CFR 501
WENATCHEE MOUNTAINS FIELD TRIP 2007
Friday, September 28, 07:00 to Sunday, September 30, 19:00

INTRODUCTION

We will collect data on the composition of forests at three sites between lower and upper treeline in the Wenatchee Mountains, a mountainous area located in the central portion of the eastern Cascade Mountain Range. Plant cover, tree condition, and seedling establishment will be measured along transects at each site. Tree age and size data for all sites are available from previous 501 field trips. The field data will be analyzed to identify the relationships between community composition and environmental gradients, and to assess the role of disturbance in structuring forest communities at these sites. Students will individually analyze the plant cover and tree age data.

LOGISTICS

Departure: Friday, September 28, 07:00 (meet in the parking lot behind Winkenwerder at 06:45)
Return to UW: Sunday, September 30, approximately 19:00.

We will be staying at the USFS Mineral Springs campground on Highway 97. The campground currently does not have running water.

Bring the following:

- Sleeping bag
- Sleeping pad
- Tent
- Hiking boots
- Rain gear (jacket and pants)
- Warm clothes (long underwear, jacket, hat, gloves)
- Clipboard and pencils
- Sunscreen and sunglasses
- Day pack
- Water bottles and extra water
- Bowl, cup, and utensils
- Money for dinner on Friday and Saturday nights
- Food (snacks, 3 lunches, 2 breakfasts that require only hot water)
- Camera (optional)
- GPS if you have one

Let Andrew and Jim know if you have questions, need to borrow any of these items, or have any potential health issues (email: cfr501@u.washington.edu).

SCHEDULE

Friday (September 28)

7 AM	Leave UW from Winkenwerder parking lot
9:30 – 6 PM	Field site A (low elevation), Little Camas Creek. Learn plant ID, transects on south slope, lunch, transects on north slope. **Read Harrod *et al*. 1999 and Hessburg *et al*. 2005**
6 PM	Travel to Mineral Springs Campground
7:30 PM	Dinner (Mineral Springs Restaurant), set up camp

Saturday (September 29)

8 AM	Breakfast **Hot water will be provided**
9 AM	Tour stand above campground
11 – 6 PM	Field site B (mid elevation), Iron Creek Transects on south slope, lunch, transects on north slope
6 PM	Travel to Mineral Springs Campground
8 PM	Dinner (Mineral Springs Restaurant)

Sunday (October 5)

8 AM	Breakfast, pack up **Hot water will be provided**
9 AM – 3 PM	Field site C (high elevation), Naneum Creek
	Transects on south slope, lunch and discussion, transects on north slope
3 PM	Leave Wenatchee National Forest
6 PM – 7 PM	Arrive UW

OBJECTIVES

1) Evaluate the relationships between vegetation and environmental factors (substrate, slope position, elevation, aspect). In six forest stands we will use a series of transects to collect data on overstory and understory plant cover, seedling establishment, and substrate. Multivariate analysis of these data will allow us to address various questions about these stands.

2) Interpret temporal changes in these forests based on age structure data, seedling data, tree-condition assessment, and field observations. These data can be used to explore questions about disturbance history, seedling establishment, and dynamic processes at work in these forest stands.

3) Integrate the results of objectives 1 and 2 to explore the interactions between the physical environment, disturbance (including fire, fire suppression), pathogens, and competition (both intra- and inter-specific) in the forests of the Wenatchee Mountains.

INSTRUCTIONS

Transect layout and coding

We will use line and belt transects to sample vegetation at each of the six forest stands:

Site A (580-670 meters) north and south slopes
Site B (1190-1250 meters) north and south slopes
Site C (1500-1580 meters) north and south slopes

Transects will be located to cover as broad an area as possible, and at least some of the sampling teams should head far up the slope. Please spread out. Each transect should be at least 5 m away from another transect. Avoid placing transects near streams, roads, or in areas obviously disturbed by humans. Try to locate half of the transects on the upper slope and half the transects on the lower slope (upper and lower are with respect to where the group stops). Transects should parallel the local contour.

You will use a 5-digit code to identify each transect: Group number (01-nn), Site (A,B,C), Slope (N,S), and slope position (L = low, H = high). For example, the code 07ANL represents the transect by group 07 on the lower half of the north slope of site A. The differentiation of "Low" and "High" is from where the group breaks up for sampling.

Sampling teams of 2-3 students will traverse each transect three times, collecting three types of data: 1) *plant cover*, 2) *seedling distribution*, and 3) *tree position and condition*. Each team will be responsible for 1 transect at each slope and elevation, which makes a total of 6 transects during the entire field trip.

Field observations

Before you collect the transect and plot data, locate your transect on the site topo maps provided and write down some observations about the location of each transect. Even though right now your memory is fresh and you just know that you'll always remember what these stands look like, when you are writing up your analysis, you will wish that you took better notes. So take good notes in the field! You might also find it useful to photograph your transect once you have laid down the tape.

First, briefly describe what the site looks like to you, then try to get some specifics down (nothing too elaborate, just enough so that your can look back on it and remember more than your poor overstressed memory alone will). Note what the ground looks like: Are there rocks? Is the soil exposed? Covered with litter? What kind of litter? Conifer needles? Lots of dead and down trees? What is the understory like? How dense is it? Patchy or consistent? What does the stand look like? Is it dense? Patchy? Are all the trees the same size? Which species are the big ones? Are there fire scars? Has there been windthrow? Insect damage? You may try to note the same things at each stand or just write what is striking about the stand in question, but DO WRITE SOMETHING!

Take about 10-15 minutes at each slope and elevation to look around and describe basic features of the overstory and understory. Is the stand open or closed? Are there many

logs, fire scars, cut stumps? Record anything that catches your attention. These field notes are invaluable for evaluating the reasonableness of our results and are often the best way to document important observations that are difficult to quantify.

Plant cover

Plant cover data will be taken along 25 m line transects running parallel to the slope contours. Use the following protocol for recording plant cover. For convenience in sampling, divide the vertical space above each transect into two levels (overstory = above 2 m, understory = 2 m) and tally live plant cover for each of these levels. For each level, record on the data sheets the distance that each plant covers on the tape. For example, if the crown of a tree begins cover the tape at the 12 m mark and stops covering the tape at the 20 m mark, write the name of the species and put 12 in the IN column and 20 in the OUT column. The smallest unit of measurement will be 5 cm.

We need to take the following shortcuts to finish the work in the allotted time. If you were taking the data in a real (*i.e.*, publishable) study, you probably would not take these shortcuts.

1) If the crowns of two trees or shrubs overlap (applies to understory and overstory):

1. *Species the same* (example 1 on GUIDE TO RECORDING PLANT COVER, Figure 1): Do not record the crown cover of each tree/shrub separately. Instead, record the point at which the first tree/shrub starts and the second tree/shrub stops covering the tape.

2. *Species not the same* (example 2 in Figure 1): Record the crown cover of each tree/shrub separately, but do not count the crown overlap. Referring to example 2, assume that the cover of species A ends and that the cover of species B begins at the midpoint of the crown overlap.

2) For the understory, record only the tallest live plants (example 3 in Figure 1). For example, if a shrub is above an herbaceous plant, record only the shrub cover. The list of recording priorities is listed at the bottom of Figure 1. This is a ruthless but necessary shortcut. In addition, if part of an individual plant falls in both overstory and understory classes, the plant is recorded as being both in the overstory and understory.

3) If a portion of the transect has intermittent grass, sedge, log, or litter cover, record the approximate total cover of that type over that portion of the tape (example 4 in Figure 1). For example, if the distance between 20 and 24 m is about half grass and half bare ground, note that 2 m of distance is covered by grass and 2 m is covered by bare ground. In other words, do not record each blade of grass individually.

4) If you cannot identify a species using your previous knowledge, keys, or pictures, label it with the transect code and your own code identifying the plant (*e.g.*, composite #1). We will help you identify it later. Be sure to use the same code on your field sheets. Collect the plant (including the belowground parts) and bag it with the label. The

following groups of plants are not identified to lower taxonomic levels: grass, sedge, moss, and lichen.

5) Record 2 types of dead organic matter: logs (greater than 5 cm in diameter) and litter (less than 5 cm in diameter).

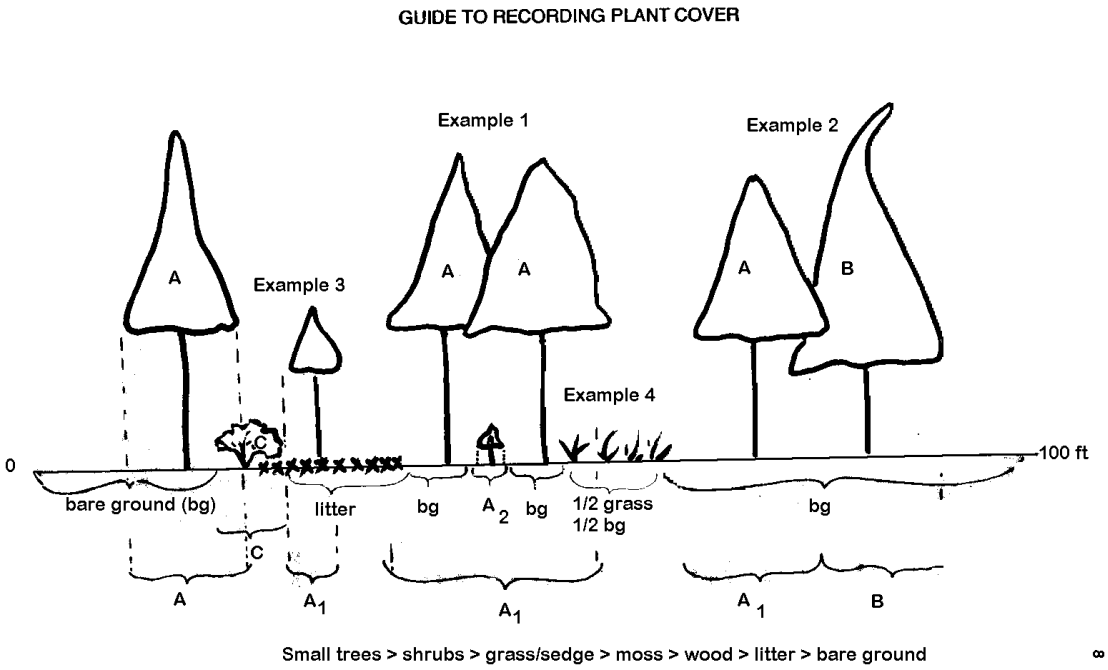

Figure 1. Necessary shortcuts for recording plant cover.

Seedling distribution

In most cases, trees must start their lives as seedlings (we will discuss at least one exception on the field trip). Because of their small size, proximity to the ground, and limited resources, seedlings are subject to more difficult environmental conditions and have less ability to tolerate those conditions than larger plants. Some ecologists believe that among the first effects of a changing climate will be change in reproductive success, rather than changes in adult survivorship. Seed production, for example, varies from year to year: 1991, 2003, and possibly 2007 were spectacular years for seed production in the Pacific Northwest, whereas 1992-1994 were poor seed years. We will examine patterns of seedlings establishment. This may give us insights into the factors limiting the location of different tree species on the landscape.

At 5, 10, 15, and 20 m along each of your vegetation cover transects, visualize a 1-m-radius circular plot. Count and identify the species of seedlings (less than 10 cm height) in each plot on each transect. For each seedling, record the substrate type (litter, woody debris, moss, or bare ground). For each plot (5, 10, 15, 20 m) record the percent cover of the substrate to the nearest 10%, and the tree canopy cover above the plot (open, partial cover, or closed). *Even if there are no seedlings*, record percent cover of substrates to the nearest 10% and canopy cover above the plot.

Tree position and condition

To sample overstory trees you will tally trees in a belt transect centered on the line transect; these will be 2x25 m on north-facing slopes (1 m above and below the tape) and 4x25 m on south-facing slopes (2 m above and below the tape). For each tree (greater than 1.37 m height, *i.e.*, saplings and adults) that falls within the belt transect record its species, diameter at breast height (DBH), whether it is dead, distance along line transect, distance from the transect, and condition (see below).

For each tree, various aspects of its condition will be examined. Note the presence of the following types of damage:

1. Suppressed
2. Fire scar
3. Mistletoe
4. Needle stress
5. Bark beetles
6. Decay

Fire scar sampling for fire history

To obtain more precise information on fire history at each stand, we will supplement our age structure data by sampling fire scars opportunistically. Fire scars form when the cambium of a tree is killed by the heat of a fire; in the years following the fire, live cambium grows over and slowly covers the scarred area (Figure 4.2). Tree rings can be used to identify the year the cambium died and thus the year of the fire. Sampling for fire scars is typically done by cutting out cross sections or wedges from trees using a chain saw. We will use increment borers, a less invasive, yet more difficult technique.

Ideally we would collect several fire scars at each site, but it is unlikely that suitable trees will always be present. Even adding a single fire scar, however, will enhance our ability to infer fire history, so take the time while sampling tree position and condition to identify potential fire scars to core. Ponderosa pine and Douglas-fir are the most likely species to have fire scars. Ideal fire scars will be bare cat faces, but also look for promising flat-faced seems – where bark has regrown over a scar.

Groups that finish their transects early will help core fire-scarred trees identified in our surveys, and/or search for and core other suitable trees. Increment borers are most successfully used when sampling trees with one fire scar. Two techniques are typically used, scar boring and face boring, with the latter being the simplest (Figure 4.11).

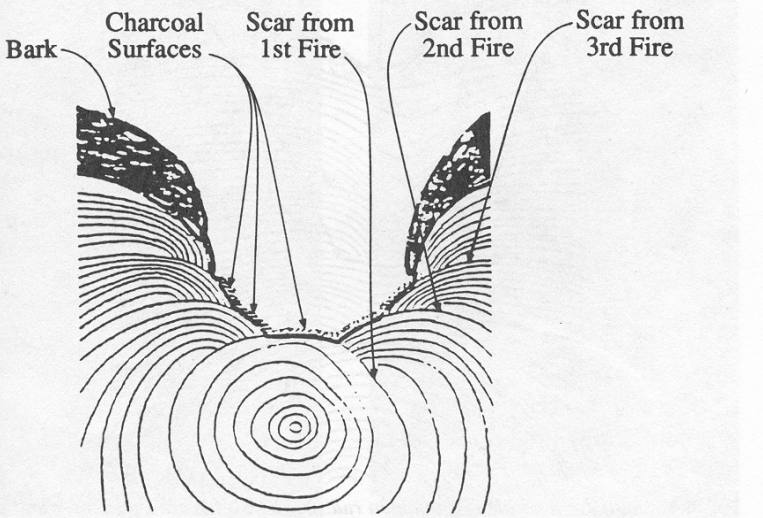

FIG. 4.2. *Characteristics of fire scars, such as the one shown in Figure 4.1.*
(From Morrison and Swanson 1990)

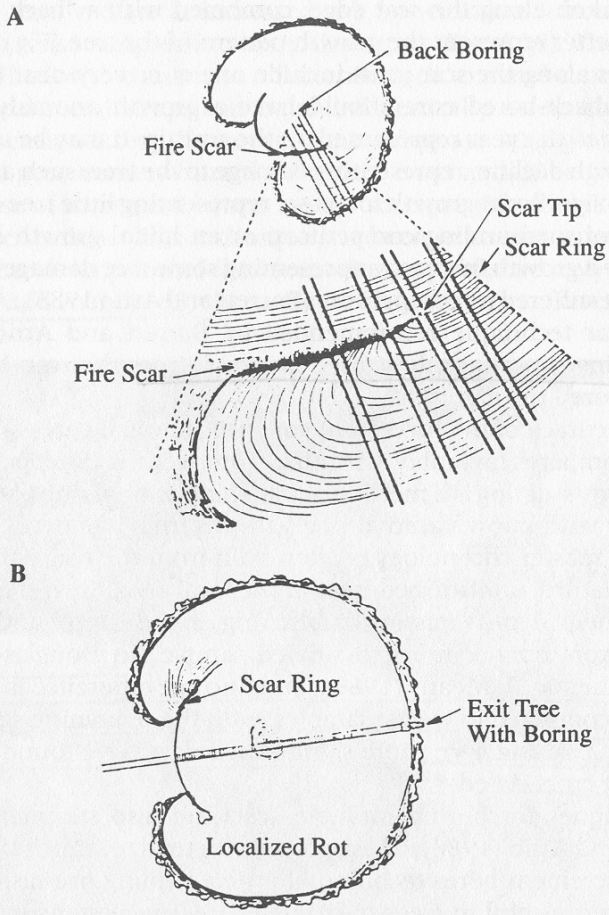

FIG. 4.11. A: *Scar-boring procedures for a tree with a single scar.*
B: *Face-boring procedures for a tree with a single scar (assumes borer is long enough to pass completely through tree).*
(From Barrett and Arno 1988)