

WILDLAND FIRE AIR QUALITY RESPONSE PROGRAM



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Partners in this effort:
USFS, NPS, BLM, FWS, EPA,
NOAA NWS, State and local
Air Quality & Health Agencies

Smoke and Fire

- Wildfires single biggest source of high-level air quality impacts (in U.S.)
- Single wildfires to multiple regional wildfires causing significant impacts to millions
 - Health, Safety, Economics, Disruption of Life, Children/School/Athletics impacts
 - **Long durations** of high levels of pollutants
 - Can contribute to fatal traffic accidents
- **Public** impacts of smoke: 1 in 3 households has someone with respiratory issues, E.g. children with asthma, COPD, emphysema
 - \$11 to \$20 Billion Dollars estimated annual medical costs due to short term exposure based on 2008-2012 wildfire seasons (longer term is higher)
 - Annual mortality estimates based on PM2.5 impacts from biomass burning:
 - 2,500/yr in US based global model, CSU Study 5,000/yr to 25,000/yr,
- EPA National Emissions Inventory – Wildland Fire
 - 2011 – Biomass burning 34% of the fine particulate (PM2.5)
 - Largest emitting wildfire in NC (duff and surface fuel consumption)
 - 2014 – Biomass burning 28% of the fine particulate (PM2.5)

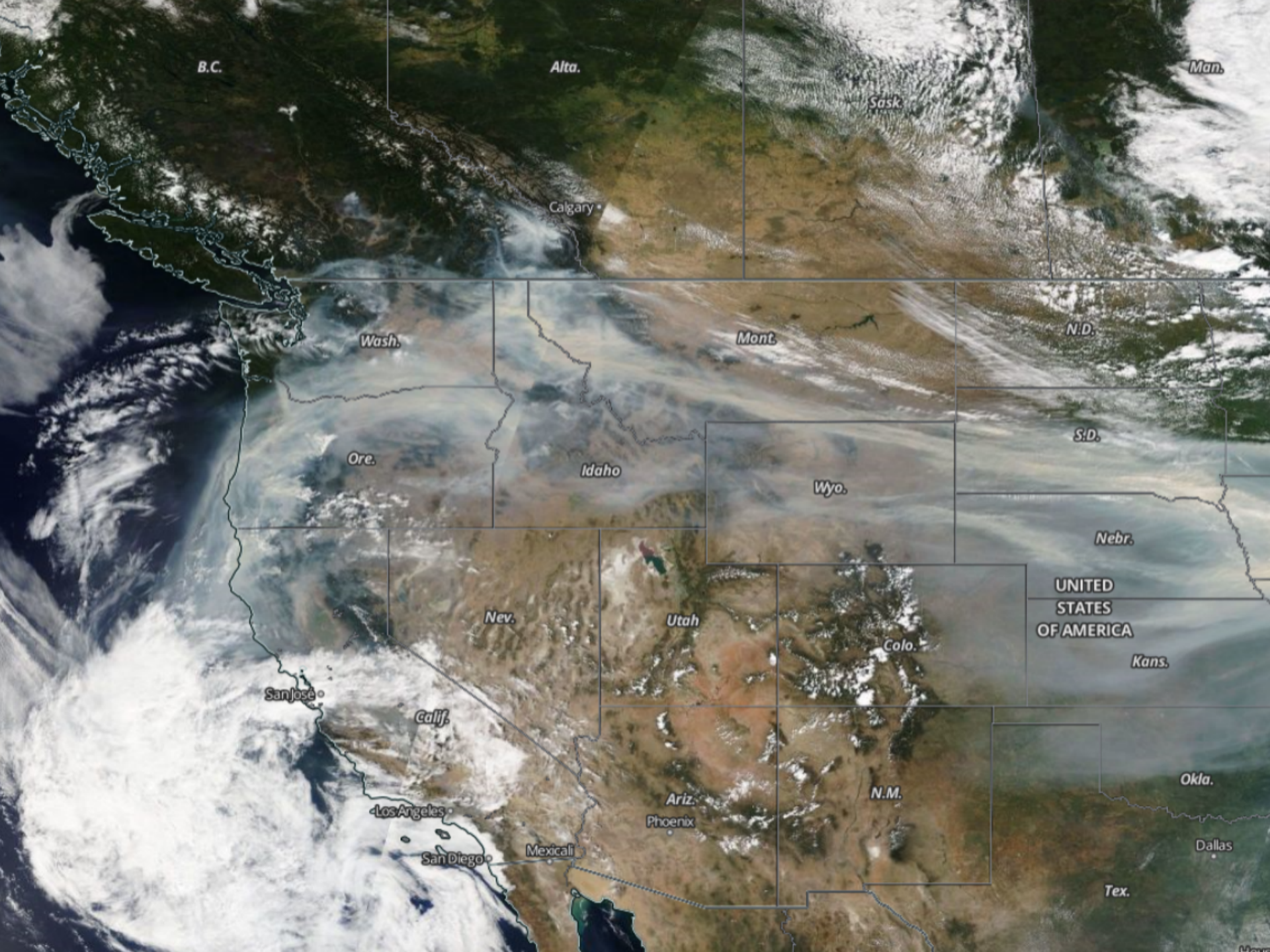
2017 Smoke and Fire

- Public exposure and regulatory impacts to States and EPA:
 - MT – 296 exceedances, 173 exceedance days to do EER
 - ID – 146 exceedances, 44 exceedance days to do EER
 - WA – 417 measurement days at Unhealthy for Sensitive Groups (AQI) with 137 PM2.5, 14 PM10 and 31 ozone exceedances, 1 EER to do
 - OR – 431 measurement days at Unhealthy for Sensitive Groups (AQI)
 - NV – 3 ozone* and 1 PM2.5 exceedances (2016)
 - CO – 10 PM2.5 exceedances on one day with 1 ozone exceedance & 1 EER to do
 - WY – 38 exceedances of PM2.5, 8 exceedances of PM, 2 ozone exceedances, 1 EER for PM2.5 for the period proposed 9/1-9/14
 - CA - 62 exceedances (incomplete)

*NV costs for 3 days, Tier 3 ozone exceedances in 2016 were \$250k, \$30k for EPA

2017 Smoke and Wildfire

- USDA Forest Service 2017 (and 2018) Fire Year Key Messages:
 - “We work closely with our cooperators to manage wildfires and *predict and mitigate smoke impacts on individuals and communities during wildfires.*”
- The Summer of Smoke 2017– Regular coverage in NPR, Washington Post, many others
- NY Times – “What to Know Before Buying an Air Purifier to Clear Wildfire Smoke”
- Focus of Congressional Hearing in Fall 2017



Wildland Fire Air Quality Response Program

- Interagency response (2011-Present)
- Operationally addressing wildfire smoke
 - Public health
 - Transportation safety
 - Fire personnel exposure
- Four components:
 - Modeling
 - Monitoring
 - Messaging / Communication
 - Air Resource Advisors (ARA)
 - Active Coordinated Response
- Integration / coordination
 - EPA, NOAA, NASA, States, and beyond



Modeling of PM2.5

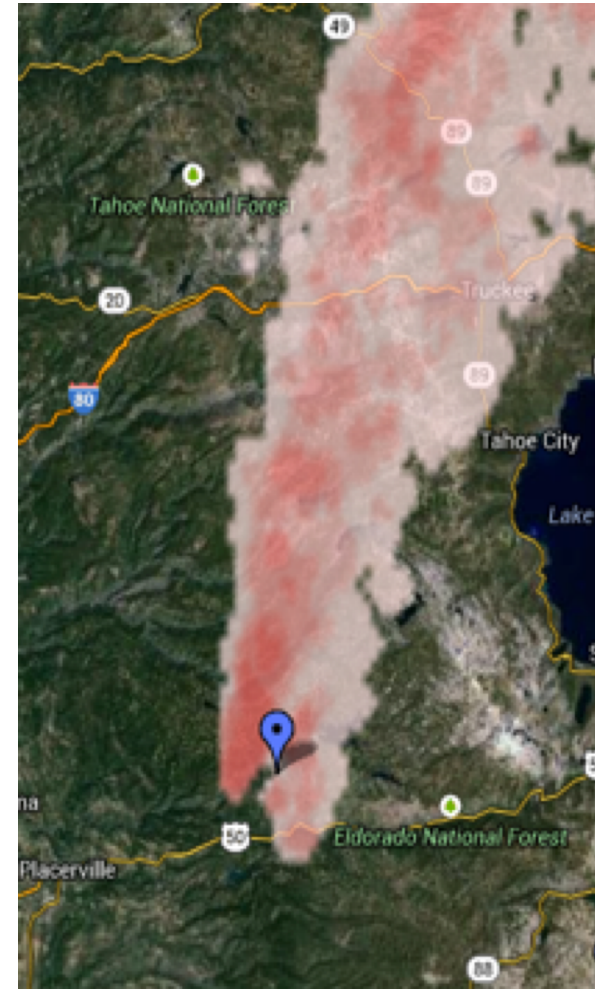
Research, Development, Application

- USFS PNW R&D AirFire Team -BlueSky smoke modeling framework
- 20+ daily regional runs to supplement national products
- Canadian wildfire emissions added mid season 2017
- New 1.8-km domains OR, AZ, NM and now 3-km CONUS
- On-incident support for high resolution and customization for best performance

King Fire 2014



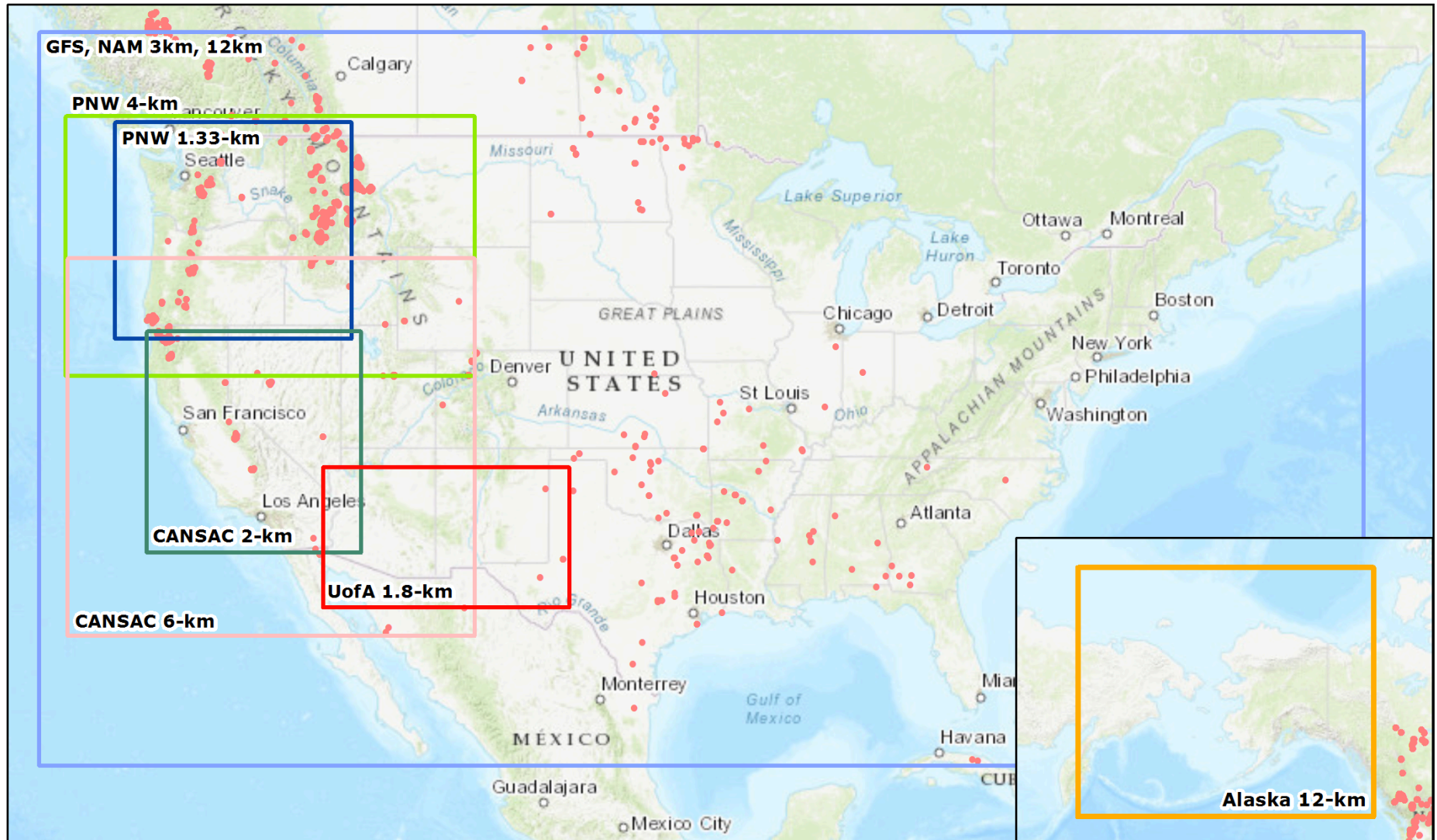
Earth Observatory 9/17/2014



BlueSky Daily Run



BlueSky Production Run Domains



24-hr Avg PM2.5 Concentration 2017-09-06

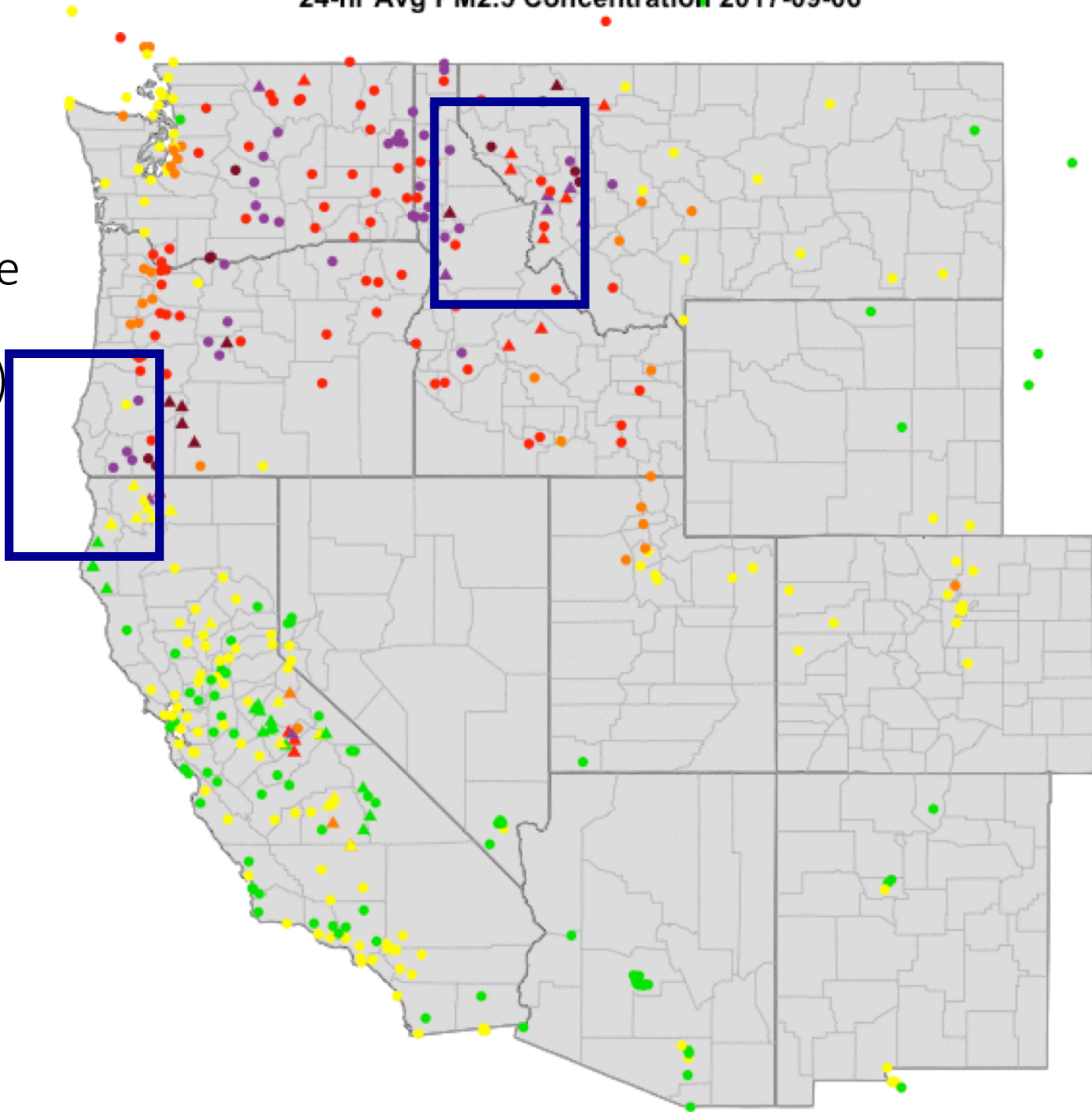
NWS 1-km

Domains:

NWS 1km domains
vastly improve smoke
model performance
(6/15-9/15 available)

Map colors:

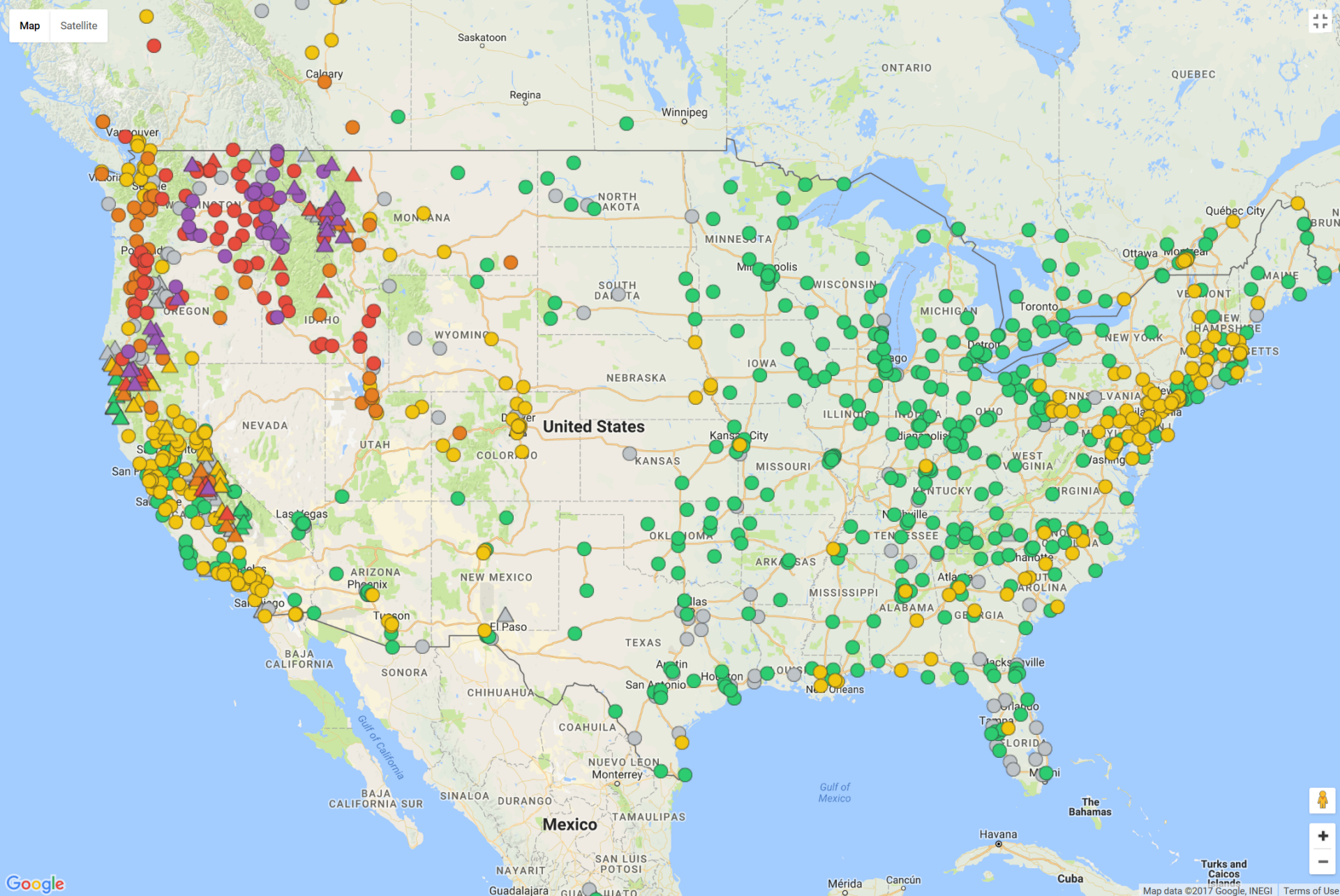
- Circles: AIRNOWTech Monitors
- Triangles: Temporary Monitors (30 WFAQRP)
- AQI Colors
 - Orange = USG
 - Red = Unhealthy
 - Purple = Very Unhealthy
 - Brown = Hazardous





Monitoring

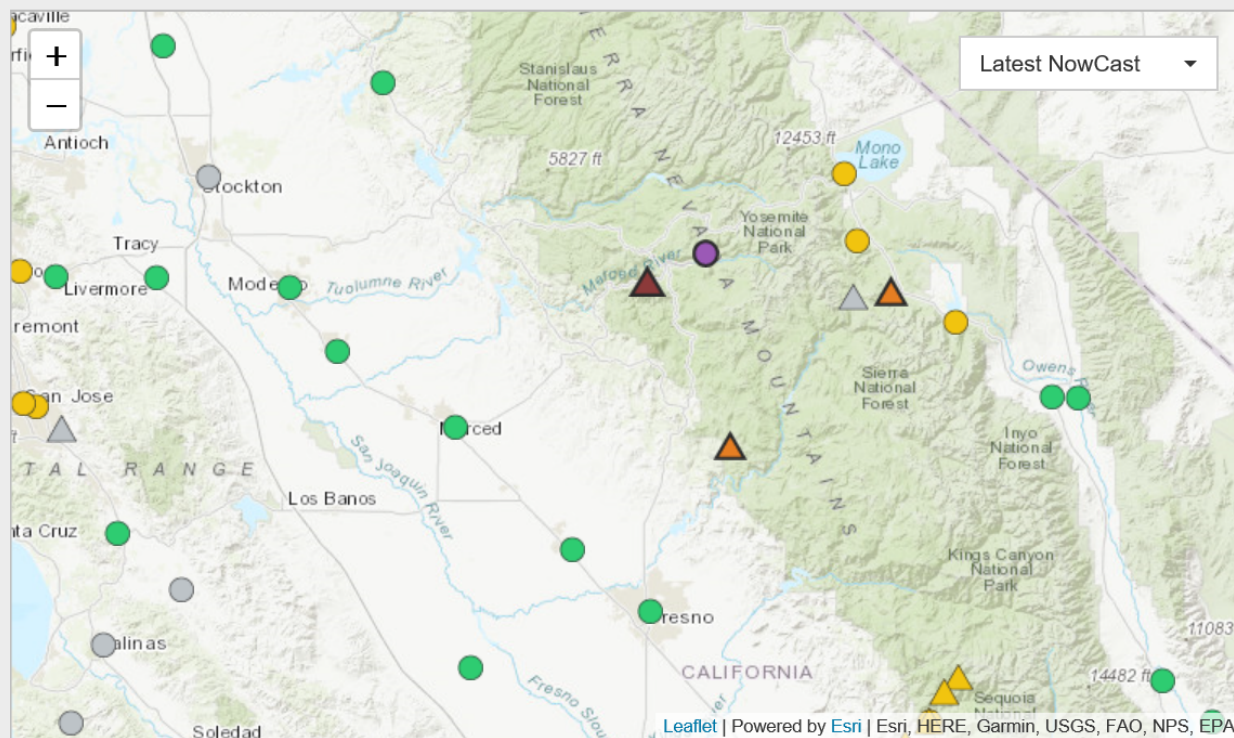
- Cache of 30 non-regulatory PM2.5 monitors (USFS-20, EPA-5 & FWS-5)
- Ordered on wildfire incidents by an Air Resource Advisor
- Rapid deployment to affected and under-served communities
- For temporary monitors deployed by ARAs in 2017:
 - 27% of days were Unhealthy for Sensitive Groups (or worse)
 - Over 3% of days were Hazardous (AQI)
 - More than 10-50x higher readings than those of permanent monitoring networks.
- Real-time telemetry and data available to all interested parties (past & present)
- Development of monitoring data analytical tools useful for wildfire smoke by USFS PNW AirFire Team for temporary and fixed stations
- <https://tools.airfire.org/monitoring/v4/>



September 6, 2017 Monitoring of PM2.5, Hourly updated display at:
<https://monitoring.airfire.org/monitoring/v3/#/?date=LATEST&productType=plotTable&userProfile=simple>



② Map is up-to-date.

Disclaimer: Data are preliminary and provided for informational purposes only. See original sources for final values. Not for official use; use at own risk.

Latest NowCast

NowCast Timeseries

last 3 days

Shown in local time

1013 North Fork



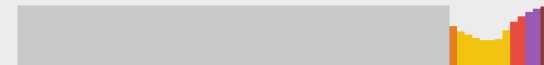
Mammoth Lakes-Banner Road



Yosemite Village - Visitor Center



lon_.119.784_lat_37.675_wrcc.smy1



② Monitor Type

- Permanent monitors
- Temporary monitors

② Latency

- Over 12 hour delay
- 6-12 hour delay
- 3-5 hour delay
- 1-2 hour delay
- on time
- no data

② AQI

- Hazardous
- Very Unhealthy
- Unhealthy
- Unhealthy for Sensitive Groups
- Moderate
- Good
- no data

② NowCast

- Hazardous
- Very Unhealthy
- Unhealthy
- Unhealthy for Sensitive Groups
- Moderate
- Good
- no data

② Last Updated

AirNow: 07/16 15:45 UTC AIRSIS: 07/16 15:46 UTC WRCC: 07/16 15:49 UTC

Selected Monitors: 4 monitors from 1 timezones.

[Data Report](#)[CSV File](#)[AQI-NowCast](#)

Air Resource Advisors

Smoke specialists deployed as part of an Incident Management Team (THSP in ICS)

46 ARA's and 48 trainees, Training Annual 2013-2018

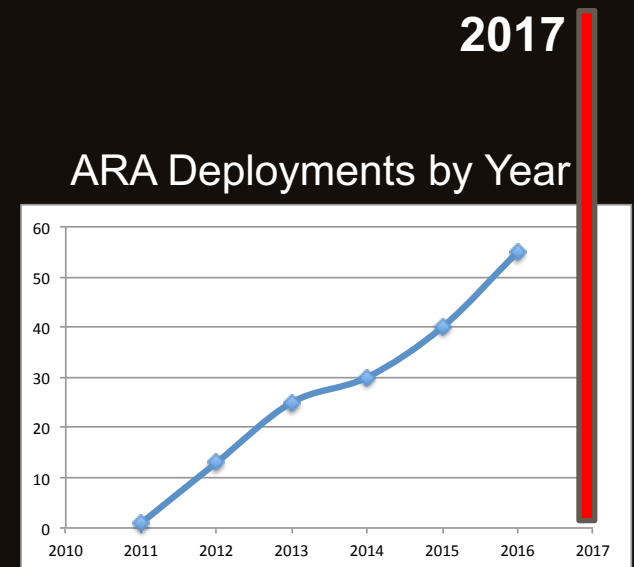
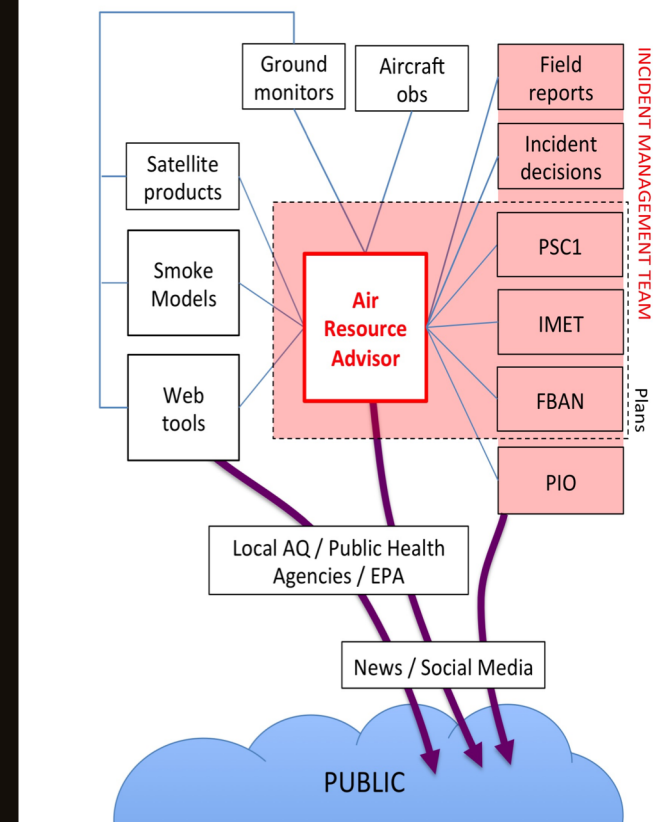
Highly diverse group: FS, BLM, NPS, FWS, EPA, NWS, State Forestry, Tribes, NRCS, AD-Contractors, and State/County Air Regulatory Agencies

Backgrounds: Wildland Fire, Air Quality, Meteorology

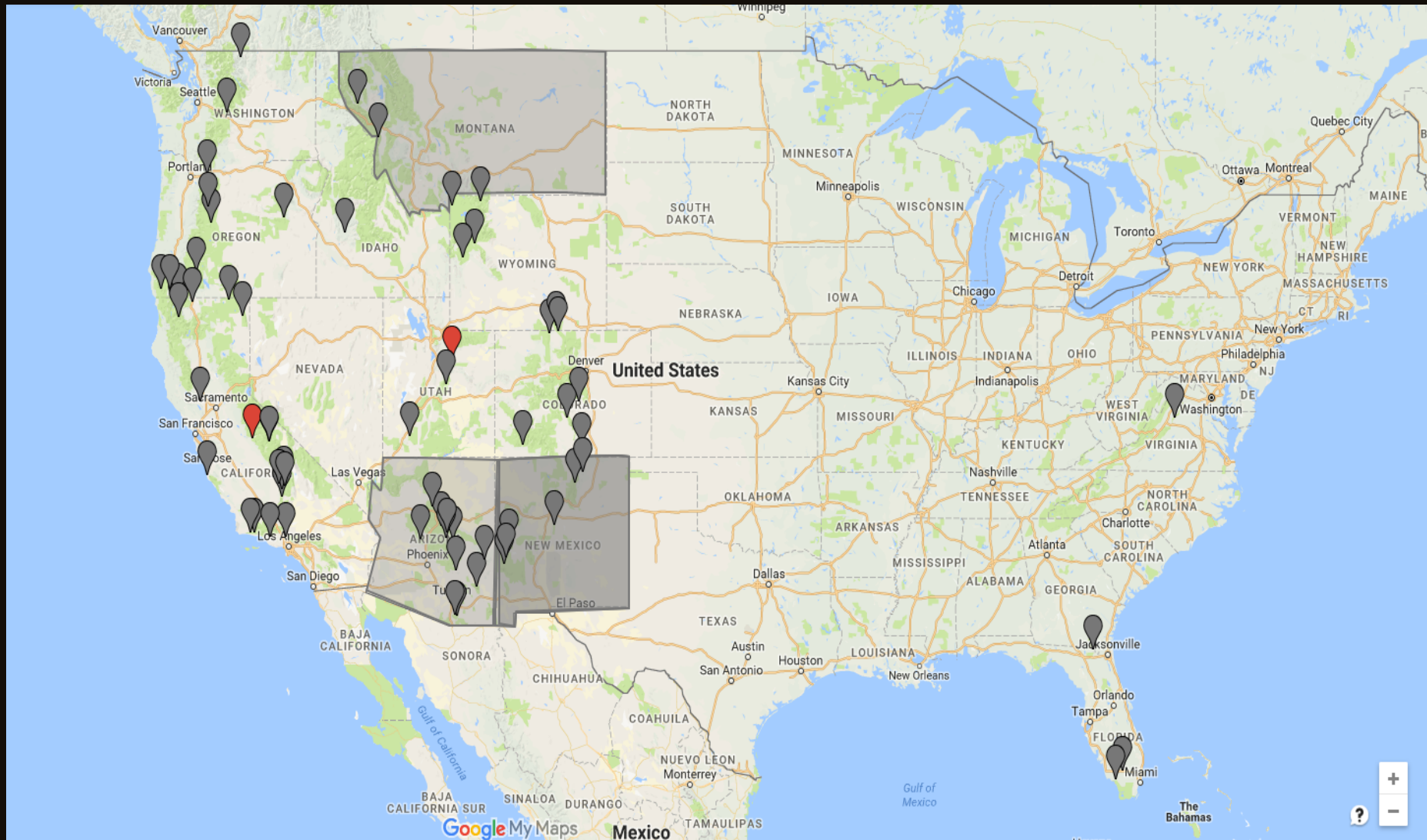
Partners: NPS; BLM; JFSP; NWS; FWS; EPA-OAQPS

Enables: Reduction of smoke exposure through behavior modification messages (public or personnel)

- Incident info tied to modeling, on-incident need & outlooks
- Coordination w/ state/tribal/local air quality regulatory agencies, public health and impacted communities
- Daily Smoke Outlook uses AQI/Nowcast
 - with peak and low impact timing information



2016-2018 ARA Dispatches



Communications

- **Create Smoke Outlooks and Impact Summaries**
 - **WFAQRP Programmatic Goal: Reduce exposure through behavior modification**
- Work closely with public health agencies (Daily Calls)
- Sync communications across impacted areas, and incident commands
- Provide critical additional information:
 - Monitor data
 - Fire activity and burnout operations
 - Fire behavior predictions
 - Meteorology
 - Incident command decisions
- PIO info and posting on net, Inciweb, blogs, social media
- Coordinate with partners on traffic smoke impact response efforts



Smoke Outlook for 6/14 - 6/15
SW Colorado 416 and Burro Fires
 Issued at: 2018-06-14 14:35 UTC

Outlook for SW Colorado

Fire

416 Fire is at about 32,000 acres, 15% containment. Burro Fire is about 3,000 acres at 0% containment. Predicted thunderstorms may bring strong outflow winds and increase the potential for extreme fire behavior.

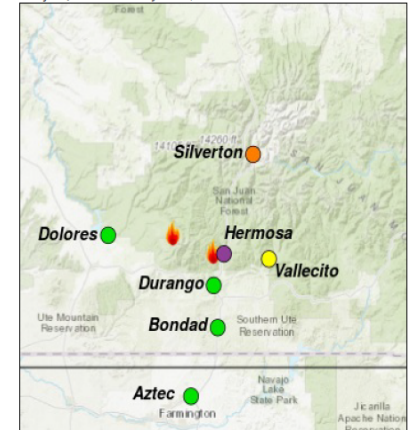
Smoke

Durango and Bondad should get a reprieve from smoke today. Hermosa will see smoke impacts at varying levels throughout today. Silverton and Lake City will see greater smoke impacts today and tomorrow. Vallecito may see smoke drifting in late this afternoon as well tomorrow morning. Dolores and Aztec should not see much smoke impacts today.

One way to reduce smoke exposure

Consider using a HEPA air filtration unit to help keep a room in your home less smoky. For more information see: <https://www.missoulacclimate.org/hepa-air-filtration.html>

Daily AQI Forecast for Jun 14, 2018



Station	Yesterday hourly	Wed 6/13	Forecast	Thu 6/14	Fri 6/15
	6a noon 6p		Comment for Today -- Thu, Jun 14		
Bondad			Generally clear today, smoke returning tomorrow morning before clearing around noon.		
Dolores			Generally clear today		
Hermosa			Heavy smoke drift mid-afternoon, some clearing tonight, returning at heavy levels early tomorrow morning, persisting to noon.		
Durango			Generally clear today with heavy smoke returning early tomorrow morning before clearing late morning.		
Silverton			Smoke drifting in late this morning, persisting overnight with heaviest concentrations after midnight and clearing late tomorrow morning.		
Vallecito			Smoke drifting in late this afternoon, clearing tonight. Smoke returning tomorrow morning, clearing before noon.		
Aztec			Generally clear today		

Issued 2018-06-14 14:35 UTC by Andrea Holland, Julie Hunter (t)

Air Quality Index (AQI)	Actions to Protect Yourself
Good	None
Moderate	Unusually sensitive individuals should consider limiting prolonged or heavy exertion.
USG	People within Sensitive Groups* should reduce prolonged or heavy outdoor exertion.
Unhealthy	People within Sensitive Groups* should avoid all physical outdoor activity.
Very Unhealthy	Everyone should avoid prolonged or heavy exertion.
Hazardous	Everyone should avoid any outdoor activity.

Disclaimer: Forecasts may be wrong; use at own risk. Use caution as conditions can change quickly. See your health professional as needed. Smoke sensitive groups should take appropriate precautions.



Issued by USFS Wildland Fire Air Quality Response Program -- www.wildlandfiresmoke.net
 SW Colorado Updates -- tools.airfire.org/production-outlooks/SWColorado
 Smoke and Health Info -- www.airnow.gov/index.cfm?action=smoke-index

Wildland Fire Air Quality Response Program Efforts 2017

- 106 ARA deployments, 40% multi-fire outlooks
- More than 1100 Smoke Outlooks
- 1 million + trajectories calculated
- 3000 custom smoke trajectories
- Over 1.4 million website hits during Summer 2017
- Many state regulatory agencies very engaged in 2017
- 2017 Much greater health department engagement
- Challenges in message (1 hr impacts vs EPA Nowcast)
- State forestry still limited use
- See wildlandfiresmoke.net

ARA 2017 Deployment Map



Challenges and Opportunities

- Accurate fuels characterization and consumption
 - Surface and sub-surface fuel moisture (duff and below)
 - Burned and unburned area within the perimeter
 - Flaming/smoldering and glowing phases
- Fog formation at surface and intersection with smoke
- Smoke and transportation corridors
- Carbon Monoxide
- Integrating real-time surface data to inform remotely sensed information – huge array of temporary monitors deployed
- Additional pollutants beyond PM2.5
- April 2020 – **International Smoke Symposium 3** hosted by NWCG Smoke Committee and International Association of Wildland Fire
 - NASA always been significant partner
 - Remote sensing and application big topic historically