

Modeling Committee Update

OTC Fall Meeting

November 15, 2017

Washington, DC

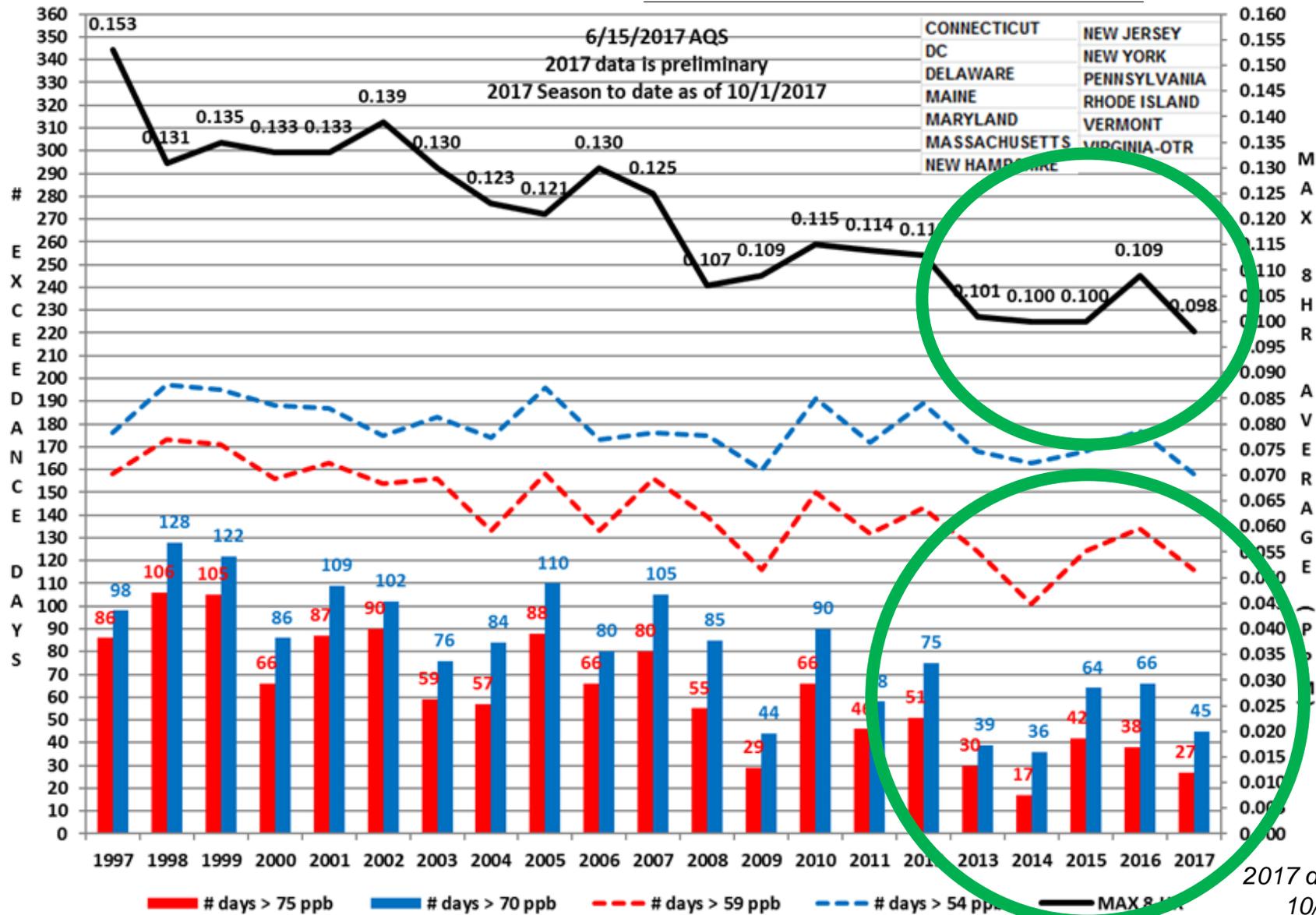


OZONE TRANSPORT COMMISSION

Overview

1. Ozone Monitoring Update
2. Ozone NAAQS Schedule
3. OTC 2011 Modeling Platform
4. New Modeling Platform Update
5. Enhanced Monitoring Plan (EMP) Update

OTR 8-Hour Ozone Trend

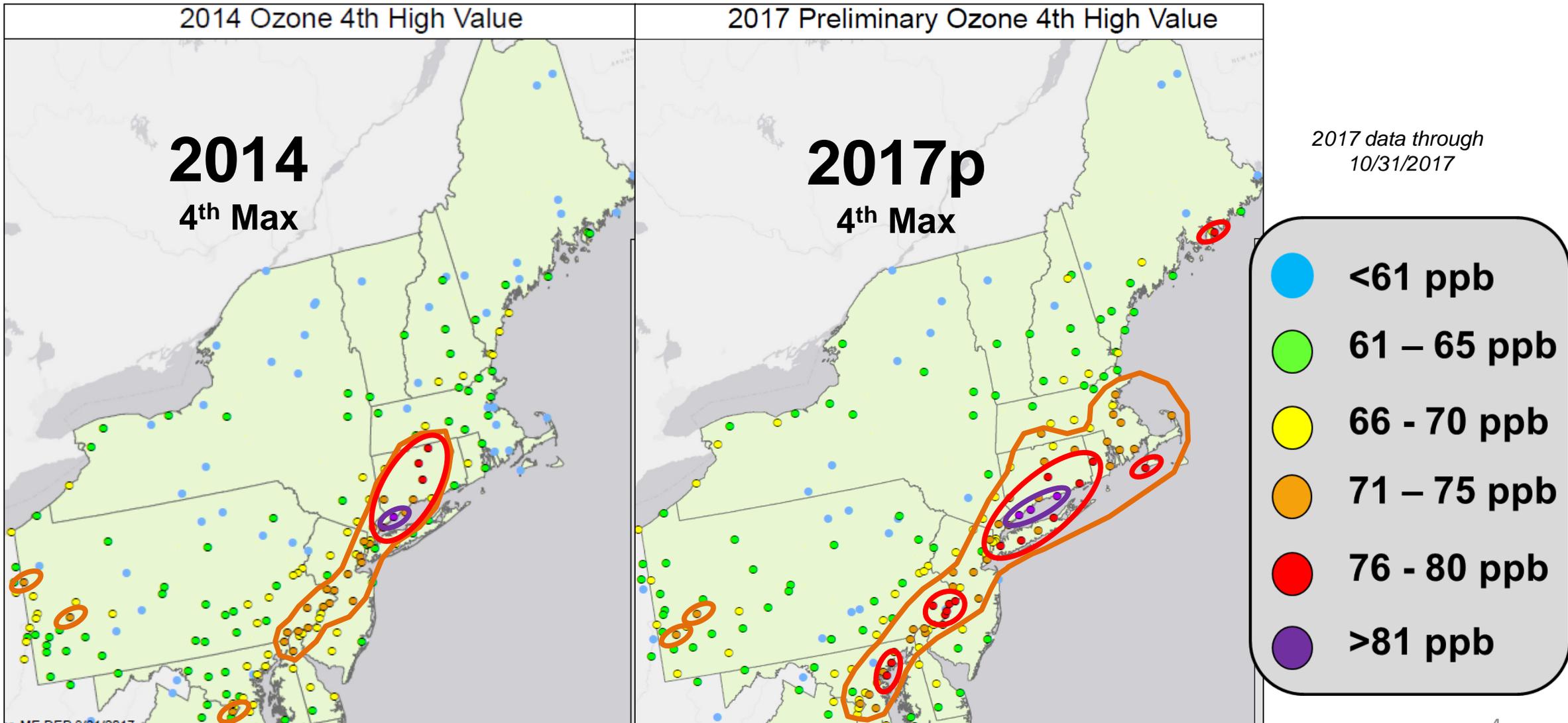


Ozone in the OTR has been relatively flat or up slightly over the past 5 years with the exception of:

- 2014 was a low ozone year
- 2016 was a little higher than the other years

2017 data through 10/31/2017

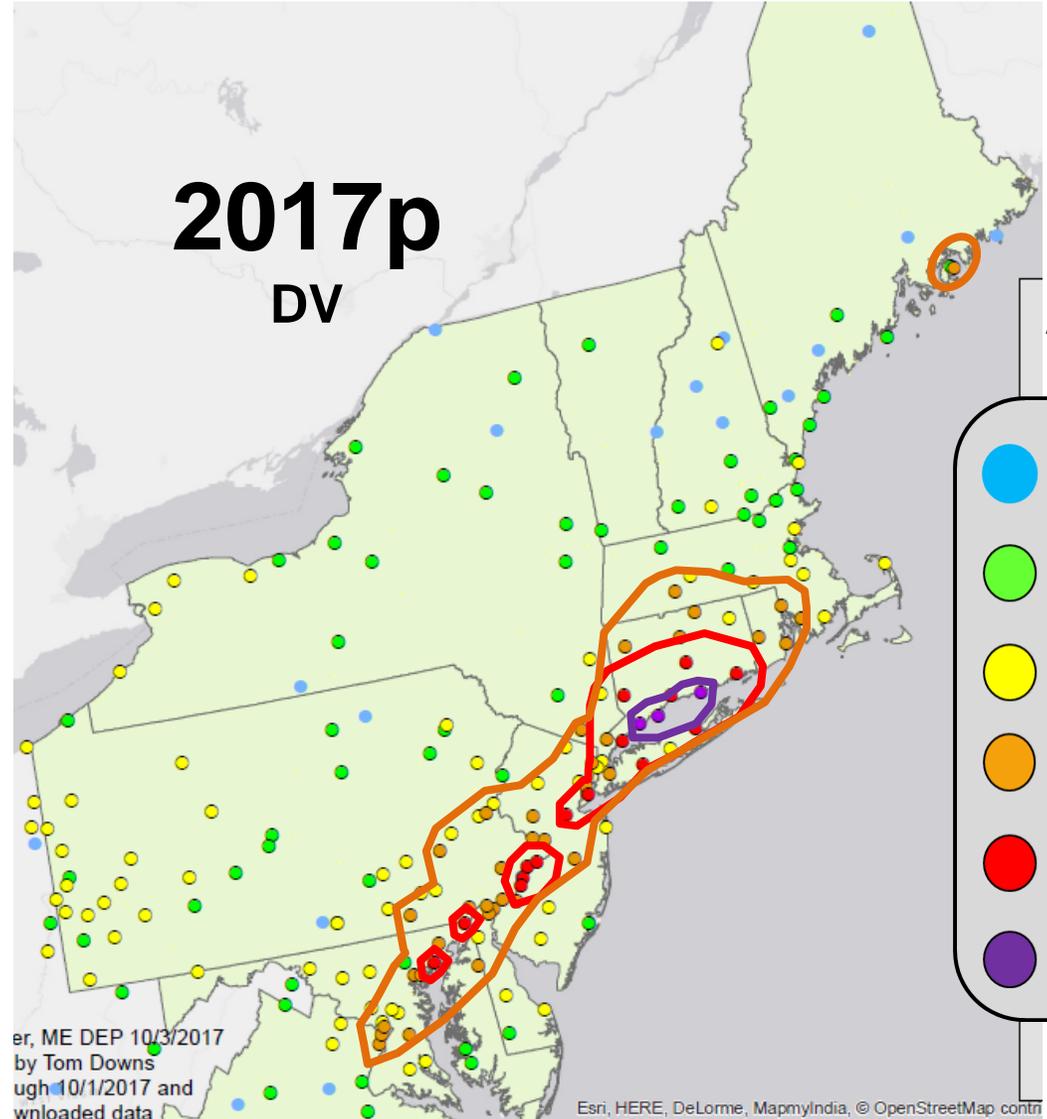
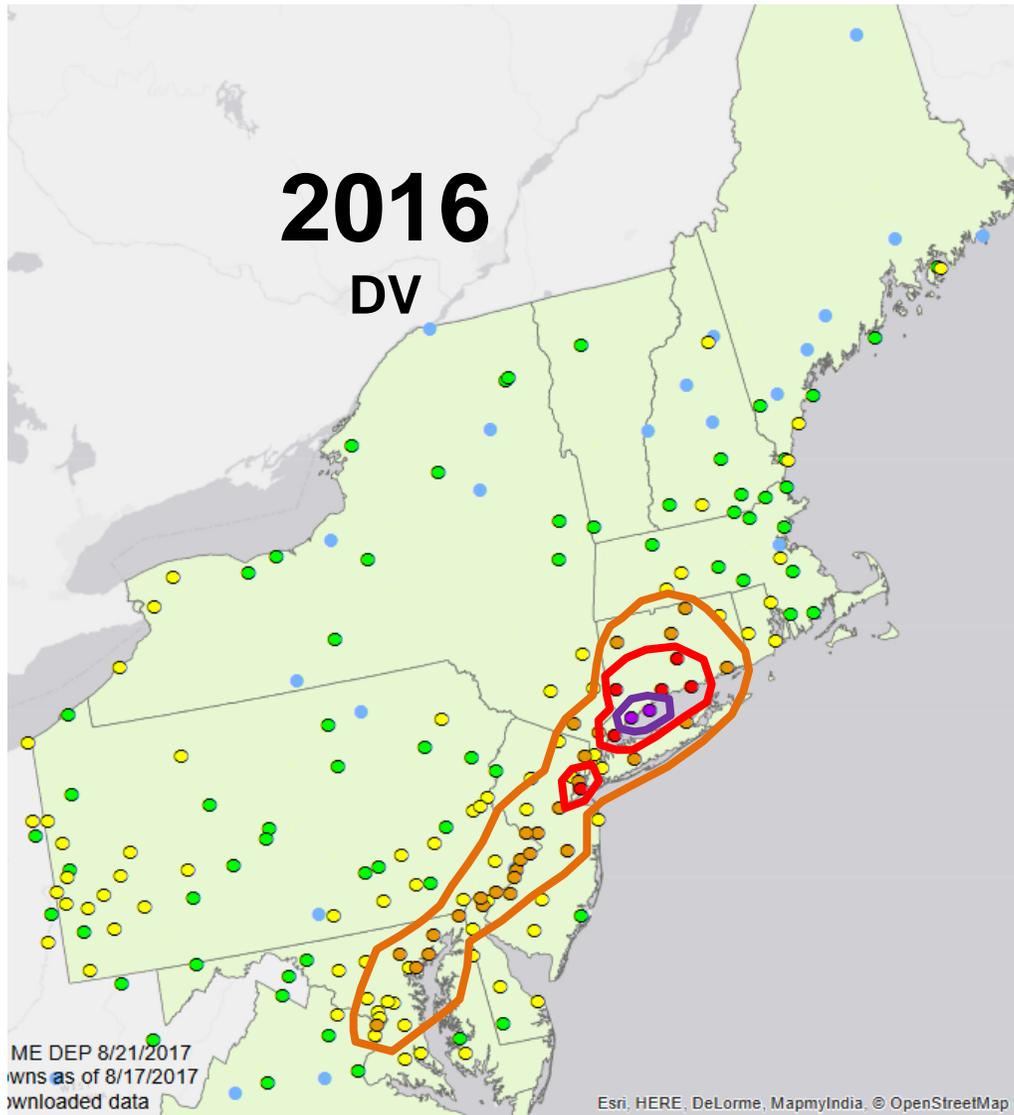
2017 Replaces 2014 for Design Value



Updating to 2015-17

Preliminary 8-hour Ozone Design Values

(excluding potential exceptional events)

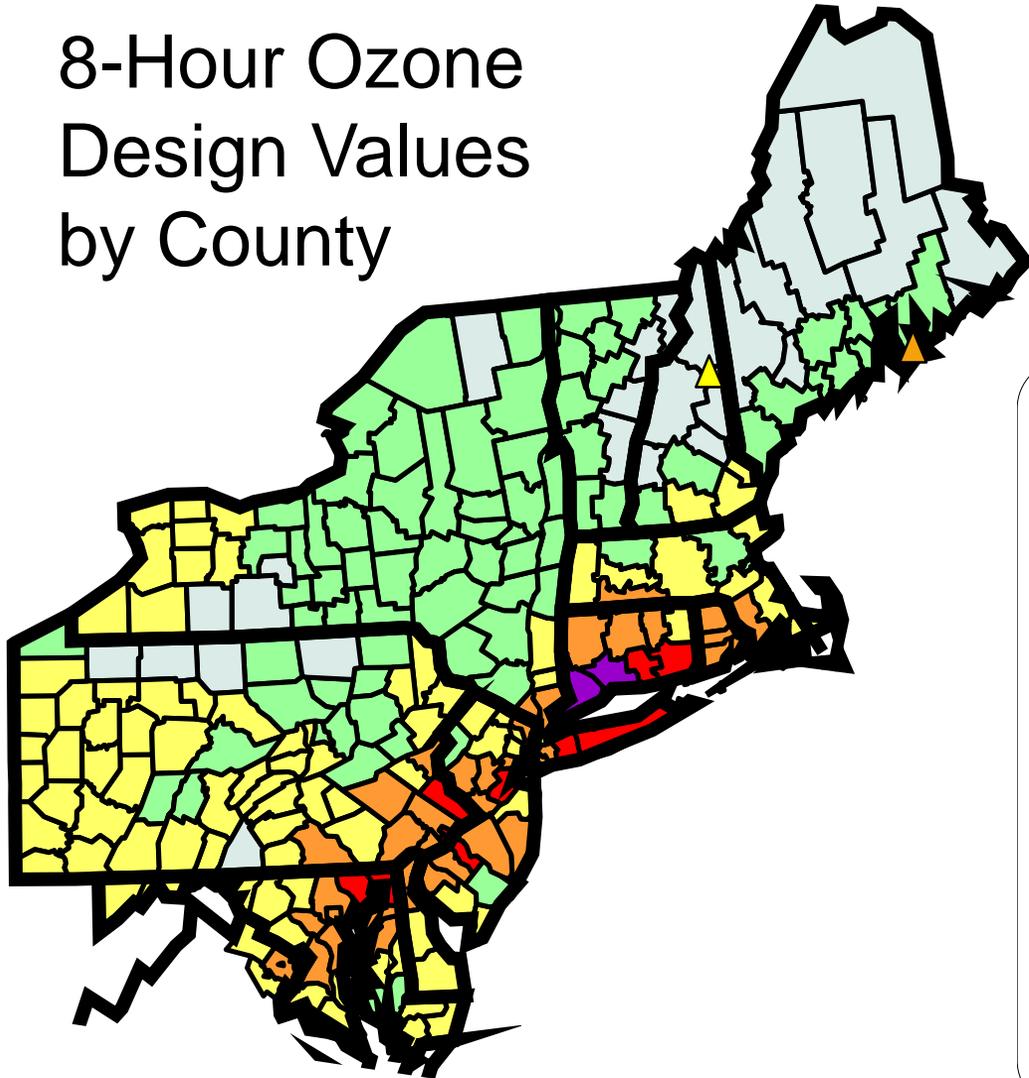


2017 data through
10/31/2017

- <61 ppb
- 61 – 65 ppb
- 66 - 70 ppb
- 71 – 75 ppb
- 76 - 80 ppb
- >81 ppb

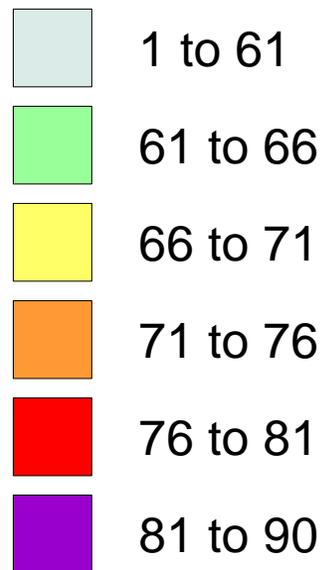
2015-17 Interpolated County 8-Hour Ozone Design Values

8-Hour Ozone Design Values by County

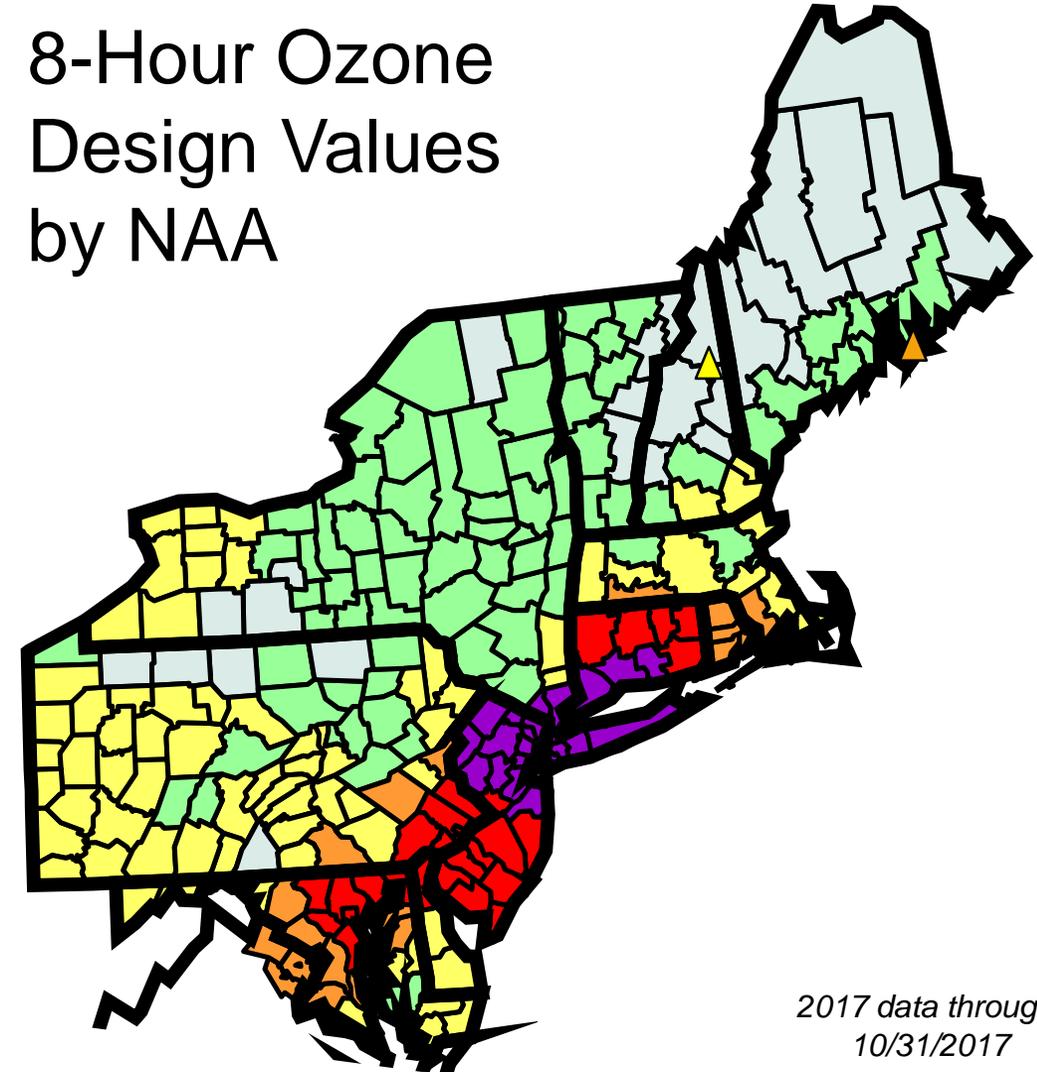


Nearest representative monitor

Ozone (ppb)



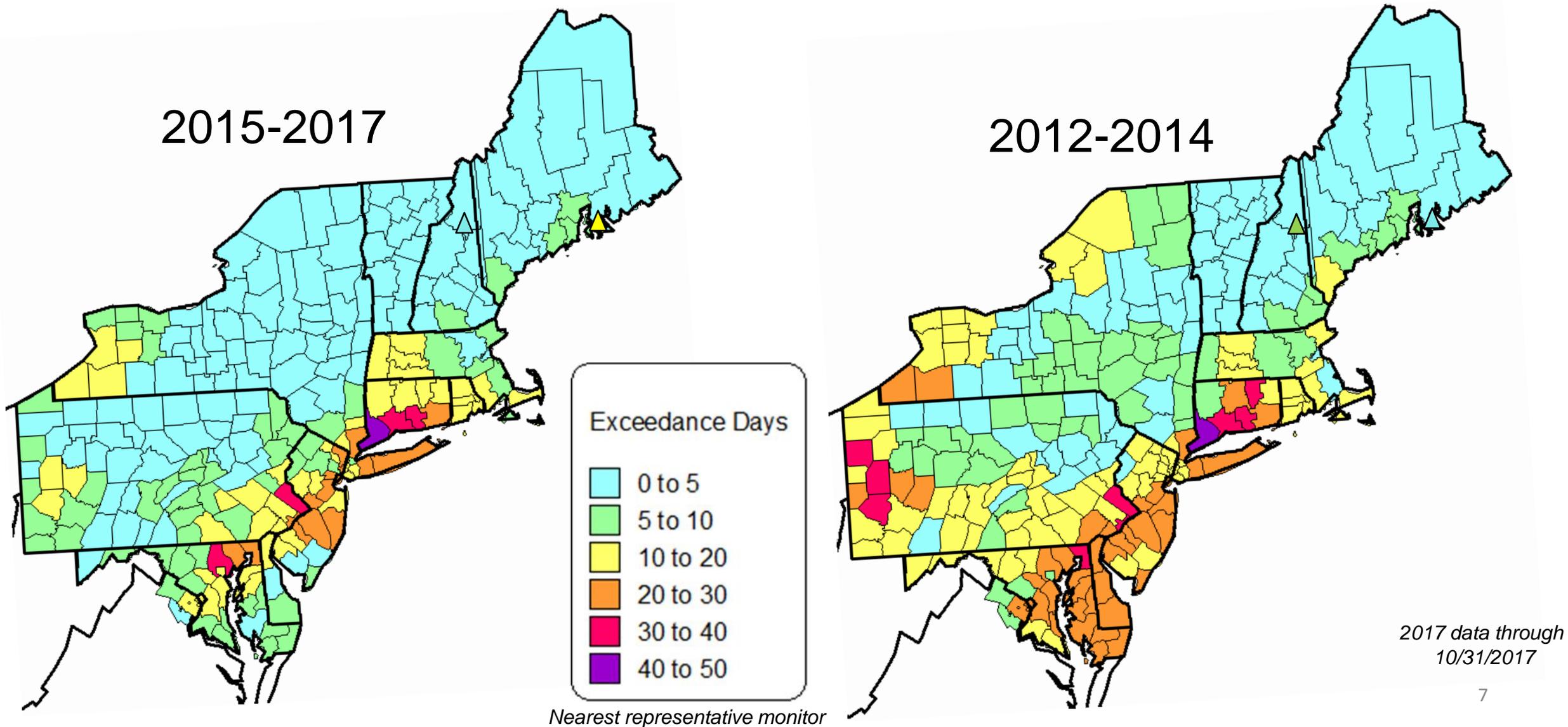
8-Hour Ozone Design Values by NAA



Nearest representative monitor

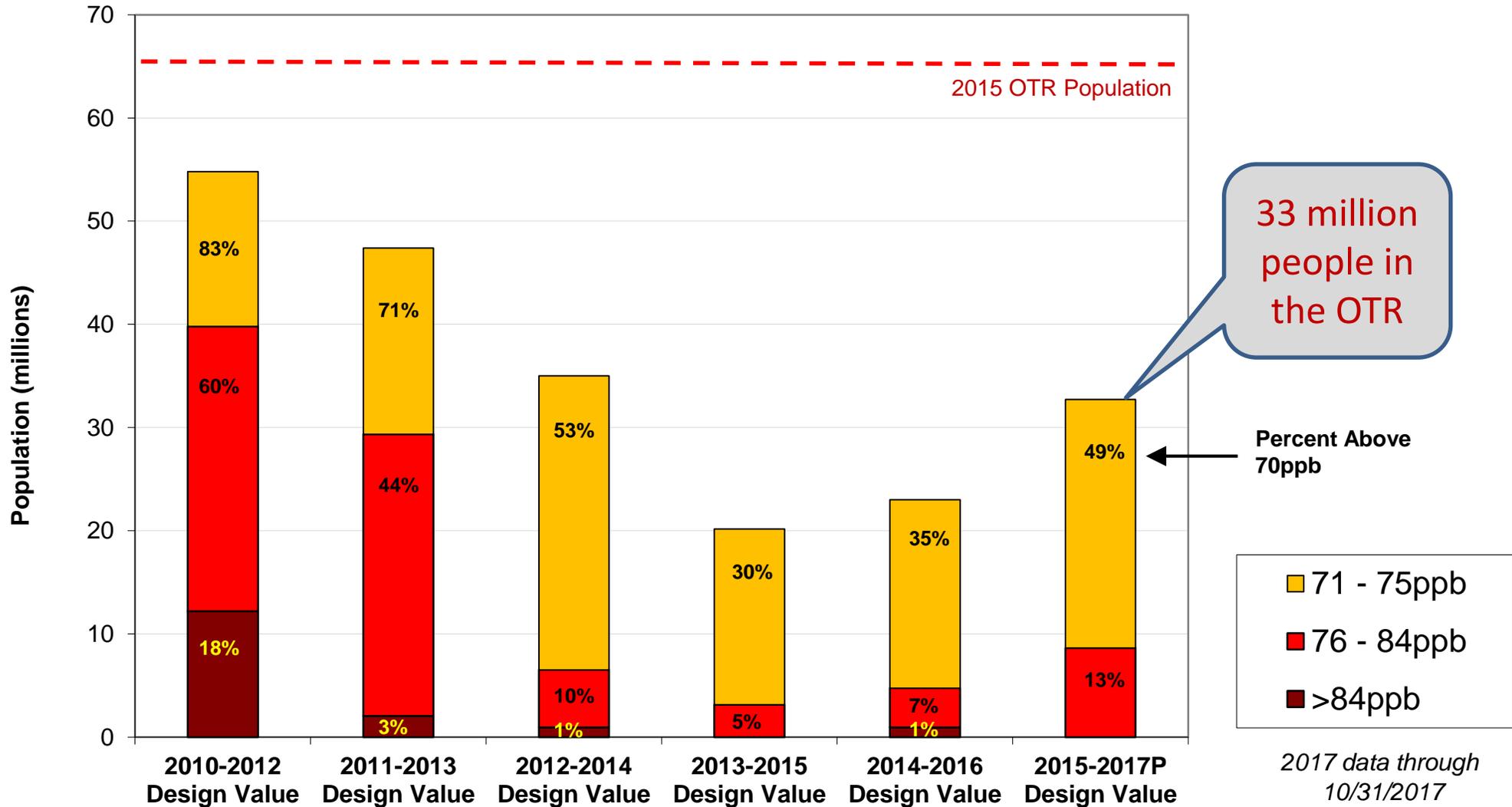
2017 data through
10/31/2017

Ozone Exposure Days by County



Ozone Transport Region

Population Exposure to 8-Hour Ozone



Population near closest representative monitor

Population based on 2015 Census Estimates

BenMap Predicted Roll-back Avoidances

Predicted Mortality

ppb	Year	Mean	-2σ	2σ
70	2013	817	410	1224
70	2014	97	48	145
70	2015	1,716	862	2,570
70	2016	1,698	853	2,543
ppb	Year	Mean	-2σ	2σ
65	2013	1,620	813	2,427
65	2014	1,378	692	2,065
65	2015	2,142	1,076	3,207
65	2016	2,266	1,139	3,394
ppb	Year	Mean	-2σ	2σ
40	2013	2,280	1,146	3,415
40	2014	2,193	1,101	3,284
40	2015	2,642	1,331	3,953
40	2016	2,620	1,317	3,923

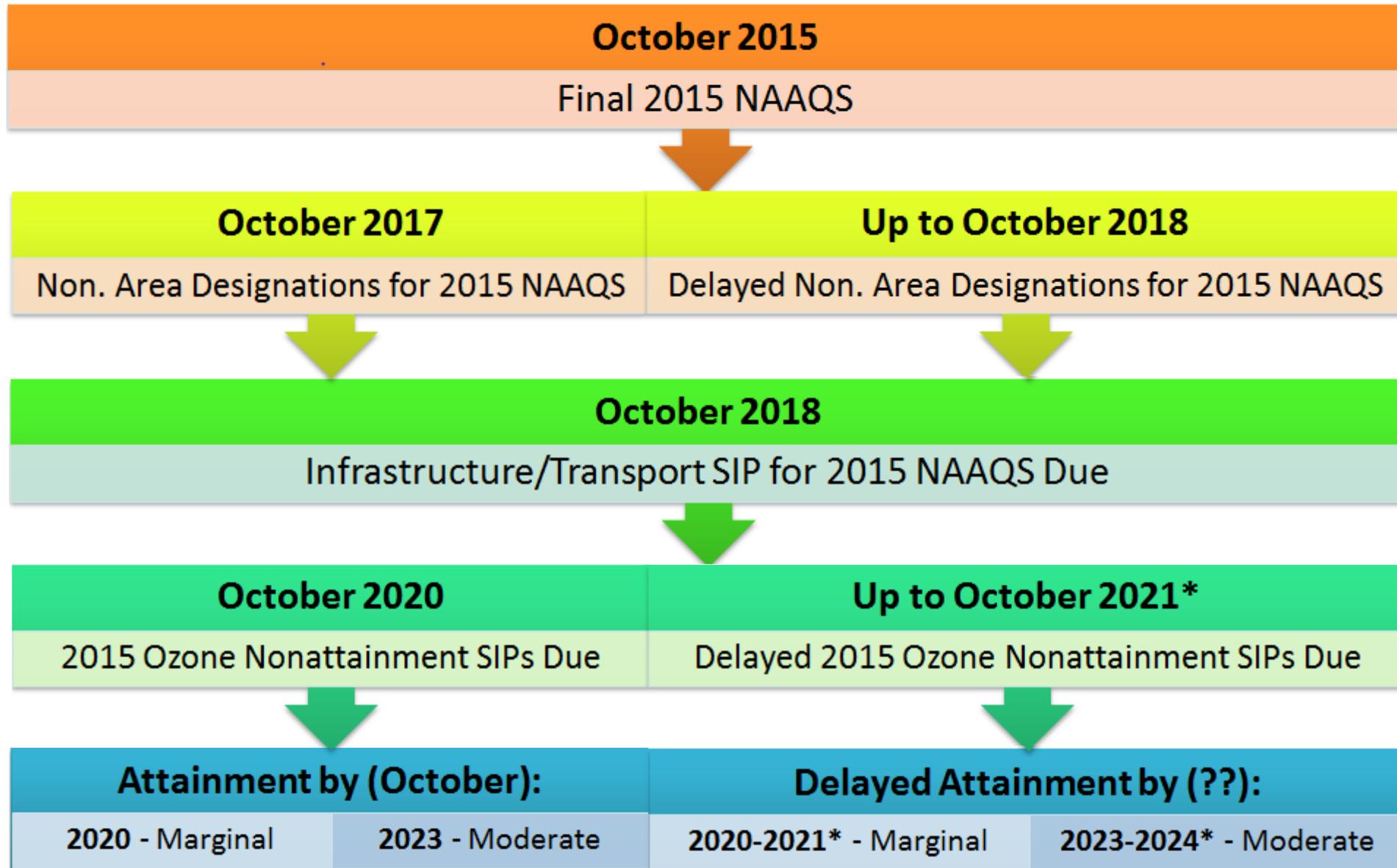
Predicted Valuation (\$ millions)

ppb	Year	Mean	-2σ	2σ
70	2013	\$ 5,202	\$ 77	\$ 10,328
70	2014	\$ 3,738	\$ 54	\$ 7,422
70	2015	\$ 8,823	\$ 135	\$ 17,510
70	2016	\$ 10,037	\$ 150	\$ 19,924
ppb	Year	Mean	-2σ	2σ
65	2013	\$ 9,549	\$ 144	\$ 18,953
65	2014	\$ 8,077	\$ 119	\$ 16,035
65	2015	\$ 11,000	\$ 168	\$ 21,833
65	2016	\$ 13,392	\$ 202	\$ 26,583
ppb	Year	Mean	-2σ	2σ
40	2013	\$ 11,716	\$ 179	\$ 23,254
40	2014	\$ 12,664	\$ 166	\$ 25,162
40	2015	\$ 13,753	\$ 213	\$ 27,293
40	2016	\$ 15,480	\$ 236	\$ 30,724

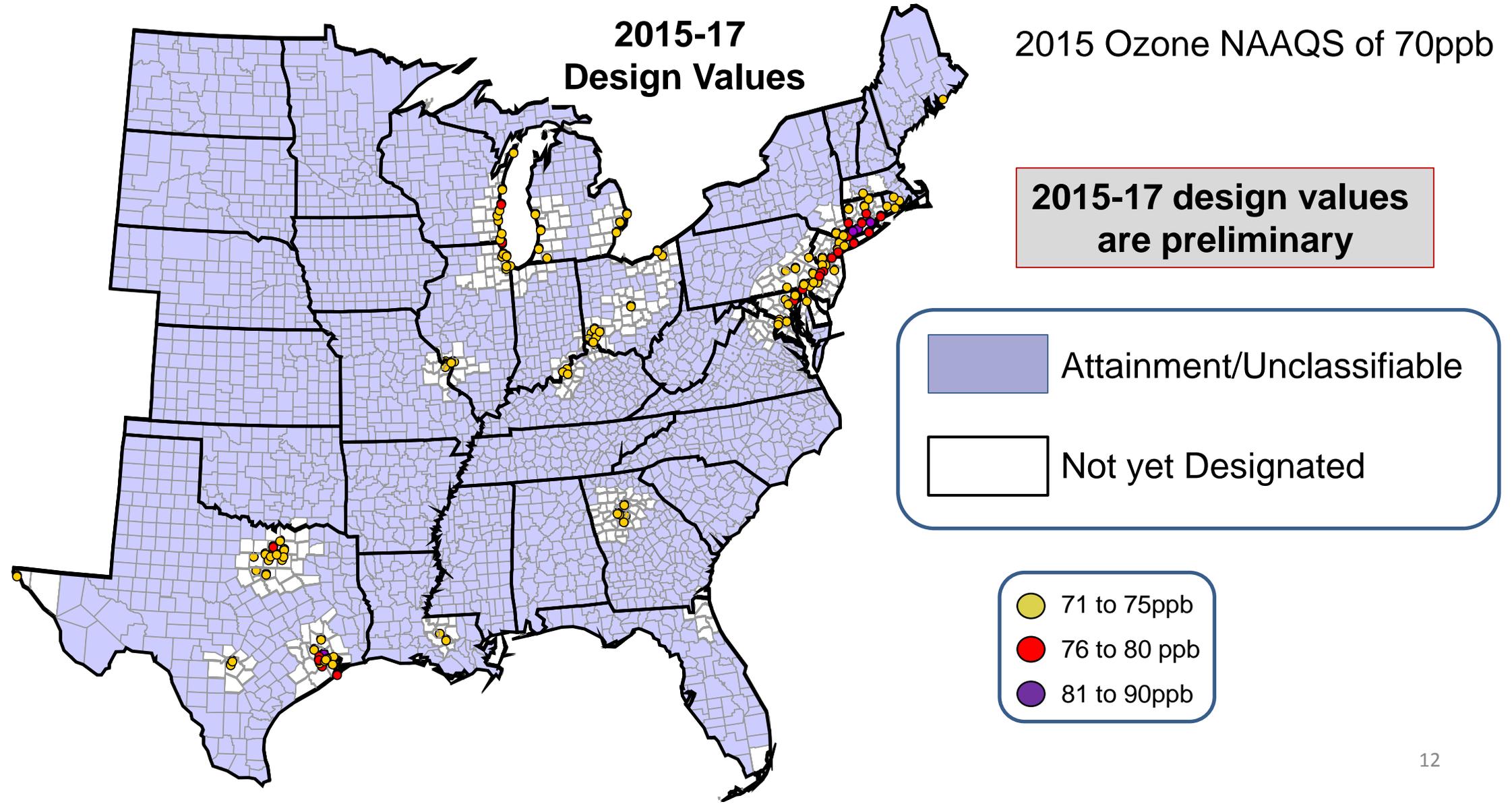
2015 Ozone NAAQS - Delayed Designations

- On June 28, 2017 EPA issued a delay of designations in the Federal Register
 - Justification cited Clean Air Act Section 107(d)(1)(B)(i)
 - EPA would have until October 2018 to designate
 - 2017 data would be certified at this point
- However on August 10, 2017 the delay withdrawn in the Federal Register
 - Allows for rolling designations to be completed by October 2018
- Phase 1 designations (only attainment areas) issued by EPA on 11/6/2017
- Designations of many nonattainment areas will be further delayed since 120 day letters have not been issued yet
 - 120 days from today is March 14, 2018 (2015-17 ozone data not yet fully certified)
 - 120 days from January 1, 2018 (2015-17 data would fully certified)

Ozone NAAQS Planning Timeline



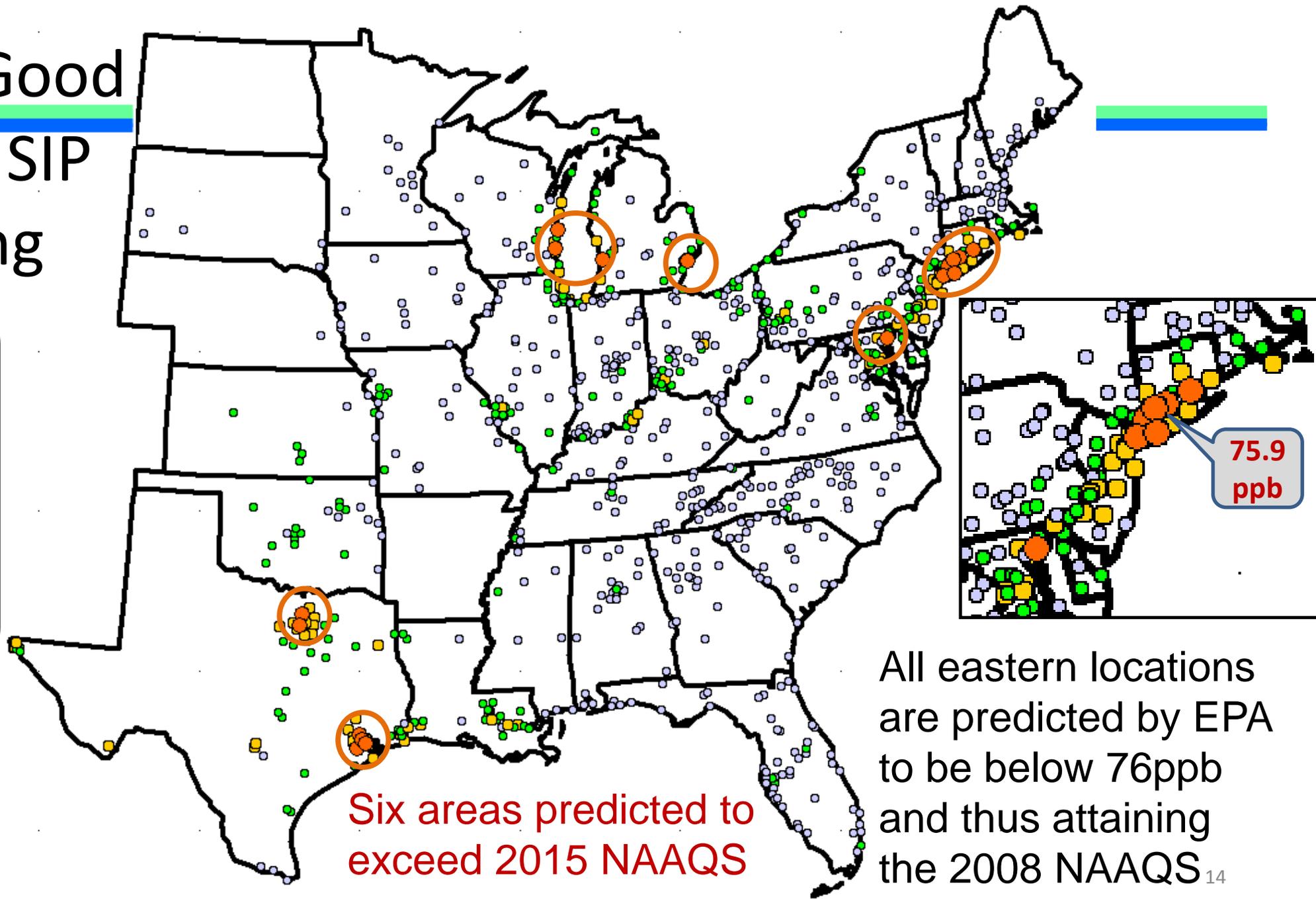
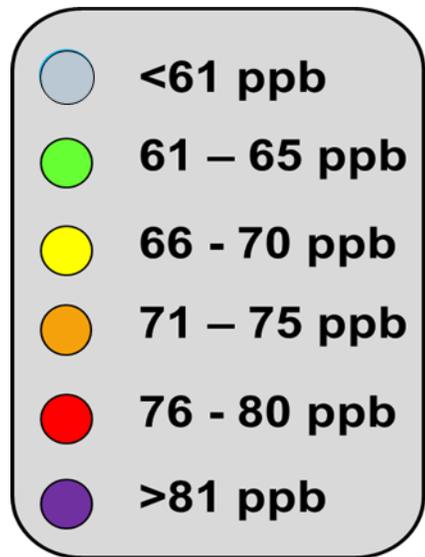
November 6, 2017 Round 1 Ozone Designations



What Went Into 2023 Transport Memo Modeling

- 2023 On-the-Books emission projections used for all sectors except EGUs
- 2023 EGU emission assumptions:
 - Clean Power Plan removed
 - Known retirements, fuel switches, and planned emission controls (including review of ERTAC data) applied
 - Units with State of the Art controls will optimize them
 - 0.10 lb NO_x/mmBtu
 - CSAPR Update region units without State of the Art controls will installed them by 2023:
 - 0.1549 lb NO_x/mmBtu for dry bottom wall-fired coal boilers
 - 0.139 lb NO_x/mmBtu for tangentially-fired coal boilers
 - Other on the books rules including BART, Connecticut's RACT rule, Pennsylvania's RACT rule
- Removal of Clean Power Plan increases annual NO_x emissions from EGUs by about 20% from previous EPA Transport Modeling for 2023
 - Several nearby upwind states (OH, IN, MI, KY) see stricter EGU emission budgets in this modeling
 - All OTC states, except VT, see less strict EGU emission budgets in this modeling

EPA 2023 Good Neighbor SIP Modeling



EPA 2023 Good Neighbor SIP Modeling

- Generally less optimistic than earlier EPA preliminary 2023 modeling by around 2-6ppb
 - Except central NYC area which became more optimistic by around 2ppb
- EPA 2023 modeling predicts greater ozone improvements in the New York City and Baltimore regions than OTC's 2023 screening modeling
 - OTC will revisit 2023 modeling with the Gamma emission inventory

2011 Modeling Platform

- Still the focus of:
 - 2008 Ozone NAAQS SIP Modeling Efforts (primarily CMAQ)
 - 2018-21 Regional Haze SIP Modeling for MANE-VU (CMAQ)
 - Contribution assessment research (CAMx)
- Emission Inventories have been updated to MARAMA Gamma for 2011, 2020, and 2023
 - MARAMA Alpha 2028 still currently in use for regional haze modeling

2011 Gamma Modeling

- Upgrade to CMAQ 5.2
- Switch from CB5 to CB6r3 chemistry
- Inventory Updates
 - Inline point sources
 - Onroad Mobile updated from EPA's 'ek' to 'el'
 - Increased penetration of e-85 fuel
 - Speciation updates
 - Updates to nonpoint, oil & gas, PFC and agfire sectors

OTC Photochemical Modeling Plan

2011 Gamma Emission Inventory Base Case (CMAQ & CAMx)

- To ensure consistent inventories and update chemistry

2023 Gamma Emission Inventory Base Case – CAMx Emission Tags

- For Use in Transport Modeling
- Guidance information for 2015 Ozone NAAQS

2020 Gamma Emission Inventory Base Case – CMAQ

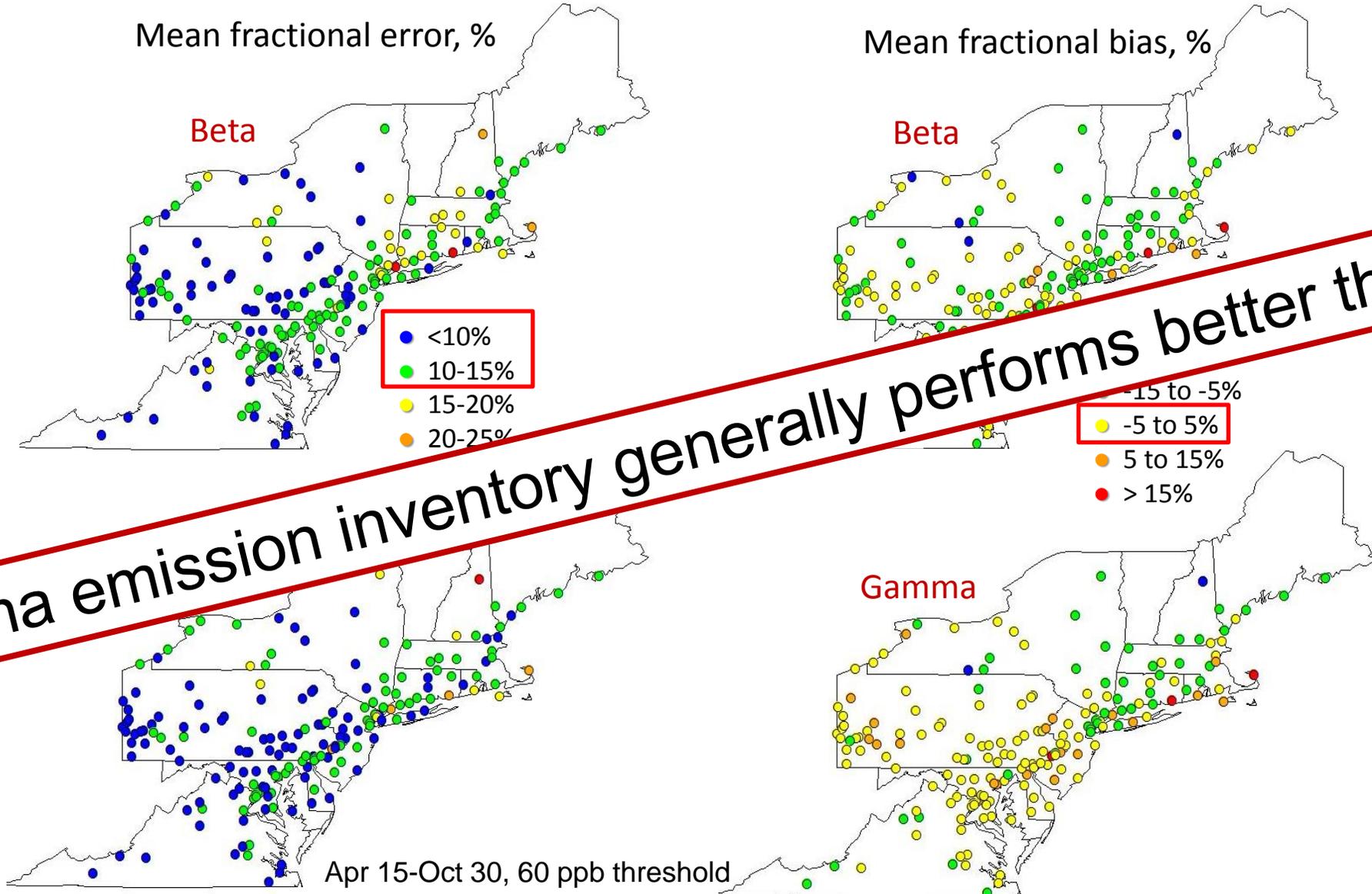
- For use in Serious 2008 NAAQS Nonattainment Ozone SIPs

2017 Beta Emission Inventory Base Case – CAMx Emission Tags

- For Use in Transport Modeling

Update Gamma Emission Inventory and Modeling Documentation

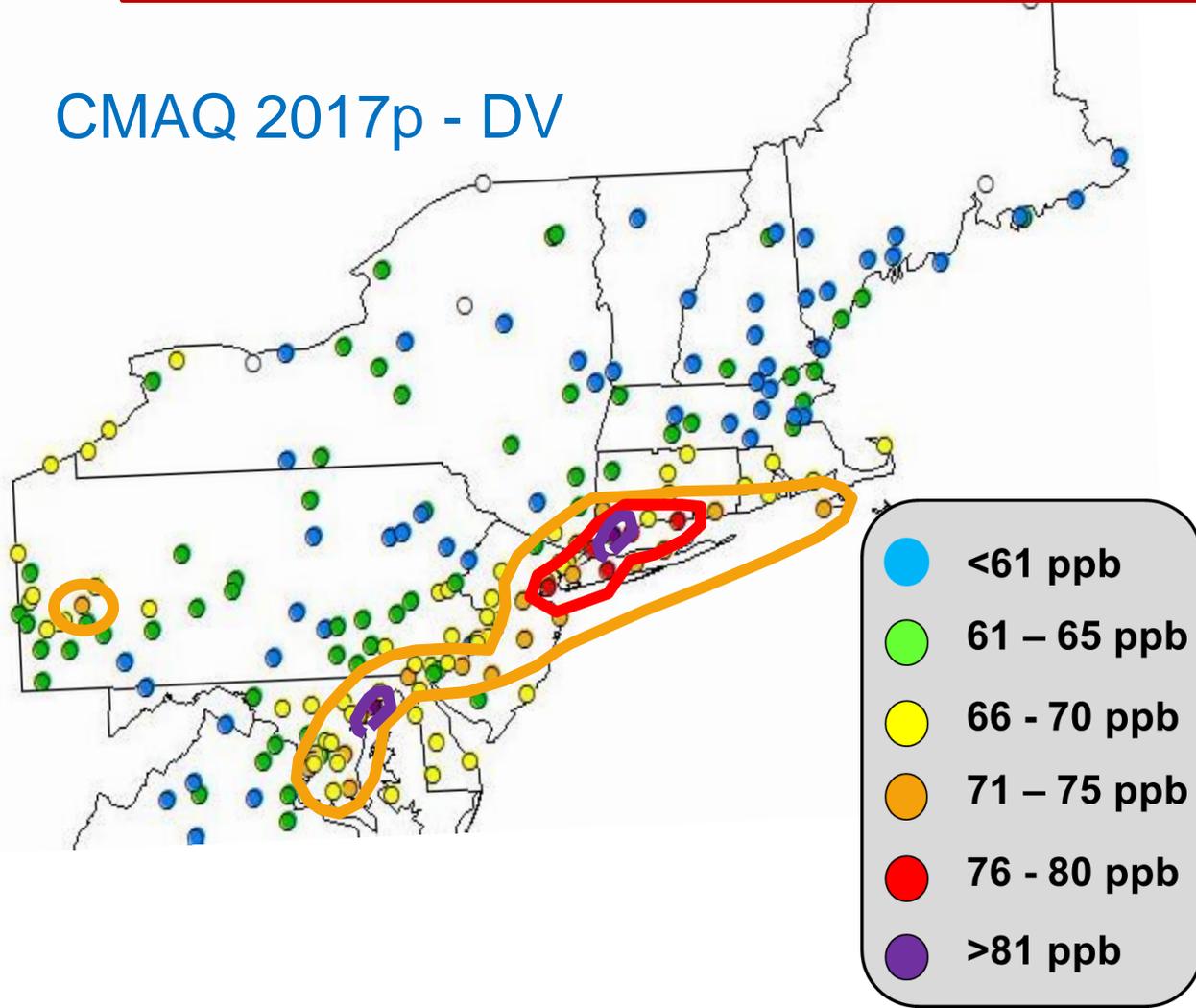
Gamma Emission Inventory Model Performance



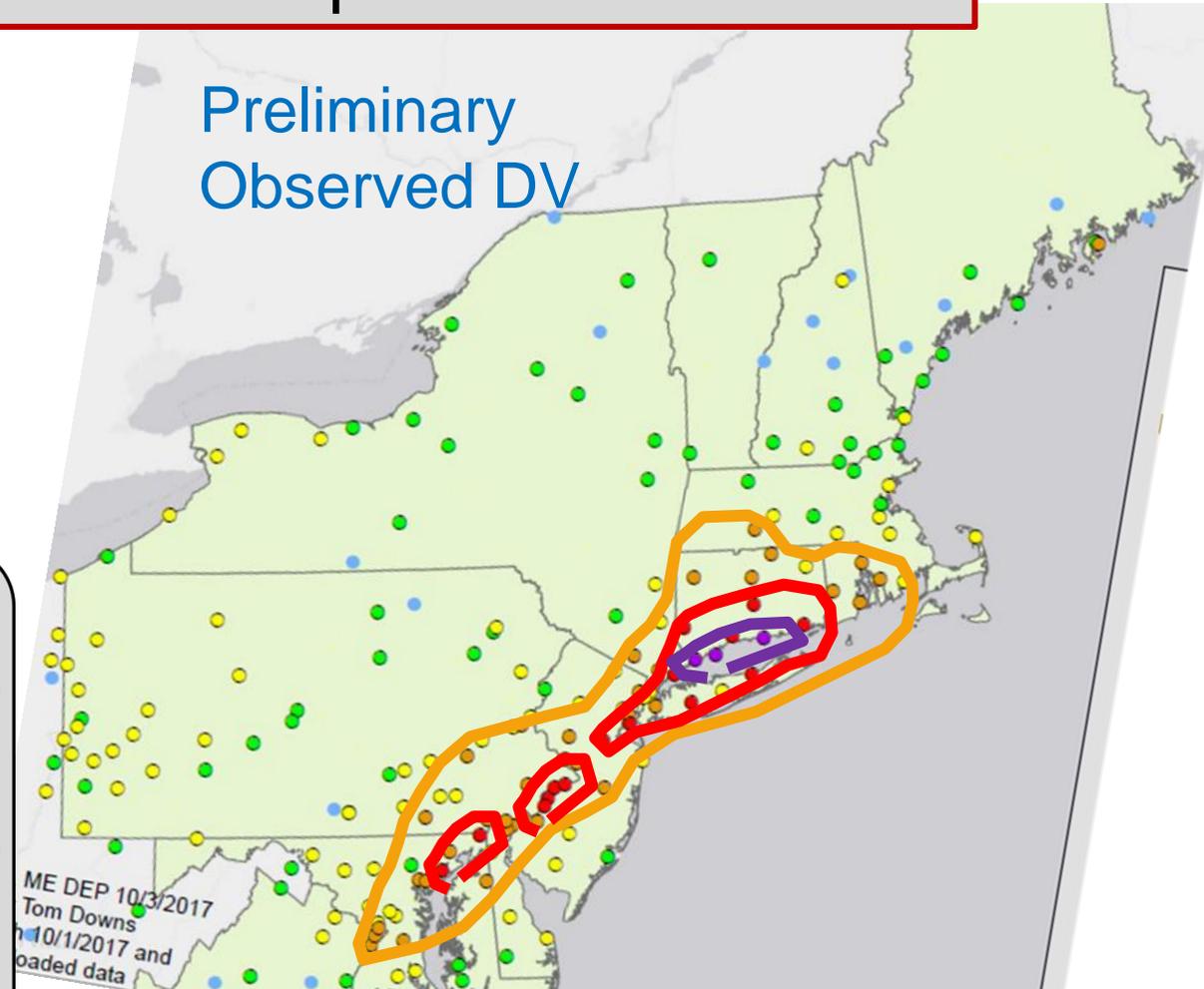
2017 – How Good is Our Modeling?

Modeling is very good but under-predicted 2017 actual data.
Note: EPA modeling is usually even more optimistic.

CMAQ 2017p - DV



Preliminary Observed DV



OTC Contribution Modeling – Emission Source Tagging

■ Emission Years

1. 2023 – Moderate 2015 NAAQS
2. 2017 – Least Projected

■ States/Anthropogenic Sectors to tag

- **All States (& partial states) in Domain**

- EGU,
- Area,
- NonRoad,
- Marine
- Non-EGUs (cement kilns, MWC, & others),
- OnRoad (diesel & others),
- Oil & Gas (area & point)

That's 385 Tags

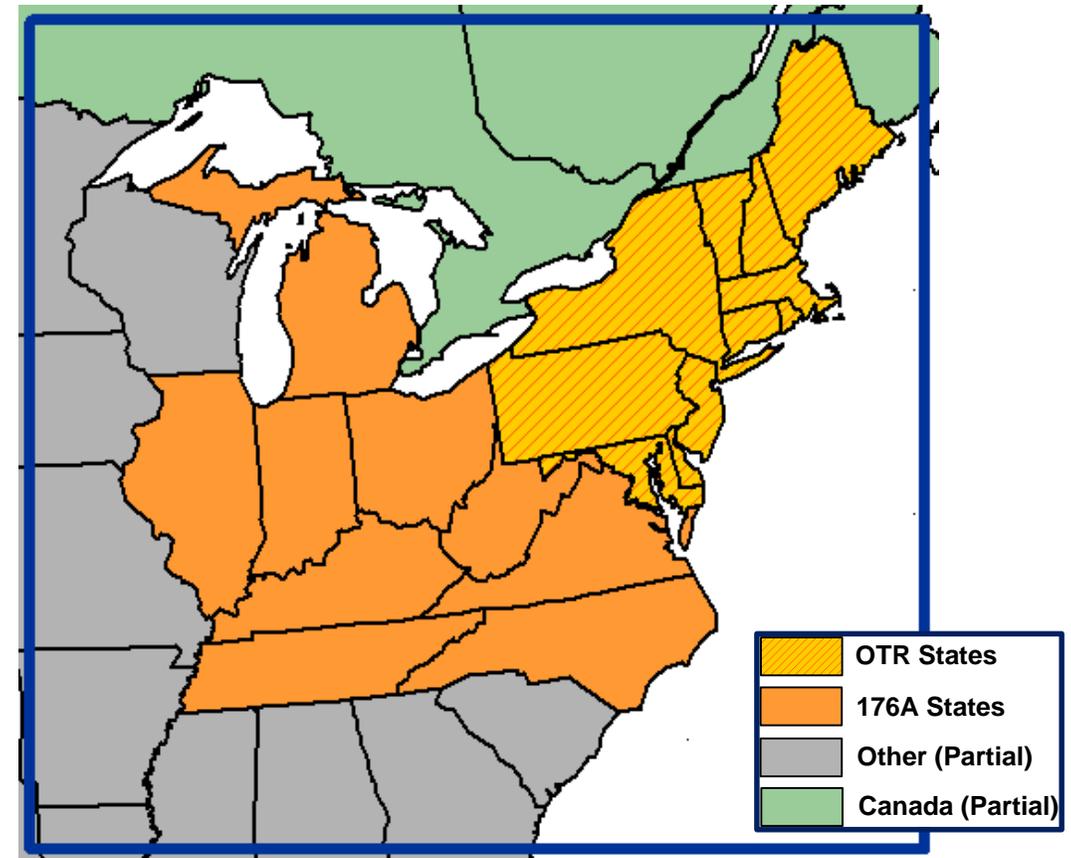
- **Only OTC States individually**

- RWC, Fires

- **Entire Domain**

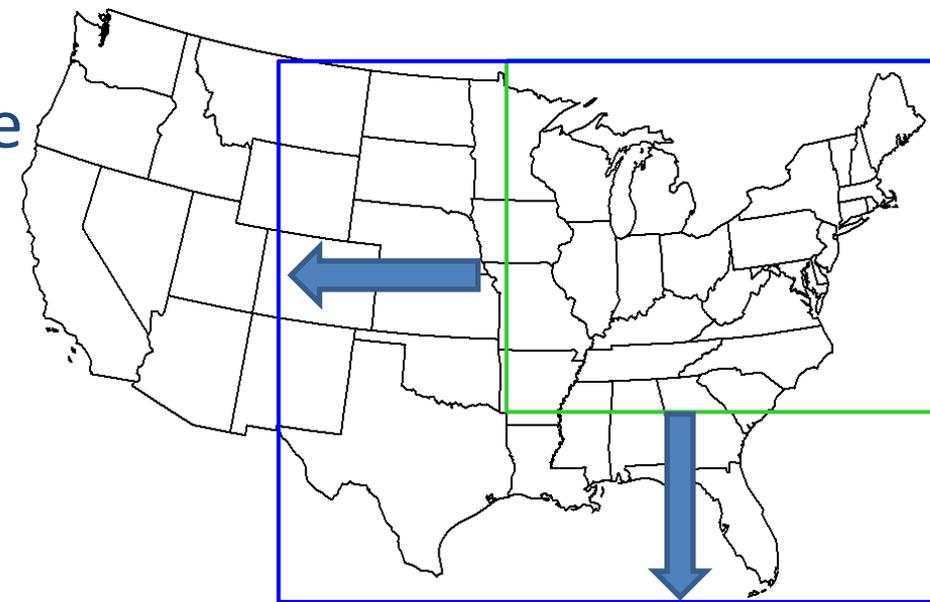
- Biogenics, Initial Conditions, Boundary Conditions, Canada, EEZ (Exclusive Economic Zone – US Territorial Waters)

OTC Modeling Domain



New OTC Modeling Platform – Under Development

- In partnership with EPA and other regions nationally for 2015 Ozone NAAQS and for Regional Haze 2021 submittals
- Likely to use a unified domain
 - OTC likely to utilize a larger portion of the national domain than in the past (i.e., east of the Rocky Mountains)
 - Common emission inventories where possible
 - 2014 NEI represents update to 2011
 - 2017 NEI will not be available until 2019
 - 2016 meteorology focus, possibly supplemented with 2015 episodes
 - Projected years, TBD

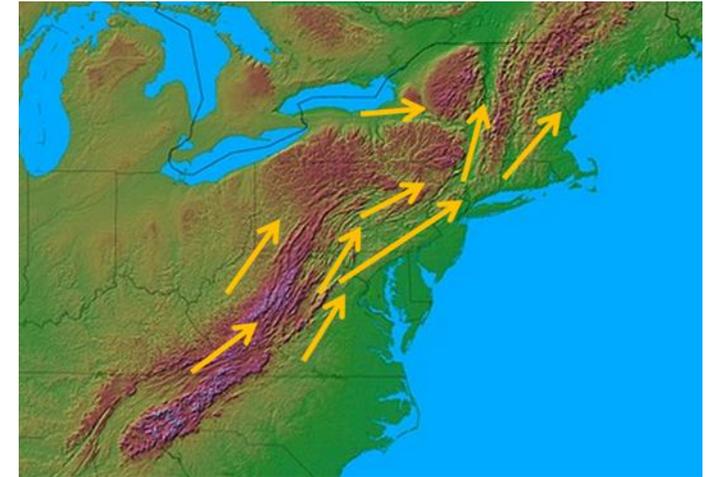
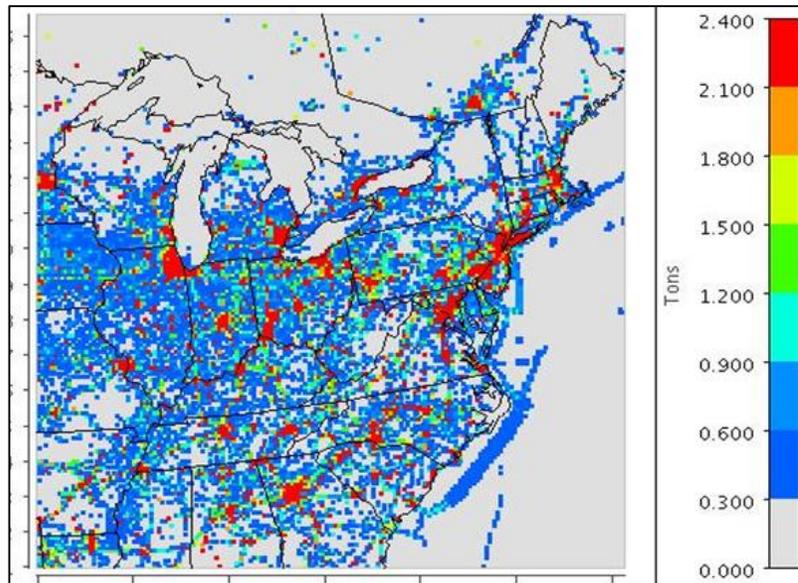


Enhanced Monitoring Plans (EMP)

- Required for all OTR states as part of 2015 Ozone NAAQS process
 - State plans are due October 2019, although EPA is encouraging early submittal by July 2018.
 - States can submit individual plans or work together on joint plans, either sub-regional, regional or super-regional.
- Effort underway to coordinate between states & EPA through OTC workgroup
 - Gain regional benefits from plans
 - More knowledge on transport
 - More knowledge of air/sea affect on ozone
 - Information to improve model performance

OTR Enhanced Monitoring Plans

- An opportunity to enhance monitoring network in a coordinated way to collect data for:
 - Better understanding emissions
 - Improve science of transport in the region
 - Meeting attainment in all portions of the OTR



Not just PAMS!

Also interested in upper air and over water measurements

Conclusions & Next Steps

- Ozone design values for 2015-17 in the OTR are generally higher than 2014-16
 - Ozone exceedances in 2017 ozone season similar to 2015 and 2016, but more than in 2014
- OTC BenMap modeling indicates that:
 - Reducing Ozone levels will substantially reduce mortality and other health issues related to ozone in the OTR
- Modeling underway includes:
 - 2011 Gamma and updated model chemistry (complete)
 - 2017 Beta with emission tagging
 - 2020 Gamma
 - 2023 Gamma with emission tagging
- Enhanced Monitoring Plans (EMPs) still in early planning discussions
 - Focused mostly on fixing remaining high ozone problem areas
 - Looking for ways to improve Northeast network efficiencies

Questions

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