Pollinator Responses to Restoring Shrub Steppe Habitat for the Greater Sage-grouse

David S. Pilliod[1], Emily R. Sun [1], Ashley T. Rohde[1], and Anne Halford[2]

[1]USGS Forest and Rangeland Ecosystem Science Center
[2]Bureau of Land Management Idaho State Office
Boise, Idaho, USA

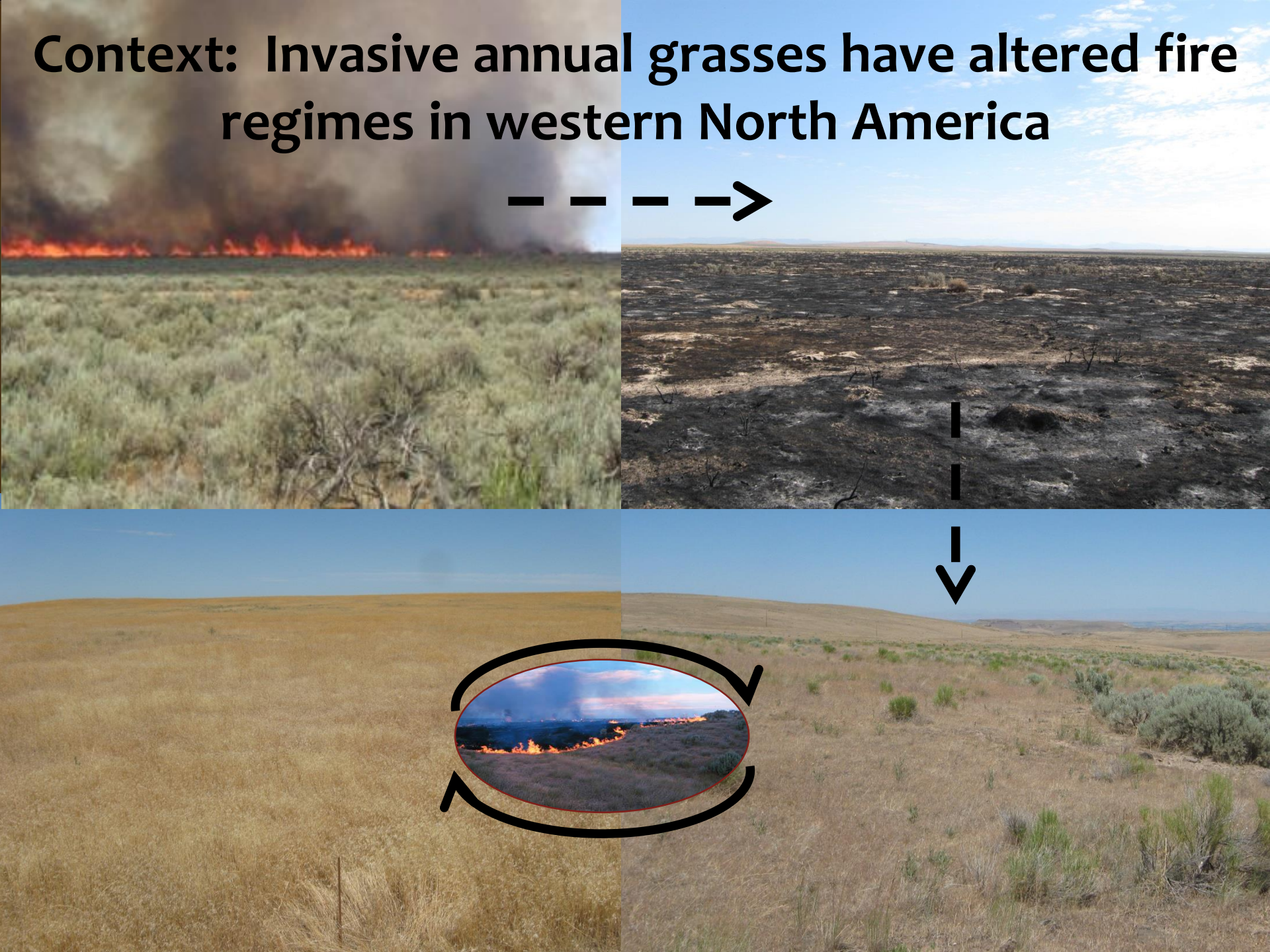
Symposium: Conceptualising and implementing ecological restoration projects with rewilding by faunal species as one of the key targeted outcomes

World Congress of the Society for Ecological Restoration
Cape Town, South Africa
26 September 2019

USGS

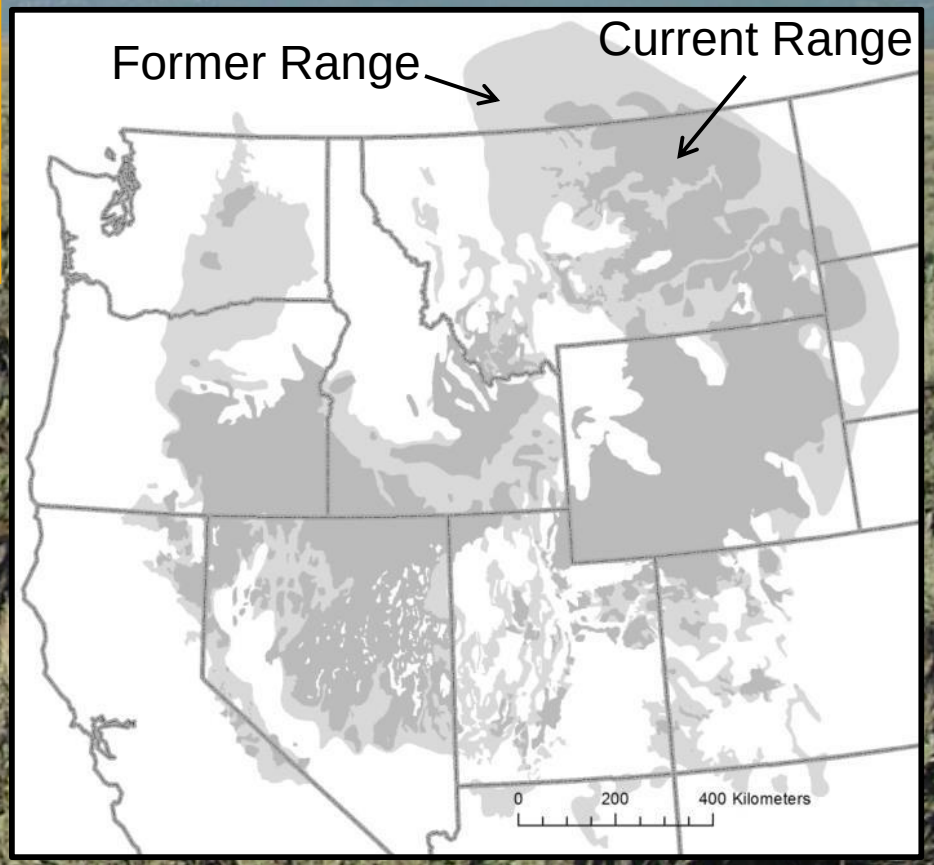
NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Context: Invasive annual grasses have altered fire regimes in western North America

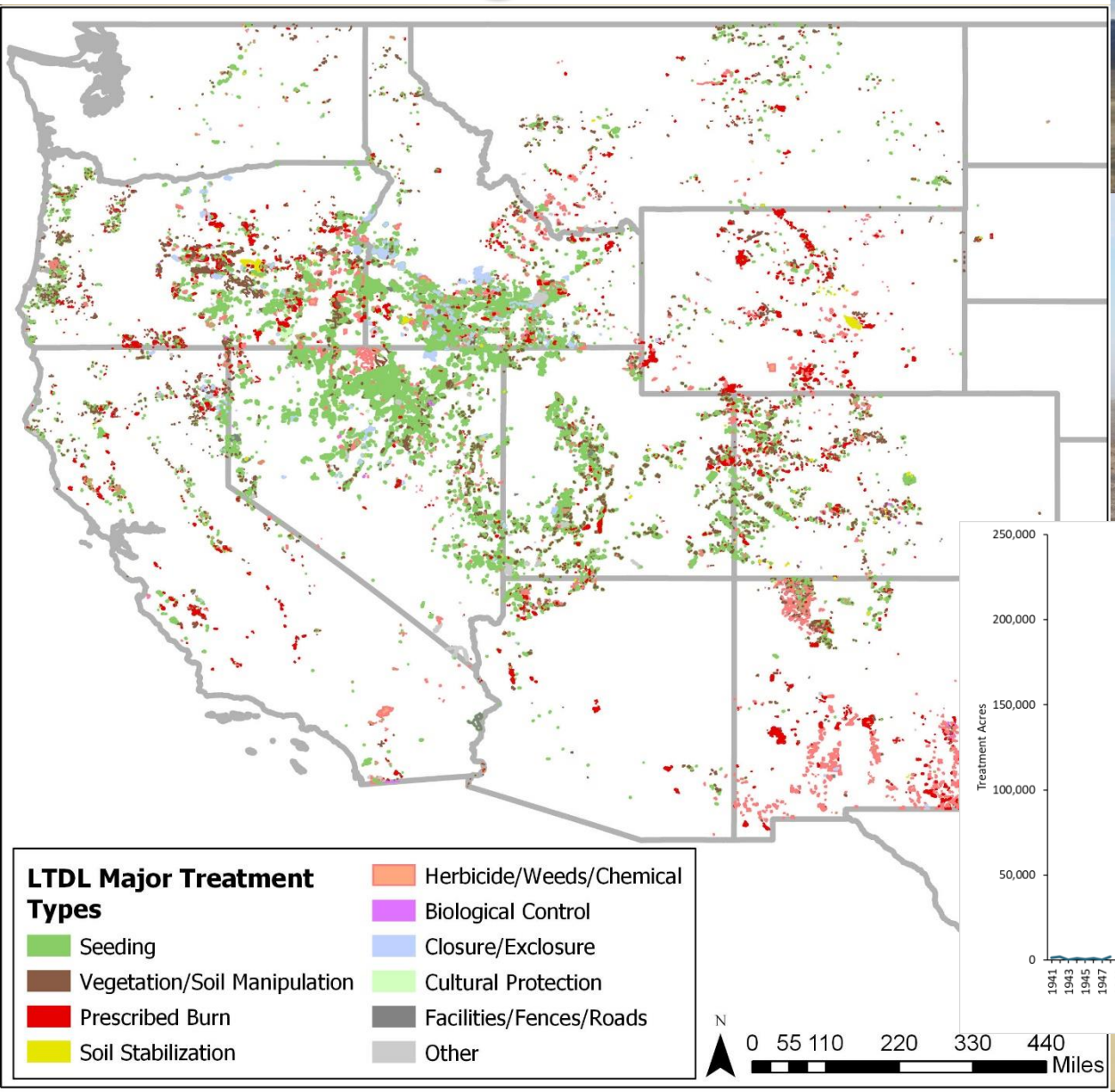


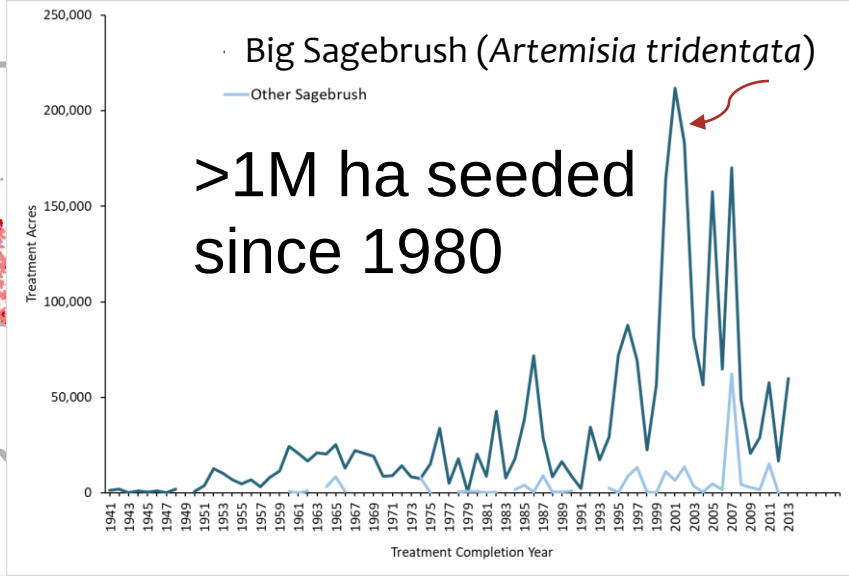
Flagship Species: The Greater Sage-grouse

- **Loss of ~45% of historic range**
- **Widespread population declines continue**



Solution: Save what is left and restore degraded habitat





Land Treatment Digital Library

Why Pollinators?

Animal pollination is needed for:

- ~75% of most important global food crops
- ~35% of global food production volumes

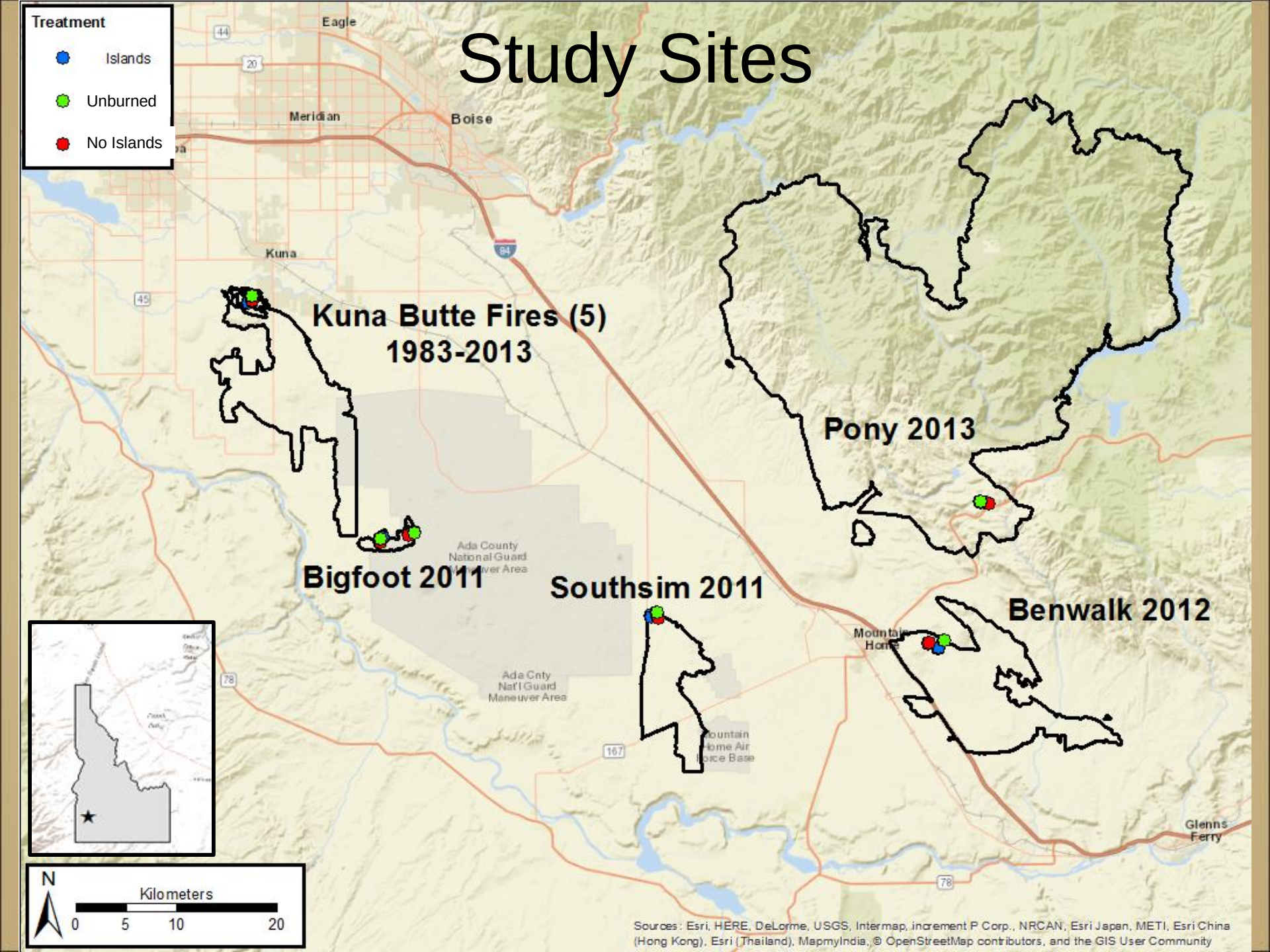
Bees are crucial pollinators

- Honey Bees only provide 14% of pollination
- Native pollinators need habitat & floral resources

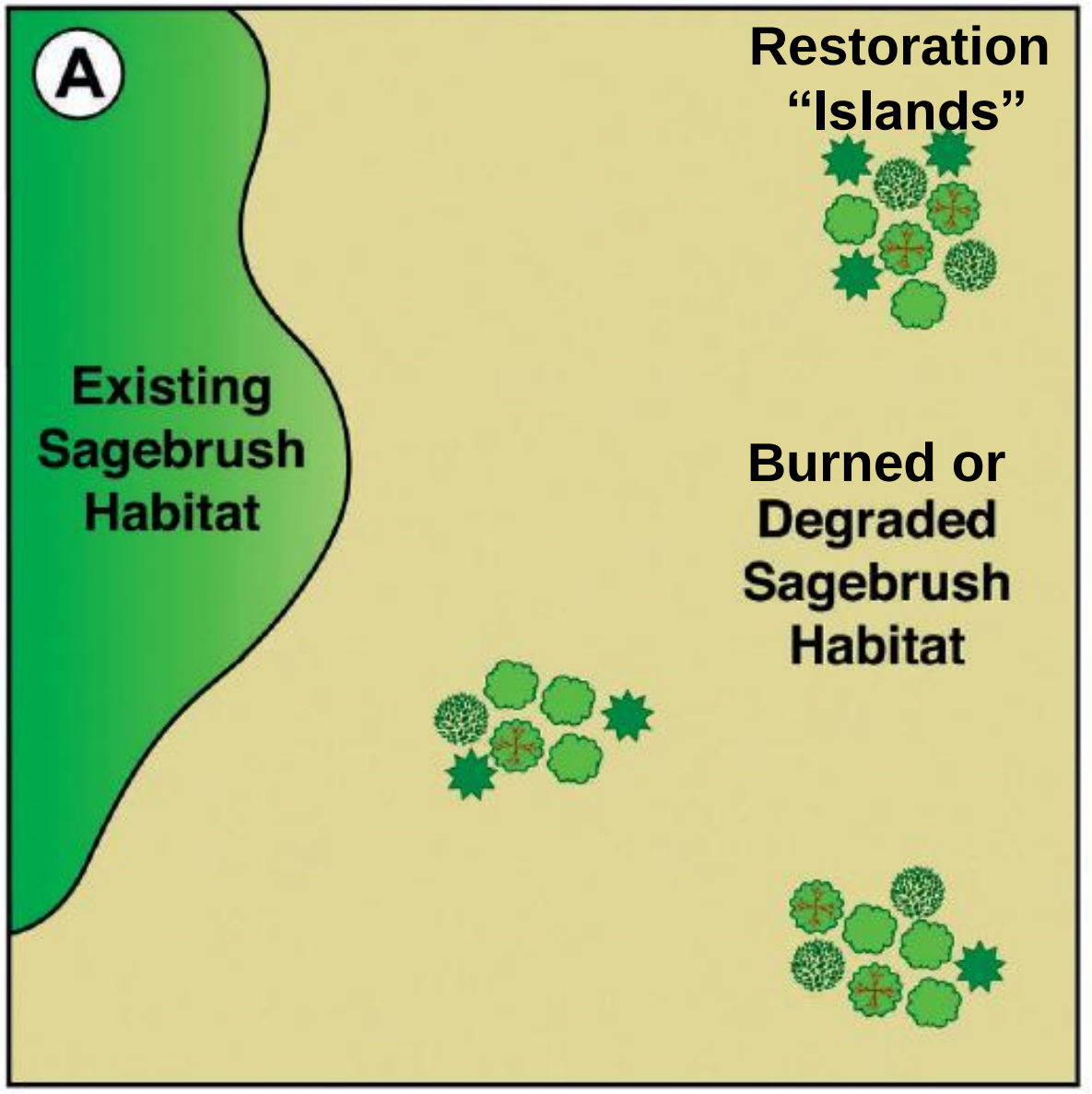
Apis mellifera

USGS

Source: Klein et al. (2007); Ollerton et al. (2011); Garibaldi et al. (2013)


Study Sites
Treatment
Islands
Unburned
No Islands
Eagle
Meridian
Boise
Kuna
Kuna Butte Fires (5)
1983-2013
Pony 2013
Bigfoot 2011
Southsim 2011
Benwalk 2012
Ada County
National Guard
Maneuver Area
Ada Cnty
Nat'l Guard
Maneuver Area
Mountain
Home Air
Force Base
Glenns
Ferry
N
Kilometers
0
5
10
20
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Restoration Islands



Dumroese et al. (2016)

USGS

Royal Penstomon
(*Penstemon speciosus*)

Hoary Tansyaster
(*Machaeranthera canescens*)

Douglas' Dustymaiden
(*Chaenactis douglasii*)

Blue Mountain Prarie Clover
(*Dalea ornata*)

Sulferflower Buckwheat
(*Eriogonum umbellatum*)

Shaggy Fleabane
(*Erigeron pumilus*)

Munro's Globemallow (*Sphaeralcea Munroana*)

Goals and Approach

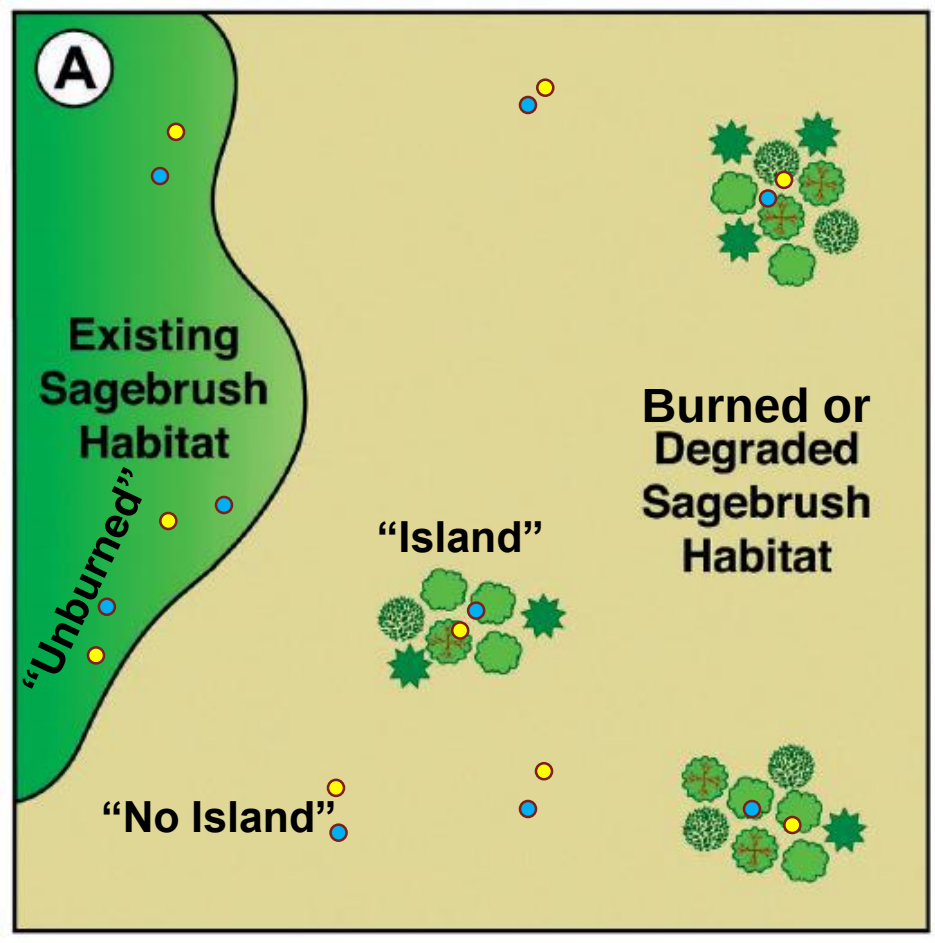
Goal - To assess bee visitation to “forb islands”

Approach – Capture flying bees in three treatment types:

1. Burned w/ Restoration **Islands** – forbs and shrubs planted in patches in a burned landscape
2. Burned w/ **No Islands** – burned areas not planted
3. **Unburned** – unburned reference areas

USGS

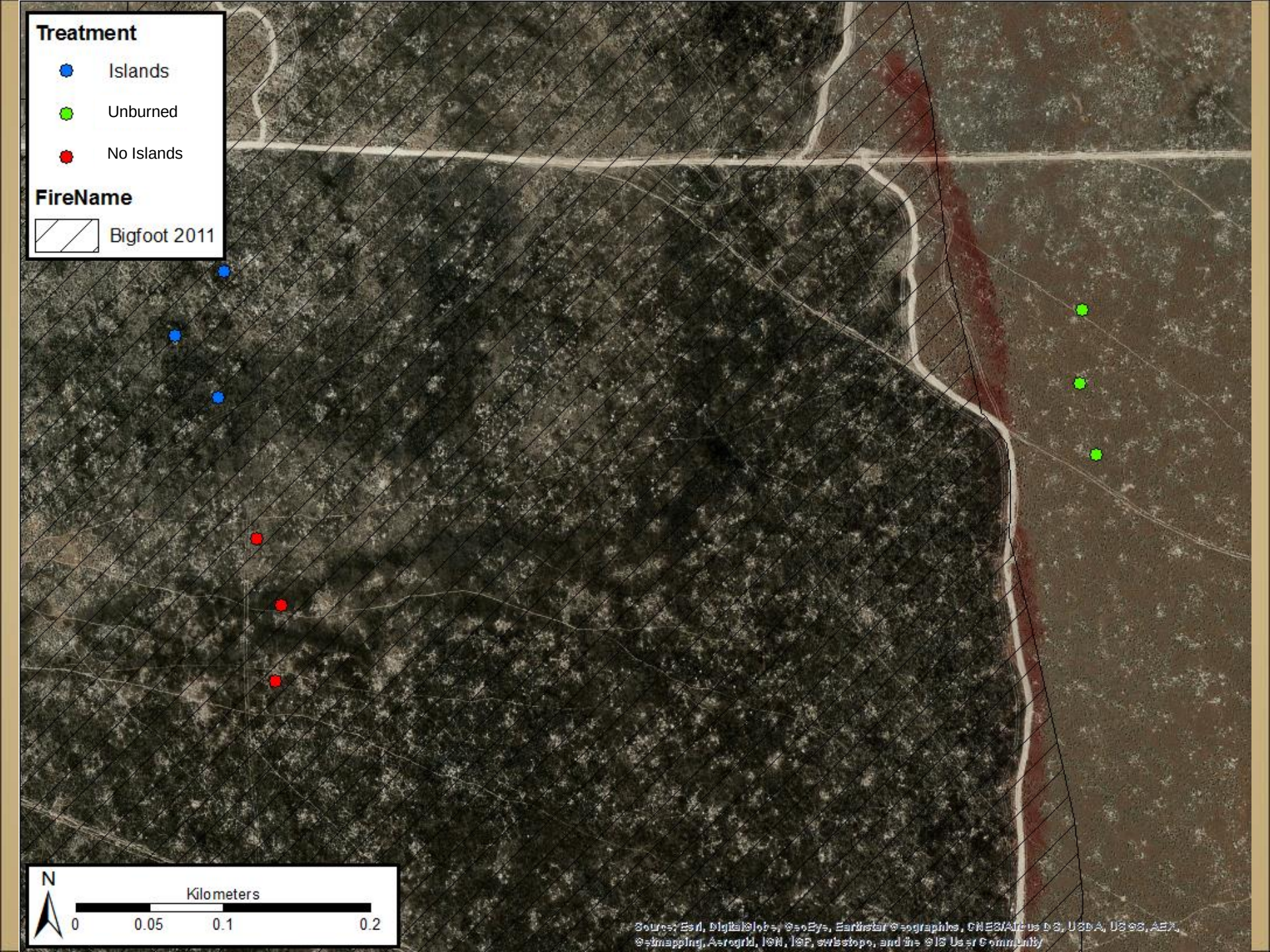
Experimental Design and Methods



Vein Traps

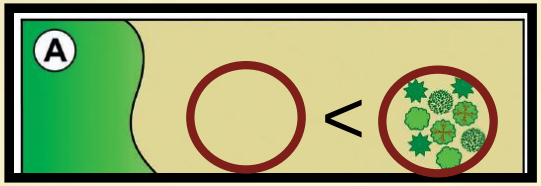
- 5 day deployment
- May - July
- 2x in 2014

USGS

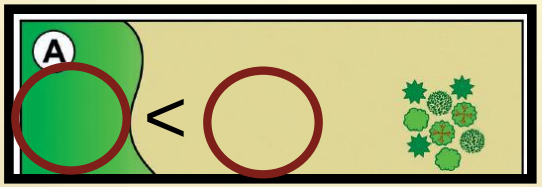

Treatment
Islands
Unburned
No Islands
FireName
Bigfoot 2011
N
Kilometers
0
0.05
0.1
0.2
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, GeoMapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Hypotheses

1. Restoration **Islands** have **higher** richness, diversity, and abundance compared with burned areas with **No Islands**



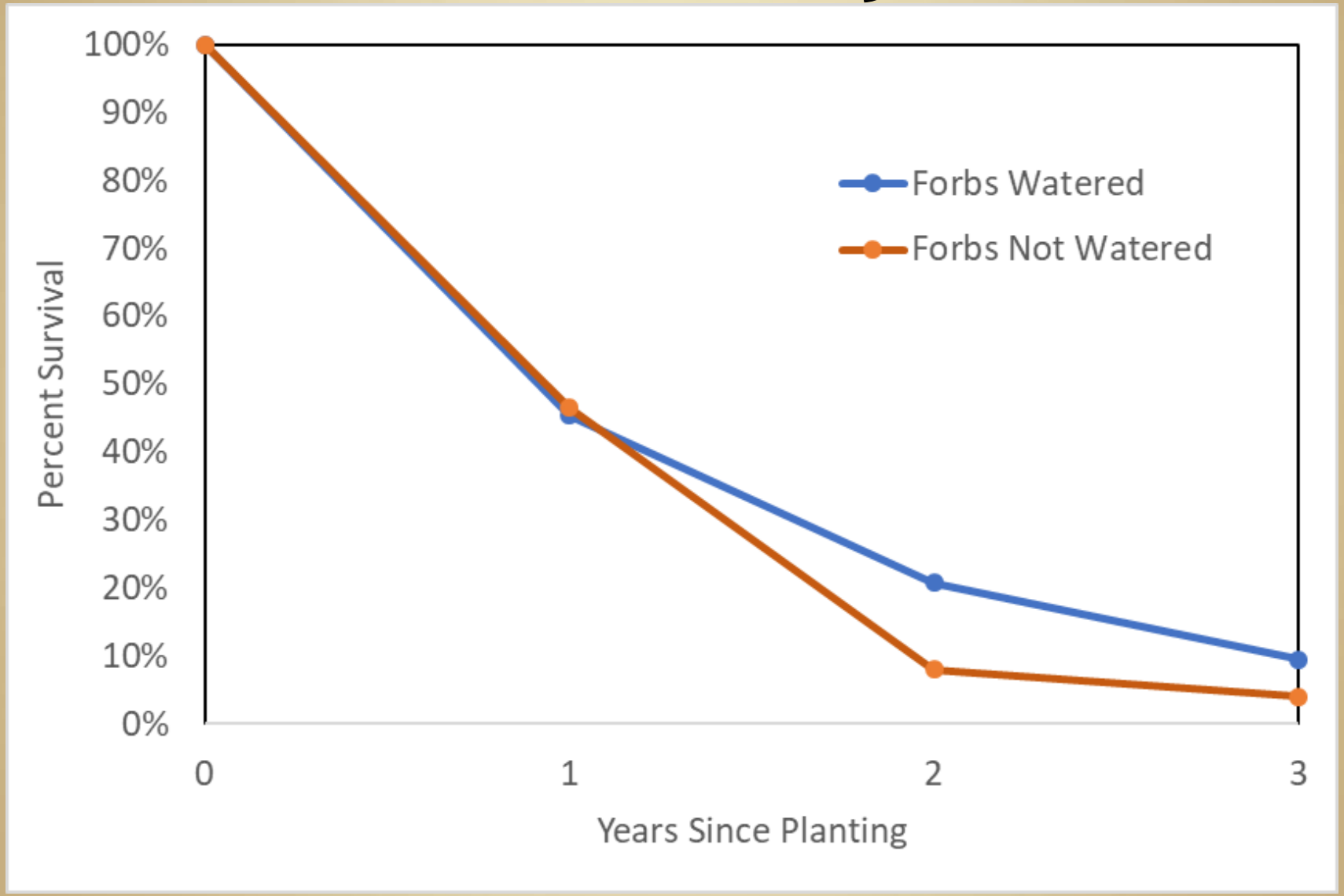
2. **Burned** areas have **higher** richness, diversity, and abundance compared with **Unburned** areas, but…



3. these relationships decrease with Time since Fire

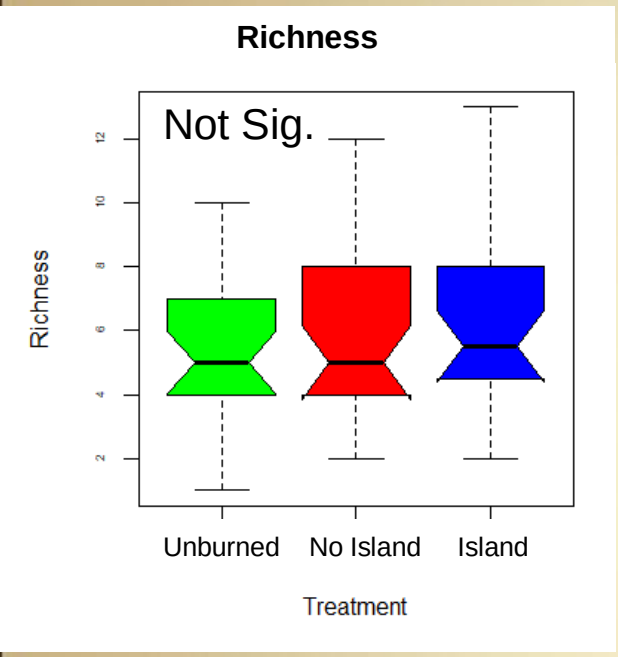
USGS

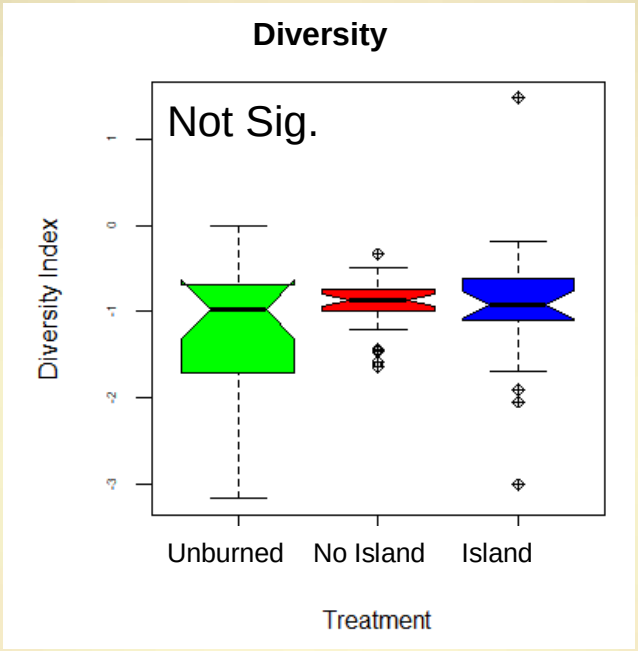
Forb survival decreased with time
Stabilized around 5-10%

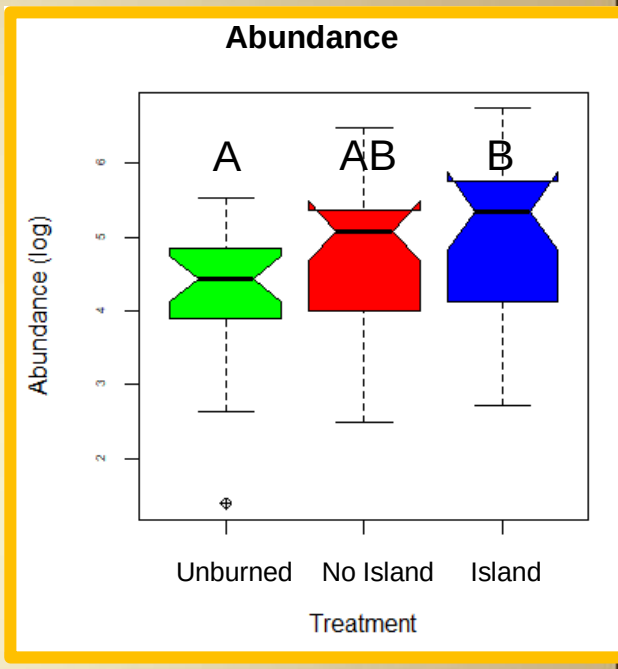


USGS

H1: Restoration Islands did not have higher abundance of bees than burn areas with No Islands



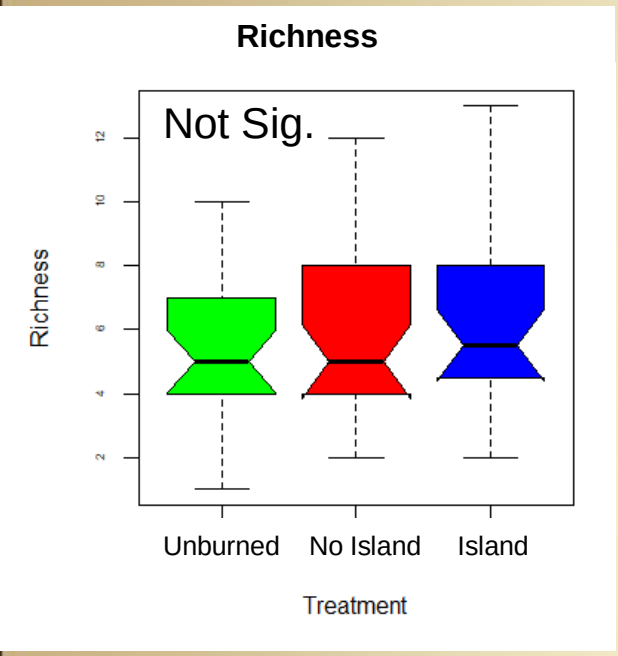


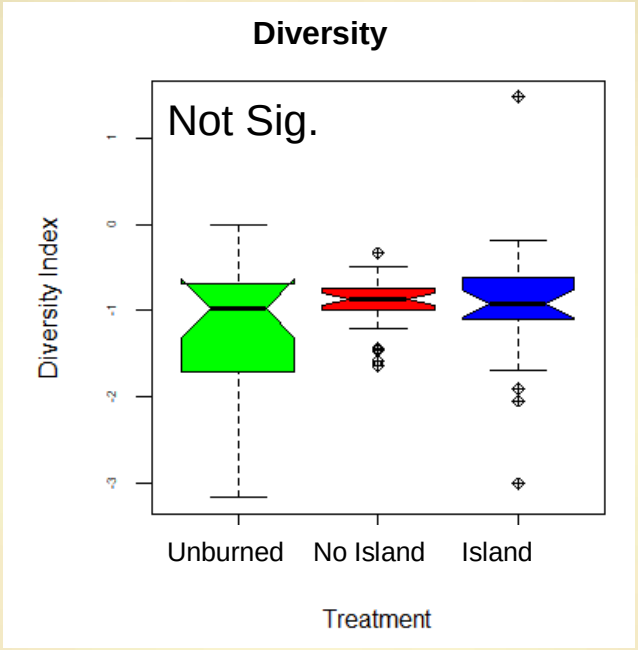


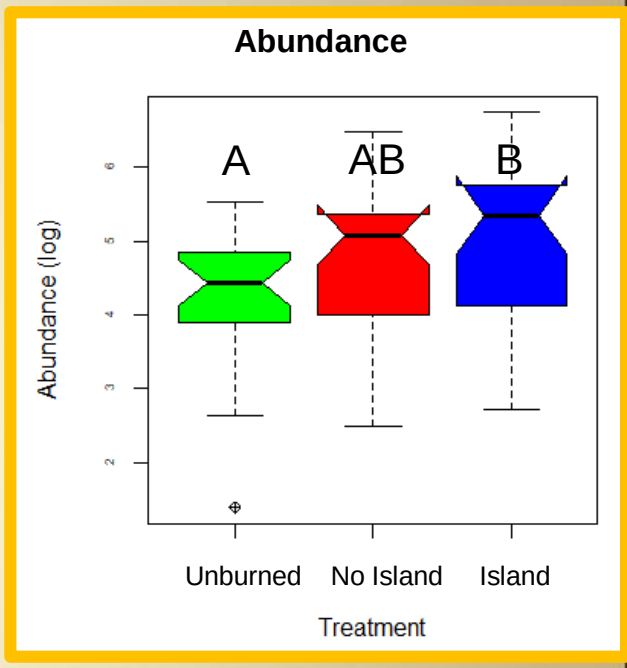
Average Richness = 5.7 genera
Max Richness = 13 genera

USGS

H2: Burned areas without restoration did not have higher abundance of bees than Unburned areas



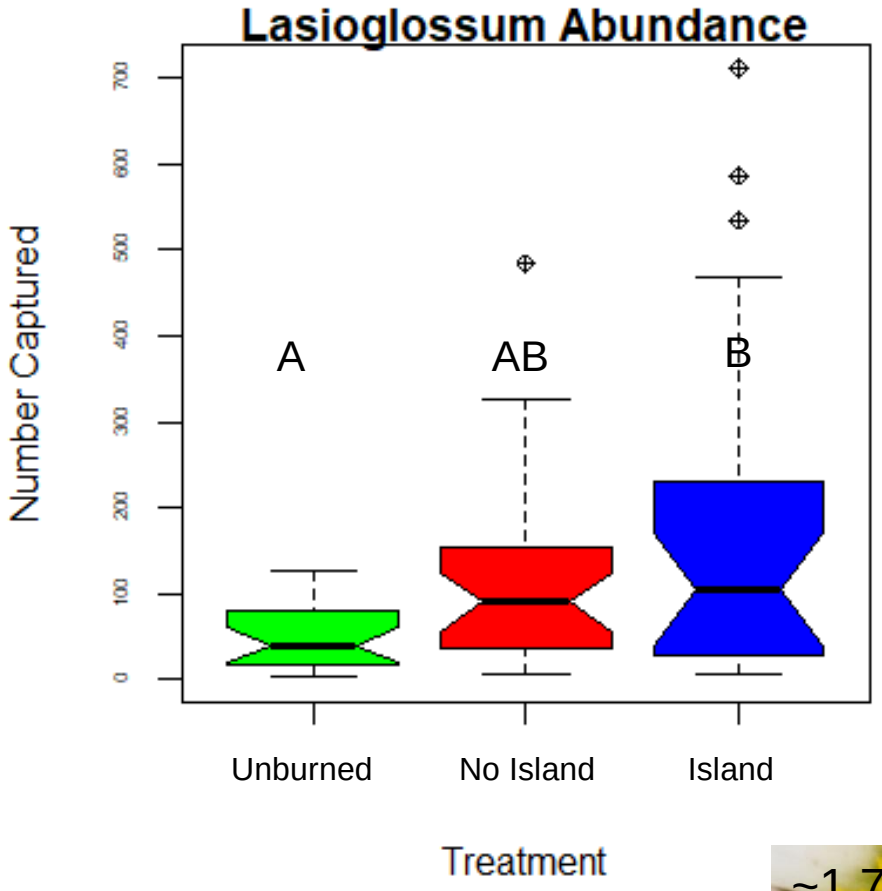


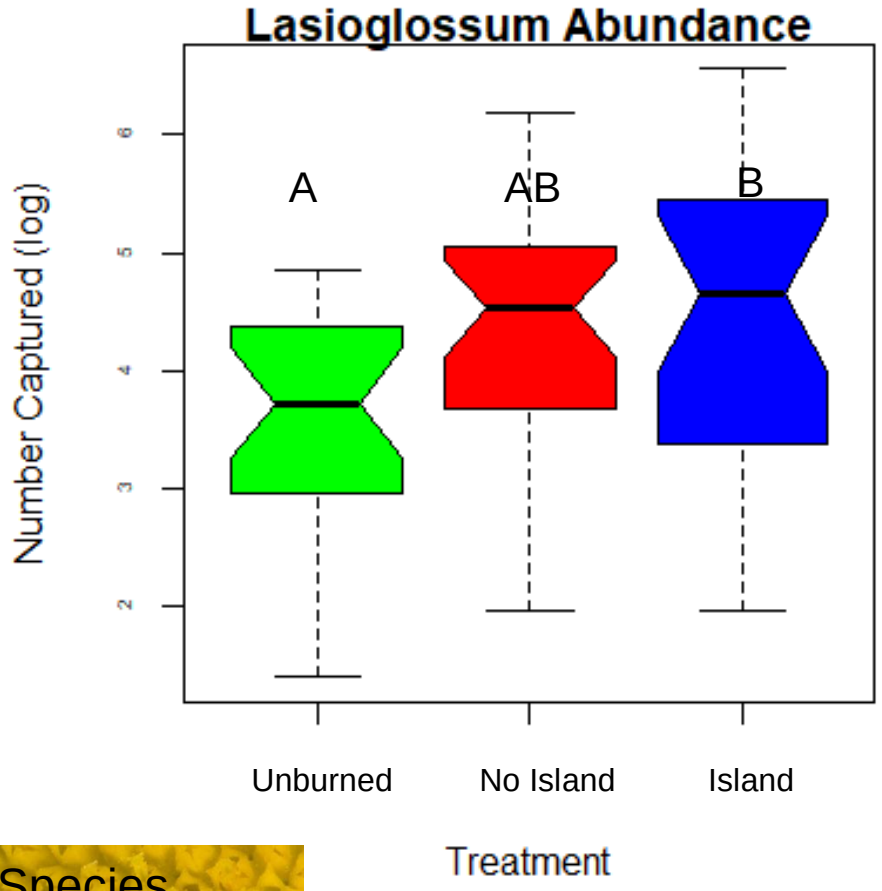


Average Richness = 5.7 genera
Max Richness = 13 genera

USGS

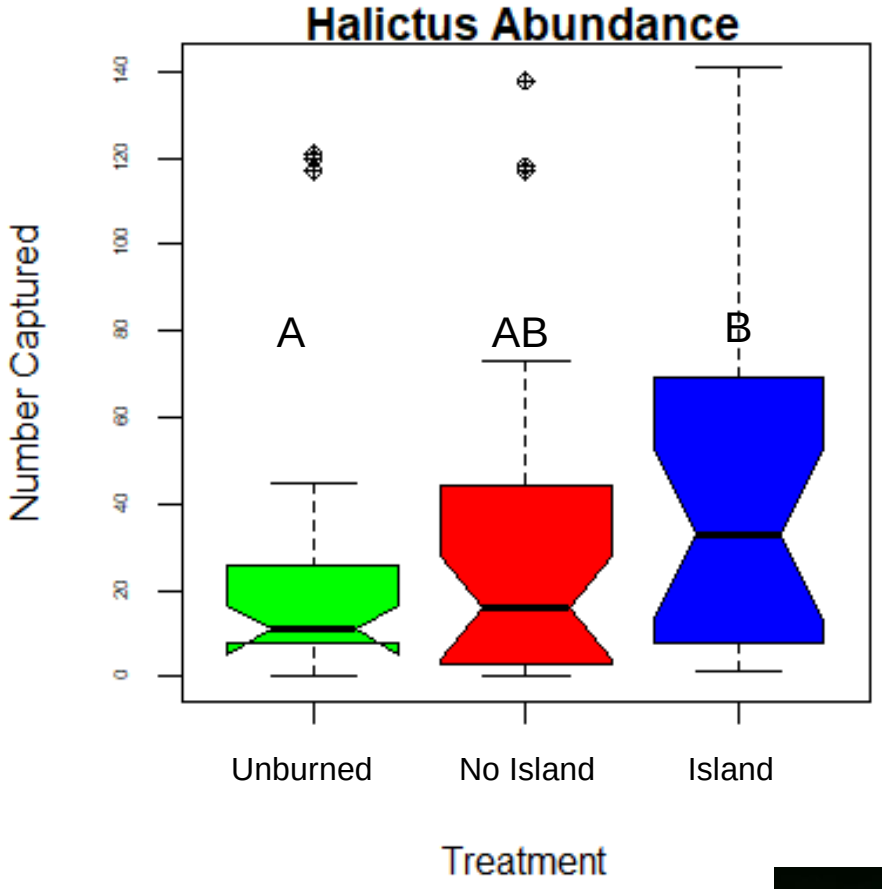
Some bees had higher abundance in burned areas, but especially in Restoration Islands

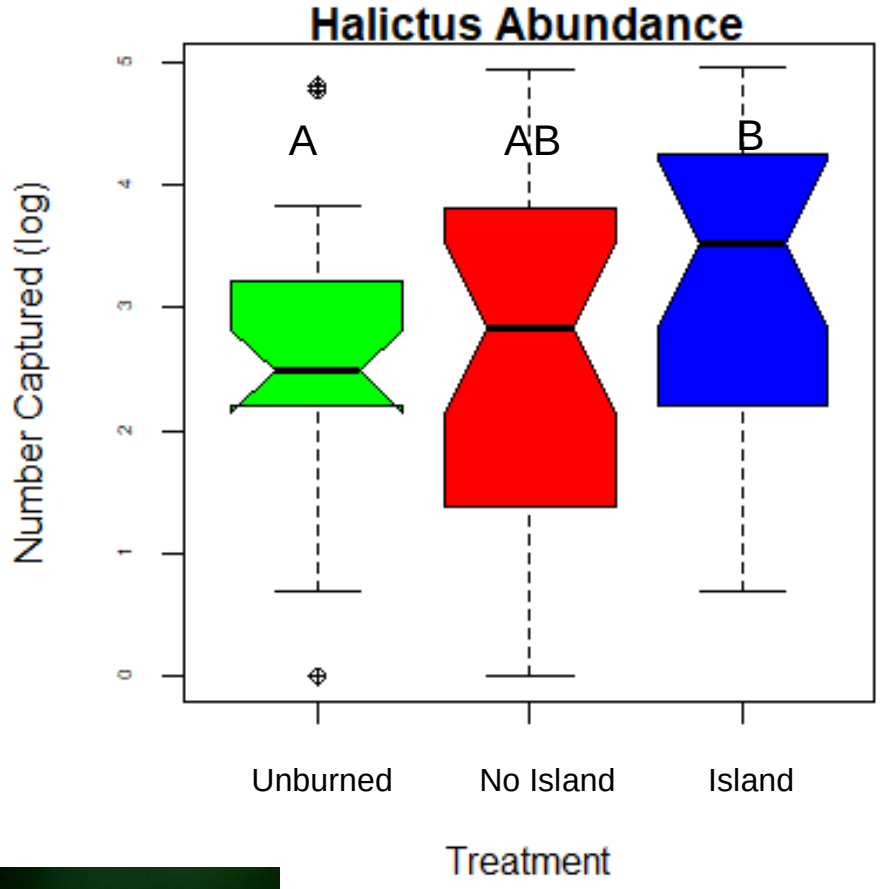




USGS

Some bees had higher abundance in burned areas, but especially in Restoration Islands





USGS

Conclusions:

- ✓ Restoration Islands did attract certain bees compared with Unburned areas (as well as burned areas with No Islands*)
- ✓ These bees were important agricultural pollinators (Lasioglossum, Halictus)
- ✓ Time since Fire (and Restoration) matters

Implications:

- Nectar foraging versus pollination
- Seed production
- Recruitment of forbs and spread of island
- Effects of non-native forbs (weeds)
- Pollination services to surrounding landscape

For more information: dpilliod@usgs.gov

Thanks to: Craig Carpenter, Ann DeBolt, Mary Dudley, Chris Link, Kristina Parker, Barb Schmidt, Nancy Shaw, Karen Colson, and many volunteers

Funding provided by: Bureau of Land Management
US Geological Survey

Photo credits: Craig Carpenter, Barbara Forderhase, Anne Halford, David Pilliod