WATERSHEDS 1 AND 3 — LONG-TERM SUCCESSION PLOTS
NOTES ON SAMPLING PROCEDURES

VERSION: 17 MAR 2008

See Data Sheet: "**Watersheds 1 and 3: Long-term succession plots**"

Header Information to record for each plot.

- Month (mo) and day (day)
- Personnel: last names
- Watershed, Unit (1 for WS1 or 1, 2, or 3 for WS3), Transect, and Pot

Be sure to record the same information on the continuation page as well.

Be sure to fill in pages numbers at the top of each form, once sampling is complete.

Plot orientation: Locate the plot center, marked with a steel reinforcing bar (rebar). At the base of the rebar should be an aluminum tag with the transect and plot numbers (e.g., 1 / 4 = transect 1, plot 4). The tag may be buried by litter. If the tag is missing, please make a note.

The rebar serves as one corner of the 2 x 2 m permanent vegetation quadrat (Quadrat 0; Fig. 1). Often, the second corner post that lies on the transect line is a tall (>2 m) metal "sighting" pole. Usually, but not always, the remaining corners of Quadrat 0 are red spray-painted PVC posts. However, other types of corner markers are possible: (1) a white or orange PVC pipe, (2) a nail on a log or a stump, spray painted orange and/or flagged in red, (3) an orange spray-painted dot on a bedrock surface, boulder, or rock.

Marking the edges of the plot: Place a PVC post along each edge of the 2 x 2 m plot, and one to split the plot in half (typically oriented up and down the slope). Two people will estimate the cover of species in separate halves of the plot, and a total will be recorded for each species. Cover is projected vertically and plots are slope corrected, thus on steep slopes plot shapes may be deceiving.

Canopy Cover Data

Recorded in three ways:

1. Canopy Cover (%) (> 2 m tall), "truck mirror densiometer". — A convex mirror with a 10x10 square grid (100 squares) divided into 4 quadrants of 25. The mirror is affixed to a ~1+ m pole, which is pushed into the soil to hold the mirror in a stable configuration at ~1 m height.

Place the pole at the rebar marking the center of the circular tree plot (i.e. the rebar with the tag). One exception — for WS1, Transect 5, Plot 8 place the pole at the PVC in the NE corner.

The mirror should be leveled with a "bubble" and positioned so the center lines dividing the quadrants are oriented along cardinal directions, giving NW, NE, SE, and SW quadrants. Compass declination should be set at 19.5 E. The eye should be held 20 cm above the mirror, in the quadrant diagonal to the one being read. 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 reading, to give an average canopy closure on a scale of 0-100% for each quadrant.

Canopies are irregular and broken; estimate cover in each square to the nearest quarter-square, even if no distinct quarters are evident.

Include conifers, hardwoods, and canopy shrubs with foliage >2 m tall. Full names are provided on the species list.

Conifers PILA, PSME, TABR, THPL, TSHE, LIDE2

Hardwoods ACMA, ALRU, ARME, CACH, CONU, POTR2, PREM, RHPU

Tall Shrubs (foliage >2 m tall)

ACCI, ACGL, ALSI, AMAL, ARCO3, CEIN, CESA, CEVE, COCOC, GAFR, HODI, OECE, PHLE2, RHDI, RHMA, RIBES, RILA, RILO, ROGY, RULE, RUPA, SACE, SALIX, SASC, SASI2, VAME, VAPA

Never move or offset the measurement point, even if a canopy estimate does not seem representative of the site.

2. Canopy Cover (%) by growth form (> 2 m tall). —This is a visual (subjective) estimate of projected cover for each growth form (see above and full species list). Maximum cover is 100% for any category. "Total" should be equal to or greater than the maximum of any one growth-form, but it cannot exceed 100%. Record 0.0% if there is no canopy cover.

3. Edge Closure (direction is relative to start of transect = "up transect")

Closure (**1** = 0-25% closed; **2** = 26-50%; **3** = 51-75%; **4** = 76-100%)

Up transect	____	Species _____, _____, _____, _____, _____, _____
Down	____	Species _____, _____, _____, _____, _____, _____
Right	____	Species _____, _____, _____, _____, _____, _____
Left	____	Species _____, _____, _____, _____, _____, _____

These are visual estimates of "relative closure" adjacent to each edge of the plot. The four plot borders are referenced relative to the transect direction. "**Up transect**" refers to the plot edge that is closest to the start of the transect (Plot 1). Note that "**up transect**" can either be uphill or downhill depending on the transect (they run in both directions in WS1), and where you are along the transect. "**Right**" and "**left**" are determined when facing in the "**up transect**" direction.

Estimates are based only on canopy plants (>2 m) close enough to influence plot light levels. Closure classes range from "**1**" (little or no closure along the plot edge) to "**4**" (fairly complete closure). There are blanks for up to 6 codes for species that contribute to edge closure. They should be listed in descending order of importance.

Ground cover types and growth forms

Cover of each ground surface type in the 2 x 2 m plot.

Definitions for ground surface conditions:

BARE = mineral soil

STONE = rock >7 cm in width (or smaller pieces if they form a contiguous surface)

LOG = litter (branch, bole, rootwad, or bark) > 10 cm in the smallest dimension. Many smaller pieces of wood/bark that form a contiguous, solid surface can be <10 cm in width individually, but together can still qualify as LOG.

STUMP = only if upright (otherwise LOG)

LITTER = leaves, needles, or woody debris < 10 cm wide. LITTER is often estimated as the difference between 100% and the categories above (but see exception no. 2 below).
Note:

- if you cannot see bare ground under a plant, consider it LITTER.
- the sum of BARE +LOG+STONE+STUMP+LITTER typically = 100% cover. However, if a log is elevated over BARE or LITTER, or if it is broad enough to overhang these, the total can exceed 100%.

MOSS = moss species lumped. Remember to use the vertical projection of cover for moss growing on logs or stumps (this will tend to reduce the true cover).

LICHEN = only lichen established on the ground, logs, or stumps, but not that which has fallen from tree canopies.

TREE = total cover of trees, *no matter how tall* (for species classified as trees; see species list)

SHRUB = total cover of shrubs, no matter how tall (for species classified as tall shrubs; see species list)

HERB = total cover of herbs (for species classified as grasses, sedges, herbs, and low shrubs; see species list). **Note**: in this study, low growing woody species such as Berberis and Gaultheria are considered "herbs" (present in the "herb-layer").

Species cover and biomass data (pre-printed species codes)

For each plot, all species found at the last sampling date (2002) are listed in the lower section of the data form. Depending on how many species were present, there may be one or two pre-printed pages per plot. Some of these species may not longer be present, but you may also find new species that are not currently listed. New species can be penciled in to the form if there is room, or they can be added to the continuation page.

Species Name. Write out the species name in full if you are at all uncertain about the code. This will allow us to correct erroneous acronyms. If unknown, record descriptive material in this space… (e.g., “grass with long awns”)

Species Code. Based on Garrison et al. 1974. See the complete list of species names and acronyms in the species list. If a plant can only be identified to genus record the first 5 letters of the genus. If a plant cannot be identified in the field, record it as "UNKN#" (where # is a unique no. for the plot). Collect a specimen from outside the plot and include a label in/on the bag with collector’s name, date, and WS/transect/plot number. Describe the morphology or draw a picture on the data form (use the back if necessary).

If the base of live tree occupies at least 1% cover, record “BUTT” as species. If it is a dead tree, record “SNAG”.

LC. Line count. LC = 1 for the 1st record of a species in a plot. If more than one line is necessary to record biomass measures (see below), increment LC as necessary (e.g., 2, 3, etc.). All records for a species do not need to be recorded in order; species can be interspersed.

Cover (%). Projected canopy cover in percent. Cover estimates for the 2 x 2 m slope corrected plots require 2 observers. Divide the plot in half (two, 1 x 2 m plots); this usually works best if each individual stands side-slope to the plot with a PVC pipe oriented up/down slope in the center. Each person should estimate cover as if the other half of the plot were completely bare, then the two estimates should be added to produce a plot total. Minimum cover of a species = 0.1% (even if cover is less than 0.1%, record 0.1%). Maximum cover of a species = 100%.

Some cover conventions

Diameter tape:	0.2 %
Paper 8.5 x 11”:	1.5 %
0.5 x 0.5 m:	6.2 %
1 x 1 m:	25.0 %

Cover should only be recorded once for a species (i.e., for LC = 1).

BIOMASS measures: For a subset of species, one or more measurements are taken to estimate biomass. These are recorded in the columns that follow after cover (DBA, DBH, Height, etc.) Consult the look-up form entitled **Biomass Parameters to Measure**. These measures are taken for only those species listed, and **only when the plants are rooted in the plot** (not if plants overhang the plot from outside the boundaries).

Note: If no stems are rooted in the plot for a species that typically is measured for biomass, place a check-mark in the “**Out**?” column. This way we know that the biomass measure was not forgotten. For large trees, "in" or "out" of the plot is based on the center of the tree.

Here are details on the various biomass measures taken:

DBA. Measured for all tall shrubs of any size (except RUPA), trees of any size without tags (<1.4 m tall at the last measurement of the tree plot), trees with tags wired on, and some herbaceous species. Diameter at the base in cm (above major butt swell for tree species) using a caliper or small diameter strip. Measurements are to the nearest 0.1 cm. If a caliper is used on an oval-shaped stem, two measurements should be taken perpendicular to each other and the values should be averaged.

Each stem should be measured separately and its diameter placed on a separate line. However, if more than one stem occurs at a particular diameter, you can record the number of stems of the same diameter in the **“No. stems**” column, thus saving additional data entry lines. The first DBA should be recorded on the line for which LC = 1 line (the one with the cover estimate). Tag # is recorded for a tree with a tag (if this is a DBA tree, the tag should hanging on a wired, not nailed on the tree).

Note: The following herb species also require a DBA measurement:

ARCA3, COCA2, LOCI, LOCR, PTAQ: simple measurement at the base.
XETE: gather the leaves into a tight bundle and wrap the diameter strip around the clump at its base.

DBH. For trees with nailed tags. Measurements are to the nearest 0.1 cm. Measure the tree just above the nail. Each stem should be measured separately and its diameter placed on a separate line. The first DBH should be recorded on the line for which LC=1 line (the one with the cover estimate). No more than one DBH measurement per line. Each tree with a DBH should have a tag #.

Height. For all shrubs and a subset of herbs. Either the modal height (**ht**) (the most common height in the plot), or the individual height of a stem, if noted as such on the look-up form **Species Biomass Parameters to Measure** (these would be coded as **i-ht**). Measure stem length (rather height off the ground) because plants often grow at an angle to the slope. Units are in centimeters. Precision is to the nearest 5 cm for plants 0-1 m tall; to the nearest 10 cm for plants 1-2 m tall; and to the nearest 20-50 cm for plants >2 m tall.

Note: for XETE, when leaves are gathered to measure diameter, measure the length of the leaves when outstretched.

Number of Stems (or Fronds). Recorded for all ferns except POMU, and for PEFR2 (herb). This is the number of stems of a particular length (e.g., ADPE, ATFI, BLSP, POGL4) or a particular diameter (PTAQ). For PEFR2 this is the number of leaves of a particular height.

Length: Length of the fronds. Recorded for all ferns except POMU and PTAQ, and for PEFR2. The height of the fronds, or for PEFR2 the height of the leaf.

Tag #: See above for trees with wired (DBA) or nailed (DBH) tags.