Native bird responses to tamarisk biocontrol: Implications for southwestern riparian habitat and management

Sean M. Mahoney*[1], Matthew J. Johnson[2], Jen A. Holmes[2]

[1]Department of Biological Sciences, Northern Arizona University
[2]Colorado Plateau Research Station, Northern Arizona University

February 6, 2019
Biocontrol: Population distribution, restoration & ecological responses session
Desert Botanical Garden
Phoenix, AZ

NORTHERN ARIZONA UNIVERSITY

@mahosean
sean.mahoney@nau.edu

Southwest Riparian areas: Important for birds

Hydrological changes

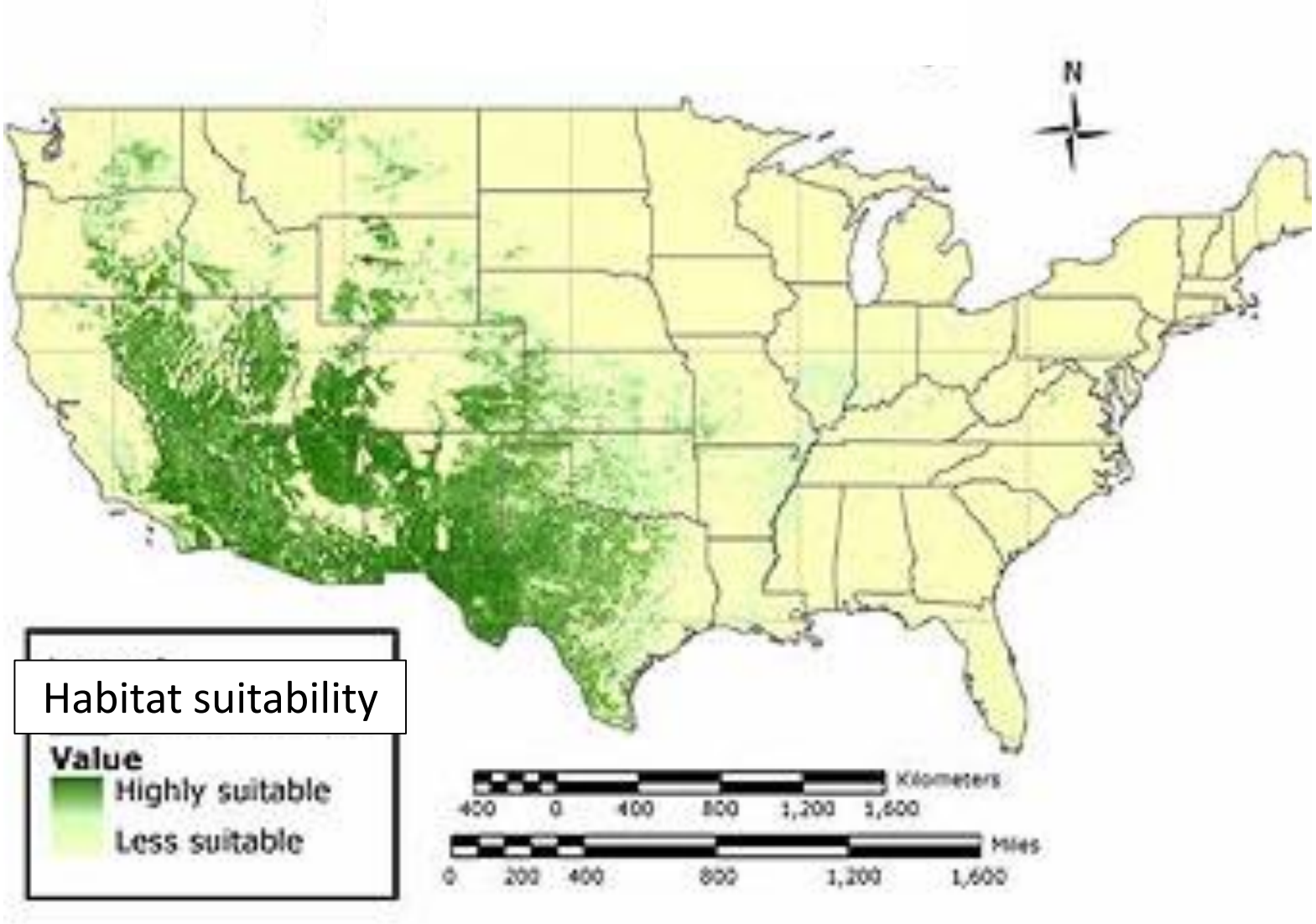
Reduces recruitment of native vegetation

Promotes non-native recruitment

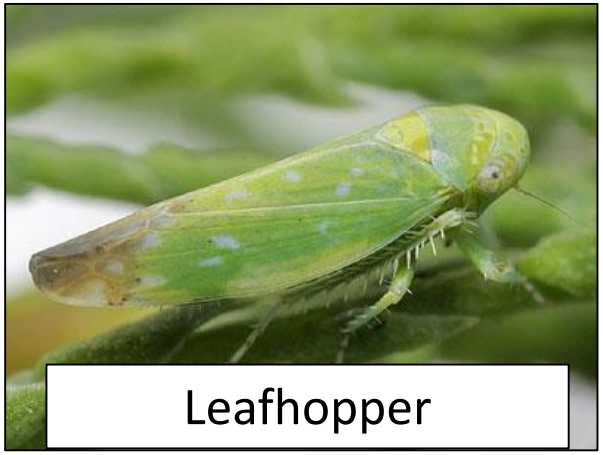
Tamarisk (*Tamarix* spp.)

- Widespread – 3rd most dominate woody plant in southwest riparian areas (Friedman et al. 2005)

Tamarisk covers ~1.5 million acres



Tamarisk-obligate insects in the Southwest



Leafhopper

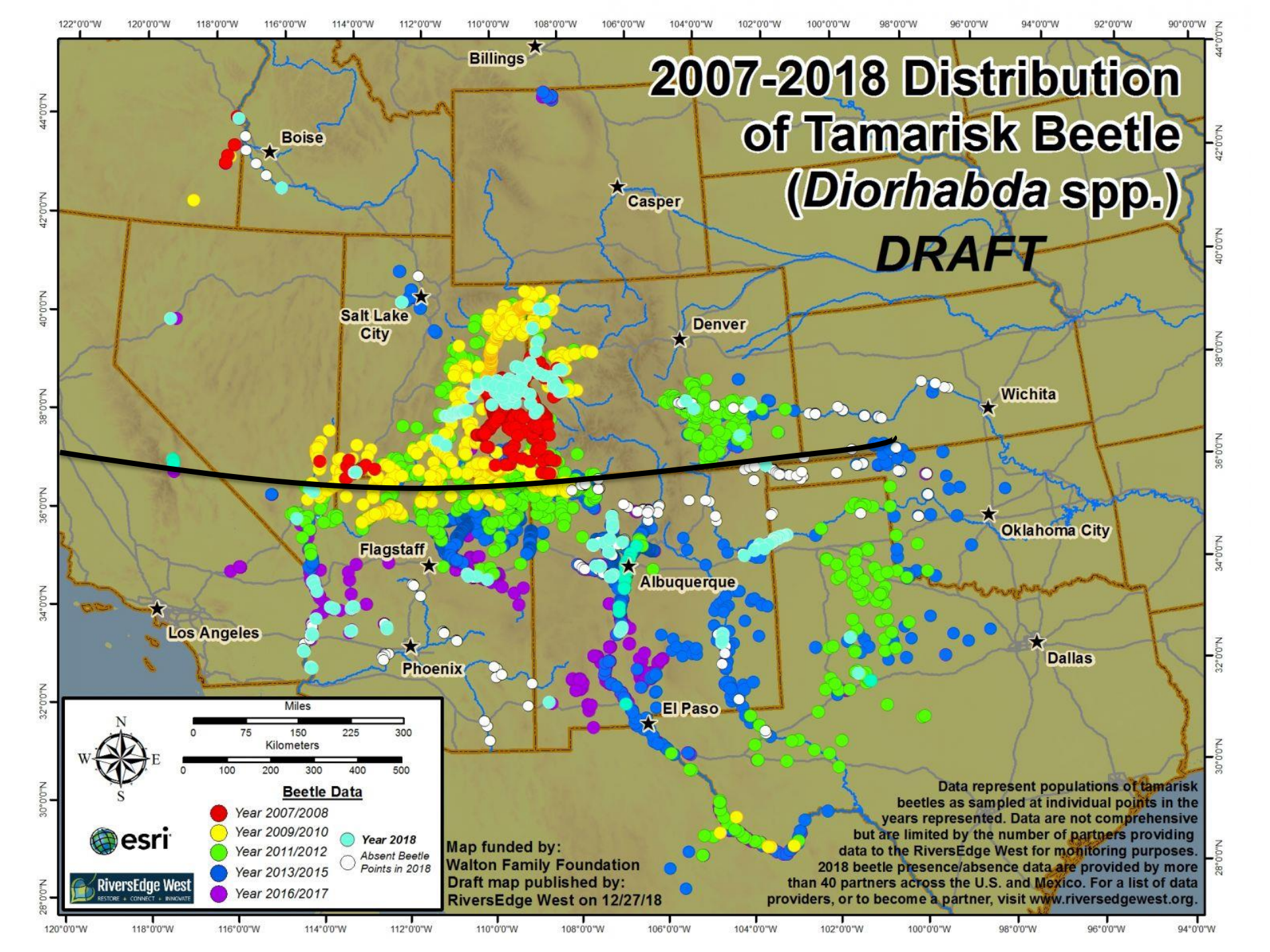
Phloem feeder

Foliage feeder

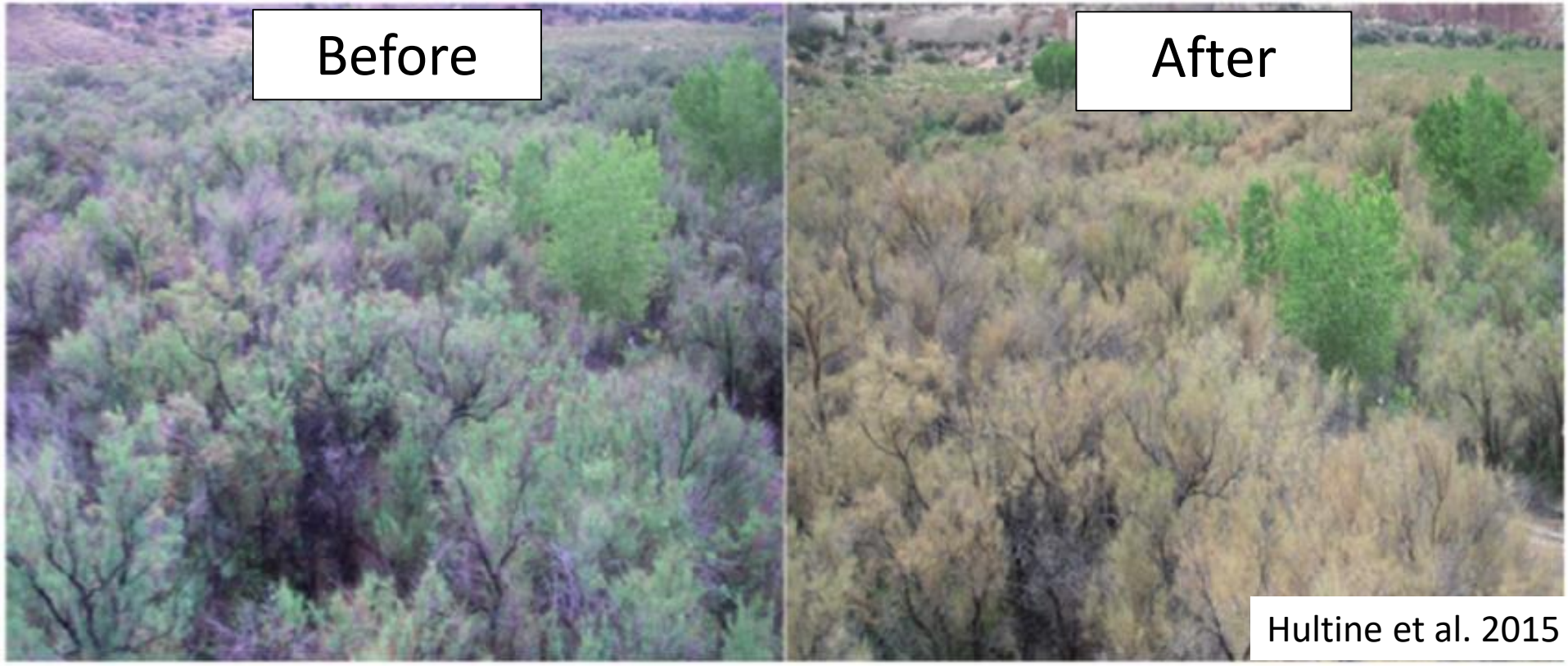
Tamarisk beetle

Weevil

Eats shoot tips


2007-2018 Distribution of Tamarisk Beetle (Diorhabda spp.)
DRAFT
Billings
Boise
Casper
Salt Lake City
Denver
Wichita
Oklahoma City
Flagstaff
Albuquerque
Los Angeles
Phoenix
Dallas
El Paso
Miles
0 75 150 225 300
Kilometers
0 100 200 300 400 500
N
W
E
S
Beetle Data
Year 2007/2008
Year 2009/2010
Year 2011/2012
Year 2013/2015
Year 2016/2017
Year 2018
Absent Beetle Points in 2018
esri
RiversEdge West
RESTORE + CONNECT + INNOVATE
Map funded by:
Walton Family Foundation
Draft map published by:
RiversEdge West on 12/27/18
Data represent populations of tamarisk beetles as sampled at individual points in the years represented. Data are not comprehensive but are limited by the number of partners providing data to the RiversEdge West for monitoring purposes. 2018 beetle presence/absence data are provided by more than 40 partners across the U.S. and Mexico. For a list of data providers, or to become a partner, visit www.riversedgewest.org.

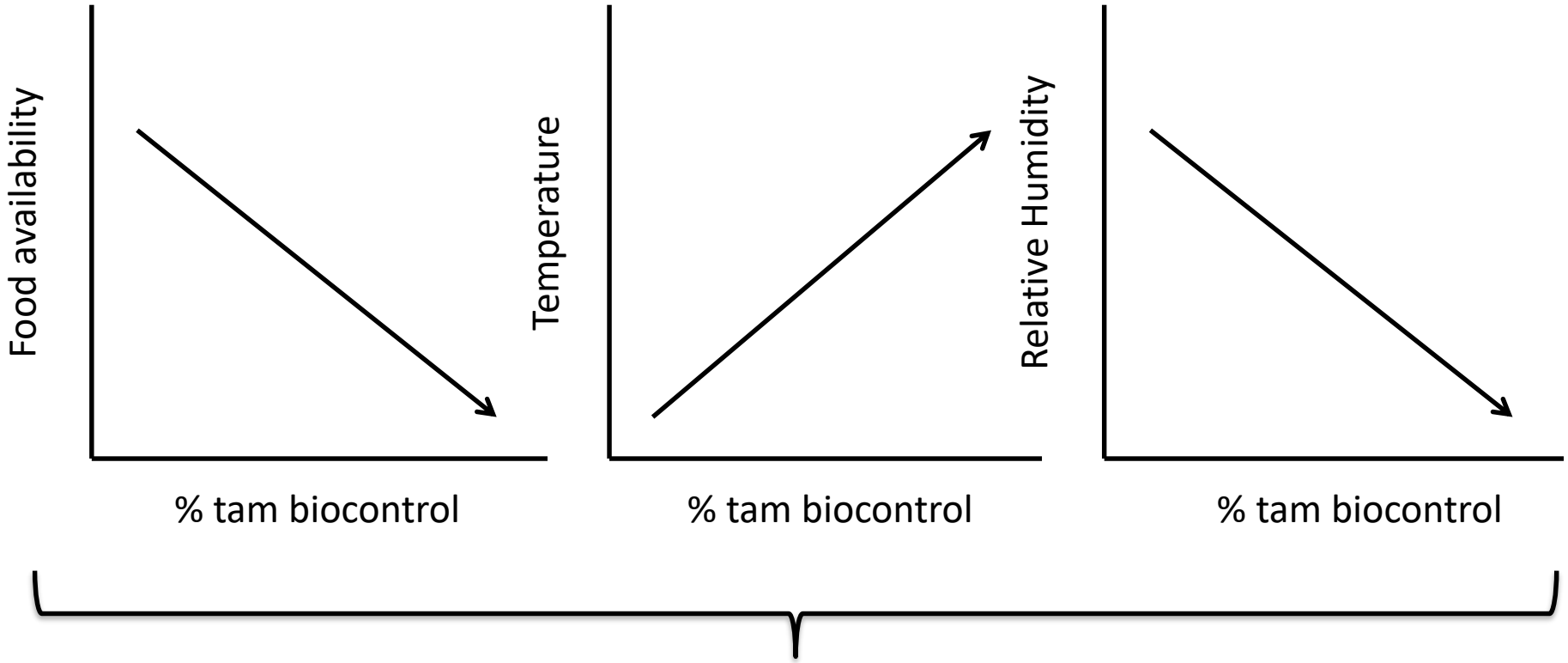
Effect of defoliation

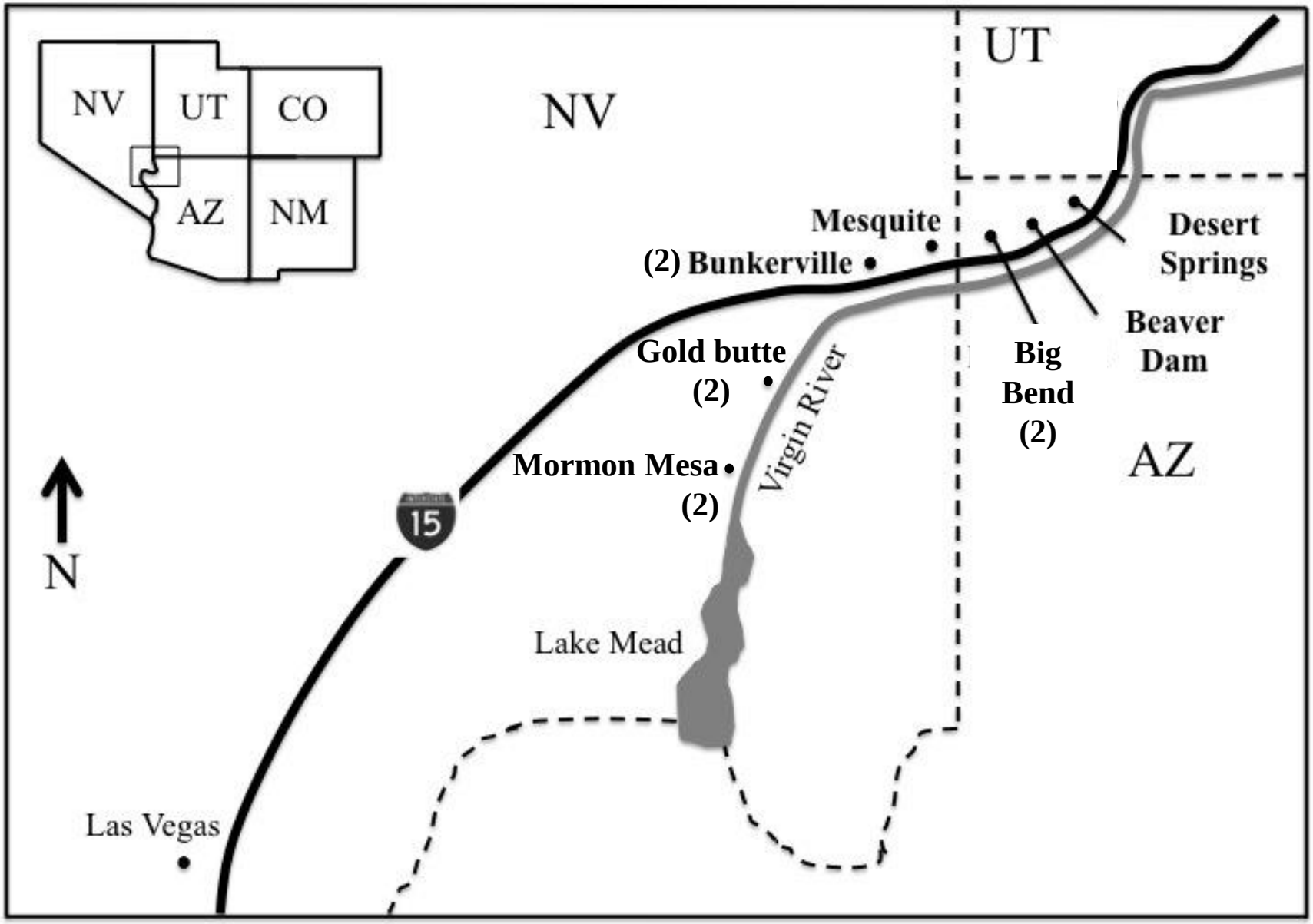


Dramatic large-scale defoliation

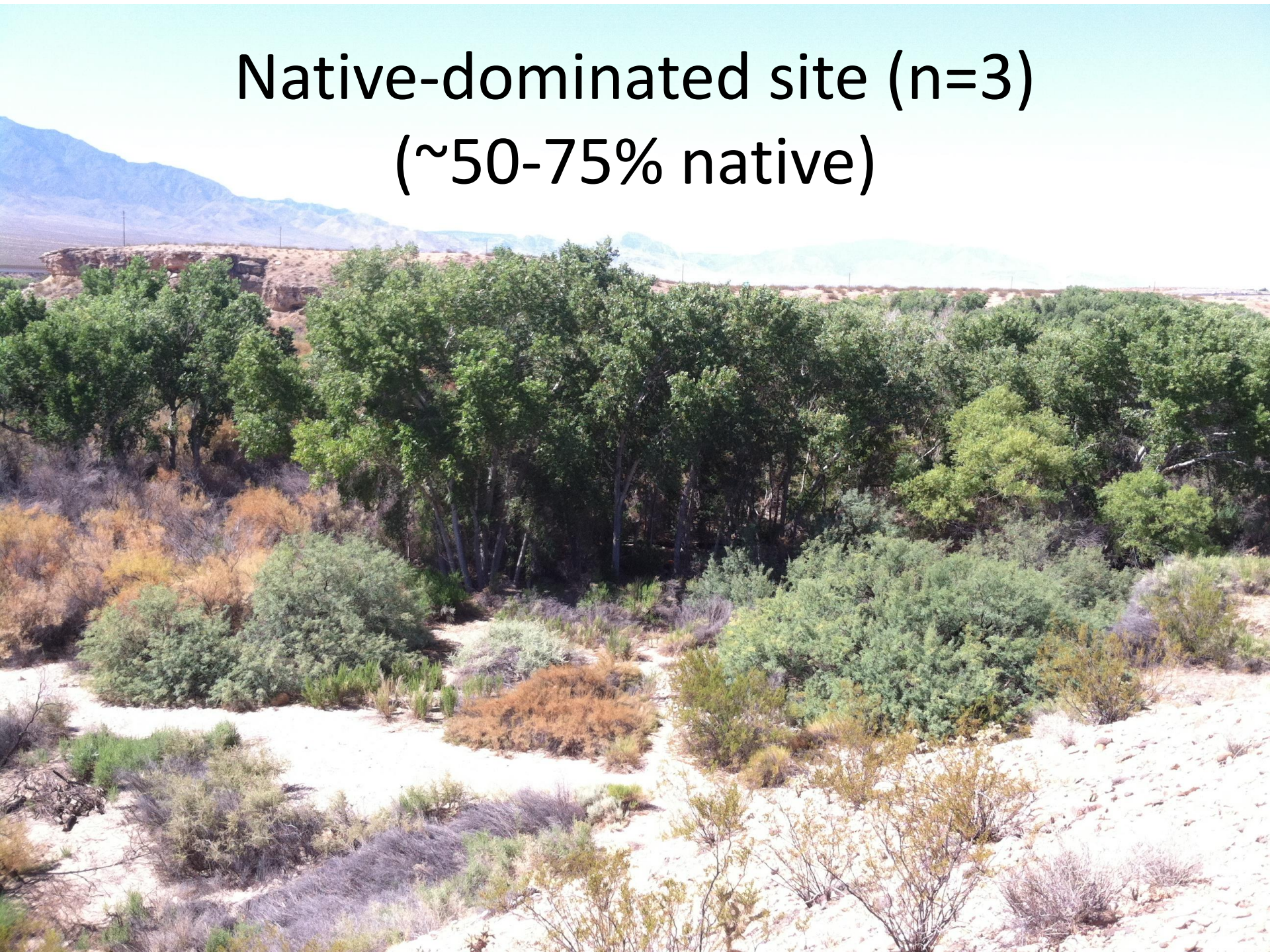
Can occur rapidly – within a season

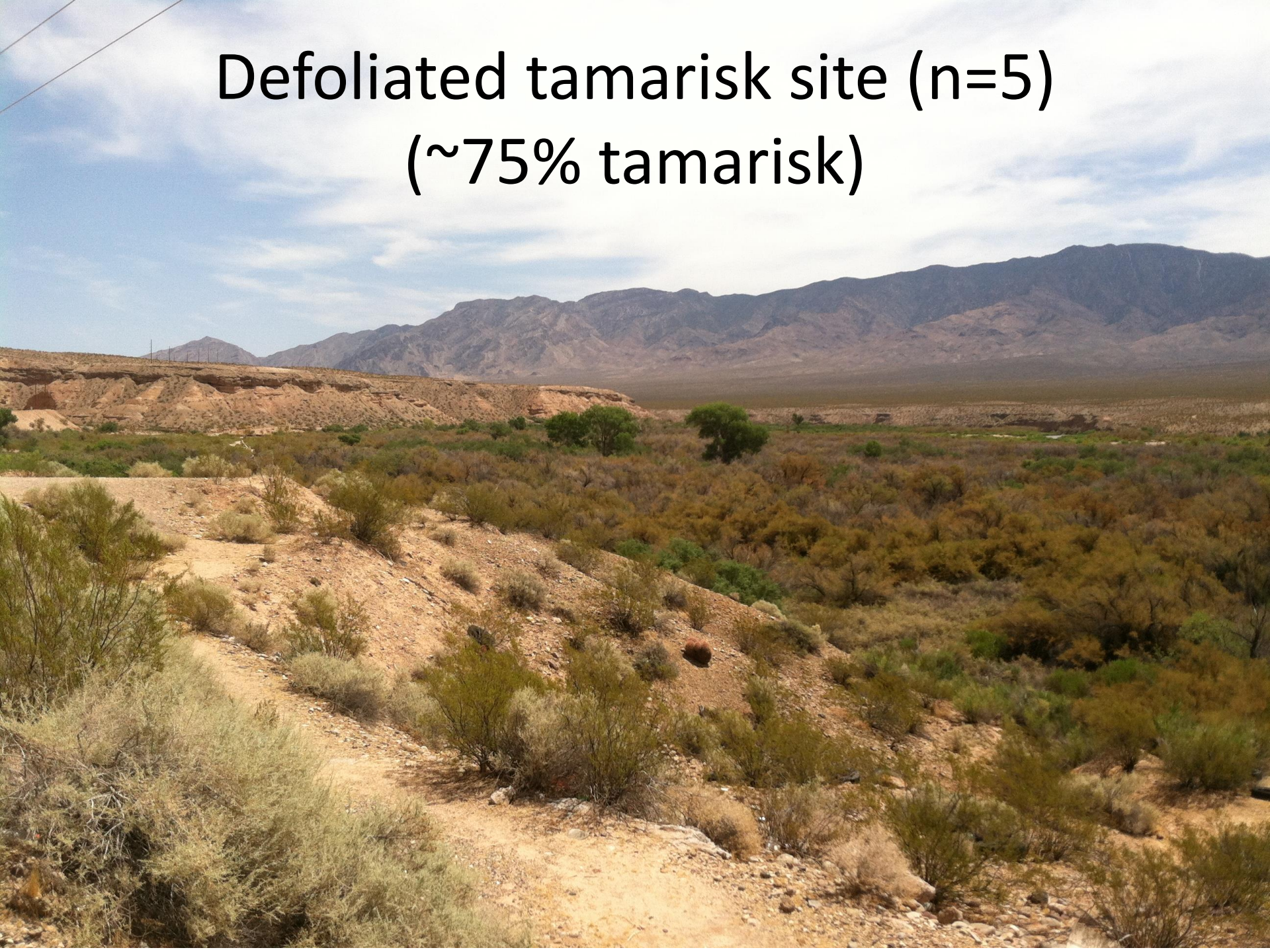
Possible effects of biocontrol




NV
UT
CO
AZ
NM
NV
UT
Mesquite
(2) Bunkerville
Desert Springs
Beaver Dam
Gold butte (2)
Big Bend (2)
Virgin River
Mormon Mesa (2)
AZ
15
N
Lake Mead
Las Vegas

Native-dominated site (n=3) (~50-75% native)



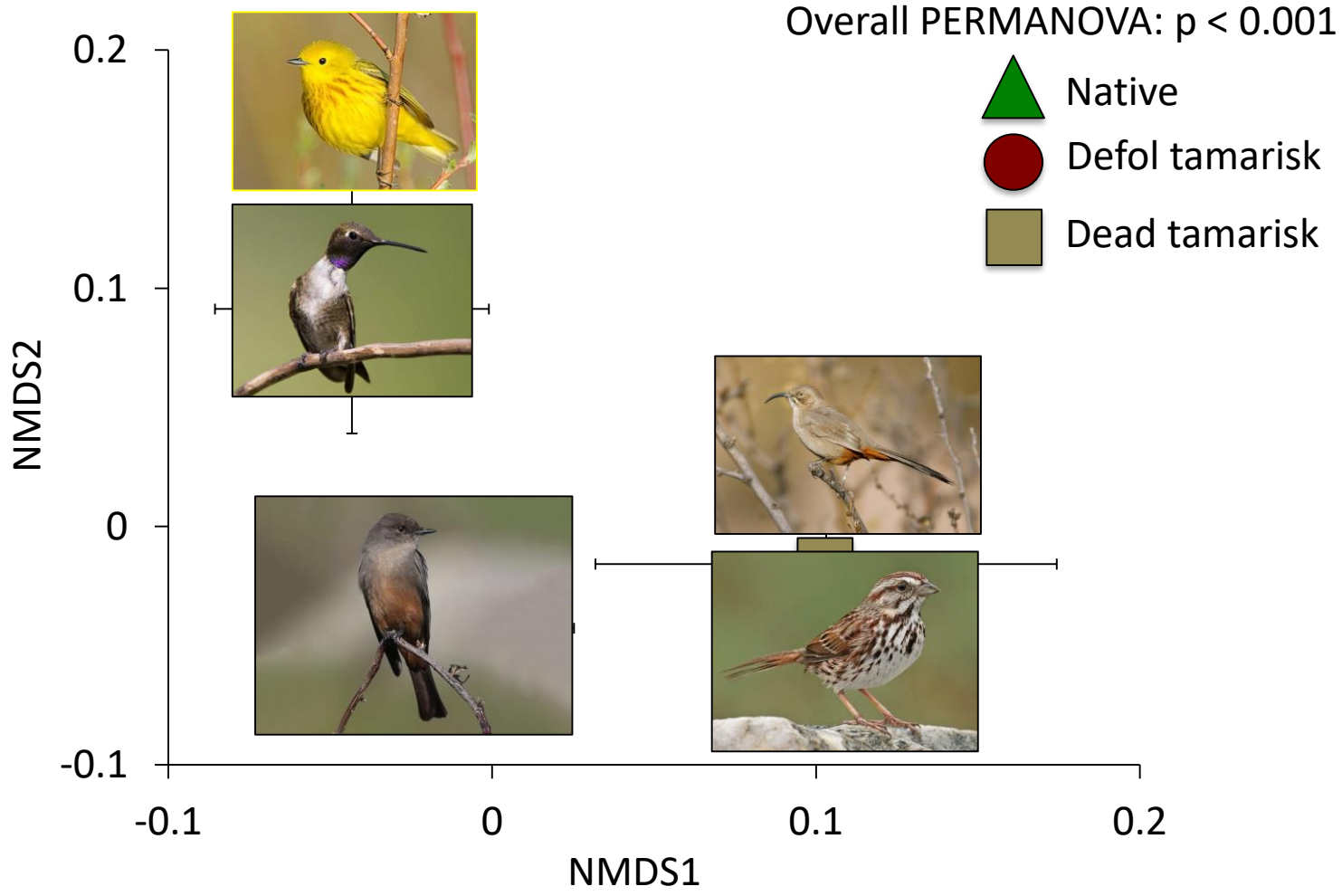

Defoliated tamarisk site (n=5)
(~75% tamarisk)

Dead tamarisk site (n=3)
(>90% presumed dead tamarisk)

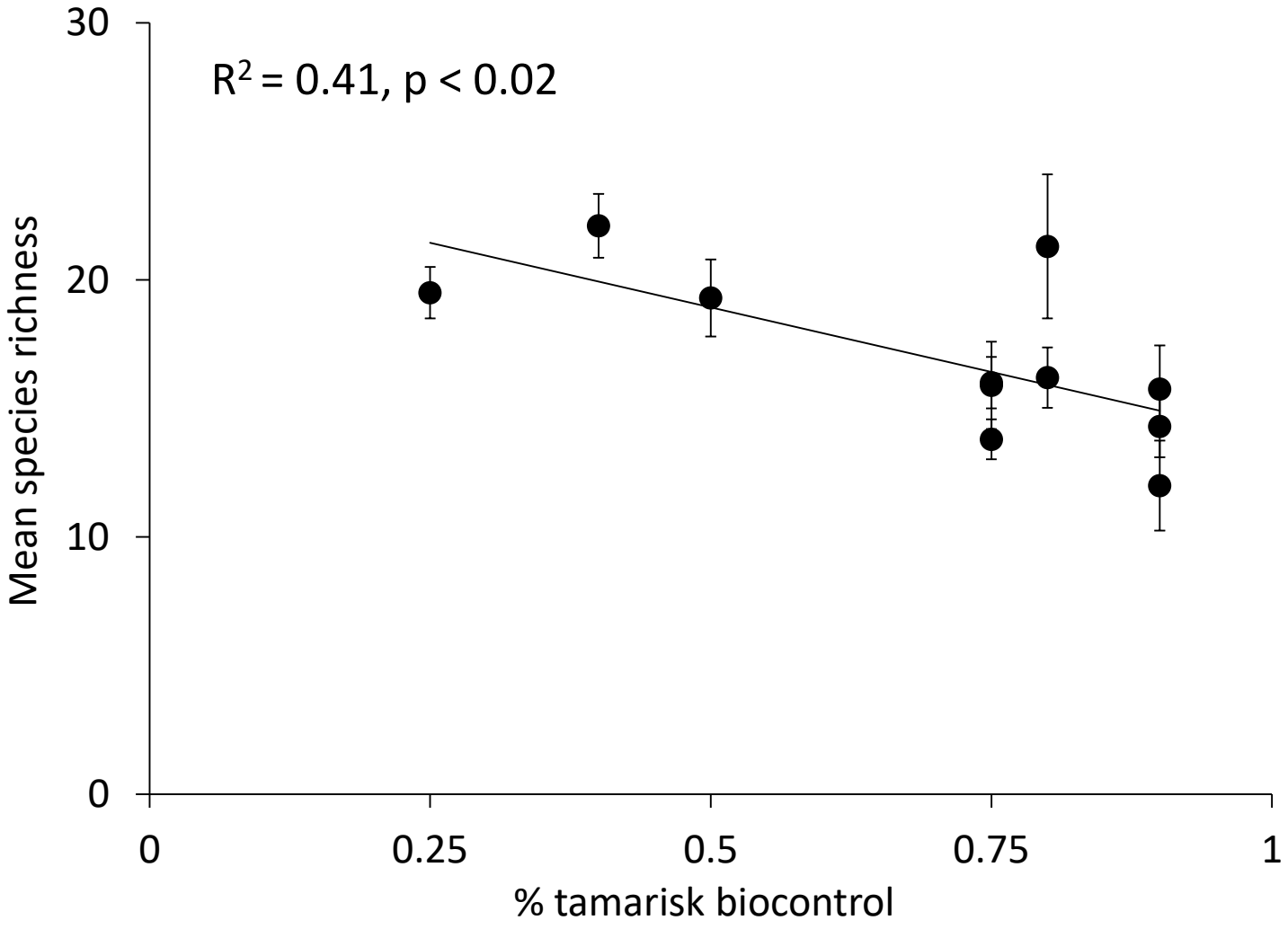
How do birds respond to tamarisk biocontrol?

- 2 point count visits in 2013 and 2014 each
- 6 points per site
- 0500-1100, low wind, no rain
- quantified the % tamarisk biocontrol
- quantified species compositions based on presence/absence
- calculated species richness
- modeled bird densities in Distance package (R)
  - Yellow warbler, blue-gray gnatcatcher, Lucy's warbler, Bewick's wren

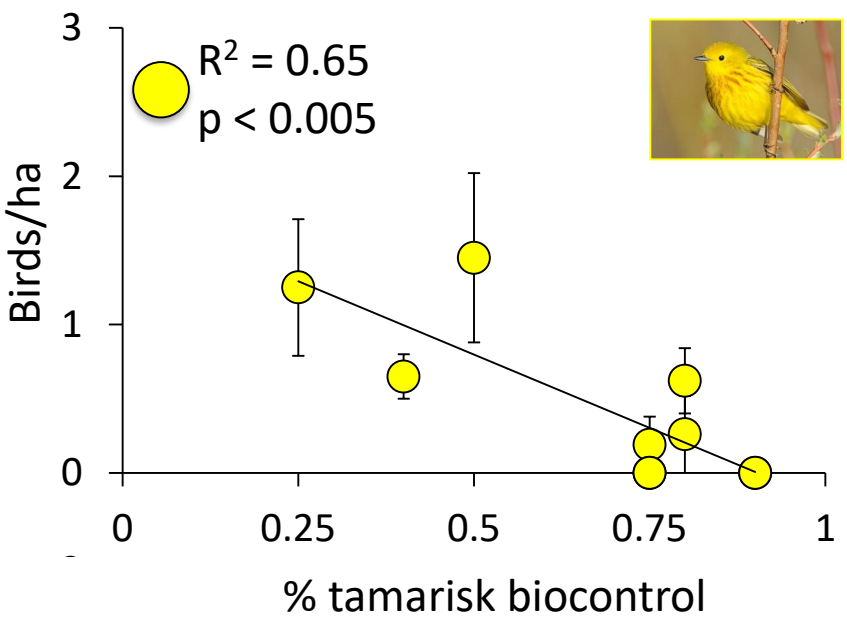
Bird species composition differ among habitats

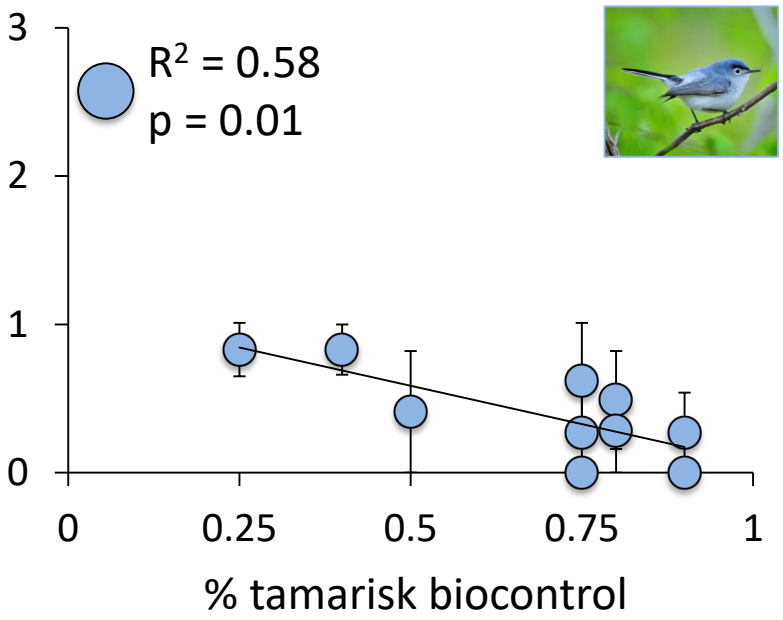


Richness declines in biocontrol-affected habitat



Different responses to biocontrol

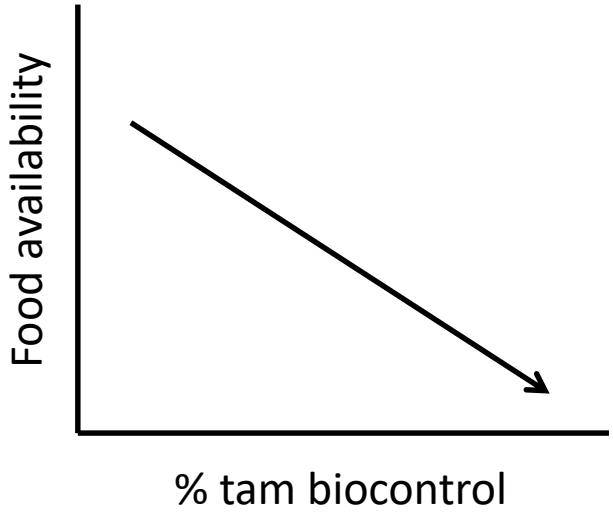


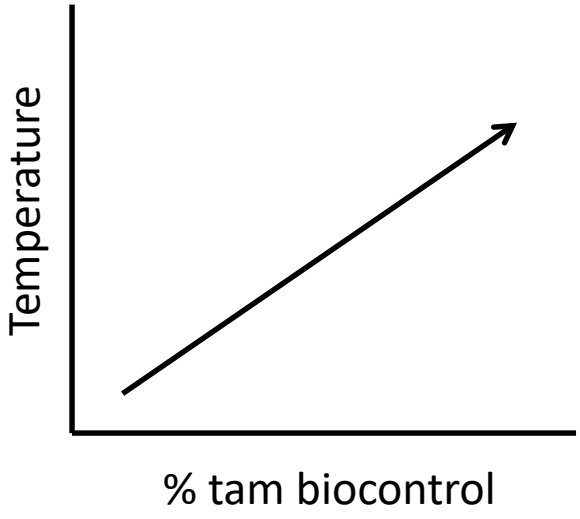


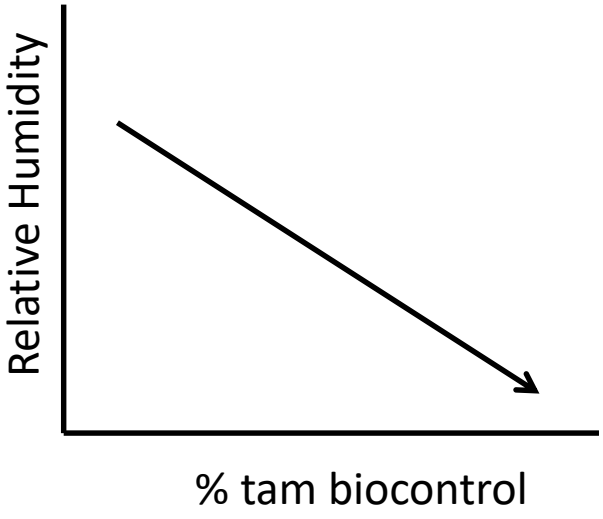
How do birds respond to tamarisk biocontrol?

1. Species composition differed by habitat
2. Species richness declined
3. Densities were different

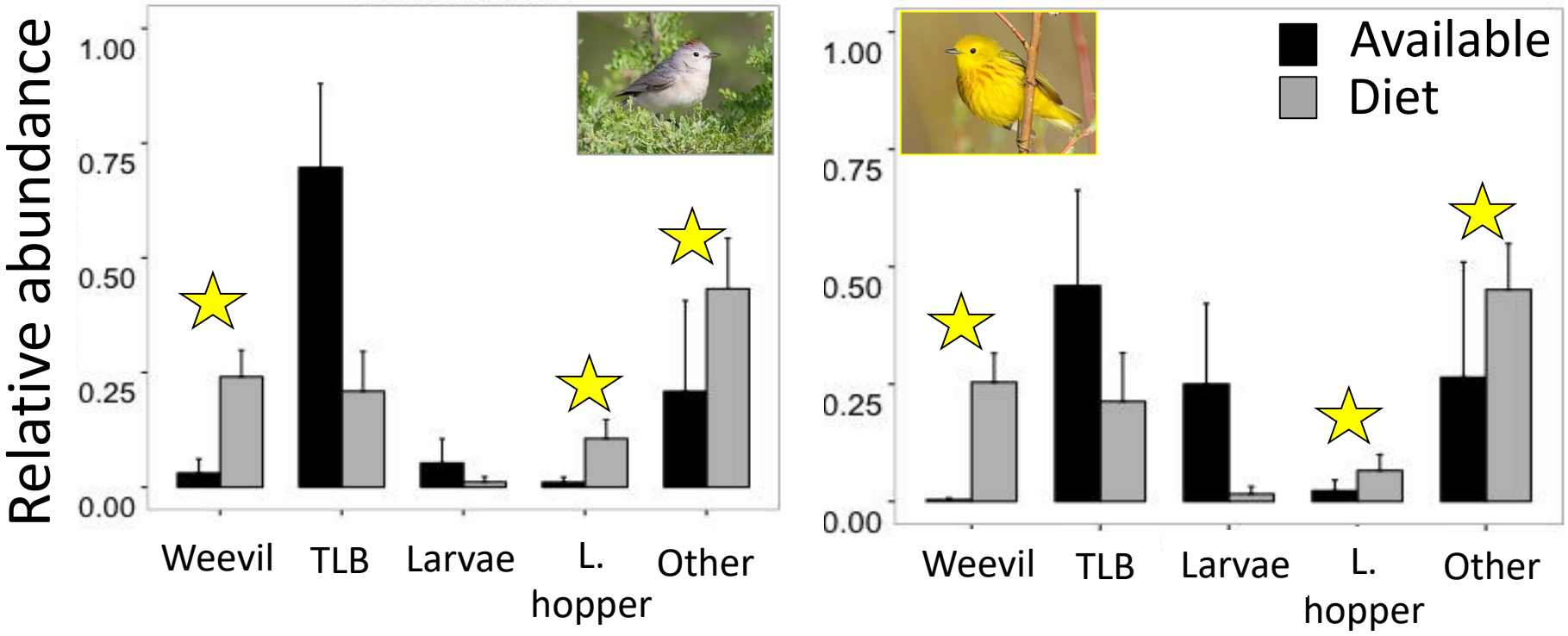
- What are the mechanisms behind these results?





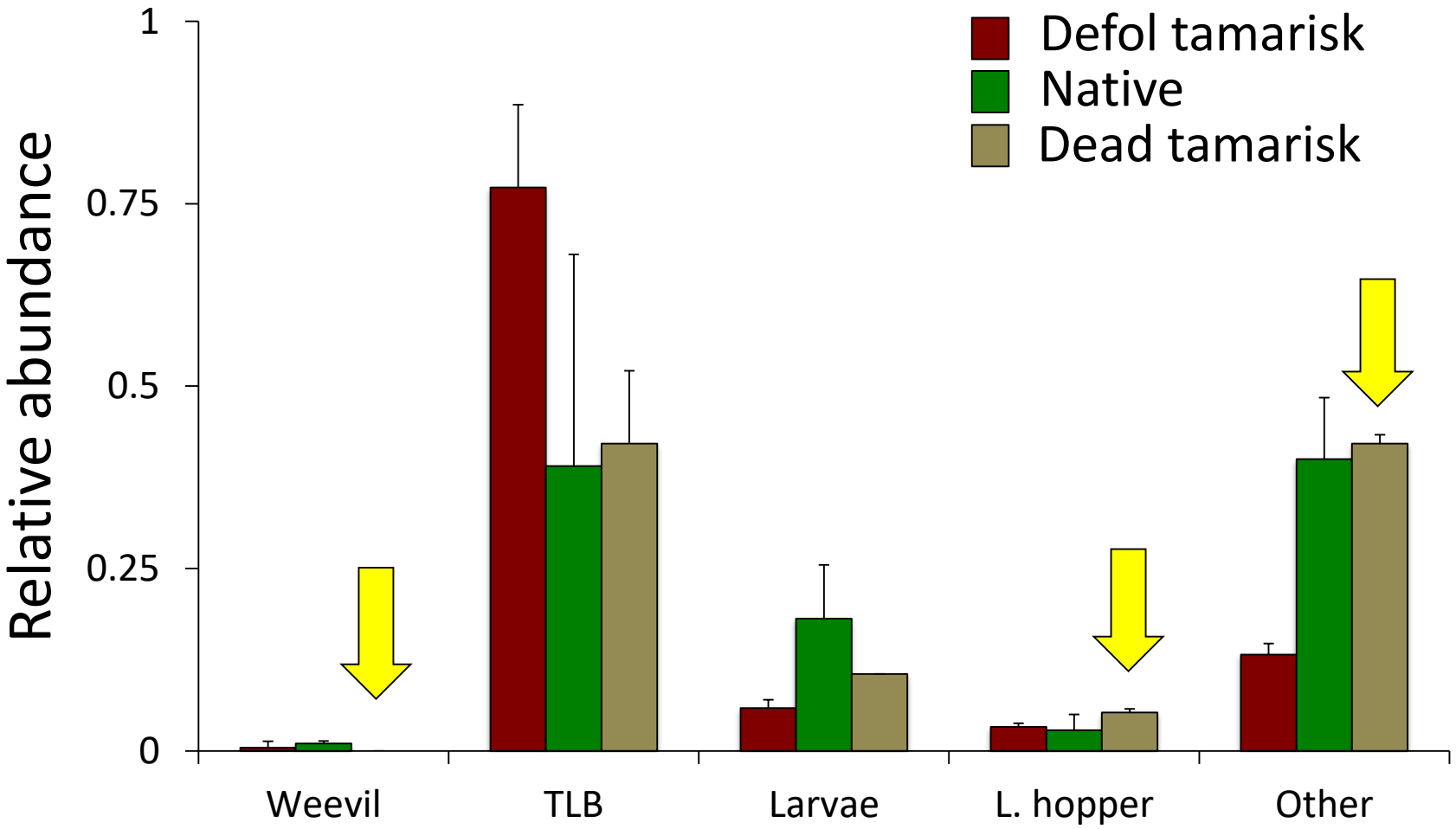


Selection for weevils, leaf hoppers and “other” prey

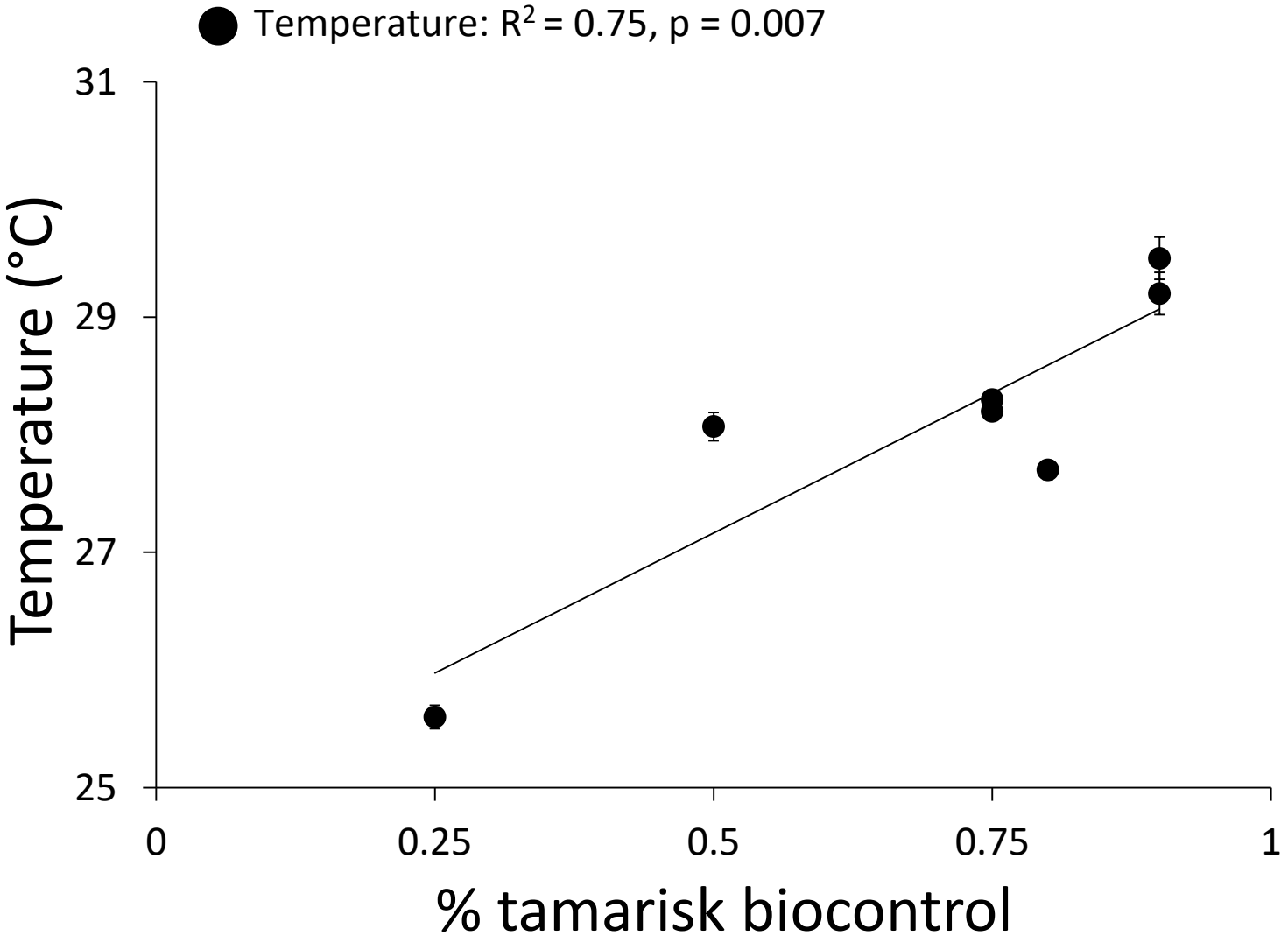


Mahoney et al. 2017
Biological Inv.

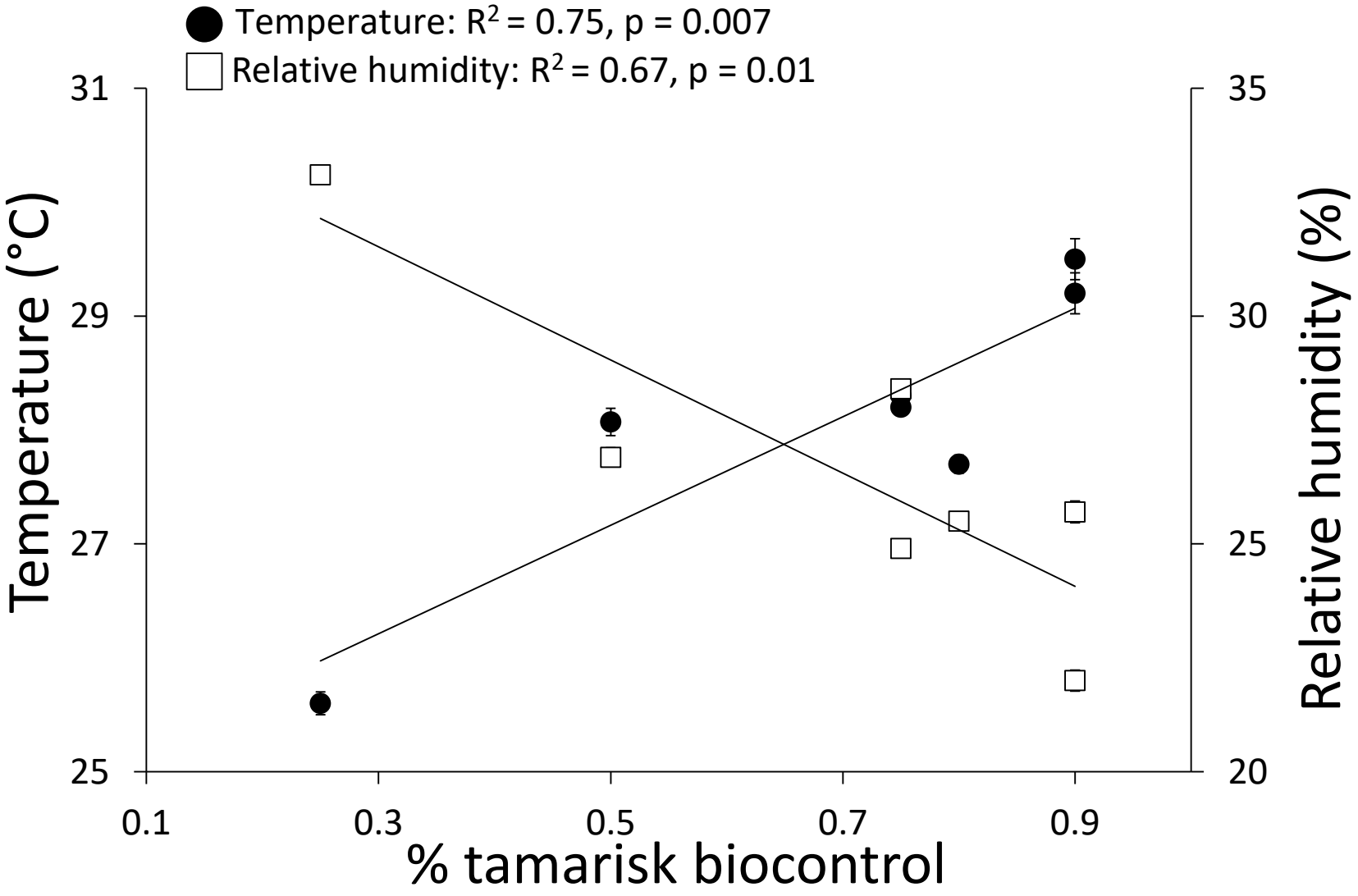
Adequate food in dead tamarisk



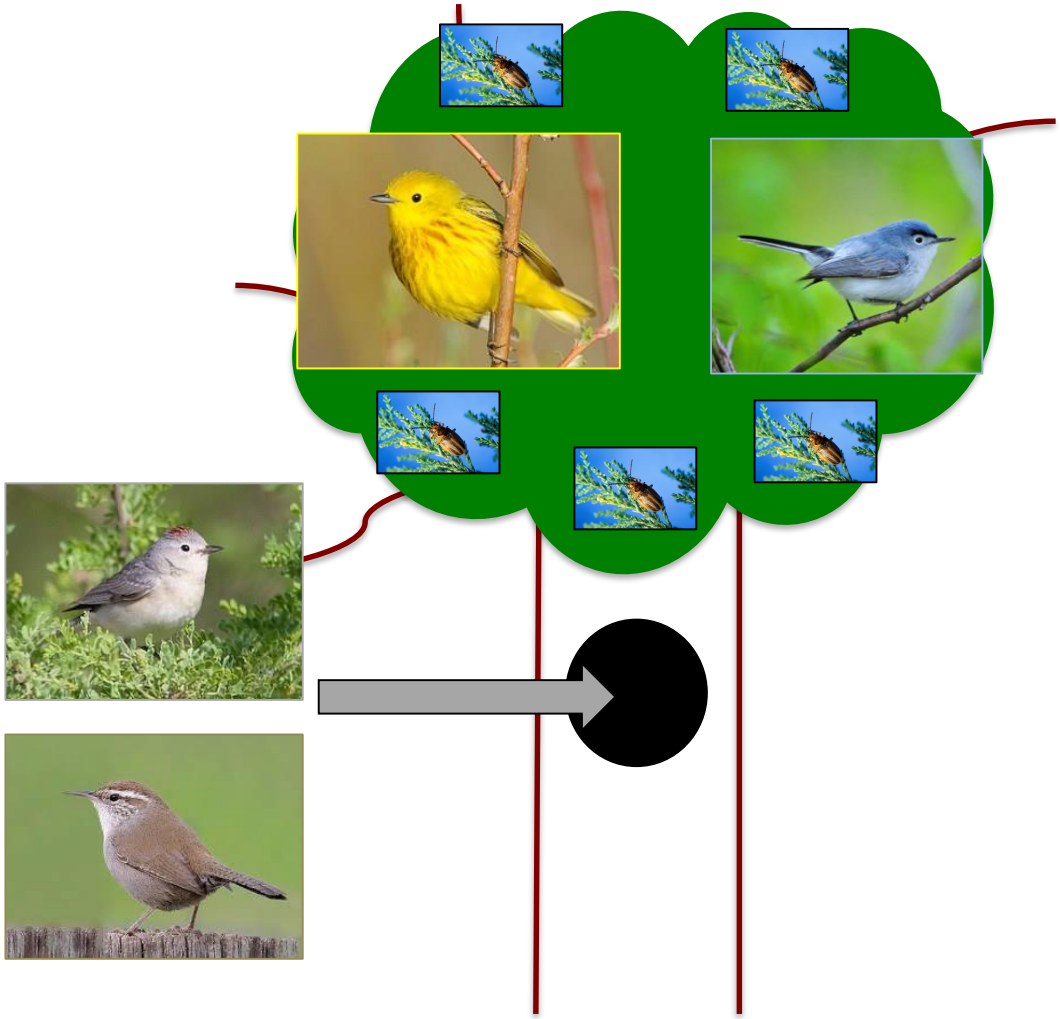
Temperature increases



Humidity decreases



Nesting behavior may predict response



Management implications

- Bird species respond differently to biocontrol
  - Surprising result, possibly because of microclimate
- Tamarisk biocontrol may change community structure
  - Changes in relative abundance
  - Extirpation of species in affected areas
- Stress the need for rapid restoration

Acknowledgements

- Theimer group (NAU)
- Chris Calvo (NAU Avian Ecologist)
- David Rakestraw (NPS)
- Zachary Watson
- Ruby Hammond (NAU)
- Pete Motyka (NAU)
- George Cummins (SWCA)
- Kent Mosher (AZGF)

@mahosean
sean.mahoney@nau.edu