

Question:

4.14 PhenoCam Culmination Activity

Write up a 1-page summary of a project that you might want to explore using PhenoCam data over the duration of this course. Include the types of PhenoCam (and other data) that you will need to implement this project. Save this summary, as you will be refining and adding to your ideas over the course of the semester.

Answer:

Possible data use: The use of phenology data to monitor vegetation stress.

Droughts negatively impact crop productivity (Bharambe et al., 2023), biodiversity (Weiskopf et al., 2020), and ecosystem services (Malhi et al., 2020). As droughts occur more frequently and with greater severity (Gu et al., 2020), understanding the strategies plants use to avoid and tolerate drought is critical to predict the fate of natural ecosystems. During drought, water stored in plant tissue may maintain plant viability (Leuschner et al., 2019; Meinzer et al., 2014) and act as a capacitor, modulating the effect of soil water limitation at the ecosystem (Sebastian et al., 2023). Drought tolerators may adopt thick, rigid cell walls as part of a general, high-investment stress tolerance strategy (Ahl et al., 2019). A better understanding of the effect of geographic location in plant water relations and their impact on drought response would enhance our ability to understand the capacity of certain species to persist in both chronically and acutely droughted environments.

Tree stress, such as drought, can be evident in the forest canopy phenology. While deciduous trees dieback in the Fall, it can be evidence of tree stress if a forest canopy experiences dieback in the Summer. This stress can be a sign of moisture stress or other elements. I hope to use the Phenocam data across two diverse forests to monitor forest canopy with the integration of environmental datasets to better understand the behavioral characteristics of forests under stress, especially drought. The goal is to examine how shifts in vegetation timing affect seasonal water availability and drought sensitivity at the landscape scale.

This project is particularly relevant in semi-arid and drought-prone regions where earlier leaf-out or prolonged growing seasons may increase evapotranspiration demands and reduce soil moisture and groundwater recharge.

Data Requirements

Phenocam Data Products

- Site-level metadata (species, location, elevation)
- Phenocam data from May to August (daily measurement and midday day)

Remote Sensing & Environmental Data

- Landsat Thermal band to get surface temperature
- Vegetation moisture index for drought stress (NDWI/NDMI)