Plasticity of *Pleuraphis jamesii* across a monsoon gradient: A field trial at the Canyonlands Research Center

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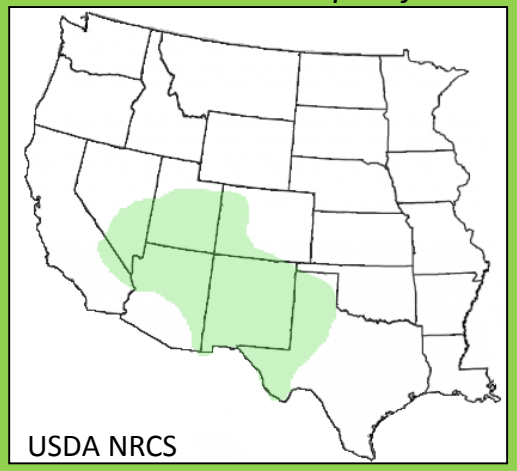
Pleuraphis jamesii (Galleta grass)

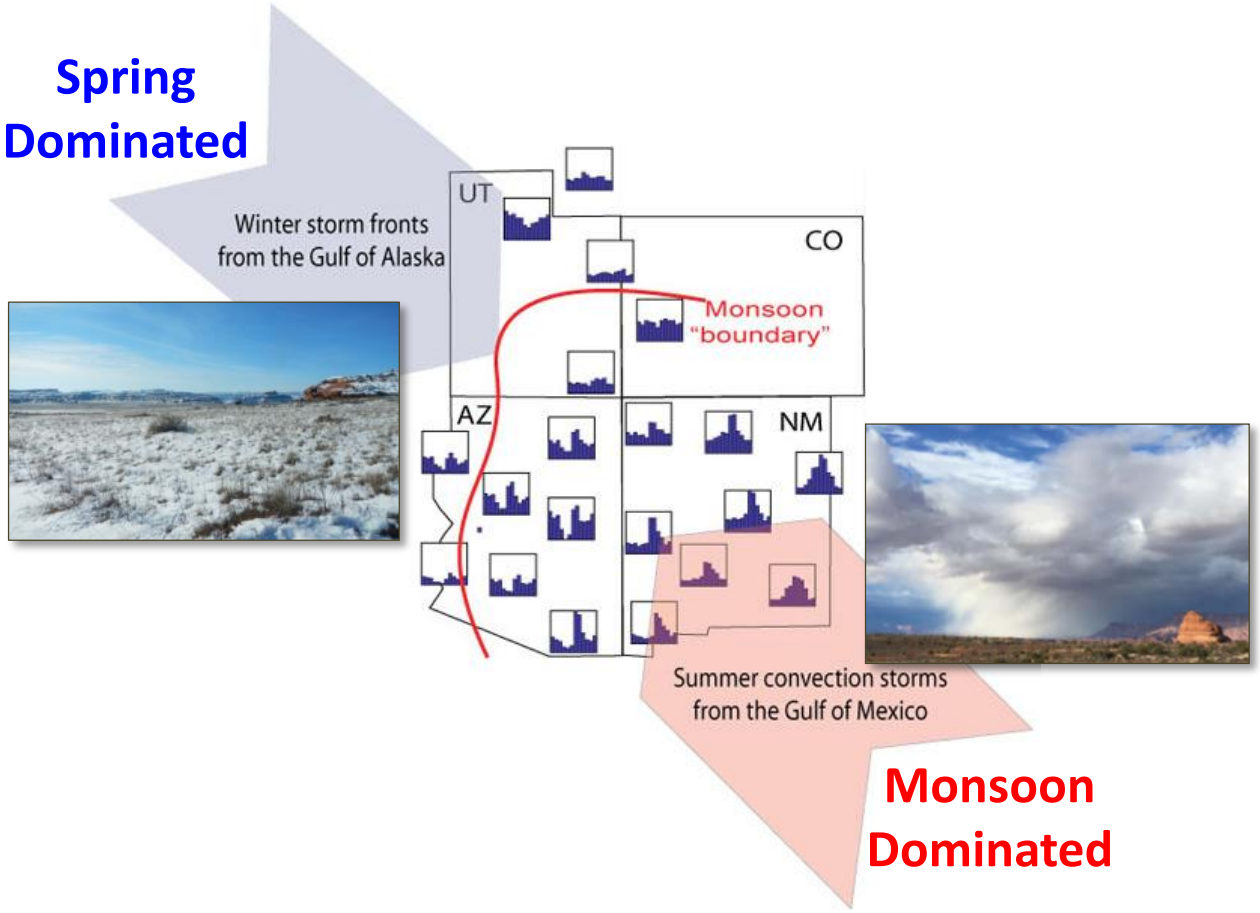
- C_4 photosynthesis (warm season grass)
- Rhizomatous
- Desirable forage for livestock and native herbivores
- Restoration: ground cover and erosion control

Distribution of *Pleuraphis jamesii*



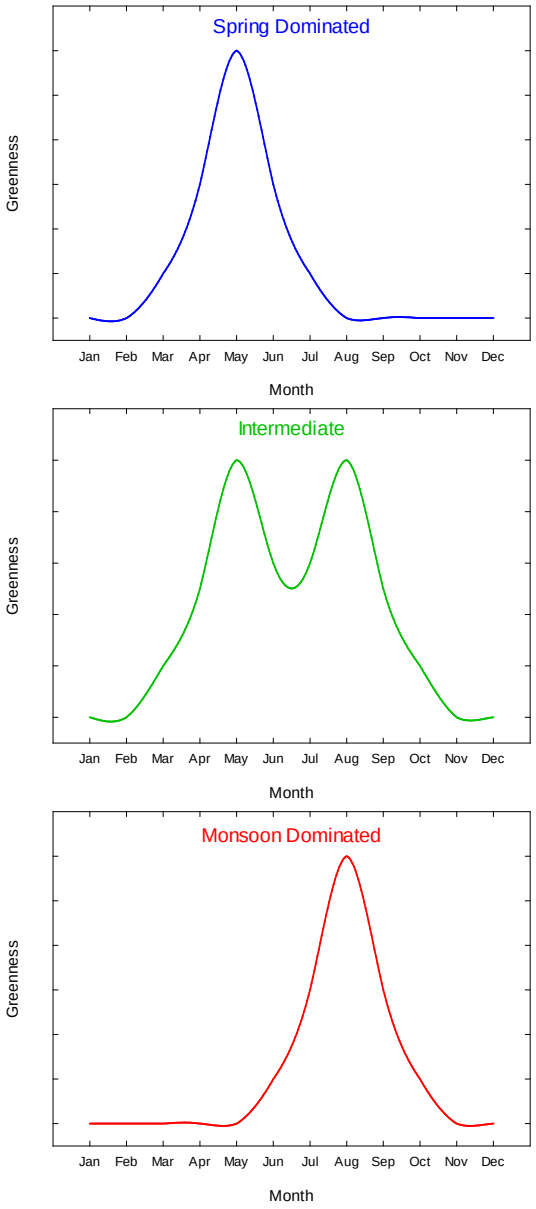
USDA NRCS

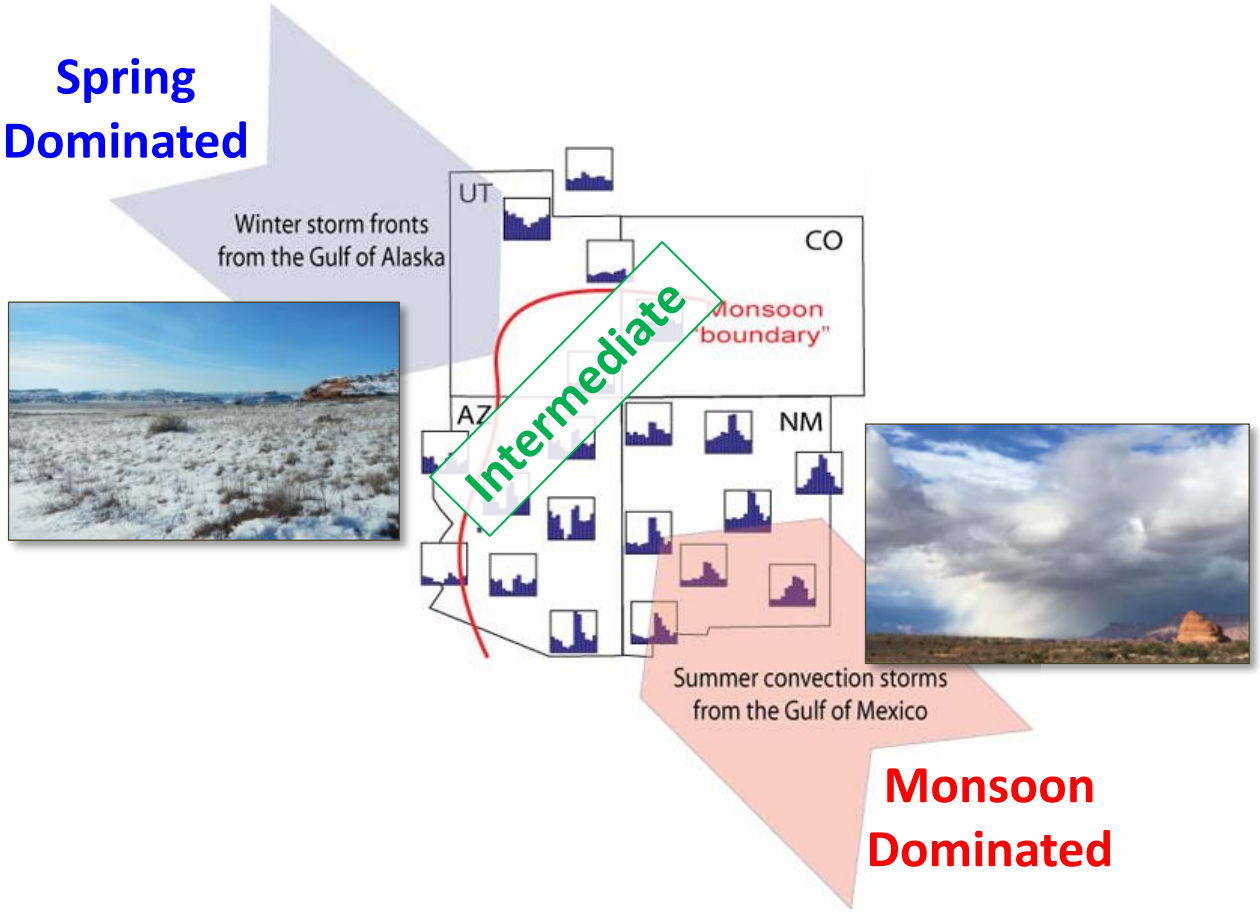
Seasonal Ecohydrology of the Southwest



Modified from
Schwinning et al. (2008)

Seasonal Ecohydrology of the Southwest





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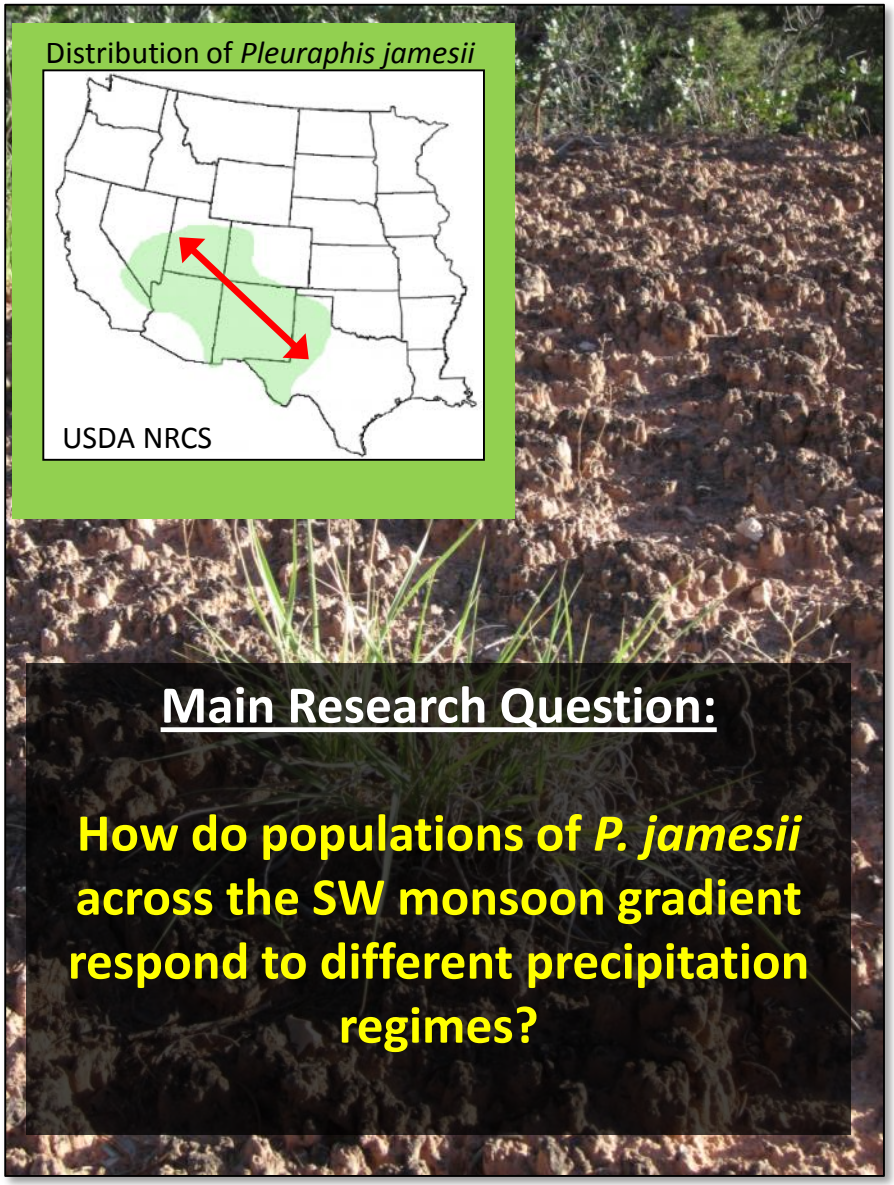
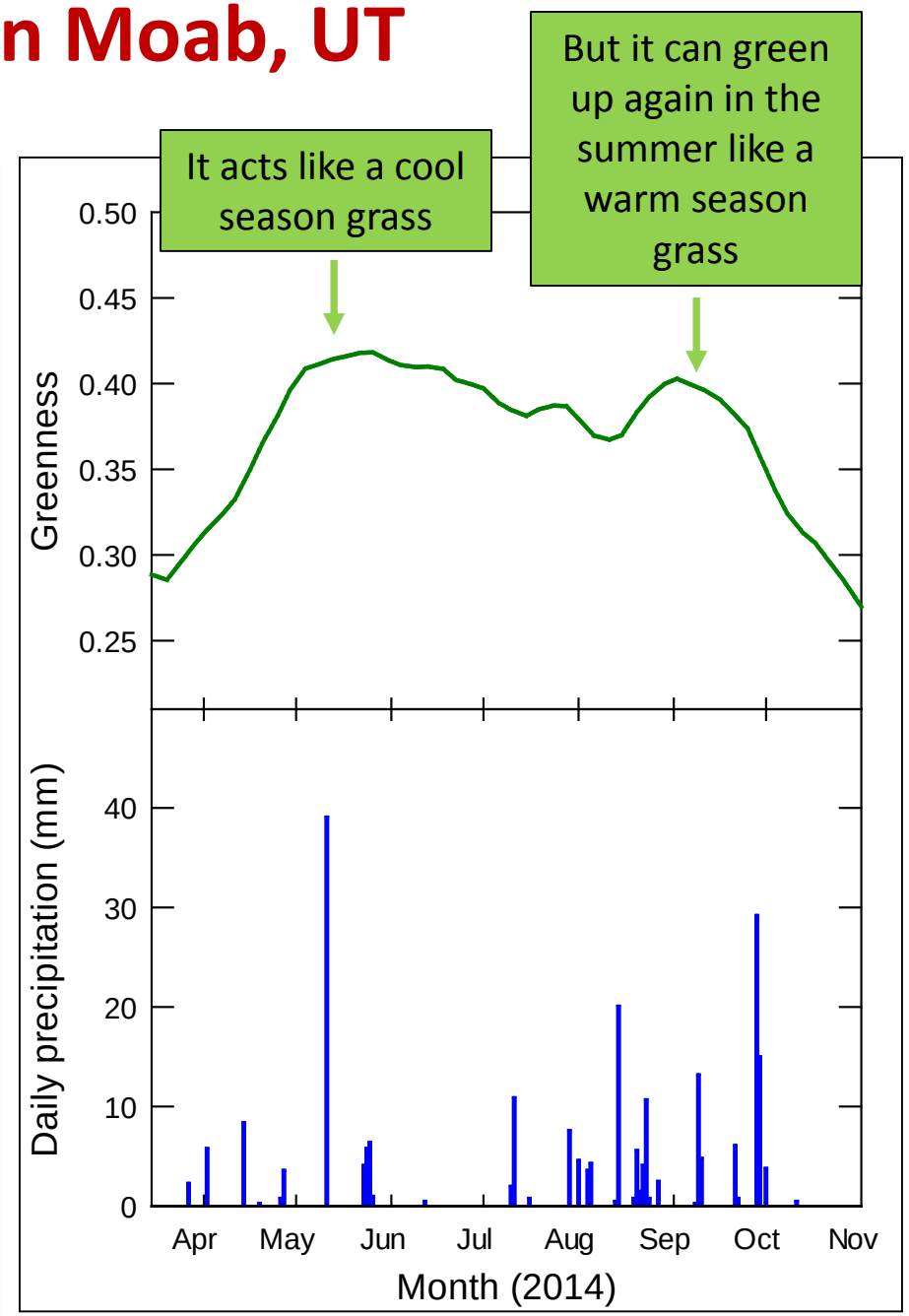
P. jamesii in Moab, UT



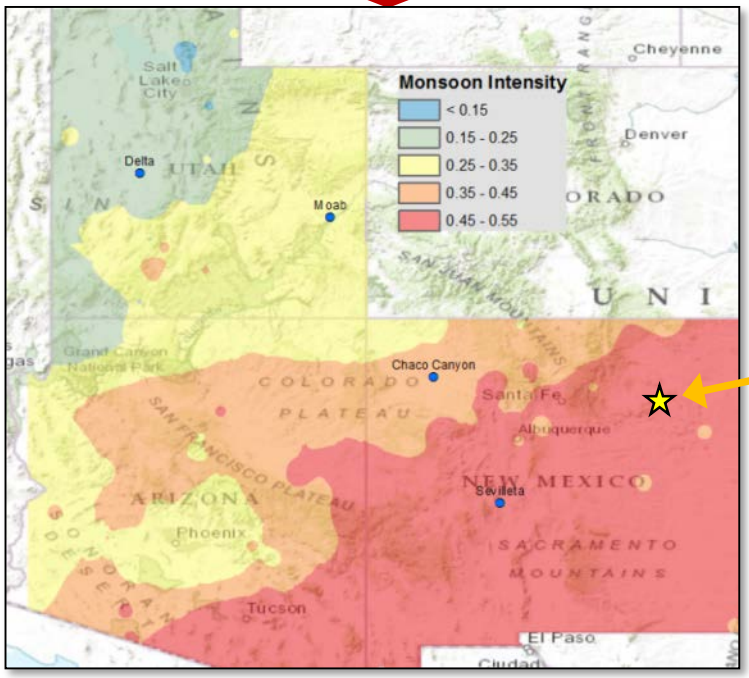
Main Research Question:

How do populations of *P. jamesii* across the SW monsoon gradient respond to different precipitation regimes?



Selecting *P. jamesii* populations for the common garden study

Selection



USDA
United States Department of Agriculture

A Conservation Plant Released by the Natural Resources Conservation Service
Los Lunas Plant Materials Center, Los Lunas, NM

'Viva' James' galleta
Pleuraphis jamesii Torr.

'Viva' James' galleta (*Pleuraphis jamesii* Torr.) was released in 1979 as a joint release between New Mexico State University's Los Lunas Agricultural Science Center and the USDA-NRCS Los Lunas Plant Materials Center.

Source
The 'Viva' James' galleta seed was collected by the Soil Conservation Service in 1944 from a native stand near Newkirk, New Mexico.

Conservation Uses
The abundance of galleta and its ability to produce considerable forage make it a very important species on many southwestern ranges. 'Viva' James' galleta is useful for critical area soil stabilization and range revegetation in its natural range of adaptation.

'Viva' galleta is very drought-resistant and maintains itself very well on arid ranges, where average annual precipitation may be as low as seven inches.

Area of Adaptation and Use
'Viva' galleta grows well on medium to heavy, moderately saline soils. It grows from rhizomes and seed mainly in the summer after sufficient rainfall. Its drought resistance allows it to do well even in areas with only 8 inches of annual precipitation. While it is green, its forage value is good for all classes of livestock and wildlife.

Galleta is widely distributed in Colorado (except in the central and north-central parts) from elevations of 3,500 to 7,500 feet (1,070 to 2,290 m). It is most commonly found in the northern two-thirds of New Mexico at elevations of 3,500 to 7,500 feet (1,070 to 2,290 m). It is also found in western Texas, Wyoming, Utah, Nevada, California, and Arizona.

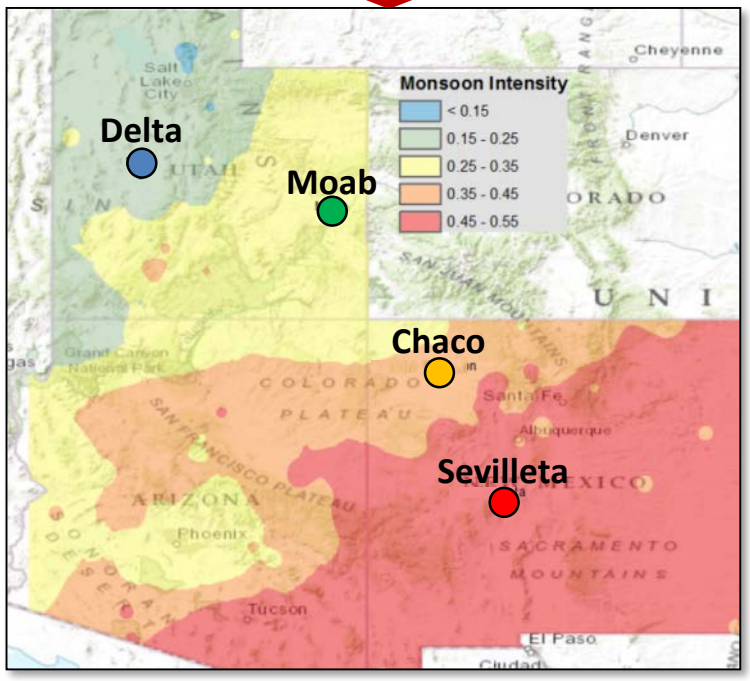
Description

Ecological Considerations
'Viva' James' galleta, when placed in mixes with other

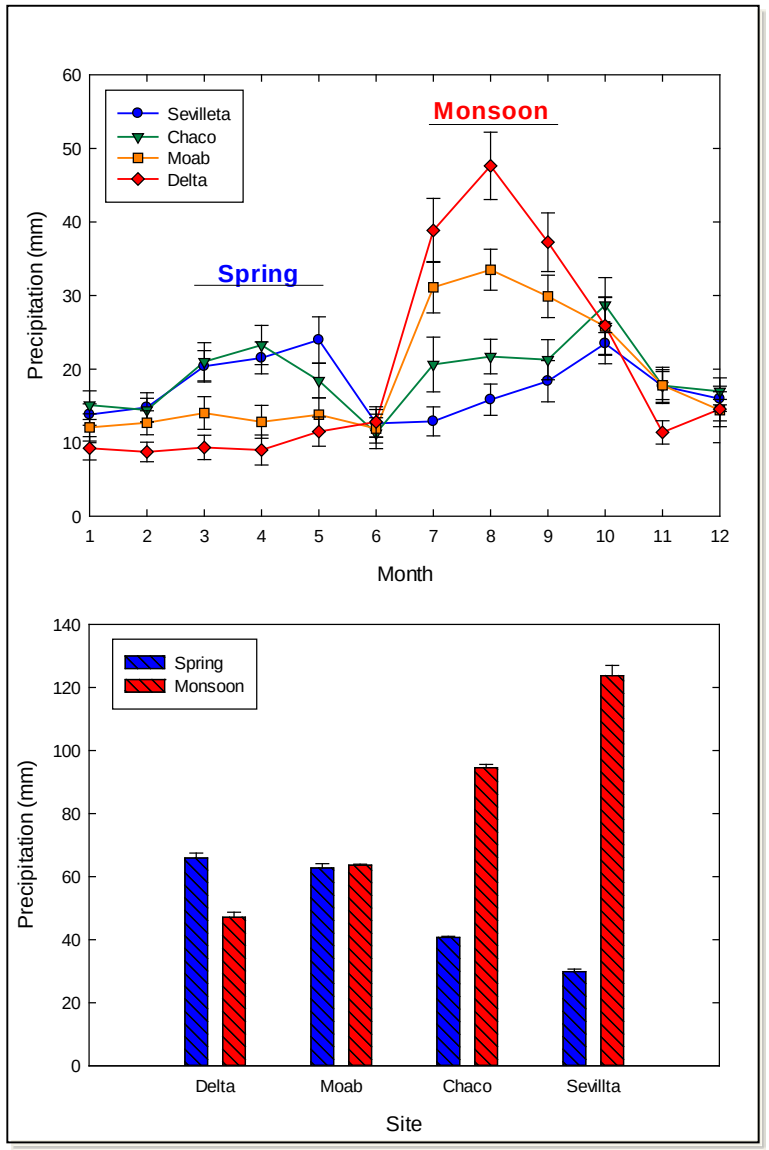
$$\text{Monsoon intensity} = \frac{\text{Monsoon precipitation(JAS)}}{\text{Annual precipitation}}$$

Selecting *P. jamesii* populations for the common garden study

Selection



$$\text{Monsoon intensity} = \frac{\text{Monsoon precipitation(JAS)}}{\text{Annual precipitation}}$$



All sites have same mean annual precipitation (~227 mm yr^{-1}), but differ in pattern

Research Questions and timeline

Questions

1. Population responses: Local adaptation vs. phenotypic plasticity?
2. Intraannual precipitation pattern: Which monsoon intensity is most favorable for plant performance?
3. Population x precipitation: Is there an interaction between population and intraannual pattern?

Timeline

- Fall 2014 – site construction, collect and transplant individuals
- Spring/Summer 2015 – establish individuals, collect pretreatment data
- Spring/Summer 2016 – begin treatments, measure responses: soil moisture, ecophysiology, phenology, morphology, biomass

Ted Wood

Common garden at the Canyonlands Research Center

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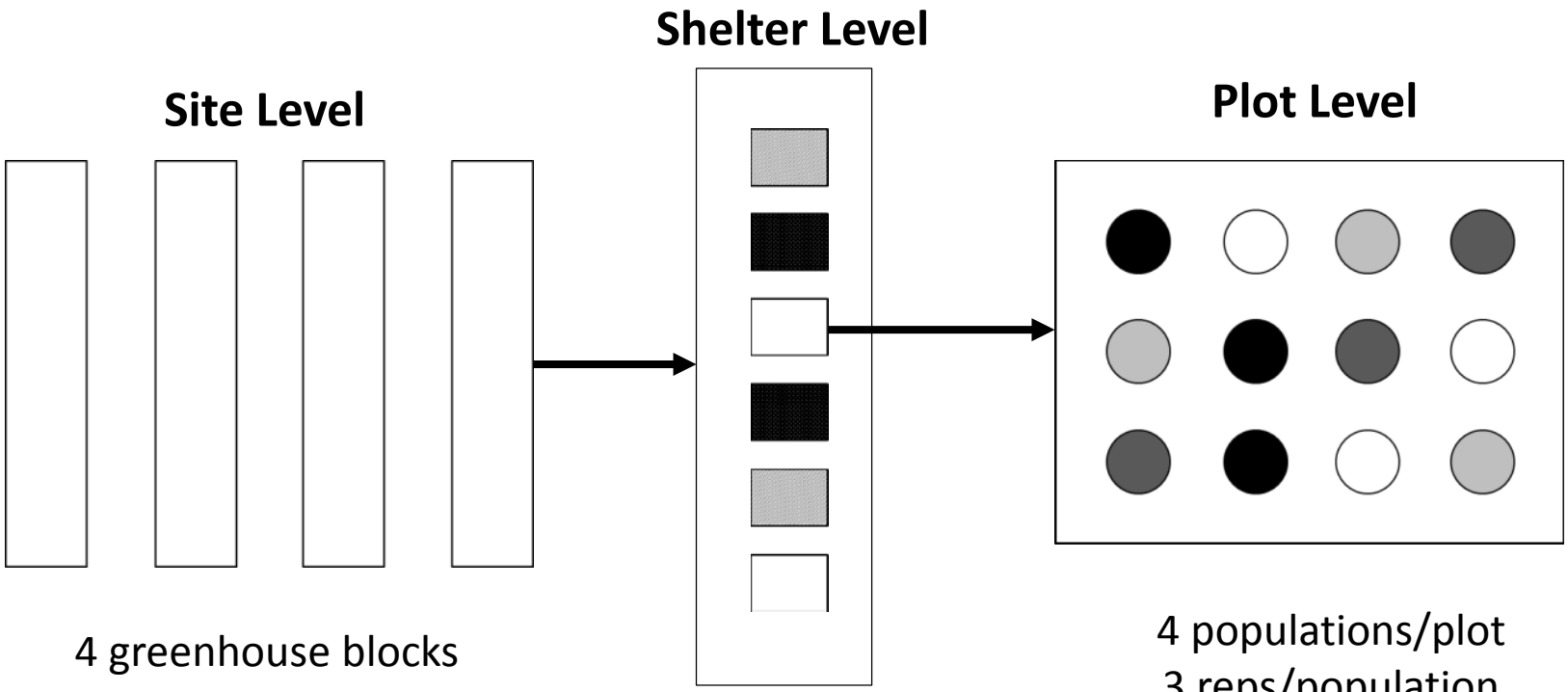
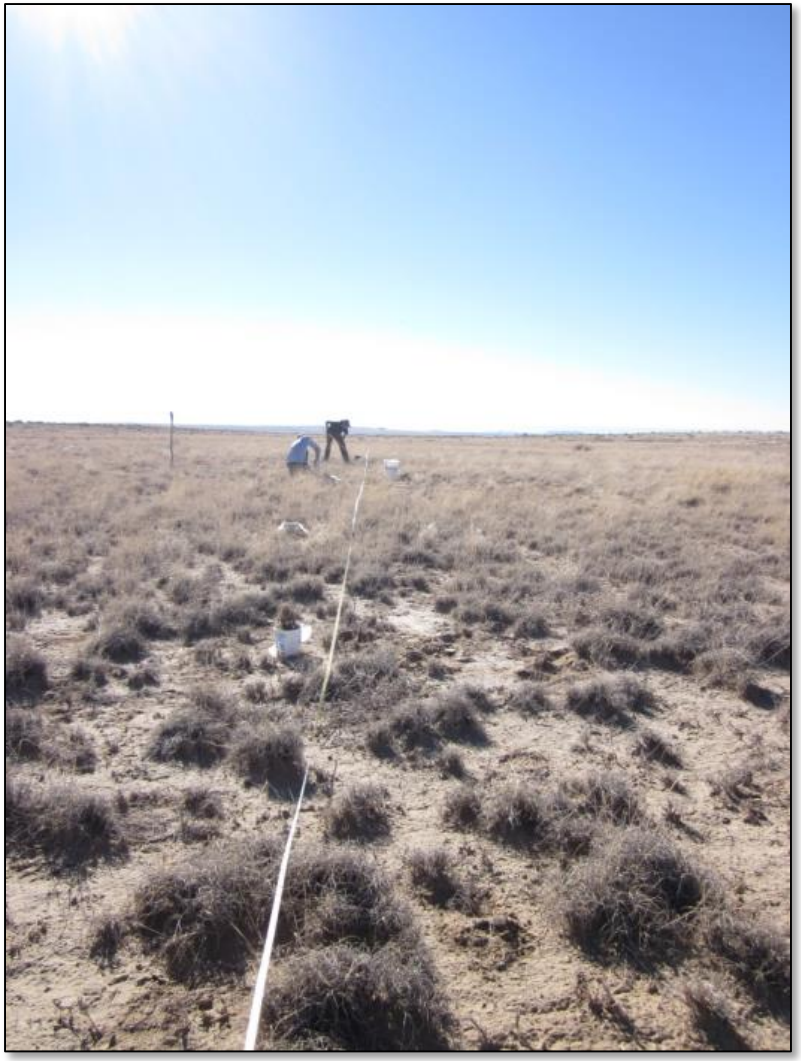
Experimental Design




Cleared and
leveled site
CAT

Trenched to hydrologically isolate plots

Collected *P. jamesii* individuals for the common garden study



Collected

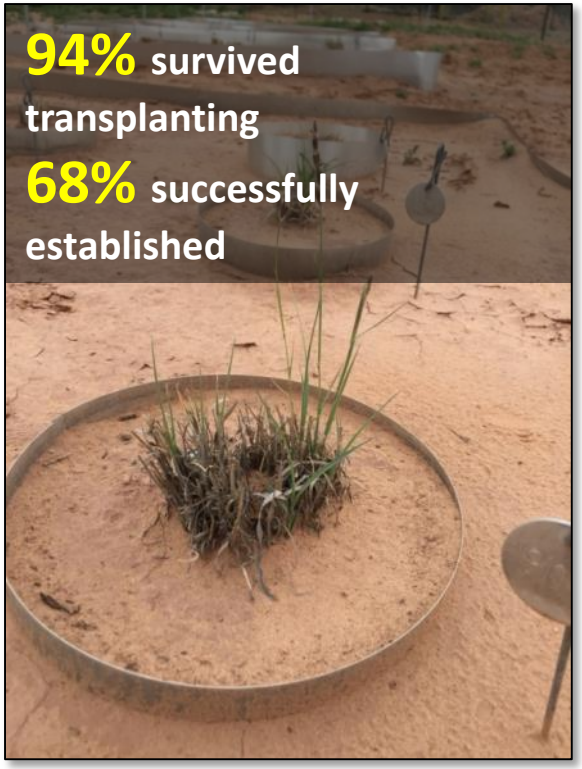
72 individuals

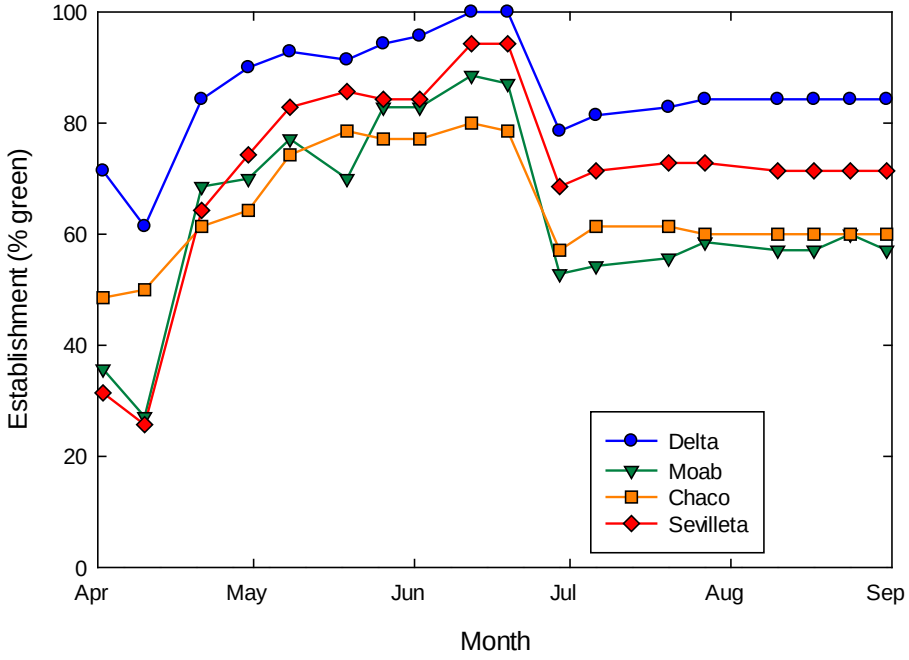
from each population

(288 total)

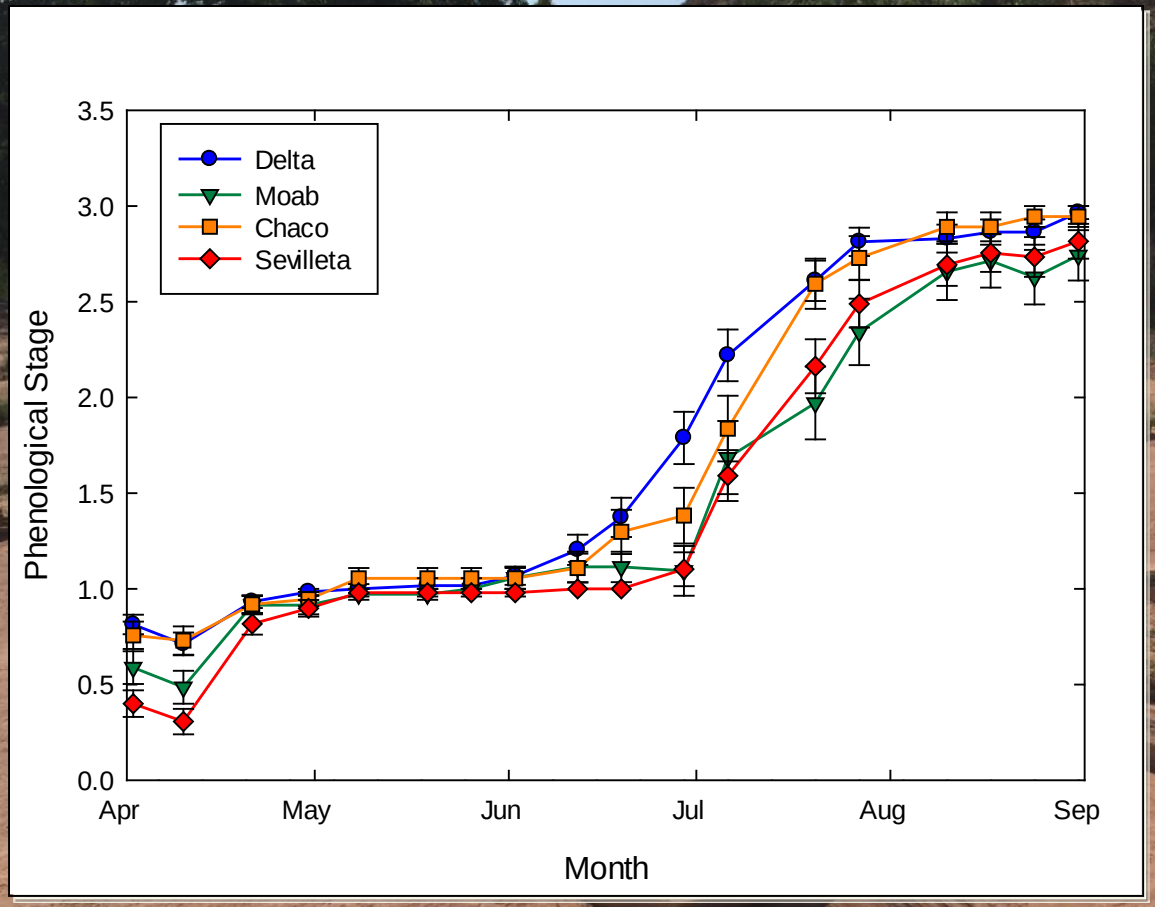

Transplanted to Common Garden
Fall 2014

Evaluating clonal propagation in 2015



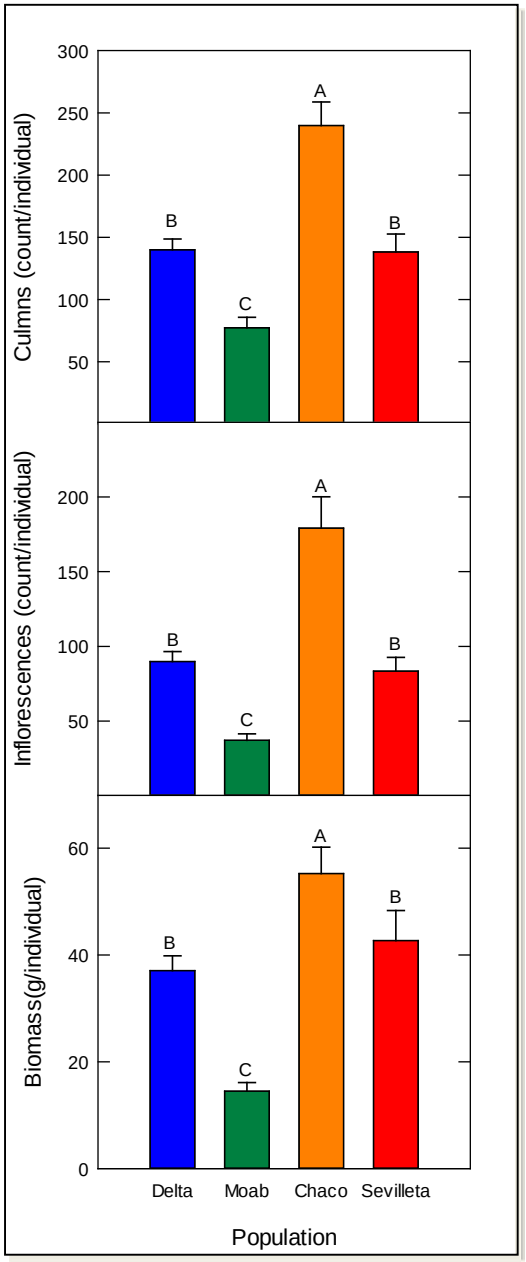


Population differences during pretreatment year?



Phenological Stages:
0 = senesced, 1 = green leaves, 2 = boot, 3 = flowering
(only includes established individuals)

Population differences during pretreatment year?



Treatments 2016

Treatment	Spring ppt (mm)	Monsoon ppt (mm)	Total ppt (mm)
Spring Dominated	120	40	160
Intermediate	80	80	160
Monsoon Dominated	40	120	160

Treatments 2016

Acknowledgements

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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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Questions?
Comments?