UNIVERSITY OF NEVADA LAS VEGAS

School of LIFE SCIENCES

CALIFORNIA FIRE SCIENCE CONSORTIUM

Scott Abella
Lindsay Chiquoine
Shelley Porter
School of Life Sciences
scott.abella@unlv.edu
Editorial Office, Ecological Restoration
abellaNRC@gmail.com

Natural Resource Conservation LLC

Retrospective Condition Assessment of Long-Term Ecological Restoration Sites in Upland Desert Habitats in Clark County

Road 108 closed and ripped, Lake Mead National Recreation Area

2025 8-18

Project 2017-UNLV-1760C Background and Objectives

Determine effectiveness of a range of different treatments across site conditions and short and long time periods

Further assess functional metrics, e.g., desert tortoise forage

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Techniques for Restoring Damaged Mojave and Western Sonoran Habitats, Including Those for Threatened Desert Tortoises and Joshua Trees

Scott R. Abella
University of Nevada Las Vegas,
School of Life Sciences
4505 S. Maryland Parkway
Las Vegas, Nevada 89154-4004

Kristin H. Berry
U.S. Geological Survey,
Western Ecological Research Center
3621 Pinot Grigio Drive
Reno, Nevada 89509

Natural Resource Conservation LLC
1400 Colorado Street
Boulder City, Nevada 89005
Author for correspondence:
scott.abella@unlv.edu

Stefanie Ferrazzano
Clark County Department of Environment and Sustainability, Desert Conservation Program
4701 W. Russell Road, Suite 200
Las Vegas, Nevada 89118

Habitat restoration practices in the Mojave Desert

Sixteen studies - outplanting nursery-grown native perennials

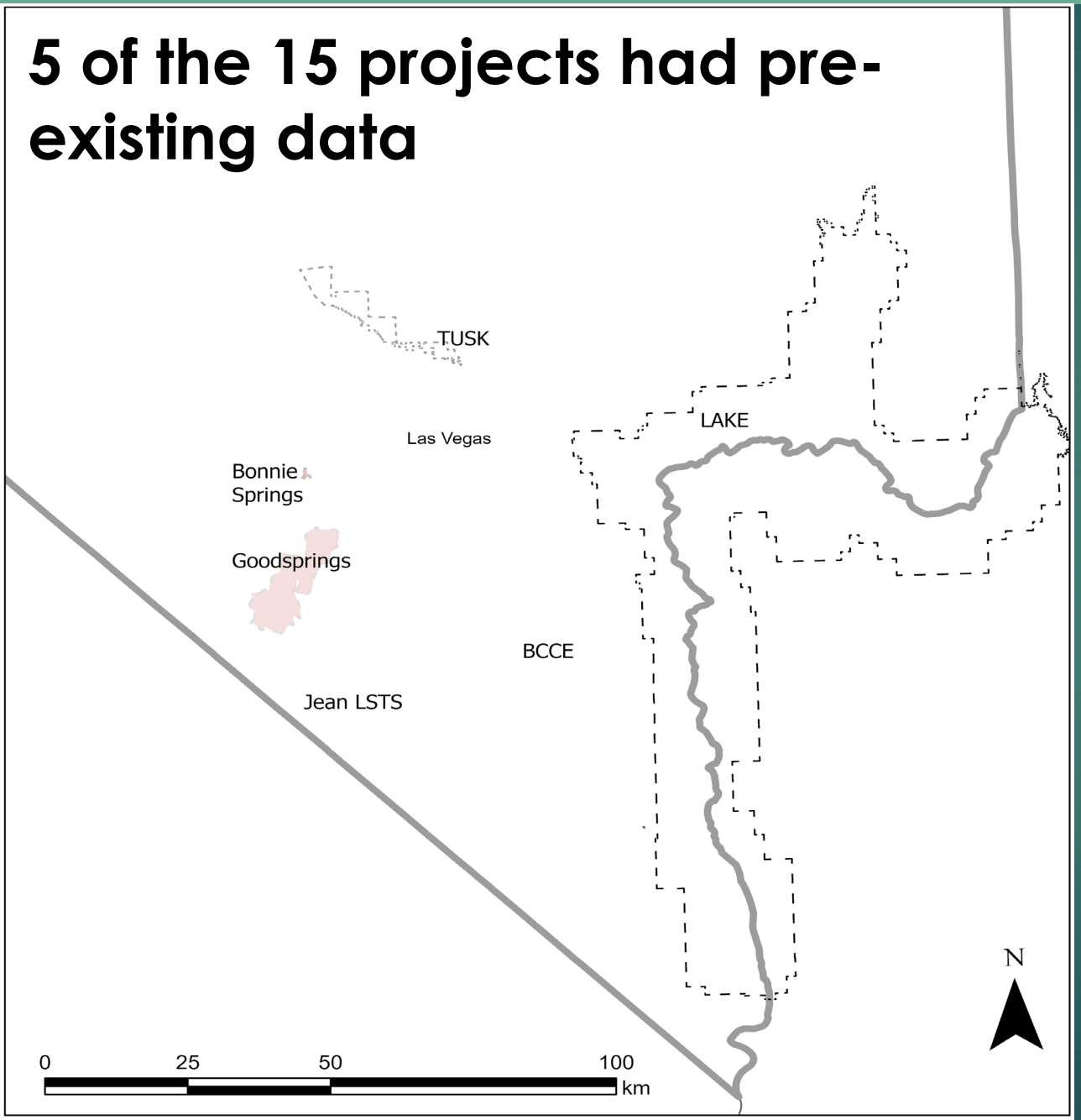
Only one study assessed outplant survival after four years

A Clark County Desert Conservation Program-sponsored synthesis

Habitat Restoration Goals

- Ameliorate degradation
- Improve ecological functions
- Reintroduce lost species, increase biodiversity
- Create structural habitat for wildlife, including pollinators
- Reestablish habitat connectivity
- Maintain or improve air quality, reduce dust which can be a human health hazard

Summary Methods and Accomplishments



- Extensive querying in 2023 for projects (e.g., SNRT)
- 15 projects in Clark County, one or more restoration treatments on public lands (uplands)
- 363 plots in 2024, full plant communities, soil metrics
- Mixture of first monitoring and long-term, as far back as 2006 and 25 years post-restoration

Disturbance Types, Ages, and Restoration Treatments

Revegetation, soil amendments/stabilization, abiotic structural restoration

Project	Disturbance	Age (yrs)	Planting	Seeding	Soil ripping/ recontouring	Vertical mulch	Topsoil	Rock mulch	Imprinting	Fencing	Permeon	Horizontal mulch
BCCE 2013/2014 Planting	Road	10	x		x		x	x				
BCCE 2020 Seeding	Road	4		x	x				x			
BCCE 2020/2021/2022 Planting	Road	2-4	x		x	x		x				
Bonnie Springs	Wildfire	16		x								
Callville Bay Landfill	Clearing	12	x									x
Fish Hatchery	Clearing	25	x					x			x	
Goodsprings	Wildfire	16	x									
Jean LSTS	Clearing	12		x						x		
Lake Mead Lodge	Clearing	2	x		x			x				x
Las Vegas Bay Landfill	Clearing	12	x									x
Northshore Road	Road	14	x				x					
Road 108	Road	22			x							
Shoreline Planting	Clearing	13	x									
SNWA Endcaps	Road	4	x		x			x				
Tule Eglington	Road	13	x	x	x	x	x	x				x
Total - 15 projects			**11**	**4**	**7**	**2**	**3**	**6**	**1**	**1**	**1**	**4**

Assessed 92 vegetation metrics; soil functions like stability

Example of Overall Findings and Report Content

Relative to controls or references, 9/15 (60%) projects successful or partially successful; individual treatment results mixed

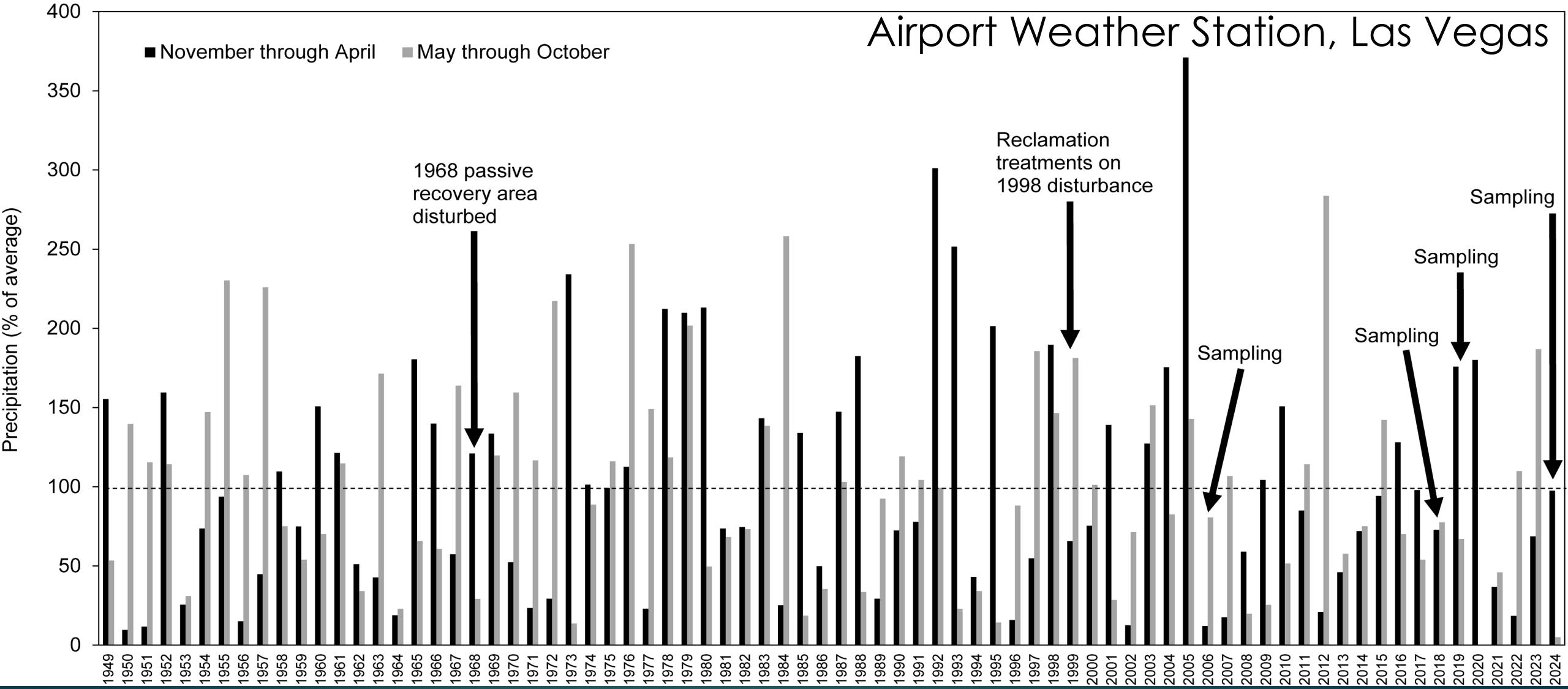
Every major ER tmt provided benefits in at least one project

Treatment	Summary effectiveness
Transplanting	+ shrub cover in 2/3 projects; dead transplants created VM; + tortoise annual food plants in 2/3
Outplanting	Partial outplant species persistence in 4/8 projects; variations like cages with outplants important
Seeding	Materially effective in 1/3 projects (+ tortoise forage in the 1); failure even with best practices
Ripping	+ native perennials in 1/1 projects; combined with other tmts in others, likely mixed effects
Topsoil application	+ native plant cover, tortoise food in 1/1 projects, synergistic with planting
Rock mulch/varnish	Applied with other tmts so cannot distinguish, but associated with + native cover in 3/4 projects
Vertical mulch	Confounded with other tmts so cannot distinguish, but created structure for visual blending
Fencing	+ tortoise annual food plant in 1/1 projects, did not increase seeded perennials
Specialized sub-tmts	
Irrigate plantings	DriWater did not forestall some planting failures, but may have + survival in others
Protect plantings	Cages/shelters did not forestall some planting failures, but may have + survival in others
Mulching plantings	Did not forestall planting failure in 1 project, though outplants persist in 2 other projects
Pelleting seed	Aided seeding success for 1 species in 1 project; appeared ineffective in 1 project
Permeon varnish	Ripping, rock mulch, planting little discernable effect at 4 yrs; ocurred during drought
Recontouring	Included with other tmts so effects not isolatable, but did roughen surface where applied

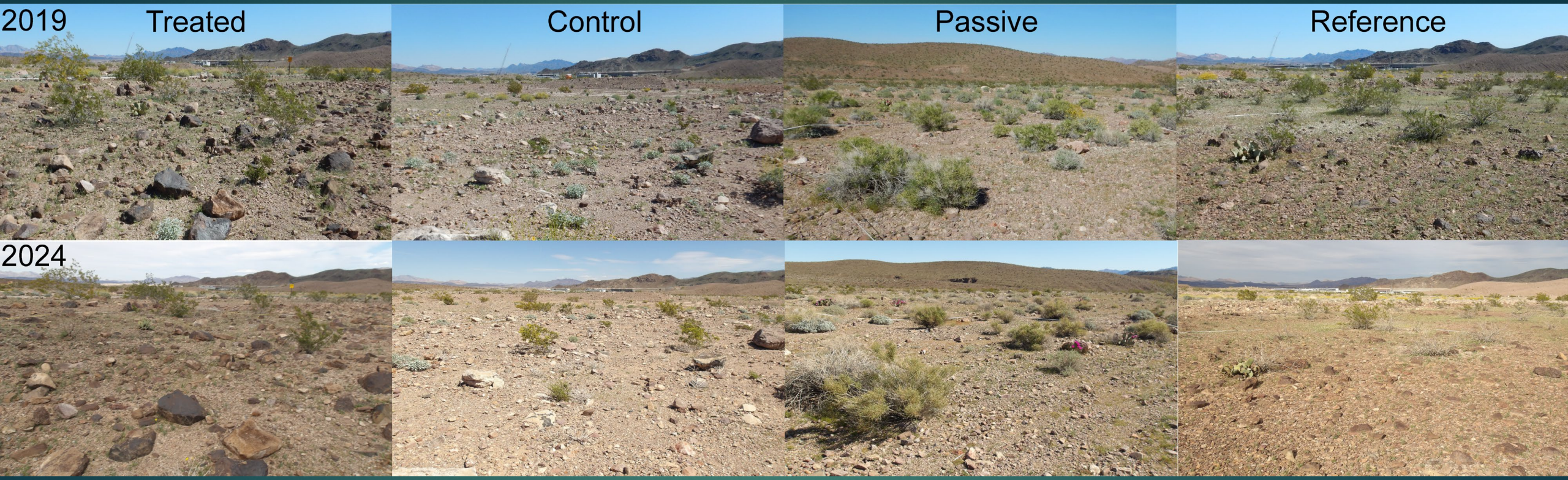
Some projects succeeded despite the failure of several or nearly all of their components but were driven to success by the one or few components that did succeed.

Fish Hatchery Lake Mead Restoration Project

1973-1980 only time 7/8 years above avg. winter precipitation



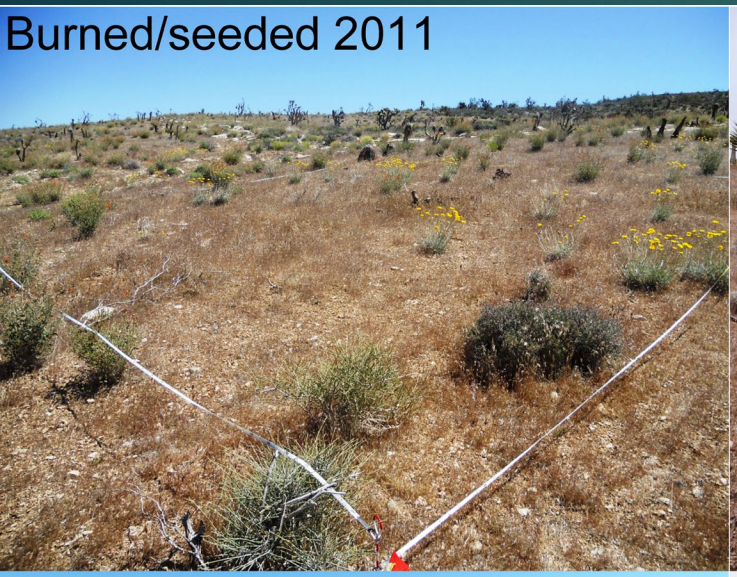
Fish Hatchery Lake Mead Restoration Project

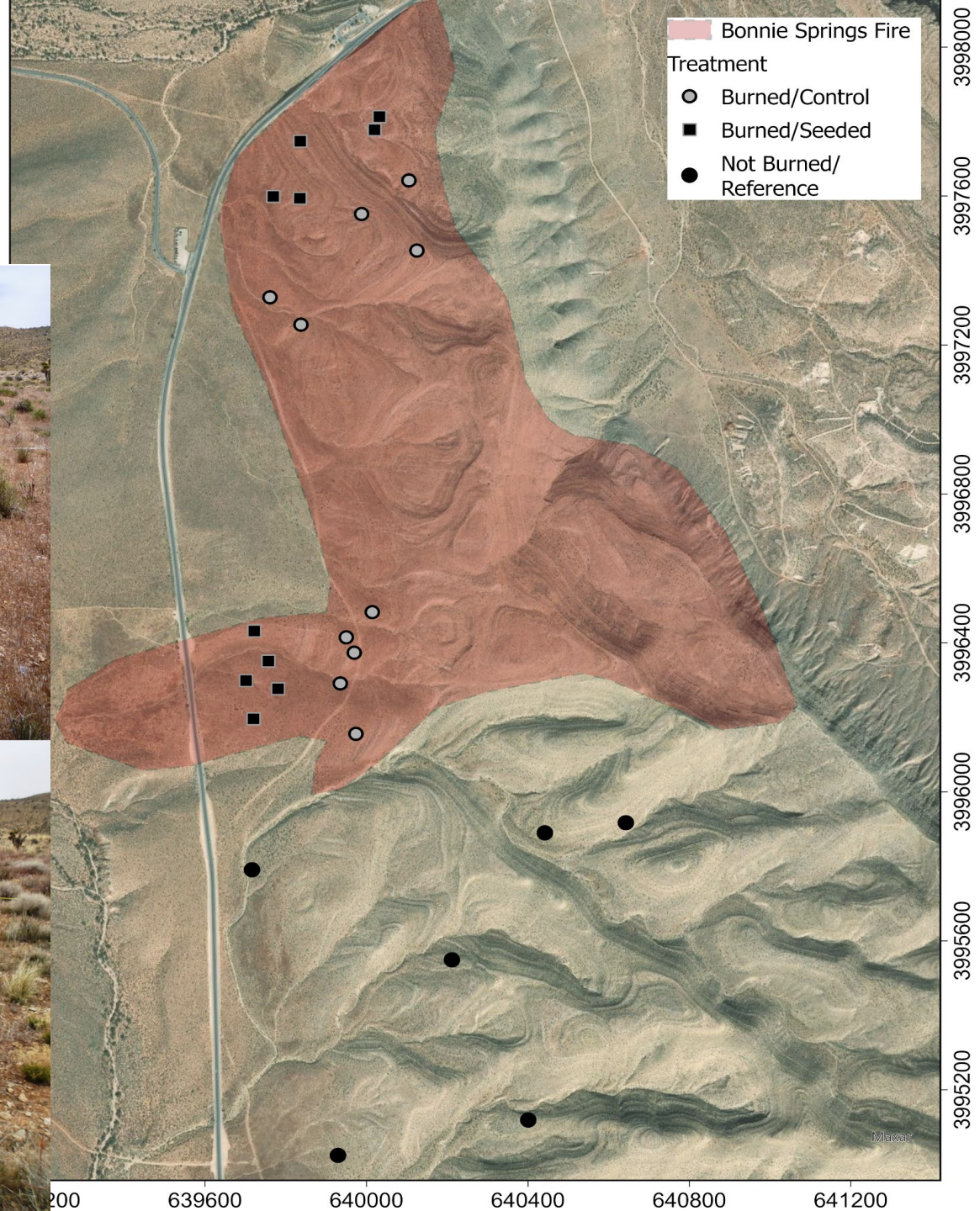


- Raking rocks, stabilizing soil surface, artificial desert varnish, shrub outplanting on treated area in 1999
- Creosote with live foliage ↓ 70% (reference) and 55% (treated)
- Forage plants (desert plantain), pavement forbs, soils sustained

Bonnie Springs Fire Seeding

- Followed best practices
- 2009-11, 2024 seed bank, veg





Goodsprings Fire Outplanting (2008 after 2005 fire)

- Survival and flowering from 2009-2011 predictive of persistence in 2024 for the 10 outplanted species
- The four species with highest 2011 survival had higher cover in 2024 or persisted on plots where had been outplanted
- White bursage, buckwheat, globemallow, creosote

Burned, planted

2024 post-drought conditions

Burned, not planted

<u>Subtle</u> cover boost with low-density planting

Boulder City Conservation Easement (2013-14 ripped, planting)

- Decommissioned road, 2024 is 10 years post-tmt
- Planted creosotes dead, but serve as vertical mulch
- Tortoise food plants 2.9% in ER, 2.2% control, 2.6% reference

Ripped, planted

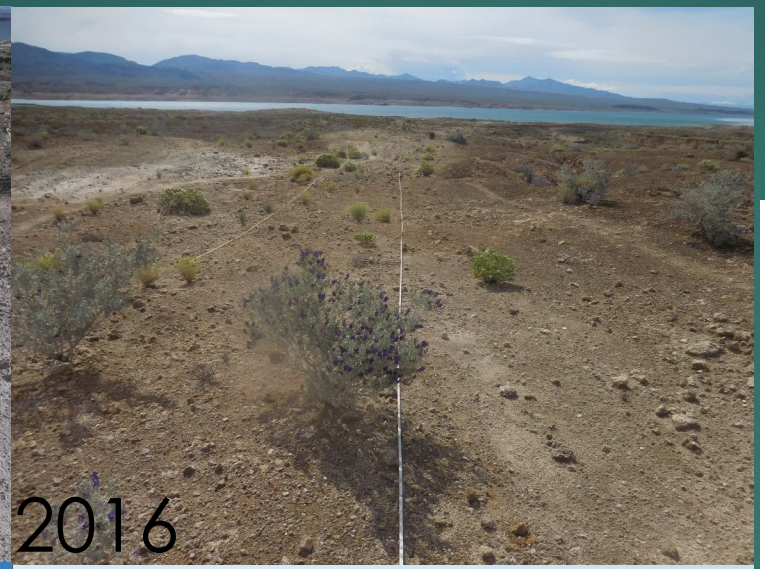
Disturbed, untreated

New DCP ongoing

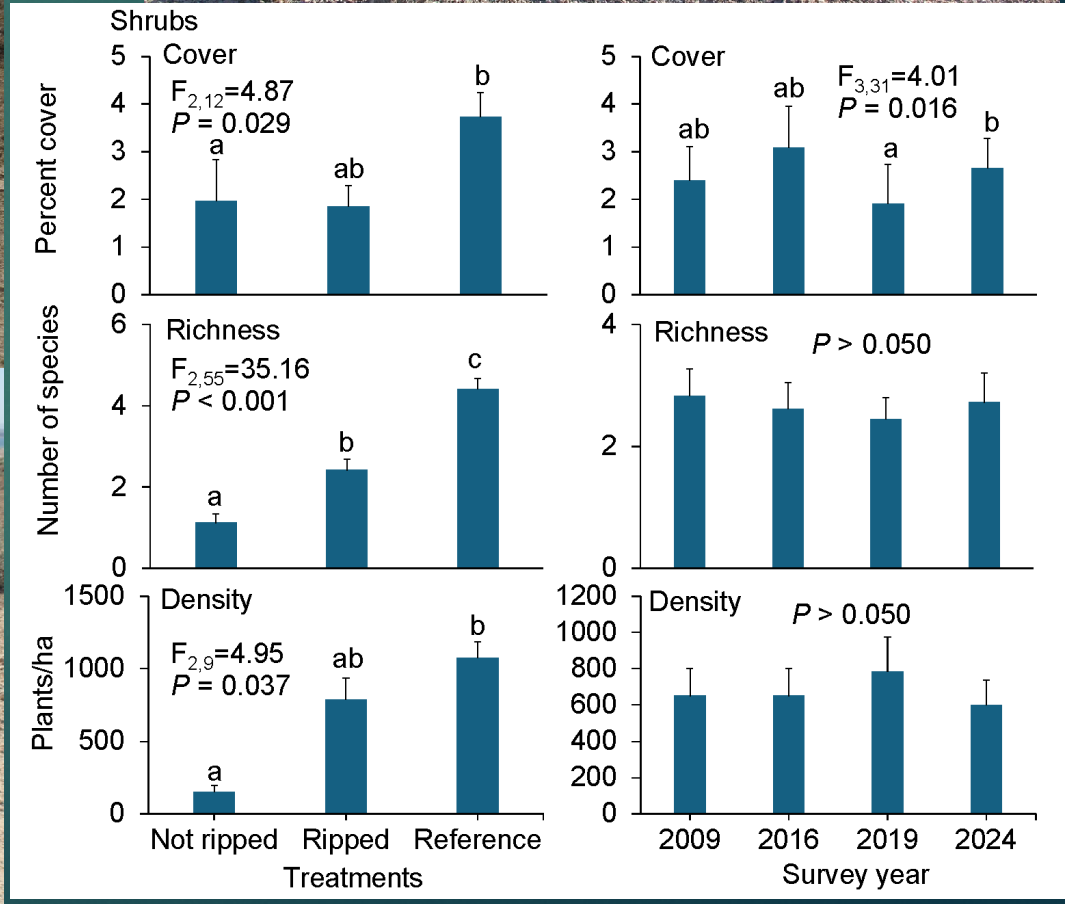
Perennial regen: need more structural complexity?

Road 108 Ripping, Lake Mead

- 2002 closure, ripping, in gypsum
- Data 7-22 years post-ER

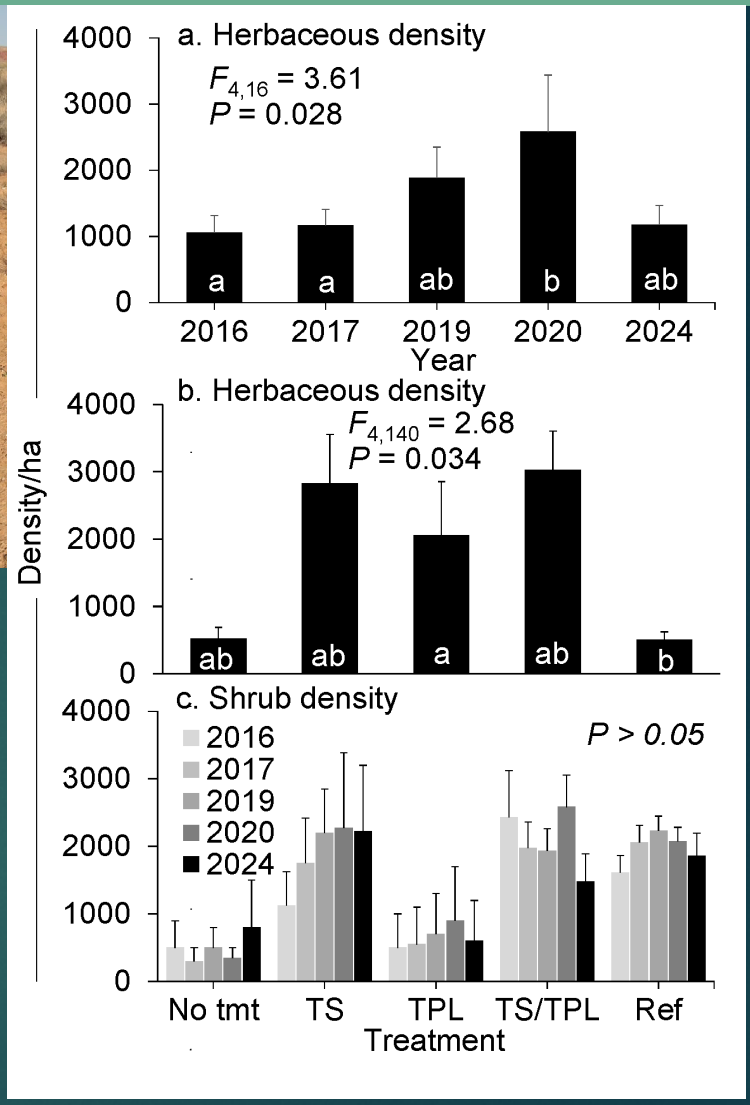


Poppy colonized ripped area



Northshore Road, Lake Mead, Topsoil & Perennial Salvage

2009 topsoil reapplication, before transplanting



Desert Tortoise Translocation Site Forage Augmentation

- Bare or pelletized desert plantain seed (others also), 2013
- 1st year: pellet seeding + fencing increase by 6x
- 2nd year: effect persists, triple the cover
- 11th year: still 2-3x the cover (though sporadic occurrence)

Enhancing Quality of Desert Tortoise Habitat: Augmenting Native Forage and Cover Plants

Scott R. Abella,* Lindsay P. Chiquoine, E. Cayenne Engel, Katherine E. Kleinick, Fred S. Edwards

S.R. Abella, L.P. Chiquoine
University of Nevada Las Vegas, School of Life Sciences, Las Vegas, Nevada 89154-4004

E.C. Engel
Nevada Division of Forestry, 4747 Vegas Drive, Las Vegas, Nevada 89108

K.E. Kleinick
Nevada Department of Transp
89101

F.S. Edwards
Bureau of Land Management

Restoration Considerations and Future Directions (Examples)

Transient, persistent, cyclic restoration dynamics (resprout?)

Idea of time-accrual of restoration benefits

Multiple treatment types, bet hedging, new practices

Topsoil salvage, abiotic tmts (e.g., vertical mulch)

Expensive, high-maintenance tmts not always most effective

Role of small experimental trails to avoid costly failures and to know what is worth upscaling; develop proactive toolbox

Augmentation or replenishment tmts, phased approach?

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