

**Impacts of invasive species to the
rare annual *Erythranthe shevockii*
(Kelso Creek monkeyflower)**

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Monkeyflower diversity



Erythranthe cardinalis



Erythranthe rhodopetra



Erythranthe carsonensis



Erythranthe shevockii



Diplacus aurantiacus



Diplacus mohavensis



Diplacus pulchellus



Diplacus rupicola

Rare Monkeyflowers

- 40 rare monkeyflowers in California (CNPS ranks 1-4)
- *Erythranthe*: 60 taxa total, 26 rare taxa (43%). 1 presumed extinct
- *Diplacus*: 44 taxa total, 14 rare taxa (32%). 2 presumed extinct
- **3/22 presumed extinct species in CA are monkeyflowers**

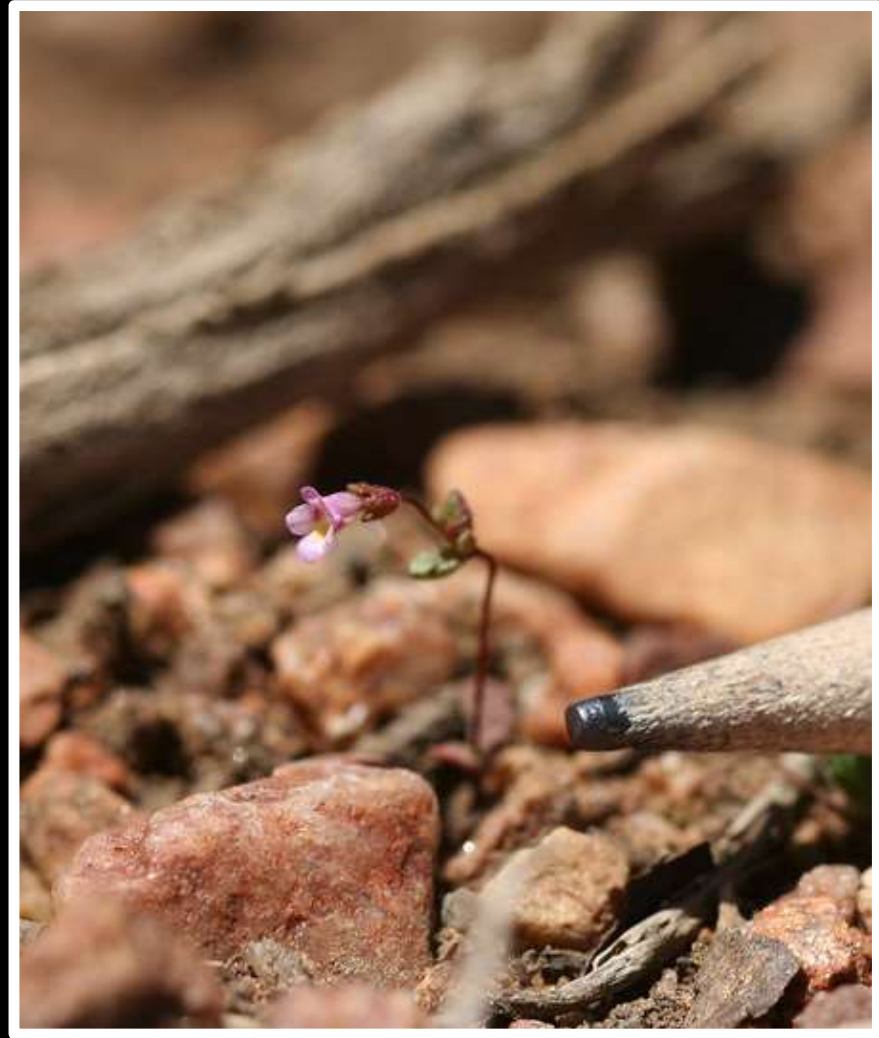


Diplacus brandegeei (Santa Cruz Island monkeyflower)

Photo by Jon Rebman

Rare Monkeyflowers

- The majority of the rare monkeyflowers are annual plants
- 36 of the 40 rare monkeyflowers native to California are annual (90%)
- Usually occur in open environments with co-occurring species at low densities (usually other native annuals).
- Poor competitors
- May be related to timing of germination (winter annuals), time to development, and diminutive size



Erythranthe exigua (eye strain monkeyflower)

Erythranthe shevockii Kelso Creek monkeyflower

- Annual in the Phrymaceae
- Endemic to southern Sierra Nevada, Kern County
- 11 known occurrences, 65 sq mi area
- California Native Plant Society Rank 1B.2
- Was petitioned for federal listing in 1994, but was rejected due to insufficient info.
- BLM sensitive, CNPS status

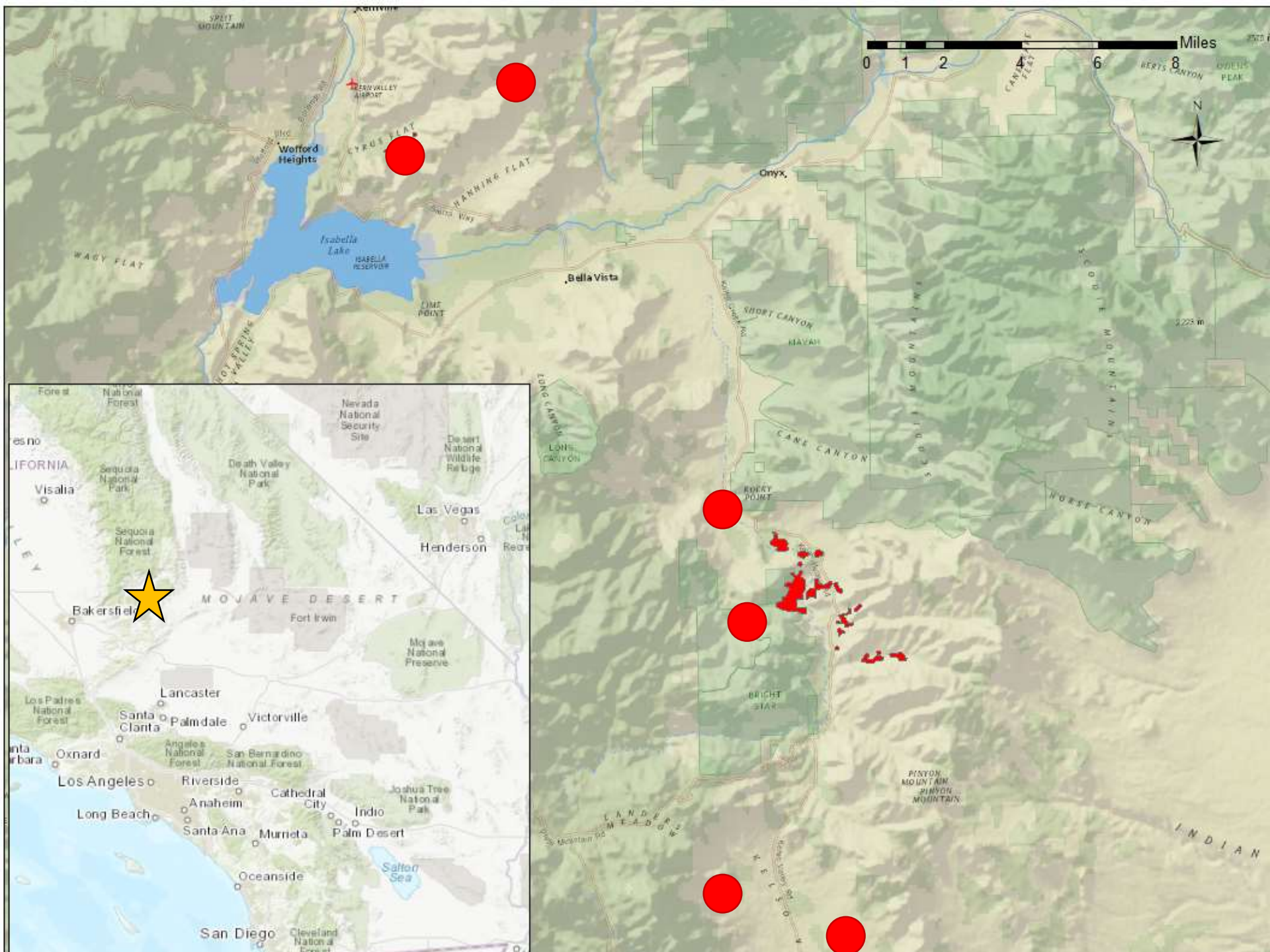


Threats

- Agriculture
 - Cattle Grazing
 - Orchards
 - Other agriculture
- Creation of Lake Isabella
- Housing Development
- OHV use
- Competition with exotic invasive plants



Erythranthe shevockii with *Erodium cicutarium*



Erythranthe shevockii
Kelso Creek monkeyflower Habitat



Erythranthe shevockii
Cyrus Canyon



Study Site

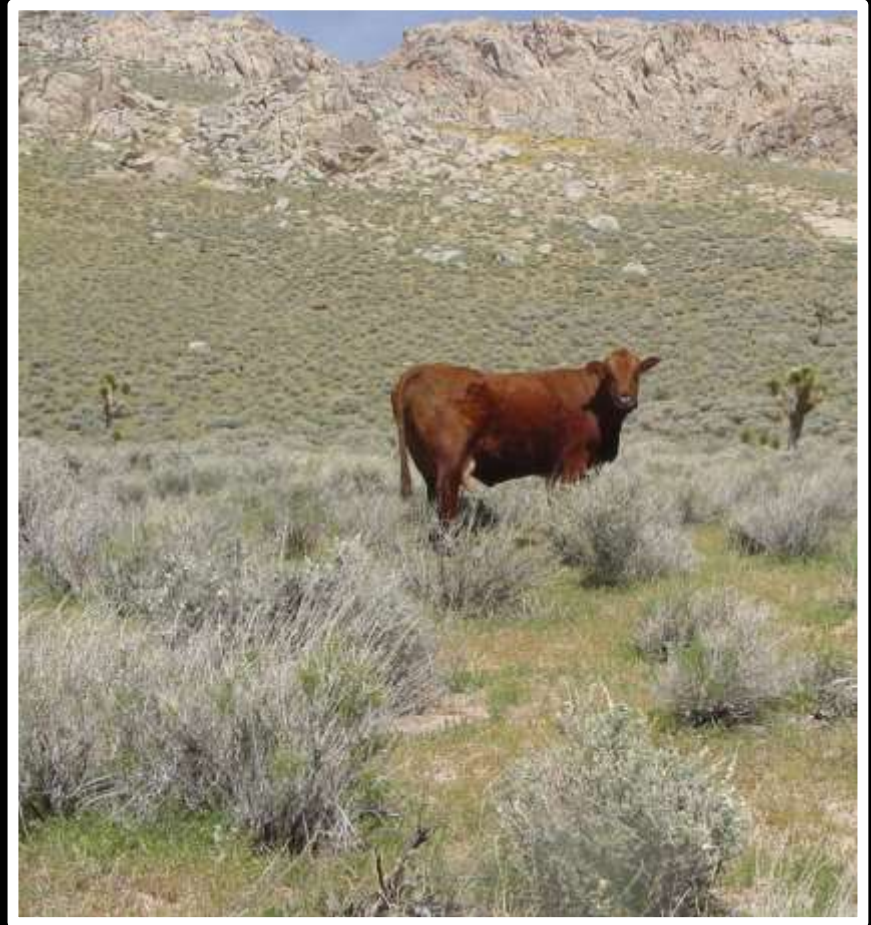
- Cyrus Canyon
- Historically a private ranch
 - Not currently grazed
- Acquired by BLM in 2006
- Designated as ACEC



Cyrus Canyon, Kernville

Study Questions

- How does grazing impact Kelso Creek monkeyflower?
 - Only actively grazed sites are on private property
- Characterize differences between occupied and non-occupied habitat
- Understand inter-annual variation of Kelso Creek monkeyflower and monitor threats



Cattle grazing in the Mojave Desert

Study Design

- Monitoring initiated in 2015
 - Modified Whitaker Plot
 - Target and Control
 - $20m^2$
 - $1m^2$
 - $0.25m^2$



Species Richness

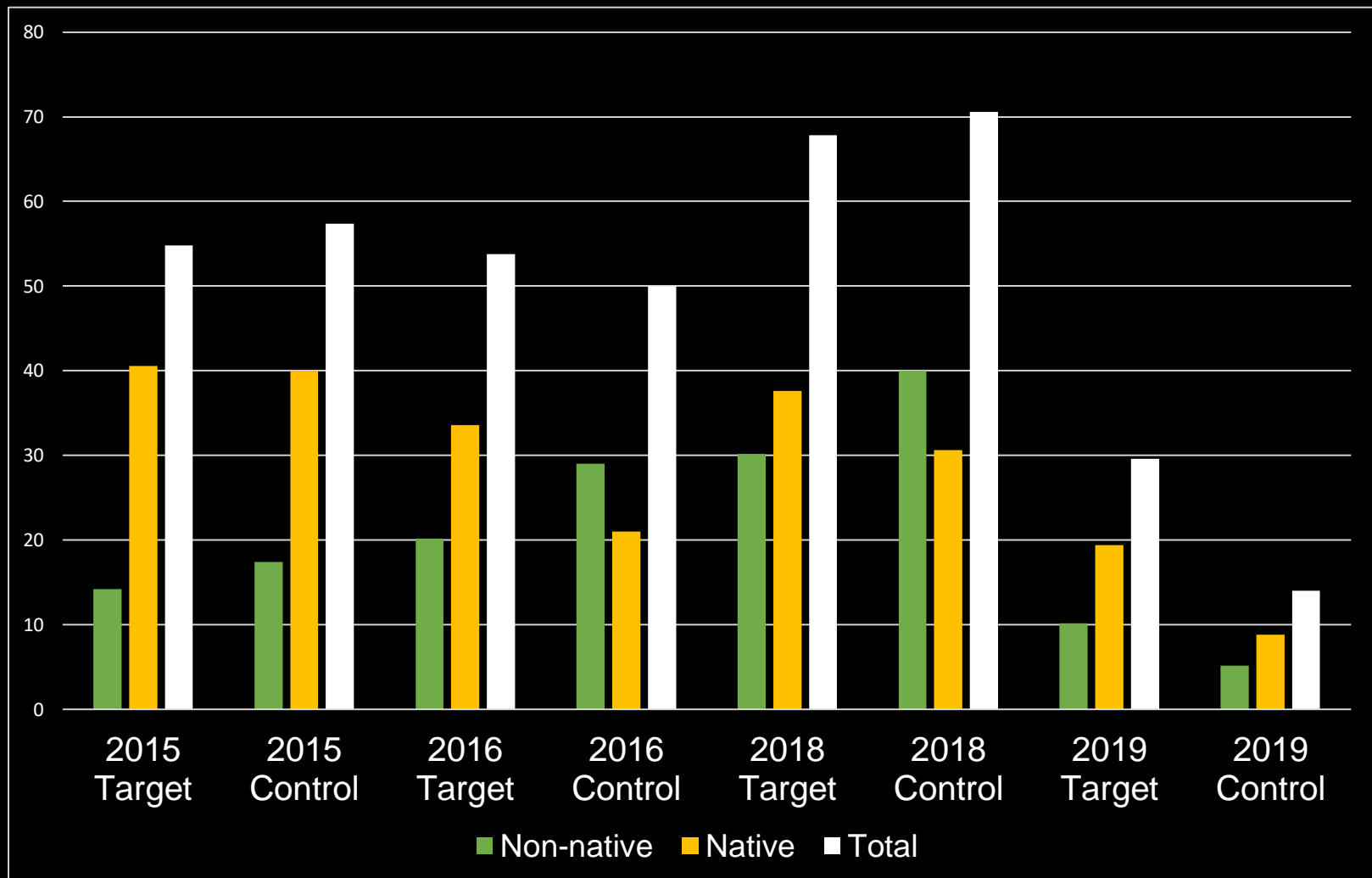
- **TARGET 20m² PLOT VS. CONTROL 20m² PLOT**

Jacard's index, the fraction of species shared between two sites.

	2015	2016	2018	2019
Jacard's index	.534	.473	.405	.386
Target Plot species richness	34	36	29	34
Control Plot species richness	32	20	22	27

Native vs. Non-native Cover

- TARGET 20m² PLOT VS. CONTROL 20m² PLOT



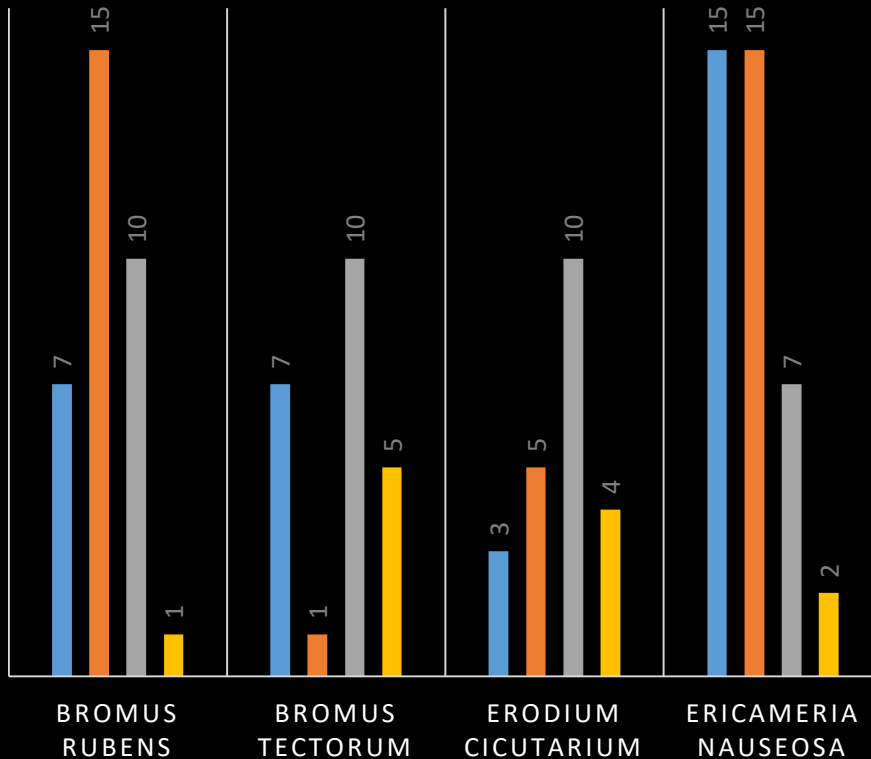
Dominant Species

- TARGET 20m² PLOT VS. CONTROL 20m² PLOT

Percent cover of most dominant species

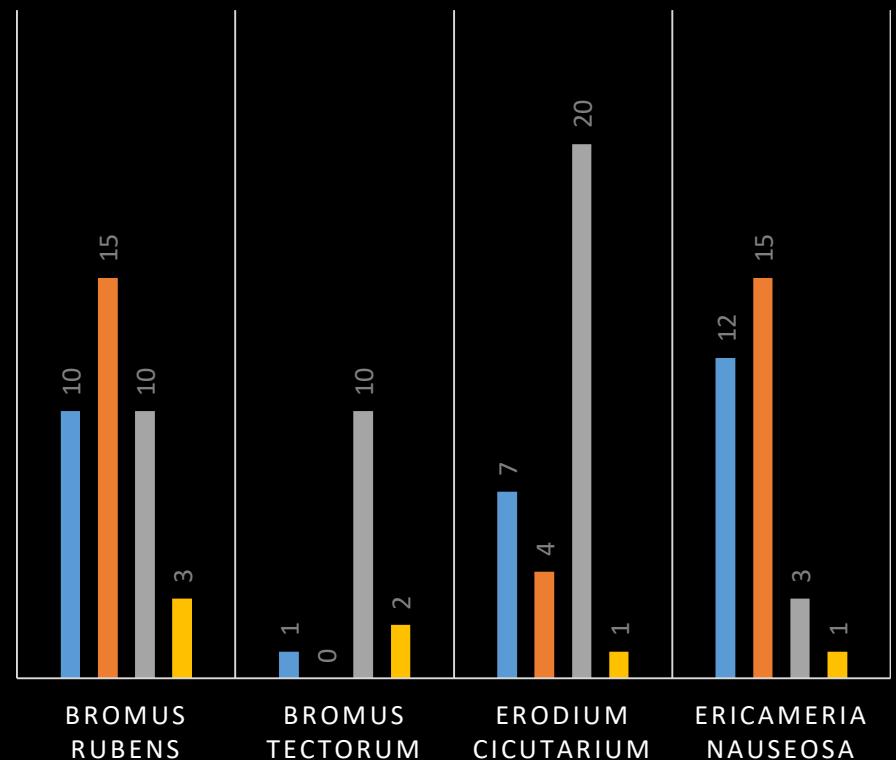
TARGET PLOT

■ 2015 ■ 2016 ■ 2018 ■ 2019



CONTROL PLOT

■ 2015 ■ 2016 ■ 2018 ■ 2019



Non-native species

- *Bromus madritensis* subsp. *rubens*
- *Bromus tectorum*
- *Erodium cicutarium*
- *Schismus barbatus*

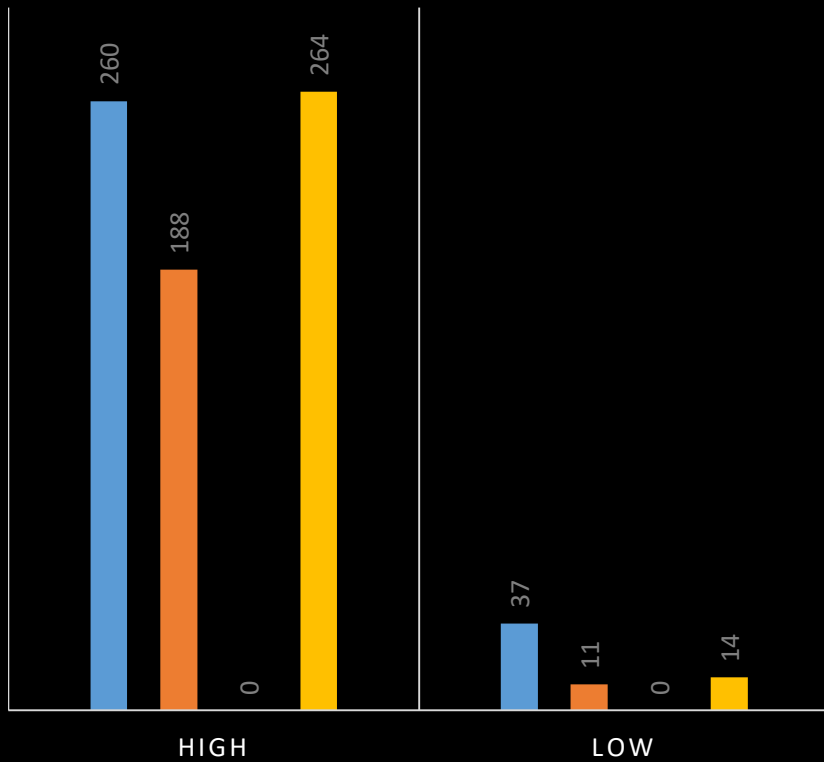


Cyrus Canyon, Kernville

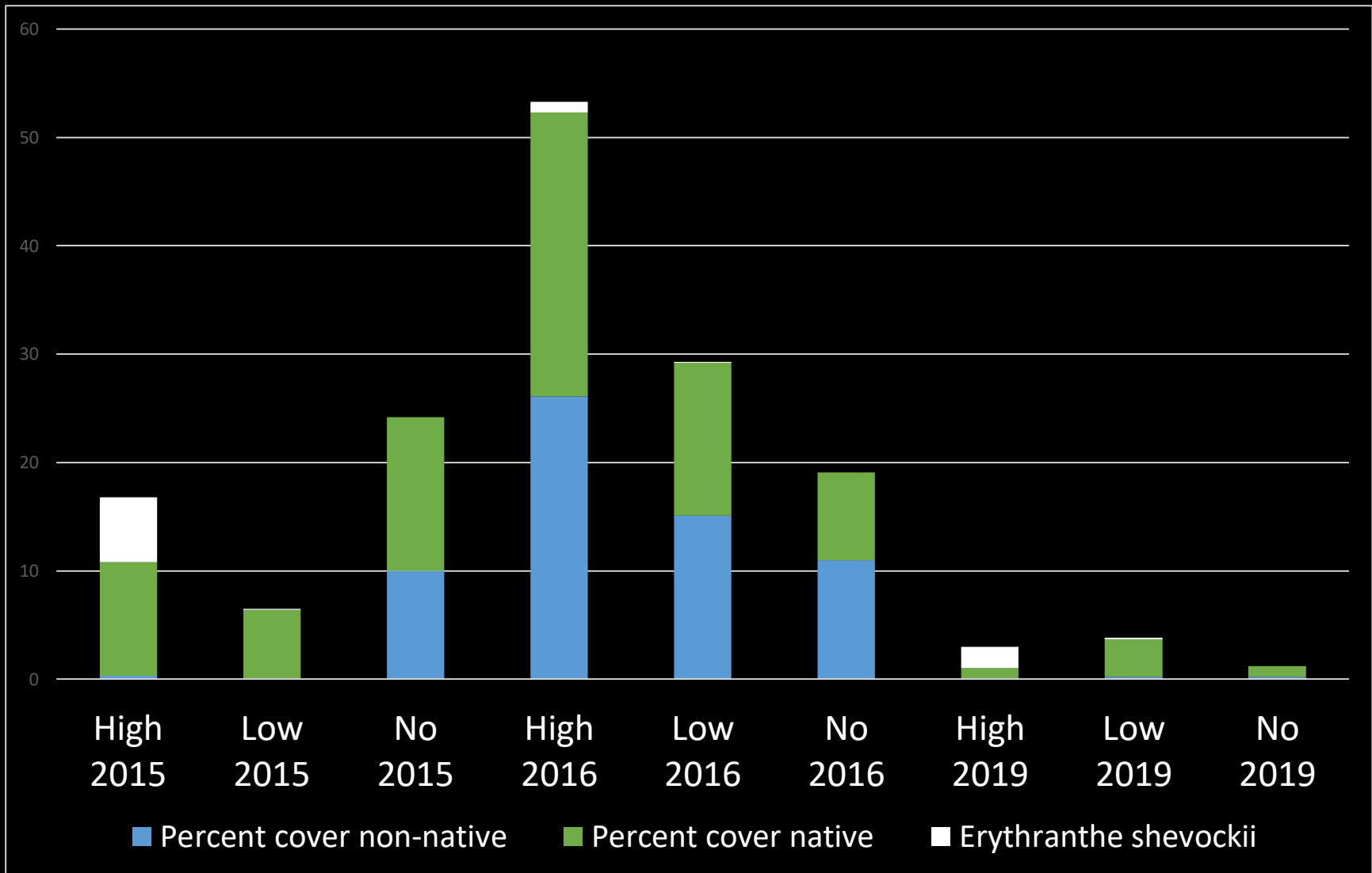
Monkeyflower Abundance

ERYTHRANTHE SHEVOCKII

■ 2015 ■ 2016 ■ 2018 ■ 2019



Erythranthe shevockii 1m-plots High Density, Low Density, and No *E. shevockii*



Summary

- Monkeyflower plots have greater species richness
- Non-native cover is greater in control plot vs. target plot.
- Species composition and cover varies annually within and between plots
- Monkeyflower tends to occur in areas with relatively less non-native species cover.



Cyrus Canyon, Kernville

Next steps

- Conduct thinning experiment
- Establish additional plots in other parts of the range
- Fine metasedimentary soil vs. coarse granitic sandy soils
- Dominant vegetation and annuals differ between soil types
- Install weather station and or incorporate regional precipitation patterns into analysis.



Erythranthe shevockii with *Bromus* under sharpie

Considerations for rare annual plants

- Invasive species impacting rare plants in the Mojave are ubiquitous and not targeted for treatment (e.g. *Bromus*, *Erodium*)
- Threats such as cattle grazing and OHV use likely exacerbate the spread of invasive annual grass.
- Historical impacts can be long lasting, especially in the desert.
- Interplay of boom and bust cycles related to precipitation for native & invasive annuals, but relationship is not clear.
- Management needed to prevent spread of invasive plants, and habitat degradation



Erythranthe rhodopetra
Red Rock Canyon monkeyflower

Eriogonum tiehmii
Tiehm's buckwheat



Questions?

- BLM Bakersfield
- Rancho Santa Ana Botanic Garden
 - UC Cooperative Extension

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