

ReclaimNet: Curating collaborative efforts to identify and mitigate barriers to successful dryland reclamation

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Outline



Background



Current restoration/reclamation experiments

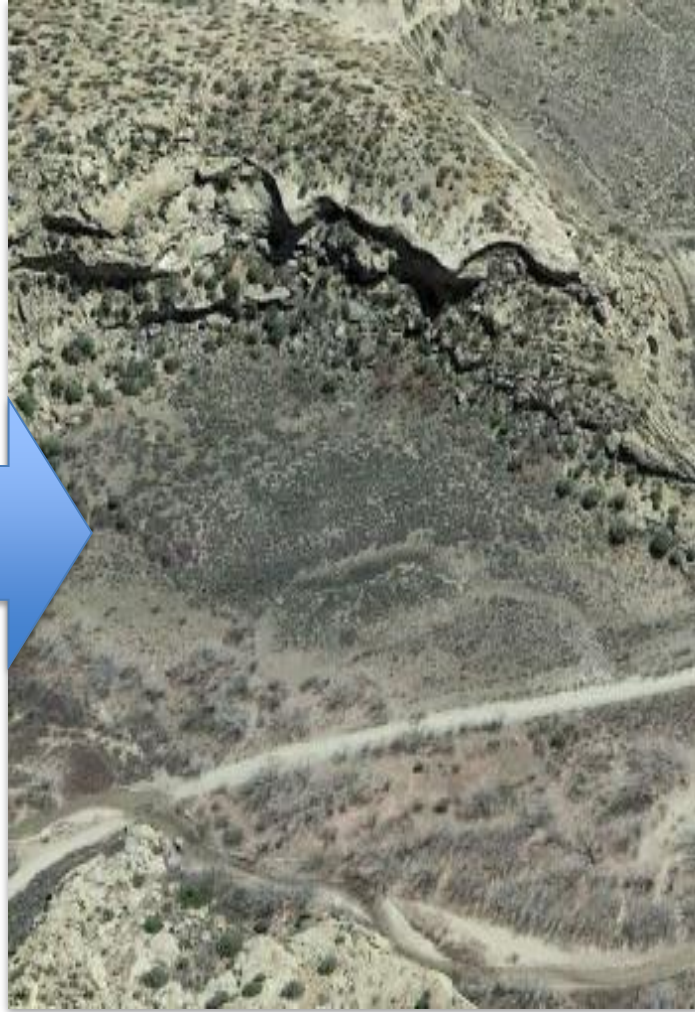


Proposed framework for the Reclamation Network (ReclaimNet)

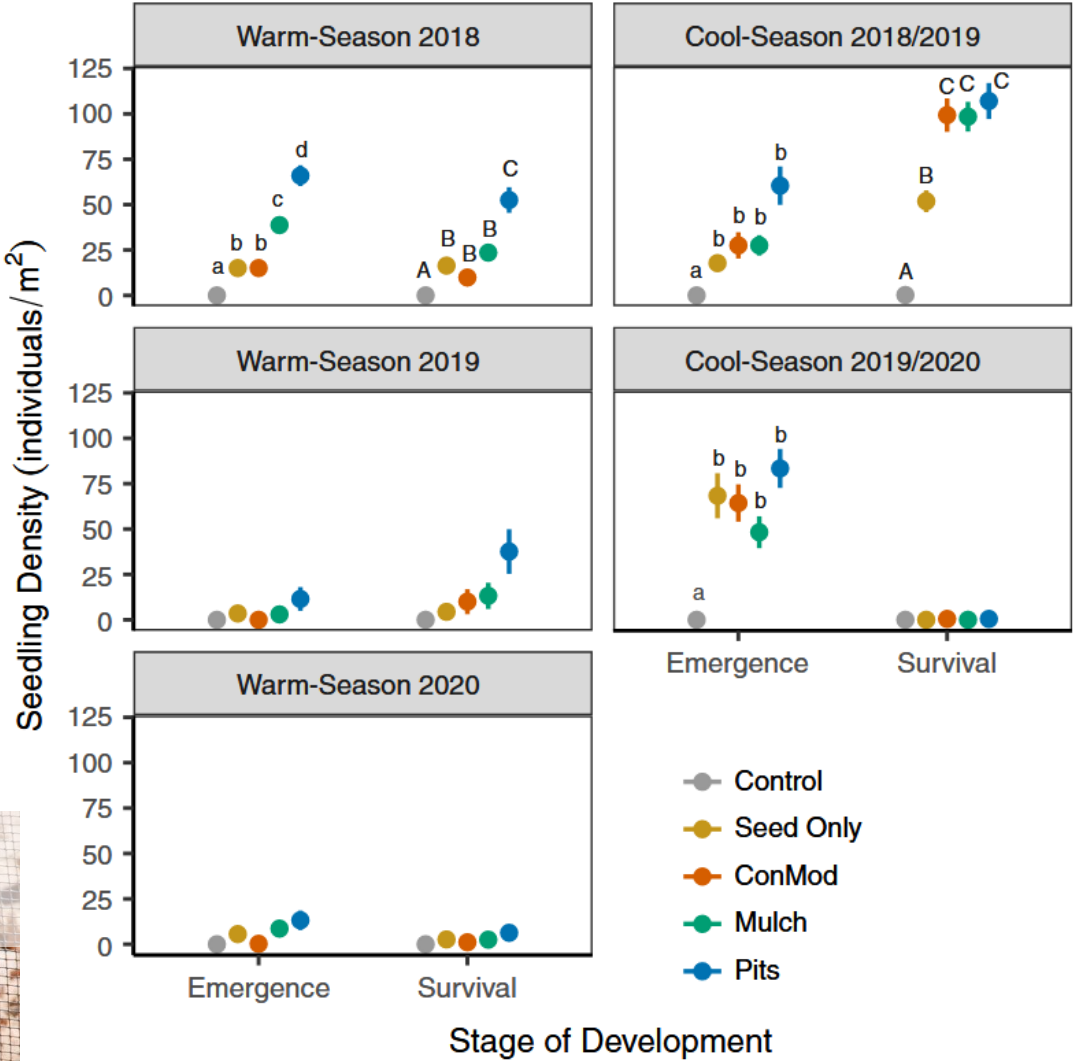
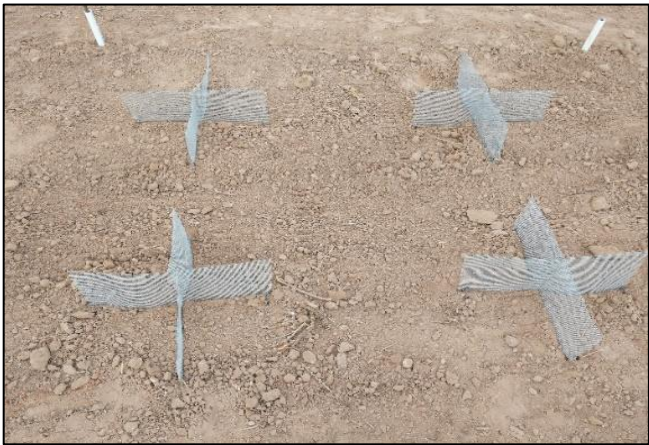


Call for feedback and input

Recovering land is important



RestoreNet



Farrell, H. L., S. M. Munson, B. J. Butterfield, M. C. Duniway, A. M. Faist, E. S. Gornish, C. A. Havrilla, L. Larios, S. C. Reed, H. I. Rowe, K. M. Laushman, and M. L. McCormick. 2023. Ecological Applications 33:e2834.

Oil and gas development can have a **substantial footprint**



Recovery of reclaimed oil and gas well pads is **variable**

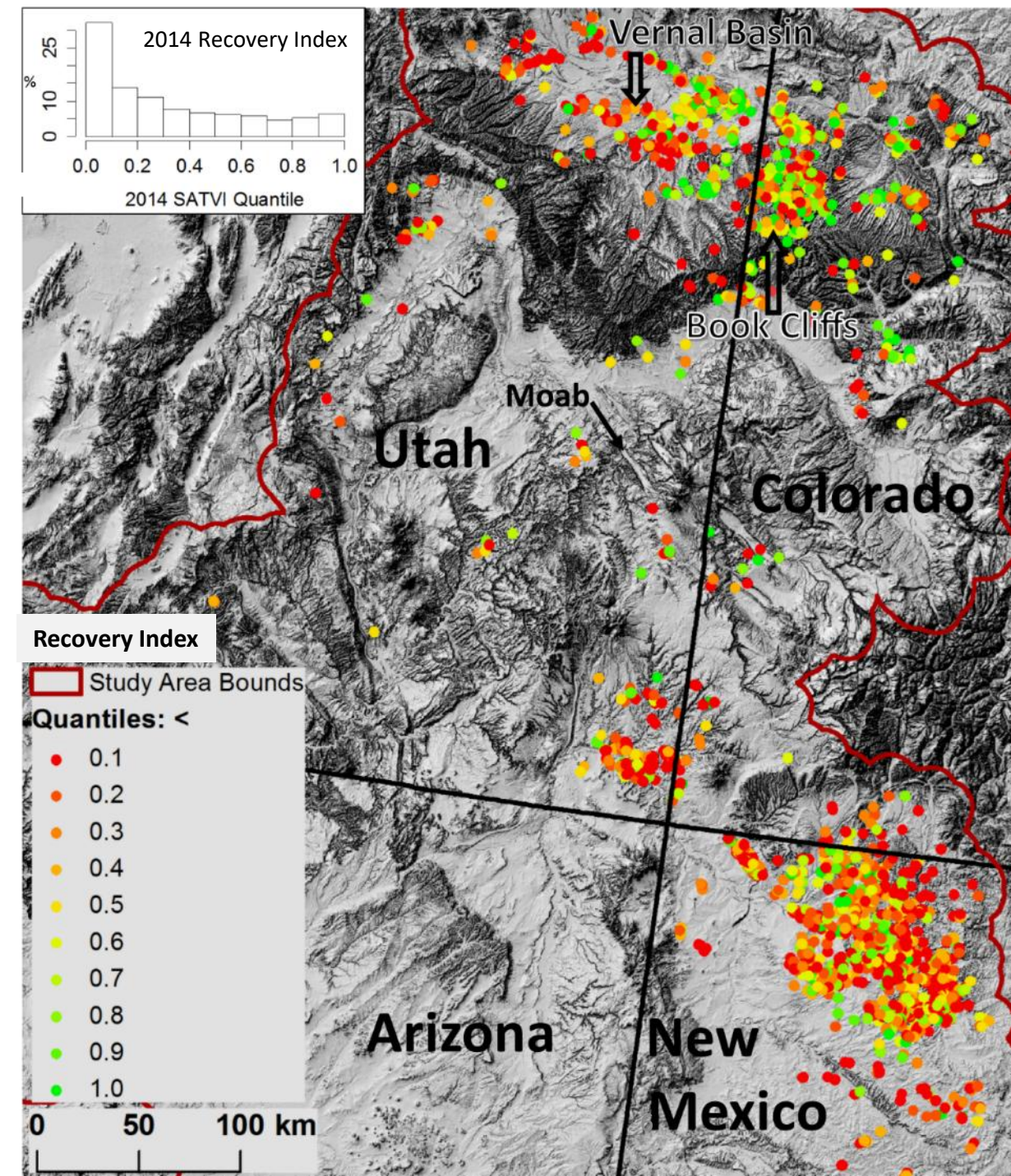
Green = Better than reference

Yellow = OK

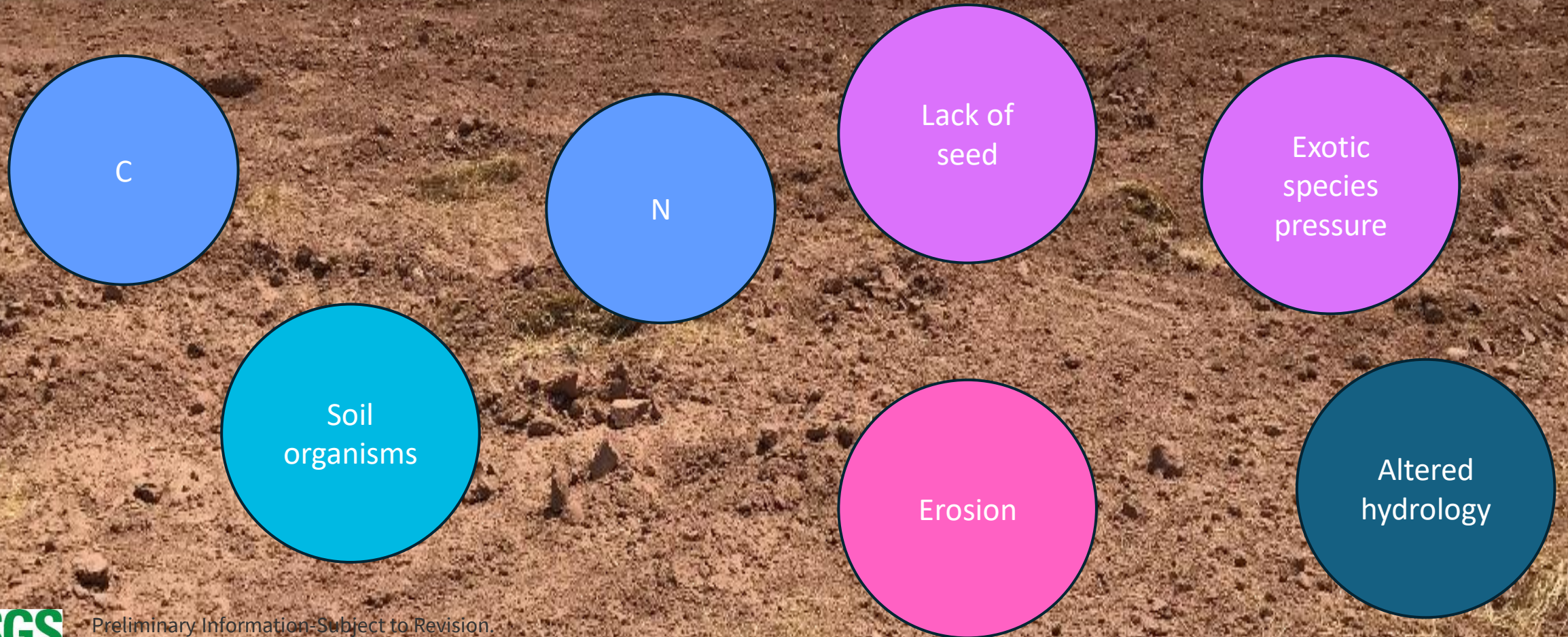
Red = Worse than reference

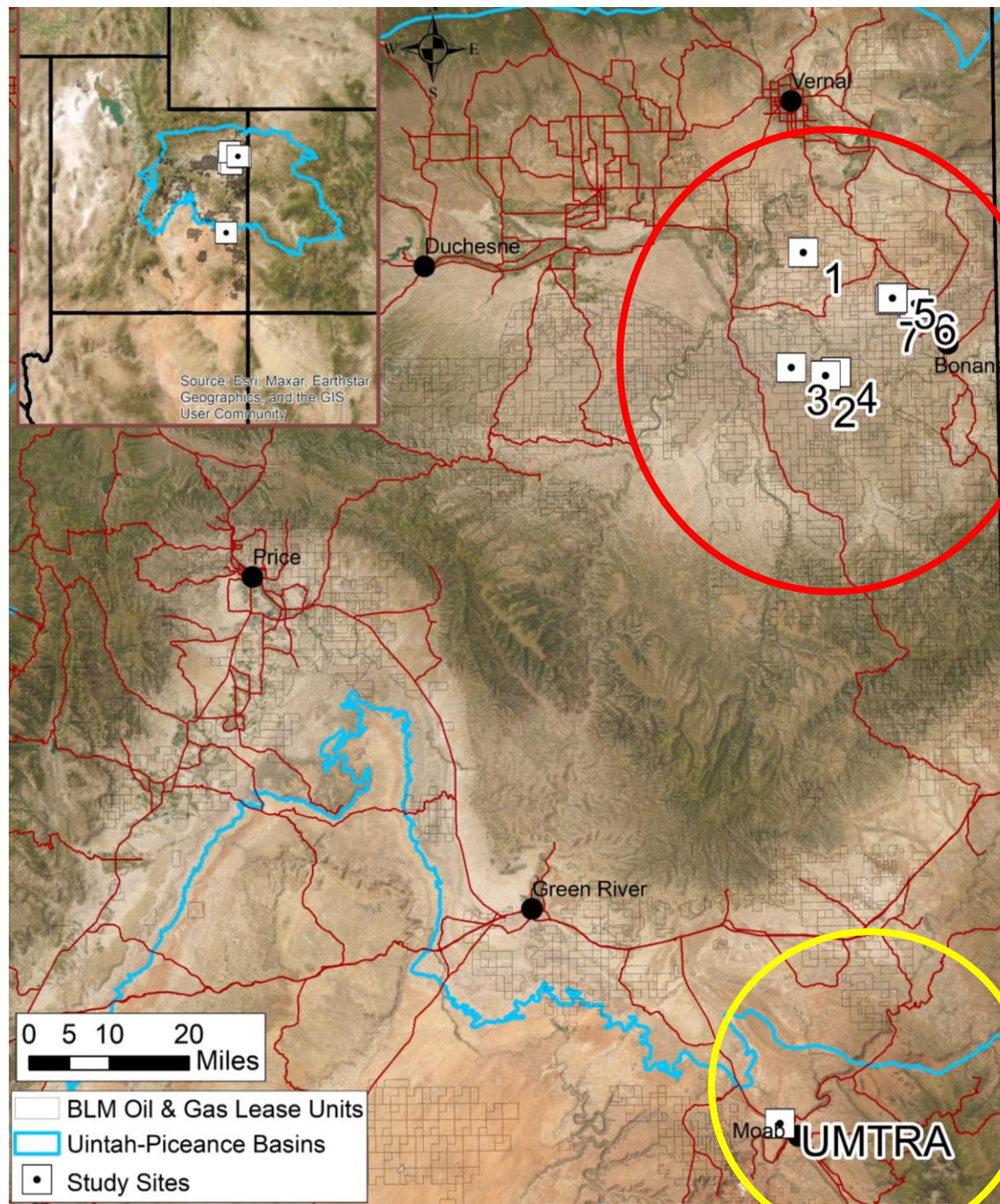
- 1858 wells plugged 1997-2005
- Assessed with Landsat in 2014

Nauman, T. W., M. C. Duniway, M. L. Villarreal, and T. B. 2017.
Science of The Total Environment **584–585:476-488**.



Information Gaps





<u>Site</u>	<u>Year Installed</u>
Pelican	2018
CIGE292	2019
CIGE226	2020
NBU1022	2020
CWD4ML	2021
HOSS6126	2021
HOSS8026	2022
CIGE138A	2023
UMTRA.A	2020
UMTRA.B	2020

Experimental Design



Surface Modifications



Soil Pits



Seedling safe-sites
Con Mods



Cedar Mulch



Collaboration



Preliminary Information-Subject to Revision.
Not for Citation or Distribution

Surface Modifications

+22 Additional Treatments

Local mycorrhizae



Woodstraw



Biocrust



Soil Pits



Seed balls



Biochar



Experimental Design

Seed mixes

Species with warm/dry distributions

Species with cool/wet distributions

SWEDR Mix; Same across sites

Operator Mix; site-specific

Soil Pits



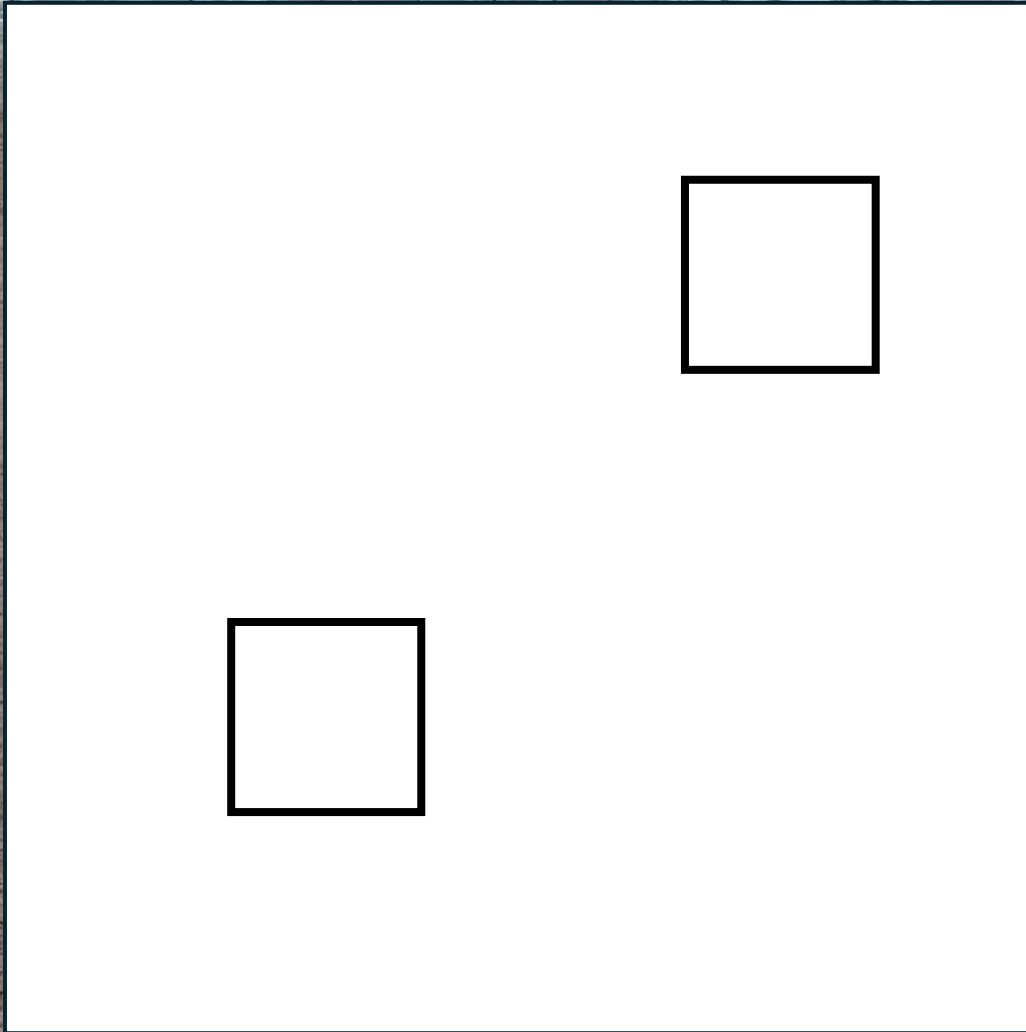
Biocrust Crust

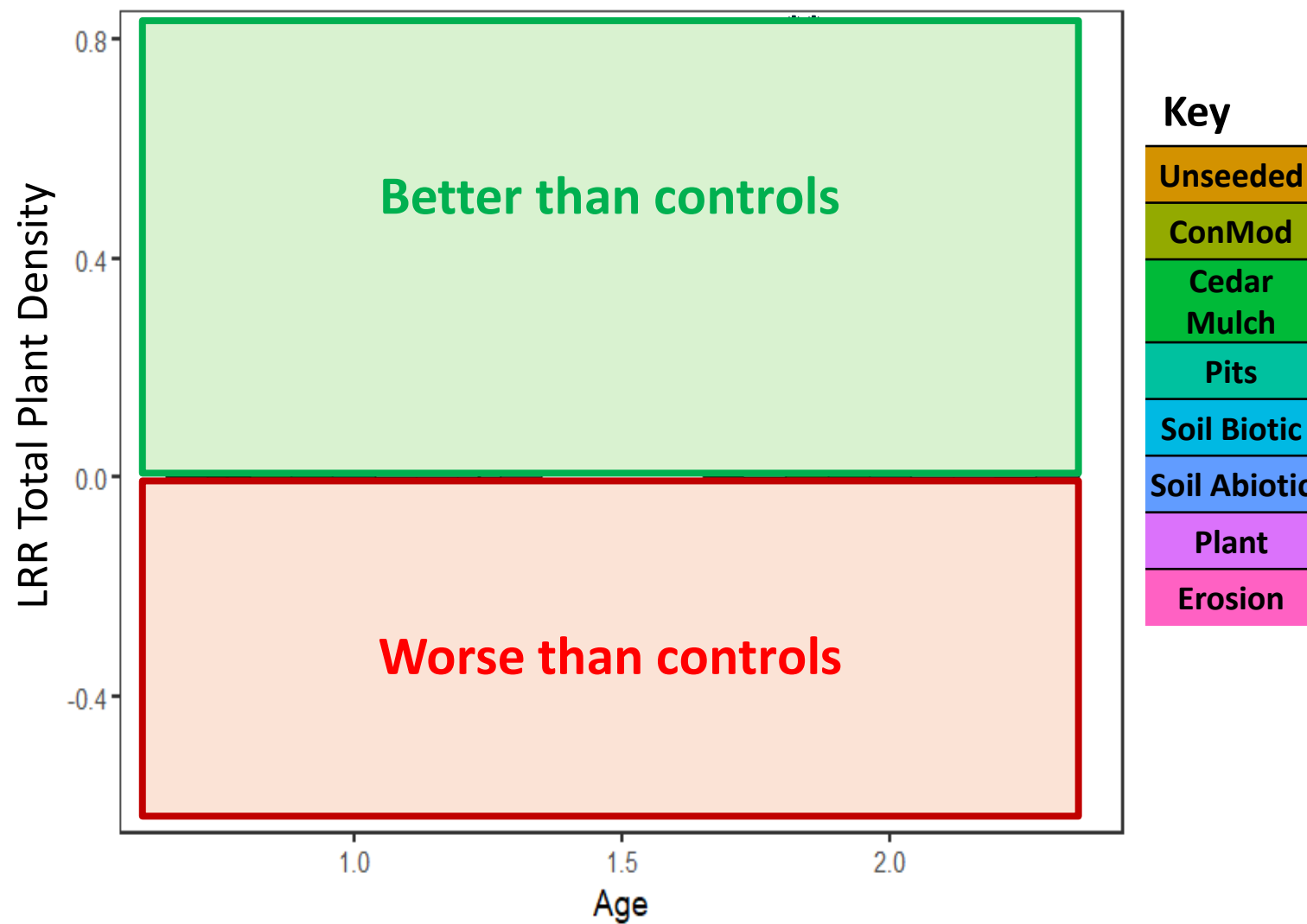


Biochar

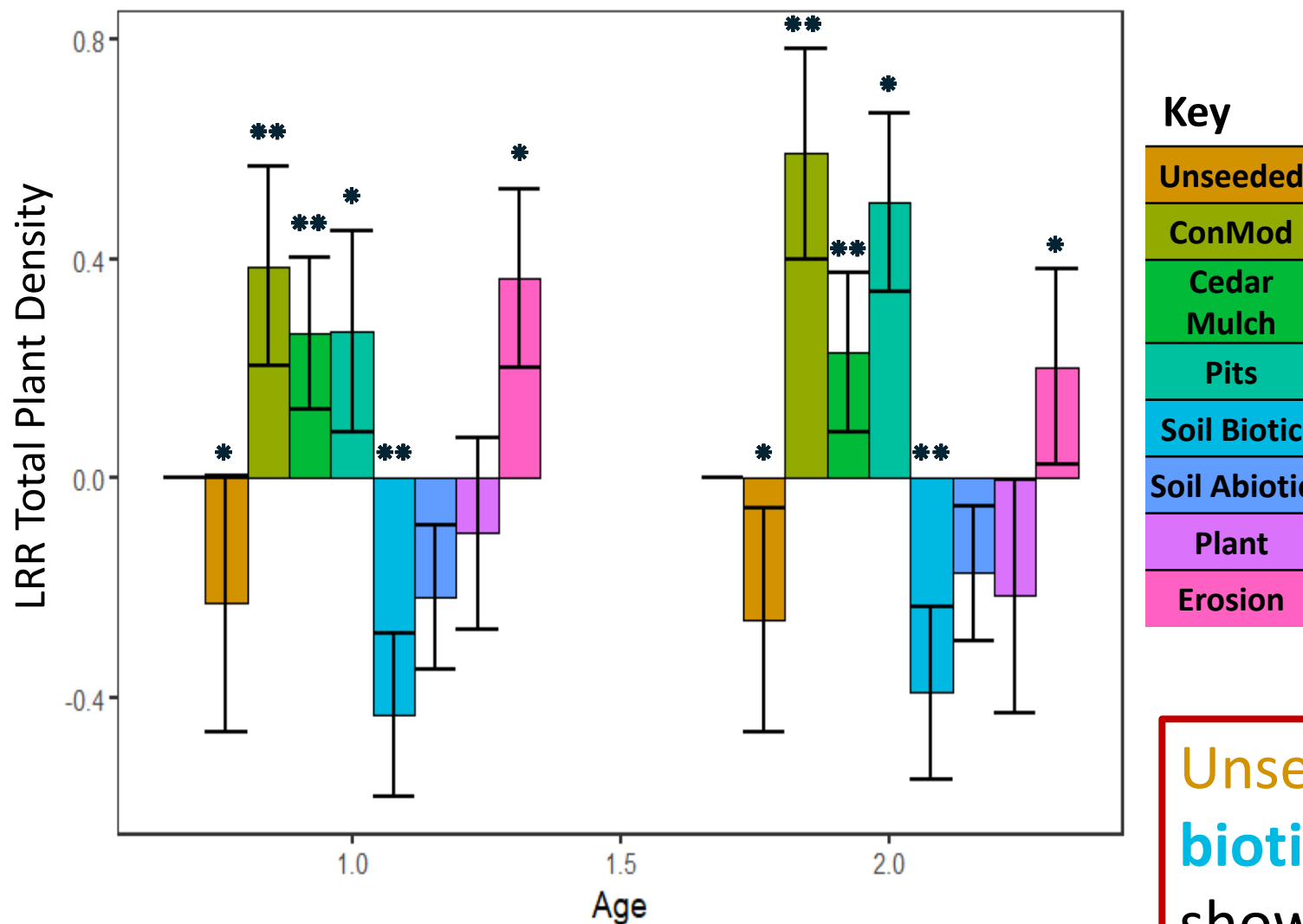


Sampling methodology



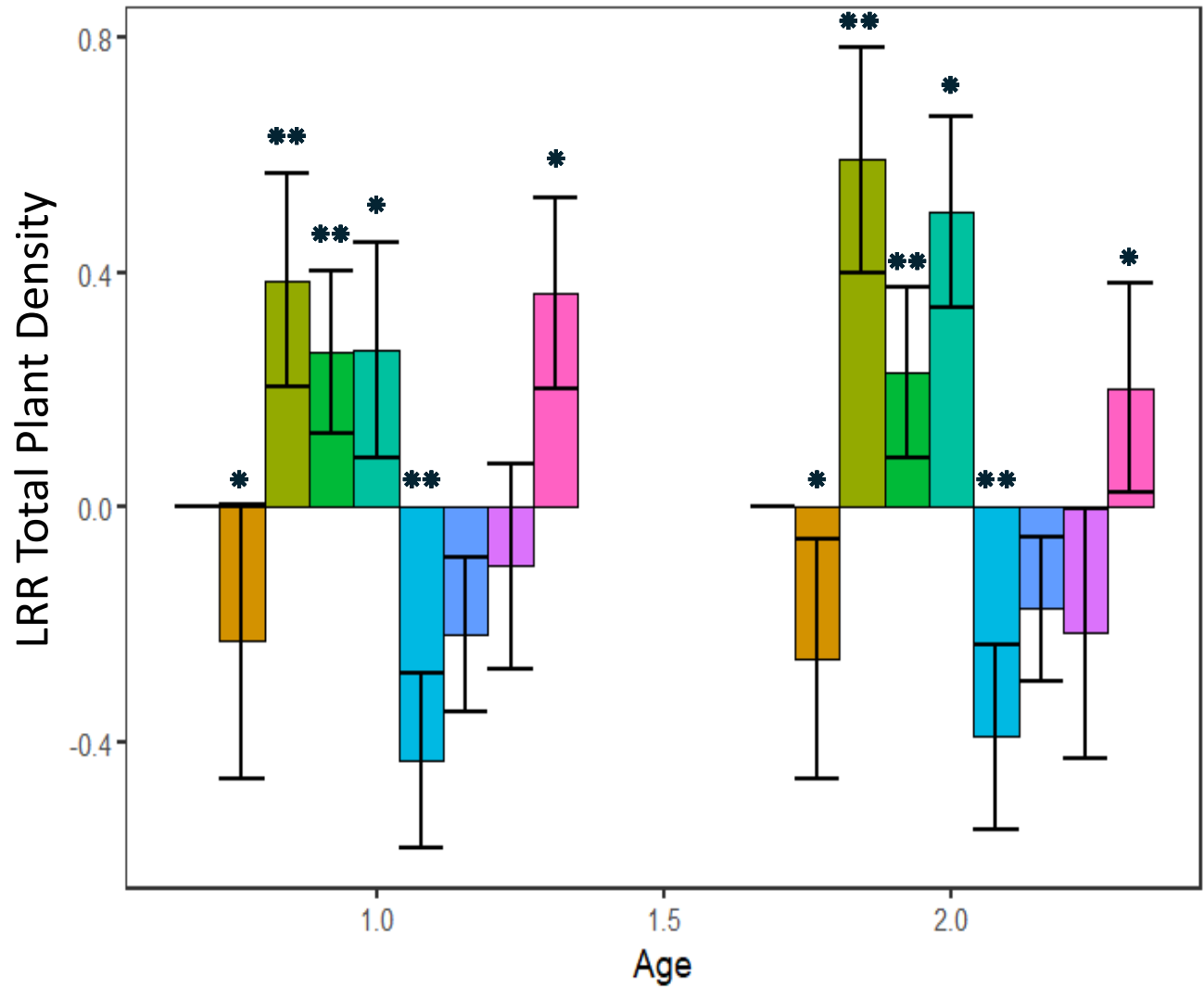


ConMods &
Mulch &
Pits &
Erosion
showed
increased
density



Unseeded & soil
biotic groups
showed decreased
density

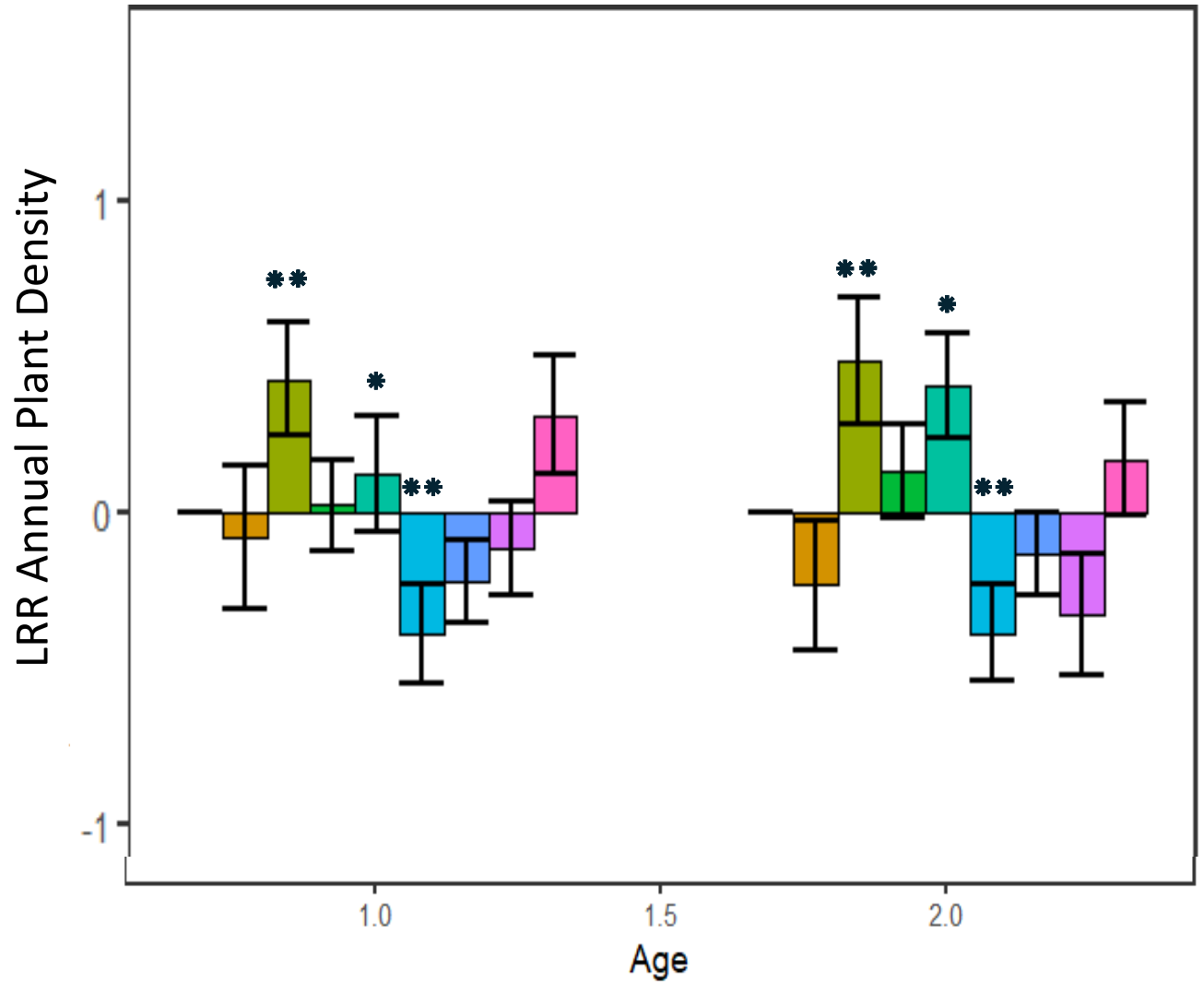
ConMods &
Mulch &
Pits &
Erosion
showed
increased
density



Key	Total	Ann.	Nat.	Per.
Unseeded	Neg			
ConMod	Pos			
Cedar Mulch	Pos			
Pits	Pos			
Soil Biotic	Neg			
Soil Abiotic				
Plant				
Erosion	Pos			

Unseeded & soil
biotic groups
showed decreased
density

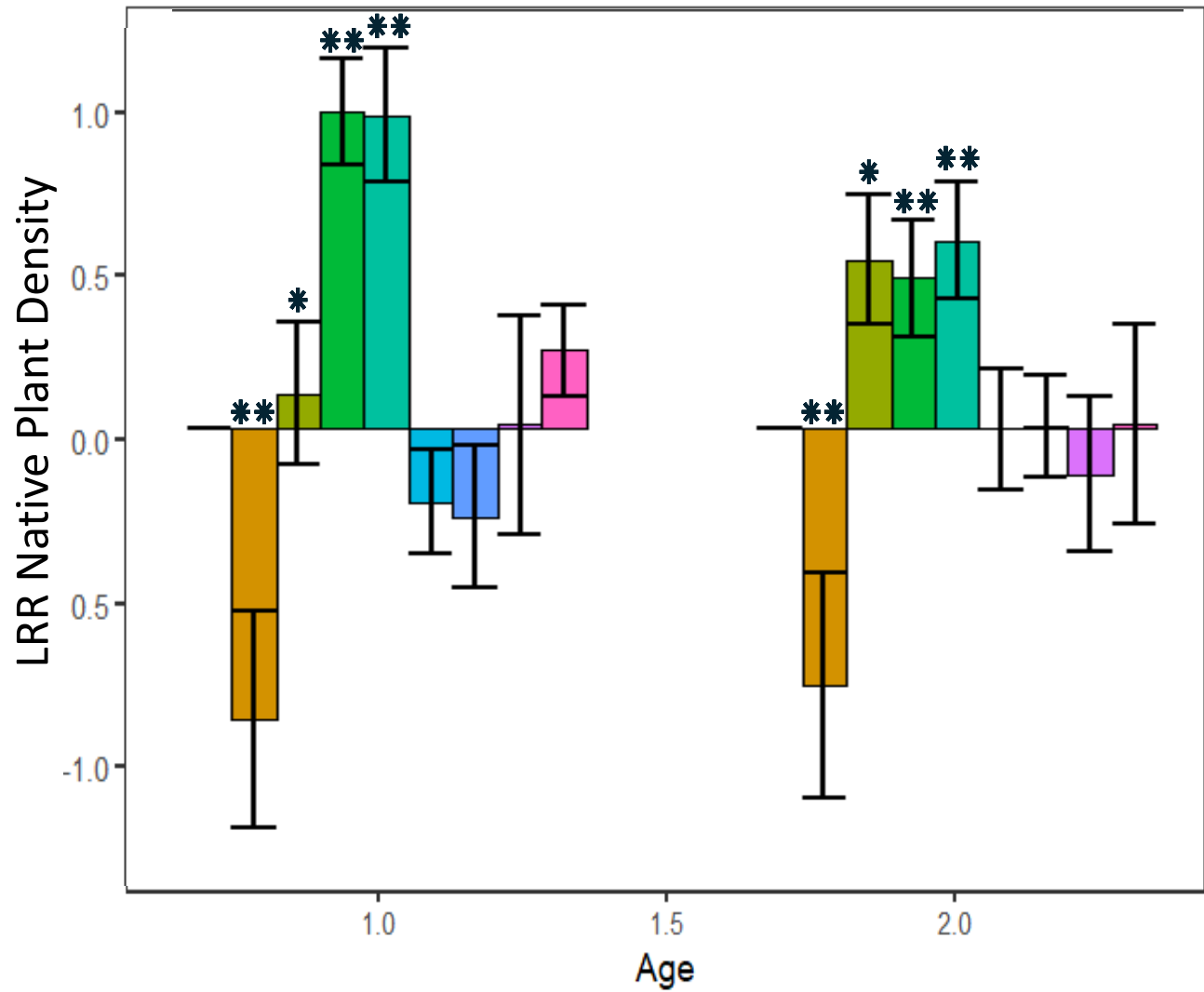
ConMods & Pits showed increased density



Key	Total	Ann.	Nat.	Per.
Unseeded	Neg			
ConMod	Pos	Pos		
Cedar Mulch	Pos			
Pits	Pos	Pos		
Soil Biotic	Neg	Neg		
Soil Abiotic				
Plant				
Erosion	Pos			

Soil biotic group showed decreased density

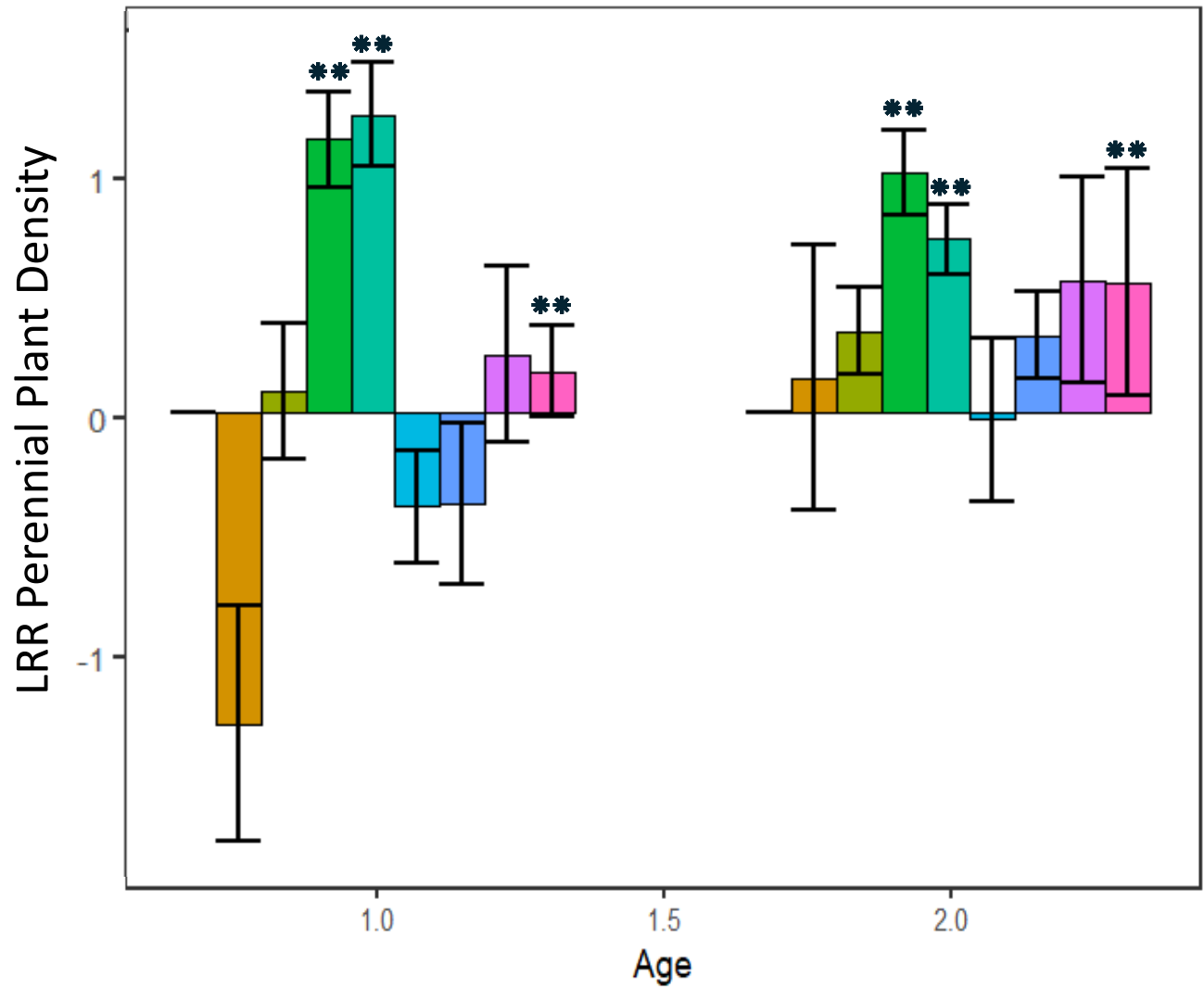
ConMods & Mulch & Pits showed increased density



Key	Total	Ann.	Nat.	Per.
Unseeded	Neg		Neg	
ConMod	Pos	Pos	Pos	
Cedar Mulch	Pos		Pos	
Pits	Pos	Pos	Pos	
Soil Biotic	Neg	Neg		
Soil Abiotic				
Plant				
Erosion	Pos			

Unseeded showed decreased density

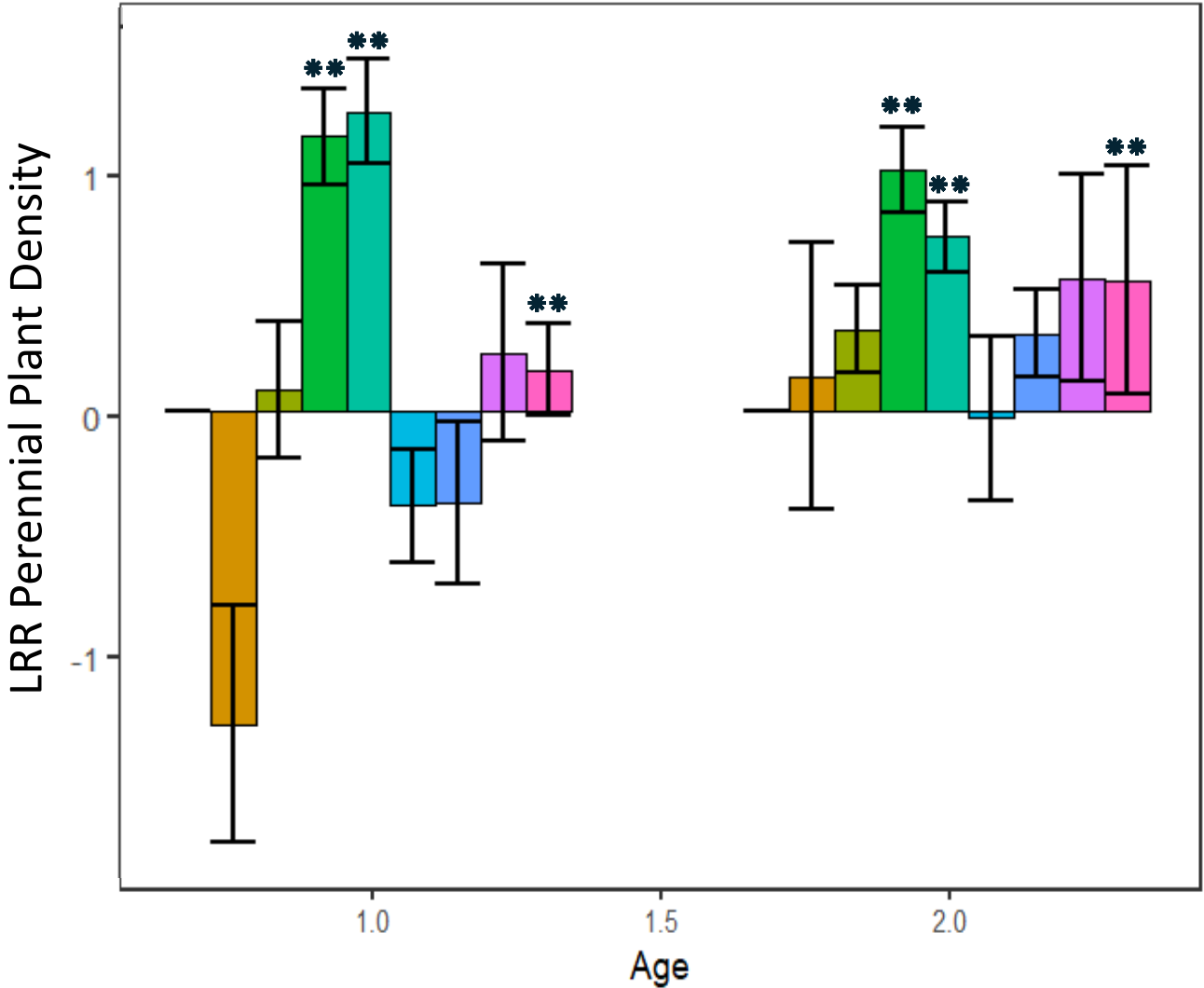
Mulch & Pits & Erosion showed increased density



Key	Total	Ann.	Nat.	Per.
Unseeded	Neg		Neg	
ConMod	Pos	Pos	Pos	
Cedar Mulch	Pos		Pos	Pos
Pits	Pos	Pos	Pos	Pos
Soil Biotic	Neg	Neg		
Soil Abiotic				
Plant				
Erosion	Pos			Pos

Mulch & Pits & Erosion showed increased density

Perennial density increased with Age



Key	Total	Ann.	Nat.	Per.
Unseeded	Neg		Neg	
ConMod	Pos	Pos	Pos	
Cedar Mulch	Pos		Pos	Pos
Pits	Pos	Pos	Pos	Pos
Soil Biotic	Neg	Neg		
Soil Abiotic				
Plant				
Erosion	Pos			Pos
Age				Pos

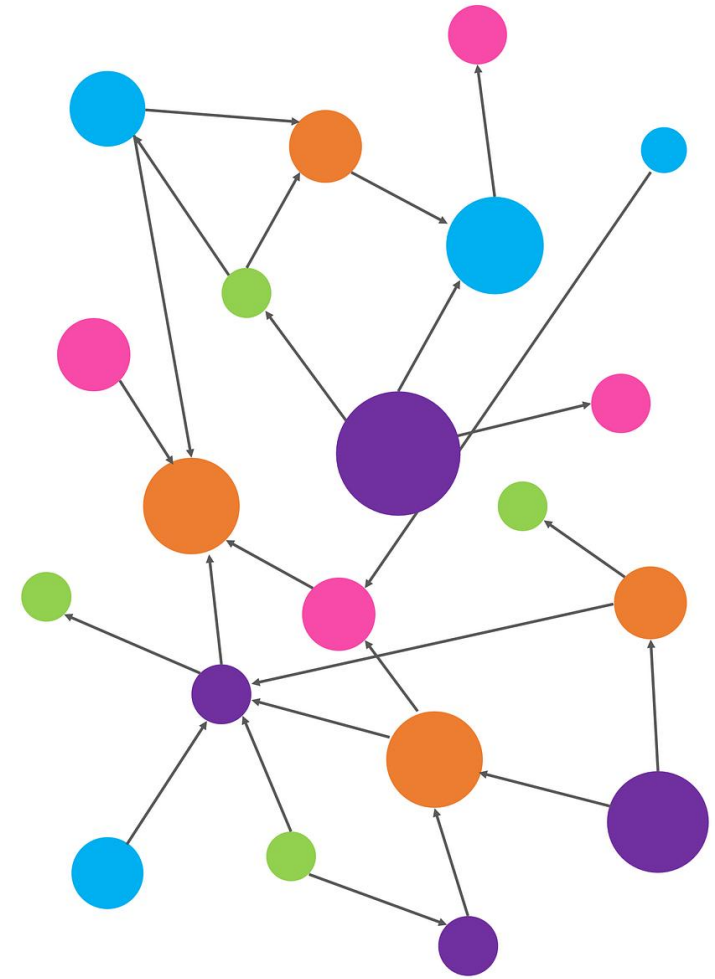
Current Projects

- Clear results show benefits of treatments on annual, native, and perennial species
 - Despite a lot of confounding variables like differences in types of treatments, seed mix, and experimental design
- Broader treatments than RestoreNet to address additional challenges



ReclaimNet

- Network of reclamation focused projects
 - Geared towards drylands in the southwest US
- Tiered levels of involvement
 - Tier 1: Share information on reclamation methods used
 - Tier 2: Standardized monitoring of existing reclamations
 - Tier 3: Network of small-scale experiments



ReclaimNet Benefits

- Increase understanding: Identify factors limiting success and effective and affordable reclamation strategies.
- Co-production of knowledge: Ecologists and land managers work together to decide which treatments to test, interpret results, and explore new ideas.
- Accessibility: Different tiers of investment make involvement low risk while building understanding to support experimental projects.

Tier 1

- Surveys on information of methods used and their general success metrics from existing reclamations
- Identify current practices and research gaps
- Increase communication between practitioners and scientists



Tier 2

- Surveys of pre-existing reclamations
 - Standardized one-time methods
- Information that could be collected:
 - Plant & soil stability metrics
 - Site location
 - Disturbance type & severity
 - Reclamation/restoration month/year
 - Date data collected



Tier 3

- Small-scale experiments installed in many locations in the southwestern US
 - Strategically test across climate and site gradients
- Using same methods & experimental design as previous experiments



Discussion & Follow-up

- Would you/your company be willing and able to share information about existing reclamations?
- Is there access to existing reclamations for standardized surveys?
- Is there opportunity to install experiments in new reclamations?
- Are there individuals/organizations that I should reach out to?
 - Anyone interested in joining creating the project?
- These are long-term goals and this is the first step
 - Some are more achievable sooner rather than later