

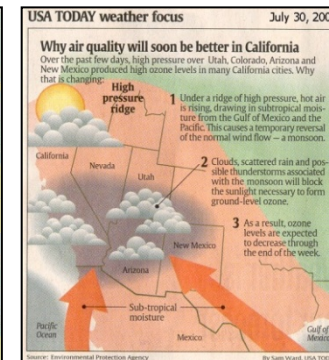
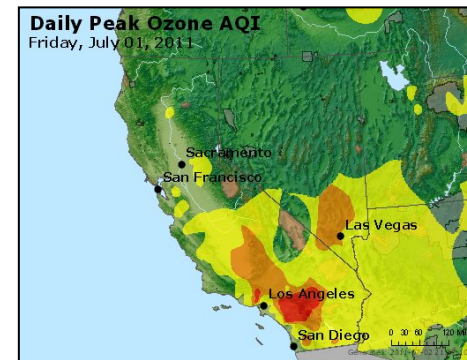
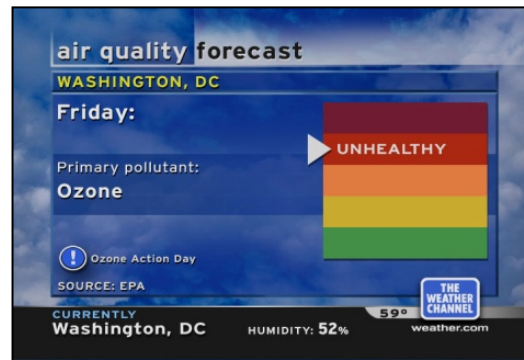
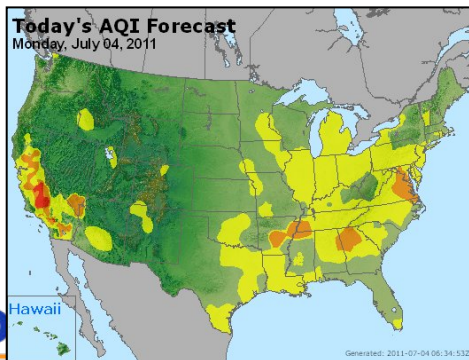


**September 15, 2016**

**Air Quality Forecaster Focus Group Workshop**

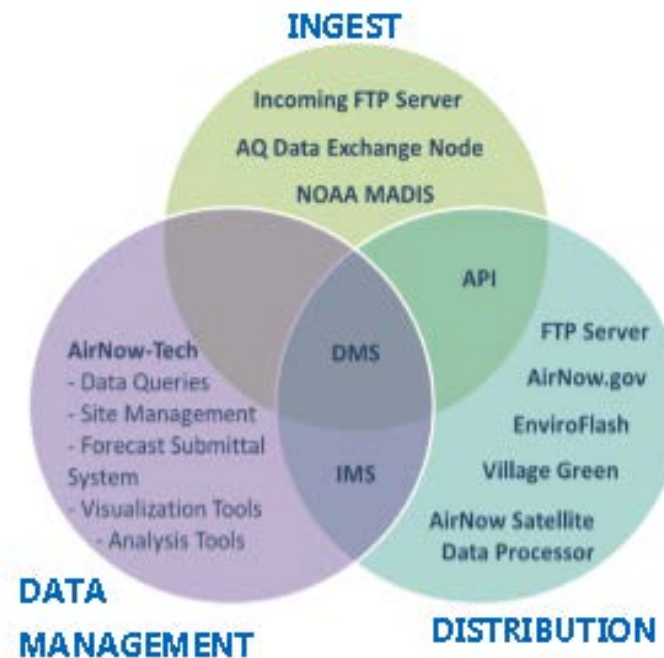
# AirNow System Basics

- Year Round 24/7 coverage/delivers real-time data (ozone & particles) for 50 States, 6 Canadian Provinces and 24 U.S. National Parks
- Next-day AQI forecasts for over 400 cities (summer) and over 300 cities (year-round)
- Successful iPhone and Android apps
- State-of-the-science information about air pollution health effects for the public, media and stakeholders
- Public/Private partnerships with The Weather Channel, USA Today, CNN, weather service providers, NOAA National Weather Service



# AirNow System: Main Elements

- Monitoring and Acquisition of Data
- AirNow Data Flow
- AirNow-Tech
- Forecasting
- Community



# Audiences

## Public

- Website: 4.8 million views/yr
- iPhone App: 100+ installed/wk; 45,000 installed total

## State/local/tribal agencies

- 280,000 EnviroFlash subscribers
- 210 million people in areas that have AQI forecasts

## Media

- Estimate 3.7 million viewers of AirNow information – USA Today, Weather Channel

## Emergency response

- Public and states used AirNow to convey info about BP, Katrina, and wildfires

## Others

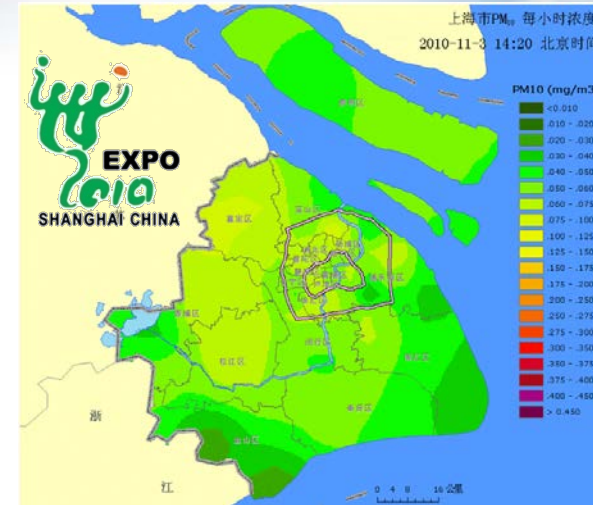
- Epi studies, researchers, other federal agencies





# AirNow International

- State-of-the-science data management system
- Successful pilot at the 2010 World Expo in Shanghai
  - Second pilot in Monterrey, Mexico in 2012
  - Third pilot in Zhejiang Province in 2013
  - Fourth pilot in Mexico City
- Data exchange from Environmental Protection Administration Taiwan (EPAT) to AirNow system
- EPA focus on India – possible AirNow there
- Encouraging data sharing in Southeast Asia
  - Evaluating: Vietnam, Thailand, Jakarta

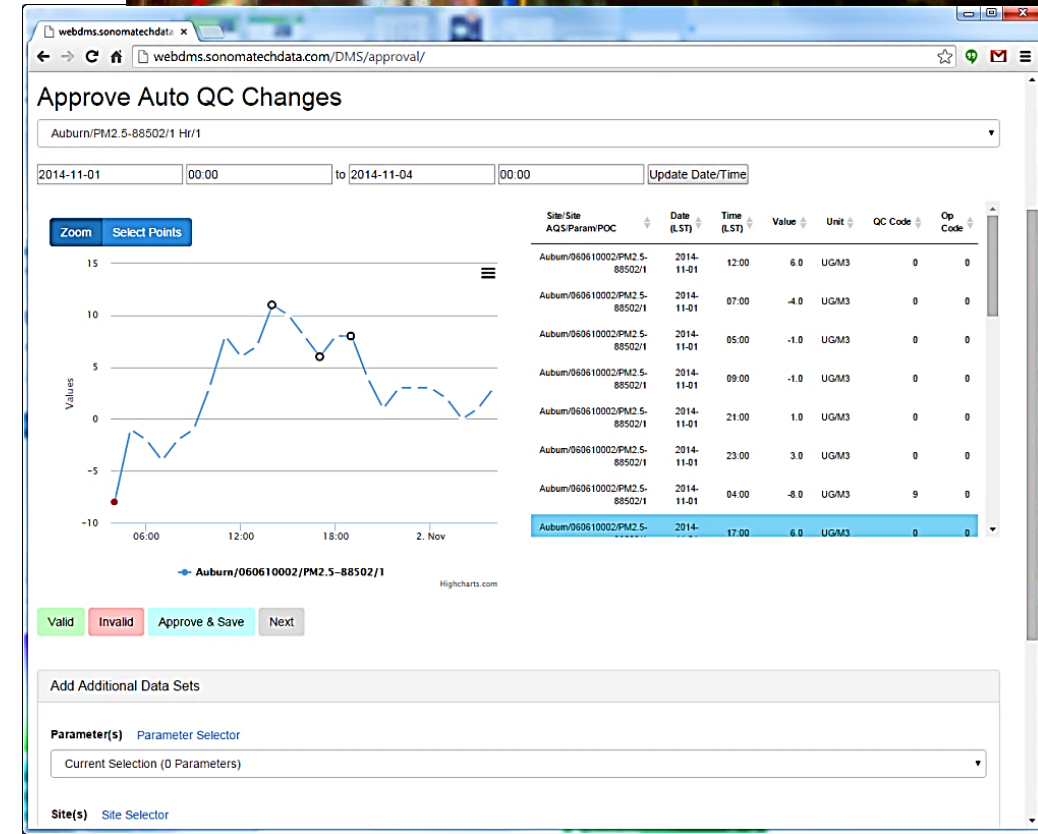
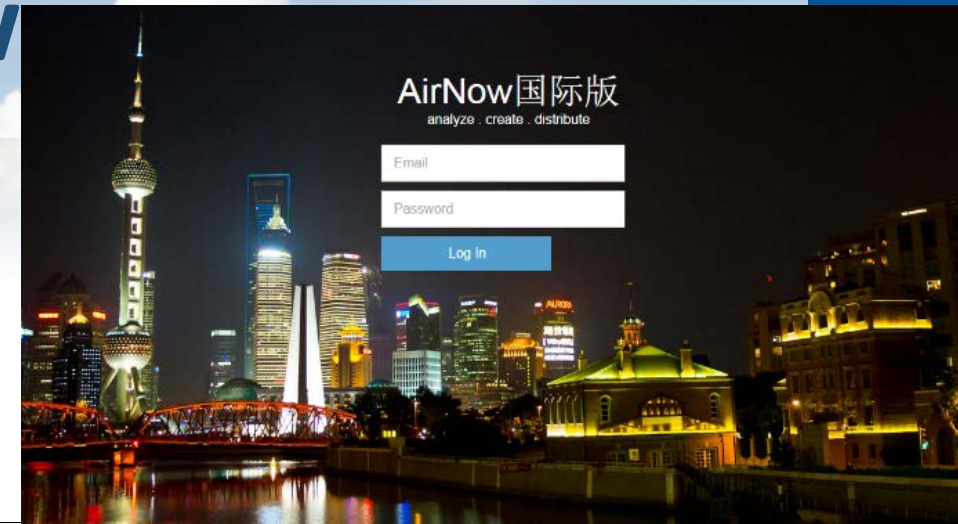


# Future Directions for AirNow

- Redesign Airnow.gov
  - Mobile friendly
  - “Persona”-based process
  - Welcome input from forecasters

- AirNow-Cloud

- Build a new cloud-based version of the international components
- Easier to deploy, scalable
- “Try before you buy”



A photograph of a bright blue sky with several large, fluffy white cumulus clouds. The clouds are concentrated in the upper half of the frame, with the sky becoming a clear, lighter blue towards the bottom.

Since last time...



# New file transfer system

- “Otter” has been decommissioned
  - Dedicated virtual server for realtime data transfer from our contractor – Sonoma Technology, Inc. (STI)
- STI now stores AirNow data on a private cloud
- Brad Johns’ scripts have been “slightly modified” to grab realtime data and process it into BUFR for the AQF
- This change *\*should\** be transparent
- Saving our group 15K per year!



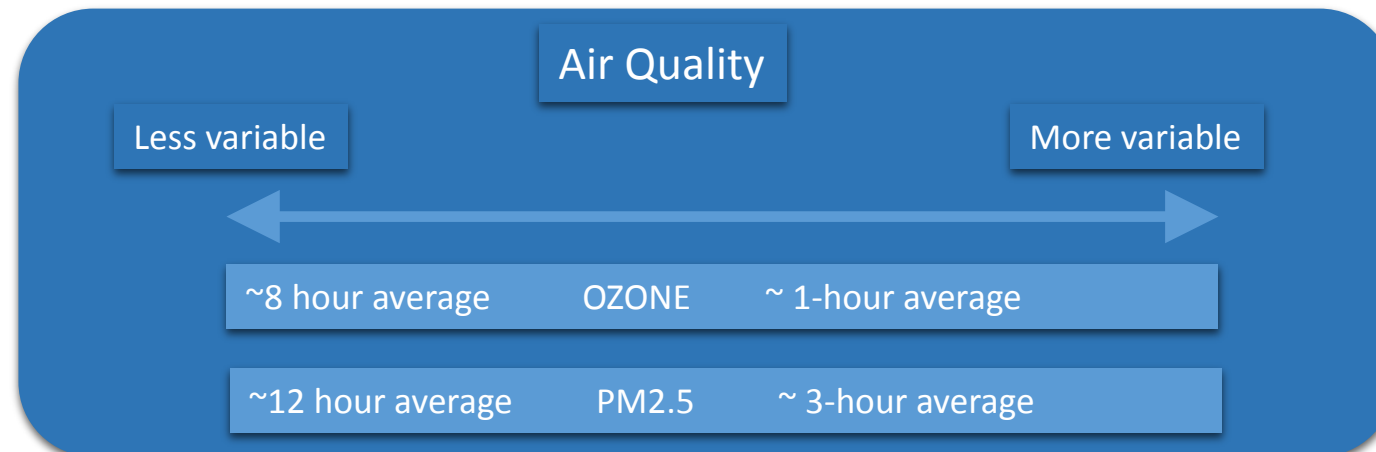


# New realtime data computation method

- “NowCast” replaces what was known as the PM2.5 and Ozone surrogate equations
- Exists to calculate an hourly value to show realtime Air Quality Index values
- The formerly used PM2.5 surrogate was generally biased low
- The ozone surrogate required intensive data analysis to derive slope-intercepts for every monitor
- New NowCast method uses a real-time “windowed” approach, making it more reactive and requiring no ongoing data analysis

# The NowCast Method

- An average of the previous 8 -12 hours
- If air quality is less variable, the hours are weighted more evenly (approaching the NAAQS averaging period of 8 hours for ozone and 24 for PM2.5)
- If air quality is more variable, recent hours are weighted more heavily



# Computing the PM2.5 NowCast

1. Compute the concentration range (max-min) over the last 12 hours. This tells us how much the air has changed, but relative to what? We need to scale it.
2. Divide the range by the maximum concentration in the 12-hour period
3. Compute the weight factor by subtracting the scaled rate of change from 1. The weight factor must be between .5 and 1. The minimum limit approximates a 3-hour average. If the weight factor is less than .5 then set it equal to .5.
4. Multiply each hourly concentration by the weight factor raised to the power of how many hours ago the concentration was measured (for the current hour, the factor is raised to the zero power)
5. Compute the NowCast by summing these products and dividing by the sum of the weight factors raised to the power of how many hours ago the concentration was measured.

## Example 12-hour period

50 80 75 90 82 53 64 74 21 10 16 13  
 Range = 90-10 = 80 ug/m3

Scaled rate of change is 80/90.

Weight factor is  $1 - 80/90 = .11 \rightarrow$  less than .5, so use .5

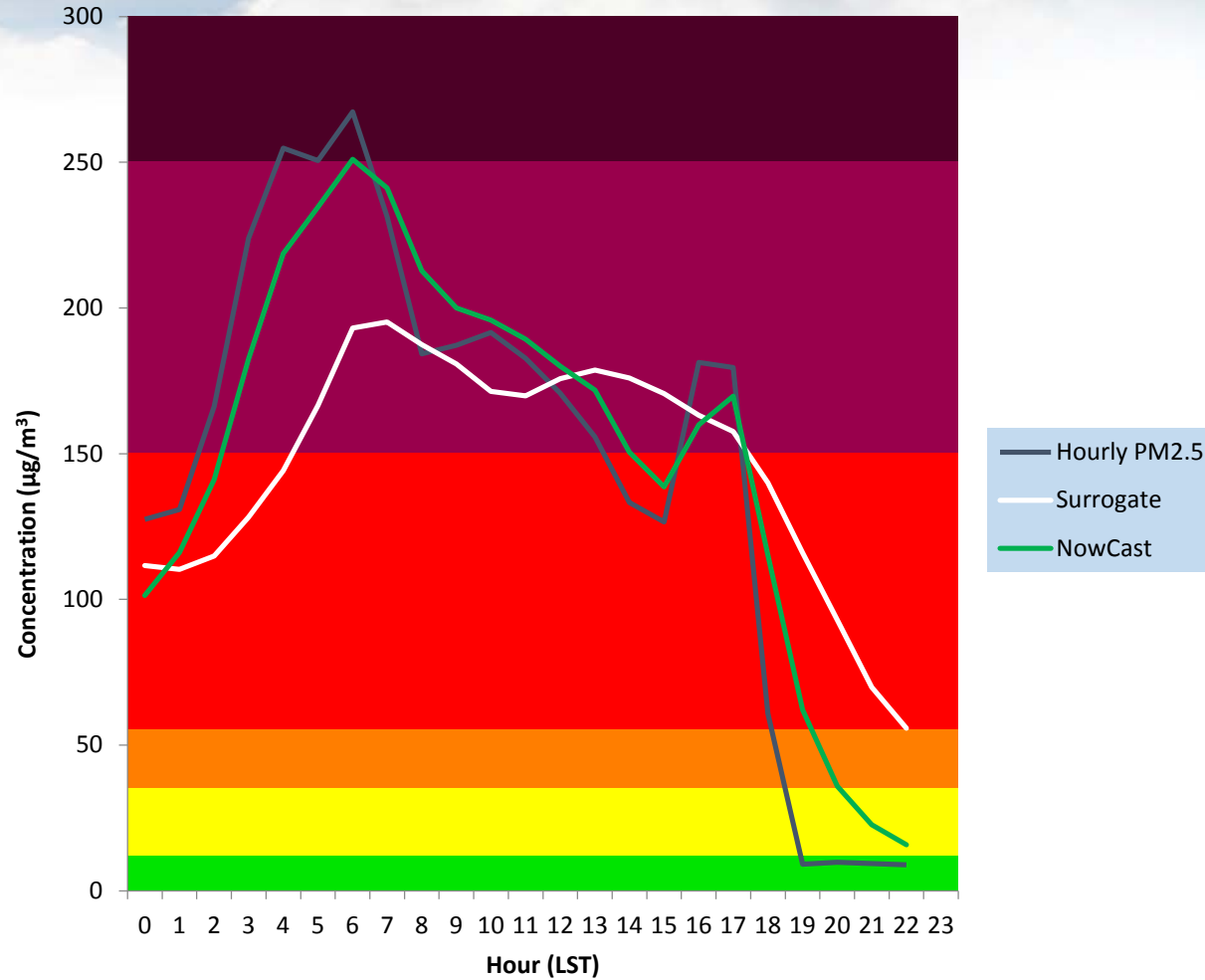
$$13*(.5)^0 + 16*(.5)^1 + 10*(.5)^2 + 21*(.5)^3 + 74*(.5)^4 + \dots$$

$$\frac{13*(.5)^0 + 16*(.5)^1 + 10*(.5)^2 + 21*(.5)^3 + 74*(.5)^4 + \dots}{(.5)^0 + (.5)^1 + (.5)^2 + (.5)^3 + (.5)^4 + \dots}$$

= 17.4 ug/m3



# NowCast is performing well



*PM<sub>2.5</sub> Hourly values, Surrogate, and NowCast (µg/m<sup>3</sup>) for Medford, Oregon on August 1, 2013. Background shading represents Air Quality Index (AQI) categories.*





# Village Green benches report to AirNow



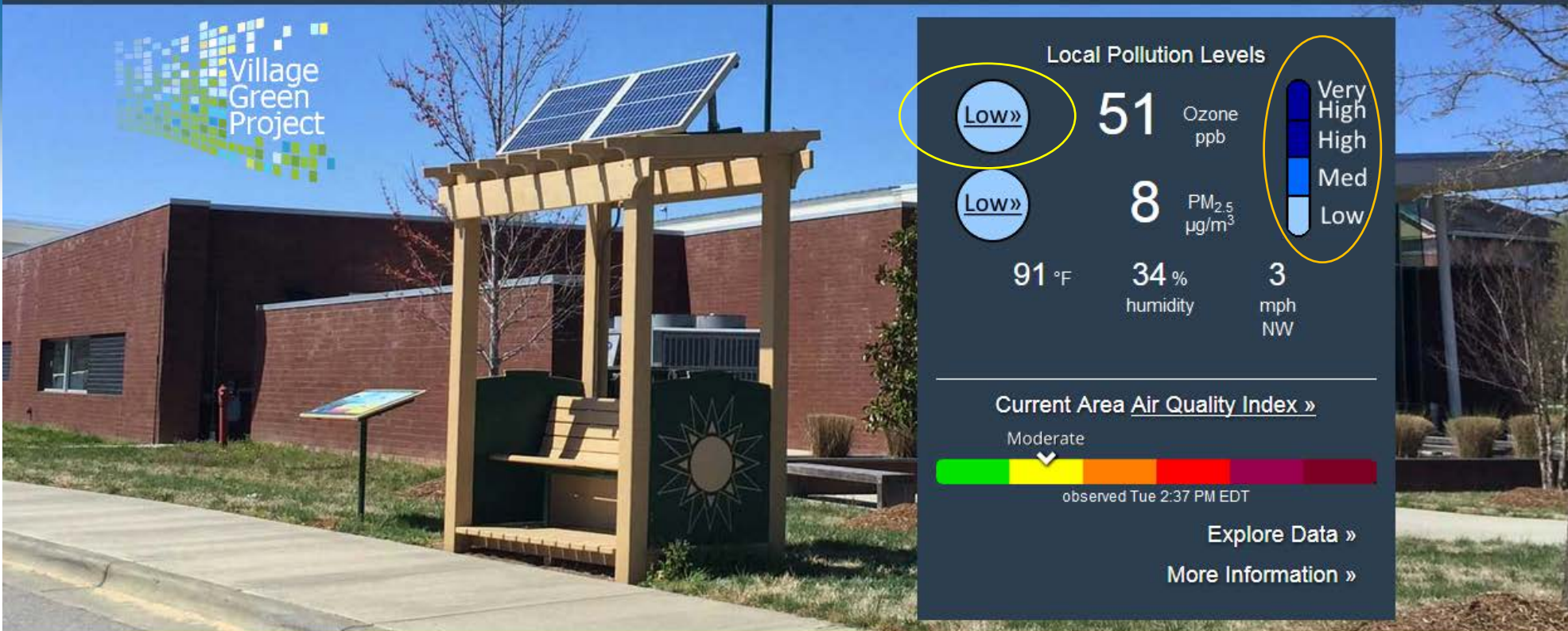
## Park Benches

- Meteorological Instruments
- Solar and wind powered

## Components Stored Behind Bench

- Air Sensors (PM & Ozone)
- Communications Component
- Power System





**Local Pollution Levels**

**Low»** 51 Ozone ppb

**Low»** 8 PM<sub>2.5</sub> µg/m<sup>3</sup>

91 °F 34 % humidity 3 mph NW

**Very High**  
**High**  
**Med**  
**Low**

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**Current Area Air Quality Index »**

Moderate

observed Tue 2:37 PM EDT

[Explore Data »](#)

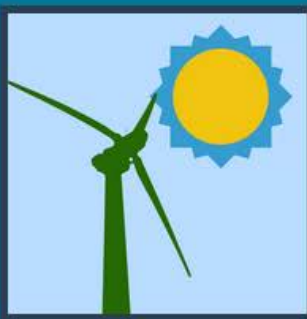
[More Information »](#)

## Welcome to the Village Green Project

a research effort to discover new ways of measuring air quality and weather conditions in community environments.



Measuring and communicating on-the-spot air quality and weather conditions for research and awareness



Developing small and rugged data collection systems that can be powered by the wind and sun



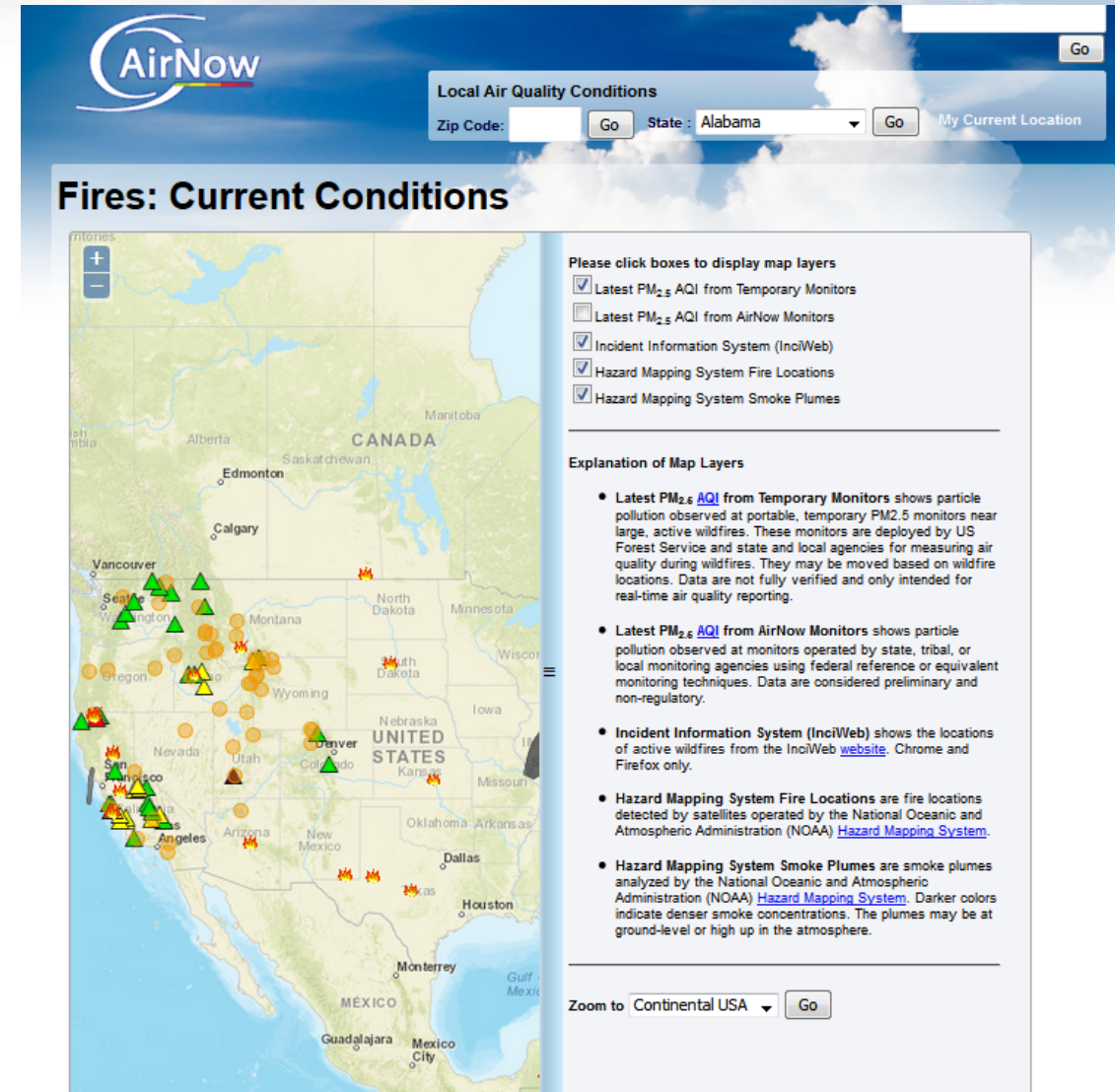
Partnering with communities to pilot test the new technology in outdoor community spaces.





# Smoke and Wildfire Map

- USFS data flowing into AirNow
- They are delivering real-time data for all USFS currently deployed emergency monitors.
- New Wildfire interactive map



# Department of State Monitoring

- Agreement between USEPA and DoS
- DoS has 14 monitors around the world, up to total of 50 planned



The screenshot shows the AirNow Department of State website. The main content area features a world map with several monitoring locations marked by colored circles and numbers: 23 (green), 96 (yellow), 35 (green), 156 (red), 152 (red), N/A (grey), 887 (yellow), 155 (red), 94 (yellow), 54 (yellow), and 189 (red). The sidebar on the right includes a search bar, a 'Local Air Quality Conditions' section with 'Zip Code' and 'State' dropdowns, and two more dropdown menus labeled 'Select a City' and 'Select a Parameter'. A welcome message for AirNow DOS is also visible, stating that the program collects data from U.S. embassies and consulates to inform U.S. personnel and citizens overseas.

Environmental Protection Agency [US] [https://airnow.gov/index.cfm?action=airnow.global\\_summary](https://airnow.gov/index.cfm?action=airnow.global_summary)

**AirNow**

Local Air Quality Conditions

Zip Code:  Go State: Alabama

**AirNow Department of State**

Select a City

Select...

Select a Parameter

Select...

**Welcome to AirNow DOS**

AirNow DOS collects Air Quality Monitoring data from U.S. embassies and consulates around the world to inform U.S. personnel and citizens overseas.

Is your country interested in air quality monitoring? Check out AirNow International, the EPA's information package on how to set up a country-wide air quality monitoring program.

*AirNow DOS is powered by the U.S. Department of State in partnership with the U.S. EPA*

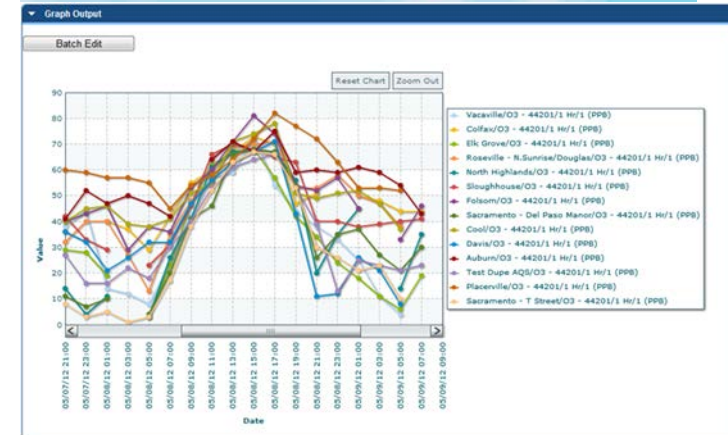
Privacy and Security | Accessibility | Contact Us | AirNow on Facebook | Subscribe to RSS | Follow us on Twitter





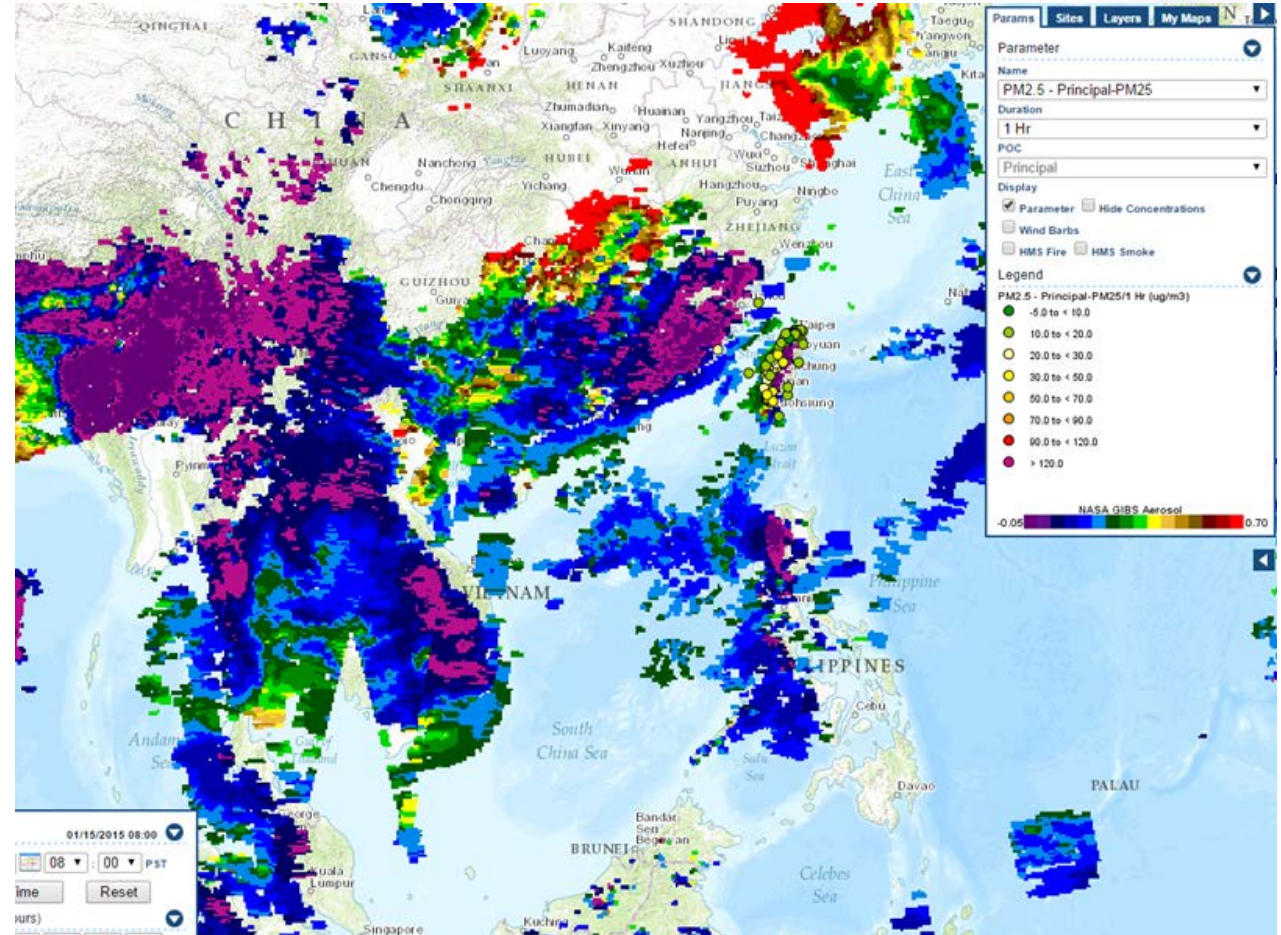
# Data Flow to AirNow Tech

- International partners
  - Format data in AirNow AQCSV format
  - Validate file format
  - Push data to AirNow FTP site
- Participating
  - Taiwan, since 2014
  - Soon: Thailand, Vietnam, Jakarta



# AirNow-Tech

- Decision Support System – management and analysis tool for the AirNow and AirNow-I Program
- GIS functions – HYSPLIT trajectory tool, satellite, and smoke products
- Data queries, personalized tools, preferences, and services



# Contact info

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**919-541-2706**