Investigating plant diversity patterns of Eastern Oregon's arid rangelands

Alexia Gee, Schyler Reis, Lucas Silva.

Environmental Studies Program and Department of Geography. College of Arts and Sciences, University of Oregon

Introduction

- Factors changing the range and composition of plant communities in the sagebrush- steppe since the mid 19th century include: grazing by livestock, active fire suppression, agricultural, changes in climate and atmospheric concentration.
- Changes in plant diversity due to change in Eastern Oregon needs to be investigated.
- Plant diversity was examined in two ways for this study; overall and functional diversity based on life form.

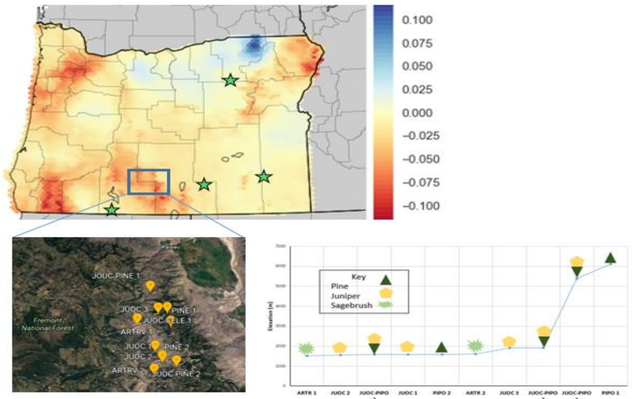

Figure 1: Oregon State annual climate pattern map of difference between 1980-2010 and 1950-1980 normals using Parameter-Elevation Regressions on Independent Slopes Model (PRISM; Wang et al., 2012). Accounts for both temperature and precipitation (Willmott & Feddema, 1992). Increasing aridity (red) or moisture (blue). Green stars represent where previous studies conducted research. Yellow markers are the plots sampled from this study. Graph represents the elevations of the plots sampled for different community types in Fremont National Forest.

Objective

- Aiding in the investigation of the role of climate change on future plant community shifts in sagebrush steppe ecosystems by examining and gathering baseline data across three plant communities and their ecotones (big sagebrush [*Artemisia tridentata]*, juniper woodlands and ponderosa pine [*Pinus ponderosa]* forests).
- Recording and characterizing understory plant community diversity and structure to determine if overall understory diversity in function, form or traits decreases with increased tree cover and elevation to find if there are any patterns.
- Comparing findings to a meta analysis of plant community diversity and traits from several studies conducted in similar ecosystems across the sagebrush steppe in Eastern Oregon.
- Start a lab plant species collection for future identification.

Methods

- Several studies with plant list from around Eastern Oregon were used to conduct a meta-analysis idea of plant diversity in surrounding areas (Figure 2).
- Field work was conducted in the Fremont National Forest in Lake county, Oregon in order to document and expand our knowledge of plant diversity across an elevational gradient (Figure 1).
- Plots were selected with in sites that fit into four *a priori* plant community types, based on dominant over story cover (big sagebrush (n=2), western juniper (n=4), western juniper and ponderosa pine(n=2), ponderosa pine(n=2)). With in each plot 49 points of ground cover were recorded → converted to functional group for analysis (Shrubs, Forbs, Grasses, Trees, Bare Ground, Rocks, Litter, and Downed Woody Debris (DWD)) (Figure 3).

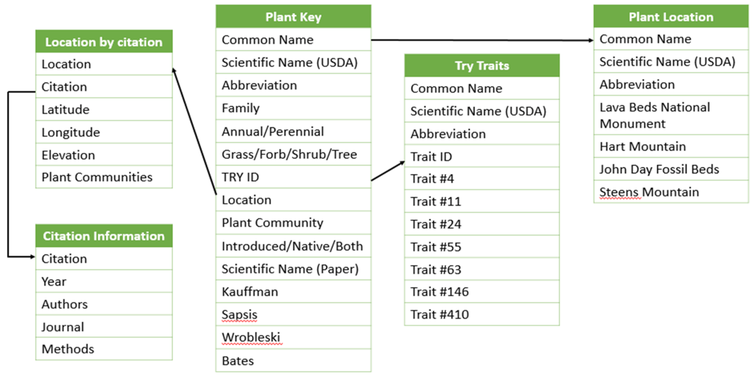

Figure 2: Star schema used to organize data from previous studies.

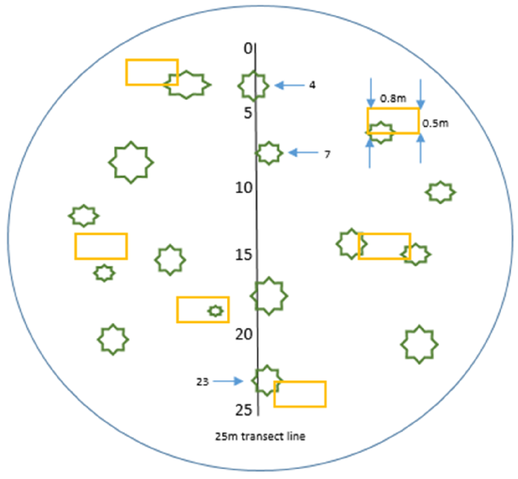

Figure 3: Diagram of randomly placed plot with a 25 meter (m) transect line running North and South and a diameter of 25m. Yellow boxes are 0.8m by 0.5m quadrants.

Results

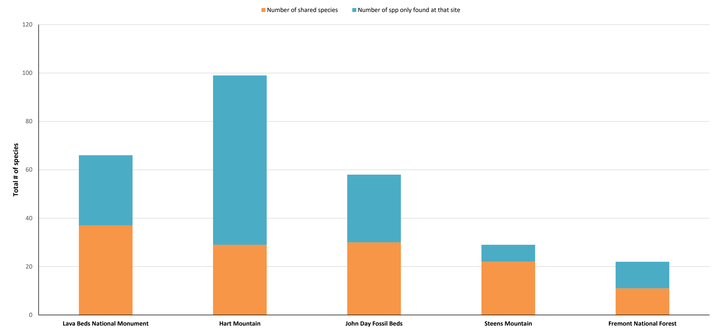

Figure 4: Total number of individual species found at each study location. Green is species shared between sites. Blue is species that were only found at that site.

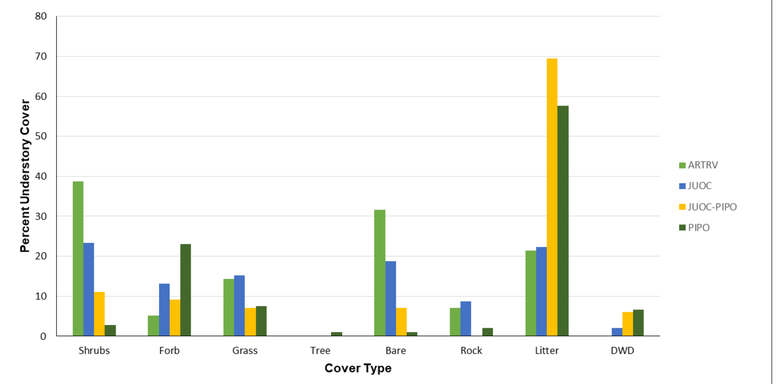

Figure 5: Percent understory cover of plant functional groups found at plots.

Discussion

- Species diversity plays an important role in maintaining ecosystem resilience. Each site seems to contain species that were only found in that particular area (Figure 4).
- Percent understory plant cover seems highest in sagebrush (ARTR) and juniper (JUOC) sites than pine (PIPO) and JUOC-PIPO sites(Figure 5).
- Litter has higher percent understory cover in JUOC-PIPO and PIPO sites (Figure 5).
- Future increases in winter precipitation could increase productivity of JUOC and PIPO at their ecotones → decrease in sagebrush habitat.
- Future step is to analyze traits of species found and contribute information found to the TRY worldwide database to fill the gap of information of plants in E. Oregon.

Acknowledgments

Material is based upon work supported by the National Science Foundation (NSF) award #1460735. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the NSF