



Understanding Portland Air Quality Multnomah County Lunch & Learn April 4th, 2022



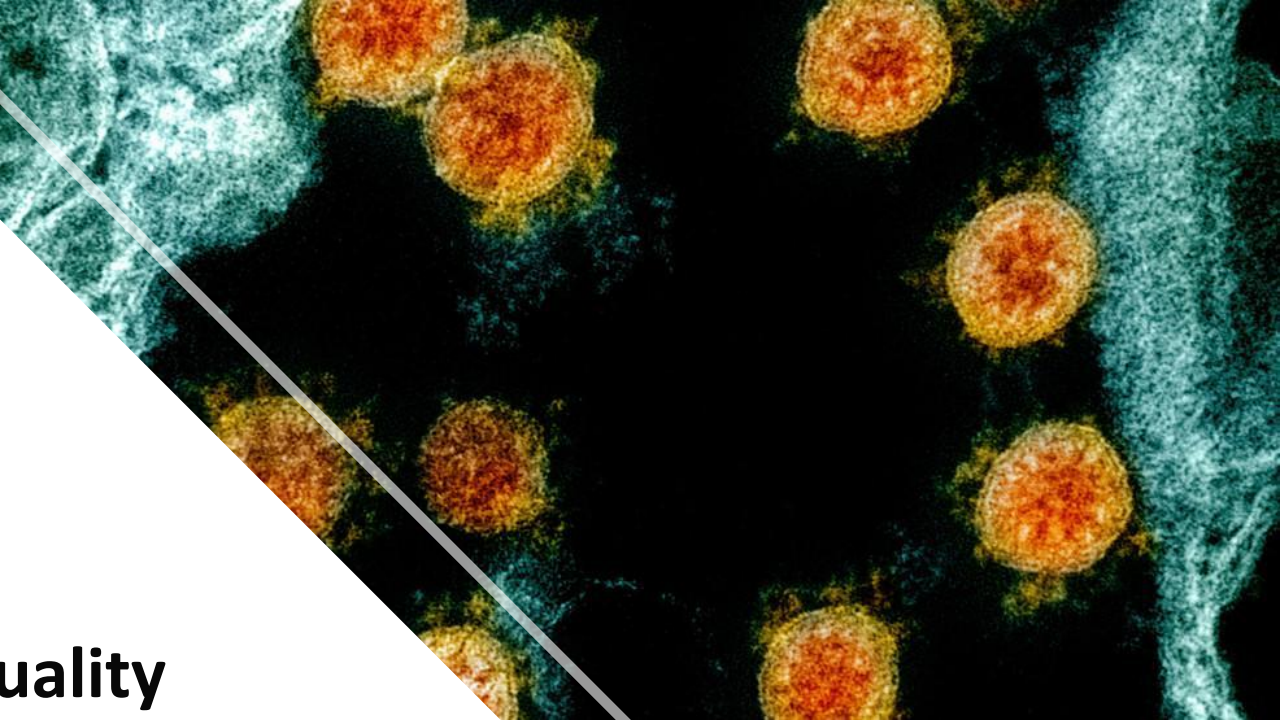
**NEIGHBORS
FOR
CLEAN
AIR**

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Air Quality Perfect Storm



What's in our air?

National Ambient Air Quality Standards (NAAQS)

Carbon Monoxide (CO)
Lead (Pb)
Nitrogen Dioxide (NO₂)
Ozone (O₃)
Sulphur Dioxide (SO₂)
Particulate Pollution

- PM 10
- PM 2.5*

*35 µg/m³

Oregon Ambient Benchmark Concentrations (ABCs)

Based on:

Cancer risk of one-in-a-million additional cancers based on a lifetime of exposure.

19/52 Air Toxics (HAPs) exceed risk in PDX

- Diesel PM
- Arsenic compounds
- Cadmium compounds
- Chromium VI
- Lead compounds Manganese compounds
- Nickel compounds
- Benzene



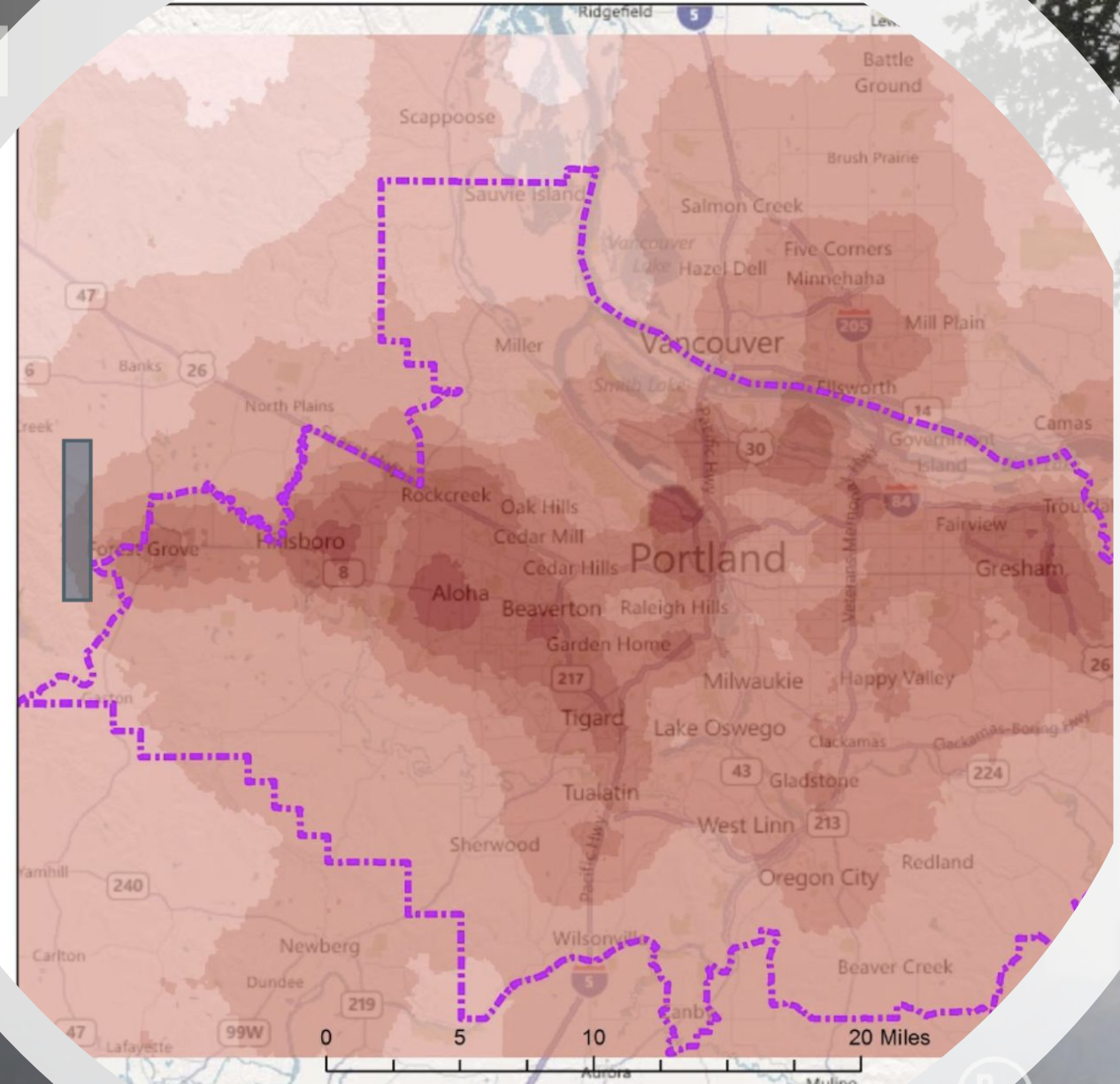
OREGON HAS TOXIC AIR POLLUTION

We all have the right to breathe clean air.

However, in the Portland metro area, the presence of fine and ultra-fine particulate matter from older dirty diesel engines makes our air unhealthy. **Clackamas, Multnomah, and Washington counties rank in the top 5 percent of all counties nationwide for ambient diesel particulate concentrations** and have the highest exposure rate of all counties in Oregon.

Oregon
Department of
Environmental
Quality

benchmark

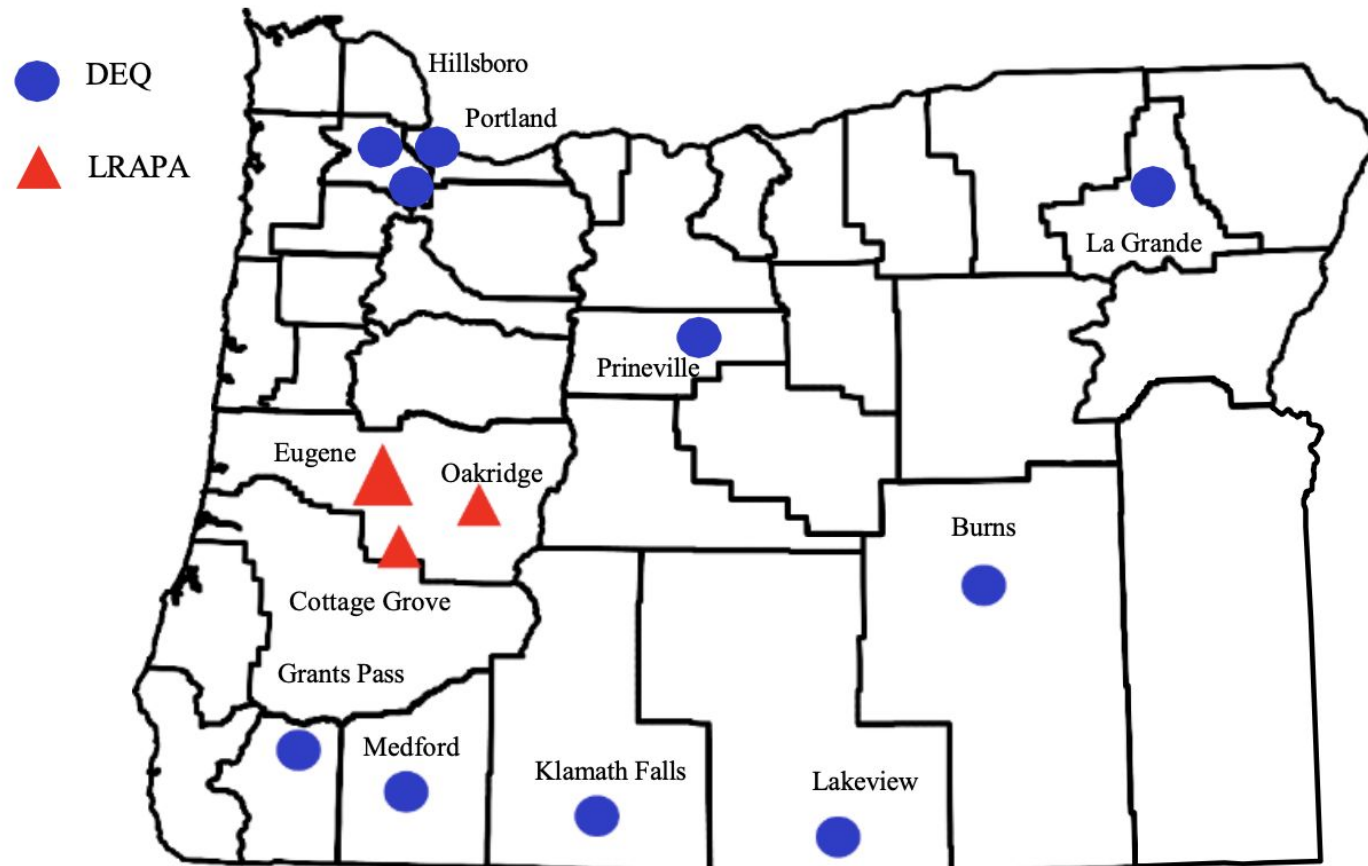


PortlandAirToxicsSolutions\EJ\EJ_Revised\GIS\EJ_Risk.mxd

Where is PM_{2.5} monitored by the DEQ in Oregon?

3.2.4 PM2.5 Network

Oregon DEQ and LRAPA have one NCORE and 14 SIAMS Federal Reference Monitoring (FRM) sites or Federal Equivalence Method (FEM) sites for PM_{2.5}. Three in the Portland-Metro area, two in Eugene, and one each in Oakridge, Cottage Grove, Grants Pass, Medford, Klamath Falls, Lakeview, and Prineville. DEQ has two PM_{2.5} speciation sites, one in SE Portland (the trend site), and one in Burns.



Legal requirements:

- OR's AQ monitoring plan must be approved annually by the regional EPA administrator
- 40 CFR 58 recommends for Portland's population, there exist a minimum of 2 or 3 sites monitoring PM_{2.5}

Federal Reference Method for PM_{2.5}:

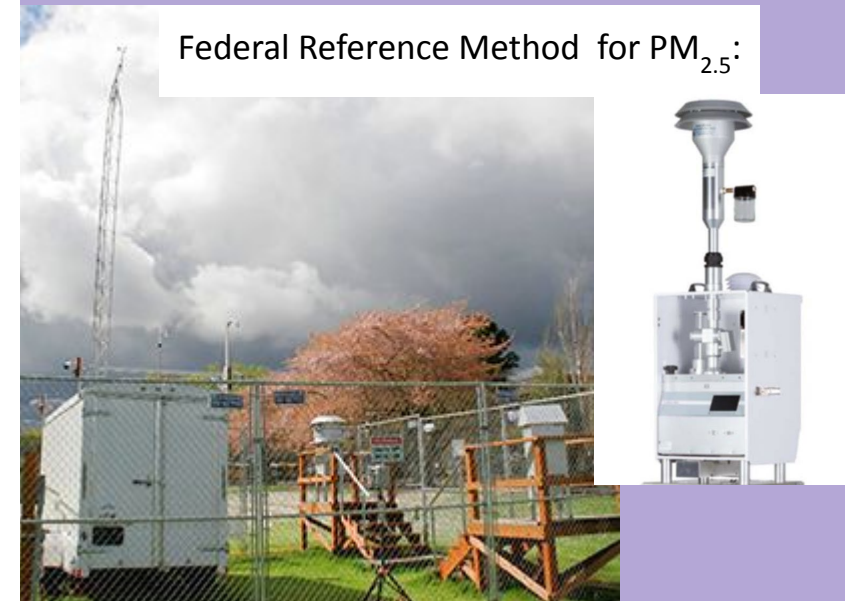

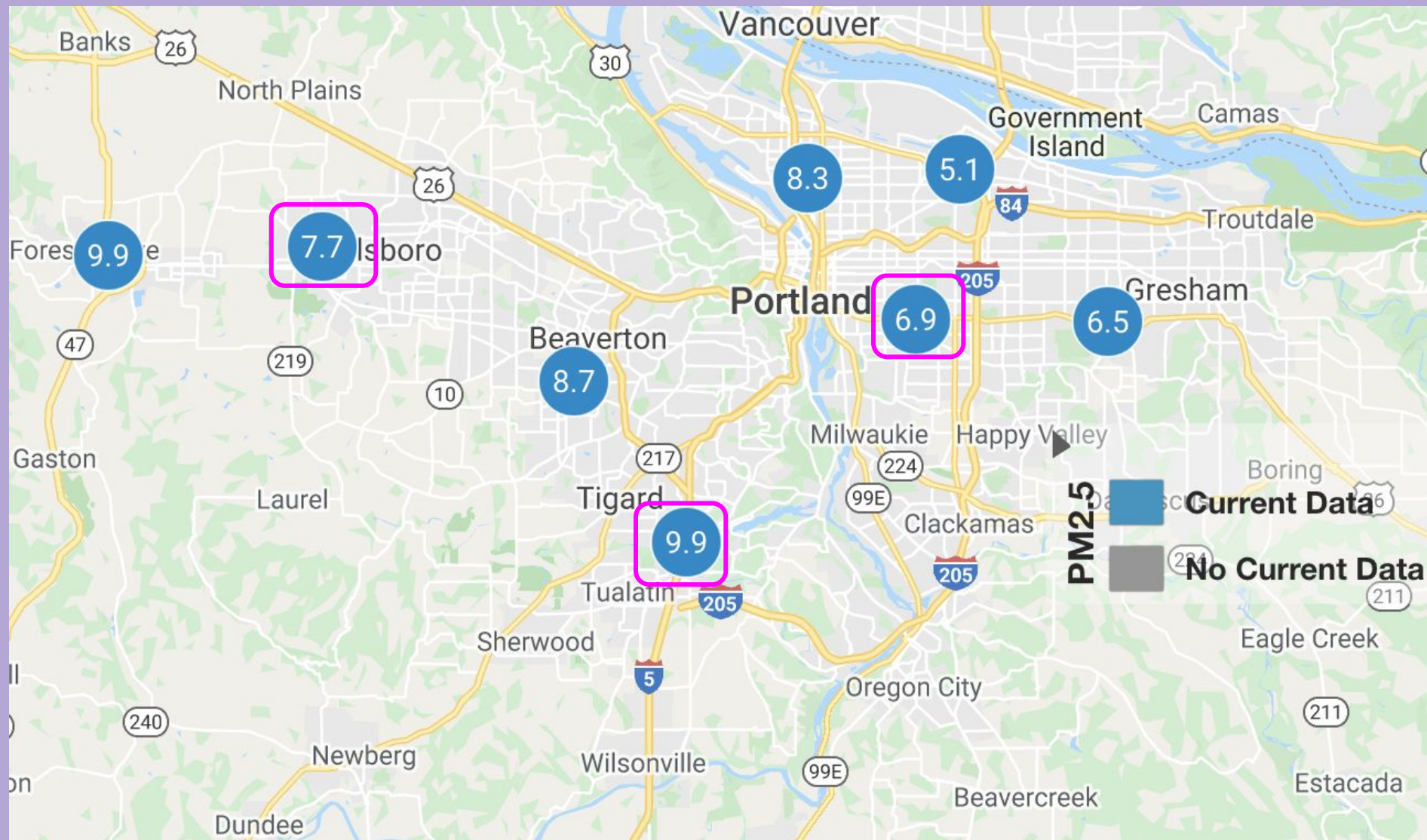


Figure 6. PM_{2.5} Monitoring Network

<https://www.oregon.gov/deq/FilterDocs/AQmonitoringplan.pdf>

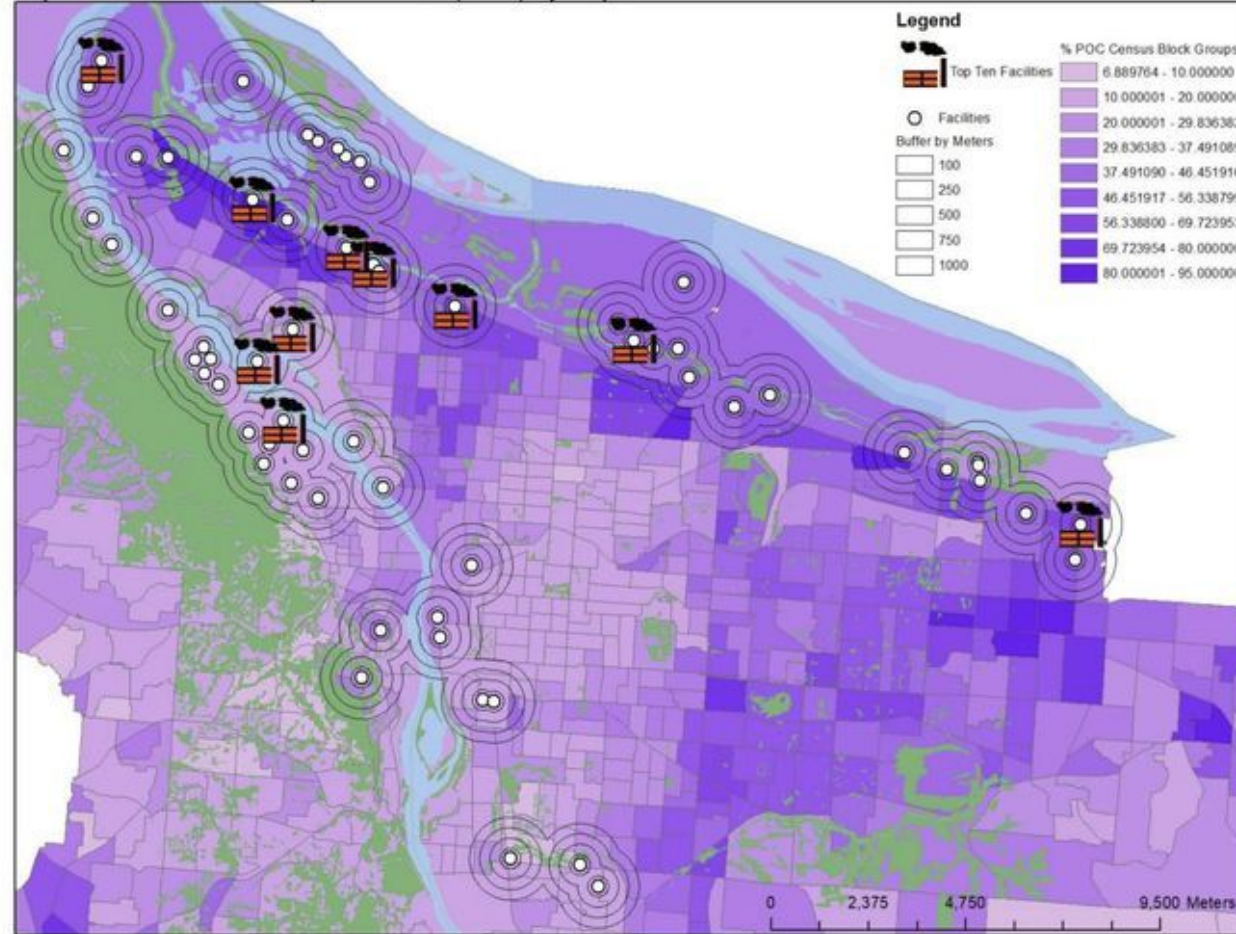


= multi-pollutant
monitoring stations
with Federal
Reference Method
monitoring
equipment

=> how can we cost-effectively expand the spatial coverage of these measurements?

What do we know about where air toxics exposure is highest in Portland?

Top 10 Facilities and People of Color (POC) by Population Share



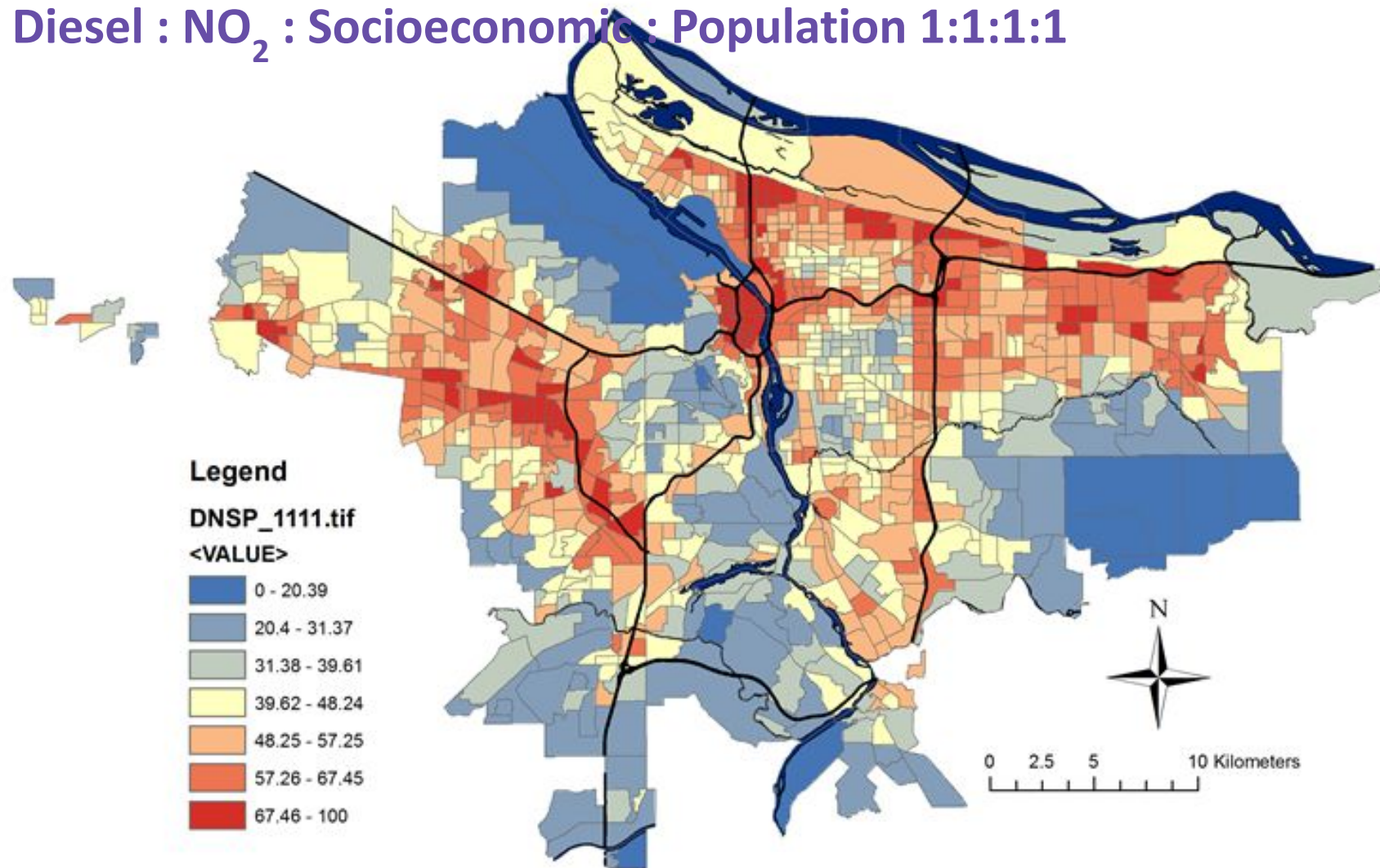
Cleaner Air Oregon 2020 "CAO Emissions By Source". Oregon Department of Environmental Quality.
RLIS Discovery: Home - Census Block Groups 2010. 2010. Available at: <http://rlisdiscovery.oregonmetro.gov/?action=viewDetail&layerID=2589>

We know that in Portland, people of color are more likely to live near top polluters.

<< based on Cleaner Air Oregon emissions reporting

What do we know about where air toxics exposure is highest in Portland?

Diesel : NO₂ : Socioeconomic : Population 1:1:1:1



Examining the overlap of diesel exposure and socioeconomic vulnerability



Dr. Yasuyo Makido

Low-cost PM_{2.5} monitoring options

Federal
Reference
Monitor:

~ \$10,000
+
~\$250K to
run

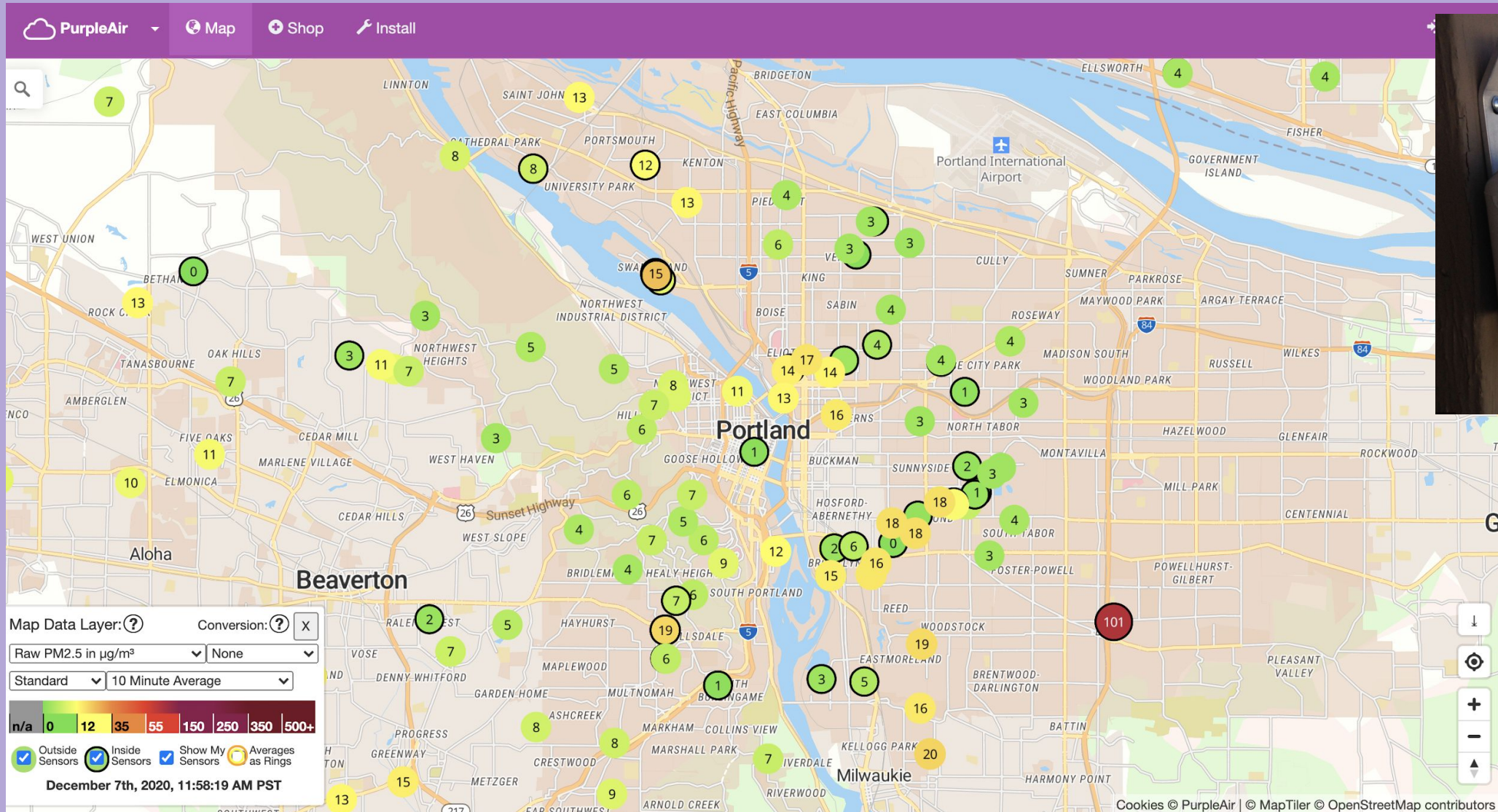


Purple Air
Monitor:

~ \$300



Particulate matter pollution and motivation to establish a broader Purple Air network in Portland



Particulate matter pollution and motivation to establish a broader Purple Air network in Portland

PurpleAir

Map

Shop

Install

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NORTHWEST INDUSTRIAL DISTRICT

BOISE

SABIN

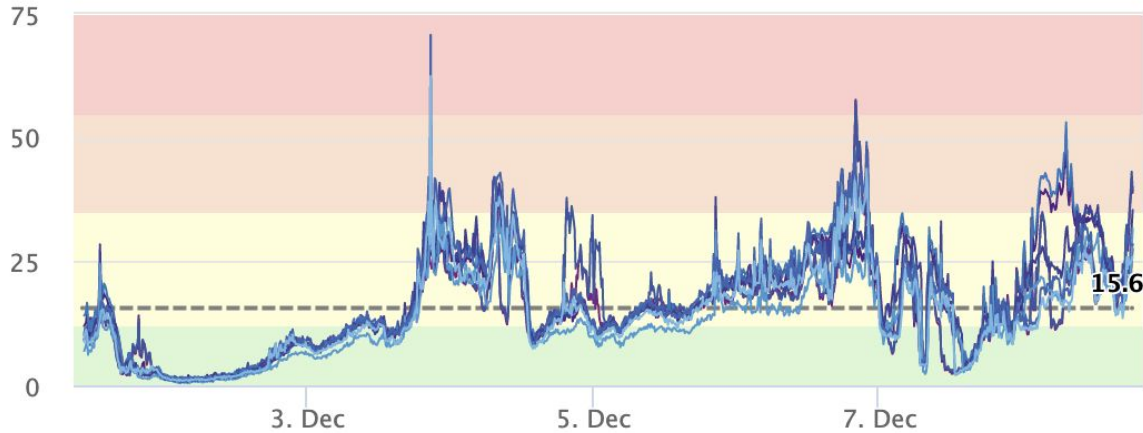
Click and drag to zoom in. Hold down shift key and drag to pan.



Raw PM2.5 in $\mu\text{g}/\text{m}^3$ 10 Minute Average



X



--- Average
--- Gnomish Garden A
--- byuki project B
--- PSU STAR LAB SEL A
--- Gnomish Garden B
--- 36th & SE Woodward A
--- PSU STAR LAB SEL B
--- byuki project A
--- 36th & SE Woodward B

PurpleAir.com

On December 8th, 2020, 6:34:13 PM PST

10 Minute
Average Raw
PM2.5 in
 $\mu\text{g}/\text{m}^3$ is now

27

12-35 $\mu\text{g}/\text{m}^3$: Air quality is acceptable; however, if they are exposed for 24 hours there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.

Now	10 Min	30 Min	1 hr	6 hr	1 Day	Week
27	27	24	23	20	18	18

Sensor: 36th & SE
Woodward

✓ 100% PA-II 6.01

Get This Widget

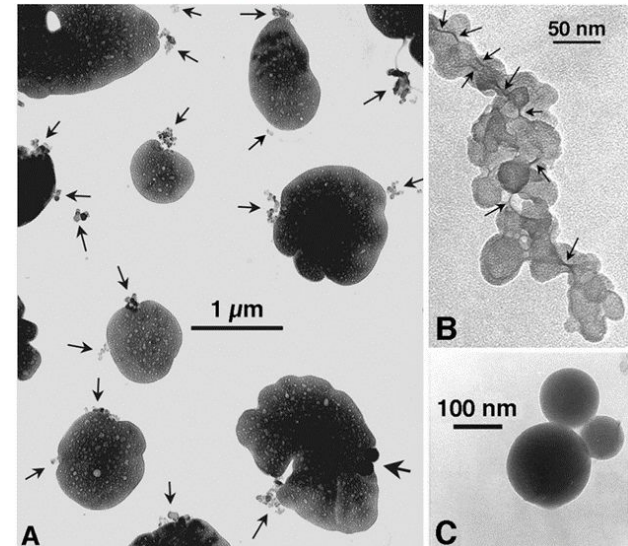
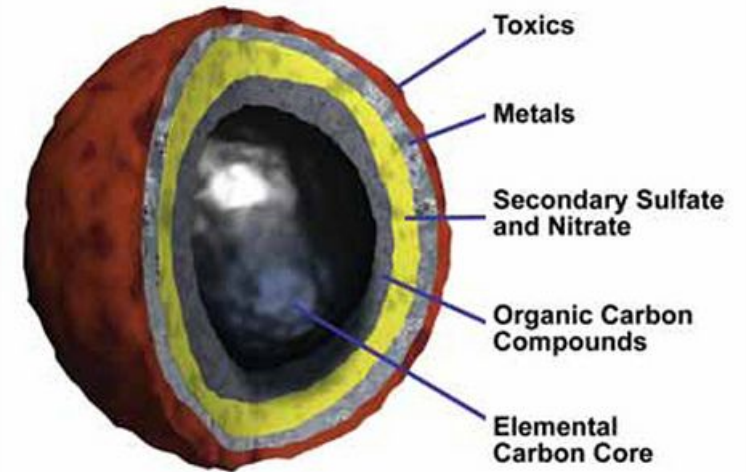
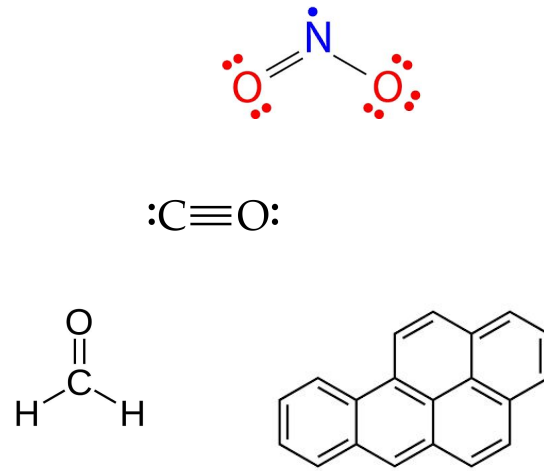


Clean Air Act:
24-hr average
regulatory standard:
35 $\mu\text{g}/\text{m}^3$

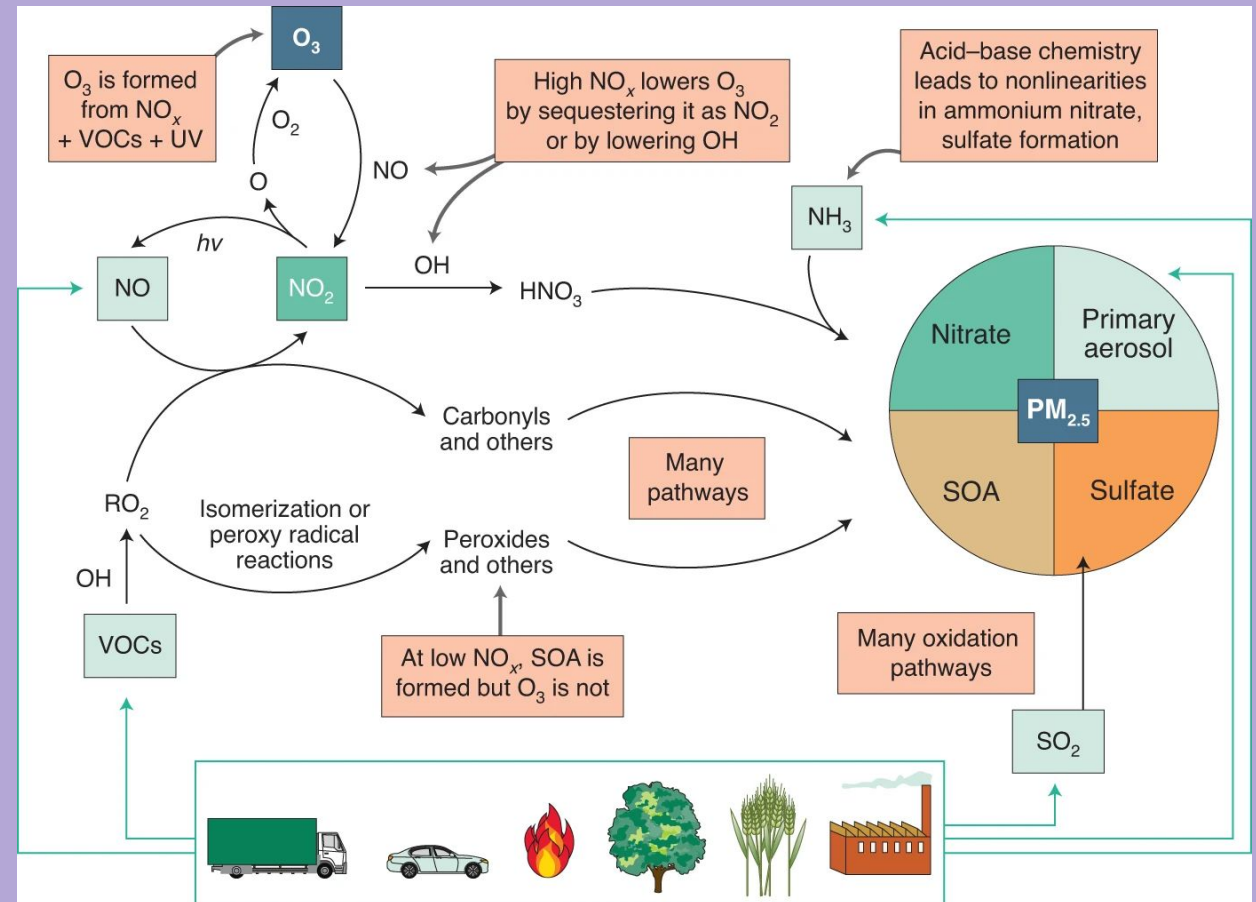
PM_{2.5} is a marker for Portland's biggest problem pollutant: diesel emissions

Diesel emissions: a complex mixture of gases and particles:

... so, measuring fine particulate matter (PM_{2.5}) is one way to track diesel pollution

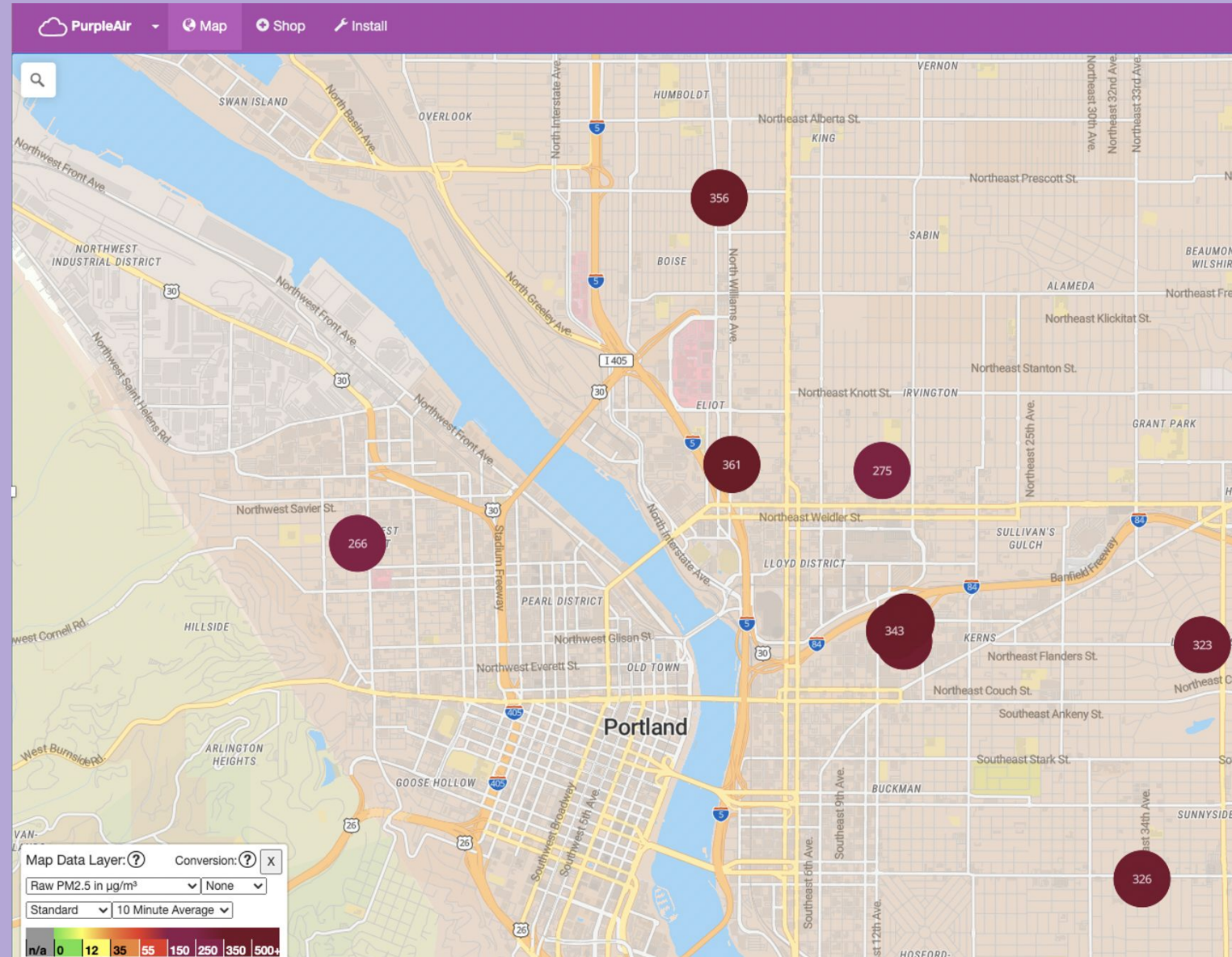


Fine particulate matter ($\text{PM}_{2.5}$) is emitted directly from diesel engines, and also formed by secondary chemistry in the air:

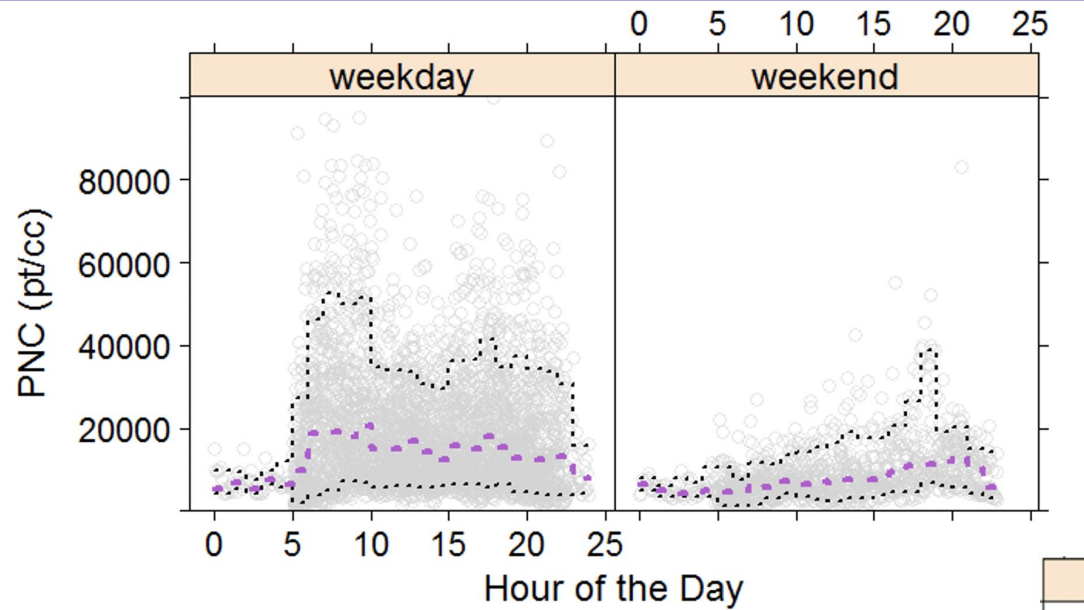


PM_{2.5} comes from diverse sources -- we can also learn about e.g. the extent of fire plumes

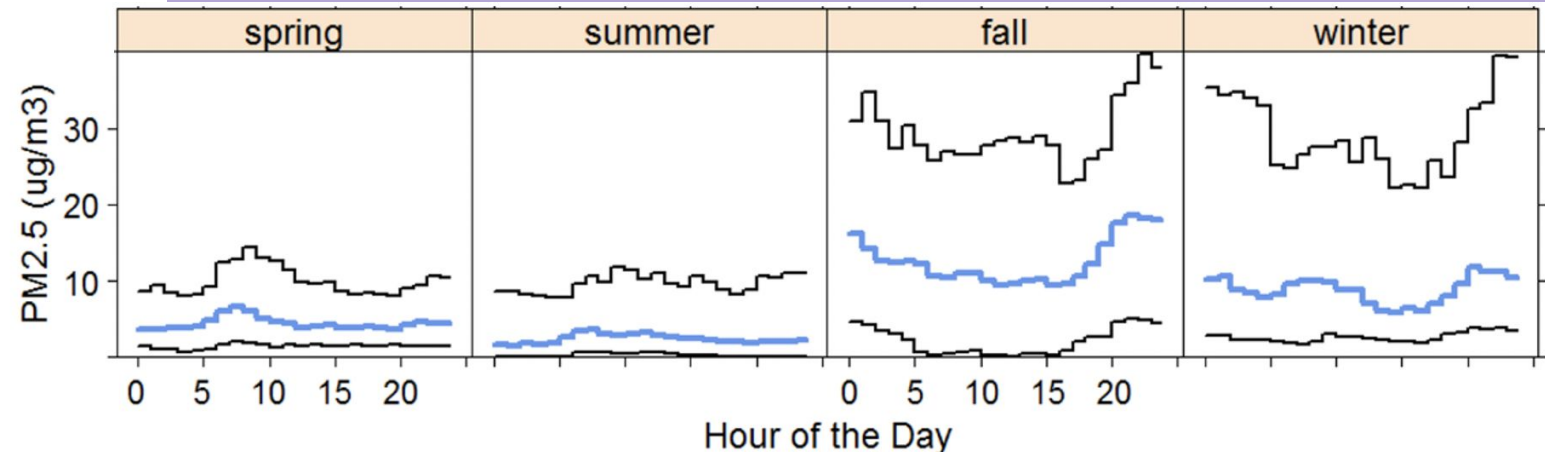
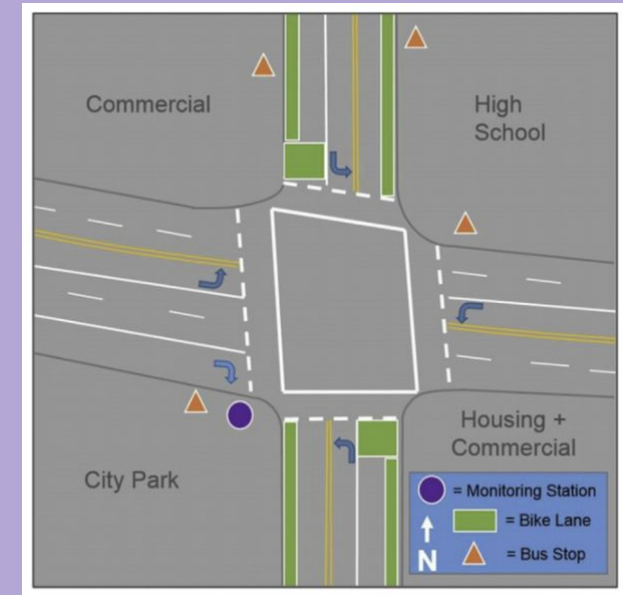
Purple Air map screenshot from Sept. 10, 2020, during Oregon wildfires



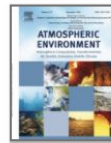
Local PSU researchers have used low-cost sensors to study traffic emissions



Roadside monitoring:
SE Powell & SE 26th



Atmospheric Environment
Volume 122, December 2015, Pages 133-141



Diurnal and seasonal variations of NO, NO₂ and PM_{2.5} mass as a function of traffic volumes alongside an urban arterial

Christine Kendricks (now Air Quality Lead, Portland BPS) and Linda George (PSU)

NCA Purple Air Project

Goal:

1. Expand network in underserved communities
2. Use Purple Air to educate and engage more people about our work to reduce air pollution in Portland.





Building a Movement to 2023

join us

www.neighborsforcleanair.org



NEIGHBORS
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THANK YOU!

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