

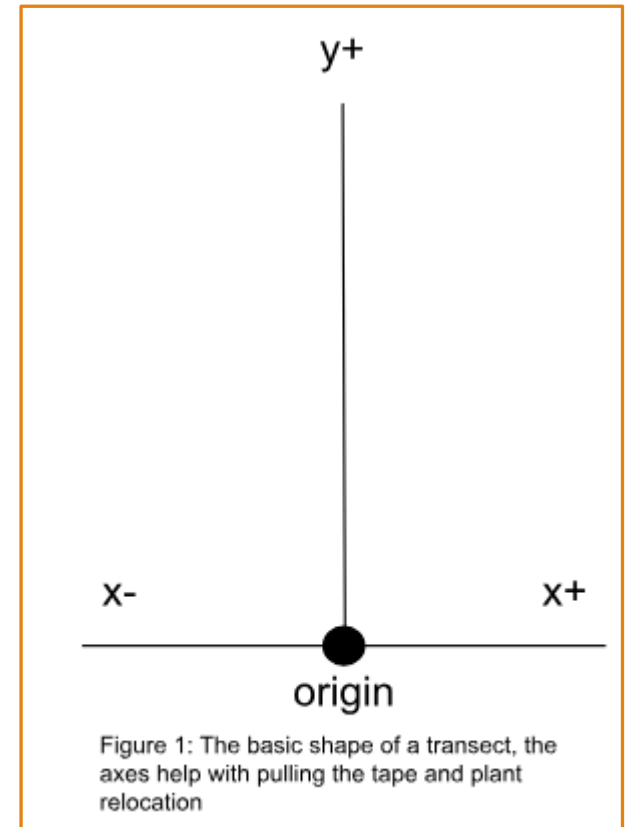
# BLM Rare Plant Demographic Monitoring

DAN HUGHES, INSTITUTE FOR APPLIED ECOLOGY  
FOR THE NM RARE PLANT TECHNICAL COUNCIL

All photo credits Alo Dodge & Helena Mieras unless credited otherwise

# Demographic Monitoring Basics

- ❖ Data collection began 2017
  - ❖ 115 plots, including macroplots
  - ❖ Annual reports
- ❖ Our crew monitors 10 species
  - ❖ Plus 1 helping Katie Sandbom, FWS
- ❖ Goals:
  - ❖ Standardized protocol for fine-scale demographic data collection.
    - ❖ *Measuring and Monitoring Plant Populations* Elzinga et al. 1998
  - ❖ Extrapolate results throughout our range.
  - ❖ Answer basic life-history questions.
  - ❖ Population viability analyses.



We also incorporate Dr. Carril's pollinator studies

# Transition Matrix Modeling

**Table 7.** Stage Class Definitions for *Townsendia gypsophila*

Stage Classes	Definitions
1	Seedling
2	Vegetative Adult
3	Reproductive Adult, 1-5 Reproductive Structures
4	Reproductive Adult, 6+ Reproductive Structures

Based on:

- Life history
- Observations
- Distribution

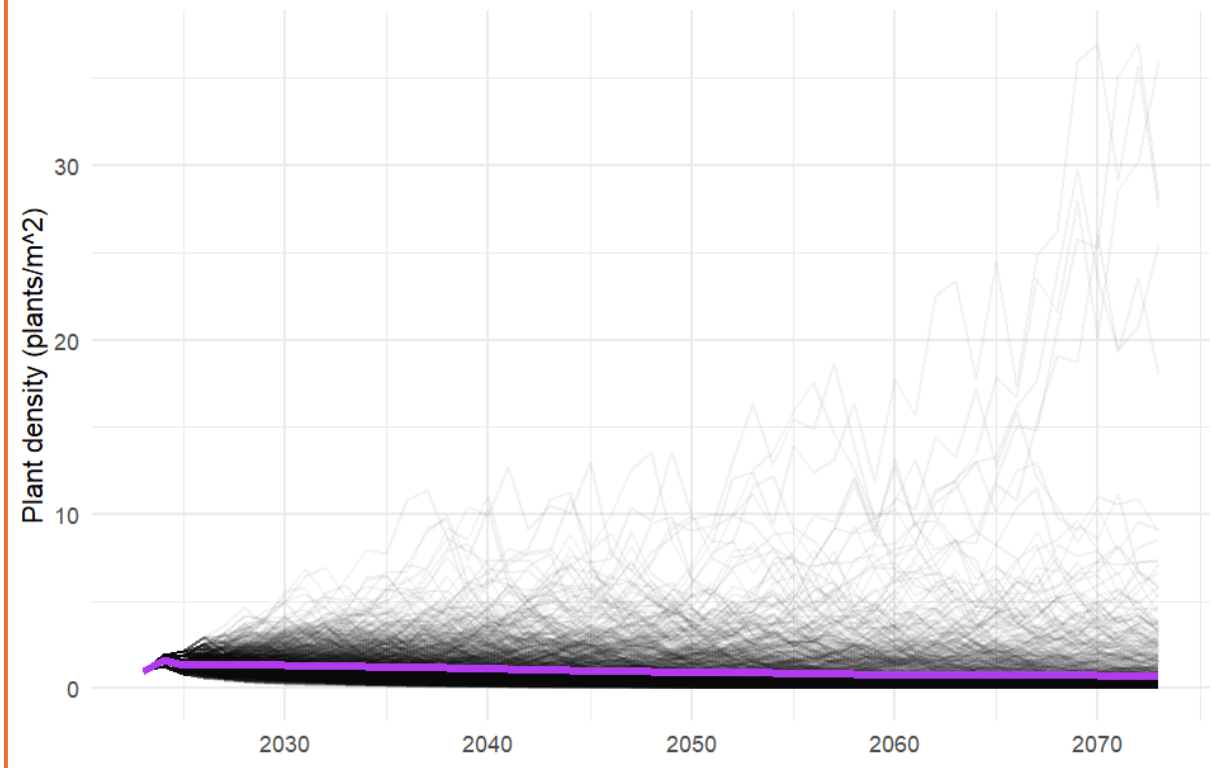
Vital Rates for *Townsendia gypsophila*

	From				
To		1	2	3	4
1		0.0000	0.0000	1.1645	1.9556
2		0.1769	0.1956	0.0729	0.0457
3		0.4615	0.3448	0.5101	0.3436
4		0.1667	0.0749	0.2726	0.4707

Improves with more data

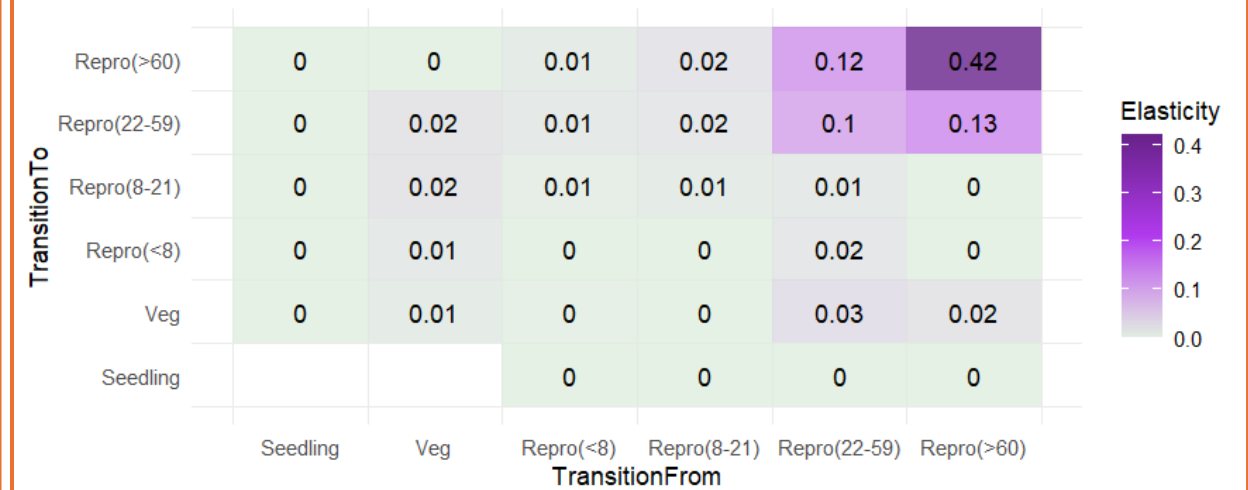
# Population Viability Analysis

Projected *Aliciella formosa* density, 2023-2073

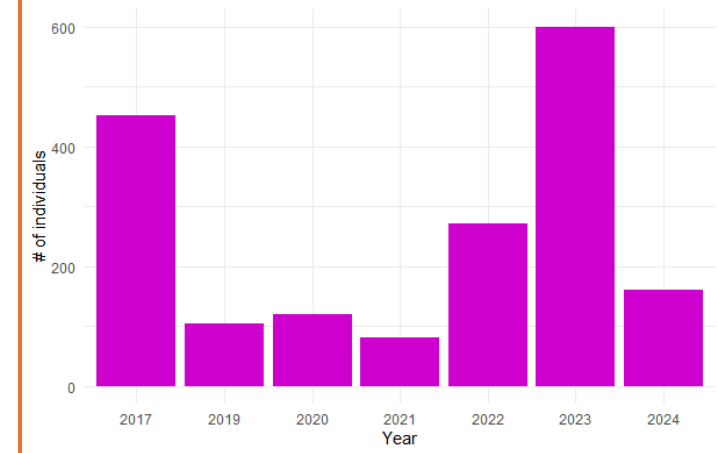


Stochastic modeling (1000 simulations)

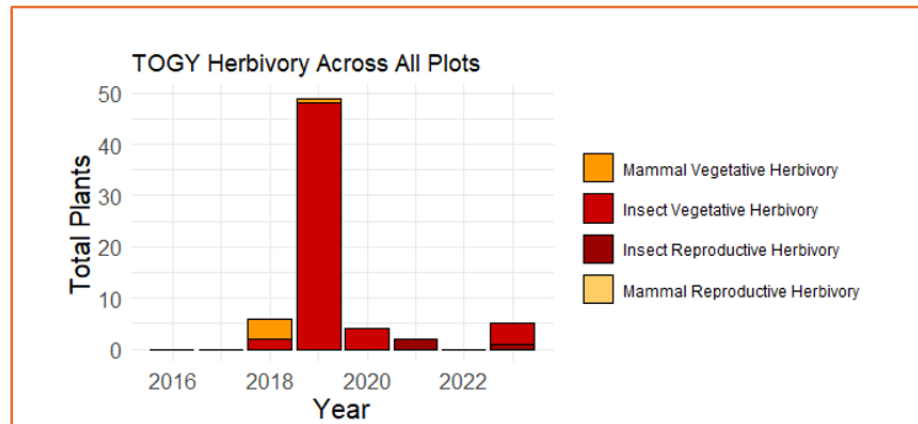
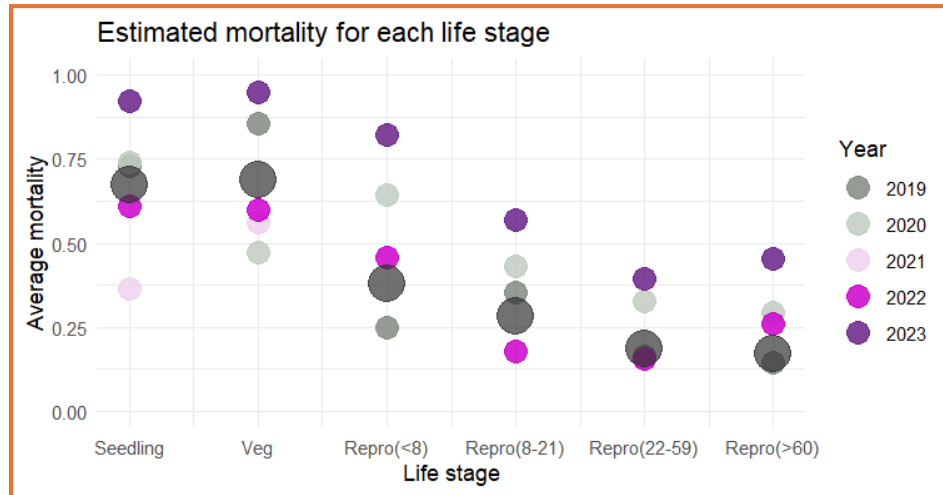
Elasticities for each stage transition in Aztec *Gilia* populations



Live ALFO Plants Across All Plots



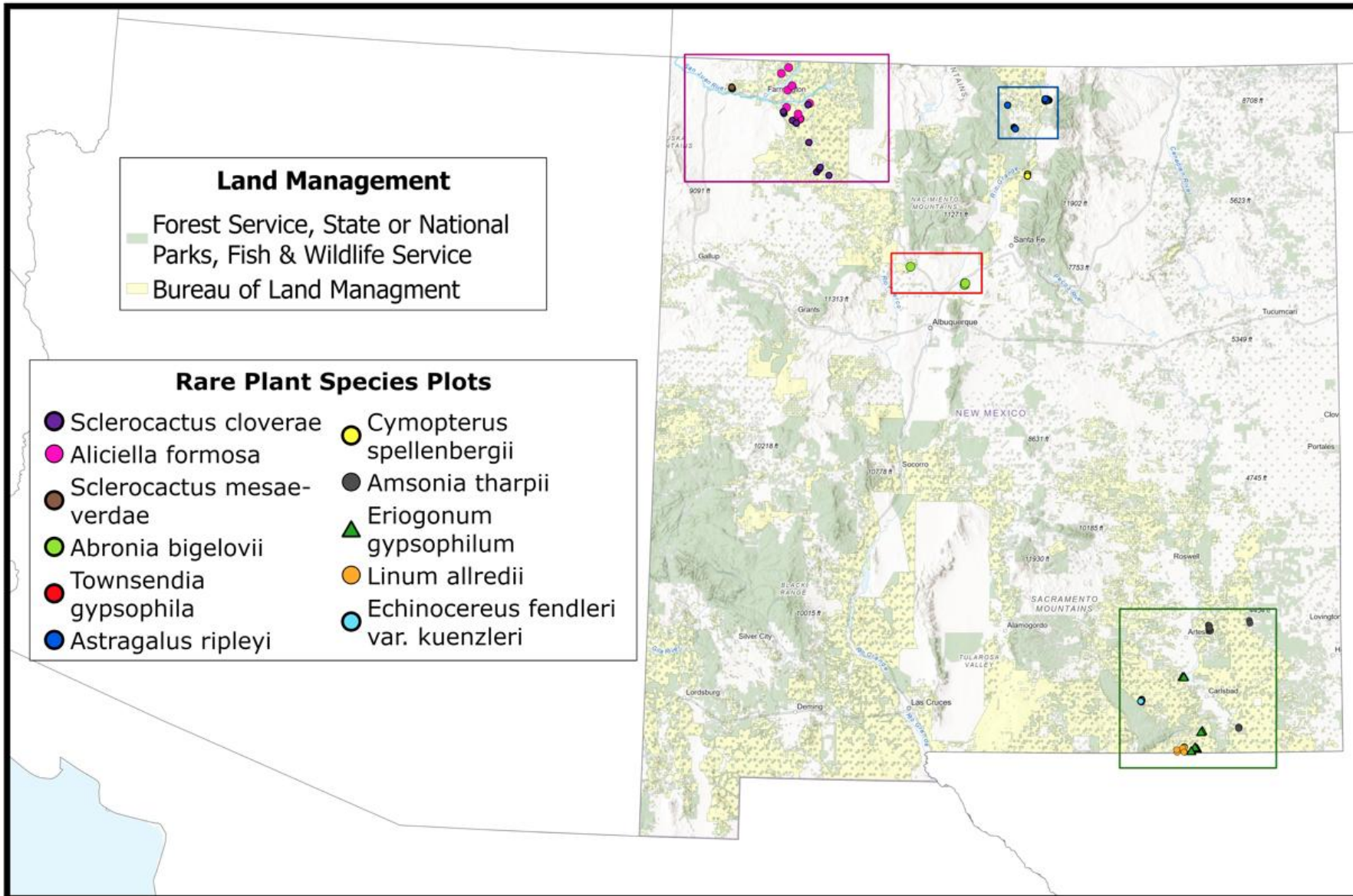
# Many other potentially important factors



Additionally:

- Size
- Phenology/Fecundity
- Associated species

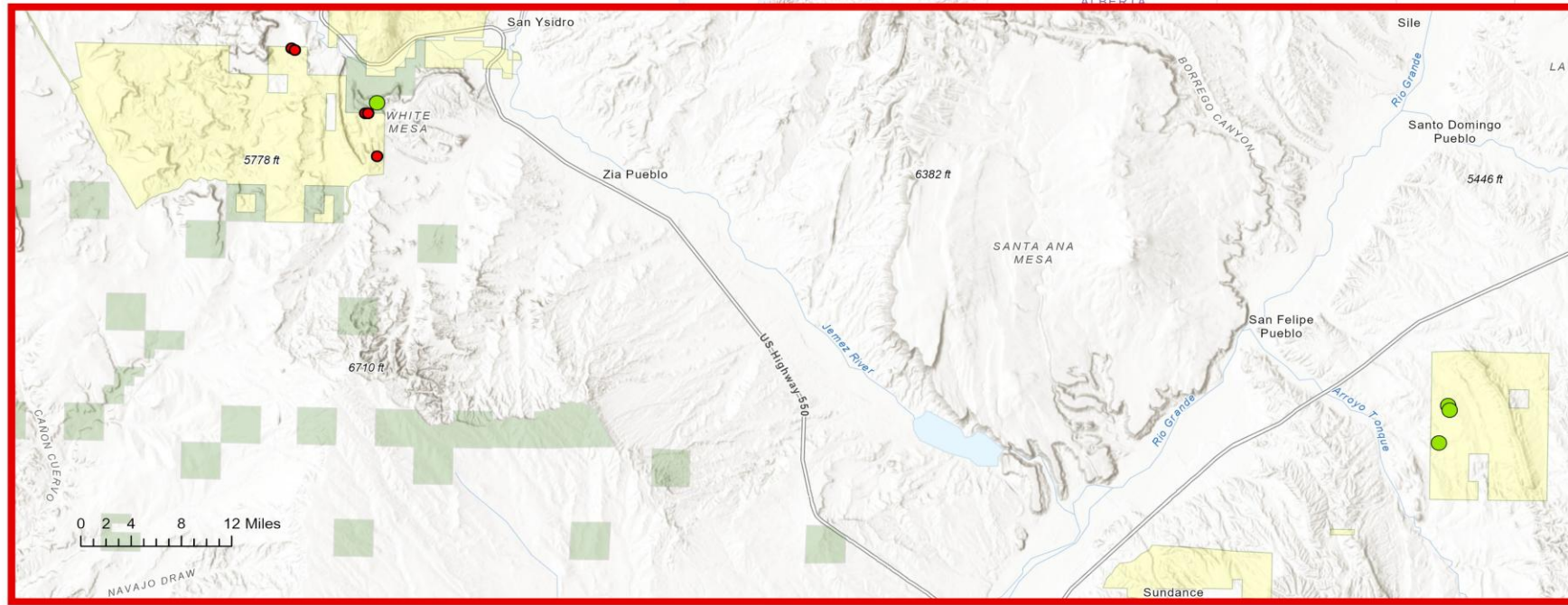
# Study Areas



Rare Plant Species	# of Monitoring Plots
<i>Sclerocactus cloverae</i>	21
<i>Aliciella formosa</i>	10
<i>Sclerocactus mesae-verdae</i>	9
<i>Townsendia gypsophila</i>	5
<i>Astragalus ripleyi</i>	14
<i>Cymopterus spellenbergii</i>	18
<i>Amsonia tharpaii</i>	22
<i>Eriogonum gypsophilum</i>	20
<i>Echinocereus fendleri var. kuenzleri</i>	5
<i>Abronia bigelovii</i>	6
<i>Linum alredii</i>	6

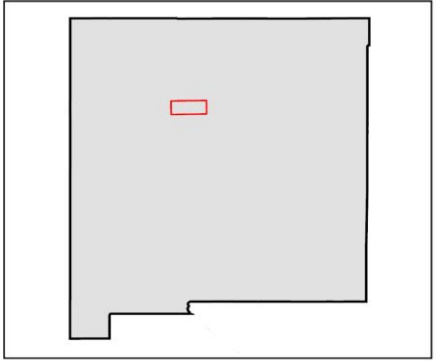


# Rio Puerco BLM Field Office



- Rare Plant Species Plots**
- Townsendia gypsophila
  - Abronia bigelovii

- Land Management**
- Forest Service, State or National Parks, Fish & Wildlife Service
  - Bureau of Land Management



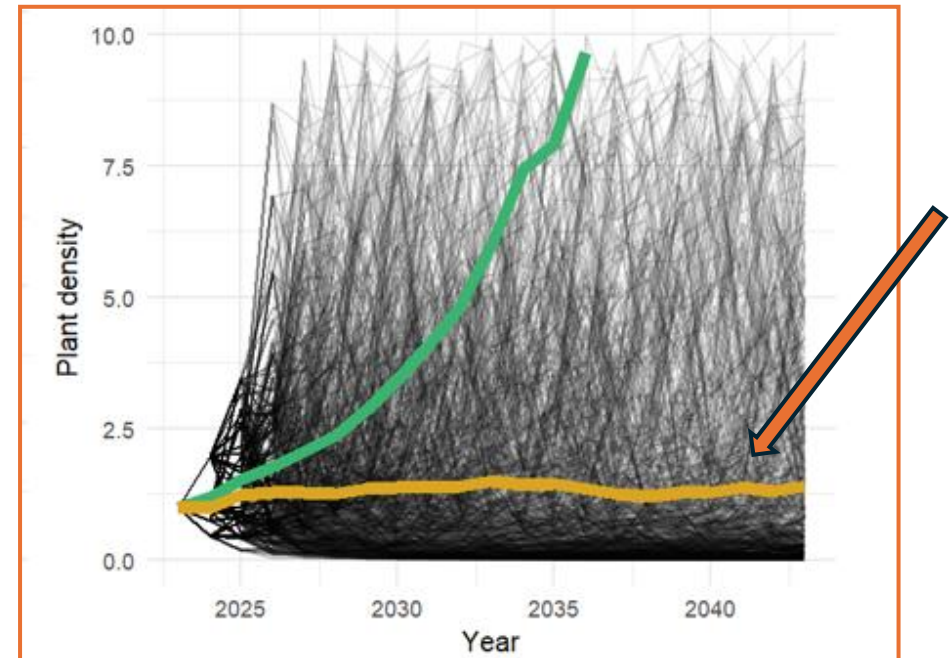
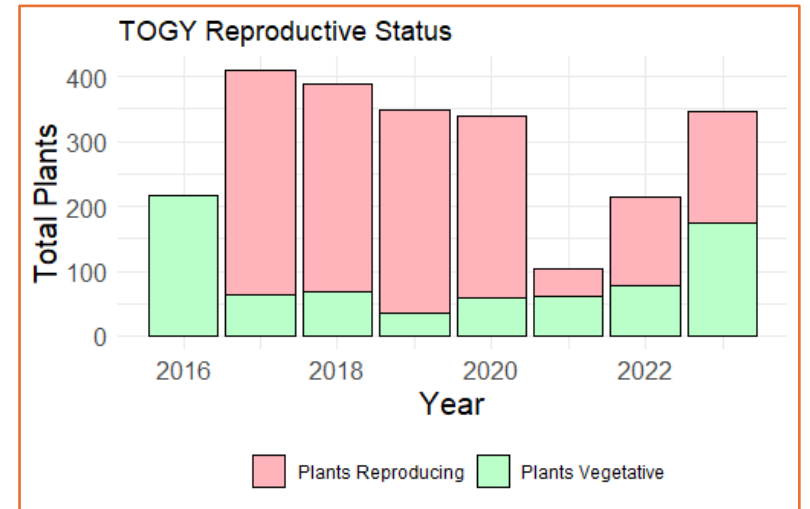
Species	# of Plots
<i>Townsendia gypsophila</i>	5
<i>Abronia bigelovii</i>	6

# *Townsendia gypsophila*

*Townsend's gypsum aster* (Asteraceae)



Photo from 2023 monitoring report



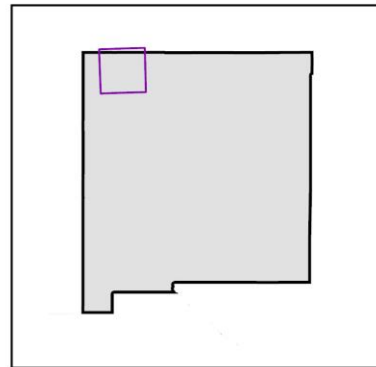
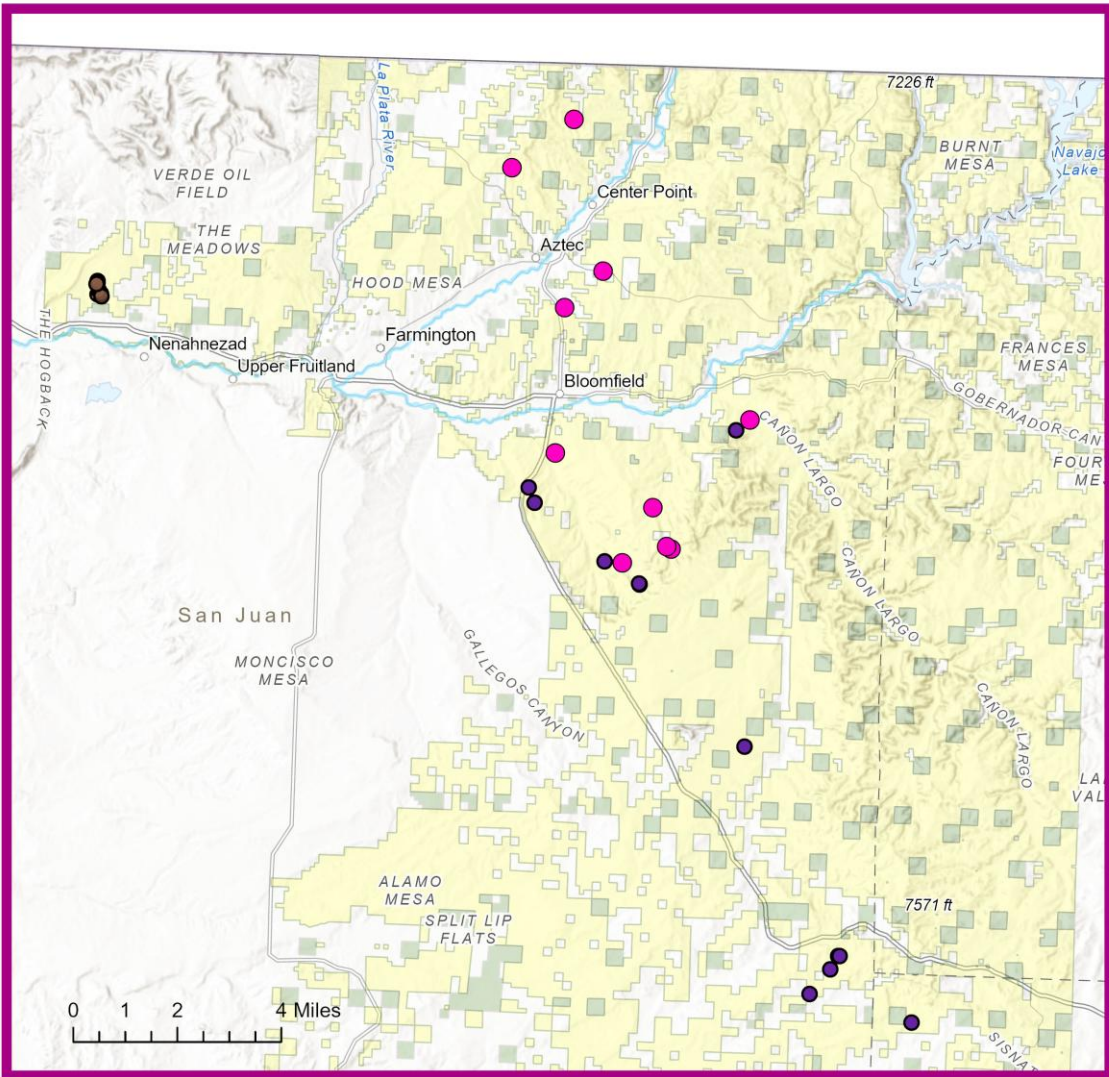


# *Abronia bigelovii*

*Galisteo sand-verbena* (Nyctaginaceae)



# Farmington BLM Field Office



- Rare Plant Species Plots**
- *Sclerocactus cloverae*
  - *Aliciella formosa*
  - *Sclerocactus mesae-verdae*

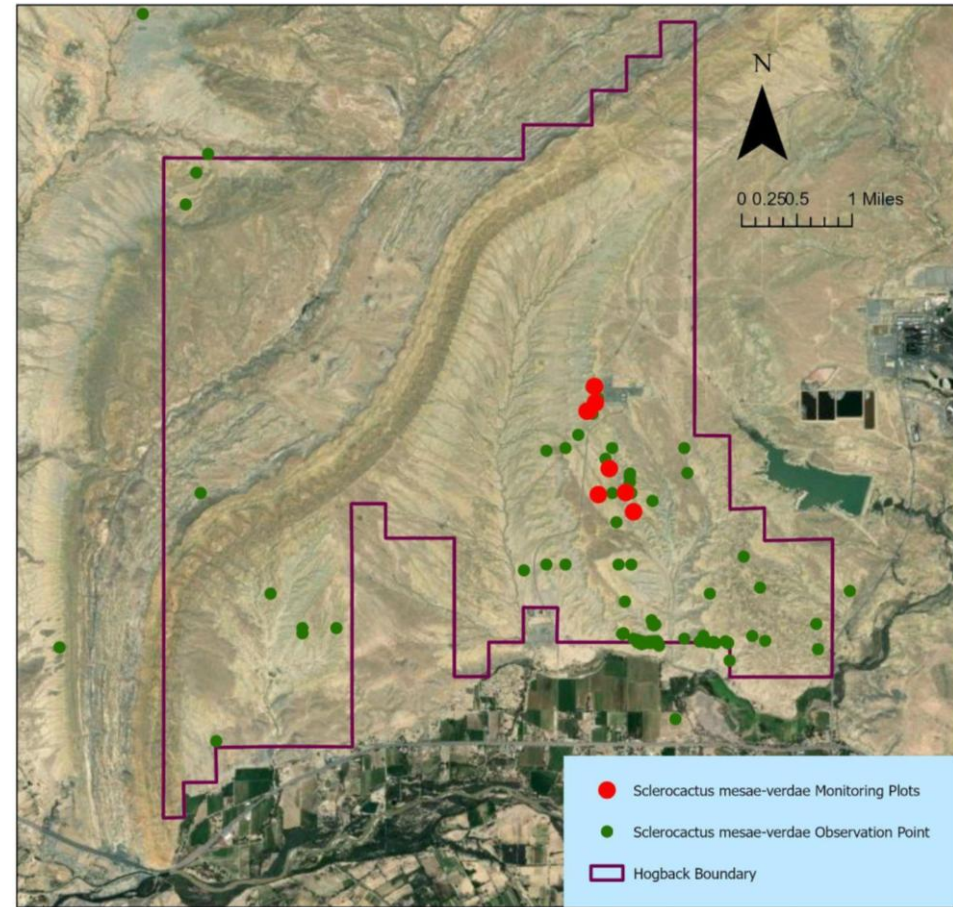
- Land Management**
- Forest Service, State or National Parks, Fish & Wildlife Service
  - Bureau of Land Management

Species	# of Monitoring Plots
<i>Sclerocactus cloverae</i>	21
<i>Aliciella formosa</i>	10
<i>Sclerocactus mesae-verdae</i>	9



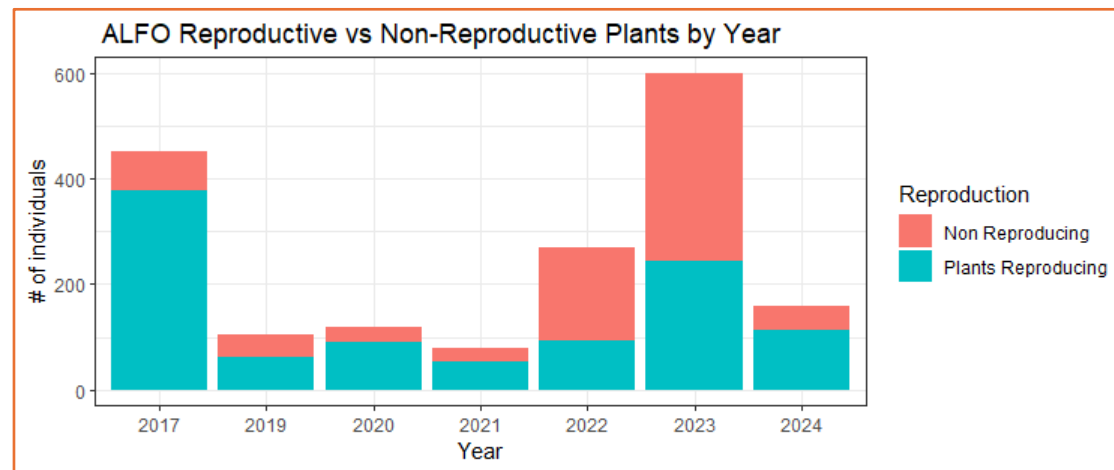
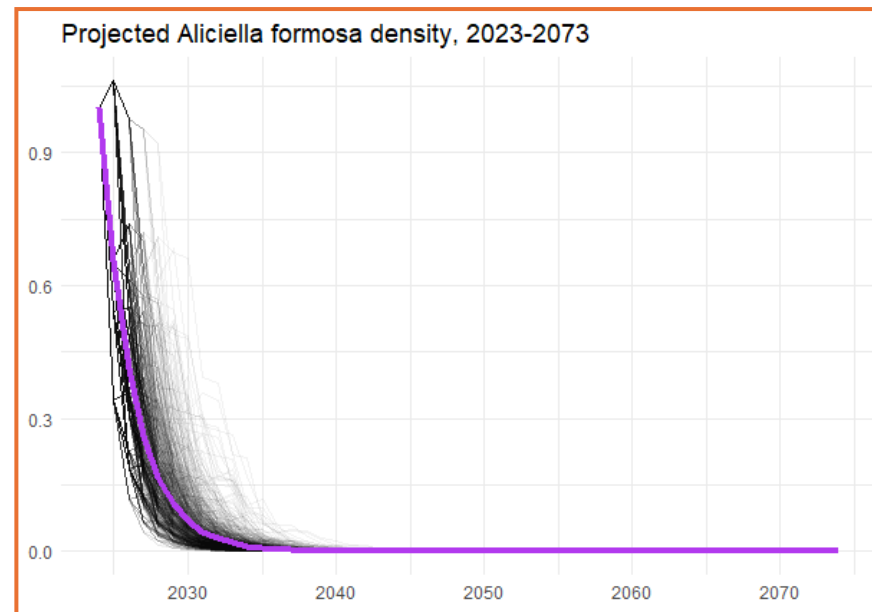
# *Sclerocactus mesae-verdae*

*Mesa Verde cactus* (Cactaceae)



# *Aliciella formosa*

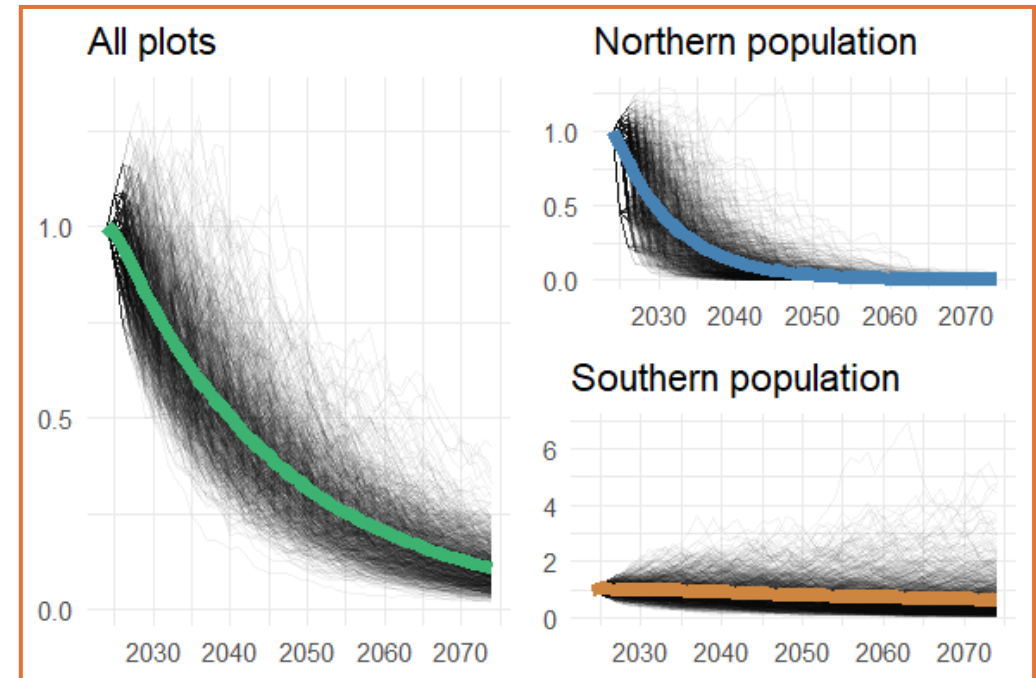
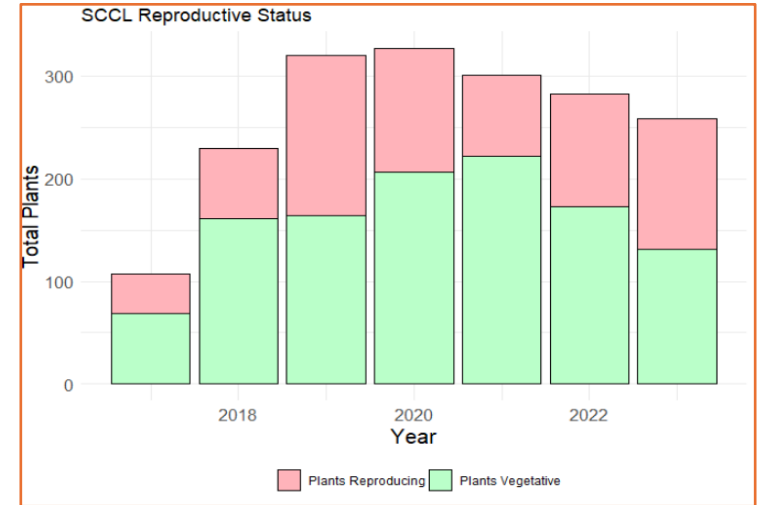
*Aztec gilia* (Polemoniaceae)



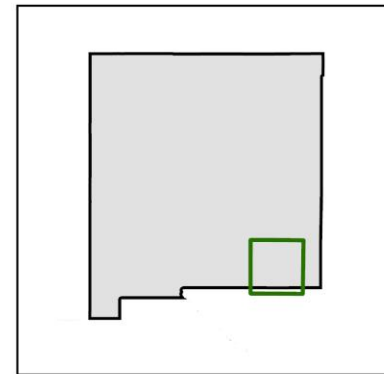
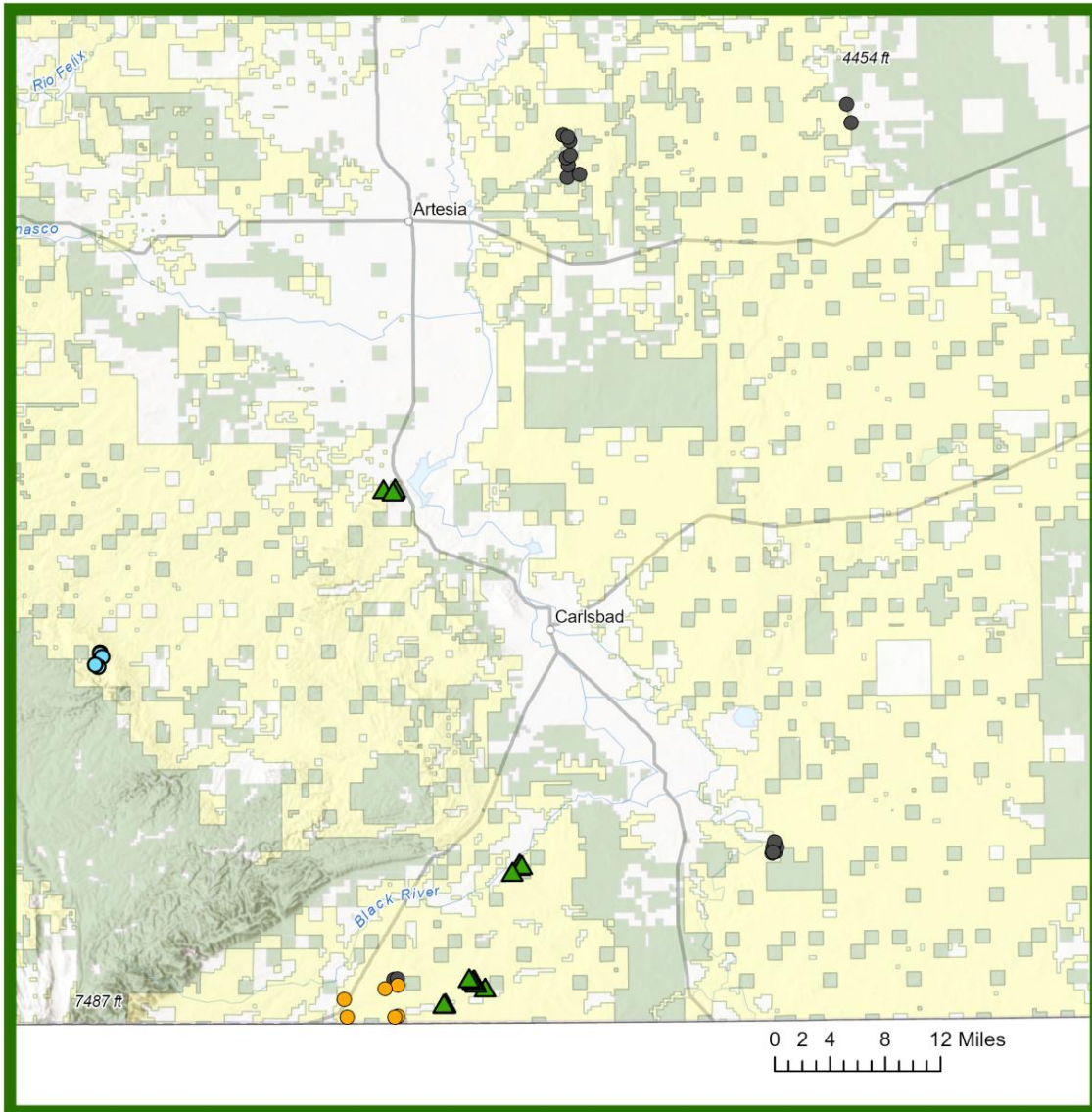


# *Sclerocactus cloverae*

*Clover's fishhook cactus (Cacteaceae)*



# Carlsbad BLM Field Office



## Rare Plant Species Plots

- *Amsonia tharpii*
- ▲ *Eriogonum gypsophilum*
- *Linum allredii*
- *Echinocereus fendleri* var. *kuenzleri*

## Land Cover & Management

- Forest Service, State or National Parks, Fish & Wildlife Service
- Bureau of Land Management

Species	# of Plots
<i>Amsonia tharpii</i>	22
<i>Eriogonum gypsophyllum</i>	20
<i>Echinocereus fendleri</i> var. <i>kuenzleri</i>	5
<i>Linum alredii</i>	6



# *Amsonia tharp*

Tharp's bluestar (Apocynaceae)

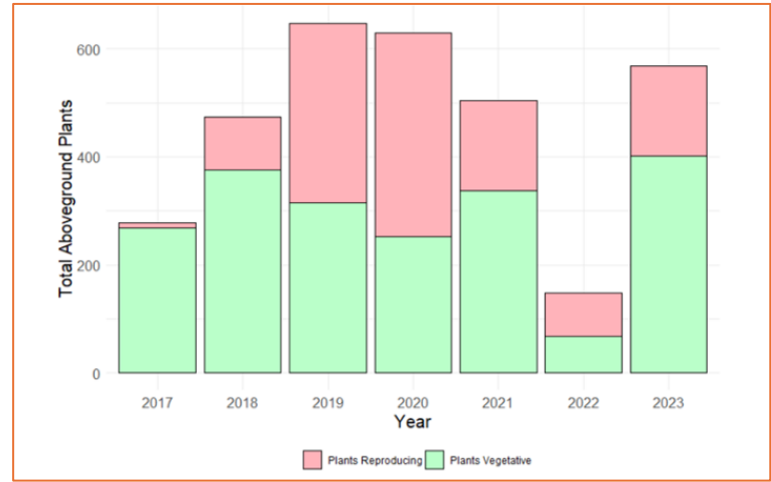
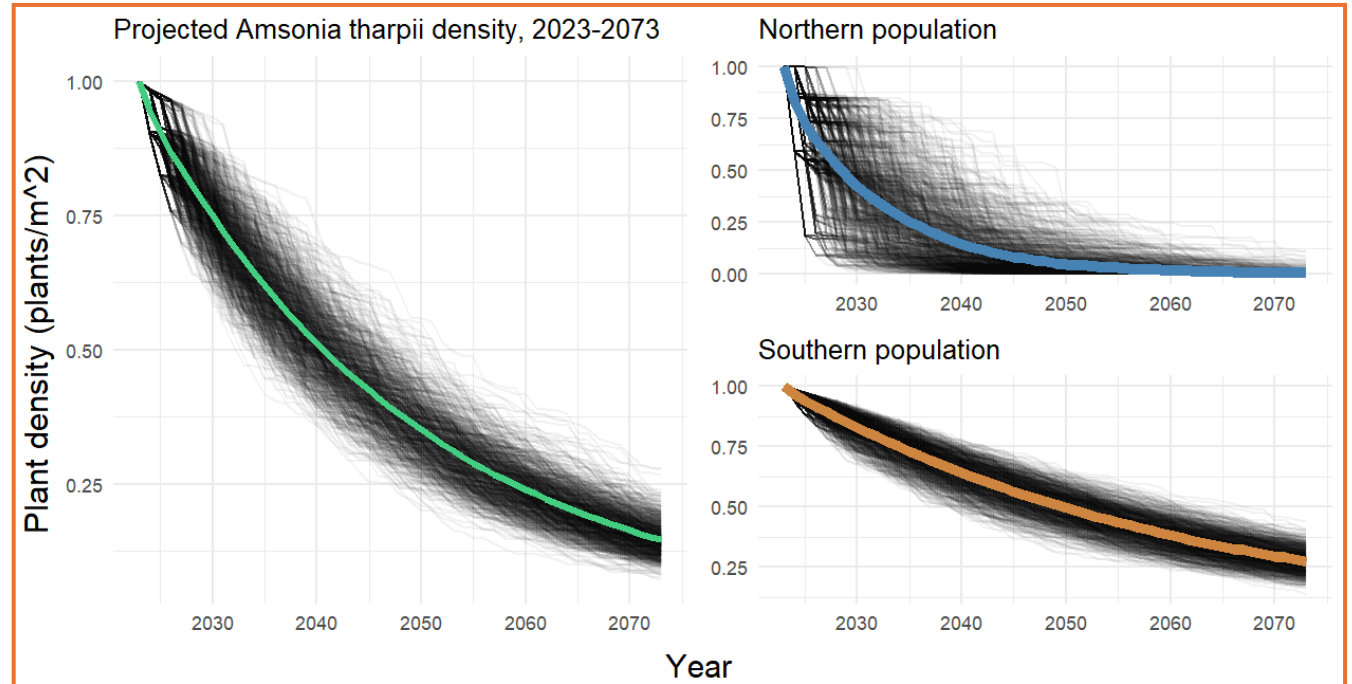
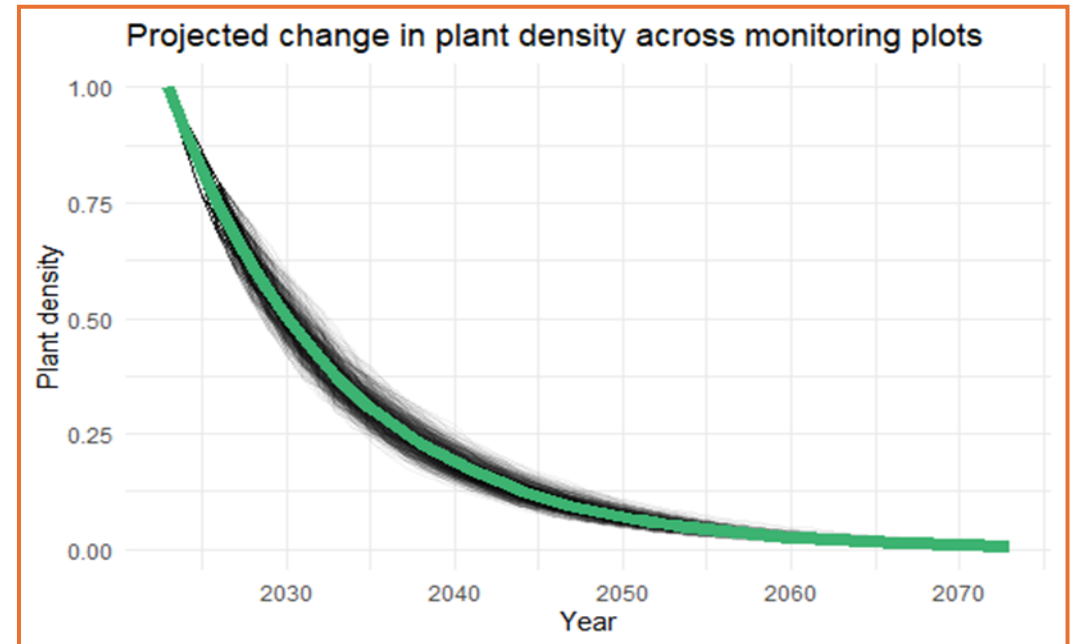
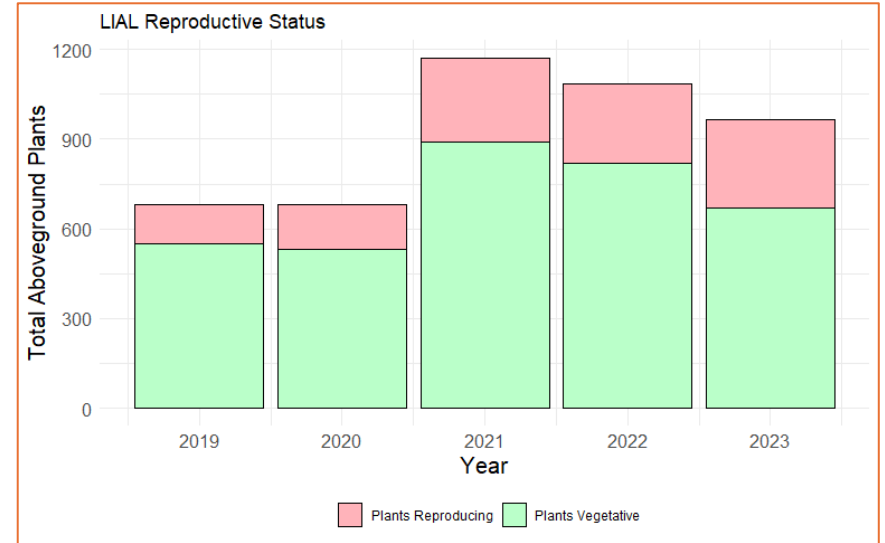


Photo from 2023 monitoring report



# *Linum allredii*

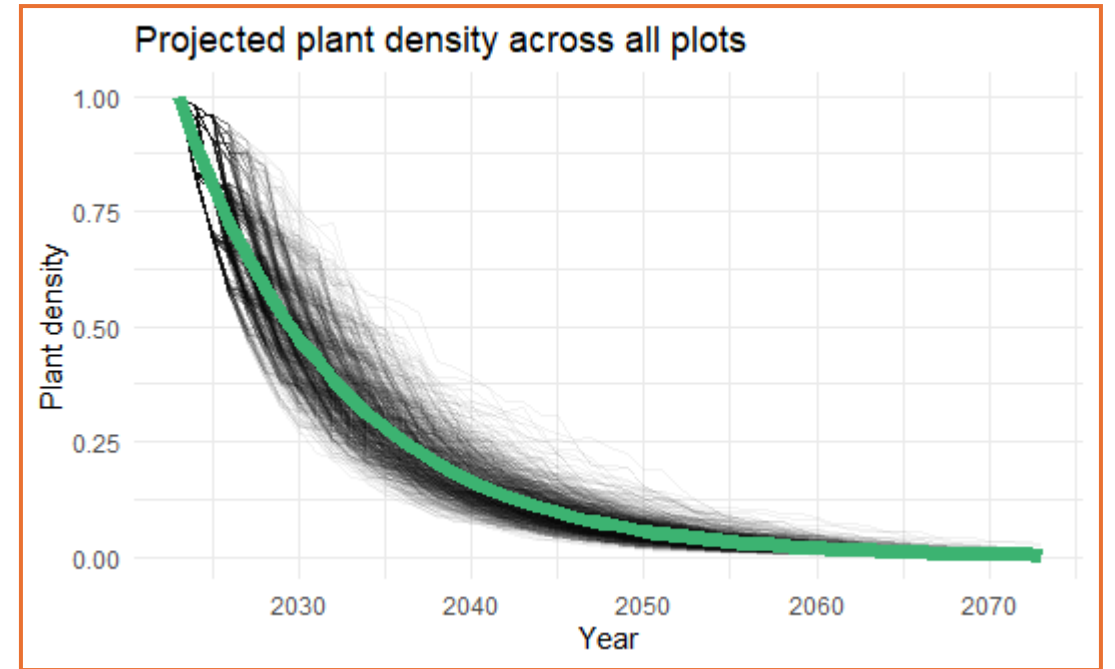
Allred's flax (Linaceae)



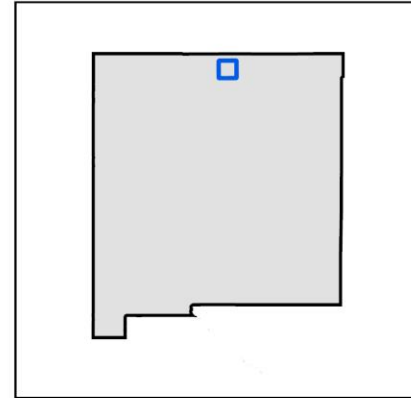
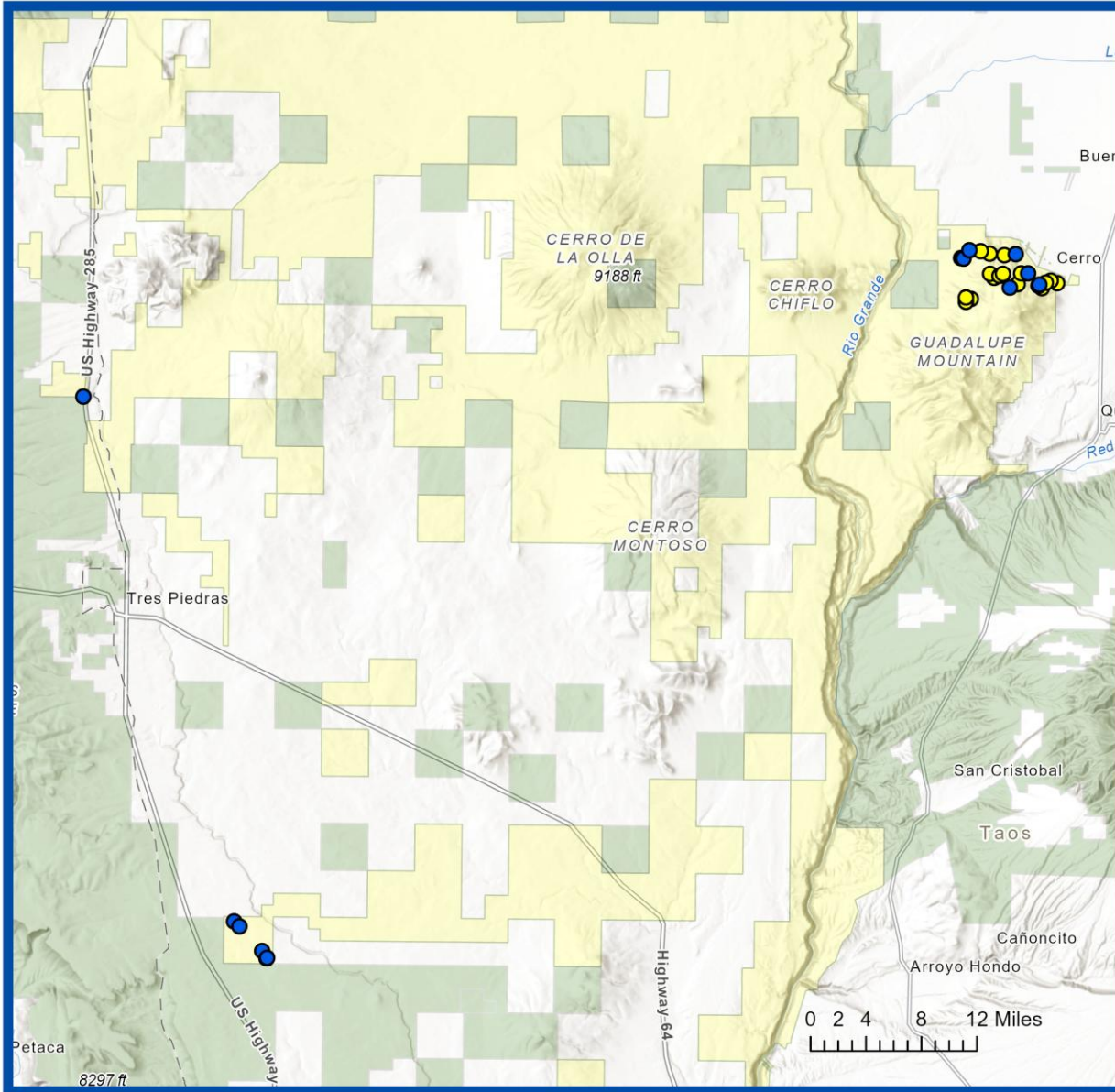


# *Echinocereus fendleri* var. *kuenzleri*

*Kuenzler's hedgehog cactus* (Cactaceae)



# Taos BLM Field Office



## Rare Plant Species Plots

- *Astragalus ripleyi*
- *Cymopterus spellenbergii*

## Land Cover & Management

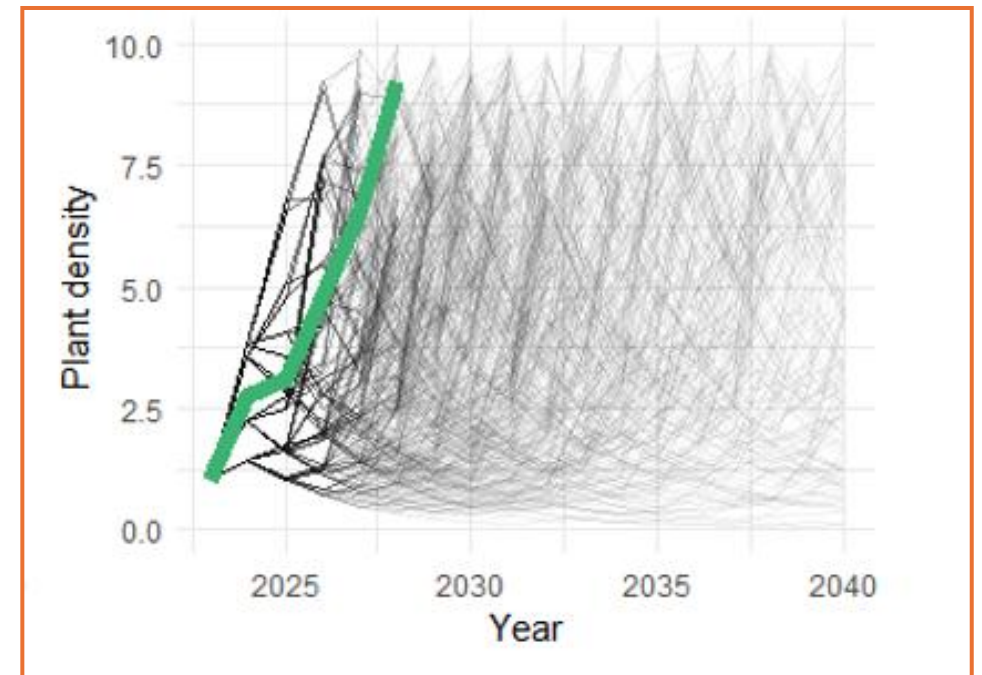
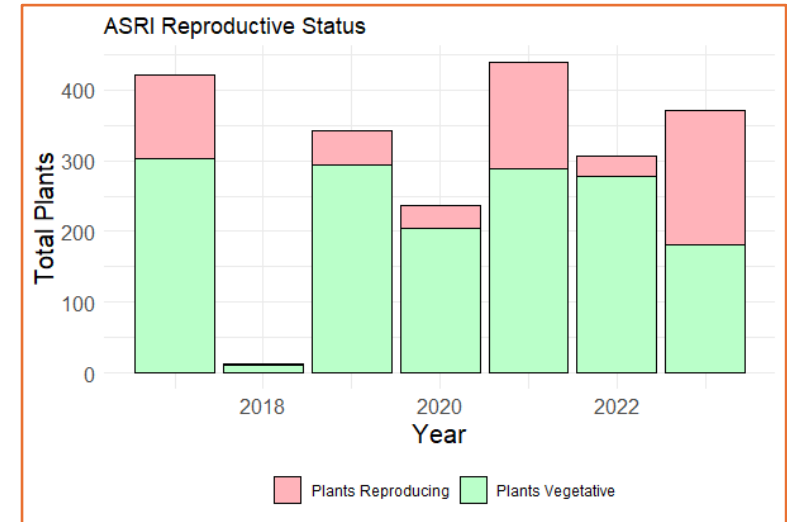
- Forest Service, State or National Parks, Fish & Wildlife Service
- Bureau of Land Management

Species	# of Plots
<i>Astragalus ripleyi</i>	14
<i>Cymopterus spellenbergii</i>	18



# *Astragalus ripleyi*

Ripley's milkvetch (Fabaceae)



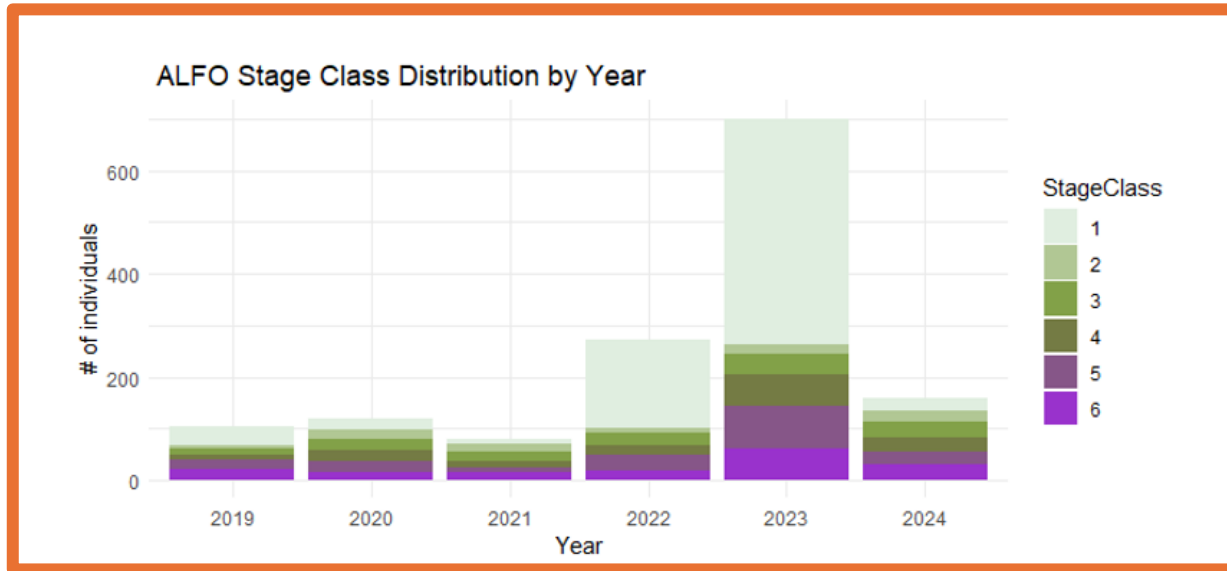
# *Cymopterus spellenbergii*

*Taos springparsley* (Apiaceae)

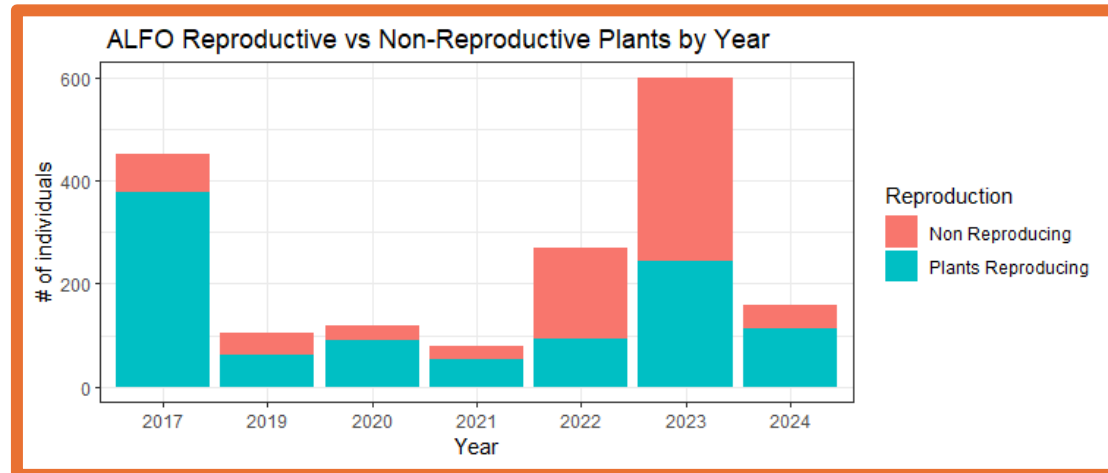




# Reasons for Declining Patterns

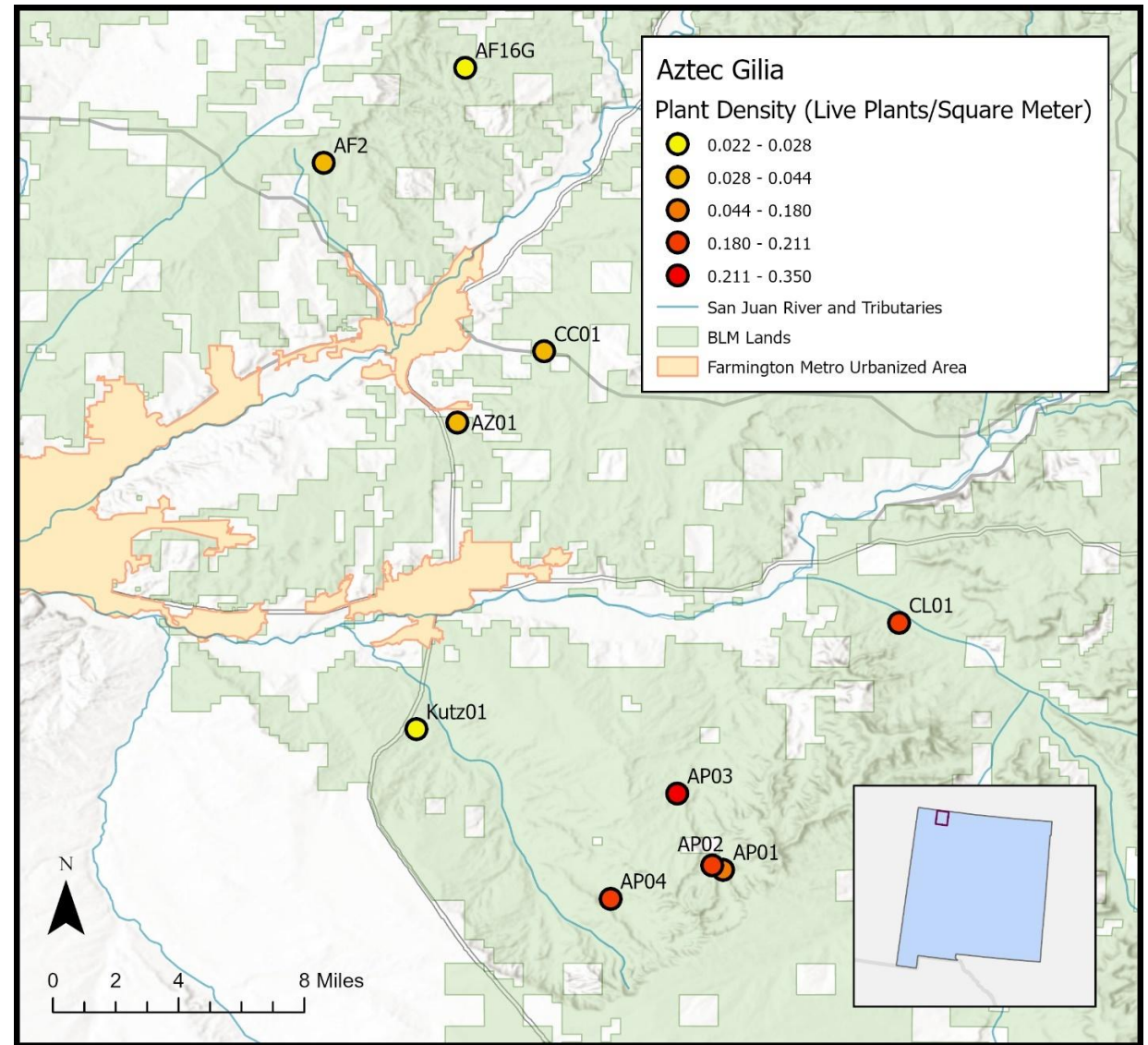


- High variability
  - Affects our population matrix
- Relatively small temporal sample size.
- Drought years may not be representative of longer-term effects



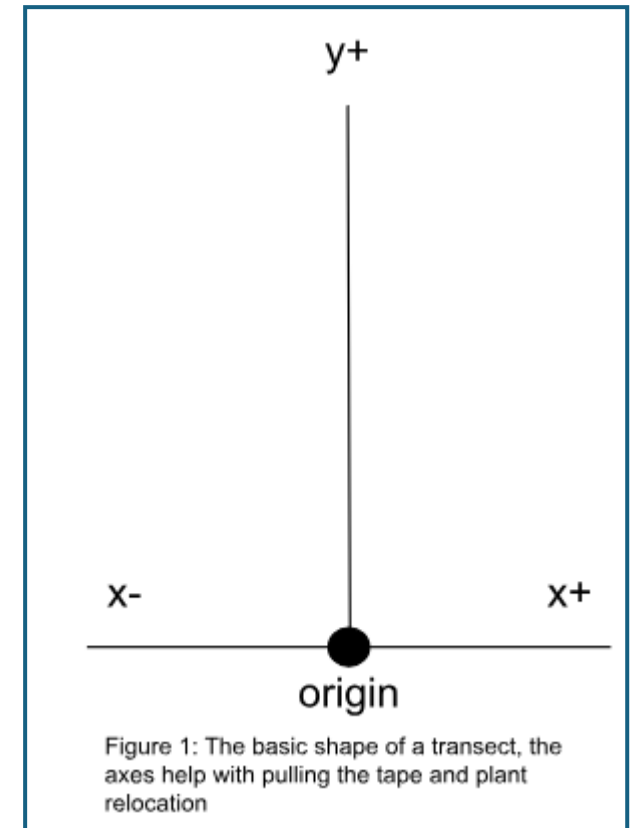
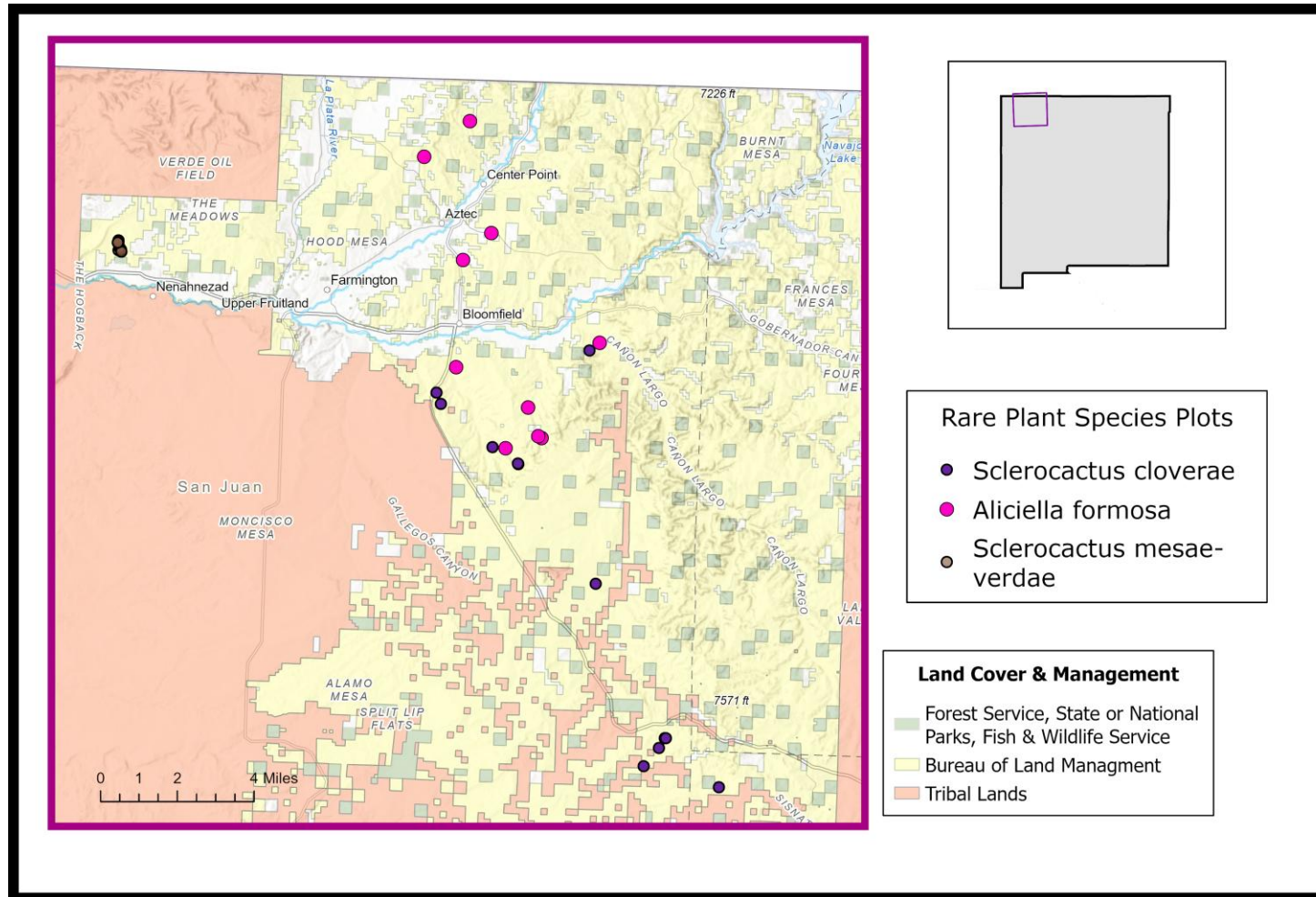
## Future Directions: Analysis

- Basic spatial analysis
- More advanced climactic analysis



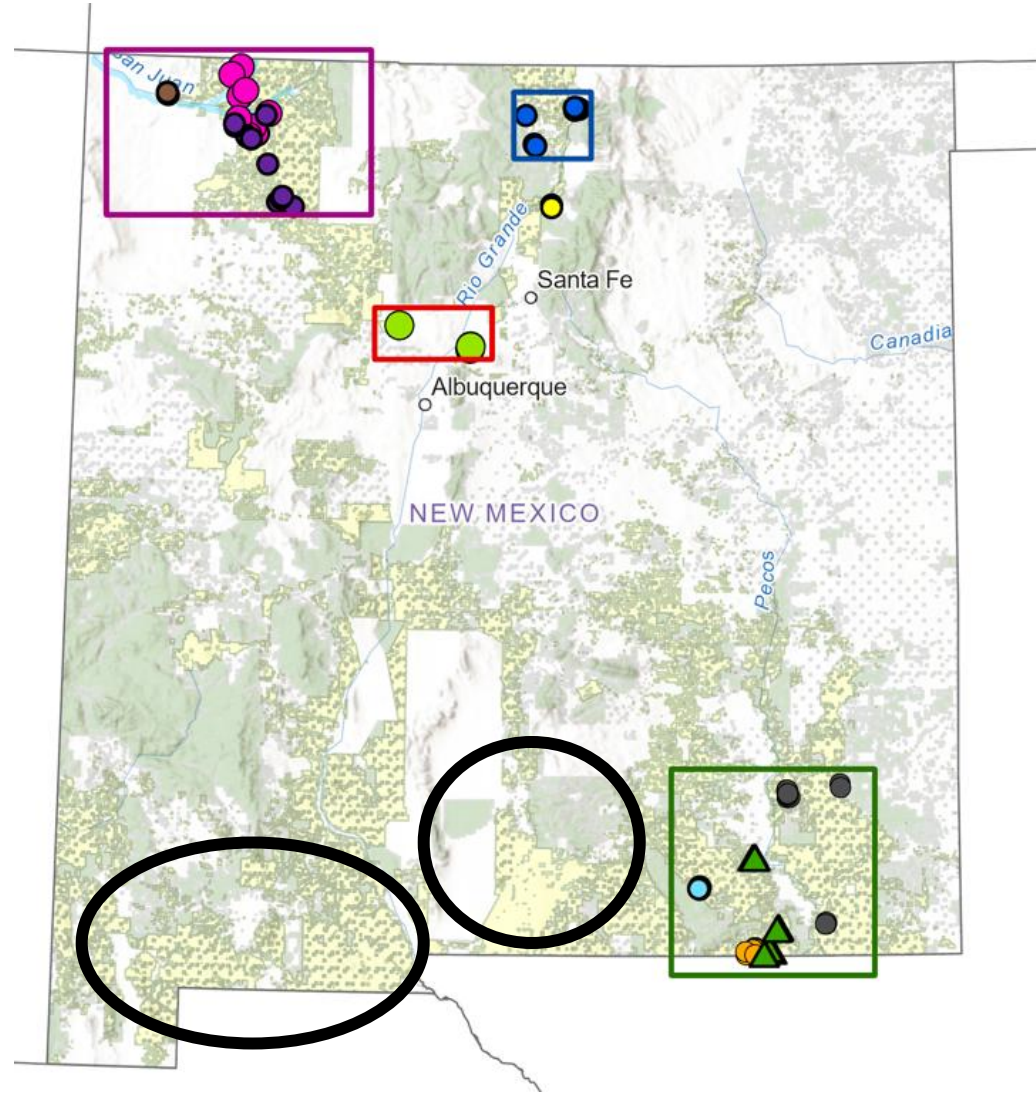
**Map 3.** *A. formosa* plots mapped, and colored by density

# Future Directions, continued: Partnerships





# Future Directions, continued: New Species



# Thanks to:

- ▶ Bureau of Land Management
  - ▶ Maria Mullins
  - ▶ Sam Reiss
  - ▶ Zoe Davidson
- ▶ Institute for Applied Ecology
  - ▶ 2025 technicians: Alo Dodge and Helena Mieras
  - ▶ Katy Silber
  - ▶ Clay Meredith
  - ▶ Melanie Gisler
- ▶ And special thanks to:
  - ▶ Erika Rowe, EMNRD
  - ▶ Katie Sandbom, FWS
  - ▶ Olivia Carril



Questions?

