

# **Southern California shrubland recovery following short-interval wildfire: Monitoring past community changes and predicting future threats**

**Stephanie Ma**

**Mathew Plummer, Carla D'Antonio**



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Natural Areas Conference  
[stephanie.ma@lifesci.ucsb.edu](mailto:stephanie.ma@lifesci.ucsb.edu)  
Linkedin: samaeco**



**UC Santa Barbara**

# Thank You!

Natural Areas Conference

UC Santa Barbara – Ecology, Evolution & Marine Biology  
University of Utah – Geography

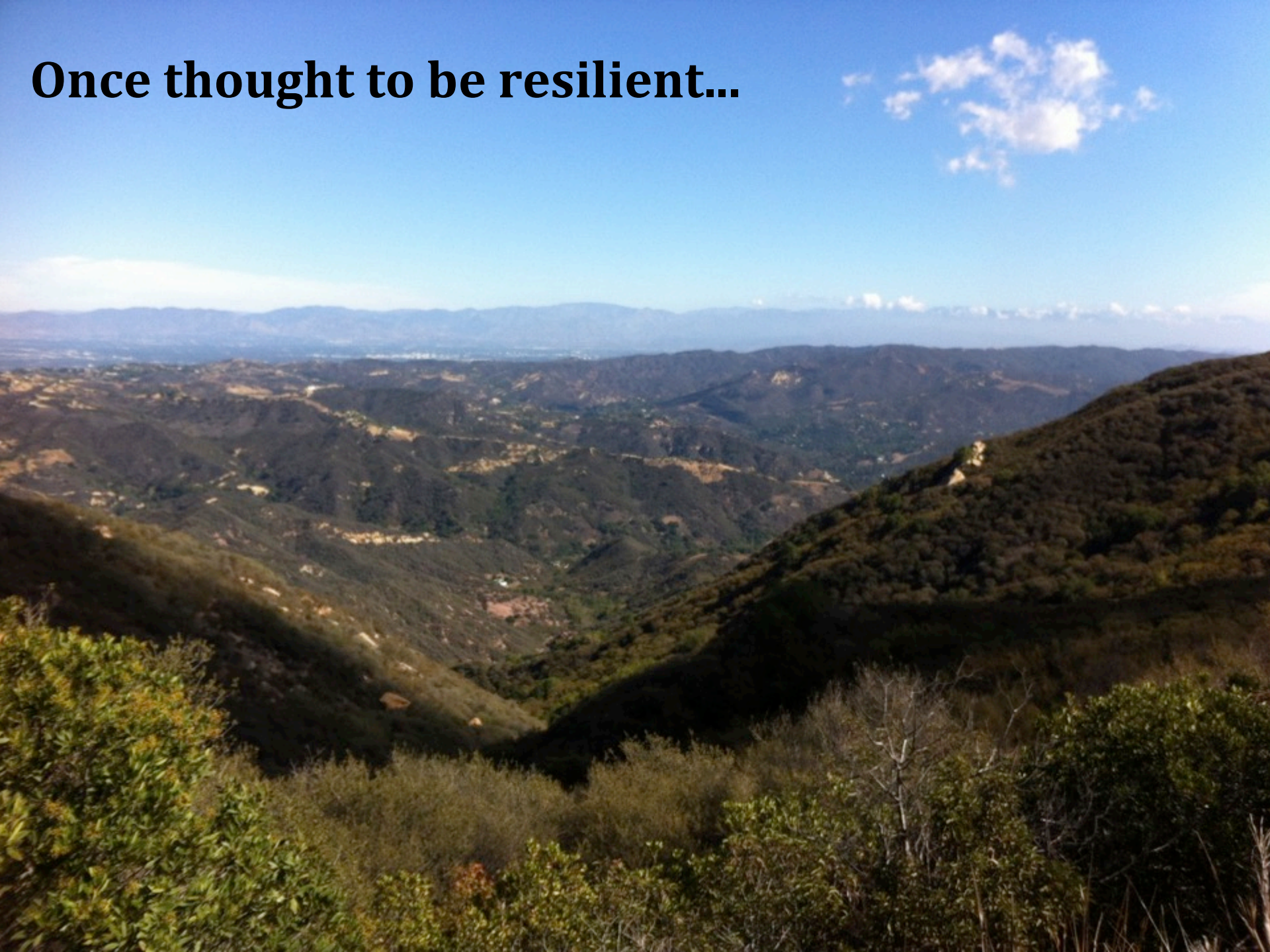
Funding : California Energy Commission, Schuyler Endowment Fund



Map & Imagery Library, UCSB



**Once thought to be resilient...**

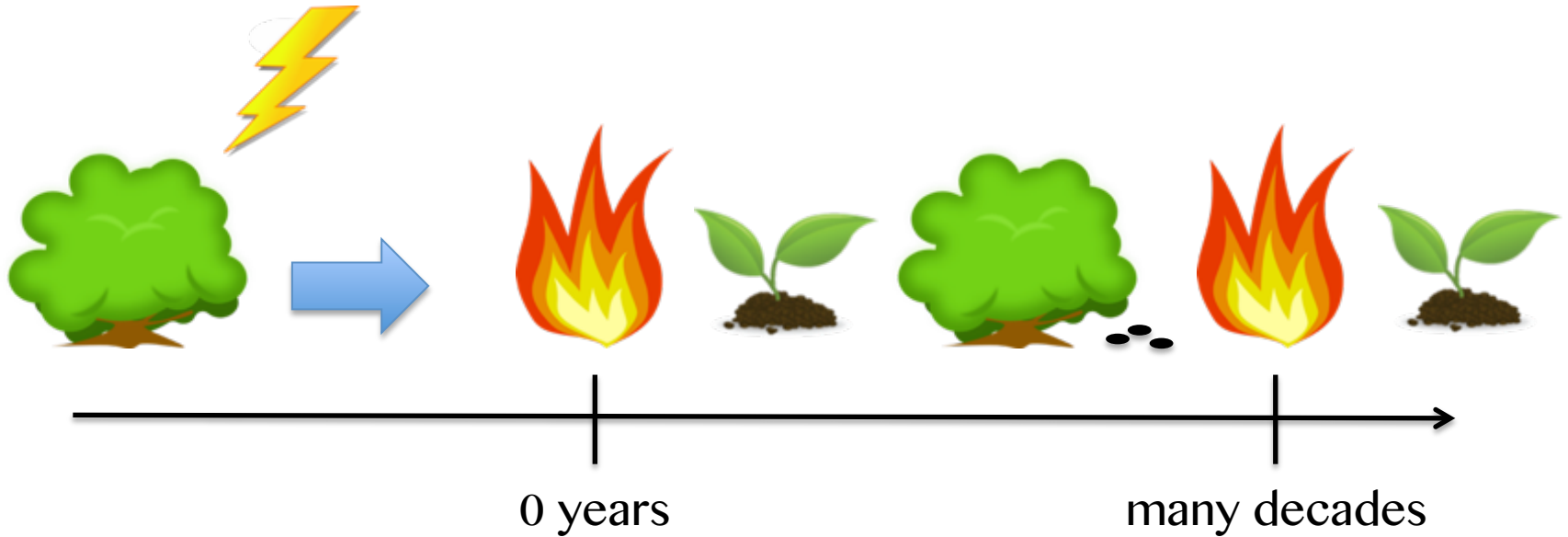




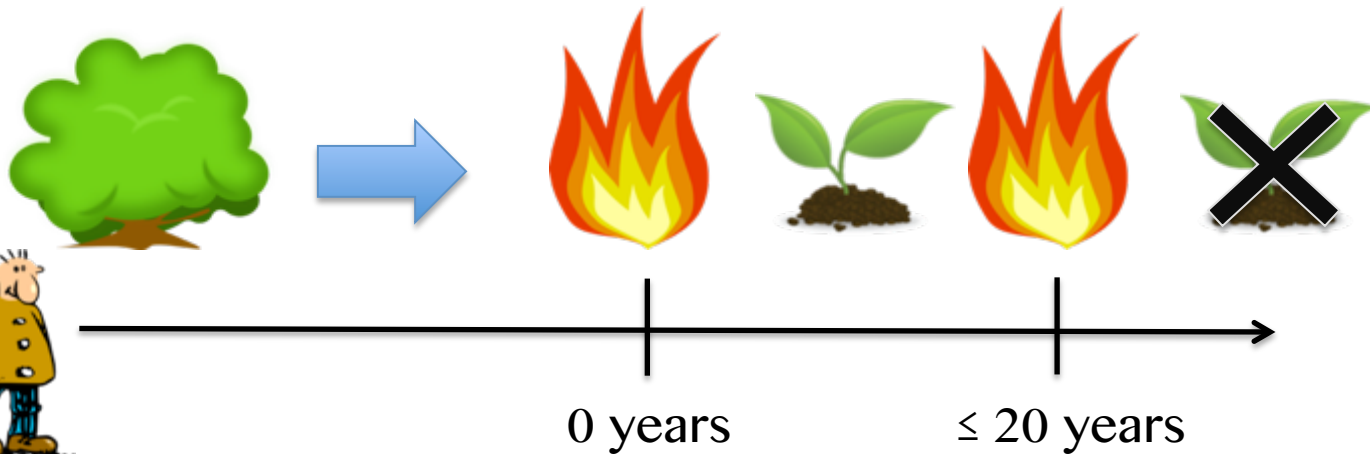
... now at risk of being lost.

# Define “short-interval fire”

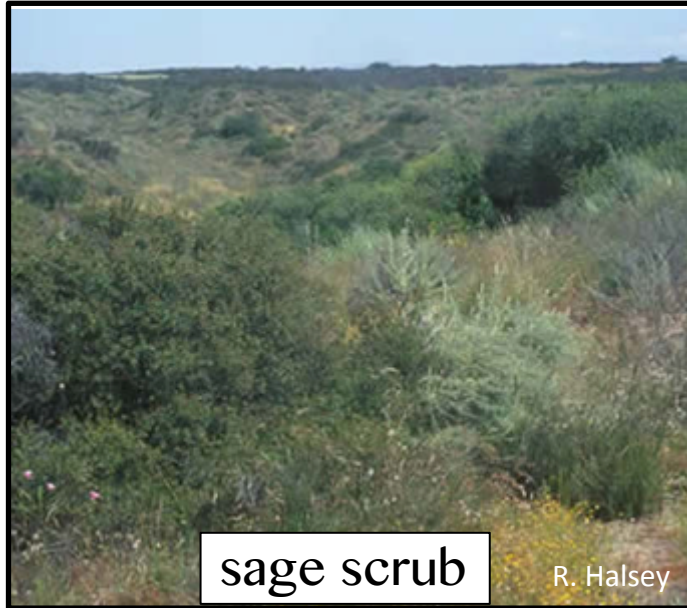
Historical interval



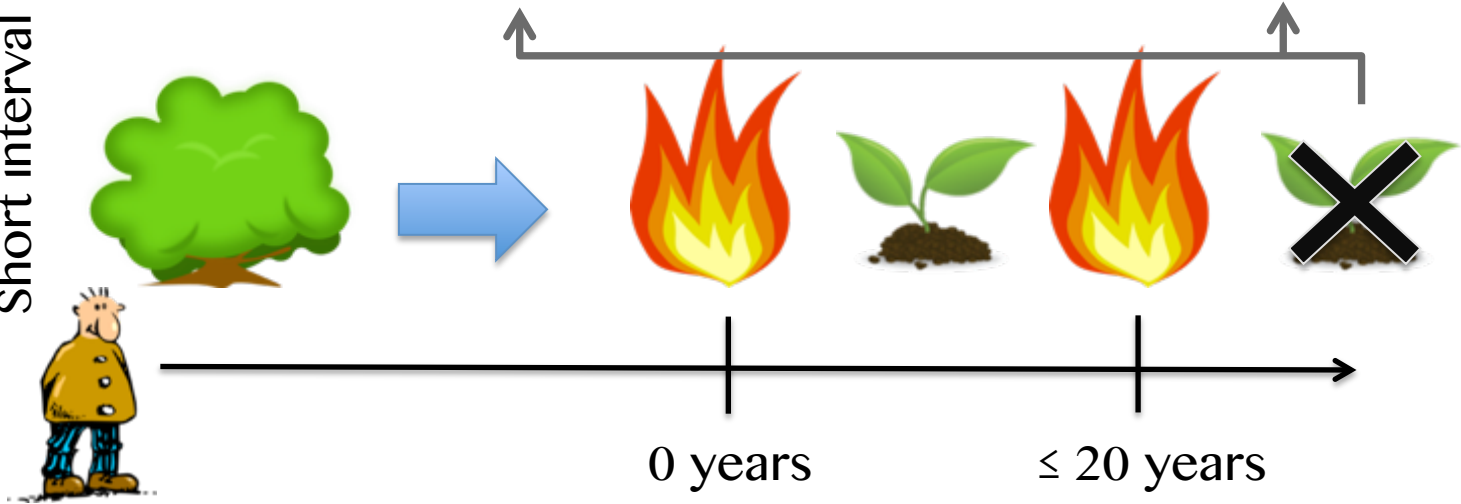
Short interval



# Chaparral replacement



Short interval



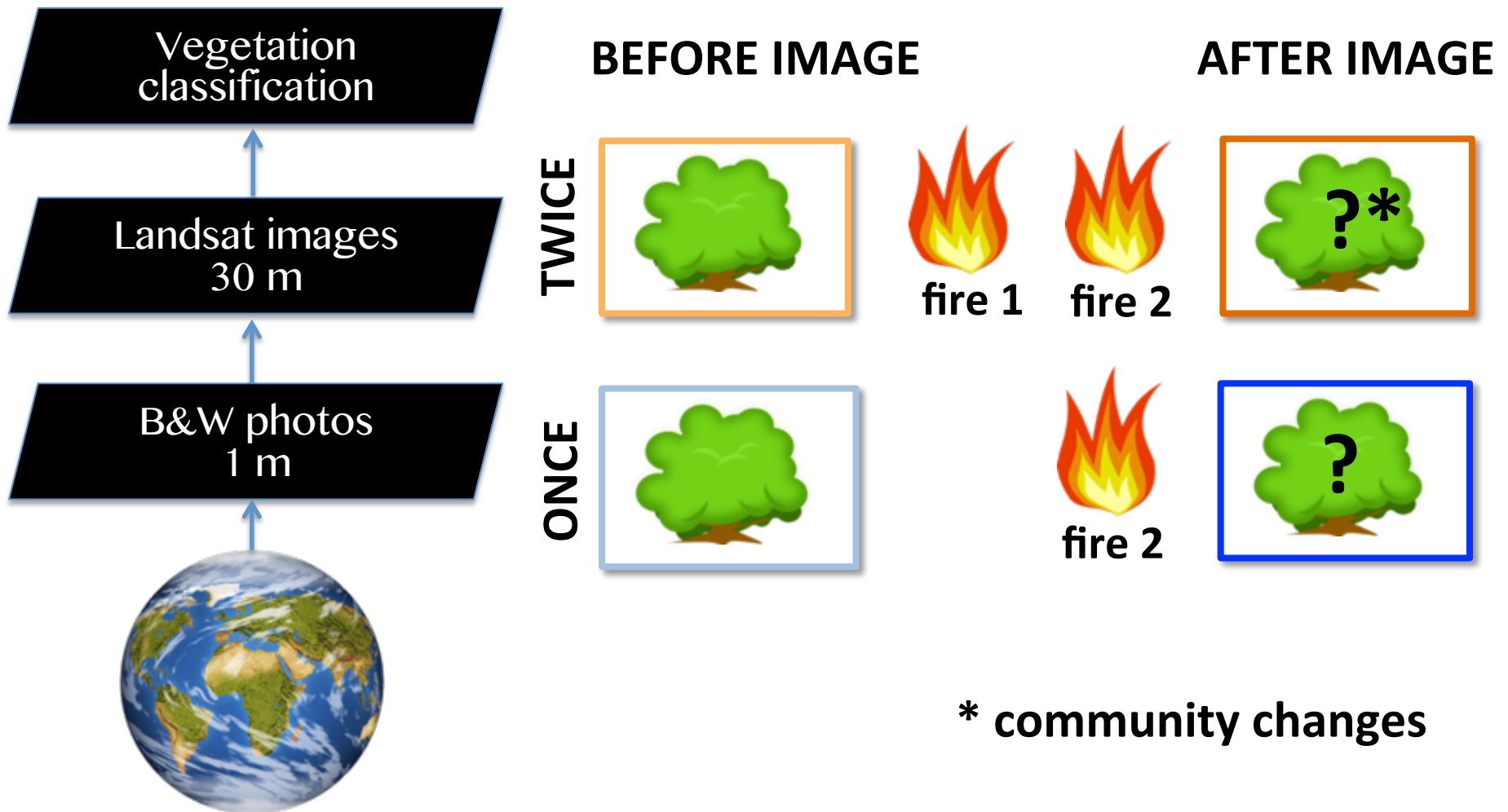
# Research questions

1. Is chaparral conversion occurring?
2. Is chaparral conversion driven by short interval fire?
3. What are the predictive variables of chaparral conversion?

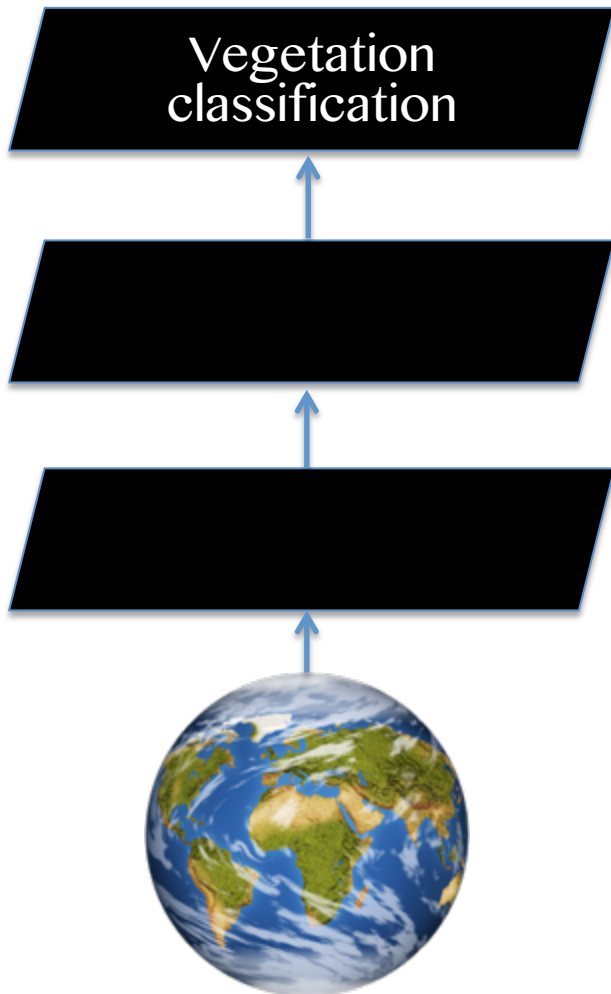
Challenge: TIME, SPACE



# Research at three spatial scales



# Research at three spatial scales

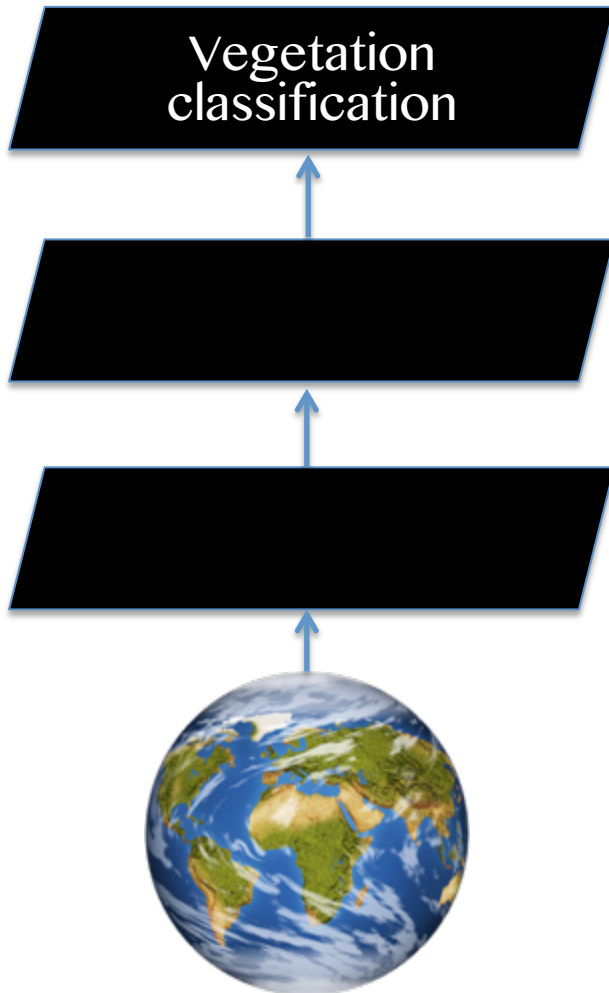


- 1930's **VTM** (Vegetation Type Mapping)
  - A.E. Wieslander - USFS
- 2001 CALVEG – USFS
- Compared polygons
  - chaparral → chaparral
  - chaparral → sagescrub/grass
- Shortest fire interval: 2-5, 6-10, 11-20 yrs



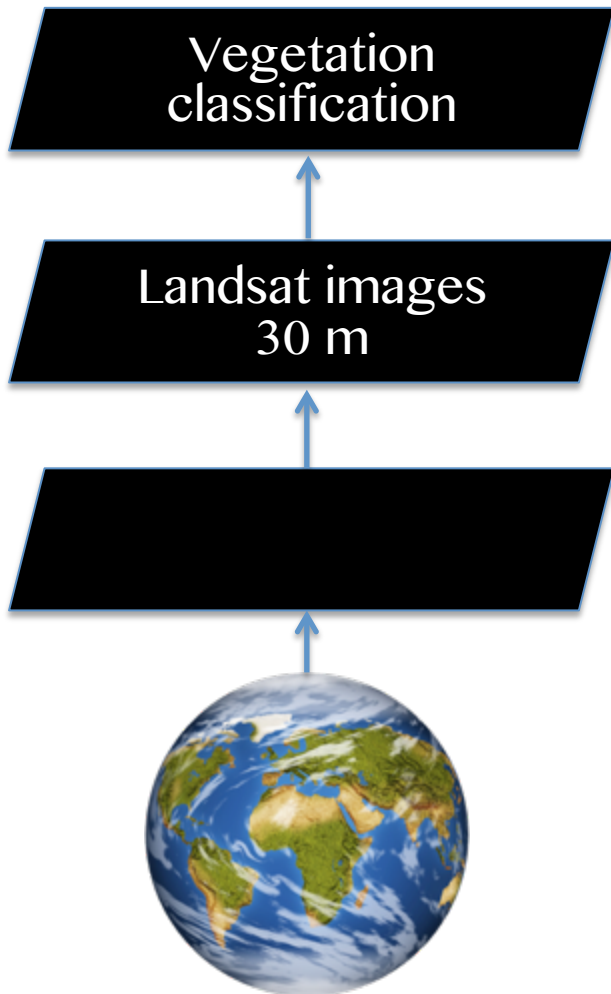
Mathew Plummer

# Research at three spatial scales

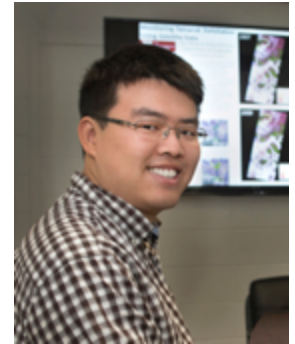


- Explanatory variables of conversion
  - Topographic
    - Elevation
    - Slope
    - Aspect
    - Distance from road
    - Distance from coast
    - Potential solar radiation at summer solstice, equinox, winter solstice
  - Climactic
    - Average maximum August temperature
    - Average minimum January temperature
    - Average annual precipitation
  - Fire
    - Number of fire
    - Minimum fire interval: 2-5 yr., 6-10 yr., 11-20 yr
- Random Forest Analysis coded in R
- Ventura and Los Angeles counties

# Research at three spatial scales

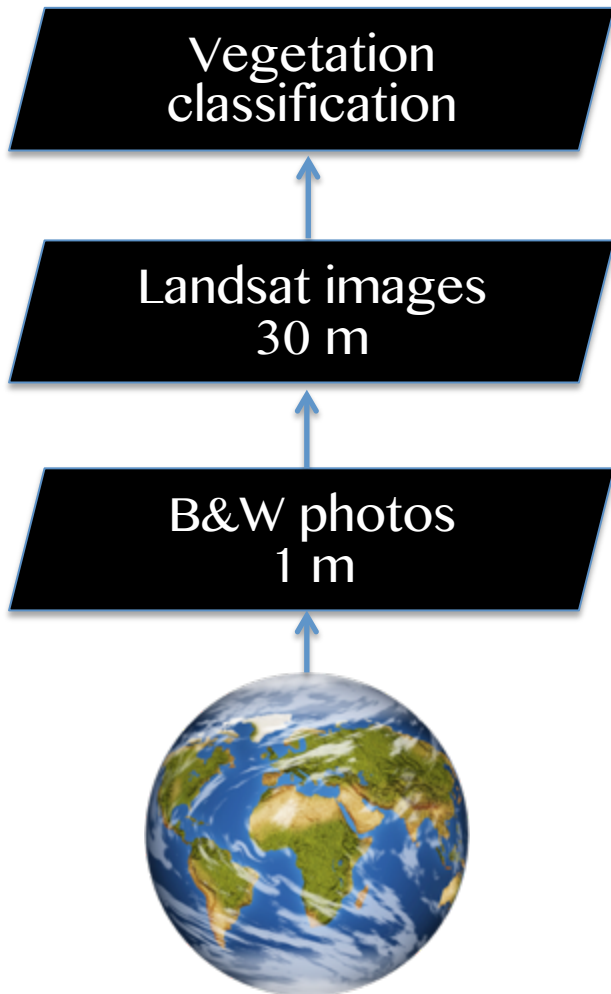


- 1985 Landsat (30 m)
- 2010 Landsat (30 m)
- Compared “vegetation recovery”
- Short fire interval:  $\leq 7$  years
- San Luis Obispo to San Diego county



Ran Meng

# Research at three spatial scales



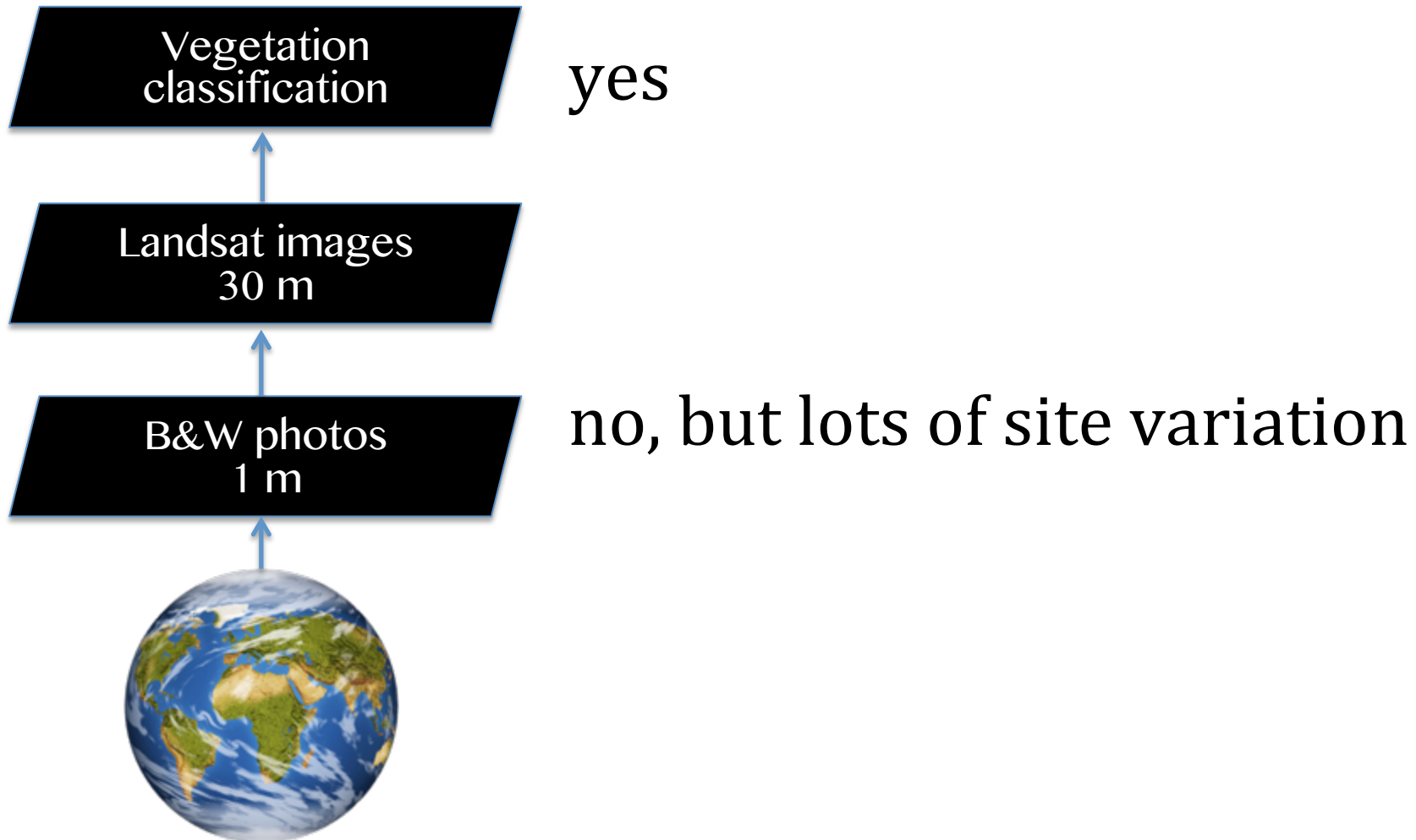
Stephanie Ma

- 1956-2003 **aerial photographs** (1 m)
- Compared visual change in cover
  - once burn
  - twice burn
- Short fire interval:  $\leq 5$  years
- Ventura and Los Angeles counties

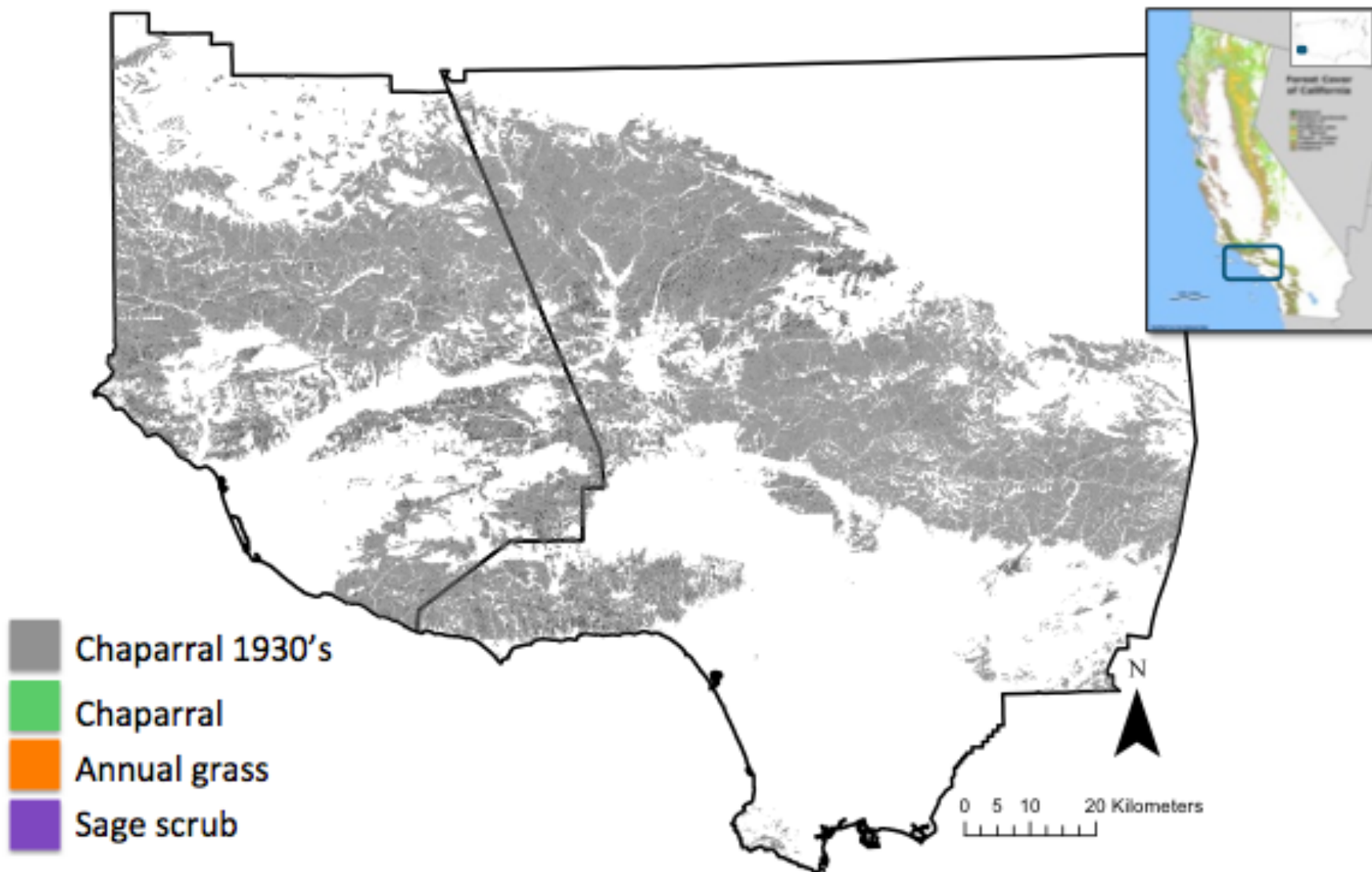
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# 1. Is chaparral conversion occurring?

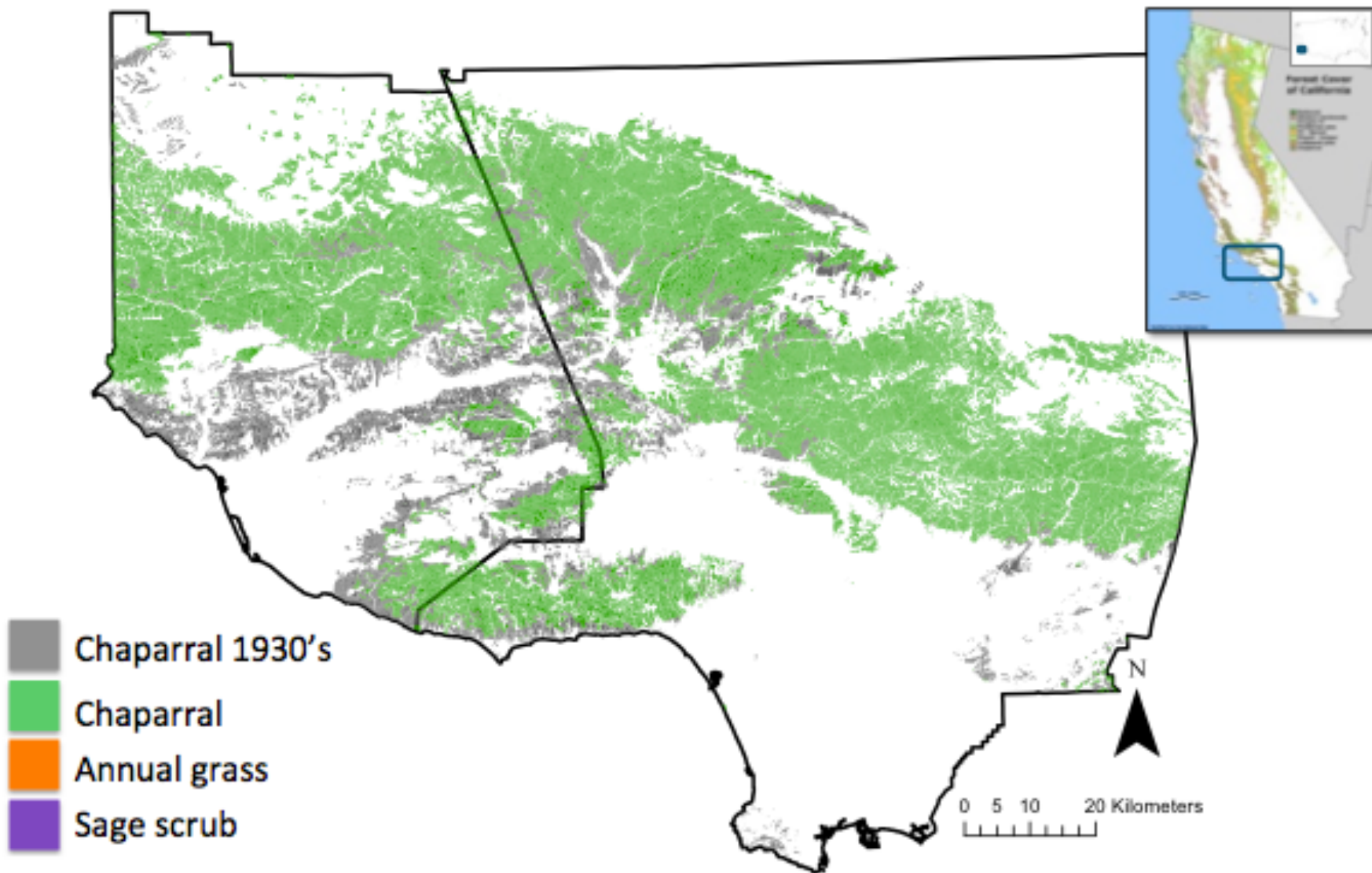


# Chaparral over time: 1930's to 2001

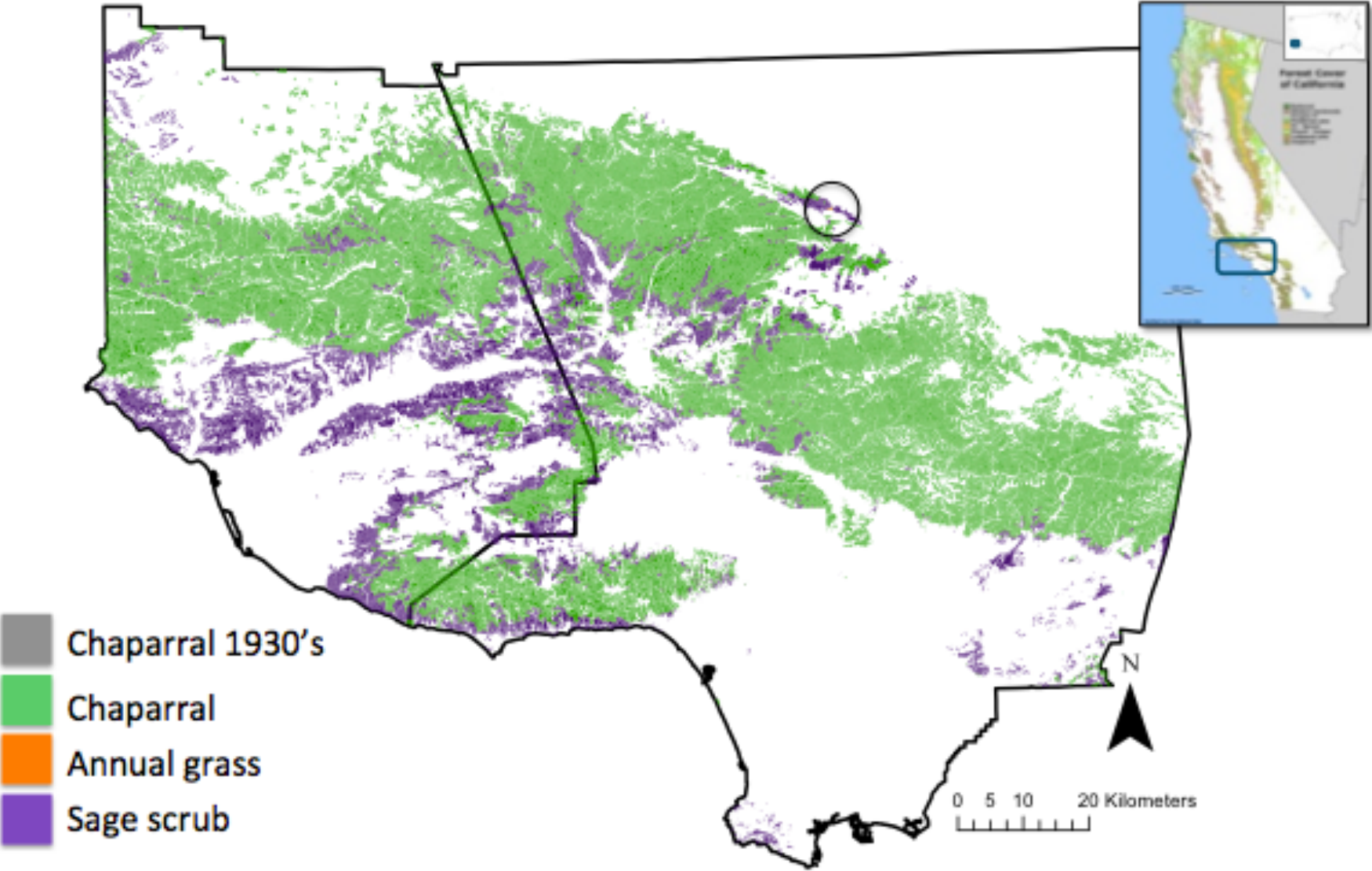




# Chaparral over time: 1930's to 2001



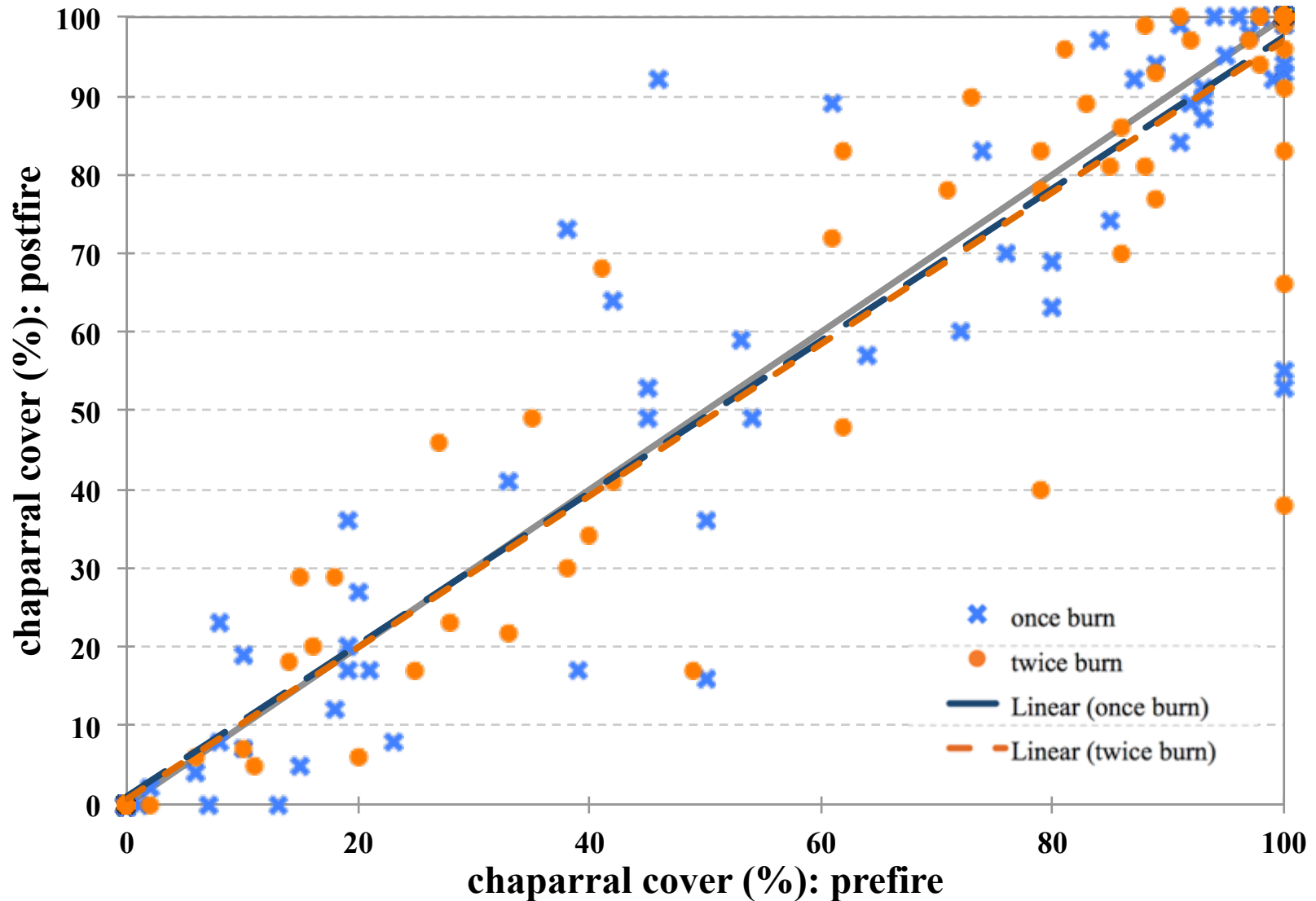
# Chaparral over time: 1930's to 2001



# Chaparral Conversion: 1930's to 2001

Vegetation classification in 2001	Total Area (km <sup>2</sup> )	Proportion of total area (%)
Grassland	16.4	1.6
Sage Scrub	165.3	16.1
Chaparral	762.8	74.3
Other	72.9	7.1
Sum	1,026.7	99.1

# Chaparral recovery and site variability



# Research questions

1. Is chaparral conversion occurring?  
→ sometimes, depends on location and scale
2. Is chap. conversion driven by short interval fire?
3. What are the predictive variables of chaparral conversion?

## 2. Is chaparral conversion driven by short interval fire?

Vegetation  
classification

yes, significant variable

Landsat images  
30 m

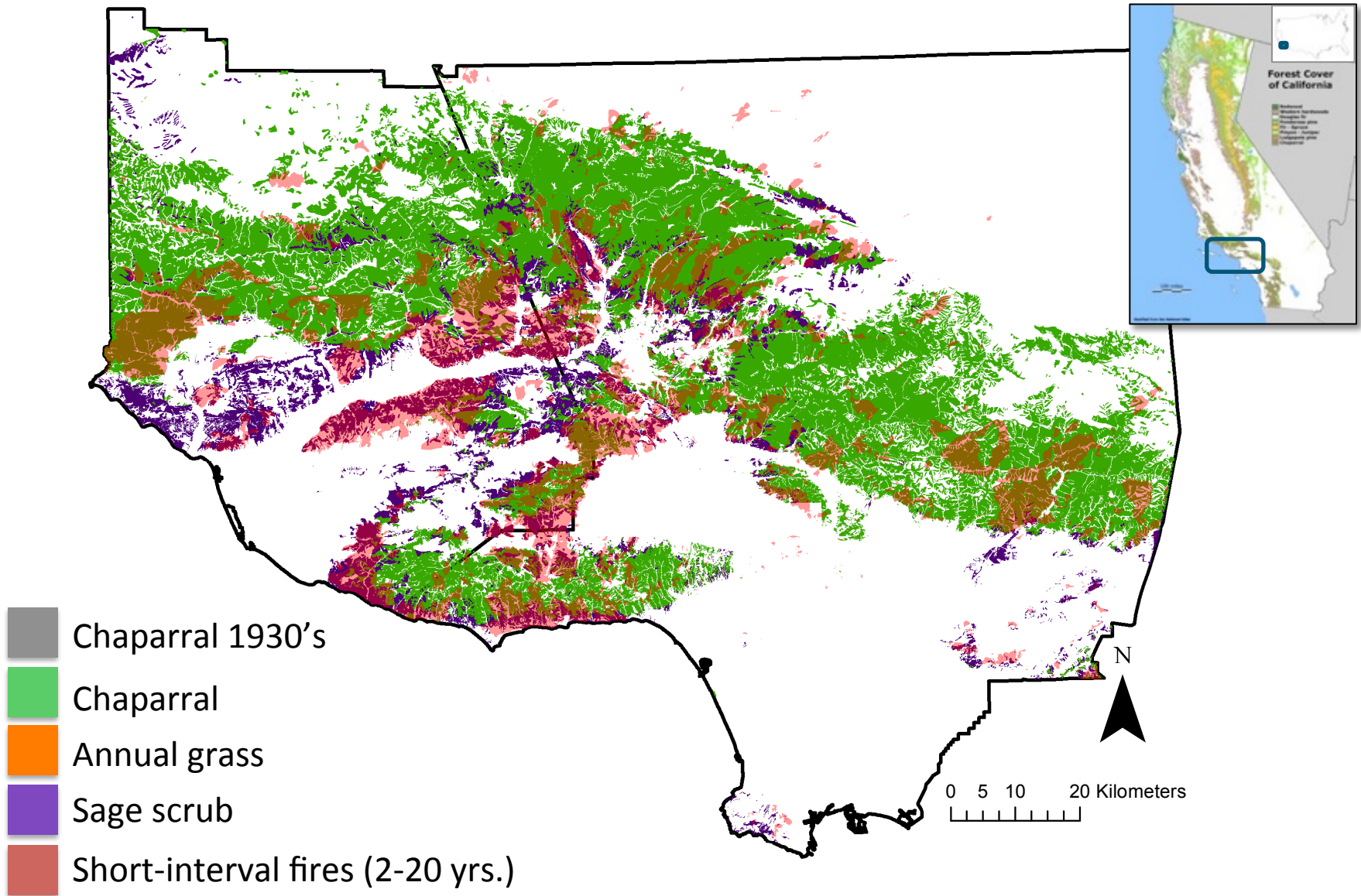
no correlation with fire interval

B&W photos  
1 m

no correlation with fire interval



# Chaparral over time: 1930's to 2001

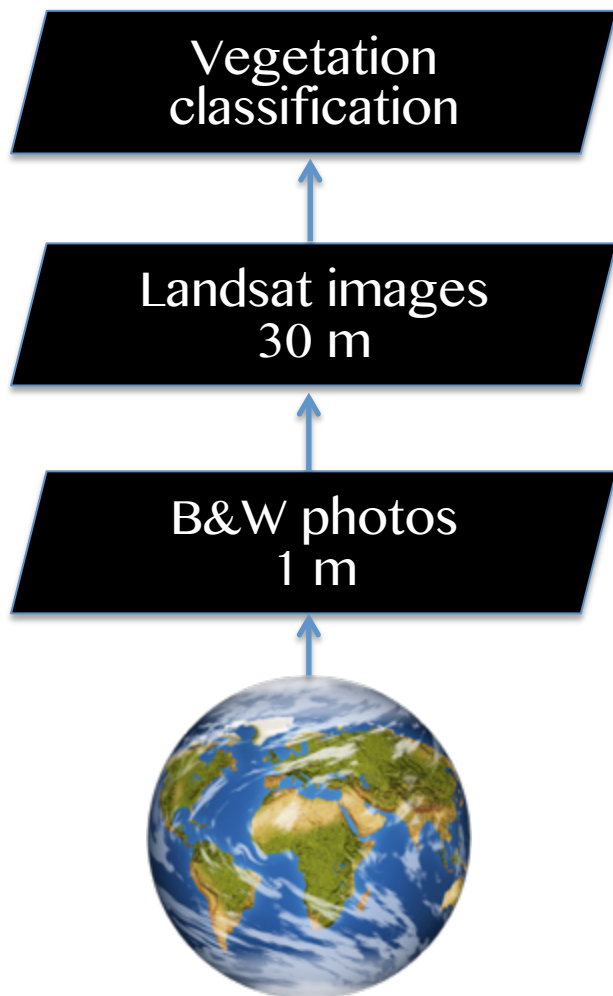


# Chaparral Conversion: 1930's to 2001

Vegetation class. in 2001	Shortest Fire Interval							
	2-5 yrs.		6-10 yrs.		11-20 yrs.		>20 yrs.	
	Area (km <sup>2</sup> )	% Area	Area (km <sup>2</sup> )	% Area	Area (km <sup>2</sup> )	% Area	Area (km <sup>2</sup> )	% Area
Grassland	6.3	2.7	3.5	2.4	7.2	3.4	8.5	1.9
Sage Scrub	36.3	15.6	31.5	21.9	43.5	20.5	53.8	12.3
Chaparral	175.6	75.5	93.9	65.2	144.6	68.2	349.0	79.6
Other	14.2	6.1	15.1	10.5	16.7	7.9	27.0	6.2
Sum	232.4	99.9	144.0	100	212.0	100	438.3	100



## 2. Is chaparral conversion driven by short interval fire?

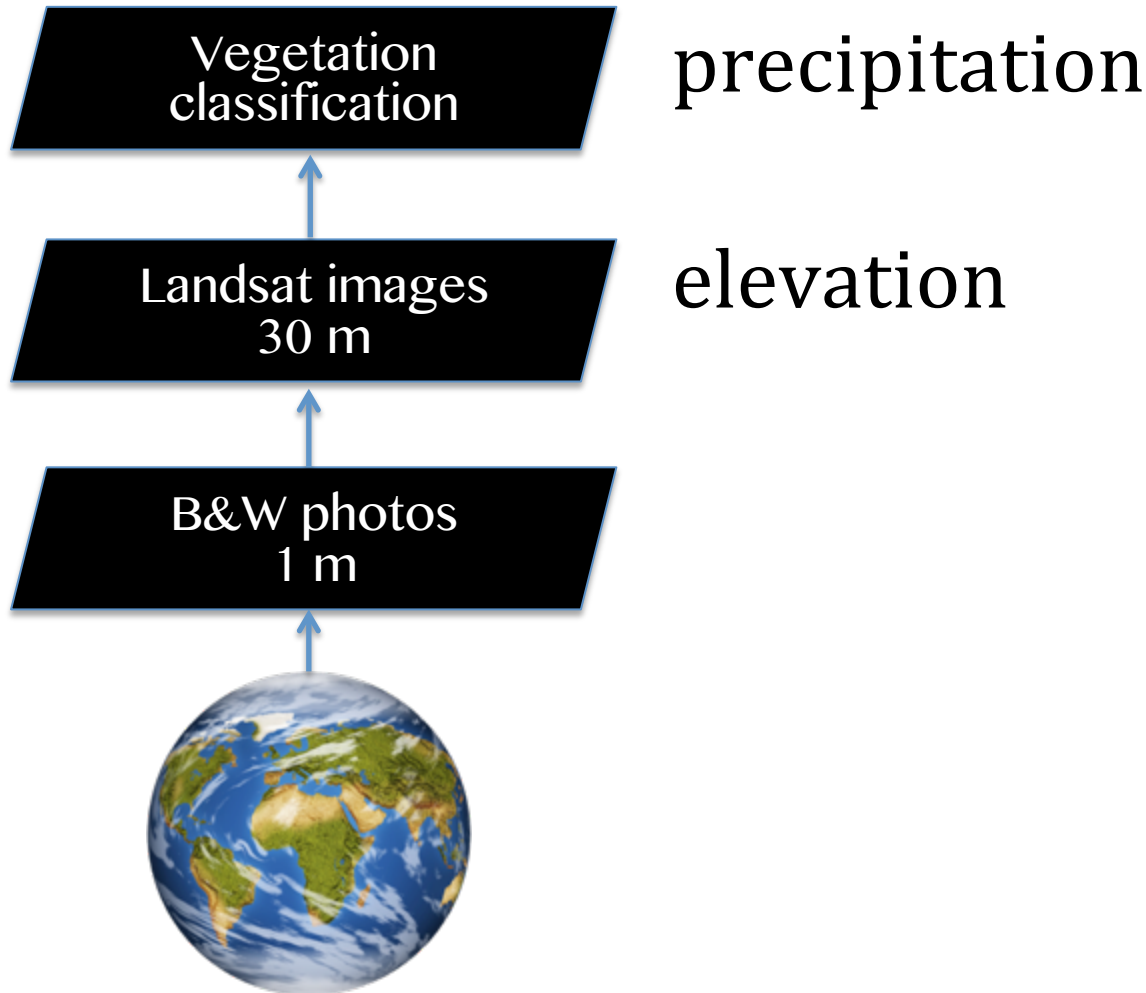


Predictive Variable	C → SSG	C → C
Min. Fire. Int. (yrs.)	17.3*	21.3
Num. of fires (#)	2.6*	2.3
Elevation (m)	650*	837
Precipitation (inch)	588*	665
Avg. max. Aug. temp (C)	32.4*	31.6
Avg. min. Jan. temp (C)	6.2*	5.3
Distance from coast (m)	38,609*	41,703
Distance from road (m)	2,575*	3,543

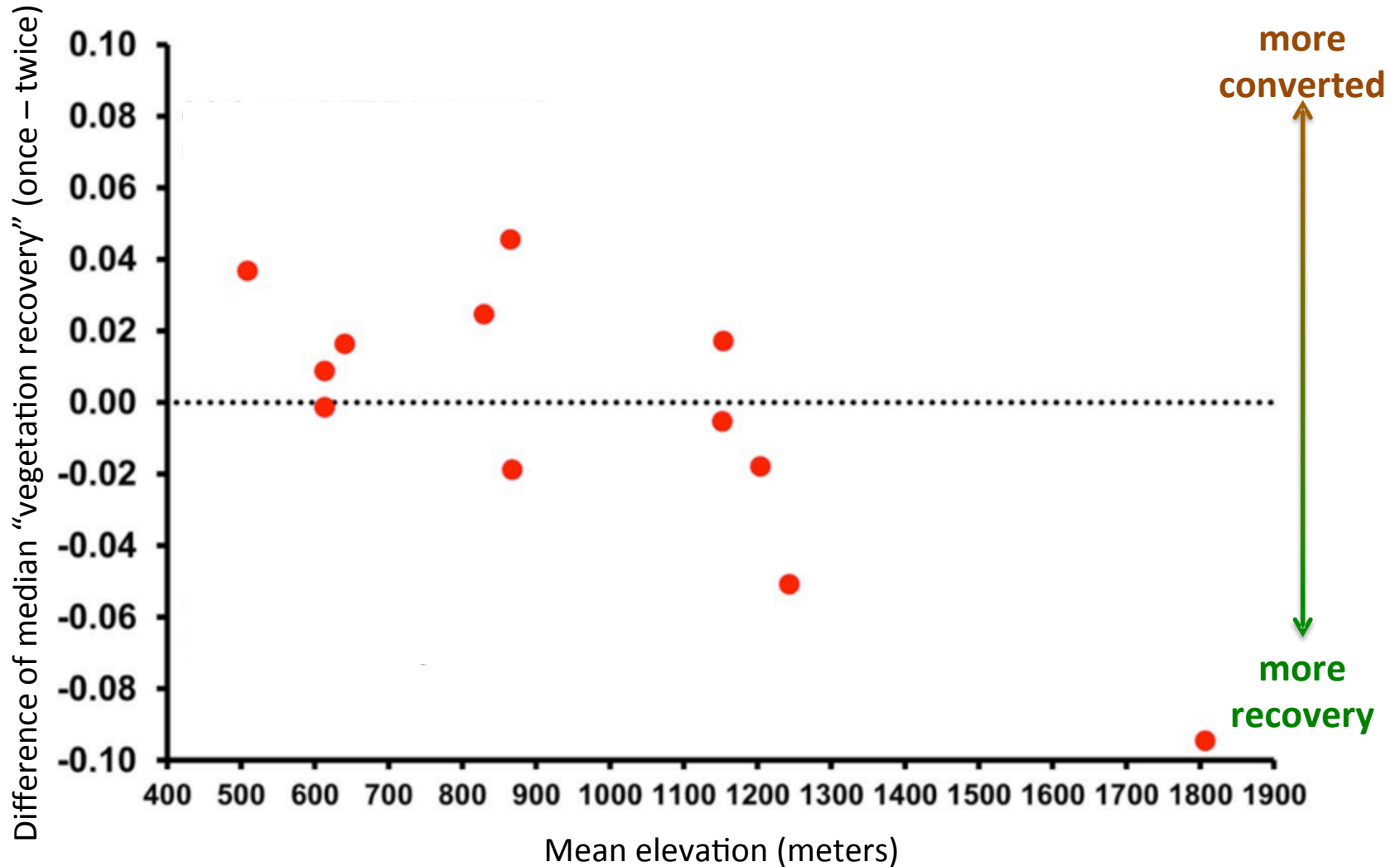
# Research questions

1. Is chaparral conversion occurring?  
→ sometimes, depends on location and scale
2. Is chap. conversion driven by short interval fire?  
→ maybe, one of many significant factors
3. What are the predictive variables of chaparral conversion?

### 3. What are the predictive variables of chaparral conversion?

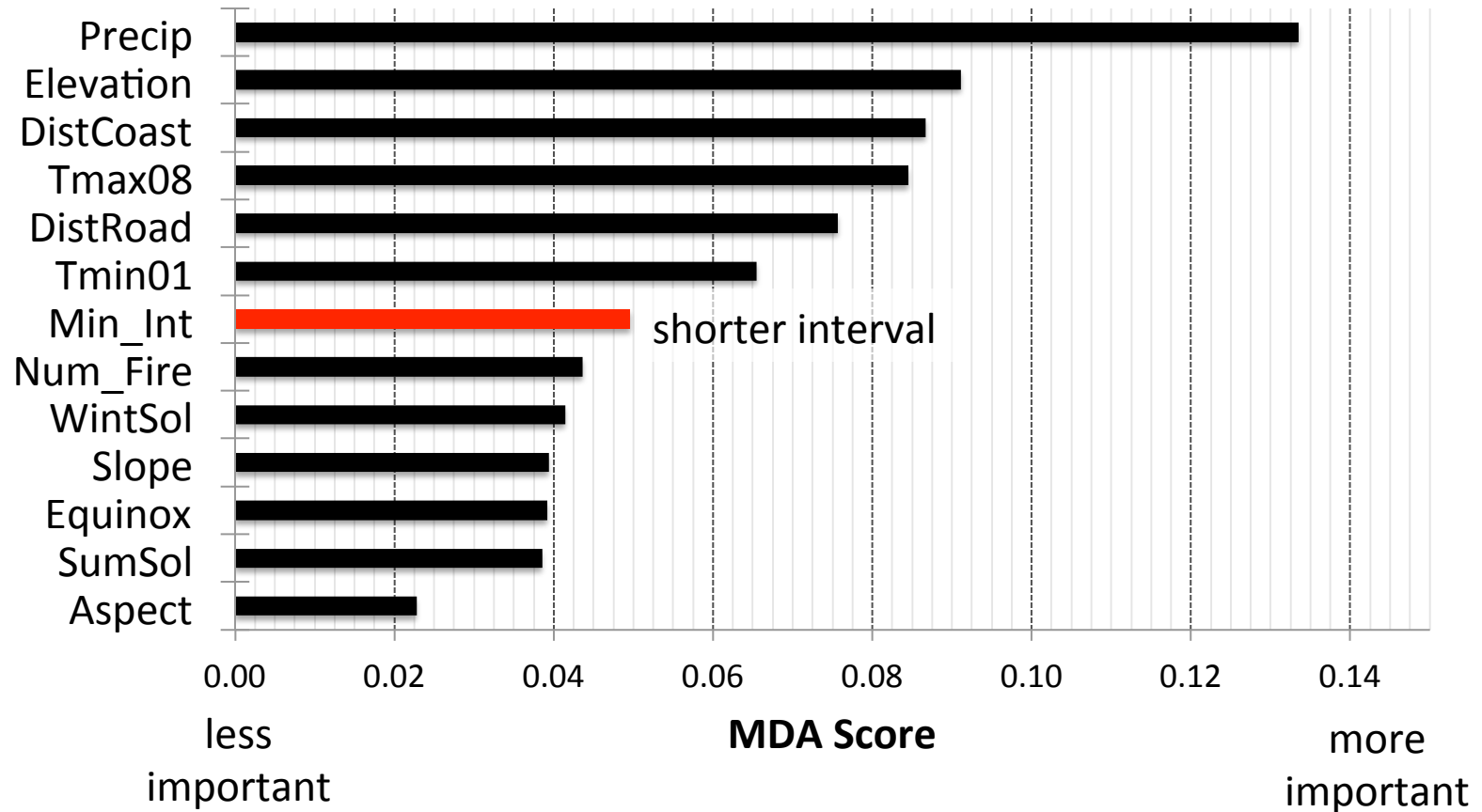


# Chaparral conversion by elevation



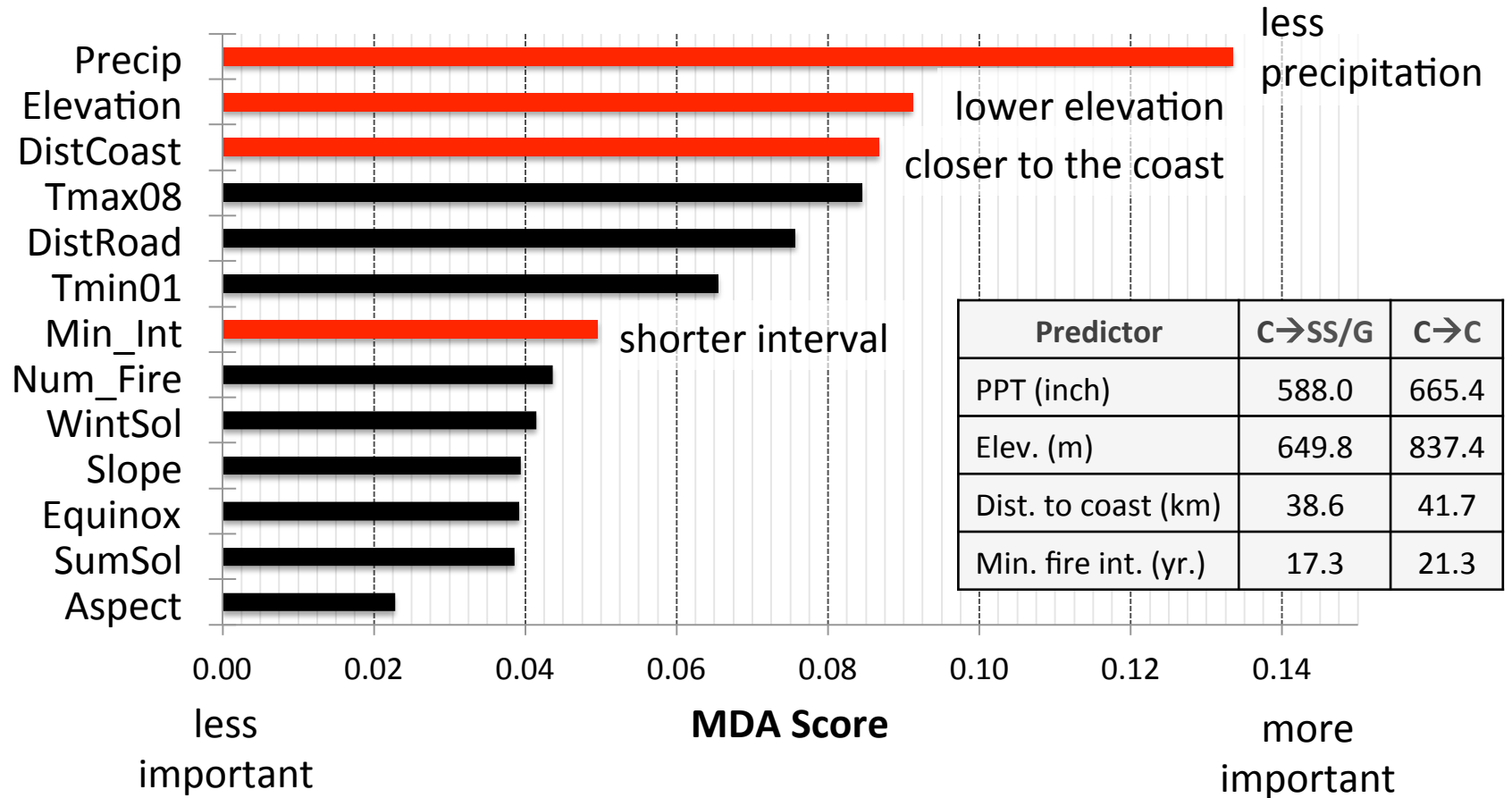
# Chaparral conversion predictors

## Chaparral-SageScrub/Grass Variable Importance



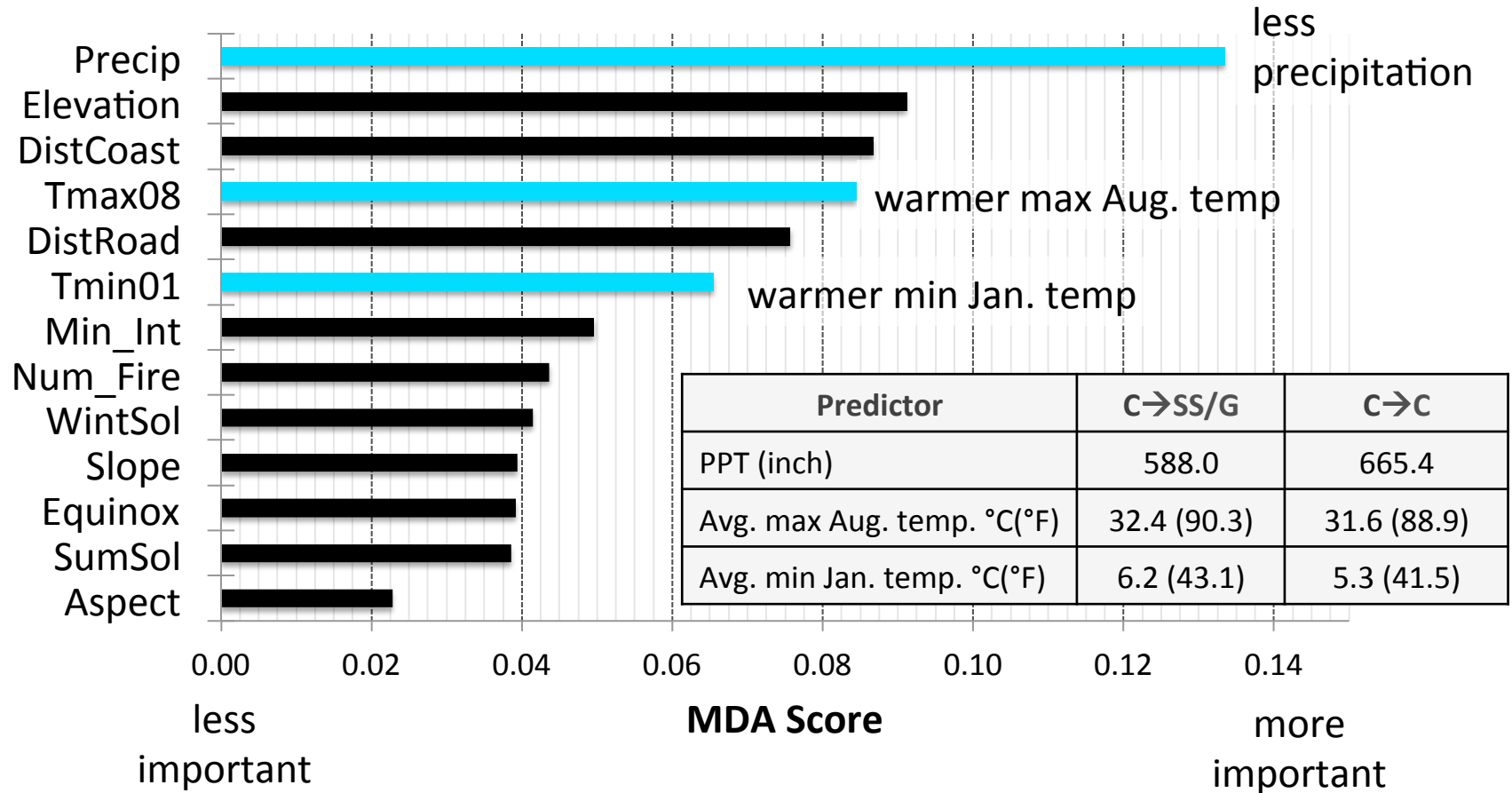
# Chaparral conversion predictors

## Chaparral-SageScrub/Grass Variable Importance



# Chaparral conversion predictors

**Chaparral-SageScrub/Grass Variable Importance**



# Research questions

1. Is chaparral conversion occurring?
  - sometimes, depends on location and scale
2. Is chap. conversion driven by short interval fire?
  - maybe, one of many significant factors
3. What are the predictive variables of chaparral conversion?
  - less precipitation, lower elevation, closer to the coast



# Summary of research questions

1. Chaparral conversion does occur, but it's variable.
2. Chaparral conversion is driven by many topographic, climatic, and fire related factors.
3. Chaparral conversion is driven most strongly by precipitation, elevation, and distance to the coast.

# Summary of most at risk shrublands

- Locations likely to convert in future:

- less precipitation
- lower elevation
- closer to the coast

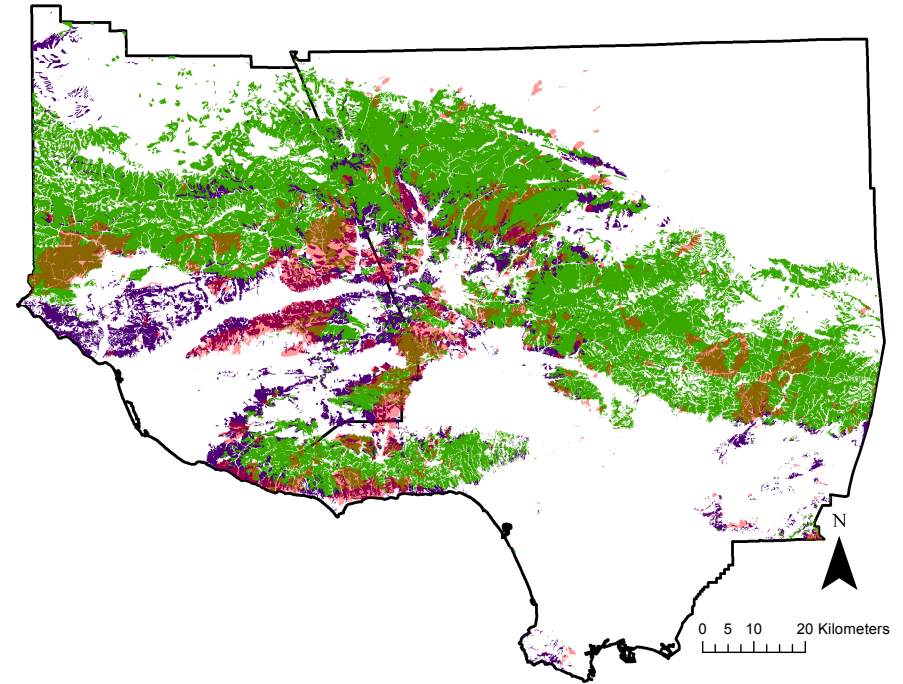
Where humans are!

- Future conversion likely to increase with drier conditions and warmer temperatures

Climate Change

# Summary of most at risk shrublands

- Locations likely to convert in future:
  - less precipitation
  - lower elevation
  - closer to the coast
- Future conversion predicted to increase with drier conditions and warmer temps



**Thank you!**

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