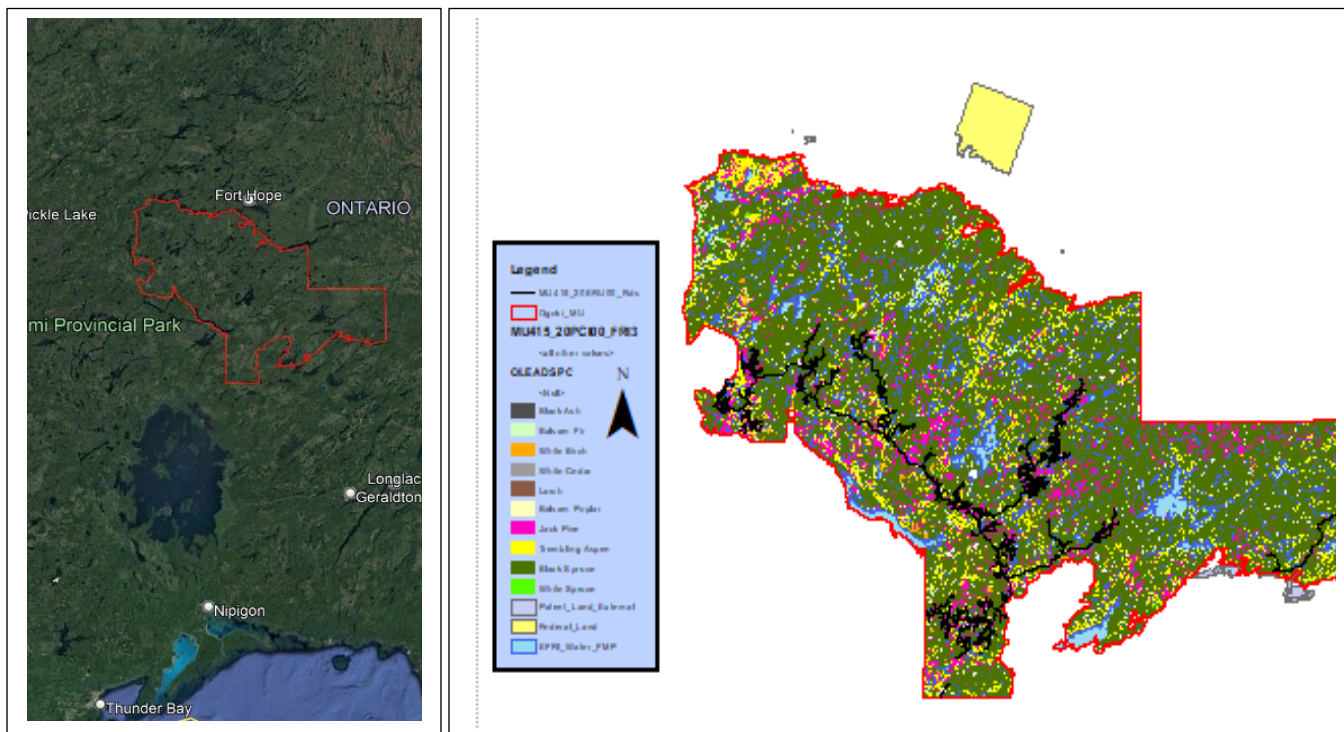# R & B CORMIER INC.

Boots on the Ground and Eyes in the Sky Since 1989

SEPTEMBER 2023 – REPORT 1 of 2

ASSESMENT FOR GENERATING CARBON CREDITS

IN ONTARIO'S OGOKI CROWN FOREST

TO: Christopher C.J. Angeconeb, *President & Chief Executive Officer*
Big Tree Carbon Inc.
Suite 3600, 22 Adelaide Street West
Toronto, Ontario, M5H 4E3

BY: **Robert G. Cormier,** President, Business Analyst, Chief Pilot, Forestry Technologist

Brain Callaghan, R.P.F., Sr Timber Supply Analyst and Certified Ontario FMP Auditor

Thomas Baglole. R.P.F., Sr Forest Carbon Analyst

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1.0   Forward

R&B Cormier Inc. is a Canada based Natural Resource Contracting and Consulting firm based in Sault Ste. Marie, Ontario. The Contracting division supplies turnkey forest resort inventory development, satellite, radar and airborne imagery, operational field services, and three-dimensional land mapping. The Consulting division specializes in wood supply, biomass and carbon analysis, including timber evaluations and non-timber forest product research.

At the request of **Big Tree Carbon Incorporated** (**BTC**) R&B Cormier Inc. (**R&B**) is pleased to provide this confidential report as per the Terms of Reference received earlier and "*requested*" below.

BTC has an agreement in place with the Agoke Development Corporation **(ADC)** to develop and profit share for developing and generating forest carbon credits on the Ogoki Crown Forest which the ADC manages under agreement with the Ontario Government 's Ministry of Natural Resources an & Forestry **(MNR&F).**

BTC Terms of Refence Received*:*

"*Terms of Reference to conduct a forest carbon sequestration assessment of the Ogoki Forest Management Unit*

Purpose:

To deliver an assessment of carbon sequestration potential of the Ogoki Forest management unit for purposes of generating carbon offset credits in both compliance and voluntary market scenarios. To identify forest stands best suited to generation of carbon offset credits. To deliver project development estimations of costs for registering credits in both compliance and voluntary market scenarios. To deliver project operation costs and audit/verification costs on an annual basis.

The Assessment Report baseline conditions must include current conditions within the Ogoki Forest, including planned harvest blocks and fibre commitments during the 2023-28 plan period.

The Assessment Report shall identify the methodology used to assess the carbon offset credit potential for both compliance and voluntary market scenarios.

1.1   Proponents/Partners

Big Tree Carbon Incorporated:

Big Tree Carbon Incorporated (**BTC**) is a carbon sequestration natural resource developer and a mineral exploration firm. It is a TSX Venture - publicly traded company with a majority Indigenous Directors and an Anishinaabe President & CEO. BTC strives to provide both access to the investing public in the Natural Asset Resource business and guidance between First Nations Communities and capital markets.

Agoke Development Corporation:

The Agoke Development Corporation **(ADC)** which was incorporated in September 2015, is equally owned by three First Nation Partners, and is designed as a vehicle to separate business from politics and to pursue forest management. Those Partners are Aroland First Nation, Eabametoong First Nation, and Marten Falls First Nation.

In March 2018, ADC signed a ground-breaking forestry agreement with the Ministry of Natural Resources and Forestry (MNR&F) to take on forest management of the Ogoki Forest's Sustainable Forestry License (**SFL**).

BTC & ADC Agreement:

In November of 2021 BTC and ADC signed an agreement in which BTC would develop and fund a forest carbon offset on behalf of ADC for a percentage of net revenues on the Ogoki Crown Forest Management Unit (**OMU).**

1.2   Project Location and Metrics

The Ogoki Crown Forest Management Unit (**OMU**) is one of forty-two Forest Management Units (**FMU)** across Ontario and one of eighteen in Northwestern Ontario. Located 240 kilometers northeast of Thunder Bay, Ontario, it is one of the farthest Northern FMUs in the Province and is just south of the treeline and covers an area of over 1,028,496 hectares (**ha**). See outline in yellow below:

Figure 1: Ontario's Crown Forest Management Units
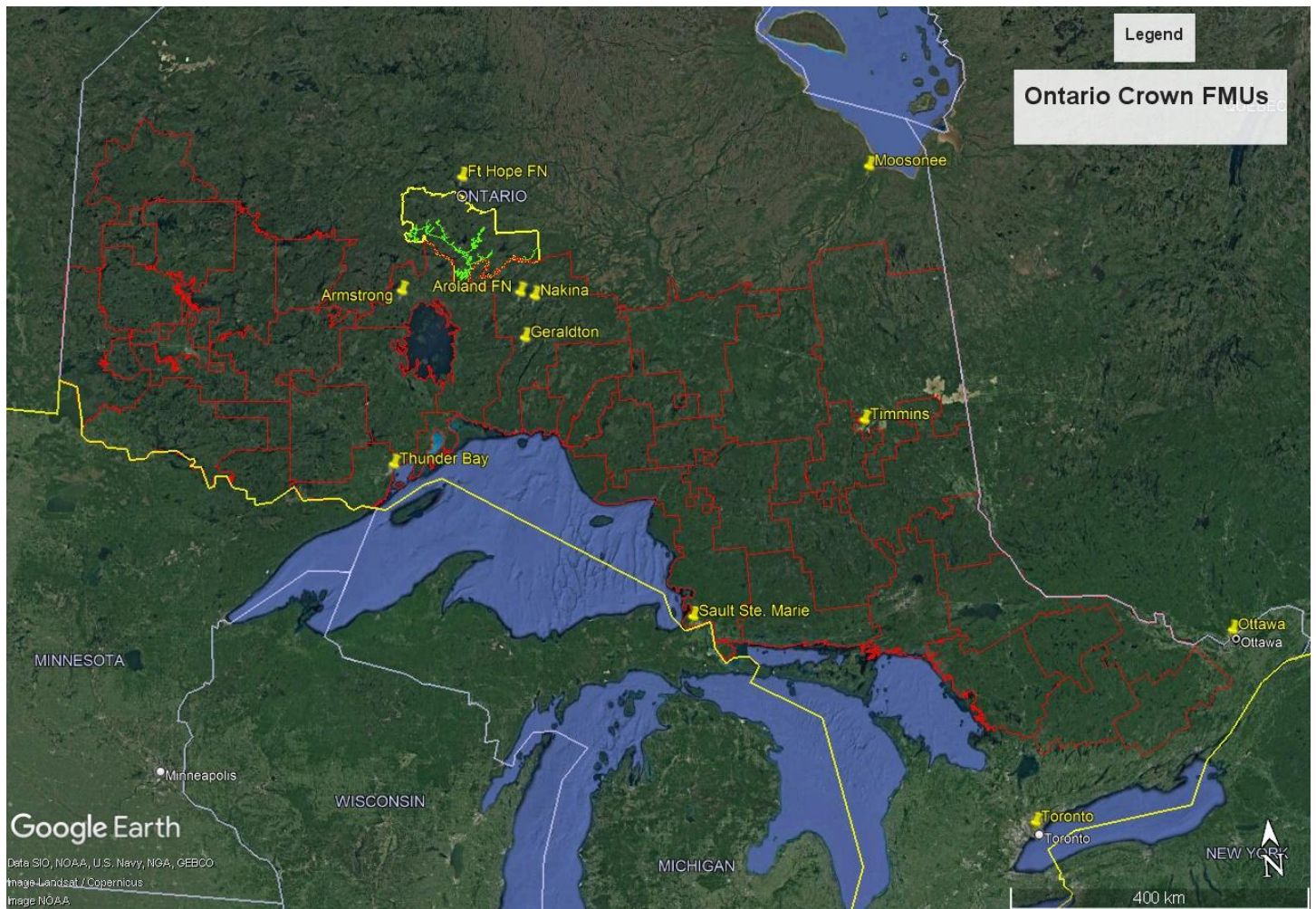
1.3 Key Forest Carbon Crediting Terms & Explanations

Forest Unit (FU) The dominant tree species in forested compartments a.k.a. stands per updated forest resource inventory **(FRI)**.

Greenhouse Gases (GHG) GHGs include the six gases listed in the Kyoto Protocol: carbon dioxide methane; nitrous oxide; hydrofluorocarbons; perfluorocarbons and sulphur hexafluoride.

Baseline The most likely sequence of events and actions which would be expected to occur in the absence of the project activity, aka business as usual based on last 5-10 years of records.

Additionality The concept that a project's emission reductions and removal enhancements must go beyond (be additional to) what would have occurred in the absence of the GHG offset project. Projects are deemed additional where they can demonstrate that the incentive of having a GHG reduction recognized as an emission offset is a key factor in overcoming financial, technological, or other obstacles to carrying out the project.

Permanence Permanent carbon offsets are reductions that cannot be reversed. In other words, the carbon removed can not be reintroduced into the atmosphere given the management and disturbance environment in which it occurs

Leakage A deduction percentage applied to a project resulting in an increase in GHG emissions from areas outside the project area, which would be directly caused by the project activity, and which occurs when the actual agent of deforestation and/or degradation moves to or undertakes activities in another area outside of the project area and continues deforesting and/or degrading activities to meet former project baseline markets.

Buffer Pools A risk deduction percentage applied to a project to form the basis of ensuring permanence, projects are also expected to prepare a Risk Mitigation and Contingency Plan to reduce the risk or scale of emissions from natural and human caused events like fires or major climate change events.

Monitoring, Reporting & Verification (MRV) All monetized GHG offset projects require being in compliance once registered and being actively traded requires documented proof as per protocol they follow and is it up to the project proponent to assure and produce independent ongoing compliance evidence and documentation.

Co-Benefit Carbon Offsets implementing more than 1 standard to follow so buyers maximize benefits across various standards and are willing to pay a premium to developer for extra costs to create a Co-Benefit offset.

Removal Carbon Offsets are generated from activities that pull carbon out of the atmosphere, such as tree growth and usually command the highest price at auction if have a robust and credible MRV program.

Avoidance Carbon Offsets are from activities that reduce emissions by preventing their released into the atmosphere such as stopping the conversion of grasslands to croplands and limiting timber harvest and quality/price depend on MRV and tract record of developer (recent auction prices at half or less than Removal).

2.0   List of Acronyms Used in Report

- **~** Approximately

- **AAC** Allowable Annual Cut

- **Ac** Acres

- **ACR** American Carbon Registry

- **ADC** Agoke Development Corporation

- **aka** also known as

- **AR** Annual Report

- **Bf** Balsam Fir Forest unit

- **BW** White Birch Forest Unit

- **BTC** Big Tree Carbon Incorporated

- **BTU** British Thermal Units

- **CAD, CDN** Canadian

- **CAR** California Air Resources Board (Compliance Carbon Offset Auction)

- **CCBA** Climate, Community & Biodiversity Alliance

- **CE** Cedar Forest Unit

- **C0^{2}e** Carbon Dioxide Equivalents

- **Dom** Dominant Species

- **ERT** Emission Reduction Tonnes

- **FN** First Nation

- **FMP** Forest Management Plan

- **FRI** Forest Resource Inventory

- **FSC** Forest Stewardship Council (Independent Forest Management Certification Agency)

- **FU** Forest Unit

- **GHG** Greenhouse Gases

- **GIS** Geographic Information Systems (spatial records and files)

- **GTV** Gross Total Volume includes all parts of tree above stump height

- **Ha, ha** hectare

- **Hrd** Hardwood (deciduous) Species

- **IFM** Improved Forest Management

- **M³**, **m3** cubic metres

- **MAI** mean annual growth increment (area based factor)

- **Mgmt** Management

- **Mx** Mixed Species

- **NMV** Net Merchantable Volume (only includes log product volumes of trees)

- **MNR&F** Ontario Ministry of Natural Resources & Forestry

- **MRV** Monitoring**,** Reporting and Verification

- **MT** Metric Tonnes

- **MU** Management Unit (Ontario Crown Forest)

- **NSR** Not Sufficiently Regenerated (stand condition post harvest or disturbance)

- **OC** Other Conifer Forest Unit

- **OMU** Ogoki Crown Forest Management Unit

- **Pj** Jackpine Forest Unit

- **PWR** Pine (White & Red) Forest Unit

- **R&B** R & B Cormier Inc.

- **SDVista** Sustainable Development Verified Impact Standard

- **SFL** Sustainable Forestry Licence

- **SPF** Spruce-Pine-Fir Forest Unit

- **TOL** Tolerant Hardwood Forest Unit

- **TPHA, tpha** tonnes per ha (in metric tonnes)

- **TPY, tpy** tonnes per year (in metric tonnes)

- **VCU** Verified Carbon Unit (in metric tonnes)

- **VERRA** Verified Carbon Standard (formerly VCS Voluntary Carbon Standard)

- **Yr, yr** year

3.0   Executive Summary

As per BTC's Terms of Reference in assessing the commercial viability of initiating a forest carbon offset crediting process on the OMU, **below is the summary of R&B's Key Findings and Recommendations.**

- Our research indicates that the voluntary carbon credit market in Canada and worldwide is growing but the focus going forward for major buyers will be for high quality credits that stand up to public scrutiny. Buyers see spending on carbon credits as non-discretionary and demand is expected to grow.

- **To date, all Ontario forest offsets being developed and, or trading are on private lands (aka freehold) and the Ontario Government has no current guidelines or policies in place for Crown lands like the OMU.**

- The OMU area is approximately 1,028,496 ha (2,541,516 ac) and is a relatively old forest where 96.4% of the commercial species are above 50 years old in which 79% are conifers (softwoods) and 21% deciduous (hardwoods). **Notably, 58%+ of trees are above 100 years old.** Geographically located in Northwestern Ontario, it is a northern boreal pyro-climax forest with a mean MAI of 0.99 M³/ha/yr.

- With Ontario Government, Regional Forest Products Industry and FN approvals there is a promising potential to create a forest carbon offset on 76% of the sustainably managed forest portion's 784,992 ha (2,939,794 ac).

- The minimum forest management plan approved harvest age for conifers is 60 years and for deciduous it is 58 years. The majority (83%) of the commercial forest biomass (as per updated FRI) is well beyond the minimum harvest age. This signifies a potential to develop and improved forest management (**IFM**) carbon offset project that would extend the rotation ages and focus on harvesting much older age classes creating **additionality** while allowing harvest of older high and low quality commercial species.

- The estimated current (2023) managed commercial tree species growing stock biomass (above and below ground at the start of 2023) and sequestered carbon is estimated to be 129,290,038 M³ (178,426,256 MT CO_2e).

- According to industry sources active in the voluntary and legislated forest carbon markets, independently verified/certified forest carbon credits of high quality are in high demand and prices are rising and the future looks promising, especially for projects based on **removal** type projects as opposed to **avoidance** types.

- Over the last 5 years since the ADC took over managing the OMU, the AAC has averaged 23% (before the last 5yr average was only 9%) and the outlook is good for the AAC to continue to supply a major SPF sawlog supplier to the nearby Nakina Ontario sawmill and lower grades of the (currently) unused AAC to the nearby Armstrong Ontario FN biomass energy plant under development. A large portion of the currently unharvested AAC consists of low-grade conifer and deciduous with limited current demand in the traditional nearby forest products industry, but it is of a high BTU and molecular density.

- Considering the unused low-grade volumes in the OMU, BTC has requested a high-level overview of potential renewable energy and non-timber forest products potential to be part of R&B's analysis and will form a secondary report as part of the Terms of Reference to this carbon offset assessment.

- **Seeing as the Ontario Government currently have no plans or policies for developing forest carbon offsets on Crown Lands (even those where FN Treaty rights/obligations exist as on the OMU), it is likely going to require work and lobbying of the Proponents (BTC and the ADC) to advance a carbon project on a Crown Forest. If a project was on FN or freehold lands there are current voluntary and legislated protocols ready for developing and monetizing.**

- Current biomass supply agreements that include Stakeholder/Public approval in the long-term FMP coupled with the above and lack of a Crown Land forest carbon offset policy are a challenge for the Proponents, albeit in the short term to move forward with a forest carbon offset initiative on the OMU.

- The OMU is located within Treaty 9 FN Traditional Territories and perhaps the Proponents can enlist their cooperation in getting the Ontario Government to begin initiating guidelines and policies that would enable future forest carbon offsets on Crown Lands that have a significant FN presence should the will to create additionality be in their mutual and combined long term environmental and financial benefits.

- **Four possible scenarios on the OMU were conservatively modelled based on Authors' goals of maximizing quality carbon credits and environmental stewardship in the long term. The modelling indicated that at 2023 market prices by project types the OMU could earn between $6.6 and $9.4 million CAD$/yr in revenues as summarized in Table below:**

| SCENARIO's Modelled →				Scenario 1	Scenario 2	Scenario 3	Scenario 4
Item	Value	Amt	Value	↓			
2023 forest biomass above & below ground	m3	129,290,038	tpy	178,746,256	178,746,256	178,746,256	178,746,256
Managed Forested area	ha	784,992	tpha	227	227	227	227
Mean Harvest Last 5 years by ADC	m3/yr	107,797	tpy	149,032	149,032	149,032	149,032
Max approved harvest per TMP	m3/yr	472,797	tpy	653,652	653,652	653,652	653,652
Market Type				Voluntary	Voluntary	Compliance	Voluntary
Protocol & Project Option Types				ACR No Harvest	ACR IFM 20% of AAC	CDN <25% of AAC	CDN VERRA IFM
C02e Baseline	m3/yr	472,797	tpy	653,652	653,652	653,652	653,652
Crediting Period	years			20	20	25	40
Permanence Time Period	years			20	20	100	0
Additionality	%			800,000	560,000	600,000	1,055,000
Less Leakage Estimate	%	40%		320,000	224,000	360,000	420,000.0
Less Buffer Pool (Risk Deductions)	%	18%		62,400	43,680	36,000.00	95,000.00
Net C02e credits/yr available for sale			tpy	417,600	292,320	204,000.00	540,000.00
Estimated Credit Selling Prices in 2023 (*)	$CAD			$22.50	$22.50	$45.50	$15.00
Estimated $CAD Gross Revenues in 2023	$CAD			$9,396,000.00	$6,577,200.00	$9,282,000.00	$8,100,000.00
Less ongoing project management & plots/yr	$CAD			$567,975	$567,975	$567,975	$567,975
Less SFL fees per yr to manage the OMU	$CAD			$210,000	$210,000	$210,000	$210,000
Estimated Net/yr1 share: MNR&F, ADT & BTC	$CAD			**$8,618,025.36**	**$5,799,225.36**	**$8,504,025.36**	**$7,322,025.36**
* Pricing Assumptions:							
Scenarios 1&2: Currently Offset buyers are favoring these "removal" types and prices and trends show a 5% increase/yr							
Scenario 3: a 30% discount from the current CDN regulated price on carbon of $65/MT							
Scenario 4: Currently there is low demand for these types of credits as they are "avoidance" types							

- **We recommend that the above Scenario 3 compliance market <u>Canadian Compliance-With minimal Harvest</u> as the best route for the ADC and BTC, while being best in the long-term for the OMU and the ADCs FN Partners. If this Scenario would be implemented now it could conservatively earn $10million CAD/yr less overhead for the Crown, the ADC and BTC.**

- Our second-choice recommendation would be the Scenario 4 voluntary market <u>VCS-With Harvest well below the estimated MAI</u> which would require an IFM approach but still produce some commercial logs for the regional forest industry. This Scenario implemented now could conservatively earn $8.1million CAD/yr less overhead for the Crown, the ADC and BTC

- Finally, there is no carbon forest project we could find whatsoever on Crown lands in Ontario, there are however such projects in British Columbia. All existing Ontario forest carbon projects are on freehold lands and split between removal and avoidance type projects. There is a small portion of freehold lands within, and adjoining to the southeast boundary of the OMU (approximately 7,100+ ha).

- **On a promising note, our research has shown that a FN and Provincial cooperative Policy Change and Revenue Sharing Agreement in Canada is not without precedent. Seven Coastal British Columbia FN's have garnered international acclaim in their cooperative and ground breaking Great Bear Rain Forest Carbon Project on Crown Lands in a win-win for economic, environmental, profit sharing and most importantly offsetting the Province's GHC emissions. Discussions with active carbon developers in British Columbia have told us that from a net revenue sharing perspective the FN retains 80% and the Provincial Government 20% of the sale of the forest carbon credit proceeds (See Appendix 4, page 41).**

- **BTC and the ADC should engage with the Ontario Government at the very highest political level and offer up the OMU as a pilot project where the Crown, the ADC and BTC can in partnership (as in British Columbia's Great Bear Rain Forest) develop and revenue share within the OMU on a <u>pilot project</u> for forest carbon offsets and green energy developments (see Our September 14, 2023 Report 2 of 2).**

- **Table 11, Pg 29 indicates that the Crown (based on published and fluctuating market conditions) earned approximately between $690,000 and $2,251,000/yr in fees paid by the ADC on logs they harvested over the last 5 years. The Crown would do far better financially, environmentally, and otherwise by implementing a 3-way partnership agreement with the ADC and BTC to develop the OMU into a quality forest carbon offset as in British Columbia's Great Bear Carbon Forest.**

- **A leading Canadian Conservation Group active in the forest carbon market also indicated that a FN lead co-benefit forest carbon initiative with strict MRV procedures would be viewed in the market as a premium offset and possibly sell at above typical commercial led projects.**

- **We highly recommend that the Proponents be their own Project Developers as opposed to partnering with large commercial carbon developers. The pool of experienced staff and, or contractors required is growing and are easily engaged on a permanent, or an as needed basis. This would allow the Proponents to better manage an OMU project and monetize their efforts.**
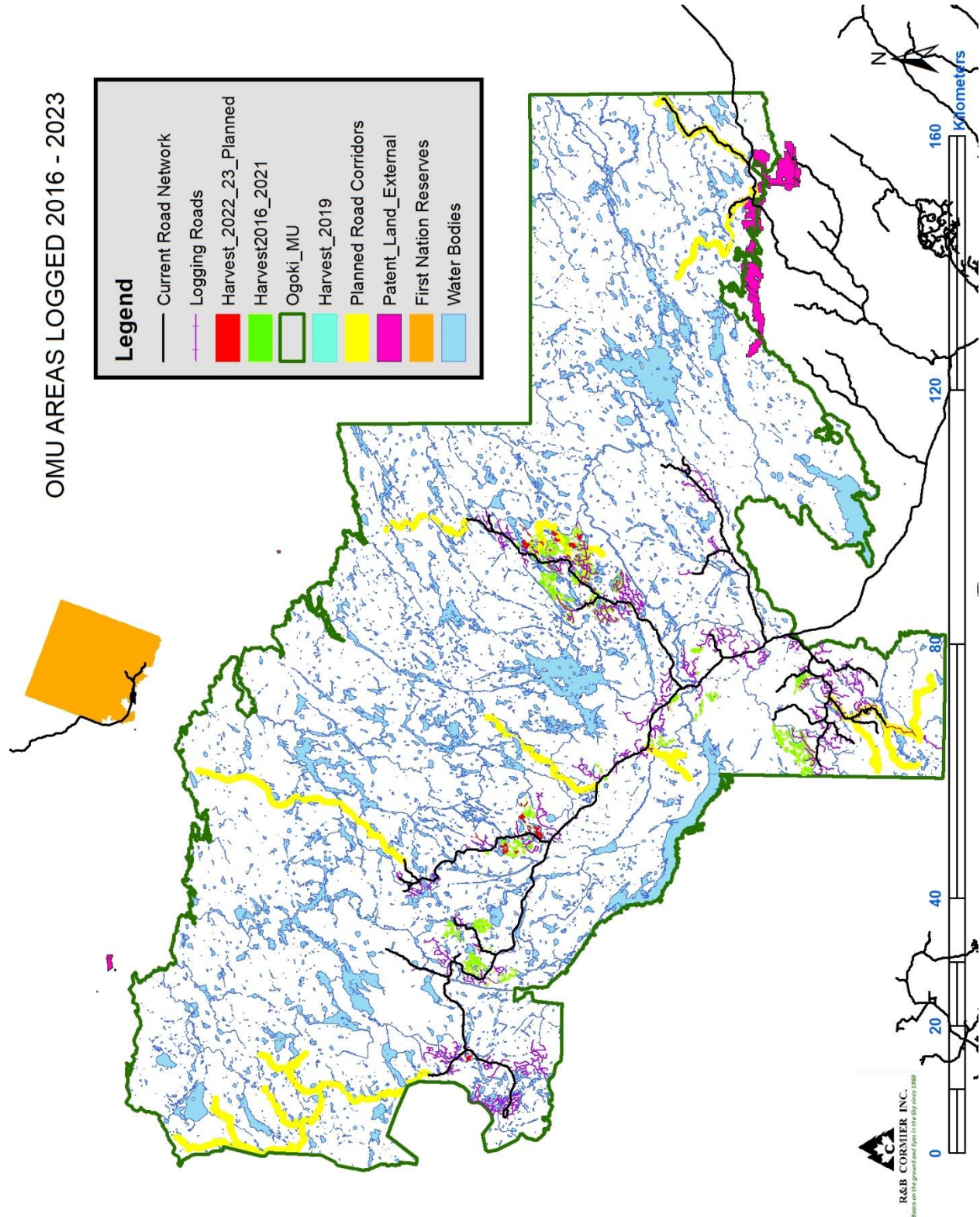
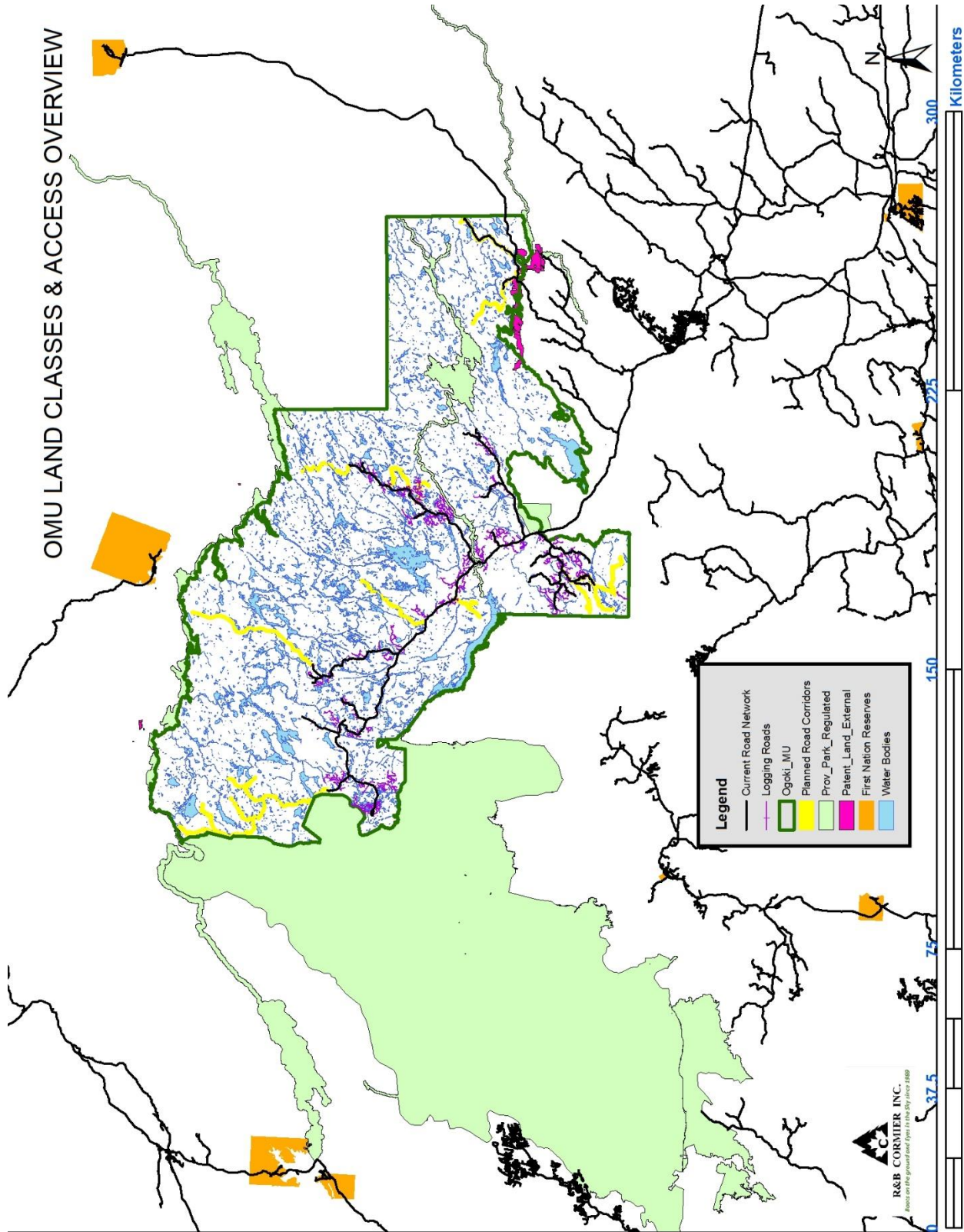## Map 1: OMU Location & Approved Harvesting Areas 2020-2030

Map 2: OMU Forest Species Distribution
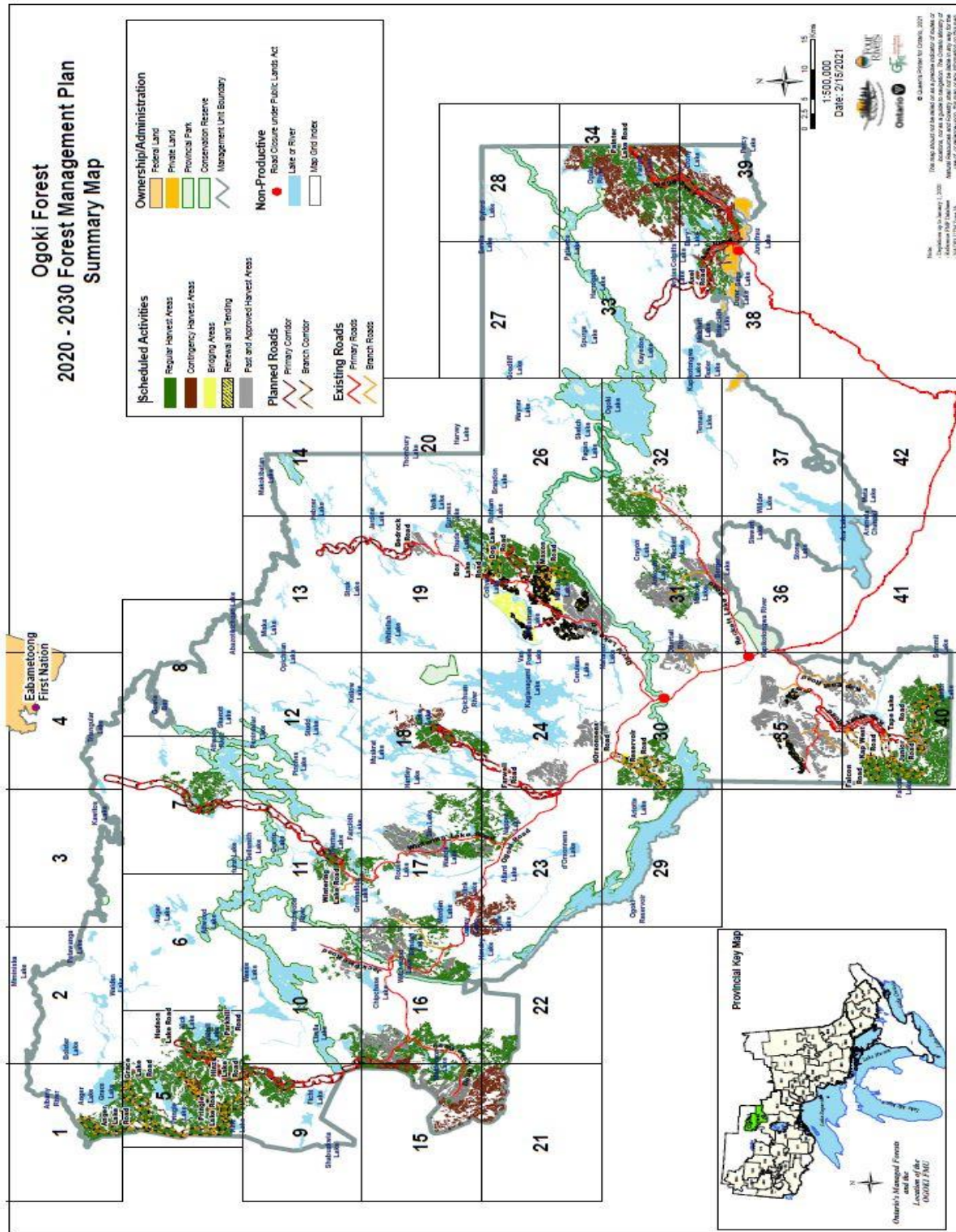
OMU FOREST SPECIES DISTRIBUTION
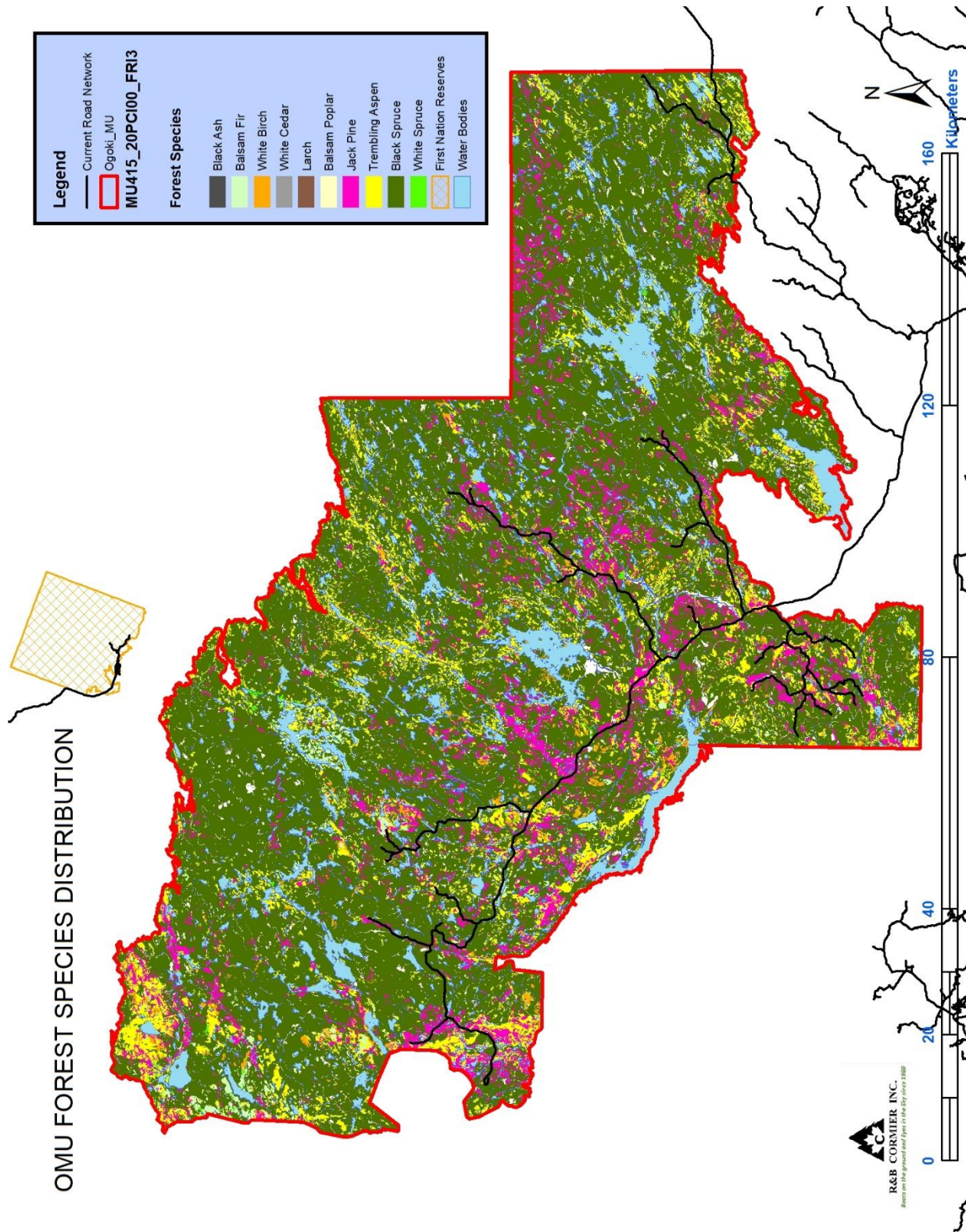
Map 3: OMU Areas Logged 2016 – 2023

Map 4: OMU Land Classes & Access Overview

4.0   OMU's FRI Tables/Graphs

Table 1: OMU Project Land & Harvesting Statistics

ITEM (per most recent FMP & FRI) Ogoki (MU 415)	Units	AMT	%	NOTES
Productive Forest Growing	ha	631,604	61%	growing stands of commercial species
Productive Forest NSR or recent disturbances	ha	153,388	15%	non sufficiently generated (**NSR**) disturbances once growing
Non Forested (water bodies)	ha	88,390	9%	includes grass, meadows & unclassified
Non-Productive Forest	ha	40,466	4%	includes wetlands, brush and rock
Non-Productive Forest under management plan	ha	114,648	11%	includes islands and protected site classes
Total Ogoki Crown Forest Management Unit	ha	**1,028,496**	**100%**	does not include 59,490 ha of patent land not managed
ITEM (per most recent AWS & MNR&F Records)				
Ave **10yr** harvested (2012-2021) before FN Mgmnt	M³	59,404	**9%**	of AAC per https://public.tableau.com/app/profile/larlo/viz/FE_HarvestVolume/DB_Chart
Ave **5yr** harvested (2017-2021)after FN Mgmnt	M³	107,797	**23%**	of AAC per https://public.tableau.com/app/profile/larlo/viz/FE_HarvestVolume/DB_Chart
Unused AAC Merchantable	M³	46,000	10%	march2023.xlsx (live.com)
Unused AAC Non-Merchantable	M³	319,000	67%	march2023.xlsx (live.com)
Ave 5 yr AAC all Commercial Species		**472,797**	**100%**	

Source: Derived from 2012 OMNR&F FRI and updated by R&B to 2023

Table 2: OMU Mean Managed Operability (Rotation) Ages

Forest Unit	Lower Operability Age Class	Additionality Group	Average
BfDom	55	conifer (softwood)	
ConMx Pj	45	conifer (softwood)	
ConMx Sb	65	conifer (softwood)	
OcLow	95	conifer (softwood)	
PjDom	55	conifer (softwood)	
PjMx	45	conifer (softwood)	
SbLow	65	conifer (softwood)	
SbMx	55	conifer (softwood)	60
BwDom	65	deciduous (hardwood)	
HrdMw	55	deciduous (hardwood)	
HrdDom	55	deciduous (hardwood)	
PoDom	55	deciduous (hardwood)	58

Source: Derived from OMU Approved FMP 2022-2030

Table 3 Current Carbon Stock Estimates in M³ Above and Below Ground:

Summary For Calculating Additionality in Cubic Metres (M³);											
Age Group	Volume	Area ha	Avg. MAI m3/yr	Conifer	Hardwoods	All Above Stump	Stump	Below soil	All Biomass	Depletions	Total C02e m3	%
0-20 yrs	GTV	76,635		196,046	47,853	243,898	8,878	48,780	301,556			0.22%
21-49 yrs	GTV	50,874	0.977	2,224,669	1,396,269	3,620,938	131,802	724,188	4,476,928			3.33%
50+	GTV	806,340	0.992	83,996,078	20,998,790	104,994,868	3,821,813	20,998,974	129,815,655			96.45%
All	GTV	933,849	0.990	86,416,793	22,442,911	108,859,705	3,962,493	21,771,941	134,594,139	-5,304,101	129,290,038	
%	GTV			79%	21%							

Derived from 2012 OMNR&F FRI and updated and modelled by R&B to 2023 using Penner's Empirical Tables

Table 4 Current Commercial Log Volumes Estimates in M³:

Supplied Inventory Calculations Grown to 2023			All values in cubic metres (m3)							
Age Group	Volume	Area ha	Avg. MAI m3/yr	SPF	CE	OC	PO	BW	TOL	Total Tree
0-20 yrs	NMV	76,635		6,166	-	7	8,505	102	-	14,780
21-49 yrs	NMV	50,874	0.977	997,521	214	17,850	599,575	131,981	16	1,747,157
50+	NMV	806,340	0.992	44,400,539	205,992	2,733,648	7,663,810	1,985,160	1,344	56,990,493
All	NMV	933,849	0.990	1,003,687	214	17,857	608,080	132,083	16	58,752,429

Source: Derived from 2012 OMNR&F FRI and updated by R&B to 2023

Table 5 Depletions Applied (Harvest & Fire 2008-2022) Estimates in M³:

Fire	Volume		SPF	CE	OC	PO	BW	TOL	Total	Stump Biomass	Below Ground	Deductions
Fire Loss (2010-22)		GTV	775,232	500	44,236	96,593	19,973	-	936,534	970,624	1,164,748	2,135,372
Harvest Years	Volume Class		SPF	CE	OC	PO	BW	TOL	Total	Stump Biomass	Below Ground	
2008-11	Volume	NMV	39,921	-	931	40,707	2,887	-	84,447	90,139	108,167	
2008-11	Undersize	NMV	3,952	-	3	-	-	-	3,955	4,222	5,066	
2012-16	Volume	NMV	57,735		245	57	18	-	58,055	61,968	74,361	
2012-16	Undersize	NMV	3,114	-	-	1	1	-	3,116	3,326	3,992	
2017-22	Volume	NMV	566,295		1,103	12,360	1,650		581,408	620,595	744,714	
2017-22	Undersize	NMV	7,673		6	10	177		7,866	8,397	10,076	
All		NMV	678,691	-	2,289	53,135	4,733	-	738,848	788,646	946,375	3,168,729
Net Growing Stock Volume (@ 2023 lost harvest/fire)												- 5,304,101

Source: OMU Annual Scaling Returns last 10 years supplied to MNR&F and MNR&F Published Fires Statistics

Table 6 Biomass Conversion Factors Applied:

	Stump	Bel Ground
GTV Stump factor	0.0364	0.2
NMV Stump factor	0.0674	0.2

FACTORS		
MIST Biomass	m3 per m3/NMV	
Bark	0.14679	
Cull/Defect	0.13882	
Leaves/Needles	0.10970	
Stump	0.06740	
Undersize	0.17445	0.63717
Unmerch Wood/Bark	0.31673	0.95390
NMV	1.00000	
Below Ground (as per FAO)	20% above ground	
	Stump	Bel Ground
GTV Stump factor	0.0364	0.2
NMV Stump factor	0.0674	0.2

Source: derived from MNR&F MIST tables and the United Nation Food and Agriculture Organization

5.0   Key Findings for Monetizing Forest Carbon Offsets the OMU

5.1   Voluntary Markets and Protocols

Our research indicates that the voluntary carbon credit market in Canada and worldwide is growing but the focus going forward for major buyers will be for high quality credits that stand up to public scrutiny. Buyers rate the quality of their purchases in the following priorities:

1. MRV type and frequencies
2. Price
3. Permanence of the Project
4. Additionality
5. Co-Benefits (seller & purchaser) that go beyond mitigating GHC emissions or taxes
6. Leakage of the Project

Large purchasers of forest carbon credits are trending away from avoidance Forest Offsets (like IFM) and favoring avoidance through protection and or conservation.

5.2   Legislated Markets and Protocols

Currently there are only voluntary markets on forest carbon offsets in Ontario (domestic & international) as there is no adopted Legislated Forest Carbon Protocol in the Province and the current political climate is slow to change. Most of our research has indicated that it could be many years before it happens as most forest in Ontario are Public (Crown owned) and Governed by the Ontario Crown Forest Sustainability Act and are deemed sustainable from a commercial exploitation perspective.

To date all Ontario forest offsets being developed and, or trading are on Private Lands (aka Freehold) and the Ontario Government has no current guidelines or Policies in place for Crown lands like the OMU.

The Federal Government led legislated market in Canada has been dragging it's feet in establishing the "Final" draft that interviewees expect to be adopted in early 2024 and be similar to the legislated protocol currently in place for British Columbia (i.e. based on VERRA's VM000034 or VM000012), (see: [Home - Verra](#)).

Legislated offset prices are generally much higher than voluntary offsets and are also expected to have more demand than supply for high quality offsets.

5.3   Challenges to Developing a Project on the OMU:

Despite many attempts and many sources contacted at the MNR&F to get clarification if such a project could even happen the only reply we received was as follows:

Per MNR&F's Maara Packalen PhD, MSc, MBA, Senior Policy Advisor Forest Management Branch Headquarters, Sault Ste. Marie, Ontario: *"As previously shared, Ontario does not have a policy to guide the consideration of carbon (greenhouse gas) offset projects involving Crown resources. The province is monitoring developments regarding offsets programs in other jurisdictions and may consider the development of an Ontario offsets policy in the future; however, as noted in a recent [update](#) on Ontario's Emissions Performance Standards, the province "is not proposing to develop a policy for offsets in the short term".*

Seeing as the Ontario Government currently have no plans or Policies for developing forest carbon offsets on Crown lands (even those where FN Treaty rights/obligations exist as on the OMU), it is likely going to require work and lobbying of the Proponents (BTC and the ADC) to advance a carbon project on a Crown Forest. If a project was on FN or Freehold lands there are current Voluntary and Legislated Protocols ready for developing and monetizing.

The second challenge going forward is that the OMU has long term supply agreements in place with a major SPF sawmill and any disruption or changes to wood flow could create legal challenges to the Proponents.

The third challenge we flagged in our research is that the approved and audited FMP on the OMU is driven by a Caribou Habitat Mosaic (see Appendix 3, Pg 40). These guidelines show spatially 50 blocks where harvesting in the long term must mimic wildfire on the landscape. These constraints could limit what is possible in terms of **Additionality** required to generate GHC credits. These predetermined blocks for part of the long term OMU's FMP **Baseline** and would require a major amendment and public/stakeholder consultations requiring times and costs and there is no guarantee that changing them (if needed) could be guaranteed. There could be a case for complete protection from any harvest for a carbon project and hence a removal project (high quality) GHC credits while maintaining the caribou management guidelines on the OMU.

Finally, there is no carbon forest project we could find whatsoever on Crown lands in Ontario, there are however in British Columbia. All existing Ontario projects are on freehold lands and split between **Removal** and **Avoidance** type projects. There is a small portion of freehold lands in the southeast boundary of the OMU.

On a promising note, our research has shown that a FN and Provincial cooperative Policy Change and Revenue Sharing Agreement in Canada is not without precedent. Seven Coastal British Columbia FN's have garnered international acclaim in their cooperative and ground breaking Great Bear Rain Forest Carbon Project on Crown Lands in a win-win for economic, environmental, profit sharing and most importantly offsetting the Province's GHC emissions. Discussions with active carbon developers in the Province have told us that from a net revenue sharing perspective the FN retains 80% and the Government 20% of the sale of the forest carbon credit proceeds (See Appendix 4, page 41).

A leading Canadian Conservation Group active in the forest carbon market indicated to R&B that a FN lead forest carbon initiative with strict **MRV** procedures and **co-benefits** would be viewed as a high-quality offset and possibly sell at a premium above typical commercial led project.

To assist the Proponents to evaluate the financial potential for a forest carbon project on the OMU after overcoming the challenges above in Section 5.3, the R&B Team looked at how (based on current market prices and MRV costs) to best monetize a project on the OMU using four possible scenarios.

Each scenario estimated the net carbon offsets that could be marketed using the most credible Protocols and Methodologies that would, or could accept projects on Provincial Public (Crown) Forests. The following Section 6 summarizes our forest carbon modelling/accounting efforts, our findings and key recommendations.

6.0   Basic Assumptions and Approach to Carbon Modelling for the OMU

We have considered scenarios with both no harvest, along with some light level of harvesting moving forward during the course of the Project length. Further, the Baseline scenario, for all analyses, considers the baseline as being a scenario wherein the maximum FMP approved AAC (472,927 m3/yr) from the OMU could be harvested on an annual basis. Our research indicated an increasing demand for forest products and biomass in the region, primarily heat and energy production, wherein the demand and harvest capacity could sustain this level of harvest. The approved AAC is below the mean MAI of 0.990 m3/ha (777,142 m3/yr).

6.1   Carbon Accounting Work Flow

Upon updating, validating and removing harvests and disturbances to the OMU FRI's growing biomass (inventory data) up to January 2023, we created a hybrid and less complicated version the Federal Government's carbon budgets CBM-CFS3 and replicated what the generic GCBM model's maps using our in house GIS. Thew work flow and outputs were as in Figure 1 below.

Figure 1: Forest Budget Modelling Steps
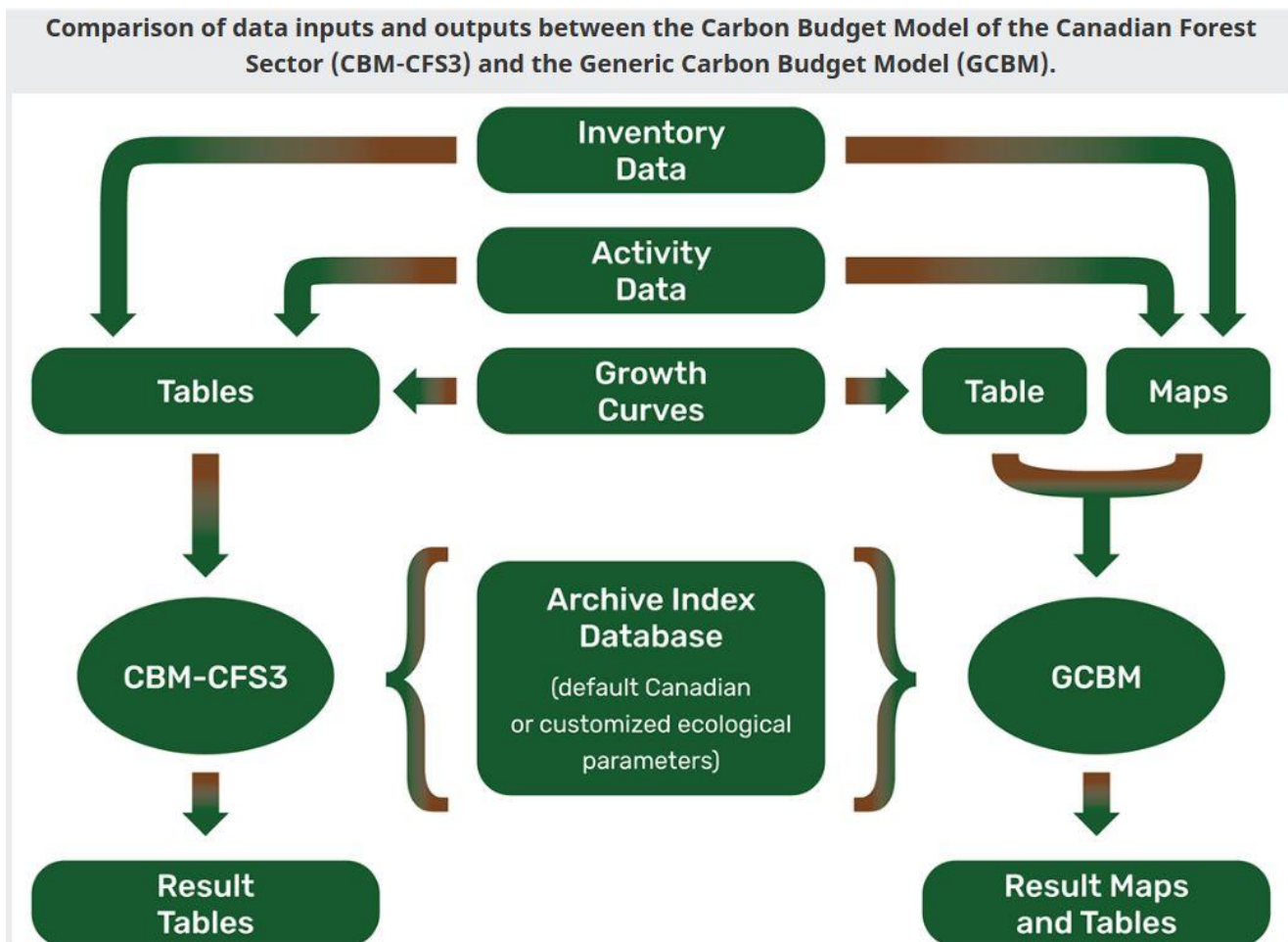
Sources: Carbon Budget Model (canada.ca) , Generic Carbon Budget Model (canada.ca)

6.2   Deduction Assumptions for Leakage and Risk Buffers on the OMU

- **Scenario 1**: American Carbon Registry Improved Forest Management Project (No Harvest); which generates a net credit estimation of ~417,600 net credits/yr. It should be noted that due to the fact that the AAC does not deplete the growing stock, 100% of the credits are tagged as 'removals' as opposed to avoided emissions. Generally, and based on our current knowledge of the markets, removals credits sell at a ~30 – 45% price premium to avoided emissions. This is driven by buyers demanding removals credits that are due to the forest actively capturing carbon beyond that expected in the baseline, especially when they have co-benefits and are sought after as "quality" offsets.

- **Scenario 2**: Same as above with ~25% harvest of AAC (115,000 m^3/year), wherein the property is still 'growing' 75% of the average MAI, at 0.74 m^3/ha/year. The crediting potentials are simply netted down by ~30% to 292,320 net credits/yr. As in Scenario 1, 100% of these are removals credits. This scenario would allow for active forestry, presumably to focus on fire-smart forestry practices and other sustainable forestry ventures to support the community that depends on this forest for biofuels.

- **Scenario 3**: We estimated the crediting potential utilizing the (unofficial version) of Canadian Federal GHG Offset System (Draft Protocol for Improved Forest Management). The main variances in this Methodology are around general forest carbon accounting principles, baseline determination, and some main variables such as leakage/buffer deductions. The net credits, based on our rough calculations for these scenarios are approximately 204,000 net credits/yr.

- **Scenario 4**: Verified Carbon Standard (Verra), either Canadian IFM Methodology (VM0034) or Logged-to-Protected (VM0012) would be viable methodologies. We recommend VM0034, under the Project Activity Type as either Logged-To-Protected or more likely 'Reduced-Impact-Logging' or 'Extended-Rotation-Age'. When comparing this project land base against other similar projects in the region, primarily (1) Boreal Wildlands project by Nature Conservancy of Canada and (2) Painted Forest Project by Perimeter Forest, we netted down credit estimates annually to 0.75 credits/ha/year. This is due to being conservative associated with the fact that the baseline to be determined on Crown land would not be more aggressive than harvesting the long-run-sustained-yield, i.e. 472,000 m3/year, as identified in the OMU's FMP. This puts the net annual crediting at 540,000 net credits/yr, based on the productive forest area in the OMU's FRI. This is most likely an under-estimate of the potential from the property, and based on that would allow some active level of harvesting toward principles of good forest stewardship. There is a possibility here to look at a "hybrid" option in which commercial logging is stopped on all forests under 100 years of age and focusses on older and lower grade species better suited to biofuels and where a small percentage of commercial log species can be sorted out during processing before debarking and in-bush chipping (as recommended in R&B's Report 2 of 2 to BTC)

- 2 scenarios using the American Carbon Registry. The American Carbon Registry has a 20-year crediting period, with a 20-year permanence period where no credits are generated. The crediting period can be extended, but at that point, the baseline would have to be remodelled and in effect you would be starting a new project. This Registry allows for project proponents to 'tag' each credit as either an avoided emission or a removal. This is advantageous, as these credits, named 'Emission Reduction Tons (ERT)' are able to demand a price premium on the market.

- 1 scenario estimating the Compliance markets in Canada. The Federal system is currently having a 25-year crediting period with a 100-year permanence monitoring period. This project has no comparable for benchmarking purposes, due to the fact that no projects have been conducted as the protocol is in draft form, and therefore we estimated conservatively across all of them. Compliance pricing is tied (at some discount) to the regulated price on carbon, this may have some advantages. We have heard many concerns around these markets, specifically around liquidity and other factors that will have to be dealt with.

Deductions ACR (Scenarios 1 & 2)

-No Activity Shifting Leakage (all lands controlled by the Proponent would be enrolled).
-40% Market Leakage based on Equation 20 of the Canadian IFM Methodology from ACR.
-13% Buffer deduction as per the Approved ACR Tool for Risk Analysis and Buffer Determination.

- 1 scenario estimated using the Verified Carbon Standard (Verra). This registry/standard has more flexibility than others, and therefore you can determine your crediting period. The VM0034 methodology has projects listed with 30, 40, and 80 year crediting periods. We selected a 40-year crediting period, and based on our understanding of VCS, there is no minimum project length, only a maximum. Therefore, at this time, there is no officially stated 'permanency' period beyond the crediting period. This therefore would put a project's permanence at a 40-year term. We believe that >60% of the voluntary carbon market is made up of VCUs, and VERRA has the highest brand recognition internationally.

Deductions Canadian Compliance (Scenario 3)

-No Activity Shifting Leakage (all lands controlled by the Proponent would be enrolled)
-60% Market Leakage based on Reconciliation Unit 17
-15% Environmental Integrity Account (Buffer) as per Table 13 in the Draft Protocol

- All estimates are based on a forest starting with 178 million tonnes of Carbon Dioxide Equivalents (CO_2e), or ~227 t CO_2e/ha. As we have discussed, much of this forest is in an old-forest state, and therefore has some level of risk for decline in productivity and/or fires. All numbers provided herein for project development purposes would be validated using an approved CDN FRI with field plots by strata methodology at the time of forest carbon project development and more in-depth modelling of forest carbon dynamics, harvested wood products, etc.

Deductions Certified Carbon Standard (Scenario 4)

-No Activity Shifting Leakage (all lands controlled by the Proponent would be enrolled)
-40% Market Leakage based on (1) verification with other Ontario VCS Project and (2) VCS standard (
-15% Buffer deduction as per comparison against similar projects and validation with the VCS Standard.

6.3 Estimated Forest Carbon Pricing in CAD$ for 2023

The current pricing in our gross revenue estimates for the OMU, is discounted (conservative) from what we hear other project developers are estimating for sale prices. It should be noted that a project such as this, supporting a First Nations community with sustainable forest management would absolutely fetch a premium in the market, and could further be proven through some type of **Co-benefits certification (i.e. CCB, SDVista, FSC Ecosystem services, etc.).** Just a few thoughts, but moving forward with conservative estimates as per below is how we approached the modelling. Note: the Nature Conservancy of Canada does this now in Canada and it costs a bit more up front but garners a premium price per VCU sold.

See: CCB Standards |CCBA (climate-standards.org) , Sustainable Development Verified Impact Standard - Verra , and Ecosystem Services | Forest Stewardship Council (fsc.org)

Scenario 1 (ACR-No Harvest): **$9.3 million/year at** $**22.50** per VCU. These are removal prices we are hearing, with some project developers stating prices closer to $25 for removals. Further, other developers often put a 5% annual growth assumptions in terms of pricing. See: American Carbon Registry Standard — American Carbon Registry

- **Scenario 1**: American Carbon Registry Improved Forest Management Project (No Harvest); which generates a net credit estimation of ~417,600 credits per annum. It should be noted that due to the fact that the AAC does not deplete the growing stock, 100% of the credits are tagged as 'removals' as opposed to avoided emissions. Generally speaking, based on our knowledge of the market, removals credits sell at a ~30 – 45% price premium to avoided emissions. This is driven by buyers demanding removals credits that are due to the forest actively capturing carbon beyond that expected in the baseline

Scenario 2 (ACR-With Harvest): **$6.5 million/year at same assumptions as above**

- **Scenario 2**: Same as above with ~25% harvest of AAC (115,000 m^3/year), wherein the property is still 'growing' 75% of the average MAI, at 0.74 m^3/ha/year. The crediting potentials are simply netted down by ~30% to 292,320 credits per annum, 100% of these are removals credits. This scenario would allow

for active forestry, presumably to focus on fire-smart forestry practices and other sustainable forestry ventures to support the communities that depends on the OMU.

Scenario 3 (Canadian Compliance-With Harvest): **$9.2 million/year at $45.50, which is 30% discount from the regulated price on Carbon ($65/tonne)**. This is a stab in the dark, as no one really knows what these credits will trade at, but we do often hear that compliance credits in the California market usually trade at a 20% + discount to the legislated price. The price growth on this would be at $15/year, peaking in 2030 at $170.00/tonne. This is the current CDN price on carbon, and trends, which is at the whim of politics and other variables that could influence all of those assumptions.

- **Scenario 3**: When estimating the crediting potential utilizing the Federal GHG Offset System – Draft Protocol for Improved Forest Management. The main variances in this Methodology are around general forest carbon accounting principles, baseline determination, and some main variables such as leakage/buffer deductions. The net credits, based on preliminary calculations for these scenarios are approximately 204,000 net credits/year

Scenario 4 (VCS-With Harvest): **$8.1 million/year at $15.00 per VCU**. This assumption is due to the fact that VCS (VERRA) does not currently differentiate removals versus avoided emissions, and therefore, to our knowledge, there is no price premium on these credits associated with the markets desire for removal credits. Some more price discovery with other offset sellers and/or buyers could be a worthy task to try and gather some more market intelligence on this front. See: Verified Carbon Standard - Verra

- **Scenario 4**: Verified Carbon Standard (Verra), either Canadian IFM Methodology (VM0034) or Logged-to-Protected (VM0012) would be viable methodologies. We recommend VM0034, under the Project Activity Type as either Logged-To-Protected OR more likely 'Reduced-Impact-Logging' or 'Extended-Rotation-Age'. When comparing this project landbase against other similar projects in the region, we netted down credit estimates annually to 0.75 credits/ha/year. This is due to being conservative associated with the fact that the baseline to be determined on Crown land would not be more aggressive than harvesting the long-run-sustained-yield, i.e. 472,000 m3/year, as identified in the OMU's approved 20 year FMP. This puts the net annual crediting at 540,000 VCU/year, based on the productive forest area. This is most likely an under-estimate of the potential from the property, and based on that would allow some active level of harvesting toward principles of good forest stewardship.

All other important factors related to project longevity apply, the Reader can make their own assumptions about revenue in the future versus the starting project metrics around prices. The OMU could sell credits

longer in the VCS project than ACR, and longer in the Compliance project than ACR. However, under the Compliance you have 100-years without any revenue and still have monitoring obligations, and therefore costs. Of course, the revenue numbers do not include the value associated with timber harvesting and any revenues generated from those activities, especially if harvesting post fire for biomass for bio-energy.

We recommend that the Scenario 3 compliance market <u>Canadian Compliance-With minimal Harvest</u> would be the best route for the ADC and BTC, while being best in the long-term for the OMU and the ADC Partners. If this Scenario would be implemented now it could conservatively earn $10million CAD/yr less overhead for the Crown, the ADC and BTC.

Our second choice recommendation would be the Scenario 4 voluntary market <u>VCS-With Harvest well below the estimated MAI</u> which would require an IFM approach but still produce some commercial logs for the regional forest industry. This Scenario implemented now could conservatively earn $8.1million CAD/yr less overhead for the Crown, the ADC and BTC.

6.4   Comparative Current Compliance Carbon Pricing in US$ for 2023

The trends for CAR carbon offsets in the compliance market have increased approximately 28% between February and August of this year. See following Table 7

Table 7: Current CAR Auction Prices US$ for 2023

CALIFORNIA CAP-AND-TRADE PROGRAM

SUMMARY OF CALIFORNIA-QUEBEC JOINT AUCTION SETTLEMENT PRICES AND RESULTS

Last updated August 2023

Auction Name	Total Current Auction Allowances Offered	Total Current Auction Allowances Sold	Current Auction Settlement Price	Total Advance Auction Allowances Offered	Total Advance Auction Allowances Sold	Advance Auction Settlement Price
August 2023 Joint Auction #36	55,760,384	55,760,384	$35.20	7,577,000	7,577,000	$34.16
May 2023 Joint Auction #35	56,084,237	56,084,237	$30.33	7,577,000	7,577,000	$30.05
February 2023 Joint Auction	56,395,720	56,395,720	$27.85	7,577,000	7,577,000	$27.01

NOTE: Currently the only forest Credits that can be sold on the above Compliance Registry are from Québec & Nova Scotia

Table 8: Summary Estimates 4 OMU Modelled Scenario Metrics, Revenues & Options

SCENARIO's Modelled →				Scenario 1	Scenario 2	Scenario 3	Scenario 4
Item	Value	Amt	Value	↓			
2023 forest biomass above & below ground	m3	129,290,038	tpy	178,746,256	178,746,256	178,746,256	178,746,256
Managed Forested area	ha	784,992	tpha	227	227	227	227
Mean Harvest Last 5 years by ADC	m3/yr	107,797	tpy	149,032	149,032	149,032	149,032
Max approved harvest per TMP	m3/yr	472,797	tpy	653,652	653,652	653,652	653,652
Market Type				Voluntary	Voluntary	Compliance	Voluntary
Protocol & Project Option Types				ACR No Harvest	ACR IFM 20% of AAC	CDN <25% of AAC	CDN VERRA IFM
C02e Baseline	m3/yr	472,797	tpy	653,652	653,652	653,652	653,652
Crediting Period	years			20	20	25	40
Permanence Time Period	years			20	20	100	0
Additionality	%			800,000	560,000	600,000	1,055,000
Less Leakage Estimate	%	40%		320,000	224,000	360,000	420,000.0
Less Buffer Pool (Risk Deductions)	%	18%		62,400	43,680	36,000.00	95,000.00
Net C02e credits/yr available for sale			tpy	**417,600**	**292,320**	**204,000.00**	**540,000.00**
Estimated Credit Selling Prices in 2023 (*)	$CAD			$22.50	$22.50	$45.50	$15.00
Estimated $CAD Gross Revenues in 2023	$CAD			**$9,396,000.00**	**$6,577,200.00**	**$9,282,000.00**	**$8,100,000.00**
Less ongoing project management & plots/yr	$CAD			$567,975	$567,975	$567,975	$567,975
Less SFL fees per yr to manage the OMU	$CAD			$210,000	$210,000	$210,000	$210,000
Estimated Net/yr1 share: MNR&F, ADT & BTC	$CAD			**$8,618,025.36**	**$5,799,225.36**	**$8,504,025.36**	**$7,322,025.36**
* Pricing Assumptions:							
Scenarios 1&2: Currently Offset buyers are favoring these "removal" types and prices and trends show a 5% increase/yr							
Scenario 3: a 30% discount from the current CDN regulated price on carbon of $65/MT							
Scenario 4: Currently there is low demand for these types of credits as they are "avoidance" types							

Table 9: Estimated Development & Overhead with ACR US Plot Method

ITEM (Typical 1 Benefactor maximize harvest)	HA	AC	Unit	Amt	$ cost/plot/method	$ CAD/10yrs	$/ha/10ysr	$/ha/yr
Validate FRI using CAR method of 1 plots/53ha (Wawa)	784,992	1,939,794	Standard FRI 200m Plots	5,902	$1,000	$5,902,195	$590,220	$0.75
Assume same costs as in Scenario 1 below	784,992						$2,764	$0.11
							$592,983	**$0.86**

Table 10: Estimated Development & Overhead with CDN VERRA Ontario FRI Method

versus:							
ITEM Based on: (quality 3 Co-Benefactors VERRA CDN)	HA	AC	Unit	Amt	$ CAD/10 yrs	$ CAD/yr	$/ha/yr
Estimated Additional Credits Modelled this Scenario	784,992	1,939,794	TPY		n/a		
Update Existing 2012 FRI Canada desktop method	784,992	1,939,794	$CAD ea/10yrs 2023 rates	1	$10,000	$1,000	0.00
Validate FRI Strata via Plots Canada method	784,992	1,939,794	$CAD ea/10yrs 2023 rates	200	$600,000	$60,000	0.08
Create Project Development Document	784,992	1,939,794	$CAD ea/10yrs 2023 rates	1	$75,000	$7,500	0.01
Third Party certification	784,992	1,939,794	$CAD ea/10yrs 2023 rates	1	$75,000	$7,500	0.01
Register with auction by Co-Benefit	784,992	1,939,794	$CAD ea/10yrs 2023 rates	1	$5,000	$500	0.00
Auction fees/yr @ $.20/credit/yr	784,992	1,939,794	$CAD ea/10yrs 2023 rates	3	$0	$0	0.00
Ongoing Project Management Overhead	784,992	1,939,794	$CAD ea/10yrs 2023 rates	1	$ 111,360	$11,136	0.01
					$876,360	**$87,636**	**$0.11**

R&B has Clients now in Ontario incurring the above costs in Table 10 and selling at a premium because of co-benefactor triple certification and spend only 12% of the US Based plot system indicated in Table 9 above.

We recommend that if BTC and the ADC proceed with a Project on the OMU they work closely with the Draft Compliance Protocol which will accept the common FRIs across Canada. This will greatly reduce Project Development and Overhead Costs going forward.

Table 11: Comparisons Estimated Crown Revenues from Harvesting on the OMU

Comparison OMU Crown earnings @ current **2022-23** rates	M³ delivered	CAD $
assumes all as SPF sawlogs harvested only	117,855	
2022/2023 Total Crown Stumpage Charges/M³		$5.85
Estimated 2023 Annual Revenue to Crown this year		**$689,451.75**
versus:		
Comparison OMU Crown earnings @ ave **2021-23** rates	M³ delivered	CAD $
assumes all as SPF sawlogs harvested only	117,855	
2022/2023 Total Crown Stumpage Charges/M³		$19.11
Estimated Mean Annual Revenue to Crown 2017-2022		**$2,251,619.78**

6.5   R&B's Approach to 2024 Carbon Pricing for the OMU

It has been our experience of late that many commercial carbon developers have painted an overly optimistic range of realizable offset revenues in Ontario. For this analysis we decided to err on the side of being more conservative. We do have a CDN Client now sold out of co-benefit type "removal" offsets at $22. US$/VCU. For the four scenarios we modelled for revenue estimates we were guided by the following:

Ontario Compliance Pricing

No one we have spoken with knows the answer to this yet, nor do they know who the buyers, or level of demand, will even be for these credits. However, our estimate approach was to apply a 30% discount to the regulated price of carbon in Canada. The price of carbon currently sits at $65/CAD/MT, increasing by $15/year to $170/CAD/MT by 2030. This would mean that the sale price of credits we factored in our calculations would be $65 * (1-0.3) = $45.50 in 2023 and $170 * (1-0.3) = $119.00 in 2030. This would suggest that on the years up to 2020 an expected 3 – 5%+ annual sale price increase should be attainable.

Ontario Voluntary Pricing

Voluntary credits range pretty broadly, but generally speaking the low-end for North-American credits would be $15CAD/MT for avoidance types and $22.50CAD/MT for removal types. Our research of exchanges found that Salesforce Net Zero Marketplace indicated that the Kotznoowoo IFM project is First Nations in Alaska, selling now at $22.80 US/MT.

7.0   Sources of Data Collected, Modelled & Reviewed

The following is a list of data provided by BTC, their associates and sourced by R&B from MNR&F publicly and industry available, both GIS and volumetric:

- Land Information Ontario Data Warehouse GIS Portal for Ontario
- Ogoki Forest Management Plan 2020-2030 (text, maps & tables/graphs)
- Ogoki Forest Annual Report April 1, 2021 to March 31,22
- Ogoki Forest Independent Forest Audit 2010- 2030 (published December 21, 2017)
- SFL supplied GIS shapefiles of all features used in managing the forestry activities
- MNR&F digital FRI records based on 2008 aerial photography
- SFL supplied Logging Records of species, log types and destinations 2014-2022
- BTC supplied Agreement "*20211104 CarbonCreditMgtAgr_ADC BTC*" with the ADC
- BTC supplied Legal Letter "*20221108 GR legal opinion*"
- ACR IFM Canada Methodology v1.0_Final
- ACR Standard v7.0_FINAL_Dec2020
- VM0034-Canadian-Forest-Carbon-Offset-Methodology-v2.0 (1)
- The Voluntary Carbon Market - 2022 Insights and Trends (Shell Nature Based Solutions)
- American Carbon Registry see report: ACR Carbon Markets 101: Additionality and Baselines for Improved Forest Management Projects — American Carbon Registry

In addition to the above data set, R&B interviewed two of Canada's major forest carbon offsets developers/land owners and participated in a (by invitation) webinar a large International Energy buyer (Shell Nature Based Solutions) that are currently active in the Voluntary markets. (see Appendix 1 Questionnaire to developers)

R&B Analysts (staff and associates) involved in the development of the report include forestry technicians, GIS technician, FRI photogrammetrists and two Registered Professional Foresters experienced in independent forest audits and forest carbon modelling in North and South America.

8.0 Synopsis of Research & Modelling Undertaken By R&B:

- Review and confirmation of the BTC and ADC agreement to profit share and develop forest carbon offsets.

- Review of three major forest carbon offset protocols that we feel are now, or assumed to be soon used in Ontario, and most suited to the OMU characteristics.

- Research and discussions with MNR&F's Forest management Branch to gage where developing Forest Carbon offsets on Ontario's Crown Managed forests (as per the OMU) were in allowing the proponents (BTC & the ADC) to do so legally and monetize for their mutual benefits.

- Data collection and validation from Ontario Government and MNR&F data warehouses and the SFL Manager contracted by the ADC to manage the day-to-day activities on the OMU.

- Research and summarize harvest and depletion records on the OMU over last 2 years and in the approved FMP and Government records.

- Perform technical GIS spatial mapping analysis and modelling to upgrade the OMU's forest inventory and bring up to 2023 using approved local empirical biometric yield tables reflective of the forest conditions and climate on the OMU.

- Participate in a voluntary carbon market trend webinar sponsored by Shell Nature Based Solutions reflective of past fiscal 2022 results and trends going forward.

- Modelled for additionality scenarios and best carbon sequestration to maximize potential revenue scenarios should an offset project be implemented.

- Interviewed two major Ontario Carbon offsets developers to gage their opinions on future trends, pricing and MRV costs going forward to estimate profitability of developing a long-term forest carbon on the OMU.

APPENDICES

1. Questionnaire to Forest Carbon Developers

Carbon Developer Protocol & Market Type questions: _____ **Date:** _____

1. What is current state of <u>legislated</u> markets in Canada and abroad?
2. What is current state of <u>voluntary</u> markets in Canada and abroad?
3. What is primary <u>legislated</u> Protocol used in Canada?
4. What is primary <u>voluntary</u> Protocol used in Canada?
5. What is your opinion & outlook for "Conservation" credits in forested lands?
6. What are costs associated with developing existing forest carbon projects as follows:

   - Size/Location/Protocol/Type (V or L):
   - Offset period in years:
   - Update existing inventory:
   - Create a field plot network:
   - Create a Project Development Document:
   - 3rd party certification:
   - Register w/auction:
   - Annual Auction fees:
   - Ongoing annual overhead to manage:
   - Interest in being a developer for FN Groups on Federal or Provincial Managed Forests?
   - Current market prices Voluntary versus Legislated and predicted trends**?**

2. OMU Managed Forest Operability (Rotation Ages) Criteria

Clearcut Harvest Operability Ranges

Harvest operability ranges define at what age limits a stand may be considered eligible for harvest. These ranges are constant and do not change through time. The lower operability limit does not imply a minimum rotation age for that forest unit but that it can be considered for harvesting in circumstances such as younger stands being mixed with older stands or in the completion of a caribou block within the DCHS.

An upper operability limit is generally not recommended within the Ogoki with the implementation of the DCHS strategy; however, scoping runs with an upper operability were completed. This was done to assess the natural successional pathways that reflect the stand age and not the stand volume, thus creating cycles of older aged stands with low volumes. However, when managing for caribou, current guidelines require forest stands to be harvested in large contiguous tracts to create an even aged forest with large landscape patches. For this reason, upper operability limits were not included. Due to use of natural successional pathways that reflect the stand age and not the stand volume, the model create a perpetual cycle of older aged stands with low volumes. This is a difference in philosophy that treats our review of the outputs in a different fashion.

The point of a specific forest unit's final transition through natural succession into a different forest unit, to either the same or different age class, may also be considered an upper operability limit.

Lower operability ages generally correspond to a minimum of approximately 45 cubic meters per hectares (net merchantable volumes) where reasonable for the age class. These volume requirements were related to the yield curves developed for each forest. Operability age ranges used for the Ogoki SFMM model are listed below in Table 51.

Table 51. Clearcut Harvest Operability Ranges

Forest Unit	Yield Curve	Lower Operability Age Class
BfDom	Average / Return To	65
	Managed Average	55
BwDom	Average / Return To	65
ConMx	PjAverage / Return To	45
	SbAverage / Return To	65
	Pj Managed Average	45
	Sb Managed Average	65
HrdMx	Average / Return To	55
HrdDom	Average / Return To	55
OcLow	Average / Return To	95
PjDom	Low / Return To	75

Forest Unit	Yield Curve	Lower Operability Age Class
	Medium / Return To	65
	High	55
	Managed Medium	55
	Managed High	45
PjMx	Average / Return To	55
	Managed Average	45
PoDom	Average / Return To	55
SbDom	Low / Return to Low	105
	Medium / Return To	75
	High / Return To	65
	Managed Low	95
	Managed Medium	65
	Managed High	55
SbLow	Low / Return To	95
	Average / Return To	75
	Managed Low	85
	Managed Average	65
	CLAAG	55
SbMx	Average / Return To	65
	Managed Average	55

Natural Condition Yield Curves

For the purposes of this FMP the yield curves and stocking profiles were developed using the MIST tool. The development of the curves involved working sessions between the MNRF, GFMI and the members of the modeling task team.

A series of yield curves was developed for the natural "Average" forest condition. The natural condition yield curves were developed to reflect the different natural forest conditions currently found on the Ogoki forest using a draft version of the BMI. Only forest stands with a natural disturbance origin were used as the sample

for the development of the natural yield curves. The team coded an interim silvicultural yield based on the 2008 FMP intensities to separate out natural stands, "Present", from those that had operational activities completed up. The sample used for the development of the yield contains 99,419 forested stands that cover approximately 696,398 hectares of the forest area.

Due the majority of the forest being a natural condition it was decided that multiple yield curves would be developed for the "present condition." The forest was initially broken into analysis units based on the productivity of the stands. Since site class is determined by the relationship between the age and height of trees and can be used as a measure of productivity, natural yield curves were developed by the site class (i.e. 0, 1, 2, and 3). Site Class 0 and Site Class 1 were grouped together to become the "High" productivity unit due to the small proportion of Site Class 0 identified on the Ogoki forest. Site Class 2 was classified as the "Medium" productivity unit and Site Class 3 was classified as the "Low" productivity grouping. An "Average" condition grouping was created for the forest units that had areas that were too small proportionally in one or more of the site class analysis units to give an accurate representation of that productivity grouping. Yield curves were developed using the productivity groups splits were accurately created for the PjDom and SbDom forest units that fall within a realistic regional range for the Ogoki Forest for all three productivity groups.

The SbLow forest unit was assigned two analysis units, "Average" and "Low." Due to the small percentage of area that would fall into the "High" analysis unit (2%), it was grouped with the "Medium" productivity to become the "Average" grouping with the "Low" kept as separate analysis unit due to the amount of area within that grouping (192,566 ha). This has the additional benefit of carrying the intentions of the 2008 FMP SbLow forest units (Slow1 and Slow3) forward into the 2020 FMP while using the Regional Standard forest units.

The tail of the yield curves for SbLow and OcLow was manually adjusted to mimic natural condition where those forest units succeed upon themselves. This was done by after the volume peaks and carries through into the future.

In order to achieve a natural yield that was within a realistic regional range, hardwood dominated stands were assigned an "Average" yield curve for the natural forest condition with no productivity divisions.

Initially a yield curve was developed for ConMx based on the area weighted average conditions found within the forest unit but it was found that this did not accurately represent the conditions that are found within the forest unit. Different silviculture treatments that could be applied on this forest unit for the managed yields that would affect yield based on the species driving the curve's volume, jack pine or spruce, and those different silviculture treatments that would be applied for various conditions. A separate MIST database was created for the development of ConMx yield curves where the standard regional forest units were split into multiple forest units based on species. Two yield curves for natural condition of the ConMx forest unit was developed, "PjAverage" and "SpAverage."

Table 16. Summary description of Natural Silvicultural Yield

Yield Code	Description
Natural	
Avg	**Average:** Stands that have originated from a natural disturbance on all Productivity Classes. This does not apply to PjDom stands, SbDom stands, ConMx stands, and SbLow stands that have a Site Class of 3.
Low **Med** **High**	**Low**: All PjDom, SbDom and SbLow stands that originated from a natural disturbance with a Site Class of 3.
	Medium: All PjDom and SbDom stands that originated from a natural disturbance with a Site Class of 2.
	High: All PjDom and SbDom stands that originated from a natural disturbance with a Site Class of 0 or 1.
PjAvg	**PjAverage:** ConMx stands that have a originated from a natural disturbance with a species composition where Pj > = Sb+Sw+Bf
SpAvg	**SpAverage:** ConMx stands that have a originated from a natural disturbance with a species composition where Sb+Sw+Bf > Pj

The yield curves generated from the productivity grouping were compared to the closest equivalent yield curves from the 2008 Ogoki FMP to assure accuracy and comparable volumes taken from past and current local knowledge.

Managed Forest Yield Curves

The managed yield curves and stocking profiles for the Ogoki were developed under the approach of generating curves based on the desired outcomes of management. Since the Ogoki forest has a small relative proportion of the forest classified as managed (32,012 ha) there is not a significant amount of area to create a sample to build managed curves. All of these existing managed stands fall in young age classes (< 20 years) that would not be suitable to use in the development of the managed yield curves.

The managed yield curves were developed to incorporate the post-harvest transition rules (FMP-5), the results of the analysis of past silvicultural treatments and performances, within the Ogoki and the surrounding region (Eco-region 3W), to consider historic information from past FMPs, and using curves developed for natural

forest condition as a basis for the managed curves (see Section 3.8). Each forest unit was considered by the potential silvicultural treatments, ecosite, productivity, and area weighted species composition to ensure that all potential scenarios would be represented in the developed yield curves and the assigned silviculture intensity.

Managed curves on the Ogoki were developed with the intention of increasing the stocking using different silviculture treatments to reach a desired minimum/target stocking level. Since the Ogoki forest has little to no historical managed stands with none of which are over the age of 20. The team has developed a conservative approach/assumption in the creation of the yield curves. With any/all of the managed curves assuming a target increase of 10% to the average weighted stocking found in the natural condition.

The following table describes the silviculture intensities developed for the classification of managed yield curves within the BMI (Table 17).

Table 17. Summary description of Managed Silvicultural Intensities

Yield Code	Description
Managed	
RTAvg **RTLow** **RTMed** **RTHigh** **MAvg**	**Return to Average**: Stands that have originated from a harvest disturbance and are expected to return to the natural yield condition based on a natural regeneration treatment. RTLow, RTMed and RTHigh only applies to PjDom and SbDom forest unit. RTLow also applies to SbLow. **Managed Average Stocking**: All stands that originated from a harvest disturbance that have received a silviculture treatment with the intent to increase stocking. This only applies to PjMx1, SbLow and SbMx1 forest units.
MAvg	**Managed Stocking on BfDom Average**: All BfDom stands that have a originated from a harvest disturbance that have received silviculture treatment with the intent to increase stocking and has a Sb or Sw lead species.
MLow	**Managed Stocking on Low**: All stands that originated from a harvest disturbance that have received silviculture treatment with the intent to increase stocking and has a Site Class of 3. This only applies to PjDom, SbDom and SbLow forest units.
MMed	**Managed Stocking on Medium**: All stands that originated from a harvest disturbance that have received silviculture treatment with the intent to increase stocking and has a Site Class of 2. This only applies to PjDom and SbDom forest units.

Yield Code	Description
Managed	
MHigh	**Managed Stocking on High**: All stands that originated from a harvest disturbance that have received silviculture treatment with the intent to increase stocking and has a Site Class of 1. This only applies to PjDom and SbDom forest units.
MPjAvg	**Managed Pine Stocking on Average**: All stands that have a originated from a harvest disturbance that have received silviculture treatment with the intent to increase stocking and has a species composition where Pj > = Sb+Sw+Bf. This only applies to ConMx forest units.
MSpAvg	**Managed Spruce Stocking on Average**: All stands that have a originated from a harvest disturbance that have received silviculture treatment with the intent to increase stocking and has a species composition where Sb+Sw+Bf > Pj. This only applies to ConMx forest units.

A total of 50 natural and managed yield curves were developed for the Ogoki base model.

3. Caribou Management Mosaic on the OMU

"**Abstract**

The Ogoki-North Nakina Forests consist of (10 638 km2) unroaded boreal forest approximately 400 km northeast of Thunder Bay, Ontario (lat 50°- 51°31'N, long 86°30'- 89°W). Woodland caribou (Rangifer tarandus caribou) inhabit discrete portions within these forests based on minimal current and past historical data. As part of the Forest Management Planning process, for the period 1997-2097, a woodland caribou habitat mosaic has been developed to coordinate present and future forest management activities with the retention and development of current and future woodland caribou habitat. Several criteria including, past fire history, forest structure, age, species composition, proximity to current road access and location of existing and potential caribou habitat, helped identify and delineate 50 mosaic harvest blocks. Each harvest block will be logged in one of five 20-year periods over a 100 year rotation (1997¬2097). The harvest blocks have been developed to simulate a pattern of past wildfire history in an area that has not been subjected to past forest management activities, while managing for woodland caribou, a locally featured species."

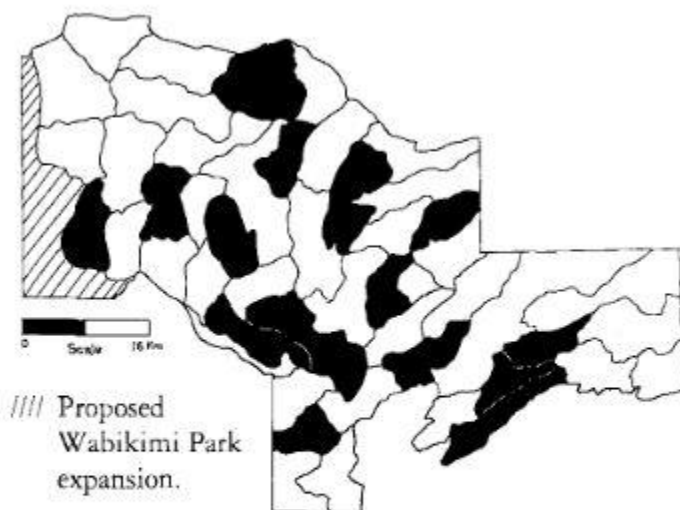//// Proposed Wabikimi Park expansion.

Fig. 2. Location of 50 mosaic harvest blocks within the Ogoki-Nakina North Forests of northwestern Ontario. Shaded blocks represents the pattern of forest logging disturbance after 40 years.

Source: Developing a woodland caribou habitat mosaic on the Ogoki-Nakina North Forests of northwestern Ontario | Rangifer (uit.no)

4   Overview of the Great Bear Rain Forest Carbon Project:

Synopsis:
The British Columbia Great Bear Forest Carbon Project is measured in ex-post carbon credits with 100-year permanence protection backstopped by the Forest Carbon Asset Management System buffer pool. The project follows the British Columbia (BC) Forest Carbon Offset Protocol for Improved Forest Management and is tracked on the BC Forest Carbon Offset third-party public carbon.
Source: Great Bear | LivClean | IFM Carbon Offset Project

Project Type : Improved Forest Management
Standard : BC Forest Carbon Offset Protocol (FCOP)
Location : North and Central-Mid Coast & Haida Gwaii, BC, Canada
Estimated Annual Emission Reductions : 1,000,000 tCO2e
Registry : BC Carbon Registry

BC Registry Overview (two of three Projects):

Account Holder
> Nanwakolas Offset Limited Partnership

Description
> Improved Forest Management project type within the BC Forest Carbon Offset Protocol (FCOP), generating emission reductions by protecting forest areas previously designated, sanctioned or approved for commercial logging. The project activities include changes in land-use legislation that result in the protection of forest areas and reduction of harvest levels across the project area. The Project encompasses the southern portion of the Central Coast Land and Resource Management Plan (LRMP) area, an area now known. The project area encompasses 1.5 million hectares of land and fresh water and over 780,000 hectares of productive forest land. As a result of the project activity, a total of 218,000 hectares are now protected in either Conservancies or Biodiversity, Mining and Tourism Areas (BMTAs). The project plan for this project was originally validated under the Greenhouse Gas Reduction Targets Act and been accepted under the Greenhouse Gas Industrial Reporting and Control Act transitional provision.

Account Holder
> Great Bear Carbon Credit Limited Partnership BCCR

Description
> The objective of the project is to protect and increase carbon stocks by converting forests that were previously available for logging to protected forests, thereby protecting existing carbon stocks, reducing emissions caused by harvesting, road building and other forestry operations, and increasing the carbon stocks as the forest continues to grow. The project proponent is a group of First Nations represented by the Council of Haida Nation, whose traditional territory is consistent with the project area. The Council of Haida Nation is part of the Great Bear Initiative Society (GBI) who represent First Nations on the North and Central Coast and Haida Gwaii. The project plan for this project was originally validated under the Greenhouse Gas Reduction Targets Act and has been accepted under the Greenhouse Gas Industrial Reporting and Control Act transitional provision

Recommended Reading & Viewing:

- First Nations Carbon: A BCAFN Discussion Paper
- PowerPoint Presentation (bcafn.ca)
- Great Bear Carbon Credit Corporation – Great Bear Business Corporation (greatbearcorp.ca)
- Atmospheric Benefit Sharing Agreements - Province of British Columbia (gov.bc.ca)
- Markit Environmental Registry - Project Details (gov.bc.ca)
- Carbon Credits - Coastal First Nations

Temporal Highlights:

BC Government Press Release **July 27, 2023**:

Co-management builds resilience in the Great Bear Rainforest | BC Gov News

|	
2006	B.C. and First Nations announce the Coast Land Use Decision and commit to ecosystem-based management throughout the Great Bear Rainforest.
2015	B.C. government, after government-to-government discussions, invites public comments on a new proposed Great Bear Rainforest Land Use Order and potential new Special Forest Management Areas.
2016	B.C. government enacts new Great Bear Rainforest Land Use Order to legally implement elements of the announcement.
2017	B.C. government passes the Great Bear Rainforest (Forest Management) Act to conserve 85% of the forest and 70% of old growth over time.
2023	B.C. government enacts amendments to the Great Bear Rainforest Land Use Order to legally implement elements of the announcement
July 27, 2023	BC Government Press Release Co-management builds resilience in the Great Bear Rainforest	BC Gov News

Four Key Environmental & Economic Take Aways:

Largest Indigenous-led Forest Carbon Project in Canada

- 85% of forests protected
- 3 projects: Haida Gwaii, North Mid Coast, South Central Coast
- Project validated (created) under BC's Forest Carbon Offset Protocol (FCOP)
- 1M+ tonnes annually since 2012
- BC government operations achieving carbon-neutral status with Great Bear offsets

Land Use & Forestry: Terrestrial Conservation in Great Bear (% Protection)
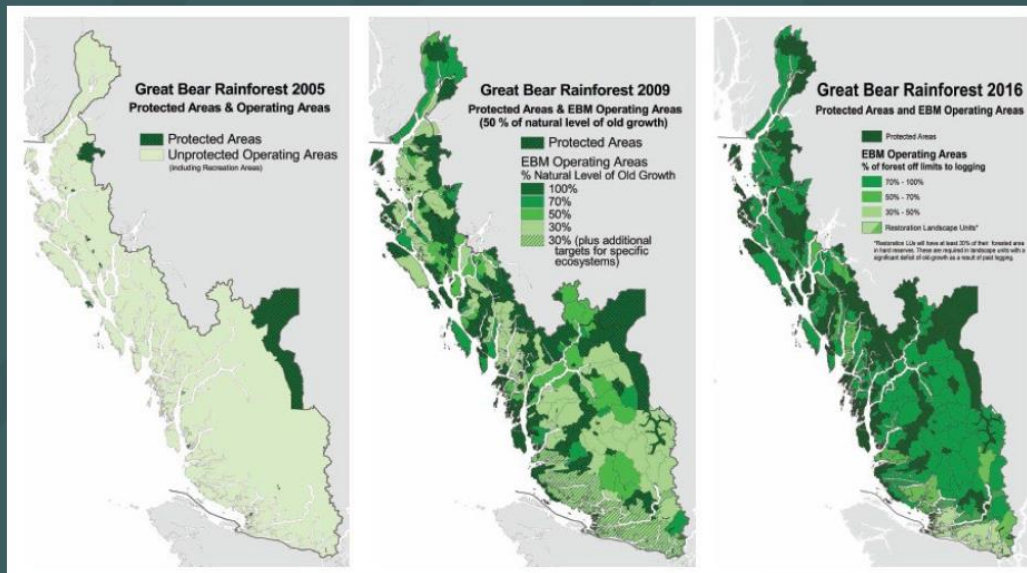
Source: Great Bear Carbon Credit Limited Partnership PowerPoint (see PowerPoint Presentation (bcafn.ca)