Modeling Committee Update

OTC Stakeholder Meeting

September 21, 2018

Webinar

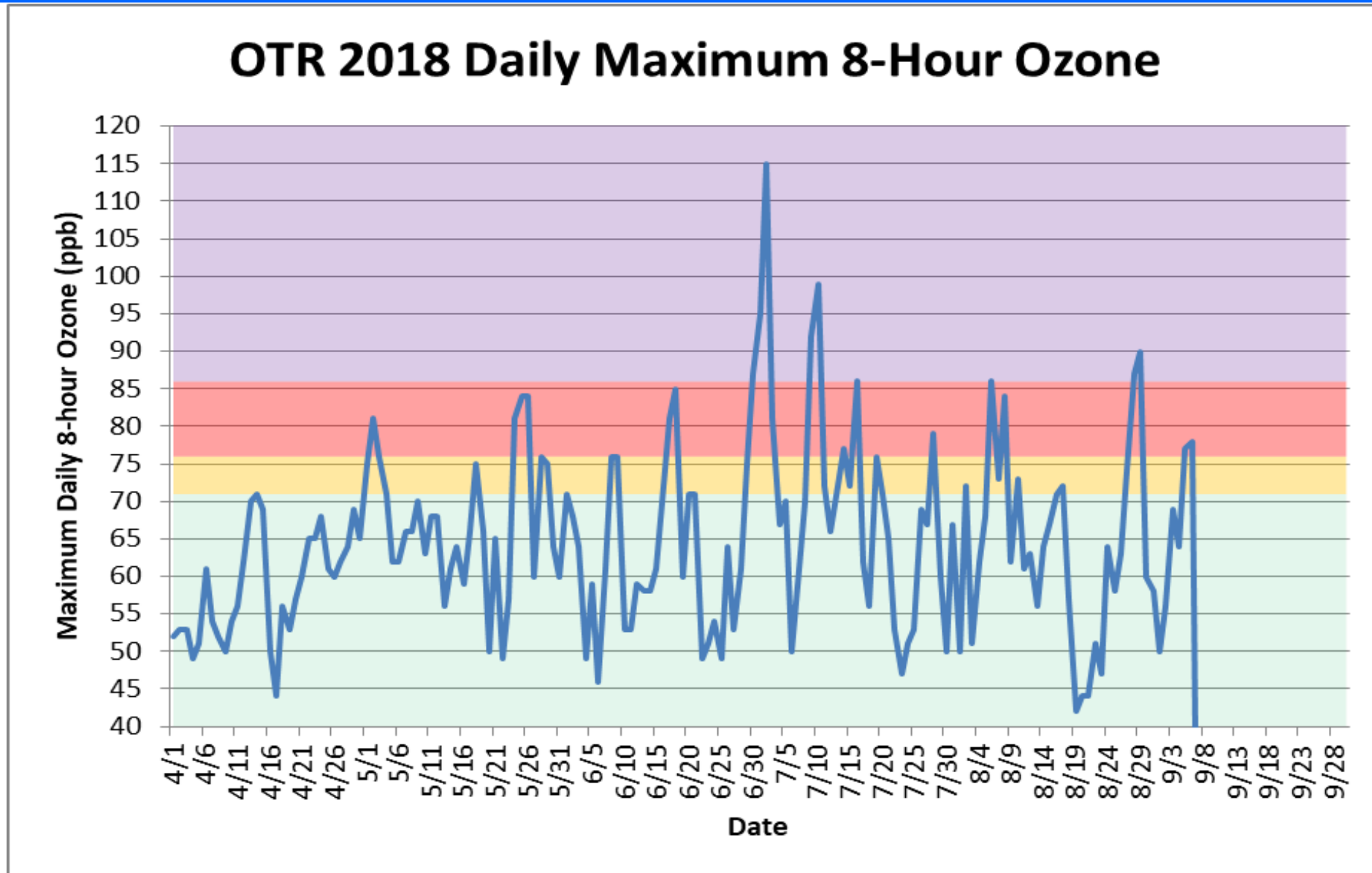**OZONE** TRANSPORT COMMISSION

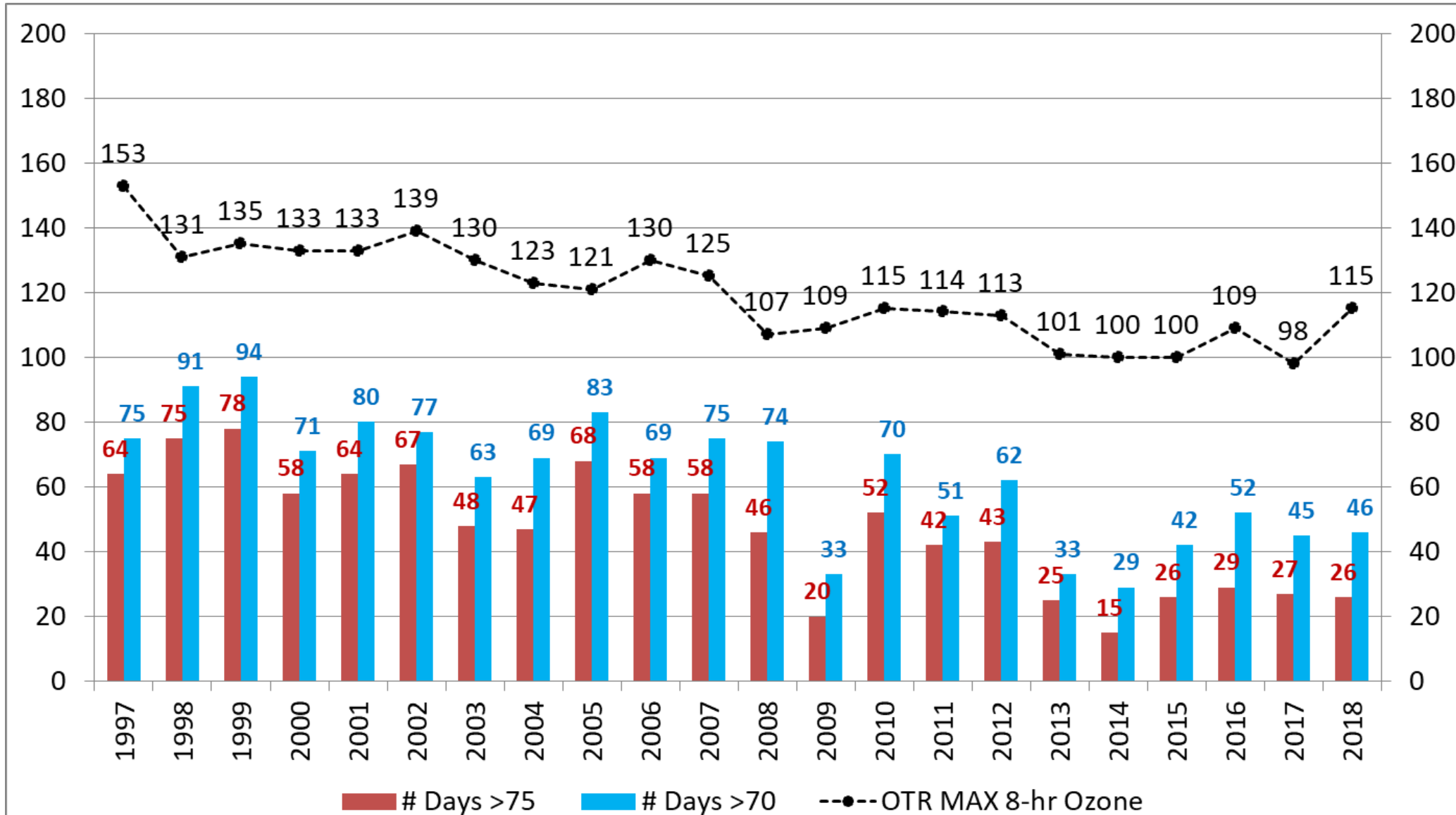OZONE TRANSPORT COMMISSION

Overview

1. 2018 Ozone Monitoring Update
2. 2011 Platform Modeling Results
3. 2016 Modeling Platform Update
4. Technical Support Document

20 events spanning 46 days

OTR 2018 Daily Maximum 8-Hour Ozone

OTR 8-Hour Ozone Trend

1997-17 data: 6/14/2018 AQS

2018 data - AIRNOW-Tech

2018 data is preliminary

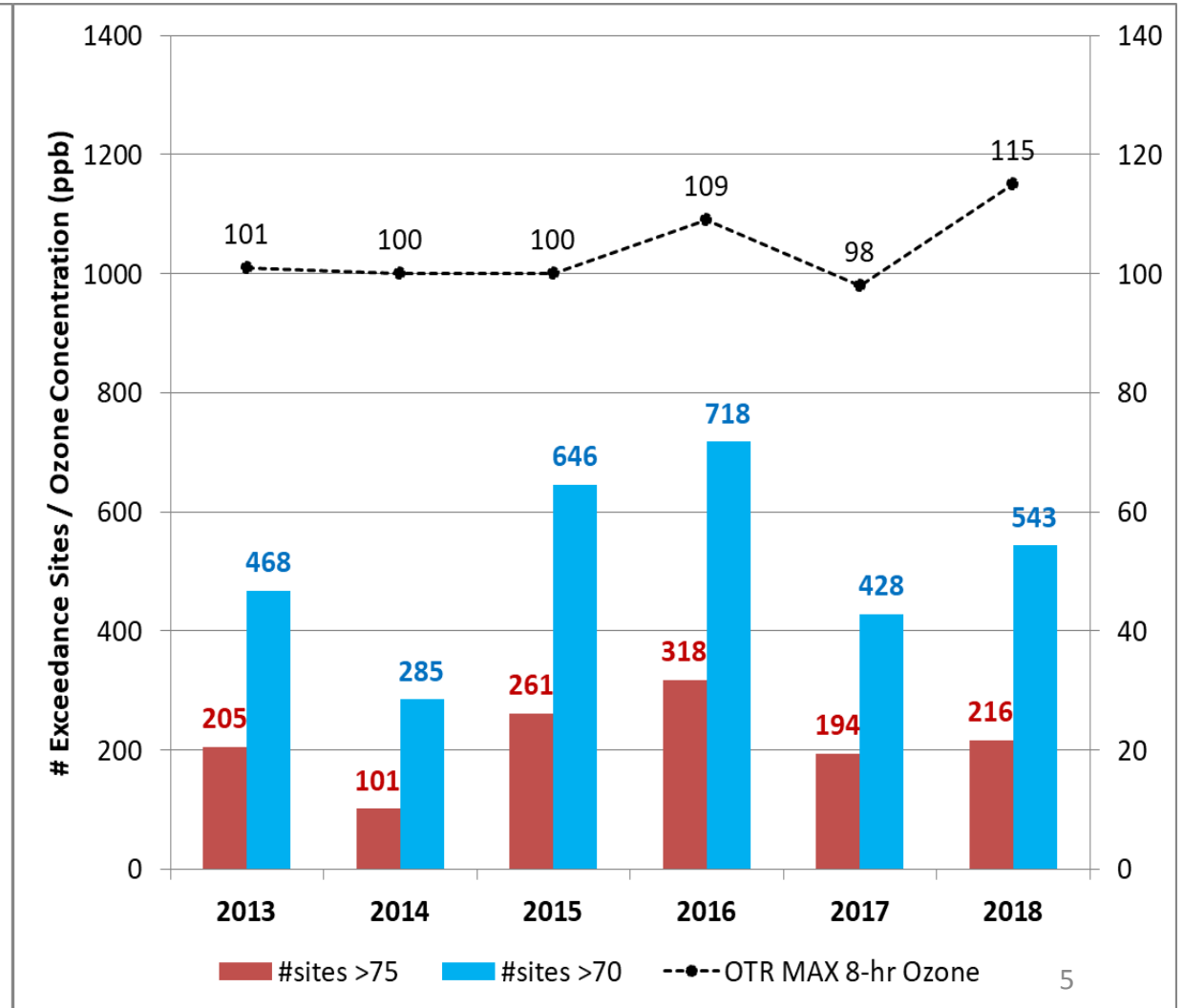2018 Season to date as of 9/6/2018

Legend: # Days >75, # Days >70, OTR MAX 8-hr Ozone

OTR 8-Hour Ozone Trend
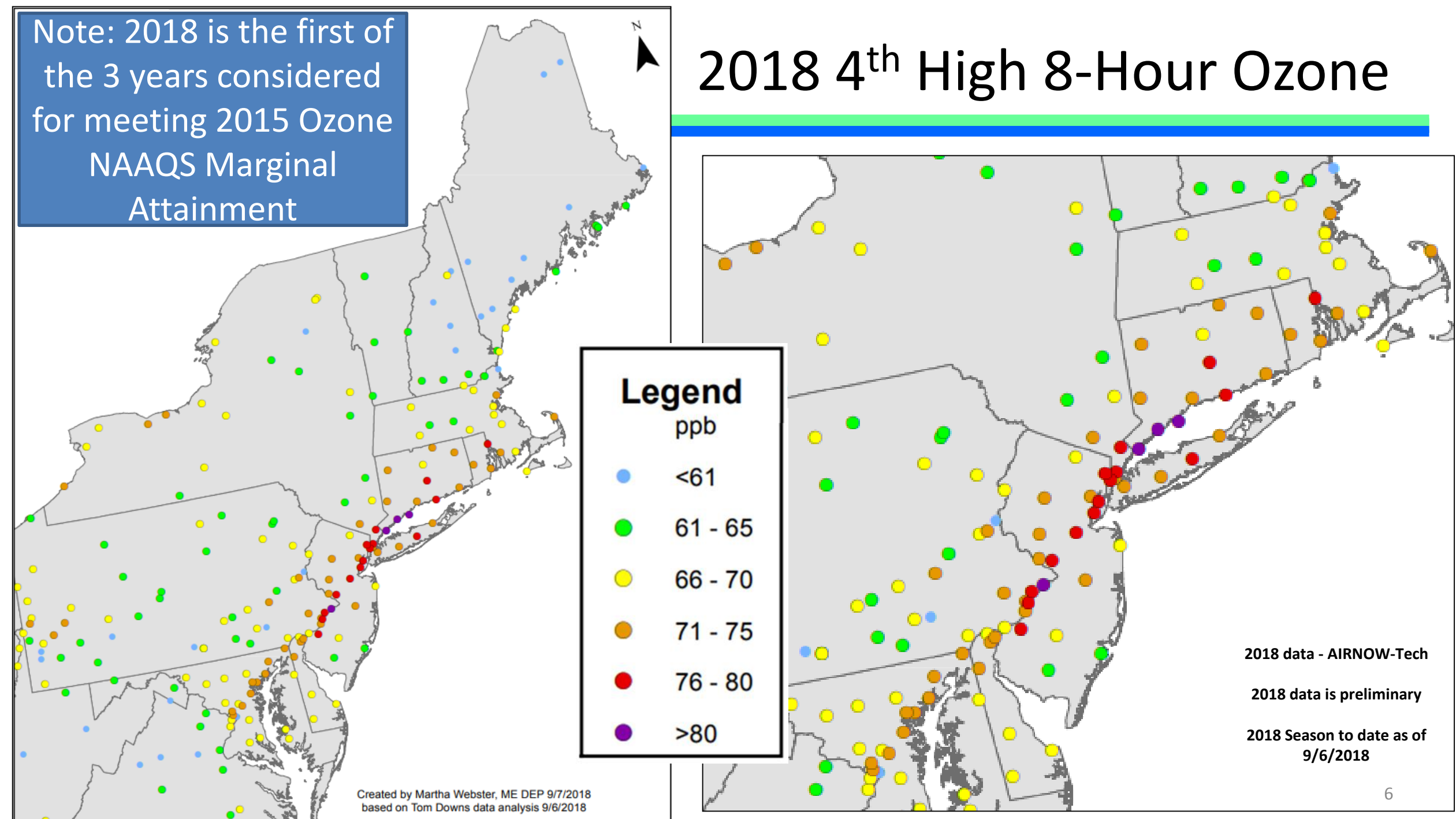

Number of Exceedance Days per Year
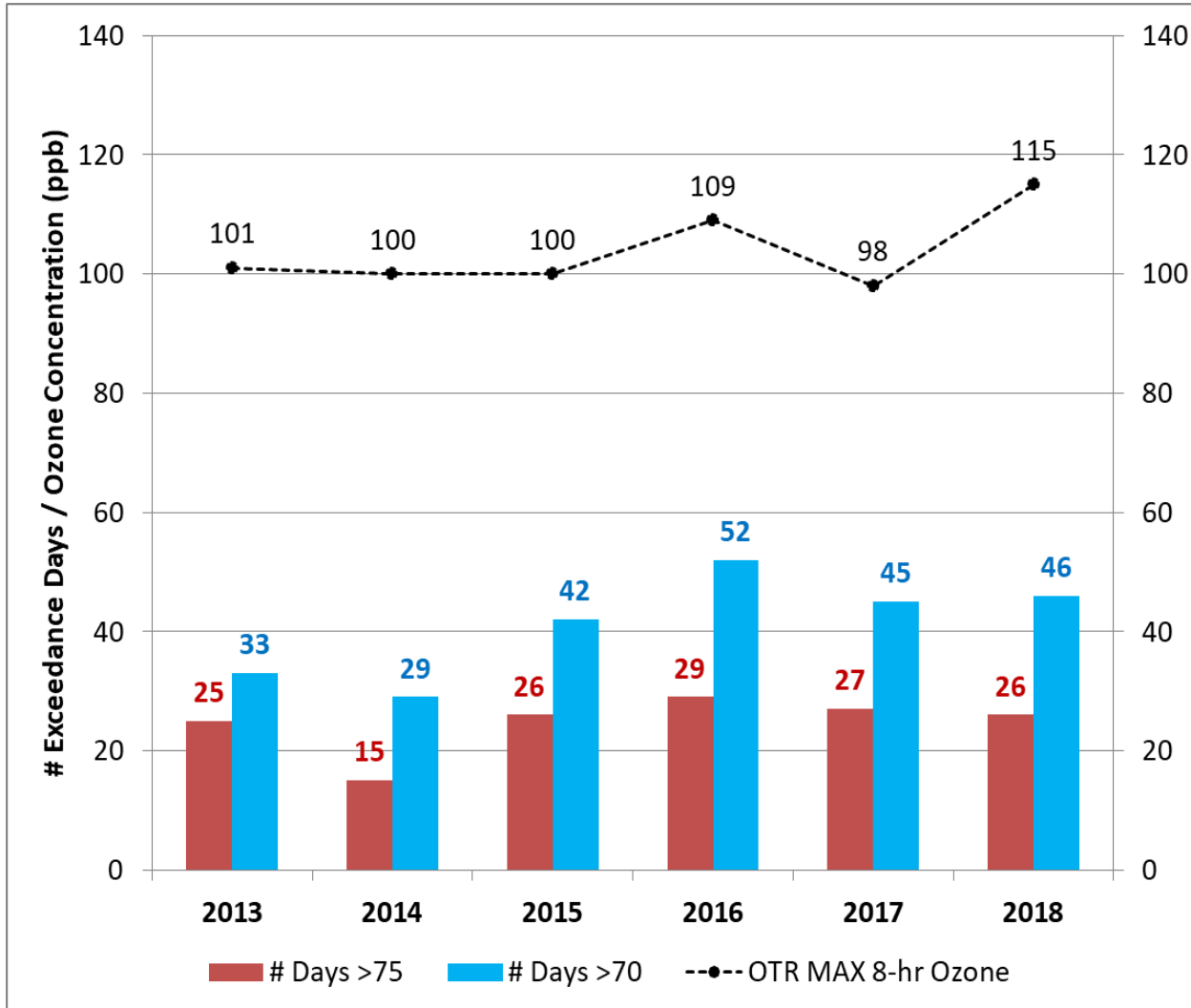
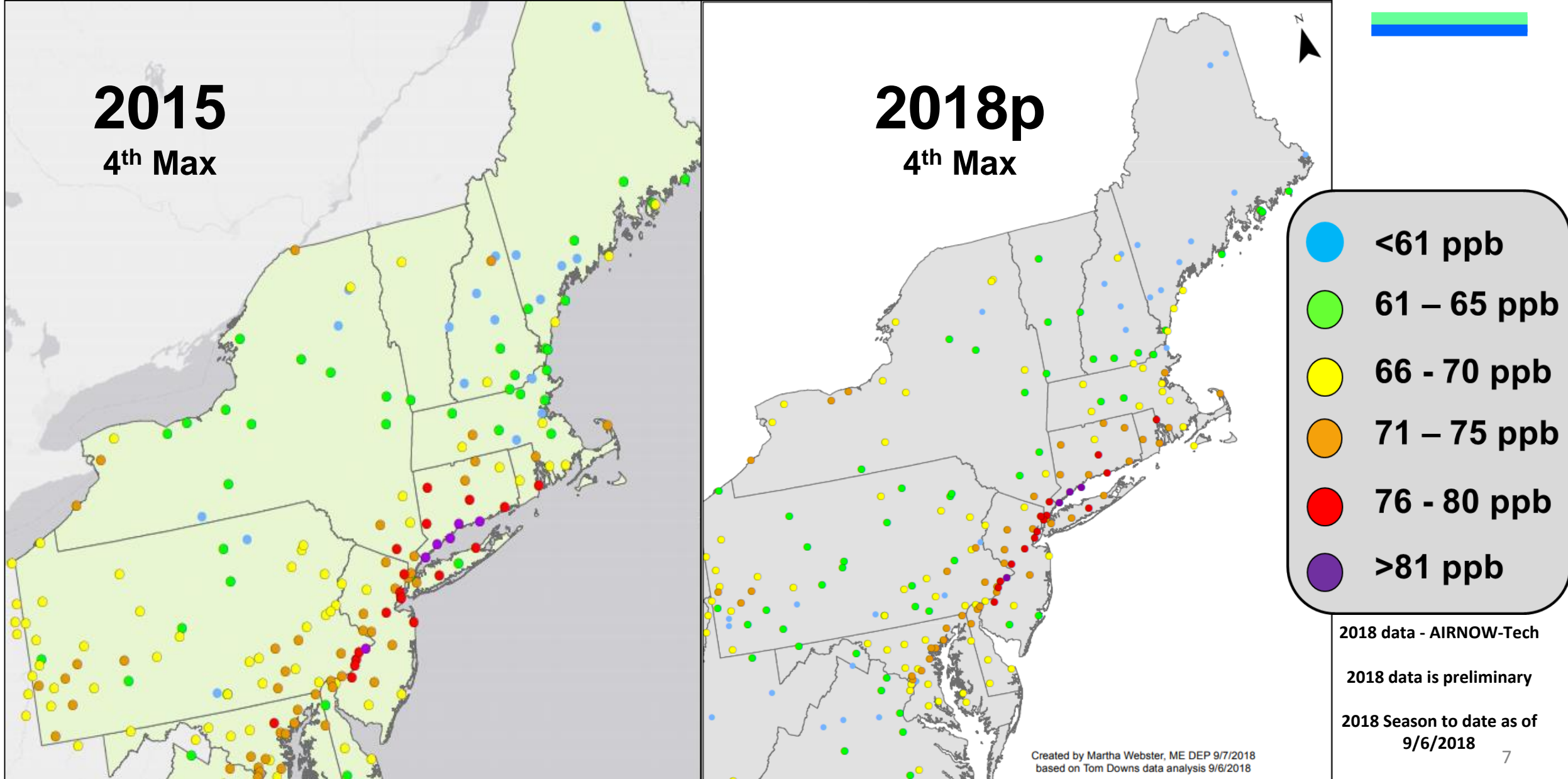**Number of Exceedance Sites per Year**

5

Note: 2018 is the first of the 3 years considered for meeting 2015 Ozone NAAQS Marginal Attainment

2018 4th High 8-Hour Ozone

Legend
ppb

- <61
- 61 - 65
- 66 - 70
- 71 - 75
- 76 - 80
- >80

2018 data - AIRNOW-Tech

2018 data is preliminary

2018 Season to date as of 9/6/2018

Created by Martha Webster, ME DEP 9/7/2018 based on Tom Downs data analysis 9/6/2018

2018 Replaces 2015 for Design Value

Legend:
- <61 ppb (blue)
- 61 – 65 ppb (green)
- 66 - 70 ppb (yellow)
- 71 – 75 ppb (orange)
- 76 - 80 ppb (red)
- >81 ppb (purple)

2018 data - AIRNOW-Tech

2018 data is preliminary

2018 Season to date as of 9/6/2018

Created by Martha Webster, ME DEP 9/7/2018
based on Tom Downs data analysis 9/6/2018

7

Preliminary 2016-18 Ozone Design Values
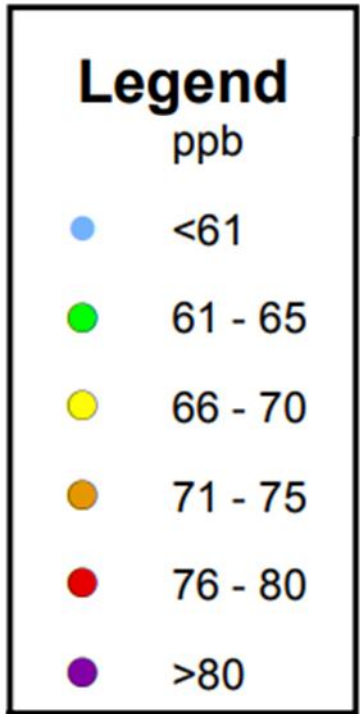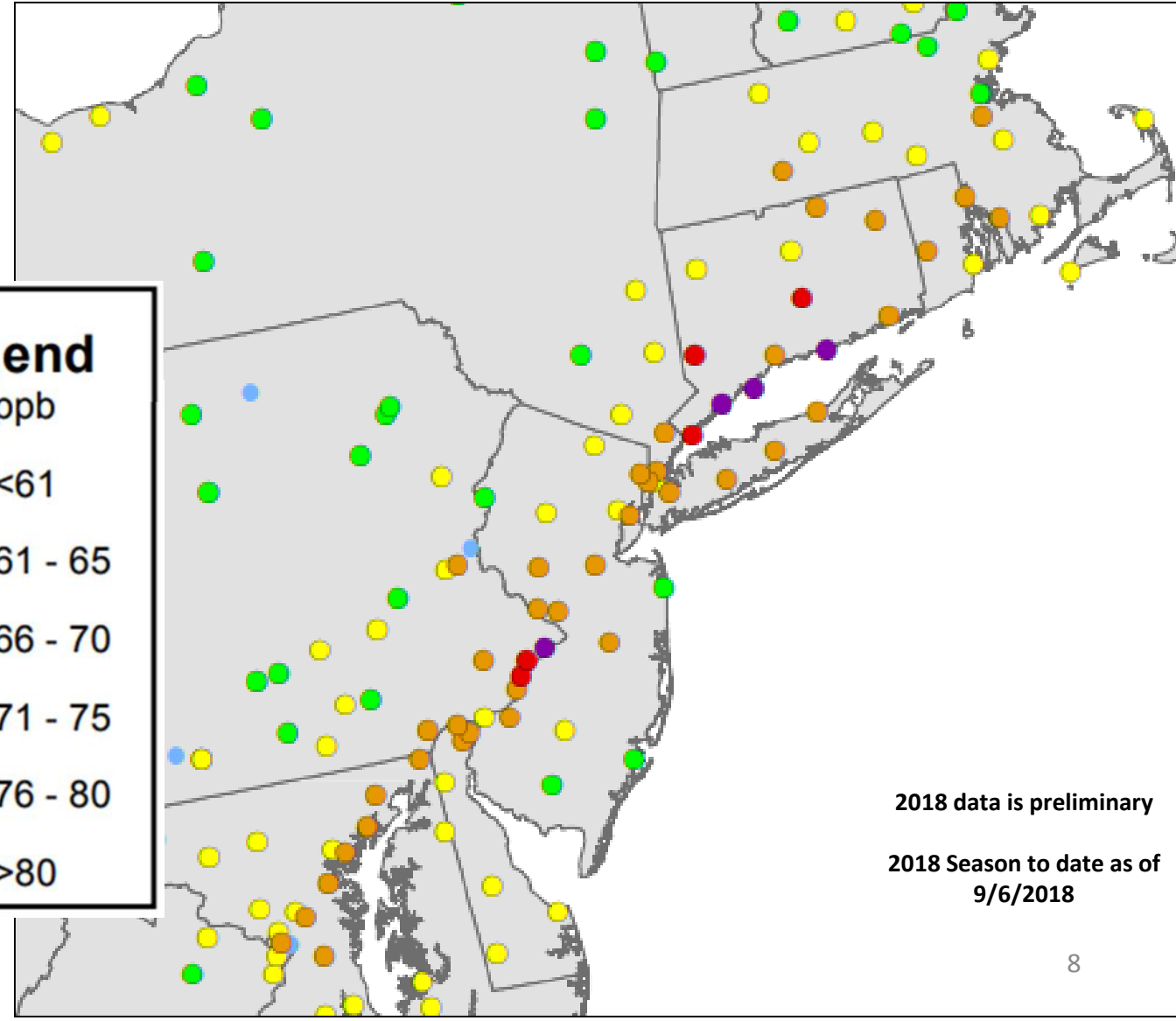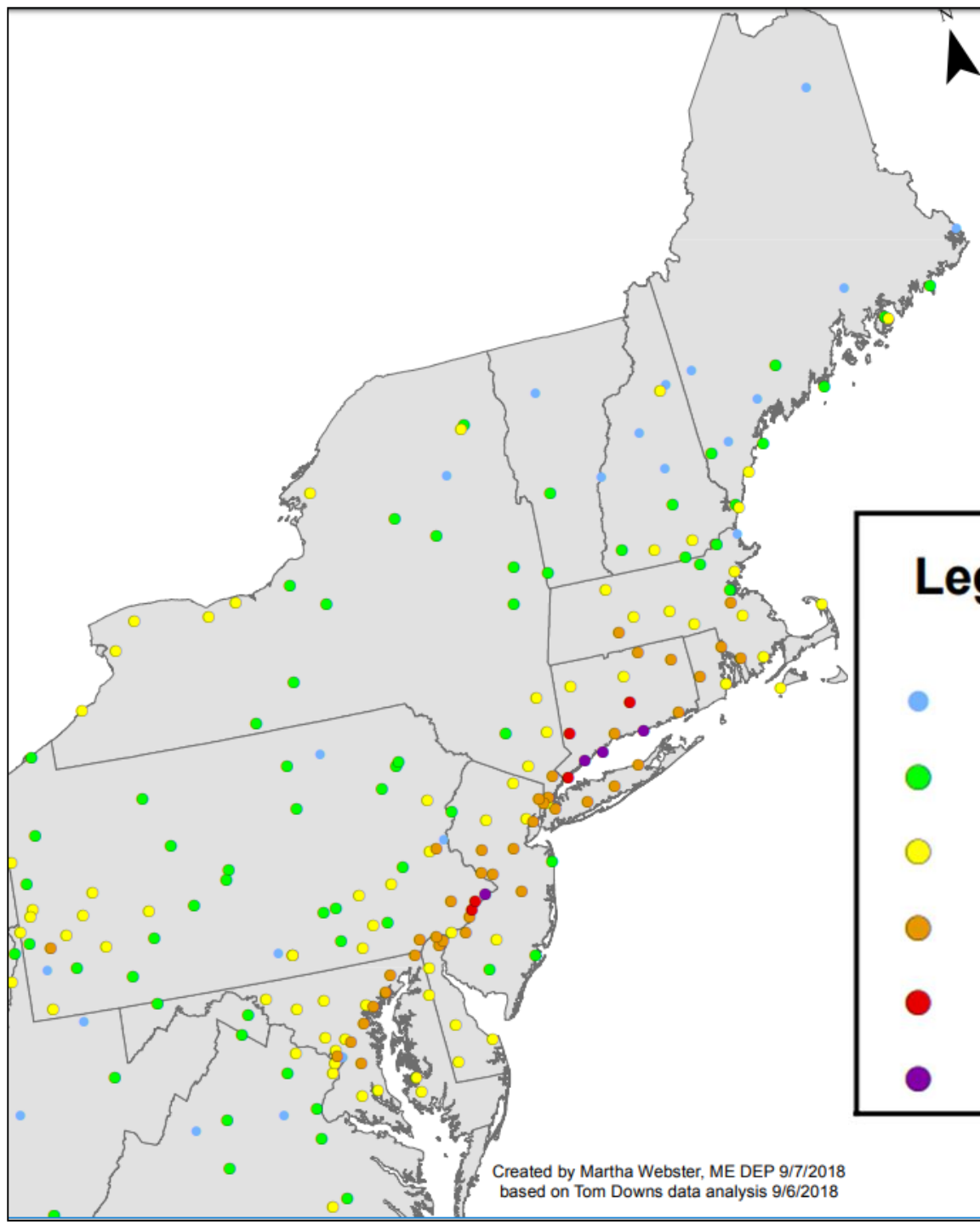
Created by Martha Webster, ME DEP 9/7/2018
based on Tom Downs data analysis 9/6/2018

2018 data is preliminary

2018 Season to date as of 9/6/2018

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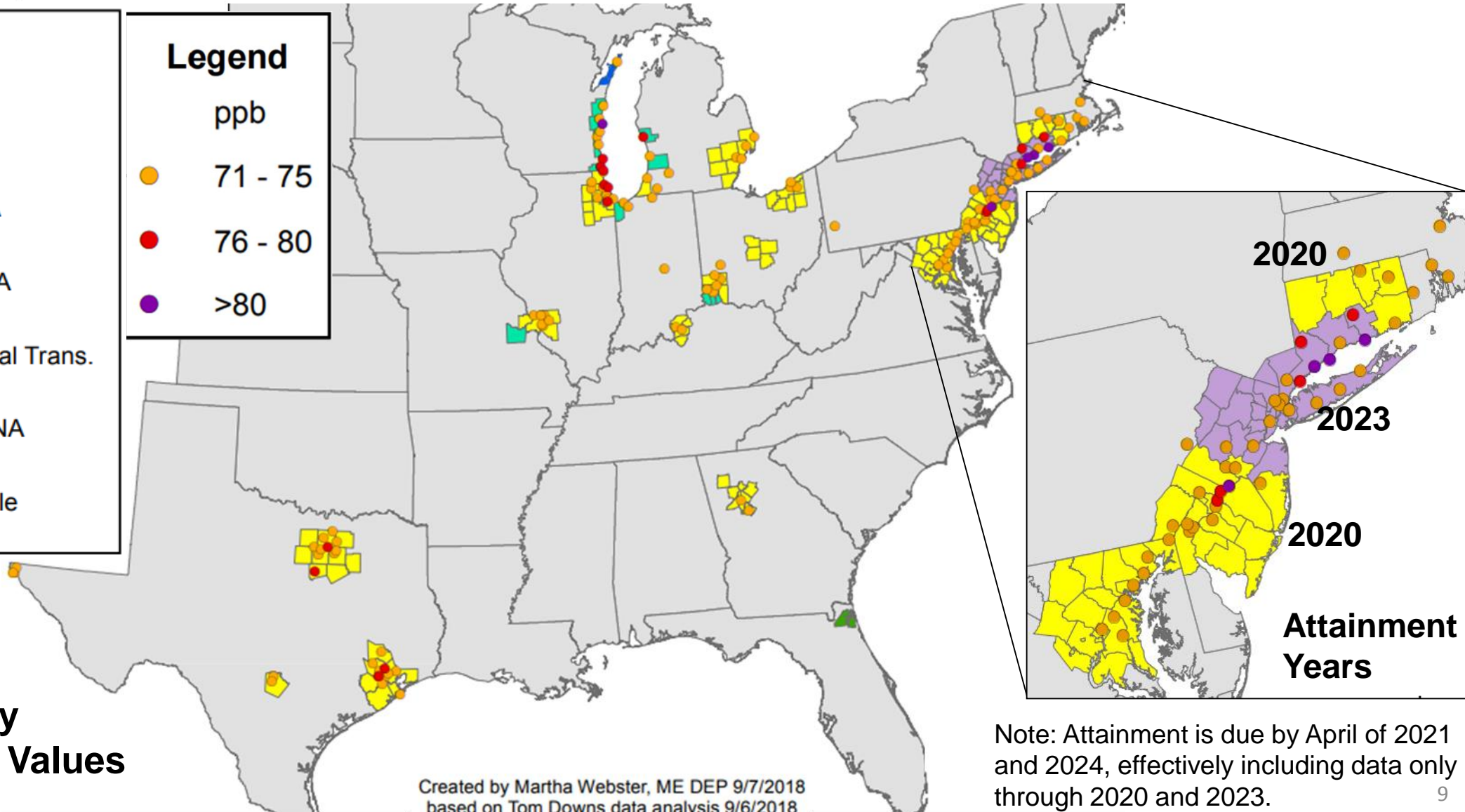- 71 - 75
- 76 - 80
- >80

2015 8-Hour Ozone NAAQS Designations

Created by Martha Webster, ME DEP 9/7/2018
based on Tom Downs data analysis 9/6/2018

OTR 8-Hour Ozone Trend By State
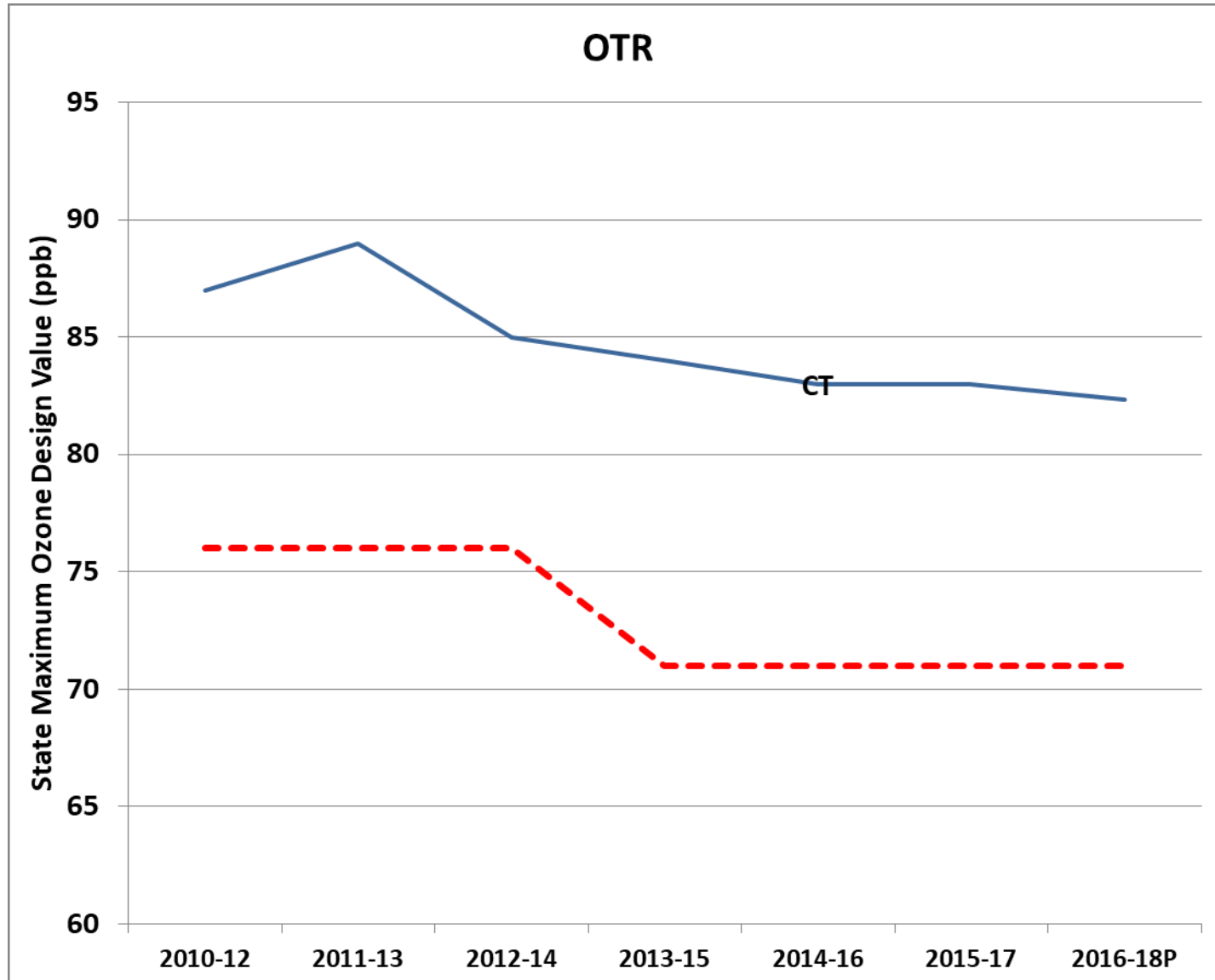
2015 Ozone NAAQS Planning Timeline

October 2015

Final 2015 Ozone NAAQS

⬇
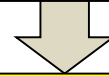
July 2018

Designations Complete

⬇
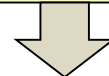
October 2018

Infrastructure and Good Neighbor SIPs Due

⬇
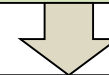
October 2021

Nonattainment SIPs Due

Monitoring for 2018-2020

Monitoring for 2021-2023

April 2021 Marginal Attainment

April 2024 Moderate Attainment

2011 Modeling Platform

- Still the focus of:
  - 2008 Ozone NAAQS SIP
  - 2015 Ozone NAAQS sensitivity modeling
    - GN SIP Modeling Efforts (primarily CAMx)
    - Contribution assessment research (CAMx)
  - 2018-21 Regional Haze SIP

OTC 2020 and 2023 CMAQ Modeling

AQS Code	County	Site	OTC 2020 Gamma CMAQ (ppb)	OTC 2023 Gamma CMAQ (ppb)
090019003	Fairfield	Sherwood Island Westport	83.4	81.1
360850067	Richmond	Susan Wagner HS	79.5	76.9
240251001	Harford	Edgewood	77.6	74.1
090010017	Fairfield	Greenwich Point	76.2	72.3
090013007	Fairfield	Lighthouse-Stratford	76.8	73.7
361030002	Suffolk	Babaylon	75.2	71.4
090099002	New Haven	Hammonasset State Park-Madison	73.9	69.7
360810124	Queens	Queens College 2	72.0	68.8
361192004	Westchester	White Plains	72.7	69.5
340150002	Gloucester	Clarksboro	72.4	69.1
090011123	Fairfield	Danbury	71.1	68.0

Comparing 2023 OTC/MARAMA Gamma Modeling with EPA 'en' Modeling

2023 Gamma NOx Compared to EPA 'en'

Overall Gamma NOx emissions are about 2% higher than EPA 'en' emissions.
(In OTC Domain)

Differences are located mostly in the EGU and Non-EGU Point files.
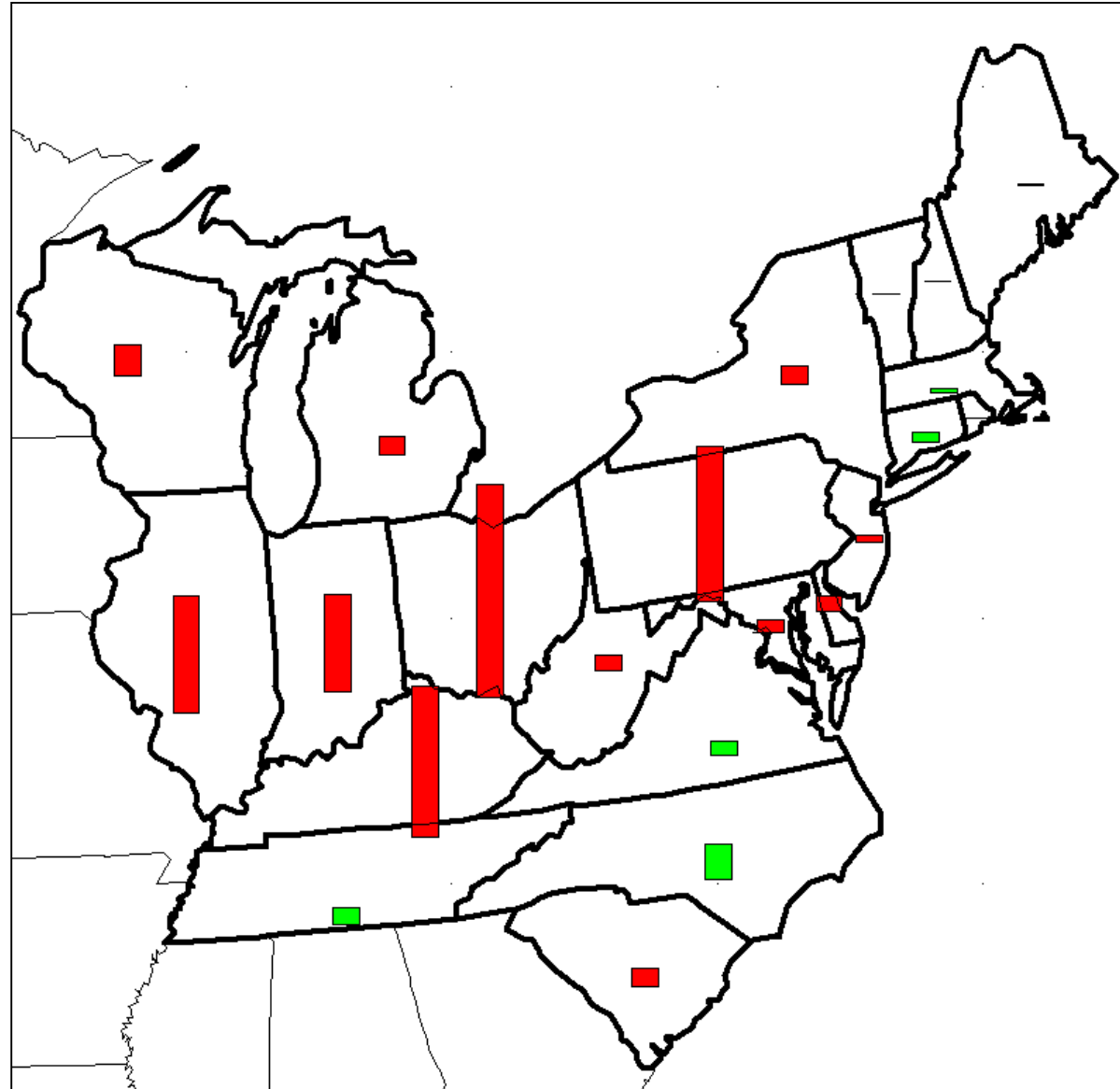
State relative NOx (tons/year) differences between Gamma and EPA 'en.'

🟥	**Gamma Higher**
🟩	**Gamma Lower**

🟥 2,000 tons	**Approximate Scale**
🟥 10,000 tons	

How Emission Differences Affects Modeling

1. Photochemical model processes emissions and predict hourly and maximum daily 8-hour ozone concentrations.

2. Modeled ozone concentrations are converted to future year design values by applying a Relative Response Factor (RRF) calculated by modeled changes in emissions in combination with the base year design value.

➢ **Because the model considers relative differences, higher emissions may not necessarily mean higher predicted DVFs**

Then Why Does it Matter?

➢ **"higher emissions may not necessarily mean higher predicted DVFs"**

1. Location of the emissions matters.

   a) locations near the locations of emissions differences may see large differences in DVFs.

2. Affects source contribution modeling results.

   a) If a sector's emissions are reduced relative to other sectors, the importance of that sector will also be reduced.

3. Chemistry changes in the model.

   a) Lower overall emissions may artificially shift the model past the tipping point, leading to potentially inflated model responsiveness to emission changes.

Model Predicted 2023 Design Values

AQS Code	County	Site	OTC 2023 Gamma CMAQ (ppb)	OTC 2023 Gamma CAMx (ppb)	EPA 2023 'en' CAMx (ppb)	EPA 2023 'en' no-water CAMx (ppb)
090019003	Fairfield	Sherwood Island Westport	81.1	71.9	72.7	73.0
360850067	Richmond	Susan Wagner HS	76.9	71.1	71.9	67.1
240251001	Harford	Edgewood	74.1	71.8	71.4	70.9
090010017	Fairfield	Greenwich Point	72.3	69.5	69.8	68.9
090013007	Fairfield	Lighthouse-Stratford	73.7	70.6	71.2	71.0
361030002	Suffolk	Babaylon	71.4	72.0	72.5	74.0
090099002	New Haven	Hammonasset State Park-Madison	69.7	69.9	71.2	69.9
360810124	Queens	Queens College 2	68.8	69.4	70.1	70.2
361192004	Westchester	White Plains	69.5	68.1	68.1	63.8
340150002	Gloucester	Clarksboro	69.1	67.5	68.2	68.2
090011123	Fairfield	Danbury	68.0	66.3	66.4	66.4

New 2016 OTC Modeling Platform Development

- In partnership with EPA and other regions nationally for 2015 Ozone NAAQS and for some states' Regional Haze 2021 submittals

- 2016 meteorology

- Common emission inventories where possible

  - 2016 base year projected from 2014 NEI

  - Projected years may include:

    - 2023
    - 2028
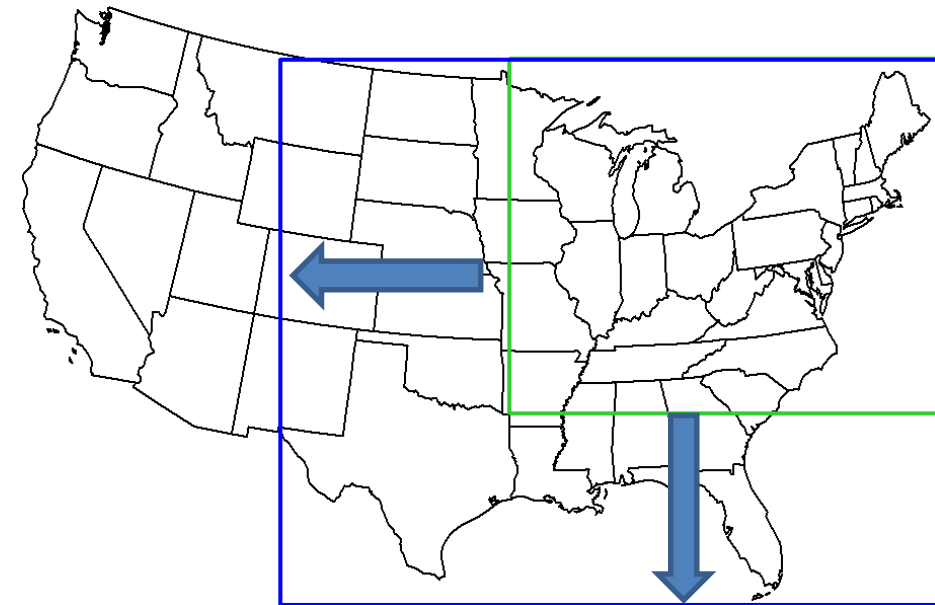
Proposed OTC 2016 Modeling Platform Domain

EPA 2016 12km WRF Domain

Current OTC Domain

CONUS Domain

Proposed OTC Domain
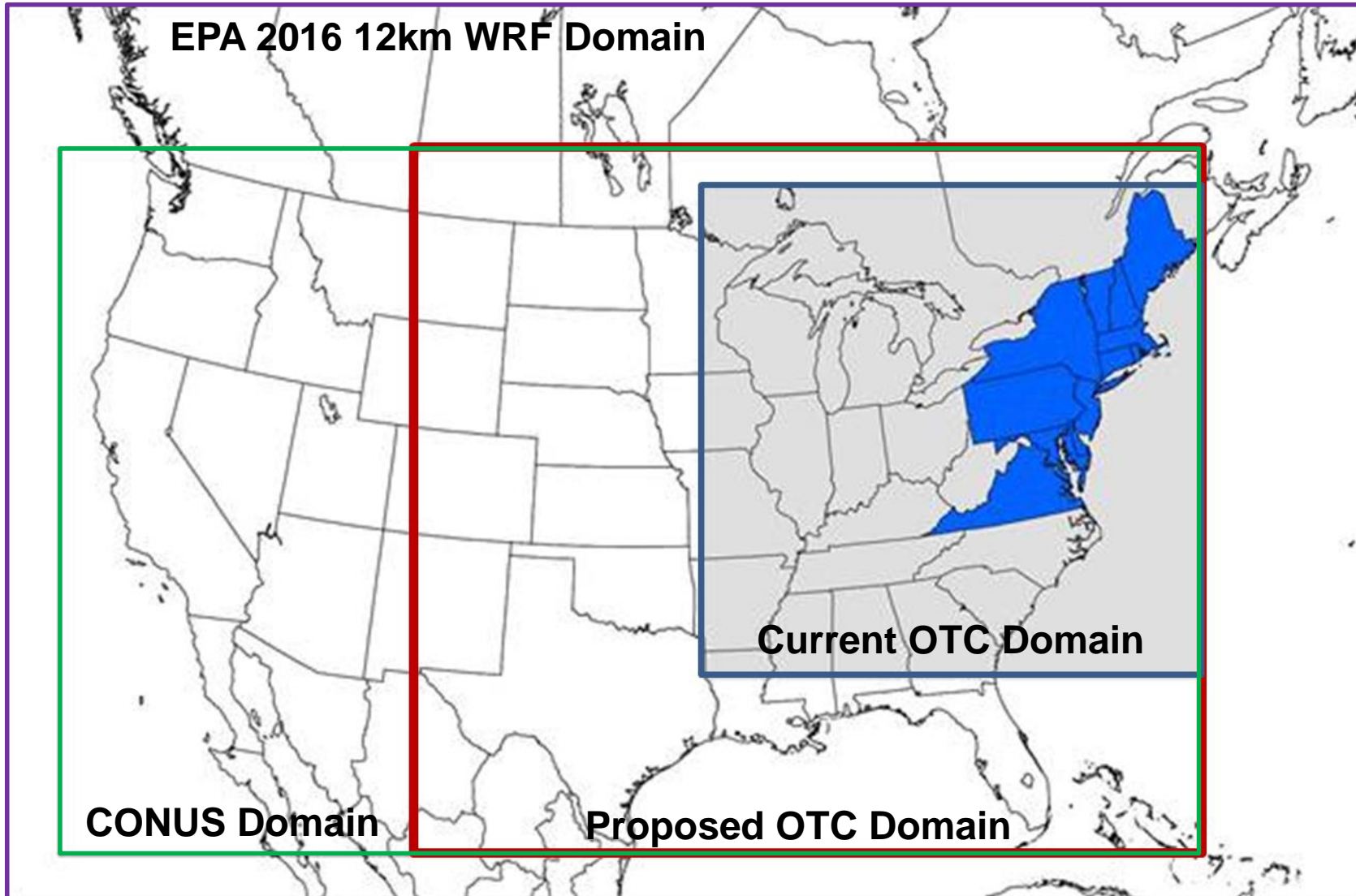
The proposed expanded domain includes all of Florida and Texas.

The 12km domain dimensions are 273 (x) by 246 (y) for a total of 67,158 surface grid cells.

Proposed vertical layers = 35.

The grey box is our current OTC 12km domain. 172x172 cells

Resources wise (runtime, storage and possible memory increase), $(273 \times 246 \times 35)/(172 \times 172 \times 35) = $**2.27x**

CONUS domain alternative: $(396 \times 246 \times 35)/(172 \times 172 \times 35) = $**3.29x**

2016 Inventory Collaborative Update, 1/3

- Draft versions: Alpha, Beta,
  - Alpha – 2016 only
  - Beta 2016 and future years 2023, 2028
  - Beta projections expected in November
- Final version (V1) – SMOKE-ready files, documentation
- Anthropogenic Sectors:
  - Onroad: Beta - updated state activity for 2016, 2023 & 2028 runs; V1 - new MOVES runs/updated emission factors and possible NOx & VOC reductions from A115 VIN decode project
  - Nonroad: Beta – MOVES 2014b w/ model defaults; install MOVES 2014b in the cloud. V1 – state & spatial allocation updates.

2016 Inventory Collaborative Update, 2/3

- Marine: Beta – projections based on existing inventory; V1 – public source for link-level data. Improvements important for NE coastal states.

- Rail: Beta – new bottom-up inventory, improving Northeast railyards (Ken Santlal)

- EGUs: Beta – ERTAC 2016 & 2023, maybe 2028. Splitting inventory to support IPM & ERTAC, temporal allocation for nonCEMS sources. New version of IPM.

- NonEGU point: Beta – 2016 done, reviewing growth & control

- Oil&Gas: Beta – tool for 2016 emissions, default approach for projections that states can update for V1

2016 Inventory Collaborative Update, 3/3

- Natural sources: FY = BY
  - Biogenic: Beta – land-use tweaks to BEIS3 Alpha run, Megan3 available. Workgroup suggested national AQ run with both.
  - Fires: Beta – a lot of new data; V1 – add Forest Service data.
- Modeling workgroup: Early stages, still forming. Will be the first users, testers. Goal to enable modeling centers to do own modeling

Technical Support Document

1	Introduction
2	Evaluation of Meteorological Modeling
3	Evaluation of Biogenic
4	Emissions Inventories Processing for Base Year
5	Model Setup
6	Model Performance
7	Evaluation of Nested Gridding
8	Emissions Inventories Processing for Future Years
9	Emissions Inventories and Processing for 2028 Visibility Control Case
10	Relative Response Factor (RRF) and Modeled Attainment Test
11	Projected 8-hour Ozone Air Quality 0ver the OTR
12	Projected Visibility Impairment in the MANE-VU Region
13	Source Apportionment Modeling Results in the OTR
14	Episodic Modeling

Conclusions & Next Steps

- Ozone design values in the OTR are no longer trending down as in previous years
- Modeling indicates that:
  - Portions of the OTR will not attain the 2008 NAAQS by their attainment dates (2017 and 2020).
  - Portions of the OTR will not attain the 2015 NAAQS by their attainment dates (2020 and 2023).
  - CAMx predicts OTR attainment of the 2008 NAAQS by 2023, but CMAQ modeling does not.
- Collaborative draft 2016 modeling Alpha platform nearly ready for testing
  - Draft version Beta emissions will be projected to future years
  - Final version 1 (V1) will include corrections and other improvements
- Technical Support Document expected completion in early October

Questions

Committee Chair:

Jeff Underhill (NH)

jeffrey.underhill@des.nh.gov (603) 271-1102

Modeling Lead:

Mike Ku (NY)

michael.ku@dec.ny.gov (518) 402-8402

Emissions Inventory Lead:

Susan McCusker (MARAMA)

smccusker@marama.org (443) 322-0317

OTC Committee Lead:

Shyamala Rajan

srajan@otcair.org (202) 318-0195