

Hello! My name is Gabby John, co-advised by Chris Still and Mark Schulze. I am a second-year graduate student in the Forest Ecosystems and Society in the College of Forestry. I'm going to talk about the progress I'm making on my thesis project Contextualizing the 2021 Heat Dome Via Climatic Relationships, Dendrometry, and Dendrochronology."

The main issue addressed in my project can be boiled down to a desire to better understand how climate change affects **patterns of tree growth**. Chris mentioned the tragedy of the **Heat Dome**. One of my research goals is to disentangle the high **temperatures and low rainfall** during this to see how they separately affected tree growth at the Andrews. For context, this figure shows accumulated precipitation data by water year – sorry Mark that this hasn't been cross checked for QA/QC yet (laugh).

Primarily, I'm looking at dendrometers and tree cores, **both shown in these photos**. **High-resolution dendrometry** shows us 5-15-minute increments of stem shrinking and swelling so we can zoom in and see exactly what is going on within a tree. R packages to analyze this type of data are relatively new and have a lot of untapped potential. **Analyzing tree cores** allows us to know how recent patterns compare long-term. We can try to find **drivers of these patterns** in microclimate data.

**How** does the dendrometry work? Dendrometer output can be **confusing** at face value due to temporary shifts in size from water swell or shrinkage. I'm using the R package **TreeNetProc** to clarify outputs. This schematic from its originating paper shows the process where you rid the data of outliers and gaps before concluding points of irreversible growth and reversible tree water deficit.

**What** have I done so far? **Here** is an example of **raw dendrometer output** a site near Andrews HQ. The **y axis** shows changes in stem diameter during the growing season for the tree. We can notice some **bumps** around the time of fall rains.

Here is a processed output that looks a little smoother. Gray lines mirror the raw output from before, the green lines are more accurate estimates of growth, and the red lines are estimates of tree water deficit. We can start to see how the raw output doesn't paint the most accurate picture from early summer shrinkage to early fall swelling. This isn't even all the package offers. Using it can help us produce faster and more accurate growth analyses, which is important as every year at HJA is different.

On the microclimate side, these figures show the accumulation of hours at or above tentative stress threshold for VPD and temperature, which is 35C and 3 kPa. The dark blue line represents 2021, the year of the heat dome, and we can see how much it sticks out compared to the other years. We think these heightened stress experiences will have negative cascading effects on growth. To find out for sure, I need to continue analyzing dendrometer data tree cores. I am excited to see how they uncover the mysteries of growth before and after the Heat Dome so we can more confidently predict forest health for this special site.