FIELD MANUAL FOR POST-HARVEST VEGETATION SAMPLING: 1999
DEMONSTRATION OF ECOSYSTEM MANAGEMENT OPTIONS (DEMO) STUDY

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GENERAL NOTES

"HEADER" INFORMATION ON ALL DATA FORMS

The following "header" information—present on all field sheets—should be completed, prior to taking any measurements within a plot.

Page ____ of _____. For many of the format (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". If a continuation form is necessary, place a check mark in the **Cont.?** ____ field of each additional data form (leave it blank on the first page). 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. The date, listed in the following order: **year (yy) / month (mm) / day (dd),** using two digits for each.

Forest/District. This is a four 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.—Forest/District Codes, Block Numbers, and Compass Declination Values**). Note, we will maintain the GRAN and GWIR codes despite recent changes in their designations.

Block. Each **Block** contains a complete set of six treatment units. Blocks are numbered from 1 to 8 (see **Table 2.— Forest/District Codes, Block Numbers, and Compass Declination Values**).

Treatment Unit. The ca. 13 ha **Treatment Units** (containing 64 grid points) are numbered from 1 to 6 within each Block. The number corresponds to the type of 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 affixed to each grid-point center post.

Plot. The **Plot** number is also found on the metal tag affixed to each grid-point center. A 3-character identifier represents the **Treatment/Row Letter/Column No.** (e.g.,1A7 = Treatment 1, Row A, Column 7).

SAMPLING AND RECORDING DATA

- Before beginning work each day, be sure that the declination on your compass is set properly (see **Table 1.—Forest/District Codes, Block Numbers, and Compass Declination Values**).
- 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 use the fine point mechanical pencil (0.5 mm HB lead) and separate eraser provided.
- Be sure that data are recorded in the units (e.g., cm, %) and with the precision (e.g., nearest cm or 0.1 cm) requested—column headings contain information on units; the style of the blank line indicates the precision. Thus, 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 should be collected in integer form.
- Do not put any extraneous marks (e.g., dashes, asterisks, or slashes) in the data columns. Be sure to write with dark characters: we will be making xerox copies of all forms and light handwriting will not reproduce. When erasing, erase completely, leaving no stray marks.
- Always use CAPITOL letters for species acronyms.

FORM U-A. GENERAL PLOT CHARACTERISTICS

Data to Record:

1. General Comments About Plot: Please comment liberally about overall plot conditions: levels and types of disturbance, forest stand features, and other noteworthy features of the ground surface, forest, or understory vegetation. If, for any reason, reinstallation of rebar or PVC is required, details should be reported here.

2. Plot Locations: For each transect, designate the location (i.e. canopy condition within the treatment unit) using one of the five possible location codes listed on the form. Note, the form also lists which codes are possible within each treatment unit.

Transect Orientations and Layout

Transect Orientations: The schematic figure at the bottom of Form U-A illustrates the orientation of Transects A-D relative to the permanent grid system. Transects should be oriented 45º from the main grid system. Transect bearing by block and treatment unit are listed in **Table 3.—Transect Bearings**.

Note: on several occasions, transects within a treatment unit were incorrectly surveyed during pre-harvest sampling. We will maintain these "unconventional" orientations. Thus, be sure to consult Table 3 before beginning each plot. In addition, please consult the separate table entitled **DEMO Vegetation Transect Reestablishment Data** which contains the orientations of transects and the locations of beginning and end points, as well as possible intermediate points (see below).

Laying out Transect Lines: Always begin at Transect A. To reduce time and to minimize disturbance, all measurements should be completed at Transect A before moving on to Transect B.

Clip the zero mark of the tape onto the rebar located 4 m from the center of the plot (this is called the “4-m" point . . PVC covers each rebar). Next, unreel the tape to the other post located 6 m away (this is called the “10-m" point) keeping the tape as tight and as straight as possible. A tape may have to be run 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 rebar. Remember to consult the listing entitled **DEMO Vegetation Transect Reestablishment Data** (not part of this field manual) which may contain information critical to establishing the transect line.

If large logs, trees, stumps, or slash piles fall along the transect line, intermediate PVC posts may have been established in front of and/or in back of these obstructions. The occurrence of all intermediate points are documented in the table entitled **DEMO Vegetation Transect Reestablishment Data**. Always consult this table before setting up the transect line. Similarly, logs and slash may force the placement of the 4-m 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 the table entitled **DEMO Vegetation Transect Reestablishment Data**. If the 4-m point is not located at 4 m, clip the tape to the rebar at the point along the tape that corresponds to the rebar location. For example, if the rebar is actually at 4.20 m, clip the tape at 4.20 m. This will greatly facilitate placement of microplot frames and other measurements.

If, after setting out the tape, the distance to the 10-m point differs from that listed in the **DEMO Vegetation Transect Reestablishment Data** by more than 10 cm, clip the tape at the new point, and be sure to make a note in the **Comments** field (e.g., “**10-m point actually at 10.17 m”**). If the difference is less than 10 cm, tighten or loosen the tape as necessary to make it conform to the distance listed.

When the "4-" and "10-m" PVC posts lie at distances other than 4 and 10 m, data should still be collected relative to the points where these posts would have been placed had there not been obstruction(s). When intermediate points are present, data collection may need to occur in segments by clipping the tape to these

intermediate posts. In both instances, it is critical that you pay particular attention to the markings on the meter tape and add or subtract distances as necessary.

Please carry several pieces of rebar and PVC with you at all times to replace missing points or to establish new intermediate points if necessary.

FORM U-B1. BRYOPHYTES AND LICHENS IN HARVESTED AND UNCUT PLOTS

Which Plots to Sample: Washington Blocks only; all understory plots in all treatment units.

This form will be used to record bryophyte and lichen data in all plots sampled for understory. Each transect requires a new field sheet, although more than one field sheet may be necessary per transect if the flora is diverse. If a continuation form is necessary, place a check mark in the **Cont.?** ____ field of the second data sheet (leave it blank on the first). If no bryophyte or lichen species are present, complete the header information and place a check mark in the **Cryptogams absent?** ____ field.

Consider only those lichens and bryophytes (1) that are growing on the ground, (2) that have established on coarse woody debris after it has fallen to the forest floor, or (3) that are attached to understory plants or bases of trees up to a height of 1 m. Do not sample material that has recently fallen from the canopy (e.g., epiphytic foliose lichens such as *Lobaria*). In some cases you will need to make a best guess as to whether the species is of arboreal origin; McCune's key will help in determining whether a lichen is typically a canopy-dwelling species, as will the taxa found in each block during pre-harvest sampling (listed in **Table 6.—Lichen and Bryophyte Species Codes**).

Sampling for bryophytes and lichens occurs at each meter mark along the transect line (see **Fig. 1.–Plot Layout**) using a Daubenmire frame (0.2 x 0.5 m). The frame should be placed on the ground if possible, on the clockwise side of the meter tape, the long axis perpendicular to the meter tape, the lower left edge at the even meter mark, and the right edge at the previous 0.8-m mark (**Fig 1.–-Plot Layout**). Thus, **Microplot 1** would lie at meter marks 0.8-1.0, **Microplot 2** at meter marks 1.8-2.0, and so on. It is easiest to place the frame on the ground by removing a short side of the frame and using the meter tape as the "missing" side. If slash is deep, the frame can be placed on or in the slash in a similar fashion. Slash within the frame can be pushed gently to the side to make it possible to see the ground surface, but don't remove the slash from the microplot. If the frame ever falls partly or wholly on a tree bole, stump or log that makes placement difficult, do not offset the frame–instead "imagine" placement of the plot frame in the appropriate position.

All observations should be made from outside (i.e. the counterclockwise side) of the 1 x 6 m belt transect area. To reduce damage to vegetation in the belt transect, the recorder should also stand outside this area. Cover estimates are made by leaning directly over the microplot.

Data to Record:

- **Total cover (%).** Estimate the total cover of bryophytes and lichens separately. For cover values between 0 and 1%, estimate to the nearest 0.1%; for cover between 1 and 10%, to the nearest 1%; and for cover >10%, to the nearest 5%. If a group is absent from a microplot, record the cover as 0.0%.

  Cover equivalents: 1 x 1 cm = 0.1% cover; 1 x 10 cm = 1.0%; 10 x 10 cm = 10%; 20 x 25 cm = 50% cover

  Bryophytes and lichens may be present on downed logs, snags, stumps, or on the bases of live trees. If so, total cover should be estimated only to a height of 1 m off the ground surface. Be sure to check the undersides of large or elevated logs. Also, cover estimates are based on vertical projections—thus, total cover will be deceptively low when it occurs on a vertical surface.

- **Presence of individual bryophyte and lichen species.** List separately all bryophyte and lichen species present in the microplot. Write the full name in the **Species name** column, the life form (B or L) in the **LF** column and the six letter species code (see **Table 6.—Cryptogam Species Codes**) in the **Species code** column. The full name makes it possible to correct an erroneous species code. Codes for species identified to the genus level should be consistent with the rules used for vascular plants (i.e., use first five letters of the genus name).

  Place a "1" in the **P?** column to indicate presence in a microplot. Record the **substrate(s)** on which the

species is found using the codes listed on the data form. Record substrate codes in order of their relative importance as rooting substrates in the microplot (i.e., the substrate that supports the bulk of the species cover should be recorded first). There are 3 potential spaces for recording substrates, however, if there are fewer than 3 different substrates record only those that are present. Leave the **P?** column blank if a species does not occur in a particular microplot.

A species that cannot be identified at the time of sampling should be coded as a unique unknown (e.g., UNKN1, UNKN2) and described in detail on the field sheet in the **Species name** column. Be sure to record the lifeform (B or L) in the **LF** column. A sample should be collected from an area outside the transect, and placed in a small paper bag (or wax envelope)—record all of the information requested on the pre-stamped label. Numbering of unknowns should begin anew for each plot, but not for each transect within a plot. Thus, the code "**B UNKN1**" can refer to more than one bryophyte species within a treatment unit, but only to one bryophyte species within a plot. Do not reference an unknown in a plot to a sample from a previous plot instead of collecting a new sample. There must be a sample of a given unknown collected for every plot, even if the same unknown is collected in other plots. Please make sure to record on the collection bag, all the transects and microplots within which the sample occurs (e.g., "**also found on Trans B, μp 1, 2; Trans C, μp 3"**). Please be sure that there is only one species included in the collection, that there is enough material to make a determination, and that sporocarps (capsules) are collected if possible. It may be difficult to find a "pure" sample; be sure that, for a "mixed" collection, you describe on the sample bag the plant for which you are seeking an identification.

Reminder: Please do not take samples from the transect.

FORM U-B2. HERB LAYER IN HARVESTED PLOTS: PRESENCE / ABSENCE AND NUMBERS OF TREE SEEDLINGS

Which Plots to Sample: All understory plots in the dispersed retention treatments (Units 3 and 5), but only harvested understory plots in the "gap" (Unit 2) and aggregated retention treatments (Units 4 and 6).

This form will be used to record herb-layer and tree seedling data in all plots that have been disturbed by harvest. Each transect requires a new field sheet, although more than one field sheet may be necessary per transect if the flora is diverse. If a continuation form is necessary, place a check mark in the **Cont.?** ____ field of the second data sheet. If no herbs or tree seedlings are present, complete the header information and place a check mark in the **Herbs/Tree Seedlings absent?** ____ field.

Vascular species in the herb layer include those species listed as grasses, sedges and rushes, ferns and fern allies, forbs, sub-shrubs, and low-shrubs in **Table 5.—Vascular Plant Species Codes and Growth-form Assignments**. The species listed in Table 5 were those found during pre-harvest sampling. Many additional weedy species will be present following harvest; these are not listed in Table 5.

Herb-layer species and tree seedlings are sampled in the same plots as the bryophytes and lichens (note, however, that the latter two groups will only be sampled in the Washington DEMO blocks). Remember, slash within the frame can be pushed gently to the side to make it possible to see the ground surface, but don't remove the slash from the microplot. All observations should be made from outside (i.e., the counterclockwise side) of the 1 x 6 m belt transect. To reduce damage to vegetation in the belt transect, the recorder should also stand outside this area. Cover estimates are made by leaning directly over the microplot.

Data to Record:

- **Total cover (%).** Estimate the total cover (vertical projection) of herb-layer species as a group. For cover values between 0 and 1%, estimate to the nearest 0.1%; for cover between 1 and 10%, to the nearest 1%; and for cover >10%, to the nearest 5%. If there are no herb-layer species present in a microplot, record the cover as 0.0%.

  Cover equivalents: 1 x 1 cm = 0.1% cover; 1 x 10 cm = 1.0% cover; 10 x 10 cm = 10% cover; 20 x 25 cm = 50% cover

- **Total no. of tree seedlings.** Record the total number of tree seedlings of all species in each microplot (see below instructions on tallying individual species). If no tree seedlings are found, record a zero (0).

- **Presence of individual herb-layer species.** List separately all herb-layer species present in the microplot. Write the full name in the **Species name** column, an "**H**" in the **LF** column, and the four or five letter **Species code** (see **Table 5.–Vascular Plant Species Codes and Growth-form Assignments**) in the next column. The full name makes it possible to correct an erroneous species code. Codes for species identified to the genus level should contain the first 5 letters of the genus name. For weedy species not listed in Table 5, consult Garrison et al. for the appropriate species code.

  Place a "1" in the **Present?** column to indicate presence in a microplot. Leave the **Present?** column blank if a species does not occur in a particular microplot. No data should be recorded in the **No. of tree sdl**. column.

A species that cannot be identified at the time of sampling should be coded as a unique unknown (e.g., UNKN1, UNKN2) and described in detail on the field sheet in the **Species name** column. Be sure to record an "**H**" in the **LF** column. A sample should be collected from an area outside the transect, and placed in a plastic bag labeled with the personnel, date, block, treatment, plot, transect and microplot number and same life form and unknown species code. Numbering of unknowns should begin anew for each plot, but not for

each transect within a plot. Thus, the code "**H UNKN1**" can refer to more than one herbaceous species within a treatment unit, but only to one herbaceous species within a plot. Do not reference an unknown in a plot to a sample from a previous plot instead of collecting a sample of the unknown. There must be a sample of a given unknown collected for every plot, even if the same unknown is collected in other plots. Please make sure to record on the collection bag/newspaper for pressing, all the transects and microplots within which the sample occurs (e.g., "**also found on Trans B, μp 1, 2; Trans C, μp 3"**). If the plant cannot be identified soon after collection in the field, it should be pressed and labeled for future identification.

An unidentifiable herb that possesses only cotyledons should be recorded as "**UNKN0**" [zero]. In the **Species name** column, record "**cotyledons only—not collected**"**.** Any other unidentifiable herbs for which samples cannot be collected should also be recorded as unknowns, described in the **Species name** column, and a note made that a reference sample was not taken (e.g., "unknown glabrous, opposite-leaved herb--not collected"). Reminder: please do not take samples from the transect.

- **No. of tree seedlings.** List all species of trees for which seedlings (< 10 cm tall) are rooted in the microplot. Write the full name in the **Species name** column, and the **life form** (T) and four or five letter **Species code** (see Table 5) in the two subsequent columns. Codes for species identified to the genus level should contain the first 5 letters of the genus name. Record the total number of seedlings rooted in the microplot in the column labeled **No. tree sdl.** No data should be recorded in the **Present?** column. A clump of hardwood stems < 10 cm tall arising from a common base at ground level—for example if a stem has been cut and resprouts with multiple stems—should be tallied as a single "individual". If no tree seedlings are present for an individual species, leave the **No. tree sdl**. column blank.

FORM U-B3. HERB LAYER IN UNCUT PLOTS: PLANT COVER, HEIGHT, AND NUMBERS OF TREE SEEDLINGS

Which Plots to Sample: All understory plots in the control treatment (Unit 1), all uncut understory plots in the "gap" treatment (Unit 2), and all understory plots in the retained patches of the aggregated retention treatments (Units 4 and 6).

This form will be used to record herb layer and tree seedling data in all plots that have remained undisturbed. Each transect requires a new field sheet, although more than one field sheet may be necessary per transect if the flora is diverse. If a continuation form is necessary, place a check mark in the **Cont.?** ____ field of the second data sheet. If no herbs or tree seedlings are present, complete the header information and place a check mark in the **Herbs/Tree Seedlings absent?** ____ field (this is not likely to occur in these forest plots).

Vascular species in the herb layer include those listed as grasses, sedges and rushes, ferns and fern allies, forbs, sub-shrubs, and low-shrubs in **Table 5.—Vascular Plant Species Codes and Growth-form Assignments**. Some additional weedy species may invade from harvested areas; these are not listed in Table 5.

Herb-layer species and tree seedlings are sampled in the same plots as the bryophytes and lichens (note, however, that the latter two groups will only be sampled in the Washington DEMO blocks). All observations should be made from outside (i.e., the counter-clockwise side) of the 1 x 6 m belt transect area. To reduce damage to vegetation in the belt transect, the recorder should also stand outside this area. Cover estimates are made by leaning directly over the microplot.

Data to Record:

- **Total cover (%).** Estimate the total cover (vertical projection) of herb-layer species as a group. For cover values between 0 and 1%, estimate to the nearest 0.1%; for cover between 1 and 10%, to the nearest 1%; and for cover > 10%, to the nearest 5%. If there are no herb-layer species present in a microplot, record the cover as 0.0%.

- **Total herb height (cm).** The height recorded for total herbs should correspond to the tallest plant in the microplot (see height measurements below).

  Cover equivalents: 1 x 1 cm = 0.1% cover; 1 x 10 cm = 1.0% cover; 10 x 10 cm = 10% cover; 20 x 25 cm = 50% cover

- **Total no. of tree seedlings.** Record the total number of tree seedlings of all species in each microplot (see below instructions on tallying individual species). If no tree seedlings are found, record a zero (0).

- **Cover and height of individual herb-layer species.** List separately all herb-layer species present in the microplot. Write the full name in the **Species name** column, and the **life form** (H) and four or five letter **Species code** (see Table 5) in the two subsequent columns. The full name makes it possible to correct an erroneous species code. Codes for species identified to the genus level should contain the first 5 letters of the genus name. For weedy species not listed in Table 5, consult Garrison et al. for the appropriate species code.

  For each species estimate the **cover** (vertical projection within the plot) and the **maximum height** (foliage or inflorescence) in centimeters. Due to overlap among species, the individual covers of species can sum to greater 100% (and can thus be greater than **Total cover (%)**, whose maximum is 100%). However, the sum of the individual species covers should at least be equal to **Total cover (%)**.

  Height should be estimated within the vertical planes defined by the microplot boundaries and should be measured as the vertical projection to the ground surface, not as stem length. For plots in the which the substrate is log or stump, height should be measured from the rooting substrate. Taxa essentially flat with

ground surface should be assigned a height of 1 cm. Otherwise, maximum heights (foliage or inflorescence) should be estimated to the nearest centimeter for individuals < 50 cm tall, and to the nearest 5 cm for taller plants. It is easiest if each species' height is measured and recorded at the same time cover is estimated.

A species that cannot be identified at the time of sampling should be coded as a unique unknown (e.g., UNKN1, UNKN2) and described in detail on the field sheet in the **Species name** column. Be sure to record an "**H**" in the **LF** column. A sample should be collected from an area outside the transect, and placed in a plastic bag labeled with the date, personnel, block, treatment, plot, transect, and microplot number and same life form and unknown species code. Numbering of unknowns should begin anew for each plot, but not for each transect within a plot. Thus, the code "**H UNKN1**" can refer to more than one herbaceous species within a treatment unit, but only to one herbaceous species within a plot. Do not reference an unknown in a plot to a sample from a previous plot instead of collecting a sample of the unknown. There must be a sample of a given unknown collected for every plot, even if the same unknown is collected in other plots. Please make sure to record on the collection bag/newspaper for pressing, all the transects and microplots within which the sample occurs (e.g., "**also found on Trans B, μp 1, 2; Trans C, μp 3"**). If the plant cannot be identified soon after collection in the field, it should be pressed and labeled for future identification.

An unidentifiable herb that possesses only cotyledon leaves should be recorded as an unknown (UNKN#). In the Species name column, record "**cotyledons only—not collected**". Any other unidentifiable herbs for which samples cannot be collected should also be recorded as unknowns, described in the **Species name** column, and a note made that a reference sample was not taken (e.g., "**unknown glabrous, opposite-leaved herb--not collected**").

Reminder: please do not take samples from the transect.

- **No. of tree seedlings.** List all species of trees for which seedlings (< 10 cm tall) are rooted in the microplot. Write the full name in the **Species name** column, and the **life form** (T) and four or five letter **Species code** (see Table 5) in the two subsequent columns. Codes for species identified to the genus level should contain the first 5 letters of the genus name. Record the total number of seedlings rooted in the microplot in the column labeled **No. tree sdl.** No data should be recorded in the **Present?** column. A clump of hardwood stems < 10 cm tall arising from a common base at ground level—for example if a stem has been cut and resprouts with multiple stems—should be tallied as a single "individual". If no tree seedlings are present for an individual species, leave the **No. tree sdl**. column blank.

FORM U-C. GROUND SURFACE CONDITIONS IN INTACT FOREST

Which Plots to Sample: All understory plots in the control treatment (Unit 1), all unharvested understory plots in the "gap" treatment (Unit 2), and all understory plots in the retained patches of the aggregated retention treatments (Units 4 and 6).

This form will be used to record the ground surface conditions in all plots that have remained undisturbed. Each plot requires only one field sheet.

Ground surface characteristics are sampled using the same 0.2 x 0.5 m microplots (Daubenmire plots) used to sample the cryptogams and herb-layer species and should be sampled at the same time as these.

Data to Record:

- **Cover.** As with the herb layer, cover estimates of all ground surface conditions are determined by leaning directly over the microplot. For cover values between 0 and 1%, estimate to the nearest 0.1%; for cover between 1 and 10%, to the nearest 1%; and for cover >10%, to the nearest 5%.

  Cover equivalents: 1 x 1 cm = 0.1% cover; 1 x 10 cm = 1.0% cover; 10 x 10 cm = 10% cover; 20 x 25 cm = 50% cover

Definitions of ground surface conditions:

Mineral soil = bare ground without appreciable surface litter or duff. This includes mineral soil, gravel or cobbles that are < 7 cm in the narrowest dimension, and organic/mucky soils.

Stone = individual pieces of rock or bedrock > 7 cm in the narrowest dimension, or contiguous smaller pieces that form a surface > 7 cm in the narrowest dimension.

Fine litter = leaves (no matter how large), needles, moss, fallen canopy lichens, or small **branches** ≤ 5 cm in diameter.

Coarse litter = branches, tree boles, rootwads, ***natural*** "stumps" or snags, or bark, all of which are greater than > 5 cm in the smallest dimension; or contiguous smaller pieces of wood or bark that form a surface > 5 cm in the narrowest dimension.

Stump = previously or newly *cut* stump.

Live tree or shrub base/root = base, buttress, or exposed roots of a live tree or shrub.

Other = enter a unique, descriptive code and define in the margin of the data form (e.g., SNAG [snag base]). Limit the use of **Other** to situations in which the standard surface types are not appropriate.

Notes: For each microplot, the cover of mineral soil + stone + fine litter + coarse litter + stump + live tree base/root + other should equal 100%, EXCEPT if a piece of coarse litter (e.g., a log) is suspended or elevated over mineral soil, stone, or fine litter within the plot—then the total can exceed 100% by the amount of that overlap. If this occurs, make a note in the margin: "**>100%, log elev.**" Multiple layers of logs should not be tallied any differently from multiple layers of foliage; thus cover of coarse litter (or any other single category) should never exceed 100%. Note: If the ground surface beneath plants cannot be seen, it should be considered to be fine litter. If a microplot lies under water (e.g., a stream or other wet spot), comment as such on the U-A form, but record substrates as if the water were absent.

FORM U-D. TALL SHRUBS and UNDERSTORY TREES: COVER AND HEIGHT

Which Plots to Sample: All understory plots in all treatment units.

A modified version of the line intercept method will be used to estimate the cover and foliage height of species in the tall shrub and understory tree (< 5.0 cm dbh) layer (**Fig. 3.—Line Intercept Methodology**).

Each transect requires a new field sheet, although more than one field sheet may be necessary. If a continuation form is necessary, place a check mark in the **Cont.?** ____ field of the second data sheet. If no tall shrub or understory trees are present, complete the header information and place a check mark in the **Shrubs/trees absent?** ___ field.

As with herb layer measurements, line intercept estimates should be made from the counterclockwise side of the 1 x 6 m belt transect area (the recorder should also stand outside this area). Cover of each tall shrub and understory tree species is determined by estimating the total portion of the 6-m long transect tape that intercepts its canopy. Cover is determined for all species that are considered to be tall shrubs or understory trees (see **Table 5.— Species Codes and Growth-form Assignments**), irrespective of height or whether the plant lies above or below the meter tape. **Note:** cover of foliage from any tree with a diameter ≥ 5 cm dbh should not be sampled.

On each line of the field sheet, there is room to enter five pairs of "**Start**" and "**End**" measurements per species. If additional pairs of measurements are necessary, simply repeat the species name and code on another line and increment the **LC** (line count) value by one.

Data to Record:

- **Cover (start and end points).** For each species, record the **Species name**, life form (**LF,** i.e. TS = tall shrub, HT = hardwood tree, CT = conifer tree), **Species code**, and a "1" in the **LC** (line count) column. Record the beginning (Start) and ending (End) meter mark intersected by each segment of the tall shrub or tree canopy that projects down to the meter tape (or up to the meter tape for prostrate stems) (see **Fig. 3.—Line Intercept Methodology**). Record these start and end points to the nearest 0.01 m (1 cm), but do not spend a lot of time attempting to resolve small gaps in cover between leaves or branches; measurements should represent the general outline of the canopy. If two or more plants of the same species overlap, record the beginning and ending meter marks that represent the species as a whole, not the individual plants (**Fig. 3.—Line Intercept Methodology**).

A species that cannot be identified at the time of sampling should be coded as a unique unknown (e.g., UNKN1, UNKN2) and described in detail on the field sheet in the **Species name** column. Be sure to record the life form as well (TS = tall shrub, HT = hardwood tree, CT = conifer tree) in the **LF** column. A sample should be collected from an area outside the transect (include stem, leaves, and flowers/fruits if possible), labeled with the date, personnel, block, plot, transect number and same unique species code, and temporarily placed in a plastic collecting bag for subsequent identification. If the plant cannot be identified soon after collection in the field, it should be pressed and labeled for future identification. **Note:** A note should also be made on the collection bag or newspaper that the specimen was a tall shrub or tree recorded on the U-D form.

- **Total cover of tall shrubs, hardwoods and conifers (start and end points)**. The "**Start**" and "**End**" points for the broader groupings of **Total Tall shrub (SHRUB), Total hardwood tree (HARDW),** and **Total conifer tree (CONIF)** can be determined coincidentally with, or after the canopies of the individual species are recorded. Simply treat all plants within each of these categories as if they belonged to the same "species" and record the "Start" and "End" points accordingly (see **Fig. 3.—Line Intercept Methodology**). If one or more of these growth-forms is absent from a transect, leave all columns blank.

Maximum height. For each meter-long interval of the transect line (0.00-1.00, 1.01-2.00, 2.01-3.00 m, etc.) record the **Species name**, Lifeform (**LF**), **Species code**, and **Maximum height** (of foliage or

inflorescence) of each tall shrub or understory tree species present within that interval along the transect line. The maximum value for **SHRUB, HARDW,** and **CONIF** will correspond to the largest value among the species within that growth form within the meter-wide interval in question. Be sure that maximum heights are recorded in the appropriate meter-wide intervals.

Heights should be estimated to the nearest 0.1 m for individuals < 3 m tall and to the nearest 0.5 m for plants > 3 m tall.

As with the herb layer, height is measured as the vertical projection to the ground surface—it is not a measure of stem length.

If the meter tape has to be run in sections between intermediate rebars (because of large trees, logs, stumps, or slash that obstruct the tape line), or if the end points do not lie at 4 or 10 m, it is not absolutely critical that the true start and end distances from the initial rebar are recorded (as only the distances between points are used in the calculation of cover). It is critical however, that data are collected between 4.0 and 10.0 m from the plot center. As a result, some sampling may be necessary before the "4-m" PVC post and some beyond the "10-m" PVC post (e.g., if the "4-m" PVC must be placed at 4.50 m or the "10-m" PVC at 9.70 m). This will require that you pay particular attention to the markings on the meter tape and add or subtract distances as necessary. If, for any reason, the distances recorded on the U-D form are not “true” distances from the 4.0 PVC post, place a check mark in the **“Start and end points are not “true” distances ____?”** field.

FORM U-E. COARSE WOODY DEBRIS

Which Plots to Sample: All understory plots in all treatment units.

The composition, quantity, and quality (decay condition) of coarse woody debris in each plot will be sampled with a modified version of the line intersect (intercept) method that has been used extensively in estimating volumes of natural woody debris and harvest residues. Along each of the four, 6-m long transect lines, all stems >10 cm in diameter should be identified to species (if possible), measured for diameter (cm) at the point of intersection with the meter tape, and assigned a length class and decay class. These will include old logs as well as new materials originating from harvest operations.

All four transects within a plot may fit onto one page. However, if there is a significant amount of CWD, more than one section of the page may be required for a particular transect. If so, place a check mark in the **Cont.?** ____ field of the subsequent section and be sure to enter the correct **Transect** label in the section's header. If no CWD is present on a transect, complete the header information and place a check mark in the **CWD absent?** ____ field.

Data to Record

Along the same 6-m long transect lines used to record cover and height of tall shrubs and understory trees record the following information:

- **Species code**, if possible; if not, record UNKN.
- **Diameter** (cm) at the point of intersection with the transect line (using a calibrated PVC post or the backside of a diameter tape). This is a measure of log diameter perpendicular to the long axis of the log, not parallel to the intercept (see **Fig. 2—Coarse Woody Debris Rules**). Measurements should be made to the nearest cm.
- **Length class** corresponds to the full length of the piece of CWD, even if it leaves the 0.04 ha tree plot. Length class codes are: **1** = < 0.5 m; **2** = ≥ 0.5-1.0 m; **3** = > 1.0 - 5.0 m; **4** = > 5.0 - 10.0 m; **5** = > 10.0 m.
- **Decay class** (see **Figure 5.—Log and Snag Decay Classes**).

  1 = bark intact; twigs < 3 cm in diameter present; texture–wood intact; log cross-section round; wood original color; log elevated on support points

  2 = bark intact; twigs < 3 cm in diameter absent; texture–wood intact to partly soft; log cross-section round; wood original color; log elevated on support points but sagging slightly

  3 = bark loose and missing in places; twigs < 3 cm in diameter absent; texture–wood hard but in large pieces; log cross-section round; wood original color to faded; log sagging and near ground

  4 = bark absent; twigs < 3 cm in diameter absent; texture–wood chunks small, soft, and blocky; log cross-section round to oval; wood color light to faded brown or yellow; all of log on ground

  5 = bark and twigs < 3 cm in diameter absent; texture–wood soft and powdery; log cross-section oval; wood color faded to light yellow or gray; all of log on ground

Rules for accepting and measuring pieces of downed woody debris (see illustrations in Fig. 2—Coarse Woody Debris Rules):

1. **Acceptable**: stems, branches, and bolewood that have fallen to the ground; uprooted stumps and roots not encased in soil; wood slivers and chunks resulting from logging, if large enough.

2. **Unacceptable**: undisturbed (upright) stumps whether natural or of human origin; dead branches attached to boles of standing trees; cones; and bark.

3. Branches or boles lying in the litter layer and above are measured, but not if the intersection between the central axis of the branch/bole lies in the duff (i.e., the forest floor below the litter).

4. If the line intercept (sampling plane) intersects the end of a piece, tally only if the central axis is crossed. If the line exactly intersects the central axis, tally every other such piece.

5. DON'T tally any piece of wood having a central axis that coincides perfectly (parallel) with the line intercept.

6. If the sampling plane intersects a curved piece of wood more than once, tally each intersection.

7. For uprooted stumps or roots, consider them as you do downed tree boles.

8. For class 4 or 5 logs that have fallen apart, visually construct a cylinder containing the rotten material and, to the best of your ability, estimate its former diameter (the original cylinder should be smaller in diameter than the actual log). If a class 5 log is largely incorporated into the forest floor (barely distinguishable), do not sample it.

9. Be sure to look up from the ground when sampling; downed material that is elevated off the forest floor can be tallied. A tree is "downed" and thus qualifies for tallying when the intersection of the sampling plane and central axis is < 2 m from the ground. If this intersection is > 2 m above the ground, the tree is considered a snag and should be tallied and measured as part of the snag plot.

FORM U-F. NATURAL REGENERATION (TREES > 10 CM TALL AND ≤ 5 CM DBH)

Which Plots to Sample: All understory plots in all treatment units.

Naturally regenerating trees > 10 cm tall but < 5.0 cm dbh are tallied by species and height class within each of the four, 1 x 6 m wide belt transects (see **Fig 1.—Plot Layout**).

All 4 transects within a plot may fit onto one page. However, in the unlikely event that there are > 5 species of trees per transect, more than one section of the page may be required for a particular transect. If it is necessary to use a second section, place a check mark in the **Cont.?** ____ field of the second section. If trees are absent from a transect, complete the header information and place a check mark in the **Natural regeneration absent?** ____ field.

Presence is determined by rooting position—i.e. where the tree base enters the litter layer. Individuals should be tallied by species within six height classes: 1 = 0.1 - 0.2 m, 2 = > 0.2 - 0.5 m, 3 = > 0.5 - 1.0 m, 4 = > 1.0-2.0 m, 5 = > 2.0-3.0, and 6 = > 3.0 m tall (see coding on field sheet).

If a tree is rooted on a stump or a log, height should be determined from the surface of the rooting substrate.

Hardwood stems > 10 cm tall but < 5.0 cm dbh arising from a common base (e.g., stump sprouts of *Acer* or *Cornus* where multiple stems emerge from the cut surface) should be tallied as a single individual and height class should be based on the stem with the maximum height.

Please avoid trampling the vegetation in and adjacent to the belt transect.

Planted trees will be tagged and measurements recorded on a separate field form (**Form U-G or U-G2**).

Data to Record:

- **Species name** and **Species code.** Legitimate codes are listed in Table 5.
- **Tally and Total.** Using a calibrated PVC post marked at 1 m to determine the "outer" edge of the 1 x 6 m belt transect, systematically search for understory trees (> 10 cm tall, < 5 cm dbh) rooted within the belt. In the **Tally** column, tally the number of understory individuals by height class using the "dot-and-line" method. For example:

1 = ; 3 = ; 4 = ; 5 = ; 8 = ; 9 = ; 10 = ; 17 = ; 33 =

Upon completing the tally, total the number individuals of each species by height class, and place the total in the **Tot** column.

FORMS U-G and U-G2. PLANTED TREES

Note to 1999 crews: Planted trees will be sampled for the first time at Watson Falls, Dog Prairie, Little White Salmon, Paradise Hills, and Capitol Forest, but will be re-sampled at Butte. **Form U-G** is used for first measurements, **Form U-G2** for re-measurements.

This task should be undertaken only after all sampling of transect lines in completed. As you establish the boundaries of these plots and search for planted trees, avoid walking through the belt transects that define the areas sampled for understory vegetation

Which Plots to Sample: All **understory** plots in the dispersed retention treatments (Units 3 and 5), but only harvested plots in the gap (Unit 2) and aggregated retention (Units 4 and 6) treatments.

One form will probably be sufficient to record all planted trees within a plot.

FORM U-G (Planted Trees: Initial tagging and first-time measurements)

Planted trees will be tagged and measured in all harvested plots. All planted trees will be tagged within the 0.04 ha circular plots used to sample overstory trees (see **Fig 1.—Plot Layout**). The boundary of the 0.04 ha tree plot (horizontal radius of 11.28 m) should be flagged with blue and white striped flagging to identify both planted and overstory trees that are "in" or "out" of the plot. From the center post, measure out as many plot radii as necessary to evaluate borderline trees. On sloping terrain, make distance corrections for slope (using your clinometer) along each radius using the slope corrected radii values listed in **Table 4.—Slope Corrected Distances**. Note that slope-corrected distances may vary for different radii within a plot depending on the topography.

Once the plot boundary is defined, systematically search the entire plot for planted trees (several species of planted trees are possible at a site). Planting densities will vary among blocks (as planned) and from plot to plot (by chance); however, on average you should encounter ~10-12 trees per plot.

Data to Record:

Around the base of each planted tree, place a uniquely numbered metal tag on a piece of green tie-tape—these tags will eventually have to be placed on side-branches so as not to girdle the trees. If the planted tree is dead, do not tag it, but proceed with the remaining tasks. Record the:

- **Quarter** location (see diagram at the bottom of the U-A form)
- **Tag number**
- **Species code**
- **Height** from the base of the tree (in centimeters); use the 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.
- **Leader Growth** (current year's growth): use a ruler and measure to the nearest 0.1 centimeter; 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 up to determine which is the longest; then measure the length of the longest lateral. Do not measure leader growth if the tree is dead.
- **Vigor:** 1= good (no apparent signs of distress); 2 = fair (some signs of stress); 3 = poor (extreme distress apparent, death imminent); 6 = dead
- **Comments:** e.g., reasons for vigor codes different from 1.

In the unlikely event that no planted trees can be found, complete the header information and place a check mark in the **Planted trees absent?** ____ field.

FORM U-G2 (Remeasurement of Planted Trees)

With the following two exceptions, the procedure is basically the same for those sites where planted trees have already been tagged (in 1999 this is Butte [Block 5] only). The two exceptions are that:

- Total height is not measured, and
- No additional tagging should be necessary (but see ** below)

For all trees that had been tagged previously, record the following data in the blanks provided:

- **New tag number:** only if necessary (see ** below)
- **Leader Growth** (current year's growth): use a ruler and measure to the nearest 0.1 centimeter; 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 up to determine which is the longest; then measure the length of the longest lateral. Do not take this measurement if the tree is dead.
- **Current Vigor:** 1= good (no apparent signs of distress); 2 = fair (some signs of stress); 3 = poor (extreme distress apparent, death imminent); 6 = dead.
- **Comments:** regarding tree condition, apparent cause of death, etc.

** If, for some reason, a live planted seedling is found without a tag, two possibilities exist. The pre-printed data on **Form U-G2** can be used to determine what has happened:

- The tree had been tagged but the tag has been lost: First, see if there is a tag number listed on **Form U-G2** that has not been found. If there is, AND if after carefully searching you cannot locate this tagged tree on the plot, AND the location, species, and size of the untagged tree seem to match those listed, it may be that this tree has simply lost its tag. If you are fairly certain that this is the missing tree, a new tag number may be placed on the seedling (as described above). The new tag # should be recorded in the **New Tag #** column, and a note made in the **Comments** field as follows: "Old tag # ___ missing".

- The tree was never tagged during the initial measurement: It may be that the tree you have found was inadvertently missed during the initial sampling/tagging. If all the tag numbers on **Form U-G2** have been accounted for, and you are absolutely sure that the tree in question was planted (i.e., that it is not natural/advanced regeneration), follow the procedures outlined above for **Form U-G**, penciling in the new information at the bottom of **Form U-G2**. In this situation, total height should NOT include the current year's leader growth; instead it should be a measure of total height as of last year. This year's leader growth should be recorded in the **Leader growth** column.

FORM U-H. PERCENT OVERSTORY CANOPY COVER ("Truck Mirrors")

Which Plots to Sample: All understory plots in all treatment units.

One form is sufficient for all measurements at a plot.

Overstory canopy cover (total canopy cover of all trees species ≥ 5.0 cm dbh) is measured at a total of 9 points in each tree plot: at the 0- and 6-m marks of each of the 4 transect lines and at the plot center (grid point). Species that qualify as overstory trees correspond to those listed as hardwoods and conifers in **Table 5.—Vascular Plant Species Codes and Growth-form Assignments**. To be counted, trees must have a dbh of ≥ 5.0 cm.

Note that measurements are not necessarily taken at the PVC posts marking the start and ends of the transects, but at the true distances of 4 and 10 m from the plot center. If a tree bole, stump, or other obstruction makes it impossible to place the mirror at the 0- or 6-m mark, move the mirror inward along the transect (i.e., to a point > 0.0 m for the 0-m mark or < 6.0 m for the 6-m mark), to the first location possible to obtain the measurement. Make a detailed note regarding mirror placement in the **Comments** column. Thus

The “truck mirror” device is a convex mirror measuring 20 cm in diameter, upon which a 10 x 10 square grid is drawn, thus giving 100 squares, divided into 4 quadrants of 25. The mirror is affixed to a swivel attached to a ~1+ m pole, which is sharpened at one end. The pole is pushed into the soil to hold the mirror in a stable configuration at ~1 m height above the sample point. It is not necessary for the post to be driven into the ground at the exact sampling location—it is the mirror that should lie precisely above the sampling location (however, it is useful to make a comment as such, when this occurs). Once the mirror is directly above the sampling location, use a compass to rotate the mirror so that the center lines dividing the quadrants are oriented along the cardinal directions to create NW, NE, SE, and SW quadrants. Once the orientation is correct, the “leveling bubble” should be placed on top of the mirror and the mirror adjusted as necessary to center the bubble in its circle.

The eye should be held 20 cm above the mirror, in the quadrant diagonal to the one being read. This will require that you walk around the mirror or lean around the mirror to sample the 4 quadrants. Be sure to close the other eye while making canopy estimates.

Each of the 25 grid cells within a quadrant is scored on a canopy closure scale of 0-4, 0 = open (<12.5% closed), 1 = ~25% closed, 2 = ~50% closed, 3 = ~75% closed, and 4 = ~100% closed. These 0-4 scores are mentally tallied during the reading, to give an average canopy closure on a scale of 0-100% for each quadrant. Although additions are done mentally, the procedure is easier than it sounds. Note that each of the 25 squares should be examined as a square, and not as a group of four equally-divided quarter-squares. Canopies are irregular and broken; estimates of cover in each square are to the nearest quarter-square, even if no distinct quarters are evident. Include overstory foliage, branches and tree boles in your estimates of cover. Remember to push tall shrubs away if necessary. Cover estimates should always be taken even when obscured by a dense shrub layer—do your best to distinguish tree cover from shrub cover.

Note: An average of 6.5 trees per hectare have been left in all harvested portions of each treatment unit and have been topped or girdled to create replacement snags for those lost during harvesting. Some of these “snags” may still retain live needles at the time of sampling. Cover attributable to the foliage, branches and boles of these snags should be included in the measurement of canopy cover but please note in the **Comments** field the amount of cover attributable to a snag(s), e.g., **NW = 5% “snag tree”**.

Data to record:

For each of the 9 points, record each of the 4 canopy cover measurements in the appropriate column. The comments field can be used to record relatively odd situations (e.g., a high proportion of hardwood cover).

FORM U-I. DISTURBANCE ASSESSMENT

Which Plots to Sample: All understory plots in all treatment units.

Each transect requires a new field sheet. If it is necessary to use a second page, place a check mark in the **Cont.?** ____ field of the second data sheet.

This form will be used to assess type and levels of disturbance, as well as ground surface conditions following harvest. Disturbance assessments will be conducted in harvested plots AND in uncut forest plots (we are sampling in the latter in case debris has fallen into, or other harvest-related disturbance has occurred within, uncut plots).

These are meant to be coarse estimates of disturbance and ground-surface conditions. Do not attempt to pull apart slash piles to view ground surfaces that are buried.

Each form contains three sections. In the first section, the line intercept method is used to record the coverage of various disturbance and substrate types (analogous to that used for sampling tall shrubs and understory trees). In the second, slash depth is recorded at a series of fixed points along each transect line. The third section is used for comments.

The full names and codes of the most common **Cover types** are pre-printed in the **Cover type** and **Code** columns of the U-I form (the full set of legitimate **Cover type** codes is listed in the header). The definitions for each **Cover type** follow:

***Slash (SLASH)* =** material < 10 cm in diameter that has derived from logging activity. This may include branches with green needles or branches with no needles. If there are large gaps (> 5 cm) between fine branches, these gaps should not be included as slash cover.

***Skid trail (SKID*) =** an area with bare mineral soil or slash, usually elongate in shape, onto which logs have been dropped or through which logs have been dragged such that the ground forms a concave surface. May be shallow (several cm) or deep (10s of cm).

Log (LOG) = logs and other coarse woody debris (≥ 10 cm in diameter), such as bark, large chunks of wood, and rootwads that do not support soil. Unlike **Slash**, these can derive either from harvest activity or natural disturbance.

***Intact forest floor (FLOOR)* =** that which retains the original litter layer. There should be no apparent displacement or mixing of mineral soil and litter.

***Disturbed soil (DSOIL)* =** all ground surfaces in which mineral soil has been exposed or deposited as a consequence of harvest operations or natural disturbance (in uncut plots).

Stone (STONE) = individual pieces of rock or bedrock > 7 cm in the narrowest dimension, or contiguous smaller pieces that form a surface > 7 cm in the narrowest dimension.

Stump (STUMP) = previously or newly cut stump.

Live tree base/root (LTREEBR) = the base, buttress, prone bole, or exposed roots of a live tree.

Coarse litter (CLITTER) = woody material <10 cm in diameter (branches, twigs) that does not derive from logging activity. Typically found in uncut plots and includes natural windfall debris.

***Rootwad (RTWAD)* =** the base of an uprooted tree that still supports mineral soil or forest floor. If there is only a wood substrate present record as **Log**.

Snag (SNAG) = snag including base and roots, must be upright; if snag is completely prone then code as **LOG**.

Stream bed or channel with water (STREAMB) **=** perennial or intermittent channel/depression that holds/conducts water.

Hole (HOLE) = animal hole or burrow

Shrub stem, base or root (SHSTEM**) =** the base or prone stem of a live shrub (similar to LTREEBR).

If, after careful thought, it is not possible to place a substrate type into one of the above **Cover type** categories, place a descriptive phrase in the **Cover type** column and a unique 5-7 letter code in the **Code** column. ****** Use this category only if absolutely necessary ***.***

Data to record:

- **Cover type and Code**: if not listed
- **Cover**: For each transect line, record the intercepts of each **Cover type** present by recording all **Start** and **End** points (as done for Tall Shrub cover) (see **Fig. 3.—Line Intercept Methodology**). Do not attempt to resolve small (< 5 cm) gaps in cover. Record obvious overlaps in cover of slash over logs or stumps, but do not try to determine the condition of the forest floor (e.g., how much intact forest floor, disturbed soil, stone) beneath piles of slash. Instead record the cover of these conditions only when slash is not present. If it is necessary to record **Start** and **End** points on a second line, pencil in the same **Cover type** and **Code** on the next blank line and record "**2**" in the **LC** column (**LC** can be incremented for as many additional lines as necessary).
- **Slash depth:** Recorded at the bottom of the data form. At each of the designated meter marks use the calibrated PVC post to measure the depth of slash (to the nearest centimeter). If no slash is present, record a zero. If a log or stump is present and is not covered by slash, record a zero. If slash lies on top of a log or stump, measure from the surface of the log or stump.

  If the meter tape has to be run in sections between intermediate rebars (to accommodate large trees, logs, stumps, or slash) or if the end points do not lie at 4 or 10 m, it is not absolutely critical that the true start and end distances from the initial rebar are recorded (as only the distances between points are used in the calculation of cover). It is critical, however, that data are collected between 4.0 and 10.0 m from the plot center). As a result, some sampling may be necessary in front of the "4-m" PVC post and some beyond the "10-m" PVC post. This will require that you pay particular attention to the markings on the meter tape and add or subtract distances as necessary. If distances recorded on the U-I form are not "true" distances from the "4-m" PVC post, place a check mark in the **"Start and end points are not "true" distances ____?"** field.

FORM 0-A. OVERSTORY TREES

Which Plots to Sample: : All overstory plots in all treatment units—that is, 32 plots in Units 1 and 2, all 64 plots in Units 3 and 5, 37 plots in Unit 4, and 32 plots in Unit 6.

Each plot requires a new field sheet. If it is necessary to use a second page, place a check mark in the **Cont.?** ____ field of the second data sheet. If there are no trees to sample, complete the header information and place a check mark in the **Trees absent?** ____ field.

All overstory trees within a circular plot of 0.04 ha (11.28 m radius) should be tagged and measured (see **Fig. 1—Plot Layout**). All species that qualify as overstory trees are listed in the Understory Hardwood and Conifer sections of **Table 5.—Vascular Plant Species Codes and Growth-form Assignments**.

All overstory trees within the 0.04 ha circular tree plot will be individually tagged and measured (see **Fig. 1—Plot Layout**). For plots that have not been harvested, where trees are relatively dense, the boundary of the plot (horizontal radius of 11.28 m) should first be flagged with blue and white striped flagging to identify trees that are "in" and "out" of the plot. Determination of "in" or "out" trees should be based on the position of the center of the tree at breast height. For trees that are leaning, "in" or "out" should be based on the position of the center of the tree at ground level. On sloping terrain, make distance corrections for slope (using your clinometer) along each radius using the slope corrected radii values listed in **Table 4.—Slope Corrected Distances**. Note that slope corrected distances may vary for different radii within the plot depending on the topography. To mark the plot boundary, hang blue and white striped flagging on the branches of trees or shrubs, or on sticks inserted in the ground. Where tree density is high, it may be necessary to measure out to individual trees to determine positions relative to the plot boundary. It is critical that “in” and “out” determinations are done accurately, as these trees will form the permanently tagged population sampled in all future measurements.

Upon completing overstory sampling, all blue and white striped flagging should be removed from the plot. As you establish and sample the overstory plot, avoid walking through the belt transects that define the areas sampled for understory vegetation.

All trees ≥ 5 cm dbh should be tagged and measured. Prior to tagging trees, determine where standard breast height (1.37 m) falls on your vest and mark it permanently with a metal binder clip. The nail and tag should be placed at exactly 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. 4.—Standards for Measuring Diameters of Trees**). However, the tag should always be placed so that it faces the plot center. Measurements are taken to the nearest 0.1 cm with the tape just above the nail and perfectly level with the cross section of the bole (have your recorder observe tape placement on each tree).

Trees should be tagged systematically, quarter by quarter. Note that snags and live trees can be tagged simultaneously. When a snag is encountered in the process of tagging live trees, record in the **Comments** field of the last live tree tagged that the next tag # is a snag (e.g., for tree #4234 record in the **Comments** field: “**Tag #4235 is a snag.**” This way, a “missing tag number” in the live tree series is accounted for in the comments.

Data to record:

- the **Quarter** location (see schematic figure on Form U-A),
- the unique **Tag number**
- **Species code**
- **DBH** (in centimeters)
- **Canopy class,** a simple classification that ranks species by their relative position in the canopy.
  --- ***Dominant*** trees are those that emerge from the general canopy layer, and thus receive light from the top and sides;
  --- ***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
--- ***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.
-- ***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 scheme was devised for closed canopy forests and has limited relevance both in the dispersed retention units (where dominant and codominant trees were retained by design) or in the harvested matrix of the aggregated retention units where only suppressed (and perhaps some intermediate) trees were left if they were not merchantable. Base your determinations of canopy class in the dispersed retention units on the relative heights of trees. Trees left in the harvested matrix of the aggregated retention treatments should be residual suppressed or intermediate class trees—use trees of comparable height in adjacent retention patches to make your determinations.

- **Vigor:** a qualitative ranking of tree health:
  -- ***Good*** (1) = no apparent signs of distress
  -- ***Fair*** (2) = some signs of distress apparent (e.g., discolored foliage, paucity of leaves)
  -- ***Poor*** (3) = extreme distress apparent (i.e., death imminent)
- **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 characterization of tree conditions are done with care, as these data will serve as the baseline for all future measurements. The recorder should watch for missed trees, incorrect species identification, and incorrect placement of the diameter tape, and should aid in assigning **Condition** codes.

Special Note to 1999 Crews: As you tag trees at Watson Falls, Dog Prairie, and Little White Salmon, please note the occurrence of any tree that appears to have fallen during the past winter (foliage is likely to be green). These will not be captured in our first-year (year 2000) assessment of mortality of tagged trees so it is important to note their presence now. For all trees that had been rooted in the plot but are now either down/dead or (2) snapped/dead record the following information on the U-A form:

- **Quarter**
- **Species code**
- **DBH:** approximate DBH location if necessary
- **Canopy class:** estimate if necessary
- **Vigor:** 6 **=** dead
- **Comment:** Please comment on the (1) cause of mortality (e.g., "uprooting, "stem breakage," or "co-opted uprooting") and (2) direction of uprooting or stem breakage (degrees).

Please do not tag these trees.

Form O-B. SNAGS

Which Plots to Sample: All overstory plots in all treatment units—that is, 32 plots in Units 1 and 2, all 64 plots in Units 3 and 5, 37 plots in Unit 4, and 32 plots in Unit 6.

There should be sufficient room on a field sheet to record the characteristics of all snags within a plot. If no snags are present, complete the header information and place a check mark in the **Snags absent?** ____ field.

Snags and natural stumps should be sampled on a circular plot of 0.08 ha area (radius of 15.96 m) centered on each overstory tree plot (see **Fig. 1.–Plot Layout**). Snags and natural stumps must be ≥ 0.5 m tall and ≥ 25 cm dbh to be sampled. (If a snag or stump is < 1.37 m tall, diameter is measured at 0.5 m height). Note: Snags can include recently tagged trees that have died: be sure to record the necessary information on both the O-B and O-D forms.

A snag need not be “rooted” in the ground: it may be leaning or partially windthrown with an exposed rootwad.

If snags and stumps are uncommon, measure distances as needed to determine if they fall within the plot. If they are numerous, flag the plot boundaries accounting for slope as described for the overstory tree plot.

Note that snags and live trees can be tagged simultaneously (see description above for Form O-A).

Data to Record:

- the **Quarter** location (see schematic figure on Form U-A
- the unique **Tag number** nailed at breast height if possible. If a tag can only be nailed at the base, do so and record the following in the **Comments** column: "**tagged at base.**" If the snag has to be tagged somewhere else, record the height of the tag as follows in the **Comments** column: **“tagged at ___ cm.”** If the snag is too decayed to hold a tag, do not attempt to tag it, and simply record the following in the **Comments** column: **"no tag—too decayed.**"
- **Species code**, if identifiable (otherwise code as UNKN). See Table 5 for species codes.
- **DBH** (in centimeters): If a snag or stump is <1.37 m tall, measure the diameter at 0.5 m height and record in the **Comments** column **“measured at 0.5 m.**” If a snag is missing a significant portion of its volume and is concave in cross section, measure DBH by wrapping the tape around the “bole” in the normal fashion, but record in the **Comments** column: “**concave in shape.**”
- **Height (length) class** (see field sheet for coding: 1 = 0.5 - 1.5 m, 2 = > 1.5 - 5 m, 3 = > 5 - 15 m, 4 = > 15 m). For leaning snags, record the length of the snag, not the height of the tip off the ground.
- **Decay class** (see field sheet for coding and **Fig. 5.—Log and Snag Decay Classes**): For a given snag, 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. 5. 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 characteristics** of the snag.
- **Origin**: For natural snags, leave blank. If snag was created during harvest operations, record “**W**” (for Wildlife tree) and record in the **Comments** column: “**created wildlife snag**” As described above, ca. 6.5 trees per hectare have been left in all harvested portions of each treatment unit and have been topped or girdled to create replacement snags for those lost during harvesting.
- **Angle of lean** from vertical (in degrees, but only if >15º): use a clinometer to measure the lean (only if >15 degrees) and be sure to read the degree scale (on the left), not the percentage (%) scale (on the right).

FORM O-C. TREE HEIGHTS

Which Plots to Sample: Those plots designated on the pre-printed **O-C Forms** (limited to Blocks 5, 7, and 8 during 1999).

Heights will be taken with the Impulse device on a pre-defined subset of tagged trees in each treatment unit; because only 40 or fewer trees per species will be sampled per treatment unit, some plots may not be visited. Each pre-printed **O-C Form** will contain the following information for the pre-defined "Height Trees."

- In the header: **Forest/District**, **Block**, **Treatment**, **Plot**
- In the data columns: **Quarter, Tag #, Alternate tag #** (blank)**, Alternate plot #** (blank)**, Species, Prior DBH, Canopy class**, **DBH, Top height, Height to lowest live branch,** and **Comments**.

If the tree listed is dead or has top damage, an alternate tree of the same species and approximately the same diameter (i.e. within 4 cm of the diameter listed) should be selected from the **Alternate Tree List**. Data for these alternate trees will be recorded in the same manner as the data on the **O-C Form**. If it is necessary to sample an alternate tree, enter its tag number in the **Alt. tag #** column and note in the **Comments** field why the alternate was chosen (e.g., "**Alternate chosen; #___ had top damage.**")

- If an alternate of the same species and diameter cannot be found in the same plot as the pre-listed tree: consult the **Alternate Tree List** for a comparable tree in an adjacent plot (or a more distant one if necessary) and record this new plot number in the **Alt. plot #** column. The standard measurements can then be taken.
- If an alternate of the same species and diameter cannot be found anywhere in the treatment unit, record in the **Comments** field the reason for not sampling the pre-listed tree (e.g., dead, top damage, as above) as well as the comment "**No alternates available.**"

For all Height Trees, record the following data:

- **DBH** (to the nearest tenth of a centimeter)
- **Top height** (to the nearest tenth of a meter)
- **Height to lowest live branch** (to the nearest tenth of a meter)
- **Comments** (if applicable)

FORM O-D. TREE MORTALITY

Which Plots to Sample: : All overstory plots in all treatment units—that is, 32 plots in Units 1 and 2, all 64 plots in Units 3 and 5, 37 plots in Unit 4, and 32 plots in Unit 6. During 1999, only blocks 5 (Butte), 7 (Paradise Hills), and 8 (Capitol Forest) will be visited to check for mortality.

Depending on the levels of mortality, one or more plots worth of data can fit on a mortality form. If it is necessary to use a second page for a plot, place a check mark in the **Cont.?** ____ field of the second data sheet. If there are no dead tagged trees, record the **Plot** number and record in the **Comments** field "**no dead trees**".

Every tagged overstory trees should be visited within a plot—use the data listing entitled "DEMO Post-harvest tree list 1999 to guide your search for all tagged trees. Trees are sorted by quarter then tag number. As you find each tagged tree and determine whether it is alive or dead, place a check mark in the blank in the left column of the data listing. If the tree is alive, nothing more needs to be done. If the tree is dead, various data need to be recorded that describe the condition and possible cause of mortality. (**Note**: if a dead tree is found that does not have a tag one can assume that it was dead at the time that trees were initially tagged; however, if not all of the tagged trees listed can be found in a plot, you may need to reconsider this assumption—a tag may have fallen off a dead tree).

For each case of mortality the following data need to be recorded:

- **Plot**
- **Qtr**
- **Tag no.**
- **Species**
- **DBH** (cm)
- **Canopy class**: this can be copied from the "DEMO Post-harvest Tree List 1999"
- **Remaining crown (%)**: see illustration on data form
- **Remaining tree (%)**: see illustration on data form
- **Lean angle** (deg): as done for snags
- **Tree position:** see **Tree Position Codes** at bottom of data form
- **Direction of uprooting** (deg): only if tree has been uprooted or snapped; otherwise blank
- **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 separate section entitled **Comments** repeat plot and tag number, and describe the physical conditions of the tree and the apparent circumstances of mortality. Here are some examples: "Suppressed individual died standing with dead needles, fine branches present"; "Windthrown/uprooted, green needles present"; "Co-opted windthrow—knocked over/crushed by large windthrown PSME #567.

Note: Be sure that similar information for each case of mortality has been recorded on the **O-B. Snag** form.

WHEN SAMPLING IS COMPLETED BE SURE THAT YOU:

- have all the equipment that you arrived with as well as all plant samples,
- remove all blue and white striped flagging from the plot,
- record additional plot-level comments on form U-A, and
- complete a thorough check of all data forms for the plot. It is absolutely critical that both the recorder and measurer carefully proof all forms before leaving the plot. Be sure that the total number of pages is recorded on each data form.
- have collected and labeled all unknowns from the plot. If a sample was not collected for a particular microplot, be sure that this is indicated on the data form.

TABLES AND FIGURES FOR FIELD MANUAL

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	
North Umpqua RD	2	Little River	UNOU	20.0 E	
Cottage Grove RD	3	Layng Creek	UCOG	20.5 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°
UNOU 2	180°,270°	154°,244°	85°,175°	86°,176°	85°,175°	20°,110°
UCOG 3	73.5°,163.5°	317°,47°	17.5°,107.5°	109.5°,199.5°	90°,180°	73.5°,163.5°
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

BLOCK	Transect	Treatment 1	2	3	4	5	6
UDIL 1 Watson Falls	A	68.5	11.5	83.5	60.5	4.5	11.5
	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
UNOU 2 Little River	A	46.5	20.5	41.5	42.5	41.5	66.5
	B	136.5	110.5	131.5	132.5	131.5	156.5
	C	226.5	200.5	221.5	222.5	221.5	246.5
	D	316.5	290.5	311.5	312.5	311.5	336.5
UCOG 3 Layng Creek	A	28.5	2	62.5	64.5	45	28.5
	B	118.5	92	152.5	154.5	135	118.5
	C	208.5	182	242.5	244.5	225	208.5
	D	298.5	272	332.5	334.5	315	298.5
UDOG 4 Dog Prairie	A	75	70	45	70	75	45
	B	165	160	135	160	165	135
	C	255	250	225	250	255	225
	D	345	340	315	340	345	315
GRAN 5 Butte	A	0	90	45	90	0	10
	B	90	180	135	180	90	100
	C	180	270	225	270	180	190
	D	270	0	315	0	270	280
GMTA 6 Little White Salmon	A	6	55	1	1	6	54
	B	96	145	91	91	96	144
	C	186	235	181	181	186	234
	D	276	325	271	271	276	324
GWIR 7 Paradise Hills	A	85	45	20	34	37	33
	B	175	135	110	124	127	123
	C	265	225	200	214	217	213
	D	355	315	290	304	307	303
CFOR 8 Capitol Forest	A	25	43	12	41	28	23
	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 0.01 ha tree plot	Radius of 0.04 ha tree plot	Radius of 0.08 ha snag plot	Slope (%)	Conversion factor	Radius of 0.01 ha tree plot	Radius of 0.04 ha tree plot	Radius of 0.08 ha snag plot
0	1.000	5.64	11.28	15.96	76	1.256	7.08	14.17	20.05
1	1.000	5.64	11.28	15.96	77	1.262	7.12	14.24	20.14
2	1.000	5.64	11.28	15.96	78	1.268	7.15	14.31	20.24
3	1.000	5.64	11.29	15.97	79	1.274	7.19	14.38	20.34
4	1.001	5.64	11.29	15.97	80	1.281	7.22	14.45	20.44
5	1.001	5.65	11.29	15.98	81	1.287	7.26	14.52	20.54
6	1.002	5.65	11.30	15.99	82	1.293	7.29	14.59	20.64
7	1.002	5.65	11.31	16.00	83	1.300	7.33	14.66	20.74
8	1.003	5.66	11.32	16.01	84	1.306	7.37	14.73	20.84
9	1.004	5.66	11.33	16.02	85	1.312	7.40	14.80	20.95
10	1.005	5.67	11.34	16.04	86	1.319	7.44	14.88	21.05
11	1.006	5.67	11.35	16.06	87	1.325	7.48	14.95	21.15
12	1.007	5.68	11.36	16.07	88	1.332	7.51	15.03	21.26
13	1.008	5.69	11.37	16.09	89	1.339	7.55	15.10	21.37
14	1.010	5.70	11.39	16.12	90	1.345	7.59	15.18	21.47
15	1.011	5.70	11.41	16.14	91	1.352	7.63	15.25	21.58
16	1.013	5.71	11.42	16.16	92	1.359	7.66	15.33	21.69
17	1.014	5.72	11.44	16.19	93	1.366	7.70	15.40	21.80
18	1.016	5.73	11.46	16.22	94	1.372	7.74	15.48	21.90
19	1.018	5.74	11.48	16.25	95	1.379	7.78	15.56	22.01
20	1.020	5.75	11.50	16.28	96	1.386	7.82	15.64	22.12
21	1.022	5.76	11.53	16.31	97	1.393	7.86	15.71	22.23
22	1.024	5.77	11.55	16.34	98	1.400	7.90	15.79	22.35
23	1.026	5.79	11.57	16.38	99	1.407	7.94	15.87	22.46
24	1.028	5.80	11.60	16.41	100	1.414	7.98	15.95	22.57
25	1.031	5.81	11.63	16.45	101	1.421	8.02	16.03	22.68
26	1.033	5.83	11.66	16.49	102	1.428	8.06	16.11	22.80
27	1.036	5.84	11.68	16.53	103	1.436	8.10	16.19	22.91
28	1.038	5.86	11.71	16.57	104	1.443	8.14	16.27	23.03
29	1.041	5.87	11.74	16.62	105	1.450	8.18	16.36	23.14
30	1.044	5.89	11.78	16.66	106	1.457	8.22	16.44	23.26
31	1.047	5.90	11.81	16.71	107	1.465	8.26	16.52	23.37
32	1.050	5.92	11.84	16.76	108	1.472	8.30	16.60	23.49
33	1.053	5.94	11.88	16.81	109	1.479	8.34	16.69	23.61
34	1.056	5.96	11.91	16.86	110	1.487	8.38	16.77	23.73
35	1.059	5.98	11.95	16.91	111	1.494	8.43	16.85	23.84
36	1.063	5.99	11.99	16.96	112	1.501	8.47	16.94	23.96
37	1.066	6.01	12.03	17.02	113	1.509	8.51	17.02	24.08
38	1.070	6.03	12.07	17.07	114	1.516	8.55	17.11	24.20
39	1.073	6.05	12.11	17.13	115	1.524	8.60	17.19	24.32
40	1.077	6.07	12.15	17.19	116	1.532	8.64	17.28	24.44
41	1.081	6.10	12.19	17.25	117	1.539	8.68	17.36	24.56
42	1.085	6.12	12.23	17.31	118	1.547	8.72	17.45	24.69
43	1.089	6.14	12.28	17.37	119	1.554	8.77	17.53	24.81
44	1.093	6.16	12.32	17.44	120	1.562	8.81	17.62	24.93
45	1.097	6.18	12.37	17.50	121	1.570	8.85	17.71	25.05
46	1.101	6.21	12.42	17.57	122	1.577	8.90	17.79	25.18
47	1.105	6.23	12.46	17.63	123	1.585	8.94	17.88	25.30
48	1.109	6.26	12.51	17.70	124	1.593	8.98	17.97	25.42
49	1.114	6.28	12.56	17.77	125	1.601	9.03	18.06	25.55
50	1.118	6.31	12.61	17.84	126	1.609	9.07	18.15	25.67
51	1.123	6.33	12.66	17.92	127	1.616	9.12	18.23	25.80
52	1.127	6.36	12.71	17.99	128	1.624	9.16	18.32	25.92
53	1.132	6.38	12.77	18.06	129	1.632	9.21	18.41	26.05
54	1.136	6.41	12.82	18.14	130	1.640	9.25	18.50	26.18
55	1.141	6.44	12.87	18.21	131	1.648	9.30	18.59	26.30
56	1.146	6.46	12.93	18.29	132	1.656	9.34	18.68	26.43
57	1.151	6.49	12.98	18.37	133	1.664	9.38	18.77	26.56
58	1.156	6.52	13.04	18.45	134	1.672	9.43	18.86	26.69
59	1.161	6.55	13.10	18.53	135	1.680	9.48	18.95	26.81
60	1.166	6.58	13.15	18.61	136	1.688	9.52	19.04	26.94
61	1.171	6.61	13.21	18.70	137	1.696	9.57	19.13	27.07
62	1.177	6.64	13.27	18.78	138	1.704	9.61	19.22	27.20
63	1.182	6.67	13.33	18.86	139	1.712	9.66	19.32	27.33
64	1.187	6.70	13.39	18.95	140	1.720	9.70	19.41	27.46
65	1.193	6.73	13.45	19.04	141	1.729	9.75	19.50	27.59
66	1.198	6.76	13.52	19.12	142	1.737	9.80	19.59	27.72
67	1.204	6.79	13.58	19.21	143	1.745	9.84	19.68	27.85
68	1.209	6.82	13.64	19.30	144	1.753	9.89	19.78	27.98
69	1.215	6.85	13.70	19.39	145	1.761	9.93	19.87	28.11
70	1.221	6.88	13.77	19.48	146	1.770	9.98	19.96	28.24
71	1.226	6.92	13.83	19.57	147	1.778	10.03	20.05	28.38
72	1.232	6.95	13.90	19.67	148	1.786	10.07	20.15	28.51
73	1.238	6.98	13.97	19.76	149	1.794	10.12	20.24	28.64
74	1.244	7.02	14.03	19.85	150	1.803	10.17	20.34	28.77

75	1.250	7.05	14.10	19.95

TABLE 5. VASCULAR PLANT SPECIES CODES AND GROWTH-FORM ASSIGNMENTS

Watson Falls (UDIL, Block 1)

Grasses

AGSC	*Agrostis scabra*
BROMU	*Bromus* sp.
BRVU	*Bromus vulgaris*
DAGL	*Dactylis glomerata*
ELGL	*Elymus glaucus*
FEID	*Festuca idahoensis*
FEOC	*Festuca occidentalis*
FESTU	*Festuca spp.*
FESU	*Festuca subulata*
FESU2	*Festuca subuliflora*
MELIC	*Melica* sp.
MESU	*Melica subulata*
TRCA	*Trisetum canescens*
TRCE	*Trisetum cernuum*

Sedges and Rushes

CACO	*Carex concinnoides*
CADE	*Carex deweyana*
CAREX	*Carex* sp.
JUNCU	*Juncus* sp.
LUCA2	*Luzula campestris*
LUPA	*Luzula parviflora*

Ferns and Fern Allies

ATFI	*Athyrium filix-femina*
BLSP	*Blechnum spicant*
DRAU2	*Dryopteris austriaca*
POMU	*Polystichum munitum*
PTAQ	*Pteridium aquilinum*

Forbs

ACMI	*Achillea millefolium*
ACRU	*Actaea rubra*
ACTR	*Achlys triphylla*
ADBI	*Adenocaulon bicolor*
ANDE	*Anemone deltoidea*
ANEMO	*Anemone* spp.
ANLY2	*Anemone lyallii*
ANMA	*Anaphalis margaritacea*
AQFO	*Aquilegia formosa*
ARMA3	*Arenaria macrophylla*
ASCA3	*Asarum caudatum*
ASHA	*Asarum hartwegii*
CASC2	*Campanula scouleri*
CIAL	*Circaea alpina*
CIAR	*Cirsium arvense*
CIRSI	*Cirsium* sp.
CIVU	*Cirsium vulgare*
CLUN	*Clintonia uniflora*
COHE	*Collomia heterophylla*
COLA	*Coptis laciniata*
COMA3	*Corallorhiza maculata*
CRCA	*Crepis capillaris*
DIHO	*Disporum hookeri*
EPAN	*Epilobium angustifolium*
EPILO	*Epilobium* sp.
EPPA	*Epilobium paniculatum*
FRAGA	*Fragaria* sp.
FRVE	*Fragaria vesca*
FRVI	*Fragaria virginiana*
GABO	*Galium boreale*
GAOR	*Galium oreganum*
GATR	*Galium triflorum*
GNPU	*Gnaphalium purpureum*
GOOB	*Goodyera oblongifolia*
HABEN	*Habenaria* sp. *(wet-site species)*
HAUN	*Habenaria unalascensis*
HECO	*Hemitomes congestum*
HIAL	*Hieracium albiflorum*
HOFU	*Horkelia fusca*
HYFO	*Hypericum formosum*
HYMO	*Hypopitys monotropa*
HYPE	*Hypericum perforatum*
IRIS	*Iris* sp.
KEGA	*Kelloggia galioides*
LICA3	*Listera caurina*
LICO3	*Listera cordata*
LOCO3	*Lotus corniculatus*
LOFO2	*Lotus formosissimus*
LOMI	*Lotus micranthus*
LOPU	*Lotus purshianus*
LOTUS	*Lotus* sp.
MAGR	*Madia gracilis*
MIOV	*Mitella ovalis*
MITEL	*Mitella* sp.
MOPE	*Montia perfoliata*
OSCH	*Osmorhiza chilensis*
PERA	*Pedicularis racemosa*
PHACE	*Phacelia* sp.
PHLOX	*Phlox* sp.
PLFI2	*Pleuricospora fimbriolata*
POGR	*Potentilla gracilis*
PRVU	*Prunella vulgaris*
PYPI	*Pyrola picta*
PYSE	*Pyrola secunda*
RAUN2	*Ranunculus uncinatus*
SADO	*Satureja douglasii*
SEBO	*Senecio bolanderi*
SEJA	*Senecio jacobaea*
SENEC	*Senecio* spp.
SMRA	*Smilacina racemosa*
SMST	*Smilacina stellata*
SOCA	*Solidago canadensis*
STME	*Stellaria media*
SYRE	*Synthyris reniformis*
TITRT	*Tiarella trifoliata trifoliata*
TITRU	*Tiarella trifoliata unifoliata*
TRLA2	*Trientalis latifolia*
TROV	*Trillium ovatum*
TRRE	*Trifolium repens*
VAHE	*Vancouveria hexandra*
VIGL	*Viola glabella*
VIOLA	*Viola* sp.
VISE	*Viola sempervirens*

Sub-shrubs

CHME	*Chimaphila menziesii*
CHUM	*Chimaphila umbellata*
COCA	*Cornus canadensis*
LIBO2	*Linnaea borealis*
LOCI	*Lonicera ciliosa*
RUBUS	*Rubus* sp.
RULA	*Rubus lasiococcus*
RUNI	*Rubus nivalis*
RUUR	*Rubus ursinus*
WHMO	*Whipplea modesta*

Low Shrubs

ARNE	*Arctostaphylos nevadensis*
BENE	*Berberis nervosa*
GAOV	*Gaultheria ovatifolia*
GASH	*Gaultheria shallon*
GAULT	*Gaultheria* sp.
PAMY	*Pachistima myrsinites*
SYMO	*Symphoricarpos mollis*

Tall Shrubs

ACCI	*Acer circinatum*
AMAL	*Amelanchier alnifolia*
BEAQ	*Berberis aquifolium*
CEIN	*Ceanothus integerrimus*
HODI	*Holodiscus discolor*
OECE	*Oemleria cerasiformis*
PHCA	*Physocarpus capitatus*
RHMA	*Rhododendron macrophyllum*
RILA	*Ribes lacustre*
RILO	*Ribes lobbii*
RIBES	*Ribes* sp.
ROGY	*Rosa gymnocarpa*
RONU	*Rosa nutkana*
RUPA	*Rubus parviflorus*
SASC	*Salix scouleriana*
SASI2	*Salix sitchensis*
SPDO	*Spiraea douglasii*
VAME	*Vaccinium membranaceum*
VAPA	*Vaccinium parvifolium*

TABLE 5. VASCULAR PLANT SPECIES CODES AND GROWTH-FORM ASSIGNMENTS

Watson Falls (UDIL, Block 1) (Continued)

Understory Hardwoods	
CACH	*Castanopsis chrysophylla*
CONU	*Cornus nuttallii*
PREM	*Prunus emarginata*
PRVI	*Prunus virginiana*
RHPU	*Rhamnus purshiana*

Understory Conifers			
ABCO	*Abies concolor*	PIPO	*Pinus ponderosa*
ABMAS	*Abies magnifica shastensis*	PSME	*Pseudotsuga menziesii*
PICO	*Pinus contorta*	TABR	*Taxus brevifolia*
PIMO	*Pinus monticola*	TSHE	*Tsuga heterophylla*
PINUS	*Pinus* sp.	TSME	*Tsuga mertensiana*

TABLE 5. VASCULAR PLANT SPECIES CODES AND GROWTH-FORM ASSIGNMENTS

Dog Prairie (UDOG, Block 4)

Grasses

BROMU	*Bromus* sp.
BRVU	*Bromus vulgaris*
DAGL	*Dactylis glomerata*
DESCX	*Deschampsia* spp. *(D. elongata* and *D. danthonioides)*
ELGL	*Elymus glaucus*
FEOC	*Festuca occidentalis*
FESTU	*Festuca* sp.
FESU2	*Festuca subuliflora*
MESU	*Melica subulata*
PHPR	*Phleum pratense*
TRCA	*Trisetum canescens*

Sedges and Rushes

CADE	*Carex deweyana*
CAPE5	*Carex pensylvanica*
CAREX	*Carex* sp.
LUCA2	*Luzula campestris*
LUPA	*Luzula parviflora*

Ferns and Fern Allies

ASDE	*Aspidotis densa*
POMU	*Polystichum munitum*
PTAQ	*Pteridium aquilinum*
WOOR	*Woodsia oregana*

Forbs

ACMI	*Achillea millefolium*	EPPA	*Epilobium paniculatum*	PHACX	*Phacelia* spp. (*P. heterophylla and P. hastata*)
ACRU	*Actaea rubra*	EPWA	*Epilobium watsonii*	PLFI2	*Pleuricospora fimbriolata*
ACTR	*Achlys triphylla*	FRVE	*Fragaria vesca*	POGL	*Potentilla glandulosa*
ADBI	*Adenocaulon bicolor*	FRVI	*Fragaria virginiana*	POMI2	*Polygonum minimum*
ANDE	*Anemone deltoidea*	GALIU	*Galium* sp.	PYAP	*Pyrola aphylla*
AQFO	*Aquilegia formosa*	GAOR	*Galium oreganum*	PYAS	*Pyrola asarifolia*
ARMA3	*Arenaria macrophylla*	GATR	*Galium triflorum*	PYPI	*Pyrola picta*
ASCA3	*Asarum caudatum*	GNMI	*Gnaphalium microcephalum*	PYSE	*Pyrola secunda*
ASRA	*Aster radulinus*	GOOB	*Goodyera oblongifolia*	PYUN	*Pyrola uniflora*
CABU2	*Calypso bulbosa*	HAUN	*Habenaria unalascensis*	RAUN2	*Ranunculus uncinatus*
CASC2	*Campanula scouleri*	HIAL	*Hieracium albiflorum*	SADO	*Satureja douglasii*
CIAL	*Circaea alpina*	HYMO	*Hypopitys monotropa*	SEBO	*Senecio bolanderi*
CICA3	*Cirsium callilepes*	LAMU	*Lactuca muralis*	SEOR2	*Sedum oreganum*
CIVU	*Cirsium vulgare*	LANE	*Lathyrus nevadensis*	SMRA	*Smilacina racemosa*
CLUN	*Clintonia uniflora*	LICA3	*Listera caurina*	SMST	*Smilacina stellata*
COGR	*Collinsia grandiflora*	LIWA	*Lilium washingtonianum*	TITRT	*Tiarella trifoliata trifoliata*
COGR	*Collomia grandiflora*	LOTR	*Lomatium triternatum*	TITRU	*Tiarella trifoliata unifoliata*
COHE	*Collomia heterophylla*	LOPU	*Lotus purshianus*	TRLA2	*Trientalis latifolia*
COMA3	*Corallorhiza maculata*	MAGR	*Madia gracilis*	TROV	*Trillium ovatum*
COPA	*Collinsia parviflora*	MIGR	*Microsteris gracilis*	VAHE	*Vancouveria hexandra*
COST2	*Corallorhiza striata*	MIMO	*Mimulus moschatus*	VIAM	*Vicia americana*
DENU3	*Delphinium nuttallianum*	MITEX	*Mitella* spp. (*M. breweri, M. pentandra, and M. trifida*)	VIGL	*Viola glabella*
DIHO	*Disporum hookeri*	MOSI	*Montia sibirica*	VIOLA	*Viola* sp.
EBAU	*Eburophyton austiniae*	NEPA	*Nemophila parviflora*	VISE	*Viola sempervirens*
EPAN	*Epilobium angustifolium*	OSCH	*Osmorhiza chilensis*		
EPILO	*Epilobium* sp.	PEGA2	*Perideridia gairdneri*		
EPMI	*Epilobium minutum*	PERA	*Pedicularis racemosa*		

Sub-shrubs

CHME	*Chimaphila menziesii*
CHUM	*Chimaphila umbellata*
LIBO2	*Linnaea borealis*
LOCI	*Lonicera ciliosa*
PEDE	*Penstemon deustus*
RULA	*Rubus lasiococcus*
RUNI	*Rubus nivalis*
RUUR	*Rubus ursinus*
WHMO	*Whipplea modesta*

Low Shrubs

APAN	*Apocynum androsaemifolium*
BENE	*Berberis nervosa*
CEPR	*Ceanothus prostratus*
PAMY	*Pachistima myrsinites*
SYMO	*Symphoricarpos mollis*

Tall Shrubs

AMAL	*Amelanchier alnifolia*
BEAQ	*Berberis aquifolium*
COCOC	*Corylus cornuta californica*
HODI	*Holodiscus discolor*
RILA	*Ribes lacustre*
RILO	*Ribes lobbii*
RIVI	*Ribes viscosissimum*
ROGY	*Rosa gymnocarpa*
RUPA	*Rubus parviflorus*
VAME	*Vaccinium membranaceum*

Understory Hardwoods

CACH	*Castanopsis chrysophylla*

Understory Conifers

ABCO	*Abies concolor*	PSME	*Pseudotsuga menziesii*
ABLA2	*Abies lasiocarpa*	TABR	*Taxus brevifolia*
CADE3	*Calocedrus decurrens*	TSHE	*Tsuga heterophylla*
PIMO	*Pinus monticola*		

TABLE 5. VASCULAR PLANT SPECIES CODES AND GROWTH-FORM ASSIGNMENTS

Butte (GRAN, Block 5)

Grasses

AGEX	*Agrostis exarata*
BRVU	*Bromus vulgaris*
FEOC	*Festuca occidentalis*
FESU2	*Festuca subuliflora*
MESU	*Melica subulata*
TRCA	*Trisetum canescens*
TRCE	*Trisetum cernuum*

Sedges and Rushes

LUPA	*Luzula parviflora*
CAREX	*Carex* sp.

Ferns and Fern Allies

ADPE	*Adiantum pedatum*
ATFI	*Athyrium filix-femina*
BLSP	*Blechnum spicant*
EQUIS	*Equisetum* sp.
GYDR	*Gymnocarpium dryopteris*
POMU	*Polystichum munitum*
PTAQ	*Pteridium aquilinum*

Forbs

ACMI	*Achillea millefolium*
ACTR	*Achlys triphylla*
ACRU	*Actaea rubra*
ADBI	*Adenocaulon bicolor*
ANMA	*Anaphalis margaritacea*
ANDE	*Anemone deltoidea*
ANLY2	*Anemone lyallii*
ANEMO	*Anemone* sp.
ARMA3	*Arenaria macrophylla*
ARLA	*Arnica latifolia*
ASCA3	*Asarum caudatum*
CASC2	*Campanula scouleri*
CASTI	*Castilleja* sp.
CIRSI	*Cirsium* sp.
CLUN	*Clintonia uniflora*
COMA3	*Corallorhiza maculata*
DIHO	*Disporum hookeri*
EPAN	*Epilobium angustifolium*
EPILO	*Epilobium* sp.
EPWA	*Epilobium watsonii*
FRVE	*Fragaria vesca*
FRVI	*Fragaria virginiana*
GAOR	*Galium oreganum*
GATR	*Galium triflorum*
GOOB	*Goodyera oblongifolia*
HABEN	*Habenaria* sp.
HEMI	*Heuchera micrantha*
HIAL	*Hieracium albiflorum*
HYMO	*Hypopitys monotropa*
LICO4	*Lilium columbianum*
LICA3	*Listera caurina*
LOMI	*Lotus micranthus*
LULA	*Lupinus latifolius*
MAEX	*Madia exigua*
MIGU	*Mimulus guttatus*
MITEL	*Mitella* sp.
MOCO	*Montia cordifolia*
MOPA	*Montia parvifolia*
MOSI	*Montia sibirica*
NONE	*Nothochelone nemorosa*
OSCH	*Osmorhiza chilensis*
PERA	*Pedicularis racemosa*
PRVU	*Prunella vulgaris*
PYAS	*Pyrola asarifolia*
PYCH	*Pyrola chlorantha*
PYPI	*Pyrola picta*
PYSE	*Pyrola secunda*
PYROL	*Pyrola* sp.
SAPU	*Saxifraga punctata*
SETR	*Senecio triangularis*
SMRA	*Smilacina racemosa*
SMST	*Smilacina stellata*
STCO4	*Stachys cooleyae*
STCR	*Stellaria crispa*
STAM	*Streptopus amplexifolius*
TITRT	*Tiarella trifoliata trifoiata*
TITRU	*Tiarella trifoliata unifoliata*
TRCA3	*Trautvetteria caroliniensis*
TRLA2	*Trientalis latifolia*
TROV	*Trillium ovatum*
VASI	*Valeriana sitchensis*
VIGL	*Viola glabella*
VISE	*Viola sempervirens*
VIOLA	*Viola* sp.
XETE	*Xerophyllum tenax*

Sub-shrubs

CHME	*Chimaphila menziesii*
CHUM	*Chimaphila umbellata*
COCA	*Cornus canadensis*
LIBO2	*Linnaea borealis*
LOCI	*Lonicera ciliosa*
RULA	*Rubus lasiococcus*
RUNI	*Rubus nivalis*
RUUR	*Rubus ursinus*

Low Shrubs

ARUV	*Arctostaphylos uva-ursi*
BENE	*Berberis nervosa*
GAOV	*Gaultheria ovatifolia*
GASH	*Gaultheria shallon*
PAMY	*Pachistima myrsinites*
SYMO	*Symphoricarpos mollis*

Tall Shrubs

ACCI	*Acer circinatum*
ACGL	*Acer glabrum douglasii*
ALSI	*Alnus sinuata*
AMAL	*Amelanchier alnifolia*
CEVE	*Ceanothus velutinus*
COCOC	*Corylus cornuta californica*
HODI	*Holodiscus discolor*
MEFE	*Menziesia ferruginea*
OPHO	*Oplopanax horridum*
RIBES	*Ribes* sp.
ROGY	*Rosa gymnocarpa*
RUPA	*Rubus parviflorus*
RUSP	*Rubus spectabilis*
SALIX	*Salix* sp.
SOSC2	*Sorbus scopulina*
SOSI	*Sorbus sitchensis*
SPBE	*Spiraea betulifolia*
SPIRA	*Spiraea* sp.
VACCX	*Vaccinium alaskaense / V. ovalifolium*
VAME	*Vaccinium membranaceum*
VAPA	*Vaccinium parvifolium*

Understory Hardwoods

CONU	*Cornus nuttallii*
RHPU	*Rhamnus purshiana*
PREM	*Prunus emarginata*
PRVI	*Prunus virginiana (not in data)*
PRUNU	*Prunus* sp.

Understory Conifers

ABAM	*Abies amabilis*
ABGR	*Abies grandis*
ABLA2	*Abies lasiocarpa*
ABPR	*Abies procera*
CHNO	*Chamaecyparis nootkatensis*
PIEN	*Picea engelmannii*
PICO	*Pinus contorta*
PIMO	*Pinus monticola*
PSME	*Pseudotsuga menziesii*
TABR	*Taxus brevifolia*
THPL	*Thuja plicata*
TSHE	*Tsuga heterophylla*
TSME	*Tsuga mertensiana*

TABLE 5. VASCULAR PLANT SPECIES CODES AND GROWTH-FORM ASSIGNMENTS

Little White Salmon (GMTA, Block 6)

Grasses

BRVU	*Bromus vulgaris*
FEOC	*Festuca occidentalis*
FESU2	*F. subuliflora*

Sedges and Rushes

LUCA2	*Luzula campestris*
LUPA	*Luzula parviflora*

Ferns and Fern Allies

ADPE	*Adiantum pedatum*
ATFI	*Athyrium filix-femina*
GYDR	*Gymnocarpium dryopteris*
POMU	*Polystichum munitum*
PTAQ	*Pteridium aquilinum*

Forbs

ACTR	*Achlys triphylla*
ACRU	*Actaea rubra*
ADBI	*Adenocaulon bicolor*
ANMA	*Anaphalis margaritacea*
ANDE	*Anemone deltoidea*
ARMA3	*Arenaria macrophylla*
ASCA3	*Asarum caudatum*
CASC2	*Campanula scouleri*
CIAL	*Circaea alpina*
CLUN	*Clintonia uniflora*
COMA3	*Corallorhiza maculata*
DIHO	*Disporum hookeri*
GAOR	*Galium oreganum*
GATR	*Galium triflorum*
GOOB	*Goodyera oblongifolia*
HEMI	*Heuchera micrantha*
HIAL	*Hieracium albiflorum*
HYDRO	*Hydrophyllum* sp.
LAMU	*Lactuca muralis*
LICO4	*Lilium columbianum*
LICA3	*Listera caurina*
LISTE	*Listera* sp.
MIBR	*Mitella breweri*
MIOV	*Mitella ovalis*
MOUN2	*Monotropa uniflora*
NONE	*Nothochelone nemorosa*
OSMOR	*Osmorhiza chilensis and/or O. purpurea*
PERA	*Pedicularis racemosa*
PYAP	*Pyrola aphylla*
PYAS	*Pyrola asarifolia*
PYPI	*Pyrola picta*
PYSE	*Pyrola secunda*
PYROL	*Pyrola* sp.
SEBO	*Senecio bolanderi*
SMRA	*Smilacina racemosa*
SMST	*Smilacina stellata*
TITRT	*Tiarella trifoliata trifoliata*
TITRU	*Tiarella trifoliata unifoliata*
TRLA2	*Trientalis latifolia*
TROV	*Trillium ovatum*
VAHE	*Vancouveria hexandra*
VIGL	*Viola glabella*
VISE	*Viola sempervirens*
VIOLA	*Viola* sp.
XETE	*Xerophyllum tenax*

Sub-shrubs

CHME	*Chimaphila menziesii*
CHUM	*Chimaphila umbellata*
COCA	*Cornus canadensis*
LIBO2	*Linnaea borealis*
LOCI	*Lonicera ciliosa*
RULA	*Rubus lasiococcus*
RUUR	*Rubus ursinus*

Low Shrubs

BENE	*Berberis nervosa*
GASH	*Gaultheria shallon*
PAMY	*Pachistima myrsinites*
SYMO	*Symphoricarpos mollis*

Tall Shrubs

ACCI	*Acer circinatum*
ACGL	*Acer glabrum douglasii*
AMAL	*Amelanchier alnifolia*
COCOC	*Corylus cornuta californica*
HODI	*Holodiscus discolor*
ROGY	*Rosa gymnocarpa*
RULE	*Rubus leucodermis*
RUPA	*Rubus parviflorus*
SOSC2	*Sorbus scopulina*
SPBE	*Spiraea betulifolia*
VAME	*Vaccinium membranaceum*
VAPA	*Vaccinium parvifolium*

Understory Hardwoods

ACMA	*Acer macrophyllum*
CONU	*Cornus nuttallii*

Understory Conifers

ABGR	*Abies grandis*
ABPR	*Abies procera*
PIMO	*Pinus monticola*
PSME	*Pseudotsuga menziesii*
TABR	*Taxus brevifolia*
TSHE	*Tsuga heterophylla*

TABLE 5. VASCULAR PLANT SPECIES CODES AND GROWTH-FORM ASSIGNMENTS

Paradise Hills (GWIR, Block 7)

Grasses

BRVU	*Bromus vulgaris*
FEOC	*Festuca occidentalis*
FESU2	*Festuca subuliflora*
PLRE	*Pleuropogon refractus*

Sedges and Rushes

—	None

Ferns and Fern Allies

ATFI	*Athyrium filix-femina*
BLSP	*Blechnum spicant*
GYDR	*Gymnocarpium dryopteris*
LYCL	*Lycopodium clavatum*
POMU	*Polystichum munitum*
PTAQ	*Pteridium aquilinum*

Forbs

ACTR	*Achlys triphylla*
ADBI	*Adenocaulon bicolor*
ALVI	*Allotropa virgata*
ANDE	*Anemone deltoidea*
ANEMO	*Anemone* sp.
ASCA3	*Asarum caudatum*
CASC2	*Campanula scouleri*
CAAN2	*Cardamine angulata*
CIAL	*Circaea alpina*
CLUN	*Clintonia uniflora*
CORAL	*Corallorhiza* sp.
DIHO	*Disporum hookeri*
FRVE	*Fragaria vesca*
FRVI	*Fragaria virginiana*
GAOR	*Galium oreganum*
GATR	*Galium triflorum*
GOOB	*Goodyera oblongifolia*
HECO	*Hemitomes congestum*
HIAL	*Hieracium albiflorum*
HYMO	*Hypopitys monotropa*
LAMU	*Lactuca muralis*
LICA3	*Listera caurina*
LICO3	*Listera cordata*
LISTE	*Listera* sp.
MADI2	*Maianthemum dilatatum*
MIOV	*Mitella ovalis*
OSCH	*Osmorhiza chilensis*
OXOR	*Oxalis oregana*
PERA	*Pedicularis racemosa*
PLFI2	*Pleuricospora fimbriolata*
PTAN	*Pterospora andromedea*
PYAS	*Pyrola asarifolia*
PYPI	*Pyrola picta*
PYSE	*Pyrola secunda*
PYROL	*Pyrola* sp.
SETR	*Senecio triangularis*
SMST	*Smilacina stellata*
STCR	*Stellaria crispa*
STAM	*Streptopus amplexifolius*
TITRT	*Tiarella trifoliata trifoliata*
TITRU	*Tiarella trifoliata unifoliata*
TRCA	*Trautvetteria caroliniensis*
TRLA2	*Trientalis latifolia*
TROV	*Trillium ovatum*
VAHE	*Vancouveria hexandra*
VEVI	*Veratrum viride*
VEAM	*Veronica americana*
VIGL	*Viola glabella*
VISE	*Viola sempervirens*
VIOLA	*Viola* sp.
XETE	*Xerophyllum tenax*

Sub-shrubs

CHME	*Chimaphila menziesii*
CHUM	*Chimaphila umbellata*
COCA	*Cornus canadensis*
LIBO2	*Linnaea borealis*
LONIC	*Lonicera* sp.
RULA	*Rubus lasiococcus*
RUPE	*Rubus pedatus*
RUUR	*Rubus ursinus*

Low Shrubs

BENE	*Berberis nervosa*
GAOV	*Gaultheria ovatifolia*
GASH	*Gaultheria shallon*
PAMY	*Pachistima myrsinites*
SYMO	*Symphoricarpos mollis*

Tall Shrubs

ACCI	*Acer circinatum*
ALSI	*Alnus sinuata*
AMAL	*Amelanchier alnifolia*
HODI	*Holodiscus discolor*
MEFE	*Menziesia ferruginea*
OPHO	*Oplopanax horridum*
RILA	*Ribes lacustre*
ROGY	*Rosa gymnocarpa*
RUSP	*Rubus spectabilis*
SOSC2	*Sorbus scopulina*
SOSI	*Sorbus sitchensis*
VACCX	*Vaccinium alaskaense / V. ovalifolium*
VAME	*Vaccinium membranaceum*
VAPA	*Vaccinium parvifolium*

Understory Hardwoods

FRLA2	*Fraxinus latifolia*
POTR2	*Populus trichocarpa*

Understory Conifers

ABAM	*Abies amabilis*
ABGR	*Abies grandis*
ABLA2	*Abies lasiocarpa*
ABPR	*Abies procera*
PIEN	*Picea engelmannii*
PIMO	*Pinus monticola*
PSME	*Pseudotsuga menziesii*
TABR	*Taxus brevifolia*
THPL	*Thuja plicata*
TSHE	*Tsuga heterophylla*
TSME	*Tsuga mertensiana*

TABLE 5. VASCULAR PLANT SPECIES CODES AND GROWTH-FORM ASSIGNMENTS

Capitol Forest (CFOR, Block 8)

Grasses

BRVU	*Bromus vulgaris*
FEOC	*Festuca occidentalis*
FESU2	*Festuca subuliflora*
FESTU	*Festuca* sp.
GLEL	*Glyceria elata*

Sedges and Rushes

CADE	*Carex deweyana*
CAHE	*Carex hendersoni*
CAREX	*Carex* sp.
LUCA2	*Luzula campestris*
LUPA	*Luzula parviflora*

Ferns and Fern Allies

ADPE	*Adiantum pedatum*
ATFI	*Athyrium filix-femina*
BLSP	*Blechnum spicant*
DRAU2	*Dryopteris austriaca*
EQAR	*Equisetum arvense*
GYDR	*Gymnocarpium dryopteris*
LYCL	*Lycopodium clavatum*
POMU	*Polystichum munitum*
PTAQ	*Pteridium aquilinum*

Forbs

ACTR	*Achlys triphylla*	LAMU	*Lactuca muralis*	TOME	*Tolmiea menziesii*
ACRU	*Actaea rubra*	LAPO	*Lathyrus polyphyllus*	TRLA2	*Trientalis latifolia*
ADBI	*Adenocaulon bicolor*	LICO3	*Listera cordata*	TROV	*Trillium ovatum*
ANDE	*Anemone deltoidea*	LYAM	*Lysichitum americanum*	VAHE	*Vancouveria hexandra*
ASCA3	*Asarum caudatum*	MADI2	*Maianthemum dilatatum*	VIGL	*Viola glabella*
CASC2	*Campanula scouleri*	MIOV	*Mitella ovalis*	VISE	*Viola sempervirens*
CAAN2	*Cardamine angulata*	MIPE	*Mitella pentandra*	VIOLA	*Viola* sp.
CHGL	*Chrysosplenium glechomaefolium*	MOUN2	*Monotropa uniflora*		
CIAL	*Circaea alpina*	MOSI	*Montia sibirica*		
CLUN	*Clintonia uniflora*	OESA	*Oenanthe sarmentosa*		
COMA3	*Corallorhiza maculata*	OSCH	*Osmorhiza chilensis*		
DIFO	*Dicentra formosa*	OXOR	*Oxalis oregana*		
DISM	*Disporum smithii*	PEFR2	*Petasites frigidus*		
GAAP	*Galium aparine*	RAUN2	*Ranunculus uncinatus*		
GALIU	*Galium* sp.	SMRA	*Smilacina racemosa*		
GATR	*Galium triflorum*	SMILA	*Smilacina* sp.		
GOOB	*Goodyera oblongifolia*	STCO4	*Stachys cooleyae*		
HIAL	*Hieracium albiflorum*	STCR	*Stellaria crispa*		
HYTE	*Hydrophyllum tenuipes*	STELL	*Stellaria* sp.		
HYMO	*Hypopitys monotropa*	TITRT	*Tiarella trifoliata trifoliata*		

Sub-shrubs

CHME	*Chimaphila menziesii*
CHUM	*Chimaphila umbellata*
LIBO2	*Linnaea borealis*
RUUR	*Rubus ursinus*

Low Shrubs

BENE	*Berberis nervosa*
GASH	*Gaultheria shallon*

Tall Shrubs

ACCI	*Acer circinatum*
OPHO	*Oplopanax horridum*
ROGY	*Rosa gymnocarpa*
RUSP	*Rubus spectabilis*
SASC	*Salix scouleriana*
SARA	*Sambucus racemosa*
VAOV2	*Vaccinium ovatum*
VAPA	*Vaccinium parvifolium*

Understory Hardwoods

ACMA	*Acer macrophyllum*
ALRU	*Alnus rubra*
POTR2	*Populus trichocarpa*
PREM	*Prunus emarginata*
RHPU	*Rhamnus purshiana*

Understory Conifers

ABGR	*Abies grandis*
PSME	*Pseudotsuga menziesii*
TABR	*Taxus brevifolia*
THPL	*Thuja plicata*
TSHE	*Tsuga heterophylla*

TABLE 6. CRYPTOGAM SPECIES CODES

Butte (GRAN, Block 5)

Bryophytes

AUL AND	*Aulacomnium androgynum*
BLE TRI	*Blepharostoma trichophyllum*
BRA ALB	*Brachythecium albicans*
BRA ASP	*Brachythecium asperrimum*
BRA FRI	*Brachythecium frigidum*
BRA HYL	*Brachythecium hylotapetum*
BRA LEI	*Brachythecium leibergii*
BRA RUT	*Brachythecium rutabulum*
BRA SAL	*Brachythecium salebrosum*
BRA VEL	*Brachythecium velutinum*
BRACH	*Brachythecium* sp.
BRY CAP	*Bryum capillare*
BRY SAN	*Bryum sandbergii*
BUX PIP	*Buxbaumia piperi*
BUX VIR	*Buxbaumia viridis*
BUXBA	*Buxbaumia* sp.
CEP BIC	*Cephalozia bicuspidata*
CEP LUN	*Cephalozia lunulifolia*
CER PUR	*Ceratodon purpureus*
CLA BOL	*Claopodium bolanderi*
CLA CRI	*Claopodium crispifolium*
DIC CIR	*Dicranoweisia cirrata*
DIC FUS	*Dicranum fuscescens*
DIC SCO	*Dicranum scoparium*
DIC TAU	*Dicranum tauricum*
DICRA	*Dicranum* sp.
DIP OBT	*Diplophyllum obtusifolium*
DIT MON	*Ditrichum montanum*
EUR ORE	*Eurhynchium oreganum*
EUR PRA	*Eurhynchium praelongum*
EUR PUL	*Eurhynchium pulchellum*
HET DIM	*Heterocladium dimorphum*
HOM MEG	*Homalothecium megaptilum*
HYL SPL	*Hylocomium splendens*
HYP CIR	*Hypnum circinale*
HYP REV	*Hypnum revolutum*
HYP SUB	*Hypnum subimponens*
ISO ELE	*Isopterygium elegans*
ISO SEL	*Isopterygium seligeri*
ISO STO	*Isothecium stoloniferum*
LEP REP	*Lepidozia reptans*
LES INC	*Lescuraea incurvata*
LES STE	*Lescuraea stenophylla*
LEU MEN	*Leucolepis menziesii*
LOP CUS	*Lophocolea cuspidata*
LOP HET	*Lophocolea heterophylla*
LOP INC	*Lophozia incisa*
LOP VEN	*Lophozia ventricosa*
MNI SPI	*Mnium spinulosum*
ORT CON	*Orthotrichum consimile*
ORT PUM	*Orthotrichum pumilum*
ORT SPE	*Orthotrichum speciosum*
ORTHO	*Orthotrichum* sp.
PLA POR	*Plagiochila porelloides*
PLA INS	*Plagiomnium insigne*
PLA DEN	*Plagiothecium denticulatum*
PLA LAE	*Plagiothecium laetum*
PLA UND	*Plagiothecium undulatum*
PLA JUN	*Platydictya jungermannioides*
PLE SCH	*Pleurozium schreberi*
POH BUL	*Pohlia bulbifera*
POH NUT	*Pohlia nutans*
POHLI	*Pohlia* sp.
POL JUN	*Polytrichum juniperinum*
POL PIL	*Polytrichum piliferum*
PTI CAL	*Ptilidium californicum*
RAC CAN	*Racomitrium canescens*
RAC HET	*Racomitrium heterostichum*
RAC PAT	*Racomitrium patens*
RHI GLA	*Rhizomnium glabrescens*
RHY LOR	*Rhytidiadelphus loreus*
RHY TRI	*Rhytidiadelphus triquetrus*
RHY ROB	*Rhytidiopsis robusta*
SCA BOL	*Scapania bolanderi*
SOL PUM	*Solenostoma pumilum*
TET PEL	*Tetraphis pellucida*

Lichens

ALE IMS	*Alectoria imshaugii*
ALE SAR	*Alectoria sarmentosa*
BRY CAP	*Bryoria capillaris*
BRY FRE	*Bryoria fremontii*
BRY FUS	*Bryoria fuscescens*
BRY ORE	*Bryoria oregana*
CET CHL	*Cetraria chlorophylla*
CET ORB	*Cetraria orbata*
CLA BEL	*Cladonia bellidiflora*
CLA CHL	*Cladonia chlorophaea*
CLA FIM	*Cladonia fimbriata*
CLA FUR	*Cladonia furcata*
CLA OCH	*Cladonia ochrochlora*
CLA PYX	*Cladonia pyxidata*
CLA SQU	*Cladonia squamosa*
CLA TRA	*Cladonia transcendens*
CLA VER	*Cladonia verruculosa*
CLADO	*Cladonia* sp.
HYP ENT	*Hypogymnia enteromorpha*
HYP IMS	*Hypogymnia imshaugii*
HYP INA	*Hypogymnia inactiva*
HYP OCC	*Hypogymnia occidentalis*
HYP PHY	*Hypogymnia physodes*
PAR SUL	*Parmelia sulcata*
PAR HYP	*Parmeliopsis hyperopta*
PEL CAN	*Peltigera canina*
PEL MEM	*Peltigera membranacea*
PEL VEN	*Peltigera venosa*
PELTI	*Peltigera* sp.
PIL ACI	*Pilophorus acicularis*
PLA GLA	*Platismatia glauca*
PLA HER	*Platismatia herrei*
USNEA	*Usnea* sp.

TABLE 6. CRYPTOGAM SPECIES CODES

Little White Salmon (GMTA, Block 6)

Bryophytes

ANT CUR	*Antitrichia curtipendula*
ATR SEL	*Atrichum selwynii*
AUL AND	*Aulacomnium androgynum*
BLE TRI	*Blepharostoma trichophyllum*
BRA ALB	*Brachythecium albicans*
BRA ASP	*Brachythecium asperrimum*
BRA HYL	*Brachythecium hylotapetum*
BRA LEI	*Brachythecium leibergii*
BRA VEL	*Brachythecium velutinum*
BRACH	*Brachythecium* sp.
BRY SAN	*Bryum sandbergii*
BUXBA	*Buxbamia* sp.
CEP LUN	*Cephalozia lunulifolia*
CLA BOL	*Claopodium bolanderi*
CLA CRI	*Claopodium crispifolium*
DIC FUS	*Dicranum fuscescens*
DIC SCO	*Dicranum scoparium*
DIC TAU	*Dicranum tauricum*
EUR ORE	*Eurhynchium oreganum*
EUR PRA	*Eurhynchium praelongum*
EUR PUL	*Eurhynchium pulchellum*
HET DIM	*Heterocladium dimorphum*
HOM MEG	*Homalothecium megaptilum*
HYL SPL	*Hylocomium splendens*
HYP CIR	*Hypnum circinale*
HYP SUB	*Hypnum subimponens*
ISO ELE	*Isopterygium elegans*
ISO SEL	*Isopterygium seligeri*
ISO STO	*Isothecium stoloniferum*
LEP REP	*Lepidozia reptans*
LES STE	*Lescuraea stenophylla*
LEU MEN	*Leucolepis menziesii*
LOP HET	*Lophocolea heterophylla*
MNI SPI	*Mnium spinulosum*
ORT LYE	*Orthotrichum lyellii*
ORT SPE	*Orthotrichum speciosum*
PLA ASP	*Plagiochila asplenoides*
PLA INS	*Plagiomnium insigne*
PLA DEN	*Plagiothecium denticulatum*
PLA LAE	*Plagiothecium laetum*
PLA UND	*Plagiothecium undulatum*
PLAGI	*Plagiothecium* sp.
POHLI	*Pohlia* sp.
POR NAV	*Porella navicularis*
PTI CAL	*Ptilidium californicum*
RAC HET	*Racomitrium heterostichum*
RAD COM	*Radula complanata*
RHI GLA	*Rhizomnium glabrescens*
RHY LOR	*Rhytidiadelphus loreus*
RHY TRI	*Rhytidiadelphus triquetrus*
RHY ROB	*Rhytidiopsis robusta*
SCA BOL	*Scapania bolanderi*
TET PEL	*Tetraphis pellucida*
ULO CRI	*Ulota crispa*

Lichens

ALE SAR	*Alectoria sarmentosa*
BRY CAP	*Bryoria capillaris*
BRY FRE	*Bryoria fremontii*
BRY FUS	*Bryoria fuscescens*
BRYOR	*Bryoria* sp.
CLA BEL	*Cladonia bellidiflora*
CLA FIM	*Cladonia fimbriata*
CLA GRA	*Cladonia gracilis*
CLA OCH	*Cladonia ochrochlora*
CLA SQU	*Cladonia squamosa*
CLA TRA	*Cladonia transcendens*
CLA VER	*Cladonia verruculosa*
CLADO	*Cladonia* sp.
HYP ENT	*Hypogymnia enteromorpha*
HYP IMS	*Hypogymnia imshaugii*
HYP INA	*Hypogymnia inactiva*
HYP MET	*Hypogymnia metaphysodes*
HYP OCC	*Hypogymnia occidentalis*
HYP PHY	*Hypogymnia physodes*
HYP RUG	*Hypogymnia rugosa*
HYP TUB	*Hypogymnia tubulosa*
HYPOG	*Hypogymnia* sp.
LET VUL	*Letharia vulpina*
LOB PUL	*Lobaria pulmonaria*
NEP PAR	*Nephroma parile*
NEP RES	*Nephroma resupinatum*
PAR SUL	*Parmelia sulcata*
PAR AMB	*Parmeliopsis ambigua*
PAR HYP	*Parmeliopsis hyperopta*
PEL CAR	*Peltigera canina*
PEL MEM	*Peltigera membranacea*
PEL NEO	*Peltigera neopolydactyla*
PEL PRA	*Peltigera praetextata*
PELTI	*Peltigera* sp.
PLA GLA	*Platismatia glauca*
PLA HER	*Platismatia herrei*
PLA STE	*Platismatia stenophylla*
SPH GLO	*Sphaerophorus globosus*
USNEA	*Usnea* sp.

TABLE 6. CRYPTOGAM SPECIES CODES

Paradise Hills (GWIR, Block 7)

Bryophytes

AUL AND	*Aulacomnium androgynum*
BLE TRI	*Blepharostoma trichophyllum*
BRA ASP	*Brachythecium asperrimum*
BRA HYL	*Brachythecium hylotapetum*
BRA LEI	*Brachythecium leibergii*
BRA VEL	*Brachythecium velutinum*
BRACH	*Brachythecium* sp.
BRY CAP	*Bryum capillare*
BUX PIP	*Buxbaumia piperi*
BUXBA	*Buxbaumia* sp.
CAL FIS	*Calypogeia fissa*
CAL MUE	*Calypogeia muelleriana*
CEP BIC	*Cephalozia bicuspidata*
CEP LUN	*Cephalozia lunulifolia*
CEP DIV	*Cephaloziella divaricata*
CON CON	*Conocephalum conicum*
DIC FUS	*Dicranum fuscescens*
DIC SCO	*Dicranum scoparium*
DIC TAU	*Dicranum tauricum*
DIT MON	*Ditrichum montanum*
EUR ORE	*Eurhynchium oreganum*
EUR PRA	*Eurhynchium praelongum*
EURHY	*Eurhynchium* sp.
HOM MEG	*Homalothecium megaptilum*
HYL SPL	*Hylocomium splendens*
HYP CIR	*Hypnum circinale*
ISO ELE	*Isopterygium elegans*
ISO SEL	*Isopterygium seligeri*
ISO STO	*Isothecium stoloniferum*
LEP REP	*Lepidozia reptans*
LES STE	*Lescuraea stenophylla*
LEU MEN	*Leucolepis menziesii*
LOP HET	*Lophocolea heterophylla*
LOP INC	*Lophozia incisa*
LOP POR	*Lophozia porphyroleuca*
LOPHO	*Lophozia* sp.
LOP VEN	*Lophozia ventricosa*
MAR POL	*Marchantia polymorpha*
MNI SPI	*Mnium spinulosum*
NEC DOU	*Neckera douglasii*
PLA POR	*Plagiochila porelloides*
PLA INS	*Plagiomnium insigne*
PLA DEN	*Plagiothecium denticulatum*
PLA UND	*Plagiothecium undulatum*
PLE SCH	*Pleurozium schreberi*
POH NUT	*Pohlia nutans*
POL JUN	*Polytrichum juniperinum*
POR NAV	*Porella navicularis*
PTI CAL	*Ptilidium californicum*
RAD COM	*Radula complanata*
RHI GLA	*Rhizomnium glabrescens*
RHY LOR	*Rhytidiadelphus loreus*
RHY TRI	*Rhytidiadelphus triquetrus*
RHY ROB	*Rhytidiopsis robusta*
RIC LAT	*Riccardia latifrons*
SCA BOL	*Scapania bolanderi*
SCL TOU	*Scleropodium tourettii*

Lichens

ALE SAR	*Alectoria sarmentosa*
BRY CAP	*Bryoria capillaris*
BRY FRE	*Bryoria fremontii*
BRY FUS	*Bryoria fuscescens*
CLA BEL	*Cladonia bellidiflora*
CLA FIM	*Cladonia fimbriata*
CLA OCH	*Cladonia ochrochlora*
CLA SQU	*Cladonia squamosa*
CLA TRA	*Cladonia transcendens*
CLA VER	*Cladonia verruculosa*
CLADO	*Cladonia* sp.
EVE PRU	*Evernia prunastri*
HYP IMS	*Hypogymnia imshaugii*
HYP INA	*Hypogymnia inactiva*
HYP OCC	*Hypogymnia occidentalis*
HYP PHY	*Hypogymnia physodes*
PAR SUL	*Parmelia sulcata*
PAR AMB	*Parmeliopsis ambigua*
PAR HYP	*Parmeliopsis hyperopta*
PEL CAN	*Peltigera canina*
PEL MEM	*Peltigera membranacea*
PEL NEC	*Peltigera neckeri*
PLA GLA	*Platismatia glauca*
PLA HER	*Platismatia herrei*
PSO HYP	*Psoroma hypnorum*
SPH GLO	*Sphaerophorus globosus*
USNEA	*Usnea* sp.

TABLE 6. CRYPTOGAM SPECIES CODES

Capitol Forest (CFOR, Block 8)

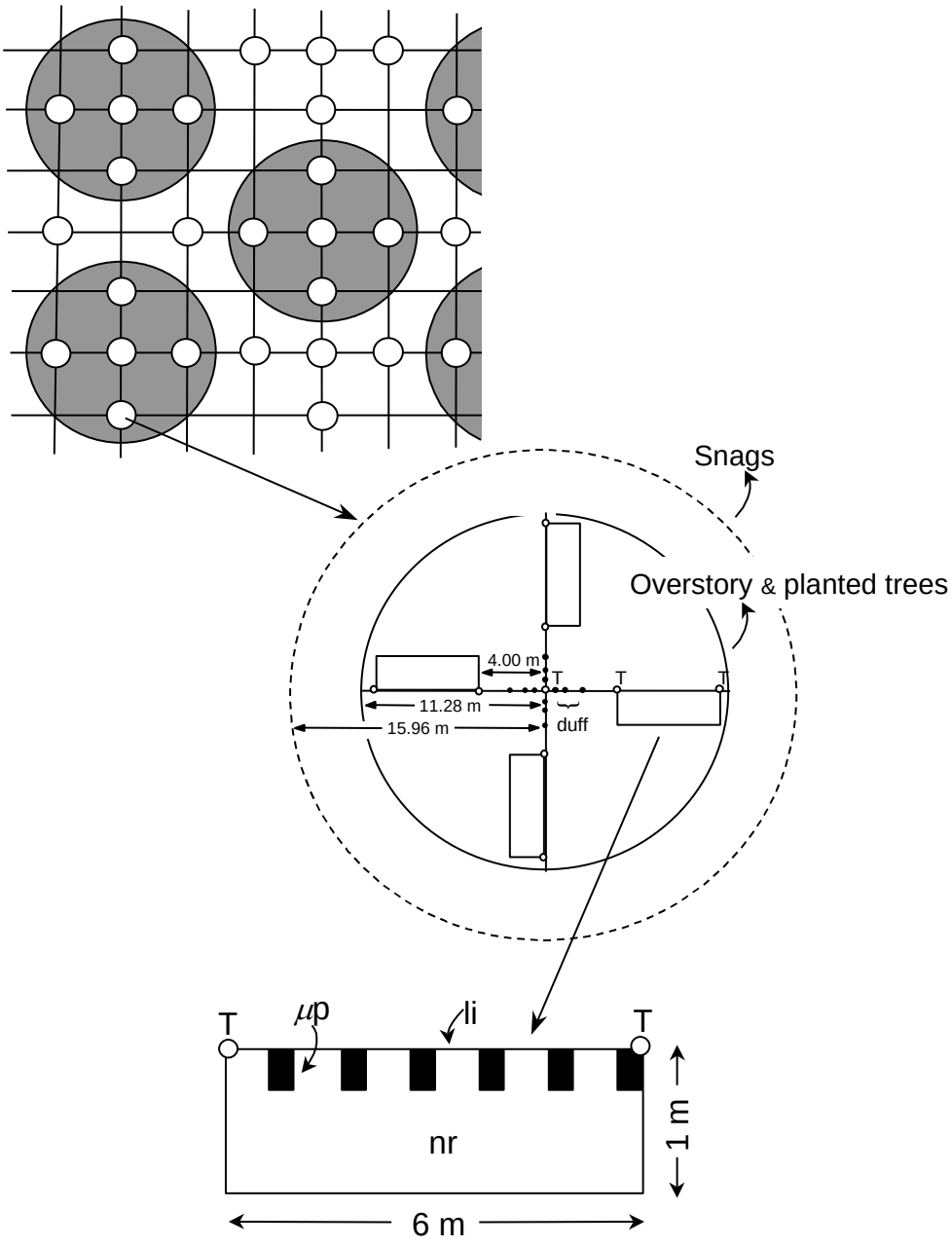
Bryophytes

ATR SEL	*Atrichum selwynii*	LEP REP	*Lepidozia reptans*
ATR UND	*Atrichum undulatum*	LOP CUS	*Lophocolea cuspidata*
AUL AND	*Aulacomnium androgynum*	LOP HET	*Lophocolea heterophylla*
BRA ASP	*Brachythecium asperrimum*	NEC DOU	*Neckera douglasii*
BRA FRI	*Brachythecium frigidum*	ORT LYE	*Orthotrichum lyellii*
BRACH	*Brachythecium* sp.	PEL EPI	*Pellia epiphylla*
CAL FIS	*Calypogeia fissa*	PLA DEN	*Plagiothecium denticulatum*
CAL MUE	*Calypogeia muelleriana*	PLA INS	*Plagiomnium insigne*
CEP BIC	*Cephalozia bicuspidata*	PLA LAE	*Plagiothecium laetum*
CEP LUN	*Cephalozia lunulifolia*	PLA UND	*Plagiothecium undulatum*
CLA BOL	*Claopodium bolanderi*	POR NAV	*Porella navicularis*
CLA CRI	*Claopodium crispifolium*	POH NUT	*Pohlia nutans*
CON CON	*Conocephalum conicum*	POR PLA	*Porella platyphylloidea*
DIC HET	*Dicranella heteromalla*	PTI CAL	*Ptilidium californicum*
DIC FUS	*Dicranum fuscescens*	RHI GLA	*Rhizomnium glabrescens*
DIC SCO	*Dicranum scoparium*	RHY LOR	*Rhytidiadelphus loreus*
DIC TAU	*Dicranum tauricum*	RHY TRI	*Rhytidiadelphus triquetrus*
EUR ORE	*Eurhynchium oreganum*	RIC LAT	*Riccardia latifrons*
EUR PRA	*Eurhynchium praelongum*	RIC MUL	*Riccardia multifida*
EUR PUL	*Eurhynchium pulchellum*	SCA BOL	*Scapania bolanderi*
FIS BRY	*Fissidens bryoides*	TET PEL	*Tetraphis pellucida*
FRU NIS	*Frullania nisquallensis*	ULO CRI	*Ulota crispa*
HOO LUC	*Hookeria lucens*		
HYP CIR	*Hypnum circinale*		
HYL SPL	*Hylocomium splendens*		
ISO ELE	*Isopterygium elegans*		
ISO SEL	*Isopterygium seligeri*		
ISO STO	*Isothecium stoloniferum*		
LEU MEN	*Leucolepis menziesii*		

Lichens

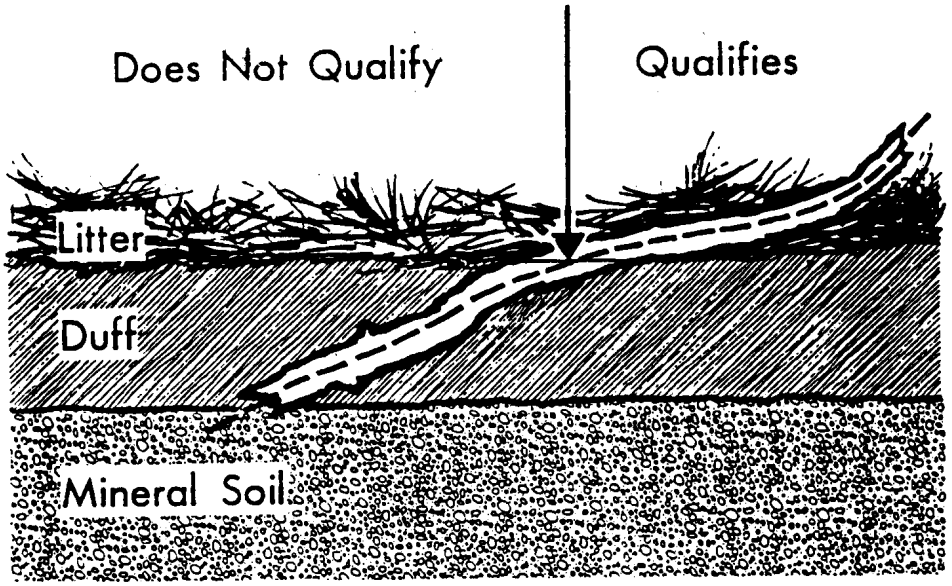
CLADO	*Cladonia* sp.
CLA OCH	*Cladonia ochrochlora*
CLA SQU	*Cladonia squamosa*
CLA VER	*Cladonia verruculosa*
PAR SUL	*Parmelia sulcata*
PEL MEM	*Peltigera membranacea*
PEL POL	*Peltigera polydactyla*
PEL RUF	*Peltigera rufescens*
USNEA	*Usnea* sp.

FIGURE 1. VEGETATION SAMPLING DESIGN

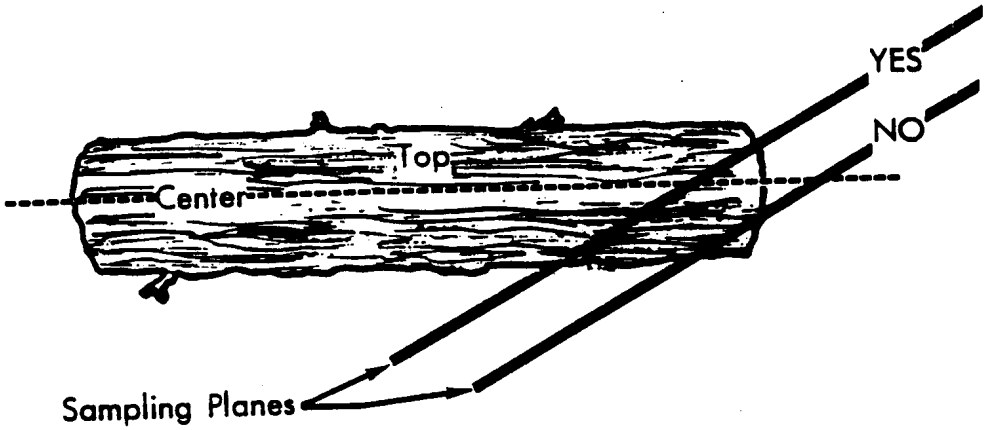


Plot and transect layout for sampling overstory and understory vegetation. Understory sampling locations are coded as follows: **T** = truck mirror densiometer for overstory canopy cover; **duff** (filled circles) = sites for measurement of duff and litter depth; **μp** = Daubenmire microplots (0.2 x 0.5 m) for ground surface conditions, herb presence/absence or cover/height, bryophyte and lichen presence/absence, density of tree seedlings; **li** = line intercept for tall shrub and understory tree cover/height, coarse woody debris, and disturbance assessments; and **nr** = density and size classes of natural regeneration.

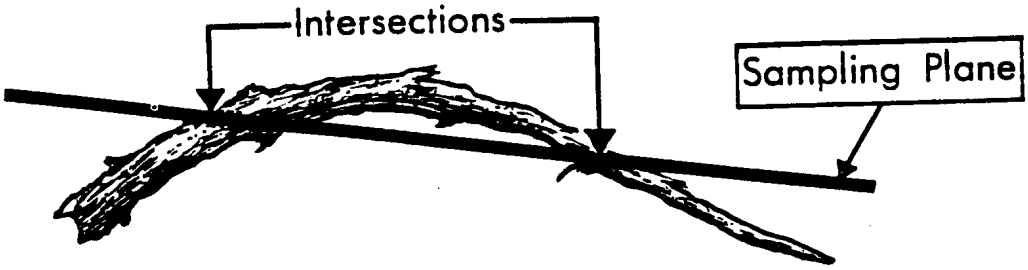
FIGURE 2. COARSE WOODY DEBRIS RULES



--Regardless of size, pieces are tallied only when intersection lies in and above the litter (right of arrow).

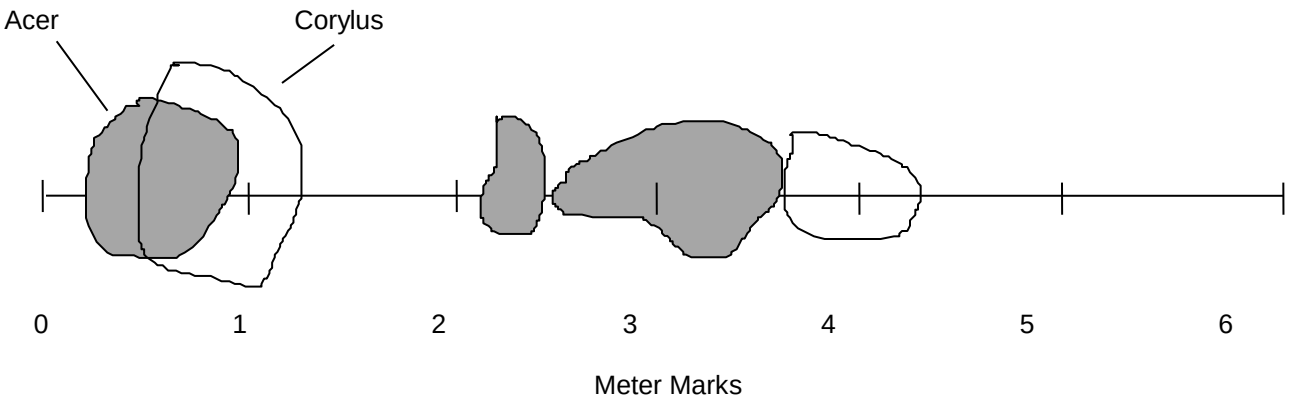


--An intersection at the end of a branch or log must include the central axis to be tallied.



--Count both intersections for a curved piece.

FIGURE 3. LINE INTERCEPT METHODOLOGY



FORM U-D. TALL SHRUBS and UNDERSTORY TREES: COVER AND HEIGHT (POST-HARVEST)

Species name	LF	Species code	LC	Start; End	Start; End	Start; End	Start; End	Start; End
Tot. tall shrub	TS	SHRUB	1	0.25; 1.25	2.10; 2.30	2.35; 4.25	___.__;___.__	___.__;___.__
Acer circinatum	TS	ACCI	1	0.25; 0.95	2.10; 2.30	2.35; 3.60	___.__;___.__	___.__;___.__
Corylus cornuta	TS	COCOC	1	0.50; 1.25	3.60; 4.25	___.__;___.__	___.__;___.__	___.__;___.__
_____	___	_____	__	___.__; ___.__	___.__; ___.__	___.__; ___.__	___.__;___.__	___.__; ___.__

FIGURE 4. STANDARDS FOR MEASURING DIAMETERS OF TREES

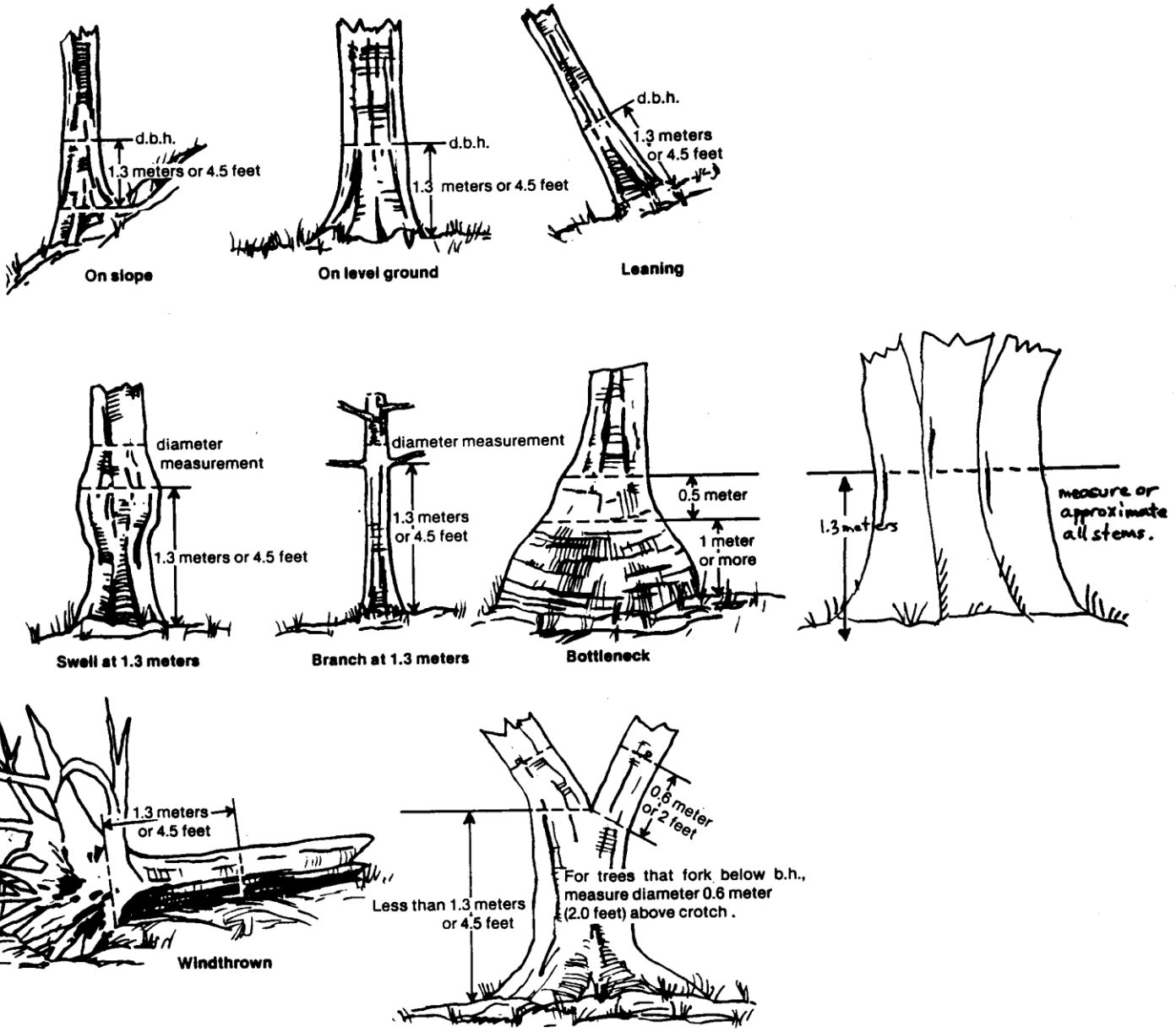


FIGURE 5. LOG AND SNAG DECAY CLASSES