Maryland
Department of the Environment

Ozone Transport

How Close Are We to Declaring Victory?

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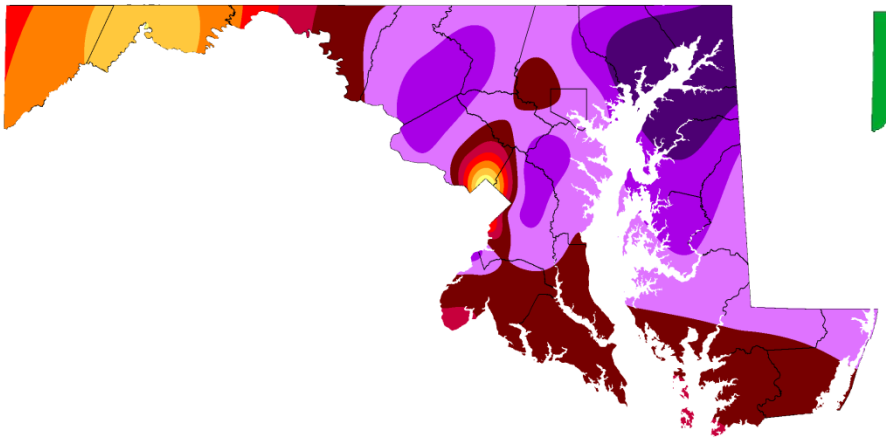
AAPCA Meeting – April 5, 2018

Topics Covered

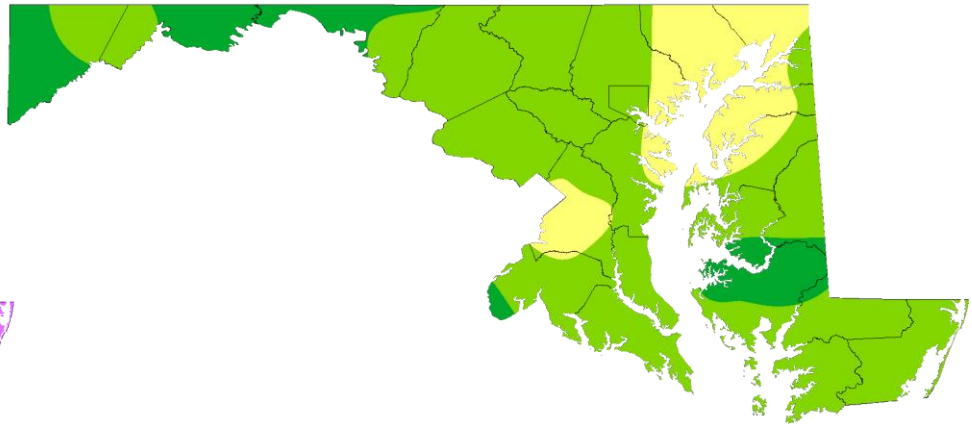
- Maryland's air quality
  - 10 years of dramatic progress
  - How much of this progress is from reduced transport?
- A few snippets from our transport research program
- Where do we go from here …
  - How can we work together to get the last five yards … to cross the goal line

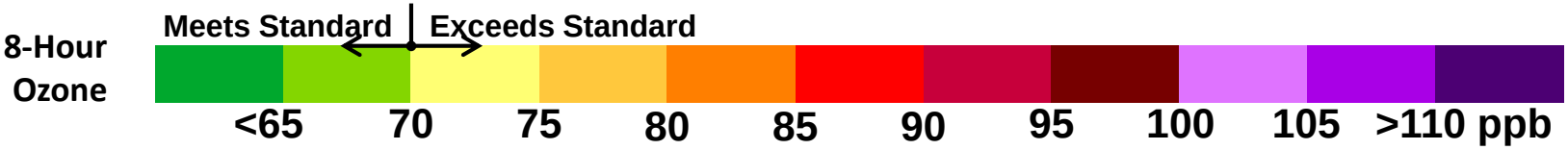
Maryland's Shrinking Ozone Problem

1990



2017*



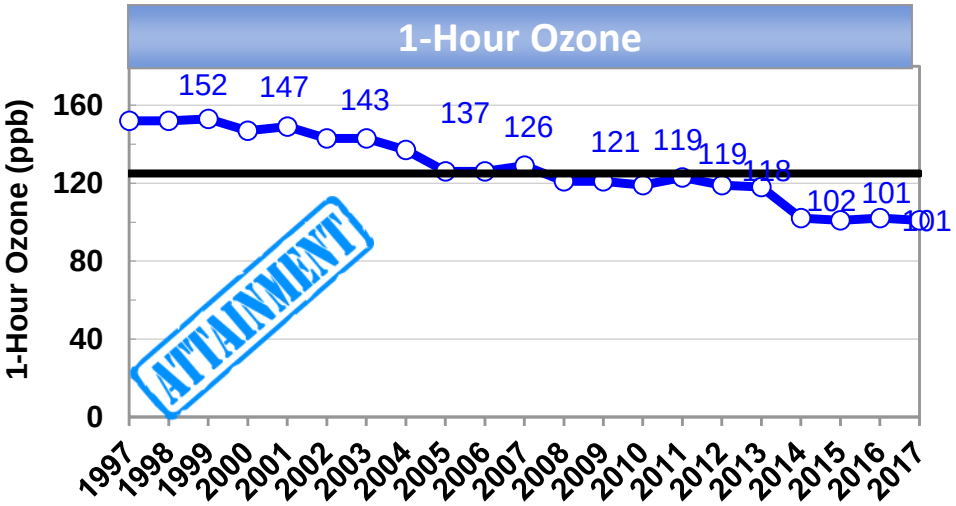


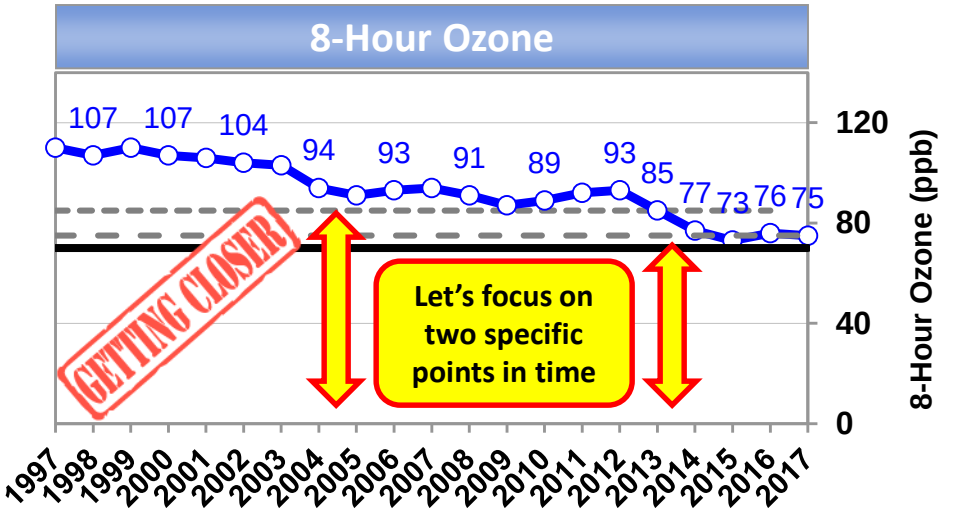
- ***In 2008, the Edgewood monitor in Harford County, Maryland was the highest reading ozone monitor anywhere outside of CA and TX. Baltimore was designated as the only Moderate ozone nonattainment area East of the Mississippi for the 2008 ozone NAAQS.***

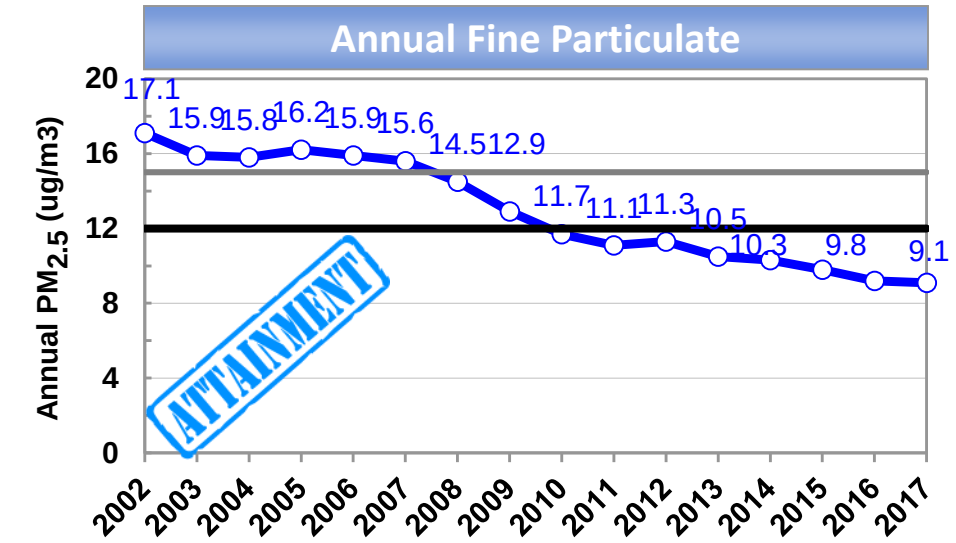
- ***2017 … only small areas of Baltimore, Harford, Kent, Cecil, and Prince George's Counties were above the new ozone threshold of 70 ppb. All areas in Maryland in attainment of 2008, 75ppb threshold!!***

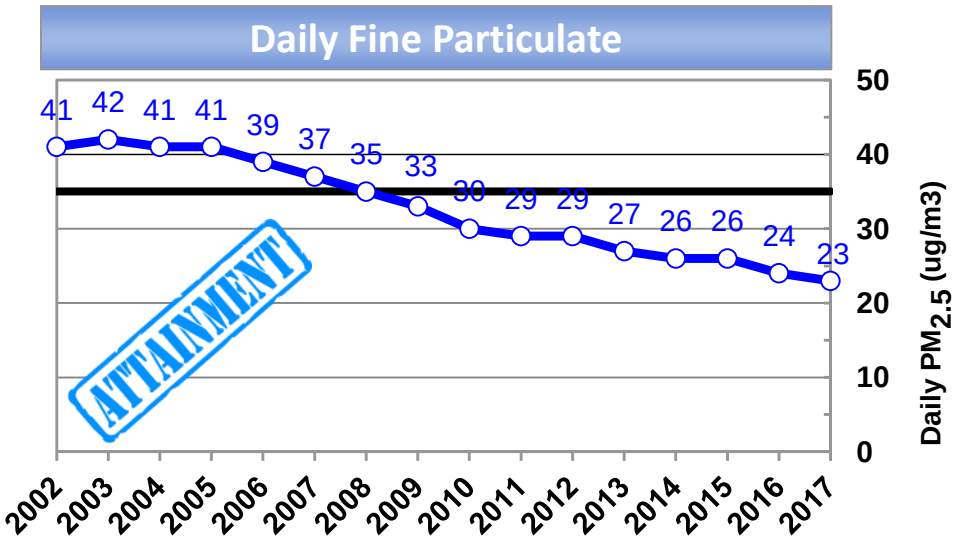
*Note: 2017 Ozone Data is Preliminary & Includes Exceptional Event Concurrences.

Progress in Cleaning Maryland's Air







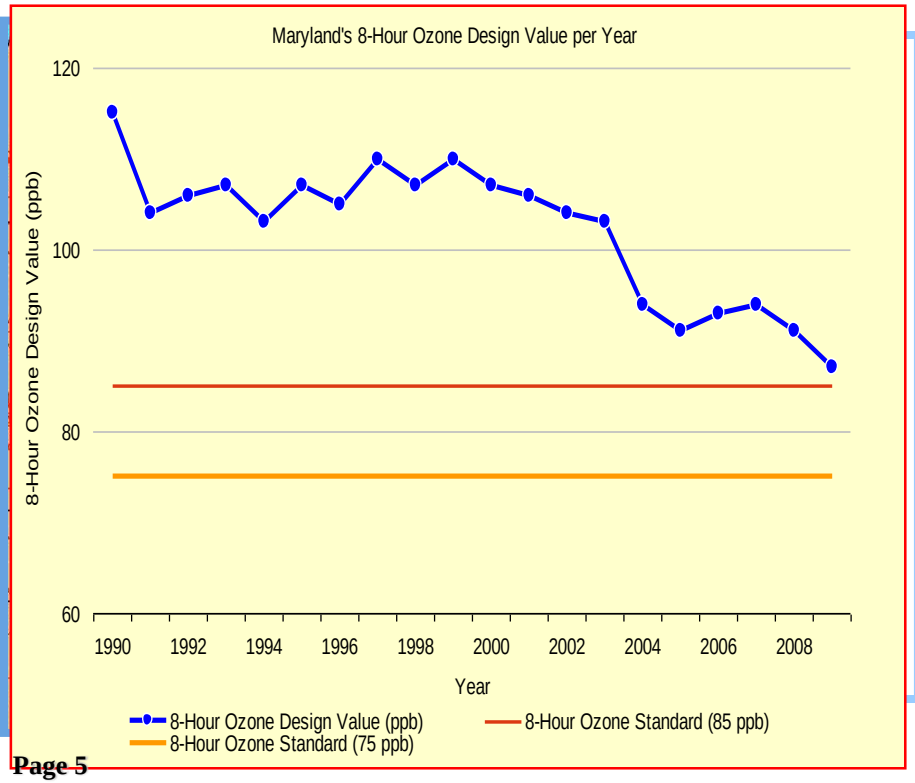


Note: 2017 Ozone Data is Preliminary.

Why the Drop around 2004?

A Classic Ozone Transport Case Study

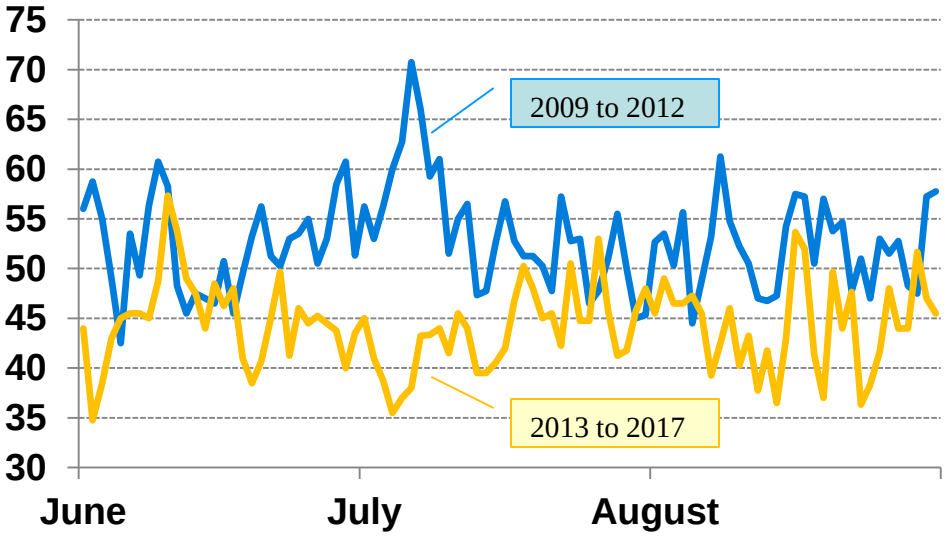
Ground Level Ozone Drops Dramatically in the Same Time Frame

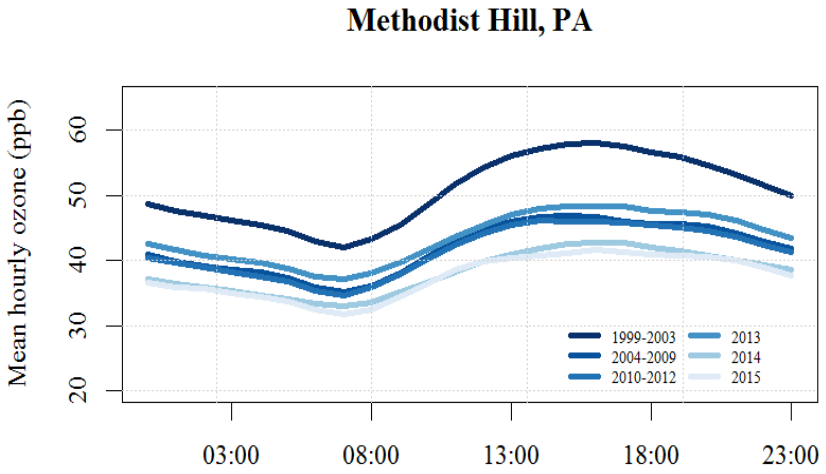


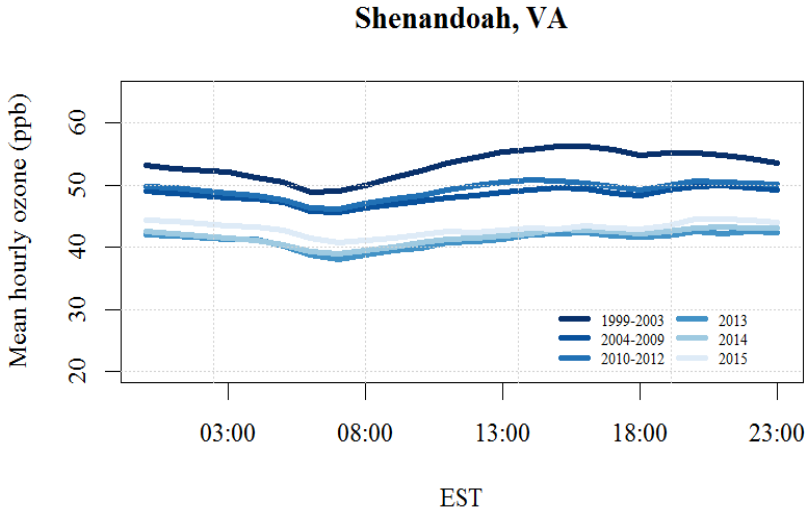
- The 2003/2004 "NOx SIP Call" as a case study. Significant NOx reductions from Federal Tier 2 Vehicle Standards also occurring in the same time frame
  - A classic ozone transport success story
  - Incoming ozone levels collect in the elevated reservoir over night
  - Real world programs like the NOx SIP Call (power plants) and the Tier 2 Vehicle Standards show that:
    - Adding regional controls …
    - Results in regional NOx emission reductions …
    - Which leads to reduced ozone in the elevated reservoir …
    - Which lead to lower ozone at ground level and public health protection!

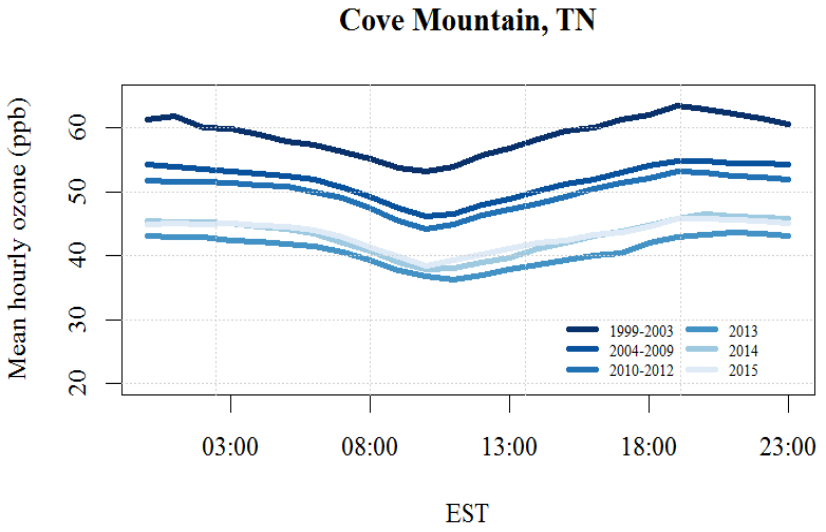
What Changed in 2013 to 2017 Time Frame?

Maryland's "Spy" Site … Piney Run



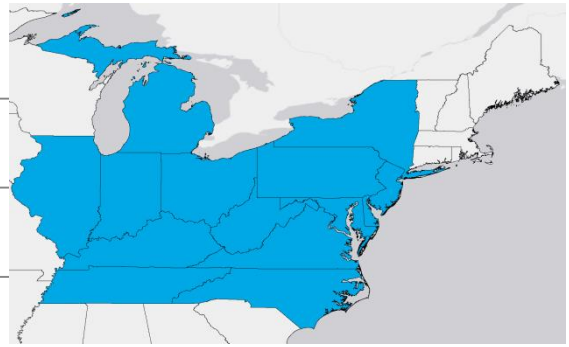


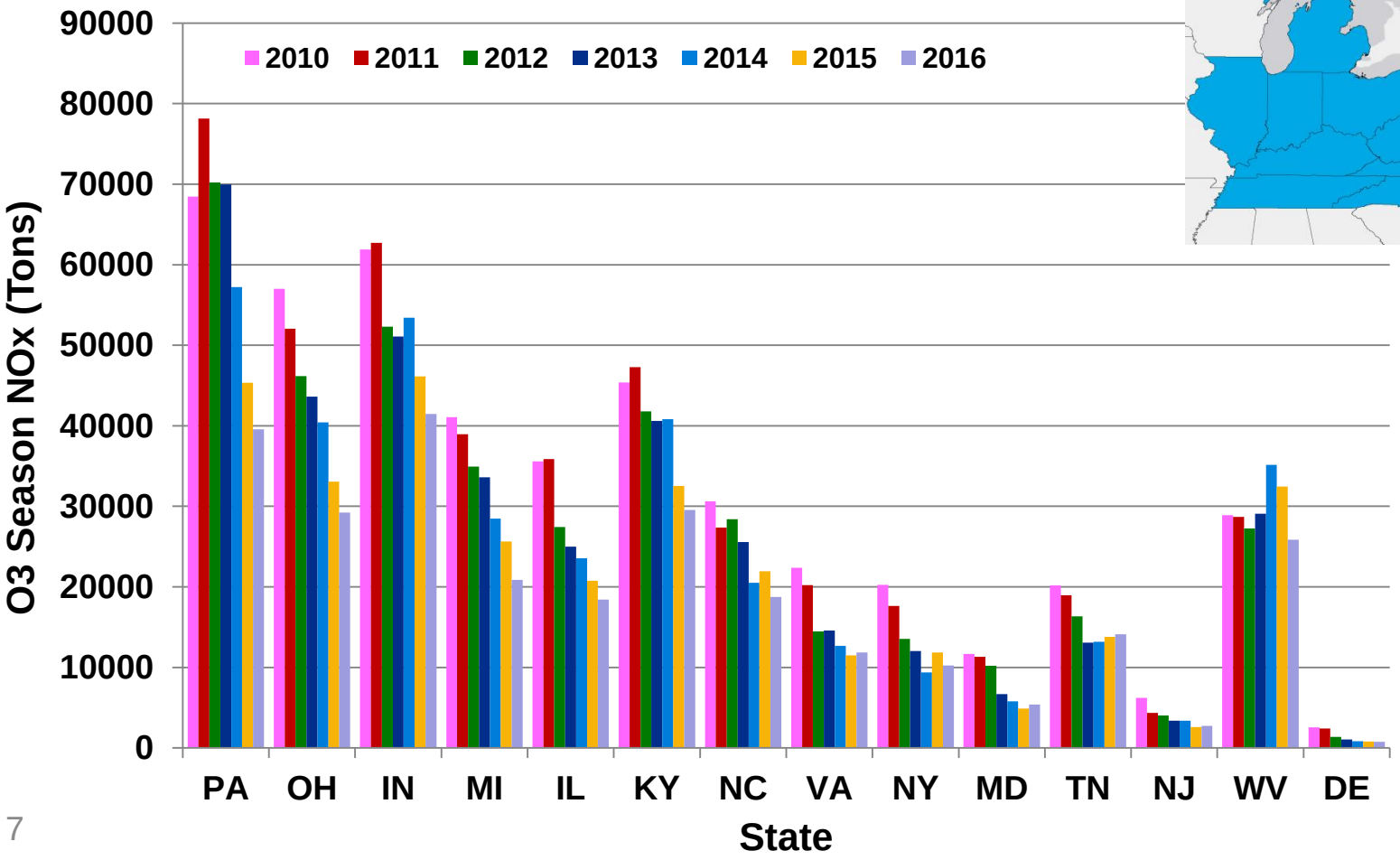




2013 to 2017 Emission Reductions

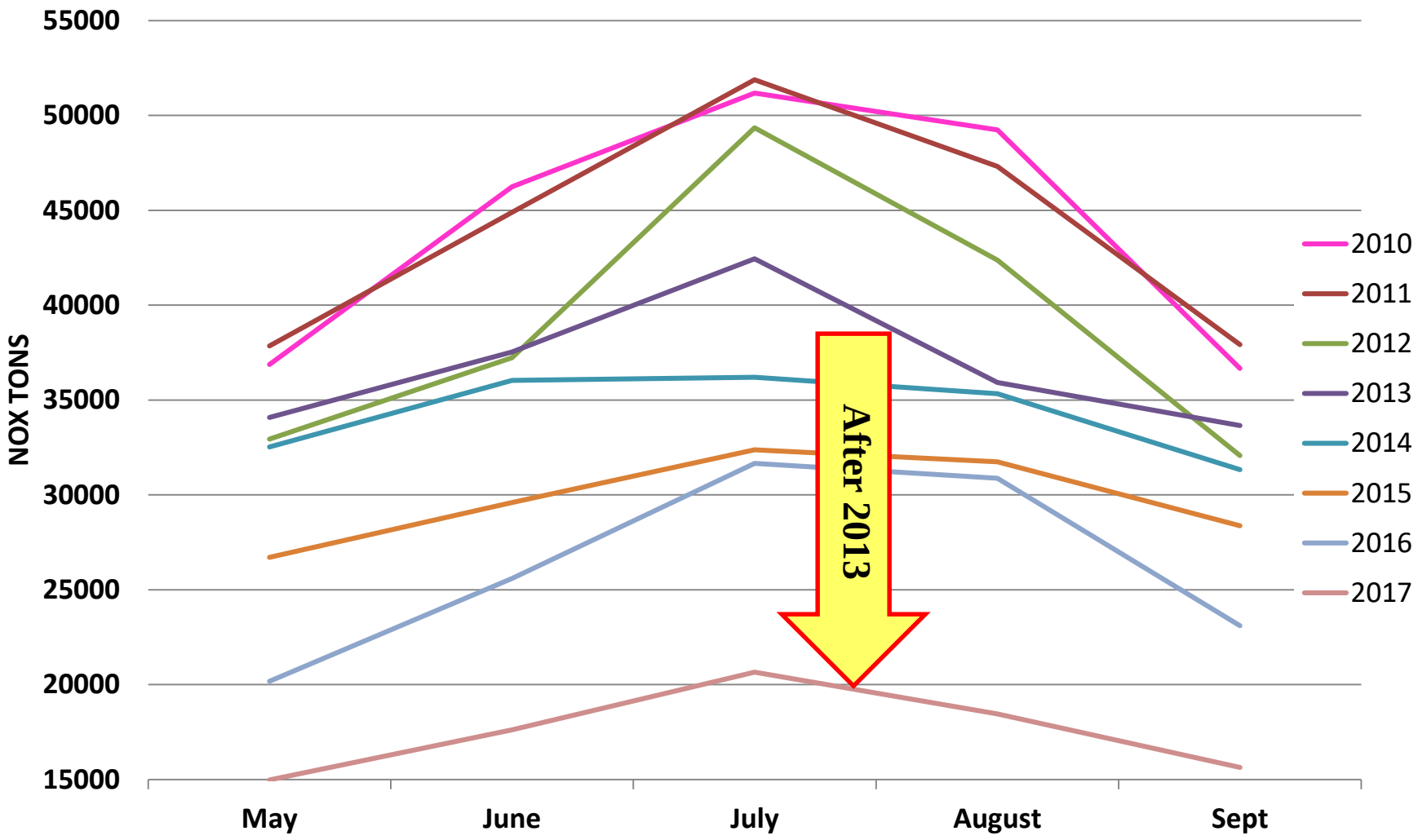
- Ozone season EGU NO_x emissions continue to noticeably decrease in almost all states
  - Most states had lowest ozone season NO_x emissions on record in 2016 and 2017.





Monthly CAMD NOx Emissions

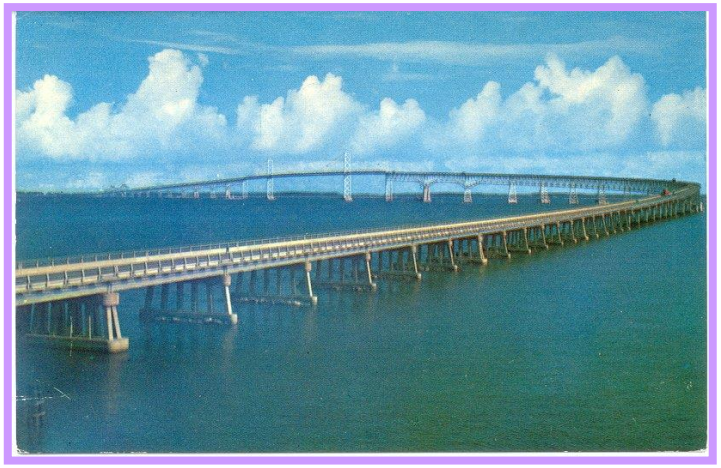
IN, OH, WV, VA, PA, MD, DC



Emissions of Indiana, Ohio, West Virginia, Virginia, Pennsylvania, Maryland and the District of Columbia were summed together on a monthly basis

Understanding Ozone Transport

- It's complicated … but not that complicated … some key concepts
- An "elevated reservoir" of ozone
  - A transport cloud
  - An elevated ocean of ozone
  - The residual layer
- Three different types of transport
  - Westerly Transport – Power plants are a major contributor
  - Night-time, Southerly Transport – Vehicles, power plants, more
  - City to City – An urban soup … Washington to Baltimore … Baltimore to Philly … NJ & NY to CT … etc. etc. etc

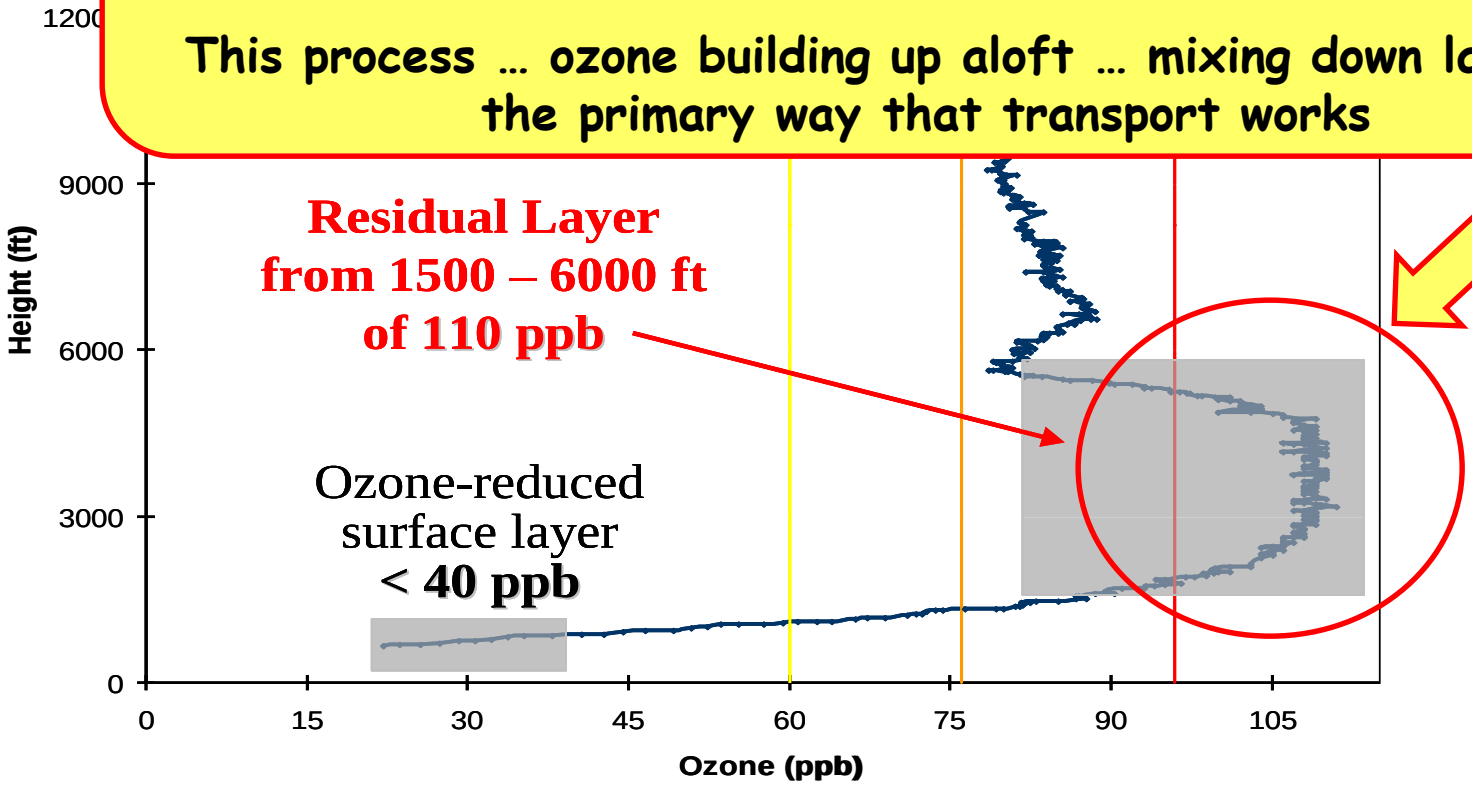


Understanding Transport
… What Is This?

This is what we call the "elevated reservoir"

A very large cloud of ozone sitting above Baltimore … Waiting to mix down

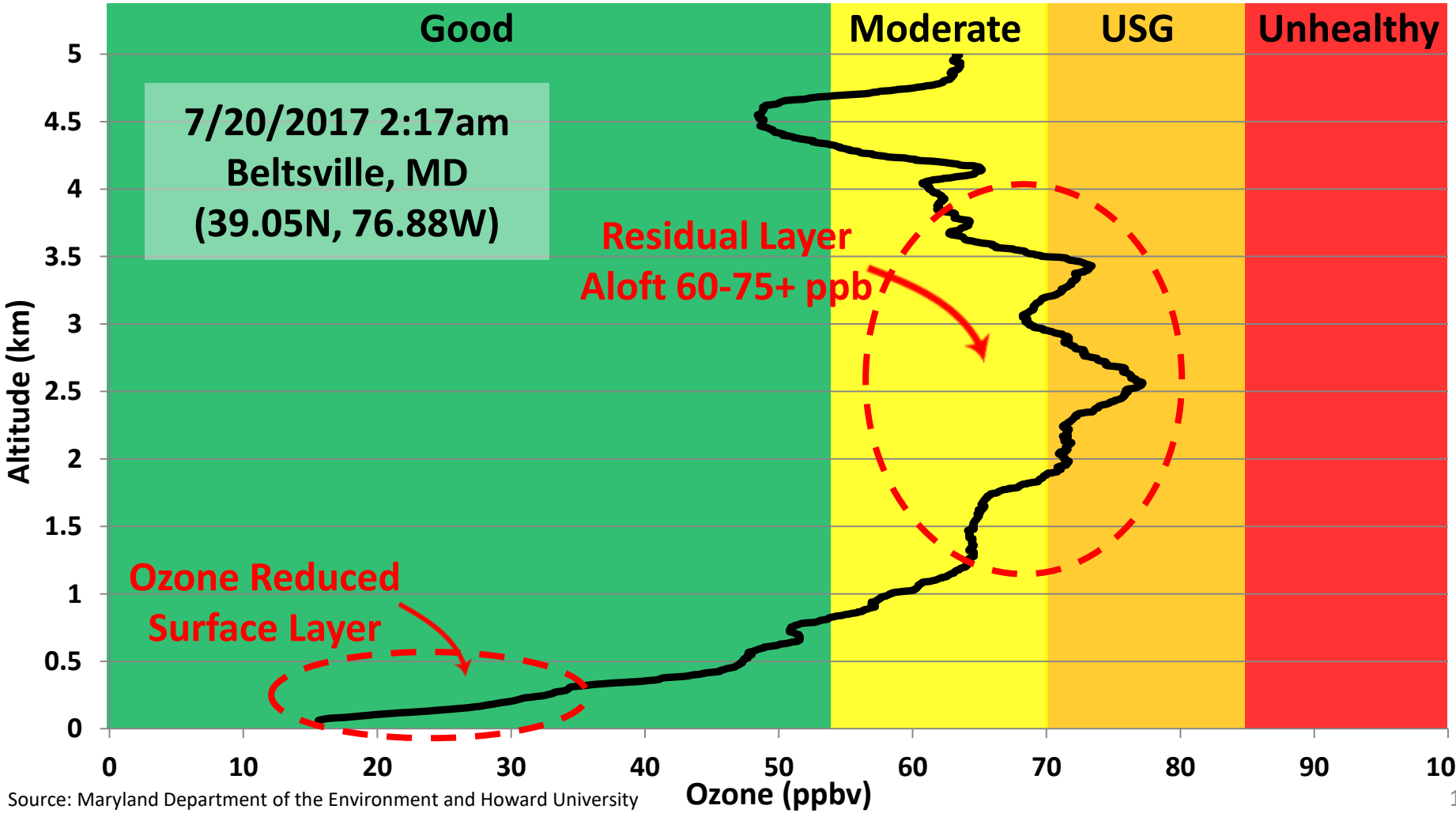
This process … ozone building up aloft … mixing down later … is the primary way that transport works



Source: Maryland Department of the Environment & Howard University

Understanding Transport in 2017

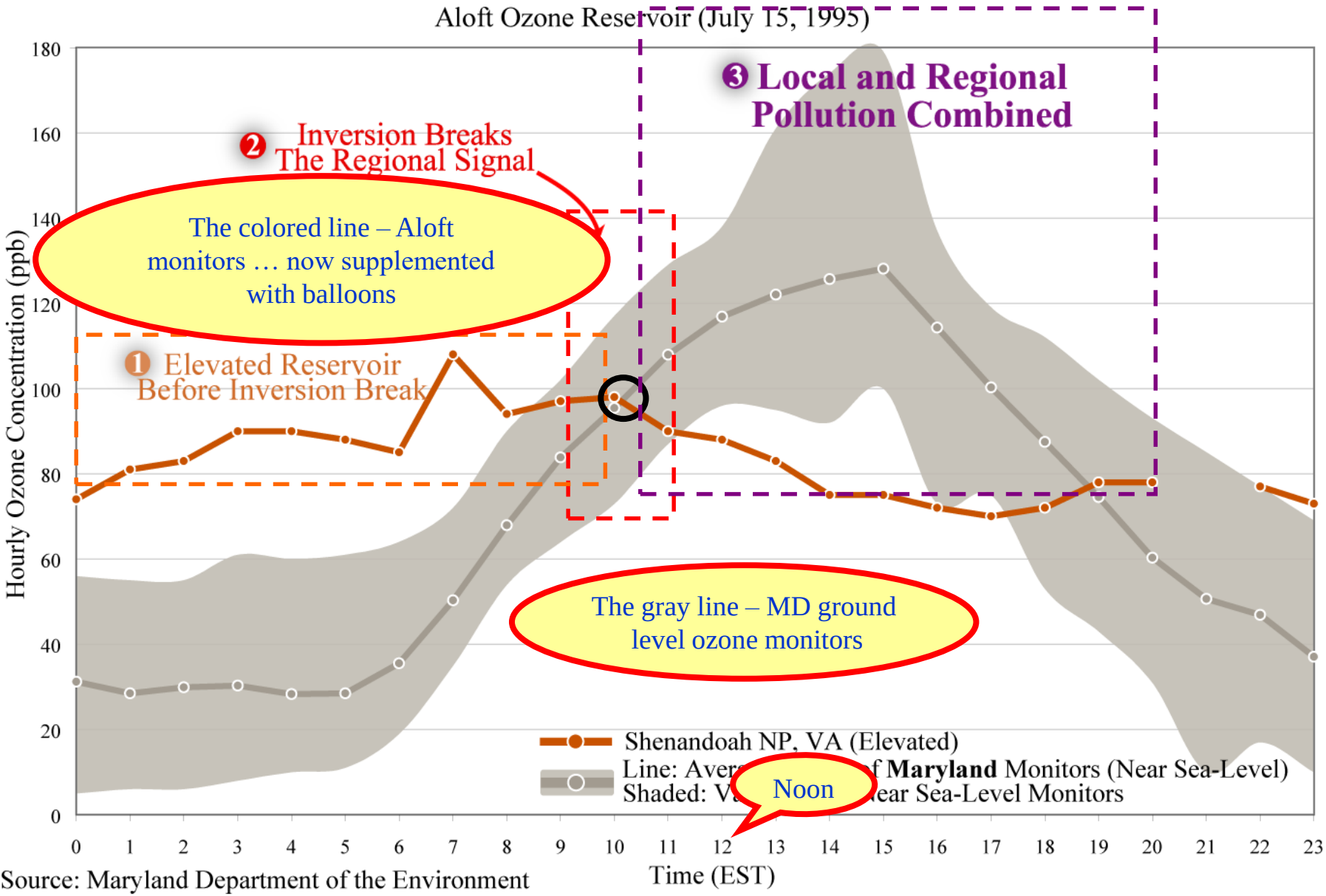
Same Elevated Reservoir - No Longer 110 ppb Aloft …
But Aloft levels Are Still Around 70 ppb



Source: Maryland Department of the Environment and Howard University

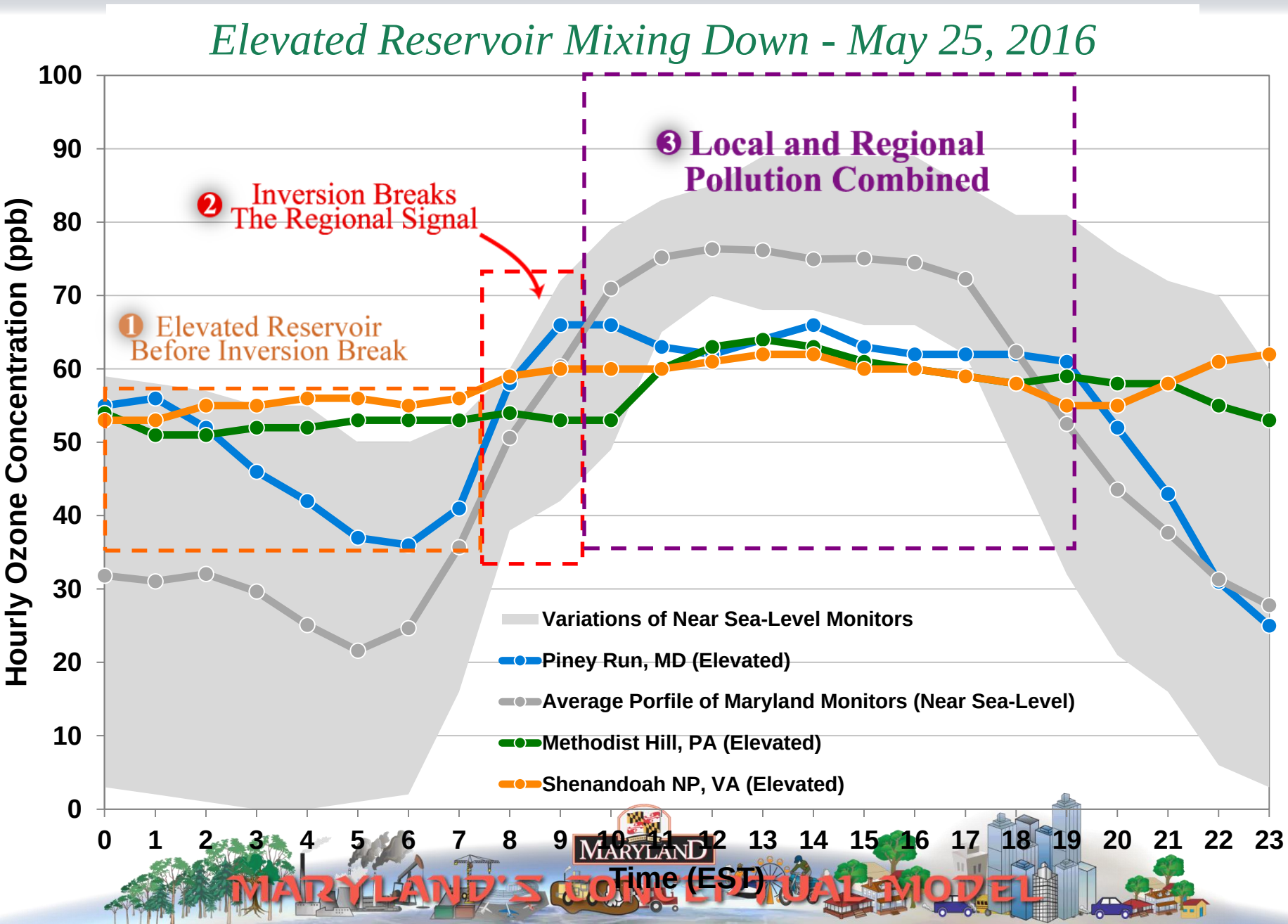
Watching the Reservoir Mix Down

A classic, worst-case event on July 15. 1995

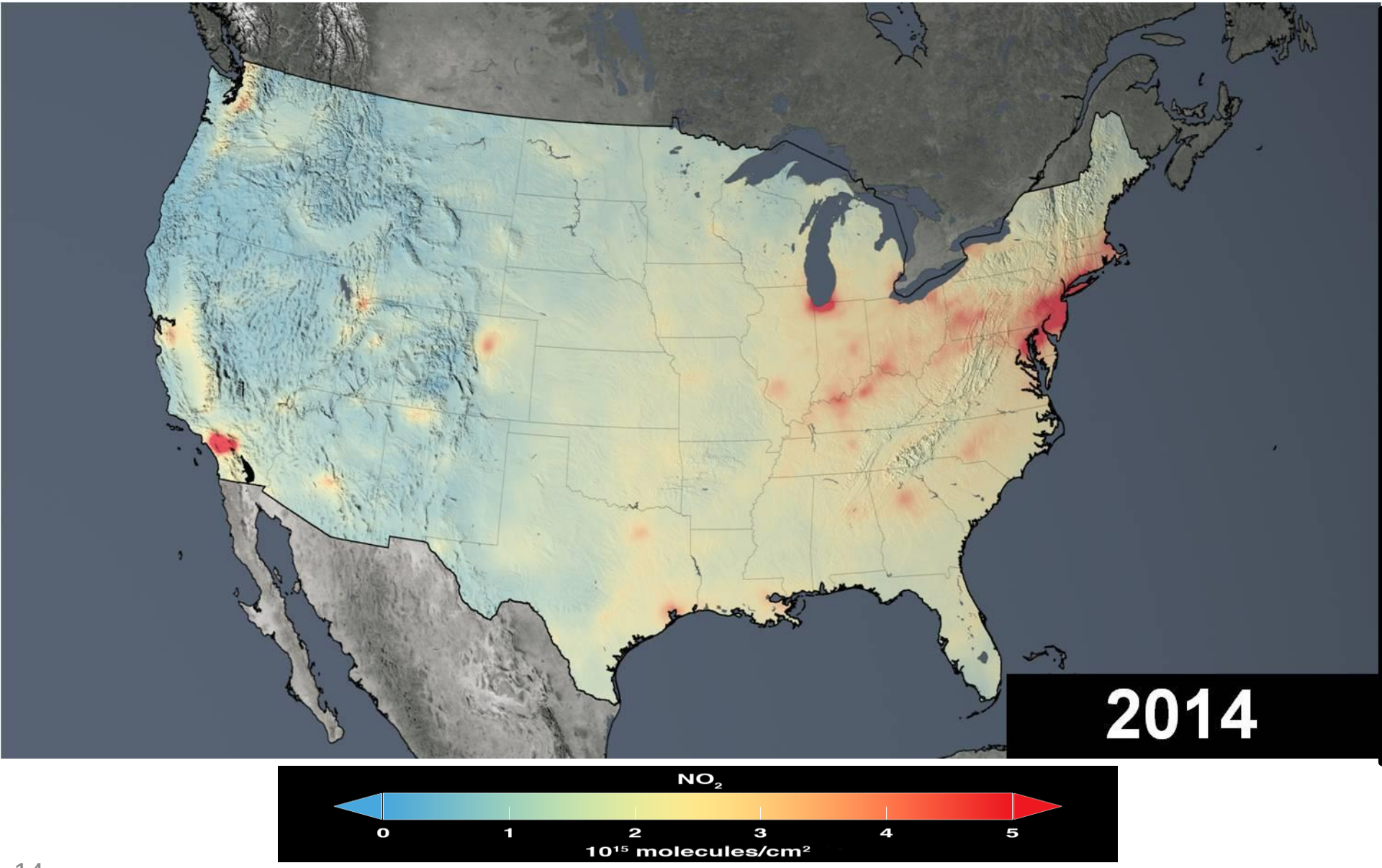


Source: Maryland Department of the Environment

Daily Ozone Pattern - More Recent



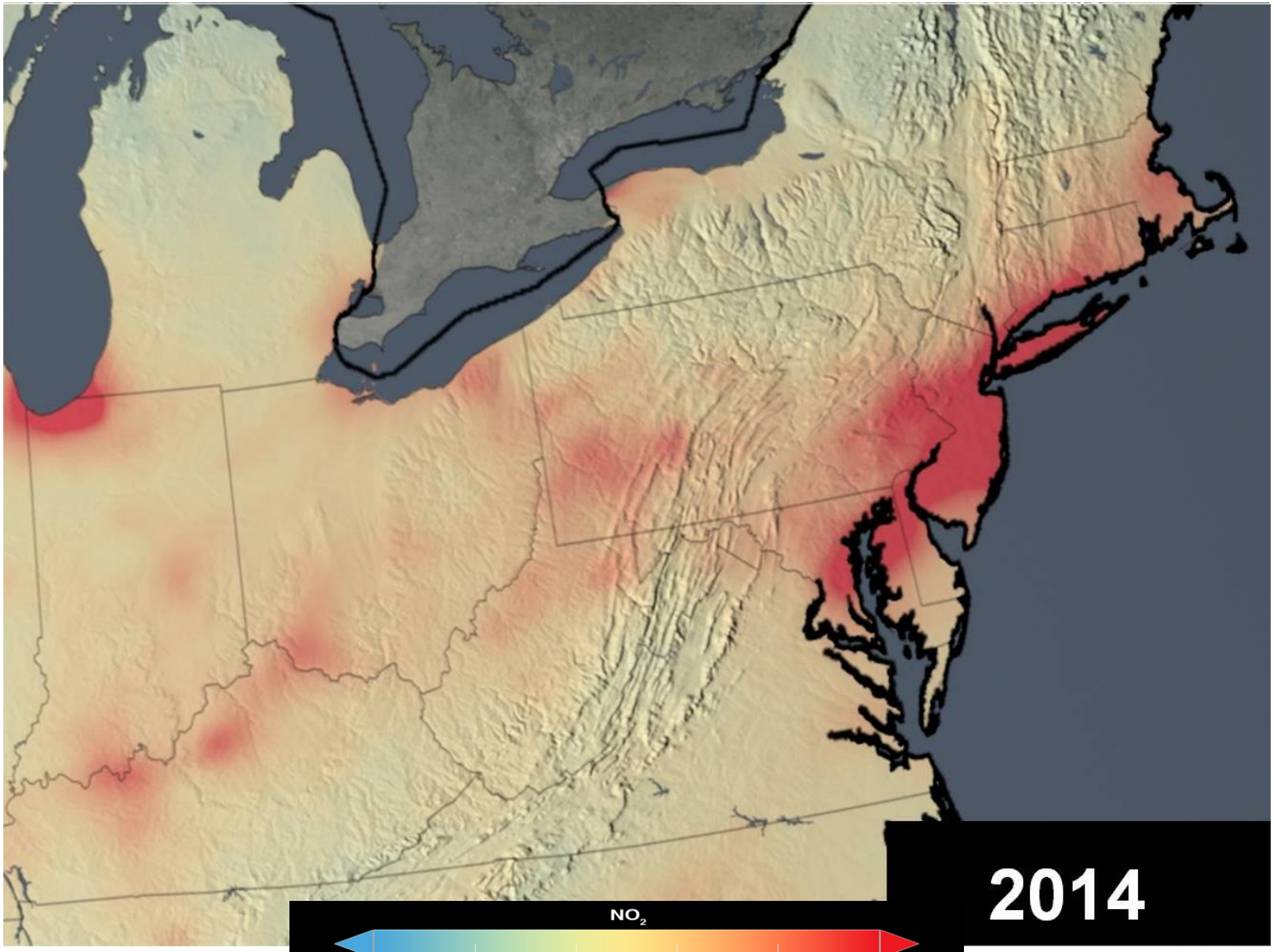
NOx Reductions from Space - 2005 to 2014



Source: NASA's Aura Satellite

Focusing on the East

NO_x Reductions from Space - 2005 to 2014



Source: NASA's Aura Satellite

So Where Do We Go From Here?

We Have a Clear Path Forward

We understand the science of ozone better than ever

We've implemented programs that have worked in the real world

We need to continue to implement a two-part strategy

- Local controls can still help
  - Can help reduce about 1/3 of the ozone problem in most Ozone Transport Commission (OTC) cities
- National/super-regional controls of nitrogen oxide (NOx) are critical
  - We know they work … we know they reduce ozone across the entire East
  - In some areas, incoming ozone is already measured at levels approaching the 70 ppb standard
  - Approximately 2/3 of the ozone problem in most Eastern cities

Good Neighbor SIPs

A Battleground or an Opportunity?

- Probably the most important SIP we all have in this era of lower ozone
  - Pretty much everyone's ozone problem is now transport driven

- Due in October 2018
  - If we are smart, our Good Neighbor SIPs will all be fairly similar
    - Remember … regional NOx reductions work
      1. Work together technically … collaboratively
      2. Take EPA guidance with a grain of salt
      3. Make EPA be a "contributing" partner in a "cooperative federalism" collaboration with the states … as some of the needed measures only work if done at the super-regional or national level
      4. Identify common sense regional NOx control measures - find the Biggest-Bang-For-The-Buck strategies
         - » Some that are ripe … right now
           - Aftermarket catalysts
           - Make progress reducing idling and
           - Push for power plants to simply run existing controls
      5. Put the measures in your Good Neighbor SIP
      6. Watch the ozone go down and declare victory !!!

Modeling Good Neighbor SIPs

What if all of our Good Neighbor SIPs included the following common sense controls:

1. Power plants simply run existing controls
2. Aftermarket catalysts that actually work (through a federal action)
3. A voluntary effort to try and cut down on unnecessary idling

Monitor	Design Value 2011	2018 EGUs Run Existing Controls	2018 Common Sense Regional NOx Reductions
Harford, MD	90	68.27	67.91
Fairfield, CT	83.7	78.12	77.74
Camden, NJ	82.7	72.82	71.42
Hamilton, OH	82	71.56	70.52
Jefferson, KY	82	70.17	69.37
Fulton, GA	81	70.03	69.85

Except for CT… We're all looking pretty good

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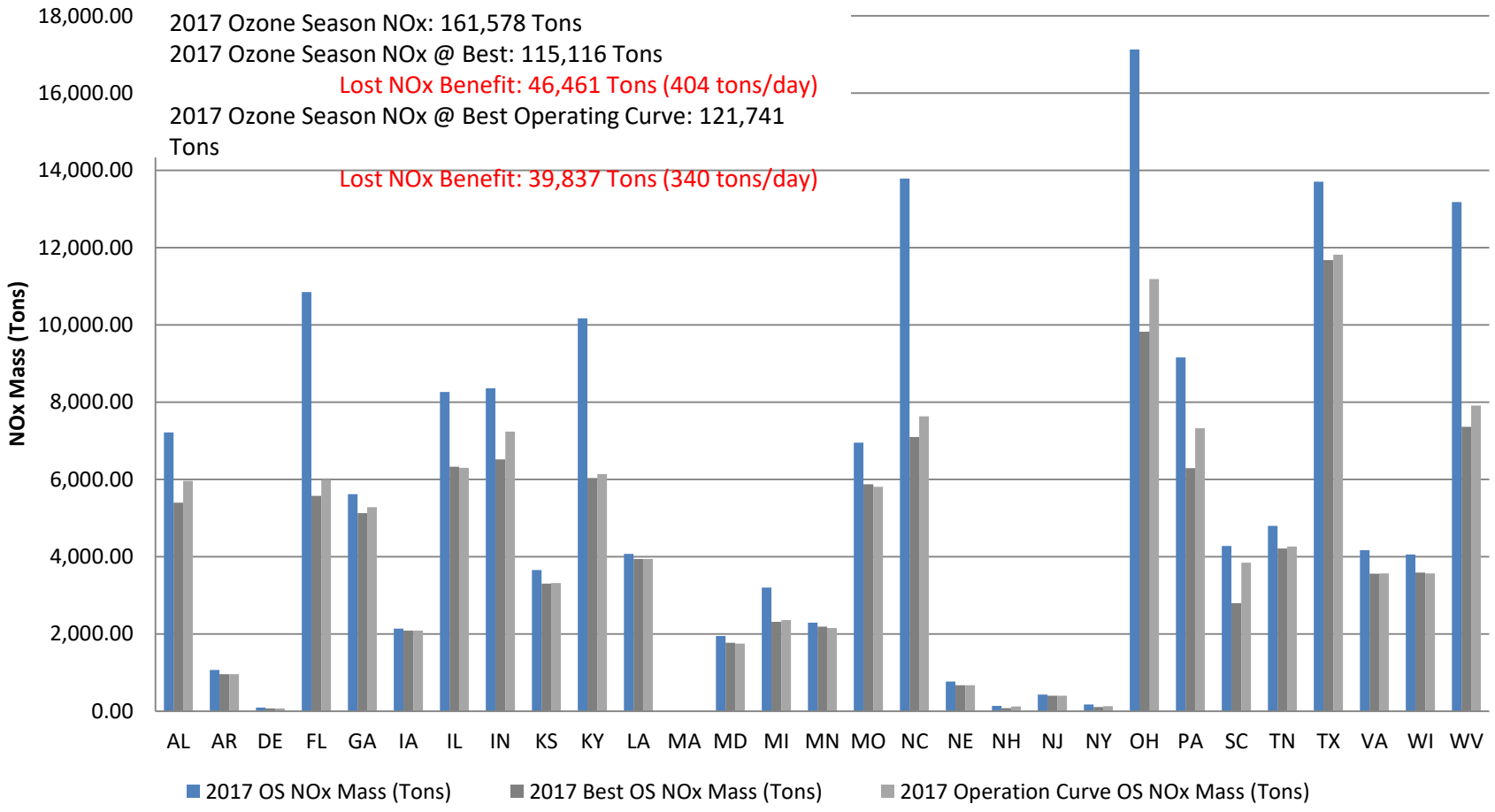
Just One Slide …

- The Maryland 126 Petition
- 36 EGUs in 5 states upwind of MD
- Went legal only after collaboration through "SCOOT" did not work as well as we had hoped
- No new controls … just run the existing controls that are already installed
  - Sort of a "when cap-and-trade" doesn't always work kind of petition
- Using CAMD 2017 data
  - Post CSAPR Update and PA RACT2
  - Still an approximate 100 tpd of NOx reductions if units simply run their controls the way they were designed to be run … each day of the summer
  - 2 to 5 ppb potential modeled ozone benefit in many area
- That's it … That's all the MD 126 Petition asks for … really not that radical

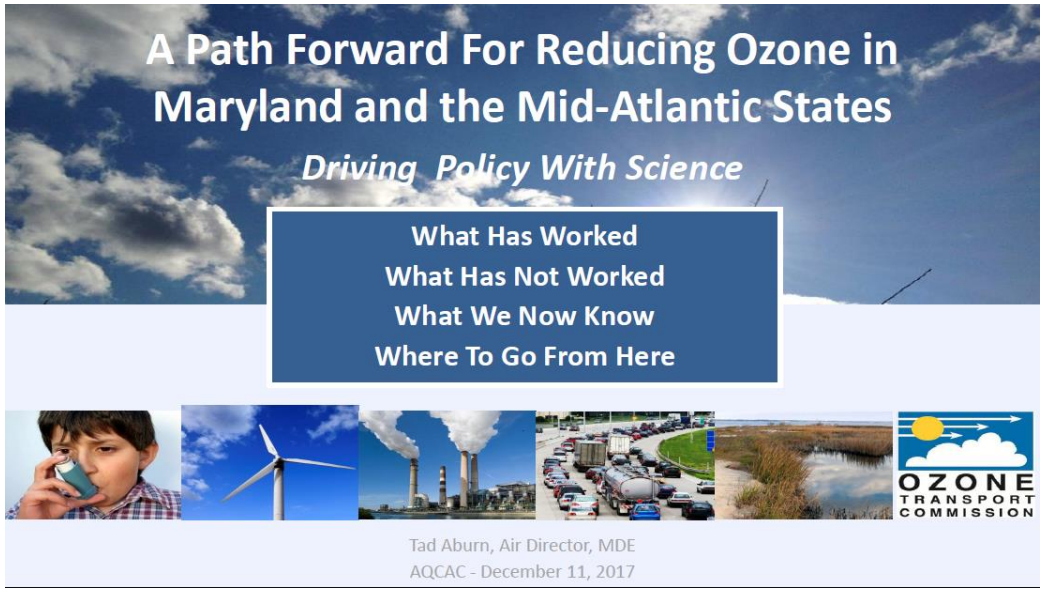
What if All Units in East Optimized Their Existing Controls?

2017 Ozone Season Total NOx Emissions - Actual, Best Rates from Past & Best OS Operating Curve (operating in a lower capacity world)



Maryland's 2017 State of the Science Presentation

- Focuses on why we have been experiencing the ozone progress we've see recently
  - More science … less policy … lot's of transport
  - About an hour
  - Happy to do a webinar if there is interest



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QUESTIONS?
ANY INTEREST IN COLLABORATING?