Hot Drought Induced Douglas-Fir Mortality Project Proposal

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Background

RELEVANT PRIOR EXPERIENCE WITH ANALYSES

Undergraduate research analyzing hyperspectral reflectance of water stressed pinyon pine needles in lethal drought experiment.

Pair specta data with conventional tree physiology measurements and using spectral vegetation indices to develop a fast and easy way to detect drought stress in trees.

REASONS FOR BEING IN THIS COURSE

My first goal is to learn and practice developing clean, easily-modified, and reproducible analyses to become a more efficient researcher.

My second goal is to designate time and motivation to work on my own data analysis for my MS thesis research.

Project

SCIENTIFIC ISSUE

To provide a more effective method to assess tree reponse to global-change-type drought, I propose to uniquely pair stable carbon isotope composition (an important proxy for plant function) with hyperspectral imaging of tree rings.

MOTIVATION TO ADDRESS THIS CHALLENGE

As a result of climate change, hot drought in the PNW is leading to widespread Douglas-fir mortality and forest managers need a rapid and scalable platform to assess tree physiological status to successively manage forests.

Project Goals for Fall 2021

GROWTH VARIATION ANALYSES

Writing reproducible code to successfully calculate Ring Width Index and Basal Area Increment from tree ring width measurements.

Creating high quality figures for annual growth ring parameters comparing dead and live trees.

Benchmark: complete by mid-October

HYPERSPECTRAL RELFECTANCE ANALYSES

Writing reproducible code to successfully complete spectral data transformation, Partial Least Squares Regression modeling, and relevent wavelength selection.

Benchmark: complete by end of term

Anticipated Challenges

PLSR MODELING

This will be my first time to use a modeling approach with this much data as I'm collected the full spectrum for every pixel of my hyperspectral image (3D Data Cube).

I anticipate it will be a challenge to pre-process my data and develop an accurate PLSR model, but will be supported by expert PLSR modeling post-docs.