**ESM 212, Spring 2023  
Exercise #1**

**Analyzing plant community diversity and dissimilarity**

The purpose of this exercise is to reinforce some of the field activities, readings, and lectures related to plant community sampling. Please read the instructions carefully and answer all questions. You can insert your figures, tables and answers into this document and then upload to GauchoSpace.

This is meant to be useful and interesting, not make-work. Please let me know if you have any questions or if the instructions are not clear and I will try to clarify asap. Please show your work by also sending me your spreadsheet calculations or R source code.

Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Your Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**About the data:**

File **grassland\_dat\_pa.csv** contains data from your first field trip. The rows are the individual subplots. Columns include plot number, subplot number, subplot area, and species presence (1) or absence (0) rating for 37 species recorded in the plots. By convention, species are abbreviated using the first two letters of the genus and first two letters of the species names.

File **grassland\_dat\_cover.csv** is in the same format but records species cover rather than presence/absence.

Full names and whether the species is native (1) or exotic (0) are provided on the worksheet **grassland\_common\_species\_ex1.csv**

R scripts for reading in the data and using the **vegan** package to examine species accumulation curves, dissimilarity and diversity are included in the file **analyze\_grassland\_dat.txt**. You can execute (source) this file in R to get started.

1. **Species richness**

1a. Plot the accumulated number of species recorded in the 10 subplots for each plot. (R script already does this for you). Now, extend the X axis and add 2 new points to include any additional species encountered in subplots 11 and 12.

1b. Plot the accumulated number of species recorded in all 40 1x0.25m subplots. (R script already does this for you). Using the program **specpool** in vegan, what is the Chao estimate of the number of grassland species in the local species pool based on 40 1x0.25m subplots?

1c. Repeat 1b, but for native species only.

1d. Repeat 1b, but for exotic species only.

Question. How do accumulation curves and estimated sizes of species pools compare for native compared to exotic species?

**2. Community dissimilarity**

There are many indices for calculating the similarity or dissimilarity of community samples. Here you will compare sample dissimilarity based on species presence-absence data vs. species cover data.

2a. Using species presence/absence data, calculate pairwise similarity of plots based on the Bray-Curtis measure of dissimilarity. (Note: This is equal to 1- S, where S is the Sorensen similarity index presented in class.) R script already does this for you, but make sure you understand how to get there.

2b. Using species cover data, calculate pairwise dissimilarity of plots based on Euclidean distance. R script already does this for you, but make sure you understand how to get there.

2c. Repeat 2a, but for native species only.

2d. Repeat 2b but for native species only.

Questions: Briefly discuss the patterns of plot dissimilarity based on P/A compared to cover data. How do they differ and why? Next, briefly discuss patterns of plot dissimilarity based on all species vs. native species only.

3. **Community evenness**

Here you will compare patterns of community diversity based on the Shannon index and Simpson index.

3a. Calculate Shannon’s H’ Index for the plots using species cover data. R script does this for you.

3b. Calculate Simpson’s Index for the plots using species cover data. R script does this for you.

3c. Repeat 3a for native species only and for exotic species only.

3d. Repeat 3b for native species only and for exotic species only.

Questions: How does the rank order of diversity among plots vary depending on whether you use the Shannon or Simpson index? How does the pattern of native species diversity compare to exotic species diversity?