

DEMO FIELD MANUAL: 2003 OVERSTORY AND UNDERSTORY TREES

IMPORTANT ISSUES IN TAKING MEASUREMENTS AND RECORDING DATA

- **Compass declination:** Each morning, be sure that declination on your compass is set properly (see **Table 1**, pg. 15).
- **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.
- **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 will be needed per plot; but for others more than one sheet may be used. When more than one sheet is used, 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 a field sheet.
 - Personnel.** The last names of crew members sampling or recording information on a plot.
 - Date.** Listed in the following order: year, month, day w/ 4 digits for year and 2 for month and day.
 - 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 **Table 1**).
 - Block.** Each **Block** contains a complete set of six treatment units. Existing blocks are numbered 1, 4, 5, 6, 7, 8 (see **Table 2**, pg. 15).
 - Treatment Unit.** The 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), 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 2003.**
 - 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":** Reader/measurer 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 other 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 double-checked, 1999 measurement incorrect").
- **How to measure slope:** Because tree and snag plots are slope corrected you may have to use your clinometer to measure the distance **between plot center and a tree in question.** One person stands at plot center, the other at the stem of interest. Sight to a height on the other person that corresponds to the height of your eye. Read slope using the % scale. Consult **Table 4** for the corrected distance: there are separate columns for the tree plot (11.28 m radius) and snag plot (15.96 m radius).
- **Units of measurement:** Be sure that data are recorded in the units (e.g., cm) and with the precision (nearest cm or 0.1 cm) requested. Column headings contain information on units and the "style" of the blank line indicates the precision. If there is a decimal point pre-printed on the data sheet, data are collected in tenths of units; if there is no decimal point, data are collected in integer form.
- **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. Be sure to write with dark characters; we will make xerox copies of all 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

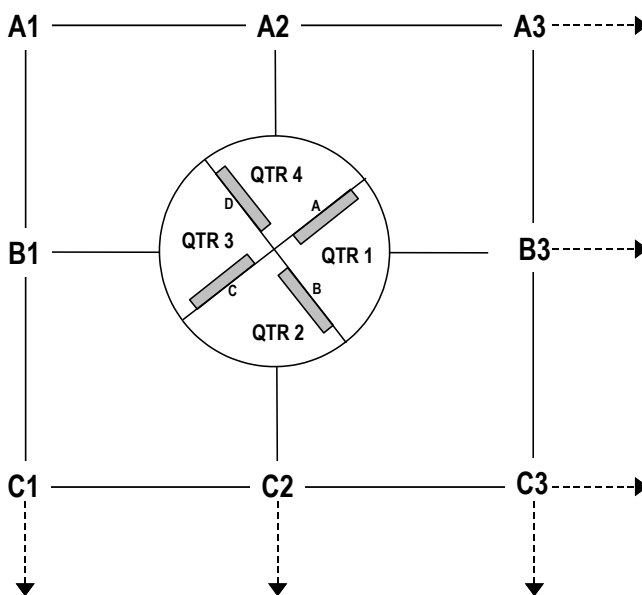
Overview of Transect Orientation and Plot Layout

Figure 1 (pg. 21) illustrates the layout of snag (0.08 ha) and tree (0.04 ha) plots, and the subplots (1 x 6 m) used to sample natural regeneration. The schematic figure below illustrates the orientation of Transects (A-D which define the 1x 6 m subplots) 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 1 x 6 m subplots) are oriented 45° off the grid system.

Table 2 (pg. 15) contains the azimuth of rows and columns for each block x treatment unit.

Table 3 (pg. 16) 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.

DEMO Vegetation Transect Reestablishment Data (separate listing) contains (1) azimuth of each transect and (2) distance of each end point of the transect (a PVC post with blue flagging) from plot center (grid point). Typically PVC posts lie at 4 and 10 m from the plot center, but occasionally distances vary due to obstructions (logs, trees). Some transects also have PVC posts at intermediate points (again due to obstructions). These intermediate posts are also recorded in this listing.



Data to Record:

General Comments About Plot: Please comment liberally about plot conditions: levels and types of disturbance, forest stand features, development of understory vegetation, recent tree mortality or disturbance, or other notable features.

If, for any reason, reinstallation of rebar or PVC is required, details should be reported here.

NATURAL REGENERATION: DENSITY, SIZE STRUCTURE, AND GROWTH

Which Plots to Sample? We will sample all plots that contain understory transects in Treatments 1, 3, 4, 5, and 6. In treatments 3 and 5, this will be every other grid point. Each plot will have PVC posts (with blue flags) marking the ends of each of the four understory transects (see **Fig. 1**). **Note:** in treatment 5 at the UDIL and GRAN blocks, transects were initially established at all grid points. Even though transects exist at all points, we will limit sampling to every other point (consult grid maps for the proper points to sample). The number of plots sampled will vary by treatment: **1, 3, 5, and 6 = 32 plots, 4 = 37 plots.**

Plot Size, Slope, and Determination of “In” and “Out” Trees: Natural regeneration are trees >10 cm tall and < 5.0 cm dbh. Sampling is limited to the 4, 1x 6 m subplots in each tree plot (see **Fig. 1**); subplots are not slope-corrected. One edge of the subplot is defined by the meter tape stretched between the PVC posts (4 to 10 m from plot center). The subplot always falls to the right of the transect as you face away from plot center (see **Fig 1**). The opposite margin of the subplot is estimated visually using a 1-m-long PVC post oriented perpendicularly to the meter tape. Presence of natural regeneration in the subplot is based on rooting position — i.e. the point at which the stem enters the litter layer.

Which Species Qualify as Trees? See conifer and hardwood species listed in **Table 5** (pg. 18).

How to Establish the 1 x 6 m Subplots: Identify transect **A** based on azimuth (consult **Table 3** or “**DEMO Vegetation Transect Reestablishment Data**”) and begin there. 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 (i.e. outside of the subplot) unreel the tape to the post located 6 m away (the 10-m” point) keeping the tape as tight and as 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 straight, tight line is run. The loose end of the tape should then be clipped to the 10-m post. After completing all measurements proceed to transect **B**, etc.

If large logs, trees, stumps, or slash fall along the transect line, **intermediate PVC posts** may have been established in front of and/or in back of these obstructions. Intermediate points are documented in “**DEMO Vegetation Transect Reestablishment Data**,” thus always 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 these intermediate posts.

Logs and slash may also have forced placement of the 4- or 10-m points at distances greater than or less than 4 and 10 m from plot center. Again, these situations will be documented in “**DEMO Vegetation Transect Reestablishment Data**.” If this listing indicates 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 the listing indicates that the post lies at 4.20 m from plot center, clip the tape at 4.20 m. This will ensure that measurements of natural regeneration are always taken within the correct distance interval from plot center (4.00 –10.00 m).

Notes:

- Please carry several pieces of rebar and PVC with you at all times to replace missing points.
- Please avoid stepping in the 1 x 6 m subplot.

Types of Data and Field Forms: Two types of blank data forms will be used:

- **U-F2:** for tallies of natural regeneration by height and diameter class, and
- **U-F3:** for detailed measurements of a subset of permanently tagged trees.

SAMPLING PROCEDURE

FORM U-F2

This form is used to tally natural regeneration in each subplot (transect) first by height class (for trees <1.5 m tall), then by diameter class (for trees ≥1.5 m tall and < 5 cm dbh).

First, enter the **Transect** (subplot) letter (A – D). Note that each page provides space for data from two transects. If additional lines are needed for a particular transect (i.e. if there are more than 5 species of regenerating trees on a transect), you may continue onto the second section of the page or you may begin a new page – in these situations, place a check mark in the continuation space provided (**Cont?**). Space is provided for each **Species name** and **Code** (see **Table 5**, pg. 18).

The **first data box** is used to tally natural regeneration by species-by-height class – this is used only for trees 0.1 – 1.5 m tall. Space is provided for tally marks (**Tally**) and a numeric total of the tally (**Tot**). Use your height pole or calibrated PVC post to determine the height class of each tree in the 1 x 6 m subplot.

The **second data box** is used to tally natural regeneration by species by 1 cm diameter classes – this is used only for 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 your diameter tape (or ruler for trees smaller < 2 cm dbh) to determine the diameter class of tree in the 1 x 6 m subplot.

Tallying by height and diameter class can be done simultaneously as you move down the transect. Remember that the height threshold for tallying in the height vs. the diameter-class sections of the data form is 1.5 m.

Once tallying is completed for a transect, enter totals for each height and diameter class in the **Tot** columns. If no individuals occur in a particular class, leave totals blank.

Note 1: If a tree is rooted on a stump or a log, height is from the rooting substrate.

Note 2: Hardwoods may sometimes occur as multiple sprouts arising from a common base or cut stump. Tally all stems of appropriate height or diameter regardless of source.

Note 3: If natural regeneration > 0.1 m tall is completely absent on a transect, place a check mark in the blank space (**No natural regen.**).

FORM U-F3

This form is used to record detailed data for a subset of individuals (**conifers only**) that you just tallied in each subplot (transect). These individuals will be permanently tagged for future measurement. Data from all four transects can be recorded on the same form, however, if an additional form is needed for a plot, place a check mark in the continuation blank at the top of the same form (**Cont?**).

1. Height class trees (trees <1.5 m tall): First, only the trees tallied by height class are considered. For each subplot, data are recorded for one individual of each species in each **height class** (but only for **true fir** [*Abies*], **pine** [*Pinus*], or **Douglas-fir**):

- Randomly pick an individual representing each species-by-height class by selecting the tree whose rank distance from plot center is a random number between 1 and *k* (see **Table 6**, pg. 19), where *k* is the number of trees tallied in that size class. The individual selected should be “undamaged”, i.e. with clear apical dominance (a single leader exceeding adjacent branches) and reasonable leader growth. For example:
 - let us assume that there are 5 trees tallied in the size class

- let us assume that the random number chosen was 3 (number has to be between 1 and 5)
- pick the tree that is 3rd closest to the plot center
- if the 3rd tree is damaged, pick the next tree in that size class.

Note: if there is only one tree in a height class, measure that tree regardless of its condition.

- Tag the tree: using green tie tape, attach the tag by looping it onto a sturdy lower branch or loosely around the base of the tree. **Before tagging, be sure that the tag number is not used elsewhere on the plot (consult U-G2, O-E and O-F forms).**
- Record **transect, tag number and species**
- Measure **total height** in centimeters (to the nearest 1 cm)
- Measure **height to the lowest live branch** in centimeters (to the nearest 1 cm); measure to the point where the branch attaches to the main stem. **Note:** if this distance is <10 cm, record a 0.
- Measure **annual height growth** for the last 6 years (i.e. 2002, 2001...1997) if possible (to the nearest 0.1 cm). Height growth is the distance between terminal bud-scale scars. Each bud scale scar should form a distinct line that completely circles the stem. Some species (e.g., Douglas-fir) produce branches at multiple heights between bud scale scars, so don't use branches as indicators of annual growth. **Note:** at the point that annual increments cannot be discerned, stop recording annual height growth, but enter the following **Comment:** "Earlier growth is not clear."
- Measure two perpendicular **crown widths** in centimeters (to the nearest 1 cm). The first crown width should be measured parallel to the transect line; the second should be measured perpendicular to this.
- Record relevant **Condition** codes for crown, stem, or disturbance (see codes and definitions on **U-F3**). **Note:** If the tree has no irregularities, record "1"s for crown, stem, and disturbance.
- There is also space for a **Comment**.

2. **DBH class trees (trees ≥ 1.5 m tall):** Second, only the trees tallied by diameter class are considered.

For each subplot, data are recorded for one individual of each species in each **diameter class** (but only for **conifers**):

- Randomly pick an individual representing each species x diameter class by selecting the tree whose rank distance from plot center is the next integer greater than a random number between 1 and k (see **Table 6**, pg. 19), where k is the number of trees tallied in that size class (see example above). The individual selected should be "undamaged", i.e. with clear apical dominance (a single leader exceeding adjacent branches) and reasonable leader growth. **Note:** if there is only one tree in a diameter class, measure that tree regardless of its condition.
- Tag the tree: If dbh >2 cm, tag the tree with green tie tape stapled to the tree at 1.37 m. If dbh <2 cm, attach the tag by looping it onto a sturdy lower branch as described above for **Height trees** or loop it loosely around the base of the tree. **Before tagging, be sure that the tag number is not used elsewhere on the plot (consult U-G2, O-E and O-F forms).**
- Record **transect, tag number and species**.
- Measure **DBH** in centimeters using a caliper, diameter strip, or diameter tape (to the nearest 0.1 cm). If tag is not stapled, mark the location where the measurement is taken with a **paint stick**.
- Measure **total height** in centimeters (to the nearest 1 cm)
- Measure **height to the lowest live branch** in centimeters (to the nearest 1 cm); measure to the point where the branch attaches to the main stem, but do not consider epicormic sprouts as branches.
- Measure two perpendicular **crown widths** in centimeters (to the nearest 1 cm). The first crown width should be measured parallel to the transect line; the second should be measured perpendicular to this.
- Record relevant **Condition** codes for crown, stem, or disturbance (see codes and definitions on **U-F3**). **Note:** If the tree has no irregularities, record "1"s for crown, stem, and disturbance.
- There is also space for a **Comment**.

Once all measurements are completed in a plot, number the pages for the entire plot (**Page ___ of ___**).

In most instances there will only be two **U-F2** pages per plot and one to two **U-F3s**.

Note 3: If there are no natural regeneration to tag/measure in a plot, place a check mark in the blank space (**No regen.**).

PLANTED TREES: GROWTH AND MORTALITY

Which Plots to Sample? We will sample all “cut” (logged) plots in Treatments 3, 4, 5, and 6. Each plot will have PVC posts (with blue flags) marking the ends of each of the four understory transects (see **Fig. 1**). The number of plots sampled will vary by treatment: **3 and 5 = 32 plots, 4 = 12 plots, 6 = 22 plots.**

Plot Size, Slope, and Determination of “In” and “Out” Trees: Planted trees are measured in a 0.04 ha plot (11.28 m radius; see **Fig. 1**). Plots are slope-corrected, thus on sloping ground, plot radii will be greater than 11.28 m. All planted trees are tagged but if a tag is missing and you question whether a planted tree is “in” or “out” of the plot, use your clinometer to measure slope (**in %**) from the plot center to the stem of interest. Use the slope-corrected distances listed in **Table 4** (pg. 17) to determine if a tree is “in” or “out.” It is critical that slope and distance measurements are accurate (**see: How to Measure Slope, pg. 2**).

Identifying Planted Trees: All planted trees in a plot are tagged; each tag is placed at the base of the tree and attached with a large loop of green tie-tape. Trees were planted in spring 1999 (1998 for the Butte block). At Dog Prairie, seedlings were replanted in 2001 due to widespread mortality of the original cohort.

Avoid Understory Transects: As you move through the plot avoid, walking through the belt transects (1 x 6 m) that define the areas sampled for understory vegetation (see **Fig. 1**).

Field Forms: Pre-printed **U-G2**.

SAMPLING PROCEDURE

Use **U-G2** to guide your search for planted trees. Trees are sorted by location in the plot (i.e. Quarter – see pg. 2 and **U-A**), then by tag number. Some planted trees are already dead and are listed as such (Vigor = 6, Comment = Dead in <year>). For these, no additional data should be recorded.

For all trees that are listed as live on **U-G2**, we will replace the green tie tape that holds the tag: cut the old tape w/ a scissors or hand clipper and use a new piece of tie tape to re-attach the tag in the same manner.

Record the following data :

- **Current height:** Total height from the base of the tree in centimeters. Use a height pole or calibrated PVC post 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 all the laterals up to determine which is the longest — then measure to the tip of the longest lateral.
 - Note:** Even if the tree has died, take a current height.
 - Note:** At UDOG, U-G2 will not list “Previous height” unless the tree was planted in 2001 or it died before 2001. However, quarter, tag number, species, and vigor are listed for all trees.
- **2002 (last year’s) Leader Growth:** Last year’s leader growth in centimeters (to the nearest 0.1 cm). Use a ruler to measure.
 - Note:** Do not take this measurement if species = western hemlock (TSHE) or redcedar (THPL); however, do add a **Comment:** “leader growth not taken for TSHE (or THPL)”
- **Current 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)
- **Comments:** A comment should be entered that addresses tree condition (e.g., browsed, broken leader, canker, etc.). If the tree is dead, be sure to add the comment "**Dead.**"

- **New tag number:** There is a column on **U-G2** to enter a new tag number. A new tag should only be assigned if a tagged tree on **U-G2** cannot be found, but one does find:
 - (1) a planted seedling that has lost its tag (green tie tape remains), or
 - (2) what appears to be the correct planted seedling without tag or tie tape (it matches with respect to quarter, species and size).A new tag number should be recorded in the **Newtag** column, and a note made in the **Comments** as follows: "Old tag # < > missing." **Before you assign a new tag number, first check that the same tag number does not already occur on O-E, O-F, or U-F3 for the plot.**

OVERSTORY TREE GROWTH, TREE MORTALITY, AND SNAG DYNAMICS

Which Plots to Sample? We will sample all overstory plots in Treatments 1, 3, 4, 5 and 6. This will yield the following numbers of plots per treatment: **1** = 32 plots, **3** and **5** = 63 or 64 plots, **4** = 37 plots, and **6** = 32 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**). 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 possible “ingrowth” tree or new snag near the perimeter of the plot. Plots are slope-corrected, thus on sloping ground, plot radii will be greater than 11.28 or 15.96 m. For a stem in question, use your clinometer to measure slope from plot center to the stem of interest. Then use the slope corrected distances listed in **Table 4** (pg. 17) to determine if the tree or snag is “in” or “out.” It is critical that slope and distance measurements are accurate.

Avoid Understory Transects: 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**).

Which Species Qualify as Trees? See species listed in **Table 5** (pg. 18).

What Qualifies as a Snag? Dead trees > 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 height on the stem (1.37 m).

Types of Data and Field Forms:

Four types of forms will be used:

O-E. OVERSTORY TREE REMEASUREMENT. This pre-printed form lists all trees ≥ 5 cm dbh that fell within the 11.28 m radius tree plot and were alive and tagged in 1998 or 1999. It also lists all tagged trees that subsequently died in 1999, 2000, or 2001 (dates of mortality checks). Records are sorted by Quarter (1-4; see schematic diagram on **U-A**), then by tag number.

O-F. POST-HARVEST SNAG ASSESSMENT. This pre-printed form lists two types of snags:

- (1) The original pool of snags (≥ 0.5 m tall and ≥ 25 cm dbh) **from the 15.96 m radius snag plot** recorded at plot establishment (1998/1999). Some are tagged, but some were too decayed to hold a tag.
- (2) All tagged trees **in the 11.28 m radius tree plot** that died in 1999, 2000, or and 2001 **and** remained standing.

After the printed data, this form also provides space to take data on new snags (tagged trees that died after 2001).

O-F snags are sorted by quarter, then tag number (but some will not have a tag number).

Note: there will be considerable overlap between records on this form and dead trees on **O-E**. However, not all dead trees on **O-E** will occur on **O-F**; tagged trees that fell when they died will not be listed on **O-F**.

O-G. POST-HARVEST INGROWTH. This blank form is used to collect data for trees that originally were too small to tag in the tree plot, but are now large enough to tag (≥ 5 cm dbh).

O-D. TREE MORTALITY. This blank form is used to record data for trees in the tree plot that have died since our last mortality check in 2001.

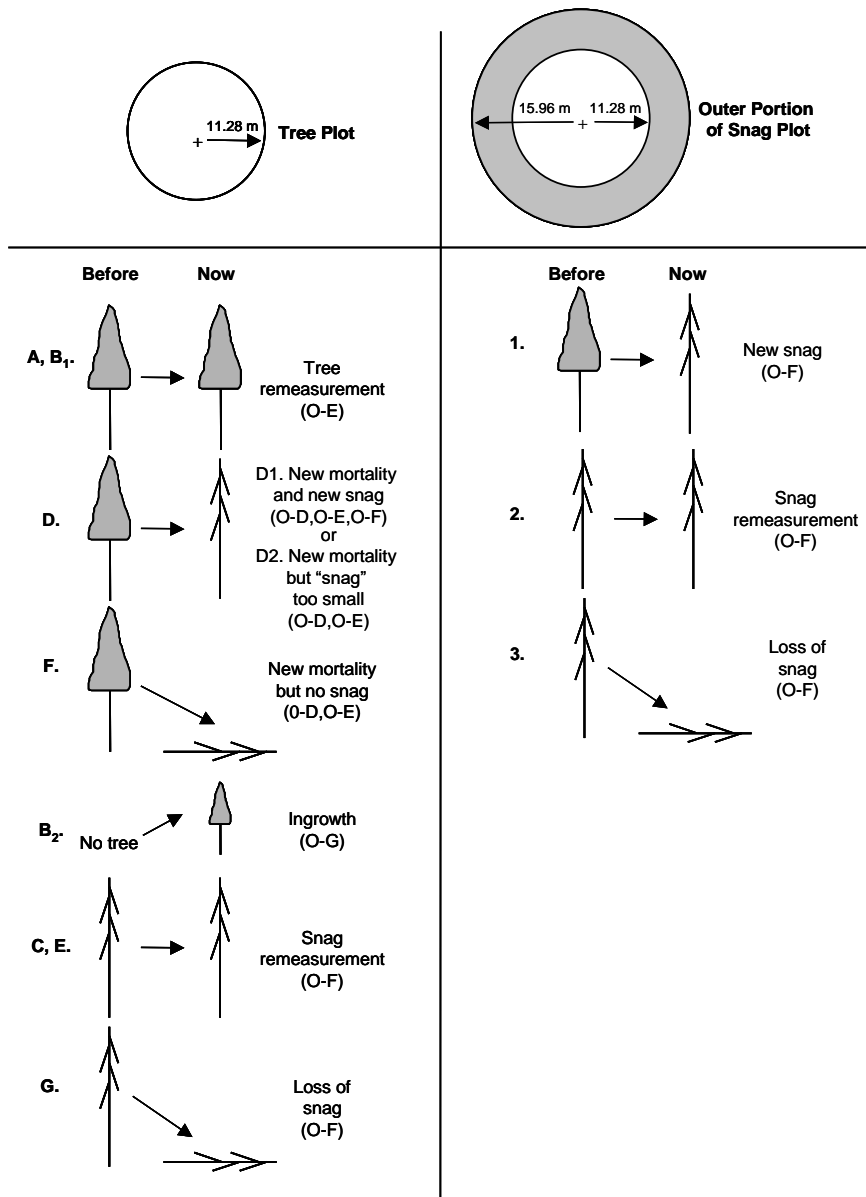
SAMPLING PROCEDURE

Begin the tree plot (11.28 m radius) and sequentially, by quarter, visit all stems ≥ 5 cm dbh. Live trees, snags, "ingrowth" and recent mortality will be sampled simultaneously as you move from stem to stem. Use **O-E** (Live trees) and **O-F** (Snag) as a guide. **Note:** there are often "skips" in tag numbering on these forms because live trees and snags were tagged sequentially as encountered. Also, some snags were not sound and could not be tagged; these can only be relocated by position (quarter of the plot) and condition (species, diameter, decay class, and height class).

Once the tree plot is completed, move to the donut-shaped area remaining in the snag plot (11.28 to 15.96 m radius). Here, consider only snags; either those that were sampled at plot establishment (1998/1999), or new snags resulting from more recent mortality. Again, decayed snags without tags can only be relocated by position and condition.

On the following pages we describe the different situations possible in the tree plot and in the donut-shaped area of the snag plot. For each, we describe the current condition of the stem and which data forms should be used. Letters or numbers to the left of the pictures refer to the particular scenarios described on the following pages.

Overstory Measurements: possible scenarios and associated data forms



STEMS IN THE TREE PLOT (11.28 M RADIUS)
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A. Stem is alive and tagged. This stem will be listed on **O-E**. Record the following data:

- **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 initial measurement, so it is important that measurements are done accurately. Measurements are taken to the nearest 0.1 cm. If the diameter has “shrunk” 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, double-checked”, or “DBH 10 cm larger, double-checked.”
- **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 excessively larger than the Old DBH (see above). Be sure to add a comment if New Vigor is not “1”.

Re-nailing tags: If the nail holding the tag provides limited room for future growth (<2.5 cm), please retag the tree **immediately 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 your wood block to support the claw of the hammer. When retagging, make sure that the new nail is driven in sufficiently to stay in the tree, but with plenty of room for growth, and with the head of the nail slightly lower than the point (so the tag slides down to the head).

B. Stem is alive but not tagged. This stem has (1) lost its tag, or (2) is an “ingrowth” — one that was smaller than 5 cm dbh at initial tagging (1998/1999), but is now large enough to tag (≥ 5 cm dbh).

B1. Lost tag: If the stem is considerably larger than 5 cm dbh, it is likely to have lost its tag. See if you can 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, be sure to check that the same tag number does not already occur on O-E, O-F, U-F3, or U-G2 for the plot.** Add a comment that “Old tag was missing.” Tag and nail should be placed 1.37 m from the ground surface as measured from the **up-slope** side of the tree (for odd situations, such as split or swollen boles, see **Fig. 2**). However, the tag should always be placed so that it faces the 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 **O-E**, treat it as an ingrowth. Assign it a unique tag number. **However, before you assign a new tag number, be sure to check that the same tag number does not already occur on O-E, O-F, U-F3, or U-G2 for the plot.** Use form **O-G. Post-harvest Ingrowth** to record the following data:

- **Quarter** (see schematic figure on **U-A**),
- **Tag number**,
- **Species code**,
- **DBH** (in cm, to the nearest 0.1 cm),
- **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 are those that emerge from the general canopy layer, and thus receive light from the top and sides;
 - C = Co-dominant** trees are those that form the main canopy; the crown extends to the top of the

general canopy layer, and so 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 Aggregated treatments, code ingrowth relative to trees sizes in the adjacent patches. In the uncut patches of Aggregated treatments, 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 condition codes can be recorded for each tree (see field form). As many as three codes can be entered to describe crown and bole conditions and two codes to describe disturbance.

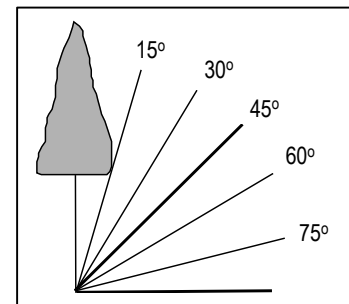
It is critical that the tagging, measuring, and rating of tree conditions are done with care as these data will serve as the baseline for future measurements. The recorder should watch for incorrect species identification or incorrect placement of the diameter tape, and she/he should aid in assigning condition codes.

C. Stem is dead and standing, tagged, and listed either on O-F, or O-E (dead) and O-F: This stem was either tagged initially as a snag (present only on **O-F**) or as a live tree that subsequently died (present on **O-E** and **O-F**). Data are only recorded on **O-F** as follows:

- **New Height Class** (1-4), defined as follows:

- 1 = 0.5 - 1.5 m tall
- 2 = > 1.5 - 5.0 m tall
- 3 = > 5.0 - 15.0 m tall
- 4 = > 15.0 m tall

- **New Lean Angle in degrees from vertical** as shown in this figure. Record lean only if it is ≥ 15 deg. 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 and standing, tagged, but not listed as dead on O-E and not listed on O-F: This is a case of new mortality (since 2001). There are two variants of this situation:

- D1. Stem is large enough to be considered a snag** (≥ 25 cm dbh, > 0.5 m tall). In this case, **O-D**, **O-E**, and **O-F** are used as indicated below.
- D2. Stem is too small to be considered a snag** (< 25 cm dbh or less than 0.5 m tall). In this case only **O-D** and **O-E** are used as indicated below.

Form O-D: Various data are recorded to describe the condition and possible cause of mortality:

- **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. Determinations are based on the main stem, not on the proportion of branches remaining.
- **Remaining tree (%):** see illustration on data form. Determinations are based on the main stem, not on the proportion of branches remaining.
- **Lean angle** (in degrees from vertical): see case **C**, above.
- **Tree position** (see position codes at bottom of data form):
 - 1 = standing w/ 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 bottom of data form). When scarring of bole has occurred, please comment on type/location.

Comments: in the lower section of the form under **Comments**, repeat plot and 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: Record the following data: **New DBH**, **Status = 6** (6 = dead), **New Vigor = 6** (6 = dead), and **Comment** = "Dead and standing." (*yes, there is a bit of redundancy with status and vigor*).

Form O-F (for case **D1** but not **D2**). In the **New Snags** section of the data form recorded the following: **Quarter, current year (2003), tag number, and species code**,

- **DBH** to the nearest cm. Measure diameter at 0.5 m height if tree has been snapped below dbh and resulting snag is shorter than 1.37 m tall (this assumes that tag remained attached to bole or is on ground and can be associated with the new snag),
- **Height class** (1-4), as defined above,
- **Decay class** (1-5), defined as follows (see **Fig 3**, pg. 23):
 - 1 = needles, twigs present; bark tight
 - 2 = needles, twigs present; bark loose
 - 3 = needles, twigs absent; bark absent
 - 4 = needles, twigs absent; top broken out
 - 5 = needles, twigs absent; bark absent; top broken out; decomposition obvious

Note: The sets of parameters used to describe its state of decay may not always be consistent with the descriptions on the field sheet or the diagrams in **Fig. 3**. You may have to decide which description, on the whole, best fits the condition of the snag. In such cases use the decay class that best describes the **bole** of the snag.

- **Lean angle** (in degrees from vertical): see case **C**, above.
- **Status**: record a 2 (2 = new snag)
- **Comment** as needed.

E. Stem is dead and standing, not tagged, and significantly decayed: Given the state of decay, it is likely that this is a **non-tagged snag** listed on **O-F**. 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 **O-F** 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 initial measurement. If this has happened these will be difficult to match to data on **O-F**, so use your best judgement. Once you have found the appropriate non-tagged record on **O-F**, record the following information as you do for tagged snags (see case **C** above):

- **New Height Class** (1-4): see case **C**, above.
- **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 the last measurement.

F. Stem is dead and on the ground, tagged, but listed as live on O-E: This is a case of new mortality (since 2001), but one in which a snag does not result. In this situation, two forms are used, **O-D** and **O-E**, but not **O-F**:

Form O-D: Various data are recorded to describe the condition and possible cause of mortality:

- **Plot, Qtr, Tag no., Species, DBH**
- **Canopy class**: leave this blank, we will extract this information from the original data file.
- **Remaining crown (%)**: leave blank

- **Remaining tree (%)**: leave blank
- **Lean angle** ((in degrees from vertical): leave blank
- **Tree position**: (see position codes at bottom of data form):
 - 1 = standing w/ crown (not possible for case F)
 - 2 = main stem broken (not possible for case F)
 - 3 = crushed
 - 4 = uprooted
- **Direction of uprooting**: azimuth (in degrees from base to top)
- **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 data form). When scarring of bole has occurred, please comment on type/location.
- **Comments**: in the lower section of the form under **Comments**, repeat plot and tag number, and describe the physical conditions of the tree and the apparent circumstances of mortality (as described above). For example: "Windthrown/uprooted, green needles present"; "Co-opted windthrow—knocked over/crushed by large windthrown PSME #567."

Form O-E: 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) (*yes, record a 6 for both status and vigor*)

G. Stem is dead and on the ground, tagged, and listed as dead on O-E and O-F: This is a case in which a snag has fallen over and should be removed from the existing snag population. Only **O-F** 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).

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 considered and data are only recorded on **O-F**. Three general cases are possible (see schematic above).

1. Snag is standing, not tagged, and not listed on O-F: This is a case of new mortality since plot establishment (1998/1999). Record the following data in the **New Snags** section of the data form the following data:

- **Quarter, current year (2003), and species code,**
- **DBH** (in cm, to the nearest cm): Measure diameter at 0.5 m height if tree has been snapped below dbh and resulting snag is shorter than 1.37 m tall,
- **Height class**:
 - 1 = 0.5 - 1.5 m tall
 - 2 = > 1.5 - 5.0 m tall
 - 3 = > 5.0 - 15.0 m tall
 - 4 = > 15.0 m tall
- **Decay class**: (1-5), defined as follows (see **Fig 3**, pg. 23):
 - 1 = needles, twigs present; bark tight
 - 2 = needles, twigs present; bark loose
 - 3 = needles, twigs absent; bark absent
 - 4 = needles, twigs absent; top broken out
 - 5 = needles, twigs absent; bark absent; top broken out; decomposition obvious
- **Lean angle** (in degrees from vertical),

- **Status:** record a 2 (2 = new snag),
- **Comment:** as needed.

2. Snag is standing, tagged or not, and listed on O-F: Tagged snags will be listed on **O-F**. Snags that are not tagged, but listed on **O-F** should be in an advanced state of decay (i.e. they could not hold a nail/tag at the time of plot establishment). **(Note: If a non-tagged snag is found of decay class 1 (or 2), this is probably a case of new mortality. If so, go to case 1, above.**

Remember, it is possible that some snags have fragmented, or lost height since initial measurement; this may make it difficult to match to data on **O-F** but use your best judgement. Once you have found the appropriate tagged or non-tagged record on **O-F**, record the following information:

- **New Height Class (1-4):**
 - 1 = 0.5 - 1.5 m tall
 - 2 = > 1.5 - 5.0 m tall
 - 3 = > 5.0 - 15.0 m tall
 - 4 = > 15.0 m tall
- **New Lean Angle** (in degrees from vertical),
- **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.
Note: Decay class is not recorded.

3. Snag is listed on O-F with or without a tag and is now on the ground: This is a case in which a snag has fallen over and will be removed from the existing snag population. If a snag retained its tag and it is visible, it should be fairly easy to match with a record on **O-F**. However 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 **O-F**. As described previously, use Quarter and condition data to aid your decision (although fallen snags may not look anything like they did when they were upright!) Only the following data are recorded:

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

BEFORE LEAVING A PLOT

- Complete a thorough check of all data forms. It is absolutely critical that both the recorder and measurer carefully proof all forms before leaving the plot.
- Be sure that every record on **O-E, O-F, and U-G2** has been accounted for.
- Be sure that all pages are numbered appropriately.
- If no data were recorded for a transect or plot, indicate as such where space is provided (e.g., "No natural regen., "No regen ___", etc.)
- 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	18.5 E	
Diamond Lake RD	4	Dog Prairie	UDOG	18.5 E	magnetic anomaly exists, questionable compass readings
Gifford Pinchot National Forest					
Cowlitz Valley RD	5	Butte	GRAN	20.0 E	formerly Randle RD
Mt. Adams RD	6	Little White Salmon	GMTA	20.0 E	
Mt. St. Helens NVM	7	Paradise Hills	GWIR	20.0 E	formerly Wind River RD
Washington Dept. of Natural Resources					
Capitol State Forest	8	Capitol Forest	CFOR	19.0 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	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 #, Name	Transect	Treatment					
		1	2	3	4	5	6
UDIL - #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 - #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 - #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 - #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 - #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 - #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

Slope (%)	Conversion factor	Radius of 0.04 ha Tree plot	Radius of 0.08 ha Snag plot	Slope (%)	Conversion factor	Radius of 0.04 ha Tree plot	Radius of 0.08 ha Snag plot
0	1.000	11.28	15.96	76	1.256	14.17	20.05
1	1.000	11.28	15.96	77	1.262	14.24	20.14
2	1.000	11.28	15.96	78	1.268	14.31	20.24
3	1.000	11.29	15.97	79	1.274	14.38	20.34
4	1.001	11.29	15.97	80	1.281	14.45	20.44
5	1.001	11.29	15.98	81	1.287	14.52	20.54
6	1.002	11.30	15.99	82	1.293	14.59	20.64
7	1.002	11.31	16.00	83	1.300	14.66	20.74
8	1.003	11.32	16.01	84	1.306	14.73	20.84
9	1.004	11.33	16.02	85	1.312	14.80	20.95
10	1.005	11.34	16.04	86	1.319	14.88	21.05
11	1.006	11.35	16.06	87	1.325	14.95	21.15
12	1.007	11.36	16.07	88	1.332	15.03	21.26
13	1.008	11.37	16.09	89	1.339	15.10	21.37
14	1.010	11.39	16.12	90	1.345	15.18	21.47
15	1.011	11.41	16.14	91	1.352	15.25	21.58
16	1.013	11.42	16.16	92	1.359	15.33	21.69
17	1.014	11.44	16.19	93	1.366	15.40	21.80
18	1.016	11.46	16.22	94	1.372	15.48	21.90
19	1.018	11.48	16.25	95	1.379	15.56	22.01
20	1.020	11.50	16.28	96	1.386	15.64	22.12
21	1.022	11.53	16.31	97	1.393	15.71	22.23
22	1.024	11.55	16.34	98	1.400	15.79	22.35
23	1.026	11.57	16.38	99	1.407	15.87	22.46
24	1.028	11.60	16.41	100	1.414	15.95	22.57
25	1.031	11.63	16.45	101	1.421	16.03	22.68
26	1.033	11.66	16.49	102	1.428	16.11	22.80
27	1.036	11.68	16.53	103	1.436	16.19	22.91
28	1.038	11.71	16.57	104	1.443	16.27	23.03
29	1.041	11.74	16.62	105	1.450	16.36	23.14
30	1.044	11.78	16.66	106	1.457	16.44	23.26
31	1.047	11.81	16.71	107	1.465	16.52	23.37
32	1.050	11.84	16.76	108	1.472	16.60	23.49
33	1.053	11.88	16.81	109	1.479	16.69	23.61
34	1.056	11.91	16.86	110	1.487	16.77	23.73
35	1.059	11.95	16.91	111	1.494	16.85	23.84
36	1.063	11.99	16.96	112	1.501	16.94	23.96
37	1.066	12.03	17.02	113	1.509	17.02	24.08
38	1.070	12.07	17.07	114	1.516	17.11	24.20
39	1.073	12.11	17.13	115	1.524	17.19	24.32
40	1.077	12.15	17.19	116	1.532	17.28	24.44
41	1.081	12.19	17.25	117	1.539	17.36	24.56
42	1.085	12.23	17.31	118	1.547	17.45	24.69
43	1.089	12.28	17.37	119	1.554	17.53	24.81
44	1.093	12.32	17.44	120	1.562	17.62	24.93
45	1.097	12.37	17.50	121	1.570	17.71	25.05
46	1.101	12.42	17.57	122	1.577	17.79	25.18
47	1.105	12.46	17.63	123	1.585	17.88	25.30
48	1.109	12.51	17.70	124	1.593	17.97	25.42
49	1.114	12.56	17.77	125	1.601	18.06	25.55
50	1.118	12.61	17.84	126	1.609	18.15	25.67
51	1.123	12.66	17.92	127	1.616	18.23	25.80
52	1.127	12.71	17.99	128	1.624	18.32	25.92
53	1.132	12.77	18.06	129	1.632	18.41	26.05
54	1.136	12.82	18.14	130	1.640	18.50	26.18
55	1.141	12.87	18.21	131	1.648	18.59	26.30
56	1.146	12.93	18.29	132	1.656	18.68	26.43
57	1.151	12.98	18.37	133	1.664	18.77	26.56
58	1.156	13.04	18.45	134	1.672	18.86	26.69
59	1.161	13.10	18.53	135	1.680	18.95	26.81
60	1.166	13.15	18.61	136	1.688	19.04	26.94
61	1.171	13.21	18.70	137	1.696	19.13	27.07
62	1.177	13.27	18.78	138	1.704	19.22	27.20
63	1.182	13.33	18.86	139	1.712	19.32	27.33
64	1.187	13.39	18.95	140	1.720	19.41	27.46
65	1.193	13.45	19.04	141	1.729	19.50	27.59
66	1.198	13.52	19.12	142	1.737	19.59	27.72
67	1.204	13.58	19.21	143	1.745	19.68	27.85
68	1.209	13.64	19.30	144	1.753	19.78	27.98
69	1.215	13.70	19.39	145	1.761	19.87	28.11
70	1.221	13.77	19.48	146	1.770	19.96	28.24
71	1.226	13.83	19.57	147	1.778	20.05	28.38
72	1.232	13.90	19.67	148	1.786	20.15	28.51
73	1.238	13.97	19.76	149	1.794	20.24	28.64
74	1.244	14.03	19.85	150	1.803	20.34	28.77
75	1.250	14.10	19.95				

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

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

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

TABLE 6. RANDOM NUMBERS BETWEEN 1 AND “K” (Continued)

Random numbers between 1 and 15

2	14	13	2	12	3	13	8	10	13	5	5	6	5	2	7	3	6	6	12
5	15	14	4	1	9	11	2	8	11	4	14	2	3	7	5	6	1	14	8
8	14	5	14	4	12	8	11	7	4	14	8	10	4	2	3	3	5	10	7
14	15	4	9	11	2	5	3	14	11	11	11	15	2	11	7	4	14	12	3
6	4	11	13	6	10	12	3	7	1	11	15	3	8	2	4	13	6	12	2
12	3	5	14	2	1	6	5	11	6	4	15	2	14	12	7	4	5	5	14
13	4	10	5	15	5	6	11	4	9	3	9	12	1	10	2	8	8	14	4
14	9	1	12	3	3	15	2	6	7	10	15	5	12	2	14	11	3	6	6
7	11	2	11	3	1	8	4	10	12	10	14	5	13	14	13	10	8	12	5
4	2	7	5	6	6	8	14	12	7	11	5	8	2	7	7	11	6	14	11
15	5	11	9	1	3	9	14	7	13	6	12	5	10	13	9	7	9	14	10
13	11	1	6	7	2	13	11	14	2	13	13	2	9	15	10	9	9	11	10
11	5	9	10	4	10	11	14	11	4	6	7	12	6	9	1	15	4	15	2
6	9	2	13	2	13	6	9	6	7	3	11	11	3	6	12	10	13	4	13
3	11	3	3	14	4	13	9	13	14	14	5	5	9	8	4	11	15	2	13
11	2	1	7	11	11	12	11	8	11	11	8	14	12	8	14	9	3	6	10
11	8	14	3	10	12	3	8	8	1	13	12	8	8	8	4	1	9	11	13
10	6	11	5	3	2	14	9	10	14	3	4	6	8	10	7	14	4	10	4
3	14	12	4	5	11	13	8	14	7	14	5	13	3	14	11	3	5	3	13
4	7	9	14	14	8	5	2	11	14	5	11	2	10	10	4	7	4	1	10
10	8	7	12	7	14	10	7	6	3	11	2	13	11	9	9	7	4	14	13
2	2	2	9	7	10	11	12	10	6	7	10	8	13	12	11	2	3	11	7
15	6	8	1	12	8	5	4	5	7	8	13	5	5	8	12	10	13	3	8

Random numbers between 1 and 20

16	9	10	17	16	6	17	16	8	12	17	20	13	3	9	6	7	14	5	14
17	17	1	8	8	19	16	4	9	8	7	14	12	8	3	3	12	13	16	3
2	17	17	16	12	8	12	19	9	16	7	18	19	5	19	10	3	17	2	11
17	8	16	4	18	13	13	14	13	11	8	13	8	3	4	14	9	10	8	5
18	6	12	12	8	6	18	2	3	16	5	7	15	14	19	3	8	3	3	7
14	11	6	18	10	3	16	3	17	19	13	13	9	7	14	6	2	19	4	17
2	10	9	2	20	15	18	17	4	10	3	18	14	12	3	2	17	17	15	12
7	18	9	16	14	12	8	2	4	11	7	16	15	9	2	9	7	4	1	16
18	8	17	13	15	12	14	7	11	10	17	8	12	9	15	7	14	4	10	9
15	19	13	16	2	15	14	9	6	4	17	4	9	10	15	11	17	19	11	8
16	8	19	18	18	9	10	8	13	16	10	2	13	10	20	13	15	11	11	18
13	19	3	14	11	6	18	6	7	11	12	10	2	1	18	15	7	2	19	18
3	18	11	1	15	18	9	9	19	5	3	5	7	19	20	15	11	3	3	3
10	18	8	9	18	11	17	19	3	6	11	18	16	18	12	13	11	10	2	13
6	3	7	10	5	14	10	20	7	6	6	17	20	12	4	9	2	12	18	6
4	8	20	18	12	2	7	20	9	7	1	4	13	7	12	8	6	6	10	15
12	5	13	8	10	14	13	7	10	12	4	6	19	17	5	19	6	12	4	2
8	8	5	12	11	5	15	14	13	10	7	19	19	9	1	5	9	19	3	5
15	5	6	4	7	11	19	3	2	19	9	18	11	20	11	2	4	6	20	6
20	6	4	6	12	17	4	12	3	2	4	18	17	16	13	19	12	12	12	11
2	11	18	17	4	7	2	14	6	11	13	13	6	1	5	14	14	5	15	16
4	10	3	16	13	6	11	8	8	2	9	3	1	17	10	14	17	6	14	7
17	19	9	16	17	14	19	15	6	14	8	10	17	15	2	13	9	7	6	11

FIGURE 1. VEGETATION SAMPLING DESIGN FOR 2003 MEASUREMENTS

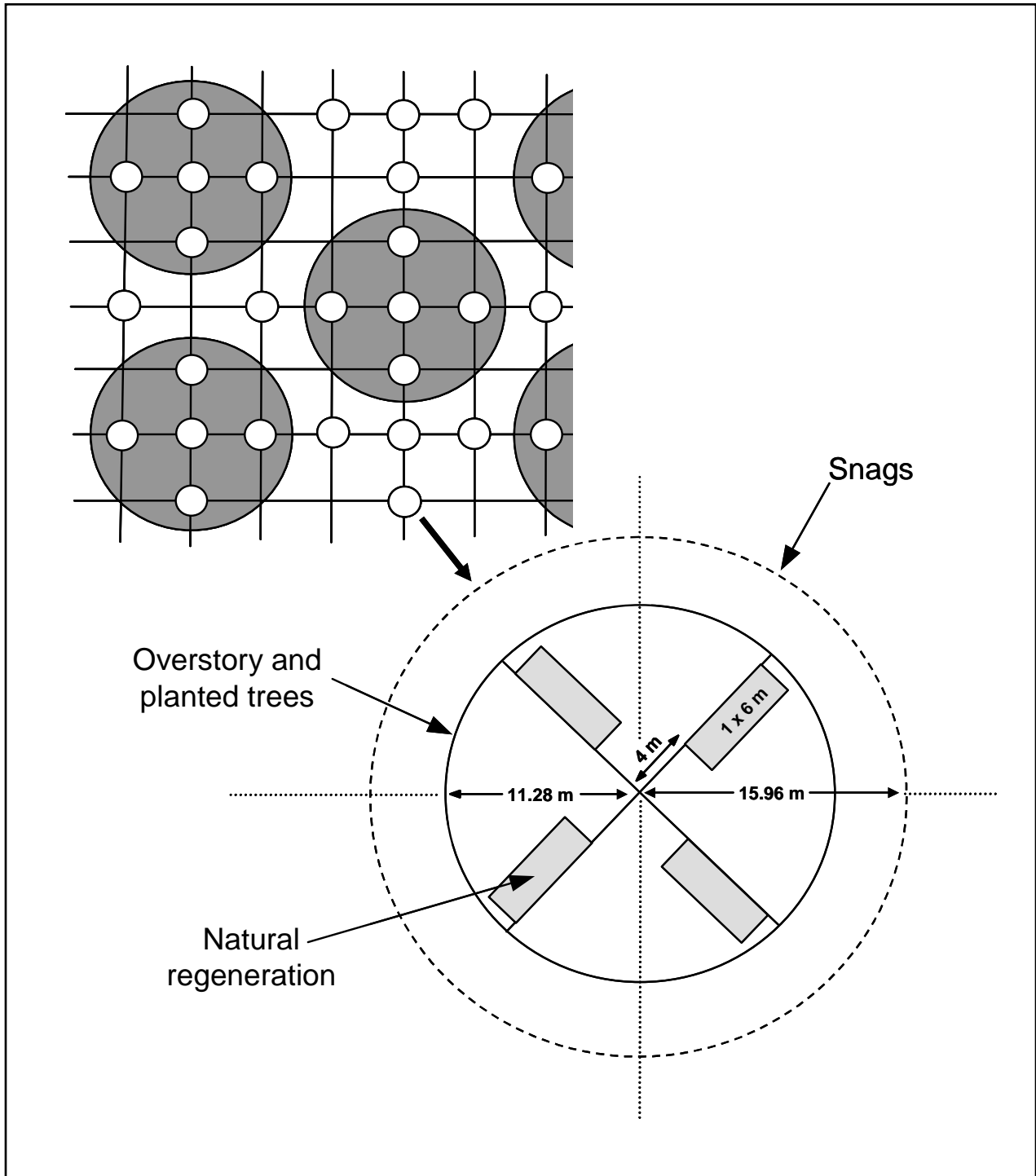


FIGURE 2. STANDARDS FOR MEASURING DIAMETERS OF TREES

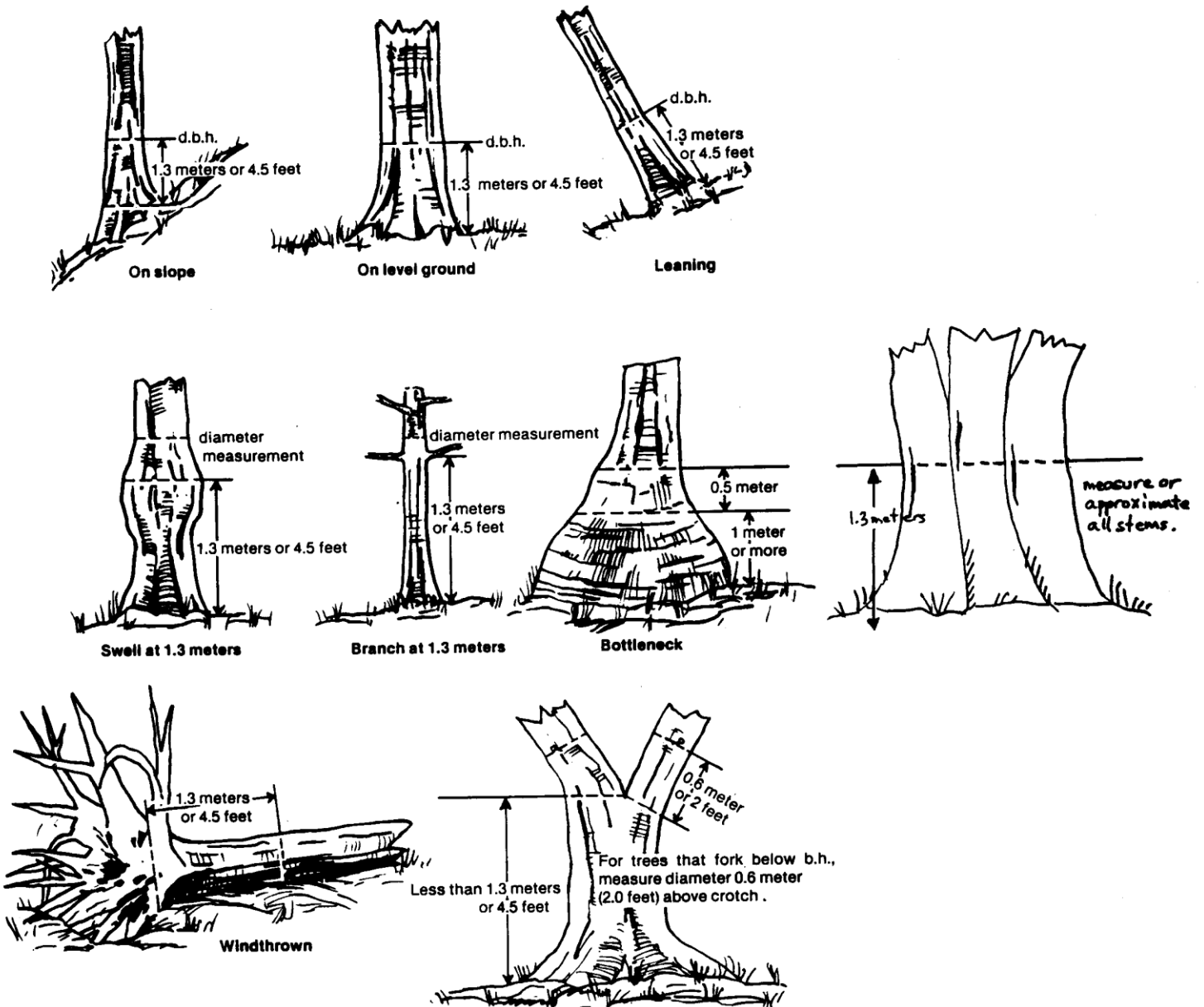


FIGURE 3. SNAG DECAY CLASSES

