

Impacts to Fire Risk & Environmental Factors After Treating Fuels in the Wildland-Urban Interface

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## Two primary parts...



1. Monkeys in the zoo
  - Research efforts into tradeoffs of fuel treatment
2. If I ran the zoo...
  - Holistic approach to WUI management



- Along the way
  - Zoo's gone wild...
    - When bad fires happen to good people



## California dreamin'...

- Build it and they will come

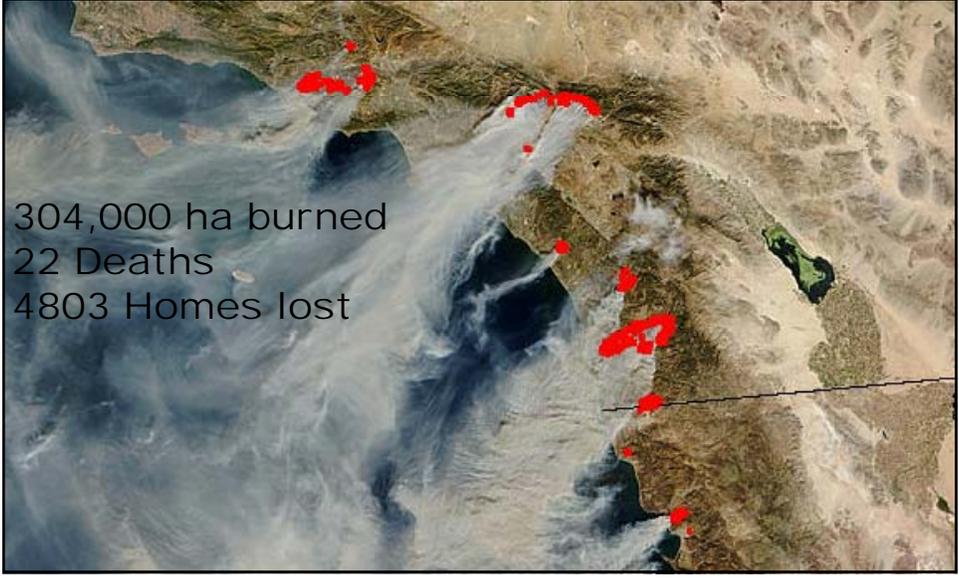
Population of Australia  
In Southern California



## California dreamin'...

- Build it and they will burn (2003)

304,000 ha burned  
22 Deaths  
4803 Homes lost



# California dreamin'...

- Build it and they will burn (2007)



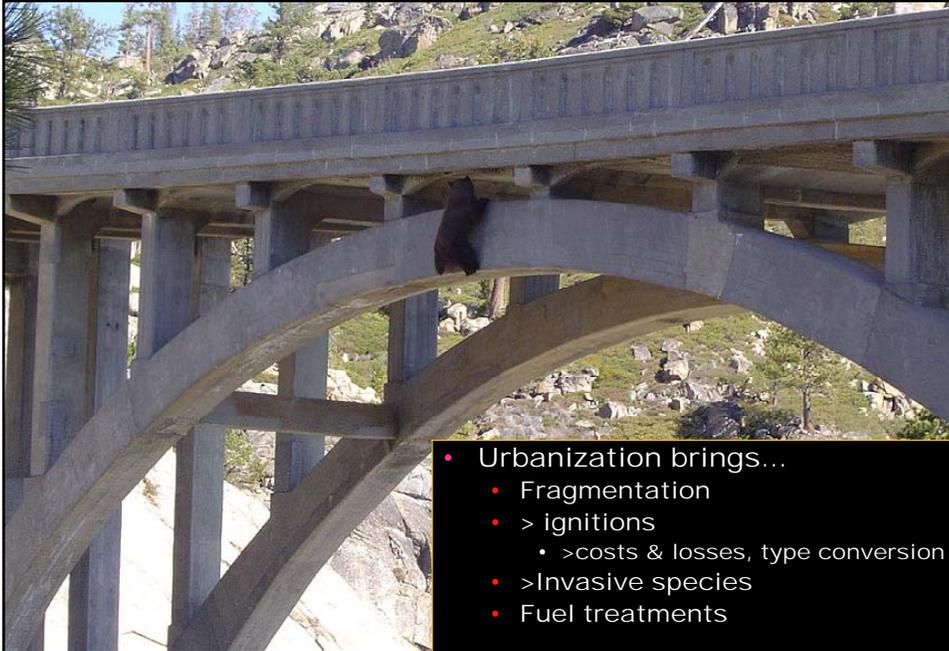
# And burn... (Santa Barbara)

November 2008: 219 homes

May 2009: 200+ homes



## WUI: An insurmountable task???



- Urbanization brings...
  - Fragmentation
  - > ignitions
    - >costs & losses, type conversion
  - >Invasive species
  - Fuel treatments

## Hazards vs. benefits

Pismo Beach, California



- Vegetation provides benefits
  - Air pollution removal
  - Carbon sequestration
  - Soil stabilization
  - Home cooling costs
  - Stormwater retention
  - Wildlife habitat
  - Home value
  - And on and on...

Vegetation is  
more than fuel!!

# Bridging the stereotypes...

Stupid bogans wanna pave the world, mate!

Dang greens like bushes more than people!



July 2003

## Urban Ecosystem Analysis San Diego, California

### Calculating the Value of Nature

**Report Contents**

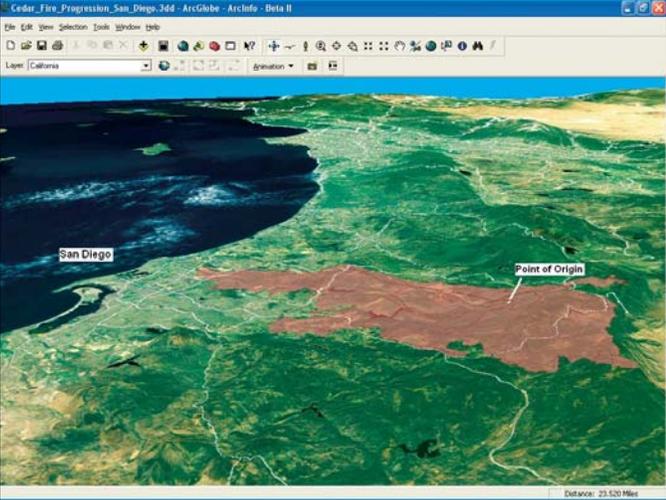
- 2 Project Overview
- 3 Major Findings
- 4 Creating a Green Data Layer
- 5-6 Tree Canopy Trends from Landsat
- 7-9 Building a Green Data Layer
- 10-11 San Diego's Green Data Layer
- 12-13 The Green Data Layer Applied to Local Issues
- 14-15 Environmental Benefits of Urban Forests
- 16 Analysis Report
- 17-18 Recommendations
- 19 About the Urban Ecosystem Analysis



- The result???
- Plant 100,000 trees



## 2003 Firestorm



The result???

- Cut it all down!
  - Clear to 33 m

**Cedar Fire**  
111,000 ha  
2820 homes  
14 fatalities

## This is too easy...

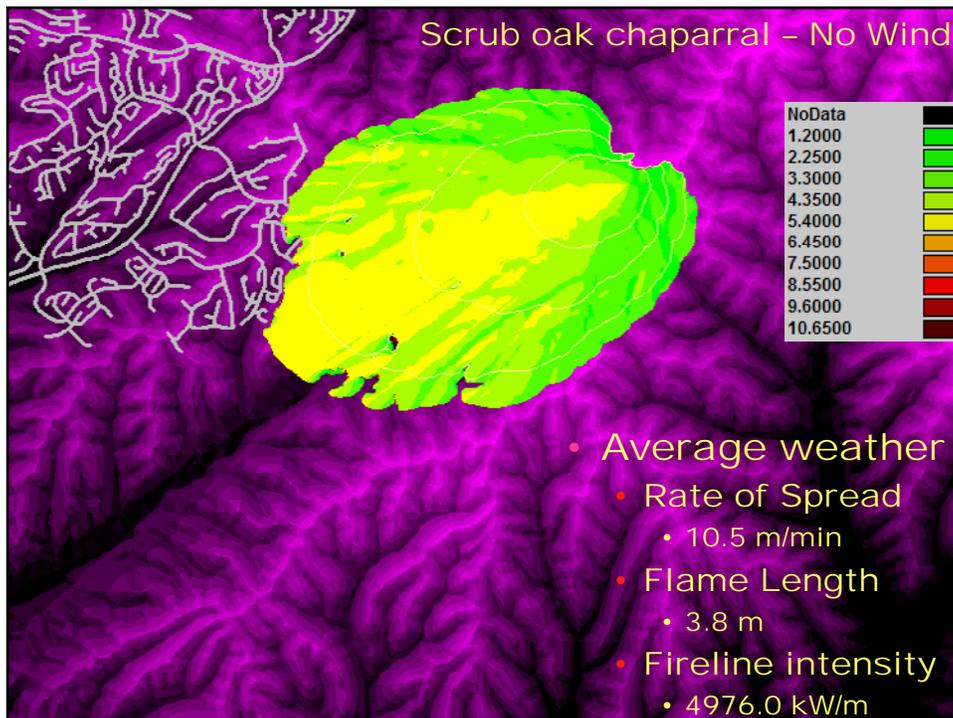


Determine...

1. Potential fire behavior for major grassland, shrubland, and woodland communities in San Diego
2. Community benefits for each
3. Which best mitigates fire risk while maximizing benefits?



## Scrub oak chaparral (SH7)



## Benefits of scrub oak chaparral???

- Air pollution removed???
- Stormwater runoff stopped???
- Carbon sequestration???

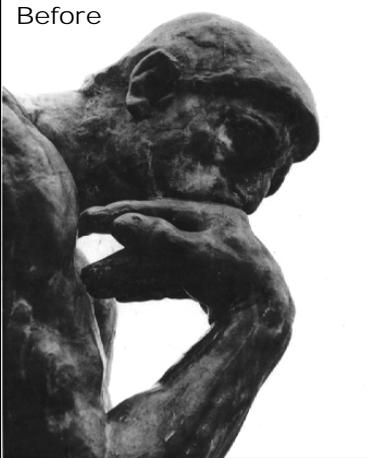
Big  
FAT  
Zero

## Conclusions...

Politically-correct, please-don't-sue-me version

- When assessing canopy benefits...
- Consider assumptions of CITYgreen model

Before



After



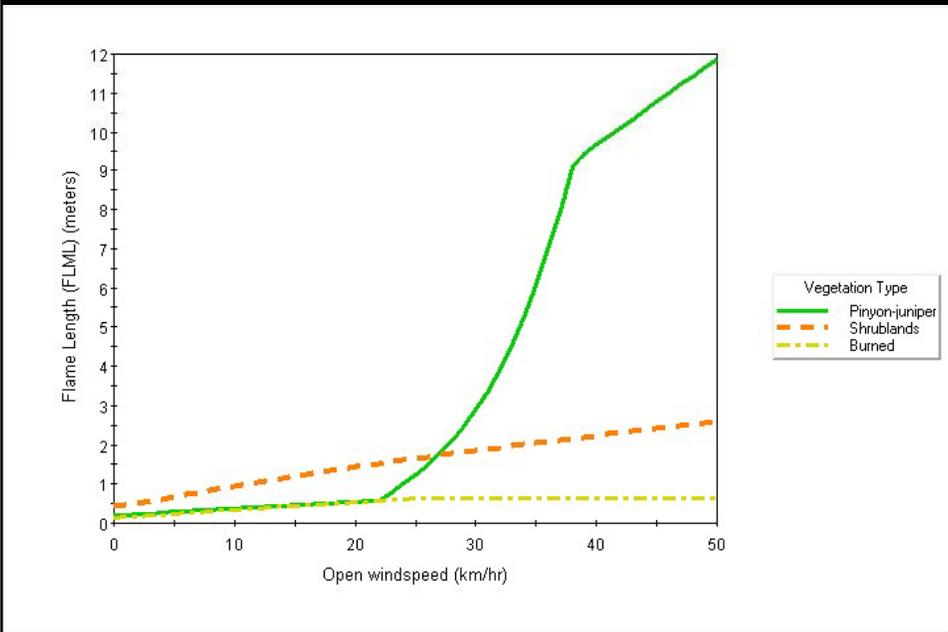
Oh please, oh please...  
(4 attempts later...)



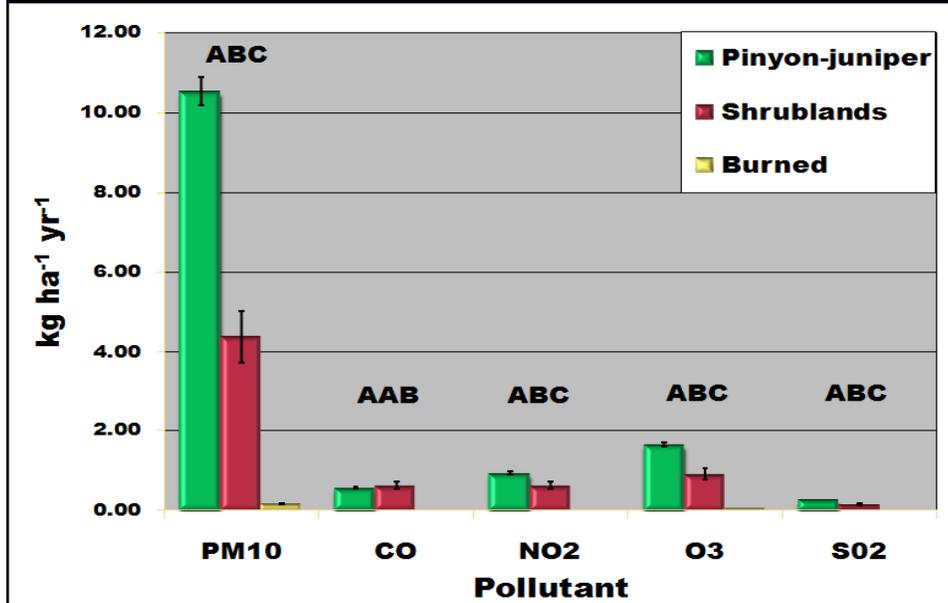
- Eastern Sierra Nevada Mountains (~ 2000 m)
  - Pinyon-juniper woodlands
  - Sagebrush shrublands
  - Grasslands from Manter Fire

Kennedy Meadows, California

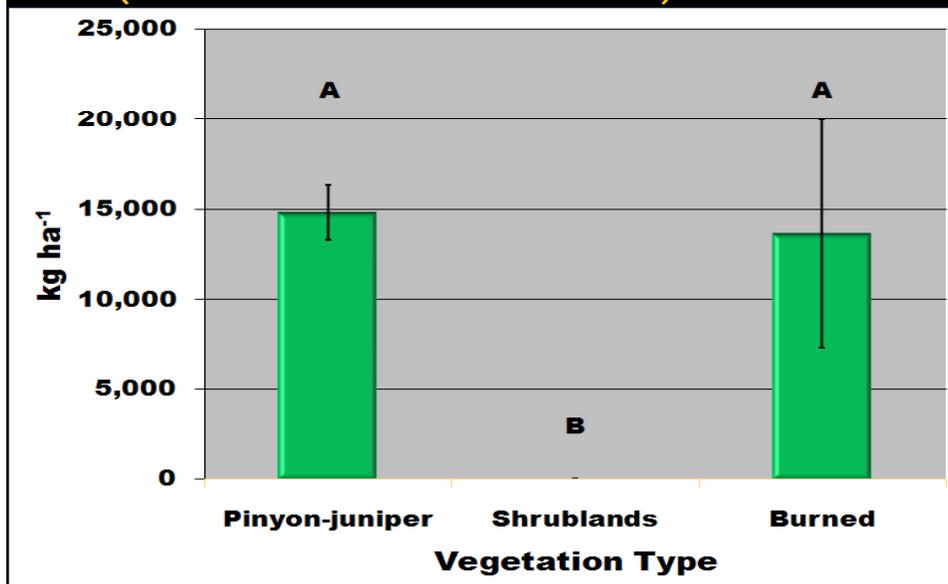
## NEXUS Flame Length – Manter Wx

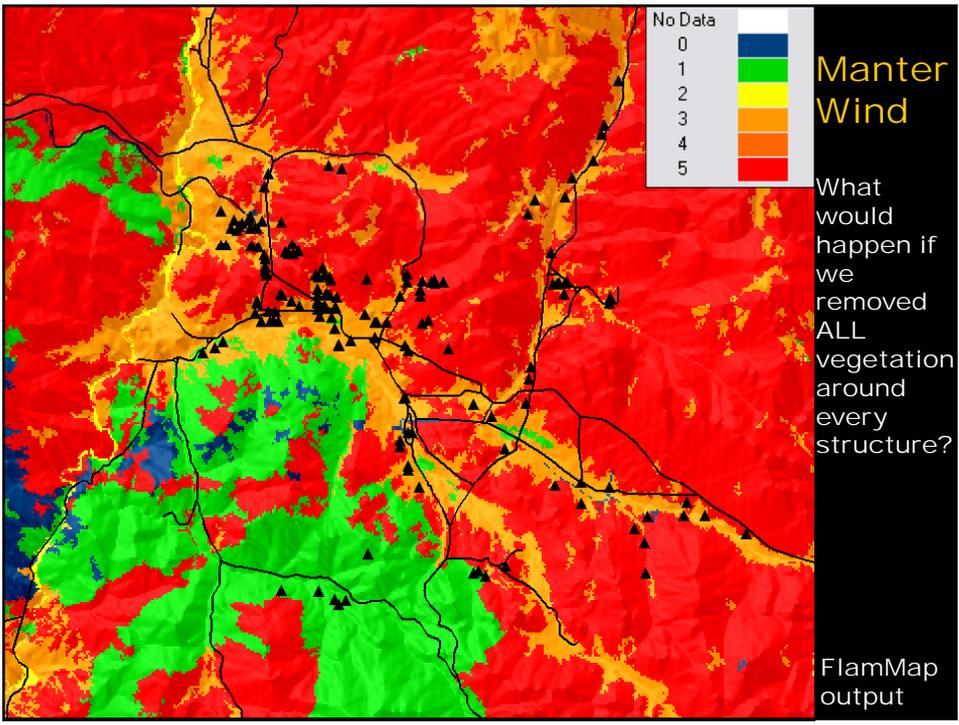
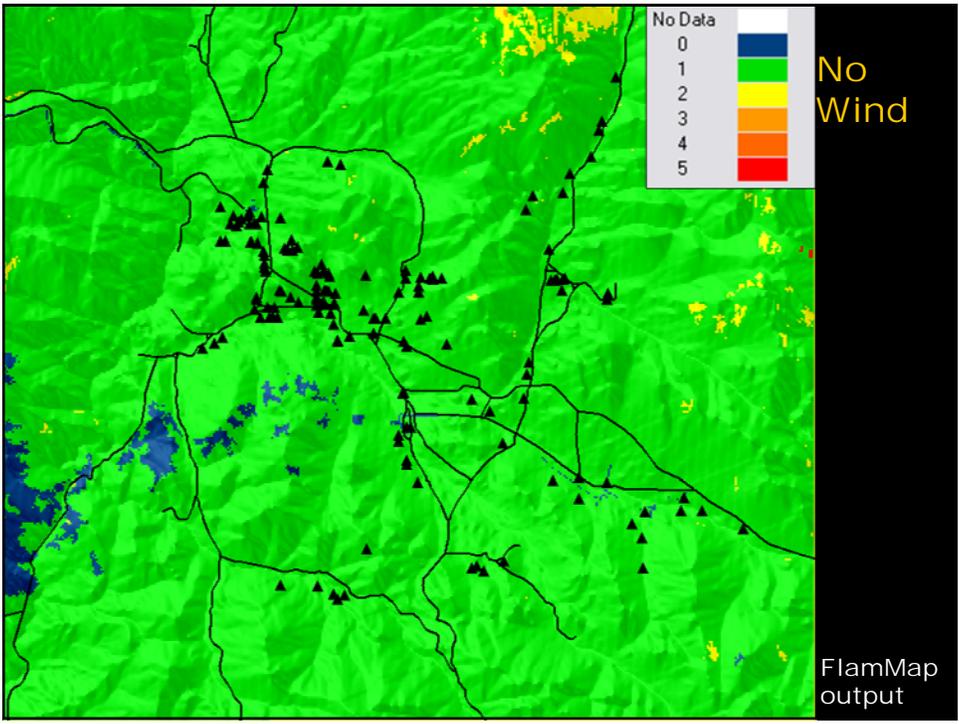


## Air pollution removal



## Carbon storage (shrubs still the devil)





Landscape effects of defensible space			
	Untreated	With 10m buffer	With 30m buffer
Pollutant	Capacity (t/yr)	Capacity lost (t/yr)	Capacity lost (t/yr)
PM <sub>10</sub>	422.338	0.028	0.323
CO	26.304	0.003	0.028
NO <sub>2</sub>	39.477	0.003	0.035
O <sub>3</sub>	68.098	0.005	0.057
SO <sub>2</sub>	11.349	0.001	0.009
<b>Total</b>	<b>567.566</b>	<b>0.040</b>	<b>0.452</b>

• Meet the monkeys...

• Current work



Jon Large



Chris Hamma



Kevin Osborne



Alex Kirkpatrick



## Current Research



- Stand-level
  - How do treatments affect
    - Fuels
    - Fire behavior
    - Ecosystem services
      - Carbon sequestration
      - Air pollution removal
- Landscape-level
  - How do
    - Treatment types
    - Intensities
    - Layout
  - Affect
    - Fire size
    - Ecosystem services
    - C lost during fire

## Part Deux -

If I ran the (holistic fire management) zoo...



"Fire is necessary, fire disasters are not"  
--Me (last night)



## Need holistic approach



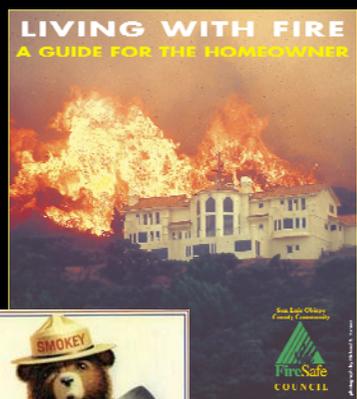
- Before the fire
  - Prevention
  - Mitigation
  - Preparation
- During the fire
  - ~~Response~~
    - Agencies
    - Residents
- After the fire
  - Recovery
    - Biophysical
    - Socioeconomic



We must  
prepare the  
battlefield!!!



# Prevention • Education (passive)



San Luis Obispo Fire Expo

# Prevention • Education (active)



WUI demonstration house, California

## Prevention



Erected AFTER 2009 bushfires



Cause of 2 fires at Cal Poly



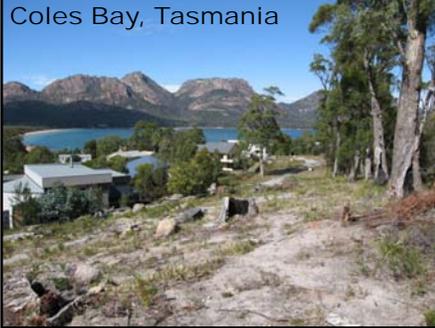
- Eliminate ignition sources
  - Power lines
  - Spark arrestors
- Fuels less receptive
  - Roadsides cleared or irrigated
- Civil and criminal liability
  - Surveillance

## • *Appropriate Fuels Management*



## • *Appropriate Fuels Management*

Coles Bay, Tasmania



Snug Tiers, Tasmania



- Landscape-level treatments
  - Limits spread to community
  - Aids responders
- Does NOTHING for individual structures

## • *Appropriate Fuels Management*



- Landscaping-level more important
  - If you live in the bush, know that it burns





### Construction standards

- Radiation and flames (fix via fuels)
- EMBERS!!!



Embers ignite deck

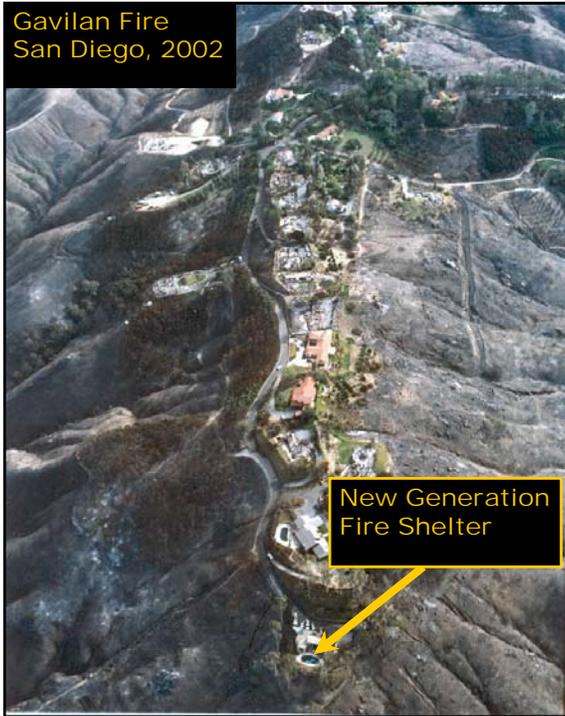


Embers melt sunroof and ignites interior

### Construction standards

- Embers
  - Roof most important
- “Mind the gap”
  - Not just for Sydney trains
  - MANY homes burn from inside out

Gavilan Fire  
San Diego, 2002



### Sound Land Use Planning

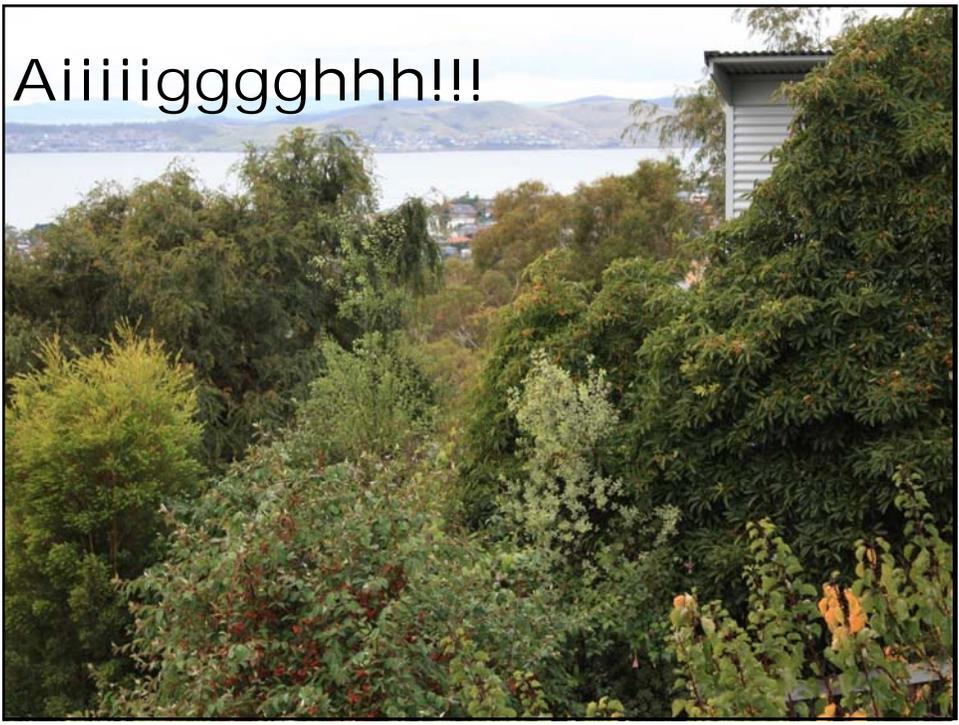
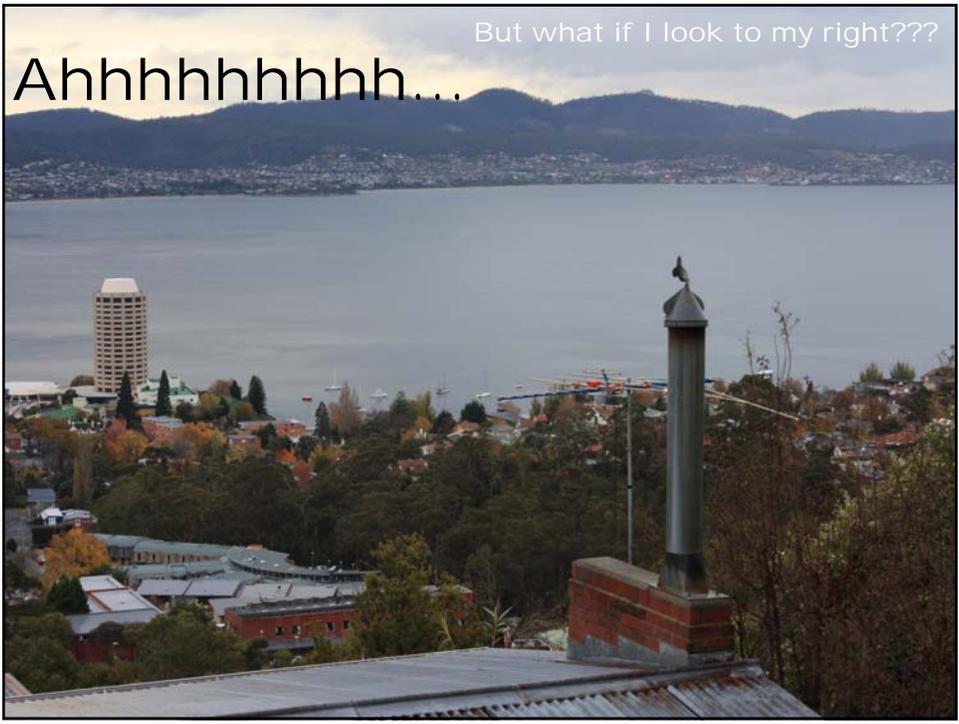
- San Diego way
  - Doesn't always work out so well...

Mt. Nelson (my home)



### Sound Land Use Planning

- Tassie way
  - Roads BAD
    - Crazy narrow
    - Crazy winding
    - Crazy scary
  - Home density facilitates structure-to-structure
  - Homes overlook gorges
- 2 fires in last 10 years spook residents
  - (but not enough)
- Why live there?



## Preparation



WUI exercise, California



"Non-combustible" water tanks

- To aid response
  - Training
  - Infrastructure
    - Water
    - Communications
  - Daily hazard
    - They didn't know in Marysville???

- Coordinated effort
  - CFA fighting with Melbourne?
  - DSE lighting backfires without CFA knowing?
- Warning residents
  - Reverse 000 could help

## Response

Marysville, Victoria

- Residents
  - Leave EARLY
  - PREPARE, Stay, & Defend
    - How do you prepare for mentally for fire???

## Response



Successful defense by 76-year-old



Can't defend against a locomotive

## Recovery

- Physical



Clean-up



Rain threatens catchments



Rebuilding infrastructure

## Recovery

- Social

Where there is HOPE, there is LOVE.

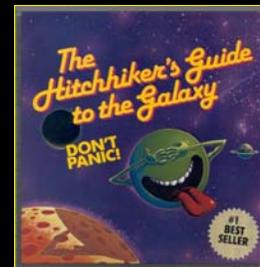
Where there is LOVE, there is LIFE.

Where there is LIFE, there is . . . MARYSVILLE



Human beings, who are almost unique in having the ability to learn from the experience of others, are also remarkable for their apparent disinclination to do so.

-- Douglas Adams, 1952 - 2001



Hobart 2006



