Envirothon
Air Quality
“Checking the Air Because We Care”

February 8, 2025

Overview

- Team Introductions
- Training PowerPoint
  - Introduction to Air Pollution
  - Ozone Pollution Impacts
  - How are Pollutants Detected?
  - The Air Quality Index
  - Air Quality Trends
  - Delaware and the NAAQS
  - Relating Air Quality to the 2025 Current Issue
    - Roots and Resiliency – Fostering Forest Stewardship in a Canopy of Change
- Final questions and wrap up

2025 Air Quality Envirothon Team

- Jacquelyn Cuneo (Environmental Engineer)
- Taylor Englert (Environmental Engineer)
- Michelle Jacobs (Small Business Ombudsman)
- Melina Lounsbury (Administrative Specialist)
- Jordan Matthews (Environmental Engineer)
- Patrick Mead (Environmental Scientist)
- Dawn Minor (Paralegal)
- Tyler Phommachanh (Environmental Engineer)
- Lindsay Rennie (Environmental Engineer)
- Yagna Shah (Environmental Engineer)

Section 1: Introduction to Air Pollution

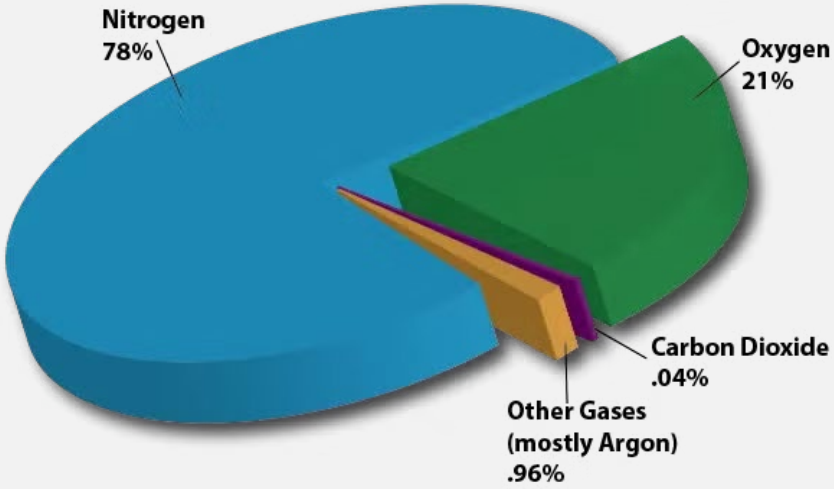
- Criteria air pollutants and other common pollutants
- Emission sources
- Clean Air Act

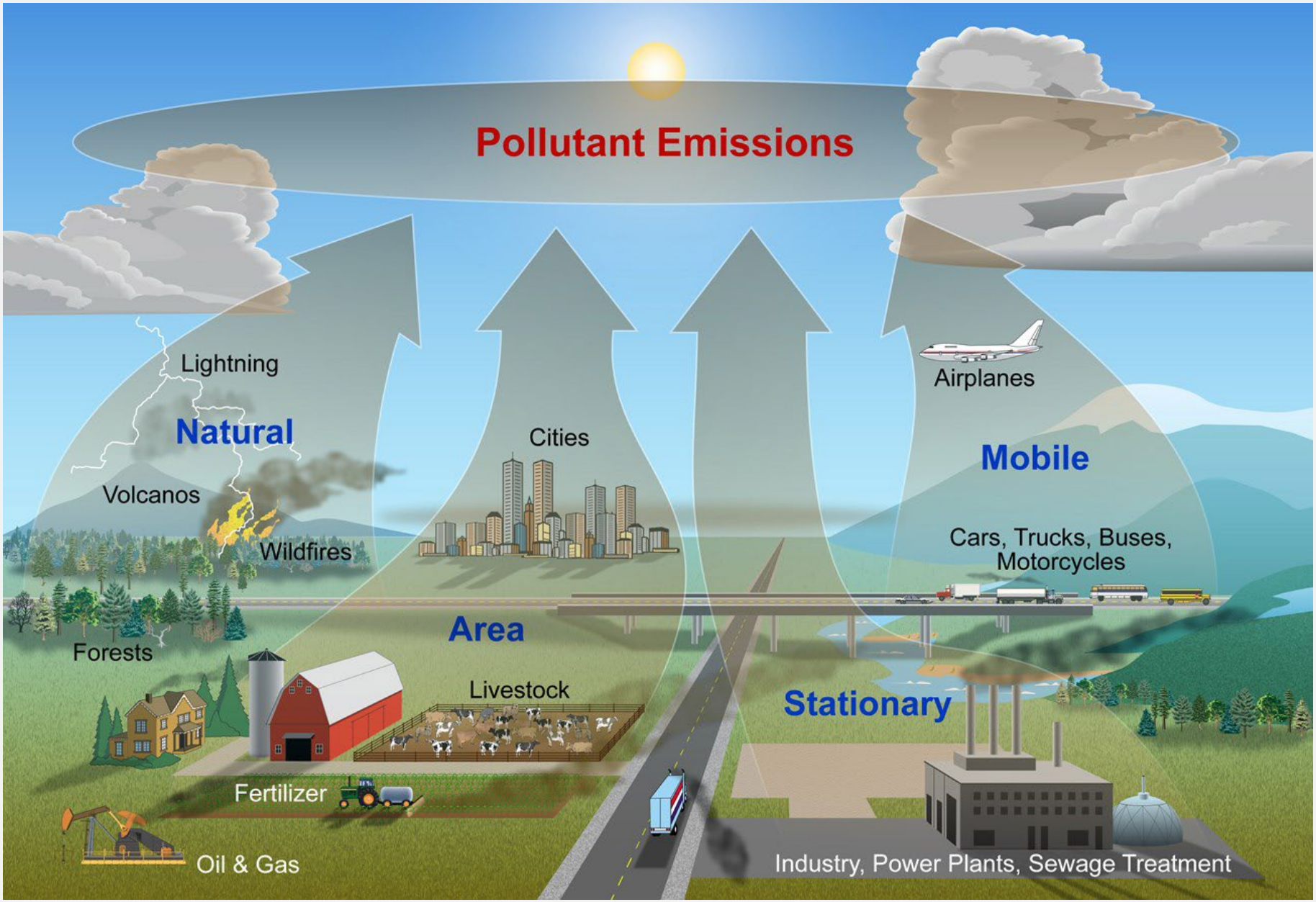
Why is Air Quality important?

- Air is a vital resource.
- On average, humans breathe in about 22,000 times each day!
- Air pollution can negatively affect air quality and cause health and environmental issues.

What is air pollution?

- Gas and particle contaminants present in the atmosphere.
- Health and environmental impacts of air pollution have local to global impacts.




Pollutant Emissions
Lightning
Natural
Volcanos
Wildfires
Forests
Cities
Airplanes
Mobile
Cars, Trucks, Buses, Motorcycles
Area
Livestock
Fertilizer
Oil & Gas
Stationary
Industry, Power Plants, Sewage Treatment

Lead (Pb)

Description

- Naturally occurring element found in small amounts in the earth's crust

Sources

- Can be emitted into the environment from industrial sources and contaminated sites such as lead smelters

Environmental Effects

- Decreased growth and reproductive rates in plants and animals; neurological effects in vertebrates

Health Effects

- Neurological effects in children; cardiovascular effects, decreased kidney function and reproductive problems in adults

Sulfur Dioxide (SO_2)

Description

- Is a gas at ambient temperatures with a pungent, irritating odor
- Comprised of one atom of sulfur and two atoms of oxygen

Sources

- Larger sources – power plants and industrial facilities
- Smaller sources – industrial processes, vehicles, and heavy equipment that burn high sulfur fuel
- Natural sources – volcanoes

Environmental Effects

- Harms trees and plants by damaging foliage and decreasing growth
- Contributes to acid rain which harms sensitive ecosystems

Health Effects

- Harms human respiratory system making breathing difficult

Carbon Monoxide (CO)

Description

- Is a colorless, odorless gas

Sources

- Greatest sources are cars, trucks, and other vehicles or machinery that burn fossil fuels

Environmental Effects

- Contributes indirectly to climate change because it participates in chemical reactions in the atmosphere that produce ozone, which is a climate change gas

Health Effects

- Reduces the amount of oxygen that can be transported in the blood stream to critical organs if inhaled in large amounts

Nitrogen Dioxide (NO_2)

Description

- Is one of a group of highly reactive gases known as oxides of nitrogen (NOX)
- Is used as the indicator for NOX

Sources

- Primarily from burning of fuel
- Forms from emissions from cars, trucks, buses, power plants, and off-road equipment

Environmental Effects

- Contributes to acid rain which harms sensitive ecosystems; haze; and nutrient pollution in coastal waters

Health Effects

- Irritates airways in the human respiratory system

Volatile Organic Compounds (VOCs)

Description

- Not a CAP
- Group of pollutants that contain carbon (some exceptions)
- Participate in photochemical reactivity

Sources

- Paints and solvents
- Pesticides
- Cleaning supplies
- Fuels and fuel combustion

Environmental Effects

- Precursor to ozone, which is a greenhouse gas (GHG) and contributes to haze

Health Effects

- Precursor to ozone
- Some can cause health effects and/or be toxic

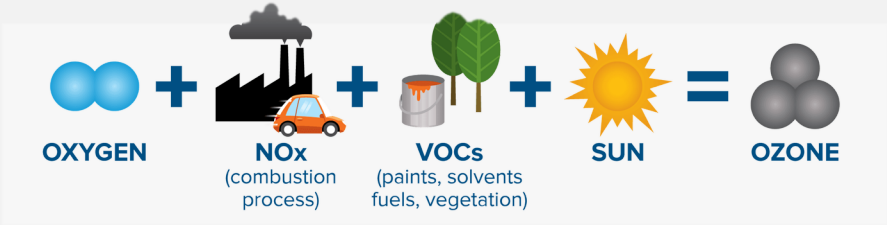
Ground-level Ozone

Description

- Found in the lower atmosphere
- Not emitted directly

Sources

- Created in the lower atmosphere when NOX and VOCs react in the presence of heat and sunlight



Environmental Effects

- Harms sensitive vegetation during the growing season
- Reduces photosynthesis; slows plant growth
- A greenhouse gas (GHG) and contributes to haze

Health Effects

- Strong respiratory irritant & health hazard
- Can reduce lung function and harm lung tissue

Particulate Matter (PM)

Description

- Mixture of solid particles and liquid droplets found in the air, such as dust or smoke
- PM10 is particle pollution less than 10 microns (PM10)
- Fine PM is smaller than 2.5 microns (PM2.5)

Sources

- Fuel combustion and fires
- Industrial processes/material handling
- Construction/demolition
- Natural sources (open lands, trees/vegetation, etc.)

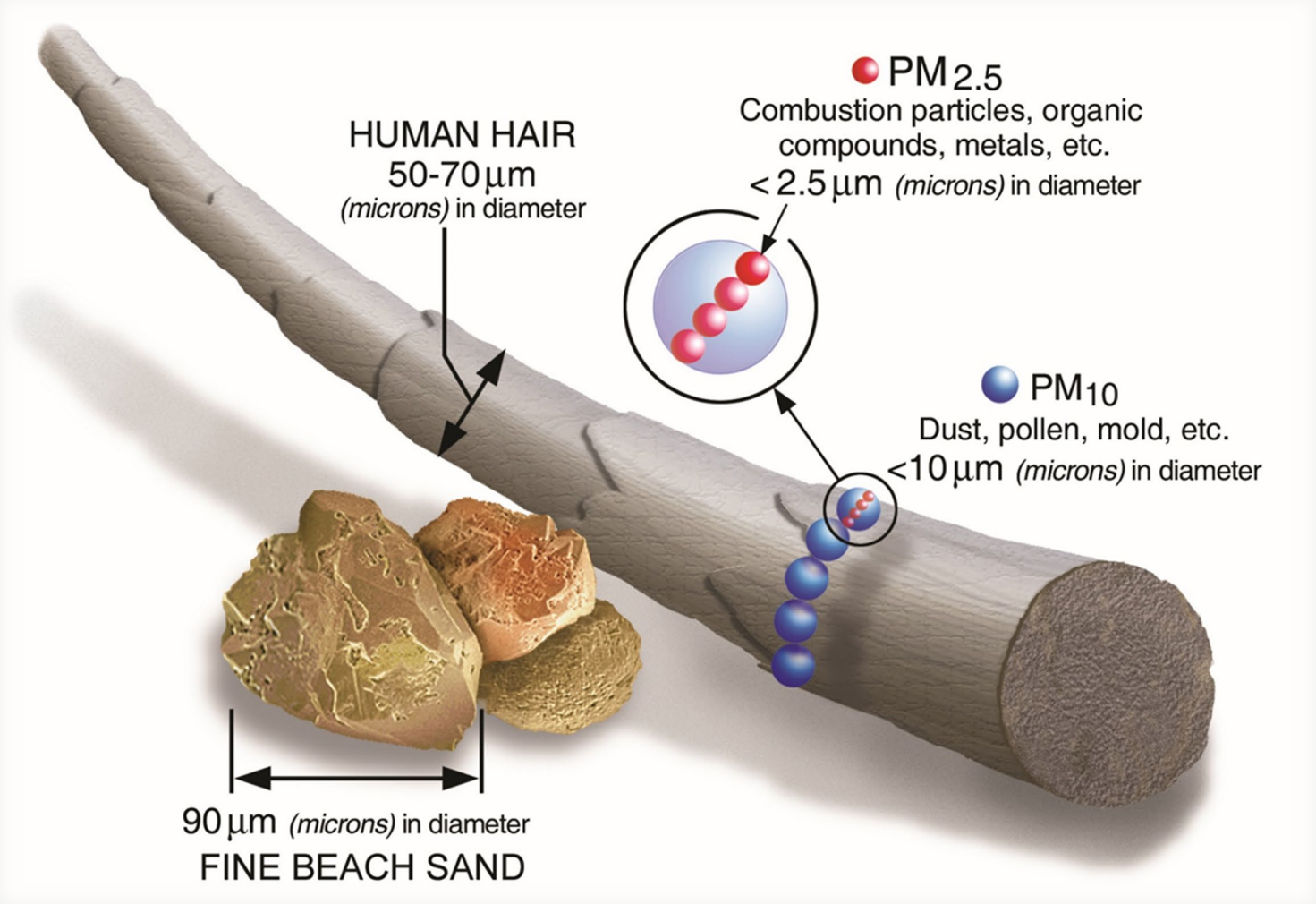
Environmental Effects

- $PM_{2.5}$ is the main cause of reduced visibility (haze) in parts of the US

Health Effects

- Increased irritation of the airways, coughing, or difficulty breathing
- $PM_{2.5}$ is a greater health concern because it can get deeper into lungs and the bloodstream

Particulate Matter (PM)



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Environmental Effects

- $PM_{2.5}$ is the main cause of reduced visibility (haze) in parts of the US

Health Effects

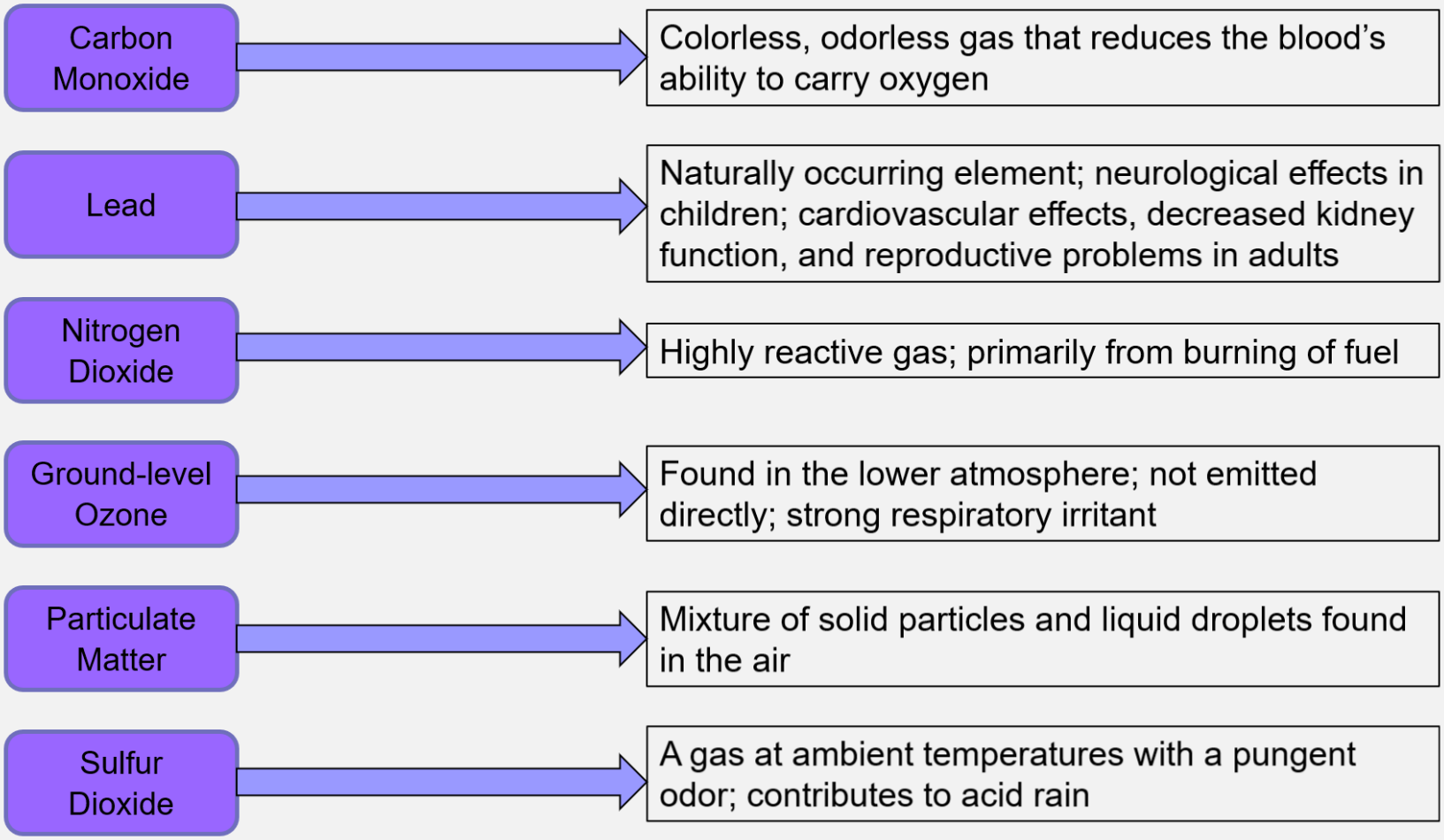
- Increased irritation of the airways, coughing, or difficulty breathing
- $PM_{2.5}$ is a greater health concern because it can get deeper into lungs and the bloodstream


Activity
time

CAP Activity

Carbon Monoxide	Naturally occurring element; neurological effects in children; cardiovascular effects, decreased kidney function, and reproductive problems in adults
Lead	Highly reactive gas; primarily from burning of fuel
Nitrogen Dioxide	A gas at ambient temperatures with a pungent odor; contributes to acid rain
Ground-level Ozone	Mixture of solid particles and liquid droplets found in the air
Particulate Matter	Colorless, odorless gas that reduces the blood's ability to carry oxygen
Sulfur Dioxide	Found in the lower atmosphere; not emitted directly; strong respiratory irritant

CAP Activity



Hazardous Air Pollutants (HAPs)

Description

- Not a CAP
- Group of 188 pollutants identified in the CAA

Sources

- Fuel Combustion
- Industrial activities/refineries
- Indoor Sources
- Natural Sources

Environmental Effects

- Some HAPs can deposit onto soils or surface waters
- When taken up by plants and ingested by animals, effects are eventually magnified up through the food chain.
- Animals may experience health problems if exposed over time.

Health Effects

- Known or suspected to cause cancer or other serious health effects, like reproductive effects or birth defects

Air Pollution Sources

- Air pollution comes from a variety of sources and each pollution source emits a variety of pollutants.
- To track air emissions, the EPA maintains the National Emission Inventory (NEI), which categorizes emission sources into the following groups:
  - Point - Larger sources at fixed, stationary locations
  - Nonpoint – Smaller sources that are individually too small in magnitude to report as point sources
  - On-road – On-road vehicles using gasoline, diesel or other fuels
  - Non-road – Off-road mobile sources that use gasoline, diesel, or other fuels
  - Fire – Wildfires, prescribed burns, etc.

Clean Air Act

- The Clean Air Act (CAA) is the federal law that defines and controls air pollution
- Sets National Ambient Air Quality Standards (NAAQS) for the 6 criteria air pollutants
  - Primary standards (provide public health protection)
  - Secondary standards (provide public welfare protection)
- The NAAQS are developed by the EPA through a regulatory process
  - Includes input from leading scientists as well as the general public
- States are required to develop a plan (SIP) to meet the NAAQS
  - Many states struggle to meet the standards
  - NAAQS for many pollutants have been lowered over the years

Section 2: Ozone Pollution Impacts

Health

Environmental

Effects of Ozone on Health

Symptoms

- Chest pain
- Coughing
- Throat irritation/soreness
- Congestion

Can Cause…

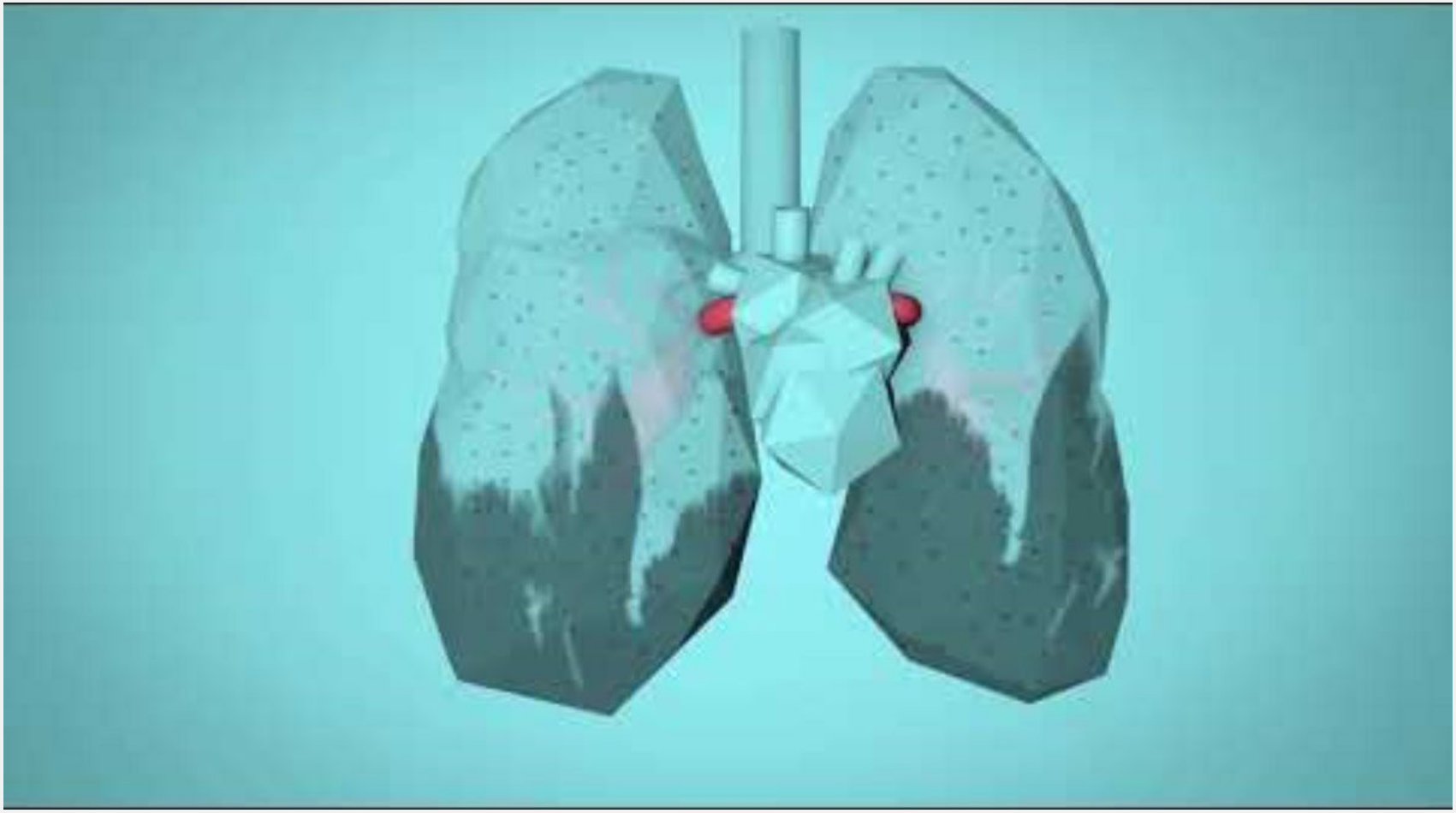
- Increased severity or frequency of lung disease
- Asthma attacks
- Pain and shortness of breath

Can affect your lungs by…

- Inflaming airways
- Damaging the lung linings
- Produce scar tissue
- Increasing likelihood of infection
- Continuous damage past initial symptoms

How Air Pollution Impacts Your Body

Please visit https://www.youtube.com/watch?v=GVBeY1jSG9Y to view video.



What does air pollution in your lungs look like?

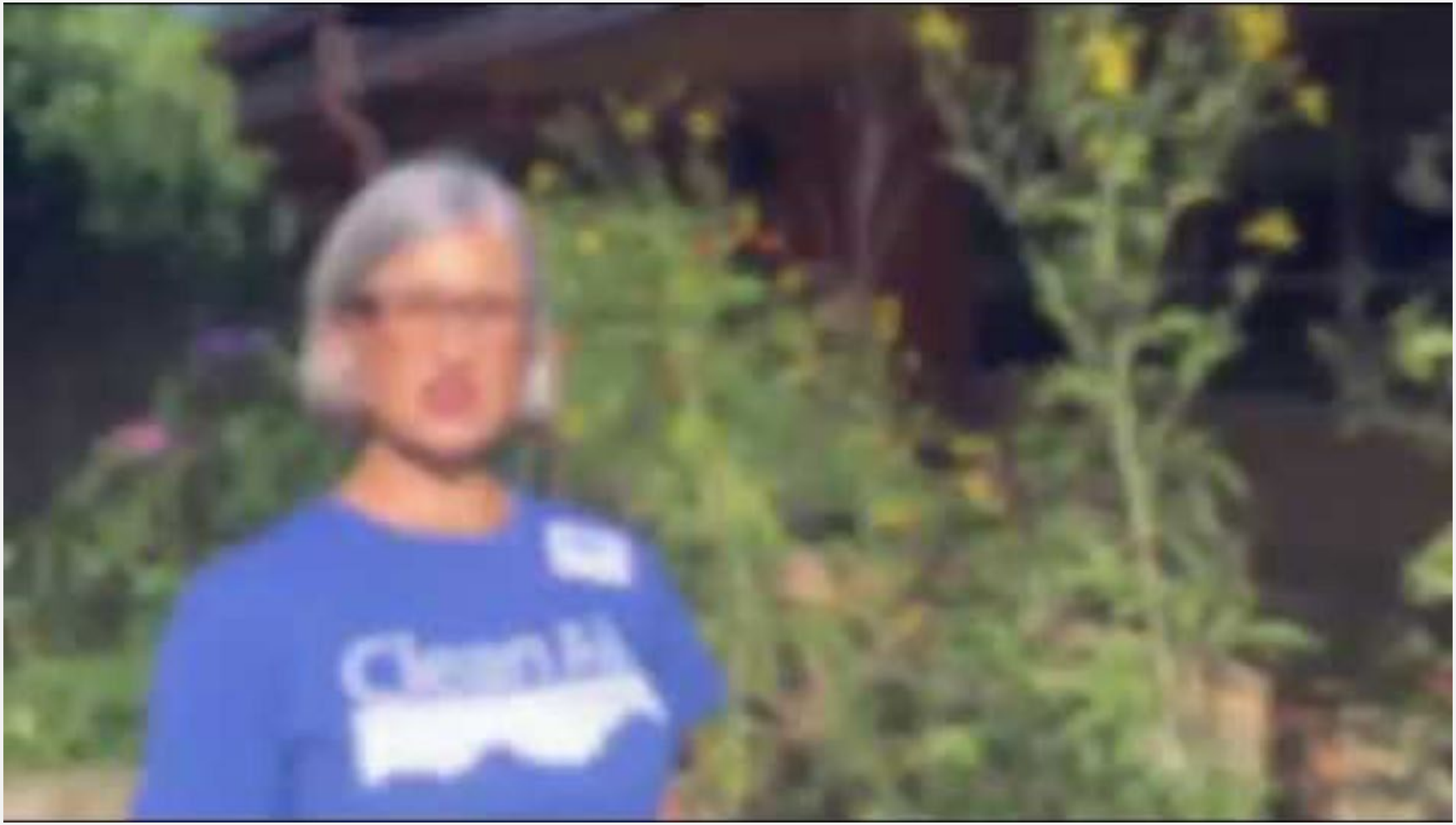
Please visit https://www.youtube.com/watch?v=ufgXecjzeAI to view video.

Environmental Impacts of Ozone

- Adversely affect trees, crops, etc.
- Interfere with the ability of sensitive plants to produce and store food.
- Visibly damage the leaves of trees and other plants, harming the appearance of vegetation in urban areas, national parks, and recreation areas
- Adverse impact on ecosystems, including loss of species diversity and changes to habitat quality and water and nutrient cycles.

Ozone Gardens: Leaf Injury

Please visit https://www.youtube.com/watch?v=M_j7bxAcf8M to view video.



Let’s Play A Quick Game

Insects

Disease

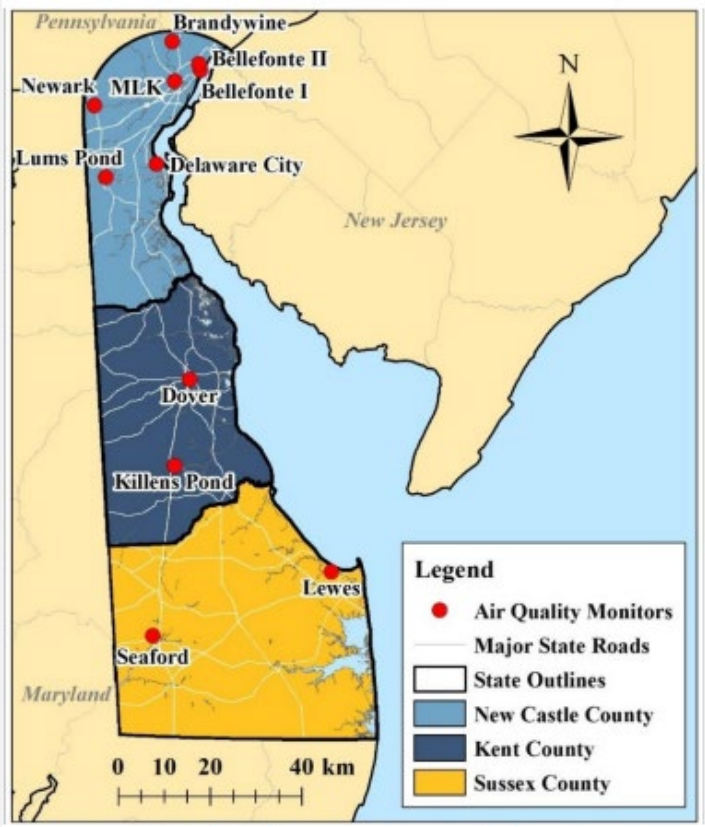
Ozone

Section 3: How are Pollutants Detected?

- Reasons to measure air pollutants
  - Assess extent of pollution
  - Provide air pollution data to public
  - Support air quality goals
  - Evaluate effectiveness of controls
  - Provide data for trends and modeling
  - Support research

Ambient Air Monitoring

Monitor Site Network Map



- 11 monitoring sites in DE
- 7 of 11 sites monitor for ozone
- Ozone Site Criteria
  - Population exposure
  - Background concentrations
  - Upwind/downwind directions for Wilmington
- DE ozone season 3/1 to 10/31

Ambient Air Monitoring

Please visit https://youtu.be/mp3kztZy7ow to view video. *Can stop video at 2:40*

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Ambient Air Monitoring

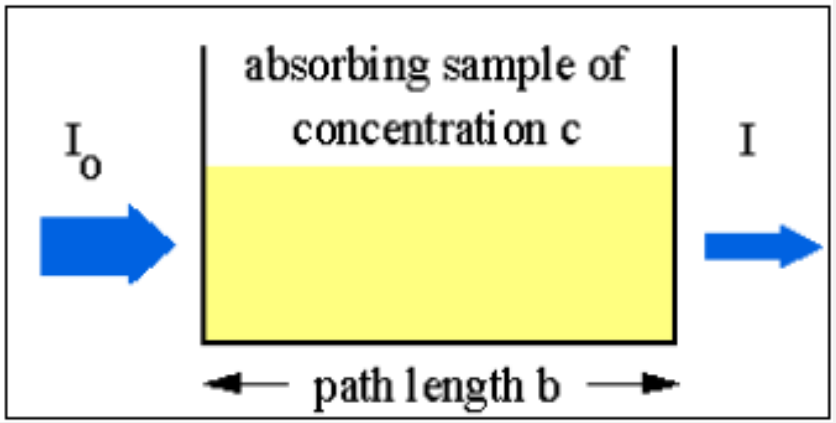
MLK Monitoring Station

- National Core monitoring stations
  - Enhances ambient monitoring
  - Better serves air quality needs
- Measures:
  - Ozone and other criteria pollutants
  - Wind speed/direction
  - Temperature and relative humidity

Ambient Air Monitoring

Ozone Measurement

- Ultraviolet Light Absorption
- Based on Beer-Lambert Law
- $C=I/I_{o,}$ (I is Light Intensity, C is Concentration)

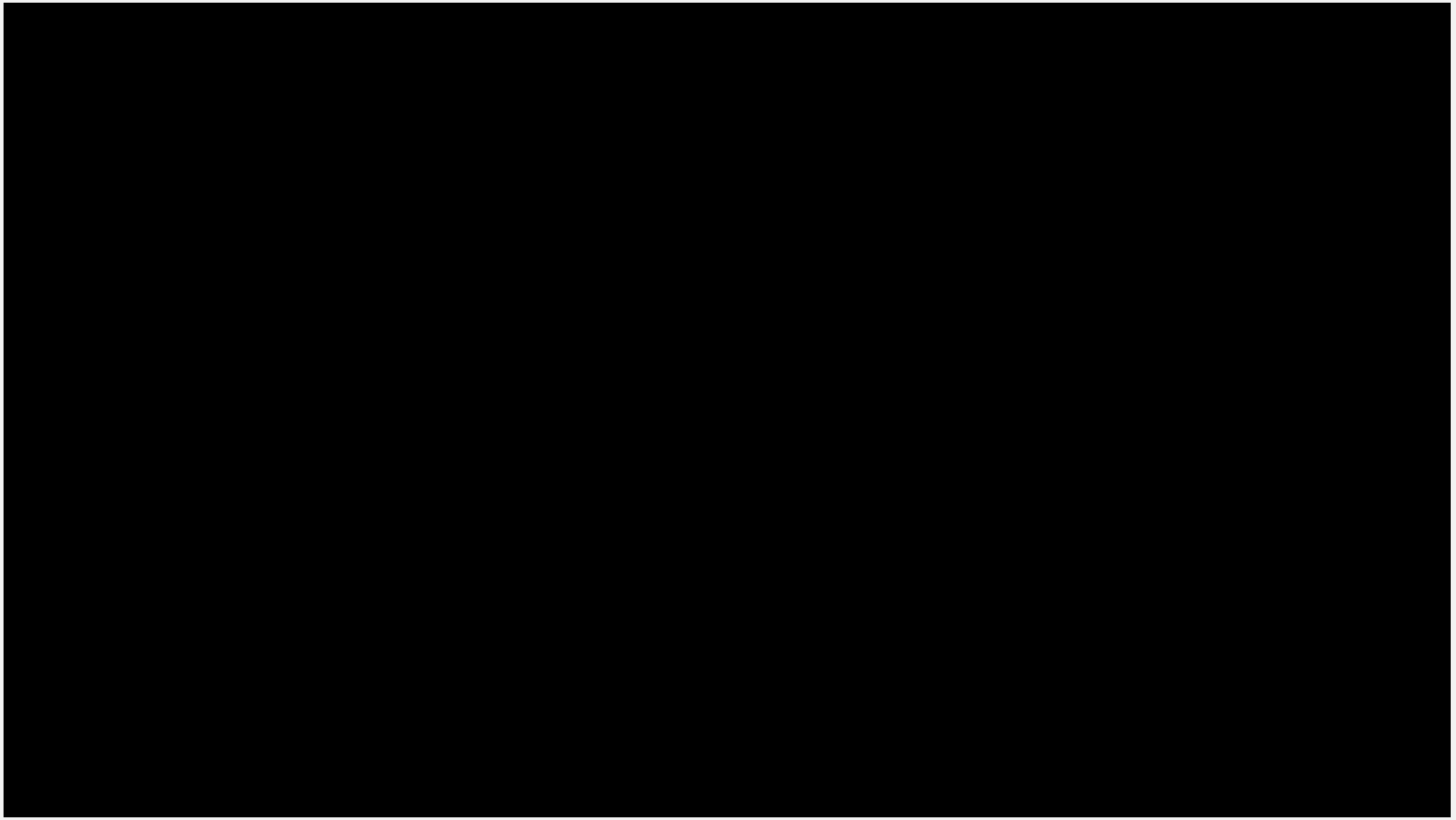


Ozone Analyzer

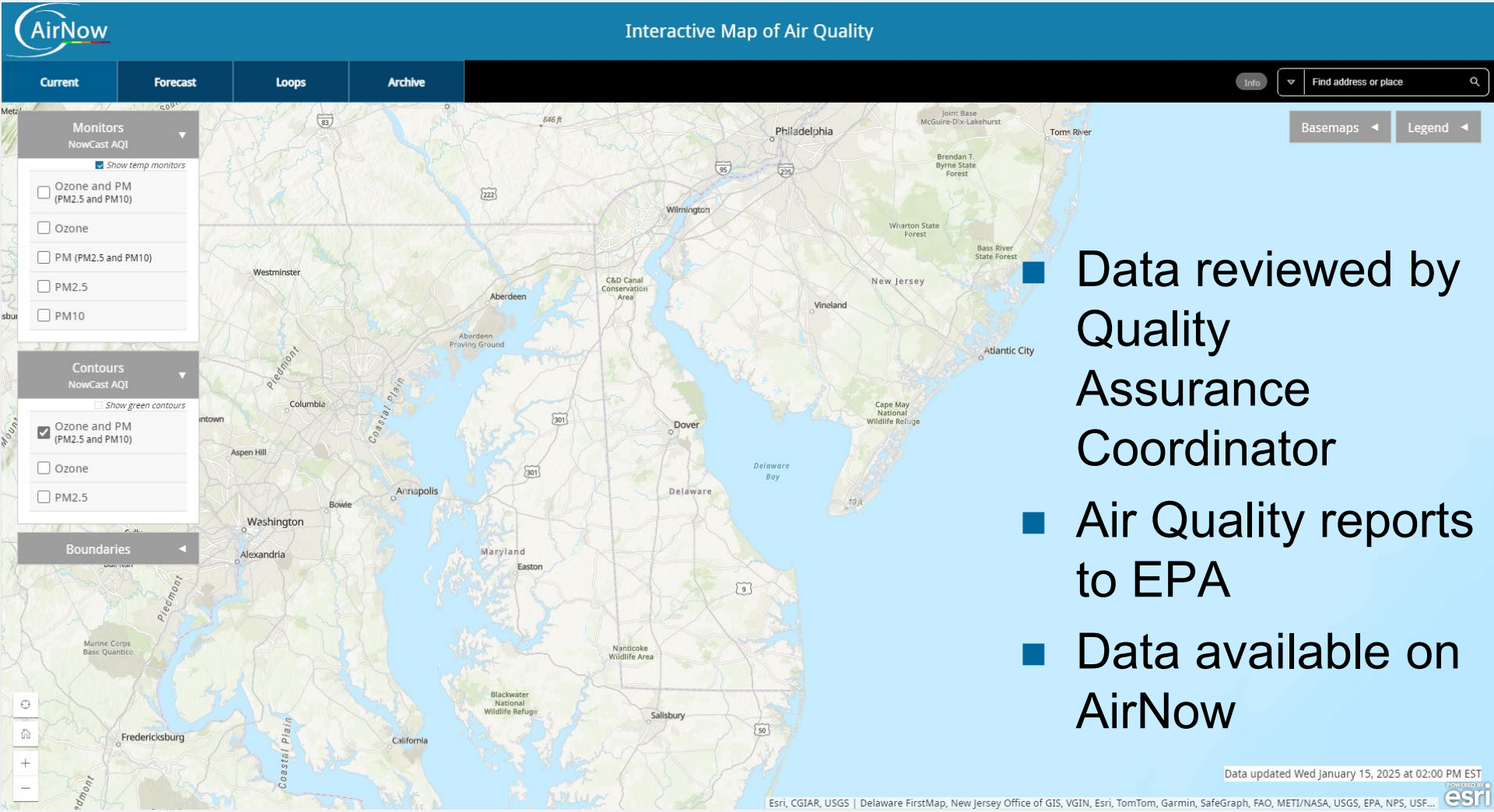
- Instrument displays data as concentrations
- Can use EPA approved instruments and methodologies only

What is One in a Million?

Please visit https://youtu.be/aa-m8a-jZ0k to view video.



Ambient Air Monitoring



- Data reviewed by Quality Assurance Coordinator
- Air Quality reports to EPA
- Data available on AirNow

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Emerging Tech in Air Quality Monitoring

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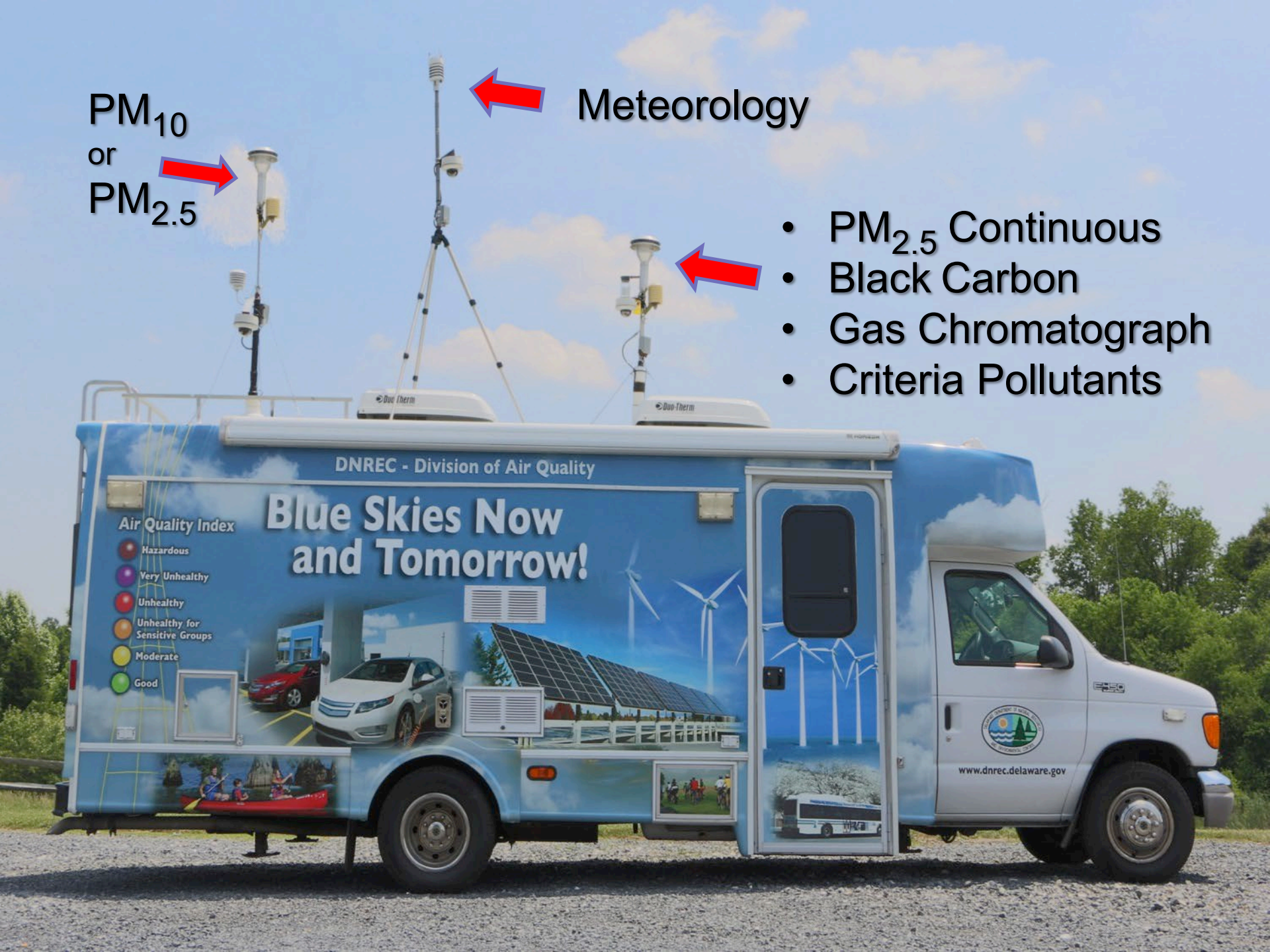
PM_{10}
or
$PM_{2.5}$
Meteorology
• $PM_{2.5}$ Continuous
• Black Carbon
• Gas Chromatograph
• Criteria Pollutants
DNREC - Division of Air Quality
Blue Skies Now and Tomorrow!
Air Quality Index
Hazardous
Very Unhealthy
Unhealthy
Unhealthy for Sensitive Groups
Moderate
Good
www.dnrec.delaware.gov

Filling up the toolbox!

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Eden Park (Terminal Ave) Project

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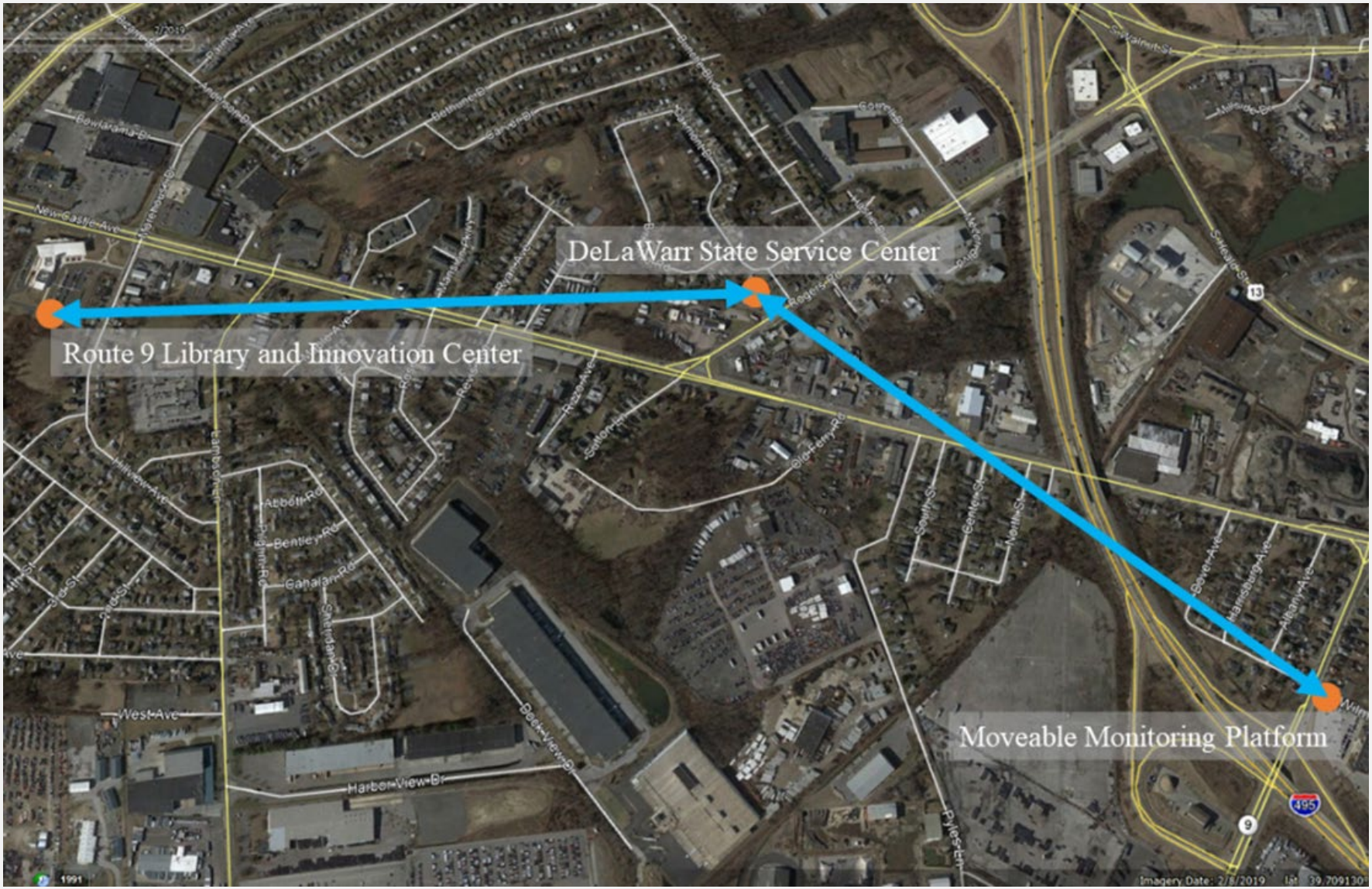

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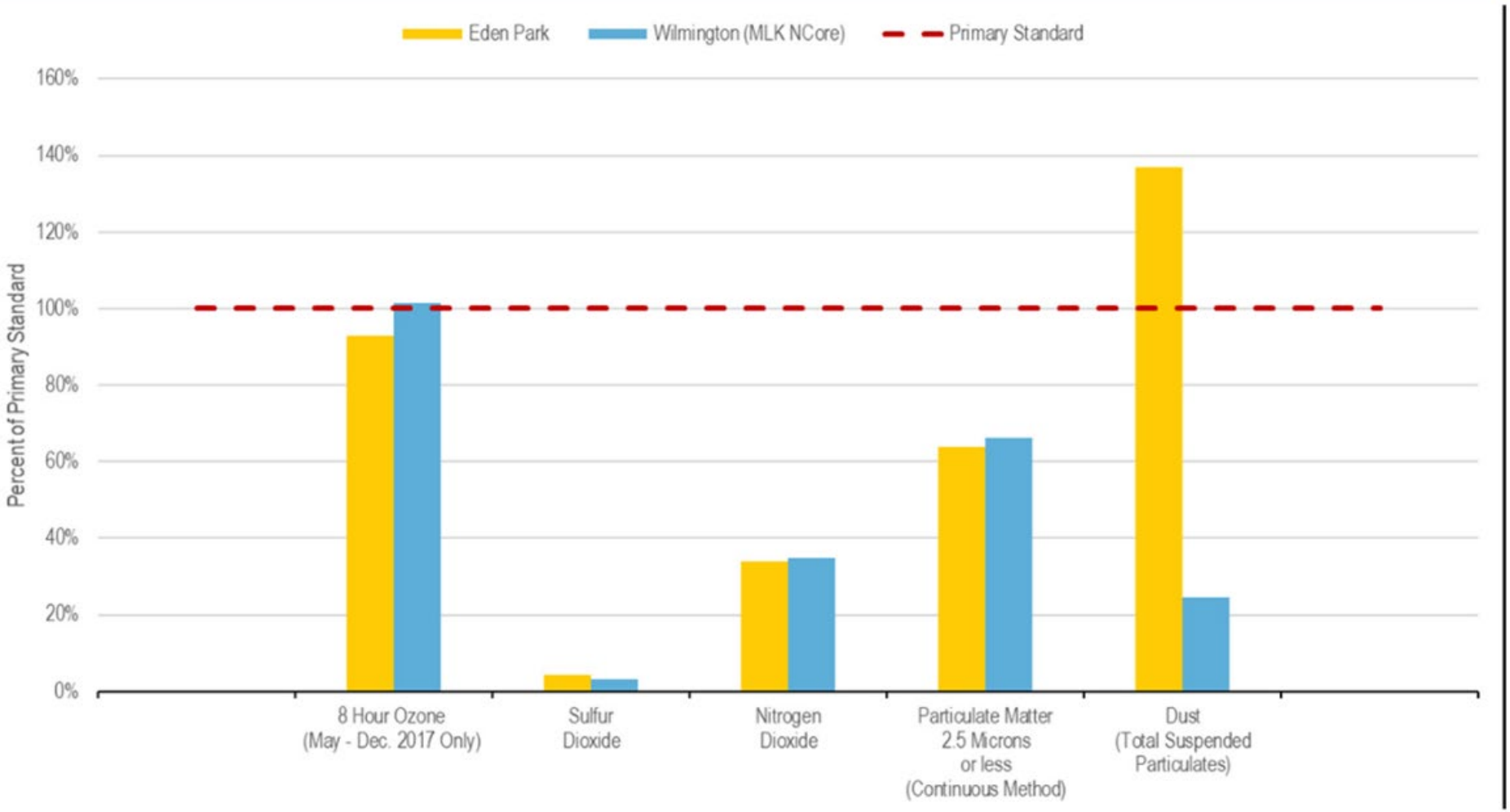
Comparison of Monitoring Results at Eden Park with State of Delaware Maximum Values



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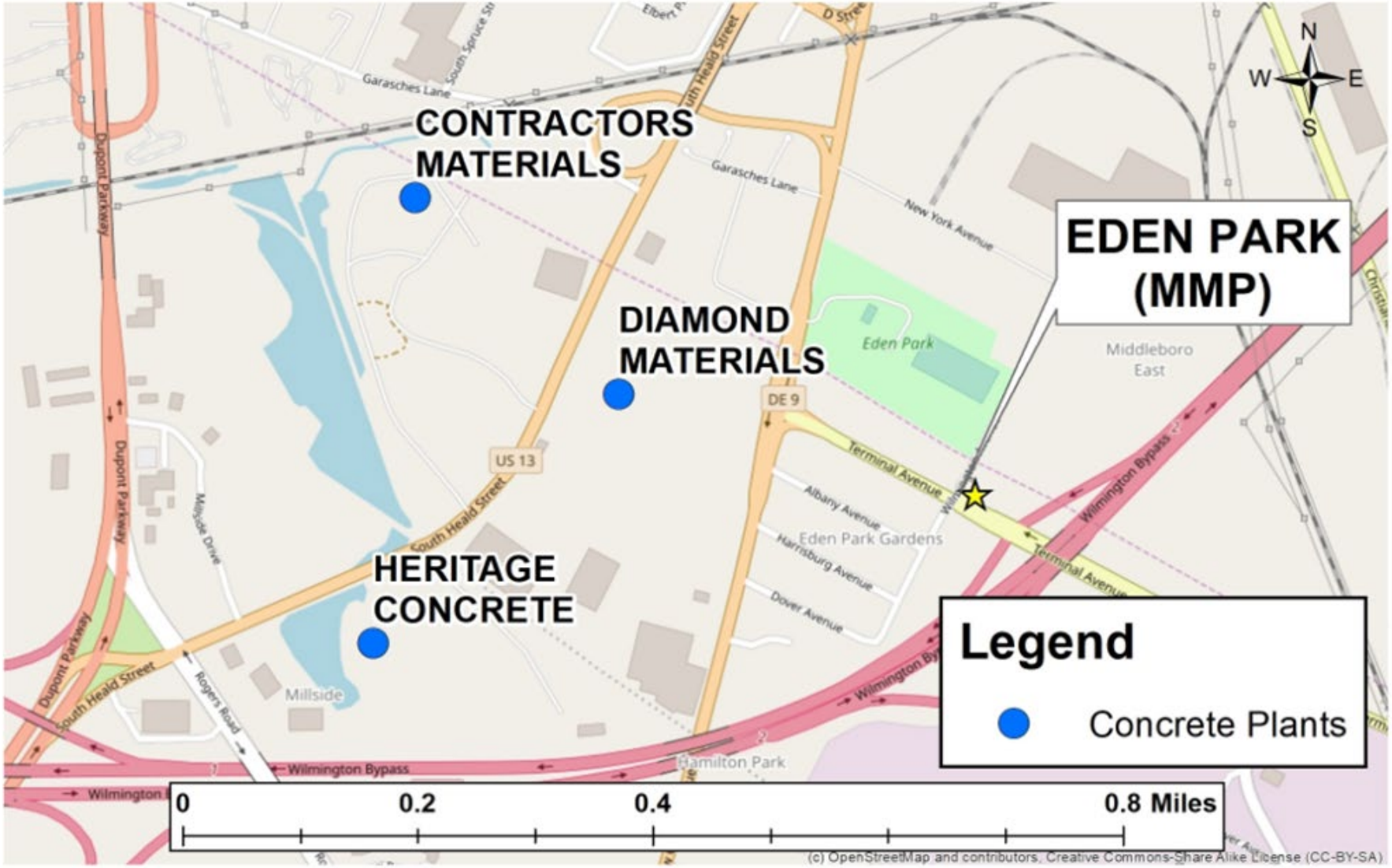
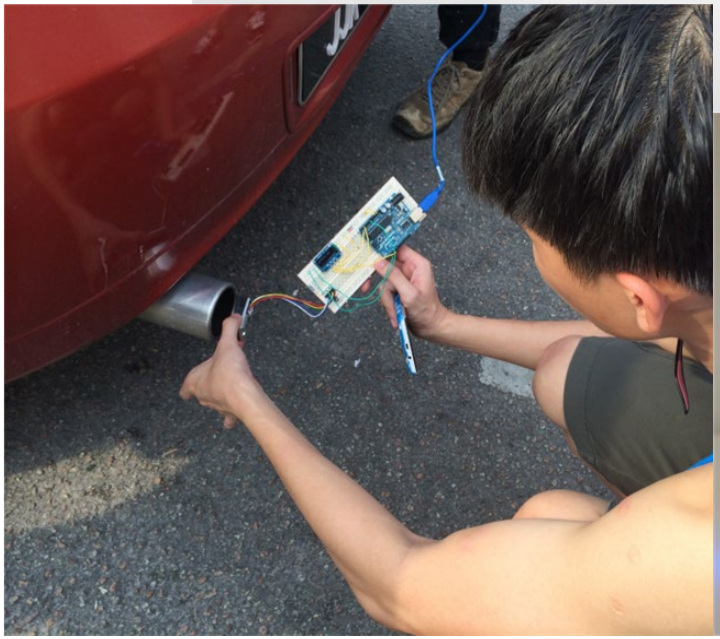
Three Concrete Facilities in the Eden Park Community



Control Techniques

Air Sensors


PURPLEAIR PA-II AIR QUALITY SENSOR
DEVICE – ID C4:0B:05:18:74:5
www.purpleair.com/register



Citizen Science

Quick 5 min. Break

Section 4: The Air Quality Index (AQI)

- AQI is a measure of overall air quality
- A color-coded scale quickly informs users of air quality
- Each AQI color correlates to a calculated value based on pollutant levels

Air Quality Index (AQI)

Daily AQI Color	Levels of Concern	Values of Index	Description of Air Quality
Green	Good	0 to 50	Air quality is satisfactory, and air pollution poses little or no risk.
Yellow	Moderate	51 to 100	Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.
Orange	Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is less likely to be affected.
Red	Unhealthy	151 to 200	Some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects.
Purple	Very Unhealthy	201 to 300	Health alert: The risk of health effects is increased for everyone.
Maroon	Hazardous	301 and higher	Health warning of emergency conditions: everyone is more likely to be affected.

Air Quality Index (AQI)

AQI Categories (Index Values)	Ozone		Particulate Matter		Carbon Monoxide (8-hr)	Nitrogen Dioxide (1-hr)	Sulfur Dioxide (1-hr)
	(8-hr)	(1-hr)	$PM_{2.5}$ (24-hr)	PM_{10} (24-hr)			
Unhealthy for Sensitive Groups (101-150)	**Sensitive groups:** Make outdoor activities shorter and less intense. Take more breaks. Watch for symptoms such as coughing or shortness of breath. Plan outdoor activities in the morning when ozone is lower. **People with asthma:** Follow your asthma action plan and keep quick-relief medicine handy.		**Sensitive groups:** Make outdoor activities shorter and less intense. It's OK to be active outdoors but take more breaks. Watch for symptoms such as coughing or shortness of breath. **People with asthma:** Follow your asthma action plan and keep quick relief medicine handy. **People with heart disease:** Symptoms such as palpitations, shortness of breath, or unusual fatigue may indicate a serious problem. If you have any of these, contact your health care provider.		**Sensitive group:** Limit heavy exertion outdoors and avoid sources of CO, such as heavy traffic.	**Sensitive groups:** Limit prolonged exertion outdoors, especially near busy roads. **People with asthma:** Follow your asthma action plan and keep quick relief medicine handy.	**Sensitive groups:** Consider limiting outdoor exertion. **People with asthma:** Follow your asthma action plan and keep quick relief medicine handy.

How the AQI is calculated

1. Identify the highest concentration for each pollutant among all of the monitors within the reporting area.

2. Use the table to find the two “breakpoints” that contain the concentration and the corresponding “low” and “high” AQI values.

How the AQI is calculated

These Breakpoints...							...equal this AQI	...and this category
O_3 (ppm) 8-hour	O_3 (ppm) 1-hour[1]	$PM_{2.5}$ ($\mu g/m^3$) 24-hour	PM_{10} ($\mu g/m^3$) 24-hour	CO (ppm) 8-hour	SO_2 (ppb) 1-hour	NO_2 (ppb) 1-hour	AQI	
0.000 - 0.054	-	0.0 – 9.0	0 - 54	0.0 - 4.4	0 - 35	0 - 53	0 - 50	Good
0.055 - 0.070	-	9.1 – 35.4	55 - 154	4.5 - 9.4	36 - 75	54 - 100	51 - 100	Moderate
0.071 - 0.085	0.125 - 0.164	35.5 – 55.4	155 - 254	9.5 - 12.4	76 - 185	101 - 360	101 - 150	Unhealthy for Sensitive Groups
0.086 - 0.105	0.165 - 0.204	(55.5 - 125.4)[3]	255 - 354	12.5 - 15.4	[3] 186 - 304	361 - 649	151 - 200	Unhealthy
0.106 - 0.200	0.205 - 0.404	(125.5 - (225.4)[3]	355 - 424	15.5 - 30.4	[3] 305 - 604)	650 - 1249	201 - 300	Very unhealthy
0.201-([2])	0.405+	225.5+	425+	30.5+	[3] 605+	1250+	301+	Hazardous [4]

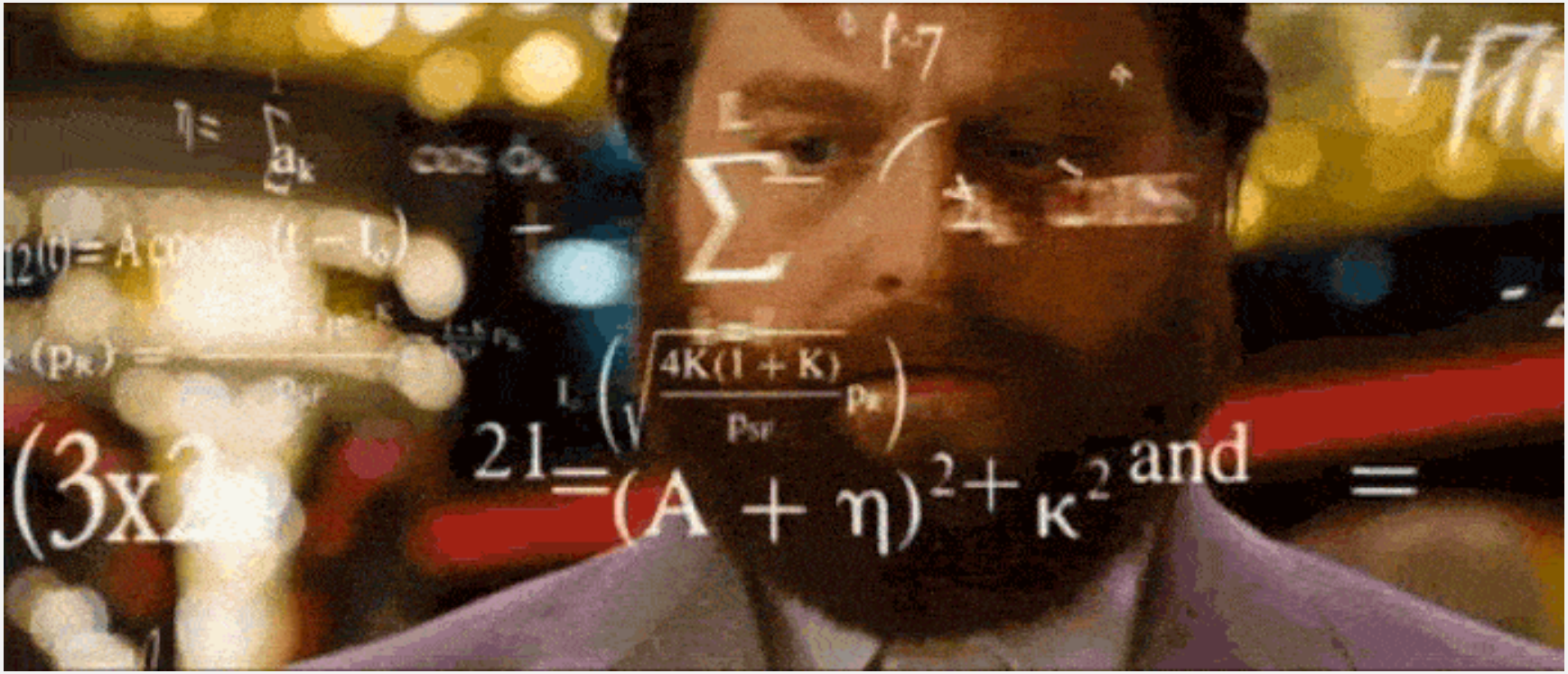
How the AQI is calculated

- Use the following equation to calculate the index:

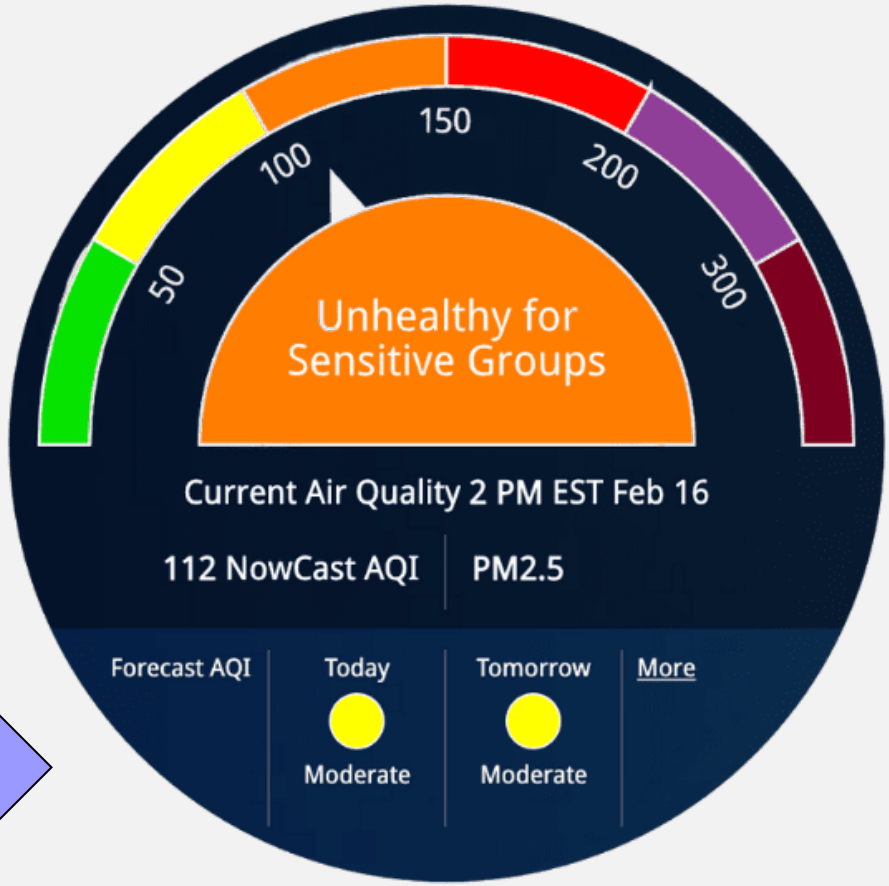
$$I_p = \frac{I_{Hi} - I_{Lo}}{BP_{Hi} - BP_{Lo}} \left(C_p - BP_{Lo}\right) + I_{Lo}$$

$$I_p = \frac{150 - 101}{360 - 101} (150 - 101) + 101 = \mathbf{110.3}$$

How the AQI is calculated



AQI Formats



Real-Time

Forecast

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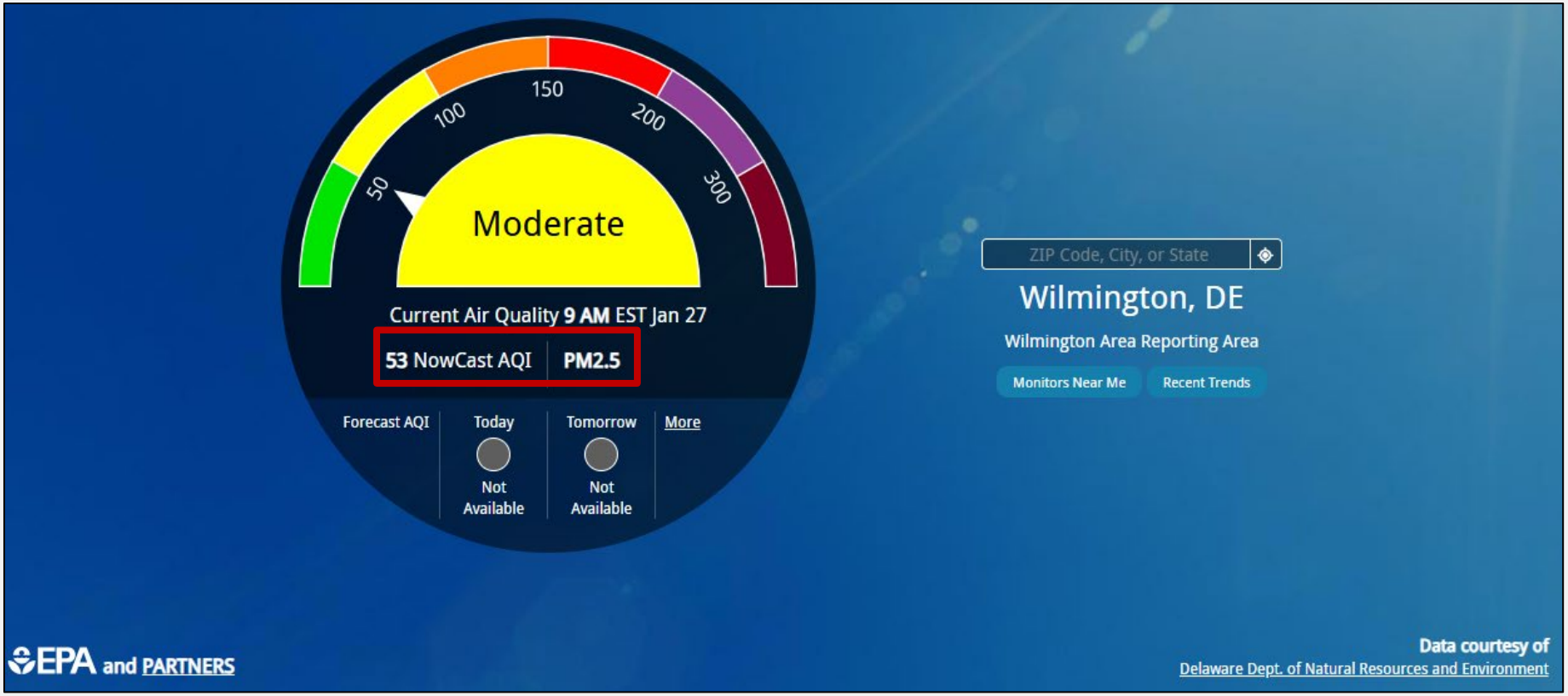
AirNow



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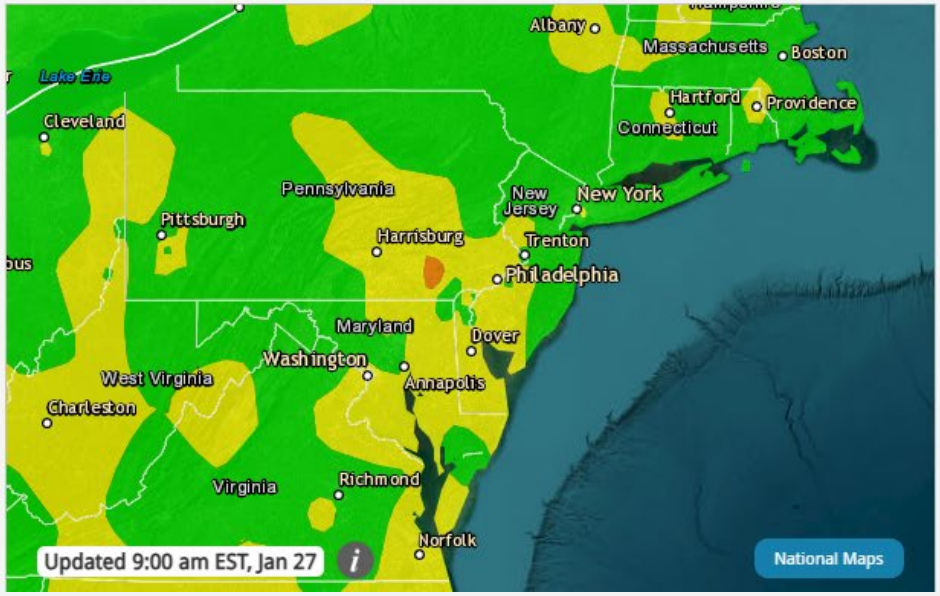
AirNow

Current Air Quality



Primary Pollutant
This pollutant currently has the highest AQI in the area.

▼	PM2.5	53	Moderate

If you are **unusually sensitive** to particle pollution, consider reducing your activity level or shorten the amount of time you are active outdoors.

▶	PM10	29	Good
▶	OZONE	27	Good

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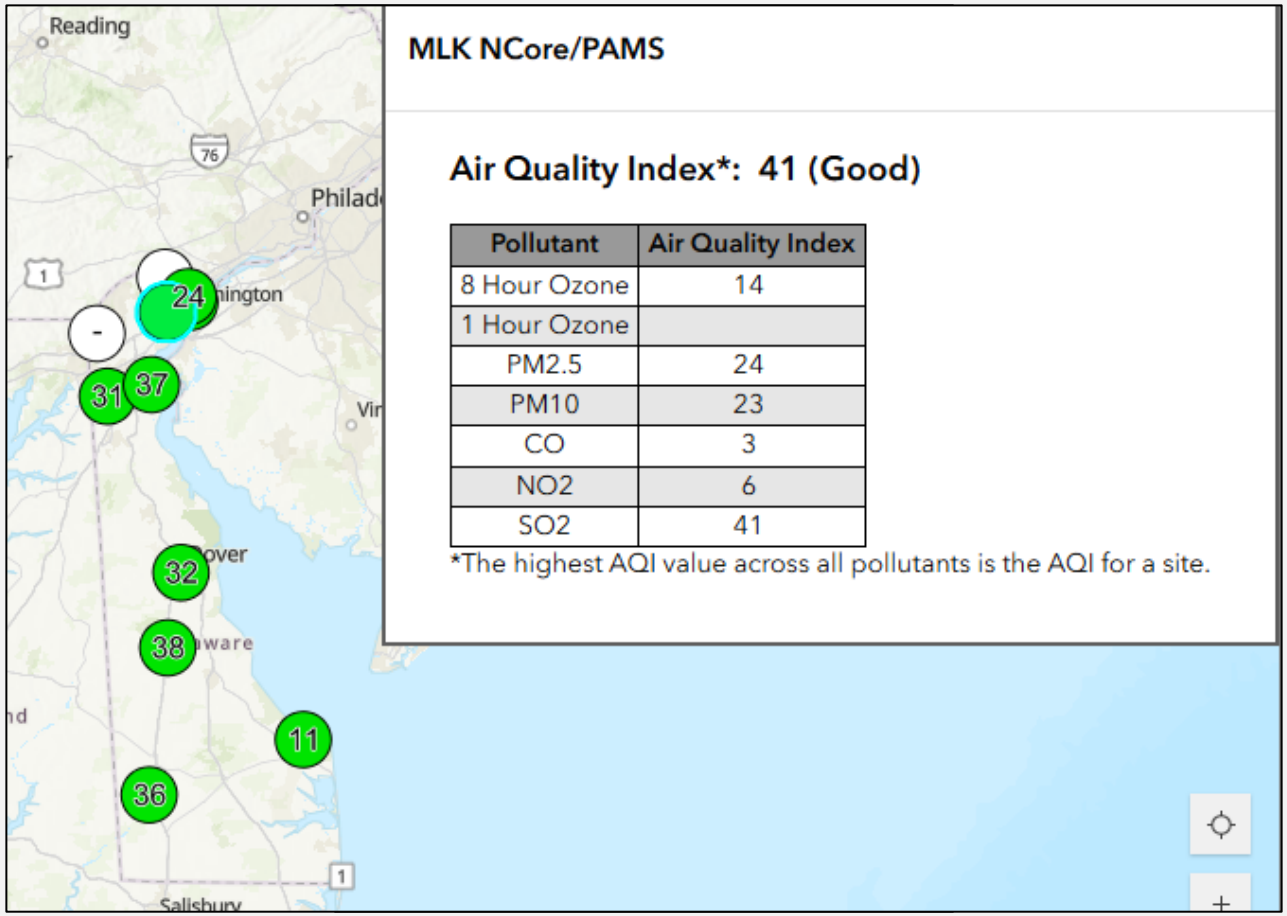
DNREC Real-Time Data



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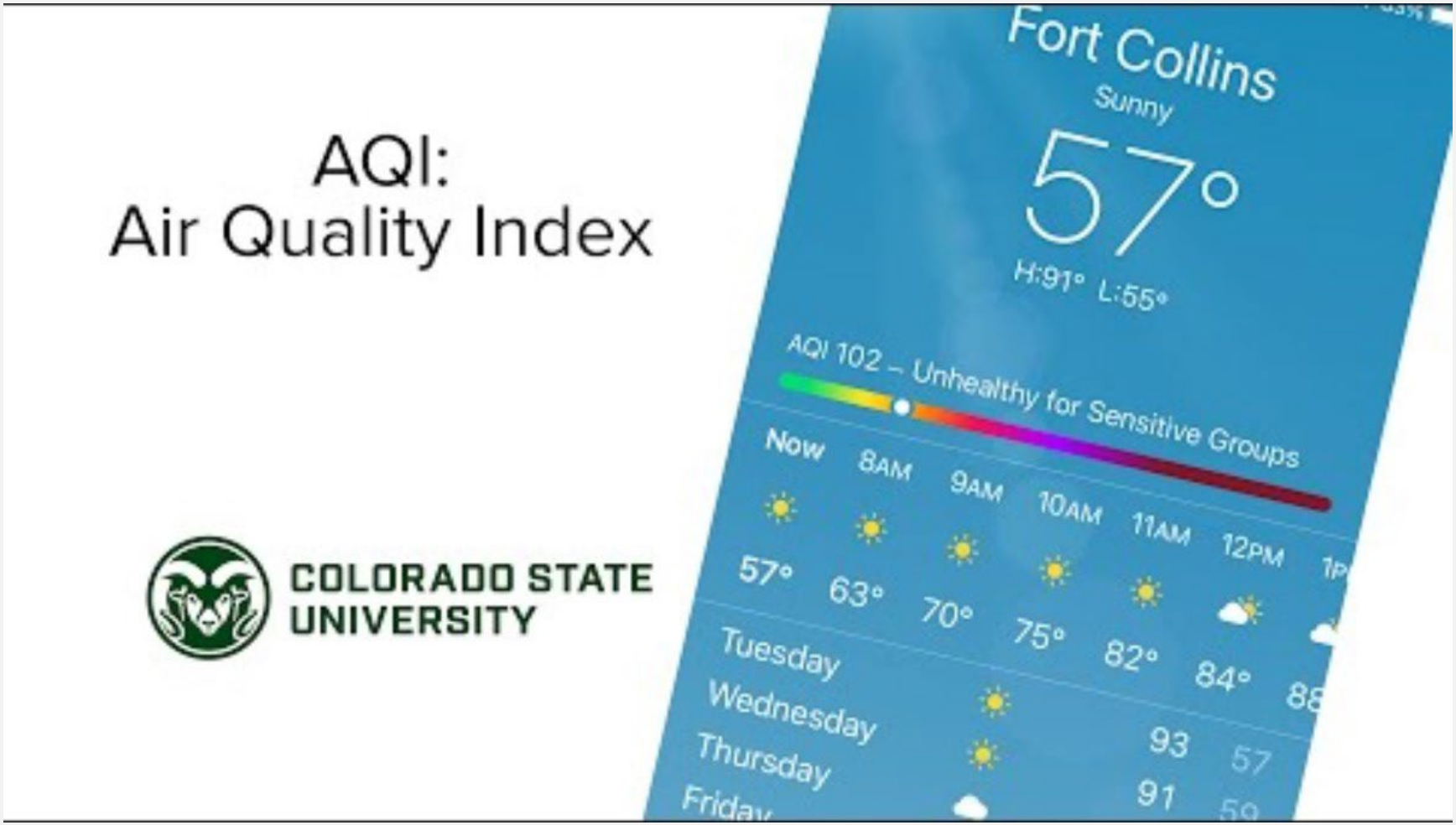
Why is AQI important?

Please visit https://www.youtube.com/watch?v=1FGwxsmouJE to view video.



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AQI Forecasts

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DNREC AQI Forecasts

Tuesday, August 27, will be an Ozone Code Orange Air Quality Action Day for Delaware!

Tomorrow's Forecast:

Tuesday, August 27 is a Code Orange Air Quality Action Day for Delaware. Upper-level high pressure west of Delaware will reduce atmospheric mixing. In addition, ample sunshine and temperatures near 90F will promote ozone formation, while light and variable winds will hinder dispersion. Furthermore, thin-density smoke across the Mid-Atlantic region will enhance ozone formation. Therefore, AQI levels are anticipated to be Unhealthy for Sensitive Groups for ozone and low-Moderate for PM2.5.

Extended Forecast:

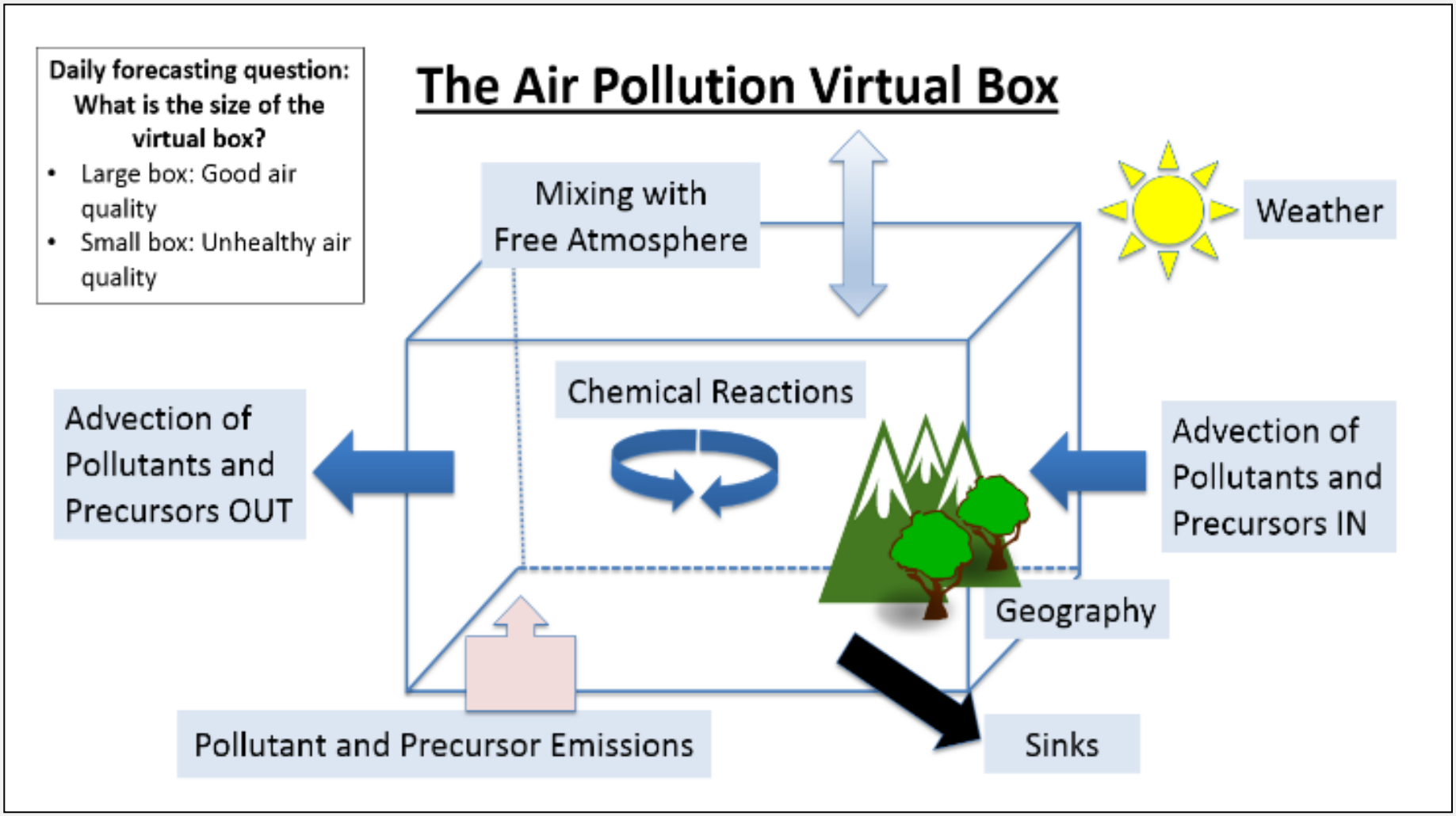
Wednesday, southerly to southwesterly winds will strengthen slightly, aiding dispersion. However, sunny skies and highs in the mid-90s will continue to support ozone formation. As a result, AQI levels are anticipated to be high-Moderate for ozone and low-Moderate for PM2.5.

Thursday, as a cold front departs the First State and surface high pressure moves into eastern Canada, moderate to gusty easterly to east-northeasterly winds will enhance dispersion. However, periods of sunshine and temperatures in the mid-80s will aid ozone development. Thus, AQI levels are anticipated to be low-Moderate for ozone and high-Good for PM2.5.

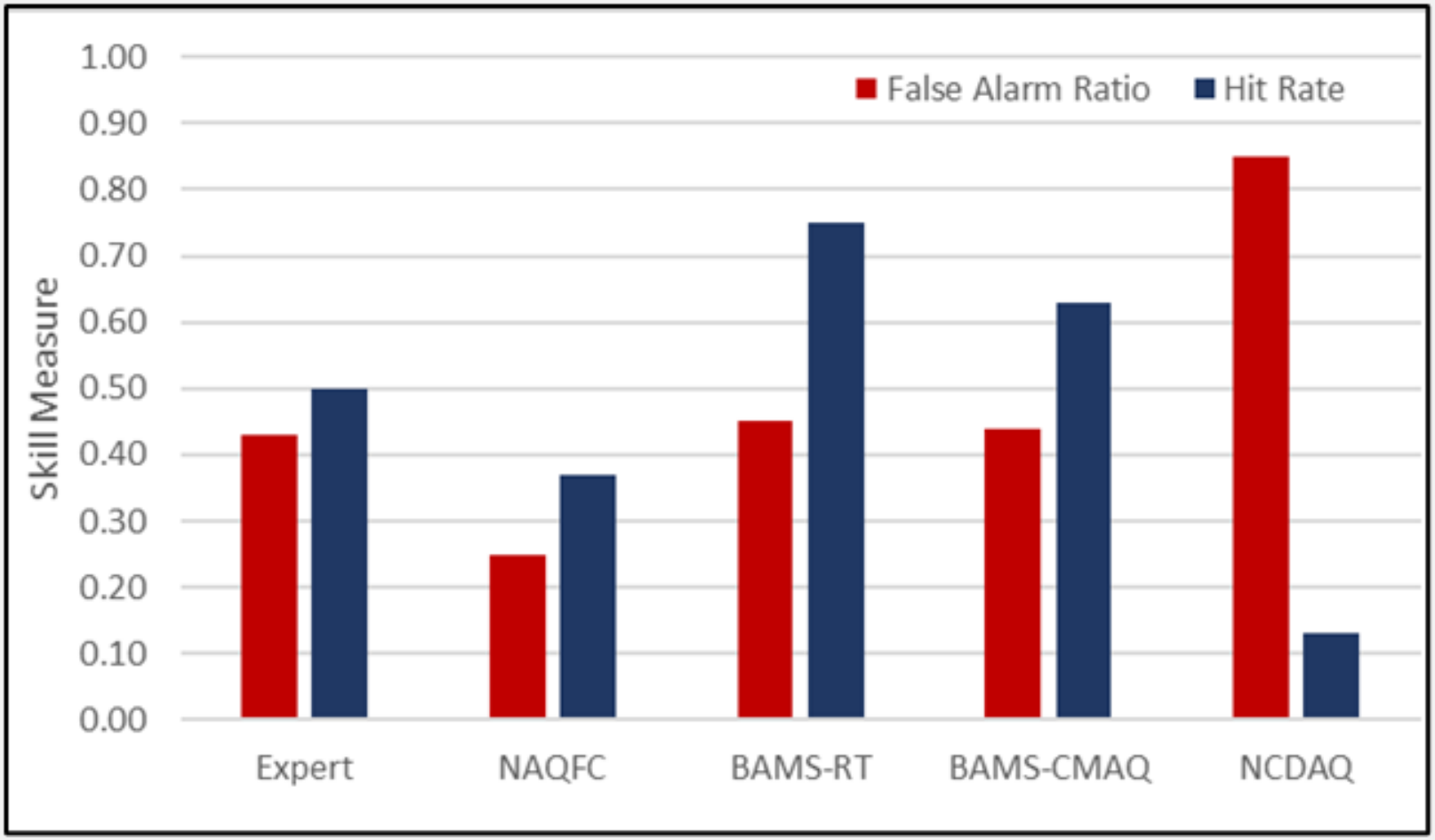
DNREC AQI Forecasts

Tomorrow's Forecast				
Tuesday, Aug 27:	112 AQI	Unhealthy for Sensitive Groups	Orange	Ozone
	62 AQI	Moderate	Yellow	Particle Pollution (2.5 microns)
Extended Forecast				
Wednesday, Aug 28:	100 AQI	Moderate	Yellow	Ozone
	53 AQI	Moderate	Yellow	Particle Pollution (2.5 microns)
Thursday, Aug 29:	64 AQI	Moderate	Yellow	Ozone
	44 AQI	Good	Green	Particle Pollution (2.5 microns)

AQI Forecasts

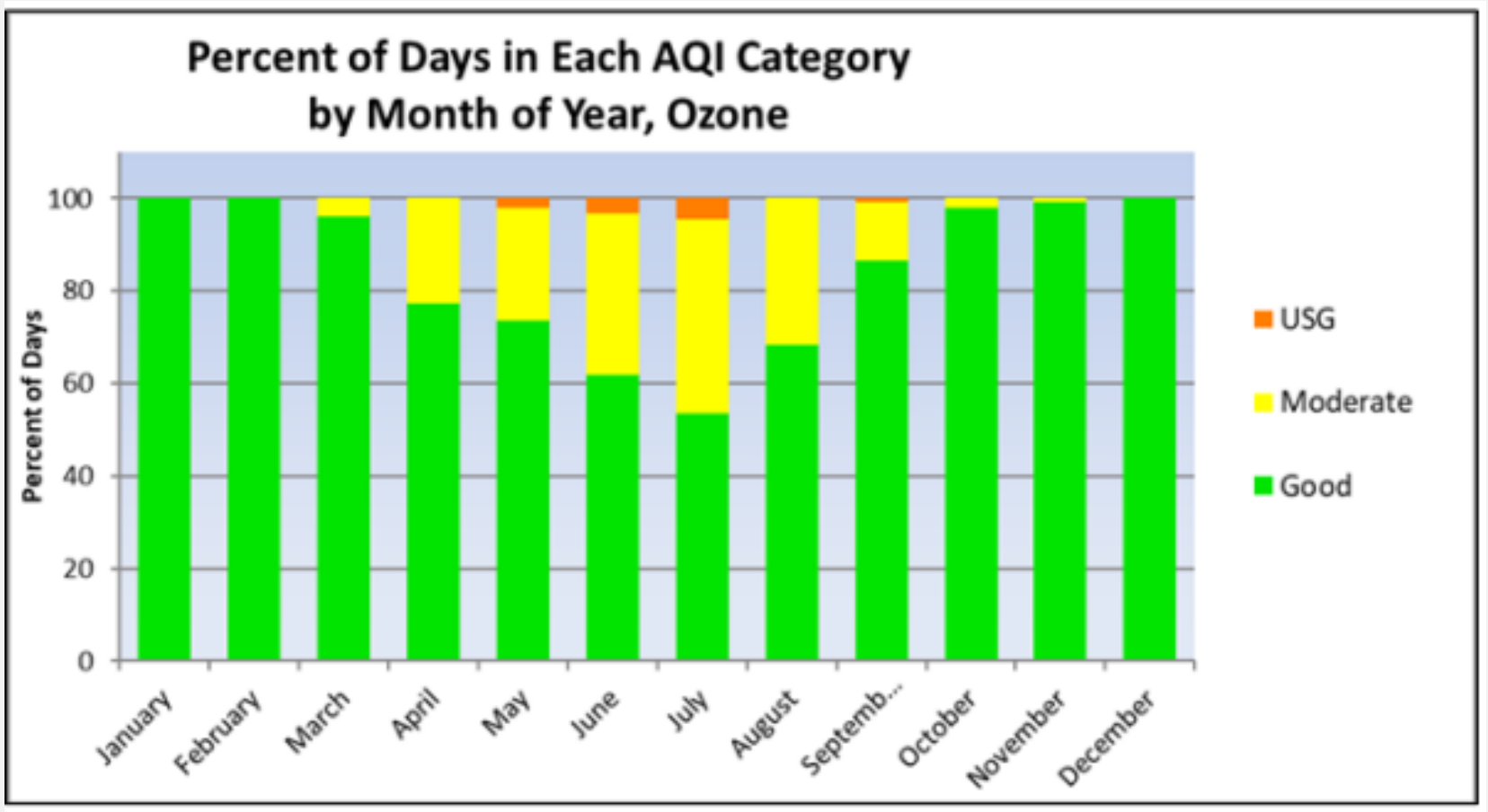


AQI Forecast Accuracy

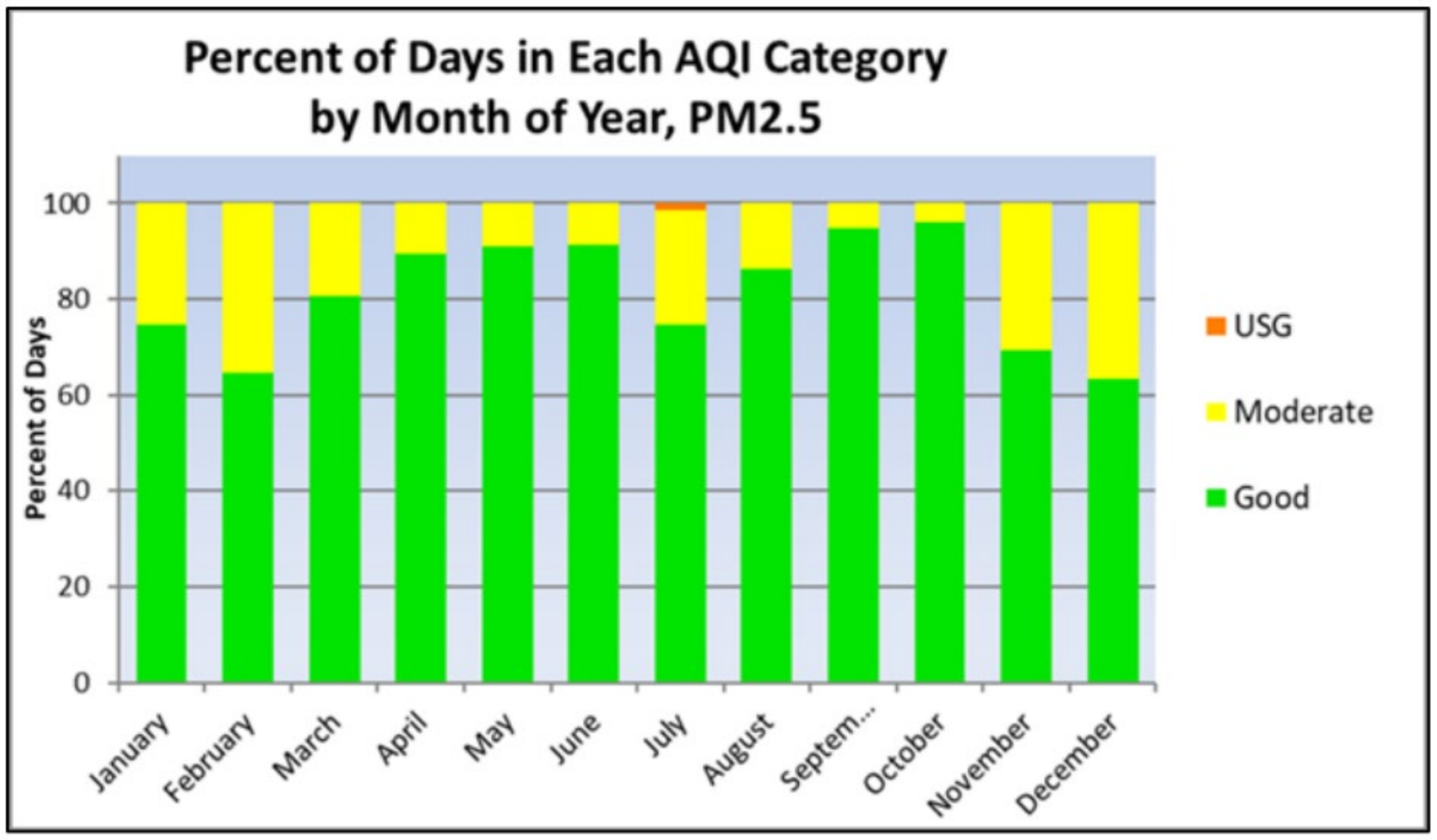


DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

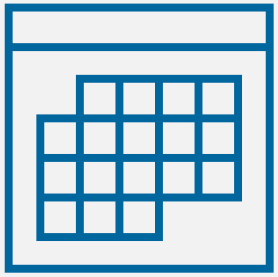
The AQI and Delaware

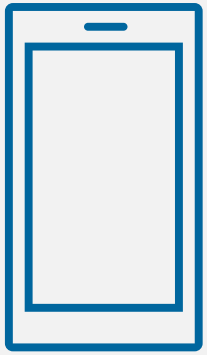


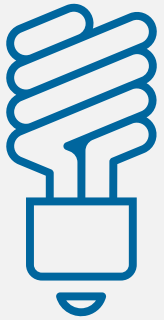
The AQI & Delaware



The AQI and You







DNREC Air Quality Notifications

Join the DNREC AQI Email Notification List

Step 1:
Scan the code

Step 2:
Send a blank email to join the email list

AirNow

AirNow App in App Store (iOS)

AirNow App in Google Play Store (Android)

Section 5: Air Quality Trends

- National
- Delaware
- Global

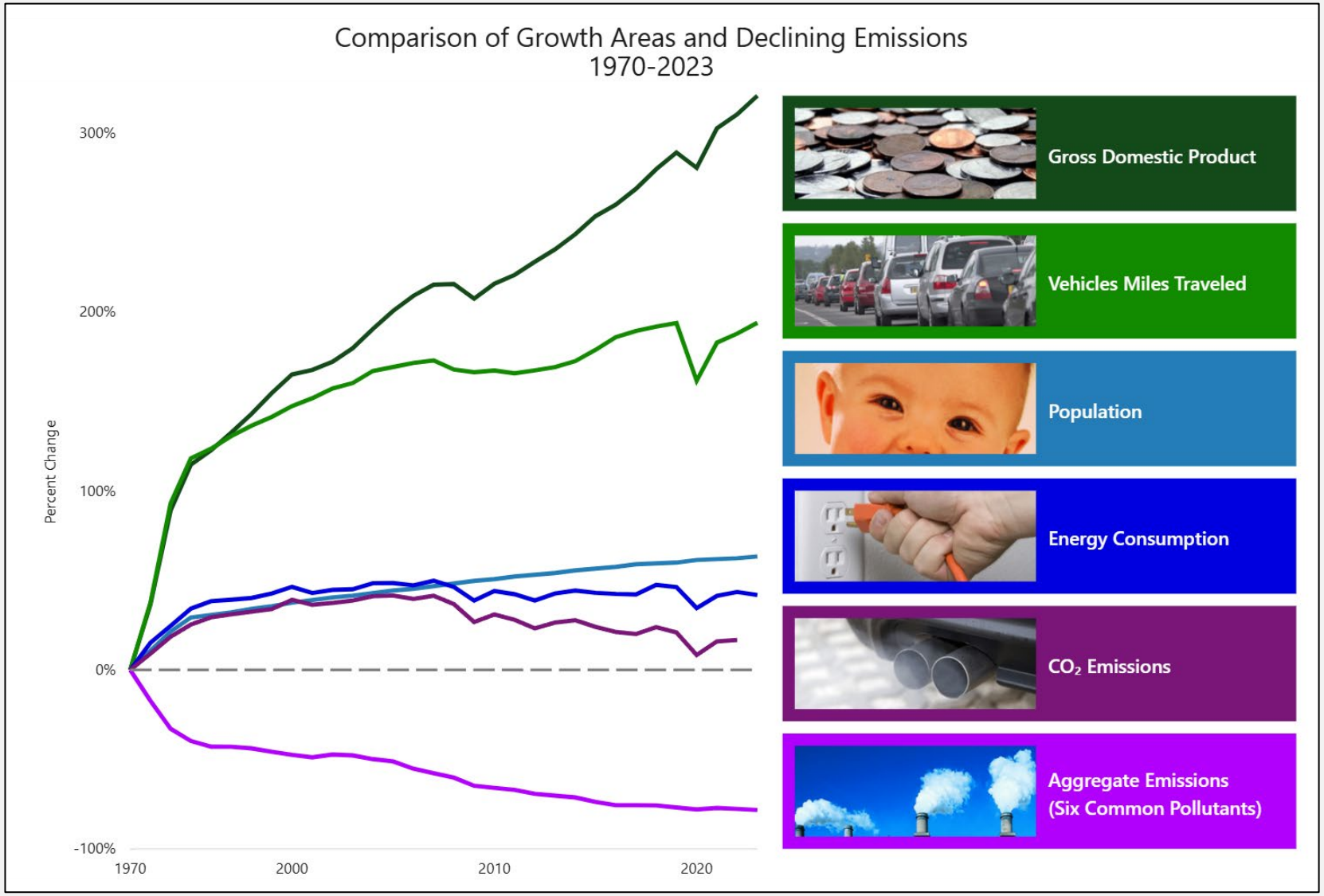
Air Quality Trends: National

- Since 1970, the US has experienced:
  - Economic Growth (↑ 321%)
  - Vehicle Miles Traveled Increase (↑ 194%)
  - Population Increase (↑ 63%)
  - Energy Consumption Increase (↑ 42%)

Air Quality Trends: National

- What effect has this national growth had on air quality?
- Total emissions from six common pollutants
  - $PM_{2.5}$ and PM_{10}
  - SO_2
  - NO_x
  - VOC
  - CO
  - Pb
- Increase or decrease?

Air Quality Trends: National



DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

Air Quality Trends: National

- Total emissions from six common pollutants decreased 78%.
- While some pollutants continue to pose serious air quality problems in areas of the U.S., nationally, trends show improvement in quality of life for many Americans.
- Air quality improves as America grows!

Air Quality Trends: Delaware

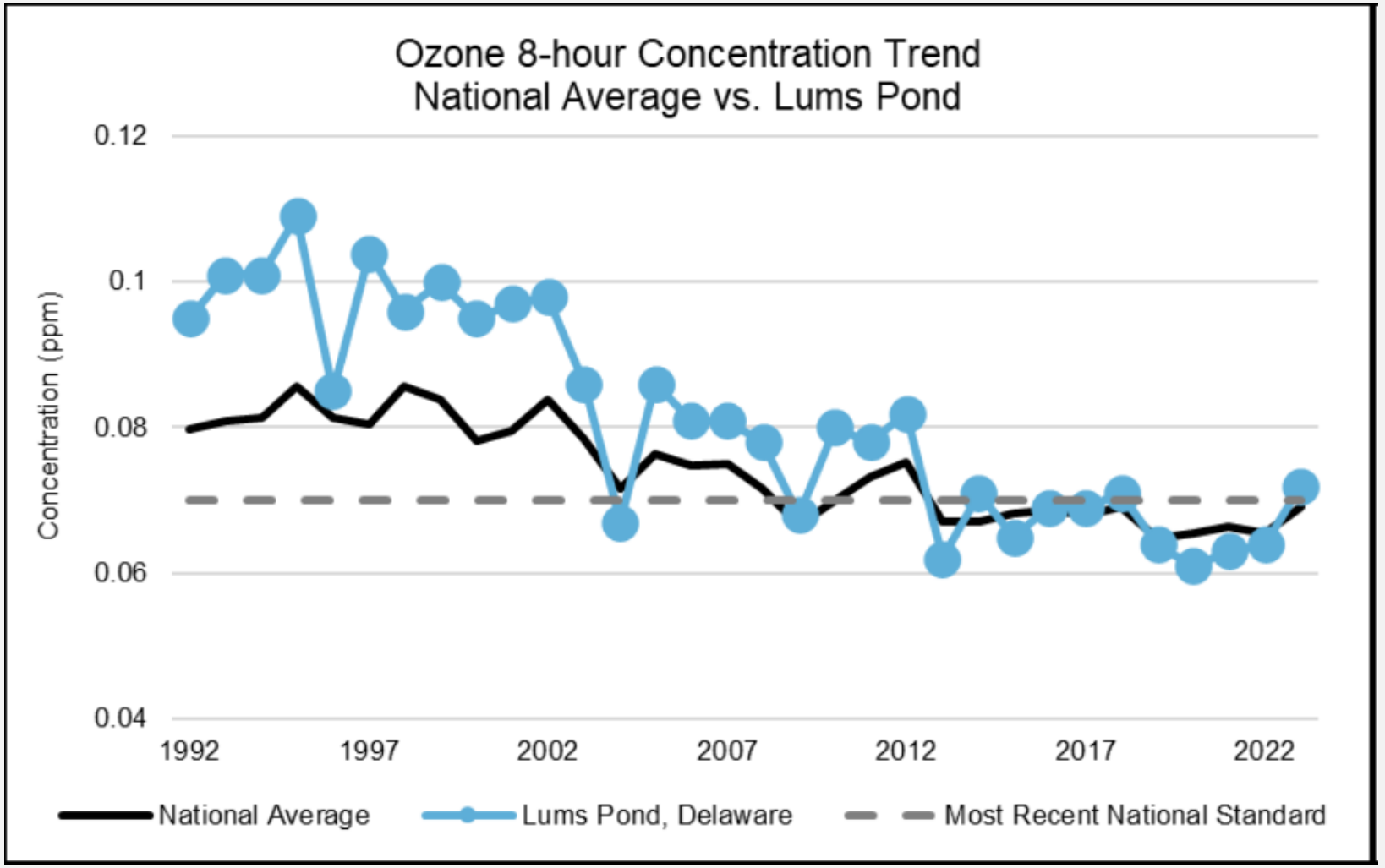
- Using air quality data to evaluate status and trends in Delaware:
  - ☐ Ambient Monitoring
  - ☐ AQI
  - ☐ Emissions Inventory
  - ☐ NAAQS Exceedance Days

Air Quality Trends:
Delaware Ambient Monitoring

- Ambient monitoring data can be used to ensure concentrations remain at levels that protect public health and the environment.

- Concentration trends show clean air progress toward attaining NAAQS.

Air Quality Trends:
Delaware Ambient Monitoring



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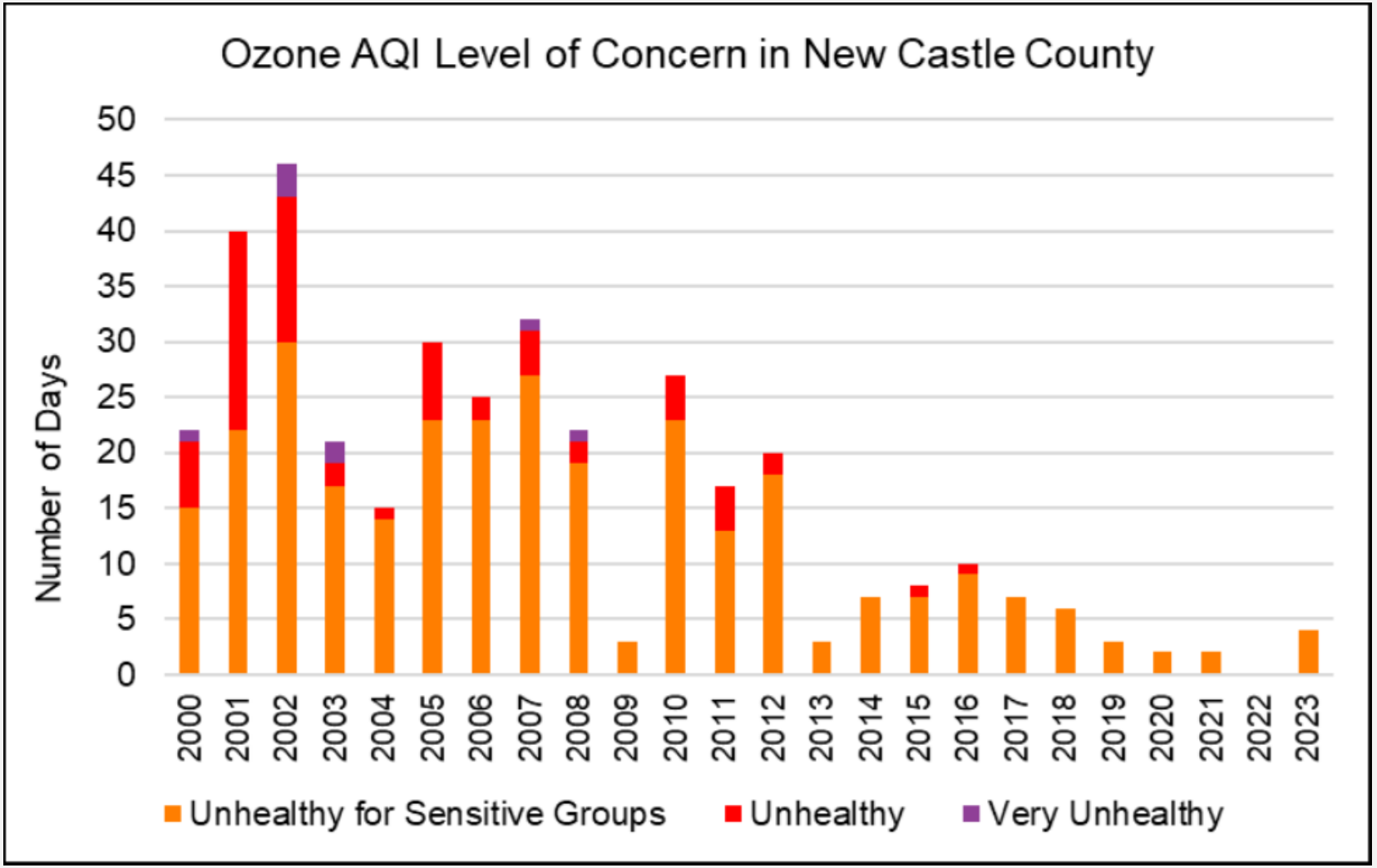
Air Quality Trends: Delaware Air Quality Index

- The daily AQI can be used to evaluate outdoor air quality and health.
- Compare number of days per year with different AQI levels of concern
  - Unhealthy for Sensitive Groups
  - Unhealthy
  - Very Unhealthy
- Ozone AQI Trends show decreasing number of these days over time.

Air Quality Trends:
Delaware Air Quality Index



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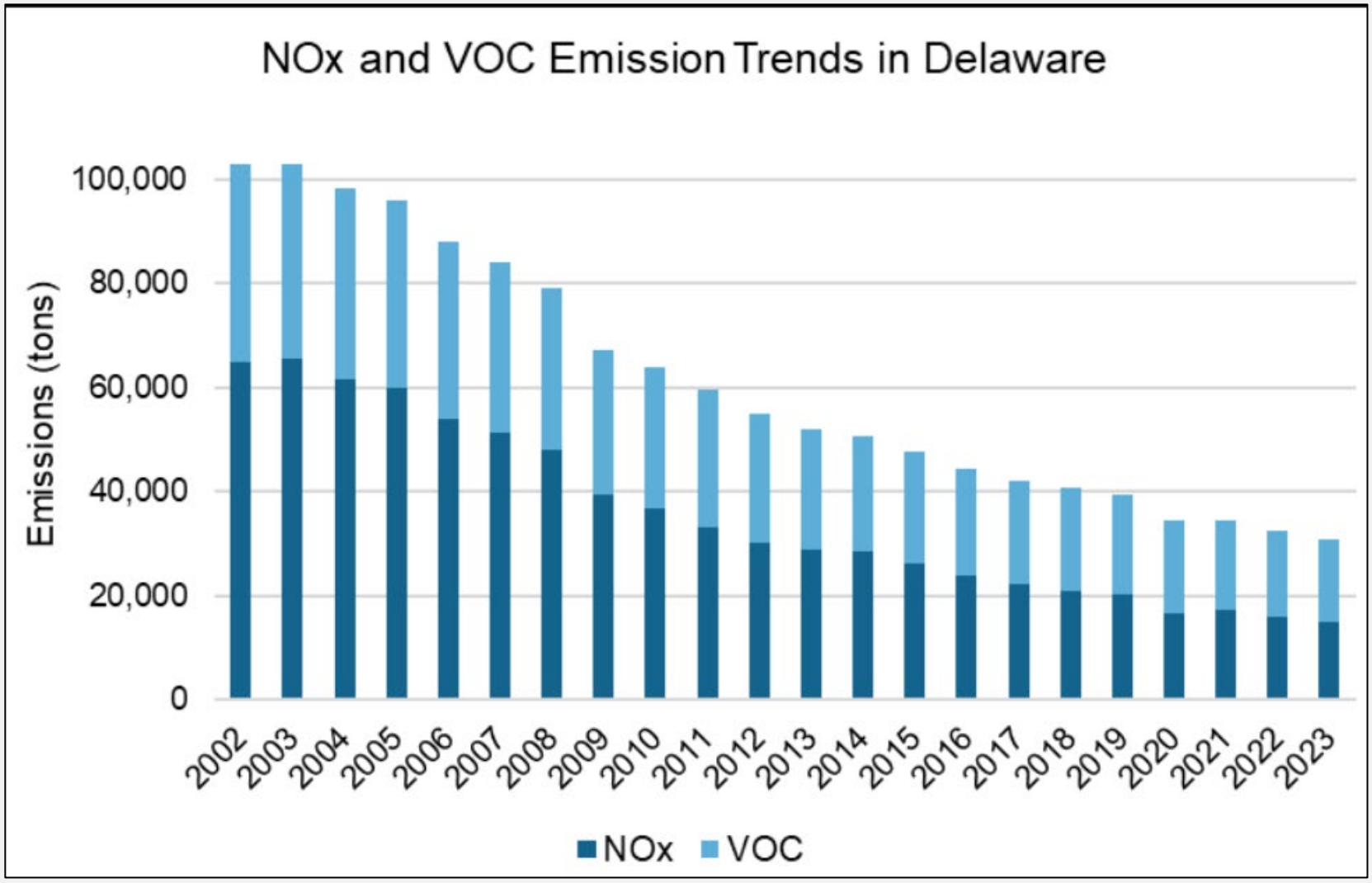
Air Quality Trends: Delaware Emissions Inventory

- NEI can be used together with ambient monitoring data to understand trends.
- Estimate of air emissions of CAPs, CAP precursors, and HAPs from air emission sources.
- EPA releases NEI every three years, based primarily on data provided by state, local, and tribal air agencies.

Air Quality Trends:
Delaware Emissions Inventory

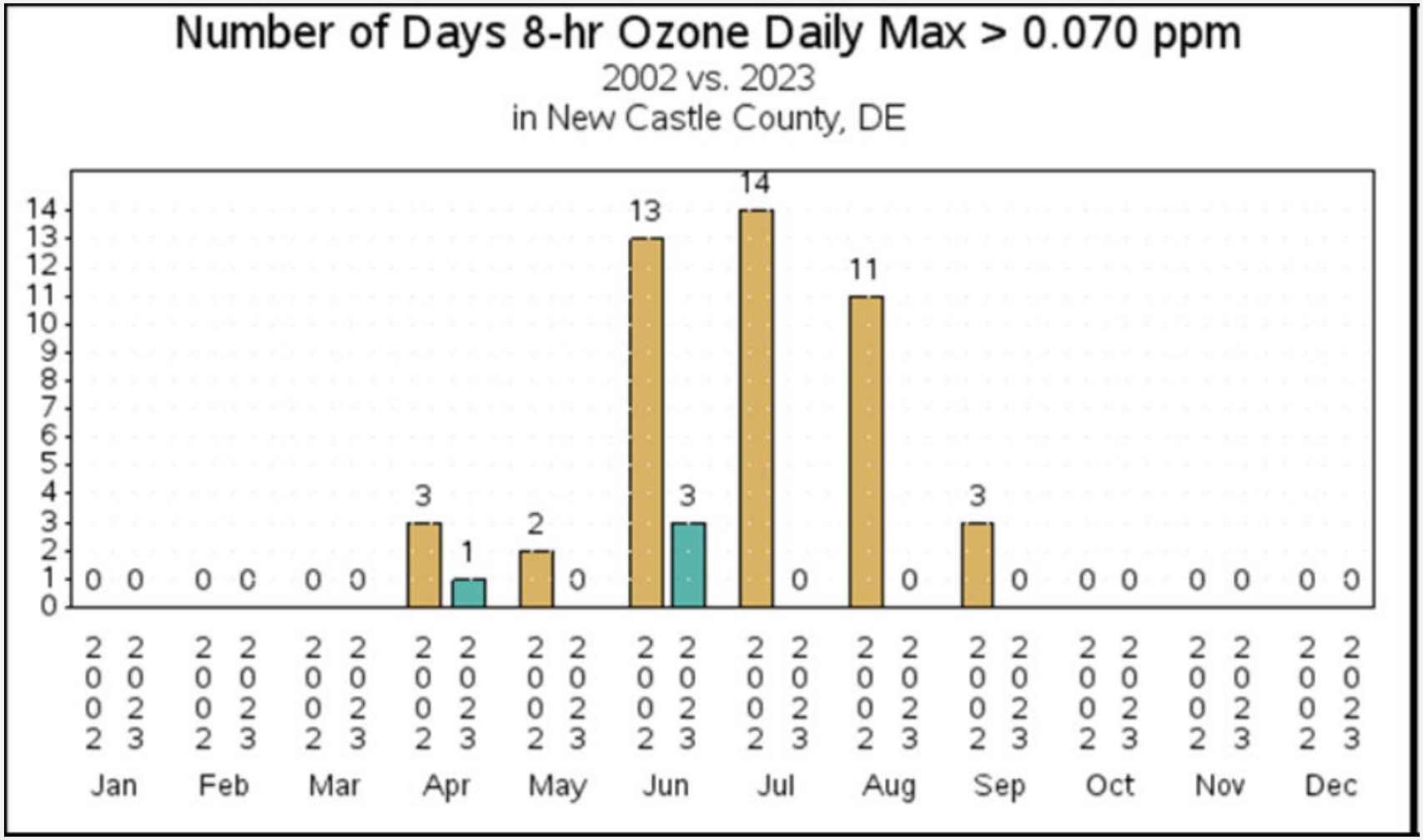


DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

Air Quality Trends: Delaware NAAQS Exceedance Days

- Over the past two decades, Delaware has significantly reduced the amount of ozone precursor emissions.
- Still occasional days where ozone NAAQS is exceeded.
- Delaware has seen a positive change in number of days/year that the ozone NAAQS was exceeded.

Air Quality Trends:
Delaware NAAQS Exceedance Days



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Air Quality Trends: Global

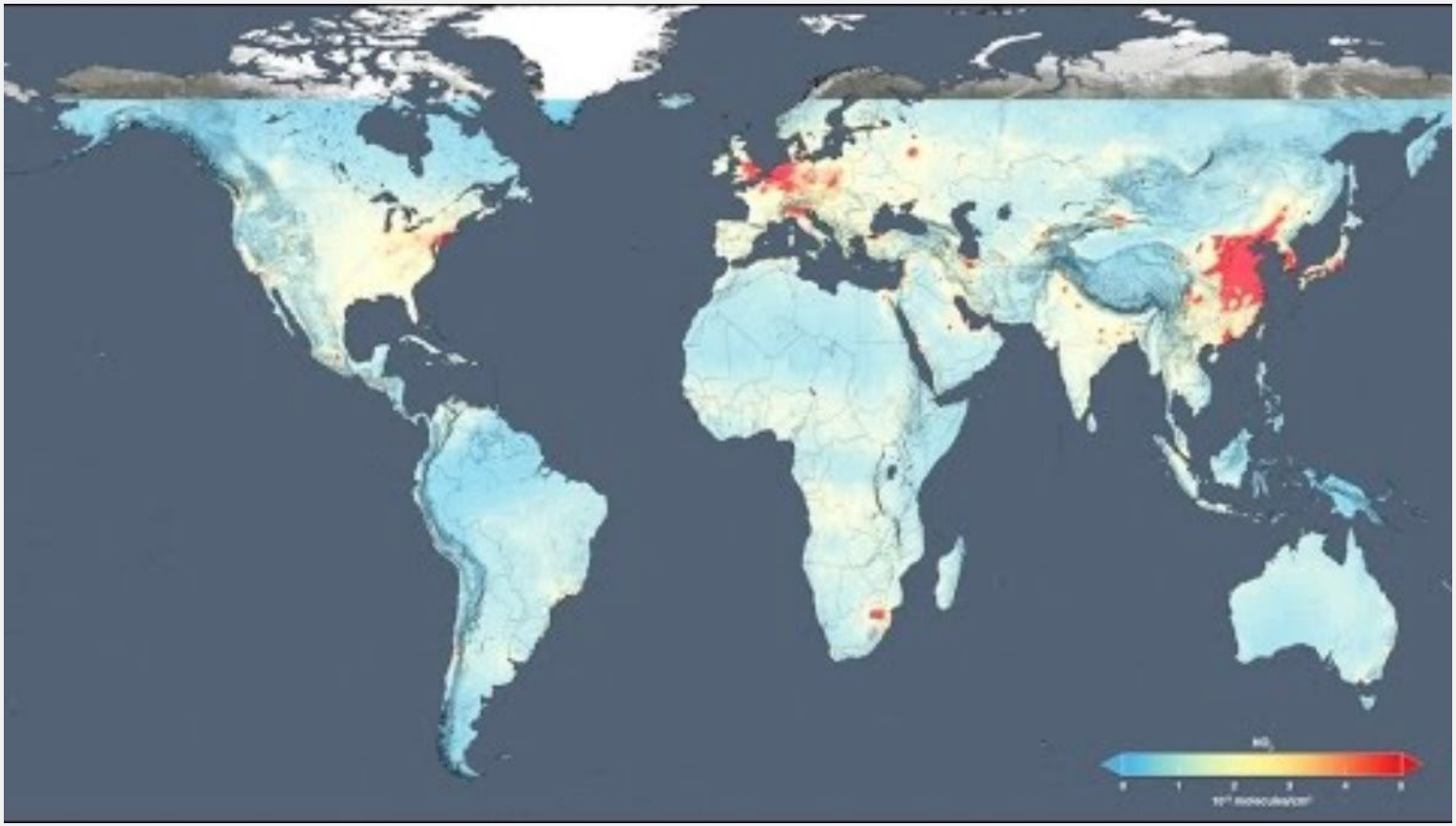
- NASA scientists track air pollution trends from space-based view.
- Offers consistent pollution information from cities or countries lacking ground-based air monitoring stations.

Air Quality Trends: Global

- NASA examines observations made by an ozone monitoring instrument aboard the Aura satellite
- One of the gases that this instrument detects is NO_2, a ground level ozone precursor
- Video shows trends from 2005 to 2014

Air Quality Trends: Global

Please visit https://www.youtube.com/watch?v=aMnDoXuTGS4 to view video.

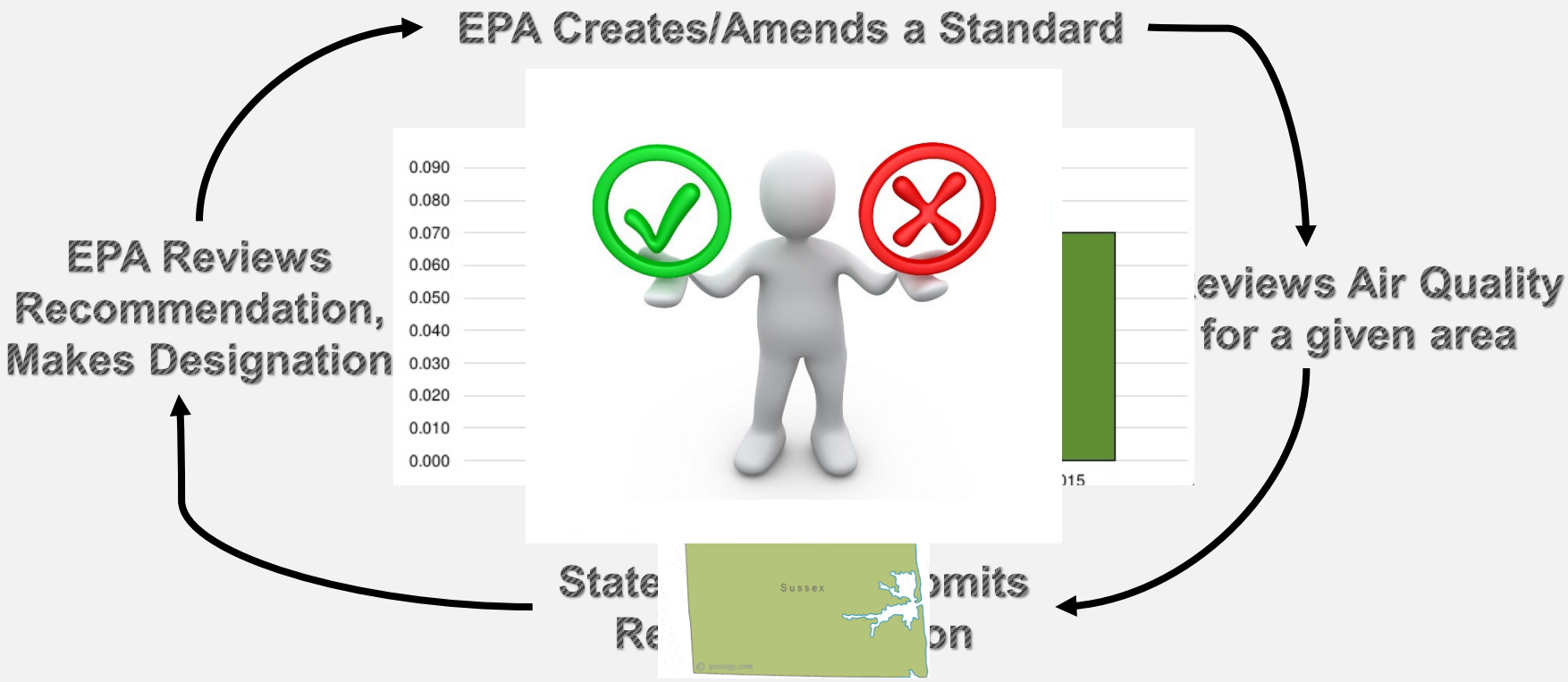


Section 6: Delaware and the NAAQS Air Quality

The NAAQS

Pollutant		Primary/Secondary	Averaging Time	Level
Carbon Monoxide (CO)		Primary	8 Hours	9 ppm
			1 Hour	35 ppm
Lead (Pb)		Primary & Secondary	Rolling 3 month average	0.15 µg/m^3
Nitrogen Dioxide (NO_2)		Primary	1 Hour	100 ppb
		Primary & Secondary	1 Year	53 ppb
Ozone (O_3)		Primary & Secondary	8 Hours	0.070 ppm
Particulate Pollution (PM)	$PM_{2.5}$	Primary	1 Year	9.0 µg/m^3
		Secondary	1 Year	15.0 µg/m^3
		Primary & Secondary	24 Hours	35 µg/m^3
	PM_{10}	Primary & Secondary	24 Hours	150 µg/m^3
Sulfur Dioxide (SO_2)		Primary	1 Hour	75 ppb
		Secondary	1 Year	10 ppb

The Standard Cycle



DELAWARE DEPARTMENT OF
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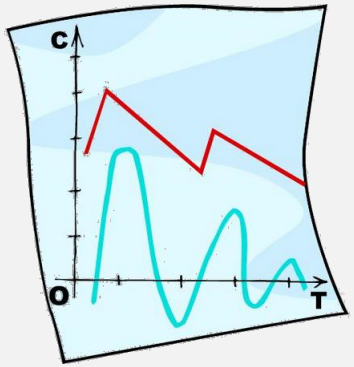
ENVIRONMENTAL CONTROL

The Good, The Bad, & The Unclassifiable

Attainment

- Classified as "Attainment/Unclassifiable"
  - Either meets standard or
  - There is insufficient evidence to find they are attaining, but are not contributing to a nearby violation of the standard



Nonattainment

- Does not meet the standard
- Classified into subcategories

Unclassifiable

- Insufficient evidence to:
  - Determine whether area meets standard; and
  - EPA has not determined whether it contributes to a nearby violation.

How Bad Is It?

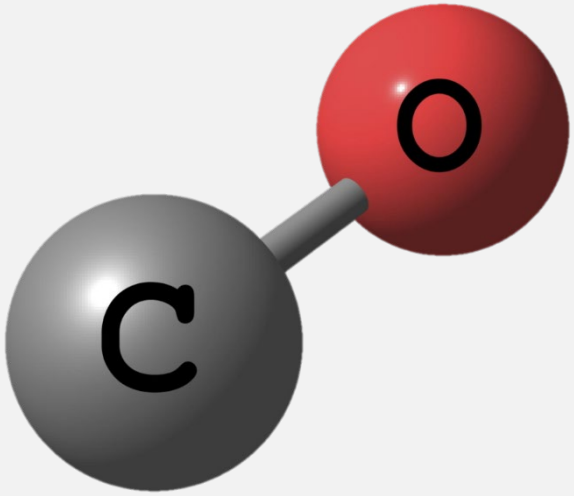
Ozone Nonattainment Classifications	
Class	**Range (ppm)**
Marginal	0.071-0.080
Moderate	0·081-0·092
Serious	**0.093-0.104**
Severe	0.105-0.162
Extreme	**+0.163**

Moving Forward

- State Implementation Plans (SIPs)
  - Collection of regulations and documents used to reduce air pollution in areas that do not meet the NAAQS
  - Provide a plan for implementation, maintenance, and enforcement of the NAAQs


ATTAINMENT
OR
NONATTAINMENT

How Does Our Air Compare?

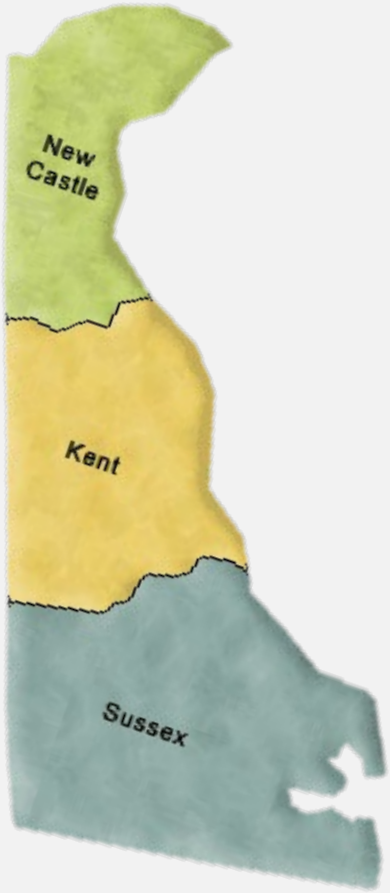


Primary 8-Hour Standard: 9 ppm

Attainment

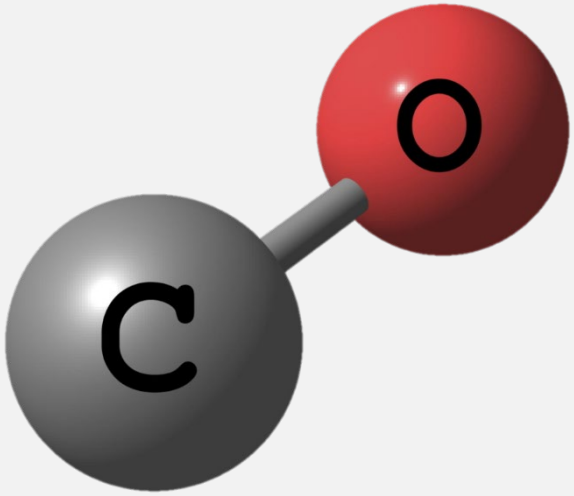
Attainment

Attainment



DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

How Does Our Air Compare?

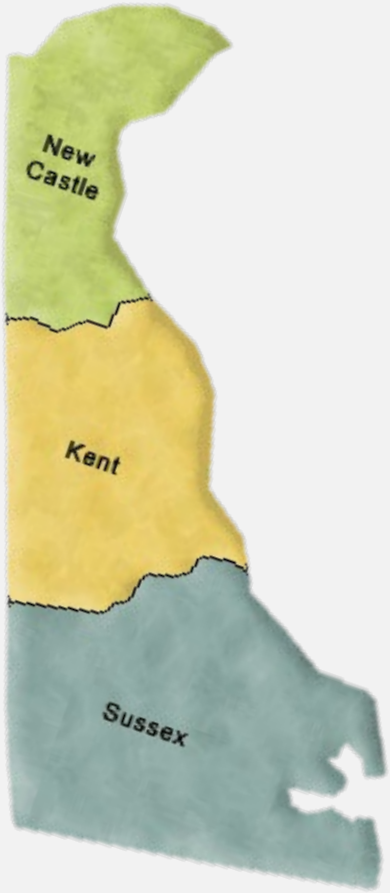


Primary 1-Hour Standard: 35 ppm

Attainment

Attainment

Attainment



DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

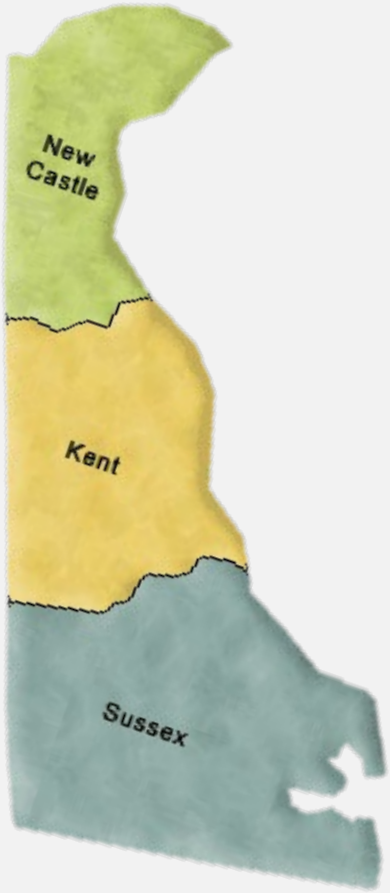
How Does Our Air Compare?

Primary & Secondary Rolling 3-Month Average Standard: 0.15 µg/m³

Attainment

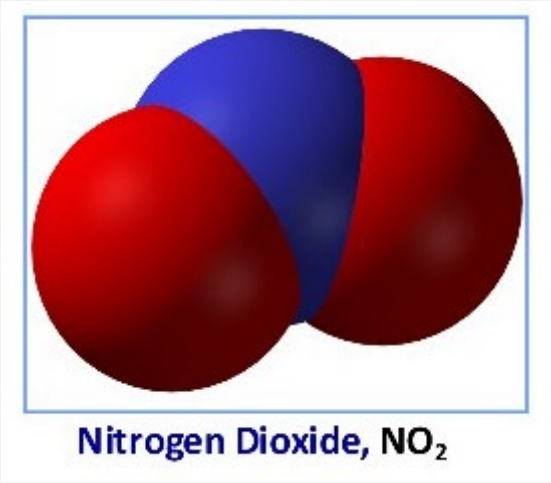
Attainment

Attainment



DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

How Does Our Air Compare?

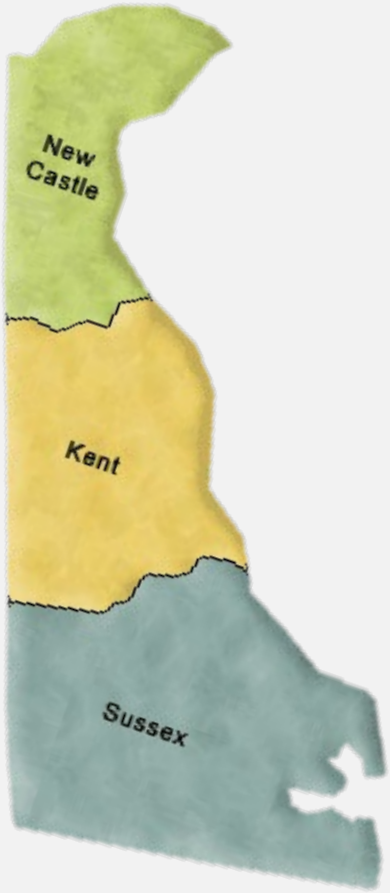


Primary 1-Hour Standard: 100 ppb

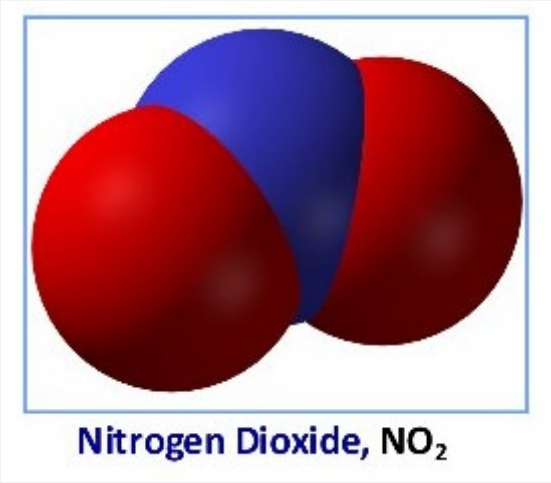
Attainment

Attainment

Attainment



How Does Our Air Compare?

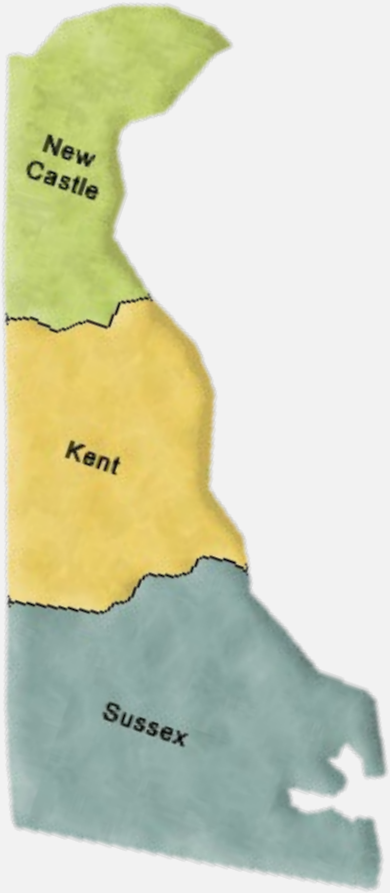


Primary & Secondary 1-Year Standard: 53 ppb

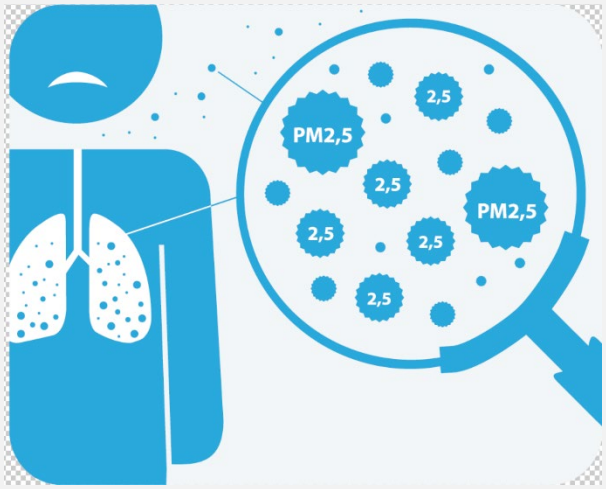
Attainment

Attainment

Attainment



How Does Our Air Compare?

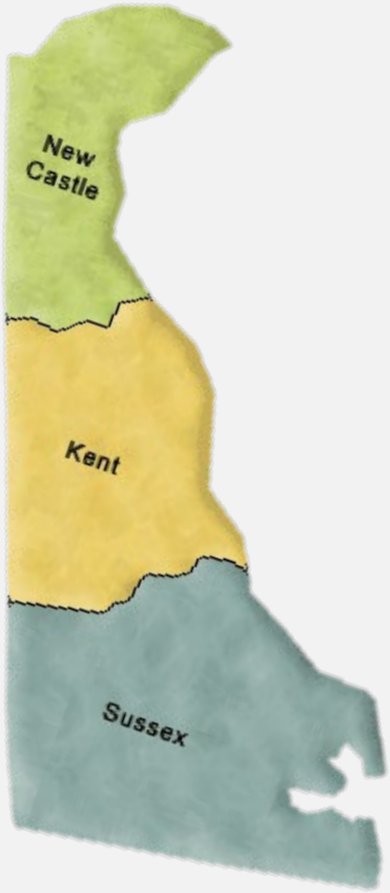


Primary 1-Year Standard: 9.0 µg/m^3

Attainment

Attainment

Attainment



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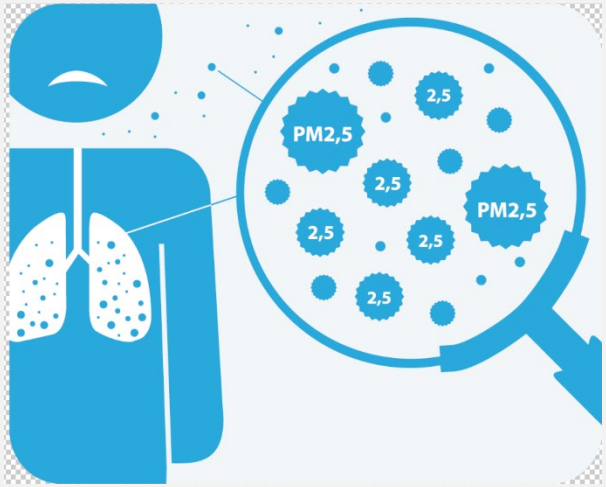
How Does Our Air Compare?

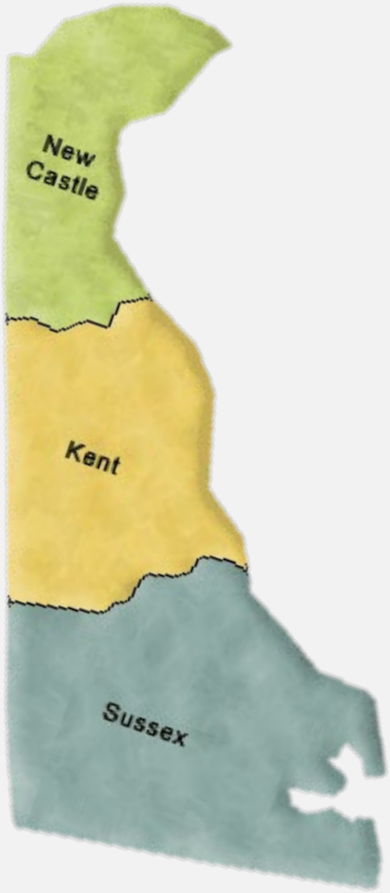


Secondary 1-Year Standard: 15.0 µg/m³

Attainment

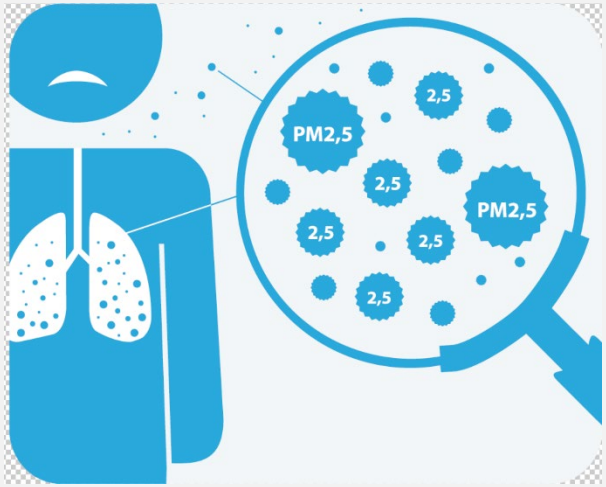
Attainment

Attainment



DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

How Does Our Air Compare?

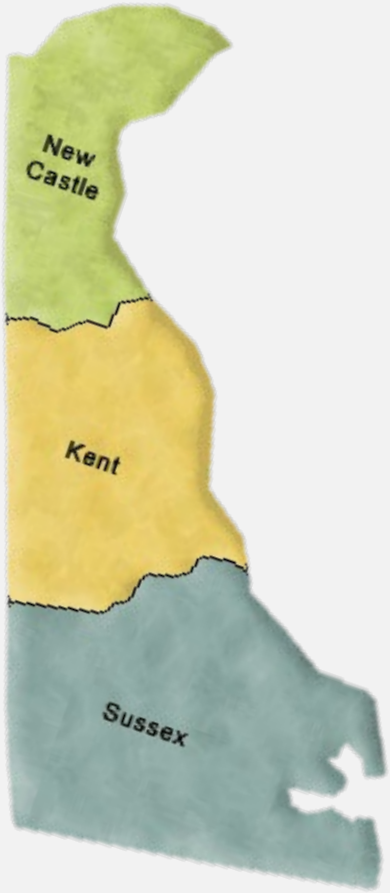


Primary & Secondary 24-Hour Standard: 35 µg/m³

Attainment

Attainment

Attainment



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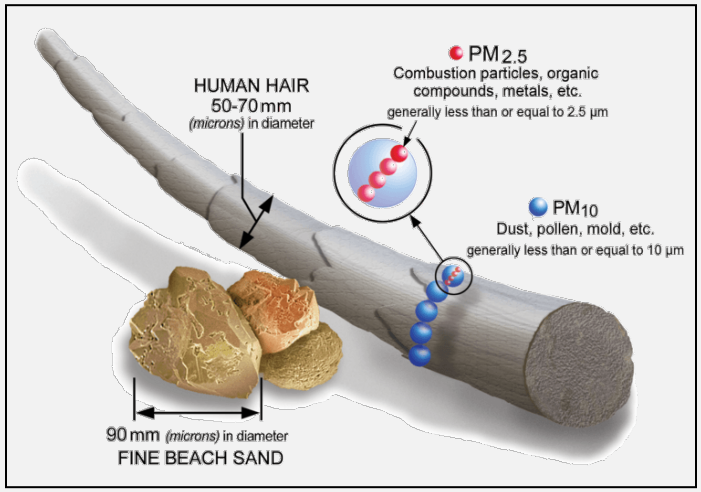
How Does Our Air Compare?

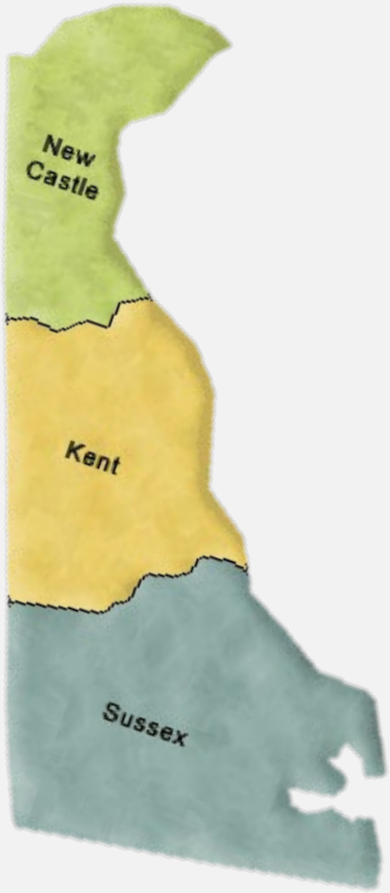


Primary & Secondary 24-Hour Standard: 150 µg/m³

Attainment

Attainment

Attainment



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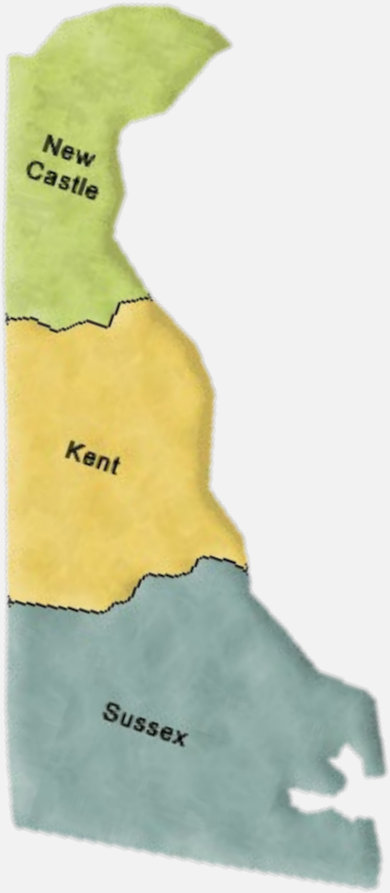
How Does Our Air Compare?

Primary 1-Hour Standard: 75 ppb

Attainment

Attainment

Attainment



DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

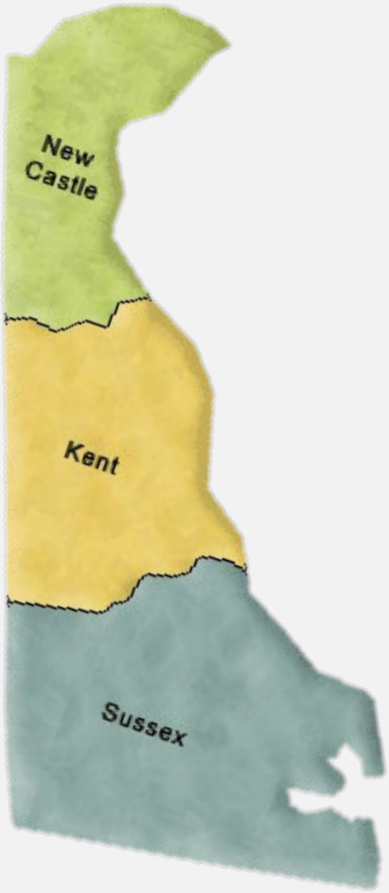
How Does Our Air Compare?

Secondary 3-Hour Standard: 0.5 ppm

Attainment

Attainment

Attainment



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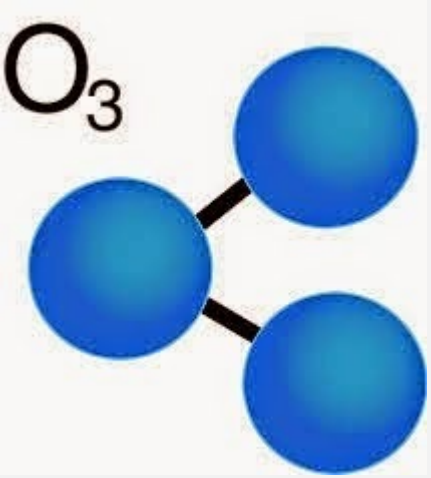
How Does Our Air Compare?

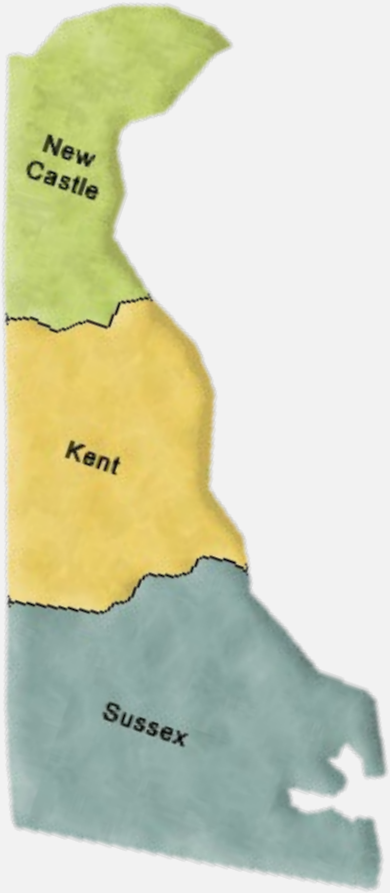


Primary & Secondary 8-Hour Standard: 0.070 ppm

Nonattainment

Attainment

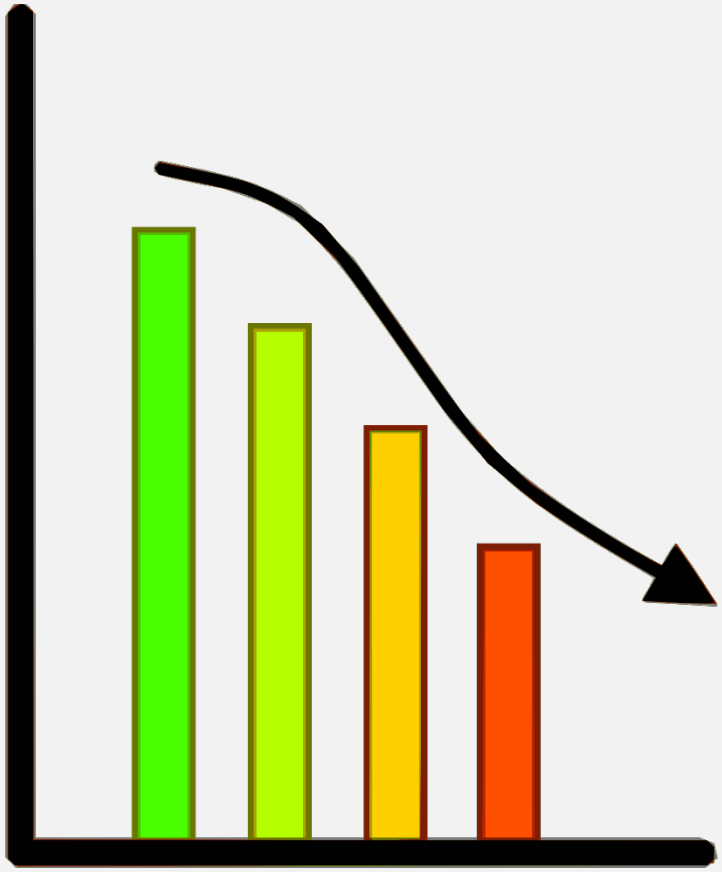
Attainment



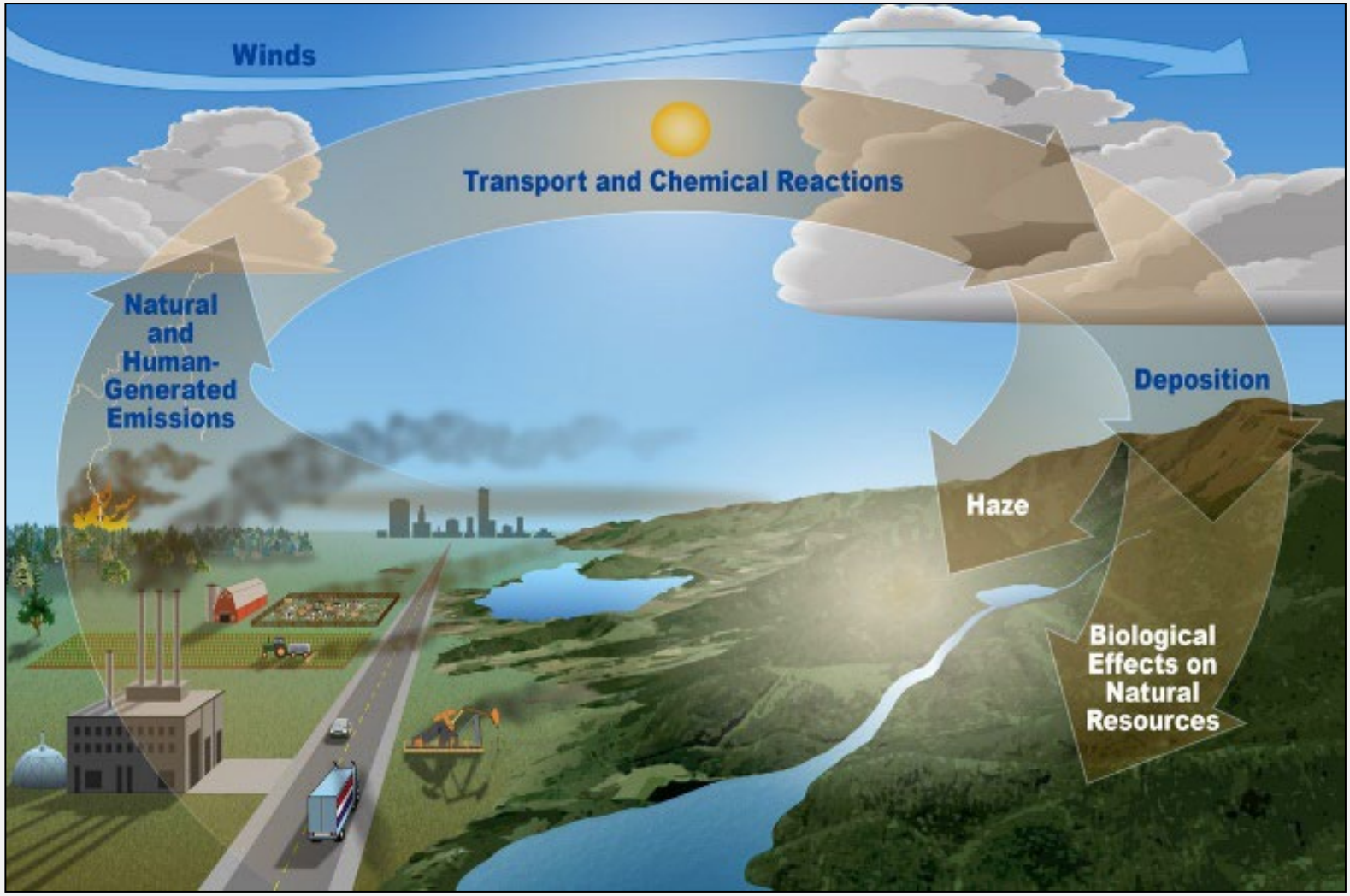
DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

A History of Ozone

- 1979 1-Hour Standard (0.12 ppm)
  - All 3 Counties
    Nonattainment
    - New Castle and Kent - Severe
    - Sussex - Marginal
- 1997 8-Hour Standard (0.08 ppm)
  - All 3 Counties
    Moderate Nonattainment
- 2008 8-Hour Standard (0.075 ppm)
  - New Castle and Sussex Counties
    Marginal Nonattainment
- 2015 8-Hour Standard (0.070 ppm)
  - New Castle County
    Serious Nonattainment



Long Range Transport



Ozone Origins

Monitoring Station	Percent (%) Contribution by State							
	DE	IN	KY	MD	OH	PA	VA	WV
Killens	2.3	2.7	3.2	14.7	4.6	7.3	5.5	3.7
Lums	1.8	2.9	2.7	17.3	4.1	9.7	5.2	3.8
Brandywine	3.6	1.8	1.8	11.5	4.2	16.7	4.2	3.6
Bellefonte	6.2	1.8	1.8	13.0	4.2	13.1	5.0	3.6
Seaford	1.5	3.2	4.3	18.1	4.5	5.2	7.4	5.3
Lewes	7.4	2.2	2.5	10.3	4.1	8.2	5.0	3.5

Recent News

Section 7: Relating Air Quality to the 2025 Current Issue

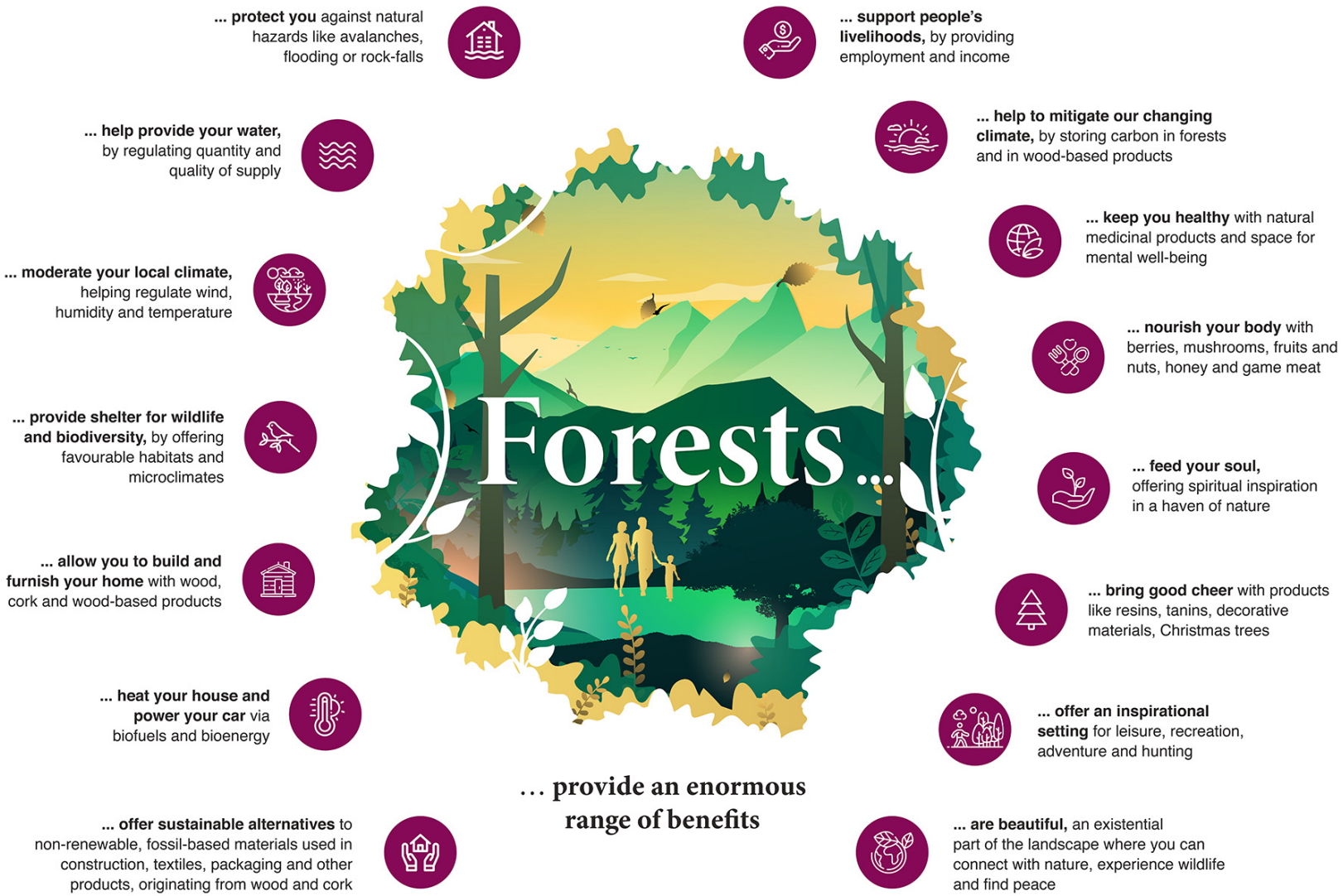
Roots and Resiliency – Fostering Forest Stewardship in a Canopy of Change

Our Forests

Please visit https://youtu.be/b4eLTYUcj7k to view video. *View from 0:50 – 1:10*

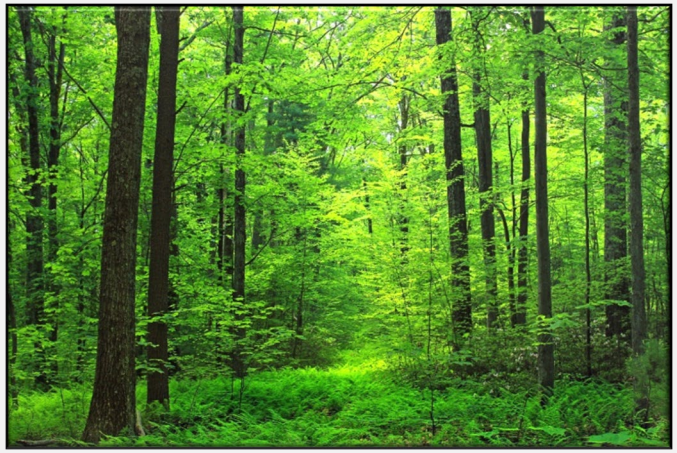
DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

Forests Benefits



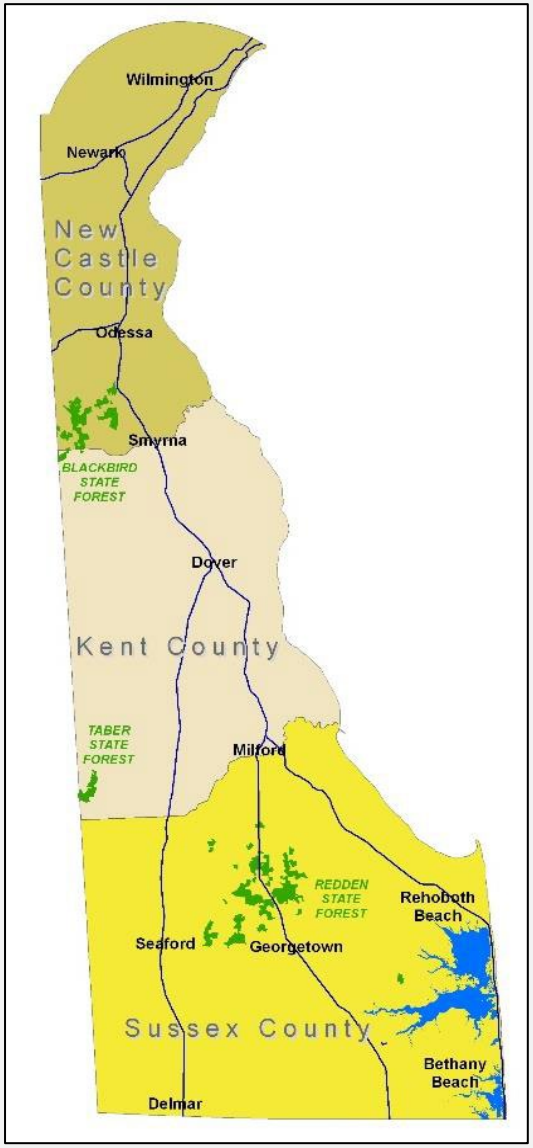
Roles of Forests on Climate Change

- Afforestation and deforestation can reduce human impact of climate changes
  - Reduce force of storms
  - Reduce runoff
- Forest regeneration can potentially capture 70 billion tons of carbon in plants and soils by 2050.



Delaware Forests

- As a low-lying state Delaware is vulnerable to the effects of climate change including rising sea levels, heavy precipitation, and flooding.
- Delaware has an estimated 353,435 acres of forested land.



DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

The Importance of Forests

Please visit https://youtu.be/HJ9yzkwX5N8 to view video. *View from 1:45 – 3:00*

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Role of Trees on Air Quality

- T: Temperature Reduction
- R: Remove Air Pollutants
- E: Emissions of VOCs
- E: Energy Effects on Buildings

Trees Benefit Air Quality

Please visit https://youtu.be/DoUdRNhW-F8 to view video.

Tree for Every Delawarean Initiative (TEDI)

Goal: Plant one million trees by 2030.


Any Questions?

Wrap up

- Training guide is posted on website
- Training PowerPoint will be posted soon
- Thank you
- Good luck in the competition ☺