

Comments on the proposed Old Growth Forest Policy submitted on Dec 8, 2021 on behalf of the Halifax Field Naturalists and the Nova Scotia Wild Flora Society

by

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Context

A draft "Old-Growth Forest Policy for Nova Scotia" was released by the Nova Scotia government on Nov 9, 2021 with a general invitation to Nova Scotians to give their feedback on proposed updates to the policy by Dec 8, 2021.

Who we are

The Halifax Field Naturalists (HFN), founded in 1975, seeks to “educate ourselves and the public at large in the natural history of Nova Scotia.” Current membership is 111 paid up members. We have a website at www.halifaxfieldnaturalists.ca.

The Nova Scotia Wild Flora Society (NSWFS), founded in 1990, is dedicated to the appreciation and conservation of wild flora and habitat in Nova Scotia. Currently we have 47 paid up members. We have a website at www.nswildflora.ca.

Both groups are Halifax based for in-person and now some virtual meetings, but we have members from all over the province, and our field trips occur throughout Nova Scotia. Whenever possible, meetings and field trips of HFN and NSWFS are open to the public at large. In the last several years we have seen rising interest in our activities, reflecting the increased appreciation generally today of nature and of the many and special opportunities we have in Nova Scotia to enjoy nature.

Many of our members are involved as individuals in trail organizations and in specific conservation efforts. As naturalist societies, we are often asked to support conservation efforts by visiting specific sites and documenting the flora and fauna, and by writing letters of support.

COMMENTS & RECOMMENDATIONS

Abbreviations

OG: old growth

OGFP 2021: the current draft policy

OFP 2012: the existing Nova Scotia's Old Forest Policy published in 2012.

OFP Layer: this refers to the map showing “all all the forest areas on publicly owned land within the Province that were accounted for in the achievement, early in 2020, of protection of at least 8% of the area of each ecodistrict as old-growth forest area and old-growth restoration opportunities.” It is available as a layer in the [NS Provincial Landscape Viewer](#) Once in the Viewer, Select the layer at Forestry>Forestry>Old Forest Policy. It is also available at <https://nsgi.novascotia.ca/gdd/>

Comment 1. The draft Nova Scotia Old Growth Forest Policy is weak on conservation of old forest species

We note that the goal given in OFP 2012 under section 1.0 Rational is "to maintain old forests and associated biodiversity in the forested landscape". In OGFP 2021 a change in title is introduced - from "Old Forest Policy" to "Old Growth Forest Policy" - and conservation of old forest biodiversity is not explicitly cited in the text as a goal.

The inclusion or not of this goal is important because habitat or components of habitat for many old forest species can, in many cases, be conserved in patches or sweeps of forest that do not meet the age criteria for Old Growth under either the OFP 2012 or the 2021 OGFP definition. Thus there are many old forest species commonly associated with and benefitting from Old Growth, but it is not age *per se* that is required but rather old rotting wood, large old fallen deadwood, or large snags, super-canopy trees/a high degree of canopy closure.*

* Many examples are cited in the very informative L&F/NRR pamphlet [A Field Guide to Forest Biodiversity Stewardship](#) by P Neily & G Parsons, 2019. Refer also to....[The living dead: acknowledging life after tree death to stop forest degradation](#) by Simon Thorn et al., in *Frontiers in Ecology & Environment* 03 September 2020; [Declining old-forest species as a legacy of large trees lost](#) by G.M. Jones et al. in *Diversity and Distributions* 05 December 2017; [Environmental drivers of forest biodiversity in temperate mixed forests – A multi-taxon approach](#) by F Tinya et al., in *Science of the Total Environment* 795 (2021) 148720.

We might recommend that the age criterion could be overridden when a forest stand contains more than certain threshold values for these non-age features. However, that would greatly complicate the assessment process, making a less functional definition of OG than provided in OFP 2012:

A forest stand where 30% or more of the basal area is in trees 125 years or older, at least half of the basal area is composed of climax species, and total crown closure is a minimum of 30%.

OGFP 2021 introduces major changes in this definition:

Old-growth forest areas are herein defined according to the vegetation types, and the old-growth ages in the table below, as well as the history of past human interventions that have affected ecological continuity...no forest areas that have received a silvicultural treatment or timber harvest within 30 years of the date of approval of this Policy will be designated to be protected, provided there is documentation of the treatment...A forest area is considered to be old growth if it is larger than 1.0 hectare in area and 20% or more of the basal area is greater than or equal to the reference age for that forest type.

FEC Forest Group ^a	FEC Vegetation Types ^a	Old-Growth Age ^b
Tolerant Hardwood	TH1, TH2, TH3, TH4, TH5, TH6, TH7, TH8	140
Spruce-Hemlock (red spruce dominant)	SH3, SH4, SH5, SH6, SH7	125
Spruce-Hemlock (hemlock dominant)	SH1, SH2	140
Mixedwood	MW1, MW2, MW3	125
Spruce-Pine	SP4, SP5, SP7, SP9	125
Wet Coniferous	WC1, WC2, WC5, WC8	100
Coastal (black spruce or balsam fir dominant)	CO1, CO4	100
Coastal (red spruce, white birch, or red maple dominant)	CO3, CO5, CO6	125
Highland (balsam fir or white spruce dominant)	HL1, HL2	100
Highland (yellow birch dominant)	HL3, HL4	140
Cedar ^c	CE1	110
Wet Deciduous	WD3, WD4, WD6, WD8	115
Floodplain	FP1, FP2, FP3	125
Karst	KA1, KA2	125

Thus there is a change from a single age of 125 years old for six “Climax Species” (OFP 2012) to a range of ages (OGFP 2021) going from 100 to 140 years old depending on the Forest Group. The inclusion of a broader range of species or Forest Groups as contributing to the criteria for OG, the reduction of minimum age for some Forest Groups, the change from 30% or more of the basal area to 20%, and the change in the minimum area requirement from “a stand” (usually 2 ha min) to 1 ha are welcome changes as they effectively allow a broader range of forest stands likely to contain features supportive of old forest species to be classified, and hopefully, protected as OG. However the increase in minimum age for three Forest Groups (Tolerant Hardwood, Spruce-Hemlock/hemlock dominant Highland/yellow birch dominant) has the opposite effect.

There is another issue related to the 140 year age requirement for those stands: there are many old forest stands in NS that developed following blowdown of Old Growth in the Saxby Gale (1869) and the Nova Scotia storm (1871) and thus have maximum possible ages today circa 140 years, the age proposed as the minimum age for three of the forest groups in the draft Old Growth Forest Policy, up from 125 years in the existing policy. Many of these stands would be excluded under the proposed policy. More details are given in the Appendix to this document. **The simplest way to solve that issue is to lower the minimum age to 100 years.**

A major virtue of the OFP 2012 definition is its simplicity and functionality as cited by Berry et al., 2018*. The definition in OGFP 2021 is more complicated conceptually and functionally.

,[Amy Berry](#) [Amanda Lavers](#), and [Lisa Mitchell](#) **Old forest policy and regulatory frameworks in Nova Scotia and New Brunswick with a comparison to British Columbia**, *The Forestry Chronicle* Volume 94, Number 01, January 2018

As a simple fix that would retain the functionality of OFP2012 but accommodate the broader range of species as in OGFP 2021 AND allow more old forest stands with features supportive of old forest species to be included, we make the following recommendation.

Recommendation 1: Define an Old Growth stand as follows

An Old Growth stand is any forest stand (polygon) or circumscribed area of 0.5 ha and greater with 20% or more of the basal area greater than or equal to 100 years of age.

Comment 2: The goal of including a minimum of 8% of Crown land in each ecodistrict in the Old Forest Policy Layer is arbitrary and insufficient to properly conserve Old Growth Forests and associated species dependent on old forests.

There is no scientific justification offered for the 8% goal. How much land and which land should be protected to ensure adequate conservation of Old Growth Forests and associated species dependent on old forests is not readily answered, but we should at least err on the precautionary side. Moessler et al., 2003 offered a target based on landscape level considerations:

...Forest resource inventory data suggest that between 1% (Lynds and LeDuc 1995) and 5% (Anonymous 2002, Fig. 1) of Nova Scotia, and perhaps less than 2–3% of New Brunswick, exists as forest older than 100 years.

Based on the frequency of stand-replacing or catastrophic natural disturbances such as fire and wind in the AFR [Atlantic Forest Region], the length of time required to develop OG, and the areal distribution of temperate-zone forests in the AFR capable of developing these late-successional forest types, we estimate that 40–50% of the pre-settlement forested landscape may have been occupied by OG forest.

Although the question of how much area should be kept in OG forest types is largely an issue of social and economic policy, given our estimates of the extent of OG in the pre-settlement forest, **it seems reasonable to suggest that at least 20–25% of our forest be maintained in these late-successional OG forest types***, perhaps 10–12% within protected areas and 10–12% within the working forest.

It is difficult to justify these amounts based purely on what science would prescribe as a minimum for maintaining a tree species according to population genetics theory. Our arguments for maintaining these amounts are based largely on our understanding of what might be necessary to maintain a viable metapopulation structure capable of continuous dispersal across a fragmented landscape in which the forest must adapt to anticipated rapid climatic changes.

Furthermore, the OG forest structure required to maintain the population viability of forest-dependent wildlife, such as the American marten, and some of the larger mammals that are endangered or have been extirpated in the Maritimes (wolves, eastern cougar, wolverine, lynx**) requires much larger areas than that prescribed by population genetics theory for the trees themselves.

- A. Mosseler, J.A. Lynds, and J.E. Major. *Environmental Reviews* 11: S47–S77 (2003)

*Age-wise, Mosseler defined late-successional, temperate-zone old-growth forest types as having “Average age of dominant species approaching half the maximum longevity for species (approximately 150+ years for most shade-tolerant trees)” and “Some old trees at close to their maximum longevity (ages of 300+ years).**The Lynx still occurs in N.B. And Cape Breton.

Recommendation 2: The goal of the OGFP should be to conserve 25% of our forests by area as Old Growth, half on Crown lands and half on private lands.

Comment 3: Given the global and local climate and biodiversity crises, we should move as quickly as possible towards this goal of conserving 25% of our forests by area as Old Growth.

The climate and biodiversity crises are strongly linked. It is our old forests and the associated species that are most threatened today and these are the forests storing the most carbon. Obviously we want to retain as much of them as we can.

Currently about 50 % of old forests which DNR includes in the Old Forest Layer are 40 -79 year old stands in Protected Areas. These are described as “restoration opportunities.”

Age classes in the OFP Layer (Fig 3 in **Implementation of Nova Scotia Interim Old Forest Policy for Crown Land “A Status Report”** Prepared by Bruce Stewart and Peter Neily March 2008)

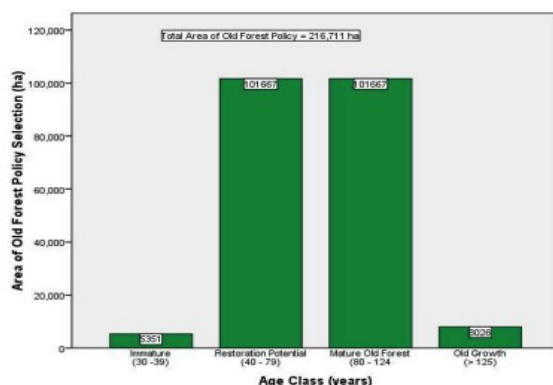


Figure 3. Age class distribution of forests selected under NSDNR Interim Old Forest Policy as determined from 162 randomly established Permanent Sample Plots measured between 1999-2003 (NSDNR, 2004).

Under both OFP 2012 and now OGFP 2021 the inclusion of these younger forests (all are in existing Protected Areas) in the OFP Layer counts towards the ‘Minimum of 8%’. That means that except where forest stands meet the criteria for classification as OG, forests older than 40-79 years in the working Crown land forest can be harvested.

If the criteria for “restoration opportunities” took into account the need to find more habitat for old forest biodiversity generally, and to accelerate transition to true old growth, then more suitable habitat would be found in the working Crown lands, much of which will otherwise be harvested, i.e. those opportunities will be lost and we will see ongoing net loss of patches of Old Growth, old forest habitat, and carbon storage. Surely this is not acceptable in 2021.

Recommendation 3. Implement a Precautionary Old Forest Protection Plan that requires a minimum 25% of forest to be in the oldest development stages (Late Mature and Multi-aged/old forest) in each ecodistrict, with at least half of that area on Crown lands. If the total for an Ecodistrict that is currently in the oldest development stages is less than 25%, then there should be no logging on those Crown lands.

A benefit of this approach is that we have already classified and mapped the development stages for all of our forests, although some updates may be required and obviously should be ongoing. Perhaps there are better approaches, but those would take much more time to work out and then implement. So this is a *Precautionary Plan*, one that is introduced to address our climate and biodiversity crises without delay, while working on a more refined plan.

These are our major recommendations that, if implemented, would build on the laudable features of our current Old Forest Policy, notably its simplicity and functionality, while addressing some of its deficiencies, and specifically address the need to take action now to address the climate and biodiversity crises. They are also consistent with the perspectives of Bill Lahey expressed in the Independent Review of Forest Practices in Nova Scotia:

I have concluded that protecting ecosystems and biodiversity should not be balanced against other objectives and values as if they were of equal weight or importance to those other objectives or values. Instead, protecting and enhancing ecosystems should be the objective (the outcome) of how we balance environmental, social, and economic objectives and values in practising forestry in Nova Scotia. Bill Lahey, 2018

We are also supportive of a broader range of comments cited in feedback on the Old Forest Policy received by Nature Nova Scotia:

Key feedback included:

- Agreeance that, at the policy states, protected areas are not enough to adequately safeguard old forests, requiring greater measures on other crown lands
- Concern that the conservation of biodiversity is not a goal in the current draft, as stated in the 2012 policy
- Concern over the short consultation period and lack of opportunities for Nova Scotians to get involved
- Concern that the old growth forest scoring protocol, the pre-treatment assessment (PTA) protocol, and the monitoring protocol, are not included with the policy, limiting public consultation
- Concern over the raising of the minimum tree age for some species to 140, and that the minimum forest size must be 1 ha
- Concern that working lands cannot be considered old forests, despite tree age, simply because they are working forests
- Concern over the fact that the Minister can still remove old growth forest areas from the policy's protection if a development project is proposed
- Recommendation to prohibit the logging of old forests on all Crown lands
- Recommendation to have a third-party oversee the identification and mapping work, to avoid a conflict of interest where the same department in charge of harvest activity is also in charge of old forest protection
- Recommendation to include clauses around repercussions for failure to follow the policy, to act as an enforcement measure
- Recommendation to make (an improved) Old Forest document into law, rather than policy

Appendix: On the significance of historic blowdowns and Pit and Mound topography

by David Patriquin

Increasing the minimum age to be classified as OG from 125 to 140 years for three of the forest groups (Tolerant Hardwood, Spruce-Hemlock/hemlock dominant Highland/yellow birch dominant) as proposed in OGFP 2021 would likely eliminate from potential protection many old stands that developed following a massive storm or storms that crossed Nova Scotia approximately 140+ years ago and blew down many Old Growth stands of the day.

Today, where there are now old stands with some trees >125 years old on these sites, these old forests are growing where there had previously been Old Growth. So the historical continuity of the old forests of today with Old Growth and Old growth processes that go back 100s of years, or perhaps even millennia.

The reason we know there had been a blowdown of Old Growth in the past – or if not Old Growth by the existing definition of OG, at least there was blowdown of very big, old trees (likely over 100 years) – is the presence of a pronounced **‘Pit and Mound’ topography.**¹

Writing about Old Growth forest in Maine, Joe Rankin, citing Andrew Whitman at the Manomet Center for Conservation Sciences and Shawn Fraver, a professor at the University of Maine’s School of Forest Resources, provided [this succinct description](#):

One other telltale feature of an old growth forest is the forest floor itself, said Whitman and Fraver. It’s not, by any means, level. Instead it’s characterized by dips and mounds. Not coincidentally they’re more or less the size of a large tree’s root ball and its accompanying soil. This “pit and mound” topography occurs when old big trees are blown down, their roots upended. The mound is created by the exposed root ball, the hollow is where it once was. Gradually, over decades, the root rots and both the mound and pit are colonized by mosses, ferns, wildflowers and young trees.

“It could take an old field a thousand years to get that pit and mound topography,” said Whitman. “In managed forests you rarely get that, because large trees are cut before they can fall down”

The lack of pit and mound topography is a good indication that the land was once smoothed by the plow, even if it was a century or two ago.*

¹In Nova Scotia, pit and mound topography, even if it exists, can be difficult to distinguish on ground where there are a lot of erratics (big boulders dropped by receding glaciers).

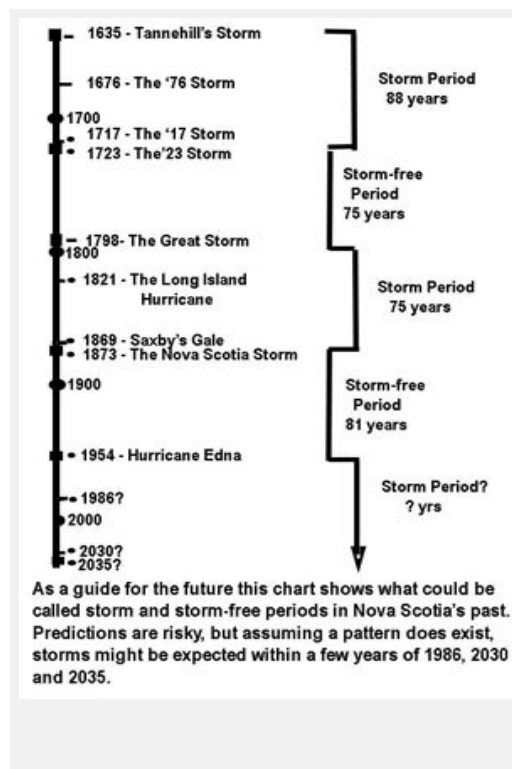
The mounds, rather than the pits or dips between the mounds, are also the preferred habitat for old growth species such as hemlock and yellow birch, so we see them growing on the tops of mounds, not between them. And upturned stumps resulting from a massive tree falls or much more limited tree fall producing gaps provide cavities for wildlife, mineral soil for seedlings, and often vernal pools; these habitats are transitory, lasting perhaps 5-30 years or so – thus maintenance of such habitats is dependent on more windfalls.

We can estimate the age of a mound – and hence the time of the disturbance that blew the big tree over – from the ages of the oldest trees growing on those mounds today. For example if a tree on a mound is 140 years old, then that mound must be *at least* 140 years old. We should add some years to the observed age which is determined on a core taken at breast height to account for the time it took to grow to that height, also the tree might have started to grow only after a few years following the disturbance. So, as a guesstimate, if we add 10 years to the 140-year old tree, we can guess that the event that blew over the big tree to form the mound occurred about 150 years ago. Such a tree today would have started to grow circa 1871.

In a very enlightening article titled [Woodlands shaped by past Hurricanes](#), Nova Scotia forester David Dwyer wrote in 1979:

“Many of our forest stands in Nova Scotia are a result of past hurricanes. Mounds on the forest floor -the result of uprooted trees – indicate this. The age of trees growing on these mounds give a good indication of when the storm occurred. These stand ages compare well with the written records of past storms...”

A common age of forest stands in Nova Scotia is 100 years. The origin of many of these stands is the blowdown resulting from Saxby’s Gale.[1869] No doubt the Nova Scotia Storm of 1873 is a contributing factor too. George MacLaren writes in his Pictou Book that the storm of August 24, 1873 “... was probably one of the most severe and destructive that has visited our coast in years”. He calls it “The Big Blow.”



Dwyer wrote in 1979, so those “100 year old stands” that survive today are circa 142 years old max. Most trees in a multi-aged stand in which the oldest trees are 142 years would be less than 142 years old. The Old Forest Scoring Procedure calls for “a minimum of 3 sample plots per stand and measuring the age of one tree at each plot. This should be selected from the most common climax species, and should be larger in diameter than 2/3’s of the basal area...For example, if 9 trees have been tallied, then count back 3 trees from the largest tree tallied.” View [Old Forest Scoring – Cruise Procedures](#) for details. It’s a bit complicated but it is clear that if the absolute oldest tree in the stand is 140 years, there is a good likelihood that the “Age of oldest 30% of the basal area” so determined will be less than 140 years and so many such stands would not be categorized as Old Growth.

So it is quite feasible under the existing protocol that a stand that has had no harvesting or other interference for hundreds of years, and that today has at least some trees close to 140 years old but not older because the prior stand was blown down in the Saxby Gale or the Nova Scotia Storm, would not qualify as old growth because of this age requirement – even though it could have all of the other features that characterize Old Growth in spades.

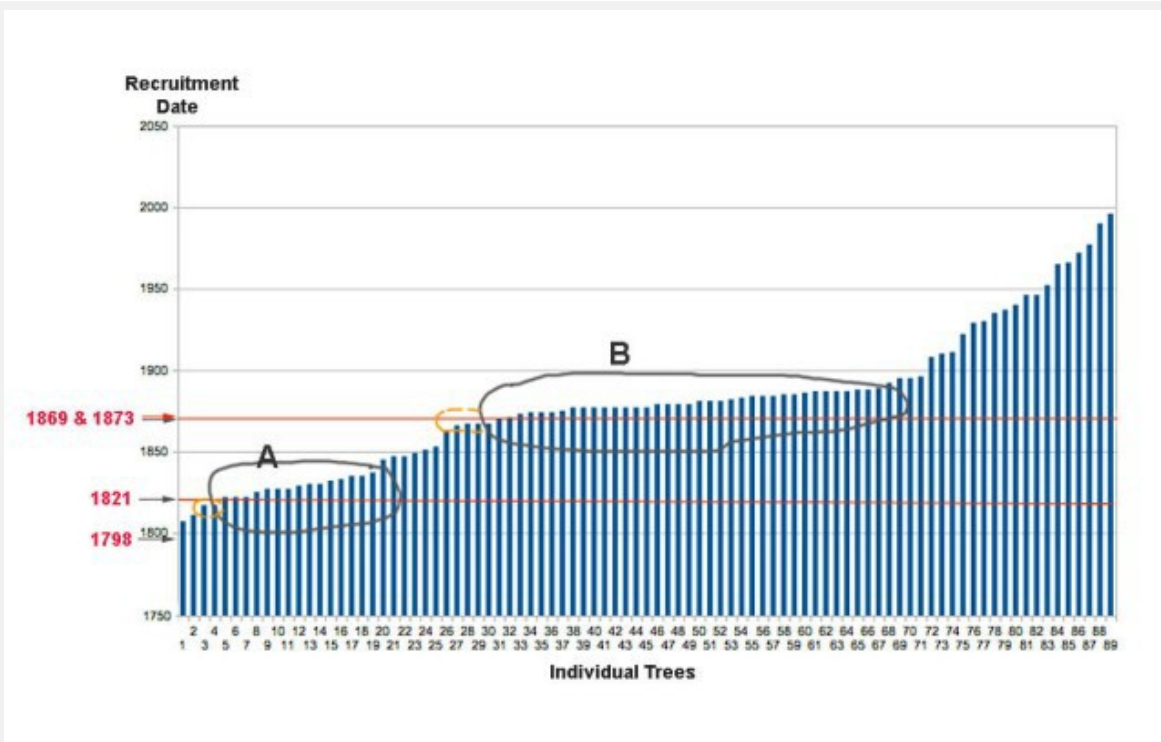
A specific example. The only actual raw data or close to raw data from L&F/NRR's many assessment of forest stands for OG status that are publicly available is a set of data obtained in connection with their assessment of stands in the Lawlor Lake area of Guysborough County in March 2018:

[*Old Forest Assessment in the Lawlor Lake Area of Guysborough County, Nova Scotia](#) by Peter Bush. May 9, 2018. Forest Technical Note No. 2018-01 Nova Scotia Department of Natural Resources.

Executive Summary

The Department of Natural Resources (DNR) assessed 27 forest stands in the Lawlor Lake area of Guysborough County in March 2018 in response to public concern about forest harvesting and forest product utilization. DNR used the old forest scoring system, outlined in the Old Forest Policy (2012) to assess these stands. The assessment looked at 12 stands that were recently partially harvested and 15 stands that were planned for partial harvest in the area. DNR found that 2 of the 12 recently partially harvested stands were old growth forest (OGF), and a further 8 were considered old forest that did not meet the criteria for old growth. Of the planned harvest stands (not treated), 11 of the stands were OGF; 1 was old forest; 1 was mature forest, and 2 were immature. Old forest scoring age for all the stands surveyed had a mean of 134 years, with a range of 45- 167 years. The Old Forest Policy currently has 27,825 ha (15.7% of the Eastern Interior Ecodistrict) of conserved OGF and restoration opportunities. An examination of the Pre-treatment Assessment indicator currently used to flag potential stands for old forest scoring found that 5 of the 13 OGF stands in this study would have been flagged if used. The Old Forest Policy and its associated tools (old forest scoring) provides a science-based approach to evaluate OGF and appropriate policy mechanisms to conserve that forest when it is found.

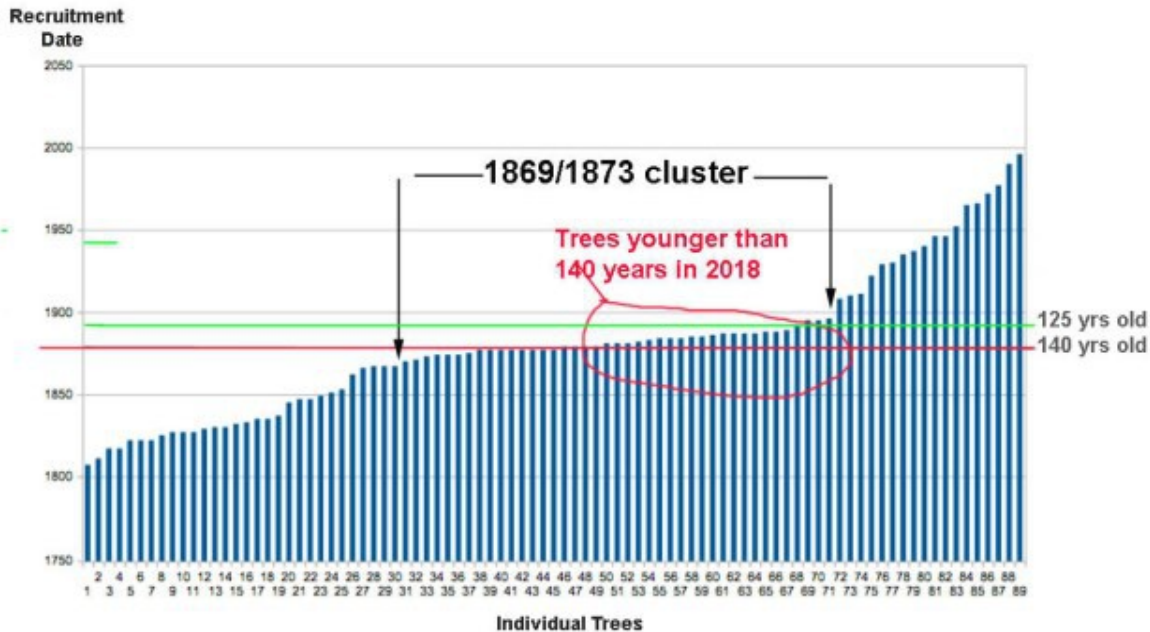
The mean age of 134 years made me wonder if these were stands blown down by some of the storms cited by David Dwyer. In [Appendix 4 of the report](#), the ages of all 89 trees that were aged are given, also the related Estimated Recruitment Dates – calculated as 2017 (last ring in tree counts) minus age. So I plotted those numbers sequentially going from the earliest to most recent recruitment date:



ABOVE: Recruitment Dates of individual trees in the DNR Lawler Lake study (from Bush 2018) ordered left to right from earliest Recruitment Date to the most recent. Dates in red correspond to storms cited by Dwyer 1979. The envelopes circle plateaus suggestive of a suite of recruitment associated with (A) the 1821 storm, and (B) the 1869 and 1873 storms together. The orange circles to the left are trees that would be included if a few years were added to the recruitment dates to allow the time required to breast height. All of these trees were hardwoods – yellow birch, sugar maple, red maple.

The plot is pretty suggestive of periods of a lot blowdown and periods of less blowdown as postulated by Dwyer (see Dwyer's diagram above), and of two major blowdown periods (A&B) corresponding to known storms.

Then I looked at how many of the trees in the B cluster – trees that grew following the 1869 and 1873 storms – would be rated as OG (Old Growth) when the age criterion is 125 years (as **currently**) and when it is 140 years (as proposed in the [draft Old Growth Forest Policy](#) for some stands):



Most of the trees in the 1869-1873 cluster are at least 125 years old, but about half are not 140 years or older. So if the critical age were raised from 125 to 140 years, many of these hardwood stands – would not be rated as OG and so not protected. Yet they are all part of the same age cluster.

Is that what we want? I don't think so.

The simplest way to solve that issue is to **lower the minimum age to 100 years**. It makes sense in order to protect more habitat supportive of old forest species; and it makes sense technically, given the history of massive blowdowns in our forests.

A concluding comment

It is odd that Pit and Mound topography is a [commonly cited](#) and [extensively researched](#) feature of Old Growth forests in northeastern North America, yet Pit and Mound topography and the associated processes are not cited as features of OG in the [Old Forest Policy 2012](#) or in the draft [Old Growth Forest Policy 2021](#) or in associated documents such as the [Story Map](#) and the [Scoring Protocol](#). They clearly should be.



Pit and Mound topography in **Old Growth** hemlock/yellow birch forest by Sandy Lake (Bedford, NS).



**An Old-Growth Forest Policy
for Nova Scotia**

An Old-Growth Forest Policy for Nova Scotia: Version 8, 2021-10-14

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An Old-Growth Forest Policy for Nova Scotia (draft version 8; 2021-10-14)

1.0 Introduction and Rationale

Across the world, policies and programs have been developed by numerous national and sub-national jurisdictions to protect forests dominated by old trees in order to conserve the ecological and social values that older forest ecosystems provide. These conservation efforts reflect the recognition that, once lost, old forest ecosystems cannot be easily replaced, and also that they continue to be under threat.

The landscape in Nova Scotia is heavily forested and Nova Scotians derive many benefits from it. Old-growth forest conditions were a more prevalent feature of Nova Scotia's forest landscape prior to European settlement in the 17th century. From that time to the present, forests with old-growth attributes have declined, largely due to a combination of timber harvesting, agriculture and urban development, and human-caused forest fires (Fernow, 1912). Scientific research has made it clear that old-growth forests are indispensable for supporting biodiversity as well as ecosystem services and functions at multiple levels. By way of this Policy, the Government of Nova Scotia takes responsibility for leadership in protecting and restoring old-growth forests on all Crown land and supporting the conservation of old-growth forests on private land.



In 1999, the Government of Nova Scotia published an "*Interim Old Forest Policy*" (NSDNR, 1999) followed by an update entitled "*Nova Scotia's Old Forest Policy*" in 2012 (NSDNR, 2012) in an effort to "maintain old forest and associated biodiversity in the forested landscape". These policies committed the Province to identify a minimum area of 8% that included old-growth forest and old-growth restoration opportunities on Crown land in each ecodistrict (see Neily et al. (2017) for descriptions of ecodistricts). The identified forest area has both legal (i.e., inside protected areas) and policy (i.e., on Crown land outside protected areas) protection from human activities, including timber harvesting. The protocols for the identification of appropriate areas for policy protection started with old-growth forest areas and the best old-growth restoration

opportunities in legally protected areas. Additional forests on the actively managed Crown landbase were then added where protected areas were insufficient.

In early 2020, the 8% minimum target by ecodistrict from the 2012 Old Forest Policy was reached. Currently, there are over four hundred thousand hectares identified in legally protected areas and just over thirty thousand hectares in the remaining Crown land. Over the past 20 years, much of the old forest that was originally identified in non-protected Crown lands through the 1999 Interim Old Forest Policy has subsequently been incorporated into legally protected areas.

The 2012 Old Forest Policy provided the province with a scientific foundation and approach for the conservation of old-growth forest. A new Policy would strengthen the Government's commitment, under an ecological forestry approach (see Lahey, 2018), to prioritize the protection of biodiversity and enhancement of old-growth forest ecosystems. It incorporates the Department's recent tools and scientific research and reconsiders definitions of old-growth forest by implementing a range of ages for specific forest groups. These strengthened efforts to conserve, restore, and promote old-growth forests in Nova Scotia merits the new name, *An Old-Growth Forest Policy for Nova Scotia*.

The Policy acknowledges that conservation of old-growth forest for ecological and societal values in Nova Scotia can be approached in three ways. One is through the continued protection of all old-growth forest from adverse human activities in all legally protected areas (e.g., wilderness areas, nature reserves, provincial parks, and national parks) as well as a system of policy-protected conservation forests identified on Crown land outside of legally protected areas. The system of policy-protected forest on Crown land provides opportunities to better represent diverse old-growth forest types across the province that are not adequately represented in legally protected areas. The second approach protects forest areas that have yet to develop into old-growth forest but are expected to do so with the passage of time, again in legally protected areas and in policy-protected Crown forest land. These forest areas are called old-growth restoration opportunities. The third approach is for Government to encourage and support the conservation and restoration of old-growth forest on private land through mechanisms such as stewardship agreements, conservation easements, Biodiversity Management Zones, education, and other means that recognize and support the efforts of private landowners. Private land accounts for 63% of Nova Scotia's forested landscape and provides important opportunities for unique and representative old-growth forests and old-growth restoration opportunities. Taken together, and given enough time, these approaches should contribute substantially to the conservation of old-growth forest, expand old-growth forest conditions, and enhance the associated biodiversity in these rare ecosystems (for examples, see Neily and Parsons, 2017).

1.1 Provincial Policy Context

This Policy does not exist in a vacuum and should be seen as influenced by other policies and contributing to the achievement of yet other policies. Several such policies stand in close relation to the Old-Growth Forest Policy:

The Biodiversity Act of 2021. The Old-Growth Forest Policy can be seen as a key instrument, among several, for attainment of the purpose of the Act, which is “to provide for the stewardship, conservation, sustainable use and governance of biodiversity in the Province . . .”. Thus,

protection of old-growth forests, a relatively rare forest-ecosystem condition, is warranted chiefly as a means of conserving critical components of Nova Scotia's forest biodiversity.

The Old Forest Policy Layer under the 2012 Old Forest Policy. The Old Forest Policy Layer is a geospatial database created and managed by the Forestry Division of the Department of Natural Resources and Renewables. It delineates all the forest areas on publicly owned land within the Province that were accounted for in the achievement, early in 2020, of protection of at least 8% of the area of each ecodistrict as old-growth forest area and old-growth restoration opportunities. The primary source of information used to identify the areas accounted for under the 2012 Old Forest Policy was the Province's forest inventory database (FID). Additional data such as field surveys have been used, where possible, to identify specific additional areas to add to the Old Forest Policy Layer and to improve the quality of information on specific areas already identified using the FID. The Old Forest Policy Layer is managed as a geospatial database independent of the FID. This acknowledges that the boundaries of old-growth forest areas and old-growth restoration opportunities do not align perfectly with the stand boundaries of the FID on account of additional data collected in the field as well as re-interpretations of stand boundaries as the FID is updated.

As indicated in the 2012 Old Forest Policy, identification of the best old-growth restoration opportunities started in the legally protected public forest lands within the Province, notably provincial parks, national parks, and wilderness areas. This Policy assumes a stability of land use in the legally protected areas of the Province and that these restoration opportunities will become old-growth forest area in time. The directives provided in this Policy (e.g., protection or activities permitted) only apply to the areas designated in the Old Forest Policy Layer that occur on other Crown forest land outside of these legally protected areas.

The Silviculture Guide for the Ecological Matrix. This Policy does not deal with the development of old-growth attributes in Crown forest areas that are designated for the joint objectives of biodiversity conservation and timber production. That is the purview of the Silviculture Guide for the Ecological Matrix (Department of Lands & Forestry, 2021). Thus, under this Policy, there is no intention of, and therefore no guidance on, using silvicultural interventions to direct forest areas to develop old-growth attributes.

2.0 Purpose and Objectives

2.1 Purpose

To provide for the conservation and restoration of old-growth forests in Nova Scotia.

2.2 Objectives

1. To identify and protect **all** old-growth forest areas on Crown land outside legally protected areas.
2. To continue protection of the forest area identified in the Province's Old Forest Policy Layer, subject to provisions associated with Objective 3. (This includes old-growth forest

areas and old-growth restoration opportunities on Crown lands outside legally protected areas).

3. To provide procedures for potential additions of forest area to, and exceptional removals of forest area from, the Old Forest Policy Layer, and ensure no net loss of forest area from the Old Forest Policy Layer.
4. To identify recreational and learning opportunities associated with old-growth forests and encourage people to engage in such opportunities.
5. To foster increased conservation and restoration of old-growth forest on private lands through programs of support, education and encouragement.

3.0 Authority, Application, Responsibility, and Accountability

3.1 Authority and Application

This Policy is administered by the Minister of Natural Resources and Renewables under the authority of the Forests Act of 1989 and the Crown Lands Act of 1989.

The protection provisions of this Policy apply to all public forest land under the responsibility of the Department of Natural Resources and Renewables (except provincial parks). The accounting provisions apply to all public forest land in the Province, which means that the old-growth forest areas and old-growth restoration opportunities in the federal Parks (i.e., Kejimikujik, Cape Breton Highlands and Louisbourg) and provincially recognized protected lands (i.e., wilderness areas, nature reserves, and parks) were accounted for before protection designations were established on the remaining Crown forest land.

3.2 Responsibility and Accountability

The **Minister of Natural Resources and Renewables** (or designate) is responsible for:

- (a) approval decisions for all additions or removals of forests to the Old Forest Policy Layer;
- (b) initiating the review of this Policy (as defined in section 6.3).

The **Executive Director of Renewable Resources** (or designate) is responsible for:

- (a) appointing an Old-Growth Forest Coordinator within Renewable Resources Branch and ensuring that the Coordinator's duties are properly discharged;
- (b) ensuring that the Old Forest Policy Layer and old-growth scoring data are maintained and up-to-date and available to the public;
- (c) monitoring the achievement of the objectives outlined in Section 3 and compliance with the provisions of this Policy.

The **Regional Resource Managers** (or their designates) are responsible for:

- (a) ensuring that no human activities or undertakings occurring in old-growth forest areas and old-growth restoration opportunity areas have significant adverse impacts on old-growth values;

- (b) ensuring that field assessments of forest areas that are potentially old growth but not yet identified as such in the Old Forest Policy Layer are completed by qualified individuals trained by the Old-Growth Forest Coordinator or his designate;
- (c) initiating reviews of any proposed changes to the Old Forest Policy Layer with regional Integrated Resource Management (IRM) teams and the Old-Growth Forest Coordinator, and submitting findings and recommendations for approval by the Minister (or designate);
- (d) monitoring the occurrence of breaches of this Policy in relation to human activities taking place, without appropriate authorization as per government regulations, in forest areas identified in the Old Forest Policy Layer.

The **Old-Growth Forest Coordinator** is responsible for:

- (a) overseeing the implementation of this Policy in consultation with Regional Services and Renewable Resources staff;
- (b) participating in IRM reviews with Regional Services staff;
- (c) overseeing information management (including the Old Forest Policy Layer) related to this Policy;
- (d) coordinating research and monitoring (e.g., forest attributes, conservation status) in support of this Policy;
- (e) acting as the departmental liaison with non-departmental stakeholders;
- (f) developing and promoting communications products for the public on the status of old-growth conservation in the province and the learning opportunities associated with old-growth forest;
- (g) promoting the conservation of old-growth forest within the province; including initiating and leading discussions with the private land sector;
- (h) periodically reviewing progress in implementing this Policy and reporting the results to the Executive Director of Renewable Resources.

4.0 Old-Growth Forest Definition

Old-growth forest is defined conceptually as late-successional forest ecosystems that evolve through long periods of forest development. This process involves fluctuating levels of low to moderate disturbances that allow understory trees to develop and grow into mature trees to create uneven-aged forests favouring long-lived species that are able to grow in shaded conditions. As a result of these development processes, old growth forests are characterized by attributes that include a patchy, multi-layered, multi-species canopy with trees of several age classes dominated by relatively large trees, occasional large dead snags, and the presence of abundant large woody material on the ground. Old-growth forest optimally occurs when a relatively large forest area has experienced a significant period of ecological continuity (say, a period greater than the maximum longevity of the dominant tree species (Mosseler et al. 2003)) and displays interior forest character. Old growth forests are not static museum pieces; they are continually reshaped and maintained by dynamics of low-intensity forest development processes.

For policy purposes, operational definitions are required. Old-growth forest areas are herein defined according to the vegetation types, and the old-growth ages in the table below, as well as the history of past human interventions that have affected ecological continuity. Old-growth

restoration opportunities are those forest areas that meet the vegetation type criterion but are younger than the old-growth age. On account of old-growth forest areas in Nova Scotia being relatively rare but at the same time best considered as characterized by relatively little recent human disturbance (see Appendix 9.1), no forest areas that have received a silvicultural treatment or timber harvest within 30 years of the date of approval of this Policy will be designated to be protected, provided there is documentation of the treatment. The old-growth ages have been based on an estimate of the minimum age-of-onset of old-growth attributes. A forest area is considered to be old growth if it is larger than 1.0 hectare in area and 20% or more of the basal area is greater than or equal to the reference age for that forest type.

FEC Forest Group^a	FEC Vegetation Types^a	Old-Growth Age^b
Tolerant Hardwood	TH1, TH2, TH3, TH4, TH5, TH6, TH7, TH8	140
Spruce-Hemlock (red spruce dominant)	SH3, SH4, SH5, SH6, SH7	125
Spruce-Hemlock (hemlock dominant)	SH1, SH2	140
Mixedwood	MW1, MW2, MW3	125
Spruce-Pine	SP4, SP5, SP7, SP9	125
Wet Coniferous	WC1, WC2, WC5, WC8	100
Coastal (black spruce or balsam fir dominant)	CO1, CO4	100
Coastal (red spruce, white birch, or red maple dominant)	CO3, CO5, CO6	125
Highland (balsam fir or white spruce dominant)	HL1, HL2	100
Highland (yellow birch dominant)	HL3, HL4	140
Cedar ^c	CE1	110
Wet Deciduous	WD3, WD4, WD6, WD8	115
Floodplain	FP1, FP2, FP3	125
Karst	KA1, KA2	125

a (Neily et al. 2013)

b based on published literature of old-forest community ages, published ages of the dominant tree species associated with the forest groups (and vegetation types), and local knowledge (see Appendix 9.2).

c eastern white cedar is listed as vulnerable under the Endangered Species Act of Nova Scotia and all naturally occurring cedar forests are protected regardless of their age.

5.0 Implementation Directives

5.1 Continued Protection of all Crown Forest Area outside of Legally Protected Areas

Policy protection for all forest areas identified in the Old Forest Policy Layer under the 2012 Old Forest Policy will remain in place subject to the provisions for potential removal described below.

5.2 Additions to the Old Forest Policy Layer

5.2.1 Old-Growth Forest Areas

The Department will ensure that all Crown forest areas considered for operational harvest approvals will first be evaluated for old-growth forest attributes through field-based assessments including pre-treatment assessment (PTA) that includes old-growth evaluation and/or the old-forest scoring procedure (Stewart et al., 2003) and through aerial photography and spatial analysis of previous forest management treatments. If a forest area is confirmed as old-growth forest according to the definition in section 4.0, Regional Resource Managers will seek confirmation from the Minister or designate that the forest area in question is to be added to the Old Forest Policy Layer and thereby set under policy protection.

5.2.2 Old-Growth Restoration Opportunities

Under circumstances where an ecodistrict falls significantly short of forest-type-specific targets for representation of old-growth forest, the Regional Resource Manager, working with the Regional IRM Team and the Old-Growth Forest Coordinator, will seek opportunities to designate protection to forest areas that are not now legally protected nor protected under the 2012 Policy but are excellent candidates as old-growth restoration opportunities. Consideration shall be given also to the cultural and educational significance of candidate areas.

5.3 Removals from the Old Forest Policy Layer

5.3.1 Old-Growth Forest Areas

Old-growth forest area that is protected under this Policy may be removed from such protection only if:

- (a) The Minister has declared the removal to be in the public interest, such as on account of a development project, or a large natural disturbance has killed most or all of the trees;
- (b) The proponent of the development project:
 - a. undertakes a detailed old-forest scoring assessment of the old-growth forest area and a description of the representation and ecological integrity of the old-growth forest in the ecodistrict; privately acquires, at their own expense, old-growth forest area elsewhere in the province and offers it to the Crown at an area rate of at least five times the removed old-growth forest area if the acquired land has old-growth attributes, as deemed by the Old-Growth Forest Coordinator, of comparable or better ecological quality than that removed, or up to ten times the removed area if the acquired land has old-growth attributes of lesser ecological quality.

The old-growth forest coordinator will also consider representation and ecological integrity (e.g., interior forest habitat) in determining whether the proposed replacement lands are acceptable. In practice, the exchange should result in a clear benefit to the Crown land, in improving and enhancing the conservation of old-growth forest and its associated ecological processes and biodiversity.

The Minister or designate has final authority on approval of a land acquisition by the Crown for the purposes of old-growth conservation. In the event the Minister deems that salvage logging is in the public interest following a large natural disturbance, the Regional Resource Manager, in consultation with the IRM Team and the Old-Growth Forest Coordinator, will search for and put under policy protection appropriate old-growth restoration opportunities in the ecodistrict should these not already be protected under this Policy.

5.3.2 Old-Growth Restoration Opportunities

In recognition of the fact that old-growth forest areas are rare on Crown forest land outside of legally protected areas, this Policy acknowledges the importance of recruiting younger forest areas of appropriate vegetation types into old-growth forest areas. There are three circumstances under which areas in the Old Forest Policy Layer, outside of legally protected areas, that are designated as old-growth restoration opportunities may legitimately be removed from the Layer and thus from policy protection:

- (a) the Government has approved a development project on such lands and therefore the areas can no longer serve as old-growth restoration opportunities;
- (b) a significant natural disturbance has killed most or all of the trees;
- (c) a forest stand that has little or no chance of developing into old-growth forest in the foreseeable future (e.g., a Norway spruce stand typed as red spruce).

If any of these circumstances prevails, the Regional Resource Manager and the IRM Team, in consultation with the Old-Growth Forest Coordinator, will search and seek protection for suitable replacement areas such that there is no net loss of old-growth restoration opportunity area in the Old Forest Policy Layer.

5.4 Permitted Activities

Activities that do not adversely affect the overall ecological integrity of old-growth forest areas protected under this Policy can be permitted. For example, hiking trails, signage, or existing OHV routes can be permitted following an IRM review.

Activities that take place more than 100 m from the edge of either a designated old-growth forest area or old-growth restoration opportunity will be deemed to have no effect on these areas unless the activities require an environmental assessment under the Environment Act in which case the findings of the assessment will prevail. Activities that are likely to have a large adverse impact on old-growth forest areas protected under this Policy will not be permitted within them except as per the provisions of section 5.3.1. If such activities are proposed to take place in areas protected under this Policy as old-growth restoration opportunities, they can be permitted only under the provisions of section 5.3.2. Activities proposed to take place on Crown land within 100 m from the edge of an old-growth forest area or old-growth restoration opportunity and that may adversely affect said areas will be assessed by the Regional Resource Manager, in consultation with the IRM Team and the Old-Growth Forest Coordinator, prior to a decision on approval.

5.5 Private Land Considerations

Private ownership of forest land in Nova Scotia, at about 63% of the total, far exceeds the amount of public forest land held by the Crown. The Department does not have authority to apply this Policy on privately owned land. However, it is recognized that old-growth forests on private land in Nova Scotia provide important social, ecological, and economic values beyond those provided by old-growth forest areas on Crown lands. In addition, private land may contain ecological values not available on Crown lands. Private landowners can contribute to old-growth forest conservation by voluntarily protecting portions of their forest property that meet the new definition of old-growth forest areas in Nova Scotia.

To further the conservation of private old-growth forest in Nova Scotia, the Department:

- commits to working with private landowners to explore mechanisms of support and encouragement for the conservation of old-growth forest on private land;
- will examine the feasibility of including old-growth forest as a priority criterion in its private-land purchase and conservation-easement programs;
- work with land owners about the opportunities to set aside Old Growth Forest areas in their 3rd-party forest certification management plans;
- will provide informative documentation and offer field-based workshops where landowners can learn to recognize old-growth forest and support its conservation and restoration, and provide information on funding programs and legislation that helps to encourage landowners to participate;
- will account for the conservation of known old-growth forest areas on private land in the reporting of old-growth forest conditions by ecodistrict across the province.

Identification of old-growth forest will only be undertaken with land owners' permission.

5.6 Recreational and Learning Opportunities

The Old-Growth Forest Coordinator will identify specific, readily accessible areas of old-growth forest across Nova Scotia and develop descriptive materials and interactive online tools for use by members of the public who might wish to visit such areas for recreational and learning opportunities.

The Old-Growth Forest Coordinator will develop educational learning materials for the public on old-growth forests and the diverse values and services they provide for Nova Scotians.

6.0 Monitoring, Reporting, and Policy Renewal

6.1 Monitoring

Monitoring programs and protocols will be designed and implemented to detect violations of the provisions of this Policy. A monitoring program will also be designed and implemented to track the condition of old-growth forest areas identified in the Old Forest Policy Layer.

6.2 Reporting

Responsibilities for reporting have been identified for the Old-Growth Forest Coordinator in

Section 3.2. The Old-Growth Forest Coordinator will periodically prepare an Implementation Status Report on Old-Growth Forest Conservation in Nova Scotia to be made publicly available.

6.3 Policy Renewal

This Policy will be reviewed, revised if necessary, and reissued no later than five years from the month and year of publication.

7.0 Supporting Documents to be developed by the Department

The following documents will be developed by the department after this Policy has been adopted: old-growth forest scoring protocol; old growth assessment PTA protocol; monitoring programs and protocols; private-land old forest accounting protocols; and other supporting documentation as needed.

8.0 References

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9.0 Appendices

9.1 Additional Definitions

Age-of-onset: This is a stand-level estimate of the minimum age-of-onset for species/ecosite combinations to enter an old-growth condition. Tree age is measured by counting annual rings on cores taken at breast height (1.3 m).

Basal Area: Area of the cross-section at breast height of one tree stem (m^2), or all stems in a hectare of forest (m^2/ha). A standard forestry measurement closely linked to tree stocking and crown closure.

Crown Closure: The proportion of available overstory space occupied by tree crowns.

Crown Land: All or any part of land under the administration and control of the Minister of Department of Natural Resources and Renewables (Forests Act, s 3(d)).

Ecodistrict: a subdivision of an ecoregion and the third level within the Nova Scotia Ecological Land Classification system (Neily et al., 2017). It is based on distinct assemblages of relief, geology, and landform.

Ecological Continuity: ecosystems (forests) for which there has been a continuity of ecological processes for long periods of time. Long and uninterrupted development in the absence of catastrophic disturbance fosters structural and species complexity, often marked by the presence of deep layers of humus or peat in the soil and a unique community of lichens and fungi that are sensitive to disturbance and require specialized microhabitats. Measures of ecological continuity are included in the forest scoring protocol.

Forest Groups: Groups of forest vegetation types with similar species composition, site conditions, and successional pathways as detailed in the Forest Ecosystem Classification Guide (Neily et al., 2013). These groups assist in the classification and presentation of unique vegetation types, also detailed in the Forest Ecosystem Classification Guide.

Forest Stand: A community of trees possessing sufficient uniformity in composition, age, arrangement, or condition to be distinguishable from the forest or other growth on adjacent areas, thus forming a silvicultural or management entity. Stands are defined and mapped in the department's forest inventory database (FID).

Integrated Resource Management (IRM): A planning and administration system used by the Department of Natural Resources and Renewables to integrate and balance the management of multiple resource values on Crown land.

Interior Forest: Forested area greater than 100 m from the forest edge. Many forest stands are too small to support species with large breeding territories such as birds like northern goshawks and blackburnian warblers. In addition, smaller forest areas with less interior do not provide the same environmental conditions as larger forest areas, such as higher humidity and complex vegetative structure, and small forest areas are more vulnerable to stand-initiating disturbances. Less structurally diverse and highly fragmented forests do not support the same diversity of plant and animal species that older forests with larger interiors support.

Legally Protected Areas: Clearly defined geographical spaces under long-term protection from all development and resource management through legal means.

Minister: Minister of Department of Natural Resources and Renewables (or designate).

Natural Disturbance: A disruption to the forest ecosystem caused by the action of natural forces (e.g., fire, insects, wind, landslides) occurring in a discrete event of sufficient intensity to significantly change forest structure and development.

Nova Scotia Forest Ecosystem Classification (FEC): The classification of Nova Scotia's forest ecosystems. It includes a separate classification of provincial soil types, ecosites, and vegetation types.

Nova Scotia Ecological Land Classification (ELC): A hierarchical classification of ecologically defined landscapes in Nova Scotia.

Old Forest Policy Layer: This is a publicly shared geodatabase of all the forest areas that are covered under this Policy and are set aside for long-term conservation.

Old-Growth Conditions: The ecological state of a mid- to late-successional forest group which is expressing quality attributes of old growth. Such attributes include dominant tree species and their contribution to stand composition, structural diversity, coarse woody material, signs of relatively low human disturbance, and tree age.

Policy Protection: Long-term conservation of old-growth forest areas and old-growth restoration opportunities and their associated functions, services, and values identified under the Policy.

Relatively Little Recent Human Disturbance: Forest stands with little or no recent human disturbance can be considered for classification as old-growth forest. Human disturbance includes recent forest management activities that have taken place in the last 30 years. Managed forest plantations are also not considered old growth.

Representation: describes the degree to which the range of natural ecosystem diversity is sustained in a naturally functioning, unmanaged state. The concept was originally introduced as a strategic component of protected areas planning, where the aim was to secure the range of ecosystem diversity within reserve systems. The overall goal is biodiversity conservation through protection of natural habitat diversity. It is employed as a coarse-scale ecosystem planning concept. Representation in this Policy is primarily assessed based on the amount of forest area in the Old Forest Policy Layer compared to Crown land forest cover for old-growth vegetation types and Nova Scotia's Ecological Land Classification.

Snag Trees: standing, dead trees, often missing a top and most of the smaller branches, that serve as habitat for many wildlife species.

Vegetation Types: Recurring and identifiable forest plant communities that reflect differences in site conditions and disturbance regimes as detailed in the Forest Ecosystem Classification Guide (Neily et al., 2013).

9.2 Old-Growth Forest Reference Ages

Old-growth forest age is assigned for each forest group (and associated FEC vegetation types) based on an estimate of the minimum age-of-onset of old-growth conditions. To determine the minimum such age, the Department considered published literature of old-forest community ages, published ages of the dominant tree species associated with the forest groups (and vegetation types), and local knowledge.

Table 9.2.1 Old-Growth Forest Community Comparisons from Other Jurisdictions

NS FEC Forest Group	NS FEC Vegetation Types	NS Old Growth Age-of-Onset	ON ^a General Species Association	ON ^a Old Growth Age-of-Onset (yrs)	Minnesota ^b Old-Growth Forest Types	Minnesota ^b Old Growth Age-of-Onset
Tolerant Hardwood	TH1, TH2, TH3, TH4, TH5, TH6, TH7, TH8	140	Hard Maple Yellow Birch Red Oak	120-140 150-160 110-120	Northern Hardwood Forests	120
Spruce-Hemlock	SH3, SH4, SH5, SH6, SH7	125	White Spruce	110-130	White Spruce Forests	90
Spruce-Hemlock	SH1, SH2	140	Hemlock	140-180	n/a	
Mixedwood	MW1, MW2, MW3	125	Yellow Birch Soft Maple Hemlock	150-160 80-120 140-180	Oak Forests	120
Spruce-Pine	SP4, SP5, SP7, SP9	125	White Pine Black Spruce	130-150 90-150	Red and White Pine Forests ^c	125
Cedar	CE1	110	White Cedar	100-150	Upland White Cedar Forests	120
Wet Coniferous	WC1, WC2, WC5, WC8	100	Black Spruce	90-150	n/a	
Coastal	CO1, CO4	100	Black Spruce Balsam Fir	90-150 70-80	n/a	
Coastal	CO3, CO5, CO6	125	White Birch Soft Maple	90-110 80-120	n/a	
Highland	HL1, HL2	100	n/a		n/a	
Highland	HL3, HL4	140	Yellow Birch	150-160	n/a	
Wet Deciduous	WD3, WD4, WD6, WD8	115	Soft Maple	80-120	Lowland Hardwood Forests	120
Floodplain	FP1, FP2, FP3	125	Hard Maple Soft Maple Red Oak	120-140 80-120 110-120	Lowland Hardwood Forests	120
Karst	KA1, KA2	125	Hemlock	140-180	n/a	

^a - Uhlig et al. (2001)

^b - Minnesota DNR (2021)

^c - Minnesota DNR (1989)

Table 9.2.2 Maximum longevity for dominant tree species associated with the forest groups (and vegetation types) included in Nova Scotia's old-growth forest definition.

Tree Species	Literature Max age ^{ab}	Literature Max age – 50%	L&F database max age ^{cde}
Eastern Hemlock	800	400	520
Red Spruce	400	200	335
White Pine	450	225	288
Black Spruce	250	125	277
Black Spruce Coastal	250	125	150
Balsam Fir	150	75	160
Sugar Maple	400	200	276
Yellow Birch	366	183	370
Red Oak	400	200	205
Red Maple	300	150	188

^a– Burns and Honkala (1990).

^b– Loehle (1987).

^c– Lands and Forestry Permanent Sample Plot Database

^d– Lands and Forestry Forest Ecosystem Classification Plot Database

^e– Lands and Forestry Old-Forest Research Plot Database