EFFECTS OF SOUTHERN CALIFORNIA WILDFIRES ON STORM WATER CONTAMINANT RUNOFF

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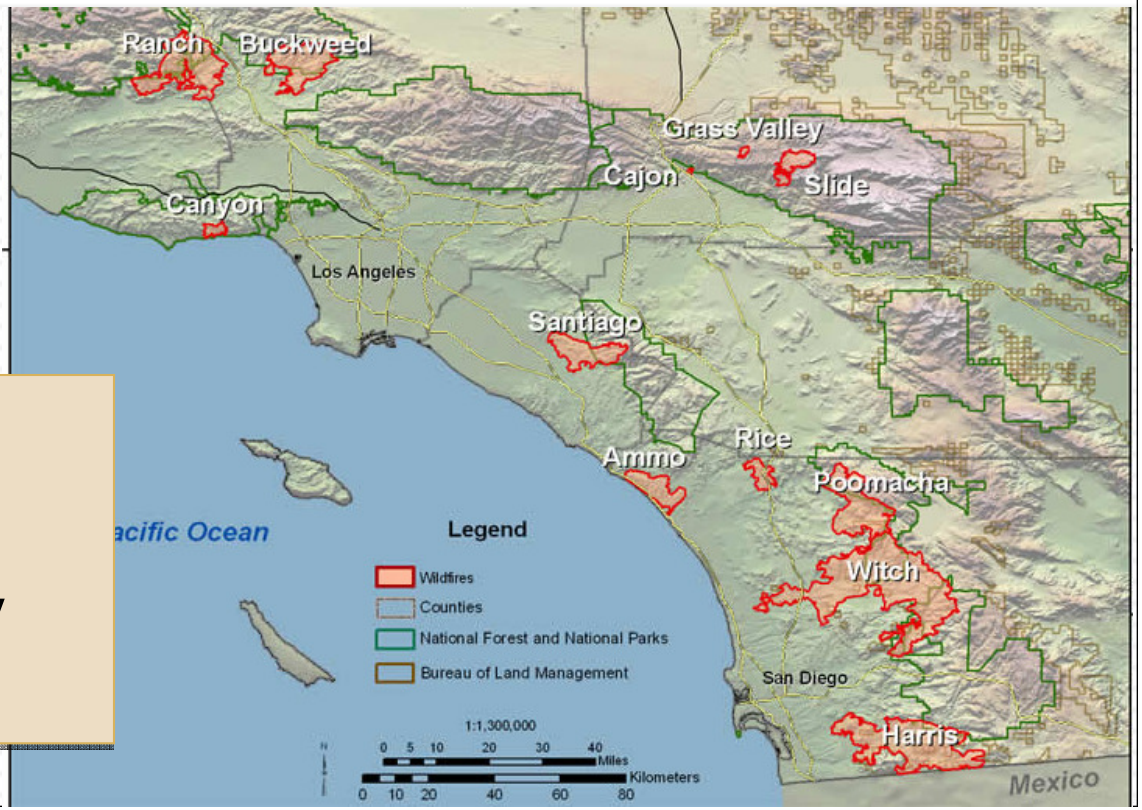
S. Ca. Coastal Water Research Project &

Fire in California

- Fire is a regular occurrence in California
- Frequency of fires increasing
- Fire alters runoff patterns
  - Higher flows
  - More sediment
  - More nutrients



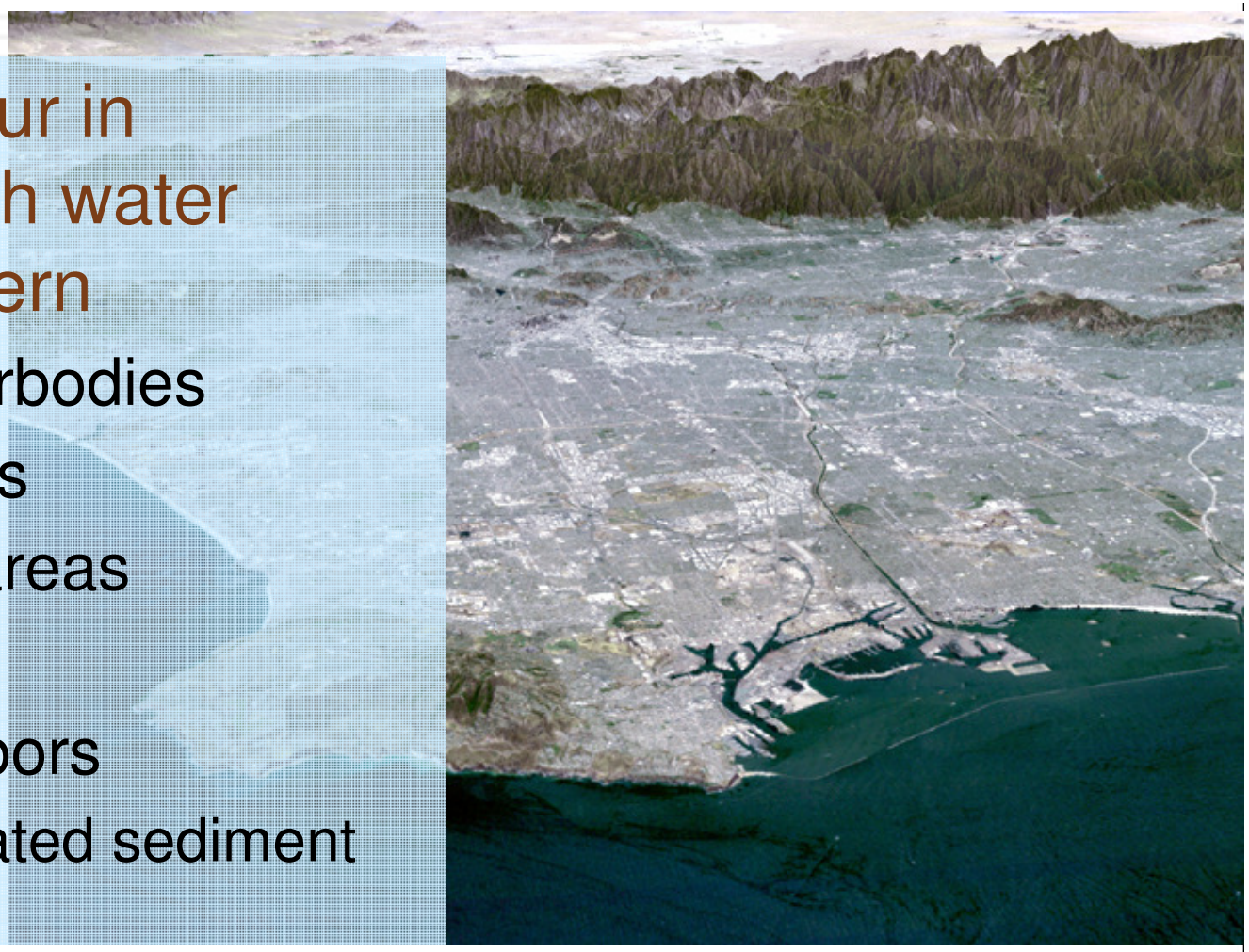
Little is known about effect of post-fire runoff on water quality

Post-fire Sources of Pollutants

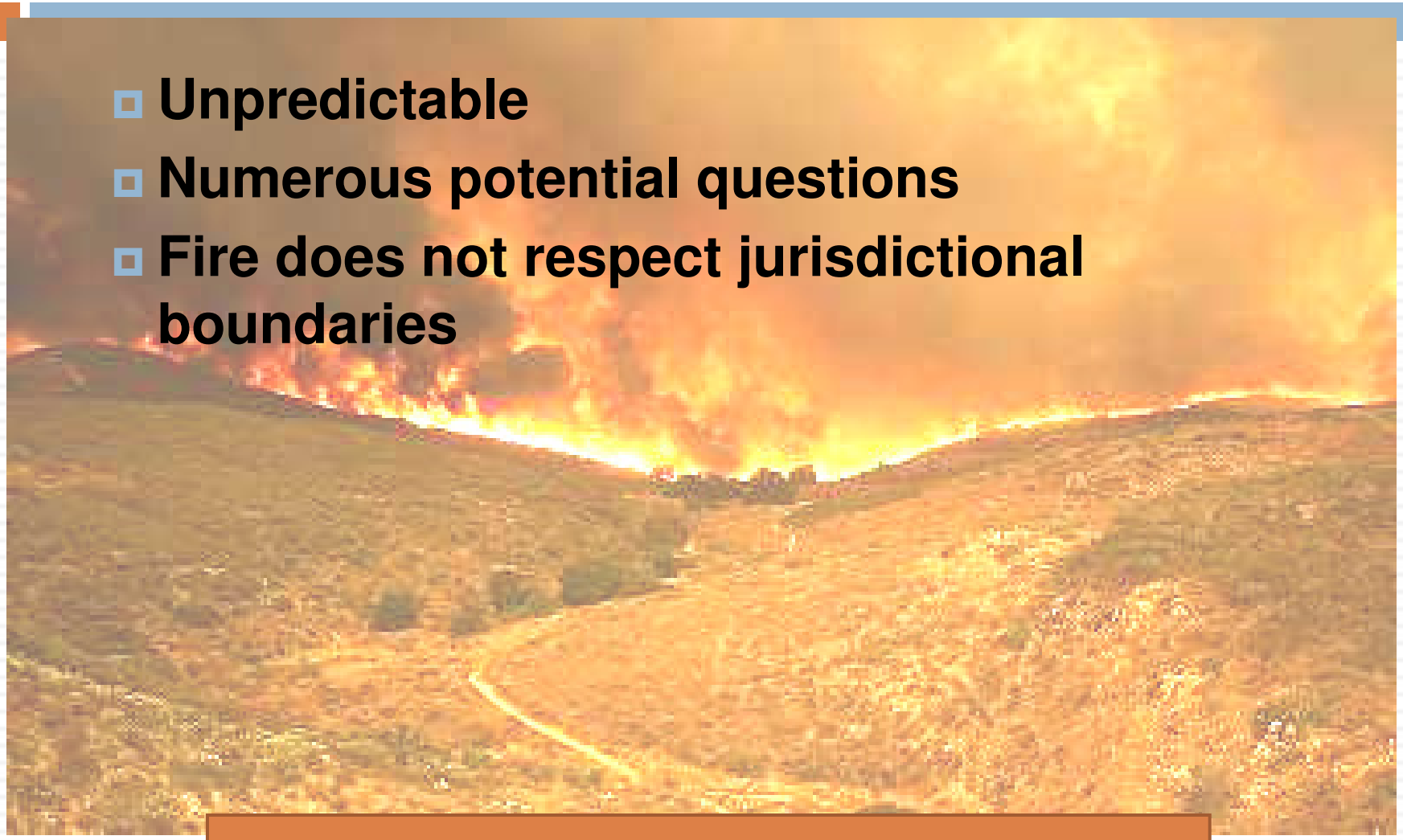
- Gasses, aerially-deposited particulates
- Fire retardants/fire suppression chemicals
- Sediment
- ASH and partially burned organic matter

Downstream Effects of Fire

- Fires often occur in watersheds with water bodies of concern
  - Impaired waterbodies
  - Sensitive areas
  - Recreational areas
  - Estuaries
  - Ports and harbors
    - Contaminated sediment

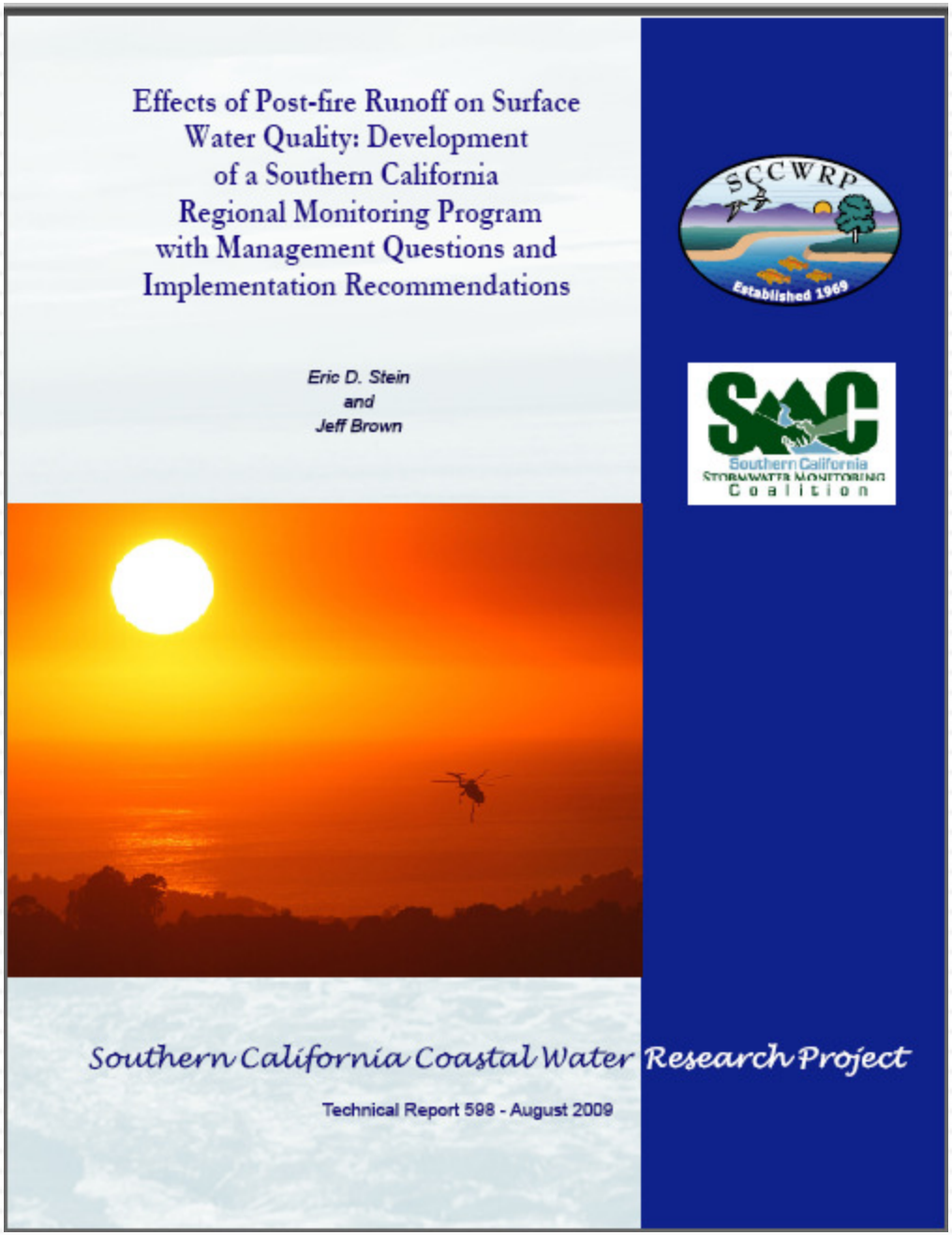


Challenges of Data Collection



- Unpredictable
- Numerous potential questions
- Fire does not respect jurisdictional boundaries

Need a coordinated regional p



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Management Questions

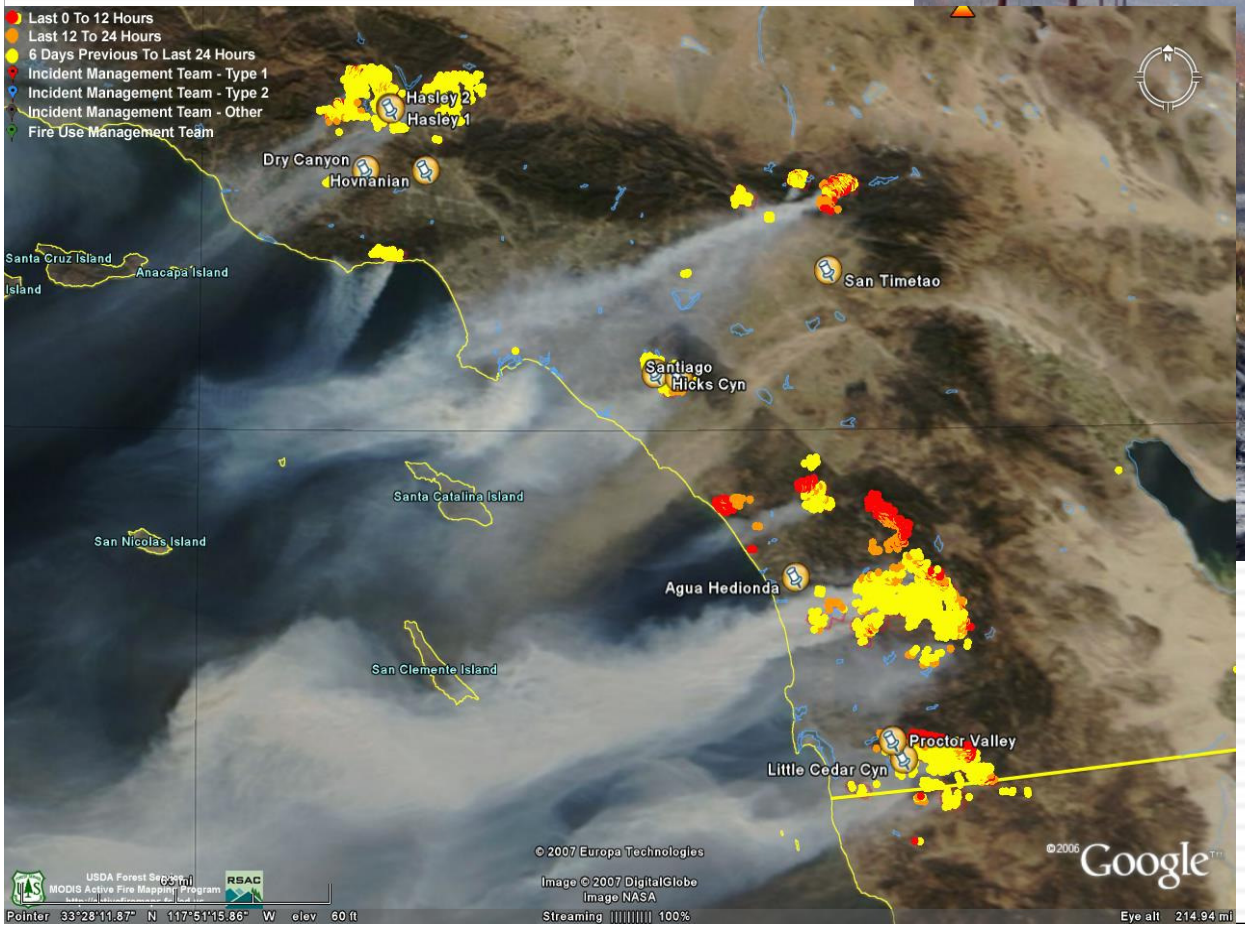
1. How does post-fire runoff affect contaminant flux?

2. What is the effect of post-fire runoff on downstream receiving waters?

3. What are the factors that influence how long post fire runoff effects persist?

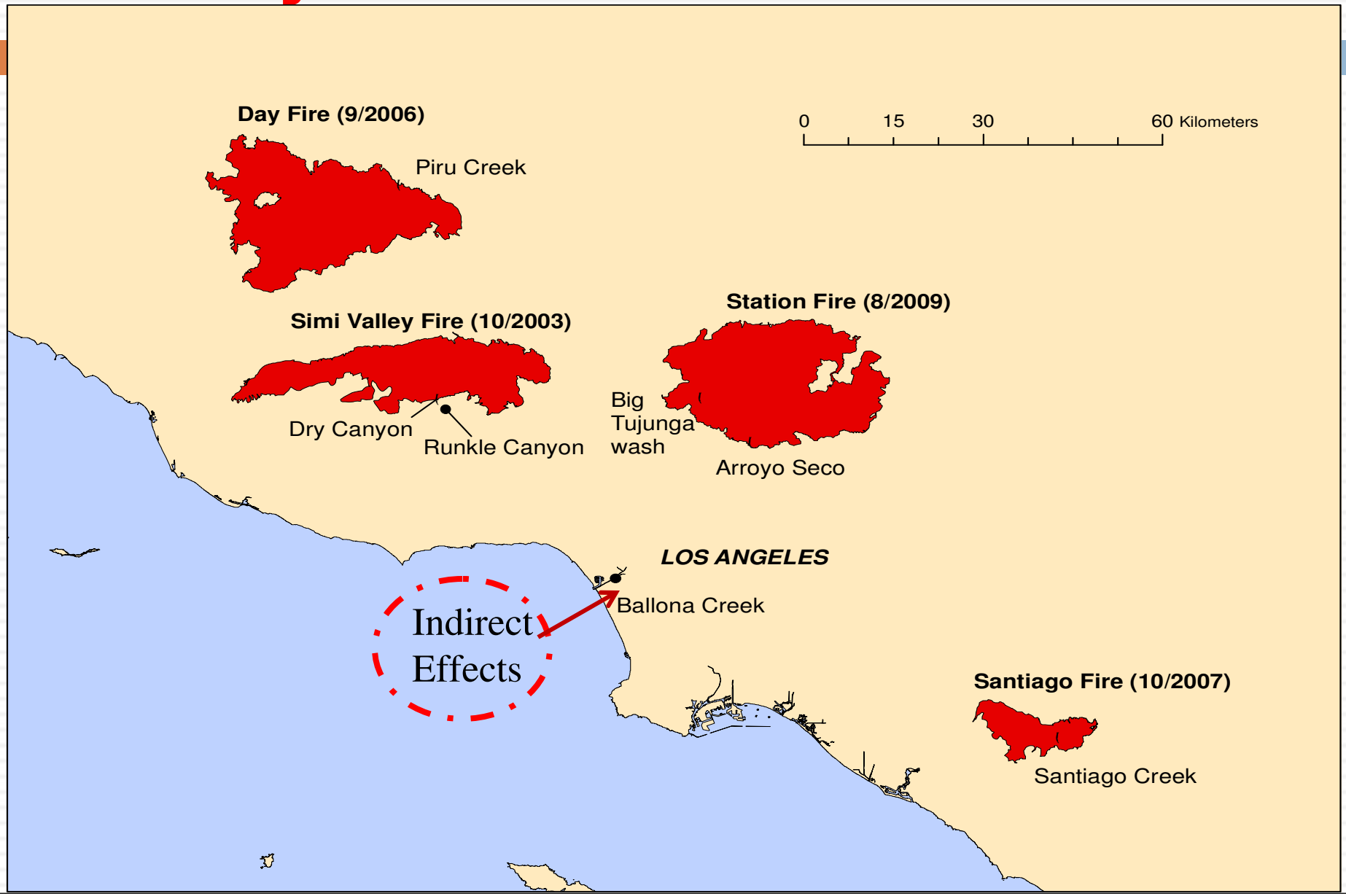
How Does Fire Affect Flux?

Direct effects



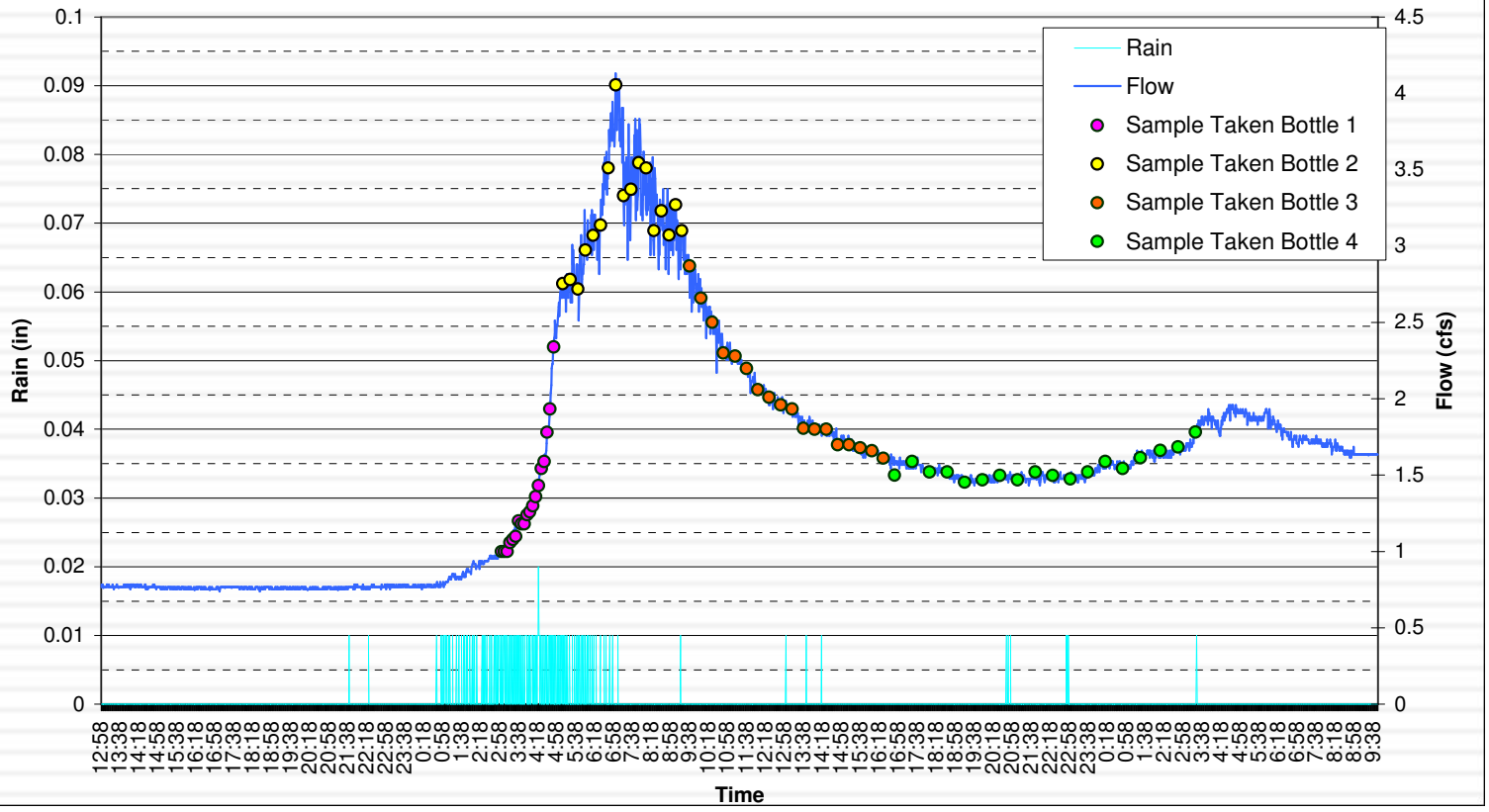
Indirect Effects

Study Locations



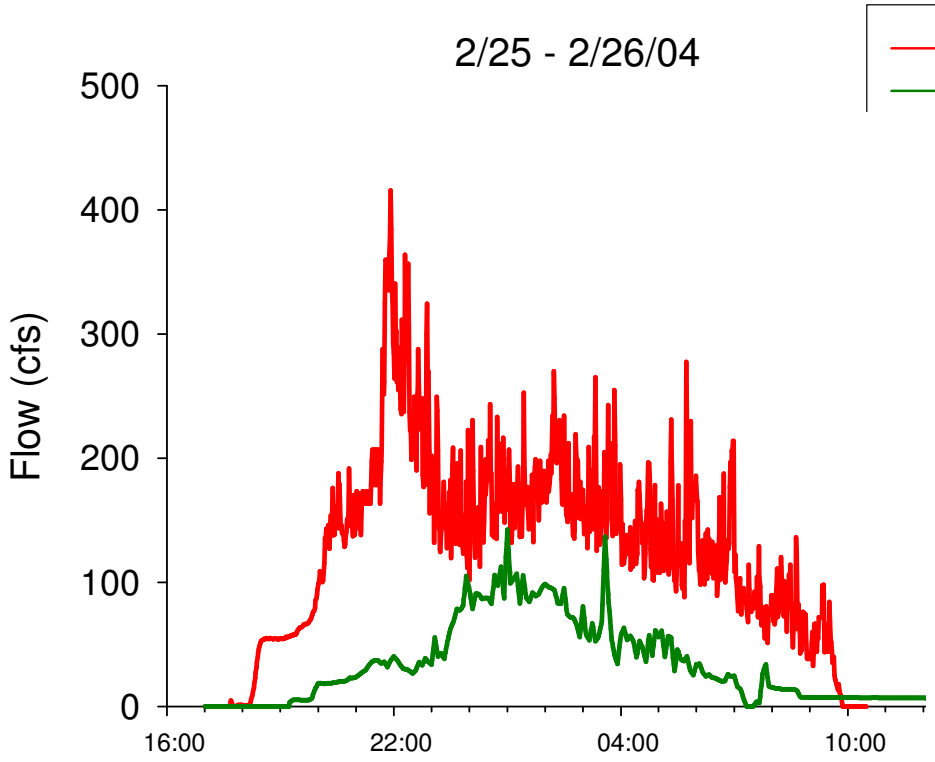
Sampling Approach

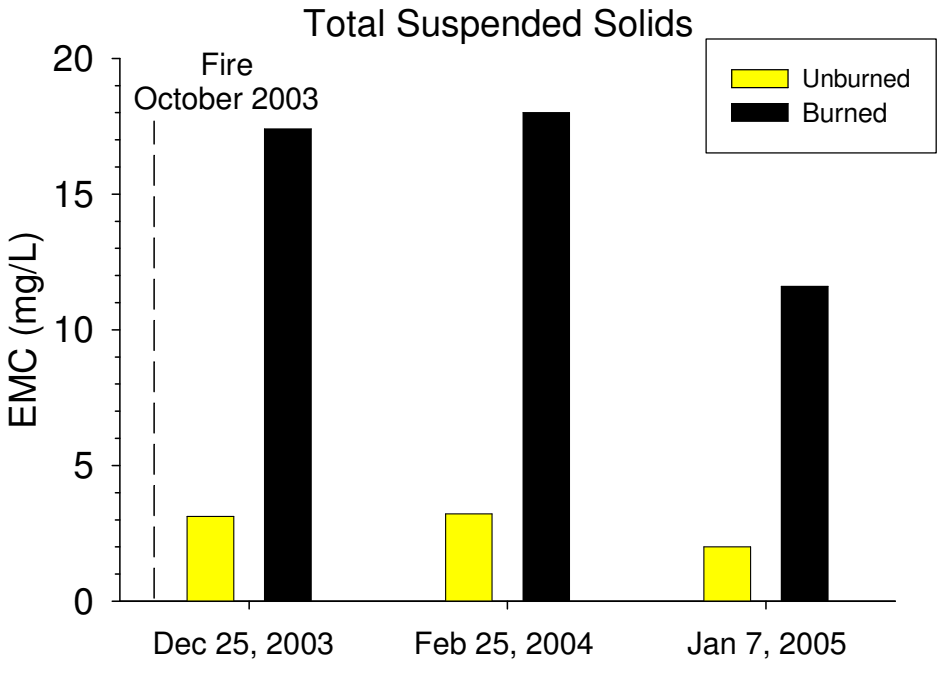
- Continuous flow monitoring
- Pollutograph sampling
- Focus on metals, PAHs, and nutrients



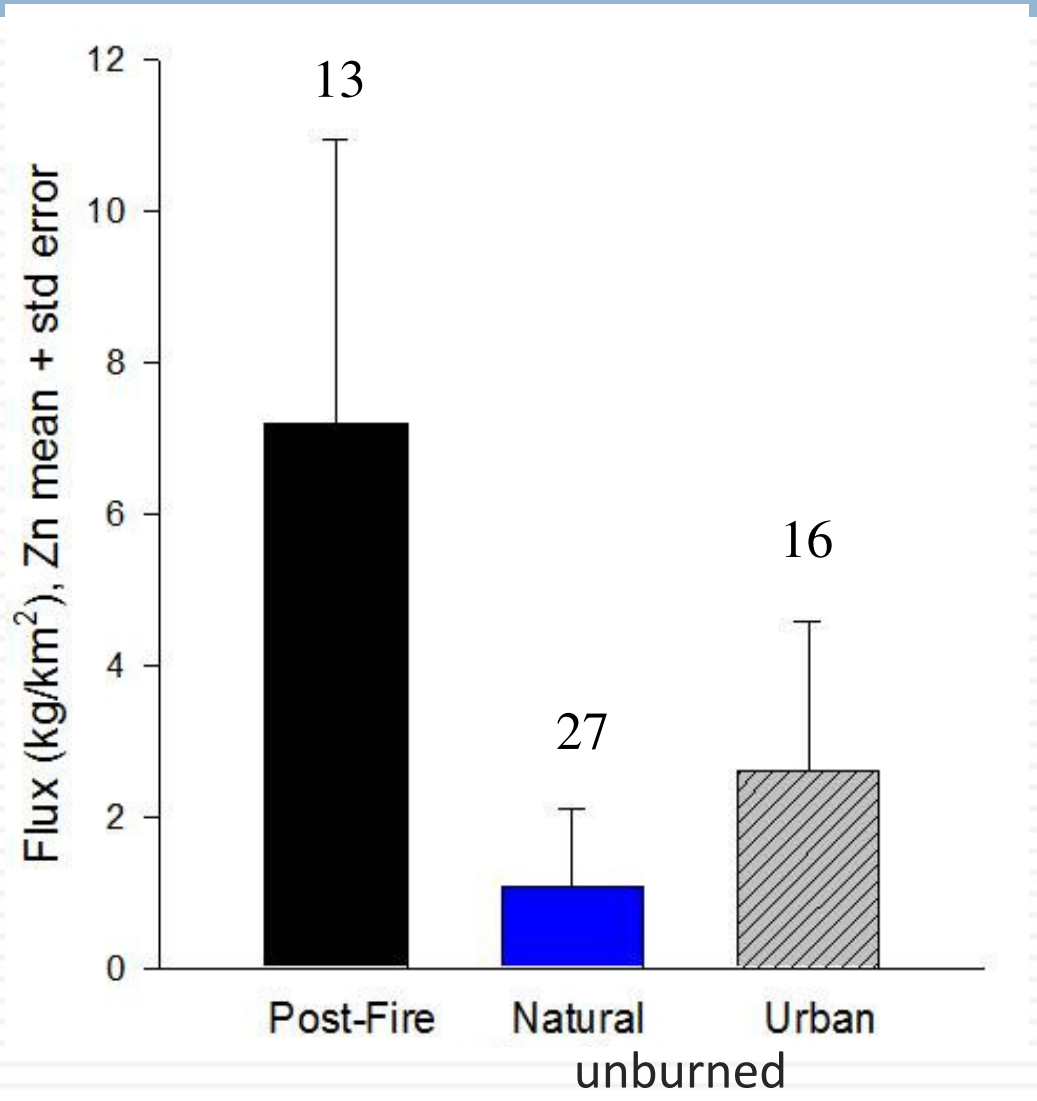
Direct Effects

Fire Produces Higher Runoff and Sediment

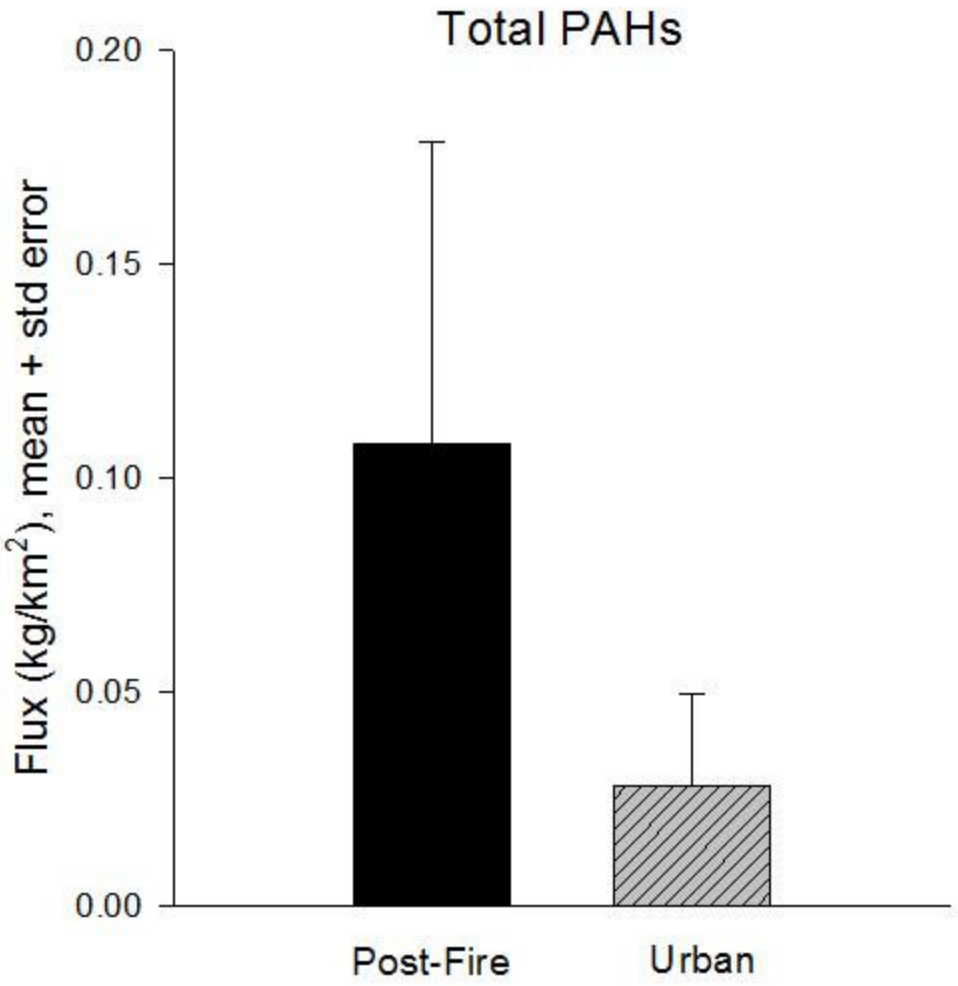


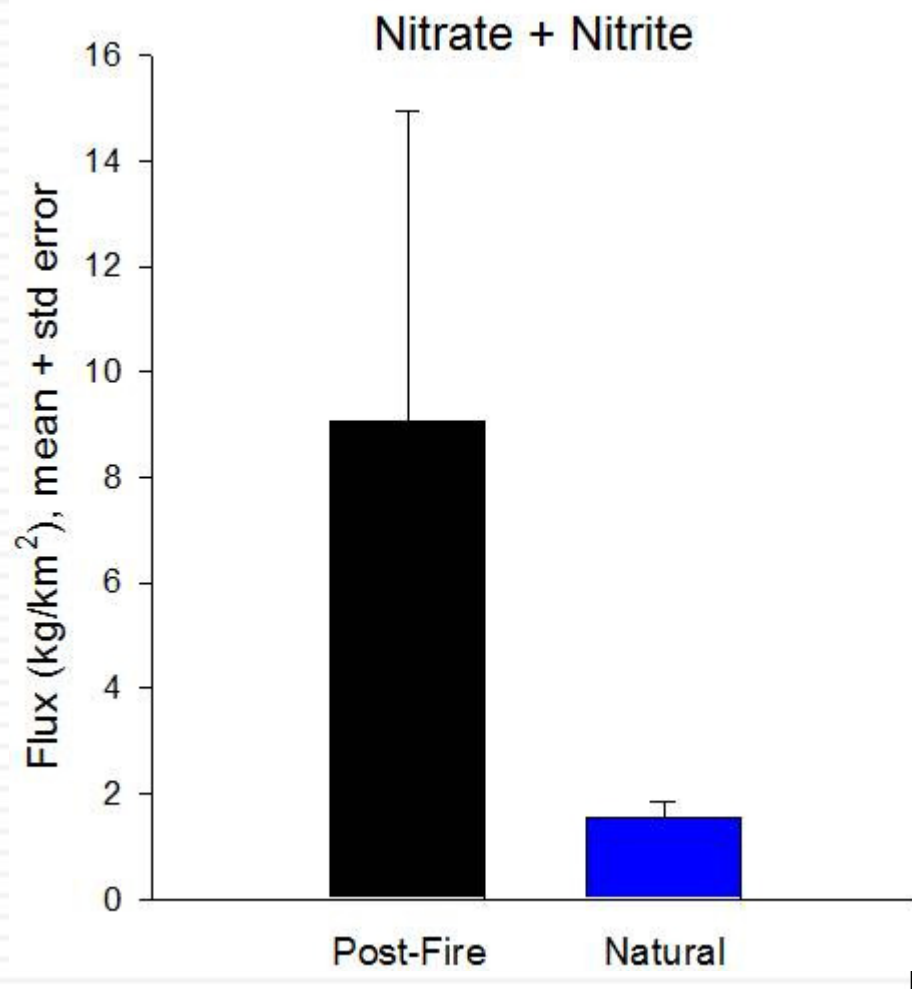


Increased Metal Flux (Zinc)



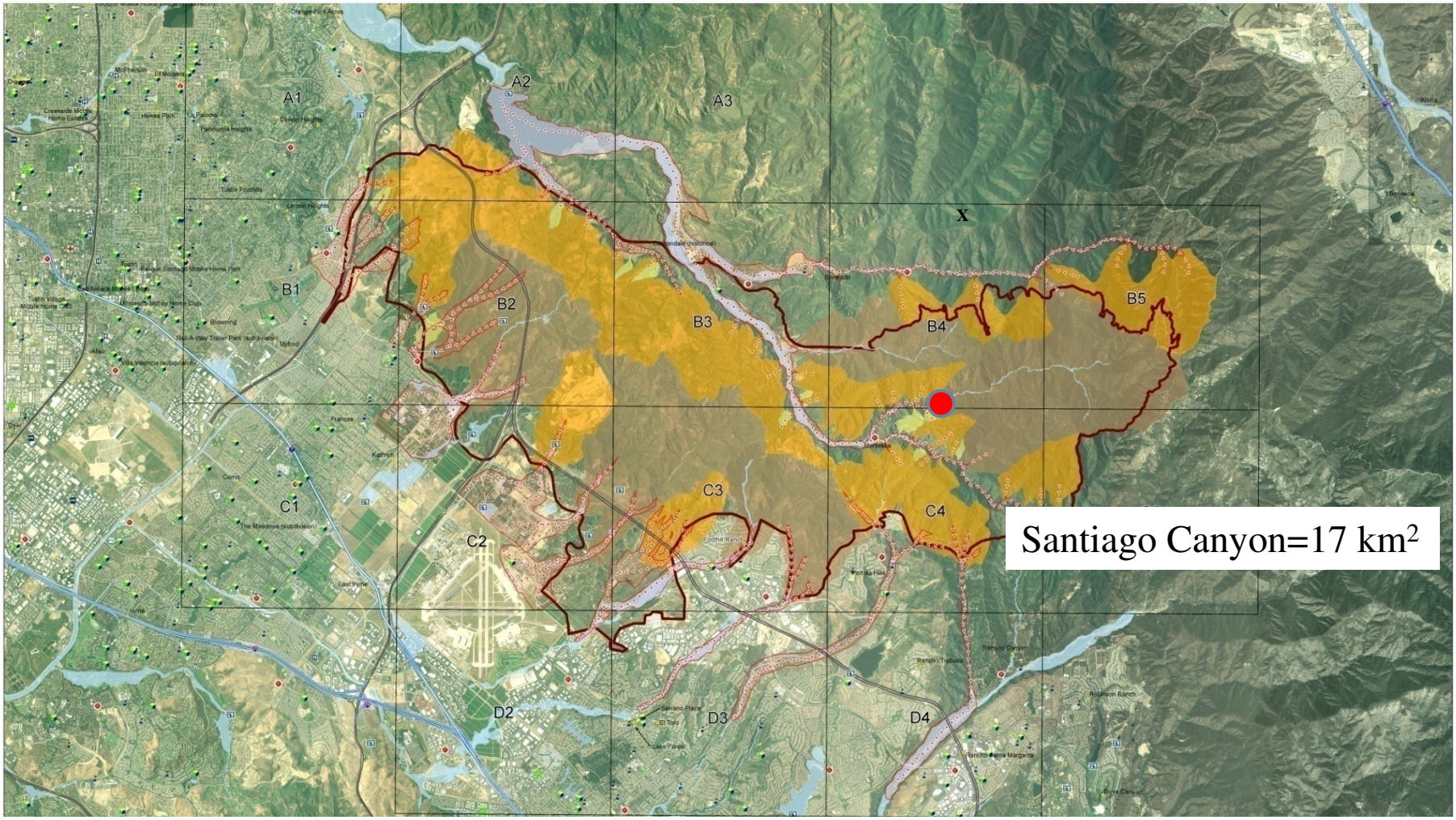
Increased PAH and Nutrient Flux





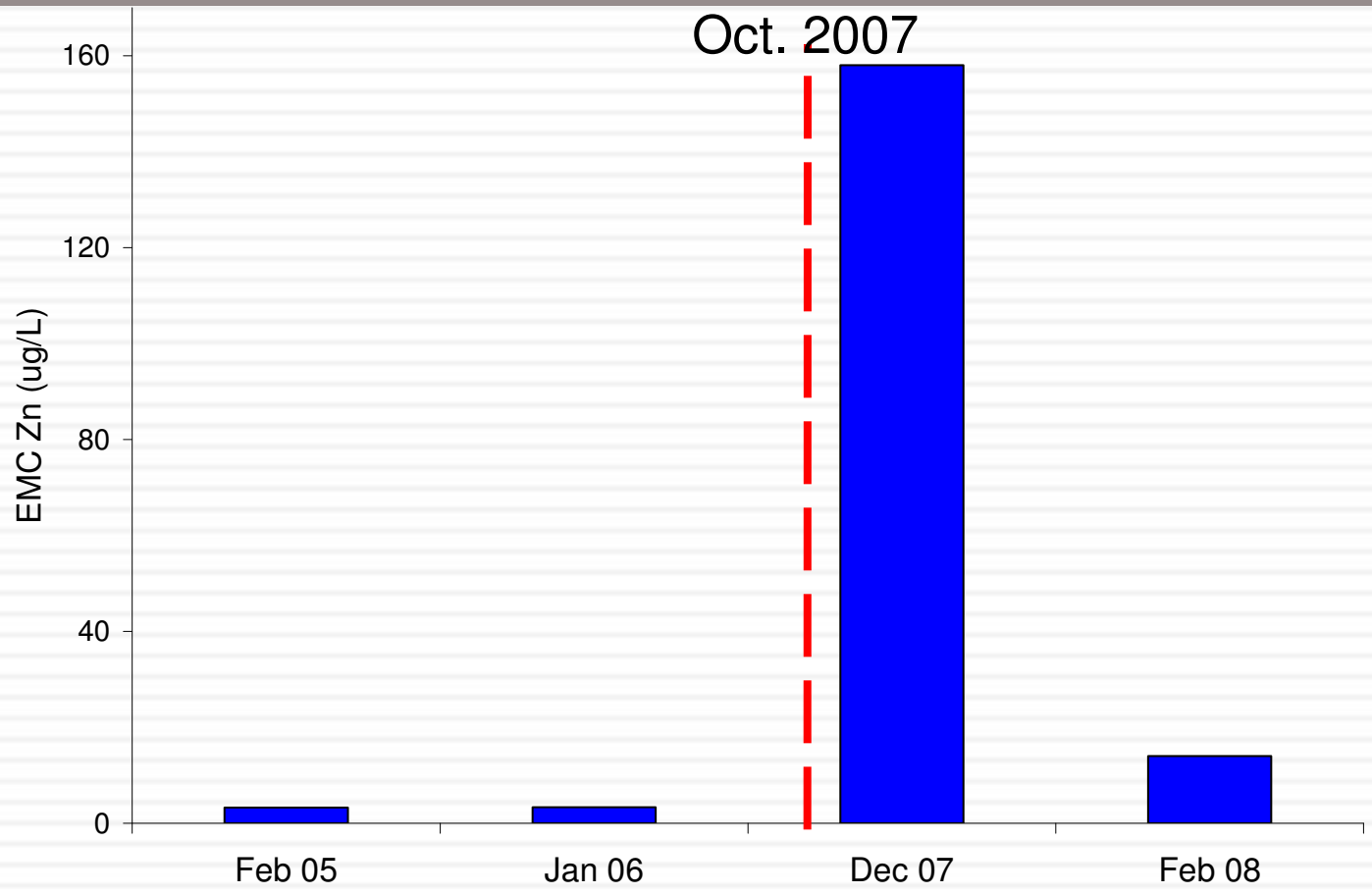
Persistence of Effects

2007 Santiago Canyon Fire



Attenuation of Concentrations (Zn)

Percent Dissolved	---	37%	1%	4%

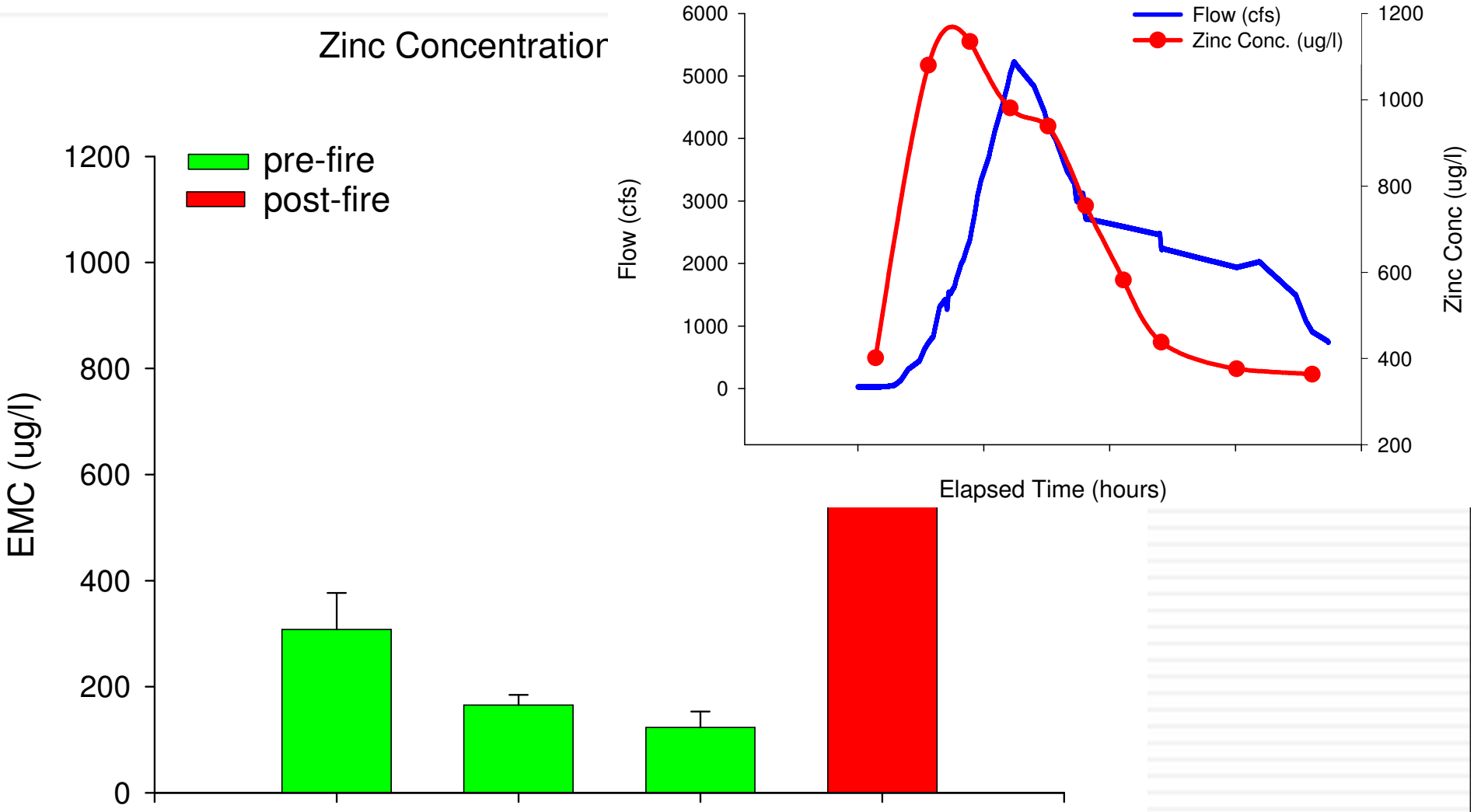


Indirect Effects

Otay Lakes, San Diego, CA
November 2007

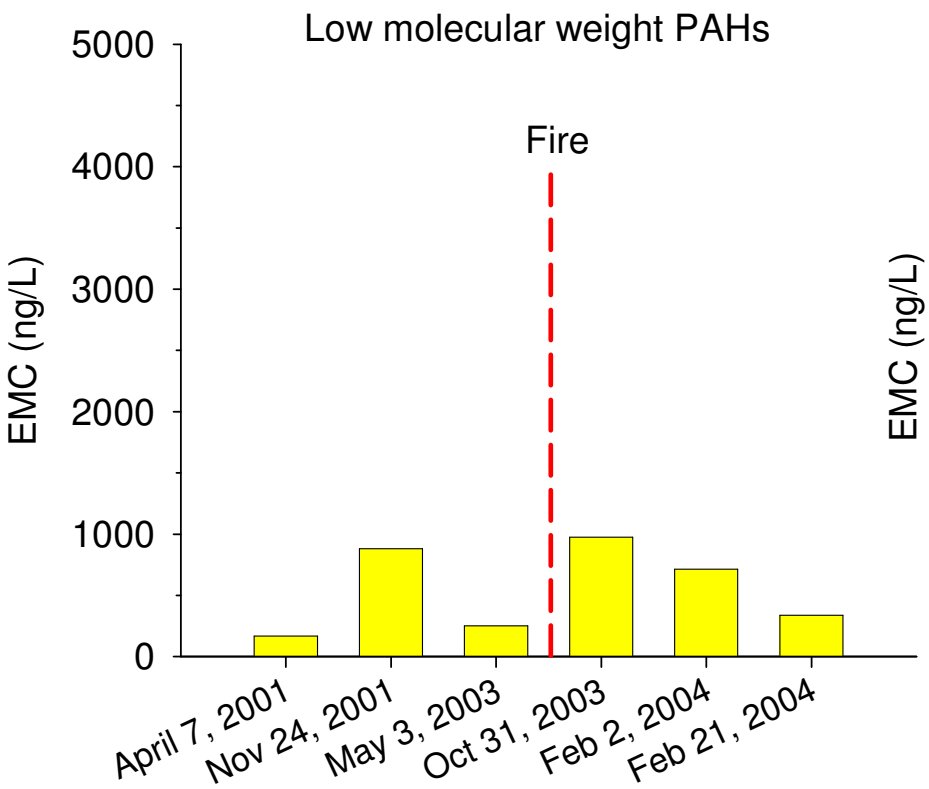
2003 Simi/Malibu Fires

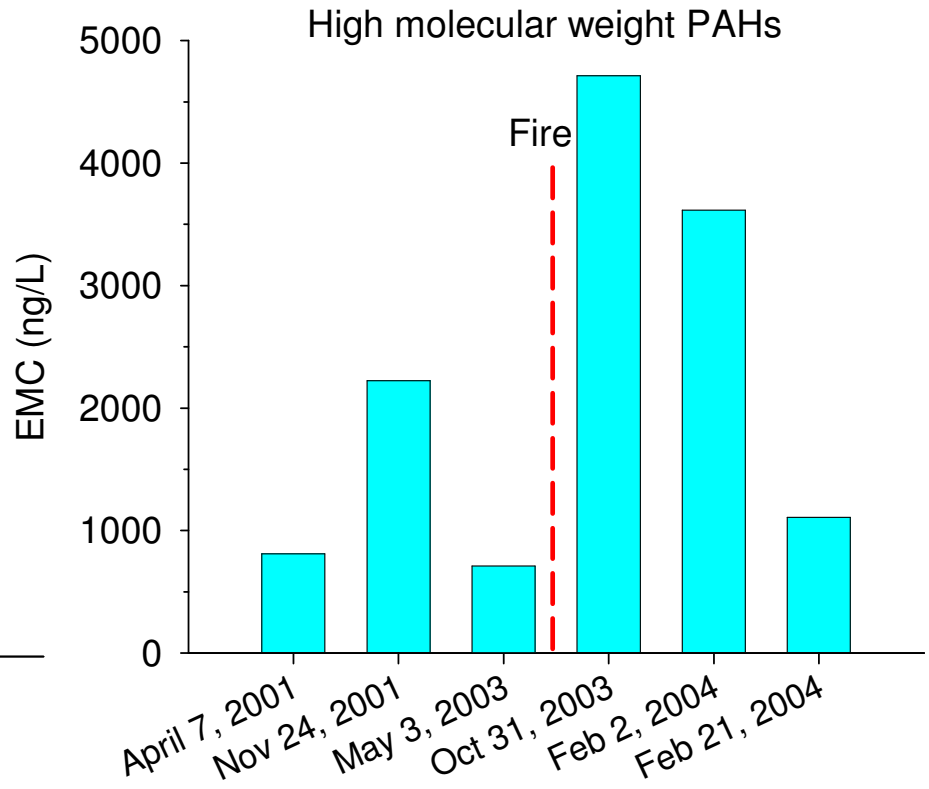
Zinc Concentrations in Ballona Creek



Indirect Effects of Fire on PAHs

	Not Influenced by Fire	Influenced by Fire
LA River	3500 ng/L	
Ballona Creek	3000 ng/L	5700 ng/L

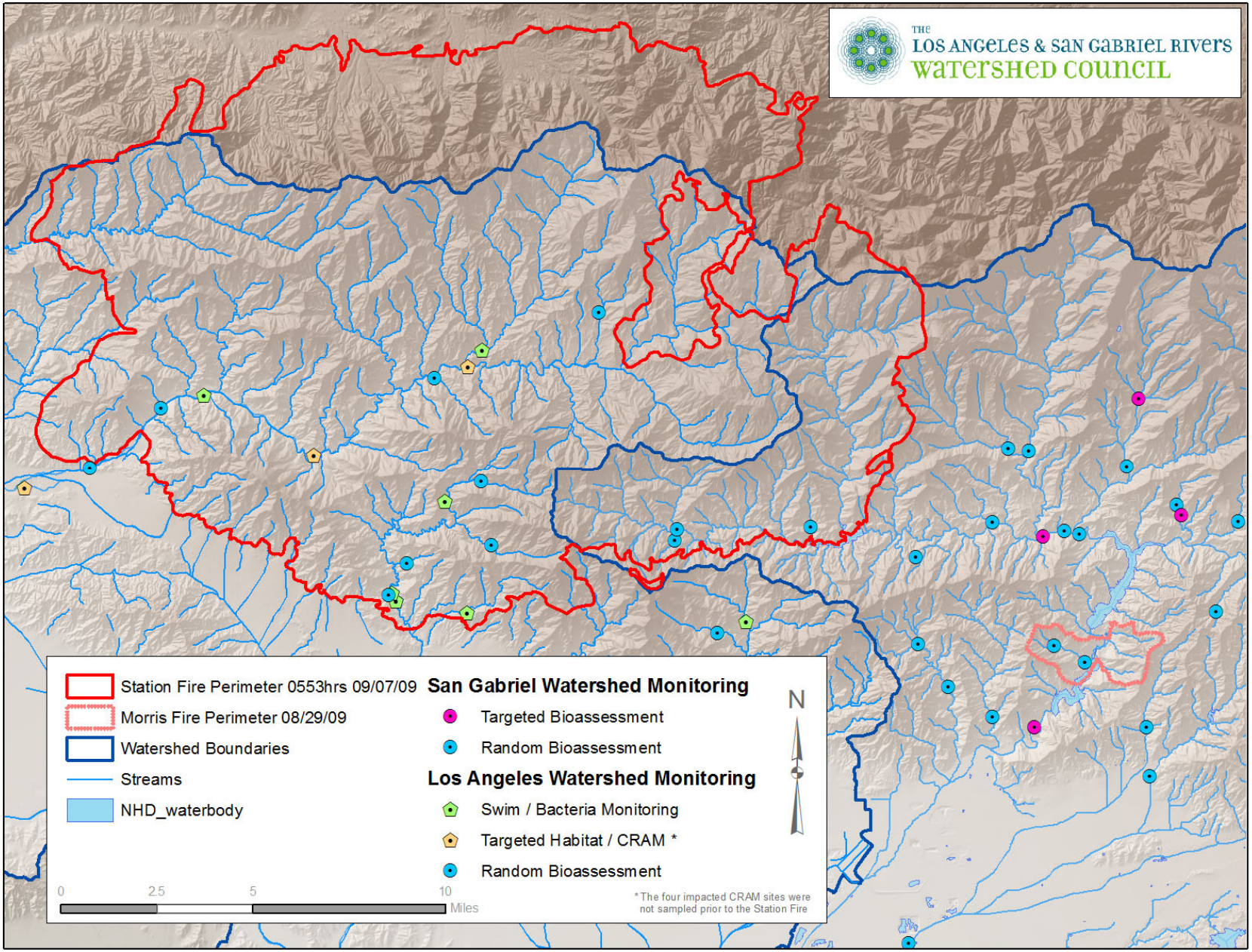




Persistence & Recovery

2009 Station Fire
Largest Fires in LA County History
Over 160,000 acres burned

2009 Station Fire



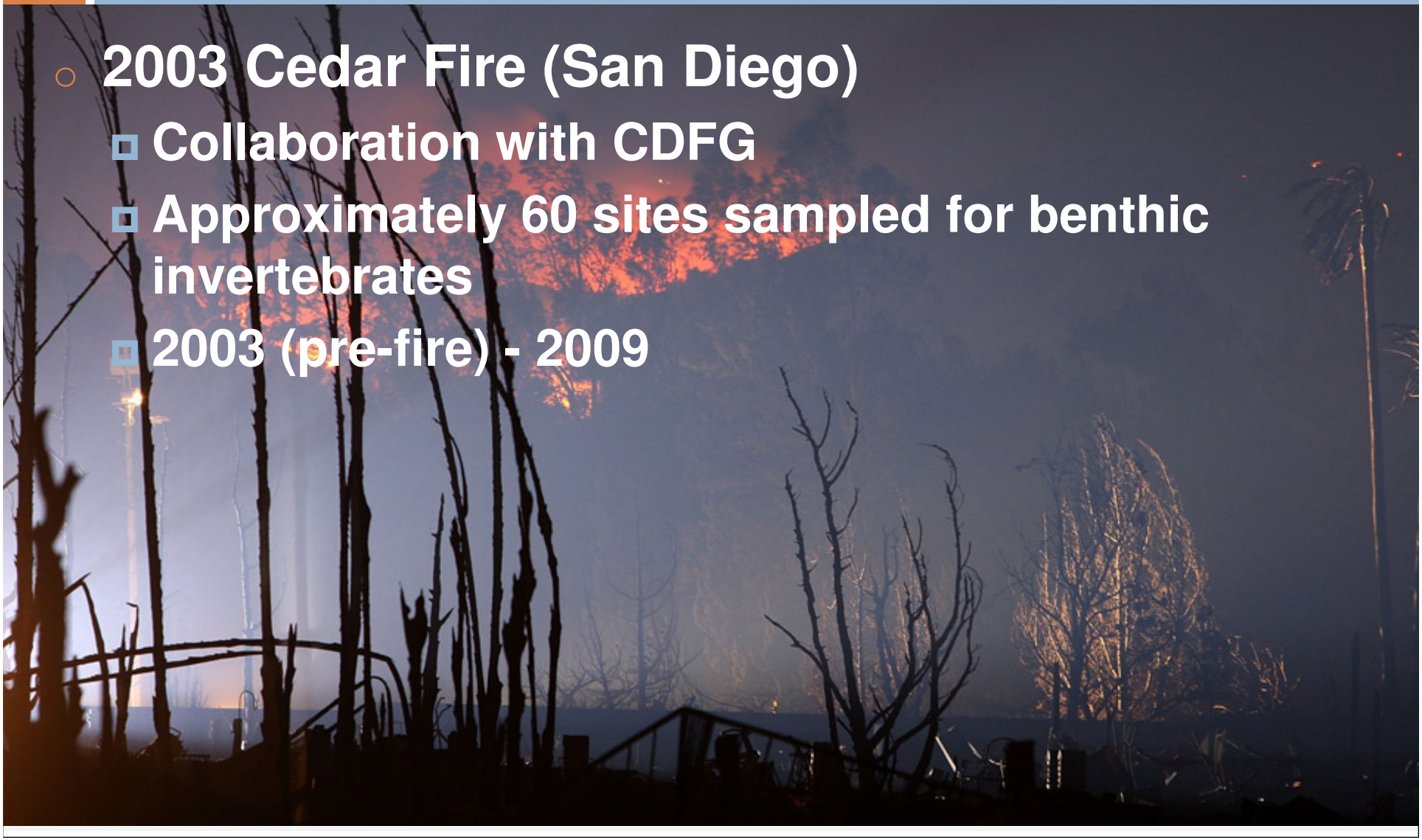
Benthic Invertebrate Sampling

- Burned sites
  - Upper Los Angeles River
  - 6 sites
  - Previously sampled in 2008 -2009

Sampling June 2010

- Unburned/Control sites
  - Upper San Gabriel River
  - 5 sites
  - Previously sampled in 2005-2008

Persistence & Recovery



- 2003 Cedar Fire (San Diego)
  - Collaboration with CDFG
  - Approximately 60 sites sampled for benthic invertebrates
  - 2003 (pre-fire) - 2009

Conclusions and Next Steps

- Post fire runoff may contribute to increased metals and PAHs
  - Greater than ten-fold increase in mass and concentration in many situations
- Effects appear to be relatively short-live
  - Levels generally return to pre-fire levels within one year
- Indirect effects associated with ashfall can also lead to higher metals and PAHs
- Need additional sampling to better understand biological effects and recovery

QUESTIONS

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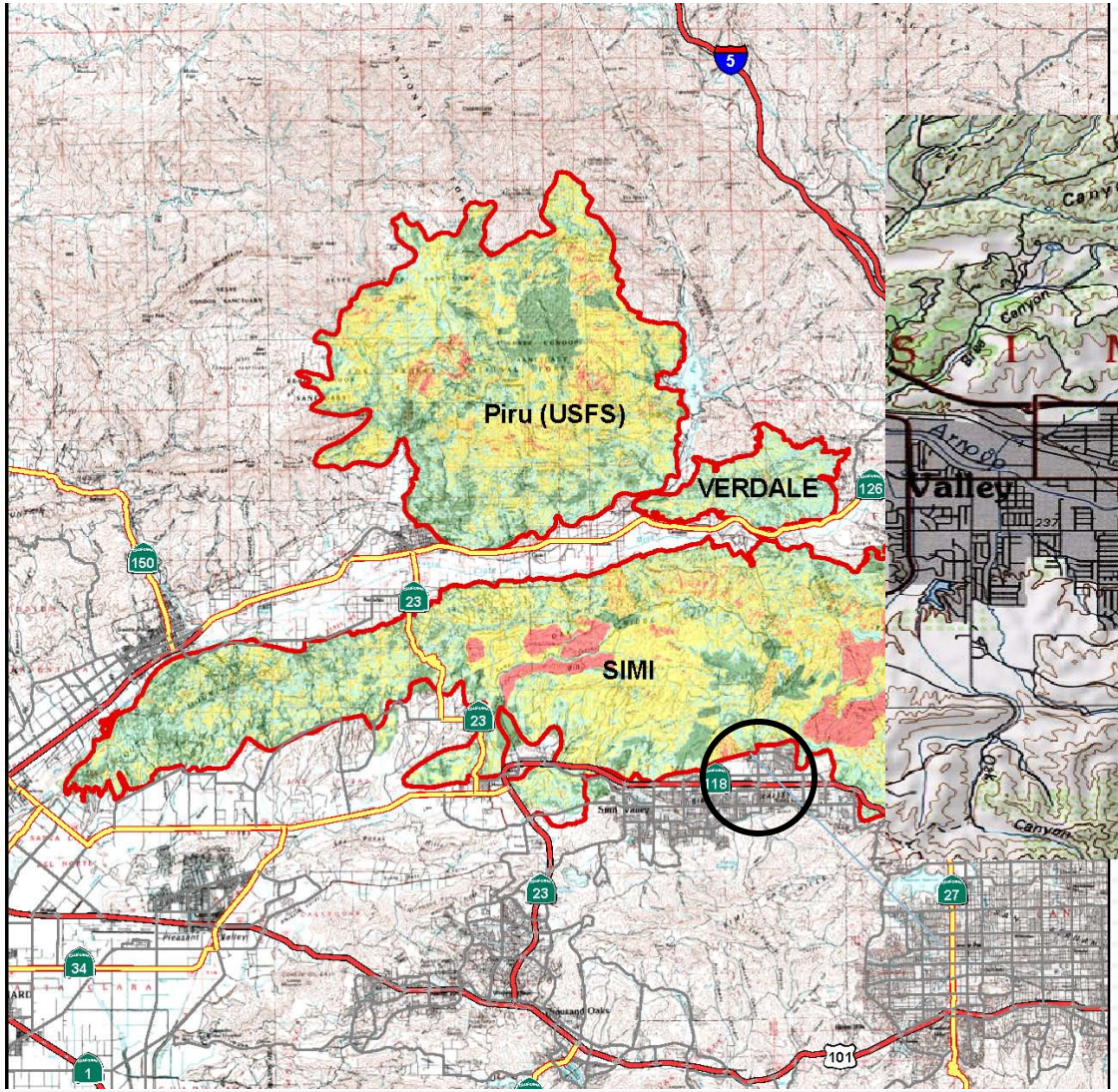
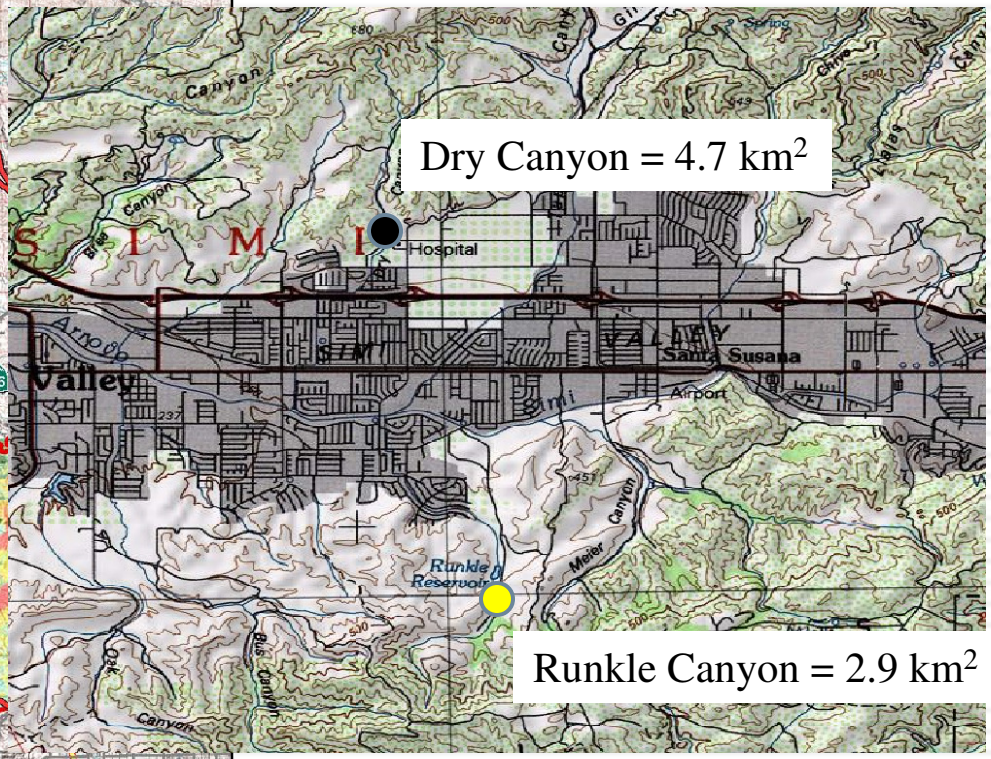
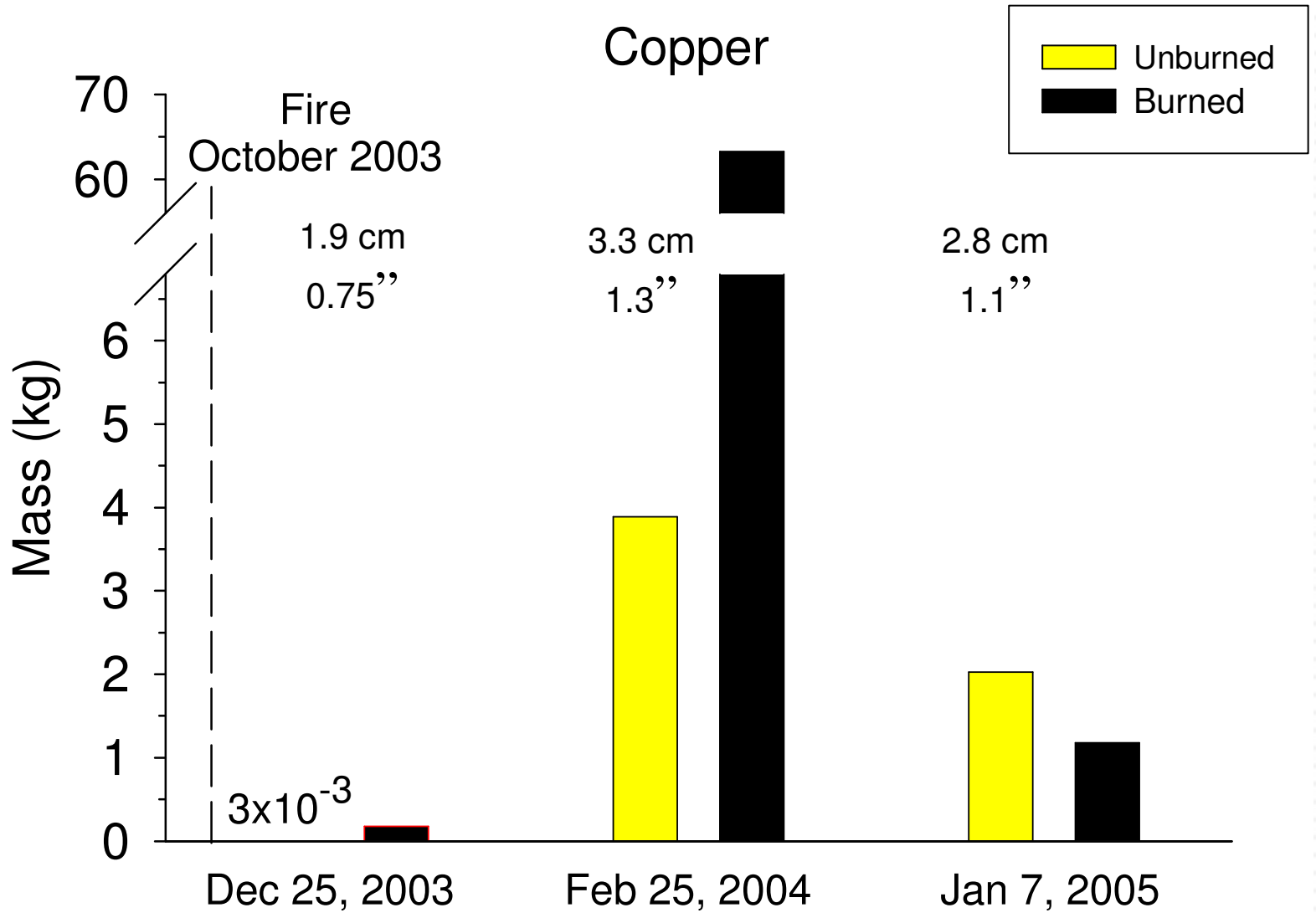
2003 Simi Valley Fire

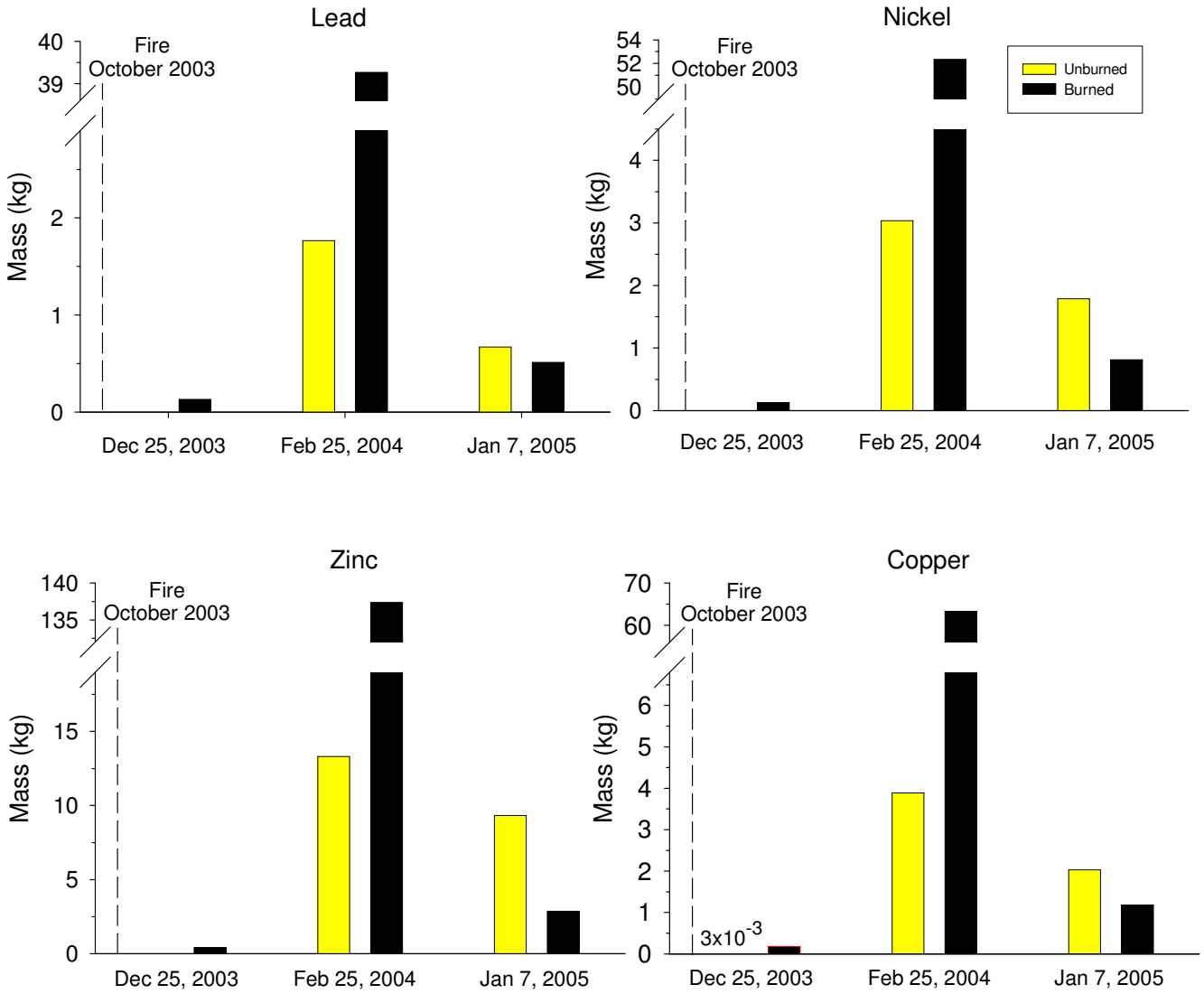




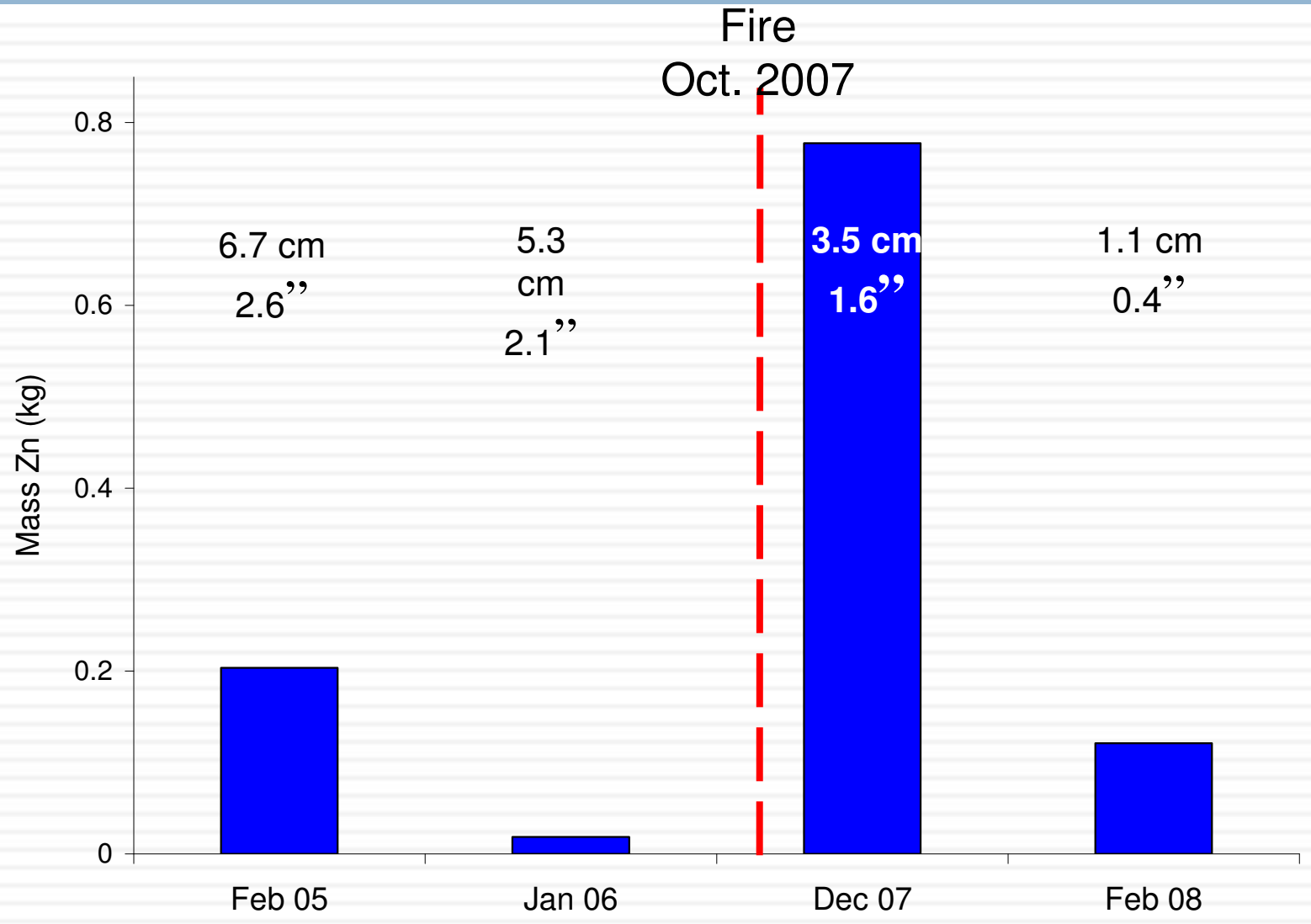
Post Fire Copper Loading



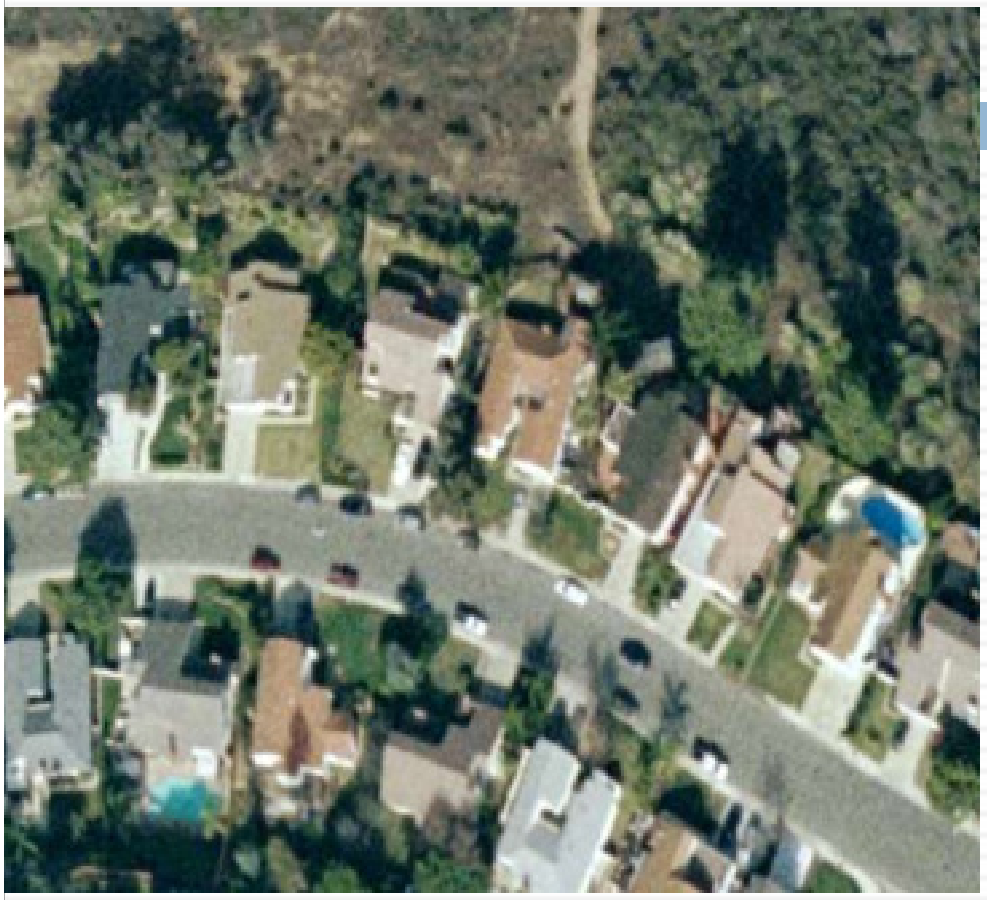
Post Fire Metals Loading



Post-Fire Zinc Loading



USGS
science for a changing world



Before and after photos of Rancho Bernardo Commur

San Gabriel Dam
August 2004 vs. April 2005

Effect of Rainfall