Monitoring sagebrush demographic rates with UAS imagery

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BACKGROUND

- The demographic variability of sagebrush populations at a landscape level is currently unknown. The knowledge gap in landscape demography represents one of the main challenges in managing and restoring biodiversity (Gurevitch et al. 2016).
- Modern techniques for remote sensing with satellites and unmanned aerial vehicles (UAVs) could enable researchers to scale up measurements of plant vital rates from plots to landscapes.
- Understanding demographic mechanisms of big sagebrush recovery will disentangle causes of high variation in demographic response in post-disturbance populations of big sagebrush (Shriver et al. 2019).

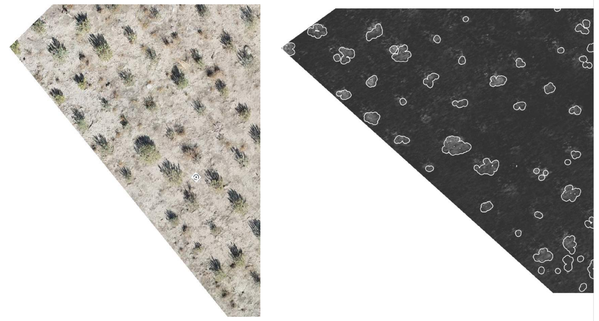
GOALS

- **Develop field methodology** to survey big sagebrush populations in post-disturbance landscapes using unmanned aerial vehicles (UAV).
- **Quantify demographic rates (growth, survival, and reproduction) and recovery trajectories** of big sagebrush on the scale of individual plants.
- **Quantify the spatial patterns** of sagebrush recruitment by identifying demographic mechanisms of population recovery.

DATA

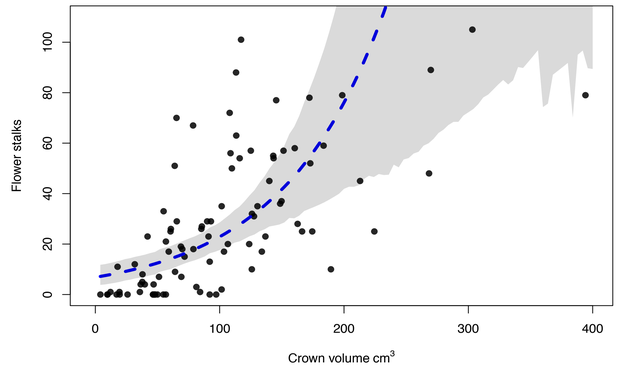
- **Post-fire recovery in the Owyhee Mountains and Snake River valley**
- **Post-agricultural sites under conservation reserve program in Marsh Valley, ID**

INDIVIDUAL PLANTS



Identifying individual crowns from a UAS image: an RGB (left) and a segmented image with outlined plant crowns (right).

- Account for individual variation on the landscape.

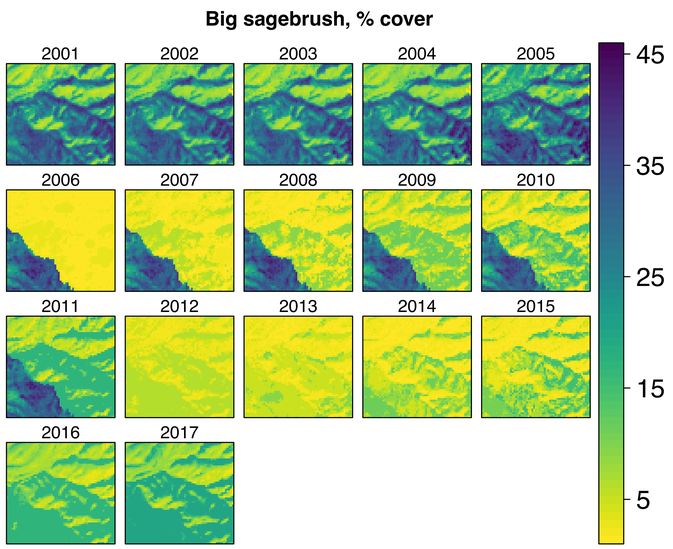


The importance of crown size distribution in big sagebrush populations: larger plants produce more flower stalks. The relationship is based on a 2018 census of big sagebrush plants in Soda common garden.

- What is a minimum crown size detectible with UAS surveys in post-disturbance landscapes?
- Can we detect and quantify a signal of individual reproduction effort and recruitment in populations?

LANDSCAPE PATTERNS

- Quantify the patterns of population expansion in recovering landscapes: what are the drivers of natural and assisted recovery?



A time series of big sagebrush cover showing a partial disturbance in 2006 and a full disturbance in 2012. The cover estimates represent a Landsat derived vegetation fractional cover data product (Rigge et al. 2019).

UAS snapshot of a landscape showing a cluster of individual plants of big sagebrush population in a CRP parcel (Marsh Valley, ID).

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