Improving the Success of Hardwood Seedling Production and Establishment

Forestry Commission

Second Interim Report

September 2023

September 6, 2023

Honourable Steven Myers
Minister of Environment, Energy and Climate Action

Minister:

The Forestry Commission is pleased to submit this, its second interim report, on hardwood seedling production and establishment. In discussions with woodlot owners and staff of the Forests, Fish and Wildlife Division during four field trips, the Commission determined that the shortage of hardwood seedlings needed to help establish a more climate-resilient Wabanaki-Acadian Forest required further analysis.

As with our first interim report on the sustainability of biomass harvesting, the Commission wishes to share this information with government and the public, and to seek input on preliminary recommendations.

We look forward to your response.

Jean-Paul Arsenault
Chair of the Forestry Commission

Cover page photo

On May 25, members of the Forestry Commission visited a site owned by the Glenaladale Heritage Trust. The plantation covers 1.1 hectare, and followed a series of block cuts carried out in 2008-2009. The stand prior to harvest was of very low quality: 75% dead and dying balsam fir, with scattered red spruce, white pine, red maple, sugar maple, and white birch. Most of the white pine and hardwoods were retained, and most of the fir was removed. The fir was chipped for biomass fuel, and the red spruce produced high quality sawlogs.

In the fall of 2009, the site was planted in red oak: 585 trees at a 3-meter spacing. In 2016, a manual maintenance was carried out to remove most of the pin cherry, poplar, and grey birch competition. The red oak is thriving, with an approximate survival rate of 75-80%. This example illustrates how hardwood seedlings, combined with appropriate silviculture techniques can transform a poor stand into a healthy, more resilient forest.

IMPROVING THE SUCCESS OF HARDWOOD SEEDLING PRODUCTION AND ESTABLISHMENT

Second Interim Report by the Forestry Commission

Introduction

The Forestry Commission was appointed by the Minister of Environment, Energy and Climate Action to assist in developing a forest recovery plan and a new Forest Policy for the province. The Commission began its work in February 2023 and has held several meetings and field trips as part of a process of learning about our private and public forests, the forest industry, and government's role in encouraging best practices.

In its discussions with woodlot owners and staff of the Forests, Fish and Wildlife Division (FFWD) during four field trips, the Commission determined that the shortage of hardwood seedlings needed to help establish a more climate-resilient Wabanaki-Acadian Forest required further analysis. The Commission wishes to share this information with government and the public, and to seek input on preliminary recommendations.

The Commission recognizes that hardwood seedling production is only part of what it will take to build healthier, more resilient forests. Silvicultural techniques that favour the establishment of late-successional hardwoods in natural stands are just as important, and the Commission will have more to say about this when it reviews the Forest Enhancement Program.

Background

The Forestry Branch of the Department of Industry and Natural Resources was established in January 1951. Prior to that date, seedlings for reforestation on private land were grown at the Bunbury Nursery, then owned and operated by the Cotton Trust. Information on seedling production for the period 1950-1983 is from an internal departmental report prepared in 1985 and, for the period 1984-2022, data were provided to the Commission by FFWD.

The J. Frank Gaudet Tree Nursery, located on Upton Rd., began operations in the mid-1970s. The Nursery supplies hardwood and softwood seedlings in support of afforestation and reforestation efforts on public and private land. Seedlings are provided to individual landowners for hedgerow establishment, and to community groups and watershed associations under the Greening Spaces Program. Some are also sold to retail nurseries, wholesale nurseries, Christmas tree growers, landscape companies, and groups such as Island Nature Trust, Nature Conservancy of Canada, Parks Canada, and other provincial government departments. In 2013, the Nursery began producing a variety of native shrubs, including herbaceous plants such as

marram grass and swamp milkweed. In 2022, the Nursery produced fourteen softwood species, eleven hardwood species, and fifteen species of shrubs and herbaceous plants.

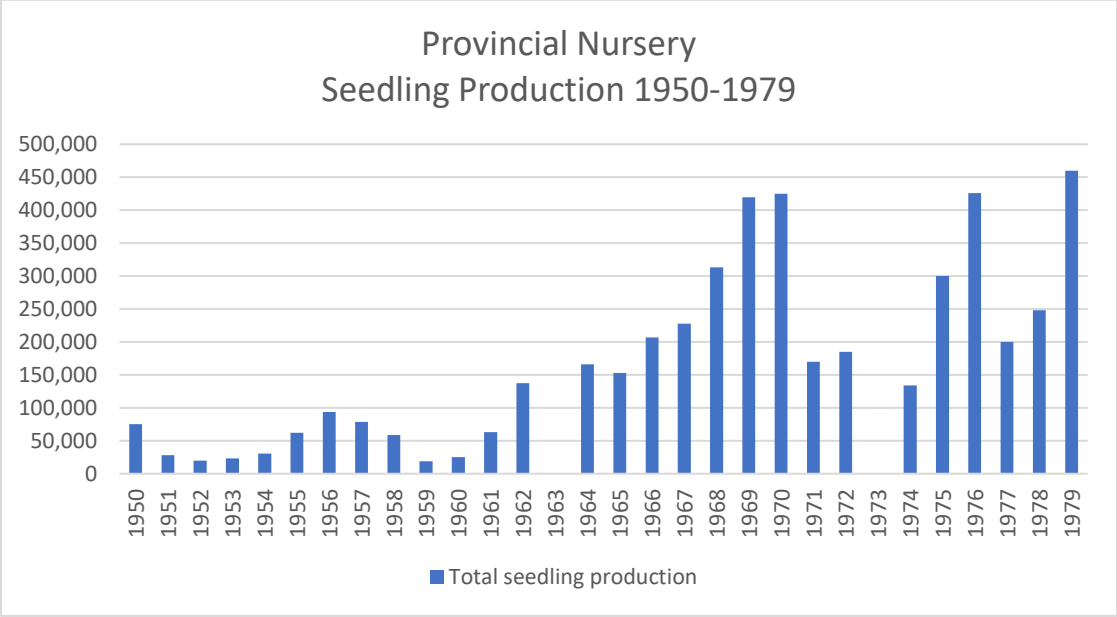
In June 2023, the province announced that it would participate in the national 2 Billion Tree (2BT) Program by increasing seedling production at the Nursery by 30% from 1,000,000 to 1,300,000. The goal of the 2BT Program is to create new permanent forest cover on currently unforested lands, in low-forest-cover watersheds and riparian zones, and in urban areas across the province. The first crop for the 2BT Program will be seeded in the spring of 2024 for out-planting in 2025, and the species mix for the additional 300,000 seedlings will consist of white spruce, white pine, eastern hemlock, white birch, yellow birch, and red maple. According to FFWD, the percentage of each species grown will depend on planting site requirements. The 2BT Program will run until 2031 and will have four different streams, with support available for agricultural operations, watershed groups, landowners, and municipalities. It is not clear at this time what impact the end of 2BT Program funding will have on longer term Nursery operations.

Aerial view of the J. Frank Gaudet Tree Nursery, Upton Rd., Charlottetown

Review and Analysis of Historical Records of Seedling Production

The provincial government began growing and planting seedlings from the time the Forestry Division was established in the early 1950s. Records show that seedlings were planted on private and public land, and that the species produced included white pine, red pine, jack pine, Scots pine, Austrian pine, lodgepole pine, cedar, balsam fir, Douglas fir, white spruce, red spruce, black spruce, Norway spruce, eastern larch, Eurpean larch, and a variety of hardwoods

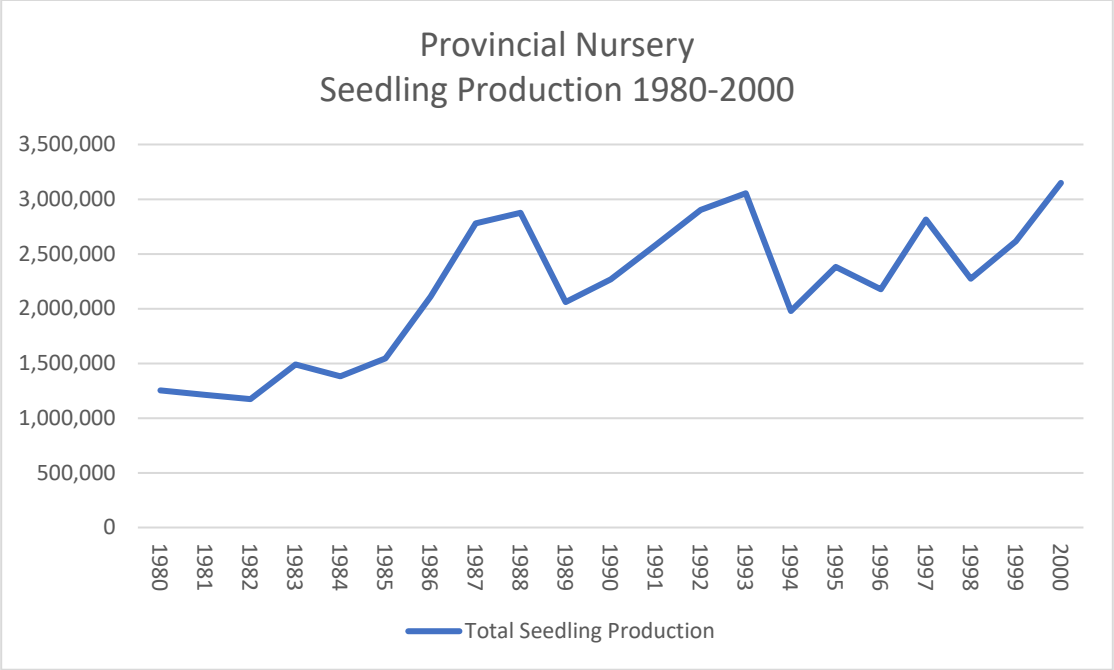
and ornamentals. The graph below shows that annual production was less than 150,000 until 1964, after which it grew gradually to 460,000 in 1979. No records are available for 1963 and 1973.



Beginning in the late 1970s, seedling production moved from Beach Grove to the Upton Rd. Nursery. Infrastructure development was funded under the Canada – Prince Edward Island Comprehensive Development Plan (CDP), a fifteen-year agreement signed in 1969. In 1965, the government of then-Premier Walter Shaw had commissioned a series of studies on the state of the province's economy, one of which outlined the potential for developing woodlots and the forest industry. Cost-shared funding in the last phase of the CDP was used to augment Nursery infrastructure and operations, resulting in production surpassing the one million mark in 1980.

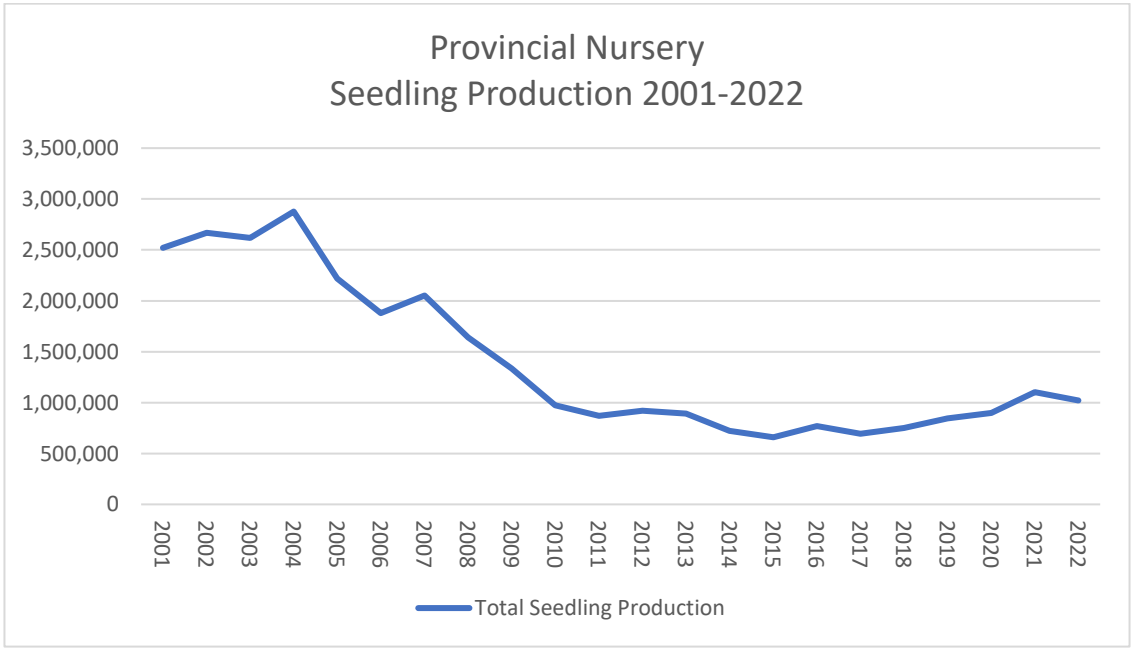
In 1983, the provincial and federal governments signed a five-year Forest Resource Development Agreement (FRDA), part of a national effort by the federal government to improve the state of the forest resource. The FRDA provided 80% federal funding for several programs, most notably seedling production and the province's first incentive program for private woodlot owners. Seedling production increased steadily during the period, consisting almost exclusively of softwood species, the most common being white spruce, black spruce, red pine, and eastern larch. Hardwood production was limited to hybrid poplar, used mostly for hedgerow establishment.

A second five-year FRDA was signed in 1988, again providing generous levels of federal funding (59%) for seedling production and reforestation on private and public lands. Nursery production peaked in 1993, but declined from three million to two million when the federal government's financial contribution came to an end. During the period from 1993 to 2000, hardwood seedling production ranged from 15,000 to 44,000, primarily yellow birch, white birch, red oak, sugar maple, red maple, and white ash.

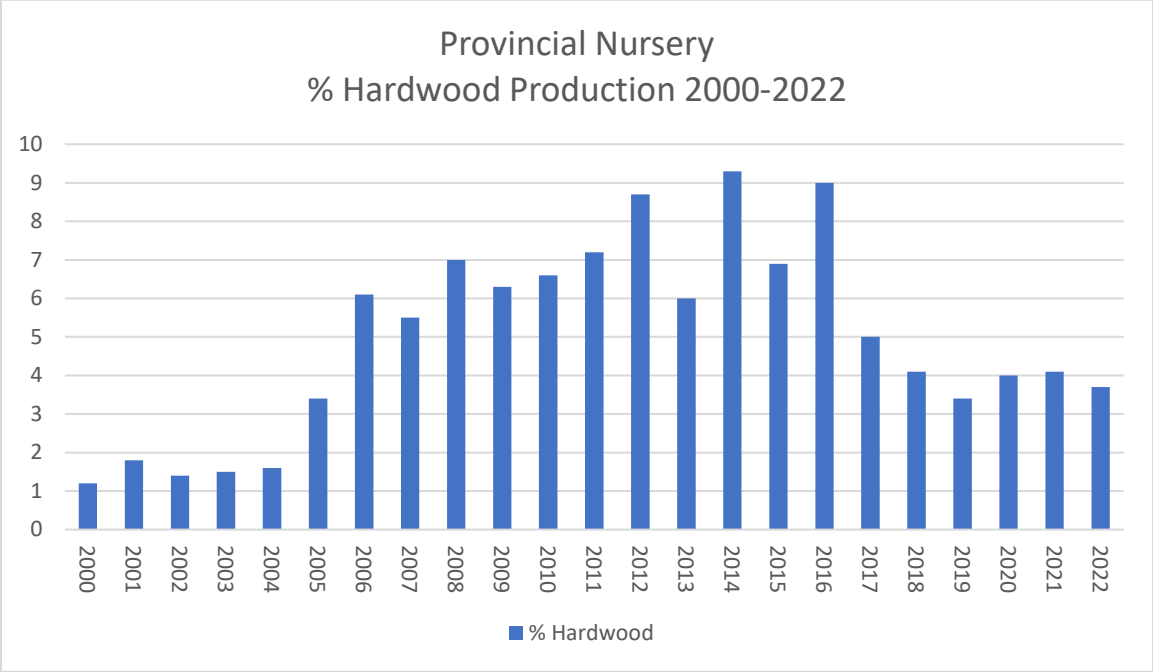


FRDA funding ended in 1993. Since then, the provincial government has covered all costs associated with seedling production, including seed orchard management, seed collection and processing, and Nursery operations. However, federal cost-shared funding was provided for the expansion needed to increase Nursery capacity for the 2BT Program.

The graph below shows a steady decline in total seedling production during the period from 2004 to 2017. Beginning in 2018, shipments increased steadily and topped the one million mark in 2022.



As shown in the graph below, hardwood seedling production has ranged from just over 1% in 2000 to a peak of just over 9% in 2014. The data show a sharp decline in hardwood percentage after 2016, with a levelling off since then at approximately 4% of total seedling production.



It is important to note that, while the J. Frank Gaudet Nursery ships most of its seedlings for planting on public forest land and on private woodlots enrolled in the Forest Enhancement Program (FEP), some are distributed under the Greening Spaces Program to communities, schools, and watershed groups to:

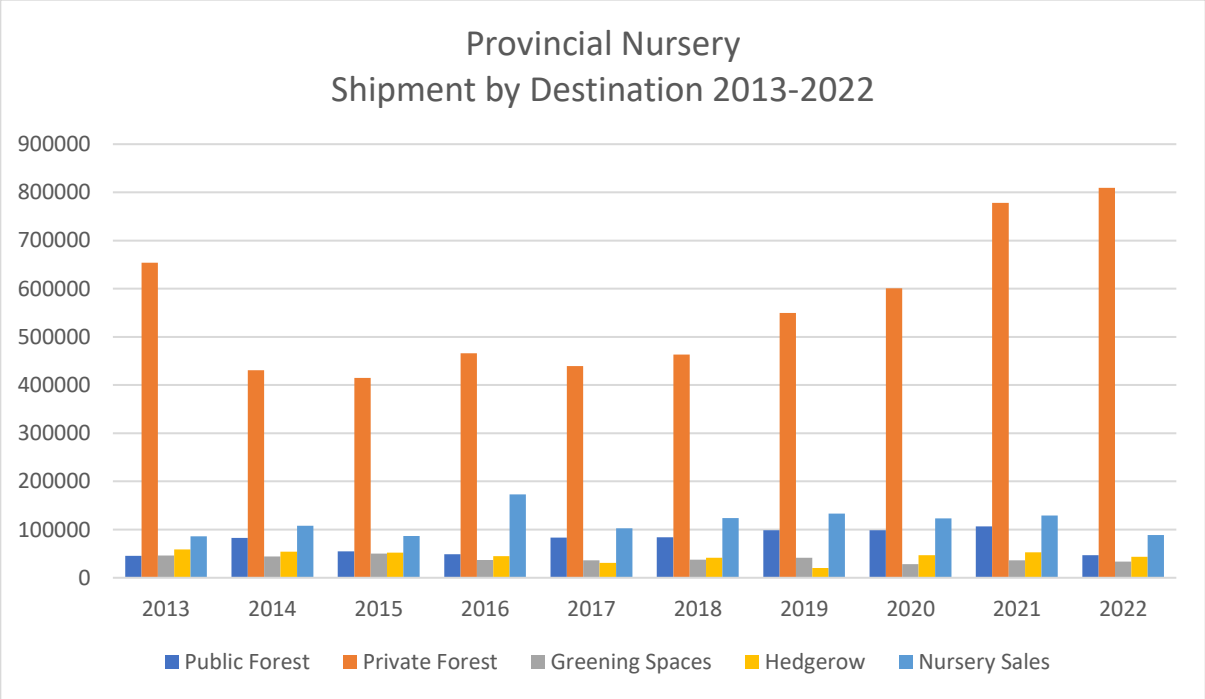
- Diversify public properties
- Buffer prevailing winds
- Provide shade
- Reduce noise
- Protect lands along streams and rivers
- Return abandoned farmland to forest cover
- Control soil erosion
- Provide wildlife habitats
- Create outdoor learning areas, such as arboreta or tree and shrub nurseries.

The province's watershed groups plant native hardwood trees and shrubs to enhance various riparian zone functions: biodiversity; wildlife corridors; control of sediment from runoff; filtration and absorption of excess nutrients; stream bank stability; and shade to keep water temperatures low. Forested riparian zones provide refugia for populations of threatened species like Atlantic salmon, whose populations are down globally. The installation and maintenance of

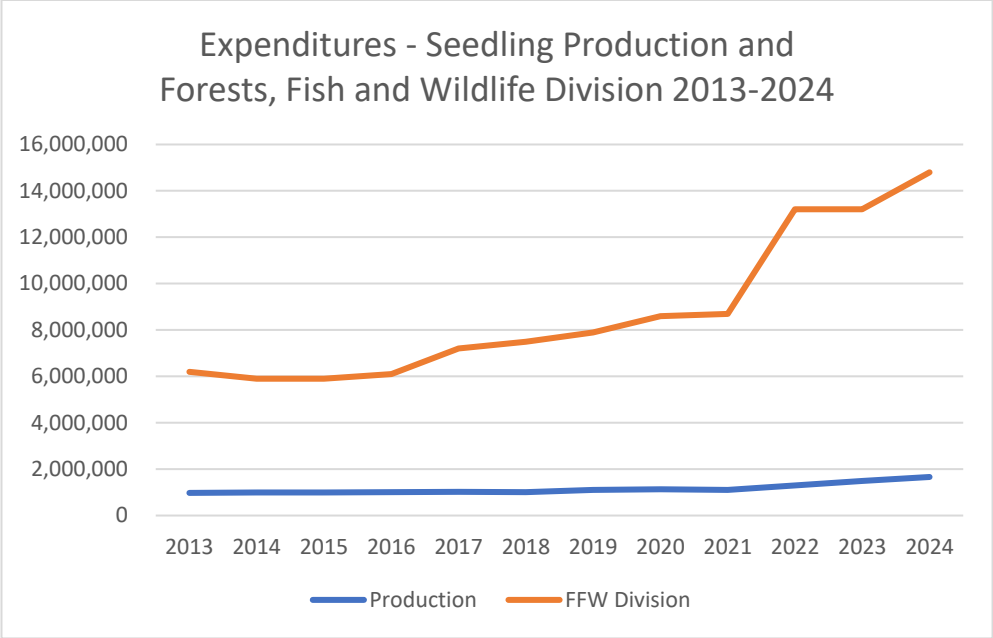
natural, native riparian zones protects water quality, mitigates erosion events and associated fish kills, and promotes and preserves the overall health of in-stream aquatic organisms.

In 2021 and 2022, approximately one-half of hardwoods shipped went to the Greening Spaces Program, and the other half to public forest land and woodlots managed under the FEP.

On the graph below, "Nursery Sales" refers to sales to retail nurseries, wholesale nurseries, Christmas tree growers, landscape companies, groups such as Island Nature Trust, Nature Conservancy of Canada, Parks Canada, and other provincial government departments. Seedlings are offered for sale only after the four core programs have received their allocations. Over the ten-year period shown in the graph below, nursery sales of hardwoods have averaged approximately 7% of total sales, ranging from a low of 2,322 seedlings in 2019 to a high of 39,448 in 2016.



A review of the province's Public Accounts from 2012-2013 to 2021-2022 and Budget Estimates for 2022-2023 and 2023-2024 shows that the budget for seedling production has grown steadily from just under $1 million annually in 2012-2013 to a projected $1.66 million for 2023-2024, just slightly more than the rate of inflation. Over the same period, seedling production has accounted for 10-17% of total expenditures for the Forests, Fish and Wildlife Division. Additional production to meet FEP demand and the 300,000-seedling target for the 2BT Program has resulted in a significant increase in budgeted expenditures for Nursery operations of approximately 50% between 2021 and 2024.



Analysis

1. The Prince Edward Island Forest Policy, entitled "Moving to Restore a Balance in Island Forests", was issued in 2006. The section on Private Forests, which make up over 85% of forest land, reads in part:

   > The funding emphasis will be shifted from the current ratio of 90:10 in favour of creation and maintenance of plantations (greater than 1,600 seedlings per hectare) to a more balanced 50:50 ratio between plantations and alternative, enhancement-style treatments (e.g., partial planting, enrichment planting, patch cuts, strip cuts, thinning, etc.).

   The section on Seedling Production reads in part:

   > The strategies and actions listed for public lands, private lands and climate change are expected to result in a decreasing emphasis on the production of white and black spruce, and increasing emphasis on the production of hardwood species, as well as species suited to the predicted warmer, drier climate. It is expected that as the aforementioned strategies and actions are implemented, the proportion of hardwoods, late successional species and presumed climate-change resistant species produced will increase.

   The Policy does not contain a measurable objective for the "shift" from production of softwood seedlings to production of hardwood seedlings. Since the Policy came into effect in 2006, hardwood seedling production for the FEP has ranged from just over 3% to a peak of just over 9% in 2014, with a sharp decline in hardwood percentage after 2016, levelling off since then at approximately 4% of total seedling production. These

numbers suggest that FFWD has failed to meet expectations created when the current Forest Policy was released.

2. The Ecosystem-Based Forest Management Standards Manual, dated May 2018, is a technical document meant to "… provide guidelines for managers to prescribe and implement appropriate treatments in appropriate forest conditions." The section on tree establishment includes detailed standards for site preparation, full planting, fill (partial) planting, enrichment planting, and plantation maintenance (suppression of undesirable vegetation). The standards apply to both softwood and hardwood seedlings.

3. The FEP includes a schedule of incentive rates for manual site preparation and planting of hardwood seedlings, hardwood pre-commercial thinning, and various incentives for treatments that favour the establishment of hardwood species in softwood plantations. In discussions with technicians and foresters who deliver the FEP, the Commission learned that the incentive rates for manual hardwood site preparation and planting seem adequate to attract enough planting contractors at current volumes. However, better training may be required for contractors who do pre-commercial hardwood thinning.

4. A review of the Province's Public Accounts for the period between 2013 and 2022 shows that the cost per seedling (all species) produced by the Nursery ranged from $1.00 to $1.50, with an average cost of $1.30. These figures do not include costs associated with infrastructure, or senior division and department management. The Nursery has not conducted a cost of production analysis for hardwood seedlings to determine the difference in cost compared to softwoods.

5. Hardwood seedlings are significantly more difficult to establish than softwood seedlings. They are also more costly to plant. Mortality can be due to poor seedling quality, improper handling of seedlings after they've left the Nursery, improper site selection, inadequate site preparation, improper planting technique, inadequate vegetation control, and predation by mammals, or any combination of these. However, it does not necessarily follow that the return on investment for softwood plantations is greater.

6. An estimate provided by FFWD suggests that the current annual shortfall in hardwood seedlings for public and private forest is 20,000. This would represent an increase of approximately 50% over 2022 hardwood seedling Nursery production, but an increase of only 2% of total Nursery production. Based on what the Commission learned during four field trips, the 20,000-seedling estimate seems low.

7. The Commission recognizes that planting hardwood seedlings is only part of the goal of achieving the Forest Policy's goals of shifting from softwood to hardwood plantations, and from plantations to alternative, enhancement-style silviculture treatments. The Commission acknowledges that FFWD technicians and foresters working on public and private forest have accumulated a significant store of knowledge on how best to

establish hardwood seedlings to the stage where they are free to grow on their own, and how to successfully incorporate silviculture treatments into management plans that favour hardwood establishment.

8. FFWD does not collect data on hardwood seedling survival.

9. Watershed groups, the Glenaladale Heritage Trust, and First Nations have an interest in producing and establishing hardwood seedlings within their respective areas of interest. They should be considered as a potential source of supply.

10. Founded in 2012, the Northern Hardwoods Research Institute (NHRI), located in Edmundston, New Brunswick, is a partnership between the forest sector, governments, and academia. Its operational objectives include:
    - Improving knowledge of the northern late-successional hardwood resource
    - Developing silviculture methods that promote the sustainable yield of desired species and products
    - Increasing the volume and value of northern hardwood stands
    - Transferring knowledge and creating value for clients, stakeholders, and partners.

    While the NHRI's geographical scope includes the Maritime Provinces, Prince Edward Island is not actively involved either at the governance or the partnership level.

High-value hardwood sawlogs

Recommendations

As stated in the Introduction to this report, hardwood seedling production is only part of what will be needed to encourage healthier, more resilient forests. The Commission is not advocating the establishment of hardwood plantations. While it may cost more to get a hardwood seed tree established, it is a worthwhile expenditure of public funds if the cost of replanting can be reduced or eliminated. The Commission will have more to say about silvicultural techniques that favour the establishment of late-successional hardwoods when it reviews the FEP.

1. The Commission recommends that FFWD quantify its long-term goal for hardwood seedling production, and that it develop a plan to increase the production of late-succession hardwood species for planting on public and private land by at least 20,000 seedlings per year by 2026. The Commission encourages FFWD to consider private sector nurseries as potential sources of supply.

2. The Commission recommends that FFWD review the current practice of producing hardwood seedlings for sale. The Commission believes that all hardwood seedlings should be reserved for the four core programs: Public Forest, Private Forest, Greening Spaces, and Hedgerows.

3. The Commission recommends that FFWD hold a workshop in the fall of 2023 for field and Nursery staff to develop a best-practices manual for establishing hardwood seedlings and to review associated rates under the FEP in time for the 2024 field season. The review should also include eligibility criteria for the pre-commercial thinning incentive in natural stands that may not have high-quality species with crop tree potential as defined in the current FEP.

4. The Commission recommends that FFWD incorporate a hardwood seedling survival survey into its field operations in 2024 and annually thereafter, ideally by assigning the responsibility to a dedicated position, and that it conduct targeted research into techniques that might improve survival rates. Several watershed groups have multi-year survival data for hardwood seedlings and would likely be willing to share their experiences.

5. The Commission recommends that FFWD, in collaboration with the Department of Economic Development, Innovation and Trade develop a strategy for optimizing the value of hardwood sawlogs and manufactured hardwood products.

6. The Commission recommends that FFWD examine the possibility of partnering with the Northern Hardwoods Research Institute to conduct collaborative research and consider becoming involved with NHRI at the governance level.