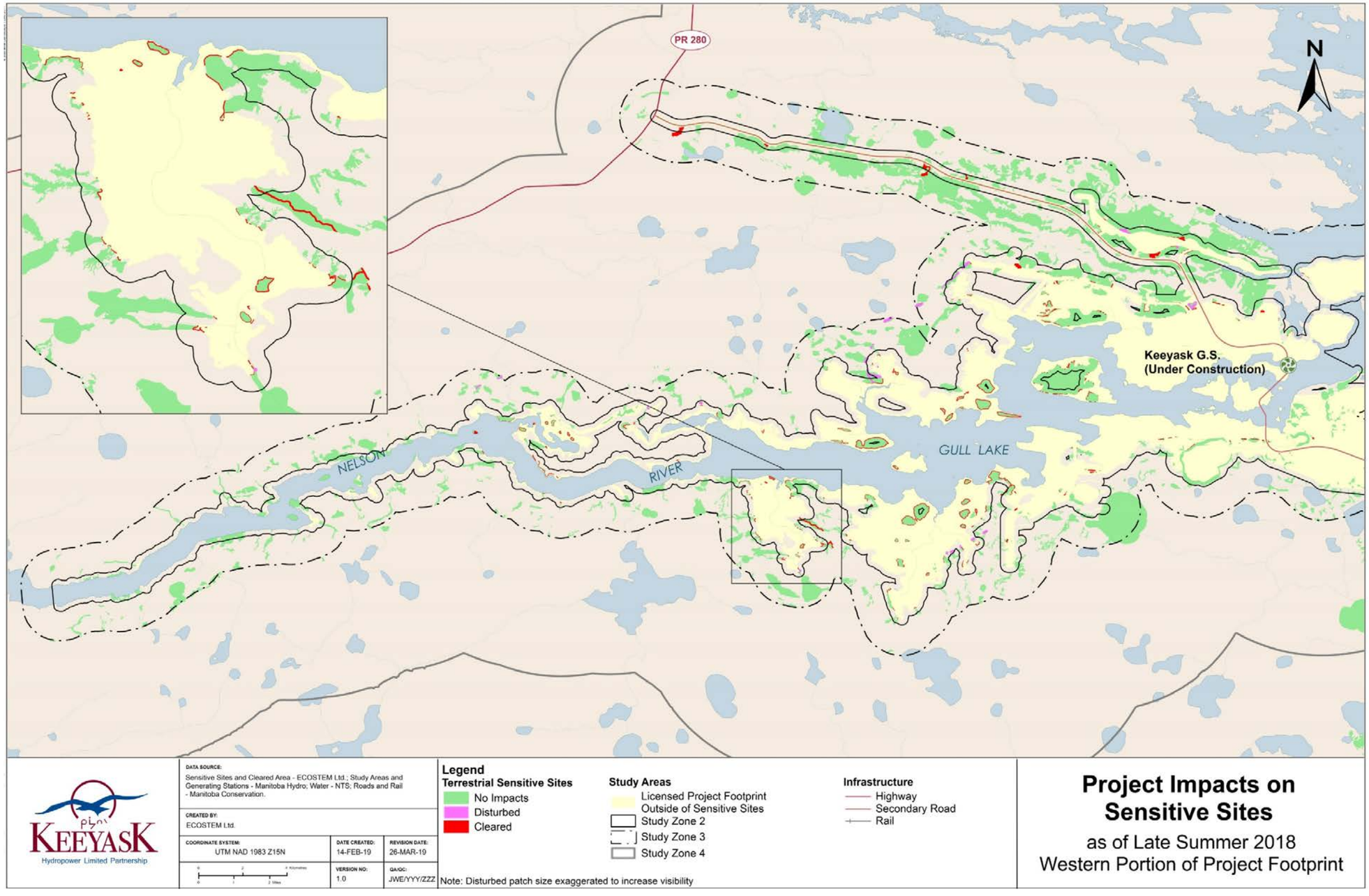
Outside the approved Project footprint, jack pine mixture vegetation on thin peatland ecosites had the largest area impacted with 1.1 ha in 2018 (Table 6-3). This area was unchanged since 2016. Virtually all the area impacted outside of the approved Project footprint from 2017 to 2018 was in the black spruce dominant vegetation on mineral ecosites priority habitat type, with 0.8 ha of area cleared. Jack pine dominant vegetation on mineral ecosites, trembling aspen mixedwood vegetation on all ecosites, and jack pine mixture vegetation on shallow peatland made up the majority of the remaining impacted areas with 0.7 ha, 0.7 ha and 0.2 ha, respectively.

**Table 3-9: Composition of impacts on priority habitats**

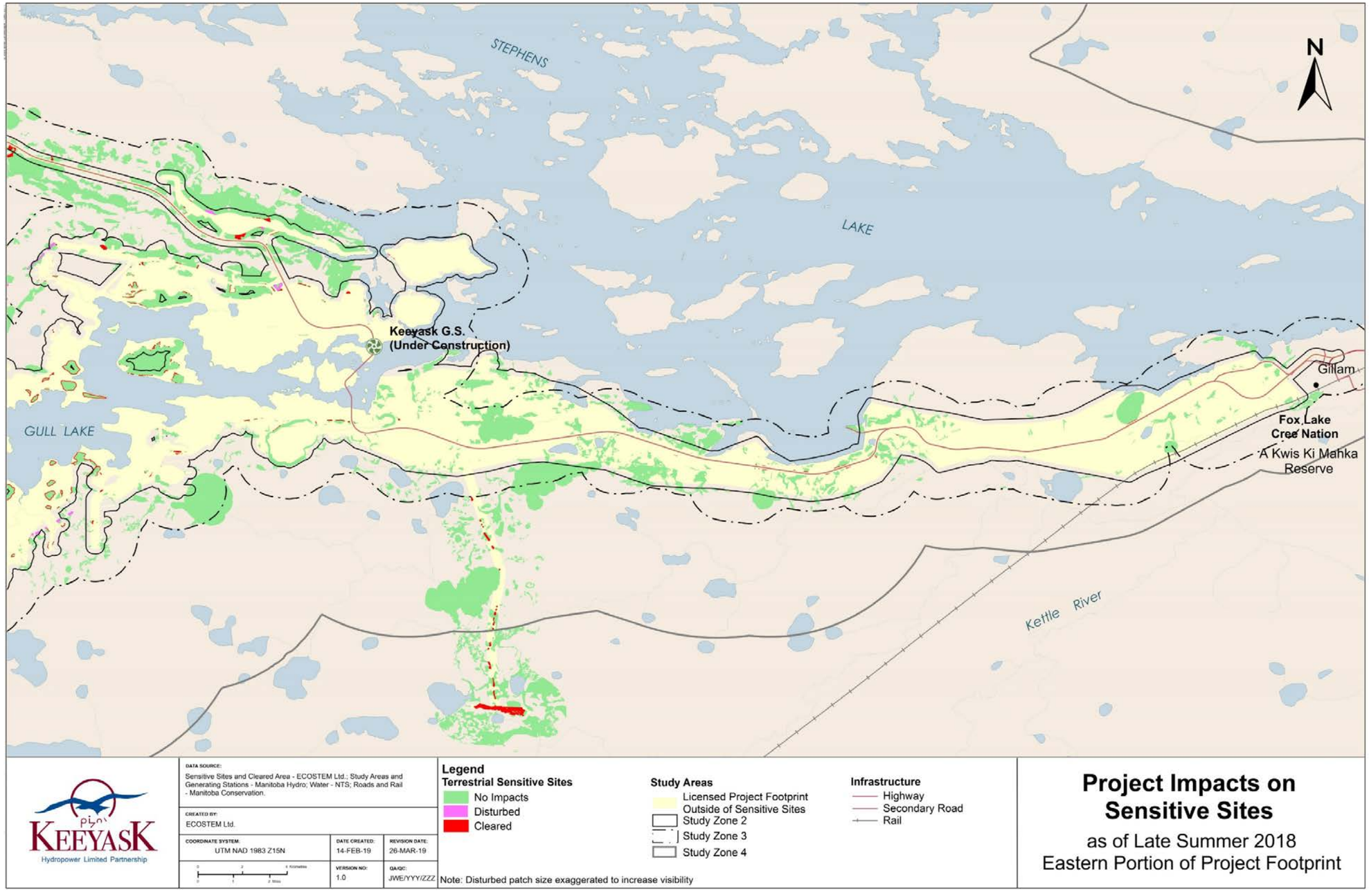
| Priority Habitat Type | Number of Sites | | Area | | |
|---|---|---|---|---|---|
| | Pre-Project | Impacted | Pre-Project (ha) | Impacted (ha) | Pre-Project Area Impacted (%) |
| Balsam poplar dominant on all ecosites | 2 | 1 | 1.0 | 0.0 | 3.1 |
| Trembling aspen dominant on all ecosites | 86 | 14 | 242.6 | 5.4 | 2.2 |
| Trembling aspen mixedwood on all ecosites | 49 | 3 | 217.5 | 2.0 | 0.9 |
| White birch dominant on all ecosites | 26 | 2 | 40.1 | 0.1 | 0.3 |
| White birch mixedwood on all ecosites | 16 | 2 | 38.3 | 0.0 | 0.0 |
| Jack pine dominant on mineral | 81 | 27 | 381.4 | 35.2 | 9.2 |
| Jack pine dominant on shallow peatland | 2 | - | 4.7 | - | - |
| Jack pine dominant on thin peatland | 17 | 1 | 74.0 | 0.6 | 0.8 |
| Jack pine mixedwood on mineral | 26 | 4 | 122.7 | 0.7 | 0.6 |
| Jack pine mixedwood on shallow peatland | 4 | - | 7.6 | - | - |
| Jack pine mixedwood on thin peatland | 20 | 4 | 83.4 | 1.9 | 2.3 |
| Jack pine mixture on shallow peatland | 11 | 2 | 44.2 | 0.3 | 0.6 |
| Jack pine mixture on thin peatland | 81 | 16 | 294.9 | 13.0 | 4.4 |
| Black spruce dominant on mineral | 34 | 3 | 54.0 | 19.8 | 36.8 |
| Black spruce dominant on riparian peatland | 17 | 2 | 5.6 | 0.1 | 1.1 |
| Black spruce dominant on wet peatland | 474 | 30 | 513.7 | 6.9 | 1.3 |
| Black spruce mixedwood on mineral | 37 | 6 | 169.0 | 1.6 | 1.0 |
| Black spruce mixedwood on shallow peatland | 7 | 1 | 5.1 | 0.0 | 0.6 |
| Black spruce mixedwood on thin peatland | 18 | 2 | 9.3 | 0.0 | 0.2 |
| Black spruce mixture on mineral | 143 | 52 | 539.6 | 67.8 | 12.6 |
| Black spruce mixture on shallow peatland | 226 | 17 | 231.3 | 2.7 | 1.2 |
| Black spruce mixture on thin peatland | 302 | 87 | 335.3 | 13.2 | 4.0 |
| Black spruce mixture on wet peatland | 23 | 1 | 18.7 | 0.1 | 0.3 |
| Tamarack- black spruce mixture on riparian peatland | 5 | - | 1.0 | - | - |
| Tamarack dominant on mineral | 7 | 3 | 6.1 | 0.4 | 6.7 |
| Tamarack dominant on riparian peatland | 1 | - | 1.1 | - | - |
| Tamarack dominant on shallow peatland | 12 | - | 5.6 | - | - |

| Priority Habitat Type | Number of Sites | | Area | | |
|---|---|---|---|---|---|
| | Pre-Project | Impacted | Pre-Project (ha) | Impacted (ha) | Pre-Project Area Impacted (%) |
| Tamarack dominant on thin peatland | 7 | 1 | 8.2 | 0.4 | 4.6 |
| Tamarack dominant on wet peatland | 19 | 1 | 27.7 | 0.0 | 0.1 |
| Tamarack mixture on mineral | 47 | 16 | 88.6 | 9.3 | 10.4 |
| Tamarack mixture on shallow peatland | 185 | 15 | 165.2 | 1.3 | 0.8 |
| Tamarack mixture on thin peatland | 146 | 27 | 155.0 | 3.1 | 2.0 |
| Tamarack mixture on wet peatland | 100 | 7 | 123.4 | 0.8 | 0.7 |
| Tall shrub on mineral | 18 | 7 | 35.3 | 0.8 | 2.2 |
| Tall shrub on riparian peatland | 1 | - | 0.0 | - | - |
| Tall shrub on shallow peatland | 64 | 5 | 150.0 | 0.2 | 0.2 |
| Tall shrub on thin peatland | 53 | 10 | 77.2 | 10.0 | 12.9 |
| Tall shrub on wet peatland | 59 | 3 | 51.3 | 0.1 | 0.3 |
| Low vegetation on riparian peatland | 23 | 4 | 41.4 | 0.1 | 0.2 |
| Low vegetation on shallow peatland | 126 | 9 | 196.5 | 0.6 | 0.3 |
| Low Vegetation on thin peatland | 3 | 1 | 1.1 | 0.1 | 11.5 |
| Low vegetation on wet peatland | 56 | 2 | 97.5 | 0.9 | 0.9 |
| Emergent island in littoral | 9 | - | 6.7 | - | - |
| Emergent on lower beach | 11 | - | 4.2 | - | - |
| Emergent on upper beach | 41 | - | 9.5 | - | - |
| Riparian- Looking Back Creek | 8 | - | 177.6 | - | - |
| Riparian | 12 | 1 | 37.0 | 0.5 | 1.4 |
| Marsh, Riparian | 7 | - | 12.1 | - | - |
| Marsh | 91 | 3 | 1,456.4 | 1.1 | 0.1 |
| Caribou Calving and Rearing Habitat | 65 | 48 | 314.7 | 14.6 | 4.6 |
| **All** | **2,878** | **440** | **6,684.4** | **215.7** | **3.2** |

Notes: a "-" indicates absence or no area, a 0 indicates a value less than 0.05.




**Map 3-1: Project impacts on terrestrial sensitive sites outside of the planned Project footprint as of September 2018 – western portion of Project footprint**




**Map 3-2: Project impacts on terrestrial sensitive sites outside of the planned Project footprint as of September 2018 – eastern portion of Project footprint**

# 4.0 DISCUSSION

In 2018, the Priority Habitats monitoring study included 2,878 individual terrestrial sensitive sites with a pre-Project area totalling 6,684 ha. Compared with 2017, this was an increase of 424 sites covering 836 ha. The large increase was primarily due to the addition of the Ellis Esker borrow area to the actual Project footprint during the winter of 2017/2018, which was unexpected.

Sensitive sites in the vicinity of the Ellis Esker borrow area and access road had not been previously included in the Priority Habitat monitoring because the EIS assumed it was highly unlikely that it would be used by the Project. However, its use was required because the actual amounts of suitable borrow material in the planned and possibly disturbed Project areas were lower than anticipated. Even though the EIS assumed that use of the Ellis Esker borrow area was highly unlikely, its potential use was still assessed separately in the EIS. Predicted cumulative effects were still not significant.

When predicting Project effects on ecosystem diversity, the EIS anticipated that a substantial proportion of the area within the licensed Project footprint area would not be used (e.g., it was unlikely that all of the planned borrow areas would be required for Project construction). The EIS did not attempt to go beyond this qualitative statement to predict how much of the total sensitive site area would remain undisturbed due to uncertainties such as the actual amount of borrow material available.

Even in qualitative terms, the percentage of sensitive site area impacted by 2018 was lower than expected, especially considering that substantial additional clearing or disturbance is not anticipated. As of September 2018, the Project had disturbed or completely cleared only 3.2% (215.7 ha) of the total pre-Project sensitive site area being monitored by this study, leaving nearly 97% of the total sensitive site area as unimpacted, and 86% of the sensitive site area within the licensed Project footprint remained unimpacted.

The affected percentages of the four general types of sensitive sites were also low. Percentage of impacted area ranged from 0.1% for off-system marsh sites to 4.2% for caribou calving and rearing habitat (all of these impacts were within the future reservoir area). The percentage of impacted area within the licensed Project footprint ranged from 0.5% (off-system marsh site) to 39.8% (caribou calving and rearing habitat).

The distribution of Project impacts within the Project areas was as expected. The planned Project footprint encompassed the majority (68%) of the impacted sensitive site area, while 24% of impacted area was within the possibly disturbed Project footprint.

Approximately 7% (14.6) ha of the impacted sensitive site area was within areas subsequently approved as Project areas by Manitoba Sustainable Development. These additional areas were needed to address construction issues that could not be foreseen when the Project was licensed (see ECOSTEM (2019a) for details). These additional effects on ecosystem diversity and other sensitivities were not a concern. Prior to submission to Manitoba Sustainable

Development for approval, the possible additional areas were evaluated for potential effects on the sensitive sites, and their locations were modified to reduce any ecological concerns. It was determined that cumulative effects on ecosystem diversity and other sensitivities would still be within the limits of acceptability used in the EIS. This was primarily due to two factors. A very small percentage (3%) of the total monitored sensitive site area had been impacted to date. Also, a high percentage (86%) of sensitive site area within the licensed Project footprint was expected to remain undisturbed at the end of construction.

Two percent (4.6 ha) of the total impacts on sensitive sites, or 0.1% of pre-impact sensitive site area, was outside of the approved Project areas. This very small amount of clearing was not a concern for the affected sensitive sites for the same reasons described above for the subsequently approved Project areas.

With respect to the four general types of sensitive sites, Project impacts were highest on priority habitat by far (93% of total impacted area). This was expected for two reasons. Compared with the other three types of sensitivity, there was much more priority habitat to start with. In addition, a much higher proportion of the area in priority habitat included granular mineral deposits, which was a preferred substrate for Project borrow areas and roads. Off-system marsh and mammal riparian habitat sites were in wet and/or peat dominated areas, which are less desirable for construction purposes.

Of the four general sensitivity types, priority habitat is the only one with sub-types. As of the 2018 surveys, 36 of the 46 priority habitat types had been impacted by the Project. Only five of these types had a percentage of area impacted that was substantially higher than the overall average for priority habitat. In order of descending percentage of area impacted, these exceptions included black spruce dominant vegetation on mineral, tall shrub vegetation on thin peatland, black spruce mixture vegetation on mineral, low vegetation on thin peatland, and tamarack mixture vegetation on mineral. For low vegetation on thin peatland, the percentage of area impacted was high because of the low total area for that type of sensitive habitat in the study area (i.e., 0.1 ha of 1.1 ha was impacted). In the case of the three habitat types on mineral ecosites, impacts were higher because they occurred on granular mineral material (see above).

Near the Looking Back Creek mammal riparian habitat sites, ground surveys further investigated potential Project impacts at two locations. At one location, erosion from the north access road (NAR) shoulder has been depositing sediment into small waterbodies adjacent to the creek since 2016. At the other location, sediment from a natural high-water event was deposited into the riparian area just downstream of the Looking Back Creek NAR crossing. A mitigation recommendation was not made for either of these locations, as the sediment appeared to be confined to the pool next to the road bank, the affected area had not noticeably expanded since 2017, and the source of the sediment at the other location was determined to be from outside of the footprint. Furthermore, silt barriers constructed from bundled logs were installed at the base of the NAR banks near the creek.

Impacts to the mammal riparian habitat along the Ellis Esker access road were minimal, and were limited to clearing of taller vegetation. The organic substrate was minimally impacted,

because the road was used in the winter when the ground was frozen. A mitigation recommendation was not made for this site as it is expected that there will be no further vegetation clearing and road use is limited to times when the ground is frozen.

# 5.0 SUMMARY AND CONCLUSIONS

The Priority Habitats study monitors Project effects on priority habitats as well as the off-system marsh, mammal riparian habitat and caribou calving and rearing habitat sites included in the Project EnvPPs. These sites are collectively called the “sensitive sites” in this report. A given sensitive site may include more than one type of sensitivity.

As of September 2018, the Project had disturbed or completely cleared only 215.7 ha, or 3.2%, of the total pre-Project sensitive site area being monitored by this study, leaving nearly 97% of the sensitive site area as unimpacted, and 86% of the sensitive site area within the licensed Project footprint unimpacted. Only 14% of the pre-Project sensitive site area within the licensed Project footprint was cleared or disturbed.

Project clearing and disturbance increased by 27.9 ha (or 15%) between the September 2017 and September 2018 monitoring surveys. The vast majority of this increase was due to the unanticipated use of the Ellis Esker borrow area and access road. This entire Project component was within the possibly disturbed Project footprint.

As expected, the majority (68%) of impacts on sensitive site area was within the planned Project footprint, followed by the possibly disturbed Project footprint (24%). The areas subsequently approved by Manitoba Sustainable Development for use by the Project included 7% of the impacted sensitive site area.

Two percent (4.6 ha) of the impacted sensitive site area was outside of approved Project areas. This very small amount of sensitive site clearing outside of the originally licensed Project footprint was not a major ecological concern given that impacts to date have been considerably lower than expected when construction began, and that current expectations are that close to 86% of the area within the licensed Project footprint will remain undisturbed at the end of construction.

There was no clearing or disturbance in the “N-6 priority habitat site to avoid” as of September 2018. Additionally, there was no evidence of activity within the nearby areas that had been cleared in 2016 for geotechnical explorations.

With respect to the four general types of sensitive sites, Project impacts were highest on priority habitat by far (93% of total impacted area). This was expected because there was much more priority habitat to start with and because a much higher proportion of priority habitat is on substrates that are preferred for Project borrow areas and roads.

While Project impacts were highest on priority habitat, these impacts were still quite low. Relative to its total pre-Project area, the Project had impacted 4% of priority habitat as of September 2018.

Of the 46 types of priority habitat types being monitored by this study, 10 remained entirely unimpacted by the Project in September 2018. The priority habitat types with the highest Project impacts included black spruce mixture vegetation on mineral ecosites and jack pine dominant

vegetation on mineral ecosites, with 67.8 ha and 35.2 ha of area impacted, respectively. In both cases, less than 13% of pre-Project area was impacted.

Caribou calving and rearing habitat sites had the second highest degree of Project impacts in September 2018, followed by off-system marsh sites.

Project clearing was observed in one of the mammal riparian habitat sites for the first time in 2018. A small portion of one site was cleared for the Ellis Esker access corridor, which is being used only in the winter.

Monitoring to September 2018 did not identify any major unanticipated Project effects on the sensitive sites. Additionally, as assumed in the EIS, much of the area in the licensed Project footprint remains undisturbed, which means construction impacts on the sensitive sites being monitored by this study have been relatively low to date. Since clearing of the south reservoir area had been completed and the Ellis Esker borrow area had been cleared as of September 2018, further Project clearing or disturbance in sensitive sites are anticipated to be minimal during the remainder of construction.

## 5.1 NEXT STEPS

Monitoring to document the amount of priority habitat and other sensitive sites affected by the Project will continue in 2019.

# 6.0 LITERATURE CITED

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# APPENDIX 1:
# DETAILED RESULTS

**Table 6-1: Number and area of terrestrial sensitive sites impacted by the Project as of September 2018, by broad/priority habitat type**

| Priority Habitat Type | Sensitivity[1] | Number of Sensitive Sites | | | | Total Area (ha) Impacted | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pre-Project | Impacted | | | Pre-Project | Impacted | | |
| | | | 2017 | 2018 | Change | | 2017 | 2018 | Change |
| Balsam poplar dominant on all ecosites | P | 2 | 1 | 1 | - | 1.0 | 0.0 | 0.0 | - |
| Trembling aspen dominant on all ecosites | P | 72 | 11 | 11 | - | 217.8 | 4.2 | 4.5 | **0.2** |
| | P,C | 8 | 3 | 3 | - | 16.6 | 0.9 | 0.9 | - |
| | P,M | 6 | - | - | - | 8.3 | 0.0 | 0.0 | - |
| Trembling aspen mixedwood on all ecosites | P | 45 | 3 | 3 | - | 214.7 | 2.0 | 2.0 | - |
| | P,M | 4 | - | - | - | 2.8 | - | - | - |
| White birch dominant on all ecosites | P | 16 | 2 | 2 | - | 25.3 | 0.1 | 0.1 | - |
| | P,C | 4 | - | - | - | 11.1 | - | - | - |
| | P,M | 6 | - | - | - | 3.7 | - | - | - |
| White birch mixedwood on all ecosites | P | 14 | 2 | 2 | - | 11.2 | 0.0 | 0.0 | - |
| | P,C | 1 | - | - | - | 26.3 | - | - | - |
| | P,M | 1 | - | - | - | 0.8 | - | - | - |
| Jack pine dominant on mineral | P | 80 | 27 | 27 | - | 380.8 | 34.2 | 35.2 | **1.0** |
| | P,M | 1 | - | - | - | 0.6 | - | - | - |
| Jack pine dominant on shallow peatland | P | 2 | - | - | - | 4.7 | - | - | - |
| Jack pine dominant on thin peatland | P | 16 | 1 | 1 | - | 74.0 | 0.6 | 0.6 | - |
| | P,M | 1 | - | - | - | 0.0 | - | - | - |
| Jack pine mixedwood on mineral | P | 23 | 1 | 4 | **3** | 119.7 | 0.6 | 0.7 | **0.1** |
| | P,M | 3 | - | - | - | 3.0 | - | - | - |
| Jack pine mixedwood on shallow peatland | P | 4 | - | - | - | 7.6 | - | - | - |
| Jack pine mixedwood on thin peatland | P | 18 | 4 | 4 | - | 80.4 | 1.9 | 1.9 | - |
| | P,M | 2 | - | - | - | 3.0 | - | - | - |
| Jack pine mixture on shallow peatland | P | 10 | 2 | 2 | - | 43.8 | 0.3 | 0.3 | - |

| Priority Habitat Type | Sensitivity[1] | Number of Sensitive Sites | | | | Total Area (ha) Impacted | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pre-Project | Impacted | | | Pre-Project | Impacted | | |
| | | | 2017 | 2018 | Change | | 2017 | 2018 | Change |
| | P,M | 1 | - | - | - | 0.4 | - | - | - |
| Jack pine mixture on thin peatland | P | 77 | 16 | 16 | - | 292.6 | 13.0 | 13.0 | - |
| | P,M | 4 | - | - | - | 2.3 | - | - | - |
| Black spruce dominant on mineral | P | 29 | 2 | 3 | **1** | 51.8 | 0.0 | 19.8 | **19.8** |
| | P,M | 5 | - | - | - | 2.1 | - | - | - |
| Black spruce dominant on riparian peatland | P | 16 | 2 | 2 | - | 5.5 | 0.1 | 0.1 | - |
| | P,R | 1 | - | - | - | 0.0 | - | - | - |
| Black spruce dominant on wet peatland | P | 449 | 25 | 30 | **5** | 505.9 | 6.4 | 6.9 | **0.5** |
| | P,M | 25 | - | - | - | 7.9 | - | - | - |
| Black spruce mixedwood on mineral | P | 36 | 5 | 5 | - | 167.9 | 1.6 | 1.6 | - |
| | P,C | 1 | 1 | 1 | - | 1.0 | 0.0 | 0.0 | - |
| Black spruce mixedwood on shallow peatland | P | 7 | 1 | 1 | - | 5.1 | 0.0 | 0.0 | - |
| Black spruce mixedwood on thin peatland | P | 18 | 2 | 2 | - | 9.3 | 0.0 | 0.0 | - |
| Black spruce mixture on mineral | P | 127 | 45 | 46 | **1** | 517.1 | 66.6 | 67.0 | **0.4** |
| | P,C | 9 | 5 | 6 | **1** | 15.9 | 0.5 | 0.8 | **0.3** |
| | P,M | 7 | - | - | - | 6.7 | - | - | - |
| Black spruce mixture on shallow peatland | P | 222 | 11 | 16 | **5** | 228.3 | 2.6 | 2.6 | **0.1** |
| | P,C | 1 | 1 | 1 | - | 0.2 | 0.0 | 0.0 | - |
| | P,M | 3 | - | - | - | 2.8 | - | - | - |
| Black spruce mixture on thin peatland | P | 290 | 68 | 82 | **14** | 328.7 | 12.7 | 13.2 | **0.5** |
| | P,C | 8 | 5 | 5 | - | 3.1 | 0.1 | 0.1 | - |
| | P,M | 4 | - | - | - | 3.4 | - | - | - |
| Black spruce mixture on wet peatland | P | 23 | 1 | 1 | - | 18.7 | 0.1 | 0.1 | - |
| Tamarack- black spruce mixture on riparian peatland | P | 5 | - | - | - | 1.0 | - | - | - |

| Priority Habitat Type | Sensitivity[1] | Number of Sensitive Sites | | | | Total Area (ha) Impacted | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pre-Project | Impacted | | | Pre-Project | Impacted | | |
| | | | 2017 | 2018 | Change | | 2017 | 2018 | Change |
| Tamarack dominant on mineral | P | 7 | 3 | 3 | - | 6.1 | 0.4 | 0.4 | - |
| Tamarack dominant on riparian peatland | P | 1 | - | - | - | 1.1 | - | - | - |
| Tamarack dominant on shallow peatland | P | 11 | - | - | - | 5.5 | - | - | - |
| | P,M | 1 | - | - | - | 0.1 | - | - | - |
| Tamarack dominant on thin peatland | P | 7 | 1 | 1 | - | 8.2 | 0.4 | 0.4 | - |
| Tamarack dominant on wet peatland | P | 17 | 1 | 1 | - | 27.6 | 0.0 | 0.0 | **0.0** |
| | P,M | 2 | - | - | - | 0.1 | - | - | - |
| Tamarack mixture on mineral | P | 45 | 13 | 16 | **3** | 88.2 | 8.0 | 9.3 | **1.2** |
| | P,M | 2 | - | - | - | 0.4 | - | - | - |
| Tamarack mixture on shallow peatland | P | 177 | 10 | 14 | **4** | 163.1 | 0.4 | 1.2 | **0.8** |
| | P,C | 1 | 1 | 1 | - | 0.3 | 0.0 | 0.0 | - |
| | P,M | 7 | - | - | - | 1.8 | - | - | - |
| Tamarack mixture on thin peatland | P | 143 | 21 | 26 | **5** | 149.7 | 2.3 | 2.9 | **0.6** |
| | P,C | 1 | 1 | 1 | - | 3.8 | 0.2 | 0.2 | - |
| | P,M | 2 | - | - | - | 1.5 | - | - | - |
| Tamarack mixture on wet peatland | P | 90 | 7 | 7 | - | 119.5 | 0.8 | 0.8 | - |
| | P,M | 10 | - | - | - | 4.0 | - | - | - |
| Tall shrub on mineral | P | 18 | 7 | 7 | - | 35.3 | 0.8 | 0.8 | - |
| Tall shrub on riparian peatland | P | 1 | - | - | - | 0.0 | - | - | - |
| Tall shrub on shallow peatland | P | 61 | 5 | 5 | - | 149.7 | 0.2 | 0.2 | **0.0** |
| | P,M | 3 | - | - | - | 0.3 | - | - | - |
| Tall shrub on thin peatland | P | 52 | 9 | 9 | - | 77.1 | 10.0 | 10.0 | - |
| | P,M | 1 | 1 | 1 | - | 0.1 | 0.0 | 0.0 | - |
| Tall shrub on wet peatland | P | 53 | 1 | 3 | **2** | 49.6 | 0.1 | 0.1 | **0.1** |
| | P,M | 6 | - | - | - | 1.7 | - | - | - |
| Low vegetation on riparian peatland | P | 21 | 4 | 4 | - | 40.9 | 0.1 | 0.1 | - |
| | P,R | 2 | - | - | - | 0.5 | - | - | - |

| Priority Habitat Type | Sensitivity[1] | Number of Sensitive Sites | | | | Total Area (ha) Impacted | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Pre-Project | Impacted | | | Pre-Project | Impacted | | |
| | | | 2017 | 2018 | Change | | 2017 | 2018 | Change |
| Low vegetation on shallow peatland | P | 118 | - | 9 | **9** | 196.2 | - | 0.6 | **0.6** |
| | P,M | 4 | - | - | **-** | 0.3 | - | - | **-** |
| | P,R | 3 | - | - | **-** | 0.0 | - | - | **-** |
| | P,M,R | 1 | - | - | **-** | 0.1 | - | - | **-** |
| Low Vegetation on thin peatland | P | 3 | 1 | 1 | **-** | 1.1 | 0.1 | 0.1 | **-** |
| Low vegetation on wet peatland | P | 55 | - | 2 | **2** | 97.0 | - | 0.9 | **0.9** |
| | P,M | 1 | - | - | **-** | 0.5 | - | - | **-** |
| Emergent island in littoral | P,M | 9 | - | - | **-** | 6.7 | - | - | **-** |
| Emergent on lower beach | P,M | 11 | - | - | **-** | 4.2 | - | - | **-** |
| Emergent on upper beach | P,M | 40 | - | - | **-** | 9.5 | - | - | **-** |
| | P,M,R | 1 | - | - | **-** | 0.0 | - | - | **-** |
| Riparian- Looking Back Creek | P,R | 4 | - | - | **-** | 160.4 | - | - | **-** |
| | P,M,R | 4 | - | - | **-** | 17.1 | - | - | **-** |
| Riparian | R | 12 | - | 1 | **1** | 37.0 | 0.0 | 0.5 | **0.5** |
| Marsh, Riparian | M,R | 7 | - | - | **-** | 12.1 | - | - | **-** |
| Marsh | M | 91 | 3 | 3 | **-** | 1,456.4 | 1.1 | 1.1 | **-** |
| Caribou Calving and Rearing Habitat | C | 65 | 47 | 48 | **1** | 314.7 | 14.3 | 14.6 | **0.3** |
| **All** | | **2,878** | **383** | **440** | **57** | **6,684.4** | **187.8** | **215.7** | **27.9** |

Notes: a "-" indicates absence or no area, a 0 indicates a value less than 0.05. [1] P = Priority Habitat, M = Off-system Marsh Habitat, R = Mammal Riparian Habitat, C = Caribou Calving and Rearing Habitat

**Table 6-2: Area of terrestrial sensitive sites disturbed or cleared by the Project as of September 2018 by broad/priority habitat type**

| Priority Habitat Type | Sensi-tivity[1] | Total Area Pre-Project | Area (ha) Cleared or Disturbed | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Disturbed 2017 | Disturbed 2018 | Change | Cleared 2017 | Cleared 2018 | Change |
| Balsam poplar dominant on all ecosites | P | 1.0 | - | - | - | 0.0 | 0.0 | - |
| Trembling aspen dominant on all ecosites | P | 217.8 | 0.0 | 0.0 | - | 4.2 | 4.5 | **0.2** |
| | P,M | 8.3 | - | - | - | 0.0 | 0.0 | - |
| | P,C | 16.6 | - | - | - | 0.9 | 0.9 | - |
| Trembling aspen mixedwood on all ecosites | P | 214.7 | 1.4 | 1.4 | - | 0.6 | 0.6 | - |
| | P,M | 2.8 | - | - | - | - | - | - |
| White birch dominant on all ecosites | P | 25.3 | - | - | - | 0.1 | 0.1 | - |
| | P,M | 3.7 | - | - | - | - | - | - |
| | P,C | 11.1 | - | - | - | - | - | - |
| White birch mixedwood on all ecosites | P | 11.2 | - | - | - | 0.0 | 0.0 | - |
| | P,M | 0.8 | - | - | - | - | - | - |
| | P,C | 26.3 | - | - | - | - | - | - |
| Jack pine dominant on mineral | P | 380.8 | 2.4 | 2.4 | - | 31.8 | 32.8 | **1.0** |
| | P,M | 0.6 | - | - | - | - | - | **-** |
| Jack pine dominant on shallow peatland | P | 4.7 | - | - | - | - | - | **-** |
| Jack pine dominant on thin peatland | P | 74.0 | - | - | - | 0.6 | 0.6 | **-** |
| | P,M | 0.0 | - | - | - | - | - | **-** |
| Jack pine mixedwood on mineral | P | 119.7 | 0.6 | 0.6 | - | - | 0.1 | **0.1** |
| | P,M | 3.0 | - | - | - | - | - | - |
| Jack pine mixedwood on shallow peatland | P | 7.6 | - | - | - | - | - | - |
| Jack pine mixedwood on thin peatland | P | 80.4 | 0.0 | 0.0 | - | 1.9 | 1.9 | - |
| | P,M | 3.0 | - | - | - | - | - | - |
| Jack pine mixture on shallow peatland | P | 43.8 | - | - | - | 0.3 | 0.3 | - |
| | P,M | 0.4 | - | - | - | - | - | - |

| Priority Habitat Type | Sensi-tivity[1] | Total Area Pre-Project | Area (ha) Cleared or Disturbed | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Disturbed 2017 | Disturbed 2018 | Change | Cleared 2017 | Cleared 2018 | Change |
| Jack pine mixture on thin peatland | P | 292.6 | 0.6 | 0.6 | - | 12.3 | 12.3 | - |
| | P,M | 2.3 | - | - | - | - | - | - |
| Black spruce dominant on mineral | P | 51.8 | 0.0 | 0.0 | - | 0.0 | 19.8 | **19.8** |
| | P,M | 2.1 | - | - | - | - | - | - |
| Black spruce dominant on riparian peatland | P | 5.5 | - | - | - | 0.1 | 0.1 | - |
| | P,R | 0.0 | - | - | - | - | - | - |
| Black spruce dominant on wet peatland | P | 505.9 | - | - | - | 6.4 | 6.9 | **0.5** |
| | P,M | 7.9 | - | - | - | - | - | - |
| Black spruce mixedwood on mineral | P | 167.9 | 0.2 | 0.2 | - | 1.4 | 1.4 | - |
| | P,C | 1.0 | - | - | - | 0.0 | 0.0 | - |
| Black spruce mixedwood on shallow peatland | P | 5.1 | - | - | - | 0.0 | 0.0 | - |
| Black spruce mixedwood on thin peatland | P | 9.3 | - | - | - | 0.0 | 0.0 | - |
| Black spruce mixture on mineral | P | 517.1 | 1.1 | 1.1 | - | 65.4 | 65.8 | **0.4** |
| | P,M | 6.7 | - | - | - | - | - | - |
| | P,C | 15.9 | - | - | - | 0.5 | 0.8 | **0.3** |
| Black spruce mixture on shallow peatland | P | 228.3 | - | - | - | 2.6 | 2.6 | **0.1** |
| | P,M | 2.8 | - | - | - | - | - | - |
| | P,C | 0.2 | - | - | - | 0.0 | 0.0 | - |
| Black spruce mixture on thin peatland | P | 328.7 | 0.2 | 0.2 | - | 12.5 | 13.0 | **0.5** |
| | P,M | 3.4 | - | - | - | - | - | - |
| | P,C | 3.1 | - | - | - | 0.1 | 0.1 | - |
| Black spruce mixture on wet peatland | P | 18.7 | - | - | - | 0.1 | 0.1 | - |
| Tamarack- black spruce mixture on riparian peatland | P | 1.0 | - | - | - | - | - | - |
| Tamarack dominant on mineral | P | 6.1 | - | - | - | 0.4 | 0.4 | - |
| Tamarack dominant on riparian peatland | P | 1.1 | - | - | - | - | - | - |

| Priority Habitat Type | Sensi-tivity[1] | Total Area Pre-Project | Area (ha) Cleared or Disturbed | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Disturbed 2017 | Disturbed 2018 | Change | Cleared 2017 | Cleared 2018 | Change |
| Tamarack dominant on shallow peatland | P | 5.5 | - | - | - | - | - | - |
| | P,M | 0.1 | - | - | - | - | - | - |
| Tamarack dominant on thin peatland | P | 8.2 | - | - | - | 0.4 | 0.4 | - |
| Tamarack dominant on wet peatland | P | 27.6 | - | - | - | 0.0 | 0.0 | **0.0** |
| | P,M | 0.1 | - | - | - | - | - | - |
| Tamarack mixture on mineral | P | 88.2 | - | - | - | 8.0 | 9.3 | **1.2** |
| | P,M | 0.4 | - | - | - | - | - | - |
| Tamarack mixture on shallow peatland | P | 163.1 | 0.2 | 0.2 | - | 0.3 | 1.0 | **0.8** |
| | P,M | 1.8 | - | - | - | - | - | - |
| | P,C | 0.3 | - | - | - | 0.0 | 0.0 | - |
| Tamarack mixture on thin peatland | P | 149.7 | 0.0 | 0.0 | - | 2.3 | 2.9 | **0.6** |
| | P,M | 1.5 | - | - | - | - | - | - |
| | P,C | 3.8 | - | - | - | 0.2 | 0.2 | - |
| Tamarack mixture on wet peatland | P | 119.5 | - | - | - | 0.8 | 0.8 | - |
| | P,M | 4.0 | - | - | - | - | - | - |
| Tall shrub on mineral | P | 35.3 | - | - | - | 0.8 | 0.8 | - |
| Tall shrub on riparian peatland | P | 0.0 | - | - | - | - | - | - |
| Tall shrub on shallow peatland | P | 149.7 | 0.1 | 0.1 | - | 0.1 | 0.1 | **0.0** |
| | P,M | 0.3 | - | - | - | - | - | - |
| Tall shrub on thin peatland | P | 77.1 | 0.2 | 0.2 | - | 9.7 | 9.7 | - |
| | P,M | 0.1 | - | - | - | 0.0 | 0.0 | - |
| Tall shrub on wet peatland | P | 49.6 | 0.0 | 0.0 | - | 0.0 | 0.1 | **0.1** |
| | P,M | 1.7 | - | - | - | - | - | - |
| Low vegetation on riparian peatland | P | 40.9 | - | - | - | 0.1 | 0.1 | - |
| | P,R | 0.5 | - | - | - | - | - | - |
| Low vegetation on shallow peatland | P | 196.2 | - | - | - | - | 0.6 | **0.6** |
| | P,M | 0.3 | - | - | - | - | - | - |
| | P,R | 0.0 | - | - | - | - | - | - |

| Priority Habitat Type | Sensi-tivity[1] | Total Area Pre-Project | Area (ha) Cleared or Disturbed | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Disturbed 2017 | Disturbed 2018 | Change | Cleared 2017 | Cleared 2018 | Change |
| | P,M,R | 0.1 | - | - | - | - | - | - |
| Low Vegetation on thin peatland | P | 1.1 | - | - | - | 0.1 | 0.1 | - |
| Low vegetation on wet peatland | P | 97.0 | - | - | - | - | 0.9 | **0.9** |
| | P,M | 0.5 | - | - | - | - | - | - |
| Emergent island in littoral | P,M | 6.7 | - | - | - | - | - | - |
| Emergent on lower beach | P,M | 4.2 | - | - | - | - | - | - |
| Emergent on upper beach | P,M | 9.5 | - | - | - | - | - | - |
| | P,M,R | 0.0 | - | - | - | - | - | - |
| Riparian- Looking Back Creek | P,R | 160.4 | - | - | - | - | - | - |
| | P,M,R | 17.1 | - | - | - | - | - | - |
| Riparian | R | 37.0 | - | - | - | 0.0 | 0.5 | **0.5** |
| Marsh, Riparian | M,R | 12.1 | - | - | - | - | - | - |
| Marsh | M | 1,456.4 | - | - | - | 1.1 | 1.1 | - |
| Caribou Calving and Rearing Habitat | C | 314.7 | - | - | - | 14.3 | 14.6 | **0.3** |
| **All** | | **6,684.4** | **7.1** | **7.1** | - | **180.6** | **208.6** | **27.9** |

Notes: a "-" indicates no area, a 0 indicates an area less than 0.05 ha. [1] P = Priority Habitat, M = Off-system Marsh Habitat, R = Mammal Riparian Habitat, C = Caribou Calving and Rearing Habitat

**Table 6-3: Area of terrestrial sensitive sites impacted by the Project as of September, 2018 by Project Area**

| Priority Habitat Type | Sensi-tivity[1] | Total Area Impacted by the Project (ha) | EnvPP Green Zone (ha) | | | EnvPP Yellow and Red Zones (ha) | | | Within Subsequently Approved Areas (ha) | | | Outside of Subsequently Approved Areas (ha) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2017 | 2018 | Change | 2017 | 2018 | Change | 2017 | 2018 | Change | 2017 | 2018 | Change |
| Balsam poplar dominant on all ecosites | P | 0.0 | - | - | - | 0.0 | 0.0 | - | - | - | - | 0.0 | 0.0 | - |
| Trembling aspen dominant on all ecosites | P | 4.5 | 3.9 | 3.9 | - | 0.4 | 0.6 | **0.2** | 0.0 | 0.0 | - | - | - | - |
| | P,M | 0.0 | 0.0 | 0.0 | - | - | - | - | - | - | - | - | - | - |
| | P,C | 0.9 | 0.1 | 0.1 | - | 0.2 | 0.2 | - | 0.1 | 0.1 | - | 0.5 | 0.5 | - |
| Trembling aspen mixedwood on all ecosites | P | 2.0 | 0.0 | 0.0 | - | 0.6 | 0.6 | - | 0.8 | 0.8 | - | 0.7 | 0.7 | - |
| White birch dominant on all ecosites | P | 0.1 | 0.0 | 0.0 | - | 0.1 | 0.1 | - | - | - | - | - | - | - |
| White birch mixedwood on all ecosites | P | 0.0 | 0.0 | 0.0 | - | 0.0 | 0.0 | - | 0.0 | 0.0 | - | - | - | - |
| Jack pine dominant on mineral | P | 35.2 | 29.2 | 30.2 | **1.0** | 0.3 | 0.3 | **0.0** | 3.9 | 3.9 | - | 0.7 | 0.7 | - |
| Jack pine dominant on thin peatland | P | 0.6 | 0.6 | 0.6 | - | - | - | - | - | - | - | - | - | - |
| Jack pine mixedwood on mineral | P | 0.7 | 0.6 | 0.6 | - | - | 0.1 | **0.1** | - | - | - | - | 0.0 | **0.0** |
| Jack pine mixedwood on thin peatland | P | 1.9 | 1.9 | 1.9 | - | - | - | - | 0.1 | 0.1 | - | - | - | - |
| Jack pine mixture on shallow peatland | P | 0.3 | 0.0 | 0.0 | - | - | - | - | - | - | - | 0.2 | 0.2 | - |
| Jack pine mixture on thin peatland | P | 13.0 | 8.3 | 8.3 | - | 0.0 | 0.0 | - | 3.5 | 3.5 | - | 1.1 | 1.1 | - |
| Black spruce dominant on mineral | P | 19.8 | 0.0 | 0.0 | - | - | 19.0 | **19.0** | - | - | - | - | 0.8 | **0.8** |

| Priority Habitat Type | Sensi-tivity[1] | Total Area Impacted by the Project (ha) | EnvPP Green Zone (ha) | | | EnvPP Yellow and Red Zones (ha) | | | Within Subsequently Approved Areas (ha) | | | Outside of Subsequently Approved Areas (ha) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2017 | 2018 | Change | 2017 | 2018 | Change | 2017 | 2018 | Change | 2017 | 2018 | Change |
| Black spruce dominant on riparian peatland | P | 0.1 | 0.0 | 0.0 | - | 0.1 | 0.1 | - | - | - | - | - | - | - |
| Black spruce dominant on wet peatland | P | 6.9 | 6.2 | 6.2 | - | 0.2 | 0.7 | **0.5** | - | - | - | - | - | - |
| Black spruce mixedwood on mineral | P | 1.6 | 1.2 | 1.2 | - | 0.2 | 0.2 | - | 0.2 | 0.2 | - | - | - | - |
| | P,C | 0.0 | - | - | - | 0.0 | 0.0 | - | - | - | - | - | - | - |
| Black spruce mixedwood on shallow peatland | P | 0.0 | - | - | - | 0.0 | 0.0 | - | - | - | - | 0.0 | 0.0 | - |
| Black spruce mixedwood on thin peatland | P | 0.0 | 0.0 | 0.0 | - | 0.0 | 0.0 | - | - | - | - | - | - | - |
| Black spruce mixture on mineral | P | 67.0 | 58.6 | 58.6 | **0.0** | 3.4 | 3.7 | **0.4** | 4.6 | 4.6 | - | 0.0 | 0.0 | - |
| | P,C | 0.8 | 0.0 | 0.0 | - | 0.4 | 0.7 | **0.3** | 0.2 | 0.2 | - | - | - | - |
| Black spruce mixture on shallow peatland | P | 2.6 | 2.3 | 2.3 | - | 0.3 | 0.3 | **0.1** | - | - | - | - | - | - |
| | P,C | 0.0 | - | - | - | 0.0 | 0.0 | - | - | - | - | - | - | - |
| Black spruce mixture on thin peatland | P | 13.2 | 11.2 | 11.2 | **0.0** | 1.2 | 1.7 | **0.5** | 0.2 | 0.2 | - | - | - | - |
| | P,C | 0.1 | 0.0 | 0.0 | - | 0.0 | 0.0 | - | 0.0 | 0.0 | - | - | - | - |
| Black spruce mixture on wet peatland | P | 0.1 | 0.0 | 0.0 | - | 0.0 | 0.0 | - | - | - | - | - | - | - |
| Tamarack dominant on mineral | P | 0.4 | 0.4 | 0.4 | - | - | - | - | - | - | - | - | - | - |
| Tamarack dominant on thin peatland | P | 0.4 | 0.4 | 0.4 | - | 0.0 | 0.0 | - | - | - | - | - | - | - |
| Tamarack dominant on wet peatland | P | 0.0 | - | - | - | 0.0 | 0.0 | **0.0** | - | - | - | - | - | - |
| Tamarack mixture on mineral | P | 9.3 | 7.9 | 8.2 | **0.4** | 0.1 | 1.0 | **0.9** | - | - | - | - | - | - |
| Tamarack mixture on | P | 1.2 | 0.3 | 0.3 | - | 0.1 | 0.9 | **0.8** | 0.0 | 0.0 | - | - | - | - |

| Priority Habitat Type | Sensi-tivity[1] | Total Area Impacted by the Project (ha) | EnvPP Green Zone (ha) | | | EnvPP Yellow and Red Zones (ha) | | | Within Subsequently Approved Areas (ha) | | | Outside of Subsequently Approved Areas (ha) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2017 | 2018 | Change | 2017 | 2018 | Change | 2017 | 2018 | Change | 2017 | 2018 | Change |
| shallow peatland | P,C | 0.0 | 0.0 | 0.0 | - | 0.0 | 0.0 | - | - | - | - | - | - | - |
| Tamarack mixture on thin | P | 2.9 | 1.3 | 1.3 | **0.0** | 0.6 | 1.2 | **0.6** | 0.4 | 0.4 | - | 0.0 | 0.0 | - |
| peatland | P,C | 0.2 | 0.0 | 0.0 | - | 0.2 | 0.2 | - | - | - | - | - | - | - |
| Tamarack mixture on wet peatland | P | 0.8 | 0.6 | 0.6 | - | 0.2 | 0.2 | - | - | - | - | - | - | - |
| Tall shrub on mineral | P | 0.8 | 0.4 | 0.4 | - | 0.4 | 0.4 | - | - | - | - | - | - | - |
| Tall shrub on shallow peatland | P | 0.2 | 0.0 | 0.0 | - | 0.1 | 0.1 | **0.0** | 0.1 | 0.1 | - | - | - | - |
| Tall shrub on thin | P | 10.0 | 7.5 | 7.5 | - | 2.2 | 2.2 | - | 0.2 | 0.2 | - | 0.0 | 0.0 | - |
| peatland | P,M | 0.0 | - | - | - | 0.0 | 0.0 | - | - | - | - | 0.0 | 0.0 | - |
| Tall shrub on wet peatland | P | 0.1 | - | 0.0 | - | 0.0 | 0.1 | **0.1** | 0.0 | 0.0 | - | - | - | - |
| Low vegetation on riparian peatland | P | 0.1 | 0.0 | 0.0 | - | 0.1 | 0.1 | - | - | - | - | - | - | - |
| Low vegetation on shallow peatland | P | 0.6 | - | - | - | - | 0.6 | **0.6** | - | - | - | - | 0.0 | **0.0** |
| Low Vegetation on thin peatland | P | 0.1 | 0.1 | 0.1 | - | - | - | - | - | - | - | - | - | - |
| Low vegetation on wet peatland | P | 0.9 | - | - | - | - | 0.9 | **0.9** | - | - | - | - | - | - |
| Riparian | R | 0.5 | 0.0 | 0.0 | - | - | 0.5 | **0.5** | - | - | - | - | - | - |
| Marsh | M | 1.1 | 0.8 | 0.8 | - | 0.3 | 0.3 | - | - | - | - | 0.0 | 0.0 | - |
| Caribou Calving and Rearing Habitat | C | 14.6 | 0.2 | 0.2 | - | 13.3 | 13.5 | **0.3** | 0.3 | 0.3 | - | 0.5 | 0.5 | - |
| **All** | | **215.7** | **144.2** | **145.7** | **1.4** | **25.2** | **50.9** | **25.7** | **14.6** | **14.6** | **-** | **3.8** | **4.6** | **0.8** |

Notes: a "-" indicates no area, a 0 indicates an area less than 0.05 ha. [1] P = Priority Habitat, M = Off-system Marsh Habitat, R = Mammal Riparian Habitat, C = Caribou Calving and Rearing Habitat