Five-Year Report on the **Status of Forestry**

APRIL 2016 – MARCH 2021

Manitoba

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Five-Year Report on the **Status of Forestry**

APRIL 2016 – MARCH 2021

MINISTER
OF NATURAL RESOUCES AND NORTHERN DEVELOPMENT

Room 330
Legislative Building
Winnipeg, Manitoba R3C 0V8
CANADA

Letter from the Minister
To Her Honour, The Honourable Janice Filmon
Lieutenant-Governor of Manitoba

Your Honour:

As Minister of Natural Resources and Northern Development, I am pleased to present the Five-Year Report on the Status of Forestry to the Legislative Assembly for the period ending March 31, 2021.

Our forests are an important part of life in Manitoba. From employment to recreation to education, this vast resource offers all Manitobans a variety of economic, environmental and cultural benefits. Managing the forests appropriately – managing them sustainably – means finding that balance between growth and protection.

Working with communities throughout Manitoba, as well as with local and national organizations, Manitoba continues to protect and enhance both urban and natural forests by monitoring and managing invasive forest insects and disease, by preparing for a changing climate and predicting how this will affect Manitoba's forests. We do all of these things by encouraging new and existing development and an emerging biomass industry to help reduce energy costs, and by consulting with and recognizing the rights of Indigenous communities throughout Manitoba.

This report reviews the last five years of forestry in Manitoba.

Yours truly,

Original signed by
Scott Fielding
Minister of Natural Resources and Northern Development

MINISTRE
RESSOURCES NATURELLES ET DU DÉVELOPPEMENT DU NORD

Bureau 330
Palais législatif
Winnipeg (Manitoba) R3C 0V8
CANADA

Lettre du ministre
à son Honneur, l'honorable Janice Filmon
Lieutenante-gouverneure du Manitoba

Madame la Lieutenante-Gouverneure,

À titre de ministre des Ressources naturelles et du Développement du Nord, j'ai le plaisir de présenter à la Assemblée législative le rapport quinquennal sur l'état des forêts pour la période qui se termine le 31 mars 2021.

Au Manitoba, les forêts font partie intégrante de la vie. La population manitobaine tire une foule d'avantages économiques, environnementaux et culturels de cette vaste ressource, tant au chapitre de l'emploi que des loisirs et de l'éducation. Grâce à une gestion adaptée – c'est à-dire durable – des forêts, il est possible de parvenir à un équilibre entre la croissance et la protection.

En collaboration avec les collectivités de la province et avec des organisations locales et nationales, le Manitoba continue de protéger et de bonifier les forêts urbaines et les forêts naturelles en surveillant et en gérant les maladies et les insectes envahissants, en se préparant pour le changement climatique et en établissant des prévisions concernant les effets de ce dernier sur nos forêts. Nous accomplissons ceci en encourageant les initiatives nouvelles et existantes visant à réduire les coûts de l'énergie, notamment en soutenant la jeune industrie de la biomasse, ainsi qu'en consultant les communautés autochtones de toute la province et en reconnaissant les droits de celles-ci.

Le rapport rend compte de la situation forestière des cinq dernières années au Manitoba.

Veuillez agréer, Madame la Lieutenante-Gouverneure,
l'expression de mon profond respect.

original signé par
Scott Fielding
Ministre des Ressources naturelles et du Développement du Nord

Manitoba
Natural Resources and Northern Development

Acting Deputy Minister Elliot Sims
Room 42 - Legislative Building
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Letter from the Deputy Minister

To the Honourable Scott Fielding,

Natural Resources and Northern Development

Honourable Minister:

I am pleased to submit the *Five-Year Report on the Status of Forestry* to the Legislative Assembly for the period April 1, 2016 to March 31, 2021.

This report reviews the Forestry and Peatlands Branch's programs, highlights changes and challenges to Manitoba's forests and forest industries, and identifies how the Province is managing these issues.

Yours Truly,

Original signed by
Elliot Sims
Acting Deputy Minister of Natural Resources
and Northern Development

Manitoba
Agriculture et Développement des ressources

Sous-ministre
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Lettre du sous-ministre

à Monsieur Scott Fielding,

Ministre des Ressources naturelles et du Développement du Nord

Monsieur le Ministre,

J'ai le plaisir de présenter à la Législature le rapport quinquennal sur l'état des forêts pour la période allant du 1er avril 2016 au 31 mars 2021.

Ce rapport, en plus d'examiner les programmes de la Direction des forêts et de la gestion des tourbières, souligne les changements et les défis associés aux forêts et à l'industrie forestière du Manitoba et explique la façon dont la Province y répond.

Veuillez agréer, Monsieur le Ministre, l'expression de mes sentiments distingués.

original signé par
Elliot Sims
Sous-ministre des Ressources naturelles
et du Développement du Nord

Executive Summary / Sommaire

Covering over 35 million hectares, Manitoba's forested landscape is vast. In our provincial parks and forests, in wetlands, on rolling rock outcrops, on the sandy backs of eskers, and in our yards, neighbourhoods and communities - trees, whether urban or natural, are an important part of life in Manitoba. They are ecologically, culturally and economically valuable. We are fortunate to have such expansive forests in Manitoba, and with appropriate and responsible management, the Forestry and Peatlands Branch helps to ensure that we can continue to enjoy them for many generations to come.

Les forêts du Manitoba, qui s'étendent sur plus de 35 millions d'hectares, couvrent une grande partie du territoire de la province. En milieu naturel ou urbain, dans les forêts et les parcs provinciaux, dans les milieux humides, sur les affleurements rocheux qui ponctuent le paysage et les pentes sablonneuses des eskers ou encore dans nos cours, nos quartiers et nos localités, les arbres font partie intégrante de la vie au Manitoba. Leur valeur est aussi bien écologique que culturelle et économique. Nous avons la chance d'être entourés d'immenses forêts, et par une gestion adaptée et responsable, la Direction des forêts et de la gestion des tourbières veille à ce que les générations futures puissent continuer à en jouir.

Threats to the forest environment, however, do exist. A changing climate may impact timber availability, carbon sinks may flip to become carbon sources, and forests may become maladapted to their local growing conditions. Understanding and incorporating such considerations into management decisions and practices helps ensure that Manitoba's forests remain resilient. Toward this, climate change mitigation projects are already underway, such as assisted migration trials and the creation of climate-sensitive forest growth models.

La forêt est cependant menacée sur plusieurs fronts. Le changement climatique pourrait avoir des répercussions sur la quantité d'arbres exploitables, les puits de carbone pourraient devenir des sources de carbone, et les forêts pourraient avoir de la difficulté à s'adapter à de nouvelles conditions de croissance. C'est en étudiant ces questions et en les intégrant à nos décisions et à nos pratiques de gestion que nous renforcerons la résilience des forêts manitobaines. Plusieurs projets d'atténuation des effets du changement climatique ont été lancés à cette fin, comme des essais de

Insects and disease, both native and invasive, continue to affect our forests. Jack pine budworm is flourishing in central and eastern Manitoba. Pine bark engraver populations have ballooned in the southeast. For the first time ever, emerald ash borer was detected in Winnipeg. Manitoba, working with federal and community partners, continues to monitor and control for such outbreaks. This work helps limit their spread across the landscape, which reduces tree damage and mortality.

In 2018, Tolko Industries Ltd.'s Forest Management License and mill in The Pas was transferred to Canadian Kraft Paper Industries (CKPI). Shortly after that, a partnership was formed between CKPI and Nekote, a partnership of seven northern First Nations, creating the Nisokapawino Forestry Management Corporation.

COVID-19 lead to record-high market prices for timber and oriented-strand board, the two main exports of Manitoba's forestry industry.

New technologies, such as mobile geospatial technology and Random Forest, can improve the Forestry and Peatlands Branch's ability to collect, analyse and inform management decisions. Field survey programs now use digital workflows, which have improved efficiencies and worker safety. Random Forest pilot projects are investigating the potential of machine learning approaches for improved forest inventories and renewal assessments.

Updated wood supply analyses were published for the Saskatchewan River and Highrock forest sections. These updates contribute to a better ecological understanding of important areas for the forest sector in Manitoba, ensuring that harvests remain at environmentally responsible and sustainable levels.

migration assistée et l'élaboration de modèles de croissance forestière qui tiennent compte des effets du climat.

D'autre part, les maladies et les insectes, indigènes ou envahissants, continuent de perturber nos forêts. La tordeuse du pin gris est en plein essor dans le centre et l'est du Manitoba, et les populations de scolyte du pin ont explosé dans le sud-est de la province. Pour la toute première fois, la présence de l'agrile du frêne a été détectée à Winnipeg. La Province, en collaboration avec des partenaires fédéraux et locaux, poursuit ses efforts de surveillance et de lutte contre ces invasions, ce qui en limite l'étendue et réduit les dommages aux arbres et la mortalité qui en découle.

En 2018, l'usine de papier de Tolko Industries Ltd. située à The Pas et la licence d'aménagement forestier de cette société ont été acquises par Canadian Kraft Paper Industries. Peu après, la conclusion d'un partenariat entre Canadian Kraft Paper Industries et Nekoté, un regroupement de sept Premières Nations, a mené à l'établissement de la Nisokapawino Forestry Management Company.

En raison de la COVID-19, le prix du bois d'œuvre et des panneaux à copeaux orientés, les deux grands produits d'exportation de l'industrie forestière du Manitoba, a atteint des niveaux records.

Le recours aux nouvelles technologies, comme la technologie géospatiale mobile et les forêts d'arbres décisionnels, peut faciliter les efforts de la Direction des forêts et de la gestion des tourbières en matière de collecte et d'analyse de données et favoriser la prise de décisions de gestion éclairées. Les programmes d'étude sur le terrain utilisent maintenant des flux de travaux numériques, ce qui améliore l'efficacité et favorise la sécurité du personnel. Par ailleurs, des projets pilotes basés sur les forêts d'arbres décisionnels explorent le potentiel de l'apprentissage machine en ce qui concerne l'amélioration de l'inventaire des ressources forestières et de l'évaluation de la régénération des forêts.

This responsibility continues beyond harvesting trees. During the reporting period, over 27 million trees were planted on Crown lands throughout Manitoba, and over 80,000 hectares received Certificates of Forest Renewal.

Public engagement and consultation helps to build mutually beneficial relationships and, ultimately, contributes to wiser, more inclusive decisions. Envirothon, community planting programs, the Heritage Tree program and Don't Move Firewood campaigns are just some of the ways the Forestry and Peatlands Branch supports and promotes community involvement.

This Five-Year Report reviews the status of forest resources and forest management programs in Manitoba.

Figure 1 - A silver maple, planted as part of Canada 150 celebrations.

Image 1 – Un érable argenté, planté à l'occasion des célébrations du 150e anniversaire du Canada

Des analyses d'approvisionnement forestier révisées ont été publiées au sujet de la zone forestière de la rivière Saskatchewan et de la zone forestière Highrock. Ces mises à jour améliorent nos connaissances écologiques relativement à des zones essentielles pour l'industrie forestière de la province et favorisent une récolte de bois durable et respectueuse de l'environnement.

La responsabilité exercée à cet égard ne se limite pas aux activités de récoltes. Ainsi, plus de 27 millions d'arbres ont été plantés sur les terres domaniales du Manitoba, et des certificats de régénération des forêts ont été délivrés pour plus de 80 000 hectares de terres.

La collaboration et la consultation du public contribuent également à l'établissement de relations mutuellement avantageuses et à la prise de décisions plus sages et plus inclusives. L'Envirothon, les programmes communautaires de plantation d'arbres, le programme de protection des arbres patrimoniaux et les campagnes de prévention du déplacement du bois de chauffage ne sont que quelques exemples des moyens utilisés par la Direction des forêts et de la gestion des tourbières pour encourager la participation citoyenne.

Le rapport quinquennal examine l'état des ressources forestières et les programmes de gestion des forêts du Manitoba.

Introduction

Providing ecological, cultural and economic benefits, Manitoba's Crown forests are all of our forests. Through The Forest Act and The Forest Health Protection Act, the Forestry and Peatlands Branch attempts to maintain and enhance these benefits. From the trees that line our streets to the forest products and jobs that industry provides, our forests continue to be indispensable parts of life in Manitoba.

In 2020, Manitoba Sustainable Development transitioned into two new departments: Climate and Conservation and Agriculture and Resource Development. The Forestry and Peatlands Branch, part of the Department of Agricultural and Resource Development*, has four sections: Planning and Development, Inventory and Analysis, Forest Health and Urban Forestry, and Forest Services.

The **Planning and Development** section provides cutting authorities, establishes conditions for all forestry operations based on input from the Forest Services section, and collects, tracks and monitors payments associated with timber dues and charges. The section also fosters economic development by supporting new and existing industries, and by facilitating increased Indigenous participation in the forest sector.

The **Inventory and Analysis** section supports the management of Manitoba's forest resources by maintaining and updating forest inventories, providing GIS and technology support, analysing and determining sustainable wood supply and supporting climate change initiatives.

The **Forest Health and Urban Forestry** section conducts monitoring and management programs that reduce damage from invasive and native forest insects and disease, delivers urban forestry programs and engages communities to enhance urban forests throughout Manitoba, and conducts forest renewal and growth surveys.

The **Forest Services** section works directly with industry, Indigenous communities, stakeholders and the public. Staff are responsible for ensuring sustainable management practices are followed, they review and approve harvest and renewal plans, monitor harvest and silvicultural activities, and they contribute expertise to a variety of projects that occur on Manitoba's forested landscapes.

* As of January 2022, the Forestry and Peatlands Branch is part of the Department of Natural Resources and Northern Development.

Climate Change

The Pan-Canadian Framework on Climate Change

Adopted in 2016 by federal, provincial and territorial governments, the Pan-Canadian Framework on Clean Growth and Climate Change (PCF) supports green economic growth while addressing climate change. The PCF represents Canada's commitment towards meeting - or exceeding - its greenhouse gas (GHG) reduction targets. These targets, set under the Paris Agreement, can help create green jobs and economic growth, and at the same time, help to increase Canada's resiliency to the impacts of climate change. Manitoba joined the PCF in 2018.

During this same time, Manitoba released its Made-in-Manitoba Climate and Green Plan, which established a Carbon Savings Account (CSA) to track emissions reductions. The plan aims to reduce GHG emissions in Manitoba by 1 million tonnes by 2022. For more information on the Made-in-Manitoba Climate and Green Plan, visit www.manitoba.ca/climateandgreenplan/index.html

Mitigating, understanding, and adapting to the effects of climate change are key to both federal and provincial plans. Forests and trees, sequestering carbon as they grow, will undoubtedly help toward these goals. In this respect, the Forestry and Peatlands Branch has contributed the following projects:

Mitigation

Carbon Sequestration in Hybrid Poplar Plantations: Planting trees to help address climate change is not a new idea. A previous initiative, which began in 2011 and continued to 2020, planted hybrid poplar clones throughout Manitoba. One site, 25 hectares of retired agricultural land near Cooks Creek, was chosen to monitor carbon sequestration rates using a solar-powered eddy co-variance flux tower. The tower measured the energy, water and carbon balances between the soil and the atmosphere. Analysis of the data showed that for the first two years, the plantation acted as a carbon source, emitting more carbon from the soil than was being sequestered by the new poplar saplings. However, from the third year on, the plantation switched to a carbon sink, sequestering more carbon

than it was releasing. Initiatives like this help provide a fuller understanding of the carbon dynamics of tree plantations.

Adaptation

Climate Change and Timber Availability:
How will the boreal forest be impacted by climate change? And how will this affect the forestry industry? Answering these questions was the goal of a joint research project between Lakehead University, the University of Winnipeg; the Manitoba, Ontario, Saskatchewan, and Ontario provincial governments; the federal government; Louisiana-Pacific Canada Ltd.; and Resolute Forest Products Canada. The study, funded by the Natural Sciences and Engineering Research Council of Canada, and lasting from 2017 to 2019, explored strategies to mitigate the effects that climate change will have on the boreal forest, and developed models to assess both the expected future supply of timber and the economic consequences. Using permanent sample plot data, the study showed that tree growth increased over time with regional warming, carbon dioxide level, and water availability for trees under weak competition, but not for those under strong competition. The results were published in the Journal of Ecology in 2019.

Climate Change Vulnerability Assessments:
Knowing how climate change may impact forests – in other words, knowing how vulnerable these forests are – will allow resource managers and forestry professionals to identify and implement adaptation measures into larger resource planning decisions. The Northern Prairie Forest Integrated *Regional Climate Change Vulnerability Assessment* looked into how climate change would affect western Manitoba's and eastern Saskatchewan's industrial forests. The Saskatchewan Research Council and the Manitoba and Saskatchewan governments (through the Forestry and Peatlands Branch), Louisiana-Pacific Canada Ltd. and Spruce Products were contributing partners to this study. The results of the study suggest that climate change presents both challenges and opportunities to forests, forest management and management planning in this area. Although forest fires may be less of a concern here, other climate-related disturbance events, such as spruce budworm, may increase substantially under future climate scenarios. Harvested timber volume may increase - and hardwood volume may increase more than softwood volume - because of higher atmospheric CO_2 levels predicted in the future. But the magnitude of these changes will depend on the availability of local moisture and nutrient levels.

Assisted Migration of Jack Pine: The First Five Years

As the climate warms, trees may not be adapted to their surrounding environments because they are stuck wherever they originally grew. In the future, a tree's ideal location may be several hundred kilometers north of where it grows now. Studies suggest that, through natural processes, trees and the forests they make up can migrate to more climatically suitable environments. But they may not be able to do so fast enough – the climate, and the local conditions climate influences, may be changing too quickly. To address this issue, one option is to help with the process of natural migration. Called assisted migration, this involves planting seedlings from warmer, southern areas, with the expectation that as they grow they will be doing so in a climate they are already adapted to.

In 2015, the Forestry and Peatlands Branch began trials to see how jack pine seedlings from different provenances grow and survive

in Manitoba's Pineland Forest Section. This research will help us understand how successful assisted migration could be when renewing Manitoba's forests.

What is a provenance? In forestry, a provenance describes a seed's origin. Similar terms like seed source or seed lot exist, but all describe the same idea: it refers to the general location from which the seeds were collected. Seeds collected from Duck Mountain Provincial Forest and from Belair Provincial Forest would have different origins, and therefore, different provenances.

What are we doing? Jack pine seedlings from Minnesota, Wisconsin, Ontario and different locations in Manitoba were planted near Menisino, Marchand and Stead. Each summer, these trees are measured for their diameter, height and health to track their growth patterns.

What are the results so far? Each year in Manitoba, millions of jack pine seedlings are planted – this could be because the area was harvested or because of large fires – and most survive. Unfortunately, new jack pine trees are tasty treats for hungry deer, and the first year of measurements showed that there was heavy deer browse on the study's seedlings. However, once these seedlings were temporarily protected using plastic tubes, there was a significant reduction in the percentage of seedlings damaged by deer. This can be seen quite clearly in Figure 2, which shows the rate of browse damage from 2015 to 2019. Why did deer browse increase in 2018? By year 4, the seedlings were too large for their protective tubes, and were removed. Because of this, the deer returned to their previous habits, complicating research trials.

Despite deer browse, seedling survival remained relatively high. Survival rates from all provenances were estimated to be near 95 per cent after the first year, declining to 60 per cent by year 5. Tree growth measurements show that Minnesota provenance MN-S1 consistently had the tallest trees, while trees from northern Manitoba had some of the shortest. This is important because it shows that jack pine seedlings from southern climates can survive and grow quite well in Manitoba's Pineland Forest Section. How these differences play out on longer timeframes remains to be seen, but results so far show encouraging signs that assisted migration could work in Manitoba.

How well will Manitoba's forests sequester carbon?

Manitoba has over 35 million hectares of forested land. Although this represents an enormous store of carbon, it also represents an enormous potential source of carbon. When trees die and decay – or when they burn – a large portion of that carbon will be released back into the atmosphere, contributing to increased greenhouse gas concentrations and, therefore, climate change. Forest management will require effective strategies to help offset greenhouse gas emissions, and Canada's Carbon Budget Model (CBM-CFS3) can help estimate how forest carbon stocks change over time.

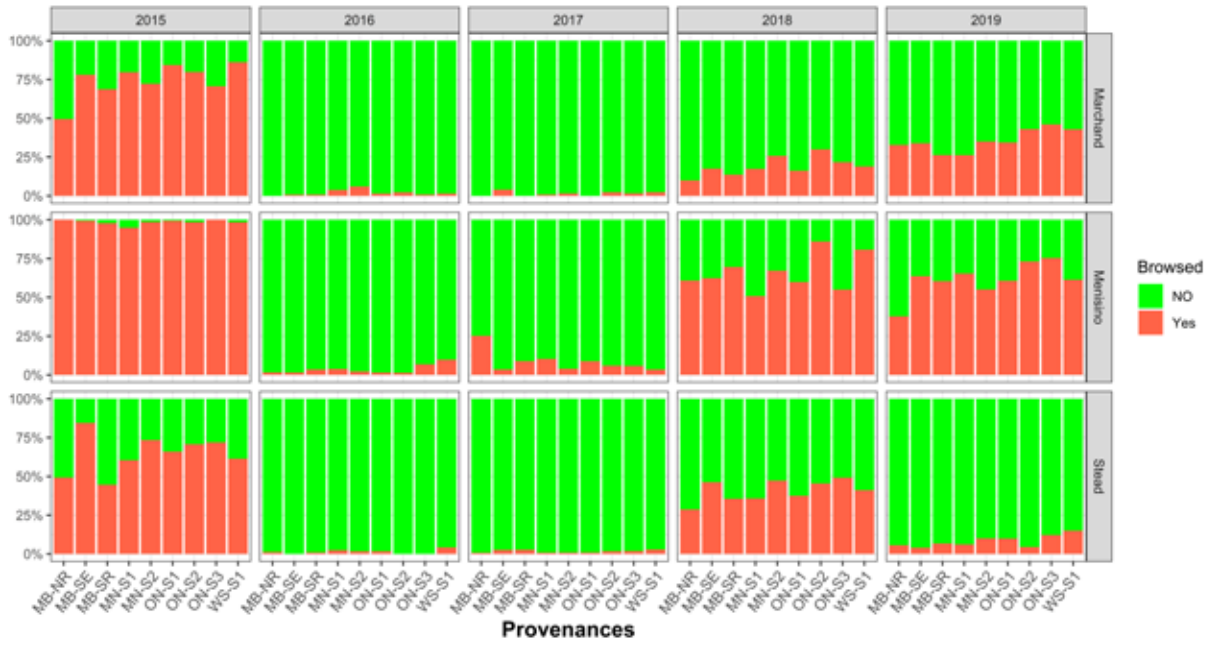

Figure 2 - Incidence of deer browse at Marchand, Menisino, and Stead assisted migration trials.

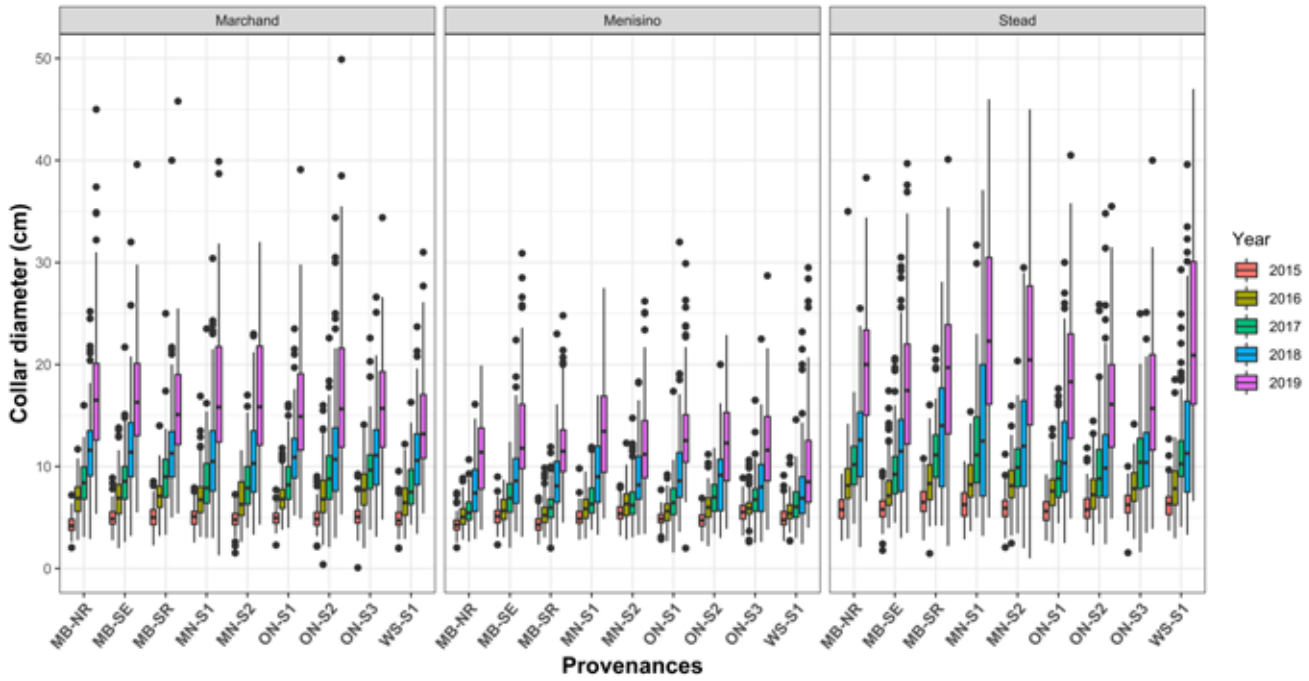

Figure 3 - Collar diameter width at Marchand, Menisino, and Stead assisted migration trials.

Recent estimates show that forests can be either sinks or sources of carbon dioxide. In 2020, Manitoba's forests continued to act as a sink, sequestering more carbon than they were releasing (Figure 4). But the CBM-CFS3 model shows that this trend may not last forever. By 2030, Manitoba's forests are projected to remain a small sink, but by 2050, they are projected to become a small source.

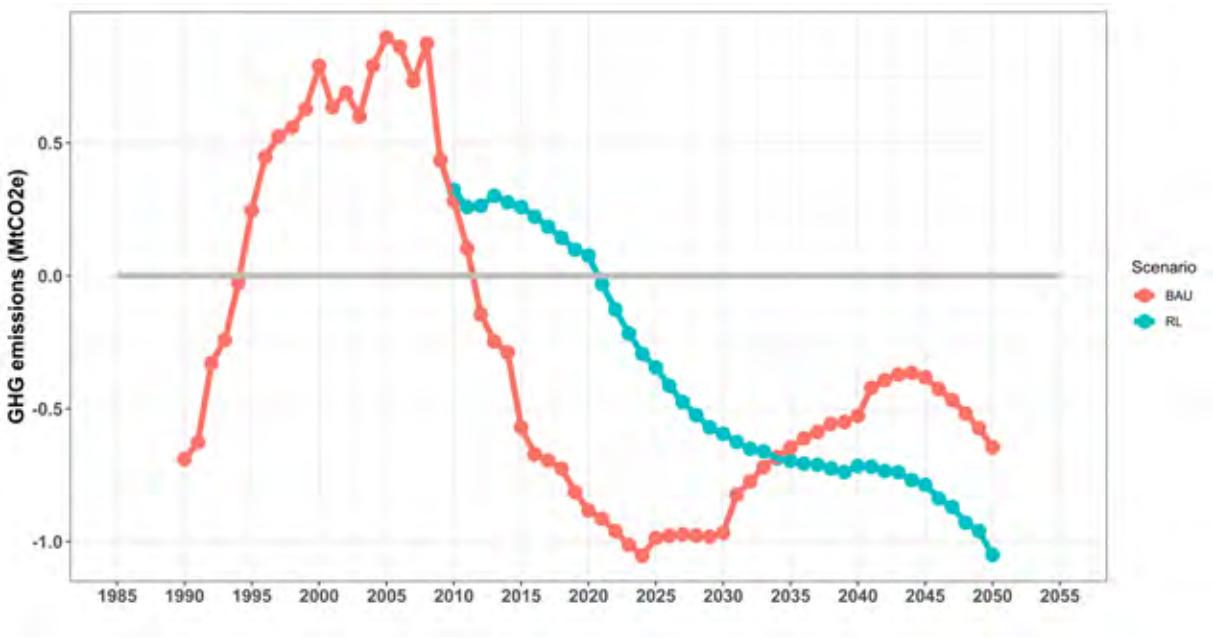

Figure 4 - RL: Reference Level (2011). BAU: Business As Usual. Until recently (2011), greenhouse gas reporting for forestry sectors excluded emissions caused by natural disturbances. Manitoba's forests were sources of greenhouse gases in the 90s and 2000s, primarily because of natural disturbances.

Boreal Wetlands Conservation Codes of Practice

Manitoba's boreal region contains 22 million hectares of wetlands, which provide habitat for many wildlife species, help clean and filter water, mitigate the impacts of flooding and drought, and store vast amounts of carbon. Development that affects the highly connected flow of water through these wetlands can have both upstream and downstream effects on biodiversity, habitat, and carbon sequestration capacity. However, these impacts can be managed, controlled and offset through best practices.

Developed through the Forest Practices Committee that included government, industry, and environmental non-governmental organization representatives, the Boreal Wetlands Conservation Codes of Practice were released on June 1st, 2020 as part of the Made-in-Manitoba Climate and Green Plan. The Codes of Practice detail a series of best management practices to provide guidance on how to avoid, minimize, and offset for permanent impacts to boreal wetlands that may result when developing resource and access roads and crossings.

Biomass Industry

What is Biomass?

Biomass can be derived from wood, agricultural crops, and other organic residues, and is often waste material from sawmills, woodworking shops, forestry operations and farms. According to the *Manitoba Bioeconomy Atlas*, there are over 5 million tonnes of biomass material available in Manitoba every year from agriculture, forestry residue, and from marginal lands and roadside ditches. Occasionally, forestry biomass is used as livestock bedding, compost and energy-production.

Biomass in Manitoba

- Several communities have switched to biomass energy, replacing old coal-fired burners with biomass burners for their farming operations.
- Located about 700 km north of Winnipeg, Dënesųłiné First Nation (Lac Brochet) is displacing diesel energy with biomass. The community has invested in biomass burners, so they can produce both heat and energy, utilizing standing timber killed from past wildfires. Alongside solar and geothermal energy, biomass utilization will help create a healthier community, local jobs, and will help reduce their dependency on diesel – all of which reduces greenhouse gas emissions.
- Spruce Products Limited and Spruce Woods Loggers, operating in the Western and Central regions of the province, respectively, produce biomass pellets for both domestic and export markets.
- Primary forest industries operating in Manitoba may also utilize biomass from their operations to offset emissions from gas and other fossil fuels, closing the loop on what was in the past considered waste. However, this practice is very limited.

The biomass industry is continually evolving in Manitoba and around the world, and research and market development in the textile, bioplastic, pharmaceutical and energy industries is ongoing. Through work with the Canadian Council of Forest Ministers, Manitoba is participating in a Canada-wide wood fibre utilization study and market analysis to better understand these new markets and their potential opportunities for the forest sector. Doing so will help these markets grow.

Figure 5 - Willow biomass bails.

Forest Industry

Although Manitoba imports more wood products than it exports, the forest sector contributes approximately $265 million annually toward provincial gross domestic product (GDP), and employs over 3,330 people.* Manitoba's forest sector also made significant capital investments during the reporting period. This included upgrades to mill infrastructure to improve energy efficiencies and changes to product lines. Canadian Kraft Paper Industries, Spruce Products Ltd., Louisiana Pacific Canada Ltd., Spruce Woods Loggers and Southeast Pallet and Wood Products collectively invested over $100 million. Such investments mean a continued or expanded presence of the forest industry in Manitoba.

Because the oriented strand board (OSB) market has remained low through this period, Louisiana Pacific Canada Ltd. (LP) made a significant investment in Manitoba to ensure the viability of their Swan Valley operations. LP has converted their facilities to specialize in high-value products. In 2015, LP invested over $100 million dollars to expand their OSB mill into one that produces LP SmartSide® siding. The engineered wood siding allows LP's Manitoba operation to remain competitive and increase employment.

The turbulent value of the Canadian dollar during the reporting period has also created challenges for Manitoba's forest industry.

Forest Commodity Prices

Forest commodity prices for this reporting period began with a slight upward trend, which continued until 2018 when oriented strand board (OSB) and softwood lumber (SWL) prices dropped. This downward trend continued into 2020. By the next spring, OSB and SWL started an unprecedented upward trend - due to the economic impacts of the COVID-19 pandemic - that would continue into 2021, when it reached an all-time high for commodity prices.

* Sources: Statistics Canada. Table 16-10-0117-01 (formerly CANSIM 301-0008): Principal statistics for manufacturing industries, by North American Industry Classification System (NAICS) (x 1,000); Statistics Canada. Table 16-10-0114-01 (formerly CANSIM 301-0009): Logging industries, principal statistics by North American Industry Classification System (NAICS) (x 1,000); The State of Canada's Forests. Annual Report 2020. 2020. Natural Resources Canada, Canadian Forest Service, Ottawa. 88 p.


OSB Market Price
USD OSB 7/16 Random Length (North Central)
CAD OSB 7/16 Random Length (North Central)
$1,200
$1,000
$800
$600
$400
$200
$0
Apr-16
Jun-16
Aug-16
Oct-16
Dec-16
Feb-17
Apr-17
Jun-17
Aug-17
Oct-17
Dec-17
Feb-18
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Jun-18
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Dec-19
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Apr-20
Jun-20
Aug-20
Oct-20
Dec-20
Feb-21


Softwood Lumber Market Price
USD/1000 FBM 2x4 #2&Btr KD Western SPF Random Lengths
CAD/1000 FBM 2x4 #2&Btr KD Western SPF Random Lengths
$1,600
$1,400
$1,200
$1,000
$800
$600
$400
$200
Mar-16
May-16
Jul-16
Sep-16
Nov-16
Jan-17
Mar-17
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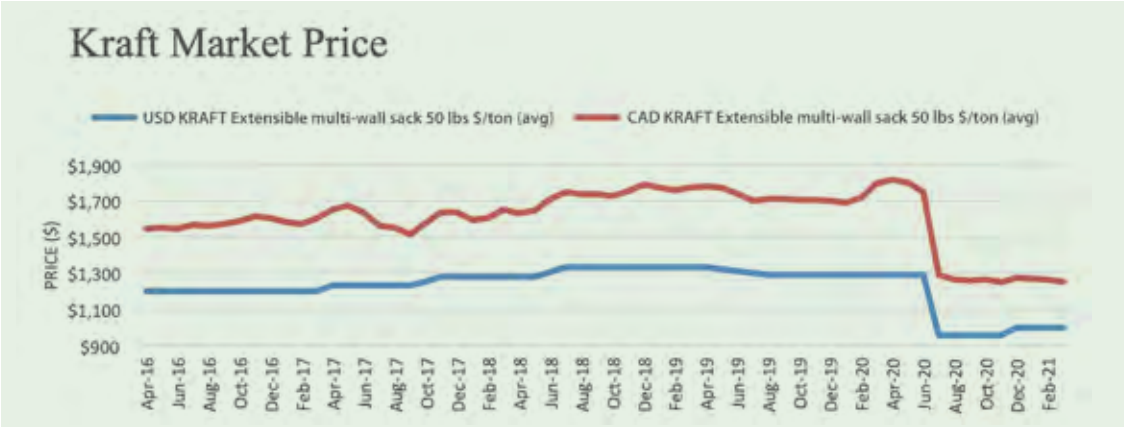
Kraft Market Price
USD KRAFT Extensible multi-wall sack 50 lbs $/ton (avg)
CAD KRAFT Extensible multi-wall sack 50 lbs $/ton (avg)
PRICE ($)
$1,900
$1,700
$1,500
$1,300
$1,100
$900
Apr-16
Jun-16
Aug-16
Oct-16
Dec-16
Feb-17
Apr-17
Jun-17
Aug-17
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Dec-20
Feb-21

Crown timber dues are based on commodity prices, and timber dues also followed the same highs and lows. Crown timber dues were the highest they'd ever been by September 2020, and they kept increasing into March 2021.

Kraft commodity pricing methodology was changed in 2020. This was done to better reflect the net trade price. The new methodology sets the price much lower than before. This is because it represents the net price after customer discounts and rebates. As a result, Crown timber dues for Kraft were also lowered. But despite this, commodity prices for Kraft have been rising.

Newsprint commodity prices, and the Crown timber dues associated with them, were relatively stable throughout the reporting period. Prices began relatively flat, rose slightly from 2018 into early 2020 and then declined into 2021. In 2019, the price assessment for the commodity 48.8-g (30.0-lb) East newsprint was discontinued and replaced with the commodity 45-g (27.7-lb) East newsprint. This was done to better reflect the North American market shift toward lighter basis weights. Although Manitoba does not have a newsprint facility, each year a small volume of wood is shipped to out-of-province newsprint mills.

Forestry Permits and e-licensing

In April 2020, Manitoba launched an e-licensing site for the online purchase of Manitoba hunting licences, fishing licences and park vehicle permits. Shortly after, this was expanded to include Personal Use Timber Permits (August 2020), Christmas Tree Permits (December 2020), Wood Processing Facility Licenses (December 2021) and Provincial Forest General Permits (February 2021).

Personal Use Timber Permits to cut wood for fuelwood or other personal uses are available through Manitoba's e-licensing portal. The availability of Crown wood for personal use, and the demand for permits, varies throughout the province, as each region has different policies that help to manage forests in a sustainable manner. From August 2020 to March 2021, nearly 1,100 timber permits were sold through the new e-licensing system.

Whether because of its online availability, the unseasonably mild weather or COVID-19 restrictions, the sale of Christmas tree permits was unprecedented! When compared to previous years, over three times as many Christmas tree permits (1510 permits) were sold in December 2020.

Wood Scaling Program

All harvested timber must be scaled to determine the Crown dues owed, and this means measuring volume. Accurate measurements of harvested wood volume are also essential for monitoring sustainable harvest levels and for tracking the movement of wood. Generally, there are two scaling methods used in Manitoba: weigh scaling, in which the weight of the wood on a hauling truck is converted to volume, and stack scaling, in which piles – or wood stacks – are measured for their length, width and depth. Nearly three-quarters of all harvested timber in Manitoba is weigh scaled, while the remainder is stack scaled.

Only licensed scalers are authorized to scale harvested timber. Scaling licenses are issued after completing Manitoba's scaling course, and these must be renewed every five years. As of March 2021, there were 60 licensed scalers in Manitoba, a decrease of 17 when compared to April 2016.

East-side Options License

Ever since Tembec Industries closed their newspaper mill in Pine Falls in 2009, the east side of Lake Winnipeg has been without commercial forestry activities, but that could soon change.

In 2019, Manitoba granted a first-of-its-kind Option License under the Forest Act. The agreement, between the province and four First Nations communities (Black River First Nation, Brokenhead Ojibway Nation, Hollow Water First Nation and Sagkeeng Anicinabe Government), has the potential to renew forestry activities in the area. This partnership could see improved economic opportunities and Indigenous-led environmental stewardship.

A considerable amount of work needs to be done before developing a Forest Management License. Wood supplies and commercial suitability studies need to be completed, and private partnerships and investment opportunities pursued. If successful, the partnership could lead to a long-term forest management license, and forestry operations will return to the east side.

Technology

Piloting Forest Inventory Using Machine Learning

Forest inventories are the basis for sustainably managing forest resources. Forests throughout Manitoba are classified and categorized – measured for height, species, and density (among many other things) – and these data are used to provide a picture of how these forests should be managed. Although the technology used to create an inventory may change, these data will always be important.

For decades, the data that made up a forest inventory was created by humans. It involved interpreting aerial photographs, meticulously recording what was seen from above – and generally, we were pretty good at it.

Can computers do a better job? Previous research indicates they can, and so a pilot project began in Forest Management Unit (FMU) 69 using a machine learning technique called Random Forest. Data from climate, elevation and ground sources, along with Sentinel satellite imagery, were compiled and correlated into a mathematical model that predicts forest inventory attributes, such as the species composition, age and height of forest stands.

The result was Manitoba's first Random Forest Inventory, or RFI. Although the approach is still a work-in-progress, the results look promising and could significantly reduce the time and cost associated with creating and updating forest inventories.

What does Random Forest have to do with trees? Nothing and everything. Random Forest is the name of a machine-learning algorithm. It builds multiple, randomly selected decision trees, and combines them into a forest, which results in a greater predictive accuracy than any individual decision tree. It has nothing to do with biological trees and the forests they make up. But, by using it to predict inventory attributes, we can see the forest for the trees. Decision trees, that is.

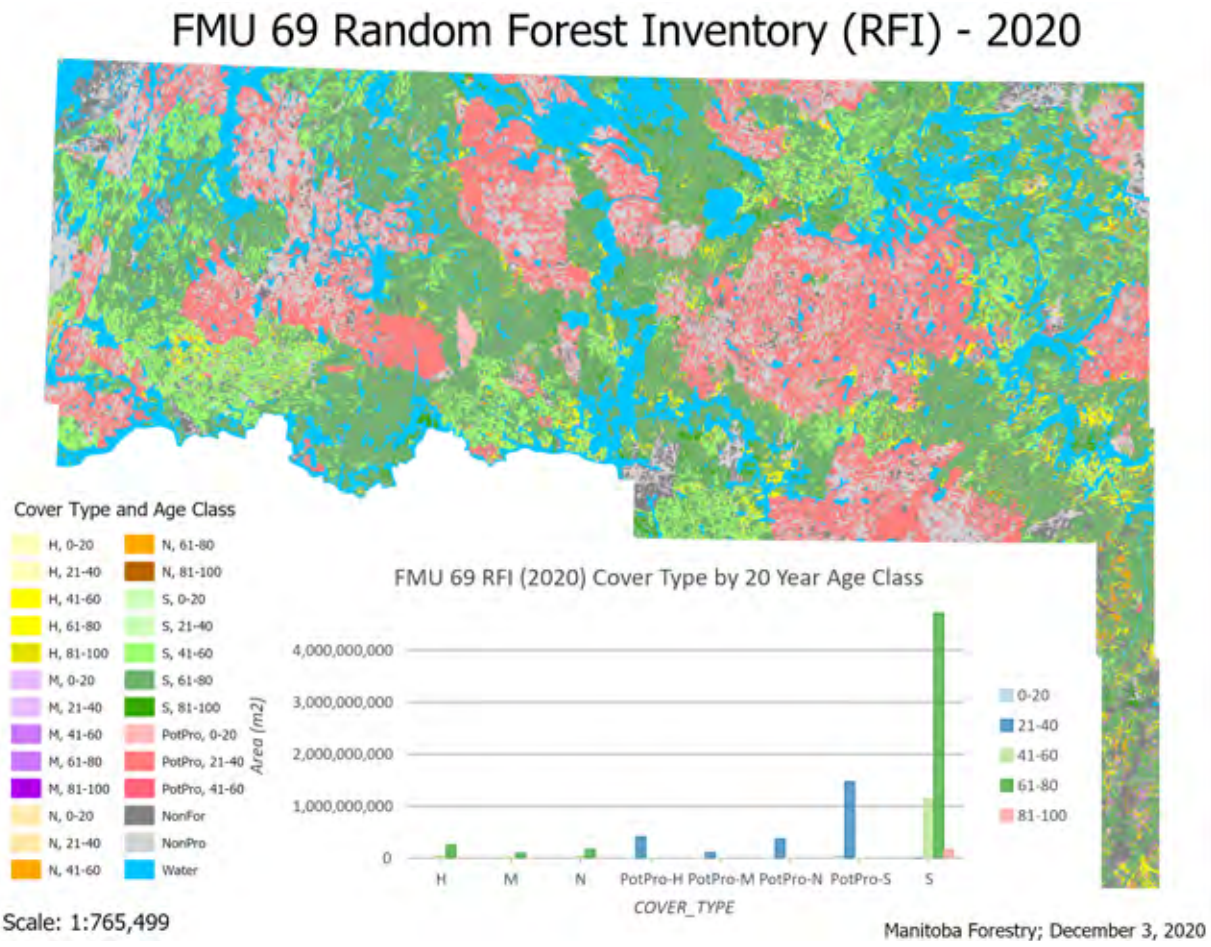


Figure 6 - Forest Management Unit 69 Random Forest Inventory map by cover type and age class.

Given the promising results of the pilot project, Forestry and Peatlands Branch may use the same Random Forest technique for the Saskatchewan River Forest Section, an area much larger than FMU 69. To support this, new ground data needed to be collected, and so a field-sampling program was launched in 2020. Tree and forest stand information were collected from 186 plots in a variety of site conditions, and similar to FMU 69, this data will be used to train the random forest model, helping to predict forest inventory attributes across the entire forest section, and ultimately, creating Manitoba's second Random Forest Inventory.

Piloting Forest Renewal Assessments Using Machine Learning

It is not only forest inventories that may benefit from machine learning. Whenever a forest stand is harvested, there are renewal standards that must be met. In other words, once trees are cut, we must ensure that they return – that a forest returns, so its benefits can last for generations. Can machine learning also help when assessing which stands are returning as they should and which are not?

To find out, the Forestry and Peatlands Branch is exploring how Unmanned Aerial Vehicle (UAV) imagery, alongside machine

learning, can be used to detect, predict and count individual trees in renewal plantations. Aerial photographs from UAVs, like the one in Figure 7, show how the resulting model identifies each tree.

Figure 7 – Drone photography showing machine learning models identifying individual trees.

There are many ways that machine learning can improve our understanding of how well forest stands are renewing. Canopy height models can be created, providing data on the heights of individual trees. Vegetation indices, like the Normalized Green Red Difference Index, can be used to predict whether the returning trees are hardwood or softwood, all of which can be compared to the renewal standards set by the province to determine which trees are performing as they should be and which ones are not. For example, Figure 8 shows in detail which areas of Block ER2009-110 are stocked and which areas are not stocked. Such analyses can allow for targeted approaches for further management decisions and actions.

Although more work is required, the results show that here too, machine learning is a promising approach.

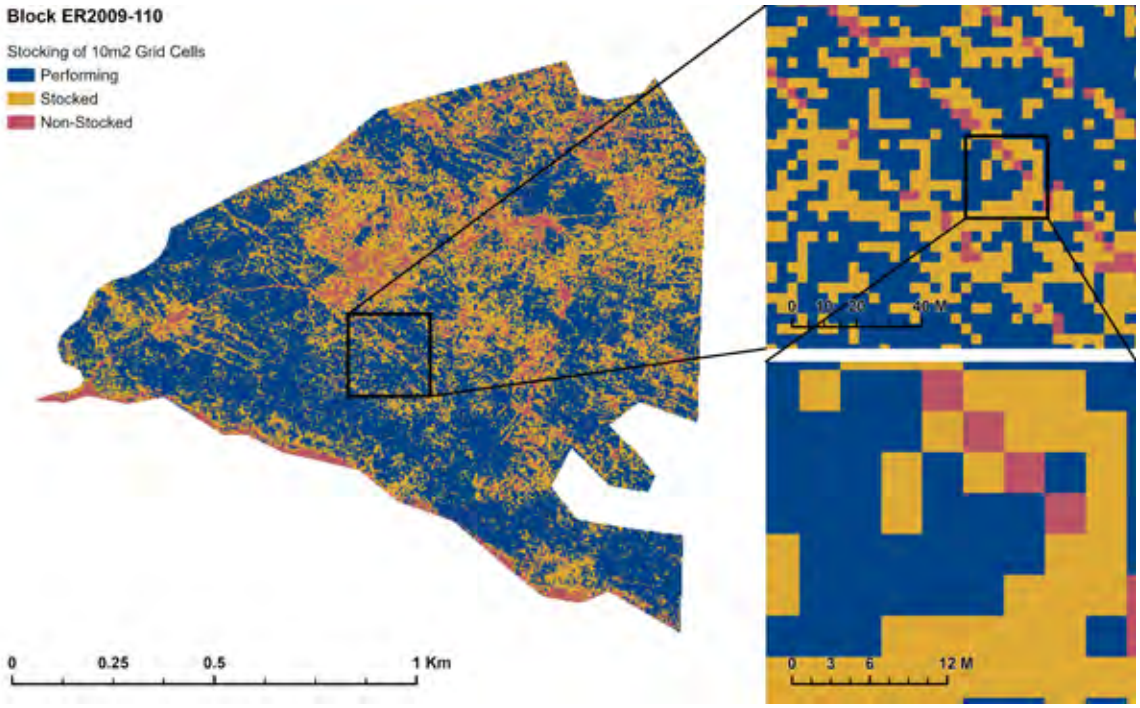


Figure 8 - Example of a regenerating forest stand (ER2009-110) classified using machine learning techniques. Pixels are classified as performing, stocked, or non-stocked.

Mobile Geospatial Technology

Field surveys are an important part of sustainable forest management, and mobile devices and services have made collecting field data even easier than before. The Forestry and Peatlands Branch has migrated almost entirely away from a paper-based workflow to a digital workflow. The digital workflow uses tablets with field data apps, and has resulted in operational efficiencies that make it easier to assess progress throughout the field season. Data that field staff collect can be monitored in near real-time, allowing senior staff to make edits, correct errors and identify learning or training opportunities while staff are in the field. Dashboards that summarize field program data as it is being collected - such as the one used for Dutch elm disease (DED) detection surveys (Figure 9) - provide information to managers that can quickly inform forest management decisions. Digital field workflows also allow for the survey data to be quickly shared with participating communities, which means removing diseased trees faster and reducing the spread of DED in Manitoba.

In the community tree inventory program, the branch provides participating communities with a digital survey form and map, and manages the collected data in the cloud. Such inventories help communities prepare for and manage forest threats like Emerald ash borer. For more information on the Forestry and Peatlands Branch's mobile geospatial technology, see Smart Digital Strategies for Sustainable Forest Management.

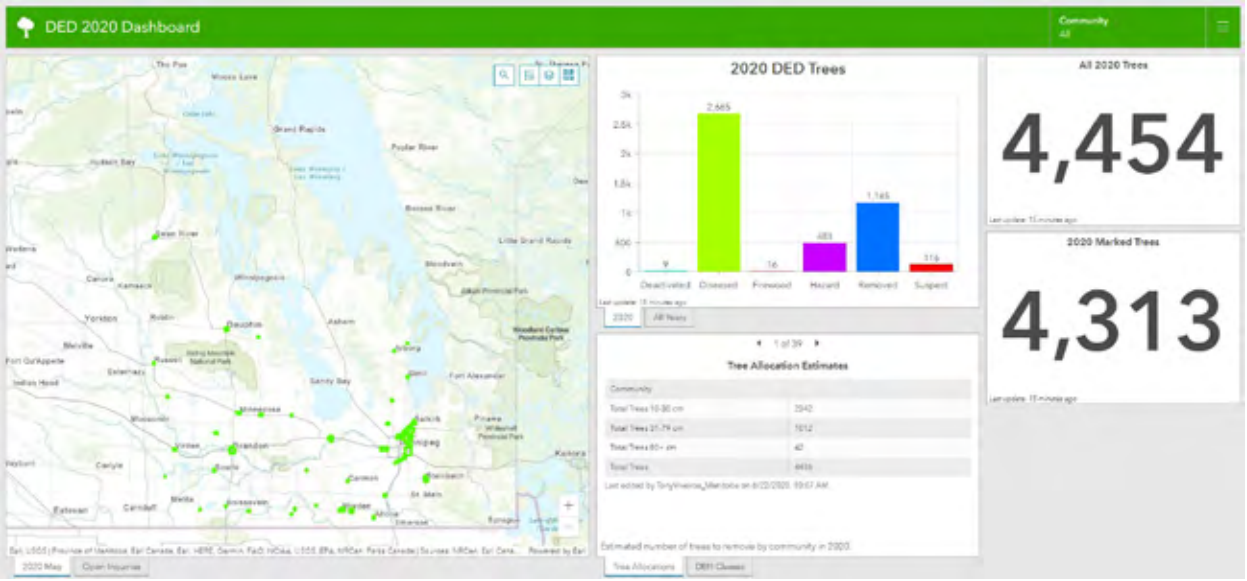


Figure 9 – Dutch elm disease dashboard showing the locations and incidence of Dutch elm disease in 2020.

Forest Inventory

Saskatchewan River Forest Section

In 2020, the Forestry and Peatlands Branch began the process to create a new forest inventory for the Saskatchewan River Forest Section. This required collecting detailed ground data from a variety of forest types (strata), tree densities and ages, and will provide information on tree growth rates, tree age and likely forest succession pathways – all of which help to predict current and future forest stand attributes across a large and ecologically diverse landscape.

The data, collected by Nisokapawino Forest Management Corporation, will be compared to historic plot data, allowing Manitoba's Growth and Yield Model to project how the forest will change or grow over time. If the results are promising, this method can help save time, resources and money.

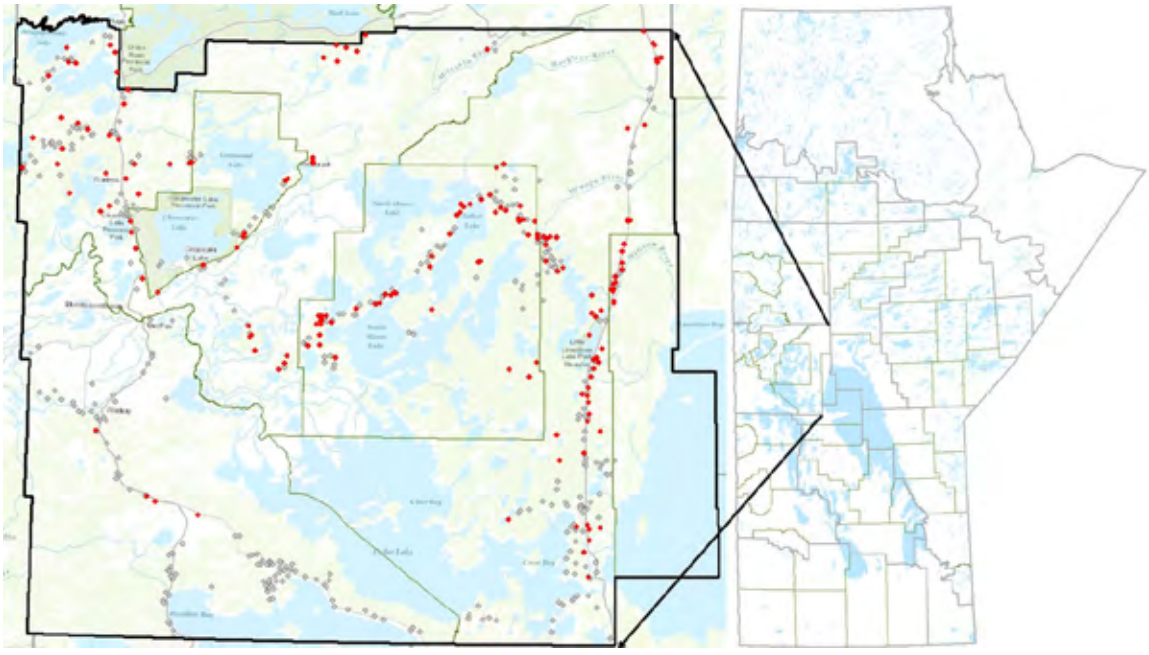


Figure 10 - Map of Saskatchewan River Forest Section. Red dots indicate sampling done in 2020; grey dots indicate historic sampling locations.

Wood Supply Analysis and Sustainable Harvest Levels (SHLs)

Once a forest inventory is completed, the volume of wood available for harvesting can be determined. This is called a wood supply analysis, and it helps ensure that our forests are not harvested beyond sustainable levels. How does the Forestry and Peatlands Branch determine sustainable harvest levels (SHLs)? The branch does this by measuring the rate of growth over time. Typically, the amount of wood volume annually grown within a Forest Management Unit (FMU) determines what the sustainable harvest level will be. However, different SHLs are available, depending on the management techniques used. This means the amount of wood harvested each year is never more than the amount of wood grown during that time. Wood supply analysis and sustainable harvest levels take into account parks and protected areas, anthropogenic and natural disturbances, land use and ownership changes, Treaty Land Entitlements, and any other considerations that would limit the availability of harvestable timber.

Updated SHLs were completed for FMU 13 in the Mountain Forest Section and for FMU 24 in the Pineland Forest Section. Additionally, wood supply reports were completed for the Saskatchewan River and Highrock Forest Sections.

Figure 11 - Examples of cookies collected in order to determine tree growth rates.

TABLE 1: MANITOBA SUSTAINABLE HARVEST LEVELS (SHL) BASED ON CURRENT UTILIZATION*

Forest Section	Softwood (m^3/yr)	Hardwood (m^3/yr)
Aspen Parkland**	1,410	21,050
Churchill River	76,080	-
Hayes River**	821,960	-
Highrock	609,709	-
Interlake	264,600	74,220
Lake Winnipeg East	617,222	15,694
Mountain	415,540	678,898
Nelson River**	818,390	28,910
Pineland**	160,575	117,985
Saskatchewan River**	379,896	-
Grand Total	4,165,382	936,757

Note:

** Utilization levels vary throughout the province.*

*** Although an SHL is not listed for all species, a sustainable harvest volume is available, depending on the management techniques.*

Not every forest section has an SHL because harvesting does not occur in every forest section. However, the full potential SHL in Manitoba is 5,238,334 cubic metres of softwood and 2,630,624 cubic metres of hardwood. Appendix 10 shows the actual harvest levels for each Forest Section. From 2016 to 2020, there was an average harvest of 850,531 cubic metres and 431,876 cubic metres for softwood and hardwood, respectively.

Northern Economic Development

The Northern Economic Development Area, or NEDA, contains the Saskatchewan River, Highrock, Nelson River and portions of Hayes River and Churchill Forest Sections. In 2020, the Forestry and Peatlands Branch commissioned an economic feasibility study that looked into the potential development of this vast area for the harvest, transport and production of forest products. This meant updating forest inventories where necessary, and assessing NEDA's wood supply and sustainable harvest levels. Specifically, the study examined the possibility of new partnership-based forest product facilities in the north that would complement existing industry.

Climate Sensitive Growth and Yield Models

Climate change will affect how forests grow. Some may grow faster than they otherwise would and others slower. Quantifying and incorporating these changes into expected growth rates will ensure that whatever changes occur, Manitoba's forests will remain sustainably managed. Manitoba uses a program called Manitoba's Growth and Yield Model to predict how forests will look in twenty, fifty or 100 years into the future. It models species-specific growth rates, and therefore volumes, for a variety of different soil types throughout the province, and this information directly informs how Manitoba sets its sustainable harvest levels. Now, a climate-sensitive growth and yield model has been developed; and it will allow for wood volume predictions that take into account a variety of climate change scenarios.

Engagement and Consultation

The Forestry and Peatlands Branch continues to regularly engage with Indigenous communities and stakeholder groups. Whether participating on resource management boards, presenting (and planting trees) at schools, implementing community timber sales agreements, or through silvicultural contracts, the Forestry and Peatlands Branch is committed to developing closer relationships with everyone that uses and enjoys Manitoba's forests.

Whenever a large landscape project is planned, forests will likely be involved, and so will the Forestry and Peatlands Branch. The branch has been involved in projects like Bipole III, the Manitoba-Minnesota Transmissions Project, the East-Side Transmission Project, the Birtle Transmission Project, and the development of Shoal Lake 40 First Nation's all-season access road. All of these required review and expert recommendations, participation in Crown-Indigenous consultation and determining a fair price for any harvested timber.

The Field Guide – Trees of Manitoba

First published in 1979, the *Field Guide – Trees of Manitoba* has been a valuable resource for tree lovers, young and old alike. But after 40 years, the guide needed to be updated, so the black and white photos were replaced and new content was added. This included Cree, Dakota, Dene, Michif, Ojibwe and Ojibwe-Cree translations of tree names. Don't worry, Manitoba's trees haven't changed - they remain just as they were before, but now they're even easier to identify. The field guide is an excellent resource for both experienced and budding naturalists. For those who don't want to carry around a paper guide, a digital version is available on the iNaturalist app, where people can add photos and field observations:

https://www.inaturalist.org/guides/8023

The updated guide was released in 2019, and was widely distributed throughout northern Manitoba's school system. In 2020, distribution surpassed 20,000 copies, as universities, colleges and other schools across Manitoba requested copies for their courses and curriculums. This free guide is also available at all provincial parks, so get yours today and start identifying!

Forest Stewardship

Forests are dynamic and variable ecosystems – constantly changing as they age. Managing them sustainably, which means ensuring they return to a forested condition after a disturbance, can be a challenging task. The disturbances may be natural events caused by weather, climate, fire or insect damages, or human caused events like harvesting.

Figure 12 – Plot center of a forest regeneration survey in a jack pine stand.

Insects (jack pine budworm, spruce budworm and pine bark engraver) continued to spread throughout the reporting period, and as they did, continued to impact forest health. This lead to mass mortalities of jack pine, white spruce and balsam fir stands in the west, central and eastern regions of Manitoba. The damage they caused will, under the best of circumstances, reduce forest productivity.

With so much standing dead wood – and the fire risk to neighbouring communities that comes with it – salvage operations and accelerated harvest plans were carried out. After all, the wood, despite the tree mortality, can still be used and contribute to Manitoba's forest product sector.

Although salvage harvesting can prevent the wood from going to waste, it is not without its difficulties. Wait too long, and the forests impacted can fill with alder, willow, and beaked hazel – and this competition crowds out the small pine or spruce in the understorey. Accelerated harvesting tries to minimize the amount of competition, relying instead on natural pathways for renewal. However, where required, it is also supplemented with tree planting programs.

From 2016 to 2020, over 27 million trees were planted on Crown lands throughout Manitoba, and over 80,000 hectares received Certificates of Forest Renewal. These efforts, by the industry and the Forestry and Peatlands Branch, help ensure that what was harvested is what is growing back.

Figure 13 - Planted white spruce seedling.

TABLE 2: NUMBER OF TREES PLANTED ANNUALLY IN MANITOBA, 2016-2020.*

Year	Region					
	Eastern	Central	Western	Northwestern	Northeastern	Totals
2016	1,044,105	20,160	-	447,865	-	1,512,130
2017	1,669,057	-	8,640	439,985	-	2,117,682
2018	1,708,080	194,860	28,080	100,320	-	2,031,340
2019	1,695,360	101,770	22,320	129,260	-	1,948,710
2020	1,372,077	74,940	14,760	162,691	-	1,624,468
Totals	7,488,679	391,730	73,800	1,280,121	-	9,234,330

* Numbers do not include those trees planted by Canadian Kraft Paper Ltd or Mountain Section Forest Renewal Company.

TABLE 3: HARVEST AND PLANTED AREA TRENDS IN MANITOBA (IN HECTARES)

	1981-85	1986-90	1991-95	1996-00	2001-05	2006-10	2011-16	2016-21
Softwood	54,149	53,377	50,984	56,000	56,820	52,940	25,809	38,660
Hardwood	0	5,045	6,769	23,000	28,352	19,428	18,194	19,630
Planted	11,735	29,475	31,128	31,128	40,204	39,540	19,511	4,197

Forestry Field Services

Field work is not easy work. Workers have to contend with mosquitos, horseflies, deer ticks, bears and badgers, wolves and wolverines, rain, snow and the unrelenting sun. Field surveyors will often work in remote areas, surrounded by miles and miles of wilderness. It exposes them to the beautiful bounty that Manitoba's forests offer, and yet it can also be dangerous. Surveyors are the Forestry and Peatlands Branch's literal boots-on-the-ground. The information they collect informs many management decisions. It is an important, invaluable and indispensable part of forest stewardship.

In 2016, the Forestry and Peatlands Branch amalgamated its field programs into one central program: Forestry Field Services. The Field Services Program includes inventory surveys (permanent sample plots, National Forest Inventory plots and volume sampling plots), silviculture surveys, forest health and urban forestry surveys and Dutch elm disease management.

The new, amalgamated program coordinates all field services under one umbrella, resulting in streamlined hiring, consistent training and a comprehensive and consistent safety program. Staff retention has also improved, as the program allows for increased opportunities to learn about and perform different surveys throughout the season. This flexibility and improved knowledge base also allows the program to support regional staff and research projects, all of which contribute to a better, wiser forest stewardship.

Urban Forestry

For many, Manitoba's urban forests – in parks, along river trails, in playgrounds and yards – are their closest links to nature. Cottonwoods, those well-rooted riparian sentinels, spread their seeds as if it were a summer snow. Manitoba maples, equal parts gnarled and bulbous, provide shelter for scavenging squirrels and woodpeckers. Cherries, Russian olives, butternut and hackberry each add to the diversity and value of a prosperous and healthy forest canopy.

There are threats to our urban forests too, both new and old. Dutch elm disease continues to claim its annual victims. Emerald ash borer seeks to turn our ash trees into ashes, and all the while, climate change stresses tree defences. There are many others too: spanworms and aphids, tent caterpillars and weed whackers. Some, like the cankerworms that always seem to hover at head height, are relatively benign, but others, like Lymantria dispar dispar, can leave no leaf in sight.

Managing these threats appropriately means using a variety of strategies, and the Forestry and Peatlands Branch has several programs to maintain and enhance our urban forests, ensuring that they continue to provide for and benefit all Manitobans.

Heritage Trees

In partnership with the Manitoba Forestry Association and Trees Winnipeg, Manitoba's Heritage Tree Program recognizes trees with exceptional significance to Manitobans. These are trees that promote environmental, cultural, social and historic awareness. The program is legislated under the Forest Health Protection Act.

One such tree, Manitoba's Halfway Tree, a laurel leaf willow, has long been recognized as the halfway point between Winnipeg and Brandon on the Trans-Canada Highway. Located about 20 kilometers west of Portage La Prairie, the Halfway Tree was designated in 2019.

Figure 14 - The Halfway Tree, a laurel leaf willow, on the Trans-Canada Highway.

Figure 15 – Plaque honouring families and survivors of missing and murdered Indigenous girls, men, boys and LGBTQ2S people.

Although the significance of most trees increases with age, others are significant from the moment they're planted. On May 29th, 2019, in honour of the families and survivors of missing and murdered Indigenous girls, men, boys and LGBTQ2S people, a burr oak tree was planted in Michaëlle Jean Park in North Point Douglas. It was the ninth such tree to be designated in Manitoba, and Forestry and Peatlands Branch staff were honoured to attend the ceremony.

On July 1st, 2017, Canada turned 150, and Manitoba celebrated by distributing and planting over 150,000 seedlings, many of which were given out at provincial parks. These trees will go on to sequester carbon, provide shade, support wildlife and much, much more! At Alfred Hole Goose Sanctuary in Whiteshell Provincial Park, a special planting took place: 150 white spruce were planted in the shape of a maple leaf.

A similar celebration was planned for Manitoba's 150th anniversary in 2020. Unfortunately, due to COVID-19, all events were cancelled. Despite this setback, over 292,000 seedlings were distributed to landowners, communities and organizations from 2016 to 2021!

Figure 16 - Burr oak tree, planted in Michaëlle Jean Park in North Point Douglas.

Invasive Forest Insects and Disease

Dutch Elm Disease

The American elm is easily recognized in Manitoba's urban forests. Naturally occurring along rivers and waterways, their large and beautiful canopies, like leafy umbrellas, arc across city streets, shading homes and walkways under their bountiful boughs. They do so while withstanding the comparatively harsh conditions of urban living: car exhaust, road salt and weed whackers. Such factors can take their toll on other kinds of trees, but the American elm was a hardy tree. It was an ideal urban tree. This was why it was planted in such abundance throughout North America's urban landscapes.

All that began to change in 1975 when Dutch elm disease was first detected in Manitoba. The invasive fungal pathogen grows within the water-conducting tissues of elm trees, creating long dark streaks in the cambium, plugging it up, and blocking any water movement from the tree's roots to its tips. Without water, these trees wilt and die.

The disease is spread by elm bark beetles. These tiny insects bore, feed and breed underneath the bark of dead or dying elms, carrying the deadly fungus in small grooves on their body. As they fly from tree to tree, they help spread the disease, infecting healthy elms along the way. This is the primary way the disease is spread, but there are other ways too. The roots of nearby elm trees are often grafted together – this helps them share nutrients between one another. It also provides a pathway for pathogens, and Dutch elm disease will spread here too.

Figure 17 - Elm tree with Dutch elm disease.

Although Dutch elm disease is here to stay – it cannot be completely eradicated – its spread throughout communities can be slowed. This involves early detection, removal, and destruction of diseased elm trees and the wood in which these beetles breed.

Through Community Forest Grant Agreements, the cooperative Dutch Elm Disease and Urban Forestry Management Program continued to protect and support urban forests in Manitoba. Provincial inspectors surveyed all 38 participating communities for diseased elm trees that were then quickly removed by the community to slow the spread of Dutch elm disease and retain mature urban tree canopies. Between 4000 and 5000 elm trees were identified and removed annually under the program. Funding from the province is provided to support tree removals and promote other urban forestry activities, such as planting trees and conducting urban tree inventories to improve urban forest management.

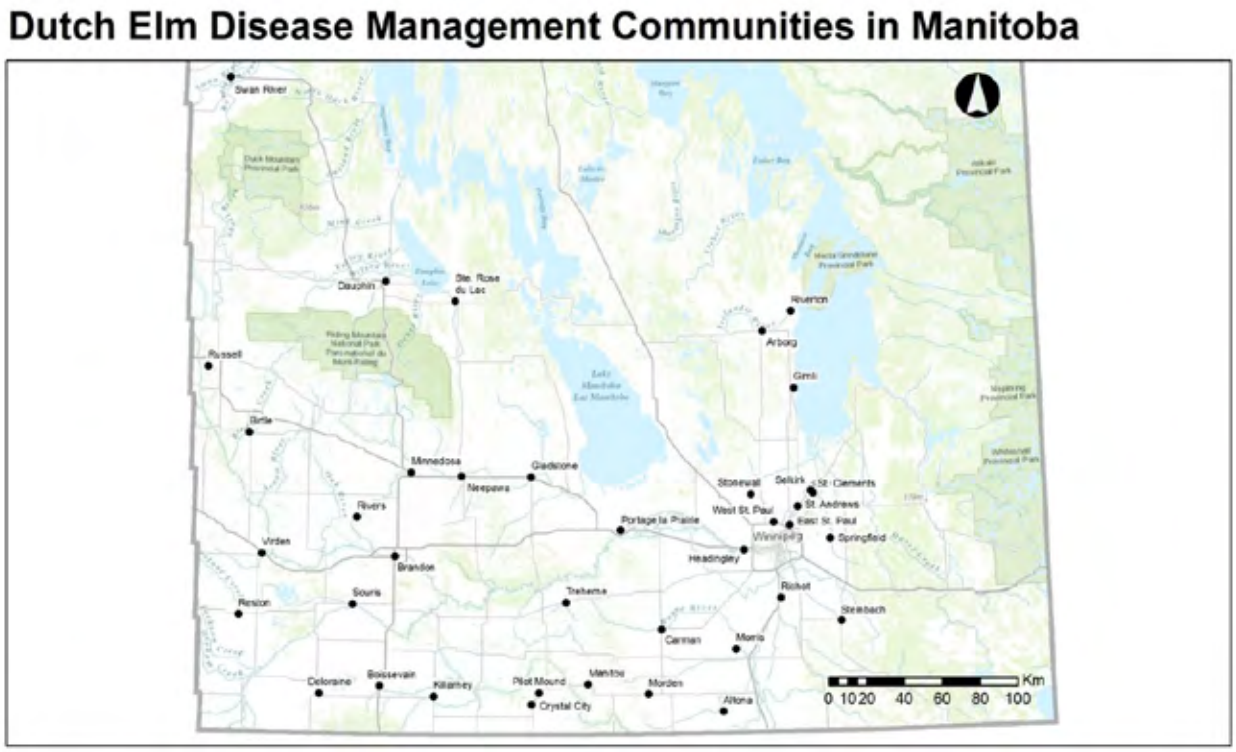


Figure 18 – Communities in Manitoba with Community Forest Grant Agreements to manage Dutch elm disease and urban tree inventories.

It is because of joint efforts like these that even after 40 years of Dutch elm disease in Manitoba, communities retain many American elms in their parks, yards and boulevards.

Tree diversity is key. Dutch elm disease was able to establish itself in North America and Manitoba, in part, because of a monoculture of American elm. Whenever a tree was planted, it was frequently an elm sapling. This made for beautifully lined streets, but it also made for easier transmission of tree diseases. Once Dutch elm disease began to ravage urban forests – of which a large portion were elms – the trees that replaced them were ash trees. Today, these trees are under threat from Emerald ash borer, and a deadly pattern has repeated itself. Tree diversity is key to a healthy urban forest. Although elm and ash should still be planted, there are many other tree species available that are just as beautiful.

Figure 19 - "Flagging" in a diseased elm tree.

Urban Tree Inventory

Urban trees and forests provide many benefits for our communities. They save on heating and cooling costs, increase property values and add to the beauty of our parks and outdoor spaces. Such valuable assets must be managed appropriately. And the first step toward responsible management is to create a tree inventory. Knowing where trees are, and what species they are, allows for more effective planning and better management.

What is an urban tree inventory? Urban tree inventories are typically limited to those trees that are publically owned. Knowing the location, species, size and health condition of each is useful for community asset management, budgeting, quantifying the value of the urban forest and for planning tree replacement programs. Urban tree inventories are also useful for predicting the impact of new invasive pests. For example, in 2017, Emerald ash borer was detected in Winnipeg. Knowing where Winnipeg's ash trees are located provided insight into what parts of the city were most at risk, and where resources should be concentrated to effectively and efficiently combat the pest. Today, inventories use Geographic Information Systems, like ESRI ArcGIS or ArcGIS Online, to store, analyse and visualize the collected data. Applications like Survey123 are used with smartphones or tablets to collect and organize field data

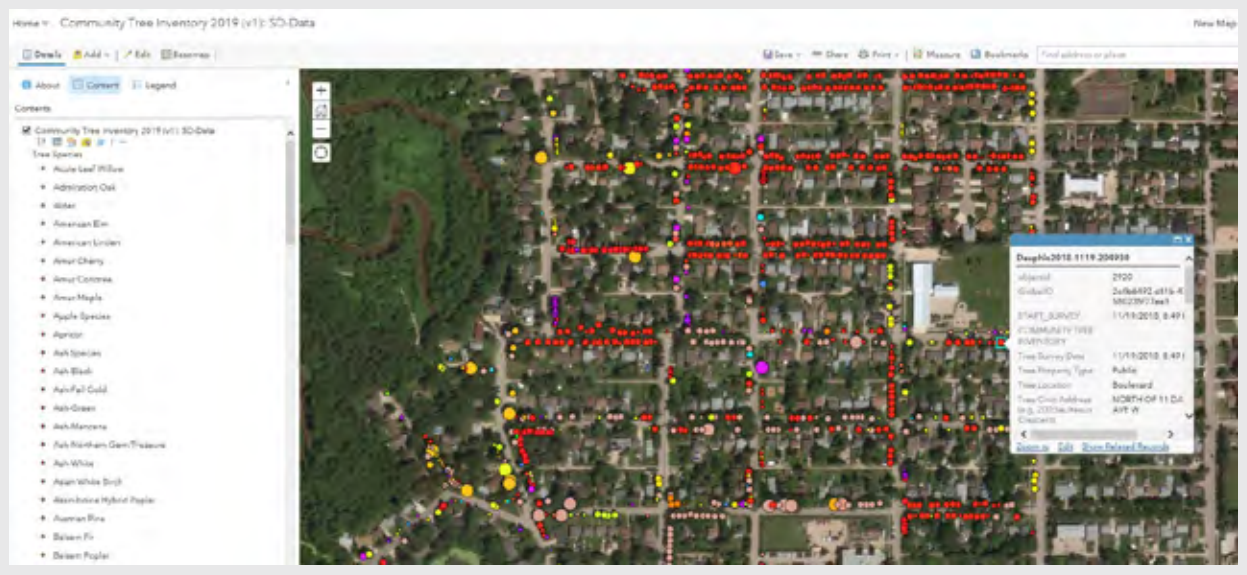


Figure 20 - Example of a GIS-based community tree inventory.

The Forestry and Peatlands Branch therefore designed a digital inventory system that communities throughout Manitoba can use to inventory their trees. The province maintains the database, and branch staff provide support and training to users so they can create and update records on their own. Inventory maps were created for a number of Manitoba communities and the branch continues to work with local governments and organizations to establish more tree inventories, increasing our knowledge about urban trees and forests in Manitoba.

Don't Move Firewood Campaign

Invasive species can be stopped. Moving firewood into or around Manitoba is one of the surest ways to spread forest pests. *Lymantria dispar dispar*, Emerald ash borer, mountain pine beetle and Dutch elm disease can all be spread by transporting firewood. **DON'T MOVE FIREWOOD!**

In 2017, knowing that Emerald ash borer was in neighbouring provinces and states, the Forestry and Peatlands Branch developed new educational and outreach tools that focused on the threat moving firewood poses. This included pamphlets, bags and stickers to remind travellers not to move firewood. New signs for communities, pop-up banners for trade shows like the Royal Manitoba Winter Fair and the Mid-Canada Boat Show, targeted ads in publications – all of which contained the **DON'T MOVE FIREWOOD** messaging.

Figure 21 - Sign informing Manitobans not to move firewood.

Awareness and knowledge are key. If you buy or cut wood, keep it local. You never know what's lurking in a piece of wood. It could be nothing, but it could also be an invasive forest pest. Help prevent their spread. Keep Manitoba's trees healthy. Keep our forests green.

DON'T MOVE FIREWOOD.

Figure 22 - Lymantria dispar dispar male moth.

Lymantria dispar dispar

Lymantria dispar dispar (LDD) is one of the most destructive forest pests in North America. The caterpillars consume the leaves of oak, poplar, elm, maple, birch – the list is a long one – and it will even eat conifer needles if it gets hungry enough. Fortunately, LDD is not yet established in Manitoba, and the goal is to keep it that way.

In 2017, a persistent population around Lee River, east of Lac Du Bonnet, was re-treated with the biological pesticide *Bacillus thuringiensis kurstak*i, or BTK. The area was first identified in 2014, when pheromone traps detected several male moths. After the area was treated with BTK in 2015, causing a large reduction in the population, a mass trapping program began in 2016, but traps and surveys showed LDD was still present. As a result, BTK was re-applied, and follow-up surveys in 2018 showed that the BTK treatment was effective. The LDD population around Lee River is now thought to be eliminated.

In 2020, ground surveys were conducted around Portage La Prairie after traps showed an increasing number of LDD moths for two consecutive years. During the search, egg masses and pupal casings were discovered, so an eradication program using BTK was planned for the spring of 2021. Follow-up surveys scheduled for 2022 will show whether these treatments were successful.

Provincial legislation under the Forest Health Protection Act allows for immediate action when new populations are discovered. If LDD becomes established in Manitoba, the Canadian Food Inspection Agency (CFIA) would regulate the affected areas under the Plant Protection Act. Trade of forestry products (Christmas trees and nursery stock) in both domestic and international markets would be restricted. Tourism to provincial parks and recreational outfitters could be affected. The province and municipalities could face significant costs to manage and control the insect, and considerable damage would be done to both urban and rural trees.

Figure 23 - Lymantria dispar dispar female moth.

What's in a name? For years, Lymantria dispar dispar *was commonly known as Gypsy Moth, a term seen as derogatory towards Romani people. That's now changed. In 2021, the Entomological Society of America (ESA) announced that it would no longer use the common name. And since then, other organizations have followed their lead. The ESA's Better Common Names Project will select a new common name for* Lymantria dispar dispar*, but until then it will be referred to as LDD.*

Figure 24 - Emerald ash borer adult. EAB adults are typically between 7.5 and 13.5 millimetres in length.

Emerald Ash Borer

Ash trees – whether green, black, or Manchurian – are cornerstone species in both riparian and urban forests throughout the central and southern parts of Manitoba. As such, the discovery of emerald ash borer in the US and Eastern Canada has meant planning and preparation for its eventual introduction here.

Emerald ash borer (EAB) larvae bore winding S-shaped tunnels under the bark of ash, cutting off the tree's water supply and eventually killing it. Worse, these infestations are hard to detect, so it may be years before the symptoms are recognized. By then, the insect will have emerged as an adult and already be on its way to the next ash tree. The Forestry and Peatlands Branch monitors for EAB using green sticky traps, and these are strategically set up in high-risk locations throughout the province.

On Nov. 30, 2017, emerald ash borer was confirmed to be present in Winnipeg. Subsequent surveys found that 14 trees were infected, and Winnipeg became the first city in Manitoba to be regulated under the federal Plant Protection Act. This means that all ash material - and any type of firewood, regardless of whether it's ash or not – cannot be moved outside of city limits.

Since then, the CFIA, the City of Winnipeg and the Manitoba government have been working to slow the spread of EAB by coordinating outreach, surveys and research opportunities to improve our understanding of EAB in Manitoba. To date, EAB has not been detected outside of Winnipeg. Help keep it that way! **DON'T MOVE FIREWOOD!**

Invasive Species Awareness Week Act

Bill 212, the Invasive Species Awareness Week Act, received royal assent in 2018, declaring the last week in April as Invasive Species Awareness Week. The act acknowledges that it is often humans who are responsible for introducing invasive species. Whether these species are on land or water, we all have a responsibility to help prevent their spread, and doing so will protect Manitoba's native species and its unique ecosystems. Awareness. Knowledge. Action. Each of us can do our part. **DON'T MOVE FIREWOOD!**

Figure 25 - Ash tree at the Legislative grounds in Winnipeg.

Native Forest Insects and Disease

Aerial Surveys

Each year, the Forestry and Peatlands Branch conducts a systematic aerial survey to get a broad understanding of what insects and diseases are affecting our Crown forests. As forest insect populations rise, they will spread throughout the landscape, defoliating and impacting tree health along the way. Monitoring and understanding these changes are important for swift and effective action.

These annual surveys use fixed-wing aircrafts flying at 27-kilometre intervals over commercially managed Crown forests. When potential damage is observed, intensive surveys are flown, allowing for greater detail and understanding of what's going on. Ground sampling may sometimes be necessary, especially if the cause is unknown.

Spruce Budworm

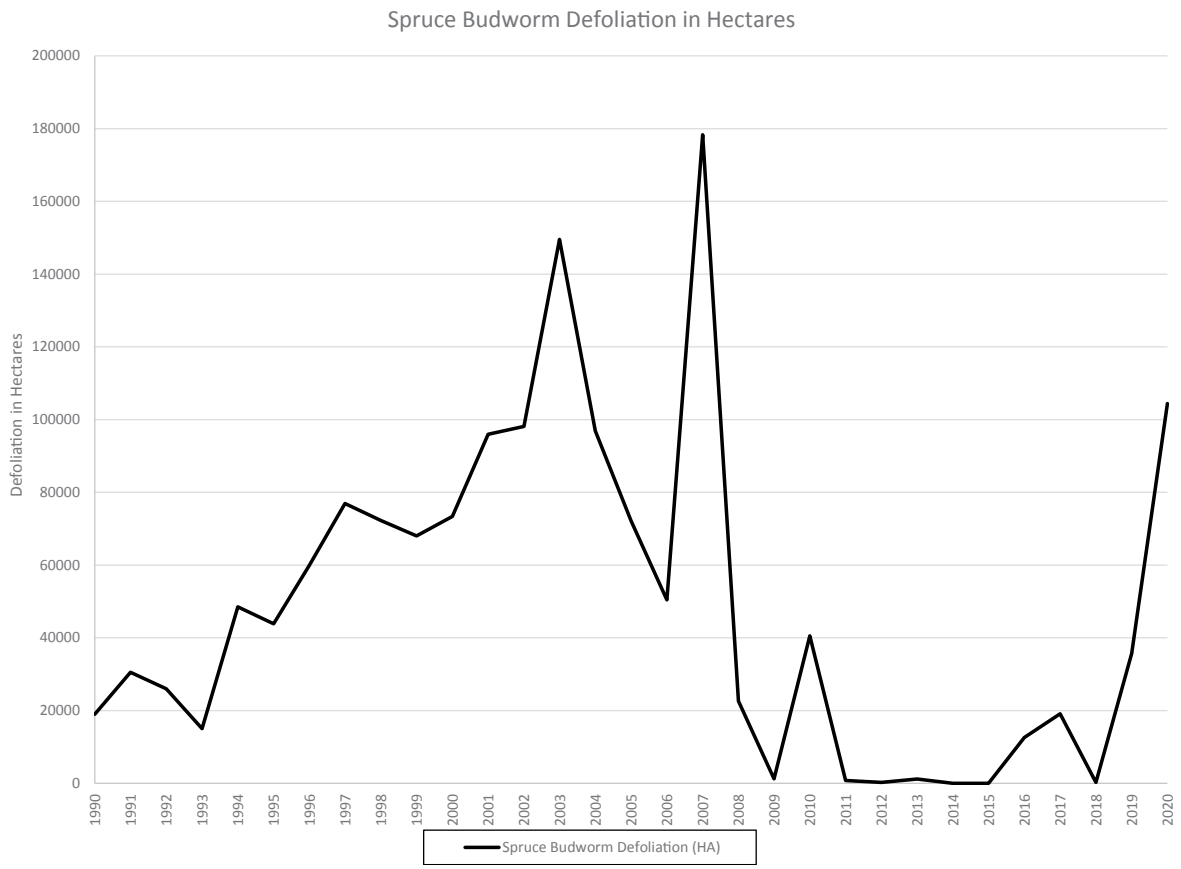
Spruce budworm is a significant defoliator of Manitoba's boreal forest. When populations are large, their caterpillars can defoliate millions of hectares of spruce and fir.

To monitor how populations rise and fall, ground sampling is necessary. In August and September, branch samples and pheromone traps are collected. These help assess not only the current levels of defoliation, but also help to predict next year's defoliation. From 2011 to 2019, spruce budworm populations in Manitoba dropped and remained low, and during this time, only a few small pockets were observed. However, since 2019, populations, and the resulting defoliation, have increased in the north and west regions of the province. No suppression programs were implemented during this reporting period.

TABLE 5: ANNUAL AREA (IN HECTARES) DEFOLIATED BY SPRUCE BUDWORM IN MANITOBA FROM 2016 TO 2020.

Year	Area defoliated in hectares
2016	12,597
2017	19,124
2018	253
2019	35,720
2020	104,433

Figure 26 - Annual recorded hectares defoliated by spruce budworm from 1990 to 2020.



Jack Pine Budworm

Like spruce budworm, jack pine budworm is common in our forests. However, sometimes it is too common. As a caterpillar, the insect feeds on the pollen cones and needles of pine trees, causing a red discolouration as the needles die. Too much of this feeding, and the trees will also die.

Many forest insects, and especially moths, go through cycles. For decades, they may remain hidden in the background, nibbling needles here and there to survive and causing little concern. But then, usually after about 17 years, populations begin to increase. The last time there was a jack pine budworm outbreak in Manitoba was in the 1980s. Since that time, these insects have remained relatively low key, until now. But every boom will have its bust and we can expect populations to eventually decline. What will cause this decline? Pollen and predators. Jack pine trees are able to sense the relentless attack of budworm, and they respond by limiting production of an important food source: pollen cones. Similarly, native predators – typically parasitic wasps and flies – dine on their newly abundant hosts. (In this case, it is particularly gruesome: parasitic wasps and flies will lay eggs on or in the budworm caterpillars, where they will burrow deep to develop, eventually eating them from the inside out. Nature can be cruel.) With less food and more predators, jack pine budworm populations collapse, and the cycle continues.

In 2015, a small pocket of damage was identified in the north Interlake. Since then, population levels have soared, and the damage has expanded each year (Table 6). In 2018, populations in the Interlake began to decrease. However, the current extent of impact is still very large because jack pine budworm have expanded into other areas of Manitoba. As Figure 27 shows, current hotspots are in the north and on the east side of Lake Winnipeg.

TABLE 6: ANNUAL AREA (IN HECTARES) DEFOLIATED BY JACK PINE BUDWORM IN MANITOBA FROM 2015 TO 2020.

Year	Area defoliated in hectares
2015	3,285
2016	199,799
2017	638,181
2018	552,118
2019	1,025,085
2020	2,580,546

TABLE 7: JACK PINE BUDWORM SALVAGE HARVEST VOLUMES (IN CUBIC METRES) IN MANITOBA, 2016 - 2021

Year	Volume Harvested (m^3)	Harvested from FMUs
2016-2017	52,156	45 and 46
2017-2018	287,157	45 and 46
2018-2019	290,939	45 and 46
2019-2020	403,793	45, 46 and 58
2020-2021	316,661	45, 46, 53 and 58
Total	1,350,706	

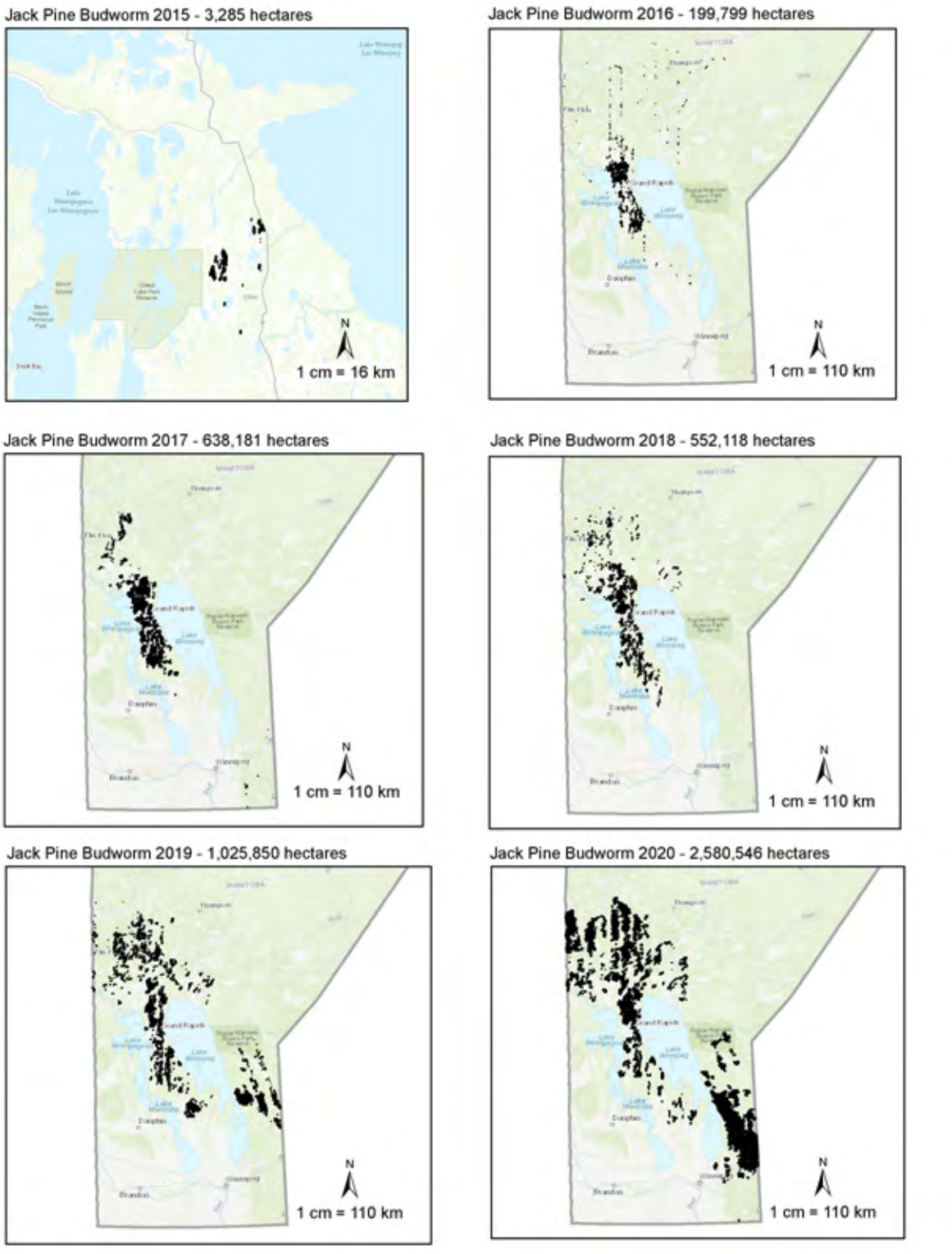


Figure 27 – Maps showing annual recorded hectares defoliated by jack pine budworm from 2015 to 2020.

ENVIROTHON

The Envirothon is a high school environmental education program delivered by the Manitoba Forestry Association (MFA).

The Envirothon allows students from across Manitoba to learn about current environmental issues. Students sample water to learn its quality, identify trees and wildlife, dig soil pits and learn to identify different kinds of scat. The students are taught a variety of skills on a variety of topics: forestry, agriculture, water stewardship and environmental issues. This approach to environmental education helps students develop problem-solving, critical thinking and public debate skills, and most importantly, it teaches them to work together.

Figure 28 - Students at Envirothon.

Each year, approximately 30 schools from all over Manitoba (representing 40 to 60 student teams) participate in the regional competition. Of those, the top 18 teams go on to the provincial competition.

The Forestry and Peatlands Branch serves as the lead coordinator for provincial funding, which provided $25,000 annually from 2016 to 2020.

Year	Location	Theme	Winner
2016	Wilderness Edge Retreat and Conference Centre	Invasive Species: A Challenge to the Environment, Economy and Society	Grant Park High School
2017	International Peace Gardens	Agricultural Soil and Water Conservation Stewardship	Westwood Collegiate
2018	Churchill	Climate Change in the North	Lord Selkirk Regional Comprehensive Secondary School
2019	Camp Assiniboia	Environmental Awareness	Westwood Collegiate
2020	Cancelled due to COVID-19 safety concerns		

Partnerships

Canadian Council of Forest Ministers

Canadian Kraft Paper Industries

Canadian Food Inspection Agency

Canadian Forest Service

City of Winnipeg

Economic Development Committee of the Shoal Lake Watershed Group

Envirothon

FP innovations

Frontiers Foundation Inc.

International Institute for Sustainable Development

LP Canada Ltd.

Manitoba Forestry Association

Manitoba Hydro

Manitoba Model Forest

Mathias Colomb Cree Nation

Métis Rights Coalition

Mountain Forest Section Renewal Company

National Forests Sinks Committee

National Research Council

Nelson House Resource Management Board

Nisokapawino Forest Management Corporation

Opaskwayak Cree Nation

Pimitotah Resource Advisory Board

Province of Ontario

Province of Saskatchewan

Saskatchewan Research Council

Scouts Canada

SERG-International

Spruce Products Ltd.

State of Minnesota

Tolko Ltd.

Trees Winnipeg

University College of the North

University of Manitoba

University of Winnipeg

Western Nursery Growers Group

Publications

Forest Management Guidelines for Terrestrial Buffers (2017)

Protection of Softwood Understorey (2017)

2020-2025 Timber Quota Policy (2019)

Field Guide – Trees of Manitoba (2019)

Boreal Wetlands Conservation Codes of Practice (2020)

Forest Renewal Assessment Manual (2020)

Manual of Scaling Instructions (2021)

Articles

Luo, Y., Nikiema, P., et al. 2019. Climatic change only stimulated growth for trees under weak competition in central boreal forests. Journal of Ecology. Volume 108, Issue 1: 36-46.

Smart Digital Strategies for Sustainable Forest Management. 2017. ArcNorth News. Volume 20, No. 2.

Stinson, G., Boyd, J., Viveiros, A., et al. A new approach for mapping forest management areas in Canada. 2019. The Forestry Chronicle. Volume 95, No. 2. A story map of the article is also available here.

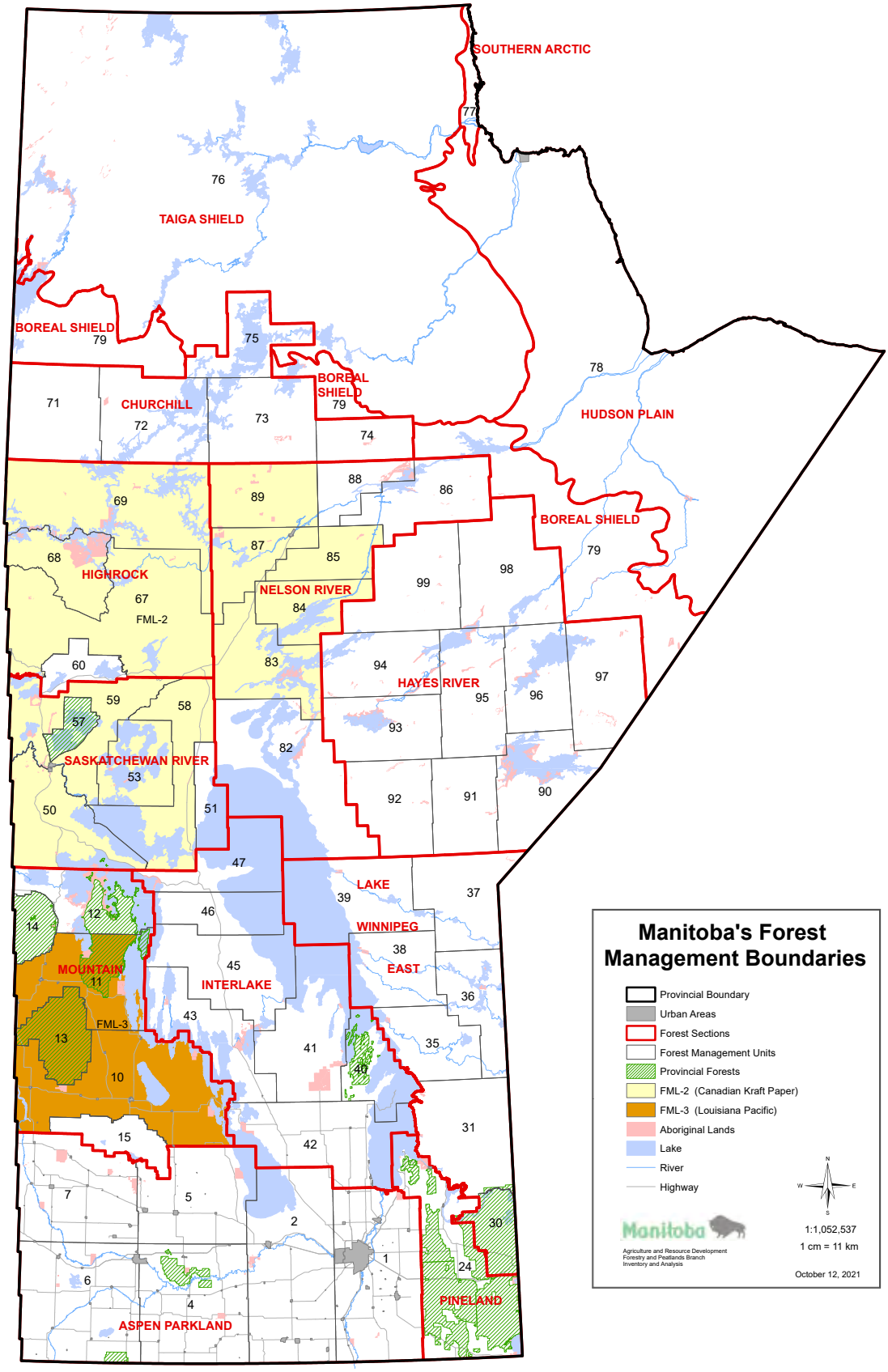
Veilleux, J., Ross, F., and Holliday, N. 2020. Bionomics of Scolytus schevyrewi (Coleoptera Curculionidae) in Saskatchewan and Manitoba, Canada. The Canadian Entomologist. 152, 183-199.

Appendices

For the purposes of this report, and to provide a link between past and future reporting, both standards (Forest Section-based reporting and Ecozone-based reporting) are shown. All tables incorporate available harvest, fire, blowdown, silvicultural and renewal data to accurately reflect current forest conditions.

Within Appendices 1, 2, and 7, 30 meter 2015 land cover data, sourced from the North American Land Change Monitoring System (NALCMS), was used to quantify land cover types and areas for the Boreal Shield, Taiga Shield, Hudson Plain and Southern Arctic forest sections (previously referred to as the white zone, where forest inventory data does not exist). The green zone refers to areas of Manitoba that have forest inventory data.

Appendices 3 and 4, although similar to appendices 1 and 2, separate mixed wood into softwood-leaning and hardwood-leaning mixed wood.


SOUTHERN ARCTIC
77
76
TAIGA SHIELD
BOREAL SHIELD
79
75
BOREAL SHIELD
79
78
71
CHURCHILL
72
73
74
HUDSON PLAIN
88
86
69
89
BOREAL SHIELD
87
85
79
68
HIGHROCK
67
FML-2
NELSON RIVER
84
99
98
60
83
94
HAYES RIVER
97
59
58
95
96
57
93
SASKATCHEWAN RIVER
82
53
92
91
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51
47
LAKE
39
37
12
46
14
WINNIPEG
38
MOUNTAIN
11
45
INTERLAKE
EAST
36
43
FML-3
41
35
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42
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PINELAND
ASPEN PARKLAND
Manitoba's Forest Management Boundaries
Provincial Boundary
Urban Areas
Forest Sections
Forest Management Units
Provincial Forests
FML-2 (Canadian Kraft Paper)
FML-3 (Louisiana Pacific)
Aboriginal Lands
Lake
River
Highway
N
W
E
S
Manitoba
Agriculture and Resource Development
Forestry and Peatlands Branch
Inventory and Analysis
1:1,052,537
1 cm = 11 km
October 12, 2021

Appendix 1: Area of Cover Types by Forest Sections for the Entire Province (km²)

Forest Section	Hardwood	Mixedwood	Softwood	Non Forest	Non Productive	Total Forest	Total Land	Water	Grand Total
Aspen Parkland	7,050.3	134.2	127.2	54,875.1	1,458.3	7,311.7	63,645.1	3,072.2	66,717.3
Boreal Shield	799.7	503.7	7,850.3	8,982.1	7,735.4	9,153.7	25,871.3	4,330.6	30,201.9
Churchill River	155.2	659.6	15,470.8	752.7	7,915.7	16,285.6	24,954.0	6,006.7	30,960.7
Hayes River	483.1	2,159.3	21,056.7	2,200.1	29,665.7	23,699.1	55,564.9	11,780.6	67,345.5
Highrock	828.3	3,522.7	13,789.7	4,861.7	8,413.9	18,140.7	31,416.3	5,302.8	36,719.1
Hudson Plain	1,028.2	686.1	18,591.9	36,089.6	9,262.8	20,306.2	65,658.6	4,954.7	70,613.3
Interlake	6,000.8	2,108.5	4,316.3	10,015.0	7,372.1	12,425.7	29,812.7	17,663.8	47,476.5
Lake Winnipeg East	1,223.1	3,302.6	14,959.6	3,059.0	11,239.3	19,485.4	33,783.6	7,597.4	41,381.1
Mountain	8,939.4	2,353.3	4,859.1	13,138.6	1,205.3	16,151.9	30,495.7	6,330.0	36,825.8
Nelson River	757.8	3,046.6	15,215.9	3,484.6	16,304.0	19,020.3	38,808.9	10,176.3	48,985.3
Pineland	1,831.3	855.6	3,172.3	2,623.9	2,803.9	5,859.1	11,286.9	1,144.5	12,431.4
Saskatchewan River	637.5	1,813.2	7,228.5	4,225.1	9,086.4	9,679.1	22,990.7	8,958.4	31,949.1
Southern Arctic	55.0	2.3	270.1	337.0	459.2	327.4	1,123.6	330.9	1,454.6
Taiga Shield	936.1	79.1	25,245.6	43,530.6	34,785.1	26,260.8	104,576.4	22,415.4	126,991.8
Grand Total	**30,725.9**	**21,226.7**	**152,154.1**	**188,175.2**	**147,707.1**	**204,106.6**	**539,989.0**	**110,064.4**	**650,053.4**

Appendix 2: Area of Cover Types by Ecozone for the Entire Province (km²)

ECOZONE	Hardwood	Mixedwood	Softwood	Non Forest	Non Productive	Total Forest	Total Land	Water	Grand Total
Boreal Plain	15,137.1	6,451.4	16,952.7	26,541.9	19,357.0	38,541.2	84,440.1	40,444.3	124,884.5
Boreal Shield	5,934.6	13,909.6	90,261.0	25,518.9	80,759.8	110,105.1	216,383.9	36,507.2	252,891.1
Hudson Plain	1,028.2	686.1	18,591.9	36,089.6	9,262.8	20,306.2	65,658.6	4,954.7	70,613.3
Prairie	7,631.0	86.2	88.2	56,052.8	1,437.8	7,805.4	65,296.0	4,204.0	69,499.9
Southern Arctic	55.0	2.3	270.1	337.0	459.2	327.4	1,123.6	330.9	1,454.6
Taiga Shield	940.0	91.1	25,990.2	43,634.9	36,430.6	27,021.3	107,086.8	23,623.2	130,710.0
Grand Total	**30,725.9**	**21,226.7**	**152,154.1**	**188,175.1**	**147,707.1**	**204,106.7**	**539,989.0**	**110,064.3**	**650,053.4**

Appendix 3: Area of Cover Types by Forest Section for the "Green Zone" (km^2)

FOREST SECTION	Hardwood	Mixed Hardwood	Softwood	Mixed Softwood	Non Forest	Non Productive	Total Forest	Total Land	Water	Grand Total
ASPEN PARKLAND	7,050.3	106.7	127.2	27.5	54,875.1	1,458.3	7,311.7	63,645.1	3,072.2	66,717.3
CHURCHILL RIVER	155.2	268.0	15,470.8	391.6	752.7	7,915.7	16,285.6	24,954.0	6,006.7	30,960.7
HAYES RIVER	483.1	815.5	21,056.7	1,343.8	2,200.1	29,665.7	23,699.1	55,564.9	11,780.6	67,345.5
HIGHROCK	828.3	1,294.3	13,789.7	2,228.3	4,861.7	8,413.9	18,140.7	31,416.3	5,302.8	36,719.1
INTERLAKE	6,000.8	1,292.1	4,316.3	816.4	10,015.0	7,372.1	12,425.7	29,812.7	17,663.8	47,476.5
LAKE WINNIPEG EAST	1,223.1	1,405.7	14,959.6	1,896.9	3,059.0	11,239.3	19,485.4	33,783.6	7,597.4	41,381.1
MOUNTAIN	8,939.4	1,278.9	4,859.1	1,074.5	13,138.6	1,205.3	16,151.9	30,495.7	6,330.0	36,825.8
NELSON RIVER	757.8	1,066.1	15,215.9	1,980.5	3,484.6	16,304.0	19,020.3	38,808.9	10,176.3	48,985.3
PINELAND	1,831.3	484.2	3,172.3	371.4	2,623.9	2,803.9	5,859.1	11,286.9	1,144.5	12,431.4
SASKATCHEWAN RIVER	637.5	751.2	7,228.5	1,061.9	4,225.1	9,086.4	9,679.1	22,990.7	8,958.4	31,949.1
Grand Total	**27,906.9**	**8,762.6**	**100,196.1**	**11,192.8**	**99,235.8**	**95,464.7**	**148,058.5**	**342,759.0**	**78,032.8**	**420,791.8**

Appendix 4: Area of Cover Types by Ecozone for the "Green Zone" (km^2)

ECOZONE	Hardwood	Mixed Hardwood	Softwood	Mixed Softwood	Non Forest	Non Productive	Total Forest	Total Land	Water	Grand Total
Boreal Plain	15,137.1	3,422.0	16,952.7	3,029.4	26,541.9	19,357.0	38,541.2	84,440.1	40,444.3	124,884.5
Boreal Shield	5,134.9	5,270.0	82,410.6	8,135.8	16,536.8	73,024.4	100,951.4	190,512.6	32,176.7	222,689.2
Prairie	7,631.0	66.1	88.2	20.1	56,052.8	1,437.8	7,805.4	65,296.0	4,204.0	69,499.9
Taiga Shield	4.0	4.4	744.5	7.6	104.3	1,645.5	760.5	2,510.3	1,207.8	3,718.2
Grand Total	**27,906.9**	**8,762.6**	**100,196.1**	**11,192.8**	**99,235.8**	**95,464.7**	**148,058.5**	**342,759.0**	**78,032.8**	**420,791.8**

Appendix 5: Age Class Distribution by Forest Section for the Forested "Green Zone" (km^2)

Forest Section	0-20	21-40	41-60	61-80	81-100	101-120	121-140	141+	Grand Total
Aspen Parkland	99.8	79.0	1,494.9	3,197.4	428.7	1,987.6	24.3		7,311.7
Churchill River	2,918.8	6,386.2	1,644.1	2,829.4	1,491.9	735.7	97.6	181.9	16,285.6
Hayes River	2,343.6	5,683.8	4,476.2	3,994.0	3,695.7	821.5	1,510.3	1,174.0	23,699.1
Highrock	1,097.0	5,195.9	3,302.3	1,645.8	3,654.9	1,309.1	1,339.4	596.2	18,140.7
Interlake	412.3	2,865.3	2,518.0	2,830.7	1,997.5	1,478.0	213.9	110.1	12,425.7
Lake Winnipeg East	2,572.8	4,810.7	2,614.8	2,022.2	4,437.7	1,871.4	937.3	218.4	19,485.4
Mountain	943.9	1,403.5	3,047.6	2,804.3	2,029.8	3,398.5	1,564.1	960.1	16,151.9
Nelson River	1,033.7	3,087.8	2,562.7	2,705.4	4,938.1	2,618.1	1,884.1	190.3	19,020.3
Pineland	677.4	625.8	726.9	1,205.3	1,082.6	843.7	602.5	95.1	5,859.1
Saskatchewan River	1,045.3	1,527.8	1,401.9	1,287.6	1,488.6	1,111.2	626.2	1,190.5	9,679.1
Grand Total	**13,144.7**	**31,666.0**	**23,789.4**	**24,522.1**	**25,245.4**	**16,174.9**	**8,799.6**	**4,716.5**	**148,058.5**

Appendix 6: Age Class Distribution by Ecozone for the Forested "Green Zone" (km^2)

ECOZONE	0-20	21-40	41-60	61-80	81-100	101-120	121-140	141+	Grand Total
Boreal Plain	2,449.3	5,782.9	6,867.1	6,781.8	5,745.7	5,988.9	2,595.8	2,329.6	38,541.2
Boreal Shield	10,569.3	25,350.9	15,105.5	14,120.0	19,157.4	8,106.7	6,190.2	2,351.3	100,951.4
Prairie	69.4	187.1	1,720.6	3,430.6	342.3	2,040.5	13.6	1.3	7,805.4
Taiga Shield	56.6	345.0	96.2	189.7		38.7		34.4	760.5
Grand Total	**13,144.7**	**31,666.0**	**23,789.4**	**24,522.1**	**25,245.4**	**16,174.9**	**8,799.6**	**4,716.5**	**148,058.5**

Appendix 7: Age Class Distribution by Forest Section/Ecozone for the Forested "White Zone" (km^2)

Forest Section	0-20	21-40	41-60	61-70	71+	Grand Total
Boreal Shield	559.8	1,112.0	165.0	93.6	7,223.3	9,153.7
Hudson Plain	494.9	709.3	18.4	31.4	19,052.3	20,306.2
Southern Arctic					327.4	327.4
Taiga Shield	883.0	2,154.7	211.4		23,011.6	26,260.8
Grand Total	**1,937.7**	**3,976.0**	**394.8**	**125.0**	**49,614.6**	**56,048.1**

Appendix 8: Cover Type and Age Class Distribution for the "Green Zone" (km^2)

Cover Type	Water, NonProd. & NonFor.	0-20	21-40	41-60	61-80	81-100	101-120	121-140	141+	Grand Total
Hardwood		1,270.0	3,763.6	5,847.6	8,245.0	3,373.8	5,009.4	380.6	16.9	27,906.9
Mixedwood		1,424.2	5,075.7	3,285.8	2,677.2	3,925.8	2,439.6	1,026.5	100.6	19,955.5
Softwood		10,450.4	22,826.6	14,656.0	13,599.9	17,945.8	8,725.8	7,392.4	4,599.0	100,196.1
Non Forest	99,235.8									99,235.8
Non Productive	95,464.7									95,464.7
Water	78,032.8									78,032.8
Grand Total	**272,733.3**	**13,144.7**	**31,666.0**	**23,789.4**	**24,522.1**	**25,245.4**	**16,174.9**	**8,799.6**	**4,716.5**	**420,791.8**

Appendix 9: Cover Type and Age Class Distribution for the "White Zone" (km^2)

Cover Type	Water, NonProd. & NonFor.	0-20	21-40	41-60	61-70	71+	Grand Total
Hardwood		124.1	812.4	14.2	9.8	1,858.4	2,818.9
Mixedwood		51.6	112.0	8.9	23.5	1,075.3	1,271.2
Softwood		1,762.1	3,051.7	371.7	91.7	46,680.8	51,958.0
Non Forest	88,939.4						88,939.4
Non Productive	52,242.5						52,242.5
Water	32,031.6						32,031.6
Grand Total	**173,213.5**	**1,937.7**	**3,976.0**	**394.8**	**125.0**	**49,614.6**	**229,261.6**

Appendix 10: Softwood and Hardwood Harvest Volumes by Year and Forest Section (in cubic metres)

	2016-2017			
FOREST SECTION	Hardwood	Softwood	Unspecified Species	Total (m^3)
ASPEN PARKLAND	531	999	110	1,640
CHURCHILL RIVER	33	525	-	558
HAYES RIVER	-	-	-	-
HIGHROCK	472	63,632	115	64,218
INTERLAKE	1,535	70,675	345	72,555
LAKE WINNIPEG EAST	57	401	95	553
MOUNTAIN	305,675	256,527	1,515	563,717
NELSON RIVER	387	38,622	122	39,130
OUTSIDE	-	-	-	-
PINELAND	68,044	195,160	2,499	265,703
SASKATCHEWAN RIVER	17,362	169,288	1,098	187,747
UNSPECIFIED FMU	-	-	-	-
Grand Total	**394,094**	**795,830**	**5,898**	**1,195,821**

	2017-2018			
FOREST SECTION	Hardwood	Softwood	Unspecified Species	Total (m^3)
ASPEN PARKLAND	2,395	2,276	178	4,848
CHURCHILL RIVER	13	398	25	435
HAYES RIVER	-	-	-	-
HIGHROCK	177	913	45	1,135
INTERLAKE	3,037	298,493	440	301,970
LAKE WINNIPEG EAST	159	760	70	988
MOUNTAIN	321,266	331,638	577	653,481
NELSON RIVER	294	1,905	115	2,313
OUTSIDE	-	-	-	-
PINELAND	61,061	183,163	12,881	257,105
SASKATCHEWAN RIVER	16,782	109,192	340	126,313
UNSPECIFIED FMU	-	-	-	-
Grand Total	**405,182**	**928,736**	**14,670**	**1,348,589**

	2018-2019			
FOREST SECTION	Hardwood	Softwood	Unspecified Species	Total (m^3)
ASPEN PARKLAND	485	2,239	208	2,931
CHURCHILL RIVER	8	435	-	443
HAYES RIVER	-	10	-	10
HIGHROCK	140	1,839	3	1,982
INTERLAKE	2,826	316,159	1,090	320,075
LAKE WINNIPEG EAST	540	724	363	1,628
MOUNTAIN	377,569	304,226	479	682,274
NELSON RIVER	210	2,365	1,580	4,155
OUTSIDE	-	-	-	-
PINELAND	64,983	135,575	5,637	206,196
SASKATCHEWAN RIVER	17,360	88,444	433	106,236
UNSPECIFIED FMU	15	30	30	75
Grand Total	**464,137**	**852,046**	**9,822**	**1,326,005**

	2019-2020			
FOREST SECTION	Hardwood	Softwood	Unspecified Species	Total (m^3)
ASPEN PARKLAND	417	3,041	372	3,830
CHURCHILL RIVER	-	393	40	433
HAYES RIVER	-	310	-	310
HIGHROCK	248	1,772	163	2,183
INTERLAKE	1,237	425,749	890	427,876
LAKE WINNIPEG EAST	194	445	540	639
MOUNTAIN	286,516	309,456	4,482	600,453
NELSON RIVER	76	1,829	613	2,518
OUTSIDE	-	-	-	-
PINELAND	115,434	100,748	19,506	235,688
SASKATCHEWAN RIVER	20,364	64,228	1,100	85,692
UNSPECIFIED FM	-	-	-	-
Grand Total	**424,486**	**907,970**	**27,706**	**1,359,622**

Appendix 10: Cont'd

	2020-2021				TOTAL			
FOREST SECTION	Hardwood	Softwood	Unspecified Species	Total (m^3)	Hardwood	Softwood	Unspecified Species	Total (m^3)
ASPEN PARKLAND	113	3,548	626	4,286	3,940	12,102	1,493	17,535
CHURCHILL RIVER	-	260	147	407	53	2,011	212	2,275
HAYES RIVER	-	-	-	-	-	320	-	320
HIGHROCK	206	272	2,229	2,707	1,242	68,427	2,555	72,224
INTERLAKE	2,210	326,270	1,346	330,055	10,845	1,437,347	4,111	1,452,302
LAKE WINNIPEG EAST	64	93	673	829	1,014	2,422	1,741	5,177
MOUNTAIN	358,436	271,037	794	630,267	1,649,463	1,472,883	7,846	3,130,192
NELSON RIVER	104	930	215	1,249	1,070	45,651	2,645	49,365
OUTSIDE	-	-	-	-	-	-	-	-
PINELAND	94,821	90,423	5,862	191,106	404,343	705,069	46,386	1,155,798
SASKATCHEWAN RIVER	12,670	70,937	629	84,236	84,537	502,090	3,599	590,226
UNSPECIFIED FMU	2,858	4,301	135	7,295	2,873	4,331	165	7,370
Grand Total	**471,481**	**768,071**	**12,655**	**1,252,436**	**2,159,380**	**4,252,653**	**70,751**	**6,482,783**

Notes: Appendix 10 data includes volumes reported by electronic data transfer, timber return, quota, and commercial and personal-use timber permits (e-licensing and paper permits). Jack pine budworm salvage harvesting in the Interlake Forest Section, and snow damage and *Ips pini* related salvage harvesting in Pineland Forest Section, contributed to increased harvest volumes. In the Aspen Parkland Forest Section, harvesting of Scots pine plantations contributed to increased softwood harvest volumes.

Appendix 11: Annual fire statistics, 2016-2020

YEAR	Number of fires					Area burned (hectares)				
	HUMAN	%	LIGHTNING	%	TOTAL	HUMAN	%	LIGHTNING	%	TOTAL
2016	106	52%	96	48%	202	6,701	17%	31,707	83%	38,408
2017	136	24%	423	76%	559	1,366	1%	223,785	99%	225,151
2018	232	49%	245	51%	477	78,901	34%	155,322	66%	234,223
2019	145	52%	133	48%	278	7,936	11%	63,351	89%	71,287
2020	80	53%	71	47%	151	34,268	71%	14,306	29%	48,574
TOTAL	**699**		**968**		**1,667**	**129,172**		**488,471**		**617,643**
5 Yr Avg.	140	42%	194	58%	333	25,834	21%	97,694	79%	123,529
Historical Avg. (1918-2020)	273	65%	149	35%	421	51,089	25%	157,393	78%	201,558

For more information on historic wildfire statistics, visit:
https://www.manitoba.ca/conservation_fire/Fire-Historical/firestatistic.html

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