AirNow-Tech Training

National Ambient Air Monitoring Conference – 08/12/24

Marcus Hylton, TD Environmental Services

Introduction

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General AirNow Technical Support

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Background

- **Meteorology**
- **Supported the AirNow project since 2015**
  - Data Management Center Lead since 2020
- **Worked as an air quality forecaster using the AirNow system for ~5 years**

Our Team

- **Team Valiant – EPA contract team supporting the AirNow program (& other EPA OAQPS systems)**
  - Valiant Solutions
  - Nollou Technology
  - TD Environmental Services
  - General Dynamics Information Technology (GDIT)

TDEnviro

Where do you work?
What is your role?
How do you use AirNow?
Have you used AirNow-Tech?

Training Schedule

- 1:30-2:00 PM – Housekeeping, AirNow background, AirNow-Tech background
- 2:00-2:20 PM – Role-based Use-cases for AirNow-Tech
- 2:20-2:30 PM – Break
- 2:30-3:15 PM – AirNow-Tech Deep Dive Part 1 – User & Data Management
- 3:15-3:30 PM – Break
- 3:30-4:15 PM – AirNow-Tech Deep Dive Part 2 – Navigator & AirFuse
- 4:15-4:45 PM – AirNow-Tech Deep Dive Part 3 – Forecasting & EnviroFlash
- 4:45-5:00 PM – Wrap up/Post training questions & discussion
- 5:00 PM - Adjourn

Training Format

- **Presentation & Live Demo's**
  - We will be hopping back and forth between the presentation and the AirNow-Tech website
  - We will walk through and give time for AirNow-Tech account creation
    - The majority of what we cover can be followed using your accounts and I will try to go at a pace that will allow you to do so
    - SOME sections/steps may not be doable on your AirNow-Tech account, depending on your user access and if your agency is currently delivering data to AirNow
- **Note: This training will *not* be diving into the planned unified system (was included in some early versions of the conference agenda with the name "UTOPIA")**
  - However, I may discuss how certain AirNow features are being considered in this new system throughout the trainings
  - Keeton Patel will be discussing the plans for the Unified System on Thursday at 11am – "OAQPS's Consolidated Data Platform"

Questions & 1-on-1 Training Opportunity

- **Dedicated question and discussion time at the end of each training section**
  - But if you have questions anytime during the training, feel free to ask at that time. I won't be offended
- **Specific troubleshooting questions when following along with live demos?**
  - Several members of the AirNow team are here that can assist during the training session
- **1-on-1 training opportunity for anything AirNow**
  - Have AirNow-Tech (or just AirNow!) questions that may take a little longer to work through or are more specific to your use-case? Schedule a time with us for 1-on-1 training during the conference!
    - Stop by the TD Enviro booth in the exhibit hall or talk to us during the breaks to schedule

TDEnviro

Questions?

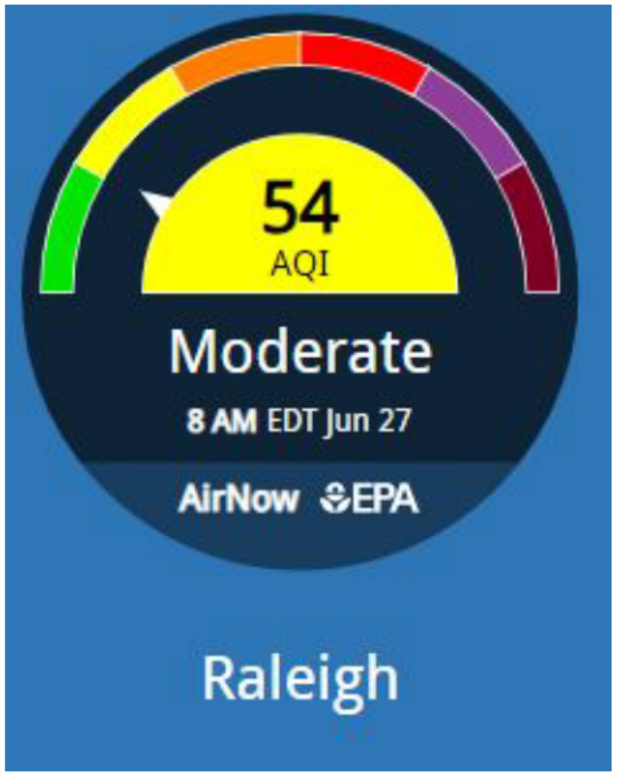
Next: AirNow Background

Part 1: AirNow and AirNow-Tech Overview

- **General AirNow background**
  - Program history
  - Current status
- **AirNow program participants**
  - New participant data delivery process
- **Data Distribution**
  - Monitoring sites vs. Reporting areas
- **AirNow-Tech**
  - General purpose
  - Obtaining an account
  - Resources

What is AirNow?

- **AirNow is a public source of outdoor ambient air quality conditions and air quality forecasts**
  - Information communicated to the public using the AQI – Air Quality Index
  - Public endpoints include AirNow.gov, the AirNow mobile app, AirNow API, and misc file products.
  - Data aggregator – data contributors (State/Local/Tribal/International agencies) own the monitoring sites and data but send their data to AirNow to reach larger audiences
  - Voluntary program – data and forecast submission is encouraged but optional
  - Focuses mainly on criteria pollutants – but accepts other pollutants and meteorological data.
  - AirNow contains preliminary data and is focused on real-time reporting – the data go through rudimentary QA/QC, but not a thorough process like data that go to the AQS system (that process usually takes weeks to months)



Creation of AirNow 1/2

- **In 1995, the American Lung Association of Maryland began developing ozone pollution maps for use on TV weather broadcasts.**
  - Became an informative resource for the public
  - Soon became too costly and high effort for the ALA to maintain (data transfer, quality control, processing, etc.)
- **In 1997, A regional Ozone Mapping System was developed**
  - Funded by the Northeast States for Coordinates Air Use Management (NESCAUM), Mid-Atlantic Region Air Managers Association (MARAM), and the Ozone Transport Commission (OTC)
  - Several states in the northeastern U.S.
  - Production of real-time animated ozone maps
- **In 1998, the AIRNow system was created**
  - EPA centralized database and production to serve as a national repository for real-time data

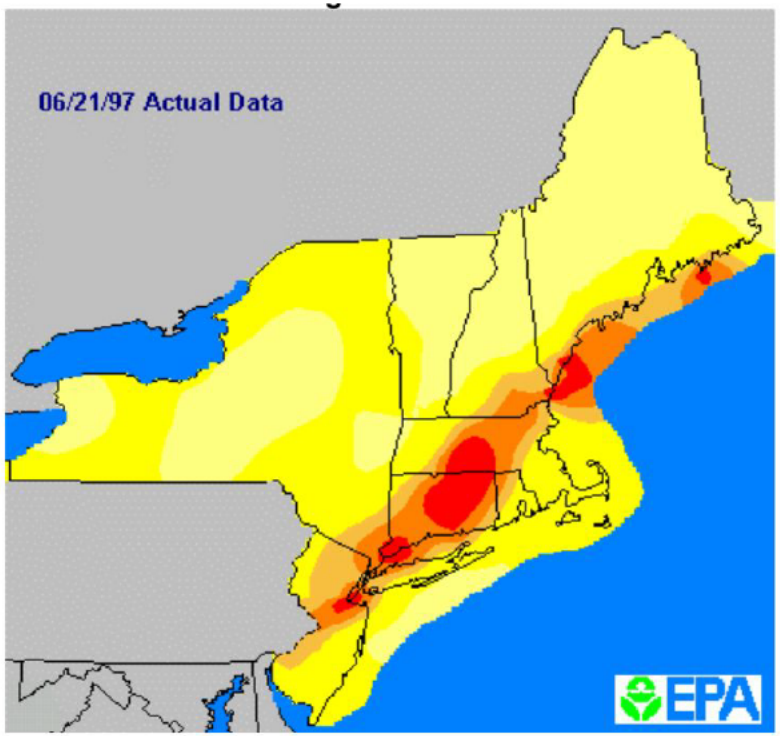
Sources: https://archive.epa.gov/international/air/web/pdf/airnow.pdf
https://wiki.esipfed.org/w/images/9/95/AIRNow_History.pdf

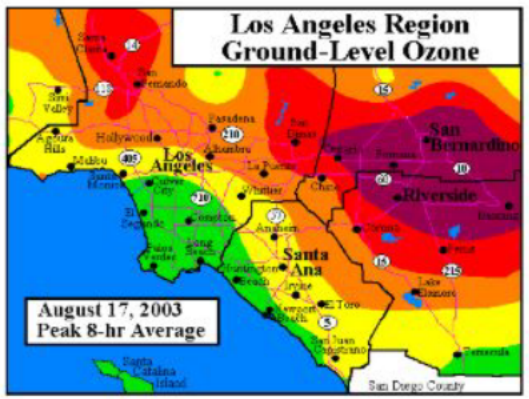
Creation of AirNow 2/2

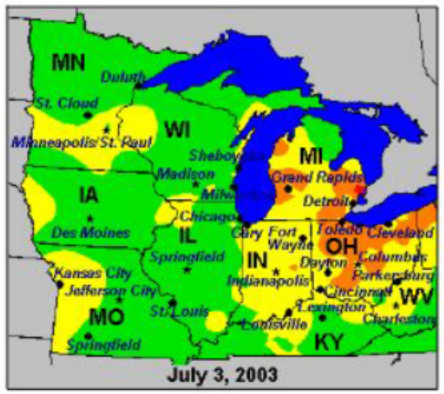
- **AirNow expanded rapidly with funding from President Clintons EMPACT (Environmental Monitoring of Public Access and Community Tracking) program**
  - Supported development of new technologies for providing environmental info to the public
  - Funds used to support state agency purchases of new hardware and software in order to participate in AirNow
- **Expansion continued over time**
  - Additional state, local, and tribal agencies
  - Introduction of the Forecast Submittal System
  - Website and application updates
  - International data sources and participation
- **Today, AirNow is a valued and trusted source for real-time & forecasted air quality**

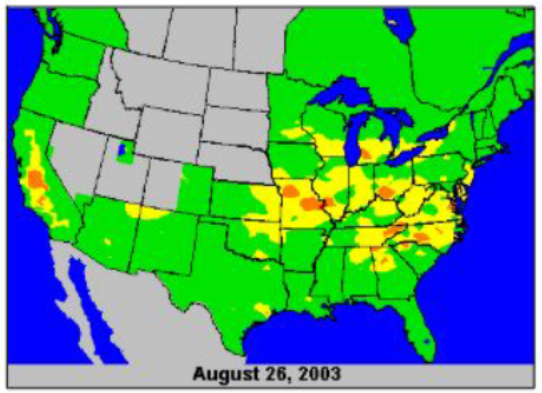
Sources: https://archive.epa.gov/international/air/web/pdf/airnow.pdf
https://wiki.esipfed.org/w/images/9/95/AIRNow_History.pdf

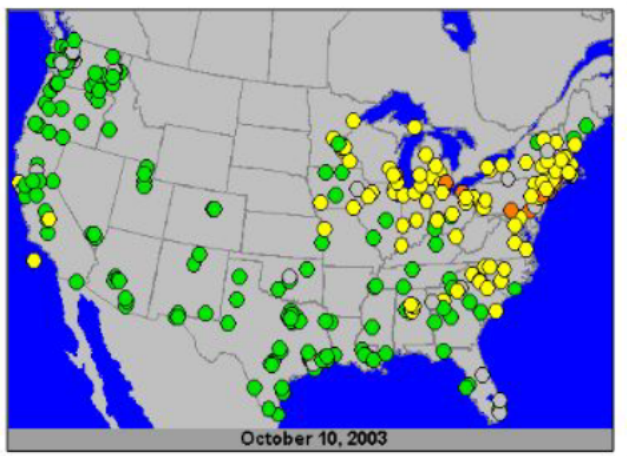
AirNow Maps
Pre-2004

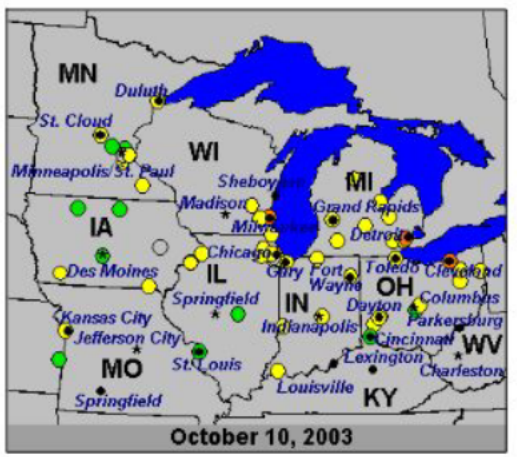








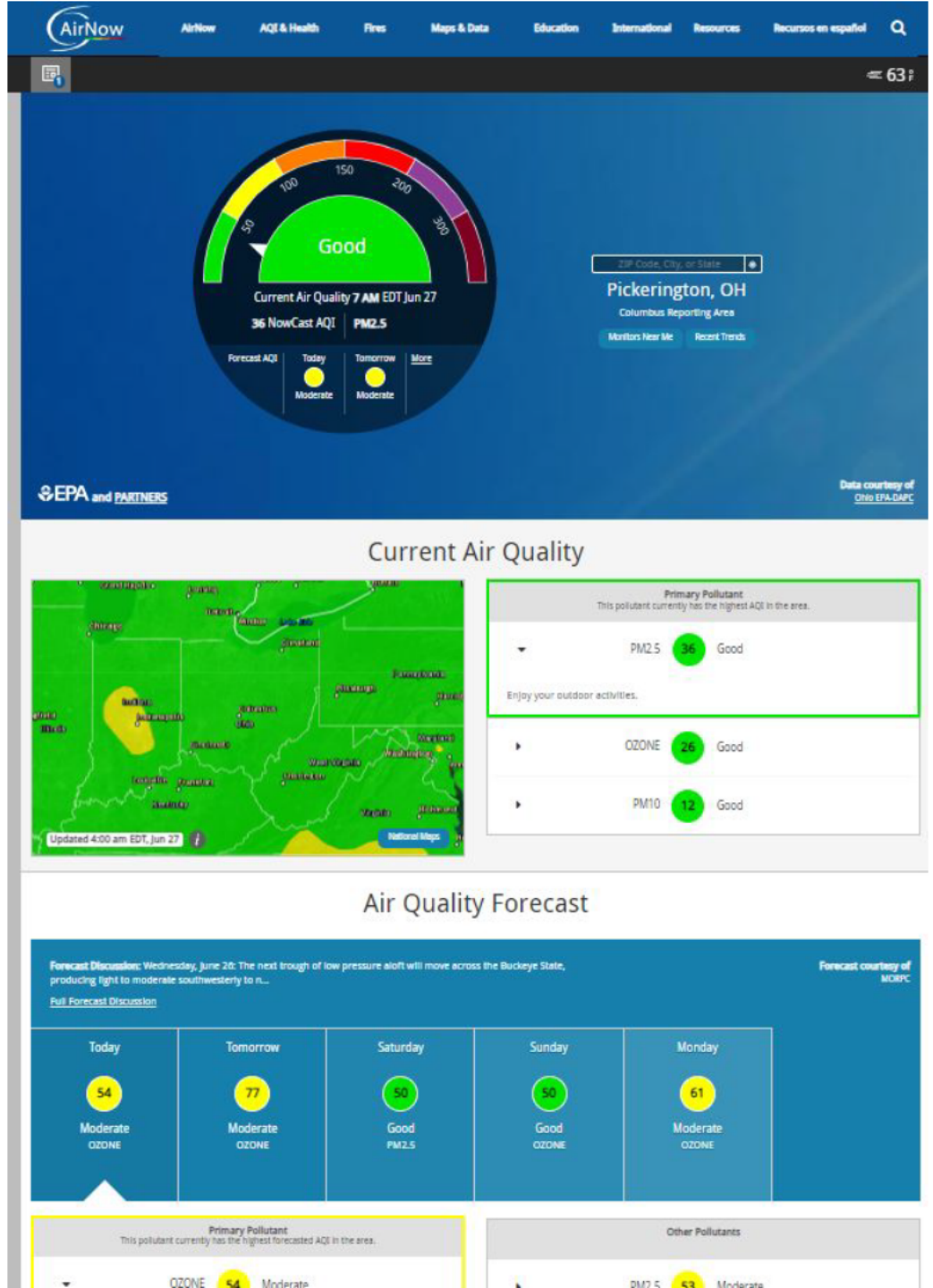




https://www.nescaum.org/documents/o3rpt_8a.pdf

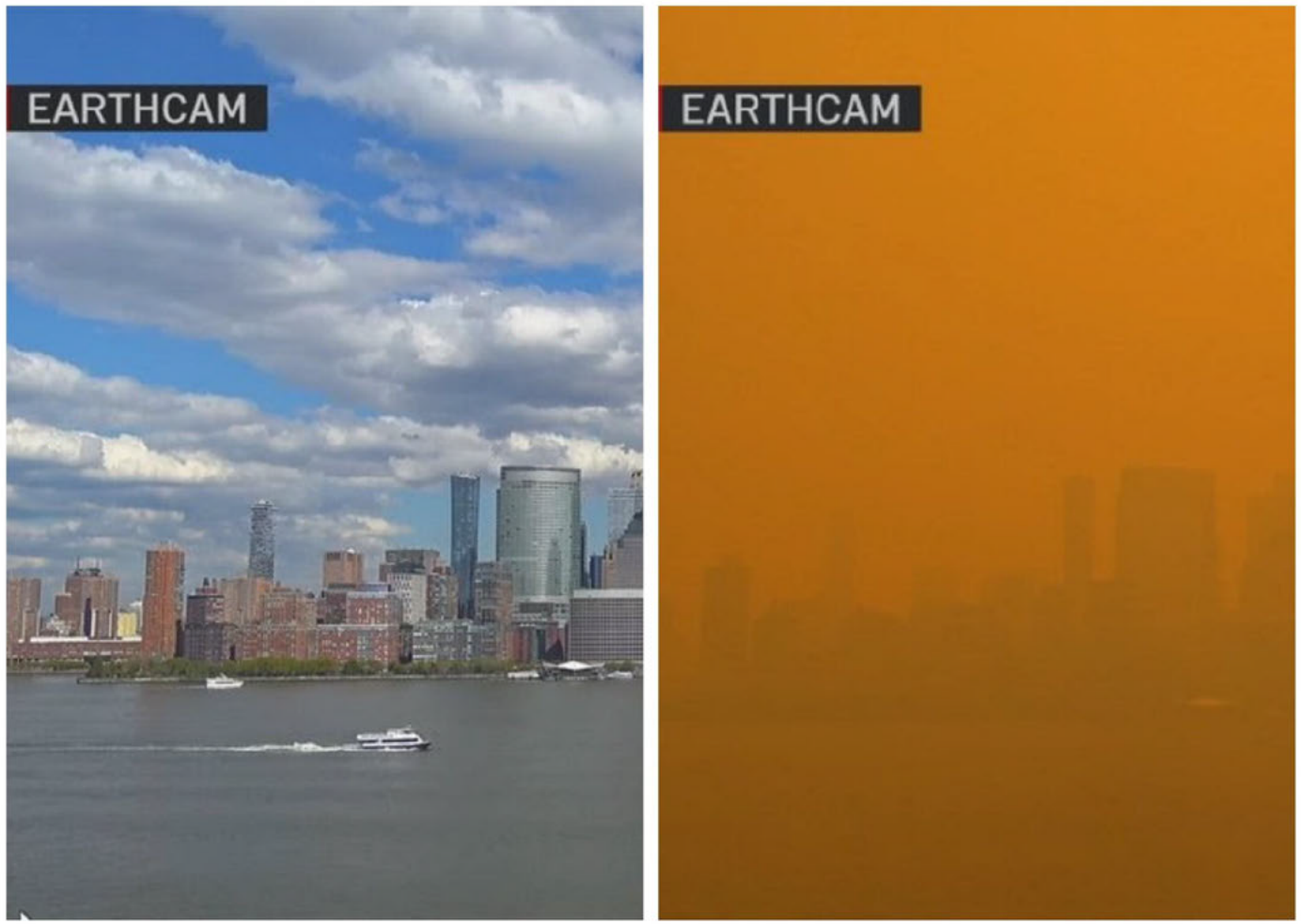
https://archive.epa.gov/international/air/web/pdf/airnow.pdf

AirNow.gov
Today



AirNow Today

- **Participants**
  - 218 agencies submitting air quality data from all 50 states
  - 92 agencies issue air quality forecasts for ~700 locations
  - ~2700 AirNow monitoring sites with up-to-date data
  - Several international agencies (mainly Canada/Mexico) and 50+ U.S. embassies contributing data
- **Traffic**
  - Most eyes to AirNow occur during high-impact events like wildfire smoke events



June 2023 – New York City

AirNow Users

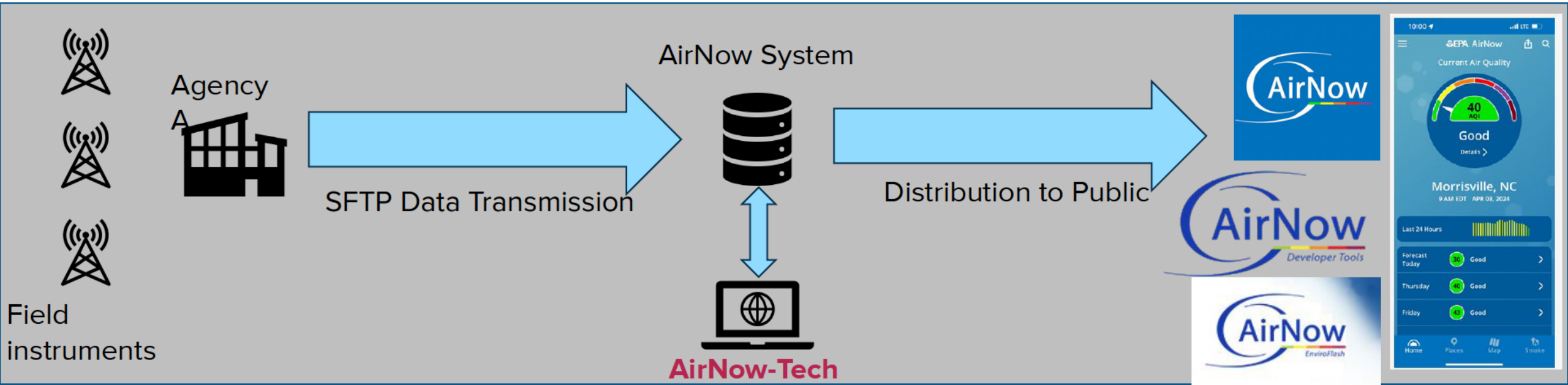
- **Public**
  - General public
  - Citizen Scientist/Developer
- **Private Sector/Educational Institutions**
  - Private Companies (Data aggregators, Data users, etc.)
  - International entities
  - Researchers
  - Educators
- **Federal, State, Local, & Tribal Agencies**
  - Data Deliverers
  - Data Analysis
  - Forecasters

Questions?

Next: AirNow Data Pipeline & Creating an AirNow-Tech account

Getting started delivering data to AirNow

- **Agency creation & setup**
  - Contact dmc@airnowtech.org
- **SLT's or international agencies interested in submitting data to AirNow?**
  - Contact dmc@airnowtech.org
  - Standardized file formatting – AQCSV
  - SFTP data delivery

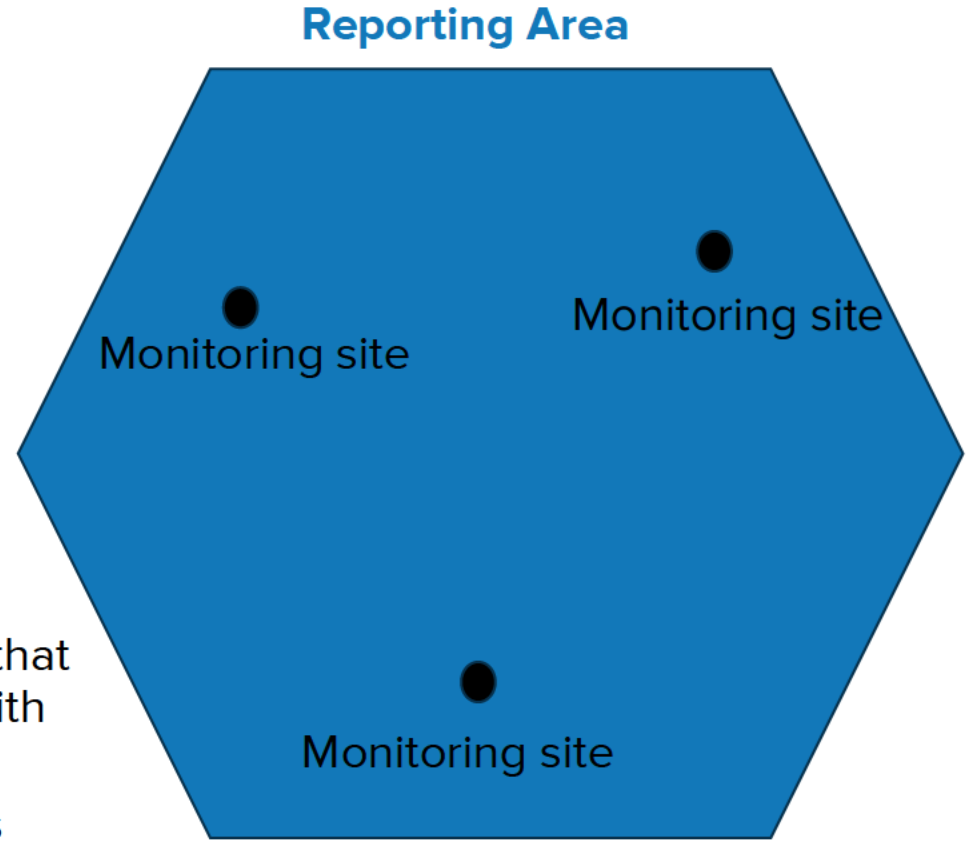


AirNow Data Distribution

- **AirNow.gov & the AirNow mobile app**
  - Dial page and widgets
  - Fire and Smoke Map
- **AirNow API (AirNowAPI.org)**
  - API web services
  - RSS Feeds
- **AirNow file products (files.airnowtech.org)**
  - Pre-generated file products
- **EnviroFlash**
  - Public email notification system for air quality forecasts and current observations
- **Other data aggregators & reporters**
  - Google, IBM, newscasters, etc.

AirNow Data Distribution – Monitoring Site vs. Reporting Area products

- **Most AirNow public products provide data in one of two formats**
  - Data by monitoring site
  - Data by reporting area
- **Monitoring Sites**
  - Physical location of the instrumentation that is measuring the pollutant/parameter
  - Defined by a unique site ID
- **Reporting Areas**
  - A region (city, county, general area) defined by SLT's in AirNow that is used for reporting observations and forecasts. Often aligns with MSA's/CBSA's
  - Individual monitoring sites are assigned to the reporting area as "Verification Sites". Verification sites are included in observation reporting for the reporting area.
  - [More on reporting areas later]



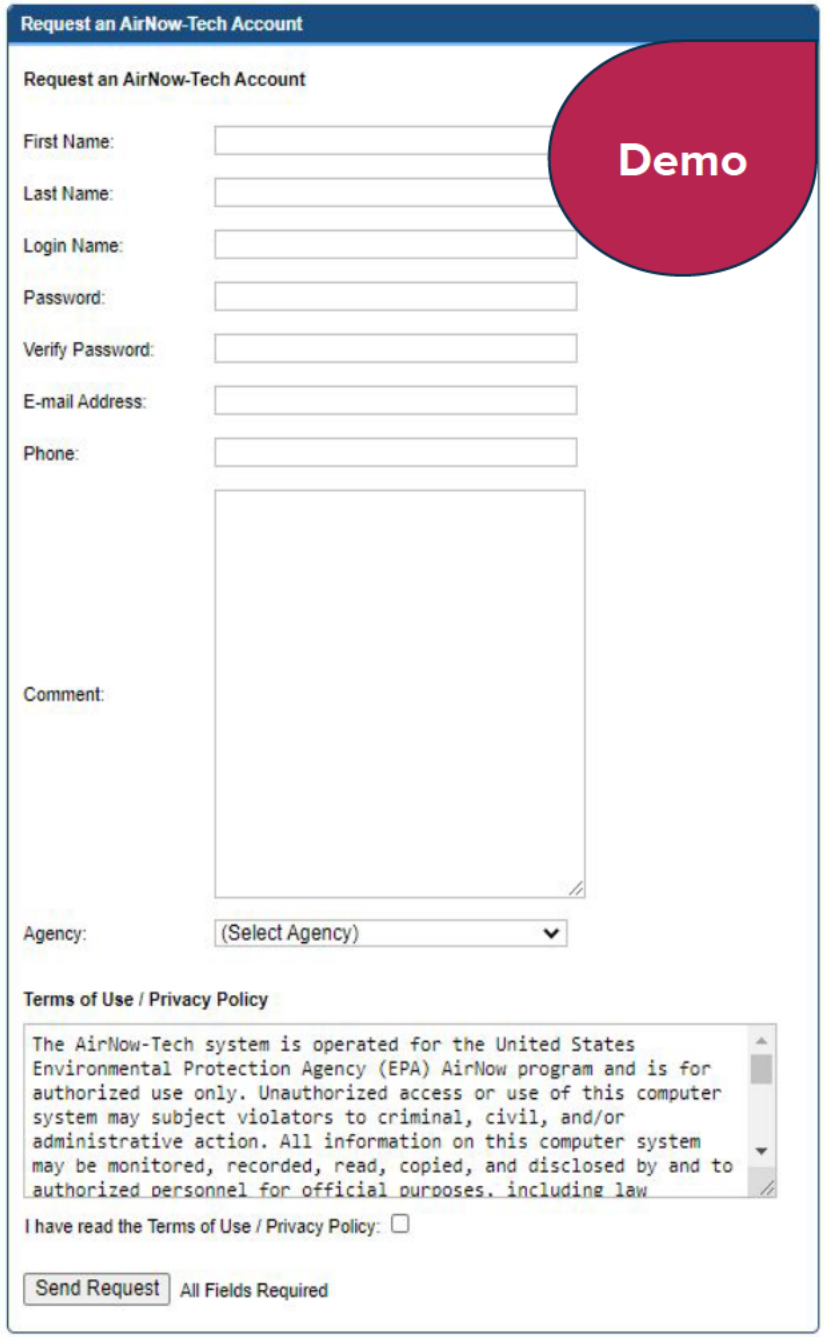
AirNow-Tech - AirNowTech.org

- **Website for air quality data management analysis, and decision support.**
  - Primarily used by the federal, State, Tribal, and local air quality organizations that provide data and forecasts to the AirNow system, as well as researchers and other air data users.
- **Main functions**
  - Access monitoring site data, information, and polling status
  - Analyze current and past air quality events and episodes
  - Submit and analyze air quality forecasts
  - Configure EnviroFlash email services for public dissemination of air quality forecasts
  - View meteorological and air quality data
  - Generate data reports

https://www.airnowtech.org/requestAccnt.cfm

New AirNow-Tech Accounts

- **Account Request Process**
  - From the AirNow-Tech homepage, select “Login” from the top right of the page
    - Choose “Request Account” below the login credential section to reach the account request form
    - Fill out form and send request
    - DMC reviews/approves account requests during business hours
  - Have an existing AirNowAPI account?
    - You do not need a separate AirNow-Tech account. Credentials are shared, but you made need additional access roles granted to access AirNow-Tech. Contact dmc@airnowtech.org if additional access is needed.
  - Forgot password?



AirNow-Tech Resources (Help□Resources)

Demo

- **Contact information**
  - How to reach the EPA or AirNow Data Management Center with questions
- **AirNow-Tech Tutorial Materials**
  - Updated guides on data management
  - Updated guides on using the Forecast Submittal System (FSS)
- **Data submission information**
  - File format and SFTP instructions
  - AirNow Quality Control details
- **Other misc. information**
- **AirNow-Tech Forum (https://forum.airnowtech.org/)**
  - Wiki's and guides on various AirNow topics (more info available after logging in using your AirNow-Tech account)

Questions?

Next: Role-based Use-cases for AirNow-Tech

Part 2: Role-based Use Cases

- **Agency Administrator**
  - *I lead the air quality group at my agency and need to manage users within my agency and monitor AirNow data status*
- **Data Management**
  - *I am responsible for managing the delivery of data to AirNow and site and parameter settings for my agency to ensure the data are reaching the public*
- **Analysis**
  - *I need to retrieve data from the AirNow system and/or visually examine past events (e.g., exceptional event analysis)*
- **Forecaster**
  - *I am an air quality forecaster and need to issue forecasts for my agency*
- **Outreach and Communications**
  - *I need to ensure air quality conditions and forecasts are promptly and accurately relayed to the community*

Use-case: Agency Administrator

I lead the air quality group at my agency and need to manage users within my agency and monitor AirNow data status

- **My Account**
  - Automated email reports
- **Dashboard**
  - Viewing file transmission status using the Event Log
  - Checking on site status using the map widget
- **Site Details**
  - Updating site settings (public parameters, ensuring site information is correct, etc)
- **Agency Details**
  - Updating Agency information
  - Managing roles/access of users within your agency

Use-case: Data Management

I am responsible for managing the delivery of data to AirNow and site and parameter settings for my agency to ensure the data are reaching the public

- **Dashboard**
  - Viewing file transmission status using the Event Log
  - Checking on site status using the map widget
- **Data Queries**
  - Retrieve current or historical concentrations and QC codes
  - Monitor status of backfills
  - Edit QC codes/concentrations as needed
- **Navigator**
  - Visual data monitoring
- **Site details**
  - Manage public settings for parameters
  - Set/Update Automated QC Criteria

Use-case: Analysis

I need to retrieve data from the AirNow system and/or visually examine past events (e.g., exceptional event analysis)

- **My Account**
  - Daily email reports
- **AirNow-Tech Data Queries and Reports**
  - Retrieve current or historical concentrations and QC codes
  - Filtered and/or aggregated AQI and concentration reports
  - Sharing data queries with other AirNow-Tech users
- **Navigator**
  - Viewing historical pollutant data
  - AirFuse
  - Satellite data layers (GOES PM2.5, Fire detections, Smoke plumes, visible satellite imagery, AOD)
  - Using the NOAA HYSPLIT trajectory tool for pollutant transport investigation

Use-case: Forecaster

I am an air quality forecaster and need to issue forecasts for my agency

- **My Account**
  - Internal forecast email notification
- **Forecast Submittal System**
  - Forecast form creation
  - Forecast submission
  - Managing reporting area verification sites
  - Forecast statistics (Verification)
- **EnviroFlash**
  - Configure forecast email sendouts
  - Confirm real-time emails
- **Navigator**
  - View current/historical air quality data
  - View fire information (Fire detections, smoke plumes, etc)
  - Run HYSPLIT trajectories to predict future pollutant transport
- **Forecast and Data Queries**
  - Retrieve current or historical forecasts and observations

Use-case: Outreach and Communications

I need to ensure air quality conditions and forecasts are promptly and accurately relayed to the community

- **Dashboard/Data queries**
  - View current data status/values
- **My Account**
  - Internal forecast email notification
- **EnviroFlash configuration settings**
  - Edit messaging used in email sendouts
  - Manage subscribers
  - Configure X/Twitter integration

Other use-cases not covered here?

Questions?

Next: Break, Then AirNow-Tech User & Data Management

10 Minute Break

Part 3: AirNow-Tech Deep Dive – User & Data Management

- **Account Management**
  - Account settings – Contact type, home page preferences, notification preferences
- **Agency Management**
  - User permissions
- **Site Management**
  - Site settings
  - Quality Control checks
- **Dashboard**
  - Recent trends
  - Site/Parameter Status
  - File Status
- **Data Queries and Reports**
  - Running, Saving, Sharing
  - Automated email reports

Account Management

Demo

- **My Account** (top right of webpage)
  - Update user info
  - Set yourself as an Agency or Forecast contact
  - Enable email notifications
    - Agency Daily – Daily polling summary
    - Agency Hourly – Sent when hourly data files are not received by AirNow from your agency
    - Forecast Daily – Sent when a forecast is issued; contains forecast AQI numbers for your agency's cities
  - Home Page Preference
    - My Agency's Forecasts
    - My Agency's Realtime Observed
    - My Agency's Polling Summary
  - Site List Management, Parameter List Management, and Email Reports Management
    - Create new Parameter and Site Lists (covered in Data Queries section of this training)
    - Select site list, query type, and time interval – Name & save query to receive a daily email with the data report attached

Agency Management

Demo

- **Agency page**
  - Edit Agency details
    - Update Data Provider/Forecast Provider URLs
  - Manage users within your agency (**Administrator** role required)
    - Grant certain user roles
      - Data Editor
      - Forecaster
      - EnviroFlash
      - Etc.
    - Mark users as an agency or forecaster contact
    - Delete users

User Roles & Access (1/2)

- **User roles can be granted upon request by agencies. Send requests to dmc@airnowtech.org**
- **Role: User**
  - Base access to AirNow-Tech and the AirNow API. Users can login and run data queries, query historical forecast data, view the dashboard, Navigator, etc.
  - Grants permissions to edit certain settings (site settings, QC criteria)
  - Users with only this role do NOT have access to forecast submission, EnviroFlash, and certain data editing roles
- **Role: Gateway**
  - Base access to AirNow API. Accounts with only this role cannot login to AirNow-Tech without additional permissions.
- **Role: Forecaster**
  - Gives access to the pages under the “Forecast” tab in AirNow-Tech (Forecast issuance, reporting area management, etc.)

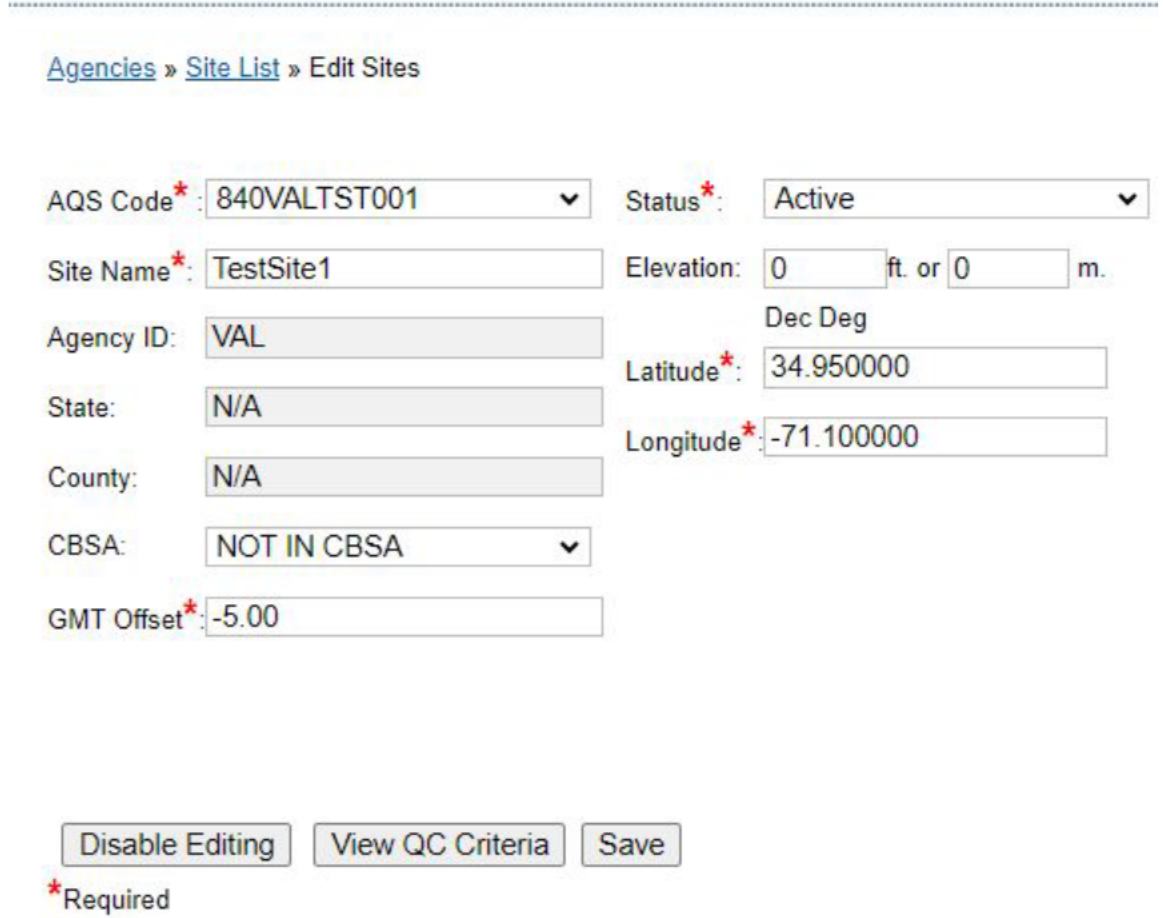
User Roles & Access (2/2)

- **Role: Data Editor**
  - Allows users to edit QC codes and concentration values for data associated with sites that belong to the user's agency
- **Role: EnviroFlash**
  - Grants access to the EnviroFlash tab in AirNow-Tech – configuration settings for EnviroFlash email sendouts
- **Role: Administrator (i.e., Agency Administrator)**
  - Grants the ability to control certain user permissions for accounts within the agency. Agency Administrators can also manage accounts within their agency (e.g., removing users who have left the agency)
  - **Recommended to have at least 1 user in your agency with this role to manage users within your agency without needing to contact the Data Management Center.**

Site Management

Demo

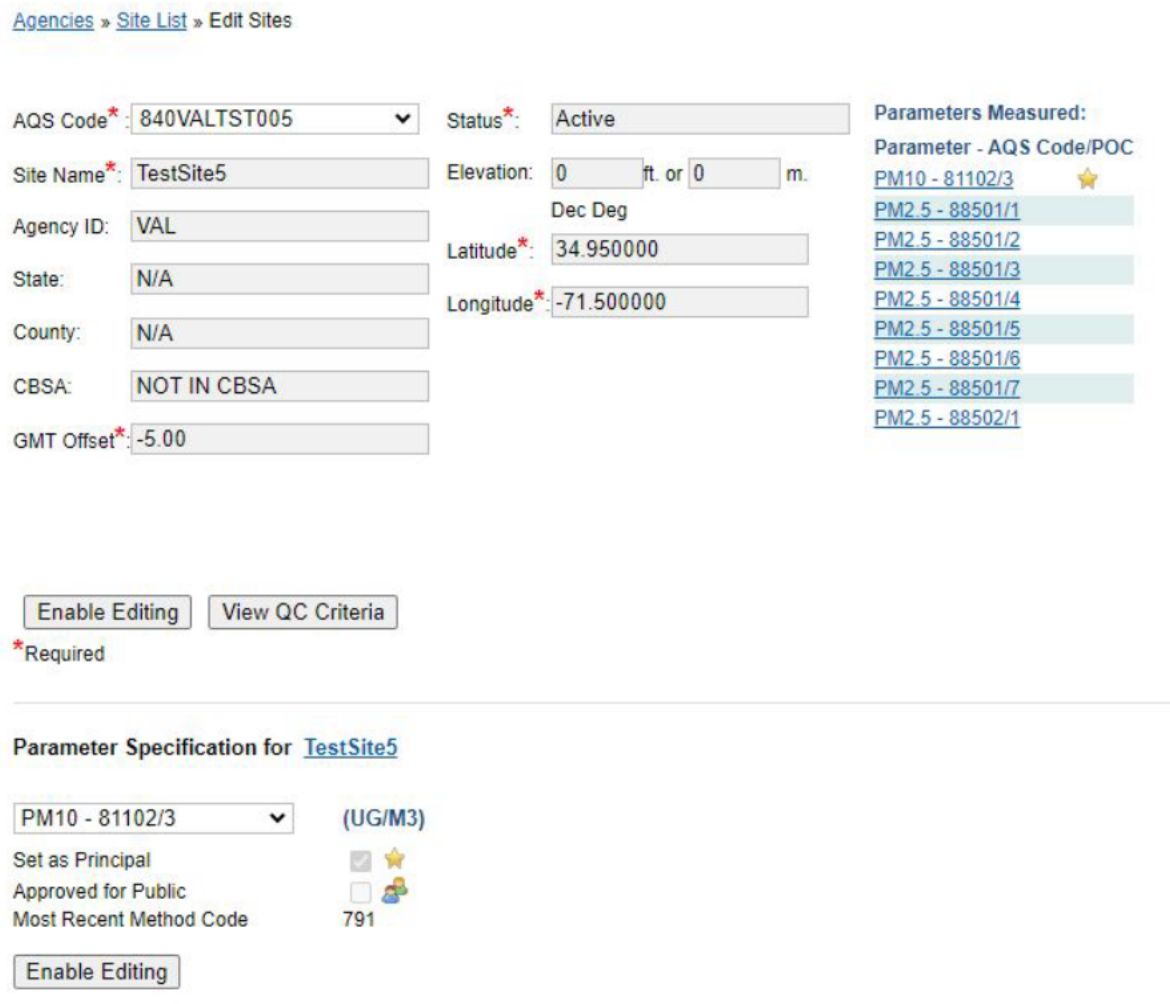
- **Site Details (Dashboard My Sites Select a site from the site list)**
  - Editing Site Details
  - Enable Editing (Only available for sites that belong to your agency)
    - Site Name
    - Active/Inactive status
    - Elevation
    - Latitude/Longitude
    - CBSA
    - Time zone offset
  - Save Changes
  - Non-editable fields determined by Site ID/Agency
- **How do I add a new monitoring site to AirNow?**
  - No preparation steps required – new sites automatically added when new unique site ID detected in agency files



Site Management

Demo

- **Parameter Details (Dashboard → My Sites → Select a site from the site list → Select a parameter from the parameter list)**
  - **Principal setting (⭐)**
    - Used to identify the primary feed between different parameter codes and POCs for the same pollutant
  - **Public setting (👥)**
    - Must be on to be included in public AirNow products.
  - **Editing the Principal/Public settings**
    - For Ozone, PM2.5, and PM10, an automated method code check is performed to determine if checkboxes can be edited
      - DMC approval required if method code check fails



Questions?

Next: Quality Control

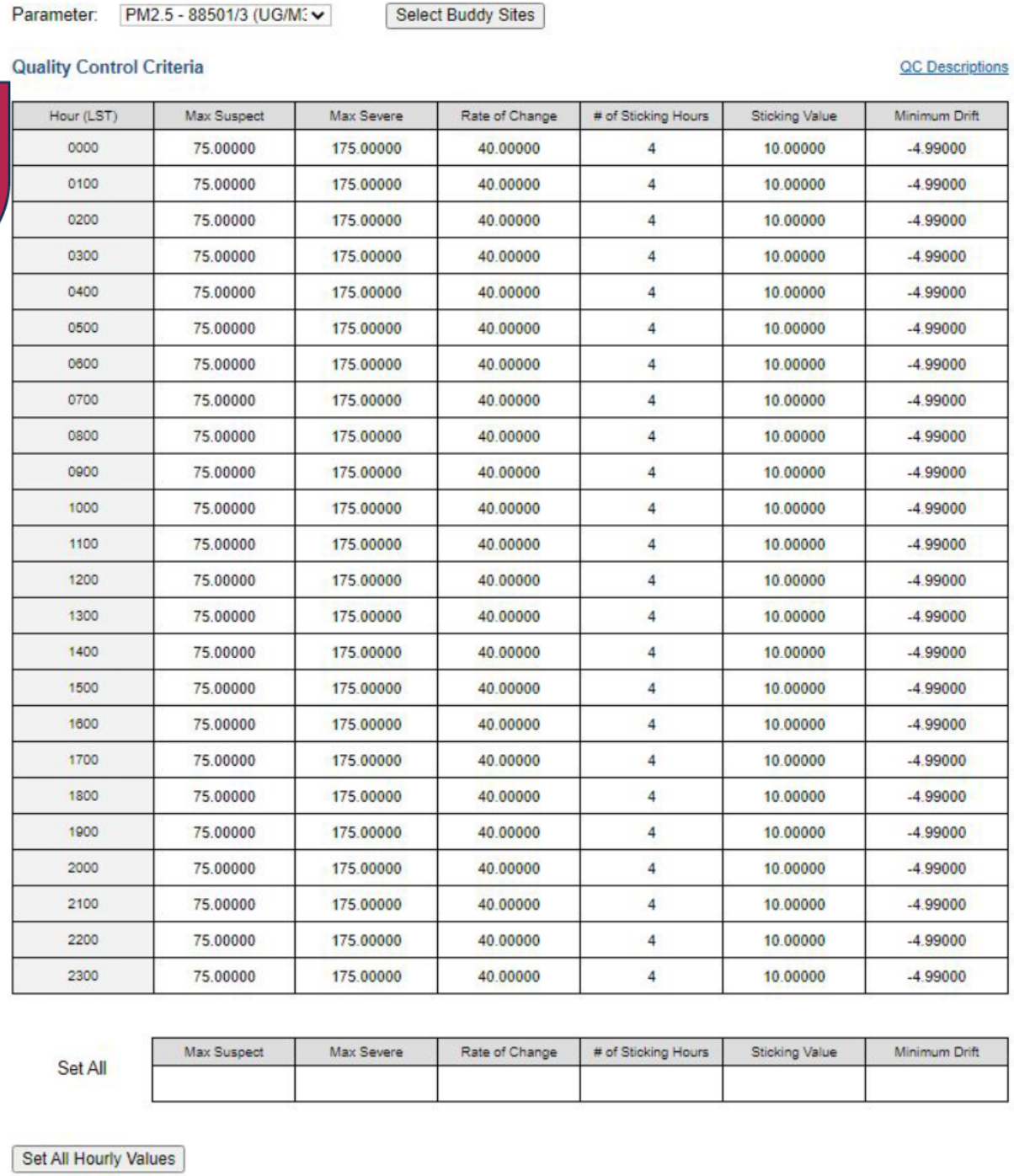
Site Management - Automated QC Background

- **Range checks**
  - **Max Suspect:** Observations greater than or equal to Max Suspect (but less than the Max Severe) are still included in data products but are flagged for review.
  - **Max Severe:** Observations greater than or equal to Max Severe are invalidated and withheld from all AirNow products
  - **Minimum Drift:** Observations less than or equal to the Minimum Drift are invalidated and withheld from all AirNow products
- **Rate of change**
  - Compares a given hour's value to the previous hour's value. If the difference is greater than or equal to the Rate of Change, the given hour is invalidated and withheld from all AirNow products.
- **Sticking Check**
  - **Sticking Value:** Observations above this value are subject to the Number of Sticking Hours QC check. Observations below this value are not checked against the Number of Sticking Hours QC check.
  - **Number of Sticking Hours:** The number of hours a value can be observed consecutively after which the value is flagged for review.
  - Data must both exceed the sticking value and be sticking for the set number of sticking hours before data are invalidated by automated QC.

Site Management - Automated QC Cont'd

Demo

- **Most pollutants receive a set of "Default" QC mated QC thresholds**
- **Automated QC thresholds can be set by parameter at each site from the Site Details page in AirNOw-Tech**
  - Go to Dashboard My Sites, and then click on a monitoring site in your agencies site list
  - Click on a parameter in the "Parameters measured" list
  - Click the "View QC Criteria" button
  - If making changes, click the "Enable Editing" button
  - Checks can be edited by hour, or the user can set all hours to a particular value using the "Set All Hourly Values" option
  - Save changes



Parameter: PM2.5 - 88501/3 (UG/M3) Select Buddy Sites

Quality Control Criteria QC Descriptions

Hour (LST)	Max Suspect	Max Severe	Rate of Change	# of Sticking Hours	Sticking Value	Minimum Drift
0000	75.00000	175.00000	40.00000	4	10.00000	-4.99000
0100	75.00000	175.00000	40.00000	4	10.00000	-4.99000
0200	75.00000	175.00000	40.00000	4	10.00000	-4.99000
0300	75.00000	175.00000	40.00000	4	10.00000	-4.99000
0400	75.00000	175.00000	40.00000	4	10.00000	-4.99000
0500	75.00000	175.00000	40.00000	4	10.00000	-4.99000
0600	75.00000	175.00000	40.00000	4	10.00000	-4.99000
0700	75.00000	175.00000	40.00000	4	10.00000	-4.99000
0800	75.00000	175.00000	40.00000	4	10.00000	-4.99000
0900	75.00000	175.00000	40.00000	4	10.00000	-4.99000
1000	75.00000	175.00000	40.00000	4	10.00000	-4.99000
1100	75.00000	175.00000	40.00000	4	10.00000	-4.99000
1200	75.00000	175.00000	40.00000	4	10.00000	-4.99000
1300	75.00000	175.00000	40.00000	4	10.00000	-4.99000
1400	75.00000	175.00000	40.00000	4	10.00000	-4.99000
1500	75.00000	175.00000	40.00000	4	10.00000	-4.99000
1600	75.00000	175.00000	40.00000	4	10.00000	-4.99000
1700	75.00000	175.00000	40.00000	4	10.00000	-4.99000
1800	75.00000	175.00000	40.00000	4	10.00000	-4.99000
1900	75.00000	175.00000	40.00000	4	10.00000	-4.99000
2000	75.00000	175.00000	40.00000	4	10.00000	-4.99000
2100	75.00000	175.00000	40.00000	4	10.00000	-4.99000
2200	75.00000	175.00000	40.00000	4	10.00000	-4.99000
2300	75.00000	175.00000	40.00000	4	10.00000	-4.99000

Set All	Max Suspect	Max Severe	Rate of Change	# of Sticking Hours	Sticking Value	Minimum Drift

Set All Hourly Values

Manual QC Review Background

- **DMC Manual Review**
  - The AirNow Data Management Center (DMC) reviews data that have been flagged by the AirNow automated QC
    - Review occurs during business hours (eastern U.S.)
    - Goals:
      - Prevent “bullseyes” i.e. high invalid readings that slip under QC checks
      - Ensure valid data makes it to public products in a timely manner
      - All validation/invalidation is considered preliminary
  - DMC review process
      - Site history
      - Local conditions – nearby sites, fires, etc
      - Weather conditions
      - Info provided by agency
      - Typical pollutant behavior (diurnal/seasonal trends)
  - DMC does not validate data that has been invalidated by the agency

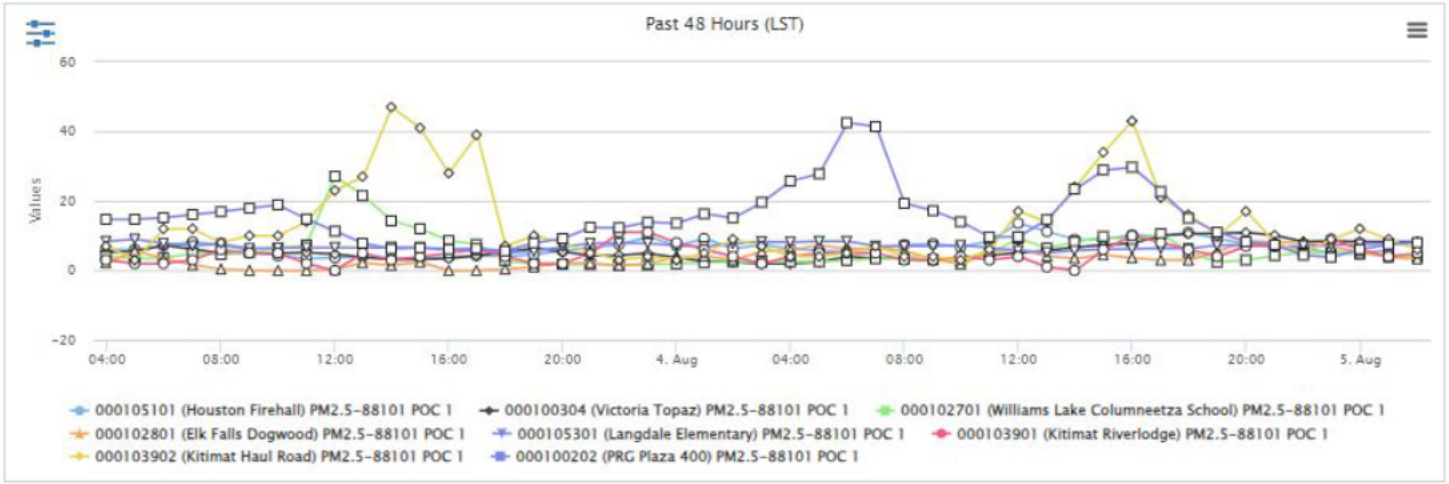
Questions?

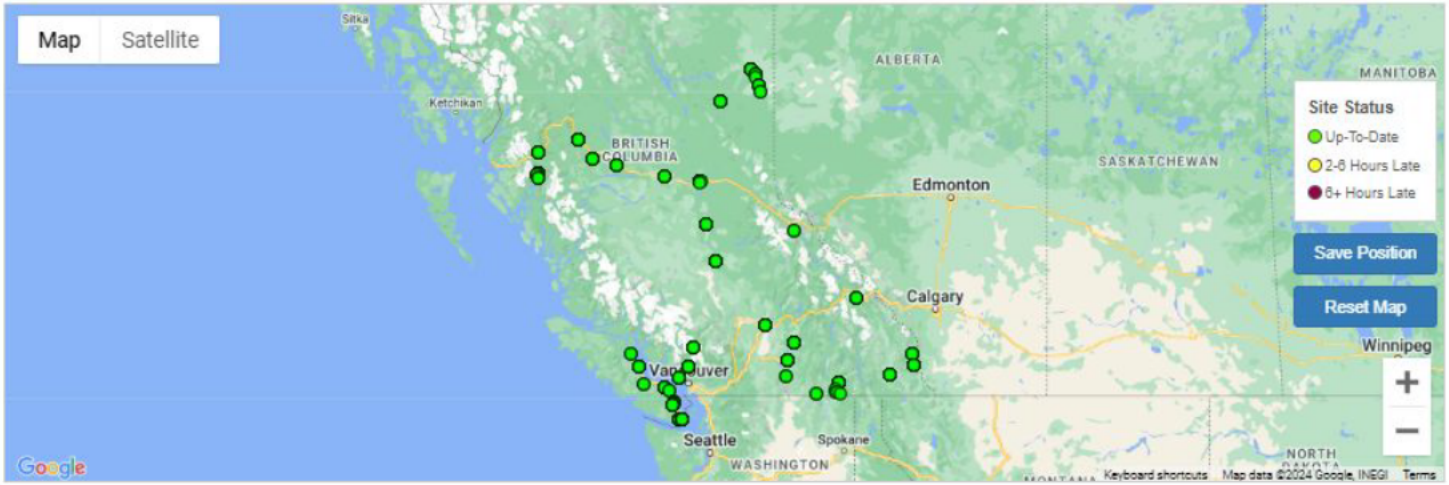
Next: Dashboard, Data Queries, and Reports

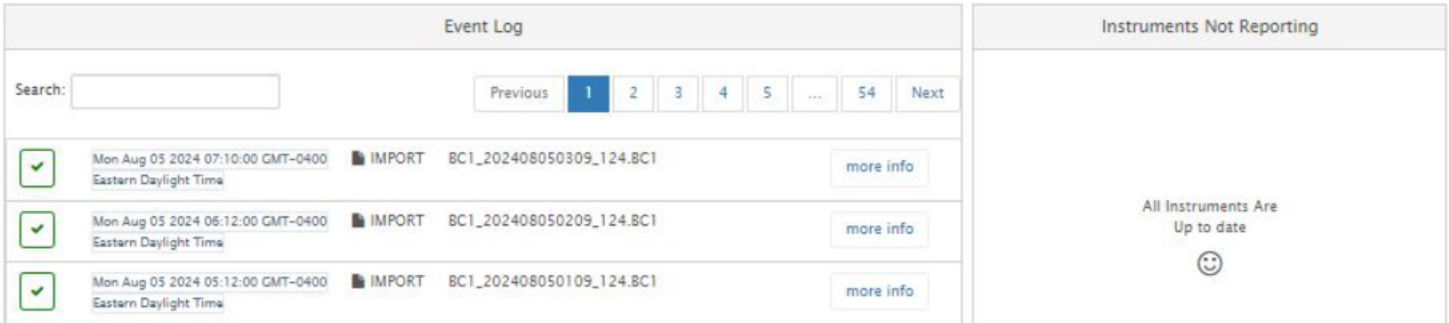
Dashboard

Demo

- **Your agency sites at a glance**
  - Recent Trends
  - Map view of site status
    - Clicking on a site brings up individual pollutants
  - Event Log
    - Recently processed files
    - Information about file
      - File name
      - File process time
      - File process status (Success/Fail)
      - Errors
      - Records processed
  - Instruments Not Reporting
    - Tabular view of out of date parameters



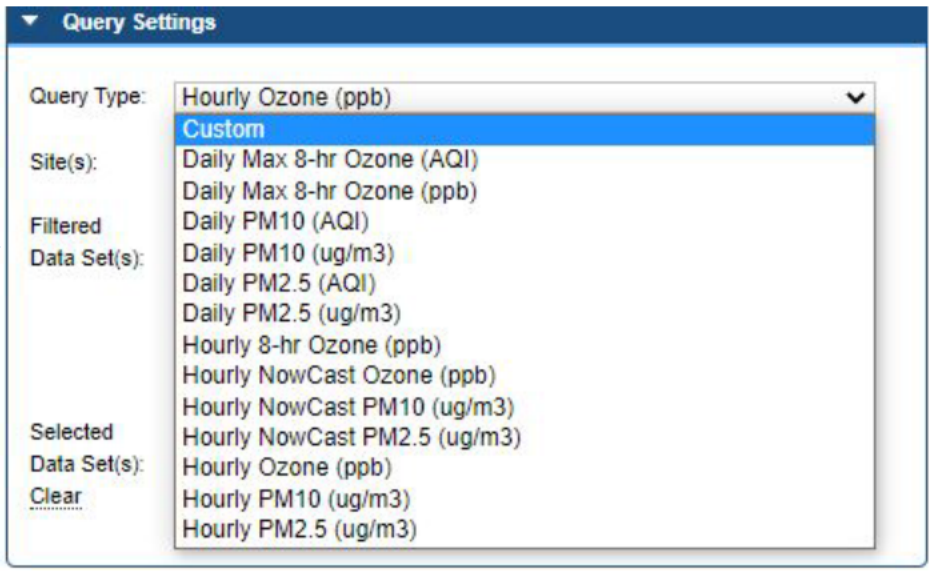




Data Queries (1/2)

Allows users to query concentration/AQI info from any site at any time in the AirNow system

- **Various display options**
  - Tables: Pivoted By Hour – Abbrev (Default), Pivoted By Hour – Full, Pivoted By Data Set, Unpivoted
  - Graph: Line, Scatter Plot
- **Canned queries for common requests**
  - Otherwise, users can use the custom Parameter & Site selector filter tools (instructions on how to use on AirNow-Tech forum)
- **Export options: CSV, KML**



Data Queries (2/2)

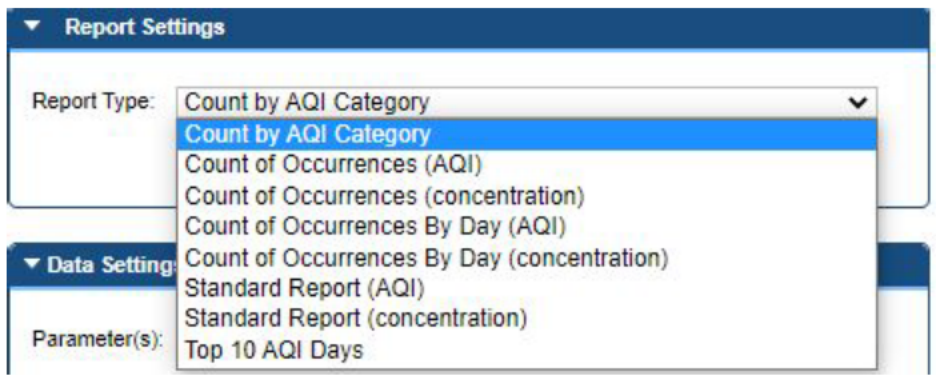
Demo

- **How to create and run a data query**
- **Tutorial Materials**
  - How to run a data query
    - https://airnowtech.org/Resources/airnow_data-queries-reports.pdf
  - Using the Site & Parameter Selector Tools
    - https://airnowtech.org/Resources/airnow_site-&-parameter-lists.pdf

Reports (1/2)

Allows users to query concentration/AQI info from any site at any time in the AirNow system

- **Various display options**
  - Tables: Pivoted By Hour – Abbrev (Default), Pivoted By Hour – Full, Pivoted By Data Set, Unpivoted
  - Graph: Line, Scatter Plot
- **Canned query options**
- **Export options: CSV, PDF**
- **Reports can handle larger queries**



Reports (2/2)

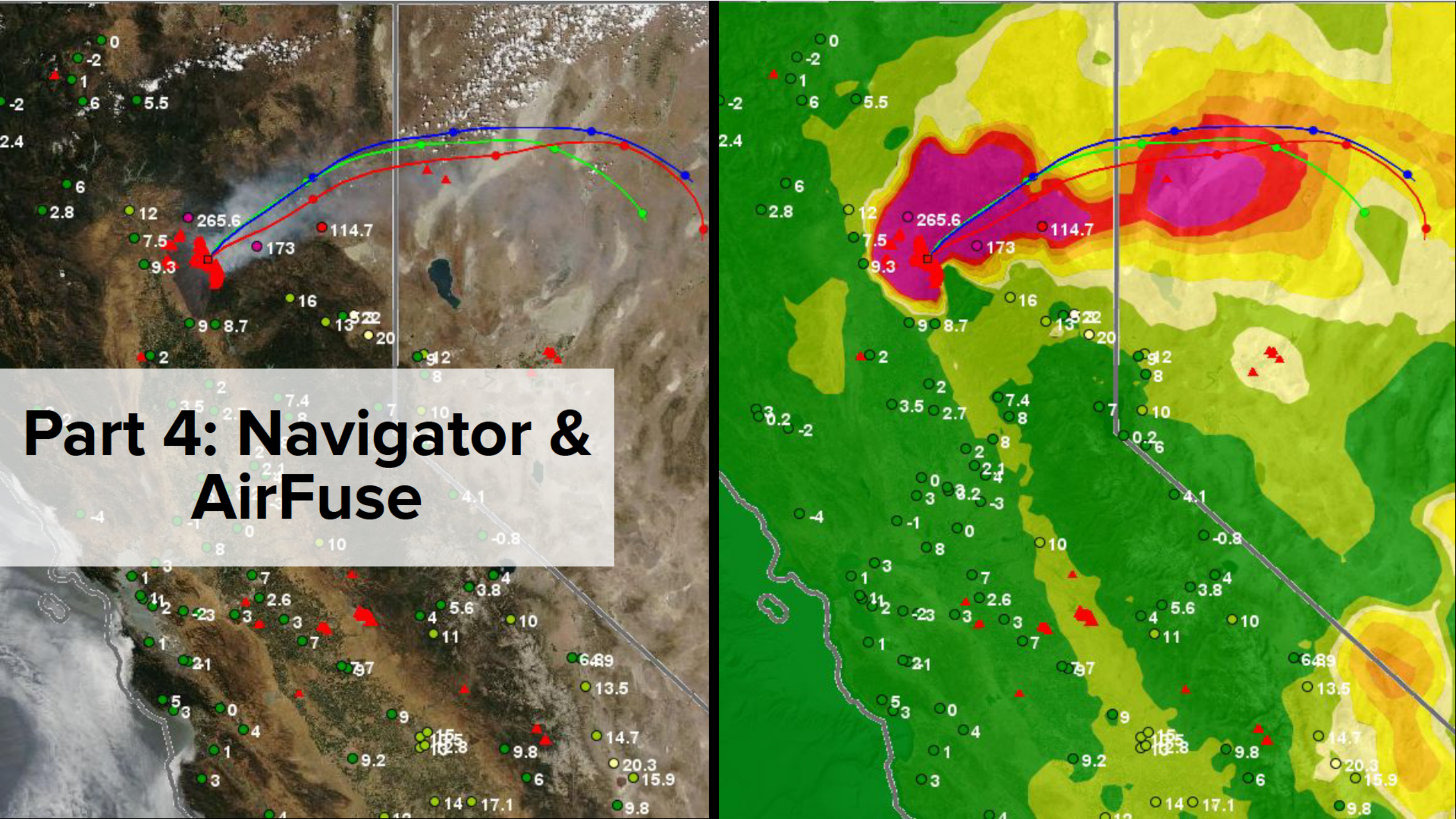
Demo

- **How to create and run a report**
- **Tutorial Materials**
  - How to run a report
    - https://airnowtech.org/Resources/airnow_data-queries-reports.pdf
  - Using the Site & Parameter Selector Tools
    - https://airnowtech.org/Resources/airnow_site-&-parameter-lists.pdf

Questions?

Next: Break, then Navigator & AirFuse

15 Minute Break



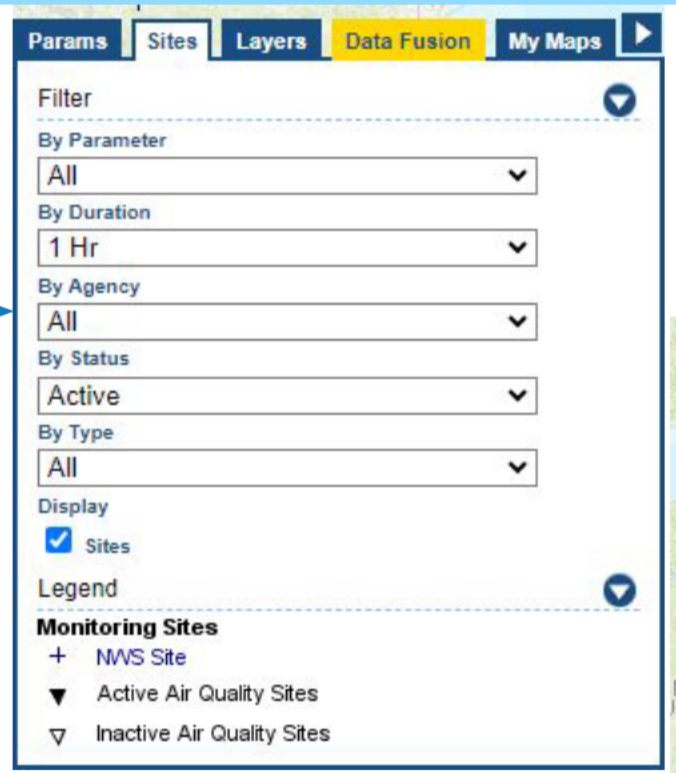
Part 4: Navigator & AirFuse

Part 4: AirNow-Tech Deep Dive – Navigator & AirFuse

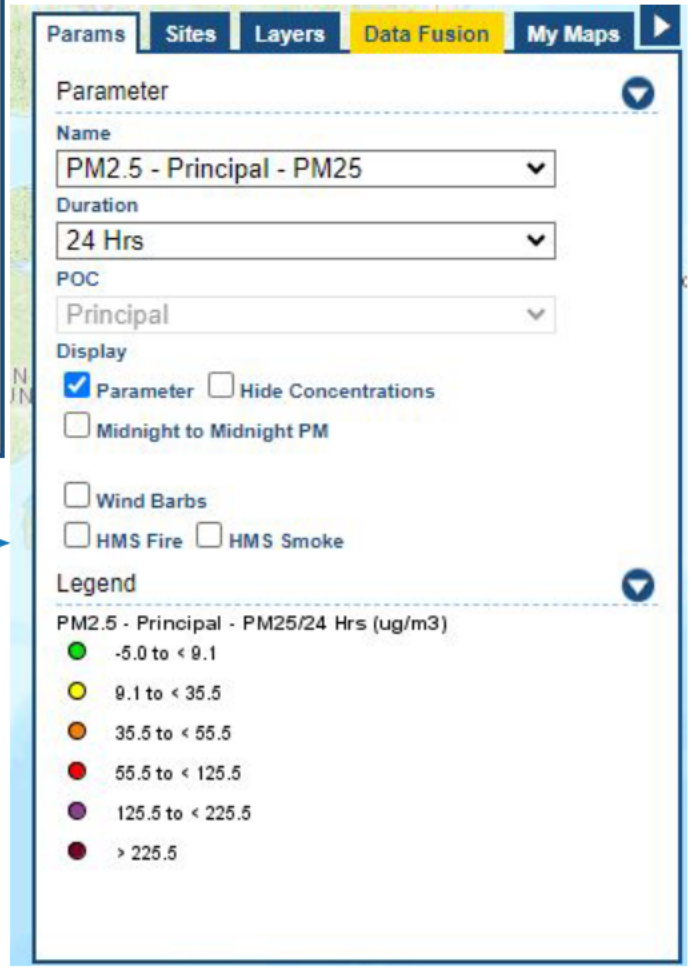
- **Features**
  - Viewing air quality data – changing parameters/durations
  - Addn. layers – Satellite data (Visible, AOD), Metadata layers
  - AirFuse
  - HYSPLIT
- **Map Configuration**
  - Enabling layers
  - Settings a default view
- **Case Studies**
  - Wildfire (NE smoke event 2023, Western U.S. smoke event)
  - Sand/Dust Storm in SW U.S.
  - Saharan Dust
  - Ozone episode

Navigator Features (1/4)

- **Site Display**
  - Displays AirNow and National Weather Service monitoring site locations
  - Filter options
    - Parameter measured
    - Duration
    - Agency
    - Active/Inactive
    - Site Type
- **Parameter Display**
  - Displays AirNow pollutant data
  - Filter Options
    - Duration
    - POC
    - Daily aggregations



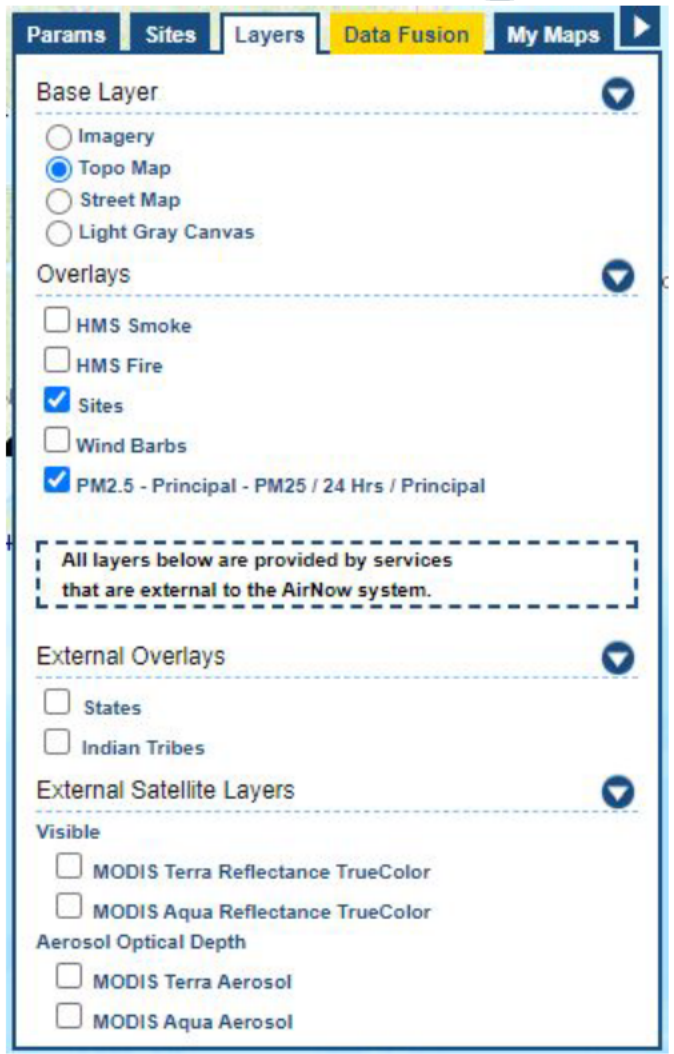
Demo



Navigator Features (2/4)

Demo

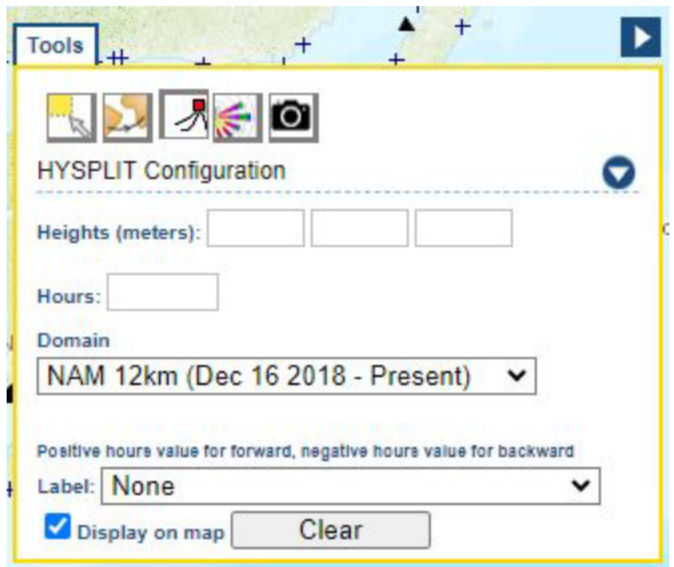
- **Layers**
  - Change Base Layer
  - Params/Sites quick overlay options
    - Params, Sites, Wind Barbs
  - 3rd party layers
    - Hazard Mapping System (HMS) Smoke
    - HMS Fire
    - State outlines
    - Tribal boundaries
    - Visible Satellite
      - MODIS Terra
      - MODIS Aqua
    - Aerosol Optical Depth (AOD)
      - MODIS Terra
      - MODIS Aqua



Navigator Features (3/4)

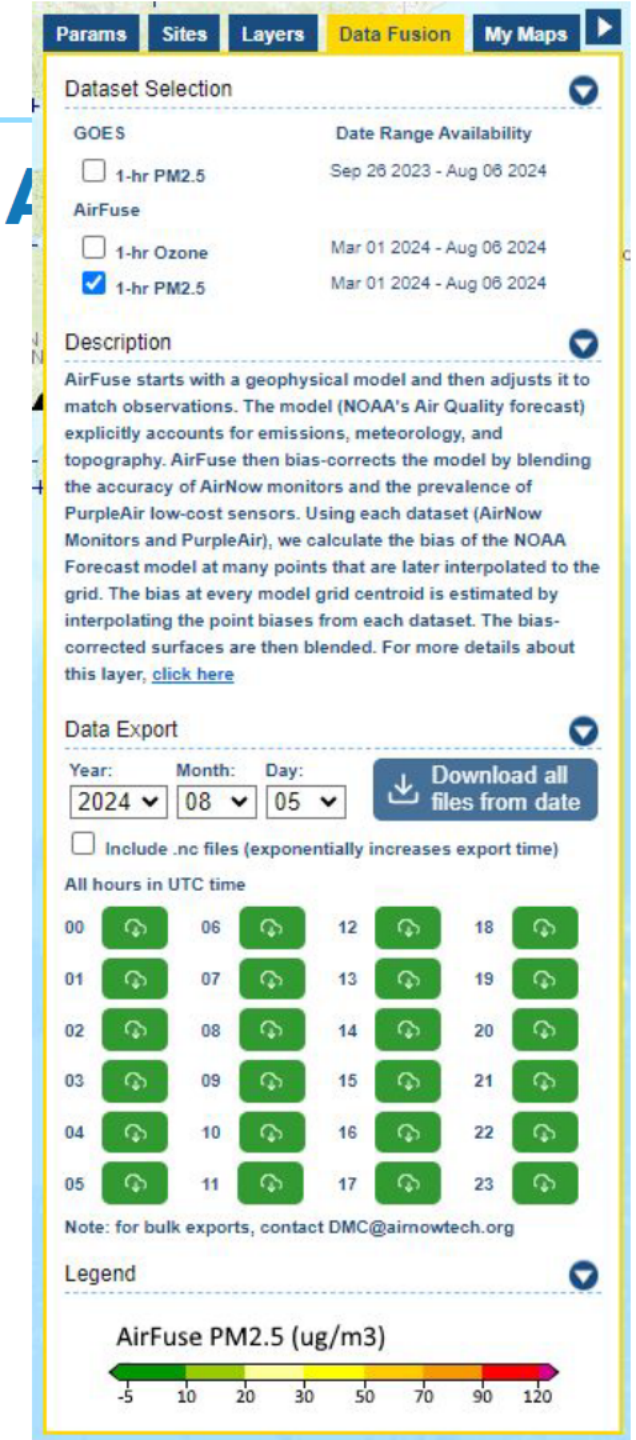
Demo

- **Tools**
  - Site Selector Tool
    - Provides site details upon clicking on a monitoring site
  - Distance Tool
    - Measure distance between multiple points (miles/km)
  - **HYSPLIT trajectory model tool**
    - Forward and backward trajectories up to 72 hours
    - Choose 3 heights (m AGL)
    - 3 model options
      - GFS 0.5 degree (Rolling 1 year availability)
      - NAM 12km (Dec 2018-Present)
      - NAM 40km (Jan 2015-Dec 2018)
  - Wind Rose
    - Pollutant and Wind Rose plotting tool with chosen date range by monitoring site
  - Export
    - Download screenshot of current map view



Navigator Features – GOES PM2.5 & A (4/4)

- **GOES PM2.5 (Documentation) Sep 2023 - Present**
  - Hourly satellite estimates of PM2.5
  - Only available during daylight hours and in areas with no cloud coverage
- **AirFuse PM2.5 (Documentation) – Mar 1 2024 - Present**
  - PM2.5 Data Fusion
    - AirNow observations
    - PurpleAir
    - NOAA Forecast Model
  - Ozone Data fusion
    - AirNow observations
    - NOAA Forecast Model
- **Layer exports**
  - GeoJSON
  - NetCDF

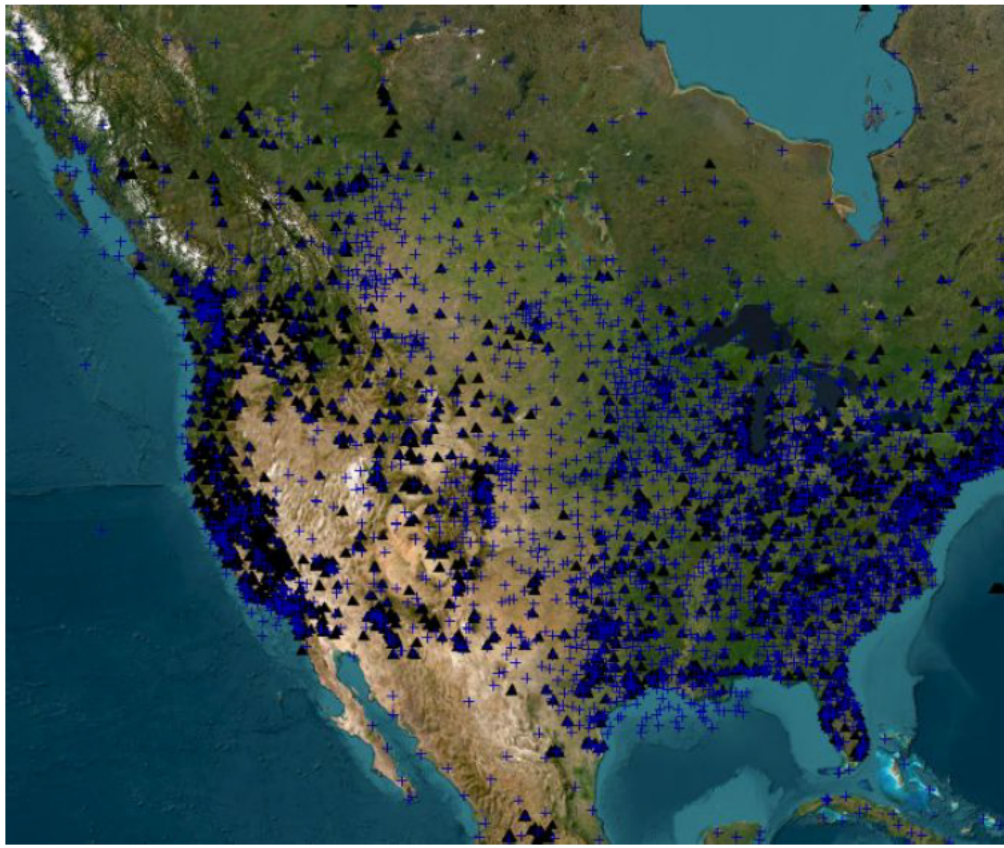


Demo

Navigator Map Configuration

Demo

- **New map setup & saving as “Default”**
  - Starting from a blank map
  - Using the Parameter selector
  - Using the time controls
  - Other layers
    - Setting base layer
    - Setting pollutants
    - Setting default map extent
  - Saving your map as the default from the “My Maps” tab in the top right menu
    - Saved changes can take ~1 minute to apply. Subsequent navigator refreshes should use the “Default” map view you have configured
    - Note: certain satellite and third-party layers don’t automatically save as enabled when configuring a default map

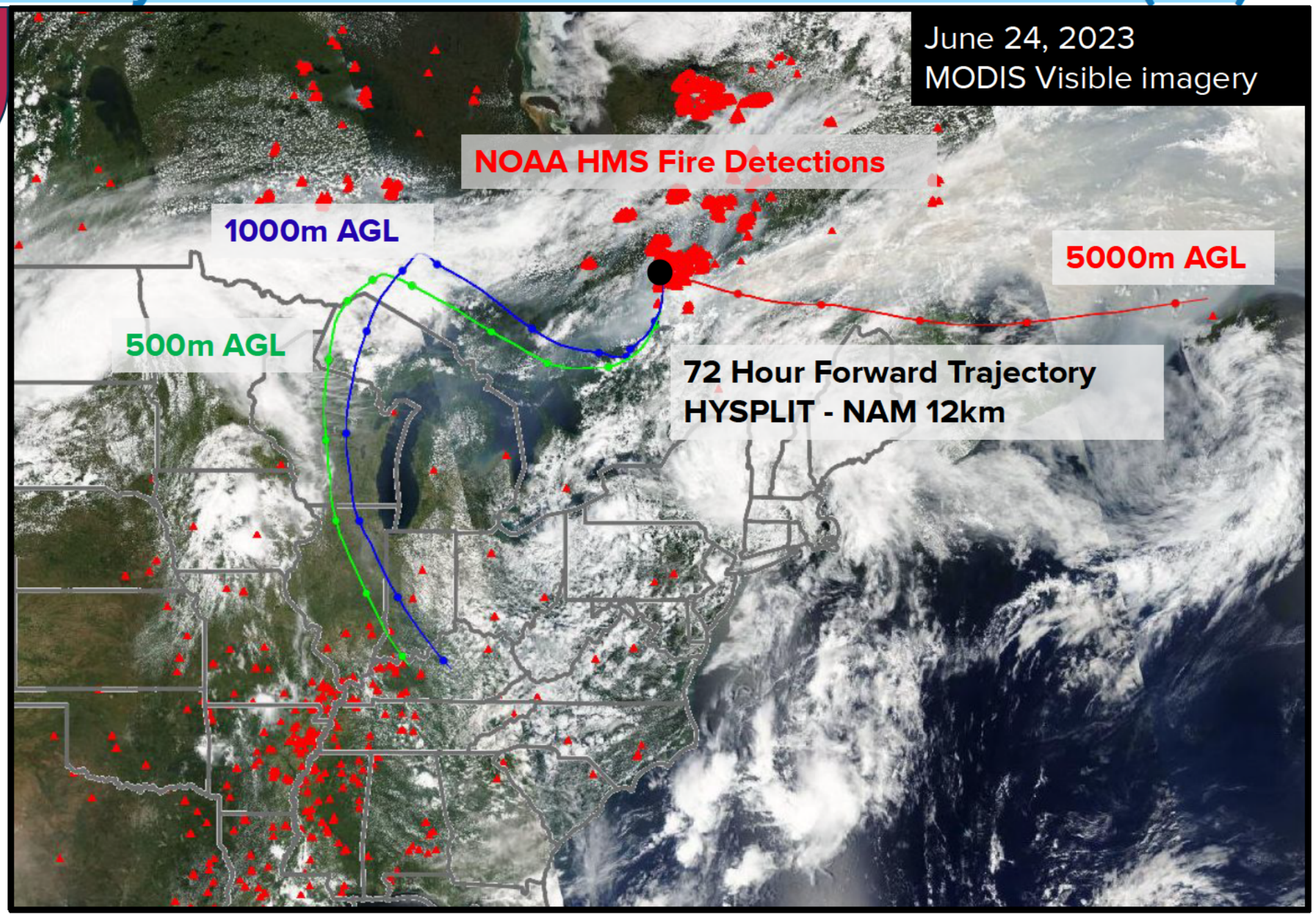


Questions?

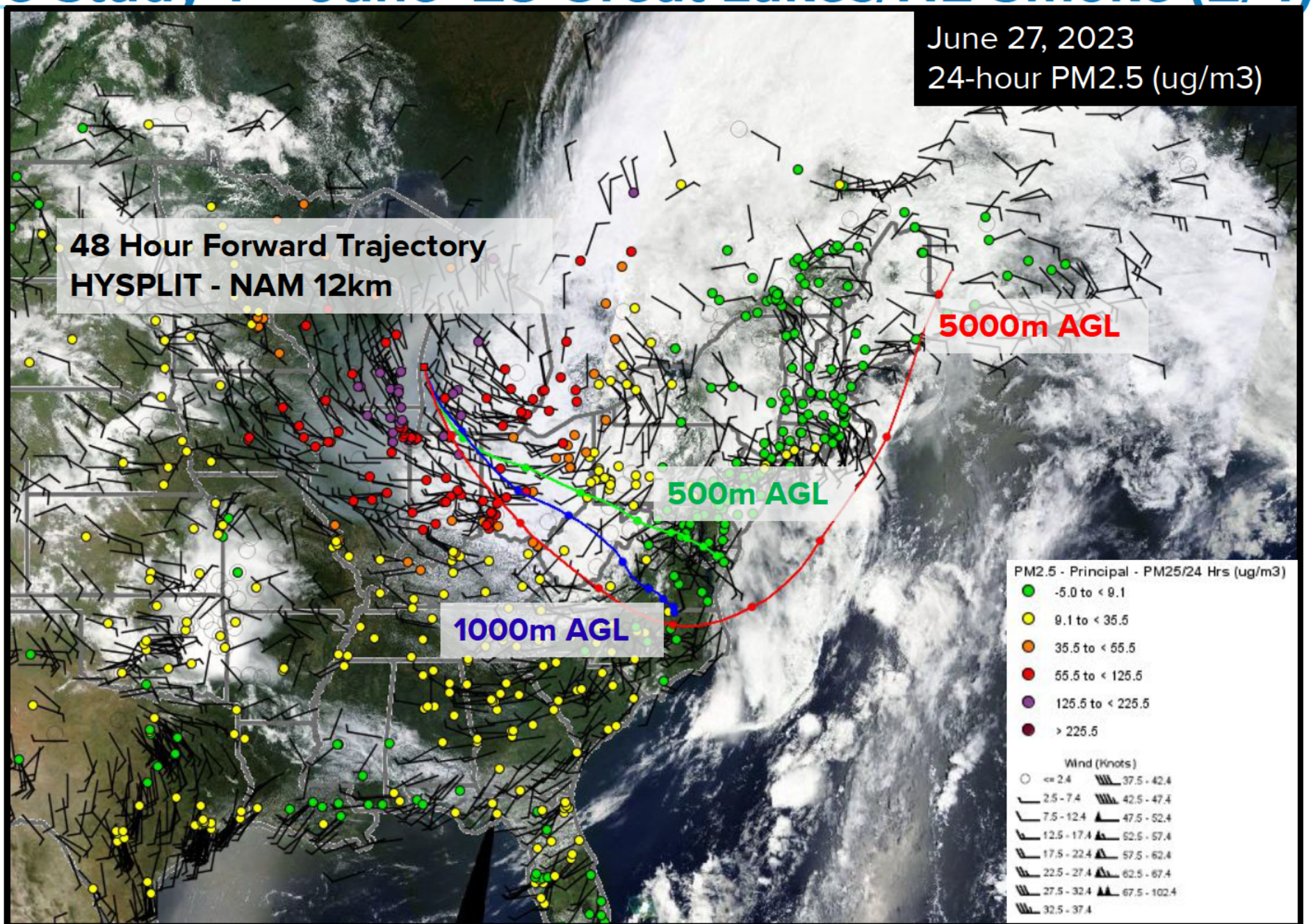
Next: Navigator Case Studies

Case Study 1 – June ‘23 Great Lakes/NE Smoke (1/4)

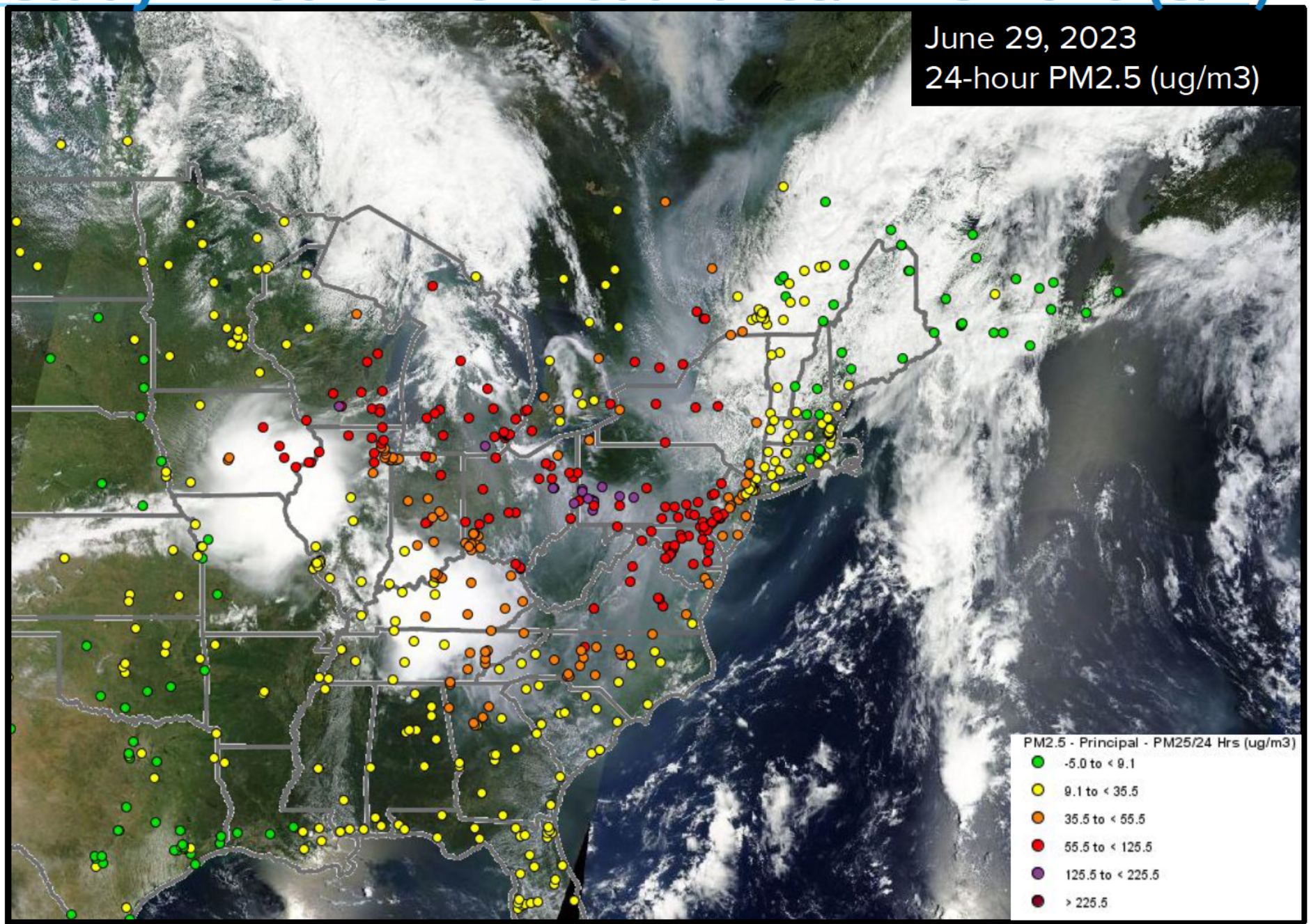
Demo



Case Study 1 – June ‘23 Great Lakes/NE Smoke (2/4)



Case Study 1 – June ‘23 Great Lakes/NE Smoke (3/4)



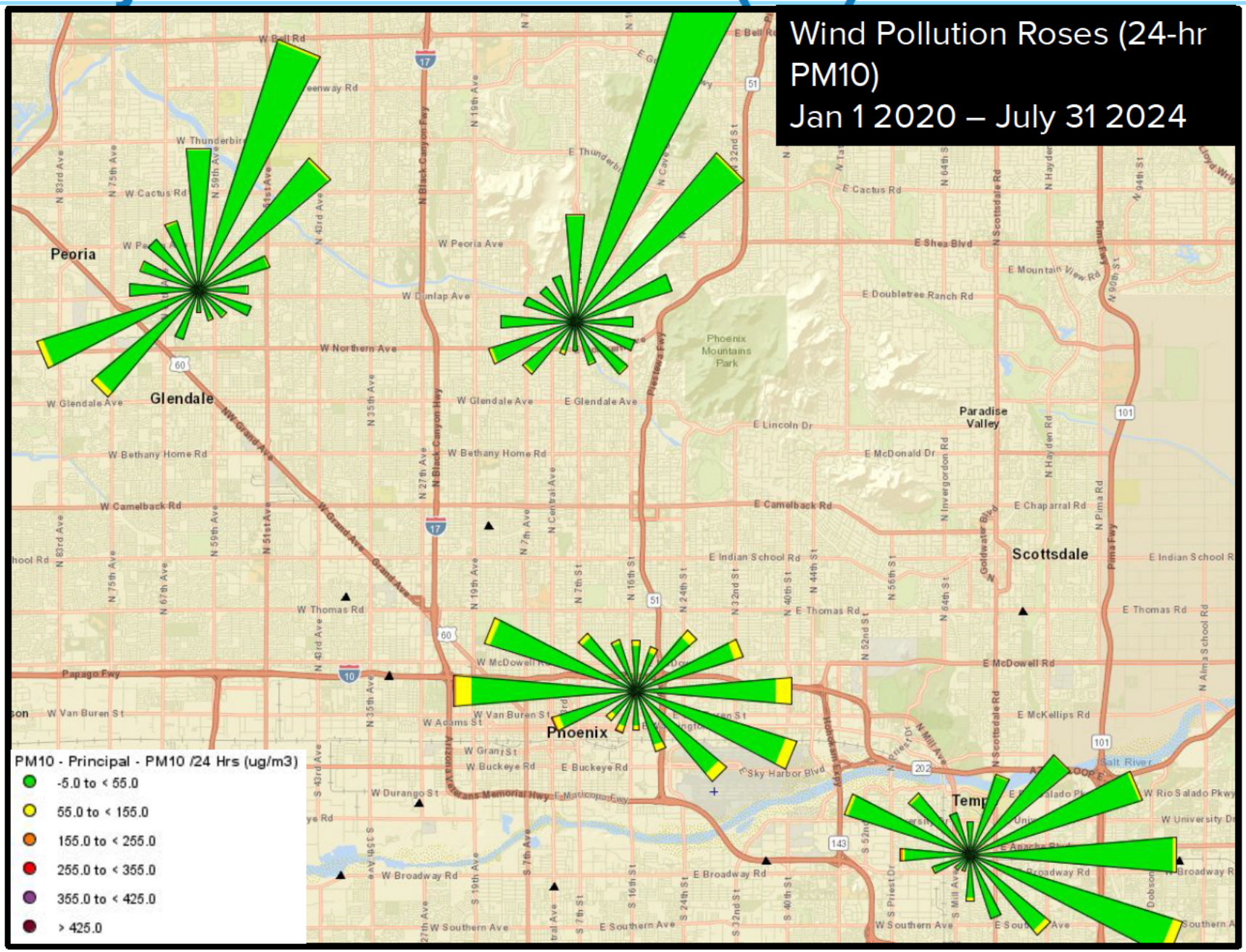
Case Study 1 – June ‘23 Great Lakes/NE Smoke (4/4)

Chicago Skyline – June 27th, 2023
Teresa Crawford/AP

Pittsburgh Skyline – June 28th, 2023
Oliver Morrison / 90.5 WESA

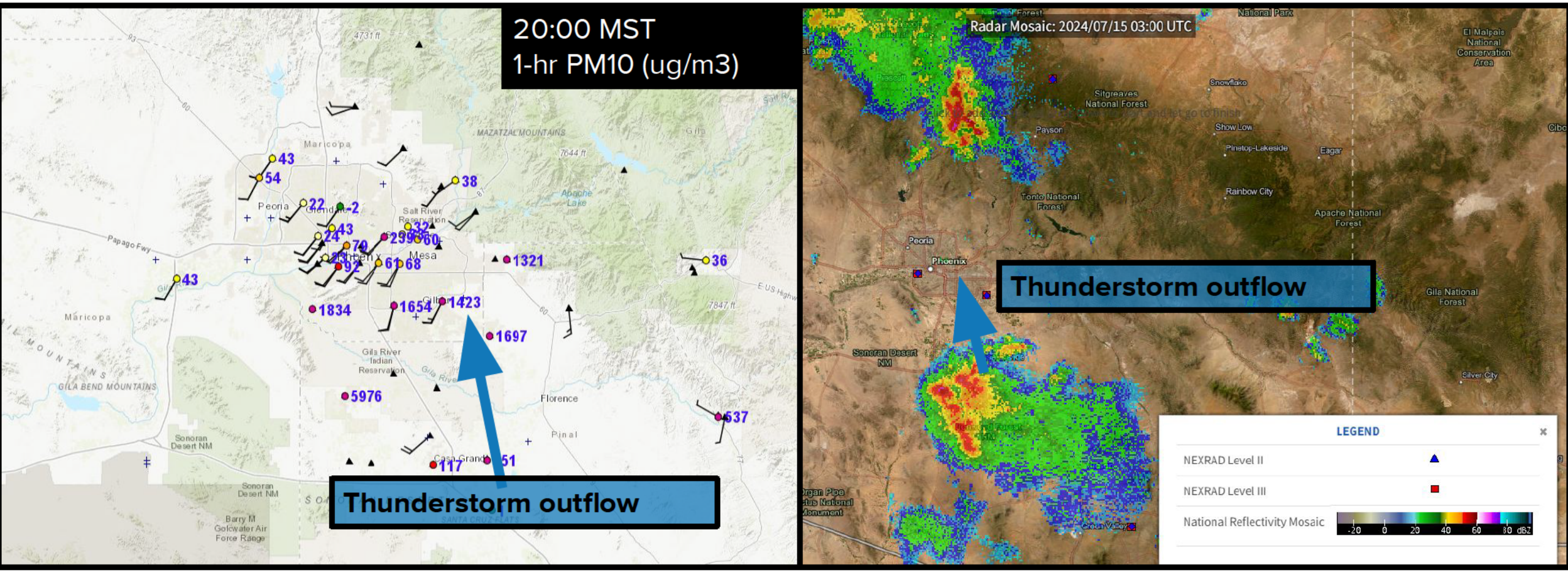
Philadelphia – June 29th, 2023
CBS News Philadelphia

Case Study 2 – Phoenix PM10 (1/4)



Unhealthy for Sensitive Groups+ days tend to have winds out of the west or southwest

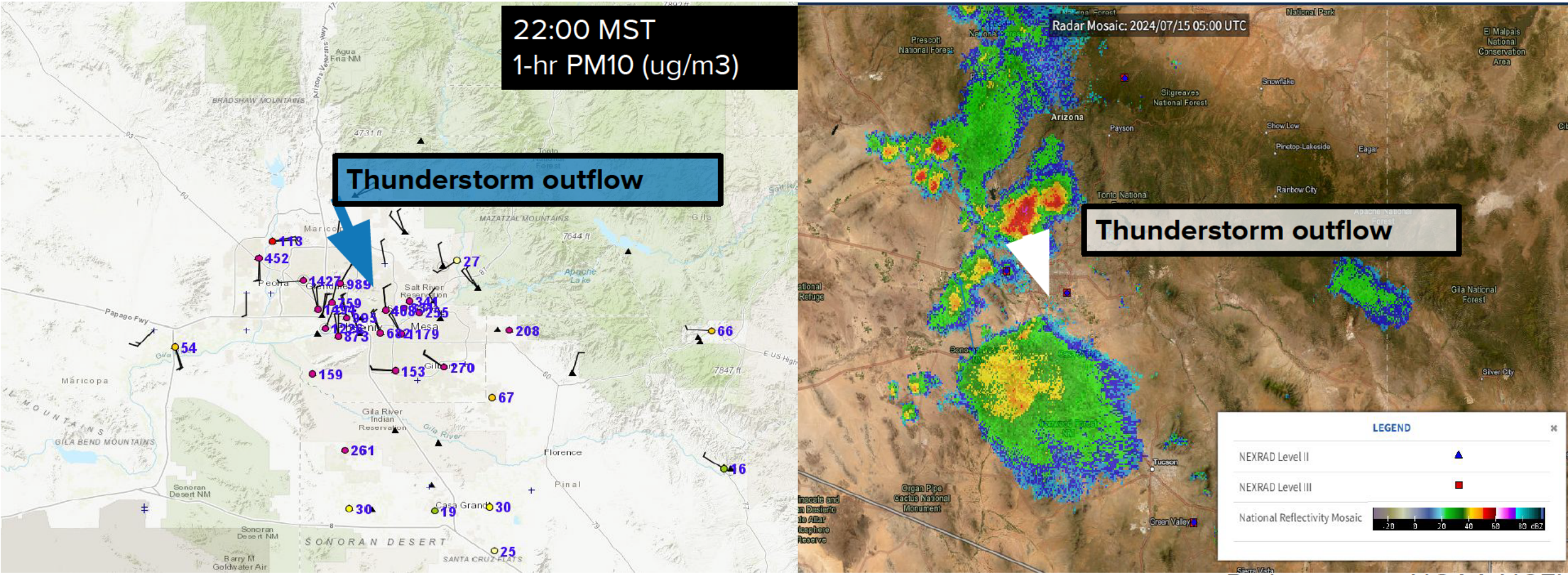
Case Study 2 – Phoenix PM10 – July 14, 2024 (2/4)



During monsoon season, thunderstorm outflow boundaries can contain high winds and cause blowing dust

Radar source: NOAA NCEI

Case Study 2 – Phoenix PM10 – July 14, 2024 (3/4)



During monsoon season, thunderstorm outflow boundaries can contain high winds and cause blowing dust

Radar source: NOAA NCEI

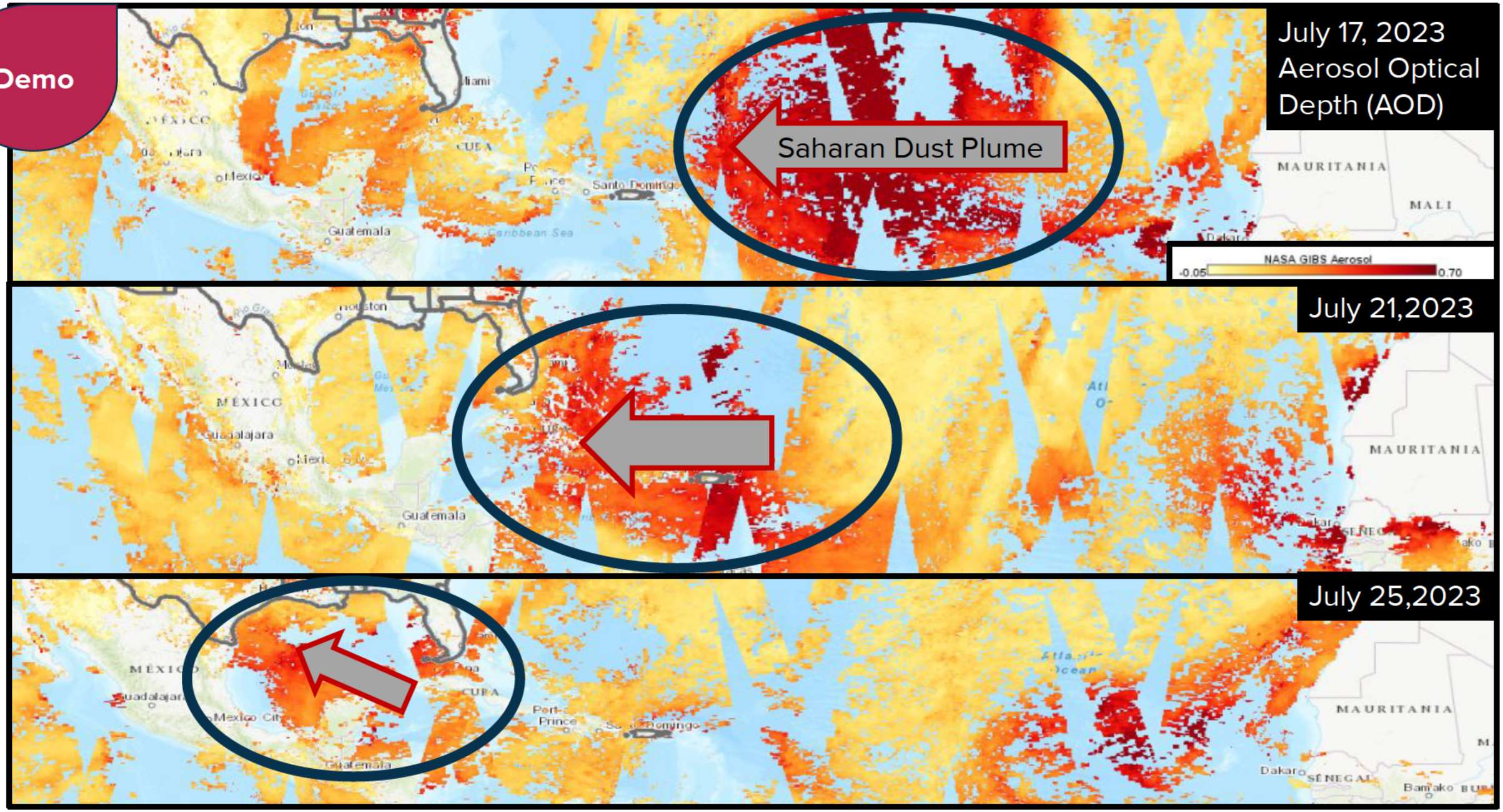
Case Study 2 – Phoenix PM10 – July 14, 2024 (4/4)

Downtown Phoenix – evening of July 14

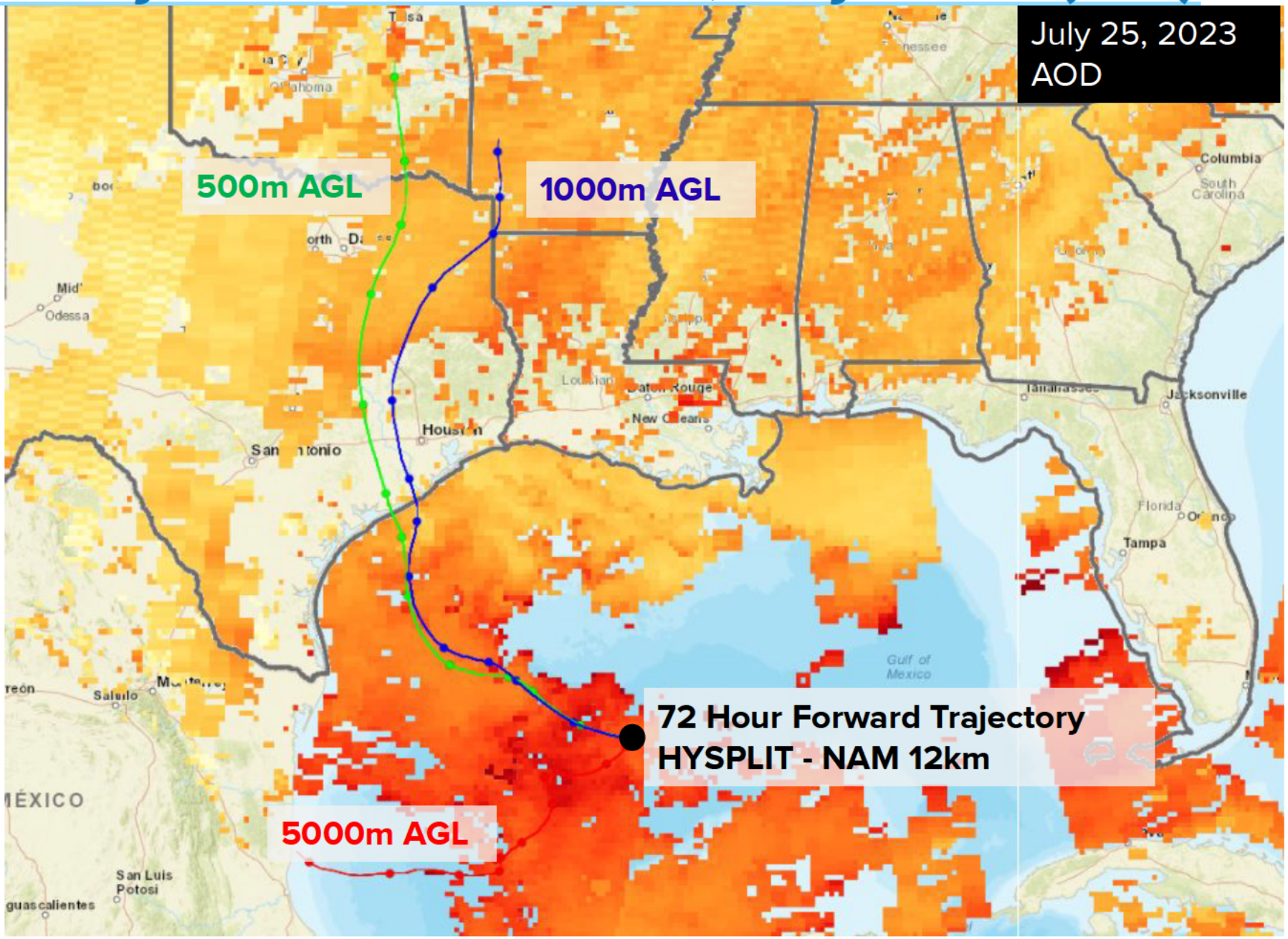
12 News Phoenix

Case Study 3 – Saharan Dust, July 2023 (1/3)

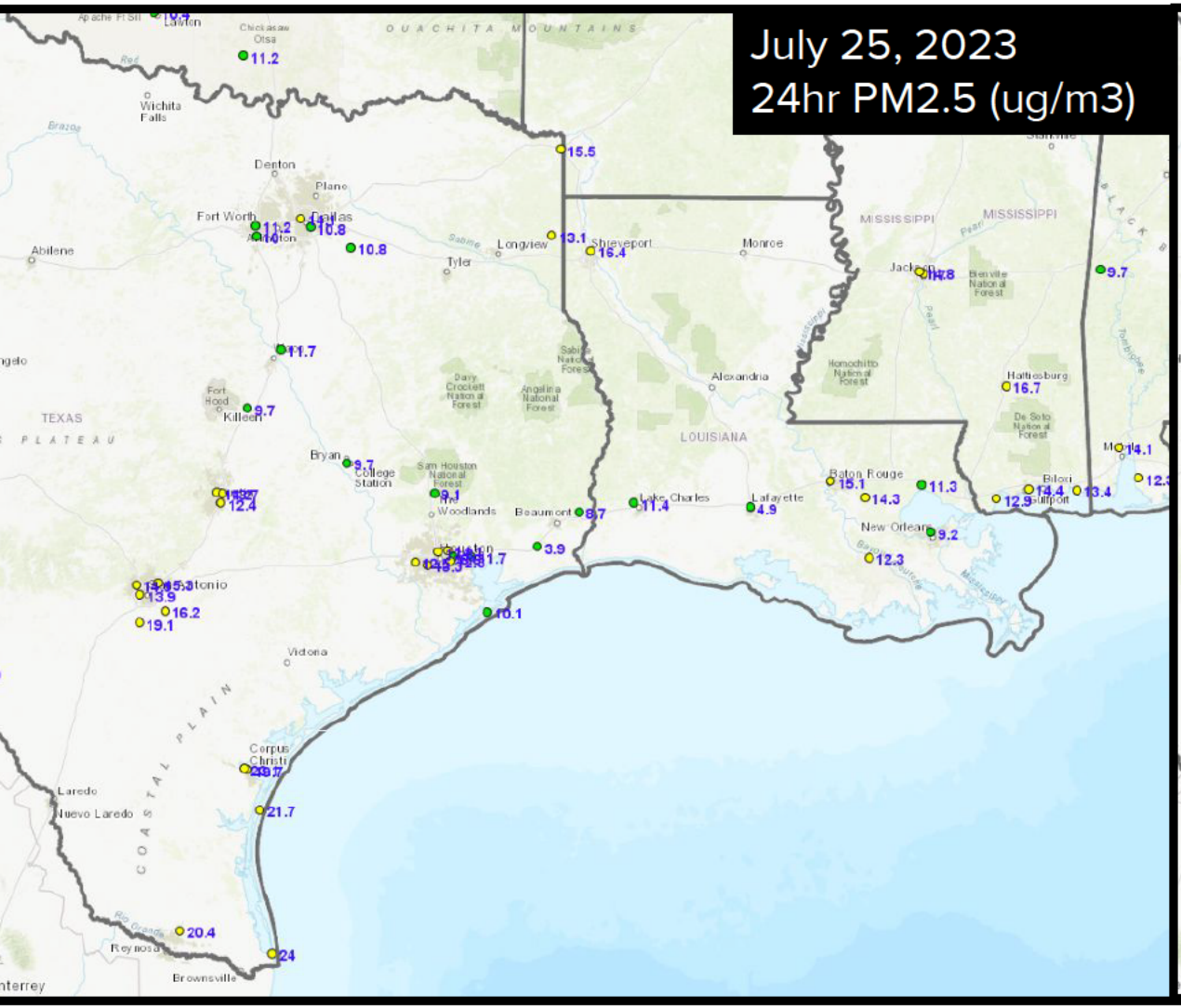
Demo

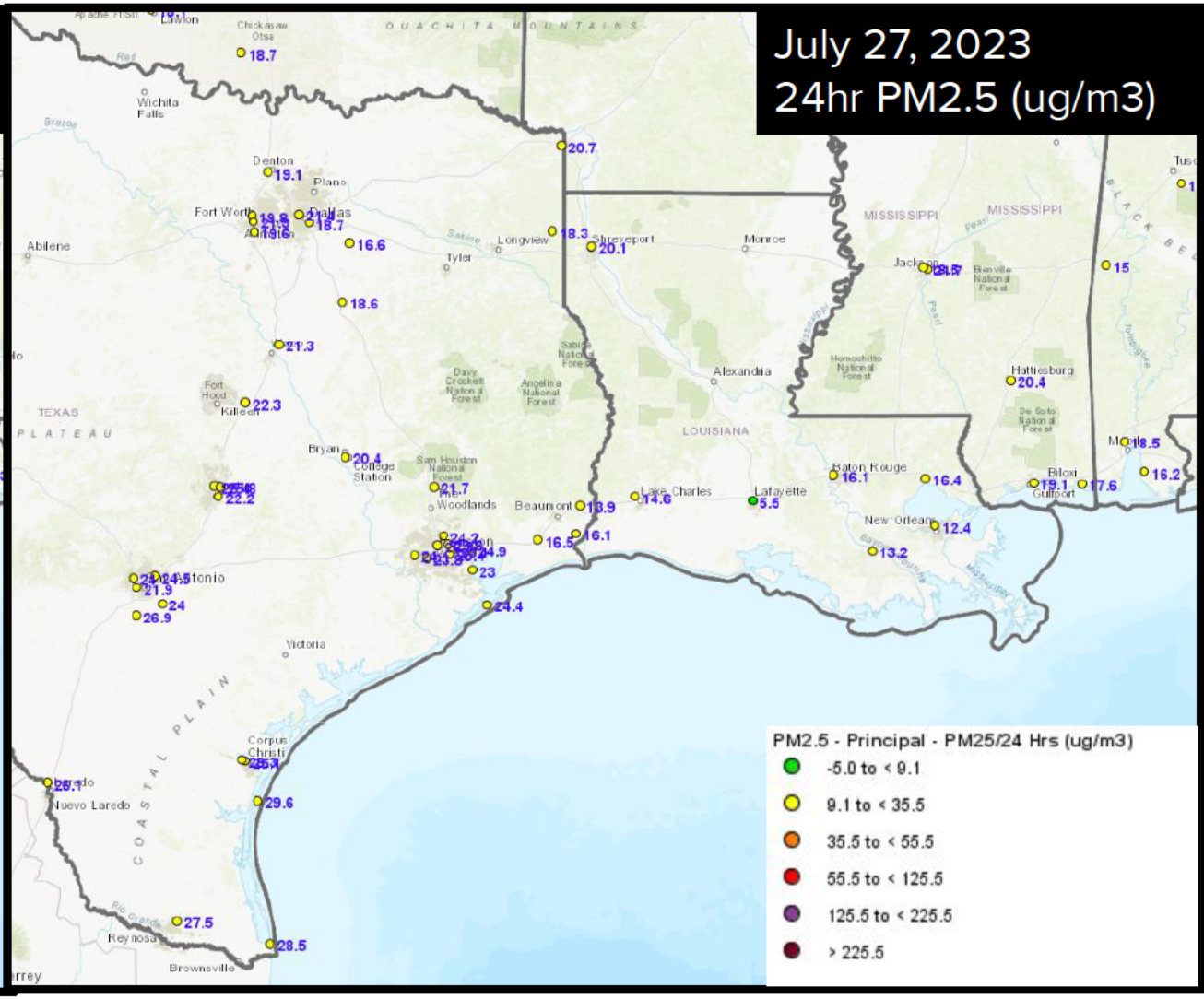


Case Study 3 – Saharan Dust, July 2023 (2/3)



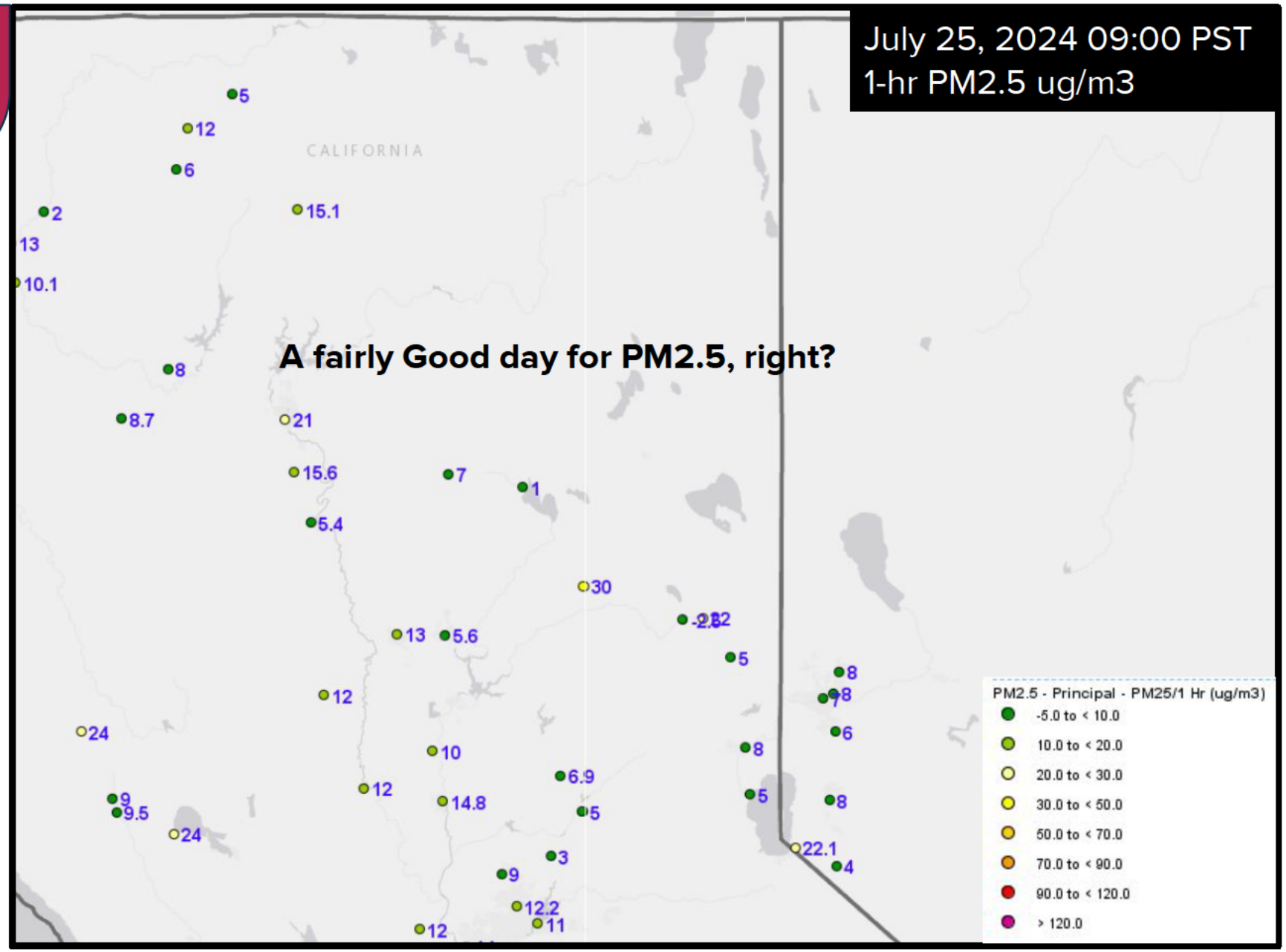
Case Study 3 – Saharan Dust, July 2023 (3/3)



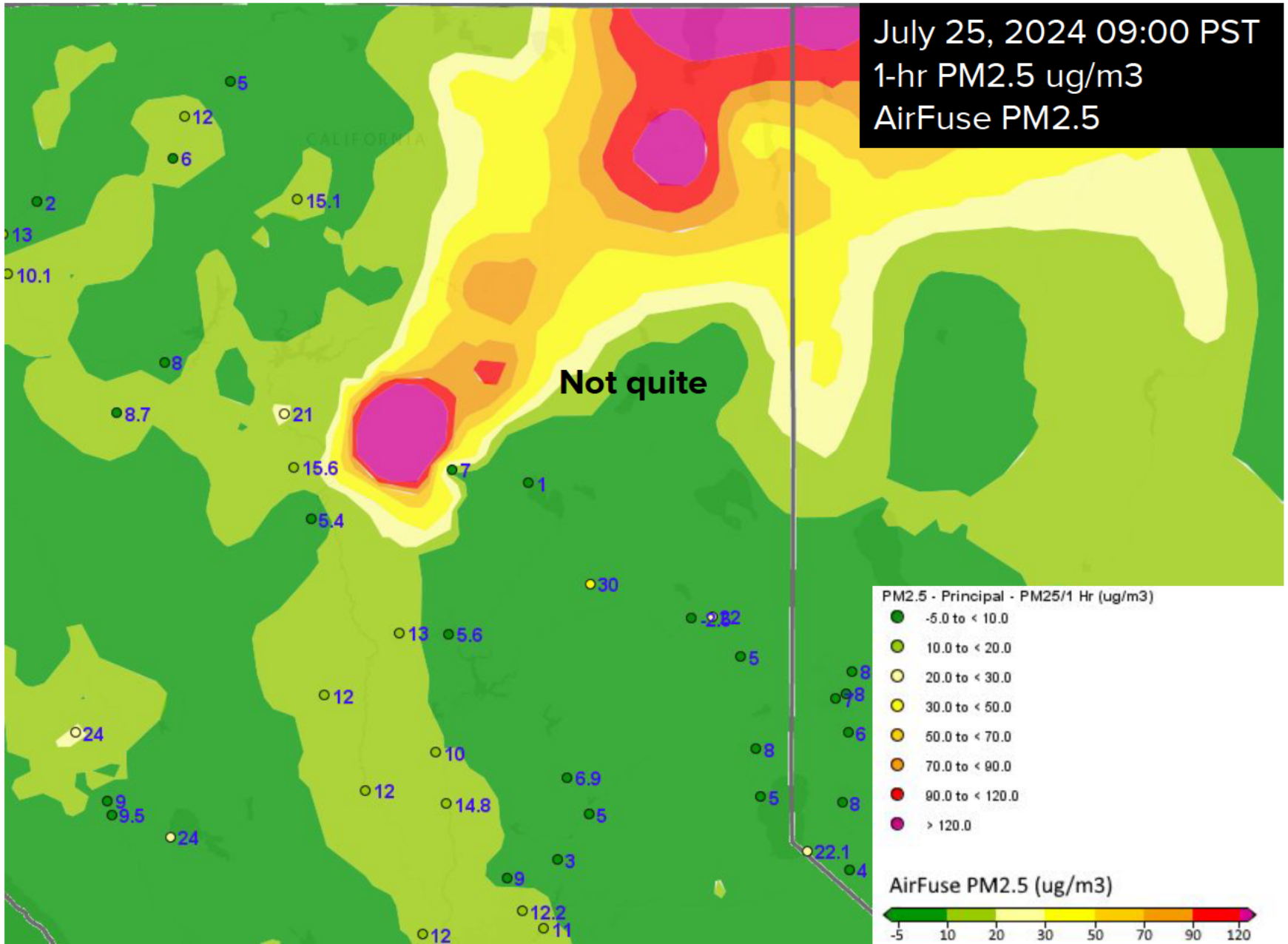


Case Study 4 – PM2.5 w/ AirFuse (1/3)

Demo



Case Study 4 – PM2.5 w/ AirFuse – Park Fire (2/3)

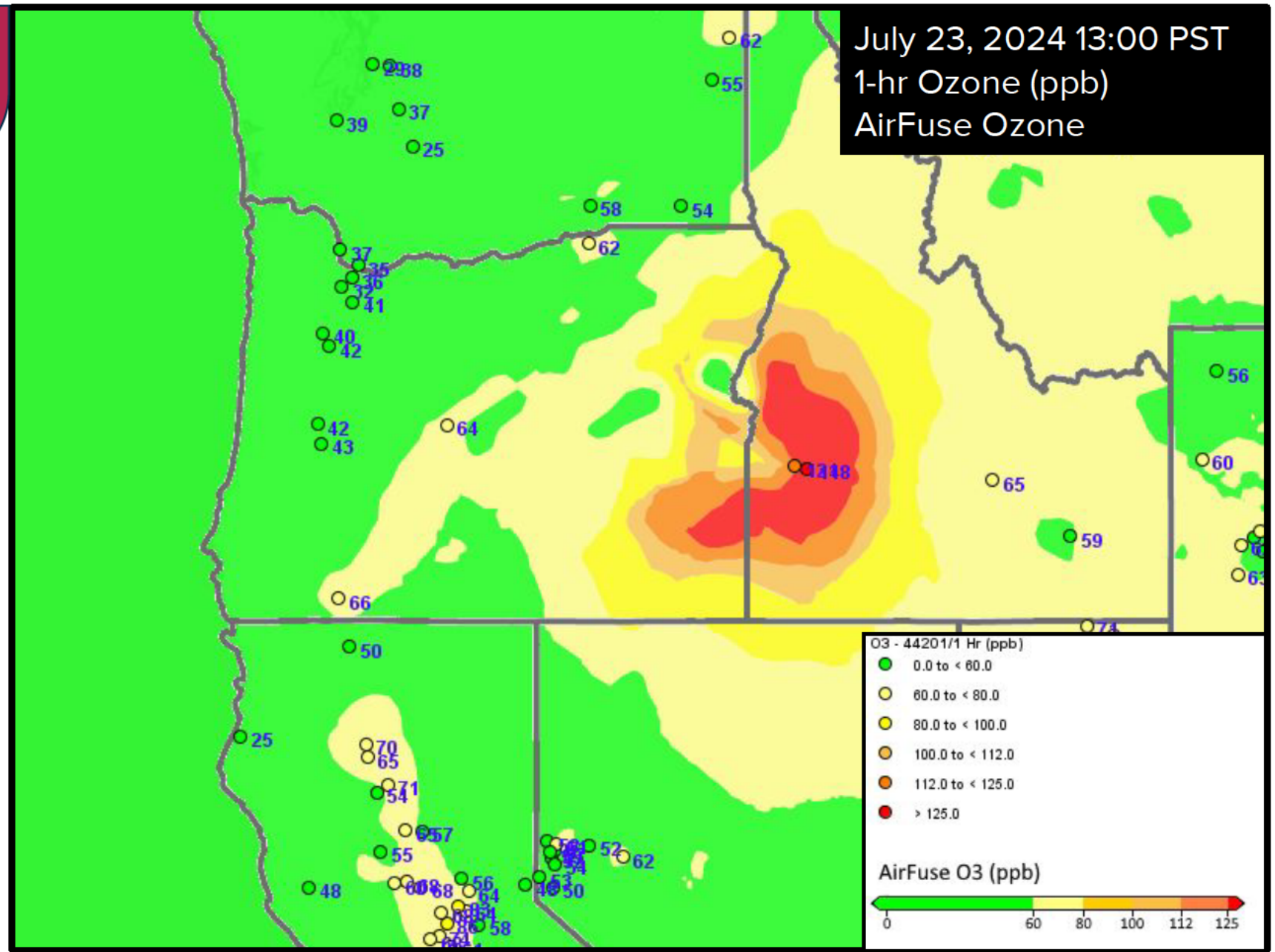


AirFuse PM2.5 layer utilizes PurpleAir and NOAA forecast model data (in addition to AirNow data) to help areas with limited monitor coverage

Case Study 4 – PM2.5 w/ AirFuse – Park Fire (3/3)

Case Study 5 – Ozone Day w/ AirFuse July 23 2024 (1/x)

Demo

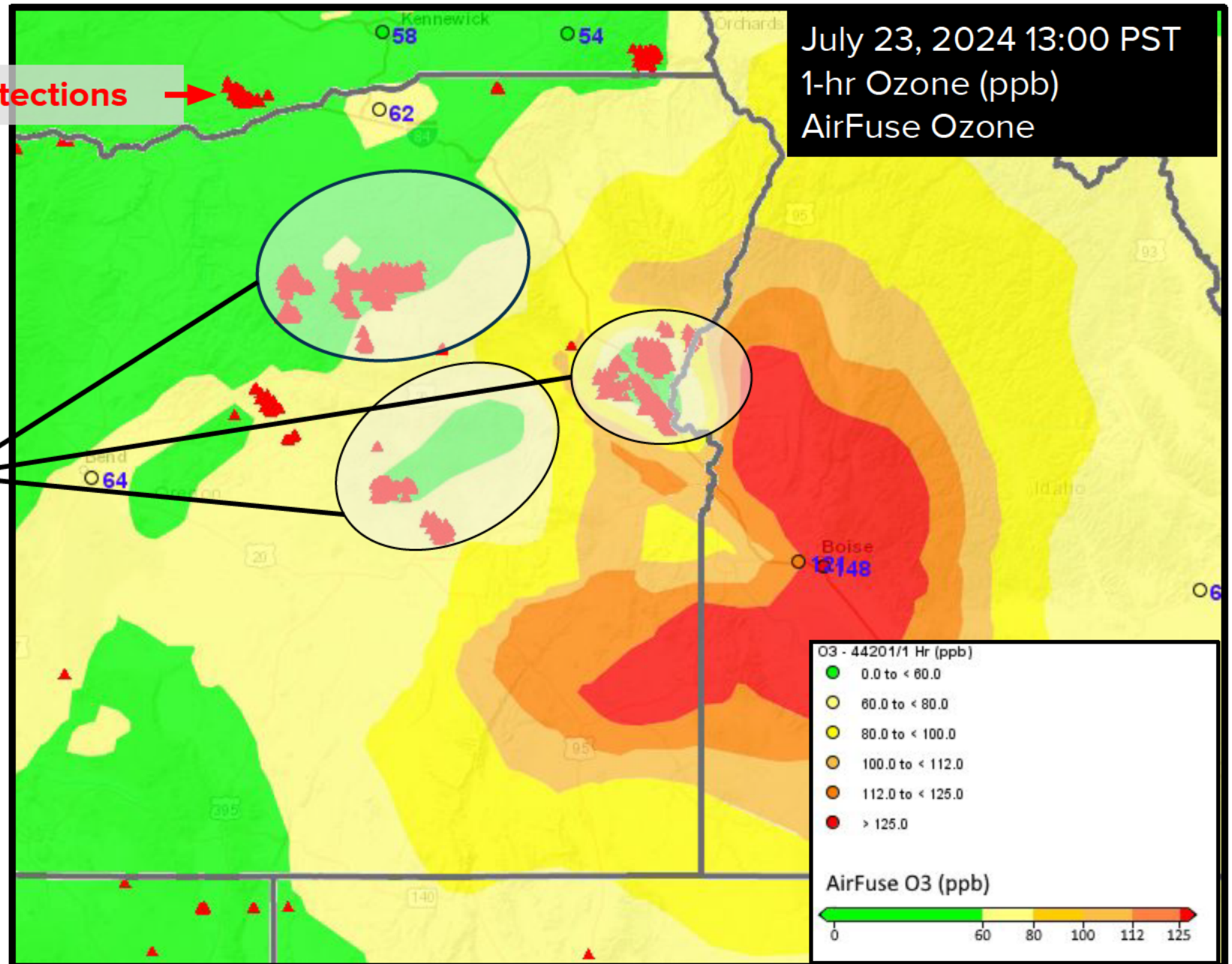


AirFuse Ozone layer utilizes NOAA forecast model data (in addition to AirNow data) to help areas with limited monitor coverage

Case Study 5 – Ozone Day w/ AirFuse July 23 2024 (2/x)

NOAA HMS Fire Detections

Good 1-hour Ozone in areas With active fires and thick smoke (little solar radiation) – AirFuse output in these areas driven by NOAA forecast model



Questions?

Next: Forecasting & EnviroFlash

Part 5: Forecasting & EnviroFlash

- **Reporting Areas & Verification Sites**
  - What is a reporting area?
  - How is that information relayed in public AirNow products?
  - How to create new reporting areas and set verification sites
- **Forecast Submittal System**
  - Setting up a forecast form
  - Submitting a forecast
    - Internal email notifications
  - Forecast queries and verification statistics
- **EnviroFlash**
  - Getting started using EnviroFlash
  - Overview of configuration options
  - X integration

What is a Reporting Area?

- **A region (city, county, general area) defined by SLT's in AirNow used for reporting observations and forecasts**
- **Reporting areas may be chosen/created using existing features (CBSAs, counties), population areas, or areas in close-proximity that experience similar air quality**
  - Examples of some reporting area names in AirNow:
    - "Boston, MA" - City
    - "New York City Region, NY" – Metropolitan area
    - "Wake County, NC" - County
    - "Northwestern Minnesota, MN" - General area of a state
- **AirNow forecasts are issued at the reporting area-level**
- **A large share of AirNow products report observations at the reporting area-level**
  - Individual air quality monitoring sites can be assigned to reporting areas in AirNow-Tech
  - **The highest AQI reading** (not an average) of all assigned monitoring sites is what is reported to a user

Reporting Area product examples

Reporting Area data

- AirNow.gov dial page, recent trends page, and information by state.
- AirNow app – home screen and places tab
- EnviroFlash (forecasts, action days, realtime alerts)
- Forecast point and contour maps
- Certain file products (Reporting Area data file) S3

Creating and Managing Reporting Areas

- **Creation**
  - Reporting area additions can be made by agencies by contacting the AirNow Data Management Center support email - dmc@airnowtech.org
    - **DMC will occasionally make suggestions**, but it needs agency approval.
- **Management**
  - **Verification Sites**: Once the reporting area is created, individual monitoring sites can be assigned as verification sites to the reporting area. This is done via the “Verification Sites” subtab under the Forecasts tab in AirNow-Tech.
    - **Verification sites are considered when reporting AQI observations in reporting area products**
  - **Zip Code Assignments:**
    - Mostly deprecated feature (from previous version of AirNow.gov), but still used in several products
      - Forecast contour maps
      - Forecast guidance determination in Forecast Submittal
    - Plans for improved spatial definition features in the future

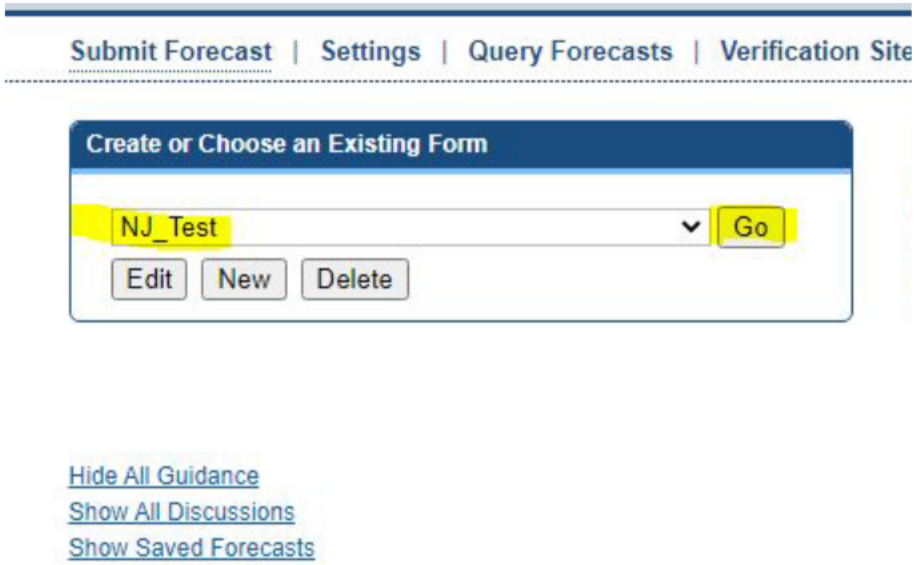
Forecast Submittal System - Overview

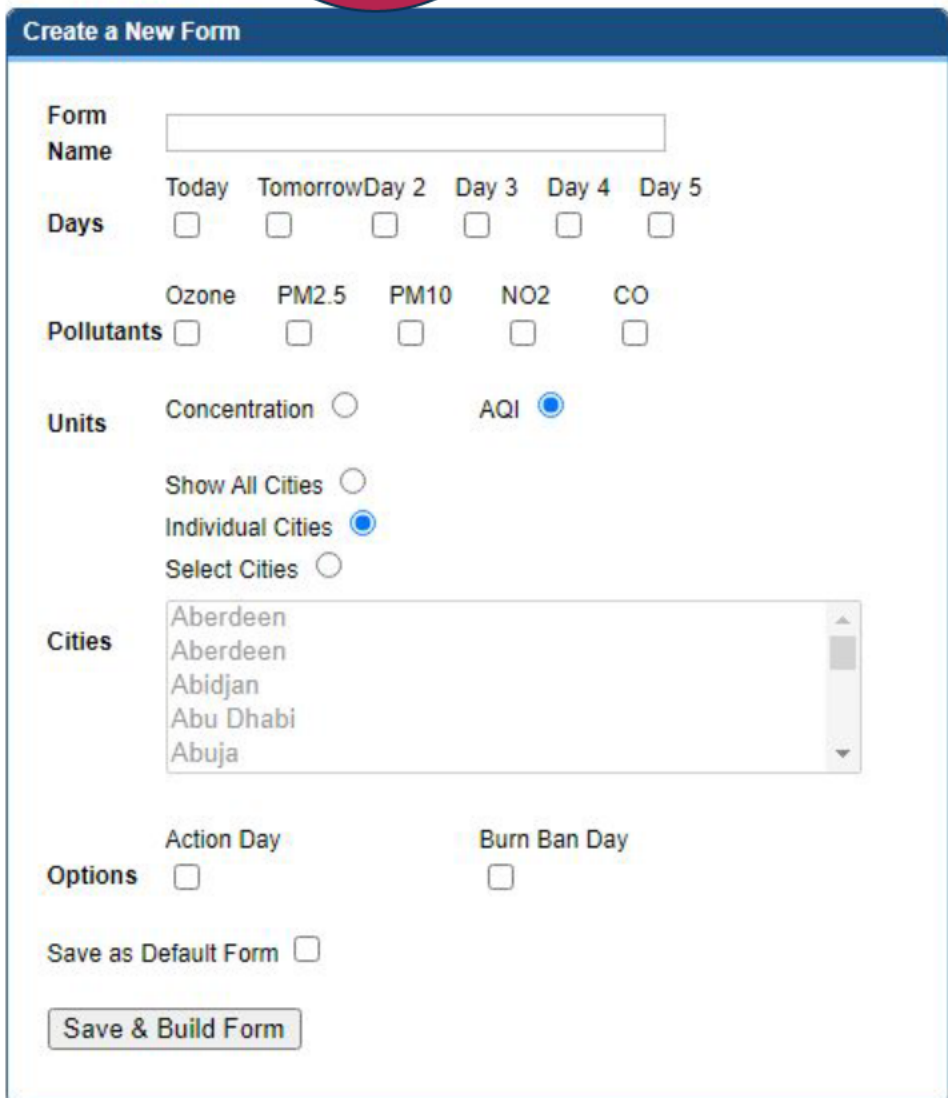
- **The Forecast Submittal System is a set of pages in AirNow-Tech that allow registered users to create and submit forecasts into the AirNow system**
  - Agencies have access to issue forecasts for reporting areas that are associated with their agency
  - Several other utility subpages exist in the forecast section of AirNow-Tech (forecast query and performances pages, verification site management for cities, zip code assignments, etc.)
  - The “Forecaster” user role in AirNow-Tech is required to view the webpages
- **Tutorial Materials:** https://airnowtech.org/fss/tutorials.cfm

Submitting a Forecast (1/2)

Demo

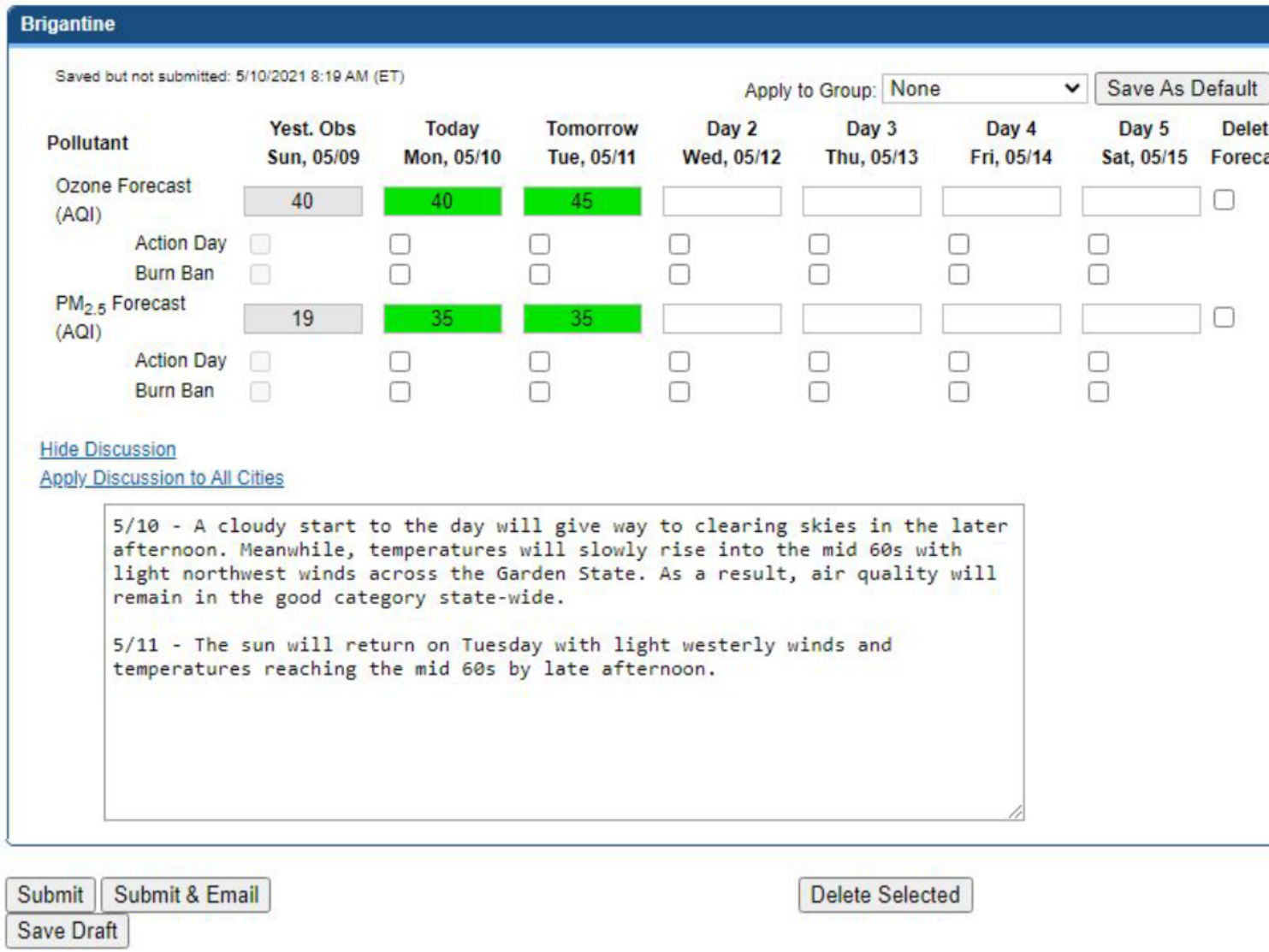
- **Create a new forecast form under the Forecast>Submit Forecast sub-tab**
  - Form settings options shown in image on right. Options for days, pollutants, units, cities, and action/burn days.
- **After Saving & Building the form, choose the form from the drop down and click "Go"**





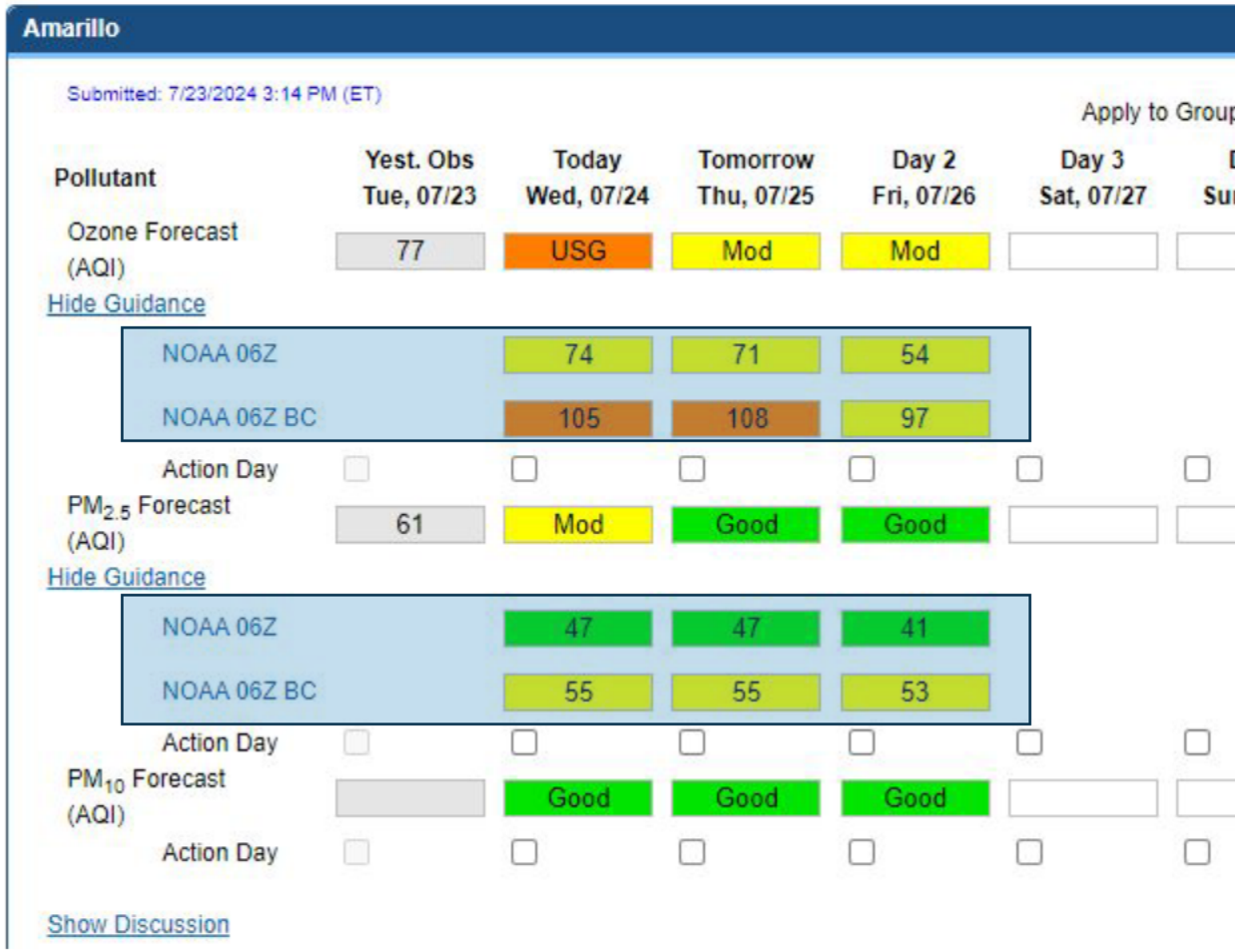
Submitting a Forecast (2/2)

- **Enter in the forecast numbers and add a discussion if desired.**
- **"Save Draft"**
  - Saves the forecast without submitting in case the forecaster needs to come back later to complete.
- **"Submit"**
  - Submits forecast to AirNow system.
- **"Submit & Email"**
  - Submits forecast to AirNow system and and notifies AN-T users in the agency email group (Not EnviroFlash)



Forecast Model Guidance

- **AirNow provides daily AQI model guidance from the NOAA air quality model**
  - Prerequisite: The reporting area must have at least one assigned zip code
- **Current model guidance availability**
  - Ozone 06Z – Standard and Bias-Corrected (“BC”)
  - Ozone 12Z – Standard and Bias-Corrected (“BC”)
  - PM2.5 06Z – Standard and Bias-Corrected (“BC”)
  - PM2.5 12Z – Standard and Bias-Corrected (“BC”)
  - Note: 12Z model output is typically not available until the early afternoon eastern time



Questions?

Next: Additional Forecast Settings & Queries

Default Forecasts

Demo

- **Configured in the Forecasts>Settings subtab**
- **Default forecasts are issued at 9:15 pm UTC (5:15 pm EDT, 4:15 pm EST). For a default forecast to be issued**
  - The city must have default forecasts enabled for the city and pollutant
  - If choosing to use an AQI number or AQI category, a number/category must be chosen
  - NOAA model option currently only available for ozone and PM2.5

Additional Forecast Settings

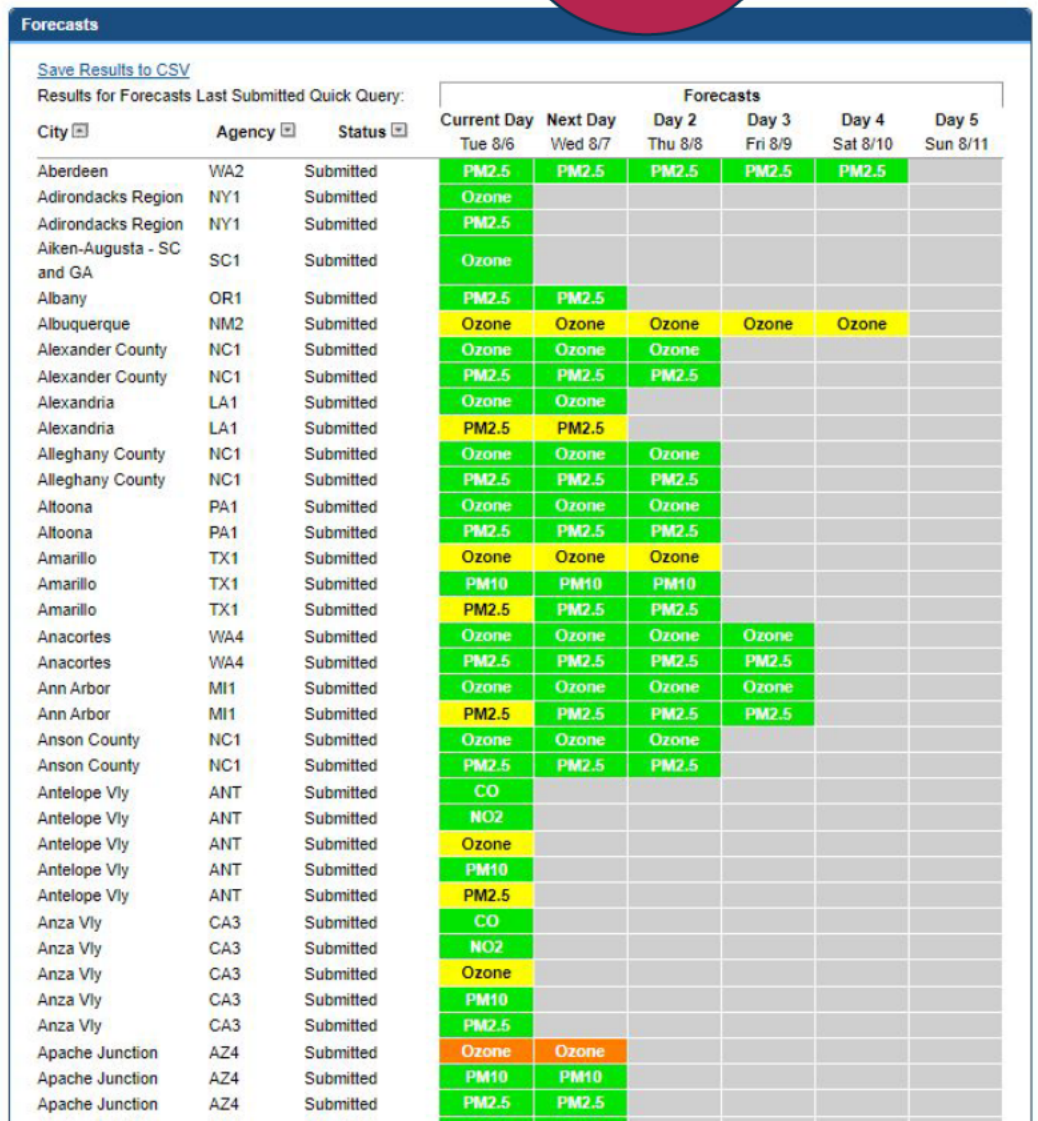
Demo

- **Creating City Groups**
  - City group creation allows users to enter in a single forecast and have it applied to many forecast cities.
- **Email Lists/Settings**
  - Users can set up internal email list to relevant AirNow-Tech users whenever a forecast is issued. Options on what to include in the email are provided as well.

Forecast Query page

- **Quick Queries**
  - Agencies who have not issued a forecast today
  - Todays forecast
  - Most Recent submitted forecasts
  - Cities with action days
- **Custom Queries**
  - Dynamic filters
- **Running a query & exporting results**

Demo



Forecasts

Save Results to CSV

Results for Forecasts Last Submitted Quick Query:

City	Agency	Status	Forecasts: Current Day Tue 8/6	Next Day Wed 8/7	Day 2 Thu 8/8	Day 3 Fri 8/9	Day 4 Sat 8/10	Day 5 Sun 8/11
Aberdeen	WA2	Submitted	PM2.5	PM2.5	PM2.5	PM2.5	PM2.5	
Adirondacks Region	NY1	Submitted	Ozone					
Adirondacks Region	NY1	Submitted	PM2.5					
Aiken-Augusta - SC and GA	SC1	Submitted	Ozone					
Albany	OR1	Submitted	PM2.5	PM2.5				
Albuquerque	NM2	Submitted	Ozone	Ozone	Ozone	Ozone	Ozone	
Alexander County	NC1	Submitted	Ozone	Ozone	Ozone			
Alexander County	NC1	Submitted	PM2.5	PM2.5	PM2.5			
Alexandria	LA1	Submitted	Ozone	Ozone				
Alexandria	LA1	Submitted	PM2.5	PM2.5				
Alleghany County	NC1	Submitted	Ozone	Ozone	Ozone			
Alleghany County	NC1	Submitted	PM2.5	PM2.5	PM2.5			
Altoona	PA1	Submitted	Ozone	Ozone	Ozone			
Altoona	PA1	Submitted	PM2.5	PM2.5	PM2.5			
Amarillo	TX1	Submitted	Ozone	Ozone	Ozone			
Amarillo	TX1	Submitted	PM10	PM10	PM10			
Amarillo	TX1	Submitted	PM2.5	PM2.5	PM2.5			
Anacortes	WA4	Submitted	Ozone	Ozone	Ozone	Ozone		
Anacortes	WA4	Submitted	PM2.5	PM2.5	PM2.5	PM2.5		
Ann Arbor	MI1	Submitted	Ozone	Ozone	Ozone	Ozone		
Ann Arbor	MI1	Submitted	PM2.5	PM2.5	PM2.5	PM2.5		
Anson County	NC1	Submitted	Ozone	Ozone	Ozone			
Anson County	NC1	Submitted	PM2.5	PM2.5	PM2.5			
Antelope Vly	ANT	Submitted	CO					
Antelope Vly	ANT	Submitted	NO2					
Antelope Vly	ANT	Submitted	Ozone					
Antelope Vly	ANT	Submitted	PM10					
Antelope Vly	ANT	Submitted	PM2.5					
Anza Vly	CA3	Submitted	CO					
Anza Vly	CA3	Submitted	NO2					
Anza Vly	CA3	Submitted	Ozone					
Anza Vly	CA3	Submitted	PM10					
Anza Vly	CA3	Submitted	PM2.5					
Apache Junction	AZ4	Submitted	Ozone	Ozone				
Apache Junction	AZ4	Submitted	PM10	PM10				
Apache Junction	AZ4	Submitted	PM2.5	PM2.5				

Forecast Verification Page

Demo

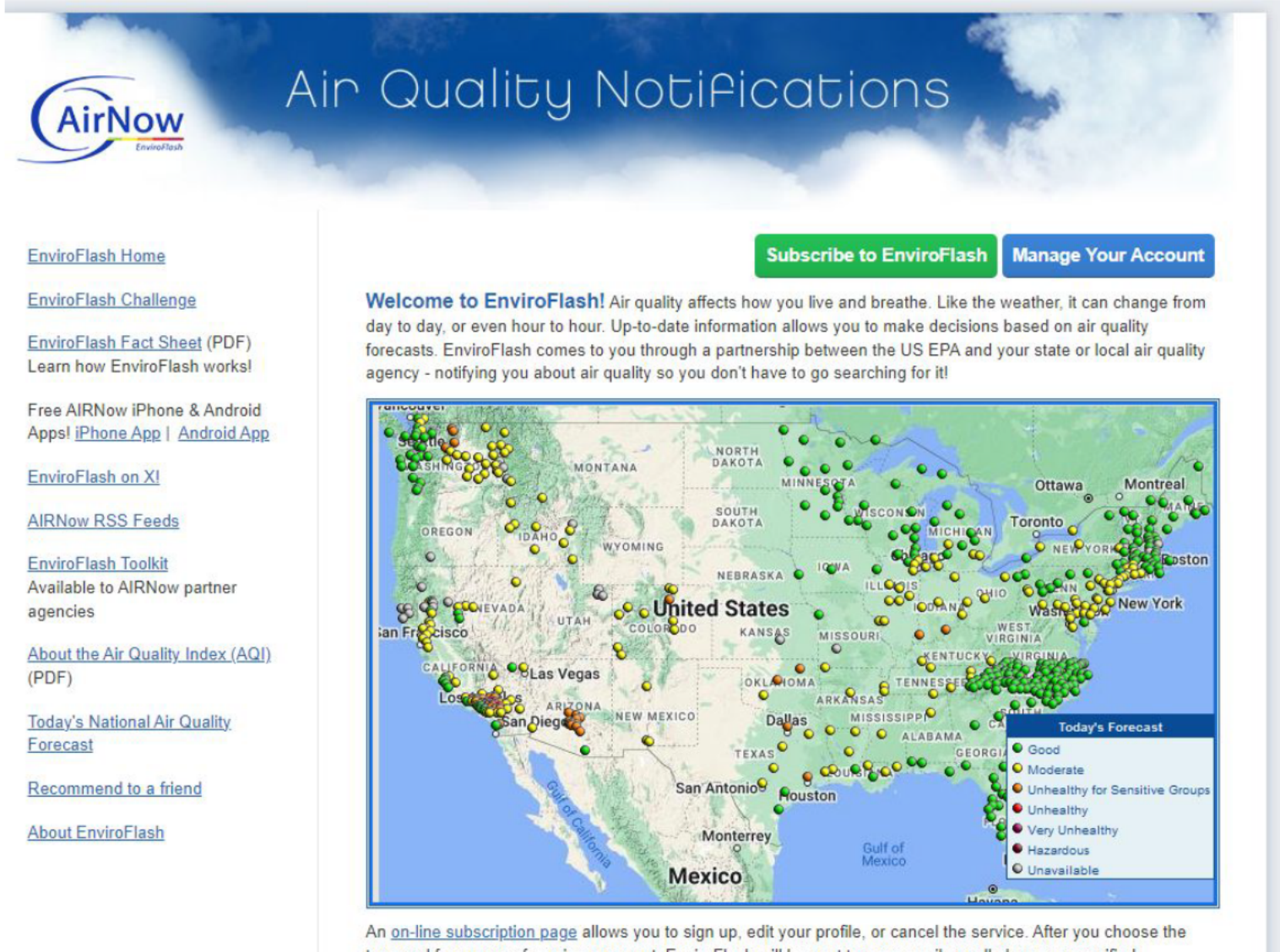
- **Assess forecasts submitted by agency**
  - Threshold Statistics
    - **Bias** – Indicates, on average, if the forecasts are underpredicted or overpredicted.
      - Value near 1 is ideal. Underpredicting – value < 1. Overpredicting – value > 1
    - **False Alarm Rate** (FAR) - Instances (%) with a forecast above the threshold and observation below the threshold
      - Smaller values are best.
        - 0 = perfect forecast of high events.
        - 50 = half of the forecasts for high events did not occur.
    - **Critical Success Index** (CSI) - How well high-pollution events were predicted (%). Unaffected by correctly forecasted, lowpollution events.
      - Higher values are best
    - **Probability of Detection** (POD) - Of observations above the threshold, how many (%) were correctly forecasted.
      - Higher values are best
    - **Skill** - Improvement (%) of a forecast with respect to a reference forecast.
      - No improvement over the reference forecast – value = 0. Significant skill improvement – value of ≥ 50%

Questions?

Next: EnviroFlash

EnviroFlash – AirNow-Tech

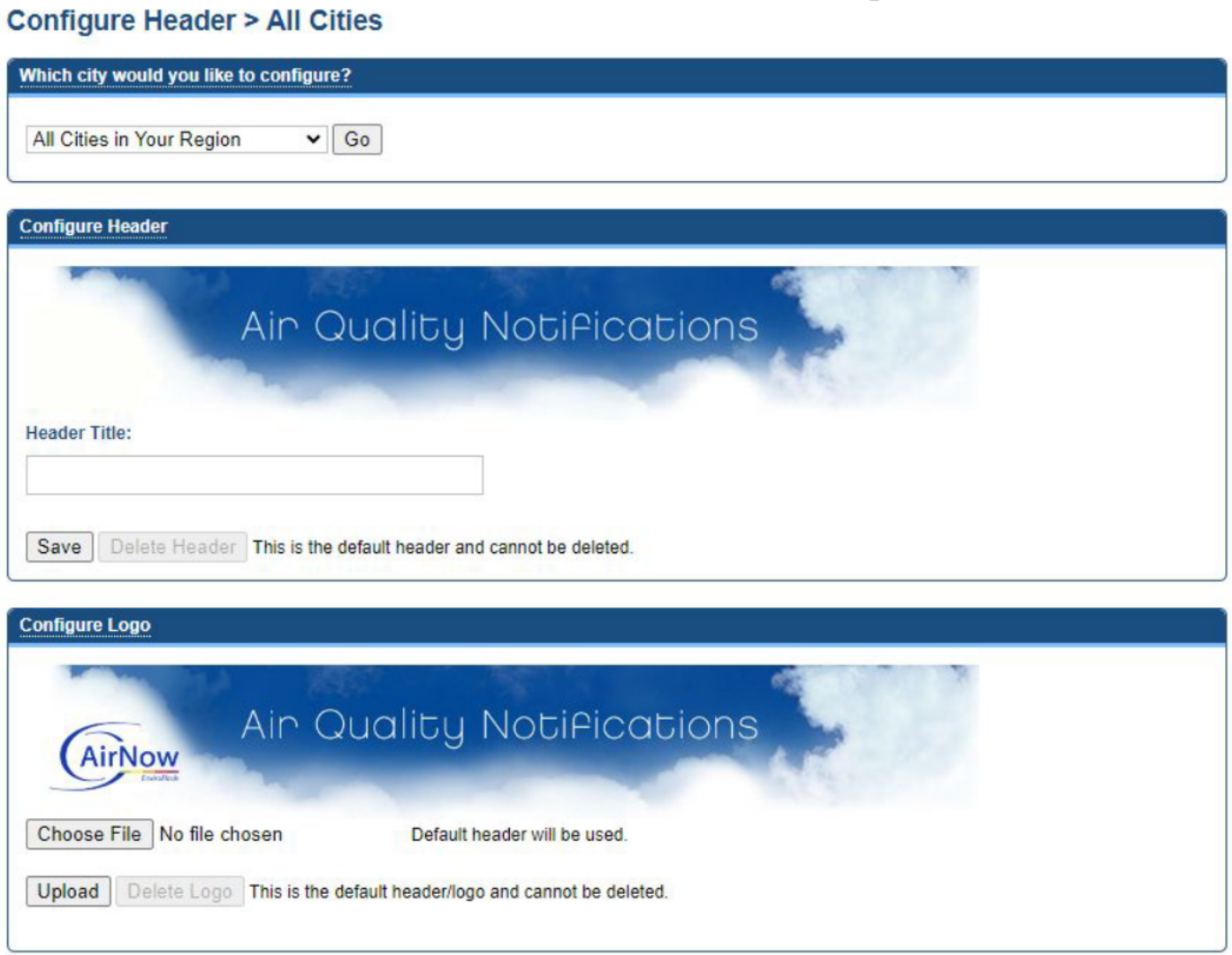
- **Opt-in public email notification system for agencies participating in AirNow**
  - Forecast (& Action Day) emails
  - Realtime conditions emails
  - Manual emails
- **Public signup website:** https://www.enviroflash.info/
- **Initial EnviroFlash setup**
  - Requests by agencies to be sent to dmc@airnowtech.org
  - EnviroFlash and Email configuration settings in AirNow-Tech
    - **EnviroFlash user role required**



EnviroFlash ANT – Configure Header

Demo

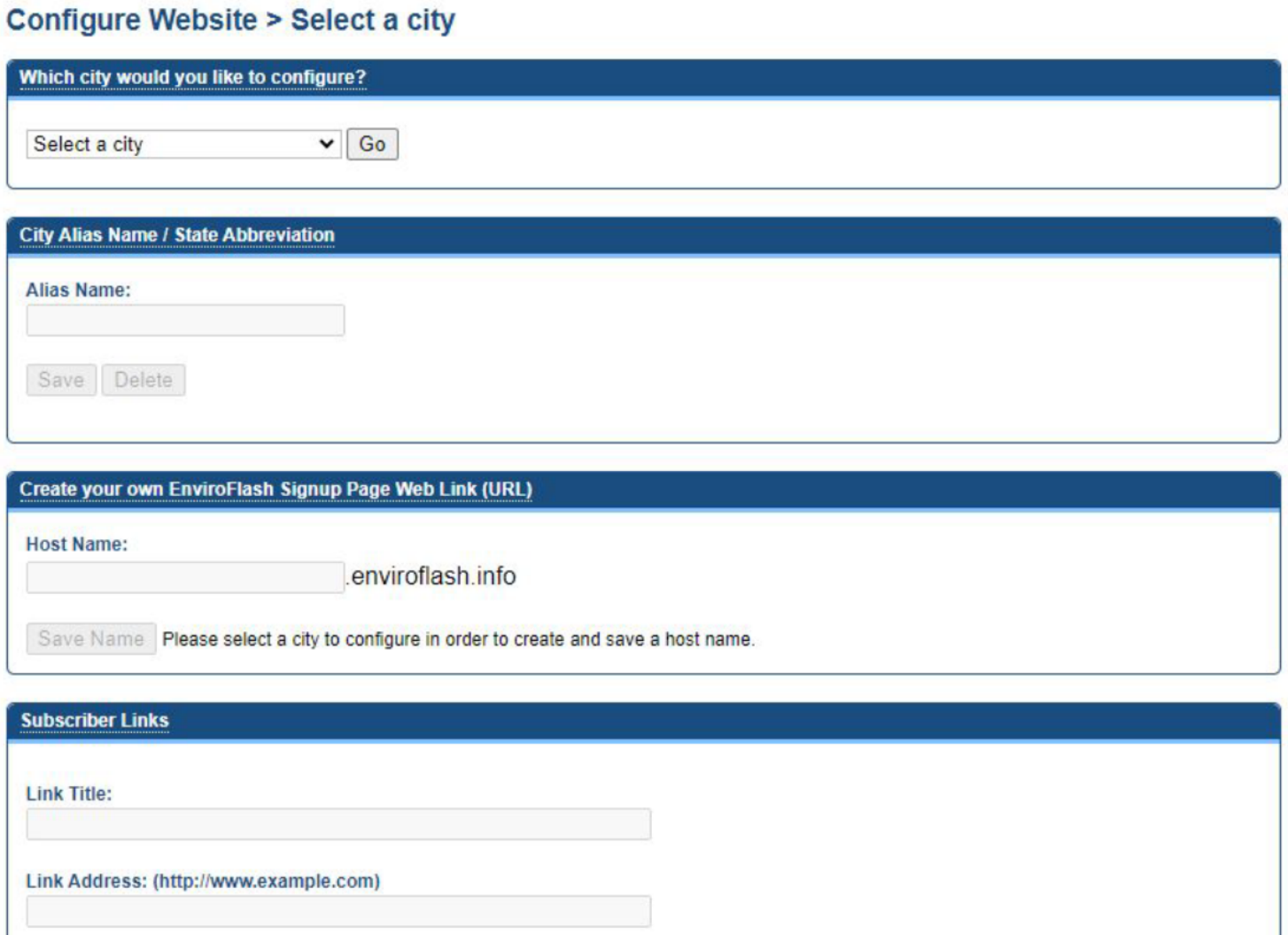
- **By reporting area, configure**
  - Header text within emails
  - Agency logo



EnviroFlash ANT – Configure Website

Demo

- **Create custom signup website with unique prefix**
  - [prefix.enviroflash.info]
  - Add agency-specific links and files



EnviroFlash ANT – Configure Website

Demo

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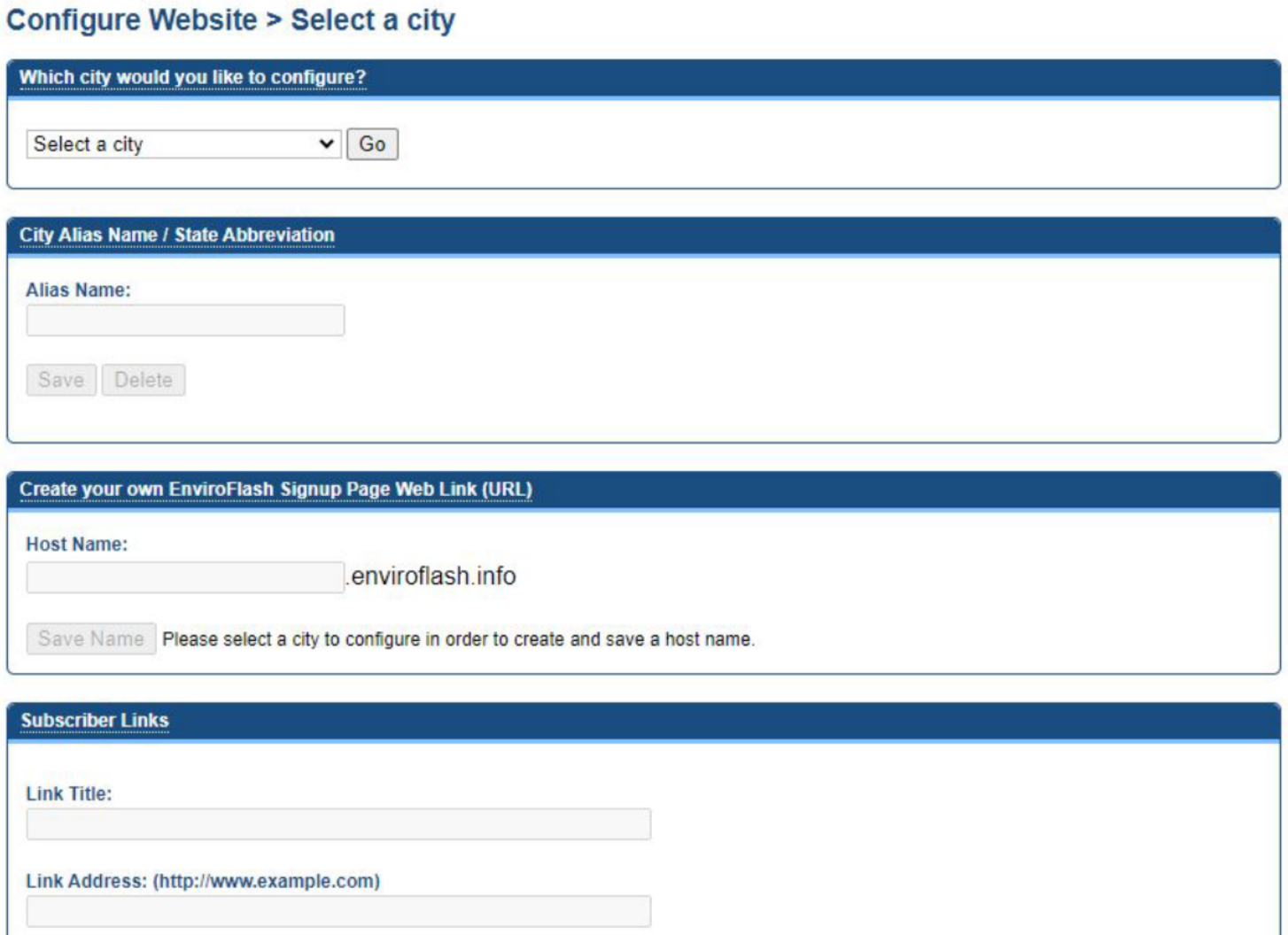
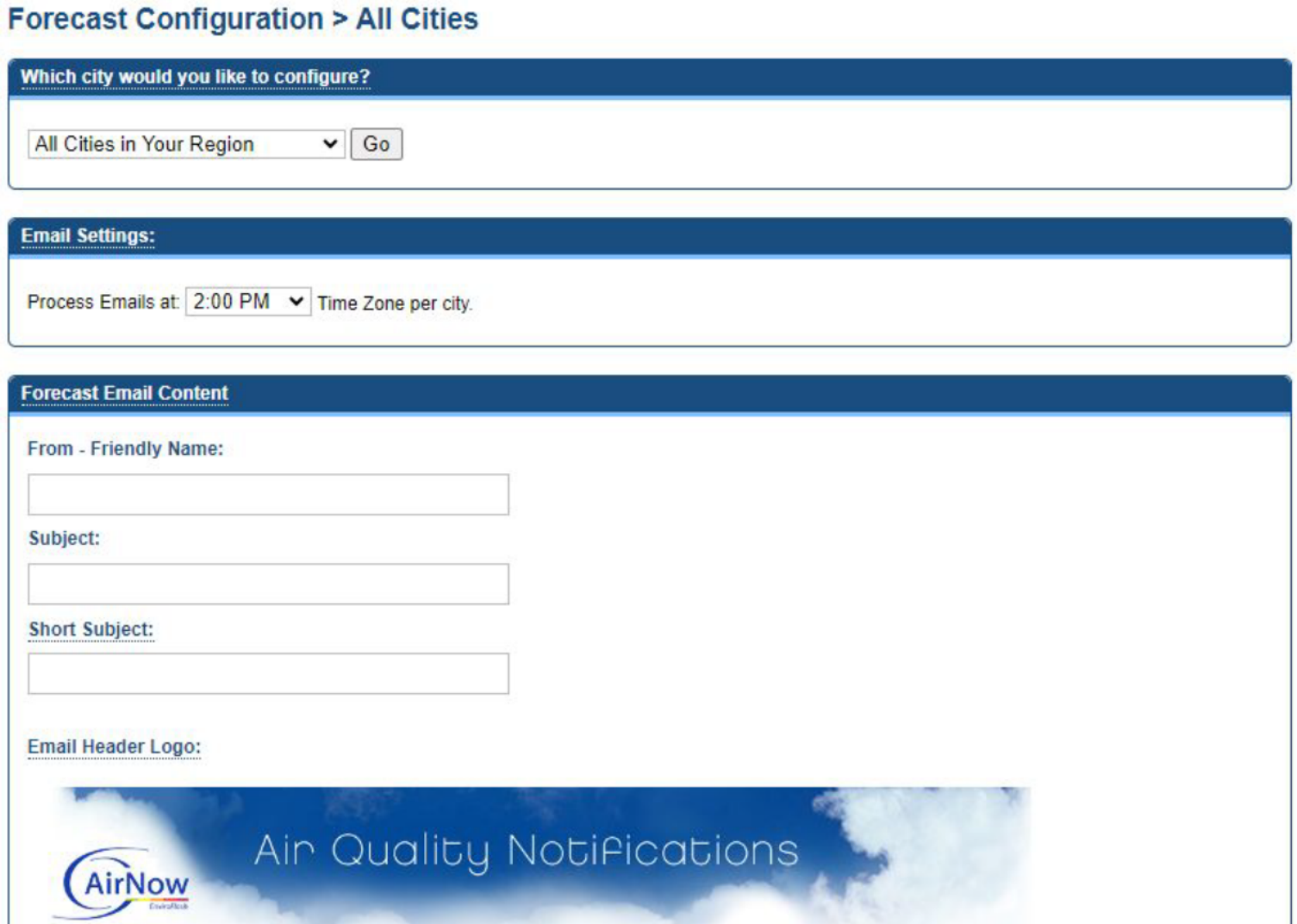


EnviroFlash ANT – Configure Forecast, Action Day, Realtime, and Manual emails

Demo

- **Customize email sendouts and content**
  - Choose forecast email daily send out time
  - Set an approval email for Action Day and Realtime emails
  - Configure email specifics
    - From/Reply To
    - Forecast data included
    - Health messaging
    - Additional links/messaging
  - Send a manual email to subscribers
  - X/Twitter integrations



EnviroFlash ANT – Configure Social Media

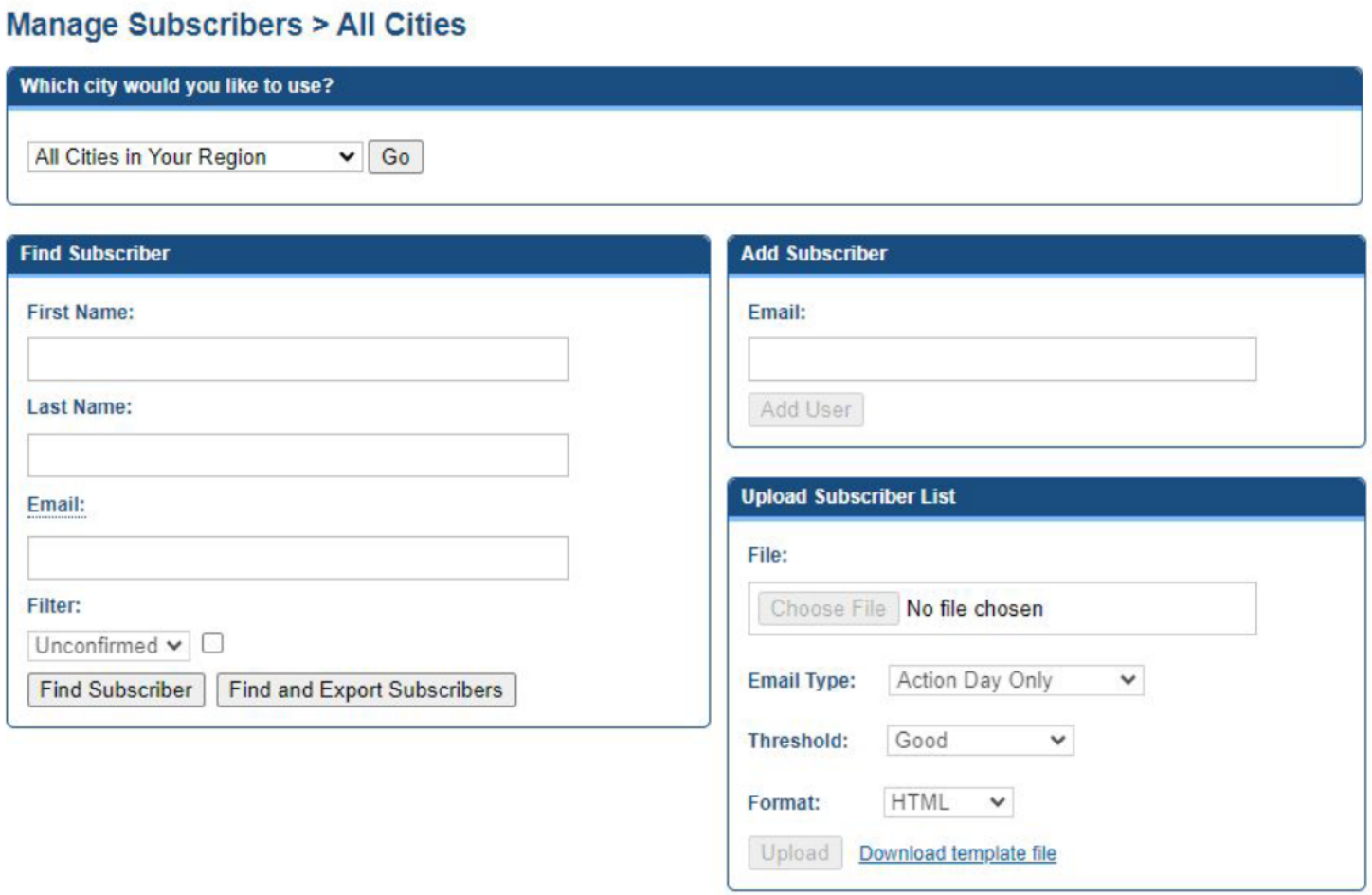
Demo

- **Link an X/Twitter account**
  - After linking, add accounts to specific email triggers from the Forecast, Action Day, or Realtime email configuration tabs.

EnviroFlash ANT – Manage Subscribers

Demo

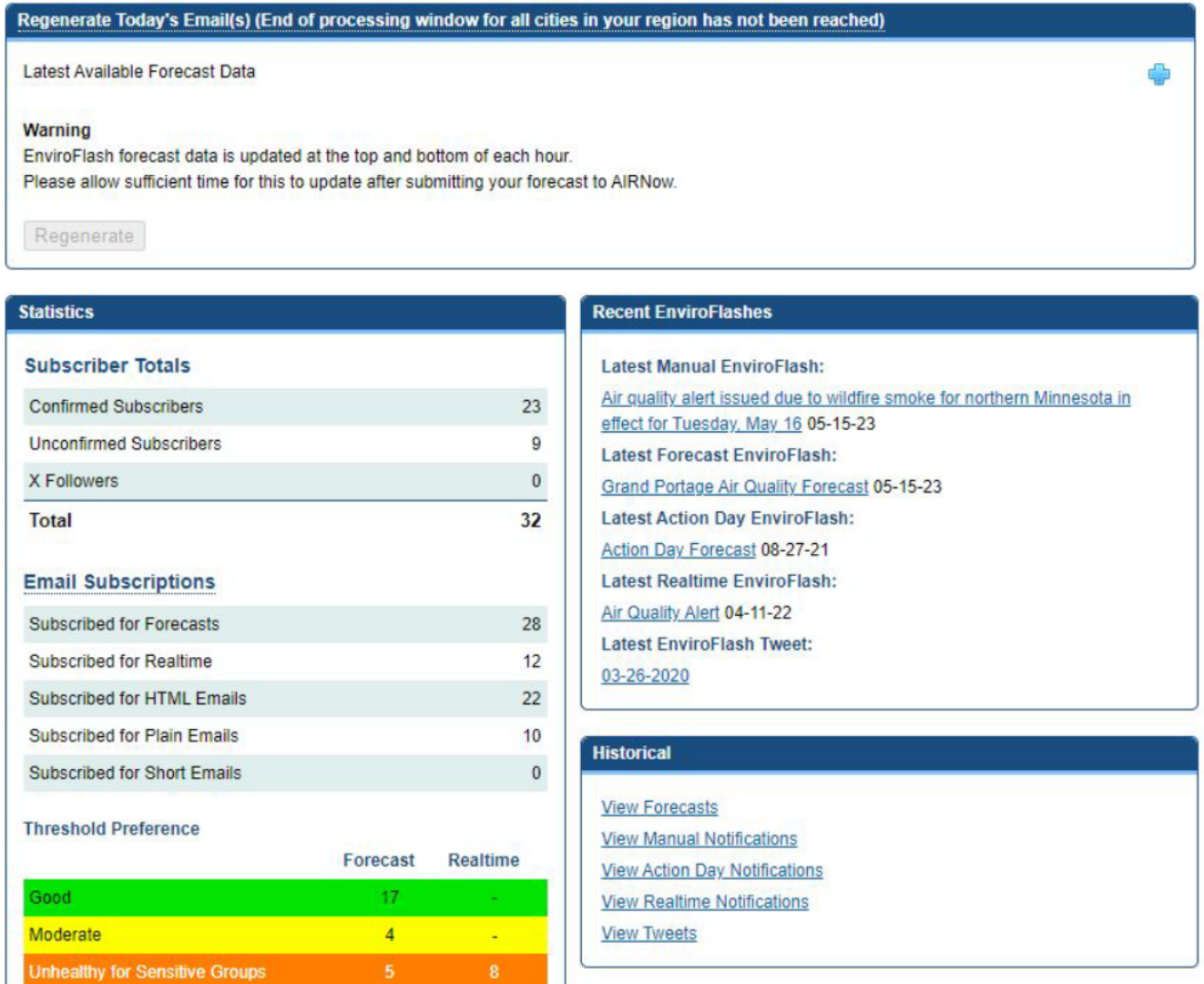
- **View subscriber information by reporting area**
  - Search subscribers
  - Manually add a subscriber
  - Upload a large subscriber list



EnviroFlash ANT – Current Status

Demo

- **View EnviroFlash statistics by reporting area**
  - Pending EnviroFlashes (if approval email is set)
  - Option to regenerate todays forecast email
  - Subscriber statistics by date range
  - Recent email sendouts
  - Sendout email history



Regenerate Today's Email(s) (End of processing window for all cities in your region has not been reached)

Latest Available Forecast Data

Warning
EnviroFlash forecast data is updated at the top and bottom of each hour.
Please allow sufficient time for this to update after submitting your forecast to AIRNow.

Regenerate

Statistics

Subscriber Totals

Confirmed Subscribers	23
Unconfirmed Subscribers	9
X Followers	0
Total	**32**

Email Subscriptions

Subscribed for Forecasts	28
Subscribed for Realtime	12
Subscribed for HTML Emails	22
Subscribed for Plain Emails	10
Subscribed for Short Emails	0

Threshold Preference

	Forecast	Realtime
Good	17	-
Moderate	4	-
Unhealthy for Sensitive Groups	5	8

Recent EnviroFlashes

Latest Manual EnviroFlash:
Air quality alert issued due to wildfire smoke for northern Minnesota in effect for Tuesday, May 16 05-15-23
Latest Forecast EnviroFlash:
Grand Portage Air Quality Forecast 05-15-23
Latest Action Day EnviroFlash:
Action Day Forecast 08-27-21
Latest Realtime EnviroFlash:
Air Quality Alert 04-11-22
Latest EnviroFlash Tweet:
03-26-2020

Historical

View Forecasts
View Manual Notifications
View Action Day Notifications
View Realtime Notifications
View Tweets

Questions?

Next: Wrap-up

Wrap-up/Conclusion

- Opportunities for 1-on-1 training/discussion
- Other notable AirNow sessions at NAAMC
  - Wednesday 2:50pm – AirNow Fire & Smoke Map
  - Thursday 11:00am - OAQPS's Consolidated Data Platform

Contact info

- **Marcus Hylton - TD Environmental Services**
  - AirNow Data Management Center (DMC) Lead
  - Marcus.Hylton@TDEnviro.com
  - dmc@airnowtech.org – For general AirNow technical support