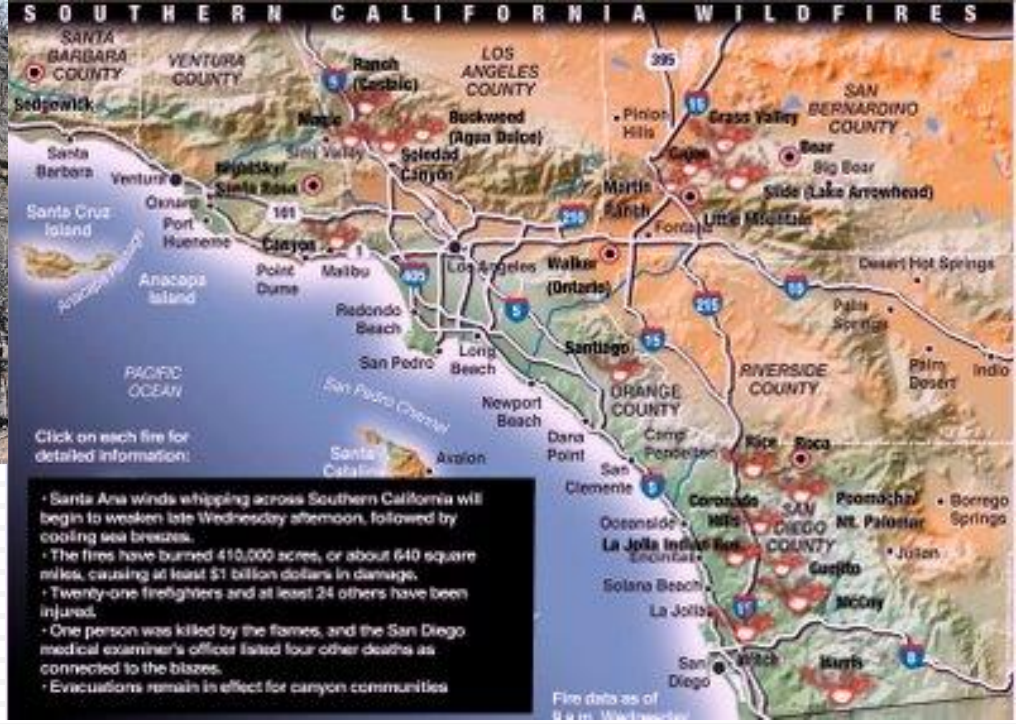
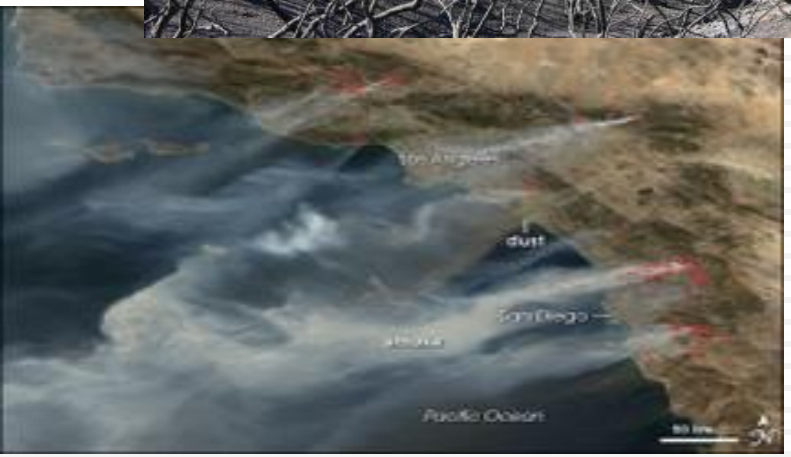




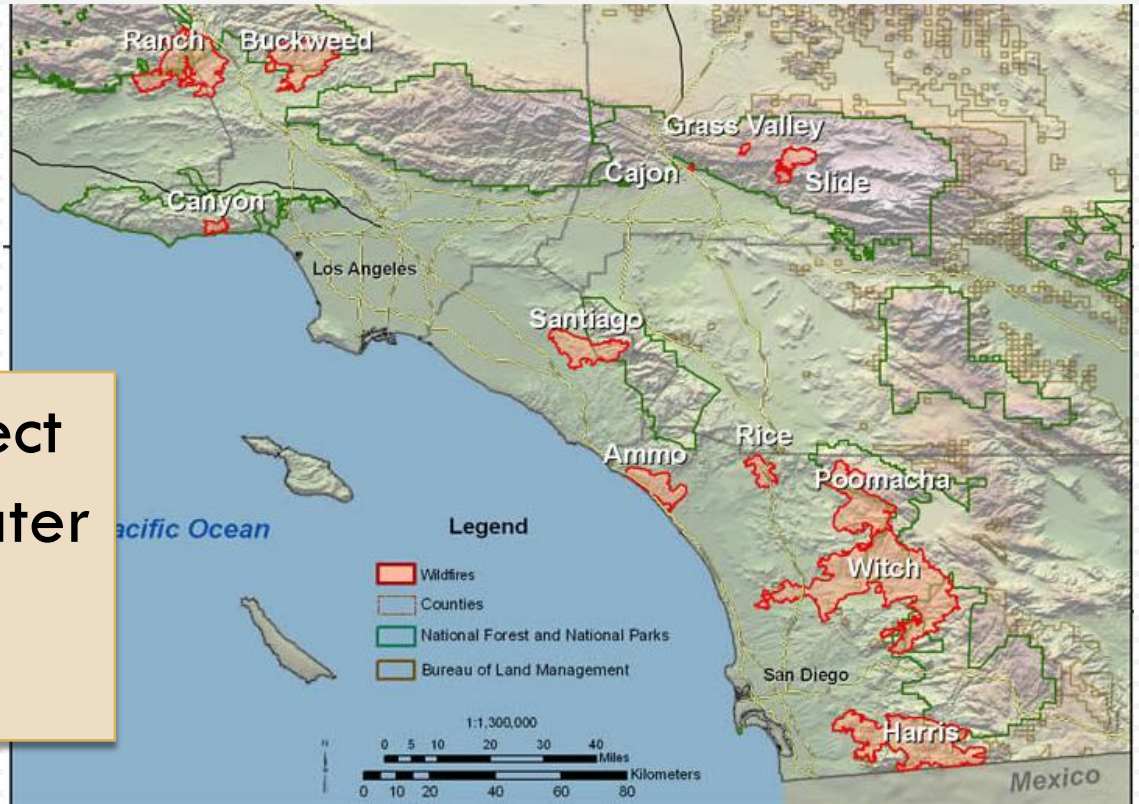
EFFECTS OF SOUTHERN CALIFORNIA WILDFIRES ON STORM WATER METALS & PAHS

Eric D. Stein

S. Ca. Coastal Water Research Project

Fire in Southern California

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

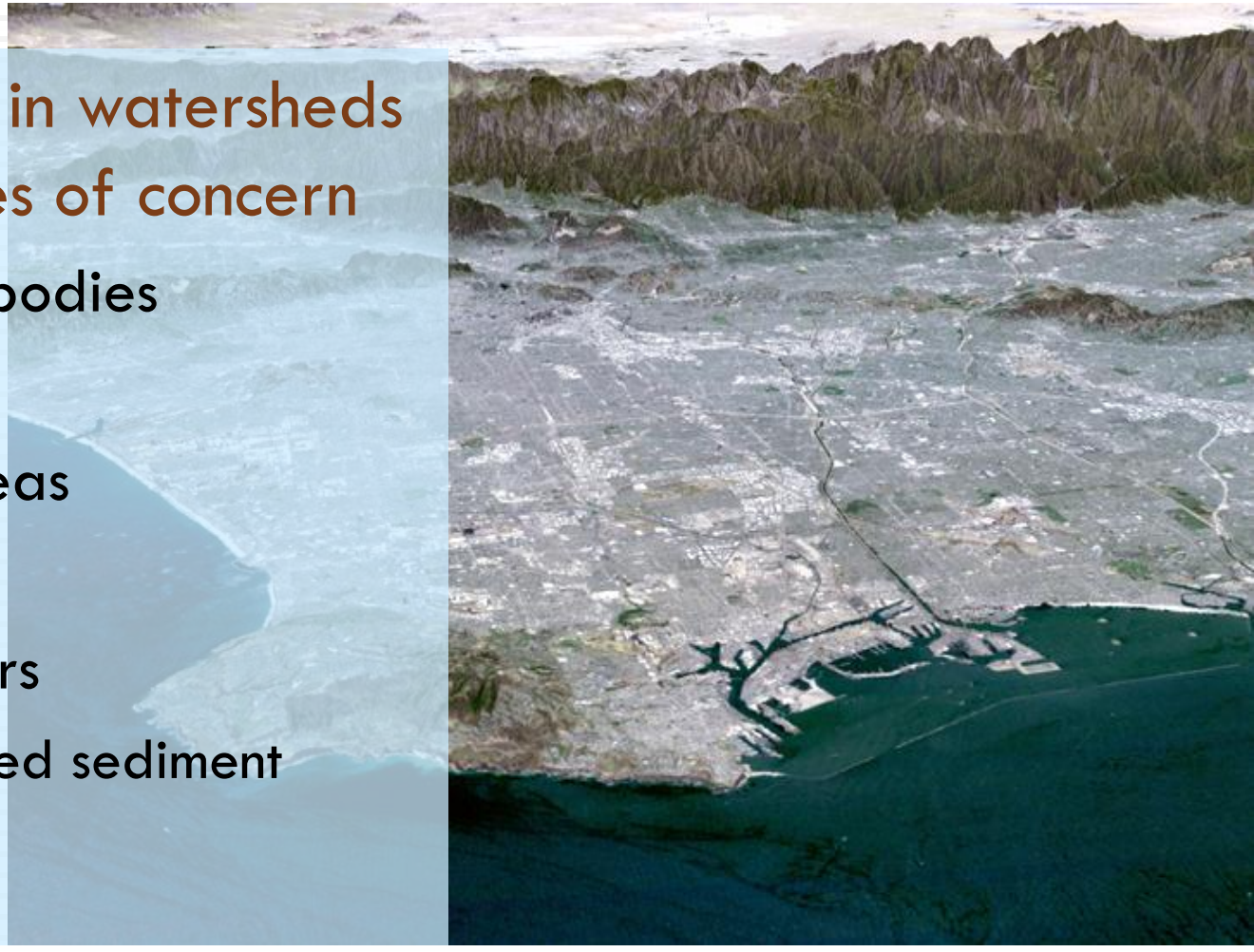


Little is known about effect of post-fire runoff on water quality

Downstream Effects of Fire

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



Post-fire Sources of Pollutants

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

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"Cabin buried by debris flow near San Gabriel Mountains." Photo by Douglas M. Morton. Source: http://geology.wr.usgs.gov/wgmt/elnino/enimages/morton2.jpg; accessed May 31, 2006.

Post-fire Sources of Pollutants

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

Key Management Questions

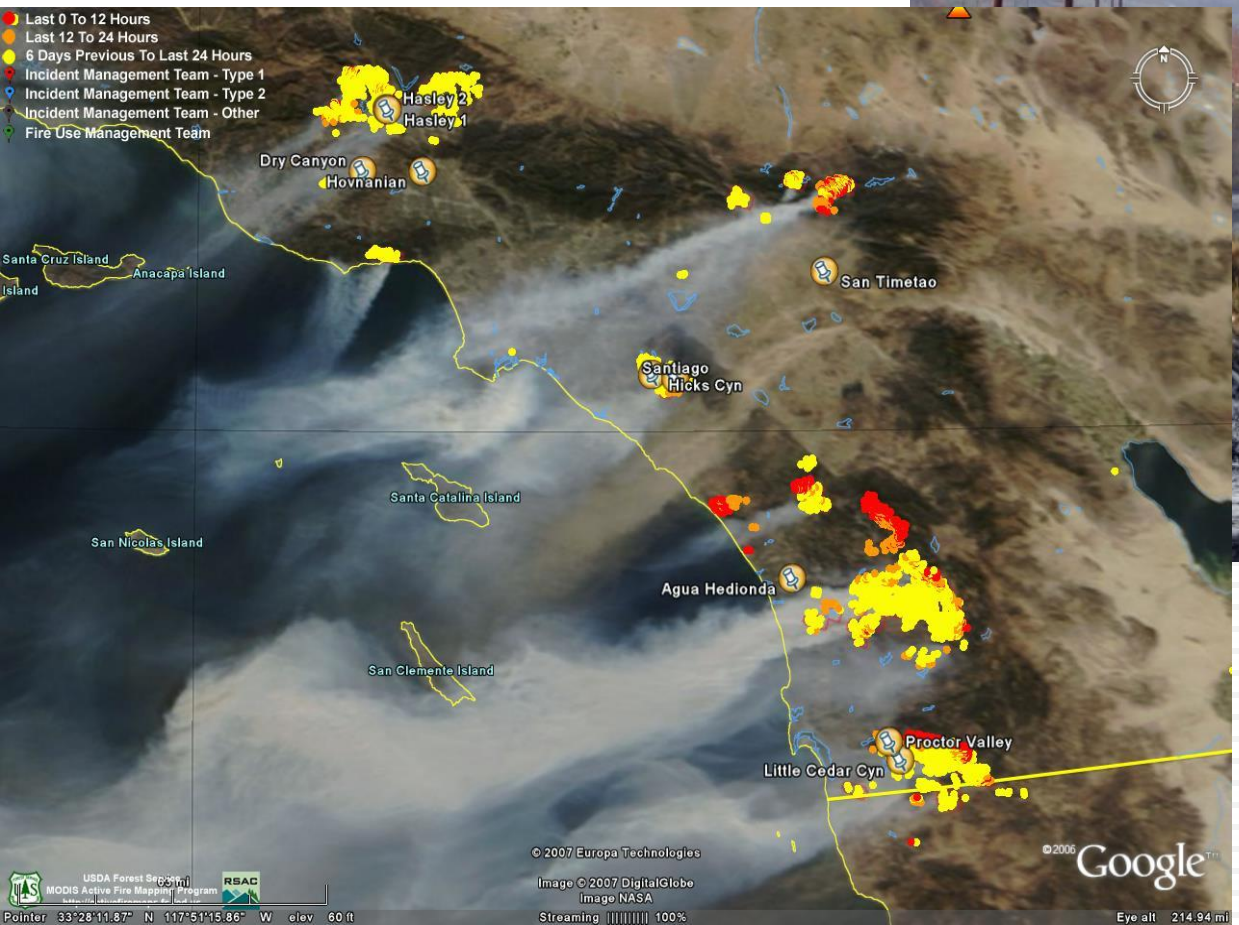
- What is the pollutant loading from burn areas?
- How long does fire-related loading persist?
- What is the effect of aerial deposition and subsequent washoff of ash on storm water loading?
- What are the appropriate management strategies to address post-fire pollutant runoff?

Potential Source Pathways

Direct effects

Potential Source Pathways

Direct effects



Indirect Effects

Our Studies

Studies of Direct Effects

- 2003 Simi Valley Fire
  - Paired watershed study
    - 1 burned/1 unburned
  - 3 storms sampled each watershed post fire
- 2007 Santiago Canyon Fire
  - Pre vs. post fire study
  - 2 storms pre fire + 2 storms post fire

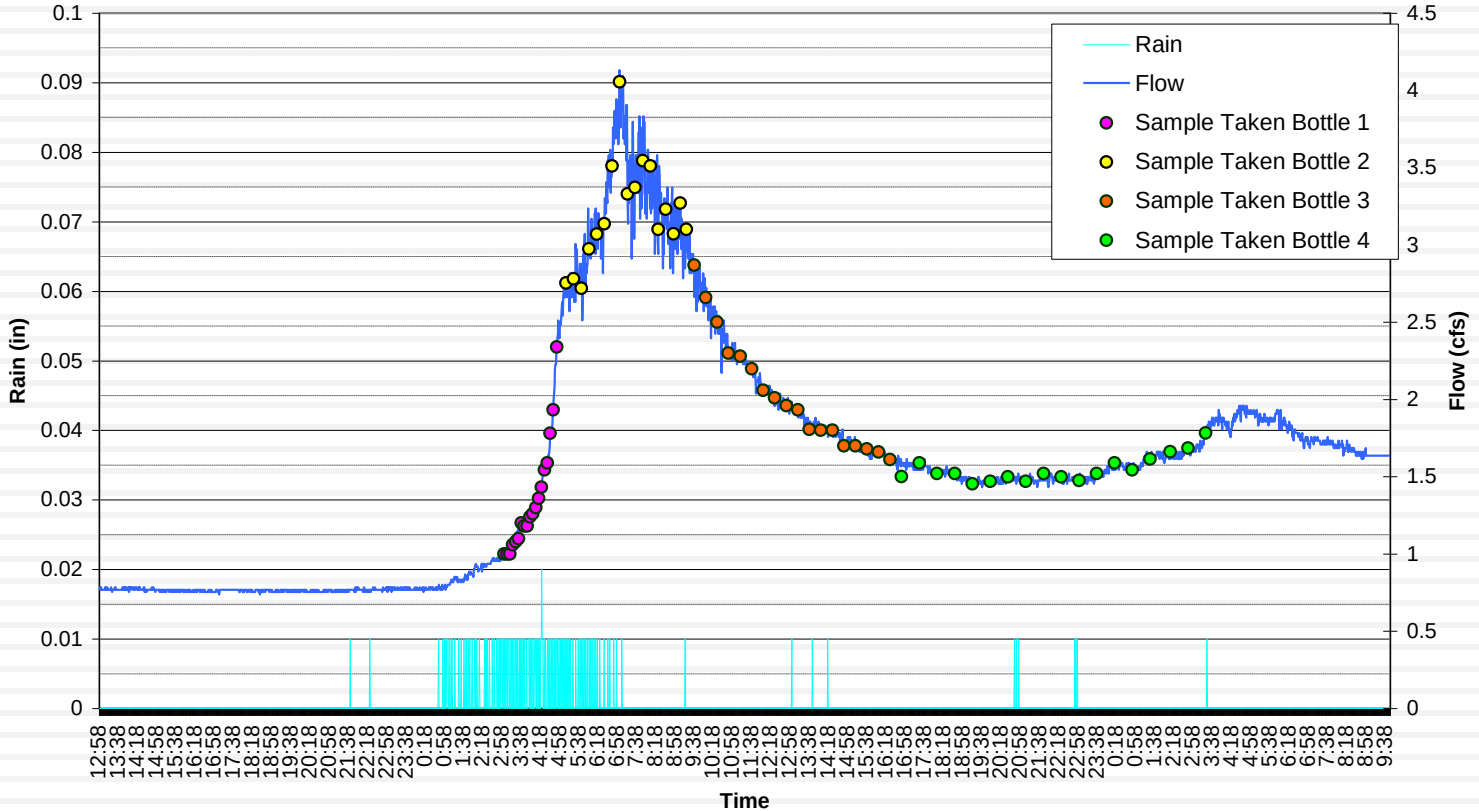
Studies of Indirect Effects

- 2003 Ballona Creek
  - No fire in the watershed
  - Substantial ashfall
  - Pre vs. post fire study
  - 3 storms pre fire + 3 storms post fire

Preliminary findings
Limited sample size

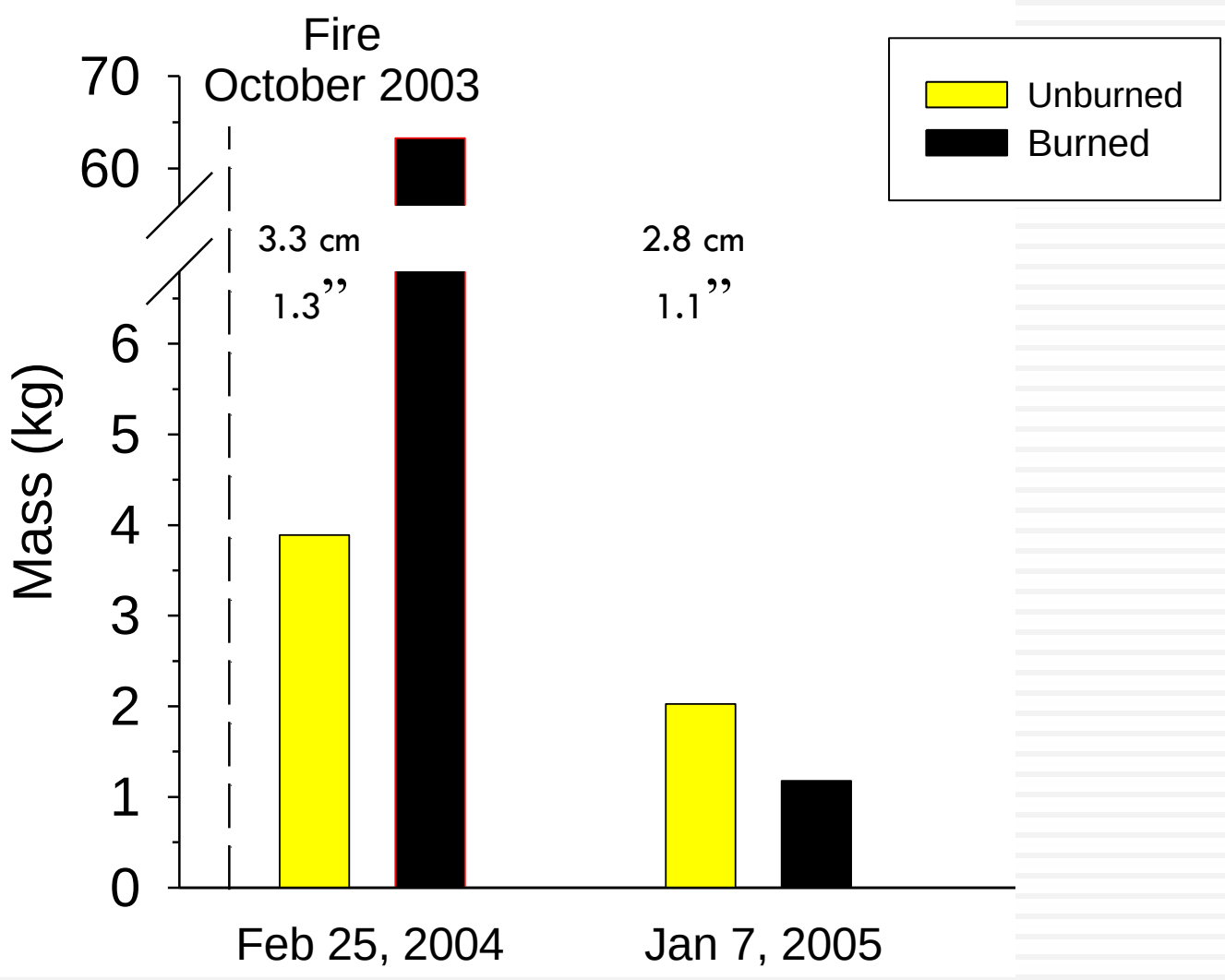
Sampling Approach

- Continuous flow monitoring
- Multiple samples collected - time vs. concentration plots
- Focus on metals and PAHs



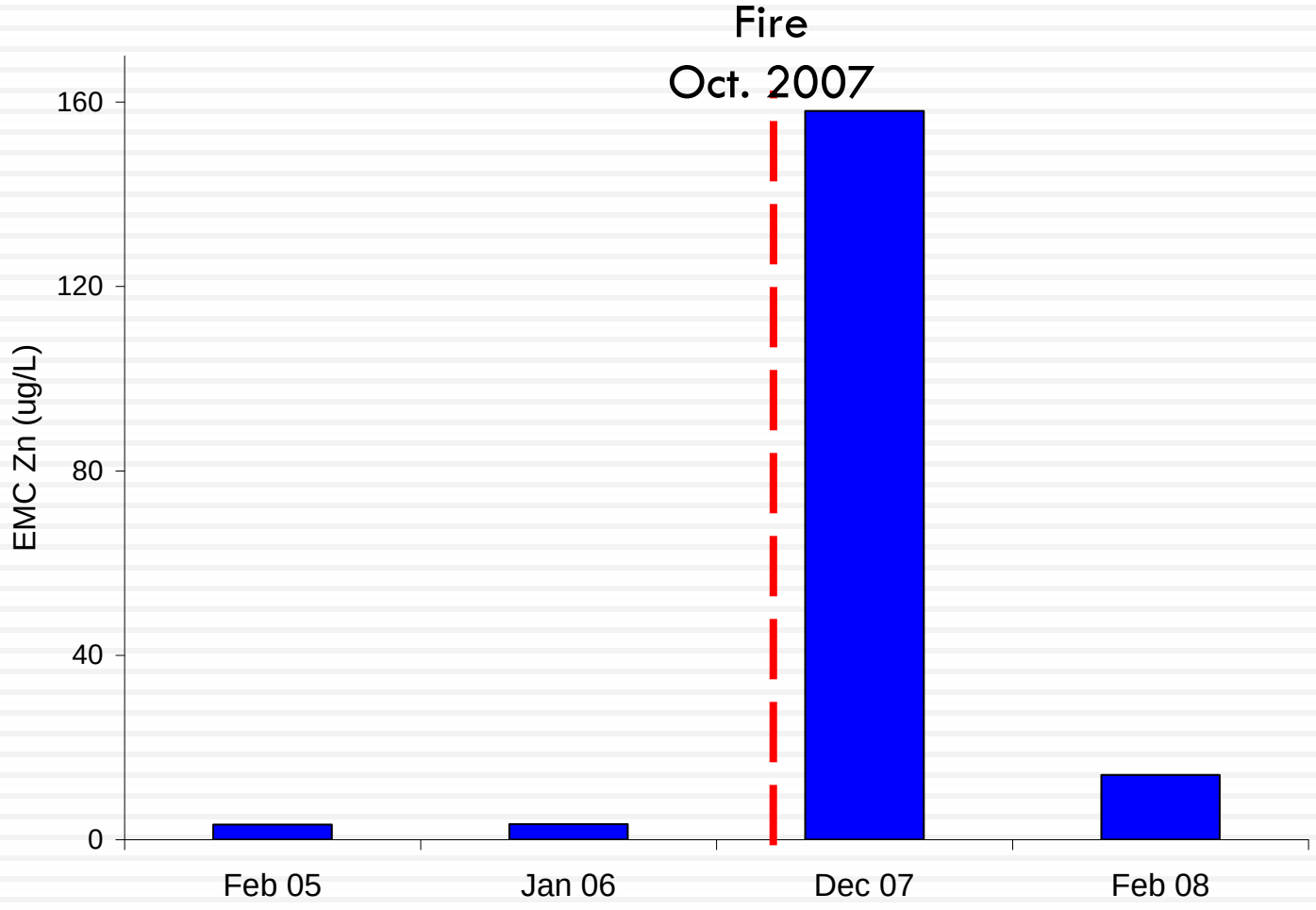
Direct Effects

Post Fire Copper Loading



Fire Effect on Zinc Concentrations

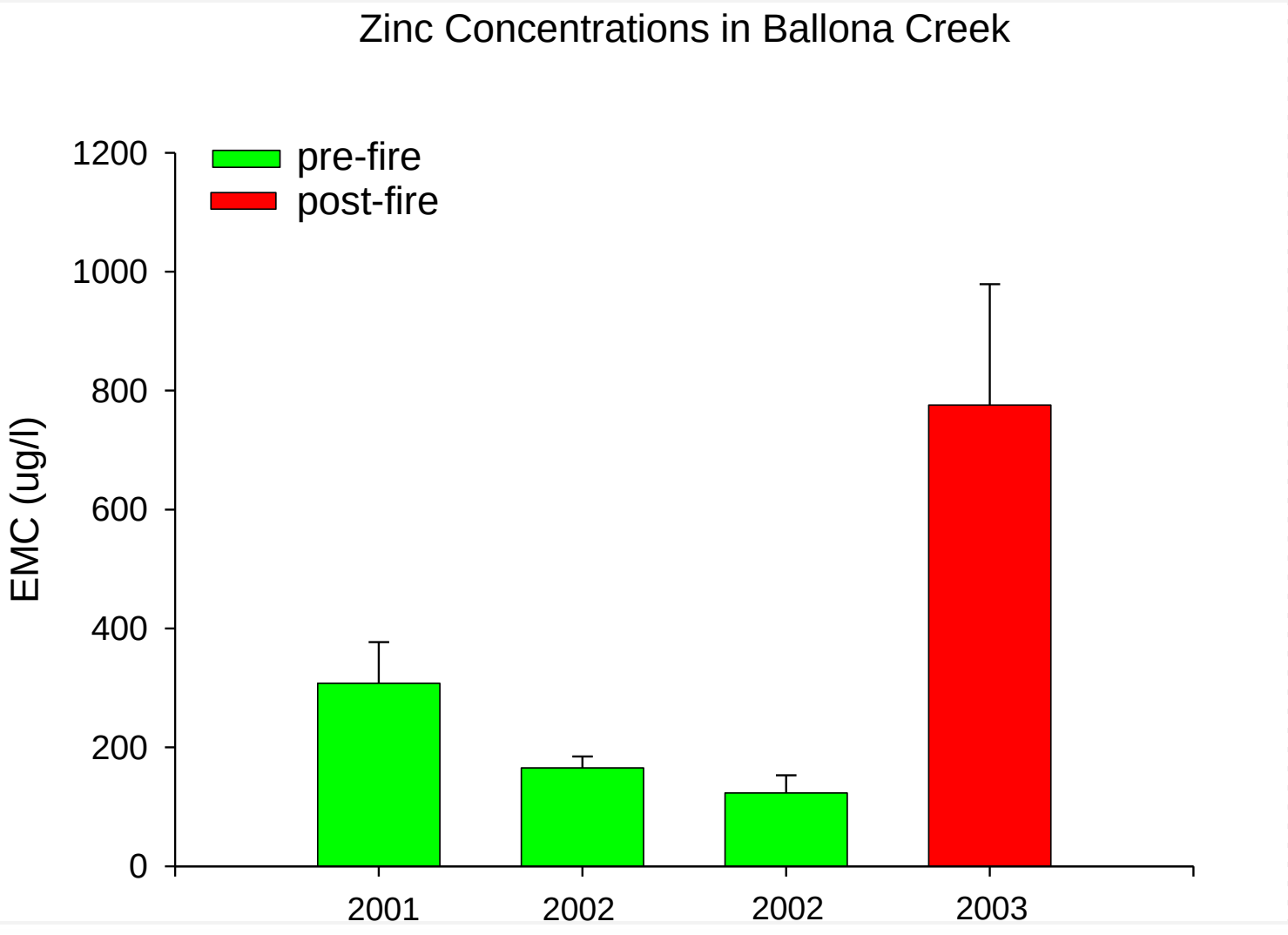
Percent Dissolved	---	37%	1%	4%



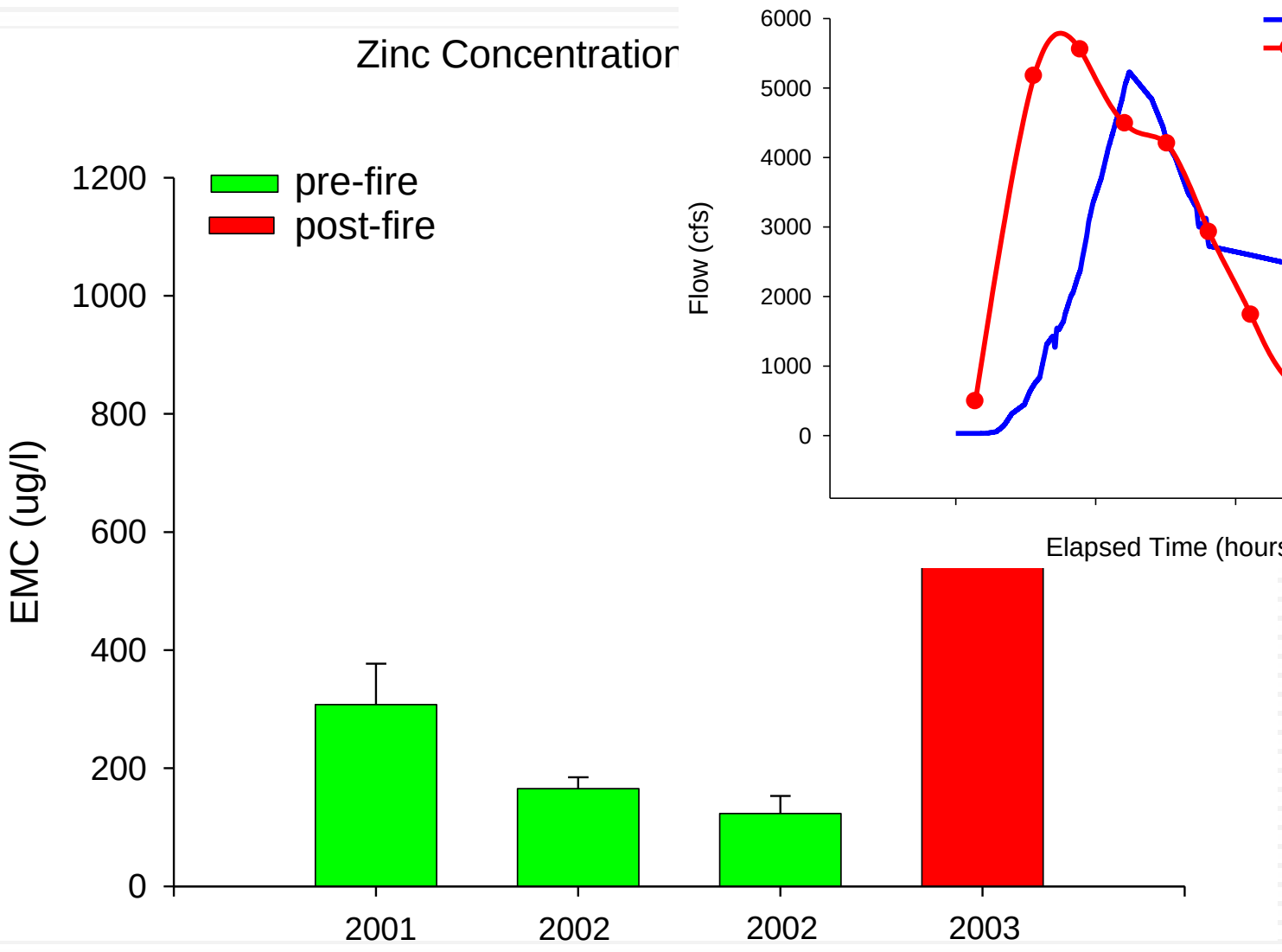
Indirect Effects

Otay Lakes, San Diego, CA
November 2007

Zinc Concentrations in Ballona Creek

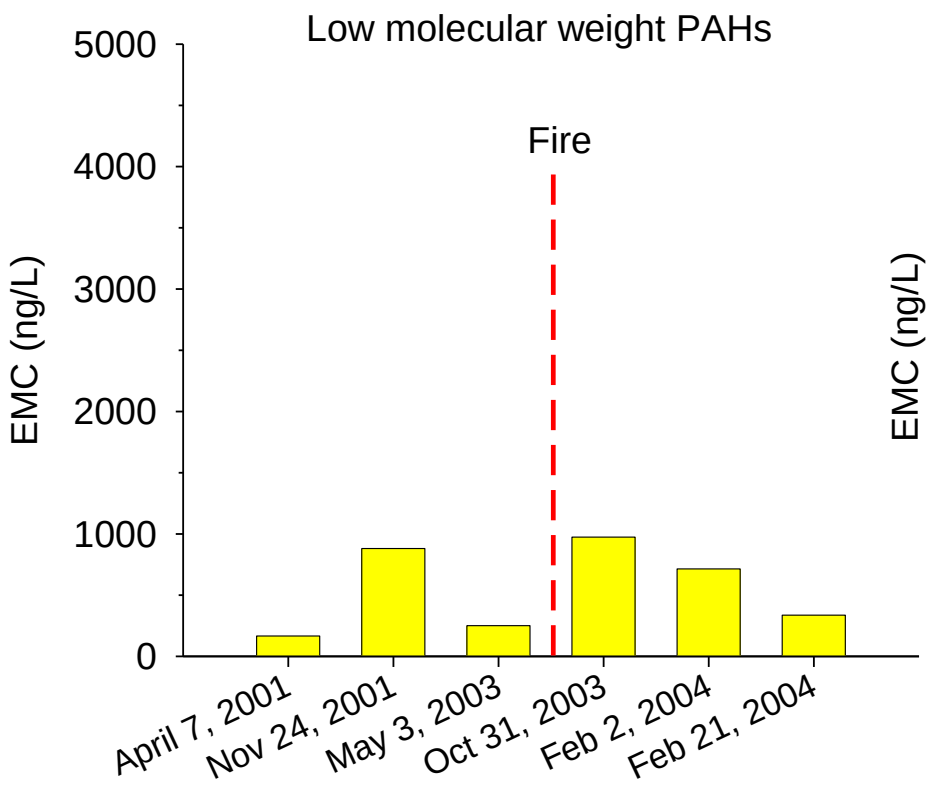


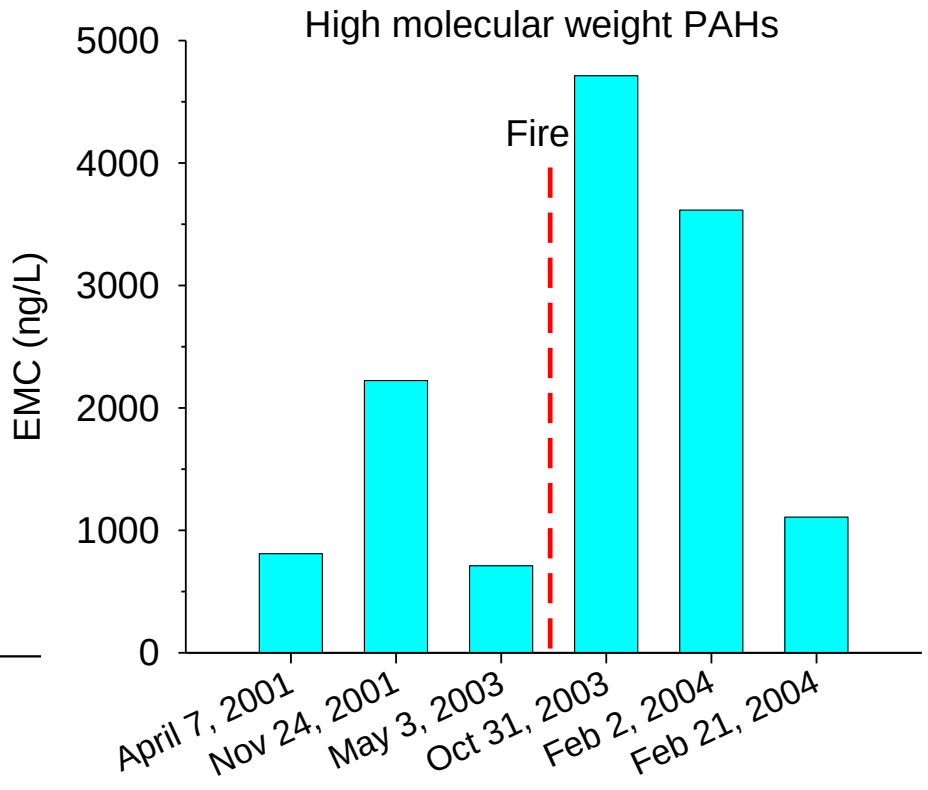
Zinc Concentrations in Ballona Creek



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





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-lived
  - Levels generally return to pre-fire levels within one year
- Indirect effects associated with ashfall can also lead to higher metals and PAHs
- Many data gaps
  - Particularly for biological and physical effects

Development of a Regional Post-fire Response Plan

- Difficulty in mobilizing, coordinating, and funding monitoring following fires
  - ***Need a regional strategy for monitoring and management response***

- Technical workshop on status of knowledge – ***SUMMER 2008***
  - 18 agencies represented
  - Indentify and compile results of existing/past research
  - Determine key monitoring questions

- Develop post-fire response plan -- 2009
  - Monitoring approaches
  - Quality control
  - Data management and coordination
  - Implementation and funding strategy

QUESTIONS

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Eric Stein
714-755-3233
erics@sccwrp.org
www.sccwrp.org/research areas/regional monitoring