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## Effectiveness of Non-Native Plant Treatments across the U.S. National Park System: a Synthesis



UNLV students revegetating tamarisk areas, Lake Mead NRA, 2017

# History of Introduction

Cargo manifests of ships similar to 1620 Mayflower document direct transport of weed seeds and likely contaminant seeds within agricultural seed lots

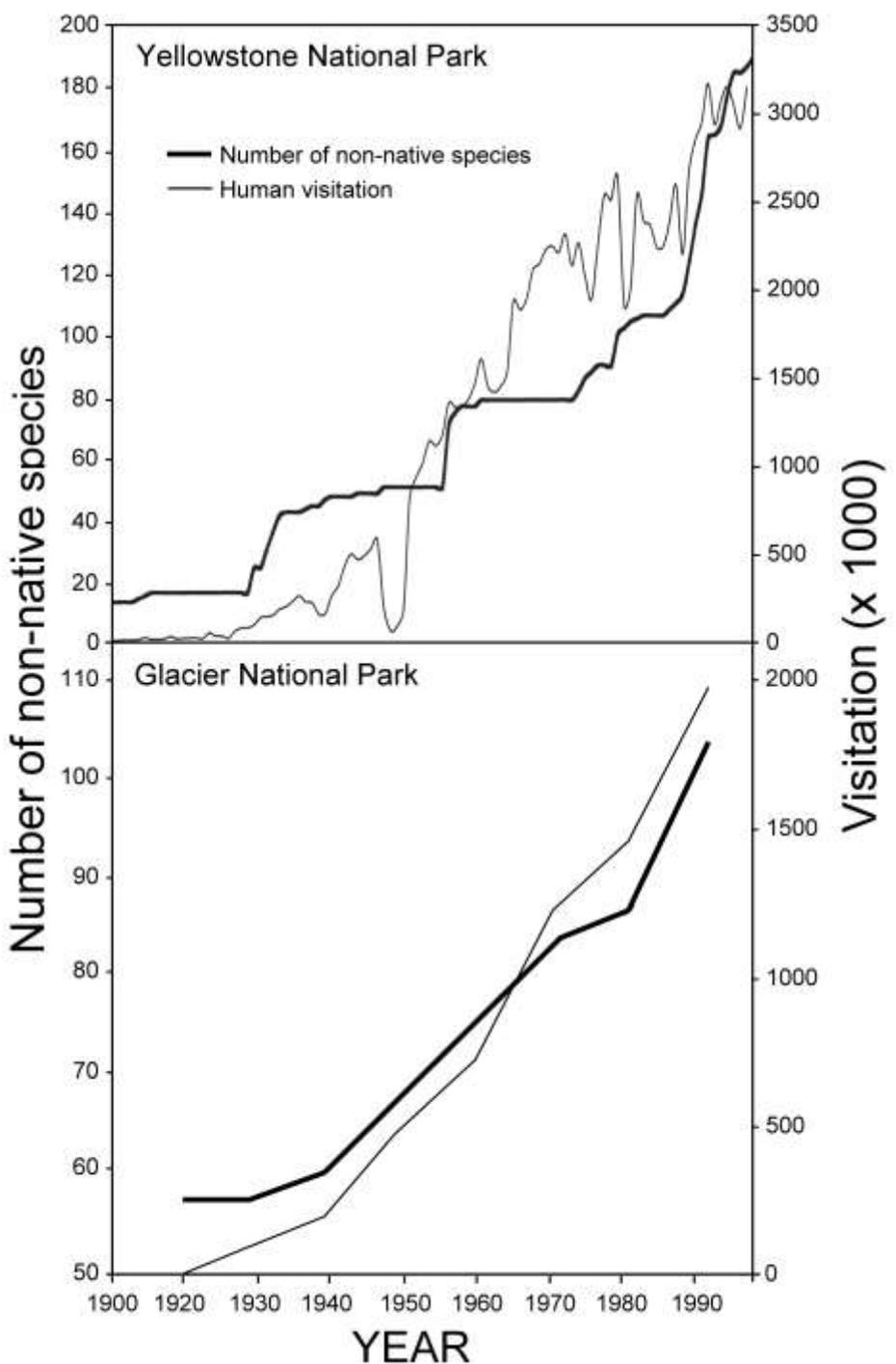
At least one non-native plant species in Yellowstone by 1886

13,727 Yellowstone visitors in 1904

331 million in NPS units in 2016



Mammoth Springs, NPS



# National Park Units

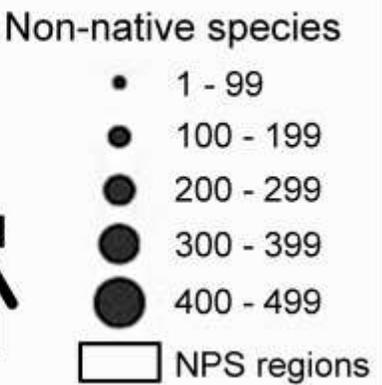
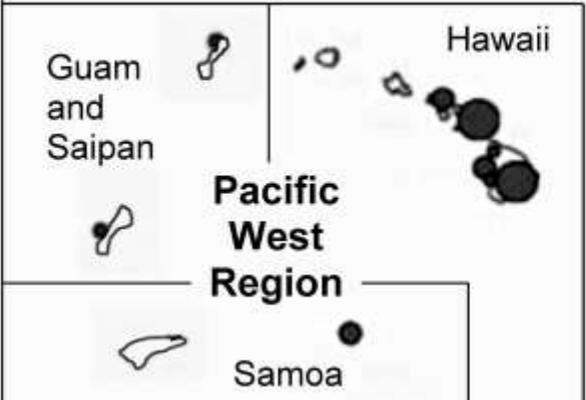
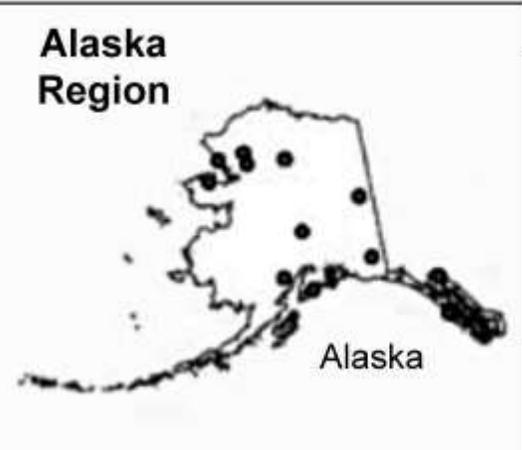
## Extent of Invasion

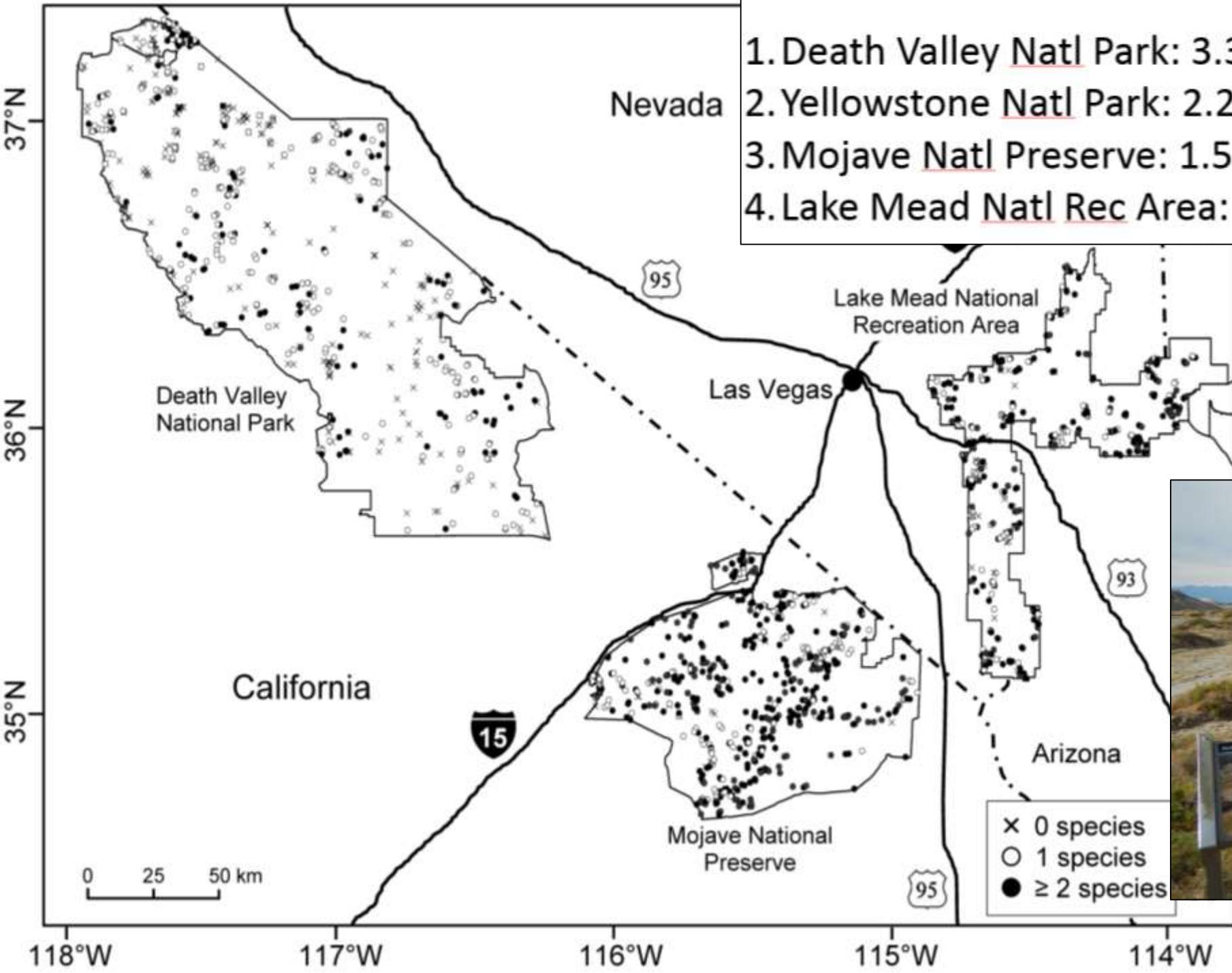
— non-native plant spp.

483 spp. in \_\_\_\_\_



Modified from Allen et al. (2009)





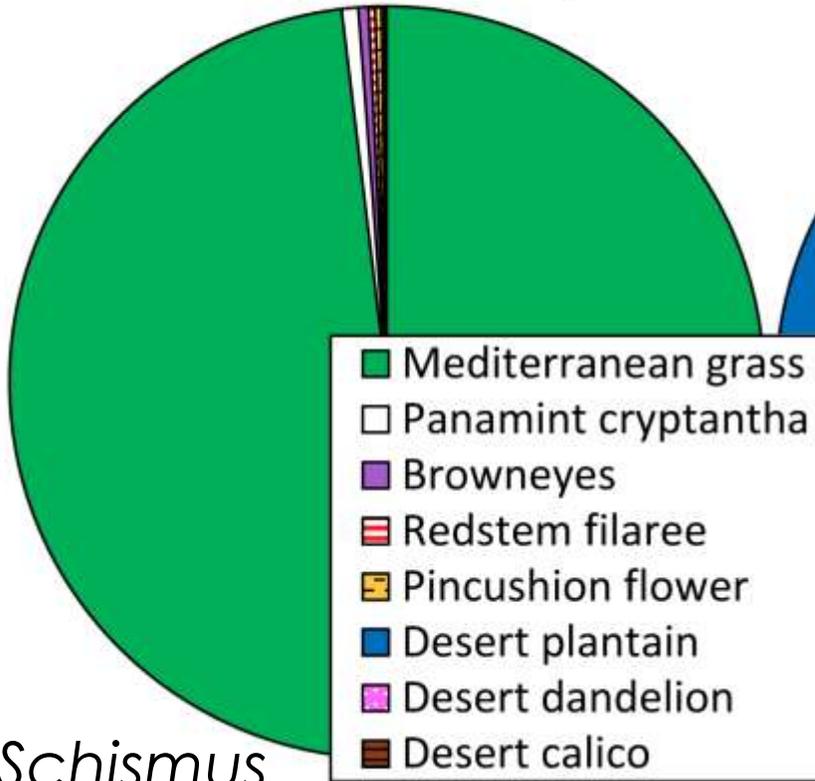
- 1. Death Valley Natl Park: 3.3 mill ac ✓
- 2. Yellowstone Natl Park: 2.2 mill ac ✗
- 3. Mojave Natl Preserve: 1.5 mill ac ✓
- 4. Lake Mead Natl Rec Area: 1.4 mill ac ✓

– 1,662 0.1-ha plots  
 – 82% at least 1 NNP  
 – 51% ≥ 2 NNP

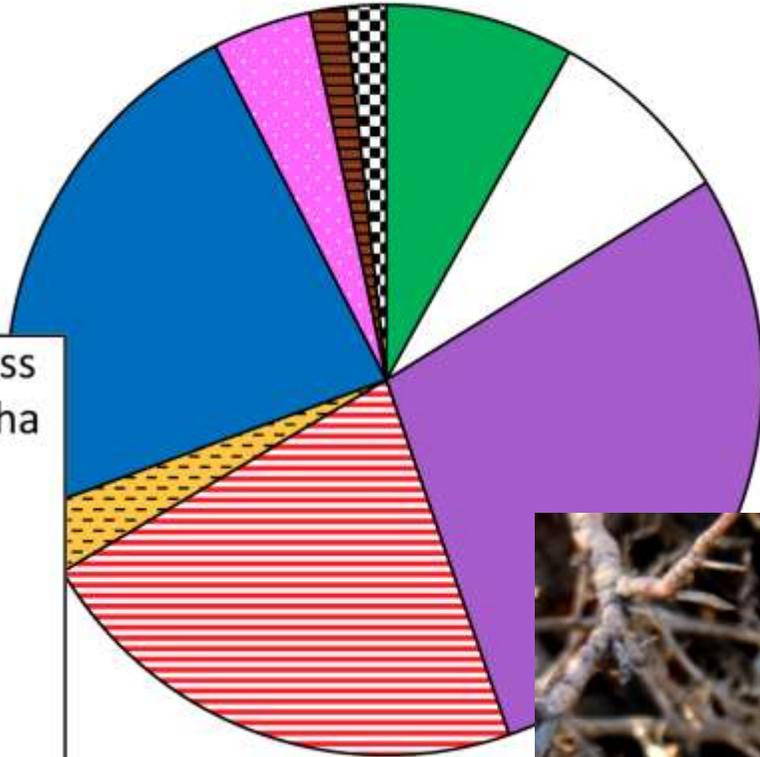


Salt Creek, Death Valley

Forage availability



Tortoise diet



*Plantago ovata*

*Schismus*

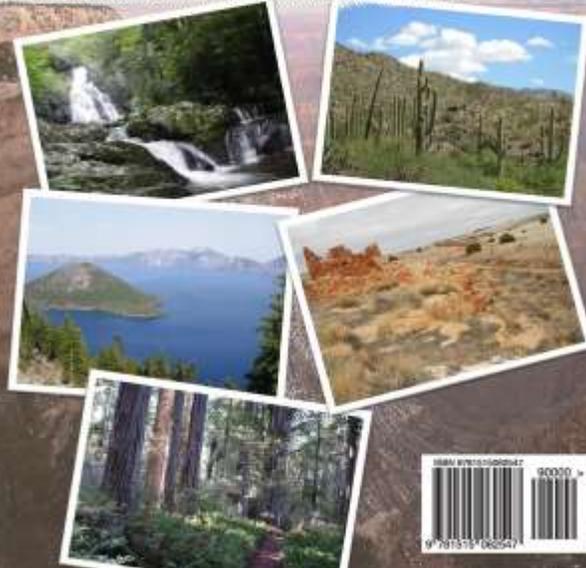


# CONSERVING AMERICA'S NATIONAL PARKS

Scott R. Abella

1916-2016, celebrating  
100 years of conservation,  
commitment, and care

*CONSERVING AMERICA'S NATIONAL PARKS* tells stories of conservation challenges and successes from America's 408 national parks. Rising sea levels, loss of wildlife species, droughts, earthworm invasions, climate change, and many other challenges face parks. But inspiring conservation successes provide hope for the future of parks. Richly illustrated with 247 photos, maps, and sketches, *CONSERVING AMERICA'S NATIONAL PARKS* is unprecedented in its scope of conservation stories unfolding in America's national parks.



## Effectiveness of Exotic Plant Treatments on National Park Service Lands in the United States

Scott R. Abella\*

The United States created national parks to conserve indigenous species, ecological processes, and cultural resources unimpaired for future generations. Curtailing impacts of exotic species is important to meeting this mission. This synthesis identified 56 studies reported in 60 publications that evaluated effects of exotic plant treatments on National Park Service lands. Studies encompassed 35 parks in 20 states and one U.S. territory and included 157 of studies reported that at least one treatment reduced focal exotic species, 53% reported that natives increased, 40% reported neutral decreased. For at least some of the neutral cases, neutrality was consistent

### Methods

- Systematic review
- Key word search
- NPS land
- Be published
- Data on mgt aimed at ↓ terrestrial NNP

# Treatments and Assessment

Channel Islands, CA



- 56 studies in 60 publications
- 35 NPS units in 20 states and 1 territory
- Hawaii Volcanoes, Everglades, Big Cypress, Channel Islands, Lake Mead (4-7)
- Desert, shrubland, prairie, wetland, forest
- Diverse treatments
- Herbicide, cutting, girdling, mowing, clearing (e.g., sod removal), covering (e.g., fabric), grazing, burning, solarization, carbon addition, competitive natives



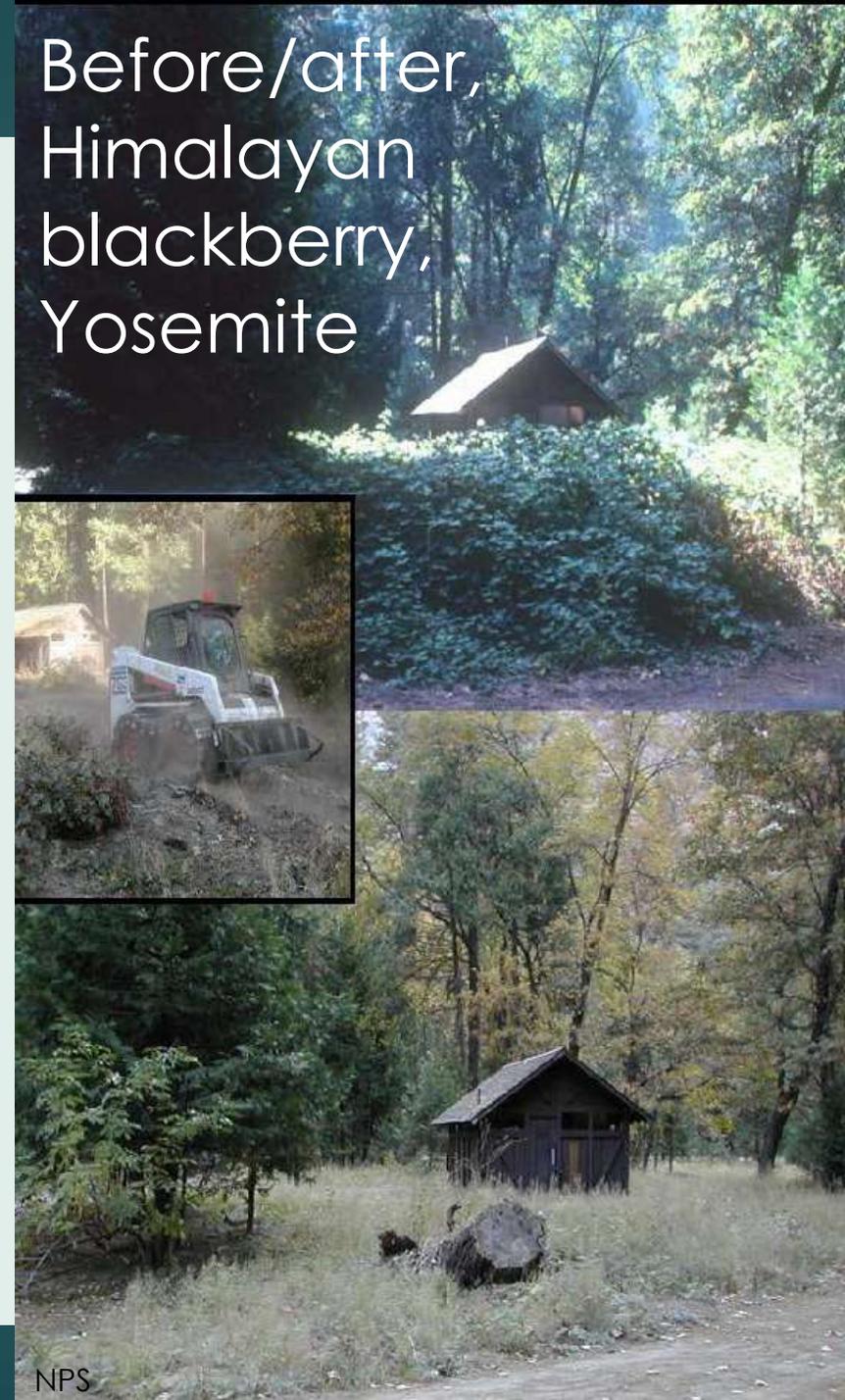
Gettysburg NMP, PA



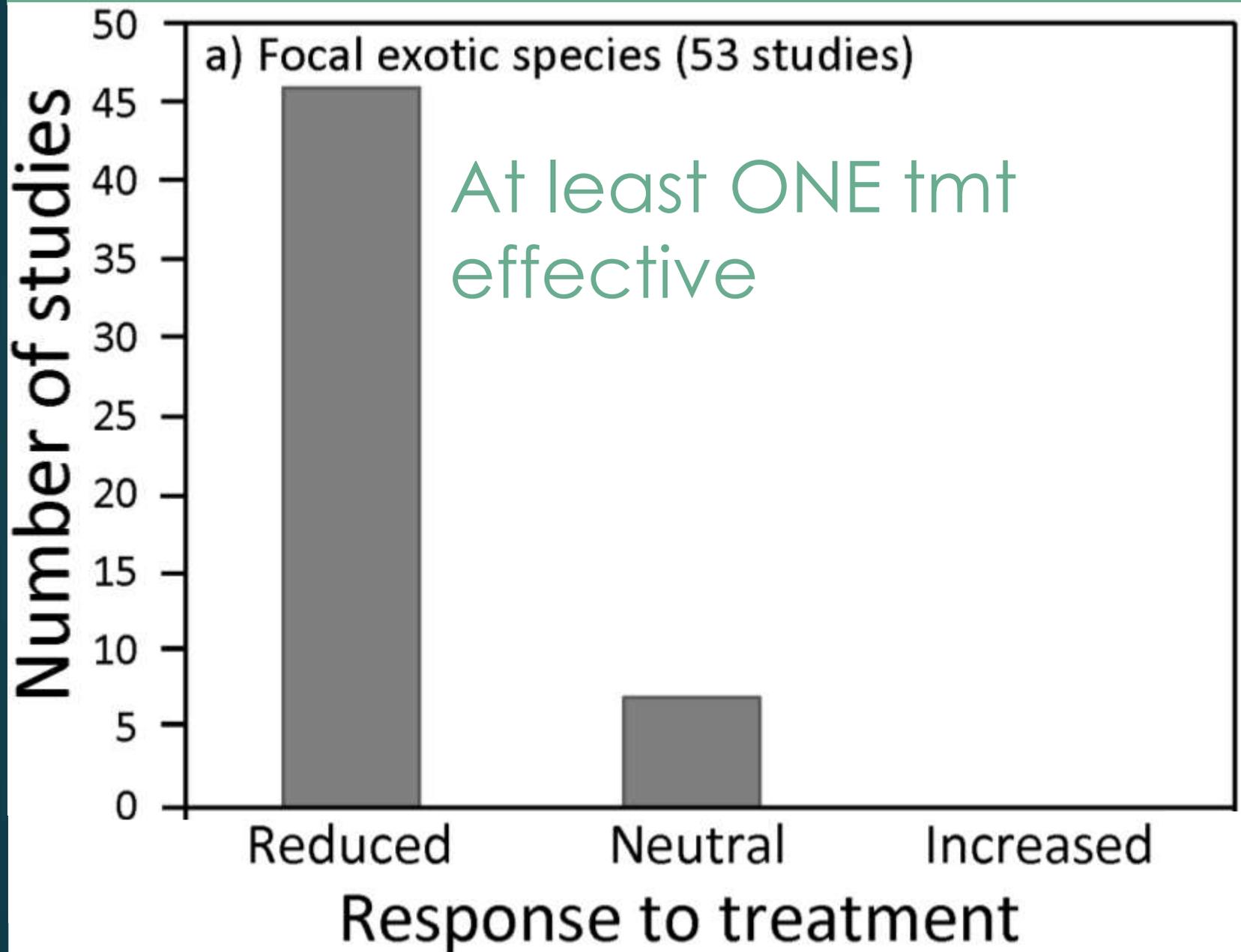
## Treatments and Assessment

- 157 focal non-native species
- 22% trees, 15% shrubs, 41% forbs, 3% vines, 19% graminoids
- 75% perennial, 7% annual
- 1-62 focal species per study
- 53/56 studies assess focal species
- 16/56 other non-natives (sec. invasion)
- 30/56 measure native plant response
- Monitor 1-12 years, median 3 years

Before/after,  
Himalayan  
blackberry,  
Yosemite

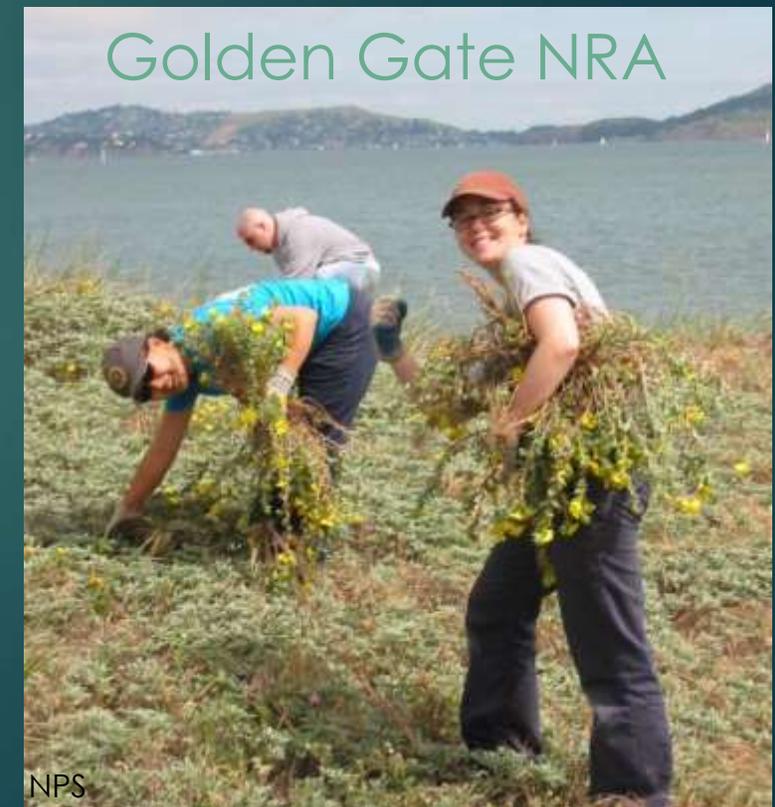
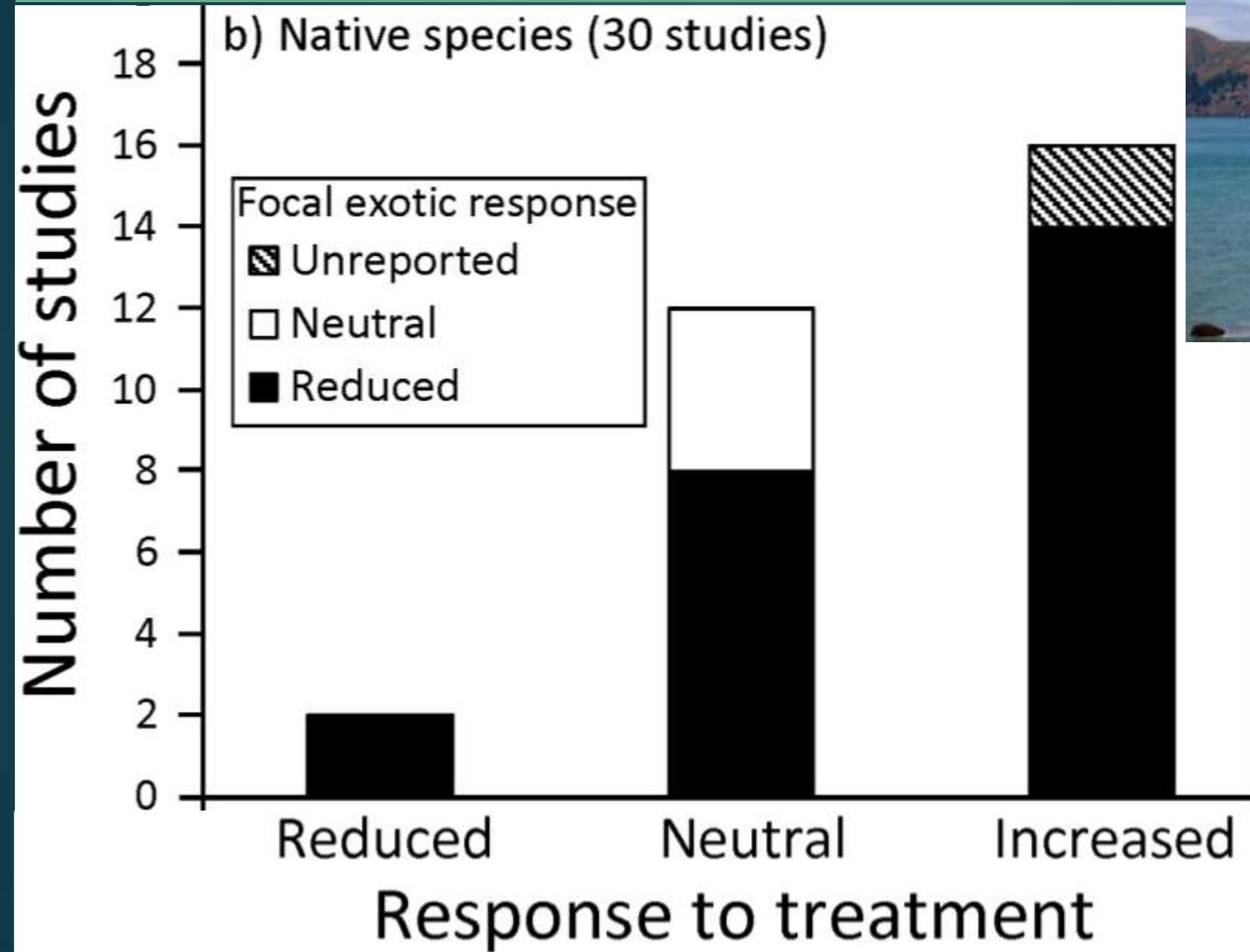


# Treatment Outcomes: Focal Non-Natives

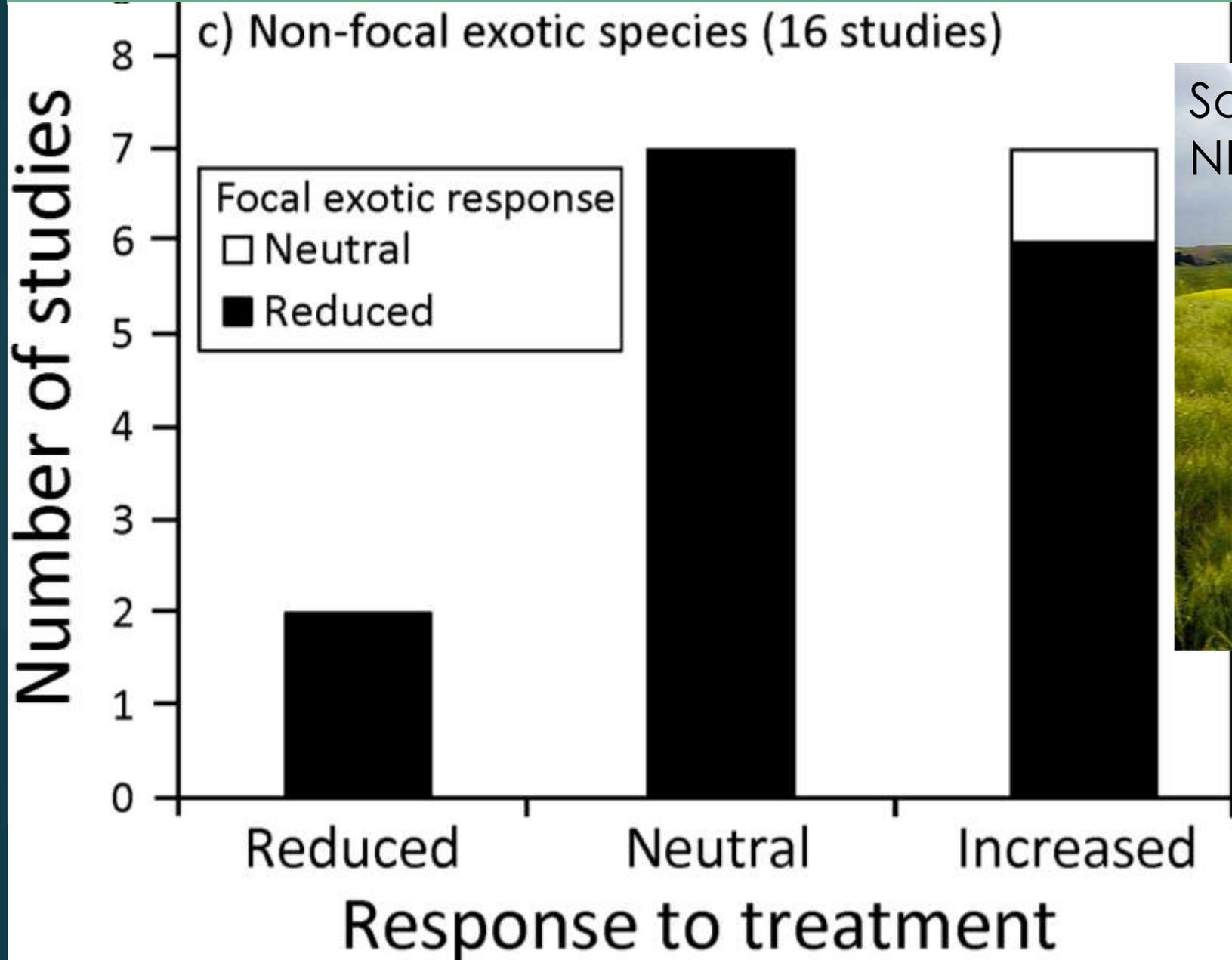


# Treatment Outcomes: Native Species

Kirkie Wrench, NPS



# Treatment Outcomes: Other Non-Natives



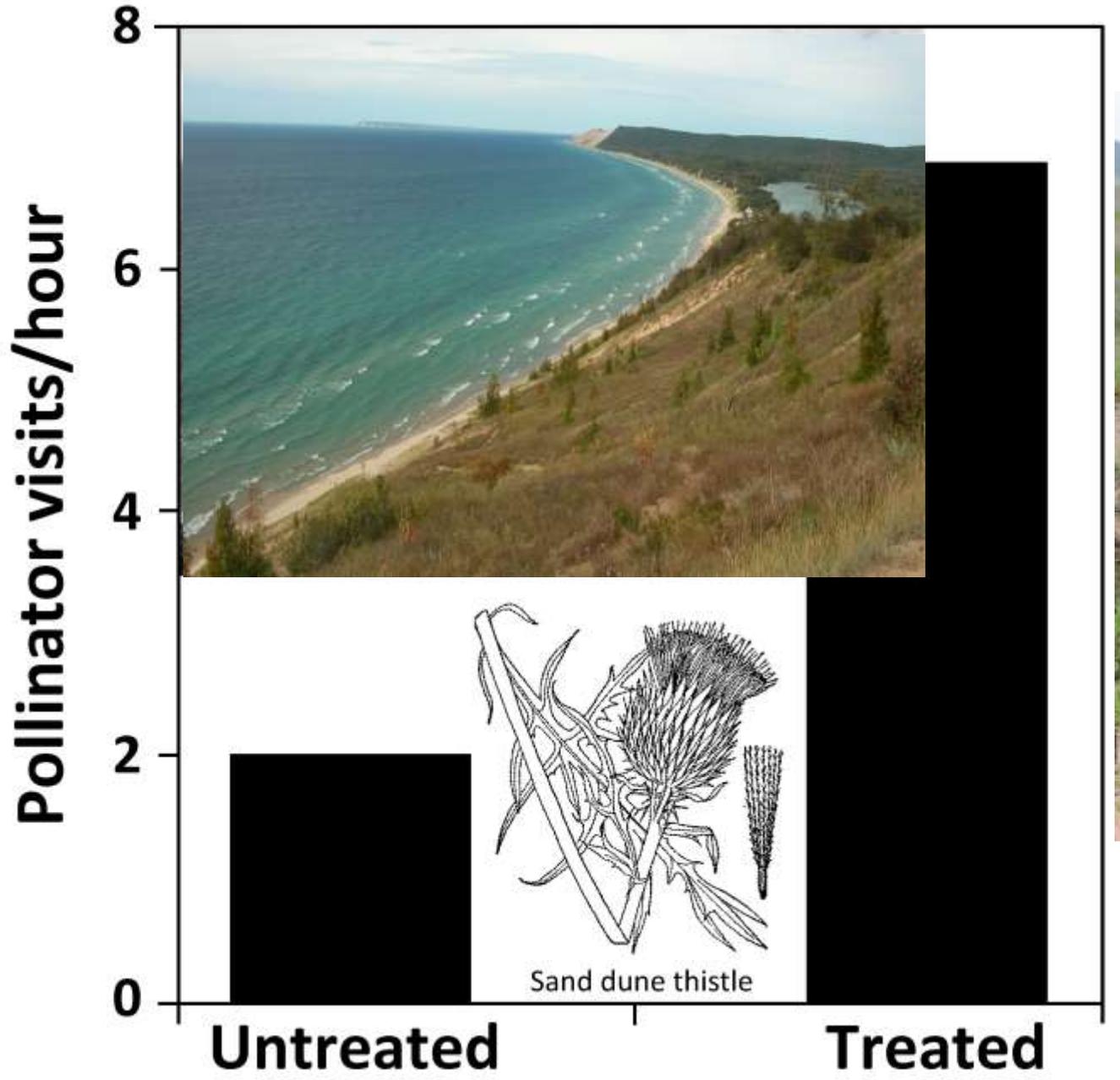
Santa Monica Mountains  
NRA

ripgut brome

Conversion from brome  
to black mustard

Photo with permission  
from John Wiley & Sons,  
Restoration Ecology 2005

# Case Studies – Sleeping Bear Dunes, MI



NPS

# Saguaro National Park, AZ

- Perennial buffelgrass
- Mechanical, herbicide

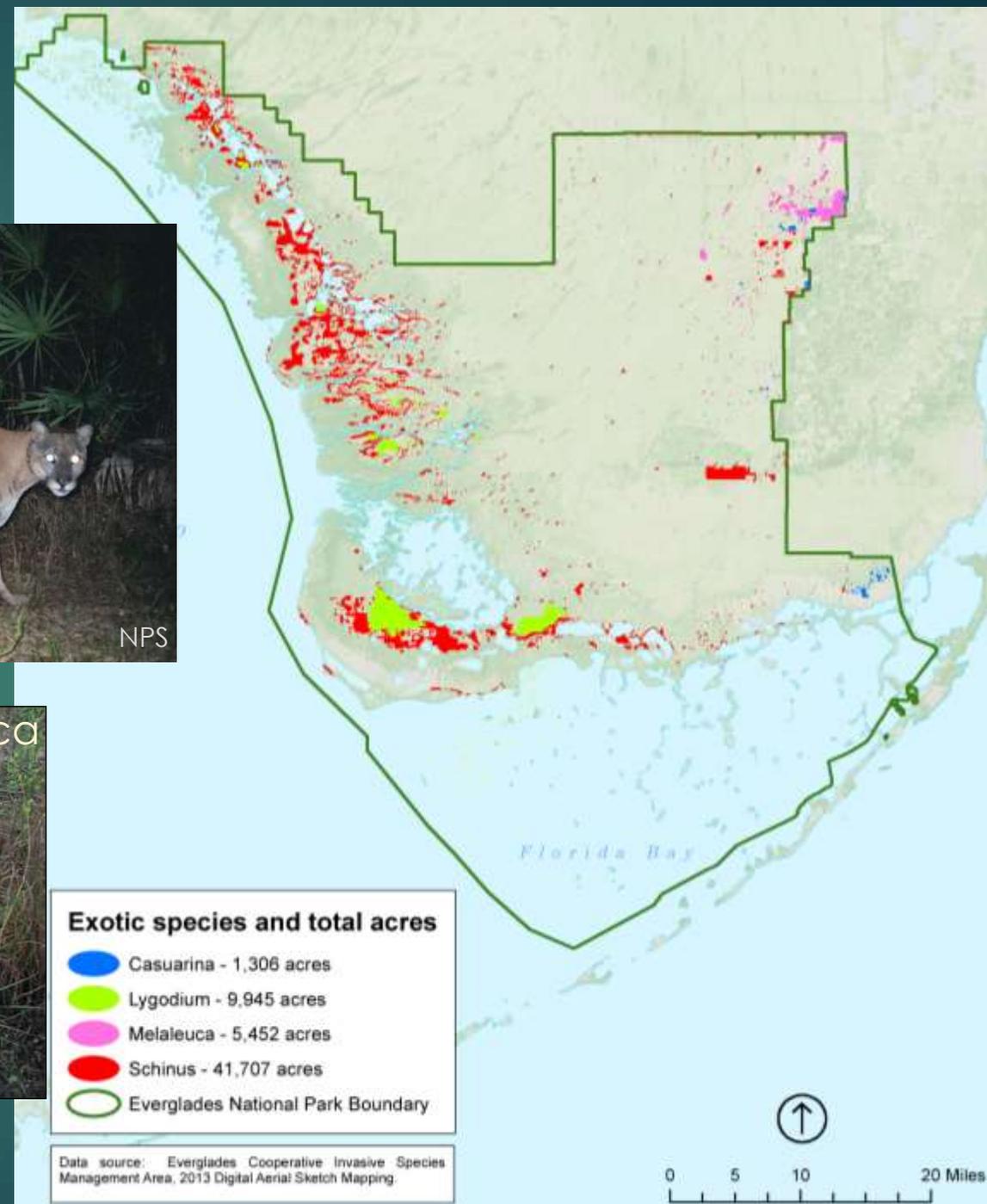


Post-tmt soils, native veg differ little between tmt and uninvaded controls

# Big Cypress and Everglades, FL

– Trees Brazilian pepper, melaleuca

– Endangered Florida panther home range size contracts by 16%, implying  habitat quality

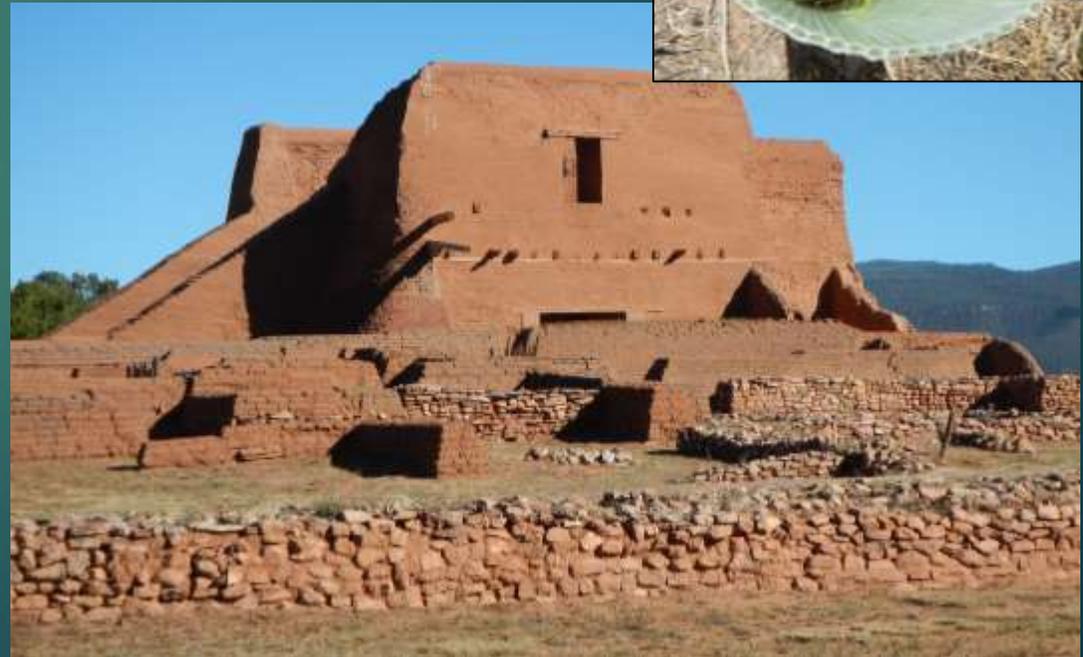


Treated melaleuca

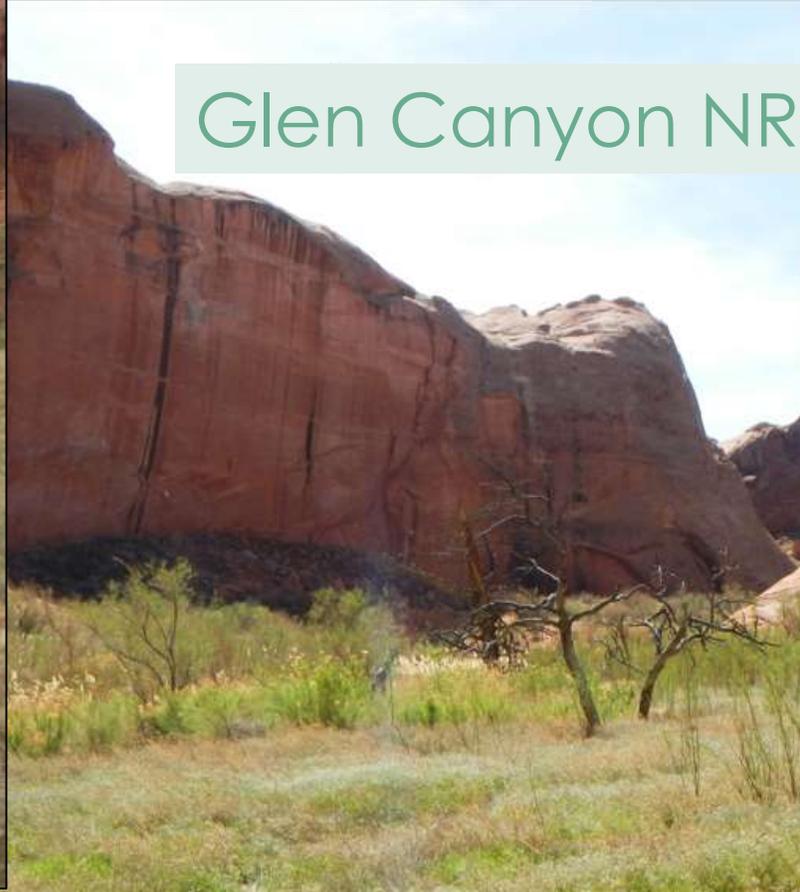


T. Pernas,  
NPS

# Pecos National Historical Park, NM



# Glen Canyon NRA, UT-AZ









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 JFSP California Fire Science  
 Consortium



UNLV Applied Ecology Lab

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[Student highlights](#)

**Las Vegas Wash Restoration January 2017**

Matthew Rader instructing volunteers how to plant. Photo credit: UNLV photographer Josh Hawkins

We are so proud of our undergraduate research team here at the Abella lab. Congratulations to Vivian Sam, Matthew Rader, and Aurdrey Rader for a great event. Together they developed and organized a field study design and all the logistics. The goals of the Las Vegas wash restoration project at Lake Mead NRA is to reintroduce native plant species along the watershed and provide wildlife habitat and protection along the now-exposed shoreline. Over the next



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