**When an ephemeral stream changes to a perennial stream: following the movement of vegetation and soil deposition due to precipitation to explain surface water hydrology regarding an ancient megadrought in Bears Ears National Monument**

Morgan S. Abbott

Faculty Mentor: Steven H. Emerman

In southeastern Utah, ancient Puebloan people lived within the boundaries of Bears Ears National Monument, but migrated 700 years ago. The current hypothesis for the migration of ancient Puebloans resulted from a boom in population, which put a strain on water supplies; this in turn was worsened by a megadrought that required the population to leave the area and look for perennial water sources. A megadrought is defined as a drought that lasts over 20 years with a 20% decrease in precipitation. In a desert, megadroughts are particularly dangerous. However woody plants (especially trees like cottonwoods) require water to survive. By knowing the plant communities in an area near perennial and water sources during a drought we can estimate where perennial and ephemeral water sources were in drought conditions 700 years ago.

The objective of this study is to determine what a megadrought map would look like in Bears Ears National Monument using plant communities and soil deposition due to precipitation. This will be addressed by the following steps:

1. Downloading a current elevation map for Bears Ears National Park via the website gis.utah.gov.
2. Determining the soil composition of Bears Ears National Monument by using soil maps available through NCRS and the Corps of Engineers.
3. Calculating precipitation across Bears Ears National Monument by using data from CoCoRaHS, the Bureau of Land Management, and local ranger stations that collect precipitation data.
4. Calculate the path of precipitation and streams using elevation data based off of the article “[Flow-Based Method for Stream Generation in a GIS](https://md.water.usgs.gov/posters/flowGIS/index.html)” by Michael E. Wieczorek
5. Determine what constitutes a drought according to the precipitation data collected.
6. Determine the woody vegetation using a table from “Woody Plants of Utah: A Field Guide with Identification Keys to Native and Naturalized Trees, Shrubs, Cacti and Vines” by Dr. Renee Van Buren et al would grow in Bears Ears based off of elevation and amount of precipitation.
7. Compare the drought map to a normal precipitation map in regards to vegetation and water flow. Show the movement of soil deposition and compare to plant community movement by century.
8. Using the maps created to show what woody plant communities would be next to our springs starting with 2017 (in megadrought conditions) and working backwards by a century until we could estimate what plant communities would be located 700 years ago during a drought.