

# Wintertime PM in Utah

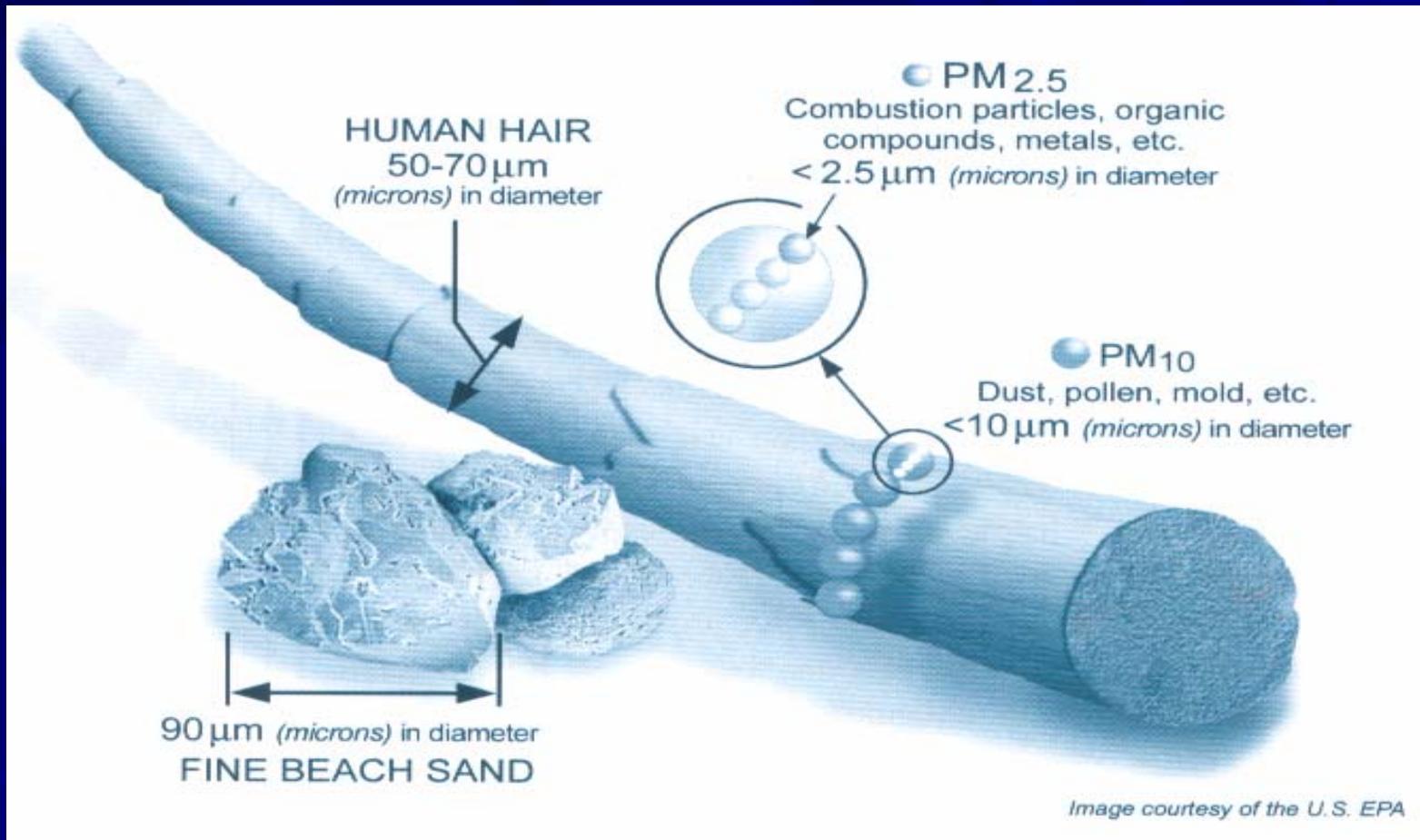


- Utah's mountain valleys and wintertime temperature inversions provide ideal conditions for the formation of fine particulate.
- PM<sub>2.5</sub> Concentrations build as temperature inversions persist.
- Utah will need to develop State Implementation Plans to meet revised federal Health Standards for PM<sub>2.5</sub>

# Background

- The Clean Air Act identifies 6 criteria pollutants (CO, Lead, NO<sub>2</sub>, Ozone, Particulate Matter, SO<sub>2</sub>)
- Establishes National Ambient Air Quality Standards (NAAQS) for each in order to protect public health
- UDAQ monitors the air to determine whether or not Utah is meeting these standards

# Particles



Fine Particles lodge deeply into the lungs, and are associated with serious health problems, including heart and lung diseases, and premature death.

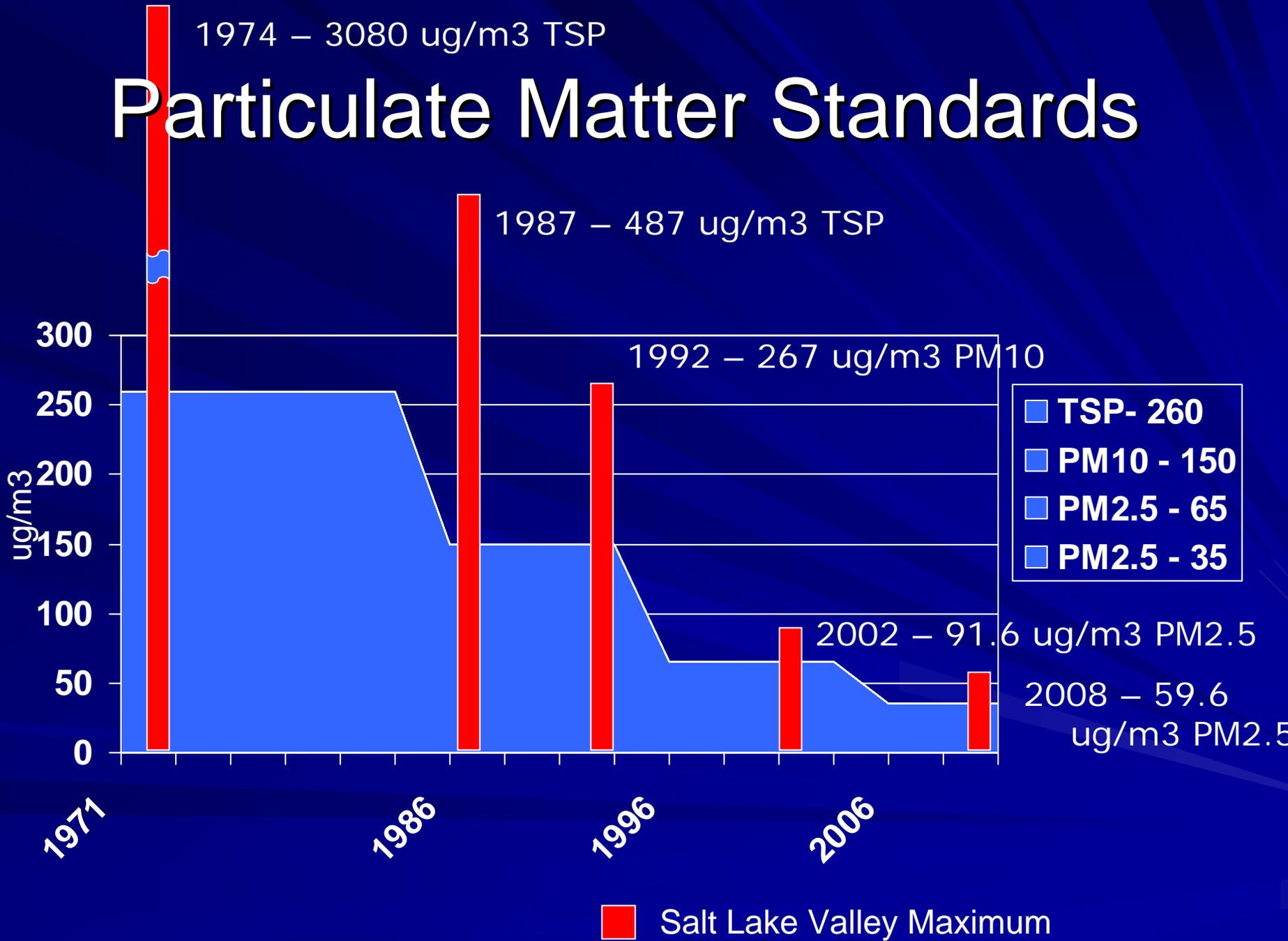
# PM2.5 in Utah

- Most of Utah's Wintertime Particulate is Fine Particulate, or PM2.5
- Most of Utah's PM2.5 is "Secondary" PM
- This Wintertime Smog develops in, and is trapped by, mountain valleys and temperature inversions

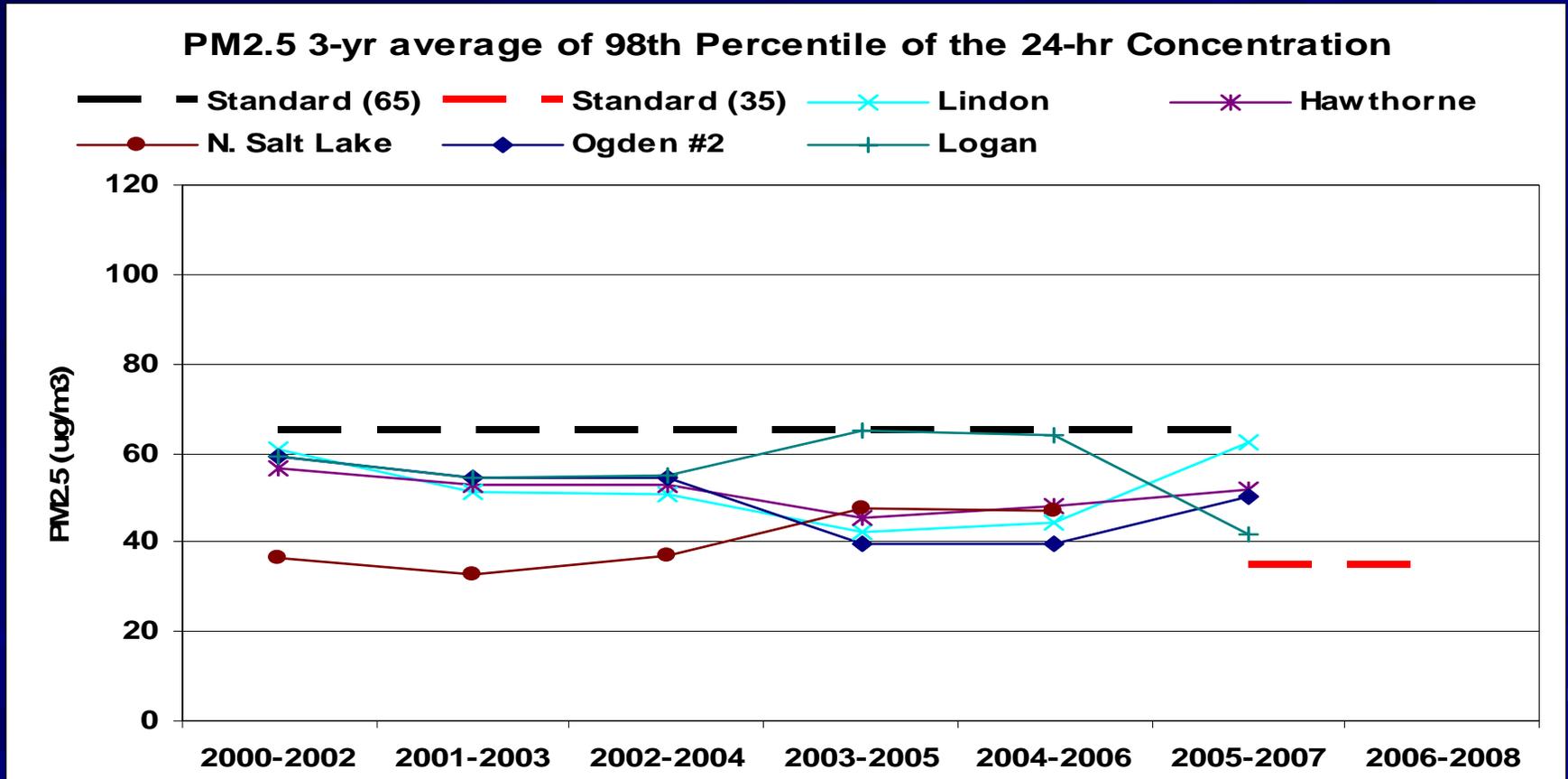
# Revised NAAQS for PM<sub>2.5</sub>

- EPA revised the NAAQS for PM<sub>2.5</sub> in December of 2006
  - 24-hr standard was lowered from 65 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) to  $35 \mu\text{g}/\text{m}^3$
  - Annual standard was retained at  $15 \mu\text{g}/\text{m}^3$
  - Retained the 24-hr standard for PM<sub>10</sub> at  $150 \mu\text{g}/\text{m}^3$

# Particulate Matter Standards



# Monitored levels of PM2.5

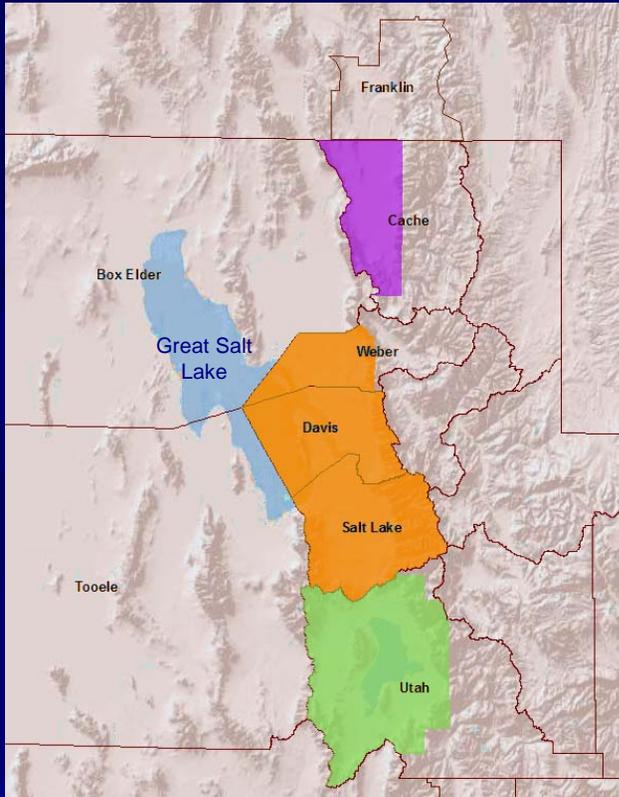


# Timeline

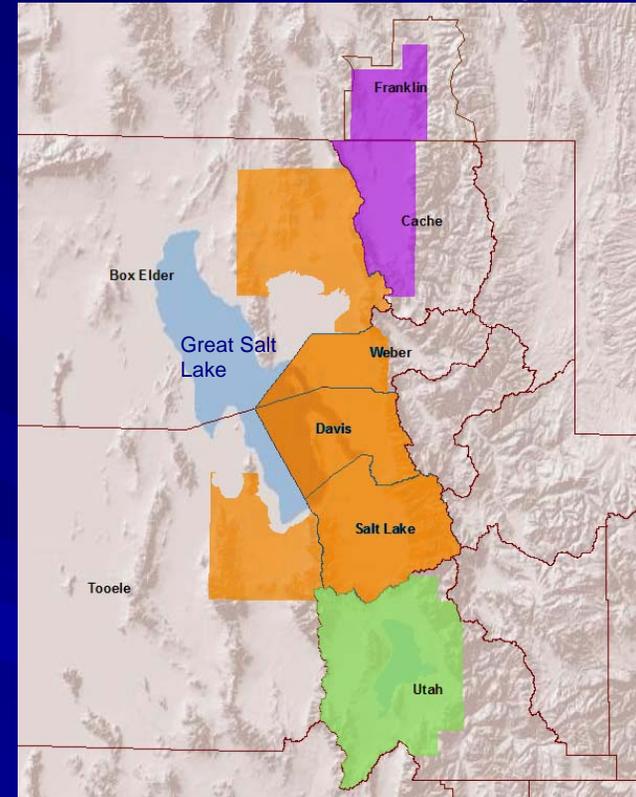
- The Clean Air Act lays out a 5-year process from revision of the standard to completion of a State Implementation Plan (SIP)
- The First 2 years are used to define the area boundaries
  - Year 1: The State makes a recommendation to EPA
  - Year 2: The EPA makes the final designations
- The next 3 years are used to develop the SIP

# PM2.5 Area Designations

Utah's Recommendation



EPA's Proposed Final Designation



- UDAQ has completed its work on area designations for PM2.5 and the Governor submitted Utah's recommendations to EPA
- UDAQ based its recommendation on a technical evaluation of local data
- EPA considered Utah's recommendation, but expanded the areas

# Current Status

- EPA has not published its findings in the Federal Register, meaning:
  - there is still no effective date, and
  - none of the clocks are ticking just yet, giving UDAQ more time to develop and implement strategies to reduce pollution
  - SIP will be due 3 years after the effective date
- Even though the clocks are not ticking, UDAQ has been working on a PM<sub>2.5</sub> SIP

# State Implementation Plan

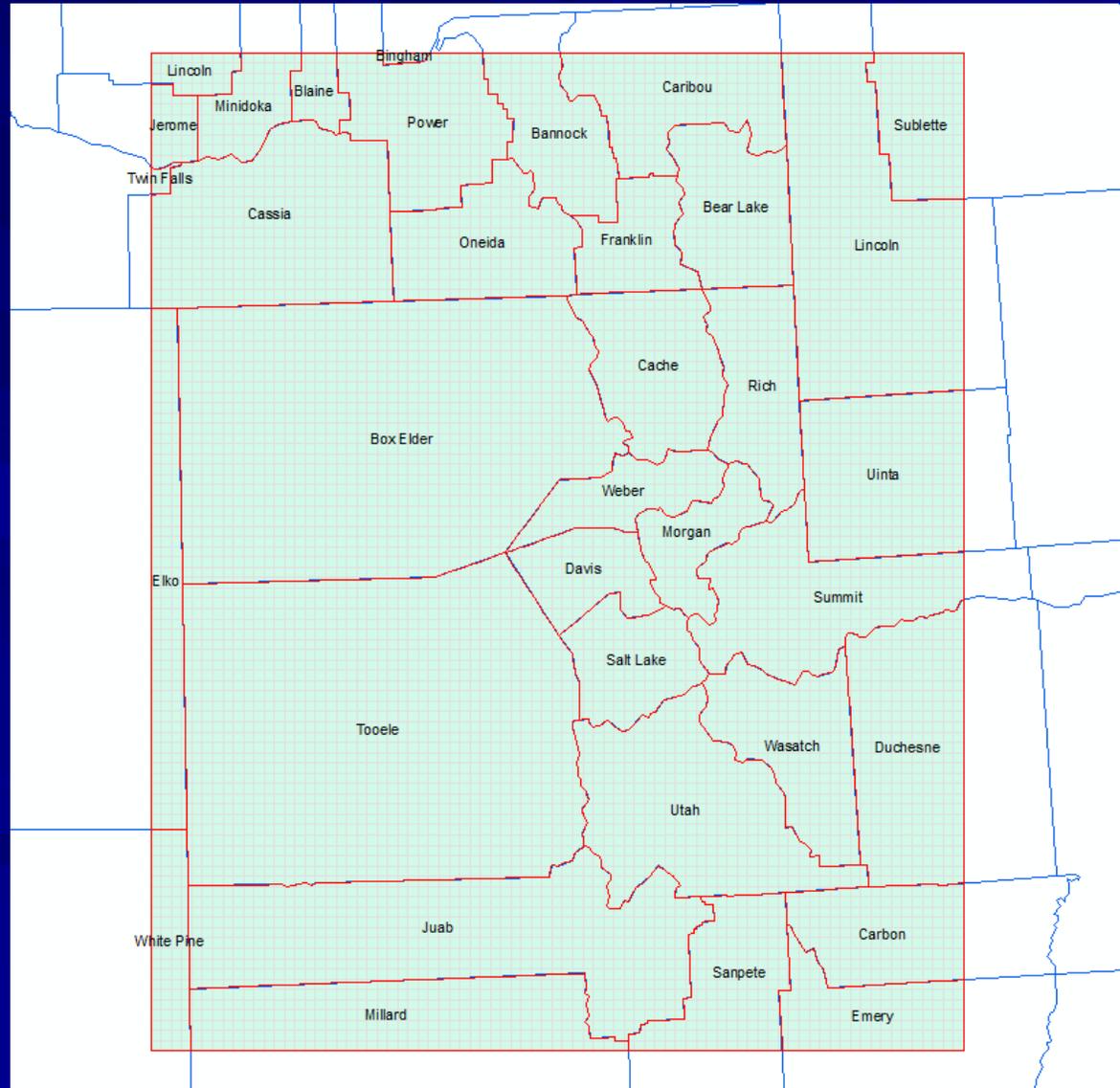
- Essentially a 3-year process
- Basic Project Phases include:
  - **Model Validation**
    - Includes Episode Selection, Inventories, Meteorological Data
  - **Control Strategy Testing / Development**
    - Sensitivity runs to Identify Targets
    - Identification of Possible Controls
    - Projection Inventories are tested in the model
  - **Administrative**
    - SIP writing & processing
    - Emission Limits
    - Technical Documentation
    - Associated Rulemakings

# Early SIP Work

- Phase I – Model Validation
- Work is already underway to develop the Air Quality Model used to support the SIP
  - Modeling Domain includes most of Northern Utah
  - Simulates the chemical and physical processes important to PM<sub>2.5</sub> (and ozone) formation
  - Will ultimately be the tool for evaluating the effectiveness of possible control strategies

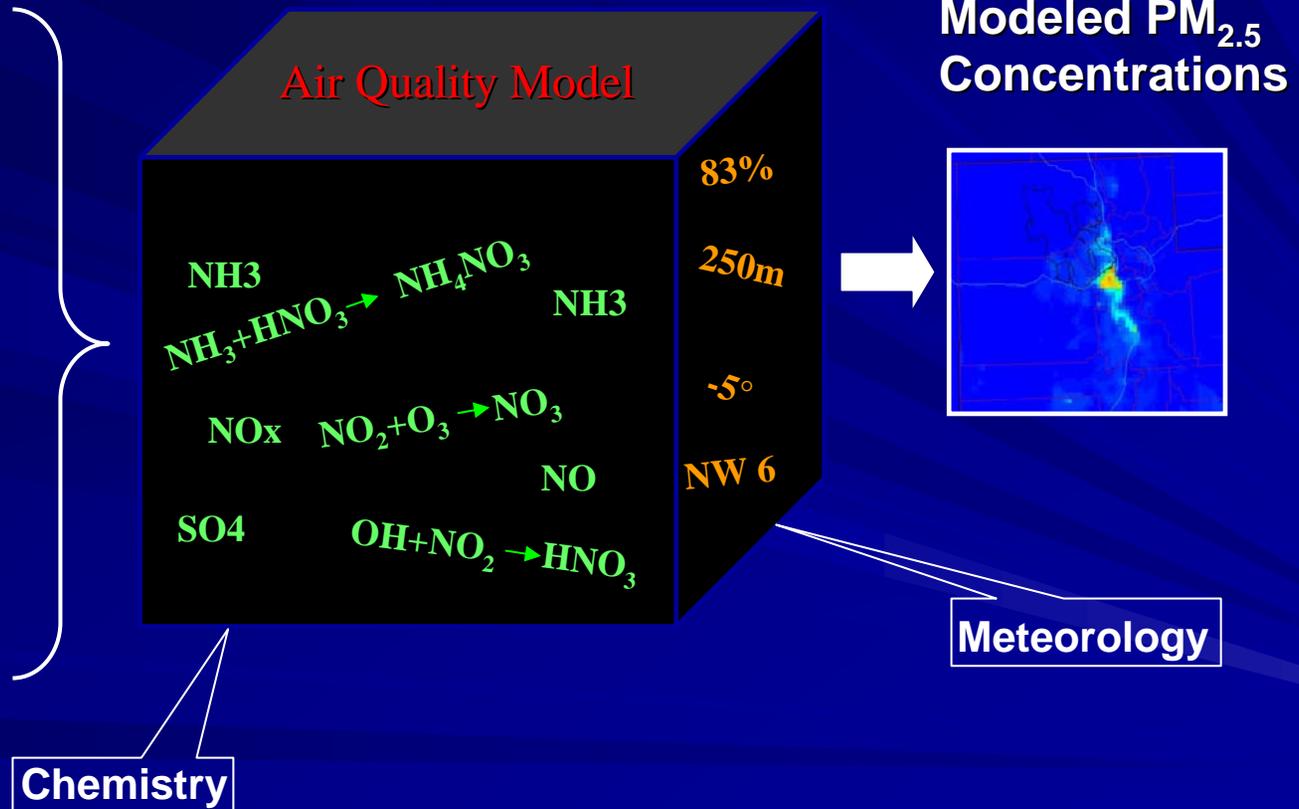
# CMAQ Modeling Domain

- **Grid-based Regional Scale Model**
- **Simulates Atmospheric Chemistry & Dispersion**
- **Input Hourly Emissions & Meteorology**
- **Outputs Hourly Gridded Concentrations**



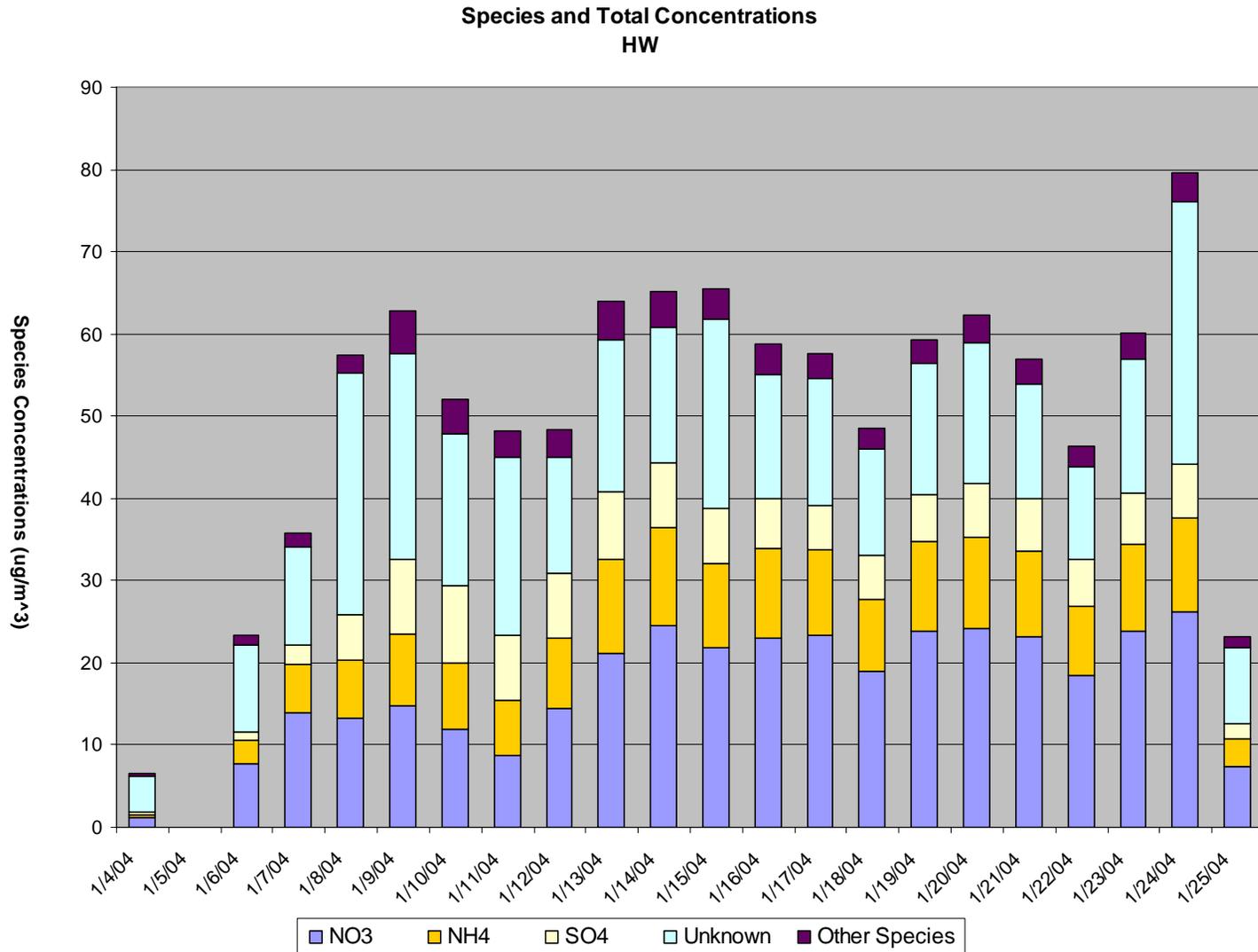
# Must replicate the complex chemistry of winter-time Fine Particulate (PM<sub>2.5</sub>) Formation

## Emissions

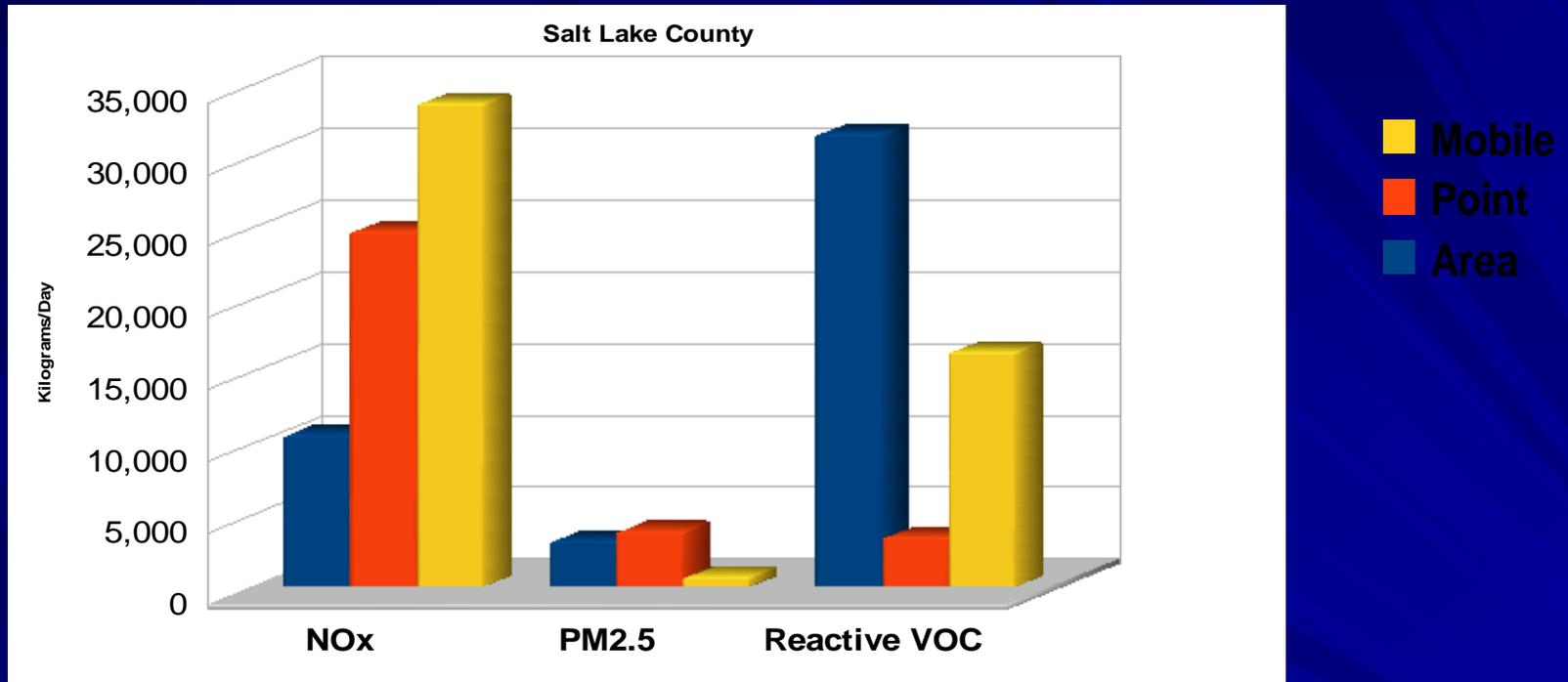


# Speciated PM2.5 Data

## January 2004 Inversion



# Winter Emissions Inventory



- Categories of Sources include Mobile (cars), Point (industry), and Area (urban activity.)
- Not only PM2.5 emissions, but also precursor emissions that become chemically altered during winter inversions to form more particulate
- Some of these precursor gasses are also important to summertime ozone formation

# Mobile Emission Models

MOBILE 6

NMIM (National Mobile Inventory Model)

MOVES (Motor Vehicle Emissions Simulator)

Local Data Input

Vehicle Type

Vehicle Speed

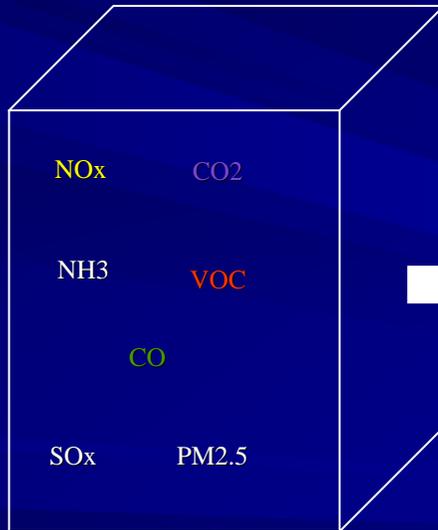
Fuel Type

Temperature /  
Humidity

Vehicle Miles Travel  
(VMT)

I/M Program

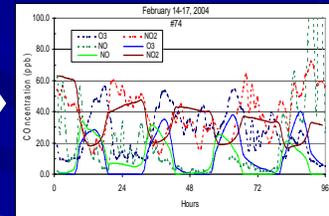
Emission Factor  
Model



Vehicle  
Emissions in  
Tons

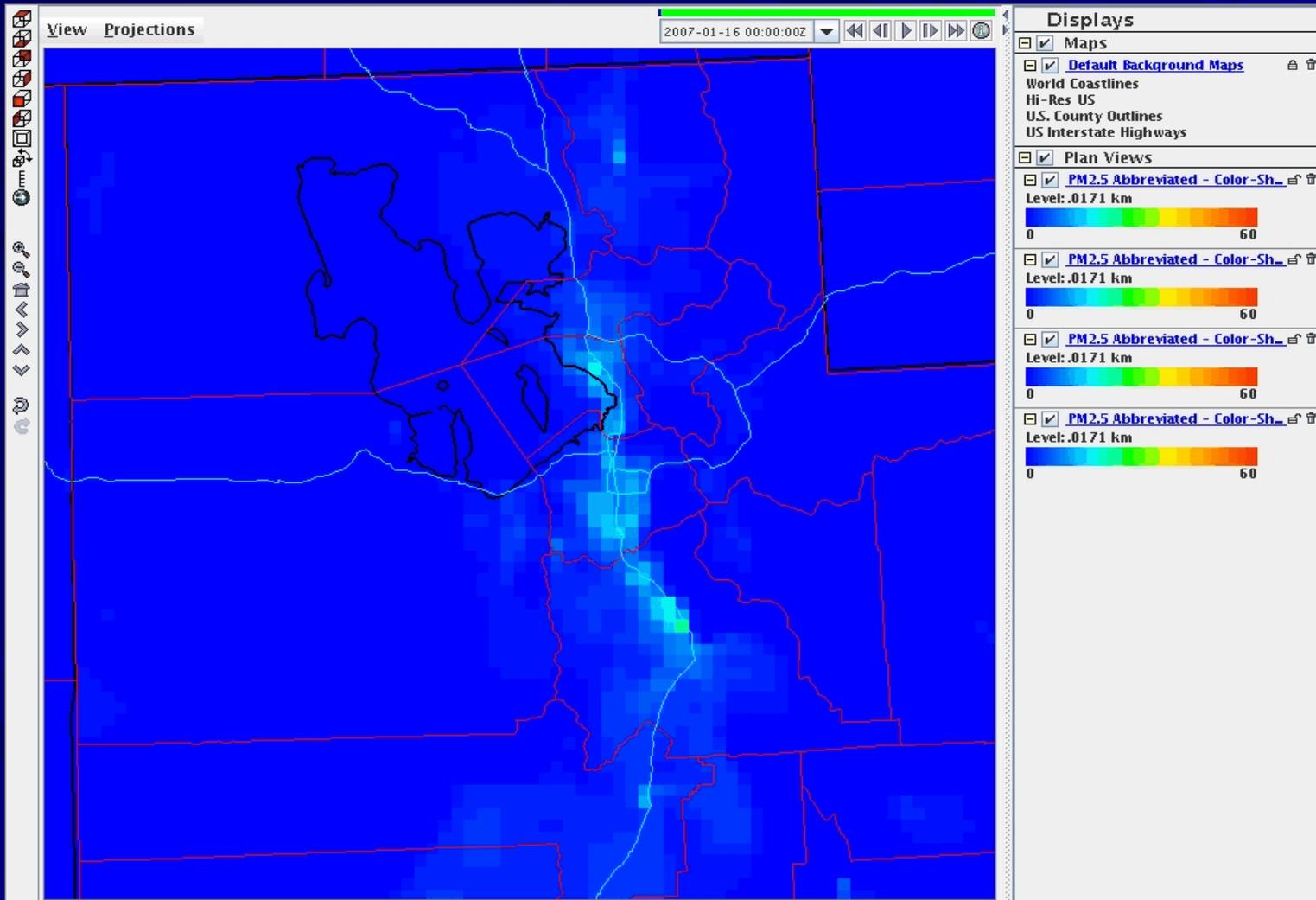
Air Quality  
Chemistry Model

Model Prediction



# Preliminary Modeling Runs

- UDAQ has been running the Air Quality model in order to replicate measured values from past episodes.
- This step insures that the model will be suitable for testing control strategies later on.
- Modeling is preliminary, but the next slide shows some early results:



# Work in the Coming Years

- Control strategies will be evaluated for all sectors within the airshed
  - PM2.5 and the precursors that form PM2.5 (NO<sub>x</sub>, SO<sub>2</sub>, VOC) from point sources will be considered
  - Controls on area sources such as wood burning and fugitive dust will be considered
  - Mobile sources will be evaluated for various I/M strategies (including on-board diagnostics (OBD) and diesel)
- Modeled Attainment Demonstration
  - Shows that control strategies will sufficient to meet the standards

# Stakeholder Involvement

- SIP development is an open stakeholder process
- Stakeholders include:
  - Local government officials
  - Industry
  - Concerned Citizens
  - Transportation Officials
- UDAQ held kick-off meetings in Salt Lake and Cache Counties
  - Well Attended
  - There will be more meetings as the SIP is developed

# Next Steps

- Project has just begun
  - Will take about 3 years
- Work is already underway
  - Episode Selection
  - Episodic Emissions Inventories
  - Assimilation of representative Meteorological Data
- We will likely re-convene when we have a Validated AQ Model