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The Oldest Trees in the Maritimes - A Stand Analysis

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Abstract

The Nova Scotia government is committed to conducting old growth forest research to improve the current understanding of these ecosystems. Through this research, two exceptionally old eastern hemlocks (*Tsuga canadensis*) were discovered. A dendrochronological examination confirmed that these trees were 532- and 533-years-old and are the oldest trees found in the Maritimes. Further research was conducted in this stand to provide insight into past disturbance agents, help confirm the successional pathway, and allow for comparisons to other Red Spruce/Eastern Hemlock forests in the Maritimes. From the data collected, it is apparent the stand has an uneven-aged structure with multiple cohorts of red spruce and eastern hemlock ranging in age from 30 – 533 years old. The presence of uneven-aged structure and analyses of the 532- and 533-year-old core samples suggest that the stand has not been subjected to a full stand replacing event in several hundred years. The dynamics of the deadwood decay and core increment growth patterns suggests that low- to mid-scale disturbances have contributed to the succession of the stand. Based on the current structure and regeneration, it appears the stand is continuing succession as a Red Spruce/Eastern Hemlock vegetation type (SH3). When compared to other old-growth SH3 forests that do not contain 500+ old trees, there were no noticeable differences in structural values. Future research should focus on other ecological characteristics, such as herbaceous and bryophyte diversity and habitat, to understand if this stand has unique ecological values compared to other Red Spruce/Eastern Hemlock stands.

Introduction

The Government of Nova Scotia is committed to conserving all remaining old-growth forests on public land, as stated in the 'Old Forest Policy' (NSDNRR, 2022). Currently, the province defines an old-growth forest area as an area where 20% or more of the basal area is in trees greater than or equal to the reference age for that vegetation type (Appendix A). An 'old forest scoring' procedure has been designed to identify forest stands that meet this definition (Stewart et al., 2003). All stands identified as old growth are entered into the 'Old Growth Forest Policy Layer' (NSDNRR 2022) and are protected from future forest management and other industrial activities.

To improve our understanding of old-growth forests in Nova Scotia, NSDNRR is committed to conducting old forest research projects across the province. In August 2021, specific stands were selected for assessment as part of an on-going research project of the Forest Research and Planning group. The identified stands are located southeast of Panuke Lake in Halifax County (Fig. 1). They are situated in the St. Margaret's Bay ecodistrict (780), which is characterized by well drained soils that have developed from glacial till and a cool, moist climate (Neily et al., 2017). Acadian Tolerant Softwood forests dominated by red spruce (*Picea rubens)*, eastern hemlock (*Tsuga canadensis*), white pine (*Pinus strobus*), and yellow birch (*Betula alleghaniensis*) occupy the zonal sites of this ecodistrict during late stages of succession (Neily et al., 2017). Strong winds from hurricanes and other windstorms influence this forest because of its geographic location and proximity to the ocean (Neily et al., 2017). Other infrequent disturbances have also shaped the forest, including fire and insect outbreaks (Neily et al., 2017; Taylor et al., 2020).

The 2021 research team collected the old forest scoring data for these stands (Appendix B). After mounting and aging the tree cores, it was discovered that one of the eastern hemlock trees was over 500 years old. The core was sent to Benjamin Phillips (Director of the Acadian Forest Dendrochronology Lab, Mount Allision University) and the age was determined to be 532 years (Phillips, 2021). Based on current inventory (RMTRR, 2021), Phillips confirmed that the tree was the oldest recorded in the Maritimes. Additional research plots were conducted in the stand and a second old hemlock was discovered. The age of this tree was determined by Phillips to be 533 years.

The stand containing the old trees is 4.3 ha and is classified through the Forest Ecosystems Classification guide (FEC) as a Red Spruce/Eastern Hemlock/Wild-lily-of-the-valley vegetation type (SH3; Neily et al. 2013). The stand is surrounded by an additional 28.3 ha of intact Spruce/Hemlock forest (Neily et al. 2013; NSDLF, 2020). Based on the old forest scoring data (Appendix B), it is evident that this area of forest encompasses numerous mature stands that are contributing to a matrix of varying ages and structural conditions. The area was previously identified as 'old forest' by the Bowater Mersey Paper Company Limited and set aside for long-term conservation. The lands were later purchased by the province and the stands were formally entered in the Province's Old Forest Policy Layer (NSDNRR, 2022).

The purpose of this technical note is to analyze regeneration, cohort, and structural attribute data collected from the stand containing this old tree. The results of this analysis will provide insight into past disturbance agents, help assess successional pathways, and allow for comparisons to other Red Spruce/Eastern Hemlock forests in the Maritimes.

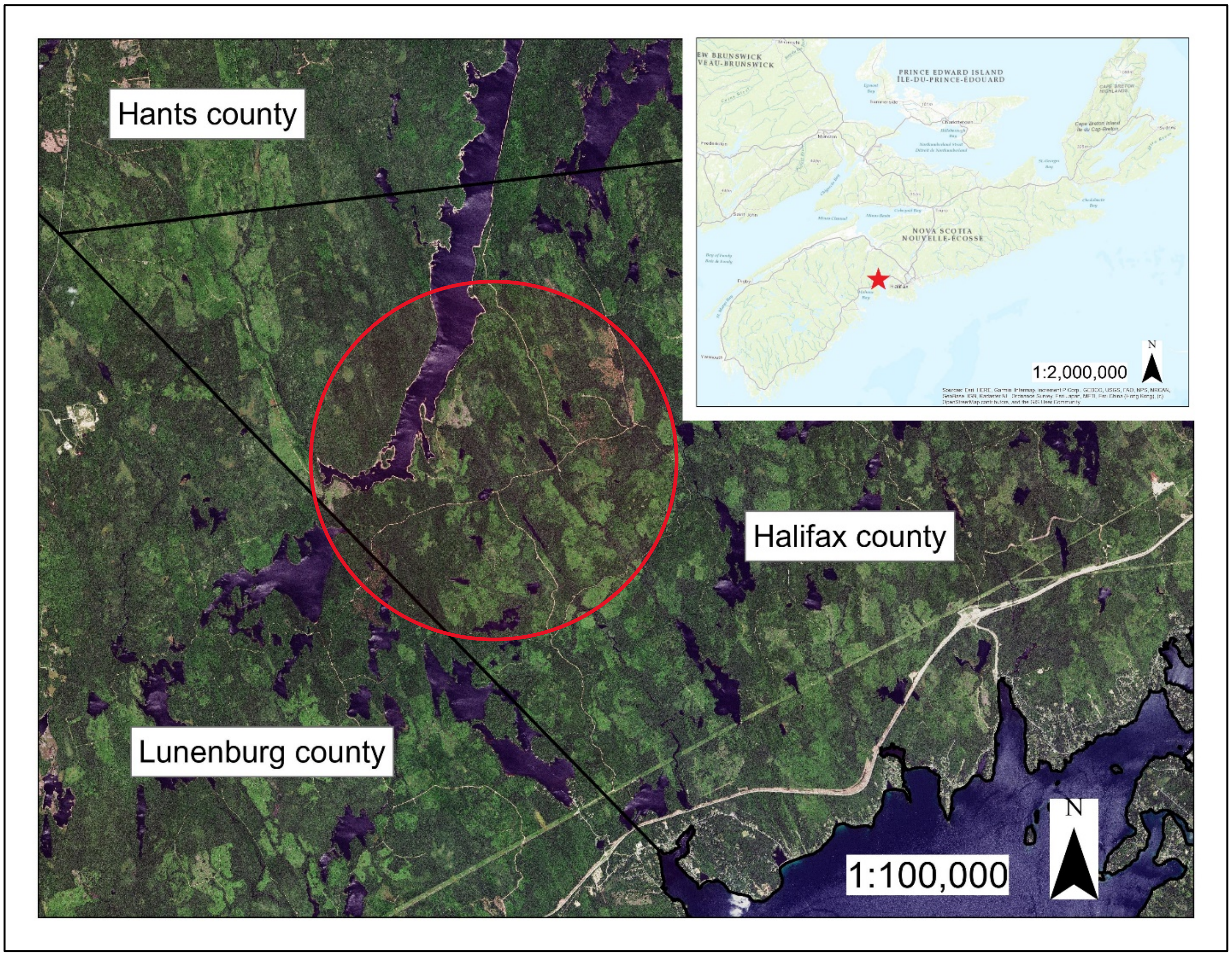

Fig. 1. Map outlining the counties and approximate area where the stand containing the old trees is located. The exact location is not disclosed to conserve the integrity of the stand.

Methods

Old forest research plots were established at the original plot locations within the stand containing the oldest tree. At the research plots, every tree is measured and aged, resulting in finer-scale stand characteristics being captured compared to the scoring plots. A prism of basal area factor 2 was used to conduct a variable-radius plot sweep to obtain the basal area (m^2/ha) and tree density (#/ha) at each plot centre. All live and dead trees (> 10 cm diameter at breast height (DBH)) captured in the plot were assigned a unique identification, and had species, status (live or snag), DBH (to the nearest 0.1 cm), and height (to the nearest 0.1 m) recorded. Heights were obtained using a sonic Vertex IV hypsometer (Haglof, Sweden). All trees were cored with an increment borer at breast height (1.3 m) to obtain an age. Samples were not collected when the trees were hollow or contained heart rot. Each core was mounted on boards, sanded, and aged by counting growth rings under a microscope. For standing dead trees (snags), the height and DBH were measured through the same methods as live trees, with the top stem diameter visually estimated to the nearest 1.0 cm to obtain snag volume (m^3/ha). The decay class, which was determined based on Stewart et al. (2003) modified decay classes, was also recorded for each snag (Appendix C). The decay classes ranged from being recently dead (Class 1) to in an advanced stage of decay (Class 4). Information regarding the regeneration layer was also collected within a 5.16-m-radius fixed-area plot. Stems > 30 cm in height and < 2 cm DBH were tallied based on species.

Any snag > 45° lean from vertical was considered downed and was tallied as downed woody material (DWM). A fixed 90-m triangular transect was used to obtain DWM volume (m^3/ha). DWM > 10 cm encountered along the transect was measured in terms of diameter at point of intersection, species, and decay class. DWM decay classes ranged from recently dead (Class 1) to advanced stage of decay but not yet part of soil (Class 5).

Results

Regeneration

Red spruce was the most abundant species in the regeneration layer, accounting for 44% of total density (stems/ha). Red maple (*Acer rubrum*) was second most abundant, comprising 32% of stems/ha, while balsam fir (*Abies balsamea*) and eastern hemlock comprised 16% and 8% respectively. Overall, the density of the regeneration layer was 6333 stems/ha. Plot 2 had the highest regeneration density value with a total of 14100 stems/ha, compared to plots 1 and 3 which had 3900 stems/ha and 1000 stem/ha respectively (Fig. 2).

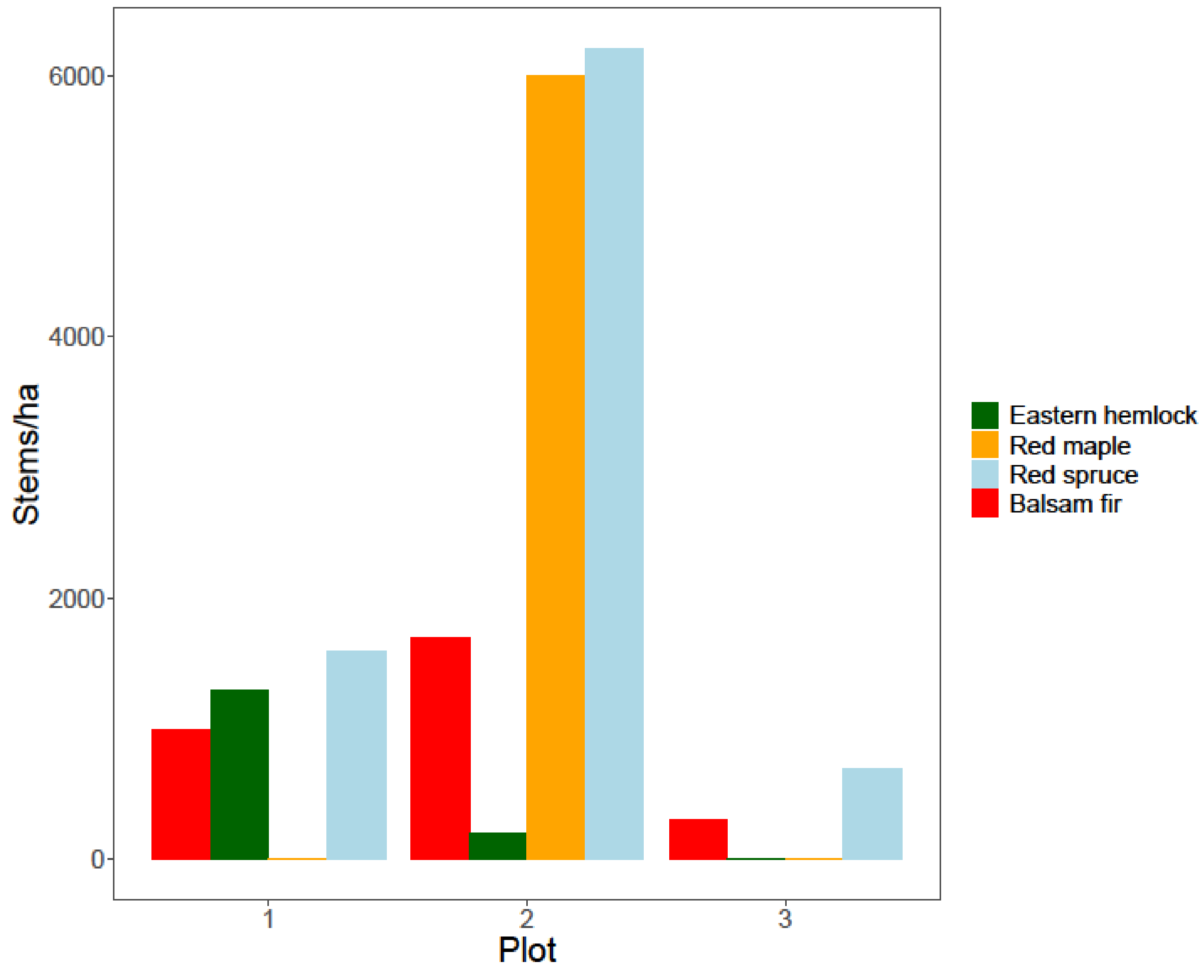

Fig. 2. Plot-level data of regeneration stems >30 cm in height and < 2cm DBH.

Cohort analysis

In total, 72 live trees were cored at breast height. Due to heart rot, eight trees (one white pine, two red spruce, and five eastern hemlock) could not be sampled. The age distribution based on stems/ha is right-skewed, with the majority of stems in the younger age classes and considerably fewer in the older age classes (Fig. 3). Trees ranged in aged from 30-years to 533-years old. The DBH of the 532-year and 533-year old trees were 51.1 cm and 78.7 cm and the heights were 18.5 m and 26.4 m respectively.

A right-skewed age distribution is also evident when basal area is organized into 100-year age categories (Fig. 3). Eastern hemlock had the most basal area of trees under 100 years old, accounting for 56% of the total. Red spruce was the second most abundant followed by balsam fir. In the next two age categories (100 – 199; 200 – 299), red spruce accounted for most of the basal area, comprising 71% and 53% respectively. In total, 66% of the total stand basal area was within these two age categories. Eastern hemlock was the only species that was measured as being over 300 years old. Hemlocks over 300 years old accounted for 20% of the total stand basal area (Fig. 3). Plot 2 had no trees older than 300 years, and exhibited a distinct cohort of red spruce at approximately 100 years old (Fig. 4).

In all three plots, a cohort of red spruce established under a mixed canopy of red spruce and eastern hemlock and obtained space in the overstory. Trees that were 17 m or taller accounted for 86% of the basal area (Fig. 4). There was also younger cohorts of eastern hemlock, red spruce, and balsam fir below the overstory canopy (< 17 m). In general, the oldest cohorts (> 300 years) were situated in the bottom portion of the upper canopy (Fig. 4).

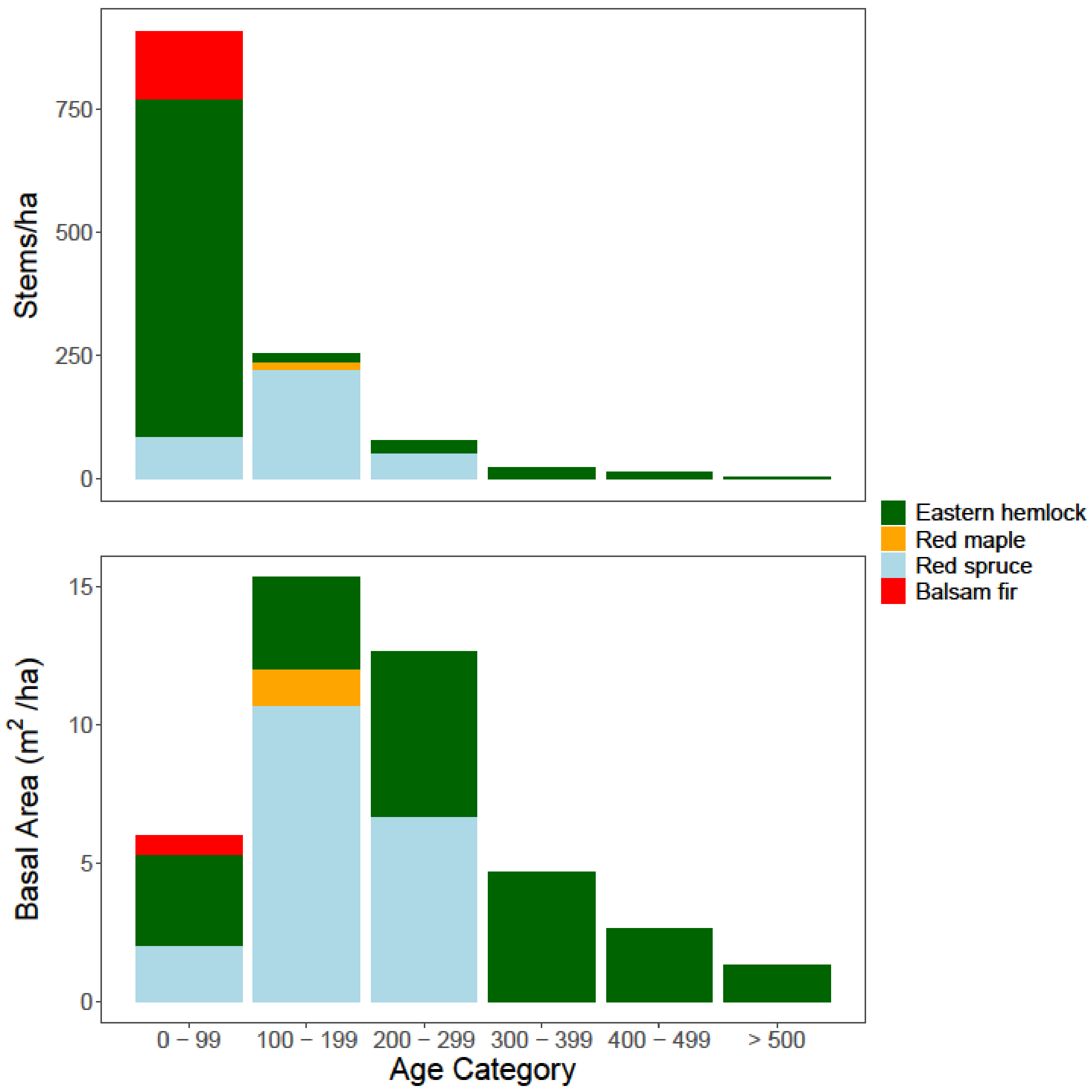

Fig. 3. Stand age distribution based on density (stems/ha) and basal area (m^2/ha) of trees > 2cm DBH and grouped into 100-year age categories.

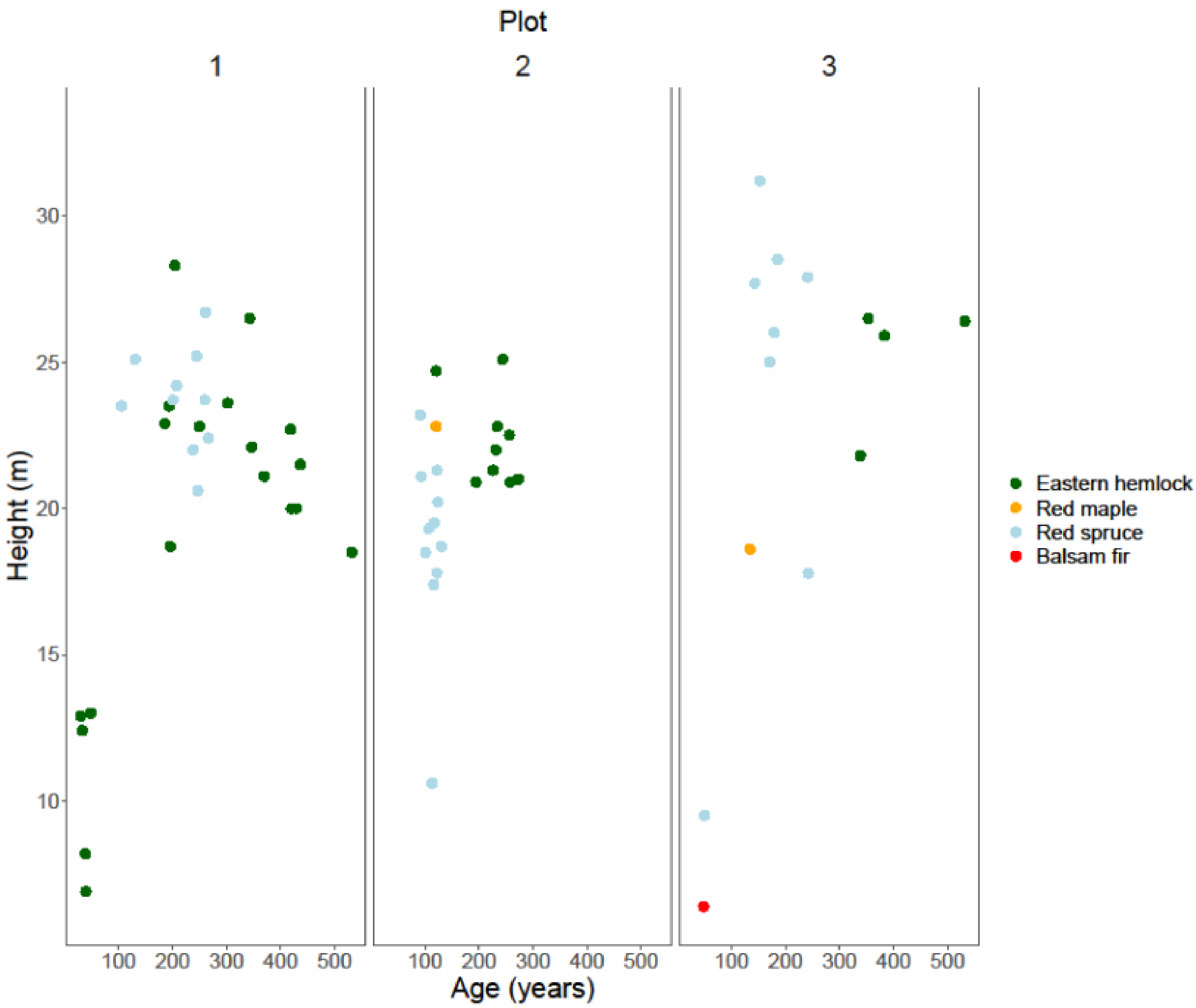

Fig. 4. Tree ages and canopy position for all trees with a countable core at each plot.

Stand structure

Stand-level values were determined by averaging the structural attributes from each of the three plots (Table 2). At each plot, eastern hemlock and red spruce were the two dominant species. Overall, eastern hemlock accounted for 50% and red spruce 43% of the species basal area composition. White pine (2%), red maple (3%) and balsam fir (2%) comprised the remaining species composition. Large live trees were present at each of the plots, with an average DBH of 42.1 cm (+/- 18.6 cm) and average height of 21.4 m (+/- 5.6 m) across the stand. Live tree density and basal area were highest in the plot 1, contributing to a stand average of 1295 stems/ha and 47.7 m^2/ha. DWM volume was relatively consistent across each of the plots, averaging 69.5 m^3/ha. Snag volume varied, with plot 1 having the least amount (7.0 m^3/ha) and plot 3 the highest (85.6 m^3/ha).

Table 2. Plot- and stand-level values of structural attributes

Plot #	Age (mean)	Age (+/-)	DBH (cm)	Height (m)	DWM volume (m^3/ha)	Snag volume (m^3/ha)	Snag density (stems/ha)	Live density (stems/ha)	Basal area (m^2/ha)
1	241	135.4	42.2	20.8	54.9	7.0	12.8	2346	58
2	162	65.9	40.8	20.5	75.9	50.4	89.3	723	48
3	225	135.3	43.2	22.8	77.8	85.6	87.4	815	38
Avg.	209	112.2	42.1	21.4	69.5	47.7	63.2	1295	48

Deadwood decay classes

The DWM volume across the three plots equaled a mean total of 69.5 m^3/ha (Table 2; Fig. 5). Decay class 1 and 3 accounted for the most DWM volume with 20.6 m^3/ha and 19.3 m^3/ha respectively. Decay class 2 and 5 also had similar values (12.3 m^3/ha and 11.2 m^3/ha), with decay class 4 accounting for the least amount of volume (6.1 m^3/ha). Across all five decay classes, the accumulation of DWM volume was relatively even, with no decay class containing the majority of total volume. The average diameter of DWM was 22.5 cm (+/- 11.6 cm). Red spruce accounted for 41% of the species tallied, with 32% classed as unknown (too decayed to identify), and 27% eastern hemlock.

Mean snag DBH was 47.2 cm (+/- 10.1 cm), resulting in an estimated mean snag volume of 47.7 m^3/ha (Table 2). The snag decay-class distribution was disproportional, with 91% of total snag volume in decay class 2 (43.2 m^3/ha), 7.3% (3.5m^3/ha) in decay class 3, 2% (1.0m^3/ha) in decay class 4, and no volume tallied in decay classes 1. Red spruce comprised 96% of total snag volume and two eastern hemlock snags were tallied, which accounted for the remaining snag volume. One hemlock snag contributed to 2% of decay class 2 volume and the other was the only snag classified as decay class 4.

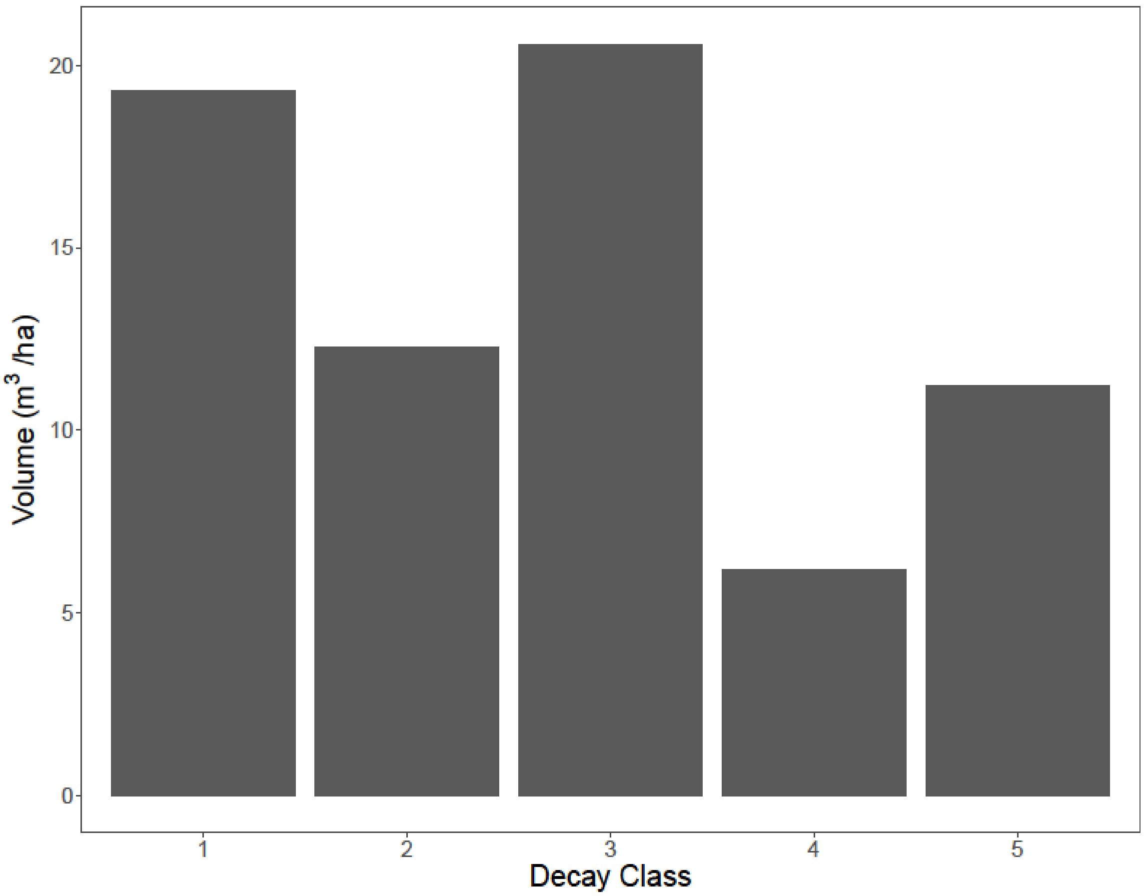

Fig. 5. Mean DWM decay-class volume (m^3/ha) from the three surveyed plots.

Discussion

Successional dynamics

Forest stands are generally understood to develop structurally either as even-aged/single-cohort or as uneven-aged/multi-cohort (Oliver & Larson, 1996). The age distribution of a stand, which typically associates the stems/ha with the respective tree age, is indicative of the stand structure. Even-aged structures are defined as those having a symmetrical, unimodal, bell-shaped, or bimodal age distribution, while uneven-aged structures exhibit a skewed distribution (Oliver & Larson, 1996; Kershaw et al., 2017; Martin et al., 2018). The stand surveyed in this study had a right-skewed age distribution, which suggests an uneven-aged structure (Fig. 3). Within the age structure, cohorts of red spruce and eastern hemlock were evident (Fig. 4). The oldest trees, which can be seen at the far right of the age distribution in Fig. 3, were all eastern hemlock. In each plot there was a distinct cohort of red spruce occupying the upper canopy with older hemlocks (Fig. 4). The stand’s regeneration layer had an average of 6333 stems/ha, with red spruce and red maple contributing the majority of stems (Fig. 2). However, the abundance of red maple in the regeneration layer was not translating to an intermediate or mature cohort of red maple. Instead, eastern hemlock and red spruce dominated the < 100-year cohort (i.e. intermediate cohort). Therefore, the forest appeared to be successionally continuing as a Red Spruce/Eastern Hemlock/Wild lily-of-the-valley (SH3) vegetation type (Neily et al., 2013).

The regeneration and cohort data indicated that red spruce was regenerating and establishing itself in the overstory (Fig. 4), but not living as long as the eastern hemlocks (Fig. 3). Although eastern hemlock and red spruce comprised a similar proportion of the stand basal area, only the hemlocks were found to be over 300 years old. Red spruce accounted for the highest amount of total DWM including 96% of the snag volume, providing further evidence that red spruce is dying more frequently than eastern hemlock, resulting in a continuous rotation of red spruce establishing and dying amongst a longer-lived eastern hemlock canopy.

Past disturbances

Based on Phillips' (2021; 2022) dendrochronological confirmations of the 532- and 533-year-old eastern hemlock cores, it was evident that the eastern hemlocks had very slow early growth and did not experience a release of radial growth for the first 150 years. This indicates that the trees lived in the understory of a closed canopy and the time since a stand initiating disturbance, such as a severe fire, is longer than the age of the trees. When comparing the two trees' radial growth, it is evident that the trees did not always experience an increase in growth at the same time. This suggests that disturbance events do not always affect the stand uniformly. This observation is confirmed when assessing the plot level cohort data. Particularly in plot 2, there are no trees older than 300 years and a distinct cohort of red spruce that established approximately 100 years ago is present. Red spruce is understood to have a reduced longevity compared to eastern hemlock and is susceptible to natural disturbances such as spruce bark beetle infestations and low to high severity wind events (Fraver & White, 2005; McGrath et al., 2021). The spruce bark beetle typically enters the uninjured bark of dying or living trees that are stressed from a previous natural disturbance, particularly windfall (Ostaff & Newell, 1981). When numerous, they can readily attack any living, healthy spruce tree and will infest the largest trees (Ostaff & Newell, 1981). The combination of wind events and spruce bark beetle infestation are likely factors contributing to the cycle of red spruce mortality and release of the hemlocks' radial growth. However, the emergence of a defoliating insect (hemlock woolly adelgid, *Adelges tsugae*) in western Nova Scotia poses a threat to the hemlock trees and may affect the cohort dynamics and future succession of this stand.

Temporal patterns of deadwood and the distribution of decay classes have also been studied to understand the scale of disturbance (Spies et al., 1988; Sturtevant et al., 1997; Brassard & Chen, 2006; Campbell & Laroque, 2007; Edman et al., 2007). However, the examination of DWM is dependent on the decay rate of deadwood in an ecosystem, which is influenced by species, size, site conditions, and climate (Harmon & Hua, 1991; Sturtevant et al., 1997). Under average conditions in Nova Scotia, mature spruce logs typically take 50 – 100 years to fully decay (Campbell & Laroque, 2007; Edman et al. 2007). Therefore, the temporal dynamics of deadwood in this stand, which is mainly comprised of spruce, can be understood for approximately the past century. An even distribution of DWM across the five decay classes is indicative of mortality occurring across broader time scales and is a result of multiple mortality events. An uneven distribution suggests mortality occurred across a shorter time frame and more likely from a single disturbance event (Spies et al., 1988; Delong & Kessler, 2000; Jonsson, 2000; Karjalainen & Kuuluvainen, 2002). In the surveyed stand, the DWM volume was relatively evenly distributed across all five decay classes (Fig. 5). Although decay class 4 had the least volume, none of the decay classes accounted for the majority of DWM volume. The size of deadwood was similar across the stand and was mainly comprised of red spruce, resulting in the decay pattern not being greatly influenced by variation in species or size. The decay pattern further suggests that mortality of red spruce is not the result of a single event but rather more consistent inputs from numerous small events or the loss of individual trees over time.

MacLean et al. suggest the return intervals for low (5 – 30 % mortality), moderate (30 – 60 % mortality), and high (> 60% mortality) severity natural disturbances to be 40 years, 294 years, and 164 years respectively for the 'Acadian Tolerant Softwood' PNV. Since only 20% of the basal area in the stand is over 300 years old, it is possible that this stand was subjected to disturbances at similar intervals, with a few older hemlocks surviving each disturbance. The cohort analysis suggests the stand has been subjected to multiple disturbances of varying severities, which have created space for established trees to grow and the regeneration layer to be released.

Stand structure

Previous research identified structural conditions such as large live and dead biomass and increased structural complexity as being indicative of forests in the old-growth stage of development (Mosseler et al., 2003; Franklin & Van Pelt, 2004). Structural complexity is understood as the heterogeneous diversity of structural attributes both vertically and horizontally across the landscape (Franklin & Van Pelt, 2004). Although these features are not characteristic of all vegetation types, such characteristics are present in Nova Scotia's Red Spruce/Eastern Hemlock stands (Mosseler et al., 2003; Stewart et al., 2003; Pesklevits, 2006). Particularly in the surveyed stand, the standard deviation for DBH (+/- 18.6 cm) and height (+/- 5.6 m) values were relatively high, which suggests high structural variability. The variability of deadwood sizes also suggests that site-specific disturbance processes unrelated to stand age induce mortality that can target different size categories (Pesklevits, 2006). The high structural variability typically indicates the presence of multiple cohorts and the transition to the old-growth stage of stand development (Oliver & Larson, 1996). Based on the high variation of tree structures and uneven-aged distribution, it is evident that the surveyed stand is in the old-growth stage of development.

In Nova Scotia, age and structural characteristics of Red Spruce/Eastern Hemlock forests have been previously examined (Mosseler et al., 2003; Stewart et al., 2003; Pesklevits, 2006). In these studies, the presence of a variety of stem sizes, including large lives stems ≥ 30 and 40 DBH, was indicative of an older site. While an increase in DBH as stands age was observed, DBH values leveled-off when stands exceeded 150 years. The surveyed stand confirms this observation, with the average DBH being similar to younger old-growth stands. At this stage in stand development, the stand is understood to be in a steady state condition, which is characterized by tree diameter and species composition remaining constant due to small-scale stand disturbances (Runkle, 2000; Mossler et al., 2003). Although tree height is also understood to increase with stand age, site productivity and the species traits do limit growth and will inhibit trees from increasing their growth exponentially (Pesklevits, 2006; Rossi et al., 2009). Basal area and stem density values typically decrease with stand age because of stem exclusion, resulting in the presence of fewer but larger trees (Oliver and Larson, 1996). Although basal area was slightly lower and live tree density was higher than the values obtained in previous studies, these differences do not appear to be notably different and could be the result of sampling technique. The surveyed stand also had similar mean values for DWM volume (69.5 m^3/ha), and snag volume (47.7 m^3/ha) compared to previously studied sites in Nova Scotia. The similarities confirm the presence of an abundance of deadwood, including larger logs and snags, as typical characteristics of old-growth SH3 forests (Mosseler et al., 2003; Stewart et al., 2003; Pesklevits, 2006; Appendix D).

Conclusion

The stand in this study exhibited uneven-aged structures and multiple cohorts of red spruce and eastern hemlock. The presence of uneven-aged structure and the dendrochronological analysis of the oldest core samples suggest that the stand has not been subjected to a full stand replacing event in several hundred years. The lack of large disturbances has allowed 20% of the stand basal area (all eastern hemlock) to exceed 300 years old, with some trees reaching record ages of 532 and 533 years. Based on Phillips' dendrochronological analyses and the even distribution of DWM decay class volume across all plots, it is apparent that the stand has been subjected to frequent low to moderate severity disturbance events. From the cohort and deadwood data, it is also evident that red spruce is establishing and dying amongst a longer-lived eastern hemlock canopy. Although red spruce appeared to have a shorter life span than the eastern hemlock, the regeneration and < 100 years cohort data suggest that both species will continue to dominate the stand, resulting in the stand continuing as a Red Spruce/Eastern Hemlock/Wild lily-of-the-valley vegetation type (SH3). However, specific disturbance agents, such as hemlock woolly adelgid, could threaten the cohort dynamics and future succession of the stand. The majority of structural attribute values were similar to younger aged old growth SH3 stands in Nova Scotia. Although old growth SH3 stands exhibit unique age and structural features compared to stands in an earlier stage of stand development, these conditions do not require having trees older than 500 years. Future research should focus on other ecological characteristics, such as herbaceous and bryophyte diversity and habitat, to understand if this 'oldest tree' stand has unique ecological values compared to other Red Spruce/Eastern Hemlock stands.

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Appendix A: Old-Growth Forest Area Definitions from the Old Growth Forest Policy for Nova Scotia (NSDNRR, 2022).

FEC Forest Group[a]	FEC Vegetation Types[a]	Old-Growth Minimum Tree 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	100
Wet Deciduous	WD3, WD4, WD6, WD8	115
Floodplain	FP1, FP2, FP3	125
Karst	KA1, KA2	125

[a] (Neily et al. 2013)
[b] Minimum age threshold as defined in Nova Scotia's Old Growth Forest Policy (2022).
[c] Eastern white cedar is listed as vulnerable under the *Endangered Species Act* of Nova Scotia.

Appendix B: Old forest scoring data from the forest surrounding the old stand studied in this report.

Stand #	Hectares	Age (years)	Height (m)	DBH (cm)	Basal Area (m^2/ha)	DWM (m/ha)	Snags (m/ha)
1*	4.3	150	21.0	49.3	52.0	2015.7	880.3
2	4.6	208	21.6	57.0	43.0	2913.3	904.6
3	1.7	199	22.0	47.1	34.0	786.0	0.0
4	5.5	135	21.6	55.2	50.0	2490.7	918.7
5	11.6	165	19.1	51.3	29.0	1849.3	626.7
6	5.0	138	21.6	44.3	39.0	1814.7	68.0

* Stand in this report

Appendix C: Stewart et al. (2003) modified decay classes based on Sollin (1982).

Decay Class	
I	Freshly dead, bark intact, branches intact (including small), needle/leaf retention, bole sound, bole raised off group on branches.
II	Beginnings of decay but rot not well established in wood that was sound at time of death. Bark mostly intact, branch stubs, bole not raised on branches, bole mostly sound.
III	Rot becoming established but sound at core. Bark loose and mostly flaked off, bole beginning to rot but maintaining structural strength – round, straight, not sinking into ground
IV	Advanced decay. Bark mostly absent, bole mostly decayed with little or no sound wood present. Colonized with vegetation. Lacking structural strength – bole oval and bending to shape of ground. Last stage for snag, which will be rotted, wobbly, and could be easily pushed over.
V	Rotted through, becoming humus. Sunken into mound on the ground, but retaining a woody character, not yet part of the soil

Appendix D: Comparison of mean values of structural attributes from other studied Red Spruce/Eastern Hemlock stands and the stand studied in this report.

Reference	# of Stands	Stand Age (years)	DBH (cm)	Height (m)	DWD volume (m^3/ha)	Snag volume (m^3/ha)	Live density (stems/ha)	Basal area (m^2/ha)
Mosseler et al. (2003)	6	146[a]	44	24	NA	NA	NA	NA
Stewart et al. (2003)	1	164[b]	36.9	24.0	91	40	1054	55.0
	1	214[b]	40.5	23.4	71	57	1195	58.3
Pesklevits (2006)	15	>250[a]	31.6	NA	68	NA	773	52.3
	17	150 – 250[a]	30.0	NA	44	NA	777	48.5
Stand in this report	1	209[c]	42.1	21.4	69.5	47.7	1295	48.0

[a] Mean age of 12 – 18 trees dominant or co-dominant selected per stand
[b] Mean age of 5 – 10 trees with the smallest diameter (±5cm) composing the largest third of basal area.
[c] Mean age of all trees measured