ANALYSIS OF 2021 OZONE EXCEEDANCE DAYS

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MWAQC-Technical Advisory Committee
November 9, 2021

Agenda Item 2

Metropolitan Washington
Council of Governments

2021 Ozone Exceedance Days

May 2021

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
25	26	27	28	29	30	01
						49
02	03	04	05	06	07	08
57	38	46	44	43	41	44
09	10	11	12	13	14	15
44	49	51	41	50	49	60
16	17	18	19	20	21	22
53	59	66	71	82	74	66
23	24	25	26	27	28	29
59	30	47	63	62	45	33
30	31					
27	45					

June 2021

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
30	31	01	02	03	04	05
		50	52	38	54	73
06	07	08	09	10	11	12
64	48	53	51	52	30	48
13	14	15	16	17	18	19
38	58	48	55	60	64	53
20	21	22	23	24	25	26
50	46	31	51	59	53	33
27	28	29	30			
29	39	42	53			

July 2021

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
27	28	29	30	01	02	03
				44	40	37
04	05	06	07	08	09	10
50	50	64	63	37	45	44
11	12	13	14	15	16	17
43	46	50	52	64	64	54
18	19	20	21	22	23	24
45	54	61	63	46	49	56
25	26	27	28	29	30	31
52	68	74	74	61	62	49

August 2021

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
01	02	03	04	05	06	07
47	54	55	61	71	67	58
08	09	10	11	12	13	14
61	62	55	50	60	58	49
15	16	17	18	19	20	21
51	37	31	23	42	42	49
22	23	24	25	26	27	28
43	53	67	80	63	59	61
29	30	31				
52	51	50				

* Draft data as of October 31, 2021

2021 Ozone Exceedances Days, Monitors, and Levels

Date	Highest 8-Hour Max Ozone (ppb)	Corresponding Monitor	Other Exceeding Monitors
May 19	71	McMilan, Takoma	-
May 20	82	McMilan	Takoma, Fredrick, Rockville, PG Eq. Center, Beltsville, HU-Beltsville, Arlington, Fairfax, Loudoun, Prince William
May 21	74	Rockville	-
June 5	73	McMilan, PG EQ. Center	Beltsville
July 27	74	Fairfax	Beltsville, McMilan
July 28	74	McMilan, PG EQ. Center	Calvert, Charles, Arlington, Fairfax
August 5	71	Arlington	-
August 25	80	Beltsville	McMilan, Takoma, Rockville, PG EQ. Center

Ozone Monitors

Monitor Names

1. Takoma Rec Center
2. River Terrace
3. McMillan NCore
4. Prince George's Equestrian Center
5. HU-Beltsville
6. Rockville
7. Sourthern Maryland
8. Fredrick
9. Calvert
10. Beltsville
11. Aurora Hills
12. Long Park
13. Ashburn
14. Franconia

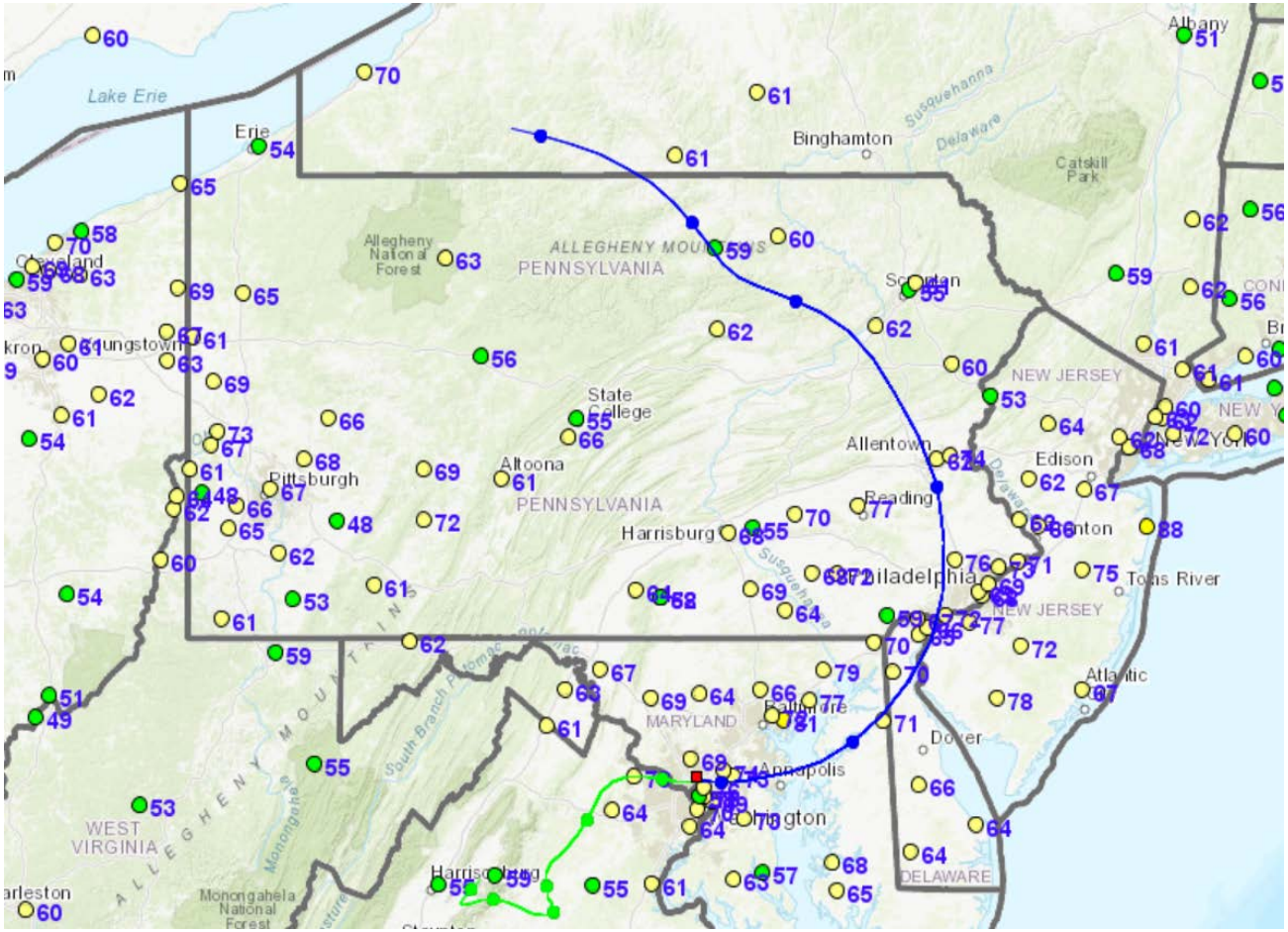
What Causes Exceedances in Washington Region?

- Exceedances in the Washington region are caused by emissions of ozone precursors such as, VOCs and NOx that are produced locally as well that come from outside.
- While local sources of emissions remain important, outside sources play a significant role too.
- Several research studies have shown that ozone and its precursors (VOCs & NOx) coming from outside the region can contribute significantly to ozone levels in the region, more so on high ozone days.

Ozone Transport & Wind Trajectories

- Wind trajectory is an important tool in studying long range ozone transport.
- It is the path followed by wind during a certain time.
- It tells us where the wind is coming from at a particular location.
- Wind brings air pollutants such as, ozone and its precursors from upwind areas. This adds to locally produced air pollution and makes the situation worse in downwind areas.
- A significant portion of ozone is brought to the region from outside such as, Ohio river valley and Western Pennsylvania where a number of coal based power plants operate.
- Wind trajectories were created at 500m and 1500m for eight ozone exceedance days in 2021 at EPA's Airnowtech.org website.

Wind Trajectory – May 19



Local + Transport

High upwind ozone level

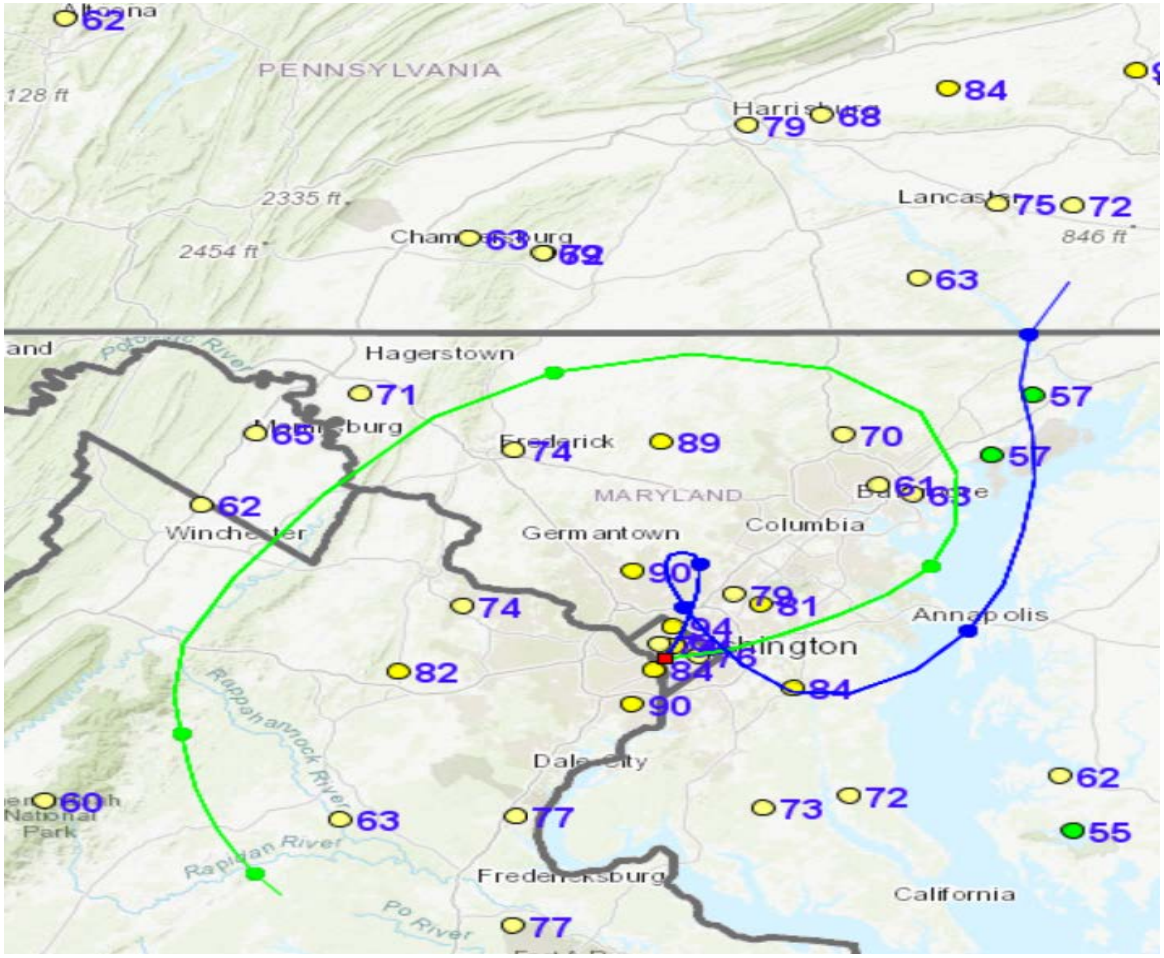
2/14 monitors exceeding standard

500 m

1500 m

8-Hour Max Ozone = 71 ppb, McMilan & Takoma

Wind Trajectory – May 20



Local + Transport + Recirculation

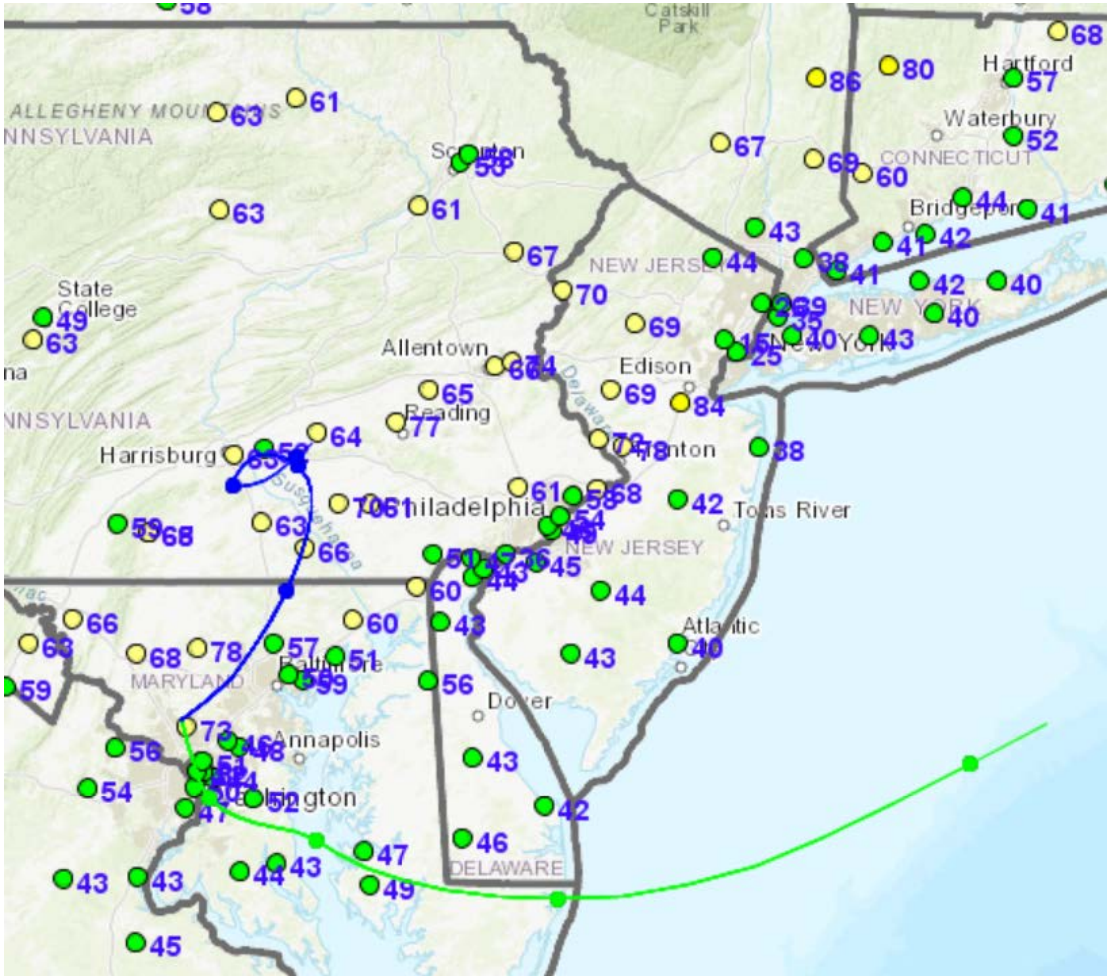
High upwind ozone level

11/14 monitors exceeding standard

500 m 1500 m

8-Hour Max Ozone = 82 ppb, McMilan

Wind Trajectory – May 21



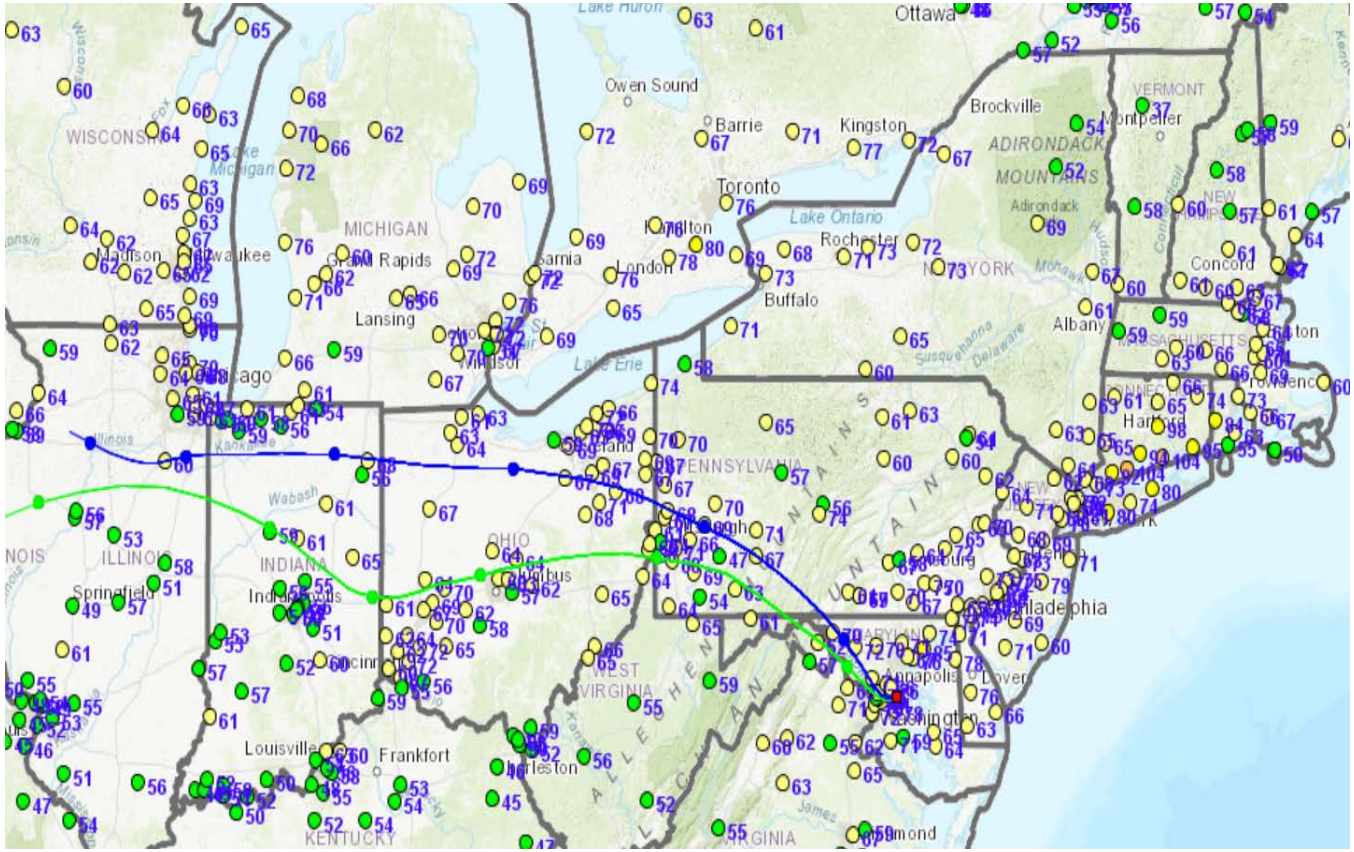
Local + Transport

Moderate upwind ozone level

1/14 monitors exceeding standard

8-Hour Max Ozone = 74 ppb, Rockville

Wind Trajectory – June 5



Local + Transport

High upwind ozone level

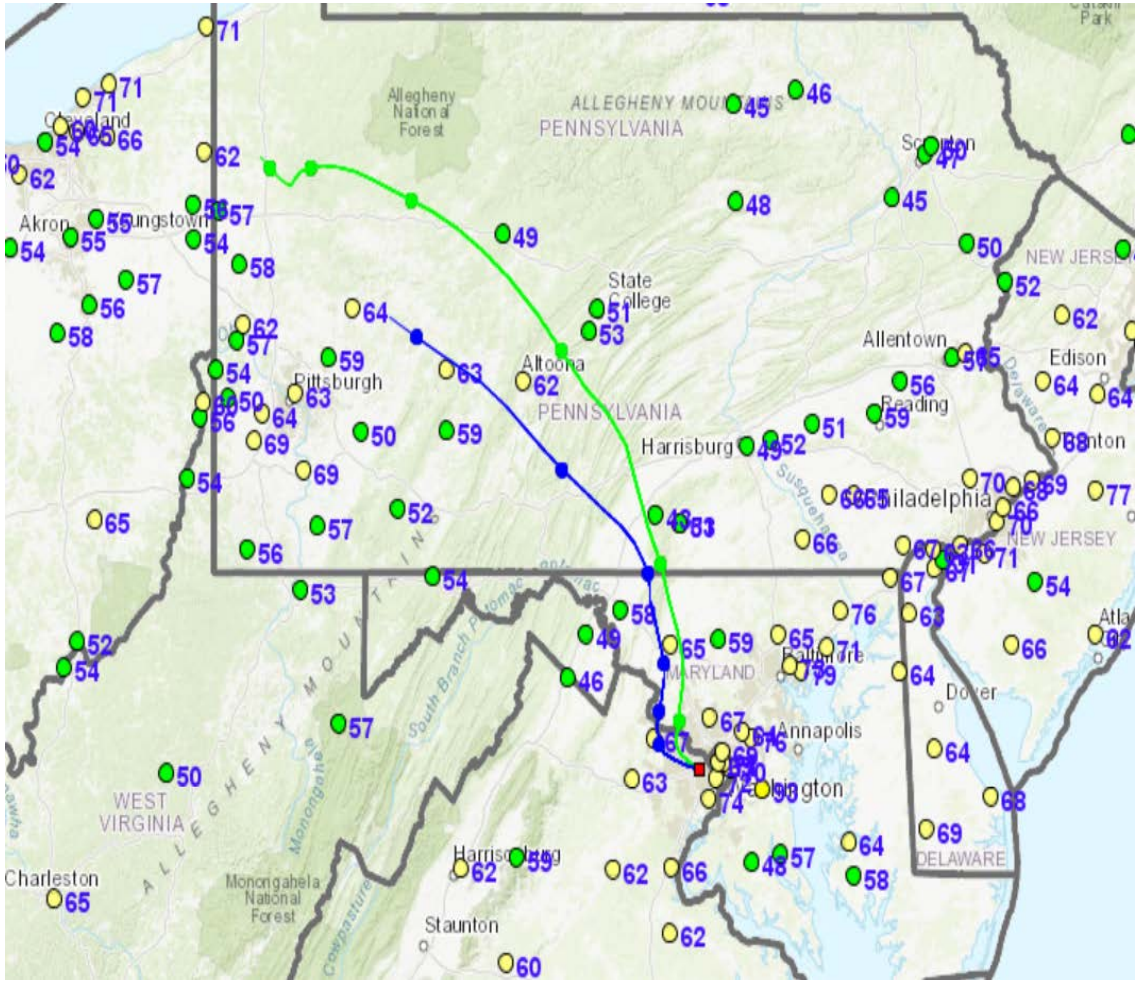
3/14 monitors exceeding standard

500 m

1500 m

8-Hour Max Ozone = 73 ppb, McMilan & PG Eq. Center

Wind Trajectory – July 27



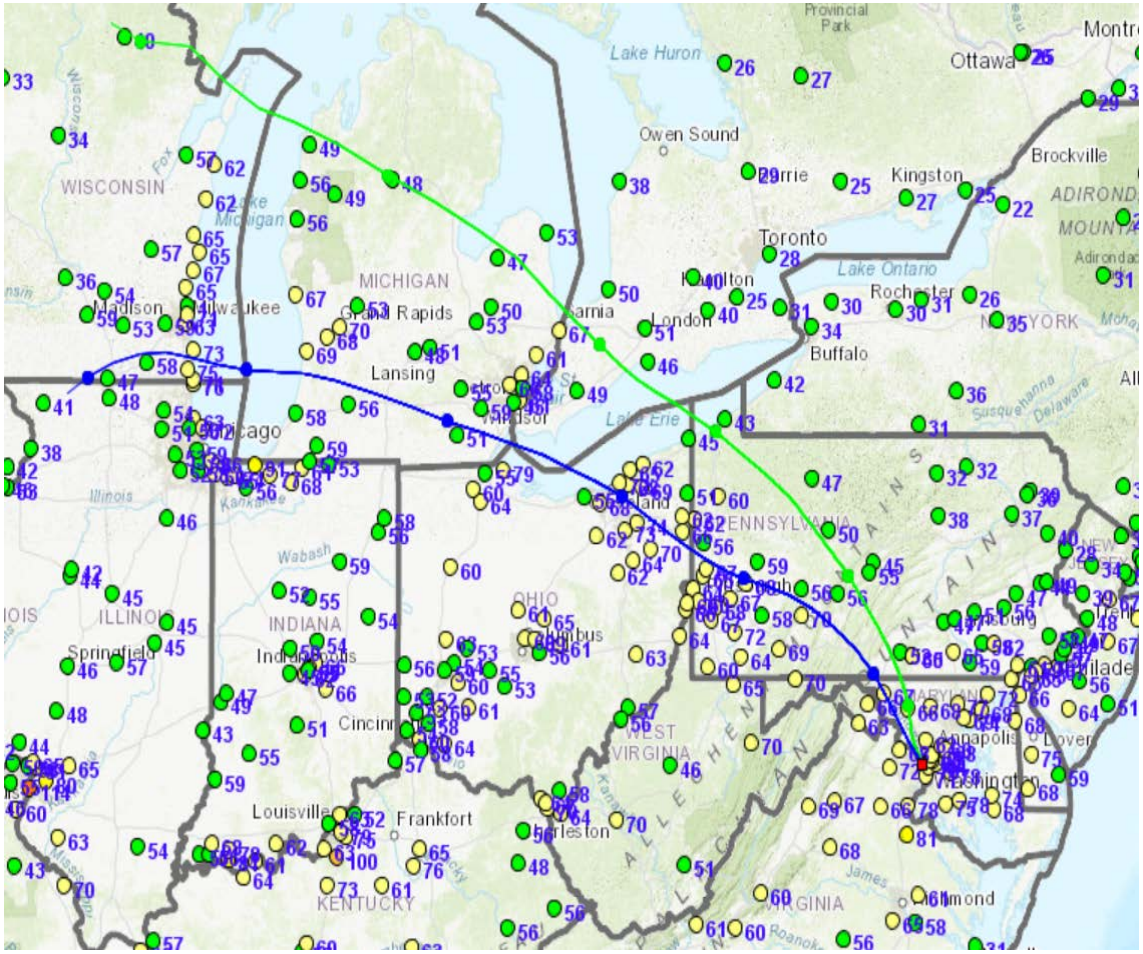
Local + Transport

Moderate upwind ozone level

3/14 monitors exceeding standard

8-Hour Max Ozone = 74 ppb, Fairfax

Wind Trajectory – July 28



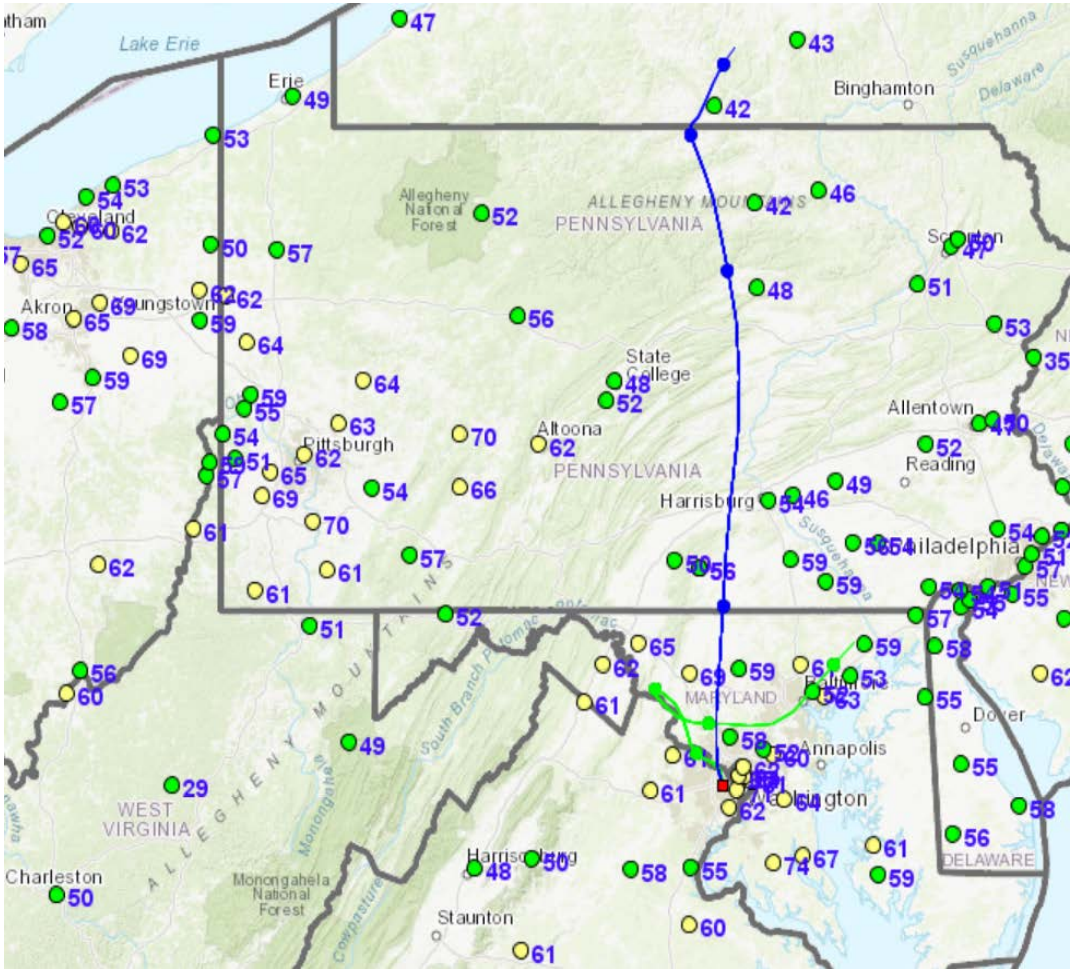
Local + Transport

High upwind ozone level

6/14 monitors exceeding standard

8-Hour Max Ozone = 74 ppb, McMilan & PG Eq Center

Wind Trajectory – August 5



500 m 1500 m

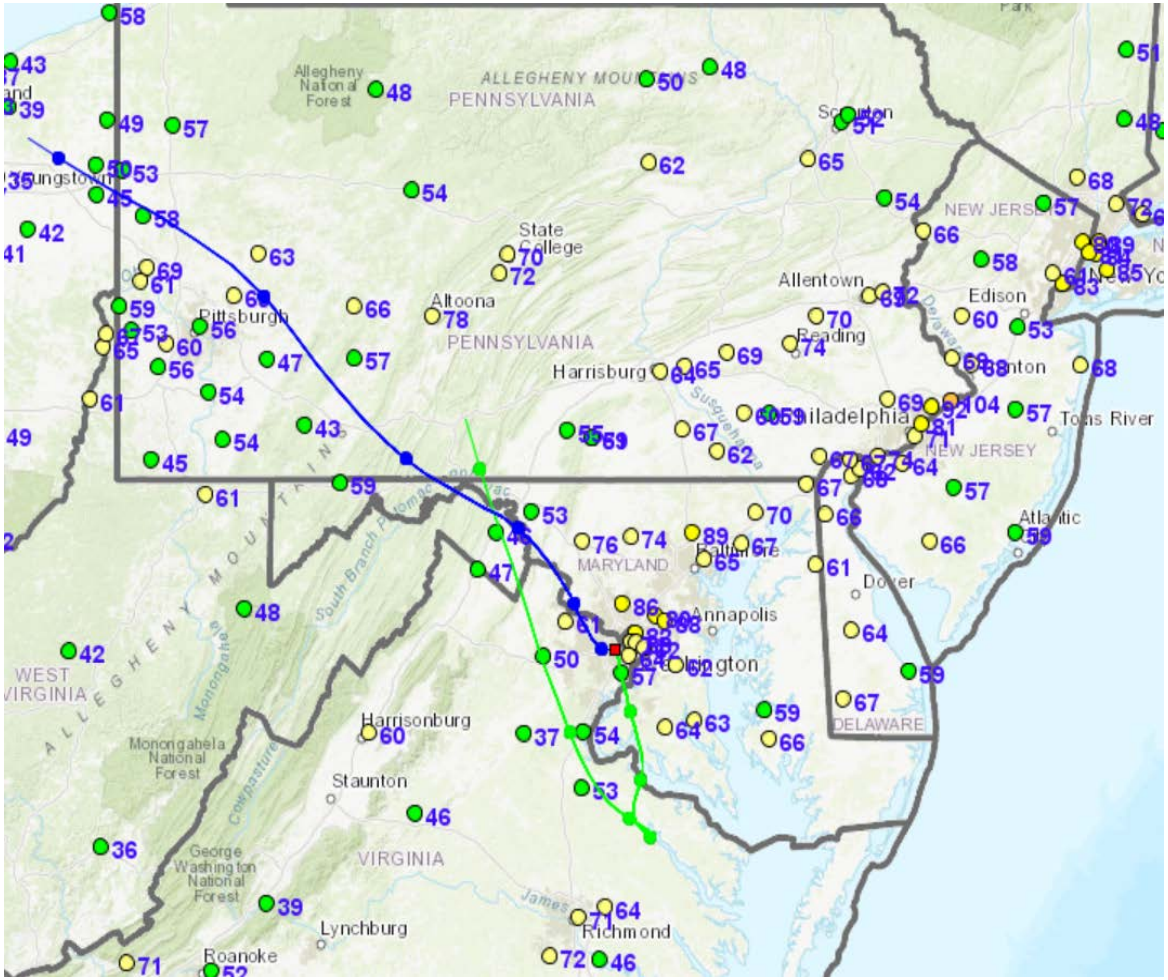
Local + Transport + Recirculation

Low upwind ozone level

1/14 monitors exceeding standard

8-Hour Max Ozone = 71 ppb, Arlington

Wind Trajectory – August 25



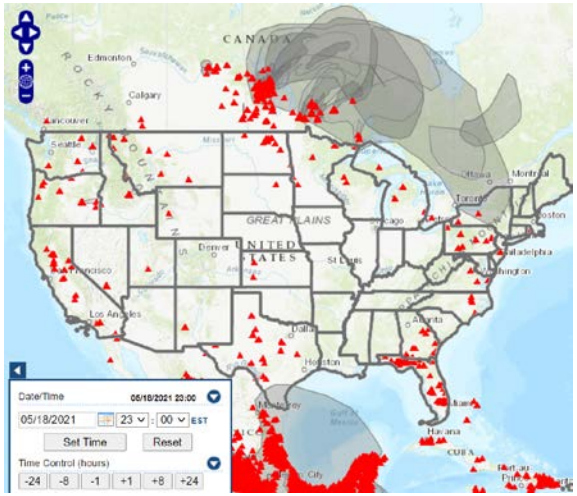
Local + Transport + Recirculation

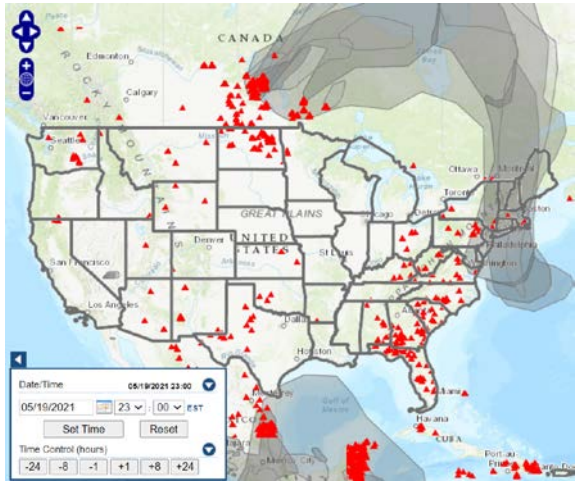
Moderate upwind Ozone level

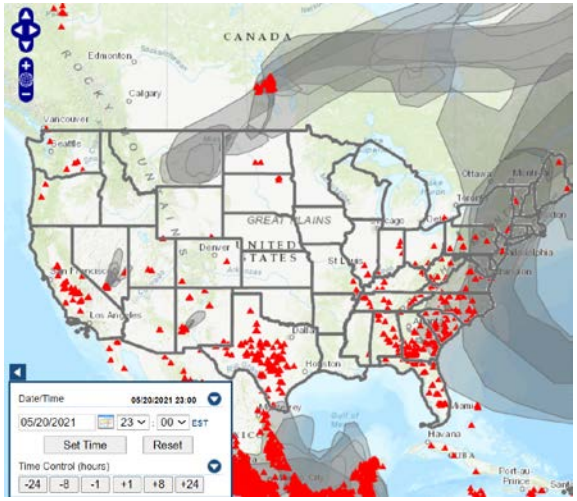
5/14 monitors exceeding standard

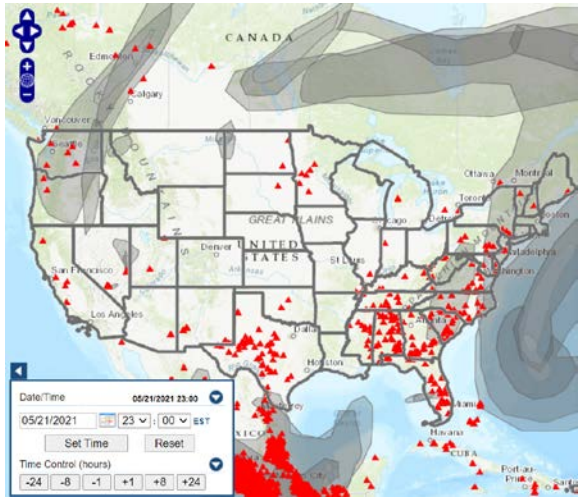
8-Hour Max Ozone = 80 ppb, Beltsville

Smoke Influence (May 18-21, 2021)

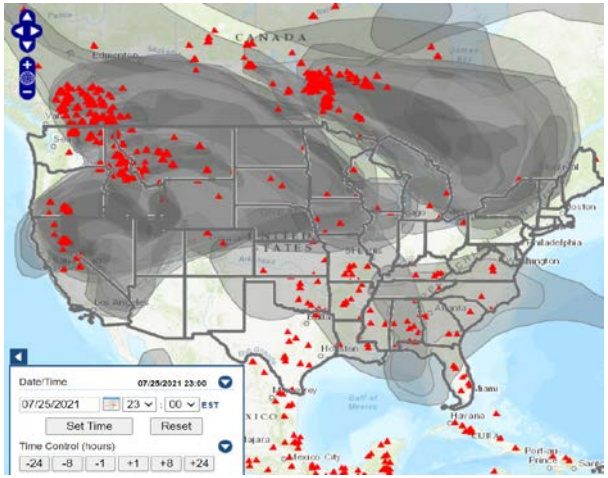


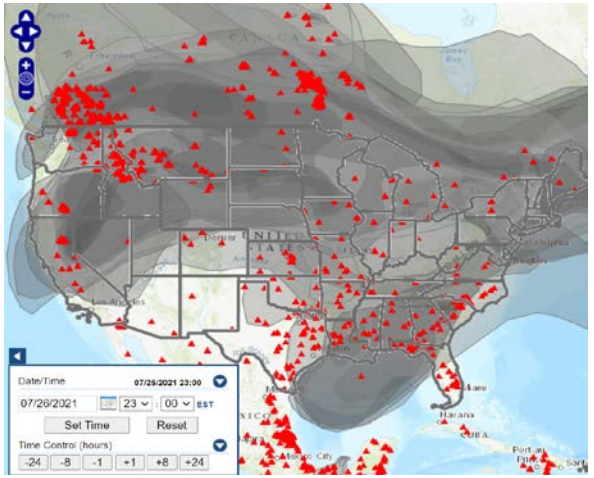


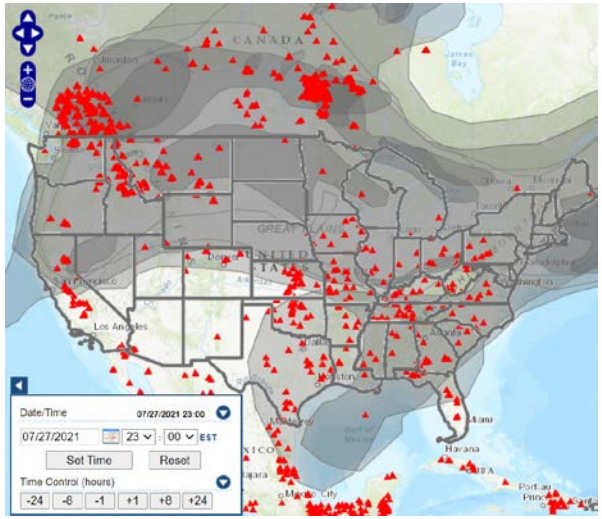


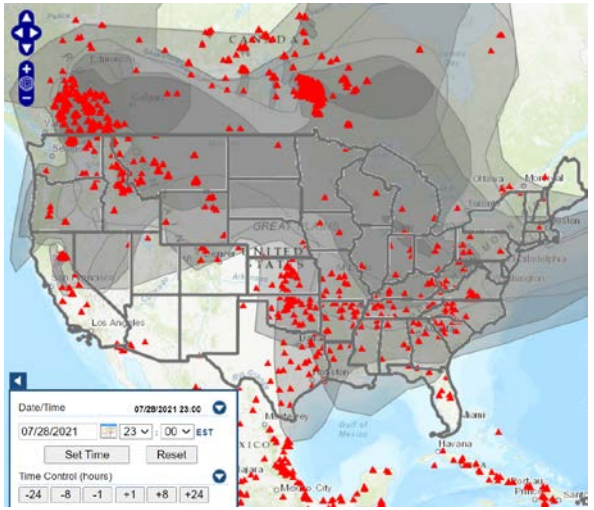


Smoke Influence (July 25-28, 2021)

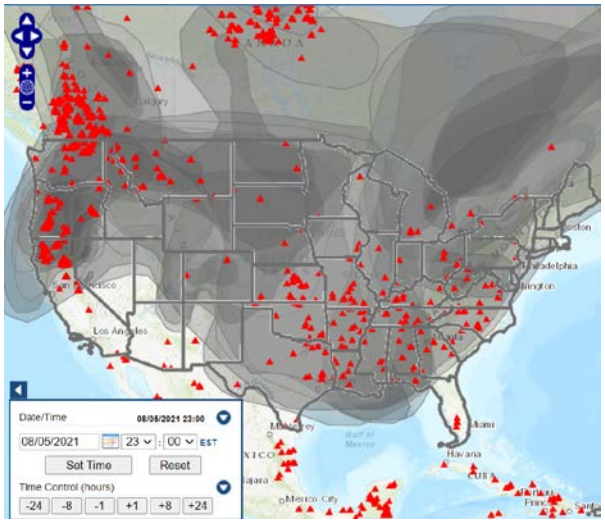


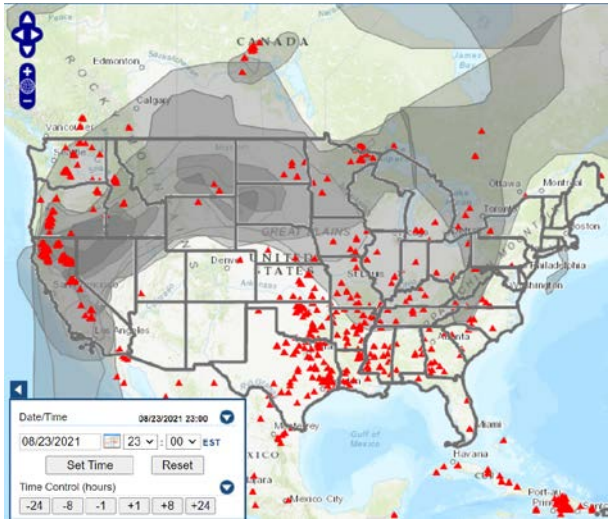


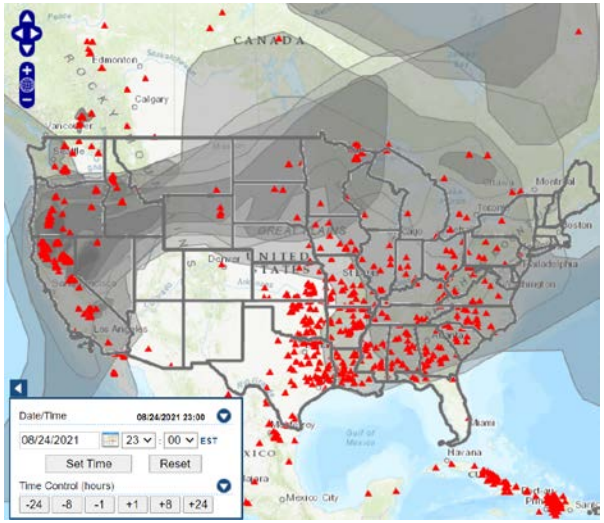


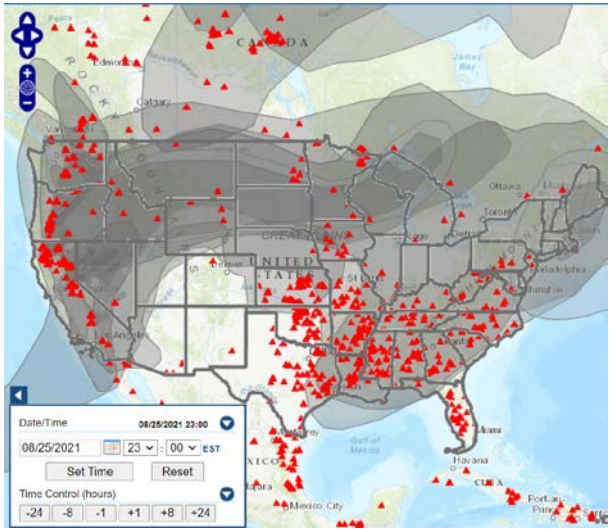


Smoke Influence (August 5, 23-25, 2021)









CONCLUSIONS

- Local and transported ozone (and precursors) caused exceedances in the Washington region on days when upwind ozone levels were high.
- Recirculation caused exceedances even on days when upwind ozone levels were low and raised ozone levels further on high ozone days.
- More smoke in 2021 compared to 2020 helped increase ozone and PM2.5 levels in 2021. July 27-28 exceedances were particularly influenced by heavy smoke.
- Exceedances can occur due to several factors (low wind, high temp, recirculation, high ozone transport, smoke, high emissions, etc.).
- 3 or less monitors exceeded on 6 out of 8 exceedance days. High ozone exceedances have been more localized in recent years.
- Beltsville (MD) and McMilan (DC) monitors are often the lead monitors in the region.