Investigating Drivers of Plant Abundance and Community Structure on Fuelbreaks

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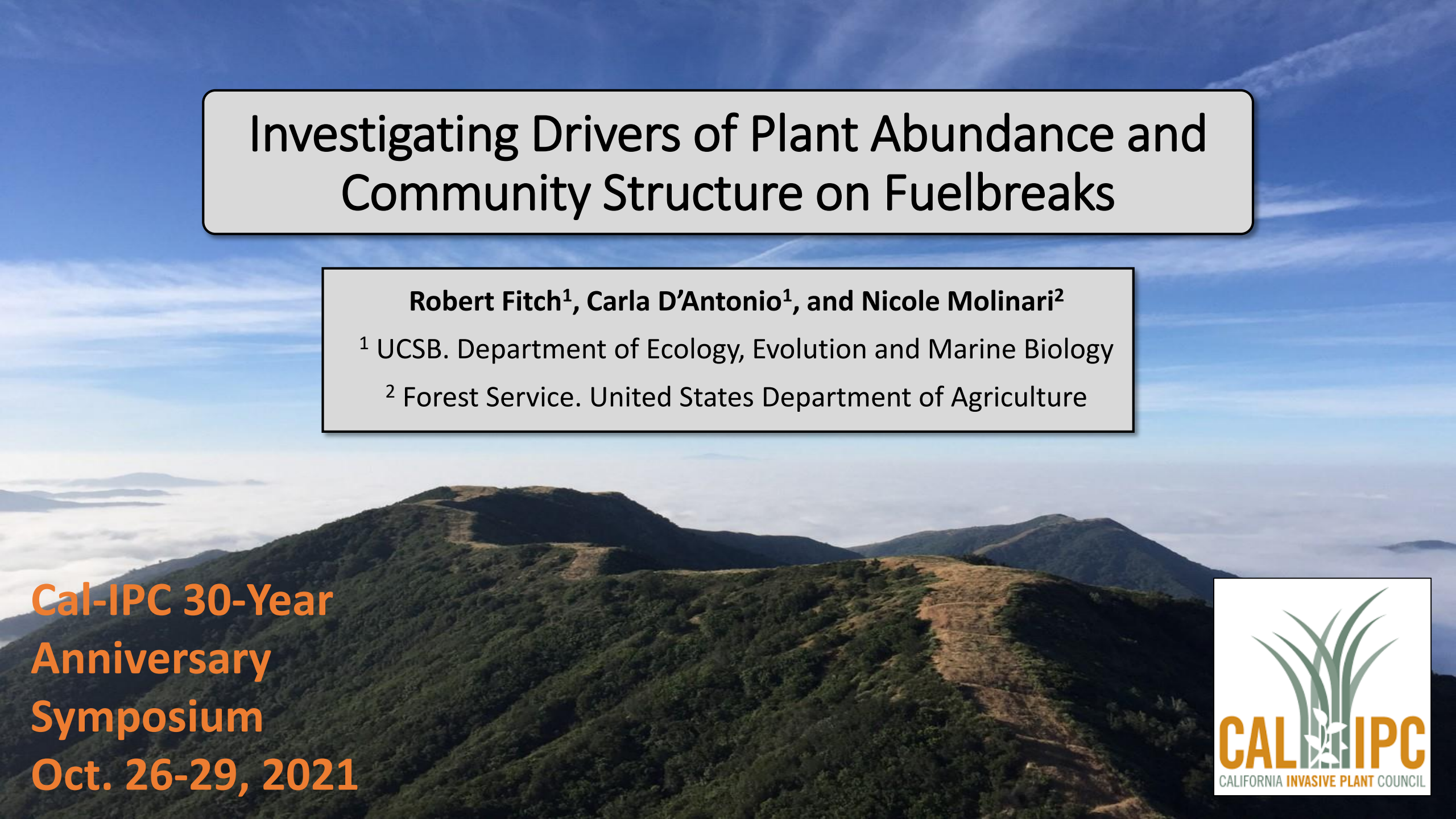

Cal-IPC 30-Year Anniversary Symposium
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CAL IPC
CALIFORNIA INVASIVE PLANT COUNCIL

Acknowledgements

Thesis Committee

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- Nicole Molinari
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Undergraduates

- Alicia Magilato

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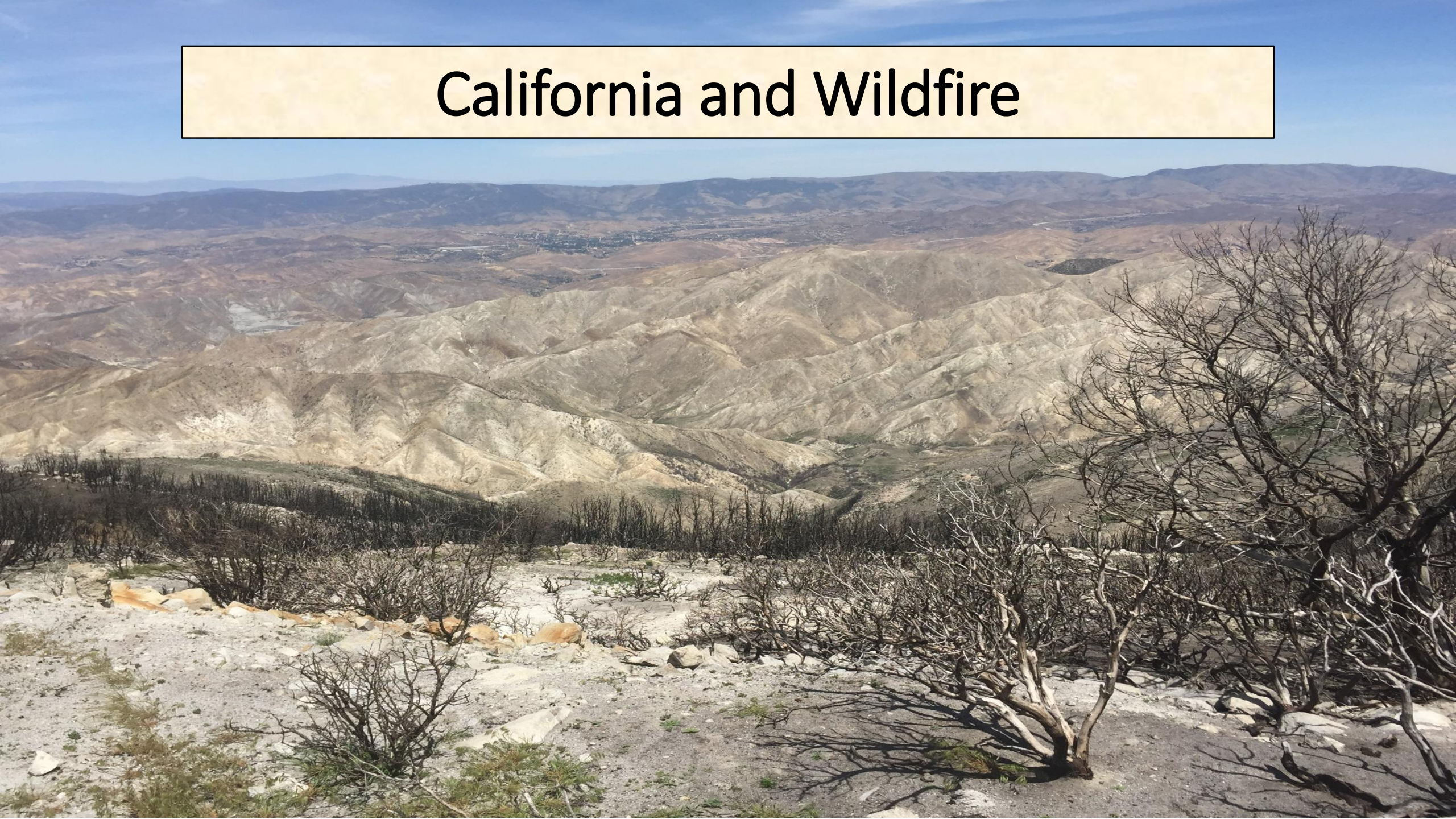
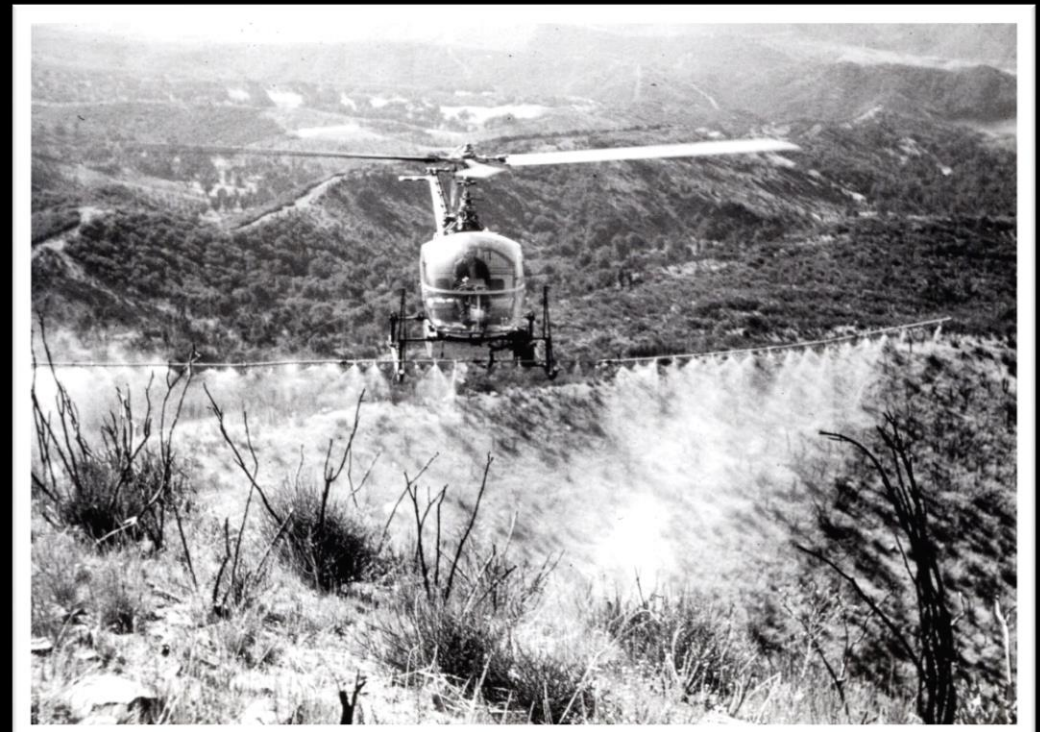
California and Wildfire





Fuelbreaks are used to:

- Decrease fire intensity
- Increase surface area of fire retardant
- Allow firefighter access
- Light backburns

Fuelbreaks and Invasive Plants

Plus frequent wildfire… threatens shrubland ecosystem stability

Fuelbreak Ecology?

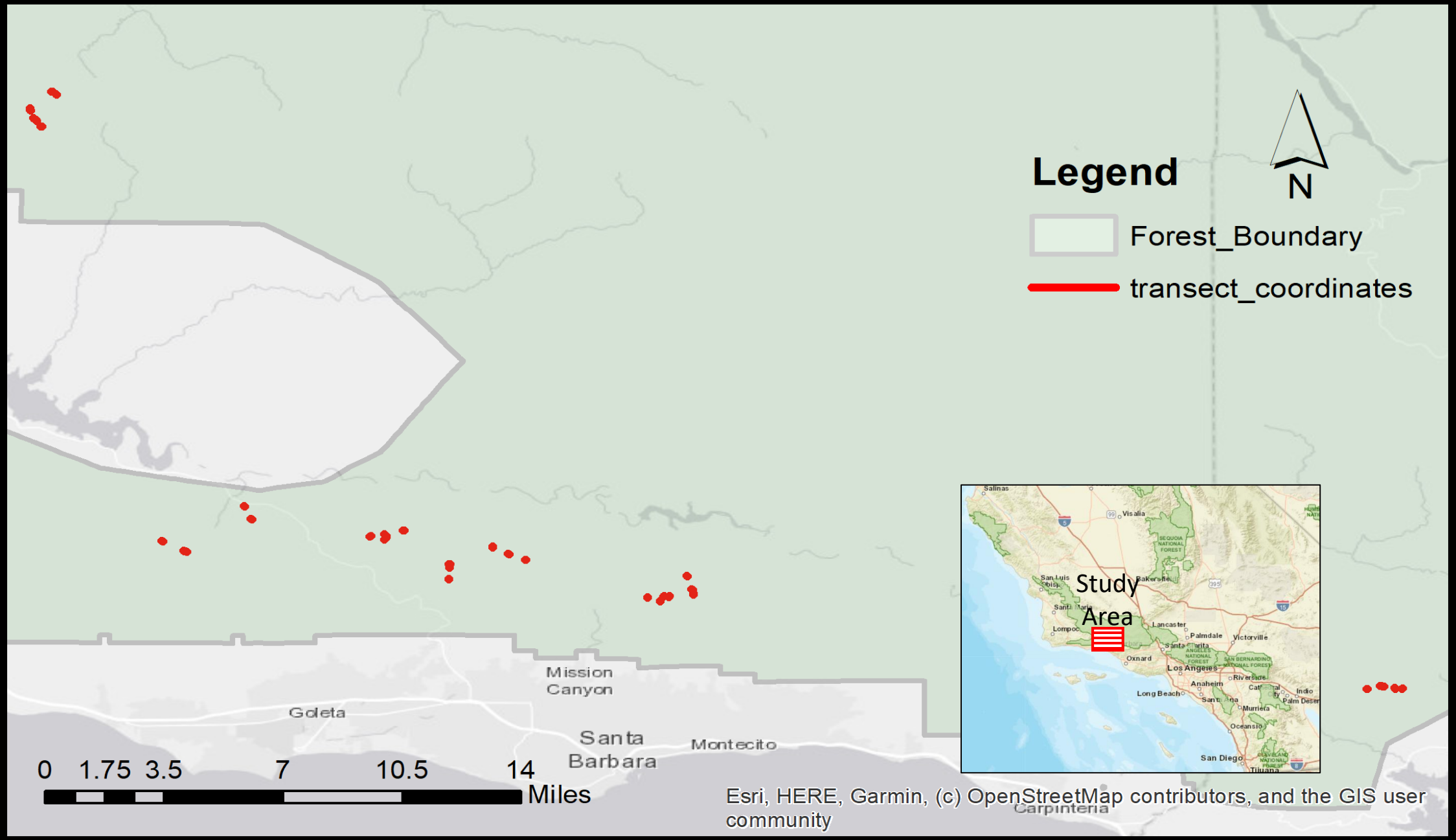
Balance fuel management and shrubland ecosystem stability

Project Questions:

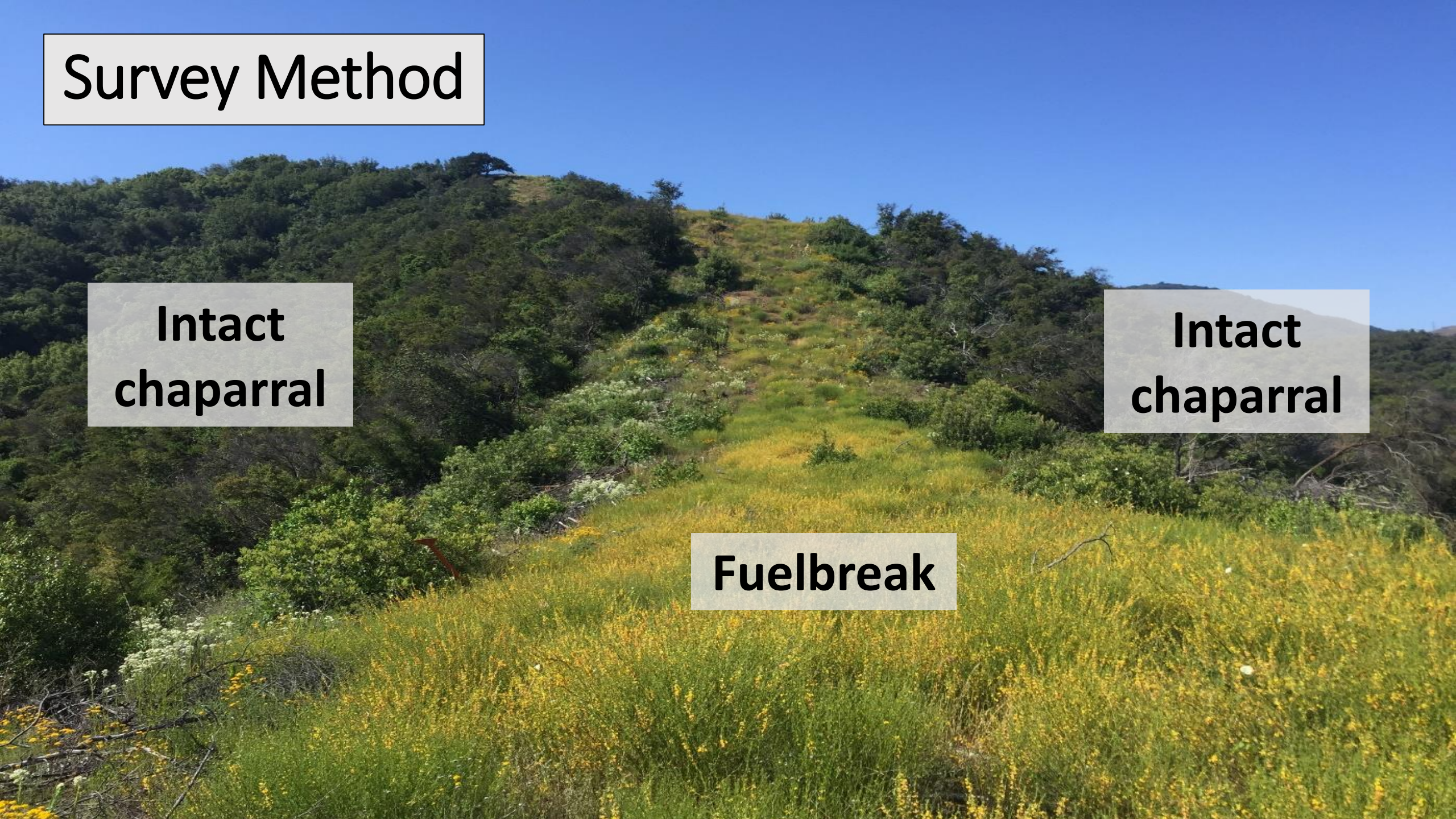
1. **What structures plant community composition?**
   - **Disturbance History**
   - **Invasive Plants**

2. **How does disturb./abiotic variables alter non-native plant abundance/diversity?**

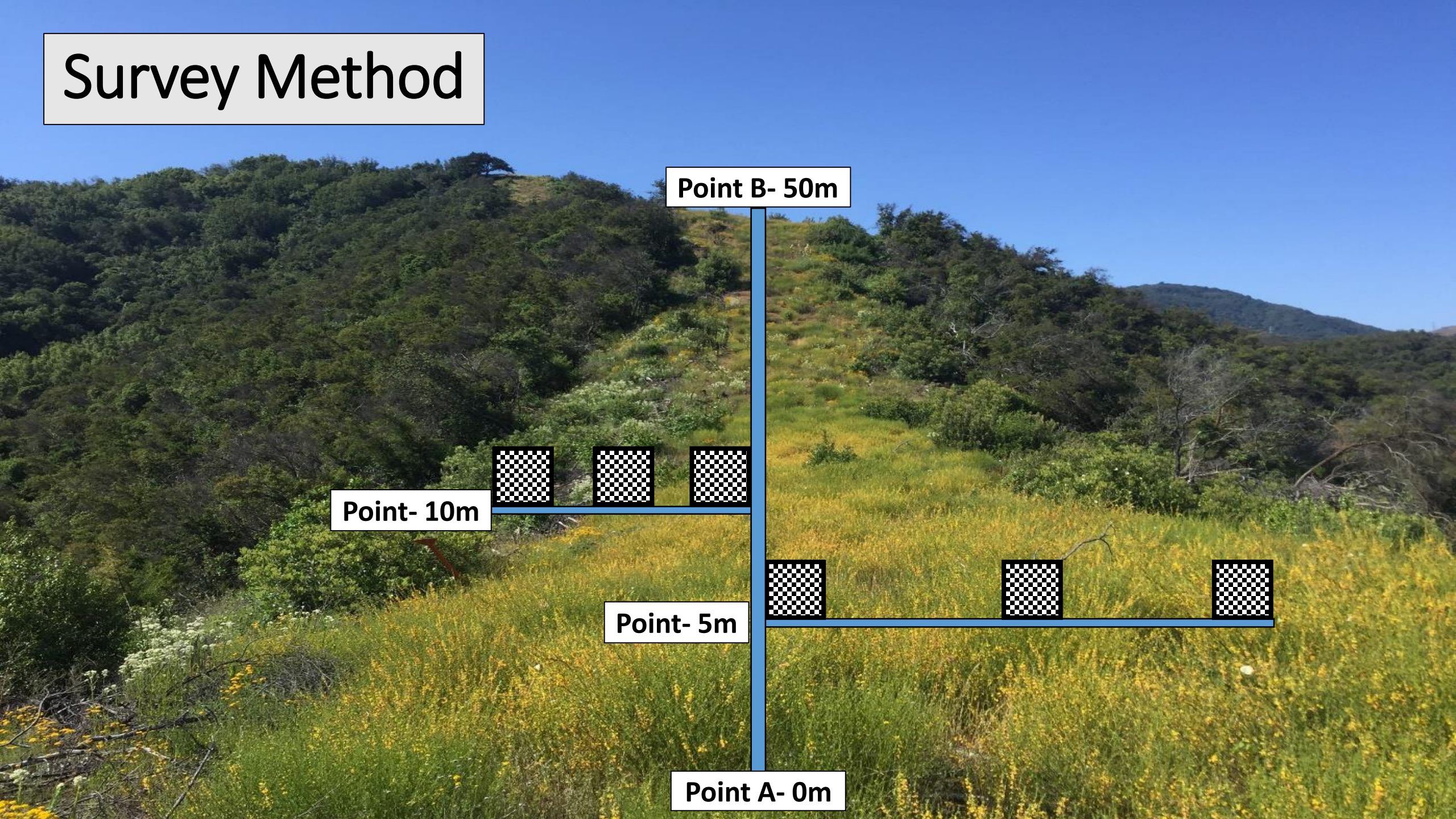
3. **Gain insights for reducing impacts, managing non-native spp, and future rehabilitation or recovery?**


Legend
N
Forest_Boundary
transect_coordinates
Study
Area
Mission
Canyon
Goleta
Santa
Barbara
Montecito
Carpinteria
0 1.75 3.5 7 10.5 14
Miles
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

Survey Method



Survey Method



Methods:

Quantifying Disturbance

- USFS records
- Aerial imagery (UCSB Framefinder, USGS, and Google Earth)

Abiotic Variables

- Downloaded climate data PRISM
- ArcGIS - average transect elevation, slope, aspect.

Invasive Plants Structure the Community

Limits light and soil moisture…

Altered the structure of the habitat

Invasive Plants Structure the Community

Which Traits May Change?

Plant Height
Flowering Duration
Seed Mass

Invasive Plants Structure the Community

Gathered trait data on native species

- Jepson Manual, Kew Gardens Seed Database

1. What structures plant community composition?

- **Disturbance History**

TRANSECTS

Dozed during 2017 Thomas Fire

Not Dozed during Thomas Fire

OLD

- consistently disturbed

NEW

- 1st Time Disturbed

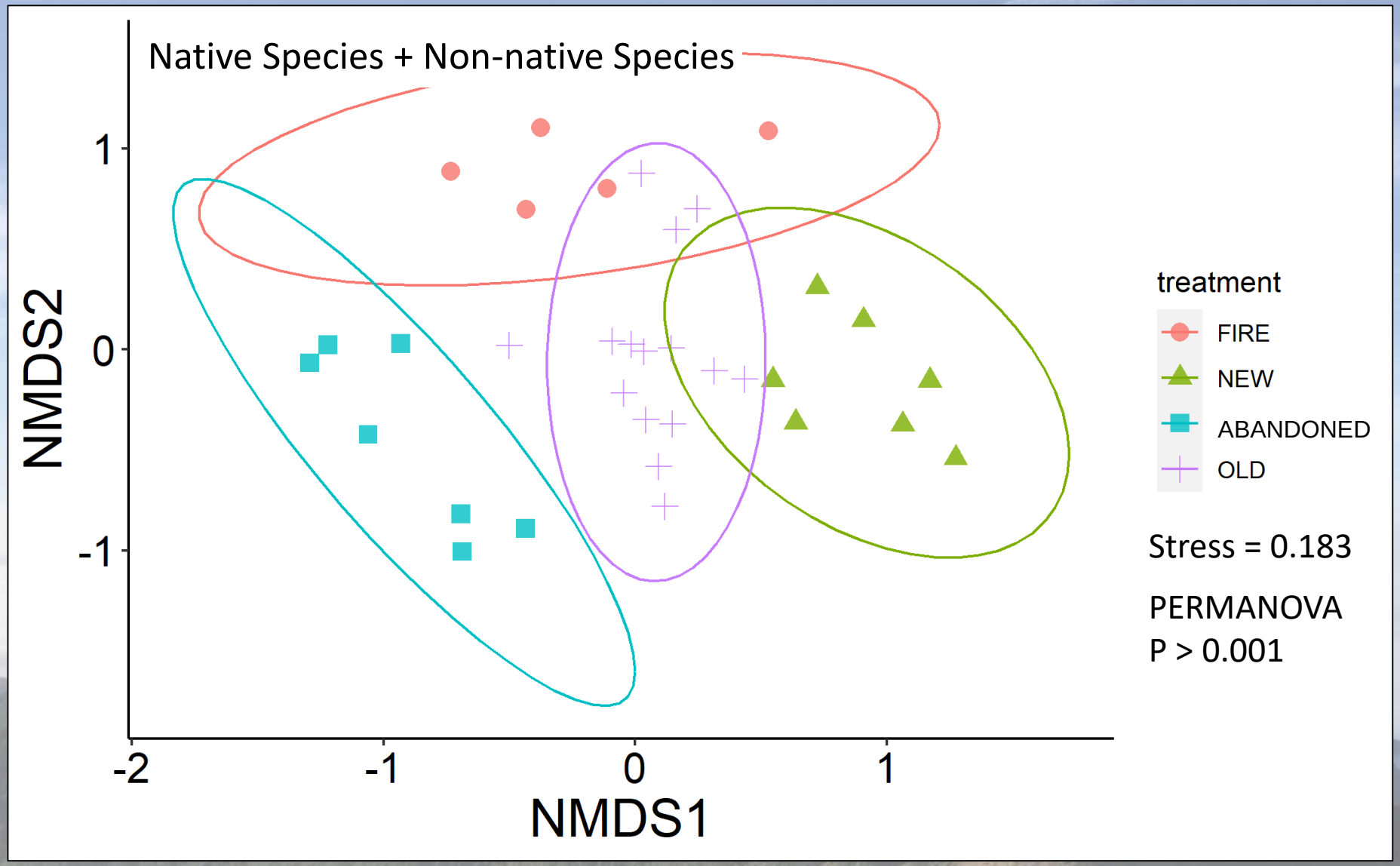
ABANDONED

- Disturbed in past

FIRE

- Burned over in Thomas Fire

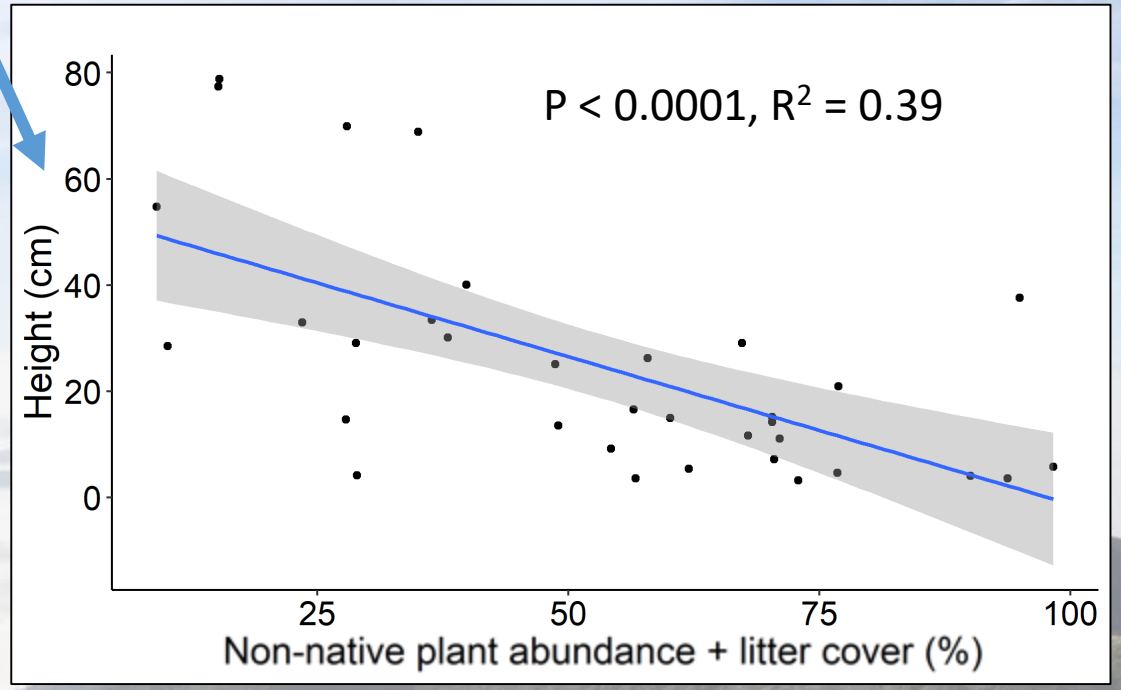
Do these different regimes result in different plant communities?


Native Species + Non-native Species
NMDS2
NMDS1
1
0
-1
-2
-1
0
1
treatment
FIRE
NEW
ABANDONED
OLD
Stress = 0.183
PERMANOVA
P > 0.001

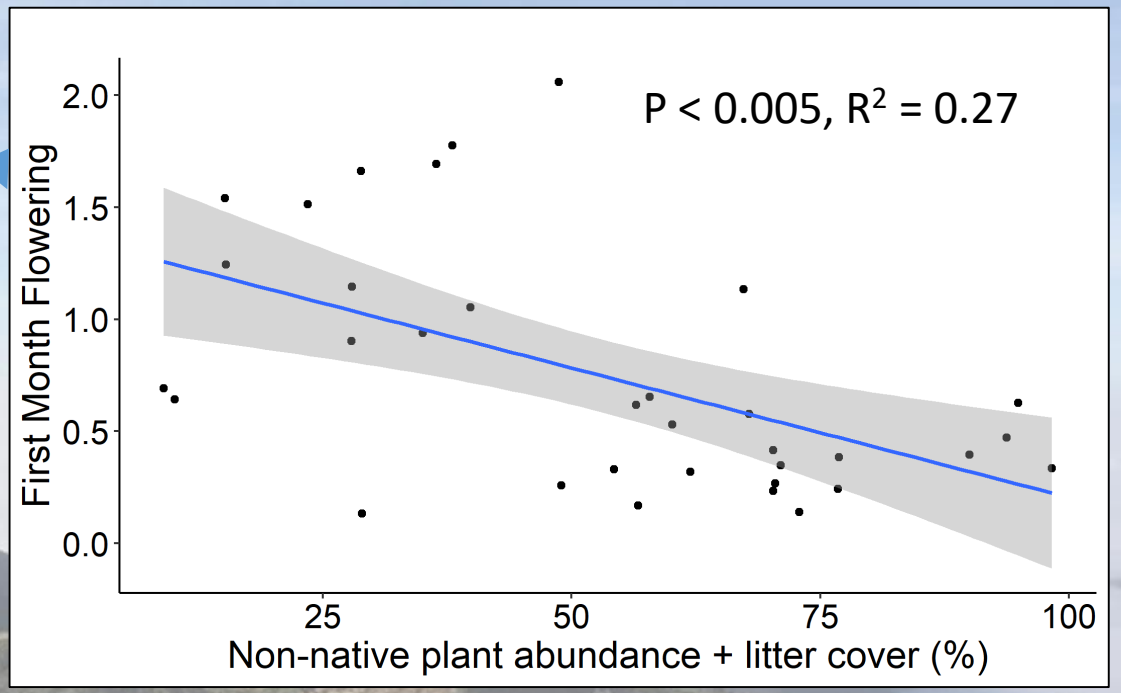
1. What structures plant community composition?

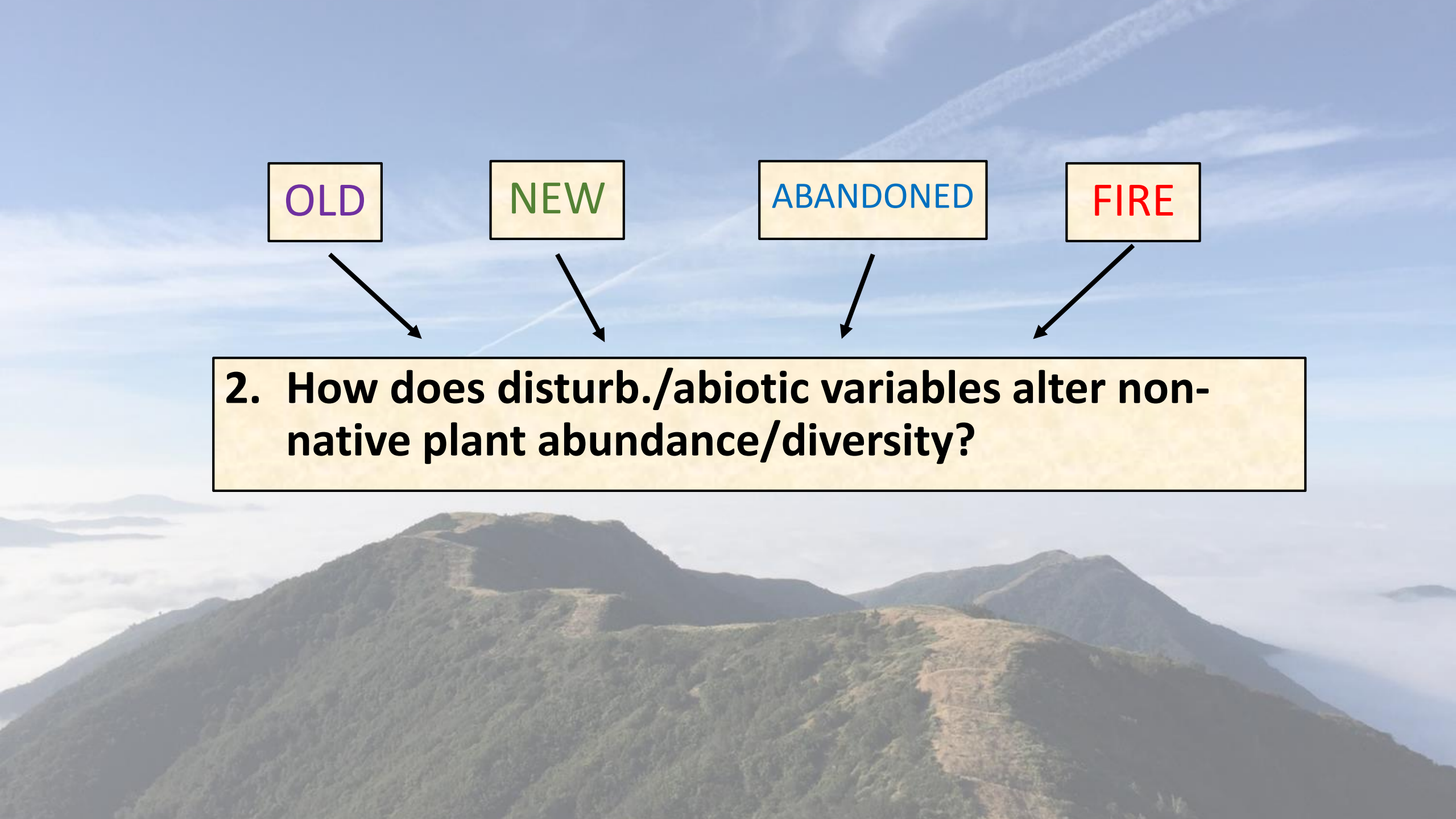
- Invasive Plants

Native Community

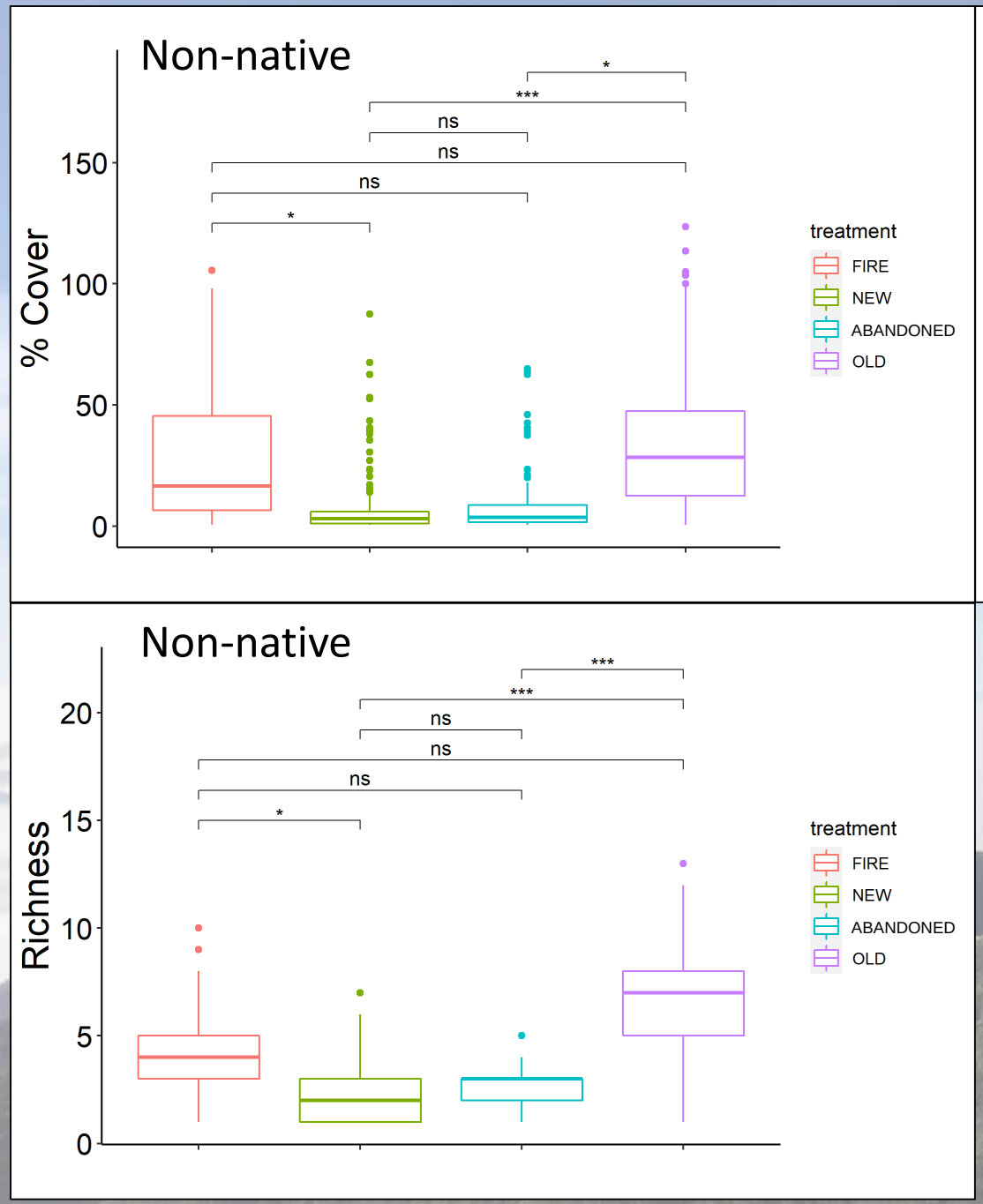


Native Community





2. How does disturb./abiotic variables alter non-native plant abundance/diversity?


Non-native
% Cover
150
100
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0
*
***
ns
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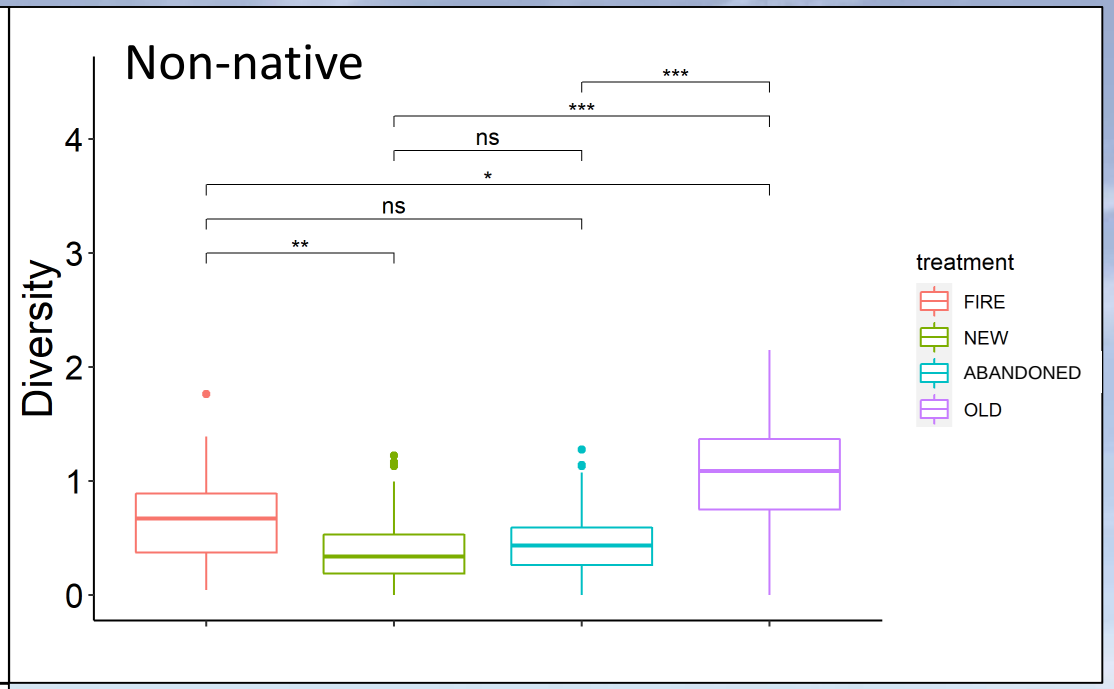
*
treatment
FIRE
NEW
ABANDONED
OLD


Non-native
Diversity
4
3
2
1
0
***
***
ns
*
ns
**
treatment
FIRE
NEW
ABANDONED
OLD

Non-native
Richness
20
15
10
5
0
***
***
ns
ns
ns
*
treatment
FIRE
NEW
ABANDONED
OLD

2. How does disturb./abiotic variables alter non-native plant abundance?

Abundance of non-native plants

Disturbance:

Frequency

Average return interval

Minimum return interval

Maximum return interval

Abiotic Variables:

Total precipitation

Minimum temperature

Maximum Temperature

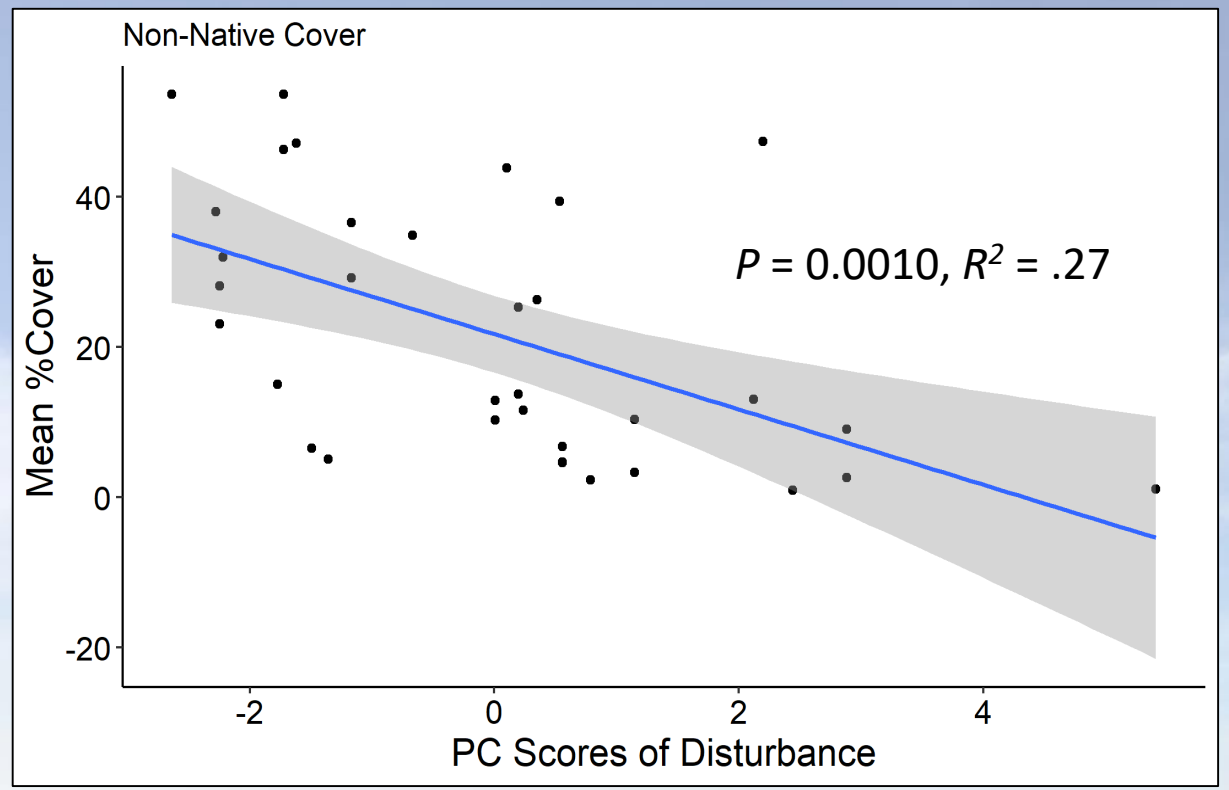
Maximum VPD

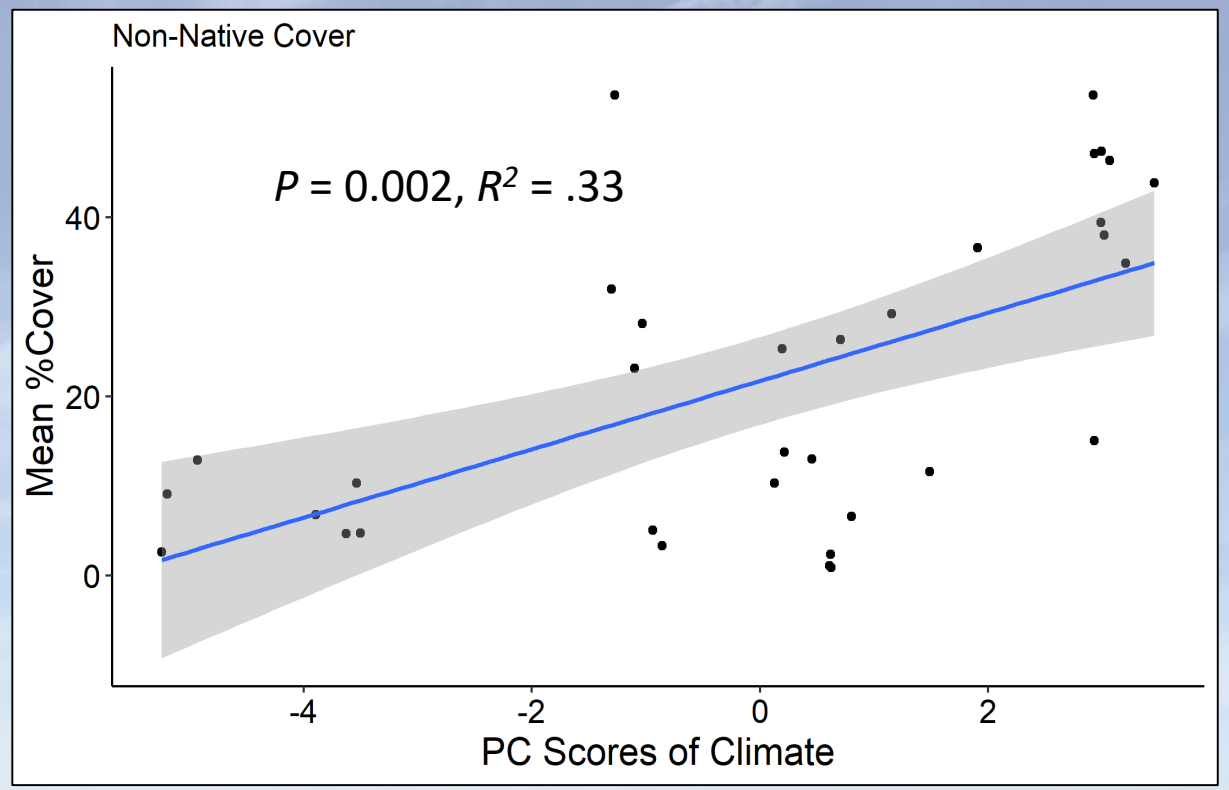
Slope

Aspect

Elevation

*Climate was subdivided into seasons





Shorter Time between disturbances

And

Many total **disturbances**

Long Time between disturbances

And

Fewer total **disturbances**

Less total ann. rainfall

And

Less winter/spring rainfall

More total ann. rainfall

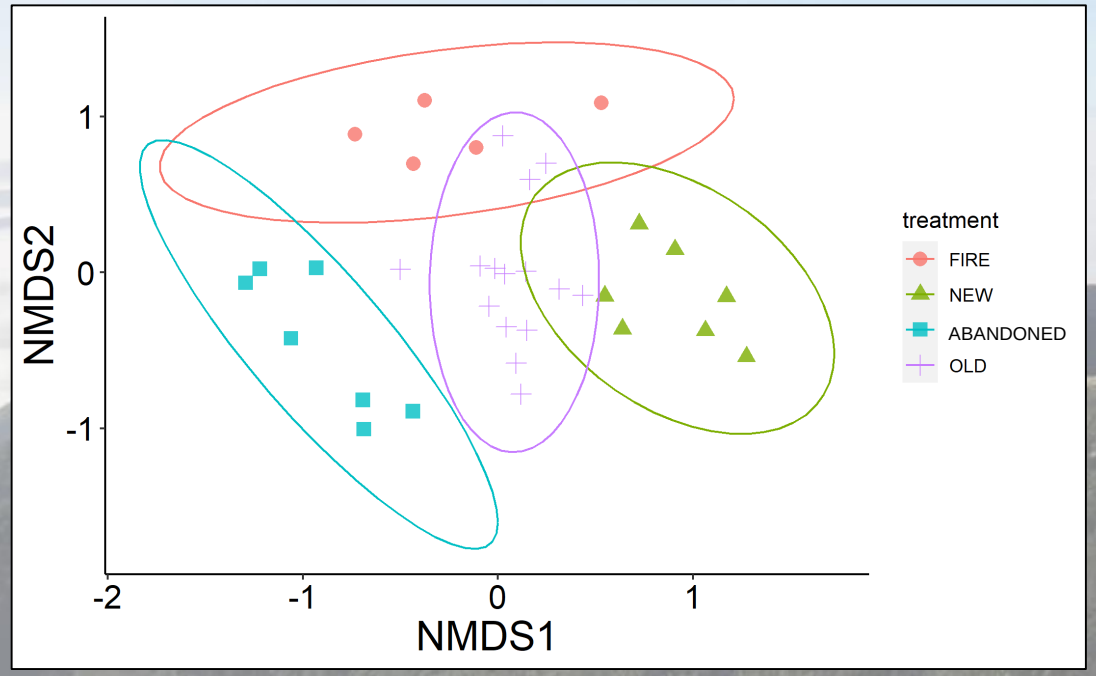
And

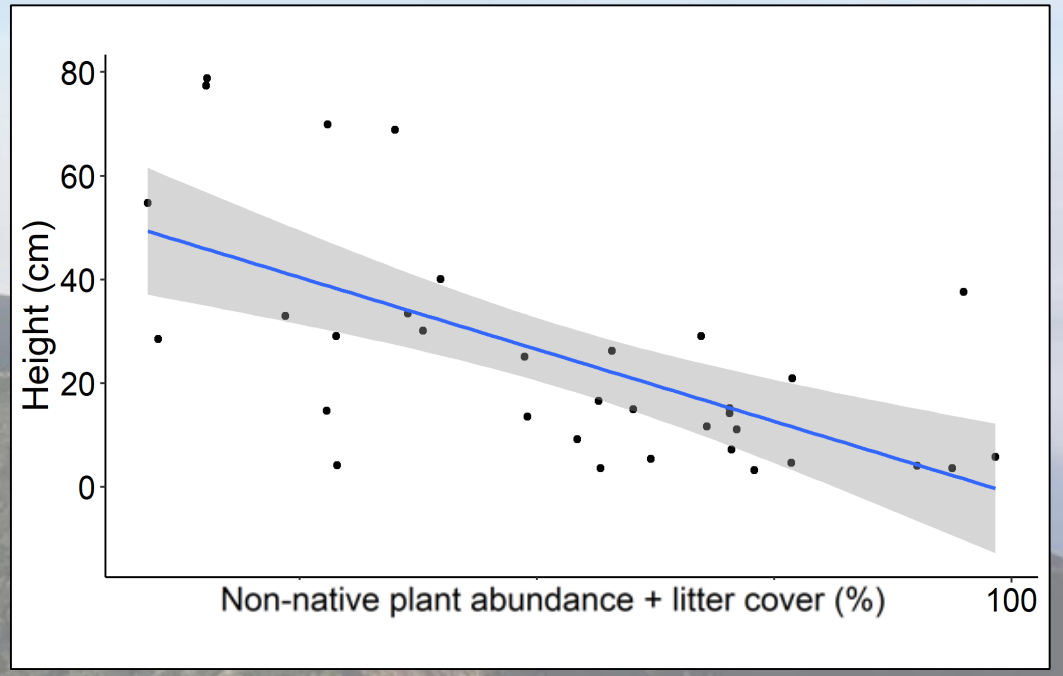
More winter/spring rainfall

1. What structures plant community composition?

Disturbance regimes create distinct plant communities

Limit native plants to "weedy", persist in grass dominated

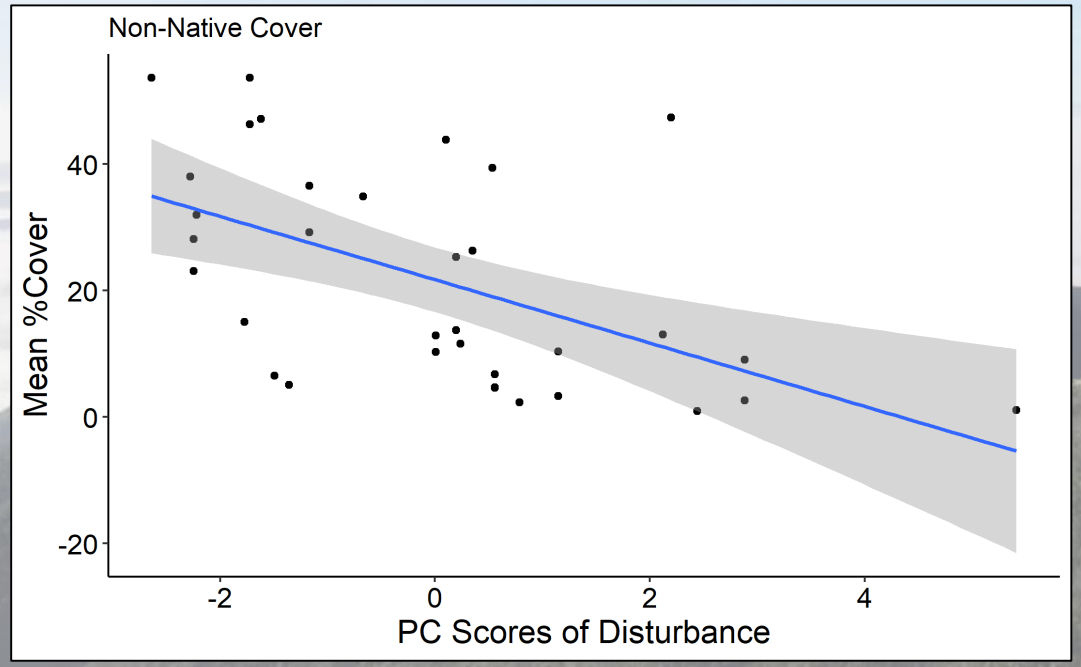


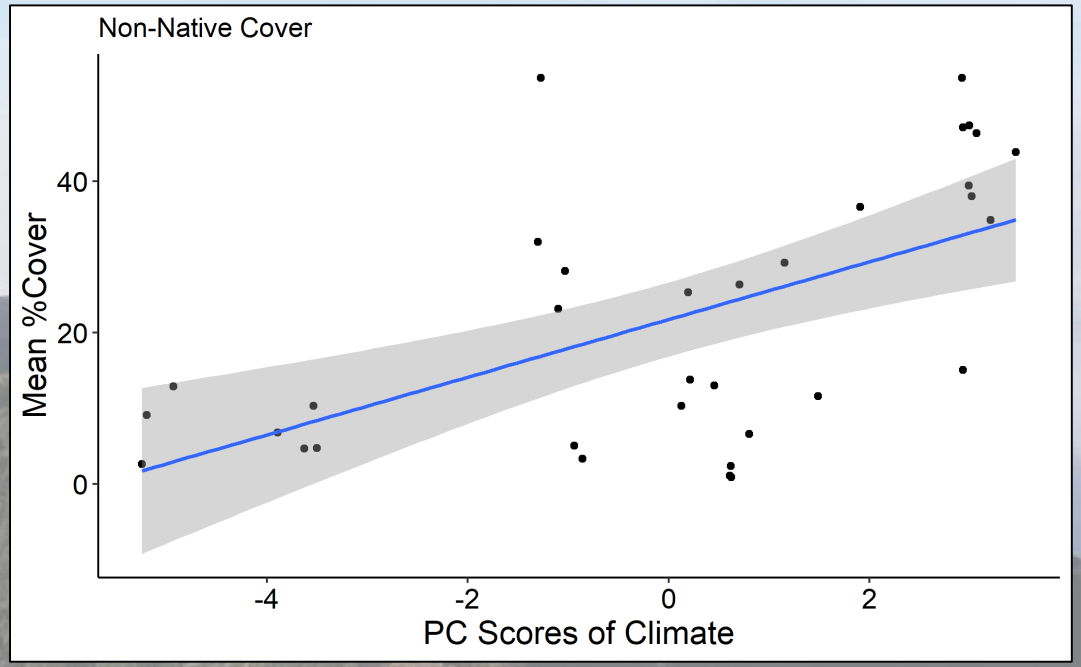


2. How does disturb./abiotic variables alter non-native plant abundance/diversity?

Frequently disturbed and short returns = increases abund.

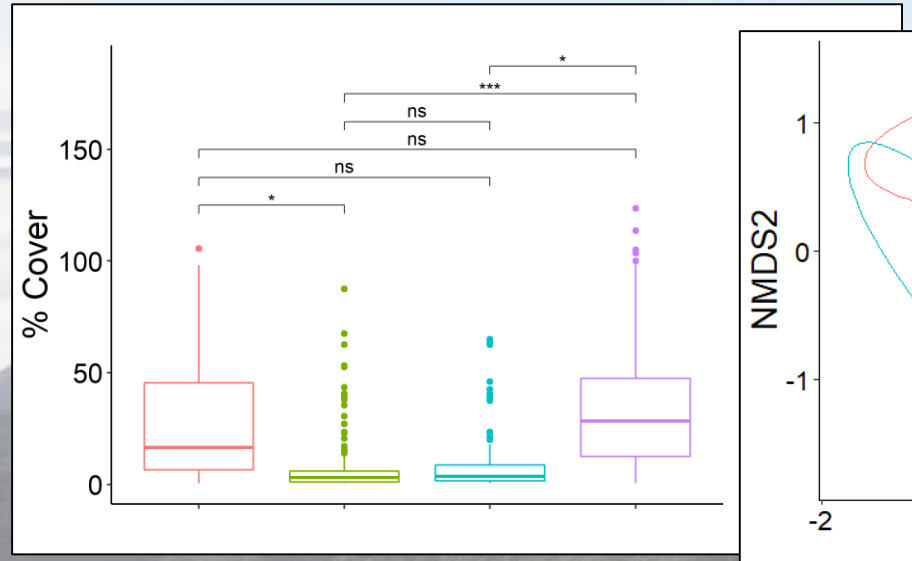
Rainfall, most important climate variable

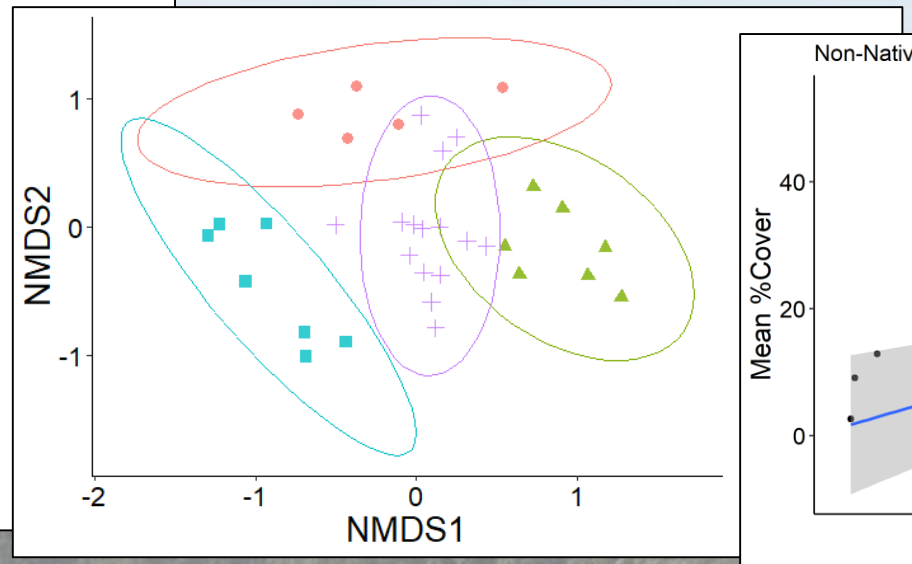


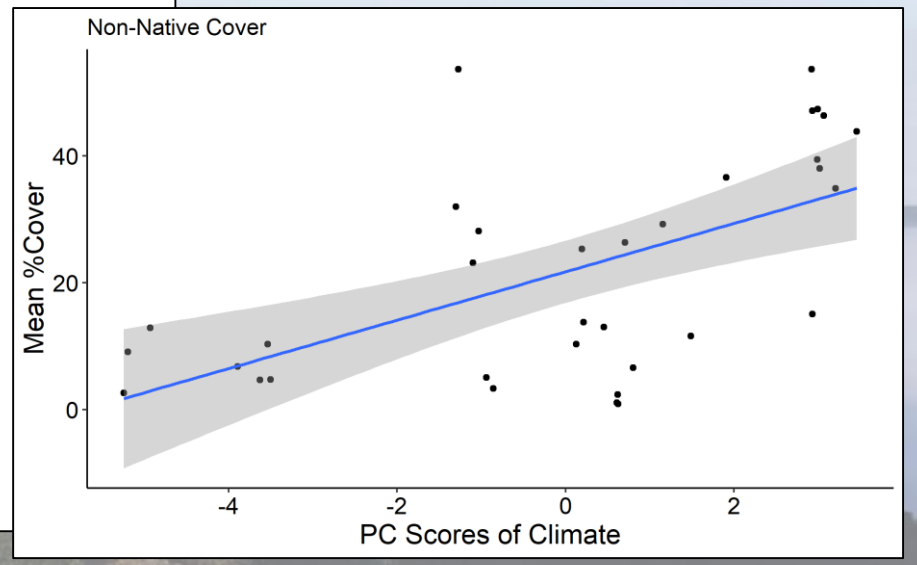


3. Implications for Management?

1. Restoration or weed control (1-2 year window)
2. Invasive species persist w/o disturbance, limit native recovery
3. Distinct community- **one size does not fit all**
4. High rainfall- increased grass abundance







Community weighted mean (CWM)

(e.g. Plant Height of native species$_i$)

$$\sum_{plot}^{n=i} trait\ value_i \times relative\ abundance_i$$

Averaged across each transect