

# CLEARING THE AIR

## Air Quality Trends in DC

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Clearing the Air Workshop #3: July 13, 2021



GOVERNMENT OF THE  
DISTRICT OF COLUMBIA  
MURIEL BOWSER, MAYOR

TAG THIS PRESENTATION @DOEE\_DC

# Outline

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- What is Air Quality? Why is it important to monitor?
- What are Criteria Pollutants?
- What is the Air Quality Index? Trends in DC.
- Criteria Pollutant Trends in the District.
- Daily and Seasonal Variations.
- Where to acquire data.

# What is air quality? Why is it important?

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- Defined as a measure of how clean or polluted the air we breathe is.

## Why monitoring is important:

- Protect public health.
- Assess ecosystems impact.
- Identify sources of pollution.
- Develop pollution control strategies
- Evaluate and develop models.

# What are the Criteria Pollutants?

- EPA established National Ambient Air Quality Standards for these **SIX** criteria air pollutants:

Carbon Monoxide (CO)

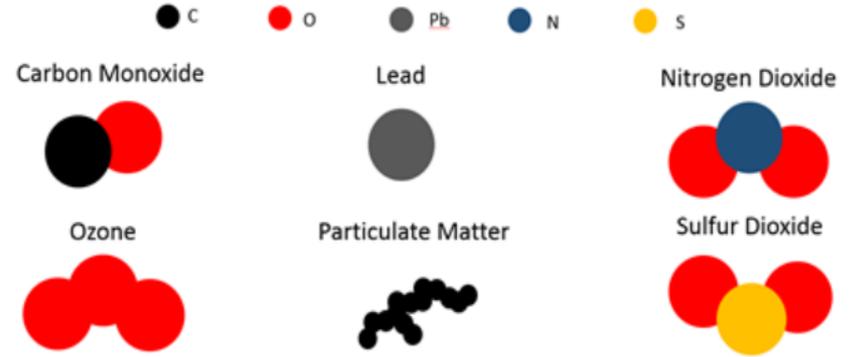
Sulfur Dioxide (SO<sub>2</sub>)

Ground-level Ozone (O<sub>3</sub>)

Lead (Pb)

Nitrogen Dioxide (NO<sub>2</sub>)

Particulate Matter (PM<sub>10</sub> & PM<sub>2.5</sub>)



\*<https://www.csusb.edu/ehs/occupational-health-and-safety/indoor-air-quality>

# National Ambient Air Quality Standards (NAAQS)

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Pollutant	NAAQS
Ozone	70 ppb
PM2.5 PM10	35 $\mu\text{g}/\text{m}^3$ & 12 $\mu\text{g}/\text{m}^3$ 150 $\mu\text{g}/\text{m}^3$
Carbon Monoxide	35 ppm & 9 ppm
Nitrogen Dioxide	100 ppb & 53 ppb
Sulfur Dioxide	75 ppb
Lead	0.15 $\mu\text{g}/\text{m}^3$

Source: <https://www.epa.gov/criteria-air-pollutants/naaqs-table>

# What is the Air Quality Index (AQI)?

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- Simple color-coded index developed by EPA for public outreach and reporting
- Based on near real-time ambient air quality data.
- Ranges from 0-500 (no units)
- Calculated by using measurements of pollutants of interest. Reports the highest/most dominant value.
- DC AQI focuses on O<sub>3</sub> and PM<sub>2.5</sub> (more problematic)

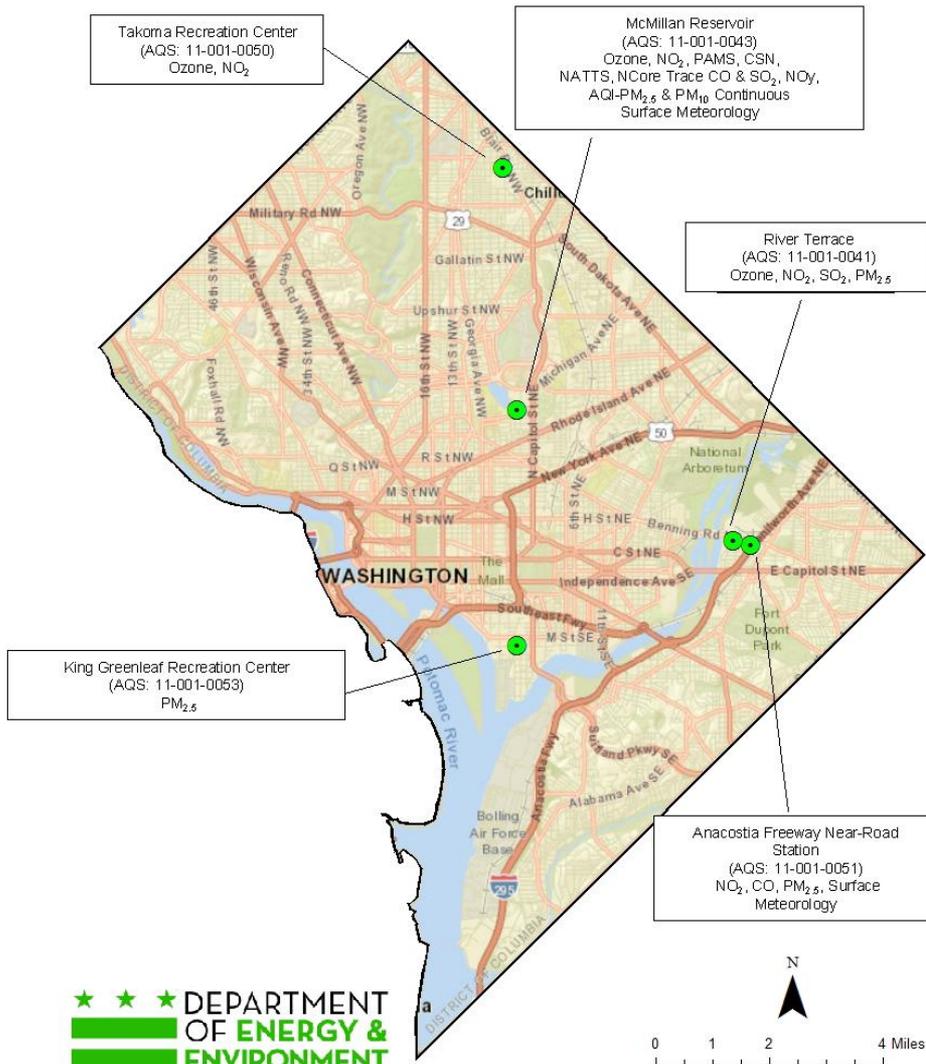
# AQI Categories

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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.

**AQI below 50 is good!**

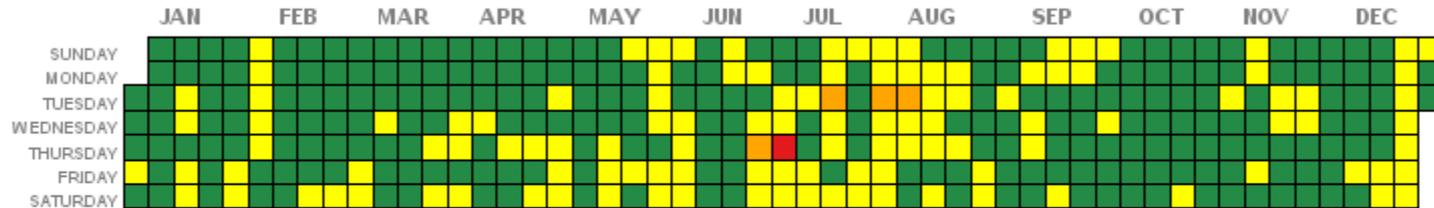
# Where are District's Monitoring Stations?



Site Name	Street Address	Location Setting
McMillan Reservoir	2500 First St NW	Urban
River Terrace Education Center	405 Anacostia Ave NE	Urban / EJ community
Takoma Rec Center	301 Van Buren St NW	Urban
I-295 Near-Road Station	Benning Rd NE at I-295 On-ramp	Urban / EJ community
King Greenleaf Rec Center	201 N St SW	Urban / EJ community

# AQI in the District

## Daily AQI Values in 2019 District of Columbia County, DC

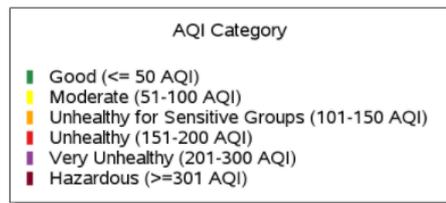
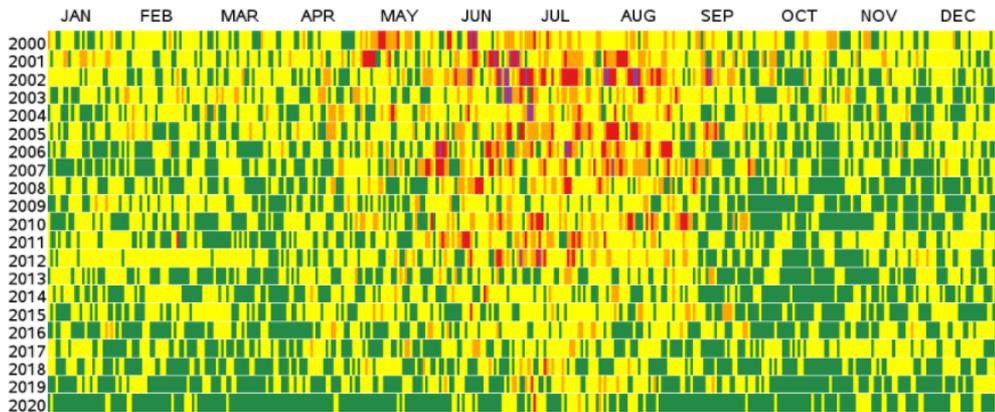


Source: U.S. EPA AirData <<https://www.epa.gov/air-data>>  
Generated: May 13, 2021

# AQI Trends in the District

- AQI has greatly improved over the last 2 decades in the DC area!

Daily AQI Values, 2000 to 2020  
Washington-Arlington-Alexandria, DC-VA-MD-WV



Source: U.S. EPA AirData <<https://www.epa.gov/air-data>>  
Generated: June 24, 2021

Ozone Air Quality Index Days (March - September)			
Year	Code Green	Code Yellow	Code Orange
2020	180	32	2
2019	123	81	10

Note: Draft data valid as of December 10, 2020.

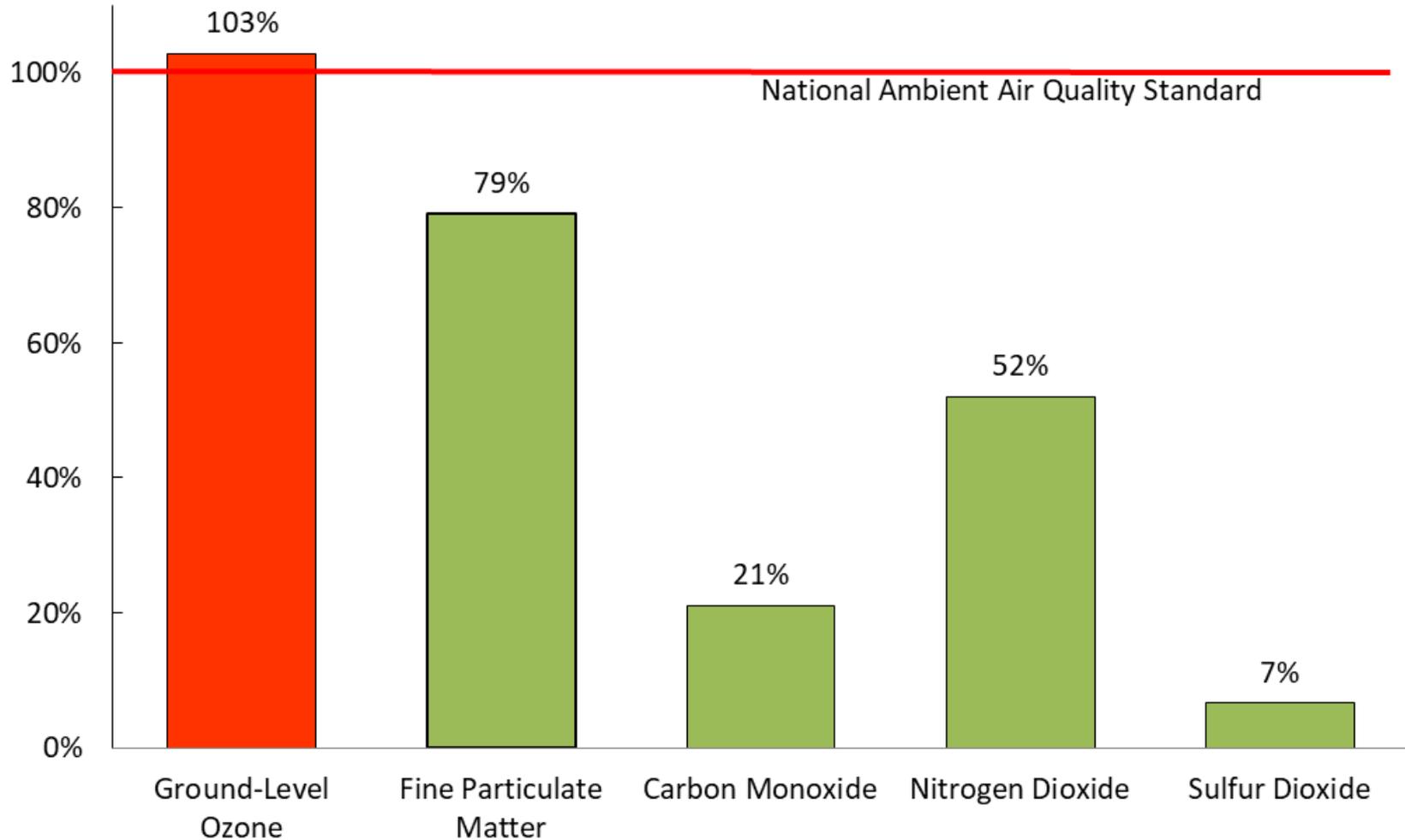
Fewer Code Orange days in 2020 compared to 2019.  
Ozone and PM<sub>2.5</sub> were lower in 2020 compared to 2019.

AQI can be found at

- AirData: [www.epa.gov/air-data](https://www.epa.gov/air-data)
- AirNow: [www.airnow.gov](https://www.airnow.gov)
- Can be found on your weather app as well.

# Trends of Criteria Pollutants in the District

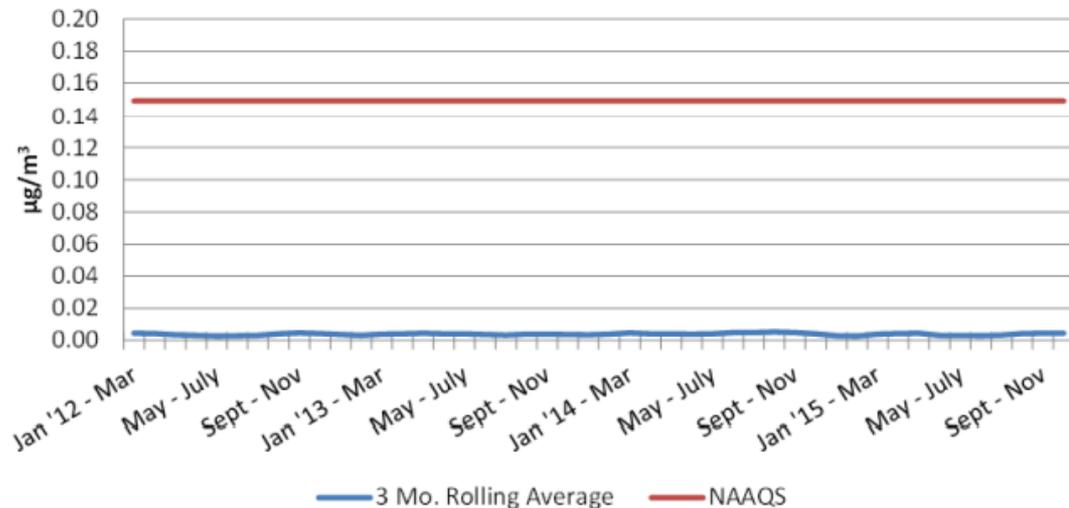
# Overall, District's Air Quality Status is...



# Lead (Pb)

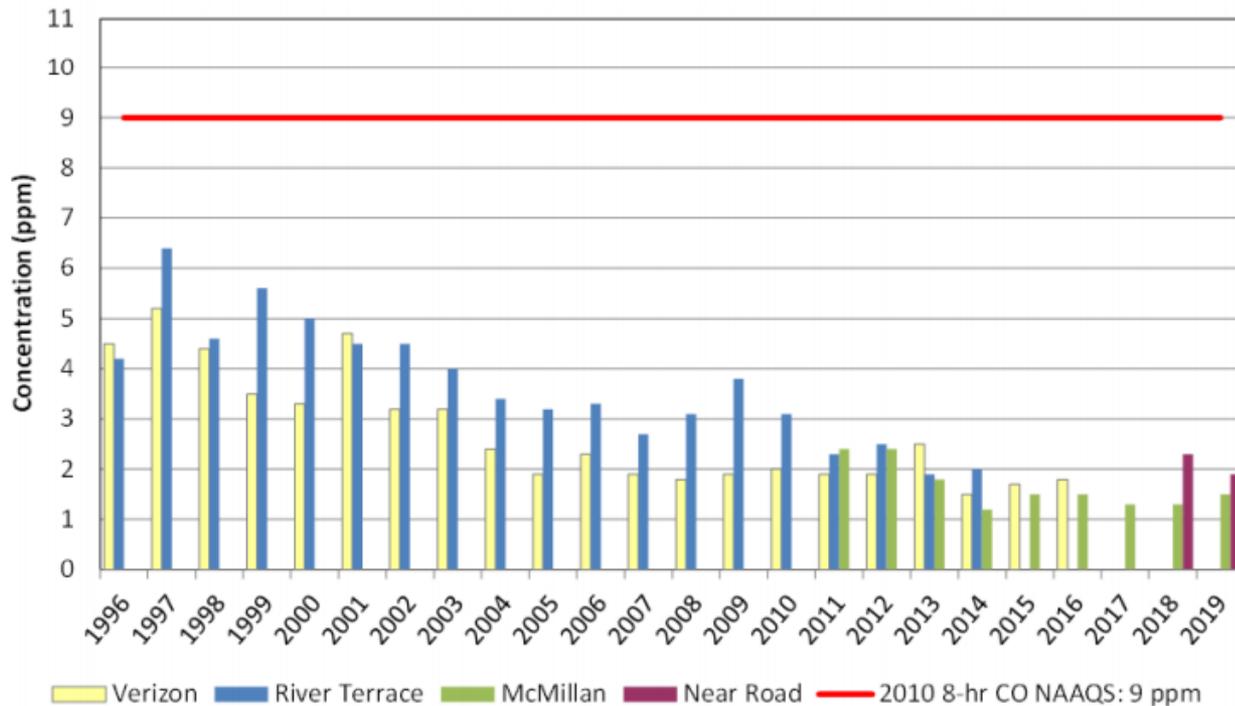
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- Ambient lead measurements began at the McMillan monitoring site in January 2012
- Due to consistently low concentrations during years 2012-2015, DOE-E discontinued lead measurements.



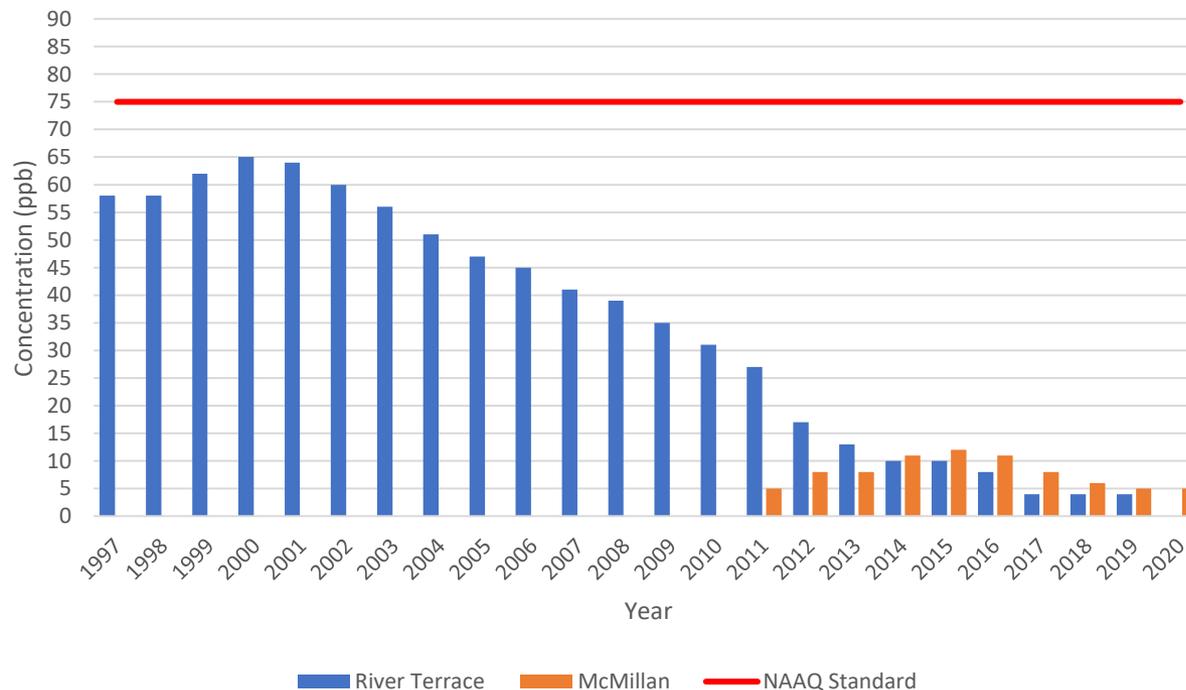
# Carbon Monoxide (CO)

- The District's CO measurements were well below the NAAQS Standard since 1996.



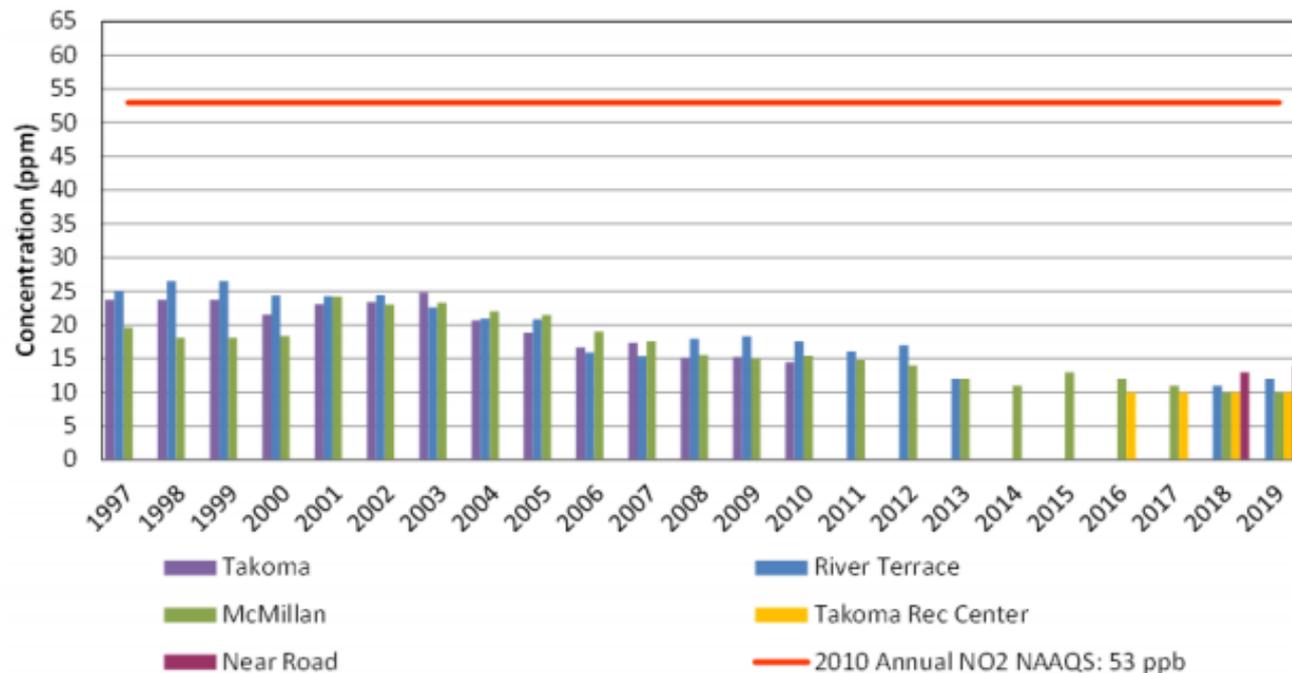
# Sulfur Dioxide(SO<sub>2</sub>)

- District's SO<sub>2</sub> levels have consistently remained below the NAAQS and have dropped since the highest readings in 2000.



# Nitrogen Dioxide(NO<sub>2</sub>)

- Over the past fifteen years, the maximum annual average NO<sub>2</sub> levels have remained at approximately half of the federal standard at all monitoring stations. They continue to remain well below the NAAQS.



# Nitrogen Dioxide(NO<sub>2</sub>)

- Satellite Image (TROPOMI) comparing 2020 average NO<sub>2</sub> to a combination of 2018 & 2019 for months June-August.

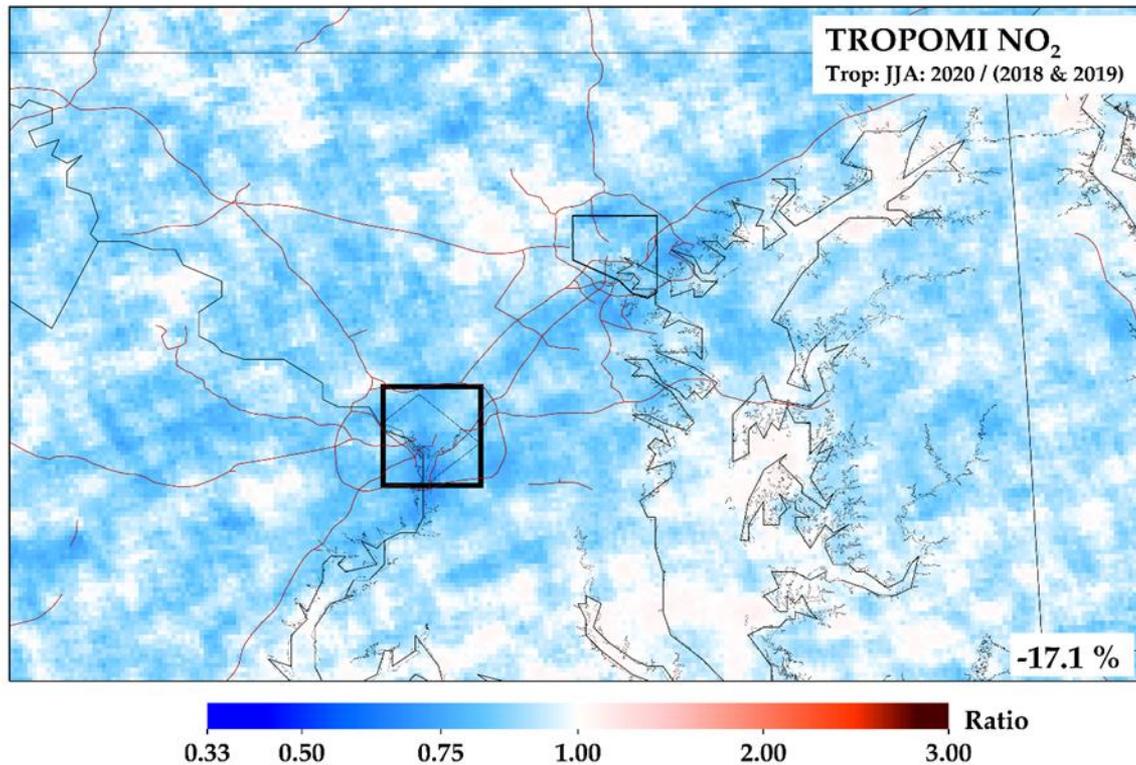
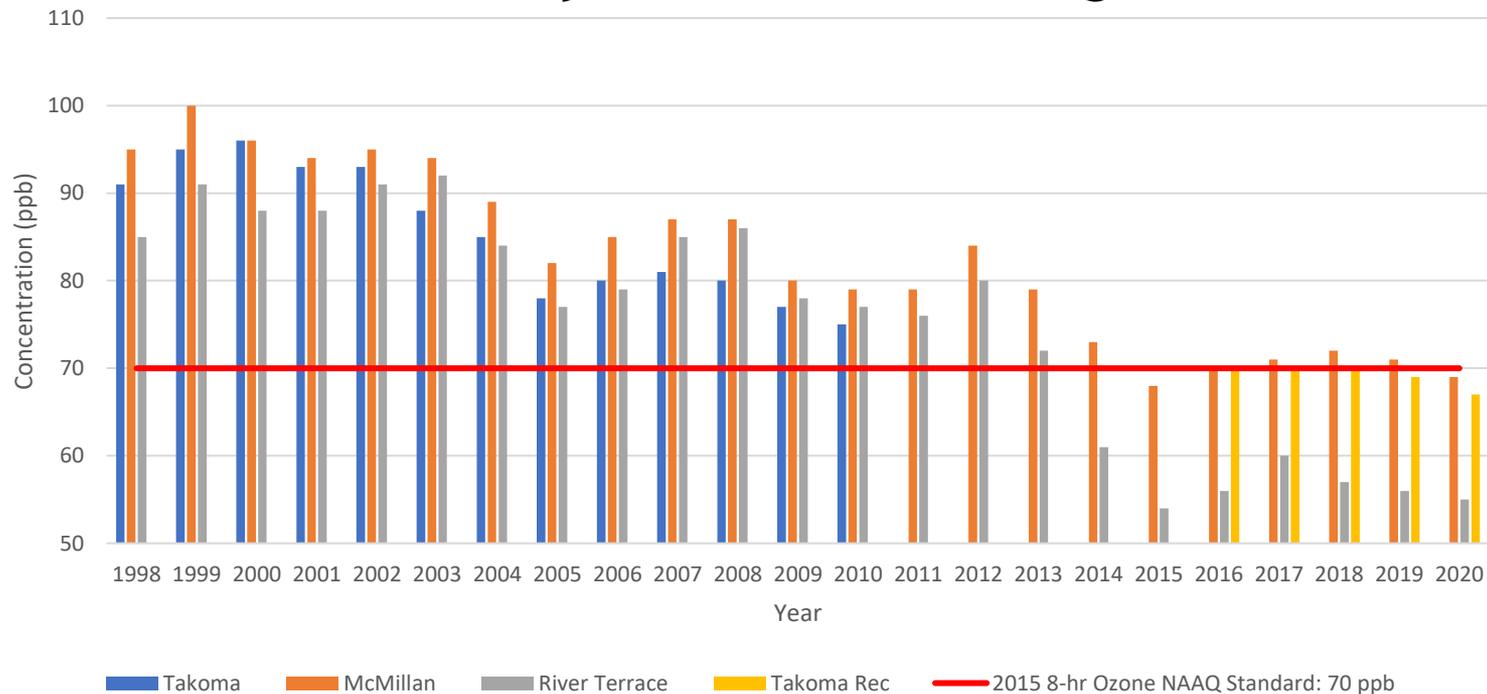


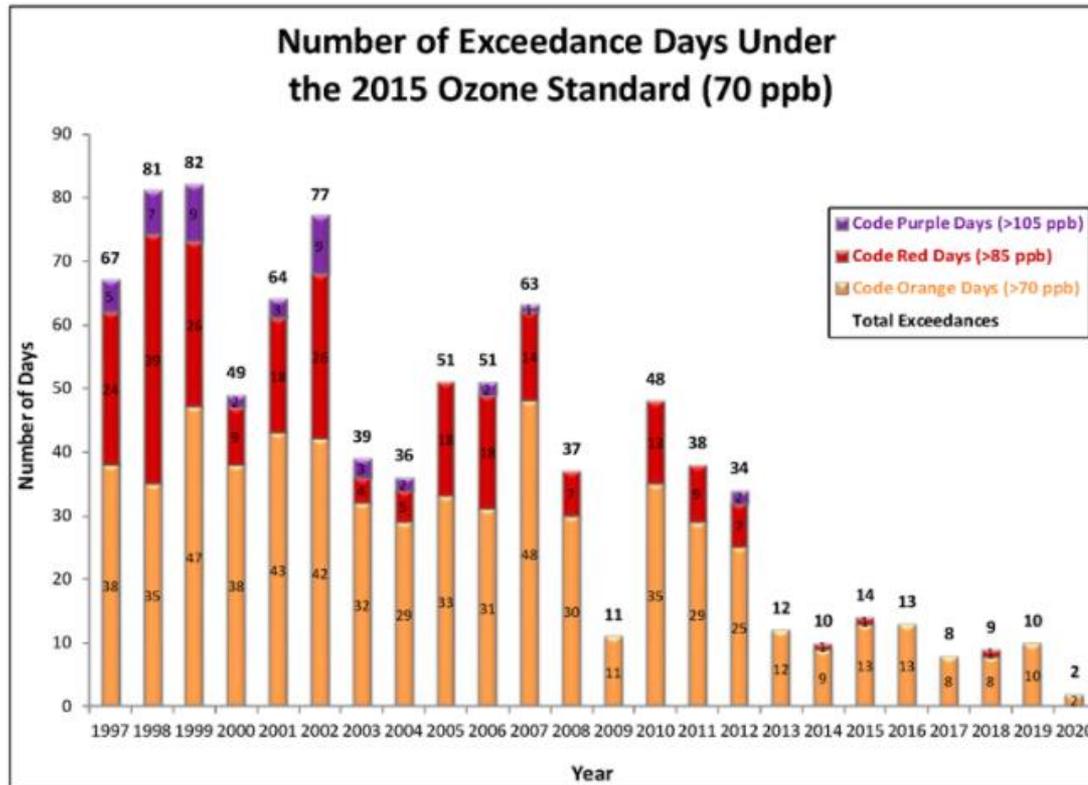
Image Courtesy of Daniel Goldberg, PhD

# Ozone (O<sub>3</sub>)

- 8-hour ozone concentrations have generally dropped in the District
- McMillan consistently measured the highest.



# Ozone (O<sub>3</sub>) Exceedance Trends

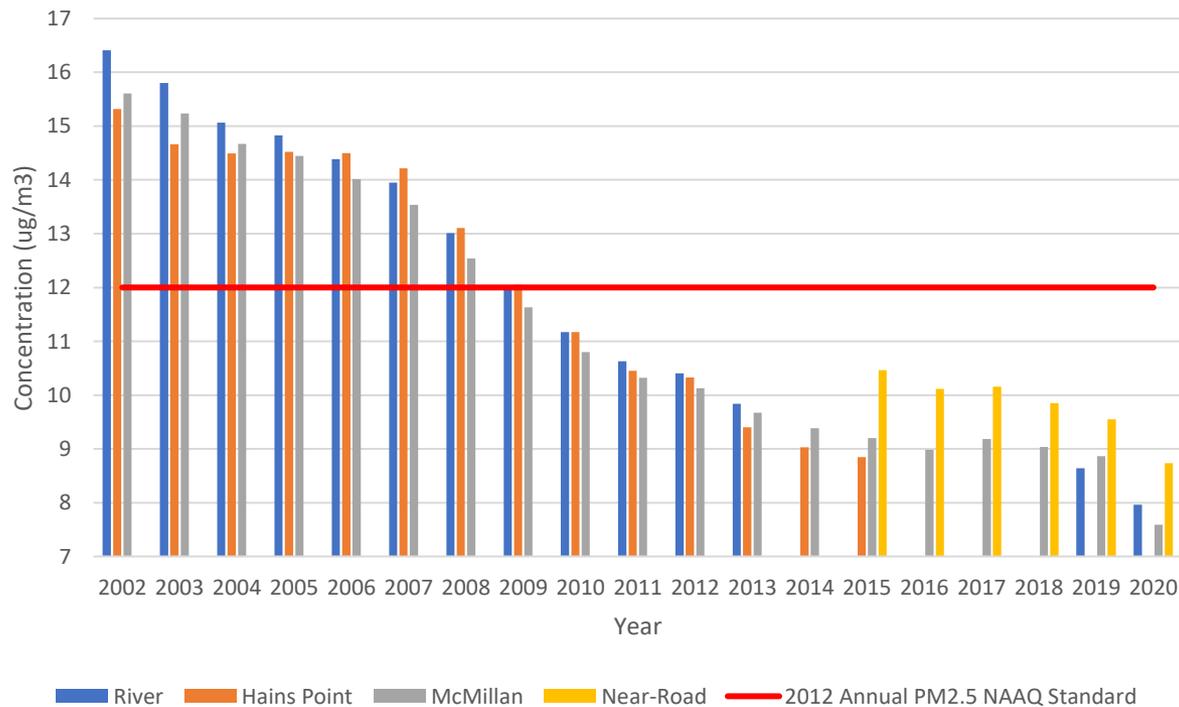


2020 had the fewest number of O<sub>3</sub> exceedance days. This is likely attributed to the traffic disruption due to the pandemic.

Analysis is based on draft and incomplete data as of August 31, 2020.

# PM<sub>2.5</sub>

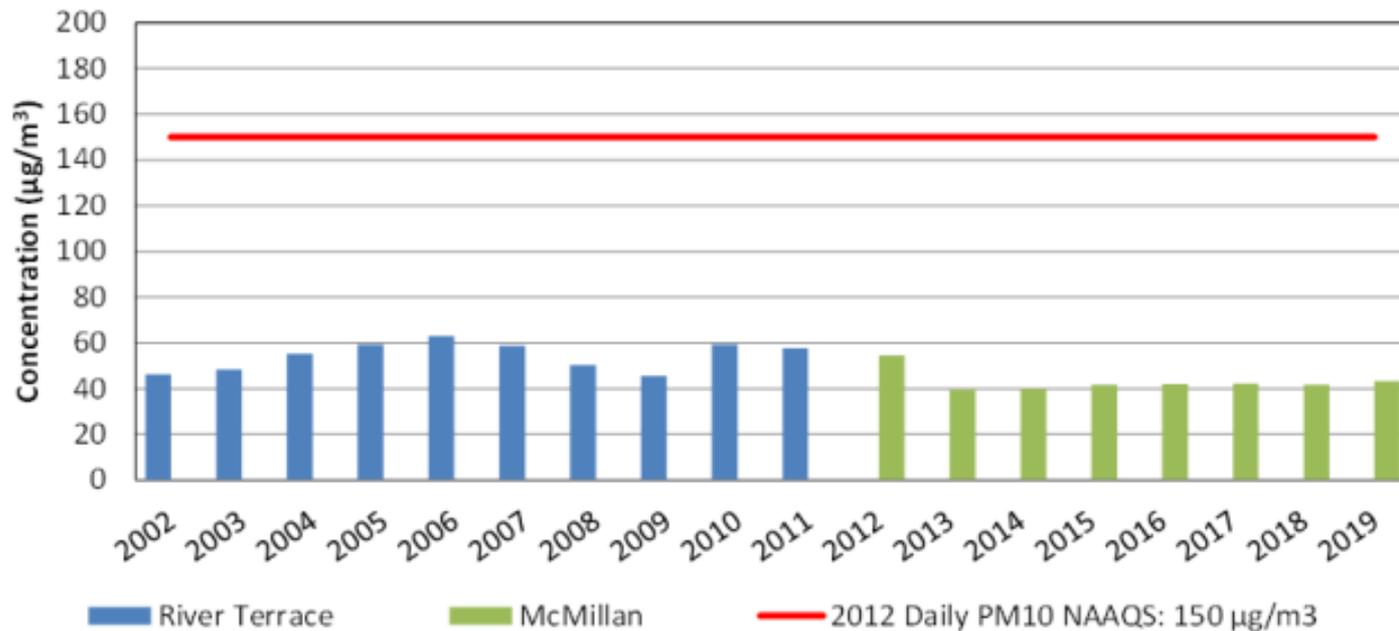
- Annual PM<sub>2.5</sub> levels have gradually declined each year since 2004 in the District.



# PM<sub>10</sub>

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- PM<sub>10</sub> is currently measured at one location in the District because levels are generally very low.

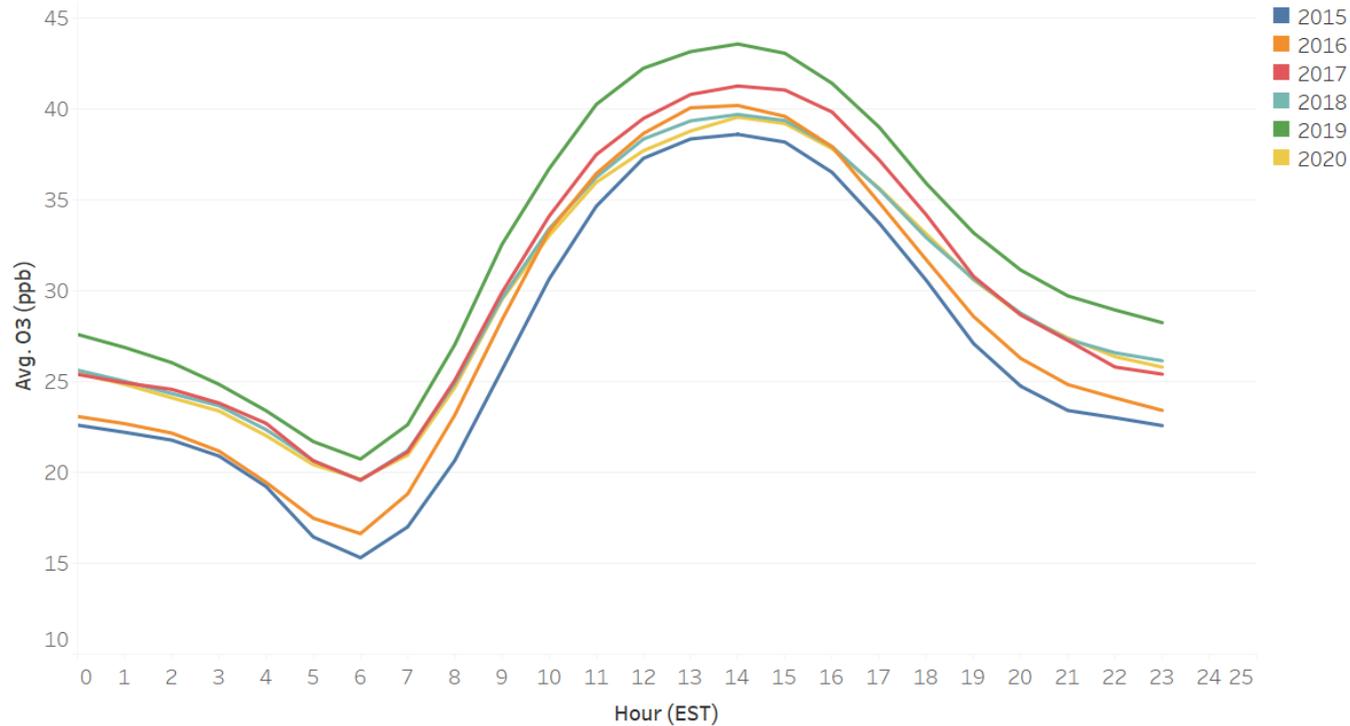


## Diurnal Cycles: Patterns that reoccur each day

- $O_3$
- $NO_2$
- $PM_{2.5}$

# Diurnal Cycle of O<sub>3</sub>

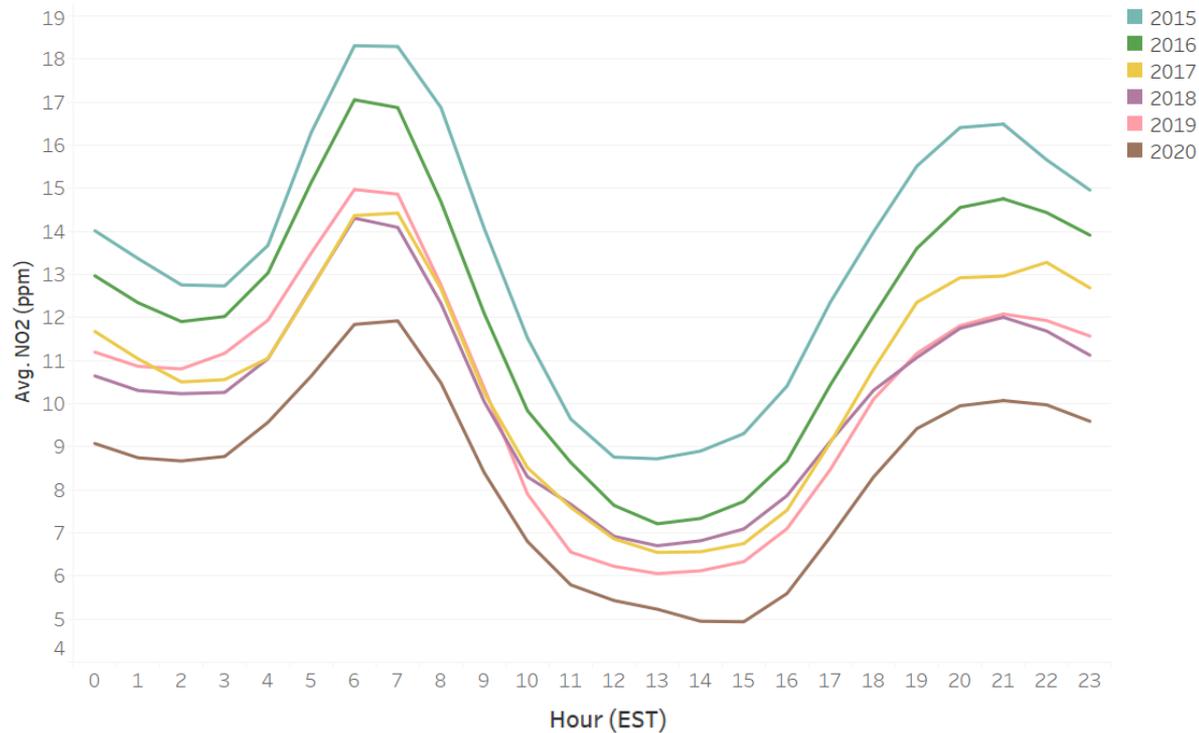
Diurnal Cycle of Ozone



- Ozone peaks during the afternoon.
- Ozone requires solar radiation to form. It is produced photochemically.

# Diurnal Cycle of NO<sub>2</sub>

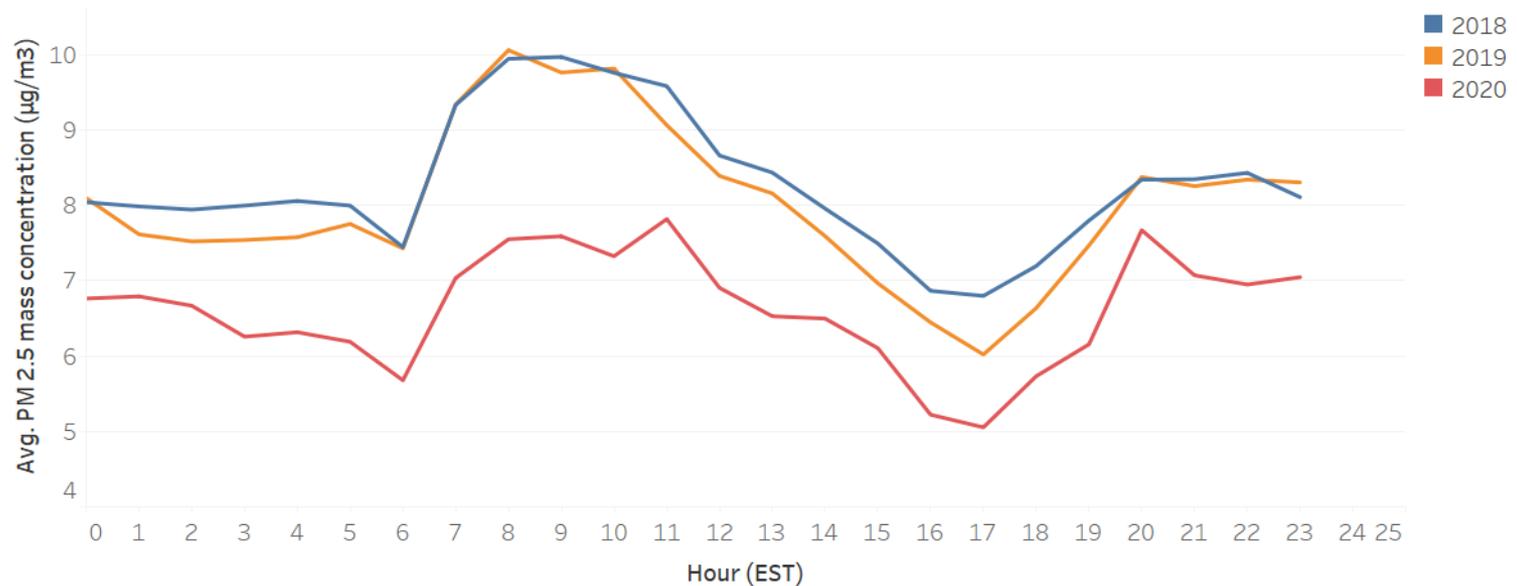
Diurnal Cycle of NO<sub>2</sub> at the McMillan monitoring site



- Diurnal cycle has two peaks (bimodal) during rush hour.
- 2020 showed the lowest avg. concentration of NO<sub>2</sub>

# Diurnal Cycle of PM<sub>2.5</sub>

Avg PM 2.5 Diurnal Cycle for the Years 2018-2020  
King Greenleaf

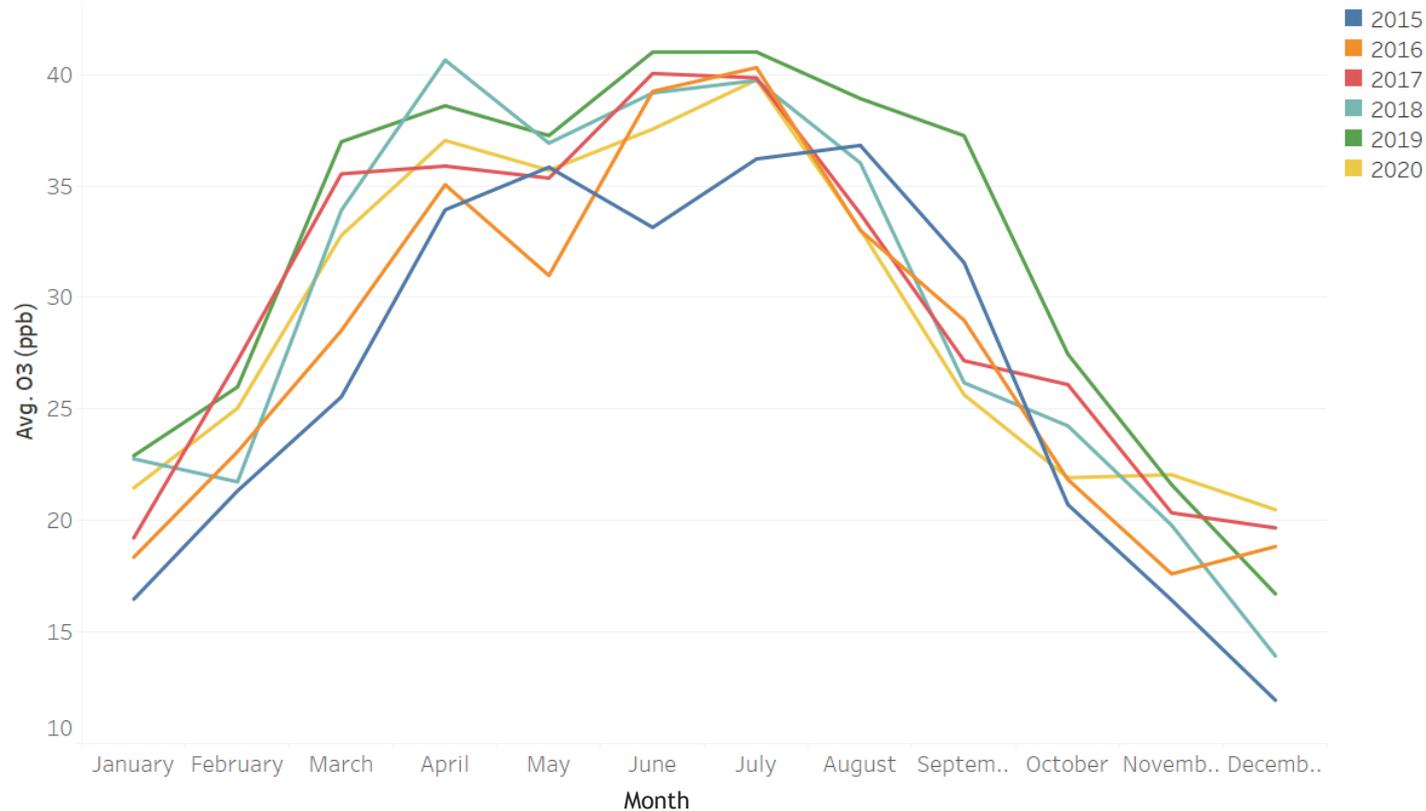


- PM<sub>2.5</sub> rises around the morning and evening rush hours.

# Seasonal Cycles

# Ozone (O<sub>3</sub>)

Seasonality of O<sub>3</sub> at McMillan monitoring site



- Ozone peaks during the summer months for all years.
- Ozone season in the District: April-October

# Nitrogen Dioxide (NO<sub>2</sub>)

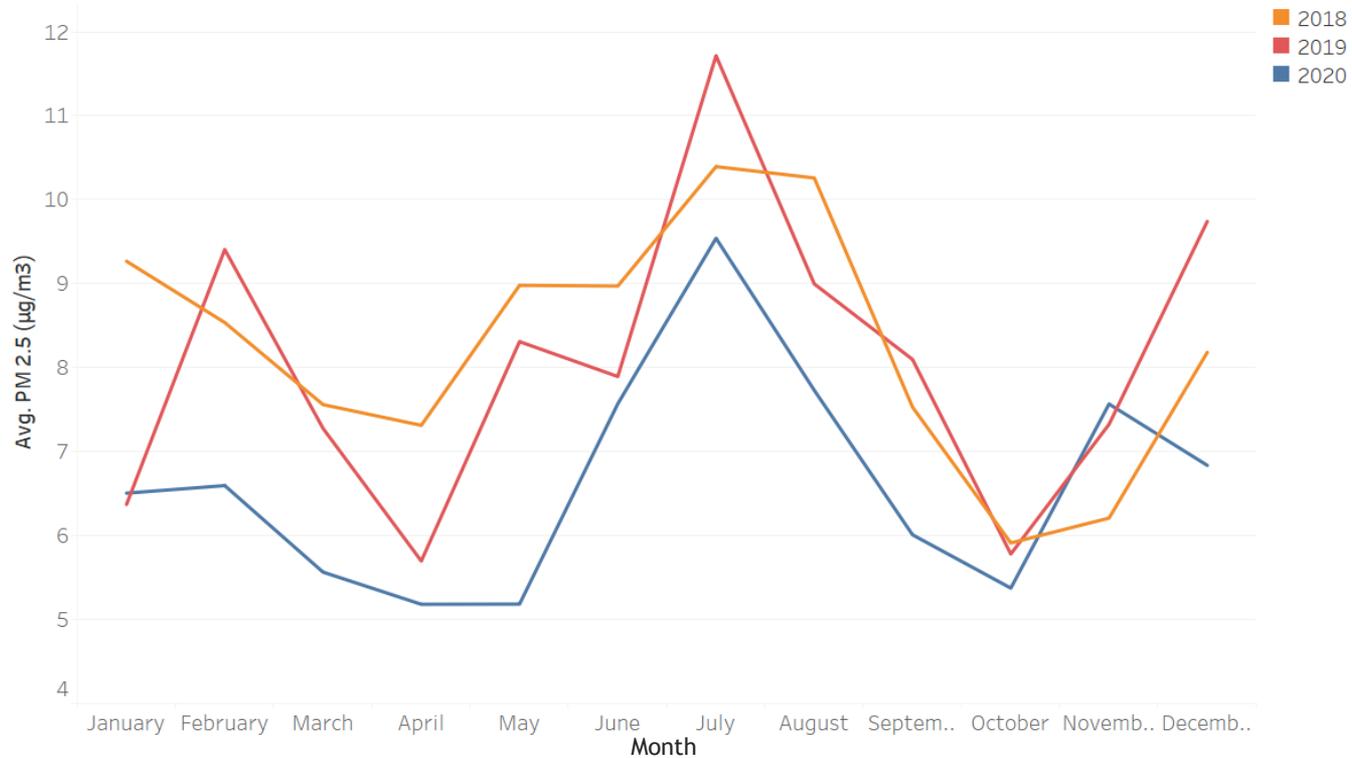
Seasonality of NO<sub>2</sub> at McMillan monitoring site



- NO<sub>2</sub> DOES NOT peak during the summer, but during the FALL/WINTER months.

# PM<sub>2.5</sub>

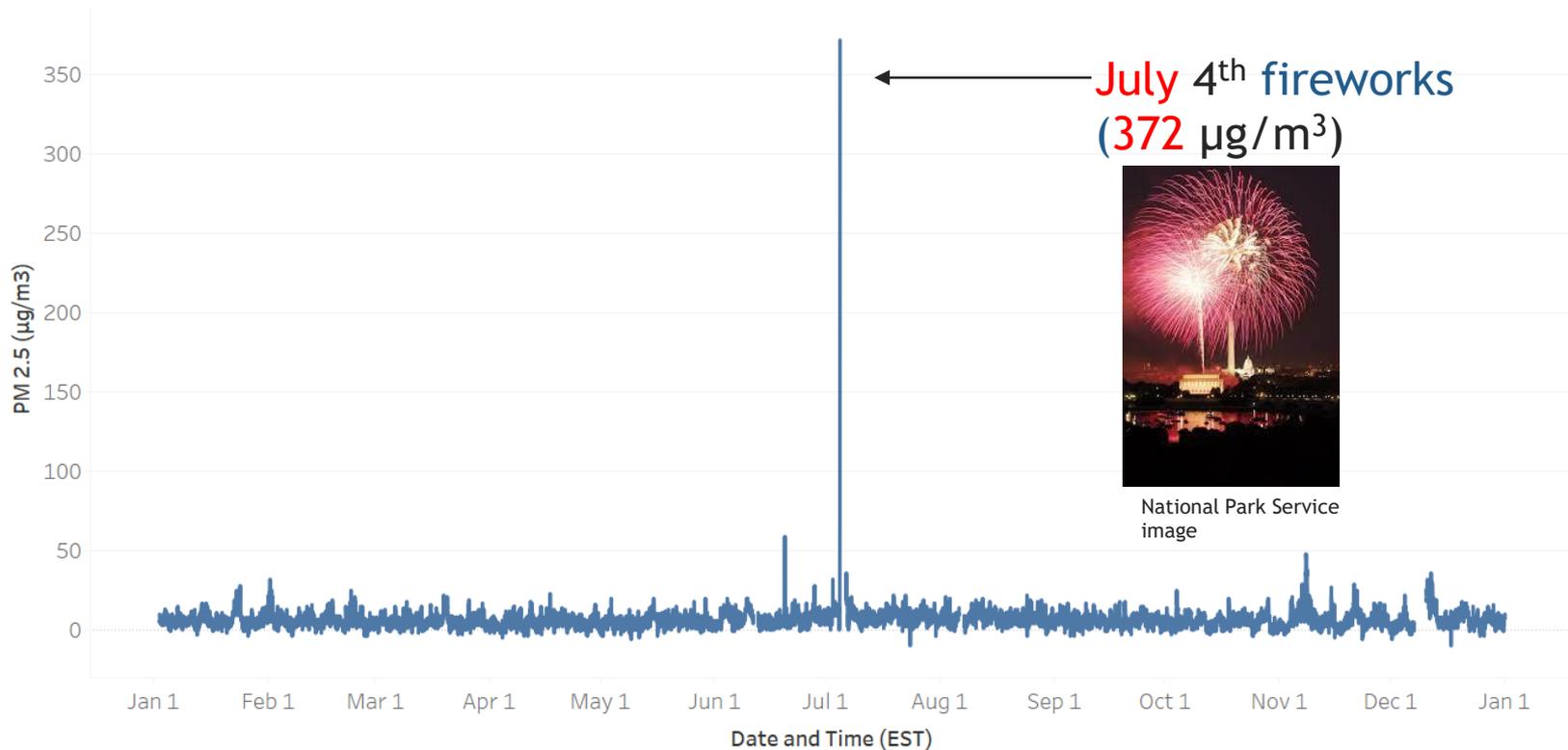
Seasonality of PM<sub>2.5</sub> King Greenleaf



- PM<sub>2.5</sub> peaks during the summer months in the District.

# Time Series of PM<sub>2.5</sub>

## 2020 King Greenleaf PM<sub>2.5</sub>



- Highest PM<sub>2.5</sub> detected on July 4<sup>th</sup>, 2020: 8:00 PM EST (9:00 pm local time)

# Where to find Air Quality Data?

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## District's ambient air data in public databases

EPA's AirData- <https://www.epa.gov/outdoor-air-quality-data>

## Real-time Data:

EPA's AirNow- <https://www.airnow.gov/>

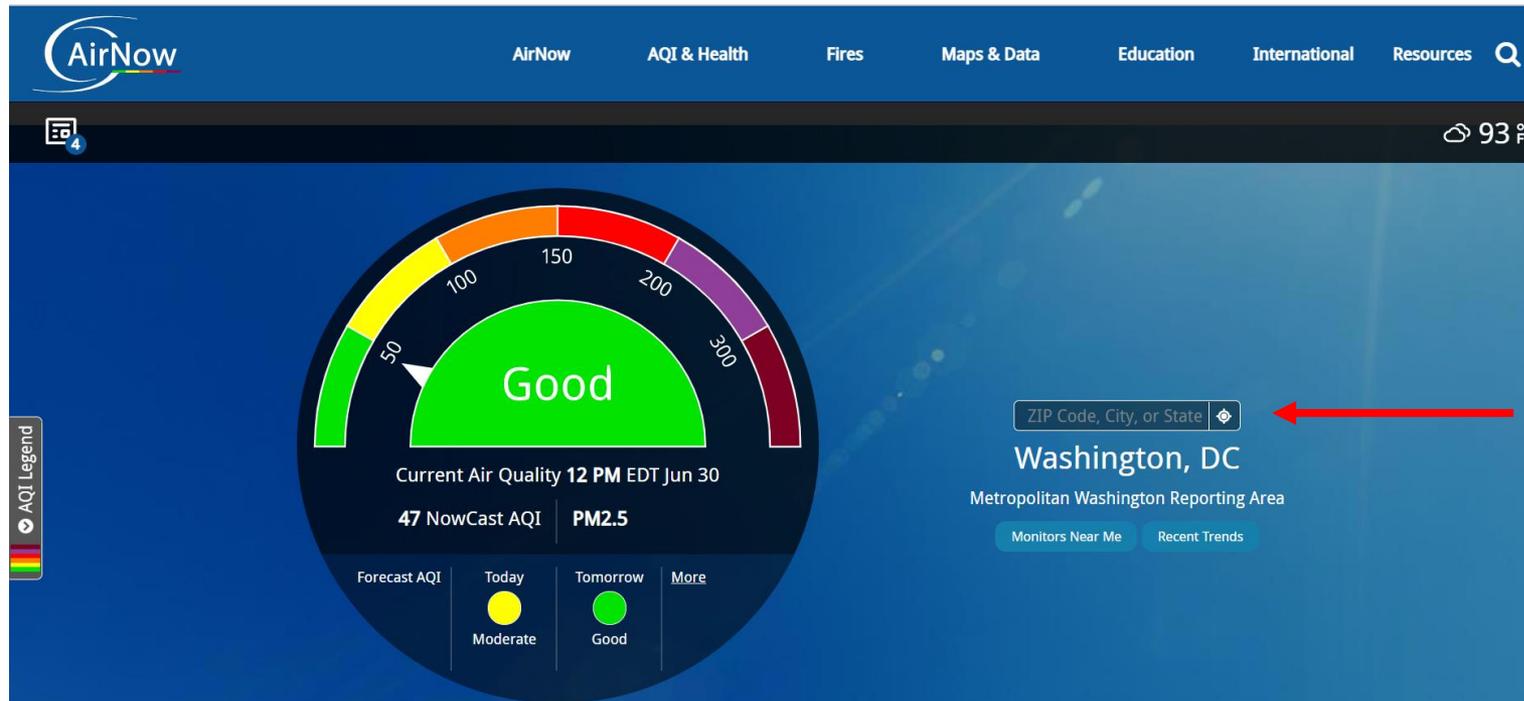
Metro Washington Council of Governments (MWCOG)  
<http://www.mwcog.org/environment/air/forecast/>

Baltimore-Washington area Clean Air Partners  
<http://www.cleanairpartners.net/current-and-forecasted-air-quality>

# Real-time Data: EPA's AirNow

EPA's AirNow: <https://www.airnow.gov/>

Useful resource that allows for users to look at current AQI, AQI trends, fire/smoke maps etc.



Put in zip code to get information on Air Quality near you!

# Quality Assured Data: EPA's AirData

EPA's AirData- <https://www.epa.gov/outdoor-air-quality-data>

Air Data Home

Learn about Air Data

Pre-generated Data Files

**Download Daily Data**

Download Raw Data (API)

Interactive Map

Air Quality Index Report

Air Quality Statistics Report

Monitor Values Report

Monitor Values Report -  
Hazardous Air Pollutants

Air Quality Index Daily  
Values Report

Daily Air Quality Tracker

Tile Plot - Multiyear

Tile Plot - Single Year

AQI Plot

## Download Daily Data

This tool queries daily air quality summary statistics for the criteria pollutants by monitor. You can get data for specific monitors or all monitors in a city, county, or state.

1. Pollutant

- Select Pollutant of interest

2. Year

- Select Year of interest

3. Geographic Area

- Select District of Columbia

-- or --

-- or --

- Choose monitor

- McMillan (110010043)
- King Greenleaf (110010053)
- River Terrace (110010041)
- Takoma Rec. Center (110010050)
- Near-Road (110010051)

4. Monitor Site

# Questions?

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Contact:  
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