Old Forest Assessment - Procedures Version 1.5 March 26, 2024

Plot Selection:

Old forest assessment plot selection is completed based on a random selection of points within forest inventory stands (polygons). Assessment will normally only be completed on forest inventory stands of >= 1 ha. The following number of plots are recommended based on the area of the inventory polygon:

Stand Size	Plots to be Sampled
1-5 ha	3 Plots
5-10 ha	5 plots
10+ ha	Plot per 2 ha, max. 10 plots

Plots are meant to be representative but randomly placed, and therefore generally represent the stand. In the field, if the random plot is not representative of the predominant stand conditions – such as wet areas (poorly drained soils, vernal pools, springs, small streams), small inclusions (of clearly different species mix), rock outcrops, etc. or anthropomorphic disturbances – such as roads, trails, landings, boundary lines, or any small, harvested area included within a larger stand; plots should be moved to another area in the stand randomly chosen in the field (either from a pre-chosen list or moved randomly approximately 25 m to avoid to not representative occurrence). Plots should also be selected to be at least 20 m from the edge of the stand boundary.

Plot Measurements:

1. Use a 2 BAF prism sample to tally live trees by species in 2 cm dbh classes.

2. During the prism sample, tally all snags that have a dbh $\geq$ 20 cm in 2 cm classes. Estimate the top diameter and height.

3. Measure the age of one tree at each plot. If you are in a stand that is only 1-2 ha, sample at least 3 trees even if you only complete 1 or 2 plots. The tree selected to age should be from the most dominate LIT/LT species in the plot and should be representative of the top 20% of the basal area. If the identified tree is not a late-successional species or is rotten, select another tree in the plot (or near the plot but still in the stand) that is late successional and is the same diameter class or slightly larger.

In some rare cases it may be necessary to core a none LIT /LT species. This may be the case if conducting a plot in an early successional vegetation type, or in a mid to late successional vegetation type with a cohort of non-LIT/LT species which comprises most of the basal area.

4. Establish three 20-metre line transects in a triangular shape (see example below) at each plot to determine the length of downed tree bole (m/ha) by diameter class. Tally each piece of wood intersected by the transect under the diameter classes corresponding to the diameter of the bole at the point of intersection. For example, a tree bole with a diameter of 42 cm at the point where it is crossed by the transect line will be given 1 dot tally under each of the ≥20 cm, ≥30 cm, and ≥40 cm classes.

Note: A dead tree is considered to be a snag if it is standing at 45 degrees or more from horizontal, in which case it will be sampled using the prism plot. If it is laying horizontally at less than 45 degrees, it is considered "downed" and will be measured using the line transect plot. All deadwood is sampled regardless of its state of decay and length.

5. Record Primal Value (document date of previous harvest if known), Crown Closure, Understory Structure, and Presence of Old-Growth Ecological Features and score based on visual assessment after completion of cruise.

6. List the most appropriate FEC vegetation type (Neily et al. 2022).

Stand Level Assessments

If more than 30% of the plots in a stand are represented by vegetation types that are eligible to be considered old growth, the lowest reference age of these will be used for the stand. If less than 30% of the plots are vegetation types eligible to be considered old growth, the stand will not be considered old-growth forest.

Stand age should be assessed starting with the average and the variance of the plot ages. One very old plot or very young plot should not be used the determine if the stand is old-growth or not. Large variances in vegetation types (i.e., distinct boundaries between forest groups) and ages can be used to consider splitting a stand. Stand splitting can only be considered with consultation with the regional forester. Each portion of a stand split must be at least 1 ha in area (ideally at least 2 ha).

When determining the old growth score for categories that have measured and calculated values (tree age, live stem density and volume of deadwood), the score is based on the stand level averages for each category. The final score is not an average of the scores for each plot. For categories that are based on observations (human disturbance, overstory crown closure and ecological features), the final score is the highest score obtained at any plot.

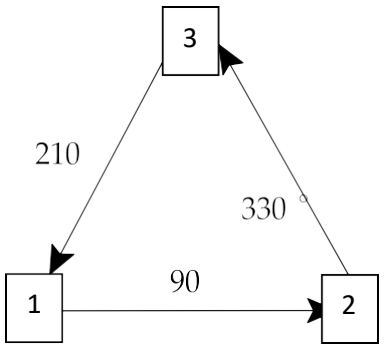
If you have any questions about the procedures, or if the determination of Old-Growth forest is not obvious based on the information collected, or is close to the threshold, please consult Peter Bush, Old-Growth Forest Coordinator, peter.bush@novascotia.ca

Old-Growth Vegetation Types and References Ages

Forest Group	Vegetation Type	Old - Growth Reference Age
Tolerant Hardwood	TH1, TH2, TH3, TH4, TH5, TH6, TH7, TH8, TH9	140
Spruce-Hemlock	SH3, SH4, SH5, SH7	125
Spruce-Hemlock	SH1, SH2	140
Mixedwood	MW1, MW2, MW3, MW4, MW11, MW13	125
Spruce-Pine	SP4, SP5, SP7, SP8	125
Wet Mixedwood	WM1, WM2	115
Wet Coniferous	WC1, WC2, WC5, WC8, WC10	100
Coastal Boreal	CB1, CB3	100
Coastal Acadian	CA1	125
Highland	HL1, HL2, HL6	100
Highland	HL3, HL4	140
Wet Deciduous	WD3, WD4,	115
Floodplain	FP1, FP2, FP3	125
Karst	KA1, KA2, KA3	125

(Neily et al., 2022)

Line-transect plot layout diagram for CWD measurement



Top 20% Basal Area Tree to Sample

TREE TO AGE	
TOTAL TREES*	**Top 20% Tree**
< 11	2
11 - 15	3
16 - 20	4
21 - 25	5
26 - 30	6
31 - 35	7
36 - 40	8
40 - 45	9
> 45	10

*Note includes all trees in prism sweep

Long-Lived Intermediate–Tolerant (LIT) species or Late-Successional (LT) Species

LIT/LT SPECIES		Acadian	Maritime Boreal
Sugar Maple		x	
Yellow Birch		x	x
American Beech		x	
Red Spruce		x	
Eastern Hemlock		x	
Red Oak		x	
White Ash		x	
White Pine		x	
Red Maple		x	x
White Spruce		x	x
Black Spruce		x	x
Balsam Fir			x

Horizontal Limiting Distance* for Trees of a Given Diameter
Basal Area Factor 2.0

DIAMETER cm	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
0	.001	.036	.071	.107	.142	.177	.213	.248	.283	.319
1	.354	.389	.425	.460	.495	.531	.566	.602	.837	.672
2	.708	.743	.778	.814	.849	.884	.920	.955	.990	1.026
3	1.061	1.097	1.132	1.187	1.203	1.238	1.273	1.309	1.344	1.379
4	1.415	1.450	1.485	1.521	1.556	1.591	1.627	1.662	1.698	1.733
5	1.768	1.804	1.839	1.874	1.910	1.945	1.980	2.018	2.051	2.086
6	2.122	2.157	2.193	2.228	2.263	2.299	2.334	2.369	2.405	2.440
7	2.475	2.511	2.548	2.581	2.817	2.852	2.688	2.723	2.758	2.794
8	2.829	2.864	2.900	2.935	2.970	3.006	3.041	3.076	3.112	3.147
9	3.182	3.218	3.253	3.289	3.324	3.359	3.395	3.430	3.465	3.501
10	3.536	3.571	3.607	3.642	3.677	3.713	3.748	3.784	3.819	3.854
11	3.890	3.925	3.960	3.996	4.031	4.066	4.102	4.137	4.172	4.208
12	4.243	4.278	4.314	4.349	4.385	4.420	4.455	4.491	4.526	4.561
13	4.597	4.632	4.667	4.703	4.738	4.773	4.809	4.844	4.880	4.915
14	4.950	4.986	5.021	5.056	5.092	5.127	5.162	5.198	5.233	5.268
15	5.304	5.339	5.375	5.410	5.445	5.481	5.516	5.551	5.587	5.622
16	5.657	5.693	5.728	5.763	5.799	5.834	5.869	5.905	5.940	5.976
17	6.011	6.046	6.082	6.117	6.152	6.188	6.223	6.258	6.294	6.329
18	6.364	6.400	6.435	6.471	6.506	6.541	6.577	6.612	6.647	6.683
19	6.718	6.753	6.789	6.824	6.859	6.895	6.930	6.966	7.001	7.036
20	7.072	7.107	7.142	7.178	7.213	7.248	7.284	7.319	7.354	7.390
21	7.425	7.460	7.496	7.531	7.567	7.602	7.637	7.673	7.708	7.743
22	7.779	7.814	7.849	7.885	7.920	7.955	7.991	8.026	8.062	8.097
23	8.132	8.168	8.203	8.236	8.274	8.309	8.344	8.380	8.415	8.450
24	8.486	8.521	8.556	8.592	8.627	8.663	8.698	8.733	8.769	8.804
25	8.839	8.875	8.910	8.945	8.981	9.016	9.051	9.087	9.122	9.158
26	9.193	9.228	9.264	9.299	9.334	9.370	9.404	9.440	9.476	9.511
27	9.546	9.582	9.617	9.653	9.666	9.723	9.759	9.794	9.829	9.865
28	9.900	9.935	9.971	10.006	10.041	10.077	10.112	10.147	10.183	10.218
29	10.254	10.289	10.324	10.360	10.395	10.430	10.486	10.501	10.536	10.572
30	10.607	10.642	10.878	10.713	10.749	10.784	10.819	10.855	10.890	10.925
31	10.961	10.996	11.031	11.067	11.102	11.137	11.173	11.208	11.243	11.279
32	11.314	11.350	11.385	11.420	11.458	11.491	11.528	11.562	11.597	11.632
33	11.668	11.703	11.738	11.774	11.809	11.845	11.880	11.915	11.951	11.986
34	12.021	12.057	12.092	12.127	12.183	12.198	12.233	12.269	12.304	12.340
35	12.375	12.410	12.466	12.481	12.516	12.552	12.587	12.622	12.658	12.693
36	12.728	12.764	12.799	12.834	12.870	12.905	12.941	12.978	13.011	13.047
37	13.082	13.117	13.153	13.188	13.223	13.259	13.294	13.329	13.365	13.400
38	13.436	13.471	13.506	13.542	13.577	13.612	13.648	13.683	13.718	13.754
39	13.789	13.824	13.860	13.895	13.931	13.966	14.001	14.037	14.072	14.107
40	14.143	14.178	14.213	14.249	14.284	14.319	14.355	14.390	14.425	14.461
41	14.496	14.532	14.567	14.802	14.638	14.873	14.708	14.744	14.779	14.814
42	14.850	14.685	14.920	14.956	14.991	15.027	15.062	15.097	15.133	15.168
43	15.203	15.239	15.274	15.309	15.345	15.380	15.415	15.451	15.486	15.521
44	15.557	15.592	15.628	15.883	15.698	15.734	15.769	15.504	15.840	15.875
45	15.910	15.946	15.981	18.016	16.052	16.087	18.123	16.158	18.193	18.229
46	16.264	18.299	16.335	16.370	16.405	16.441	16.476	18.511	18.547	18.582
47	16.618	18.653	16.688	18.724	18.759	18.794	18.830	16.865	16.900	16.936
48	16.971	17.006	17.042	17.077	17.112	17.143	17.183	17.219	17.254	17.289
49	17.325	17.360	17.395	17.431	17.488	17.501	17.537	17.572	17.807	17.643
50	17.878	17.714	17.749	17.784	17.820	17.855	17.890	17.926	17.961	17.996
51	18.032	18.067	18.102	18.138	18.173	18.208	18.244	18.279	18.315	18.350
52	18.385	18.421	18.456	18.491	18.527	18.562	15.597	18.633	18.668	18.703
53	18.739	18.774	18.810	18.845	18.880	18.918	18.951	18.986	19.022	19.057
54	19.092	19.128	19.163	19.198	19.234	19.269	19.305	19.340	19.375	19.411
55	19.446	19.481	19.517	19.552	19.587	19.623	19.858	19.693	19.729	19.764
56	19.799	19.835	19.870	19.906	19.941	19.976	20.012	20.047	20.082	20.118
57	20.153	20.188	20.224	20.259	20.294	20.330	20.365	20.401	20.436	20.471
58	20.507	20.542	20.577	20.613	20.648	20.683	20.719	20.754	20.789	20.825
59	20.860	20.896	20.931	20.966	21.002	21.037	21.072	21.108	21.143	21.178
60	21.214	21.249	21.284	21.320	21.355	21.390	21.426	21.461	21.497	21.532

* metres

Calculations

Tree Density Factor:

$$TDF = \frac{BAF}{(0.0000785) \times (DBH)^2}$$

Where:

TDF = Tree density factor for diameter class
BAF = Basal area factor of prism
DBH = Diameter at breast height, in centimeters

Trees per Hectare for Diameter Class:

$$TPH = TDF \times (\#\ \text{of Trees Tallied in Diameter Class})$$

Where:

TPH = Trees per hectare
TDF = Tree density factor for diameter class

Snag Volume (taken from Government of British Columbia 2011):

$$\mathrm{V} = \left[\left(\frac{\frac{\pi T^2}{10000} + \frac{\pi B^2}{10000}}{2}\right) \times L\right] \times \mathrm{TDF}$$

OR

$$\mathrm{V} = [(0.0001571T^2 + 0.0001571B^2) \times L] \times \mathrm{TDF}$$

Where:

V = Volume of log in cubic meters
T = Radius of the small (top) end, in centimeters
B = Radius of the large end in centimeters
L = Length of the log in meters
TDF = Tree density factor for diameter class

Note: Division of the top and butt areas by 10,000 converts square centimeters to square meters. Division of the sum of the top and butt areas by 2 determines the average end area.

DWM Volume (taken from Marshall et al., 2000) :

$$V = \pi^2 \left[\left(\frac{Diameter\ Class\ at\ Intersection^2}{8 \times Transect\ Length} \right) \times (\#of\ Tallies\ per\ Diameter\ Class) \right]$$

Where:

V = Volume of log in cubic meters
Diameter Class at Intersection = Diameter class of log where intersected along transect, in centimeters
Transect Length = Total length of triangular transect, in meters (E.g. 20-m x 3 = 60 m)

References

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