

ESCI 197C INTRODUCTION TO FIELD RESEARCH

Fall 2026

Moss Distribution Project

Due Friday 30 October 2026

Introduction

This project will provide you experience in hypothesis development in a field setting, followed by field measurements and analysis to evaluate your hypothesis(es). We will study patterns in moss cover on trunks of Bigleaf maple (*Acer macrophyllum*) trees: some trunks and some portions of trunks support extensive moss cover, while other portions of maple trunks have only sparse moss cover. We will evaluate potential explanations for these differences.

We will work in Schome Arboretum, which contains many Bigleaf maple trees and much moss. Many kinds of mosses grow in the Arboretum, although careful moss identification is beyond the scope of this project. If you want to learn more about the moss species in the Arboretum, Vitt et al. (1994, or 2nd edition published in 2007) is an excellent resource. If you want to learn more about factors affecting moss growth, moss cover, and fascinating details about lives of mosses, Kimmerer (2003) is arguably the best source.

Potential factors affecting moss cover

Water availability: mosses depend on water for all of their life processes (Kimmerer 2003).

Light availability: mosses require light for photosynthesis, but exposure to intense sunlight may reduce moisture availability (Mathews 2021).

Substrate texture: mosses may establish more readily on textured than smooth surfaces (Kimmerer 2003).

Time available for moss establishment: older substrates may have accumulated greater moss cover over time (Kimmerer 2003).

Physical disturbance frequency or intensity: disturbances can strip mosses from substrates, reducing local moss cover and time since disturbance to zero. Low disturbance frequency leads to longer time for moss establishment; see above factor.

Potential moss cover comparisons, involving factors described above

Maple trunks near forest edge vs. forest interior:

consider exposure to sunlight, drying due to light or wind exposure.

Upward sloping vs. overhanging sides of trunk:

consider flow of water, light availability, and exposure vs. protection from disturbances.

Close to ground vs. elevated substantially above ground level:

consider decrease in moisture with height, due to distance and wind-induced desiccation.

Large diameter vs. small diameter trunks:

consider differences in bark texture and time available for moss establishment.

Base of slope vs. mid-slope vs. ridgetop:

consider differences in soil humidity and differential exposure to desiccating winds.

Moss cover hypotheses

Select a moss cover factor(s) described above and a related moss cover comparison(s). Then translate the factor(s) and comparison(s) into hypotheses to predict and explain contrasts in moss cover among Bigleaf maple trunks with various orientations. A template for writing hypotheses is below. For a more comprehensive explanation of [hypothesis structure, see the document linked to the course web site.](#)

Hypothesis template:

If _____ (premise, involving factor) _____,
then _____ (prediction about moss cover difference between maple trunk locations) _____,
because _____ (mechanism explaining why maple trunk locations differ in the factor) _____.

Hypothesis example (contrived):

If moss gemmae are distributed exclusively by sapsucker feet,
then moss cover will be high on trunks formerly maintained as sapsucker well grids and low on trunks without sapsucker well activity,
because high activity of sapsuckers on former well grids would have deposited gemmae that grew into mosses and minimal sapsucker activity and gemmae deposition would have occurred on trunks without sapsucker wells.

Field Methods

- 1 Locate an area of forest containing many Bigleaf maple (*Acer macrophyllum*) trees. Many maple trees should have mosses growing on some part of their trunks.
- 2 Select at least ten (10) maple trunk surfaces with trunks matching orientations described by your hypotheses.
- 3 Randomly locate a position on the first selected trunk surface and center a circular quadrat frame (provided) on that position.
- 4 Estimate moss cover (%) within the circular quadrat. Record your estimate in the table below.
- 5 Repeat steps 3-4 with the remaining trunk surfaces identified in step (2).

Data Analysis

- 1 Calculate average (mean) moss cover from the ten quadrat measurements, for each of the two kinds of surface orientations.
- 2 Calculate standard deviation in moss cover for each of the two kinds of surface orientations. (We will do this as a class in a computer lab.)

(3 Consider arcsine-transforming % data and then calculating means and standard deviations. Arcsine transformations usually convert % data into normal distributions.)

4 Determine the magnitude of the difference between average moss cover on your two kinds of surfaces.

5 Determine the probability of finding such a (large) difference in average moss cover in your samples, if there is no difference in reality. If that probability is small enough (e.g., $<5\%$), then conclude that the average moss cover does differ among the maple trunk orientations (by amount in step 4). This step will involve using a t -test, which we will do and explain as a group in a computer lab.

6 Use results of step (5) to interpret your hypothesis. Do your data support your hypothesis, refute it, or are they inconclusive?

References

Kimmerer, RW. 2003. *Gathering Moss*. Oregon State University Press, Corvallis, OR.

Mathews, D. 2021. *Cascadia Revealed: A Guide to the Plants, Animals, and Geology of the Pacific Northwest Mountains*. Timber Press, Portland, OR.

Vitt D, J Marsh, and R Bovey. 1994. *Mosses, Lichens and Ferns of Northwest North America*. Lone Pine Pub., Vancouver, BC.

Moss cover data

[illegible]