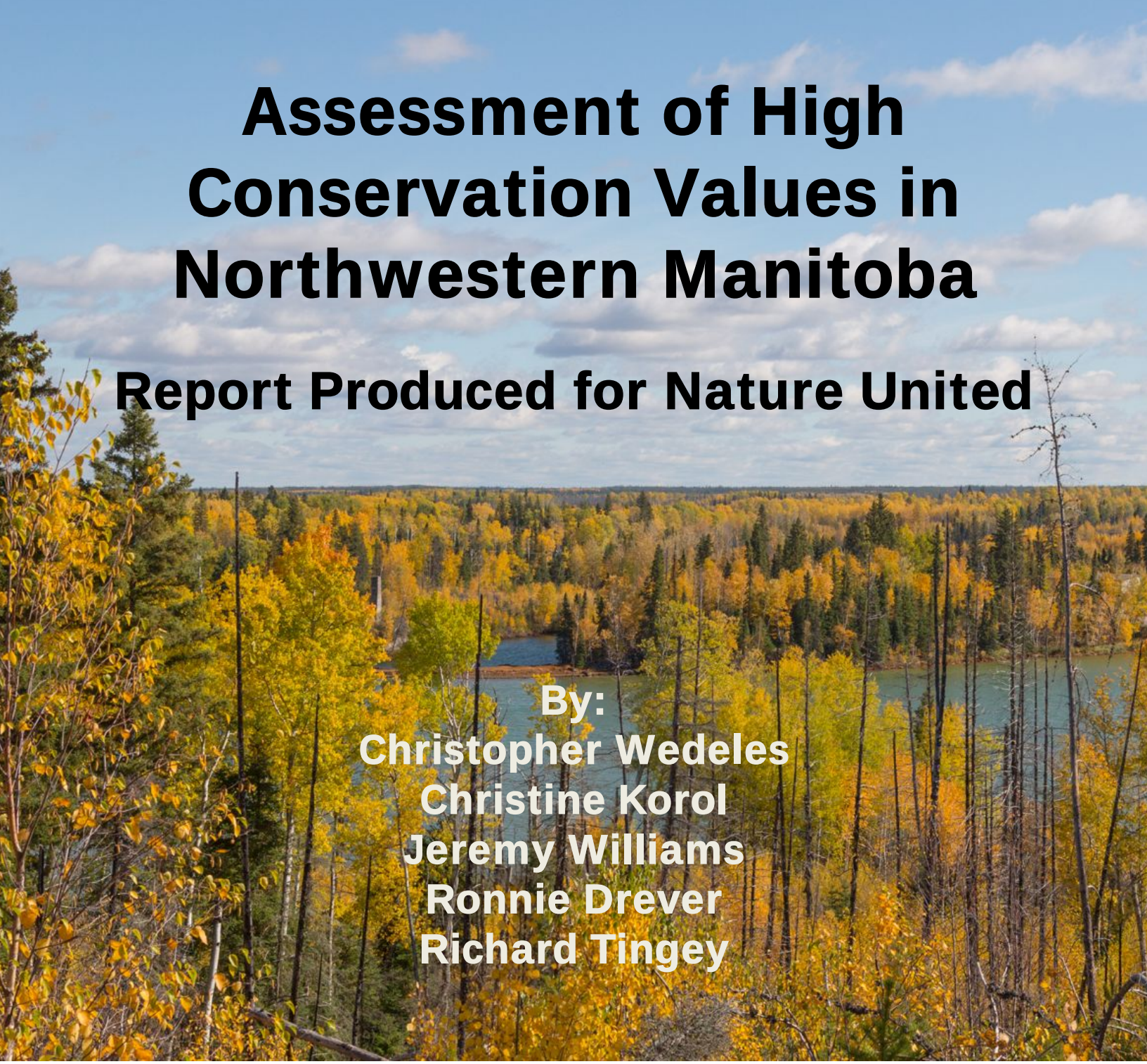
Assessment of High Conservation Values in Northwestern Manitoba

Report Produced for Nature United



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March 27, 2020

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1 EXECUTIVE SUMMARY

Using FSC Canada's High Conservation Value (HCV) Framework in its new National Forest Management Standard as a guide, HCVs were assessed for the area of FML-2 (and a large buffer around the FML) in northwestern Manitoba. HCVs were identified for HCV Categories 1-4, which address 1) species diversity, 2) landscape-level ecosystems, 3) ecosystems and habitats, and 4) critical ecosystem services. This project did not identify HCVs associated with Categories 5 and 6 (which address community needs and cultural values), but summarized the scope of values normally considered, and evaluated the guidance given by FSC Canada and the HCV Resource Network in assessing these categories. Recommendations for HCV 5 and 6 are provided that address the need for training for communities that may undertake their own assessments, the need for resources and mentoring, consideration of ownership of information collected, and the potential role of Nature United in the review of existing documentation.

The results of the assessment for HCV Categories 1-4 are given in Table 1 below.

Table 1. Summary of HCVs by Category

Question[1]	Potential Impact from Forest Management			Notes
	High	Moderate	Low	
HCV1: Species Diversity				
1. Does the forest contain species at risk or potential habitat for species at risk?	• Canada Warbler • Eastern Wood Pewee • Evening Grosbeak • Rusty Blackbird • Woodland Caribou • Wolverine	• Chimney Swift • Common Nighthawk • Olive-sided Flycatcher • Peregrine Falcon • Bank Swallow • Barn Swallow • Little Brown Myotis • Northern Myotis • Flooded Jellyskin	• Eastern Whip-poor Will • Horned Grebe • Piping Plover • Short-eared Owl • Western Grebe • Yellow Rail • Little Brown Myotis • Northern Myotis • Wood Bison • Northern Leopard Frog • Lake Sturgeon • Shortjaw Cisco • Monarch Butterfly • Nine-spotted Lady Beetle • Transverse Lady Beetle • Lori's Water Lilly	Assessments of extent of potential impact based on descriptions of threats identified in Table 3
	In addition to the species above, 76 species (9 birds, 1 insect, and 66 plants) identified in by Manitoba Conservation Data as being uncommon in the Assessment Area are identified as CDC HCVs.			No potential impact categorization is assigned to these species.
2. Does the contain endemic species?			• Dodi Tiger Moth • Wood Bison • Lori's Water Lily	Some overlap exists between endemic species and species at risk.
3. Does the forest contain critical habitat for globally, nationally, or regionally significant seasonal concentrations of species?		• Kaweenakumik Lake IBA	• Saskatchewan River Delta • Balbas Island • North Lake Winnipegosis Reefs • Gull Bay Spits • Little George Island	Most Important Bird Areas (IBAs) are islands or reefs and so potential impact from forest management is low.
4. Does the forest support concentrations of species at the edge of their natural ranges or outlier populations?		• Eastern White Cedar • Flooded Jellyskin	• Fox Sparrow	
5. Does the forest contain critical habitat for regionally significant species	• Moose			Significant population declines in parts of the province.

Question[1]	Potential Impact from Forest Management			Notes
	High	Moderate	Low	
6. Does the forest lie within, adjacent to or contain a conservation area?	Eleven parks are identified as HCVs: • Amisk Park Reserve • Birch Island Park • Chitek Lake Anishinaabe Park • Clearwater Lake • Goose Islands • Grand Island • Grass River • Kettle Stones • Little Limestone Lake • Paint Lake • Pisew Falls	All eight ecological reserves located in the Assessment Area are identified as HCVs • Kaweenakumik Ecological Reserve • Long Point • Birch River • Armit Meadows • Lake Winnipegosis Salt Flats • Red Rock • Walter Cook Caves • Pasla Hazel		In general we believe these sites are at low risk from forest management, however we do not have sufficient familiarity to state so categorically.
HCV2: Landscape Level Ecosystems				
1. Does the forest constitute or form part of a globally, nationally, or regionally significant landscape (i.e. Intact Forest Landscape)	All Intact Forest Landscapes within the Assessment Area are designated as HCVs.			There are 45 IFLs in the Assessment Area totalling approx. 18.5 million ha. There are 17 IFLs in the FML, totalling approx. 6 million ha.
HCV3: Ecosystems and Habitats				
1. Are large landscape level forest fragments rare or absent in the region	No large forest fragments are identified as HCVs			Given the widespread abundance of Intact Forest Landscapes no landscape-level fragments warrant designation as HCV.
2. Does the forest contain naturally rare ecosystem types.	The following communities identified as regionally rare by the Conservation Data Centre are identified as HCVs. • Alkali Grass-wild Barley-Nuttall's Salt Meadow Grass-seaside Plantain Saline Herbaceous Vegetation • Boreal Inland Alkaline Cliff Sparse Vegetation • Eastern White Cedar-Black Spruce, Balsam Fir/speckled Alder Wetland Forest • Inland Lake Cobble-gravel Shore Sparse Vegetation The following communities identified as globally rare in NatureServe are identified as HCVs: • Tall grass prairie in Armit Meadows Ecological Reserve • Wild Rice marshes in several lakes in the Assessment Area: Dyce, Cormorant, Dolomite, Hargrave, North Moose, South Moose, Reed and Wekusko lakes. The following rare communities in Provincial Parks and Ecological Reserves are			In general we believe these sites are at low risk from forest management, however we do not have sufficient familiarity to state so categorically.

Question[1]	Potential Impact from Forest Management			Notes
	High	Moderate	Low	
	identified as HCVs: • Remnant prairie with sandstone concretions (kettle stones) in Kettle Stones Park • Salt flat complex shoreline Lake Winnipegosis Salt Flats Reserve • Little Limestone Lake (a marl lake) in Little Limestone Lake Park • Beach ridge vegetation in proximity to deep muskeg and very old cedar and spruce trees in Long Point Reserve • Calcareous fen with peat palsas surrounded by limestone plateaus and drumlins in Pasla Hasel Reserve The old-growth cedar communities in the southern portion of the Assessment Area are identified as an HCV.			Old growth cedar may be at moderate potential risk from forestry as they may occur in communities with commercially valuable species.
3. Are there ecosystem types that have significantly declined or are under sufficient present and/or future development pressures that they will likely become rare in the future (e.g. old seral stages)"	No HCVs are identified in association with this question.			No evidence of significantly declining ecosystems was found. In addition, there is a large extent of IFL and large forest patches, suggest the forest ecosystem remains largely intact.
HCV4: Critical Ecosystem Services				
1. Does the forest provide a significant source of drinking water?	Drinking water sources for 23 communities are identified as HCVs (See Table 17).			Sources of drinking water are varied, however insufficient information to assess the extent to which the sites may be at risk from forest management.
2. Does the forest provide a significant ecological services in mediating flooding and/or drought, controlling stream flow regulation and water quality?	Although the forest contains some significant water control features (dams) for generation of hydro-electricity, no significant natural features that ameliorate or mitigate flooding or drought are identified or designated as HCVs.			
3. Are there forests critical to erosion control?	Areas in the north and northwest of the FML and along the Saskatchewan River of rank 6 (Figure 24) area identified as HCV Areas susceptible to erosion and compaction as identified in Figure 26 are also identified as HCV			In general risk of erosion in the FML is not high.
4. Are there forests that provide a critical barrier to destructive fire?	Thompson's Community Firesmart zone is designated as an HCV			
5. Are there forest landscapes or regional landscapes that have a	No HCVs associated with agriculture are identified.			We do not have sufficient information on individual lakes

Question[1]	Potential Impact from Forest Management			Notes
	High	Moderate	Low	
critical impact on agriculture or fisheries	All commercial fishing lakes identified in Table 18 are designated as HCVs.			to assess the extent to which they may be susceptible to risk from forest management.
Soil Carbon	The Assessment Area contains several expanses of high density of soil carbon in the southern extent of FML-2 (Figure 32). Their importance as globally significant storehouses of soil carbon warrant consideration of these areas as HCV.			Soil carbon is not explicitly recognized in HCV 4, but there is wide acceptance of its role and value in the ecosystem dyanamics and in mitigating climate change.

[1] For brevity, questions are paraphrased in some circumstances. For full text of question, see Annex D of FSC Canada's National Forest Stewardship Standard.

2 INTRODUCTION

This exercise is part of a broader initiative undertaken by Nature United that aspires to support and empower Indigenous communities in northernwestern Manitoba in resource and ecosystem management. One piece of that larger undertaking is cataloguing values that merit particular attention because of their ecological and/or social significance. These values may be special because they are defining ecosystem characteristics, have strong cultural importance, or are vulnerable to impacts related to human presence and use. Nature United elected to use the concept of High Conservation Values (HCVs) as a framework for identifying these values. For Canada's forests, The Forest Stewardship Council of Canada has adapted the broader HCV concept for particular Canadian use and its recently-approved Forest Management Standard provides a framework intended to assist in the identification of HCVs. There are six broadly-recognized HCVs:

1. Species Diversity: focuses on biological diversity including species at risk, endemic species, and concentrations of biological diversity.
2. Landscape-level Ecosystems: focuses on large intact ecosystems and mosaics that are significant at global, national or regional levels. in Canada, this HCV category is synonymous with Intact Forest Landscapes.
3. Ecosystems and Habitats: focuses on rare, threatened and endangered habitats or refugia.
4. Critical Ecosystem Services: identifies basic ecosystem services, that are vital to protection of landscapes.
5. Community Needs: focuses on sites and resources fundamental to satisfying the necessities of local communities or Indigenous Peoples.
6. Cultural Values: focuses on sites, resources, habitat and landscapes of cultural significance.

This assessment focussed on the identification of values for the first four categories. However, the consideration of values encompassed by categories 5 and 6 is at an earlier stage of development and this project concentrated on review of relative scope of values that could be included in an assessment, appropriate methodologies to use, an evaluation of guidance provided by reputable sources.

The geographic area that is the focus of this study is Forest Management License (FML) 2 in northwestern Manitoba. The area is under a forest management License to Canadian Kraft Paper Industries Limited (CKP). For the purposes of most of the assessments included in this report, the Assessment Area included the FML plus a 100 km buffer. Because the FML abuts the Manitoba-Saskatchewan border, the buffer extends into Saskatchewan, however for most values, the assessment considers only those that occur in Manitoba.

Figure 1. The HCV Assessment Area in context of central and western Canada. The FML is indicated as the black shape, and the dotted white line includes the buffer.

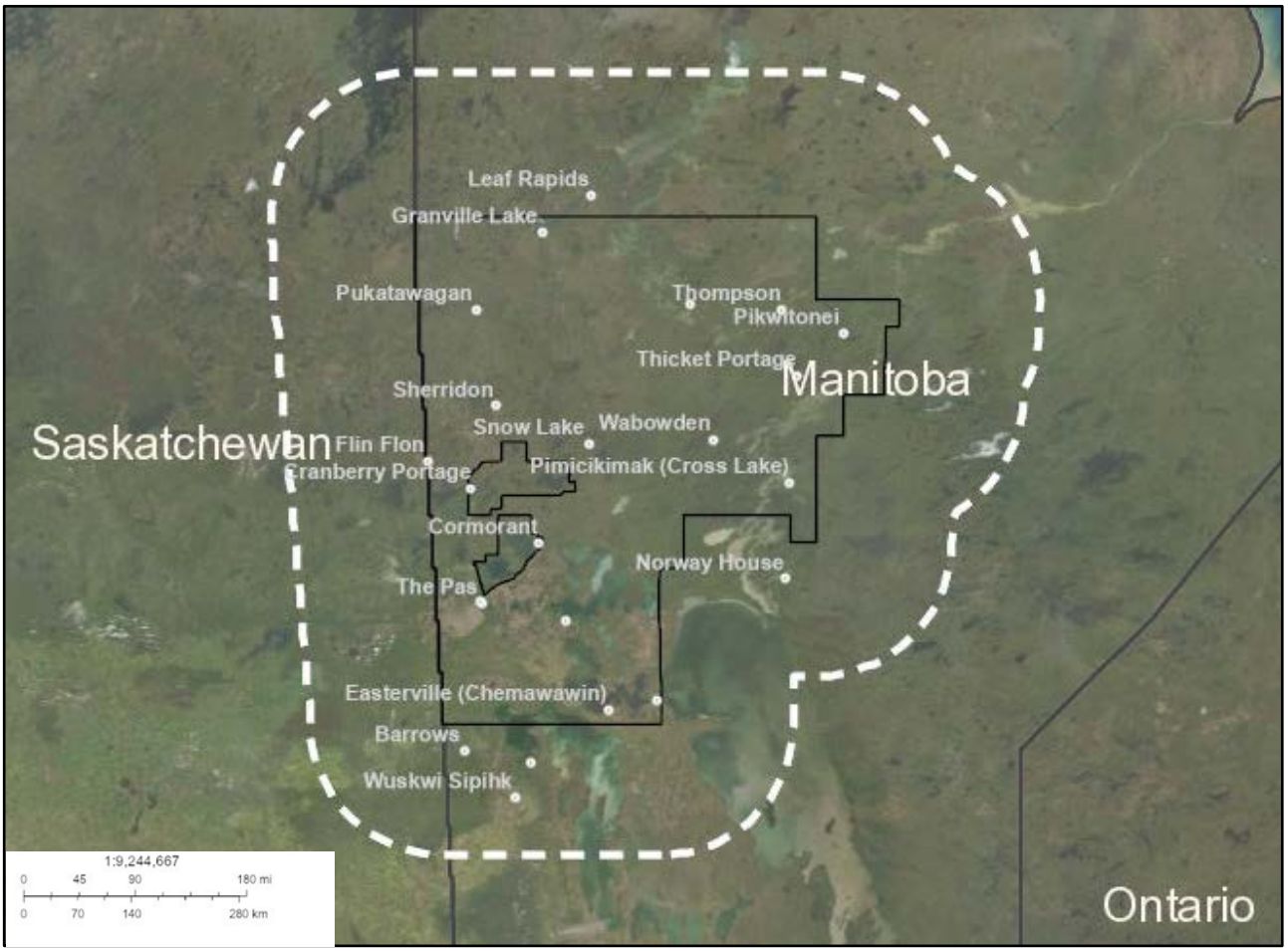

Figure 2. The Assessment Area and buffer in detail, including the communities within.

This report is divided into five subsequent chapters: HCVs 1-4 comprise the next four chapters, and the discussion on appropriate approach for HCVs 5&6 is the final chapter.

3 HCV CATEGORY 1 – SPECIES DIVERSITY

3.1 INTRODUCTION AND SUMMARY

As described earlier, HCV Category 1 addresses species diversity. It encompasses a suite of values very strongly associated with ecological quality, chief among them perhaps being species at risk. FSC's definition of HCV1 is: "*Concentrations of biological diversity including endemic species, and rare, threatened or endangered species, that are significant at global, regional, or national levels.*"

Canada's National Forest Management Standard facilitates the development of assessments by asking six questions related to HCV1:

1. Does the forest contain species at risk or potential habitat of species at risk as listed by international, national or territorial/provincial authorities?
2. Does the forest contain endemic species?
3. Does the forest include critical habitats containing globally, nationally or regionally significant seasonal concentrations of species (one or several species, e.g. concentrations of wildlife in breeding sites, wintering sites, migration sites, migration routes or corridors – latitudinal as well as altitudinal)?
4. Does the forest contain critical habitat for regionally significant species (e.g. species declining regionally)?
5. Does the forest support concentrations of species at the edge of their ranges or outlier populations?
6. Does the forest lie within, adjacent to, or contain a conservation area:
    a. designated by an international authority,
    b. legally designated or proposed by a relevant federal/provincial/territorial legislative body, or
    c. identified in regional land use plans or conservation plans?

There is often considerable overlap in the response to these questions, as, for example, it is likely that endemic species could be identified as rare, threatened or endangered species (referred to in this report as Species at Risk or SAR), and it is also often the case that areas that have significant concentrations of species have been identified as parks or conservation areas.

Below is a brief summary of HCV designations made related to this HCV Category.

Question 1 – Species at Risk

Table 2 identifies species at risk HCVs with associated potential impacts from forest management.

Table 2. HCV Species at Risk with Identified Potential Impacts

Taxon	Potential Impact		
	High	**Moderate**	**Low**
Birds	• Canada Warbler • Eastern Wood Pewee • Evening Grosbeak • Rusty Blackbird	• Chimney Swift • Common Nighthawk • Olive-sided Flycatcher • Peregrine Falcon • Bank Swallow • Barn Swallow	• Eastern Whip-poor Will • Horned Grebe • Piping Plover • Short-eared Owl • Western Grebe • Yellow Rail
Mammals	• Woodland Caribou • Wolverine	• Little Brown Myotis • Northern Myotis	• Wood Bison
Amphibians			• Northern Leopard Frog
Fish			• Lake Sturgeon • Shortjaw Cisco
Insects			• Monarch Butterfly • Nine-spotted Lady Beetle • Transverse Lady Beetle

Taxon	Potential Impact		
	High	Moderate	Low
Plants and Lichen		• Flooded Jellyskin	• Lori's Water Lilly

In addition, many species were identified in Conservation Data Centre data that are rare in the Assessment Area. These species are identified as CDC HCVs, and include 9 bird species, 1 insect, and 66 plant species (Table 5).

Question 2 – Endemic Species

Three endemic species were identified:

- Lori's Water Lily – **HCV with low potential impact from forest management;**
- Dodi Tiger Moth – **HCV with low potential impact from forest management; and**
- Wood Bison - **HCV with low potential impact from forest management.**

Question 3 – Significant Seasonal Concentrations

The following Important Bird Areas were identified as HCVs. Given the nature of the habitat and location relative to forest management activities, few direct threats from forest management are evident. **Kaweenakumik Lake IBA is designated as an HCV with moderate potential impact from forest management. All other IBAs identified below are designated as HCV with low potential impact from forest management.**

- Saskatchewan River Delta;
- Balbas Island;
- North Lake Winnipegosis Reefs;
- Gull Bay Spits; and
- Little George Island.

Question 4 – Edge of Range Concentrations

The following three populations are HCVs associated with edge-of-range concentrations:

- Eastern White Cedar - **HCV with moderate potential impact from forest management.**
- Fox Sparrow - **HCV with low potential impact from forest management**.
- Flooded Jellyskin - **HCV with moderate potential impact from forest management**.

In addition to the three populations noted above, several other species are identified as outliers with presence recorded in the Assessment Area. However, whether or not they represent points of concentration is uncertain, so their presence is noted, but they are not identified as HCVs.

Question 5 – Regionally Significant Declining Species

The only species identified in response to this question is moose. Moose is a socially and ecologically important species that has declined markedly over the last couple of decades. Because of the notable relationship between forest management and moose habitat and mortality as potentially influenced by forestry-related access infrastructure, the species is identified as an **HCV with high potential impact from forest management.**

Question 6. – Conservation Areas

Eleven parks and eight ecological reserves are identified as HCVs. These include parks whose designation (indicated in parentheses) is consistent with the concept of High Conservation Values. They are:

- Amisk Park Reserve (Wilderness designation);
- Birch Island Park (Natural);
- Chitek Lake Anishinaabe Park (Indigenous Traditional Use);

- Clearwater Lake (Natural);
- Goose Islands (Natural);
- Grand Island (Natural);
- Grass River (Natural);
- Kettle Stones (Natural);
- Little Limestone Lake (Natural);
- Paint Lake (Natural); and
- Pisew Falls (Recreation).

All eight ecological reserves in the Assessment Area are also identified as HCVs:

- Kaweenakumik Ecological Reserve;
- Long Point;
- Birch River;
- Armit Meadows;
- Lake Winnipegosis Salt Flats;
- Red Rock;
- Walter Cook Caves; and
- Pasla Hazel.

In general we believe these sites are at low risk from forest management, however we do not have sufficient familiarity to state so categorically.

3.2 SPECIES AT RISK

3.2.1 Context

In keeping with the consistent interpretation of this question, all SAR within the Assessment Area are considered to be HCVs. Whether or not SAR are at risk from forest management activities is not a factor in determining whether they 'qualify' as an HCV, although it obviously should be taken into account in determining management and monitoring strategies. Further, the species are the HCVs themselves, not necessarily the forests or other habitats in which they are found, although those may be also identified as HCVs in response to subsequent questions and should be considered in management and monitoring strategies.

3.2.2 Methodology

Information used in this assessment was gathered initially from on-line data sources, and in some cases further information on the status of species was provided by Manitoba Sustainable Development staff or others knowledgeable about specific species. A variety of systems or processes exist that provide determinations of species' status considering where they should be placed on the 'at risk' spectrum. To qualify for HCV status, we accepted that it was sufficient for a species to be ranked as some sort of 'at risk' status if two systems identified it as such. The ranking systems and legislation considered are identified below. Their HCV determinations for each species is identified in the 'Status' column of Table 3 below.

- **Committee on the Status of Species at Risk in Canada**(COSEWIC) – COSEWIC is a committee of experts tasked by the federal government to identify species' status. COSEWIC reports are well-researched and based on up-to-date science. Status determinations are made for each species, subspecies or population evaluated and may include:
    - **Extinct** – A wildlife species that no longer exists;
    - **Extirpated** – A wildlife species no longer existing in Canada, but occurring elsewhere;
    - **Endangered** – A wildlife species facing imminent extirpation or extinction;
    - **Threatened** - A wildlife species likely to become endangered if limiting factors are not reversed;
    - **Special Concern** – A wildlife species that may become threatened or an endangered wildlife species because of a combination of biological characteristics and identified threats;

- **Not at Risk** – A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances; or
- **Data Deficient** – A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction

- **Species at Risk Act(SARA)**– Canada's federal legislation related to species at risk. In its Schedules, the Act categorizes species using the same definitions as COSEWIC, for Extirpated, Endangered, Threatened, and Special Concern.

- **Manitoba Endangered Species and Ecosystems Act (MESEA)** – Manitoba's legislation related to species and ecosystems at risk. It uses the same categories as COSEWIC and SARA, but uses them in the context of the province of Manitoba, rather than in Canada as a whole:
  - **Extirpated** – A species formerly indigenous to Manitoba that no longer exists in the wild in Manitoba but exists elsewhere;
  - **Endangered** – A species indigenous to Manitoba threatened with imminent extinction or with extirpation through all or a significant portion of its Manitoba range;
  - **Threatened** –A species indigenous to Manitoba that is likely to become endangered or is because of low or declining numbers in Manitoba, particularly at risk if the factors affecting its vulnerability do not become reversed; and
  - **Special Concern** – A species indigenous to Manitoba that is at risk of becoming a threatened or endangered species because of a combination of biological characteristics and identified threats to the species.

- **Conservation Data Centre (CDC)**. CDC is a storehouse of information on Manitoba's biodiversity. Among other functions, the Centre assigns conservation status ranks based on how rare species or ecosystems are in the province. The ranking system used by CDC fits within the hierarchical system used by NatureServe's Global System. The ranks identified by CDC are based on species' subnational status, denoted by a first letter "S". Within that geographic range (here, the province of Manitoba) are numeric identifiers as follows:
  - **S1 (Critically Imperilled)** - At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors;
  - **S2 (Imperilled)** - At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors;
  - **S3 (Vulnerable)**- At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors;
  - **S4 (Apparently Secure)** - At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors; and
  - **S5 (Secure)** - At very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundant populations or occurrences, with little to no concern from declines or threats.

  Where two numbers are provided for the same species (e.g. S2S3), it indicates some uncertainty about the most appropriate categorization. Further, CDC ranks include a letter at the end of the code's designation (either a B, N, or M) to indicate that the rank applies to breeding, non-breeding, or migrant populations.

- **NatureServe.** NatureServe is an international organization whose mission is to provide the scientific basis for effective conservation action. A key part of addressing that mission is identification of species' status. This HCV assessment includes NatureServe's global assessment of species. The NatureServe rankings shown in Table 3 are based on the status of species globally as indicated by

the letter **G**, rather than the letter **S** used by CDC. The definitions associated with the numeric parts of the rank are analogous to those used by CDC.

- **International Union for the Conservation of Nature (IUCN)**. The IUCN is composed of both government and civil society organizations and provides a variety of tools for use in conservation. Among those tools is Red List Assessments that are intended to measure the change of global diversity through assessments of individual species that evaluate the chances of extinction in the foreseeable future based on past and expected future trends. Definitions of key terms are: as follows:
    - **Critically Endangered** – refers to a taxon with an extremely high risk of extinction in the wild in the immediate future;
    - **Endangered** – refers to a taxon with a very high risk of extinction in the wild in the immediate future;
    - **Vulnerable** – refers to a taxon with a high risk of extinction in the wild in the immediate future;
    - **Near Threatened** – refers to a taxon that does not qualify for critically endangered, endangered or vulnerable status now, but is close to qualifying for, or is likely to qualify for, a threatened category in the near future; and
    - **Least Concern** – refers to a taxon that does not qualify for critically endangered, endangered, vulnerable or near threatened. Widespread and abundant taxa are included in this category.

Several observations can be made regarding species rankings:

1. While there is a more-or-less comparable gradation of categories from least concern (e.g. not at risk) to that indicating the most dire condition (e.g. Critically Endangered), there is not consistency across ranking systems in terms of rank definitions and language. The lack of consistency is likely due to different criteria used to evaluate species' conditions including the nature of threats considered, different population thresholds and conditions associated with considerations of viability, age and quality of data, and the geographic area encompassed in the assessment.

2. Although COSEWIC rankings are used as input into the SARA status, they are not the same. This dissimilarity is likely reflective of the gap in timing between the production of a COSEWIC determination and updates to the Species at Risk Act. Another consideration is that it is not mandatory that COSEWIC rankings be adopted by SARA - the process allows for discretion in considering the ranking to be incorporated into SARA.

3. There is considerable difference between the Manitoba-specific rankings as indicated by MESEA and the Canadian rankings as indicated by COSEWIC and SARA. Likely explanations for this difference are that the MESEA rankings consider the species status in Manitoba only, and that the timing of legislative updates is not related to COSEWIC reporting or SARA updates.

4. Although CDC and NatureServe are part of the same broad organization, their rankings are different – in some cases strikingly so (e.g. Chimney Swift is ranked by CDC as S2B, but as G4G5 by NatureServe). This is likely due to the fact that the NatureServe rankings are based on global status, but the CDC ones are based only on Manitoba.

3.2.3 Results

Species identified as HCVs and a description of important aspects of context and their ecology are identified in Table 3. Based on the evidence provided in the table, this assessment concludes that there are 29 SAR that are HCVs in the Assessment area and of these have a moderate or high potential to be affected by forest management.

Table 3. Species at Risk in the Assessment Area,

Species	Status	Range in Assessment Area and Province	Ecology	Risks and Threats	Forest Management Notes & References
Birds					
Bank Swallow (*Riparia riparia*)	COSEWIC – Threatened MESEA –Not Listed SARA – Threatened CDC – S5B NatureServe – G5 IUCN - Least Concern **HCV with <u>moderate</u> potential impact from forest management**	• Uncommon in the Assessment Area. Presence is primarily in western portion, and even there it is uncommon. • The species occurrence in the province is greatest in the south, primarily southwest. Rare and scattered through the rest of the province.	• The species is highly colonial – nesting in both natural and anthropogenic banks and bluffs (riverbanks, lake bluffs, aggregate pits, rock cuts, etc.). • Broad and significant population declines of > 90% since 1970. • Population declines are occurring throughout the ecological guild of aerial insectivores to which the Bank Swallow belongs.	• The main causes of population decline are: 1) loss of breeding habitat through projects related to erosion control, flood control aggregate management and conversion of pasture land to cropland; and 2) declines in insect populations likely due to widespread pesticide use. • Threats during migration and on the wintering grounds are largely unknown.	• Forestry does not likely have significant impacts. However, insecticide application is used during outbreaks and may, in those circumstances affect local populations . Local populations may also be affected through rehabilitation of aggregate pits. • References: COSEWIC (2013a), Taylor (2018)
Barn Swallow (*Hirundo rustica*)	COSEWIC – Threatened MESEA –Not Listed SARA – Threatened CDC – S4B NatureServe – G5 IUCN - Least Concern **HCV with <u>moderate</u> potential impact from forest management**	• Not uncommon in the Assessment Area – records are clustered around areas of settlement. • Throughout the province records are associated with human settlement, so they are much more widespread and common in the south.	• Nesting is highly associated with settlement and human structures in rural environments. Nesting sites include barns, garages, sheds, bridges, culverts, verandas, wharfs, etc. • Typically forage on the wing for insects in open habitats proximal to nest locations. • Still relatively common, but populations have declined significantly; > than 70% decline from 1970 – 2009. • Population declines are occurring throughout the ecological guild of aerial insectivores to which the barn swallow belongs.	• The main causes of population decline are: 1) loss of breeding sites due to conversion from conventional to modern farming structures and techniques; 2) declines in insect populations likely due to widespread pesticide use; and 3) effects of climate change, including cold snaps during the breeding period. Other limiting factors may include ectoparasitsm, competition for nest sites, and loss of overwintering habitat.	• Forest management is not believed to have a significant detrimental impact However, as with bank swallow, insecticide application is used during outbreaks and may, in those circumstances affect local populations. • References: COSEWIC (2011), Poole (2018)
Canada Warbler (*Cardellina canadensis*)	COSEWIC – Threatened MESEA – Endangered/ Threatened[1] SARA – Threatened CDC – S3B NatureServe – G5 IUCN - Least Concern	• Not uncommon in the Assessment Area - primarily in the west and south west-central portions. • MBBA notes species' abundance limited to central/southern boreal portion of province with greatest densities in the Cedar Lake vicinity (in the	• The Canada Warbler is primarily associated with mature boreal forest with lush shrubby understoreys. • Species population decline as been ~ 5%/year with most decline evident in eastern portion of range.	• Significant habitat loss has occurred in winter range where up to 95% of prime habitat has been converted to agriculture. • Habitat loss has also occurred in eastern part of breeding range.	• Loss of old forest through forestry activities contributes to habitat decline. • Management practice to address habitat loss is required and exists in some provinces. • References: Roberto-

Species	Status	Range in Assessment Area and Province	Ecology	Risks and Threats	Forest Management Notes & References
	HCV with <u>high</u> potential impact from forest management	FML) and along south-eastern shore of Lake Winnipeg.			Charron (2018), COSEWIC (2008b)
Chimney Swift (*Chaetura pelagica*)	COSEWIC – Threatened MESEA –Endangered SARA – Threatened CDC – S2B NatureServe– G4G5 IUCN - Vulnerable **HCV with <u>moderate</u> potential impact from forest management**	• Very uncommon in the Assessment Area; MBBA records only three squares with breeding evidence – in the vicinity of Flin Flon, and The Pas. • Patchy presence in southern Manitoba, with a concentration around Winnipeg.	• Nesting is highly associated with human structures (often chimneys) in urban and settled environments. • Natural nesting sites are hollow portions of standing trees. • Typically forage on the wing for insects in open habitats proximal to nest locations. • Populations and areas of occupancy are declining though the species' range; estimated population decline from 1968 – 2005 was 95%. • Population declines are occurring throughout the ecological guild of aerial insectivores to which the chimney swift belongs.	• The main causes of population decline are: 1) loss of breeding sites through urban renovation; and 2) declines in insect populations. Bad weather during breeding may also have an impact.	• Loss of old forest habitat, through harvest/removal of snags and dead trees may reduce populations in natural environments. • References. COSEWIC (2007), Poole et al. (2018)
Common Nighthawk (*Chordeiles minor*)	COSEWIC – Special Conc. MESEA – Threatened SARA - Threatened CDC - S3B NatureServe – G5 IUCN – Least Concern **HCV with <u>moderate</u> potential impact from forest management**	• Recorded throughout the Assessment Area, with highest presence in the northern portion. • CDC provides 94 records in the Assessment Area. • Provincial presence is greatest east of Lake Winnipeg.	• The Common Nighthawk is an aerial insectivore; many species in this guild are suffering population declines. • Habitats include a wide variety of open areas, including logged and burned forest, clearings, and natural open-forest habitats • The Canadian population has declined by more than half over its range, and up to 70% in some portions of its range over the last 50 years.	• Widespread insect declines due to habitat change, pesticide use and climate change are believed to pose a significant risk. • Additional threats may include loss of overwintering habitat, loss of nesting habitats, agricultural intensification, and collisions with structures and vehicles.	• Loss of boreal transition forest has contributed to declines in the Prairie provinces. • Maintenance of open areas in forests will provide on-going habitats. • References: Brigham (2011) COSEWIC (2018), Sigurdsson and Artuso (2018a)
Eastern Whip-poor-will (*Antrostomus vociferus*)	MESEA - Threatened SARA – Threatened CDC - S2S3B NatureServe–G5 IUCN– Near Threatened **HCV with <u>low</u> potential impact**	• Patchy distribution primarily through the western portions of the Assessment Area. • Within the province, there is a notable southeast-northwest pattern of distribution generally	• The Eastern Whip-poor-will is an aerial insectivore; many species in this guild are suffering population declines. • Generally prefers habitats with mixed/open forests (frequently early-mid succession) with relatively little ground cover.	• No definitive causes have been identified, but like other aerial insectivores, widespread insect declines due to habitat change, pesticide use and climate change are believed to be threats • Additional threats may include	• Forest harvesting is not believed to be a threat as regenerating deciduous and mixed forest areas provide good quality habitat. References: COSEWIC

Species	Status	Range in Assessment Area and Province	Ecology	Risks and Threats	Forest Management Notes & References
	from forest management	following the distribution of boreal hardwood transition forest.	• Like tyrannid flycatchers, it feeds primarily by sallying from perches. • Based on Breeding Bird Surveys, the continental population was estimated to have declined by 69% between 1970 and 2014.	loss of overwintering habitat, loss of nesting habitats, agricultural intensification, and collisions with structures and vehicles.	(2009d), Cink et al. (2017), and Mills et al. 2018
Eastern Wood Pewee (*Contopus virens*)	COSEWIC – Special Concern MESEA –Not Listed SARA – Special Concern CDC – S3B NatureServe – G5 IUCN –Least Concern **HCV with <u>high</u> potential impact from forest management**	• MBBA indicates limited presence in the Assessment Area – limited to the western portion. • In Manitoba highest breeding concentrations are in the forests of the southeastern portion of the province. • Moderate levels of occurrence in other portions of southern Manitoba are associated with riparian forests.	• Optimal habitat is hardwood forest. • The species is an aerial insectivore; many species in this guild are suffering population declines. • Although still relatively abundant, long term declines (~ 70% in the 40 years prior to 2011) are evident; its 10-year rate of decline (25%) comes close to the criteria for a COSEWIC rating of "Threatened".	• Several factors are considered threats to populations and habitats, including: 1) degradation of habitat on breeding grounds due to urban development and forestry; 2) degradation of winter habitat; 3) declines in insect populations; 4) possible high rates of mortality during migration and on wintering grounds; 5) nest predation; and 6) changes in forest structure.	• Forest management affects abundance of mature hardwoods which may affect habitat quality. • Some studies indicate that selection harvesting may improve habitat quality. • References. Artuso (2018c), and COSEWIC (2012)
Evening Grosbeak (*Coccothraustes vespertinus*)	COSEWIC – Special Concern MESEA –Not Listed SARA – Not Listed CDC – S2S3 NatureServe – G5 IUCN –Least Concern **HCV with <u>high</u> potential impact from forest management**	• Not uncommon through western part of Assessment Area. • In Manitoba, breeding records cluster around the central-western part of the boreal forest, Riding Mountain Park, and the boreal forest in the southeast of the province.	• Optimal habitat is mixedwood forests with significant conifer component. • Main foods are conifer seeds and spruce budworms during irruptions. • As the species can be nomadic and irruptive, trends are hard to discern, but indications are of a significant decline (> 70% decline from 1970 – 2016) in Canada.	• A number of factors related to mortality and/or lack of productivity including, window strikes while visiting feeds, road collisions when individuals are gathering grit, range contraction due to climate change, and removal of old forest habitat through logging.	• Forestry may contribute to population decline from removal of old/mature conifer and mixedwood forest habitat, and through decrease in budworm populations or irruptions through pest control. • References-Artuso (2018b) and COSEWIC (2016a)
Horned Grebe (*Podicepts auritus*)	COSEWIC – Special Conc. MESEA – Not Listed SARA – Special Concern CDC –S3B NatureServe – G5 IUCN –Vulnerable **HCV with <u>low</u> potential impact from forest management**	• Confirmed breeding west and north-west of Lake Winnipeg • Provincial presence is greatest in prairie potholes of southwestern Manitoba. • An eastern population (in the Magdalen Islands of Quebec) is rated as endangered by COSEWIC and SARA.	• Small ponds and lake inlets with emergent vegetation are prime habitat. • Key foods include small fish, insects, crustaceans and other aquatic animals • Long-term significant declines of> 75% were found in Breeding Bird Survey (BBS) and Christmas count data, although increase in recent years has been noted.	• Loss of wetlands to agriculture is a primary threat. • Additional threats include drought, eutrophication of wetlands, and expansion of predators on the prairies.	• Limitation of disturbance by forestry operations during nesting season and provision of buffers around suitable habitat are appropriate forest management measures. • References: COSEWIC (2009a), Mitchell (2018) Steadman (2018),

Species	Status	Range in Assessment Area and Province	Ecology	Risks and Threats	Forest Management Notes & References
Olive-sided Fly catcher (*Contopus cooperi*)	COSEWIC – Spec. Conc. MESEA – Threatened SARA – Threatened CDC – S3B NatureServe – G4 IUCN – Near Threatened **HCV with <u>moderate</u> potential impact from forest management**	• Recorded throughout the Assessment Area, with highest presence in the northern portion. • Provincial presence is greatest east of Lake Winnipeg	• The species is an aerial insectivore, many species in this guild are suffering population declines. • Associated with open coniferous or mixed-wood forests, where it sallies from tall trees or snags for insect prey. • Also frequently associated with burned forest, and recent cutovers are known to provide reasonable habitat. • The species is widespread nationally, but population is estimated to be declining at a rate of 3.4%/yr.	• Precise causes of widespread recent declines are uncertain although possible reasons include widespread declines in insect populations, perhaps associated with insecticides or climate change, fire suppression in boreal forests, deforestation and land conversion in non-breeding habitat.	• Maintenance of snags in harvested areas provides perching and foraging structure. • Management of post natural-disturbance habitat to retain structure is important. • References - Altman and Salabanks(2012), Environment Canada (2016)
Peregrine Falcon (*Falco pereginus anatum*)	COSEWIC – Not at Risk MESEA – Endangered SARA – Special Concern CDC – N/A NatureServe– G4 IUCN – Least Concern **HCV with <u>moderate</u> potential impact from forest management**	• Peregrine Falcons are very uncommon in Manitoba and their presence in the FML area would be striking given the lack of suitable nesting habitat (large cliffs). • Manitoba BBA documents one possible breeding record near Goose Lake in the western portion of the FML.	• Primarily cliff-nesting birds that prey on small-to medium-sized birds. • Continent-wide significant population declines from the 1940's to the 1970's were attributed to low nesting success associated with pesticide use. • Strong population growth has occurred over most of the species' range in Canada since DDT controls were instituted.	• The Peregrine Falcon remains potentially vulnerable to threats including toxic chemicals, heavy metal contamination, and severe weather effects associated with climate. In remote environments Peregrines are also susceptible to disturbance.	• Significant buffers around known nests and historic nesting sites are typically used to protect falcons. • References –COSEWIC (2017b), Olynyk (2018), White (2002)
Piping Plover (*Charadrius melodus circumcinctus*)	COSEWIC – Endangered SARA – Endangered MESEA– Endangered CDC – S1B NatureServe – G3 IUCN – Near Threatened **HCV with <u>low</u> potential impact from forest management**	• Piping plovers have undergone a dramatic decline in Manitoba. The 2013 COSEWIC status report notes a decline from 80 reported adults in 1991 to just 2 in 2011. • The Manitoba Breeding Bird Atlas describes successful fledging at individual nests in southern Manitoba in both 2016 and 2017. • Piping plovers were reported to nest in relative	• Over 1/3 of the global population of piping Plovers nest in Canada. • Piping Plovers nest on wide sandy beaches with little vegetation and a mix of substrates such as pebbles, gravel or sand. • The beaches used by piping plovers generally have characteristics which are also valued for recreation by humans.	• Human disturbance and human mediated habitat loss are the biggest threats to piping plovers. • Climate change also poses a threat – rise in lake levels may reduce the extent of habitat available and increases in severe storms may inundate nests.	• Plover nesting habitat is not endangered by forestry, although forest activities may disturb nesting birds if the nest sites are near operations – however this is likely very uncommon. • References COSEWIC (2013d), Porteous (2019) IBA Canada (undated)

Species	Status	Range in Assessment Area and Province	Ecology	Risks and Threats	Forest Management Notes & References
		abundance in the Gull Bay Spits Important Bird Area (in the northern portion of Lake Winnipeg in the Assessment Area); reported in 1988 (52 adults & 14 juveniles, and 1991 (38 individuals), but there have been no sightings since 2005. • It is possible that the Piping plover no longer nests in the Assessment Area.			
Rusty Blackbird (*Euphagus corolinus*)	COSEWIC – Special Concern MESEA – Not Listed SARA - Special Concern CDC - S4B NatureServe- G4 IUCN - Vulnerable **HCV with <u>high</u> potential impact from forest management**	• Most of the forested portion of Manitoba is within the range. • Manitoba BBA documents sparse presence in Assessment Area with possible, probable, and confirmed breeding.	• Breeding habitat is primarily coniferous forests adjacent to wetlands. • Diet is highly associated with aquatic insects. • Canadian population is estimated at > 4 million birds, but annual rates of decline have exceeded 5% in recent decades and recent population estimates indicate 85-90% decline since the 1970's.	• Degradation of wintering habitat and loss of wetlands in the southeastern U.S. are considered primary threats. • Blackbird control programs in agricultural areas, mortality due to pesticides, contamination of wetlands by mercury, wetland acidification and climate change also pose risks.	• Harvesting proximal to wetlands has been shown to decrease nesting success. • Maintenance of wetlands and use of significant buffers along all waterbodies is important to safeguard habitat. • References - Avery (2013), COSEWIC (2017a)
Short-eared Owl (*Asio flammeus*)	COSEWIC – Special Concern MESEA – Threatened SARA – Special Concern CDC – S2S3B NatureServe – G5 IUCN - Least Concern **HCV with <u>low</u> potential impact from forest management**	• Presence in the Assessment Area is primarily in the west-central portion, although number of records is low. • As the species is primarily an open-country bird, it is more common, although still relatively rare, in southern Manitoba.	• The short-eared owl is an open-country, ground-nesting bird, feeding primarily on small mammals. • The species has a very wide global distribution but is considered only an occasional breeder in Manitoba. • Long term declines are evident from Christmas Bird Count data, indicating an annual decline of ~ 3% over the past 40 years.	• Loss of open-country habitat in both breeding and winter range to agriculture is the most significant threat. • Pesticides may pose a secondary threat.	• Forest management does not pose a significant risk to short-eared owls. • Maintenance of open areas in forests will provide on-going habitats where they exist. • References: Artuso (2018) COSEWIC (2008a), Wiggins et al. (2006)
Western Grebe (*Aechmophorus occidentalis*)	COSEWIC – Special Concern MESA – Not Listed SARA – Special Concern CDC – S3S4B NatureServe – G5 IUCN – Least Concern	• Very rare in Assessment Area –Manitoba BBA documents only one confirmed occurrence in the area of the Saskatchewan River Delta. • Breeding presence is also noted in IBA information in	• Typically breeds in colonies, although sizes vary from just a few birds to > 1,000. • Most of Canadian population is concentrated in 10-12 colonies in the prairie provinces. • Typical habitat is marshes and lakes with stands of emergent	• Important threats to breeding populations include human disturbance of colonies, habitat degradation (especially of emergent vegetation), nesting season fluctuation in water levels, introduction of non-native fish, fishing-related incidental	• Forest management does not pose a significant threat, although disturbance may occur if operations are near nesting colonies. References: COSEWIC

Species	Status	Range in Assessment Area and Province	Ecology	Risks and Threats	Forest Management Notes & References
	HCV with <u>low</u> potential impact from forest management	the Kaweenakumik Lake Ecological Reserve and Important Bird Area • Manitoba is the eastern-most extent of the species range in Canada with presence in southern and primarily southwestern portions of the province	vegetation, extensive areas of open water, and stable water levels. • The 2014 COSEWIC report notes that the 15 year period between 1995-2010 saw a continental population decline of 44%.	take, and declines in prey availability (caused by pollution) •	(2014 b), Manitoba (2015) Mitchell and Artuso (2018).
Yellow Rail (*Coturnicopus novemboracensis*)	COSEWIC – Special Concern MESEA – Not Listed SARA – Special Concern CDC – S3B Nature Serve – G4 IUCN –Least Concern **HCV with <u>low</u> potential impact from forest management**	• Presence in the Assessment Area is primarily in the south west-central portion, although number of records is low. • The species is uncommon through Manitoba with its primary reported range in the southern interlake region	• The yellow rail is a secretive wetland bird, found in a variety of wetland types (although sedge vegetation is preferred) that maintain consistent water levels throughout the breeding season. • Given its reclusive nature, population data are scarce; nonetheless atlas data and anecdotal reports suggest declines in recent decades of up to 30%.	• Agriculture and wetland drainage have caused significant historic declines in habitat. • Global warming is predicted to increase droughts and therefore will likely be detrimental to the consistent habitat/water level requirements of the species. • Forest management per se is not a main contributed to habitat loss.	• Forest management does not pose a significant threat to yellow rails. • Avoidance of wetlands, particularly during the breeding season is important. • References: Bazin (2018), COSEWIC (2009b)
Mammals					
Little Brown Myotis (*Myotis lucifugus*)	COSEWIC – Endangered MESEA –Endangered SARA – Endangered CDC – S2N, S5B NatureServe – G3 IUCN – Endangered **HCV with <u>moderate</u> potential impact from forest management**	• The entire Assessment Area is in the species' range. • Most of the province is in the species' range – there is uncertainty about whether the species exists in the far north, and northeast of the province.	• Like most bats, the species is insectivorous, feeding on the wing. • In the boreal forest, prefers deciduous and mixed deciduous-spruce forests and old forests. • Demographics poorly understood. • The species overwinters in cold humid hibernacula, sometimes in association with other bat species.	• An existential threat to the species is white-nose syndrome (WNS), a fungal disease caused by an introduced pathogen, first detected in Canada in 2010. • An emergency listing by COSEWIC identified this species, *Myotis septentrionalis* and *Permiyotis subflavus* as endangered in response to dramatic population declines and pervasiveness of WNS. • WNS was first detected in Manitoba in 2018, and has also been detected in the northwestern states so it is highly likely the disease will spread throughout Canada. • Population declines where the disease is present are ~ 90-99%.	• Forest management may affect habitat somewhat, but impacts can be limited by snag retention, partial cutting, and retention of old forests. • Impacts of forest management are slight compared to those of WNS, however remnant populations may be affected if poor stand-management practices are implemented. • References. COSEWIC 2013b, Environment and Climate Change Canada 2018b, white-nose syndrome.org (web site)
Northern Myotis (*Myotis*	COSEWIC – Endangered	• Most of the Assessment Area is in the species'	• Like most bats, the species is insectivorous, feeding on the	• An existential threat to the species is white-nose syndrome	• Forest management may affect habitat somewhat,

Species	Status	Range in Assessment Area and Province	Ecology	Risks and Threats	Forest Management Notes & References
septentrionalis)	MESEA –Endangered SARA – Endangered CDC – S3S4N, S5B NatureServe – G1G2 IUCN – Near Threatened **HCV with <u>moderate</u> potential impact from forest management**	range; the species may not exist in the northeastern portion of the Assessment Area. • Most of the province is in the species' range – its range does not extend quite as far north as *M. lucifugus* and the species does not exist in north and northeastern Manitoba.	wing. • In the boreal forest, prefers deciduous and mixed deciduous-spruce forests and old forests. • Demographics poorly understood. • The species overwinters in cold humid hibernacula, sometimes in association with other bat species.	(WNS), a fungal disease caused by an introduced pathogen, first detected in Canada in 2010. • An emergency listing by COSEWIC identified this species, *Myotis lucifugus*and *Permiyotis subflavus* as endangered in response to dramatic population declines and pervasiveness of WNS. • WNS was first detected in Manitoba in 2018, and has also been detected in the northwestern states so it is highly likely the disease will spread throughout Canada • Population declines where the disease is present are ~ 90-99%.	but impacts can be limited by snag retention, partial cutting, and retention of old forests. • Impacts of forest management are slight compared to those of WNS, however remnant populations may be affected if poor stand-management practices are implemented. • References. COSEWIC 2013b, Environment and Climate Change Canada 2018b, white-nose syndrome.org (web site).
Wood Bison (*Bison bison athabascae*)	COSEWIC – Special Concern MESEA – Not Listed SARA –Threatened CDC – SNA NatureServe – G4T2T3Q IUCN – Near Threatened **HCV with <u>low</u> potential impact from forest management**	• The only herd in the province is in the vicinity of Chitek Lake, at the southeastern extreme of the Assessment Area, where approximately 300 animals exist within an area of approx. 3,800 km^2.	• Nine distinct populations exist in Canada (Figure 8). The Chitek Lake herd is furthest east and is outside the historic range of the species. • Wood bison are primarily grazers, feeding on grasses and sedges found in meadows, with a broader matrix of hardwood, coniferous and mixed forest, bogs, fens and shrublands.	• Encroachment/loss of habitat due to agriculture may be important in some areas, but likely not in Chitek Lake area given the nature of the landscape. • The species is susceptible to brucellosis and bovine tuberculosis when herds occur in proximity to livestock farming. • Road and railway mortality can be an issue in some areas.	• Where forestry occurs in proximity to herds, clear-cutting may create new meadows and regenerate summer habitat, but these areas do not represent good winter habitat. • No harvesting of which we are aware in Chitek Lake area, therefore forestry impacts are nil. • References. COSEWIC 2013c, Environment and Climate Change Canada 2018c)
Woodland Caribou (*Rangifer tarandus caribou*)	**See discussion following this table**				
Wolverine (*Gulo gulo*)	COSEWIC – Threatened MESEA –Not Listed SARA – Threatened CDC – S3S4 NatureServe – G4T4 IUCN – Least Concern	• Likely present in low densities through most of the Assessment Area. • Present in most of the province north of 53^o latitude and range in the province extends further south to the east of Lake	• Aggressive scavenging and predatory member of the mustelid family with very large home range (up to 1,500 km^2 for males). • Very broad food habits, including carrion and prey from rodents to caribou.	• Threats include: o trapping, although low trapping effort in Manitoba exists for northcentral and northwest; o access created by logging roads which facilitates human intrusion and	• Forest management affects the quality of caribou habitat by increasing access by humans, decreasing landscape connectivity, and potentially decreasing prey abundance by facilitating hunting and

Species	Status	Range in Assessment Area and Province	Ecology	Risks and Threats	Forest Management Notes & References
	HCV with <u>high</u> potential impact from forest management	Winnipeg, likely to around Berens River.	• Presence is considered to be an indication of ecosystem health, given its dependence on extensive, connected ecosystems. • Estimated Canadian population may be > 10,000; population in Manitoba estimated at 1,100 – 1,600.	anthropogenic mortality (trapping, hunting, vehicle collision) and predation by wolves; o decline in caribou populations (and so loss of a food source); o climate change which may impact food abundance and availability; and o recreational activities and resource development which leads to wolverine avoidance of sites with human presence/impacts.	decrease in caribou. • References. Bowman et al. (2010), COSEWIC (2014a), Scrawford et al. (2017)
Amphibians and Reptiles					
Northern Leopard Frog (*Lithobates pipiens*)	COSEWIC – Special Concern MESEA –Not Listed SARA – Special Concern CDC – S4 NatureServe – G5TNR IUCN – Least Concern **HCV with <u>low</u> potential impact from forest management**	• Present in appropriate habitat through Assessment Area, though likely less common in north. • In Manitoba, greater abundance, present and historical in the south. Northern limit reported as Southern Indian Lake at the north end of the Assessment Area.	• To provide habitat for breeding, foraging, and overwintering leopard frogs require wetlands, access to moist foraging areas, and well-oxygenated waterbodies. • Is an important link in food chain – they consume large numbers of invertebrates and are in turn food for fish, waterfowl, snakes, and large invertebrates through their life cycle. • Population declines in western Canada have been drastic. In Manitoba severe declines occurred in the 1970's, but populations in appropriate habitat seem to have recovered, particularly in southern parts of the province.	• Threats include: o habitat loss to agriculture and urbanization in southern parts of range, and introduced plants such as Phragmites and purple loosestrife; o diseases, including 'red leg', which was responsible for severe declines in western Canada, Rana virus, and Chytridiomycosis, which has devastated frog populations around the world and has been linked to declines in North America; o predation by stocked and introduced fish; o pesticides and herbicides as amphibians are sensitive to environmental contaminants; and o climate change impacts on habitat.	• Forest management activities in wet forests may impact foraging areas. • Maintenance of wetlands and use of buffers along all waterbodies is important to safeguard habitat. • General potential impact of forest management is low relative to other threats. • References. COSEWIC (2009c), Canadian Herpetological Society (2019)
Fish					
Lake Sturgeon (*Acipenser fulvescens*)	COSEWIC – Endangered MESEA –Not Listed SARA – Not Listed CDC – N/A	• Two Designatable Units of Sturgeon exist in the Assessment Area:1) Saskatchewan and Nelson River Populations; and 2)	• Lake Sturgeon are extremely long-lived (50 – 150 years) and slow reproducing. • They do not reach sexual maturity until 15-25 years and	• Historical declines of the Designatable Units/Populations in the Assessment Area have been due primarily to hydroelectric development and	• Effluents from forestry-associated mills may have had an impact historically, but this is no longer believed to be a threat.

Species	Status	Range in Assessment Area and Province	Ecology	Risks and Threats	Forest Management Notes & References
	NatureServe – G3G4TNR IUCN – Not Evaluated **HCV with <u>low</u> potential impact from forest management**	Western Hudson Bay Populations • Lake Sturgeon populations are distributed in large rivers and waterbodies throughout the province, from the Churchill River in the north, to the Red and Assiniboine in the south.	thereafter spawn only periodically making recovery from population trauma extremely challenging and drawn out. • Lake Sturgeon have been historically important to Indigenous Peoples and were also extensively harvested commercially. • The species is a benthic specialist, and requires a variety of habitat conditions to spawn, and spend different parts of its life cycle. • Most populations in Canada declined precipitously beginning in the 18th century. Although some populations have recovered, others continue to struggle.	anthropogenic exploitation – historical and current. • Hydroelectric developments affect populations through altering river morphology (removal of breeding and neonatal habitat, etc.), creation of migratory barriers, entrainment, and flow regulation which may preclude upstream passage • Historic commercial harvesting caused significant declines, and subsistence harvesting is still a threat in Western Hudson Bay populations. • Water pollution may have had an effect historically, but it is no longer believed to be a threat.	• References. COSEWIC (2017c), Manitoba Hydro (2016)
Shortjaw Cisco (*Coregonus zenithicus*)	COSEWIC – Threatened MESEA –Not Listed SARA – Threatened CDC – S2 NatureServe – G3 IUCN – Vulnerable **HCV with <u>low</u> potential impact from forest management**	• Present in at least some large lakes in the Assessment Area, including Reindeer Lake, Lake Athapapusco, and Lake Clearwater Lake. • Present in large lakes in the province including Lakes Winnipeg and Winnipegosis.	• Generally inhabits deep waters of large lakes, although habitat requirements outside of Great Lakes have not been significantly investigated. • Foods consist primarily of limnetic crustaceans and benthic organisms. • Where they occur in numbers they are likely an important link in the food chain, being fed up by trout, burbot and others. • Long-term population data are limited although indications overfishing in some lakes led to significant declines relative to previous natural levels.	• Several factors are considered threats to populations and habitats, including: 1) pollution and eutrophication of lakes; 2) over-fishing; 3) competition from introduced smelt and alewives; and 4) predation by sea lamprey.	• Given that Shortjaw Cisco inhabit the deep portions of large lakes, there is little potential for impact from forest management. • No reference to impacts of forestry was cited in literature. • References. COSEWIC (2003), Fisheries and Oceans Canada web site.
Insects					
Monarch Butterfly (*Danaus plexippus*)	COSEWIC – Endangered MESEA –Not Listed SARA – Special Concern CDC –S3S4B NatureServe – G4T1	• The Monarch is recorded sparsely in the Assessment Area. As the Assessment Area is north of the natural northern limit for the milkweeds that Monarchs rely on for food, COSEWIC	• The three most striking aspects of Monarch's ecology are: o they are very strongly associated with milkweed and exist in numbers only where milkweed occurs;	• Most Monarchs are concentrated in the winter in a few hectares of Oyamel Fir forest in Mexico. The forest has been fragmented and degraded by conversion to agriculture, fire, and logging.	• Given the scarcity of Monarchs in the Assessment Area, there is little risk from forestry operations (and even in areas where Monarchs were more plentiful in the

Species	Status	Range in Assessment Area and Province	Ecology	Risks and Threats	Forest Management Notes & References
	IUCN – Not Evaluated **HCV with <u>low</u> potential impact from forest management**	(2016b) notes that its presence represents non-breeding vagrants and occurrence at isolated patches of milkweeds planted outside their native range. • Monarchs are common in southern Manitoba, within the natural range of milkweeds.	o Adults of the eastern North American population migrate annually to overwintering habitat in the mountains of central Mexico. It can take 1 – 3 generations for return migrants to arrive back in Canada.; and o Populations have declined precipitously over the last 20-or-so years.	• Climate change models predict that the area of suitable forest at the overwintering sites will decline; • Additional important threats may include: o loss of breeding and feeding habitat in to agriculture, particularly intensive industrial agriculture; o herbicide and insecticide impacts, particularly glyphosate and neonicotinoid insect ides; o residential and commercial development; o loss of habitat related to spread of alien species; and o release of commercially bred Monarchs.	Assessment Area, there would still be little risk, and the main threats are not associated with forestry). • References. COSEWIC (2016b), Nature North Monarch Web page.
Nine-spotted Lady Beetle (*Coccinella novemnotata*)	COSEWIC – Endangered MESEA –Not Listed SARA –Not Listed CDC –N/A NatureServe – G5 IUCN – Not Evaluated **HCV with <u>low</u> potential impact from forest management**	• The abundance of the Nine-spotted Lady Beetle (also known as C-9) in the Assessment Area is unknown. There are very few records, however the species is easily overlooked and the Assessment Area contains habitats in which C-9 has been recorded elsewhere. • The traditional range of C-9 is in southern Manitoba.	• C-9 has a wide ecological niche and has been recorded across a wide variety of habitats and temperature regimes in Canada. • Prey is primary aphids. • Prior to the mid 1970's the species was considered very common, however the decline since then has been rapid, and the species likely persists only in extremely low numbers. • Only 56 individuals have been collected in Manitoba in the most recent reported decade (2005-2014), the lowest in any province in which records are kept.	• The decline in populations of C-9 has been co-incident with the introduction of exotic species of ladybug, primarily Seven-spotted Lady Beetle and multicoloured Asian Lady Beetle. • Hypothesized mechanisms responsible for the decline include competition, predation by exotic ladybugs or introduction of pathogens. • Pesticide effects, most notably from neonicotinoids, are also noted as being possible cause, given that ladybugs' prey (aphids) feeds upon plants that are treated with this family of pesticides.	• Forest management is not considered a threat. • References. COSEWIC (2016c) Evans (et. al. 2011)
Transverse Lady Beetle (*Coccinella transverso-guttata*)	COSEWIC – Special Concern MESEA –Not Listed SARA –Not Listed CDC –N/A NatureServe – G5T5 IUCN – Not Evaluated	• The abundance of the transverse lady beetle (TLB) in the Assessment Area is unknown. There are records from proximal portions of Saskatchewan and northeastern Manitoba.	• Like C-9, TLB has a wide ecological niche and feeds primarily on aphids. • Prior to the mid 1980's the species was widely distributed and among the most common lady beetles in North America.	• As with C-9, the decline in populations of TLB -9 has been co-incident with the introduction of exotic species of ladybug. • Hypothesized mechanisms responsible for the decline include competition, predation	• Forest management is not considered a threat. • References. COSEWIC (2016d) Marriott et al. (2009)

Species	Status	Range in Assessment Area and Province	Ecology	Risks and Threats	Forest Management Notes & References
	HCV with <u>low</u> potential impact from forest management	The absence of records from the Assessment Area is likely the result of lack of searches. TLB is associated with habitats found in the Assessment Area. COSEWIC presumes the Assessment Area is in the range of the beetle. • There are many records from Manitoba south of Lake Winnipeg.	• In many parts of its former range, TLB is either absent or below detection limits. • Information specifically on Manitoba not found.	by exotic ladybugs or introduction of pathogens. • Other contributing factors may be pesticides, habitat loss through agricultural and urban expansion, but these are considered less significant than the interactions with exotic species of lady beetle.	
Vascular Plants and Lichens					
Flooded Jellyskin (*Leptogium rivulare*)	COSEWIC – Special Concern MESEA –Not Listed SARA –Threatened CDC –S1 NatureServe – G3G5 IUCN – Near Threatened **HCV with <u>moderate</u> potential impact from forest management**	• COSEWIC reports an outlier population near Flin Flon (See Section 3.5.3). • In Manitoba there are also records in the boreal forest of southeastern portion of the province.	• Flooded Jellyskin requires humid habitat that is both calcareous and subject to seasonal flooding. • For the species to thrive, the water must have a low sediment load and there has to be a suitable stratum upon which to attach itself (i.e. tree, shrub or rock) and appropriate temperatures. It is most often recorded on ash trees, but also maple, elm, and willow. • Flooded Jellyskin is a cyanolichen in which the photosynthetic partner is a cynobacterium. Cyanolichens have been shown to contribute significant amounts of nitrogen to the ecosystems in which they occur. • Since the original COSEWIC assessment in 2004, there has been an increased number of known occurrences, which as of the 2015 COSEWIC reports numbered 76 (roughly 352,000 individuals).	• A significant threat to the Flooded Jellyskin is the emerald ash borer, which kills native ash trees – the most significant host of the lichen. • The occurrences near Flin Flon may be impacted by pollution from mining and smelting activity that have decreased substratum pH over a large area. • Climate change may also be another threat. Climate change may alter seasonal flooding and vernal pools along watercourses where flooding creates appropriate conditions for the lichen and the preferred host trees and shrubs.	• Forestry that removes trees in or near vernal pools or along waterways may be a threat as increased sun exposure may increase evaporation rates and reduce humidity; however, most forest management guidelines guard against such practices. • References. COSEWIC 2015), COSSARO (2014)
Lori's Water Lily (*Nymphaea loriana*)	COSEWIC – Not Listed MESEA –Not Listed SARA –Not Listed	• The known range of Lori's water lily is very small, and is confined entirely to the Assessment Area and	• Although first observed in the late 1940's, only recent (2008) efforts resulted in finding plants again and led to its	• Possible threats include: changes in water quality or water level and collecting by the horticulture industry.	• The Minago River in Manitoba may be too remote for commercial logging at the present time,

Species	Status	Range in Assessment Area and Province	Ecology	Risks and Threats	Forest Management Notes & References
	CDC –G1G2 NatureServe – G1G2 IUCN – Endangered **HCV with <u>low</u> potential impact from forest management**	proximal areas in Saskatchewan (See Section 3.3.3.1). • In Manitoba, the species is known to exist only in an 8 km stretch of the Minago River, approx. 150 km SW of Thompson. • In Saskatchewan, it has been recorded only on Egg Lake and Leaf Lake, approx. 40 and 20 km respectively west of the Manitoba-Saskatchewan border abutting FML-2.	classification as a new species. • Habitat is fresh, stagnant or slowly moving water in boreal lakes and rivers. • Occurs in association with other emergent and submerged aquatic plants. • Although the species is undoubtedly rare, the true extent of its range and population are not known because limited searching has been conducted. • As the species is only recently identified and not been the subject of research studies, little is known of its ecological relationships.	• Changes in water quality may occur through poorly implemented forestry, mining or agriculture. • Climate change or dam construction may affect water quantity. • Horticultural collection occurs for water lilies, however given the remoteness of the known populations this seems unlikely.	however commercial logging has apparently been occurring around Leaf Lake. Implementation of appropriate buffers around waterbodies should avoid any significant impacts. • References. Borsch et al. (2014), Robson et al. (2016),

1 – Canada Warbler is listed as both threatened and endangered in the MESEA Regulation.

3.2.3.1 Woodland Caribou (*Rangifer tarandus caribou*)

All of Canada's caribou, from woodland caribou in the boreal forest to the migratory herds of the tundra, belong to a single species, *Rangifer tarandus*. However, after that basic distinction, the taxonomy and language used to describe subdivisions within the species become complex. This complexity is due in part to the continuing evolution in understanding of caribou ecology, and to some extent, the burden of language used over the years to describe caribou. The following terms are used to describe subdivisions within the species:subspecies, migratory patterns, ecotypes, designatable units, population groups, populations, subpopulations, ranges, herds, and probably others. The caribou of importance in this assessment are the boreal ecotype which includes woodland caribou occurring in the boreal forest from British Columbia and the Northwest Territories to Labrador.

Boreal woodland caribou in Manitoba have the following at-risk designations:

COSEWIC – Threatened
MESEA –Threatened
SARA – Threatened
CDC – S2S3
NatureServe – G5TNR
IUCN – Vulnerable

Range and Populations in the Assessment Area and Province

Similar to other provinces, Manitoba attempts to manage caribou according to discrete populations divided into ranges (Figure 3). However, use of range boundaries is, at present, somewhat confusing as the definitions from the 2012 Federal Recovery Strategy (FRS) (Environment Canada 2012) were modified by the province as reflected in its 2015 Recovery Strategy (Manitoba Boreal Woodland Caribou Management Committee 2015), and were not completely updated in the ECCC's (2017) report on the implementation of the FRS. The 2012 FRS noted that the populations on 10 of the 13 ranges then recognized in the province were stable, and that trend information for the remaining three was not available. From the 2015 Provincial Recovery Strategy, the population trend for all but two of the then-identified 15 ranges in the Assessment Area are noted as being 'under review' (although no information at all is provided for one of the mapped ranges). ECCC's 2017 review of implementation similarly notes that population trend information is generally not available (Table 4).

The benchmark number used in estimates of population size in the Federal documents is 100 individuals, with populations being noted as either < 100 or ≥ 100. A minimum of 100 animals is used as it provides a reference for when local populations might be vulnerable to extinction from stochastic events due to small size. The 2012 FRS Strategy notes that 5 of the 13 of the ranges it identified in the province have populations of < 100. Only three ranges are noted as having populations of < 100 in the 2017 document; however, this comparison is of limited use due the changes in range boundaries and the fact that population estimates are noted as being 'not available' for most ranges in the 2017 Review. The province's 2015 document does not provide quantitative information but notes that populations are low in two of the province's nine management units (which may be comprised of more than one range), acceptable in six, and unknown in one. A conclusion from this somewhat confusing mix of information is somewhat difficult to extract, but generally populations in most of the ranges in the Assessment Area are beyond the level where they may be at risk because of stochastic events, but trend information to confirm their status is generally not available.

Information on the disturbance levels in the Assessment Area as garnered from the Provincial and Federal documents is also somewhat confusing (because of disturbance categories rather than actual levels being identified in the provincial document, and the changing range definitions discussed above), however a general conclusion is that most of the ranges in the Assessment Area are either beyond or approaching the 35% disturbance threshold (discussed below).

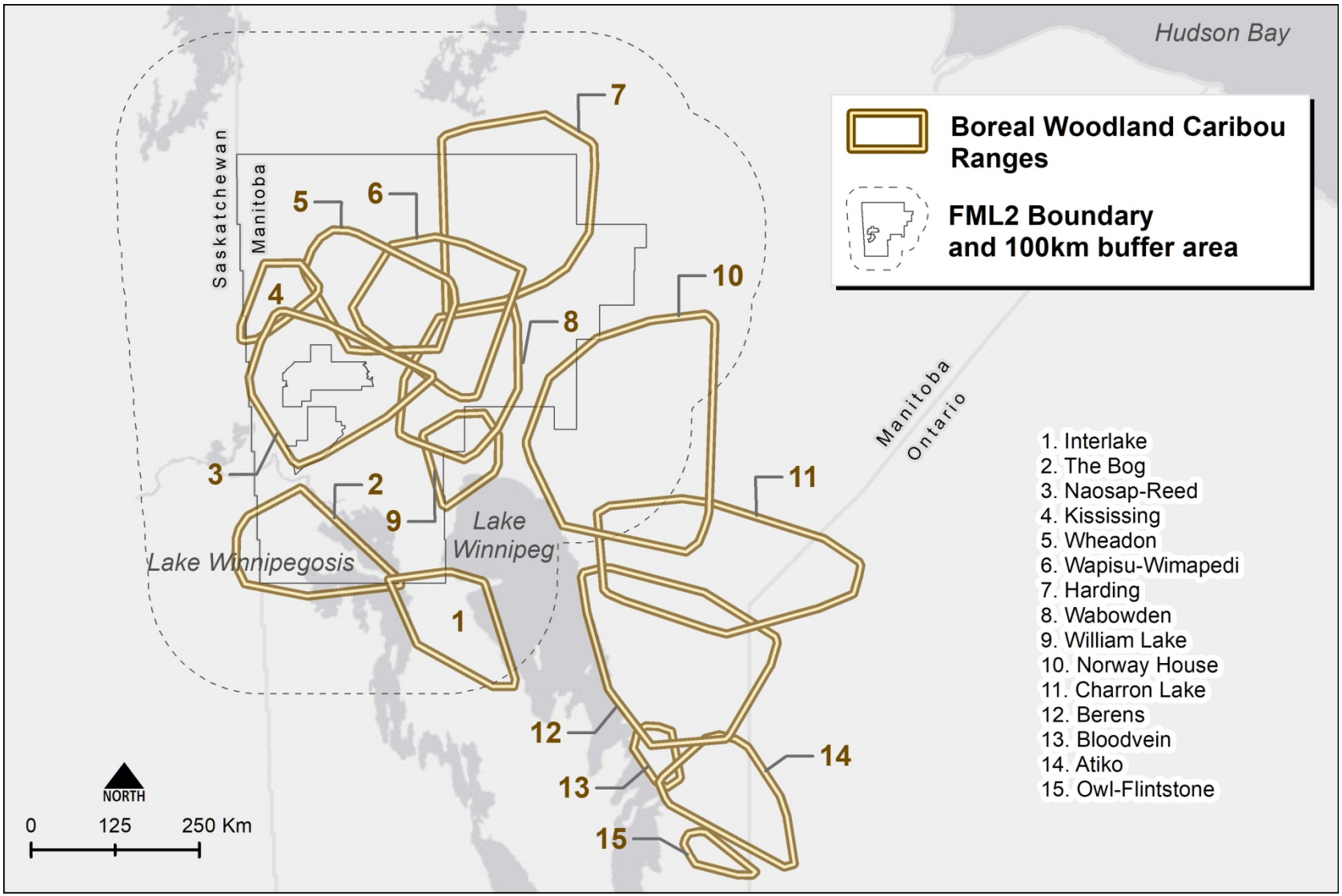

Figure 3. Caribou Ranges in Manitoba From the Boreal Woodland Caribou Recovery Strategy (Manitoba Woodland Caribou Management Committee (2015)).

Table 4. Population and disturbance information from caribou ranges in Assessment Area (from Manitoba's 2015 Recovery Strategy and the 2017 Federal Recovery Strategy Progress Report)

Range	From Manitoba Recovery Strategy (2015)					From Federal Recovery Strategy Progress Report (2017)[7]			
	Popn. Size	Popn. Trend	Natural Disturbance	Anthropogenic Disturbance	Planned Development[2]	Popn. Size (est.)	Popn. Trend[6]	Natural Disturbance	Anthropogenic Disturbance
Interlake	<100	Declining	<20%	5-15%	Limited	<100	Not Available	4%	14%
The Bog	≥100	Under Review[1]	<20%	5-15%	High	≥100	Not Available	6%	14%
Naosap/Reed[3]	≥100	Under Review	≥40%	≥15%	High	≥100	Not Available	28% (Naosap) 7%(Reed)	28%(Noasap) 20% (Reed)
Kississing	≥100	Under Review	≥40%	≥15%	High	≥100	Not Available	39%	15%
Wheadon[4]	≥100	Under Review	≥40%	<5%	High	N/A	N/A	N/A	N/A
Wapsiu-Wimapedi	≥100	Under Review	≥40%	<5%	High	≥100	Not Available	11%	13%
Harding	≥100	Under Review	≥40%	<5%	High	< 100	Not Available	No Info	No Info
Wabowden	≥100	Under Review	20 – 40 %	≥15%	High	≥100	Not Available	10%	20%
William Lake	≥100	Under Review	20 – 40 %	≥15%	High	<100	Not Available	25%	17%
Norway House[5]	N/A	N/A	N/A	N/A	N/A	≥100	Not Available	No Info	No Info
Charron Lake	≥100	Under Review	≥40%	<5%	Limited	≥100	Not Available	No Info	No Info

1- The Manitoba Recovery Strategy uses the term 'under review' for circumstances in which data collection to assess population trend is currently ongoing.
2 – The Manitoba Recovery Strategy notes that Planned Development is "*determined from an assessment of known planned development that will occur within a management unit within the life of the recovery strategy (10 year)*".
3–Naosap and Reed are treated as distinct ranges in the Federal Recovery Strategy.
4– Not identified as a distinct range in the Federal Recovery Strategy.
5 – Norway House range is identified in the map of ranges in the Manitoba Recovery Strategy but no data are provided regarding population trends or disturbance levels.
6 – The Federal Recovery Strategy notes that population trend for the ranges is not available as they are under review by Manitoba.
7 – These data are based on Range boundaries as identified in the 2012 Federal Recovery Strategy and may not align precisely with the boundaries as identified in the province's 2015 Recovery Strategy.

Ecology

The fundamental dynamic of caribou ecology, identified in Environment Canada's (2011) scientific review, is the striking negative relationship between landscape disturbance and mean recruitment of new individuals into the population, based on data from 24 ranges across boreal Canada (Figure 4). Boreal caribou have evolved with and adapted to the natural disturbance regimes of boreal forest ecosystems. However, habitat loss as quantified through extent of landscape disturbance impairs habitat quality to such an extent as to threaten continued existence of caribou in moderately or heavily affected landscapes. Fragmented landscapes provided greater habitat for moose which in turn increases populations of predators such as wolves or bears, which makes caribou vulnerable to levels of predation beyond those that they are capable of sustaining. Furthermore, road access and other linear corridors facilitate predator movement, also making caribou more vulnerable.

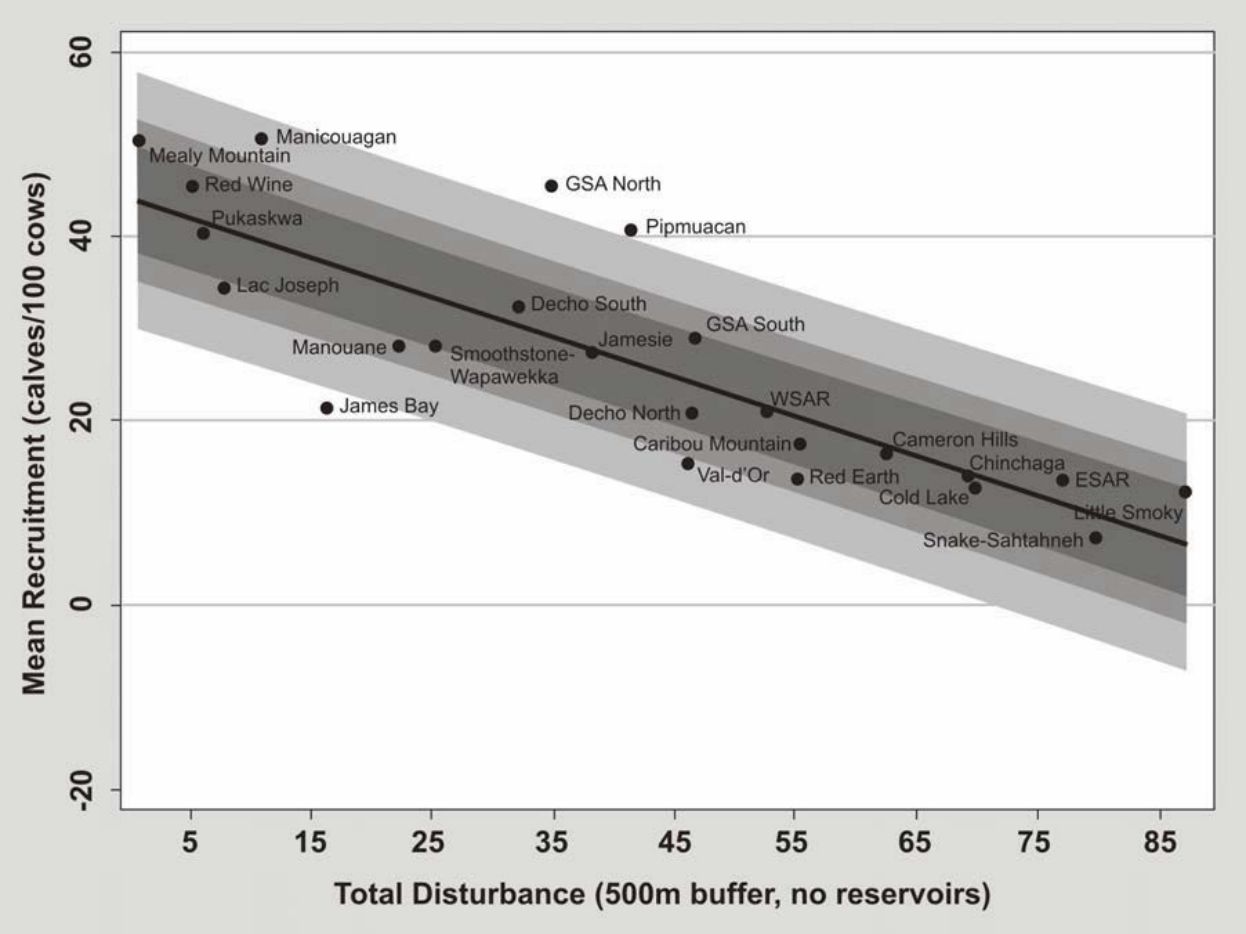

Figure 4. Graph showing 50, 70, and 90% prediction bands of the relationship between total disturbance (natural and anthropogenic) and mean caribou recruitment based on data from caribou ranges across the boreal forest. From Environment Canada (2011).

Environment Canada (2011) derived management thresholds from a generalized disturbance-population growth function to identify risk (in terms of likelihood of population sustainability) associated with levels of disturbance (Figure 5). From this relationship it is determined that a level of 35% landscape disturbance results in a 60% probability of population stability. Although this level of disturbance by no means guarantees population persistence, it was identified by ECCC as a disturbance threshold with an acceptable level of risk and has become codified in the federal government's range management guidance (ECCC 2016).

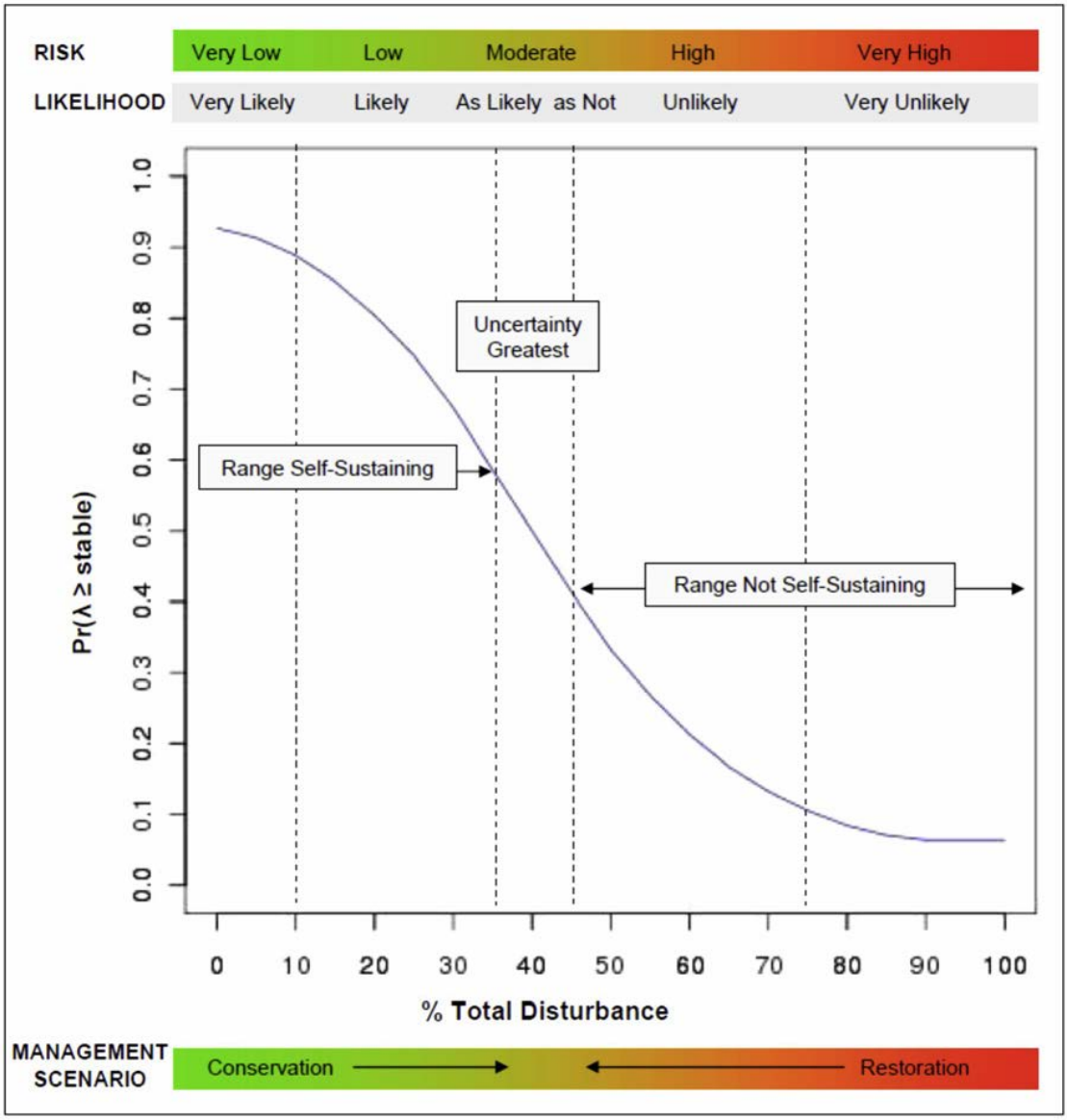

Figure 5. Probabilistic relationship between range disturbance and population stability based on range-specific information. From Environment Canada (2011)

Disturbance as included in the relationship in Figure 5 includes both natural and anthropogenic disturbance.

In the boreal forest, natural disturbances include windthrow, insect infestation and, most prominently, wildfire. Anthropogenic disturbances include roads, settlements, hydro-electric corridors, oil and gas development and exploration, and forest harvesting. Among these factors, forest harvesting and its related infrastructure of access roads are the most prominent factor of concern to caribou in many parts of the boreal forest (Festa-Bianchet et al. 2011, Johnson et al. 2015). Given the key relationship between caribou persistence and disturbance, and the fact that logging and associated roads are principal sources of anthropogenic disturbance in the boreal forest, this assessment concludes that boreal caribou are **an HCV with high potential impact from forest management.**

3.2.3.2 Conservation Data Centre Information

Element of Occurrence data were extracted from the Manitoba Conservation Data Centre (CDC) resources for the Assessment Area. Through this effort, data on approximately 80 species, most of which were plants, with an S rank of 3 or lower were obtained as either point, polygon, or linear- feature information(Table 5). For some species, additional rankings (i.e. COSEWIC, MESEA, SARA or IUCN) confirmed that they should be considered as species at risk, but for most species the circumstances were less clear. Most species were not listed or evaluated by the additional ranking systems, or had rankings indicating little concern, leaving their status in the Assessment Area somewhat unclear. Although the species are, or could be, rare in the Assessment Area, without additional corroboration by other ranking systems we felt it was not practical to assign an HCV status using the categories identified for SAR above or other considerations within HCV1. For example, a species could be rare as flagged by its S ranking because it is an uncommon endemic (Question 2 of the HCV queries), at the edge of its range (Question 5), or simply because it is hard to identify and relatively little effort has been put into floral surveys or analysis in the area. However, because of the lack of corroboration by the other systems, and because we did not find documentation of endemism or edge-of-range status of these species in our searches related specifically to these topics (discussed in Sections 3.3 and 3.5), we are not confident in articulating the precise causes or attributes of these species' rarity. In addition, because the species were not identified as at-risk by at least two of the six ratings used (the criterion identified above), they are not considered species at risk for this evaluation (but see Golden-winged Warbler and Red-headed Woodpecker following Table 5). However, in recognition of their CDC status, **the species below are identified as CDC HCVs**.

Table 5. Species identified as rare by CDC Data and designated as CDC HCVs.

Species	CDC &NatureServe Rankings	Other Rankings	Assessment Area Elements of Occurrence
Birds			
Barred Owl (*Strix varia*)	CDC – S3S4 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 5 records
California Gull (*Larus californicus*)	CDC – S3B NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN– Least Concern	• 6 records
Caspian Tern (*Hydropognec aspia*)	CDC – S3S4B NatureServe – G4	COSEWIC – Not at Risk MESEA – Not Listed SARA – Not Listed IUCN– Least Concern	• 19 records
Eared Grebe (*Podiceps nigricollis*)	CDC - S3S4 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN– Least Concern	• 1 record
Golden-winged Warbler[1] (*Vermivora chrysoptera*)	CDC - S2S3B NatureServe – G4	COSEWIC – Threatened SARA – Threatened MESA – Threatened IUCN – Near Threatened	• 4 records
Great Gray Owl (*Strix nebulosa*)	CDC - S3S4 NatureServe – G5	COSEWIC – Not Listed SARA – Not Listed MESEA – Not Listed	• 6 records

Species	CDC &NatureServe Rankings	Other Rankings	Assessment Area Elements of Occurrence
		IUCN – Least Concern	
Red-headed Woodpecker[1] (*Melanerpes erythrocephalus*)	CDC - S3B NatureServe – G5	COSEWIC - Endangered SARA – Threatened MESA – Not listed IUCN – Least Concern	• 2 records
Trumputer Swan (*Cygnus buccinator*)	CDC - S2B NatureServe – G4	COSEWIC – Not at Risk MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 3 records
Western Wood-pewee (*Contopus sordidulus*)	CDC - S2B NatureServe – G5	COSEWIC – Not Listed MESA – Not Listed SARA –Not Listed CDC - S2B NatureServe – G5 IUCN – Least Concern	• 1 record
Insects			
Columbine Duskywing (*Erynnis lucilius*)	CDC – S3 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Vascular Plants, Mosses and Lichens			
Alpine Woodsia (*Woodsia alpina*)	CDC–S2 NatureServe – G4G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 3 records
American Moor Rush (*Juncus stygius var. Americanus*	CDC–S1S2 NatureServe – G5T5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 1 record
American Pellitory (*Parietaria pennsylvanica*)	CDC – S3S4 NatureServe-G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Auricled Twayblade (*Neottia auriculata*)	CDC–S1 NatureServe-G3G4	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Beautiful Cottongrass (*Eriophorum callitrix*)	CDC–S2 NatureServe-G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 1 record
Bodin's Milkvetch (*Astraglus bodnii*)	CDC–S1 NatureServe – G4	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Bog Adder's-mouth (*Malaxis paludosa*)	CDC– S1 NatureServe – G3G4	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 1 record
Cathcart's Woodsia (*Woodsia oregana* ssp. *cathcartianai*)	CDC–S1 NatureServe – G5T5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Checkered Rattlesnake-plantain (*Goodyerates selata*)	CDC – S2 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA- Not Listed IUCN – Not Evaluated	• 1 record
Cleavers (Catchweed Bedstraw) (*Galium aparine*)	CDC– S3 NatureServe – S5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 3 records
Daisy-leaved Moonwort (*Botrychium matricariifolium*)	CDC – S1 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed	• 1 record

Species	CDC &NatureServe Rankings	Other Rankings	Assessment Area Elements of Occurrence
		SARA – Not Listed IUCN – Not Evaluated	
Douglas' Sedge (*Carex douglasii*)	CDC – S2 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 2 records
Dragon's-mouth Orchid (*Arethusa bulbosa*)	CDC – S3 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 2 records
Dwarf Bilberry (*Vaccinium caespitosum*)	CDC – S3 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 5 records
False Heather (*Hudsonia tomentosa*)	CDC – S3 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Few-flowered Meadow-rue (*Thalictrum sparsiflorum*)	CDC – S1S3 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 2 records
Few-flowered Sedge (*Carex pauciflora*)	CDC – S3 NatureServe G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 5 records
Few-seeded Sedge (*Carex oligosperma*)	CDC – S3S4 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 3 records
Floating Marsh-marigold (*Caltha natans*)	CDC – S2S4 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Fragrant Water-lily (*Nymphaea odorata* ssp. *Odorata*)	CDC – S2 NatureServe – G5T5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Fragrant Wooodfern (*Dryopteris fragrans*)	CDC – S3S5 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Gastony'sCliffbrake (*Pellaea gastonyi*)	CDC – S1 NatureServe – G3	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Graceful Mannagrass (*Glyceria pulchella*)	CDC –S2S3 NatureServe – G4G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 1 record
Green Adder's-mouth (*Malaxis unifolia*)	CDC – S2? NatureServe– G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 2 records
Horned Beakrush (*Rhynchospora capillacea*)	CDC – S2S3 NatureServe – G4G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 2 records
Horned pondweed (*Zannichella palustris*)	CDC – S3 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 3 records
Iowa Golden-saxifrage (*Chrysosplenium iowense*)	CDC – S1 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed	• 2 records

Species	CDC &NatureServe Rankings	Other Rankings	Assessment Area Elements of Occurrence
		SARA – Not Listed IUCN – Not Evaluated	
Lake Quillwort (*Isoetes lacustris*)	CDC – S2 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 3 records
Large White-flowered Ground-cherry (*Leucophysalis grandiflora*)	CDC – S3S4B CDC – G4?	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Leathery Grapefern (*Sceptridium multifidum*)	CDC – S3 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Limestone Oak-Fern (*Gymnocarpium robertianum*)	CDC – S1 NatureServe– G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 3 records
Livid Sedge (*Carex livida*)	CDC – S3 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 1 record
Loesel's Twayblade (*Liparis loeselii*)	CDC – S3S4 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 2 records
Long-spurred Violet (*Viola selkirkii*)	CDC – S2 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 2 records
Long-Stalked Sedge (*Carex pedunculata*)	CDC – S3 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 3 records
Low spikemoss (*Selaginella selaginoides*)	CDC – S3S4 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Michaux's Sedge (*Carex michauxiana*)	CDC – S1 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 2 records
Moschatel (*Adoxa moschatellina*)	CDC –S1 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 2 records
Nahanni Oak Fern (*Gymnocarpium continentale*)	CDC – S3S4 NatureServe – G5T	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 3 records
Northern Firmoss (*Huperzia selaga*)	CDC – S2S3 NatureServe G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed CIUCN – Not Evaluated	• 3 records
Oblong-leaved Sundew (*Drosera anglica*)	CDC – S3S4 NatureServe G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 3 records
Pallas Buttercup (*Coptidium pallasii*)	CDC – S1S2 NatureServe G4G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Porcupine Sedge (*Carex hystericina*)	CDC – S3 NatureServe G5	COSEWIC – Not Listed MESEA – Not Listed	• 1 record

Species	CDC &NatureServe Rankings	Other Rankings	Assessment Area Elements of Occurrence
		SARA – Not Listed IUCN – Least Concern	
Ram's-head Lady's-slipper (*Cypripedium arietinum*)	CDC – S2S3 NatureServe G3	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Near Threatened	• 16 records
Robbin's Pondweed (*Potamogeton robbinsii*)	CDC – S2S3 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 2 records
Rock Willow (*Salix vestita*)	CDC – S3 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 4 records
Round-leaved Bog Orchid (*Platanthera orbiculata*)	CDC – S3S4 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 5 records
RyeGrass Sedge (*Carex loliacea*)	CDC –S2? NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 1 record
Seaside Plantain (*Plantago maritima*)	CDC – S2 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA –Not Listed IUCN – Least Concern	• 1 record
Shrubby Willow (*Salix arbusculoides*)	CDC – S2S3 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA-Not Listed IUCN – Least Concern	• 6 records
Siberian Polypody (*Polypodium sibiricum*)	CDC – S3 NatureServe – G5?	COSEWIC – Not Listed MESEA – Not Listed SARA –Not Listed IUCN – Not Evaluated	• 5 records
Slender-leaved Sundew (*Drosera linearis*)	CDC – S2? NatureServe – G4G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 2 records
Small Pondweed (*Potamogeton pusillus* spp. *tenuissimus*)	CDC – S2 NatureServe – G5T5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 7 records
Small Water-lily (*Nymphaea tetragona*)	CDC –S2? NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 2 records
Smooth woodsia (*Woodsia glabella*)	CDC – S2 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 14 records
Smooth Cliffbrake (*Pellaea glabella*)	CDC – S2 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Smooth Twig-rush (*Cladium mariscoides*)	CDC – S2S3 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 1 record
Spatulate Moonwort (*Botrychium spathulatum*)	CDC – S1S2 NatureServe – G3	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Spikenard (*Aralia racemosa*)	CDC – S2 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed	• 1 record

Species	CDC &NatureServe Rankings	Other Rankings	Assessment Area Elements of Occurrence
		SARA – Not Listed IUCN – Not Evaluated	
Sterile Sedge (*Carex sterilis*)	CDC – S1 NatureServe – G4G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 1 record
Straightleaf Pondweed (*Potamogeton strictifolius*)	CDC – S2S3 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 2 records
Wahlenberg's Woodrush (*Luzula wahlenbergii*)	CDC –S1? NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 1 record
Weak Arctic Sedge (*Carex supina* ssp. *spaniocarpa*)	CDC – S2S3 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 1 record
Western Dwarf Cliffbrake (*Pellaea glabella* ssp. *occidentalis*)	CDC – S2 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 10 records
White Adder's-mouth (*Malaxis monophyllos*)	CDC –S2? NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Not Evaluated	• 3 records
White Beakrush (*Rhynchospora alba*)	CDC – S3 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 10 records
Yellow Sedge (*Carex flava*)	CDC – S2 NatureServe – G5	COSEWIC – Not Listed MESEA – Not Listed SARA – Not Listed IUCN – Least Concern	• 3 records

1 – Golden-winged Warbler and Red-headed Woodpecker are both identified as at-risk by COSEWIC and the SARA. However, neither the Manitoba Breeding Bird Atlas nor COSEWIC status reports for these species show presence in the Assessment Area. Although CDC did provide a small number of records for these species, in the absence of additional evidence of sustained presence in the Assessment Area, this was not sufficient basis to categorize them as SAR HCVs.

3.3 Endemic **SPECIES**

3.3.1 Context

FSC Canada defines an endemic as a "*species or subspecies that is restricted to a defined geographical area*". This definition is intentionally both broad and vague. Both qualities relate to the lack of specificity regarding "*geographical area*". While the definition of endemic is clearly not intended to apply just to a forest management unit, it also requires reasonable interpretation so as to not encompass an area so extensive as to dilute the obvious intent of focusing on exceptional values associated with the categorization of a species as an HCV. For this assessment we considered a species or subspecies to qualify as 'endemic' if it exists only the central North American boreal forest.

In keeping with the consistent interpretation of this question, **all endemic species are considered HCVs.** As with SAR, whether they are at risk from forest management activities is not a factor in determining whether or not they 'qualify' as an HCV.

3.3.2 Methodology

As with other parts of this assessment, the focus of efforts to identify endemic species was based on internet and library searches. An intensive internet search yielded only a modest number of results; however, we

believe the results to be a good portrayal of the relatively limited number of endemics that occur in the boreal forest. We conducted numerous keyword searches and reviewed a number of authoritative websites (e.g Catalogue of life - https://www.catalogueoflife.org/, Living National Treasures - http://lntreasures.com/, BONAP's taxonomic data centre http://bonap.net/tdc) and other reference literature.

3.3.3 Results

There are very few species endemic to the boreal forest. The World Wildlife Fund's Conservation Assessment of Terrestrial Ecosystems of North America (Ricketts et al. 1999) does not identify any endemic species as inhabiting the two ecoregions they identify that are within the Assessment Area (i.e. Midwestern and Mid-Continental Canadian Forests). Similarly, the assessment of North American terrestrial ecoregions undertaken by the Commission for Environmental Cooperation does not describe any endemic species in this portion of boreal Canada (Wicken et al. 2011). Also similarly, using data from Haber (1994), the Ecosystem Components map of the Atlas of Canada identifies much of the Assessment Area as having no endemic plant species, and the more southern portion having 1-3 endemics. For aquatics, Abell et al. (2000) in an assessment comparable to that of Rickets et al. (1999) does not identify any aquatic endemics in the two aquatic ecoregions (Lower Saskatchewan and English-Winnipeg Lakes) that transect the Assessment Area. Finally, the Freshwater Ecoregions of the World, a joint project by World Wildlife Fund and The Nature Conservancy also does not identify any endemic species in the aquatic ecoregions within the Assessment Area. (http://www.feow.org/). In summary, these synoptic references suggest that few, if any endemic species exist in the Assessment Area. However, we did find reference to a small number of endemics in the Assessment Area through targeted searches for information.

3.3.3.1 Lori's Water Lily

The most notable endemic species within the Assessment Area is Lori's Water Lily (*Nymphaea loriana* sp. nov.) which has only recently been recognized as a distinct species (Borsch et al. 2014). The known range of the species is restricted to a small area very local to the Assessment Area (Figure 6). Although the species was first observed in the 1940's, only recent (2008) efforts resulted in finding plants again and led to its classification as a new species. Although the area encompassing known occurrences of the species extends over 15,000 km^2, the actual areas in which it has been recorded – its area of occupancy- is only 20 km^2 (Robson et al. 2015). More information on Lori's Water Lily is provided in Table 6.

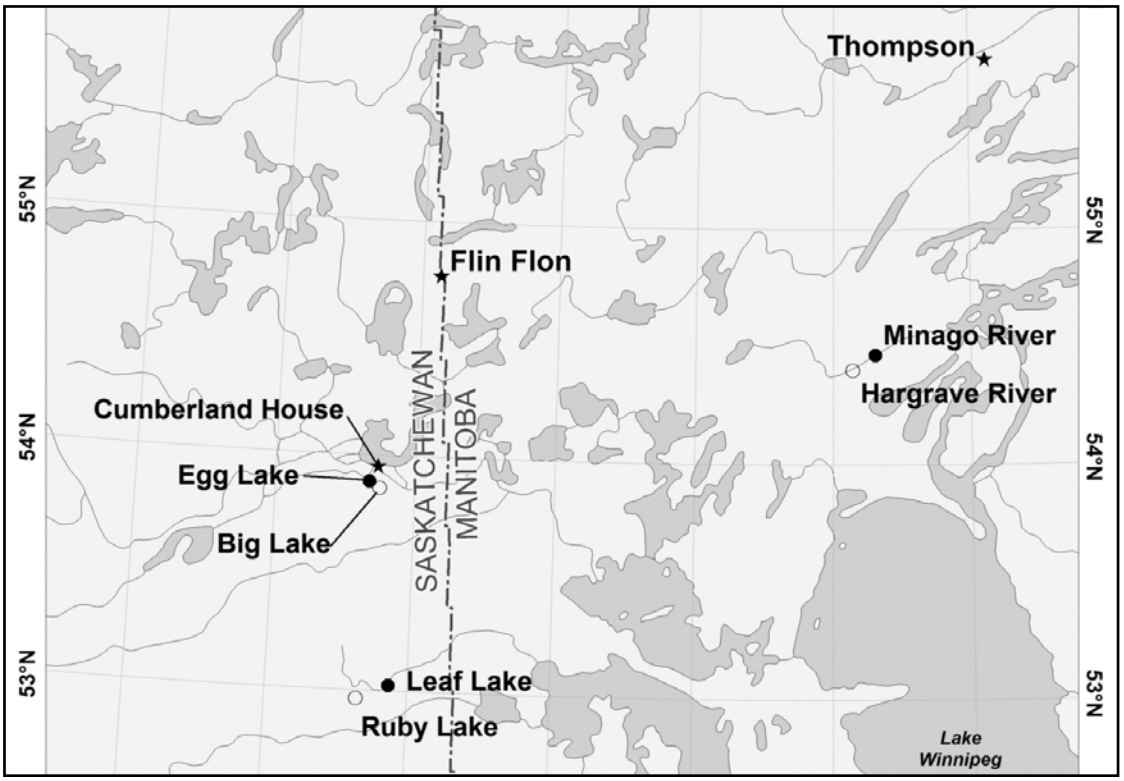

Figure 6. Known locations (solid circles) and searched locations (open circles) of occurrence of Lori's Water Lily, from Robson et al. (2016).

3.3.3.2 Tiger Moth

A species of Tiger Moth (*Dodia tarandus*) is endemic to boreal Canada, and has been recorded on the periphery of the Assessment Area (Schmidt and Macaulay 2009) (Figure 7). The species was distinguished from others in the genus based on morphological characteristics as identified during a review of previously-collected specimens in Canada's national collection of insects. The species has been found in black spruce bogs and adjacent pine uplands. Because tiger moths are rarely collected, and because of the similarity between *Dodia tarandus* and *Dodia albertae*, Schmidt and Macaulay (2009) suggest that it may be more widespread and abundant than present records suggest. More information is provided in Table 6.

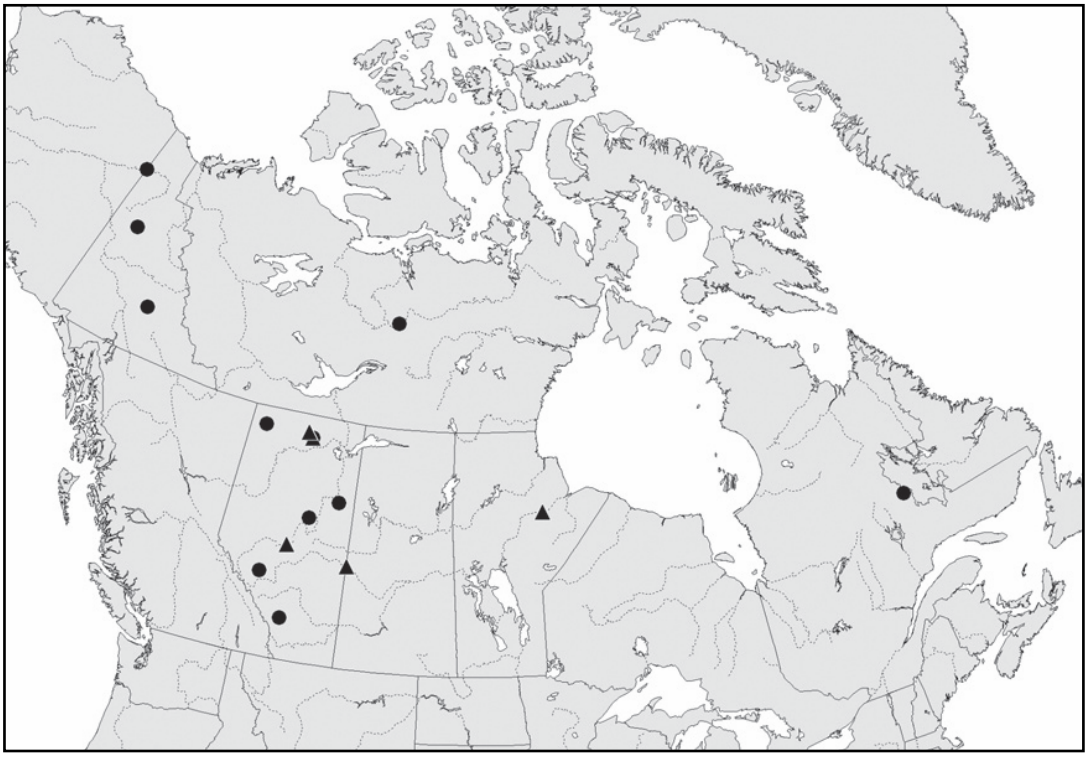

Figure 7. Distribution of examined specimens of *Dodia tarandus* (triangles) and a related species – *Dodia albertae* (circles), from Schmidt and Macaulay (2009).

Wood Bison

The following discussion is taken from material in COSEWIC (2013c) and Environment and Climate Change Canada (2018c). Wood Bison (*Bison bison athabascae*) are endemic to boreal Canada. Along with Plains Bison, populations declined drastically in the late 1800's as a result of unsustainable hunting pressure. By the end of the 19th century only a small number of Wood Bison remained in what is now Wood Buffalo National Park. In the late 1920's more than 6,000 Plains Bison were moved to the Park and subsequently interbred with the Wood Bison, and all Wood Bison existing today are descendants of this mixing. Nonetheless, Wood Bison remain genetically distinct from Plains Bison and are managed separately.

Two translocation initiatives took place moving bison from Wood Buffalo Park to Elk Island National Park in Alberta in the 1960's. The Elk Island herd has been used as a source for other populations and there are now nine populations of Wood Bison in Canada. One of the populations is the Chitek Lake population in the southeastern extremity of the Assessment Area (Figure 8). In 1984, 34 bison were shipped to the area from the surplus stock of several zoos in western Canada. After a period of adjustment in a holding area, the animals were released first into a fenced pasture, and eventually into the wild. There are now believed to approximately 300 bison spread over an area of approximately 3,800 km^2. The Chitek Lake population appears to be self-sustaining; however, it is not included in ECCC's (2018c) assessment of critical habitat because it is outside the original range of Wood Bison. More information is provided in Table 6.

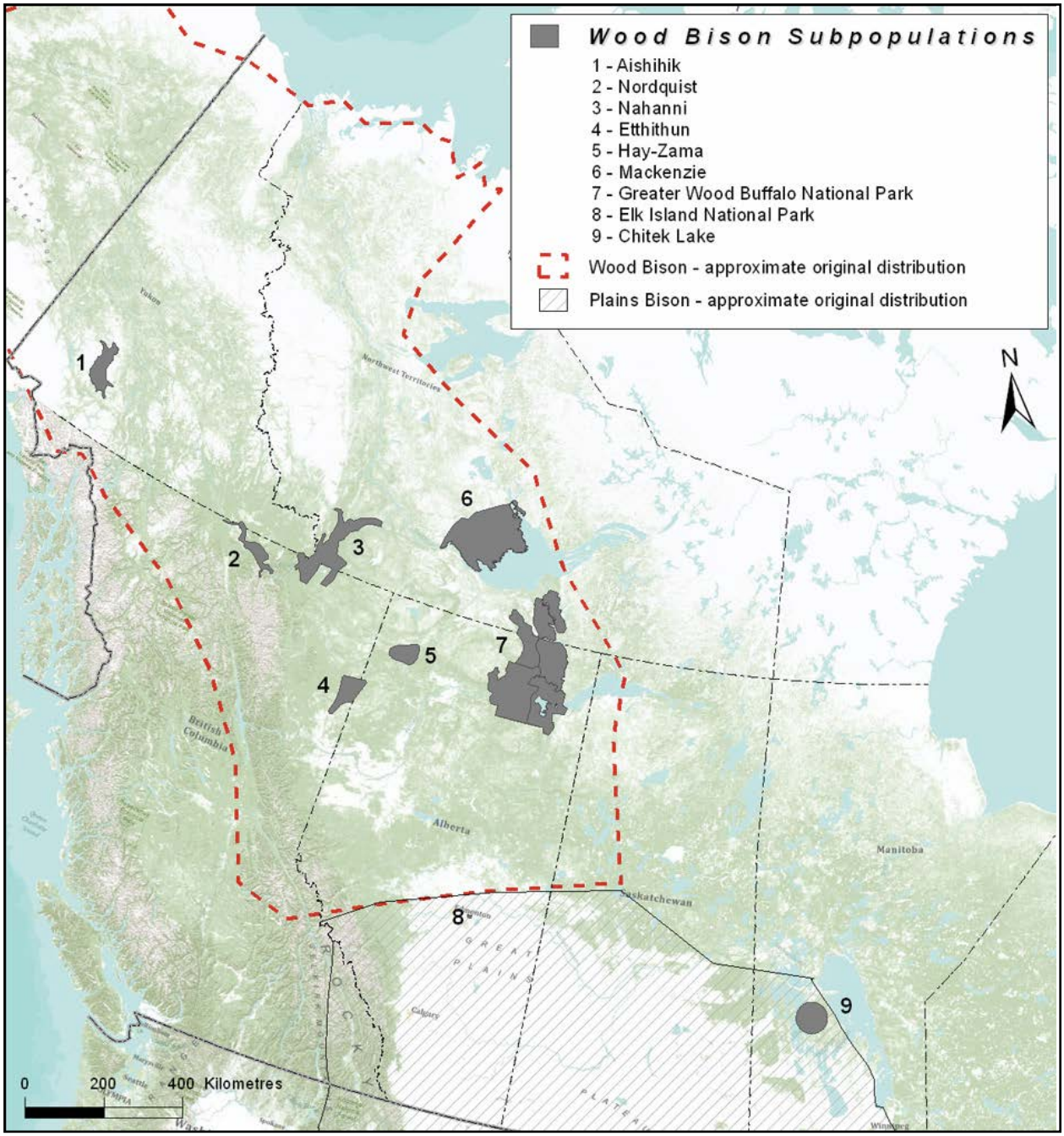

Figure 8. Wood bison subpopulations in Canada. Site 9 is the Chitek Lake population. (From COSEWIC 2013c).

Table 6. Endemic Species Recorded in the Assessment Area. (Information in this table for Lori's Water Lily and Wood Bison repeats the content of Table 3.)

Species	Status	Range in Assessment Area and Province	Ecology	Risks and Threats	Forest Management Notes & References
Lori's Water Lily (*Nymphaea loriana*)	COSEWIC – Not Listed MESEA –Not Listed SARA –Not Listed CDC –G1G2 NatureServe – G1G2 IUCN – Endangered **HCV with <u>low</u> potential impact from forest management**	• The known range of Lori's Water Lily is very small, confined entirely to the Assessment Area and proximal areas in Saskatchewan. • In Manitoba, the species is known to exist only in an 8 km stretch of the Minago River, approx. 150 km SW of Thompson. • In Saskatchewan, it has been recorded only on Egg Lake and Leaf Lake, approx.40 and 20 km respectively west of the Manitoba-Saskatchewan border abutting FML-2.	• Although first observed in the late 1940's, only recent (2008) efforts resulted in finding plants again and led to its classification as a new species • Habitat is fresh, stagnant or slowly moving water in boreal lakes and rivers. • Occurs in association with other emergent and submerged aquatic plants. • Although the species is undoubtedly rare, the true extent of its range and population are not known because limited searching has been conducted. • As the species is only recently identified and not been the subject of research studies, little is known of its ecological relationships.	• Possible threats include: changes in water quality or water level and collecting by the horticulture industry. • Changes in water quality may occur through poorly implemented forestry, mining or agriculture. • Climate change or dam construction may affect water quantity. • Horticultural collection occurs for water lilies, however given the remoteness of the known populations this risk seems unlikely.	• The Minago River in Manitoba may be too remote for commercial logging at the present time. However, commercial logging has apparently been occurring around Leaf Lake. Implementation of appropriate buffers around waterbodies should avoid any impacts • References. Borsch et al. (2014), Robson et al. (2016),
Dodia Tiger Moth (*Dodia tarandus)*	COSEWIC – Not Listed MESEA –Not Listed SARA – Not Listed CDC – No data NatureServe – G3 IUCN - Not Evaluated **HCV with <u>low</u> potential impact from forest management**	• Only one documented record in the Assessment Area and in the province, but because of its inconspicuous nature it is likely more common.	• *Dodia* is a genus of woolly-bear moths. Although there are few species in the genus, there are many within the family Erebidae to which it belongs, including tiger, lichen, and wasp and tussock moths. • Typical habitat is black spruce bog and open adjacent uplands. • Larval host plants are likely willow or ericaceous shrubs. • No population information exists. • The genus is Holarctic and the precise range of this species is uncertain.	• Uncertain. Within Canada habitat is generally abundant.	• Forest management does likely not have significant impacts, although may be vulnerable to insecticides including the biological insecticide *Bacillus thuringiensis* which is specific to lepidopterans. • References: COSEWIC (2011), Poole (2018)
Wood Bison (*Bison bison*	COSEWIC – Special Concern	• The only herd in the province is in the vicinity of	• Nine distinct populations exist (Figure 8**)** in Canada. Chitek	• Encroachment/loss of habitat due to agriculture may be	• Where forestry occurs in proximity to herds, clear-

Species	Status	Range in Assessment Area and Province	Ecology	Risks and Threats	Forest Management Notes & References
athabascae)	MESEA – Not Listed SARA –Threatened CDC – SNA NatureServe – G4T2T3Q IUCN – Near Threatened **HCV with <u>low</u> potential impact from forest management**	Chitek Lake, at the southeastern extreme of the Assessment Area, where approximately 300 animals exist within an area of approx. 3,800 km^2	Lake herd is furthest east and is outside the historic range of the species. • Wood Bison are primarily grazers, feeding on grasses and sedges found in meadows, with a broader matrix of hardwood, coniferous and mixed forest, bogs, fens and shrublands.	important in some areas, but likely not in Chitek Lake area given the nature of the landscape. • The species is susceptible to brucellosis and bovine tuberculosis when herds occur in proximity to livestock farming. • Road and railway mortality can be an issue in some areas.	cutting may create new meadows and regenerate summer habitat, but these areas do not represent good winter habitat. • No harvesting of which we are aware in Chitek Lake area, therefore there are no forestry impacts. • References. COSEWIC 2013c, Environment and Climate Change Canada 2018c)

3.4 SIGNIFICANT SEASONAL CONCENTRATIONS OF SPECIES

3.4.1 Context

This HCV grouping is intended to address whether the forest supports significant seasonal concentrations of one or more species. Sites identified as HCVs using this criterion may be breeding or transitional (migratory) areas. In most applications of this HCV1 category, identified sites have high densities of breeding or migratory birds. That is the case in this assessment too.

We identified several sites with seasonally high breeding and migratory bird concentrations. By virtue of their location and their habitats, most of these sites are not threatened by forest management. **Kaweenakumik Lake IBA is designated as an HCV with moderate potential impact from forest management**. All others are idetified as HCVs with **HCVs with low potential impact from forest management**.

3.4.2 Methodology

For this portion of the assessment the main data sources were databases on key biodiversity areas (http://www.keybiodiversityareas.org/home) and (http://www.kbacanada.org/), which contain a considerable amount of overlap in the sites identified. Searches of these sites ultimately ended up focusing more specifically on Important Bird Areas (IBAs) and the use of the IBA Canada web site (https://www.ibacanada.com/index.jsp?lang=en) from which searches specific for Manitoba identified a number of IBAs in the Assessment Area. Conversations with MSD biologists confirmed that the identification of IBAs was the most relevant source of information for significant concentrations of species.

3.4.3 Results

Six IBAs exist with the Manitoba portion of the Assessment Area and, as noted above, all are identified as HCVs. Details of the IBAs are provided in Table 7.

Table 7. Important Bird Areas in the FML and the Manitoba portion of the surrounding buffer. (Table contents derived or taken from information available on the IBA Canada web site https://www.ibacanada.com/index.jsp?lang=en)

Name	Description	Significance for Wildlife	Threats
Saskatchewan River Delta Size = 7,282 km^2	• Encompasses the town of The Pas and a large surrounding area. • Area is dominated by the Saskatchewan River delta and contains both the mouth of the River at Cedar lake and the upper reaches of the river itself. • Much of the site is low-lying extensive wetlands, including extensive stretches of marshes, bog and meadow. • At somewhat higher elevations are deciduous, coniferous and mixed boreal forest, and ridge forests interspersed with levees. • Natural habitats include mixed woods, rivers/streams, marshes, cliffs and rocky shores. • Anthropogenic habitats include farms and urban/industrial areas.	• Possibly the most important wetland in the province for breeding waterfowl. • Approximately 500,000 ducks nest in the Delta, including the abutting Cumberland Marshes IBA in Saskatchewan: > 100,000 Mallards and tens of thousands of other species including Blue-winged Teal, Lesser Scaup, American Wigeon, Ring-necked Duck, Canvasback, Common Goldeneye and Redhead. • Also important breeding habitat for non-waterfowl species including Bald Eagles and Osprey, Common and Black Terns. • Globally significant spring resting area for Tundra Swans, with large concentrations of other species including Mallard, Pintail, Canada Goose, Sandhill Crane and Ring-billed Gulls. • Also used by hundreds of thousands of waterfowl and other birds on fall migration. • Wetlands and river are important for fish spawning, including sturgeon.	• Possible intensification of land use including aquaculture, farming, wetland drainage. • Given the nature of the habitat, there is little direct threat from forest management.
Balabas Island Size = 4.4 km^2	• Balabas Island is one of the larger islands in the western extension of Lake Winnipegosis. • Much of the island is heavily forested, although tree mortality from cormorant nesting is reported.	• Globally significant numbers of Double-crested Cormorants nest on the island (~8,000 - 14,000 nests reported in surveys from 1999 – 2012). • Other species reported nesting on the island or in its aquatic habitats include Great Blue Heron, Black-crowned Night Heron, Herring Gull, Mallard, Gadwall, Blue-winged Teal and Red-breasted Merganser – all in numbers significantly less than the cormorants (100 or fewer nests).	• Hunting, possible persecution of cormorants. • Given the nature of the habitat, and location of the island, there is no direct threat from forest management.
North Lake Winnipegosis Reefs Size = 43.3 km²	• The IBA consists of six reefs associated with a group of islands in a channel between Muddy Bay to the north and Cameron Bay to the south in the northern part of Lake Winnipegosis. • Portions of the reefs are unvegetated or dominated by grasses and shrubs.	• The reefs support globally significant numbers of breeding colonial waterbirds, especially American White Pelican, Double-crested Cormorant and Caspian Tern. • Approx. 3,000 Caspian Terns have been recorded nesting on two of the reefs together (north and south Spruce Island reefs) – approximately 3% of the North American population. • More than 1% of the global breeding populations of American white pelican and double-crested cormorant have been recorded nesting on the reefs. • Other breeding birds include California gull, bald eagle, American widgeon, canvasback, redhead, and common and red-breasted mergansers.	• Hunting, possible persecution of cormorants. • Declines in number of fish would greatly affect the piscivorous populations. • Given the nature of the habitat, and location of the island, there is no direct threat from forest management.
Kaweenakumik Lake	• Kaweenakumik Lake is located south of Grand	• Caribou have been recorded calving on the islands in the	• Hunting, possible persecution of

Name	Description	Significance for Wildlife	Threats
Size = 137 km^2	Rapids, between Lake Winnipeg and Lake Winnipegosis. • The islands located primarily in the southern portion of the lake have considerable value to wildlife – some are small and rocky, and others are large with little relief and substantial tree and shrub cover. • Kaweenakumik Island, a provincial ecological reserve (See Section 3.7) is in the lake.	lake. • The islands in the lake provide nesting sites for large colonies of waterbirds including American White Pelican, Common Tern, and Ring-billed Gull. • Other nesting birds include great blue herons (which have been reported nesting in shrubs on the islands, rather than in tree-tops as is usual), White-winged Scoter, California Gull, Double-crested Cormorants, Herring Gull, and Western Grebe. • Parts of the IBA contain dense submergent vegetation and support large numbers of swans, geese and ducks during fall migration.	cormorants. • Declines in number of fish would greatly affect the populations. • Forestry cited as a possible threat in IBA documentation.
Gull Bay Spits Size = 18.7 km^2	• The Gull Bay Spits consists of two separate narrow semi-terrestrial extensions into Gull Bay, which is the western portion of lake Winnipeg immediately south of Long Point, about 30 km southeast of Grand Rapids. • The spits may be wholly or partially above water depending on water level; primary vegetation is grasses, shrubs, willows and cattails.	• Through the 1980's and 90's there were many records of breeding Piping Plover on the spits. However, the numbers have steadily declined. The Breeding Bird Atlas now shows no breeding activity there (Porteous 2019) • The spits provide habitat for Ring-billed and Herring Gulls and Common Tern.	• The spits may be susceptible to inundation in years of high water in Lake Winnipeg. • Given the nature of the habitat, and location of the island, there is no direct threat from forest management.
Little George Island Size = 8.2 km^2	• This IBA is located in the northern basin of Lake Winnipeg, about 40 km southwest of the Poplar River First Nation. • The terrestrial portion of the IBA – Little George Island – is a remote island only 12 ha in size. A lagoon is located in its middle, and a sandy point extends to the northwest of the island.	• Little George Island is a prime nesting site for colonial nesting birds, including Caspian and Common Terns, Herring and Ring-billed Gulls and Double-crested Cormorant. • Little George Island is also the most southerly documented breeding site for Greater Scaup in Manitoba.	• Portions of the island may be susceptible to inundation in years of high water in Lake Winnipeg. • Given the location of the island, there no direct threat from forest management.

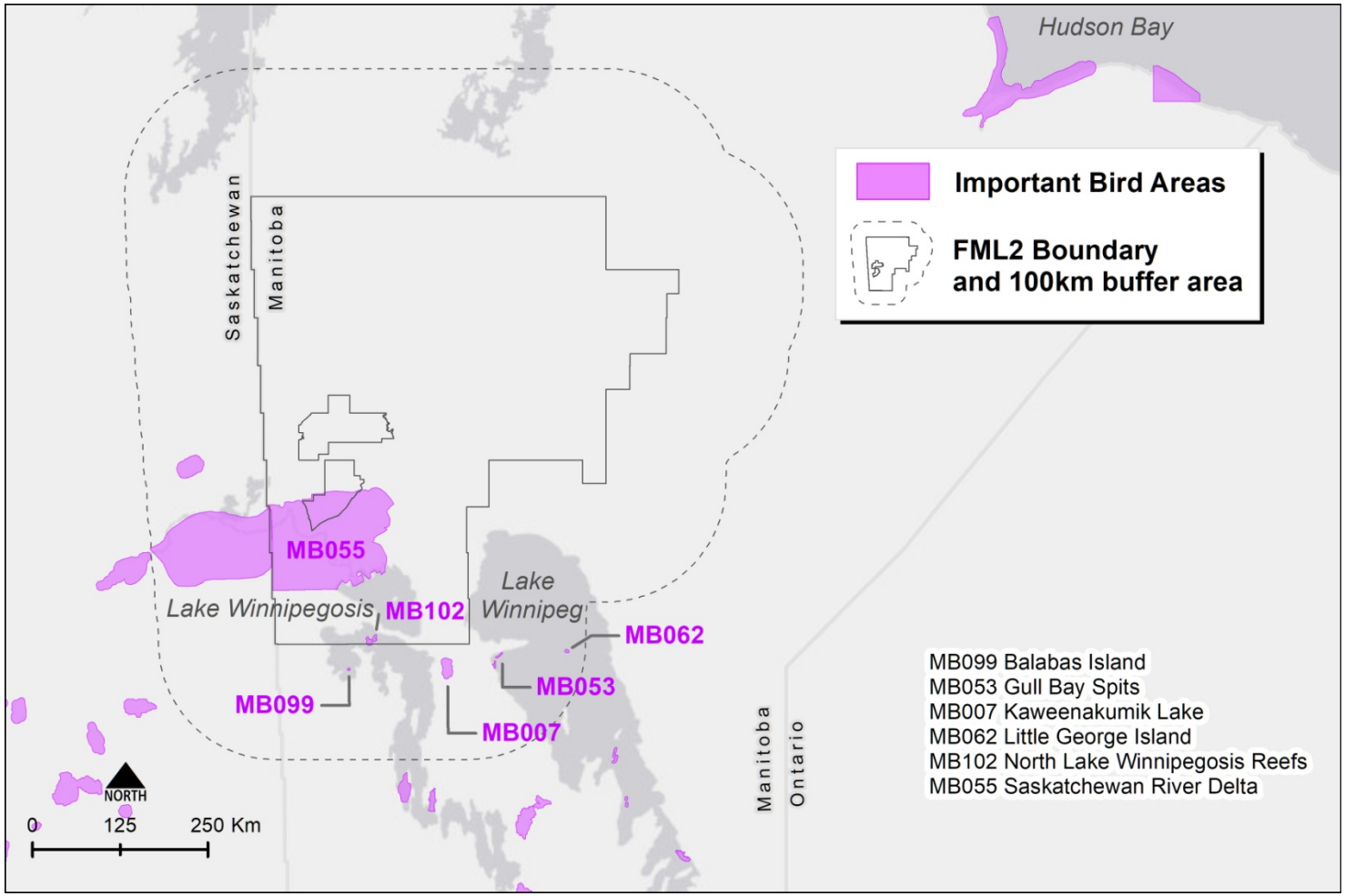

Figure 9. Important Bird Areas in the FML and its Buffer.

3.5 EDGE-OF-RANGE CONCENTRATIONS

3.5.1 Context

This HCV grouping is intended to address whether the forest supports concentrations of species at the edge of their natural ranges or outlier populations as reflections of issues related to vulnerability against range contraction, and potential genetic variation at range edge. There is not an intention to categorize isolated outliers or vagrant occurrences as HCVs.

In maintaining the precautionary approach towards categorization as HCVs, **all outlier populations are considered HCVs**. In addition, as with other species-related HCV categories, outlier populations are considered HCVs whether or not they are at risk from forest management activities, i.e. these activities are not a factor in determining whether or not they 'qualify' as an HCV.

3.5.2 Methodology

As with other parts of this assessment, efforts to identify outlier populations were based on internet and library searches.

3.5.3 Results

There are indications of three species – Eastern White Cedar, Fox Sparrow, and Flooded Jellyskin existing in concentrations beyond their normal ranges in the Assessment Area, as described below.

Eastern White Cedar (*Thuja occidentalis*)
A disjunct population of mostly old-growth Eastern White Cedar has been documented in the Assessment Area (Heinrichs 2009, Grotte et al. 2012). In the area of Grand Rapids, populations/stands of cedar exist which are approximately 300 km northwest of the limit of the species' continuous range in southeastern Manitoba (Figure 10). Henrichs (2009) hypothesized these stands may have become established because of long-distance transport by Indigenous People who often lined their canoes with boughs of cedar (Bell 1897 as cited by Henrichs) and this may have facilitated transport of seeds. As described by Grotte et al. (2012), "the area is characterized by a long narrow moraine composed of calcareous till and is surrounded by Cedar Lake, Lake Winnipegosis and Lake Winnipeg. Bogs and fens are widespread, dominated by P. mariana and L. laricina respectively." Grotte et al. (2012) noted the stands in this region may be protected from stand-replacing fires by the wetland environment in which they are ensconced.

There is no mention of use of cedar as a commercial species in CKP forest management documents, however there is some potential for it to be harvested or affected by harvest for co-occurring conifers, so we believe that the population of disjunct cedar is an **HCV with <u>moderate</u> potential impact from forest management**.

Figure 10. Location of disjunct cedar population in the assessment area, as indicated by the red arrow. From Grotte et al. (2012)

***Fox Sparrow* (*Passerell ailiaca*)**
The Manitoba Breeding Bird Atlas (Artuso 2019d) displays a cluster of occurrence squares in the vicinity of The Pas (Figure 11)that are the only breeding occurrences of Fox Sparrow in the boreal taiga plains in Manitoba that are depicted as a disjunct breeding area beyond the southern breeding distribution in the province The ecological significance of this southern extension is unclear.

Typical breeding habitat for Fox Sparrow includes shrub and stunted forest ecosystems with small openings for ground foraging (Weckstein et al. 2002). As these communities are not of interest in commercial forest management, the Fox Sparrow breeding concentration is an **HCV with <u>low</u> potential impact from forest management**.

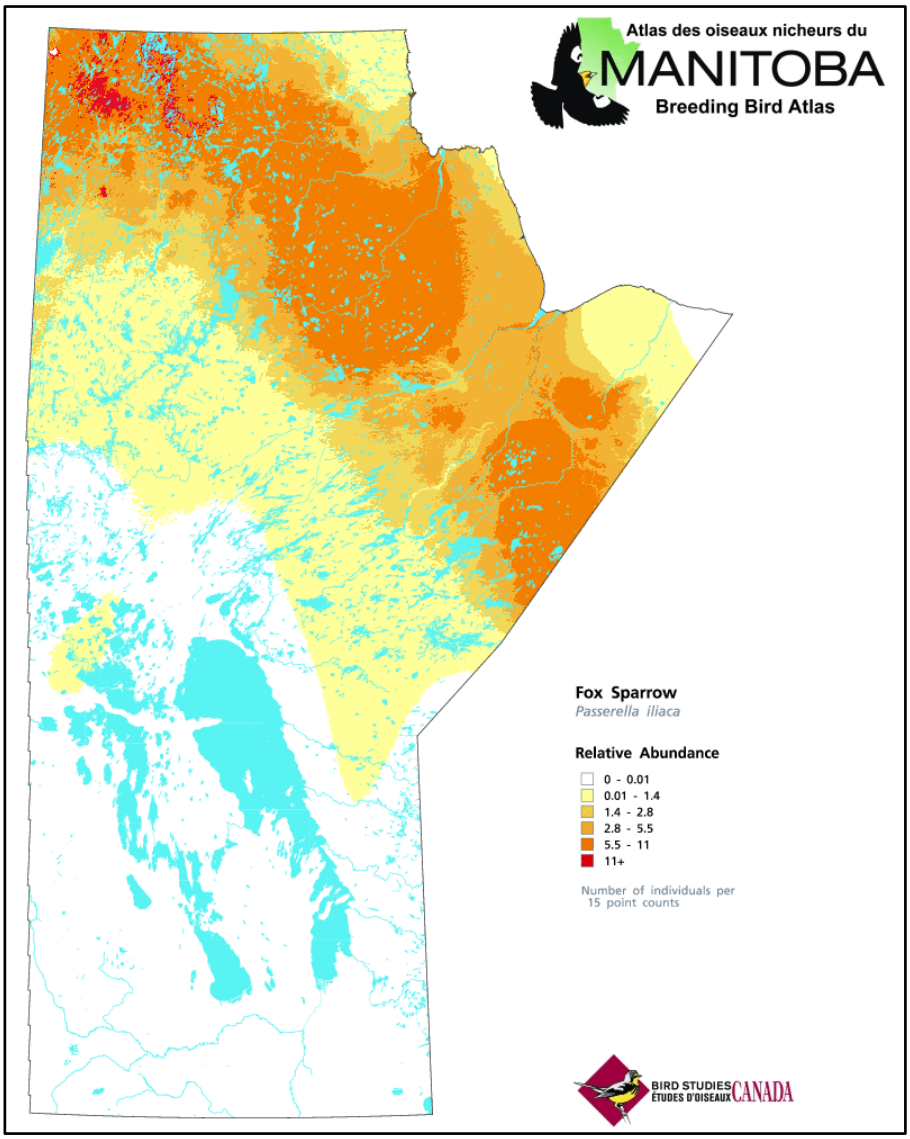

Figure 11. Breeding distribution of fox sparrows in Manitoba. Note the somewhat disjunct breeding range in the area of The Pas. From Artuso (2018)

Flooded Jellyskin (*Leptogium rivulare)*
COSEWIC (2015) reports an outlier population of Flooded Jellyskin near Flin Flon, representing the most northerly recorded location in Canada. Although the site is hundreds of km from the nearest known subpopulations in southern Manitoba and northwestern Ontario, it is considered part of the populations that include those locations. Known locations of occurrence in the Flin Flon area include Payuk, Neso, Twin and Whitefish lakes. The occurrences near Flin Flon may be impacted by pollution from mining and smelting activity in the region that has decreased substratum pH over a large area (COSEWIC 2015). In addition, the species is also often associated with ash trees and may grow in areas of commercial interest for forest management operations. Flooded Jellyskin is identified as an **HCV with <u>moderate</u> potential impact from forest management**.

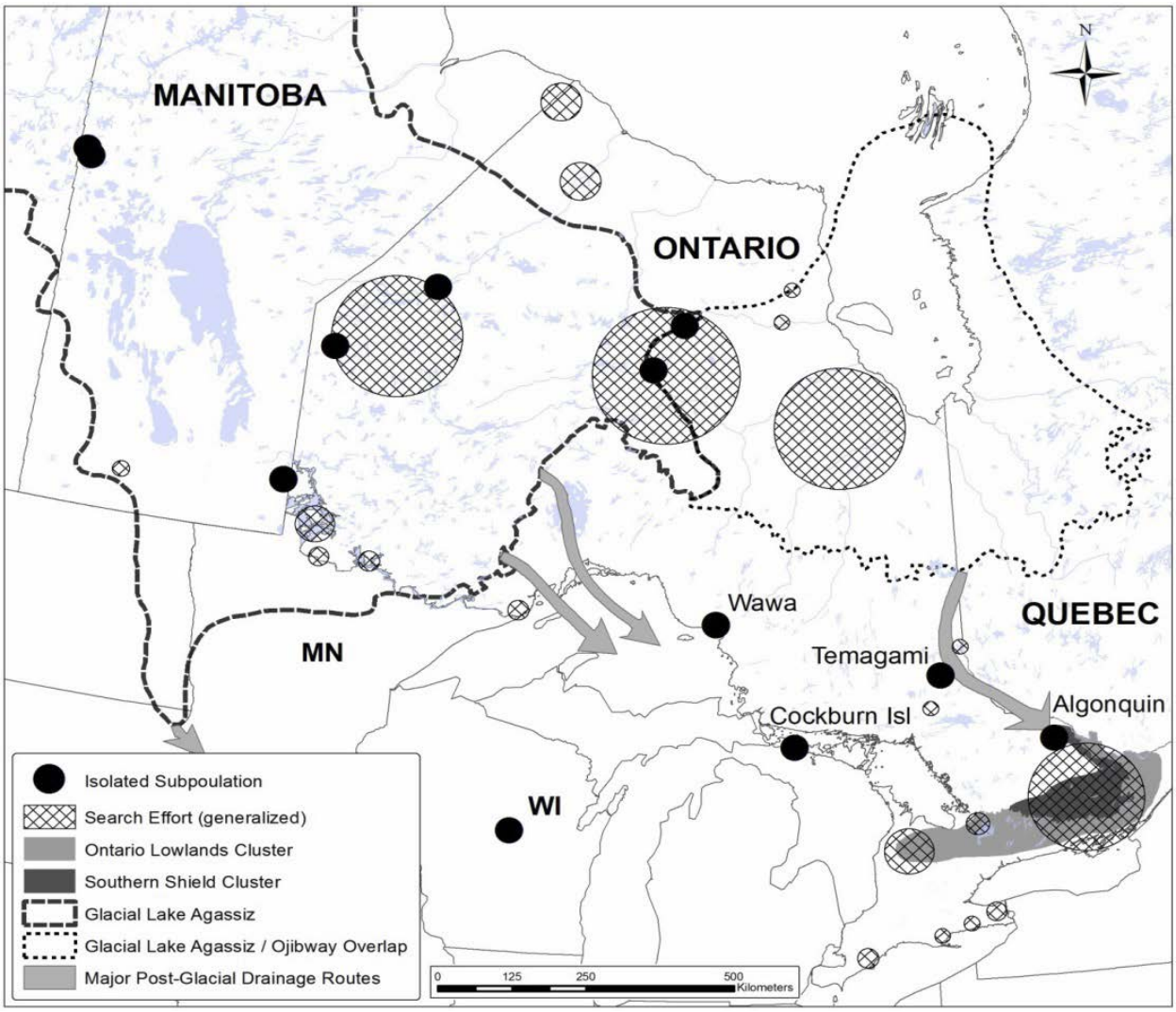

Figure 12. Distribution of Flooded Jellyskin in Canada. Although the location near Flin Flon is disjunct from other known populations, it is considered part of the Glacial Lake Agassiz population. (From COSEWIC 2015).

Additional outliers
The three species concentrations described above are the only ones that we believe can be designated as HCVs based on their disjunct concentrations. However, we found reference to other disjunct occurrences, which were not cited as concentrations per se, but are worth noting nonetheless should future proximal instances of their occurrence be found.

The following species were identified in a small number of distributed breeding bird squares in the Assessment Area in the Manitoba Breeding Bird Atlas (Artuso et al. 2018):

- Short-billed Dowitcher;
- Mountain Bluebird; and
- Yellow Rail.

The following plant species were identified on maps as having disjunct or somewhat disjunct occurrences in the Assessment Area by Riley (2003) in a publication on the flora of the Hudson Bay Lowlands:

- *Aster brachyactis;*
- *Astragalus americanus;*
- *Ceratophyl lumdemersum;*
- *Chenopodium glaucum*var. *salinum;*
- *Tanacetum huronense;*
- *Cicuta mackenzieana;*
- *Cypripedium passerinum;*
- *Cypripedium reginae;*
- *Erigeron acris;*
- *Erigeron lonchophyllus;*
- *Limosella aquatica;*
- *Poa alpina;*
- *Saxifraga paniculata;*
- *Spergularia marina;*
- *Suaeda calceoliformis; and*
- *Zannichellia palustris.*

The following additional disjunct or edge-of-range species occurrences are noted related to the ecological reserves that occur in the Assessment Area:

- Manitoba (undated a) notes that American Avocet (*Recurvirostra americana*) are known to breed in the Kaweenakumik Ecological Reserve near the southern edge of the Assessment Area;
- Manitoba (undated b) notes that Birch River Ecological Reserve near the southwestern edge of the Assessment Area contains records of Dusky Shrew (*Sorex monticolus*) and Black Northern Pocket Gophers (*Thomomys talpoides*), both at the northern extreme of their ranges;
- Manitoba (undated c) notes that the Lake Winnipegosis salt flat contains a perennial ragweed (*Ambrosia psilostachya*) 200 km north of its normal range, and Seaside Plantain (*Plantago maritima*) likely near or at the southern edge of its range. The reserve also contains species normally restricted to northern oceanic coastlines, including: Red Swampfire(*Salicornia rubra*), Nuttall's Alkali Grass(*Puccinellia nuttalliana*), and Cosmopolitan Bulrush(*Schoenoplectus maritimus*); and
- Manitoba (undated d) notes that the Red Rock Ecological Reserve contains the province's northernmost occurrence of Bur Oak (*Quercus macrocarpa*) in the province.

Finally, Little George Island Important Bird Area in the northern basin of Lake Winnipeg is noted as the southernmost breeding location for Greater Scaup in Manitoba, and Western Grebe has been reported nesting in Kaweenakumik Lake IBA (Table 7).

3.6 REGIONALLY SIGNIFICANT DECLINING SPECIES

3.6.1 Context

This HCV grouping is based on whether the forest contains critical habitat for regionally significant species, in particular species with declining populations. There is a lot of overlap in this consideration with other designations within HCV 1 (e.g. Species at Risk, Endemic Species, etc.). For example, Woodland Caribou, identified in Section 3.2 above, is a notable, significant species in decline. To avoid repetition, many HCV

assessments addressing this criterion focus on identification of declining species which have not been identified in other aspects of the assessment. That approach is taken here.

3.6.2 Methodology

As with other parts of this assessment, the focus of efforts to identify regionally significant declining populations was based on internet searches. In addition, an interview with Manitoba Sustainable Development Staff (July 24, 2019) was helpful in addressing questions related to individual species and providing an overall ecological context.

3.6.3 Results

Through internet searches and discussions and correspondence with Manitoba Sustainable Development (MSD) staff, we identified that in addition to concerns regarding species identified as at-risk, there is significant concern about a provincial decline in moose population. Provincial-scale moose population data are not routinely collected, but there is considerable evidence of local or regional declines (CPAWS web site, undated)[1]. The web site notes that in the 1960's the population in the province was approximately 45,000 and is now below 20,000 animals. These reference numbers are also cited by the Wildlife Society, Manitoba Chapter (2015), although Timmerman and Rogers (2017) cite a personal communication from an MSD biologist who noted the population was 27,000. These figures represent a decline of 40 – 56% from the 1960's population estimate. The precise reason for the decline is not identified in these sources, although several possible contributory causes are discussed, including legal, illegal, and undocumented harvests (facilitated by increased access network), increased predation, parasitism by winter tick and moose brainworm (mediated by increasing deer populations), habitat changes, and climate change. There are interactions among these mechanisms which further complicate attributing proportional responsibility for the decline.

The Wildlife Society (2015) assembled a map (Figure 13) showing the regional status of moose in the province. The figure was assembled based on "recent and historical aerial survey reports, field investigations, research projects, scientific studies and professional judgement". The figure shows that moose populations in most of the Assessment Area either 'require attention' or are a 'major concern'. The Wildlife Society (2015) noted that declines have not taken place in protected areas, areas that are roadless boreal or tundra environments and in some private agricultural lands. These observations cause the Society to conclude that hunting pressures may be the primary cause. Hunting as facilitated by forest access roads has been identified as a major factor in moose mortality in a number of scientific studies (e.g. Eason 1985, Voigt et al. 2000). A CPAWS survey of Manitobans revealed that most (68% of approximately 400 respondents) believed that overhunting was a major factor in the population decline. The other possible causes that were identified as a major factor by more than 20% of respondents were habitat loss (25%) and predation (22%). Based on the suite of information regarding moose populations in the Assessment Area and the credible science that establishes a link between forest access roads and hunting pressure, moose are considered to be an **HCV with a <u>high</u> potential impact from forest management.**

[1] The Canadian Parks and Wilderness Society is spearheading a "Save Our Moose" campaign and its web site contains information on population, possible causes, a citizen's survey etc.. The information in the CPAWS report is not available as a document but is provided in various pages on its web site: https://saveourmoose.ca/

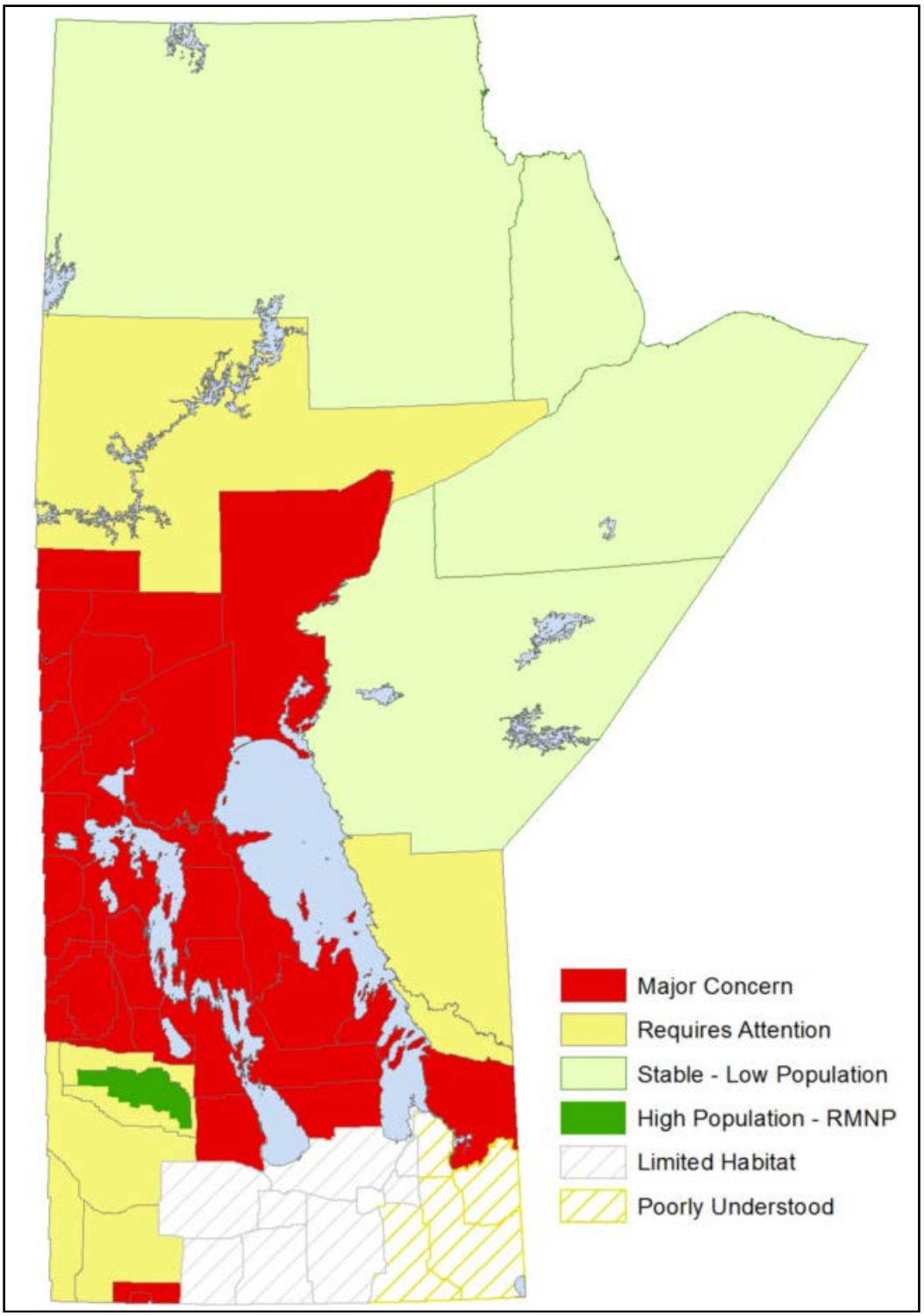

Figure 13. Status of the moose population in Manitoba. From The Wildlife Society (2015).

3.7 CONSERVATION AREAS

3.7.1 Context

This HCV designation is intended to address whether the forest occurs either within, adjacent to, or contains protected areas that are either a) recognized by an international authority, b)legally designated within the political jurisdiction within which the forest occurs, or c) identified in regional or local plans. Consistent with the intent of this assessment to focus on high-quality ecological values, HCV areas identified here are those that address the criteria of one of IUCN categories I-IV (Table 8).[2]

Table 8. IUCN Protected Area Categories (as defined in Dudley 2008). Categories that have been used in this HCV assessment are shaded in the table.

IUCN Category	Description
Ia. Strict Nature Reserve	Areas strictly protected for biodiversity and also possibly geological/ geomorphological features, where human visitation, use and impacts are controlled and limited to ensure protection of the conservation values.
Ib. Wilderness Area	Usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, protected and managed to preserve their natural condition.
II. National Park	Large natural or near-natural areas protecting large-scale ecological processes with characteristic species and ecosystems, which also have environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.
III. Natural Monument or Feature	Areas set aside to protect a specific natural monument, which can be a landform, sea mount, marine cavern, geological feature such as a cave, or a living feature such as an ancient grove.
IV. Habitat/Species Management Area	Areas designated to protect particular species or habitats, where management reflects this priority. Many areas will need regular, active interventions to meet the needs of particular species or habitats, but this is not a requirement of the category.
V. Protected Landscape or Seascape	Where the interaction of people and nature over time has produced a distinct character with significant ecological, biological, cultural and scenic value, and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.
VI. Protected Areas with Sustainable Use of Natural Resources	Areas which conserve ecosystems, together with associated cultural values and traditional natural resource management systems. Generally large, mainly in a natural condition, with a proportion under sustainable natural resource management and where low-level, non-industrial natural resource use compatible with nature conservation is seen as one of the main aims.

3.7.2 Methodology

Information was gathered from publicly available internet sources. For parks, the main sources of information were the Canadian Council on Ecological Areas (CCEA) Conservation Areas Reporting and Tracking System (CARTS) publicly available data, and information on individual parks on the Manitoba Sustainable development web site (https://www.gov.mb.ca/sd/parks/index.html). For ecological reserves the main sources of information were the 2015 Five-year report to the Manitoba Legislature on Ecological Reserves (Manitoba 2015) and corresponding specific information on the identified on individual reserves on the Manitoba Sustainable Development web site (https://www.gov.mb.ca/sd/environment_and_biodiversity/ecological-reserves/index.html).

[2] The exception to this is Paint Lake park. The park is designated as a Natural park by Manitoba. As it has value both in its ecological representation of the ecoregion and is historically and archaeologically significant it is included as an HCV.

3.7.3 Results

Manitoba's provincial parks are classified into a several types (Table 9. The province's system of park classification does not map neatly in all circumstances onto the IUCN designation categories as some parks address more than one IUCN characteristic.

Table 9. Manitoba Provincial Parks classification system. (From Manitoba 2018).

Provincial Park Class	Description
Wilderness	Wilderness parks contribute to the provincial network of protected areas by preserving representative areas of an ecoregion.
Natural	The main purpose of a natural park is both to preserve areas of an ecoregion and to accommodate a diversity of recreational opportunities and resource uses. Natural parks minimize land available for resource extraction and, to the greatest extent possible, contribute to the provincial network of protected areas and provide outdoor recreational and educational experiences in a natural setting.
Indigenous Traditional Use	The main purpose of an Indigenous Traditional Use park is to preserve land that has been traditionally used by Indigenous Peoples and that is significant to Indigenous Peoples because of its natural features or cultural importance. The establishment of new Indigenous Traditional Use parks is based upon proposals put forward by Indigenous Peoples and the significance of these sites as traditional use areas.
Recreation	Recreation parks provide outdoor recreation opportunities in a natural setting. The establishment of new recreation parks is based on an assessment of recreational needs, economic viability and existing community services.
Heritage	Heritage parks preserve unique and representative cultural and heritage resources of outstanding provincial significance. Partnerships with heritage groups and communities are essential to the creation of heritage parks.

There is no system of classification for ecological reserves comparable to that of provincial parks as the main intent of all reserves is to play a role in preserving outstanding ecological features, whereas parks are designated for a variety of purposes. The 2015 Five-year Report to the Legislature on Ecological Reserves (Manitoba 2015) notes that the reserve system supports the province's Green Plan aspirations (Manitoba 2014) and through the preservation of ecological features also directly supports key elements of several national and international commitments and agreements, including:

- the 1989 World Wildlife Fund Canada Endangered Spaces Campaign;
- the 1992 United Nations Convention on Biodiversity; and
- the 1992 federal-provincial-territorial Statement of Commitment to Complete Canada's Network of Protected Areas.

There are 11 provincial parks and 7 nature reserves that merit HCV designation (Table 10 and Table 11). In general we believe these sites are at low risk from forest management, however we do not have sufficient familiarity to state so categorically. There are no national parks or other designated conservation lands within the Assessment Area.

Table 10. Provincial parks identified as HCVs. Data from Manitoba (2018).

Protected Area	Type& Size (ha)	Key Features	EcoRegion
Amisk	Park Reserve (Wilderness) 198,000	The intent of the park is to preserve physical features and biological communities representative of the Churchill River Upland Ecoregion. The park is presently a 'park reserve', meaning it has yet to be officially gazetted as a park. The Amisk park reserve: • protects a portion of the North Indian River Moraine, marking the boundary between the Kewatin and Labradorean ice sheets of the last glaciation; • provides undisturbed habitat for moose, black bear, wolves, and many other species; and • provides wilderness, recreational opportunities The final status of the park will be determined in consultation with Indigenous Peoples and interested parties.	Churchill River Upland
Birch Island	Natural 80,088	The intent of the park is to preserve representative communities of the ecoregions. The park includes Birch Island itself and a number of small islands, reefs and shoals. The park: • provides nesting habitat for many colonial nesting birds, including Great Blue Heron, terns and gulls, American White Pelicans and Double-crested Cormorant; and • has diverse mix of habitats, such as jack pine and black spruce ridges, mixed-wood forests and black spruce muskeg.	Mid-Boreal Lowland and Interlake Plain
Chitek Lake Anishinaabe	Indigenous Traditional Use 100,300	The intent of the park is to provide recognition of the importance of the area to local First Nations as a traditional use area and to preserve physical features representative of the ecoregions. The park: • provides winter habitat for the threatened Wood Bison; • preserves culturally significant archaeological sites; • provides commercial fishing opportunities; and • protects colonial nesting water birds.	Mid-Boreal Lowland and Interlake Plain
Clearwater Lake	Natural 59,265	The intent of the park is to represent the physical features and biological communities of the ecoregion, preserve the water quality of Clearwater lake, and accommodate a range of recreational activities. The park: • provides cottaging, camping, boating and fishing opportunities; • protects a string bog, and colonial bird habitat; and • protects upland areas adjacent to the lake.	Mid-Boreal Lowland
Goose Islands	Natural 137	The park consists of five separate islands near the north-eastern shore of Lake Winnipegosis. The main intent of the park is to protect the breeding and nesting grounds of colonial birds such as Double-crested Cormorant, Caspian and Common terns and Ring-billed and Herring gulls. The park: • protects the breeding and nesting grounds of colonial birds; and • is comprised primarily of mud flats, marshes and beaches, with scrubby vegetation.	Mid-Boreal Lowland
Grand Island	Natural 1,035	The main intent of the park is to preserve physical features and associated biodiversity associated with the ecoregion. The park: • contains diverse landscapes, including rock outcrops, cliffs, gravel ridges, marshes and mud flats; and provides backcountry experiences.	Mid-Boreal Lowland
Grass River	Natural 227,930	The park is situated in the transition zone between the Pre-Cambrian Shield and Manitoba Lowlands. The intent is to preserve physical features, and accommodate recreational opportunities and resource use. The park: • is dominated by boreal forest, rocky outcrops and bogs; • provides habitat for Woodland Caribou; and	Churchill River Upland and Mid-Boreal Lowland

Protected Area	Type& Size (ha)	Key Features	EcoRegion
		• contains the Palsa Hazel Ecological Reserve (described below).	
Kettle Stones	Natural 400	The park exists primarily to protect a series of sandstone formations known as kettle stones. The stones range in size from 45 cm to 5.5 m in diameter. The park: • is the only place in Manitoba where a high concentration of kettle stones can be observed in a natural setting; and • is considered sacred by Indigenous Peoples.	Interlake Plains
Little Limestone Lake	Natural 4,810	Little limestone lake is the world's largest marl lake. Marl is created when calcite (a component of limestone) is precipitated from warm water. As the temperature rises, the quantity of marl increases, changing the colour of the water to shades of turquoise. The park: • is considered one of the best examples of a marl lake in the world; and • in the area surround the lake, contains many caves, sinkholes and disappearing streams, underground springs and lakes.	Mid-Boreal Lowland
Paint Lake	Natural 27,400	In addition to providing ecological representation of the ecoregion, Paint Lake park contains sites of historic and archaeological significance including excavation sites that have uncovered pottery, tools, and other items from 2,000 years ago. The park: • has a complex geological makeup as it straddles the Thompson Nickel belt and is rich in nickel and copper deposits; • accommodates a diversity of recreation, including cottaging, camping, boating, fishing, snowmobiling and cross-country skiing; • permits commercial resource opportunities such as mining provided they do not compromise other park activities.	Hayes River Upland
Pisew Falls	Recreation 93	Pisew falls is one of Manitoba's largest waterfalls. At the base of the falls, mist and spray form a tower of ice during winter and create a unique microclimate in the river channel. The ice can persist well into summer, resulting in a community of plants that are adapted to a short growing season and moist conditions. The park: • provides a unique ecological environment and recreational opportunity.	Hayes River Upland

Table 11. Ecological Reserves identified as HCVs. Data from Manitoba (2015) and information on individual reserves from the province's ecological reserve web page (https://www.gov.mb.ca/sd/environment_and_biodiversity/ecological-reserves/index.html).

Reserve	Size (ha)	Key Features	EcoRegion
Kaweenakumik Island	20	The reserve consists of eight flat islands in Kaweenakumik Lake. The focal point of the reserve is the nesting habitat they provide for several species of birds. The reserve: • provides nesting habitat for white-winged scoter, American white pelican, Caspian term, common tern, double-crested cormorant, great blue heron, ring-billed gull, herring gull, western grebe, and American avocet, which is at the northern edge of its range; • provides important nesting habitat for white-winged scoter, which was extirpated in southern Manitoba due to hunting and bycatch in commercial fishing nets; • contains the largest nesting colony of pelicans in Manitoba; and • is categorized Ia by IUCN - the highest degree of protection.	Mid-Boreal Lowland
Long Point	1600	The reserve juts into the northwest portion of Lake Winnipeg and contains a beach ridge and community of bog plants. The reserve: • contains white cedar and white spruce trees that date back to the early-mid 1700's; • contains exceptionally deep peat in places, providing an extraordinary substrate for bog-affiliated plants; and • is categorized Ia by IUCN - the highest degree of protection.	Mid-Boreal Lowland
Birch River	183	The complex geological and glacial history of the reserve is reflected in its unique physical environment that includes beach lines formed by the former glacial Lake Aassiz, and a rich variety of coniferous, deciduous, mixedwood and shrub-dominated forest communities, along with wetlands, including bogs, sedge meadows, floating bogs and muskeg. The reserve: • provides habitat for 17 species of orchid, representing > 40% of Manitoba's orchid flora; • supports at least six plants considered rare in Manitoba, including Large-leaved White Violet, Marsh Bedstraw, Adder's Mouth Orchid, Bog Adder's Mouth Orchid, Moschatel, and Slender-beak Rush; • supports a diverse small-mammal population including records of Dusky Shrew – at the northern edge of their range, and a preponderance of Pocket Gopher – also at their northern limit; and • is categorized Ia by IUCN - the highest degree of protection.	Mid-Boreal Lowland
Armit Meadows	263	The reserve is located within the Porcupine Provincial Forest and includes the southeastern portion of the Armit River Canyon. Although spruce forest is the most abundant vegetation community, a series of small, but ecologically-significant meadow and wetland communities are dispersed throughout. The reserve: • contains remnants of the fescue prairie ecosystem – the most northerly location in Manitoba; • contains rare plants associated with the prairie ecosystem; • provides winter habitat for Elk; and • is categorized Ia by IUCN - the highest degree of protection.	Mid-Boreal Lowland
Lake Winnipegosis Salt Flats	560	The reserve is located at the extreme northwestern edge of Lake Winnipegosis. The reserve is a unique salt flat complex that likely represents the only extensive inland saline shoreline in North America. Some elements of typical boreal forest are present, but disjunct halotrophic vegetation normally found in very distant locales make this site unique. The reserve: • contains plant species normally restricted to northern oceanic coastlines, including: Red Swampfire, Nuttall's Alkali Grass, Cosmopolitan Bulrush and Seaside Plantain, which is at or near the southern extremity of its range;	Mid-Boreal Lowland

Reserve	Size (ha)	Key Features	EcoRegion
		• additional rare species include Salt Marsh Sand Spurry, Marsh Alkali Aster, Mistassini Primrose and Shooting star. • Perennial Ragweed is also found here – 200 km further north than its normal range. • is categorized Ia by IUCN - the highest degree of protection.	
Red Rock	485	The reserve is significant because it contains a high diversity of plant communities: submerged meadow, emergent marshes, open to closed shrub and deciduous forest, pure aspen stands, closed mixed-wood stands, pure conifer stands and open mixed-wood stands. The reserve: • contains a variety of aquatic ecosystems including shallow eutrophic lakes and ponds, small watercourses, a large stream and a marsh; • contains the most northerly stand of Bur Oak in Manitoba; and • is categorized Ia by IUCN - the highest degree of protection.	Mid-Boreal Lowland
Palsa Hazel	1,648	The reserve is significant for the rare ecological community dominated by peat landforms. The reserve consists of a calcareous fen with peat palsas and palsa scars. Palsas are landforms created by frost heaving in boggy environments more common in polar and sub-polar climates. The intermittent permafrost in the reserve has created small palsas and peat plateaus that rise out of the fen. The reserve: • contains highly mineralized springs that support a sedge-tamarack community; • is underlain by permafrost which is rare this far south in Manitoba; • is categorized Ia by IUCN - the highest degree of protection.	Mid-Boreal Lowland
Walter Cook Caves	2,250	The reserve is significant because it protects a series of caves with unique geologic and ecological elements and also contains an area of Karst topography, with limestone and dolomite areas creating sinkholes and grassy depressions and other geologic features. The reserve: • includes six caves: Walter Cook's, Iguana Crypt, Ice Cascade, 4-eyed, and Caprocl and Anticipation; • contains a collection of grassy surface depressions known collectively as 'Deep Basin", which is unique to North America; • provides breeding and over-winter habit for little brown, and northern myotis (although there status is uncertain now given the prevalence of white-nose disease; • a series of subterranean passages carved by alternating periods of inundation and desiccation; and • overall, is a very unique geologic area.	Mid-Boreal Lowland

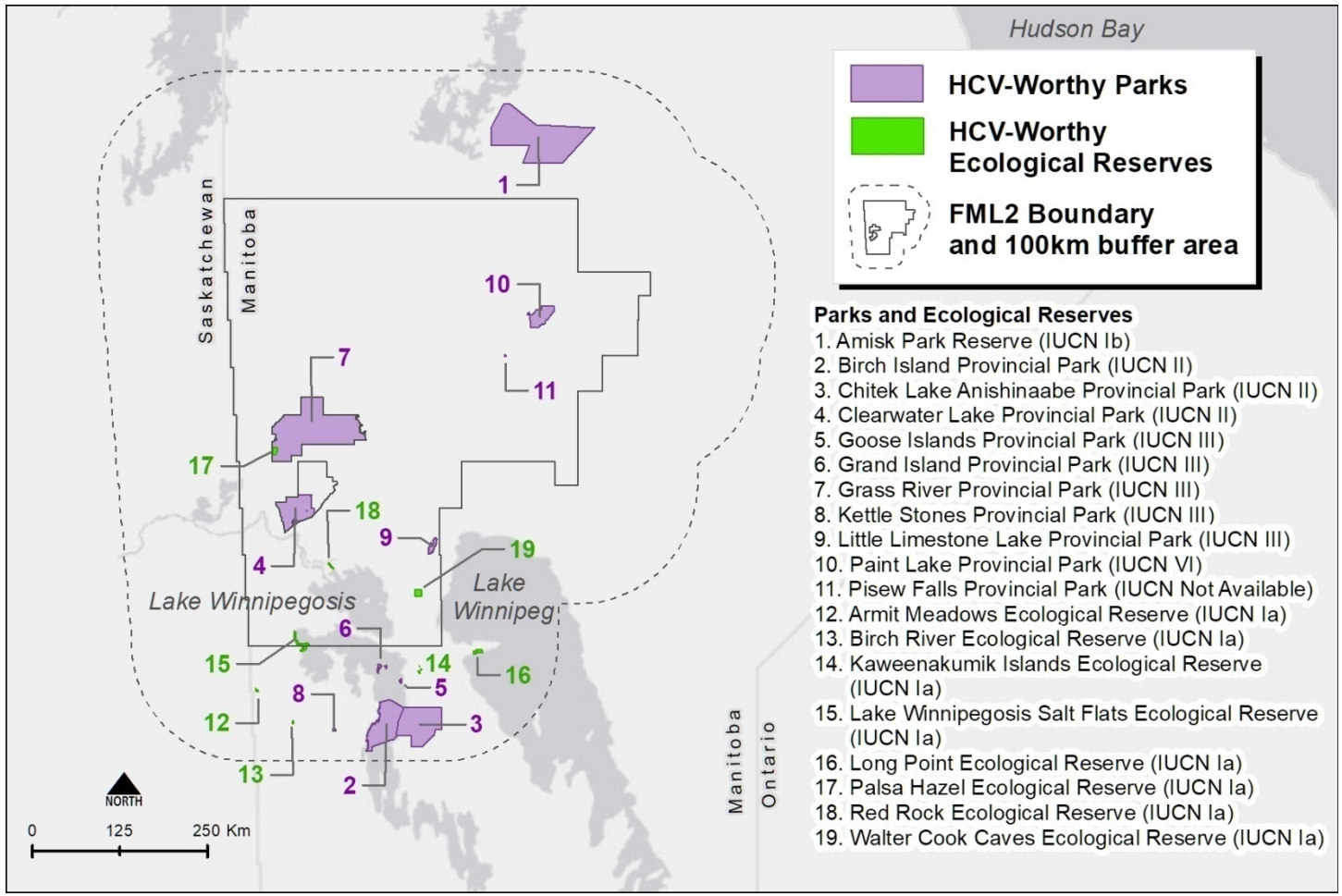

Figure 14. Provincial Parks and Ecological Reserves designated as HCVs.

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4 HCV 2 – LANDSCAPE-LEVEL ECOSYSTEMS (I.E. INTACT FOREST LANDSCAPES)

4.1 INTRODUCTION AND SUMMARY

HCV 2 is defined by the Forest Stewardship Council as "*Landscape-level ecosystems and mosaics. Intact Forest Landscapes and large landscape-level ecosystems and ecosystem mosaics that are significant at global, national or regional levels, and that contain viable populations of the great majority of the naturally occurring species in natural patterns of distribution and abundance*." (FSC Canada 2018). HCV2 has become more-or-less synonymous with Intact Forest Landscapes (IFLs) and a series of exercises have been undertaken to define and identify them (e.g. Potapov et al. 2008, High Conservation Resource Network 2013, Smith and Cheng 2016, Venier et al. 2018). IFLs provide many important ecological qualities and services; they support high levels of biodiversity, provide habitat for sensitive wildlife species, increase ecosystem resilience, maintain landscape-scale ecosystem processes, and serve as scientific benchmarks of natural processes (Venieret.al 2018). Along with Brazil and Russia, Canada is one of the world's largest reservoirs of IFLs – as of 2015, these three countries contained approximately 65% of the world's entire IFL area(FSC HCV Manager's Guide, 2015).

FSC Canada's National Forest Management Standard facilitates HCV assessments by providing direction on HCV 2 that requires forest managers to consider the following elements when determining the presence of IFLs:

"A*re there contiguous forest landscapes that have the following characteristics?*

- *at least 50,000 ha in size;*
- *minimal width of 10 km;*
- *free of permanent infrastructure and less than 5% non-permanent anthropogenic disturbance;*
- *free of large-scale industrial resource extraction activities;*
- *dominated by forest, but inclusion of other ecosystems to a reasonable extent is permissible;*
- *dominated by native plants and communities; and*
- *not necessarily dominated by old forest communities*."

Consistent with the direction in the HCV Framework, all IFLs are designated as High Conservation Values.

4.2 CONTEXT AND METHODOLOGY

4.2.1 IFLs & Impacts on Species at Risk

In principle, the threshold size for considering a forest area as HCV 2 should be related to the area required to maintain viable populations of wide-ranging species. Although this criterion is valid, there is some subjectivity in the use of the 50,000 ha threshold for IFLs. However, in the absence of definitive and widespread evidence of a single quantitative benchmark that could serve this purpose, there is general acceptance among ecologists of the appropriateness of a 50,000 ha threshold.

Given the effect of human disturbance and landscape fragmentation on some wildlife species, IFLs play an important role in maintaining habitat for wide-ranging boreal species at risk, such as woodland caribou. Analysis of IFL degradation between 2000 and 2013 in Canada shows a significant impact on ranges of woodland caribou and other species at risk (Smith and Cheng, 2016). Approximately 92% of the IFL degradation occurred in areas known to have endangered or threatened species (Smith and Cheng, 2016). Increased national and provincial focus on the management of declining caribou populations lends itself to valuing IFLs as an important component of caribou management. This issue is discussed more later in this document.

4.2.2 Prominence of IFLs in FSC

Under Principle 9 of FSC's Forest Management Standard (High Conservation Value Forests), forest managers are required to evaluate whether large landscape level forests (HCV2) occur on the Management Unit. In 2014, FSC members voted to specifically include the concept of IFLs under Principle 9 at FSC's General Assembly, and in 2017 a suite of International Generic Indicators (IGIs) related to IFLs was approved by FSC International and incorporated into the broader set of IGIs that must be used in development of National Forest Management Standards (FSC 2017). In Canada, the recently released National Forest Management Standard has not yet incorporated indicators specifically related to IFLs. Work to incorporate IFLs is expected to be completed in 2020.

Concomitant with the development of IFL requirements in FSC, and particularly important in Canada, has been the evolution of the concept of Indigenous Cultural Landscapes (ICLs). Although the concept has been in existence for some time, it has only been since the increased prominence of IFLs that ICLs have gained traction with FSC, through the organization's Permanent Indigenous Peoples Committee and the Aboriginal Chamber of FSC Canada. ICLs are defined as:

> *"Living landscapes to which Indigenous Peoples attribute social, cultural and economic value because of their enduring relationship with the land, water, fauna, flora and spirits, and their present and future importance to their cultural identity. An ICL is characterized by features that have been maintained through long-term interactions with the landscape based on land-care knowledge, and adaptive livelihood practices. They are landscapes over which Indigenous Peoples exercise responsibility for stewardship."*

This development was important within FSC as it acknowledges the long standing and current traditional uses of the land by Indigenous People, whether or not the forest has been defined as being 'intact'. Work on integrating the ICL concept under Principle 9 is in early stages, and occurring in parallel to the development of IFL requirements. In Canada, acceptance of the principle of ICLs as a cultural parallel to the concept of IFLs and incorporation of it into the National Standard is seen as crucial to the inclusion of IFLs into the National Standard.

Given the early nature of the discussion around how to integrate ICLs into identification and management of IFLs, we do not consider ICLs in this assessment.

4.2.3 IFL Data Sources and Identification

Data from Global Forest Watch (GFW) serve as good starting points to determine whether IFLs are present on the forests in FML-2. However, there exist various datasets identifying IFLs according to different metrics used by different branches of GFW. Both Global Forest Watch International (GFWI) and its regional partner Global Forest Watch Canada (GFWC) have identified IFLs within Canada. However, there are some key differences between GFWC and GFWI in the criteria they use for defining IFLs (Table 12). The differences result in considerably more area being considered IFL by GFWC than by GFWI.

Table 12. Summary comparing the different between GFWI and GFWC criteria for delineating IFLs. (From. Smith and Cheng. 2016.

Criteria	Global Forest Watch International	Global Forest Watch Canada
Size of IFLs	≥50,000 hectares	≥50,000 hectares
Fire-related disturbance	Considered burned areas in the vicinity of transportation infrastructure, agricultural areas, and logging sites as caused by humans and thus were treated as an IFL reduction factor.	Does not consider any fire a human disturbance.
Buffering of Infrastructure	1 km, including navigable waters	Major highways 1 km, other features buffered at 500 m. Navigable waters not buffered
Corridors	Narrow corridors ≤2 km in wide were considered degraded and so not part of IFLs	All appendages and narrow corridors were included as IFLs
Minimum diameter	10 km	No requirement
Geographic Extent	Includes areas with at least 20% tree canopy	Includes Canada's eleven forest ecozones
Total IFL area in Canada	2.9 million sq. km	4.3 million sq. km

The approach of GFWC was intended to be more appropriate for the ecology of Canada's forests compared to the more generic considerations of GFWI's approach. For example, GFWC treats all fires as a natural disturbance regardless of proximity to human infrastructure, whereas GFWI considers any fires in the vicinity of human development as human-caused (Potapov, 2017). This distinction means burned areas are eligible for inclusion in GFWC's assessments, but much is not eligible for inclusion under GFWI. GFWI criteria also include other more restrictive elements when considering what spatial characteristics constitute an IFL, resulting in fewer and smaller IFLs identified using the GFWI dataset than the GFWC. Another significant difference relates to the extent of land considered 'eligible' for IFLs. The GFWI approach is based on 20% tree canopy using global tree cover data at 500 m resolution (Potapov et al. 2008), whereas GFWC's approach was to consider all area within Canada's eleven forest ecozones. As is apparent from , this difference had the effect of extending the total area eligible for IFL designation considerably farther north than GFWI.

Unfortunately, GFWC ceased operations in 2017, and therefore updates to IFL mapping after 2013 (the last data used in a GFWC publications) will not be available. Thus, while the GFWC data are more relevant to IFL mapping in the Canadian context, the utility of using GFWC datasets as the basis for IFL identification will become increasingly less over time. Currently, FSC permits IFLs identified by either GFWC or GFWI to be acceptable (FSC ADVICE-20-007-018 V1-0).

FSC Canada has presented an alternative approach (FSC Canada, 2017) to using the GFWC and GFWI datasets to identify IFLs. This 'interim' approach provides guidance to forest managers who wish to conduct their own analysis identifying IFLs within their land base using more up-to-date and/or finer-scale land use data than that which was used for the GFWC or GFWI datasets. This approach provides guidance and considerations for spatially identifying and demarking IFLs on a map. Refer to FSC Canada (2017, Table 1) for details.

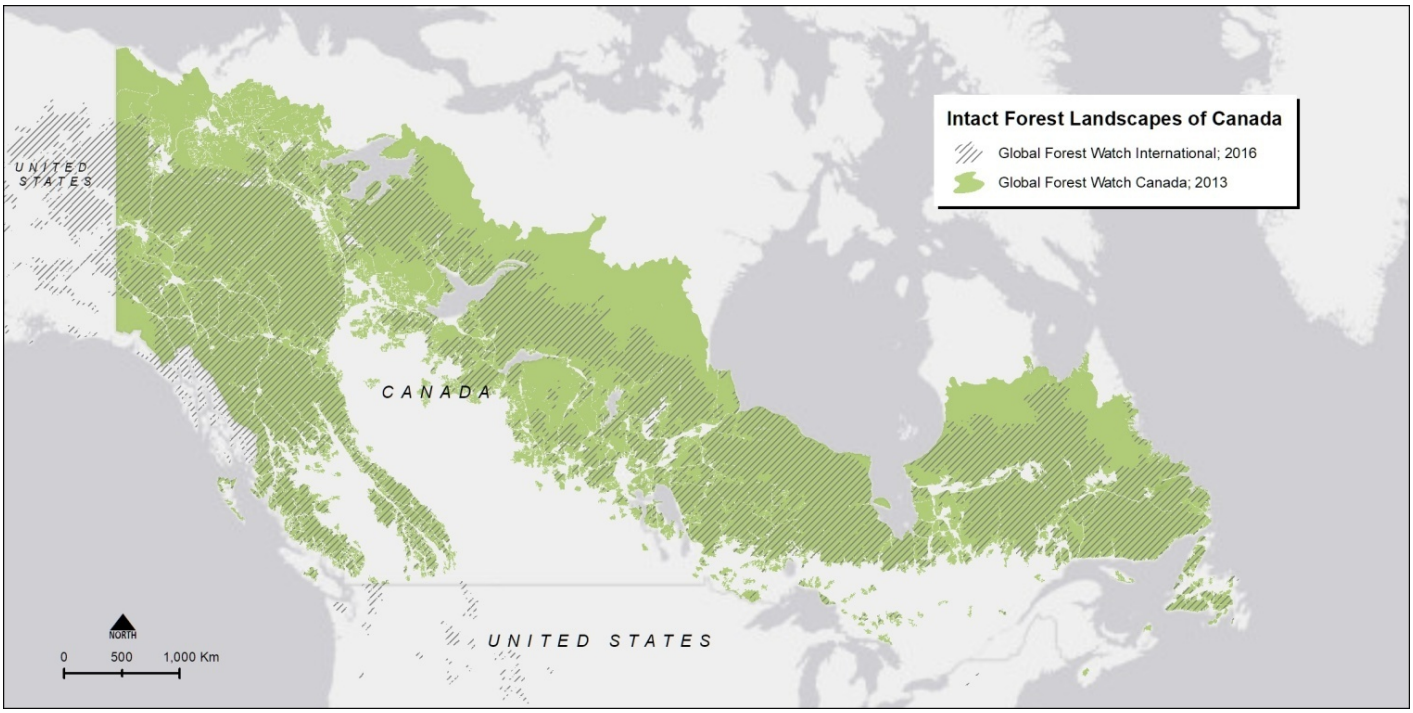

Figure 15. Comparison of Global Forest Watch Canada and Global Forest Watch International identification of IFLs in Canada.

For the purpose of this HCV assessment, the decision was made to use the GFWC dataset (2013) as the basis for IFL identification, because of its greater ecologically appropriateness for the boreal context compared to the GFWI dataset and because the pace of forest development in the assessment area has been considerably slower than in other forests in the southern boreal. However, there are a few caveats to using the GFWC data as the basis for IFL identification. First, as noted above, the data are over 6 years old, and therefore do not account for the impact of human disturbance (e.g. forestry and mining operations, road building, etc.) since 2013. Secondly, GFWC data are rather coarse, and not necessarily reflective of fine-scale data that a land manager may have access to. The most accurate way to identify and delineate IFLs on the forest would be to implement the FSC Interim Guidance for the Delineation of IFLs (FSC Canada, 2017) using fine-scale FML-level spatial data, but this exercise was considered outside of the scope of this evaluation at this time.

4.3 Results and Discussion

Five IFLs have their entire extent completely within the FML (that is, no portions of them extend beyond the FML). The IFLs account for a very large proportion of the landbase - 69.0% of the FML. In total, 27 IFLs, totalling 6.32 million ha overlap FML-2 and 46 IFLs totalling 18.51 million ha overlap the area encompassed by the FML and the FML plus the 100 km buffer respectively 71.5% of the FML plus 100-km buffer. This is indicative of a mostly intact landbase with a generally low footprint of industrial disturbance. In spite of the number of communities and extent of road infrastructure in the Forest, these high proportions suggest that the large undeveloped proportion of the landbase is still very significant relative to the human footprint. We know of very few other managed forest landbases in Canada with a comparable proportion of IFLs.

Consistent with the direction in the HCV Framework, all IFLs are designated as High Conservation Values.

Figure 16 suggests that the extent and number of IFLs would be considerably less if the GFWI data were used for this analysis. A relatively detailed analysis would be necessary to understand exactly why this is, but it is most likely that the greater restriction on burned areas would be a primary cause of the discrepancy.

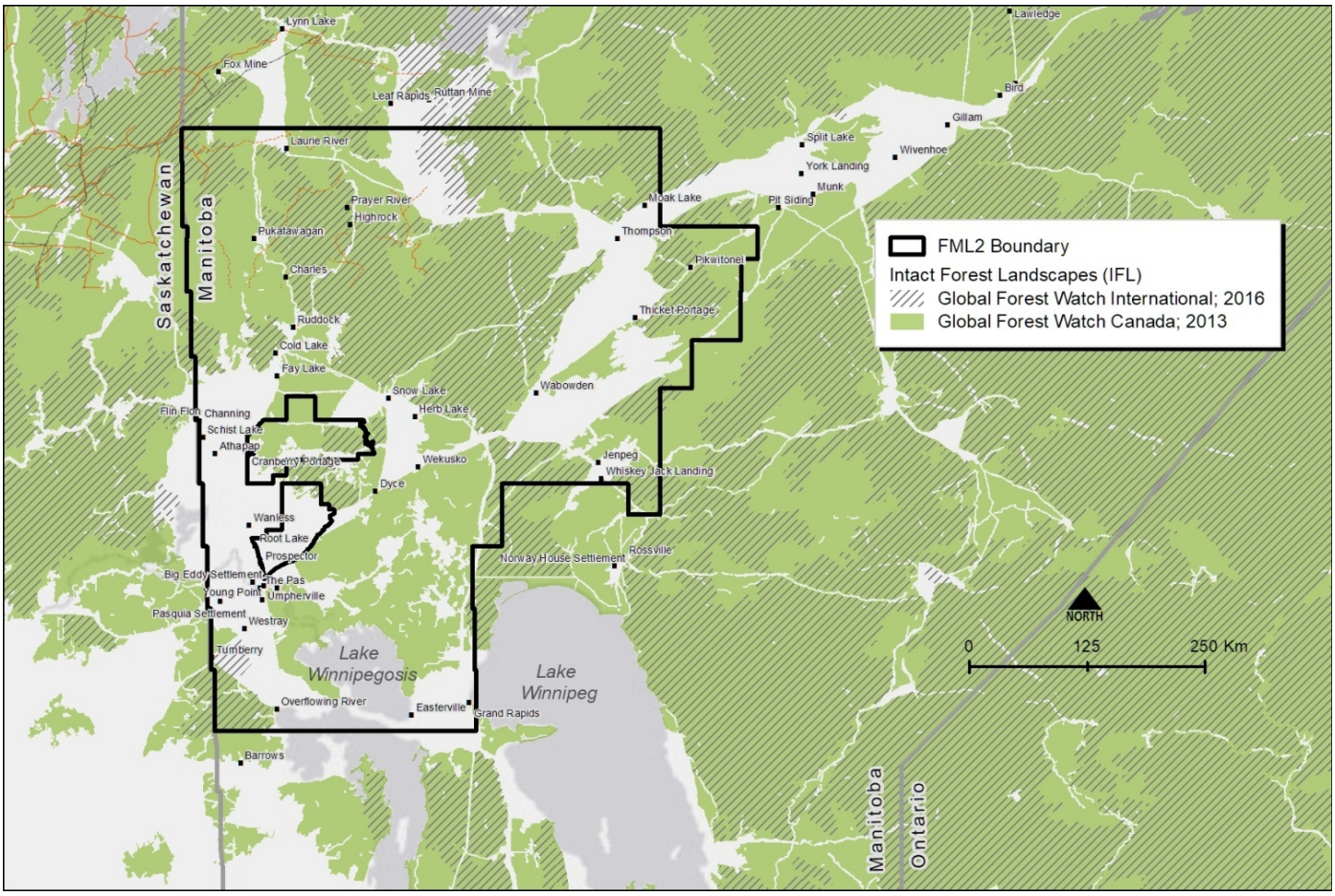

Figure 16. Intact Forest Landscapes in the FML and surrounding area.

Figure 17 presents the size distribution of IFLs located within or partially within the FML and the surrounding buffer. This is valuable information as it communicates the importance of the FML's place in the surrounding landscape. To have a sense of the nature of the land entirely within the FML, it is also useful to know the quantitative nature of the portions of IFLs that are completely within the bounds of the FML and its buffer. This is provided in Figure 18.

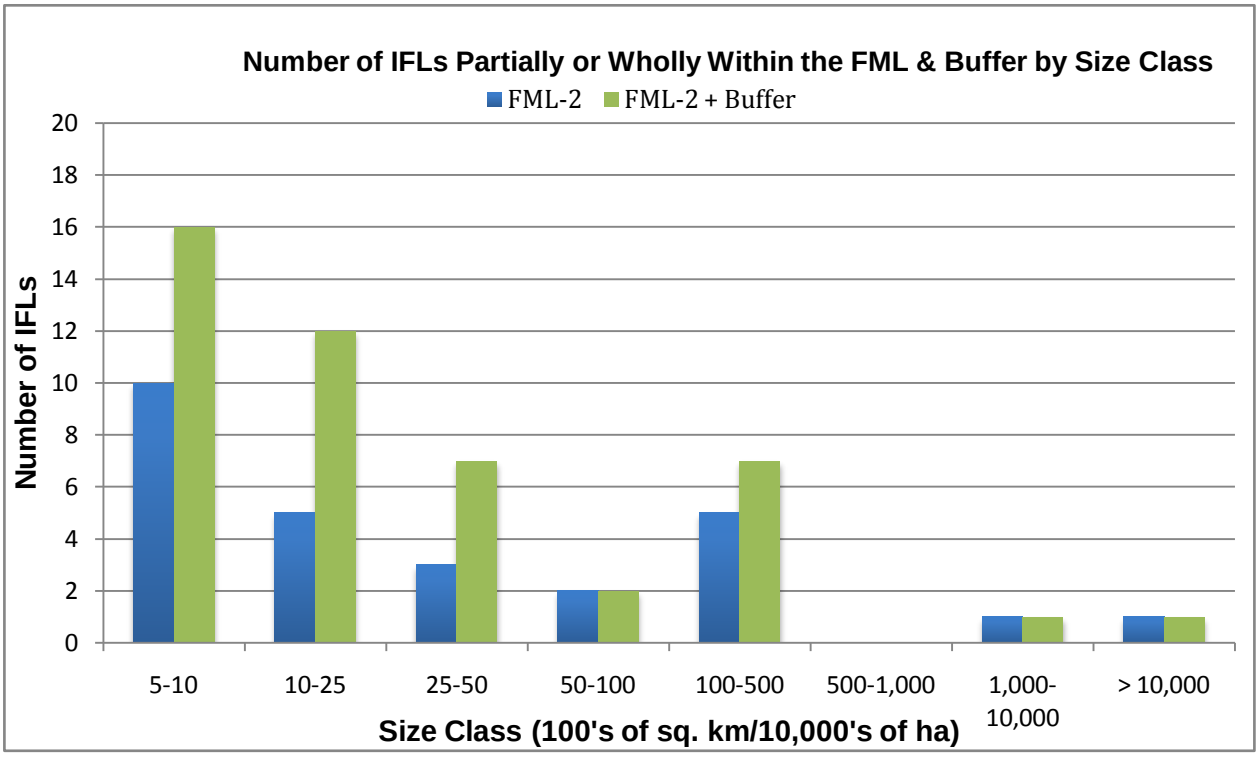

Figure 17. Size distribution of IFLs located within or partially within FML-2, and within or partially within FML-2 + buffer area.

IFLs that overlap the FML are located throughout the FML, and the main size class is the 50,000-100,000 ha range. Not surprisingly, there is a declining frequency of IFLs in larger class-sizes, in other words, there are many relatively smaller IFLs and few relatively larger ones. Notable is that two IFLs that overlap the FML area are tremendously large – one is approximately 640,000 sq km (64 million ha) and the other is 281,000 sq km (28.1 million ha). These IFLs are part of the largely unbroken forest that extends through Nunavut and the Northwest Territories into northwestern Ontario that are evident in Figure 15. Carlson et al. (2009) indicates that this is part of the largest forest expanse in the world.

Figure 18 presents the size distribution for those portions of IFLs that occur within the FML and buffer. Obviously every IFL that is included in this Figure is also represented in Figure 17. Figure 17 portrays the total area of IFLs that 'cross paths' with the FML and its buffer, whereas Figure 18 only represents those portions that occur in the FML and its buffer.

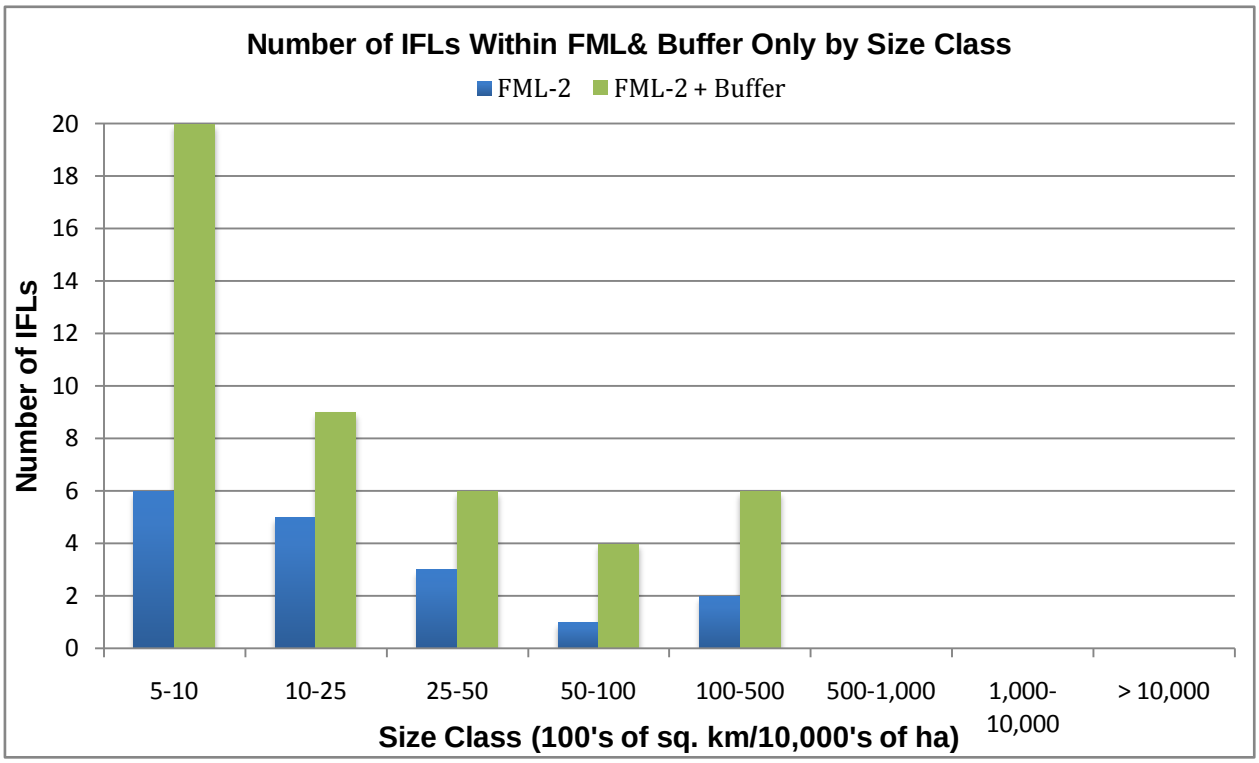

Figure 18. Size distribution of IFLs including area only within the FML and Buffer

At first glance comparison of Figure 17 and Figure 18 may be difficult to interpret. The figures indicate that the area within the FML and its buffer (Figure 18) contain more IFLs in the smallest size class than are included among those that overlap or occur partially within the area. This is because some IFLs whose total size is greater than the smallest size class are accounted for in this size class when only their area within the FML plus buffer is considered. It is also notable that the total number of IFLs in the two charts (and as indicated in Table 13 below) is similar. This is a function of the tremendous size of the area encompassed by the FML – there is in fact, only one IFL that overlaps with the buffer that does not also occur in the FML itself.

Table 13. Comparison of number and extent of IFLs based on landbase extent

Landbase	Total # IFLs	Area of IFLs (ha)	% of Landbase encompassed in IFL
IFLs in FML[1]	17	6,103,358	66.7
IFLs within and overlapping FML[2]	27	6,320,119	69.0
IFLs in FML + buffer only[3]	45	18,508,242	71.4
IFLs within and overlapping FML + buffer	46	18,514,323	71.5

[1] – Includes contiguous blocks of 50,000 ha or greater within the FML
[2] – includes pieces of contiguous blocks of 50,000 ha or greater than occur within the FML
[3] – includes contiguous blocks of 50,000 ha or greater within the FML + buffer
[4]– includes pieces of contiguous blocks of 50,000 ha or greater that occur within the FML + buffer

Aside from their somewhat confusing nature when studied together, both figures provide additional and very graphic evidence of the extent and size of IFLs within the FML and its buffer. Many forests within Canada's productive forest zone have no IFLs, and few have IFLs that exceed 100,000 ha. In this landscape, there are 11 contiguous blocks of greater than 100,000 ha completely within the FML and 25 in the area encompassed by the FML plus its buffer.

4.4 IFLs AND CARIBOU

Boreal Woodland Caribou are known to be sensitive to human presence and a key metric in predicting the survival of caribou herds is the extent of disturbance in the landscape. Generally, there is a negative relationship between disturbance and population recruitment, such that there is a greater probability of population stability in less-disturbed landscapes. Caribou herds within landscapes that have a ≤ 35% disturbance are generally predicted to have a 60% chance of persistence based on the calibrated relationship between disturbance and recruitment (Environment Canada 2011) and the translation of this relationship into the probability of populations' achieving stability

We assessed the extent of IFL in the caribou ranges that overlap FML2 (Table 14). The FML encompasses the majority of the total area of the range for nine of the ten ranges that exist there, and IFLs comprise more than 70% of the area of the ranges that occur within the FML .

Table 14. Relationship between Caribou Ranges and IFLs in the IFL + Buffer. Areas in sq km.

Range	Total Range Area	Range area in FML	IFL in Range area in FML	Propn of Range in FML that is in IFL
Interlake	7,019	344	1	< 0.01
The Bog	8,731	6,725	2,165	0.32
Naosap-Reed	12,242	8,582	3,010	0.35
Kississing	2,603	2,526	1,994	0.79
Wheadon	9,232	9,232	8,181	0.89
Wapisu-Wimapedi	12,590	12,590	10,893	0.86
Harding	16,806	13,045	9,437	0.72
Wabowden	10,129	8,975	6,284	0.70
William Lake	3,733	1,278	993	0.78
Norway House	26,225	1,328	1,048	0.79

Figure 19 shows that much of the area within the FML is within one or more caribou ranges

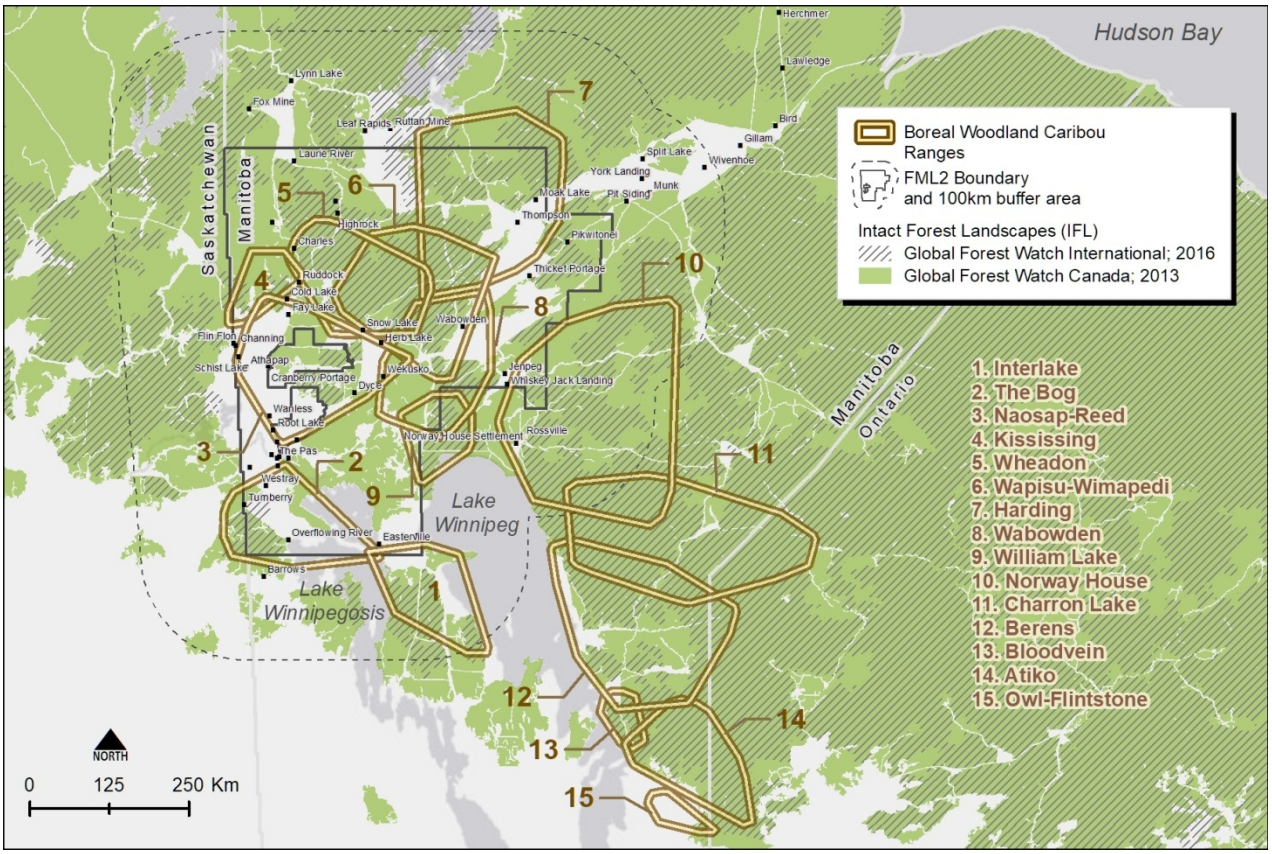

Figure 19. Caribou ranges in the vicinity of the FML and their overlap with IFLs.

As described above, much of the FML exists in contiguous blocks of forest that are of sufficient size so as to be considered IFLs. Although the contiguous nature of these landscapes bodes well for the fate of caribou herds in the vicinity of the FML, it does not guarantee their persistence. The 2019 amended recovery strategy for boreal woodland caribou (ECCC 2019) presented a risk assessment on the state of all herds in the country, based on landscape disturbance, population size, and population trend. The results for Manitoba are challenging to cast in light of the results above as Manitoba is redefining the boundaries of some ranges (although the general extent of ranges will likely remain comparable to those shown in Figure 19). ECCC's assessment of the 13 ranges it identifies in Manitoba are that three are considered to be not self-sustaining, four are on the cusp between self-sustaining and not self-sustaining, and six are self-sustaining, however the assessment is hampered by the in-progress nature of the redefining of ranges due to the absence of population levels and trend data. Going forward it will be helpful to revisit ECCC's ongoing efforts to assess the state of the province's caribou herds when more population data become available.

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5 HCV CATEGORY 3 – ECOSYSTEMS AND HABITATS

5.1 INTRODUCTION AND SUMMARY

As described earlier, HCV Category 3 addresses rare, threatened or endangered ecosystems and habitats. Inasmuch as habitats provide environments for species, and given the HCV framework's focus on uncommon species and areas of considerable biodiversity, there is overlap between this HCV Category and Category 1, which addresses species diversity.

Canada's FSC National Forest Management Standard facilitates the development of assessments by asking three questions related to HCV3:

7. Are large landscape-level forests (i.e. unfragmented forests) rare or absent in the forest or ecoregion?
8. Does the forest contain naturally rare ecosystem types?
9. Are there ecosystem types within the forest or ecoregion that have significantly declined or under sufficient pressure and/or future development pressures that they will likely become rare in the future (e.g. old seral stages)?

Below is a brief summary of HCV designations related to HCV Category 3, followed by in-depth analyses of landscape-level forests, naturally rare ecosystem types and declining ecosystems.

Question 1 – Large landscape-level forests

Large landscape patches are not uncommon in the Assessment Area. There are 42 large landscape patches in the FML itself and 75 in the total Assessment Area. In addition, as noted in HCV 2, there is a very high level of IFLs in the landscape. Given the widespread abundance of intact landscapes, **we do not believe the fragments identified in this analysis should be designated as HCVs** as they are most definitely not rare in the Assessment Area.

Question 2 – Naturally rare ecosystem types

The following communities identified as regionally rare by the Conservation Data Centre are identified as HCVs.

- Alkali Grass-wild Barley-Nuttall's Salt Meadow Grass-seaside Plantain Saline Herbaceous Vegetation
- Boreal Inland Alkaline Cliff Sparse Vegetation
- Eastern White Cedar-Black Spruce, Balsam Fir/speckled Alder Wetland Forest
- Inland Lake Cobble-gravel Shore Sparse Vegetation

The following communities identified as globally rare in Nature Serve are identified as HCVs:

- Tall grass prairie in Armit Meadows Ecological Reserve; and
- Wild Rice marshes in several lakes in the Assessment Area: Dyce, Cormorant, Dolomite, Hargrave, North Moose, South Moose, Reed and Wekusko lakes.

In addition to the tall grass prairie community in Armit Meadows, **the following rare communities in Provincial Parks and Ecological Reserves are identified as HCVs:**

- Remnant prairie with sandstone concretions (kettle stones) in Kettle Stones Park
- Salt flat complex shoreline Lake Winnipegosis Salt Flats Reserve
- Little Limestone Lake (a marl lake) in Little Limestone Lake Park
- Beach ridge vegetation in proximity to deep muskeg and very old cedar and spruce trees in Long Point Reserve
- Calcareous fen with peat palsas surrounded by limestone plateaus and drumlins in Pasla Hasel Reserve

- The community of rare plants at the base of Pisew Falls in Pisew Falls Park; and
- The northerly population of Bur Oak in Red Rock Reserve

In general we believe these sites are at low risk from forest management, however we do not have sufficient familiarity to state so categorically.

The old-growth cedar communities in the southern portion of the Assessment Area are identified as an HCV. We believe it is possible that the cedar communities may co-occur with commercially valuable species and so may be damaged in harvest operations and so they are designated as **HCV with moderate potential risk from forest management .**

Question 3 – Declining Ecosystems

No HCVs were identified in response to this question.

5.2 LANDSCAPE-LEVEL FORESTS

5.2.1 Context

There is obviously considerable thematic overlap between this aspect of HCV3 and the entirety of HCV2, which focuses on Intact Forest Landscapes (IFLs). The key distinction between the HCV elements is size. Whereas IFLs are defined as contiguous forest areas that exceed 50,000 ha, this aspect of HCV3 draws attention to smaller contiguous patches – those that are greater than 5,000 ha, but less than 50,000 ha. These patches can be important in providing connectivity among and within contiguous forest environments, although, particularly with the smaller of these patches, there are more limited broader landscape connotations and features than are associated with IFLs.

5.2.2 Methodology

GIS-based analyses were completed to identify fragments. Spatial data were taken from the Global Forest Watch Canada (http://www.globalforestwatch.ca) data provided on Databasin (https://databasin.org/datasets/fd2cff38687249598450d09154753840). These data are comparable to those used for the analyses of IFLs in Section 4. A spatial overlay was completed of forest patches and the Assessment Area. Patch-size analyses (Figure 20 and Figure 21) were done using excel tabulations of the overlay output.

5.2.3 Results

There are 42 large landscape fragments, totalling approx. 720,500 ha including those with at least a portion of their area within the FML itself. The size-class distribution of these fragments is shown in Figure 20. There are 75 large landscape fragments totalling approximately 1,351,000 ha including those with at least a portion in the FML plus its 100 km buffer (Figure 2). Not surprisingly there is a greater abundance of patches in the smallest class size (5,000 – 10,000 ha) than in any of the other size classes. There are 22 such patches in the FML and 33 in the FML plus its buffer. Nonetheless, there are also a reasonable number of patches in the largest patch size (40,000 – 50,000) ha, with 6 such patches in the FML and 8 in the FML plus its buffer.

Figure 22 shows the location of the forest fragments in the Assessment Area. The apparent proximity of some forest patches to each other is notable. The Figure 22 map highlights that there are clusters of patches, particularly in the southwestern portion of the Assessment Area. The rules for determining independence/separation of patches (i.e. buffering) are the same as used for IFLs, that is, major transportation corridors have a 1 km buffer and other infrastructure features are buffered at 500 m. The scale of the figure may give the impression of tighter proximity than may be apparent on the ground.

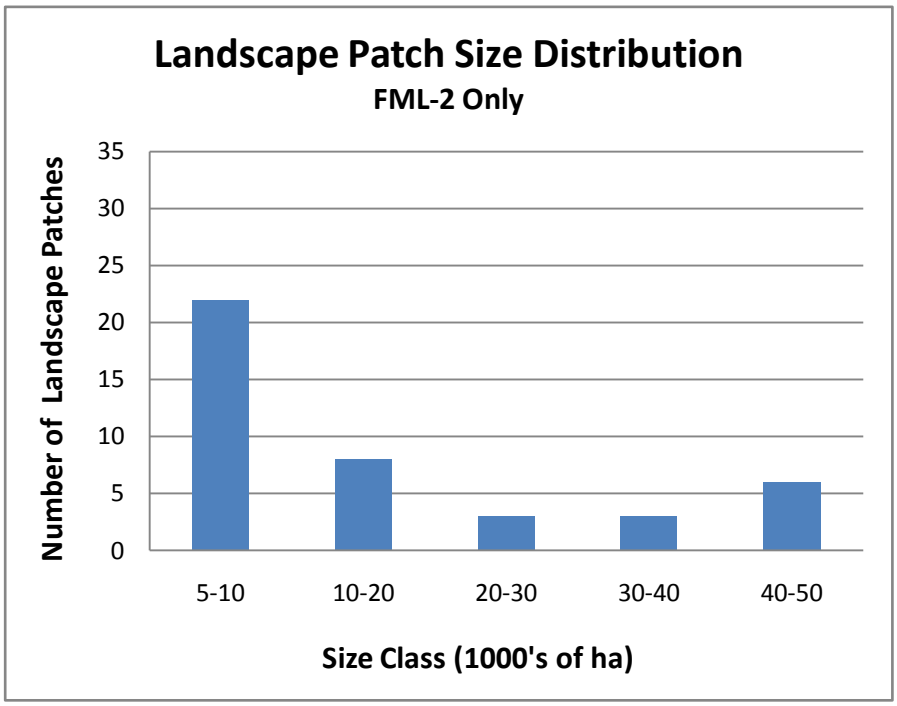

Figure 20. Size class distribution of large landscape fragments within or overlapping the FML.

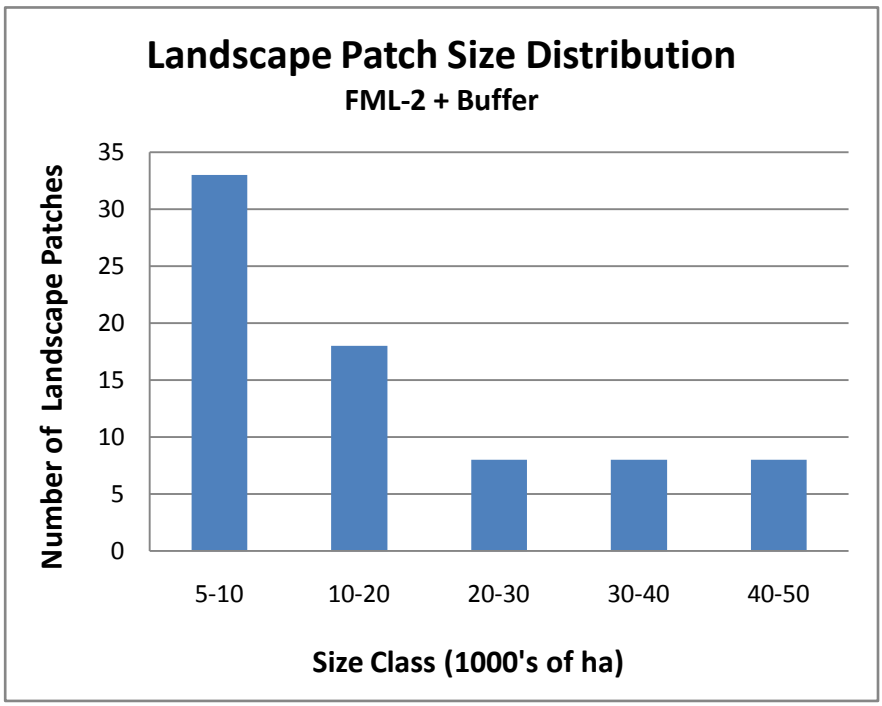

Figure 21. Size class distribution of large landscape fragments within or overlapping the FML plus its buffer.

Given their abundance in the Assessment Area, it is apparent that large landscape fragments are not rare in the FML landscape. Further, given the striking abundance of IFLs in the FML and the broader landscape beyond the FML, as documented in Section 4 - HCV2, contiguous forest is not uncommon in this portion of the boreal forest. Although this HCV assessment has generally taken a precautious approach to recognizing ecological features as HCVs, given the widespread abundance of intact landscapes, we do not believe the fragments identified in this analysis should be designated as HCVs as they are most definitely not rare in the forest or ecoregion.

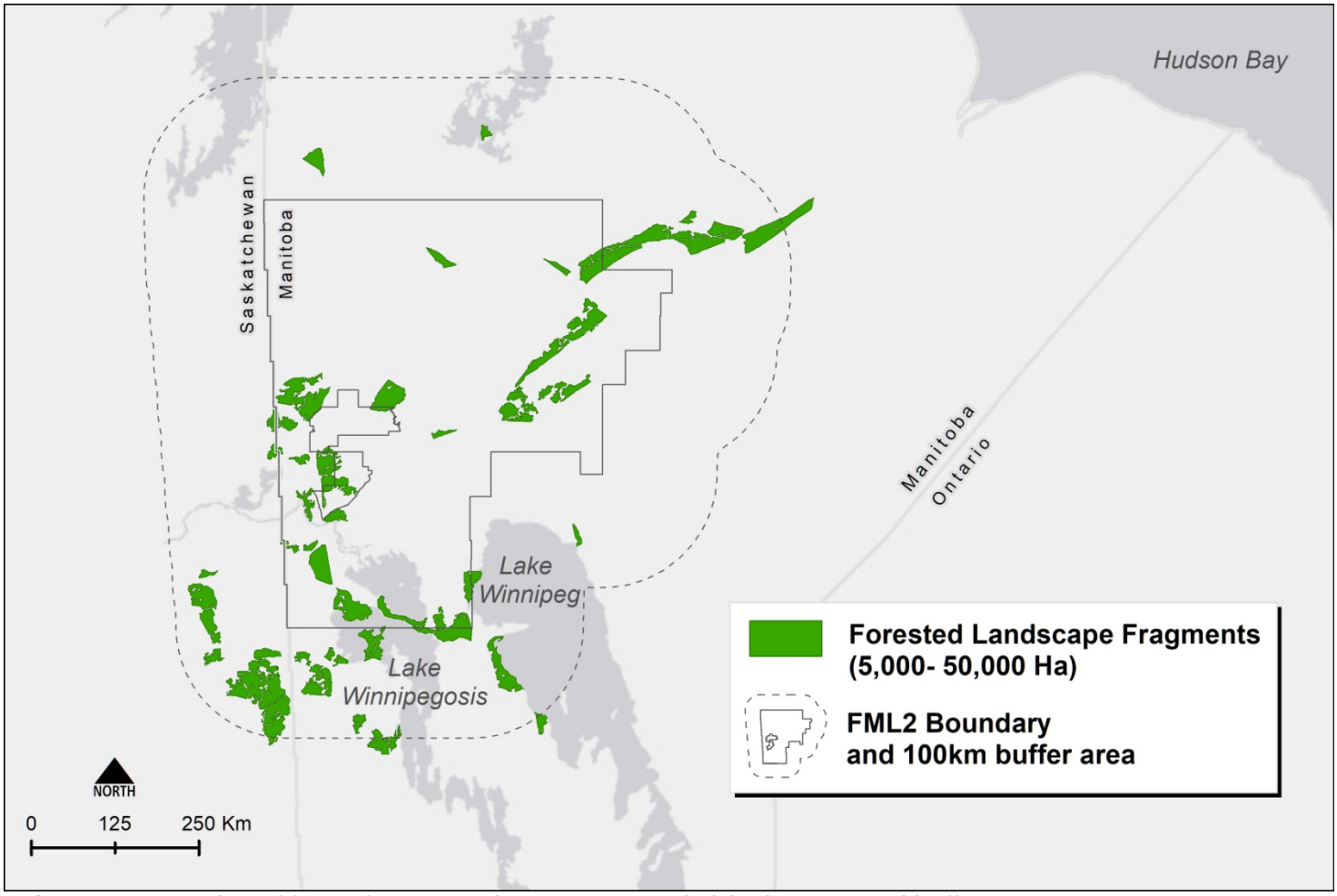

Figure 22. Location of forest fragments (5,000 – 50,000 ha) in the FML and buffer.

5.3 NATURALLY RARE ECOSYSTEM TYPES

5.3.1 Context

The focus of this HCV type is intended to draw attention to uncommon or unique communities that are specifically adapted to conditions in the forest, or are rare regionally, nationally, or globally.

5.3.2 Methodology

As with other parts of this assessment, efforts to identify naturally rare ecosystems focused on internet and literature searches. In addition, we examined entries contained in the Manitoba Conservation Data Centre and reviewed NatureServe status of communities that may exist in the Assessment Area. We also reviewed documentation on parks and ecological reserves in the Assessment Area for information regarding rare ecosystems within them and queried MSD staff regarding rare ecosystems.

5.3.3 Results

Broad Assessments

Most broad-scale assessments of the ecoregions encompassing the Assessment Area have not identified regionally rare ecosystems. However, these sources tend to focus at a broad scale and, as noted below, seem to have not considered ecosystems at the scale relevant for this assessment. The World Wildlife Fund's Conservation Assessment of Terrestrial Ecosystems of North America (Ricketts et al. 1999) does not include the two ecoregions they identify that are within the Assessment Area (i.e. Midwestern and Mid-Continental Canadian Forests) as being biologically distinct due to rare habitats. Wicken et al. (2011) make no mention of naturally rare ecosystem types in the region in their assessment (although this was not a primary objective of the publication). In its assessment of rare ecological and evolutionary phenomena associated with aquatic ecosystems, Abell et al. (2000), draws attention to the following for the two aquatic ecoregions in the Assessment Area:

- Lower Saskatchewan Ecoregion – rich in oligotrophic; glacial lakes and clear streams; streams provide food for summering polar bears
- English-Winnipeg Lakes Ecoregion – prairie rivers; three big, shallow, and productive lakes (Lakes Winnipeg, Winnipegosis, and Manitoba).

While these attributes are valid, they lack the specificity associated with identification of HCVs in this category.

A review of the description of the ecodistricts within the Assessment Area provided by Smith et al. (1998), identifies some notable characteristics, including:

- The Pas Moraine Ecodistrict – a relatively small ecodistrict (4,253 km^2) consisting primarily of drumlinizied moraine that extends in a curvi-linear manner from Long Point on Lake Winnipeg northwest to the vicinity of The Pas. The geomorphology of the moraine arises from the retreat of the continental ice sheet and wave and ice scouring associated with the shores of former Lake Agassiz. Ridges arising from these actions have cobble and gravel composition, which may be rare in the Assessment Area. However, the description of the vegetation communities (typical mixedwood boreal trees with undergrowth of swamp-birch, ericaceous shrubs, sphagnum and feather moss) does not suggest rare composition. However, additional investigation may reveal further consideration as an HCV rare community.
- Saskatchewan Delta Ecodistrict –a relatively small piece of the Manitoba portion of the Assessment Area (1,537 km^2), although approximately four-fifths extends in Saskatchewan. The delta is part of the Saskatchewan River drainage system, and as noted in Section 3.4 is identified as an HCV associated with its status as an Important Bird Area and the concentrations of waterfowl there.

All the ecodistricts identified in Smith et al. (1998) have distinguishing characteristics, however, the level of detail provided in the document is not sufficient to definitively determine what aspects may be worthy of HCV designation.

CDC and NatureServe

The Manitoba CDC contained no records of communities identified as S1 and only five communities identified as S2 or S3 (globally all categorized as GNR). The communities are:

- Alkali Grass-wild Barley-Nuttall's Salt Meadow Grass-seaside Plantain Saline Herbaceous Vegetation (1 record)
- Boreal Inland Alkaline Cliff Sparse Vegetation (2 records)
- Eastern White Cedar-Black Spruce, Balsam Fir/speckled Alder Wetland Forest (1 record)
- Inland Lake Cobble-gravel Shore Sparse Vegetation (1 record)

These communities are identified as HCVs. The extent to which the communities may be at risk from forest management activities is uncertain. The communities themselves seem very unlikely to contain desirable logging opportunities, however some risk may exist if the communities are proximal to communities that may contain economically valuable species and suitable logging opportunities.

Figure 23 shows the location of the rare communities as provided in CDC Data. Community #1 in the figure (Alkali Grass-wild Barley-Nuttall's Salt Meadow Grass-seaside Plantain Saline Herbaceous Vegetation*)* occurs inside the Lake Winnipegosis Salt Flats Ecological Reserve. According to CDC location data, Communities 3 (Eastern White Cedar-Black Spruce, Balsam Fir/Speckled Alder Wetland Forest)and 4 (Inland Lake Cobble-gravel Shore Sparse Vegetation)occur approximately 7 km southwest of Long Point Ecological Reserve. However, we note that the generalized nature of CDC point data casts some doubt on their precise location. Given the description of the reserve (Table 11) and information on individual reserves from the province's ecological reserve web page (https://www.gov.mb.ca/sd/environment_and_biodiversity/ecological-reserves/index.html) it would seem likely that the sites are in the Reserve. There is no Reserve in the vicinity of the two CDC locations of Community #2.

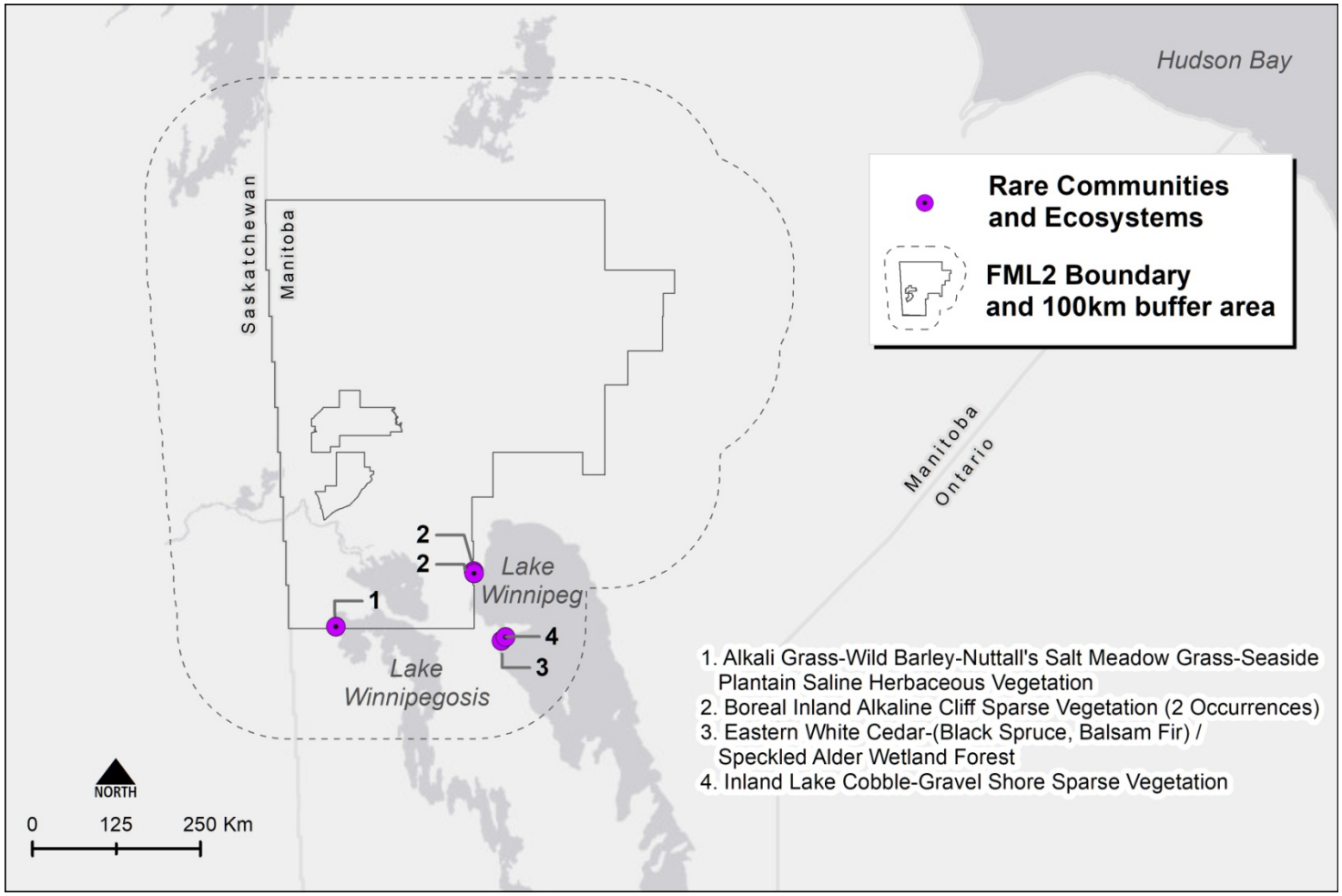

Figure 23. Location of communities identified as rare (S2 and S3) in the Manitoba CDC.

A search of NatureServe for Temperate and Boreal Forests classed as G1,G2 or G3 in Manitoba identified a number of communities (Table 15). Two of the community types identified in the table are known to occur in the Assessment Area:

- Tall grass prairie exists in Armit Meadows Ecological Reserve (Manitoba 2015); and
- Wild Rice marshes are known to exist in several lakes in the Assessment Area: Dyce, Cormorant, Dolomite, Hargrave, North Moose, South Moose, Reed and Wekusko (Szwaluk Environmental Consulting et al. 2011).

These communities are identified as HCVs. Other wild rice marshes may also exist in the Assessment Area and should be recognized as HCVs when they become known. As with the communities discussed above, these communities seem very unlikely to contain desirable logging opportunities, however some risk may exist if the communities are proximal to communities that may contain economically valuable species and suitable logging opportunities.

Other communities identified in Table 15 may also exist in the Assessment Area, however we could find no definitive documentation of their existence.

Table 15. List of communities identified as by NatureServe as G1, G2, or G3 in Manitoba.

Ecosystem	Group	Communities	Rank
Temperate and Boreal Forest Woodland	Great Lakes Pine Barrens	Jack Pine / Prairie Forbs Barrens	G2
	Northwestern Great Plains Aspen Woodland	Paper Birch / Beaked Hazelnut Woodland	G2G3
	Central Midwest Oak Openings & Barrens	Bur Oak Northern Tallgrass Wooded Grassland.	G1G2
	Great Plains Bur Oak Forest & Woodland	Bur Oak / Mixedgrass Loam Wooded Grassland	G1Q
		Bur Oak / Mixedgrass Sand Wooded Grassland	G1
		Bur Oak / Hazelnut Woodland	G3
	Laurentian Subboreal Dry-Mesic Pine - Black Spruce - Hardwood Forest	Subboreal Red Pine - White Pine Dry-Mesic Forest	G3
Temperate and Boreal Open Rock Vegetation	Central Midwest-Interior Cliff & Rock Vegetation	Northern Tallgrass Quartzite - Granite Rock Outcrop	G3?
Shrub & Herb Wetland	Eastern North American Boreal Alkaline Fen	Boreal Extremely Rich Seepage Fen	G2Q
	Eastern North American Boreal Bog & Acidic Fen	Open Schlenke Bog	G2?
		Northern Sedge Poor Fen	G3G4
	Eastern North American Freshwater Marsh	Wild Rice Marsh	G3G4
	Laurentian-Acadian Wet Meadow & Shrub Swamp	Red-osier Dogwood - Mixed Willow Northern Shrub Swamp	G3G4
	Midwest Prairie Alkaline Fen	Bog Birch - Willow Prairie Fen	G3

5.3.4 Rare Communities in Parks and Reserves

Parks and ecological reserves in the Assessment Area that merit HCV designation are identified in Section 3.7. Rare communities known to exist within these protected areas are identified in Table 16. Although the protected areas in which these communities exist are already identified as HCVs, we believe designation of the communities themselves is warranted to draw specific attention to their uniqueness and to address the specific topic of this HCV category.

The rare communities identified in Table 16 are designated as HCVs. As these communities occur in parks and reserves, they are not believed to be at risk by forest management.

Table 16. Rare communities known to exist in protected areas in the Assessment Area.

Park/Reserve	Rare Communities
Armit Meadows Reserve	• Isolated fescue meadows containing rare northern extension of fescue prairie ecosystem • Tall grass prairie is identified as G1G2 (Table 15) and is also recognized as an endangered ecosystem in the regulations of the Endangered Species and Ecosystems Act.
Kettle Stones Park	• Remnant prairie with sandstone concretions (kettle stones). • The only known location of such concretions in Manitoba.
Lake Winnipegosis Salt Flats Reserve	• Contains a salt flat complex that likely represents the only extensive inland saline shoreline in North America. • Raised coastal sites with low salinity contain geographically unique meadow environments normally restricted to northern oceanic coastlines, which contain disjunct species. • The saline community is recognized as S2 by Manitoba CDC.
Little Limestone Lake Park	• Little limestone lake is the world's largest marl lake. Marl is created when calcite (a component of limestone) is precipitated from warm water. As the temperature rises, the quantity of marl increases, changing the colour of the water to shades of turquoise. • The area surrounding the lake, contains many caves, sinkholes and disappearing streams, underground springs and lakes.
Long Point Reserve	• Beach ridge vegetation community in proximity to deep muskeg with very old cedar and spruce trees.
Palsa Hazel Reserve	• Calcareous fen with peat palsas surrounded by limestone plateaus and drumlins • Palsas are rare this far south in Manitoba. • Also contains highly mineralized springs.
Pisew Falls Park	• The misty environment at the base of the falls creates a unique cool microclimate that fosters a community of plants that favour a short growing season and very moist conditions.
Red Rock Reserve	• The reserve contains a northerly population of Bur Oak. • Bur Oak is noted as a component in several NatureServe communities identified as G1 and G3.

Other

The Manitoba endangered ecosystems regulation (most recently revised May 15, 2015) identifies only two endangered ecosystems – Alvars, and Tall Grass Prairie. As noted above, Tall Grass Prairie remnants exist in the Armit Meadows Ecological Reserve. There are no known alvars in the Assessment Area. In Manitoba, alvars occur in the southern portion of the Interlake District, considerably south of the Assessment Area (Neufeld et al. 2012).

As noted in Section 3.5, populations of disjunct cedar exist in the Assessment Area in the vicinity of Grand Rapids and in the Long Point Reserve. These cedar populations are identified as HCVs due to their status as an edge-of-range concentration. In addition, they merit recognition as a rare community in the Assessment Area. Grotte et al. (2012) noted three distinct kinds of cedar communities associated with different moisture regimes – xeric, mesic, and hydric. All are noteworthy old-growth communities providing unique habitat conditions that support rare species of orchids and songbirds and they may be gene repositories as well. Grotte et al. (2012) also note that "*The presence of these old-growth T. occidentalis stands perhaps constitute the best estimate of what could be multiple, century-long successional processes in the boreal forest in the absence of stand-replacing fire. In this context , they also constitute the baseline of what old-growth in the mixed boreal forest would be....Considering that these T. occidentalis stands are unique and have taken hundreds of years to develop and provide multiple values and services, every effort should be made toward their conservation.*"

The old-growth cedar communities are recognized as an HCV. Cedar communities in the Long Point Reserve are likely not vulnerable to forestry impacts. Cedar does not appear to be a target species for CKP harvest operations (Canadian Kraft Paper 2017), but old cedar trees and communities may occur proximal to desirable softwood species (black and white spruce, jack pine, and balsam fir) and so there may be risk to these cedar communities.

5.4 DECLINING ECOSYSTEMS

5.4.1 Context

FSC's Forest Management Standard notes that the focus of this HCV type is intended to draw attention to ecosystem types "*that have significantly declined or are under sufficient present and/or future development pressures that they will likely become rare in the future (e.g. old seral stages)*". Declines of magnitude 50% or greater is a benchmark provided in guidance for this HCV type, as is consideration of whether the ecosystem types under consideration are significantly declining relative to the broader ecoregion.

5.4.2 Methodology

The usual broad literature and internet searches were used to research this topic. As there was considerable overlap between this topic and those of several HCV themes, such as rare ecosystems, species at risk, regionally declining species, etc. searches were often combined to provide economy of effort. We also investigated whether the Forest Resource Inventory could be useful in assessing this topic. In addition, we queried MSD staff during conversations for their input on this topic.

5.4.3 Results

The WWF North American assessments of terrestrial (Ricketts et al. 1999) and aquatic (Abell et al. 2000) ecoregions both identify conservation issues related to the ecoregions which overlap the Assessment Area. However, the relevant ecoregions extend well beyond the Assessment Area and so some of the concerns identified (e.g. loss of habitat due to agriculture and fragmentation related to forest management) are not generally applicable to the Assessment Area. The identified concern of downstream effects of dam construction may be more valid, but the implications and extent of related ecosystem decline in the Assessment Area are unclear.

Internet searches identified topics related to the preservation of rare ecosystems, such as identified in Sections 3.4 and 3.5, but for those which occurred in the Assessment Area, rarity is not equated with declining in abundance. This is most apparent for the ecosystems identified in Parks and Reserves (Table 16) in which rare ecosystems exist by virtue of geographic isolation, unique geomorphology, association with enduring features ,etc., but there is no implication of declines caused by anthropogenic activities. A review of internet sites related to Manitoba conservation (e.g. https://cpawsmb.org/, http://www.manitobawildlands.org/) and those identified with affiliation to the Manitoba eco-network (https://mbeconetwork.org/members/member-groups-3/) identified concerns regarding declining ecosystems, but these tended to be in southern Manitoba where considerable concern exists related to declining and rare prairie habitats. Concerns were identified for boreal forests, but these tended to be related to the issue of ecologically appropriate management to avoid declines, rather than out of concerns about human-induced rarity (https://www.natureunited.ca/about-us/where-we-work/manitoba/).

We reviewed the potential of using the Manitoba Forest Resource Inventory (FRI) as a basis to identify declining ecosystems (and rare ecosystems, discussed above), but did not pursue this for three related reasons: 1) the FRI is oriented towards assessing the forest based on a commercial/harvestability perspective rather than an ecological perspective. For example, the strata are defined primarily based on leading species, rather than, say, ecological communities. Non-commercially valuable areas are typically classed as 'non-productive' or 'non-forested' forest types and this categorization undoubtedly includes a host of communities/conditions; 2) time series of information would need to be available to assess decline and these data are unavailable; and 3) a deep understanding of the nuances of the data would be necessary to provide a

useful analysis and avoid making unintended or unknown assumptions (e.g. what is the implication of the fact that almost 40% of the polygons in the inventory have an age of '0'?).

One of the key questions in the Guidance of the FSC HCV framework related to this topic focuses on significant declines of 'original old forest type'. We do not believe this to be a concern in the Assessment Area for two reasons: 1) the extent of IFLs (HCV2) and large forest patches (discussed in Section 4 above) in the Assessment Area indicates the existence of a very high proportion of undisturbed forest, and 2) the extent of forest harvesting in IFLs remains low relative to the annual allowable harvest (for example, in 2016/17 only 13% of the AAC was harvested (CKP 2018)).

Finally, in discussions with MSD biologists, no declining ecosystems were identified in response to questions regarding this topic.

For the suite of reasons identified above, **there are no HCVs identified related to declining ecosystems.**

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6 HCV 4: CRITICAL ECOSYSTEM SERVICES

6.1 INTRODUCTION AND SUMMARY

HCV Category 4 addresses ecosystem services – those aspects of forest environments that are of value to society due to the functions they perform in providing services, creating safe environments, or mitigating risks. FSC's definition, and that of the HCV Common Guidance (Brown et al. 2013) is "*basic ecosystem services in critical situations including protection of water catchments and control of erosion of vulnerable soils and slopes.*" HCV 4 is, therefore, very anthropocentric.

The element of criticality plays an important role in typical determination of whether the ecosystem service warrants a HCV designation. The HCV Common Guidance (Brown et al. 2013) considers an ecosystem service to be 'critical' in situations where "*a disruption of that service poses a threat of severe, catastrophic or cumulative negative impacts on the welfare, health or survival of local communities, on the functioning of important infrastructure (roads, dams, reservoirs, hydroelectric schemes, irrigation systems, buildings, etc.), or on other HCVs.*" Thus, criticality is largely a function of the extent to which the ecosystem service is essential for the survival and ongoing safety and existence of human communities in the forest. In its implementation in Canada the element of criticality has tempered the extent to which values have been identified as HCV4. While many ecosystem features are important to human communities, relatively few have been identified as meeting the high bar identified through the concept of criticality. As is evident below, this assessment takes a more discretionary view of whether a value should be considered an HCV.

Similar to HCV 5 and 6, HCVs identified in this category tend to be significant to the communities that rely on them. This means they are not relative to any predetermined scale, yet are generally irreplaceable to the communities. In assessments carried out for certification analyses, an important component of identifying HCV 4 is consultation with local communities to determine which areas are considered critical in terms of their community's survival. This assessment did not incorporate consultation with local communities, but is based entirely on information gathered through internet searches.

The FSC Canada HCV framework considers five questions or attributes when assessing HCV 4:

1. Significant sources of drinking water;
2. Water regulation (maintaining water quality and quantity);
3. Erosion control;
4. Forests that act as a barrier to fire; and
5. Forest landscapes critical for agriculture and fisheries.

In addition the HCV 4 attributes listed, soil carbon was also assessed under this HCV Category.

Below is a brief summary of HCV designations related to this HCV Category.

Question 1 – Significant Sources of Water

Drinking water sources for 23 communities (as identified in Table 17) are designated as HCVs. We have insufficient information to assess the extent to which the sites may be at risk from forest management.

Question 2 - Water Regulation

Although the forest contains some significant water control features (dams) for generation of hydro-electricity, **no significant natural features that ameliorate or mitigate flooding or drought are identified.**

Question 3 – Erosion Control

Areas identified by Domigues-Cuesta and Bobrowsky (2012) as shown in Figure 25 to the north and northwest of Lake Winnipeg and areas along the Saskatchewan River that **have high potential for slope instability are designated has HCVs**. In addition, areas identified in Stantech (2011) as **soils that are susceptible to**

erosion (Figure 26) are also identified as HCVs. We have insufficient information to assess the extent to which these sites may be at risk from forest management.

Question 4 – Barriers to Fire

Thompson's Community Firesmart zone is designated as an HCV.

Question 5. – Areas Crucial for Agriculture and Fisheries.

Agriculture is not a significant land use in the Assessment Area, **so no HCVs associated with agriculture are identified.** However commercial fisheries are important to local economies. As a precautionary approach, **all of the lakes identified in Table 18 are identified as HCVs.** We insufficient information to assess the extent to which these lakes may be at risk from forest management.

Soil Carbon

The globally significant **storehouses of soil carbon in the Assessment Area warrant consideration of these areas as HCV.**

6.2 SOURCES OF DRINKING WATER

This attribute considers forest areas critical to maintaining the quality, quantity and seasonal flows of the primary drinking water source for a community. Northern Manitoba has a recent history of troubles in provision of safe drinking water to its communities (White et al. 2012, Kirby 2015). For example, the province's water advisories as of October 2019 (Manitoba 2019) included several communities in the Assessment Area (Norway House, Moose Lake, Leaf Rapids, Lynn Lake and Sherridon). While the quality of drinking water is often associated with the absence of treatment facilities or poorly maintained ones, the long-standing water quality issues highlights the importance of sources of drinking water in the Assessment Area.

6.2.1 Methodology

Identification of drinking water sources was undertaken using internet searches for relevant information. For many communities in the Assessment Area, community profiles have been developed by Manitoba Indigenous and Northern Relations (MINR). These brief documents provide an outline of basic community features and infrastructure, including drinking water source and treatment, and were the source of information for many communities. Information on drinking water sources for other communities came from a variety of sources.

6.2.2 Results

Results of the search for drinking water sources are provided in Table 17 Due to the importance of drinking water, and the issues related to the provision of safe water, **drinking water sources for all communities are identified as HCVs.** We have insuffient information to assess the extent to which the sites may be at risk from forest management.

Table 17. Drinking water sources for communities in the Assessment Area.

Community	2016 Census Population	Drinking Water Source	Reference
Barrows	98	Local Wells	MINR (2016g)
Cormorant	244	Community wells	MINR (2016a)
Cranberry Portage	771	Athapapuskow Lake	Kelsey District Conservation (2015)
Cross Lake/Pimicikamak	238	Cross Lake	MINR (2016b)
Easterville/Chemawawin	44/15	Municipal and private wells	MINR(2016c)
Flin Flon	4,982	Cliff Lake	Jacques Whitford (2008)

Community	2016 Census Population	Drinking Water Source	Reference
Grand Rapids/ Misipawistik	268/835[3]	Ground water	Genaille (2013)
Granville Lake	10	Granville Lake	MINR(2016d)
Leaf Rapids	582	Granville Lake[1]	Manitoba Sustainable Development (2015)
Mathias Colomb/ Pukatawagan	1715[3] /1724	Pukatawagan Lake[1]	Neegan Burnside (2011)
Moose Lake	1,124	South Moose Lake	MINR(2016e)
Nisichawayashihk/ Nelson House	2,430[3]/2,547	Footprint Lake	MINR(2016k)
Norway House	433	Nelson River	MINR(2016f)
Opaskwayak	2,510[3]	Ground water	Neegan Burnside (2011)
Pikwitonei	64	Pikwitonei River	MINR(2016h)
Sapotaweyak	795[3]	Lake Winnipegosis	MINR(2016l)
Sherridon	108	Sherridon and Cold Lakes	MINR(2016i)
Snow Lake	899	Snow Lake	Newson (2011)
Thicket Portage	126	Landing Lake	MINR(2016k)
Thompson	13,678	Burntwood River	Manitoba Public Utilities Board (2018)
The Pas	5,369	Ground Water	Town of The Pas (2016)
Wabowden	442	Bowden Lake	MINR(2016j)
WuskwiSipihk/Birch River	35[3]/198	Swan Lake[2]	Neegan Burnside (2011)

[1]These lakes are not actually identified by name in the cited documents. The documents note that the water source is "surface" water, and as the communities are on the indicated lakes, we assume those are the sources.
[2]. WiskwiSiphih First Nation includes several reserves mostly(?) on the western shores of Swan Lake
[3]Number indicates the on-reserve population as reported by Statistics Canada for 2016.

6.3 WATER REGULATION

This attribute considers forest areas that are significant in mediating flooding and/or drought, controlling stream flow, and water quantity - in other words, forest areas that are important in water level regulation.

Most of the publicly available information regarding significant natural flooding in the province pertains to populated areas in the south, where flooding of the Red and Assiniboine Rivers is a relatively frequent occurrence during the spring thaw. Although flooding does occur in the north, related discussion and documentation of impacts is dominated byte history of the development of major hydro-electric facilities and their effects on Indigenous communities through forced relocation, flooding, environmental and social upheaval (e.g. Known History Inc. 2016). The effect of these hydroelectric projects has been significant, resulting in a "profound impact on communities in the area of these projects, as well as on the environment upstream and downstream"(Manitoba Clean Environment Commission Report, 2013), causing "changes to the water levels of our rivers and lakes, which resulted in flooding and disruptions to our waterways that affected our hunting, fishing, trapping and sacred sites" (Nisichawayasihk Cree Nation 2019).

Major rivers, such as the Nelson River, Churchill River, Burntwood River and related tributaries, have experienced extensive hydroelectric development to create electricity for the province, under the Churchill River Diversion (CRD) and the Nelson River Hydroelectric Projects (Figure 24). These developments are the primary factors regulating water flow and water levels on major waterways within the Assessment Area. For

example, an average of 25% more water flows into the Nelson River system due to the CRD (Manitoba Hydro 2019). The Nelson River Hydroelectric project has "…altered the water regime of Lake Winnipeg, the Nelson and Churchill rivers, and their tributaries. Some areas were flooded, while others were exposed. Flooding and increased water flow led to increased erosion and sedimentation, while control structures altered natural seasonal water levels in some areas" (Know History Inc., 2015).

Although there is geographic and ecological diversity across the Assessment Area, in general, a number of natural circumstances, including underlying substrate, limited topographic relief, and poor drainage, foster the occurrence of seasonal inundation. In addition, flooding caused by winter ice-jams on rivers occurs in some locations, and more generally, melting of winter snow-packs causes susceptibility of low-lying locations. While impacts may be tempered to some extent by local vegetation, it is likely that most settlements across the area are situated where they are, at least partly because of the reduced susceptibility of their location to flooding. Although the occurrence of large-scale, or high-consequence flooding is consistent with the notion of criticality, we could find no examples from the Assessment Area where the existence of natural features such as identified in HCV Common Guidance (Brown et al. 2013) caused potentially significant flood events to be avoided or considerably ameliorated.

Overall, the limited data available to identify specific natural areas within the FML that regulate the flow of water **results in no HCV areas being identified under this Category** at this time. Consultation and engagement with local and affected people would be helpful in further refining areas that may be critical to mediating water quantity and quality within the FML.

6.4 EROSION CONTROL

This attribute considers forest areas critical to erosion control. It includes areas where the soils are at risk of due to slope or other aspects of physiography.

As described in the Forest Management Plan for FML-2 (Canadian Kraft Paper, 2012), the topography of the Forest "ranges from generally flat terrain in the southern areas of the Mid-boreal Ecoregion to more rolling in the Hayes River Uplands. The area comprised of the Highrock Forest Section, which is most of the western portion of the Churchill River Uplands is typically Canadian Shield country with interspersed rock outcrops and lowland areas occurring frequently".

Generally, the forest does not have steep slopes which are prone to avalanches. However, susceptibility to landslides as a proxy for areas vulnerable to erosion was considered in the assessment of this HCV.

6.4.1 Methodology

An intensive internet search yielded only modest results. This may be because there is not much information on soil susceptibility to erosion in northern Manitoba, or we were unable to key on any such information that may exist. For susceptibility to mass events, the landslide susceptibility index of Dominguiez-Cuesta and Bobrowsky(2012) and Bobrowsky and Dominguez (2012) is of some use, however the scale of mapping presented makes fine-scale interpretation difficult[3]. Briefly, the authors constructed a national-scale map using digital layers of information on slope, aspect, precipitation, permafrost, surficial geology, vegetation, distance to rivers, bedrock lithography and other variables. The data were combined to develop a susceptibility ranking. The map produced (Figure 25) is compelling, but exists, as far as we can tell, only at a rather coarse scale, limiting its utility in this assessment.

Other data on soil erosion in the Assessment Area were found in various technical documents associated with Manitoba's Bipole III Transmission Project (Stantec Inc. 2011a, 2011b, 2011c, and 2011d). The route of the Transmission Project bisects a portion of the Assessment Area, so some data are available through the technical information used in the Project's environmental assessment. However, these data are also of

[3] Attempted communication with the authors was not productive in leading to more detailed local information.

modest utility as they are only summarized for the transmission corridor. Nonetheless, they do indicate where some soils that are susceptible to erosion and compaction exist.

Erosion is mentioned as an occasional site-specific phenomenon in northern Manitoba in the benchmark publication on ecological zones in Manitoba (Smith et al. 1998), but the lack of consistent treatment of the topic limits the document's utility.

6.4.2 Results

The scale of the landslide susceptibility map produced by Domigues-Cuesta and Bobrowsky (2012) (Figure 25) is national (1:6 million) and reveals, at a coarse level, the significant variability that exists across Canada with respect to slope instability. Generally, the Canadian shield is ranked as 1 (least susceptible), therefore the majority of the FML-2 is low risk for slope instability. There are, however, some portions of the FML, notably to the north and northwest of Lake Winnipeg and areas along the Saskatchewan River that have high potential for slope instability (ranked 6 or most susceptible), likely due to the presence of glaciocustrine and lacustrine soils, and close proximity to rivers and lakes. **These 'red' areas are considered HCV areas under this HCV Category.** However, we note the coarse scale of the assessment may limit its utility for this assessment.

As noted above, the results of the Stantech (2011) assessments of susceptibility to erosion and compaction are of limited utility because of the relatively small portion of the Assessment to which they apply. Nonetheless, they indicate where some soils that are susceptible to erosion and compaction occur (Figure 26), and as the data are essentially a transect through the Assessment Area, it may be possible to extract some broader utility. **The areas identified through the Stantech work as being susceptible to erosion are identified as HCVs**, with the caveat the assessment of such areas only covers only a small portion of the Assessment Area.

Areas of both high slope and susceptibility to erosion may be at risk from forest management activities, however we have insuffient information to assess the extent to which the sites may be at risk from forest management.

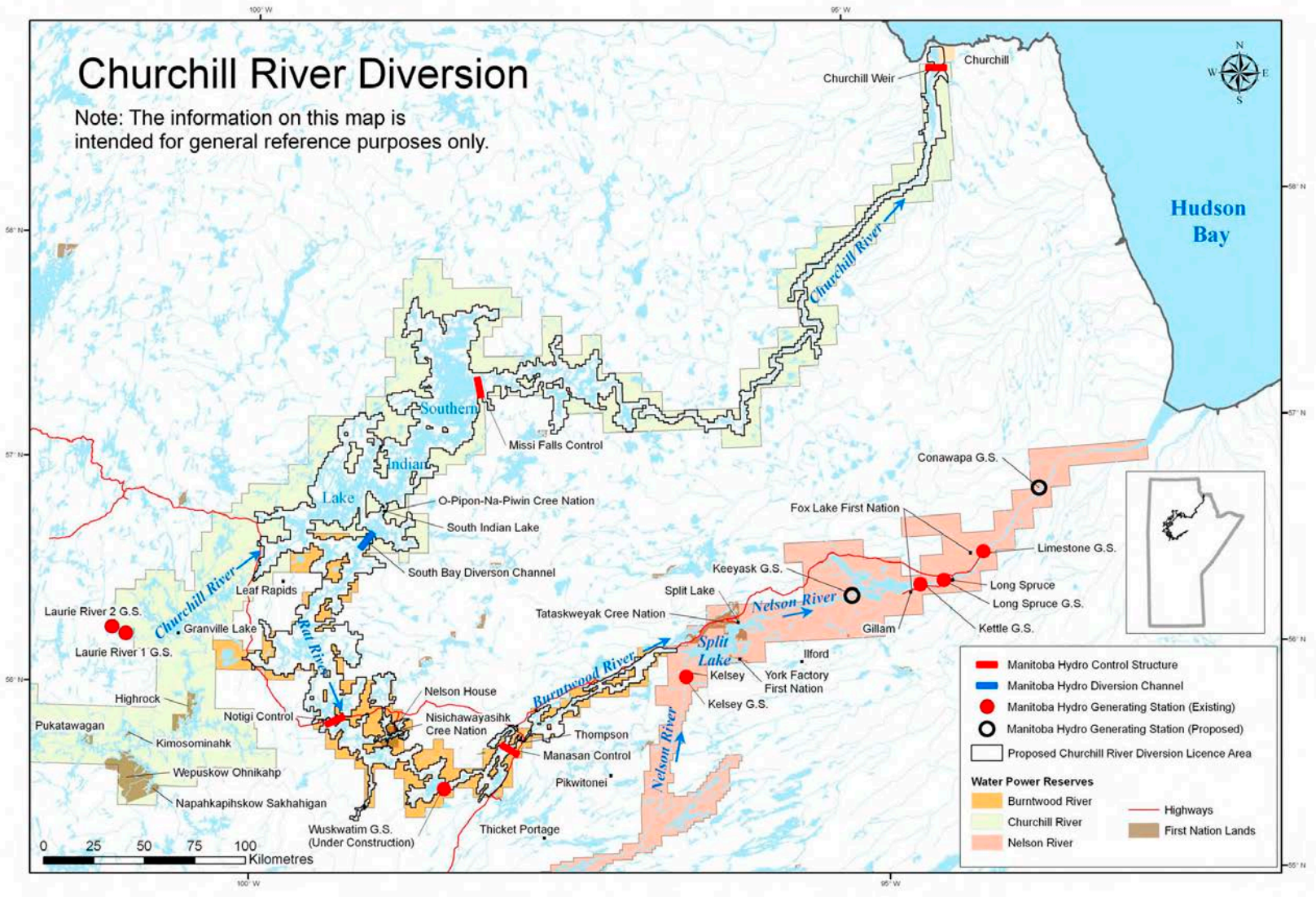

Figure 24. Hydro-electric projects in Northeastern Manitoba. From: https://www.gov.mb.ca/sd/waterstewardship/licensing/pdf/crd_map_web.pdf

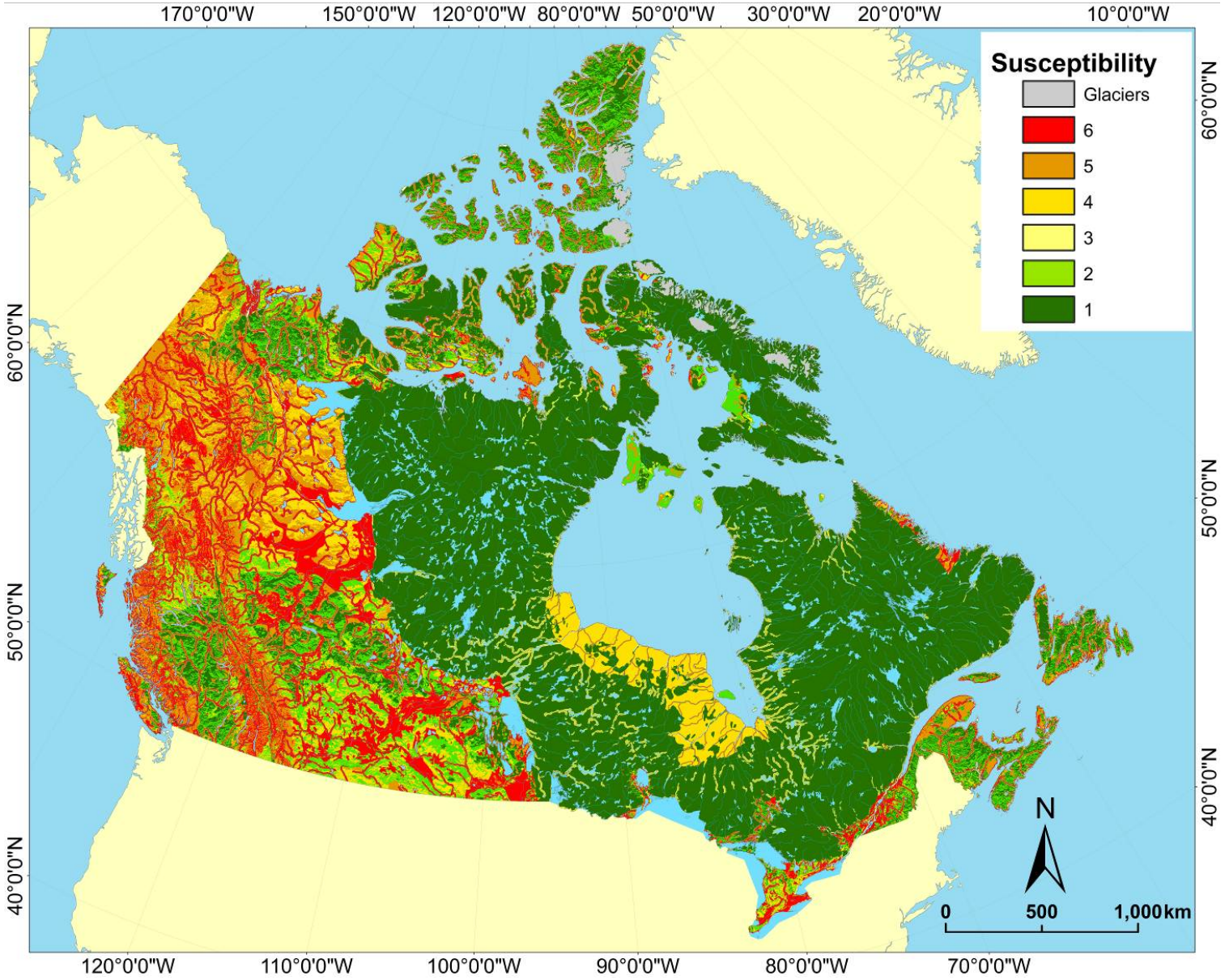

Figure 25. Landslide susceptibility Index for Canada. From Dominguez-Cuesta and Bobrowsky (2012).

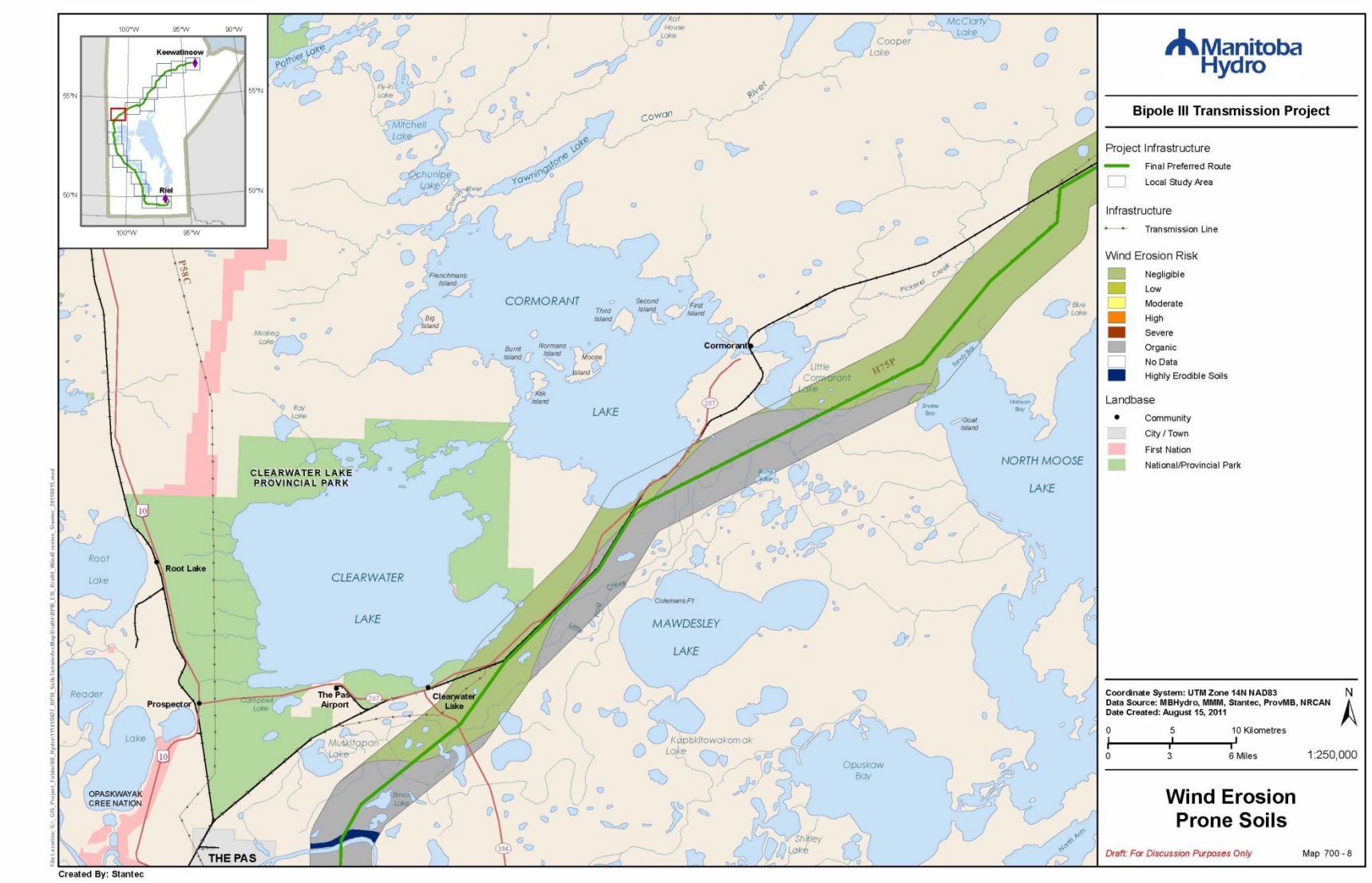

Figure 26. Example of an area of erodible soils identified in the technical documents of the Bipole III Transmission Corridor Assessment from Stantech. Note that the area along the Saskatchewan River east of the Pas contains highly erodible soils.

6.5 BARRIERS TO FIRE

This HCV attribute recognizes forests that are a barrier to destructive fire. Guidance provided in FSC's National Standard identifies that forest areas may be considered as HCVs if they provide a barrier to the spread of fire in an area in which there is a high risk of wildfire. Generally this HCV attribute is not identified for Canadian forests given the relatively frequent occurrence of natural disturbance. Recently, however, the City of Thompson developed a wildfire management protection plan (City of Thompson 2019), the first in Manitoba, that merits recognition here.

A key element of the plan is intended to protect the community through vegetation management within a "Community Firesmart zone" (Figure 27). Management within the zone includes collection of dead and down fuelwood, removal of standing dead trees, and thinning of live vegetation, all of which reduce fire fuel, and therefore will limit the likelihood of fire to spread. At a finer scale, homeowners within the community zone are encouraged to manage their own properties to limit fuel loading. **Thompson's Community Firesmart zone is recognized as an HCV.**

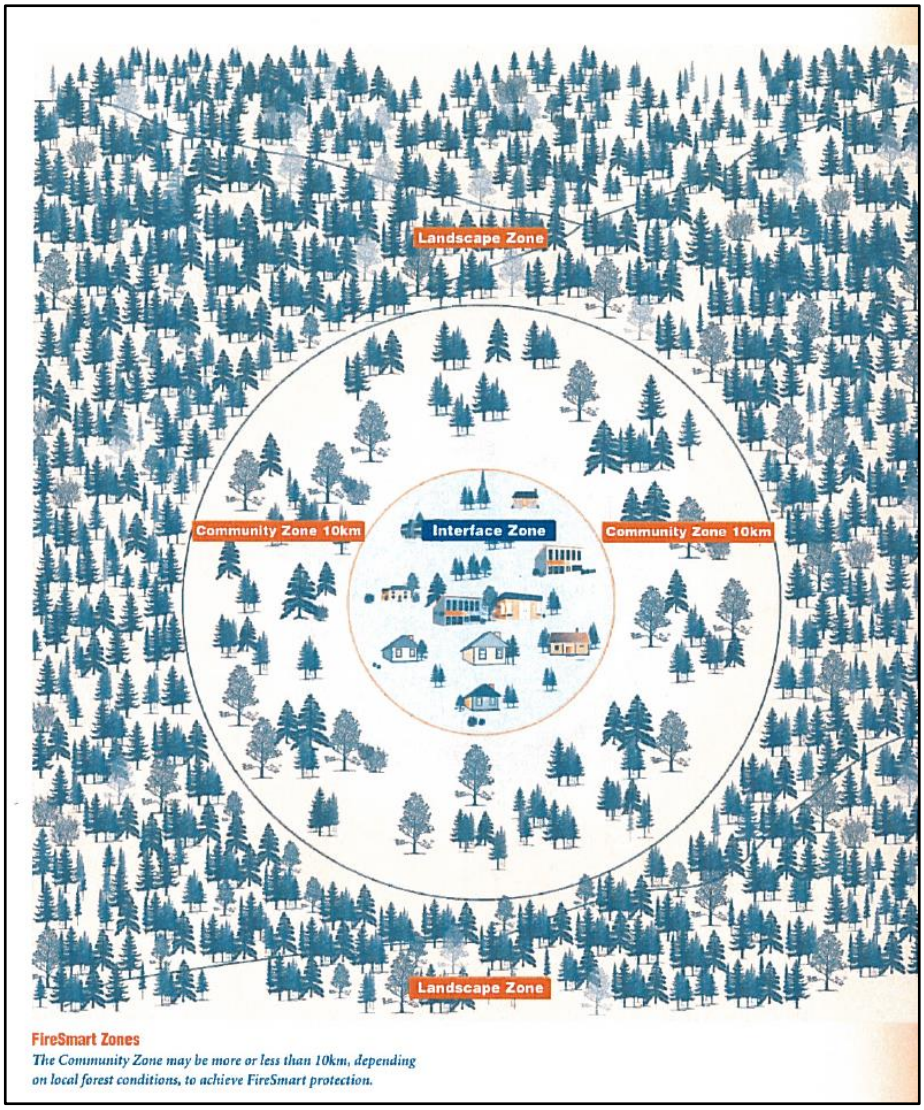

Figure 27. Illustration of Community Firesmart zones to be in place in Thompson Manitoba. From City of Thompson (2019).

6.6 AGRICULTURE AND FISHERIES

This HCV attribute considers forest landscapes that have a critical impact on agriculture or fisheries. FSC's assessment framework relates the value of both the potential for agriculture and fisheries to their role in meeting the basic needs of local communities and whether these areas are negatively impacted by changes in forest landscapes.

6.6.1 Methodology

Internet searches revealed two documents of considerable use. Manitoba Agriculture (2019) provides a map of Agricultural Regions, which led to comparable information being available online through the province's agrimaps web site (https://www.gov.mb.ca/agriculture/environment/soil-management/soil-management-guide/using-soil-survey-information.html) . Information from Canada's Land Inventory for the area proximal to The Pas was also considered.

For fisheries, the province's commercial fishery regulation (Manitoba 2018) listed the all waterbodies which are available for commercial fisheries.

6.6.2 Results

Agriculture is not a prominent land use in the FML or its buffer (Manitoba Agriculture, 2019), and therefore the forest's ability to mediate agricultural production is not deemed significant under this under this category. Figure 28 shows the very limited extent of agricultural land in the Assessment Area, as show in Manitoba's Agrimap web application (http://agrimaps.gov.mb.ca.). Figure 29 shows an area of agriculture-capable lands south of the Pas identified by Canada Land Inventory (https://www.geostrategis.com/c_cli-the%20pas.htm#c) , but it too is limited in extent. These areas do not meet the FSC's criterion for this question of 'having a critical impact on agriculture.

Consideration of fisheries is more regionally relevant, given the numerous lakes throughout the Assessment Area. Manitoba's commercial fishery is highly important to local economies, and a significant employer of northern Manitoba and the Interlake region(Manitoba Conservation and Water Stewardship, 2012). Figure 30 shows the distribution of fish packing stations in the province (as of 2012). There are over 300 lakes commercially fished in the province and 107 of these are in the Assessment Area (Table 18, Figure 31). These waterbodies are regulated by Manitoba's commercial harvest schedule (Manitoba 2018), which sets annual quotas (kgs) and harvest restrictions. Data on the specific economic value of individual lakes were not available, **so as a precautionary approach we identify each of the lakes listed in Table 18 as an HCV.** However we do not have sufficient information on individual lakes to assess the extent to which they may be susceptible to risk from forest management.

We note also that there are many lakes that are important for Indigenous food security in northern Manitoba (Islam 2016), however identifying these lakes is beyond the capacity of this exercise. **When information on these lakes becomes available, they should also be considered as HCV.**

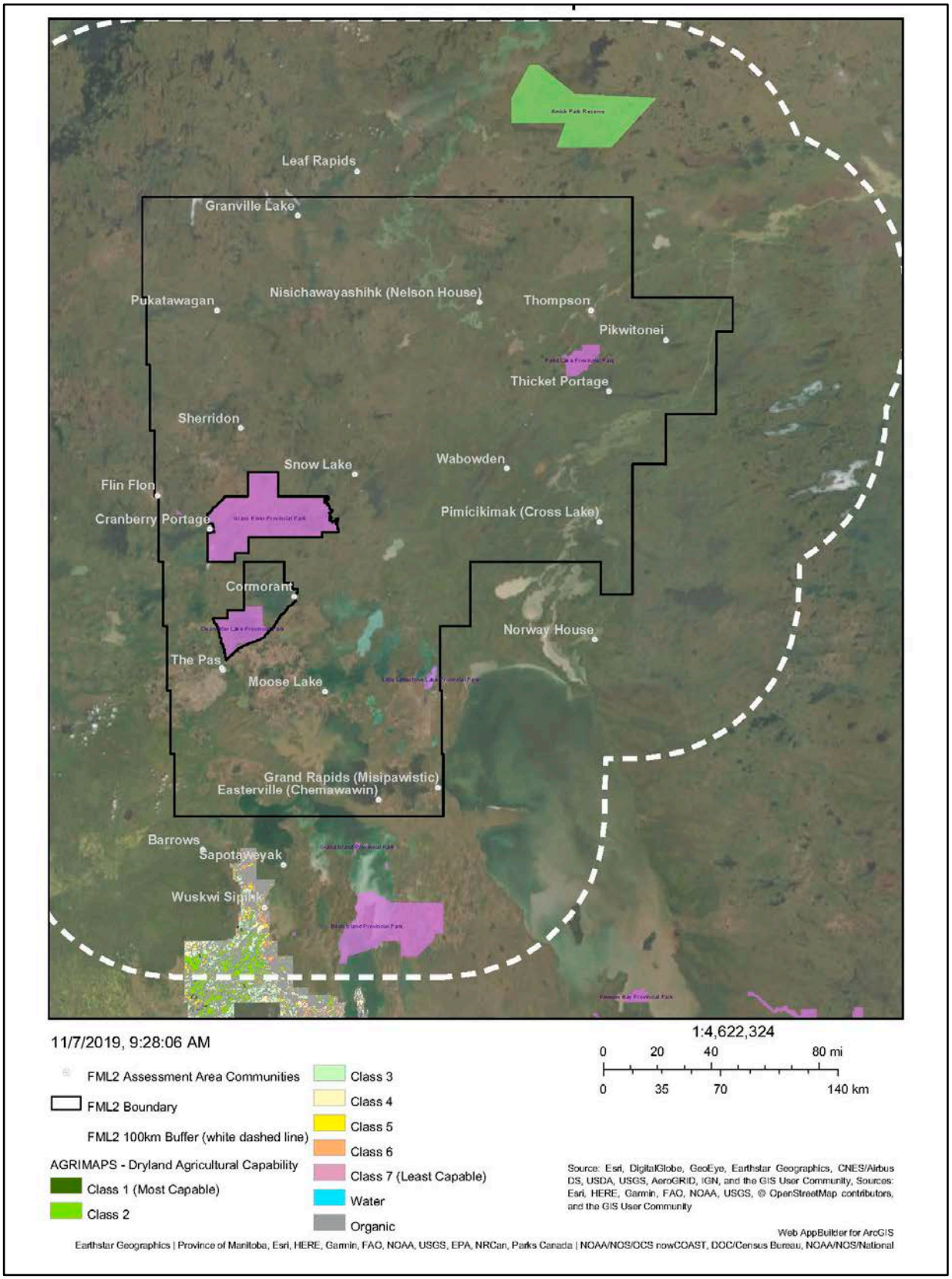

Figure 28. Agricultural Capacity in the Assessment Area. Note that agricultural capable land occurs only in the southern portion of the Assessment Area. Data from Manitoba Agriculture Agrimap web application (http://agrimaps.gov.mb.ca.)

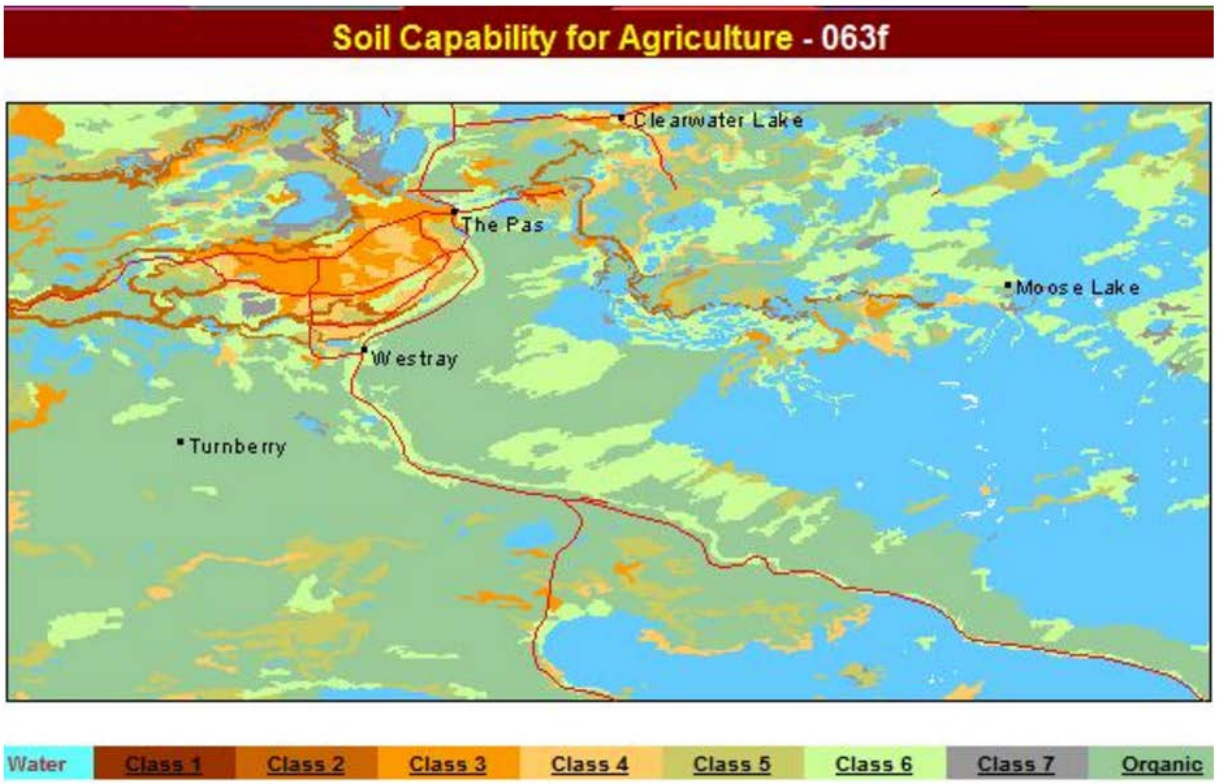

Figure 29. Agriculture Soil Capability in the vicinity of The Pas. Taken from Canada land Inventory (https://www.geostrategis.com/c_cli-the%20pas.htm#c)

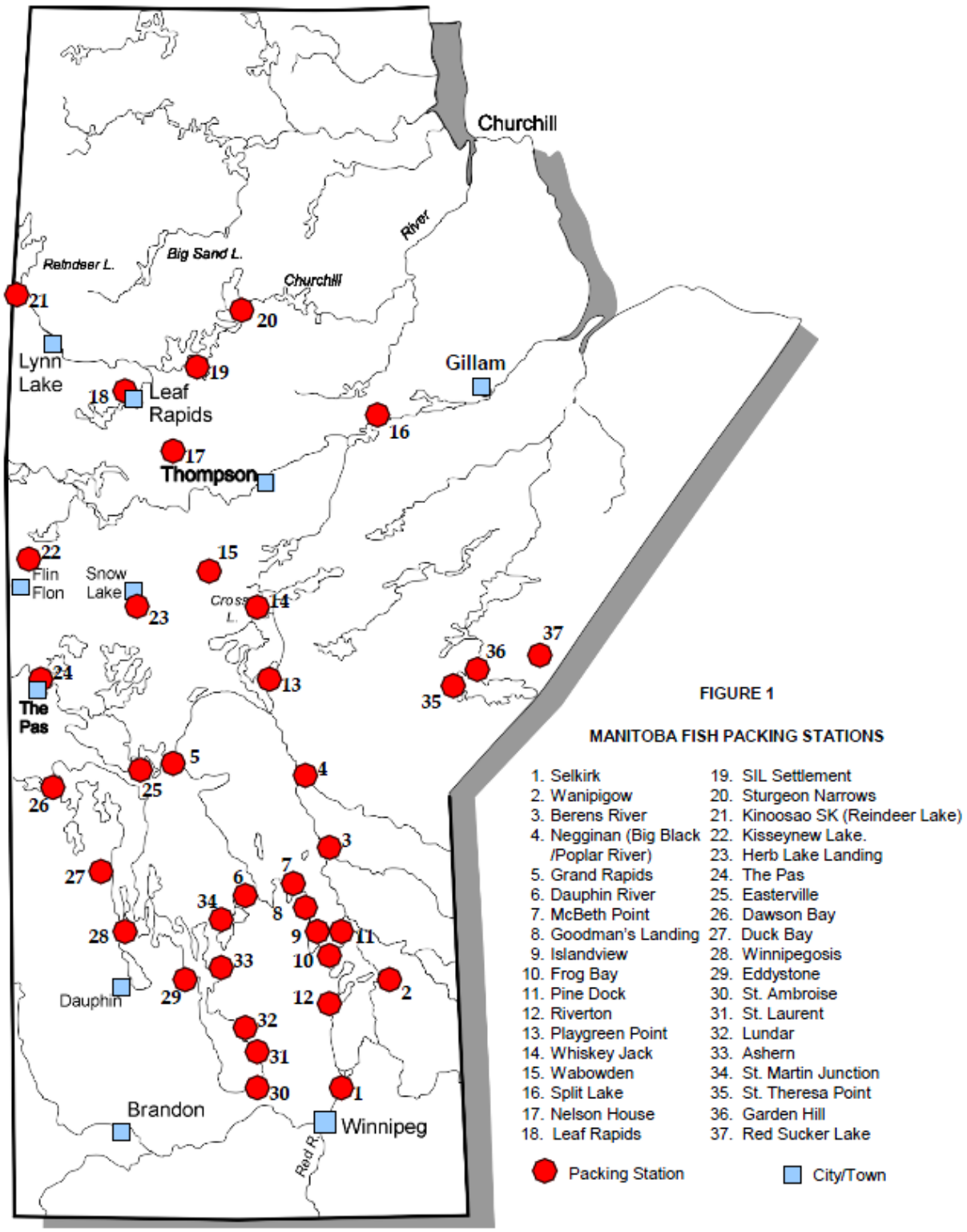

Figure 30. Fishpacking Stations in Manitoba. Note the large number in northern Manitoba. From Manitoba Conservation and Water Stewardship, Fisheries Branch (2012).

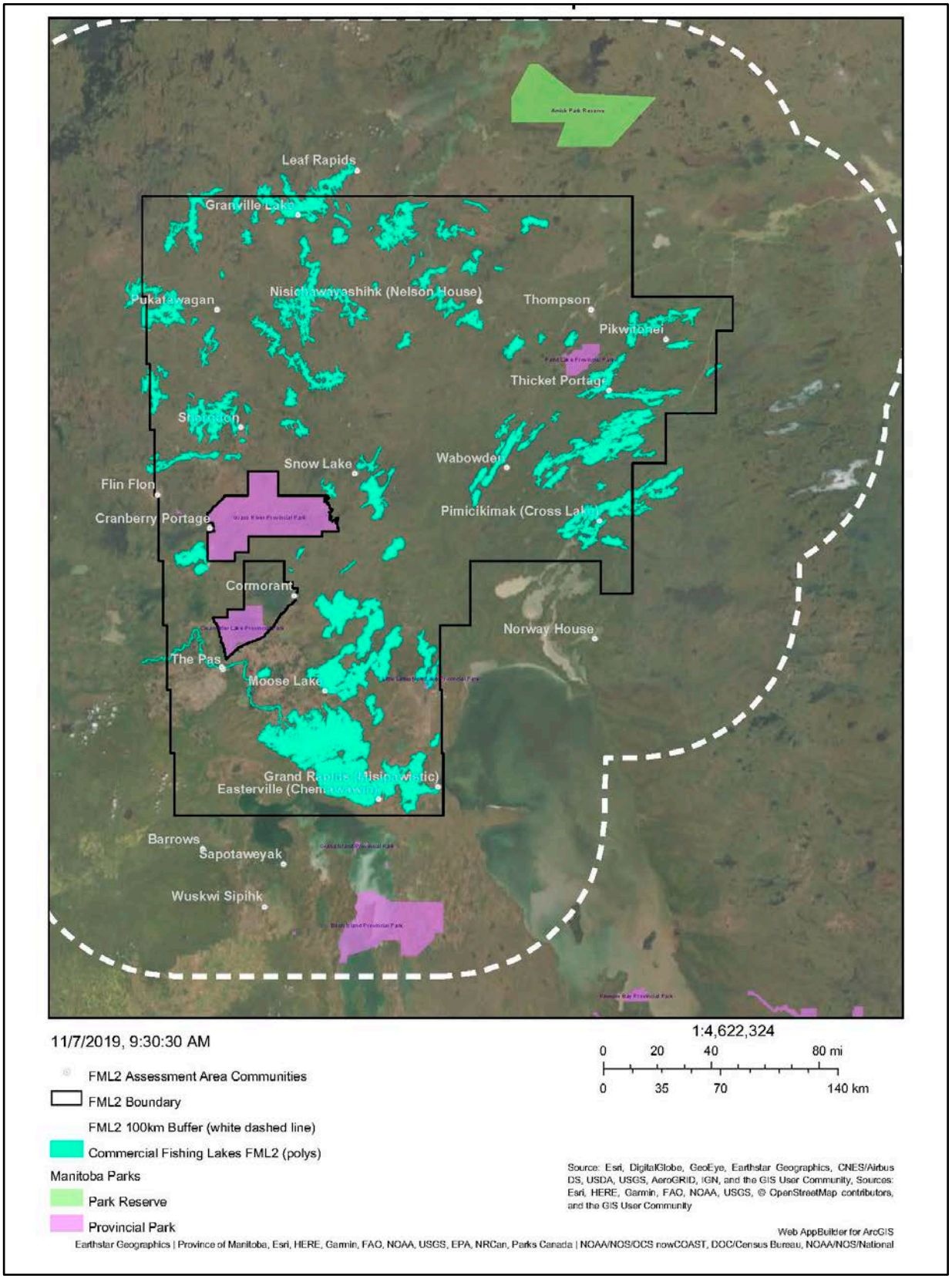

Figure 31. Commercial fishing lakes in the Assessment Area. Data from Manitoba (2018)

Table 18. Commercial Fishing Lakes within or intersecting FML-2. Data from Manitoba (2018)

Lake	Waterbody No.	Latitude	Longitude
Allen Lake	7270	56°04'	100°30'
Anikwuchas Lake	7160	56°01'	99°25'
Apeganau Lake	6801	55°34'	99°33'
Armstrong Lake	6914	55°43'	96°55'
August Lake	6716	55°10'	98°36'
Batty Lake	6459	55°09'	100°39'
Bruneau Lake	6867	55°02'	97°56'
Buffalo Lake	5516	53°26'	99°16'
Cedar Lake	5347	53°19'	100°10'
Costello Lake	7271	56°12'	100°08'
CrossBay	5484	53°12'	99°30'
Cross Lake East	5735	54°44'	97°30'
Dey Lake	6558	55°26'	101°50'
Dolomite Lake	6037	54°27'	100°32'
Duck Lake	5940	54°51'	98°09'
Dugas Lake	6868	55°03'	98°00'
Dyce Lake	6050	54°22'	100°05'
Egg Lake	6018	54°22'	101°27'
Fish Lake	6718	55°02'	98°41'
FiveMile Lake	6719	55°06'	98°39'
Florence Lake	6202	54°58'	101°52'
Gestur Lake	6559	55°24'	101°47'
Girouard Lake	6571	55°28'	101°25'
Goose Lake	6019	54°28'	101°29'
Granville Lake	7373	56°17'	100°28'
Grindstone Lake	9280	56°09'	99°53'
Guthrie Lake	6582	55°16'	100°37'
Halfway Lake	6701	55°04'	98°23'
Harding Lake	7141	56°12'	98°22'
Hall Lake	6807	55°51'	99°50'
Hargrave Lake	5797	54°28'	99°39'
Herblet Lake	5886	54°55'	99°54'
Jumbo Lake	6560	55°17'	101°32'
Kayayk Lake	7334	56°16'	101°07'
Kinwaw Lake	7182	56°17'	98°54'
Kipahigan Lake	6561	55°18'	101°50'
Kiski Lake	5927	54°45'	98°55'
Kisseynew Lake	6210	54°57'	101°36'
Kississing Lake	6523	55°10'	101°20'
Landing Lake	6886	55°17'	97°25'
Landry Lake	5463	53°48'	100°52'
LimestonePoint Lake	6470	55°06'	100°31'
LittleLimestone Lake	5528	53°45'	99°20'
Loon Lake	6641	55°50'	101°55'
Macheewin Lake	7156	56°01'	98°54'
McCallum Lake	7306	56°05'	101°45'
North Moose Lake (North Arm)	5958	54°04'	100°12'
Mooswu Lake	6817	55°52'	99°28'
Mooswuchi Lake	6829	55°57'	98°42'
Morin Lake	6621	55°35'	101°22'
Mutcheson Lake	6849	55°12'	96°58'
Natawahunan Lake	6934	55°42'	97°10'
Notigi Lake	6818	55°56'	99°18'
Opegano Lake	6784	55°35'	98°18'
Osik Lake	6833	55°58'	98°57'
Oskoon Lake	7379	56°16'	100°05'
Ospwagan Lake	6785	55°35'	98°02'
Pakwa Lake	5929	54°51'	98°52'
Partridge Crop Lake	6937	55°38'	97°25'

Lake	Waterbody No.	Latitude	Longitude
Pearson Lake	6659	55°55'	101°15'
Peekwachikwask-waypichickayo Lake	5744	54°48'	97°44'
Pemichigamau Lake	7174	56°16'	99°32'
Pikwitonei Lake	6939	55°33'	97°03'
Pipestone Lake	5737	54°30'	97°38'
Pistol Lake	6720	55°05'	98°42'
Porcupine Lake	6634	55°41'	101°31'
Rat Lake	7166	56°10'	99°39'
Russell Lake	7310	56°14'	101°30'
Sabomin Lake	6891	55°15'	97°15'
Saskatchewan River	5481	53°11'	99°15'
Scatch Lake	5944	54°52'	98°14'
Setting Lake	5932	54°59'	98°37'
Sipiwesk Lake	6870	55°05'	97°35'
Sisipuk Lake	6637	55°44'	101°49'
Squirrel Lake	6819	55°59'	99°29'
Suwannee Lake	7272	56°07'	100°10'
Talbot Lake	5540	54°05'	99°53'
Three Finger Lake	6540	55°13'	101°01'
Three point Lake	6793	55°41'	98°55'
Trophy Lake	7287	56°13'	100°56'
Wapisu Lake	6820	55°46'	99°10'
Wekusko Lake	5908	54°46'	99°52'
Wheatcroft Lake	7289	56°11'	100°43'
White Chicken Lake	7384	56°16'	100°11'
White Rabbit Lake	5753	54°58'	97°21'
William Lake	5545	53°53'	99°21'
Wintering Lake	6878	55°23'	97°43'
Wuskwatim Lake	6794	55°33'	98°32'
Bess Lake	6504	55°03'	101°04'
Bracken Lake	5533	53°37'	99°52'
Burntwood Lake	6592	55°21'	100°25'
Clearwater Lake	5534	53°33'	99°48'
Cole Lake	6698	55°09'	98°10'
Elvyn Lake	605	56°08'	101°01'
Fay Lake	6255	54°58'	101°07'
Flatrock Lake	6615	55°37'	100°47'
Hawk Lake	6702	55°10'	98°11'
Highrock Lake	6687	55°45'	100°29'
Molly Lake	6528	55°06'	101°02'
Morgan Lake	6403	54°45'	100°13'
Mynarski Lake	1	56°09'	99°11'
Nelson Lake	6688	55°45'	100°06'
Patrick Lake	6710	55°11'	98°10'
Prud'Homme Lake	6898	55°26'	96°42'
South Moose Lake	0	53°49'	100°01'
Syme Lake	6289	54°58'	101°12'
Wolfpack Lake	7302	56°06'	101°02'
Woosey Lake	6435	54°47'	100°16'

6.7 SOIL CARBON

Storage of carbon in natural systems is increasingly recognized as an important ecological service that can help mitigate anthropogenic climate change (Griscom et al. 2017). Areas of high soil carbon have high value for conservation as their disturbance by forest harvest or other means can result in large releases of carbon into the atmosphere. In addition, despite the strong natural variation in time and space of net primary productivity (NPP)across boreal forests, we assessed areas of high NPP, as these areas are capturing CO_2 and can play a role in climate mitigation, thereby deserving consideration as possible HCVs in terms of ecosystem services.

6.7.1 Methodology

We assessed soil carbon using SOILGRIDS (Hengl et al. 2017), a global system of soil mapping at 250-m resolution based on machine learning methods and soil profile information, which depicts soil organic carbon stock (tonnes per ha) for depth interval of 0-1 m. We used a threshold of 608 tonnes/ha in the top 1-m of soil to characterize areas of high value, as Deluca and Boisvenue (2012) document that soils containing above this amount constitute the highest densities of soil carbon in boreal soils.

To assess NPP, we relied on spatial data at 250-m resolution from Gonsamo et al. (2013). These data simulate NPP for Canada in 2008 using input data related to meteorology, land surface, soil properties, and photosynthesis and respiration rates, as well as error assessment and ground-truthing based on flux tower sites where all measured C flux, meteorology, and ancillary data sets are available.

6.7.2 Results

The Assessment Area contains several expanses of high density of soil carbon in the southern extent of FML-2 (Figure 32), corresponding principally with fens and peatlands. These expanses include a large contiguous span that stretches diagonally across the centre of the FML and have some of highest-recorded carbon densities on Earth, up to 3,879 tonnes/ha.

Their importance as **globally significant storehouses of soil carbon warrant consideration of these areas as HCV**.

In terms of NPP, the Assessment Area exhibits wide variation across its extent (Figure 33), as expected with a variable that depends on, among other things, stage of forest succession, land cover and latitude. In general, there is a pattern of low productivity sites overlapping the peatlands south of The Pas and the contiguous wetland expanse that stretches across the centre of the FML mentioned above, while the highest productivity sites occur in the northeast of the Assessment Area and the area south and parallel of Clearwater Lake. These high productivity areas overlap primarily with land cover classed as sub-polar needle leaf forests in the northeast and wetland areas of the Saskatchewan River delta.

The naturally high variability of NPP across the study area, in particular as related to forest succession, complicates the identification of specific areas as HCVs. **More analysis is needed to characterize high productivity sites that may sequester carbon on a long-term, rather than ephemeral, basis**. These analyses would support assessment of HCV areas on the basis of permanence as a carbon sink.

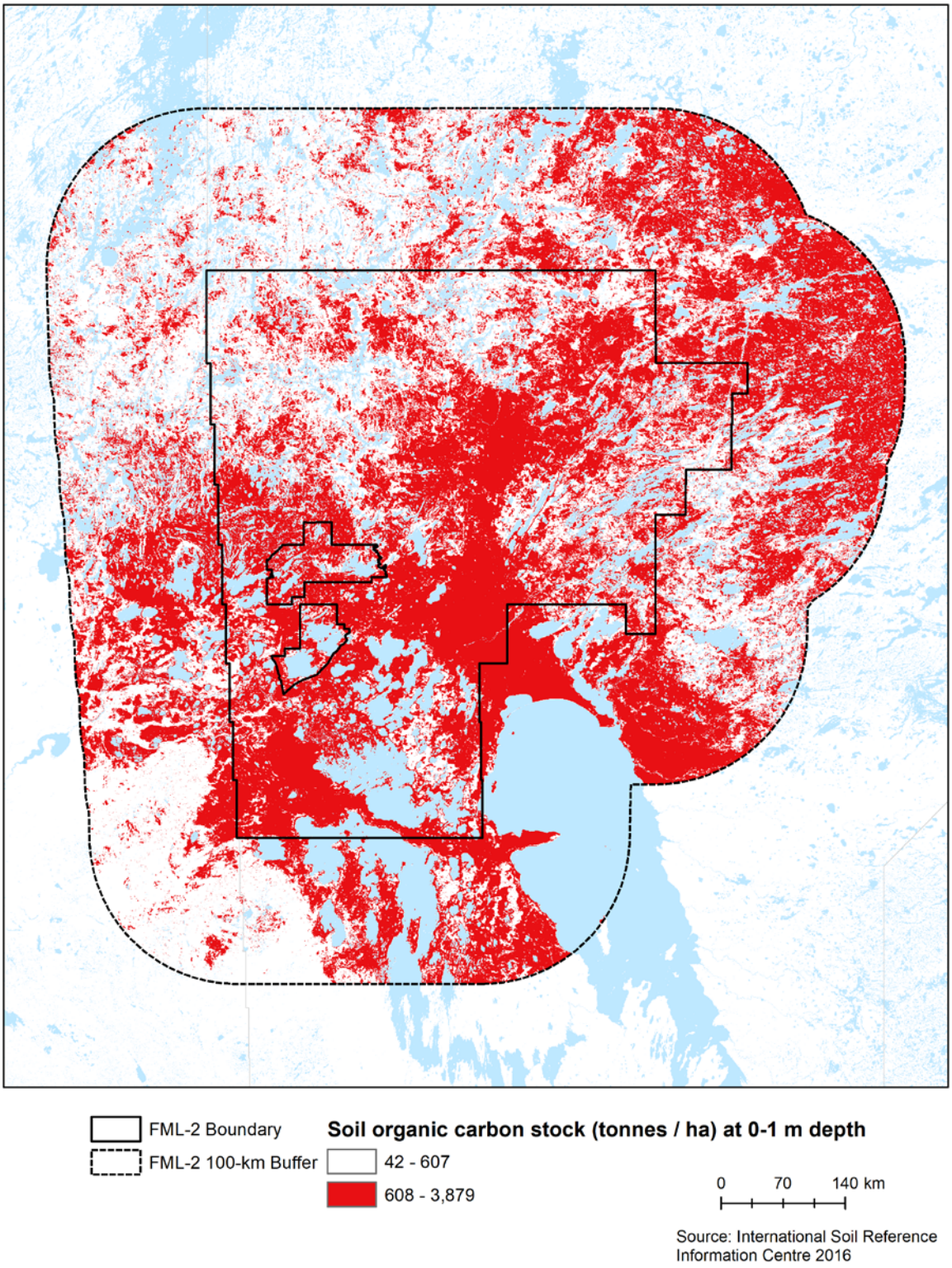

Figure 32. Areas of high soil organic carbon in the Assessment Area.

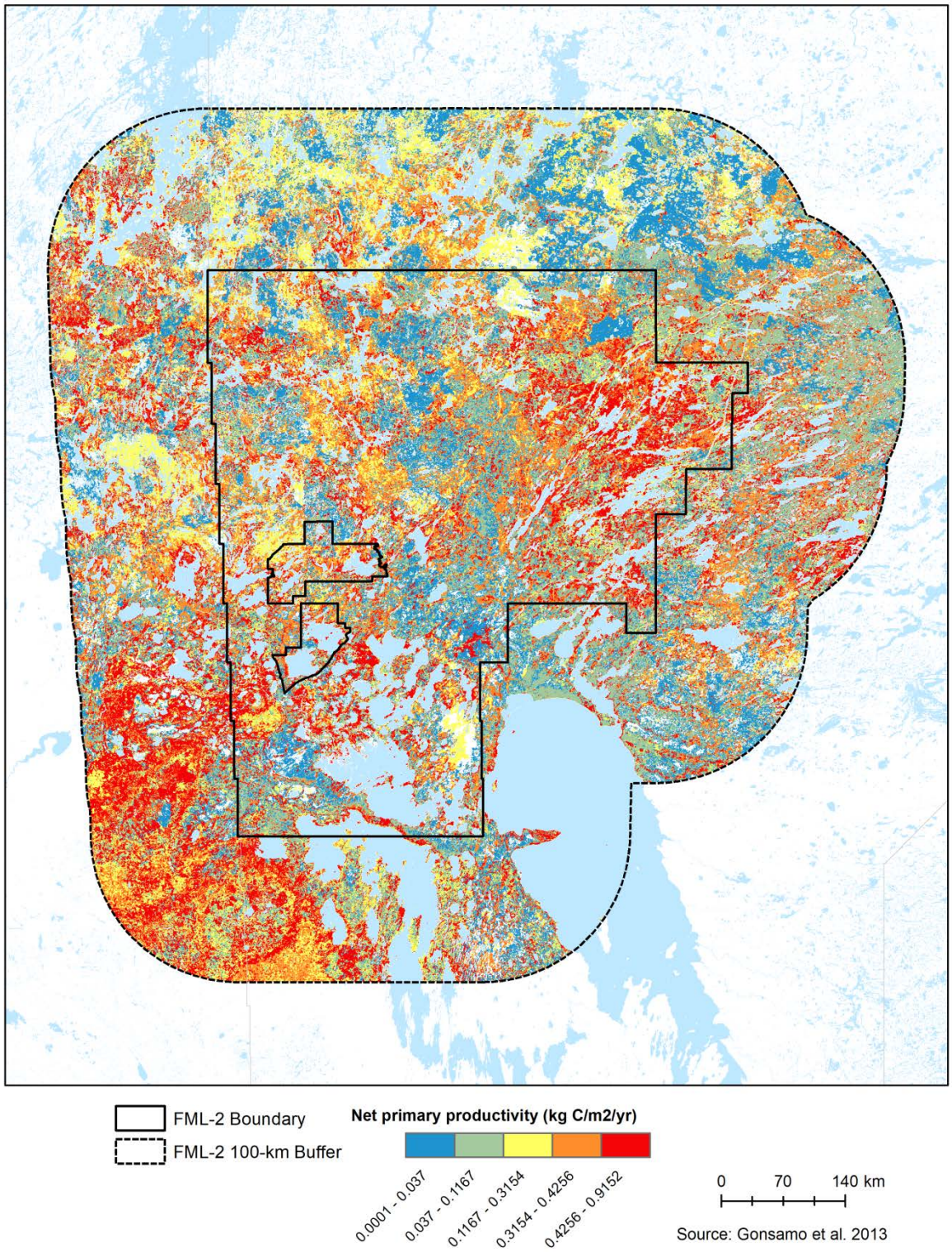

Figure 33. Net primary productivity (kg C/m/yr) in the Assessment Area. Data shown in five quantiles.

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7 HOW HCV5 AND HCV6 HAVE BEEN ASSESSED IN CANADA: A REVIEW

7.1 INTRODUCTION

High Conservation Value categories 5 (community needs) and 6 (cultural values) have very strong social and cultural dimensions to them, and there is a considerable variation in how different organizations assess these HCVs. ArborVitae Environmental Services was asked by Nature United to summarize the scope of the values considered under these two categories of HCV, evaluate the guidance given by the Forest Stewardship Council (FSC) and the HCV Resource Network (2013) in assessing these categories, and review a number of HCV assessments to see what approaches were used and the range of values that were considered.
This task is part of a broader project assessing HCVs in northwestern Manitoba, centered on FML-2. That project is looking beyond the classic FSC HCV definitions in some ways to specifically incorporate some values and considerations that extend beyond FSC's framework and initial vision, such as forest carbon for example. Nonetheless it is very helpful to take advantage of the guidance provided by FSC and other organizations (i.e. the HCV Resource Network) as they provide the basis and ongoing evolution of the concept. So while we are recognizing and using FSC's constructs, we are not necessarily constrained by them. This broader perspective may be brought to bear in the future as Nature United tackles the challenges of HCV5 and 6 more directly.

7.2 DEFINITIONS OF HCV5 AND HCV6

The term HCV was coined by the FSC, which identified the six categories of HCV. The original descriptions have been refined but the values of interest under these two categories have not changed. The definitions of HCV5 and HCV6, provided by the HCV Resource Network, are as follows:

7.2.1 HCV5 Community Needs

HCV5 are sites and resources fundamental for satisfying the basic necessities of local communities or Indigenous peoples (for livelihoods, health, nutrition, water, etc), identified through engagement with these communities or Indigenous peoples.

The guidance document developed by FSC International for use in the Centralized National Risk Assessments (2016) identified three sub-categories of HCV5:

- Unique/main sources of water for drinking and other daily uses;
- Unique/main sources of water for irrigation of food crops; and
- Food, medicines, or fuel, etc for local consumption.

Other suitable values include building and craft resources, protection of agricultural plots against adverse microclimate (e.g. wind), and traditional farming practices. The Common Guidance for HCV Identification (HCV Resource Network 2013) also identifies the following as potential HCV5's:

- Hunting and trapping grounds (for game, fur or skin);
- Fuel for household cooking, lighting and heating;
- Fodder for livestock and seasonal grazing; and
- Items which are bartered in exchange for other essential goods, or sold for cash which is then used to buy essentials including food or medicine, or pay for school fees.

FSC Canada's recently released National Forest Management Standard (2018) incorporates these considerations into its HCV Framework, including referencing the guidance documents produced by the HCV Resource Network. The new National Standard also requires that the identification of all HCV's includes engagement with affected and interested stakeholders, which includes local communities. HCV-related engagement with Indigenous Peoples is to be undertaken in accordance with the principles of Free, prior and Informed Consent (FPIC).

The key challenge for an assessor is to determine the level of dependence by a community on a resource or site, and determine whether the resource or site represents a fundamental necessity. In the FSC lexicon, "fundamental" is interpreted as being such that the loss of the resources from the HCV5 area would have a significant impact on the supply of the resource and decrease the well-being of the local community or Indigenous peoples. If the services provided by the site or resource are irreplaceable (i.e. alternatives are not readily available or are too expensive) and its loss would cause serious suffering or prejudice the affected stakeholders, the site or resource qualifies as an HCV5. Recreational hunting or commercial timber harvesting are considered to be uses that are not basic or fundamental to human needs.

7.2.2 HCV6: Cultural Values

HCV6 are sites, resources, habitats and landscapes of global or national cultural, archeological or historical significance, and /or of critical cultural, ecological, economic or religious /sacred importance for the traditional cultures of local communities or Indigenous peoples, identified through engagement with these local communities or Indigenous peoples.

The guidance document developed by FSC International for use in the CNRAs (2016) identified five sub-categories of HCV6:

- Aesthetic values;
- Historic values;
- Scientific values;
- Social (including economic) values; and
- Spiritual values.

As with HCV5, FSC Canada's Forest Management Standard (2018) incorporates these considerations into its HCV Framework, however the engagement principles and process are specified in more detail, as described above for HCV5.

FSC generally interprets Cultural significance as aesthetic, historic, scientific, social or spiritual value for past, present or future generations. Cultural significance is embodied in the place itself, its setting, use, associations, meanings, records, related places and related objects. Examples include:

- Sites recognized as having high cultural value within national policy and legislation;
- Sites with official designation by national government and/or an international agency like UNESCO;
- Sites with recognized and important historical or cultural values, even if they remain unprotected by legislation;
- Religious or sacred sites, burial grounds or sites at which traditional ceremonies take place that have importance to local or Indigenous people; and
- Plant or animal resources with totemic values or used in traditional ceremonies.

The HCV Resource Network guidance (2013) points out that the definition of HCV6 is extremely broad and suggests that it be sub-divided into two parts: cultural values of global or national significance and values critical for the culture of local people at the site scale. Where internationally or nationally significant sites or values occur, they are normally well-known and protected either in national or provincial parks, as UNESCO World Heritage Sites or under other frameworks.

7.3 GUIDANCE FOR ASSESSING HCV5 AND HCV6

7.3.1 HCV Network Guidance

The guidance for HCV5 and HCV6 mandates that these HCV's be identified through engagement and consultation with the local communities or Indigenous peoples. Both HCVs may apply to any community, including Indigenous ones.
The HCV Network has prepared an HCV Assessment Manual which outlines the process that HCV Network Assessors should use to conduct an HCV assessment (HCVN 2019). In general terms, the process involves

scoping and preliminary analysis, including a review of existing studies and datasets and interviews with knowledgeable people, followed by a site visit. HCV5 and HCV6 are to be assessed using a combination of stakeholder engagement and participatory mapping.

The HCV Assessment Manual requires the assessors to understand how natural features as well as social features may affect, for example, which communities are considered to be within the bounds of the assessment area related to the Forest Management Unit. Watersheds and networked communities are examples of situations that need to be considered in scoping the assessment area.
The Manual also requires that the principles of FPIC be applied. Guidance has been provided by FSC Canada for their application in Canada (FSC Canada 2016).

7.3.2 HCV Assessments in FSC Canada's National Forest Management Standard

FSC Canada's recently-released National Standard provides direction on assessment of all HCV Categories in the National Framework as an Annex in the Standard itself. The Annex is, obviously, tailored specifically for Canada, and so the guidance is somewhat narrower and more specific than that provided by the HCV Network. For HCV5 the annex identifies the following key points:

- There is a distinction being made between use by individuals and where use of the forest is fundamental to local communities.
- Engagement with communities themselves is the most important way of collecting information. Engagement can (and should) be conducted by people other than the forest managers.
- Having established that the community uses the forest to fulfill some needs, it is necessary to assess whether any of these uses are fundamental to meet any of the community's basic needs. To address this point, the following questions are provided as guidance:
    - Is this the sole source of the value(s) for the local communities?
    - Is there a significant impact to the local communities because of a reduced supply of these values?

Through this content in the Annex, it is obvious that the Standard sets a high bar for inclusion of values as HCV5s; the concept stipulates 'fundamental for communities', i.e. not just used by individuals or non-fundamental use by communities.

For HCV6 the Annex provides the following key points:

- The definition of 'local communities' includes communities within the assessment area as well as those that are close enough to be impacted by forest management activities in a number of ways.
- As with HCV5, the Annex stresses that engagement with communities is the most important way of collecting information, in spite of the fact that it can be difficult.
- In general, a reasonably broad approach should be used in accepting a cultural value as an HCV; the scale of the HCV may vary considerably from individual sites, to large landscapes.
- Possible indications of cultural importance include: names for landscape features, stories about the forest, sacred or religious sites, historical associations, and amenity or aesthetic value.

7.4 REVIEW RESULTS

Ten HCV assessments are reviewed below. Table 19 presents the results for HCV5 and Table 20 presents the results for HCV6. The description of the methodologies that were followed often contains duplication in Table 19 and Table 20, which occurs when the reports upon which they are based provide only a general overview of the assessment methodology. However, some of the reports used different approaches for HCV5 and for HCV6, and this is reflected in the discussion.

Table 19. Summary of Assessments of HCV5.

Area Assessed	Methodology	Values Considered	Outcome
Mistik Management (Saskatchewan) 2009	• The assessment relied on information used in forest planning as well as some additional background work that was done to set the foundation for the HCV assessment. Records from comments made during forest planning by stakeholders and Aboriginal people were also reviewed, however there was no engagement with stakeholders or Aboriginal communities during the HCV assessment. • The assessment proceeded by responding to the questions set out in the National HCV framework.	• A full range of forest uses were considered, including hunting, trapping, fishing, gathering etc. • The forest is heavily used by local communities; the area is relatively remote and sparsely populated.	• **A composite HCV including elements of both of HCV5 and HCV6 was identified for waterways and the lands adjacent to the waterways, including wild rice harvesting areas which were specifically identified in the assessment under HCV5.**
Alberta-Pacific (Alberta) 2004 and updated in 2009	• The approach followed in the 2004 assessment used the recommended approach in the ProForest Toolkit; for the 2009 update, the assessment of all HCVs was undertaken by assessing the 18 questions in Appendix 4: HCVF National Framework of the FSC National Boreal Standard. • In the 2004 work, a scoping analysis (preliminary literature scan and interviews with some knowledgeable people) was undertaken to identify the presence of potential HCV5. This was followed by a more intensive process that involved a review of land use and occupancy studies, ethnographies, studies of the subsistence economy and community profiles were among the studies reviewed. • The work undertaken in 2004 did not identify any HCV5's primarily because the assessors did not interview community members, which brought the process to a close. The 2009 update reflected engagement that Al-Pac had undertaken with Indigenous communities in and adjacent to the FMA area. The engagement resulted in the identification and	• Big game, furbearers, fish, birds, berries, plants and trees, herbs and medicinal plants, settlement sites, trails and traplines, and spiritual sites and grave sites were all identified as values in 2004 and 2009. • Treaty Land Entitlement areas were added in the 2009 update.	• **No determination of HCV5 was made in the 2004 report as it was an initial determination only,** and there was no direct discussion with any of the Indigenous communities. • The assessors identified that collectively, the values of the types listed in the column to the left were significant to local Indigenous communities for subsistence as well as for maintaining their culture. Al-Pac observed that the majority of HCV5 and 6 values were located near water bodies and rivers and created 1 km consultation zones around 13 lakes and four rivers – Al-Pac will engage in consultation tailored specifically to these HCVs with Aboriginal communities when operations are planned with the consultation zones. HCV5 and 6 were not distinguished separately.

Area Assessed	Methodology	Values Considered	Outcome
	mapping of site- and area-specific Aboriginal traditional land use information.		
Ottawa Valley (Ontario) 2012	• The assessor relied on the Forest Management Planning process to meet the FSC consultation requirements • The HCV report was also provided to the Algonquin First Nations with the understanding that their ability to participate may be limited by the on-going land claim. • The Company also has an Open Door Policy where people can meet and discuss values.	• No real discussion of what values were considered.	• The assessment discusses the importance of the Forest to the local communities as a supply of timber, for providing tourism and recreational opportunities, including hunting, trapping, fishing, etc. • The assessment stated that it was clear that the whole forest was required to make its contribution to the well-being of local communities. • **No potential or confirmed HCV5 were identified.**
Hearst (Ontario) 2014	• Assessment based on management experience and knowledge of stakeholder interests • Local communities not engaged	• A fairly generic list of values considered – food, medicine, fuel, building and craft materials, water, income.	• The assessment stated that the entire forest is highly valued but the whole forest cannot be made an HCV5. • The assessment notes past values collection exercises with Indigenous people and their participation on forest management planning teams, and reports on timber commitments and presents an inventory of tourism establishments. • **No potential or confirmed HCV5 were identified.**
Port Hawkesbury (Nova Scotia) 2015	• HCVs were identified using the FSC Maritime Standard and guidance from the ProForest HCV Toolkit and WWF Canada's HCV Support document. • The initial assessment was completed in 2010 and was based on review of a large number of data sets and discussions with staff from municipal, provincial and federal government and the Company's Advisory committee. • Also reviewed were the Company's FMP,	• Game (moose, deer, bear), fish, medicinal plants. cattle grazing, wind power generation, fuelwood, crafts, water, income, and tourism and recreation.	• The report identifies a number of scenic areas, an easement that provides access to drinking water for a community, and cattle grazing as HCV5. • The report also notes that there were HCV1 and HCV3 identified for mainland moose, salmon and trout coldwater refugia and fishing grounds that are also relevant for the values considered in the HCV5 assessment.

Area Assessed	Methodology	Values Considered	Outcome
	EMS, public input during Open Houses held in 1998, and a project with the Union of Nova Scotia Indians. • One or two of the people engaged were Indigenous but there was no community consultation directly associated with HCV identification. • The report was reviewed and updated in 2015.		
Taan – Haida Gwaii (British Columbia) 2016	• The methodology is not clearly described – it appears that existing documentation, especially the Queen Charlotte Islands Land Use Plan Background Report, which contains expert information, was used as a key source of information. • The assessment was based on the HCV Framework in the National Standard	• The assessment used the HCV Network's wording of the HCV5 description as the basis for assessing the presence of HCV5.	• Even though many community members use the Forest, the Forest does not provide fundamental subsistent or health related benefits to the community. • **As a result, it was concluded that there were no HCV5 present.**
Tasmania 2017	• This assessment differs from the others considered in that it covers a geopolitical unit, rather than a forest management unit • The assessment of the Permanent Timber Production Zone (PTPZ) lands was undertaken using the Australian HCV Framework and the HCV Network's Common Guidance for the Identification of HCVs. • Forestry Tasmania prepared an HCV Management Plan in 2014 that received a great deal of pushback, leading to additional stakeholder and expert engagement and its revision. • The assessment was undertaken by summarizing the lifestyles of those people who live in Tasmania and near PTPZ land, documenting use and availability of potential HCV5 resources, and review of other published guidance.	• Unique/main sources of water for drinking and other daily uses; • Unique/main sources of water for irrigation of food crops; • Food, medicines, or fuel for local consumption.	• The assessment noted that Tasmania is a First World mixed economy where basic needs and services are provided, Indigenous peoples are generally well-integrated into the broader economy and subsistence lifestyles are not followed. • The HCV Guidance indicators were assessed (e.g. access to health centres or hospitals is difficult ....) and none were considered applicable. **As a result, despite the presence of potential HCV5 resources, none were considered to qualify as HCV5.**

Area Assessed	Methodology	Values Considered	Outcome
Big Pic /Pic River (Ontario) 2017	• In addition to document review, the assessors met with the Local Citizens Committee to review draft HCV values and solicit additional values and conferred with technical experts. • Indigenous people's comments provided during FMP planning were also reviewed. • The assessment was based on the HCV Framework in the Boreal Standard	• The assessment discusses many of the resource uses that take place in the forest, ranging from commercial forestry to recreation and tourism.	• There was consideration given to identifying the forest industry as an HCV5 however **it was decided that there were no HCV5's in the two Pic Forests.**
Kruger Cornerbrook (Newfoundland) 2017	• International, national and provincial databases were reviewed for the presence of HCVF attributes, and where potential HCV5 attributes were identified, they were listed as candidates. • Stakeholders were invited to submit proposed HCV5 areas, and were asked to answer some or all of the 19 questions in the National HCV framework. • An assessment committee convened for the project made a final determination.	• A wide range of forest uses was considered.	• Because much of the regional population is rural, the forest is used to provide a wide range of benefits, ranging from wood, game, fish and the basis for employment (sawmills, tourism). • **Identified HCV5 include recreation, cutting timber for wharves and boats, income from working in the forest, firewood, roads, and wood to be processed in the area sawmills.**
Rayonier Advanced Materials (RYAM) Témiscamingue (Québec) 2018	• This is an updated study. The initial HCV identification process was developed jointly by Tembec and the World Wildlife Fund for Nature. Appendix E of the FSC Standard (2018) was the basic reference during the update and helped to refine the methodology. • HCV5 and HCV6 were assessed jointly, in part because many of the data sources applied to both categories of HCV. • Initial values data were obtained from land use maps, provided and updated by government authorities. In a second step, the public consultation made during the various stages of the forest planning was reviewed; it provided a lot of information on the sites of importance for the local communities. Work from the Integrated Resource Management	• HCV5 and HCV6 were assessed jointly, and these values included the basic needs of local communities include, among others, sustenance, health, culture, ecology, economy and spirituality.	• **HCV5 and HCV6 were identified around the Hunter's Point Aboriginal Settlement. Special operational zones have been designated where there are values around this site of interest.** • **Camp sites used by communities, burial sites, but also sites of archaeological interest are also present on the territory and have been identified as HCV6.** • **Other areas are protected under the provincial forestry regulations, particularly with respect to landscape protection.** • **HCV5 includes recreational rivers, aesthetic views, cabins and shelter areas, and portages**

Area Assessed	Methodology	Values Considered	Outcome
	Tables was also considered. Finally, information was obtained through meetings and interviews with Indigenous communities that use the territory.		

Table 20. Summary of Assessments of HCV6.

Area Assessed	Methodology	Values Considered	Outcome
Mistik Management (Saskatchewan) 2009	• The assessment relied on information used in forest planning as well as some additional background work that was done to set the foundation for the HCV assessment. Records from comments made during forest planning by stakeholders and Aboriginal people were also reviewed, however there was no engagement with stakeholders or Aboriginal communities during the HCV assessment. • The assessment proceeded by responding to the questions set out in the National HCV framework.	• A full range of forest uses were considered, including hunting, trapping, fishing, gathering etc. • The forest is heavily used by local communities; the area is relatively remote and sparsely populated	• **Cultural values that have been identified and designated by the Saskatchewan provincial government were assessed as HCV6.** • **In addition, cultural values identified by the communities were also identified as HCV6** • **A composite HCV including elements of both of HCV5 and HCV6 was identified for waterways and the lands adjacent to the waterways**.
Alberta-Pacific (Alberta) 2004 and updated in 2009	• The approach followed in the 2004 assessment used the recommended approach in the ProForest Toolkit; for the 2009 update, the assessment of all HCVs was undertaken by assessing the 18 questions in Appendix 4: HCVF National Framework of the FSC National Boreal Standard. • In the 2004 work, a scoping analysis (preliminary literature scan and interviews with some knowledgeable people) was undertaken to identify the presence of potential HCV6. This was followed by a more intensive process that involved a review of land use and occupancy studies, ethnographies, studies of the subsistence economy and community profiles were among	• Big game, furbearers, fish, birds, berries, plants and trees, herbs and medicinal plants, settlement sites, trails and traplines, and spiritual sites and grave sites were all identified as values in 2004 and 2009. • Treaty Land Entitlement areas were added in the 2009 update.	• **No determination of HCV6 was made in the 2004 report as it was an initial determination only**, and there was no direct discussion with any of the Indigenous communities. • The assessors identified that collectively, the values of the types listed in the column to the left were significant to local Indigenous communities for subsistence as well as for maintaining their culture. **Al-Pac observed that the majority of HCV5 and HCV6 values were located near water bodies and rivers and created 1 km consultation zones around 13 lakes and four rivers** – Al-Pac will engage in consultation tailored specifically to these HCVs with Aboriginal

Area Assessed	Methodology	Values Considered	Outcome
	the studies reviewed. • he work undertaken in 2004 did not identify any HCV5's primary because the assessors did not interview community members, which brought the process to a close. The 2009 update reflected engagement that Al-Pac had undertaken with Indigenous communities in and adjacent to the FMA area. The engagement resulted in the identification and mapping of site- and area-specific Aboriginal traditional land use information.		communities when operations are planned with the consultation zones. HCV5 and 6 were not distinguished separately.
Ottawa Valley (Ontario) 2012	• The assessor relied on the Forest Management Planning process to meet the FSC consultation requirements with respect to HCV6 identification. • The HCV report was also provided to the Algonquin First Nations with the understanding that their ability to participate may be limited by the on-going land claim. • The Company also has an Open Door Policy where people can meet and discuss values. • Communities within and adjacent to the Forest, and interested Algonquin communities, were considered to be within scope.	• No real discussion of what values were considered. Non-Aboriginal interests were considered to fall under Category HCV5.	• The assessment noted that the Algonquins have provided their values to the Company for use in planning but these are confidential. • The report also discusses the on-going land claim but notes that that process is also confidential. • **The assessment did not identify any values originating from the planning process or the land claim but it did identify that there are several registered archeological sites on the Forest, and these would qualify as HCV6**.
Hearst (Ontario) 2014	• Assessment based on management experience and knowledge of stakeholder interests • Local communities not engaged .	• Doesn't really specify what values or types of locations were looked for as HCV6.	• The assessment notes the regular use of the Forest by Indigenous and other community members "on an almost traditional basis". • Constance Lake First Nation, located wholly within the Forest, was not considered a traditional community because the community was only moved there in the late 1940's, and for some community members the former community location (also within the Forest) tends to be the area of primary focus.

Area Assessed	Methodology	Values Considered	Outcome
			• **No potential or actual HCV6 were identified.**
Port Hawkesbury (Nova Scotia) 2015	• HCV6 were identified using the FSC Maritime Standard and guidance from the ProForest HCV Toolkit and WWF Canada's HCV Support document. • The initial assessment was completed in 2010 and was based on review of the Company's FMP, EMS, an MOU and Benefits Agreement between the Company and Mi'kmaq Chiefs, and other Mi'kmaq resource forums. • There was no mention of any community consultation directly associated with HCV identification.	• A wide list of medicinal plants and historical uses of resources were described in the assessment.	• **Areas where plants that are culturally significant for traditional use are gathered are identified as HCV6.** These areas have been identified by the Unama'ki Institute of Natural Resources. • **I**t is anticipated that the conclusion of the Benefits Agreement may result in additional HCV6 areas being identified.
Taan – Haida Gwaii (British Columbia) 2016	• The assessment was based on information contained in the Queen Charlotte Islands Land Use Plan Background Report, which contains expert information. • The key question was whether any part of the forest was strongly tied to cultural identity.	The assessment used the HCV Network's wording of the HCV6 description as the basis for assessing the presence of HCV6.	• The Background Report identified three classes of cultural resources considered important: Archeology Sites, Haida Traditional Use Sites, and Historic Sites. • The Haida Land Use Objectives Order also identified a number of sites and values of cultural importance. These include Haida Traditional Heritage Features, Haida Traditional Forest Features, Monumental Cedar and Culturally Modified Trees. Since these are located throughout the forest, **the entire forest area, or a total of 189,576 ha, was identified as HCV6.**
Tasmania 2017	• This assessment differs from the others considered in that it covers a geopolitical unit, rather than a forest management unit • The assessment of the Permanent Timber Production Zone (PTPZ) lands was undertaken using the Australian HCV Framework and the HCV Network's Common Guidance for the Identification of HCVs. • Forestry Tasmania prepared an HCV Management Plan in 2014 that received a	• Sites of international, national or state level of cultural significance; • Non-Aboriginal historic values; • Aesthetic values; • Sites with high scientific value; • Sites with high social	• The assessment noted that a number of sites that could be classified as HCV6 were already identified under other HCV categories and so were not duplicated under HCV6; • Culturally significant sites, sites of historic importance and with science values are known and mapped; • Spiritual sites tend to be cultural heritage

Area Assessed	Methodology	Values Considered	Outcome
	great deal of pushback, leading to additional stakeholder and expert engagement and its revision.	value; and • Sites with spiritual values.	sites identified above; • Forests are already managed for aesthetic values during operational planning, and • Giant trees and a key recreational area was identified as HCV6.
Big Pic /Pic River (Ontario) 2017	• In addition to document review, the assessors reviewed the comments provided by Indigenous people during FMP planning as well as the Indigenous peoples' planning products (Aboriginal Background Information Report, etc). • The assessment was based on the HCV Framework in the Boreal Standard.	• Two of the five First Nations communities with traditional use in the Forest had completed some values collection however this information was not shared with the assessors.	• **HCV6 areas were associated with archeological sites and sites documented in the ABIR. Sites that were encountered that contained historical logging artefacts were also to be identified as HCV6.**
Kruger Cornerbrook (Newfoundland) 2017	• International, national and provincial databases were reviewed for the presence of HCVF attributes, and where potential HCV6 attributes were identified, they were listed as candidates. • Stakeholders were invited to submit proposed HCV6 areas, and were asked to answer some or all of the 19 questions in the National HCV framework. • In addition to this general process, the assessors met with the Qalipu Mi'kmaq First Nation Band and the Miawpukek First Nation and were informed that the First Nations have identified the locations of burial and sacred sites, spirit areas and medicinal plants. The locations of these areas were not shared as the inventory process was not yet completed.	• The assessors relied on the information provided the by two First Nations to identify the range of sites considered as HCV6.	• **HCV6 were identified as the locations of burial and sacred sites, spirit areas and medicinal plants.**
Rayonier Advanced Materials (RYAM)	• This is an updated study. The initial HCV identification process was developed jointly by Tembec and the World Wildlife Fund for Nature. Appendix E of the FSC Standard	• HCV5 and HCV6 were assessed jointly, and these values included the basic needs of local	• **HCV5 and HCV6 were identified around the Hunter's Point Aboriginal Settlement. Special operational zones have been designated where there are values**

Area Assessed	Methodology	Values Considered	Outcome
Témiscamingue (Québec) 2018	(2018) was the basic reference during the update and helped to refine the methodology. • HCV5 and HCV6 were assessed jointly, in part because many of the data sources applied to both categories of HCV. • Initial values data were obtained from land use maps, provided and updated by government authorities. In a second step, the public consultation made during the various stages of the forest planning was reviewed; it provided a lot of information on the sites of importance for the local communities. Work from the Integrated Resource Management Tables was also considered. Finally, information was obtained through meetings and interviews with Indigenous communities that use the territory.	communities include, among others, sustenance, health, culture, ecology, economy and spirituality.	**around this site of interest.** • **Camp sites used by communities, burial sites, but also sites of archaeological interest are also present on the territory and have been identified as HCV6.** • **Other areas are protected under the provincial forestry regulations, particularly with respect to landscape protection.**

7.5 SYNTHESIS AND OBSERVATIONS

All of these assessments are for forests that are certified to FSC, and there is a considerable range of rigour amongst the studies. HCV assessments for the Hearst and Ottawa Valley Forests are more cursory whereas the assessments undertaken for Tasmania, Alberta-Pacific, Témiscamingue and Haida Gwaii are more rigourous. The results of the review also showed that more perfunctory assessments of HCV5 and HCV6 tended to identify no HCVs in these categories. The HCV assessment reports do not necessarily provide much in the way of methodological description for the assessment of individual HCV's, and some do not provide much if any rationale for the conclusions that are drawn. However, the more descriptive and comprehensive reports indicate that a thorough process was undertaken.

The Proforest Toolkit was widely used, especially in the earlier assessments and provided a good framework for the assessment. Only one HCV assessment, the update of the Témiscamingue assessment, referenced the HCV direction in the new national standard, and it did not say explicitly how that new direction modified or affected the assessment process.

7.5.1 Community Engagement

It was striking that there was very little Indigenous or community consultation undertaken specifically for approximately half of the assessments, particularly the earlier ones. Instead, the assessors relied on minutes or summaries of consultation processes that had been undertaken with respect to forest planning or other initiatives, or in one or two cases, relied on their experience to assess resource use by the communities and cultural values. Since consultation is stated as being required in the assessment of HCV5 and HCV6, the failure to conduct engagement for the purpose of identifying HCV5 and HCV6 gives one pause regarding the associated certifications. Moreover, the use of information obtained in one process (forest planning) in place of consultation in another process (HCV assessment) is misleading at best and is not likely to improve trust between the stakeholders, the communities and the forest manager. The more recent HCV assessments, especially those associated with Cornerbrook, Tasmania, and Témiscamingue, involved specific engagement with Indigenous communities as well as non-Indigenous communities as part of the process. The Al-Pac assessment was also notable for extensive engagement.

7.5.2 Assessment of HCV5

It is somewhat surprising how few of the forest areas had HCV5 areas identified on them. As indicated, a lack of direct consultation or engagement represents a gap in the process followed by many assessment teams, and is likely a contributing factor to the general lack of HCV5 identified in the studies, especially in the earlier ones. Where there was engagement (e.g. Cornerbrook and Témiscamingue), a number of HCV5 were usually identified. HCV6 values were identified more frequently but the values and/or their locations were either unavailable to the assessors or could not be detailed in the HCV Assessment Reports due to confidentiality agreements.

HCV5 appears to be one of the more poorly understood categories of HCV. Some assessors included Indigenous communities under HCV5 whereas other assessors considered all Indigenous values and resource uses under HCV6. There are few if any standard sources of data that are used for assessing HCV5, and those data sources are few in number. The number of pages devoted to the assessment of HCVs 1-3 was typically an order of magnitude larger than the space taken up by the HCV5 assessment discussion. And, as mentioned, very few HCV5's were identified. This result may reflect the Canadian context, where the country is one of the world's wealthiest and relatively few people live a subsistence lifestyle or are forced through circumstances to directly rely heavily on resources for basic needs. However, all communities require water and one might have expected that the watersheds, aquifers, and other sources of water for drinking, washing, and other purposes would have been more consistently identified as HCV5.

It was also somewhat surprising that several of the assessments identified timber or the forest industry as an HCV5. While the definition of HCV5 is broad enough so that a plausible argument could be made for identifying the forest sector as an HCV5, this is clearly not what is intended since forest operations are almost

always one of the threats to HCV's, including HCV5. There is no doubt that some in the forest industry feel persecuted these days, and identifying forestry as an HCV5 is a statement of this. However the identification of timber as an HCV5 does not enhance the credibility of an assessment.

7.5.3 Assessment of HCV6

Where assessments were able to identify the existence of HCV6, this is primarily due to the values collection work that the Indigenous communities had undertaken previously. With Indigenous communities asserting ownership of their traditional knowledge and being mistrustful about revealing these data, much of the HCV6 assessment and the results is hidden from public view. This is perhaps as it should be. Surprisingly, the Témiscamingue HCV report includes maps showing the various HCVs of all categories.

It was evident that the Indigenous worldview also finds it difficult to segregate and compartmentalize different values. A number of the assessment reports commented to this effect and some of the assessment conclusions, such as the Haida conclusion that the entire forest is HCV6, reflect in part this perspective. The Haida conclusion also reflects the presence of numerous culturally modified trees, monumental cedars, and other HCV6s that have not been mapped. Again, it was noted that some assessors included non-Indigenous heritage values as HCV6, such as ruins of sawmills and other structures, while others considered HCV6 to apply only to Indigenous values.

7.5.4 Concluding Thoughts

In conclusion, HCV5 and HCV6 present different types of challenges to an assessor. HCV5 are, in general terms, the most challenging category of HCV to assess, and it may well be that many forests truly do not have them. However, given the wide range of interpretations, the limited amount of consultation, and the lack of readily available datasets, there may be other reasons for the low number of HCV5 that are typically identified (e.g. communities are integrated into the regional economy and do not depend on the forest for subsistence). In contrast, there is a fairly standard list of generic HCV6 values that are present in most forests, however the principle challenge is in locating them. HCV6 assessment is most effective when the identification work has already been done by the relevant Indigenous communities, and usually most significant non-Indigenous historical values have also been identified. However, unless the assessors have the participation of the relevant communities, more specific identification of HCV6 is unlikely to be successful.

7.6 RECOMMENDATIONS

Nature United has requested that recommendations be provided regarding processes that communities can undertake themselves that would help them identify HCV5 and HCV6. In this regard, the communities would require some initial training to help them to develop an understanding of HCVs and how they can be identified. Resourcing will also be required, as well as some sort of mentoring or assistance to make sure that the assessment stays on process and that the understanding of HCV's is ensured throughout. There should also be consideration given as to whether the communities might be asked to identify any other categories of HCV. Nature United would need to think about whether there should be separate processes undertaken for individual communities or groups of communities, or whether a regional assessment involving all communities would work. Besides depending on regional community dynamics, a regional assessment would depend on whether the appropriate body can be created to ensure that the process is followed properly. Individual communities may be more readily suited to undertaking this level of exercise, however this would lead to a proliferation of individual projects which may not be feasible to oversee and /or resource.

Expectations will also need to be discussed with the communities. Some values collection exercises involve extensive interviews with elders and other experienced members of the community, and then transcribing and mapping the values. Any process such as this would be very expensive and take a considerable amount of time to complete, and is unlikely to be acceptable to Nature United for these reasons. Access to GIS is a consideration; it is not known how many communities have access to mapping tools however this would seem to be a pre-requisite for a successful HCV assessment process.

A further consideration is ownership of the information that is collected. Typically, a data sharing or data ownership agreement is signed in circumstances where a community is engaged to collect information, and such would likely be the case in this situation. Typically, such agreements cover data ownership, use, storage, amendments, and dispute resolution, at a minimum.

The standard for HCV assessments, as is described in the guidance documents and in Annex 4 of the 2018 National Boreal Standard, includes use of existing documentation, maps, and records as well as input from the participation of local communities. Nature United may be able to play a role in the review of existing documentation, however the exact process would need to be spelled out with the communities. The provincial government and CKP should be kept in the loop, and perhaps invited to participate in a steering committee overseeing the HCV assessment process(es).

7.7 LITERATURE CITED

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