

ESCI 340 BIostatistical Analysis

Project 1: Edge Effects on Tree Growth

Foresters, plant ecologists, and restoration ecologists often evaluate effects of environmental factors on tree growth, which has applications to forest succession, forest restoration, forest management, and silviculture. In this project, you will evaluate edge effects on growth of Douglas fir (*Pseudotsuga menziesii*) trees in Sehome Hill Arboretum. All trees were removed from the area at the end of the 19th Century; most Douglas fir trees there now are roughly 100 years old. Consequently, you may assume that edge vs. interior comparisons are controlled for tree age.

Research Question

Do Douglas fir trees grow larger near forest edges than at forest interior sites?

Hypotheses

- 1 If Douglas fir growth is limited primarily by light availability, then trees near edges will be larger than trees of similar ages at forest interior sites, because light intensity is greater at forest edges.
- 2 If Douglas fir growth is limited primarily by soil water potential, then trees near edges will be smaller than trees of similar ages at forest interior sites, because soil dries more rapidly near edges.
- 3 If Douglas fir growth is limited primarily by a factor(s) unrelated to proximity to forest edges, then trees near edges will not differ in size from trees of similar ages at forest interior sites.

Note that this study is observational, rather than experimental. You will collect data from areas that differ from each other in many factors beyond your control. You will attribute differences in your samples to differences in some of the factors, but you will not determine whether or how those factors actually caused the observed differences. In particular, differences in light intensity and edge proximity may be confounded with differences in wind stress, pathogen exposure, proximity to pavement, slope stability, and soil structure and composition.

Field Methods

Find one or two partners. Each group should have the following equipment: (1) diameter tape, (2) table of random numbers, (3) pencil or other writing implement, (4) paper for recording data. So outfitted, complete the following steps.

- 1 Walk to the western edge of Sehome Hill Arboretum.
- 2 Randomly select a Douglas fir tree that is growing at or near the edge. (For this project, define an “edge” tree as one whose crown is in full sun to the west, or as one whose trunk stands within 20 meters of the forest edge.)
- 3 Measure the diameter of your selected tree at breast height (dbh), which is defined as 1.4 meters above ground level. Record the dbh measurement on your data sheet.
- 4 Repeat steps 2-3 until you have measured ten edge trees.
- 5 Move to the interior of Sehome Hill Arboretum. Please walk along established trails.
- 6 Measure and record dbh of ten randomly selected interior trees, using methods similar to steps 2-4.
- 7 Return your dbh tape to the Teaching Assistant. Please bring your dbh data to class on Friday.

Data Analysis, Project 1

- 1 Do the trees you measured provide a representative sample of trees growing at edge and interior locations on the west side of Sehome Hill Arboretum? Why or why not?.
- 2 Plot histograms of dbh measurements for edge and interior trees.
- 3 Describe the shapes of the two histograms from (2). Do they appear similar to any of the distributions discussed in class? How?
- 4 Calculate the mean and median values for tree dbh for the edge sample. Repeat for the interior sample.
- 5 Calculate the variance, standard deviation, and standard error for edge tree dbh. Repeat with your interior sample.