October 25, 2021

Assessing the Impact of Implementing FSC's Protection Measures for Intact Forest Landscapes in Canada

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Photo of Pic Forest taken by Jeremy Williams

Acknowledgements

The consultants would like to express their appreciation to the people who took time to be interviewed. We appreciated people's willingness to share their knowledge and insights – a list of those who were interviewed, their positions and affiliations can be found in Annex I of this report.

We would also like to acknowledge the foundational analysis that FSC Canada and its contractors undertook, especially the work of Chris Wedeles and Rick Tingey, in analyzing many aspects of Intact Forest Landscapes (IFLs) in relation to tenure, protected areas and caribou habitat. They have kindly allowed us to incorporate some of their analysis into this report.

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Executive summary

Through Motion 65, the Forest Stewardship Council® (FSC®) raised the profile and importance of protecting Intact Forest Landscapes (IFLs). IFLs are the last remaining large unfragmented forest areas, undisturbed by roads or other industrial infrastructure. Protection measures for IFLs are currently implemented in FSC®-certified forests and in IFLs located in non-certified forests where wood is sourced by FSC®-certified companies. This study has been undertaken on behalf of FSC® Canada to assess the economic, environmental and social impacts of protecting IFLs in commercial forests in Canada. Canada is a large diverse country; we were requested to focus on British Columbia, Ontario and Québec, which have large forest industries and numerous IFLs.

The consultants were mandated by FSC® Canada to undertake this study by reviewing literature, conducting spatial analyses, and interviewing a wide range of stakeholders. Interview subjects included representatives of forest companies managing certified and uncertified forests, provincial government staff, experts on Indigenous issues, environmental non-governmental organization (ENGO) representatives, and those involved in the recreation and tourism sectors (Annex 4 lists those who were interviewed and their affiliations). Due to project budget limitations and lack of information in the published literature, the assessment of social impacts focussed on forest sector employment.

For the purpose of this study, the forest managers of two non-certified Forest Management Units (FMUs) and 11 certified FMUs with IFLs (42% of the FSC®-certified forests with IFLs in Canada) were interviewed and asked to quantify the impacts of IFL protection on short- and long-term wood supply, wood costs, forest management costs, and employment. In this study, we considered the current forest management plan term to be the short-term time horizon, which would generally be within the next ten years. All managers were able to provide quantitative data on the impacts of IFL protection during the current term of their forest management plan, while longer-term impacts (i.e., impacts in subsequent plan periods) were estimated.

The majority of forest managers who were interviewed informed the consultants that in the short-term they were able to either harvest in IFLs in a manner that was consistent with FSC® requirements, or they were able to manage in such a way so as to avoid harvesting in IFLs. As a result, compliance with IFL requirements did not affect the present wood supply. The exception was one forest manager who reported that the protection measures for sourcing-controlled wood in an FMU where IFLs were present was reducing the current wood supply.

The protection measures for IFLs do not affect the annual allowable cut (AAC) because the provincial and territorial governments set the ground rules for AAC calculations, and they do not recognize IFLs. Consequently, the IFL area that is eligible for harvest is included in the allowable harvest land base.

FSC®'s requirements for IFL protection had a negligible to minor impact on the current costs of timber, but none of the managers had analyzed the cost impacts in any level of detail. Some managers stated that they had to build more road to access timber and that there were additional administrative costs associated with tracking the source of timber and ensuring compliance with FSC® requirements. Based on our interviews, which yielded very consistent results, we concluded that for the majority of certified forests, protection of IFLs results in very minor negative economic impacts for the forest industry in the short-term. Impacts over the long term might be more significant, as we will see below.

The study team did not undertake any wood supply analysis to assess the impacts of IFL protection. To our knowledge, as confirmed during interviews with forest managers, no one has done a robust analysis of the future impacts of protection of IFL on wood supply. Our assessment relies on the information shared by forest managers. They all felt that within 5 to 20 years, the impacts on wood supply would become more pronounced. For licensees in Ontario and Québec, their best estimate was that continued conservation of IFLs would reduce the long-term wood supply by an amount roughly proportional to the percentage of the available land base occupied by IFLs. Current IFL protection covers on average 25%, 16% and 19% of the land base in BC, Ontario and Québec, respectively. These numbers are disproportionately influenced by a small number of FMUs with a high proportion of IFLs. By removing the three FMUs with the highest proportion of IFL in each province, the proportions fall to 18%, 9% and 13%. This analysis is not relevant for volume-based Timber Supply Areas in BC and was conducted for only Tree Farm Licences (TFLs).

To provide additional insight, we assessed the overlap of IFLs with areas that are already protected and with areas where harvesting is constrained. Our study shows that much of the IFL area is already protected and/or unsuitable for harvest because these are low productivity areas or steep slopes. In BC 65% of the IFL area is either protected or has a constraint that makes harvesting unlikely. The analogous figures are 46% and 52% in FMUs in Ontario and Québec, respectively. Due to the fact that in those two provinces the actual harvest for softwood is historically below the AAC, theoretically with the permission of the provincial government, in FMUs where IFLs impact supply, there could be opportunities to compensate by sourcing wood outside IFLs in other neighbouring FMUs. Based on the fact that the overlap between IFLs and FMUs is in most cases minor and that a large proportion of the IFLs in an FMU are either inoperable or are already protected from harvesting, we conclude that long-term economic impacts should be modest in the majority of FMUs but could be significant in a minority of FMUs where harvest blocks are planned in IFLs in the current management plan or because IFLs represent a large proportion of the land base available for future harvest. In certified forests, if IFL protection requires a reduction of the harvest levels without an alternative supply, protection could represent a revenue loss for companies, forest workers and communities. Interviewees were also asked to assess the impacts under three levels of IFL protection – 80%, 50%, and 30%; impacts were generally felt to be proportional to the level of protection.

None of the forest managers interviewed cited any economic benefits associated with IFL retention. However, some managers spoke in general terms of the benefits of FSC® certification that permitted them to access markets for their products, especially pulp and paper products.

A number of forest managers expressed frustration with the requirements for identifying IFLs and complying with FSC® requirements. Technical questions arose regarding IFL delineation, including how bottlenecks and road impacts on IFLs are assessed. Managers noted that IFL boundaries are based on remote sensing and may include areas that were harvested decades ago and appear undisturbed in remote imagery. Many managers advocated for opportunities to create new intact areas after operations were complete by decommissioning roads and pulling bridges. Consultants found that there would be stronger support for higher levels of IFL protection if managers could "restore" intactness to areas, especially those adjacent to IFLs.

IFLs provide ecological benefits by retaining remoteness and intactness. Maintaining intactness prevents fragmentation of the landscape through road construction, limiting hunting, and avoiding losses, or at least changes, to forest composition brought about by timber harvesting. This helps maintain biological diversity and species at risk habitat, most notably woodland caribou habitat. Because caribou is very sensitive to human presence and disturbance, maintaining large intact areas within their ranges benefits them. IFLs are additional to existing land use designations such as parks, conservation areas, and caribou zones, and many forest managers downplayed the value of intactness. A clearer definition of the ecological values that IFLs are meant to protect would permit the delineation of IFLs in a manner to protect such values.

IFLs were viewed as providing carbon benefits by interviewees in the environmental community. Because these areas are undisturbed, substantially greater amounts of carbon will normally have accumulated in the soils and dead wood pools than are present in managed forests. Others, including most forest managers and provincial government staff, were more skeptical of the carbon benefits. They contended that IFL areas are likely to experience natural disturbance, since the boreal forest is strongly influenced by large disturbances. In any case, IFL conservation holds the promise of yielding carbon offsets that may provide an additional revenue stream to forest managers; there is also the promise of additional revenue streams from the provision of ecological services from IFLs.

Our interviews related to the social impacts focused on concerns expressed by Indigenous people because a large number of communities are located in proximity of IFLs. The majority of the Indigenous people we spoke with were fundamentally opposed to the way IFLs were presented and implemented and have advocated for recognition of an alternate landscape level approach – adopted by FSC® as Indigenous Cultural Landscape (ICL) – that is more consistent with their values. Currently, the measures to protect IFLs are implemented without the free, prior, informed consent of the affected communities because Advice Note 18 does not require it. However, Motion 65 clearly requires FPIC to be achieved for IFL protection measures. Moreover FSC®-GUI-30-010 V1-0 EN Intact Forest Landscapes Guidance for Forest Managers came into effect in 2020 and provides clearer guidance for identifying, managing and monitoring IFLs, including provisions around FPIC. The incorporation of FPIC is a matter that needs to be addressed by FSC® Canada during the development of the IFL protection measures.

Some other social impacts are correlated with wood supply, and since there were no wood supply reductions caused by IFLs on most certified forests during the current plan period, there is no impact on employment, royalties and social services. There are several social impacts that have not been addressed as part of this study because they are considered to be outside the scope of the study. The gaps in addressing social impacts should be considered in future work.

Provincial governments see FSC®'s IFL requirements as an unwarranted intrusion into land-use planning, a provincial domain, and no provincial or territorial government confers official recognition of FSC® IFLs. This is of particular importance because the long-term preservation of IFLs, including IFLs outside certified forests, can only be achieved in collaboration with the provincial governments. At present, there are no subsidies or other incentives in place to encourage the retention of IFLs aside from overlapping requirements for the protection of woodland caribou habitat. In developing measures for protecting IFLs, FSC® will work with Indigenous groups, forest companies, local communities, forest workers, environmental groups and governments to build support and work towards consistent implementation of requirements.

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Introduction

Through Motion 65 – Conservation Value 2 (HCV2) – Intact forest landscapes protection – passed at the 2014 FSC General Assembly with 95% support of FSC delegates, the Forest Stewardship Council (FSC) raised the profile and importance of protecting Intact Forest Landscapes (IFLs). IFLs are the last remaining large unfragmented forest areas, undisturbed by roads or other industrial infrastructure, in which there has been no industrial harvesting in the past 30-70 years.[1] Canada is among the countries that are fortunate to have substantial areas of IFLs.

A frequently-used methodology to delineate and track IFLs was developed by a group of experts from the University of Maryland collaboratively with NGOs.[2,3] They completed global assessments of IFLs in 2000, 2013 and 2016. The 2016 IFLs are shown in Figure 1; they total 285 million ha, representing approximately 80% of Canada's forest area. Most of the IFL area is located outside of the commercial forest zones, either in the far north or in rugged and difficult to operate areas of British Columbia. The area of IFLs located within managed forests is 65.8 million ha, or 23% of all IFLs; however, this figure is skewed by challenges in assessing the amount of IFL area in managed forests in BC. If the Timber Supply Areas in BC are excluded, approximately 10% of the IFL area is located within forest tenures.

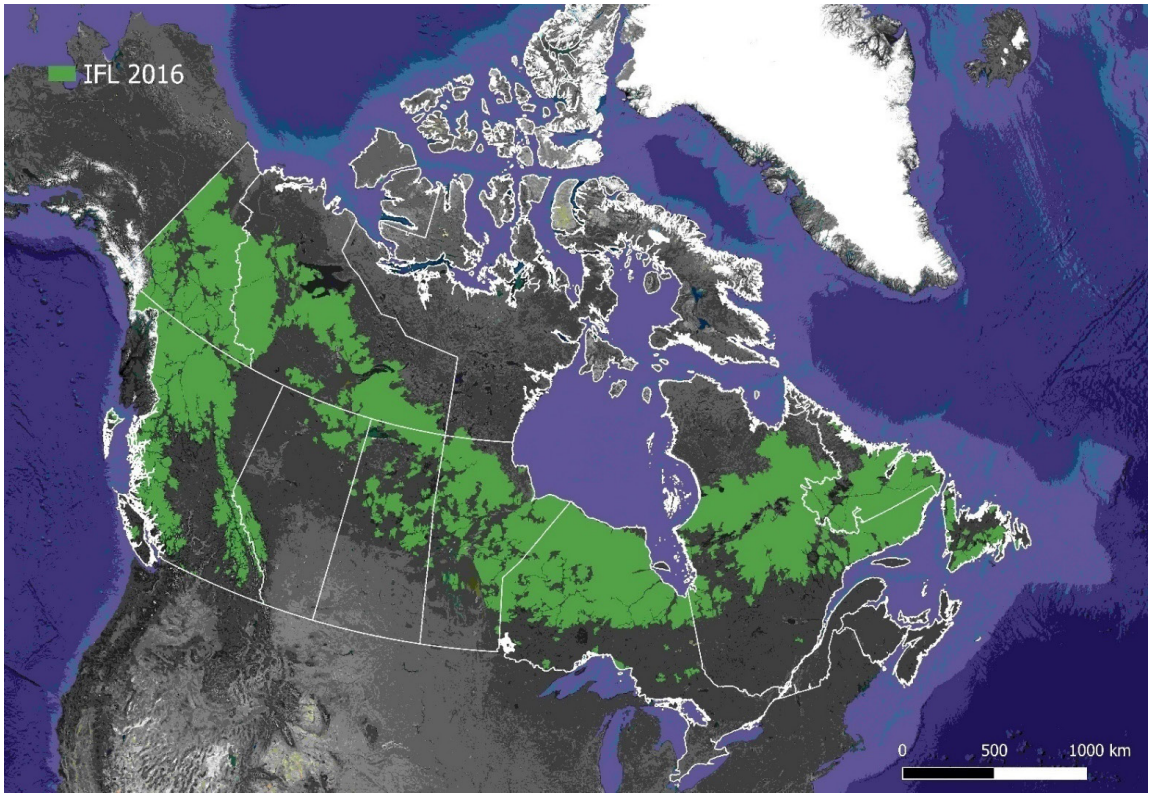

Figure 1. IFLs in 2016 in Canada (green).

1 FSC. 2021.Intact Forest Landscapes. Internationalhttps://fsc.org/en/for-forests/intact-forest-landscapes. (Accessed: February 2021)
2 Potapov, P., A. et al. 2008. Mapping the world's intact forest landscapes by remote sensing. *Ecology and Society* 13(2): 51. [online] URL: http://www.ecologyandsociety.org/vol13/iss2/art51
3 There are somewhat different methodologies for delineating IFLs; for example, the controlled wood direction differs somewhat from the direction provided for forest management.

Motion 65 (shown in Annex 1) stipulated that if suitable indicators for IFLs had not been developed by the end of 2016, a set of default measures would be applied. Motion 65 explicitly requires that the principles of Free Prior and Informed Consent of Indigenous Peoples be respected in this process. FSC Advice Note ADVICE-20-007-018 V1-0 set out the following interim direction: Harvesting and road-building may not impact more than 20% of the IFL area within a management unit and cannot reduce any IFLs below the 50,000-ha threshold. The Advice Note is effective until national indicators for Motion 65 become effective. FSC Canada released a new National Forest Stewardship Standard (NFSS) in June 2019, however it did not include indicators for IFLs. While FSC Canada continues to work on aligning direction on IFLs with Version 2 of the International Generic Indicators, the interim direction applies today on FSC-certified forests. FSC chain-of-custody certificate holders sourcing from IFLs outside FSC certified forests are required to implement measures to protect IFL threatened by forest management i.e., specified risk IFLs[4].

The presence of IFLs on FSC-certified forests represents another constraint on wood supply when the IFL area includes merchantable forest that would otherwise be available; applying the protection measures required by FSC represents a complex challenge that forest managers must resolve to maintain/obtain certification. In recognition of the challenges posed by conserving IFLs, FSC Policy Motion 34 (shown in Annex 2) calls for national FSC organizations to undertake a more detailed and systematic assessment of the short-term and long-term positive and negative impacts associated with the protection of IFLs. That is the objective of this project. More precisely, the objective is to assess the economic, environmental, and social impacts of implementing IFL protection measures in certified forests of Canada. The motion states: "Particular effort will be made to ensure the inclusion of impacts on Indigenous Peoples, traditional peoples and forest dependent communities in these assessments." Annex 2 also includes the guidance issued by FSC International for implementing Motion 34.

FSC Canada established the following requirements for this project, as well as stipulating that the project should address the Motion 34 requirements:

1. Collect and analyze data on the economic impacts for forests with IFLs;
2. Collect and analyze other stakeholder and member perceptions and experiences of impacts;
3. Survey literature for relevant data; and
4. Analyze inputs identifying trends and outcomes in an Impact Assessment Report.

FSC International also instructed the consultants to emphasize the economic impacts of IFL protection related to harvest reductions or cost impacts on forest companies. The economic impacts are generally considered to be in opposition to the ecological impacts, which is the perspective that the concept of "sustainable development" was intended to disrupt but has had limited success in doing so to date. The consultants note that economic impacts are felt by trappers, tourism operators, providers of recreation opportunities and others; however, little relevant information in these areas was found for this study. The climate change crisis has led to the recognition that stored carbon and carbon sequestration has an economic value, while carbon emissions represent a cost. Carbon pricing systems have made this clear and, accordingly, the carbon impacts of IFLs are discussed separately from other economic impacts, since carbon and climate change have strong economic and environmental dimensions. Some social impacts were identified in this review, including those associated with Indigenous peoples and those linked to wood supply, including employment and royalties.

4 FSC International Center. 2021. FSC National Risk Assessment. https://ca.fsc.org/preview.national-risk-assessment-for-canada-fsc-nra-ca-v1-0.a-2392.pdf (Accessed: February 2021)

2. Methodology

Our findings are reported in separate sections for economic, environmental, carbon/climate and social impacts. To identify and evaluate potential impacts, we reviewed literature, conducted GIS analysis and interviewed stakeholders and knowledgeable Indigenous people.

2.1 GIS ASSESSMENT

IFLs have been tracked globally by an IFL mapping team[5] since 2000 using satellite imagery. Maps of IFLs are publicly available for years 2000, 2013 and 2016. FSC Canada had done some valuable background work that provided statistics reported in our study, based on the 2016 layer of IFL. We used this same 2016 IFL data to conduct additional analysis using publicly-available government (federal and provincial) spatial information.

2.1.1 Harvestable area in IFLs

As part of this study, we made a high-level estimate of the area that could potentially be harvested inside IFLs for forest management units in British Columbia, Ontario and Québec. We mapped IFL areas that are incompatible with harvesting, such as treeless areas, unproductive forests, water bodies and steep slopes. To do this, we overlaid the 2016 IFLs on forest management units (FMUs) in British Columbia (Timber Supply Areas and Timber Farm Licences), Ontario and Québec. We also used the protected and conserved area database,[6] water bodies database buffered 20 meters,[7] topographic map to derive steep-slopes (≥30 degrees), and above ground biomass (AGB) to identify areas with less than 40 tonnes of carbon per hectare. For spruce 40 tonnes C/ha represents 20 merchantable m3/ha in BC (for the Montane Cordillera Ecozone), 10 m3/ha in Ontario and 21 m3/ha in Québec.[8] This is very conservative in all provinces. For example, in Québec, the government considers all forest areas that cannot produce 30 m3/ha as unproductive.[9] The area with low AGB also includes recently naturally disturbed areas that are productive. This should not change our interpretation of the results because naturally disturbed areas also reduce sustainable harvest levels.

5 Intact Forest Landscapes. 2017. http://www.intactforests.org/team.html (Accessed: February 2021)
6 Government of Canada. 2020. Canadian Protected and Conserved Areas Database: https://www.canada.ca/en/environment-climate-change/services/national-wildlife-areas/protected-conserved-areas-database.html (Accessed: February 2021)
7 Government of Canada. 2016. Lakes and Rivers (polygons), Boundary files - 2016 Census: https://open.canada.ca/data/en/dataset/d0cdef71-9343-46c3-b2e7-c1ded5907686 (Accessed: February 2021)
8 Canada's National Forest Inventory. 2016. Merchantable Stand Biomass Calculator https://nfi.nfis.org/en/biomass_stand_merch (Accessed: February 2021)
9 Direction des inventaires forestiers (DIF) du Ministère des Forêts, de la Faune et des Parcs (MFFP). 2016. Norme d'inventaire écoforestier : placette-échantillons temporaires. https://mffp.gouv.qc.ca/publications/forets/connaissances/Norme-PET.pdf (Accessed: February 2021)

2.1.2 IFLs and Indigenous Peoples' lands

The Canadian Constitution recognizes three Indigenous Peoples: First Nations, Inuit and Métis. We used available data to map the land that is officially recognized by the Government of Canada as belonging to Indigenous Peoples, as well as lands that are covered by treaties. These data include:

a. Aboriginal lands of Canada,[10] including Indian Reserves, Land Claim Settlement areas and recognized Indigenous Peoples lands (officially "Indian Lands");

b. Pre-1975 treaties (historic treaties);[11]

c. Post-1975 treaties;[12] and

d. First Nations' administrative office addresses as they are registered in Indigenous Services Canada (ISC)[13]. These are point locations which we buffered using a 150km and a 300km radius.

2.1.3 IFL loss after 2016

We analyzed the loss of IFLs between 2016 to 2019 using the 2016 IFL layer as a baseline. To identify the anthropogenic forest loss in IFLs, we used 2019 forest cover change data from Global Forest Change.[14] To eliminate natural disturbance as a cause of forest loss, we subtracted forest loss caused by fires based on the Canadian National Fire Database.[15] We also removed all isolated pixels and patches of forest loss that were more than 1 km inside the IFL since they could not be anthropogenic given that there is no road access. The amount of forest loss remaining after these adjustments was increased with a 1km buffer and was considered to be IFL loss.

Finally, we checked if the spatial thresholds for IFLs were maintained, i.e., minimum area of 50,000 ha and minimum width of 10 km. Our methodology is consistent with the FSC Canada's guidance[16] to delineate the impact of IFLs, but it is a simplified method because we used a 1-km buffer uniformly around human caused disturbance and we did not verify bottlenecks. Bottlenecks are constrictions of an intact area to a width of less than 2 km. The IFL should not include any portions that are less than this width.[17] These approximations do not materially affect the reporting of the current trend.

10 Government of Canada. 2017. Aboriginal Lands of Canada Legislative Boundaries https://open.canada.ca/data/en/dataset/522b07b9-78e2-4819-b736-ad9208eb1067 (Accessed: February 2021)
11 Government of Canada.2012. Pre-1975 Treaties (Historic Treaties). https://open.canada.ca/data/en/dataset/f281b150-0645-48e4-9c30-01f55f93f78e (Accessed: February 2021)
12 Government of Canada. 2012. Post-1975 Treaties (Modern Treaties). https://open.canada.ca/data/en/dataset/be54680b-ea62-46f3-aaa9-7644ed970aef (Accessed: February 2021).
13 Government of Canada. 2016. First Nations Location. https://open.canada.ca/data/en/dataset/b6567c5c-8339-4055-99fa-63f92114d9e4 (Accessed: February 2021).
14 Hansen, M.C. et al. (2013). High-Resolution Global Maps of 21st-Century Forest Cover Change. Science (New York, N.Y.). 342. 850-853. https://science.sciencemag.org/content/342/6160/850.
15 Natural Resources Canada. Canadian National Fire Database (CNFDB)https://cwfis.cfs.nrcan.gc.ca/ha/nfdb (Accessed: February 2021).
16 FSC Canada. 2017. Interim guidance for the delineation* Intact Forest Landscapes (IFL). https://ca.fsc.org/preview.delineating-intact-forest-landscapes.a-2420.pdf (Accessed: February 2021).
17 Ibid. #15.

2.2 STAKEHOLDER INTERVIEWS

A key part of the information gathering phase of this project was interviewing a diverse group of knowledgeable people. The short- and long-term economic impact assessment relies mostly on information provided by forest managers. Table 1 shows the number of people contacted, by group, and the number of people interviewed. The forest managers listed as being FSC certified included those who access timber through the FSC Controlled Wood system, which requires the protection of IFLs. Interview guides for forest managers and other stakeholders and Indigenous people are provided in Annexes 3 and 4, respectively.

Group	Contacted	Interviewed
FSC-certified forest managers	15	11
Non-FSC-certified forest managers	5	2
ENGOs	8	7
Indigenous Representatives	8	3
Provincial Government	5	4
Other	9	4
SUM	**50**	**31**

Table1. A complete list of the people who were interviewed is provided in Annex 5.

In some of the interviews there were two or even three people from the same organization, and each of those people is included in the table below. So, the number of people interviewed exceeds the number of interviews conducted. Some of those interviewed could have been listed in multiple categories, especially Indigenous tenure holders, who were listed as forest managers rather than Indigenous representatives. Lastly, for some of the larger forestry companies, separate interviews were held with staff in Ontario and Québec since the companies are structured so that each province has a separate management staff. People in the "Other" category included trappers' associations, tourism and recreation outfitter organizations, forest industry associations, and university professors.

The interviews were open ended, based on a general interview guide that depended on which group the interviewee belonged to. We did more interviews with forest managers because assessing the economic impact was the primary focus of this study. The interviewees were pressed to some extent to list impacts and provide quantitative impact information, or at least to describe in detail the impact and its magnitude.

We recorded interviews on interview forms and compared the responses of participants. We listed the impacts reported by interviewees and grouped them when they were similar. Some participants provided data to support their informed perception. Most of the data was internal analysis by forest companies of the impact on wood supply of protecting IFLs and sources from the literature provided by stakeholders.

3. General Statistics Regarding IFLs in Canada

3.1 FOREST MANAGEMENT IN IFLS

The federal government and the provincial/territorial governments own approximately 92% of the total forest land base in Canada while 6% is private and 2% is owned by Indigenous communities and nations.[18] Private lands are mostly located in the south of the country and outside IFLs. This assessment is focussed on provincial lands (77% of the land base). While there are large IFL areas in the Yukon and Northwest Territories, there is very little commercial forestry. None of the operations there are FSC-certified.

The provinces administer their lands under frameworks that emphasize sustainability. Each province has its own customized approach related to planning and management. The provincial governments license the right to harvest timber to private industry and, sometimes, to communities, not-for-profit organizations and agencies, and First Nation entities. Licences can be granted on an area basis, giving the holders the right to manage and harvest certain tracts of land, or on a volume basis, meaning that licensees have the right to harvest specifically-allocated volumes of wood within a tract of land. In this report, we use the term forest management unit (FMU) to refer to large forest areas licensed for commercial forestry.

Figure 1 shows that the majority of IFLs in provinces occur in British Columbia, Manitoba, Ontario, Québec and Labrador and Newfoundland. The extensive exploration and drilling activity of the oil and gas industry has greatly reduced the amount of IFL area in Alberta and Saskatchewan, as well as in northeastern BC. The heavily settled smaller provinces – Nova Scotia, New Brunswick, and Prince Edward Island – no longer have IFLs.

Figure 2 illustrates the extent of FMUs in each province/territory, the area under FSC certification, and the area of IFLs within FMUs. Annex 6 shows a map of IFLs and FMU boundaries in Canada, Ontario and Québec, which have substantial pulp and paper sectors, have the highest FSC penetration, with 57% and 53% of their FMU area certified to FSC. In Alberta, 23% of the area under forest management is certified and for Canada as a whole, 22% of the FMU area is certified. Figure 2 also shows that Newfoundland and Labrador have little area under forest management. while Manitoba and the Yukon have forest managements areas with IFLs, but none are FSC certified.

In Figure 2, it is the area of Tree Farm Licences (TFLs) in BC that is shown as the FMU area. TFLs are the largest area-based tenures in BC; data for the other smaller area-based tenures were not readily available. Almost 80% of the timber harvest in BC comes from volume-based licences that are issued within Timber Supply Areas (TSAs); the province is divided into 37 TSAs. The TSAs include substantial non forest areas such as urban areas, agriculture lands, lakes, and treeless ecosystems such as alpine areas, as well as extensive areas of low productivity forest in the sub-alpine areas and productive forests on steep and rugged terrain that are inoperable. Accordingly, TSAs are not equivalent to FMUs in other provinces, or to TFLs, and they have been omitted from the overview data because it is difficult to include them in a way that is not misleading.

18 Natural Resources Canada. Statistical data. https://cfs.nrcan.gc.ca/statsprofile/ (Accessed: February 2021)

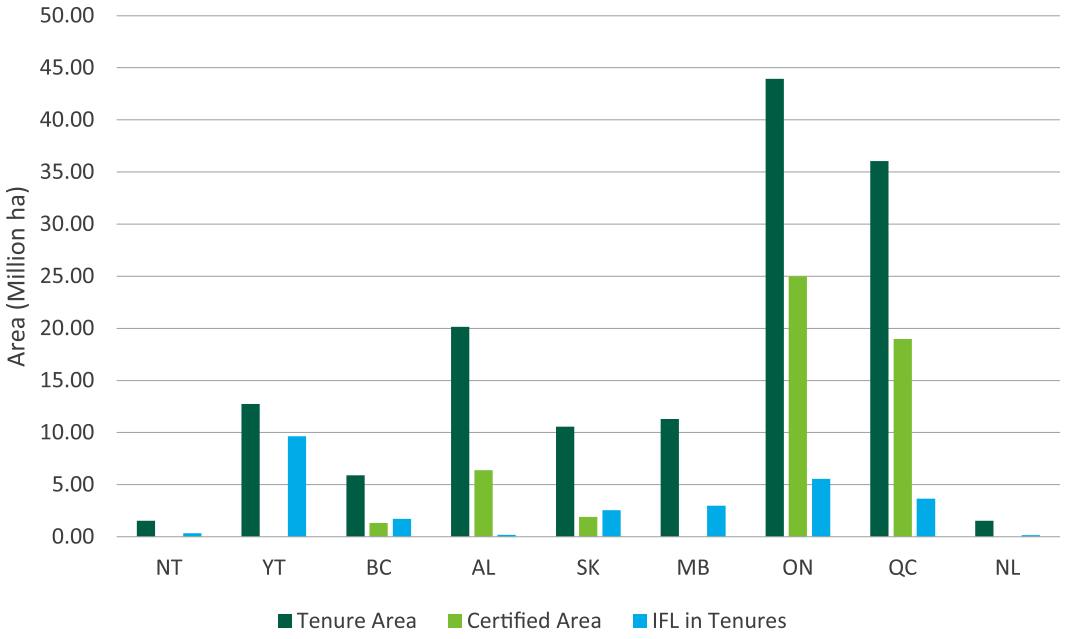

Figure 2. FMU and Certified Area by Province /Territory. NT – Northwest Territory, YT – Yukon Territory, BC – British Columbia, Al – Alberta, SK – Saskatchewan, MB – Manitoba, ON – Ontario, QC – Québec, NL – Newfoundland and Labrador

Table 2 provides some statistics regarding FMUs and IFLs in Canada. The Northwest Territories, the Yukon Territory, Nunavut, New Brunswick, Prince Edward Island and Nova Scotia are omitted for the reasons given above.

Province	IFL Area (Million ha)	# FMU	FMU with IFLs[a]	FMU area (Million ha)[b]	IFL Area in FMU (ha)[b]	Percentage of FMU in IFLs
Alberta	7.67	17	8	20.16	179,342	0.9
British Columbia – TFL	40.73	32	20	5.89	1,736,682	20.0
Manitoba[c]	28.76	2	2	11.16	2,933,011	26.3
Newfoundland	21.96	1	1	1.53	159,417	10.4
Ontario	47.20	40	26	40.35	4,424,581	11.0
Québec	54.08	59	22	36.16	3,649,073	10.1
Saskatchewan	10.84	8	6	9.75	2,455,948	25.2
TOTAL	**211.24**	**196**	**85**	**125.00**	**14,981,968**	**12.0**

Table 2. IFL Data from Selected Canadian Jurisdictions.

a. Includes all FMUs with overlapping IFLs
b. Excludes areas of tenures that are legally-regulated protected areas
c. Excludes Integrated Wood Supply Area (IWSA) in Manitoba

The area of FMUs in the selected jurisdictions amounts to approximately 125 million ha, and there is approximately 15 million hectares of IFL within FMUs, representing 12% of the FMU area and 7% of the total area of IFLs in these provinces. In BC, Table 2, as well as Figure 3, show statistics for Tree Farm Licences only. Timber Supply Areas are large areas where the province issues volume-based licences and the volumes available in IFLs are unknown.

Despite the relatively large amount of certified area in Ontario and Québec, Figure 3 shows that the proportion of IFL area within FSC-certified forests is very modest in those two provinces, as it is in all other provinces and territories. These results also show that the majority of FMUs that contain IFLs are not FSC certified and that the impacts of the protection measures have implications on the future growth in forest area certified to FSC.

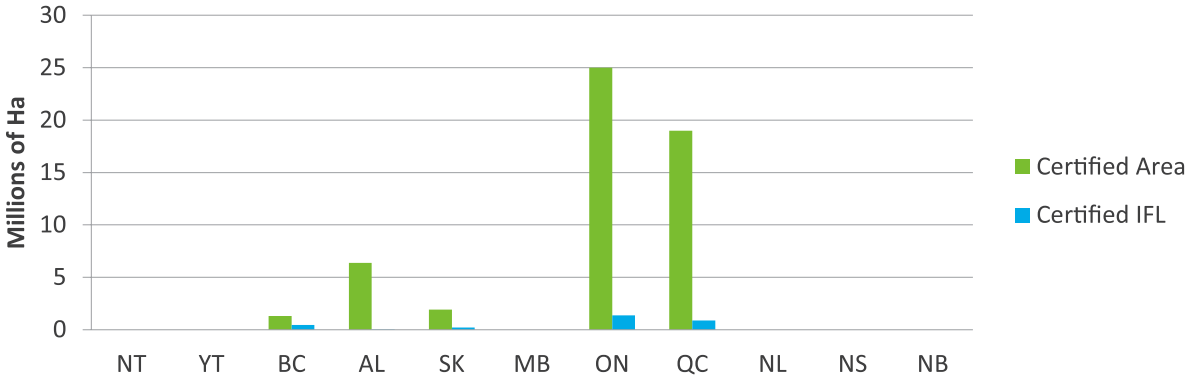

Figure 3. Tenured and Certified Area IFL Area by Province /Territory

In this assessment, we are primarily interested in IFLs that are within FMUs. Québec, Ontario and British Columbia have large areas of forest under management, a significant area of IFL within the managed forests, and a large proportion of FSC-certified FMUs. As a result, this report concentrates on these provinces, and reviews the circumstances in Alberta and Saskatchewan to a lesser extent.

3.2 CHANGES IN IFL AREA SINCE 2000

Table 3 shows the IFL loss between 2000 and 2019 in Canada. In total, we find that the total area of IFL has been reduced during this period by 20.7 million ha, or approximately 7%, mostly in areas beyond commercial forests. The annual rate at which IFLs are lost was slightly lower in the 2017 to 2019 period in comparison to the previous periods.

Period	Start Area (million ha)	End Area	Change (million ha)	Avg Annual Change	Annual %
2000-2013	303.9	289.8	14.1	1.08	0.035
2014-2016	289.8	286.2	3.6	1.2	0.040
2017-2019	286.2	283.2	3	1	0.006
2000-2019	303.9	283.2	20.7	1.08	

Table 3. Changes in IFL Area over Time (Million ha).

Figure 4 shows the location of IFL loss that occurred between 2000 and 2019 (in red). A significant proportion of the IFL loss occurred above the northern limit to commercial forestry while in the south, some of the losses represent IFLs that fell below the 50,000-ha threshold and so were no longer deemed IFLs by FSC (or Global Forest Watch). Between 2000 and 2016 natural disturbance was considered to be IFL loss. Between 2017 and 2019, we made best efforts to exclude natural disturbance from IFL loss, but it is likely that some natural disturbance has been captured in the IFL loss that we report. This will overestimate IFL loss. In the southern IFLs, loss is thought to have occurred mainly due to forestry. We did not evaluate the bottleneck threshold. This may underestimate IFL loss.

Figure 4. IFL Losses during three periods from 2000–2019.

4. General Assessment of the Economic Impacts on the Forest Industry (EC)

The forest industry is important to Canada's economy and it accounts for approximately 7% of Canada's total exports. In 2017 the forest industry contributed approximately $24 billion to Canada's economy.[19] Because these benefits occur in many northern communities, they are particularly important. Forestry generally contributes 1-2% to Canada's Gross Domestic Product and 12-13% of Canada's manufacturing GDP. More information on the socio-economic importance of forestry and trends in Canada is provided in Section 4.5.

As directed by FSC International, the economic impacts category consists solely of impacts on the commercial forest industry. Economic impacts may also be felt in tourism, recreation, trapping and non-timber forest products. The impact of protecting IFLs on these other forest-related activities is mostly related to the reduction of access, which is difficult to quantify in economic terms. Access reduction is discussed in the assessment of social impacts.

19 Natural Resource Canada. 2020. Forest Industry – National Picture. https://www.nrcan.gc.ca/our-natural-resources/forests-forestry/forest-fact-book/forest-industry-national-picture/21683 (Accessed: January 2021)

4.1 INTERVIEW RESULTS

Throughout our interviews, forest managers generally expressed similar concerns and, for clarity, we grouped their comments in Table 4 and linked them with specific economic impacts.

Specific impact	Comments made by interviewees on IFL protection measures economic impacts
Short term harvest area reduction (within the current plan period)	• For all those interviewed, except for one forest tenure-holder, current plan harvesting inside IFLs is below the allowable 20% threshold of IFL loss or has been reallocated outside IFLs with little impact on wood supply. • One forest tenure-holder reported significant impact on the wood supply in the current management plan. • See provincial descriptions - 4.2 British Columbia, 4.3 Ontario, and 4.4 Québec
Future harvest area AAC reduction (≥10 years in Ontario and British Columbia and ≥5 years in Québec)	• Companies do not have the authority to remove IFL areas from their AAC land base. The company's "FSC tool box" is limited to applying deferrals, altering harvest scheduling, proposing candidate areas for conservation, etc. Portions of IFLs are excluded from the AAC by the province where there are other constraints such as protected areas. • Respondents noted portions of IFLs are already protected by constraints such as parks, woodland caribou habitat, HCV, Indigenous values and other land use considerations. • If harvest in IFLs is precluded, wood supply impact will be significant in some FMUs. • In forest tenures where future impacts are perceived as significant by forest managers, IFLs generally cover a large portion of the tenure and represent a large proportion of the medium-term available harvest. • In some forest tenures, protecting IFLs is perceived as having a lower long-term impact because they are mostly unproductive or protected for other constraints. • IFLs cover most of the part of one forest tenure discussed during interviews. The current protection measures in FSC would preclude harvesting the majority of the tenure. If the current IFL protection measures were implemented, forestry would not be viable in the long term in this tenure. • The impact of IFLs needs to be considered cumulatively with other constraints such as caribou protection, identification of new protected areas on provincial land, etc. • See provincial descriptions - 4.2 British Columbia, 4.3 Ontario, and 4.4 Québec
Increase cost of wood supply	• Managing controlled wood sourcing and meeting FSC certification standards increase administrative costs. • Respondents reported that IFLs cause road network expansion for harvesting across disbursed smaller patches. In Québec average road construction costs amount to approximately 9$/m3[20] and one Ontario forest manager cited costs of between $50,000 and $90,000 per kilometre of primary road.
Removal of high productivity short haul areas from harvest	• Respondents urged flexibility to focus on protecting IFLs in less productive forest areas • Distance to the mill is a major consideration – IFLs far from mills have a low impact on wood supply
Volume loss due to natural disturbance inside IFLs	• Within forestry regulations and FSC rules, some salvage is allowed in natural disturbances - this volume compensates for other FSC constraints • Within IFLs the area cannot be salvaged resulting in volume loss
Increased uncontrolled access by other (non forestry) industrial users	• Other industrial sectors (mining, energy) require access roads within IFLs. Some projects may not be viable; for example, exploration for mining if forestry roads are not present. Otherwise, they may create access roads. • In most provinces, forestry roads are regulated, planned and can be removed or access restricted. • Canadian forest managers have little control over access into IFLs for non-forestry users
Inability to restore IFLs	• A number of respondents commented that harvested areas can recover to a reasonable quality of IFL; companies would like to be able to restore IFLs but FSC rules prevent this. • Restoration could mitigate other economic and AAC impacts. • Restoration would improve the perception of companies' role in management and differentiate FSC.

Table 4. Comments received during interviews with stakeholders grouped under economic impact categories.

20 GROUPE DDM, 2020. Enquête sur les couts d'opération forestière dans les forêts du domaine de l'État ainsi que sur les couts et revenus de l'industrie du sciage du Québec 2019. Rapport présenté au ministère des Forêts, de la Faune et des Parcs, 23 p et annexes.

Table 4 shows that the perceived economic impacts are diverse and include volume loss and, in some cases, additional roads and transportation and administrative costs. Interviewees, mostly forest managers, did not perceive economic advantages from the protection of IFLs. In the short-term, IFLs had little impact on wood supply in most FMUs. In the long-term the impact is perceived as significant mostly because IFLs reduce the supply area inside FMUs. However, a portion of many IFLs resides in parks and other reserves where forestry is not allowed, nor are they are inoperable or unproductive areas – these portions of an IFL were already excluded from the wood supply and so do not impose wood supply constraints.

As part of the interviews, we asked forest companies about the impact of various thresholds for IFL protection in Canada. Forest companies have not analysed the impacts of these thresholds. As a result, these interviews did not provide specific data regarding the impacts associated with 80%, 50% or 30% thresholds of protection. The results of our study describe the impacts of the 80% protection threshold in comparison to a no-IFL scenario (0% IFL protection). We can safely assume that the economic impacts of IFLs would decrease as the protection requirements were reduced.

4.2. IMPACTS ON WOOD SUPPLY IN BRITISH COLUMBIA

There are 22 million ha of managed forest in BC.[21] The forest management model is a unique mix of area-based and volume-based licences. The area-based licences are primarily Tree Farm Licences and there has been an expansion over the past twenty years in the area allocated to Community Forests. Woodlot Licences are small area-based licences and the province recently introduced First Nations Woodland Licences, which are also area-based.

The volume-based portion of the harvest is managed through Timber Supply Areas (TSAs); the entire province has been divided into 37 TSAs containing productive forest land referred to as the Crown Forest Land Base (CFLB). Harvesting is allocated in available and accessible parts of the CFLB known as the Timber Harvesting Land Base (THLB). The THLB excludes areas that are not compatible with forestry such as urban areas, agriculture, and infrastructure. BC is a mountainous province and a large proportion of the land base is either non-forest (typically alpine areas), low-productivity forests, or productive but inoperable due to the ruggedness of the site. BC also has many parks, conservation reserves, and other forms of protection[22] that fully or partially limit timber harvesting inside IFLs. The provincial Chief Forester determines an AAC in operable forests and allocates areas on a regular basis, and a variety of companies and other entities, such as BC Timber Sales, are issued licences to harvest blocks within the THLB.

The volume-based nature of much of the BC tenure has proven to be a major obstacle to FSC certification in the province, with the result that there are only two FSC forest management certificates in the province. Interviewees also suggested that the low level of FSC-certification is partially due to the prohibitive level of difficulty of being compliant with the BC regional standard, which preceded the 2019 national standard.

21 Gilani and Innes. 2020. The state of British Columbia's forests. A global comparison. Forests 11(3): 16. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjT19mKkpfvAhWtUt8KHf4CBzcQFjADegQIARAD&url=https%3A%2F%2Fwww.mdpi.com%2F1999-4907%2F11%2F3%2F316%2Fpdf&usg=AOvVaw3kseEwHNEh-G0oLOsIY40TC

22 FSC Canada. 2018. FSC National Forest Stewardship Standard of Canada. https://ca.fsc.org/preview.fsc-std-can-01-2018-en-v1.a-2364.pdf

During our interviews with BC forest managers, we asked if they could quantify short-term and medium-term impacts of IFL protection on harvest volumes. One BC respondent commented that because of the high bar originally set by the FSC BC standard, IFLs were not a significant impact. They had already set aside significant lands in doing their HCV assessments and for meeting other constraints associated with the standard. They also commented that new wood supply commitments by government to Indigenous forestry programs were placing additional strain on the already tight AAC.

Forest Management Unit	FSC Certified	FMU Area (ha)	IFL Proportion[a]	Current impact on wood supply (<5 years)	Medium/long term impact on wood supply (>5 years)
Tree Farm Licence 14	Yes	150,931	0.42	No impact as Canfor's operating area is much larger than the TFL and company can work around IFL	Unknown
Tree Farm Licence 60	Yes	198,514	0.02	No impact as the company can work around the IFLs.	Negligible

Table 5. IFL proportion in Forest Management Units in BC and their impact on wood supply.

a. Proportion of FMU area identified as IFLs based on GFWI spatial dataset

IFLs are in all TSAs in BC and in several TFLs of the two primary forest regions – Coastal and the Interior. There are no studies that quantify the short- or long-term impacts on the AAC of protecting IFLs. As elsewhere, IFL protection measures are perceived as an additional constraint that could reduce the wood supply. As part of this study, we conducted a landscape analysis to assess the presence of constraints in IFLs using available geodata. We conducted the analysis using polygons of TSAs that include the TFL areas. Consequently, IFLs overlapping with TFLs are also captured in our results. Table 6 shows that 65% of IFLs are either protected, low productivity stands, or inoperable in BC. This is an indication that the short- and long-term impact of protecting 80% of IFL area would be low in most of BC.

Constraints to harvesting in IFLs	Area (ha)[a]	Proportion of IFL (%)
IFL average area in TSAs	2,228,064 ± 3,992,634	N/A
Protection areas	685,011 ± 1,091,136	30.1%
Water bodies and 20-meter buffers	20,446 ± 72,724	0%
Steep slopes (≥30 degrees)	351,566 ± 498,985	15.8%
Unproductive or treeless (AGB ≤40 tonne C/ha)	375,582 ± 921,557	16.8%
Total protected, inoperable, or low productivity	**1,431,584 ± 2,429,706**	**64.5%**

Table 6. Constraints in IFLs areas in TSAs of British Columbia

a. Average area ± standard deviation for all TSAs with more than 10,000ha IFLs.

Figure 5 shows that constraints cover the majority of IFLs in all TSAs. We found that 65% or more of the IFL area is not suitable for harvest in 26 out of 37 TSAs with ≥10,000 ha IFL. This suggests that protecting 80% of IFLs will have a limited impact on AAC in most areas because the IFLs are largely not suitable for harvest. However, TSAs such as Prince George and Boundary, have much more suitable forest for harvest in IFLs and the protection measures could have a more significant impact on the wood supply in these TSAs.

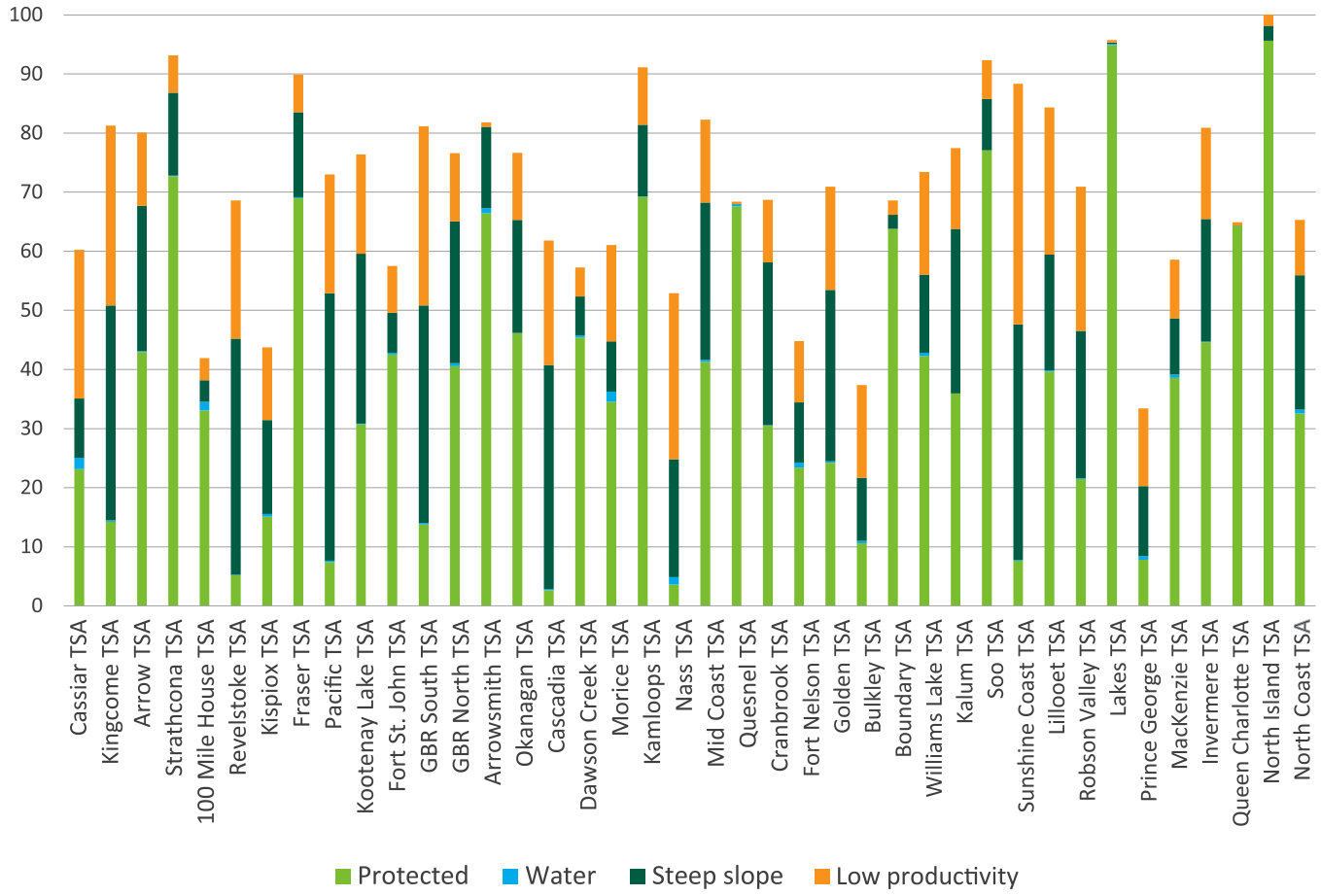

Figure 5. Proportion of unsuitable area for harvest in IFLs on TSAs in BC.

SUMMARY OF ECONOMIC IMPACTS IN BRITISH COLUMBIA

- Many BC IFLs have little area suitable for harvesting; protection measures for IFLs will have a marginal short-term or long-term impact on wood supply. A few TSAs with relatively high amounts of available forest in IFLs could be more significantly impacted.
- IFLs are likely not a significant obstacle to FSC certification in BC; the lumber orientation of the BC sector and the large amount of volume-based tenures are more significant obstacles.

4.3. IMPACTS ON WOOD SUPPLY IN ONTARIO

Roughly one-half of Ontario's 1.076 million sq km^2 is forested and a total of 43.94 million ha are covered by FMUs. The majority of the province's 40 FMUs are licensed to forest companies through Sustainable Forest Licences (SFLs), which also contain within them federal and private land, as well as an assortment of parks and reserves (technically these lands are not included in the licensed area). SFL-holders prepare Forest Management Plans that yield an area-based AAC. The land base used to calculate the AAC consists of provincial land that is deemed to be available for timber harvesting; however, substantial proportions of the AAC land base have low levels of productivity, undesirable species, or are uneconomic to harvest. As a result, even though the harvest on most FMUs is between 40 and 60% of the AAC, the gap between the AAC and the actual harvest does not represent the extent of surplus wood supply.

Twenty-six of Ontario's 40 FMU's have IFLs. The IFLs in the northern FMUs tend to be located at the northern edge of the FMU – that is, the most distant and/or least accessible forest. IFLs located further south are sometimes clustered around protected areas and sometimes consist largely of distant and low productivity forest, or forest interspersed with bog and other types of non-forest areas. Figure 6 shows the area of each of those 26 FMUs divided between IFLs and non-IFLs.

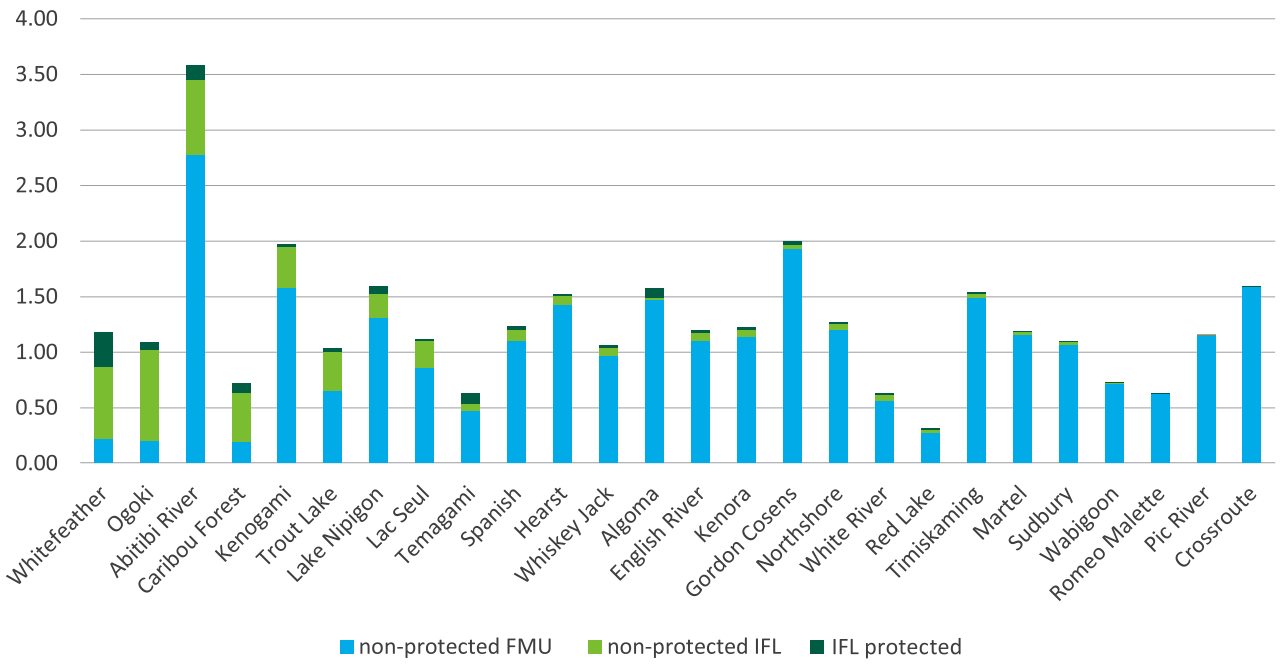

Figure 6. FMU area by IFLs and protected area status.

Figure 6 shows that in most forests with significant IFLs, relatively little of the IFL area is protected. These tend to be the northern FMUs. Of the ten FMUs with the greatest amount of total IFL area (i.e., Whitefeather to Spanish Forests inclusively), only the Abitibi River Forest is FSC certified. In contrast, 11 of the 16 remaining forests are FSC-certified.

Table 7 groups the FMU's in Ontario according to the amount of non-protected area that is IFL. Only one of the nine forests with more than 10% of its non-protected area in IFLs is FSC certified, while seven of the nine forests with less than 5% (but not zero) area in unprotected IFLs are FSC certified. Half of the forests with no IFL area are FSC-certified. The lack of certified forests with high proportions of IFL area may suggest that IFLs are a disincentive for FSC certification. While forest managers did not specifically say that the FSC provisions for IFLs were a deterrent to certification, there appears to be a very strong correlation between amount of IFL area present and whether a forest is FSC certified. Forests with high proportions of IFL area are likely able to harvest a substantial area within IFLs while meeting FSC's requirements. The consultants are aware that many of the FMUs with high proportions of IFLs are located in the north of Ontario's commercial forestry zone, and harvest levels are generally very low in these forests. Given the low harvest levels, FSC certification may be seen as having little benefit relative to its cost, especially for those forest managers who are focussed on solid wood products. It may be that the forests most affected by FSC's IFL requirements are those where IFLs make up 10-20% of the available forest area – there may be too much IFL to manage but too little for much harvesting in them to be allowed.

Percent of Non-Protected Area in IFL	# FMUs	# FMUs FSC certified
Zero	14	7
0.1 – 5%	9	7
5.1 – 10%	8	3
10.1 – 20%	3	0
20.1 – 50%	3	1
Above 50%	3	0

Table 7. Number of FMUs by Percent of Unprotected Area in IFLs.

During our interviews with Ontario forest managers, we asked them to quantify short-term and long-term impacts of IFLs on volumes. The impacts that they reported are described in Table 8.

Forest Management Unit[a, c]	FSC Certified	FMU Area (ha)	IFL Proportion[b]	Current impact on wood supply (<10 years)	Medium/long term impact on wood supply (>10 years)
Whitefeather Forest (2012-2022)	No	828,314	0.80	No impact as there has been very little harvesting to date	Unknown
Caribou Forest (2008-2018)	No	629,566	0.729	No impact. Net planned road and harvest of 26,943 ha within IFL in the current plan period.	Uncertain but expected to be significant.
English River Forest (2009-2019)	No	1,093,076	0.077	No impact. Net planned road and harvest of 1,189 ha within IFL in the current plan period	Uncertain – likely in line with IFL proportion
Martel Forest (2011-2021)	Yes	1,191,274	0.028	No impact. No harvesting is planned in IFL.	IFLs contain 1.5–4 years of harvest volume.
Gordon Cosens Forest (2010-2020)	Yes	1,855,201	0.035	No impact. Majority of IFL is in a bog complex; some harvesting is planned during current plan period.	IFLs contain 6–7 years of harvest volume.
Spanish Forest (2020-2030)	No	1,226,452	0.11	Significant impact. The reduction is 4,860 ha with the current controlled wood measures. The reduction would be 7,987ha in the current FMP if the Spanish forest were FSC certified because the protection measures would apply to all IFLs instead of applying to the 'Specified Risk' IFLs under the controlled wood measures.	Significant impact. The total IFL area in Spanish forest is approximately 129,703 ha. As always, the future impact on the AAC will depend on how much area is eligible for harvest (minimum operable harvest age) outside IFLs however the impact is potentially significant because the IFL area is mostly unprotected productive mature forest.
Temagami Forest (2020-2030)	No	634,529	0.25	Negligible short-term impact. Harvesting allocated inside IFL are below the 20% threshold.	Medium impact. The IFL overlapping the forest is large and little of it has been impacted. More than half of it is protected area.
Romeo Malette Forest (2009-2019)	Yes	611,731	0.003	No impact	Loss of a few months of harvest
Sudbury Forest (2020-2030)	Yes	1,098,356	0.027	Would have allocated more IFL area if it were unrestricted; allocated area elsewhere	Expected to be in line with IFL proportion of Crown land, or 2.7%.

Table 8.The IFL proportion in Forest Management Units in Ontario and their impact on wood supply.

a. Management Units are those whose managers were interviewed by consultants)
b. Proportion of FMU area identified as IFLs based on GFWI spatial dataset
c. Most recent 10-year planning period.

To better understand the long-term implications of protecting IFLs, we assessed the presence of constraints to harvesting within IFLs. Table 9 shows that 46% of IFLs are either unproductive or inoperable in Ontario. This suggests that a significant proportion of IFLs are already excluded from the wood supply.

Constraints to harvesting in IFLs	Area (ha)[a]	Proportion (%)[b]
Average IFL overlap with FMU	239,281 ± 279,243	N/A
Protection areas	47,122 ± 75,005	19.7%
Water bodies and 20-meter buffers	13,802 ± 17,730	5.8%
Steep slopes (≥30 degrees)	3 ± 8	0%
Unproductive or treeless (AGB ≤40 tonne C/ha)	48,164 ± 91,306	20.1%
Total protected, inoperable, or low productivity	**108,491 ± 146,329**	**45.6%**

Table 9. Constraints within IFL areas in Ontario

a. the average and standard deviation is calculated for IFLs in 22 FMUs with IFL ≥10,000 ha
b. the proportion calculated on the total average area in IFLs

Figure 7 shows that some IFLs have less protection and constraints. The non-protected IFL area is available for timber harvest under provincial forest management planning procedures, which do not formally recognize IFLs and hence pay no attention to them for planning purposes. The consultants paraphrase the provincial government's position as being that it feels that it has in place a robust and sustainable forest management framework and hence there is no additional benefit to recognizing and maintaining IFLs.

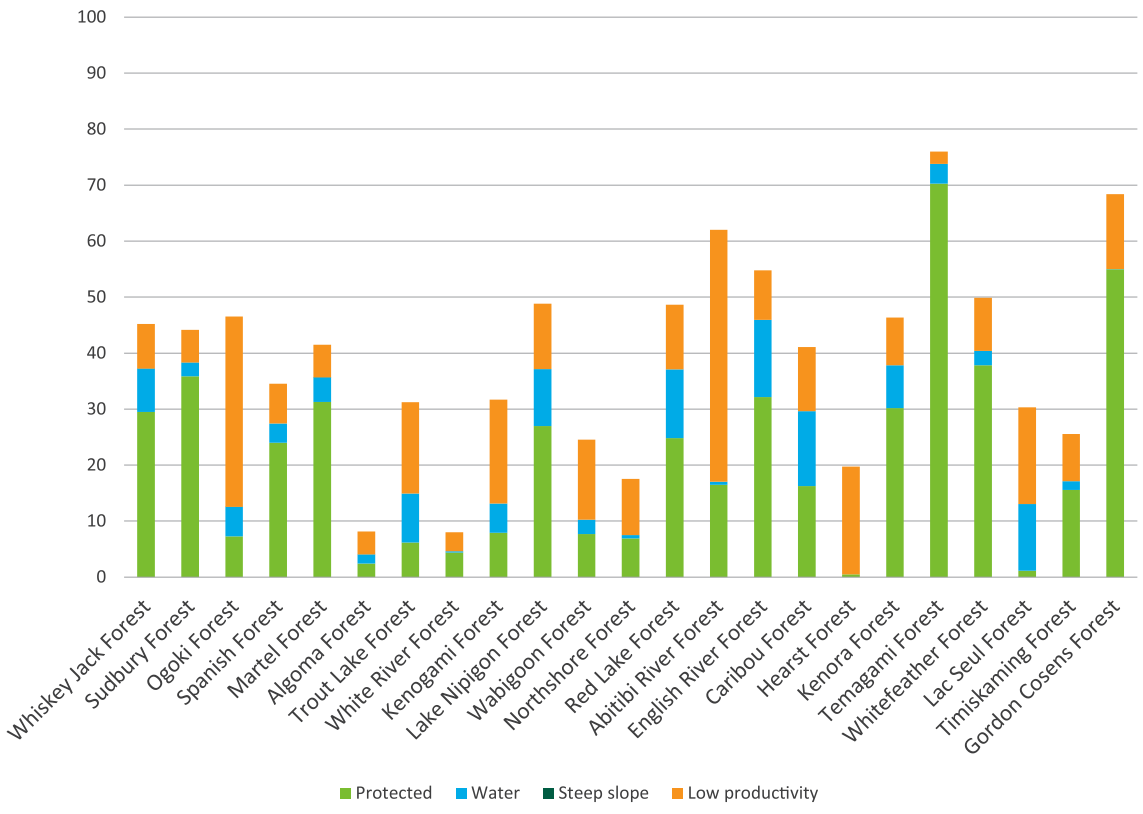

Figure 7. Proportion of unsuitable area for harvest in IFLs on FMUs in Ontario.

SUMMARY OF ECONOMIC IMPACTS IN ONTARIO

- Most forest managers interviewed were able to manage to address IFLs during the near term, or able to harvest within IFLs and were doing so.
- One forest manager reported a significant impact on AAC in the current management plan.
- On some forests, avoiding harvest in IFLs adds some cost for added roads and planning, but added cost is minor, currently.
- Mid-term impacts (≥10 years) were expected to range from minor to significant,
- In several FMUs, protecting IFLs may eventually have a significant impact on wood supply.
- The low level of FSC certification on FMUs that have high percentages of unprotected area in IFLs suggests that the treatment of IFLs under FSC may be a deterrent to certification.

4.4. IMPACTS ON WOOD SUPPLY IN QUÉBEC

Canada's largest province also has the largest forest area, at 90 million ha[23]. Of the forested area, a total of 36 million ha is licensed by the province. The remaining forests consists of privately owned land and forest north of the commercial forests. In Québec, FMUs do not include large protected areas. Of the 59 FMUs in the province, 22 have IFLs within them and most have only a very small amount of IFL.

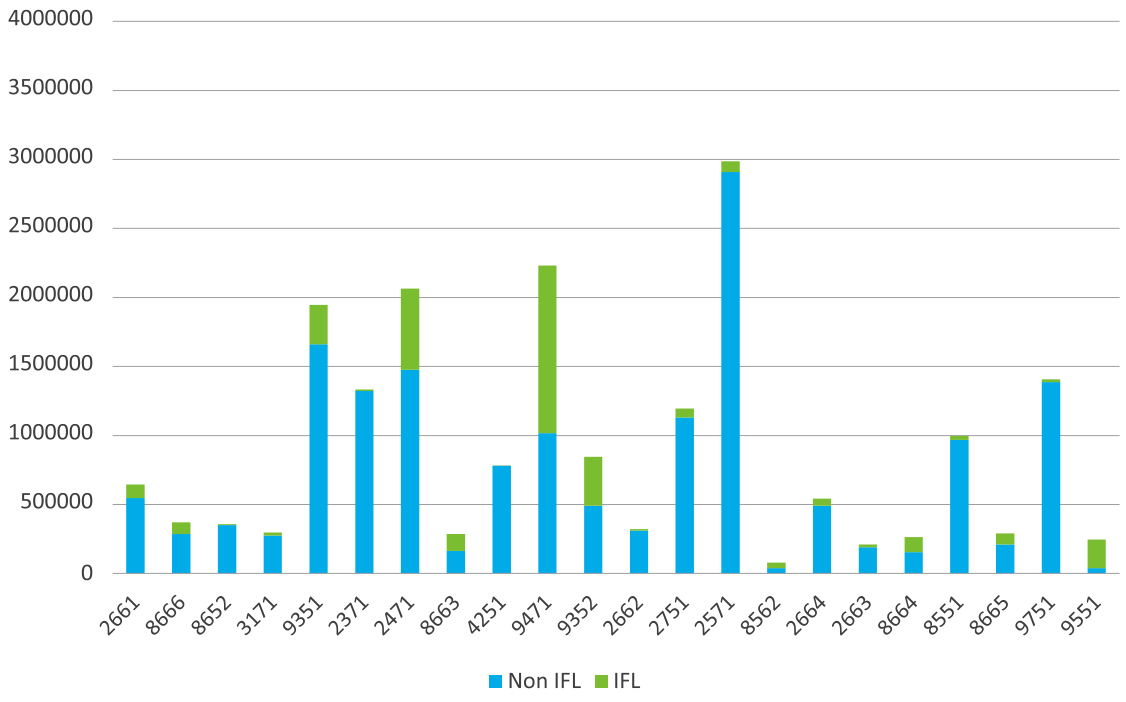

Figure 8. FMUs having IFLs showing proportion IFL and non-IFL.

23 https://mffp.gouv.qc.ca/les-forets/international/

Figure 8 shows the area of IFL and non-IFL in the 22 FMUs with IFL area present in them. Three tenure areas (9471, 8562, 9551) have 50% or more of their area as IFLs - of these, tenure area 8562 is very small at 79,000 ha and 9471 is large 2,230,000 ha. Roughly half of the tenures with IFLs in them have less than 10% IFL area, but the percentage of IFL area on the other tenures ranges as high as 84% on tenure 9471. In Quebec, forest tenures do not include officially designated protected areas.

Table 10 groups the tenure areas in Québec according to the amount of area within the tenure that is IFL area. Two of the nine forests with more than 20% of its area in IFLs are FSC certified, while six of the eleven forests with less than 10% (but not zero) area in IFLs are FSC certified. Only about 25% of the forests with no IFL area are FSC-certified. The implication is that in Québec there is not a strong correlation between certification and IFL area being present in a forest.

Percent of IFL	# Tenures	# Tenures FSC certified
Zero	37	10
>0 - 5%	7	4
5.1 – 10%	4	2
10.1 – 20%	2	1
20.1 – 50%	6	2
Above 50%	3	0

Table 10. Number of tenures by percentage IFLs.

As part of our interviews with forest managers in Québec we asked if they could quantify short term and medium/long term impacts of IFL on volumes. The impacts that they reported are described in Table 10.

The wood supply analysis in Québec is conducted by the "Forestier en chef". Although the forester in chief reports to the Minister responsible for forests (Ministère des Forêts, de la Faune et des Parcs du Québec), the office is independent from both companies and the Ministry. In Québec IFLs are not recognized and therefore the wood supply analysis (AAC) is conducted without considering IFLs. However, caribou habitat protection measures overlap with IFLs and they have been included as a constraint in the 2018-2023 supply analysis. The provincial impact of caribou management has been reported to be 759,800m^3/year by the forester in chief[24].

24 Bureau du forestier en chef. 2018. Analyse d'impacts Caribou Forestier. https://forestierenchef.gouv.qc.ca/wp-content/uploads/2019/10/ficheanalyse_caribouforestier_scenarioctmav20180705_v20190826.pdf

FMU	FSC certified	FMU Area (ha)[a]	IFL Proportion	Current impact on AAC (current plan)	Medium/long term impact on AAC (>5 years)
9351	Yes	1,949,470	0.15	Negligible short-term impact. Harvesting allocated inside IFL are below the 20% threshold and harvesting can be reallocated outside IFLs.	Significant. The IFL is mostly productive forest and a significant proportion of the IFL does not overlap with other constraints and is therefore available for harvest in a regulatory standpoint.
02661	Yes	645,914	0.15	Negligible short-term impact. Harvesting allocated inside IFL are below the 20% threshold and harvesting can be reallocated outside IFLs	Significant. The IFL is mostly low productivity forest and protected for caribou. The caribou protection is temporary but could become permanent. If so, less than 10% of the IFL will be available for harvest. Nonetheless, the impact could be significant because under the Paix des Braves with the Cree there is a limit of disturbance by trapline. Therefore, the overall area available for harvest is very limited and removing available forests from IFL where there is no disturbance in the trapline and therefore less constraints to harvest could disproportionately impact AAC.
02664	Yes	555,165	0.10	Negligible short-term impact. Harvesting allocated inside IFL are below the 20% threshold and harvesting can be reallocated outside IFLs	Medium. Approximately 5% of the IFL is available for harvest (including the temporary caribou protection). There could still be a medium impact due to the constraints of the Paix des Braves described for FMU 02661.
08551	Yes	996,260	0.03	Negligible short-term impact. Harvesting allocated inside IFL are below the 20% threshold and harvesting can be reallocated outside IFLs	Small. No significant impact is reallocated perceived by the forest manager because the IFLs area mostly in unproductive forest, far from the mill. IFLs also significantly overlap with the current caribou habitat protection measures.
08562	Yes	79,082	0.52	Negligible short-term impact. Harvesting allocated inside IFL are below the 20% threshold and harvesting can be outside IFLs.	Small. No significant impact is perceived by the forest manager because the IFLs area mostly in unproductive forest, far from the mill. IFLs also significantly overlap with the current caribou habitat protection measures.

Table 11. The IFL proportion in Forest Management Units in Québec and their impact on wood supply.

a. area within the FMU under forest management planning. For 2664 and 2661 see Table 6 of the PAFIT https://mffp.gouv.qc.ca/documents/forets/amenagement/PL_02660_PAFIT_2018-23_revise_2020.pdf. This is the same area used for the analysis of constraints below.

Table 11 shows that in FMUs that we sampled, harvesting has been reallocated outside IFLs in the FMUs without impacting the wood supply during the current five-year planning horizon (2018–2023).

In the mid-to long-term, one of the three companies interviewed estimated that the impact would be small mostly because their IFLs are composed of low productivity forests that are distant from the mill and protected for caribou habitat. The two other companies had approximately 10-15% of their FMUs covered by IFLs and they suggested the impact would be medium or large because their IFLs were dominated by productive forest; they are not significantly protected for caribou and they represent a significant proportion of the forest at age for harvesting.

To better understand the long-term implications of protecting IFLs, we assessed the presence of constraints to harvesting in IFLs. For this analysis (Table 12 and Figure 9) we only used IFLs that overlapped FMUs ≥10,000 ha. Table 12 shows that the average proportion of IFLs in FMUs is smaller than in Ontario and that 52% of IFLs are not available for harvest. This suggests that a significant proportion of IFLs in Ontario are already excluded from the supply in several FMUs. The long-term loss of harvestable area is therefore limited. IFL areas are not protected because in Québec, protected areas are removed from FMUs when they are designated.

Constraints to harvesting in IFLs	Area (ha)[a]	Proportion (%)[b]
Average IFL area in FMUs	174,604 ± 276,190	N/A
Protection areas	8 ± 21	0
Water bodies and 20-meter buffers	3,778.8 ± 5,869	2%
Steep slopes (≥30 degrees)	352.9 ± 1,242	0.2%
Unproductive or treeless (AGB ≤40 tonne C/ha)	49,538 ± 56,157	28.4%
Interim caribou habitat protection measures	37,343 ± 61,415	21.4%
Protected, inoperable, or low productivity	**91,021 ± 117,250**	**52.1%**

Table 12: Constraints within IFL areas in Québec

a. the average and standard deviation is calculated for IFLs in 20 FMUs with IFL ≥10,000 ha
b. the proportion calculated on the total average area in IFLs

Figure 9 shows that in 12 out of 20 FMUs, the IFLs contain little production forest. On the other hand, some FMUs have very few constraints. They overlap significantly with IFLs in Québec and if they become permanent, they would greatly increase the level of protection of IFLs.

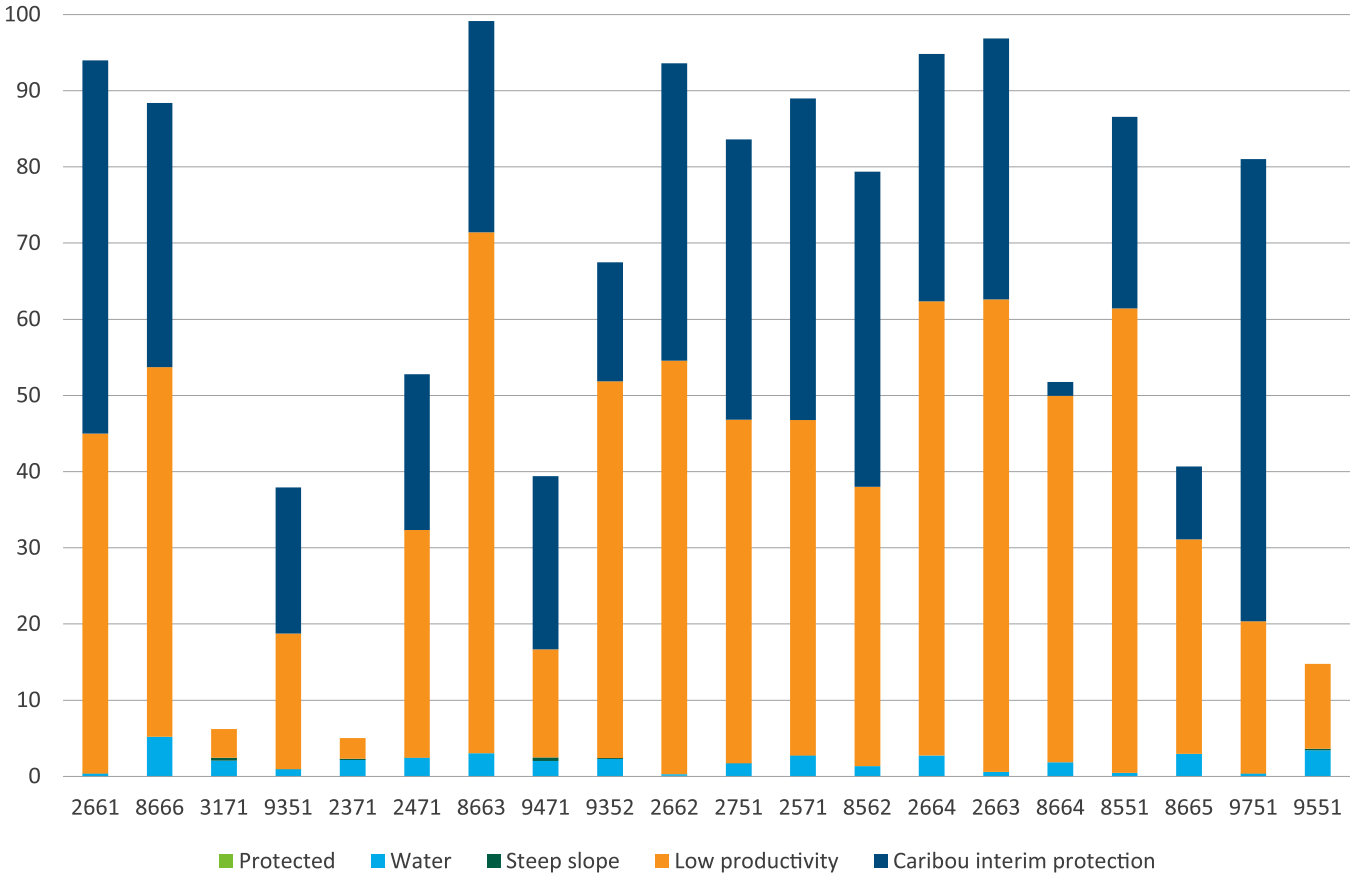

Figure 9. Proportion of inoperable area and low productivity area in IFLs on FMUs in Québec.

SUMMARY OF ECONOMIC IMPACTS IN QUÉBEC

- In FSC certified forests sampled in this study, for the current plan (2018–2023) IFLs are avoided or harvesting is below the threshold of 20% of the IFL in the FMU.
- On average 30% of IFLs are low productivity areas and therefore large portions of IFLs are of low economic interest.
- Many northern FMUs with IFLs also harbour caribou and the Government of Québec has temporarily set aside large forest tracts for caribou which overlap with IFLs. A significant proportion of the IFLs are therefore protected for caribou.
- In some FMUs, where IFLs are mostly productive forests, IFLs will have a more significant impact on wood supply in the medium- or long term.
- Medium- or long-term impact on AAC is amplified because protection measures for IFLs are cumulative to the impact of caribou protection and other regulatory or operational constraints, including the adapted forestry regime in the Paix des Braves.

4.5 ECONOMIC IMPLICATIONS OF PROTECTING IFLS

As described above, the current wood supply impacts of protecting IFLs are small in most FMUs. In our sample, in only one FMU did IFLs cause a significant reduction in wood supply in the current management plan term. Interviews with the managers of certified forests in Alberta and Saskatchewan were consistent in this regard. In the case of the Alberta licensee, IFLs, if present, represents a very small proportion of the land base and the company has been able to avoid operations there. The Saskatchewan manager has a significant area of IFL on the FMU and is allowed to harvest in it but is not currently doing so.

Some managers suggested that there may be increased costs for administration or road construction that may not be negligible, but these costs are difficult to isolate. None of the companies we spoke with that mentioned higher costs had estimated the cost impact of IFLs. Yemshanov et al. (2020) estimated that reallocating harvest to protect IFLs in Alberta increased the timber cost by CAD$1.10–2.00/m^3. However, they pointed out that in Alberta this impact can be partially mitigated by harvesting in areas disturbed by the oil and gas extraction industry.

The result of our interviews suggests that compliance with measures to protect IFLs could reduce, in the medium/long term, the wood supply from some FMUs. Their best estimate is that the impact of IFL protection on the AAC will be proportionate to the percentage of the land base that becomes unavailable to maintain IFLs. Current IFL protection covers on average 25%, 16% and 19% of the land base in BC, Ontario and Québec, respectively. These numbers are disproportionately influenced by a small number of FMUs with a high proportion of IFLs. By removing the three FMUs with the highest proportion of IFLs in each province, the proportions fall to 18%, 9% and 13%. We can also estimate that reducing IFL protection to 50% or 30% instead of 80%, will proportionately reduce the impact. This analysis is not relevant for volume-based timber supply areas in BC and was only conducted for tree farm licenses. Russell (1987) estimated the direct and indirect economic benefit from 1 cubic meter at CAD$200[25]. Although the study is outdated, it provides an order of magnitude for estimating the economic impact of reduced harvest levels. Wood available for harvest in IFLs represents tens of millions of dollars in direct and indirect economic benefits.

However, we found that in BC and in some FMUs in Ontario and Québec, the impact of IFL protection should be low in most FMUs because, as shown by our analysis, the IFLs are largely inoperable, low productivity or under regulatory protection already. In Saskatchewan, the IFLs were there because of First Nations' land management efforts. In other words, there is a reason that these areas have remained intact. For example, IFLs are mostly (≥50%) unsuitable for harvest in 34 out of 37 TSAs in BC (TFLs are embedded in the TSA analysis), in 4 out of 23 FMUs in Ontario and 12 out of 20 FMUs in Québec. In FMUs with a significant percentage of IFLs and where they are mostly suitable for harvest, there is more potential for there to be an impact on wood supply. Although these results are insightful, the impact of IFLs on wood supply depends on many other factors that have not been captured by our analysis, including:

25 Russell, J. 1987, Economic Benefits of Timber and Productive Forest Land in British Columbia. Economic Benefits of Timber and Productive Forest Land in British Columbia (cif-ifc.org)

- The size of the IFL area;
- The age, species and quality of timber in an IFL;
- The extent of the gap, if any, between the actual timber harvest level and the upper limit on the sustainable harvest level;
- The manner in which forest tenure is laid out and whether it is area-based or volume-based;
- The extent and overlap of IFLs with other landscape-level management measures, such as those for caribou habitat;
- The extent to which an IFL is shared by two or more FMUs, or extends into the non-commercial forestry zone; and,
- The amount of activity on the part of other resource sectors, such as oil and gas and mining.

One forest manager pointed out that the IFL area as a percentage of the forest area masks the potential impact of an IFL on the harvest allocation process, and hence its economic impact. This is because the amount of area in an FMU that is mature and eligible for harvest is a relatively small fraction of the total forest area. Given that the age class of IFLs tends towards the mature/overmature, their withdrawal can become significant within the next 20 years or so.

Actual harvest levels are below the allowable levels in many regions of Canada,[26] which may suggest that there is room for accommodating IFL protection. However, in provinces such as Ontario, allowable harvest calculations often include a considerable amount of undesirable species and/or lands that are not economically accessible. As a result, the harvest, particularly of spruce, pine and fir, may be much tighter than the FMU level statistics suggest. When actual harvests are close to allowable harvests, there is likely to be a higher cost associated with IFL protection. This may be the case in Québec where 84% of the provincial allowable cut was harvested for spruce, pine, fir and larch between 2013-2018. The allowable cut was attained or slightly exceeded in at least 17 FMUs of the province.[27] However, the supply chain for wood products is strongly integrated (or interrelated) in most regions of Canada. This means that it is economically viable for most producers to source wood within 150 to 300 km of the mill. Most companies' wood supply is sourced regionally –not at the scale of an FMU. It is therefore necessary to look at the supply at a broader level to understand IFL impacts. Such an analysis is beyond the scope of this report.

In provinces where the harvest level is below the allowable level, there may be options for forest managers who are harvesting close to their allowable cut to obtain timber from nearby FMUs with low harvest levels. Gaining access to wood on neighbouring FMUs could reward forest managers who seek to maintain IFLs. This is a theoretical approach only, because providing one company with access to another company's wood supply requires the provinces to support IFL protection, which they currently do not. An FSC-certified company with an IFL area in its FMU must allocate the AAC around the IFL, or harvest within the IFL subject to FSC requirements. Where an allocation in an IFL is left unharvested on an FSC-certified forest, the BC and Québec governments have mechanisms to enable non-FSC-certified companies to cut the unused allocations. This is of particular importance because the long-term preservation of IFLs can be achieved only in collaboration with the provincial governments.

26 Conference Board of Canada. 2016. How Canada Performs – Use of Forest Resources https://www.conferenceboard.ca/hcp/provincial/environment/forest-resources.aspx
27 MFFP. 2020. Bilan quinquennial de l'aménagement durable des forêts. .https://mffp.gouv.qc.ca/documents/forets/amenagement/reddition-comptes/BilanQuinquennalADF.pdf

SUMMARY OF ECONOMIC IMPACTS

- Most FSC-certified forest managers with IFLs on their FMUs are able to either avoid harvesting IFLs or keep the harvest to an allowable level under FSC requirements during the current plan period. Some managers mentioned that this led to somewhat higher road construction costs; however, they could not quantify the impact. Other managers said there was no discernable impact on costs.
- For one forest manager interviewed in this study (but there are likely others), IFL protection has a significant short-term impact because the approved harvest blocks are inside IFLs.
- There has been no impact on employment, provincial royalties, or tax payments on most FMUs during the current plan period. On the forest where the wood supply was reduced by the presence of IFLs, the forest manager was very concerned with the economic impacts of implementing Controlled Wood measures to protect IFLs.
- Most forest managers expected that the maintenance of IFLs under FSC would reduce their wood supply during the next 5–10 years. Those managers who provided estimates felt that the impact would be in line with the percentage of non-protected productive forests in IFLs in their FMU.
- IFL protection represents 25%, 16% and 19% of the FMU area in BC, Ontario and Québec, respectively. These numbers are disproportionately influenced by a small number of FMUs with a high proportion of IFLs. By removing the three FMUs with the highest proportion of IFLs in each province, the proportions fall to 18%, 9% and 13%.
- Using publicly available geodata, we found that 65%, 46% and 52% of the forest area is unsuitable for harvesting in IFLs in BC, Ontario and Québec respectively. Unsuitable areas are protected areas, woodland caribou habitat protection, regulatory and operational constraints.
- The gaps that exist between AACs and actual harvests in most provinces do not provide a clear indication of the size of the opportunity for increased conservation, since the land base used to calculate the AAC may include inoperable or unmerchantable areas, and all timber is not created equal.
- The portion of IFLs that is not overlapping with other constraints is of significant importance for forest managers. In our interpretation, it is the cumulative impact of IFLs with these constraints that is most concerning for forest managers in the long term. This is why they feel it is so crucial to have more flexibility over how IFLs are managed.

5. Environmental impacts

In our interviews, it was primarily the representatives from environmental organizations that described the environmental impacts of IFLs. There was universal agreement among ENGOs that the environmental impacts were positive, and their comments have been grouped and are presented in Table 13.

IFL Impact	Comments made by interviewees on IFL protection measures: Environmental impacts
IFLs have higher levels of biodiversity than managed forests	• IFLs maintain areas with high levels of stand-level as well as regional diversity • IFLs contribute to the maintenance of habitat for caribou
Protecting IFLs helps maintain habitat for species with large home ranges including breeding/calving habitat of species at risk	• Maintaining IFLs contributes to the conservation of habitats for far-ranging species, some of which are endangered, threatened, or of special concern (e.g., grizzly bear, woodland caribou, wolves and wolverine).
Protecting IFLs maintains a reservoir of old forests	• IFLs are unharvested so forests tend to be older, depending on fire return interval. • IFLs are not chosen for age, only lack of infrastructure, so age tends to be mixed.
Ecological processes can operate unaltered within IFLs	• IFLs provide sufficient area for natural ecological processes that preserve some habitat intactness that cannot be sustained across smaller areas.
IFLs create opportunities to improve the protected area network	• Canada, although not all provinces, had the objective of protecting 17% of the land base by 2020. The next objective may be to increase the protection to 30% in 2030. This objective will likely be met with the contribution of Crown land currently allocated to forestry. Protecting IFLs provides large areas that can be converted into parks.
Maintaining IFLs helps maintain landscape level ecological services	• Maintaining IFLs contributes to conserving ecological services essential to humans and other species such as water quality and regulation of local climate processes (e.g., rainfall patterns).
Protecting IFLs maintains remoteness	• IFLs are the most southern remaining areas that have almost no human impact.
Protecting IFLs increases the intensity of harvesting in non-IFL portions of the forests that are already fragmented	• IFLs contribute to forest depletion in areas outside IFLs because in Canada IFLs are not recognized by governments and the wood supply is calculated based on regulatory requirements. Therefore, the AAC is calculated for the whole supply area, including IFLs. Harvesting has been deferred in IFLs which causes the reallocation of harvest in areas that are already disturbed, therefore increasing pressure on these areas.

Table 13.Environmental impacts described by stakeholders during interviews.

Interviews suggest that the environmental impacts of protecting IFLs is mostly positive, with the exception that restricting harvesting in IFLs increases harvesting pressure outside of the IFLs. This is due to the fact that the AAC calculations ignore IFLs and so are determined on a larger land base than the manager of an FSC-certified forest has access to. Some interviewees questioned the importance of intactness as a value and noted that many IFLs do not cover areas with special ecological attributes. Others who were interviewed downplayed the extent of the benefits because they felt that other land use designations already provide equivalent environmental objectives on the landscape. The rationale for the positive impacts is supported by literature and further discussed below.

5.1 ENVIRONMENTAL BENEFITS OF PROTECTING IFLS

Venier et al. (2018)[28] published an overview of the ecological benefits of maintaining IFLs, and summarized six benefits:

- Conservation of biodiversity;
- Maintenance of ecological services;
- Maintenance of ecological processes;
- Existence values;
- Benchmarks for science; and
- Application of the precautionary principle.

The literature review considered IFLs in a more generalized way, as distinct from how FSC defines IFLs, whereas many of the interviewees were conversant with FSC's definition and referred to IFLs as defined by FSC in their comments. Despite this subtle distinction, there was broad agreement within the literature and among the environmental stakeholders that were interviewed that biodiversity conservation and the maintenance of ecological services and processes were the most important ecological benefits of IFLs (e.g., Noguerón et al. 2002).[29]

These benefits were not always expressed in the same way. For example, several papers cited ecological integrity as a key benefit of conserving IFLs; resilience and intactness were other expressions of these benefits. All of these qualities map closely onto biodiversity and the maintenance of ecological processes and services. For example, Wells et al. (2020)[30] stated that "*the North American Boreal Forest biome's intactness has allowed it to retain many globally significant conservation features including long-distance mammal and fish migrations, healthy populations of large predators, one to three billion nesting birds … massive stores of carbon and ecological functionality*". Mittermeier et al. (2003) evaluated large wilderness areas in the world, among them the boreal forest in Canada, and stated that the "ecosystem services [these areas] provide have enormous value, for example, through hydrological control, nitrogen fixation, pollination, and carbon sequestration, in addition to providing destinations for ecotourism and adventure tourism. The wilderness areas serve as valuable controls against which to measure the health of the planet".

Attributes of biodiversity supported by IFLs include important breeding reservoirs for migratory birds (Wells and Blancher 2011,[31] Wells 2020) and habitat for far-ranging species such as caribou, wolverine and grizzly bear. Smith and Cheng (2016) linked IFLs and species at risk, reporting that in Canada "*92% of IFL degradation between 2000 and 2013 intersects the known presence of species at risk and more than 14% coincides with the presence of at least 6 species at risk*". More specifically, the potential role of IFLs in maintaining woodland caribou was cited by many interviewees; the intersection of caribou habitat and IFLs is discussed in the following section.

Venier et al. (2018) issued a caveat, pointing to a lack of direct evidence linking loss of intact areas with bird species declines. They did observe, however, that the data necessary to link bird declines with development in the boreal forest are lacking. Venier et al. (2018) also suggested that IFLs in the boreal forest are too small to fully accommodate unconstrained fire dynamics, although IFLs may provide sufficient area to maintain predator-prey interactions, such as wolf-ungulate relationships. Those that overlapped with significant parts of watersheds would also maintain the

28 Venier, L.A. et al. 2018. A Review of the Intact Forest Landscape Concept in the Canadian boreal forest: Its History, Value and Measurement. Environmental Reviews: https://www.doi.org/10.1139/er-2018-0041.
29 Nogueron, R. et al. 2002. Low-access forests and their level of protection in North America. Global Forest Watch. World Resources Institute, Washington DC
30 Wells, J.V. et al. 2020. The State of Conservation in North America's Boreal Forest: Issues and Opportunities. Frontiers in Forests and Global Change. Vol. 3. 90 pp. https://www.frontiersin.org/article/10.3389/ffgc.2020.00090
31 Wells, J. and Blancher, P. (2011) Global role for sustaining bird populations. In: Boreal birds of North America: a hemispheric view of their conservation links and significance (ed. J. Wells). University of California Press, Berkeley.

hydrological processes in the watershed. IFLs at the southern edge of their range in Canada, which overlap with commercial forest operations, are ecologically distinct from those in the north, and may be more ecologically significant due to their relative scarcity in the landscape (Venier et al. 2018, Carlson et al. 2015[32]).

IFLs were also cited as having value as potential reservoirs of old forest. It is recognized that the boreal forest goes through natural succession so that the initial even-aged stands tend to become all-aged over time, in the absence of disturbance. Such all-aged stands were cited as having high levels of ecological value.

A number of forest managers and provincial government staff questioned the value of IFLs in providing significant ecological benefits, contending that, because forests are managed sustainably, the conservation of IFLs provides little added benefit. Venier et al. (2018) point out several considerations that mitigate against a strong acceptance of this contention. In particular, forest harvesting converts primary forests to different types of forest and causes structural changes, most notably in the amounts of dead and downed woody debris. Managed forests also tend to have truncated age class structures, since forest is generally cut when it becomes merchantable. Lastly, the creation of access roads and trails has significant impacts on wildlife due to fragmentation, increases in hunting, and a generally greater level of human activity and presence. Caribou is particularly sensitive to human presence and increased predation when access is created.

Several forest managers indicated that the retention of IFLs led to more intensive road-building and harvesting on the non-IFL portion of the forest. There was no clarity regarding the extent to which these off-IFL impacts reduced the overall ecological benefits of IFLs (or, for that matter, mitigated the negative economic impacts perceived by forest managers).

5.2 IFLS AND CARIBOU HABITAT

The boreal woodland caribou, which is listed as threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), continues to inhabit parts of the commercial forestry zone. Caribou are known to be very sensitive to human intrusion and they are wide-ranging species, which means that there is a considerable overlap between measures to sustain IFLs and caribou conservation measures. Many stakeholders interviewed by the consultants identified caribou as a key biodiversity element that benefits from conserving IFLs.

In Canada, Environment and Climate Change Canada (2019)[33] recognizes 51 distinct boreal woodland caribou ranges. Based on a risk assessment that considered the extent of habitat disturbance, the population trend and population level of the range, each range was categorized as being either self-sustaining (SS), not self-sustaining (NSS), or as likely as not to be self-sustaining (NSS/SS). The five largest ranges in Canada each exceed 10 million ha, and all have IFLs in them. Four of the five ranges are considered self-sustaining. Figure 12 shows area data for the 46 ranges that are less than 10 million ha. The IFL and non-IFL portions of each range are shown, as well as the range status.

32 Carlson et al. 2015. Balancing the relationship between protection and Sustainable Management in Canada's Boreal Forest.
33 Environment and Climate Change Canada. 2019. Amended Recovery Strategy for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal population, in Canada [Proposed]. *Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. xiii + 143pp.

Figure 12 shows that all range sustainability classes occur in Manitoba, Ontario, and Québec, while all the ranges in British Columbia and Alberta are considered NSS. Two Newfoundland ranges are NSS/SS and the third is SS. The NSS ranges tend to lack IFL areas and be relatively small in size, although range ON-8 is an exception that is both large and has considerable IFL area in it. Alternatively, there are four or five small ranges with little or no IFL area in them that are either SS or NSS/SS. On the other hand, ranges ON2, QC4 and NL1 and NL3 are large and have substantial IFL area in them yet the status of the range is NSS/SS.

Range Sustainability Status (Probability)[a]	# Ranges	# with IFLs[b]	Average Range Size (ha)	Average IFL Prop. in Range	Average Prop. of Range in FMUs	Average Prop. of IFL within Range Area in FMUs.
NSS (< 40%)	26	11	1,225,438	0.136	0.684	0.051
NSS/SS (<60% to ≥40%)	10	10	3,558,078	0.478	0.455	0.308
SS (≥60 %)	16	16	11,808,734	0.454	0.448	0.305

Table 14. Characteristics of boreal woodland caribou relative to FMUs and IFLs.[34]

a. Sustainability status as described by the probability of achieving a self-sustaining outcome.
b. Number with IFLs or portions of IFLs

These general observations from Figure 12 are corroborated by the information presented in Table 14, which shows that, on average, caribou ranges that are not self-sustaining (NSS) have a lower proportion of IFLs in their range and higher proportions of the range in forest tenures. The positive relationship between IFLs and caribou suggests that measures to protect IFLs contribute to maintaining undisturbed habitat which helps to sustain caribou ranges.

The caribou habitat management strategies of the provinces are geared towards retaining large areas of mature forest. In Québec these large forest areas are currently under interim protection pending a permanent habitat protection plan that is being developed in collaboration with First Nations. In Ontario and British Columbia these areas are planned to shift over time as they are harvested, made inaccessible again, and left to regenerate. In any case, protection measures for IFLs can only have a positive effect on caribou.

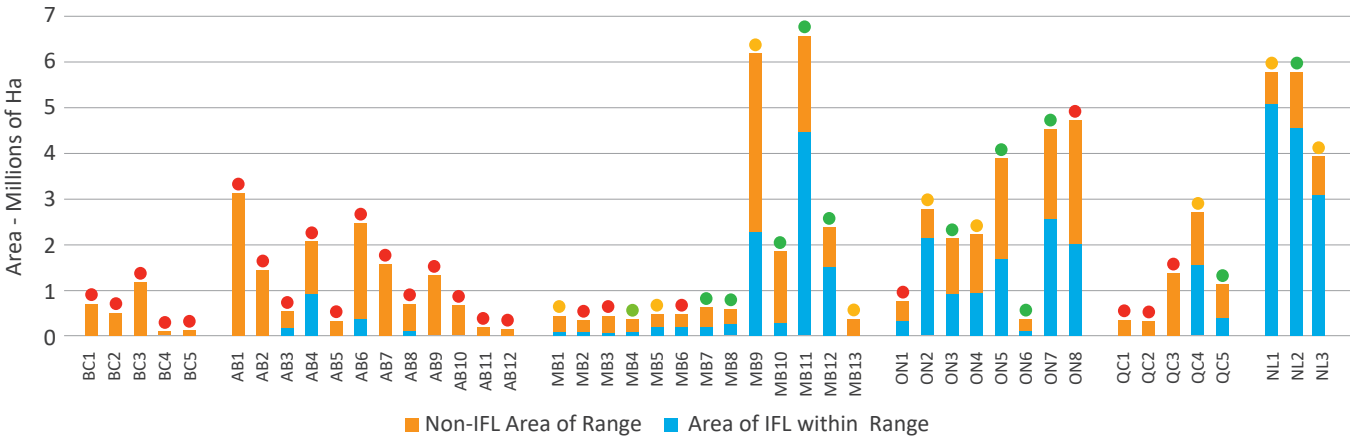

Figure 10. IFL and non-IFL area within 46 of Canada's caribou ranges (those with total area of < 10 million ha). Red dots (●) indicate a status of Not Self Sustaining; yellow dots (●) indicate a status of Not Self Sustaining/Self Sustaining), and green dots (●) indicate a status of Self-Sustaining)

34 Boreal caribou range data provided by Environment and Climate Change Canada, and distribution of Forest Management Units from GFWC Can-logging dataset.

SUMMARY OF ENVIRONMENTAL IMPACTS

- Most interviewees, but notably ENGOs, reported that the environmental impacts of IFLs are positive. This is also supported by literature. Two most important benefits are:
  - Contribution to biodiversity;
  - Maintenance of ecological services;
- Caribou in particular is a species at risk that relies on the maintenance of intact areas.
- Intact forests may also have higher levels of old forest compared to managed forests, supporting species that prefer older forests.
- The biodiversity benefit is due as much to the absence of roads as the absence of timber harvesting. Some forest managers and provincial government staff downplayed these benefits, indicating an important disconnect.

6. Social Impacts

Social impacts of protection measures for IFLs are discussed in five sub-sections. The first presents the perspectives of the Indigenous representatives that we interviewed. The views expressed were generally consistent regarding the main points; however, a more extensive survey might find a wider and more nuanced set of perspectives. The second sub-section discusses potential impacts on local forest sector employment, with impacts on royalties, access, and social services discussed in the third, fourth and fifth sub-sections. There may also be other impacts on the quality of life in a community linked to the health of the local forest industry, but these are not in the scope of this project. We also note that the literature that was reviewed had very little to say about the social impacts of protecting IFLs.

Specific impact	Comments made by interviewees on IFL protection: Social impacts
Impact on forest sector employment	• Forest managers do not foresee a short-term impact on forest sector employment. • Some forest managers said that if the constraint caused by IFLs is too great, they would drop certification before they cut jobs.
Impact on local social services (e.g., recreation and arts programs, parks, and community projects)	• The interviews suggest that there will be little impact on wood supply in the short term and social services should not be greatly affected by IFL protection in the short term. • In the longer term, IFL protection has the potential to reduce the wood supply from some FMUs which could reduce employment; however, mill managers may be able to source wood from other FMUs or private land to make up for any reductions.
Impact on provincial timber royalties	• The interviews suggest that there will be little impact on wood supply in the short-term and royalty payments should not be greatly affected by IFL protection in the short term. • In the longer term, IFL protection has the potential to reduce the wood supply from some FMUs which could reduce royalty payments.
IFL protection measures constrain new access	• For some communities, including some First Nations, one of the benefits of forestry is to create access to the forest for outdoor activities. IFL protection limits new access and the associated benefits.
IFL protection measures limit economic development opportunities	• Some Indigenous communities are within areas of extensive IFLs. The protection measures for IFLs permit very little timber harvesting activity, limiting economic opportunities, including Indigenous forestry.
IFL protection measures reduce social acceptability of forestry and of FSC for First Nations	• Representatives of First Nations consulted during this study reject the IFL concept because it is imposed and contributes to undermining their capacity to make land-use planning decisions. • FSC recognizes the importance of FPIC for forest management planning; however, Indigenous Peoples have not been consulted in developing the IFL concept or the measures of protection for IFLs and they have not given their consent to having IFLs protected in their territories. • With that said, First Nations want to protect their territories in a culturally appropriate manner, recognizing differences between communities.
Protection measures for IFLs maintain undisturbed forest areas important to Indigenous Peoples' heritage, spiritual values, and recreational opportunities	• Indigenous Peoples have an intimate relationship with the land and preserving the natural integrity of the land is of crucial importance.

Table 15. Social impacts as described in interviews.

6.1 ABOUT INDIGENOUS PEOPLES AND IFLS

Canada has embarked on a long process of reconciliation with Indigenous Peoples. Canada's Constitution recognizes three Indigenous Peoples: First Nations, Métis and Inuit. Of these, First Nations and Métis have traditional territories in the forested regions of Canada; traditional Inuit territory is generally non-forested. Many First Nations signed treaties with the British Government and/or the colonial governments, in which Indigenous lands were ceded to the Crown in exchange for continued use of forest lands. Indigenous Peoples deny that the treaties were about ceding lands and resources but were solemn exchanges to share the land. Other First Nations did not sign any treaties and Métis were generally excluded from treaties. As a result, Indigenous Peoples are asserting their rights and this may involve signing modern day treaties or agreements which include the transfer of large areas of land to the Indigenous communities.

A majority of IFLs are located on traditional Indigenous lands, which primarily encompass Crown land but may overlap private land as well. Managing these overlapping sets of rights is challenging and complex but needs to be done to achieve reconciliation. FSC Canada's Aboriginal Chamber has proposed an alternate landscape level designation called an Indigenous Cultural Landscape (ICL) that may be viewed as a complement to IFLs, rather than a substitute for IFLs. An ICL was designed to reflect the values and concerns of Indigenous Peoples and translate them to resource management actions. While many of these values and concerns are shared across the four Chambers of FSC Canada, the Indigenous relationship to the land is unique. The broad and descriptive definition presented below does not delineate the size, form, or purpose of an ICL. Landscape values held by Indigenous Peoples (and many others) are multifaceted and multifunctional. The working definition for ICLs is

> *Indigenous Cultural Landscapes are living landscapes to which Indigenous Peoples attribute environmental, 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 based on land-care knowledge, and adaptive livelihood practices. They are landscapes over which Indigenous peoples exercise responsibility for stewardship.*[35]

At the time of writing this report, efforts to bring ICLs into the FSC standard have stalled, frustrating many Indigenous people.

This is important because IFLs are located on Indigenous lands. As shown in Figure 13, many Indigenous communities (the blue dots in the figure) and their traditional lands overlap with IFLs. In fact, we found 483 Indigenous communities were located within 150 km of an IFL.

35 FSC Canada. 2016. Intact Forest Landscapes and Indigenous Cultural Landscapes. Discussion Paper January 2015. 6 p.

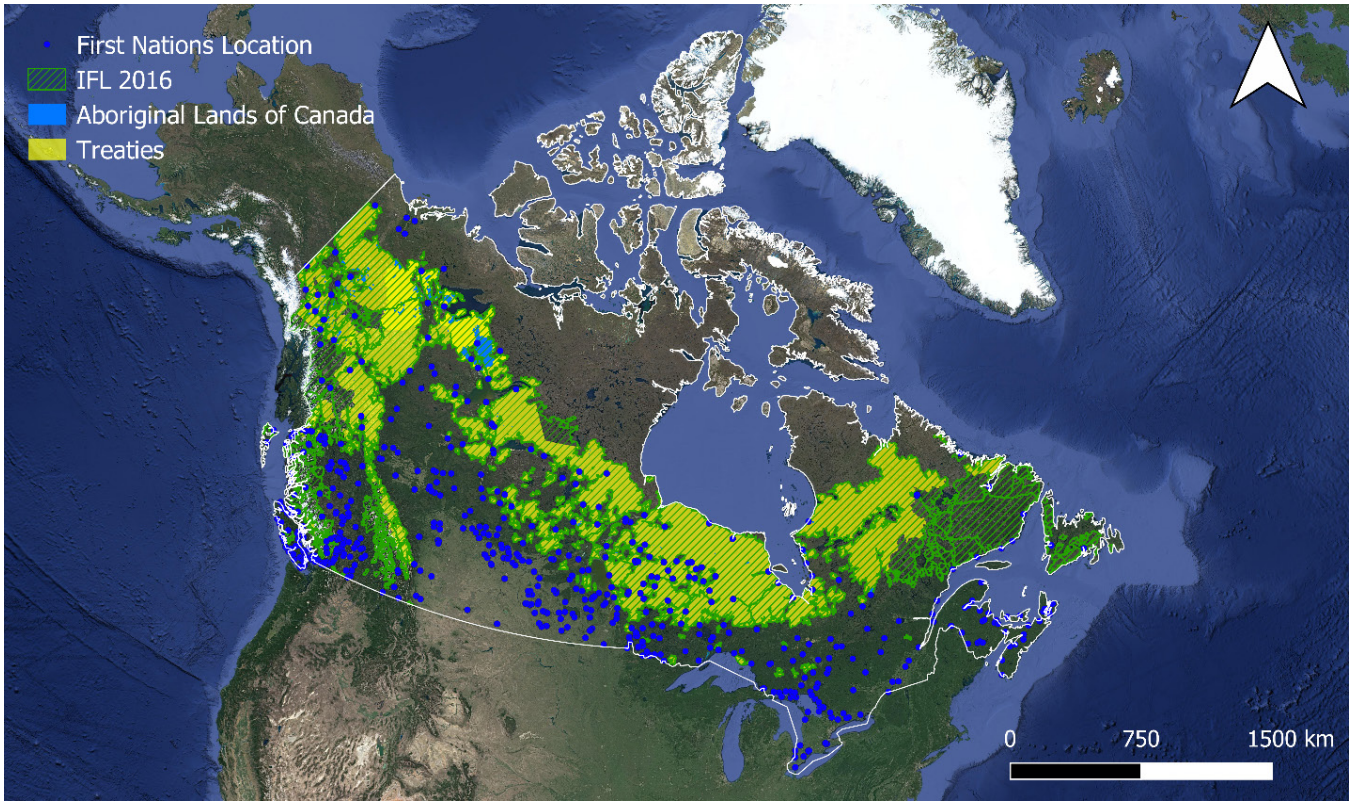

Figure 11. Overlap of IFLs with Indigenous traditional lands based on publicly available data.

The treaties and recognized lands of Indigenous Peoples cover 216.81 million ha which is 75% of IFLs. These are primarily First Nation lands; information regarding Métis traditional lands could not be located. The map does not include all lands with treaties and therefore these statistics are likely underestimated.

These statistics confirm that there is a significant overlap of IFLs with Indigenous traditional territories. Undisturbed forests have important value for Indigenous Peoples because of their natural heritage, spiritual values, and recreational opportunities[36] (Lee et al. 2010). In addition, many Indigenous communities depend on IFLs for tourism and recreational businesses. Furthermore, some communities that inhabit IFLs still practice their traditional way of life and depend upon the forests for much of their food and medicines.[37] At the same time, forestry is a primary industry in many Indigenous communities. For example, in B.C., forestry is the largest Indigenous employer in the natural resource sector. The associated business agreements and stewardship partnerships between the forest industry and Indigenous Nations were equivalent to approximately $250 million in economic benefits to Indigenous communities (iTotem Technologies, 2019).[38]

Indigenous people interviewed as part of this project generally rejected IFLs. One issue is that Indigenous people want to exercise responsibility and stewardship over their land. FSC standards require organizations seeking certification to respect international laws, including the United Nations Declaration on the Rights of Indigenous Peoples.[39] Foundational to UNDRIP is the concept of Indigenous Peoples' right to self-determination (Article 3) that includes the right of

36 WWF. 2018. WHITE PAPER - Comparative analysis of land use options within Intact Forest Landscapes. How can FSC make a difference? https://wwfint.awsassets.panda.org/downloads/comparative_analysis_white_paper_m34_1.pdf
37 Wilson, S. 2005.The Value of The Boreal Region To Aboriginal Peoples And Subsistence Living. Counting Canada's Natural Capital: Assessing The Real Value Of Canada's Boreal Ecosystems, Pembina Institute https://www.pembina.org/pub/counting-canadas-natural-capital
38 iTotem Technologies. 2019. Deep Roots. Strong Communities. 2019 Regional Supply Chain Study completed for Council of Forest Industries.
39 The United Nations Declaration on the Rights of Indigenous Peoples. 2007. https://www.un.org/development/desa/indigenouspeoples/declaration-on-the-rights-of-indigenous-peoples.html.

Indigenous Peoples to grant their free, prior and informed consent before any natural resource development occurs (Article 32). FSC Canada has incorporated these principles into its national standard. While FPIC is recognized by FSC, it has not been incorporated into how IFLs are delineated or protected under FSC on certified forests overlapping with Indigenous lands. Indigenous people were not involved in the development of the IFL concept, nor its implementation, and object that IFLs are imposed on lands that are part of their traditional territories. This is perceived as undermining the right of self-determination and the control over their land.

In fact, the point was made by some that IFLs exist because of the efforts of Indigenous people to have some say in how their traditional lands are managed. The value that many non-Indigenous people see in IFLs runs counter to the Indigenous view of the natural world and people's place within it. The concept of an IFL as a landscape unsullied by human presence erases the fact that the entire landscape has been and continues to be subject to wide-ranging use and management by Indigenous people.

The imposition of IFLs on Indigenous Peoples in Canada appears contrary to the fundamental values expressed by FSC in regard to Indigenous Peoples in that FSC recognizes the importance of empowering communities to improve social acceptance of forestry in certified forests.

Interviews with First Nation respondents confirm the need to involve affected First Nations in determining how IFLs will be protected or managed. This engagement would provide opportunities to better balance conservation and development for each First Nation community and could enable IFL solutions that can achieve the free, prior and informed consent (FPIC) of Indigenous Peoples. Despite the overtures that FSC Canada has made to the Aboriginal Chamber, there has been little progress on how to reconcile these perspectives.

6.2 IMPACTS ON FOREST SECTOR EMPLOYMENT

IFL conservation is usually thought to have its greatest impact on local communities through effects on forest sector employment. Where IFL conservation has the effect of reducing wood supply, there may be employment reductions as a result. Not only might woodlands employment be affected, but there is also a potential that mill employment will be affected.

The forest sector was a major economic driver for 105 communities in 2016 in Canada.[40] In Québec, a 2020 study reported that 5.5% of the municipalities in the province significantly depend on the forest industry.[41] The forest industry provides a reasonable income for workers. Over the years 2007-2016, the average income for workers in the wood product manufacturing sector was somewhat less than the average income in all manufacturing sectors combined (92%), while the average income in the forestry and logging sector was on par (99%). In contrast, average salaries in the pulp and paper sector exceeded the average manufacturing wage by a considerable amount (117%).[42]

As described in the economic impact section of this report, in the short term, there is relatively little impact of IFL protection on wood supply and, consequently, on jobs. However, in the longer term, most forest managers expected there to be an impact on wood supply. Bergeron and Gélinas (2015) estimated that in the region of Saguenay-Lac-Saint-Jean (Québec), a reduction in the allowable cut of 1.5 million m^3 would result in a total loss of 2,390 direct and indirect jobs

40 Statistics Canada. 2018. Human Activity and the Environment 2017: Forests in Canada. https://www150.statcan.gc.ca/n1/pub/16-201-x/2018001/sec-2-eng.htm.
41 Schepper, B. and Bégin, A. 2020. Portrait de l'industrie forestière au Québec : une industrie qui a besoin de l'État. https://cdn.iris-recherche.qc.ca/uploads/publication/file/Forets_WEB.pdf.
42 Ibid. 41.

for a total loss of wages of $ 110.2 million. It is thought by forest managers that less IFL protection in the FSC standard would lead to greater security; however; Bergeron and Gélinas (2015) argued that regional context and other factors like the modernity of mill infrastructure and the health of the forest product sector will also influence industry success.

Bergeron and Gélinas (2015) suggest that job loss could have a more significant impact on paper mills for which certification of pulp and paper products is a requirement of their customers, while many customers in the wood products and energy sectors do not explicitly demand FSC-certified products.

A factor that further complicates this discussion is that FSC-protection of IFLs could well be overruled by provincial governments that might allocate harvest within IFLs to companies willing to cut there.

6.3 IMPACT ON TIMBER ROYALTIES

IFLs are overwhelmingly located on provincial lands. Timber royalties, also referred to as stumpage fees, are paid by the forest managers to the provincial government based on volumes harvested from publicly owned FMUs. The impact of IFL protection measures on royalties should be proportionate to the impact on wood supply, which, as indicated, is minimal in the short term on most FMUs. In the longer term there is a greater potential for IFL protection to reduce royalties by an amount that is proportional to the percentage of available forest occupied by IFLs.

6.4 IMPACTS ON SOCIAL SERVICES

The forest industry also indirectly supports services through employment benefits such as health care, education, income from benefit sharing mechanisms, etc. However, in Canada social services are mostly provided by governments and therefore the direct impact of IFLs on access to health care, education and security will be indirect and limited. Forest companies that own facilities or offices pay taxes to the municipality where they are located, as well as to provincial and federal levels of government. Those who work in the sector also pay taxes to the various levels of government. Reductions in employment, especially mill closures, may have substantial negative impacts on municipal revenue and the ability of the municipality to provide services and amenities. As discussed above, the impact of IFLs is negligible on employment and mill stability in the short term. In the longer term, there is the potential for IFL protection to lead to more significant impacts; however, we did not encounter evidence suggesting that protecting IFLs could be a primary cause of a mill closure. Mills typically close when they become uncompetitive, which usually occurs during a cyclical downturn in the sector.

6.5 IMPACTS ON RECREATION AND ACCESS

Our review of the literature did not result in the identification of any studies that quantified potential economic impacts on tourism in IFLs. One of the issues with converting IFLs to protected areas is that road access is required for much forest-based tourism (although not for remote tourism), and road access in Canada is mainly developed by the forest industry.

The protection of IFLs limits the development of motorized access for hunting, fishing, hiking, berry-picking and other activities. In the consultants' experience, most local residents, including Indigenous people, and especially hunters and anglers, desire to have full access to the forest. It is debatable whether the average person would specifically link IFLs to unavailable recreational opportunities; however, if the option of access or no access was presented, the consultants have found that most local people would opt for access. We interviewed two recreational industry representatives from Quebec and IFL protection was viewed positively because there is a demand for activities such as canoe-camping and hiking in remote intact areas. A representative of the Conseil Québec du loisir commented that in Quebec, recent investments in the maintenance of trails and outdoor sites are significant but more resources are needed to restore or maintain existing infrastructure and that creating infrastructure to access new areas is less of a priority.

Based on an interview with a representative of the Fédération des Trappeurs Gestionnaires du Québec, and also based on the consultant's experience, IFLs should be perceived as beneficial to most trappers since, in Québec, most forest operations do not take traplines into account when planning harvests because the spatial scale of traplines is too small (on average about 60 km^2).[43] A considerable portion of a trapline may be harvested in a short period of time. In the experience of the consultants, this is true for both Indigenous and non-Indigenous trappers. Trapping in northern Canada is a strongly supported activity that is a defining cultural aspect of Indigenous people and is enjoyed by many non-Indigenous people.

SUMMARY OF SOCIAL IMPACTS

- Many IFLs are in Indigenous Peoples' lands. Our interviews found that there is widespread opposition to the principle of IFLs being considered as "areas without the impact of humans".
- Many Indigenous Peoples consider that implementing IFLs without their consent is disfranchising them from their right to participate to land use planning on their lands.
- Current levels of IFL protection were not found to have an immediate impact on employment; future employment may be reduced but this will also depend on many factors external to the forest.
- Because protection measures do not reduce current access from communities, the impact of not developing new access is positive for some forest users such as trappers and may be perceived as negative for some users.
- A factor that further complicates this discussion is that FSC-protection of IFLs could well be overruled by provincial governments that might allocate harvest within IFLs to companies willing to cut there.

43 An exception is the Cree of Northern Quebec's Paix des Braves Agreement (2002) with Quebec that, among other things, makes the trapline the forest management unit (Article 3.7). https://www.cngov.ca/governance-structure/legislation/agreements/

7. Carbon Impacts

IFL Impact	Comments made by interviewees on IFL protection: Carbon impacts
Protecting IFLs helps maintain forests that contain a significant amount of carbon.	• IFLs contain more carbon than a forest that has been logged. • For a carbon standpoint it is better to log IFLs before they burn and release large amounts of carbon. • Peatland are sensitive areas containing significant carbon and occur in some IFLs. • Storing carbon in forests is associated with a risk to permanence, but that this risk is not uniformly distributed and has a low probability in many forested parts of Canada.

Table 16.Carbon impacts described by stakeholders during interviews.

There was a divergence of views regarding the contribution of IFLs to carbon sequestration and storage. A number of interviewees felt that the long-term carbon value of IFLs was uncertain, due to the risks of extensive disturbance that would release much of the carbon stored in the biomass. Some interviewees also contended that old and declining forests, which those in IFLs would become, were carbon sources and it would be better to harvest them and establish fast-growing young forests. There is evidence that long-term sustainable forest management has the potential to increase the amount of carbon that is sequestered in forests[44,45]. Harvested timber that is used for long-lived wood products in substitution of carbon intensive materials such as steel or concrete reduces the net carbon emissions of harvesting IFLs.

The counter arguments were that harvesting would release significant amounts of carbon dioxide from both the living biomass as well as the soils, especially when the IFL was situated on peatlands. Thus, the short-term impact of harvesting is not mitigated until 40 to 50 years in the future, when the new stands have significant volume. Put another way, the benefits of keeping the carbon out of the atmosphere in the short- and medium-term were considered to be a significant positive impact of retaining IFLs.

One of the factors behind the differing perspectives is the time scale that the interviewee felt was most relevant. At the site level, it is well-accepted that following stand-replacing disturbances such as clearcuts or fires, boreal forests are net sources for a period of time until the Net Ecosystem Production becomes positive. The timing at which this point is reached is generally from 10 to 20 years after harvest (Kurz et al. 2013). More controversial is the behaviour of old forests. For many years, they were considered to be carbon sources as old trees stopped growing and started to die and decay. This view began to be questioned about 10-15 years ago. Luyssaert et al. (2008) reported that some old-growth forests (≥200 years) continue to absorb carbon[46]. Kurz et al. (2013) wrote that in very old boreal stands, dead organic matter pools may remain net sources while the live tree vegetation may be a sink – old stands could either be small sinks or small sources.

44 Birdsey, R.; Alig, R.; Adams, D. 2000. Chapter 8: Mitigation Activities in the Forest Sector to Reduce Emissions and Enhance Sinks of Greenhouse Gases. In: Janowiak, M.; Swanston, C.; Ontl, T. 2017. Management of Forest Carbon Stocks. (June, 2017). U.S. Department of Agriculture, Forest Service, Climate Change Resource Center. https://www.fs.usda.gov/ccrc/topics/management-forest-carbon-stocks

45 Timo Pukkala, Does management improve the carbon balance of forestry? *Forestry: An International Journal of Forest Research*, Volume 90, Issue 1, 1 January 2017, Pages 125–135, https://doi.org/10.1093/forestry/cpw043

46 Luyssaert, S., Schulze, ED., Börner, A. *et al.* Old-growth forests as global carbon sinks. *Nature* **455,** 213–215 (2008). https://doi.org/10.1038/nature07276.

There is a growing sense of urgency that a substantial reduction in net emissions has to occur by 2050, which is when, according to the Intergovernmental Panel on Climate Change, the world should reach net zero to limit warming to 1.5°C)[47]. Looking at forests and carbon over a 30-year time frame creates a very different analytical framework than the one hundred years plus periods that Canadian foresters generally consider.

IFLs and forest carbon are closely linked, and there has been a recent outpouring of scientific studies and reports making the case that IFLs provide carbon benefits that are disproportionately large compared to their size. However, there is no one-size-fits-all approach to managing IFLs because Canada has a large variation in the composition of its IFLs that reflects differences in disturbance regimes and therefore different risks to carbon permanence. The risk to permanence is much higher in northern Saskatchewan, where fire cycles are short, than in coastal BC, where fire cycles are very long. Even the boreal forests of Quebec's north shore have quite long fire cycles and thereby low risk to permanence.

In the last decades some studies report that boreal forests were a net carbon source mostly because of insect infestations and wildfires.[48] Other studies report that it was a net sink in the same period.[49] The calculation results depend on the methodology used and the scope of the carbon flux being considered.

There is an increasing appreciation of the role of forests in the global carbon cycle and in maintaining climate patterns. The 2015 Paris Climate Accord specifically mentions the value of forests. Kurz et al. (2013) report that global forests have removed approximately 30% of anthropogenic fossil fuel C emissions since 1990; the proportion of anthropogenic emissions remaining in the atmosphere has remained roughly constant even though humankind's emissions have increased. In 2010, Canada accounted for 21-27% of the world's boreal forests and 8% of the world's forest (Kurz et al. 2013).

Table 17 summarizes the average carbon content in three forest biomes. In what may be a counterintuitive result, the amount of carbon stored in boreal soils is vastly higher than the total carbon stored in temperate and even tropical forests (Mahli et al. 1999)[50] The colder temperatures in the boreal mean that decomposition rates are slower and the biome supports abundant mosses and bryophytes in many ecosystem types.

Forest biome	C density vegetation	C density soils	Combined C density
Boreal	64	343	407
Temperate	57	96	153
Tropical	121	123	244
Average	86	189	275

Table 17. Average carbon density by forest type (t C/ha). (Source: Malhi et al. 1999).

47 Intergovernmental Panel on Climate Change. 2018. Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways in the context of strengthening the global response to the threat o climate change, sustainable development, and efforts to eradicate poverty (eds Masson-Delmotte, V. et al.) (World Meteorological Organization, 2018).

48 Zhao, B., Zhuang, Q., Shurpali, N. *et al.* North American boreal forests are a large carbon source due to wildfires from 1986 to 2016. *Sci Rep* **11,** 7723 (2021). https://doi.org/10.1038/s41598-021-87343-3

49 Harris, N.L., Gibbs, D.A., Baccini, A. *et al.* Global maps of twenty-first century forest carbon fluxes. *Nat. Clim. Chang.* **11,** 234–240 (2021). https://doi.org/10.1038/s41558-020-00976-6

50 Malhi, Y. 2010. The carbon balance of tropical forest regions, 1990-2005. Current Opinion in Environmental Sustainability. 2. 237-244.

Kurz et al. (2013)[51] assessed the carbon content of the Canadian-managed boreal forest (which was defined regionally and so included IFL areas) and found lower levels of carbon than Malhi et al. (1999). Kurz et al. (2013) found an average of 193 t C/ha in total, of which 40 t C/ha occurs in aboveground live biomass. Forty percent of the total carbon was in soil organic matter, with the rest in the dead wood, litter and below-ground live biomass pools. Both Kurz et al. (2013) and Malhi (1999) found a similar proportional distribution of carbon, if allowance is made for the greater aggregation of pools in Malhi's work. Interestingly, Kurz et al. (2013) declined to provide estimates of carbon stocks in unmanaged boreal forests, which were defined as areas north of the zone of commercial forestry and unproductive alpine and sub-alpine areas. The high level of uncertainty, including significant differences based on the measurement methodology, led them to note that, compared to managed forests, only the litter and soil pools in the unmanaged forest would have an even greater proportion of the carbon stored within them. Overall Kurz et al. (2013) concluded that Canada's managed boreal forest was a weak sink, due to the high level of natural disturbance (fire and mountain pine beetle) during the measurement period and the generally old age of the forest. However, in years where there are numerous and widespread disturbances, Canada's forests will be a net source.

There is no doubt that some old forests are able to store significant amounts of carbon and that in general undisturbed intact forests store larger amounts of carbon than those which are actively used, including for timber harvesting. Productive forests that are Intact tend to have more large trees in the canopy, and large trees that are actively growing can sequester disproportionately high levels of CO_2. In the average US forest, the largest 1% of trees in undisturbed primary or mature secondary forest accounted for approximately 30% of the above ground living biomass, while the average was roughly 23% in boreal forests (Lutz et al. 2018).[52] Maine's forests (which are not boreal), many of which have been harvested continuously over the past 200 years, have less than one third the carbon density of forests in southern Vermont and New Hampshire, which have not been harvested extensively for the past 75-150 years (Moomaw et al. 2019).[53] The difference is attributed to the absence of large trees in the former region.

Goldstein et al. (2020) reported that many forest ecosystems contain 'irrecoverable carbon' that is vulnerable to release upon forest harvesting and clearing and, once lost, is not recoverable within a timescale that will prevent a rise in temperature above 1.5°C.[54] Goldstein et al. identified peatlands, mangroves, old-growth forests and marshes as ecosystems with high densities of irrecoverable carbon; northwestern North America was identified as one of seven global regions with the highest biomass carbon densities in the world, with much of it likely unrecoverable.

One of the most surprising results in the literature was the finding, based on work done in tropical forests, that forest area within 500 m of the forest edge had an average of 25% less carbon than remote locations, and even areas within 5 km of edge have less than 90% of the carbon stores found in more remote forests (Watson et al. 2018).[55] Watson et al. did not discuss the extent to which the edge effects which drove these results (i.e., different microclimate, increased penetration of wind and pioneer species, including invasive species) would have the same effect in boreal forests.

A final emerging issue in climate science, and especially in climate mitigation, is the impact of albedo. The land surface's reflectivity of incoming solar radiation has an interesting relationship with forest management.[56] Because dark land cover (e.g., conifer forest) absorbs more sunlight than snow cover, logging and conversion actually have a counterintuitive impact on mitigation, as they reduce albedo-related warming. The albedo effect is principally relevant to conversion from forest to another land cover and it may have implications for IFL management.

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51 Kurz, W.A. et al. 2013. Carbon in Canada's boreal forest — A synthesis. Environmental Reviews 21(4):260-292.
52 Lutz, J.A. et al. 2018. Securing the climate benefits of stable forests. Global Ecology and Biogeography. 19(7):1–16.
53 Moomaw et al. 2019. Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good. Frontier in Forests and Global Change, 11 June 2019.
54 Goldstein, A., Turner, W.R., Spawn, S.A. *et al.* 2020. Protecting irrecoverable carbon in Earth's ecosystems. *Nat. Clim.* Chang. 10, 287–295. https://doi.org/10.1038/s41558-020-0738-8.
55 Watson, J. et al. (2018). The exceptional value of intact forest ecosystems. Nature Ecology & Evolution. 2. 10.1038/s41559-018-0490-x.
56 BrightRyan M., Antón-FernándezClara, AstrupRasmus, and StrømmanAnders H.. Empirical models of albedo transitions in managed boreal forests: analysis of performance and transportability. Canadian Journal of Forest Research. 45(2): 195-206. https://doi.org/10.1139/cjfr-2014-0132

Without a doubt, the consideration of IFLs in boreal forest regions differs from that in temperate and tropical forests because the most significant natural disturbances in boreal ecosystem tend to be stand-replacing fire and insect infestations. While many insect pests focus on one or two species (e.g., mountain pine beetle and spruce budworm), the propensity for boreal forest stands to be dominated by one or two species means that an insect infestation has the potential to kill large expanses of forest. As forest managers have contended, there is risk that intact forests could be extensively burned or attacked by insects. While the risk of fire is lower when there is less human activity, it is to be expected that some boreal IFLs will experience major disturbance – which weakens to some extent the carbon-based argument for retaining IFLs.

Moomaw et al. (2019) argue that proforestation – growing intact forests to their full potential – offers a low-cost effective approach that will also yield substantial co-benefits, and proforestation should be considered in policy as well as afforestation and reforestation. Law et al. (2018)[57] reported that extending rotations and reducing harvesting on public land in the northwest US had a larger carbon impact than afforestation or reforestation. At a global scale, Funk et al. (2019)[58] concluded that "stable" forests would play an out-sized role as a climate solution due to their sequestration and storage capabilities. Watson et al. (2018) argue that forests which are free of significant human degradation, such as that caused by fragmentation, forestry, and over hunting, should be given special consideration in policy-making and planning.

For the past 20 years, afforestation and reforestation have been commonly cited strategies for climate change mitigation. Reducing harvest levels and maintaining existing IFLs are also relevant measures because neither afforestation nor reforestation in Canada will remove substantial amounts of carbon during the critical next 20-30 years.[59] On the other hand, increasing the retention of forest ecosystems that have high carbon densities and continue to sequester carbon can reduce net atmospheric carbon emissions.[60] With more widespread carbon pricing at increasingly high levels (Canada plans to raise its carbon price to $170/tonne C by 2030 [61], the retention of IFLs can provide a flow of revenue as well as help in the fight against climate change.

SUMMARY OF CARBON IMPACTS

- Respondents differed in their assessment of whether IFLs provided carbon benefits. The main question was whether the IFLs would end up being disturbed, thus emitting large amounts of carbon.
- The next 30 years is a critical period for the fight against climate change, in this time scale, storing carbon in IFLs keeps more carbon out of the atmosphere compared with harvesting and renewing with fast-growing tree species.
- Some literature suggests that intact forests have more ecosystem carbon than managed forests, primarily in soil, humus, and dead wood pools. Increased human use associated with roads also reduces forest carbon stores.

57 Law, B. E. et al. 2018. Land use strategies to mitigate climate change in carbon dense temperate forests. Proceedings of the National Academy of Sciences USA 115: 3663– 3668.
58 Funk, J. M. et al. 2019. Securing the climate benefits of stable forests. Climate Policy.
59 Chen, Z., Yu, G. & Wang, Q. Effects of climate and forest age on the ecosystem carbon exchange of afforestation. *J. For. Res.* 31, 365–374 (2020). https://doi.org/10.1007/s11676-019-00946-5
60 Luyssaert, S., Schulze, ED., Börner, A. et al. Old-growth forests as global carbon sinks. Nature 455, 213–215 (2008). https://doi.org/10.1038/nature07276
61 Pricing carbon pollution. https://www.canada.ca/content/dam/eccc/documents/pdf/climate-change/climate-plan/annex_pricing_carbon_pollution.pdf

8. Conclusions

Perspective matters a great deal when interpreting the impacts of IFLs. We heard a wide range of perspectives from the people we interviewed and one thing in common was that everyone had strongly held views on the impacts of IFLs and the trade-offs associated with protecting them. The main focus of this assignment, as directed by FSC Canada and FSC International, was to assess the economic impacts of protecting IFLs under FSC. Accordingly, the majority of our effort was directed towards this end. The report also describes environmental impacts, the relationship between IFLs and forest carbon balances, and a sub-set of the wide range of social impacts.

IFLs are a constraint on forest managers who are FSC certified when the IFLs contain area that would otherwise be available for commercial forestry. However, our study shows that many IFLs are partly protected and/or unsuitable for harvest because they are low productivity areas or steep slopes. In BC 65% of the IFL area is either protected or has an operational constraint that makes harvesting unlikely. The area is respectively 46% and 52% in Ontario and Québec. In Québec, this includes caribou protection measures which do not yet permanently protect IFLs.

Based on our interviews with approximately a dozen forest managers, we found that the current economic impact is negligible for most forests but that it is likely significant for a small number of forests. This is because in many FMUs, harvesting can be located outside IFLs or because limited harvesting of IFLs is permitted. However, most forest managers are concerned about the impacts in 15 to 20 years in FMUs where IFL protection reduces the area available for timber supply; few have modelled the impacts. However, many provided estimates that disproportionately exceeded the proportion of otherwise available forest occupied by IFLs. Moreover, companies conduct their supply analyses based on provincial regulations, which do not recognize IFLs; this hides the impact of IFLs on wood supply. In our interpretation, it is the cumulative impact of IFLs with these constraints that is most concerning for forest managers in the long term. This is why they feel it is so crucial to have more flexibility in how IFLs are managed. As an example, with the permission of the provincial government, in FMUs where IFLs impact supply there could be opportunities to source wood from neighbouring FMUs. Based on our assessment, we conclude that in most FMUs, the short-term economic impacts are negligible and the mid- to long-term impacts will be modest. However, there are substantial short-term impacts in a small number of FMUs and more FMUs may experience more significant mid- to long-term impacts. These conclusions are predicated on the assumption that the provincial governments do not change their stance and that initiatives such as 30 by 30 do not result in the addition of IFLs into protected areas.

IFLs provide ecological benefits in particular by retaining remoteness and intactness. Maintenance of biodiversity through avoidance of fragmentation, timber harvesting, and restriction of human impact was cited by all ENGO representatives as a primary benefit. IFLs tend to also overlap significantly with species at risk habitat, especially woodland caribou. A point made by many provincial government staff and forest managers was that IFLs are based only on intactness and may be areas of lower ecological value; in other words, the value of intactness is not widely viewed as being important. A clearer definition of the ecological values that IFLs are meant to protect would perhaps increase their acceptance.

IFLs were also viewed as having positive carbon benefits by ENGO representatives that we interviewed, whereas forest managers and provincial government staff were more skeptical. The primary carbon benefit from IFLs is that the carbon stores within them will not be released into the atmosphere, recognizing that some natural disturbance will invariably occur in some IFL areas.

Our interviews regarding social impacts were directed towards Indigenous peoples, as IFLs were known to be a major concern, and the results of these interviews were an important component of our social impact assessment. The majority of the Indigenous people we spoke with were fundamentally opposed to the way IFLs were presented and implemented and have advocated for recognition of an alternate landscape level approach that is more consistent with their values. Namely Indigenous Cultural Landscapes. Currently, the measures to protect IFLs are implemented without the free, prior, informed consent of the affected communities because the Advice Note 18 does not require it. However, Motion 65 clearly required FPIC to be achieved for IFL protection measures and IGI 3.2.4 implies FPIC for any management activity that will affect Indigenous Peoples' rights. Moreover FSC-GUI-30-010 V1-0 EN Intact Forest Landscapes Guidance for Forest Managers came into effect in 2020 and provides clearer guidance for identifying, managing and monitoring IFLs, including provisions around FPIC. The failure to explicitly incorporate FPIC when considering measures to protect IFLs needs to be addressed by FSC Canada.

We viewed forest sector employment as a second key social impact and discussed this with managers, as well as impacts on forest access, royalties and social services. The analyses were based on a combination of the consultants' experience, an extrapolation of the impacts on wood supply, and a small number of interviews. There are several social impacts that have not been addressed as part of this study and several groups of social stakeholders were not interviewed or had few interviews, such as union leaders, community mayors, and recreational users. A more extensive survey and review of social impacts is recommended to provide more balance to the discussion regarding impacts. Also, in most FMUs, there is currently no wood supply reduction caused by IFLs and therefore no impact on employment or on economic benefits to local communities.

Provincial governments see FSC's IFL requirements as an unwarranted intrusion into land-use planning, a provincial domain, and no provincial or territorial government confers official recognition on FSC IFLs. This is of particular importance because the long-term preservation of IFLs, including IFLs outside certified forests, can only be achieved in collaboration with the provincial governments. In developing measures for protecting IFLs, FSC should work with governments along with Indigenous groups, forest companies and environmental groups.

Annex 1: Motion 65

MOTION 65, FSC GENERAL ASSEMBLY 2014, Policy Motion (high-level action request):

To ensure the implementation of Principle 9 and the protection of Intact Forest Landscapes—the world´s remaining large undisturbed forest areas contained in HCV2—across FSC certified operations, FSC will direct Standard Development Groups (SDGs) and Certification Bodies (CBs), where no SDG exists, to develop, modify, or strengthen (according to standards revision processes) indicators within National Standards and CB standards that aim to protect the vast majorities of IFLs. Taking into account scale, intensity and risk as well as respecting the activities, customary and legal rights of traditional forest communities, this process will:

1. Be based on best available, independent, peer-reviewed science and other information;
2. Take into consideration IFL degradation in FSC FMUs since 2000;
3. Respect Free Prior and Informed Consent of indigenous Peoples, traditional peoples and forest dependent communities in affected FMUs;
4. Within IFL cores ensure that Certificate Holders implement protection measures (for example, set-asides, legal protected areas, conservation reserves, deferrals, community reserves, indigenous protected areas etc.) ensuring management for intactness, in areas within their control;
5. Require a comparative assessment of the viability and effectiveness of alternative land use options, in maintaining and enhancing intactness of IFLs including in areas outside FSC FMUs (landscape level);
6. In limited circumstances, allow limited development of IFL cores if such operations produce clear, substantial, additional, long-term conservation and social benefits;
7. Where applicable, address the need to reduce timber harvesting rates to reflect any reduction in the timber volume due to removal of IFL areas from harvesting;
8. Prioritize development of low-impact/small scale forest management, non-timber forest products in unallocated IFL areas, and provide first access to local communities an taking into consideration section iii; and
9. Promote alternative models for forest management/conservation (for example, ecosystem services etc.) within the IFLs.

If by the end of 2016 a relevant standard has not been implemented, a default indicator will apply that mandates the full protection of a core area of each IFL within the management unit. For this purpose, the core area of the IFL will be defined as an area of forest comprising at least 80% of the intact forest landscape falling within the FMU

Annex 2: Motion 34 and Guidelines for implementation

34/2017 Regional assessments of the impacts of the implementation of Motion 65/2014

Policy Motion (high-level action request)

Enable the conducting of regional assessments of the short and long-term impacts – positive and negative – of the management and protection measures associated with the implementation of Motion 65/2014 and the International Generic Indicators (IGI) which are the starting point for developing National Standards. In accordance with item 5 of the Motion, these assessments should compare various scenarios of implementing Motion 65/2014 and the IGIs and consider the environmental, social, and economic dimensions. Particular effort will be made to ensure the inclusion of impacts on Indigenous Peoples, traditional peoples and forest dependent communities in these assessments.

GUIDELINES FOR STANDARD DEVELOPMENT GROUPS

Purpose

Motion 34 requires FSC to 'enable the conducting of regional assessments of the short and long-term impacts – positive and negative – of the management and protection measures associated with the implementation of Motion 65/2014 and the International Generic Indicators (IGI)'. This document describes the framework in which these regional assessments will be developed. FSC has prioritised the following countries for the development of the assessments in 2018:

- Russia / Boreal
- Canada / Boreal
- Brazil / Amazon
- Congo Basin

Other countries / SDGs may follow but will also be required to take this Framework / Guidelines into account when working on the assessments.

The Framework / Guidelines have 2 major fields of required compliance:

1. Process of assessments of impacts in the implementation associated with Motion 65/2014
2. Minimum content requirements in the assessment of impacts in the implementation associated with Motion 65/2014

Motion 34 can be applied at 2 moments in the standard setting processes:

1. To develop indicators: During the standards development process, before the SDG decides on a standard, to see what the implications would be of the different options for wording of the indicator that are discussed in the SDG; OR
2. To monitor developed and agreed indicators: When the standard has been approved, assessing what the implication of the indicators are for managing Intact Forest Landscapes. The Standard Development Group agrees in the first stage of implementing Motion 34 which approach will be taken and communicates this with PSU and the Motion34 Steering Committee members.

PROCESS OF ASSESSMENTS OF IMPACTS IN THE IMPLEMENTATION ASSOCIATED WITH MOTION 65/2014

Summary illustration:

FSC Motion 34 Steering Committee
Checks ToR towards Framework, checks Quality of reports towards ToR / advises on global implementation of findings in the reports

Canada	Russia	Amazon/Brazil	Congo Basin
1. appoints a chamber balanced Task Force	1. appoints a chamber balanced Task Force	1. appoints a chamber balanced Task Force	1. appoints a chamber balanced Task Force
2. TF develops ToR	2. TF develops ToR	2. TF develops ToR	2. TF develops ToR
3. TF appoints an independant, external consultant	3. TF appoints an independant, external consultant	3. TF appoints an independant, external consultant	3. TF appoints an independant, external consultant
4. TF receives and checks report of consultant, formulating outcomes and actions	4. TF receives and checks report of consultant, formulating outcomes and actions	4. TF receives and checks report of consultant, formulating outcomes and actions	4. TF receives and checks report of consultant, formulating outcomes and actions

1. International level

1.1. FSC International appoints a Motion 34 Steering Committee of 3 FSC directors:

1.1.1. Hans Joachim Droste (Chief Policy Officer)

1.1.2. Jeremy Harrison (Chief Marketing Officer)

1.1.3. Gemma Boetekees (FSC Stakeholder Solutions Director)

1.2. The role of the Motion 34 Steering Committee is to:

1.2.1. Agree the ToR to be compliant with the Framework in this paper

1.2.2. Agree the report of the external independent consultant appointed by the regions/countries to be compliant with the ToR and the expected quality.

1.2.3. Develop a plan of outcomes, proposed actions and solutions for FSC International and the SDGs to address the identified solutions in the reports delivered.

2. National/Regional level

2.1. the (prioritised) SDG allocates a part of the FSC Activity Compensation Fee towards the development of the impact assessment. This figure is agreed between FSC International and the FSC National Office in the 2018 work plan.

2.2. The SDG appoints a 3-chamber based Task Force for the impact assessment research, with at least:

2.2.1. One social chamber member of the SDG

2.2.2. One economic chamber member of the SDG, and

2.2.3. One environmental chamber member of the SDG.

2.3. The SDG Task Force for the impact study develops and approves Terms of Reference for the Impact Assessment Research, based on paragraph 3 of these Guidelines as mandatory elements of the research.

2.4. The SDG Task Force for the impact Study sends the ToR for a check on compliance with the Framework to the Motion 34 Committee. If needed, the SDG Task Force adjusts the ToR in agreement with the Global Motion 34 Committee.

2.5. The (Board of the) FSC National Office runs a selection process to appoint an independent consultant for the Impact Assessment, based on the approved Terms of Reference.

2.6. The Board of the FSC National Office selects an external and independent consultant to commit the Impact Assessment, in line with the approved Terms of Reference of the Task Force of the SDG.

2.7. The Task Force of the SDG for the Impact Assessment assesses the selected candidate for the impact assessment, for compliance with:

2.7.1. The Terms of Reference

2.7.2. The available budget

2.7.3. The independence of the consultant from any specific environmental, economic or social interest in forests.

2.7.4. If compliance is achieved, the consultant is appointed.

2.7.5. If compliance is not achieved, the consultant cannot be appointed and a renewed call for candidates is needed.

2.8. The report of the consultant is presented to the SDG Task Force and the Board of the FSC office and compliance with Terms of Reference is assessed and ensured.

2.9. The report is sent to the Motion 34 Steering Committee, for a consistency check with these Global Guidelines. The report sent to the Motion 34 Steering Committee includes outcomes and actions and is solution oriented.

3. Minimum content requirements in the assessment of impacts in the implementation associated with Motion 65/2014

The following elements shall be addressed in the Terms of Reference of the impact studies.

3.1. General aspects

3.1.1. What is the place of the (potentially interested) certificate holders' forest area in the Intact Forest Landscape (IFL) in the region/country?

3.1.1.1. A small map of the IFL, with the boundaries of the certificate holders indicated

3.1.1.2. An indication of protected area within the IFL

3.1.1.3. An indication of known settlements, communities and indigenous area

3.1.1.4. An indication of the extent (in ha) of IFLs in the region and its development since 2000?

3.1.1.5. What is the overlap of FSC certified area with IFLs?

3.2. Economic Impacts

The economic impact assessment shall at least respond to the following questions:

3.1.1 Is the implementation of Motion 65 economically viable, attractive and/or acceptable to all interested parties?

3.1.1.1 How much of the total revenue and how much of the annual harvest of the company is coming from Intact Forest Landscapes?

3.1.1.2 What are the costs and benefits flow for (potentially interested) certificate holders?

3.1.1.3 How do IFL IGI and the Instructions for Standard Developers contribute to minimizing the economic burden and improving economic viability for (potentially interested) certificate holders / stakeholders (scenarios: no protection, 30% protection, 50% protection, 80% protection)?

3.1.1.4 What is the economic impact of protecting a percentage (see scenarios in 3.1.1.3) of a Management Unit for different stakeholders (e.g. Indigenous and Traditional Peoples and local communities) living in or adjacent to the Management Unit?

3.1.1.5 What do (potentially interested) certificate holders / stakeholders consider as an acceptable economic threshold of protecting IFL areas within the MU (i.e. % of MU)?

3.1.2 What are the budget and financial sustainability implications of the implementation of Motion 65 for the certificate holder?

3.1.2.1 What investments of the (potentially interested) certificate holders were / will be required which are specifically related to the implementation of M65/2014 on Intact Forest Landscapes? (e.g. funds needed to cover operating expenses)

3.1.2.2 What are the cash flow implications for the (potentially interested) certificate holder over time? How does this influence sustainable management of the forests?

3.1.2.3 How stable and predictable are the costs and benefits flows for the (potentially interested) certificate holder?

3.1.3 Are subsidies, investments or other incentives received to make the implementation attractive?

3.1.4 How do affected stakeholders react to various economic impact scenarios? (e.g. continuing certification, dropping certification, moving to a less demanding certification scheme)

3.1.5 What indirect/intangible economic benefits may arise from the implementation of Motion 65? (e.g. protecting IFLs improves the image and value of the FSC brand) What risks may arise from the implementation of Motion 65?

3.2 Social impacts

The social impact assessment shall at least respond to the following questions:

3.2.1 How are the returns and costs of the implementation of Motion 65 benefitting or disadvantaging the different stakeholder groups?

3.2.1.1 To which degree do they impact on

3.2.1.1.1 Social services (access to health care, schools, security) of the rural municipalities and indigenous peoples

3.2.1.1.2 Tax from the concessions

3.2.1.1.3 Employment of forest workers

3.2.1.1.4 Indigenous peoples access

3.2.1.1.5 Recreation

3.2.2 How are Indigenous Peoples, traditional peoples and/or forest dependent communities recognized and impacted (positively and/or negatively) by the Intact Forest Landscape, particularly within the certified concession?

3.2.2.1 With respect to traditional knowledge?

3.2.2.2 With respect to land use priorities and intactness?

3.3 Environmental impacts

The environmental impact assessment shall at least respond to the following questions:

3.3.1 What is the historical background of the IFL in which the (potentially interested) certificate holders is operating?

3.3.1.1 Is fragmentation happening in the IFL in which the (potentially interested) certificate holder has its operations? If so, what are the main reasons?

3.3.2 What mechanisms or policies are in place to protect the IFLs in the region/country? How are they effective?

The expectation of the report coming from this impact assessment is a report of maximum 10 pages.

4. Timeline

The SDGs develop a timeline, in which:

- The moment in the standard setting process is identified to address Motion 34, and
- The 4 steps are planned as planned in the summary illustration on page 1.

This timeline is sent to the Motion 34 Steering Committee before 31 December 2018. The process as described above is finalized by the Standard Development Committee, latest August 2020.

Annex 3: Interview guide for forest managers

1	What are your MU / supply forests? Are there any IFLs that overlap these MUs / forests? If yes, how many, do you know the IFL number?
2	Are the forests certified?
3	Approximately how much of the allowable cut comes from the IFLs?
4	Does the protection of IFL affect the annual harvest (choice of sectors and possibility)
5	Other than the potential loss of volume, are there other costs related to IFL protection?
6	Explain the large volume of unharvested wood in the FMP for the last 10 years?
7	Do you see positive elements in the protection of IFLs?
8	Currently, 80% IFLs are protected in certified forests, is this a proportion that seems acceptable to you? Otherwise what would be an acceptable protection threshold?
9	Are there any grants, investments or other incentives received for the protection of IFLs?
10	Does the protection of IFL have an impact on the taxes paid in the context of your operations?
11	Is there an impact on employees and forestry workers?
12	To your knowledge, are there policies and mechanisms for the protection of IFLs in your region, province, country? Are they effective?
13	Are there any risks for the implementation of IFL protection?
14	What is your perception of the position of the govt. in Ontario in relation to FSC certification and requirements?
15	In your opinion, are IFLs important for the credibility of FSC?
16	Are there any users of intact forests in your territory, i.e., natives, hunters, tourists, science, etc.
17	In your opinion, is the protection of IFLs consistent with the needs and interests of local communities (i.e., including First Nations)
18	Other considerations

Annex 4: Interview guide First Nations and other users/NGO

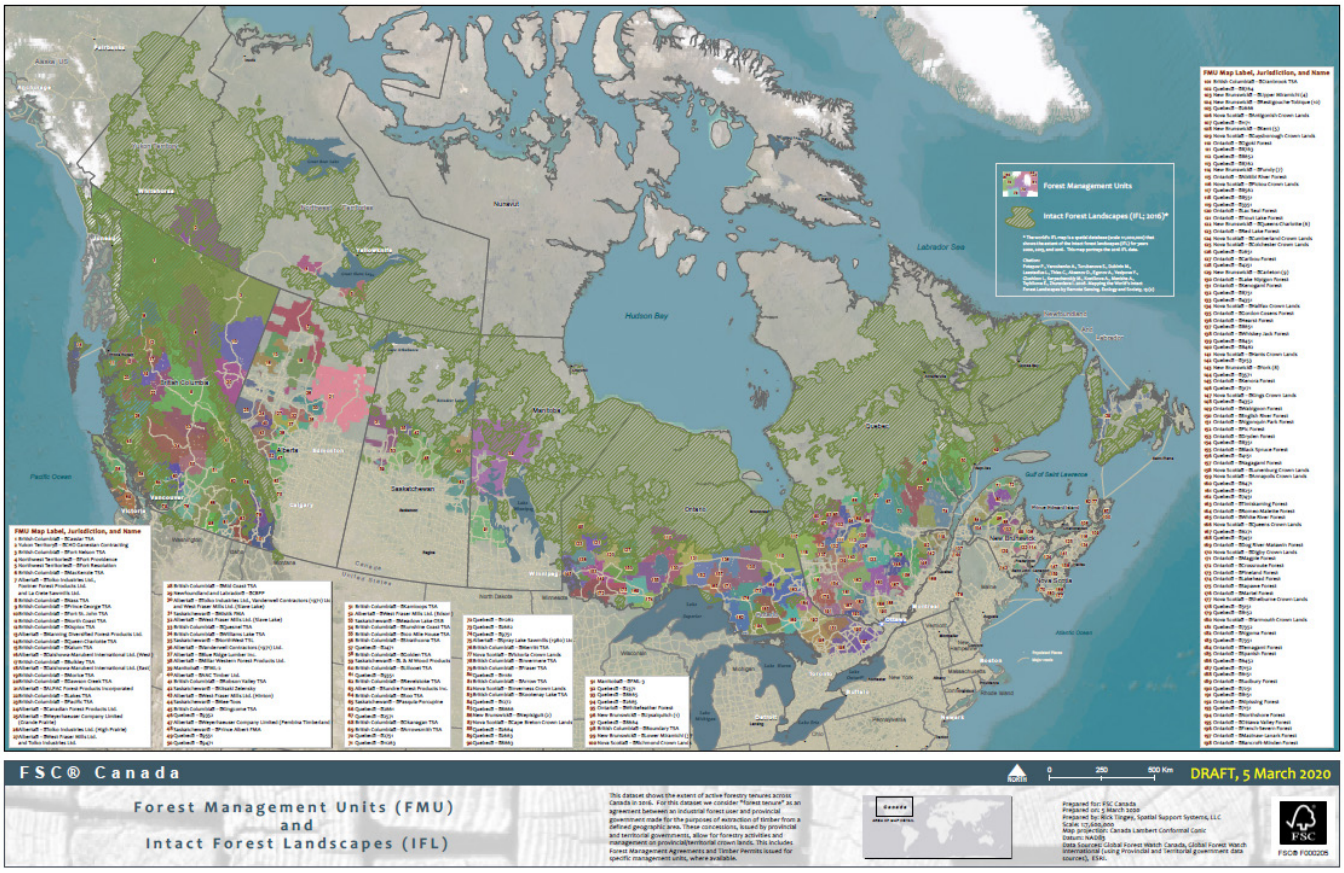
1	Do you know what an IFL is and do they you think protection is important?
2	What do you consider as an acceptable threshold of protecting IFL areas within the MU (i.e., % of MU)?
3	Do you feel IFLs may have an impact on Social services (access to health care, schools, security).
4	Are you worried about an impact on employment of forest workers?
5	Do you perceive an impact on access?
6	How important do you think IFL's are to FSC's credibility and brand?
7	Do you think the protection measures are consistent with the interest of first nations? Or if forest user/first nation are the protection measures consistent with the interest
8	Do you perceive an impact on traditional knowledge?
9	Do you perceive an impact to land use priorities and intactness?

Annex 5: List of stakeholders Interviewed

Interviewee	Affiliation
Albert Nussbaum	BC Forest Analysis and Inventory Branch, Forests, Lands, Natural Resource Operations & Rural Development
Andrew Chapeskie	Whitefeather Forest Management
Catharine Grant	Canopy
Chris Longmore	Mercer International
Chris McDonell	Rayonier Advanced Materials and Board member of FSC Canada
Christine Galliazzo	BC Forests, Lands, Natural Resource Operations & Rural Development
Christine Leduc	Eacom Timber Corporation
Courtenay Lewis	National Resources Defence Council
Dave Lepage	Chantiers Chibougamau
Don Bazeley	Rayonier Advanced Materials
Elston Dzus	Alberta-Pacific Forest Industries Inc
Ian Thompson	Consulting biologist
Kari Stuart-Smith	Canadian Forest Products Ltd
Peggy Smith,	FSC Aboriginal Chamber Member
Ronnie Drever	Nature United
Étienne Bélanger	Forest Products Association of Canada
Étienne Vézina	Resolute Forest Products
Félix Plante	Chantiers Chibougamau
Geoff Quaile	Grand Council of the Crees (Eeyou Istchee)
Jennifer Skene	National Resources Defence Council
Julee Boan	Ontario Nature
Keith Moore	Moore Resource Management
Kevin DelGuidice	Rayonier Advanced Materials

Interviewee	Affiliation
Kevin Gillis	Mistik Forest Management
Marie-Ève Sigouin	Rayonier Advanced Materials
Mark Lockhart	Nipissing Forest Resource Management
Nyssa Temmel	Natural Resource Operations & Rural Development
Olivier Kormel	Greenpeace
Pamela Perrault,	FSC Aboriginal Chamber Member
Pier-Olivier Boudreault	Société pour la nature et les parcs (CPAWS Québec)
Ryan Murphy	Aditiya Burla Group, AVTB
Sarah Bros	Whitefeather Forest Management
Scott McPherson	Nipissing Forest Resource Management
Simon Lamoureux	Fédération des Trappeurs Gestionnaires du Québec
Solange Nadeau	Canadian Forest Service, NRCan
Sonia Vaillancourt	Conseil Québécois du Loisir
Stephanie Parsei	Eacom Timber Corporation
Thomas Ratz	Resolute FP Canada
Troy Anthony,	Ontario Ministry of Natural Resources and Forestry
Valérie Courtois	Indigenous Leadership Initiative Ministère des Forêts, de la Faune et des Parcs

Annex 6: IFL distribution map overlaid with FMU boundaries



Annex 7: Revision History

The table below presents the history of changes and revisions to the Impact Assessment of Implementing FSC's Protection Measures for Intact Forest Landscapes in Canada. These changes resulted in a new version of the report. This table is persistent throughout the lifetime of the impact assessment.

Date	From version…	To version…	Section	Change
25/10/2021	June 24, 2021	October 25, 2021	2. Methodology	In section 2.1.3. "minimum area of 50,000 ha and minimum width of 10 km."
			3.1 Forest management in IFLs	We updated table 2 to include all FMUs with IFLs instead of FMUs with ≥1000 ha IFL.
			4.4 Impact on wood supply in Quebec	In Figure 8, FMU names were corrected, and minor changes were made in the text and to reflect the updated table 8.
				These revisions do not impact the conclusions of the impact assessment.