

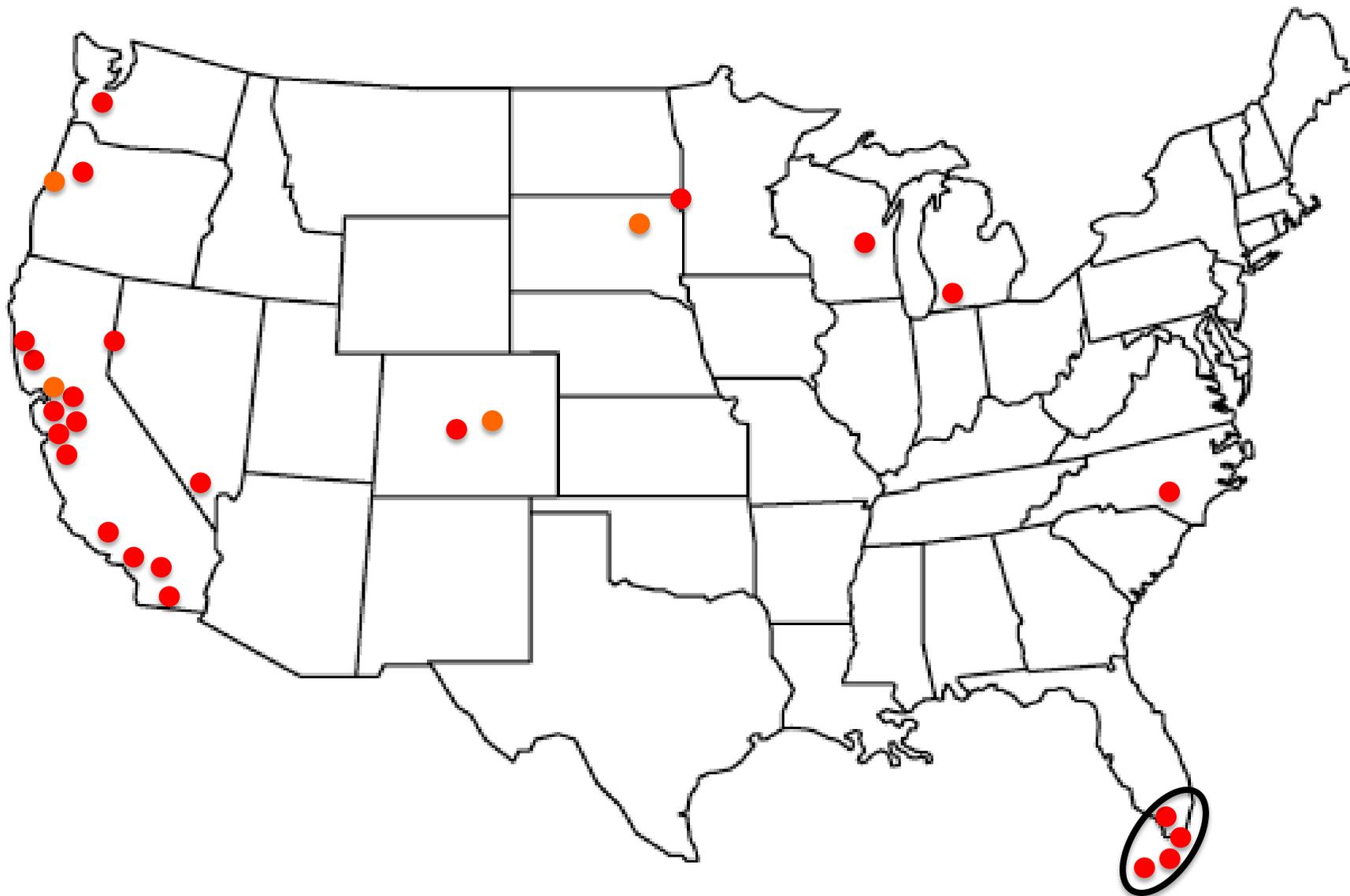


Miami blue



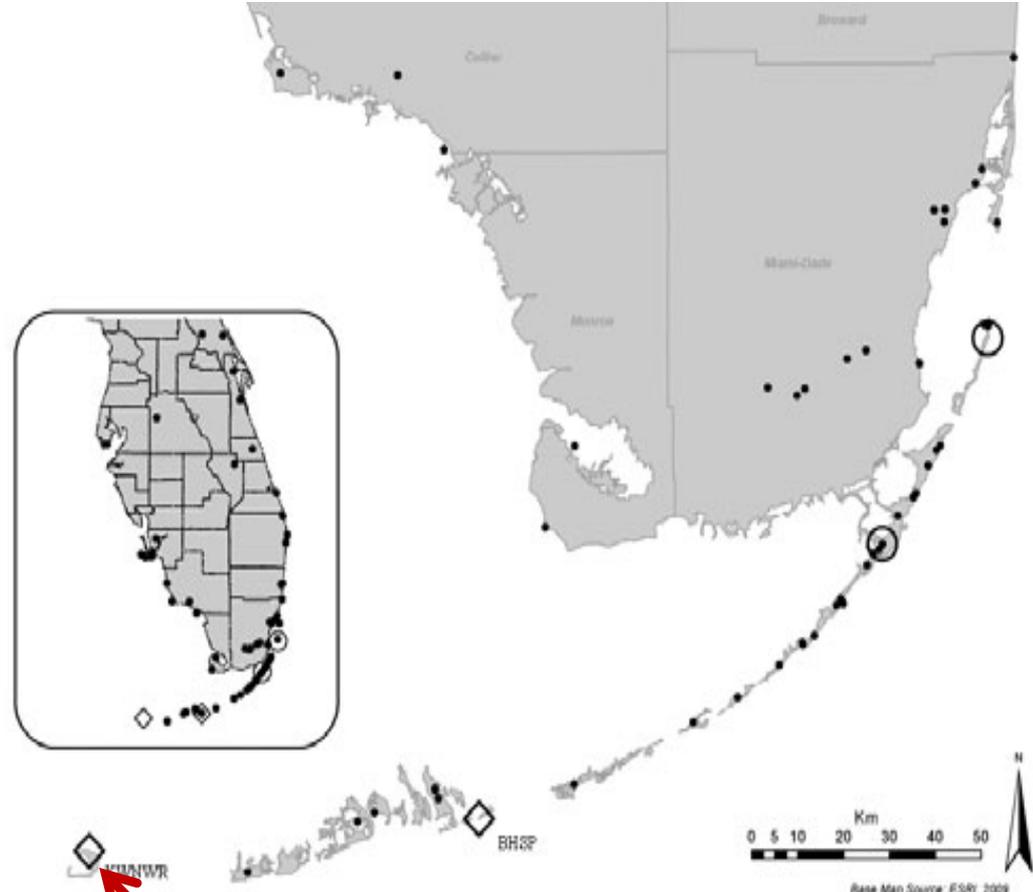
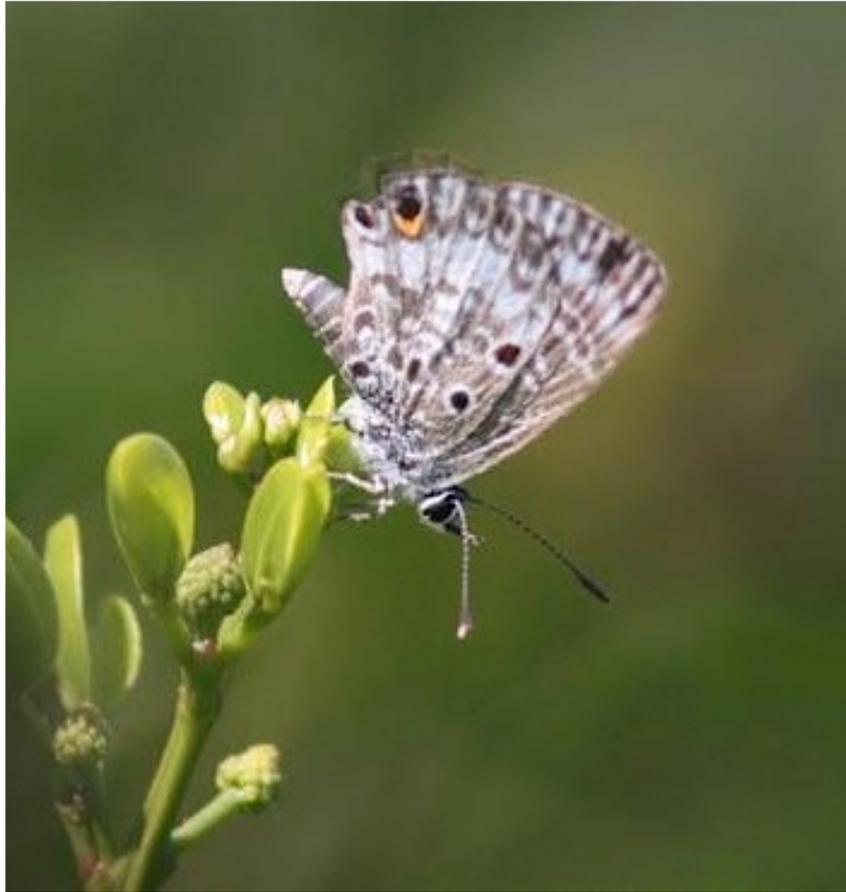
Bartram's scrub-hairstreak

# ESA listed butterflies



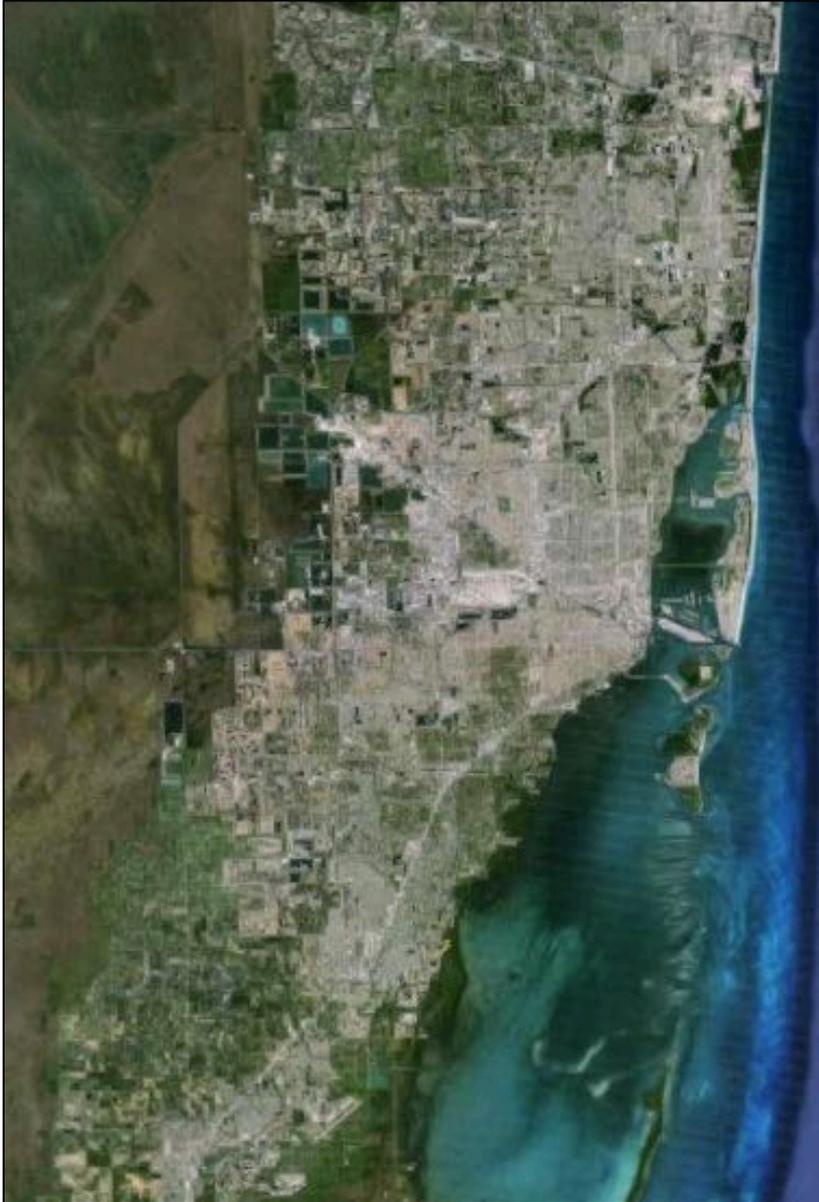


# Miami blue butterfly (*Cyclargus thomasi bethunebakeri*)

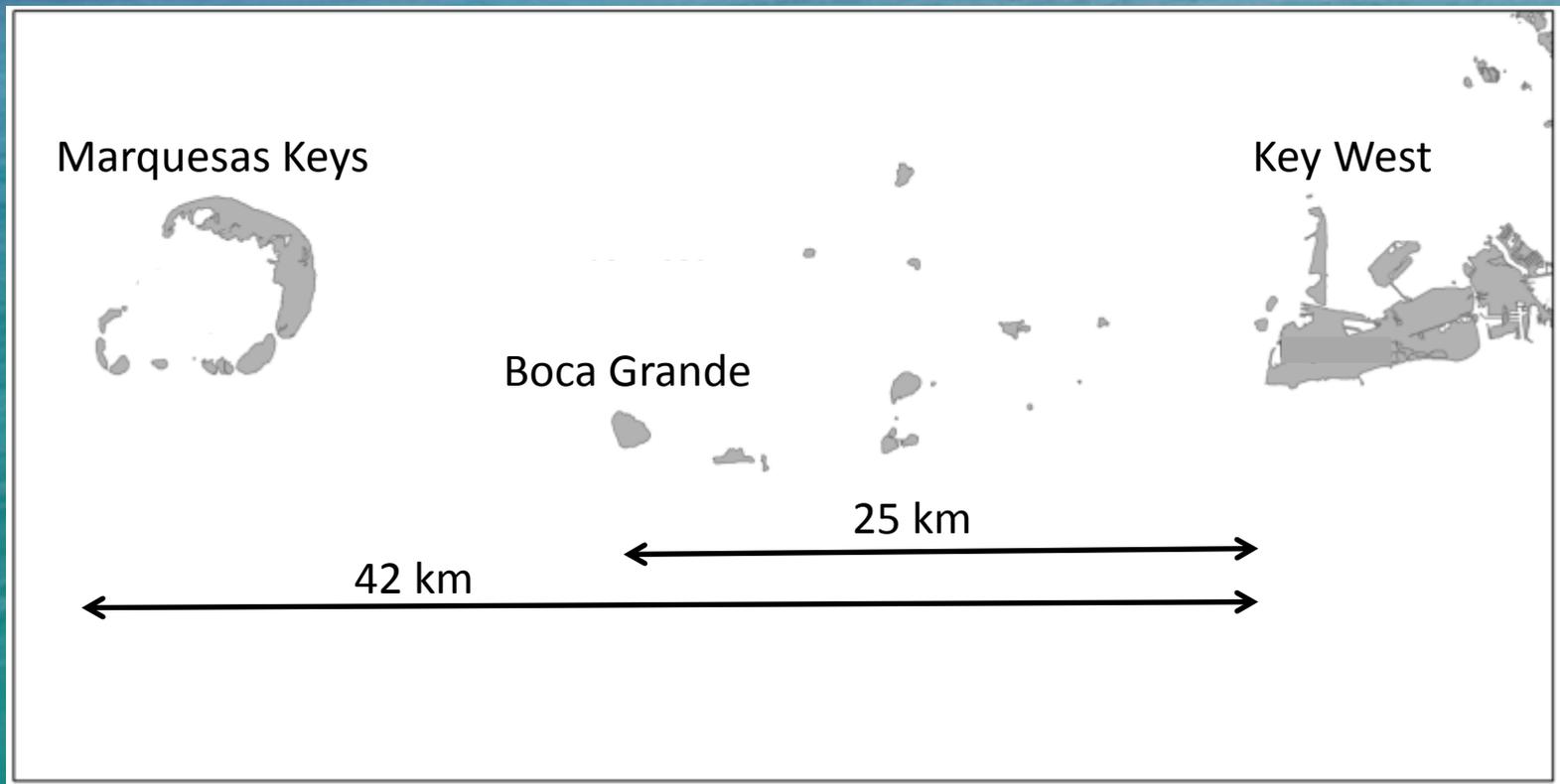


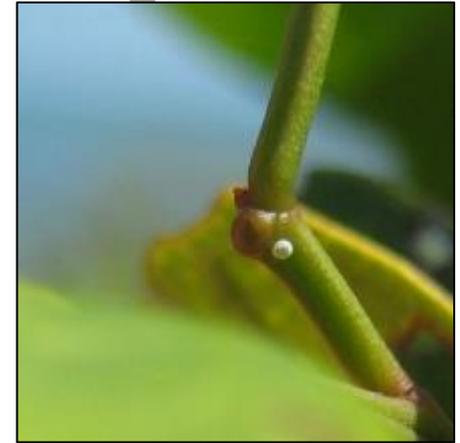
Last remaining  
population

# Habitat Loss



# Miami blues occupy remote, low-lying islands





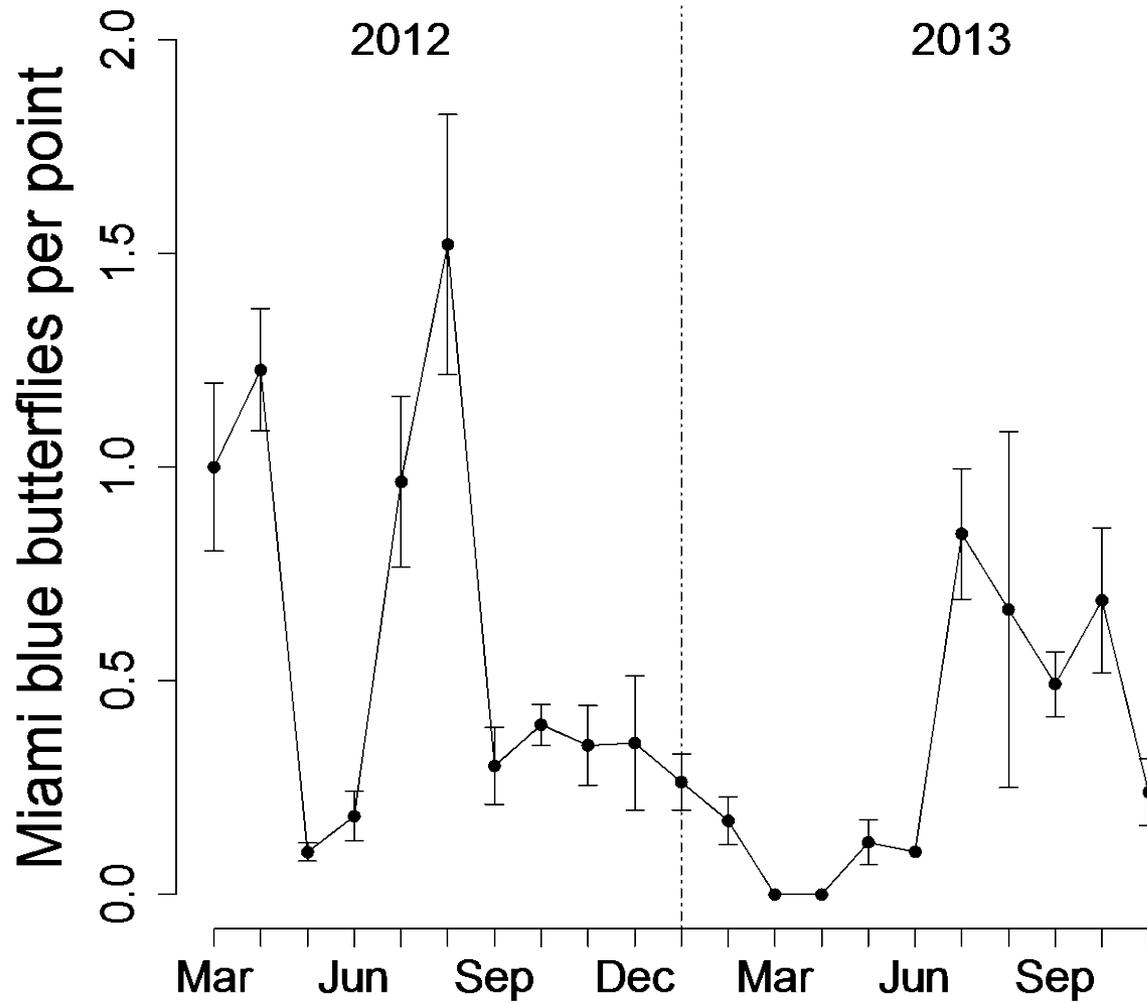
Life cycle depends  
on host plant



# Temperate butterflies

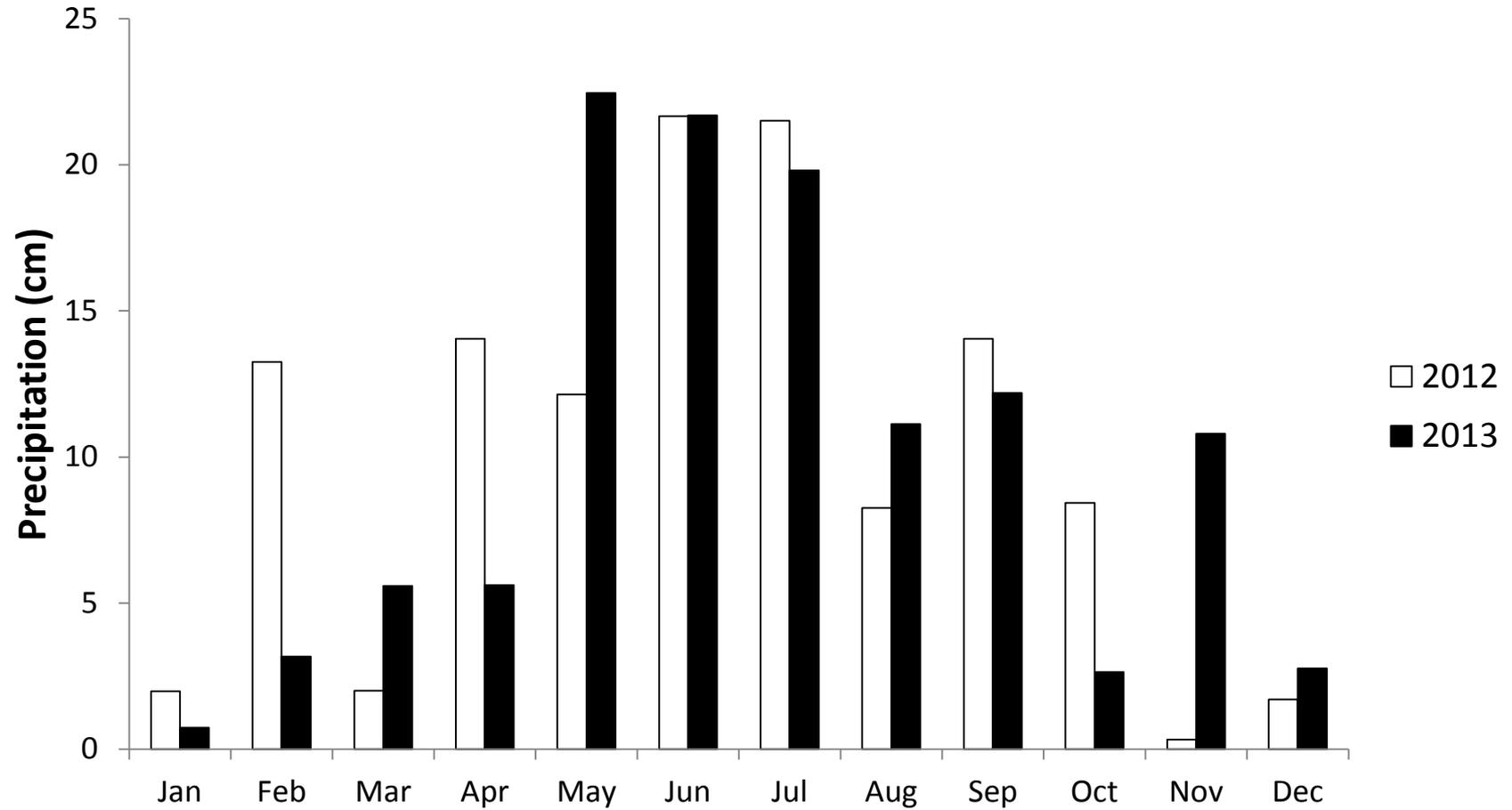


# High year-to-year variability

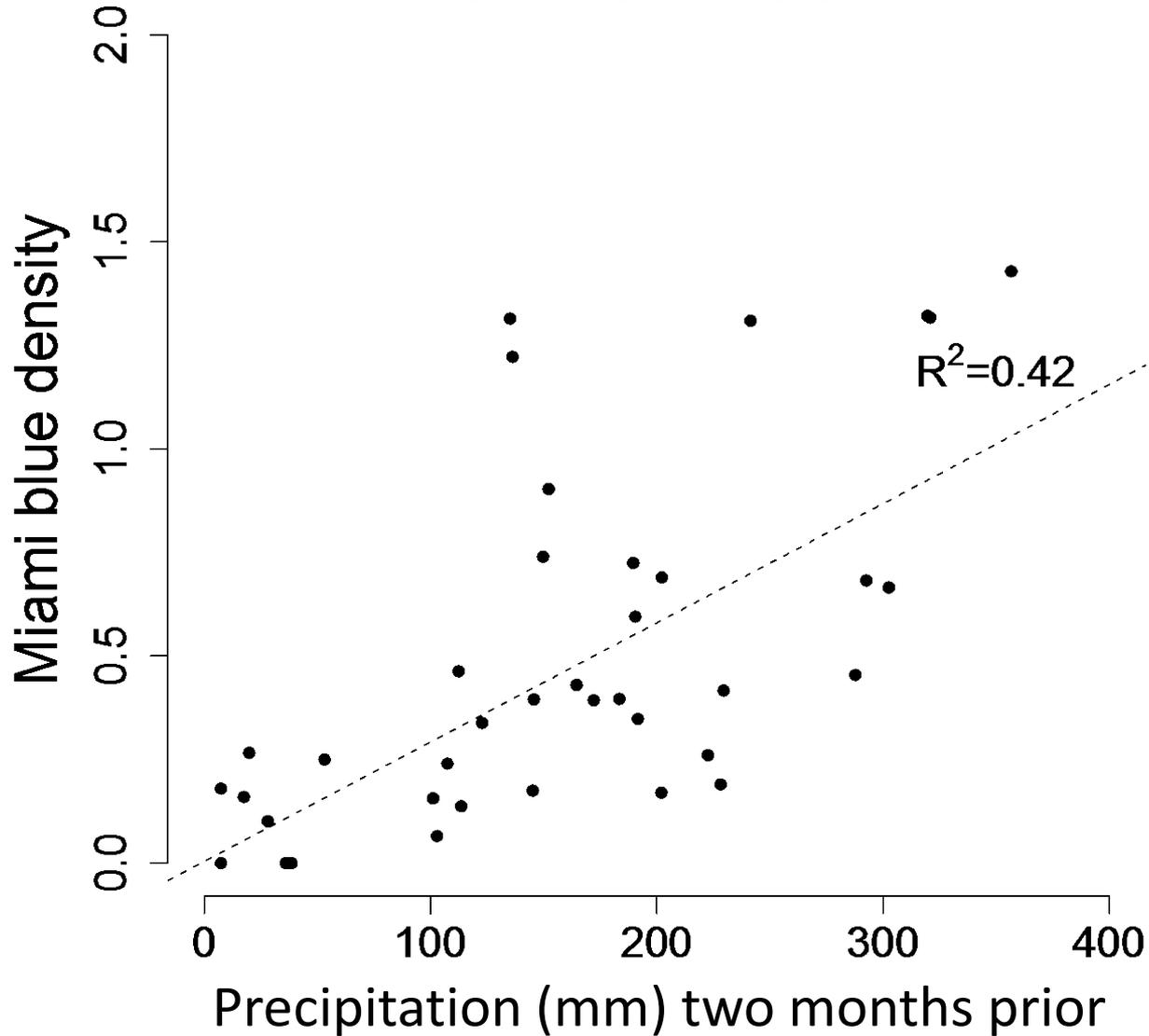




# Precipitation patterns are highly variable



# Previous precipitation drives butterfly abundances



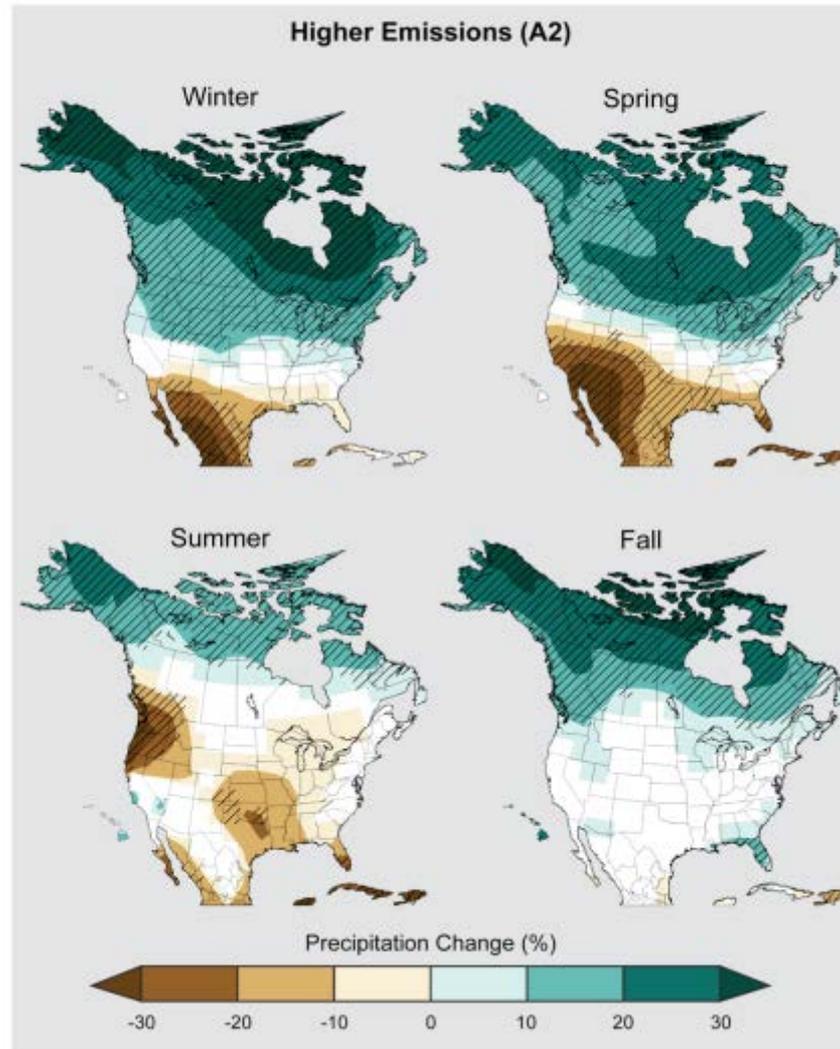


Drought-induced  
pause?



# Threat of future droughts?

Projected Precipitation Change by Season



# Analysis of future population dynamics

- How do changes in precipitation affect Miami blue populations?
- What is the most immediate threat, sea level rise or drought?



# Analysis of future population dynamics

- How do changes in precipitation affect Miami blue populations?
- What is the most immediate threat, sea level rise or drought?

Regardless, minimizing additional threats is crucial to population persistence

Bartram's scrub-hairstreak  
(*Strymon acis bartrami*)  
habitat restoration



Photo: Chad Anderson



## Loss of Rockland Habitat in Dade County

1996: 8,140 hectares

1900: 74,000 hectares



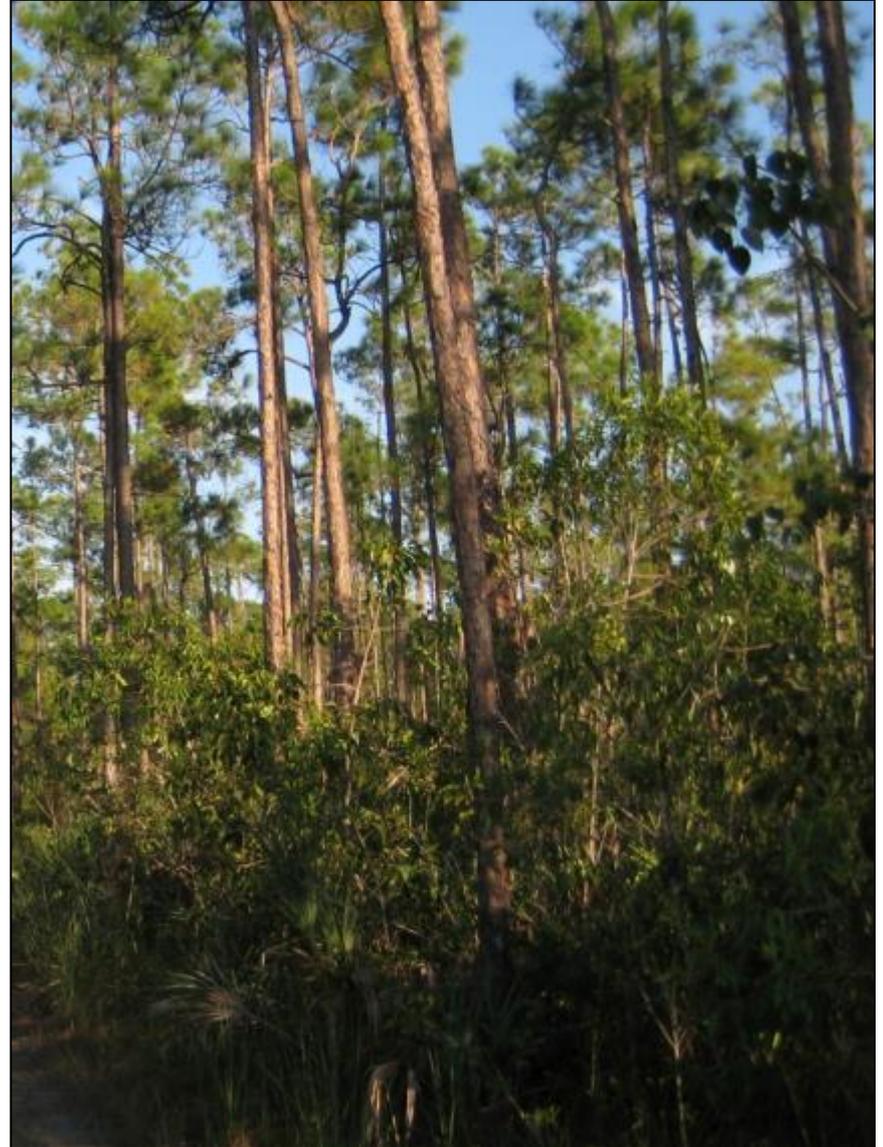
— Dade County  
— Rockland habitat

FAIRCHILD  
TROPICAL  
GARDEN

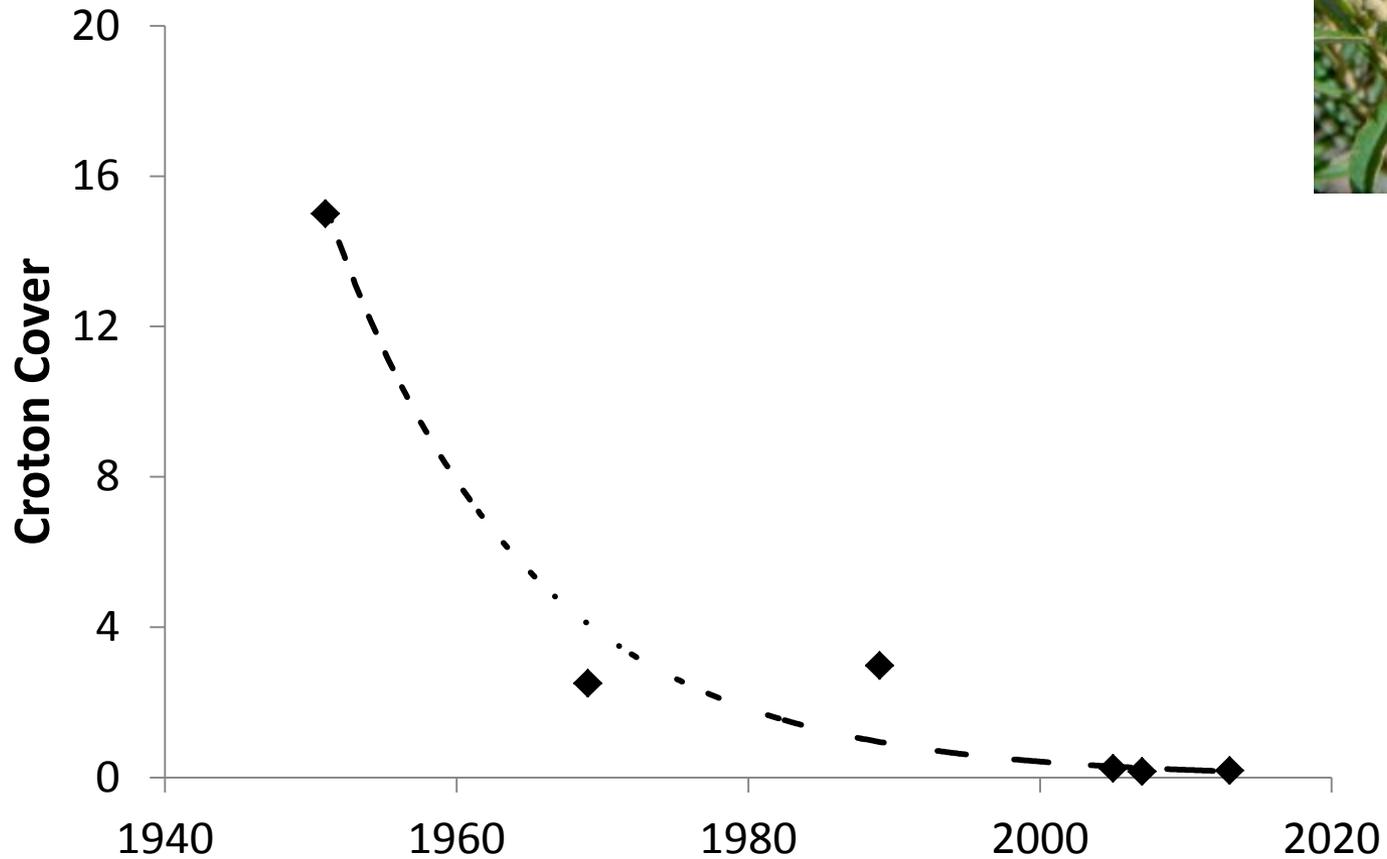
data and map prepared by Christopher Kremen



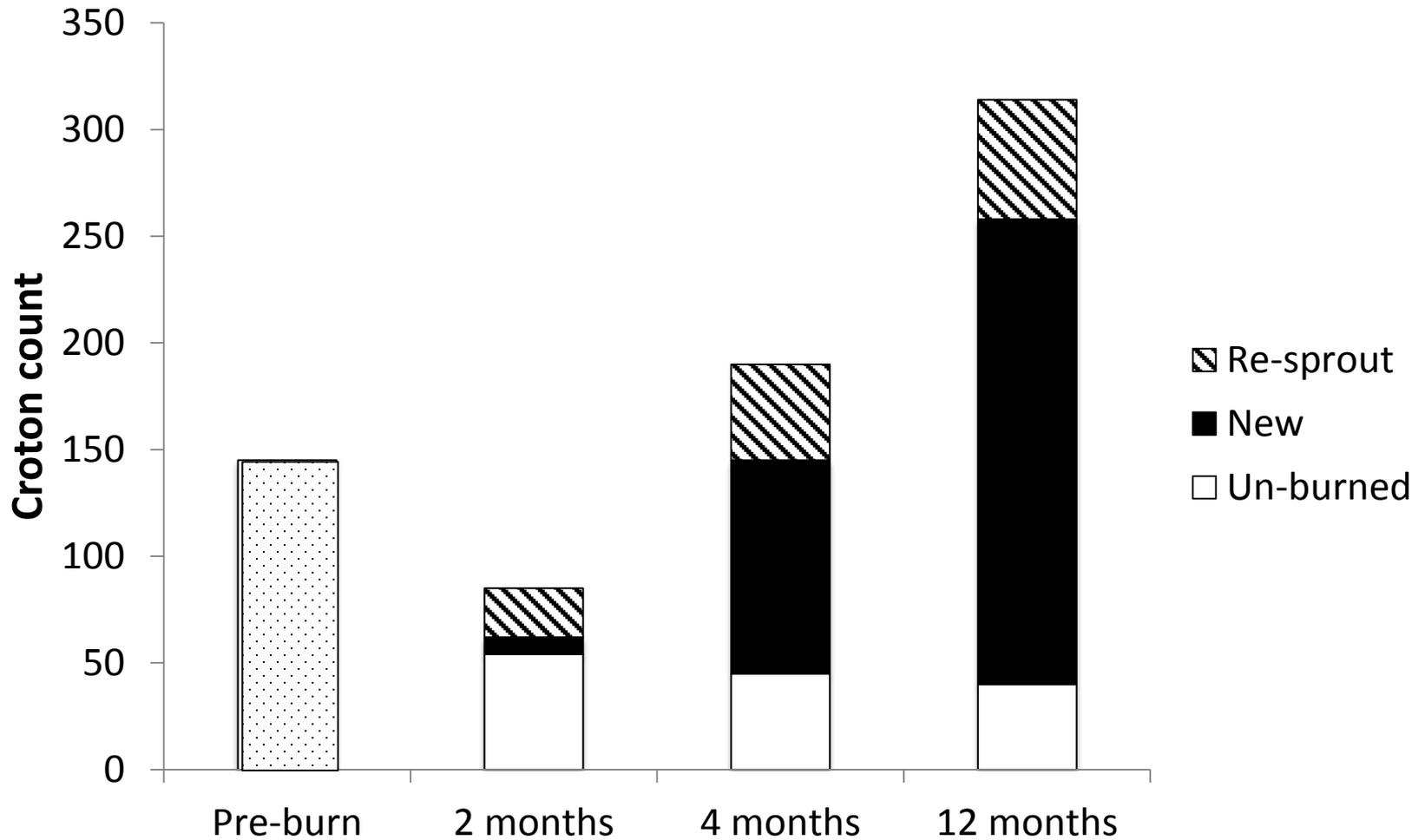
# Habitat Degradation

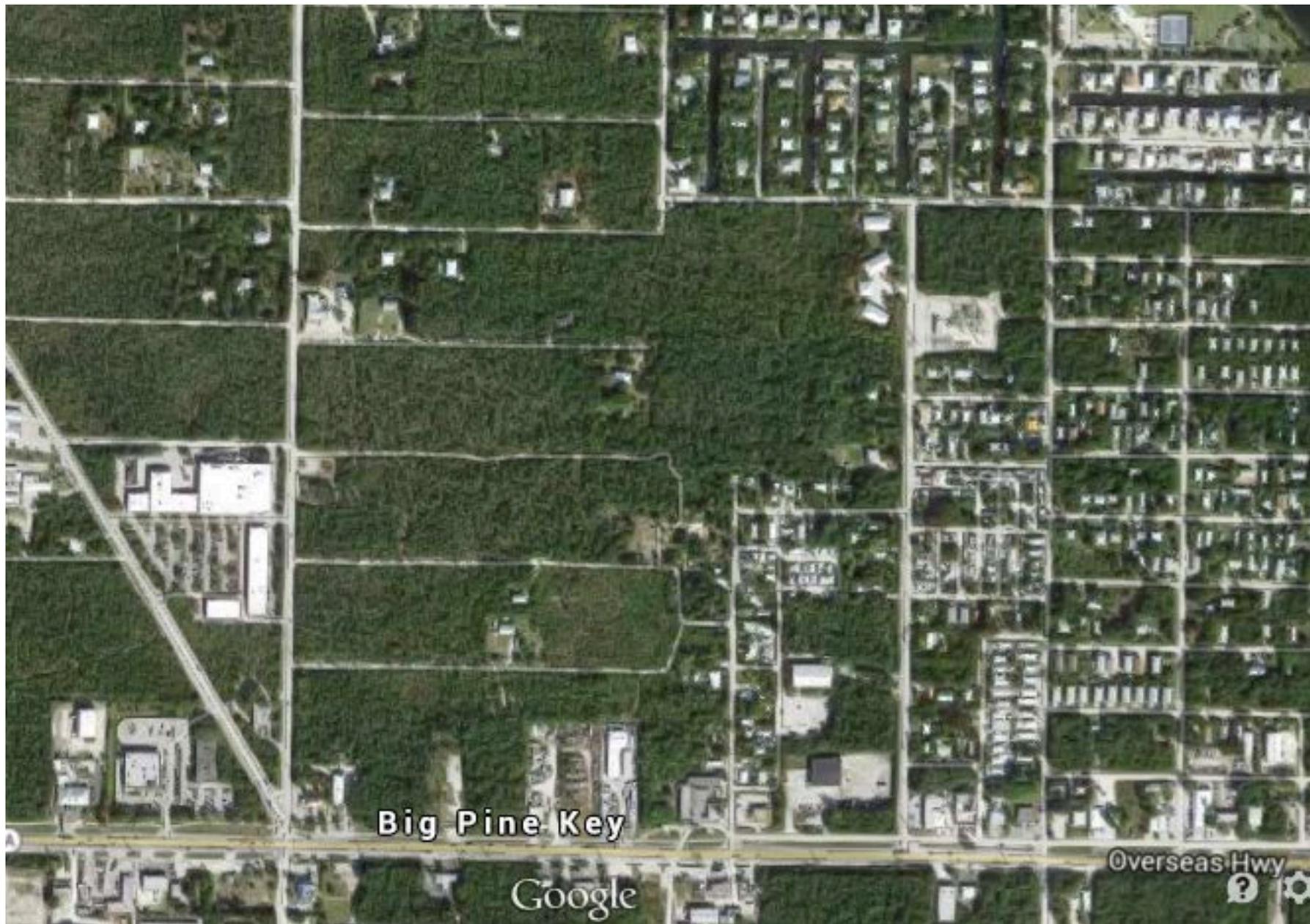


# Less disturbance = less croton



# Croton likes fire!





Big Pine Key

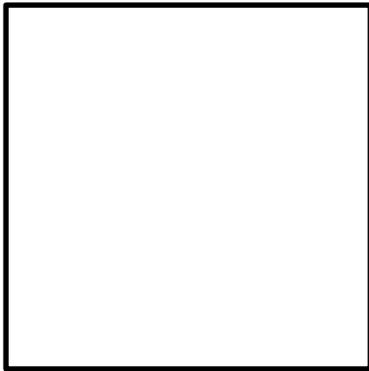
Google

Overseas Hwy



# Experimental restoration

Control



Mechanical



Fire



Mechanical + Fire



# Experimental restoration



# How does disturbance affect croton populations?

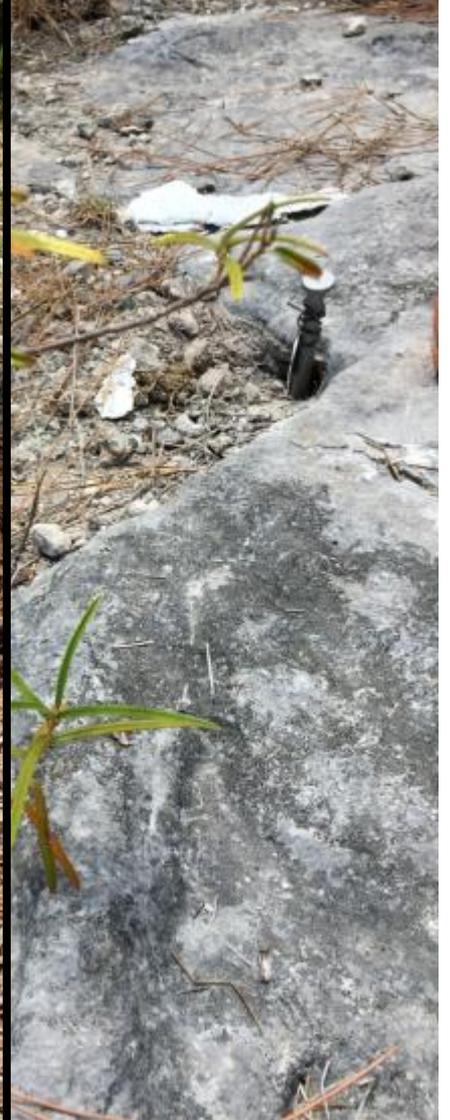


# How does disturbance affect croton populations?



How doe

croton



# How does disturbance treatment affect predator abundance and behavior?

- Ants



- Anoles



# LOTS of butterflies NEED disturbance



Large blue and grazing



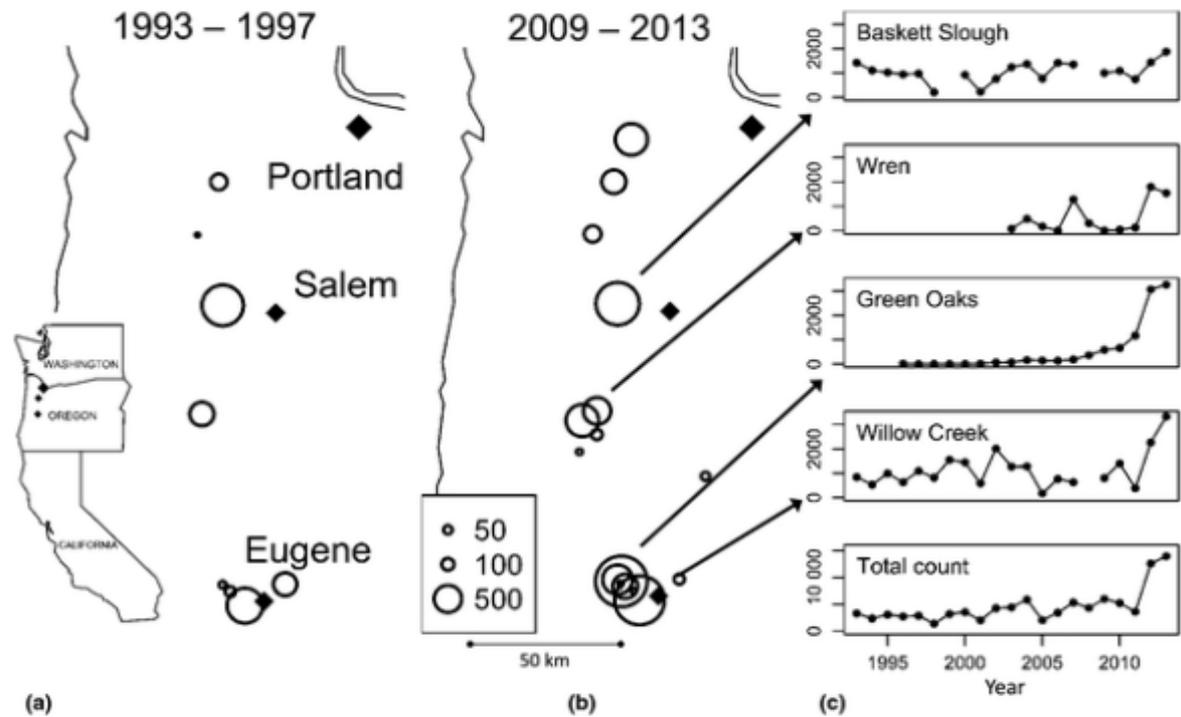
Fender's blue and fire



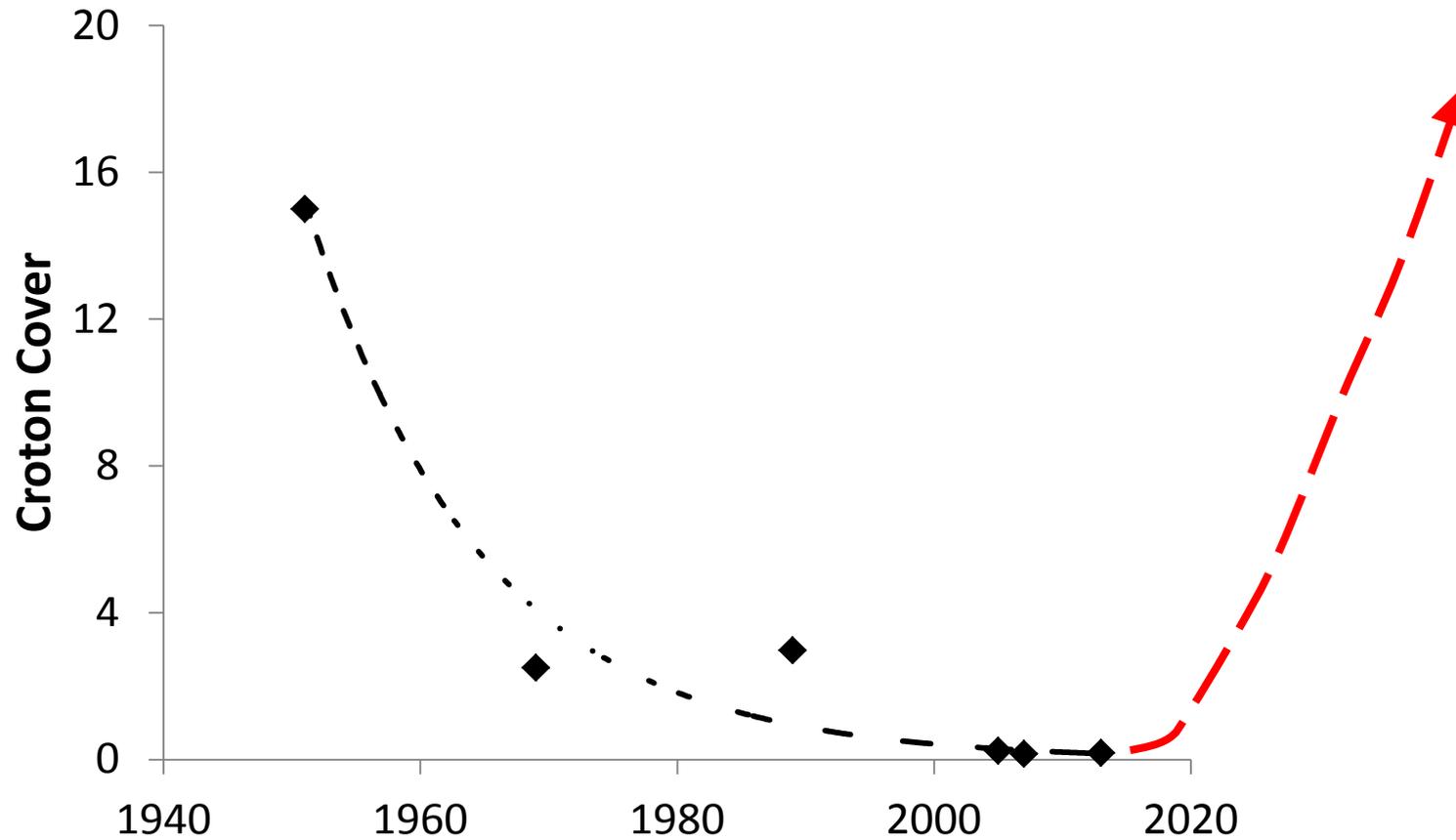
St. Francis' satyr and beavers



# Fender's blue and fire

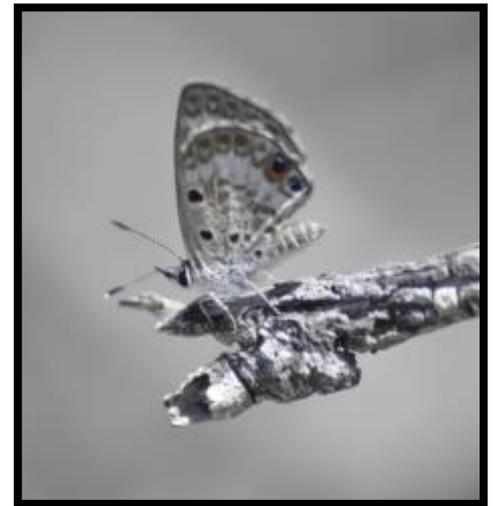


# Bartram's and fire and/or mechanical??



# Thanks!

- Nick Haddad – NC State
- Bill Morris – Duke
- Jaret Daniels – U. of Florida
- US Fish and Wildlife Service
  - Chad Anderson, Kate Watts, Chris Eggleston, Nancy Finley, Steve Nelms, and countless FL Keys Refuge Interns!



**NC STATE**  
UNIVERSITY

**UF** UNIVERSITY of  
**FLORIDA**



DEPARTMENT of the INTERIOR  
SE CLIMATE SCIENCE CENTER

