



Keeyask Generation Project  
Terrestrial Effects Monitoring Plan

Priority Habitats Monitoring Report

TEMP-2018-02



# **KEEYASK GENERATION PROJECT**

## **TERRESTRIAL EFFECTS MONITORING PLAN**

REPORT #TEMP-2018-02

### **PRIORITY HABITATS MONITORING**

Prepared for

Manitoba Hydro

By

ECOSTEM Ltd.

June 2018

This report should be cited as follows:

ECOSTEM Ltd. 2018. Keeyask Generation Project Terrestrial Effects Monitoring Plan Report #TEMP-2018-02: Priority Habitats Monitoring. A report prepared for Manitoba Hydro by ECOSTEM Ltd., June 2018.



# 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 fourth 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 are especially important for ecosystem health and/or to people. These include the habitat types in the Keeyask region 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 types.

## What was done?

This study monitors Project effects on terrestrial sensitive sites located within approximately 1.1 km of the licensed Project footprint. This monitoring area is much larger than where Project effects on sensitive sites are predicted to occur so that if there are any unanticipated effects, they can be found.

During construction, this study documents direct Project effects (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.

Approximately 5,844 ha of sensitive sites are being monitored by this study. These 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.

A map of Project clearing or physical disturbance up to September 2017 was used to determine which and how much of the sensitive sites were impacted. Ground surveys were also carried

out at 16 sensitive sites because they were of special interest or they were already being visited for other reasons.

**What was found?**

As of September 2017, Project clearing or disturbance had impacted 188.5 ha, or 3.2%, of the total pre-Project sensitive site area. This was an increase of 20.3 ha, or 0.3%, of total sensitive site area since September 2016. Clearing or disturbance outside of the approved Project areas impacted 0.1% of total sensitive site area. Most (92%) 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 sensitive sites was very low as of September 2017, impacting only 3% of the total sensitive site area being monitored.

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 sites that were impacted. Also, 87% of the sensitive site area within the licensed Project footprint had not been cleared or disturbed as of September 2017, and it is expected that much of this area will remain undisturbed as Project clearing is already complete.

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. 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 sensitive sites affected by the Project will continue in summer 2018.

# ACKNOWLEDGEMENTS

ECOSTEM Ltd. would like to thank Rachel Boone, Sherrie Mason and the on-site Manitoba Hydro staff, including Tammis Bruccolieri, Kim Bryson, Megan Anger, Michele Nicholson, Tanner Booth, Tyler Fourre, Gordon Macdonald and Linda Campbell for their support and assistance in planning field activities and access to the sites. Rachel Boone and Sherrie Mason are also gratefully acknowledged for coordinating the terrestrial monitoring studies.

Chiefs and Councils of Tataskweyak Cree Nation (TCN), War Lake First Nation (WLCN), York Factory First Nation (YFFN) and Fox Lake Cree Nation (FLCN) are gratefully acknowledged for their support of this program.

We would also like to thank North/South Consultants Inc., in particular Ron Bretecher, Shari Fournier and Regan Caskey, for their guidance, logistical support and other resources that made these studies possible.

Custom Helicopters is gratefully acknowledged for providing transportation during fieldwork and Nicole Pokornowska and Ben Hofer for coordinating the logistics.

# STUDY TEAM

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

Fieldwork in 2017 was conducted by Nathan Ricard and Brock Epp.

Data analysis and report writing in 2017 were completed by Brock Epp and James Ehnes. GIS analysis and cartography was completed by Nathan Ricard.

# TABLE OF CONTENTS

<b>1.0</b>	<b>INTRODUCTION.....</b>	<b>1</b>
<b>2.0</b>	<b>METHODS.....</b>	<b>3</b>
2.1	SENSITIVE SITES MONITORED .....	3
2.2	PROJECT AREAS.....	4
2.3	IMPACT MAPPING .....	5
<b>3.0</b>	<b>RESULTS.....</b>	<b>9</b>
3.1	OVERALL IMPACTS ON SENSITIVE SITES.....	9
3.2	IMPACTS ON MAMMAL RIPARIAN HABITAT SITES.....	18
3.3	IMPACTS ON OFF-SYSTEM MARSH SITES .....	19
3.4	IMPACTS ON CARIBOU CALVING AND REARING HABITAT SITES.....	20
3.5	IMPACTS ON PRIORITY HABITAT SITES .....	20
<b>4.0</b>	<b>DISCUSSION .....</b>	<b>27</b>
<b>5.0</b>	<b>SUMMARY AND CONCLUSIONS.....</b>	<b>28</b>
5.1	NEXT STEPS .....	29
<b>6.0</b>	<b>LITERATURE CITED.....</b>	<b>30</b>



# LIST OF TABLES

Table 3-1:	Number and area of impacted sensitive sites as of September 2017 .....	9
Table 3-2:	Project clearing or disturbance in sensitive sites as of September 2017, by Project area .....	11
Table 3-3:	Changes to Project clearing or disturbance in sensitive sites as of September 2017, by Project area.....	11
Table 3-4:	Number and area of terrestrial sensitive sites with documented Project clearing or disturbance as of September 2017, by type of sensitivity.....	13
Table 3-5:	Impacts on terrestrial sensitive sites, as a percentage of pre-Project totals, as of September 2017, by type of sensitivity .....	14
Table 3-6:	Area of terrestrial sensitive sites with documented Project impacts as of September 2017, by clearing or disturbance and by type of sensitivity.....	15
Table 3-7:	Area of terrestrial sensitive sites impacted by the Project as of September 2017, by Project area.....	16
Table 3-8:	Change in area of sensitive sites impacted by the Project between September 2016 and 2017, by Project area and type of sensitivity .....	17
Table 3-9:	Composition of impacts on priority habitats .....	23
Table 6-1:	Number and area of terrestrial sensitive sites impacted by the Project as of September 2017, by broad/priority habitat type .....	32
Table 6-2:	Area of terrestrial sensitive sites disturbed or cleared by the Project as of September 2017 by broad/priority habitat type.....	36
Table 6-3:	Area of terrestrial sensitive sites impacted by the Project as of September, 2017 by Project Area .....	40

## LIST OF MAPS

Map 2-1:	Terrestrial sensitive sites included in the Priority Habitat study .....	6
Map 2-2:	Project areas as of September 2017 .....	7
Map 2-3:	Terrestrial sensitive sites in the licensed Project footprint .....	8
Map 3-1:	Project impacts on terrestrial sensitive sites outside of the planned Project footprint as of September 2017 – western portion of Project footprint .....	25
Map 3-2:	Project impacts on terrestrial sensitive sites outside of the planned Project footprint as of September 2017 – eastern portion of Project footprint .....	26

## LIST OF PHOTOS

Photo 3-1:	Example of Project clearing and excavation in a priority habitat type (black spruce mixture vegetation on mineral site) .....	10
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) .....	10
Photo 3-3:	Erosion and sedimentation from the North Access Road into a natural waterbody adjacent to Looking Back Creek .....	18
Photo 3-4:	Sediment deposition in riparian zone downstream of the NAR crossing at Looking Back Creek.....	19
Photo 3-5:	Trails and reservoir clearing adjacent to the western and southern boundary of the N-6 priority habitat site to avoid .....	21

## LIST OF APPENDICES

Appendix 1: Detailed Results .....	31
------------------------------------	----

# 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 patches 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 and 2017. ECOSTEM (2016; 2017b) provides results for the priority habitat monitoring conducted in 2015 and 2016. The following presents the monitoring conducted during 2017.

## 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 2017. The methods were the same as in 2016 (ECOSTEM 2017b).

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<sup>2</sup> 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<sup>2</sup>. 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 sensitive sites included in this monitoring are priority habitats, off-system marsh habitat, mammal riparian habitat and caribou calving and rearing habitat. Caribou calving and rearing habitat was included in the reporting beginning in 2016. The first Project impacts on caribou calving and rearing habitat occurred after the 2015 field surveys, once clearing for the future reservoir began.

Map 2-1 shows the 5,844 ha of terrestrial sensitive sites that are being monitored for this study. Contiguous sites prior to construction were combined with each other, resulting in 2,751 spatially distinct sensitive sites. A given sensitive site may include more than one of the four general types of terrestrial sensitive sites. One site, referred to as the “N-6 priority habitat to avoid”, was of particular interest because it encompasses a priority habitat type (white birch dominant or mixed forest) that is very rare in the Keeyask region. Project mitigation includes avoiding this site or indirectly affecting it.

Some individual sites that were very small in size were not monitored. The primary reason for the occurrence of these very small sites was that the remainder of the site had been removed because it overlapped a permanent Project feature.

## 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 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 2016, the vast majority (90%) of the possibly disturbed Project footprint had not been impacted by the Project (ECOSTEM 2017).

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

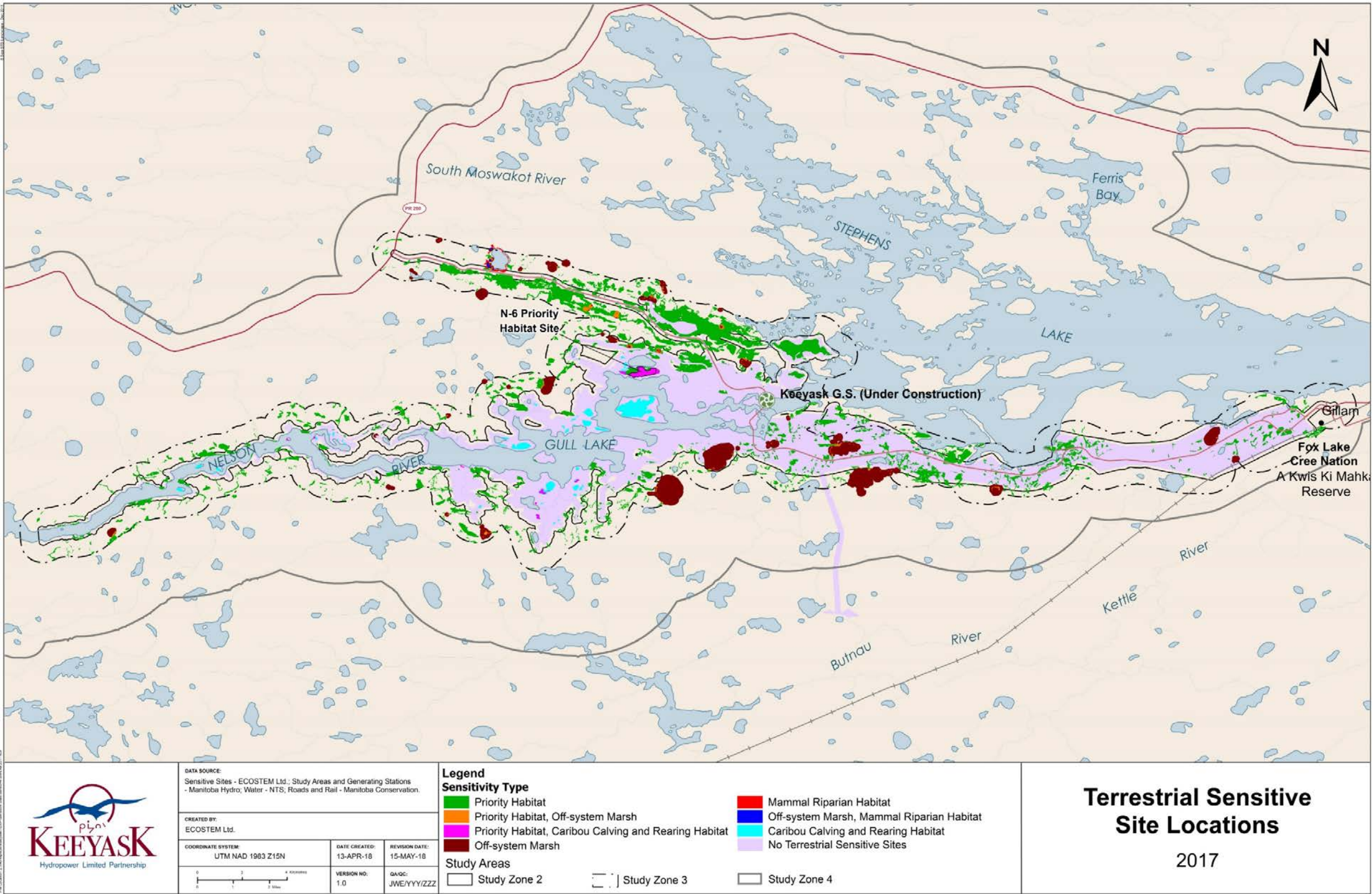
Initial site selection for the 2017 aerial surveys was based on sites surveyed in 2016 given that digital orthorectified imagery (DOI) showing clearing since September 2016 was not available. Aerial surveys conducted on August 31, September 1 and 19, 2017 were used to identify any other sensitive sites that may have been affected by recent clearing. The aerial surveys showed that, with the exception of reservoir clearing south of the Nelson River, the footprint clearing boundaries had not substantially grown since September 2016.

Ground surveys were also carried out at 16 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 monitoring studies. The remaining 12 sites were surveyed as part of the wetland loss and disturbance study, the results of which are provided in a separate report (ECOSTEM 2018b).

Ground surveys were not done at the “N-6 priority habitat to avoid” because low altitude aerial surveys in 2017 found that there had been no additional clearing or construction activity within or near this site since 2016.

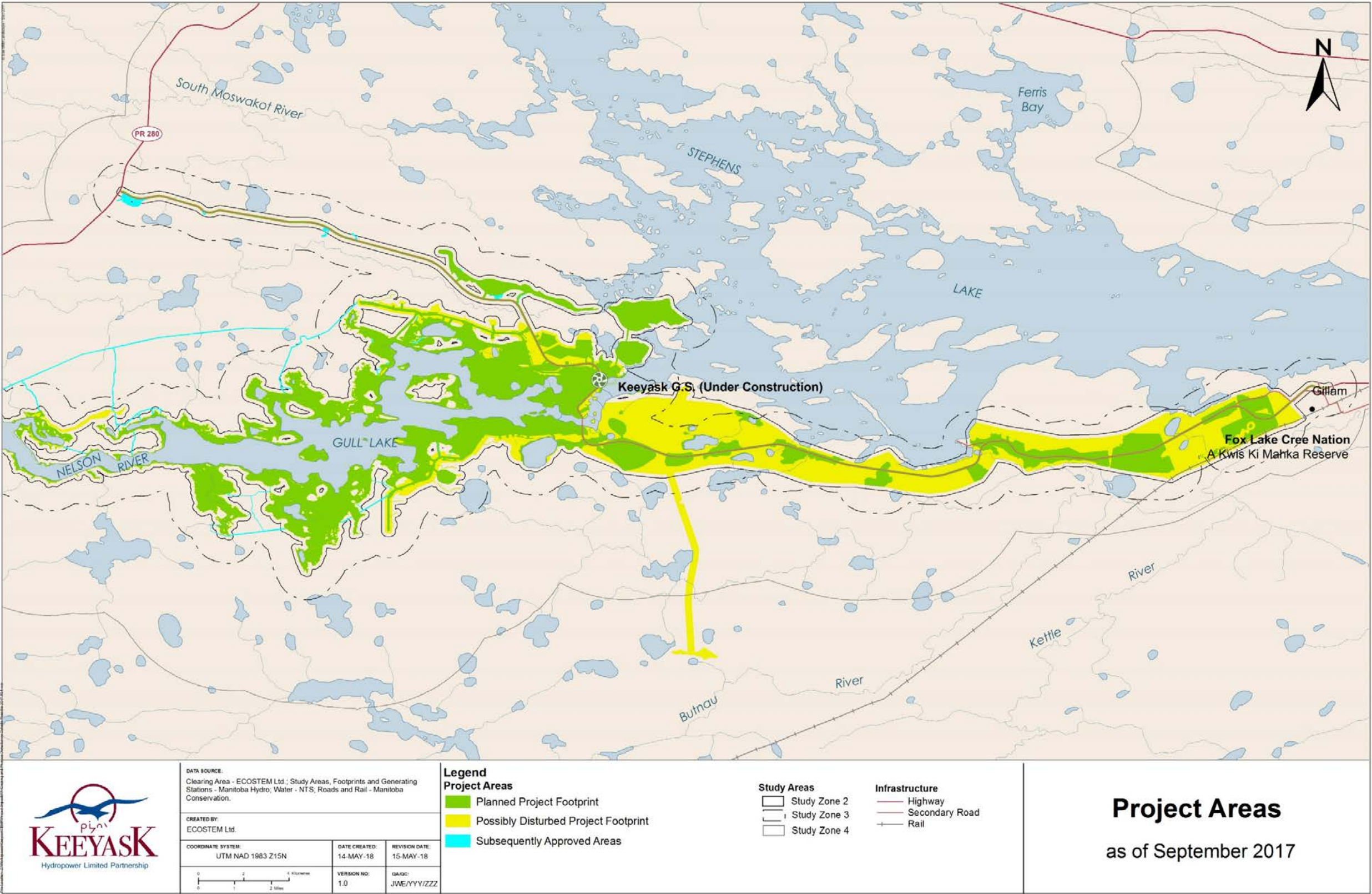
Ground sampling recorded conditions in the visited sensitive sites using reconnaissance surveys, geo-referenced photographs, marked-up maps and notes. Field data were mapped in a GIS using digital orthorectified imagery (DOI) as the base maps. The DOI was created from Worldview 2 imagery acquired on July 11, 2017.

This study used the Project clearing or disturbance mapping produced by the Habitat Loss and Disturbance study (ECOSTEM 2018a) to quantify and locate the terrestrial sensitive sites that were impacted as of September 2017. 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.



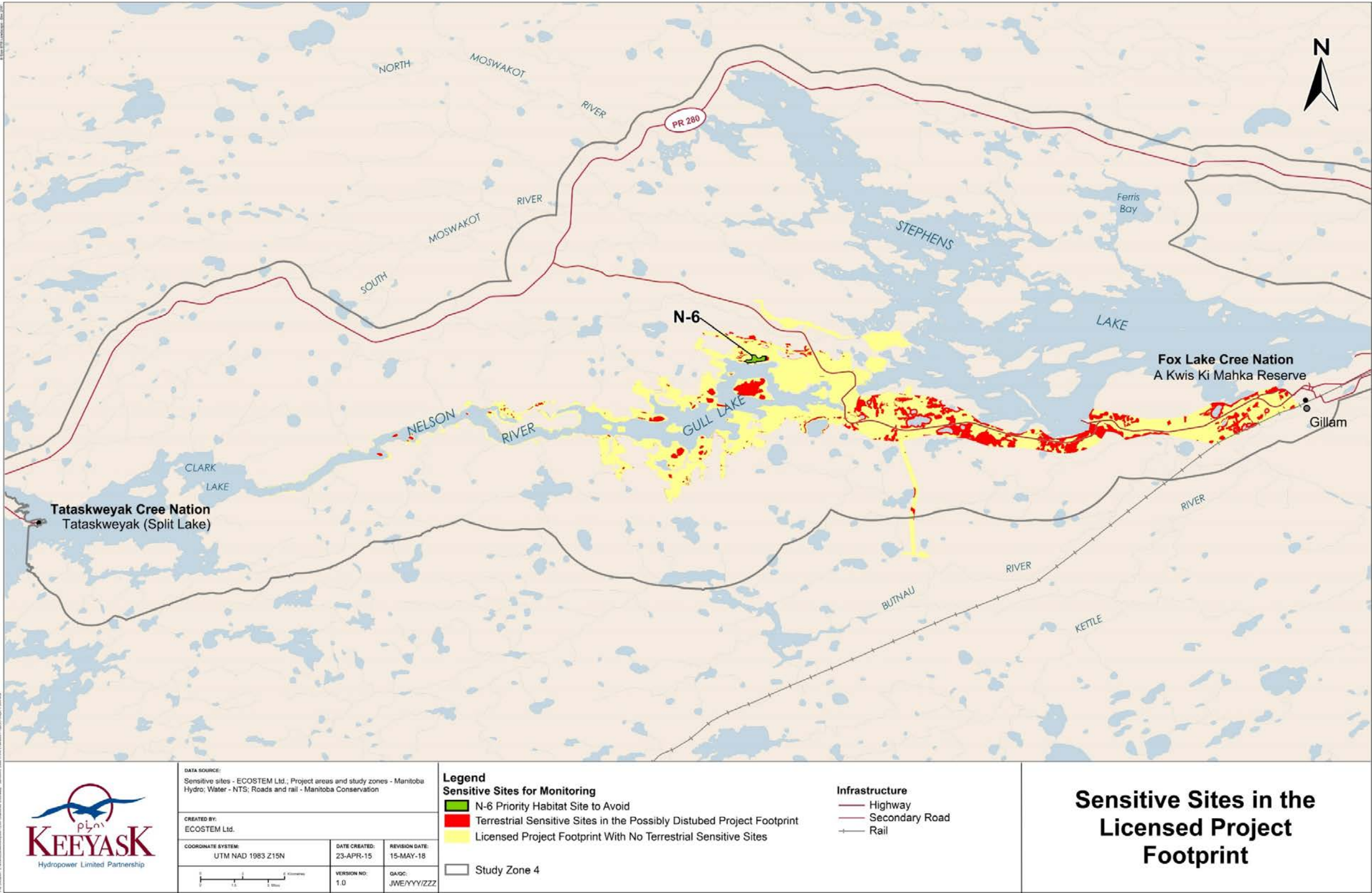
Map 2-1: Terrestrial sensitive sites included in the Priority Habitat study





Map 2-2: Project areas as of September 2017





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

## 3.0 RESULTS

### 3.1 OVERALL IMPACTS ON SENSITIVE SITES

The 2,751 sensitive sites being monitored for this study covered 5,844 ha in Study Zone 3.

Map 3-1 and Map 3-2 shows 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 2017 (see Section 2.0 for definitions of clearing and disturbance).

As of September 2017, Project impacts in the form of clearing or disturbance had affected 412 of the 2,751 sensitive sites. The total impacted area was 188.5 ha, or 3.2%, of total sensitive site area (Table 3-1), leaving approximately 97% of the sensitive site area as unimpacted.

The total amount of impacted sensitive site area increased by 20.3 ha from September 2016 to September 2017 (0.3% of total pre-Project sensitive site area).

**Table 3-1: Number and area of impacted sensitive sites as of September 2017**

Parameter	Pre-Project	Project Impacts (cleared or disturbed)			
		2015	2016	2017	Change from 2016 to 2017
Number of Sites					
Total number	2,751	189	306	412	106
Number of sites impacted as a percentage of pre-Project total	0.0	6.9	11.1	15.0	3.9
Area (ha)					
Total area	5,844.2	131.6	168.2	188.5	20.3
Area impacted as a percentage of pre-Project total	0.0	2.3	2.9	3.2	0.3





**Photo 3-1: Example of Project clearing and excavation in a priority habitat type (black spruce mixture vegetation on mineral site)**



**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 2017, 97% of the terrestrial sensitive site area identified within the possibly disturbed Project footprint had not been cleared or disturbed. Additionally, 87% 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 2017, 144.8 ha (or 77%) was situated within the planned Project footprint (Table 3-2). Just over 13% of the impacted sensitive site area was in the possibly disturbed Project footprint, or 25.3 ha of area, which was an increase of 8.7 ha over 2016 (Table 3-3). Clearing or disturbance of sensitive sites within areas subsequently approved for Project use was 14.6 ha in 2017 (Table 3-2), which was 1.4 ha higher than in 2016 (Table 3-3). As of September 2017, clearing or disturbance outside of the approved Project areas was 3.8 ha, or 2.0% of total impacted area, which was an increase of 0.5 ha over 2016. All of this increase was associated with reservoir clearing south of the Nelson River.

**Table 3-2: Project clearing or disturbance in sensitive sites as of September 2017, 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	581.9	144.8	2.5	76.8
Within the possibly disturbed Project footprint	761.2	25.3	0.4	13.5
Within subsequently approved Project areas	14.6	14.6	0.2	7.7
Outside of the approved Project footprint	-	3.8	0.1	2.0
All other area being monitored	4,482.8	-	-	-
<b>Total</b>	<b>5,844.2</b>	<b>188.5</b>	<b>3.2</b>	<b>100.0</b>

**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	Increase
Within the planned Project footprint	117.8	135.2	<b>144.8</b>	<b>9.7</b>
Within the possibly disturbed Project footprint	1.8	16.7	<b>25.3</b>	<b>8.7</b>
Within the subsequently approved Project areas	10.6	13.2	<b>14.6</b>	<b>1.4</b>
Outside of the approved Project footprint	1.3	3.2	<b>3.8</b>	<b>0.5</b>
<b>Total</b>	<b>131.6</b>	<b>168.2</b>	<b>188.5</b>	<b>20.3</b>

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., 190.4 ha for total sensitive site area impacted) because some sites included more than one sensitivity.

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.

As of September 2017, priority habitat had the highest area impacted by clearing or disturbance (Table 3-4). 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 marsh.

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). Seventy-two percent of its pre-Project sites, and 4% of its pre-Project area had clearing or disturbance as of September 2017. Priority habitat also had 4% of its pre-Project area impacted, but only in 15% of the sites. Only 2% of the pre-Project marsh sites, and 0.1% of the area had clearing or disturbance in 2017.

Priority habitat had the largest increase in impacted area from 2016 to 2017 (16.6 ha). Caribou calving and rearing habitat impacts increased an additional 5.0 ha since 2016, as clearing of the south reservoir area (an area with a large amount of caribou calving and rearing habitat) occurred the previous winter.

Mammal riparian habitat had not been impacted by the Project as of September 2017.

**Table 3-4: Number and area of terrestrial sensitive sites with documented Project clearing or disturbance as of September 2017, by type of sensitivity**

Sensitivity <sup>1</sup>	Number				Area (ha)			
	Pre-Project	Project Impacts			Pre-Project	Project Impacts		
		2016	2017	Change		2016	2017	Change
Total Including Sites with More Than One Sensitivity <sup>2</sup>								
P	2,502	274	370	96	4,258.4	156.5	173.1	16.6
M	430	8	9	1	1,331.5	1.1	1.1	0.0
R	17	-	-	-	28.7	-	-	-
C	72	33	52	19	392.9	11.2	16.2	5.0
All	2,751	306	412	106	5,844.2	168.2	188.5	20.3
Total by Combination of Sensitivities								
P	2,245	265	351	86	4,098.0	155.9	171.3	15.4
P, M	231	1	2	1	82.2	0.0	0.0	0.0
P, C	26	8	17	9	78.3	0.6	1.9	1.2
M	186	7	7	-	1,242.5	1.1	1.1	0.0
R	4	-	-	-	21.8	-	-	-
M, R	13	-	-	-	6.9	-	-	-
C	46	25	35	25	314.7	10.6	14.3	3.7
All	2,751	306	412	106	5,844.2	168.2	188.5	20.3

<sup>1</sup> P = Priority Habitat, M = Off-system Marsh Habitat, R = Mammal Riparian Habitat, C = Caribou Calving and Rearing Habitat

<sup>2</sup> 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 2017, by type of sensitivity**

Sensitivity <sup>1</sup>	Number			Area		
	Pre-Project	Percent Impacted		Pre-Project (ha)	Percent Impacted	
		2016	2017		2016	2017
Total Including Sites with More Than One Sensitivity						
P	2,502	11.0	14.8	4,258.4	3.7	4.1
M	430	1.9	2.1	1,331.5	0.1	0.1
R	17	-	-	28.7	-	-
C	72	45.8	72.2	392.9	2.8	4.1
Total by Combination of Sensitivities						
P	2,245	11.8	15.6	4,098.0	3.8	4.2
P,M	231	0.4	0.9	82.2	0.0	0.0
P,C	26	30.8	65.4	78.3	0.8	2.4
M	186	3.8	3.8	1,242.5	0.1	0.1
R	4	-	-	21.8	-	-
M,R	13	-	-	6.9	-	-
C	46	54.3	76.1	314.7	3.4	4.5
All	2,751	11.1	15.0	5,844.2	2.9	3.2

<sup>1</sup> P = Priority Habitat, M = Off-system Marsh Habitat, R = Mammal Riparian Habitat, C = Caribou Calving and Rearing Habitat

<sup>1</sup> P = Priority Habitat, M = Off-system Marsh Habitat, R = Mammal Riparian Habitat, C = Caribou Calving and Rearing Habitat

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 166.0 ha of clearing that occurred, with 4.2% of total impacts in this type.

For priority habitat, most (83%) of impacts were in the planned Project footprint (Table 3-7); this was also the case for off-system marsh sites (74%). However, most (88%) of the impacted caribou calving and rearing habitat was in the possibly disturbed Project footprint. For priority habitat and caribou calving and rearing habitat, clearing or disturbance in the possibly disturbed Project footprint increased by 4.9 ha and 4.5 ha since 2016, respectively (Table 3-8). Clearing outside of the approved Project footprint for these two sensitive site types each increased by 0.5 ha since 2016.

In 2016, the sensitive site ground surveys found high accumulations of road dust on the vegetation extending more than 100 m from the road in places, which was much further than assumed for the EIS. Ground surveys in 2017 continued to find dust on vegetation, up to 70 m away from the north access road ROW. A study to further document road dust accumulation on vegetation will commence in 2018.

**Table 3-6: Area of terrestrial sensitive sites with documented Project impacts as of September 2017, by clearing or disturbance and by type of sensitivity**

Sensitivity <sup>1</sup>	Pre-Project Area (ha)	Cleared or Disturbed Area (ha)					
		Disturbed 2016	Disturbed 2017	Change	Cleared 2016	Cleared 2017	Change
Total Area, Including Sites with More Than One Sensitivity							
P	4,258.4	6.8	7.1	0.3	149.7	166.0	16.3
M	1,331.5	-	-	-	1.1	1.1	-
R	28.7	-	-	-	-	-	-
C	392.9	-	-	-	11.2	16.2	5.0
Total Area by Combination of Sensitivities							
P	4,098.0	6.8	7.1	0.3	149.1	164.1	15.0
P, M	82.2	-	-	-	0.0	0.0	0.0
P, C	78.3	-	-	-	0.6	1.9	1.2
M	1,242.5	-	-	-	1.1	1.1	0.0
R	21.8	-	-	-	-	-	-
M, R	6.9	-	-	-	-	-	-
C	314.7	-	-	-	10.6	14.3	3.7
All	5,844.2	6.8	7.1	0.3	161.4	181.4	20.0

<sup>1</sup> P = Priority Habitat, M = Off-system Marsh Habitat, R = Mammal Riparian Habitat, C = Caribou Calving and Rearing Habitat

**Table 3-7: Area of terrestrial sensitive sites impacted by the Project as of September 2017, by Project area**

Sensitivity <sup>1</sup>	Pre-Project Area (ha)	Cleared or Disturbed Area (ha)				Total Area Impacted
		Planned Project Footprint	Possibly Disturbed Project Footprint	Subsequently Approved Project Areas	Outside the Approved Project Footprint	
Total Area, Including Sites with More Than One Sensitivity						
P	4,258.4	143.8	11.8	14.3	3.3	173.1
M	1,331.5	0.8	0.3	-	0.0	1.1
R	28.7	-	-	-	-	0.0
C	392.9	0.4	14.2	0.6	1.0	16.2
Total Area by Combination of Sensitivities						
P	4,098.0	143.7	10.8	14.0	2.8	171.3
P, M	82.2	0.0	0.0	-	0.0	0.0
P, C	78.3	0.1	0.9	0.3	0.5	1.9
M	1,242.5	0.8	0.3	-	0.0	1.1
R	21.8	-	-	-	-	0.0
M,R	6.9	-	-	-	-	0.0
C	314.7	0.2	13.3	0.3	0.5	14.3
All	5,844.2	144.8	25.3	14.6	3.8	188.5

<sup>1</sup> P = Priority Habitat, M = Off-system Marsh Habitat, R = Mammal Riparian Habitat, C = Caribou Calving and Rearing Habitat



**Table 3-8: Change in area of sensitive sites impacted by the Project between September 2016 and 2017, by Project area and type of sensitivity**

Sensiti- vity <sup>1</sup>	Pre-Project Area (ha)	Planned Project Footprint (ha)			Possibly Disturbed Project Footprint (ha)			Subsequently Approved Project Areas (ha)			Outside the Approved Project Footprint (ha)		
		2016	2017	Change	2016	2017	Change	2016	2017	Change	2016	2017	Change
Total Area, Including Sites with More Than One Sensitivity													
P	4,258.4	134.1	143.8	9.7	6.8	11.8	4.9	12.8	14.3	1.4	2.8	3.3	0.5
M	1,331.5	0.8	0.8	0.0	0.3	0.3	0.0	-	-	-	0.0	0.0	-
R	28.7	-	-	-	-	-	-	-	-	-	-	-	-
C	392.9	0.4	0.4	0.0	9.8	14.2	4.5	0.6	0.6	0.0	0.5	1.0	0.5
Total Area by Combination of Sensitivities													
P	4,098.0	134.0	143.7	9.7	6.6	10.8	4.2	12.6	14.0	1.4	2.8	2.8	0.0
P, M	82.2	-	0.0	-	0.0	0.0	-	-	-	-	0.0	0.0	-
P, C	78.3	0.1	0.1	0.0	0.2	0.9	0.7	0.3	0.3	0.0	-	0.5	0.5
M	1,242.5	0.8	0.8	-	0.3	0.3	0.0	-	-	-	0.0	0.0	-
R	21.8	-	-	-	-	-	-	-	-	-	-	-	-
M,R	6.9	-	-	-	-	-	-	-	-	-	-	-	-
C	314.7	0.2	0.2	0.0	9.5	13.3	3.7	0.3	0.3	0.0	0.5	0.5	0.0
All	5,844.2	135.2	144.8	9.7	16.7	25.3	8.7	13.2	14.6	1.4	3.2	3.8	0.5

<sup>1</sup> P = Priority Habitat, M = Off-system Marsh Habitat, R = Mammal Riparian Habitat, C = Caribou Calving and Rearing Habitat

<sup>1</sup> P = Priority Habitat, M = Off-system Marsh Habitat, R = Mammal Riparian Habitat, C = Caribou Calving and Rearing Habitat

## 3.2 IMPACTS ON MAMMAL RIPARIAN HABITAT SITES

Mammal riparian habitat made up a very small portion (< 0.01%) of pre-Project sensitive site area (Table 3-4). This was because mammal riparian habitat was uncommon in the possibly disturbed Project footprint.

No Project clearing or disturbance was observed in any of the mammal riparian sites in any of the survey years.

Ground surveys at Looking Back Creek in 2016 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, and this was continuing in 2017 (Photo 3-3). No mitigation recommendation was made for this site as the sediment was still confined to the pool next to the road bank. In 2017, sediment from a high-water event were found deposited into the shrub and graminoid-dominated riparian area just downstream of the Looking Back Creek NAR crossing (Photo 3-4). The source of the sediment did not appear to be the NAR, as sediment deposition was also found upstream, so no mitigation recommendations were made.



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





**Photo 3-4: Sediment deposition in riparian zone downstream of the NAR crossing at Looking Back Creek**

### **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 program (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 2017, Project clearing had affected nine of the off-system marsh sensitive sites included in the licensed Project footprint (one more than in 2016), for a total of 1.1 ha (Table 3-4), and 83% of this was in the 100 m buffer zone surrounding the marsh habitat (ECOSTEM 2018b).

Compared to clearing, no off-system marsh site had Project disturbance as of September 2017 (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).

### **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 2017 (Table 3-4). Caribou calving and rearing habitat impacts were solely in the reservoir area, and consisted of clearing which began during the winter prior to the 2016 terrestrial sensitive site surveys. Caribou calving and rearing habitat disturbance by the Project was not observed as of September 2017.

About 16.2 ha of reservoir clearing impacted almost three-quarters of the total number of pre-Project caribou sensitive sites as of September 2017. These impacts were generally situated in places where clearing was a long, very narrow band along the sensitive site boundaries.

The bulk of the impacted caribou calving and rearing habitat was within the possibly disturbed Project footprint, where 14.2 ha was cleared (Table 3-8). This was an increase of 4.5 ha since 2016. Only 0.4 ha of clearing was in the planned Project footprint. Approximately 0.6 ha of clearing was 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 largest area impacted (14.2 ha) within the possibly disturbed Project footprint in 2017 (Table 6-3).

### **3.5 IMPACTS ON PRIORITY HABITAT SITES**

As of September 2015, 15.0% (412) of the 2,502 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% (173.1 ha) of total area (Table 3-4; Table 3-5).

The vast majority of impacted priority habitat (143.8 ha) was in the planned Project footprint (Table 3-7). Subsequently approved Project areas included the next highest amount of priority habitat (14.3 ha), followed by the possibly disturbed Project footprint (11.8 ha), followed by areas outside the approved Project areas (3.3 ha).

Compared with September 2016, the amount of priority habitat area cleared by the Project increased by 16.3 ha in 2017, while disturbance increased by 0.3 ha (Table 3-6). The



disturbance occurred in a trail used to access the south reservoir clearing areas. The trail followed a pre-existing cutline.

Most of the increased impacts on priority habitat from 2016 to 2017 (9.7 ha) were in the planned Project footprint (Table 3-8). The amount of impacted priority habitat in the possibly disturbed Project footprint increased by 4.9 ha. Changes within the subsequently approved areas increased by 1.4 ha while those outside the approved Project footprint increased by 0.5 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 3-5). Aerial surveys in 2017 found no evidence of additional activity in the already cleared areas near the N-6 site or in the site itself.



**Photo 3-5: Trails and reservoir clearing adjacent to the western and southern boundary of the N-6 priority habitat site to avoid**

Of the 54 priority habitat types, 14 had not been impacted by the Project as of September 2017 (Table 3-9). For most priority habitat types, increases in area impacted between September of 2016 and 2017 were small (less than 5% of pre-Project area). Priority habitat types with the largest increase in impacts relative to their pre-Project area were low vegetation on riparian peatland (43%), black spruce dominant on riparian peatland (20%) and black spruce dominant on thin peatland (18%).

Project impacts on priority habitat types as of September 2017, were highest in black spruce mixture vegetation on mineral ecosites (66.6 ha) and jack pine dominant vegetation on mineral ecosites (34.2 ha; Table 3-9), respectively. An increase of 5.8 ha was found in black spruce mixture on mineral and a 3.6 ha increase was found in jack pine dominant on mineral since 2016 (Table 6-1).

In relative terms, black spruce dominant vegetation on shallow peatland had the highest impacts at 78% (0.6 ha) of the total pre-Project area being monitored, which was unchanged from 2016. None of the other habitat types had impacts on more than 13% of their total pre-Project area.

Project disturbance was highest in the jack pine dominant on mineral priority habitat type, with 2.41 ha in 2016 (Table 6-2), which amounted to only 0.6% of the total pre-Project area. This was unchanged from 2016. Black spruce dominant vegetation on mineral ecosites had the highest disturbance in percentage terms in 2017, affecting 1.1% of pre-Project area.

Table 6-3 provides the areas impacted by the Project as of September 2017 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 (29.2 ha) and black spruce mixture on thin peatland (11.2 ha). Jack pine dominant vegetation on mineral ecosites had the highest increase in impacted area from 2016 to 2017 (3.4 ha).

The priority habitat type with the largest cleared or disturbed area within the subsequently approved Project areas was Black spruce mixture vegetation on mineral ecosites with 4.6 ha in 2017 (Table 6-3), increasing approximately 0.9 ha since 2016. Jack pine dominant vegetation on mineral ecosites and jack pine mixture vegetation on thin peatland ecosites were similarly impacted with 3.9 and 3.5 ha, respectively in 2017. These amounts were unchanged since 2016.

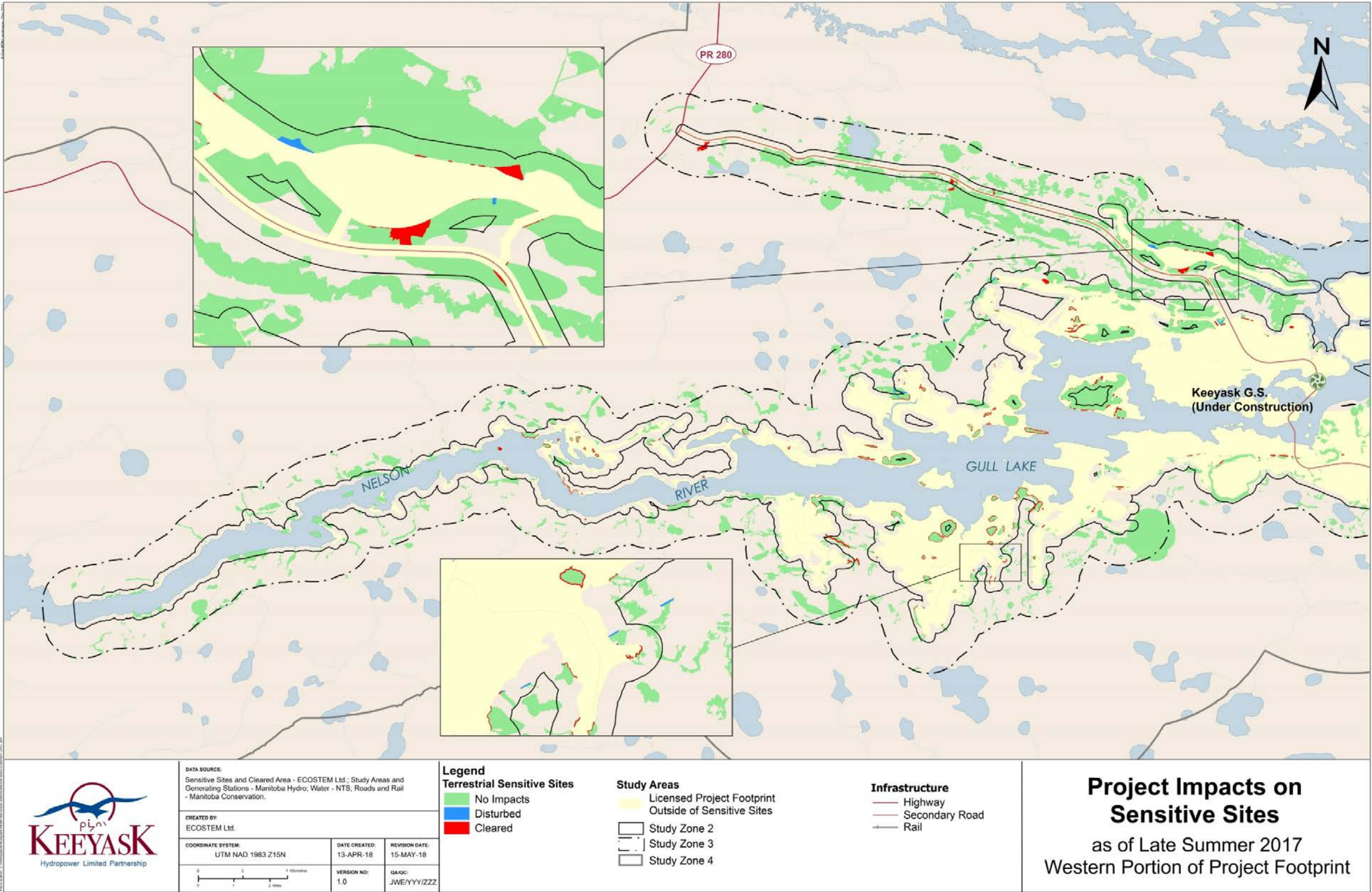
Jack pine mixture vegetation on thin peatland ecosites had the largest area impacted outside the approved Project footprint with 1.1 ha in 2017 (Table 6-3), which was unchanged since 2016. While trembling aspen dominant vegetation on all ecosites had the largest increase in impacted area from 2016 to 2017, the total area was only 0.5 ha. 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 0.8 ha, 0.7 ha and 0.2 ha, respectively.



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

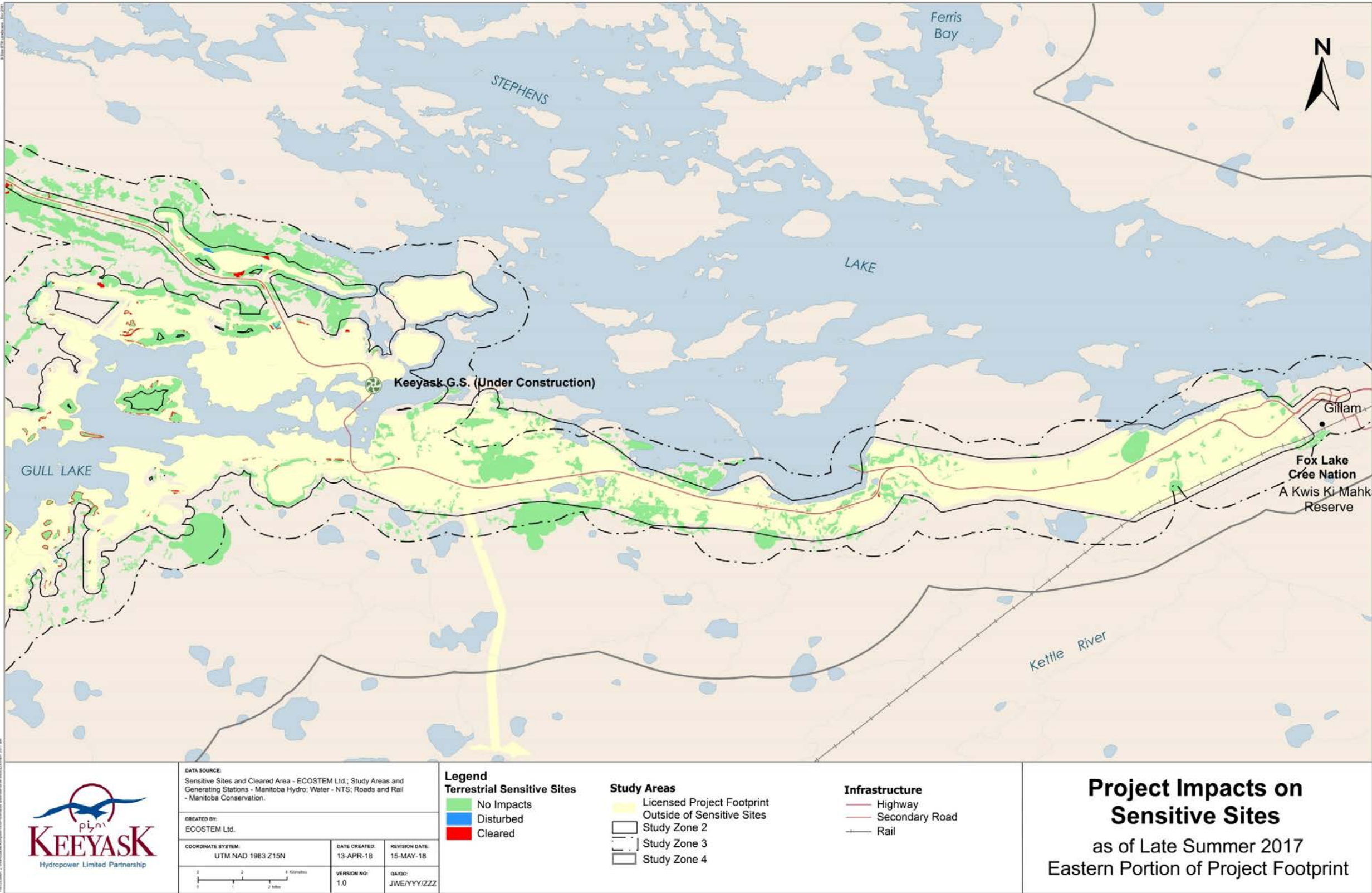
Priority Habitat Type	Number of Sites		Total Area (ha)	
	Pre-Project	Impacted	Pre-Project	Impacted
Balsam poplar dominant on all ecosites	2	1	1.0	0.0
Trembling aspen dominant on all ecosites	91	16	242.6	5.2
Trembling aspen mixedwood on all ecosites	54	3	217.5	2.0
White birch dominant on all ecosites	25	2	40.1	0.1
White birch mixedwood on all ecosites	16	2	38.3	0.0
Jack pine dominant on mineral	88	30	376.7	34.2
Jack pine dominant on shallow peatland	2	-	4.7	-
Jack pine dominant on thin peatland	17	1	74.0	0.6
Jack pine mixedwood on mineral	34	2	122.7	0.6
Jack pine mixedwood on shallow peatland	4	-	7.6	-
Jack pine mixedwood on thin peatland	23	4	83.4	1.9
Jack pine mixture on shallow peatland	12	2	44.2	0.3
Jack pine mixture on thin peatland	86	18	294.9	13.0
Black spruce dominant on ground ice peatland	5	4	0.3	0.1
Black spruce dominant on mineral	8	2	0.9	0.0
Black spruce dominant on riparian peatland	2	2	0.3	0.1
Black spruce dominant on shallow peatland	18	7	0.7	0.6
Black spruce dominant on thin peatland	20	6	0.6	0.1
Black spruce dominant on wet peatland	476	25	432.6	6.4
Black spruce mixedwood on mineral	37	7	166.9	1.6
Black spruce mixedwood on shallow peatland	5	1	4.2	0.0
Black spruce mixedwood on thin peatland	18	2	9.3	0.0
Black spruce mixture on ground ice peatland	1	-	0.0	-
Black spruce mixture on mineral	146	58	528.8	67.1
Black spruce mixture on shallow peatland	232	12	218.3	2.6
Black spruce mixture on thin peatland	300	72	333.9	12.7
Black spruce mixture on wet peatland	25	1	17.9	0.1
Tamarack- black spruce mixture on riparian peatland	3	-	0.4	-
Tamarack dominant on mineral	7	3	6.1	0.4
Tamarack dominant on shallow peatland	9	-	5.3	-
Tamarack dominant on thin peatland	5	1	5.9	0.4
Tamarack dominant on wet peatland	17	1	25.9	0.0
Tamarack mixture on mineral	40	13	69.9	8.0
Tamarack mixture on shallow peatland	164	12	132.9	0.5
Tamarack mixture on thin peatland	129	22	134.5	2.5
Tamarack mixture on wet peatland	100	8	103.3	0.8
Tall shrub on mineral	18	7	35.3	0.8
Tall shrub on riparian peatland	1	-	0.0	-
Tall shrub on shallow peatland	64	5	150.0	0.2

Priority Habitat Type	Number of Sites		Total Area (ha)	
	Pre-Project	Impacted	Pre-Project	Impacted
Tall shrub on thin peatland	55	11	77.2	10.0
Tall shrub on wet peatland	63	1	51.3	0.1
Low vegetation on mineral	4	1	0.4	0.0
Low vegetation on riparian peatland	5	4	0.2	0.1
Low vegetation on shallow peatland	1	-	0.0	-
Low Vegetation on thin peatland	3	1	1.1	0.1
Low vegetation on wet peatland	1	-	0.0	-
Marsh	186	7	1,242.5	1.1
Riparian	4	-	21.8	-
Riparian- Looking Back Creek	14	-	177.6	-
Marsh, Riparian	13	-	6.9	-
Emergent island in littoral	5	-	6.6	-
Emergent on lower beach	15	-	4.2	-
Emergent on upper beach	32	-	8.0	-
Caribou Calving and Rearing Habitat	46	35	314.7	14.3
<b>All</b>	<b>2,751</b>	<b>412</b>	<b>5,844.2</b>	<b>188.5</b>



Map 3-1: Project impacts on terrestrial sensitive sites outside of the planned Project footprint as of September 2017 – western portion of Project footprint





Map 3-2: Project impacts on terrestrial sensitive sites outside of the planned Project footprint as of September 2017 – eastern portion of Project footprint

## 4.0 DISCUSSION

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.

The Priority Habitats monitoring includes 2,751 individual sensitive sites with a pre-Project area totalling 5,884 ha. Even prior to Project construction, some of the individual sites were very small in size, primarily because overlaps with permanent Project features were removed.

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.

Approximately 8% (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 (2018a) for details). These additions were not a concern for the sensitive sites being monitored by this study. It was expected that some impacts would occur on sensitive sites. Also, the potential additional areas were evaluated for potential effects on the sensitive sites prior to their submission for approval, and their locations were modified to reduce any ecological concerns. Given the very small percentage (3%) of the total monitored sensitive site area that had been impacted to date, as well as the high percentage (87%) of area within the licensed Project footprint that was expected to remain undisturbed at the end of construction, cumulative effects to the sensitive sites would still be within the acceptable limits used in the EIS.

Two percent (3.8 ha) of sensitive site clearing, or 0.1% of pre-impact sensitive site area, was outside of 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.

## 5.0 SUMMARY AND CONCLUSIONS

As of September 2017, the Project had disturbed or completely cleared only 188.5 ha, or 3.2%, of the total pre-Project sensitive site area being monitored by this study. This was a 20.3 ha increase over the total area impacted as of September 2016.

In terms of the Project areas, 90% (170.2 ha) of the impacted sensitive site area was within the licensed Project footprint, and 77% (144.8 ha) was within the planned Project footprint. Only 13% of the pre-Project sensitive site area within the licensed Project footprint was cleared or disturbed.

Approximately 8% (14.6) ha of the impacted sensitive site area was within areas subsequently approved as Project areas by Manitoba Sustainable Development, and 2% (3.8 ha) was outside of approved Project areas. These small amounts of clearing in sensitive sites were not a major ecological concern.

There was no clearing or disturbance in the “N-6 priority habitat site to avoid” as of September 2017. Additionally, there was no evidence of activity within the nearby areas that had been cleared in 2016 for geotechnical explorations related to potential fish egress channels.

Projected clearing or disturbance impacted 4% of the pre-Project priority habitat area as of September 2017. Of the terrestrial sensitivities being monitored by this study, Project impacts were highest on priority habitat by far (93% of total impacted area). This was expected for two reasons. Compared with the other types, there was much more priority habitat to start with. Also, a much higher proportion of priority habitat included areas with granular mineral material, 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.

Caribou calving and rearing habitat sites had the second highest degree of Project impacts in September 2017, followed by off-system marsh sites. No Project clearing or disturbance was observed in any of the mammal riparian habitat sites.

Of the 54 types of priority habitat being monitored by this study, 14 remained entirely unaffected by the Project in September 2017. 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 66.6 ha and 34.2 ha of disturbed or cleared area, respectively.

Near the Looking Back Creek mammal riparian habitat sites, ground surveys further investigated potential impacts at two locations. At one location, erosion from the north access road (NAR) shoulder was depositing sediment into small waterbodies adjacent to the creek. A mitigation recommendation was not made for this location as the sediment appeared to be confined to the pool next to the road bank. At the second location, it appeared that a high-water level event had deposited sediment into the riparian vegetation downstream of the NAR. A mitigation recommendation was not made for this site, as the NAR did not appear to be the source of sediment.

In 2016, the ground surveys at Looking Back Creek found high accumulations of road dust on the vegetation more than 100 m from the road, which was much further than assumed for the EIS. These dust accumulations were observed again in 2017. A new study will continue examining dust accumulations on plants near the main access roads in 2018.

Monitoring to September 2017 did not identify any major unanticipated Project effects on the important habitats. 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.

## 5.1 NEXT STEPS

Monitoring to document the amount of priority habitat and other sensitive sites affected by the Project will continue in 2018. A study to monitor dust accumulations on plants near the main access roads will begin in summer 2018.



## 6.0 LITERATURE CITED

- ECOSTEM 2015. Keeyask Infrastructure Project: Terrestrial plant, habitat and ecosystem monitoring during construction: Annual report 2014 - 2015.
- ECOSTEM 2016. Terrestrial Effects Monitoring Plan Annual Report 2015 – 2016: Keeyask Generation Project: Terrestrial Plant, Habitat, and Ecosystem Monitoring: Annual Report 2015-2016. A report prepared for Manitoba Hydro by ECOSTEM Ltd., June 2016.
- ECOSTEM. 2017a. Keeyask Generation Project Terrestrial Effects Monitoring Plan Report #TEMP-2017-01: Habitat Loss and Disturbance Monitoring Report. A report prepared for Manitoba Hydro by ECOSTEM Ltd., June 2017.
- ECOSTEM. 2017b. Keeyask Generation Project Terrestrial Effects Monitoring Plan Report #TEMP-2017-02: Priority Habitats Monitoring Report. A report prepared for Manitoba Hydro by ECOSTEM Ltd., June 2017.
- ECOSTEM. 2018a. Keeyask Generation Project Terrestrial Effects Monitoring Plan Report #TEMP-2018-01: Habitat Loss and Disturbance Monitoring Report. A report prepared for Manitoba Hydro by ECOSTEM Ltd., April 2018.
- ECOSTEM. 2018b. Keeyask Generation Project Terrestrial Effects Monitoring Plan Report #TEMP-2018-03: Wetland Loss and Disturbance Monitoring Report. A report prepared for Manitoba Hydro by ECOSTEM Ltd., April 2018.
- Keeyask Hydropower Limited Partnership (KHLP). 2012a. Keeyask Generation Project Environmental Impact Statement: Response to EIS Guidelines, Winnipeg, Manitoba. June 2012.
- Keeyask Hydropower Limited Partnership (KHLP). 2012b. Keeyask Generation Project Environmental Impact Statement: Terrestrial Environment Supporting Volume, Winnipeg, Manitoba. June 2012.
- Keeyask Hydropower Limited Partnership (KHLP). 2015. Keeyask Generation Project Terrestrial Effects Monitoring Plan. Winnipeg, Manitoba. December 2015.



## **APPENDIX 1: DETAILED RESULTS**

**Table 6-1: Number and area of terrestrial sensitive sites impacted by the Project as of September 2017, by broad/priority habitat type**

Broad/Priority Habitat Type	Sensitivity <sup>1</sup>	Number of Sensitive Sites				Total Area (ha) Impacted			
		Pre-Project	Impacted			Pre-Project	Impacted		
			2016	2017	Change		2016	2017	Change
Balsam poplar dominant on all ecosites	P	2	-	1	<b>1</b>	1.0	-	0.0	<b>0.0</b>
	P	73	9	12	<b>3</b>	217.8	2.7	4.2	<b>1.5</b>
Trembling aspen dominant on all ecosites	P,C	4	2	3	<b>1</b>	16.6	0.4	0.9	<b>0.6</b>
	P,M	14	-	1	<b>1</b>	8.3	-	0.0	<b>0.0</b>
Trembling aspen mixedwood on all ecosites	P	46	3	3	-	214.7	2.0	2.0	<b>0.0</b>
	P,M	8	-	-	-	2.8	-	-	-
	P	12	1	2	<b>1</b>	25.3	0.1	0.1	<b>0.0</b>
White birch dominant on all ecosites	P,C	2	-	-	-	11.1	-	-	-
	P,M	11	-	-	-	3.7	-	-	-
	P	13	2	2	-	11.2	0.0	0.0	<b>0.0</b>
White birch mixedwood on all ecosites	P,C	1	-	-	-	26.3	-	-	-
	P,M	2	-	-	-	0.8	-	-	-
Jack pine dominant on mineral	P	86	28	30	<b>2</b>	376.1	30.5	34.2	<b>3.6</b>
	P,M	2	-	-	-	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	2	2	-	119.7	0.6	0.6	<b>0.0</b>
	P,M	11	-	-	-	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	<b>0.0</b>
	P,M	5	-	-	-	3.0	-	-	-
Jack pine mixture on shallow peatland	P	10	2	2	-	43.8	0.3	0.3	-
	P,M	2	-	-	-	0.4	-	-	-
Jack pine mixture on thin peatland	P	79	18	18	-	292.6	13.0	13.0	<b>0.0</b>

Broad/Priority Habitat Type	Sensitivity <sup>1</sup>	Number of Sensitive Sites				Total Area (ha) Impacted			
		Pre- Project	Impacted			Pre- Project	Impacted		
			2016	2017	Change		2016	2017	Change
	P,M	7	-	-	-	2.3	-	-	-
Black spruce dominant on ground ice peatland	P	5	1	4	<b>3</b>	0.3	0.0	0.1	<b>0.0</b>
Black spruce dominant on mineral	P	8	2	2	-	0.9	0.0	0.0	<b>0.0</b>
Black spruce dominant on riparian peatland	P	2	1	2	<b>1</b>	0.3	0.0	0.1	<b>0.0</b>
Black spruce dominant on shallow peatland	P	18	7	7	-	0.7	0.6	0.6	<b>0.0</b>
Black spruce dominant on thin peatland	P	19	-	6	<b>6</b>	0.6	-	0.1	<b>0.1</b>
	P,M	1	-	-	-	0.0	-	-	-
Black spruce dominant on wet peatland	P	440	24	25	<b>1</b>	424.7	6.4	6.4	<b>0.0</b>
	P,M	36	-	-	-	7.8	-	-	-
Black spruce mixedwood on mineral	P	36	5	6	<b>1</b>	165.8	1.6	1.6	<b>0.0</b>
	P,C	1	1	1	-	1.0	0.0	0.0	<b>0.0</b>
Black spruce mixedwood on shallow peatland	P	5	1	1	-	4.2	0.0	0.0	-
Black spruce mixedwood on thin peatland	P	18	2	2	-	9.3	0.0	0.0	<b>0.0</b>
Black spruce mixture on ground ice peatland	P	1	-	-	-	0.0	-	-	-
	P	133	42	53	<b>11</b>	511.8	60.7	66.6	<b>5.8</b>
Black spruce mixture on mineral	P,C	7	3	5	<b>2</b>	15.9	0.2	0.5	<b>0.3</b>
	P,M	6	-	-	-	1.1	-	-	-
	P	225	5	11	<b>6</b>	215.3	2.3	2.6	<b>0.3</b>
Black spruce mixture on shallow peatland	P,C	1	-	1	<b>1</b>	0.2	-	0.0	<b>0.0</b>
	P,M	6	-	-	-	2.8	-	-	-
	P	285	44	67	<b>23</b>	327.4	11.0	12.7	<b>1.7</b>
Black spruce mixture on thin peatland	P,C	8	2	5	<b>3</b>	3.1	0.0	0.1	<b>0.0</b>
	P,M	7	-	-	-	3.4	-	-	-
Black spruce mixture on wet peatland	P	25	1	1	-	17.9	0.1	0.1	-
Tamarack- black spruce mixture on riparian peatland	P	3	-	-	-	0.4	-	-	-
Tamarack dominant on mineral	P	7	3	3	-	6.1	0.4	0.4	<b>0.0</b>
Tamarack dominant on shallow peatland	P	7	-	-	-	5.2	-	-	-

Broad/Priority Habitat Type	Sensitivity <sup>1</sup>	Number of Sensitive Sites				Total Area (ha) Impacted			
		Pre- Project	Impacted			Pre- Project	Impacted		
			2016	2017	Change		2016	2017	Change
	P,M	2	-	-	-	0.1	-	-	-
Tamarack dominant on thin peatland	P	5	1	1	-	5.9	0.4	0.4	<b>0.0</b>
Tamarack dominant on wet peatland	P	16	-	1	<b>1</b>	25.9	-	0.0	<b>0.0</b>
	P,M	1	-	-	-	0.0	-	-	-
Tamarack mixture on mineral	P	38	12	13	<b>1</b>	69.5	7.9	8.0	<b>0.1</b>
	P,M	2	-	-	-	0.4	-	-	-
Tamarack mixture on shallow peatland	P	154	6	11	<b>5</b>	131.6	0.1	0.4	<b>0.4</b>
	P,C	1	-	1	<b>1</b>	0.3	-	0.0	<b>0.0</b>
	P,M	9	-	-	-	1.0	-	-	-
Tamarack mixture on thin peatland	P	126	11	21	<b>10</b>	130.2	1.2	2.3	<b>1.1</b>
	P,C	1	-	1	<b>1</b>	3.8	-	0.2	<b>0.2</b>
	P,M	2	-	-	-	0.6	-	-	-
Tamarack mixture on wet peatland	P	80	7	8	<b>1</b>	101.3	0.8	0.8	<b>0.1</b>
	P,M	20	-	-	-	2.0	-	-	-
Tall shrub on mineral	P	18	6	7	<b>1</b>	35.3	0.6	0.8	<b>0.2</b>
Tall shrub on riparian peatland	P	1	-	-	-	0.0	-	-	-
Tall shrub on shallow peatland	P	61	2	5	<b>3</b>	149.7	0.1	0.2	<b>0.1</b>
	P,M	3	-	-	-	0.3	-	-	-
Tall shrub on thin peatland	P	54	10	10	-	77.1	9.9	10.0	<b>0.1</b>
	P,M	1	1	1	-	0.1	0.0	0.0	-
Tall shrub on wet peatland	P	53	1	1	-	49.6	0.1	0.1	-
	P,M	10	-	-	-	1.7	-	-	-
Low vegetation on mineral	P	4	1	1	-	0.4	0.0	0.0	-
Low vegetation on riparian peatland	P	5	-	4	<b>4</b>	0.2	-	0.1	<b>0.1</b>
Low vegetation on shallow peatland	P	1	-	-	-	0.0	-	-	-
Low Vegetation on thin peatland	P	3	-	1	<b>1</b>	1.1	-	0.1	<b>0.1</b>
Low vegetation on wet peatland	P	1	-	-	-	0.0	-	-	-
Marsh	M	186	7	7	-	1,242.5	1.1	1.1	<b>0.0</b>

Broad/Priority Habitat Type	Sensitivity <sup>1</sup>	Number of Sensitive Sites				Total Area (ha) Impacted			
		Pre- Project	Impacted			Pre- Project	Impacted		
			2016	2017	Change		2016	2017	Change
Riparian	R	4	-	-	-	21.8	-	-	-
Marsh, Riparian	M,R	13	-	-	-	6.9	-	-	-
Riparian- Looking Back Creek	P	4	-	-	-	160.4	-	-	-
Riparian- Looking Back Creek	P,M	10	-	-	-	17.1	-	-	-
Emergent island in littoral	P,M	5	-	-	-	6.6	-	-	-
Emergent on lower beach	P,M	15	-	-	-	4.2	-	-	-
Emergent on upper beach	P,M	32	-	-	-	8.0	-	-	-
Caribou Calving and Rearing Habitat	C	46	25	35	<b>10</b>	314.7	10.6	14.3	<b>3.7</b>
<b>All</b>		<b>2751</b>	<b>306</b>	<b>412</b>	<b>106</b>	<b>5,844.2</b>	<b>168.2</b>	<b>188.5</b>	<b>20.3</b>

<sup>1</sup> 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 2017 by broad/priority habitat type**

Broad/Priority Habitat Type	Sensitivity <sup>1</sup>	Total Area Pre-Project	Area (ha) Cleared or Disturbed					
			Disturbed 2016	Disturbed 2017	Change	Cleared 2016	Cleared 2017	Change
Balsam poplar dominant on all ecosites	P	1.0	-	-	-	-	0.03	<b>0.03</b>
Trembling aspen dominant on all ecosites	P	217.8	0.01	0.01	-	2.72	4.24	<b>1.52</b>
	P,M	8.3	-	-	-	-	0.00	<b>0.00</b>
	P,C	16.6	-	-	-	0.37	0.93	<b>0.57</b>
Trembling aspen mixedwood on all ecosites	P	214.7	1.40	1.40	<b>0.00</b>	0.62	0.62	<b>0.00</b>
	P,M	2.8	-	-	-	-	-	-
White birch dominant on all ecosites	P	25.3	-	-	-	0.10	0.10	<b>0.00</b>
	P,M	3.7	-	-	-	-	-	-
	P,C	11.1	-	-	-	-	-	-
White birch mixedwood on all ecosites	P	11.2	-	-	-	0.01	0.01	<b>0.00</b>
	P,M	0.8	-	-	-	-	-	-
	P,C	26.3	-	-	-	-	-	-
Jack pine dominant on mineral	P	376.1	2.41	2.41	-	28.12	31.76	<b>3.64</b>
	P,M	0.6	-	-	-	-	-	-
Jack pine dominant on shallow peatland	P	4.7	-	-	-	-	-	-
Jack pine dominant on thin peatland	P	74.0	-	-	-	0.61	0.61	-
	P,M	0.0	-	-	-	-	-	-
Jack pine mixedwood on mineral	P	119.7	0.62	0.62	<b>0.00</b>	0.00	0.00	<b>0.00</b>
	P,M	3.0	-	-	-	-	-	-
Jack pine mixedwood on shallow peatland	P	7.6	-	-	-	-	-	-
Jack pine mixedwood on thin peatland	P	80.4	0.02	0.02	<b>0.00</b>	1.93	1.93	<b>0.00</b>
	P,M	3.0	-	-	-	-	-	-
Jack pine mixture on shallow peatland	P	43.8	-	-	-	0.26	0.26	-
	P,M	0.4	-	-	-	-	-	-
Jack pine mixture on thin peatland	P	292.6	0.64	0.64	<b>0.00</b>	12.31	12.31	<b>0.00</b>
	P,M	2.3	-	-	-	-	-	-

Broad/Priority Habitat Type	Sensitivity <sup>1</sup>	Total Area Pre-Project	Area (ha) Cleared or Disturbed					
			Disturbed 2016	Disturbed 2017	Change	Cleared 2016	Cleared 2017	Change
Black spruce dominant on ground ice peatland	P	0.3	-	-	-	0.02	0.05	<b>0.04</b>
Black spruce dominant on mineral	P	0.9	0.01	0.01	<b>0.00</b>	0.01	0.01	-
Black spruce dominant on riparian peatland	P	0.3	-	-	-	0.01	0.06	<b>0.05</b>
Black spruce dominant on shallow peatland	P	0.7	-	-	-	0.57	0.57	<b>0.00</b>
Black spruce dominant on thin peatland	P	0.6	-	-	-	-	0.11	<b>0.11</b>
	P,M	0.0	-	-	-	-	-	-
Black spruce dominant on wet peatland	P	424.7	-	-	-	6.38	6.38	<b>0.01</b>
	P,M	7.8	-	-	-	-	-	-
Black spruce mixedwood on mineral	P	165.8	0.19	0.19	-	1.40	1.40	<b>0.00</b>
	P,C	1.0	-	-	-	0.02	0.02	<b>0.00</b>
Black spruce mixedwood on shallow peatland	P	4.2	-	-	-	0.03	0.03	-
Black spruce mixedwood on thin peatland	P	9.3	-	-	-	0.02	0.02	<b>0.00</b>
Black spruce mixture on ground ice peatland	P	0.0	-	-	-	-	-	-
Black spruce mixture on mineral	P	511.8	1.11	1.12	<b>0.01</b>	59.61	65.43	<b>5.82</b>
	P,M	1.1	-	-	-	-	-	-
	P,C	15.9	-	-	-	0.19	0.54	<b>0.35</b>
Black spruce mixture on shallow peatland	P	215.3	-	-	-	2.30	2.56	<b>0.26</b>
	P,M	2.8	-	-	-	-	-	-
	P,C	0.2	-	-	-	-	0.03	<b>0.03</b>
Black spruce mixture on thin peatland	P	327.4	0.07	0.15	<b>0.09</b>	10.93	12.51	<b>1.59</b>
	P,M	3.4	-	-	-	-	-	-
	P,C	3.1	-	-	-	0.05	0.08	<b>0.03</b>
Black spruce mixture on wet peatland	P	17.9	-	-	-	0.05	0.05	-
Tamarack- black spruce mixture on riparian peatland	P	0.4	-	-	-	-	-	-

Broad/Priority Habitat Type	Sensitivity <sup>1</sup>	Total Area Pre-Project	Area (ha) Cleared or Disturbed					
			Disturbed 2016	Disturbed 2017	Change	Cleared 2016	Cleared 2017	Change
Tamarack dominant on mineral	P	6.1	-	-	-	0.41	0.41	<b>0.00</b>
Tamarack dominant on shallow peatland	P	5.2	-	-	-	-	-	-
	P,M	0.1	-	-	-	-	-	-
Tamarack dominant on thin peatland	P	5.9	-	-	-	0.38	0.38	<b>0.00</b>
Tamarack dominant on wet peatland	P	25.9	-	-	-	-	0.01	<b>0.01</b>
	P,M	0.0	-	-	-	-	-	-
Tamarack mixture on mineral	P	69.5	-	-	-	7.94	8.04	<b>0.10</b>
	P,M	0.4	-	-	-	-	-	-
Tamarack mixture on shallow peatland	P	131.6	0.00	0.17	<b>0.16</b>	0.07	0.26	<b>0.19</b>
	P,M	1.0	-	-	-	-	-	-
	P,C	0.3	-	-	-	-	0.04	<b>0.04</b>
Tamarack mixture on thin peatland	P	130.2	-	0.04	<b>0.04</b>	1.23	2.27	<b>1.04</b>
	P,M	0.6	-	-	-	-	-	-
	P,C	3.8	-	-	-	-	0.21	<b>0.21</b>
Tamarack mixture on wet peatland	P	101.3	-	-	-	0.76	0.82	<b>0.06</b>
	P,M	2.0	-	-	-	-	-	-
Tall shrub on mineral	P	35.3	-	-	-	0.55	0.79	<b>0.24</b>
Tall shrub on riparian peatland	P	0.0	-	-	-	-	-	-
Tall shrub on shallow peatland	P	149.7	0.09	0.11	<b>0.02</b>	0.03	0.09	<b>0.06</b>
	P,M	0.3	-	-	-	-	-	-
Tall shrub on thin peatland	P	77.1	0.23	0.24	<b>0.01</b>	9.68	9.75	<b>0.07</b>
	P,M	0.1	-	-	-	0.01	0.01	-
Tall shrub on wet peatland	P	49.6	0.01	0.01	-	0.04	0.04	-
	P,M	1.7	-	-	-	-	-	-
Low vegetation on mineral	P	0.4	-	-	-	0.00	0.00	-
Low vegetation on riparian peatland	P	0.2	-	-	-	-	0.07	<b>0.07</b>
Low vegetation on shallow peatland	P	0.0	-	-	-	-	-	-
Low Vegetation on thin peatland	P	1.1	-	-	-	-	0.13	<b>0.13</b>



Broad/Priority Habitat Type	Sensitivity <sup>1</sup>	Total Area Pre-Project	Area (ha) Cleared or Disturbed					
			Disturbed 2016	Disturbed 2017	Change	Cleared 2016	Cleared 2017	Change
Low vegetation on wet peatland	P	0.0	-	-	-	-	-	-
Marsh	M	1,242.5	-	-	-	1.10	1.10	<b>0.00</b>
Riparian	R	21.8	-	-	-	-	-	-
Marsh, Riparian	M,R	6.9	-	-	-	-	-	-
Riparian- Looking Back Creek	P	160.4	-	-	-	-	-	-
	P,M	17.1	-	-	-	-	-	-
Emergent island in littoral	P,M	6.6	-	-	-	-	-	-
Emergent on lower beach	P,M	4.2	-	-	-	-	-	-
Emergent on upper beach	P,M	8.0	-	-	-	-	-	-
Caribou Calving and Rearing Habitat	C	314.7	-	-	-	10.57	14.30	<b>3.73</b>
<b>All</b>		<b>5,844.2</b>	<b>6.81</b>	<b>7.14</b>	<b>0.33</b>	<b>161.40</b>	<b>181.39</b>	<b>19.99</b>

<sup>1</sup> 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, 2017 by Project Area**

Broad/Priority Habitat Type	Sensitivity <sup>1</sup>	Total Area Impacted by the Project (ha)	Planned Project Footprint (ha)			Possibly Disturbed Project Footprint (ha)			Subsequently Approved Areas (ha)			Outside the Approved Project Footprint (ha)		
			2016	2017	Change	2016	2017	Change	2016	2017	Change	2016	2017	Change
Balsam poplar dominant on all ecosites	P	0.03	-	-	-	-	0.03	0.03	-	-	-	-	0.00	0.00
Trembling aspen dominant on all ecosites	P	4.25	2.45	3.87	1.42	0.26	0.37	0.10	0.01	0.01	-	-	-	-
	P,M	0.00	-	0.00	0.00	-	-	-	-	-	-	-	-	-
	P,C	0.93	0.13	0.13	0.00	0.16	0.23	0.07	0.08	0.08	-	-	0.49	0.49
Trembling aspen mixedwood on all ecosites	P	2.02	0.00	0.00	0.00	0.59	0.59	0.00	0.77	0.77	-	0.66	0.66	0.00
White birch dominant on all ecosites	P	0.10	0.00	0.00	0.00	0.10	0.10	0.00	-	-	-	-	-	-
White birch mixedwood on all ecosites	P	0.01	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-
Jack pine dominant on mineral	P	34.18	25.77	29.22	3.45	0.08	0.28	0.20	3.94	3.94	-	0.75	0.75	0.00
Jack pine dominant on thin peatland	P	0.61	0.61	0.61	-	-	-	-	-	-	-	-	-	-
Jack pine mixedwood on mineral	P	0.62	0.62	0.62	0.00	-	-	-	-	-	-	-	-	-
Jack pine mixedwood on thin peatland	P	1.94	1.89	1.89	0.00	-	-	-	0.05	0.05	-	-	-	-
Jack pine mixture on shallow peatland	P	0.26	0.04	0.04	-	-	-	-	-	-	-	0.22	0.22	-

Broad/Priority Habitat Type	Sensi- tivity <sup>1</sup>	Total Area Impacted by the Project (ha)	Planned Project Footprint (ha)			Possibly Disturbed Project Footprint (ha)			Subsequently Approved Areas (ha)			Outside the Approved Project Footprint (ha)		
			2016	2017	Change	2016	2017	Change	2016	2017	Change	2016	2017	Change
Jack pine mixture on thin peatland	P	12.95	8.33	8.33	0.00	0.02	0.02	0.00	3.48	3.48	-	1.12	1.12	0.00
Black spruce dominant on ground ice peatland	P	0.05	-	-	-	0.02	0.05	0.04	-	-	-	-	-	-
Black spruce dominant on mineral	P	0.02	0.02	0.02	0.00	-	-	-	-	-	-	-	-	-
Black spruce dominant on riparian peatland	P	0.06	0.00	0.00	0.00	0.01	0.06	0.05	-	-	-	-	-	-
Black spruce dominant on shallow peatland	P	0.57	0.53	0.53	-	0.05	0.05	0.00	-	-	-	-	-	-
Black spruce dominant on thin peatland	P	0.11	-	0.05	0.05	-	0.07	0.07	-	-	-	-	-	-
Black spruce dominant on wet peatland	P	6.38	6.19	6.19	0.00	0.18	0.19	0.01	-	-	-	-	-	-
Black spruce mixedwood on mineral	P	1.59	1.16	1.16	0.00	0.25	0.25	0.00	0.19	0.19	-	-	-	-
	P,C	0.02	-	-	-	0.02	0.02	0.00	-	-	-	-	-	-
Black spruce mixedwood on shallow peatland	P	0.03	-	-	-	0.02	0.02	-	-	-	-	0.01	0.01	-

Broad/Priority Habitat Type	Sensi- tivity <sup>1</sup>	Total Area Impacted by the Project (ha)	Planned Project Footprint (ha)			Possibly Disturbed Project Footprint (ha)			Subsequently Approved Areas (ha)			Outside the Approved Project Footprint (ha)		
			2016	2017	Change	2016	2017	Change	2016	2017	Change	2016	2017	Change
Black spruce mixedwood on thin peatland	P	0.02	0.01	0.01	0.00	0.01	0.01	-	-	-	-	-	-	-
Black spruce mixture on mineral	P	66.56	55.50	58.56	3.06	1.51	3.37	1.86	3.71	4.63	0.92	0.00	0.00	0.00
	P,C	0.54	-	0.00	0.00	0.04	0.39	0.35	0.15	0.15	-	-	-	-
Black spruce mixture on shallow peatland	P	2.56	2.27	2.29	0.02	0.03	0.27	0.24	-	-	-	-	-	-
	P,C	0.03	-	-	-	-	0.03	0.03	-	-	-	-	-	-
Black spruce mixture on thin peatland	P	12.67	10.33	11.20	0.87	0.57	1.23	0.66	0.09	0.24	0.15	-	-	-
	P,C	0.08	-	0.00	0.00	-	0.03	0.03	0.05	0.05	0.00	-	-	-
Black spruce mixture on wet peatland	P	0.05	0.04	0.04	-	0.01	0.01	-	-	-	-	-	-	-
Tamarack dominant on mineral	P	0.41	0.41	0.41	0.00	-	-	-	-	-	-	-	-	-
Tamarack dominant on thin peatland	P	0.38	0.38	0.38	0.00	0.00	0.00	-	-	-	-	-	-	-
Tamarack dominant on wet peatland	P	0.01	-	-	-	-	0.01	0.01	-	-	-	-	-	-
Tamarack mixture on mineral	P	8.04	7.89	7.89	0.00	0.05	0.15	0.10	-	-	-	-	-	-
Tamarack mixture on shallow peatland	P	0.42	0.06	0.34	0.28	0.01	0.09	0.08	0.00	0.00	-	-	-	-
	P,C	0.04	-	0.00	0.00	-	0.04	0.04	-	-	-	-	-	-
Tamarack mixture on thin peatland	P	2.31	1.16	1.31	0.15	0.07	0.61	0.54	-	0.36	0.36	-	0.02	0.02
	P,C	0.21	-	-	-	-	0.21	0.21	-	-	-	-	-	-
Tamarack mixture on wet peatland	P	0.82	0.63	0.63	-	0.14	0.20	0.06	-	-	-	-	-	-



Broad/Priority Habitat Type	Sensi- tivity <sup>1</sup>	Total Area Impacted by the Project (ha)	Planned Project Footprint (ha)			Possibly Disturbed Project Footprint (ha)			Subsequently Approved Areas (ha)			Outside the Approved Project Footprint (ha)		
			2016	2017	Change	2016	2017	Change	2016	2017	Change	2016	2017	Change
Tall shrub on mineral	P	0.79	0.19	0.43	0.24	0.36	0.36	0.00	-	-	-	-	-	-
Tall shrub on shallow peatland	P	0.21	0.02	0.04	0.02	0.03	0.08	0.05	0.07	0.09	0.02	-	-	-
Tall shrub on thin peatland	P	9.98	7.50	7.50	0.01	2.18	2.25	0.07	0.22	0.22	-	0.00	0.00	-
	P,M	0.01	-	-	-	0.01	0.01	-	-	-	-	0.00	0.00	-
Tall shrub on wet peatland	P	0.05	-	-	-	0.04	0.04	-	0.01	0.01	-	-	-	-
Low vegetation on mineral	P	0.00	-	-	-	-	-	-	0.00	0.00	-	-	-	-
Low vegetation on riparian peatland	P	0.07	-	0.00	0.00	-	0.07	0.07	-	-	-	-	-	-
Low Vegetation on thin peatland	P	0.13	-	0.13	0.13	-	-	-	-	-	-	-	-	-
Marsh	M	1.10	0.82	0.82	-	0.28	0.28	0.00	-	-	-	0.00	0.00	-
Caribou Calving and Rearing Habitat	C	14.30	0.23	0.23	0.00	9.53	13.27	3.73	0.33	0.33	0.00	0.47	0.47	0.00
<b>All</b>		<b>188.53</b>	<b>135.15</b>	<b>144.83</b>	<b>9.68</b>	<b>16.66</b>	<b>25.33</b>	<b>8.68</b>	<b>13.16</b>	<b>14.60</b>	<b>1.44</b>	<b>3.24</b>	<b>3.76</b>	<b>0.52</b>

<sup>1</sup> P = Priority Habitat, M = Off-system Marsh Habitat, R = Mammal Riparian Habitat, C = Caribou Calving and Rearing Habitat