



Keeyask Generation Project Terrestrial Effects Monitoring Plan

Priority Habitats Monitoring Report

TEMP-2022-02



KEEYASK GENERATION PROJECT

TERRESTRIAL EFFECTS MONITORING PLAN

REPORT #TEMP-2022-02

PRIORITY HABITATS MONITORING

Prepared for
Manitoba Hydro

By
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SUMMARY

Background

Construction of the Keeyask Generation Project (the Project) at Gull Rapids began in July 2014. The vast majority of construction activities had been completed by fall 2021.

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 2021, the eighth summer of Project construction. It also evaluates Project effects on ecosystem diversity during construction.

Why is the study being done?

Ecosystem diversity refers to the number, size and distribution of different ecosystem, or habitat, types within the Keeyask region. Some of these habitat types are especially important for ecosystem health and/or to people. These are the 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”). The Project’s Environmental Protection Plans (EnvPPs) include measures to avoid or lessen Project effects on the priority and other habitat types. Additional habitat types are included 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.

The purpose of this study is to confirm the predicted Project effects on the terrestrial sensitive sites. As clearing and disturbance from construction activities was largely complete as of fall 2021, Project effects on ecosystem diversity were also evaluated.



A sensitive riparian site being monitored for disturbance



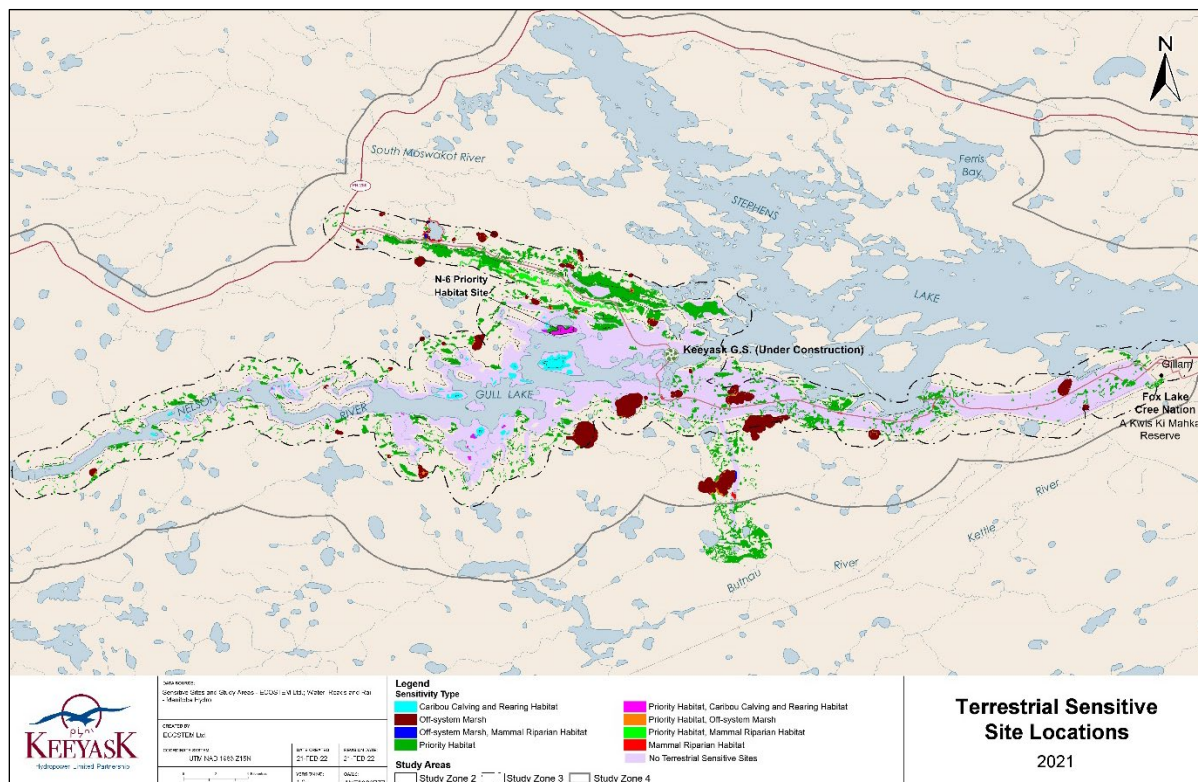
A rare white birch stand along Gull Lake being monitored for disturbance

What was done?

This study monitors Project effects on terrestrial sensitive sites that could be affected by the Project. It also documents overall effects on ecosystem diversity during the construction phase.

The portion of the Keeyask region being monitored by this study is larger than where Project effects on terrestrial sensitive sites are expected to occur. This is being done in case there are unanticipated effects beyond the Project footprint and, if there are any, they are documented.

Another terrestrial monitoring study mapped Project clearing and physical disturbance areas as of September 2021. This mapping was used to determine which sensitive sites and how much of each type of sensitive site was impacted as of September 2021, and how Project construction had affected ecosystem diversity. Ground surveys were also carried out at ten sensitive sites because they were of special interest (e.g. vegetation beside streams) or they were already being visited for other studies.



What was found?

Most (93%) of the impacted sensitive site area was in priority habitats. The priority habitat types with the highest Project impacts were black spruce mixture and jack pine dominant vegetation on mineral substrates.

The vast majority of actual Project effects on ecosystem diversity during construction were lower than predicted, and some were considerably lower (e.g., total area of affected priority habitat was 39% lower). While Project effects on three of the 41 priority habitat types were higher than predicted, the additional affected area was very small (ranging from 0.05 to 0.2 ha) and due to the addition of approved areas after the Project was licensed (e.g., the Ellis Esker borrow area and the access road to it).

What does it mean?

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

Project clearing or disturbance in terrestrial sensitive sites was very low as of September 2021, impacting only 3% of the total sensitive site area. The increase in total impacted area between 2020 and 2021 was the lowest observed since construction monitoring began.

While a higher proportion of priority habitat has been impacted by the Project compared with the other types of sensitive sites, these impacts were still less than 7% of the maximum amount predicted in the EIS.

It was expected that a higher proportion of priority habitat would be impacted by the Project compared with the other types of sensitive sites. 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. Conversely, other sensitive sites, including off-system marsh and mammal riparian habitat sites are found in wet and/or peaty areas, which are not locations where these features are typically placed.

The clearing recorded outside of the approved Project areas is not a major ecological concern for two reasons. Only 14% of the terrestrial sensitive site area within the licensed Project footprint had been cleared or disturbed as of September 2021, and it is expected that most of the area still undisturbed will remain that way since Project construction is essentially complete. Also, there are no specialized concerns with the specific sensitive sites that were impacted.

Monitoring has shown that the EIS predictions for construction phase effects on ecosystem diversity and priority habitats were consistent with what was observed, and were cautious. One of the reasons that actual Project effects were lower than predicted was because the mitigation measures outlined in the EIS were generally implemented as prescribed, and were effective.

What will be done next?

Surveys to document Project impacts on priority habitats and the other types of terrestrial sensitive sites will continue in summer 2022.

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STUDY TEAM

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GLOSSARY

Term	Definition
approved Project footprint areas	All areas that were either initially licenced or subsequently approved for use by the Government of Manitoba.
DOI	A spatial dataset produced from satellite images or digital stereo photos that have been stitched together and processed so that all pixels are positioned in an accurate ground position. Such processing is necessary because the earth's surface is round and has topography.
ecosystem diversity	The number of different ecosystem types, as well as their size and distribution, within a defined geographic area.
habitat loss	Permanent physical removal or alteration of previously undisturbed habitat.
licensed Project footprint	Footprint licensed for Project use under the Project's <i>Environment Act</i> Licence.
marsh	A class in the Canadian Wetland Classification System which includes non-peat wetlands having at least 25% emergent vegetation cover in the water fluctuation zone.
off-system	Water body or waterway outside of the Nelson River hydraulic zone of influence.
planned Project footprint	A subdivision of the licensed Project footprint where clearing or disturbance was expected and is largely comprised of permanent Project features.
possibly disturbed Project footprint	A subdivision of the licensed Project footprint where clearing or disturbance could potentially occur.
priority habitat	Native habitat types that are particularly important for ecological and/or social reasons.
Project clearing	Project areas with complete removal of trees and tall shrubs. Includes terrestrial areas that were flooded, or formerly aquatic areas that were dewatered.

Term	Definition
Project component	Defined areas within the Project footprint that serve a specified general purpose.
Project disturbance	Physical disturbance in an area of intact vegetation or use of pre-existing trails or borrow areas.
Project effect	Ecological consequences resulting from the physical impact of Project activity.
Project impact	Physical impact on terrestrial habitat and ecosystems as a result of Project activity.
Project footprint	Boundary of all areas affected by Project activities.

ACRONYMS

Acronym	Name
DOI	Digital orthorectified imagery
EIS	Environmental Impact Statement
EMPA	Excavated material placement area
EnvPP	Environmental Protection Plan
GIS	Geographic Information System
GS	Generating Station
KHLP	Keeyask Hydropower Limited Partnership
KIP	Keeyask Infrastructure Project
KM	Kilometre
NAR	North Access Road
TEMP	Terrestrial Effects Monitoring Plan

1.0 INTRODUCTION

The Keeyask Generation Project (the Project) is a 695-megawatt hydroelectric generating station (GS) and the associated facilities. 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. Project construction began in July 2014. The vast majority of construction activities had been completed by fall 2021. The reservoir was first brought to full supply level in September 2020 and the final generating unit went into service on March 9, 2022.

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; KHLP 2015) 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 ecosystem diversity, which is the focus of this report.

Ecosystem diversity refers to the number of different ecosystem types, as well as their size and distribution, within a defined geographic area. Priority habitat types are those native habitat types that are particularly important for ecological and/or social reasons.

As described in TEMP, during construction and operation, the Priority Habitats study is evaluating effects on ecosystem diversity based on changes in the various priority habitat types. The Priority Habitats 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, while priority habitats focus on the habitats that make particularly important contributions to ecosystem diversity. In this monitoring study, priority habitat types are the native habitat types in the Keeyask region that are rare or uncommon, highly diverse (i.e., species rich and/or structurally complex), highly sensitive to disturbance, have a high potential to support rare plants and/or are 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 each year from 2015 to 2021. ECOSTEM (2016; 2017; 2018b; 2019; 2020; 2021a) provide the findings for the priority habitat monitoring conducted from 2015 to 2020.

This report presents the priority habitat monitoring conducted in 2021, which includes addressing all four of the study objectives. As was the case for previous annual reports during Project construction, it addresses the first two objectives. This report also evaluates Project effects on ecosystem diversity during the construction phase, which is considered to have largely been completed in September 2021.

2.0 METHODS

2.1 APPROACH

The terrestrial sensitive sites included in this study (Section 2.2) were monitored to meet the first and second objectives of this study, which are to:

- Confirm that the N-6 priority habitat site identified for avoidance in the EIS is not disturbed; and,
- 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.

The remaining sensitive sites within Study Zone 3 (Map 2-1) were monitored to meet the third and fourth objectives of this study, which are to:

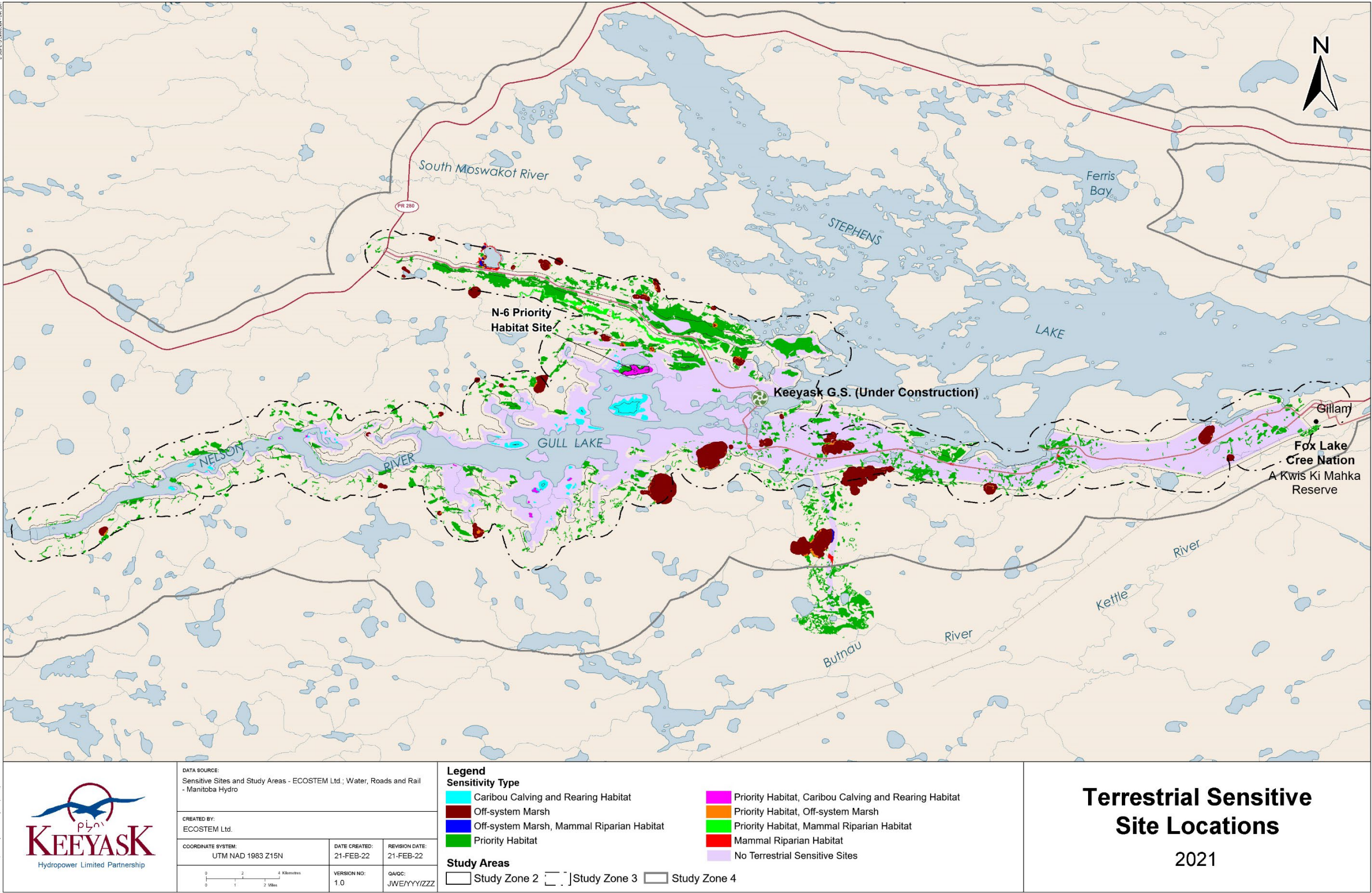
- Locate and quantify the amounts and locations of priority habitat types affected by the Project; and,
- Locate and quantify Project effects on ecosystem diversity.

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 (included in this report), 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 2021. The methods were the same as in previous years (ECOSTEM 2021a).

In the terrestrial habitat, ecosystems and plant studies reports, clearing is defined as complete vegetation removal in a patch that was at least 400 m² in size. Disturbance is defined as either physical disturbance in an area of intact vegetation (e.g., machinery trail, test pits), use of a pre-existing trail or a clearing smaller than 400 m². 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).

Bringing the reservoir to full supply level in fall 2020 introduced reservoir flooding as a Project impact type for the first time during construction monitoring. In situations where this report identifies which habitat areas were inundated for the reservoir, such impacts are referred to as initial flooding.



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

2.2 SENSITIVE SITES MONITORED

The general types of terrestrial sensitivities included in this monitoring study are priority habitats, off-system marsh habitat, mammal riparian habitat and caribou calving and rearing habitat (Map 2-1). 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 it was expected that these areas would be lost to Project construction. Also, some individual sites that had a very small area are not being monitored. Very small sites occur primarily because the majority of these sites were part of a permanent Project feature.

The total area of terrestrial sensitive sites being monitored is 6,684 ha. This total area has not changed since 2018.

The total monitored area included 2,878 individual sites (i.e., with one or more sensitivities) that may or may not be adjacent to another site. After grouping adjacent sites, there were 1,503 spatially distinct sensitive areas.

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 (*Betula papyrifera*) 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.

2.3 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 disturbed Project footprint, and the avoidance of environmentally sensitive sites to the extent feasible within this area.

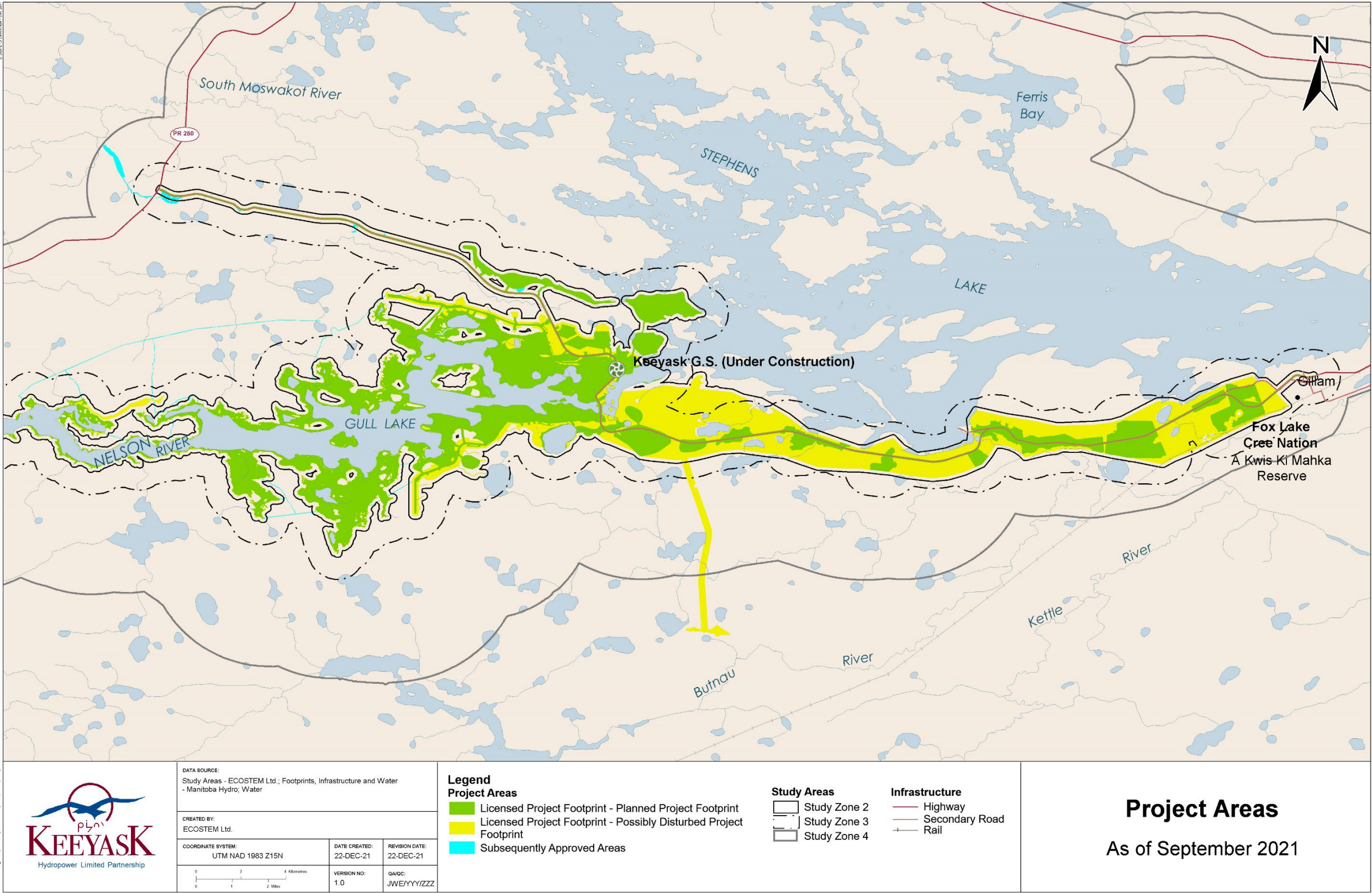
After the Project was licensed, several additional areas (called “subsequently approved Project areas” in this report) were approved for Project use by the Government of Manitoba (Environment, Climate and Parks). This is the third type of Project area. Portions of the licensed Keeyask Infrastructure Project (KIP) footprint that have been used for the Project are included as a subsequently approved area. These areas primarily include the former KIP start-up camp (which was originally planned as only a temporary camp for the KIP), Borrow Area G-5 and trails that were used to access reservoir clearing areas.

The trails were evaluated for potential effects by the Project’s terrestrial specialists prior to their submission to the Government of Manitoba, and their locations were 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 caution by overestimating the amount of habitat loss and disturbance. As of September 2021, more than half (56%) of the licensed Project footprint had not been impacted by the Project (ECOSTEM 2022a).

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.



Map 2-2: Project areas as of September 2021

2.4 IMPACT MAPPING

Initial site selection for the 2021 aerial surveys was based on sites surveyed in 2020. This occurred because digital orthorectified imagery (DOI) showing the entire Project footprint in summer 2021 was not available. Aerial surveys conducted on September 12, 2021 were used to identify any other sensitive sites that may have been affected by recent clearing. The aerial surveys showed that the footprint clearing boundaries had not grown substantially since September 2018.

Ground surveys were also carried out at 10 sensitive sites because they were of special interest or because they were already being visited for other reasons. Four of the terrestrial sensitive sites were surveyed as part of the Wetland Loss and Disturbance study, the results of which are provided in a separate report (ECOSTEM 2022b).

Ground surveys were not done at the “N-6 priority habitat to avoid” because low altitude aerial surveys in 2021 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 Geographic Information System (GIS) using DOIs as the base maps. The DOI was created from composite Worldview 2 imagery acquired on August 30, 2021.

This study used the Project clearing or disturbance mapping produced by the Habitat Loss and Disturbance study (ECOSTEM 2022a) to quantify and locate the terrestrial sensitive sites that were impacted as of September 2021. Mapping in 2021 included identifying areas flooded by the newly formed reservoir.

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.

3.0 RESULTS

3.1 OVERALL IMPACTS

The 2,878 sensitive sites being monitored for this study covered 6,684 ha.

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 2021 (see Section 2.0 for definitions of clearing and disturbance).

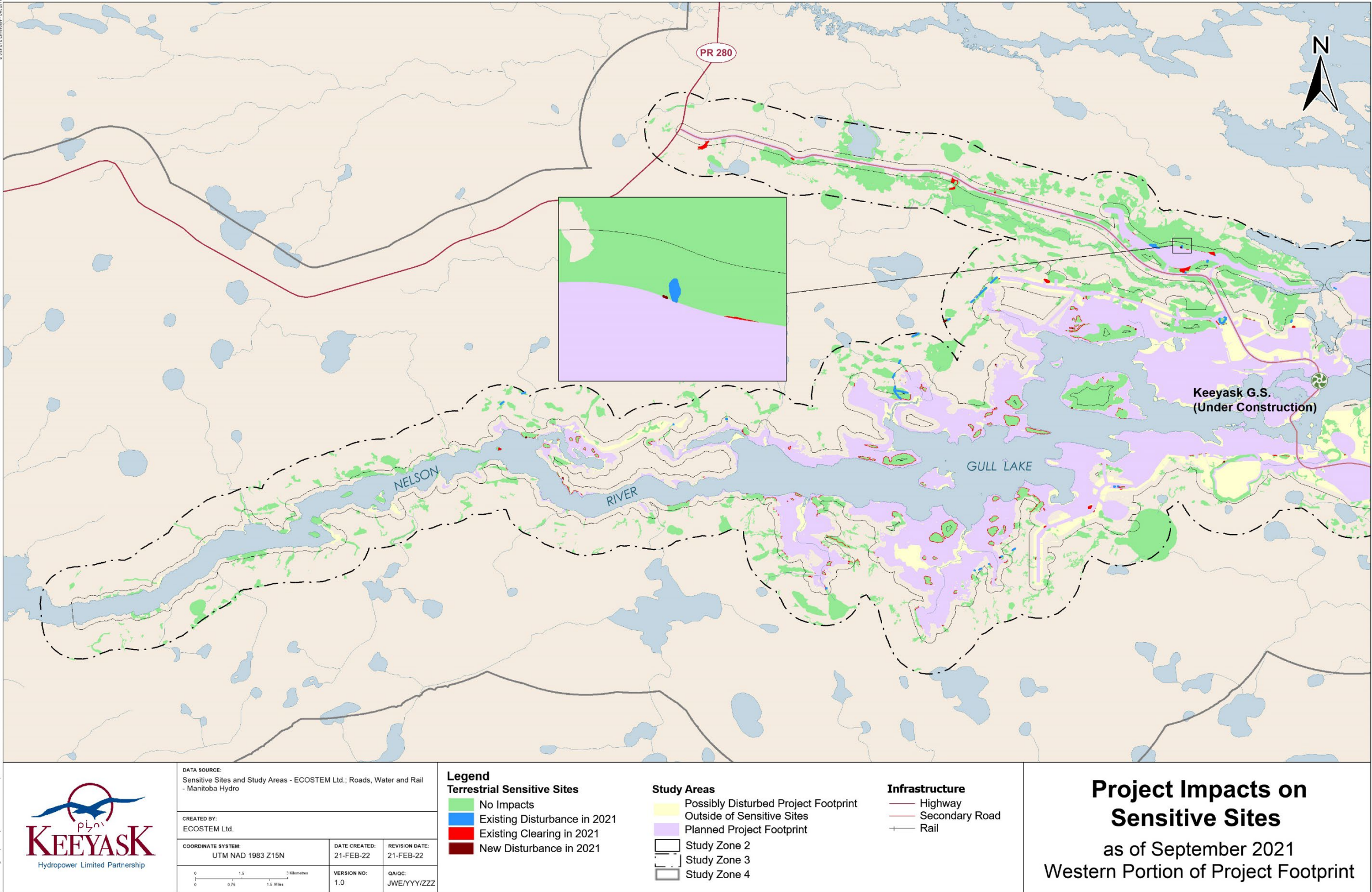
As of September 2021, Project impacts in the form of clearing or disturbance had affected 443 of the 2,878 sensitive sites. The total impacted area was 220.2 ha, or 3.3%, of total sensitive site area (Table 3-1).

The total amount of impacted sensitive site area increased by only 0.1 ha from September 2020 to September 2021 (less than 0.01% of total pre-Project sensitive site area).

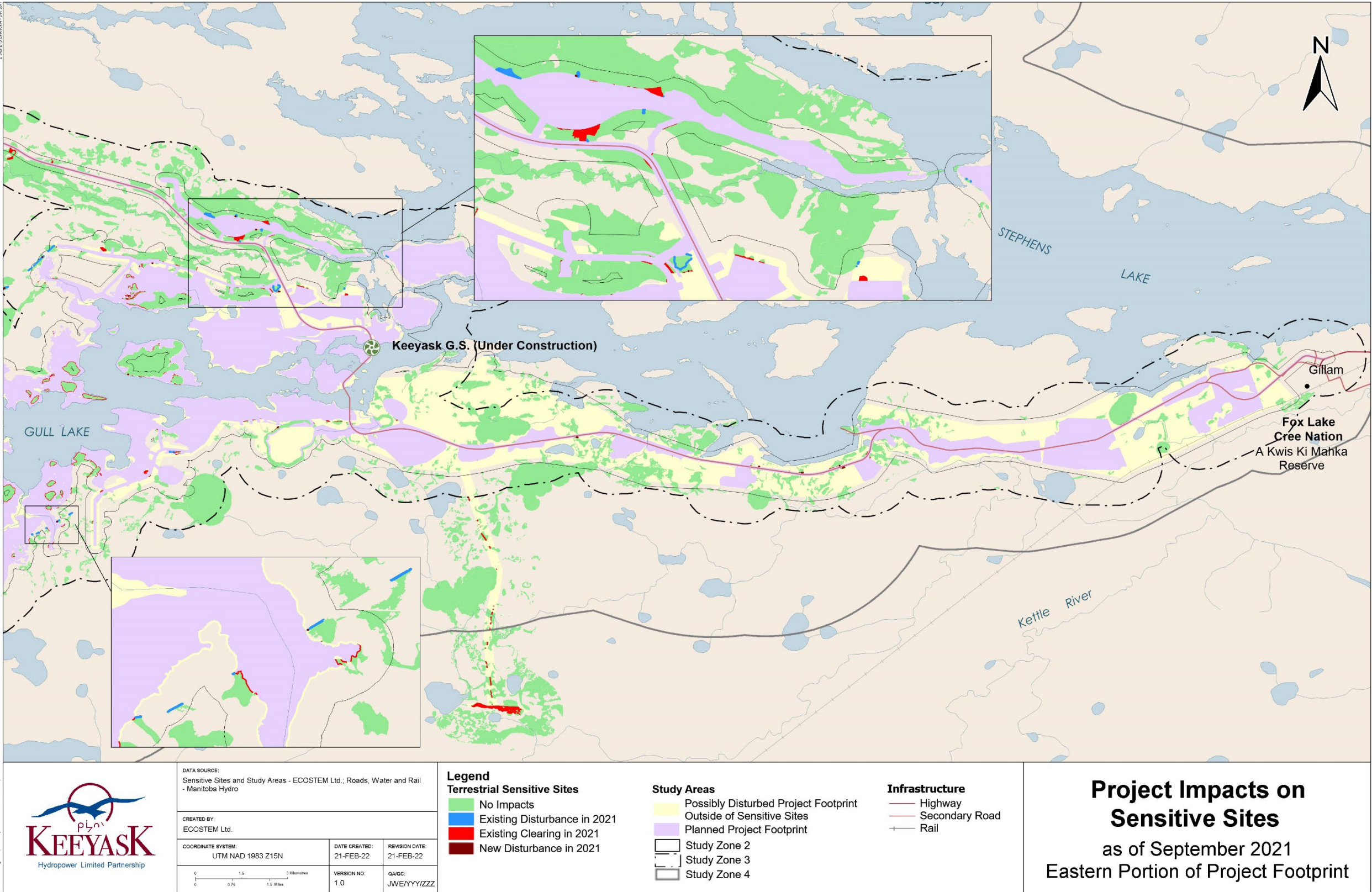
Table 3-1: Cumulative number and area of impacted sensitive sites as of September 2021

Parameter	Pre-Project	Project Impacts (cleared or disturbed)							Change from 2020 to 2021
		2015	2016	2017	2018	2019	2020	2021	
Number of Sites									
Total number	2,878	159	282	383	440	441	443	443	-
Cumulative number of sites impacted as a percentage of pre-Project total ¹	0.0	5.5	9.8	13.3	15.3	15.3	15.4	15.4	-
Area (ha)									
Total area	6,684.4	131.1	167.6	187.8	215.7	219.8	220.1	220.2	0.08
Cumulative area impacted as a percentage of pre-Project total ¹	0.0	2.0	2.5	2.8	3.2	3.3	3.3	3.3	0.00

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



Map 3-1: Project impacts on terrestrial sensitive sites outside of the planned Project footprint as of September 2021 – western portion of Project footprint



Map 3-2: Project impacts on terrestrial sensitive sites outside of the planned Project footprint as of September 2021 – eastern portion of Project footprint



Photo 3-1: Example of 2021 Project clearing in a priority habitat type (black spruce mixture vegetation on shallow peatland)



Photo 3-2: Example of an area with sediment deposition into priority habitat (Tall shrub vegetation on thin peatland site) in September, 2021

In September 2021, 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 2021, 149 ha (or 68%) was located within the planned Project footprint (Table 3-2). This was a 0.1 ha increase from 2020 (Table 3-3).

Nearly 24% of the impacted sensitive site area was in the possibly disturbed Project footprint, or 51.9 ha of area. There was no change since 2020.

Clearing or disturbance of sensitive sites within areas subsequently approved for Project use was 14.6 ha in 2021 (Table 3-2), which has been unchanged since 2017 (Table 3-3).

As of September 2021, clearing or disturbance of terrestrial sensitive sites outside of the approved Project areas was 4.7 ha, or 2.1% of total impacted area, which had not changed since 2020.

Table 3-2: Project clearing or disturbance in sensitive sites as of September 2021, 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	149.0	2.2	67.7
Within the possibly disturbed Project footprint	845.4	51.9	0.8	23.6
Within subsequently approved Project areas	14.6	14.6	0.2	6.6
Outside of the approved Project footprint	-	4.7	0.1	2.1
All other area being monitored	5,239.0	-	-	-
Total¹	6,684.4	220.2	3.3	100.0

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

Table 3-3: Cumulative Project clearing or disturbance in sensitive sites as of September 2021, by Project area and year

Project Area	Clearing or Disturbance (ha)							
	2015	2016	2017	2018	2019	2020	2021	Increase
Within the planned Project footprint	117.3	134.6	144.3	145.7	148.9	148.9	149.0	0.1
Within the possibly disturbed Project footprint	1.8	16.6	25.2	50.9	51.8	51.9	51.9	-
Within the subsequently approved Project areas	10.6	13.2	14.6	14.6	14.6	14.6	14.6	-
Outside of the approved Project footprint	1.3	3.2	3.8	4.6	4.6	4.7	4.7	-
Total¹	131.6	167.6	187.8	215.7	219.8	220.1	220.2	0.1

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 2.2). 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 individual sites. Adding the rows in the top half of a table yields a higher total than shown in the last row (e.g., 220.2 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 type with the highest total number of sites and total area identified 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 2021, priority habitat was the sensitivity type that had the highest impacted area (Table 3-4). These impacts tended to be the areas with granular mineral material, which was a preferred location 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.

When considering the total number of sites and area of sensitive sites identified 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 2021. Priority habitat also had 4% of its pre-Project area impacted, but only in 14% of the sites. Only 2% of the pre-Project off-system marsh sites (0.1% of pre-Project area) had clearing or disturbance as of 2021. For mammal riparian habitat sites, one (3%) of the pre-Project sites and 0.2% of the total area had clearing or disturbance at the time of the 2021 surveys. Impacts on caribou calving and rearing habitat did not change since 2018.

Priority habitat was the only sensitive habitat type that increased in impacted area from 2020 to 2021 (0.1 ha). Most of the area was due to clearing in Borrow Area Q-1 and disturbances in EMPA D16(1)-E and EMPA D12(2)-E.

Table 3-4: Number and area of terrestrial sensitive sites with documented Project clearing or disturbance as of September 2021, by type of sensitivity

Sensitivity ¹	Number				Area (ha)			
	Pre- Project	Project Impacts			Pre- Project	Project Impacts		
		2020	2021	Change		2020	2021	Change
Total Including Sites with More Than One Sensitivity ²								
P	2,704	390	390	-	4,864.3	204.0	204.0	0.1
M	276	5	5	-	1,564.7	1.1	1.1	-
R	35	1	1	-	227.2	0.5	0.5	-
C	99	66	66	-	392.9	16.7	16.7	-
All	2,878	443	443	-	6,684.4	220.1	220.2	0.1
Total by Combination of Sensitivities								
P	2,481	371	371	-	4,528.8	201.8	201.9	0.1
P, M	172	1	1	-	79.0	0.0	0.0	-
P, C	34	18	18	-	78.3	2.1	2.1	-
P, R	10	-	-	-	161.0	-	-	-
P, M, R	6	-	-	-	17.2	-	-	-
M	91	4	4	-	1,456.4	1.1	1.1	-
R	12	1	1	-	37.0	0.5	0.5	-
M, R	7	-	-	-	12.1	-	-	-
C	65	48	48	-	314.7	14.6	14.6	-
All	2,878	443	443	-	6,684.4	220.1	220.2	0.1

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 2021, by type of sensitivity

Sensitivity ¹	Number			Area		
	Pre-Project	Percent Impacted		Pre-Project (ha)	Percent Impacted	
		2020	2021		2020	2021
Total Including Sites with More Than One Sensitivity ²						
P	2,704	14.4	14.4	4,864.3	4.2	4.2
M	276	1.8	1.8	1,564.7	0.1	0.1
R	35	2.9	2.9	227.2	0.2	0.2
C	99	66.7	66.7	392.9	4.2	4.2
Total by Combination of Sensitivities						
P	2,481	15.0	15.0	4,528.8	4.5	4.5
P, M	172	0.6	0.6	79.0	0.0	0.0
P, C	34	52.9	52.9	78.3	2.7	2.7
P, R	10	-	-	161.0	-	-
P, M, R	6	-	-	17.2	-	-
M	91	4.4	4.4	1,456.4	0.1	0.1
R	12	8.3	8.3	37.0	1.4	1.4
M, R	7	-	-	12.1	-	-
C	65	73.8	73.8	314.7	4.6	4.6
All	2,878	15.4	15.4	6,684.4	3.3	3.3

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 and off-system marsh habitat were the only types with Project disturbance (Table 3-6; see Section 2.0 for definitions of disturbance versus clearing). The 7.6 ha of disturbance was low compared to the 197.6 ha of clearing that occurred in these sensitive site types.

In total, 73% of the impacted priority habitat area and 72% of the impacted off-system marsh area were in the planned Project footprint (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 0.1 ha between 2020 and 2021 (Table 3-8). This is the second smallest annual increase since Project construction began in 2014.

There was no increase of disturbance area outside of the approved Project footprint between September 2020 and 2021 (Table 3-8). No clearing has occurred in any sensitive site since 2019.

Table 3-6: Area of terrestrial sensitive sites with documented Project impacts as of September 2021, by clearing or disturbance and by type of sensitivity

Sensitivity ¹	Pre-Project Area (ha)	Cleared or Disturbed Area (ha)					
		Disturbed 2020	Disturbed 2021	Change	Cleared 2020	Cleared 2021	Change
Total Area, Including Sites with More Than One Sensitivity ²							
P	4,864.3	7.5	7.6	0.1	196.4	196.5	0.0
M	1,564.7	0.0	0.0	-	1.1	1.1	-
R	227.2	-	-	-	0.5	0.5	-
C	392.9	-	-	-	16.7	16.7	-
Total Area by Combination of Sensitivities							
P	4,528.8	7.5	7.6	0.1	194.3	194.4	0.0
P, M	79.0	-	-	-	0.0	0.0	-
P, C	78.3	-	-	-	2.1	2.1	-
P, R	161.0	-	-	-	-	-	-
P, M, R	17.2	-	-	-	-	-	-
M	1,456.4	0.0	0.0	-	1.1	1.1	-
R	37.0	-	-	-	0.5	0.5	-
M, R	12.1	-	-	-	-	-	-
C	314.7	-	-	-	14.6	14.6	-
All	6,684.4	7.5	7.5	0.1	212.6	212.6	0.0

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 2021, 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	148.0	37.6	14.3	4.2	204.0
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	4,528.82	147.8	36.3	14.0	3.7	201.9
P, M	79.03	-	0.0	-	0.0	0.0
P, C	78.25	0.1	1.2	0.3	0.5	2.1
P, R	160.97	-	-	-	-	0.0
P, M, R	17.19	-	-	-	-	0.0
M	1,456.38	0.8	0.3	-	-	1.1
R	36.97	-	0.5	-	-	0.5
M,R	12.07	-	-	-	-	0.0
C	314.67	0.2	13.5	0.3	0.5	14.6
All	6684.4	149.0	51.9	14.6	4.7	220.2

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 2020 and 2021, 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)		
		2020	2021	Change	2020	2021	Change	2020	2021	Change	2020	2021	Change
	Total Area, Including Sites with More Than One Sensitivity ²												
P	4,864.3	147.9	148.0	0.1	37.6	37.6	-	14.3	14.3	-	4.2	4.2	-
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	-	14.7	14.7	-	0.6	0.6	-	1.0	1.0	-
Total Area by Combination of Sensitivities													
P	4,528.8	147.8	147.8	0.1	36.3	36.3	-	14.0	14.0	-	3.7	3.7	-
P, M	79.0	-	-	-	0.0	0.0	-	-	-	-	0.0	0.0	-
P, C	78.3	0.1	0.1	-	1.2	1.2	-	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	-	13.5	13.5	-	0.3	0.3	-	0.5	0.5	-
All	6,684.4	148.9	149.0	0.1	51.9	51.9	-	14.6	14.6	-	4.7	4.7	-

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.

3.2 MAMMAL RIPARIAN HABITAT SITES

Mammal riparian habitat made up a very small portion (3.4%) of the 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 road corridor (Photo 3-3). The cleared area was within the possibly disturbed portion of the licensed Project footprint, and the Ellis Esker access road was only used in winter.



Photo 3-3: Mammal riparian habitat sensitive site in Ellis Esker access corridor in 2018. Yellow arrow points to clearing visible at lower left of photo

Ground surveys at Looking Back Creek since 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.



Photo 3-4: Erosion and sediment deposition from the North Access Road (yellow area) into a natural waterbody adjacent to Looking Back Creek in 2021

Ground surveys in 2021 found that the spatial extent of the sediment deposition from the NAR appeared to be the same as in 2020 (Photo 3-4). Sediment barriers, constructed from bundled logs, were installed at the base of the banks adjacent to Looking Back Creek (Photo 3-5). The barriers have continued to stop the majority of the sediment moving down the road bank. Sediment was still bypassing barriers on the northeast side of the bridge. A further mitigation recommendation is not being made at this time since the affected area was small, and it appeared that impacts were mostly contained.



Photo 3-5: “Bundled log” sediment barrier in riparian zone near base of NAR bank in 2018

3.3 OFF-SYSTEM MARSH SITES

The Priority Habitats monitoring is focusing 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).

Off-system marsh was the second-least impacted sensitive habitat type. As of September 2021, only 1.1 ha (Table 3-4), or 0.1% (Table 3-5) of its pre-Project area was impacted. Project clearing had affected four of the 66 off-system marsh sensitive sites included in the licensed Project footprint, which was unchanged since 2016.

No disturbance was found within off-system marsh sites between September 2020 and September 2021.

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 2021b) for further details.

3.4 CARIBOU CALVING AND REARING HABITAT SITES

Of the four types of sensitive site types, caribou calving and rearing habitat was the second most impacted type as of September 2021 (Table 3-4). Caribou calving and rearing habitat impacts were solely in the future reservoir area, and consisted of clearing which occurred under the Project's reservoir clearing program 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 2021, which is unchanged from 2018, since reservoir clearing had been completed the winter prior to that year. 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). The remaining impacted area 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 2021 (Appendix 1, Table 7-3).

3.5 PRIORITY HABITAT SITES

As of September 2021, 14.4% (390) of the 2,704 priority habitat sites being monitored had been impacted (Table 3-4; Table 3-5). Impacts on total priority habitat area were much lower at 4.2% (204 ha) of total area (Table 3-4; Table 3-5).

The vast majority of impacted priority habitat (148 ha; 73%) was within the planned Project footprint (Table 3-7). Possibly disturbed Project footprint areas included the next highest amount of priority habitat (37.6 ha) cleared or disturbed, followed by the subsequently approved Project areas (14.3 ha) and areas outside the approved Project areas (4.2 ha).

Compared with September 2020, the amount of priority habitat area disturbed by the Project in 2021 increased by 0.05 ha, which comprised 59% of the newly impacted area and the amount of cleared area increased by 0.03 ha, comprising the remainder of the newly impacted area (Table 3-6).

All of the impacts in priority habitat between 2020 and 2021 were in the planned Project footprint (Table 3-8). The amount of impacted priority habitat in the possibly disturbed Project footprint and within the subsequently approved areas was unchanged from 2019 and had not increased outside the approved Project footprint since 2020.

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 from 2017 to 2021 found no evidence of additional activity in the already cleared areas near the N-6 site or in the site itself. Note that the 2013 wildfire, which was unrelated to the Project, affected a portion of the N-6 site.



Photo 3-6: Trails and reservoir clearing adjacent to the western boundary of the “N-6 priority habitat site to avoid” in 2021

Thirty-nine of the 50 priority habitat types monitored in 2021 (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 2020 and 2021 were small (less than 1% of their pre-Project area).

Between the 2020 and 2021 surveys, only four priority habitat types had increases in the area impacted. The priority habitat type with the largest increase in impacted area in absolute terms (0.03 ha) was black spruce (*Picea mariana*) mixture on shallow peatland, however the habitat type with the largest increase in impacted area relative to its pre-Project area was tall shrub on thin peatland ecosites (0.02%; Appendix 1, Table 7-1). The remaining priority habitat types had increases far less than 0.1% of their pre-Project area.

The priority habitat types with the highest Project impacts in absolute terms as of September 2021 (Table 3-9), were black spruce mixture vegetation on mineral ecosites (67.9 ha) and jack pine (*Pinus banksiana*) dominant vegetation on mineral ecosites (35.7 ha). This represents only 28% and 31% of the area predicted to be impacted by the project for these two habitat types, respectively.

In relative terms, black spruce dominant vegetation on mineral ecosites had the highest impacts at 37% (19.8 ha) of the total pre-Project area being monitored, which has been unchanged since 2018. Impacts on tamarack (*Larix laricina*) mixture vegetation on mineral ecosites totaled 14% of the total pre-Project area and none of the remaining 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 ecosites, with 2.4 ha in 2016 (Appendix 1, Table 7-2), which amounted to only 0.6% of the total pre-Project area.

Appendix 1, Table 7-3 provides the areas impacted by the Project as of September 2021 by habitat type and Project area. Black spruce mixture vegetation on mineral ecosites had the largest area (58.7 ha) impacted within the sensitive site portion of the planned Project footprint, followed by jack pine dominant vegetation on mineral ecosites (30.7 ha) and black spruce mixture vegetation on thin peatland ecosites (11.2 ha). Black spruce mixture on shallow peatland and jack pine mixture on thin peatland had the highest increase in impacted area from 2020 to 2021 (0.06 ha), followed by tall shrub on thin peatland and tamarack mixture on mineral (0.02 ha).

Within the possibly disturbed Project footprint, black spruce dominant vegetation on mineral ecosites had the largest area impacted by far (19.0 ha; Appendix 1, Table 7-3). The next highest impacts in this Project area were in black spruce mixture on mineral ecosites (3.8 ha) and in tall shrub on thin peatland ecosites (2.2 ha).

Within the subsequently approved Project areas, the priority habitat type with the largest cleared or disturbed area in 2020 (Appendix 1, Table 7-3) 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 3.9 and 3.5 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 1.2 ha in 2021 (Appendix 1, Table 7-3). Black spruce dominant on mineral, jack pine dominant vegetation on mineral ecosites and trembling aspen (*Populus tremuloides*) mixedwood vegetation on all ecosites made up the majority of the remaining impacted areas with 0.8 ha, 0.7 ha and 0.7 ha, respectively.

Table 3-9: Composition of impacts on priority habitats as of September 2021

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	35.7	9.4
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	67.9	12.6
Black spruce mixture on shallow peatland	226	18	231.3	2.8	1.2
Black spruce mixture on thin peatland	302	87	335.3	13.3	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	-	-

Priority Habitat Type	Number of Sites		Area		
	Pre-Project	Impacted	Pre-Project (ha)	Impacted (ha)	Pre-Project Area Impacted (%)
Tamarack dominant on shallow peatland	12	-	5.6	-	-
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	12.6	14.2
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	11	77.2	10.1	13.1
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	4	1,456.4	1.1	0.1
Caribou Calving and Rearing Habitat	65	48	314.7	14.6	4.6
All	2,878	443	6,684.4	220.2	3.3

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

4.0 DISCUSSION

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). Even after considering this, the percentage of total sensitive site area impacted to September 2021 was lower than expected. As of September 2021, the Project had disturbed or completely cleared only 3.3% (220.2 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 unimpacted.

The previous annual report (ECOSTEM 2021a) anticipated that there would be very little Project clearing after September 2019 given that Project clearing and disturbance were essentially complete. At 0.1 ha, the increase in impacted area between 2020 and 2021 was the lowest observed since Project construction began in 2014 (the next lowest being 0.3 ha between 2019 and 2020).

The affected percentages of the four general types of sensitive sites were also low. Percentage of impacted area for all monitored sites ranged from 0.1% for off-system marsh sites to 4.2% each for priority habitat and caribou calving and rearing habitat (all of the latter's impacts were within the future reservoir area, which was impounded in 2020). The percentage of impacted area for sites within the licensed Project footprint ranged from 0.6% (off-system marsh site) to 39.8% (caribou calving and rearing habitat).

The distribution of 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 the Government of Manitoba. These additional areas were needed to address construction issues that could not be foreseen when the Project was licensed (see ECOSTEM (2022a) for details). These additional effects on ecosystem diversity and other sensitivities were not a concern. Prior to submission to the Government of Manitoba for approval, the possible additional areas were evaluated by the Project's terrestrial specialists 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, and 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 (4.7 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. There was no increase since September 2020.

With respect to the four general types of sensitive sites, Project impacts were highest on priority habitat types (93% of total impacted area). This was expected because a much higher proportion of the area in priority habitat included granular mineral deposits, which was a preferred location for Project borrow areas and roads. Off-system marsh and mammal riparian habitat sites were in wet and/or peat dominated areas, which are the least desirable areas for construction purposes.

Of the four general sensitivity types, priority habitat is the only one with sub-types. As of the 2021 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 included black spruce dominant vegetation on mineral, tamarack mixture vegetation on mineral, tall shrub vegetation on thin peatland, black spruce mixture vegetation on mineral, and low vegetation on thin peatland ecosites. 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 one location. Erosion from the NAR shoulder has been depositing sediment into small waterbodies adjacent to the creek since 2016. A mitigation recommendation was not made because the sediment appeared to be confined to the pool next to the road bank, and the affected area had not noticeably expanded since 2017. The sediment barriers installed during the Keeyask Infrastructure Project (KIP) appeared to be intercepting the sediment at all locations except the pool.

5.0 COMPARISON WITH PREDICTED EFFECTS

5.1 PREDICTED EFFECTS

The *Keeyask Generation Project Response to EIS Guidelines* (KHLP 2012b) included predictions as to how the Project was expected to affect ecosystem diversity. The EIS predicted that Project construction would:

1. Not change the total number of native broad habitat types;
2. Not substantially change the proportional area of any of the regionally common or uncommon native habitat types;
3. Reduce the total number of stands for eight out of the 14 native broad habitat types with 20 or less stands and six out of the 12 habitat types with less than 10 stands in Study Zone 4
4. Would not increase pre-existing effects on three priority habitat types; and,
5. Affect between 0.1% and 3.8% of estimated area for the 40 remaining priority habitat types.

A moderately high level of certainty was associated with these predictions because: (i) the existing amounts of the priority habitat types in Study Zone 4 were mapped with relatively high certainty; (ii) the spatial extent of Project-related direct habitat loss as a percentage of the Regional Study Area could be predicted with relatively high accuracy; (iii) there was moderate uncertainty associated with the historical amounts of each priority habitat type in the Regional Study Area; and, (iv) there was moderate uncertainty associated with the current amounts of each priority habitat type in the portion of the Regional Study Area that is outside of Study Zone 4.

5.2 MITIGATION

The EIS predictions were based on the following mitigation measures being implemented during the construction period:

1. The N-6 sensitive site in Borrow Area N-6 will be avoided to reduce effects on the white birch priority habitat types, and protection measures will be implemented to ensure that soil alteration or accidental disturbance within this site does not occur;
2. Clearing and disturbance within the Project Footprint will be minimized to the extent practicable;

3. Disturbance of areas adjacent to the Project Footprint will be avoided to the extent practicable;
4. A rehabilitation plan will be developed that gives preference to rehabilitating the most affected priority habitat types using approaches that “go with nature”; and,
5. Except for existing resource-use trails (as established in the Construction Access Management Plan), Project-related cutlines and trails will be blocked where they intersect the Project Footprint, and the portions of these features within 100 m of the Project Footprint will be revegetated to minimize the risk of habitat disturbance, invasive plant spreading, accidental fires and access-related effects.

N-6 Sensitive Site

As demonstrated by Section 3.0, measures to avoid the N-6 sensitive site were implemented as prescribed, and were effective. As of September, 2021, there was no Project clearing or disturbance within the N-6 site, and the sole Project impact within 300 m of the site was the necessary removal of trees in areas that would be inundated by the future reservoir.

Minimize Project Clearing and Disturbance

As demonstrated by Section 3.0, environmental protection measures directed towards minimizing Project clearing and disturbance were implemented, and were effective. The EIS assumed that the terrestrial habitat component of the Construction Footprint would be 6,952 ha in area (includes the Ellis Esker borrow area). However, the actual size of the Construction Footprint was 5,578 ha, or 20% lower than assumed (see ECOSTEM 2022a for details).

Avoid Disturbing Areas Adjacent to the Project Footprint

Environmental protection measures directed towards minimizing Project clearing and disturbance were predominantly implemented as prescribed, and were effective. Areas impacted outside of the approved Project footprint as of September 2021 totalled only 8.6 ha, or 0.15% of total impacted area. This 8.6 ha of impacts was also very small (0.12%) compared with the 7,123 ha of habitat area within the licensed Project footprint remained undisturbed at the end of construction.

Rehabilitate the Most Affected Priority Habitat Types

The *Keeyask Generation Project Vegetation Rehabilitation Plan* (KHLP 2015b) outlines the rehabilitation measures that will give preference to rehabilitating the most affected priority habitat types using approaches that “go with nature”. This Plan, which is part of the overall Environmental Protection Program, provides the framework for rehabilitating terrestrial habitat in areas impacted by Keeyask Infrastructure Project (KIP) and the Project.

Elements of the Plan that are relevant for ecosystem diversity are as follows. Areas that were temporarily required for construction but are not required for operation of the generating station or long-term maintenance of the associated infrastructure (e.g., borrow areas), will be rehabilitated based on the framework outlined in this plan. Best efforts will be made to re-establish the habitat types that existed prior to construction. Preference will be given to rehabilitating the most affected priority habitat types. Plant species that are important to the partner First Nations

will be incorporated into habitat restoration, where feasible. Permanent Project features that require sight lines for safety purposes will be revegetated with plant species that are appropriate for the site. A rehabilitation “target” will be determined for areas based on the above criteria.

ECOSTEM (2022b) documents actual rehabilitation efforts to September, 2021. To date, rehabilitation efforts have been proceeding as construction areas are decommissioned. Work completed to date that is relevant for effects on ecosystem diversity includes initial plantings of jack pine and black spruce seedlings on mineral substrates. These and subsequent rehabilitation efforts will contribute to restoring area for some of the black spruce and jack pine habitat types that were among those most affected by the Project.

Block Project-related Cutlines and Trails

Cutline and trail blocking were not implemented as originally planned (ECOSTEM 2022b). Two trails were blocked in 2017 with piled soil and vegetation. Dense vegetation regeneration following the 2013 wildfire effectively blocked the cutlines and remaining trails, and made many of them nearly indistinguishable from the surrounding area (ECOSTEM 2018a).

5.3 RESIDUAL PROJECT EFFECTS

Direct Project effects on ecosystem diversity during the construction phase were evaluated by enhancing the terrestrial habitat map for Study Zone 4 (the Regional Study Area, RSA, for plants and habitat monitoring) to identify which broad and priority habitat areas are within the actual Project Footprint during construction (i.e., the Construction Footprint). The resulting map was then used to locate and quantify actual Project effects on ecosystem diversity, which was then compared with the EIS predictions.

ECOSTEM (2022) provides the Construction Footprint and the methods used to produce it. In brief, the Construction Footprint includes all Project clearing and physical disturbance that occurred from 2014 up to September, 2021.

The indicators used for the ecosystem diversity assessment included overall changes to habitat composition and priority habitats. Effects on overall ecosystem diversity was measured using the total number of native broad habitat types, the total number of stands for each of the native broad habitat types, and changes to the proportions of the regionally common and uncommon native habitat types in the RSA.

Monitoring has shown that direct Project effects on ecosystem diversity during the construction phase were consistent with the EIS predictions, and predominantly either lower or the same as was predicted. The major reason why actual Project effects were lower than predicted was that the Construction Footprint was much smaller than assumed for the EIS predictions. Effective implementation of mitigation measures also contributed to lower than predicted effects.

Actual Project effects on overall ecosystem diversity during construction were as follows:

- As predicted, the total number of native broad habitat types in the RSA did not decline;

- The total number of stands affected for each of the native broad habitat types was either less or the same as predicted, depending on the habitat type; and,
- As predicted, the proportional area of each of the common and uncommon native habitat types in the RSA did not change substantially.

As expected, total Project effects on priority habitat during construction were lower than predicted. The Construction Footprint included approximately 1,418 ha of priority habitat area, which was 39% (897 ha) less than predicted.

Of the 41 priority habitat types included in the predicted and/or the actual Project areas, actual Project effects were lower than predicted for 33 types and the same for five types. In descending order, the largest area differences were for black spruce dominant on mineral, black spruce mixture on mineral and tall shrub on riparian peatland ecosites (Table 5-1). Note that the areas in Table 5-1 are higher than those in Table 3-1 because the latter table does not include most of the area inside of the planned Project Footprint (Section 2.2).

Actual residual Project construction effects were slightly higher than predicted for three of 41 priority habitat types (Table 5-1), with the amounts ranging from 0.05 to 0.2 ha. For one of these types, the higher than predicted effects was due to including Borrow Area E-1 in the Construction Footprint. Borrow Area E-1 and the access road to it had not been included in the detailed priority habitat breakdown in the EIS because: the location of the access road to it was highly uncertain; and, it was thought that it was highly unlikely that it would be used. The slightly higher than predicted areas for the remaining two types were due to increasing the size of the approved Project footprint after EIS was submitted (Section 2.3).

Table 5-1. Predicted and actual area (ha) of priority habitats in the Construction Footprint

Priority Habitat Type	Predicted	Actual	Difference
Black spruce dominant on mineral	478.5	314.4	-164.1
Black spruce mixture on mineral	310.2	149.3	-160.8
Tall shrub on riparian peatland	214.0	60.8	-153.1
Trembling aspen dominant on all ecosites	104.6	34.6	-69.9
Low vegetation on riparian peatland	172.7	104.1	-68.6
Low vegetation on shallow peatland	157.4	110.0	-47.5
Jack pine mixture on thin peatland	58.0	19.8	-38.3
Black spruce mixture on thin peatland	127.6	98.3	-29.4
White birch mixedwood on all ecosites	30.9	5.3	-25.6
White birch dominant on all ecosites	17.7	2.1	-15.6
Tamarack mixture on thin peatland	51.4	37.1	-14.3
Jack pine dominant on mineral	75.4	61.3	-14.1
Tamarack mixture on mineral	25.8	13.0	-12.8
Jack pine mixedwood on mineral	15.1	3.9	-11.2
Jack pine mixedwood on thin peatland	11.2	2.2	-9.0
Tall shrub on mineral	11.3	3.1	-8.2
Tall shrub on thin peatland	38.1	30.2	-7.9

Priority Habitat Type	Predicted	Actual	Difference
Trembling aspen mixedwood on all ecosites	36.0	29.1	-6.9
Black spruce mixture on shallow peatland	50.7	44.6	-6.1
Black spruce mixedwood on mineral	9.7	4.2	-5.5
Black spruce dominant on wet peatland	75.7	70.3	-5.4
Black spruce dominant on riparian peatland	27.8	22.9	-5.0
Low vegetation on wet peatland	100.1	95.4	-4.7
Tall shrub on shallow peatland	11.3	7.6	-3.8
Jack pine dominant on thin peatland	6.9	3.9	-3.0
Tamarack dominant on mineral	3.8	1.4	-2.4
Black spruce mixedwood on shallow peatland	1.9	0.3	-1.6
Tall shrub on wet peatland	26.0	24.5	-1.5
Black spruce mixture on wet peatland	3.3	2.4	-0.8
Black spruce mixedwood on thin peatland	3.0	2.6	-0.4
Tamarack- black spruce mixture on riparian peatland	1.2	1.0	-0.2
Tamarack mixture on shallow peatland	36.9	36.8	0.0
Tamarack dominant on wet peatland	1.3	1.2	0.0
Balsam poplar dominant on all ecosites	0.1	0.1	0.0
Jack pine dominant on shallow peatland	-	-	-
Jack pine mixedwood on shallow peatland	-	-	-
Tamarack dominant on riparian peatland	-	-	-
Tamarack dominant on shallow peatland	-	-	-
Tamarack mixture on wet peatland	18.5	18.6	0.0
Tamarack dominant on thin peatland	0.9	1.0	0.1
Jack pine mixture on shallow peatland	0.1	0.3	0.2
All	2,315	1,418	-897

Notes: A value of “-” indicates nil while “0” indicates a value that rounds to zero.

6.0 SUMMARY AND CONCLUSIONS

As of September 2021, the Project had disturbed or completely cleared only 220.2 ha of the total pre-Project sensitive site area being monitored by this study. This meant that the Construction Footprint included only 3.3% of the total sensitive site area, and only 14% of the total sensitive site area within the licensed Project footprint. Impacts on priority habitat types were less than 7% of the maximum amount that was assumed in the EIS.

Total Project clearing and disturbance increased by 0.1 ha (less than 0.01%) between the September 2020 and September 2021 monitoring surveys. This was the lowest increase since construction monitoring began. The majority of this increase was associated with disturbance from nearby borrow areas and EMPAs.

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

To date, 4.7 ha (2%) 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 within the licensed Project footprint have been considerably lower than expected when construction began, and that it is now expected 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 2021. Additionally, there was no evidence of Project activity within 300 m of the N-6 site with the exception of tree clearing in areas that would be flooded by the future reservoir.

For 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 mineral substrates, which 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 2021.

Of the 46 types of priority habitat types being monitored by this study, 10 remained entirely unimpacted by the Project in September 2021. 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 67.9 ha and 35.7 ha of area impacted, respectively. In both cases, less than 30% of the pre-Project area within the approved Project areas was impacted.

Caribou calving and rearing habitat had the second highest degree of Project impacts as of September 2021, followed by off-system marsh sites.

Monitoring has shown that the EIS predictions for Project construction phase effects on sensitive sites and ecosystem diversity were consistent with what was observed, and were cautious.

Monitoring did not identify any major unanticipated Project effects. Additionally, as assumed in the EIS, much of the area within the licensed Project footprint remains undisturbed, which means construction impacts on the sensitive sites being monitored by this study as well as ecosystem diversity have been relatively low to date.

Monitoring has shown that actual Project effects on ecosystem diversity during construction were predominantly lower than predicted, and considerably lower for some measures (e.g., total area of affected priority habitat was 39% lower). The higher effects than predicted for three of 41 priority habitat types were very small in all cases (ranging from 0.05 to 0.2 ha).

The major reason why actual Project effects were lower than predicted was that the Construction Footprint was much smaller than assumed for the EIS predictions. Effective implementation of mitigation measures also contributed to lower than predicted effects.

Monitoring to document the amount of priority habitat and other sensitive sites affected by Project development will continue in 2022.

7.0 LITERATURE CITED

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APPENDIX 1: DETAILED RESULTS

Table 7-1: Number and area of terrestrial sensitive sites impacted by the Project as of September 2021, by broad/priority habitat type

Priority Habitat Type	Sensitivity ¹	Number of Sensitive Sites				Total Area (ha) Impacted			
		Pre-Project	Impacted			Pre-Project	Impacted		
			2020	2021	Change		2020	2021	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	4.5	4.5	-
	P,C	8	3	3	-	16.6	0.9	0.9	-
	P,M	6	-	-	-	8.3	-	-	-
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	35.7	35.7	-
	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	4	4	-	119.7	0.7	0.7	-
	P,M	3	-	-	-	3.0	-	-	-
Jack pine mixedwood on shallow peatland	P	4	-	-	-	7.6	-	-	-

Priority Habitat Type	Sensitivity ¹	Number of Sensitive Sites				Total Area (ha) Impacted			
		Pre-Project	Impacted			Pre-Project	Impacted		
			2020	2021	Change		2020	2021	Change
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	-
	P,M	1	-	-	-	0.4	-	-	-
Jack pine mixture on thin peatland	P	77	16	16	-	292.6	13.0	13.0	0.0
	P,M	4	-	-	-	2.3	-	-	-
Black spruce dominant on mineral	P	29	3	3	-	51.8	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	30	30	-	505.9	6.9	6.9	-
	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	46	46	-	517.1	67.1	67.1	-
	P,C	9	6	6	-	15.9	0.8	0.8	-
	P,M	7	-	-	-	6.7	-	-	-
Black spruce mixture on shallow peatland	P	222	17	17	-	228.3	2.8	2.8	0.0
	P,C	1	1	1	-	0.2	0.0	0.0	-
	P,M	3	-	-	-	2.8	-	-	-
Black spruce mixture on thin peatland	P	290	82	82	-	328.7	13.3	13.3	-
	P,C	8	5	5	-	3.1	0.1	0.1	-
	P,M	4	-	-	-	3.4	-	-	-

Priority Habitat Type	Sensitivity ¹	Number of Sensitive Sites				Total Area (ha) Impacted			
		Pre-Project	Impacted			Pre-Project	Impacted		
			2020	2021	Change		2020	2021	Change
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	-	-	-
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	-
	P,M	2	-	-	-	0.1	-	-	-
Tamarack mixture on mineral	P	45	16	16	-	88.2	12.6	12.6	0.0
	P,M	2	-	-	-	0.4	-	-	-
Tamarack mixture on shallow peatland	P	177	14	14	-	163.1	1.2	1.2	-
	P,C	1	1	1	-	0.3	0.0	0.0	-
	P,M	7	-	-	-	1.8	-	-	-
Tamarack mixture on thin peatland	P	143	26	26	-	149.7	2.9	2.9	-
	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	-
	P,M	3	-	-	-	0.3	-	-	-
Tall shrub on thin peatland	P	52	10	10	-	77.1	10.1	10.1	0.0
	P,M	1	1	1	-	0.1	0.0	0.0	-
Tall shrub on wet peatland	P	53	3	3	-	49.6	0.1	0.1	-

Priority Habitat Type	Sensitivity ¹	Number of Sensitive Sites				Total Area (ha) Impacted			
		Pre-Project	Impacted			Pre-Project	Impacted		
			2020	2021	Change		2020	2021	Change
	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	-	-	-
Low vegetation on shallow peatland	P	118	9	9	-	196.2	0.6	0.6	-
	P,M	4	-	-	-	0.3	-	-	-
	P,R	1	-	-	-	0.1	-	-	-
	P,M,R	3	-	-	-	0.0	-	-	-
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	-	-	-	17.1	-	-	-
	P,M,R	4	-	-	-	160.4	-	-	-
Riparian	R	12	1	1	-	37.0	0.5	0.5	-
Marsh, Riparian	M,R	7	-	-	-	12.1	-	-	-
Marsh	M	91	4	4	-	1,456.4	1.1	1.1	-
Caribou Calving and Rearing Habitat	C	65	48	48	-	314.7	14.6	14.6	-
All		2,878	443	443	-	6,684.4	220.1	220.2	0.1

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 7-2: Area of terrestrial sensitive sites disturbed or cleared by the Project as of September 2021 by broad/priority habitat type

Priority Habitat Type	Sensitivity ¹	Total Area Pre-Project	Area (ha) Cleared or Disturbed					
			Disturbed 2020	Disturbed 2021	Change	Cleared 2020	Cleared 2021	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	-	4.5	4.5	-
	P,M	8.3	-	-	-	-	-	-
	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	-	-	-	-	-	-
	P	25.3	-	-	-	0.1	0.1	-
White birch dominant on all ecosites	P,M	3.7	-	-	-	-	-	-
	P,C	11.1	-	-	-	-	-	-
	P	11.2	-	-	-	0.0	0.0	-
White birch mixedwood on all ecosites	P,M	0.8	-	-	-	-	-	-
	P,C	26.3	-	-	-	-	-	-
	P	380.8	2.4	2.4	-	33.3	33.3	-
Jack pine dominant on mineral	P,M	0.6	-	-	-	-	-	-
	P	4.7	-	-	-	-	-	-
	P	74.0	-	-	-	0.6	0.6	-
Jack pine dominant on thin peatland	P,M	0.0	-	-	-	-	-	-
	P	119.7	0.6	0.6	-	0.1	0.1	-
	P,M	3.0	-	-	-	-	-	-
Jack pine mixedwood on mineral	P	7.6	-	-	-	-	-	-
	P	80.4	0.0	0.0	-	1.9	1.9	-
	P,M	3.0	-	-	-	-	-	-
Jack pine mixedwood on shallow peatland	P	43.8	-	-	-	0.3	0.3	-
	P,M	0.4	-	-	-	-	-	-
	P	43.8	-	-	-	0.3	0.3	-
Jack pine mixture on shallow peatland	P,M	0.4	-	-	-	-	-	-
	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 2020	Disturbed 2021	Change	Cleared 2020	Cleared 2021	Change
Jack pine mixture on thin peatland	P	292.6	0.7	0.7	0.0	12.3	12.3	-
	P,M	2.3	-	-	-	-	-	-
Black spruce dominant on mineral	P	51.8	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	-	-	-	6.9	6.9	-
	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	1.2	1.2	-	65.9	65.9	-
	P,M	6.7	-	-	-	-	-	-
	P,C	15.9	-	-	-	0.8	0.8	-
Black spruce mixture on shallow peatland	P	228.3	-	-	-	2.8	2.8	0.0
	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	-	13.0	13.0	-
	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	P	1.1	-	-	-	-	-	-

Priority Habitat Type	Sensi- tivity ¹	Total Area Pre- Project	Area (ha) Cleared or Disturbed					
			Disturbed 2020	Disturbed 2021	Change	Cleared 2020	Cleared 2021	Change
peatland								
Tamarack dominant on shallow peatland	P	5.5	-	-	-	-	-	-
peatland	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	-
	P,M	0.1	-	-	-	-	-	-
Tamarack mixture on mineral	P	88.2	-	0.0	0.0	12.6	12.6	-
	P,M	0.4	-	-	-	-	-	-
Tamarack mixture on shallow peatland	P	163.1	0.2	0.2	-	1.0	1.0	-
	P,M	1.8	-	-	-	-	-	-
	P,C	0.3	-	-	-	0.0	0.0	-
Tamarack mixture on thin peatland	P	149.7	0.0	0.0	-	2.9	2.9	-
	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	-
	P,M	0.3	-	-	-	-	-	-
Tall shrub on thin peatland	P	77.1	0.3	0.3	0.0	9.7	9.7	-
	P,M	0.1	-	-	-	0.0	0.0	-
Tall shrub on wet peatland	P	49.6	0.0	0.0	-	0.1	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	-	-	-	-	-	-

Priority Habitat Type	Sensi- tivity ¹	Total Area Pre- Project	Area (ha) Cleared or Disturbed					
			Disturbed 2020	Disturbed 2021	Change	Cleared 2020	Cleared 2021	Change
	P,R	0.0	-	-	-	-	-	-
	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	-	-	-	0.5	0.5	-
Marsh, Riparian	M,R	12.1	-	-	-	-	-	-
Marsh	M	1,456.4	0.0	0.0	-	1.1	1.1	-
Caribou Calving and Rearing Habitat	C	314.7	-	-	-	14.6	14.6	-
All		6,684.4	7.5	7.6	0.0	212.6	212.6	0.0

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 7-3: Area of terrestrial sensitive sites impacted by the Project as of September, 2021 by Project Area

Priority Habitat Type	Sensitivity 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)		
			2020	2021	Change	2020	2021	Change	2020	2021	Change	2020	2021	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	-	0.2	0.3	-	0.0	0.0	-	-	-	-
Trembling aspen mixedwood on all ecosites	P,C	0.9	0.1	0.1	-	-	0.1	-	0.1	0.1	-	0.5	0.5	-
White birch dominant on all ecosites	P	2.0	-	-	-	0.0	0.8	-	0.8	0.8	-	0.7	0.7	-
White birch mixedwood on all ecosites	P	0.1	-	-	-	-	-	-	-	-	-	-	-	-
Jack pine dominant on mineral	P	0.0	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	-	-	-
Jack pine dominant on thin peatland	P	35.7	30.7	30.7	-	3.7	3.9	-	3.9	3.9	-	0.7	0.7	-
Jack pine mixedwood on mineral	P	0.6	0.6	0.6	-	-	-	-	-	-	-	-	-	-
Jack pine mixedwood on thin peatland	P	0.7	0.6	0.6	-	0.1	0.1	-	-	-	-	0.0	0.0	-
Jack pine mixture on shallow peatland	P	1.9	1.9	1.9	-	0.1	0.1	-	0.1	0.1	-	-	-	-
Jack pine mixture on thin peatland	P	0.3	0.0	0.0	-	-	-	-	-	-	-	0.2	0.2	-
Black spruce dominant on mineral	P	13.0	8.3	8.4	0.0	3.3	3.5	-	3.5	3.5	-	1.2	1.2	-
Black spruce dominant on riparian peatland	P	19.8	0.0	0.0	-	19.0	19.0	-	-	-	-	0.8	0.8	-
	P	0.1	-	-	-	-	-	-	-	-	-	-	-	-

Priority Habitat Type	Sensitivity 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)		
			2020	2021	Change	2020	2021	Change	2020	2021	Change	2020	2021	Change
Black spruce dominant on wet peatland	P	6.9	6.2	6.2	-	0.5	0.5	-	-	-	-	-	-	-
Black spruce mixedwood on mineral	P	1.6	1.2	1.2	-	0.0	0.2	-	0.2	0.2	-	-	-	-
	P,C	0.0	-	-	-	-	-	-	-	-	-	-	-	-
Black spruce mixedwood on shallow peatland	P	0.0	-	-	-	-	-	-	-	-	-	0.0	0.0	-
Black spruce mixedwood on thin peatland	P	0.0	0.0	0.0	-	-	-	-	-	-	-	-	-	-
Black spruce mixture on mineral	P	67.1	58.7	58.7	-	3.8	4.1	-	4.6	4.6	-	0.0	0.0	-
	P,C	0.8	-	-	-	0.3	0.4	-	0.2	0.2	-	-	-	-
Black spruce mixture on shallow peatland	P	2.8	2.4	2.5	0.0	0.1	0.1	-	-	-	-	-	-	-
	P,C	0.0	-	-	-	-	-	-	-	-	-	-	-	-
Black spruce mixture on thin peatland	P	13.3	11.2	11.2	-	0.6	0.6	-	0.2	0.2	-	-	-	-
	P,C	0.1	-	-	-	-	0.0	-	0.0	0.0	-	-	-	-
Black spruce mixture on wet peatland	P	0.1	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	-	-	-	-	-	-	-	-	-	-
Tamarack dominant on wet peatland	P	0.0	-	-	-	0.0	0.0	-	-	-	-	-	-	-
Tamarack mixture on mineral	P	12.6	10.7	10.7	0.0	1.7	1.7	-	-	-	-	-	-	-
Tamarack mixture on shallow peatland	P	1.2	0.3	0.3	-	0.8	0.8	-	0.0	0.0	-	-	-	-
	P,C	0.0	-	-	-	-	-	-	-	-	-	-	-	-
Tamarack mixture on thin	P	2.9	1.3	1.3	-	0.6	0.6	-	0.4	0.4	-	0.0	0.0	-

Priority Habitat Type	Sensitivity 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)		
			2020	2021	Change	2020	2021	Change	2020	2021	Change	2020	2021	Change
peatland	P,C	0.2	-	-	-	-	-	-	-	-	-	-	-	-
Tamarack mixture on wet peatland	P	0.8	0.6	0.6	-	-	-	-	-	-	-	-	-	-
Tall shrub on mineral	P	0.8	0.4	0.4	-	-	-	-	-	-	-	-	-	-
Tall shrub on shallow peatland	P	0.2	0.0	0.0	-	0.0	0.1	-	0.1	0.1	-	-	-	-
Tall shrub on thin peatland	P	10.1	7.5	7.5	0.0	-	0.2	-	0.2	0.2	-	0.1	0.1	-
Tall shrub on wet peatland	P,M	0.0	-	-	-	-	-	-	-	-	-	0.0	0.0	-
Tall shrub on wet peatland	P	0.1	-	-	-	0.1	0.1	-	0.0	0.0	-	-	-	-
Low vegetation on riparian peatland	P	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	-	-	-	0.5	0.5	-	-	-	-	-	-	-
Marsh	M	1.1	0.8	0.8	-	0.0	0.0	-	-	-	-	-	-	-
Caribou Calving and Rearing Habitat	C	14.6	0.2	0.2	-	0.3	0.6	-	0.3	0.3	-	0.5	0.5	-
All		220.2	148.9	149.0	0.1	37.3	39.9	-	14.6	14.6	-	4.7	4.7	-

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