

Understanding mechanisms and thresholds of native and non-native plants for improving restoration and adaptive range management.

Rory O'Connor



My Background

- BSc – BYU-Idaho (Rangeland Ecology)
- MSc – BYU (Annual grass ecology)
- PhD – KSU (Woody encroachment ecology)
- Wildlife Technician (Contractor)
- Rangeland Technician (ARS)
- Research Ecologist (USGS-contractor)



Current Research: Ecological Drought

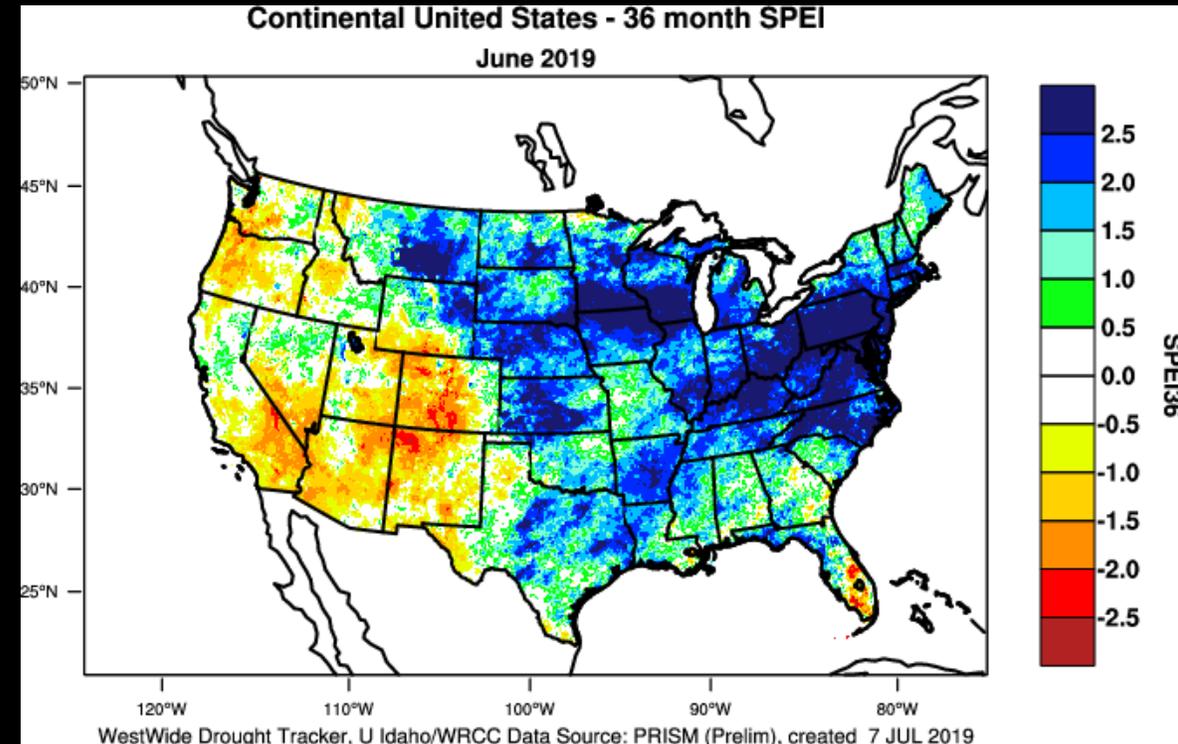
Ecological drought = water deficit that drives an ecosystem beyond a threshold

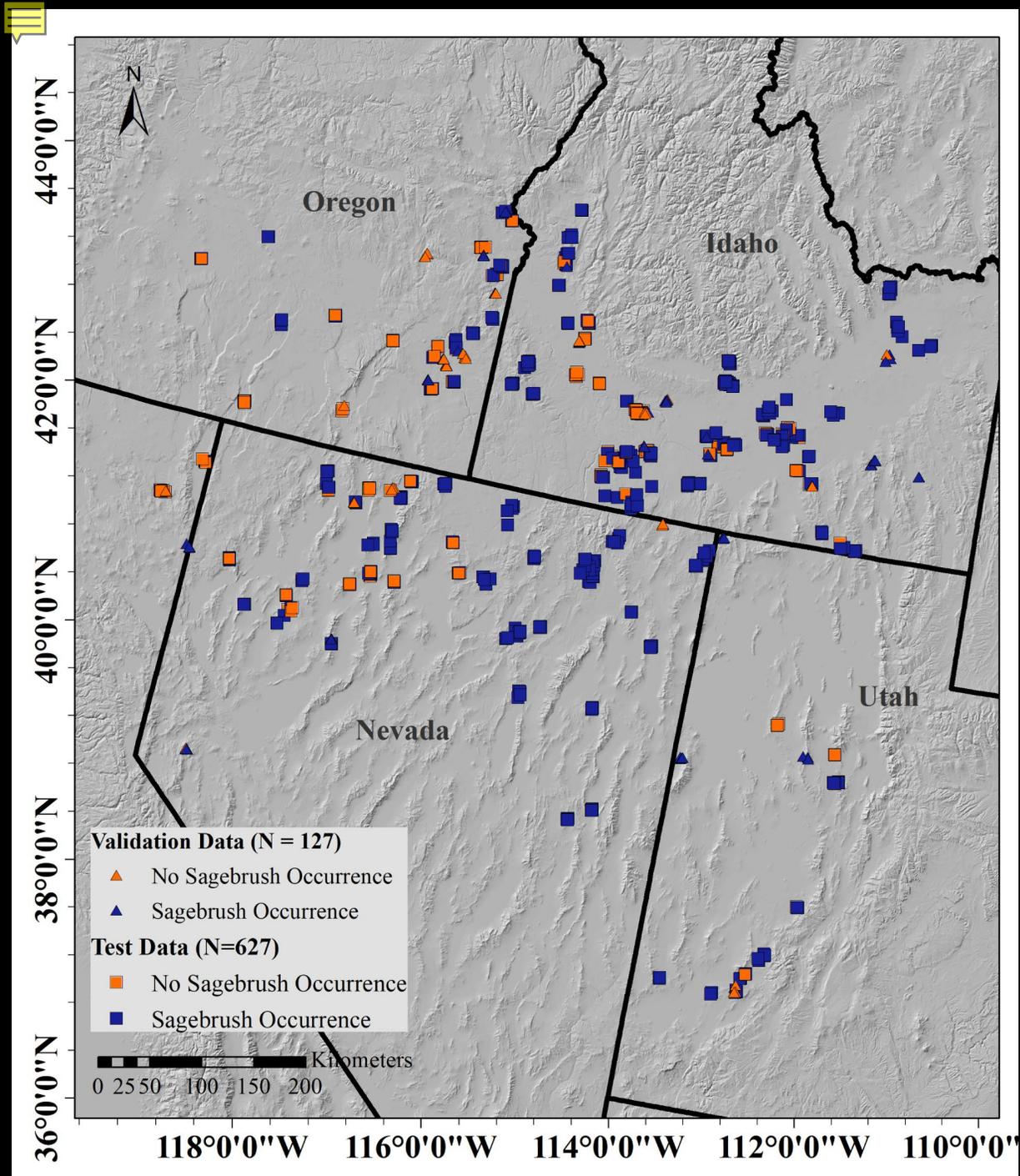
(Crausby et al., 2018, BAMs)

How do we quantify ecological drought?

- Standardized Indices
- Reduced precipitation
- Differs from normal precipitation
- Low Soil Moisture
- Plant water stress

(Slette et al., 2019, GCB)





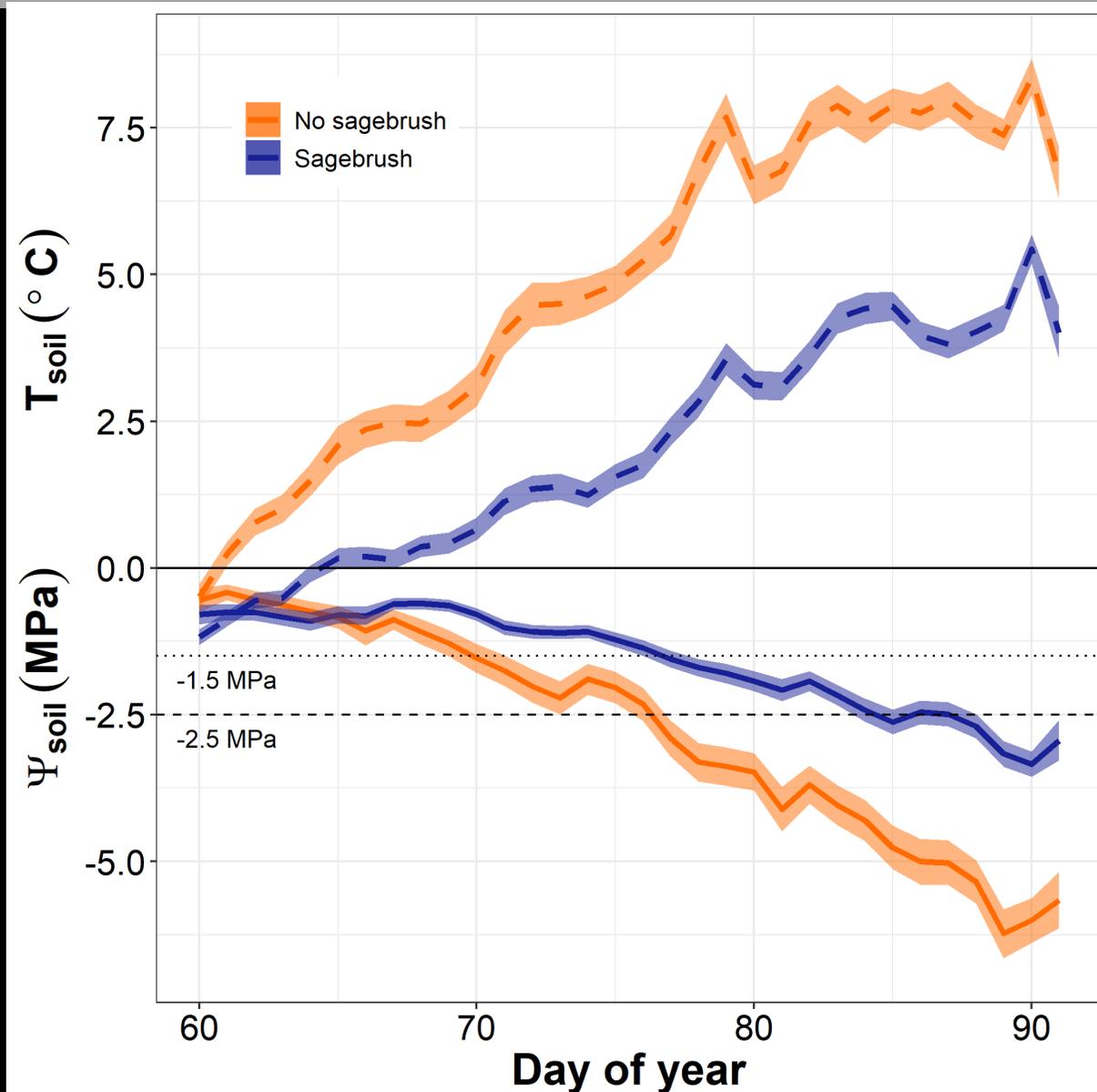
- CASC Proposal Lead PI Matthew Germino (USGS)
- Robert Arkle (USGS), Justin Welty (USGS), David Pilliod (USGS) for Sage Success and LTDL data.
- Dave Barnard (ARS) , Caitlin Andrews (USGS), John Bradford (USGS) for SPEI and SoilWat data.

Drought and Sagebrush Restoration

Sagebrush absent

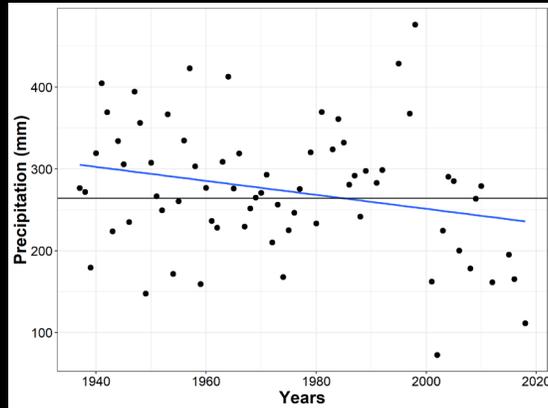
- **Decreased soil water potential earlier.**
- **Increased soil temperatures**
- **7 fewer days of favorable soil conditions for germination**

Environmental Research Letters (In Press)



Proposed Restoration Research

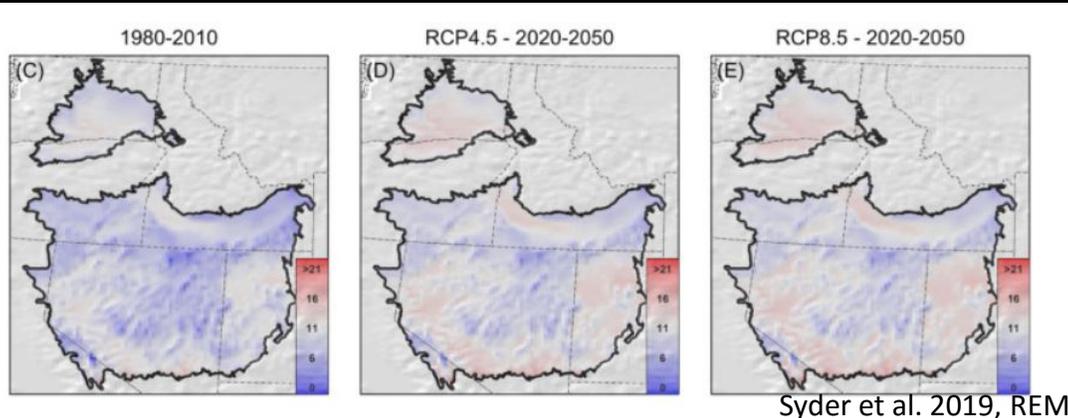
Weather Variability



Fire/Grazing



Climate Change

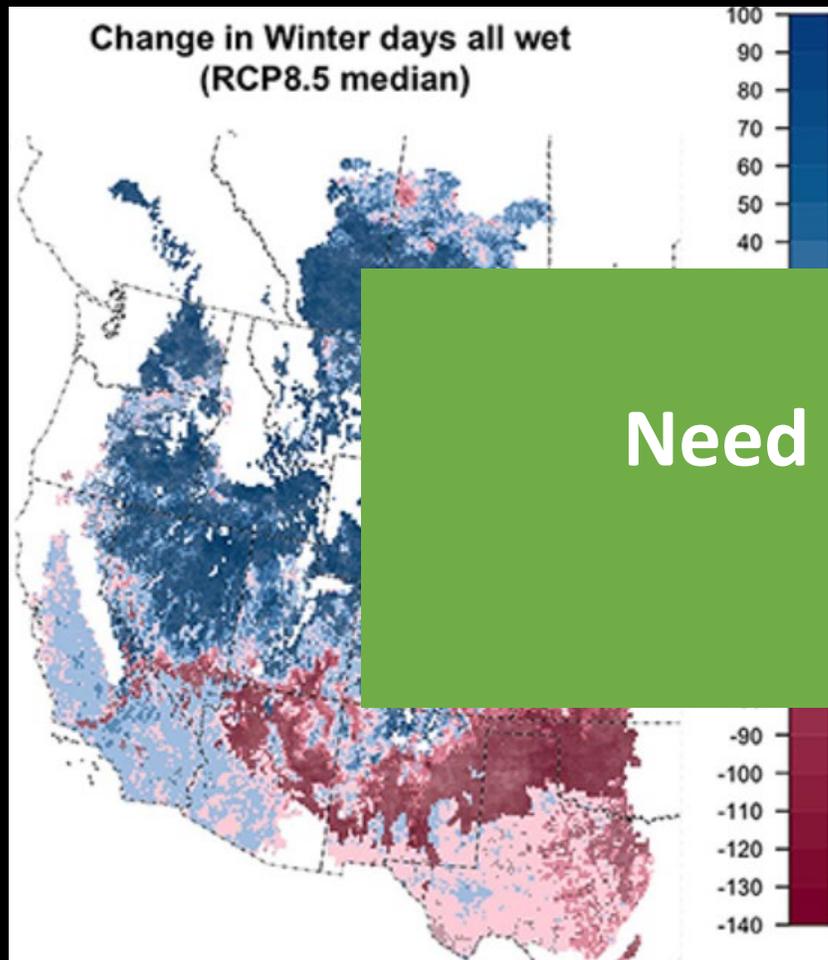


Invasive & Encroaching Species



Restoration – Climate Change

Winter

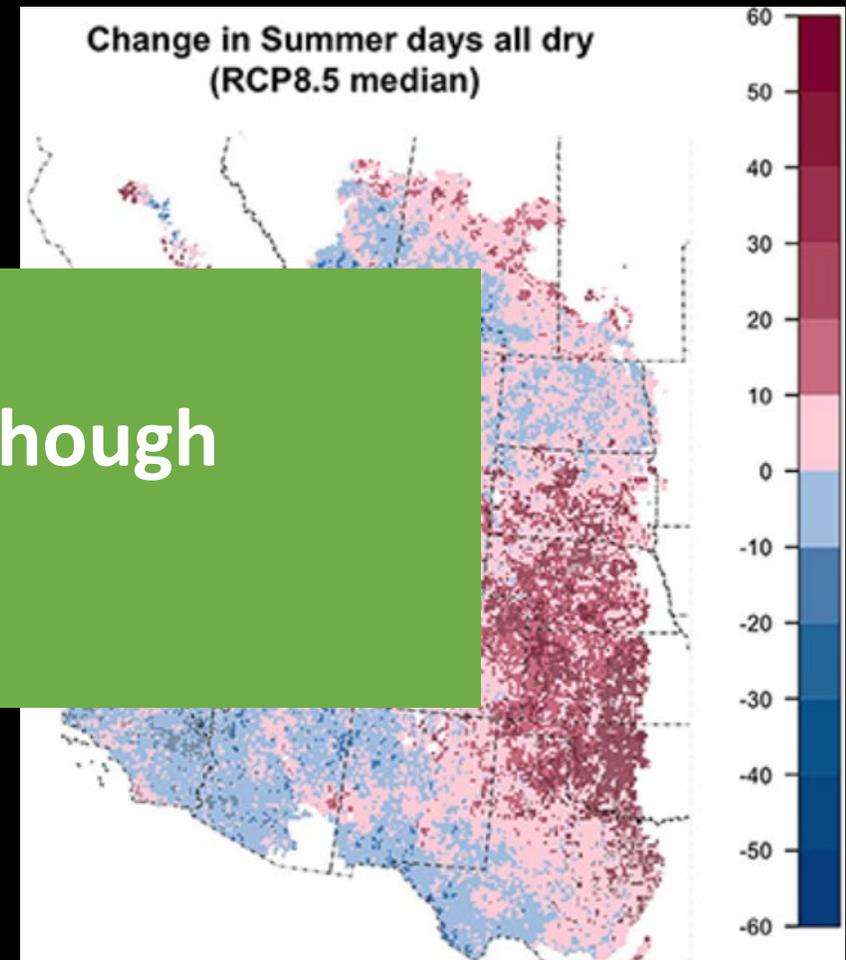


- Potential shift in

Need to verify predictions through experiments!

annual grasses.

Summer



Restoration – Climate Change



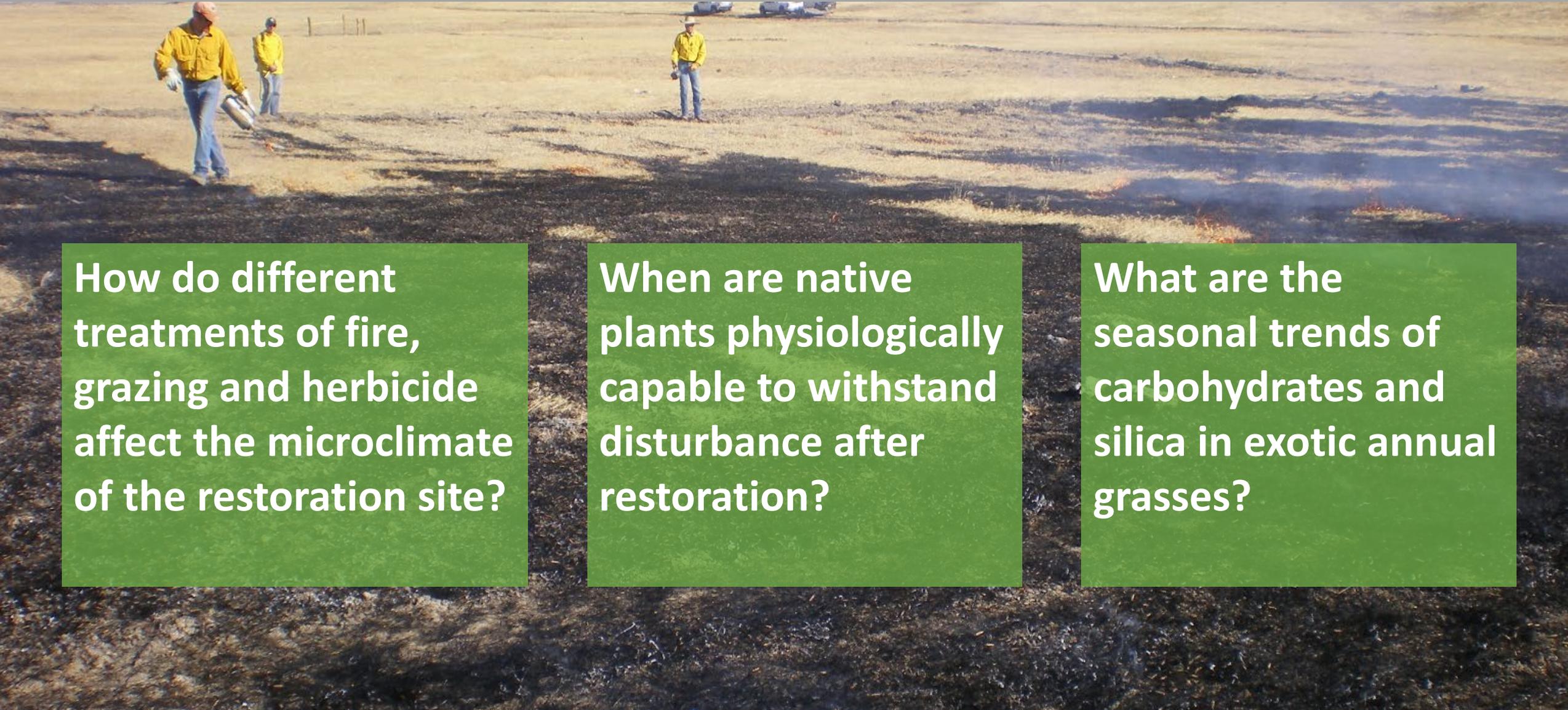
How can we inform management and restoration practices if we don't know the physiological and demographic responses of plants?

Restoration – Fire, Grazing & Invasive Species

Restoration requires use of some or all the tools in the toolbox. Some tools are the traditional tools we are accustomed to using and others require an open mind, ingenuity and a willingness.



Restoration – Fire, Grazing & Invasive Species



How do different treatments of fire, grazing and herbicide affect the microclimate of the restoration site?

When are native plants physiologically capable to withstand disturbance after restoration?

What are the seasonal trends of carbohydrates and silica in exotic annual grasses?

Restoration – Fire, Grazing & Invasive Species

Dormant season grazing

Conditions within thatch

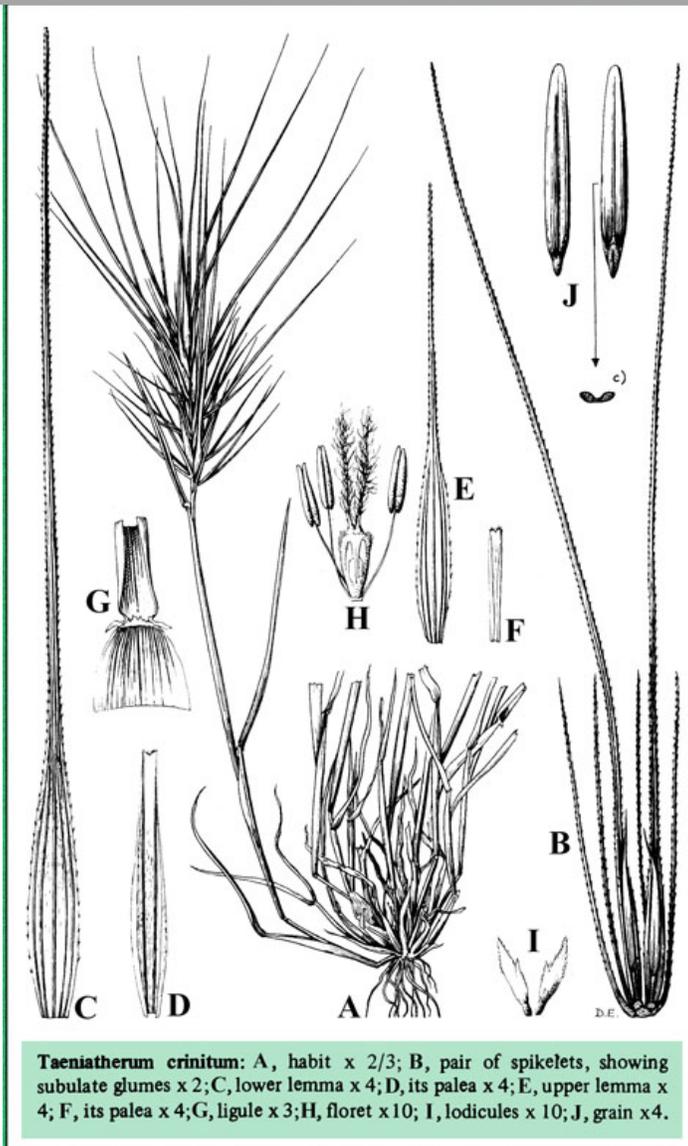
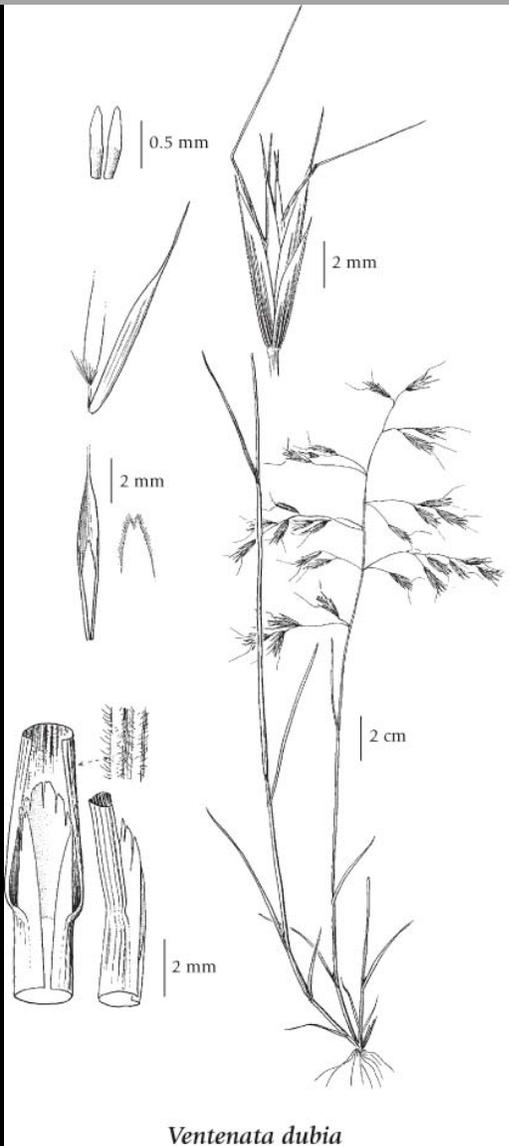
- Microclimate conditions
- Ratio of Native to Invasive germinates

Fuel reduction

Can effective herbicide and seeding be possible if certain conditions are met?



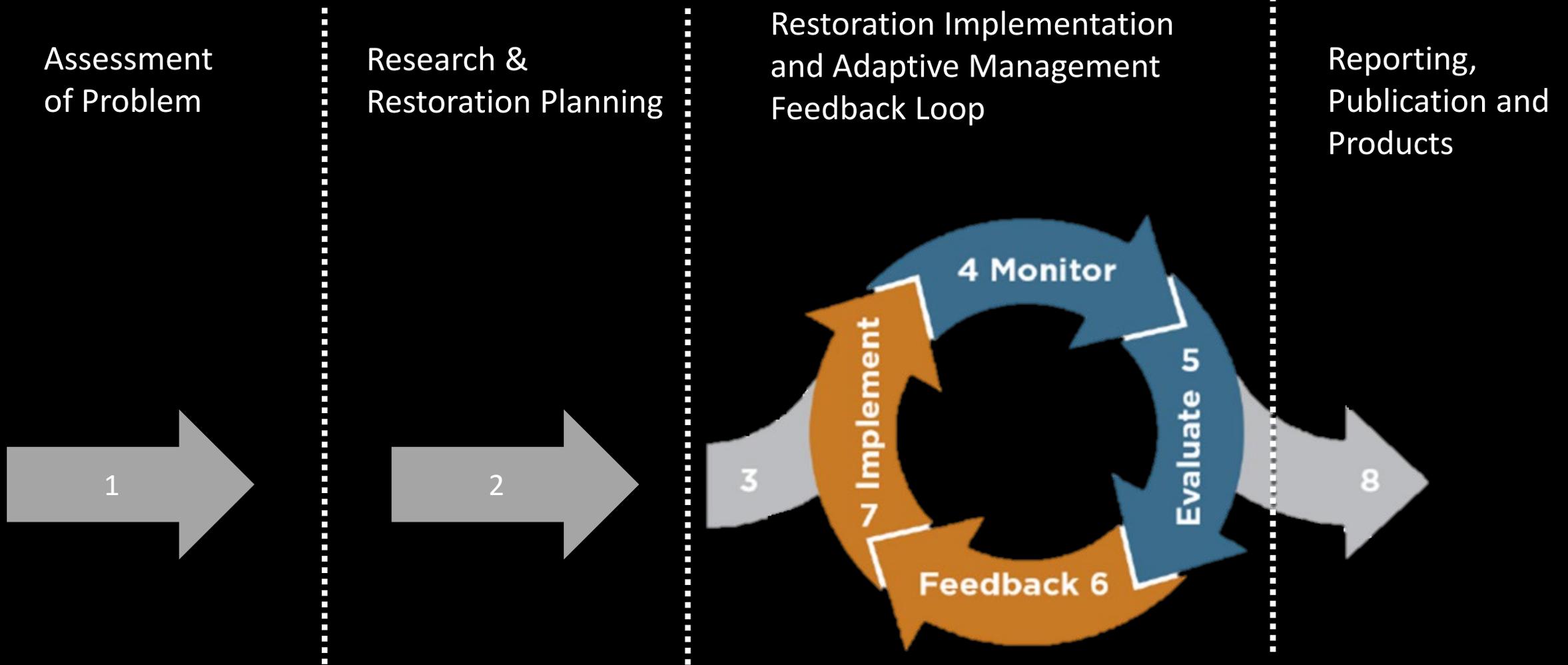
Restoration – Fire, Grazing & Invasive Species



Mixed-Herd & Herbicide Treatments

- Use grazers that evolved with these two grass species
- What is the silica content before and after grazing?
- How much carbohydrates are in annual grasses through a season?
- Applications of herbicides like Imazapic or Esplanade

Input from land managers and ranchers



Thank You!

“Mother Earth can be forgiving when, in ignorance, we err. But she can die of good intentions. She needs someone who will care. Not with platitudes of poets touting blood and sweat and toil, But the daily care of someone with his hand upon the soil.” - **Baxter Black, ‘Of The Land’**