



# Connecticut Department of Energy and Environmental Protection



# EPA's Proposed Revisions to the National Ambient Air Quality Standards for Ozone

December 9, 2014  
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SIPRAC



Connecticut Department of Energy and Environmental Protection

# Reason for EPA's Proposal

- **CAA §108/§109 Requires NAAQS Review**
  - Mandates EPA to review new science and to revise NAAQS (if warranted), every 5 years
  - Primary NAAQS: “requisite to protect public health with an adequate margin of safety” ... cost cannot be a factor
  - Secondary NAAQS: protect public welfare (“effects on soils, water, crops, vegetation, man-made materials, animals, wildlife, weather, visibility and climate . . .”)
  - Last updated 2008 (75 ppb 8-hr, for both NAAQS)
- **2014 Court Order to Review Both 2008 NAAQS**
  - Required proposal by 12/1/2014 and final by 10/1/2015
- **2013 Court Remand of 2008 Secondary NAAQS**
  - EPA failed to justify NAAQS protected public welfare

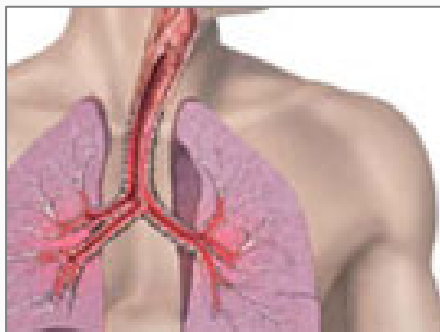


# EPA Health Effects Review

- More than 1,000 new studies reviewed
- Some report harmful effects at ozone levels below the current NAAQS



## Health effects of ground-level ozone



### The science shows that ozone:

- Inflames and damages the airways
- Aggravates lung disease, including asthma, emphysema and bronchitis
- Increases the frequency and severity of asthma attacks
- Reduces lung function, making it harder to breathe as deeply as normal
- Causes coughing and sore throat or burning sensation in airways

## Health effects of ground-level ozone

- Millions of Americans are affected by ozone pollution. At-risk groups include:
  - Children, because their lungs are still developing and they are more likely to be active outdoors. They are also more likely to have asthma.
  - People with lung disease such as asthma or chronic obstructive pulmonary disease (COPD)
  - Older adults
  - People who are active outdoors, such as outdoor workers
- Breathing ozone can lead to:
  - More medication use for people with asthma
  - More frequent visits to the doctor
  - Missed school days
  - Missed work days
  - More emergency room visits and hospital admissions
  - Increased risk of premature death from lung or heart diseases





## Ozone and the Environment

- Ground-level ozone is absorbed by the leaves of plants, where it can:
  - Interfere with the ability of sensitive plants to produce and store food, leading to reduced growth and yields.
  - Make sensitive plants more susceptible to certain diseases, insects, harsh weather, other pollutants, and competition.
  - Visibly injure the leaves of plants, affecting the appearance of vegetation in national parks, recreation areas and cities.
  - Reduce or change plant species diversity.
  - Such effects have the potential to impact ecosystems and the benefits they provide.



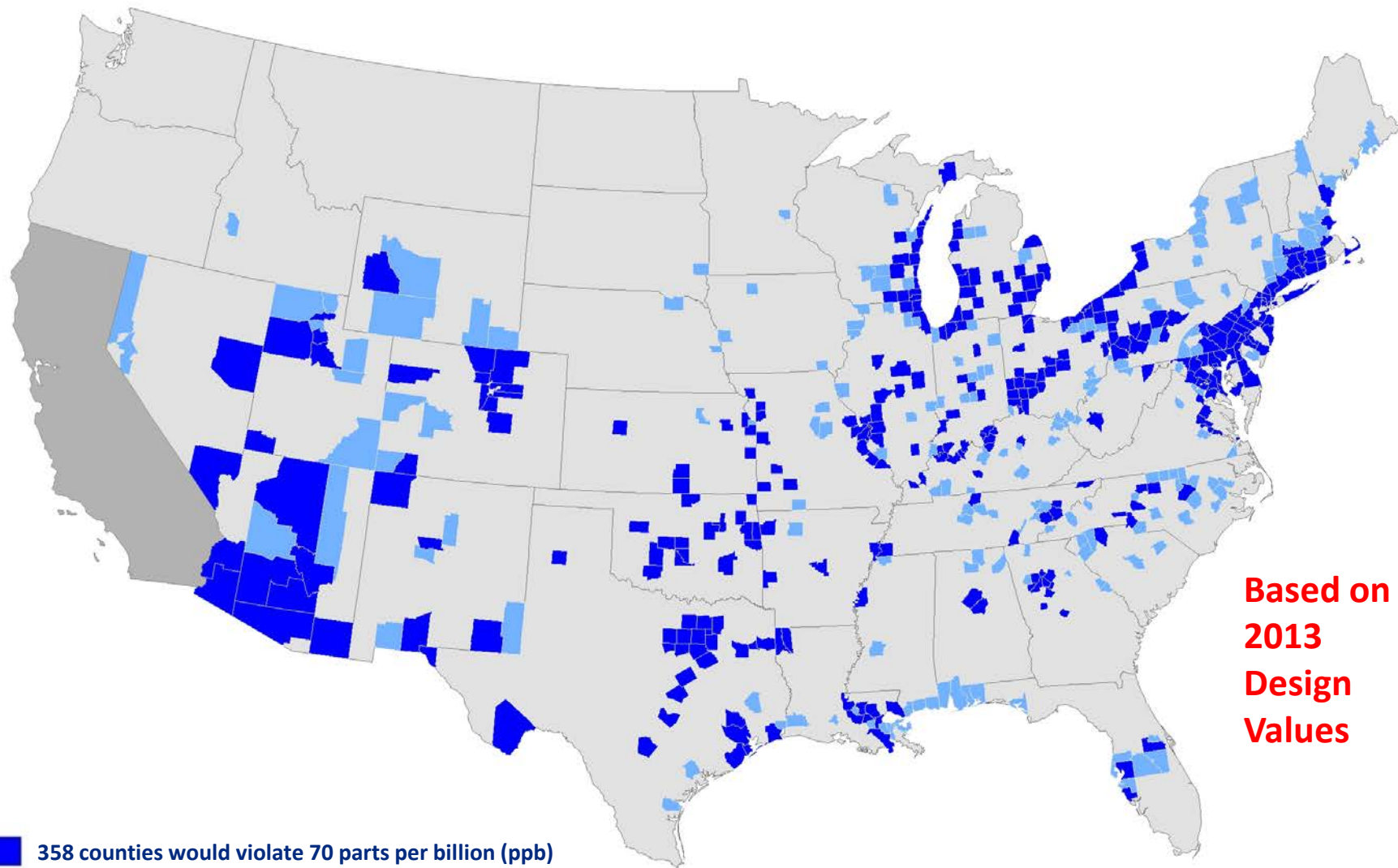


## Setting Ozone Standards - Primary

- Proposing health-based standard of **65-70 ppb** (8-hr average).
  - Taking comment on lower levels including 60 ppb and on the proposed decision that the current standard does not protect public health with an adequate margin of safety
- Proposing to retain the averaging time and form of the standard.
- CASAC and EPA staff experts concluded that the scientific evidence supports a standard within a range of 60 to 70 ppb.
- The Administrator did not include a standard of 60 ppb in the proposed range, because of increasing uncertainty in the scientific evidence at lower ozone concentrations.
  - This uncertainty reduces confidence that ozone standard levels set below 65 ppb will result in additional health improvements beyond those that would result from a standard in the proposed range of 65 to 70 ppb.



# Counties Where Measured Ozone is Above Proposed Range of Standards (65 – 70 parts per billion)

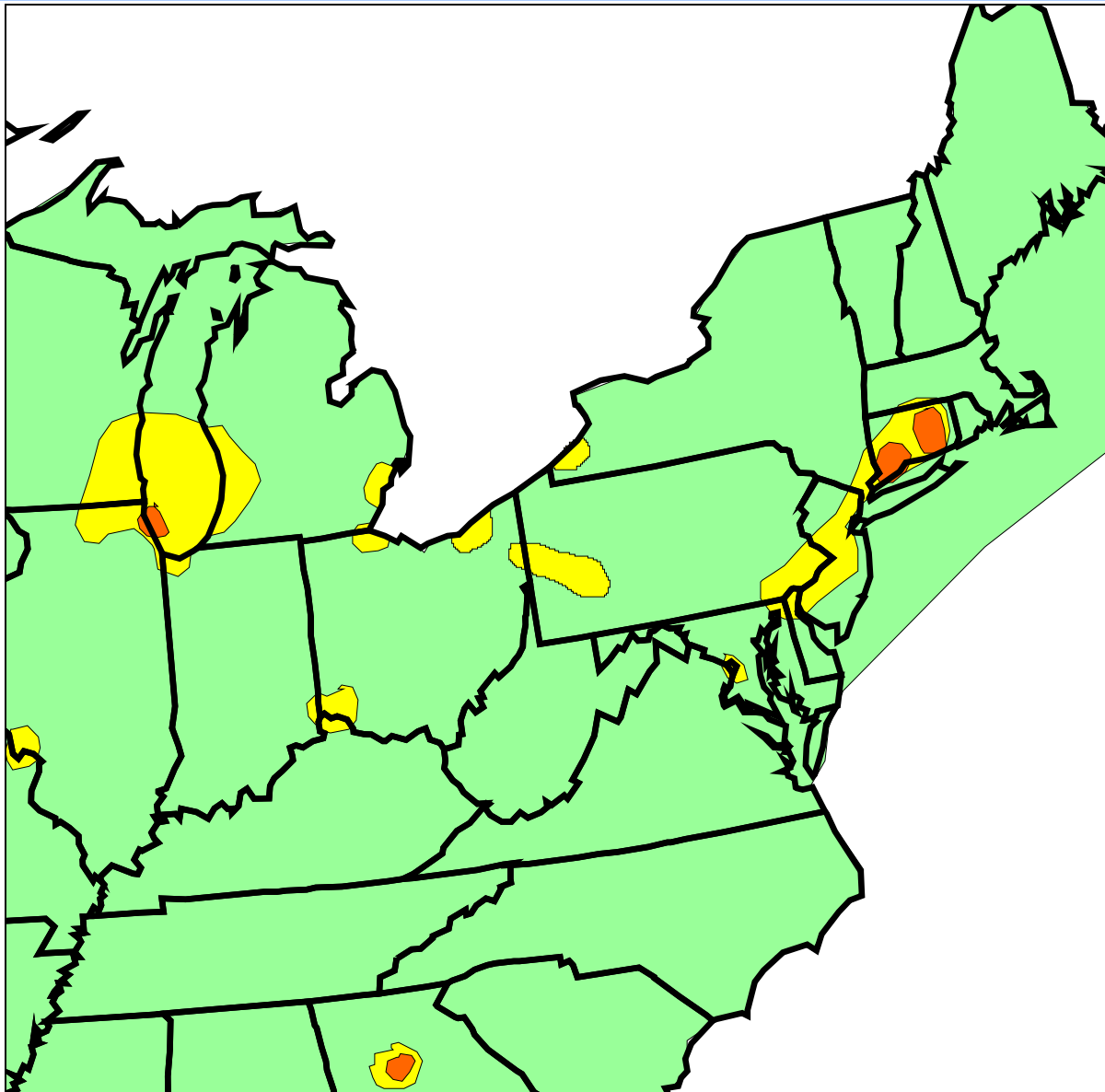


**Based on  
2013  
Design  
Values**

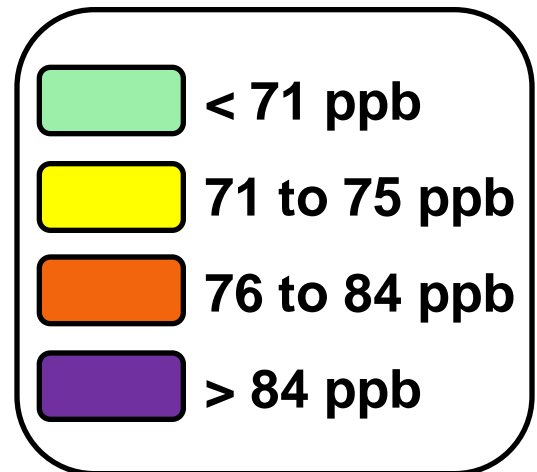
- 358 counties would violate 70 parts per billion (ppb)**
- 200 additional counties would violate 65 ppb for a total of 558**

Based on 2011 – 2013 monitoring data

# 2014 Ozone 4<sup>th</sup> Highest 8-hour Value



**EPA plans to use  
2016 Design Values  
(2014-2016 data)  
for designations**

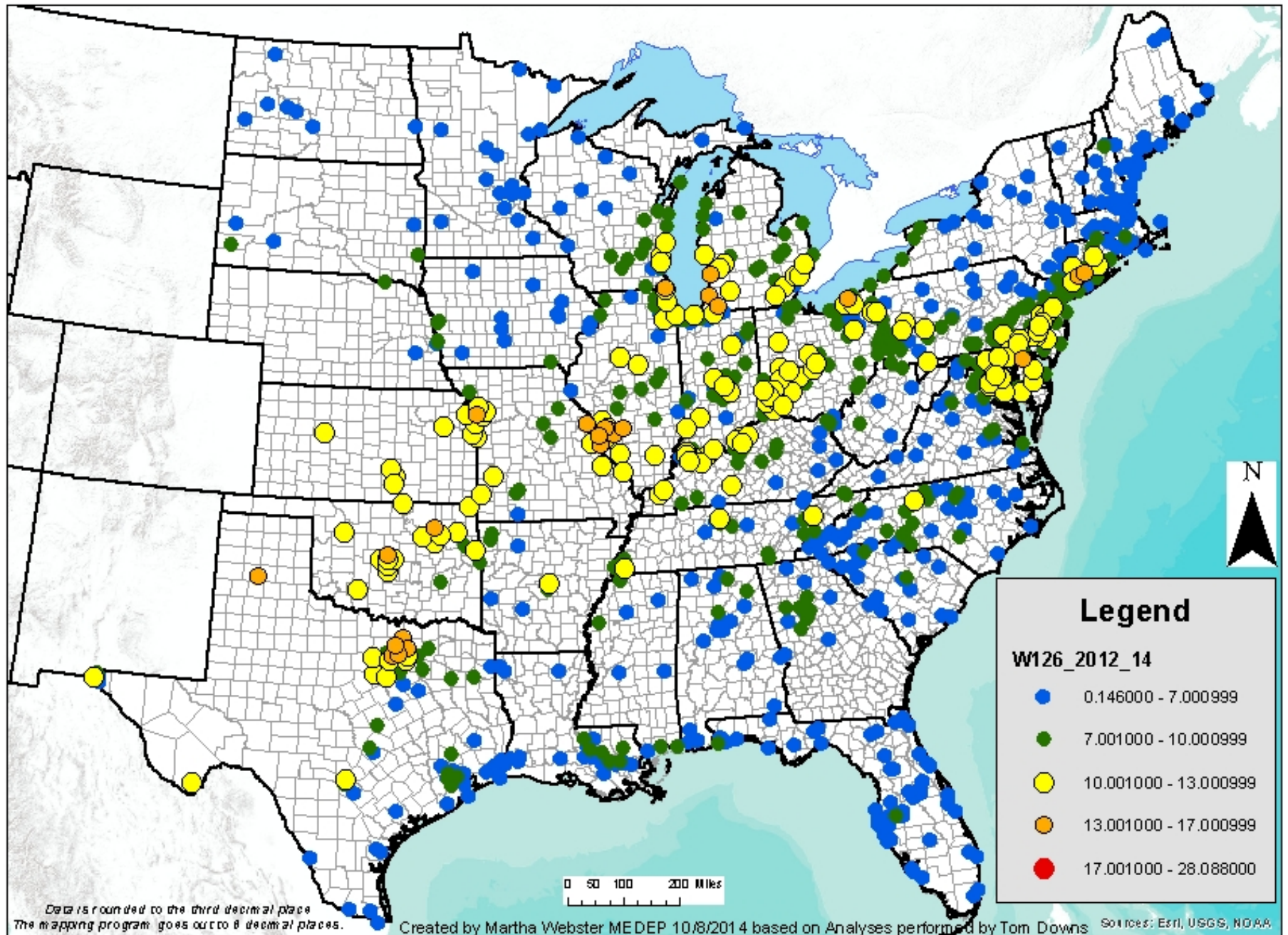




## Setting Ozone Standards - Secondary

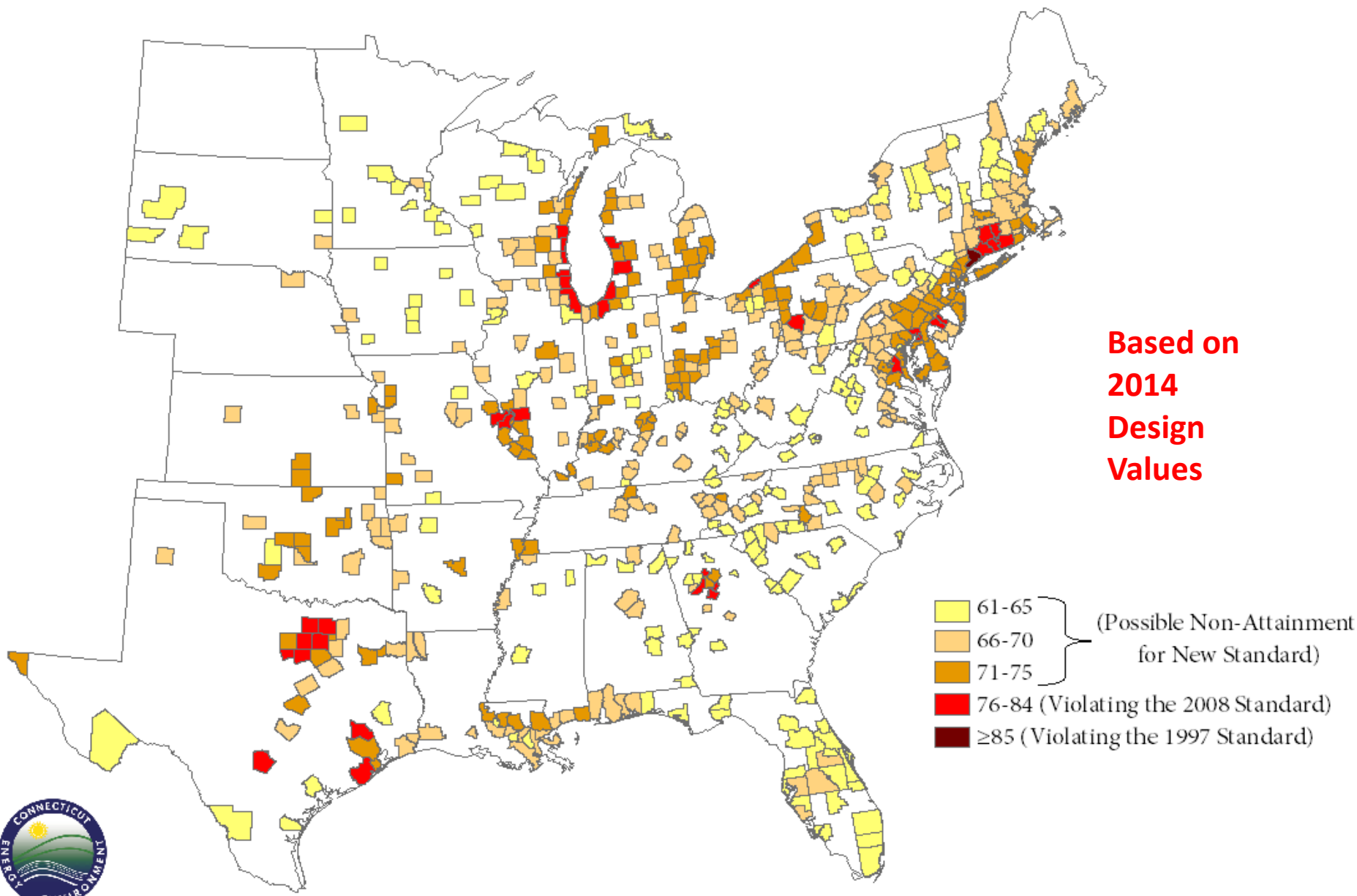
- The impact of ozone exposure on trees, plants and ecosystems is often assessed using a seasonal index.
- Proposing to define a target level of protection for public welfare in terms of a cumulative, seasonal metric (W126) index value within the range of 13 to 17 ppm-hrs (3-year average).
  - Soliciting comment on defining a target level of protection within the range of 7 to 13 ppm-hrs.
- Proposing **secondary** ozone standard to protect public welfare to a level within the range of 65 ppb to 70 ppb. Analyses show that a standard in this range would provide protection equivalent to a W126 index value of 13 to 17 ppm-hrs.
  - Soliciting comment on revising the secondary standard to a distinct W126-based standard within a range of 13 to 17 ppm-hrs.
  - Soliciting comment on a distinct W126-based standard within the range extending below 13 ppm-hrs down to 7 ppm-hrs.
  - Soliciting comment on retaining the current standard of 75 ppb.

# Ozone 2012 - 2014 Preliminary W126 Value



# Possible Non-Attainment Counties in Eastern US for 8-hour Ozone Standards

Note: Based on Preliminary 2014 Design Values. All values are preliminary until certified. Preliminary data for western states not readily available.  
source: <http://www.maine.gov/dep/ftp>



Based on  
2014  
Design  
Values





# Benefits and Costs of Meeting the Proposed Standards

- EPA estimates that meeting the standards in 2025 will yield annual health benefits of:
  - \$6.4 to \$13 billion for a standard of 70 ppb
  - \$19 to \$38 billion for a standard of 65 ppb
- This includes the value of preventing significant health effects in children and adults.
- EPA estimates that annual costs would be:
  - \$3.9 billion for a standard of 70 ppb
  - \$15 billion for a standard of 65 ppb

Health Effects Avoided	70 ppb	65 ppb
<b>Premature deaths</b> <i>(adults and children)</i>	710 to 1,400 or higher	2,000 to 4,300 or higher
<b>Asthma exacerbation</b> <i>(children 6-18)</i>	320,000	960,000
<b>Acute bronchitis</b> <i>(children 8-12)</i>	790	2,300
<b>Upper and lower respiratory symptoms</b> <i>(children 7 – 14)</i>	24,000	70,000
<b>School loss days</b> <i>(children 5 - 17)</i>	330,000	1 million
<b>Asthma emergency room visits</b> <i>(adults and children)</i>	1,400	4,300
<b>Respiratory hospital admissions</b> <i>(adults and children)</i>	510	1,500
<b>Cardiovascular hospital admissions</b> <i>(adults)</i>	180	530
<b>Days when people miss work</b> <i>(adults)</i>	65,000	180,000
<b>Days when people must restrict their activities</b> <i>(adults)</i>	1.3 million	4 million
<b>Nonfatal heart attacks</b> <i>(adults)</i>	64 to 600	180 to 1,700

Note: These numbers do not include California which was analyzed separately



## Tentative timeline for designations and implementation

- After a standard is final, states and tribes work with EPA to make plans to meet it. This process is laid out in the Clean Air Act and some of the key milestones are shown here.

<i>Designation Schedule</i>		
	Schedule	Tentative Date
State and Tribe Recommendations	Within 1 year after NAAQS promulgation	October 2016
Final Designation	Within 2 years after NAAQS promulgation (Administrator has discretion to extend the deadline by one year to collect sufficient information.)	October 2017 Effective date may vary. (Air quality data years: 2014 –2016)
<i>Implementation Schedule</i>		
Infrastructure SIP	Within 3 years after NAAQS promulgation	October 2018
Attainment Plans Due	Within 36 - 48 months after designations depending on classification	October 2020-2021

<i>Attainment Schedule by Classification</i>		
Classification	Schedule*	Year
Marginal	3 years to attain	<b>2020</b>
Moderate	6 years to attain	<b>2023</b>
Serious	9 years to attain	<b>2026</b>
Severe	15 to 17 years to attain	<b>2032/4</b>
Extreme	20 years to attain	<b>2037</b>

\*Areas must attain as expeditiously as practical, but not later than the schedule in the table. Two one-year extensions are available in certain circumstances based on air quality.



# Proposed Changes to the Air Quality Index

- EPA is proposing updates to the Air Quality Index (AQI) for ozone pollution.
  - The AQI is EPA’s color-coded tool used by state and local governments to help inform the public about current and daily air quality and recommends steps that individuals can take to reduce their exposure to air pollution.
  - The AQI converts ozone concentrations to a number on a scale from 0 to 500.
- EPA is proposing to change the breakpoints for each AQI category based on the level of the proposed primary standard and information from the health studies examined in the review.
- EPA is soliciting comments on these proposed revisions to the AQI.

AQI Category	Index values	Current Breakpoints (2008 AQI) (ppb, 8-hour avg)	Proposed Breakpoints (ppb, 8-hour avg)
<b>Good</b>	0 - 50	0 - 59	0 – (49 to 54)
<b>Moderate</b>	51 – 100	60 – 75	(50 – 55) – (65 to 70)
<b>Unhealthy for Sensitive Groups</b>	101 - 150	76 - 95	(66 to 71) - 85
<b>Unhealthy</b>	151 - 200	96 - 115	86 - 105





# Proposed Changes to Monitoring Requirements

- EPA is proposing changes to monitoring requirements to smooth the transition to any revised standards and assure that the public has full information about air quality.
- **Ozone monitoring season**
  - Proposing to extend the ozone monitoring season for 33 states, to match the times of year when data show ozone can approach unhealthy levels, and to alert the public;
  - Proposing to require year-round monitoring at 80 existing multipollutant monitoring sites (NCORE) stations.
  - Implementation of revised seasons proposed for January 1, 2017.
- **Photochemical Assessment Monitoring Stations (PAMS)**
  - Revising PAMS applicability to all ozone non-attainment areas with NCORE sites – uses existing network infrastructure.
  - Proposing changes to certain required methods.
  - Proposing changes to decrease monitoring burden and increase flexibility.
  - Implementation deadlines of 2017 or 2019 based on nonattainment status of areas.
- **Ozone Federal Reference Method**
  - Proposing to add a new ozone Federal Reference Method (FRM) while retaining the current FRM and Federal Equivalent Methods (FEMs).
  - Impact on state monitoring networks will be minimal as existing approved methods are adequate for continued operation.



# Proposed Ozone Monitoring Season in Region 1 and 2 (NESCAUM)

- **Connecticut (March 1- Sept. 30)**
- **Maine (April 1- Sept. 30) (*unchanged*)**
- **Massachusetts (March 1- Sept. 30)**
- **New Hampshire (March 1- Sept. 30)**
- **Rhode Island (March 1- Sept. 30)**
- **Vermont (April 1- Sept. 30) (*unchanged*)**
- **New Jersey (March 1 – Oct. 31)**
- **New York (March 1 – Oct. 31)**
  
- NCore stations to be January – December (year round) regardless of location
  
- Proposed Deadline – revised season requirements to be effective on first day of ozone monitoring season in **2017** for existing stations.

**AQI ozone forecasts for revised NAAQS likely to start with 2016 season. Forecasts will apply to regulated community.**

# Comparison of Monitored Ozone Exceedance Days for NAAQS of 75 ppb and 70 ppb

Year	# CT Days > 75 ppb	# CT Days > 70 ppb
2014	8	16
2013	18	23
2012	27	33
2011	14	20





# Proposed Changes to Clean Air Permitting Provisions and Other Efforts to Ease Transition

- PSD Grandfathering
  - Proposing that any in-the-pipeline permit application meeting certain conditions would be required to consider its impact on the 2008 NAAQS but not the 2015 NAAQS
  - Seeking comment on appropriate criteria for PSD grandfathering

EPA is proposing a grandfather provision that would apply to PSD permit applications if either:

- o The permitting agency has formally determined the application to be complete on or before the date EPA signs a final rule; or
- o The public notice for a draft permit or preliminary determination has been published prior to the date revised ozone standards become effective (60 days after publication in the Federal Register).



## Ozone NAAQS Review Schedule

- **Proposal** signed on November 25, 2014
- **Public comment period** for 90 days after proposal is published in the Federal Register
  - Comments should be labeled with Docket ID number EPA-HQ-OAR-2008-0699
- **3 Public hearings** will be held in January 2015. More details will be announced in a separate Federal Register notice.
- **Final Rule** to be signed by October 1, 2015
- For more information on the rule and how to comment, go to <http://www.epa.gov/air/ozonepollution/>

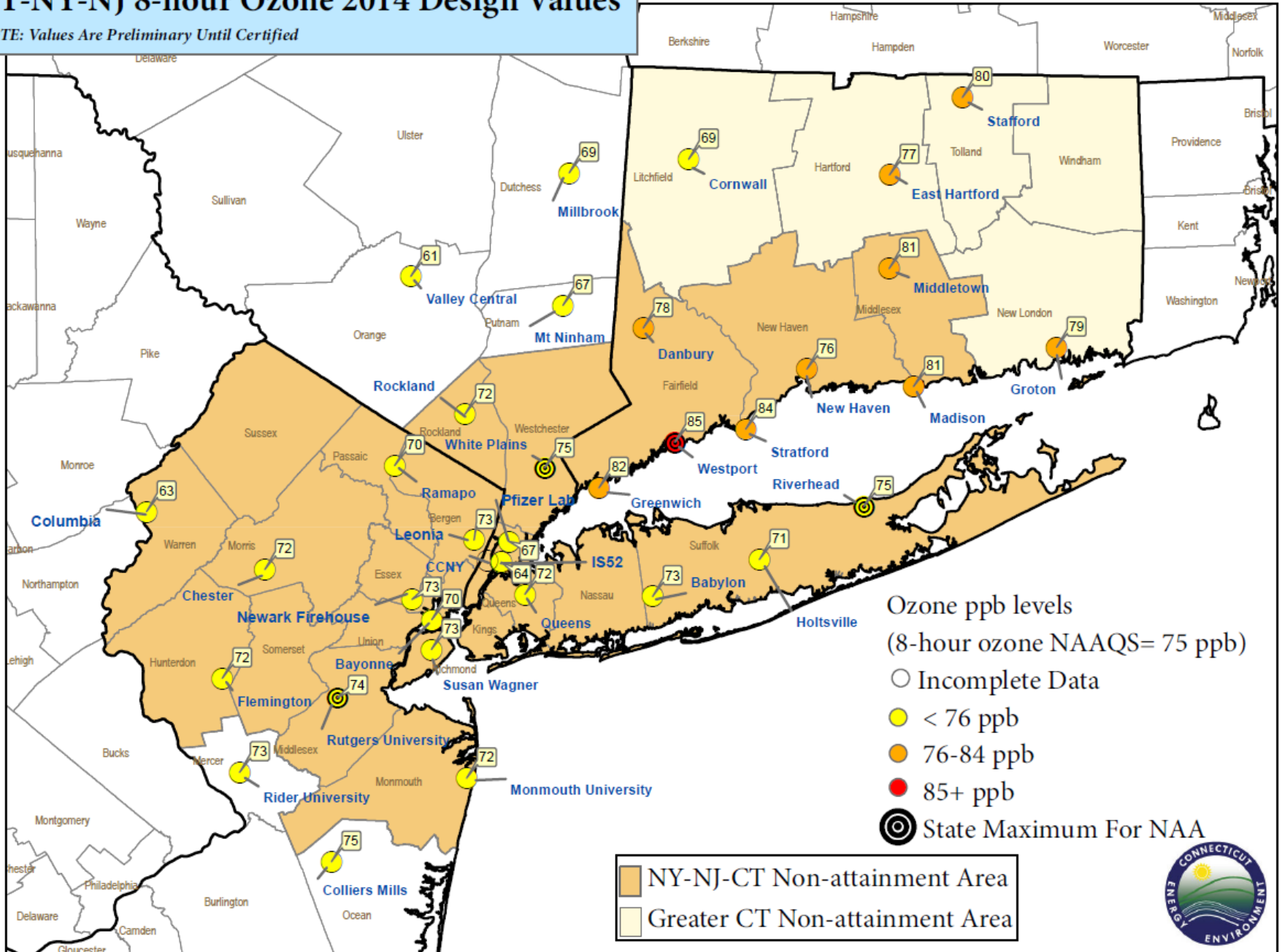
# Existing Obligations Still Apply

- **1997 and 2008 NAAQS Still in Play**
  - CT monitors in violation of both NAAQS
  - EPA's SIP Call for 1997 NAAQS yet to be finalized
  - Deadline for 2008 NAAQS is end of 2015
  - Likely NY/NJ/CT and Greater CT bump-ups to “moderate” in 2016 for 2008 NAAQS
  - Would require attainment SIPs in 2017 showing compliance with 2008 NAAQS by end of 2018



# CT-NY-NJ 8-hour Ozone 2014 Design Values

NOTE: Values Are Preliminary Until Certified



# Questions?

Comment deadline will be 90 days after  
mid-December Federal Register publication

<http://www.epa.gov/air/ozonepollution/>

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# Extra Slides



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## Calculating the W126 Index

- The impact of ozone exposure on trees, plants and ecosystems often is assessed using a seasonal index.
- **W126 index is a seasonal index designed to reflect the cumulative ozone exposures that can damage plants and trees. Here's how it's calculated for EPA's proposal:**
  - **Measure** hourly ozone concentrations for each hour from 8 a.m. to 8 p.m.;
  - **Weight** each hourly measurement, with more weight given to higher ozone concentrations;
  - **Add** the 12 weighted hourly values to get a daily value;
  - **Add** the daily values for each month to get a monthly value;
  - **Add** the monthly values in each consecutive three-month period during the ozone season. The highest of these three-month sums is the seasonal index value.
  - **Average** the seasonal index values over the most recent three years.



# **O<sub>3</sub> Welfare Effects and the W126 Metric**

**Presentation for the Joint Fall Meeting of the  
OTC and MANE-VU**

November 19, 2014

*Dr. Bryan Hubbell  
EPA/OAQPS*

# O<sub>3</sub> Effects on Sensitive Plants

Reduced above ground growth/  
productivity



Visible leaf injury



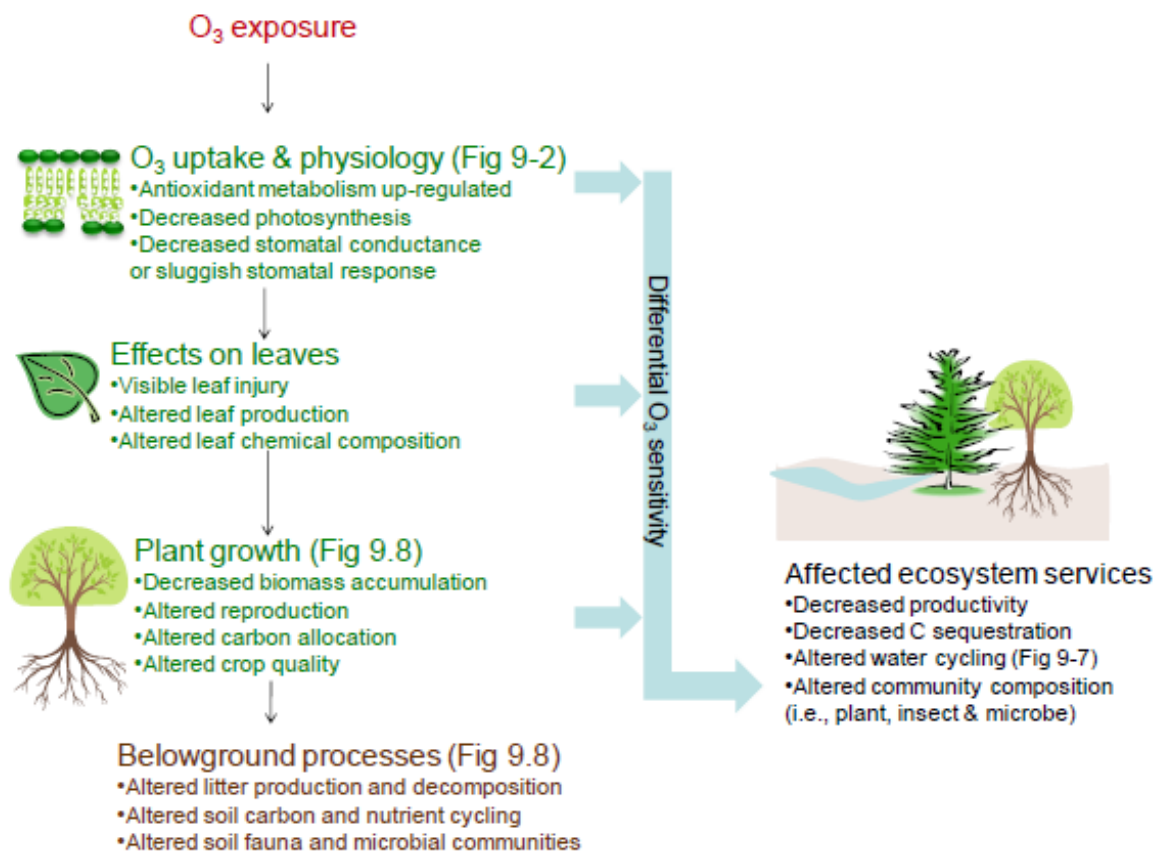
Reduced  
reproduction/  
yields



Reduced below ground  
root growth/storage

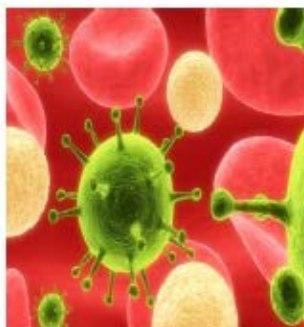


# O<sub>3</sub> Effects on Sensitive Plants, Associated Ecosystems and Services



## O<sub>3</sub> Effects on Sensitive Plants (2)

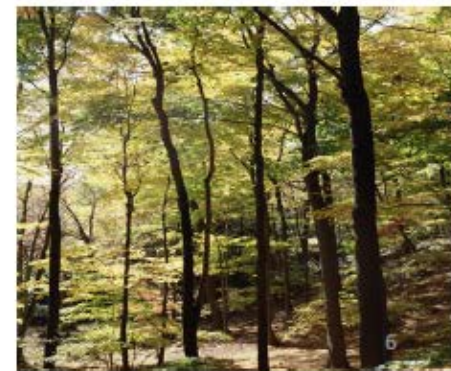
Reduced resistance  
to insects/disease



Reduced resistance  
to harsh weather



Alteration of competitive  
interactions





## O<sub>3</sub> Impacts on Associated Ecosystems and Services

- Decreases air pollution removal in urban areas
- Decreases CO<sub>2</sub> sequestration/climate regulation
- Decreases crop and timber yields
- Damages aesthetics in valued natural areas
- Alters biogeochemical and hydrologic cycles
- Potential impacts to insect outbreaks, fire regimes
- Potential impacts on community composition



## Why the focus on a W126 metric?

- Plant response to  $O_3$  depends on both the cumulative nature of exposures over the growing season and levels of exposure
  - The 1996 AQCD and subsequent reviews have continued to reach these same conclusions based on the most recent research.
- The 2008 review and the current review both considered the appropriateness of different forms.
  - Other forms considered included those analyzed in various studies, including SUM06, AOT06, and W95.
  - It was determined that the W126 was the more appropriate form, particularly based on the scientific understanding that there is not an exposure threshold that is applicable across studied plant species.
- Since 1996, CASAC has consistently supported the use of a cumulative form and in both 2008 and the current review, preferred the W126 index.



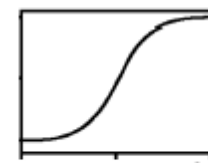


## Summary of CASAC Advice

- **Adequacy:** “the current secondary standard is not adequate to protect against current and anticipated welfare effects of ozone on vegetation”
- **Form:** Strong evidence that cumulative exposures drive plant response, therefore secondary standard should be in terms of a cumulative, seasonal form (i.e., W126 - 8 am to 8 pm sum and maximum 3-month sum)
- **Level:** Recommends that the level be within the range of 7 to 15 ppm-hrs (annual)
- **Averaging period:** CASAC “does not recommend” a 3-year averaging period but if using 3-year average, level should be set lower to not allow annual level to exceed in any one year

## Key Features of the W126 Metric

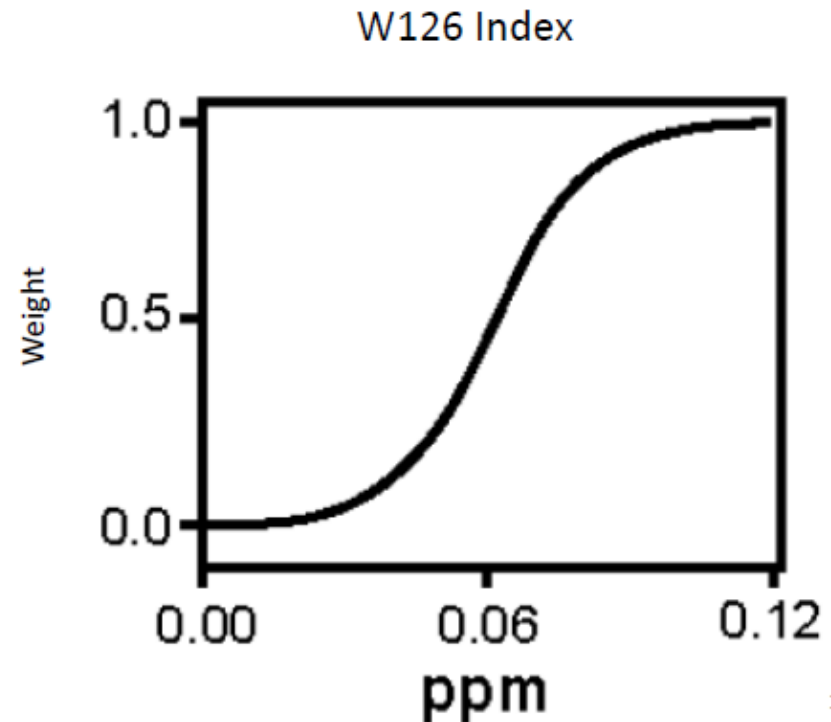
- Daily period – 12 hour daylight period (8:00 am to 8:00 pm)
- Seasonal period – Consecutive 3 month period with max exposure
- Weighting function – W126 weighs higher exposures more
- Both annual and 3-year average forms



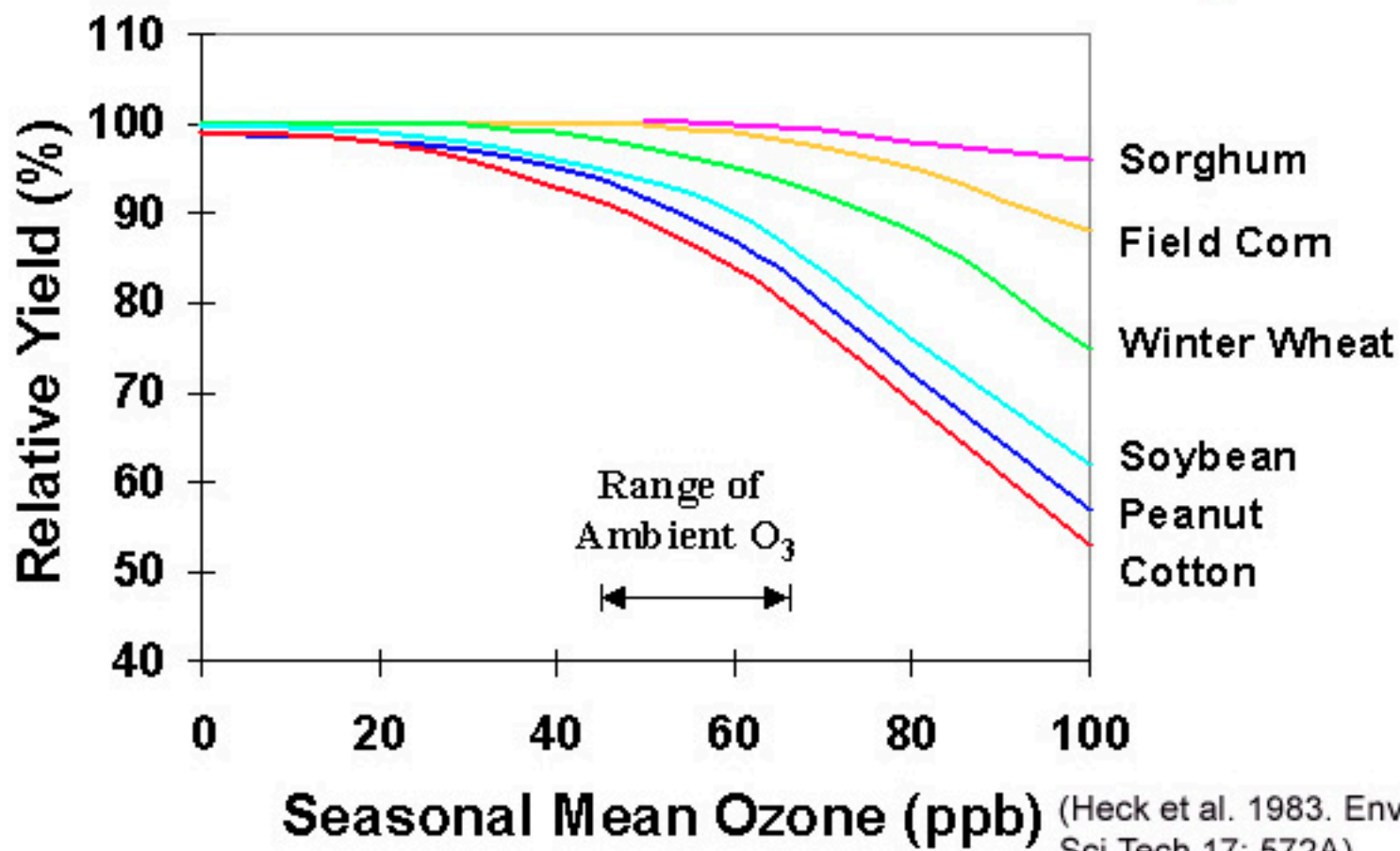
## The W126 Metric

$$D.I. = \sum_{i=8am}^{7pm} O_{3i} \left( \frac{1}{1 + (4403 e^{-126 O_{3i}})} \right)$$

<http://www.epa.gov/ttn/analysis/w126.htm>



# Effect of O<sub>3</sub> on Yield of Crops



**TABLE 1 Sensitivity of Trees and Shrubs to Ozone**

<i>Sensitive</i>	<i>Intermediate</i>	<i>Tolerant</i>
American Sycamore	Dogwood	Oaks (most species)
Blackberry	Hickory	Arborvitae
Tulip Poplar	Boxelder	Pine (most species)
Ash	White Oak	Spruce
Sweetgum	Pin Oak	Maples
Sassafras	Willow	Birch
Black Walnut	Ailanthus	
Bigleaf Linden	Linden	
'Imperial' Honeylocust	Hawthorne	
Fastigiata English Oak	Cotoneaster	
'Bloodgood' London Plane	Black Elder	
	Kentucky Coffeetree	
	Zelkova	

<http://www.bartlett.com/resources/Ozone-Injury-to-Landscape-Plants.pdf>

