Shifty Shrubs

Ethan Yackulic: Data scientist at Vibrant Planet
Charles Zhang: Post-bac researcher at Harvard University
Nicole Hemming-Schroeder: Postdoc at EarthLab
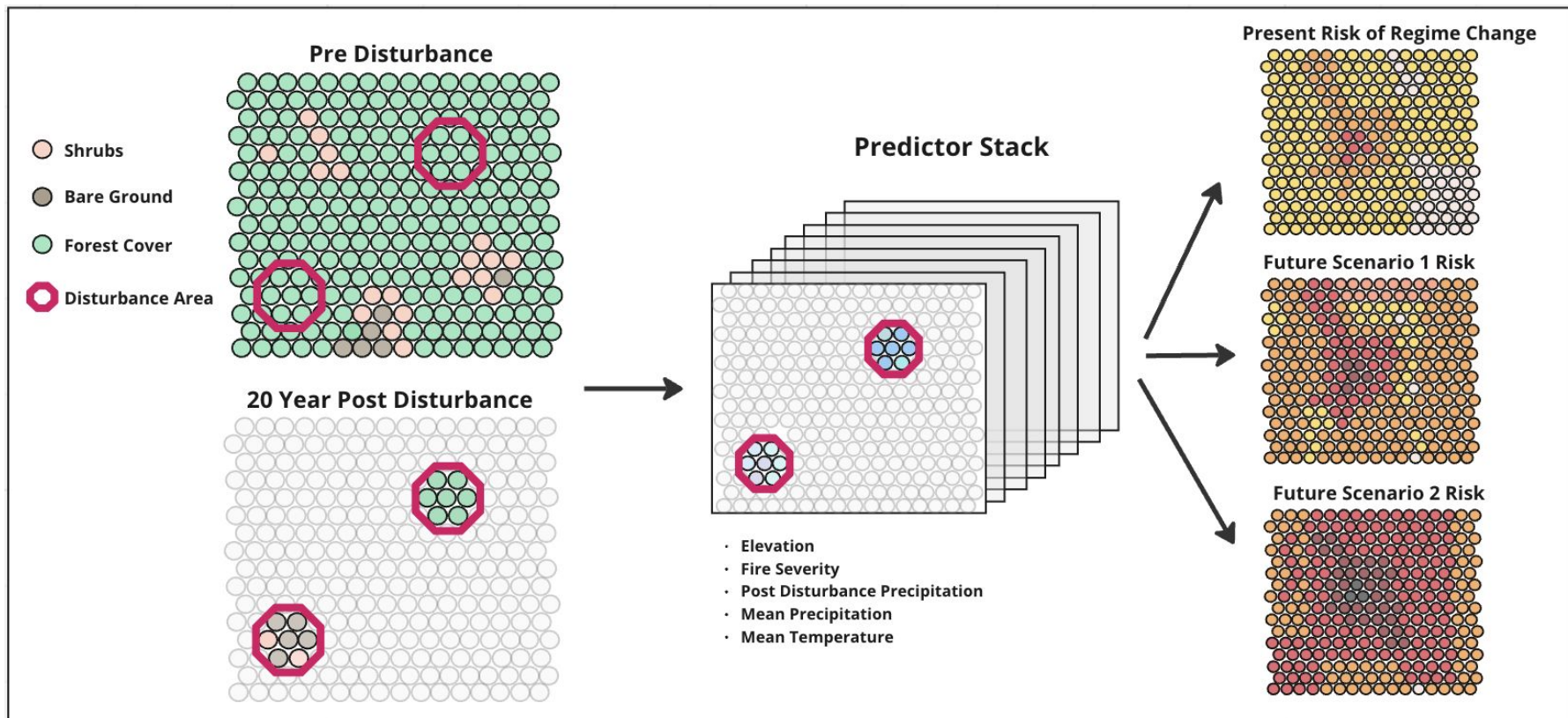Alex Vierod: Remote Sensing Scientist at BeZero Carbon

Background

- Post-disturbance reorganization period is a critical time for ecosystems
- Some forested areas maybe no longer be as suitable for new growth due to changes in climate–zombie forests!
- In the southern rockies, it's been found that some areas post-fire stay as shrub land after a recovery period (Nayani)
- Under what conditions does this happen?

Question

What variables are best at predicting whether areas affected by wildfire in the Southern Rockies will recover as a forest or transition into shrub or grassland?

Pre Disturbance

20 Year Post Disturbance

○ Shrubs

● Bare Ground

○ Forest Cover

⬡ Disturbance Area

Predictor Stack

· Elevation
· Fire Severity
· Post Disturbance Precipitation
· Mean Precipitation
· Mean Temperature

Present Risk of Regime Change

Future Scenario 1 Risk

Future Scenario 2 Risk

Final Step : Assess potential loss of carbon storage capacity at each risk level using GEDI biomass estimates

Data sources

- LCMAP for land cover classification
- CBI for wildfire data
- CU Boulder Disturbance Stack for drought data
- CHELSA for climate data
- NASADEM for topographical data
- GEDI for biomass data

Climate data

CHELSA Daily 1-arcsecond (Karger *et al.* 2021)

- Mean surface air temperature

- Precipitation
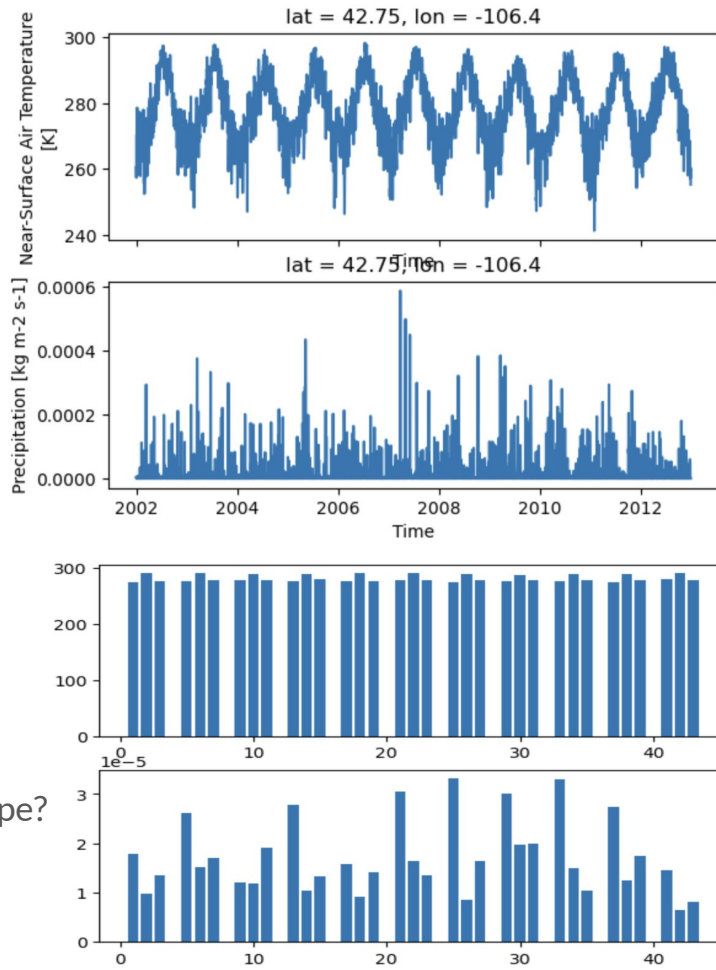
Compile to annual seasonal predictors

- Winter (Dec-Feb)
- Growing season (Mar-May)
- Summer / Fire season (Jun-Aug)

Disturbance point

10 year time series for feature generation

Post-recovery cover type?

Tree / Shrub / Bare

Next steps

1. Visualize map of disturbances and the land cover type post-recovery (10yrs)
2. Generate tabular dataset for fire disturbance samples with the corresponding features
3. Derive feature importance ranking after fitting a random forest model
4. Apply model to future wildfire and climate predictions to explore land cover change and carbon storage change

Variable generation

Date of disturbance x Location

Seasonal (effects of immediate climate extrema)

Winter frost - mean of min winter (could we add more temporal like day of first frost)

Rainfall (during growing season mar-may)

Summer heat - mean of max next summer (jun-aug)

Number of surrounding forested pixel