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
BlueSky Production Run Domains

- GFS, NAM 3km, 12km
- PNW 4-km
- PNW 1.33-km
- CANSAC 2-km
- CANSAC 6-km
- UofA 1.8-km
- Alaska 12-km
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/](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
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
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
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