Los Alamos NATIONAL LABORATORY

Avian Communities are Decreasing with Piñon Pine Mortality in the Southwest

Resilience and adaptation of ecological systems and populations

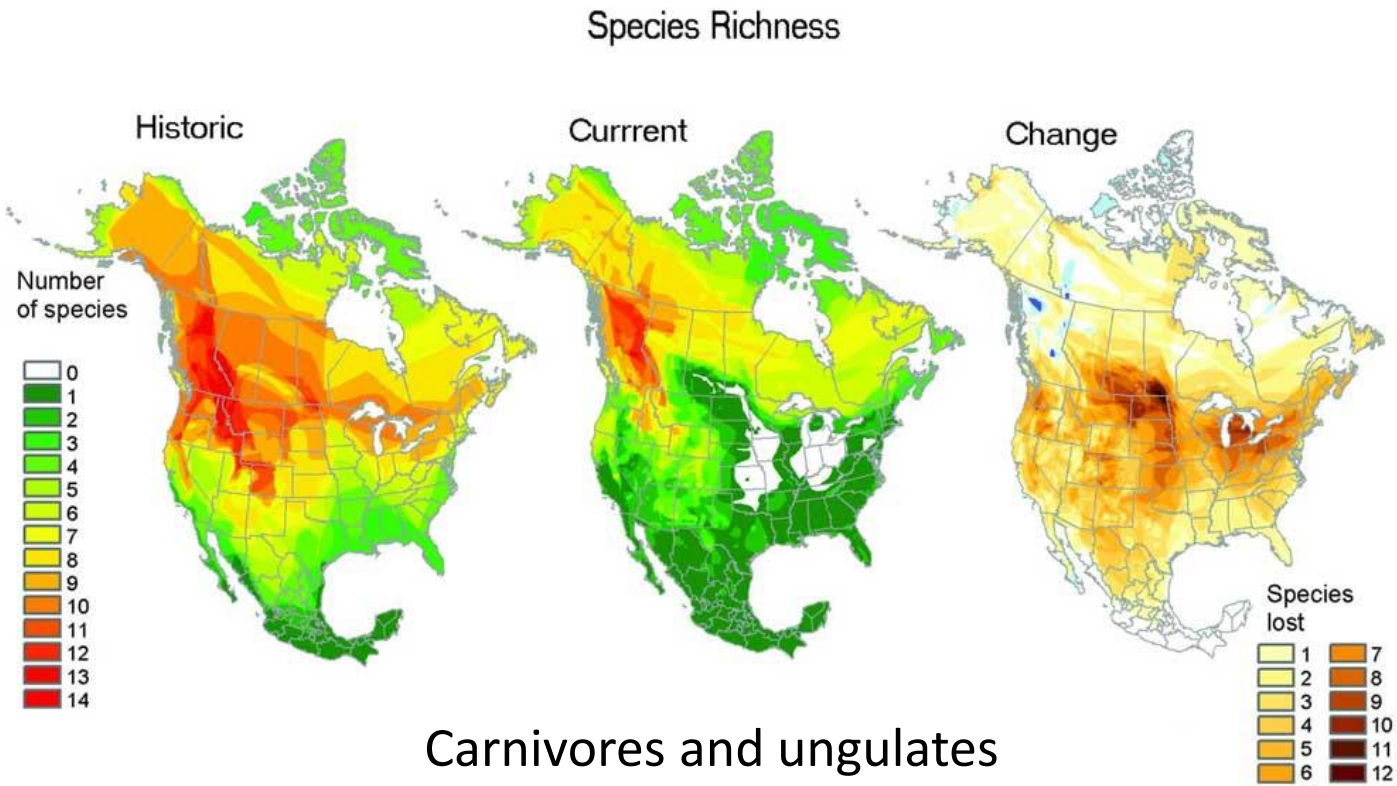
Jeanne M. Fair, Ph.D.

April 23, 2024

LA-UR-18-22953

Climate resilience is the ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate.

Species respond to environmental change differently

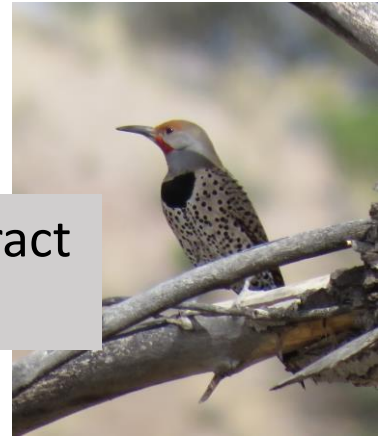


Carnivores and ungulates

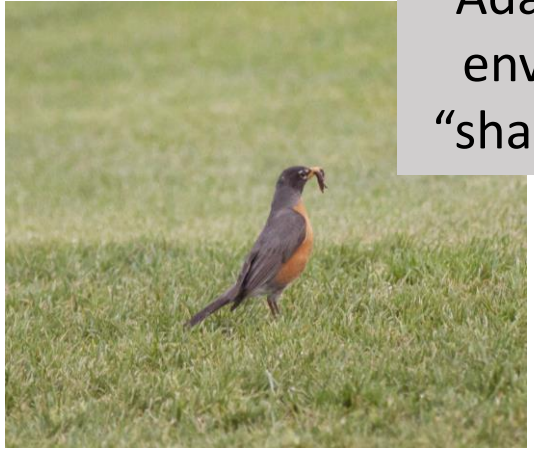
Laliberte and Ripple. 2004. Range Contractions of North American Carnivores and Ungulates, BioScience, 54:123–138,

Species respond to environmental change differently

Shift their ranges



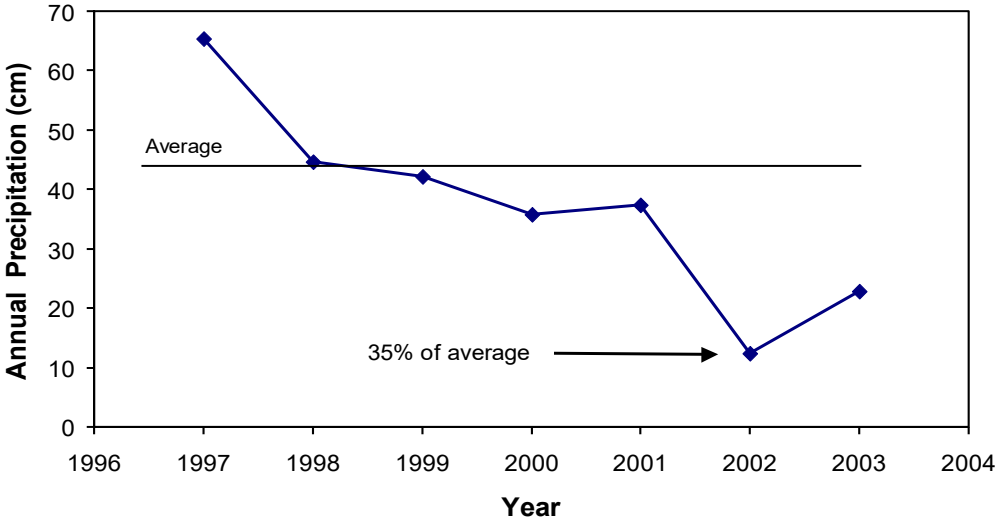
Expand or contract their ranges

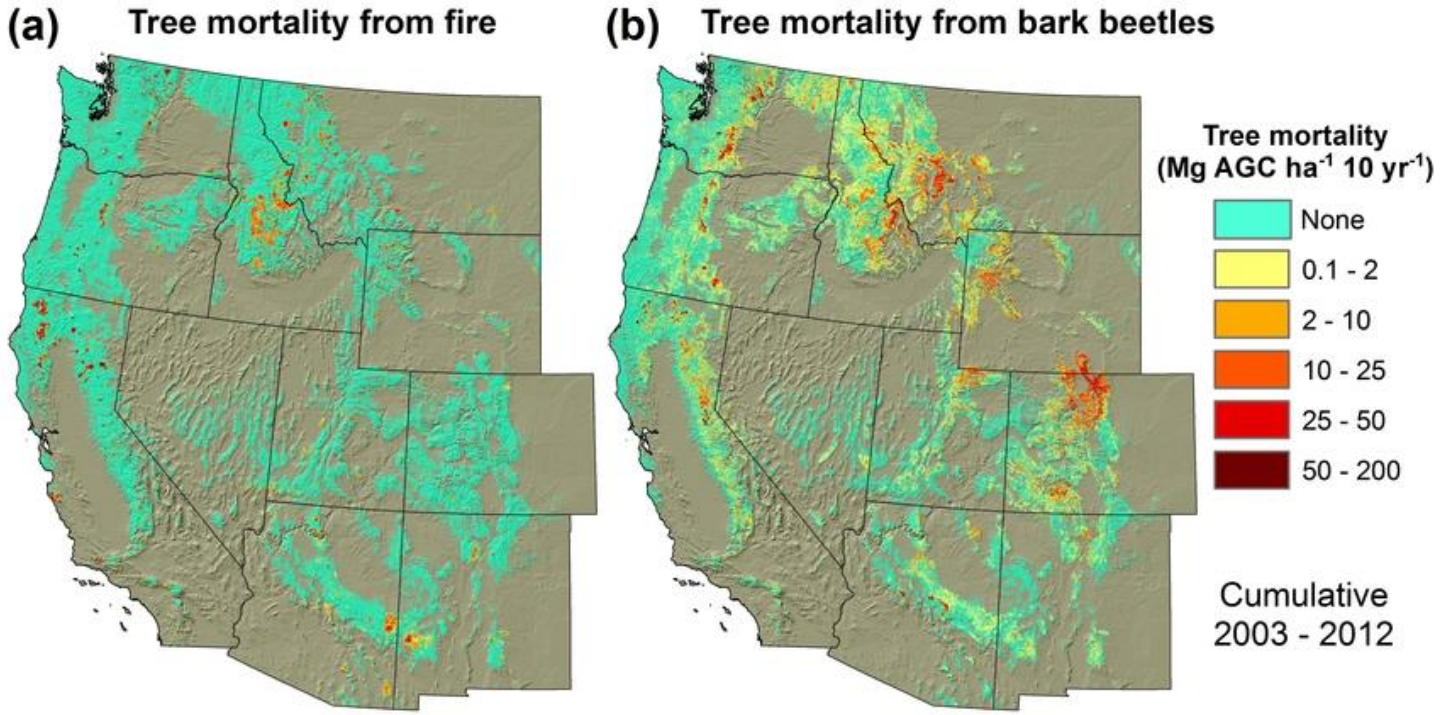


Adapt to new environment “shapeshifting”

Adapt their phenology

Cerro Grande Fire 2000 & 2000-2003 drought





Berner et al. 2017. Environmental Research Letters.

Objectives

Determine avian community responses to tree thinning and tree mortality over time

9 study sites
- 5 unthinned (controls)
- 4 thinned

- Species richness – number of species
- Species abundance – number of each species
- Species diversity (e.g. Simpson's D) – index of species richness and relative abundances

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Biological Conservation

journal homepage: www.elsevier.com/locate/biocon

Avian communities are decreasing with piñon pine mortality in the southwest☆

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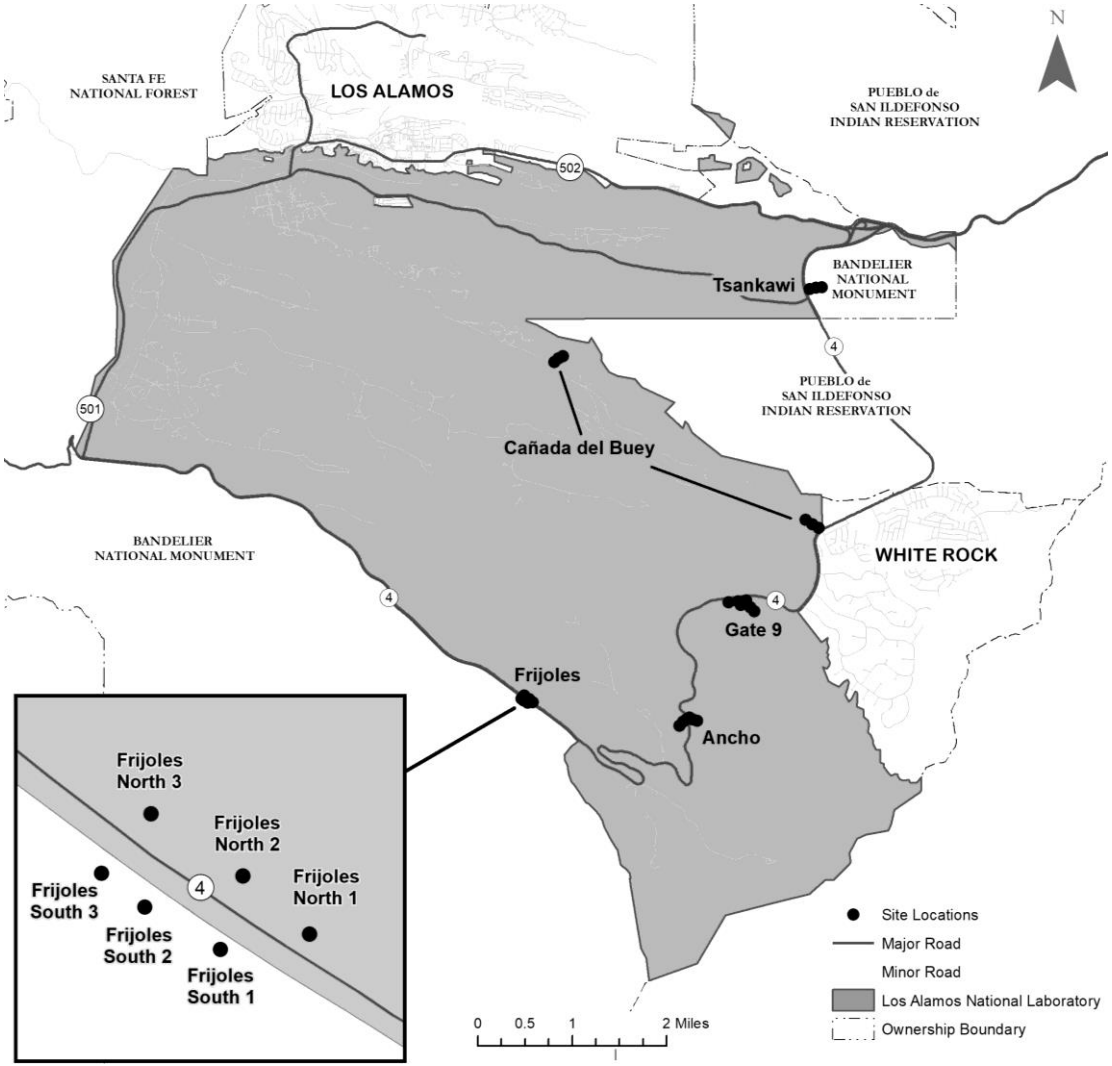
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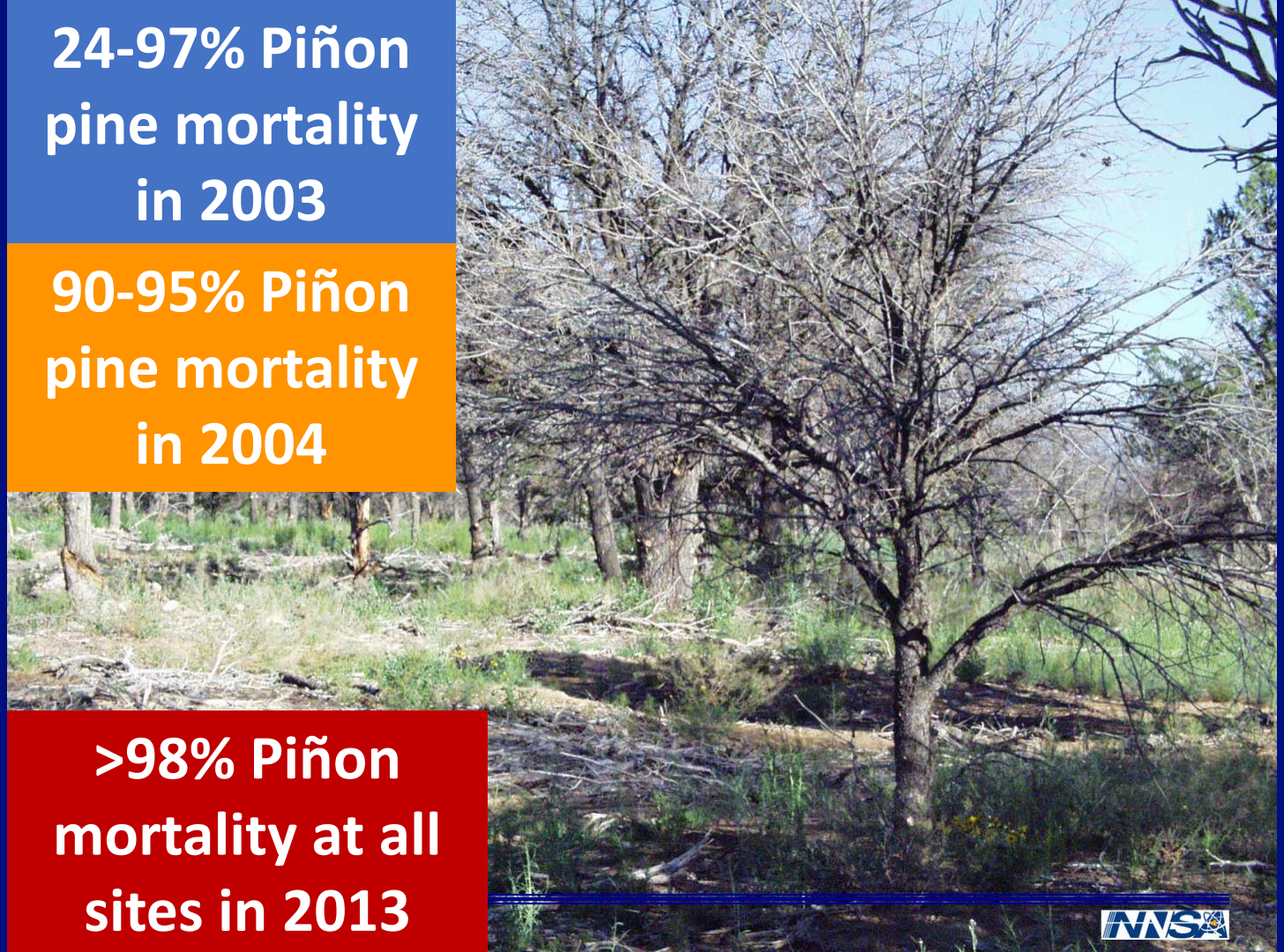
SANTA FE
NATIONAL FOREST
LOS ALAMOS
PUEBLO de
SAN ILDEFONSO
INDIAN RESERVATION
502
Tsankawi
BANDELIER
NATIONAL
MONUMENT
4
PUEBLO de
SAN ILDEFONSO
INDIAN RESERVATION
501
Cañada del Buey
BANDELIER
NATIONAL MONUMENT
WHITE ROCK
4
4
Gate 9
Frijoles
Ancho
Frijoles
North 3
Frijoles
North 2
Frijoles
North 1
Frijoles
South 3
Frijoles
South 2
Frijoles
South 1
4
Site Locations
Major Road
Minor Road
Los Alamos National Laboratory
Ownership Boundary
0
0.5
1
2 Miles

24-97% Piñon pine mortality in 2003

90-95% Piñon pine mortality in 2004

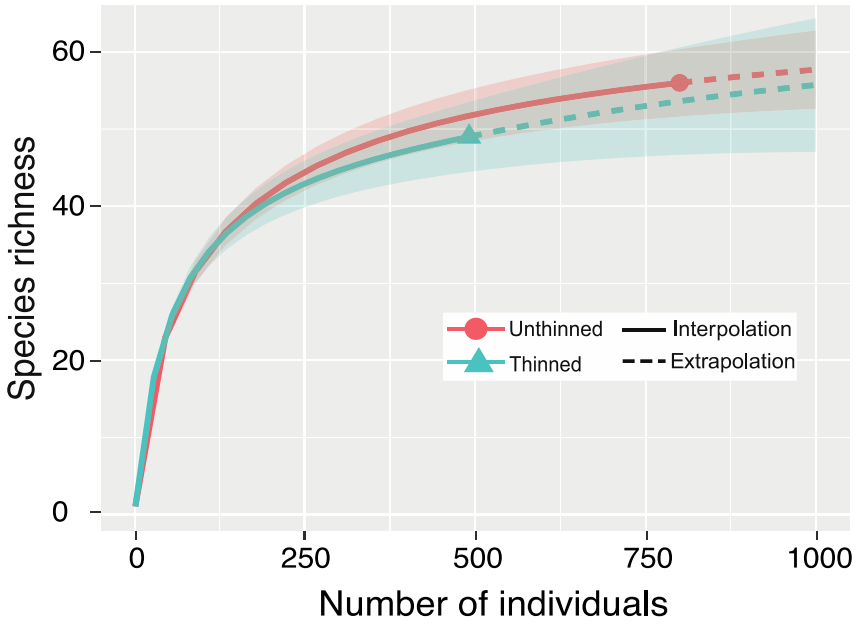


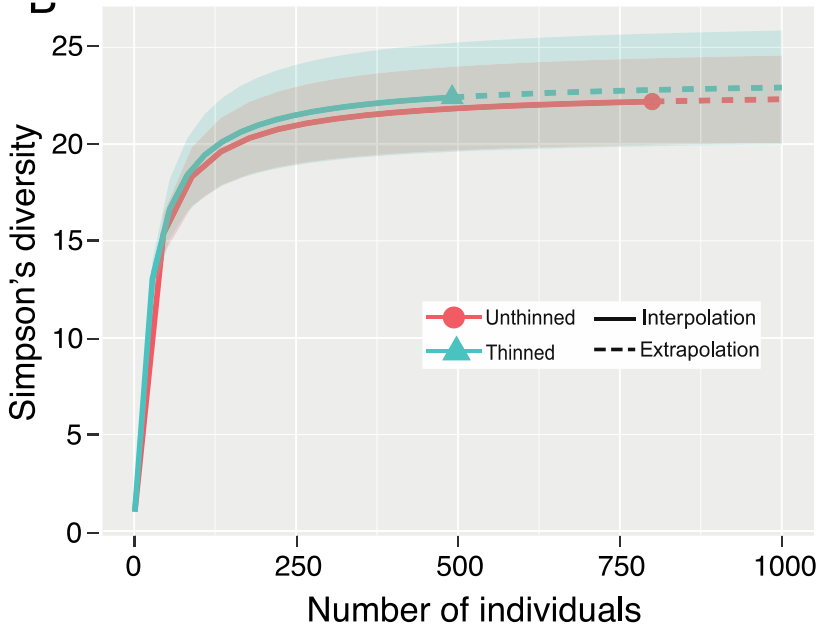
>98% Piñon mortality at all sites in 2013

Point counts 2003–2013

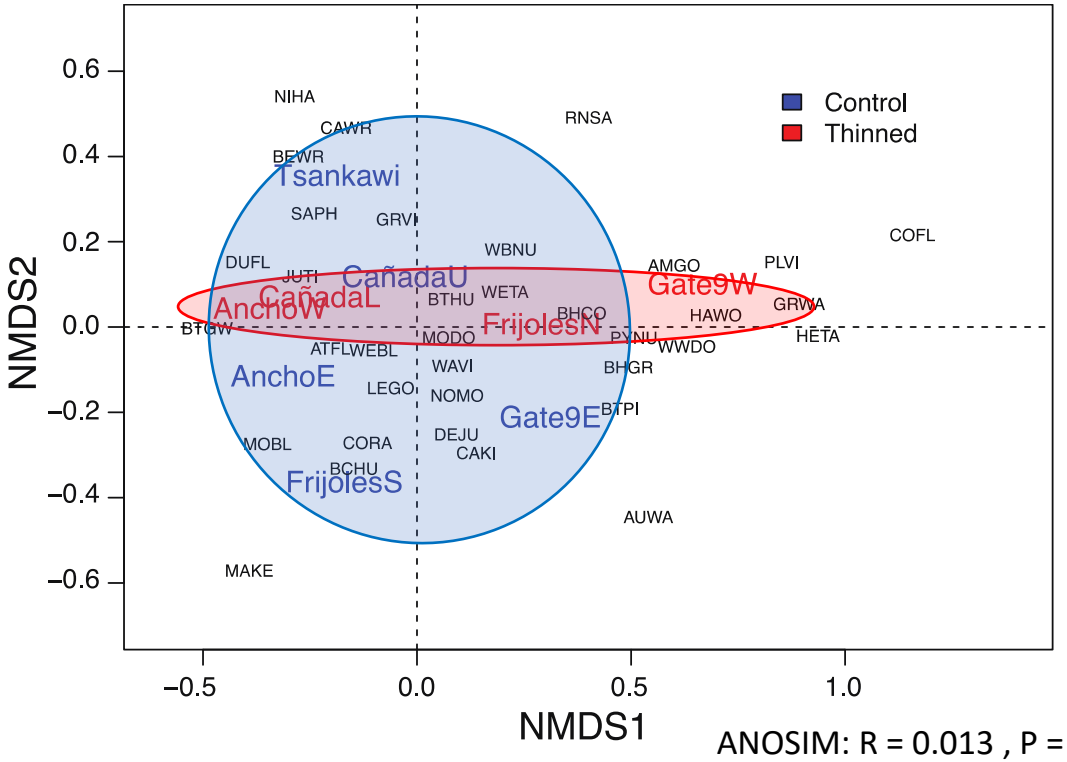
- 1291 individuals counted from 2003-2013
  - 800 birds at unthinned sites
  - 491 at thinned sites
- 60 species total
  - 57 species counted at unthinned sites
  - 49 species were counted at thinned sites

2003–2013 Thinning





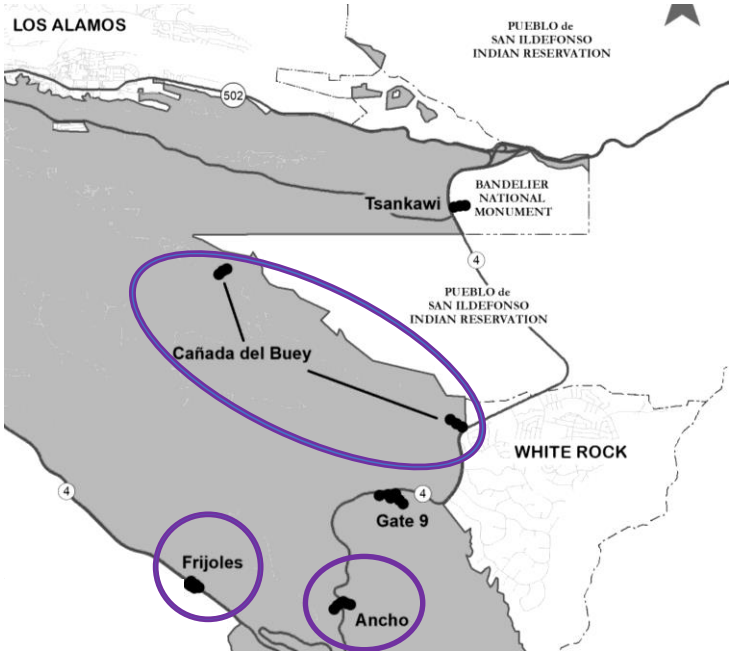
2003–2013 Thinning



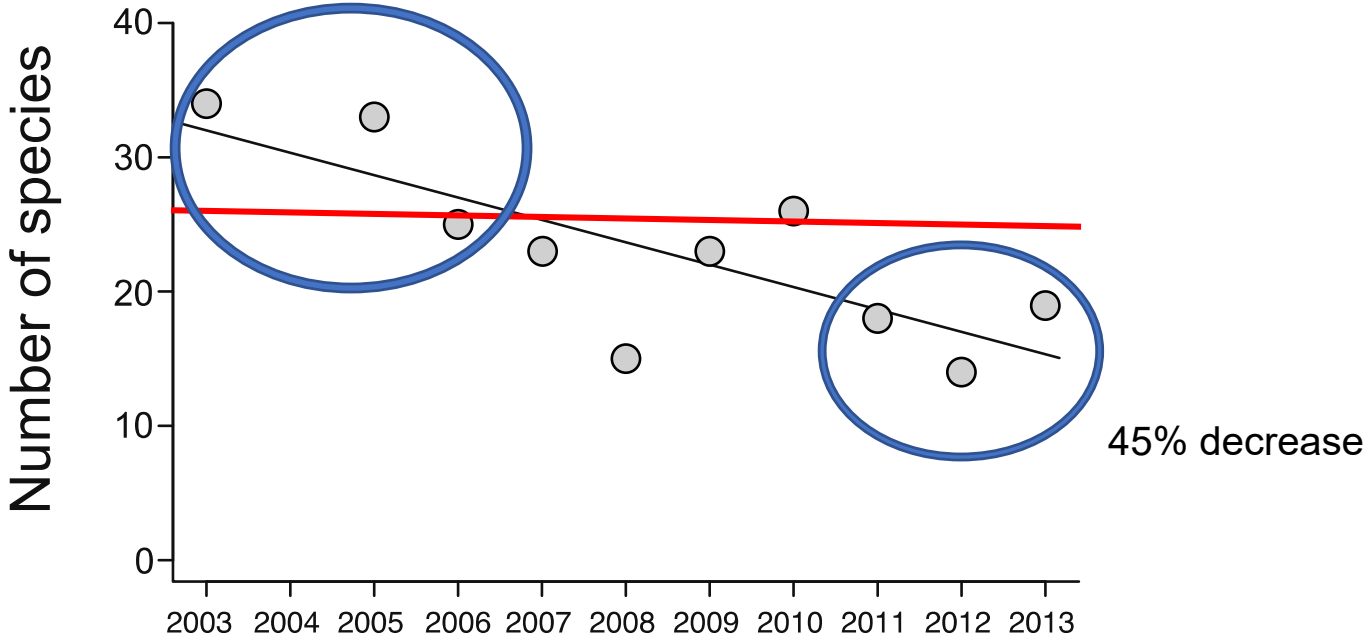
ANOSIM: R = 0.013 , P = 0.48

Change over time

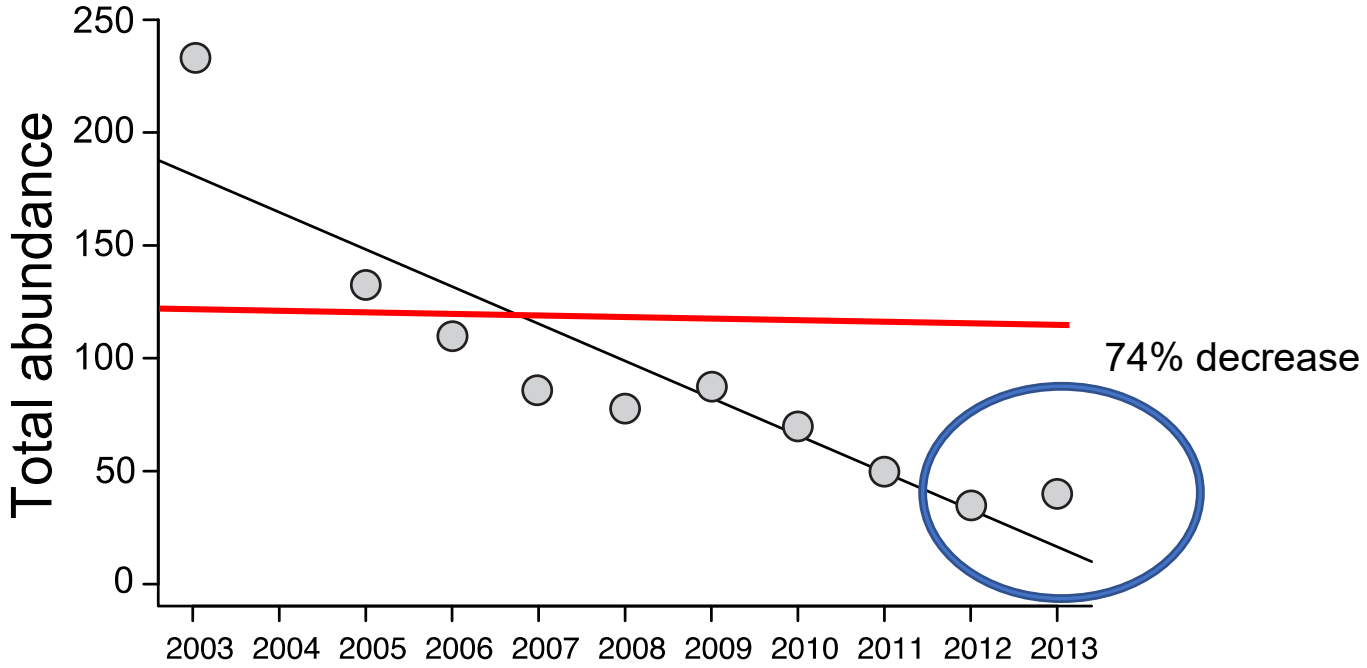
- Quantify changes to community structure on the Pajarito Plateau
- Used 3 locations (6 sites) each year to standardize sampling
  - 3 controls
  - 3 treatments



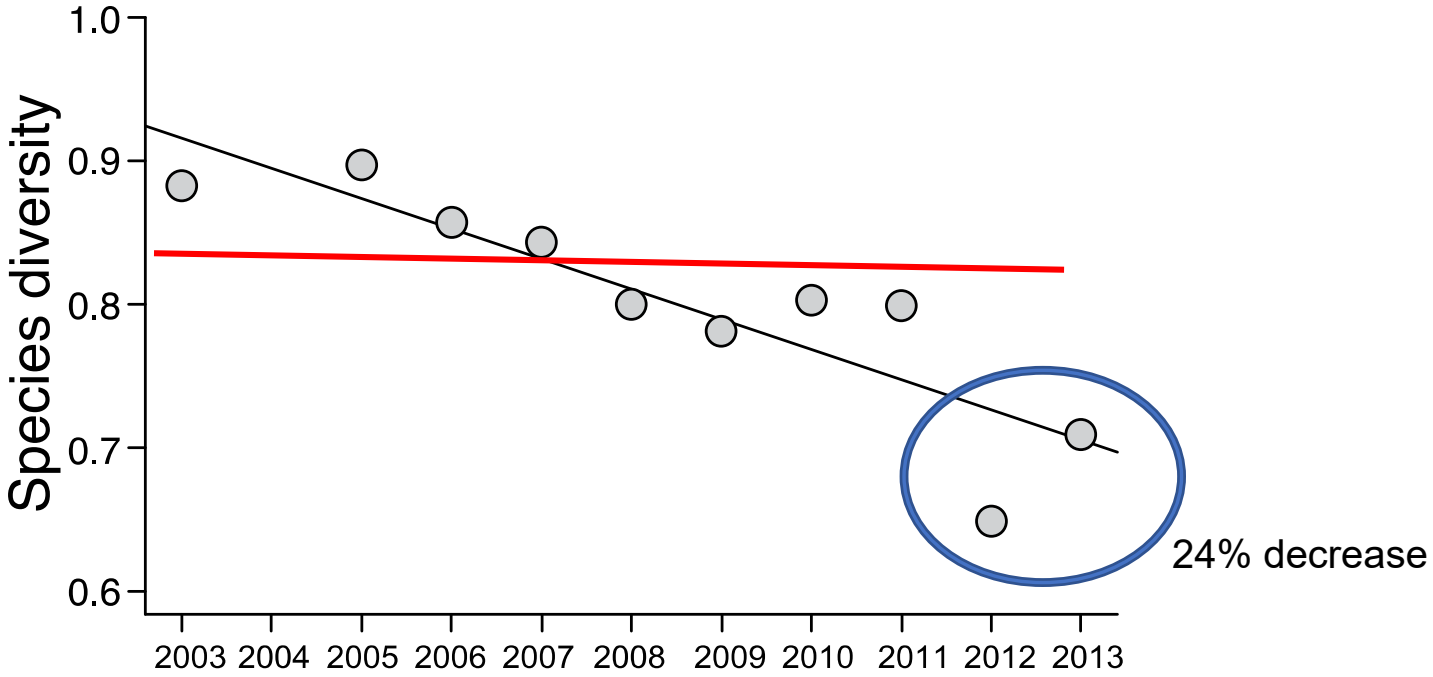
Change over time



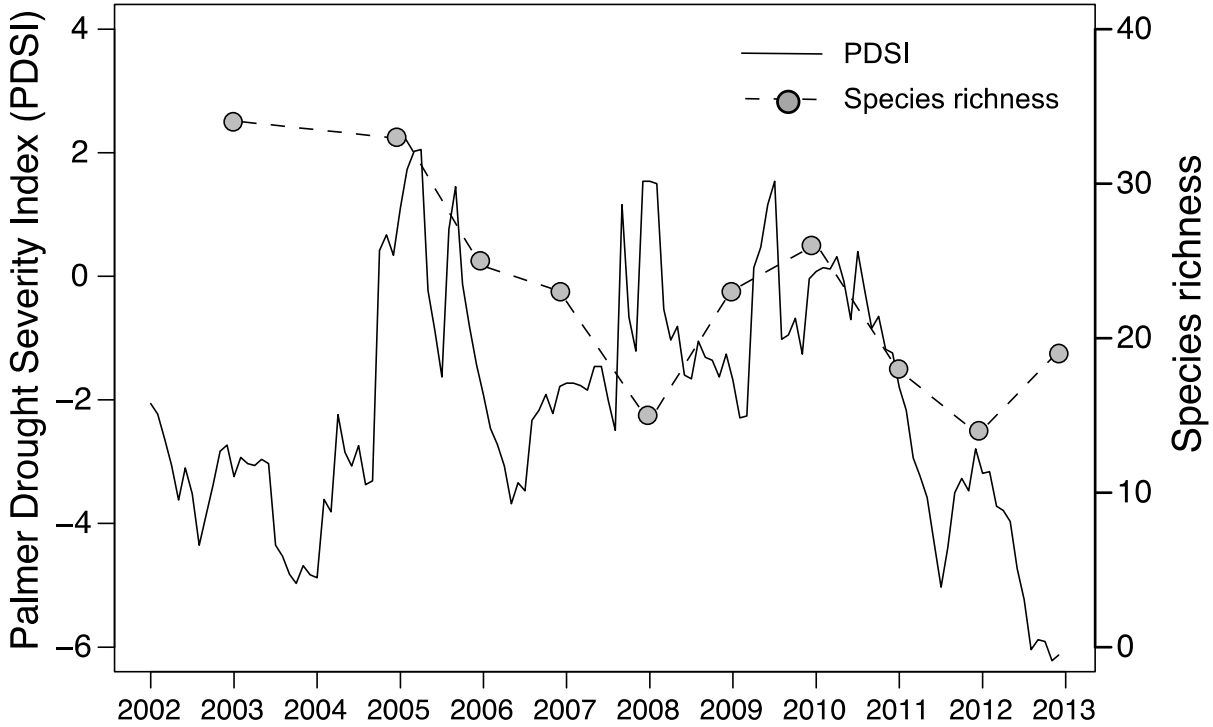
Change over time



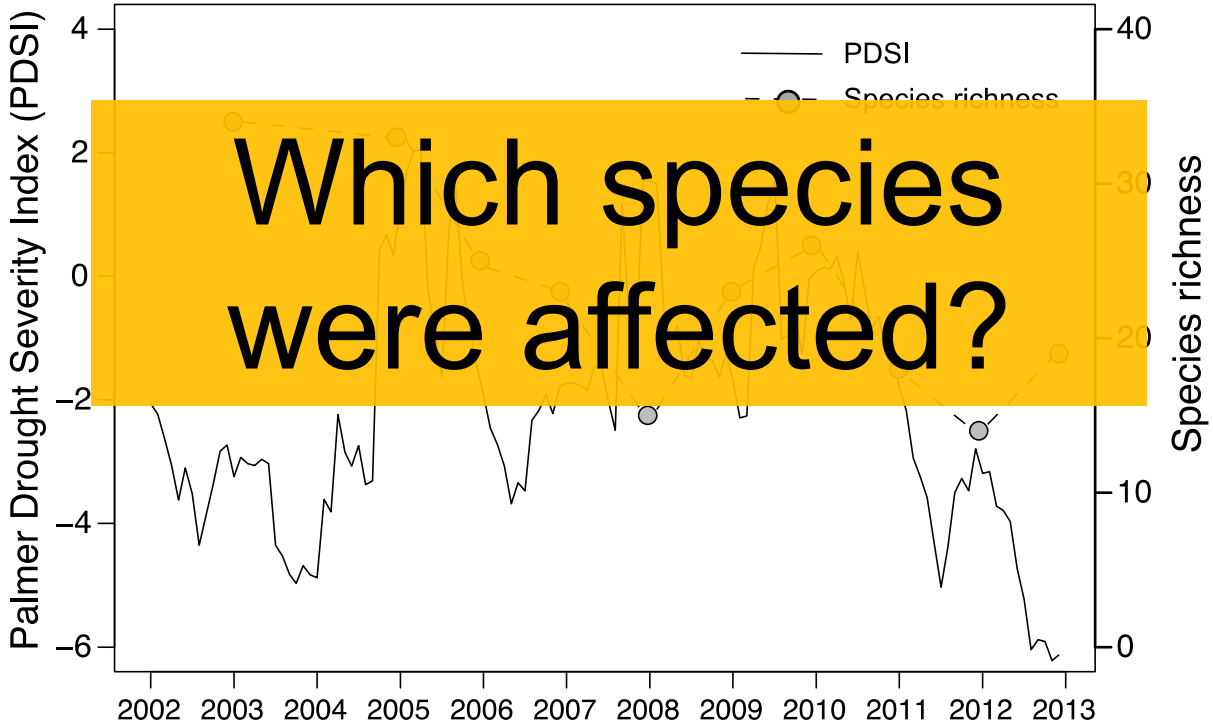
Change over time



Change over time



Change over time



Which species were affected?

Species lost

- **Found between 2003 – 2006**
- **Not found between 2011 – 2013**

Green-tailed Towhee

Plumbeous Vireo

Bushtit

Pygmy Nuthatch

Black-headed Grosbeak

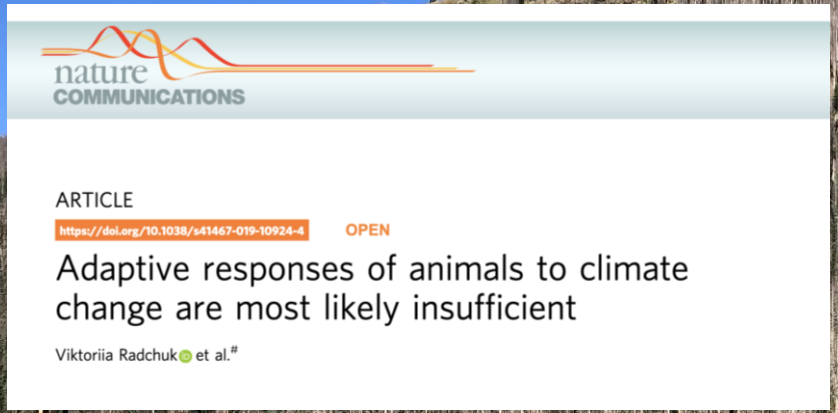
Common Nighthawk

Species emigrating, but no species immigrating

Summary

- No effect of thinning treatment
- Decrease in richness, abundance, and diversity
  - species richness decreased by 45%
  - abundance decreased by 74%
- Piñon mortality may be a threat to bird communities
- Tree thinning may also be an added risk

Resilience



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https://doi.org/10.1038/s41467-019-10924-4 OPEN

Adaptive responses of animals to climate change are most likely insufficient

Viktoriia Radchuk et al.#

Monitoring how species are adapting, or not, is important to better predict and mitigate changes to ecological systems

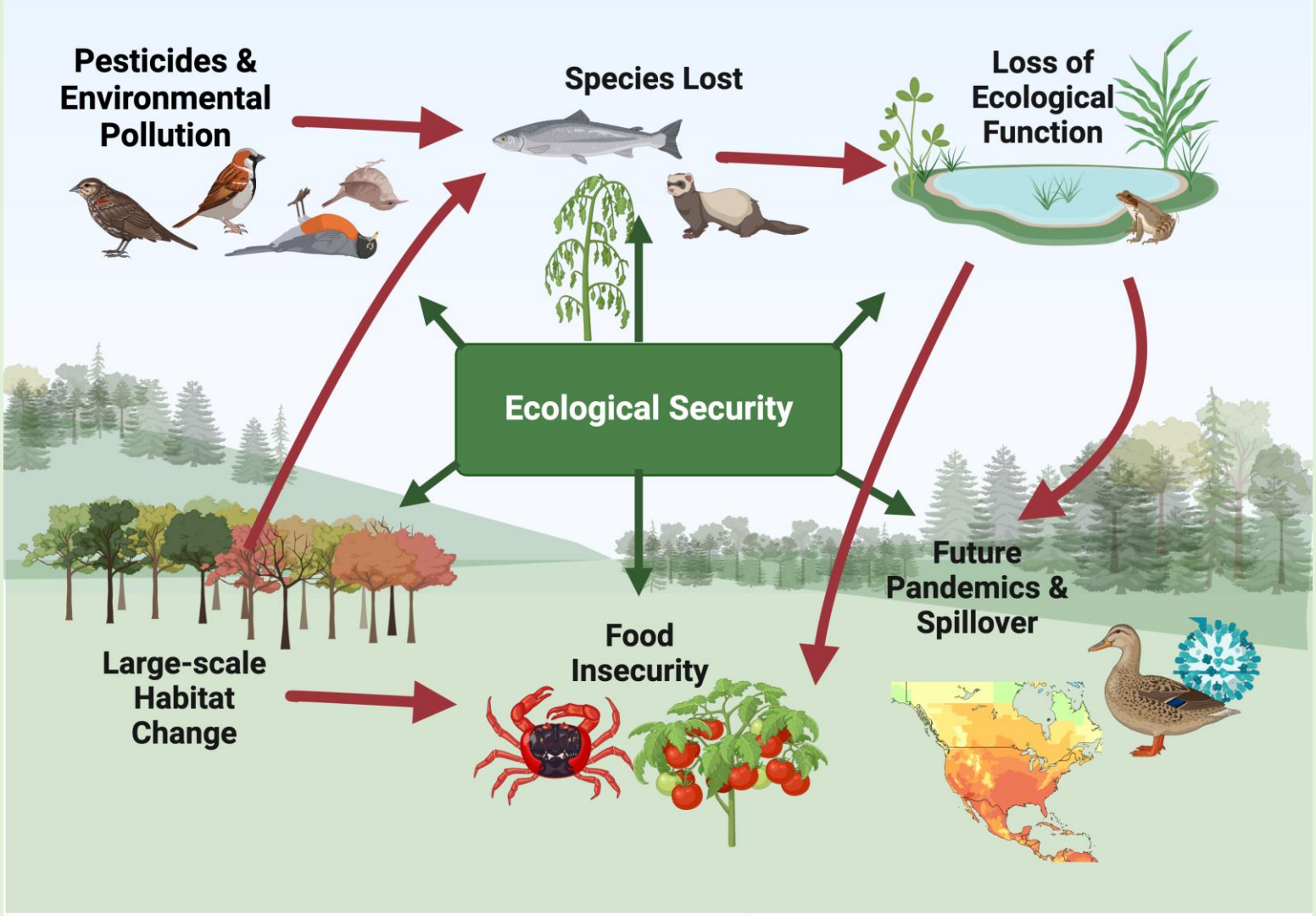
JSE Journal of Systematics and Evolution

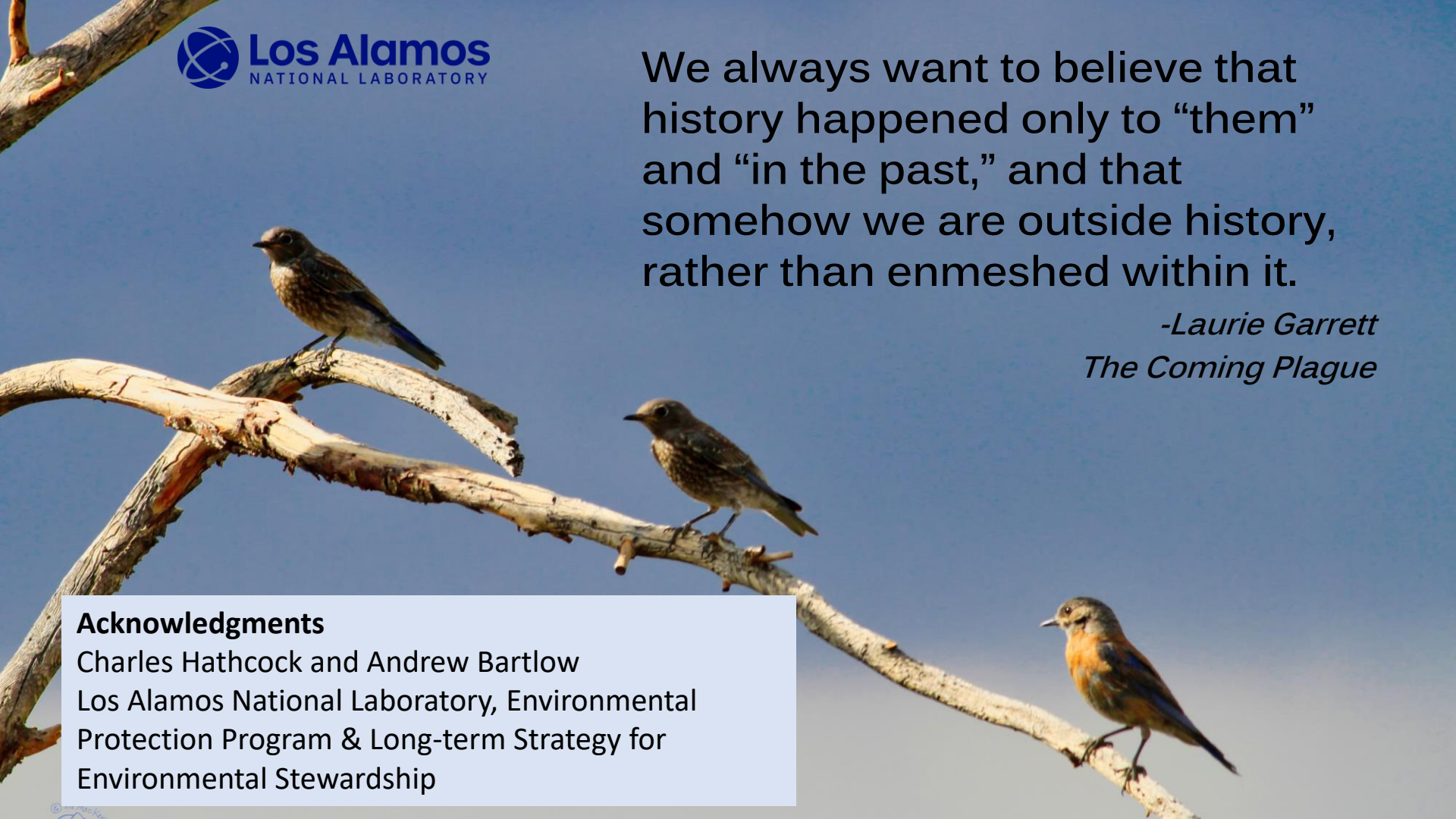
Review | Free Access

Plant adaptation to climate change—Where are we?

Jill T. Anderson, Bao-Hua Song

First published: 18 June 2020 | https://doi.org/10.1111/jse.12649 | Citations: 72


Pesticides & Environmental Pollution
Species Lost
Loss of Ecological Function
Ecological Security
Large-scale Habitat Change
Food Insecurity
Future Pandemics & Spillover



We always want to believe that history happened only to “them” and “in the past,” and that somehow we are outside history, rather than enmeshed within it.

-Laurie Garrett

The Coming Plague

Acknowledgments

Charles Hathcock and Andrew Bartlow

Los Alamos National Laboratory, Environmental Protection Program & Long-term Strategy for Environmental Stewardship