Overview of U.S. Forecasting/Outreach Methods

John E. White, US EPA
white.johne@epa.gov

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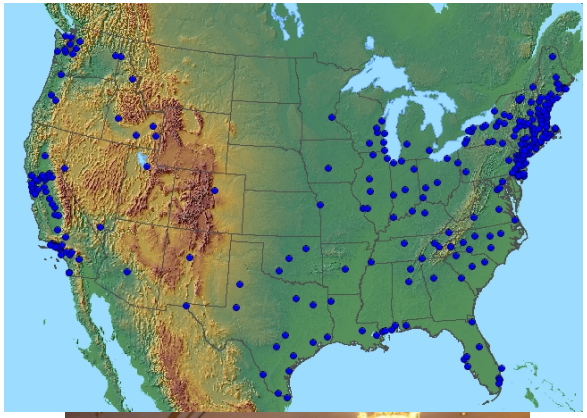
Outline

- **Air Quality Forecasting in the U.S.**
  - How it is done…
  - Challenges of Forecasting Agencies
  - The Forecasting Process
  - Role of AirNow
- **Usefulness to EPA and the Public**
- **Outreach Methods**

Air Quality Forecasting in the U.S.

- **A distributed network of independent agencies**
  - 80+ forecasting →All VOLUNTARY
  - No Federal law for forecasting or real-time reporting of air quality
  - AirNow —> provides centralized organization
  - **EPA and NOAA do NOT issue forecasts**
- **Various forecasting methods! (most agencies use an ensemble approach)**
  - Criteria (rule of thumb)
  - Statistical
  - Photochemical models
  - Experience
  - Numerical models (NOAA, BlueSky, private sector, in-house)
- **Educational materials are available**
  - Guidance documents
  - Air quality short courses
- **Air Quality Forecasts**
  - 400 cities forecasting for ozone and PM2.5
  - Air quality action days



Forecasting Process – Typical Agency

- It takes time, experience and understanding to develop air quality forecasting expertise
- Start with ozone and/or PM “climatology”
- Complete weather analysis and a solid weather forecast
- Assess the current pollutant scenario in concert with the weather conditions
- Utilize various tools (numerical and statistical models, datasets, programs)
- Apply knowledge of the pollutant behavior under the expected weather conditions
- Issue and disseminate forecast (EPA AirNow, local media/groups)

Forecasting Agency Challenges

- **Type of forecast staff:**
  - Range from all meteorologists to technical staff (w/ met. training and/or experience)
- **Staff time for forecasting:**
  - Varies by region (function of area size, severity of AQ problem, other duties)
  - Ranges from as low as 5-10 hours per week to as high as 20-25 hours per week
- **Forecast program resources:**
  - Some groups use little beyond continuous monitors and the Internet (weather pages, AirNow-Tech, NOAA model)
  - Other agencies have their own:
    - Meteorological towers
    - Visibility cameras
    - Classification schemes
    - Simplified decision aid tools
    - Radar profilers
    - GOES satellite processing tools, etc

Forecasting Agency Challenges

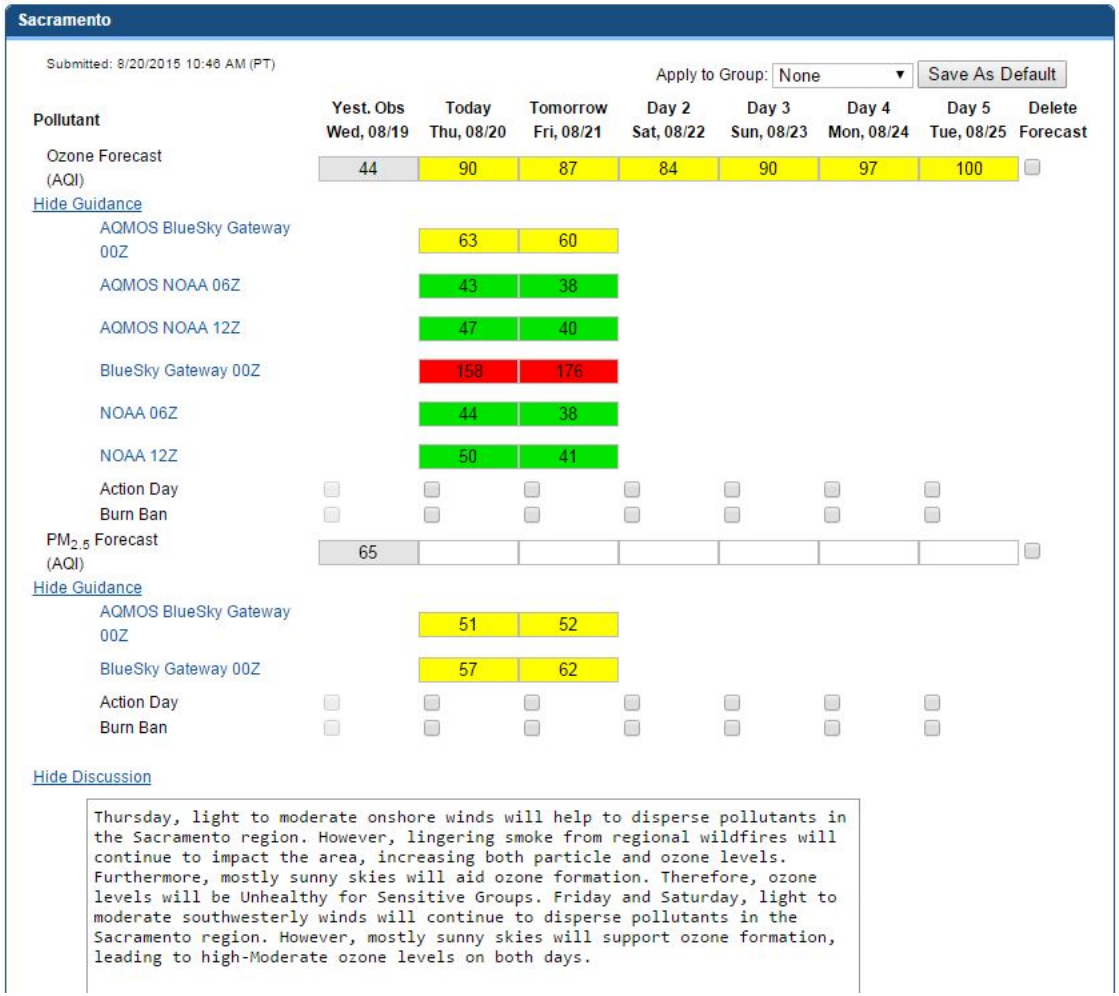
- **Time constraints**
  - Forecast deadlines - early afternoon for media (range from 1pm to 4pm Eastern)
  - Most all 00Z model products are available at the beginning of the workday for morning discussions and current day forecast updates
  - 12Z ETA / NGM / RUC model products downloaded/printed just after 12:00 EDT. Some reanalysis products, BUFKIT, take longer
  - Around 13:00 - 12Z AVN and many 12Z MM5 products are starting to appear
  - This leaves about two hours of intense informational analysis before forecast discussion production
  - Continual communication/analysis with the air quality monitors occurs up to forecast submission
- **Budget constraints**
  - More monitoring requirements, less EPA support/funding, overall budget issues!
- **Changing Federal Air Quality standards…**
- **Changing chemistry/meteorological processes…**

Role of EPA AirNow in Forecasting

- **Provides centralized organization to 80+ forecasting agencies**
  - Communication and standardized products
- **AirNow-Tech Decision Support Tool**
  - Forecast Submittal System
  - HYSPLIT, ASOS, Satellite and Fire Detect data
- **NOAA model guidance integration**
  - AirNow displays model predictions on city level to aid in forecasting
  - AQI conversion
- **AirNow API (web services/text files, RSS)**
  - Media distribution
  - Researchers/agencies
- **Forecasting Training (workshops, courses, videos, guidance docs)**
  - Not so much in recent years due to lack of funding

AirNow-Tech - Forecast Submittal System

- **Used by state/local agencies to submit forecasts**
- **Provides NOAA model output for their forecast area**
- **Also contains HYSPLIT trajectories, satellite coverage and other analytical tools**
- **Provides forecast statistics and NOAA model verification**



Sacramento

Submitted: 8/20/2015 10:46 AM (PT)

Apply to Group: None | Save As Default

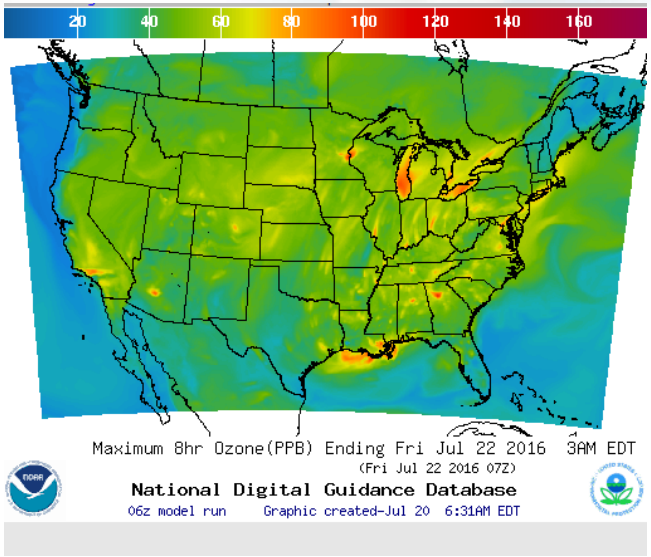
Pollutant	Yest. Obs Wed, 08/19	Today Thu, 08/20	Tomorrow Fri, 08/21	Day 2 Sat, 08/22	Day 3 Sun, 08/23	Day 4 Mon, 08/24	Day 5 Tue, 08/25	Delete Forecast
Ozone Forecast (AQI)	44	90	87	84	90	97	100	
Hide Guidance								
AQMOS BlueSky Gateway 00Z		63	60					
AQMOS NOAA 06Z		43	38					
AQMOS NOAA 12Z		47	40					
BlueSky Gateway 00Z		158	176					
NOAA 06Z		44	38					
NOAA 12Z		50	41					
Action Day								
Burn Ban								
$PM_{2.5}$ Forecast (AQI)	65							
Hide Guidance								
AQMOS BlueSky Gateway 00Z		51	52					
BlueSky Gateway 00Z		57	62					
Action Day								
Burn Ban								

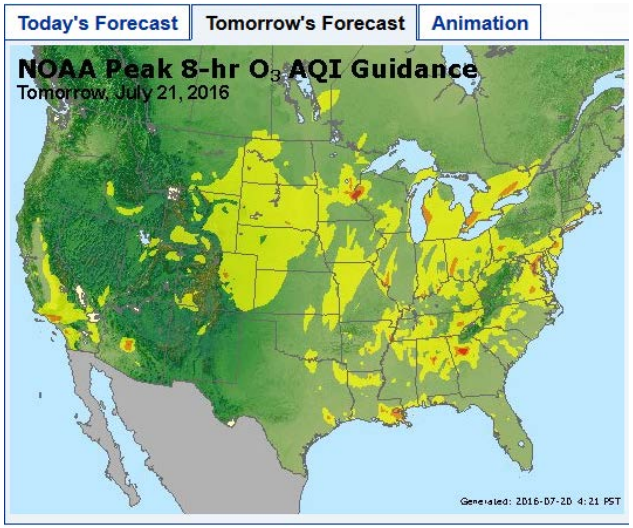
Hide Discussion

Thursday, light to moderate onshore winds will help to disperse pollutants in the Sacramento region. However, lingering smoke from regional wildfires will continue to impact the area, increasing both particle and ozone levels. Furthermore, mostly sunny skies will aid ozone formation. Therefore, ozone levels will be Unhealthy for Sensitive Groups. Friday and Saturday, light to moderate southwesterly winds will continue to disperse pollutants in the Sacramento region. However, mostly sunny skies will support ozone formation, leading to high-Moderate ozone levels on both days.

NOAA AQ Forecast Model Guidance

- **NOAA Model Components:**
  - Operationally integrated on NCEP's supercomputer
  - NCEP mesoscale NWP: WRF-NMM
  - NOAA/EPA community model for AQ: CMAQ
  - NOAA HYSPLIT model for smoke prediction
- **Gridded forecast guidance products**
  - Updated 2x daily
- **Verification basis, near-real time:**
  - Ground-level AirNow observations
  - Satellite smoke observations
- **Customer outreach/feedback**
  - State & Local AQ forecasters coordinated with EPA
- **No PM Forecasts, do have smoke and dust**





Usefulness to EPA and the Public

Estimate – AirNow saves at least $38 million in health care costs annually

Process:

Data

Information

Health Info

Outreach

Exposure Avoidance

Health Outcome

Economic Value

- Estimated daily media impressions (about 3.7 million viewers)
- Used 2009-2010 ozone and PM2.5 conditions for AirNow forecast cities (400 cities covering 124 million people)
- Estimated number of people who took actions to protect their health (average of 57,000 per day)
- Assessed health benefit costs based on methods1 similar to EPA's Benmap

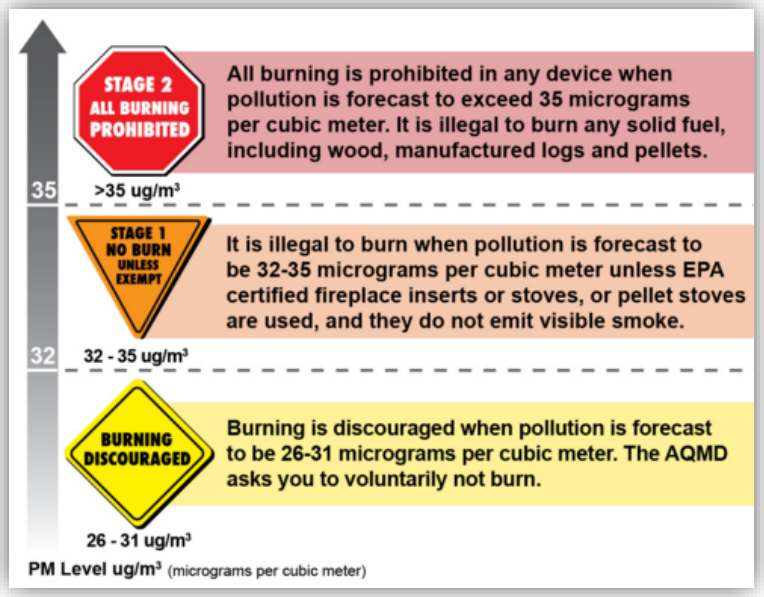
[1]Brajer, Hall, and Lurmann (2010) Valuing Health Effects: The Case of Ozone and Fine Particles in Southern California. Contemporary Economic Policy (doi:10.1111/J.1465-7287.2010.00240.X).

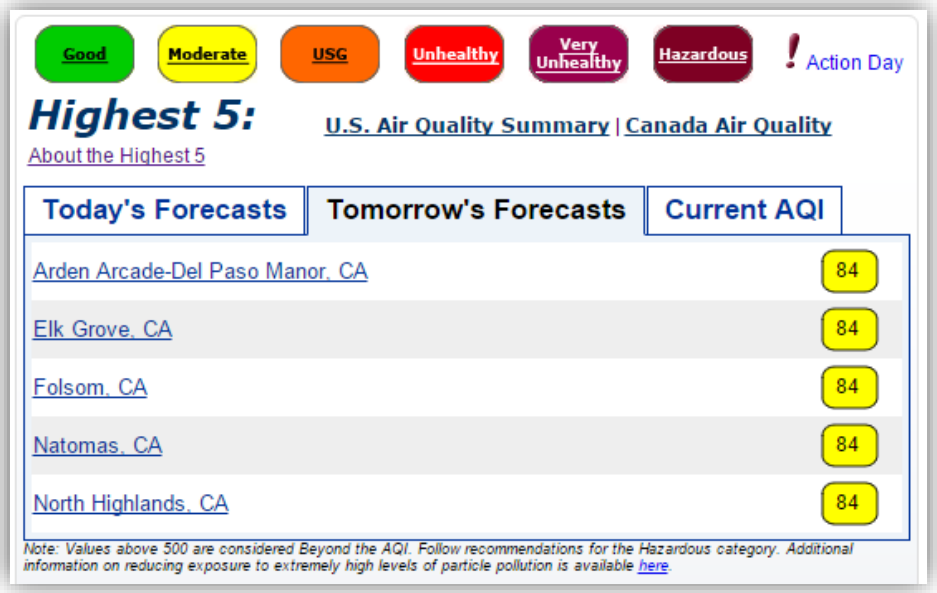
Usefulness to EPA and the Public

Emissions Reduction

AQI forecasts submitted to AirNow help plan episodic emissions reduction activities on action and advisory days.

- Centralized portal provides information on voluntary actions the public can take to help improve air quality
- Some local agencies have mandatory regulations



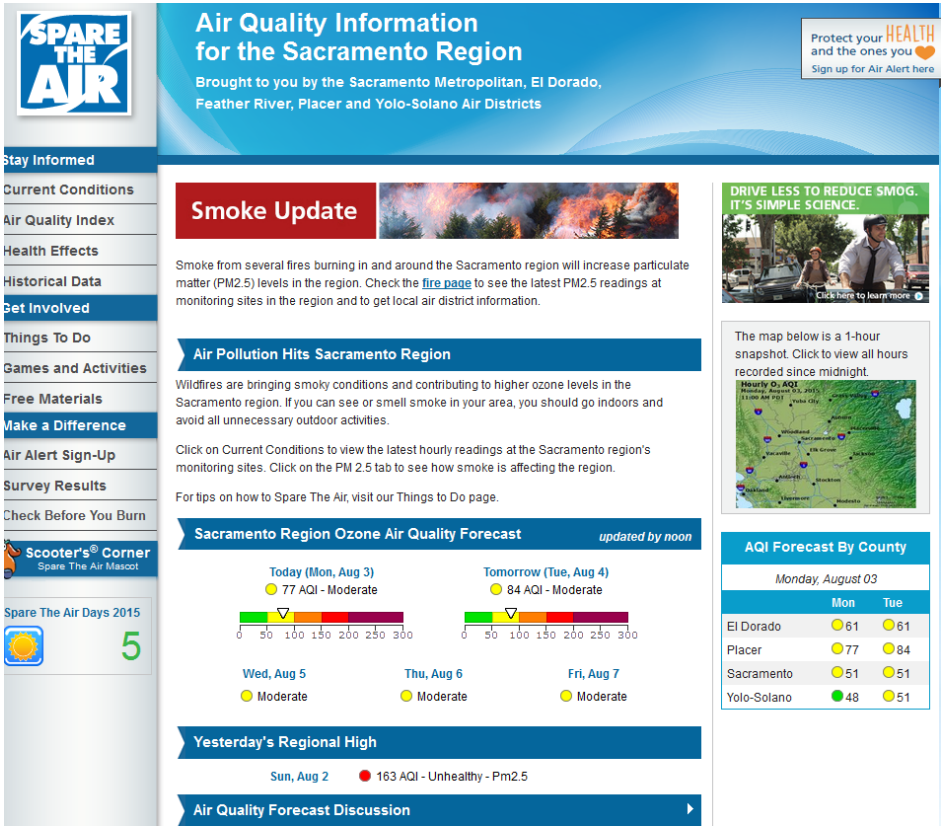


Outreach Methods

Spare the Air (a good example)

AirNow's outreach role

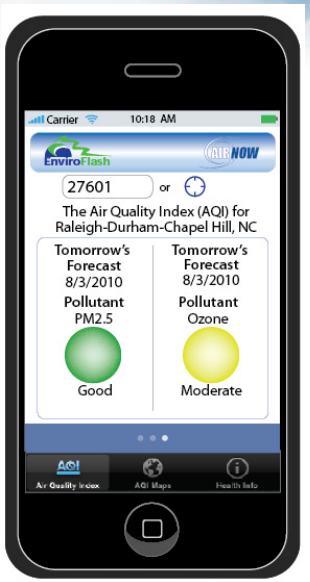
- National media partners
- Data sharing
- Products
- News Stories



Outreach Methods

Who:

Parents
Schools and Daycares
Coaches
Businesses
Healthcare Workers



How:

[AirNow Website](#)
- over 5 million page views/year

Smartphone Apps/[EnviroFlash](#)
[AirNow API](#)
[Air Quality Flag Program](#)
[CEU Training](#) for Health Professionals
[Teacher Training Toolkit](#)
[Facebook](#) and [Twitter](#)

Thank You!

John E. White

white.johne@epa.gov