

MINISTRY OF FORESTS

INVENTORY BRANCH

INTERIM SAMPLING INSTRUCTIONS TO MONITOR THE
GROWTH OF STANDS TREATED UNDER THE INTENSIVE FORESTRY
PROGRAM: 1979 FIELD SEASON

OBJECTIVE

The objective of the sampling is to monitor and analyse the growth responses of stands treated under the intensive forestry program, including those which are part of the "Canada - British Columbia Intensive Forest Management Subsidiary Agreement".

METHODOLOGY

The methodology for the establishment and measurements of sample plots is that outlined in the "Operations Manual for Growth and Yield - Managed Stand", with the following changes.

1. Selection of Sample Areas

Sample areas are to be selected in accordance with the following priority: treated stands that are located in a Timber Supply Area that is being inventoried during the 1979 field season are selected first, followed by stands which comprise large homogeneous areas in term of control and treatment, notwithstanding special interest areas that are agreed upon jointly by the Silviculture and Inventory Branches.

2. Sample Design

In order to be able to monitor the growth of the trees within both the control and treated areas, the sample plots must be distributed in a representative manner. It is recommended that only fixed-area circular plots be used. Plot sizes may vary, depending on the sizes and shapes of the control and treated areas; for statistical considerations, the total number of trees in all plots established within any treated area should not be less than 100. Accordingly, it is recommended that 10 circular plots, each comprising 0.01 ha (5.64 m radius), be established

within each treated or control area. In order to satisfy the statistical requirement of obtaining at least 100 trees per sample, it may be necessary to increase the size of each plot to 0.02 ha (7.98 m radius). The 10 sample plots are to be arranged, depending on the shape of each homogeneous stratum, so that plot centres are either in a straight line or form a grid. The distance between plot centres may vary from a minimum of 50 m to a length that would result in a representative placement of plots within any particular stratum.

*30 m. used 1979
in homogeneous types may use 5 x .02 ha plots*

3. Plot Establishment

The establishment of plots should be carried out according to the procedures described in the "Operations Manual for Growth and Yield - Managed Stands". However, plot centers are to be marked by 60 cm long aluminum stakes. Each stake must be driven into the ground for approximately 30 cm, and for protection purposes, a rock cairn is to be built around each one.

4. Plot Identification

If there is a tree with d.b.h. > 5 cm close to the plot centre, two aluminum markers are to be nailed to opposite sides of the tree at a height of 2 m above ground; if there are no trees large enough, the plot markers are to be wired to the centre stake. The information to be shown on the plot markers is the installation and plot number.

5. Plot Layout

Once the plot markers have been placed, the staff compass is placed on the tripod dead centre above the plot stake. Make sure that the proper declination as found in the isogonic chart (Appendix 4 of the Manual) is set on the compass. The compass has to be levelled to prevent needledrag and with it an incorrect reading. Rotate the compass until the marked end of the needle points to the north and run the plot tape out over the radius distance appropriate for the chosen plot size. Take a slope reading with the clinometer and make the slope correction if necessary. String the first segment string out along this line, repeat in a clockwise manner at 45° intervals if 8 segments suffice, or at 22.5° intervals if the stand is dense enough to demand 16 segments. While stringing the perimeter make sure that you take radial measurements for every borderline tree.

6. Tree Count and Determination of Minimum Diameter

When the plot has been strung, the next step is to do a tree count with the tree gauge. Trees will be recorded in a simple dot count by species, by segment, and by d.b.h. class. The trees will be measured with the aid of an aluminum diameter gauge placed at 1.3 m on the tree being measured.

The gauge is divided in the following manner:

DBH Class Limites (cm)

1	-	0.0	-	1.9	cm
2	-	2.0	-	3.9	cm
3	-	4.0	-	5.9	cm
4	-	6.0	-	7.9	cm
5	-	8.0	-	+	cm

The tree count will aid in the future calculation of ingrowth, and more important, it will enable us to determine the minimum d.b.h. for the trees to be selected as sample trees. We will require a minimum of 20 trees per average plot with a d.b.h. greater than 2.0 cm. If the above criterion cannot be met we will measure heights and ages only until the stand grows to a size where we get sufficient diameters above the 2.0 cm limit.

Where sufficient trees for a diameter sample are present, a general comment about the presence and the abundance of trees smaller than 1.3 m in height will be required.

When the minimum d.b.h. has been determined, the next step is to paint a white line at breast height (1.3 m) around the bole of each tree that has a diameter of the chosen d.b.h. limit or greater. The white line should be approximately 3 cm wide and the tree's diameter should be taken at the top of this line. Breast height should be located on all trees within the plot before the trees are numbered and the diameter taken.

Tagging of the trees with painted d.b.h. lines will then commence in segment 1 and will proceed from plot centre toward the circumference with tags facing the plot centre. In segment 2, tagging starts from the circumference and proceeds toward plot centre only this time the tags will face toward the circumference. Therefore, in all odd-numbered segments tags will face the circumference. The plastic tags will be affixed with aluminum nails 10 to 20 cm above the painted breast height line. In cases where the trees are too small for nailing, tags will be attached to branches with plastic string or wire.

7. Sample Tree Heights

The number of height trees required for the sample is 30, which means that 1 dominant and 2 codominant trees have to be measured for each 0.01 ha plot and double that number for the 0.02 ha plot.

8. Sample Tree Ages

Whenever the stand to be sampled for age is too small for increment borings, trees will be felled outside of the plot in the control strip at a height of 30 cm above the ground and ages directly counted. The correction factor will be applied to determine total age (see page 45 of the manual). The total number of age trees for the sample is 30, which means that 3 trees per 0.01 ha plot and 6 trees per 0.02 ha plot will have to be measured for age.

9. Determination of Reference Height

The reference height for diameter measurements will be determined for each individual plot. In addition to the regular height trees taken at the plot a tree in the smaller range will be measured. The reference height will be chosen from the following table.

Table 3. Minimum, Optimum, and Maximum tree heights (centimetres) applicable to fixed diameter reference heights.

Diameter Reference Height, cm	Douglas Fir			Lodgepole Pine			Spruce		
	Min.	Opt.	Max.	Min.	Opt.	Max.	Min.	Opt.	Max.
30	115	167	333	97	115	375	100	200	333
40	154	222	444	129	154	500	133	267	444
50	192	278	555	161	192	625	167	333	555
60	231	333	666	194	231	750	200	400	666
70	269	389	777	226	269	875	233	467	777
80	308	444	888	258	308	1000	267	533	888
90	346	500	1000	290	346	1125	300	600	1000
100	385	556	1111	323	385	1250	333	667	1111
110	423	611	1222	355	423	1375	367	733	1222
120	462	667	1333	387	462	1500	400	800	1333
130	500	722	1444	419	500	1625	433	867	1444

Until tables have been constructed for other leading species in treatment areas, the available ones will have to be substituted.

Installation Numbering For Intensive Forestry Program

Each Forest Region will have a code number as follows

Forest Region	Code	Instal. No.
Cari boo	1	1 - 999
Kamloops	2	1 - 999
Nelson	3	1 - 999
P. George	4	1 - 999
P. Rupert	5	1 - 999
Vancouver	6	* 100 - 999

Procedures for Managed Stands Sample Establishments

- 1) Chain into all central strip and into the area to be treated and layout the necessary plots.
- 2) For each plot drive an aluminum centre stake partly into the ground & build a rock cairn around it.
- 3) Place two aluminum plaques on a tree of sufficient size or if none can be found wire the markers to the centre stake which has a hole drilled for this purpose.
- 4) String all of the plots and divide each one into the requirements segments
- 5) Do a count of all the trees on each plot with the aid of a tree gauge
- 6) From the tree count determine what DBH limit to use to get the required number of trees.
- 7) Paint a DBH line on all trees equal to or greater than ~~than~~ the chosen DBH limit on each plot.
- 8) Tag all trees that were painted.
- 9) Take the required height and age measurements.
- 10) Determine what reference height to use for each plot and measure the diameter at this point for all tagged trees.
- 11) Measure the diameter at DBH for all tagged trees
- 12) Note Pathological indicators
- 13) Stem map the tagged trees
- 15) Paint the tie line between plots and to tie point
- 16) Describe location & access to installation tie point
- 17) in Control sample - pick two trees on opposite sides of stake and take direction from centre point and distance from centre point