

**FIELD MANUAL FOR POST-HARVEST VEGETATION SAMPLING: 1998  
DEMONSTRATION OF ECOSYSTEM MANAGEMENT OPTIONS (DEMO) STUDY**

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## GENERAL NOTES ABOUT "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 measurements that you take, only one field sheet will be needed for each plot. Other types of data may require more than one field sheet for each plot. For these situations, field sheets should be numbered sequentially, and after the plot sampling is completed, the total number of pages should be entered on each sheet (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. This makes it possible to easily detect the 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 / month / day**, 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 Table 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 will correspond to the type of harvest treatment that will be imposed on the unit: 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 can also be found on the metal tag affixed to each grid-point center. The code is a 3-character identifier representing the **Treatment Unit/Row Letter/Column No.** (1A7 = Treatment Unit 1, Row A, Column 7).

## GENERAL NOTES ABOUT 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. Use stumps as much as possible.
- Conduct sampling of Duff and Litter Depth (Form U-J) first; these data will then be collected before the area near the plot center is disturbed.
- 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 at the resolution (e.g., nearest cm) requested (see data forms). If there is not a decimal point already printed on the data sheet, none is necessary.
- 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. PLOT CHARACTERISTICS

### Data to Record:

- 1. The General Comments:** 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, rebars or PVCs require installation or reestablishment this should be noted here.
- 2. Plot Locations:** For each transect, designate the location (canopy condition within the treatment unit) using one of five possible location codes. The field form indicates which designations are possible within a given 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  $45^\circ$  from the main grid system. Transect bearings have been calculated for you (by block and treatment unit) and are listed in Table 3.—Transect Bearings. 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 transect end and intermediate points (see below)**

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

Place the metal hook of the meter tape in the top of the PVC pipe that is located 4 m from the center of the plot (this is the **4 m PVC**); insert a rubber stopper to hold the hook in place. Next, unreel the tape to the other PVC post 6 meters away (this is the **10 m PVC**) keeping it as tight and as straight as possible. Your partner should sight along the tape to ensure that a straight line is run. The loose end of the tape should then be clipped to the 10 m PVC with one of the green plastic clips.

If large logs, trees, stumps, or slash piles fall along the transect line, **intermediate PVC posts** may be present in front 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 result in the placement of the 4 or 10 m PVC posts 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.**

**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 true 4 and 10 m distances (i.e., 4.0 and 10.0 m from the plot center). As a result, it may be necessary to sample in front of the 4 m PVC post or 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. Likewise, where intermediate points are present, data collection may need to occur in segments by clipping the tape to these intermediate posts.**

**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.**

## FORMS U-B1, U-B2, AND U-B3. BRYOPHYTES, LICHENS AND HERB-LAYER SPECIES

### Form U-B1: BRYOPHYTES AND LICHENS IN HARVESTED AND UNCUT PLOTS

**Which Plots to Sample:** 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 extremely 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 (i) that are growing on the ground, (ii) that have established on coarse woody debris after it has fallen to the forest floor, or (iii) 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 typically is a canopy dwelling species. The taxa found during pre-harvest sampling are 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 between meter marks 0.8 and 1.0, **Microplot 2** between meter marks 1.8 and 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 each group separately. For cover values between 0 and 1%, estimate to the nearest 0.1%; for cover between 1 and 10%, estimate to the nearest 1%; and for cover >10%, estimate to the nearest 5%. If one or both of these groups are 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% cover; 10 x 10 cm = 10% cover; 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—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 in the **LF** column (e.g., B or L) and the six letter **Species code** (see Table 6.—Cryptogam Species

Codes). 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 (L or B) 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 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.

**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 (Units 4 and 6) treatments.

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 extremely 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.—Species Codes and Growth-form Assignments. The species listed in Table 5 were those that were found during pre-harvest sampling. Many additional weedy species will be present as a consequence of 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. 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%, estimate to the nearest 1%; and for cover >10%, estimate 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.** Obtained by summing the densities of individual species of tree seedlings in each microplot (see below for individual species tallies). If no tree seedlings are found, record a **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, the life form (H) in the **LF** column, and the four or five letter **Species code** (see Table 5.—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 the lifeform as well (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, 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. 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 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 multiple shoots—should be tallied as a single individual. Thus, although there may be more than one aerial stem, we will count these 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 extremely 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.—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. 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%, estimate to the nearest 1%; and for cover >10%, estimate 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 greatest height recorded for the individual species 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.** Obtained by summing the densities of individual species of tree seedlings in each microplot (see below for individual species tallies). If no tree seedlings are found, record a 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.

**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 after its cover is determined.

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 as well (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, 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. 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 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 **Cover** or **Ht.** columns. 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 multiple shoots—should be tallied as a single individual. Thus, although there may be more than one aerial stem, we will count these 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%, estimate to the nearest 1%; and for cover >10%, estimate 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 (mineral soil or gravel < 7 cm in the narrowest dimension), without appreciable surface litter or duff (this includes 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** = record and define (on back of form) as necessary (e.g., snag base).

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. 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 (< 5.0 cm dbh) tree 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. Regardless of height, cover is determined for all species that are considered to be tall shrubs or understory trees (see Table 4.—Species Codes and Growth-form Assignments). **Regardless of the height at which their foliage is displayed, cover of trees with diameters  $\geq$  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**, lifeform (**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 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 lifeform 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.

- **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 microplot, 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 **Total tall shrub**, **Total hardwood tree**, and **Total conifer tree** will correspond to the largest value for all species within that growth form category within that meter-wide interval.

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 (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-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.

Be sure that maximum heights are recorded in the appropriate meter-wide intervals.

## 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 4 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. 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 4, 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. Measurements should be made to the nearest cm.
- **Length class**. 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:

**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, see Fig. 4.—Coarse Woody Debris Rules).
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 (see Fig. 4.—Coarse Woody Debris Rules).
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 (see Fig. 4.—Coarse Woody Debris Rules).
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).
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 with height class 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).

**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.

### FORM U-G. PLANTED TREES

This task should be undertaken only after all sampling of transect lines is 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.

**Note to 1998 crews: Trees will only have been planted at the Butte block prior to summer sampling.**

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 depending on the topography of the plot.

Once the plot boundary is defined, systematically and thoroughly search the entire 0.04 plot for all planted trees (several species of planted trees are possible at a site). Numbers will vary among blocks (as planned) and from plot to plot (by chance); on average you should encounter 10-12 trees per plot.

**Note to 1998 crews: Planted trees will be 90% PSME and 10% PIMO (*Pinus monticola*).**

#### Data to Record:

For each planted tree, place a uniquely numbered metal tag on an aluminum wire and loop the wire loosely around a **side branch** of the tree.

**If a side branch is too small or not sturdy enough, make a very wide loop and place it around the base of the stem—these tags will eventually have to be placed on side-branches so as not to girdle the trees.**

Record the:

- **Quarter** location (see diagram at the bottom of the U-A form);
- **Tag number**;
- **Species code**,
- **Height** in centimeters,
- **Vigor** (*good*, *fair* = some signs of distress, *poor* = death is imminent), and any
- **Comments** regarding its condition.

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-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  $\geq 5.0$  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). **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.** Species that qualify as overstory trees correspond to those listed as hardwoods and conifers in Table 5.—Species Codes and Growth-form Assignments. To be counted trees must have a dbh of  $\geq 5.0$  cm.

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 and pushed into the soil to hold the mirror in a stable configuration at ~1 m height above the sample point. **It is not necessary the post be driven into the ground at the exact sampling location—it is the mirror that should lie precisely above the sampling location.** Once the mirror is directly above the sampling location, using a compass rotated 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, but never move or offset the measurement point, even if a canopy estimate seems unrepresentative of the site.

### 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).

**Note:** An average of 6.5 trees per hectare have been left in all harvested portions of each treatment unit. These will be turned into snags this summer by sawing their tops off. However, their canopies may still be present at the time of sampling. All large trees in the harvested portions of the aggregated retention and "75% gap" units are "snag trees". "Snag trees" in the dispersed retention units are uniquely marked with orange or yellow spray paint and in some block (Little White Salmon and Paradise Hills) spray painted in orange with a "W" (for Wildlife). Any canopy cover that derives from these individuals should be noted as such in the comments field in the following manner: (NW = 5% "snag tree").

## 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 levels and types of disturbance, as well as ground surface conditions following harvest. **Disturbance assessments will be conducted in harvested plots AND in uncut forest 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, 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.

Definitions for **Cover types:**

**Slash** = material <10 cm in diameter that has derived from logging activity. This may include branches, 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** = an area with of bare mineral soil or litter/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.

**Logs (and other coarse woody debris)** = logs and other coarse woody debris such as rootwads, that are >10 cm in diameter. Unlike **slash**, these can derive either from harvest activity or natural disturbance.

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

**Disturbed soil** = all ground surfaces in which mineral soil has been exposed or deposited as a consequence of harvest operations.

**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** = previously or newly *cut* stump.

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

**Other** = For any other unique cover type, place a full descriptive phrase in the **Cover type** column and a unique 5-7 letter code in the **Code** column (e.g., Snag base/root and SNAGBR).

**Data to record:**

- **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 (intact**

**forest floor, disturbed soil, stone) beneath piles of slash. Instead record the cover of these conditions only when slash is not present.**

- **Slash depth:** 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 4.0 PVC post, place a check mark in the "**Start and end points are not "true" distances \_\_\_\_?"**" field.

## FORM U-J. DUFF AND LITTER DEPTH

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

Data from all 4 transects can be recorded on a single field sheet.

This form will be used to measure the depth of duff (the O horizon consisting of decayed organic material) and fine litter (fresh and un-decayed). Data will be used primarily by wildlife scientists studying ground-dwelling small mammals.

In contrast with all other measurements, sampling occurs only **between** the grid points and the 4-m marks that denote the beginnings of the vegetation transects.

### **Data to Record:**

At three distances—0.5, 1.0 and 2.0 m from the central grid point—and in line with each vegetation transect, depth of duff and litter are determined using a trowel and ruler. Push the trowel down at each point to expose the duff and litter. Then, sweep the trowel horizontally to create a clean profile for measuring. Measurements should be made to the nearest cm.

First measure from the mineral soil to the top of the duff layer (usually much darker in color than the surface litter) and record this distance as **depth of duff**; then, measure from the mineral soil to the top of the litter layer and record this as **depth of duff + litter** (litter does not include twigs or branches of any sort, only fresh leaves or needles). The latter distance should always be equal to or greater than the former.

**Condition:** If duff and litter are intact or undisturbed, record the **Condition** as "0". If duff and litter have been mixed or removed by logging activity (i.e., they cannot be distinguished) leave the duff field blank, record only the summed value (duff + litter), and enter a "1" in the **Condition** column. It is possible for the duff or the duff + litter measurement to be zero.

**If access to the sampling point is impeded by a log or large pile of slash, move the minimal distance necessary adjacent to the designated point (and at the same distance from the plot center) to obtain a new sample. Do not move piles of slash. If buried/decayed wood or stones are present above the mineral soil, move to a new point, as described.**

## 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.—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 leaning trees it 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 depending on the topography of the plot. 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 form the permanently tagged population of trees for 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  $\geq 5$  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: "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.

- **Vigor:** a qualitative ranking of tree health
  - **Good** = no apparent signs of distress (e.g., discolored foliage, paucity of leaves)
  - **Fair** = some signs of distress apparent
  - **Poor** = 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.

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.

## 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 smaller overstory tree plot (see Fig. 1.—Plot Layout). Snags and natural stumps must be  $\geq 0.5$  m tall and  $\geq 25$  cm dbh to be sampled. (If a snag or stump is  $< 1.37$  m tall, diameter is determined at 0.5 m height).

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

1. 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. 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: “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** 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 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. Note that 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 that it is **"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;
- **Angle of lean** from vertical (in degrees, but only if  $> 15^\circ$ ): 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).

***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 reader carefully proof all forms before leaving the plot. Be sure that the total number of pages is recorded on each data form.



**FORM 0-C. TREE HEIGHTS**

**Will not be sampled by summer field crews**