Alberta
SUSTAINABLE RESOURCE DEVELOPMENT

STAND DYNAMICS SYSTEM
FIELD REMEASUREMENT MANUAL

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1.0 INTRODUCTION

As Alberta's forest industry continues to grow and expand so does the requirement for timber, and the demand for better forest management. There is a need for an increased awareness and understanding of this resource. Two gaps in our knowledge centre around the growth and dynamics of stands younger than 20 years of age, and the dynamics of stands established after harvesting.

To fill these gaps, the Public Lands and Forests Division, established a series of permanent sample plots throughout areas of Alberta where harvesting occurs. This is a long-term project monitoring stand growth and dynamics from seedling to mature tree. Due to the various phases of growth that will be monitored, it was necessary to establish nested sample plots. At the regeneration stage, the four regen plots will fall within a larger area that is monitored in the sapling stage. This plot area falls within the bounds of a standardized 1/10 ha.

Three other areas also under study are:

1) The regeneration, growth, and development of new stands after pine beetle infestation, estimating the rate of deterioration and breakdown of standing dead trees infested with the mountain pine beetle.
2) The effect of herbicide spraying in the MOF (Maintain our Forests) cut blocks and
3) stand growth and regeneration on the Lodgepole well blowout site.

2.0 FIELD PROCEDURES

The field procedures outlined here are compatible with procedures used for remeasuring the standard Forest Management mature PSP's.

2.1 PLOT ESTABLISHMENT

The plot establishment procedure is not included in this manual. The measurements of the plot (Figure 2.1) can be used to replace any missing posts. For more information see the STAND DYNAMICS FOLLOWING HARVESTING FIELD MANUAL for establishment procedure.

2.2 PLOT MAINTENANCE

The following items are checked:

1) Evaluate the access (see Master Appendix 7)
2) Rate the overall condition of the plot and buffer, noting any damages and their location on the plot maintenance sheet (Figure 2.10).

   If the trees are too small to paint, a 200 m x 200 m buffer should be clearly marked with blue PSP flagging. Contact Forest Management Branch, Resource Analysis Centre for this flagging.

Do not flag into standing mature timber or across seismic lines, roads, etc. that are less than 75 m away from the tree plot. Use them as a boundary and record the appropriate changes on the maintenance report, Figure 4.22.

3) Check the condition and tags of all the posts, centre and corners. Replace and retag where necessary. Paint all corner, plot centre and regen posts blue. Mark corner posts with orange and blue geo-flagging. Plot centre is flagged blue, orange and yellow. Sapling aluminum angles are flagged orange.

4) Rate the overall condition of the plot and buffer noting any damages and their location on the plot maintenance sheet (Figure 4.22) and Plot Retreatment Report (Figure 4.29).

5) Measure all regen, sapling, and tree plot sides. Record sizes on maintenance tally sheet. Remeasure only if you had to re-establish posts, otherwise record previous measurements.

6) The tie-point for each plot must be confirmed. This includes checking the distance and azimuth from plot centre to the tie-point. The previous azimuth and distance was to northwest corner, redo to plot centre, if necessary. Keep in mind the distances are horizontal and must be adjusted for slopes exceeding 10%. Whenever possible, a second tie-point should be established in the event that the original tie-point is destroyed. Suitable tie-points include definite bends in the road, stream crossings such as bridges and culverts, or any other permanent land features. A topofil or survey chain must be used to measure the distance between tie points. A vehicle odometer is not accurate by our standards therefore it is not acceptable for measuring distance.

7) Ensure the North arrow is correctly located on the maintenance tally sheet.

8) Tie-points will be taken to plot centre from now on. Redo maintenance map if they were taken to northwest corner.

9) Complete check off list.

Planted trees in the NE, SW and SE corners have their main stem painted blue. Re-paint at time of remeasurement.

2.3 MAINTENANCE REPORT

The information recorded on the maintenance report is documented on the Header Sheet (TM 267). Some of this information is subjective, and requires good judgement, as budget requirements, planning of field work, and other office decisions are based on this information.
The PSP maintenance sheet (Figure 4.22) is located on the reverse side of the PSP Header Sheet, TM 267.

The legal location of the group is confirmed once the tie-point information and associated map work is completed. An SDS plot can conceivably occupy up to four sections and legal subdivisions.

Access is extremely important for planning purposes for both remeasurement and maintenance crews. Budget estimates rely heavily on the amount of time it takes to travel to a plot and what type of transportation is required (i.e. 4-wheel drive vehicle, all terrain vehicle, or helicopter). Access is assessed using the following codes (see Master Appendix 7 for description).

1 - All weather road
2 - Dry weather road
3 - Deteriorating road
4 - All terrain vehicles only
5 - Helicopter access only
6 - Unknown (office use only)

Plot and buffer damage to the plot is assessed using the following codes:

1 - No damage
2 - Natural damage
3 - Manmade damage
4 - Natural and manmade damage
5 - Closed
6- Over Damage inside buffer greater than 20 m from the plot

Code 6 is used to indicate buffer damage only.

7 - If there is seismic damage to the plot or buffer that was not recorded on the previous maintenance report, attempt to determine the year the damage was done, and indicate on the maintenance report exactly where the damage is.
8 - The lengths and azimuths of the buffer must be recorded on the map.
9 - Make general comments on planted trees, ingress etc. on maintenance sheet. Eg. Planted still in bare soil and chlorotic - probably from nutrient deficiency.

3.0 REMEASUREMENT PROCEDURE

The following procedures are for remeasurement and are to be used whether data is collected on tally sheets or on field computer program (produced February, 1998 - see field computer instructions).

If trees decrease in height a condition code must be given. If trees over 1.3m in height, the DBH is required.

If a tree height grows only 2 to 3 cm in 2 or 3 years then something is wrong. Give trees an appropriate condition code.

Make sure you $\underline{\surd\surd}$ HT and $\underline{\surd\surd}$ DBH (in comments) if they shrink or stay the same size.

DBH's have to remain the same or increase otherwise use appropriate condition code.

Each Regen plot should be separated by a line and/or on a new sheet. Checklist must be completed **BEFORE** leaving plot.

All trees that are added in need to **HAVE** an Age and ORIGIN; if Birth year is > than harvest year Origin = "I", if Birth year < harvest year then origin = "A", planted (use guideline sheet provided) "B" or "C" is for. Write birth years in Age column. Place all other comments in the comments column. When trees die (Code 25) you **MUST** give a cause. If a tree dies it must be given code 25 and cause of death. Look for previous damage codes in comment or examine dead tree for clues. If the tree is >9.1cm DBH and tree is dead and down (CC1=61), can have a CC2 if necessary to say what put the tree down on the ground.

Write proper code in condition codes to verify that the tree has died. A missing (15) code can only be used following a dead code (25). Look carefully and try to match previous height to find the tree. All trees over 1.1cm DBH and >1.3m tall require stem mapping.

√√ azimuth and distance that are obviously outside the proper range. Saplings and planted trees should only be found between 270^{o} and 360^{o}. Trees noted as out of range on conflict sheet, verify Distance and Bearing. Visually verify "IN" or "OUT" if these trees are okay and tree is in plot **TAKE THE BEARING ON THE CLOSEST LEG'S** (need 2 bearings) and record in comments section.

Be careful when using codes higher than 51. Many have lower size limits.

Use caution before changing any species. This is particularly important with Sw and Sb. If in doubt **DO NOT** change the species.

Cmp Hgt-Typ (Competition Height and Type) - This is a two-digit code describing the height and type of competition affecting individual seedlings/saplings.

Code	-	**Cmp Hgt**
0	-	Little or no competing vegetation present.
1	-	Competing vegetation below seedling/sapling height.
2	-	Competing vegetation equal to seedling/sapling height.
3	-	Competing vegetation above seedling/sapling height.
4	-	Microsite shading (by dead or inorganic materials).
5	-	Crushing - seeding in close contact with organic/inorganic debris such that physical damage may occur. (Remember to replace debris to minimize the remeasurement disturbance).

Code	-	**Cmp Typ**
0	-	No competition
1	-	Herbs, forbes, etc.
2	-	Grasses, sedges, etc.
3	-	Shrubs (non-acceptable species eg. willows, roses)
4	-	Trees (acceptable species eg. Fir, Birch, Aspen)

Competition should be tallied only if the canopy area of competing vegetation overlaps approximately 40% of the seedling/sapling canopy area. The canopy area refers to the area directly above and below the leaves of the vegetation. If there is a number of different types of competition, the type that occupies or intercepts the greatest canopy area of the seedling/sapling should be tallied. This dominant competition type may occupy less than 40% of a seedling/sapling canopy area (approximately 30%) if combined with other vegetation type. The height of the competition is evaluated by distribution of competing leaf surface area relative to the height of the seedling/sapling. The two factors of height and density of competing leaves must be weighted together. It was decided that height would have more weight than density of leaf surface area when overtopping occurs. Significant overtopping is roughly defined as having at least 20% of the competing leaf surface area above the height of the seedling/sapling.

Competition will be tallied as above if the seedling/sapling is significantly overtopped by competing vegetation. Competition is to be tallied as equal to if the competition is approximately the same height as the seedling/sapling. There can be some overtopping but not a significant amount (less than 20% leaf surface area). The densest competing leaf surface area should be generally the same height as the seedling/sapling leaf surface area. Competition will be tallied as below if the height of the competing vegetation is less than the seedling/sapling. There must be an insignificant amount of overtopping and the densest competing leaf surface area should be below the seedling/sapling's densest leaf surface area.

There is no room on SDS tally sheets for this 2 digit code, so record it in comments area.

Field computer program requires these 2 variables.

3.1 REGEN PLOTS (RECORD TYPE 6 – (refer to Figure 4.23)

There are 4 circular regen plots located in the northwest corner of the tree plot. All regen is tagged up to a maximum of 50 per plot. If there are more than 50 regen, a height class table is used (see section 3.2). Be careful to number new trees up to 50 with a new number. If 50 trees have been tagged in past and a new tree that used to be counted on the tree tally form grows into 1.3m (doesn't need DBH >1.1cm), number this tree to the next number eg. Plot #1, Tree # 1051. It is very important that you write the correct regen plot number next to these trees.

All pinned and tagged seedlings must be numbered. Numbering starts in plot one at the point closest to the NW corner and continues sequentially in a clockwise direction. Numbering in plot two starts at the point closest to plot one and continues in a clockwise direction, numbering in plot three starts at the point closest to plot two and numbering in plot four starts at the point closest to plot three. When numbering ingress the numbering continues where it was left off from the last measurement. The numbering system is as follows:

Plot one	1001-1050
Plot two	1051-1100
Plot three	1101-1150
Plot four	1151-1200
Plot five (planted)	1201-

On all planted trees greater than 60 cm leave pin in place and put new tag on lateral branch and paint lateral branch blue.

All planted trees must be stem mapped and given crown classes, even those in regeneration plots.

At establishment all seedlings are pinned and numbered to a maximum of fifty. If there are less than fifty seedlings in the plot at establishment then only the amount present is pinned and tagged then when the plot is remeasured all ingress is tagged and numbered until a maximum of fifty in total is tagged and numbered, for example:

Establishment in 1987 - 27 seedlings are pinned and tagged numbers used are 1001-1027

Remeasurement in 1989 - 2 seedlings have died and 14 ingress are found. All of the ingress is pinned and tagged bringing the total to 39 live seedlings and 2 dead = 41 total (last #1041).

Remeasurement in 1991 - 4 more seedlings have died and 17 ingress are found. 9 of the ingress are pinned and tagged bringing the total number tagged to 50. The remaining 8 ingress are measured and recorded on the height class tally sheet. The total number of seedlings is now 44 live tagged seedlings, and 6 dead = 50 tagged, and 8 more recorded on the height class tally sheet (Figure 4.27). Numbers used 1001-1050.

Now that all of the numbers available in regen plot one have been used, any more ingress that occurs in future remeasurements will be recorded into the height class tallies. (CSTM 100). Refer to Section 4.24. **DO NOT DUPLICATE OR RE-USE PREVIOUSLY ASSIGNED NUMBERS**.

There should be no trees with 2000 numbers (sapling) in the 4 regen plots. Call supervisor if found. **DO NOT** change numbers to sapling numbers if a tree grows into a sapling. Keep original number.

The height of all pinned, tagged, and numbered seedlings is measured to the nearest cm (excluding current years growth) and recorded on the tally sheet (CSTM 101). Species and any condition codes (refer to for the Master Tree Condition Codes) present are also recorded, crown classes are not recorded until tree's DBH becomes > 1.1cm. If code 15 is recorded for the previous measurement, look for tree again and if found but dead, try to decide what killed it. i.e. 25 18. If unable to find it or tell what killed the tree use code 25(dead), 37(unknown). If tree is found alive, record previous missed height in comments section.

If a seedling grows to a sapling (greater than 1.3 m in height and 1.1 cm DBH) the pin is pulled and the tag and number is put on the sapling. This sapling has the same number and retains its place in the regen plot tally. It is stem mapped from the main plot centre (azimuth and distance recorded) and the height, diameter, crown class and condition codes are recorded. Diameters are recorded to the nearest millimetre. Mark DBH with blue paint. It is still recorded as record type 6.

If the area has been planted (paint lateral branch blue), then all planted seedlings within the sapling plot were pinned, tagged, and numbered at establishment. At remeasurement, current height and any condition codes for the planted seedlings are recorded on the tally sheet (CSTM

100) under regen plot five. Planted trees are stem mapped regardless of size and crown class recorded. All planted trees in the NE, SW and SE corners have had their main stem painted blue. Repaint these trees at time of measurement. If establishing a plot on a new cutblock that has been planted, pin the planted trees in the NE, SW and SE with "blue" painted wire pigtails. At each remeasurement, these pins should be repainted "blue". Maintain this procedure, until the planted the trees DBH >9.1 cm and then they will be tagged as a 3000 tree number.

Paint all around the main stem, up high with "blue"paint to make them more visible.

Aspen and pine are shade intolerant and may die if they were overtopped by other trees. Spruce are shade tolerant. Be aware of this concept when damage codes are considered.
If a seedling dies, the pin is pulled and the condition code 25 (dead) is entered as the 1st code and you have to use the 2nd condition code to tell what the tree died from (3rd code can be used if necessary). You can pull the tree out of the ground to look for armillaria, flooding, etc. Species **HAS** to be recorded. If a pin is missing and the seedling to which it was assigned cannot be located, using historical height and the numbering sequence, then the condition code 25 for dead is used with a condition code of 15 for missing as the second code. These seedling numbers are not reused.

If a pin will not stay firmly in the ground due to bedrock, etc., loosely tie the tag to a lateral branch of the tree. At **NO** time should a tree be tagged on a main stem.

Starting in the 1999 field season, root collar diameter (RCD) was collected on regeneration or planted trees that were less than 130cm in height. If the plot is measured on paper, this variable (RCD) will have to be recorded in the comments section. The office will enter it into the electronic data file later. Field computer programs automatically prompts the surveyor for the RCD if the tree is less than 130cm in height.

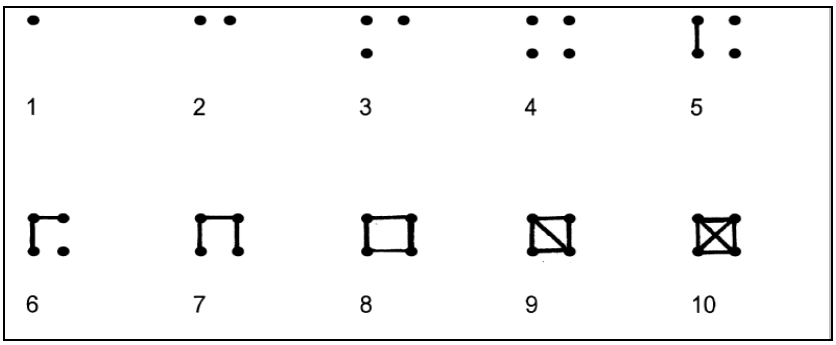
3.2 REGENERATION HEIGHT CLASS RECORD (CSTM 100)

This is a record of untagged live seedlings, filled out if the number of tagged seedlings on a regeneration plot exceeds 50. The number of seedlings by species, in each height class, for each regeneration plot is recorded on form CSTM 100 (Figure 4.27). In the header line, **Record type is 61**, plot type is left blank and each species within each plot is recorded on a separate line.

Each untagged seedling is to have a pin placed beside it. The reason for pinning all non-tagged seedlings during remeasurement (when seedlings total more than fifty) is to ensure that all seedlings are counted. When you measure and record the height class and species you can pull the pin, measure the next seedling and pull the pin, and continue in this manner until all of the seedlings are measured and all the pins without tags are pulled. This avoids missing or double measuring any seedlings.

This form **MUST** be filled out for each Regen Plot. Record No Tally in first column (0-10 cm) and first row if no trees found on regen plots with 50 tagged trees or if plot has less than 50 trees.

Dot tally initially and then write number of trees once completed. Right justify and zero fill to left.



DOT TALLY

Regen Plot 5

Planted trees must have azimuth and distance recorded even if they are less than 1.1cm DBH and/or less than 1.3m in height.

ALL planted trees should get a crown class.

If previous species is wrong put √√ species in comments. If DBH or HT shrink √√ check and put in comments.

3.3 SAPLING PLOT (RECORD TYPE 7)

Any stems within the sapling plot over 1.3 m in height and 1.1 cm DBH, (excluding current year's growth), that are not yet tagged must be tagged and an azimuth and distance recorded from plot centre. Place tags on the north side of the tree and mark DBH with a blue painted stripe. Any stem that is forked below breast height is counted as two stems and both stems are tagged. All new saplings are numbered continuing from the last number previously assigned. **DO NOT USE DUPLICATE TREE NUMBERS**. The numbering system for saplings starts at 2000 and continues until all saplings are numbered (up to 2999). The original numbering order started at the SW corner and proceeded in a fan pattern to the NE corner. Ingrowth or new, additional saplings should be tagged in a similar pattern. Stem map all new saplings (**note that, for analysis purposes, 2 saplings cannot have identical azimuths and distances**) and record height, diameter, conditions codes and crown class of all saplings. All of this data is recorded on the sapling tally sheets (CSTM 101) under record type 7 (see Figure 4.25).

In extremely dense stands, stems that are on the border of the tree plot sides, but not actually within the plot, can be painted with an orange or yellow vertical stripe facing into the tree plot. This will assist future crews in determining the plot boundary.

Age and get origin on all **NEW** sapling - using guideline provided if necessary.

Ensure proper swathing techniques are followed. See Figure 2.3.

If trees cannot be tagged on a lateral branch, tie the tag around the tree with a long wire and leave it loose so that the tree is not girdled before the next measurement.

Trees that have a DBH > 9.1cm needs height to live crown measurements.

3.4 TREE PLOT (RECORD TYPE 8)

The tree plot is the full 1/10 ha plot. Once a stem reaches 9.1 cm in diameter at breast height, a tag is tied to a lateral brach or around main stem with a long piece of wire and a number assigned. Refer to the Permanent Sample Plot field procedures manual for proper "swathing" methods. The numbering system for the tree plot starts at 3001 and continues until all the trees are numbered. The height, height to live crown and diameter of all trees and azimuth and distance from the tree plot centre are measured and recorded along with any condition codes present and crown class. This information is recorded on the stand dynamics tally sheet (CSTM 101) under record type 8 (see Figure 4.26 Use condition codes in Master Condition Code List to assess the trees health. DBH is painted blue, just like in the sapling plot.

Trees from record plot 6 or 7 that grow over 9.1cm will **KEEP** their original number, i.e.; #1051 will stay as #1051 but you must also record height to live crown. New trees that grow over 9.1cm are recorded from 3001 and up.

Age and get origin on all trees - use guideline provided if necessary. Also use other trees similar in height in NW corner to get a good estimate of Birth year.

Use codes => 51 for this record. May use other codes if these are in appropriate.

Planted trees in NE, SW and SE quarters have had the main stem painted blue. If these trees become 3000 trees, we don't need Birth year or origin, just write planted in comments.

3.4A CROWN WIDTH MEASUREMENT

Starting with the year 2000 field season the crown width of a sample of trees/saplings/regen by species will have 4 crown widths measured. The crown width to the North, West, South and East of the selected tree/sapling/regen will be recorded to the closest decimeter and recorded in the comments section. The criteria for selecting trees/saplings/regen to have crown width measured **by species** is as follows for new trees/saplings/regen (previous measured trees/saplings/regen have already been selected).

a) If < 10 trees/saplings/regen select all new trees/saplings/regen for crown measurements.
b) If > 10 but <=20 trees/saplings/regen select every second tree for crown measurements.
c) If > 20 but <=40 trees/saplings/regen select every fifth tree for crown measurements.
d) If > 40 but <=100 trees/sapling/regen select every eighth tree for crown measurements.
e) If > 100 trees/saplings/regen select every tenth tree for crown measurements.

This measurement is to be taken in the 4 cardinal point directions and is measured from the stem out. A reading of 2.5 metres is to be recorded as 25 (decimeters). This measurement is not to be done on dead trees/saplings/regen. If a tree has died that has been selected to have it crown measured, do not measure dead branches. Select the next tree of the same species as the new crown width tree and record the 4 measurements on the tally sheets.

The crown measurement is estimated at the widest portion of the foliage looking up from the base of the tree (Figure 2.8).

3.5 PLOT PHOTOGRAPHY

35 mm colour photos of each plot are taken once the measurements are complete. These photos serve as visual documentation of the overstorey and understorey of the plot and cover type. Numbered cards must be used in the photographs to identify the plot, as well as a card showing the month/ year the photo was taken. Two photographs are taken from plot centre; one facing east and the other facing west, with the photographer standing at plot centre.

3.6 VEGETATION DESCRIPTION

Figure 4.28 shows the format used for plot vegetation. The record type is #5 (Parent Vegetation is only measured at establishment).

3.7 PLOT VEGETATION ASSESSMENT

The vegetation plot is a 10m x 10m square plot located in the southwest corner of the tree plot (see Diagram 2.1). The vegetation plot can be moved to the northeast corner of the tree plot only if the southwest corner is not representative of the entire tree plot. If the vegetation plot is moved to the northeast corner, be sure to indicate this on the vegetation description form under the comments section. All this information is recorded on Stand Dynamic Vegetation Sheet (CSTM 102). Coverage can be over 100% as a result of one species growing beneath another. Assess the vigour of the species using a three part scale:

1 - Poor
2 - Average
3 - Outstanding

a) **Field Name** - The field name is a seven letter code based on the scientific name of the species (see Master Appendix 12 & 13). The first four letters of the genus are recorded, followed by the first three letters of the species. For example, white spruce (Picea glauca) is tallied as PICEGLA. In some instances it is acceptable to record only the genus (i.e. Salix). When this is done the species part of the field name is filled in as "SP".

   When you do not know what exact species the plant is write down the 4 letters of the genus and ‘SP’. **Do not** use a period or and extra P. (eg. PYROSPP.Should be written as PYROSP). If in doubt about what to record, please check Appendix 13. The only exceptions are the Poa species. They require a space after POA. Eg. POA GLA, POA INT, POA SP.

b) **Code** - The next range of columns divides the plant cover into eight groups, based on height and vegetation type. Within each group there are three columns labelled "%" and "vigour". The first two of these columns are reserved for recording the percentage of the area which is covered by each coded species in each group, and the last column (vigour) is used to record a subjective evaluation of the plant species vigour within the plot.

c) **Trees** - All vegetation taller than 5.0 metres, regardless of species, is recorded in this column.

d) **Tall Shrubs** - Includes all vegetation between 2.5 and 4.99 metres tall.

e) **Low Shrubs** - Includes all vegetation between 0.3 and 2.49 metres tall.

f) **Ground Shrubs** - All woody species that are less than .29 metres tall.

g) **Herbs** - Record all herbaceous species in this column.

h) **Grass** - Record all grass species within the plot.

i) **Moss/Lichen** - Record all moss species within the plot.

j) For trace amounts of any species, record the percent cover as 0%. In cases where there is more than or equal to 0.5%, record the percent cover as 1%. Note that 1% cover on 1/10 ha is ten metres squared (1 m x 1 m).

3.8 PLOT RETREATMENT REPORT (RECORD TYPE 9)

The plot re-treatment report is filled out at each remeasurement. The header information (boxes 1-24) must be filled out regardless of the plot has been disturbed or not. See figure 4.29

The report consists of 5 parts:

1. **Stand Tending:** The year of treatment refers to the last year the plot was tended e.g. 1989 - record as 89, type of treatment. Indicate Y(yes) or N (no) in each box that describes whether the plot was thinned, cleaned or deciduous species only were removed. More than one box can be filled in. Record the % of the tree plot to the nearest 10 that has been cleaned, etc. If the plot has been fertilized, obtain the fertilizer type and application rate from the appropriate district office, or forest headquarters.

2. **Replant:** Thee plot and/or buffer was replanted indicate this in columns 46 with an x. Obtain stock type from the district office and the date it was replanted.

3. **Weather/Natural Damage:** If there is any evidence of flooding, hail damage, browsing, snow or frost damage, indicate with an 'x' beside the appropriate description. Record the percent damage to the tree plot to the nearest 10%.

4. **Physical Description:** Indicate true or false in the box if there is a windthrow within the tree plot. If there is exposed mineral soil and no vegetation growing on it record the

percentage of the tree plot that it covers to the nearest 10%. If the buffer is a standard 200m x 200m record 'Y'. If it is smaller or larger, record 'N'.

5. **Plot Sizes:** Record the north and west plot sides for both the sapling and tree plots. Measure to nearest 0.1m. Write above each leg, the leg you are measuring, e.g. NW to NE, NW to SW etc.

   Azimuth and distance to each Regen Plot from plot centre is to be recorded in the comments section. (This only has to be done once - check with supervisor if needed).

3.9 PLOT AGING

1. Ages in the four regeneration plots.

   Ages on tally sheets should not be used to age the trees. This is an approximation and may change based on your age that you get in the field.
   When aging trees, it is important to use the height increment printout along with counting increments. If a tree was tagged in 1986, it cannot have a birth year of 1989.

   a) Fill in the plot number and date on the age sheet (see Figure 4.30).

      In Regen Plot# column record appropriate regen plot number. Use form for sapling and trees with appropriate Record number.

   b) These forms can be used for more than one regen plot **BUT** separate plots by a blank line.

   c) Select three of the tallest, tagged, healthiest trees for both tree types, Advanced and Ingress for each species. These trees should have a high probability of being there at least 25 years from today. DO NOT select trees that are obvious of poor vigour (dying).

      Advanced tree type are trees that were left during harvesting and their age is older than the remeasurement date minus harvest date.

      Ingress tree type are trees that germinated after harvest date or scarification date (see SDS checklist form). (Record "A" in tree type column for Advanced and "I" for Ingress).

   d) If less than 3 trees per species on a plot select all trees and record appropriate condition codes (on next line) if necessary (see lines 3 and 4, Figure 4.30).

   e) Planted trees do not need aging.

   f) Be AWARE that you may encounter a previous dead top or some other damage that the tree recovered from and you should include another year or two on top of the current age since the tree recovered. Pine have lammas branches which should not be counted as a whorl. This is common on pine but rare on spruce. Past condition codes (One

Only) can be recorded on the next line for that specific year. Mark the next lines Tree # column with CC (see Line#4 on tallysheet). If more HT number columns are needed use the next line (after CC line if necessary) and write in Year HT, etc. and record total height immediately below the new heading (see lines 6 and 7 on tallysheet).

g) Deciduous trees over 8 metres should not be taken as age trees. Tall deciduous trees yearly increments are hard to discern and the guidelines provided are to be used (see line #7).

h) On conifers greater than 5 metres in height, yearly Total height is taken up to 5 metres and then Total height is taken in 5 year increments (see line 10 and 11 on tallysheet).

i) An additional five trees per tree type, per species in each plot are selected systematically for Total age and height ONLY (see lines 15 and 16 on tallysheet).

- Count the total number of trees alive for each species and subtract the three trees already aged. Divide this number by five to decide which trees to measure for height and age only i.e. 20 Pl on regen plot minus 3 trees already measured = 17 divided by 5 = 3.4. Round off to 3. Take tree #3, 6, 9, 12 and 15 depending on point #2 below.

- These trees are taken whether they are damaged or healthy. If the tree has already been used as one of the initial three tallest trees, take the tree (same species) before or after it.

- If less than five trees for that species on the plot, record them all.

j) DO NOT fill in any height measurements if you can't tell the increment on that particular year, eg. Tree #2009 in 1989 was 464 and in 1992 it was 381, not sure for 1990 and 1991. DO NOT fill 1990 and 1991 with 381.

2. Ages in Sapling Plots.

<u>DO NOT</u> choose trees over 8 metres in height for age trees (see lines 18 to 21 on tallysheet).

4.0 ALLOWABLE ERRORS

STANDARDS FOR STAND DYNAMICS PLOT MEASUREMENT

4.1 REGENERATION PLOT MEASUREMENTS

ITEM	STANDARD	ALLOWABLE ERROR
Tagged Seedlings (Type 6 data)	All seedlings must be located. Condition code (if any) filled - i.e. for dead, damaged or diseased seedlings.	None Any impacted seedlings must have appropriate condition code recorded
Species	All seedlings must be correctly identified by species. Special consideration should be given to Sb versus Sw, Pb versus Aw.	None
Height	Using Regeneration height measuring stick, measure to base of the candle or branch whorl on stem (exclude current years growth).	The allowable error for measured seedling heights is +/-4.0 cm
Seedling growth to Sapling height	All stems located and stem mapped (azimuth & distance	Azimuth recorded within 1 degrees and distance within 10 cm.
Number of non-tagged seedling tally (type 61)	All seedlings not tagged must be accounted for and species and height class recorded on height class tally sheet	Total number of seedlings recorded within 2 seedlings.

4.2 SAPLING PLOT MEASUREMENTS

Saplings already tagged	All saplings located and condition code (if any) filled in	Any impacted sapling must have appropriate condition code recorded
New Saplings (ingrowth)	Saplings must be located, correctly numbered and condition code, if any, filled in	Numbering continues from last tagged sapling. Any impacted sapling must have appropriate condition

		code recorded
Species	All saplings must be correctly identified by species	None
Height	Measured with sapling height pole	Measured within 20 cm
Diameter	Measure at breast height (1.3 m)	Diameter measured within 1 cm. Breast height $\pm$ 1.0cm.
Number of Trees	All new trees must be recorded and stem mapped (azimuth & distance). Take care with 2 stems from the same stump, both tagged and measured if fork below 1.3 m	Allowable Error +/- 1% of all trees tallied Azimuth recorded within 1 degree, distance within 10 cm. Record declination used

4.3 VEGETATION MEASUREMENTS

Vegetation Tally Sheets	All major species must be identified and recorded. Identify as much vegetation as possible and record an estimate of vigour.	Major species are those > 2% cover must be identi-fied. Total plot vegetation cover to be measured within 20%.

4.3A PLOT RETREATMENT MEASUREMENTS

	All disturbances must be marked in the appropriate box	Percent damage recorded must be within $\pm$10% of the check cruise.

4.4 PLOT REJECTION

The plot may be required to be remeasured if the entire plot has:

- more than 5 percent of regeneration height measurements are outside specified allowable error - or;
- more than 5 percent of sapling height measurements are outside specified allowable error - or;
- species is incorrect on more than 5 percent of regeneration and sapling measurements - or;

- the number of seedlings by species is incorrect in more than 2 height classes on a plot
- the condition codes are incorrect on more than 10 percent of the regeneration, saplings and trees - or;
- azimuth and distance measurements are incorrect on more than 10 percent of the saplings or trees - or;
- vegetation tally sheets are incomplete, completely missing more than 3 major species (which cover more than 2 percent of plot area).
- plot retreatment report is incomplete.

4.5 DATA ENTRY ON HEADER AND TALLY SHEETS

Measurements taken on permanent sample plots are recorded on Permanent Sample Plot Header Sheets (TM267), Permanent Sample Plot Tally Sheets (TM249) and on Regeneration Tally Sheets (TM261). Data recorded on the front of each tally sheet in the white columns is keypunched in the same format to keep the tally sheets and computer files compatible. It is important that all letters and numbers are legible to avoid keypunch errors resulting in costly computer errors. Quality measurements are of no value if they are not legible. See Appendix 14 for common problems.

4.6 STAND DYNAMICS GENERAL INFORAMTION (CSTM 100 AND CSTM 101) – See Appendix # 17.

4.7 SUGGESTED EQUIPMENT AND SUPPLIES - See Appendix # 1.

4.8 TREE SPECIES CODE – See Appendix #12.

4.9 TREE HEIGHT MEASUREMENT USING A CLINOMETER – See Appendix #14.

4.10 HEIGHT TO LIVE CROWN

The height from the ground to the base of the live crown (see Figure 2.5) is measured on all trees that have been measured for total height. The base of the live crown is the point that separates the continuously branched portion of the tree and the part that has sporadic or no branching. Live crowns on deciduous species start at the leaves, not at the branches. Live crowns on coniferous species start at the tip of the live branch, not at the base of the branch. The height to live crown is quite variable depending on stand maturity and density with young, open stands having low live crowns and mature, stocked stands having higher, live crowns. Height to live crown is measured on age trees when they are on the ground and being prepared for sectioning.

4.11 SLOPE CORRECTION FACTORS AND TABLES – See Appendix #5.

4.12 CONDITION CODES – See Master Condition Code List.

4.13 MISTLETOE RATING SYSTME – See Figures 11 and 12.

4.14 LEGAL SURVEY OF ALBERTA – See Appendix # 8

4.15 DETERMINING BREAST HEIGHT – See Appendix #14.

4.16 ROUNDING OFF – See Appendix 9-h.

4.17 PROBLEMS WITH RECORDING DATA – See Appendix #15 and 16.

4.18 CROWN CLASS

Crown class (CC) refers to the position of an individual tree within the canopy of the stand inside the plot. Crown class is assessed on a plot-by-plot basis, not on the stand as a whole. For example, an intermediate tree in one PSP plot may be codominant in the next. The following figure shows the types of crown class in a single layer stand. Crown classes are recorded for all tress with the exception of those with a broken top/system, are dead, cut down, missing, or have a severe lean (see Figure 2.6).

4.19 STEM MAPPING

All tagged stems within the tree sapling plot are stem mapped. Stem mapping is used to identify the position of each tree or sapling with respect to other surrounding trees or sapling and can be used in distance dependent growth models and is used in plot remeasurement to locate missing trees or sapling.

A staff compass and a metric tape is used to determine the azimuth and distance to the centre of each tree or sapling, at breast height, from the plot centre. Azimuth are recorded from 1°-360° and distances are measured to the nearest 0.1 m. Standing dead trees are to be stem mapped.

Regeneration are not stem mapped.

4.20 SEED VS. SUCKER – ORIGIN ON POPULUS SP. – See Figure 4.32.

References for Condition Code Assessments for Wildlife

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