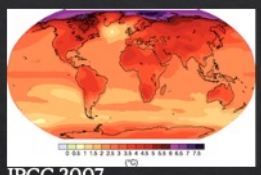
Velvet mesquite establishment in Sonoran grasslands: grass utilization is of little consequence to monsoon precipitation variation

Austin Rutherford
Steve Archer, Luis Weber-Grullon, Osvaldo Sala

AZ SRM Winter Mtg
1/24/2020

Santa Rita Experimental Range (SRER)

Drivers



IPCC 2007

Jornada LTER

Precipitation

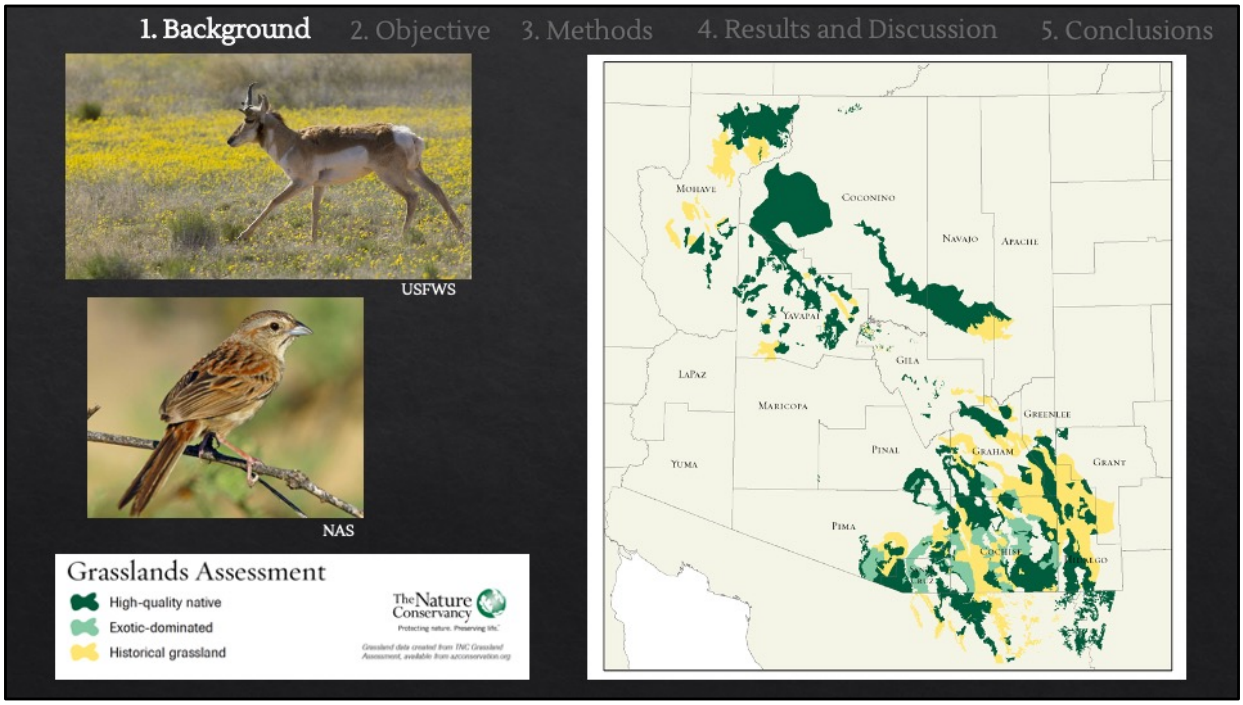
Temperature

Overuse of grasses

Seed dispersal

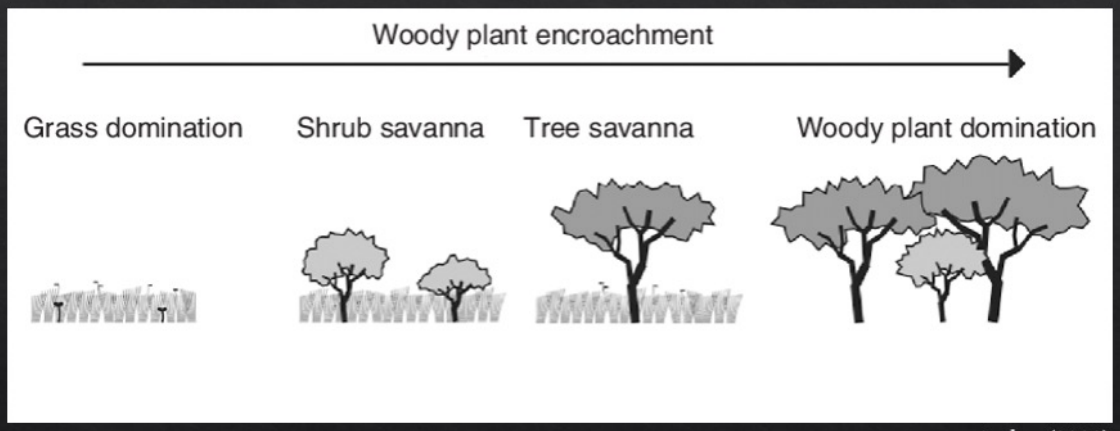
Frequency

Fuel



Grasslands are prized in Arizona and Southern Arizona for their now unique habitat for species like sonoran pronghorn antelope or grassland dwelling birds like botteri's sparrow

-maintain grasslands to keep habitat for threatened species or to keep the grassland in it's historical condition



Archer (2009)

LCNCA (North of Sonoita, AZ) : ~$124 to ~$523/ac for Brush Management (BM) to mesquite cover of 5%

Brush Management-Mechanical

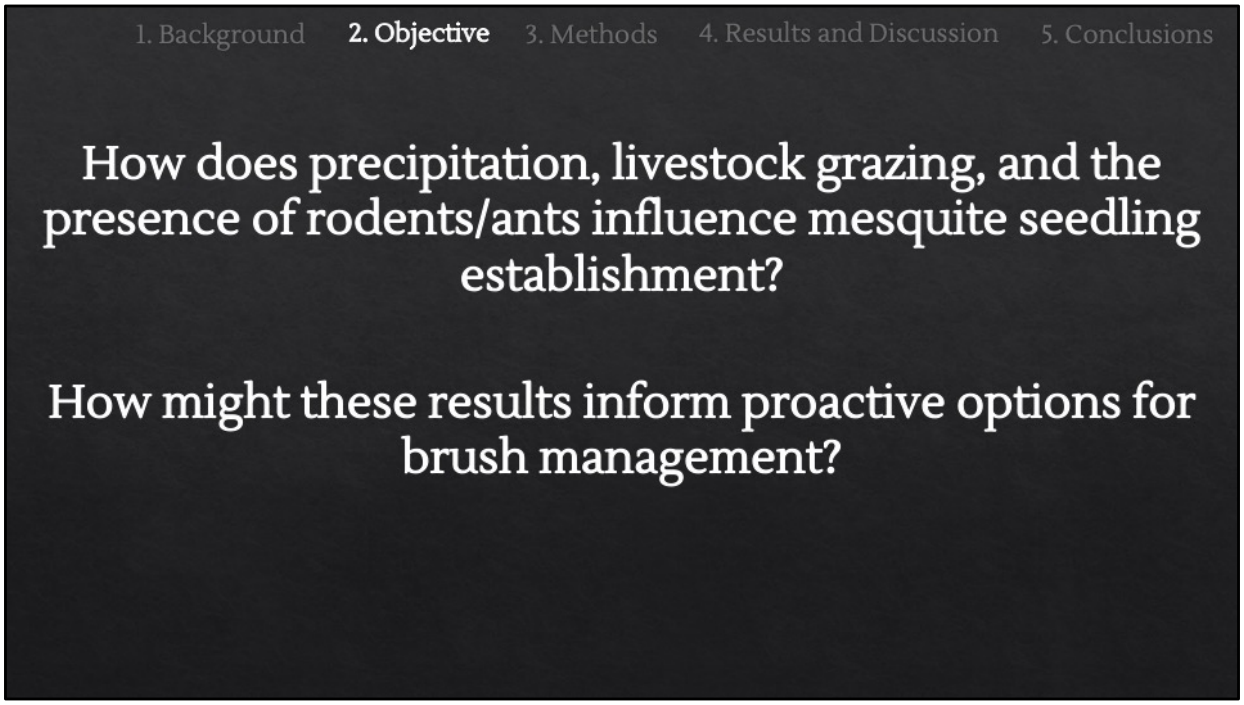
Rocky Mountain Elk Foundation

Brush Management-Herbicide

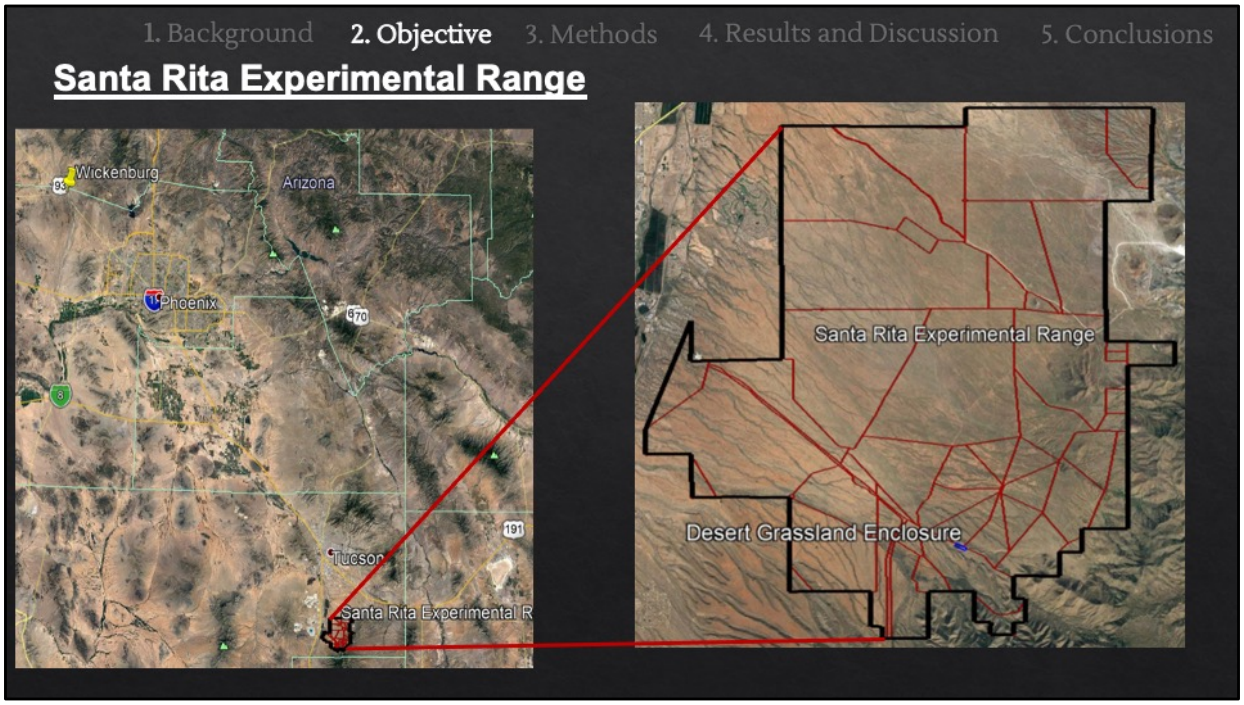
Photo: Mark Heitlinger

Brush Management-Prescribed Fire

NPS



Natural landscapes with ants and rodents who consume mesquite seeds and seedlings

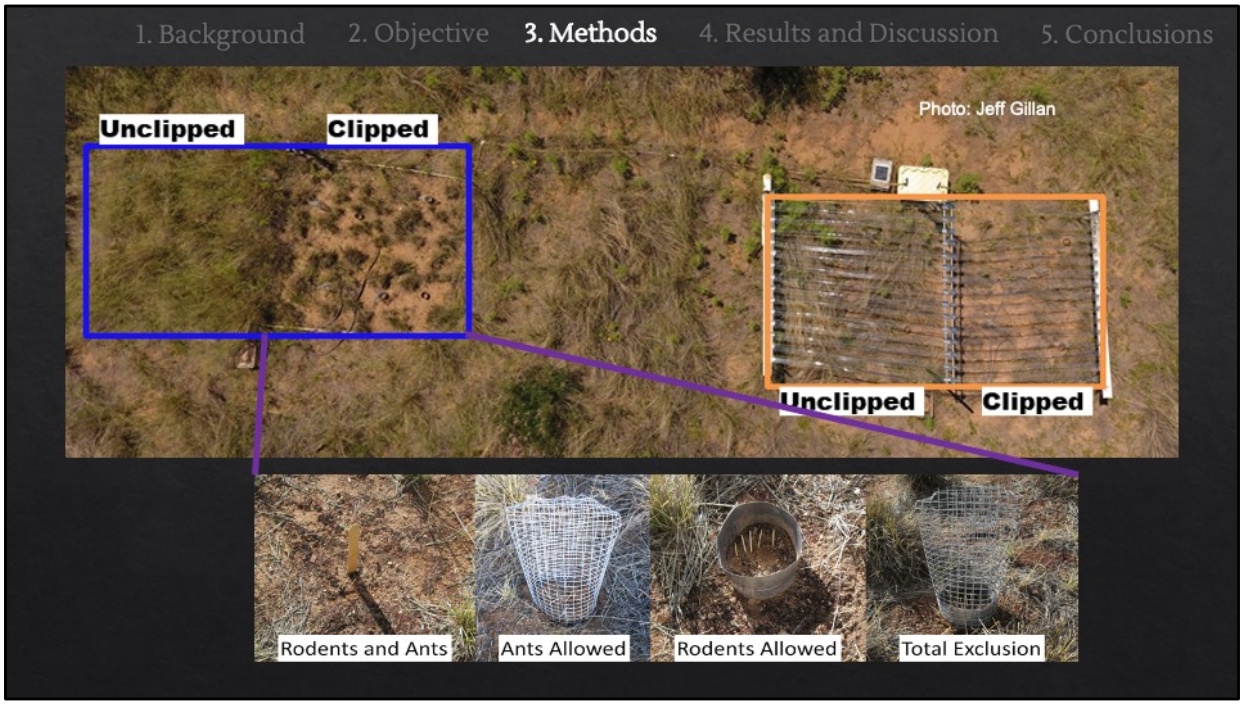


-Managed by the University of Arizona and founded in 1903
-Located roughly 30 miles south of Tucson, AZ at the base of the Santa Rita Mountains
-comprised of ~52,000 acres of actively grazed rangeland
-Spans an elevation gradient of 2900 ft to 5000 ft
-Vegetation communities = desert at lower elevation, velvet mesquite grassland savannas at mid-elevations, and Oak woodlands at upper elevations.
-DGE site has a mean annual precipitation of 16 in and has been excluded from livestock grazing for ≥ 80 years
-Lehmann's Lovegrass, Arizona cottontop, threeawns, plains bristlegrass , grammas, and bush muhly
-alluvial, Holocene-age soils, Surface soil texture is loamy sand with 15-20 % gravels giving way to subsurface soil of very gravelly clay loam

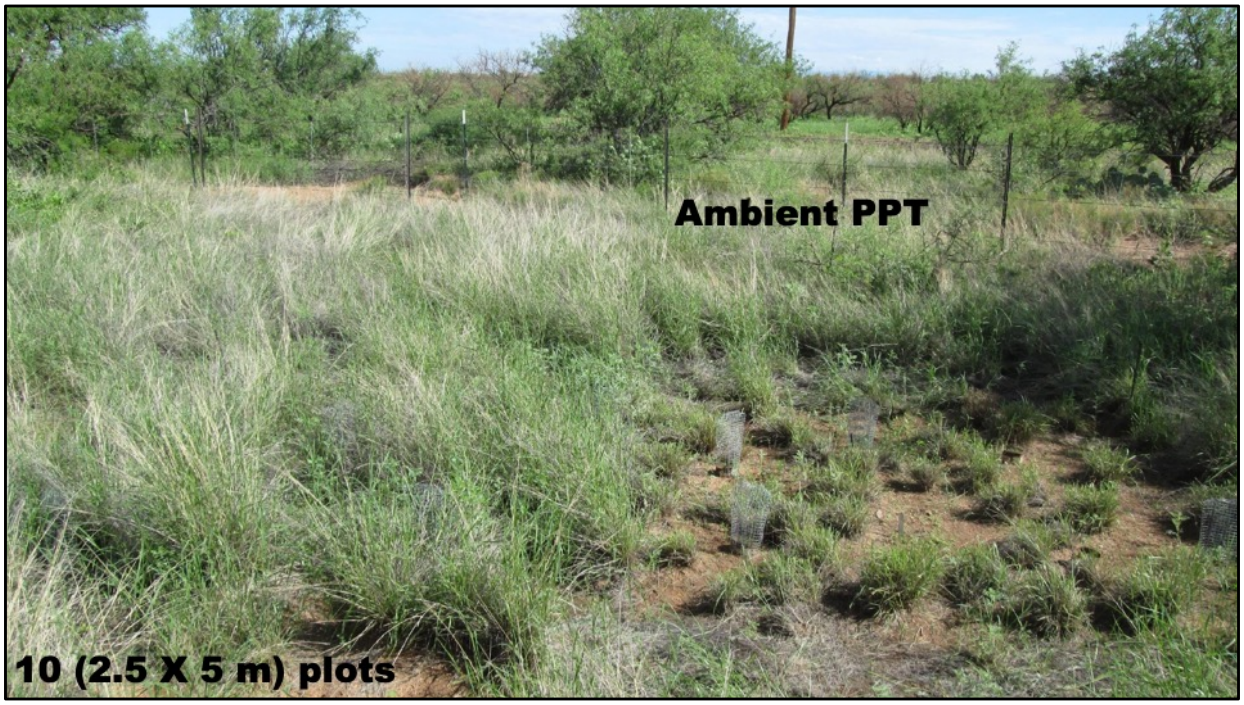
1918

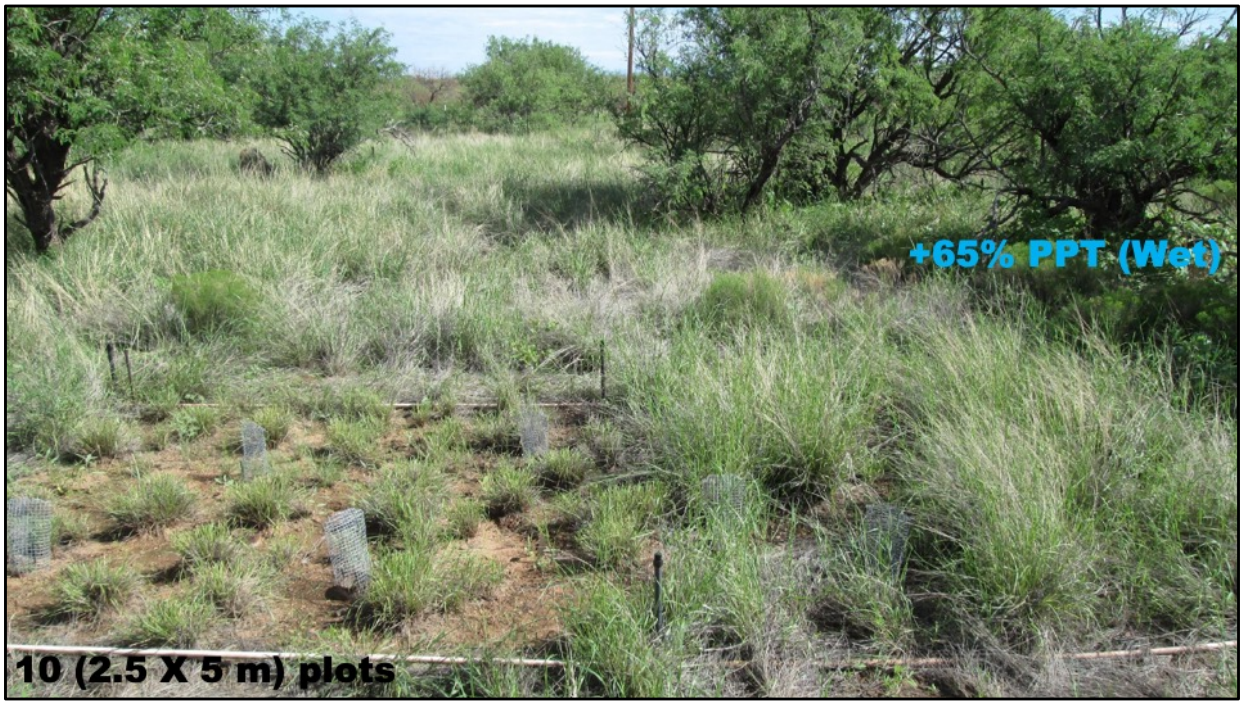
1947

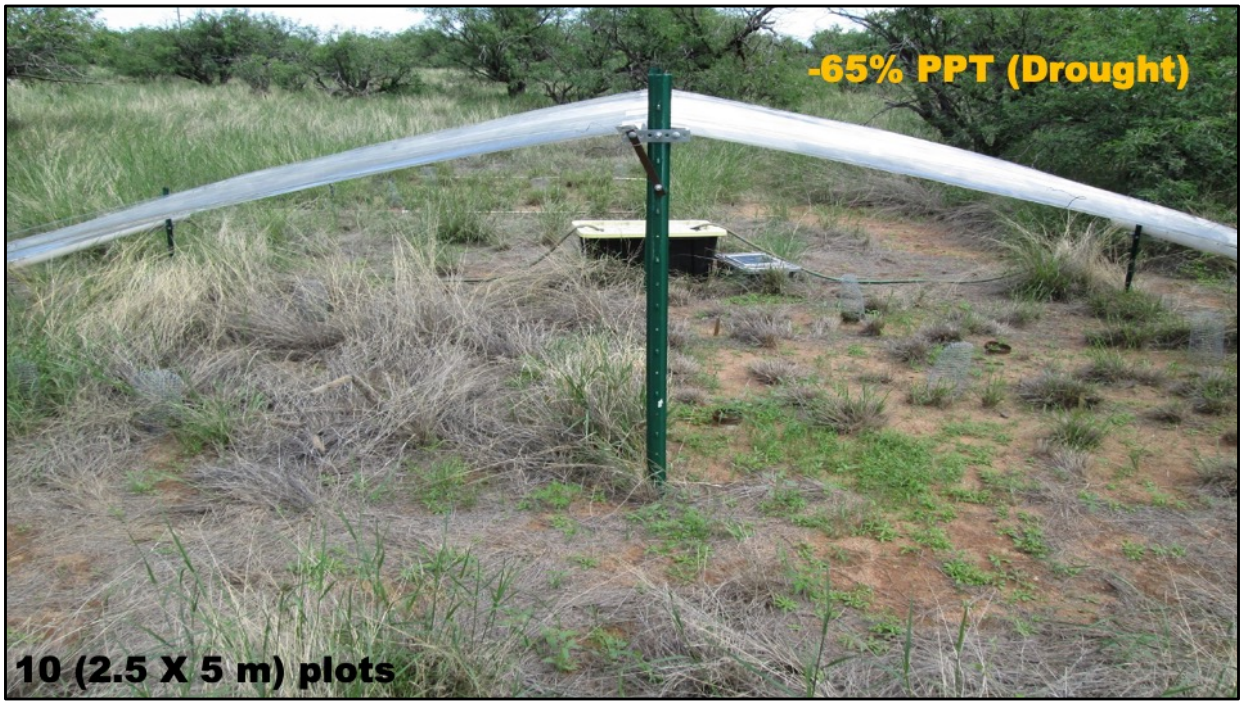
2000



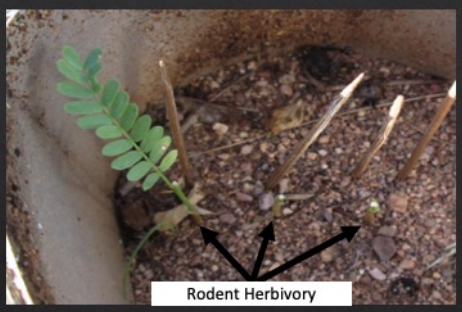
Plant 2400 seeds beginning of monsoon
Track the seedlings over time


Ambient PPT
10 (2.5 X 5 m) plots

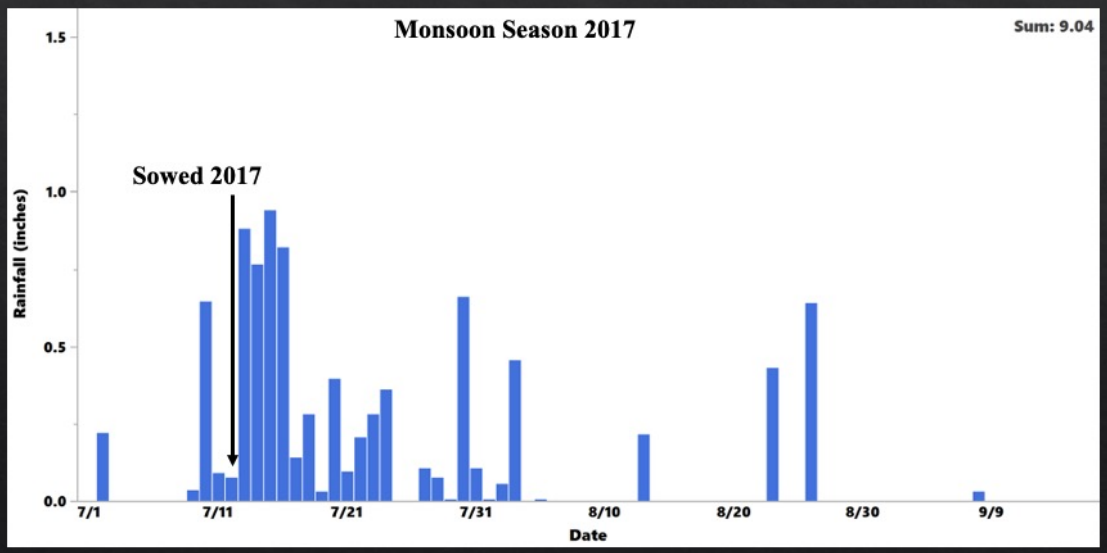

+65% PPT (Wet)
10 (2.5 X 5 m) plots


-65% PPT (Drought)
10 (2.5 X 5 m) plots

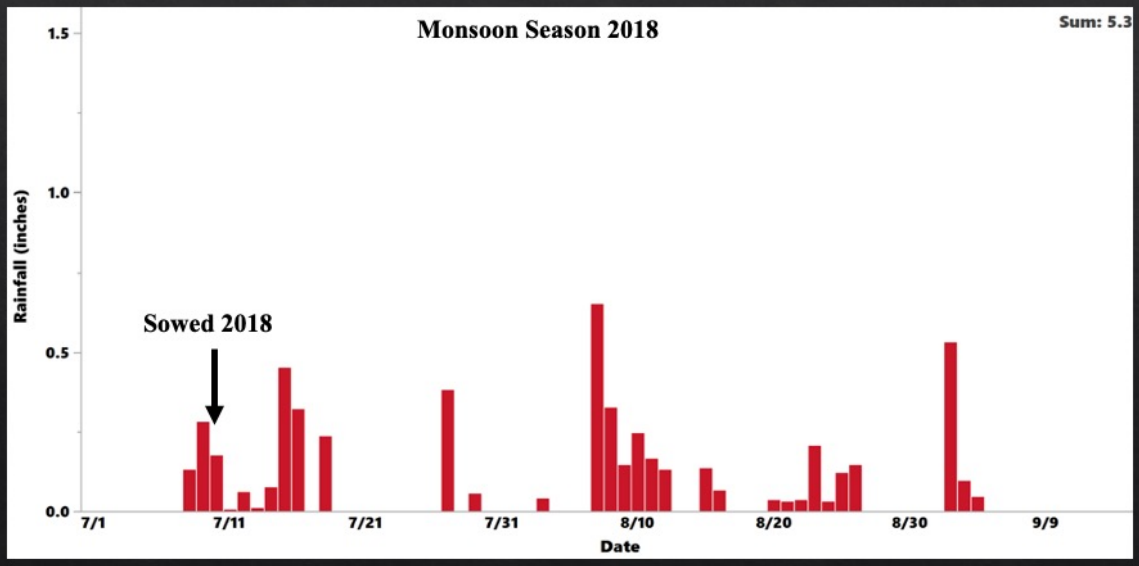
1. Background 2. Objective **3. Methods** 4. Results and Discussion 5. Conclusions



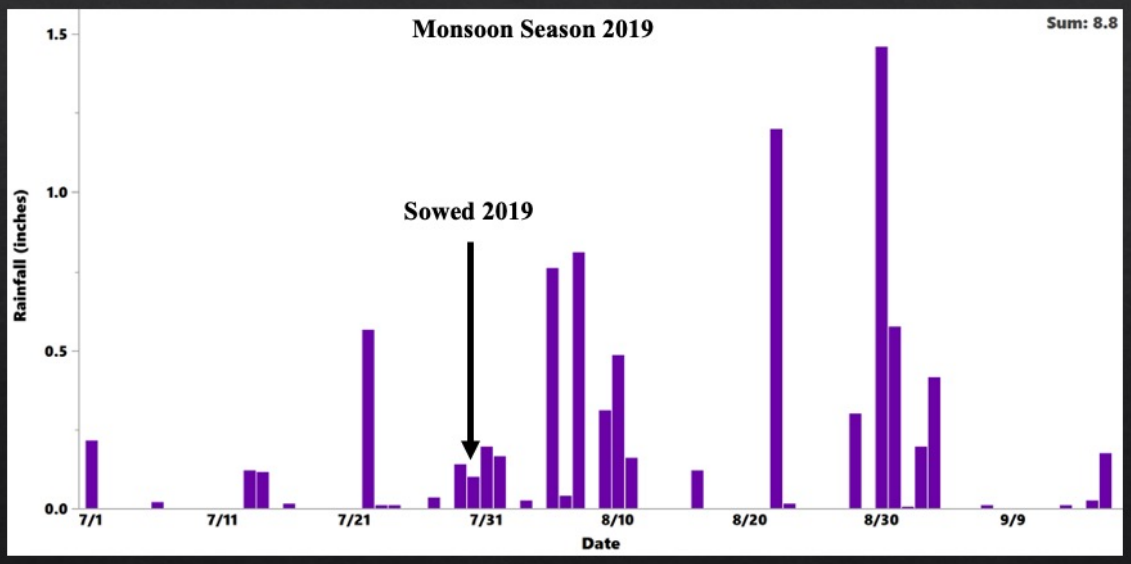
Precipitation



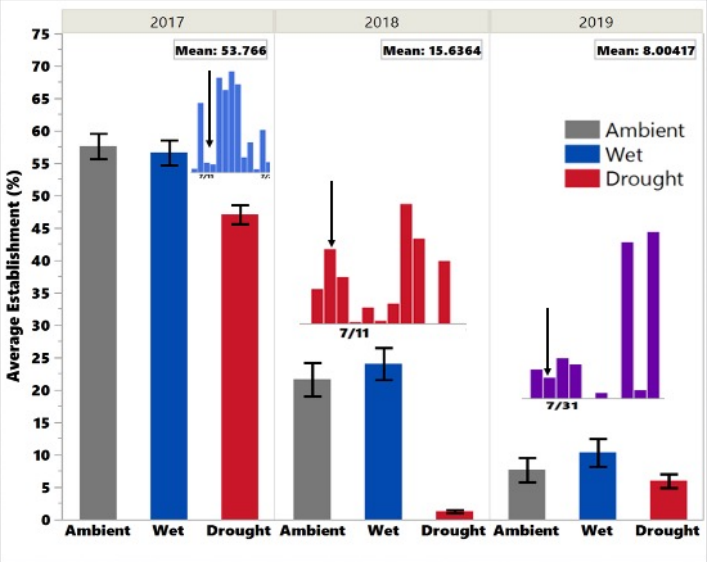
Precipitation



Precipitation



Precipitation Treatments



- More seedlings in 2017 compared to 2018/19 despite 2017 & 2019 PPT amounts
- Seedlings are sensitive to frequency and magnitude of PPT events
- Lowest establishment under drought conditions
- No statistical difference between ambient and wet treatments

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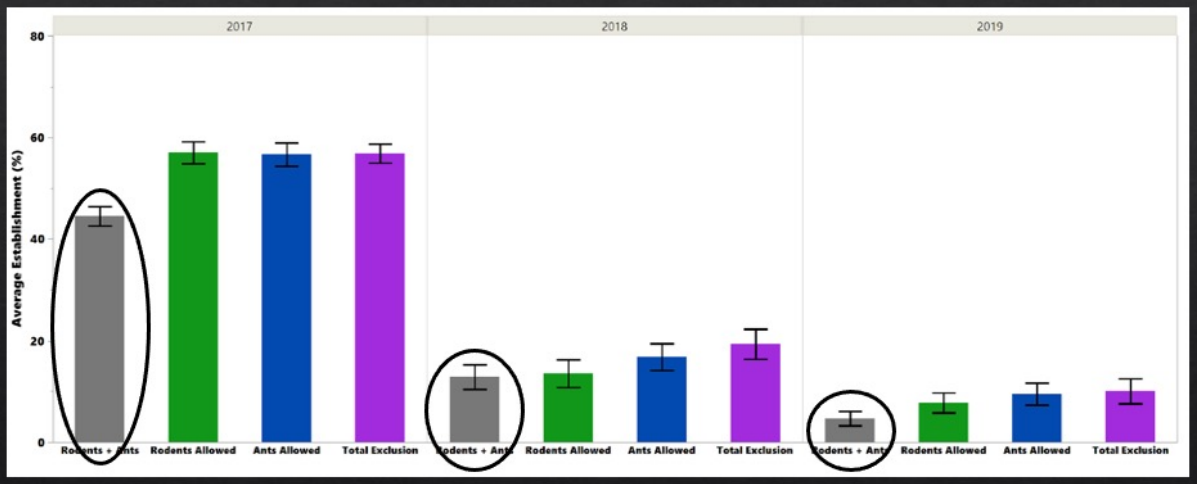
Rodent/Ant Herbivory



Establishment lowest in areas where rodents + ants allowed

More seed/seedling predators = less establishment, more protection = more successful establishment

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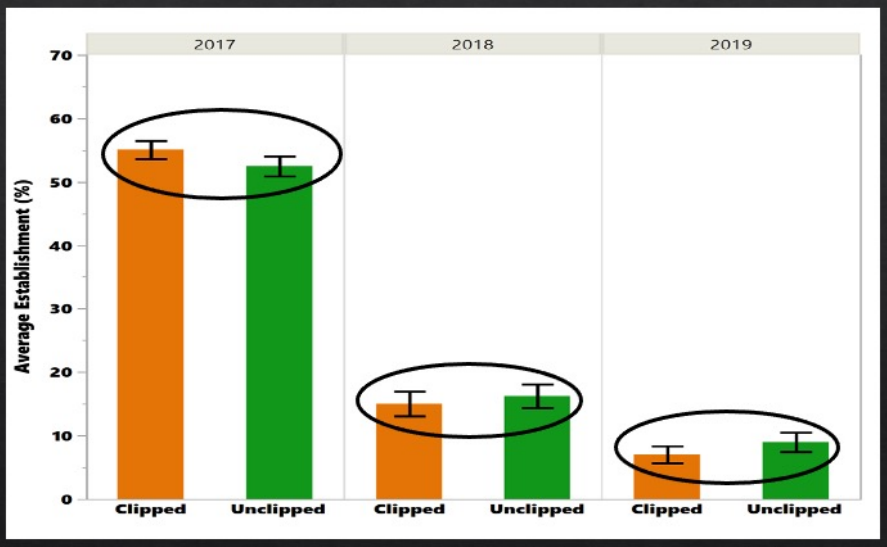
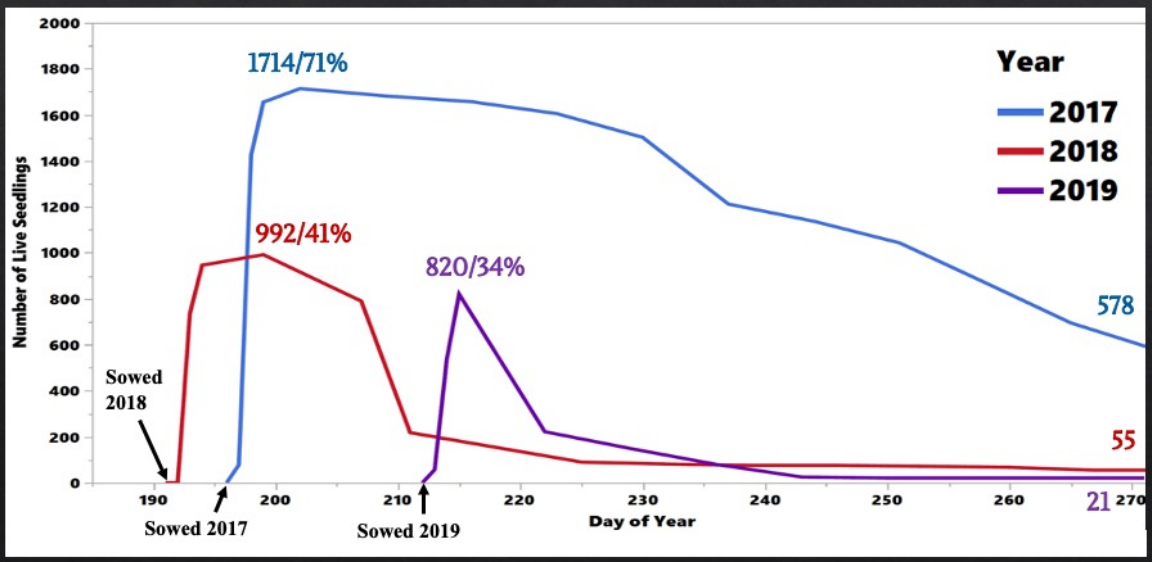
Simulated Grazing/Clipping



- **Heavy grass defoliation/utilization not significant across years**

Only showing clip/unclip but patterns hold across PPT/Exc treatments for each year

Episodic or Continuous Establishment?



Explain continuous vs episodic recruitment/establishment
21 seedlings = ~1%
Every year you get more seedlings even with extreme drought

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1. **Establishment is sensitive to within Monsoon season PPT event patterns**

2. **Mesquite can establish in grasslands under extreme climatic, rodent/ant predation, and livestock grazing conditions**

3. **Proactive management (e.g., advanced planning) and fire may be the best options for seedling control**

Acknowledgements

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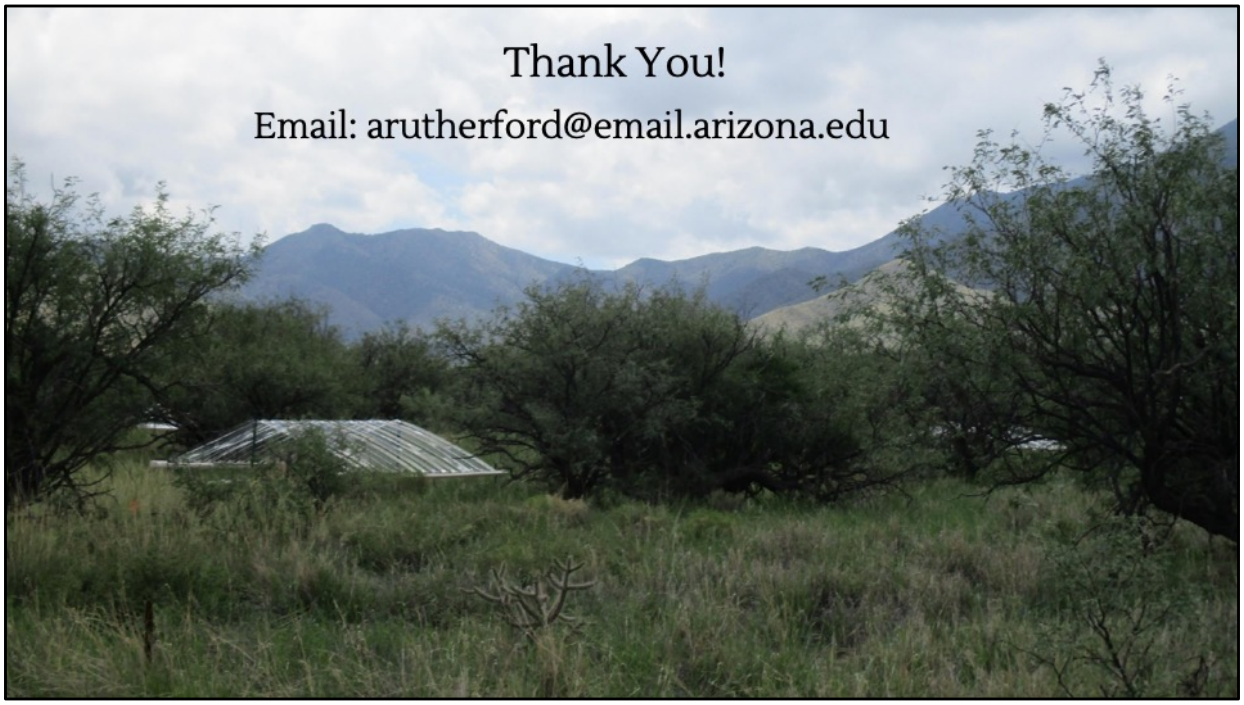
Thank You!
Email: arutherford@email.arizona.edu