

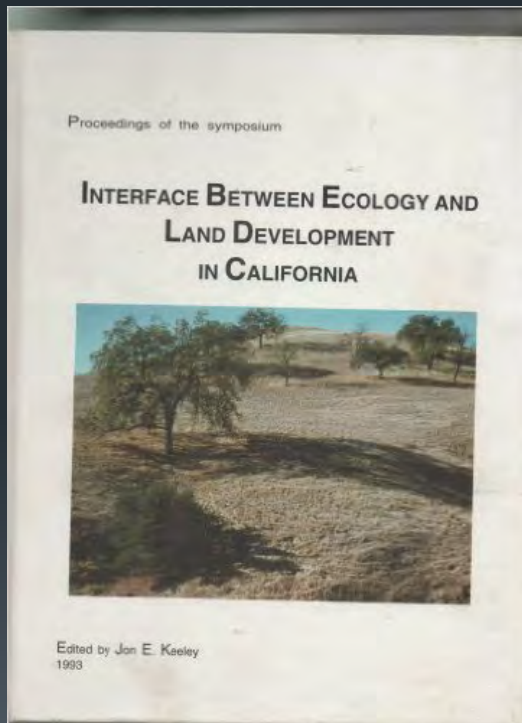
Fire at the Wildland Urban Interface: Lessons from Southern California

Alexandra D. Syphard, Conservation Biology Institute
Jon E. Keeley, Tess Brennan, US Geological Survey

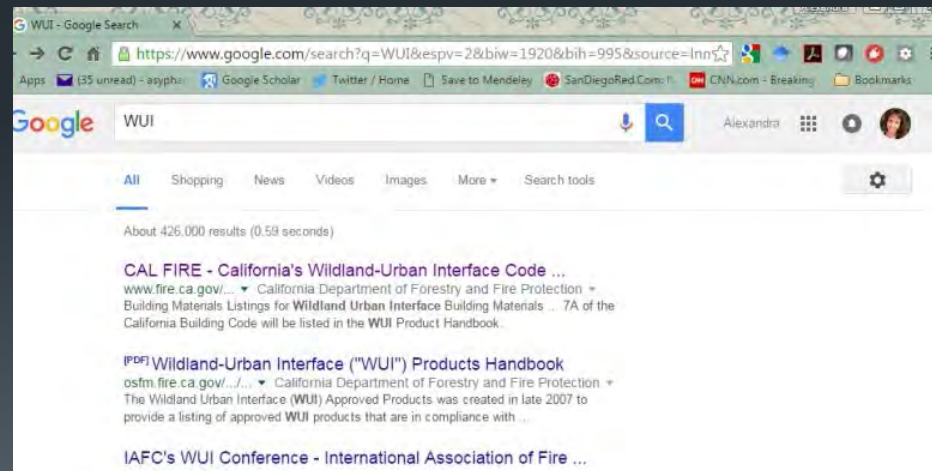
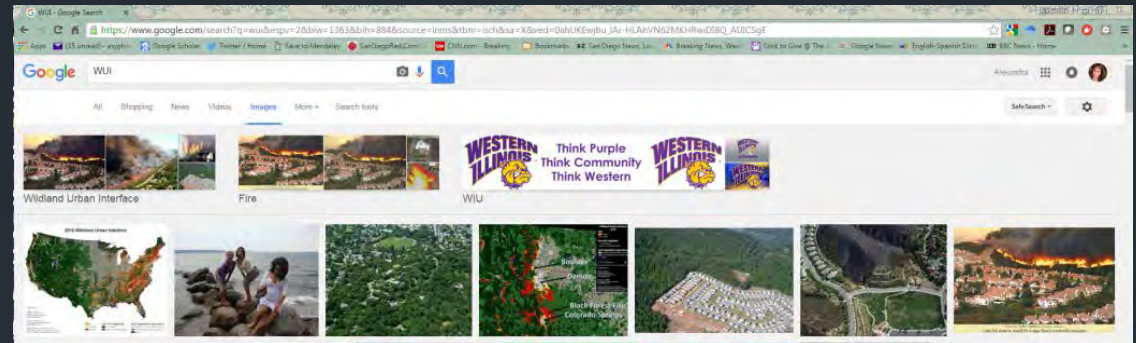


The WUI

- 20 years ago: “is it urban-wildfire interface, or??”
- Today...



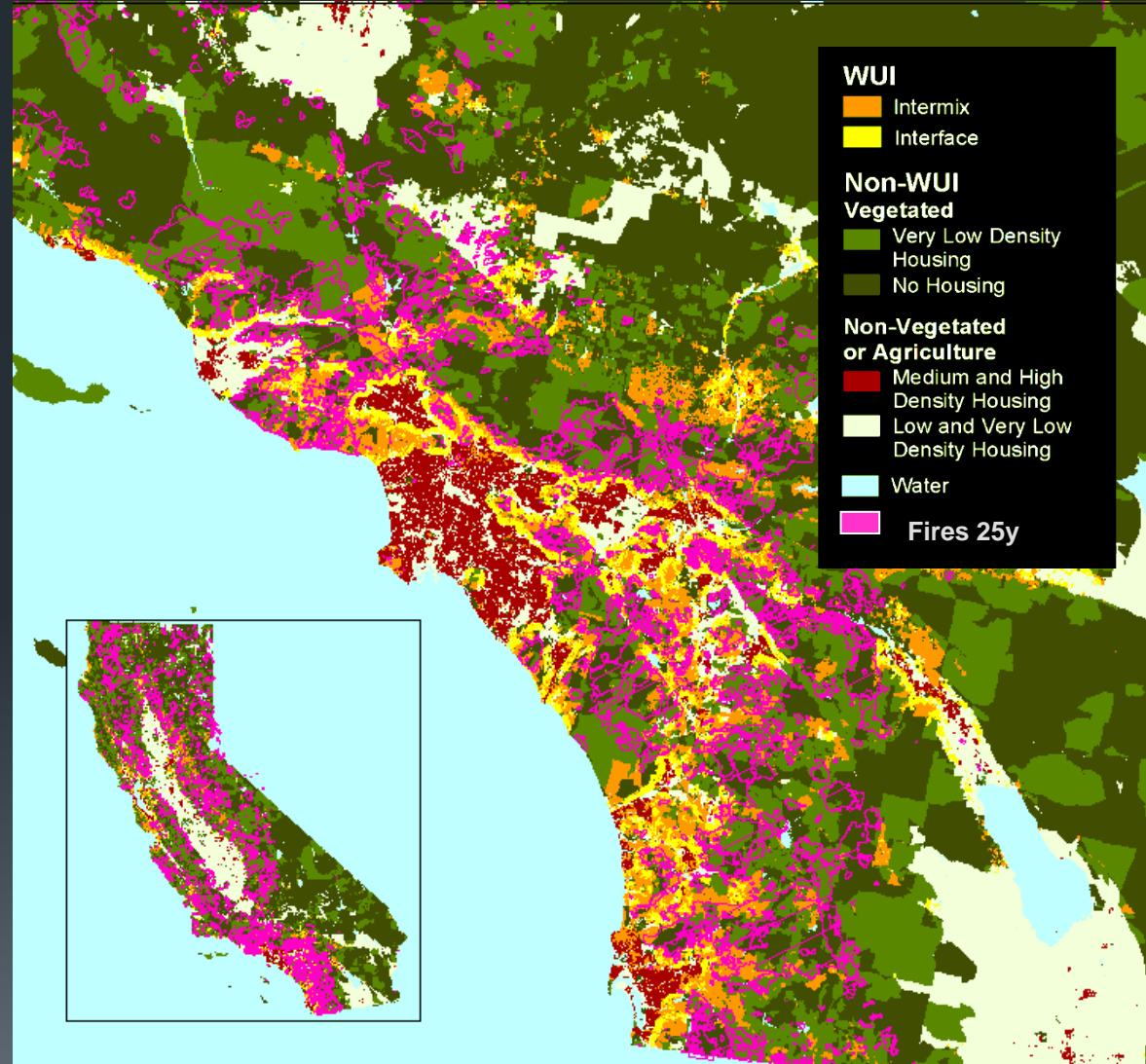
1993



2016

The Wildland Urban Interface

- Where houses meet or intermingle w/ wildland veg
- Where most fires occur
- Where most house loss occurs



Human Issue: Houses Lost to Wildfire 2001-2010

➤ 10,000 homes damaged or destroyed

Fires resulting in home loss

Santa Barbara

Los Angeles

San Diego



San Diego County 2003
2820 structures & 15 died

Ecological Issue: Repeated Fire Eliminates Native Shrubs

- Only resilient at longer return intervals (> 10-15 yrs)
- Convert to weedy, fire-prone annual grass

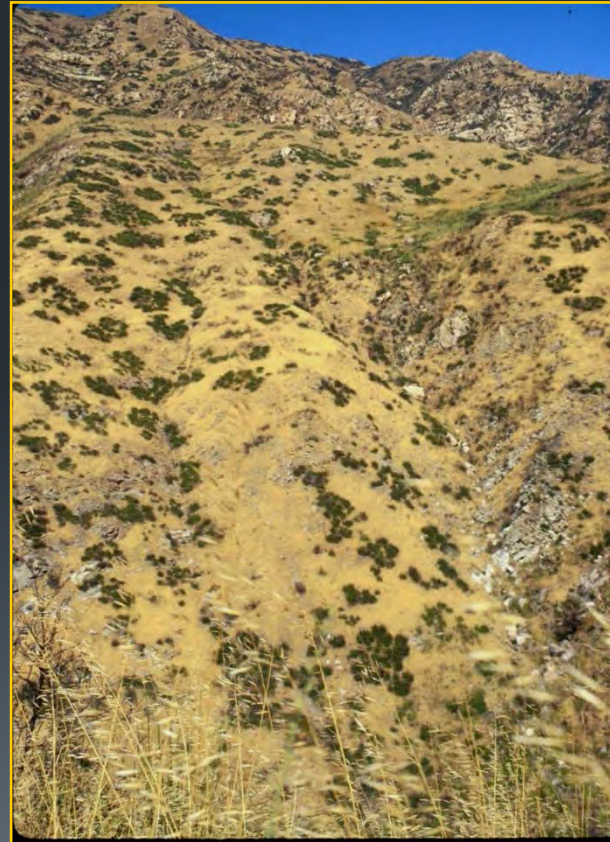
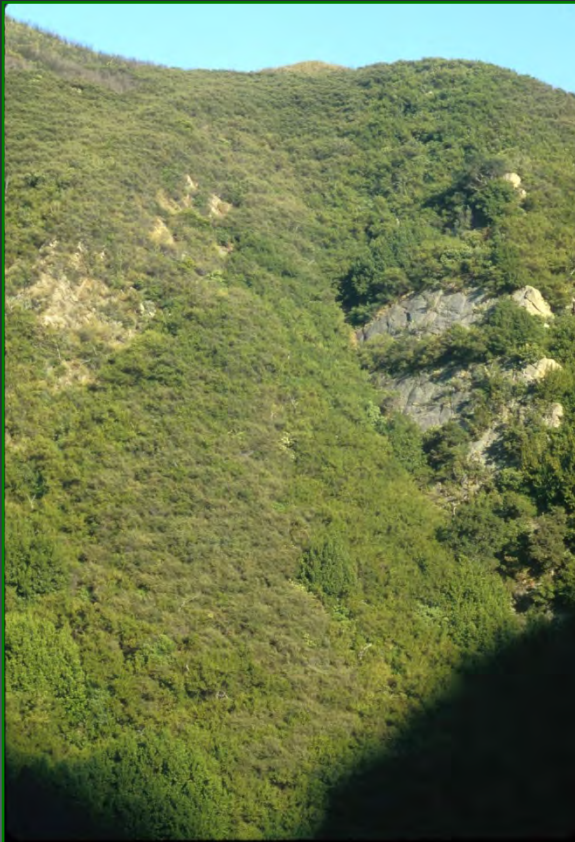
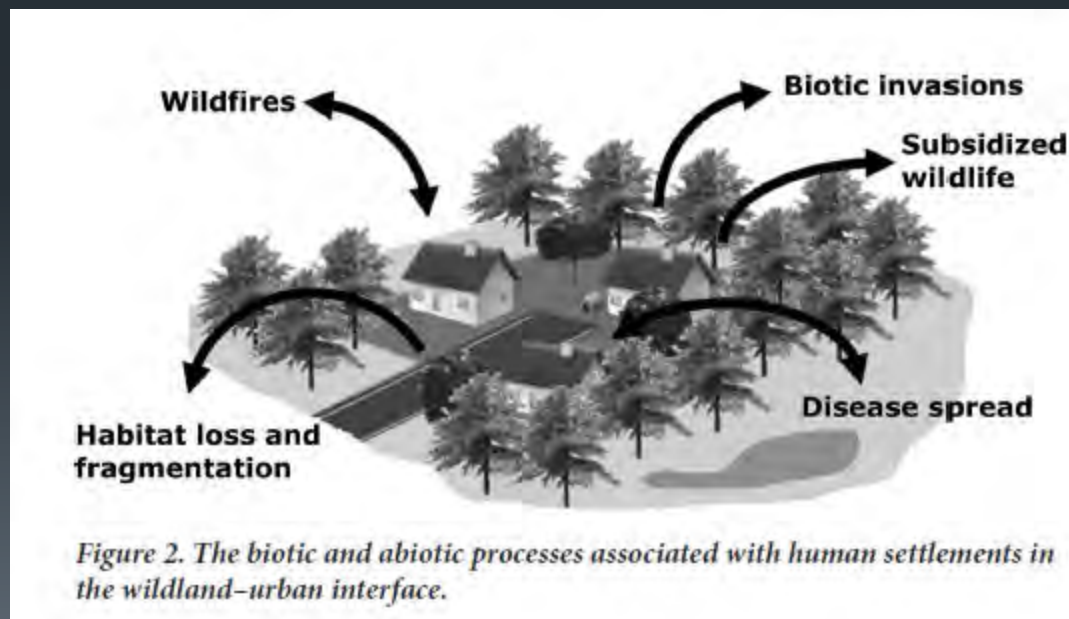


Photo by
Anna Jacobsen

Ecological Issue (s) Beyond Wildfire....



The Question: Why is this happening?! And what do we DO about it?!

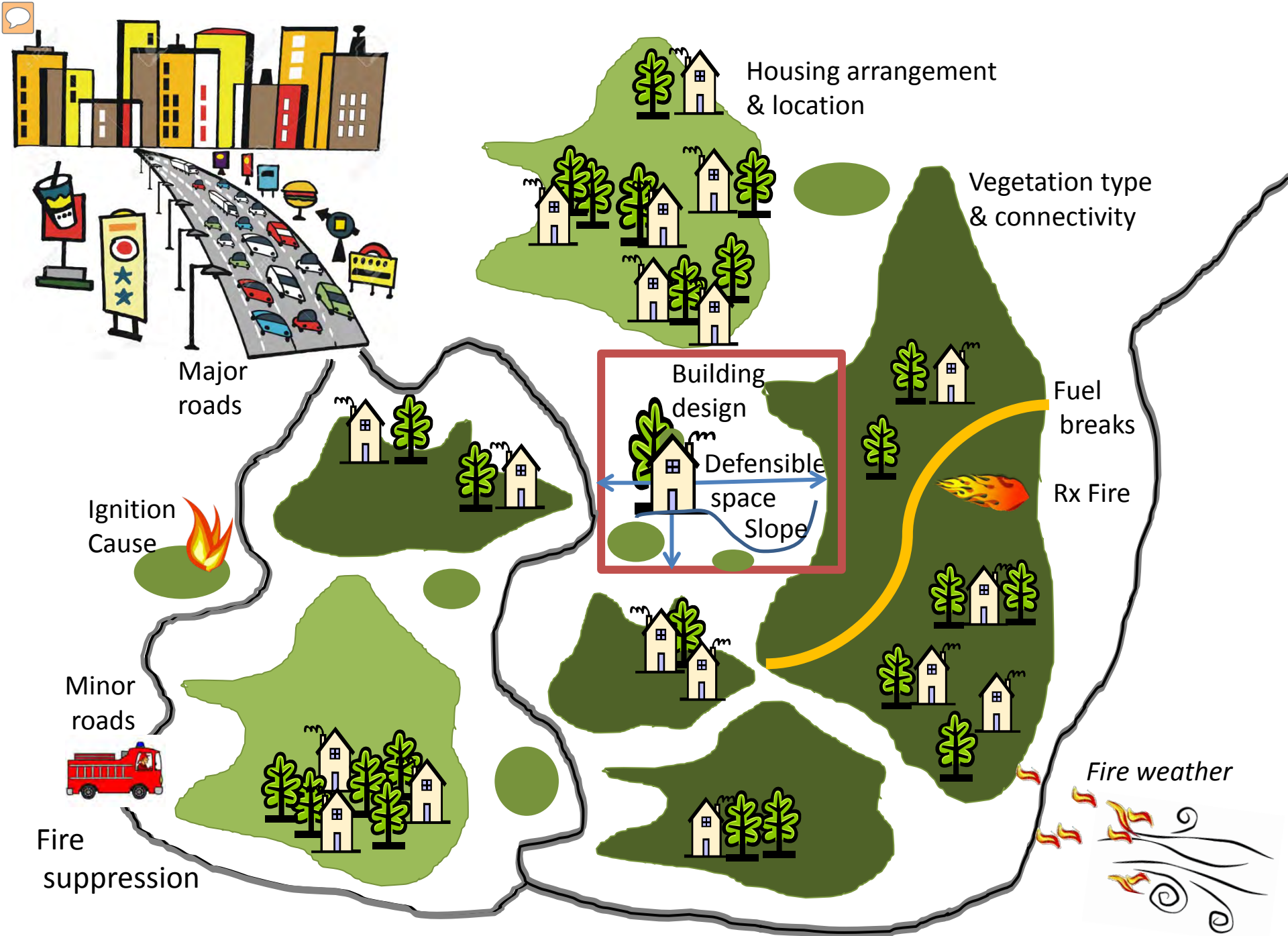


Photo by JOHN GIBBINS / Union-Tribune
Cedar Fire about to engulf the Scripps Ranch residential community

Ongoing Research

- Why do some homes burn and others don't?
- Which actions can maximize human welfare and minimize harm to biodiversity?
- Studies across scales; involve different stakeholders

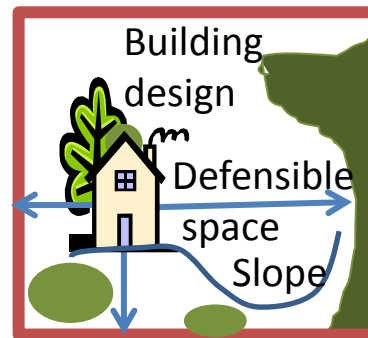






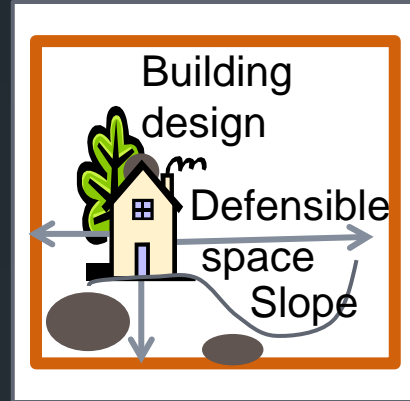
The Homeowner

“From the house out”



Defensible Space

- Strongly encouraged for home protection
- Create “clearance” b/w structure & wildland
- Horizontal and vertical spacing between plants



Defensible Space in Practice

- CA law - 100 ft, but sentiment of more is better
- 300 ft + encouraged, often required, or insurance denied
- Potentially substantial habitat loss
- Could increase problem – grasses & flashy fuels

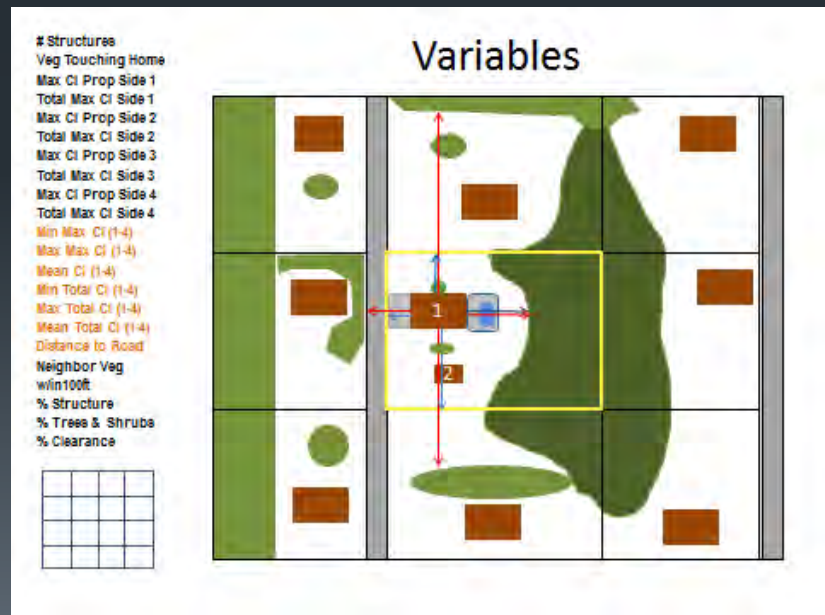
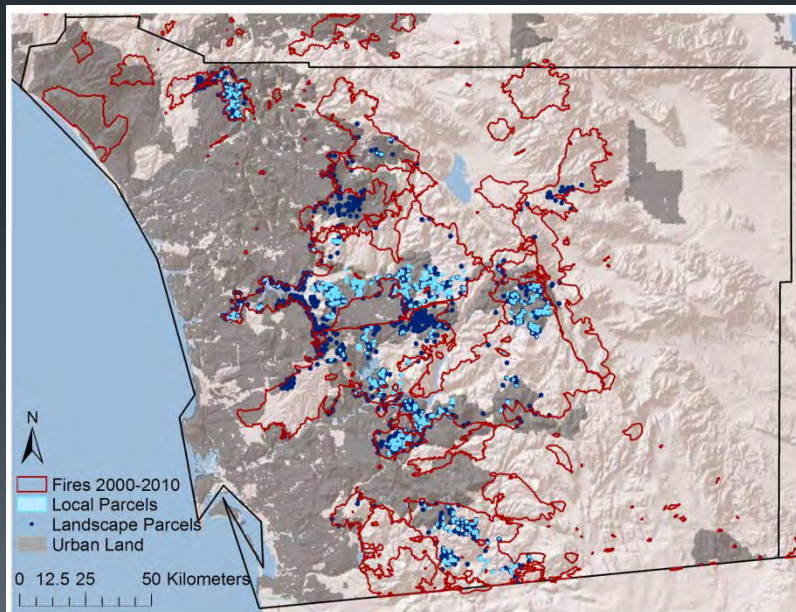
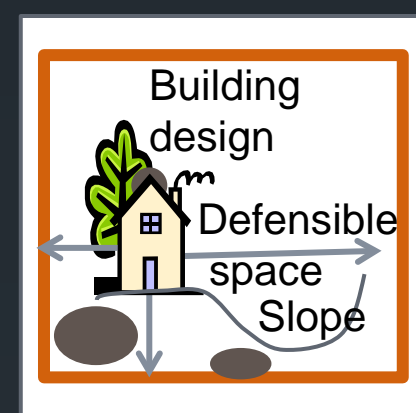




The law of unintended consequences

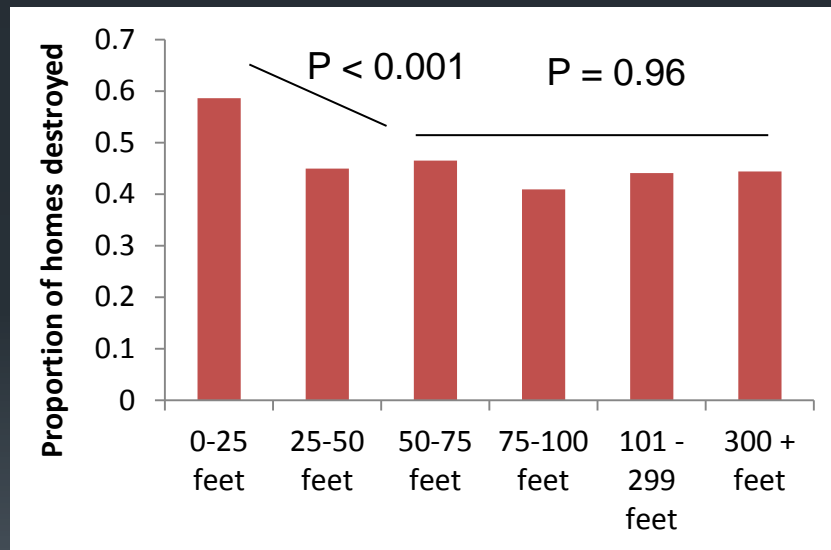
Building Considerations

- Assumed to be very important
- New fire-safe building codes
- Need research under real wildfire conditions
- Two studies
 - How much defensible space is needed?
 - Which local variables are most important?



Defensible Space up to 30m (100ft)

- Most effective: 15 – 60 ft, including steep slopes
- Recommend 100ft for firefighter safety
- Directly adjacent: veg over roof or touching



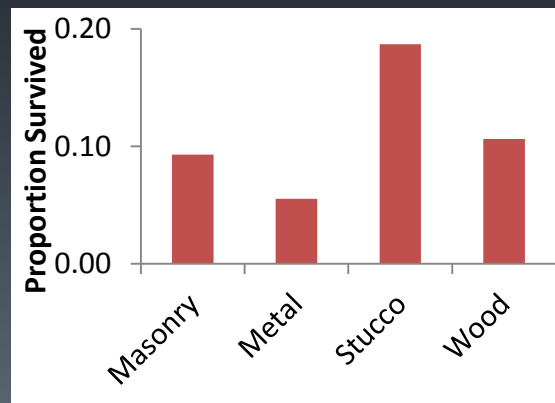
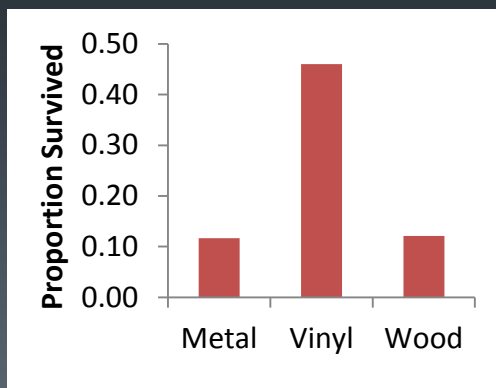
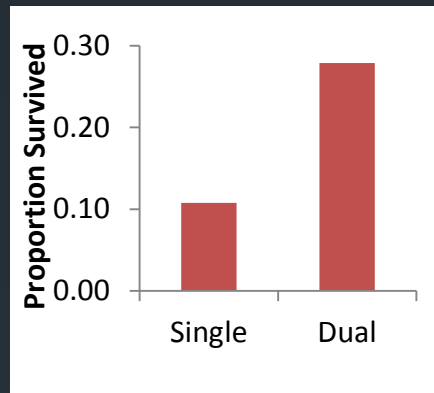
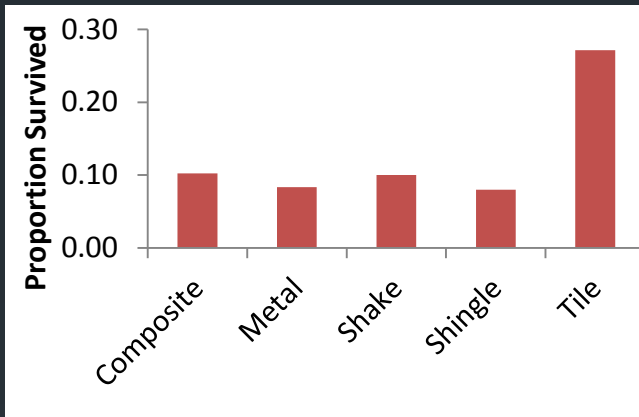
More than 100 ft – no additional benefit

Syphard, Brennan & Keeley 2014

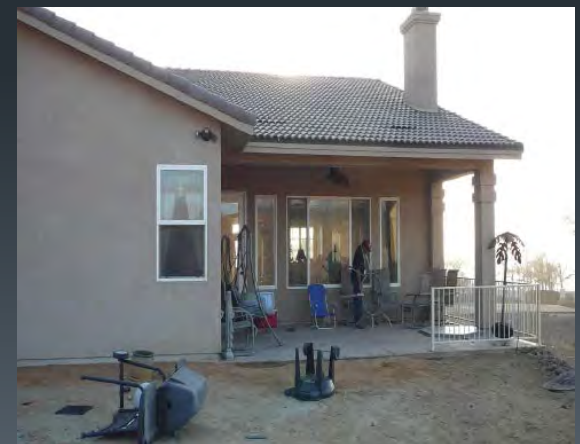


Building Considerations

- Can significantly increase safety;
- Some materials better than others
- New construction using those materials (bldg. codes)



Comparison: similar importance of DS & building

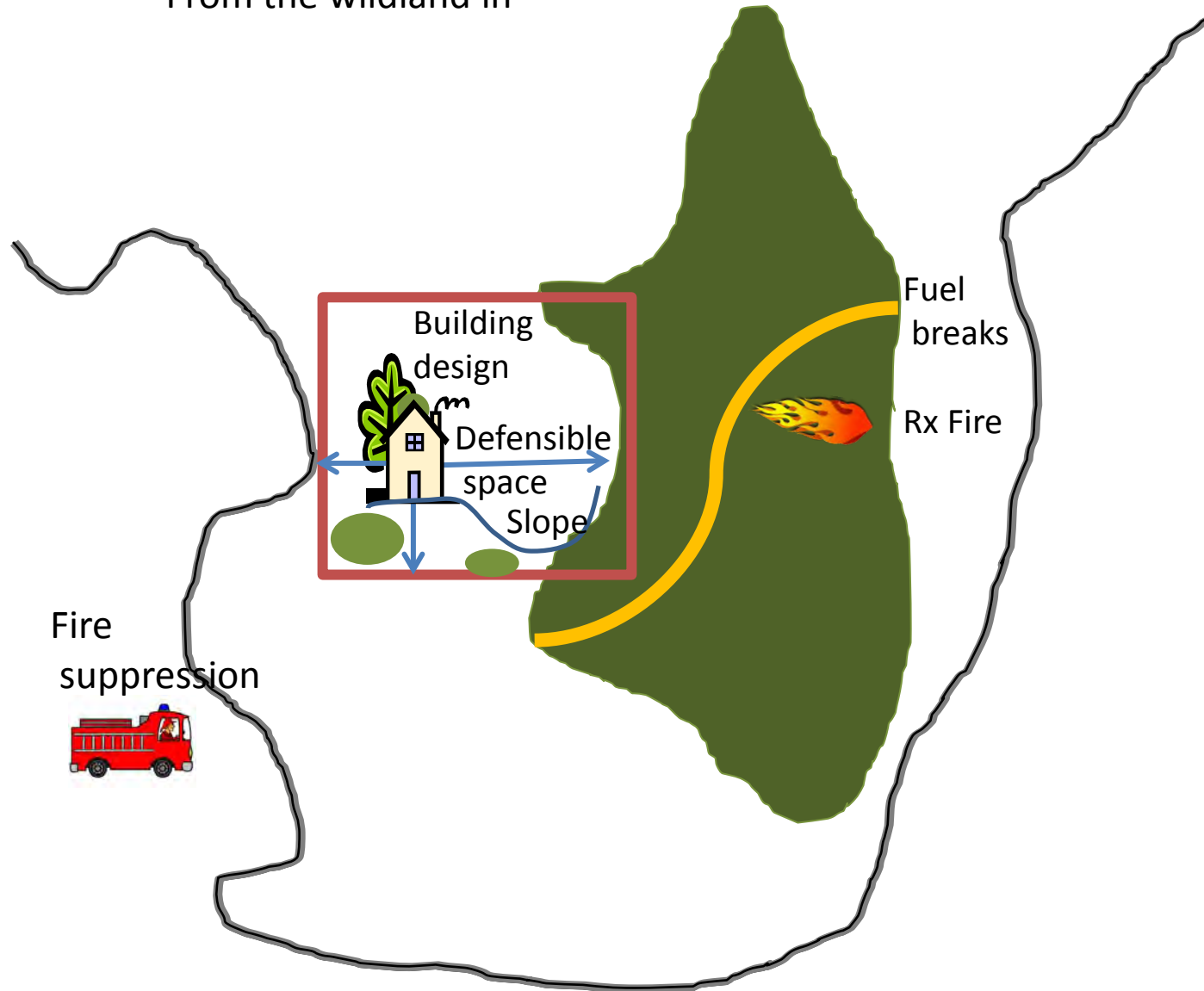


House that survived



The Fire Manager

“From the wildland in”



Traditional Fire Management

Same approach used throughout CA

Suppress burning fires – offsets increase

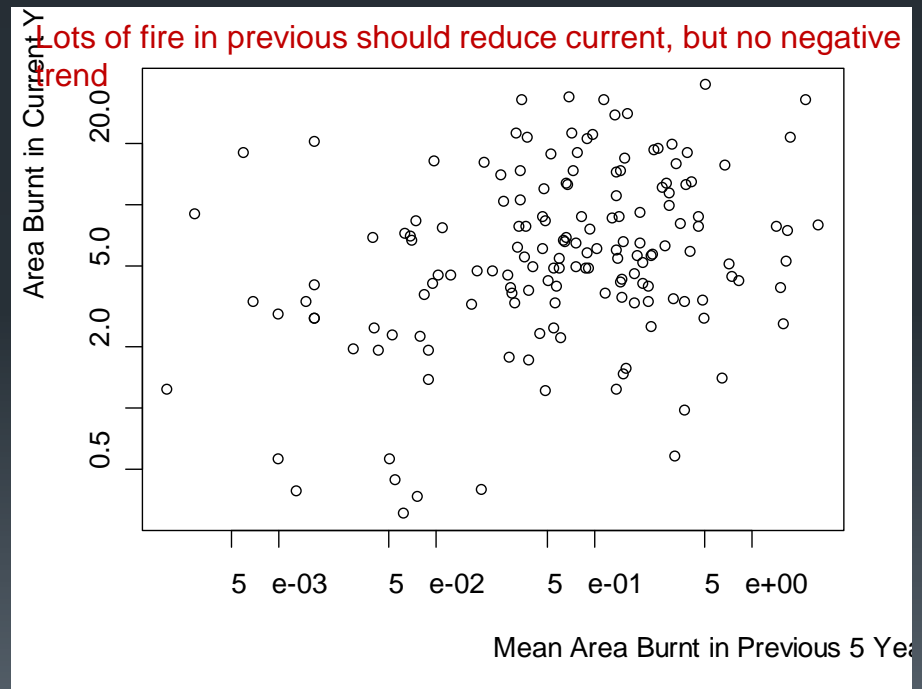
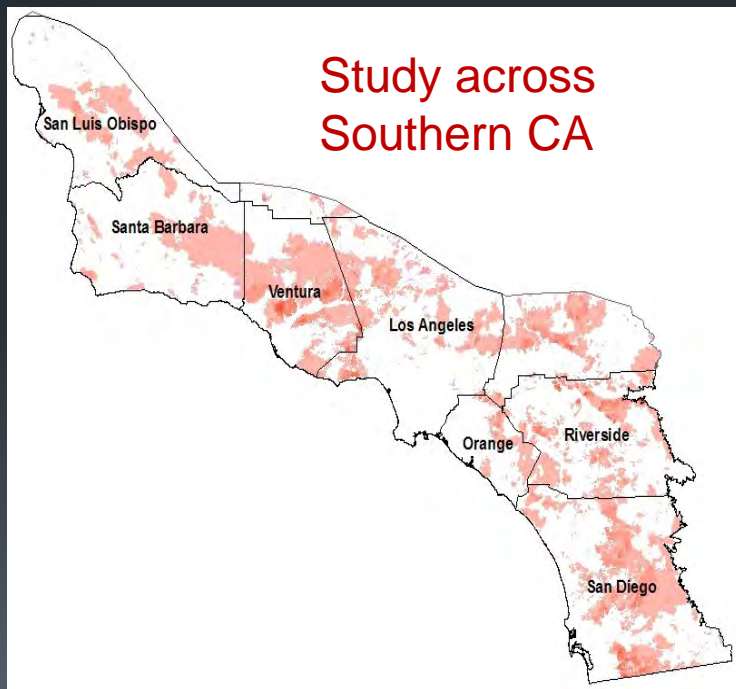
Pre-fire fuel reduction (Rx or fuel breaks)

Studies on effect of both



Prescribed Fire

- Difficult – extensive development, safety, air quality
- Ecological impact of adding even more fire
- Wildland and Rx fire has not reduced subsequent fire



Fuel Treatments in Different Regions

Conifer forests

Obj: Reduce severity, change behavior

Reducing risk often compatible with ecological benefits

Chaparral shrublands

Obj: Prevent fire spread into communities (or parks)

Resource sacrifice: high risk of ecological impact



Study: Fuel Breaks in SoCal USFS Lands



Syphard, Keeley, and Brennan
Forest Ecology and Management 2011
International Journal of Wildland Fire 2011

What is the role of fuel breaks in controlling large fires & what factors influence this role?

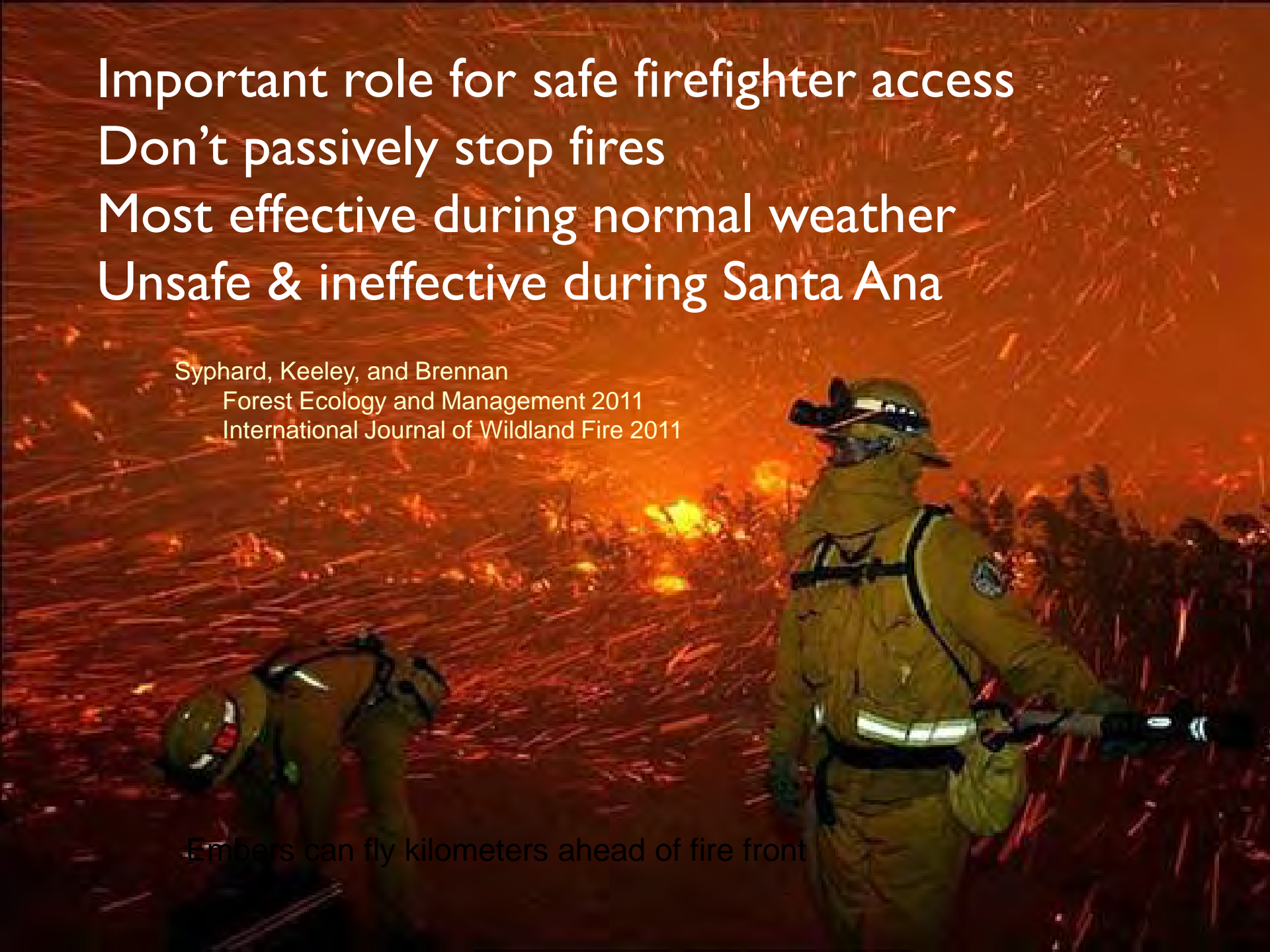
Analysis from 1980-2007 (95 fires)
Spatial statistics & personal interviews



Important role for safe firefighter access
Don't passively stop fires
Most effective during normal weather
Unsafe & ineffective during Santa Ana

Syphard, Keeley, and Brennan
Forest Ecology and Management 2011
International Journal of Wildland Fire 2011

Embers can fly kilometers ahead of fire front



The Role of Fuel Breaks in Southern CA National Forests

Strategic location - around communities



Photo: RW Halsey

The Homeowner

The Fire Manager

“From the house out”

“From the wildland in”



The Land Use Planner

Decisions over space & time

Major roads

Minor roads

Fire suppression

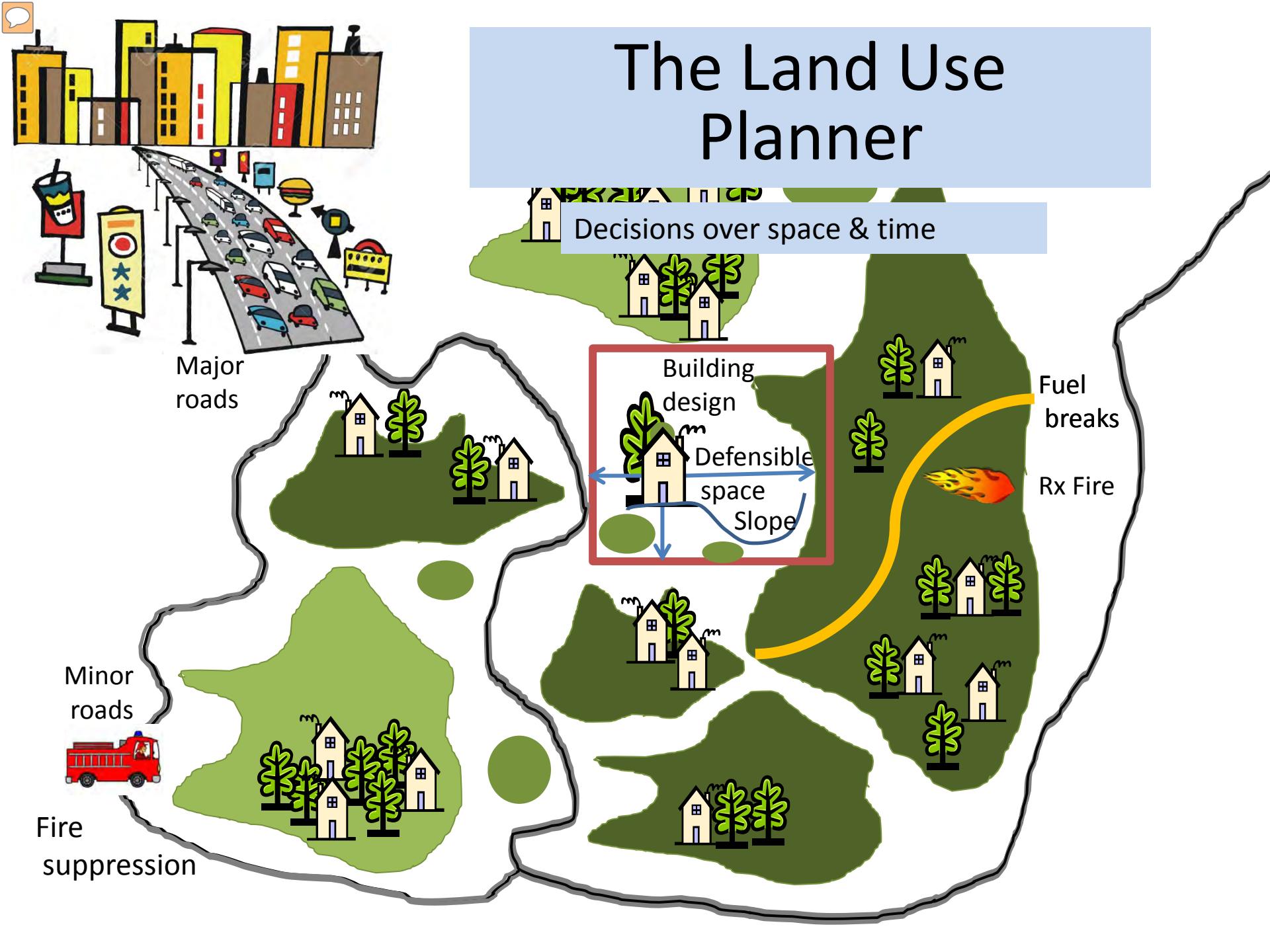
Fuel breaks

Rx Fire

Building design

Defensible space

Slope

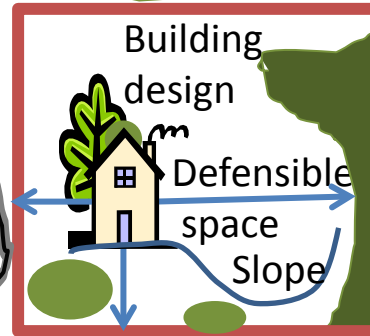


The Conservation Planner



Major roads

Decisions over space & time



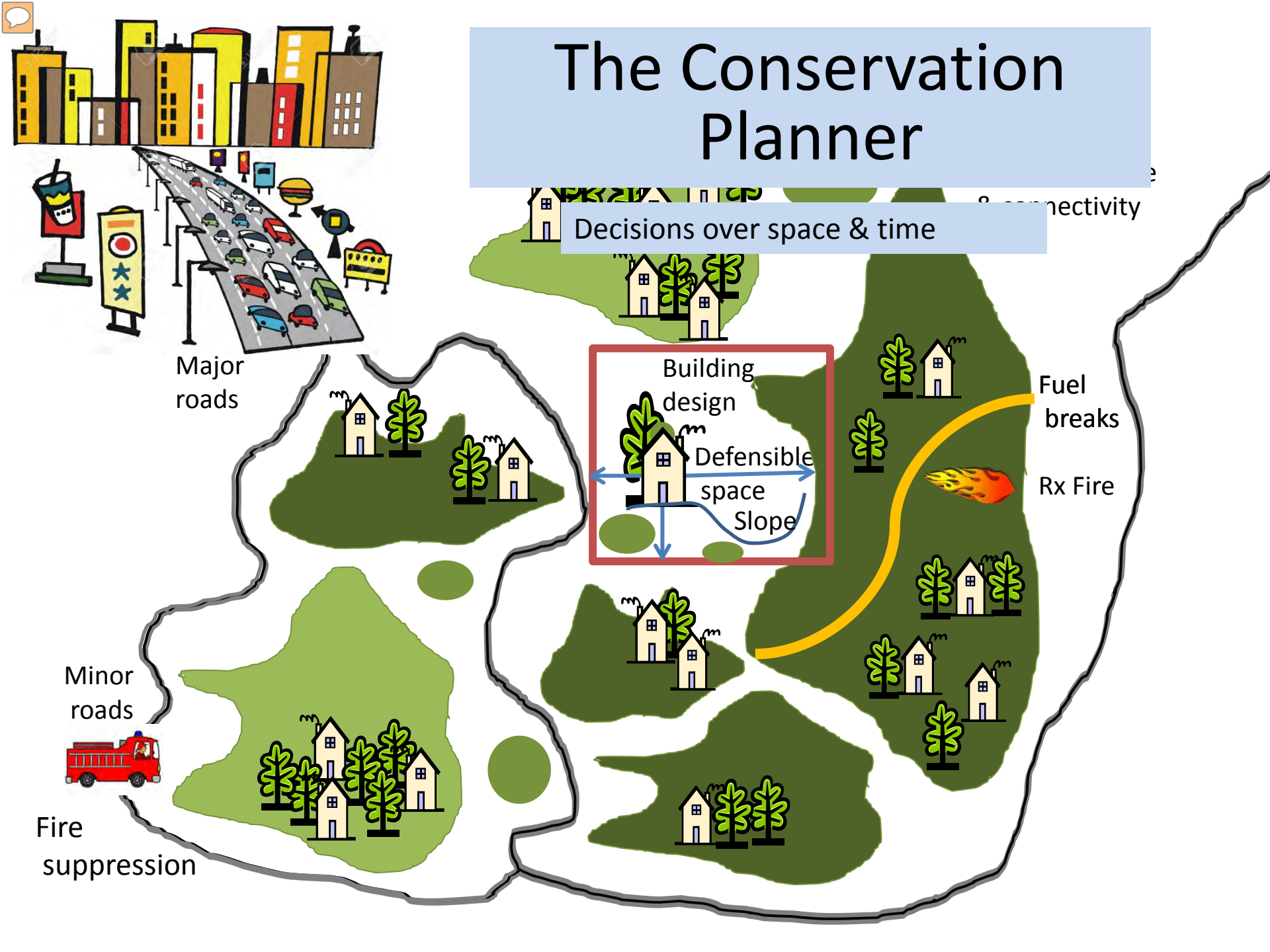
Fuel breaks

Rx Fire

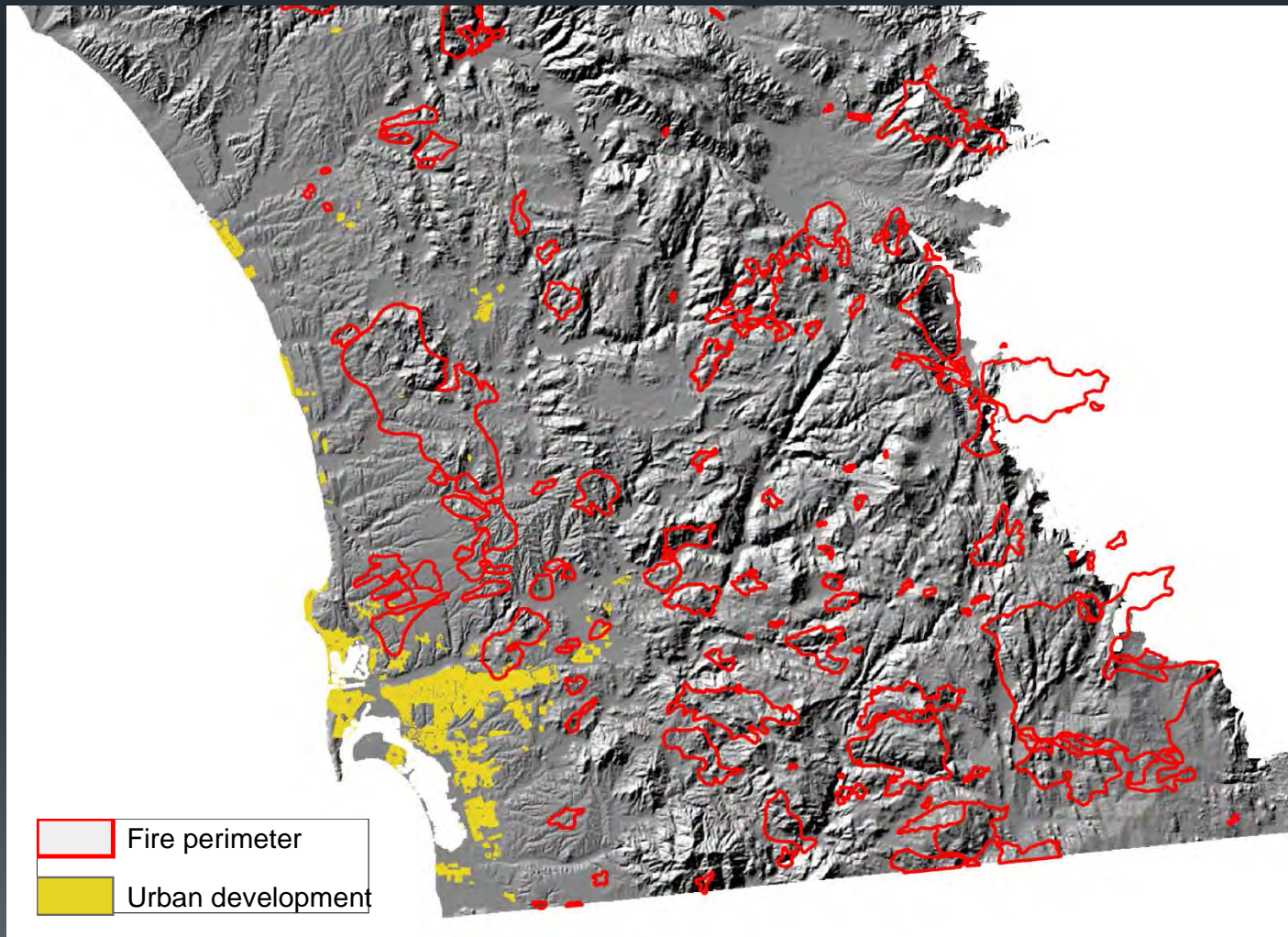
Minor roads



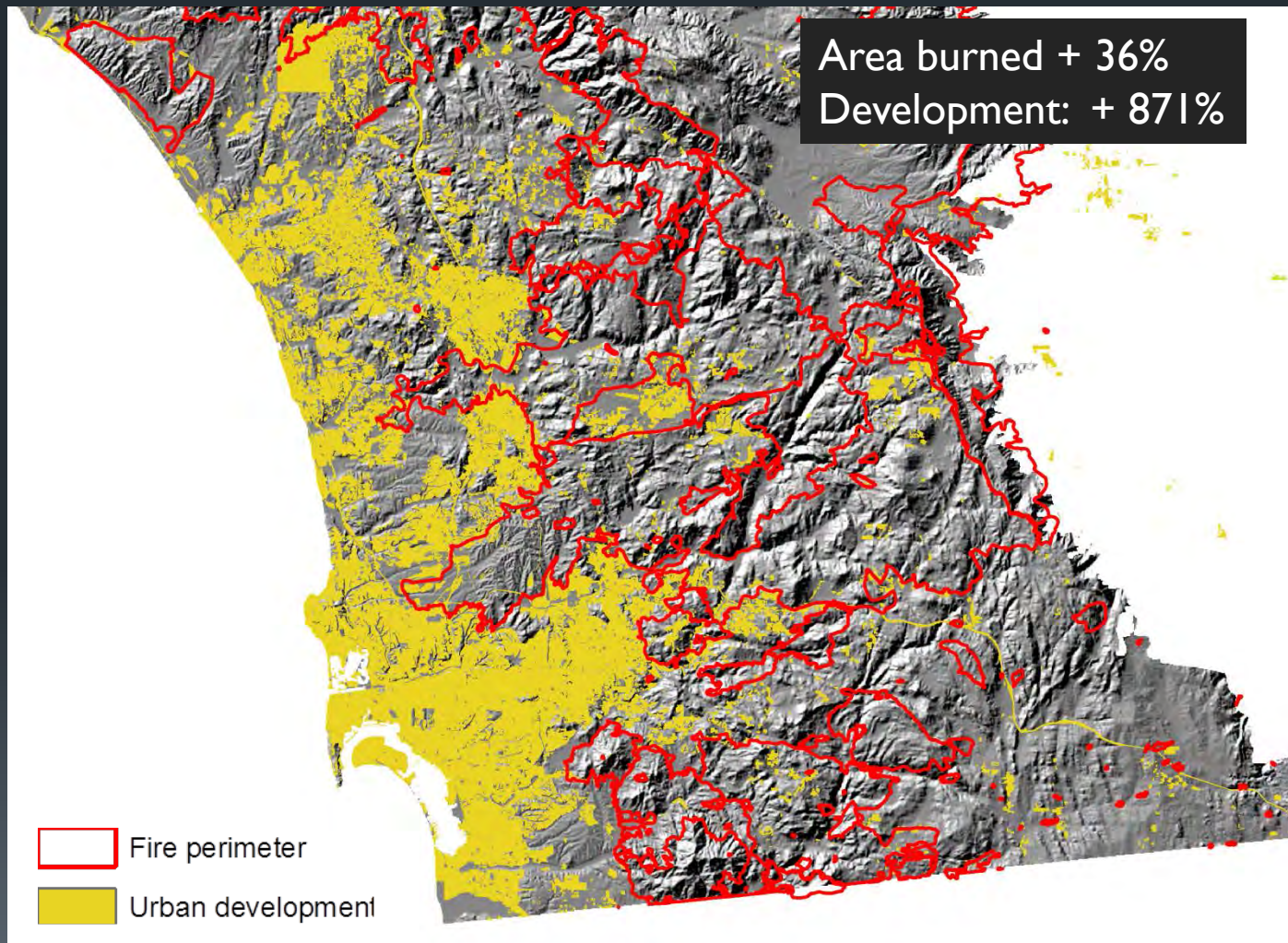
Fire suppression



Fires & Development 1940 - 1950



Fires & Development 2000 - 2010



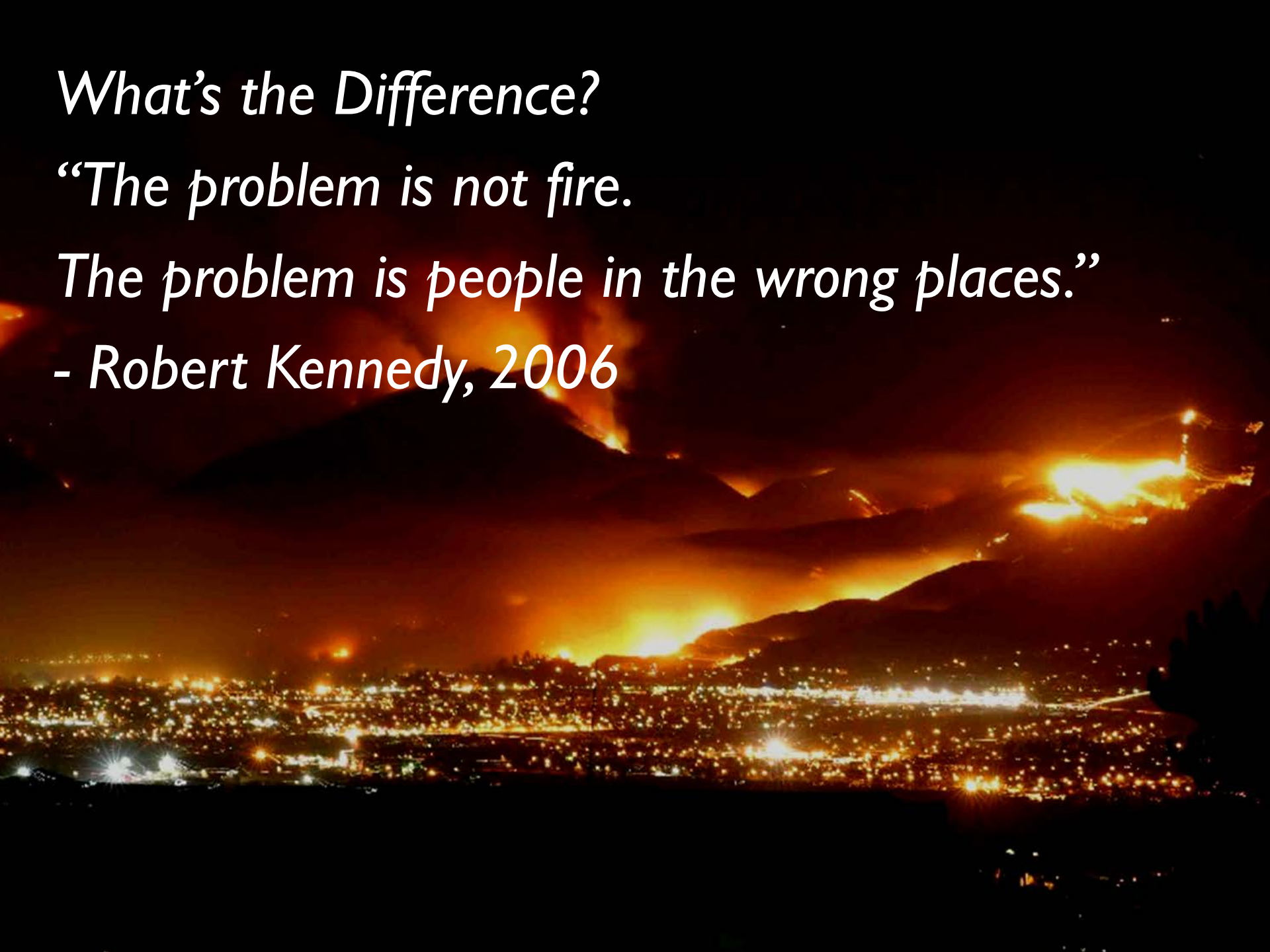
2000 – 2010: >5K homes, >100 killed/injured, \$billions

What's the Difference?

“The problem is not fire.

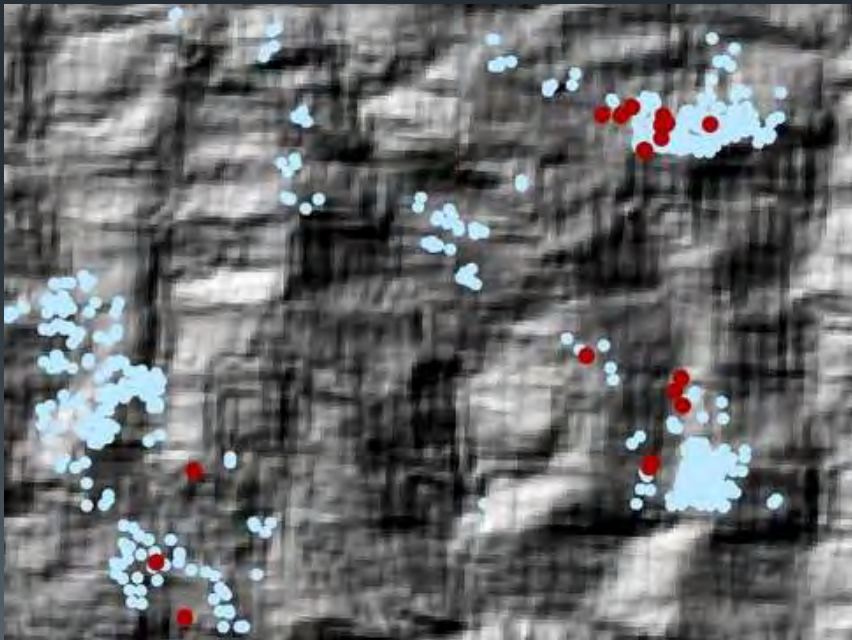
The problem is people in the wrong places.”

- Robert Kennedy, 2006



Analysis of Geographic Database

- Landscape-scale analysis in 2 regions
- > 700 000 unburned; > 5500 burned
- Housing pattern; fuel type; terrain (e.g., Slope); roads



Housing Arrangement & Location

The most important

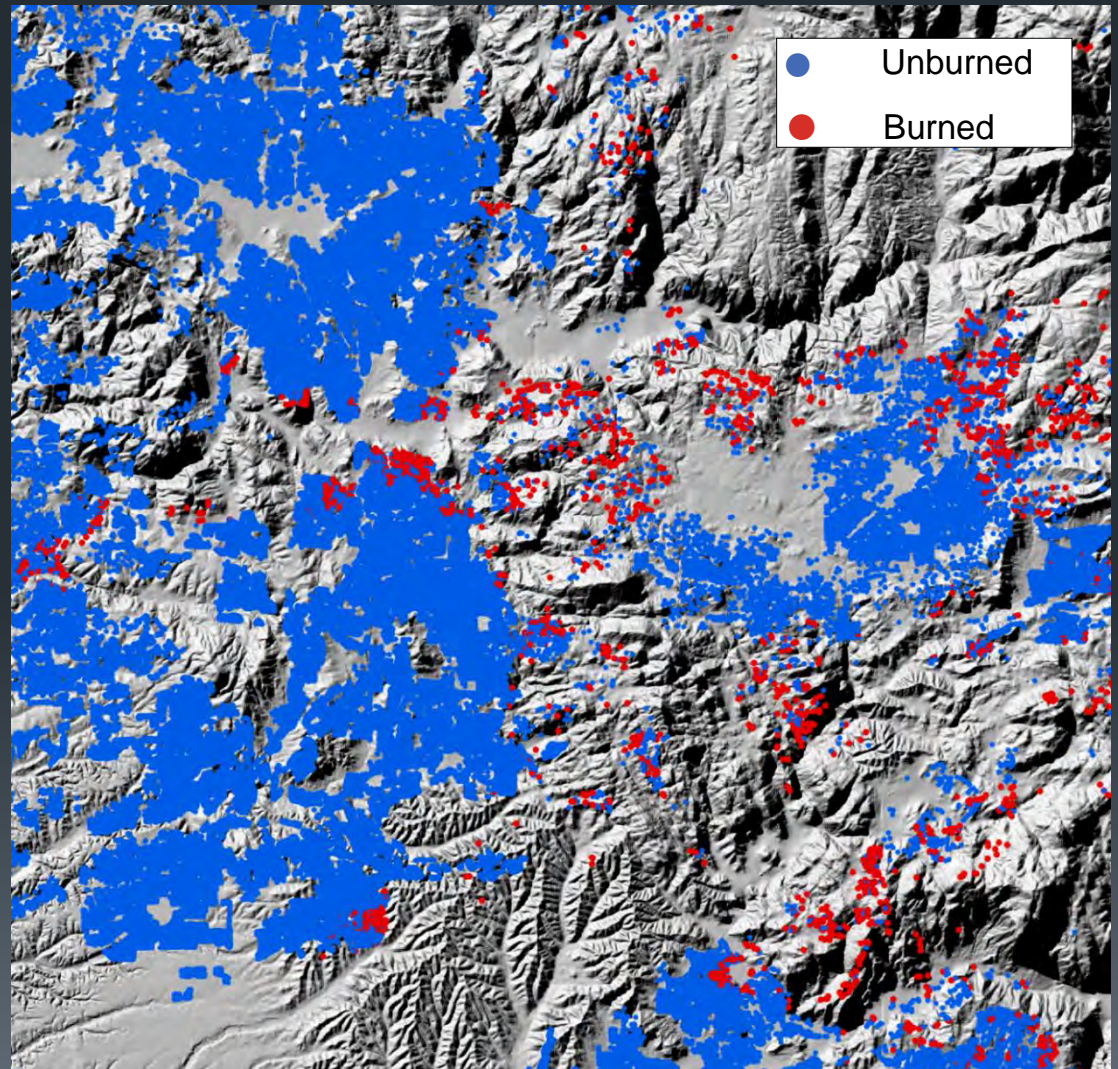
Most likely to burn**:

- Low-intermediate density
- Small, isolated cluster
- Close to edge of cluster
- Steep slope
- Fewer roads

**At finer scales, high density could cause structure-to-structure spread

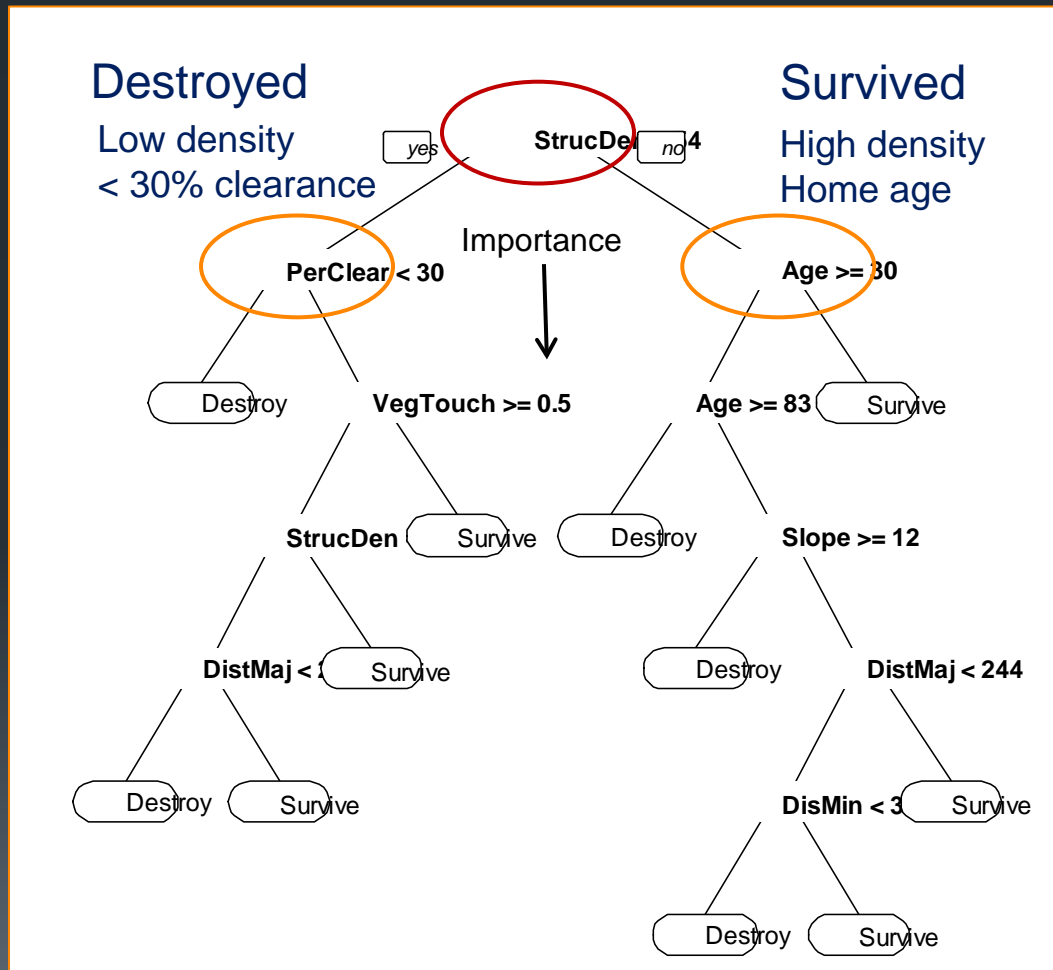
Syphard et al. 2011, *PLoS ONE*

Alexandre et al. 2015, *Landscape Ecology*



Local vs. Landscape

- Housing density most important
- Next : structure age for high density; defensible space for low

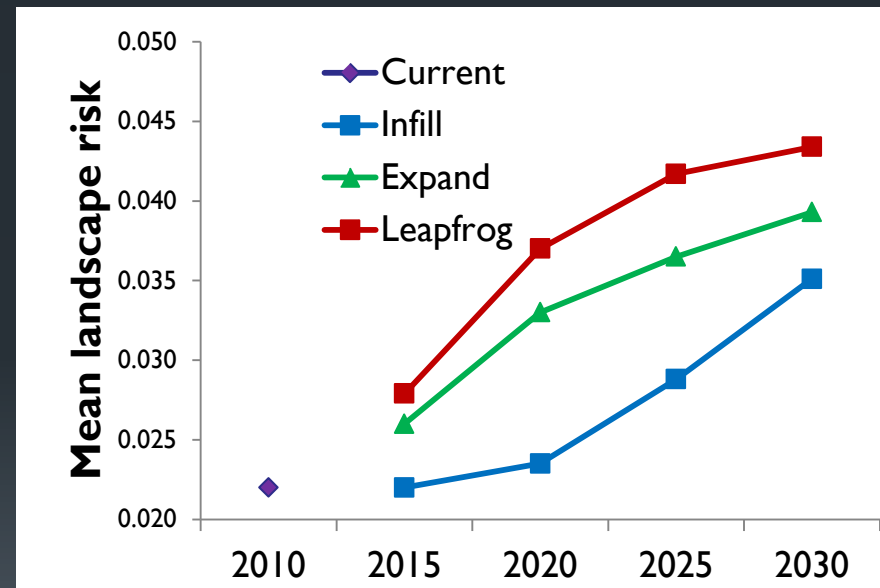
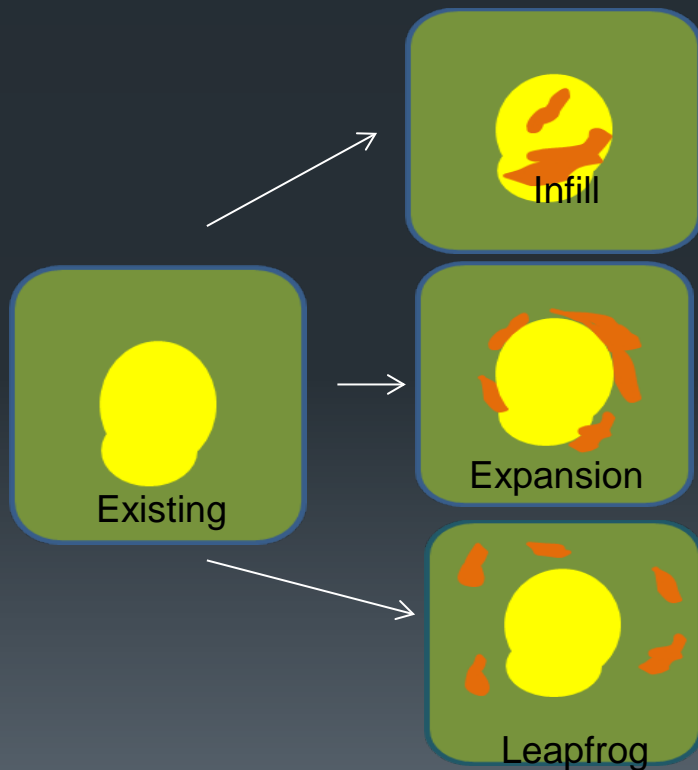


Land Use Decision-Making

- Can't change existing, but would planning for future reduce risk? And conserve biodiversity?
- Land planning through zoning
 - Policies advocating different growth patterns
 - Directly regulate where houses are placed
- Land acquisition for biodiversity protection
 - New housing restricted, must go elsewhere
- Two studies simulating future development, 30 yrs
 - Types of housing growth
 - Method of selecting conservation lands

Planning Simulations via Zoning

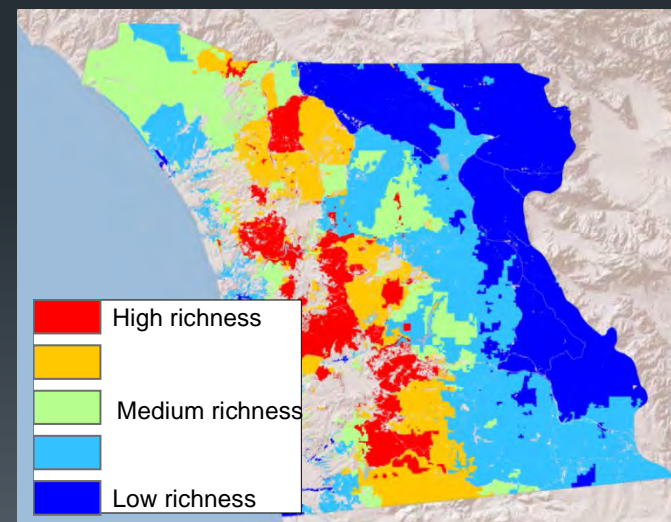
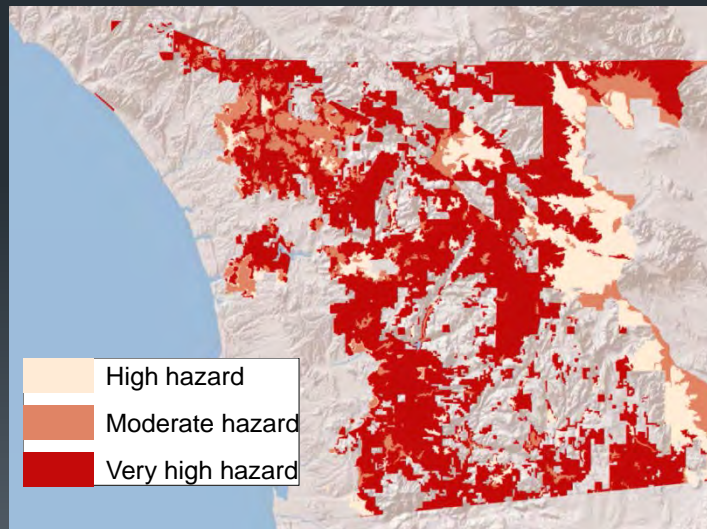
- Infill development – lowest fire risk, most habitat
- Leapfrog development – highest fire risk, highest fragmentation



Syphard et al. PLoS ONE 2013

Land Purchase for Conservation

- Different strategies affect future fire risk and biodiversity
- Mutual objectives can be met if focus on protecting high biodiversity or hazard
- Other strategies not as effective (e.g., area, cost)



Syphard et al. Ecology & Society, in press

The Policy Maker The Educator Community Groups Law Enforcement Us....



Major roads

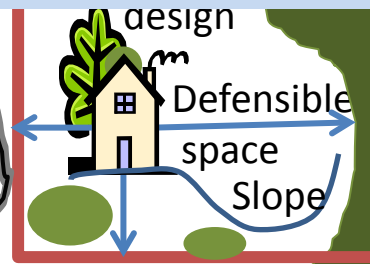


Ignition Cause

Minor roads



Fire suppression



breaks

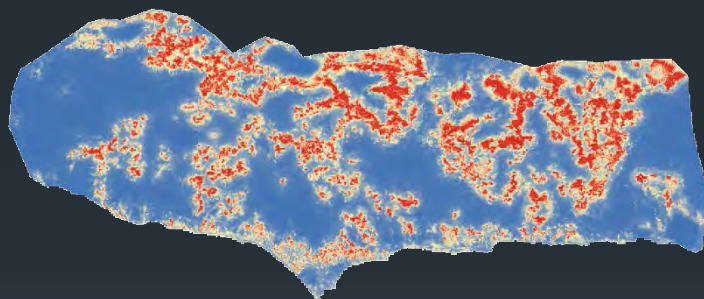
Rx Fire



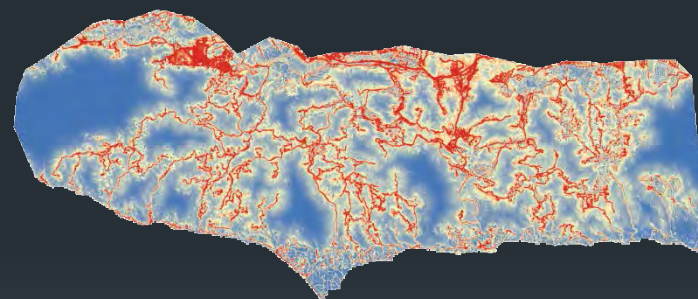
Ignition Prevention

- > 95% caused by humans
- Reduce fire -> reduce human and biodiversity impacts
- Different causes -> different timing and pattern

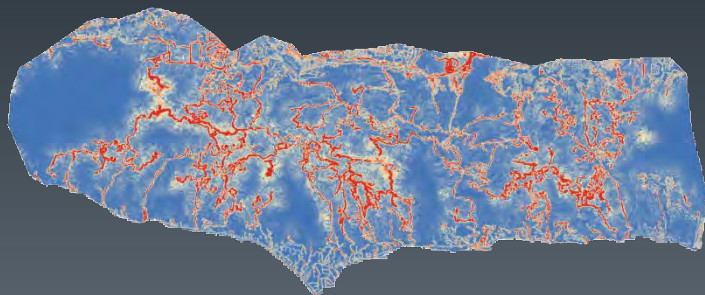
Equipment



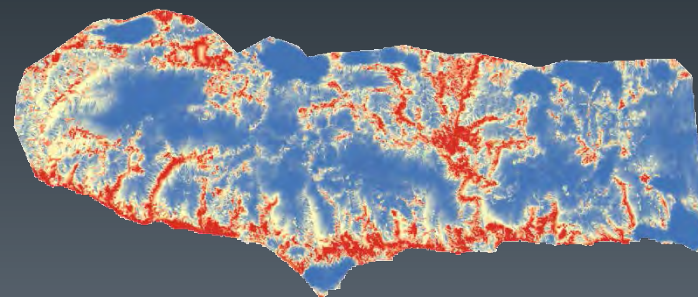
Arson



Vehicle



Powerline



Lessons Learned

- “From the house out” – significantly improves outcome
 - Defensible space – immediately adjacent to house
 - Unintended ecological consequences
 - Building codes effective, retrofits for older
 - Fire-safe construction does not guarantee survival in intermix
- “From the wildland in” – important but not enough
 - Prescribed fire, negative impact with little benefit
 - Firefighter access key for fuel treatments
 - Strategic placement close to community
 - Consider trade-offs

Lessons Learned So Far

- Land use planning – Best for fire and ecology
 - Source of problem / prevent exposure
 - Zoning: compact and clustered
 - Selection priority: high fire hazard/high biodiversity areas
- Ignition prevention reduces fire altogether





Housing arrangement
& location

Need comprehensive solution for a complex problem

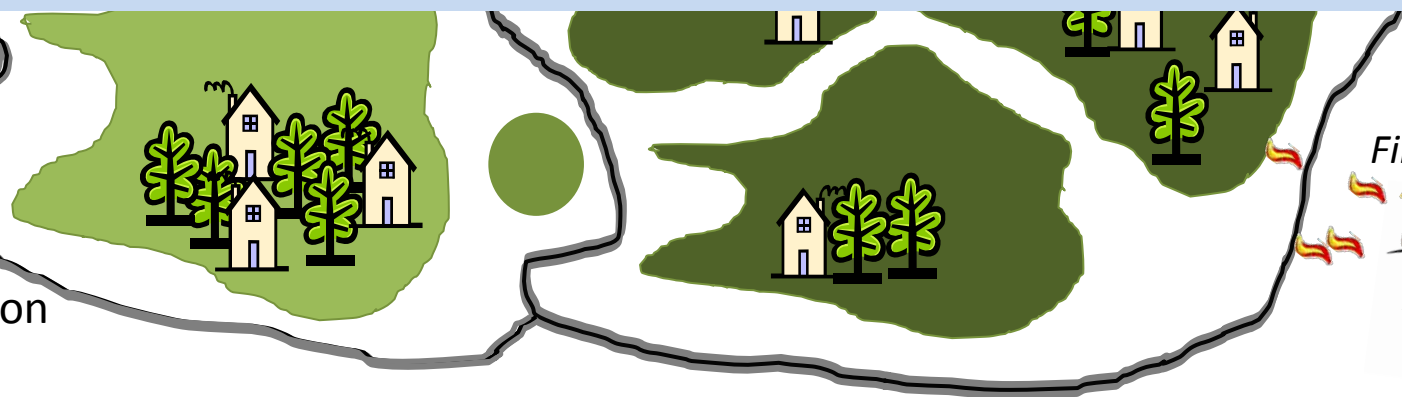
- Will become more complex with global change
- Need science-based, long-term strategies
- Involving multiple stakeholders

Ign
Ca

Minor
roads



Fire
suppression



Fire weather



When solving problems, dig at
the roots instead of just hacking
at the leaves.

- Anthony J. D'Angelo



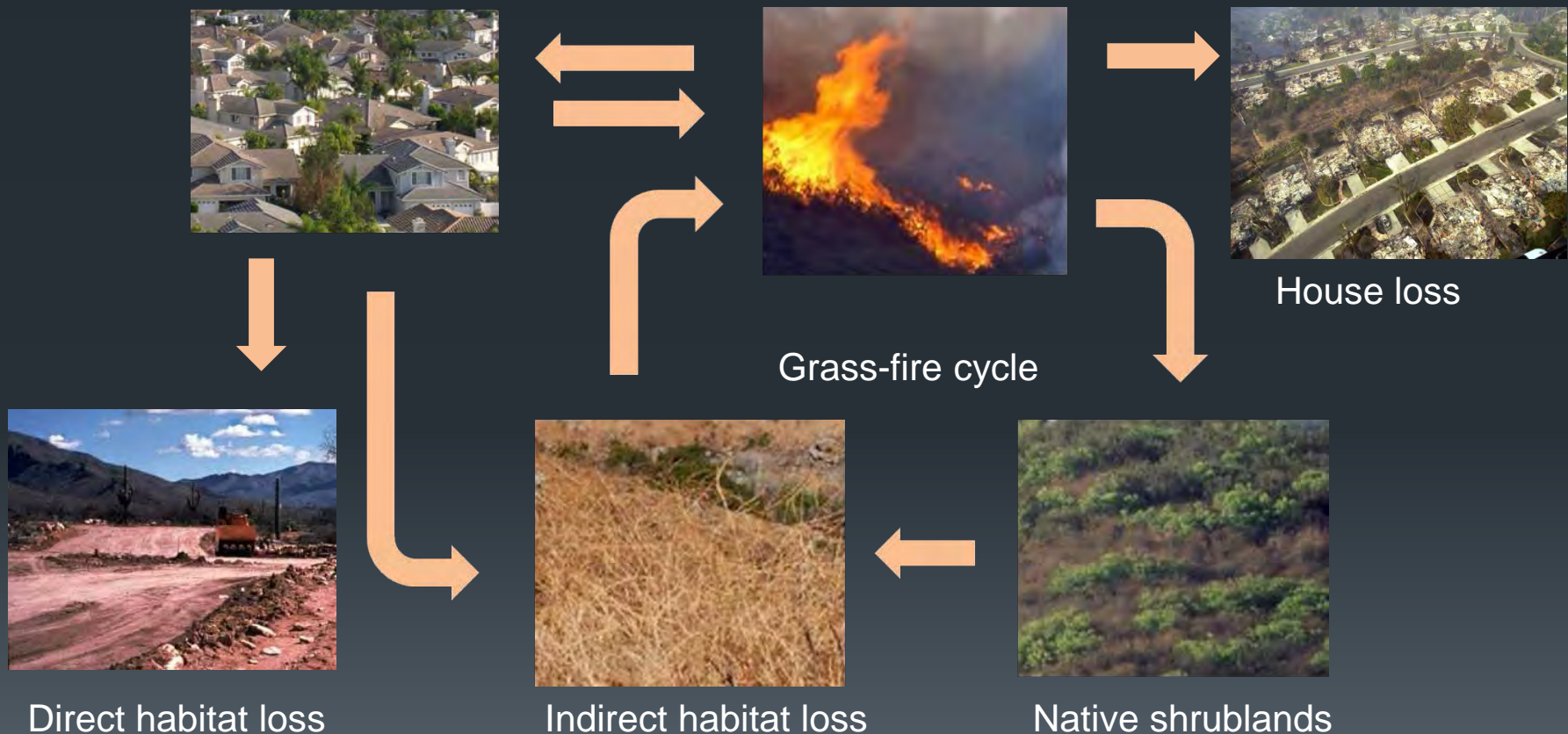
Thank you



The Complexity of the Problem



- “What we do” requires this recognition



Which is Most Important?

- Building & defensible space BOTH
- Windows more than roof, roof more than exterior
- May be other factors not considered here

