WILDFIRE EMISSIONS IN CALIFORNIA

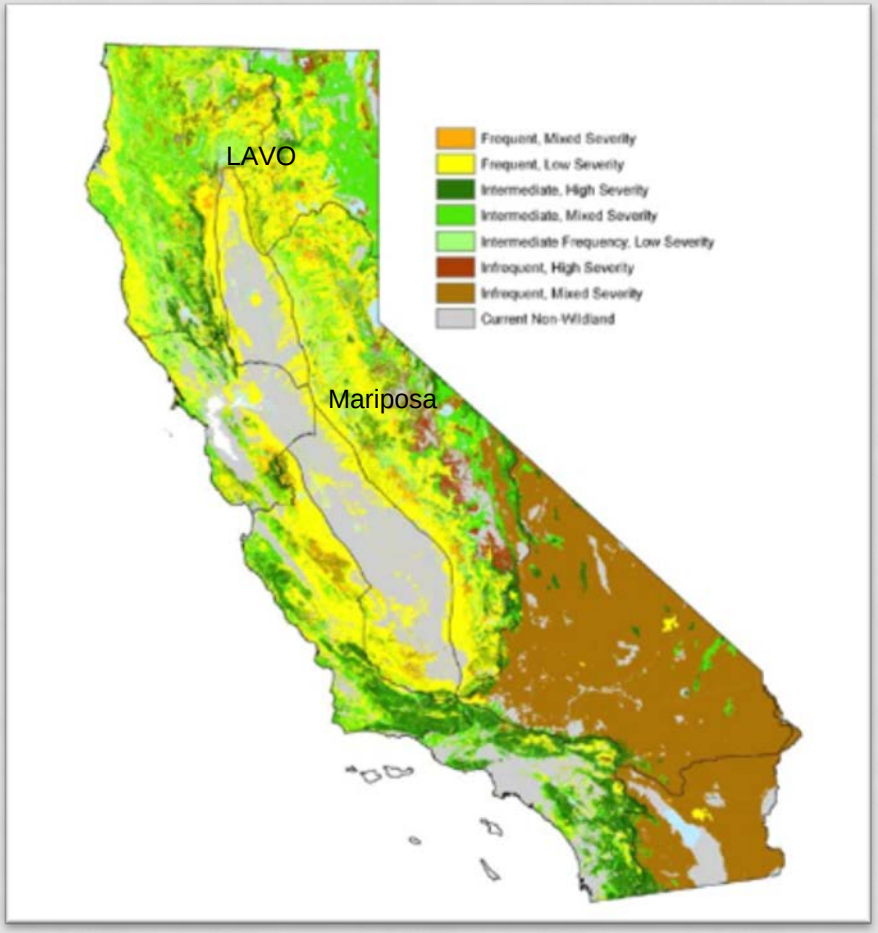
Fire Summit
Research Triangle Park
November 3, 2014

California Environmental Protection Agency
Air Resources Board

UNDERSTANDING THE ISSUES

- California's Fire Ecology
- Calculating Emissions
- Planning/Regulatory Implications

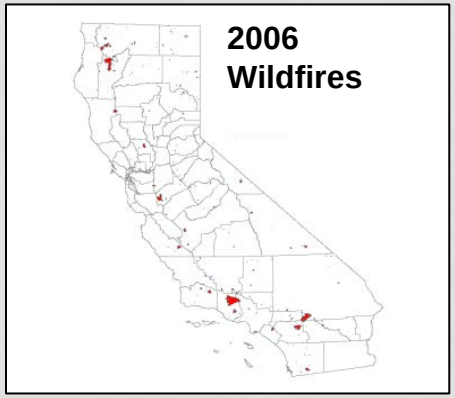
CALIFORNIA FIRE ECOLOGY

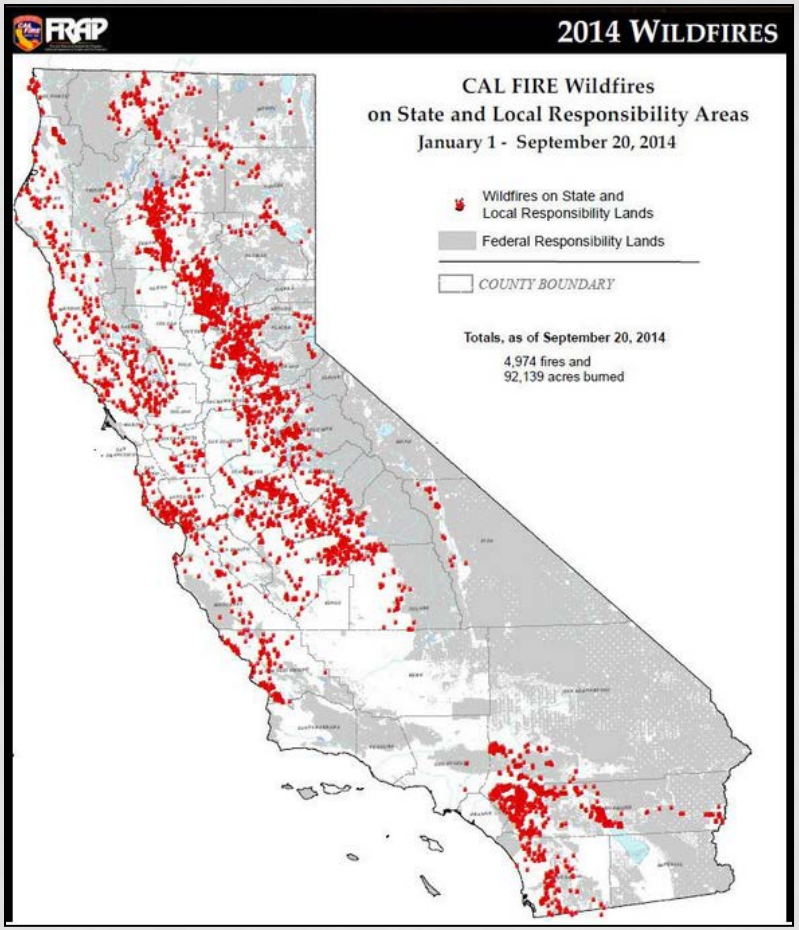


- 160,000 square miles (over 100 million acres)
- Estimate that two-thirds of the State is land under public management
- Diverse land forms - land use, fuel types, fire frequency correlate
- 38 million people clustered in urban, agricultural, and urban-wildland interface settings

WILDFIRE OCCURRENCE

- Variations year to year
  - Time (usually not winter)
  - Place
  - Intensity
  - Fuel Type

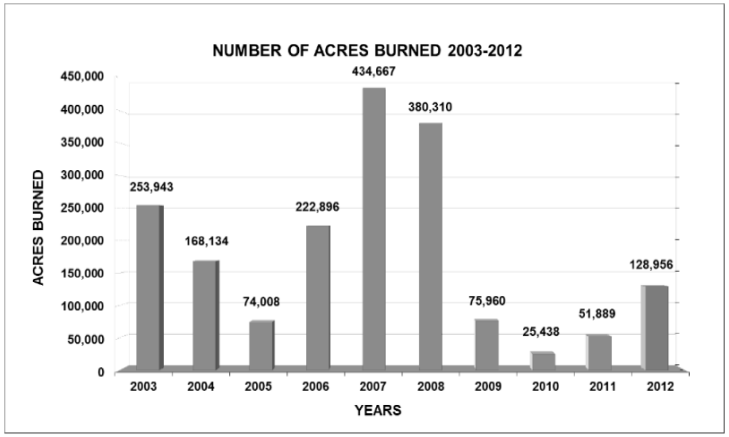




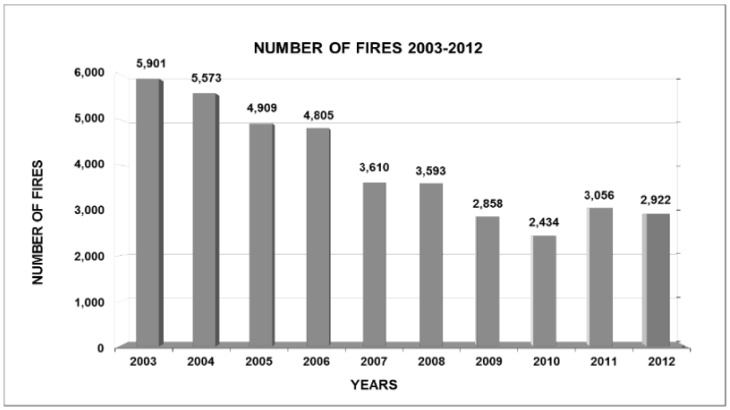
CALFIRE WILDLAND FIRE STATISTICS

2012 Wildfire Activity Statistics — California Department of Forestry and Fire Protection

Graphic Figure 2. Number of Acres Burned — 2003-2012



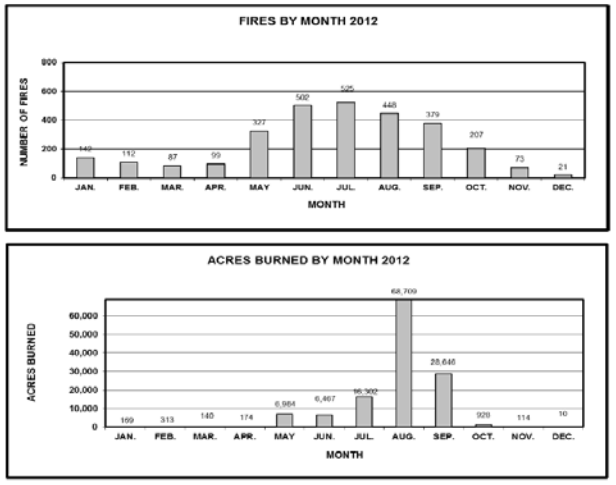
Graphic Figure 3. Number of Fires — 2003-2012



- Data from State Responsibility Area
- Number of fires not related to acres burned
- Greatest number of fires in the dry season (May-October)
- Largest fires in dry season

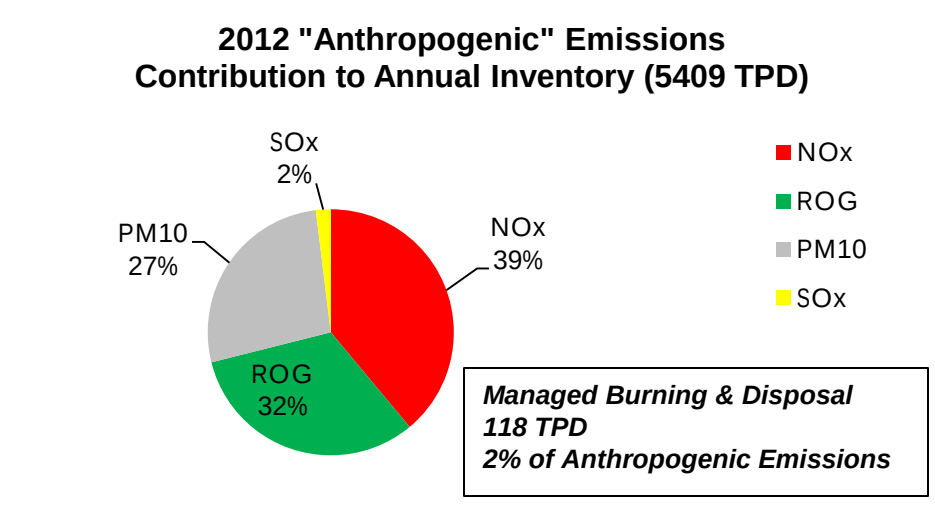
2012 Wildfire Activity Statistics — California Department of Forestry and Fire Protection

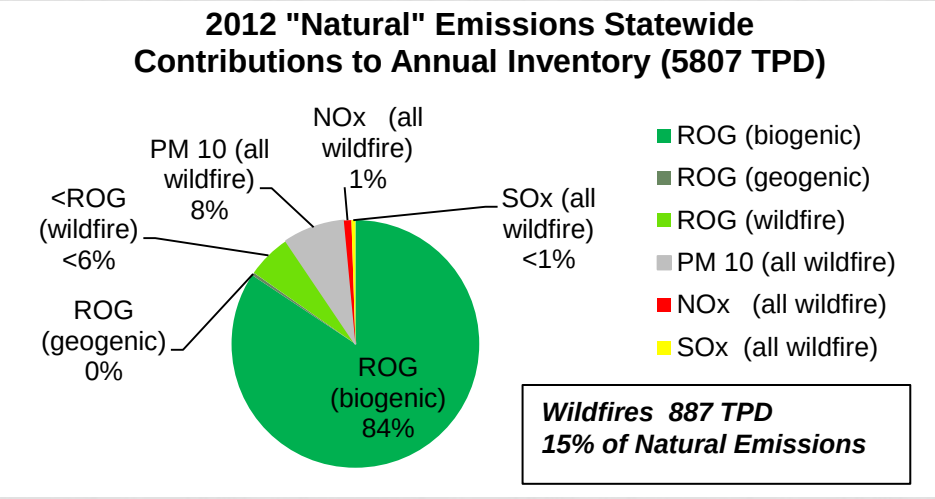
Graphic Figure 9. Number of Fires and Acres Burned by Month



CALIFORNIA EMISSIONS INVENTORY

- Smoke is Smoke
  - Acres burned & fuel types recorded
  - Emissions calculated by pollutant
  - Inventory classification differs from planning and modeling use
- Anthropogenic Inventory
  - Managed Burning & Disposal
  - All planned and approved through Smoke Management Program
  - Agricultural and Prescribed Burning
- Natural Inventory
  - Wildfires (unplanned)
- Emissions Reported to Inventory
  - Ten-year average for wildfires (natural)
  - Managed Burning - annual district reports

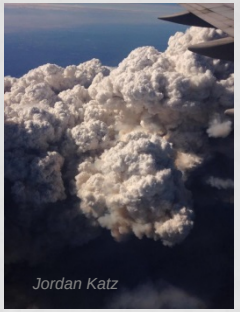




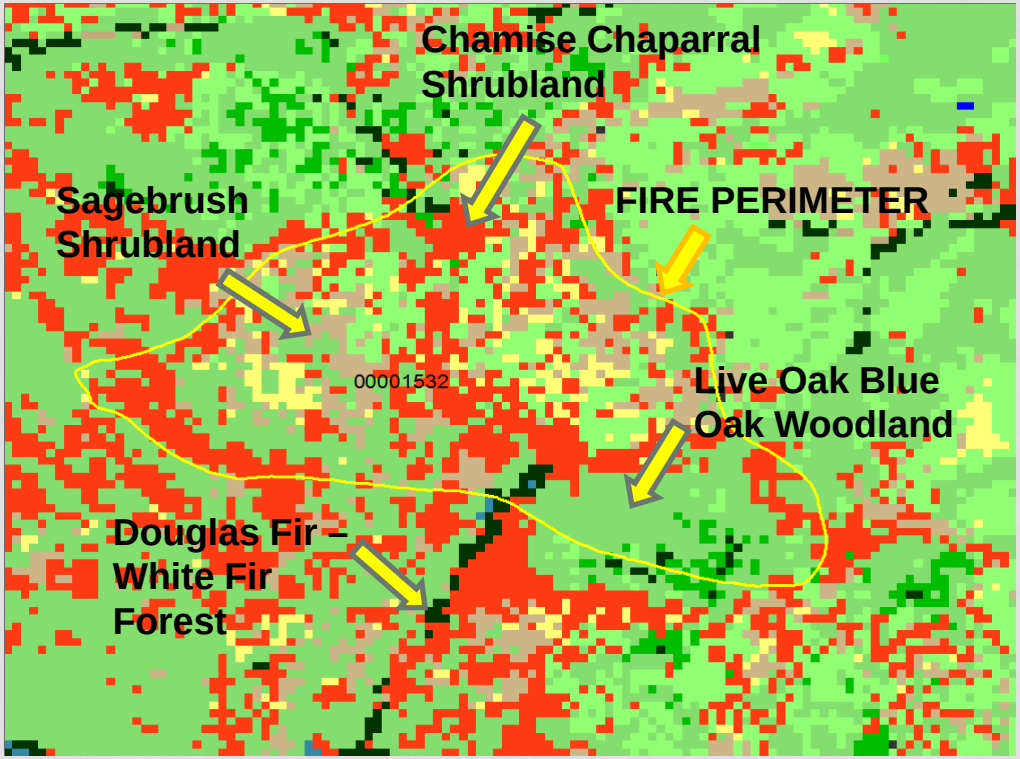
WILDLAND FIRE METHODOLOGY

- Model – FOFEM
- Inputs
  - Fire perimeters – CalFIRE-FRAP, GeoMac
  - Fuels raster – FCCS (landfire.gov)
  - Moisture raster 1000-hr fuels – WFAS, monthly average by year

- Steps
  - Geoprocessing scripts - build FOFEM batch input file
  - Run FOFEM
- Post-process FOFEM batch output
  - Emission totals (flame, smolder) by individual fire and FCCS fuelbed
  - Add-on species (NH_3, N_2O, TNMHC)
- Other post-processing (for modeling with CMAQ)
  - hourly & vertical allocation, map emissions to 4x4 km grid, MEDS/NetCDF
  - Use FINN for fires outside California; speciate VOCs, PM



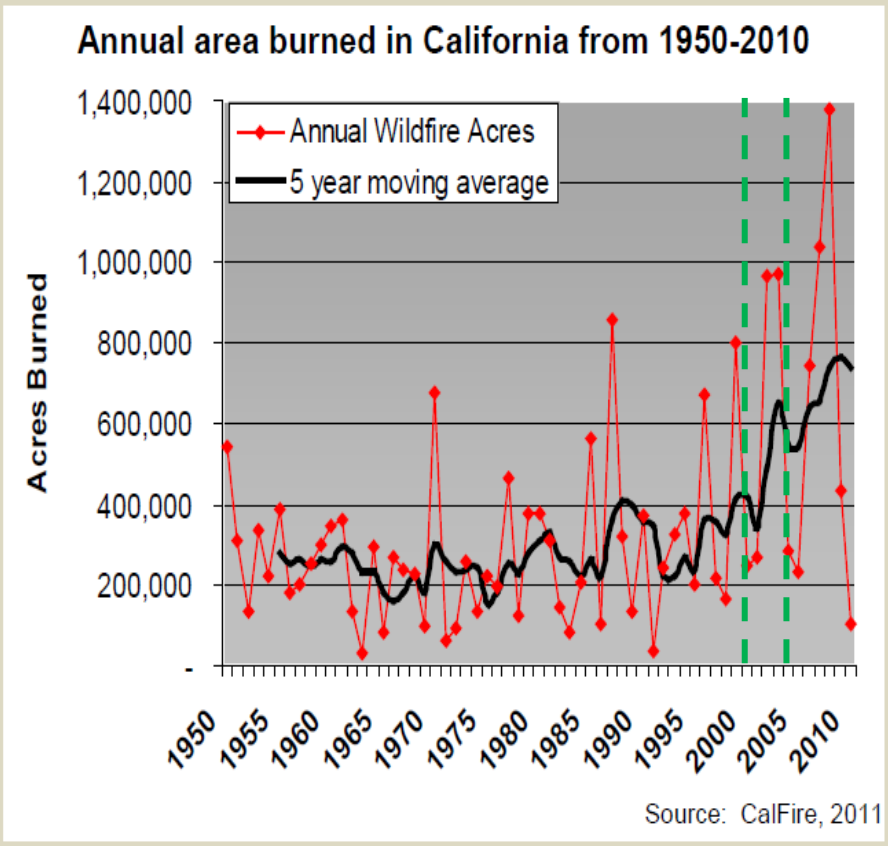
EXAMPLE: INDIVIDUAL FIRE EMISSIONS



Fire ID 00001532 Sierra Nevada Foothills
Mariposa County June 26, 2005 545 acres

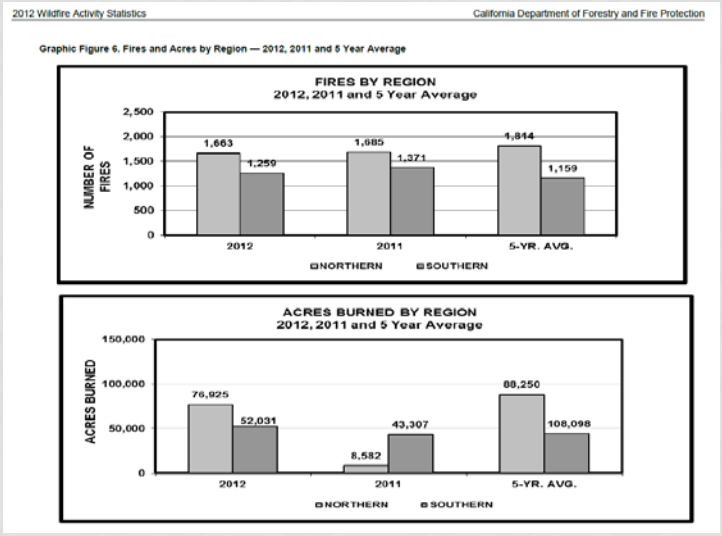
- Emissions from “Fire 1532”
  - 31 tons TNMHC
  - 7 tons NOx
  - 46 tons PM10
- Inventory comparison with Mariposa County averages for “managed burning” versus “wildfire”
  - 2160 vs. 3083 tons TOG
  - 1231 vs. 1757 tons ROG
  - 43 vs. 92 tons NOx
  - 1591 vs. 2294 tons PM10
- Modeling Use
  - 4x4 km grid for criteria pollutants
  - 30x30 km grid for regional haze

AVERAGE VS. ANNUAL EMISSIONS



Total for Federal & State Responsibility Areas
Regional Haze Base Years 2000-2004

- Modeling known emissions
  - Seasonal vs. episode vs. daily
  - Model performance vs. future goals
- Air quality planning requirements and unplanned fires
  - Exceptional events for criteria pollutants
  - Monitoring data compared with local and regional emission changes for haze

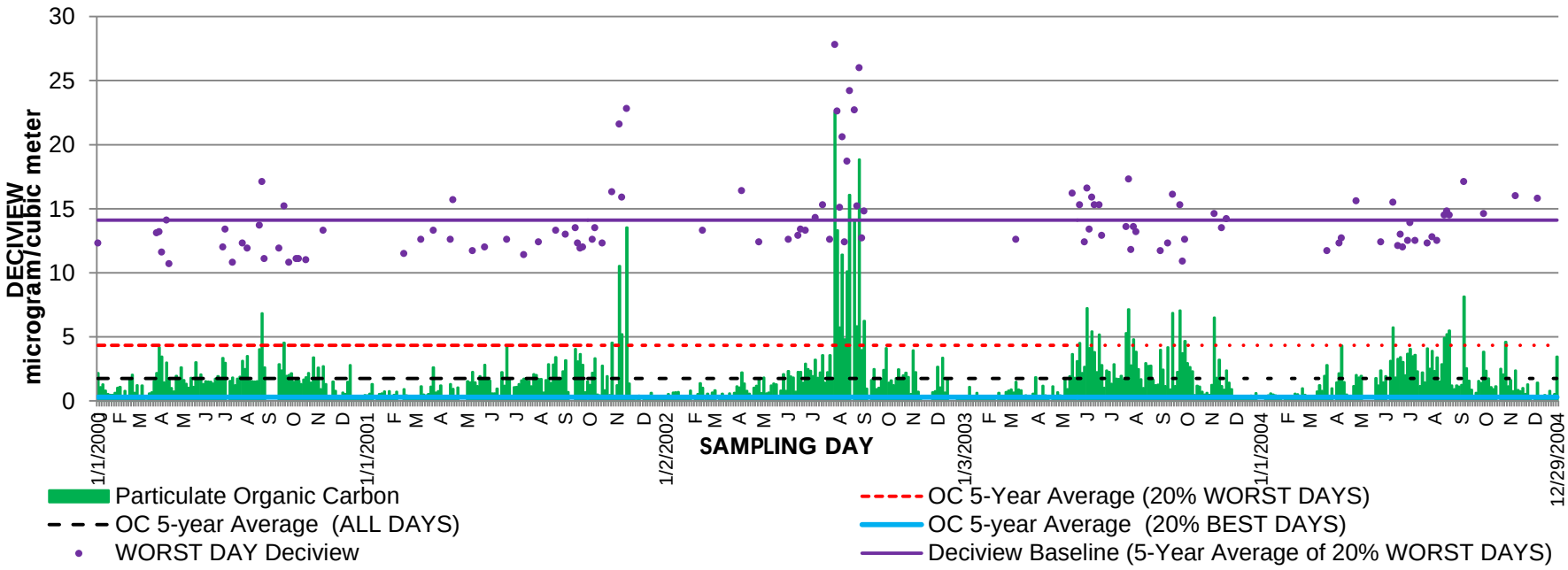


State Responsibility Areas Only

CASE STUDY: REGIONAL HAZE

IMPROVE MONITOR: LAVO at Lassen Volcanic National Park, Shasta County Northern California

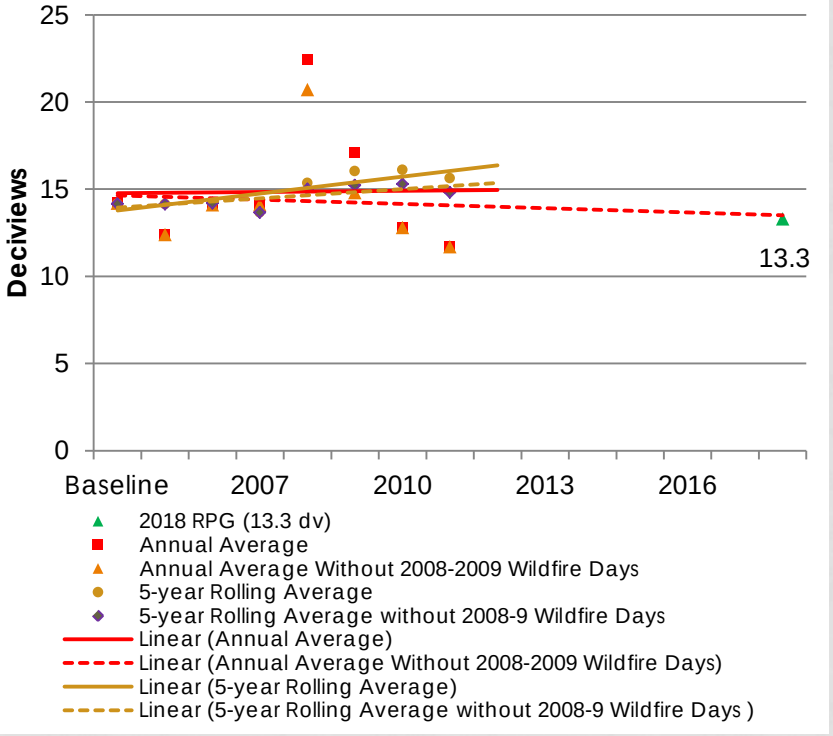
- Wildfire events are part of “Natural Conditions” that contribute to Regional Haze
- Particulate Organic Carbon “spikes” in data indicate fire emissions; correlates with haziest days
- Progress measured by 20% Worst Days each year, averaged over five years
- Model future year to calculate interim Reasonable Progress Goal (RPG)
- Baseline 5-year average (2000-2004) held constant for wildfire emissions to model first interim goal year (2018 – 365 days) using 30x30 kilometer grids over 13 western states

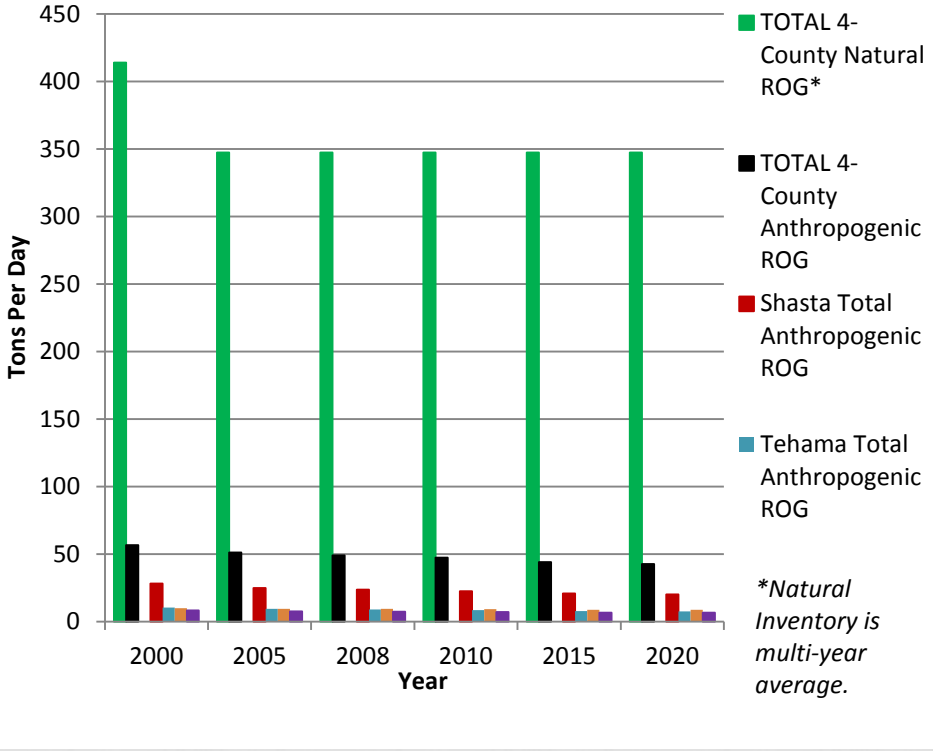


CASE STUDY: REGIONAL HAZE

IMPROVE MONITOR: LAVO at Lassen Volcanic National Park, Shasta County Northern California

- RPGs based on planned anthropogenic emissions reductions and constant natural emissions
- Visibility improvement progress demonstrated by anthropogenic emissions inventory reductions near LAVO because high wildfire years skewed data and masked progress





FUTURE CONSIDERATIONS

- Fire Emissions important to western states
  - Transported smoke from large fires
  - Change in fuels post-fire, and as land use and population evolves
  - Regional haze

- Technical contacts at CARB
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  - Fire Emissions Calculations: Klaus.Scott@arb.ca.gov