Growth and Yield

Remeasurement of Permanent Growth
Samples in Natural Stands

1993
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FOREST INVENTORY

Remeasurement of Permanent Growth Samples in Natural Stands

Growth samples in natural stands are remeasured every ten years. This interval should be maintained whenever possible. A list of growth plots with their establishment and remeasurement dates and map locations is regularly circulated to the regions so that remeasurement can be planned in advance. The standards of measurement for permanent samples are listed in Appendix 8-1. If not already done, all samples due for remeasurement must be ecologically classified in accordance with Research Branch specifications.

Since permanent growth samples are cost intensive, their protection is of utmost importance. To ensure their protection, the buffers illustrated in Appendix 8-31 are recommended.

Office Preparation

Before field work, prepare and collect:

- Copies of the original field record sheets — with room to record the new measurements.
- Maps for navigation, (e.g., 1:250 000 contour maps) and photocopies of parts of forest cover maps (approximate scale 1:20 000) showing plot locations in detail.
- Photos showing original tie points, either those used at the time of establishment or preferably the latest photos on which tie points and plot locations have been replotted.
- Equipment: see Appendix 8-17.

Field Training

All personnel involved in remeasurement must attend a short training course to familiarize them with field procedures.

Relocation of the Sample and its Centre

Access Notes and Tie Point

The notes on location and access usually begin with a description of an easily identifiable point. Follow the access notes to the tie point and correct them when necessary.

The reference or tie point generally is a prominent topographic feature distinguishable on the photos and on the ground, such as a road junction, a bend in a road, a creek junction or a bridge. The tie tree is a blazed painted tree located near this reference point. Usually, aluminum growth plot markers are attached by nails to the tree, and strands of plastic flagging tape are still noticeable on or near the tree. The location of this tree is described in the access notes. On the aluminum marker of this tree (see Appendix 8-18), pertinent plot information is recorded such as: region number, compartment number, sample type (G), growth sample and plot number (usually 1 but there are some 3 plot samples) and date of plot establishment. If a new tie point is needed, select one recognizable on the photos and on the ground. From the map, measure and record the new bearing and distance to the plot centre. Blaze both
sides of the tie tree in the direction of the tie line. Above the blazes, nail two aluminum growth plot markers and on them inscribe the pertinent information (see Appendix 8-18).

**Note:** "Date" on the marker always refers to the original date of plot establishment.

Flag the tie tree with two strands of flagging tape, one above and one below the markers.

Each aluminum marker is divided into three sections. When used as a tie point marker, complete only the middle and bottom sections and, when used as a plot-centre marker, complete only the top and bottom sections.

To aid future measurement crews, prepare a sketch (to be attached to the sample sheets) showing the tie point, the sample location, and other significant topographic features.

**Tie Line**
- From the tie point, the tie line is run with a hand compass, clinometer and measuring tape. When rerunning the original tie line it is sufficient to either paint or renew the blazes as well as renewing the tape markings. If a new tie point is established, run a new tie line.

**Centre Tree**
- Each established plot has a centre tree marked with aluminum markers and straps of flagging tape usually secured about two metres above ground to avoid interference with measurements of d.b.h. If this tree is missing, either through natural mortality or through man’s activity, select another centre tree near the plot centre and mark it properly.

**Centre Tree Markers**
- It is usual to find missing or illegible plot centre tree markers; replace them at the time of remeasurement. They are identical to those used in the tie point (see Appendix 8-18) but complete only the top and bottom sections and on them inscribe sample type (G), sample number, plot number, region number, compartment number, and date of plot establishment.

Very often the plot centre also serves as a tie point for the next plot on the tie line, in which case, the middle section of the marker is also filled out. Because this is a measured tree on the plot, do not blaze it.

**Plot Centre Stake**
- Plot centre is marked by a tubular aluminum stake either driven into the ground or supported by a cairn on rocky ground. The stake can usually be identified by the flagging tape on it. If the plot centre stake is missing, pulled out but lying on the ground, or bent but still in the original location, replace it with a new one. To replace a bent stake is not difficult as the original hole is preserved. With some investigation, it may be possible to locate the original location of a stake found lying on the ground. However, if the stake is missing, it is a difficult, time consuming (unless the centre stake location has been stem mapped) but necessary task to relocate the plot centre.

If the centre stake location has not been stem mapped and if the plot centre stake is missing, it is preferable first to tally the original trees on the plot. Some tags may be down or missing, so replace them before relocating the centre stake.

Secondly, determine the approximate centre by observing the layout of the sectors (see Appendix 8-7).

Thirdly, find trees close to the plot perimeter and measure the plot radius from these trees until the approximate plot centre is determined. This procedure is particularly important where
the plot boundary goes through a clump of trees.

If not already done, build a cairn around all plot centre stakes; measure the bearing, slope percent, and slope distance from plot centre to the centre of each of the three trees near the plot stake; and record beside each tree number, the bearing, slope percent, and slope distance in the stem map columns of the field sheet. On the back of the field sheet on the section titled "Notes," record the year of measurement and whether the stake was in place or missing.

Remeasurement of the Plot and Establishment of the Sub-plot

Accurate, conscientious work is required when comparing new measurements with previous measurements and when rechecking measurements that appear to be out of the expected range, that is, ones showing a very large increase compared with those showing little or no increase. Place a check mark beside double-checked data on the field sheet. Correct errors in species identification and note them in the remarks column: for example, "Tree no. 60 is an Hw not a Fd."

Industrial PSP Breast Height Conversion and Sub-plot Establishment

Breast Height Conversion

Convert all Industrial permanent sample plots not yet converted from imperial (1.37 m) to metric (1.3 m) breast height. The conversion entails obtaining a one base-year measurement of diameters at 1.3 m and 1.37 m above the germination point for all trees 2.0 cm d.b.h. and greater. This includes all of the originally tagged trees (including those with missing tags, and those that died since the last measurement or were cut down), ingrowth and sub-plot trees. For this purpose use one of two methods (the first being the preferred one) but note that only one method is to be used within a Forest Region.

Method 1

Ensure that the tree number tags are nailed to each tree at 1.37 m above germination. If necessary, replace the nail and tag (with the same number) and ensure that the nail is out far enough to allow for future growth. Drive a second nail 0.07 m below the nail at 1.37 m. Measure both diameters above the nails.

Method 2

For originally tagged trees, measure the diameter at 1.37 m and mark the metric breast height at 0.07 m below the nail at 1.37 m. Move the nail and tag (if necessary, replace the nail and replace the tag with the same number) and place them at 1.3 m. Measure the diameter at 1.3 m above the germination point.

For trees not previously tagged (i.e., ingrowth and sub-plot trees) mark the breast heights at 1.37 m and 1.3 m above the germination point. Nail the tag at 1.3 m and measure both diameters (at 1.37 m and 1.3 m). If method 2 is used, note it on the field sheet.

Note: If the breast height is being converted to 1.3 m at this measurement, ignore the sections in the manual that deal with measurement procedures after the one base-year measurement of diameters at 1.3 m and 1.37 m have been taken.

Sub-plot Establishment

In addition to converting breast height, a sub-plot must be established (perimeter not to extend beyond the plot boundary) in order to
have some representation from trees below the tagging limit (i.e., trees less than 4.0 cm d.b.h.). The objective is to obtain a minimum of 20 trees in each sub-sample that are less than 4.0 cm d.b.h. but are at least 0.3 m in height. The sub-sample size is dependent on density (see Appendix 8-19 for a list of sub-plot radii). Choose the sub-plot size, and mark the sub-plot circumference with string.

Within the sub-plot, tag (as in Method 1 or 2 above) all living trees 2.0 cm d.b.h. and greater but less than 4.0 cm d.b.h. (d.b.h. assessed at 1.3 m above germination). In addition, count in a dot tally, the remaining trees within the sub-plot that are less than 2.0 cm d.b.h., derive their metric d.b.h. classes (i.e., either d.b.h. class 0 or 1) at 1.3 m (see Table 1), and record them on the tree count section of the field sheet (see Appendix 8-7).

Tree Tagging

In 1991 breast height determination changed from point of germination to the base of the tree on the uphill side. To determine breast height for trees with missing tags or ingrowth, continue using point of germination for samples established prior to 1991 and use base of the tree on the uphill side for samples established from 1991.

One base-year measurement of diameter at 1.3 m and 1.37 m above the germination point has been completed for all Ministry of Forests samples. All future remeasurements of diameter will be at 1.3 m.

At the completion of the last remeasurement (1980 to 1989 inclusive) all living trees 7.5 cm and greater in diameter at breast height (1.3 m) had been tagged with either aluminum tags or round blue plastic tags in one of two tagging methods (the first being the most common).

Method 1

The tree number tags were nailed to the trees at 1.37 m above germination. A second nail was driven into each tree at 1.3 m.

Method 2

The tree number tags were nailed to the trees at 1.3 m above germination.

If method 1 was used, pull out the nail and tag that is at 1.37 m. Nail the tree tag at 1.3 m (near the nail that was previously driven in at 1.3 m). Finally, pull out the original nail that was at 1.3 m.

If method 2 was used, the tag and nail are already at 1.3 m. A note indicating that method two was used will be present on the field sheet if this option was selected.

For all previously measured living trees with missing tags, determine breast height at either 1.3 m above germination or above the base of the tree on the uphill side for samples established after 1990 and nail a tag with the same tag number.

During the first measurement, tagging began in sector 1 and continued in a zigzagging pattern toward the circumference with tags facing the plot centre. Once all taggable trees in sector 1 were numbered, the procedure was repeated in sector 2, only this time tagging began at the circumference with the tags facing away from plot centre. The procedures for tagging sectors 1 and 2 were repeated alternately for all remaining sectors of the plot.

For subsequent remeasurements, repeat this same procedure while looking for the next tree. On the back of the field sheet on the section titled "Notes," record the percentage of tags missing at the time of remeasurement.
D.B.H. Measurement

Measure the diameters at 1.3 m above the nail for all numbered living trees and record them to the nearest millimetre (see Appendix 8-5). If a number is missing, renumber the tree as described in the Tree Tagging section of this chapter.

To more accurately measure the diameter of trees that have grown together (e.g., trees forked near breast height) or will have grown together by the next remeasurement, place a second nail at the halfway point around the tree from the nail holding the tree tag (1/2 wrap nails). Note this in the remarks column and, on remeasurement, ensure that the nails are pulled out enough to allow for growth until the next remeasurement.

- **Note 1:** When remeasuring diameter, readjust the nail holding the number. Pull it out enough to allow for tree growth until the next remeasurement.

- **Note 2:** Measure the diameters at 1.3 m (and at 1.37 m if the permanent plot is being converted to metric breast height) above the nail for all previously numbered living trees that are now dead. Assign the same diameter as for the previous measurement if the dead tree cannot be found. If the tree has been cut down record it as tree class 6 and assign the same diameter as for the previous measurement.

Tree Class and Decay Indicators

**Tree Class**

Each tagged tree is classed as either tree class 1 (residual), tree class 2 (suspect), tree class 3 (dead potential), tree class 4 (dead useless), tree class 5 (veteran), or tree class 6 (dead, cut down): 

- **Tree Class 1: Residual**
  - Record tree class 1 if the tree is alive and free of the decay indicators. Also record tree class 1 for all tagged trees less than 2.0 cm d.b.h. since an assessment of decay indicators is not made for tagged trees in this category.

- **Tree Class 2: Suspect**
  - Record tree class 2 if the tree is alive but not a veteran (see tree class 5), and if one or more decay indicators is present.

**Note:** Do not record decay indicators in the path remarks section for tagged trees less than 2.0 cm d.b.h., but only note them in the remarks section. Record tagged trees less than 2.0 cm d.b.h. as tree class 1.

- **Tree Class 3: Dead Potential**
  - Record tree class 3 if the tree is dead (standing or downed) and is estimated to contain at least 50 percent by volume in sound wood content thus making it potentially useful; that is, if the area were logged, this sound wood could be extracted along with other merchantable material. Include only stems that are greater than or equal to 10 cm d.b.h. and greater than or equal to 3 m in height or length. If it can be determined that the tree died as a result of an insect or disease, record the primary insect or disease responsible for the death of the tree (see the Pest and Injury Codes section of this chapter).

- **Tree Class 4: Dead Useless**
  - Record tree class 4 if the tree is dead (standing or downed) and is not potentially useful (see tree class 3). If it can be determined that the tree died as a result of an insect or disease, record the primary insect or disease responsible
for the death of the tree (see the Pest and Injury Codes section of this chapter).

**Tree Class 5: Veteran Tree**

Record tree class 5 if a tree proves to be at least 40 years older than the mean age of the main stand. Veterans belong to a distinctly older age class than that of the main stand being sampled. In growth sampling it is important that these trees be properly classified, and it is essential that the increment borer be used to determine the age of trees that appear to be veterans.

A veteran is not always an old tree: for example, a 20-year old stand could have 60-year old veterans which are remnants of a stand destroyed by fire. For a veteran component to be recognized, the veterans must have an estimated crown closure of less than six percent for a sample. Veterans are not recognized in stands 121 years or older except in lodgepole pine stands, which may have a veteran component of Douglas-fir or larch.

In complex-layered stands, a tree is called a veteran (tree class 5) when the tree is:

- A remnant of a much older stand.
- At least 100 years older than the oldest samples of trees of the main stand.
- Of a much larger diameter than those of the trees in the main stand. This criterion is necessary because of the subjectivity in determining what constitutes the main stand owing to the wide range of ages possible in it.

**Tree Class 6: Dead, Cut Down**

Record tree class 6 if the tree is dead as a result of being cut down. In addition, record "cut down" in the remarks section.

**Decay Indicators**

The eight indicators of decay (pathological remarks) are defined and illustrated in Appendix 8-9 and are:

- **Conk** — In immature stands, it usually occurs on deciduous trees.
- **Blind Conk** — It very seldom occurs on immature trees.
- **Scar** — It must be weathered and may be grown over or open.
- **Fork or Crook** — It includes multiple leaders.
- **Frost Crack** — It may resemble a scar but it always follows the grain.
- **Mistletoe** — It can occur on the trunk and on branches. Record a branch swelling that extends to the trunk of the tree as mistletoe. Because mistletoe may be an inhibitor of growth, also record it if present on swollen limbs even if at some distance from the trunk, but only in the remarks column.
- **Rotten Branch** — It must have a minimum diameter of ten cm and in immature stands should only be present on veterans.
- **Dead or Broken Top** — It includes a broken or dead leader (see Appendix 8-6).

These abnormalities are not indicators of decay and are illustrated in Appendix 8-9: butt rot, flute, candelabra branch, branch fan, black knot, burl and gall, sweep, exposed root, spiral grain, dry side, sapsucker hole, and insect boring. Record their occurrence in the remarks section of the field sheet.

**Tree Classification**

**Decay Indicators**

- Record each of the decay indicators in the pathological remarks section of the field sheet as occurring in the lower, middle or upper
third of the total height of the tree by entering

the numerical decay indicator position codes
(see Appendix 8-8). These examples illustrate
the relationship between the decay indicator
and its position code:

- Suppose that a suspect tree has scars in the
  lower and middle third, and a fork in the
  middle third. In the pathological remarks
  section under "SCAR," enter 4; and under
  "FK/CK," enter 2.

- Suppose that a suspect tree has a dead top,
  conks in the lower third, and a crook in the
  middle third. In the pathological remarks
  section under "D/B T," enter 3; under
  "CONK," enter 1; and under "FK/CK,"
  enter 2.

- Suppose that a suspect tree has a fork in the
  middle third, a large scar extending the
  whole length of the tree, and the leader from
  the tallest fork is broken. In the
  pathological remarks section under
  "FK/CK," enter 2; under "SCAR," enter 7;
  and under "D/B T," enter 3.

For veterans (tree class 5), record decay
indicators in the same way as for other trees.

To classify a tree properly, it has to be viewed
from all sides. As most defects in the upper
portion of a tree are not visible to an observer
standing at its base, it is important that the
recorder station himself so that the crown of
each tree being classified is clearly visible to
him. The person measuring d.b.h. should
move away from the tree far enough to be able
to classify the whole lower third of the stem,
while the recorder moves around the tree to
classify the upper two thirds.

Pest and Injury Codes
To quantify the effects of insect, disease and
injury on tree growth, the Growth and Yield

Section has been requested to collect insect,
disease and injury data during the
remeasurement of permanent growth samples.

For each tree affected, record the pest or injury
code (see Appendix 8-30) in columns 61 to 64
of the field record sheet. Identify (if possible)
the pest species and, if the observer is suitably
trained, assess the severity of pest attack (for
pests listed within the table) using the rating
system identified in the Quantification of
Damage section of the Pest and Injury Codes
table. For other pests, consult an appropriate
specialist for a rating system. If the observer
is not suitably trained, assess the severity of
pest attack using the following subjective
assessment codes: L = Low, M = Medium,
S = Severe, P = Past Attacks.

If the observer is not able to identify the insect
or disease species, a shorter incomplete label is
still useful. For example, an observer may
identify a defoliating insect and assess the
percent defoliation for the tree as 30 percent.
This would be recorded as ID_3 in columns
61 to 64.

In addition to recording the primary pest or
injury for each tree affected, make a general
assessment of the primary pest or injury for the
total sample and record it in the sample header
section (stand disturbance, columns 57 to 67 of
card type 1) of the field sheet. If known, also
record the year of attack.

Crown Class and Live-crown Length
Crown Class
Crown class refers to the position of the crown
of a tree relative to all other trees within the
general plot area (not the whole stand). Each
tagged tree classed as tree class 1, 2 or 5 is
assigned a crown class code. The six crown
classes are dominant, codominant, intermediate,
suppressed, veteran and understory; their
respective crown class codes are 1, 2, 3 and 4, 5, 6 (see Appendix 8-10).

Note: Crown class 6 should be used sparingly (i.e., do not confuse it with crown class 4) since it is only intended for use in older stands (60 years +) in which the understory trees (usually shade tolerant) are clearly of a much younger age than the main stand.

Live-crown Length
Live-crown length is the length from the top (if alive) of the tree or from the top of the live portion (if top dead) to the base of the lowest contiguous live crown as a percentage of the total tree height. When determining the base of the lowest contiguous live crown, do not consider forks originating below breast height or epicormic branches. As the tops of defoliated trees may appear dead at the time of live-crown assessment, care must be taken so that the live-crown length is not underestimated.

- Assign to each live tagged tree a live-crown length estimated to the nearest ten percent. Record live-crown length as 0 for 100%, 1 for 10%, 2 for 20%, etc.

Ingrowth
Ingrowth refers to commercial and non-commercial trees that were below the tagging limit in diameter at the last measurement and are now 4.0 cm d.b.h. and greater at 1.3 metres above the germination point (or above the base of the tree on the uphill side for samples established after 1990). When all previously numbered trees have been remeasured, tag all commercial and non-commercial living trees that are now 4.0 cm d.b.h. and greater by consecutive number for the plot.

Special rules govern the tagging of forked trees:
- If the fork occurs at or above 1.3 m, tag the stem as a single tree provided it has a d.b.h. of at least 4.0 cm.
- If the fork occurs below 1.3 m, and two or more stems of the fork are 4.0 cm or greater in d.b.h., tag each stem separately using consecutive numbers. When the diameters are recorded on the tally sheet, bracket the numbers of the stems making up the fork(s).
- If the fork occurs below 1.3 m, and only one of the stems is 4.0 cm or greater, tag it as a single tree.

For tagging ingrowth trees, use consecutive pre-numbered blue plastic tags if a large number of ingrowth trees are present or aluminum tags (inscribe the consecutive tree number for the plot) if few are present.

Nail the tag to the tree 1.3 m above the germination point (or above the base of the tree on the uphill side for samples established after 1990).

For these ingrowth trees, record measurement number, tree number, species, sector, measured diameters at 1.3 m to the nearest millimetre, tree class, decay indicators, crown class, live-crown length, pest or injury code (if applicable), and the tree number of the closest previously numbered living tree. For plots in dense stands, it is advisable to string the plot circumference beforehand.

Sub-plot and Tree Count
To have some representation from trees below the plot tagging limit, a sub-plot was established for each sample. The objective was to obtain a total of 30 trees (minimum number accepted is 20) in each sub-sample that were less than the plot tagging limit but at least
0.3 m in height. The sub-sample size was dependent on density. For a list of sub-plot radii, see Appendix 8-19.

Within the sub-plot, all living commercial trees 2.0 cm d.b.h. and greater but less than the plot tagging limit were tagged as in either method 1 or method 2 previously mentioned (see the Tree Tagging section of this chapter). Trees of commercial species less than 2.0 cm but 0.3 m in height had their tags wired onto either a branch or the main stem. The tagging of trees less than 2.0 cm (i.e., tags wired) was discontinued (except in very young stands in which the major component was in stems less than 2.0 cm d.b.h.) because many tags fell off soon after tagging and for many stands, the importance of this data was insignificant.

For trees 2.0 cm d.b.h. and greater previously tagged within the sub-plot, use the same method (method 1 or 2) of re-tagging that was used for trees previously tagged within the plot (see the Tree Tagging section of this chapter). If a tree was less than 2.0 cm d.b.h. at the time of previous measurement (i.e., total height was measured instead of d.b.h.) but is now 2.0 cm d.b.h. or greater, attach the tag to the tree with a nail at breast height (1.3 m). If a tree was less than 2.0 cm d.b.h. at the time of previous measurement (i.e., has tag wired on) and it is still less than 2.0 cm d.b.h., remove its tag and include this tree only in the dot count.

Special rules govern the tagging of forked trees that are at least 2.0 cm d.b.h. but less than 4.0 cm d.b.h. within the sub-plots:

- If the fork occurs at or above 1.3 m, tag the stem as a single tree.
- If the fork occurs below 1.3 m, tag each fork as a tree provided each is 2.0 cm d.b.h. and greater.

For each tagged tree 2.0 cm d.b.h. and greater in the sub-plot, record these measurements in the appropriate columns of the field sheet: measurement number, tree number, species, sector number, d.b.h. (at 1.3 m), tree class, decay indicators, crown class, live-crown length, pest or injury code (if applicable), and the number of the closest previously tagged living tree. Count in a dot tally, the remaining sub-plot trees and record them as d.b.h. class 0 or 1 (see Table 1) and by species (see Appendix 8-7).

Give special attention to the method of counting forked trees less than 2.0 cm d.b.h. To avoid counting numerous leaders of trees that have been severely browsed, for example, count only the tallest leader. See Appendix 8-6 for a further explanation.

Now and then, unusual live trees are found within the sub-plot. Special rules apply to the measurement of the height of these abnormal trees that are less than 2.0 cm d.b.h. (see Appendix 8-6).

### Table 1

<table>
<thead>
<tr>
<th>D.B.H. Class</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.3 m to 1.3 m in height</td>
</tr>
<tr>
<td>1</td>
<td>0.0 cm to 1.9 cm in D.B.H.</td>
</tr>
</tbody>
</table>

### Stand Structure

Stand structure is the physical arrangement or pattern of organization of the stand. Stand structure is described and classified according to recognizable differences in age and in height.

The stand structures recognized are:

A. Single layer

1. Simple structure (even age, even height)
   a) Without veterans
b) With veterans

2. Complex structure (uneven age, uneven height)
   a) Without veterans
   b) With veterans

B. Multi-layer
   A multi-layered stand has two distinct layers
   1. Layer 1 (top layer)
   2. Layer 2 (bottom layer)

For further details on stand structure, see Appendix 8-11.

For each tagged tree, identify the layer to which it belongs. For single-layered stands, leave the layer column (column 65) blank (including veterans) as 1 is assumed for trees in the main stand and tree class 5 identifies the veteran layer. For multi-layered stands, record the layer code for each tagged tree in column 65: codes 1 and 2 for layer 1 and layer 2, respectively.

Sample Trees

Sample Trees for Height
...
Distribute them evenly throughout the d.b.h. range down to 2.0 cm.

- C. For the Veteran layer, select for height measurement one sample tree from each species present. Estimate the height of all the other veterans and record it in the small tree or Vet height section (columns 27 to 29 of card type 3) and write “estimated” in the remarks column.

- Ensure that height sample trees previously taken are remeasured for height (unless no longer suitable) even if the resultant distribution over the d.b.h. classes is not optimum. However, ensure that the full range of diameters down to 2.0 cm d.b.h is covered.

- Whenever possible, select residual trees (tree class 1) for height measurements, otherwise select trees that do not have major suspect characteristics such as a major fork which affects the true height or a major scar at breast height which affects its true diameter.

- Do not use trees with estimated diameters and trees with leans or sweeps greater than five degrees.

For good height measurements, the top and the bottom of the tree must be clearly visible and the reading of the Suunto percent scale should not exceed 90 percent. The bottom reading should be taken at the tree tag height for the correction of 1.3 metres.

- In some areas it may not be possible to meet the height requirements if only "suitable" sample trees are taken. In this situation take the best of the "poor" height trees to try and meet the requirements unless the individual tree height is at least ten percent shorter than it would be without the defect (e.g., lean, fork, broken top, etc.). Make a note of the amount (in metres) that the top height has been underestimated due to using less suitable top height trees.

- Note: Reconfirm height measurements of trees that decreased or increased excessively since the last measurement.

- To ensure accurate and consistent measurements of suppressed trees with flattened tops (common with hemlock), sight on the highest point of the top and keep the top reading as low as possible (less than 60 percent). Even though lateral branches are often higher than the tiny (not very visible) leader of suppressed cedar trees, ensure that the top reading is taken on the tiny leader and not on the lateral branch that may be higher.

- Note: To ensure that the height measurement is consistently taken from the same location, paint a blue spot at the base of the tree to indicate the direction from which the height measurement was made.

- Sample Trees for Age

As a result of changing to top height and breast height age for site determination, breast height ages are required for the top height trees (i.e., a one time measurement).

- In single layer single structure stands (pure and mixed) average age is determined from the ages of the top height trees of the leading major species on the sample. In mixed stands, take one additional age for the second major species to determine if it is in the same age class. If the second major belongs to a different age class, and its volume is within ten percent of the first, then also take the same number of ages for it. The age of the second major is not included in the calculation of average sample age, but the presence and the age of it are noted in the stand description.

- The sample mean age is derived only from the top height trees of the leading species even if
some cores have rot. By estimating the rot portion, a total age can be derived and used in the calculation of the mean age.

- In single layer complex structure stands, average age is also determined from the ages of the top height trees of the leading major species.

- In multi-layered stands select sample trees for age as above for each layer. The top height method for determining site index is more suited to even-aged stands. However, for simplification, select age sample trees for both layers of a multi-layered stand using the top height requirements as above.

- Bore trees selected for age at 1.3 m (breast height) above the base of the tree on the uphill side. Half the cores taken must include the pith. If the pith is included, record Y in the pith column of the field sheet. If the pith is missed by more than an estimated three years on a tree under 100 years old, or by 5 years on a tree over 100 years old, then rebore the tree. Count ages in the field and record them on the field sheet. Then measure the radial increment for the last 10 and 20 years (to the nearest millimetre) and record the measurements in the radial increment section of the field sheet.

- If any sample tree has rot, count the rings on the portion of core that is sound, estimate the number of years in the rotten portion, add the number of years in the sound portion to the number of years in the rotten portion and record the total breast height age in the boring age section (columns 46 to 48 of card type 4) of the field record sheet. Record R for rot in column 56 of the field record sheet (card type 4).

- Note: If it is not possible to bore a small tree (i.e., tree less than 5.0 cm d.b.h.) for age without damaging it, select an outside-plot tree and bore it. Assign tree numbers 980 to 999 to outside-plot trees. Paint a blue spot on each tree at breast height and reference the tree by including a diagram (in the remarks section of card type 4) showing the plot and the approximate location of the tree.

Crown Closure and Slope Position

Crown Closure

Crown closure is the percentage of ground area covered by the vertically projected tree crowns. Estimate crown closure for each plot by layer to the nearest ten percent and record it in the crown closure column of the field sheet. Record crown closure for the veteran component to the nearest percent. Crown closure for the veteran component in the sample must be less than six percent or it must be classified as a separate layer.

Slope Position

Slope position is the relative position of the sample within a catchment (water) area. The recognized slope position categories (see Figure 1) are Crest, Upper, Mid, Lower, Toe, Flat (level) and Depression. Record the slope position below the slope percent (%) columns as C, U, M, L, T, F and D respectively.
### Growth Sample Field Sheet (F.S. 820)

<table>
<thead>
<tr>
<th>Column</th>
<th>Item</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 2</td>
<td>Region No.</td>
<td>Entered at establishment.</td>
</tr>
<tr>
<td>3 to 5</td>
<td>Compt. No.</td>
<td>Entered at establishment.</td>
</tr>
<tr>
<td>6</td>
<td>Compt. Letter</td>
<td>Entered at establishment.</td>
</tr>
<tr>
<td>7 to 9</td>
<td>Sample No.</td>
<td>Entered at establishment.</td>
</tr>
<tr>
<td>10</td>
<td>Sample Type</td>
<td>Enter G if not entered.</td>
</tr>
<tr>
<td>11</td>
<td>Plot No.</td>
<td>Entered at establishment.</td>
</tr>
<tr>
<td>12</td>
<td>No. of Plots in Sample</td>
<td>Enter 1 or 3 if not entered.</td>
</tr>
<tr>
<td>13</td>
<td>Card Type</td>
<td>Card type 1 is entered.</td>
</tr>
<tr>
<td>14</td>
<td>Measurement No.</td>
<td>Enter 1 for the first remeasurement, 2 for the second, etc.</td>
</tr>
<tr>
<td>15</td>
<td>Agency</td>
<td>Enter 1 for Company sample or leave blank if Ministry sample.</td>
</tr>
<tr>
<td>16</td>
<td>St. Str. Code</td>
<td>Enter 1 for simple stand structure, 2 for complex stand structure, and 3 for multi-layer.</td>
</tr>
<tr>
<td>17</td>
<td>Primary Layer</td>
<td>Enter Primary Layer (1 or 2) if multi-layer stand structure.</td>
</tr>
<tr>
<td>18 to 30</td>
<td>Ecosystem</td>
<td>Enter the ecosystem if ecologically classified.</td>
</tr>
<tr>
<td>30 to 33</td>
<td>Mean Age (Layer 1)</td>
<td>Add the number of years since the last measurement to the previous age.</td>
</tr>
<tr>
<td>34 to 36</td>
<td>Mean Age (Layer 2)</td>
<td>As above.</td>
</tr>
<tr>
<td>37 to 39</td>
<td>Mean Age (Layer V)</td>
<td>As above.</td>
</tr>
<tr>
<td>40 to 45</td>
<td>Age Range</td>
<td>As above.</td>
</tr>
<tr>
<td>46</td>
<td>Sel. Logged</td>
<td>Enter S if the sample is in a stand that has been selectively logged.</td>
</tr>
<tr>
<td>47</td>
<td>Stem Map</td>
<td>If the sample is not stem mapped, enter N; if it is stem mapped, enter Y.</td>
</tr>
<tr>
<td>48 to 50</td>
<td>Top Height (Layer 1)</td>
<td>Leave Blank</td>
</tr>
<tr>
<td>51 to 53</td>
<td>Top Height (Layer 2)</td>
<td>Leave Blank</td>
</tr>
<tr>
<td>Measurement</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>54 to 56</td>
<td>Top Height (Layer V) Leave Blank</td>
<td></td>
</tr>
<tr>
<td>57 to 60</td>
<td>Complete Disturbance Record the complete disturbance type and year.</td>
<td></td>
</tr>
<tr>
<td>61 to 67</td>
<td>Partial Disturbance Record the partial disturbance type, species, year, and degree.</td>
<td></td>
</tr>
</tbody>
</table>

**Card Type 2 - Plot Data**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Card Type 2 - Plot Data</td>
</tr>
<tr>
<td>14</td>
<td>Measurement No. Enter 1 for the first remeasurement, 2 for the second remeasurement, and so on.</td>
</tr>
<tr>
<td>15</td>
<td>F.I.Z. Enter the Forest Inventory Zone.</td>
</tr>
<tr>
<td>16 to 19</td>
<td>Plot Size Entered at establishment.</td>
</tr>
<tr>
<td>20 to 23</td>
<td>Plot Radius Entered at establishment.</td>
</tr>
<tr>
<td>24 to 27</td>
<td>Sub-plot Size Entered previously.</td>
</tr>
<tr>
<td>28 to 31</td>
<td>Sub-plot Radius Entered previously.</td>
</tr>
<tr>
<td>32 to 34</td>
<td>Aspect Entered at establishment.</td>
</tr>
<tr>
<td>35 to 37</td>
<td>Slope Entered at establishment.</td>
</tr>
<tr>
<td></td>
<td>Slope Position Record the slope position category (C, U, M, L, T, D, and F) of the sample just below the slope percent columns.</td>
</tr>
<tr>
<td>38 to 41</td>
<td>Elevation Entered at establishment.</td>
</tr>
<tr>
<td>42 to 44</td>
<td>Crown Closure (Layer 1) Enter the crown closure of each plot (for Layer 1) to the nearest 10%.</td>
</tr>
<tr>
<td>45 to 47</td>
<td>Crown Closure (Layer 2) Enter the crown closure of each plot (for Layer 2) to the nearest 10%.</td>
</tr>
<tr>
<td>48</td>
<td>Crown Closure (Layer V) Enter the crown closure of each plot for the veteran component (for three plot samples, the average of all plots in the sample must be less than 6%).</td>
</tr>
<tr>
<td>49</td>
<td>Plot Status Enter the status of the plot (A = active, D = inactive - abandoned, X = destroyed, L = lost in field, B = badly disturbed).</td>
</tr>
<tr>
<td>50</td>
<td>Stand Origin Enter the stand origin (C = coppice, F = fill planted, G = genetic, N = natural, P = planted, R = residual stand, S = seeded).</td>
</tr>
<tr>
<td>51 to 56</td>
<td>Date of Measurement Enter the date of plot measurement (year-month-day).</td>
</tr>
<tr>
<td>57 to 64</td>
<td>Map No. Enter the B.C.G.S. map sheet number.</td>
</tr>
</tbody>
</table>
## FOREST INVENTORY

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>65 to 72</td>
<td>Photo No.</td>
<td>Enter the B.C. flight number and photo number.</td>
</tr>
<tr>
<td>73 to 74</td>
<td>Year of Plantation</td>
<td>For silviculturally treated samples only.</td>
</tr>
<tr>
<td>75</td>
<td>Stock Age</td>
<td>For silviculturally treated samples only.</td>
</tr>
<tr>
<td>76 to 77</td>
<td>Tagging Limit</td>
<td>For silviculturally treated samples only.</td>
</tr>
<tr>
<td>78</td>
<td>Tagging Limit Code</td>
<td>Enter the tagging limit code (H = ht, D = diameter).</td>
</tr>
<tr>
<td>13</td>
<td>Card Type 3 - Tree Data</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Measurement No.</td>
<td>Enter 1 for the first remeasurement, 2 for the second, and so on.</td>
</tr>
<tr>
<td>15 to 18</td>
<td>Tree No.</td>
<td>Enter the tag number of the tree being examined.</td>
</tr>
<tr>
<td>19 to 20</td>
<td>Species</td>
<td>Enter the commercial or non-commercial species code of the tree being examined. For species codes, see Appendix 8-14.</td>
</tr>
<tr>
<td>21 to 22</td>
<td>Sector No.</td>
<td>Enter the sector in which each tagged tree is located.</td>
</tr>
<tr>
<td>23 to 26</td>
<td>D.B.H. (1.3 m)</td>
<td>Enter the diameter at breast height (1.3 m above germination point or above the base of the tree on the uphill side) of each tagged tree 2.0 cm d.b.h. and greater to the nearest millimetre.</td>
</tr>
<tr>
<td>27 to 29</td>
<td>Small Tree or Vet Height</td>
<td>Enter (if applicable) small tree height to the nearest decimetre for tagged trees (trees greater than 1.3 m in height but less than 2.0 cm d.b.h. at 1.3 m). Also, record the estimated or measured height for veteran trees.</td>
</tr>
<tr>
<td>30</td>
<td>Tree Class</td>
<td>Enter the tree class code: residual (1), suspect (2), dead potential (3), dead useless (4), veteran (5), or dead cut down (6). For tagged trees less than 2.0 cm d.b.h., always record tree class code 1.</td>
</tr>
<tr>
<td>31 to 38</td>
<td>Pathological Remarks</td>
<td>Record decay indicators present on each tree.</td>
</tr>
<tr>
<td>39</td>
<td>Crown Class</td>
<td>Record the crown class (1 to 6) of each tree.</td>
</tr>
<tr>
<td>40 to 48</td>
<td>Stem Mapping</td>
<td>Record the stem-mapping information for each tree.</td>
</tr>
<tr>
<td>49 to 55</td>
<td>Stumps</td>
<td>Do not use.</td>
</tr>
<tr>
<td>56 to 59</td>
<td>Near Tree No.</td>
<td>Record the tree number of the closest sequentially numbered living tree to the ingrowth or sub-plot tree being measured.</td>
</tr>
<tr>
<td>60</td>
<td>Sub-plot Tree</td>
<td>Leave Blank</td>
</tr>
<tr>
<td>61 to 64</td>
<td>Pest</td>
<td>Record the pest code and severity if injury or pests are present on the tree.</td>
</tr>
</tbody>
</table>
FOREST INVENTORY

65 Layer
If the stand has more than one layer, enter the layer to which that tree belongs (for single-layered stands, the layer column must be left blank). For veteran trees (tree class 5), also leave blank.

66 Live-crown Length
Enter the length of the live crown expressed as a percentage of the total length of the tree (to the nearest 10%).

67 Missed Tree and Out of Plot
Enter M if the tree was missed at previous measurement, estimate the d.b.h. at previous measurement and record d.b.h. in the remarks column. Enter D if the tree is to be dropped because it is determined to be outside of the plot

68 Nat., Plant
Enter P if tree was planted. Leave blank if tree regenerated naturally.

69 to 74 Remarks
Enter pertinent tree information not recorded in preceding columns.

- Back of the Growth Sample Field Sheet (see Appendix 8-7) -

Card Type 4 - Sample Tree Data

1 to 12 Plot Identity
Entered previously (region no., comp. no., letter, sample no., sample type, plot no., no. of plots in sample).

13 Card Type
Card type 4 is entered.

14 Measurement No.
Enter 1 for the first remeasurement, 2 for the second, etc.

15 to 18 Tree No.
Enter the tree number of the sample tree.

19 to 20 Species
Enter the species of the sample tree.

21 to 23 Top
Enter the top Suunto reading (% scale).

24 to 26 Bottom
Enter the bottom Suunto reading (% scale, + or -).

27 to 29 Total
Enter the total of the top and bottom readings.

30 to 32 Slope Dist.
Enter the slope distance from the tree to the measurer.

33 to 34 Slope %
Enter the slope percent.

35 to 37 Horiz. Dist.
Enter the horizontal distance between the tree and the measurer.

38 to 40 Height
Enter the calculated height.

41 to 42 Height Correction
Enter the height correction (normally 1.3 m).

43 to 45 Total Height
Enter the total height.
<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
<th>Data Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>46</td>
<td>Boring Age</td>
<td>Enter the boring age.</td>
</tr>
<tr>
<td>49</td>
<td>Boring Height</td>
<td>Enter the boring height (1.3 m).</td>
</tr>
<tr>
<td>51</td>
<td>Age Correction</td>
<td>Enter the age correction.</td>
</tr>
<tr>
<td>53</td>
<td>Total Age</td>
<td>Enter the total age.</td>
</tr>
<tr>
<td>56</td>
<td>Pith</td>
<td>If the pith is included, enter Y, if missed leave blank, and if the core has rot enter R.</td>
</tr>
<tr>
<td>57 to 62</td>
<td>Rad. Inc. (mm)</td>
<td>Record the radial increment (to the nearest mm) in the last 10 and 20 years for trees bored for age.</td>
</tr>
<tr>
<td>63</td>
<td>Comp. Age</td>
<td>Record A if the tree is to be included in the sample average age calculation.</td>
</tr>
<tr>
<td>64</td>
<td>Comp. Ht.</td>
<td>Record H if the tree is to be included in the top height calculation.</td>
</tr>
<tr>
<td>65 to 66</td>
<td>Remarks</td>
<td>Enter pertinent remarks.</td>
</tr>
</tbody>
</table>

**Card Type 5 - Tree Count Summary Data**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Card Type</td>
</tr>
<tr>
<td>14 to 15</td>
<td>Species</td>
</tr>
<tr>
<td>16</td>
<td>Measurement No.</td>
</tr>
<tr>
<td>17 to 19</td>
<td>Dot Tally</td>
</tr>
<tr>
<td>20 to 21</td>
<td>D.B.H. Class 0</td>
</tr>
<tr>
<td>22 to 24</td>
<td>Dot Tally</td>
</tr>
<tr>
<td>25 to 26</td>
<td>D.B.H. Class 1</td>
</tr>
<tr>
<td>27 to 29</td>
<td>Total</td>
</tr>
<tr>
<td>30 to 43</td>
<td>Tree Count</td>
</tr>
<tr>
<td>44 to 57</td>
<td>Tree Count</td>
</tr>
</tbody>
</table>

**Card Type 6 - Stem Mapping Data**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Card Type</td>
</tr>
</tbody>
</table>

For the necessary information for stem-mapped samples.
For use in distance-dependent growth modeling studies, ten percent of the growth samples in natural stands are stem mapped. The Inventory Branch designates the growth samples to be stem mapped.

To establish the location of trees on these circular plots, measure and record on the stem mapping section of the field sheet the bearing and distance from a point, usually plot centre, to each tagged tree. For a list of equipment needed for stem mapping, see Appendix 8-12.

To stem map growth samples:
- Set up the staff compass directly over the aluminum plot centre stake, and level the instrument. Record 1 in column 15 (card type 6) on the back of the field sheet.
- Adjust the staff compass for magnetic declination, and raise the sighting vanes. In Western Canada, magnetic declination is east of true north. Obtain the correct magnetic declination from an isogonic chart (see Appendix 8-13).
tree on the sample.

To avoid sighting the wrong tree, place the d.b.h. stick, wrapped with flagging tape to make it more visible, in front of the tree being sighted. To avoid false compass readings, keep sources of magnetic interference such as steel tapes, axes, knives, steel datum holder, eye glasses with steel frames, and most metal objects away from the staff compass. To simplify recording, use a staff compass that has Azimuth bearings, when available.

- Measure the slope distance between plot centre, (staff compass) and the centre of the tree.
- Measure the slope with the clinometer (Suunto) using the percent scale.
- Read the staff compass bearing on the scale at the north end of the compass needle.
- Record the measurements alongside each tree number on the growth sample sheet.

As with tree tagging, begin stem mapping in segment 1 and continue in a clockwise direction until all the tagged trees are stem mapped.

Quality Control

Refer to Appendix 8-1 for the standards of measurement which state the non-sampling error or variation allowed. Sampling crews should emphasize accuracy of measurement and then production.

To ensure that crews continue to work efficiently, and they follow and understand the application of recommended procedures, regular inspections must be carried out on each crew. Inspect at least ten percent of all samples remeasured, and where the inspection shows that a growth sample has been poorly done, the original crew may be required to redo it.

Office Checking of Samples

Check all field sheets in the office before sending them to the Growth and Yield Section at the Inventory Branch. A proper office check involves checking that:

A. All information recorded is legible and dark enough for clear photocopying.

B. The region number, compartment number, compartment letter, sample number, sample type, plot number, number of plots in sample, and measurement number have been recorded on every page and that the tree information is complete, recorded in the proper column, and correctly justified.

C. A general summary on the condition of the sample has been recorded in the "Notes" section of the field sheet. For example:
   1980 - Centre stake was in place.
   - Ten percent of the original tags were missing.

D. The bearing and distance from plot centre to three tagged living trees have been recorded in the stem map columns for each plot.

E. The required information on the set-up and location of the staff compass has been recorded for card type 6 for plots that were stem mapped.

F. A zero has been recorded in the slope percent column, that is, for stem map and height measurements if the distance measured is a horizontal distance.

G. The assignment of the tree class meets the criteria for that class:

Tree class 1 — Tree has no decay indicators.
Tree class 2 — Tree has one or more decay indicators.

Tree class 3 — Tree is dead potential.

Tree class 4 — Tree is dead useless.

Tree class 5 — Tree is a veteran.

Tree class 6 — Tree was cut down.

H. The latest remeasurements of diameter compare with those of the previous measurement. If a diameter has not increased, has decreased, or has increased more than normal, make sure that the crew rechecked the diameter and placed a check mark in the remarks column.

I. The sample trees have been selected in accordance with the specifications in this manual (see the Sample Trees section of this chapter).

J. Height calculations are correct by comparing the latest height remeasurements with those of the previous measurement. If the height has decreased or has increased excessively, make sure that the crew rechecked the height and placed a check mark in the margin.

K. For each ingrowth or sub-plot tagged tree, the sector in which it is located and the tree number of the closest tagged living tree have been recorded in the appropriate columns of the field sheet.

L. A tree count (if applicable) has been recorded.

M. The mean sample age and mean sample height have been calculated correctly and have been recorded only on the first sheet of each plot.

N. Agency, stand structure code, primary layer (if multi-layered stand), ecosystem applicable), stand disturbance (if applicable), age range (if applicable), selectively logged code (if applicable), stem map code, F.I.Z., plot and sub-plot sizes and radii, crown closure, plot status, stand origin, map number, photo number, and the date of remeasurement have been recorded only on the first sheet of each plot.

O. The pages have been numbered properly and the tally person has signed the sample.

Plot Inspection Procedures

Pre-field Inspection

A. Randomly select one plot that has been office checked according to the procedures in the Office Checking of Samples section of this chapter.

B. Randomly select seven trees from the tree detail section (card type 3) of the field sheet and transcribe their respective measurements onto the top section of the plot inspection report (see Appendix 8-15). Of the seven, select one from the newly tagged ingrowth trees and another from the newly tagged sub-plot trees.

C. Randomly select five trees from the sample tree section (card type 4) of the field sheet and transcribe their height measurements onto the sample tree section of the plot inspection report.

D. Transcribe the assessment of crown closure (percent) of the plot into the appropriate section of the plot inspection report.

E. Enter the sample identity (region, compartment, sample, sample type and plot), plot and sub-plot sizes, plot and sub-plot radii, inspection date, original tally crew, and the date of measurement in the top sections of the plot inspection report.
F. Randomly select (from the tree count summary section) one diameter class to check (in the field) that the dot tally is correct for that class.

Field Inspection
A. Use the access notes to get to the plot.
B. If a new tie tree was selected on remeasurement, check that it has been marked as specified in the Access Notes and Tie Point section of this chapter.
C. If a new tie line was run, verify that the bearing and distance were run within the allowable standards.
D. Check that the aluminum plot centre markers have been inscribed correctly and the plot centre stake has been properly protected with a cairn.
E. Check that the bearings and distances from plot centre to the three stem-mapped trees are correct.
F. Check the plot and sub-plot radii each at a minimum of three different locations on the perimeter for trees that should have been included or excluded from the plot or sub-plot. Also, check that trees away from the perimeters but within the plot and sub-plot that are larger than the tagging limits were not missed. Flag with a circled asterisk any tree missed or tallied when it should have been included or excluded, respectively.
G. Check that all sub-plot trees less than 4.0 cm d.b.h. but at least 0.3 m in height were either tagged or counted in the dot tally.
H. Carefully measure all the selected trees recorded on the plot inspection report for:
   1. Tree identification
      Check that the genus or species of each tree inspected is correct and place a circled asterisk beside a tree that was incorrectly identified.

2. Tree tag height
   Check the tag height of the selected ingrowth and sub-plot trees to verify that breast heights (if applicable) have been located at 1.3 m above the germination point (for plots established prior to 1991) or at 1.3 m above the base of the tree on the uphill side (for plots established after 1990). At the same time, make sure that the nails have been securely driven into the trees and the nail with the tag has been driven in at a slight angle so that the tag hangs away from the tree.

3. Diameter and pathological remarks (decay indicators)
   Measure the seven selected trees for d.b.h. and classify them.

4. Sample tree heights
   Measure the five selected trees for height.

5. Sample tree ages
   Count the age of the two trees selected for age.

6. Stem mapping
   If the sample was stem mapped, check the seven selected trees for bearing, distance, and percent slope.
   Also, assess crown closure for the plot.
   Compare all of these measurements with the previous measurements and give the crew the benefit of the doubt on any slight discrepancy.
Damage to the Sample

Samples may be damaged by certain events from nature such as slides, windthrow, snow, fungi, insects, disease, and fire. A sample that has received any level of this type of damage should still be remeasured since it can be utilized in the Protection matrix.

Samples may also be damaged by activities from man such as logging, road building, right of way (pipe-line, power line) clearing, and escaped fires. Remeasure a sample that has received this type of damage if at least 50 percent of the initially measured trees are still alive and attach a detailed description of the damage to the field sheet. If a sample is to be destroyed, remeasure it one last time (if at least three years have elapsed since the last measurement), ecologically classify it, and ensure that the plot centre can be re-located after logging so that the long term productivity effects can be determined.

Return of Growth Sample Field Sheets (F.S. 820)

Once the field sheets have been office checked and corrected, make good legible photocopies before sending the originals to the Growth and Yield Section at the Forest Inventory Branch. Store the photocopies in the Forest Region for security and reference. Include a cover letter with the originals that lists the samples sent, and keep a duplicate for field office records. Send by registered mail if using Canada Post.