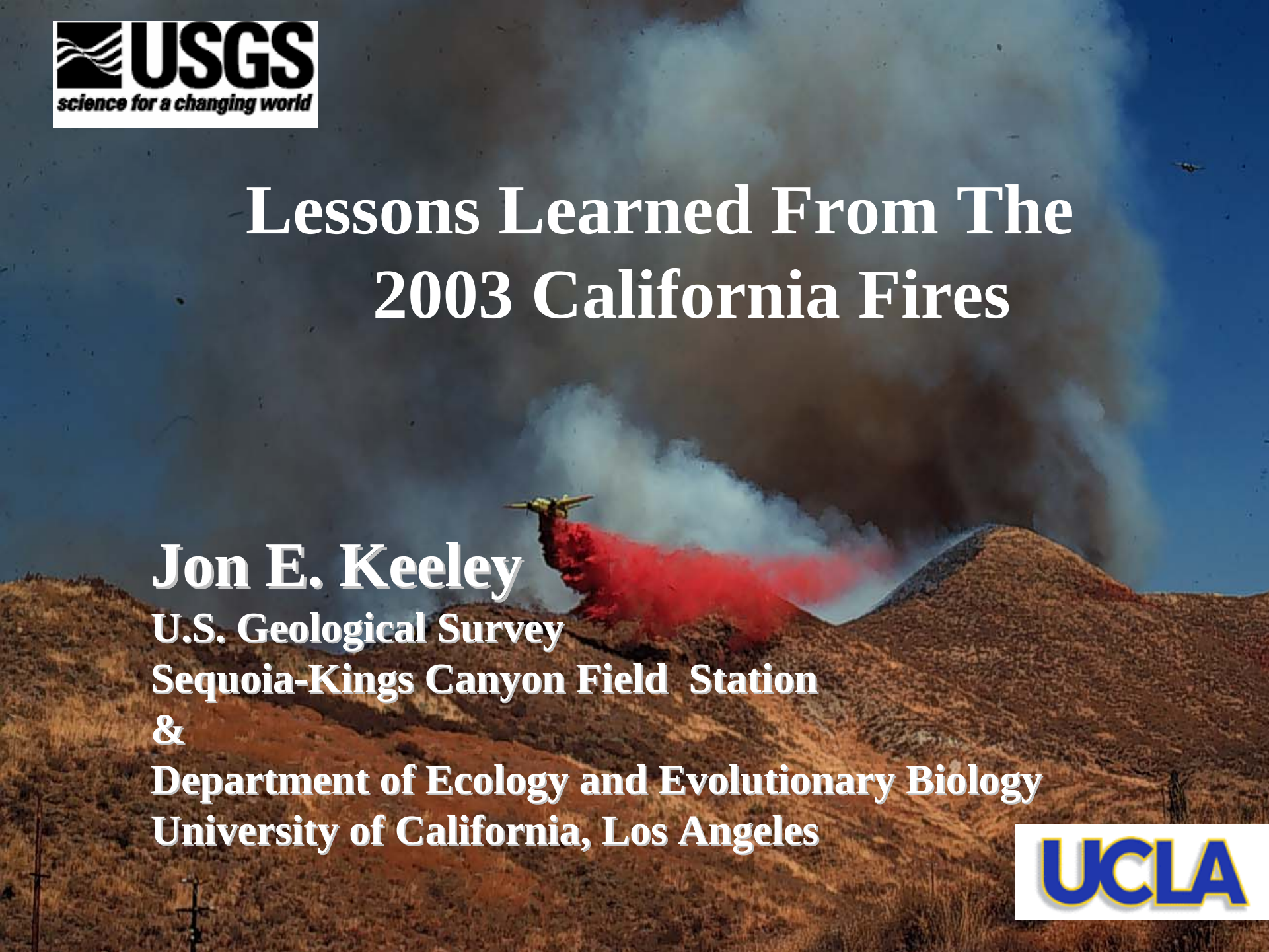

Lessons Learned From The 2003 California Fires

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Understanding Human/Fire Interactions

1. Human impacts often have opposing effects,
   e.g., humans perturb natural ecosystems by suppressing fires and by igniting fires

2. A one-size-fits-all model of how humans affect natural ecosystems is inappropriate,
   e.g., human impacts are often different in forests vs shrublands

USGS

Photo by Eric Knapp

Fire Suppression in Forests & Shrublands

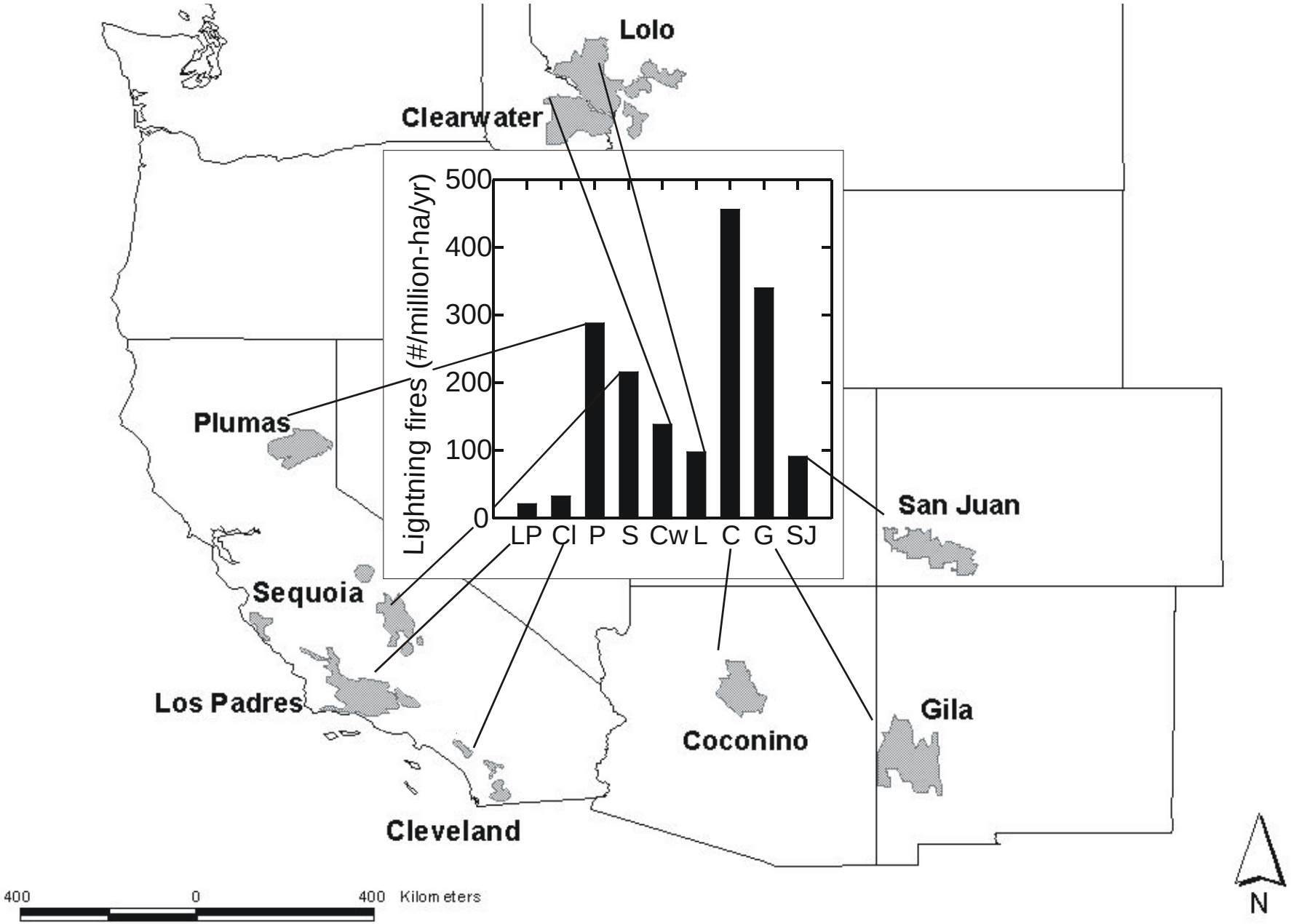
In forests fire suppression has been highly successful

Thus, Fire Suppression Policy = Fire Exclusion

In shrublands, fire suppression has been unable to eliminate fire

Thus, Fire Suppression ≠ Fire Exclusion

Natural Lightning-ignited Fires in the Western U.S.



Natural forest fires are usually low intensity surface fires

Example of Fire History Chronology

Ponderosa Pine-Mixed Conifer Forest

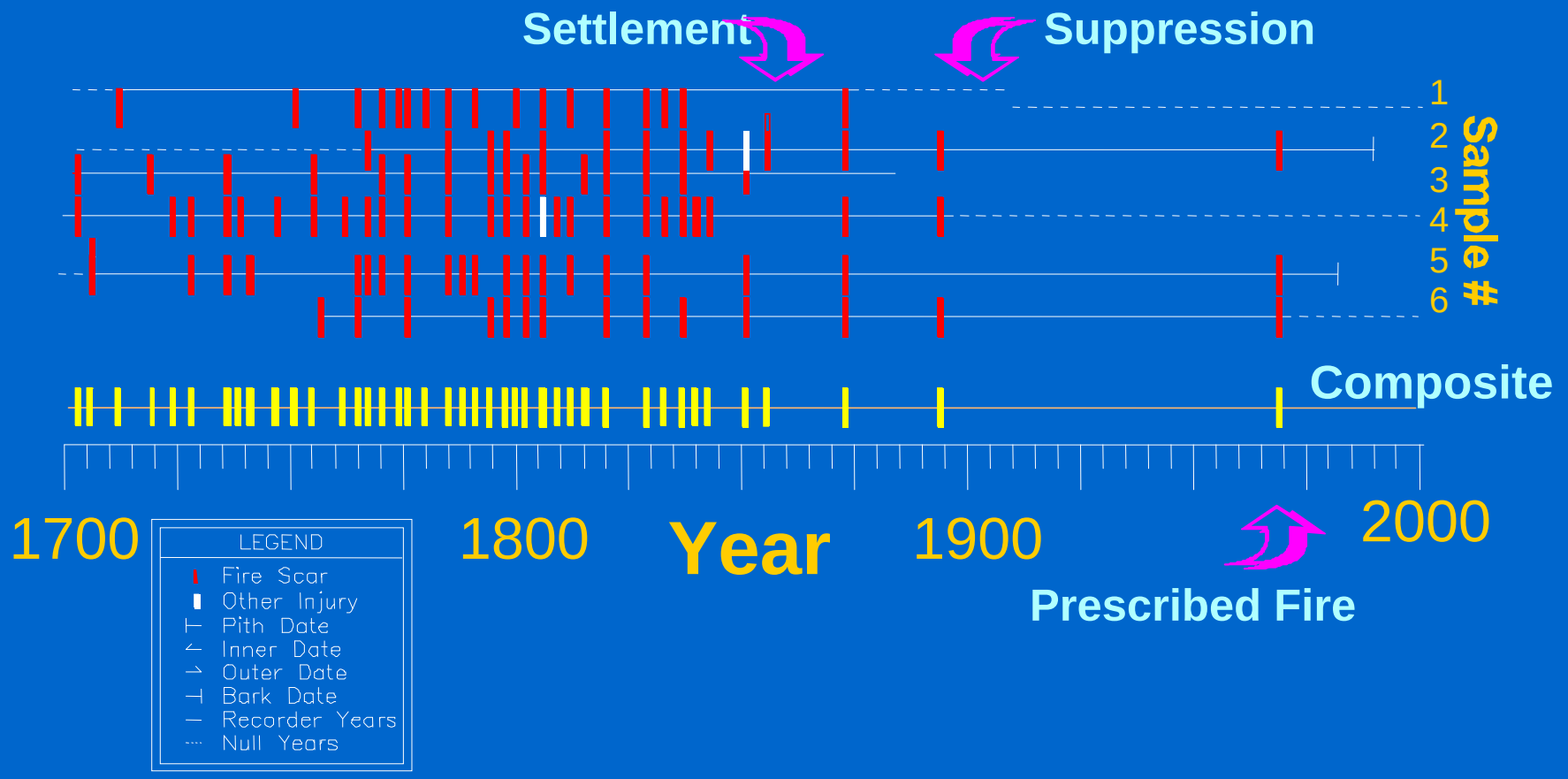


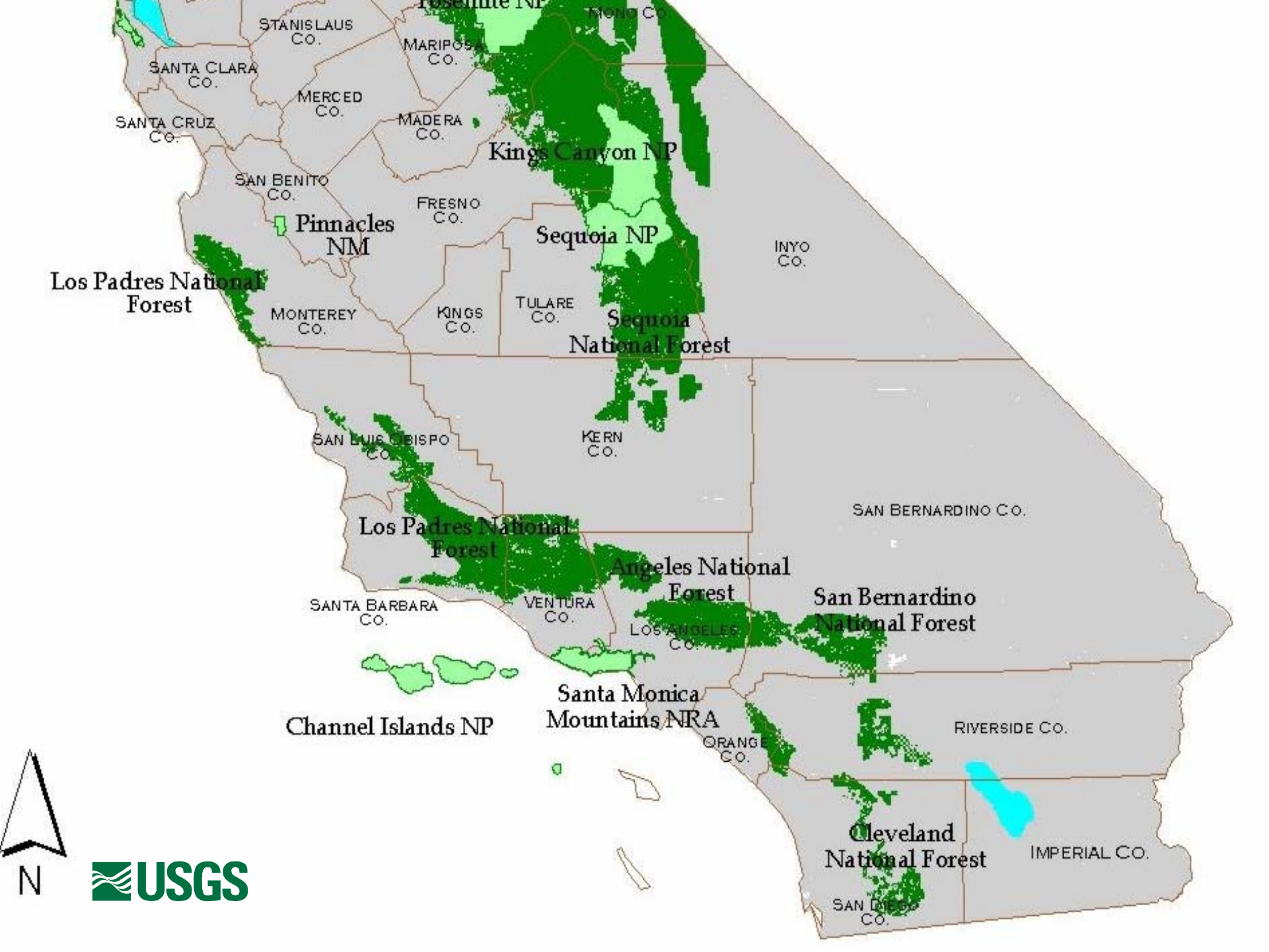
Image by Tony Caprio

Consequences of Fire Exclusion in Forests

- Increased surface fuels
- Increased in-growth = ladder fuels
- Increased fire hazard for humans

Pine dominated forests In the Western United States have experienced a century of very few fires and as a result there is an unnatural accumulation of fuels that greatly increase the hazard for destructive wildfires

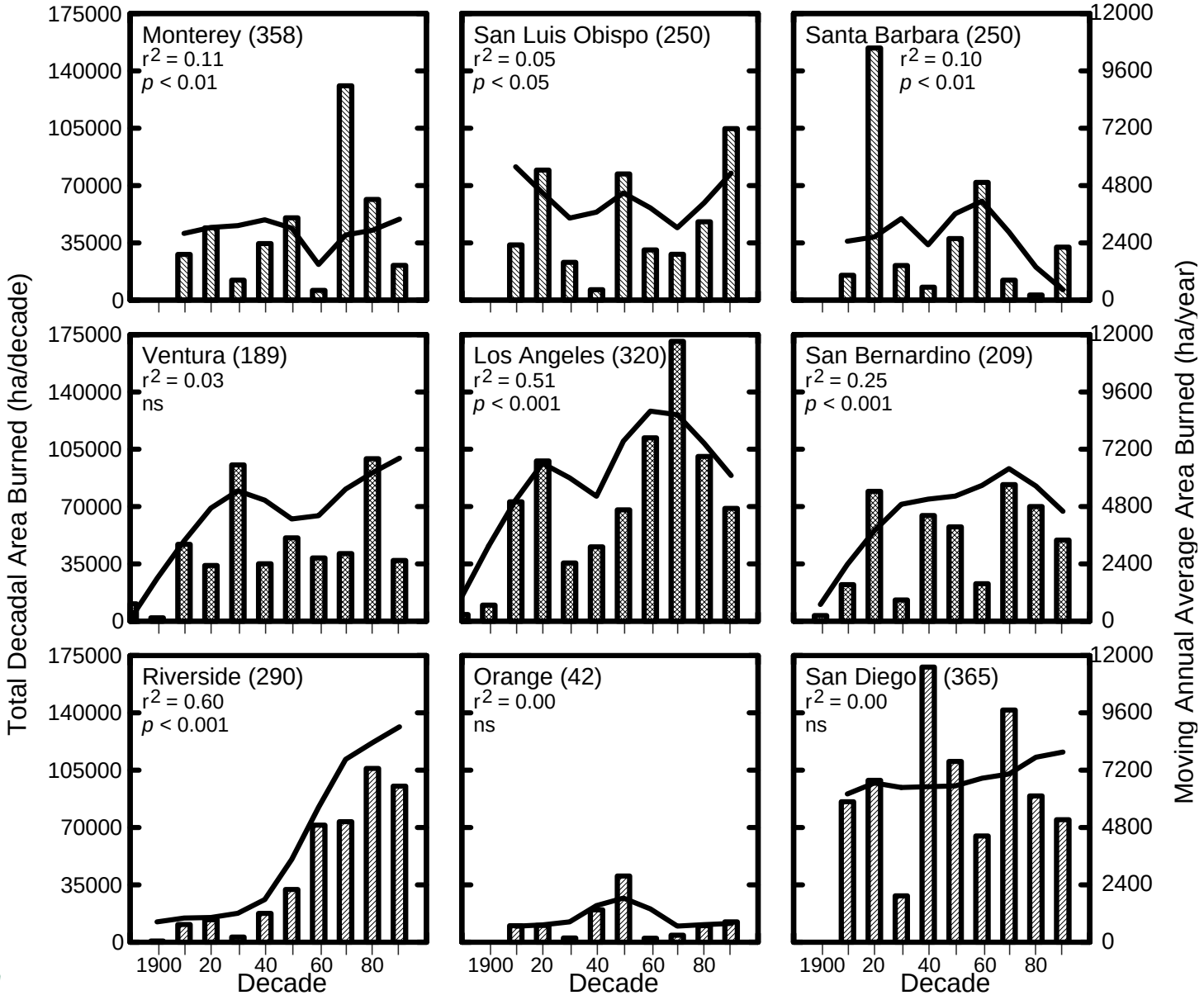
Fire management policy is presently focused on attempting to prevent these fires using pre-fire fuel manipulations, either with mechanical thinning of forests or restoring the natural role of fire


STANISLAUS CO.
MARIPOSA CO.
SANTA CLARA CO.
MERCED CO.
SANTA CRUZ CO.
MADERA CO.
Kings Canyon NP
SAN BENITO CO.
FRESNO CO.
Pinnacles NM
Sequoia NP
INYO CO.
Los Padres National Forest
MONTEREY CO.
KINGS CO.
TULARE CO.
Sequoia National Forest
KERN CO.
SAN LUIS OBISPO CO.
SAN BERNARDINO CO.
Los Padres National Forest
Angeles National Forest
San Bernardino National Forest
SANTA BARBARA CO.
VENTURA CO.
LOS ANGELES CO.
Santa Monica Mountains NRA
Channel Islands NP
RIVERSIDE CO.
ORANGE CO.
Cleveland National Forest
IMPERIAL CO.
SAN DIEGO CO.
N
USGS

In coastal California, the situation is very different than most of the forested parts of the Western U.S.

The landscape is dominated by dense shrublands

Fire suppression policy has been unable to exclude fires



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Fire suppression has not excluded fires

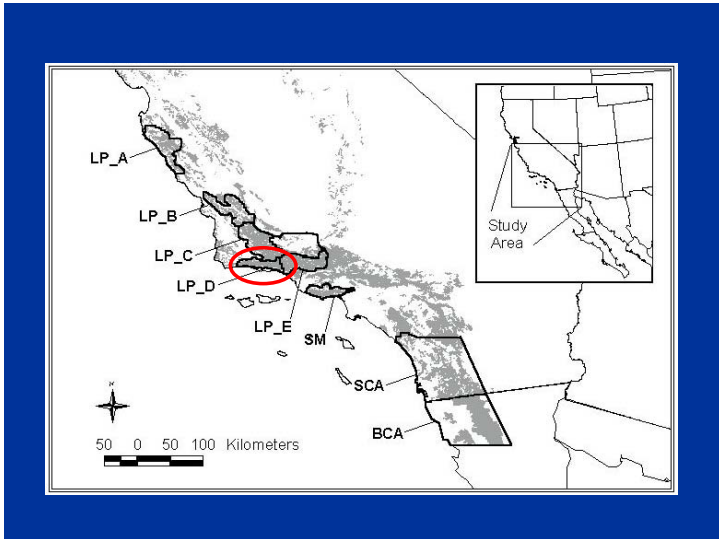
Therefore there has not been an unnatural accumulation of fuels

Studies of fire hazard versus age of vegetation since the last fire have shown that the probability of burning changes very little with age

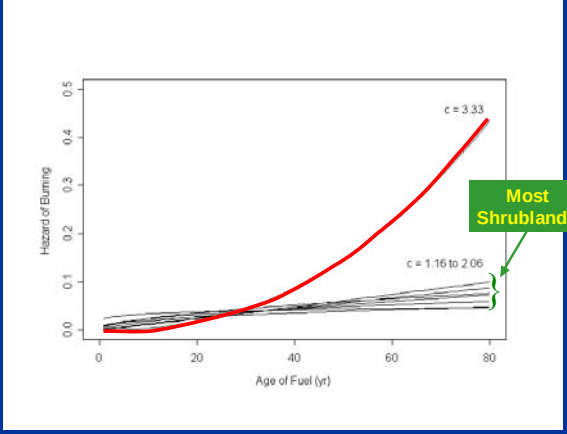
Conclusion: Using pre-fire fuel manipulations such as prescription burning hold little promise for reducing fire losses

Fire Hazard Analysis (Moritz et al (2004)

Fire hazard is not highly age dependent



Hazard vs. Age




All catastrophic fires are driven by high Santa Ana winds (100km / hr) that occur every autumn
Young (low) fuels can not stop them and they usually burn until they reach the ocean
NPS photo

Santa Monica Mtns. --- 12 largest fires 1925-2003

All occurred during autumn Santa Ana (foehn) winds

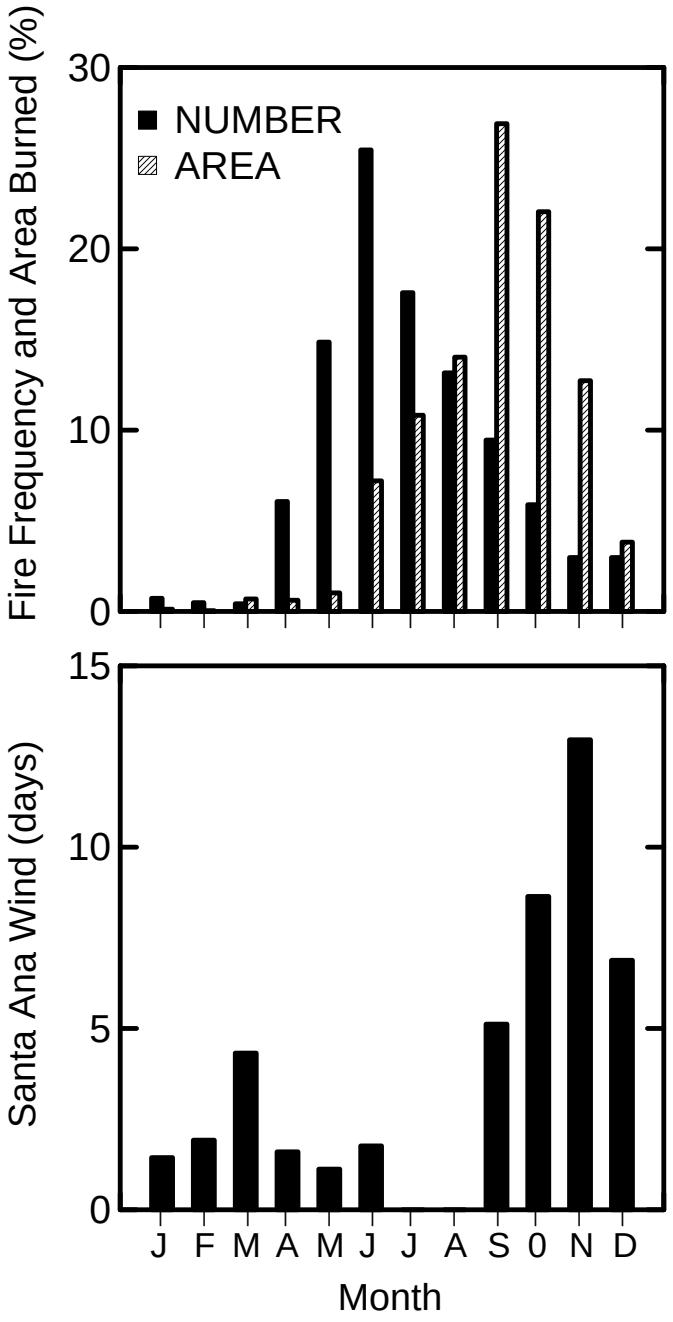
Year	Name	Area (acres)
1982 **October**	Dayton Canyon	43,043.1
1993 **October**	Green Meadow	38,478.8
1956 **December**	Sherwood/ Zuma	35,217.5
1970 **September**	Wright	28,195.4
1935 **October**	Malibu	28,191.9
1978 **October**	Kanan	25,565.3
1970 **September**	Clampitt	24,650.4
1967 **October**	Devonshire-Parker	23,005.3
1949 **October**	Simi Hills	20,573.0
1930 **November**	Potrero No. 42	20,391.5
1958 **December**	(name unknown)	18,115.8
1993 **November**	Old Topanga Fire	16,462.5

(Data from Dr. Marti Witter, NPS)

Most fires occur in summer

But most area burned occurs in autumn

Autumn is also the time of Santa Ana winds



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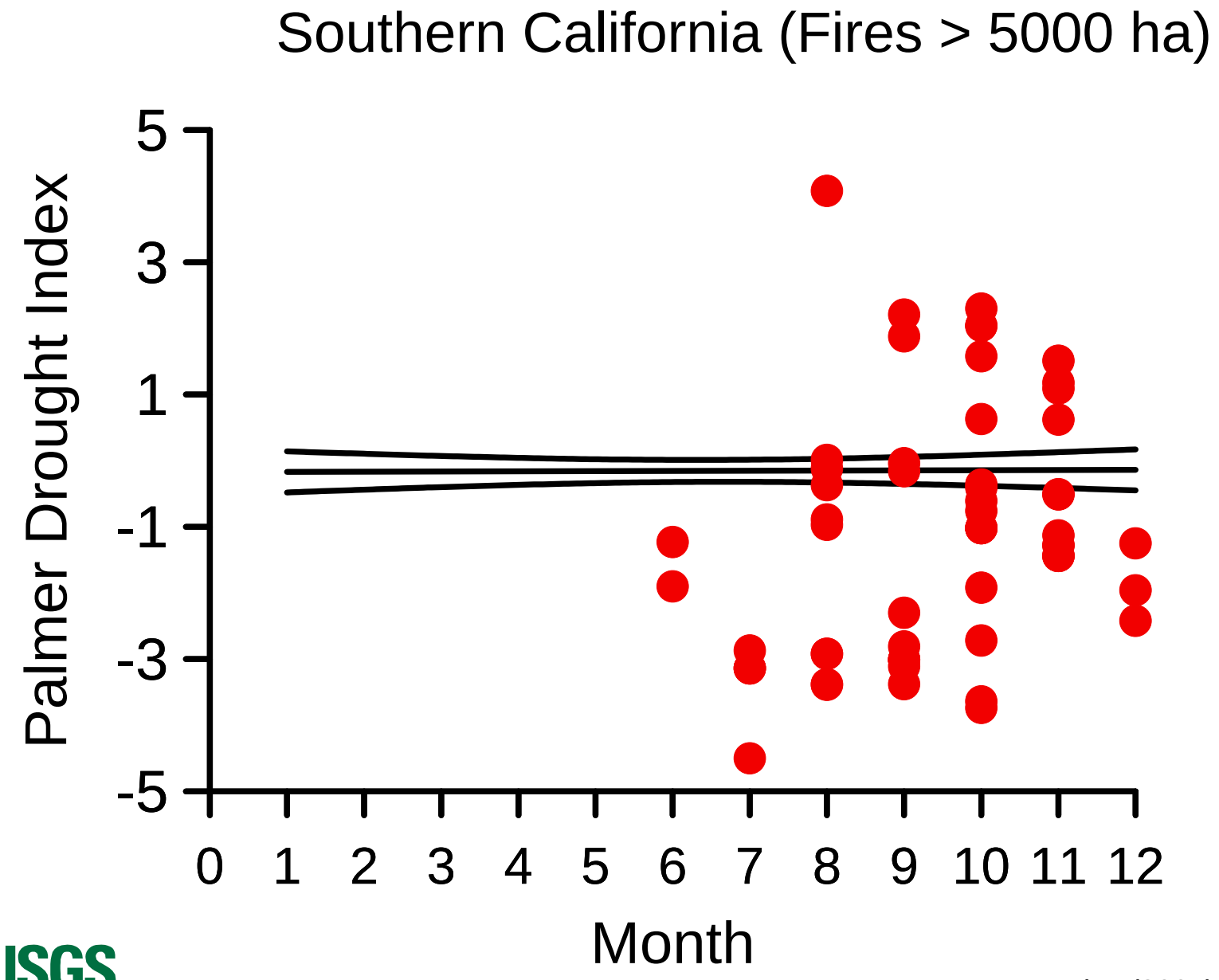


USGS

Keeley (2004)

California shrubland wildfires are among the most destructive of all U.S. wildfires

Since 1970, 12 of the nation's 15 most destructive Wildfires have occurred in California, costing the Insurance industry $4.8 billion.

The most recent example was in October 2003: 342,000 hectares burned in southern California destroying over 3,300 homes and killing 26 people only 5% of the area burned was in forests, the vast majority of burning occurred in dense shrublands

California During The 20th Century

Every decade has been followed by a decade of increased fire suppression expenditures

But, every decade has also experienced increased losses of property and lives

Why?

Key Lessons

#1: Massive fires occurred in the past and likely will occur in the future

#2: Past fire management practices have not been effective at preventing these fires

#3: New approaches are needed that include fire managers, land planning and the public

Lessons Learned # 1

Although the 2003 fires were massive, their size was not unprecedented, below is news-paper account of ~500,000 ha fire from 1889

Telegraph Sep 27, 1889
The Los Angeles Times

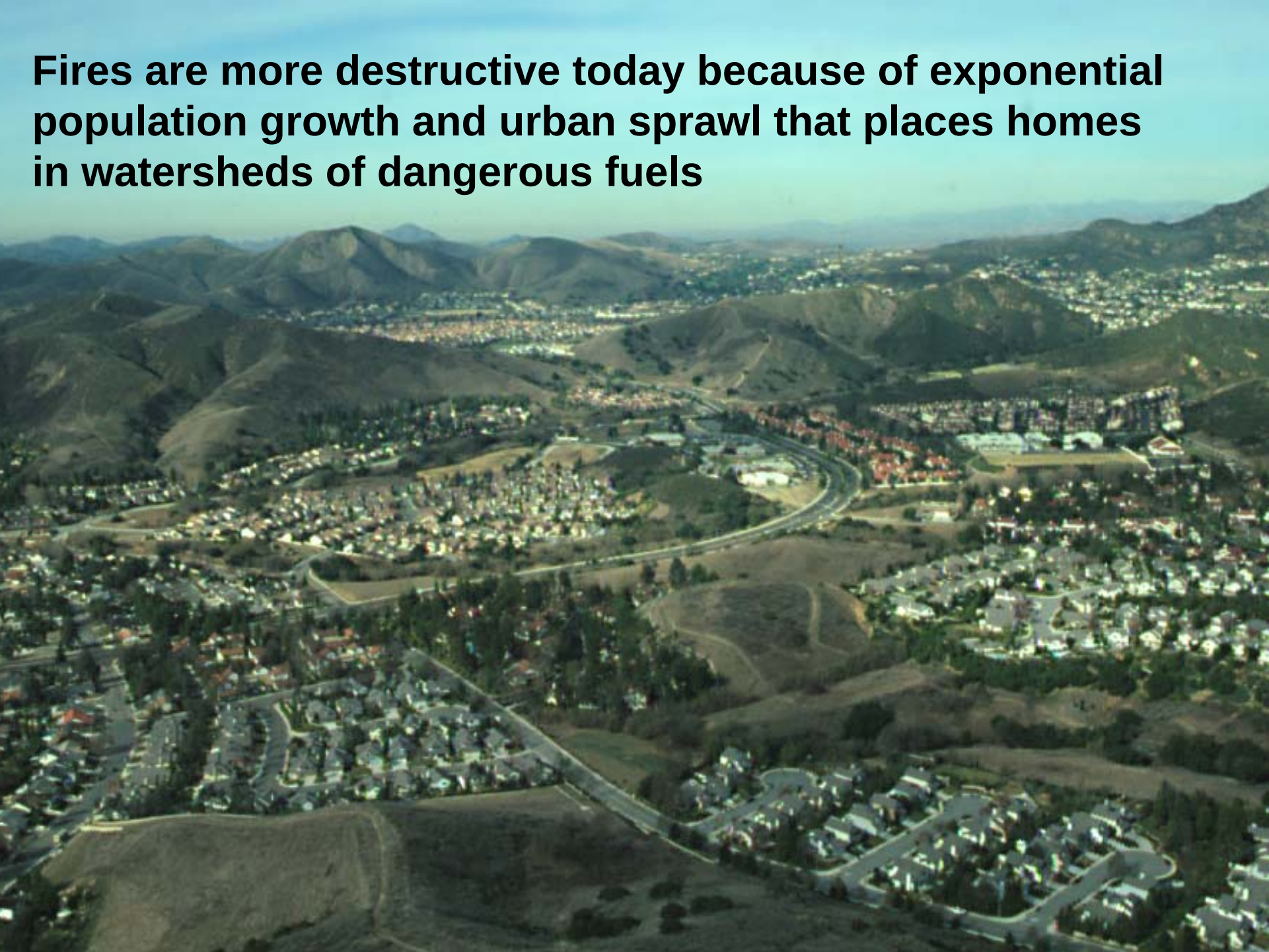
AROUND SANTA ANA.

SANTA ANA, Sept. 26.—The fire which has been burning for the past two days still continues in the cañons. The burned and burning district now extends over one hundred miles from north to south, and is 10 to 18 miles in width. Over $100,000 worth of pasturage and timber has been destroyed.

IN SANTA BARBARA COUNTY.

SANTA BARBARA, Sept. 26.—In the upper part of Santa Barbara county it is estimated that $200,000 worth of property, including timber and feed, has been destroyed during the past week.

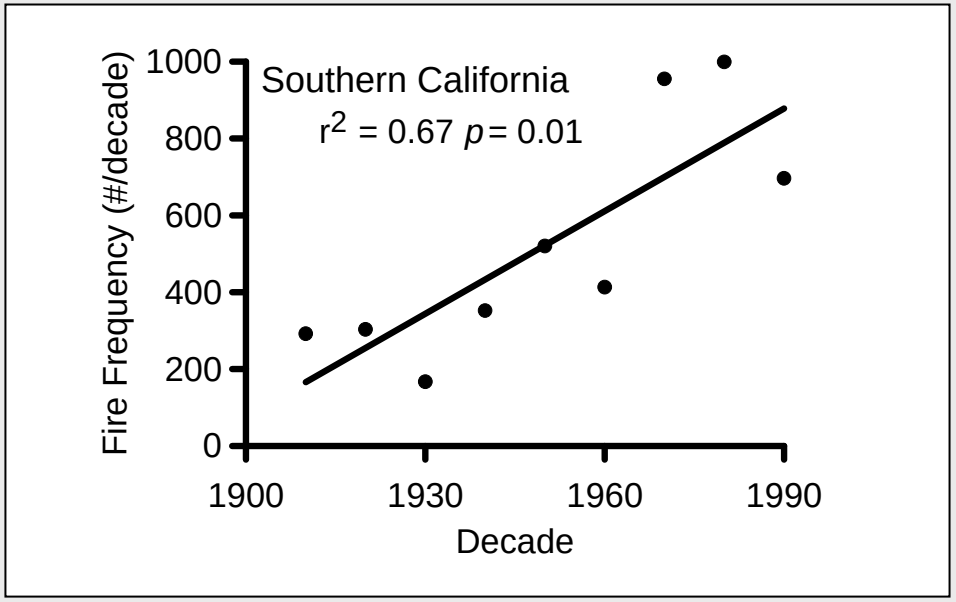
Fires are more destructive today because of exponential population growth and urban sprawl that places homes in watersheds of dangerous fuels



Key Lesson #1 Conclusions:

Massive fires occurred in the past and likely will occur in the future

Nearly all fires are started by people and populations continue to grow, as do number of fires, thus a future catastrophic fires may be more common



Lessons Learned #2

Fire management policy is not effective at preventing these massive fires.

Two theories why:

i. **Limited commitment to fuel treatments, particularly lack of funding and air quality restrictions for prescription burning**

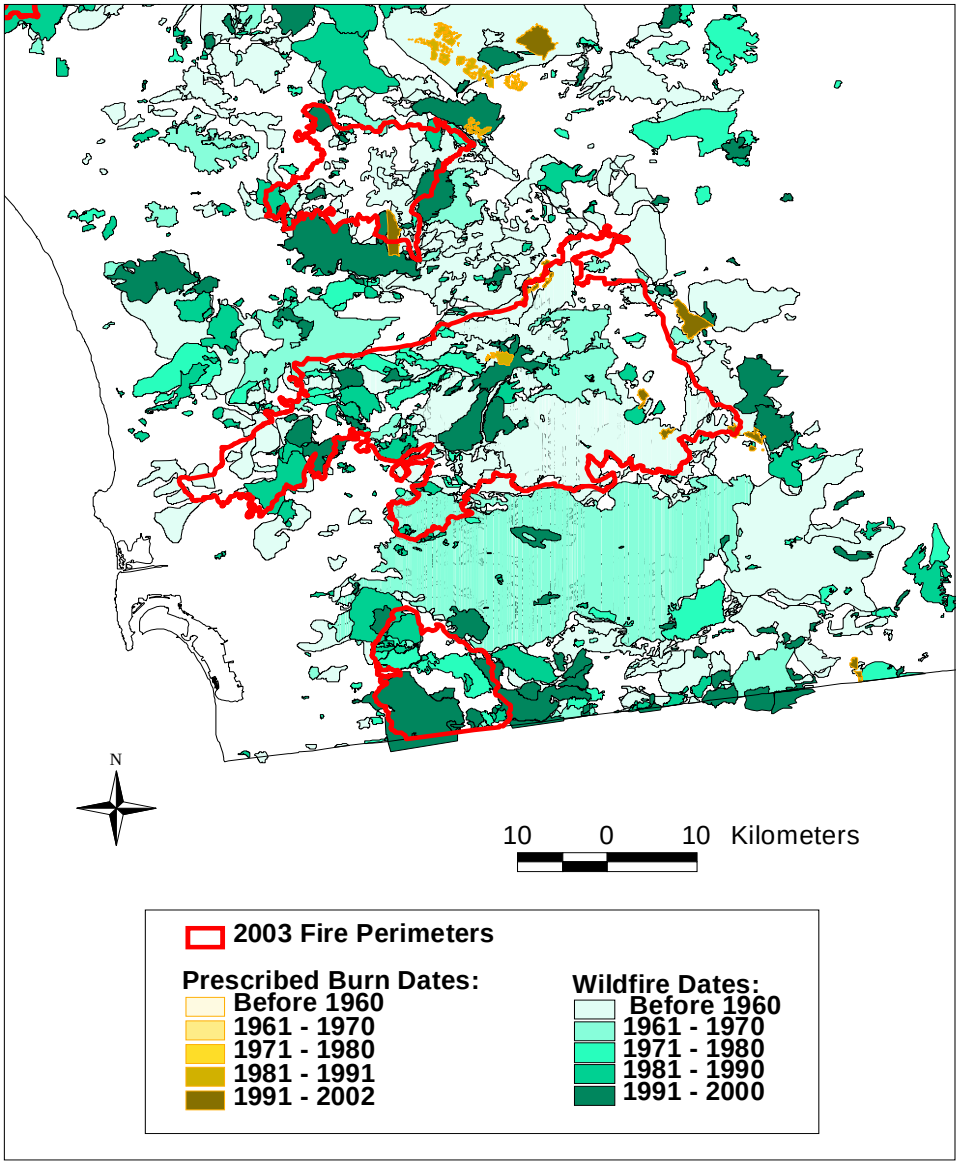
   --- Find political solutions to money & air quality
   --- Use other fuel manipulations

ii. **Alternatively, we may need to reevaluate the efficacy of fuel treatments in these crown-fire ecosystems**

To What Extent Can Fuel Manipulations Affect the Fire Outcomes?

a. They have limited ability to act as barriers during severe fire weather.

Oct 2003 Fires:
Prior to these massive fires the vegetation was a mosaic of different age classes that did little good in stopping the fires




This fuel break maintained for decades was ineffective at preventing the spread of fire to the adjoining community

To What Extent Can Fuel Manipulations Affect the Fire Outcomes?

a. They have limited ability to act as barriers during severe fire weather.

b. During severe fire weather the primary value of prefire fuel treatments is in reducing fire intensity and thus providing defensible space for fire fighters

Consequently, strategic placement is more important than the amount of area treated

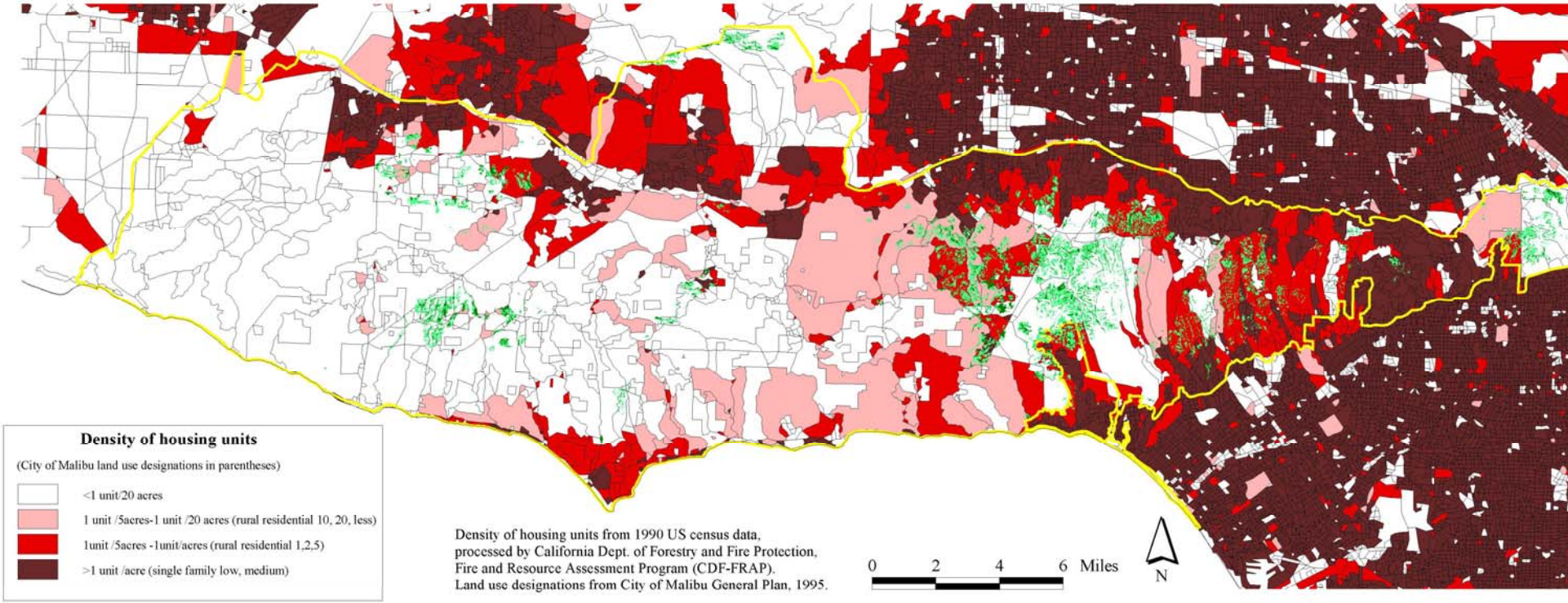
Strategic placement of fuel treatments needs to consider where is “defensible space” during severe fires

For example, steep slopes will not provide defensible space and thus fuel treatments on those sites will be less effective

The most cost effective placement will be at the wildland/urban interface

Areas potentially appropriate for strategic fuel modification and density of housing units

Areas indicated in green have slopes slopes <20% (high opportunity for control, dark green) or slopes 20%-40% (moderate opportunity for control, light green). All green areas also have chaparral or nonnative woodland vegetation and time since last burn >35 years. Such areas may be appropriate for strategic fuel modification projcets where tactical and environmental considerations are also met.



What creates strategic defensible space and reduced chances of property loss?

Homes with (in order of known importance):

- ⇨ **>30 m fuel reduction zone**
- ⇨ **good road access**
- ⇨ **someone remains to extinguish embers**
- ⇨ **setback from ridges**
- ⇨ **fire resistant construction**
- ⇨ **adjacent to fire resistant homes**

Fire resistant home construction is of least importance because:

Most evidence in favor of it is anecdotal we have few scientifically valid studies demonstrating it is cost-effective

Housing costs in California are extremely high and additional fire resistant construction increases costs beyond reach of many people, thus it is politically unpopular

To What Extent Can Fuel Manipulations Affect Fire Outcomes?

a. They have limited ability to act as barriers during severe fire weather.

b. Their primary value is reducing fire intensity and thus providing safer attack. Consequently, strategic placement is more important than "acres treated"

c. Under moderate weather conditions fuel treated areas over the broad landscape may assist fire fighters by providing zones of reduced fuels where fires may burn out. But fires under these weather conditions present a much lower fire hazard, and thus they may not be cost-effective.

Structures & Lives Lost From Major Wildfires in San Diego County

Fire	Mon	Year	Acres	Lost Structures	Lives
*Cedar	Oct	2003	281,000	2,232	14
*Laguna	Oct	1970	190,000	382	5
*Paradise	Oct	2003	56,600	169	2
*Harmony	Oct	1996	8,600	122	1
*Viejas	Dec	2001	10,350	23	0
*Gavilan	Feb	2002	6,000	43	0
Pines	July	2002	61,690	45	0
La Jolla	Sep	1999	7,800	2	1

*Santa Ana wind-driven fires

(from CJ Fotheringham)

Fuel Treatments and Fire Hazard Summary

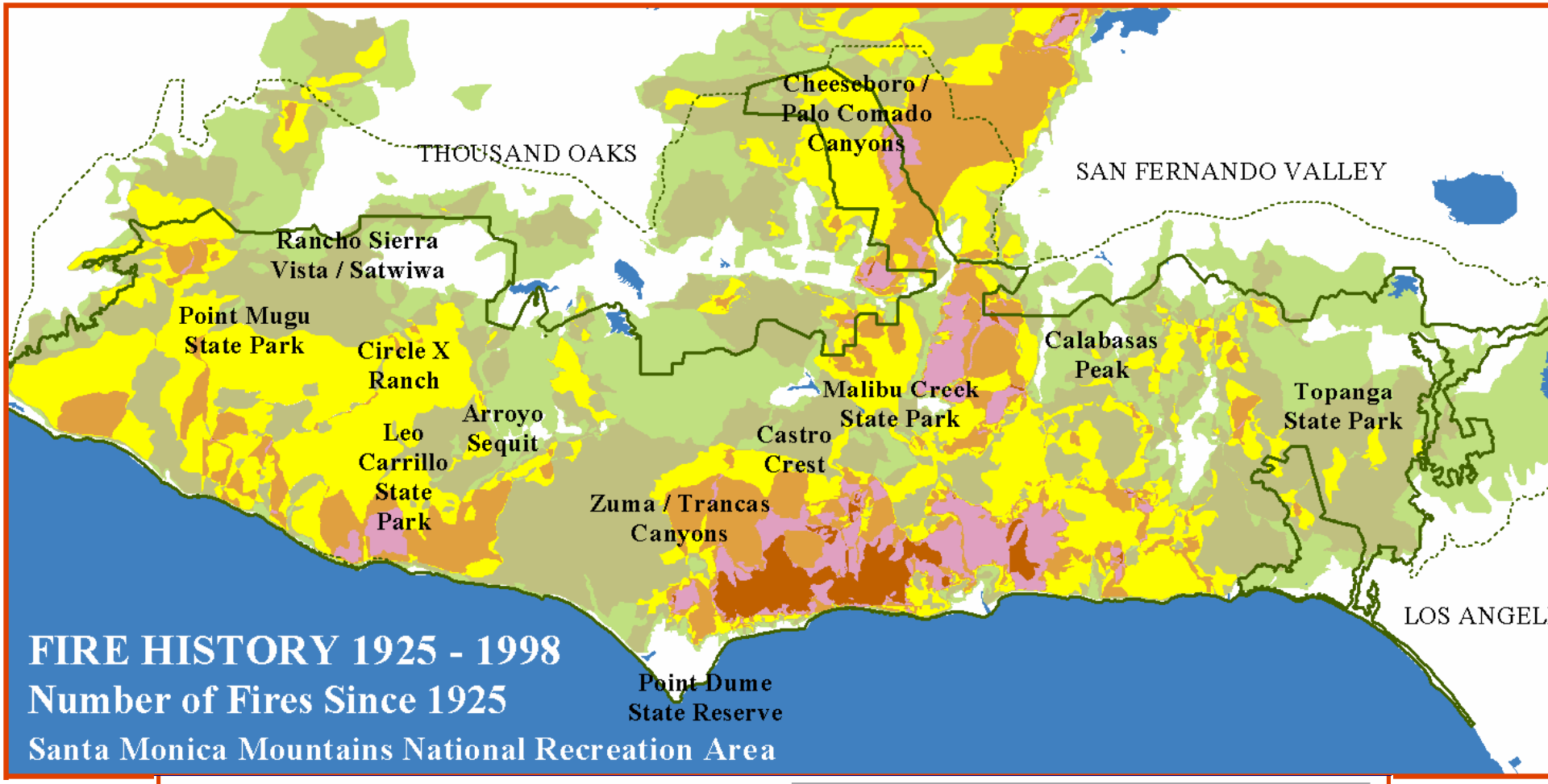
Fire Weather	Losses	Fuel treatments
Severe	Very high	Can not stop fires! In defensible zones near communities may help save property & lives Very cost effective
Moderate	Low	Can provide barrier to fire spread May not be cost effective

Fuel Treatments and Postfire Resources

Prescription burning, when used to create landscape mosaics with younger fuels, may lead to lower severity wildfires and these may lead to better postfire vegetation recovery:

Data show:

Low severity fires may increase diversity and plant cover in the 1st postfire year, but some species are favored by high severity fires and there appear to be very few long term impacts of high severity fires.



Number of Times Burned

- one
- two
- three
- four
- five
- six or more

Santa Monica Mountains NRA Boundary

Santa Monica Mountains Ecological Zone

# of Times Burned	Hectares Burned	Percent of Study Area
0	2031	2.39 %
1	21956	25.8 %
2	26769	31.4 %
3	19784	23.2 %
4	9398	11.0 %
5	3438	4.04 %
6 or more	1680	1.98 %

Photo by Anna Jacobsen, Pepperdine University

Fuel Treatments and Postfire Resources

Prescription burning, when used to create landscape mosaics with younger fuels, may lead to lower severity wildfires and these may lead to **increased watershed stability**:

Data show:

Low severity fires may reduce postfire soil erosion, but this is generally only a major problem when fires are immediately followed by a winter of exceptionally high rainfall.

Annual Sediment Production With Alternative Fire Intervals

Fire Interval (yrs)	Annual m^3 / km^2 after fire	Reduction
22	40,843	-
15	32,367	8,476
10	25,614	15,229
5	17,166	23,677

(Loomis et al. 2003)

Postfire Sediment Loss Is A Function Of:

Fire Severity

Time after fire (exponential decay)

Slope Characteristics

Winter precipitation

high years >>> low years

Comparing Sediment Loss

Shortterm vs Longterm Impacts

Over a 25 yr period,
how do 22 yr and 5 yr FRI compare?

5 year burns have 5 times greater chance
of being followed by high ppt
Thus, greater potential for catastrophic event

5 year burns have 5 x 17,166 m^3/km^2
= more than double 22 yr burns
Thus, greater filling of debris basins

5 year prescription burning likely will result in type conversion to alien grassland

& greater potential for slope failure

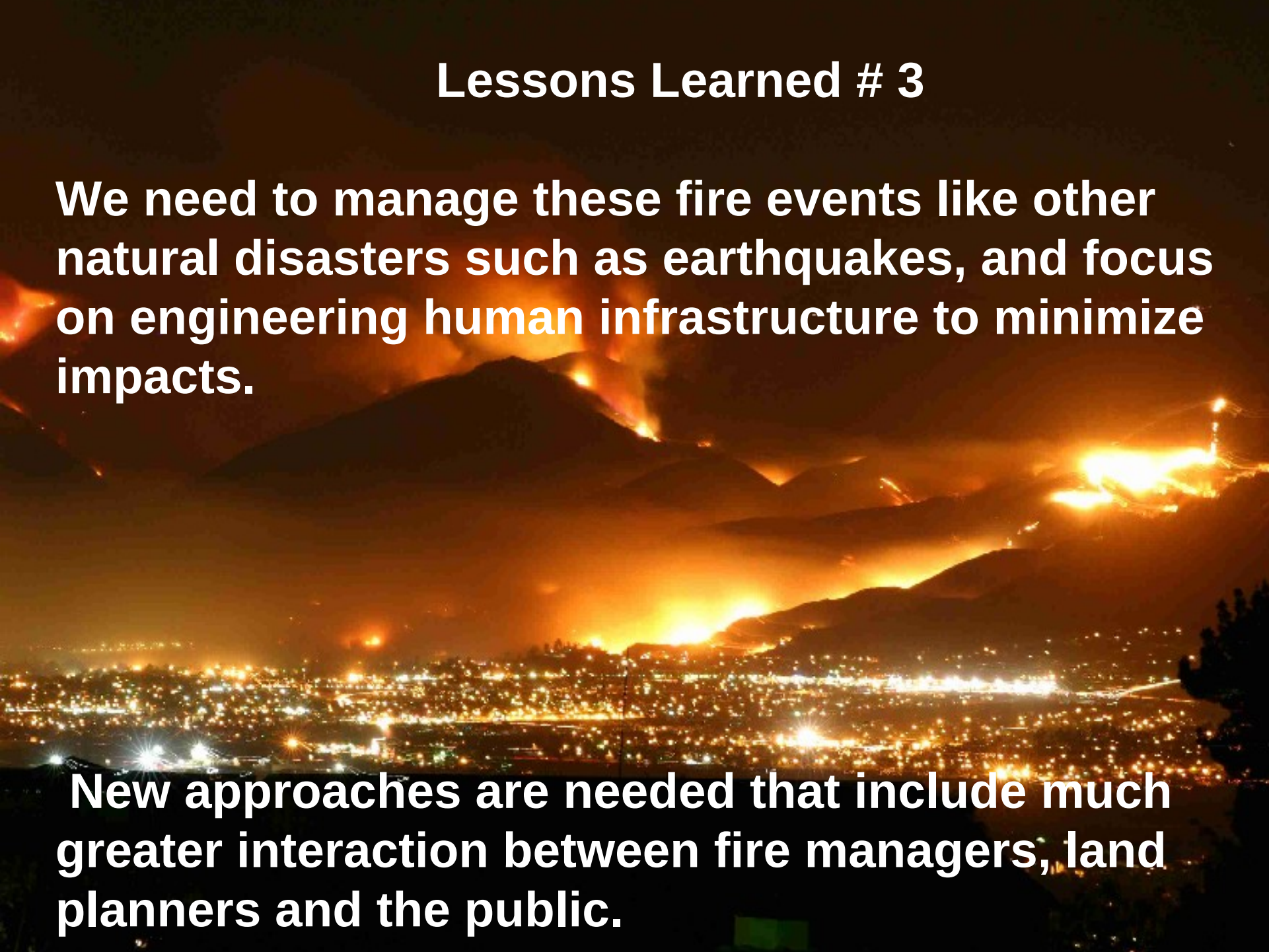
Key Lesson #2 Conclusions:

Value of prefire fuel treatments in reducing fire hazard is a function of fire weather, they are of *local strategic value* under severe fire weather conditions and of *wider landscape value* under the least threatening fire weather conditions.

Prefire fuel treatments are of questionable value to postfire ecosystem recovery

Lessons Learned # 3

We need to manage these fire events like other natural disasters such as earthquakes, and focus on engineering human infrastructure to minimize impacts.



New approaches are needed that include much greater interaction between fire managers, land planners and the public.

Lessons Learned # 3

We need to manage these fire events like other natural disasters such as earthquakes, and focus on engineering human infrastructure to minimize impacts.

New approaches are needed that include much greater interaction between fire managers, land planners and the public.

Lessons Learned

1st step, fire managers need to acknowledge their limitations in being able to protect all homes at the wildland/urban interface


Buffer zones on the periphery may act as barriers to fire spread across the wildland/urban interface
Photo from SDFRN

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