

A photograph of a forest fire. The scene is dominated by bright orange and yellow flames that are consuming the trees and undergrowth. In the foreground, a dirt road leads away from the viewer towards the burning area. The overall atmosphere is hazy and smoky, with a strong orange glow from the fire.

Air Quality and emissions from California Wild land Fires

-Stephan Stornetta



Background

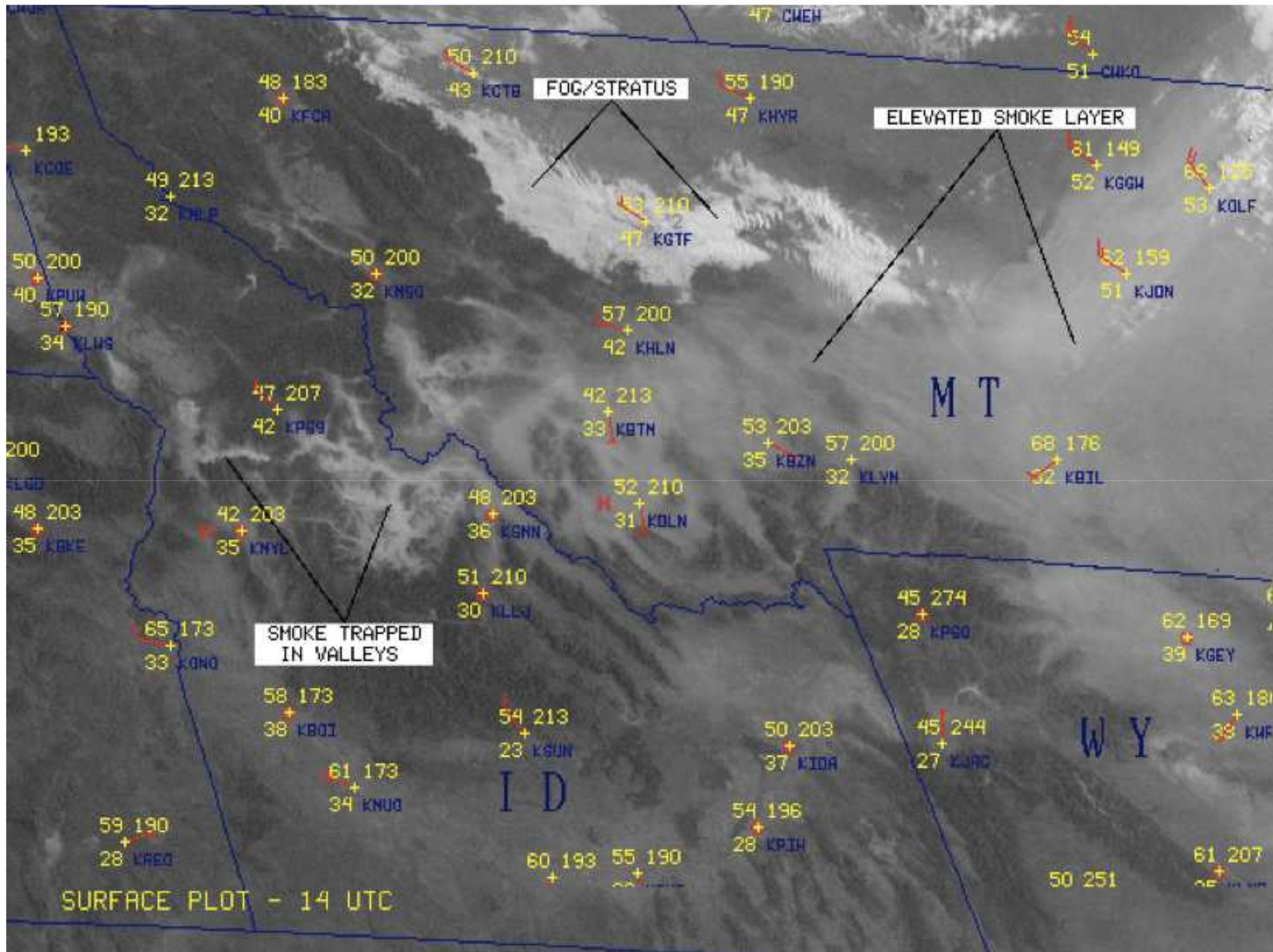
- “Wildfires are a major environmental hazard that have historically cost California more than \$800 million each year and contribute to bad air days throughout the state”
- They are due to a high resident population, strong winds, and a dramatic wet season and dry season.

A large fire with firefighters silhouetted in the foreground. The fire is bright orange and yellow, filling the upper half of the image. The firefighters are dark silhouettes in the lower half, looking towards the fire. The background is a dark, smoky sky.

5-Year Averages

Fires- 7,871

Acres burned- 270,351





Health Effects

Wildfire smoke produces small soot particles, which can cause or aggravate cardiovascular and respiratory illness and lead to premature death.

Large Fire Statistics

Wildfire	Area Burned (acres)	Density (trees/acre)	Surface Fuels* (tons/acre)
Angora Fire	3,100	273	25.4
Fountain Fire	59,840	301	24.5
Star Fire	16,171	400	39.7
Moonlight Fire	65,714	428	37.6

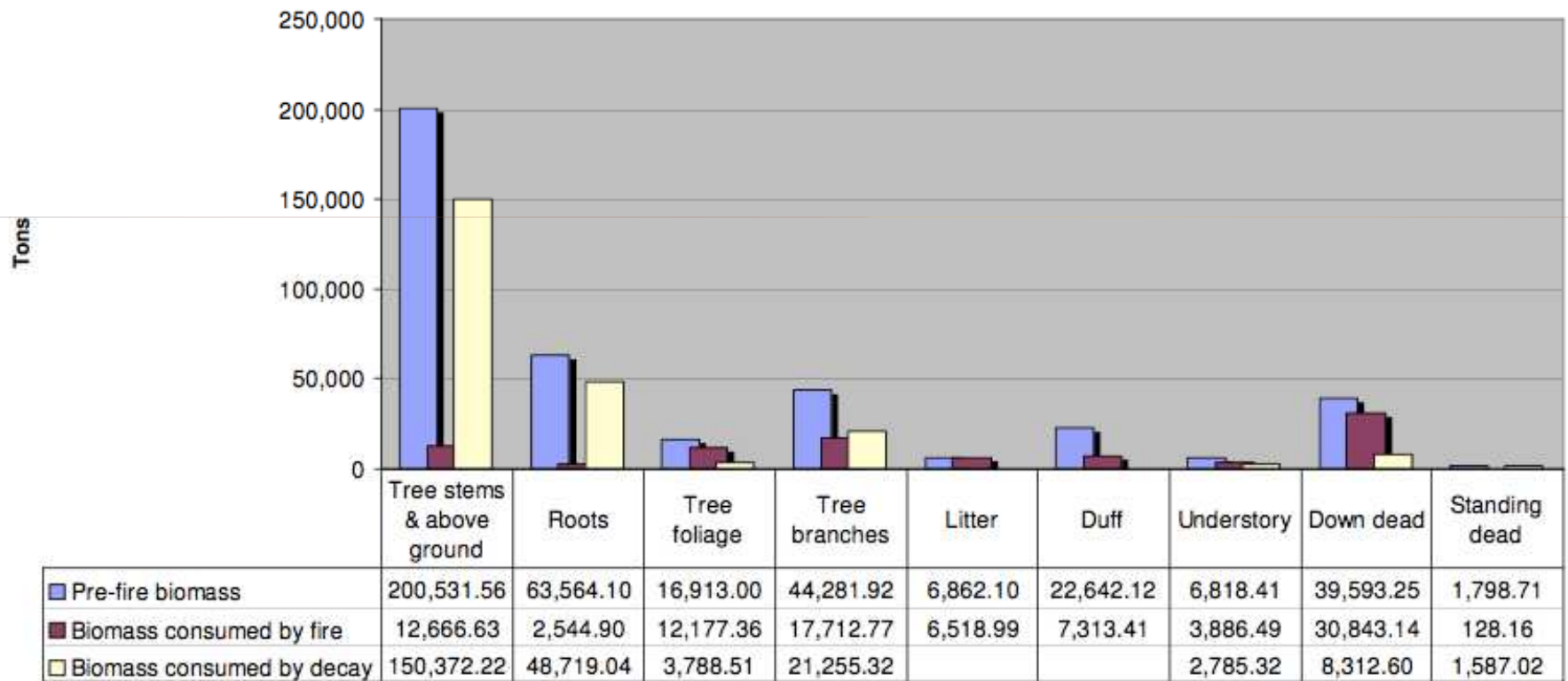
CO2 Emissions

- In heavy forest areas with about 350 trees/acre, the combustion alone produces about 63 tons of CO₂/acre or about 9.5 million tons of CO₂/fire
- The average density is about 50-60 trees/acre, but dense shrubbery and increased biomass leads to more fuel for the fires

CO2 Emissions

- Combustion is only a portion of the CO2 emitted from the fires, but decay of the landscape produces additional CO2 and greenhouse gases
- Average (Decay + Combustion)/Fire= 38 million tons of greenhouse gases

Angora Fire



Car Equivalents

Wildfire	Passenger Car Emission Equivalents* for Combustion (cars)	Passenger Car Emission Equivalents* for Combustion (cars/acre)
Angora Fire	28,166	9
Fountain Fire	629,294	11
Star Fire	244,284	15
Moonlight Fire	966,880	15

Car Equivalents

Wildfire	CO2 Emissions from Combustion & Decay* (tons)	CO2 Emissions from Combustion & Decay* (tons/acre)	Passenger Car Equivalents for Combustion & Decay (cars)	Passenger Car Equivalents for Combustion & Decay (cars/acre)	Proportion of Annual Passenger Car Emissions** (%)
Angora Fire	571,543.2	184.4	105,503	34	0.75
Fountain Fire	13,044,610.0	218.0	2,407,094	40	17.19
Star Fire	4,457,242.9	275.6	825,021	51	5.89
Moonlight Fire	19,657,975.0	299.1	3,629,015	55	25.9

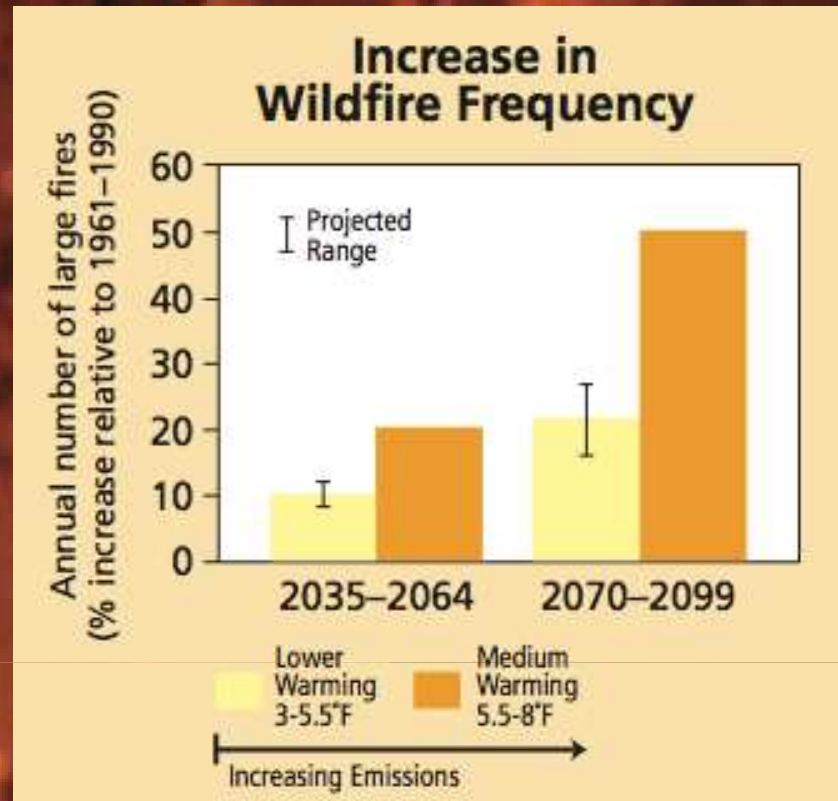
- * Includes roots, but not soil. Decay emissions occur over 100 years
- ** Based on 14 million passenger cars on the road in California in 2005 (California Air Resources Board 2006).a 100-year period.

Recovery Effects?

Table 10. FCEM estimates of total CO₂ recovered from dead tree removal, planting, and an interim harvest of planted trees on private forestlands for the four wildfires analyzed.

Wildfire	Grand Total of CO₂ Recovered (tons)	Grand Total of CO₂ Recovered (% of loss)
Angora Fire	0	0
Fountain Fire	14,870,916.7	114.0
Star Fire	2,247,290.9	50.4
Moonlight Fire	8,235,783.8	41.9

If global warming emissions are not substantially reduced, large wildfires in California are projected to increase 55 percent.



Future for California?

Sources:

- Bonnicksen, Thomas M., Greenhouse Gas Emissions from Four California Fires, March 2008
- Westerling, A., and B. Bryant. 2006. Change and wildfires around California: Fire modeling and loss modeling. California Climate Change Center report. Online at www.energy.ca.gov/2005publications/CEC-500-2005-190/CEC-500-2005-190-SF.pdf
- Wu, J., A. Winer, and R. Delfino. Exposure Assessment of Particulate Matter Air Pollution Before, During, and After the 2003 Southern California Wildfires. Accepted for publication in *Atmospheric Environment*, January 2006.
- http://cdfdata.fire.ca.gov/incidents/incidents_stats?year=2009