

Sahara Mustard in the Desert Southwest: Impacts to Biodiversity



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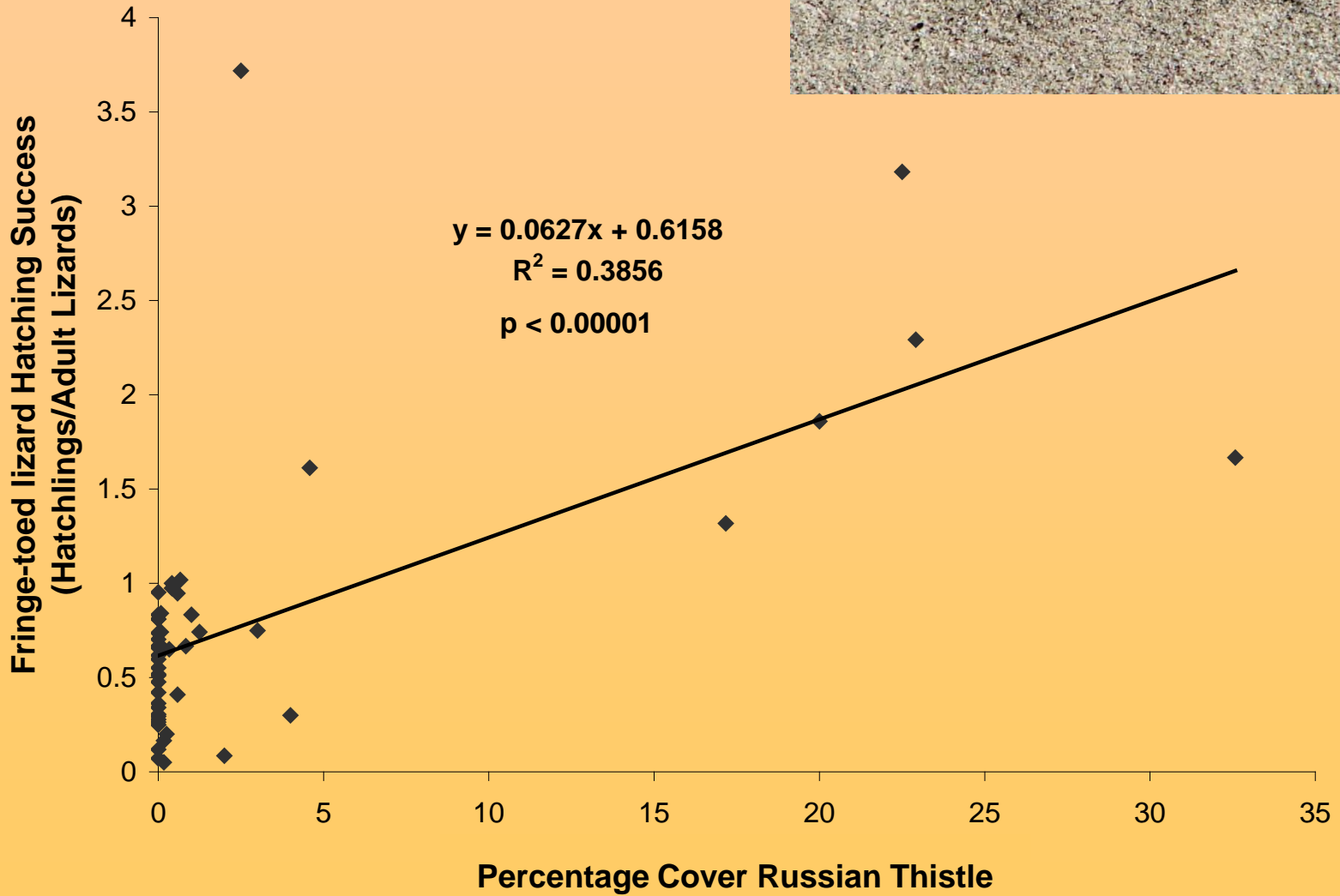


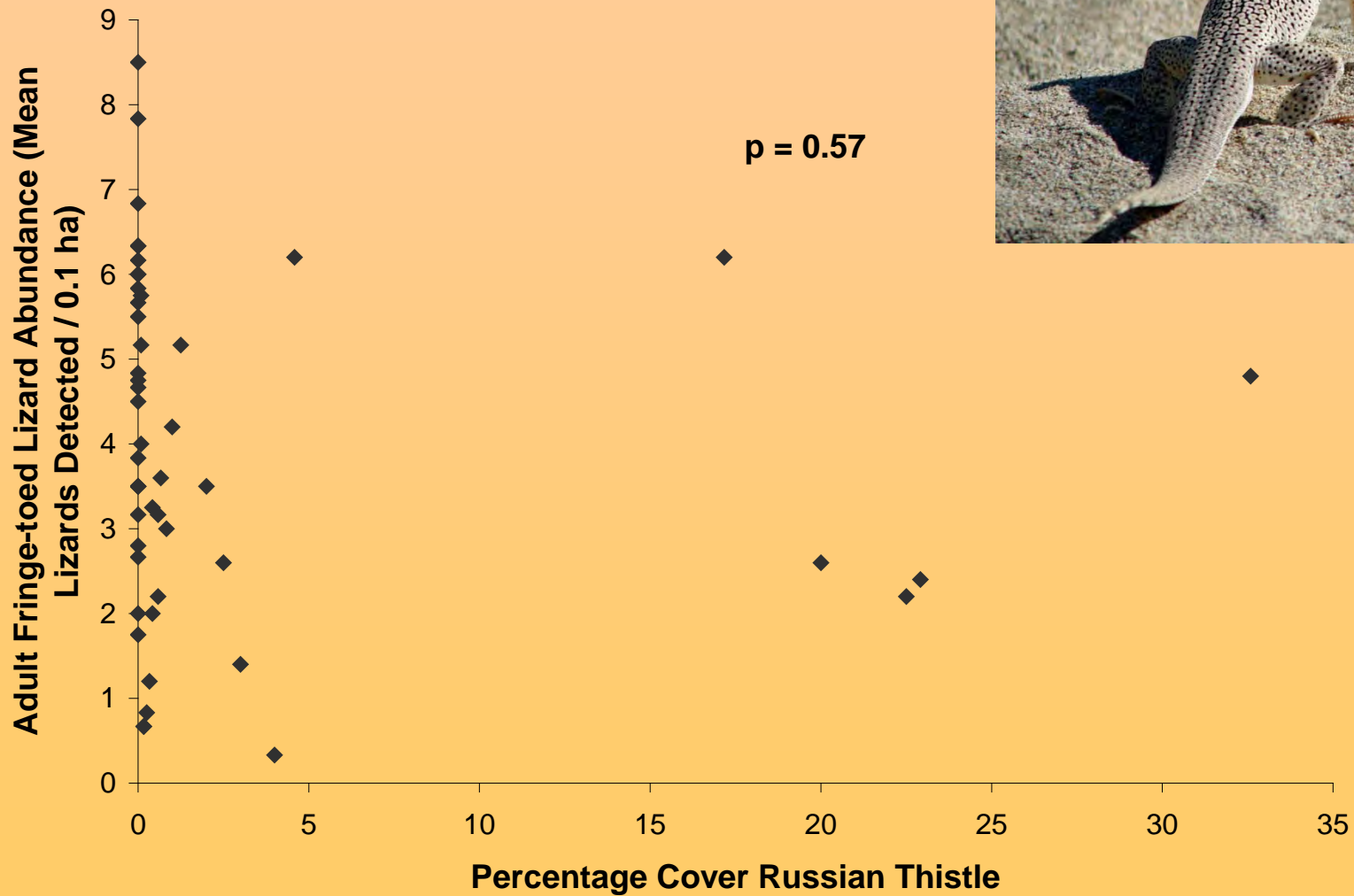
We usually assume invasive species have negative impacts to biodiversity, however....

Coachella Valley fringe-toed lizard

Uma inornata

Federally Threatened, State Endangered





For Russian thistle, control would be costly without benefits to native biodiversity – in fact in some areas fringe-toed lizard numbers would decline

But what about Sahara mustard?







1927

Following maps were prepared by
Yue Max Li , PhD Student
University of Arizona



1940s

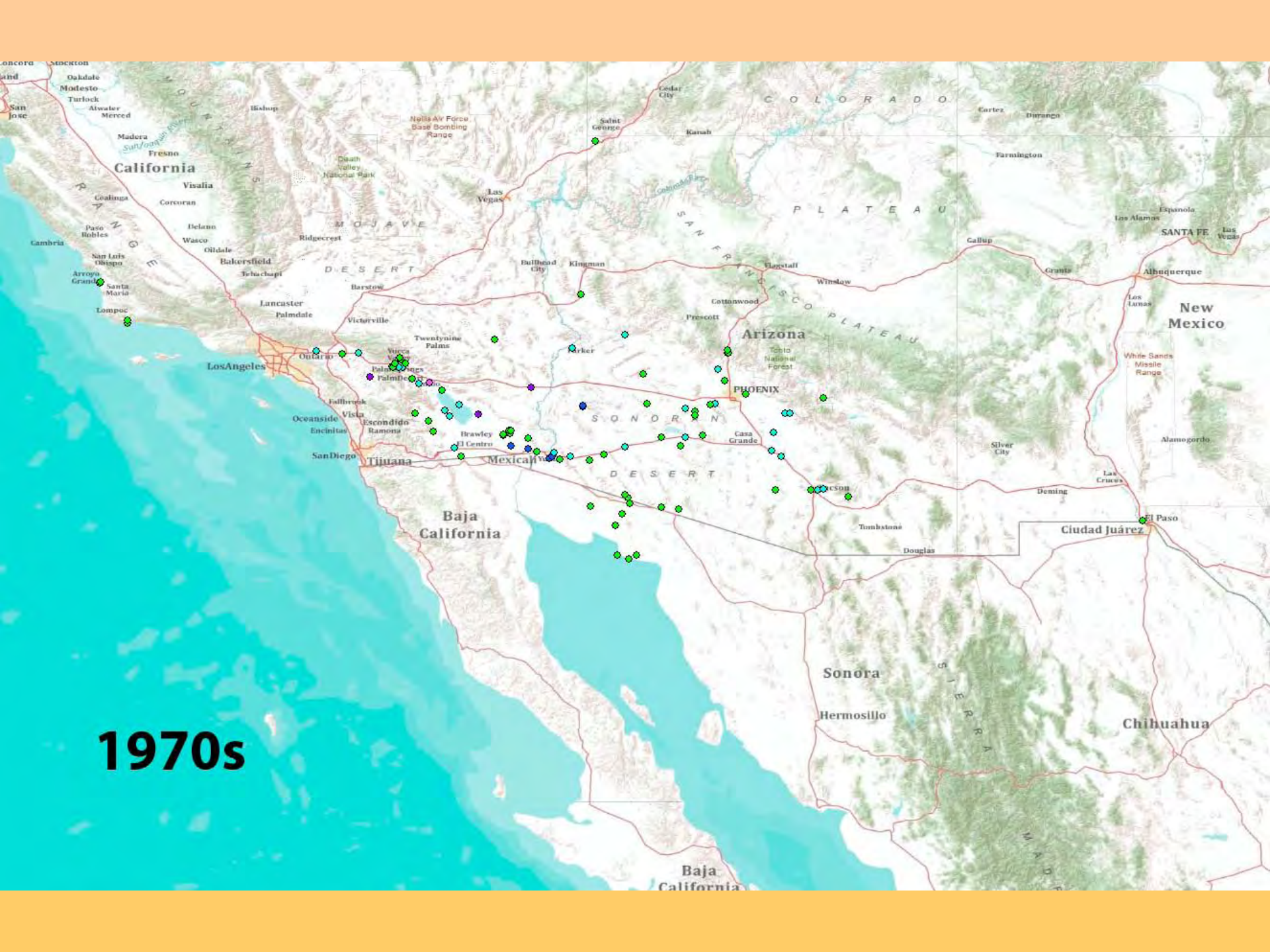


1950s





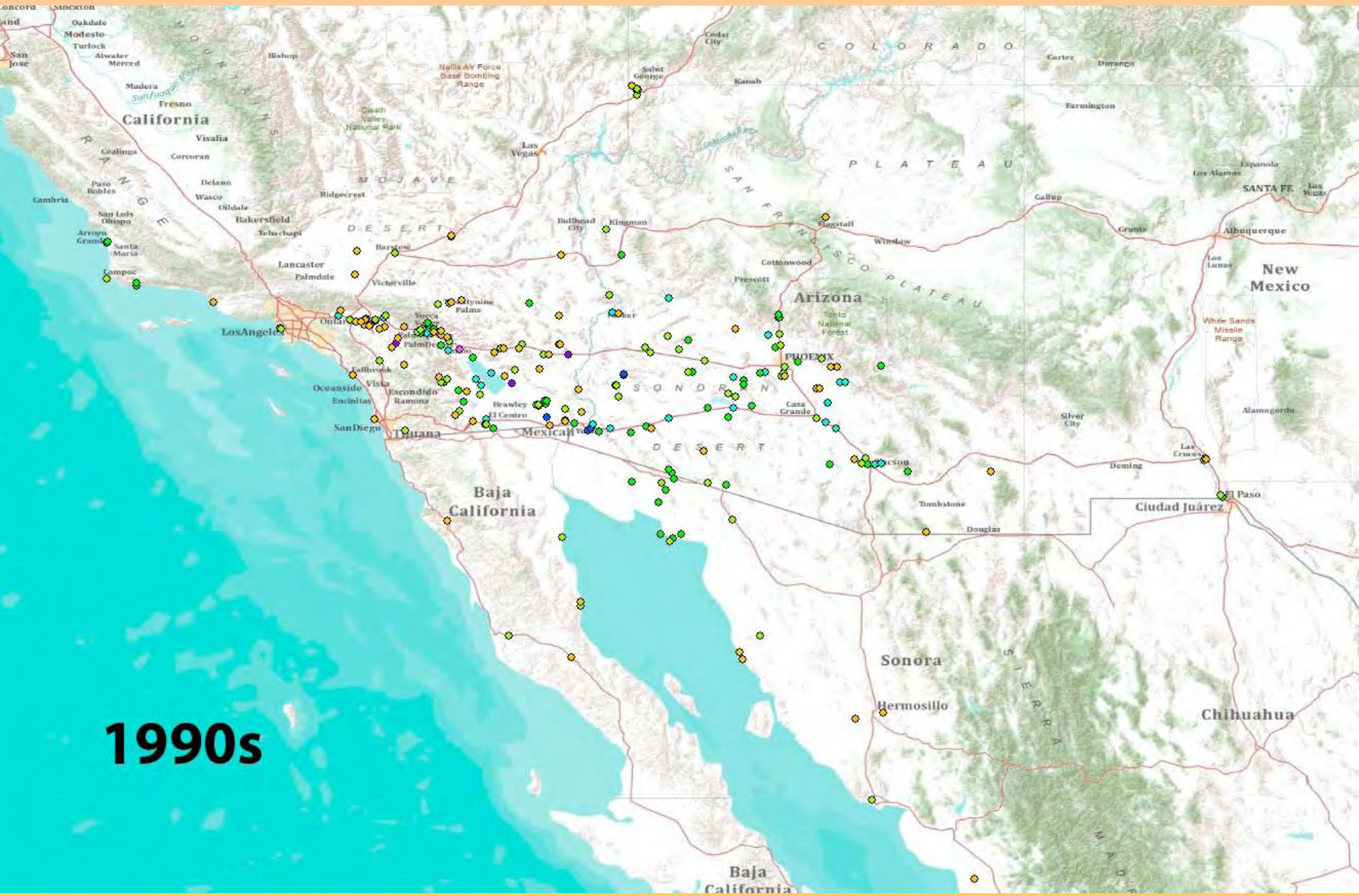
1960s



1970s



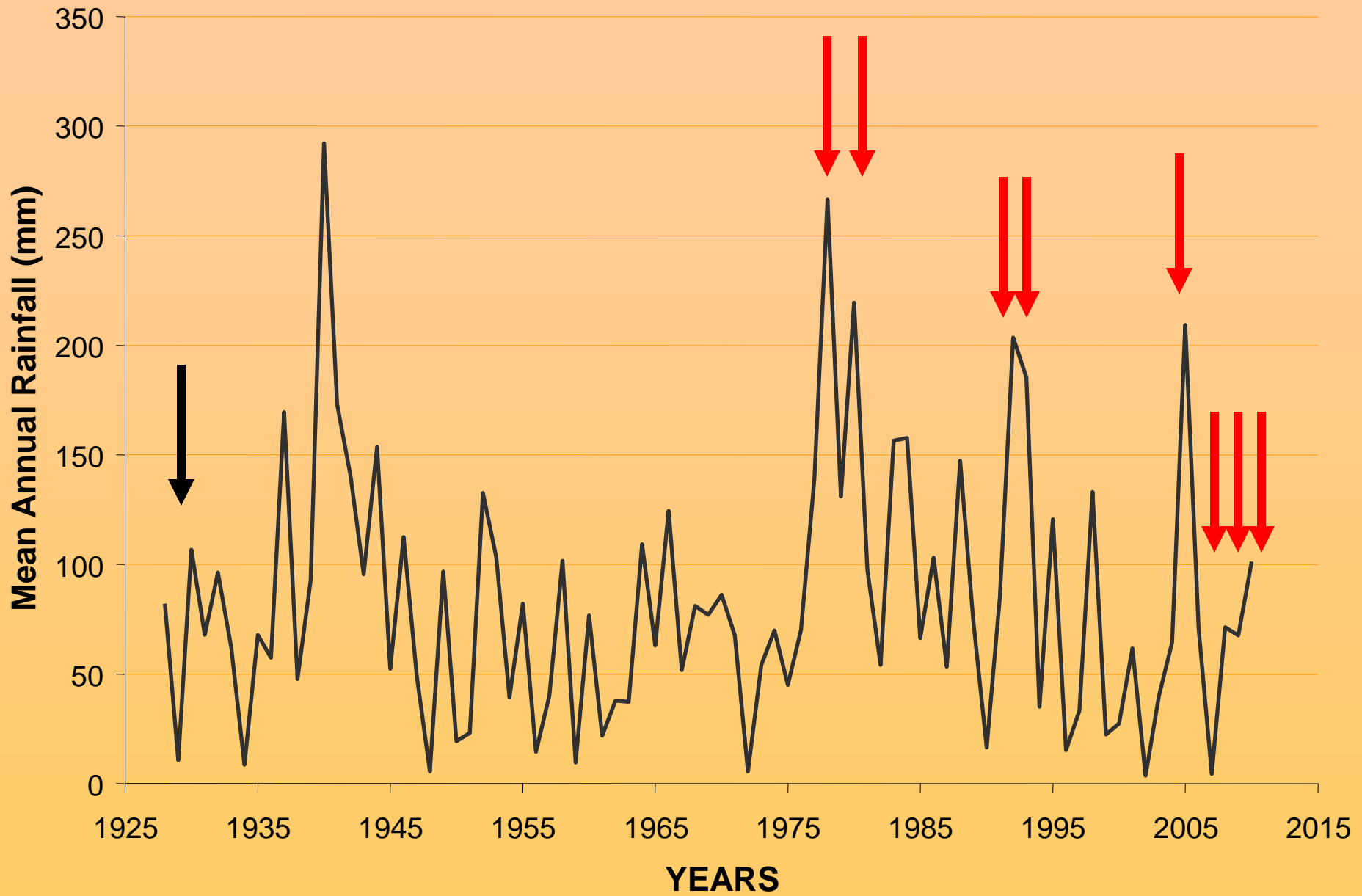
1980s



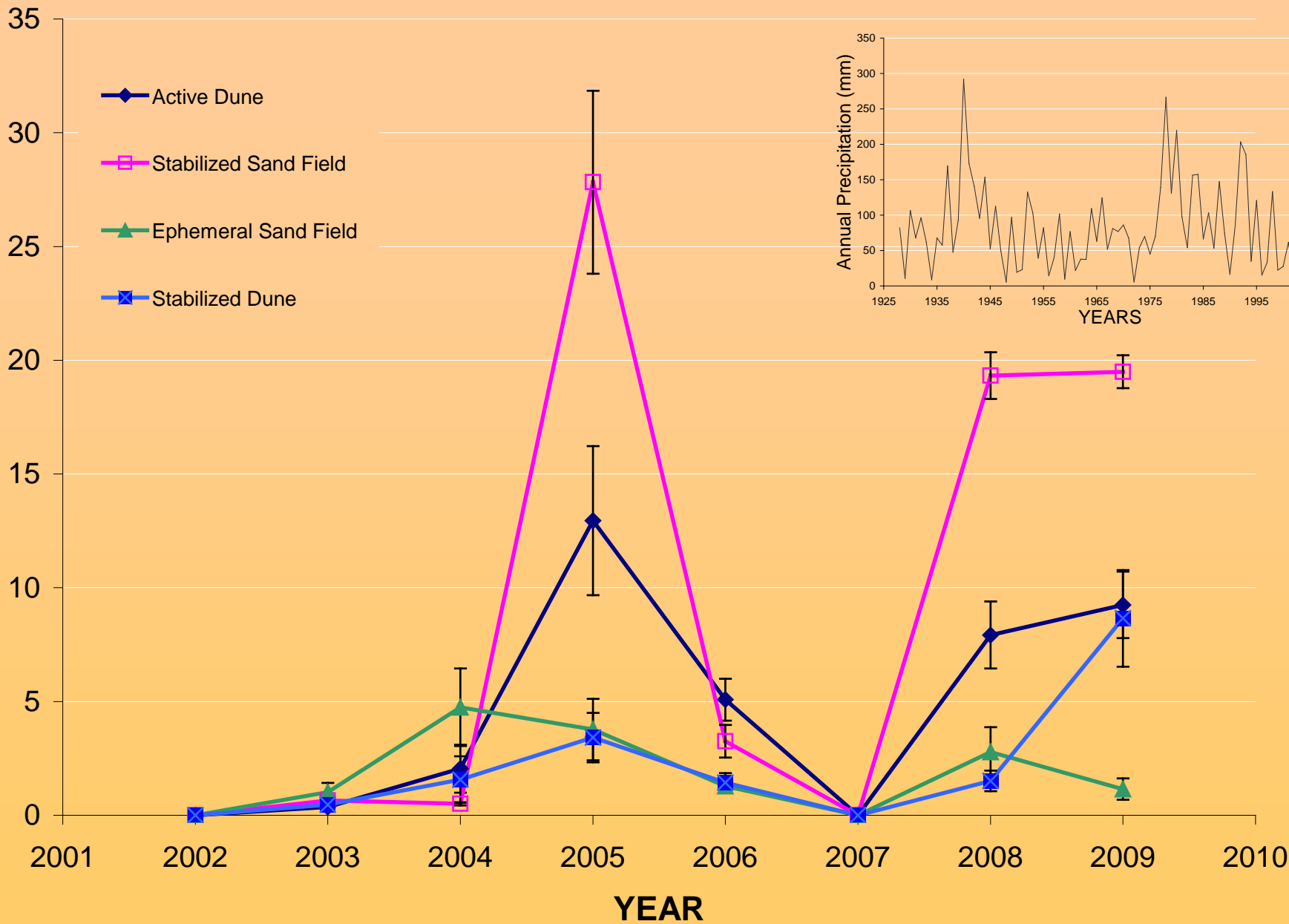
1990s



2000 and beyond



Percent Cover Sahara Mustard





**Sahara Mustard
Invasion in aeolian sand habitats**

Reduction in Native Annuals

**Reduction in native
annual plant seed bank**

Reduction in
plant-eating arthropods

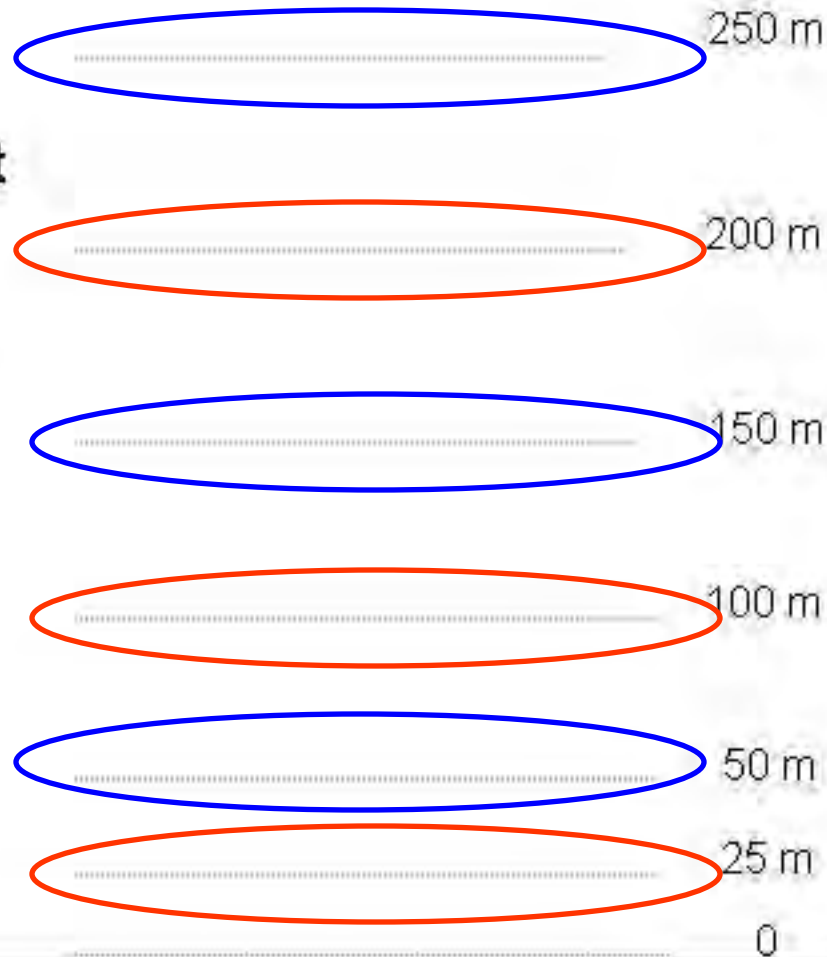
**Reduced prey abundance
and diversity
for dune lizards**

The mustard is persistent for up to a year or more, whereas native annuals fragment and blow away by early summer, and so leads to dune stabilization

**Reduced seed
scarification
for endemic dune plants**

**Reduced
habitat suitability
for dune endemics**

Aeolian Sand Habitat



**Transect
Locations**

Mustard removed (red) and control (blue) plot arrangement

5 plot clusters (as shown above), with 15 plots weeded, and 15 used as controls





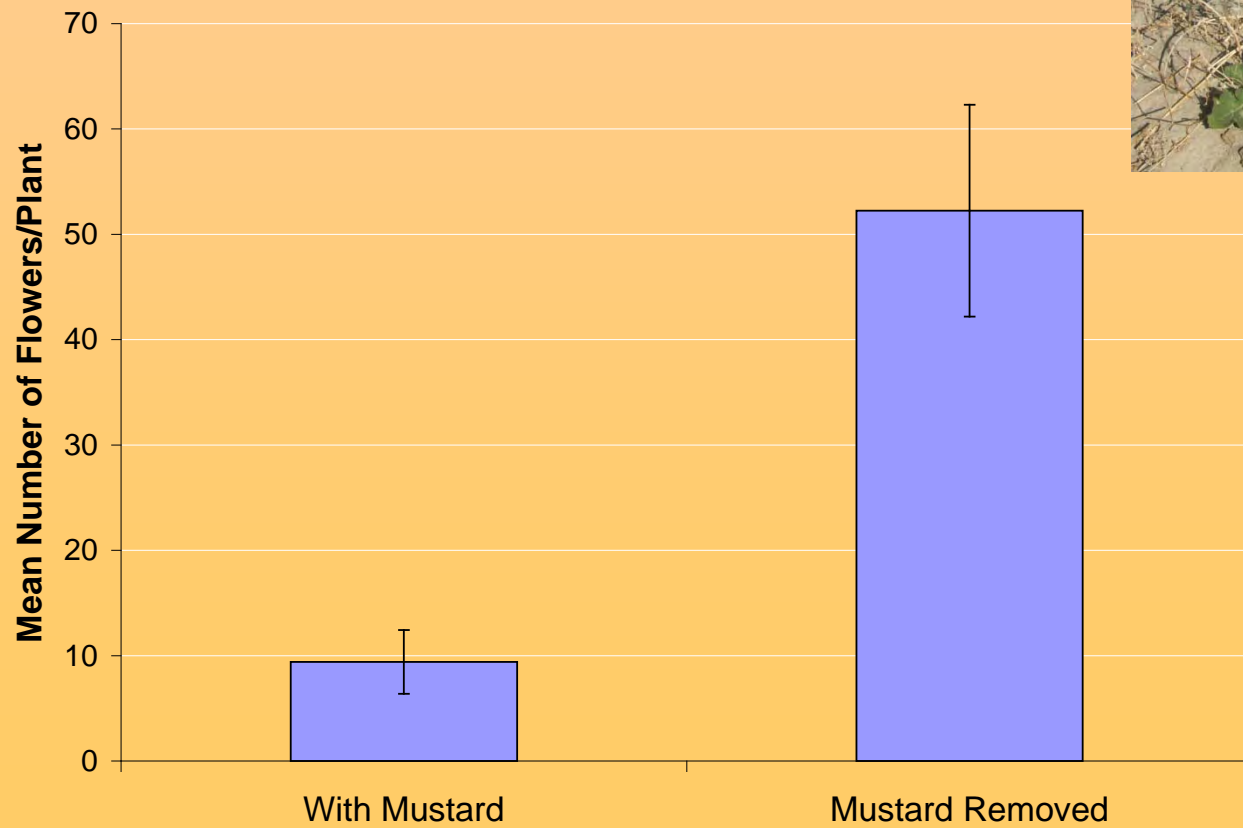




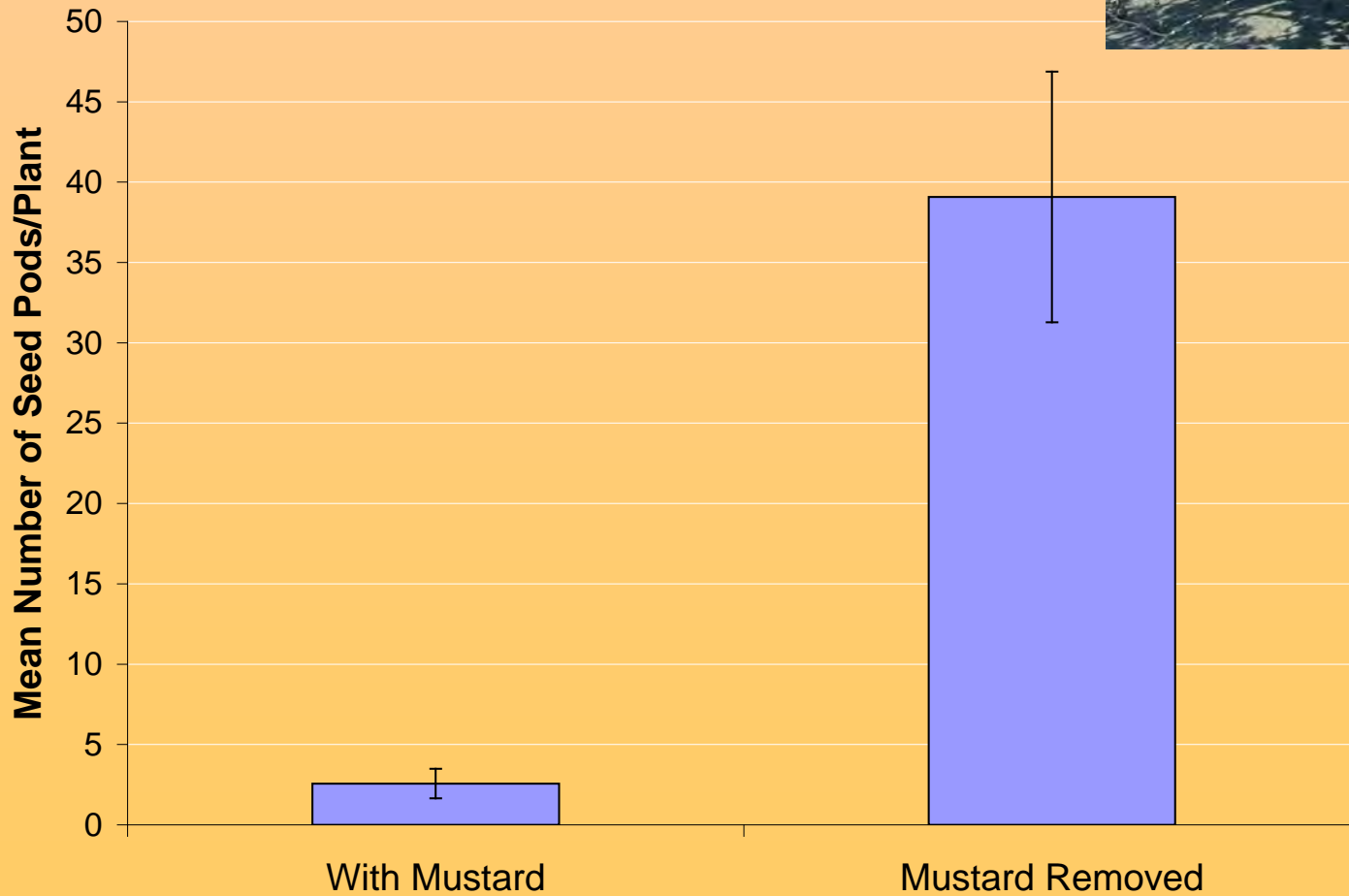


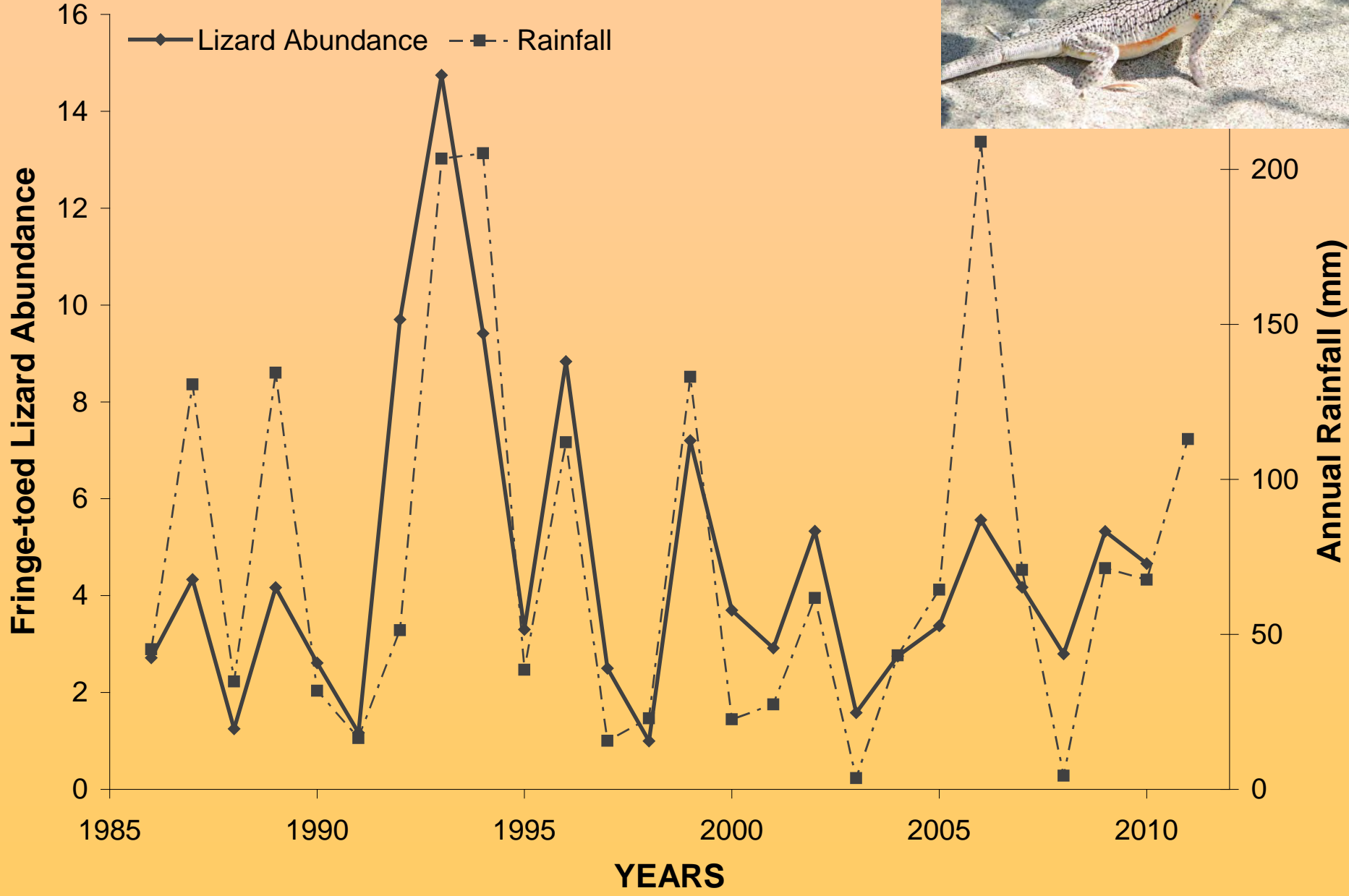


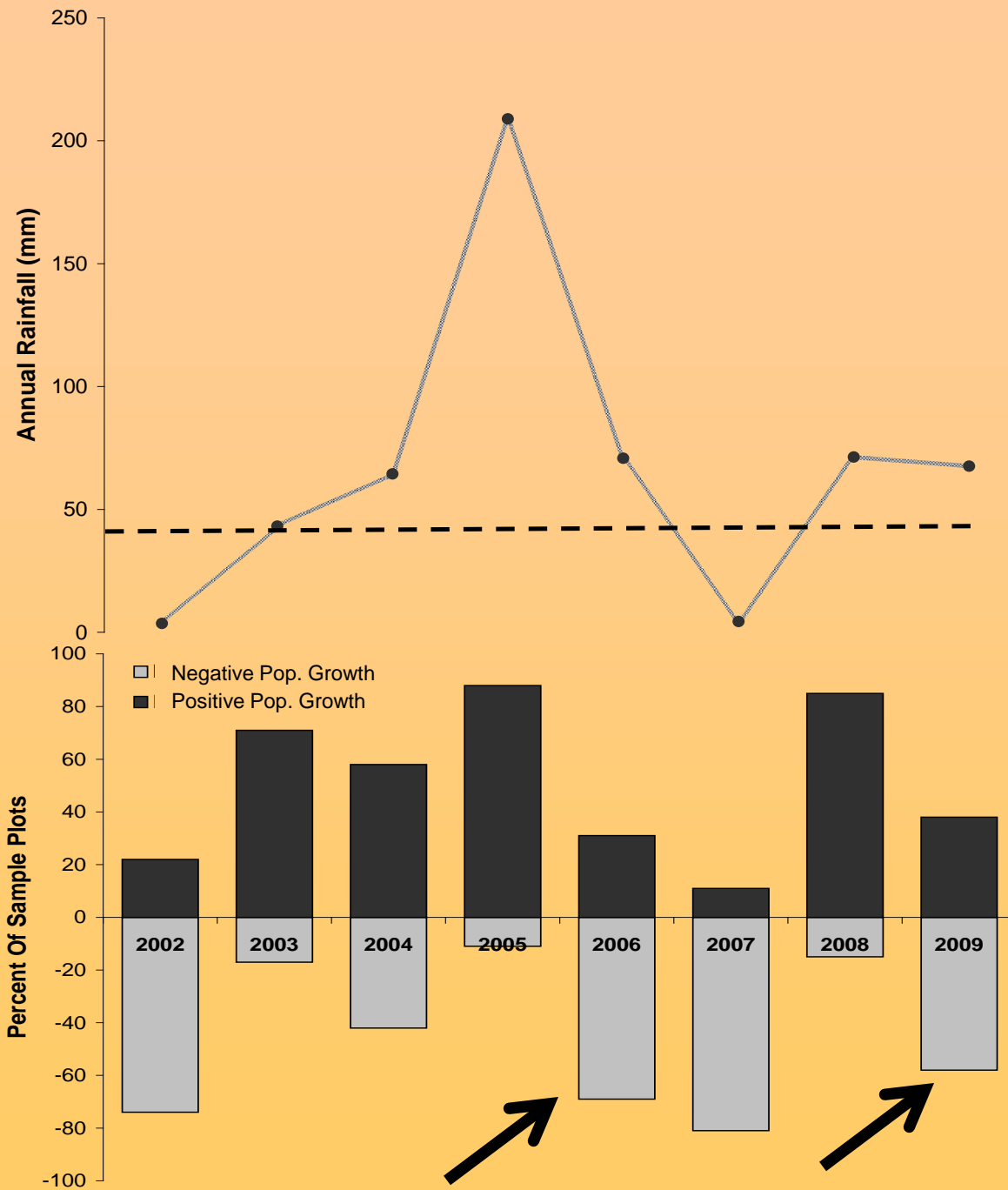
Dune primrose
Oenothera deltoides



Coachella Valley milkvetch
Astragalus lentiginosus var *coachellae*
State and Federal Endangered





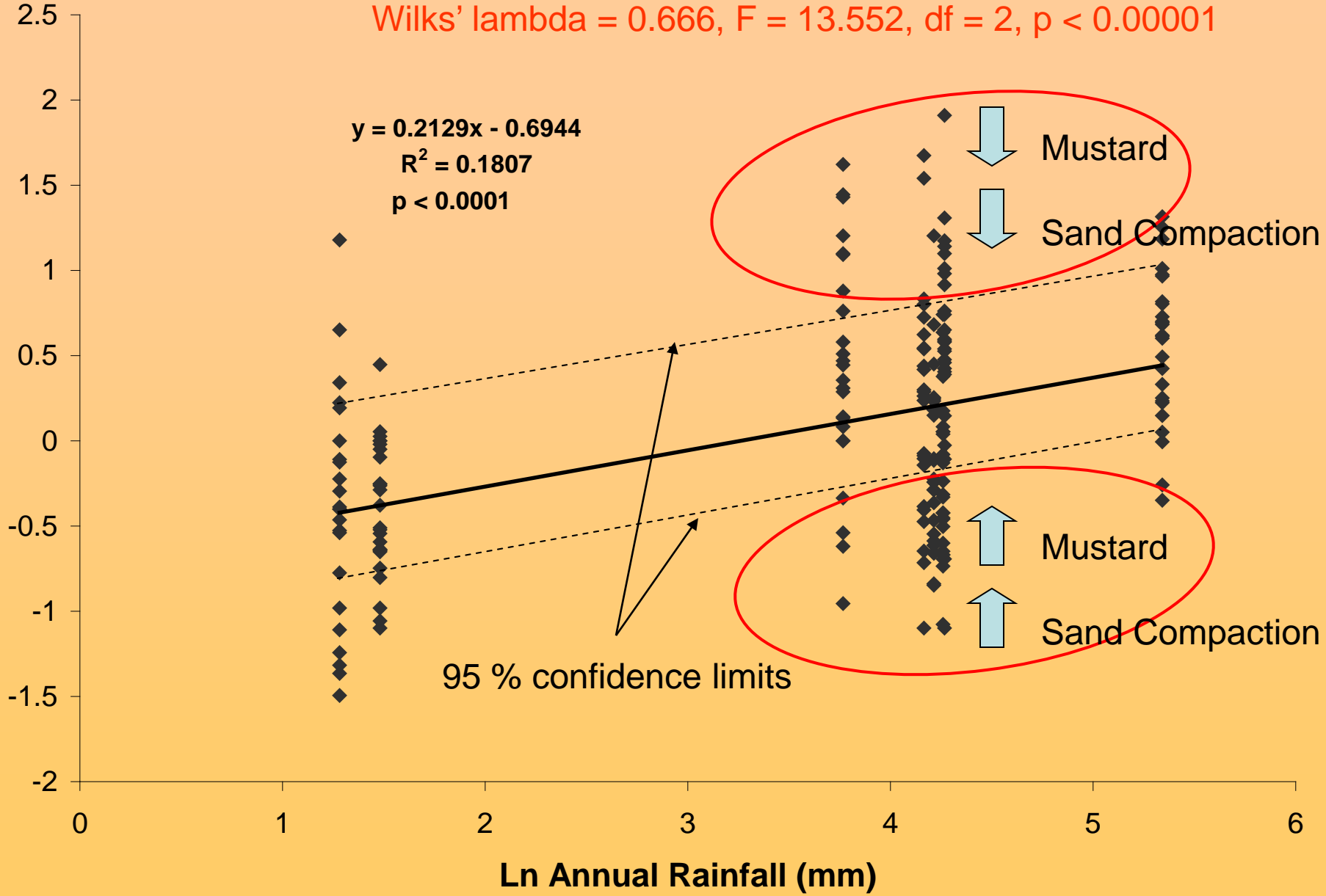


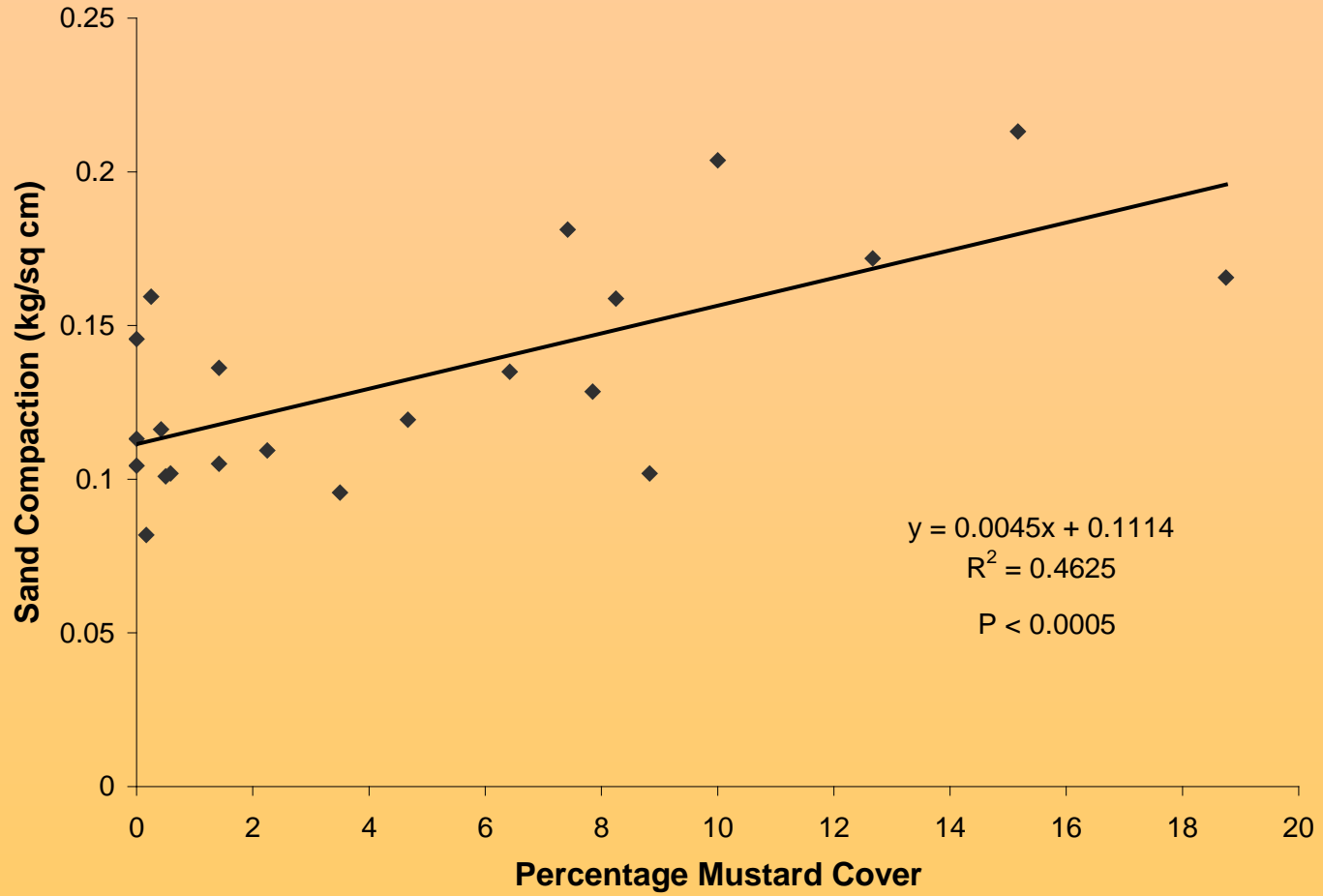
Ln (Pop. yr2 / Pop. yr1)

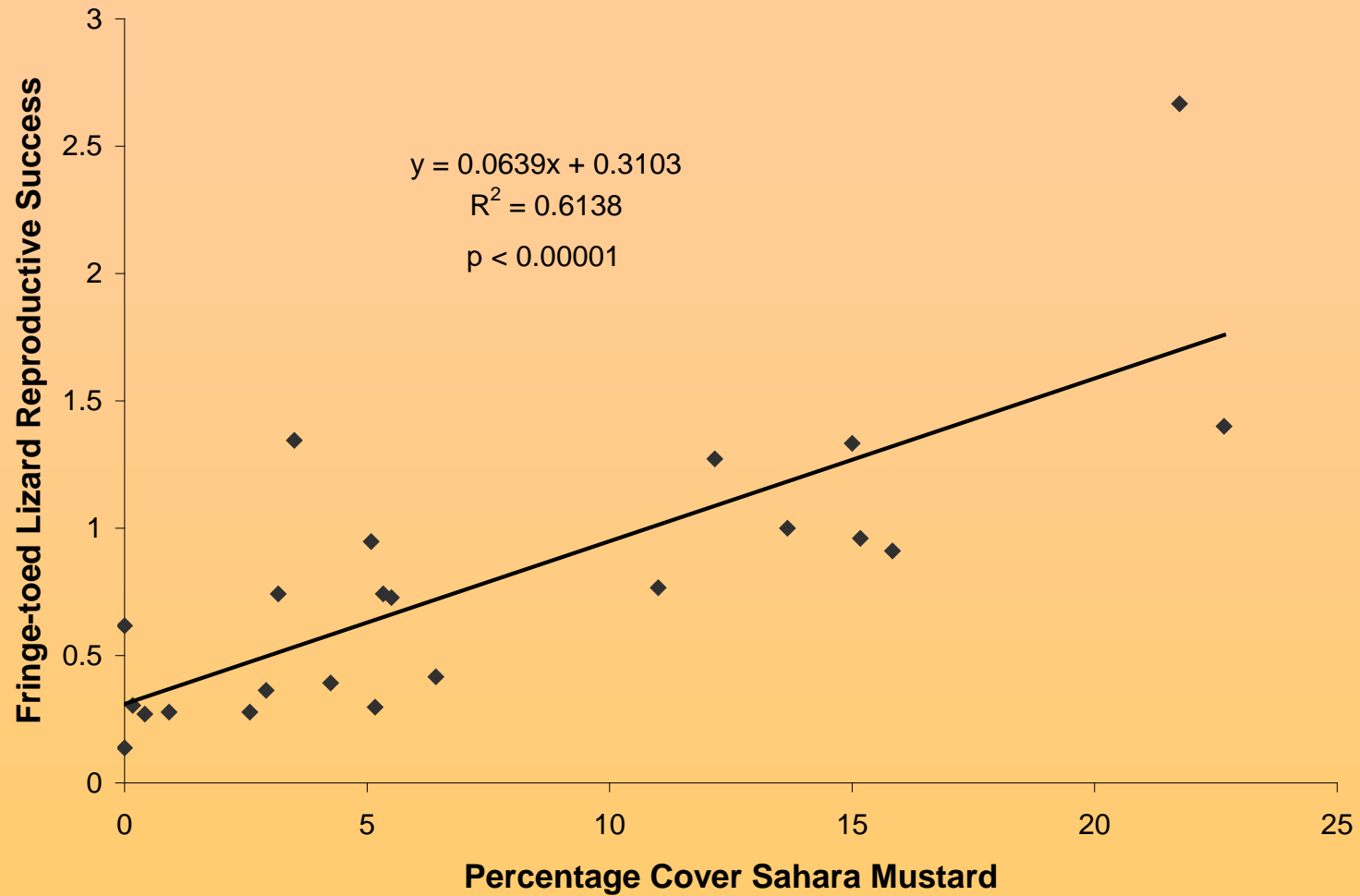
Wilks' lambda = 0.666, F = 13.552, df = 2, p < 0.00001

Population Growth Rate

$y = 0.2129x - 0.6944$
 $R^2 = 0.1807$
 $p < 0.0001$







Apparently lizard hatchlings may benefit from the cover the mustard provides, but either seek other, more open habitats as adults, or perish before maturing

There are complex affects of Sahara mustard on fringe-toed lizard populations, some positive (increased apparent reproduction), some indirect (an increase in sand compaction and dune stabilization), with a negative influence on the lizards' population growth.

It is clear that with increasing mustard abundance on active dunes, fringe-toed lizards, Coachella Valley milkvetch, and overall biodiversity will decline.

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Reduced habitat suitability for dune endemics



Bagrada hilaris

- locust plague-like numbers where the mustard occurs, otherwise less common
- eats everything
- are food for fringe-toed lizards, as well as other lizards species





Sahara Mustard

Native Annuals



October

November

December

January

February

March



There may be a window of opportunity for treatment with short-lived herbicides while minimizing effects on annuals

Or.. Biological controls?

Targeting control efforts on habitats with high levels of endemism, like sand dunes, should be the immediate focus.

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- **the California Department of Fish and Game.**

