Reconciling Expansion of Restorative Burning with Protecting Public Health from Smoke Impacts

Interagency Air And Smoke Council (IASC)

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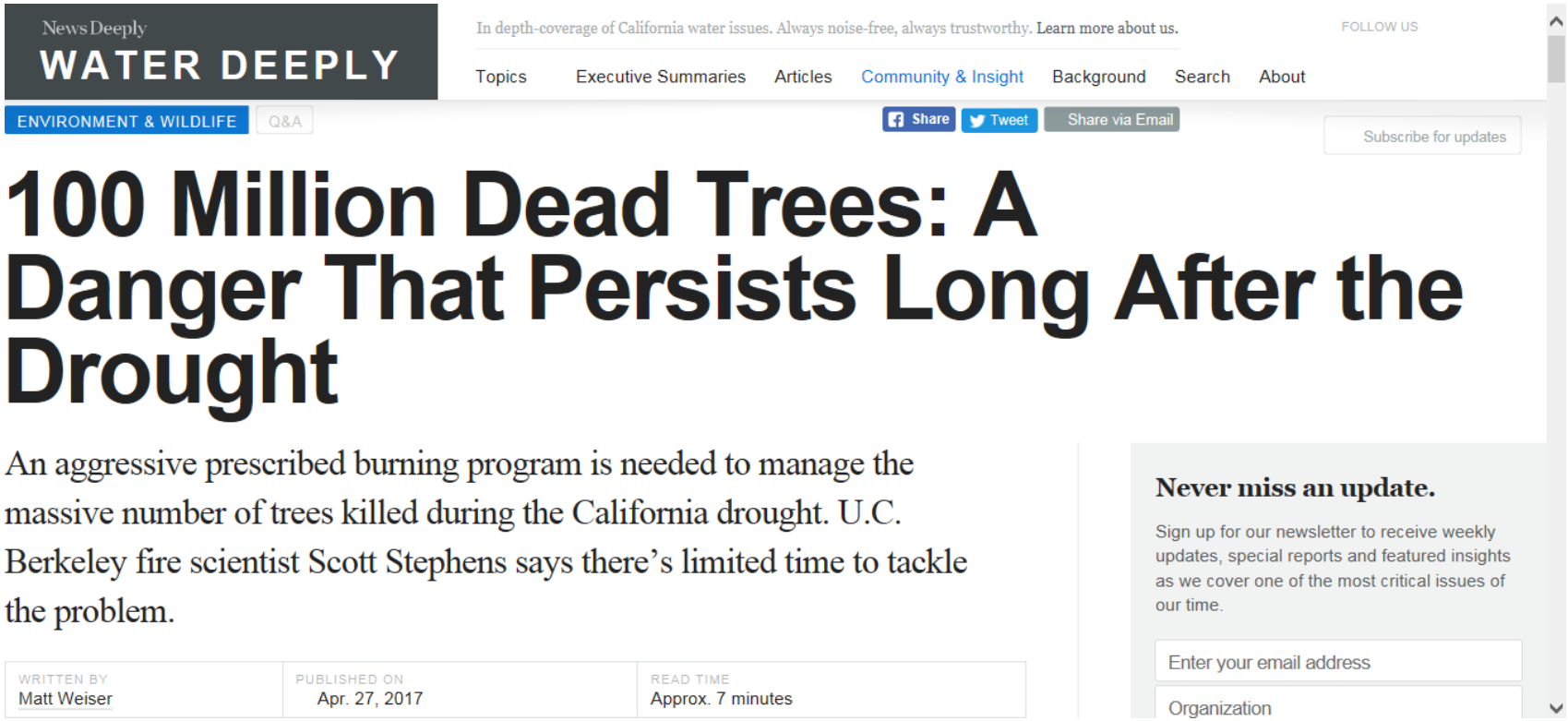
Proposed Burning Response to Tree Mortality

Scott Stephens (UC Berkeley): “So you begin to work by going in there and burning out the understory fuels.
And then as more and bigger material starts coming down from all those dead trees, in 10 years or 15 years, you do it again. You’re taking out the accumulated fuel in layers.”



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100 Million Dead Trees: A Danger That Persists Long After the Drought

An aggressive prescribed burning program is needed to manage the massive number of trees killed during the California drought. U.C. Berkeley fire scientist Scott Stephens says there’s limited time to tackle the problem.

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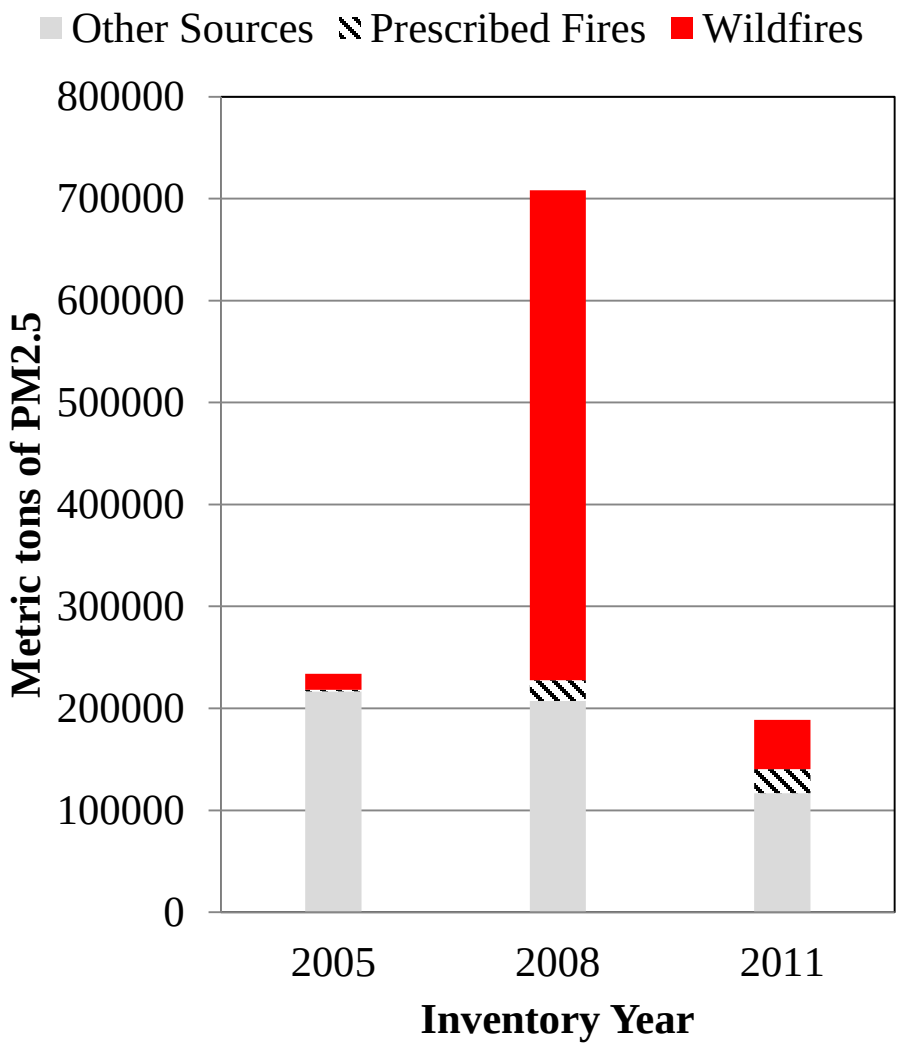
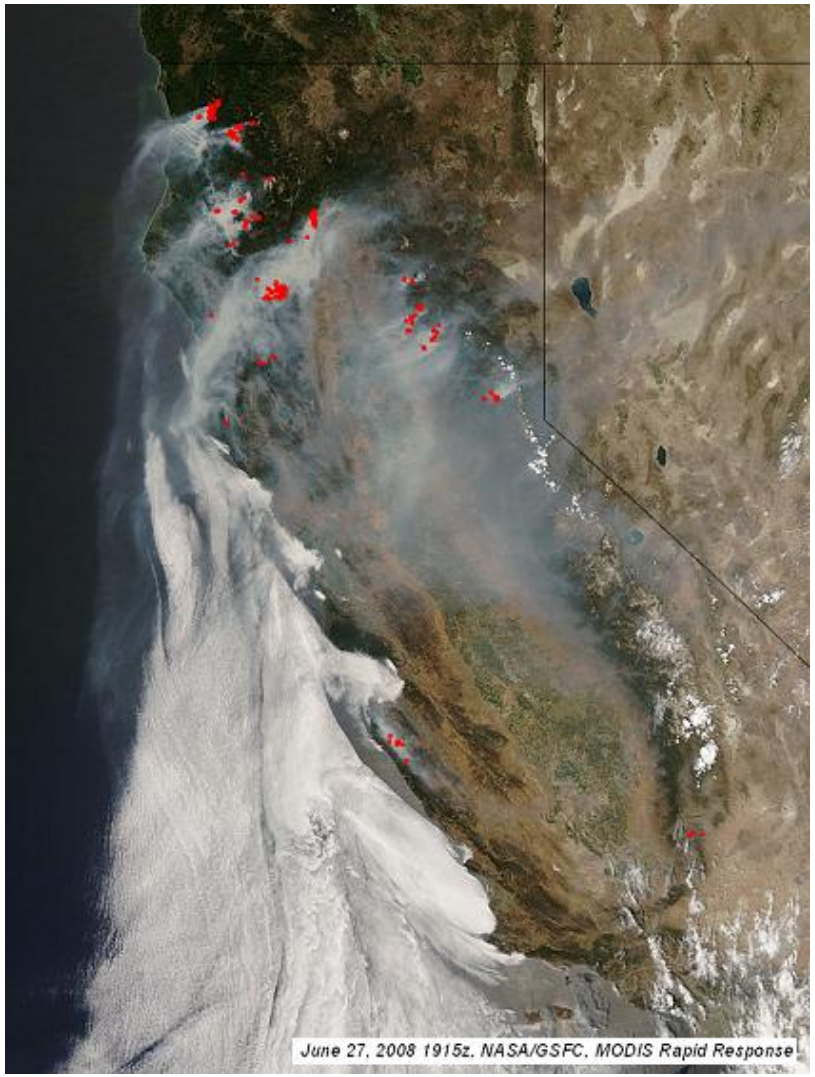
Key Questions for Addressing Public Health Impacts of Restorative Burning

- What is an appropriate framework for evaluating smoke impacts and tradeoffs?
- How could shifting to more frequent use of fire help reduce smoke health impacts?
- What have been air quality obstacles toward using more fire?
- What are strategies and tactics for using fire while minimizing smoke impacts?

Wildfires can be a huge source of particulate emissions in California





Will expanding the scale of burning (more acres) lead to worse air quality for the public?

Not necessarily, because impacts are largely a function of:

1) daily emissions	2) conveyance to downwind communities	3) size and vulnerability of those communities
		

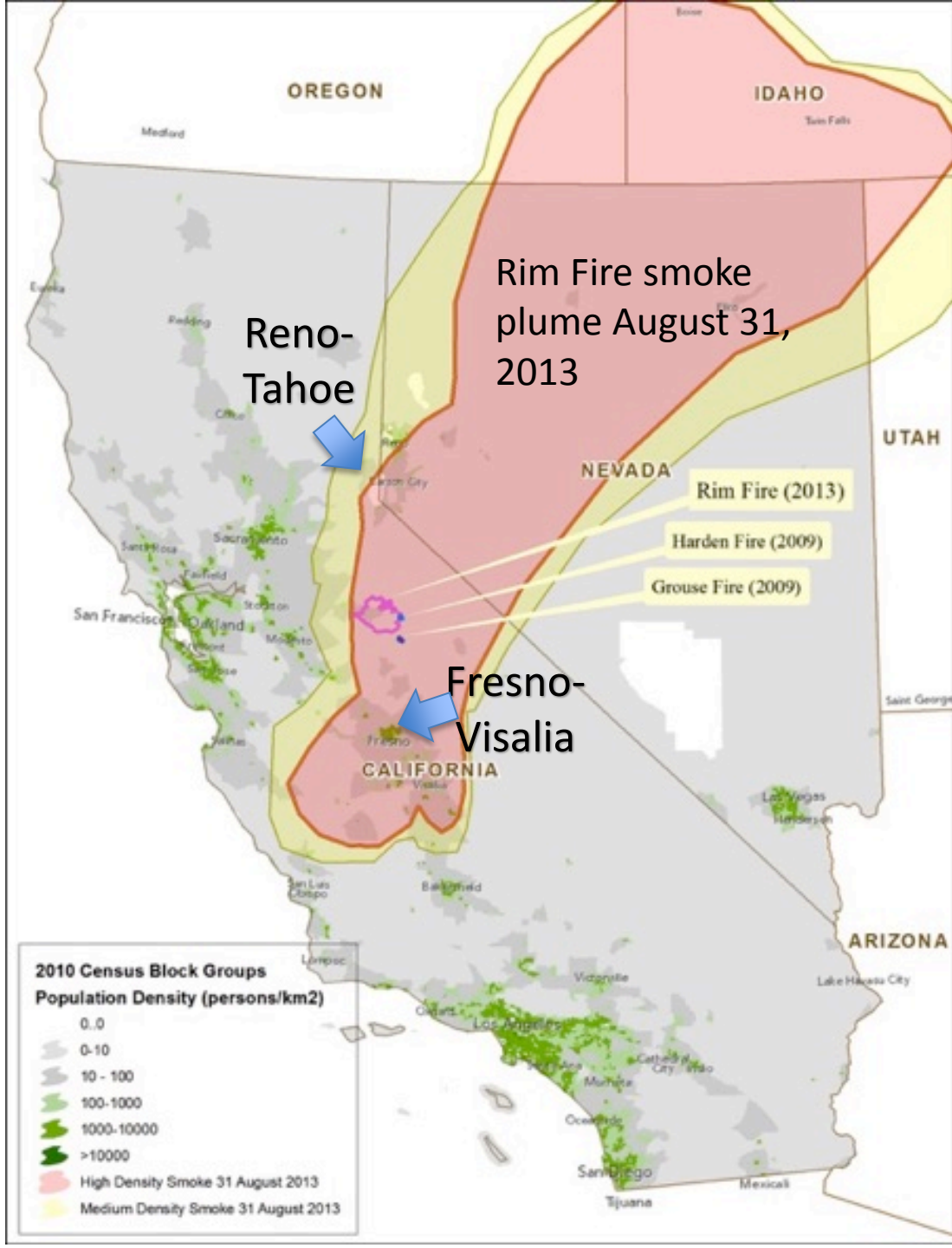
Applying a smoke impacts framework reveals enormous impacts of extreme fires

Method:
Populations under maps of smoke plumes weighted by probability of a statistically significant increase in PM2.5 at ground monitoring stations

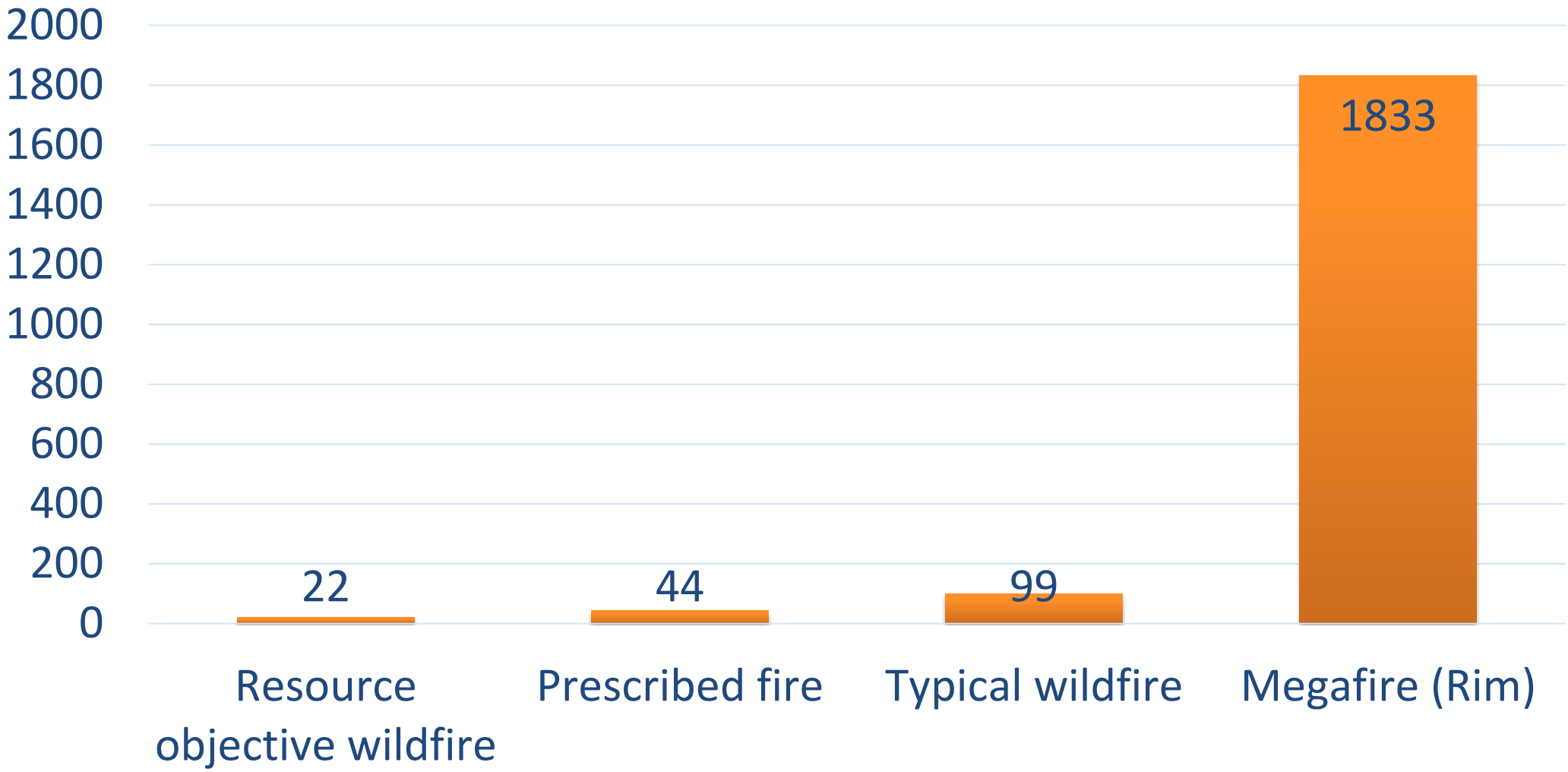
Rim Fire estimated impact:

7 million person-days of smoke impact (especially in Reno-Tahoe area)

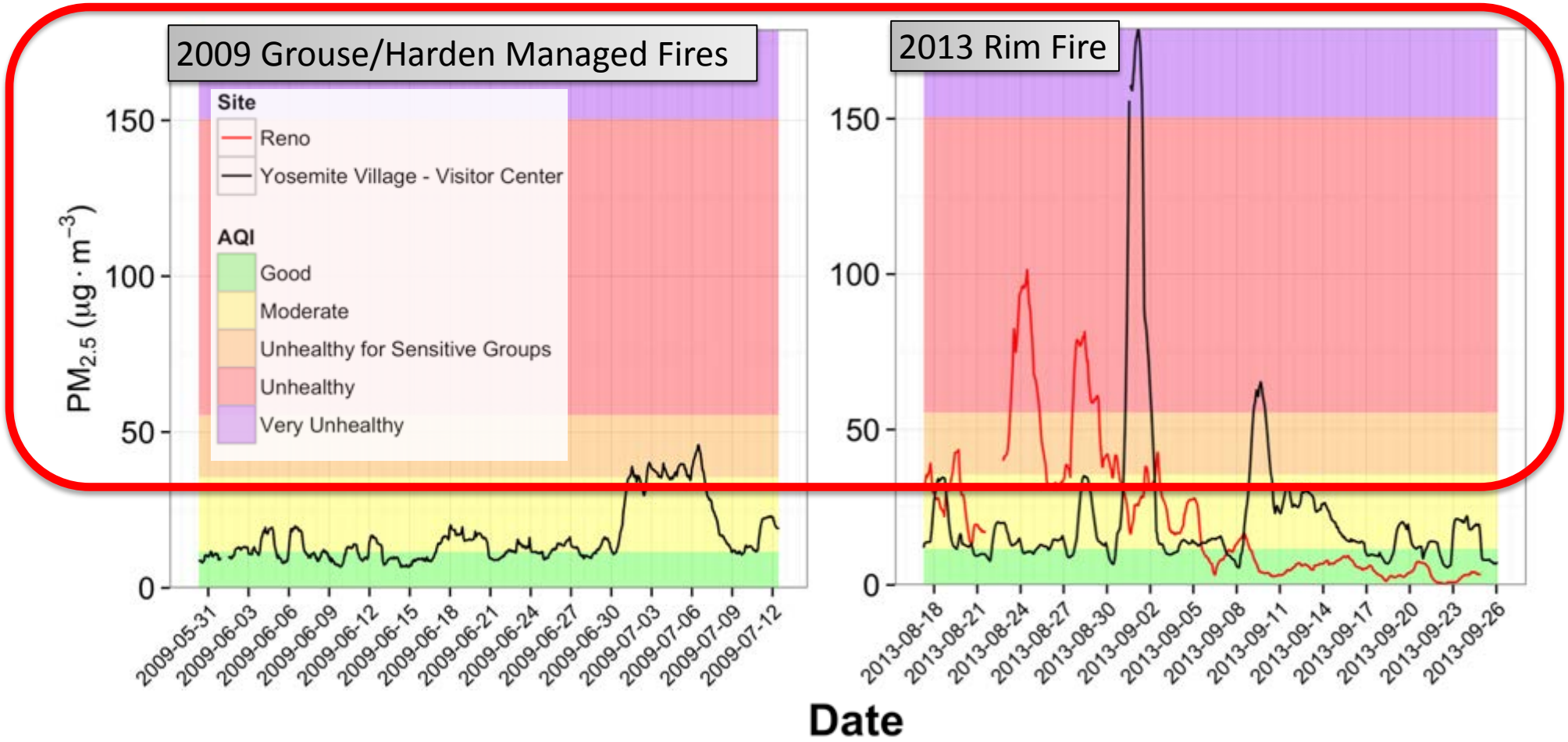
Over **5.5 X** more impact per unit area burned as two managed fires in the same airshed



Average daily emissions ($PM_{2.5}$/day) by fire type in a 10 year analysis from Yosemite National Park

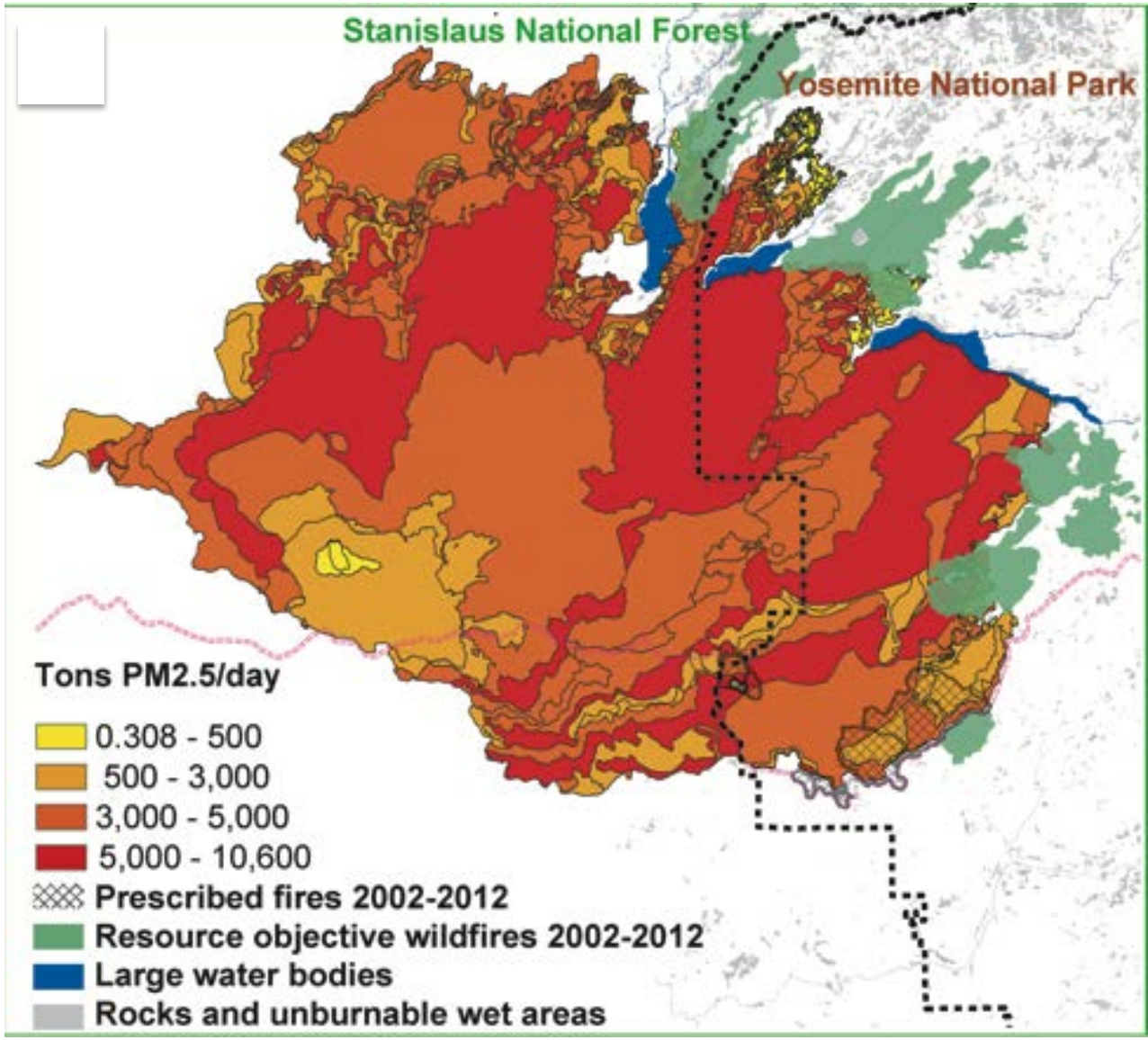


Using the right tactics under favorable dispersion, **large areas can be burned** with limited smoke impacts on downwind communities



How Resource Objective Fires Reduce Smoke Impacts

1. Reduction of fuels and consumption
2. More favorable dispersion
3. Greater ability to regulate fire spread per unit time (using “push-pull” tactics)
4. Creation of anchors that facilitate future fire management
5. Advance planning, notification, and opportunities to mitigate exposure



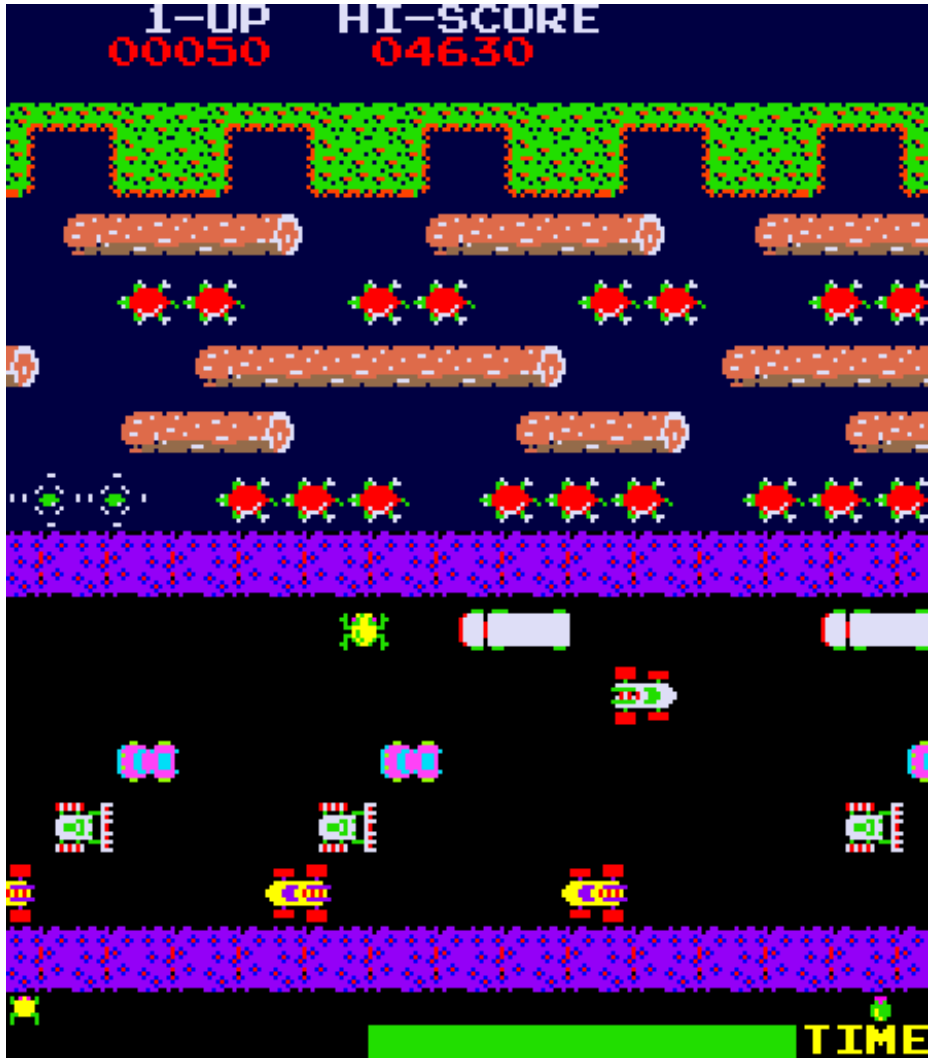
Rate of spread and size cause emissions per day to vary greatly

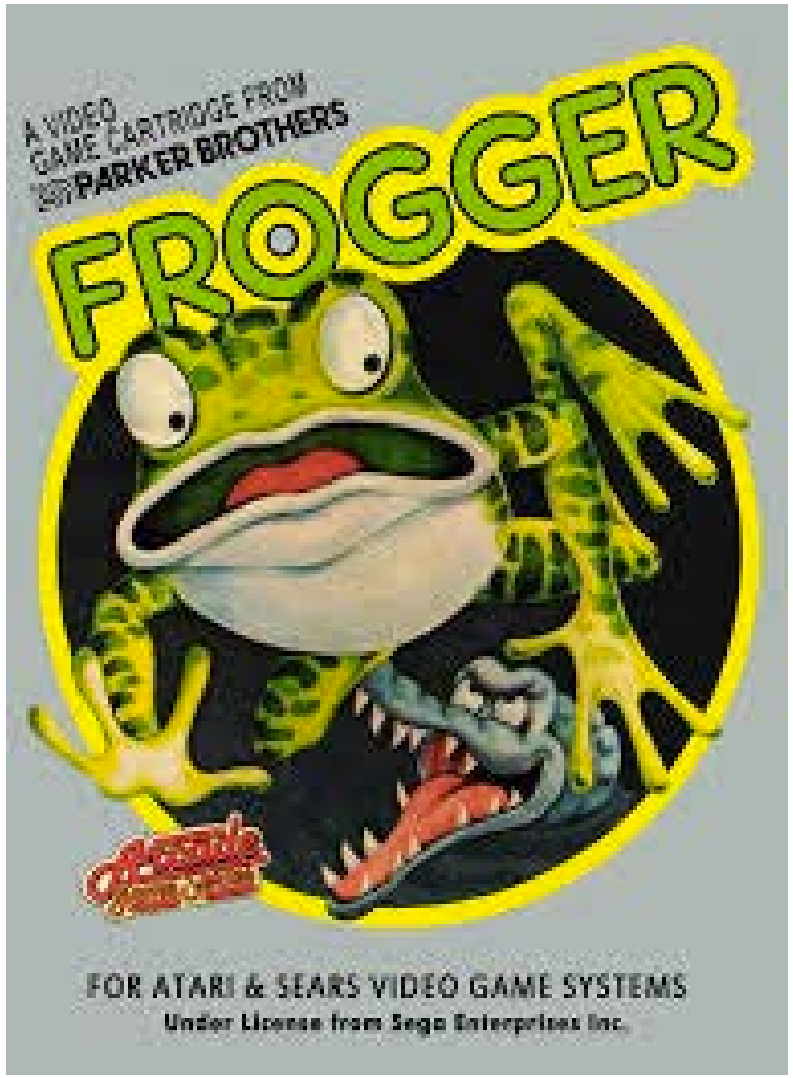
Aligning Incentives to Reduce Smoke Impacts while Increasing Area Burned

1. Avoiding area-based constraints and policies: for example, apply flat fees for restorative burning rather than charge per acre burned
2. Provide for exceptional events exceedances for resource objective fires when needed
3. Support landscape-scale resource objective burns with air resource advisors
4. Align public information and firefighting resources to use expected burn windows

Resource objective fires planned to burn 600-1000 acres at ~50 tons/acre fuels could emit <500 tons/day with minor impacts under good dispersion

Overcoming Challenges to Landscape-Scale Restorative Burning





GOAL: Restored Ecosystem

EXECUTION

Complaints

Availability of crews

- **Temporary employees available**
- **Outside of training**
- **On call for or resting from suppression**

Competition for airshed

Burn bans

Suitable moisture and wind

Resource Objective Wildfire

PERMITTING

Limited Operating Periods

(Fisher Owl Goshawk Frog Migratory Birds)

Air quality: burn day windows available for expected emissions

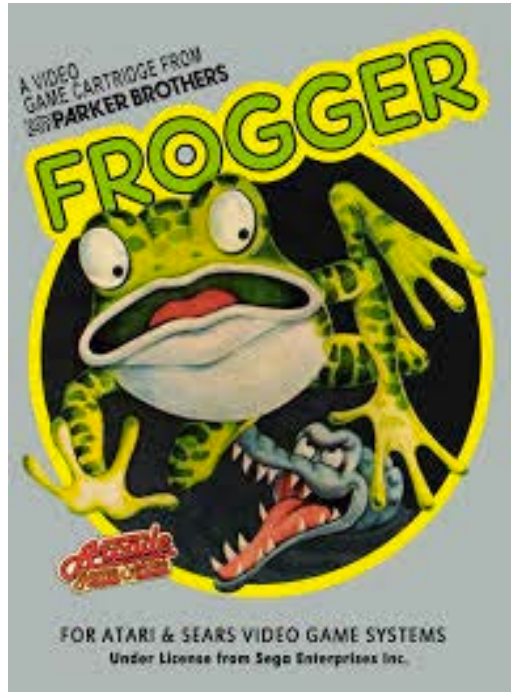
- **May need 3-5 continuous days for large burns**
- **Typically spring and some fall periods are best bets for restorative burns**

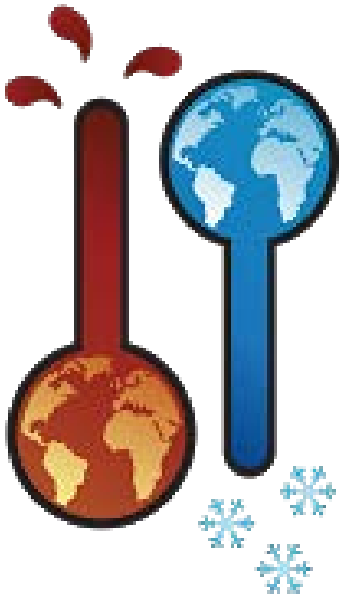
NEPA and future fires dictate time constraint

Climate Change

- Greater likelihood of smoke “waves” of extended harm*
- Narrower burn windows?
- Longer fire seasons→more smoke fatigue?
- Greater risk to using managed fire?

ADVANCED VERSION!





Liu et al. 2016, “Particulate air pollution from wildfires in the Western US under climate change”, *Climatic Change 138(3):655–666.*

Effective Smoke Management

for both wild and resource objective fires