Introduction

- Evapotranspiration is an essential component to the hydrologic cycle, but it can be difficult to measure.
- ET is affected by climate, plant community structure, and elevation.
- In this study, we use data collected from the iUTAH climate stations in order to execute a water balance approach to estimate ET.
- At each iUTAH climate station in the GAMUT network there are a series of TDT sensors and data loggers documenting the change in water content over time.
- We've compared ET rates along an elevation gradient.
- We predicted and confirmed that ET and elevation are inversely related.

Results

- After identifying when snowmelt occurs and when ET begins using the data from the TDT sensors, we accounted for the inputs in the water balance such as precipitation and calculated ET.
- The graph below shows that elevation influences the timing of soil water usage through ET. Sites at lower elevations tend to exhibit an early change in soil water content due to ET.
- Sites at higher elevations such as TWDEF, Franklin Basin, and Knowlton Fork show a lower ET rate.

Fig. Cumulative ET (cm) of sites in the Logan and Red Butte Watersheds from the time of snowmelt through September.

Theoretical Considerations

Using data from the TDT sensors, our aim was to calculate ET in the three watersheds in the iUTAH network. We used the water budget equation:

\[ P = ET + DR + RO + \Delta W \]

and simplified it in order to solve for ET.

\[ ET = P - \Delta W \]

The change in soil water content can be calculated using this equation:

\[ \Delta W = \Delta \theta \cdot D_i \]

The change in volumetric water content is gathered from the array of TDT sensors and the depth increment is calculated based on the depths along the soil profile.

Discussion

- The change in soil water content is greater at lower elevations and therefore ET is greater in lower elevations.
- The water balance must equate to zero while using this approach in calculating ET. Further studies should account for groundwater contribution as an input in the water balance for sites like the Logan Golf Course.
- Each site has unique characteristics that are important to consider in order to understand its hydrology. These factors include water table height, plant community type, and soil texture.
- We would expect to see the GIRF site to have a high ET rate based on its elevation, however, the high gravel content at the site influenced where the sensors could be placed. Thus, the sensors are in a shaded location closer to the creek rather than an open meadow, affecting the ET output of the system.

References: