DEMO 2009 FIELD MANUAL
OVERSTORY AND UNDERSTORY TREES

GENERAL GUIDELINES FOR TAKING MEASUREMENTS AND RECORDING DATA

Compass declination and hypsometer calibration: Each morning, be sure that the declination on your compass is correct (**Table 1,** pg. 14). Before work each morning and after lunch each day, calibrate your hypsometer to a 10-m reference distance using your meter tape (see **Vertex IV/Transponder T3 Users Guide**).

- **Minimize physical impact to the plot**: To minimize damage to vegetation within a plot, **do not establish "camp" at the center of the plot**; leave packs and eat lunch outside the circular tree plot. Sit/store gear on stumps/sound logs as much as possible to reduce soil disturbance and disturbance to older logs.

- **Carry several pieces of PVC** to each plot in case it is necessary to replace missing transect posts.

- **Always complete data form Header:** The following "header" information, present on all field sheets, should be completed, prior to taking any measurements within a plot.

  Page _____ of _____. For some data types, only one field sheet is used per plot; for others, more than one sheet is used. When more than one sheet is used per plot, pages should be numbered sequentially, and after sampling is completed, the total number of pages should be entered on each page (i.e. Page 1 of 3, Page 2 of 3, Page 3 of 3). If only one sheet is used, enter "Page 1 of 1." These procedures make it possible to detect loss of field sheets.

  Personnel. The last names of crew members sampling or recording information on a plot.

  Date. Listed in the following order: year (4 digits), month and day (two digits each).

  Forest/District. A 4-letter code based on the first letter of the **National Forest** (Gifford Pinchot = G, Umpqua = U), and three letters from the **Ranger District** (e.g., Diamond Lake = DIL) (see T**able 1**).

  Block. Blocks (study locations) are numbered 1, 4, 5, 6, 7, 8 (see **Table 2,** pg. 14).

  Treatment Unit. 13-ha **Treatment Units** (w/ 63 or 64 grid points) are numbered from 1 to 6 in each Block; numbers correspond to harvest treatment: 1 = 100% retention (control), 2 = 75% retention (gaps), 3 = 40% retention (dispersed), 4 = 40% retention (aggregated), 5 = 15% retention (dispersed), and 6 = 15% retention (aggregated). This number will be the first number on the metal tag attached to each grid-point center post. **We are not sampling Treatment 2 in 2009.**

  Plot. Plot number is also found on the metal tag attached to each grid-point center. A 3-character identifier represents the **Treatment/Row/Column** (e.g., **1A7** = Treatment 1, Row A, Column 7).

- **Use the following approach to ensure that data are properly "transmitted":** Individual who takes the measurement (e.g., diameter or height) calls out to recorder the relevant data. Recorder calls back to the reader the same information to ensure that she/he heard correctly. If the recorder notices a discrepancy between previous data on the field form and current data (e.g., tree w/ excessive shrinkage), she/he brings this to the attention of the reader and the problem is resolved in the field. If it is decided that an error was made in the past, a comment is recorded on the data form (e.g., "dbh confirmed, 2004 measurement incorrect").

- **How to measure slope:** Because tree and snag plots are slope corrected (i.e., radii vary with the steepness of the slope, see **Table 4**), you may have to use your hypsometer to measure the distance **between plot center and a tree in question**. One team member with the hypsometer stands at plot center, the other places the transponder on the tree of interest. Using the horizontal distance function of the hypsometer (see **Haglof Vertex Users Manual**) determine whether the center of the tree (or snag) is within the radius of the tree (11.28 m) or snag (15.96 m) plot. Be sure to account for the additional distance to the center of the tree (50% of the diameter).

- **Units and precision of measurement**: Be sure that data are recorded with the proper units (e.g., cm) and precision. Column headings indicate units; previous data indicate precision (integers, tenths, or hundredths).

- **Penmanship**: Always use a fine-point mechanical pencil (0.5 mm HB lead). Do not put extraneous marks (dashes, asterisks, or slashes) in the data columns. Write with dark characters; we make xerox copies of forms and light handwriting does not reproduce well. When erasing, erase completely, leaving no stray marks. Always use Upper Case letters for species codes.

FORM U-A. GENERAL PLOT CHARACTERISTICS

**Overview of Transect Orientation and Plot Layout**

Figure 1 (pg. 18) illustrates the layout of snag (0.08 ha) and overstory tree (0.04 ha) plots, and the strip plots (1 x 6 m) used to sample natural regeneration. The schematic figure below illustrates the orientation of Transects (A-D which define the strip plots) and the Quarters (1-4) of the tree plot, relative to each other and the grid system in each treatment unit. In the figure below, the **letter-number** combination = **row-column** in the grid and defines the plot number. For example, in **Treatment 1**, grid point **A2** = Plot **1A2**. Note that transects and strip plots are oriented 45° off the grid system, and the strip plots fall to the clockwise side of the 45° line.

Table 2 (pg. 14) contains the azimuths of the rows and columns of each block x treatment unit.

Table 3 (pg. 15) contains the azimuth of each transect (A-D) for each block x treatment unit. **Note**: for several treatment units, transect azimuths were not established exactly 45° off the grid system. Nonetheless, we have retained these orientations. Please consult **Table 3** before beginning each plot. In addition, a separate plot-specific listing, "**DEMO Vegetation Transect Reestablishment Data**", contains (1) the azimuth of each transect and (2) the distance from plot center (i.e., grid point marked by a tall PVC post and metal tag) to the start and end points of each transect (a PVC post with blue flagging, **although many of these may be bent or missing**). Typically, PVC posts are at 4.00 and 10.00 m (not slope corrected) from the plot center. However, distances can vary due to obstructions (logs or trees), and some transects can also have posts at intermediate points (due to obstructions). The distances of these intermediate posts are also recorded in this listing.

Data to Record:

General Comments About Plot: Please comment liberally about plot conditions, e.g., recent disturbance or tree mortality, forest stand features, development of understory vegetation, or other notable features. If, for any reason, reinstallation of rebar or PVC is required, details should be reported here.
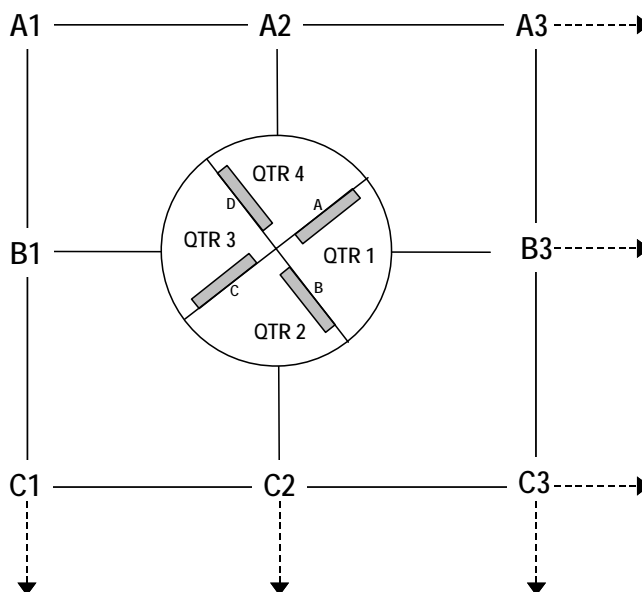
Data Forms Not Used in the Plot: At the bottom of the U-A form is an area to record whether one or more of the blank form types was not used in the plot: Form **O-D (Tree mortality) , O-F2 (Snag recruitment), or O-G (Ingrowth)** (e.g., if there were no mortality events or ingrowth).   It is critical that an "X" is recorded for any form type that is not used. **If a form type is not used and an X is not recorded, one could assume that either a data sheet has been lost or a team has forgotten to record an X. We'd prefer not to guess.**

FORM U-F2. NATURAL REGENERATION (trees >10 cm tall and <5 cm dbh)

Because it is possible to damage small seedlings while sampling overstory or planted trees, natural regeneration is sampled first in each plot, in a series of four 1 x 6 m strip plots (see **Fig. 1**).

WHICH PLOTS ARE SAMPLED? **** Note: We are not sampling natural regeneration at block 8 (CFOR).** At all other blocks, all plots (grid points) with understory transects in treatments 1, 3, 4, 5, and 6 are sampled. The number of plots varies by treatment: treatments **1, 3, 5,** and **6 =** 32 plots; treatment **4 =** 37 plots. In treatments 1, 3, and 5, every other grid point is sampled. Each plot will have PVC posts (with blue flags) marking the ends of each of the four transects (see **Fig. 1**).

Note: (1) Sampling of natural regeneration at **Butte (GRAN, block 5)** will not be necessary; it will be done by a separate crew sampling understory vegetation at that block.   (2) At the UDIL block, transects were initially established at all grid points in **treatment 5,** however natural regeneration will be sampled at every other grid point, i.e., only the points for which data packets contain U-F2 sheets.

DISTINGUISHING NATURAL REGENERATION FROM PLANTED TREES. Natural regeneration are trees >10 cm tall and <5.0 cm dbh. Species considered to be trees, and previously found in our overstory tree plots or natural regeneration strip plots, are listed in **Table 5** (pg. 17). Plots may contain planted trees of the same species, but all planted trees should have metal tags (unless they have been lost) making it possible to distinguish them from natural regeneration (see tag numbers on **FORM U-G2. REMEASUREMENT OF PLANTED TREES – 2009).** There are two exceptions, however. At blocks UDIL and GWIR, some natural regeneration in the 1 x 6 m strip plots were tagged in 2003. A complete list of these tagged stems is provided in: "**LIST OF TAGGED NATURAL REGENERATION AT UDIL AND GWIR (FROM U-G3 DATA, 2003)".** The list should be carried at all times in these blocks.

ESTABLISHING STRIP PLOT BOUNDARIES. Natural regeneration are tallied in four, 1 x 6 m strip plots in each tree plot (see **Fig. 1).** Strip plots are not slope-corrected. One of the long sides of each strip plot is defined by PVC posts with blue flags. Identify each strip plot (transect) based on its azimuth (see **Table 3 or "DEMO Vegetation Transect Reestablishment Data")**. Clip the zero mark of the tape onto the post located 4 m from plot center (the "4-m" point). Walking along the left side of the transect to avoid stepping in the strip plot, unreel the tape to the post located 6 m away (the "10-m" point) keeping the tape as tight and straight as possible. The tape may have to be threaded under and/or between logs and slash to keep it tight and straight. Your partner should sight along the tape to ensure that a tight, straight line is run. The loose end of the tape should then be clipped to the 10-m post. If large logs, trees, stumps, or slash fall along the transect line, **intermediate PVC posts** may have been established before and/or after these obstructions. Intermediate points are documented in "**DEMO Vegetation Transect Reestablishment Data,"** thus consult this listing before running the tape. When intermediate points are present, data collection may need to occur in segments by clipping the tape to intermediate posts. Logs and slash may also have forced placement of the 4- or 10-m end points at distances greater than or less than 4 and 10 m from plot center. These situations will also be documented in "**DEMO Vegetation Transect Reestablishment Data**." If it is indicated that the 4-m point is not located at 4 m, clip the tape to the post at the point along the tape that corresponds to the actual post location. For example, if it is indicated that the post lies at 4.20 m, clip the tape at 4.20 m. This will ensure that measurements of natural regeneration are made within the correct 1 x 6 area (4.00 –10.00 m) relative to plot center.

One edge of the 1 x 6 m strip plot is defined by the meter tape stretched between PVC posts. The strip plot always falls to the right (clockwise side) of the transect as you face away from plot center (see **Fig. 1**). The opposite edge of the strip plot is estimated visually using a 1-m-long PVC post extended perpendicular to the meter tape. Whether a tree is in or out of a strip plot is based on its rooting location—where the stem emerges from the ground surface (or litter). If necessary, lay your 1-m post on the ground perpendicular to the meter tape to make this decision.

SAMPLING PROCEDURE. Form U-F2 is used to tally natural regeneration in each strip plot by height class (for stems

<1.5 m tall) and diameter class (for stems ≥1.5 m tall and < 5 cm dbh). Tallying by height and diameter class can be done simultaneously down the transect with each stem tallied either by height or diameter class.

- Enter the **Transect** (strip plot) letter (**A, B, C** or **D**) in the blank provided at the upper left of both data sections. Note that each page can hold data for two transects. If more lines are needed for a particular transect (i.e., if there are >5 species present), continue in the second section of the page or begin a new page, but first place a check mark in the continuation space at the top of the first section **(Cont? _√_).**
- For each species present, record **Species name** and **Code** (see **Table 5,** pg. 17).
- The first data section is used to tally by height class (trees <1.5 m tall). Space is provided for tally marks (**Tally**) and a numeric total of the tally (**Tot**). Use a height pole or calibrated PVC post to determine the height class. If a tree is rooted on a stump or log, height is measured from the rooting substrate.
- The second data section is used to tally by diameter class at breast height (trees **≥1.5 m tall** and **<5 cm dbh**). Space is provided for tally marks (**Tally**) and a numeric total of the tally (**Tot**). Use a dbh tape, dbh strip, or ruler (for trees smaller <2 cm dbh) to gauge the diameter of each tree.
- Once tallies are completed for a transect, enter totals for each height and diameter class in the **Tot** columns. If no individuals occur in a particular class, enter zero in the total column.
- If there are no trees meeting the height or diameter criteria for the entire transect, place a check mark in the blank space provided at the upper right of each height and/or diameter section **(None present on transect _√_).**

Note: Hardwoods may sometimes occur as multiple sprouts from a common base or cut stump. Tally all stems of appropriate height or diameter.

FORM U-G2. PLANTED TREES

Planted trees, if present, are sampled after natural regeneration. As you move through the plot avoid walking through the belt transects (1 x 6 m) that define the areas sampled for natural regeneration and understory vegetation.

WHICH PLOTS ARE SAMPLED? The same as for natural regeneration, but only "cut" plots (logged areas of Treatments 3, 4, 5, and 6). No trees were planted in Treatment 1, or in the aggregates of Treatments 4 or 6. The number of plots varies by treatment: treatments **3** and **5 =** 32 plots, treatment **4 =** 12 plots, treatment **6 =** 22 plots.

DETERMINING PLOT SIZE, SLOPE, AND WHETHER TREES ARE "IN" OR "OUT". Planted trees are measured in a 0.04 ha plot (11.28 m radius; see **Fig. 1)**. However, plots are slope-corrected, thus on steeper ground, plot radius will be greater than 11.28 m. All planted trees are tagged, but if a tag is missing and you question whether a tree toward the edge of a plot is planted or natural regeneration, use your hypsometer in "horizontal distance" mode, to determine whether the tree is "in" or "out" (see description on pg. 1).

IDENTIFYING PLANTED TREES. All planted trees in a plot should be tagged. Tags are attached on a loop of green tie tape placed either at the base of the tree (on the ground) or (2) on a sturdy branch. Tags on the ground may be covered with litter. Trees were planted in spring 1999 at most blocks, but at Butte in 1998. In addition, at Dog Prairie, trees were replanted in 2001 due to widespread mortality of the original cohort.
Recall however, that at UDIL and GWIR, some natural regeneration within the 1 x 6 m strip plots were tagged in 2003. A complete list of these tagged stems is provided in: "**LIST OF TAGGED NATURAL REGENERATION AT UDIL AND GWIR (FROM U-G3 DATA, 2003)".** This list should be carried at all times in these two blocks.

MOVING TAGS ON PLANTED TREES. If possible, each planted tree will have its tag moved from the loop of green tie-tape on the ground (or on an existing side branch) to a cable-tie placed on a sturdy, upward or horizontally oriented side branch with a sufficient number of live sub-branches to prevent tag loss. The cable tie **will not** be tightened, but will be looped loosely around the branch. If a tree is too small or does not have a sturdy side branch, replace the existing tie tape with a large loop of new tie-tape placed around the base of the tree. **If the tree has reached a dbh of ≥5 cm, the tag gets nailed at dbh (see below).**

SAMPLING PROCEDURE. Use the **U-G2 Form** to guide your search for planted trees. Trees are sorted by location in the plot (quarter, **Qtr**, see pg. 2 and **U-A**) and tag number. Planted trees that died in 2003 are listed as dead (Status = 6) without underscore spaces for additional data collection. Planted trees that could not be found in 2003 are listed as missing (Status = 9), also without underscore spaces. If a tree previously listed as dead or missing is found alive in 2009, data should be taken as described for live trees below.

Record the following data for all live or recently dead (since 2003) planted trees:

- **Current total height:** Total height from the base to the tip of the tree (in centimeters). Use a calibrated PVC post (or hypsometer if needed), to measure from the ground surface along the main axis of the tree. Gently straighten the leader if it is bent. If the terminal leader is gone or damaged, wrap your hand around the top whorl of branches and pull the laterals branches up to determine which is the longest — then measure to the tip of the longest lateral branch. **Note:** Even if the tree has died, take a current height.

- **2008 (last year's) leader growth:** Use a ruler to measure last year's leader growth (to the nearest 0.1 cm). **Note:** Do not measure leader growth for western hemlock (TSHE) or redcedar (THPL) (this can be very difficult). Do measure leader growth for all other species.

- **DBH (if ≥5 cm dbh):** if a planted tree has a diameter at breast height (dbh) of 5 cm or more, nail the tag at dbh height (1.37 m), facing plot center. The nail should be angled slightly downward so the tag falls away from the tree. The DBH measurement should be made directly above (touching) the shaft of the nail; the diameter tape should be level with the cross-section of the bole. To avoid confusion during subsequent measurement of the overstory tree plot, an ingrowth record should be entered onto a blank ingrowth form: **FORM O-G. POST-HARVEST INGROWTH (**see section B2, pg. 8)

- **Current Vigor/Status (1–3):** this is a qualitative rating of tree health defined as follows.
  If the tree is **alive** one of three codes is possible:
    1 = good, i.e. no apparent signs of stress
    2 = fair, i.e. some sign(s) of stress (e.g., discolored foliage, relatively few needles)
    3 = poor, i.e. extreme distress (death imminent)
  If the tree is **dead**: status = **6**.
  If the tree **cannot be found**: status = **9**.

- **Comments:** A comment should be entered that addresses unusual tree conditions (e.g., browsed, broken leader, canker, etc.). If the tree is dead, be sure to add the comment, "**Dead**" (if standing) or "**Dead and down**" (if it has fallen). It is okay to write in the space above previous comments. Only new comments will be entered with the 2009 data.

- **New tag#:** There is a column on the **U-G2 Form** to enter a new tag number. A new tag should only be placed on a tree if a previously listed tree cannot be found, but one does find sufficient evidence to confirm that a non-tagged tree was planted. For example: (1) green tie tape is found at the base of the tree, or (2) what appears to be a planted tree matches the missing tree with respect to location (quarter), species, and size (previous height). The new tag number should be recorded in the **New tag#** column, and a note made in the **Comments** as follows: "Tag not found; assumed to be <old tag #>." **Note:** before assigning a new tag, first check that the same tag number does not already occur on any other data form for the plot **(Forms O-E** or **O-F,** or the "**LIST OF TAGGED NATURAL REGENERATION AT UDIL AND GWIR (FROM U-G3 DATA, 2003)**".

<div style="border:1px solid black">

FORMS O-C, O-D, O-E, O-F, O-F2, and O-G. OVERSTORY TREES AND SNAGS

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Overstory trees and snags are sampled after natural regeneration and planted trees. A number of data forms are used simultaneously to record information on live trees and snags; this includes data on ingrowth (recruitment into the tagged tree population), mortality, diameter growth, and/or tree height.

WHICH PLOTS ARE SAMPLED? All overstory plots in Treatments 1, 3, 4, 5 and 6. The number of plots varies by treatment as follows: **1** = 32 plots, **3** and **5** = 63 or 64 plots, **4** = 37 plots, and **6** = 32 plots. Tree heights are measured on a subset of trees (not in all plots).

PLOT SIZE, SLOPE, AND DETERMINATION OF "IN" AND "OUT" TREES AND SNAGS. Live trees are measured in a 0.04 ha plot (11.28 m radius) and snags in a 0.08 ha plot (15.96 m radius) (see **Fig. 1)**. As you move through the plot avoid walking through the belt transects (1 x 6 m) that define the areas sampled for natural regeneration and understory vegetation (see **Fig. 1**). At the boundary of a plot, determining whether a stem is in or out is based on the center of the stem (at ground level for leaning trees). For the most part, boundaries will not need to be measured unless one encounters a potential "ingrowth" tree or new snag near the perimeter of the tree or snag plots. Plots are slope-corrected: on sloping ground, plot radii will be greater than 11.28 for trees or 15.96 m for snags. For a stem in question, use the hypsometer in "horizontal-distance" mode to determine whether the center of the stem is within the radius of the tree (11.28) or snag (15.96 m) plot (see description on pg. 1). **Note: these measurements must be made carefully and accurately as they are the basis for adding trees to plots.**

WHAT QUALIFIES AS A SNAG? To be a snag, a dead tree must be **> 50 cm tall** and **>25 cm dbh**. Stumps from recent harvest are not included. If a snag is leaning, it must be >2 m off the ground at dbh (1.37 m along the bole).

TYPES OF DATA AND FIELD FORMS. As many as six types of data forms may be used:

O-C. POST-HARVEST TREE HEIGHTS. This pre-printed form lists the trees for which height and height to live crown are measured. Records are sorted by Quarter (**Qtr**; see schematic diagram on **U-A**), then by tag number.

O-D. TREE MORTALITY. This blank form is used to record data for trees that have died since 2003**. If there are no new cases of mortality in a plot, the form is not used, and an X mark is placed in the appropriate blank in the bottom section of the U-A Form.**

O-E. OVERSTORY TREE REMEASUREMENT. This pre-printed form lists all tagged trees ≥5 cm dbh within the 11.28 m radius tree plot that were alive or died in 2003 (but not trees that died prior to that). Records are sorted by Quarter (**Qtr**; see schematic diagram on **U-A**), then by tag number.

O-F. POST-HARVEST SNAG ASSESSMENT. This pre-printed form lists all snags within the 15.96 m radius snag plot that were standing or fell in 2003. Records are sorted by Quarter then by tag number. However, some snags may not have tags if they were too decayed to hold a nail.

O-F2. POST-HARVEST SNAG RECRUITMENT. This blank form is used to record data on new snags—those arising from mortality of previously live, tagged trees, or new mortality in the outer portion of the snag plot where live trees were not tagged. **If there is no snag recruitment in a plot, the form is not used, and an X mark is placed in the appropriate blank in the bottom section of the U-A Form.**

O-G. POST-HARVEST INGROWTH. This blank form is used to collect data for trees that were too small to tag (< 5 cm dbh) in 2003, but are now large enough (≥ 5 cm dbh). **If there is no ingrowth in a plot, the form is not used, and an X mark is placed in the appropriate blank in the bottom section of the U-A Form.**

FORM O-C. TREE HEIGHTS

Form O-C (Tree heights) lists the subset of trees in each plot for which height measurements are made. Note that not every plot will have an **O-C Form**. Heights are taken at the same time that trees are measured for diameter thus it is necessary to consult the **O-C** and **O-E Form (Live trees)** together.

Note: The **O-C (Tree heights) Form** may contain multiple years of data for a tree. However, blank fields (underscore lines) for new data (2009) are only associated with 2003 records. If an **O-C Form** does not contain a 2003 record, no blank fields are available and no height data are taken.

The procedure for measuring tree height is described in the **Vertex IV/Transponder T3 Users Guide**.

If a tree listed on the **O-C Form (Tree heights)** is dead or has top damage, select a replacement tree of the same species and approximately the same diameter (+/- 4 cm of the dbh listed). If a replacement cannot be found in the same plot, select a tree in the next plot visited. If a tree is selected from a new plot, cross out the old **Plot** and **Qtr** and, above these, pencil in the new **Plot** and **Qtr**. Record the **Tag #** of the replacement tree under **Alt. Tag #**. Make a note in the **Comments** field that the original tree died or had top damage. Substituting a tree will require that you remember to locate a replacement tree when you arrive at the next plot. As reminder, before you leave the plot, place the **O-C (Tree heights) Form** on top of the data packet for the next plot to be visited.   Continue to search for a replacement tree until you have exhausted all possibilities within existing plots. If a replacement cannot be found anywhere in the treatment unit, draw a line through the dead or damaged tree and add a note to the **Comments** field that a suitable replacement could not be found.

For all height trees, record the following data:
- **DBH** (to the nearest 0.1 cm)
- **2009 Height** (height to the top of the tree, to the nearest 0.1 m)
- **2009 Ht to live crown** (height to lowest live branch at its attachment point on the bole, to the nearest 0.1 m)
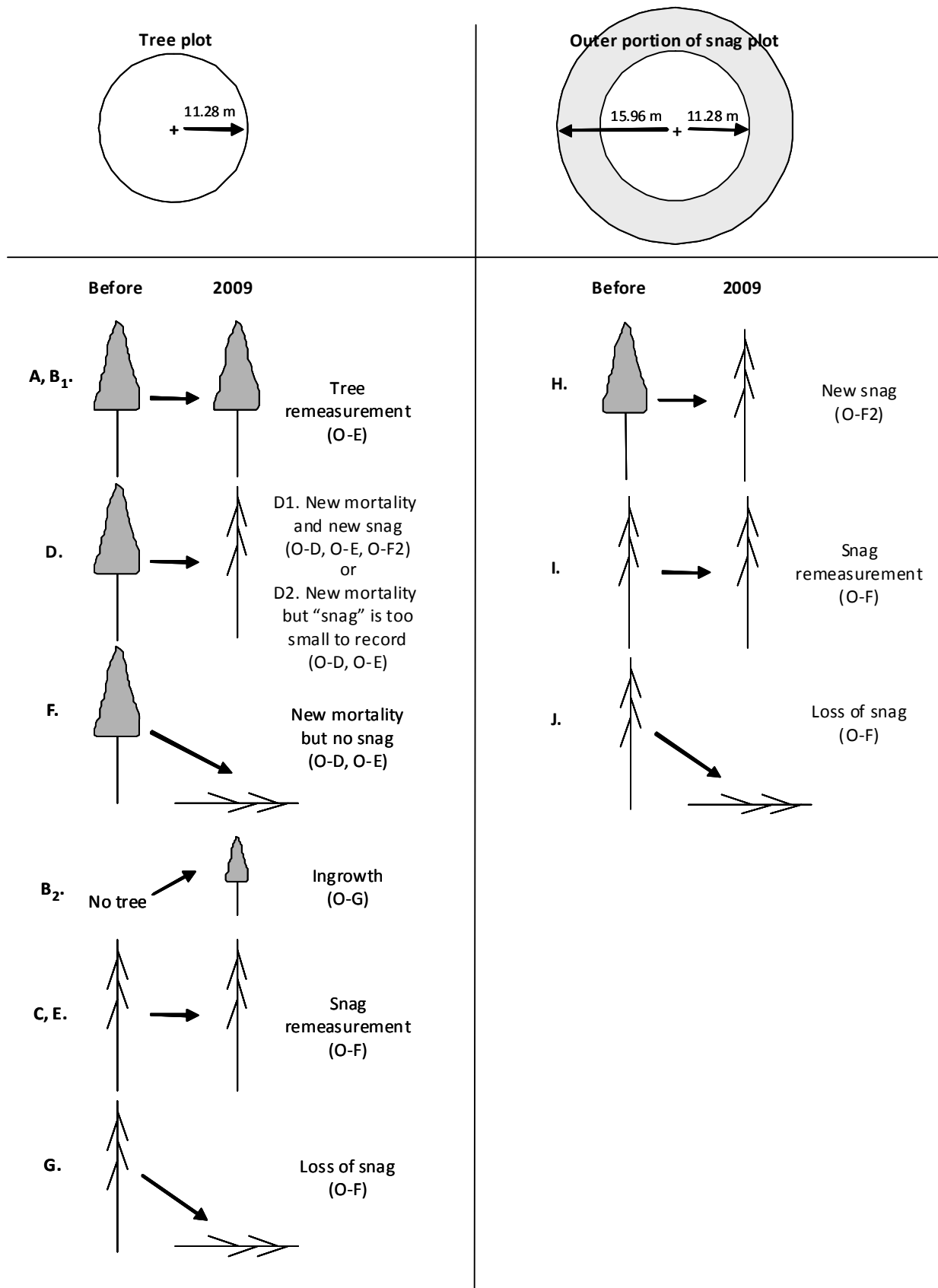- **Comments** (if applicable)

FORMS O-D, O-E, O-F, AND O-G. LIVE TREES (DIAMETER, MORTALITY, AND INGROWTH) AND SNAGS (HEIGHT AND DECAY CLASS)

SAMPLING PROCEDURE FOR LIVE TREES AND SNAGS. Begin in the tree plot (11.28 m radius) and sequentially, by quarter, visit all stems $\geq$ 5 cm dbh. Live trees, snags, "ingrowth" and recent mortality will be sampled simultaneously as you move from stem to stem. Use the information on the **O-E (Live trees) and O-F (Snag) Forms** as a guide. **Note**: there are often "skips" in tag numbering of **O-E and O-F Forms** because live trees and snags were originally tagged sequentially by position within a plot. Also, some snags were not sound and could not be tagged; these can only be relocated by position (quarter of the plot) and their physical characteristics (species, diameter, decay class, and height class).

Once the tree plot (11.28 m radius) is completed, move to the donut-shaped area remaining in the snag plot, a distance of 11.28 to 15.96 m from plot center. In this region, consider only snags. As in the tree plot, decayed snags without tags can only be relocated by position and condition. Some may also be new (resulting from trees that died since 2003).

The following pages describe the various situations possible in the tree and snag plots and how data are recorded for each situation. The schematic diagram on page 8 illustrates each of these situations. Letters or Letter-number combinations to the left of the pictures refer to the particular scenarios described.

Possible Scenarios (A → J) for Live Trees and Snags and Associated Data Forms

Tree plot

11.28 m

Outer portion of snag plot

15.96 m   11.28 m

Before   **2009**

A, B₁.   Tree remeasurement (O-E)

D.   D1. New mortality and new snag (O-D, O-E, O-F2) or D2. New mortality but "snag" is too small to record (O-D, O-E)

F.   New mortality but no snag (O-D, O-E)

B₂. No tree   Ingrowth (O-G)

C, E.   Snag remeasurement (O-F)

G.   Loss of snag (O-F)

Before   **2009**

H.   New snag (O-F2)

I.   Snag remeasurement (O-F)

J.   Loss of snag (O-F)

FORMS O-D, O-E, O-F, O-F2, AND O-G. STEMS IN THE TREE PLOT (11.28 M RADIUS)

A. Stem is alive and tagged. This stem will be listed on the **O-E (Live trees) Form**. Record the following:
- **New DBH** (in cm, to the nearest 0.1 cm) – measurement should be made directly above (touching) the shaft of the nail with the diameter tape level with the cross-section of the bole. The recorder should watch the measurer to be sure that the tape is straight and tight. Many trees will not have grown much since the last measurement, thus it is important that measurements are accurate. Measurements are taken to the nearest 0.1 cm. If the diameter has declined by more than 0.2 cm since the last measurement, or has increased excessively (> 8 cm), recheck the measurement. If you are confident that your measurement is correct, make a note in the Comments, for example: "DBH shrank, confirmed", or "DBH 10 cm larger, confirmed."
- **Status** (1, 6, or 9): record a 1 (1 = still present /alive)
- **New Vigor** (1-3): this is a qualitative rating of tree health, coded and defined as follows:
   1 = good, i.e. no apparent signs of stress
   2 = fair, i.e. some sign(s) of stress (e.g., discolored foliage, relatively few needles)
   3 = poor, i.e. extreme distress (death imminent)
- **Comment**: Write a brief comment if there is something unusual about the tree condition (e.g., physical damage), or if the New DBH is smaller or much larger than the Old DBH (see above). Be sure to comment if New Vigor is not "1".

Re-nailing tags: If the nail shaft has limited room for future growth (<2.5 cm), please renail the tree **adjacent to (*NOT* above or below) the existing hole**, using a new nail if necessary. To remove the nail without damaging the cambium or bark of the tree, use a wood block to support the claw of the hammer or pull the nail out without touching the bole. When retagging, make sure the new nail sufficiently deep to stay in the tree, but with plenty of room for growth, and with the nail angled downward so the tag falls away from the tree.

B. Stem is alive, but not tagged. This stem has either (1) lost its tag, or (2) is "ingrowth" ⸺ one that was <5 cm dbh in 2003, but is now large enough to tag (≥5 cm).

   B1. Lost tag: If the stem is considerably larger than 5 cm, it is likely to have lost its tag. Try to find the old nail hole. If you cannot, but you can match it to a stem on **O-E** based on location (Quarter), species, and size, assign a new tag and record this under **New tag no.,** then proceed as described above for case **A**. **Before assigning a new tag number, confirm that the same tag number does not already occur in plot (check the O-E, O-F, U-G2, or "LIST OF TAGGED NATURAL REGENERATION …" Forms)**. Add a comment: "Old tag was missing."   Tag and nail should be placed 1.37 m from the ground as measured from the **up-slope** side of the tree (for odd situations, such as split or swollen boles, see **Fig. 2,** pg. 19). However, the tag should always be placed so that it faces plot center.

   B2. Ingrowth: If the stem is equal to or slightly larger than 5 cm dbh it may be an "ingrowth" stem. If the tree cannot be matched to a record on the **O-E (Live trees) Form**, treat it as ingrowth and assign it a unique tag number. **However, before you assign a new tag number, confirm that the same tag number does not already occur in the plot (check the O-E, O-F, U-G2, or "LIST OF TAGGED NATURAL REGENERATION …" Forms)**. Use the **O-G. POST-HARVEST INGROWTH Form** to record the following:
- **Quarter** (see schematic figure on **U-A Form**)
- **Tag#**
- **Species code**
- **DBH** (in cm, to the nearest 0.1 cm)
- **Height** (in m, to the nearest 0.01 m) using the hypsometer
- **Canopy class,** a classification that ranks species by relative position in the canopy. In most instances, ingrowth should be classified as S (suppressed) or I (intermediate) – see **Note** below.
      D = Dominant trees emerge from the general canopy layer and thus receive light from the top and sides;
      C = Co-dominant trees form the main canopy; the crown extends to the top of the general canopy layer and receives light from the top, but not much from the sides;

> **I = Intermediate** trees are shorter than co-dominants; the crown extends into the lower portion of the general canopy layer and thus receives mostly filtered light from the top and sides;
>
> **S = Suppressed** trees are the shortest individuals that form the lowest tree layer. The crown is completely beneath the general canopy layer. Contrary to their name, they are not necessarily any more stressed than trees in any other layer.

Note: This classification was developed for closed-canopy forests and has limited relevance here. Nonetheless, use the following guidelines: In Dispersed treatments, code ingrowth relative to retained overstory trees. In cut areas of the aggregated treatments, code ingrowth relative to trees in the aggregates. In the aggregates, code ingrowth relative to surrounding trees.

- **Vigor** (1-3): a qualitative ranking of tree health, coded and defined as under case **A**, above
- **Conditions:** A series of crown, bole, and disturbance codes can be recorded for each tree: see "**Conditions**" in the header of the **O-G (Ingrowth) Form**. As many as three codes can be entered to describe crown or bole conditions and two codes to describe disturbance. If a tree has no unusual conditions, record a "1" in the first cell of each category.

Note: It is critical that tagging, measuring, and rating of tree conditions are done carefully; these data will serve as the baseline for future measurements. The recorder should watch for incorrect species IDs or incorrect placement of the diameter tape, and she/he should aid in assigning condition codes by viewing the tree from a different angle.

C. Stem is dead, standing, tagged, and listed either on the O-F (Snag) Form or both the O-F and O-E (Live trees) Forms: This stem was either a snag prior to 2003 (present only on the **O-F Form**) or was a live tree that died in 2003 (present on both the **O-E** and **O-F Forms**). Data are only recorded on the **O-F Form** as follows:

- **Height**: in meters to the nearest 0.1 m using the hypsometer. This will be the first precise measurement of height for a snag. Previously, snag heights were recorded by height class (1 = 0.5 - 1.5 m, 2 = >1.5 - 5.0 m, 3 = >5.0 - 15.0 m, 4 = >15.0 m).
- **Decay class** (1-5)**,** defined as follows (see **Fig. 3**, pg. 20):
  1 = needles and twigs present; bark tight
  2 = needles and twigs present; bark loose
  3 = needles and twigs absent; bark absent
  4 = needles and twigs absent; top broken out
  5 = needles and twigs absent; bark absent; top broken out; decomposition obvious
  Note: The characteristics used to describe decay may not always be consistent with the descriptions on the field sheet or diagram in **Fig. 3**. You may have to decide which description, on the whole, best fits the condition of the snag. When weighing these characteristics, choose the decay class that best describes the **bole** of the snag.
- **New lean angle** (in degrees from vertical) as shown in this figure. Record lean angle only if it is ≥15 degrees (estimate to the nearest 5 degrees if possible). On steeply sloping terrain, lean angle can exceed 90 degrees if trees are leaning down slope.
- **Status:** record a 1 (1 = still present)
- **Comment**: if necessary, add a comment to describe why the height class or lean angle has changed since the last measurement.
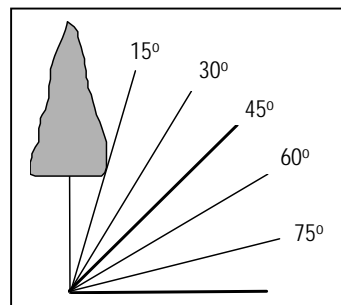
D. Stem is dead, standing, and tagged, but not listed as dead (status = 6) on the O-E (Live trees) Form and not present on the O-F (Snag) Form: This is a case of new mortality (died after 2003). There are two possible variants:

    D1. Stem is large enough to be considered a snag ($\geq$ 25 cm dbh and > 0.5 m tall). For this case, three forms are used: **O-D (Mortality)**, **O-E (Live trees)**, and **O-F2 (Snag recruitment)**, as described below.

    D2. Stem is too small to be a snag (i.e., < 25 cm dbh or <0.5 m tall). For this case, only the **O-D (Mortality)** and **O-E (Live trees) Forms** are used as described below.

Form O-D (Mortality): Various data are recorded to describe the condition and possible cause of mortality. Note, as many as 6 mortality cases can be recorded per plot per data form. For each stem record the following:

- **In the header: District, Block, Treatment Unit,** and **Plot**
- **In the body of the form: Qtr, Tag no., Species, DBH**
- **Canopy class**: leave this blank, we will extract this information from the original data file
- **Remaining crown (%)**: see illustration on data form
- **Remaining tree (%)**: see illustration on data form
- **Lean angle** (in degrees from vertical): see case **C**, above
- **Tree position** (see position codes at bottom of data form):
    - 1 = standing with crown (not possible for case **F**)
    - 2 = main stem broken
    - 3 = crushed (not possible for case **D**)
    - 4 = uprooted (not possible for case **D**)
- **Direction of uprooting or break** (azimuth in degrees): leave blank if snag is intact. If a portion of the bole has snapped off, direction is from the snag to the top of the downed piece
- **Tree condition codes**: up to 6 codes can be entered to describe the physical attributes of the tree including disease and damage conditions (see **Tree condition codes** at bottom of **O-D Form**). When scarring of bole has occurred, please comment on type/location

Comments: in the lower section of the form under **Comments,** repeat the tag number and describe the physical conditions of the tree and the apparent circumstances of mortality. For example: "Suppressed individual died standing with dead needles, fine branches present."

Form O-E (Live trees): Record the following data: **New DBH in cm**, **Status = 6** (6 = dead), **New Vigor = 6** (6 = dead), and **Comment** = "Dead and standing."

Form O-F2 (Snag recruitment) (for case **D1,** but not **D2**): Multiple mortality cases can be recorded per form. All can be from the same treatment unit and from the same or different plots. For each stem record the following:

- **District**, **Block, Treatment unit, Plot, and Qtr**
- **Tag#:** before assigning a tag number to a snag, confirm that the same tag number does not already occur on **O-E, O-F, U-G2, or "LIST OF TAGGED NATURAL REGENERATION …" Forms** for the plot
- **Year:** 2009
- **Species code**
- **DBH** (to the nearest cm): If a tree has snapped below dbh (1.37 m), measure diameter at 0.5 m height
- **Height:** to the nearest 0.1 m (using the hypsometer or for small snags a calibrated PVC post)
- **Decay class** (1-5)**,** defined as in case C, above (see also **Fig. 3**)
- **Lean angle** (in degrees from vertical): as in case C, above
- **Status:** record a 2 (2 = new snag)
- **Comment:** as needed

E. Stem is dead , standing, not tagged, and significantly decayed: Given the state of decay, it is likely that this is a **non-tagged snag** listed on the **O-F Form.** Look at all cases of snags without tags and see if you can match a snag that has a similar position (Quarter) and set of conditions (species, diameter, decay class, and height class). Remember, however, that snags listed on the **O-F Form** extend out to the boundary of the snag plot (15.96 m). Also, it is possible that some snags have fragmented, or lost height since the last measurement. If this has happened these will be more

difficult to match to the records on **the O-F Form**. Once you have found the appropriate non-tagged record on the **O-F Form,** record the following information as you do for tagged snags (see case **C** above):

- **Height:** to the nearest 0.1 m (using the hypsometer or on small snags a calibrated PVC post)
- **Decay class** (1-5)**,** defined as in case C, above (see also **Fig. 3**)
- **New Lean Angle** (in degrees from vertical): see case **C**, above
- **Status:** record a 1 (1 = still present)
- **Comment**: if necessary, add a comment to describe why the height class or lean angle has changed since 2003.

F. Stem is dead and on the ground, tagged, but listed as live in the O-E (Live trees) Form: This is a case of new mortality (since 2003), but one in which a snag does not result. In this situation, two forms are used: **O-D** (Mortality) and **O-E (Live trees)**.

Form O-D (Mortality): Various data are recorded to describe the condition and possible cause of mortality. Note, as many as 6 mortality cases can be recorded per data form. All can be from the same treatment unit and from the same or different plots. For each stem record the following:

- **In the header: District, Block, and Treatment unit**
- **In the body of the form: Plot, Qtr, Tag no., Species, DBH**
- **Canopy class**: leave this blank, we will extract this information from the original data file
- **Remaining crown (%)**: see illustration on data form
- **Remaining tree (%)**: see illustration on data form
- **Lean angle** (in degrees from vertical): see case **C**, above
- **Tree position** (see position codes at bottom of data form):
    - 1 = standing with crown
    - 2 = main stem broken
    - 3 = crushed (not possible for case **D**)
    - 4 = uprooted (not possible for case **D**)
- **Direction of uprooting** (azimuth in degrees): leave blank if snag is intact, but if a portion of the bole has snapped off, direction is from the snag to the top of the downed piece.
- **Tree condition codes**: up to 6 codes can be entered to describe the physical attributes of the tree including disease and damage conditions (see **Tree condition codes** at the bottom of the **O-D Form**). When scarring of bole has occurred, please comment on type/location.

Comments: in the lower section of the form under **Comments,** repeat the tag number, and describe the physical conditions of the tree and the apparent circumstances of mortality. For example: "Windthrown/uprooted, green needles present" or "Co-opted windthrow⸺knocked over/crushed by large windthrown PSME #567."

Form O-E (Live trees):   Record the following data:
- **New DBH** (in cm, to the nearest 0.1 cm), record old DBH if tape cannot be wrapped around stem,
- **Status:** record a 6 (6 = Dead)
- **New Vigor**: record a 6 (6 = Dead)

G. Stem is dead and on the ground, tagged, and listed as dead on the O-E and O-F Forms: This is a case in which a snag has fallen over and should be removed from the existing snag population. Only the **O-F** Form is used and the following data are recorded:
- **Status:** record a 6 (6 = snag has fallen)
- **Comment**: add the following comment "Snag has fallen"

After accounting for all stems in the tree plot, move to the donut-shaped area between the perimeter of the tree plot (11.28 m) and the boundary of the snag plot (15.96 m).

FORMS O-F AND O-F2. SNAGS IN THE OUTER PORTION OF THE SNAG PLOT (11.28 - 15.96 M RADIUS)

In this area of the snag plot, **only snags** are sampled and data are recorded on the **O-F Form (Snags)**. Three situations are possible (see schematic above).

H. Snag is not tagged and is not listed on the O-F Form: This is a case of new mortality since 2003. Record the following data on the **O-F2 (Snag recruitment) Form** (recall that multiple new snags from the same or different plots can be recorded on the same **O-F2 Form**):

- **District**, **Block, Treatment unit, Plot, and Qtr**
- **Tag#:** before assigning a tag number to a snag, confirm that the same tag number does not already occur on **O-E, O-F, U-G2, or "LIST OF TAGGED NATURAL REGENERATION …" Forms** for the plot
- **Year:** 2009
- **Species code**
- **DBH** (to the nearest cm): If a tree has snapped below dbh (1.37 m), measure diameter at 0.5 m height
- **Height:** to the nearest 0.1 m (using the hypsometer or for small snags a calibrated PVC post)
- **Decay class** (1-5)**,** defined as in case C, above (see also **Fig. 3**)
- **Lean angle** (in degrees from vertical): as in case C, above
- **Status:** record a 2 (2 = new snag)
- **Comment:** as needed

I. Snag is tagged or not, and is listed on the O-F Form: All tagged snags will be listed on the **0-F Form.** Snags that are listed without a tag, were too decayed to hold a nail/tag at the time of plot establishment). **Note: If a non-tagged snag is found of decay class 1 or 2, it is probably a case of new mortality. If so, go to case H, above.**

It is possible that a snag has fragmented or lost height since 2003 making it difficult to match it to a record on **the O-F Form.** Use your judgment in matching stems and comment on uncertainty as needed. Once you have found the appropriate tagged or non-tagged record on the **O-F Form,** record the following information:

- **Height:** to the nearest 0.1 m (using the hypsometer or for small snags a calibrated PVC post)
- **New decay class** (1-5)**,** defined as in case C, above (see also **Fig. 3**)
- **New lean angle** (in degrees from vertical)
- **New status:** record a 1 (1 = still present)
- **Comment**: if necessary, comment on why height, decay class, or lean angle has changed since 2003

J. Snag is listed on the O-F (Snag) Form with or without a tag, but is now on the ground: This is a case in which a snag has fallen. If its tag is visible, it should be fairly easy to match with a record on the **O-F (Snag) Form**. If the tag fell off or is hidden, or if the snag was initially too decayed to hold a tag, it may be more difficult to match a downed stem with a record on the **O-F Form**. As described previously, use location (Qtr) and condition data to aid in your decision. Note: fallen snags may not look like they did when standing. Record the following data:

- **Status:** record a 6 (6 = snag has fallen)
- **Comment**: add the following comment "Snag has fallen"

BEFORE LEAVING A PLOT

- Carefully check all data forms **before** leaving the plot. The measurer should check the work of the recorder.
- Be sure that every record on each form has been has been accounted for.
- If no data were recorded for a transect on the **U-F2 Form,** make sure there is a check mark by "None present …"
- If **Forms O-D, O-F2, or O-G** are not used, verify that this is recorded in the bottom section of the **U-A Form.**
- Be sure that you have all of your equipment/supplies.

TABLE 1. FOREST/DISTRICT CODES, BLOCK NUMBERS, AND COMPASS DECLINATION VALUES

Forest / Ranger District	Block No.	Block name	Block code	Declination (deg)	Comments
Umpqua National Forest					
Diamond Lake RD	1	**Watson Falls**	UDIL	15.5 E	
Diamond Lake RD	4	**Dog Prairie**	UDOG	15.5 E	magnetic anomaly, questionable compass readings
Gifford Pinchot National Forest					
Cowlitz Valley RD	5	**Butte**	GRAN	16.3 E	formerly Randle RD
Mt. Adams RD	6	**Little White Salmon**	GMTA	16.3 E	
Mt. St. Helens NVM	7	**Paradise Hills**	GWIR	16.3 E	formerly Wind River RD
Washington Dept. of Natural Resources					
Capitol State Forest	8	**Capitol Forest**	CFOR	17.1 E	

TABLE 2. GRID SYSTEM BEARINGS

Convention: 1st azimuth = bearing from A1 to A7 (across rows); 2nd azimuth = bearing from A1 to G1 (down columns).

Treatment Number

Block No.	1	2	3	4	5	6
UDIL 1	113°,203°	56°,146°	128°,218°	105°,195°	49°,139°	56°,146°
UDOG 4	120°,210°	115°,205°	90°,180°	115°,205°	120°,210°	90°,180°
GRAN 5	45°,135°	45°,135°	0°,90°	45°,135°	45°,135°	55°,145°
GMTA 6	231°,321°	280°,10°	226°,316°	316°,46°	236°,326	279°,9°
GWIR 7	310°,40°	90°,180°	245°,335°	349°,79°	82°,172°	348°,78°
CFOR 8	250°,340°	268°,358°	147°,237°	86°,176°	73°,163°	248°,338°

TABLE 3. TRANSECT BEARINGS (DEGREES)

Block Code-No./ Name	Transect	Treatment					
		1	**2**	**3**	**4**	**5**	**6**
UDIL - Block 1	A	68.5	11.5	83.5	60.5	4.5	11.5
Watson Falls	B	158.5	101.5	173.5	150.5	94.5	101.5
	C	248.5	191.5	263.5	240.5	184.5	191.5
	D	338.5	281.5	353.5	330.5	274.5	281.5
UDOG - Block 4	A	75	70	45	70	75	45
Dog Prairie	B	165	160	135	160	165	135
	C	255	250	225	250	255	225
	D	345	340	315	340	345	315
GRAN - Block 5	A	0	90	45	90	0	10
Butte	B	90	180	135	180	90	100
	C	180	270	225	270	180	190
	D	270	0	315	0	270	280
GMTA - Block 6	A	6	55	1	1	6	54
Little White Salmon	B	96	145	91	91	96	144
	C	186	235	181	181	186	234
	D	276	325	271	271	276	324
GWIR - Block 7	A	85	45	20	34	37	33
Paradise Hills	B	175	135	110	124	127	123
	C	265	225	200	214	217	213
	D	355	315	290	304	307	303
CFOR - Block 8	A	25	43	12	41	28	23
Capitol Forest	B	115	133	102	131	118	113
	C	205	223	192	221	208	203
	D	295	313	282	311	298	293

TABLE 4. SLOPE CORRECTED DISTANCES — TREE AND SNAG PLOT RADII

Slope (%)	Radius of 0.04 ha tree plot	Radius of 0.08 ha snag plot	Slope (%)	Radius of 0.04 ha tree plot	Radius of 0.08 ha snag plot	Slope (%)	Radius of 0.04 ha tree plot	Radius of 0.08 ha snag plot
0	11.28	15.96	51	12.66	17.92	101	16.03	22.68
1	11.28	15.96	52	12.71	17.99	102	16.11	22.80
2	11.28	15.96	53	12.77	18.06	103	16.19	22.91
3	11.29	15.97	54	12.82	18.14	104	16.27	23.03
4	11.29	15.97	55	12.87	18.21	105	16.36	23.14
5	11.29	15.98	56	12.93	18.29	106	16.44	23.26
6	11.30	15.99	57	12.98	18.37	107	16.52	23.37
7	11.31	16.00	58	13.04	18.45	108	16.60	23.49
8	11.32	16.01	59	13.10	18.53	109	16.69	23.61
9	11.33	16.02	60	13.15	18.61	110	16.77	23.73
10	11.34	16.04	61	13.21	18.70	111	16.85	23.84
11	11.35	16.06	62	13.27	18.78	112	16.94	23.96
12	11.36	16.07	63	13.33	18.86	113	17.02	24.08
13	11.37	16.09	64	13.39	18.95	114	17.11	24.20
14	11.39	16.12	65	13.45	19.04	115	17.19	24.32
15	11.41	16.14	66	13.52	19.12	116	17.28	24.44
16	11.42	16.16	67	13.58	19.21	117	17.36	24.56
17	11.44	16.19	68	13.64	19.30	118	17.45	24.69
18	11.46	16.22	69	13.70	19.39	119	17.53	24.81
19	11.48	16.25	70	13.77	19.48	120	17.62	24.93
20	11.50	16.28	71	13.83	19.57	121	17.71	25.05
21	11.53	16.31	72	13.90	19.67	122	17.79	25.18
22	11.55	16.34	73	13.97	19.76	123	17.88	25.30
23	11.57	16.38	74	14.03	19.85	124	17.97	25.42
24	11.60	16.41	75	14.10	19.95	125	18.06	25.55
25	11.63	16.45	76	14.17	20.05	126	18.15	25.67
26	11.66	16.49	77	14.24	20.14	127	18.23	25.80
27	11.68	16.53	78	14.31	20.24	128	18.32	25.92
28	11.71	16.57	79	14.38	20.34	129	18.41	26.05
29	11.74	16.62	80	14.45	20.44	130	18.50	26.18
30	11.78	16.66	81	14.52	20.54	131	18.59	26.30
31	11.81	16.71	82	14.59	20.64	132	18.68	26.43
32	11.84	16.76	83	14.66	20.74	133	18.77	26.56
33	11.88	16.81	84	14.73	20.84	134	18.86	26.69
34	11.91	16.86	85	14.80	20.95	135	18.95	26.81
35	11.95	16.91	86	14.88	21.05	136	19.04	26.94
36	11.99	16.96	87	14.95	21.15	137	19.13	27.07
37	12.03	17.02	88	15.03	21.26	138	19.22	27.20
38	12.07	17.07	89	15.10	21.37	139	19.32	27.33
39	12.11	17.13	90	15.18	21.47	140	19.41	27.46
40	12.15	17.19	91	15.25	21.58	141	19.50	27.59
41	12.19	17.25	92	15.33	21.69	142	19.59	27.72
42	12.23	17.31	93	15.40	21.80	143	19.68	27.85
43	12.28	17.37	94	15.48	21.90	144	19.78	27.98
44	12.32	17.44	95	15.56	22.01	145	19.87	28.11
45	12.37	17.50	96	15.64	22.12	146	19.96	28.24
46	12.42	17.57	97	15.71	22.23	147	20.05	28.38
47	12.46	17.63	98	15.79	22.35	148	20.15	28.51
48	12.51	17.70	99	15.87	22.46	149	20.24	28.64
49	12.56	17.77	100	15.95	22.57	150	20.34	28.77
50	12.61	17.84						

TABLE 5. TREE SPECIES CODES, NAMES, AND PRESENCE BY BLOCK

Oregon Blocks		Watson Falls	Dog Prairie
Conifers			
ABAM	*Abies amabilis*	X	X
ABCO	*Abies concolor*	X	X
ABMAS	*Abies magnifica* var. *shastensis*	X	X
CADE3	*Calocedrus decurrens*	X	X
PICO	*Pinus contorta*	X	
PIMO	*Pinus monticola*	X	X
PIPO	*Pinus ponderosa*	X	
PSME	*Pseudotsuga menziesii*	X	X
TABR	*Taxus brevifolia*	X	X
TSHE	*Tsuga heterophylla*	X	X
TSME	*Tsuga mertensiana*	X	X
Hardwoods			
CACH	*Castanopsis chrysophylla*	X	X
CONU	*Cornus nuttallii*	X	

Washington Blocks		Butte	White Salmon	Paradise Hills	Capitol Forest
Conifers					
ABAM	*Abies amabilis*	X	X	X	
ABGR	*Abies grandis*	X	X	X	
ABLA2	*Abies lasiocarpa*	X		X	
ABPR	*Abies procera*	X	X	X	
CHNO	*Chamaecyparis nootkatensis*	X			
PICO	*Pinus contorta*	X			
PIEN	*Picea engelmannii*	X		X	
PIMO	*Pinus monticola*	X	X	X	
PIPO	*Pinus ponderosa*		X		
PSME	*Pseudotsuga menziesii*	X	X	X	X
TABR	*Taxus brevifolia*	X	X		X
THPL	*Thuja plicata*	X	X	X	X
TSHE	*Tsuga heterophylla*	X	X	X	X
TSME	*Tsuga mertensiana*	X		X	
Hardwoods					
ACMA	*Acer macrophyllum*		X		X
ALRU	*Alnus rubra*				X
CONU	*Cornus nuttallii*		X		
POTR2	*Populus trichocarpa*			X	
PREM	*Prunus emarginata*				X
PRUNU	*Prunus* sp.	X			
RHPU	*Rhamnus purshiana*				X

FIGURE 1. SAMPLING DESIGN

Plot locations in 40% aggregated treatment

Outer boundary of snag plot

Outer boundary of plot for overstory and planted trees

4 m

11.28 m

15.96 m

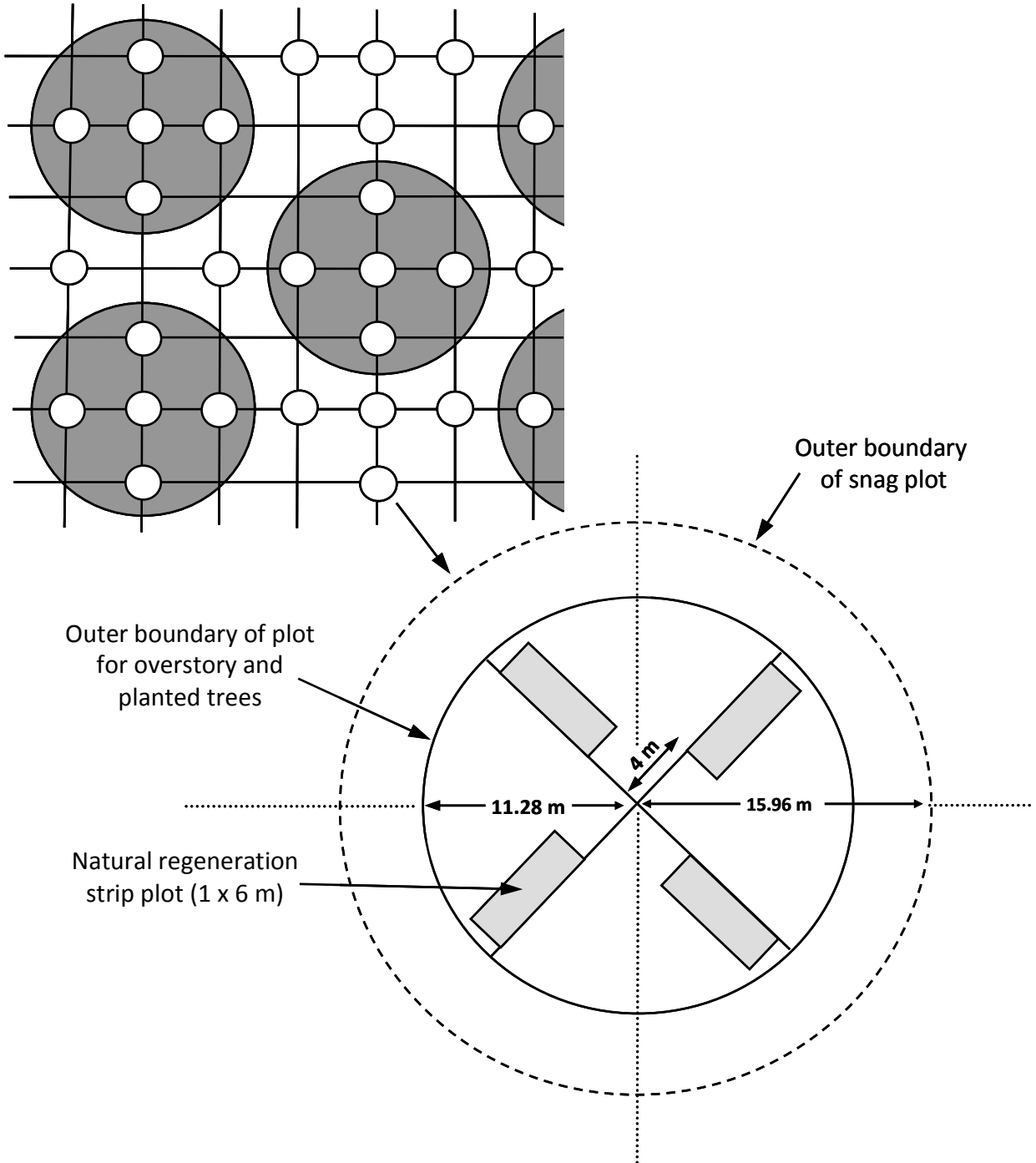Natural regeneration strip plot (1 x 6 m)

FIGURE 2. STANDARDS FOR MEASURING DIAMETERS OF TREES

Note: dbh is <u>1.37</u> m, not 1.3 m

d.b.h.

1.3 meters or 4.5 feet

On slope

d.b.h.

1.3 meters or 4.5 feet

On level ground

d.b.h.

1.3 meters or 4.5 feet

Leaning

diameter measurement

1.3 meters or 4.5 feet

Swell at 1.3 meters

diameter measurement

1.3 meters or 4.5 feet

Branch at 1.3 meters

0.5 meter

1 meter or more

Bottleneck

1.3 meters

measure or approximate all stems.

1.3 meters or 4.5 feet

Windthrown

Less than 1.3 meters or 4.5 feet

0.6 meter or 2 feet
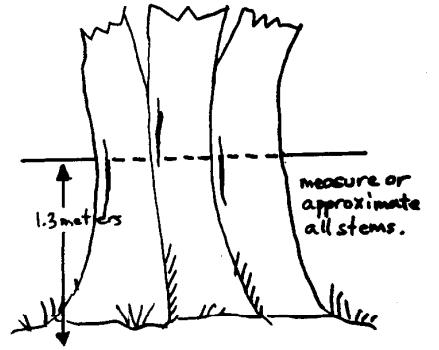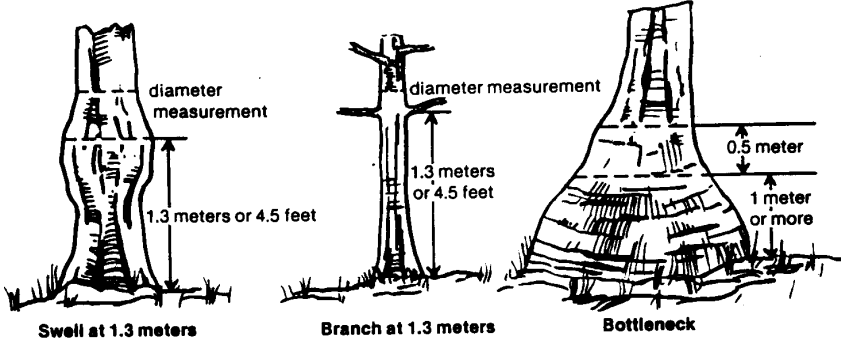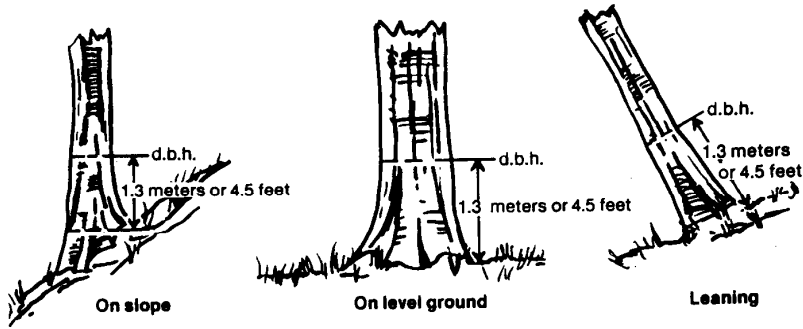
For trees that fork below b.h., measure diameter 0.6 meter (2.0 feet) above crotch.

FIGURE 3. SNAG DECAY CLASSES

CLASS 1   CLASS 2   CLASS 3   CLASS 4   CLASS 5