**Argrett Lab 10**

Congratulations! You’ve made it to the last lab!

In this lab, we will practice using NMDS and PERMANOVA to understand the effects of fire on vegetation composition in a northern Nevada sagebrush ecosystem (Mahood and Balch 2019). 20 points total.

In this study, the authors surveyed plant composition in plots that represented sites that have experienced different numbers of fires in the past 31 years (no burn, 1 burn, 2 burns, 3 burns). They have 7 independent plots in each burn category, totaling 28 plots.

Research question: Does plant composition in this ecosystem differ among fire frequency regimes?

Just like the in-class example, there are two data frames for this exercise:

sagefire\_abund\_matrix.csv: this is the species by plot matrix

sagefire\_info.csv: this contains the fire frequency information for each plot

1. After you load the sagefire\_info data, make sure to make “FireFreq” a factor (this will help with plotting later)
2. Make a distance matrix using Bray-Curtis dissimilarity from the abundance matrix. Include this line of code here (2 pts).

* fire.dist<-vegdist(fire, method="bray")

1. Run a PERMANOVA on the distance matrix to answer our research question above. Include your line of code here (2pts).

* adonis(fire.dist~Firefreq, data = fire.info, permutations=999)

1. Interpret the PERMANOVA output and write a results sentence. Please make sure to report all of the relevant statistics (4pts).

* We found that plant composition differed significantly among fire frequency regimes (F3,24 = 6.25, R2 = 0.44, P = 0.001). Fire frequency explained 44% of the variation.

1. Run an NMDS ordination using the distance matrix, with 100 tries and 2 dimensions. Include your line of code here (2 pts).

* fire.nmds<-metaMDS(fire.dist,distance="bray", k=2,try=100)

1. What is the stress value of the best/final NMDS solution? (2pts)

* The final stress value = 0.1108785 (Good)

1. Chart, scatter chart

   Description automatically generatedCheck the NMDS fit by making a stress plot (Shepard plot). Include the plot here and state your conclusion (2pts).

* The relationship is monotonic. The R2 is also very high suggesting a good fit

1. Chart, scatter chart

   Description automatically generatedFinally, create a publication-quality NMDS plot that reflects the analyses above. Include a figure caption. (4pts)

* Fig 1: Non metric multidimensional scaling plot of plant composition. Each point corresponds to a single site. Colors indicate fire interval. The stress for this ordination solution is 0.11.

1. Write some discussion. What do you notice about the vegetation composition change across the different fire frequency regimes? Are the points in each fire frequency level equally clustered and separate from the other levels? (2pts)

* There was significant clustering of vegetation composition change across the three fire intervals as compared to unburned sites. One- and two-year intervals clustered more closely. Three-year burn intervals had more variation and a wider range of plant composition than did one or two year intervals. Unburned sites shared similar plant composition.