Overview of Ozone, the new 2015 Ozone National Ambient Air Quality Standard, and Fine Particulate Matter

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CT-DEEP

April 28, 2016

Ground-level Ozone is:

- The primary component of smog
- Sometimes called “bad ozone” to distinguish it from “good ozone”
  - Both types of ozone have the same chemical composition (O_3)
  - “Good ozone” occurs naturally in the upper portions of the earth’s atmosphere and forms a layer that protects life on earth from the sun's harmful rays
  - “Bad ozone” at ground level is harmful to breathe
- Not emitted directly into the air, but forms when emissions of nitrogen oxides (NOx) and volatile organic compounds (VOCs) “cook” in the sun
  - Emissions from industrial facilities, electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are the major man-made sources of NOx and VOCs
- Mainly a summertime pollutant, because sunlight and hot weather accelerate its formation
- Ozone levels can be high in urban due to NOx and VOC emissions that form ozone and in rural areas due to transport of ozone

Ozone and Health

- Ozone can penetrate deep into the lungs and can:
  - Make it more difficult for people working or playing outside to breathe as deeply and vigorously as normal
  - Irritate the airways, causing: coughing, sore or scratchy throat, pain when taking a deep breath, and shortness of breath
  - Increase asthma attacks and use of asthma medication
  - Inflame and damage the lining of the lung by injuring the cells that line the air spaces in the lung
  - Increase susceptibility to respiratory infection
  - Aggravate chronic lung diseases such as asthma, emphysema and bronchitis
- Repeated episodes of ozone-induced inflammation may cause permanent changes in the lung, leading to long-term health effects and a lower quality of life
- Ozone may continue to cause lung damage even when symptoms have disappeared

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
    - This can lead to reduced growth, biomass production and/or yields
  - Make sensitive plants more susceptible to certain diseases, insects, harsh weather, other pollutants, and competition
  - Reduce or change the diversity of plant species
    - This can lead to damage to ecosystems dependent on those species
  - Visibly injure the leaves of plants, affecting the appearance of vegetation in national parks, recreation areas and cities

National Ambient Air Quality Standards (NAAQS)

The 1970 Clean Air Act made EPA directly responsible for establishing limits on air pollutants and enforcing them.

On April 30, 1971, EPA announced final publication of the National Ambient Air Quality Standards for six common classes of pollutants:

- Sulfur Oxides
- **Particulate Matter,**
- Carbon Monoxide,
- **Photochemical oxidants (ozone),**
- Nitrogen oxides, and
- Hydrocarbons.

On September 29, 1978, EPA announced a final atmospheric air quality standard for lead.

History of the Ozone NAAQS

- EPA issued the first national air quality standards for ozone in 1971.
- EPA revised the standard in 1979.
- In 1993, EPA reviewed the standards but determined that revisions were not warranted.
- In 1997 and 2008, EPA revised the standard to ensure the continued protection of public health and welfare.
- In 2010, the agency proposed, but did not finalize, revisions as part of a reconsideration of the 2008 standards.
- On Jan. 21, 2014, the Sierra Club, American Lung Association, Environmental Defense Fund and Natural Resources Defense Council sued EPA for not completing the review of the standards within five years - by March 2013. EPA was ordered to sign a proposed rule by Dec. 1, 2014 and a final rule by Oct. 1, 2015.

NAAQS Review Process

- **Planning:** The planning phase of the NAAQS review process begins with a science policy workshop, which is intended to gather input from the scientific community and the public regarding policy-relevant issues and questions that will frame the review. Drawing from the workshop discussions, EPA prepares an Integrated Review Plan (IRP) that presents the schedule for the entire review, the process for conducting the review, and the key policy-relevant science issues that will guide the review.

- **Integrated Science Assessment (ISA):** This assessment is a comprehensive review, synthesis, and evaluation of the most policy-relevant science, including key science judgments that are important to inform the development of the risk and exposure assessments, as well as other aspects of the NAAQS review.

- **Risk/Exposure Assessment (REA)**: This assessment draws upon information and conclusions presented in the ISA to develop quantitative characterizations of exposures and associated risks to human health or the environment associated with recent air quality conditions and with air quality estimated to just meet the current or alternative standard(s) under consideration. This assessment includes a characterization of the uncertainties associated with such estimates.

- **Policy Assessment (PA):** This assessment provides a transparent staff analysis of the scientific basis for alternative policy options for consideration by senior EPA management prior to rulemaking. Such an evaluation of policy implications is intended to help ‘‘bridge the gap’’ between the Agency’s scientific assessments, presented in the ISA and REA(s), and the judgments required of the EPA Administrator in determining whether it is appropriate to retain or revise the NAAQS. In so doing, the PA is also intended to facilitate the Clean Air Scientific Advisory Committee’s (CASAC’s) advice to the Agency and recommendations to the Administrator, as provided for in the CAA, on the adequacy of the existing standards or revisions that may be appropriate to consider. The PA focuses on the information that is most pertinent to evaluating the basic elements of the NAAQS: indicator, averaging time, form, and level.

- **Rulemaking:** Taking into consideration the information in the ISA, REA(s), and PA and the advice of CASAC, EPA develops and publishes a notice of proposed rulemaking that communicates the Administrator’s proposed decisions regarding the review of the NAAQS. A public comment period, during which public hearings are generally held, follows publication of the notice of proposed rulemaking. Taking into account comments received on the proposed rule, EPA issues a final rule.

Updated 2015 Standard –

- Based on the science, the Administrator has determined that the **2008 standard was not adequate to protect public health**.

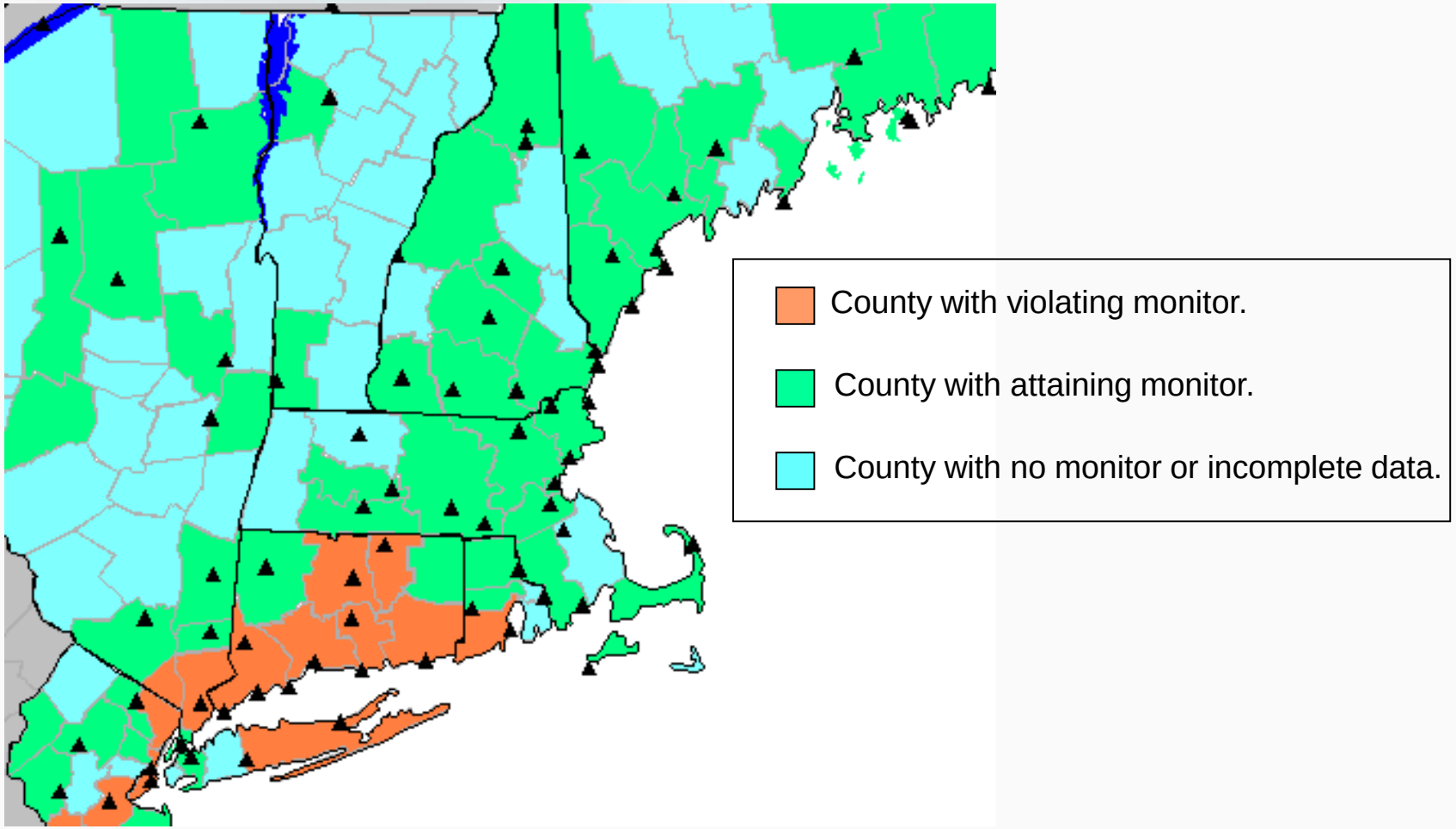
- **Revised Primary Standard of <u>70 ppb</u>**:
  - Is below the level shown to cause adverse health effects in the clinical studies.
  - Essentially eliminates exposures shown to cause adverse health effects, protecting 99.5 % of children from even single exposures to ozone at 70 ppb.
  - Substantially reduces exposures to levels lower than 70 ppb, reducing multiple exposures to 60 ppb by more than 60%.

Health Benefits of Revised 2015 Ozone Standard

EPA estimates that meeting the 70 ppb standards will yield health benefits valued at $2.9 to $5.9 billion annually in 2025 nationwide outside of California. These annual benefits include the value of avoiding a range of harmful health effects, including:

- 320 to 660 premature deaths
- 230,000 asthma attacks in children
- 160,000 days when kids miss school
- 28,000 missed work days
- 630 asthma-related emergency room visits
- 340 cases of acute bronchitis in children

Counties with monitors that do not meet the updated standards

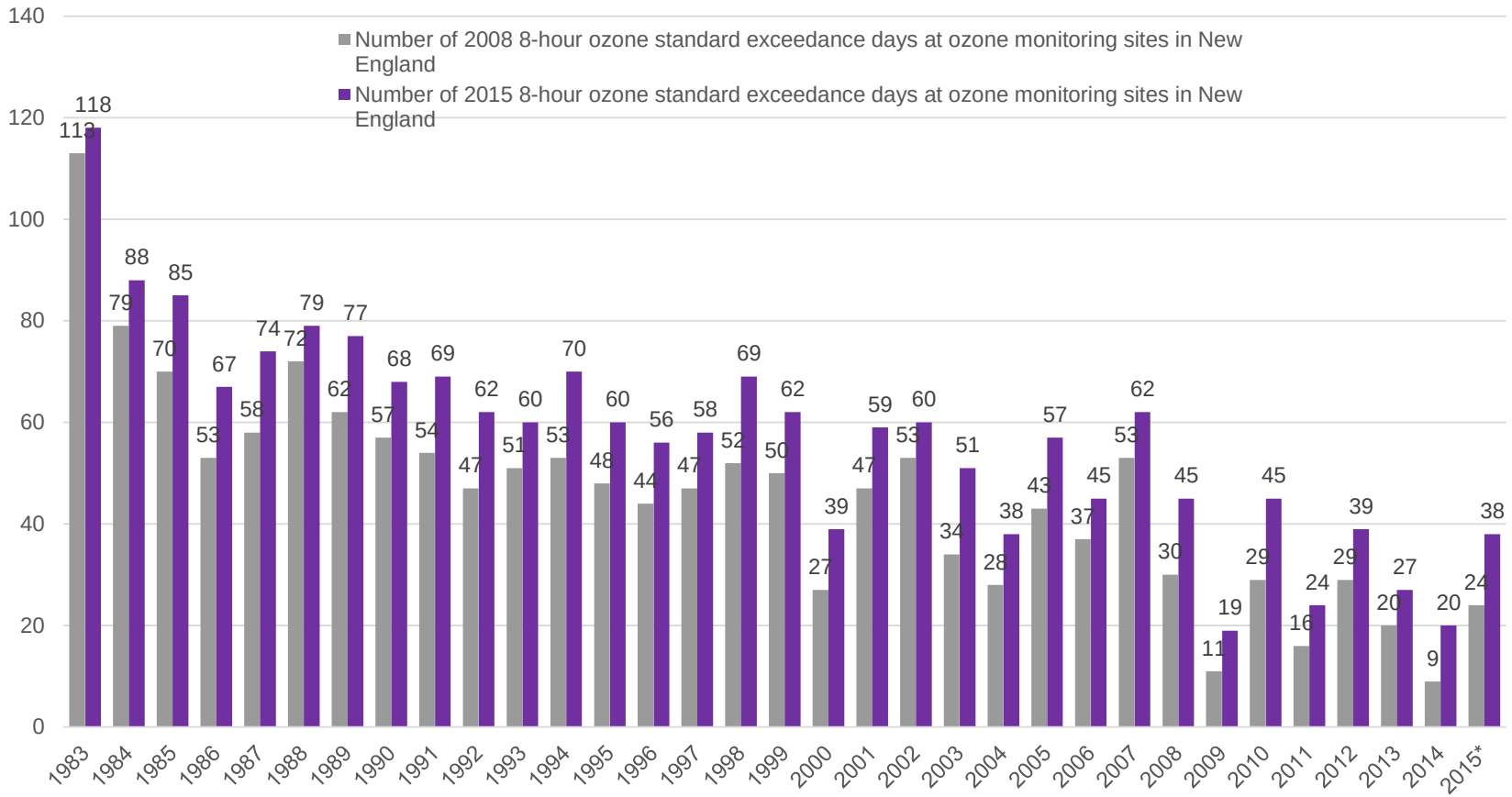


Based on 2013 – 2015* monitoring data

* 2015 ozone data is preliminary and subject to change

Please note: Not all ozone monitoring locations are included

Number of 8-Hour Ozone Exceedance Days in New England



*2015 Data preliminary and subject to change

What is the Air Quality Index?

- Using data from air quality monitors, the AQI tells you how clean or polluted your air is on a daily basis. Real-time data is available at www.airnow.gov.

  - The AQI focuses on health effects that can happen within a few hours or days after breathing polluted air.

  - AQI tracks five major air pollutants that have national standards: ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide. Ozone is responsible for most bad air days.

AIRNOW

O_3, PM, CO, SO_2, & NO_2

AQI AIR QUALITY INDEX

Air Quality Index for Ozone

Index Values (Conc. Range)	Air Quality Descriptors	Cautionary Statements for Ozone
0 – 50 (0-54 ppb)	Good	**No health impacts are expected when air quality is in this range.**
51 – 100 (55-70 ppb)	Moderate	**Unusually sensitive people should consider limiting prolonged outdoor exertion**
101 – 150 (71-85 ppb)	Unhealthy for Sensitive Groups	**Active children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion**
151 – 200 (86-105 ppb)	Unhealthy	**Active children and adults, and people with respiratory disease, such as asthma, should avoid prolonged outdoor exertion; everyone else, especially children should limit prolonged outdoor exertion.**
201 – 300 (106-200 ppb)	Very Unhealthy	**Active children and adults, and people with respiratory disease, such as asthma, should avoid all outdoor exertion; everyone else, especially children, should limit outdoor exertion.**

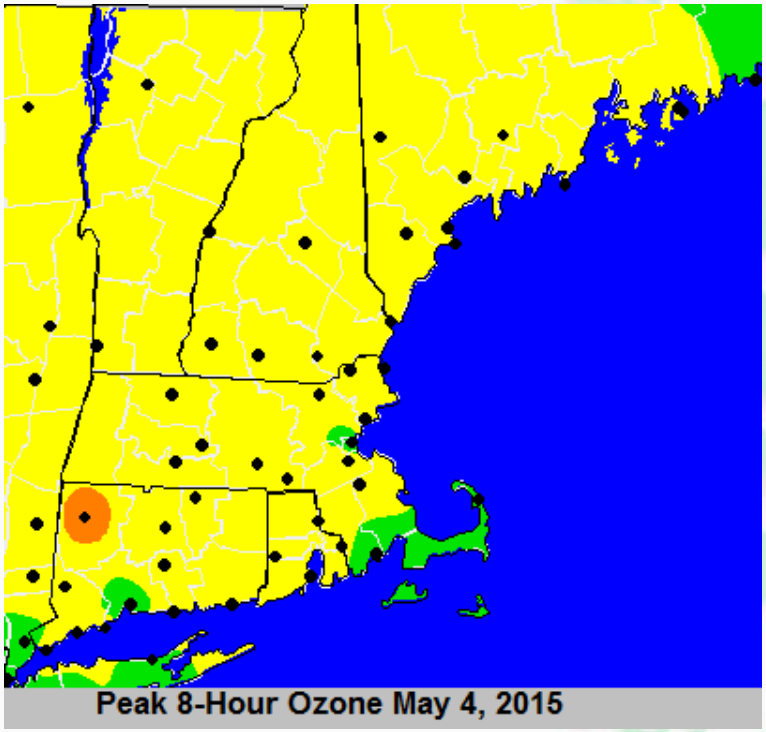
Air Quality Index

AQI Category	Index Values	Breakpoints in the 2008 AQI (ppb, 8-hour average)	Updated Breakpoints (ppb, 8-hour average)
Good	0 - 50	0-59	0-54
Moderate	51 - 100	60-75	55-70
Unhealthy for Sensitive Groups	101 – 150	76-95	71-85
Unhealthy	151 – 200	96-115	86-105
Very Unhealthy	201 – 300	116-374	106-200
Hazardous	301 –500	375 to the Significant Harm Level*	201 to the Significant Harm Level*

**The Significant Harm Level for ozone is 600 ppb, two-hour average*

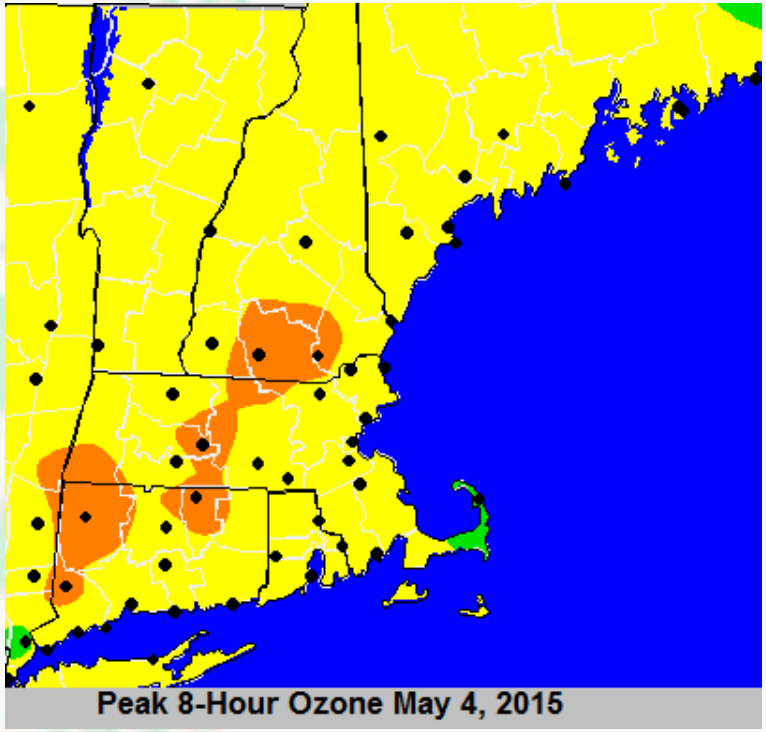
Current AQI Cutpoints

2008 Ozone Standard (75 ppb)



Revised AQI Cutpoints

2015 Ozone Standard (70 ppb)



Good | Moderate | USG | Unhealthy | Very Unhealthy | Hazardous

Current AQI Cutpoints

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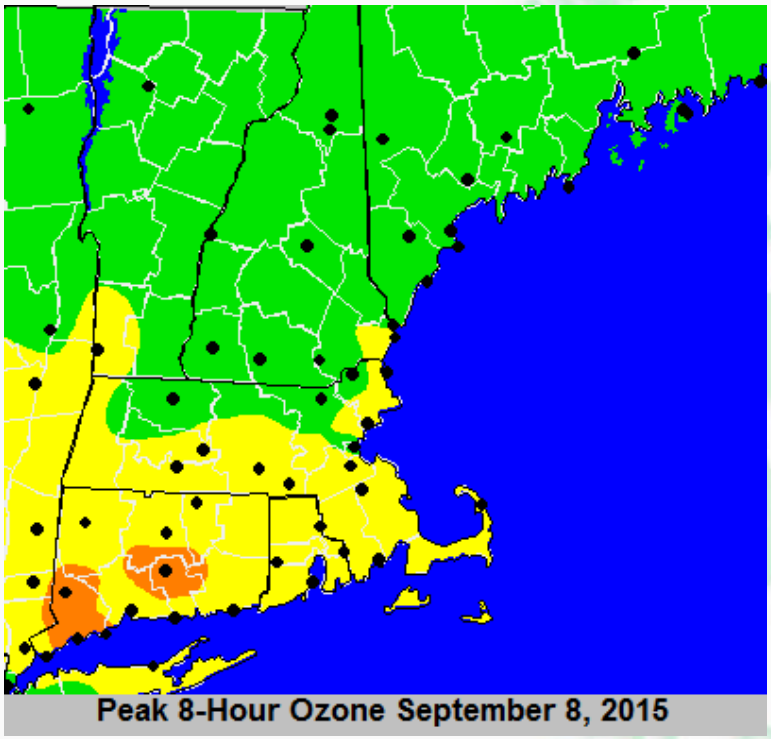

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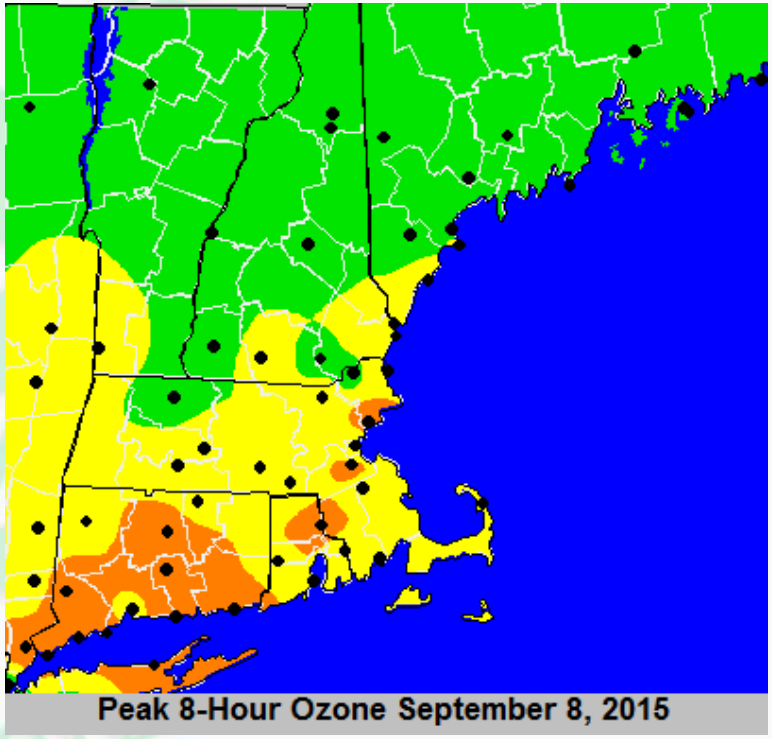

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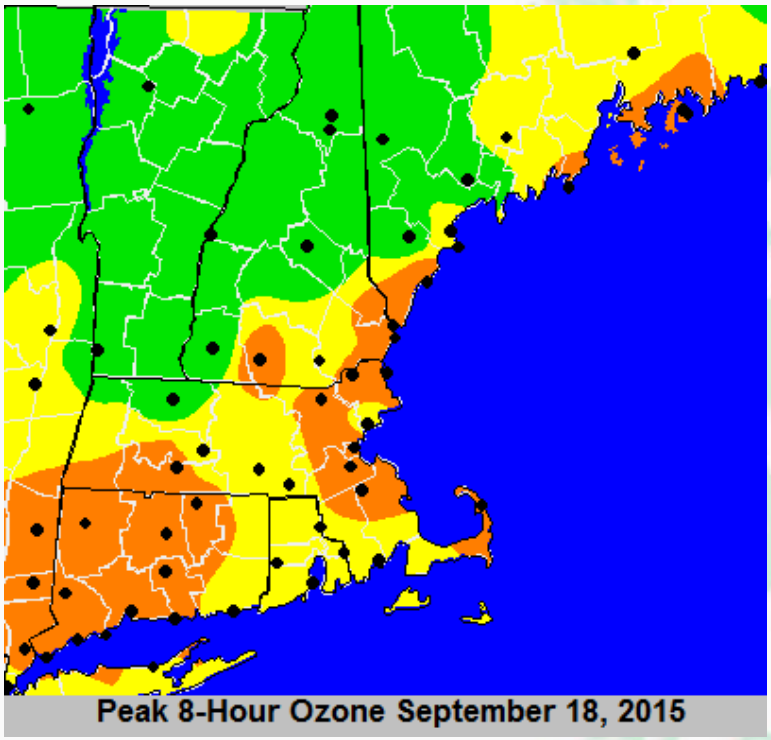

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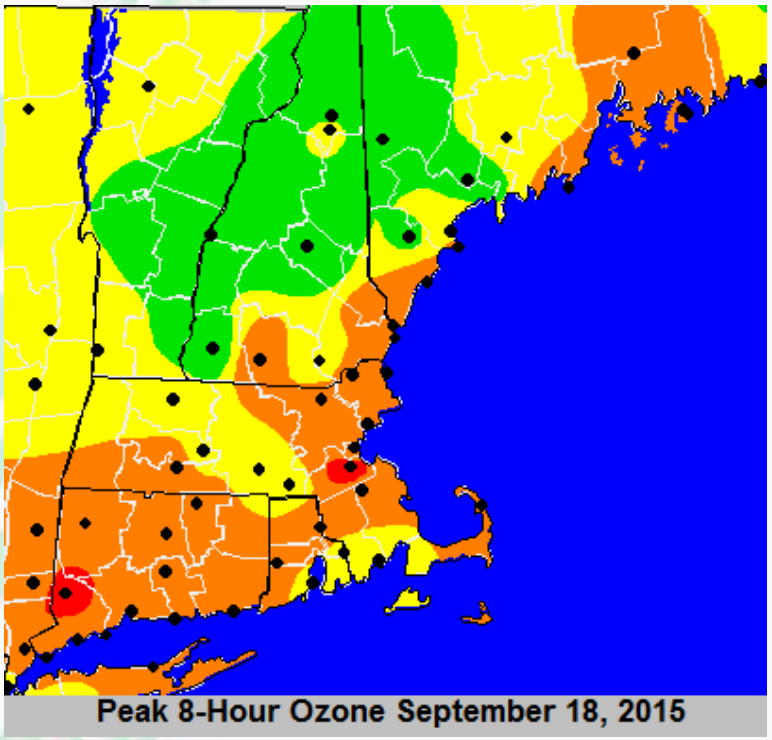

Good | Moderate | USG | Unhealthy | Very Unhealthy | Hazardous

Air Quality Forecasts, Alerts, and Real-time Information

- AQI Next Day Forecasts for New England are available at **www.epa.gov/region01/aqi**

- Users can sign up for e-mail and text message forecasts and alerts for their area via EnviroFlash on www.airnow.gov.

- Also available are AIRNow mobile applications for Apple and Android provide you real-time air quality information that you can use to protect your health when planning your day.

When Unhealthy Air Quality is Forecasted

EPA New England @EPAnewengland · 17 Aug 2015

Elevated levels of ozone/smog expected today throughout southern #CT & southern coastal #Maine epa.gov/region1/aqi/in...

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News Releases from Region 01

Poor Air Quality Expected to Continue in Parts of New England on Tuesday, Aug. 18

08/17/2015

Contact Information:
David Deegan ()
617-918-1017

BOSTON -High levels of ground-level ozone is expected to result in poor air quality for interior western Connecticut, including the Connecticut River Valley, and along coastal New Hampshire and Maine, for Tues. Aug. 18, 2015. Much of this same area is also expecting unhealthy air quality today (Aug. 17).

Sun 8/16/2015 4:18 PM

EnviroFlash <enviroflash@sonomatech.com>

Daily Air Quality Forecast for Bridgeport

To McWilliams, Anne K.

If there are problems with how this message is displayed, click here to view it in a web browser.

Air Quality Notifications

Forecast for Bridgeport, CT
Tomorrow's Forecast

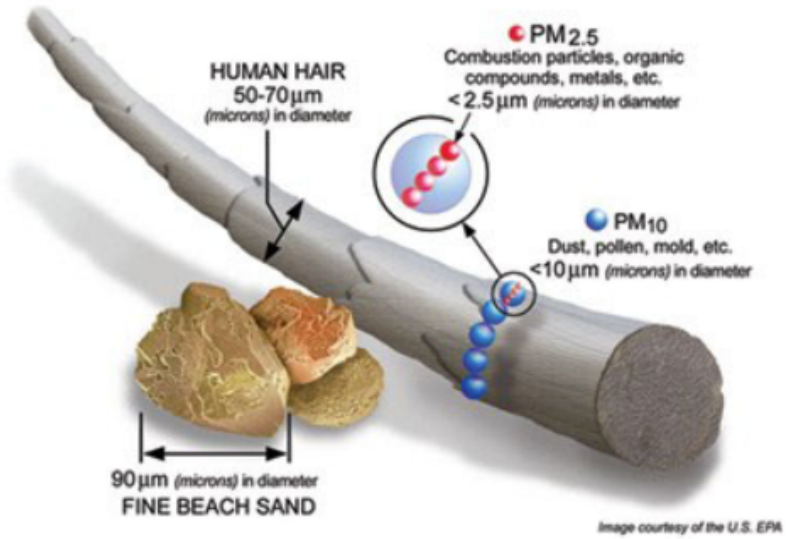
Monday, Aug 17: 114 AQI Unhealthy for Sensitive Groups **Orange** Ozone

For additional information concerning the air quality forecast, go to:
http://cfpub.epa.gov/airnow/index.cfm?action=airnow.local_state&stateid=7&tab=0

Ozone Action Day Tips

- Conserve electricity and set your air conditioner at a higher temperature.
- Choose a cleaner commute – share a ride to work or use public transportation.
- Refuel cars and trucks after dark.
- Combine errands and reduce trips.
- Limit engine idling.
- Use household, workshop, and garden chemicals in ways that keep evaporation to a minimum, or try to delay using them when poor air quality is forecast.

Particle Pollution



- **Coarse dust particles (PM_{10})** are 2.5 to 10 micrometers in diameter. Sources include crushing or grinding operations and dust stirred up by vehicles on roads.

- **Fine particles ($PM_{2.5}$)** are 2.5 micrometers in diameter or smaller, and can only be seen with an electron microscope. Fine particles are produced from all types of combustion, including motor vehicles, power plants, residential wood burning, forest fires, agricultural burning, and some industrial processes

Particle pollution, also called particulate matter or PM, is a mixture of solids and liquid droplets floating in the air. Some particles are released directly from a specific source, while others form in complicated chemical reactions in the atmosphere.

Particles come in a wide range of sizes. Particles less than or equal to 10 micrometers in diameter are so small that they can get into the lungs, potentially causing serious health problems. Ten micrometers is less than the width of a single human hair.

Basic Facts about Particle Pollution ($PM_{2.5}$)

- Caused by human and natural sources
- May be bad near busy roads and factories
- May occur at any time of year
- May be especially bad in winter for valley locations
- May be elevated outdoors and indoors
- Consists of microscopic particles of dust, dirt, smoke, or liquid droplets
- May penetrate deep into the lungs
- Can cause serious health effects

Particle pollution can:

Cause:

- Coughing
- Difficult or painful breathing
- Chronic bronchitis
- Premature death in people with heart or lung disease

Aggravate:

- Asthma
- Heart disease

Sensitive groups for particle pollution are:

- People with heart or lung disease
- Older Adults
- Children

EPA's Particle Standards

On December 14, 2012, EPA strengthened the air standards for fine particles

- For particles less than 2.5 microns in size ($PM_{2.5}$):
  - Annual standard = 12 $\mu g/m^3$, based on 3-year average of the annual arithmetic mean
  - 24-hour standard: 35 $\mu g/m^3$, based on 98- percentile of 24-hour concentrations in a year (averaged over 3 years)
- For larger coarse particles (PM_{10}):
  - 24-hour standard = 150 $\mu g/m^3$, not to be exceeded more than once per year on average over a three year period.

Air Quality Index for PM2.5

Index Values (Conc. Range)	Air Quality Descriptors	Cautionary Statements for Ozone
0 – 50 (0-12.0 ug/m3)	Good	**No health impacts are expected when air quality is in this range.**
51 – 100 (12.1-35.4 ug/m3)	Moderate	**Unusually sensitive people should consider reducing prolonged or heavy exertion.**
101 – 150 (35.5-55.4 ug/m3)	Unhealthy for Sensitive Groups	**People with heart or lung disease, older adults, and children should reduce prolonged or heavy exertion.**
151 – 200 (55.5-150.4 ug/m3)	Unhealthy	**People with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion.**

When elevated particle pollution is expected:

- Reduce or eliminate recreational burning
- Reduce or eliminate fireplace or wood stove use
- Avoid burning leaves, trash, and other materials
- If you do burn, “Burn Wise” by:
  - Using seasoned and dry wood
  - Burning hot fires
  - Starting fires with clean newspaper and dry kindling
- Avoid using gas-powered lawn and garden equipment
- Carpool or use public transportation

Questions?

Anne McWilliams

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