

# The Feasibility of Chaparral Restoration on Type-converted Slopes

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# Introduction to the Project

- This study is being conducted in the San Timoteo Canyon on an Ecological Preserve owned by the Riverside Land Conservancy
- Historically this area had been used for rangelands.
- 1930s imagery indicates that the slopes had once been chaparral.



Live Oak Canyon Road and San Timoteo Canyon Road



El Casco Lake prior to development

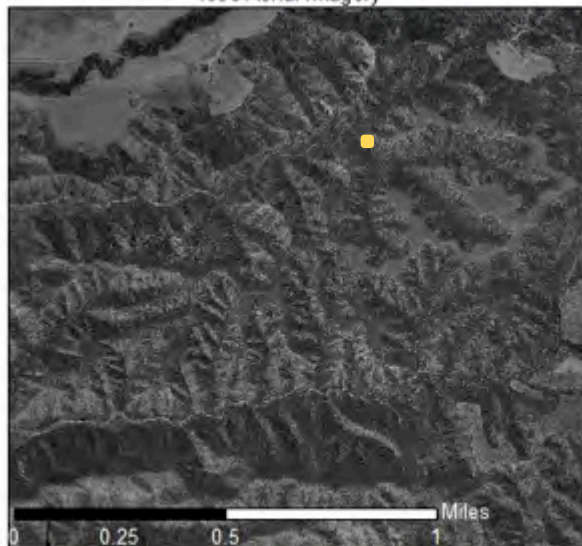


# 1938 Aerial Imagery Comparison to 2013 Aerial Imagery

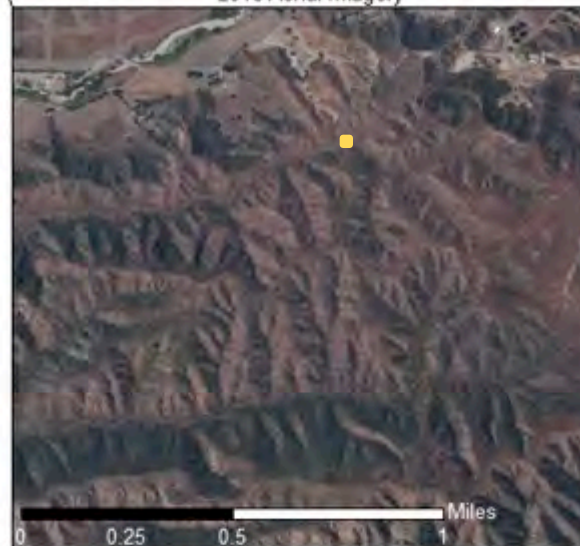
(For the same locality south of Live Oak Canyon Road)



1938 Aerial Imagery



2013 Aerial Imagery

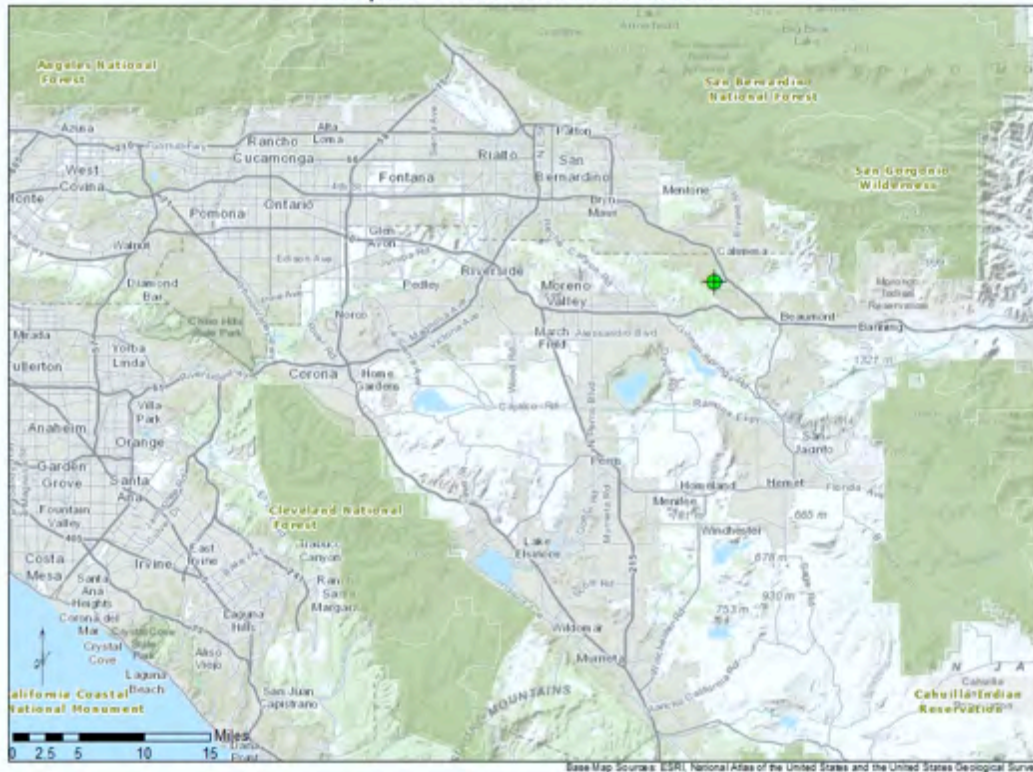


# Objectives

- Compare the effectiveness of a broad-spectrum herbicide against a grass-specific herbicide
- Assess the difference between seeding and planting seedlings as a mode of restoration and which is more effective
- Analyze the seed bank of the research area to see if a relict seed bank that could possibly be used for restoration

# Study Area

Chaparral Restoration Research Area



Base Map Source: ESRI, National Atlas of the United States and the United States Geological Survey

Study Area

made 11 Jun 2013



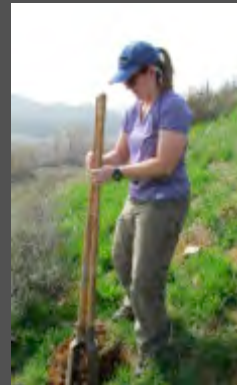
# Plot Design

<b>Treatment</b>	<b>No treatment</b>	<b>Smoke Water Application</b>	<b>Seeding</b>	<b>Planting</b>
<b>No Herbicide</b>	Control Control	Control SW	Control Seeding	Control Planting
<b>Fusilade</b>	Fusilade Control	Fusilade SW	Fusilade Seeding	Fusilade Planting
<b>Glyphosate + Fusilade follow up</b>	Gly + Fus Control	Gly + Fus SW	Gly + Fus Seeding	Gly + Fus Planting



# Planting and Maintenance

- 4 different species were purchased:
  - *Adenostoma fasciculatum*
  - *Eriogonum fasciculatum*
  - *Quercus berberidifolia*
  - *Rhus ovata*
- Control and Fusilade plots were planted 20 Dec 2012, and Glyphosate + Fusilade follow-up plots were planted on 30 Jan 2013.



# Seeding

- The following species were purchased for seeding treatment:
  - *Artemisia californica*
  - *Adenostoma fasciculatum*
  - *Eriogonum fasciculatum*
  - *Gutierrezia sarothrae*
  - *Quercus berberidifolia*
  - *Rhus ovata*
  - *Rhus trilobata*



\*Seeding was unsuccessful



# Transplant Success

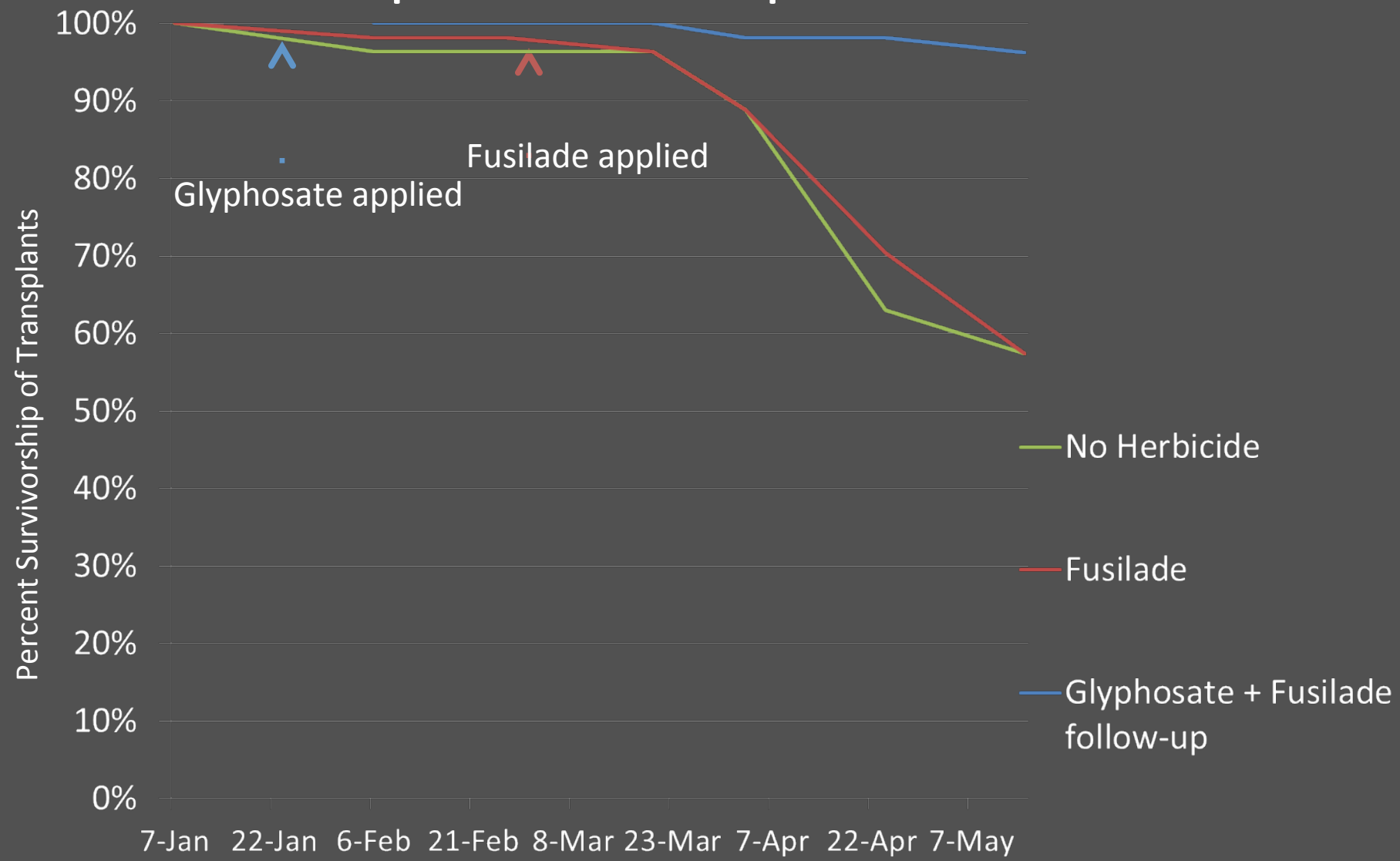
Control plot



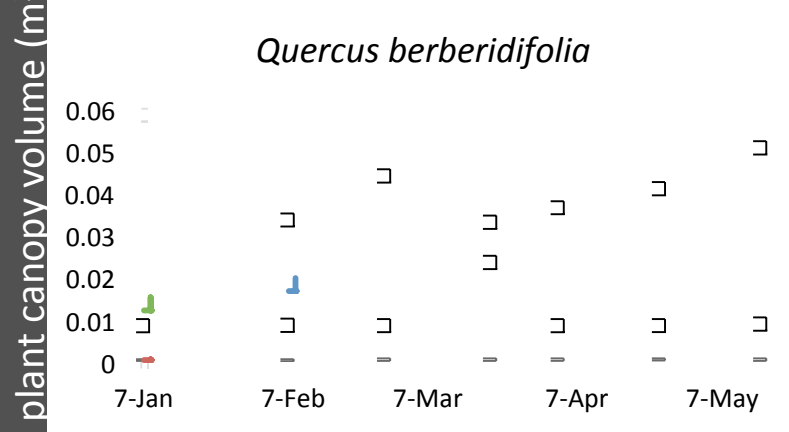
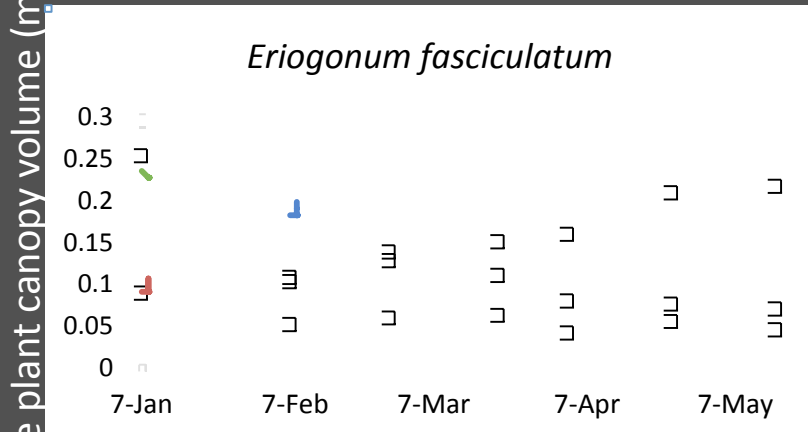
Glyphosate + Fusilade follow-up plot



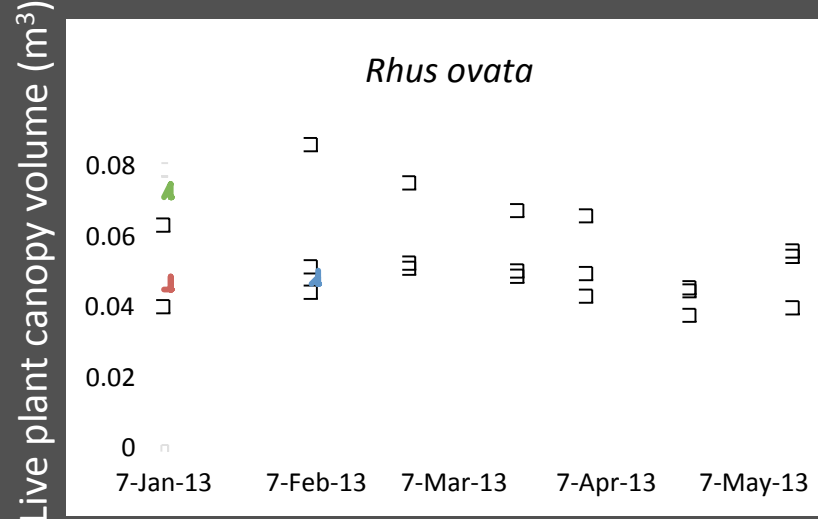
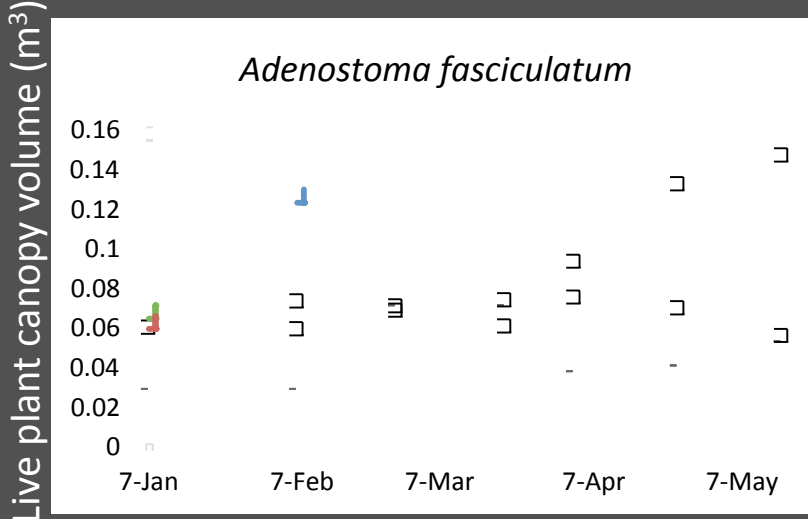
# Survivorship of Transplants



# Live Plant Canopy Volume



■ No Herbicide     
 ■ Fusilade Only     
 ■ Glyphosate + Fusilade Follow-up





# Soil Moisture

Sample Depth increments:

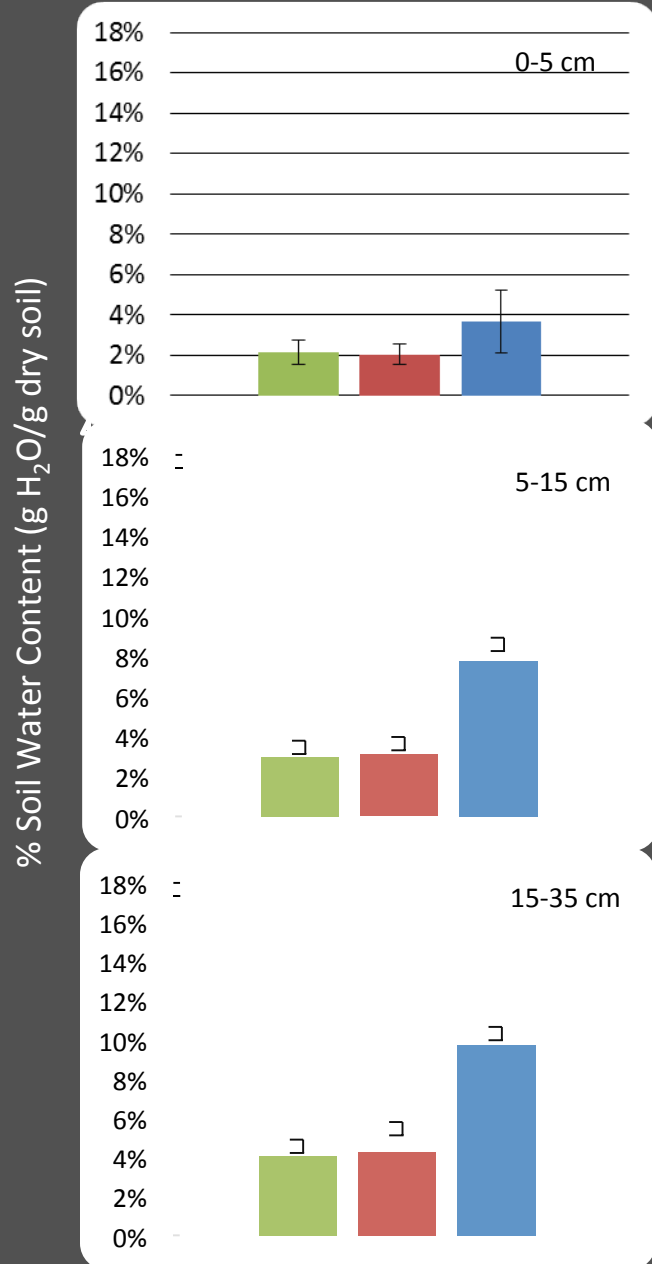
- 0-5 cm
- 5-15 cm
- 15-35 cm



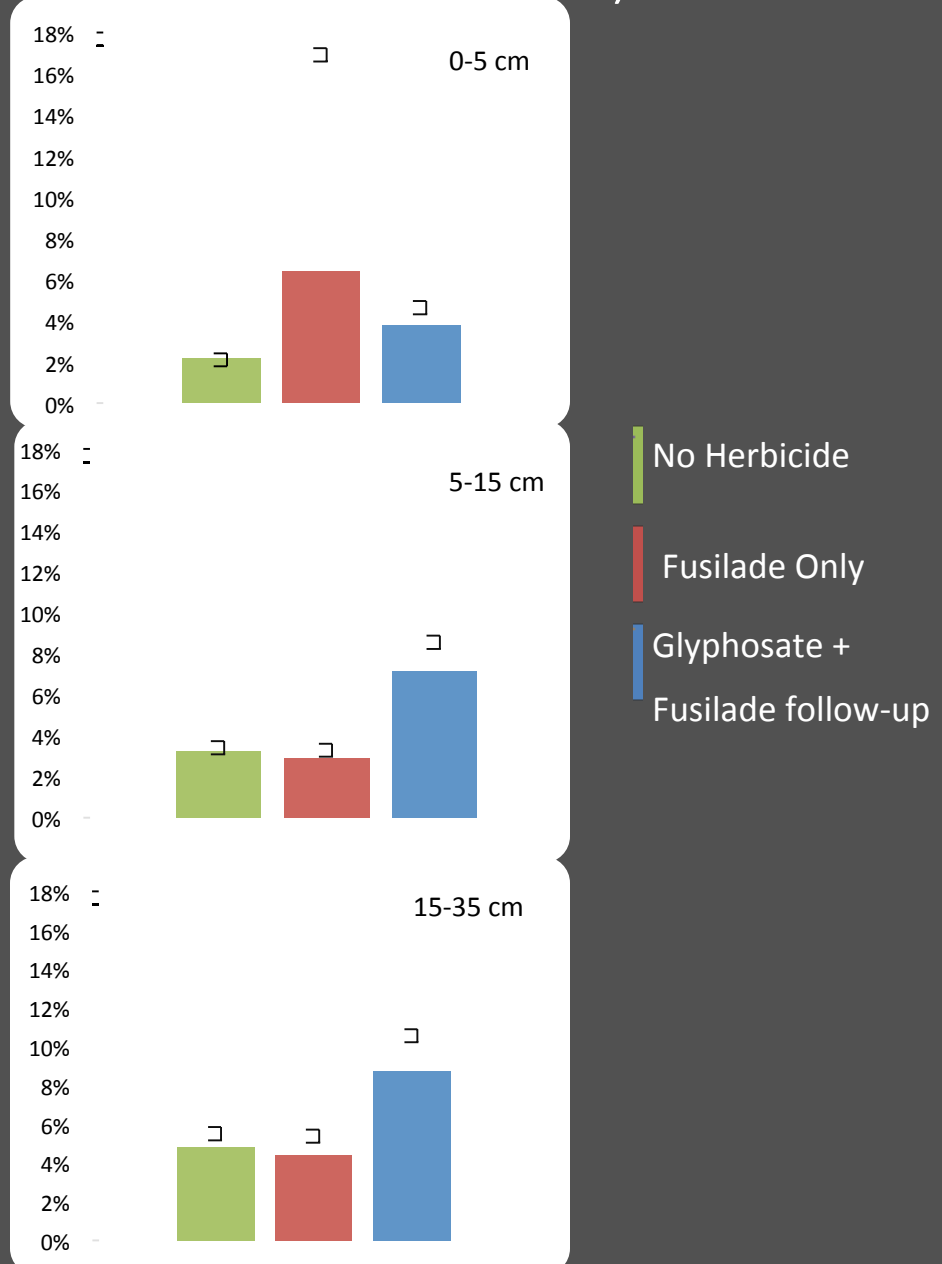
Treatment	No treatment	Smoke Water Application	Seeding	Planting
No Herbicide	Control Control	Control SW	Control Seeding	Control Planting
Fusilade	Fusilade Control	Fusilade SW	Fusilade Seeding	Fusilade Planting
Glyphosate + Fusilade follow up	Gly + Fus Control	Gly + Fus SW	Gly + Fus Seeding	Gly + Fus Planting

# Soil Moisture Results

## No Irrigation (not planted)



## With Irrigation (planted plots)



- No Herbicide
- Fusilade Only
- Glyphosate + Fusilade follow-up

# Partial Summary

- The Glyphosate + Fusilade follow-up treatment increased:
  - Seedling survival
  - Seedling growth
  - Soil water content
- Fusilade-only treatment was not effective

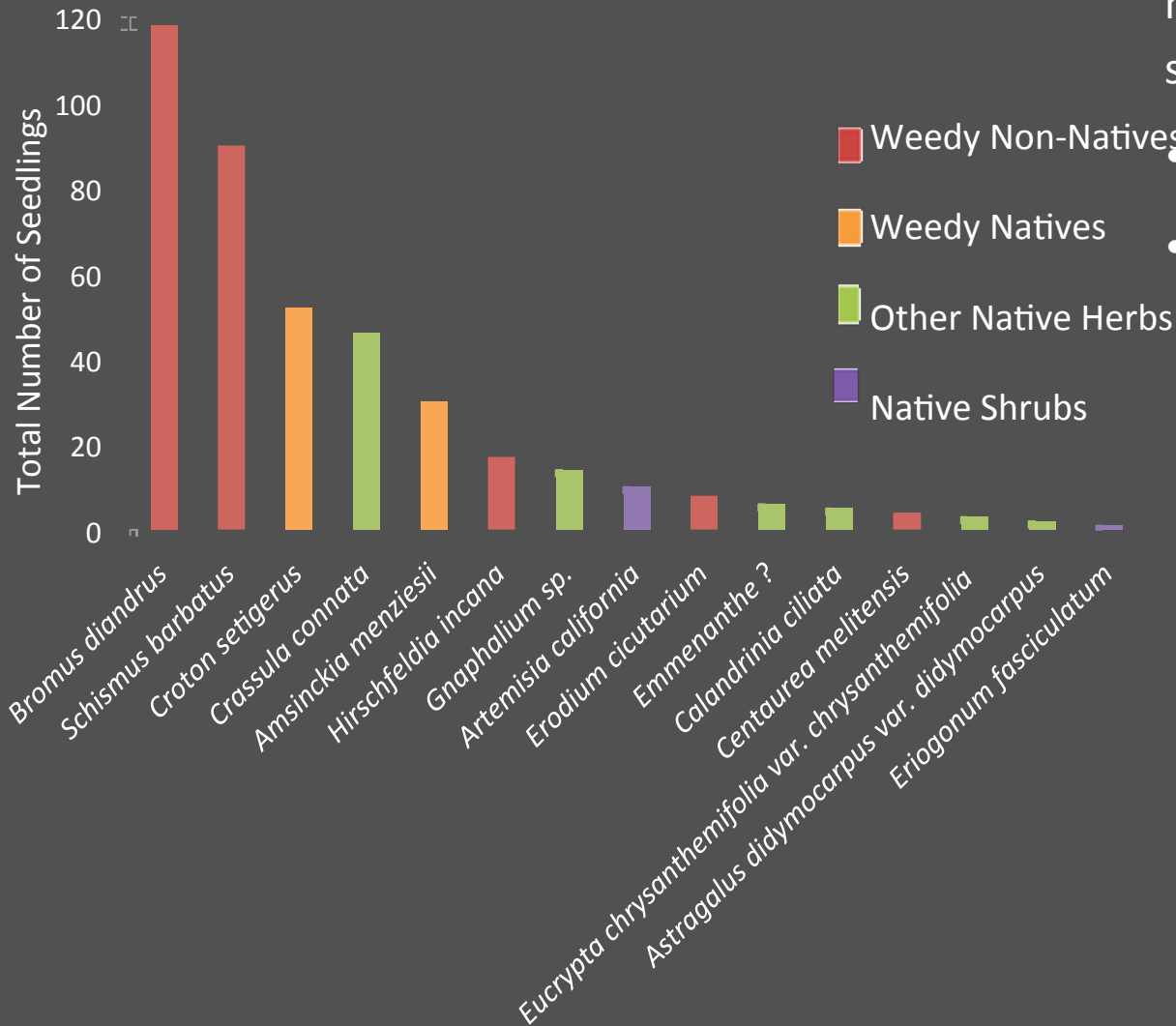


# Is There a Relict Native Seed Bank on the Site?

- The soil was spread into flats, and 4 different treatments were applied
  - no treatment
  - smoke water
  - smoke water + heat
  - gibberellic acid.
- Plants were then transplanted and keyed



# Seed-Bank Results



Native species in plots that did not come up in the seed-bank study:

- *Calochortus plummerae*
- *Dichelostemma capitatum*



# Summary

- Glyphosate + Fusilade follow-up was most effective in promoting transplant success.
  - Increased the soil moisture content substantially
- Seeding was unsuccessful.
- On this site, the relict seed bank was minor and may be insufficient to assist in restoration.



# Acknowledgements

- US Forest Service
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