

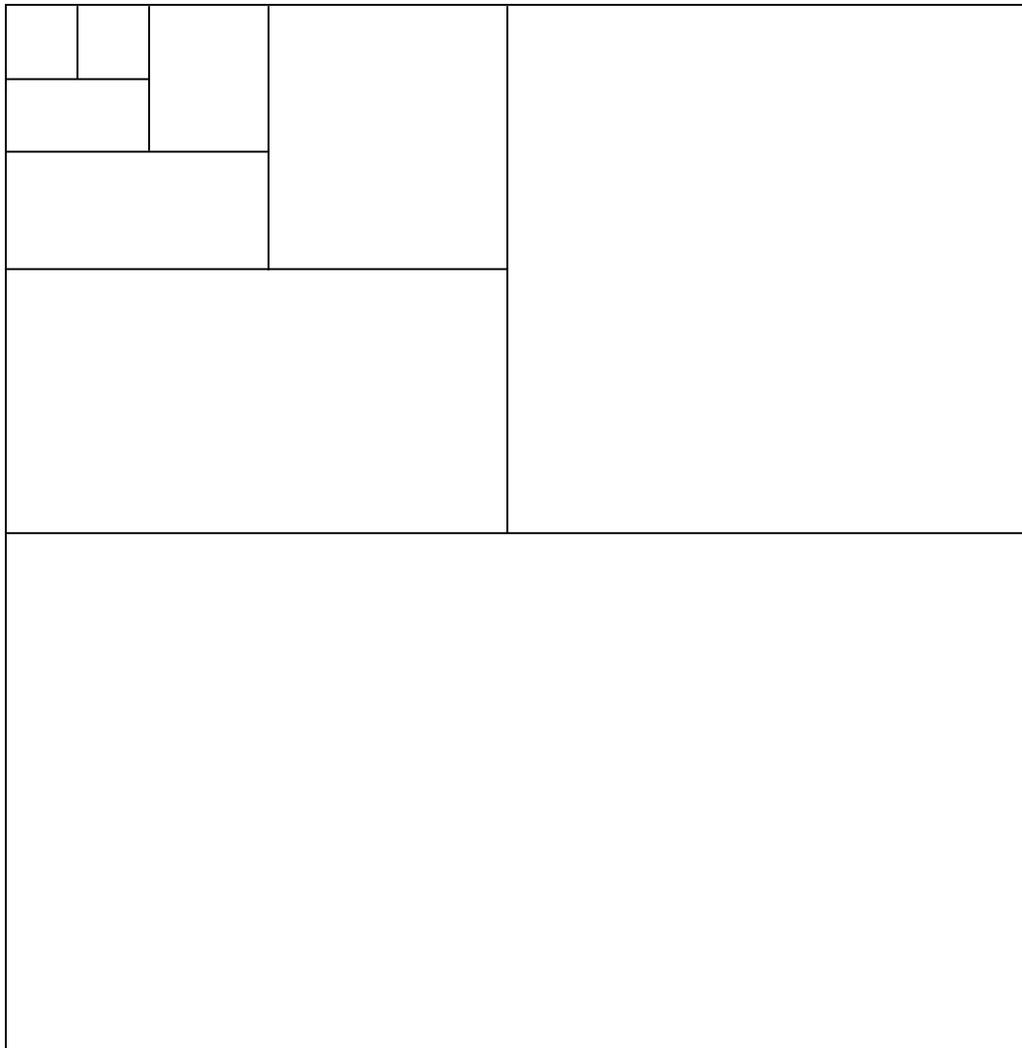
General Biology: Ecology/Evolution
Lab #4: Vegetation plot survey to develop species-area curve

This lab focuses on a key question in ecology and conservation biology. How is biodiversity distributed in space? How will the size and configuration of a biological preserve influence the biodiversity that is protected within it? We examine these problems by focusing on several specific questions. How does the size of an area influence the number of species that exist in that area? Within the same site, how much variation exists between different plots of equal area? And how can we use this information—in the form of a species-area curve—to develop prudent strategies for designing biological preserves?

You will explore such questions by conducting a field survey of plant species that are present in increasingly larger plots on at least two sites. You will then graph the results of this survey and use these results to estimate species diversity in larger areas.

(1) We will all work together as one large group. On the Evergreen campus, we will generate two plots sites and collect data to generate a species area curve for plant species in each of the sites. For each site, create a study area with the following dimensions. (the dimensitons on the vertical side are identical to those across the top).

[1 m][1 m][-- 2m --][----- 4 m -----][----- 8 m -----]



(2) Begin a "museum" that contains a type specimen (flower, leaf, plant sketch, etc.) for each of the plant species that you collect from the site. In our case, this museum will be a binder that includes pages with each type specimen and its name. Identify each type specimen using Pojar and MacKinnon, *Plants of the Pacific Northwest Coast* (copies are available from me). Write down the scientific (Genus species) and common name on the page that contains the type specimen. If you cannot identify a type specimen, then (following taxonomic culture) the person who discovered the plant must christen it with a new name and scientific description.

(3) Conduct a survey of each of the plant species found in the first plot (1 m²), followed by a list of all the plant species found in the second plot (also 1 m²), followed by a list of all the plant species found in the third plot (2 m²), and so on until you complete the survey for all 9 plots (see Form 1). Note that you are collecting presence/absence data rather than attempting to measure the abundance or density of species. However, you should make qualitative notes about the site and the abundance or density of particular species.

(4) After collecting data from each of the study plots, compile and analyze the data. For each site, summarize your data in a single table (see Form 2) by marking the boxes to indicate when particular species are present in these plots. For each site, use Excel to make a scatterplot (area vs. number of species). The x and y axes should be in log scale

Questions:

- (a) What is the function of the species-area curve? How could ecologists use the species-area curve to assess the efficiency and reliability of their survey methods? How could conservation biologists use the species-area curve to assess the effectiveness of biological preserves?
- (b) What does your data suggest about the amount of variation in species number as a function of sampling size? You might compare results for 1 m² plots, 2 m² plots, etc. to determine whether there is a pattern.
- (c) For each site, predict how many plant species will be found in an area that is 500m², 5000 m², 50,000 m², and 1 km². Based on your data, estimate how many plant species will be found on the approximately 1,000 acres of the Evergreen State College campus. Assess the accuracy of this estimate based on ecological and statistical factors.
- (d) Suppose that you were asked to create a preserve or preserves that protected 95% of the plant species that existed in Thurston County (Area=1883 km²). How would you proceed? What is the likelihood that your preserved areas would protect threatened or endangered species in the county?

