

Evaluating Roadside Restoration Techniques and Success: Case Studies from Joshua Tree National Park and Lake Mead National Recreation Area

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Site History



- Keys view road repaved as a Fed Hwy road reconstruction project completed fall, 2007 (5.6 mile road corridor disturbed)



Restoration Treatments and Methods



- Topsoil was salvaged and reapplied along road corridor
- 4 restoration treatments:
 - Outplanted plants
 - Vertical mulch
 - Outplant + vertical mulch
 - Bare plots
- Treatments applied in swaths along the road resulting in replicated experimental framework



Outplanting



Vertical mulch



Outplanting Methods



- Post-construction outplanting (spring 2008) included salvaged perennial species and propagated individuals
- 628 individuals outplanted
- Field care: plants were watered monthly for two years following outplanting and caged for protection
- Joshua Tree NP assessed survival



Project Goals



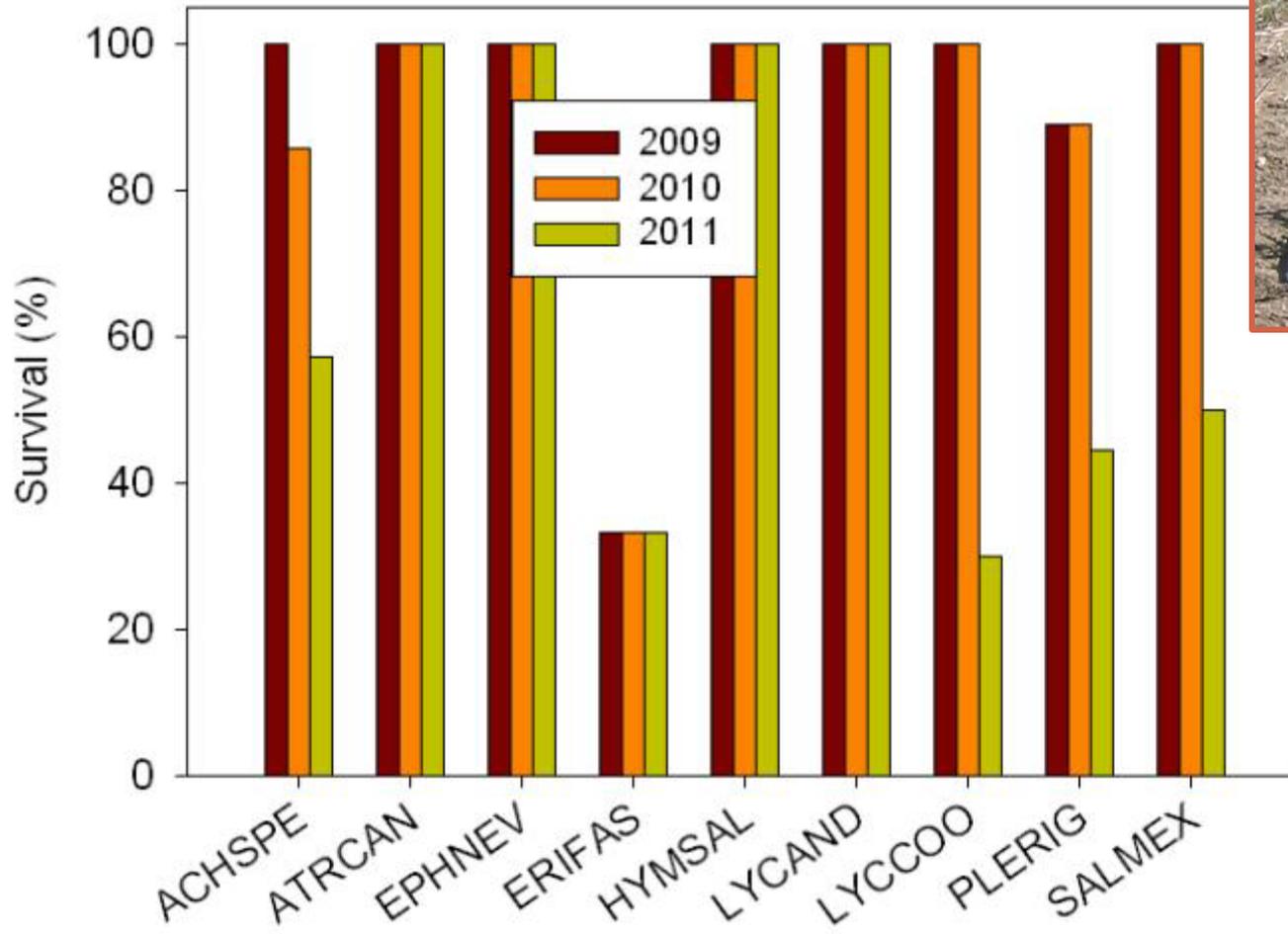
- “...to develop and implement monitoring protocols to evaluate the efficacy of revegetation techniques in promoting ecosystem succession and resilience to invasive species of restored disturbed lands.”
- We focused on how treatments affected:
 - Plant community establishment (recruitment)
 - Invasive species colonization

Sampling Methods & Data Analysis



- Randomly selected sites for treatment + undisturbed plots
- Established 2 m x 10 m transects, parallel to road
- Interspace and microsites (outplant and vertical mulch) sampled separately (1 m² or 0.25 m² subplots)
- We analyzed the data separately for plot level and microsite treatment effects

Outplant survival



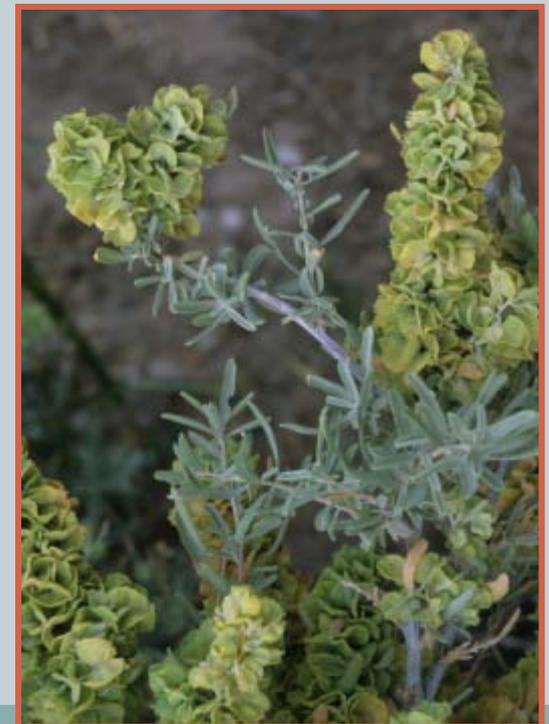
Top 10 native species recruitment (2011)



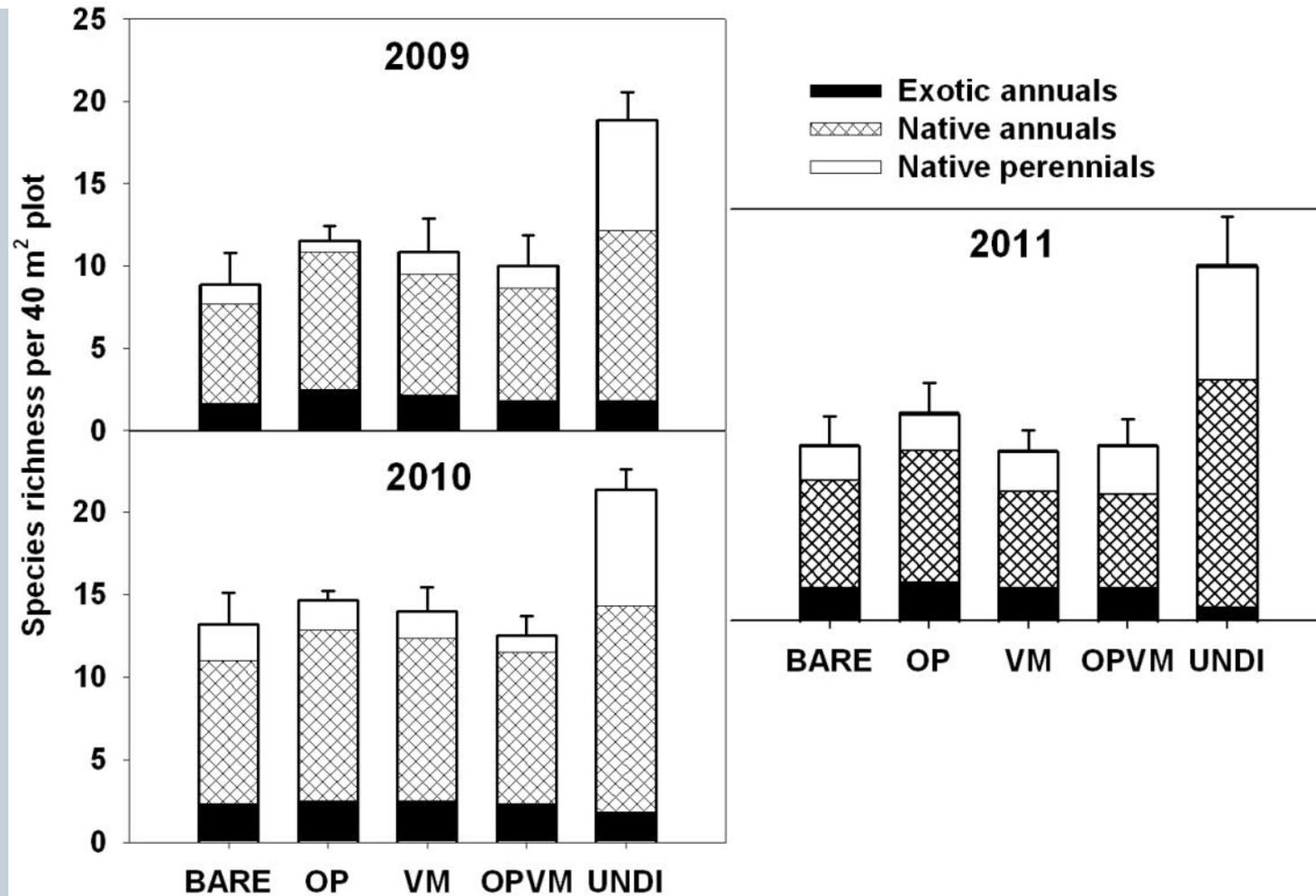
Scientific name	Common name	Life stage
<i>Amsinckia tessellata</i>	Bristly fiddleneck	Annual
<i>Atriplex canescens</i>	Fourwing saltbush	Perennial
<i>Ambrosia acanthicarpa</i>	Burr ragweed	Annual
<i>Eriogonum wrightii</i>	Bastardsage	Perennial
<i>Linanthus aureus</i>	Golden linanthus	Annual
<i>Stephanomeria exigua</i>	Small wirelettuce	Annual
<i>Eriogonum spp.</i>	Annual buckwheat	Annual
<i>Astragalus lentiginosus</i>	Freckled milkvetch	Perennial
<i>Gilia spp.</i>	Gilia	Annual
<i>Achnatherum spp.</i>	Needlegrass and Ricegrass	Perennial



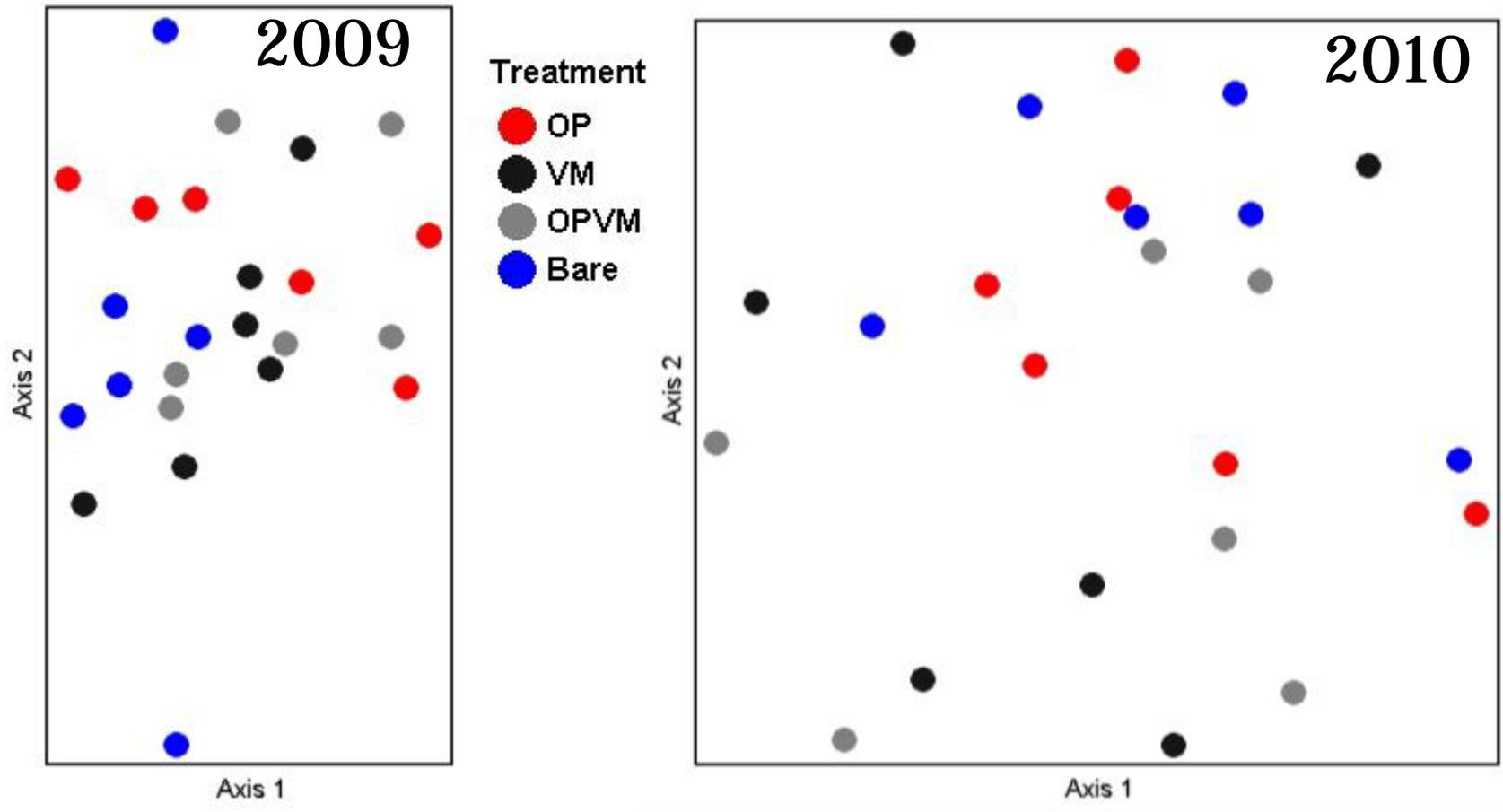
(c) Walter Feller - MojaveDesert.NET



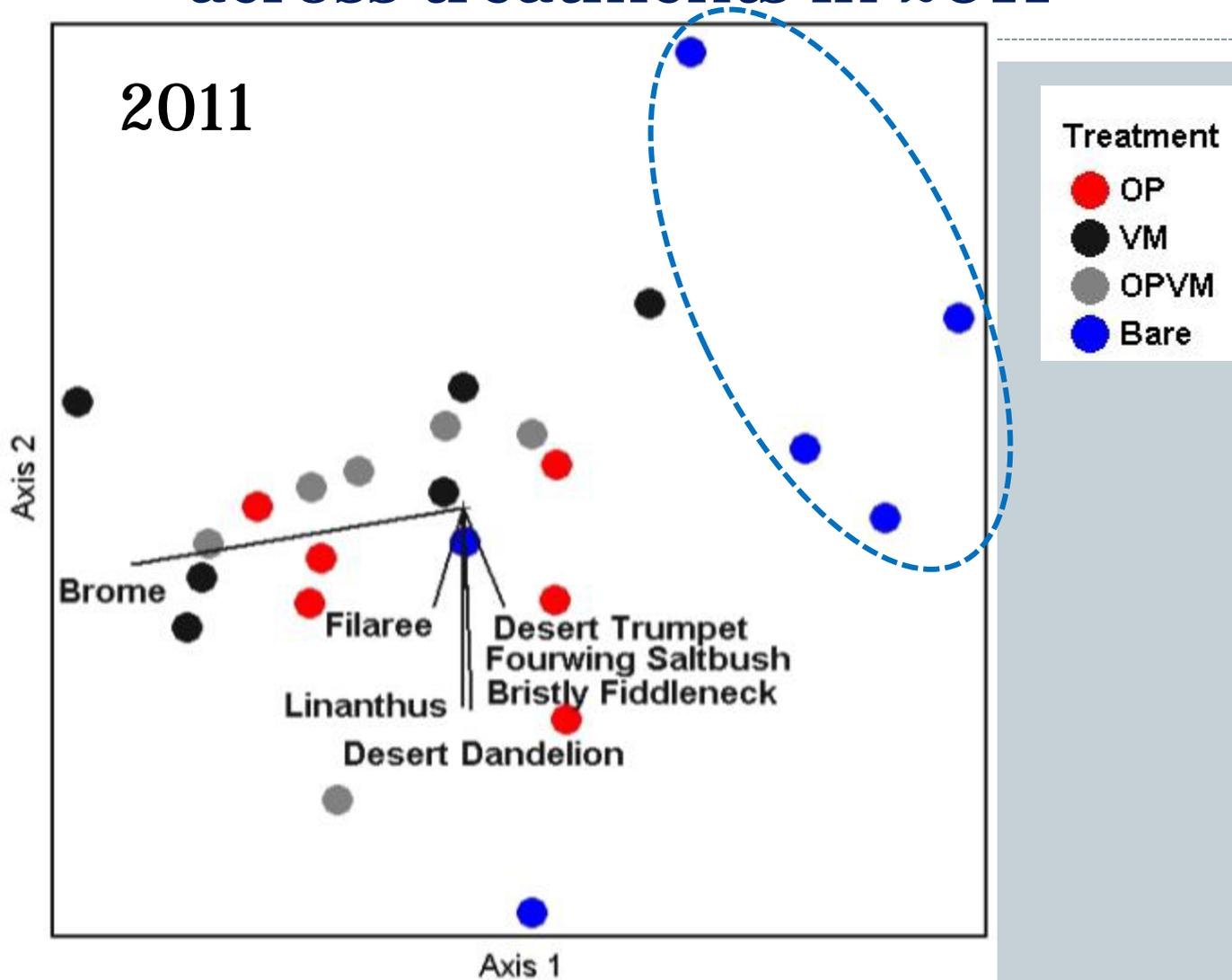
No differences in native or exotic richness among treatments



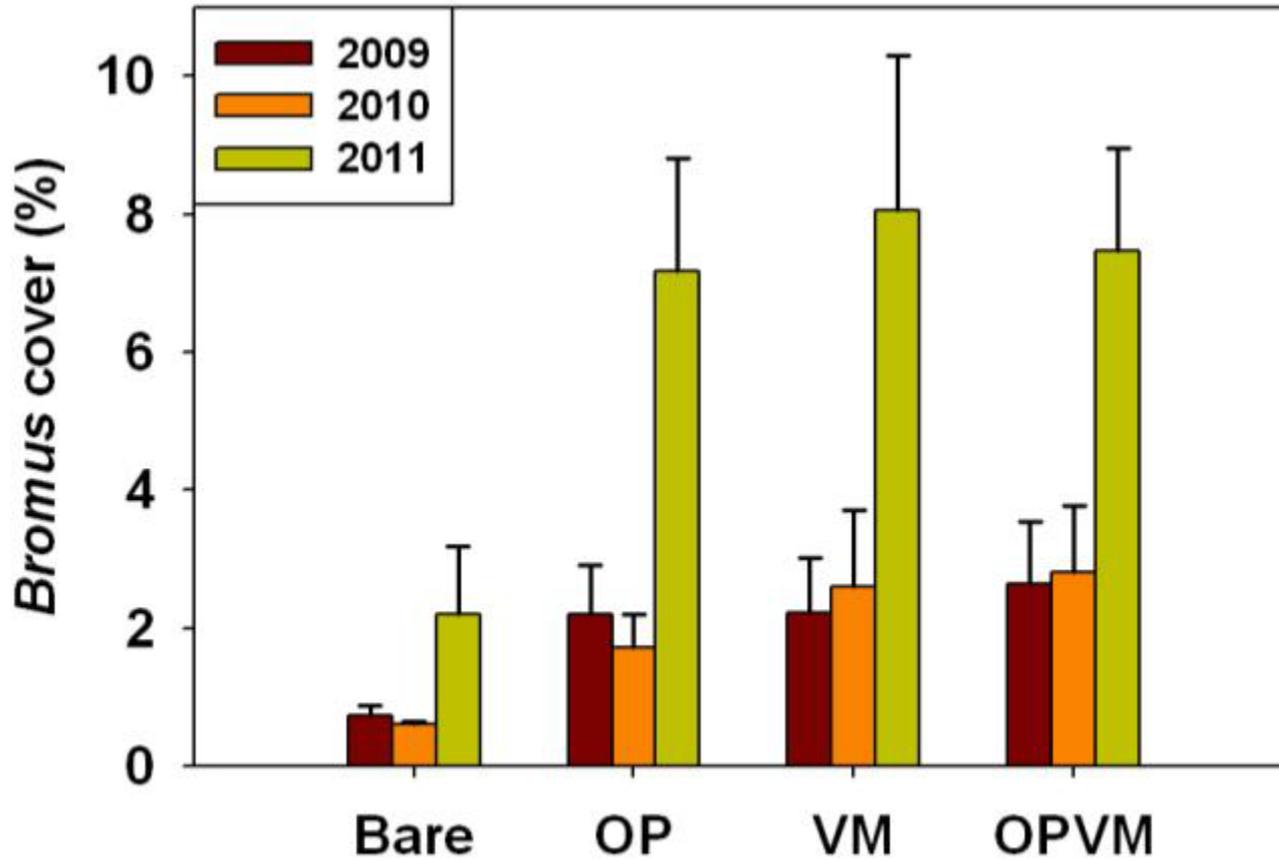
Community composition similar across treatments in 2009 and 2010



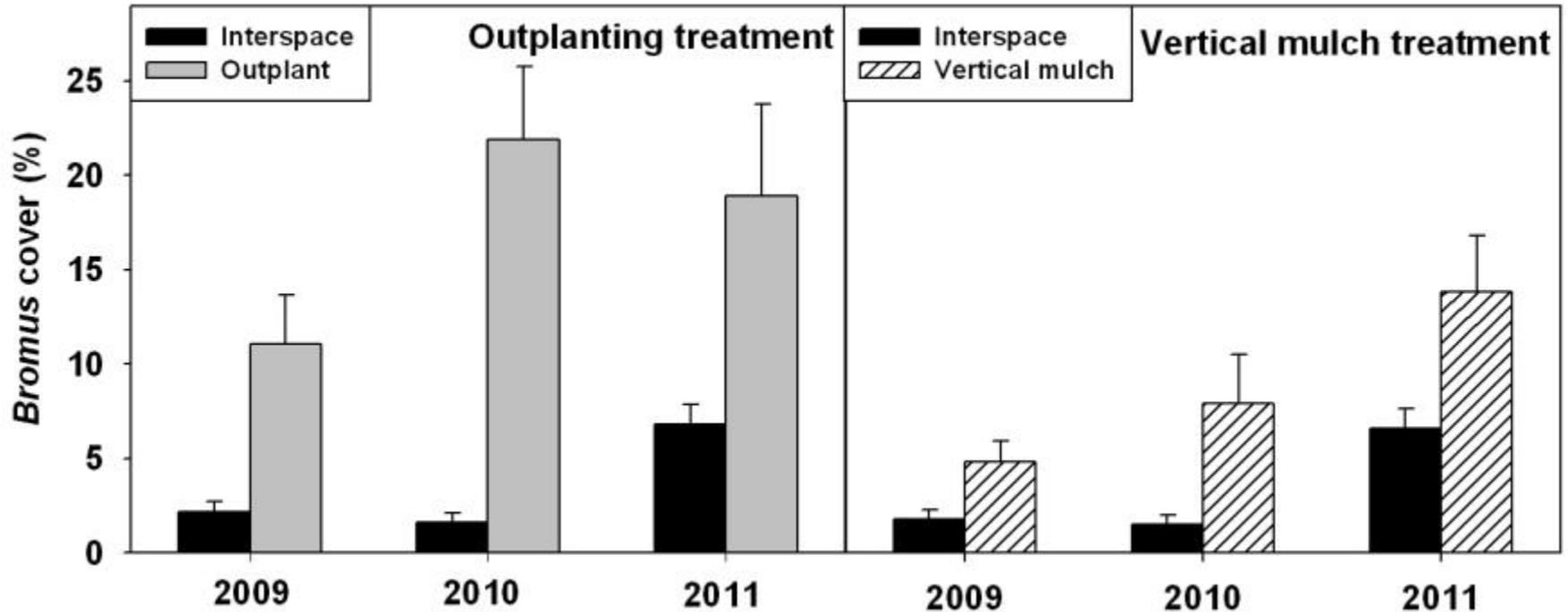
Community composition slightly differed across treatments in 2011



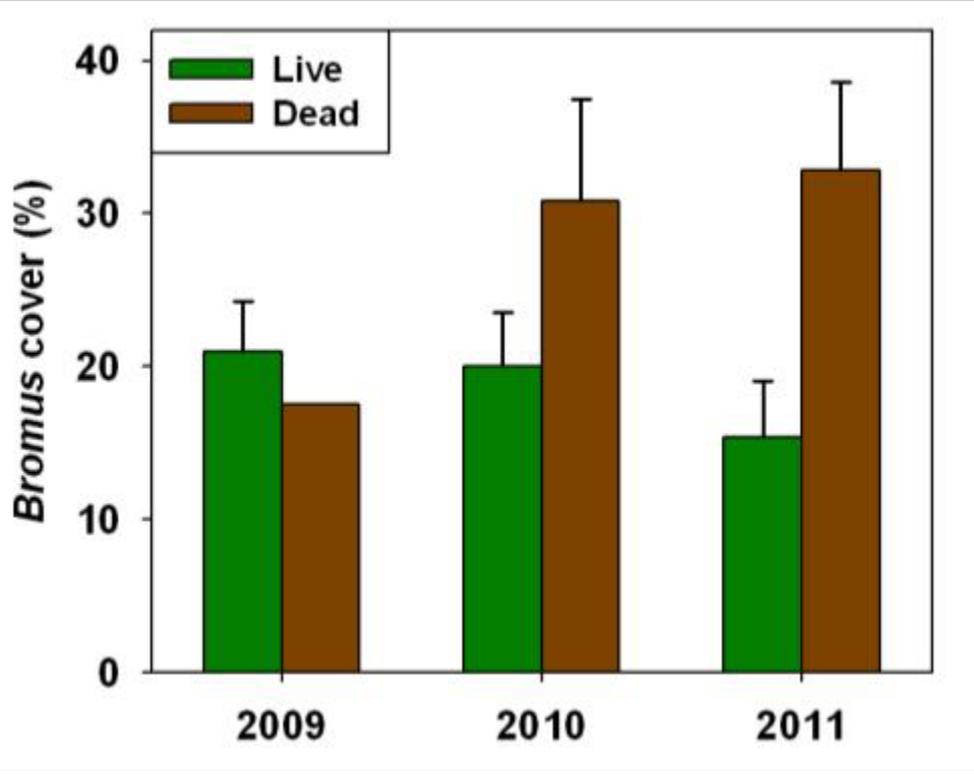
Brome abundance least in bare plots



Brome abundance greater in outplanting and vertical mulch microsites



Brome cover is greater when outplants are dead



Summary



- Native and exotic species richness did not change across treatments
- After three years, community composition differed among bare plots and all treatment plots indicating different levels of native (and non-native) recruitment
- Brome abundance increased in outplant and vertical mulch microsites



Gypsum Soil Restoration and Revegetation in Lake Mead National Recreation Area

TREATMENTS, MONITORING, AND MANAGEMENT ACTIVITIES

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Site History

Lake Mead National Recreation Area- Road Realignment areas along Northshore Road 2008-2010



- Lake Mead National Recreation Area - Northshore Rd realignment began in early 2000s with funding from Federal Highway Administration
- Three portions used for road construction and realignment research areas of 2008
- Completed revegetation research in disturbed roadside areas

Salvage Plant Treatments



- Plant salvage - Oct. 2008
 - Watersorb ® Polymers -(slurry)
 - 1H-Indole-3-butanoic acid (IBA)



Plant nursery at Overton Beach – spring 2009

- Plant care and maintenance –Oct. 2008-Jan. 2010
 - Survival surveys Oct.-Nov.



NS/Overton Beach Rd intersection - Nov. 2009

Watersorb ® Polymers - super absorbent polymer that reduces water depletion to improve the ability of soil and other growing media to retain water and nutrients

1H-Indole-3-butanoic acid is a root stimulating hormone in the auxin family that assist in plant's life cycle and body development.



Transplant Treatments

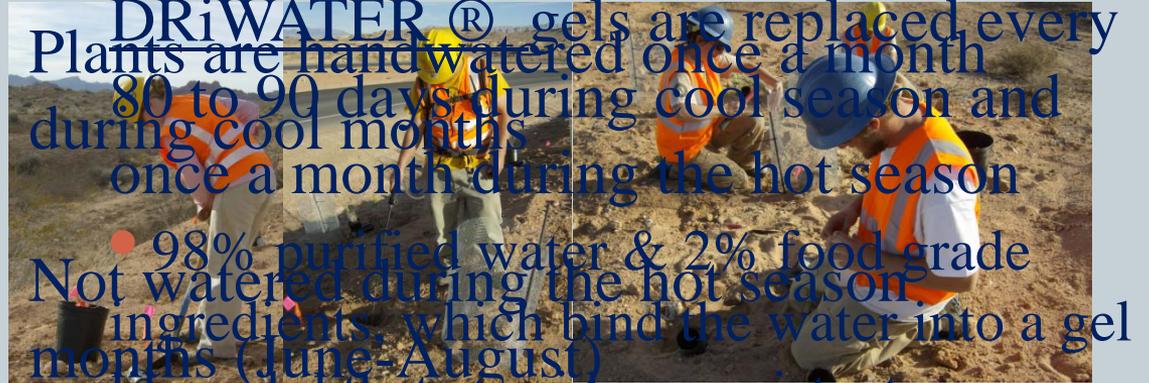
- Surviving plants transplanted first and third weeks of Jan. 2010

- Three treatments

- 1) No water
- 2) Hand-watering
- 3) DriWater gel

DRIWATER[®] gels are replaced every 80 to 90 days during cool season and during cool months once a month during the hot season

- 98% purified water & 2% food grade ingredients, which bind the water into a gel like solid that provides consistent subsurface irrigation

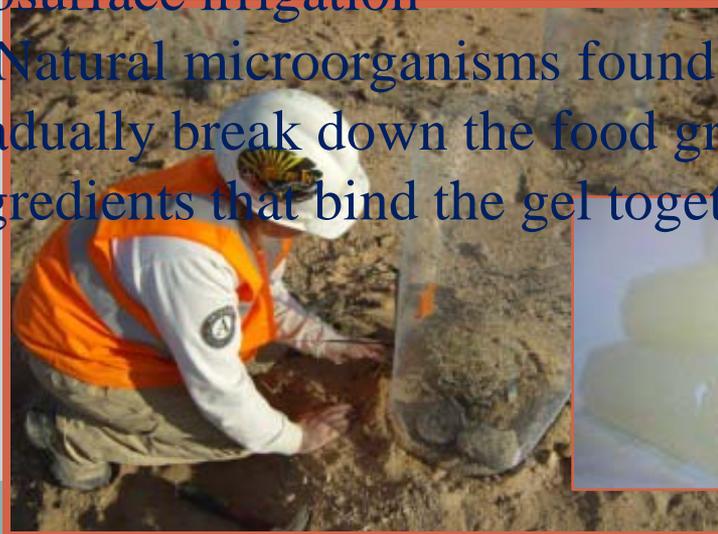


- Survival survey March/April 2011

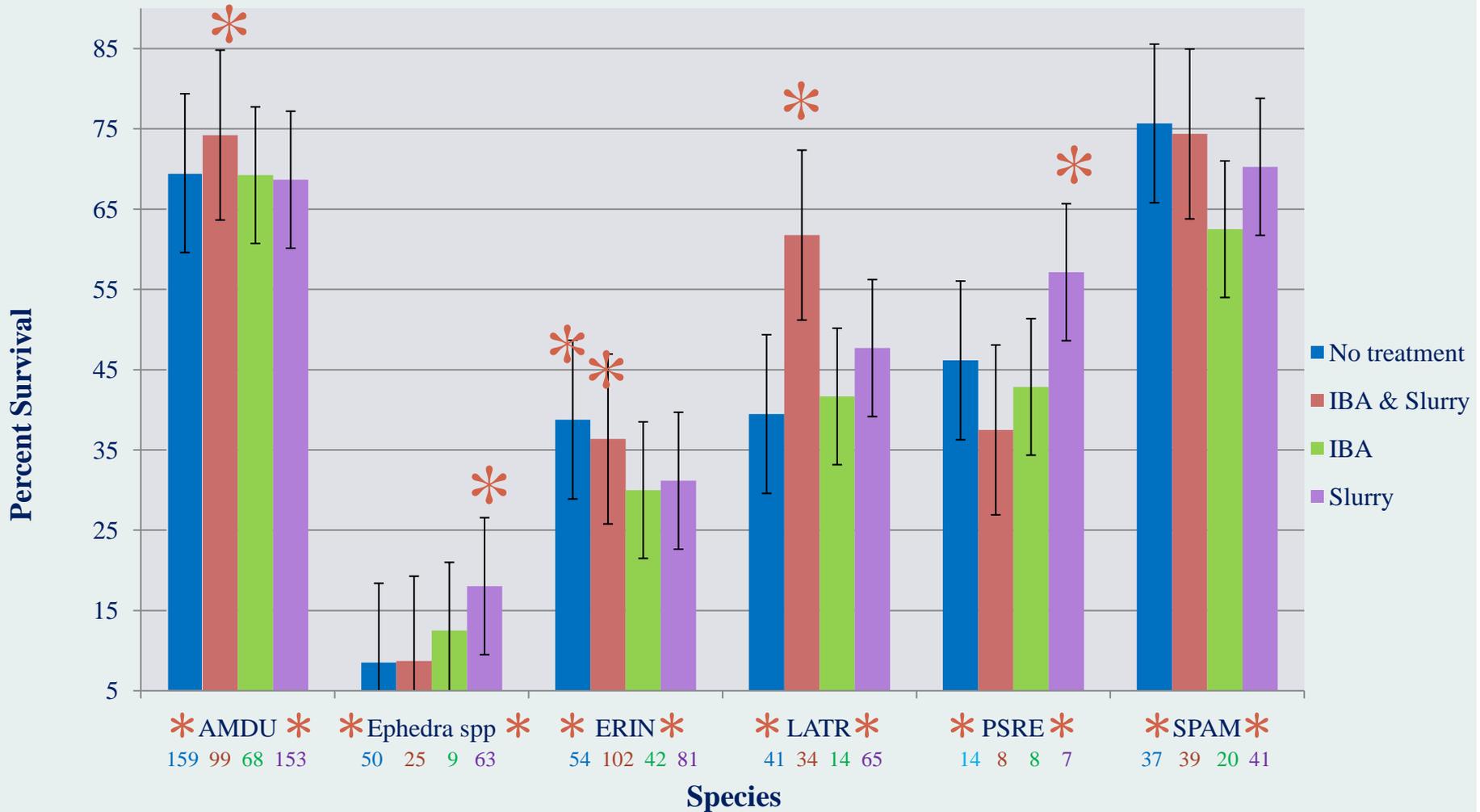


NCC planting crew

- Natural microorganisms found in soil gradually break down the food grade ingredients that bind the gel together



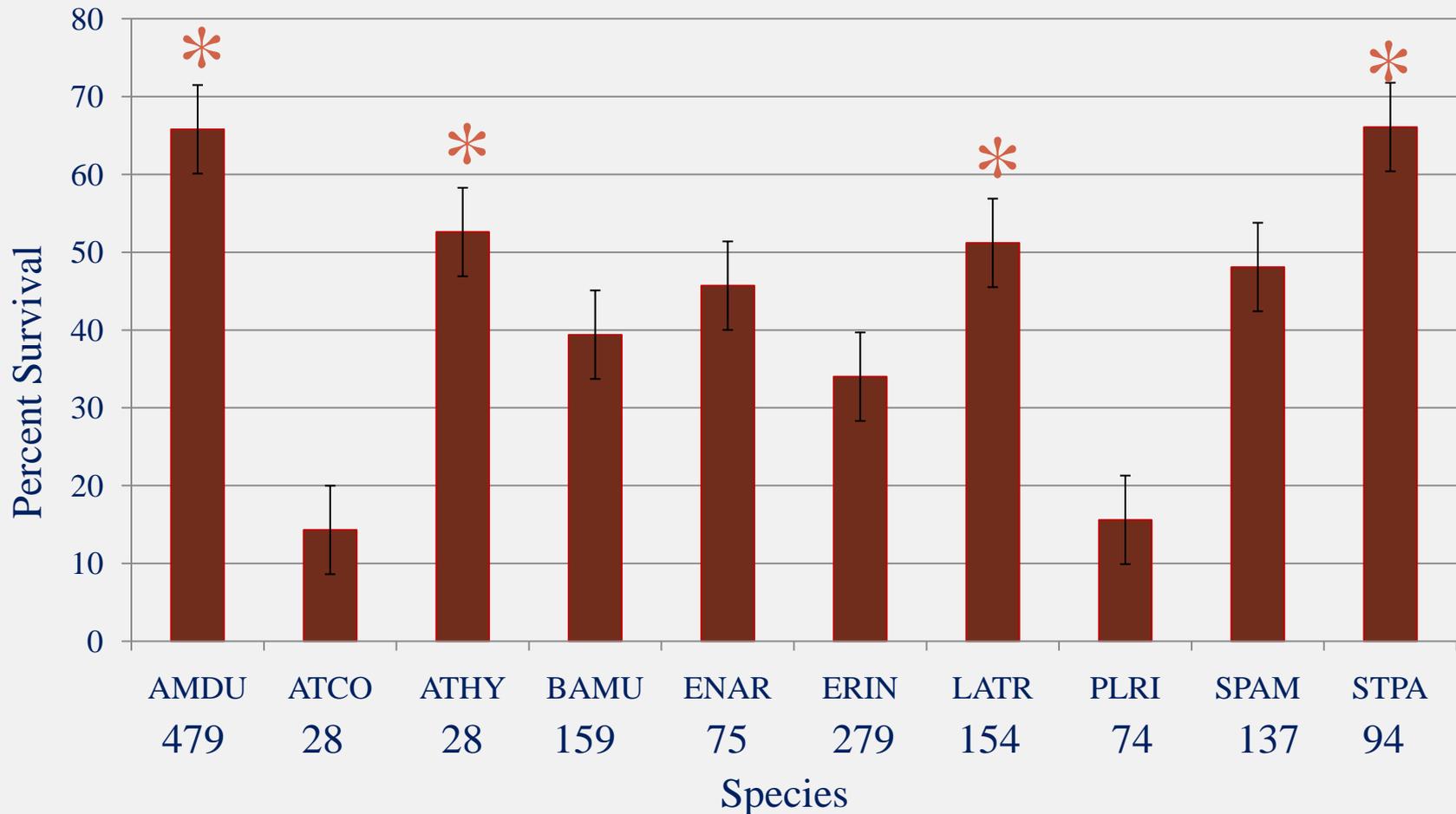
Results: plant salvage survival after one year



Results: transplant overall species survival



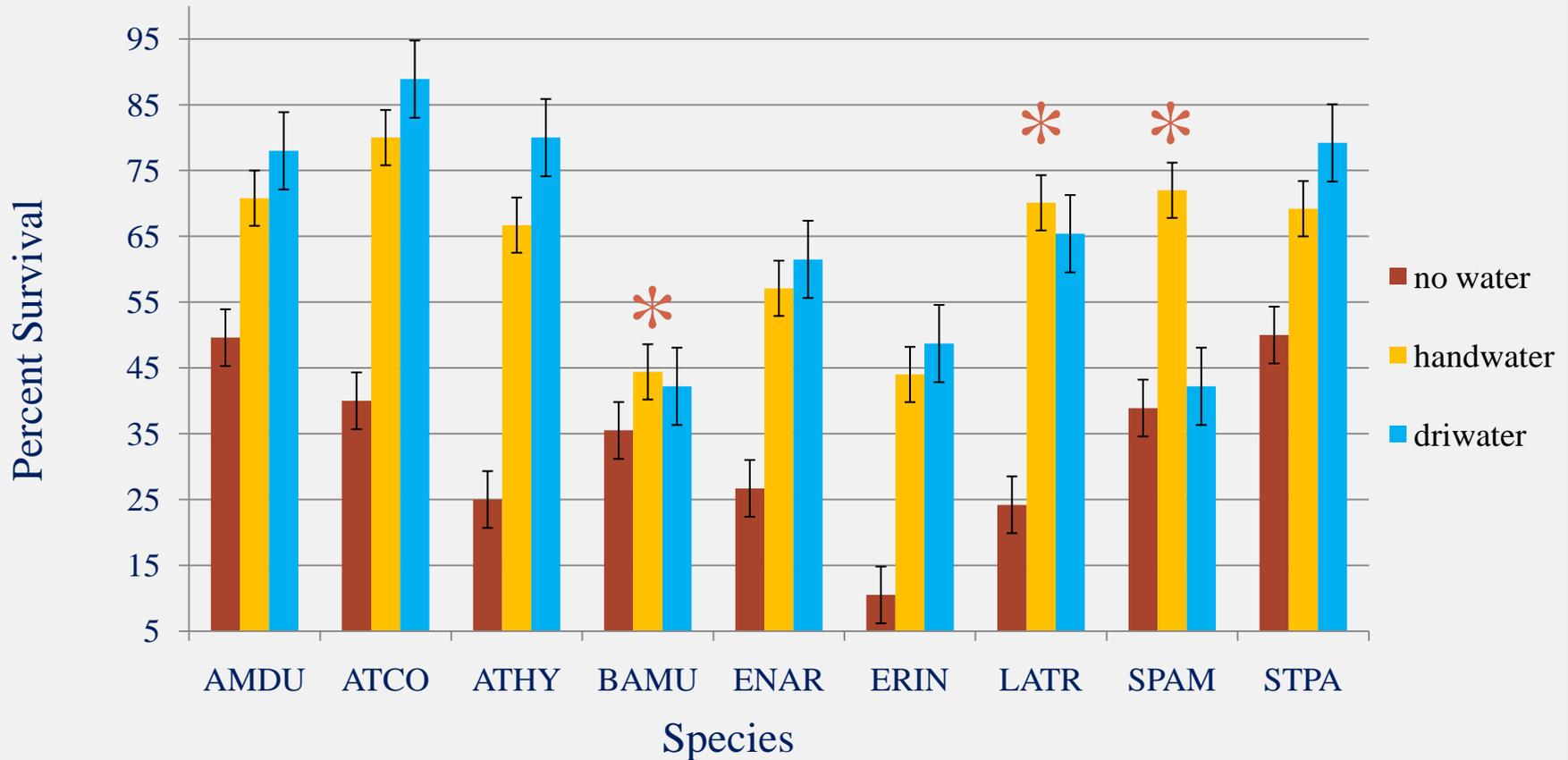
Percent Survival per Species



Results: transplant survival after one year



Survival per species per watering treatment



Summary



- Which treatments perform the best per species
- Plant survival after salvage and transplanting
- No overall pattern across all species
 - No obvious difference between treatments for woody shrubs and non-woody herb species
 - Species specific
- For all transplanted species, survival increased with water treatments
 - Not necessarily a difference between two water treatments
 - *Baileya multiradiata*, *Sphaeralcea ambigua*, and *Larrea tridentata* had a greater survival with hand-watering treatment
 - *Sphaeralcea* had the greatest difference in survival between hand-watering and DriWater

*Baileya
multiradiata*



*Larrea
tridentata*



*Sphaeralcea
ambigua*

Discussion



- More analysis is required to find correlations between watering treatments and specific species
 - Influence from environment (aspect, slope, soil)
- Continued monitoring of survival of transplants required for another year
 - Additionally, eventual 'hardening' of plants will be required for those individuals receiving watering treatments
- Study indicates some species that may be best for use in outplanting or transplanting