



**GEORGIA**  
DEPARTMENT OF NATURAL RESOURCES

ENVIRONMENTAL PROTECTION DIVISION

# Exceptional Events in Georgia

**Jim Boylan**  
Chief, Air Protection Branch

**EPA/MJOs Exceptional Events Wildfire  
and Prescribed Fire Smoke Workshop**  
St. Louis, MO  
February 28, 2024



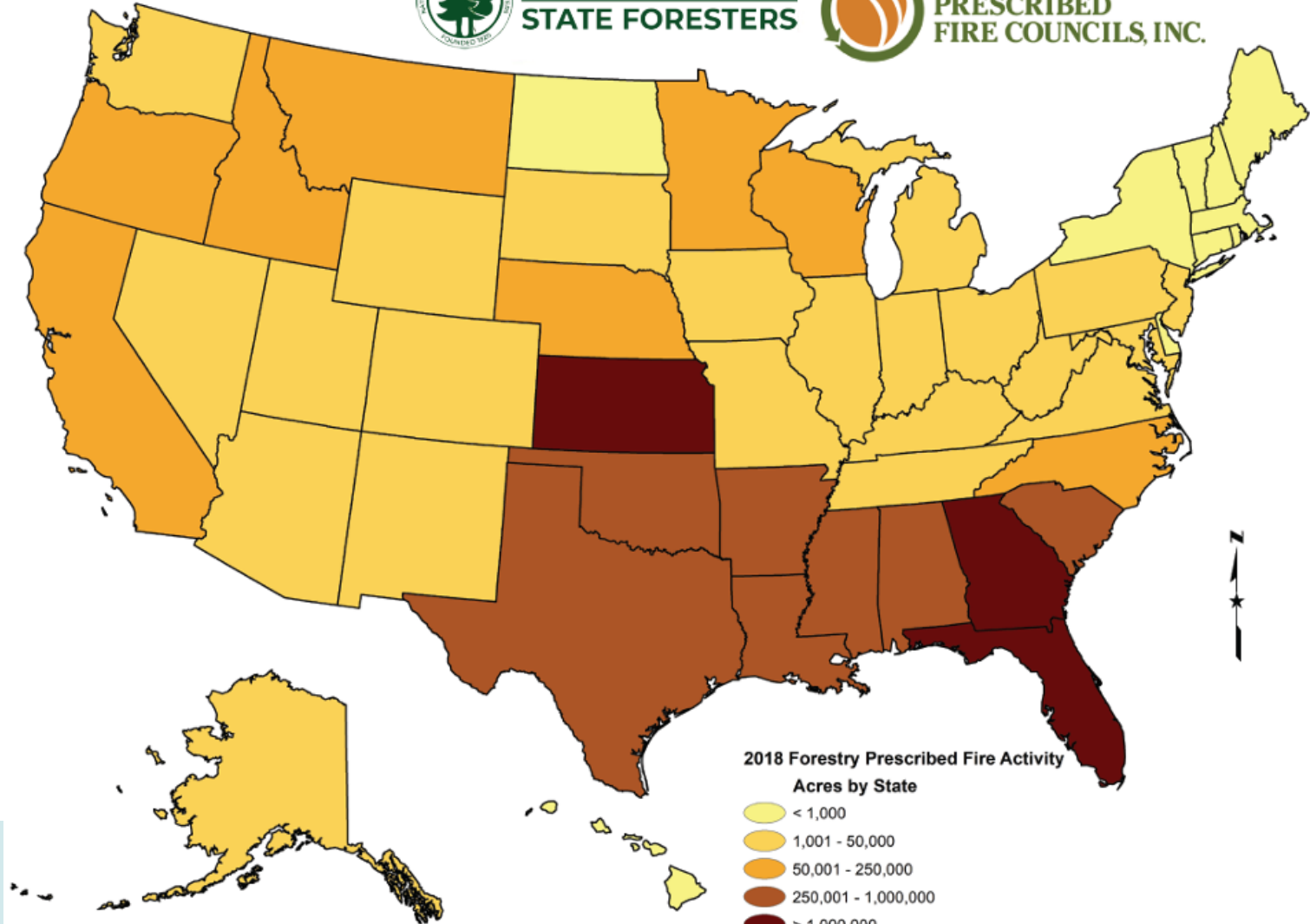
# PRESCRIBED FIRE ACRES



NATIONAL ASSOCIATION OF  
STATE FORESTERS



COALITION OF  
PRESCRIBED  
FIRE COUNCILS, INC.





# DESIGNATION RECOMMENDATIONS

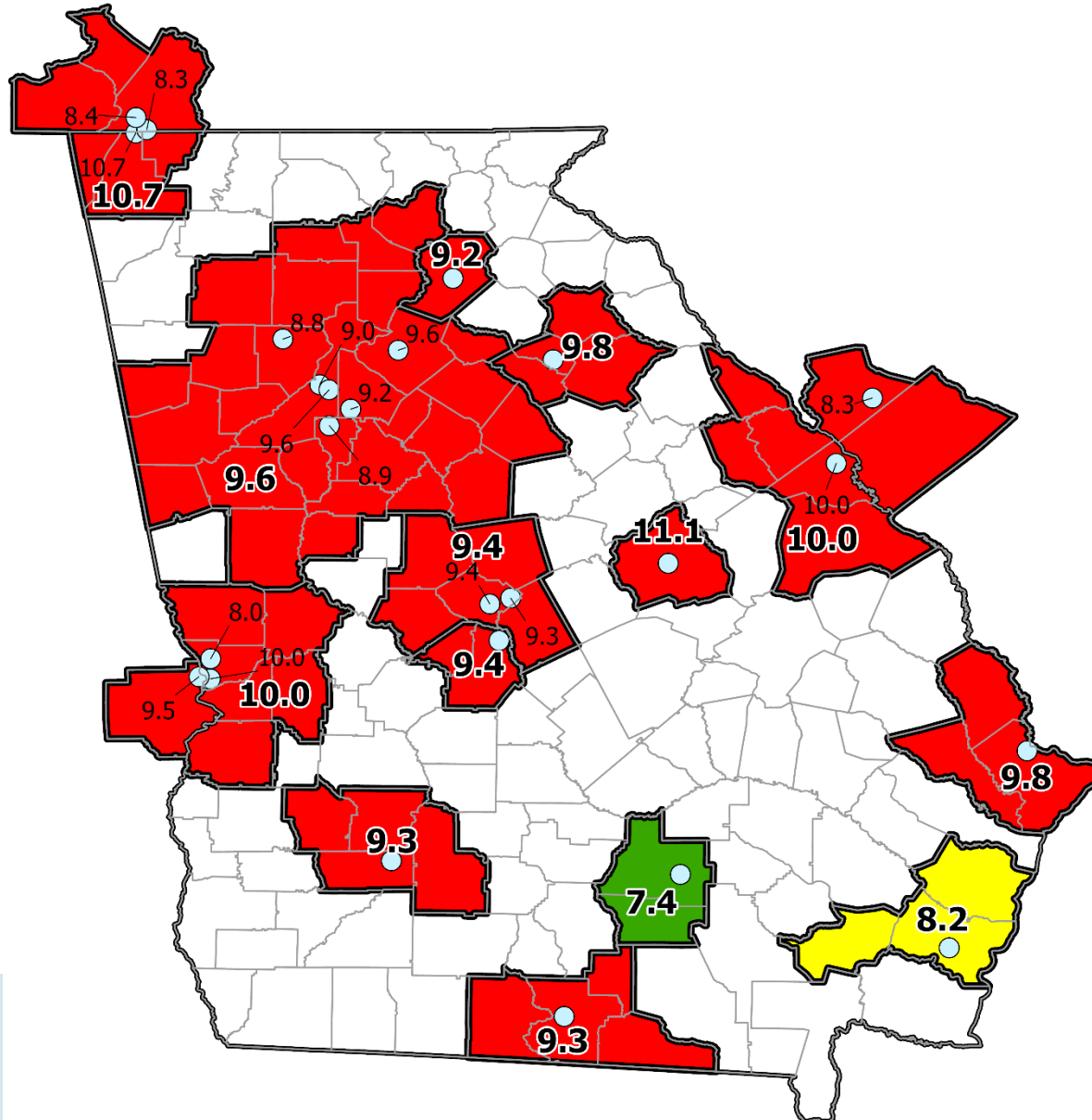


# ADJUSTMENT APPROACH

- Apply FEM bias adjustment factor to all FEM measurements prior to August 1, 2023 (Teledyne firmware install date in GA).
- Remove high  $PM_{2.5}$  events until 3-year (2021-2023) annual  $PM_{2.5}$  design value meets the NAAQS.
  - Focus on 2022 and 2023 events
  - Address EPA's five EE elements
- Submit exceptional events demonstrations for all days removed to EPA for approval.

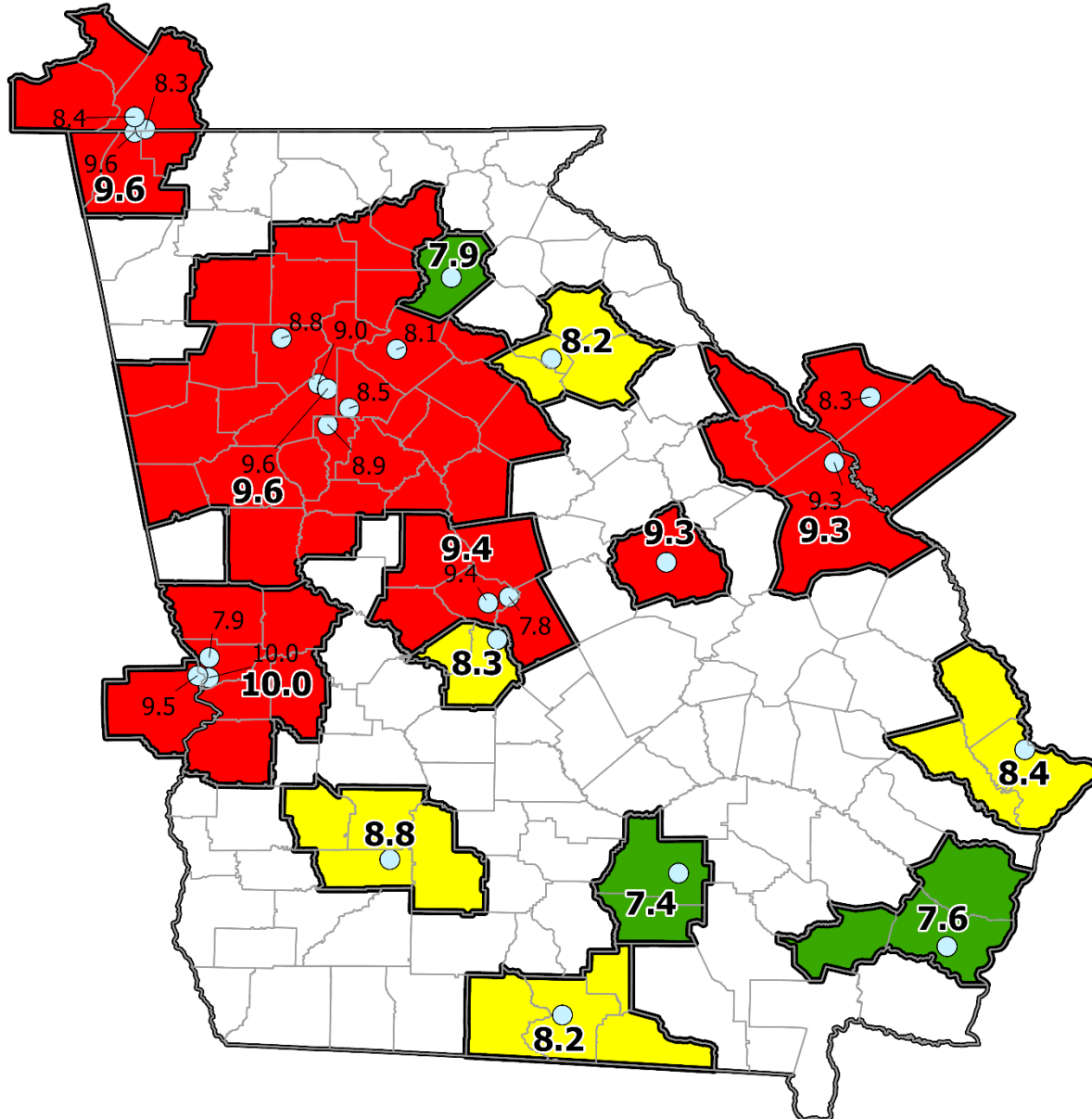


# 2021-2023 DESIGN VALUES



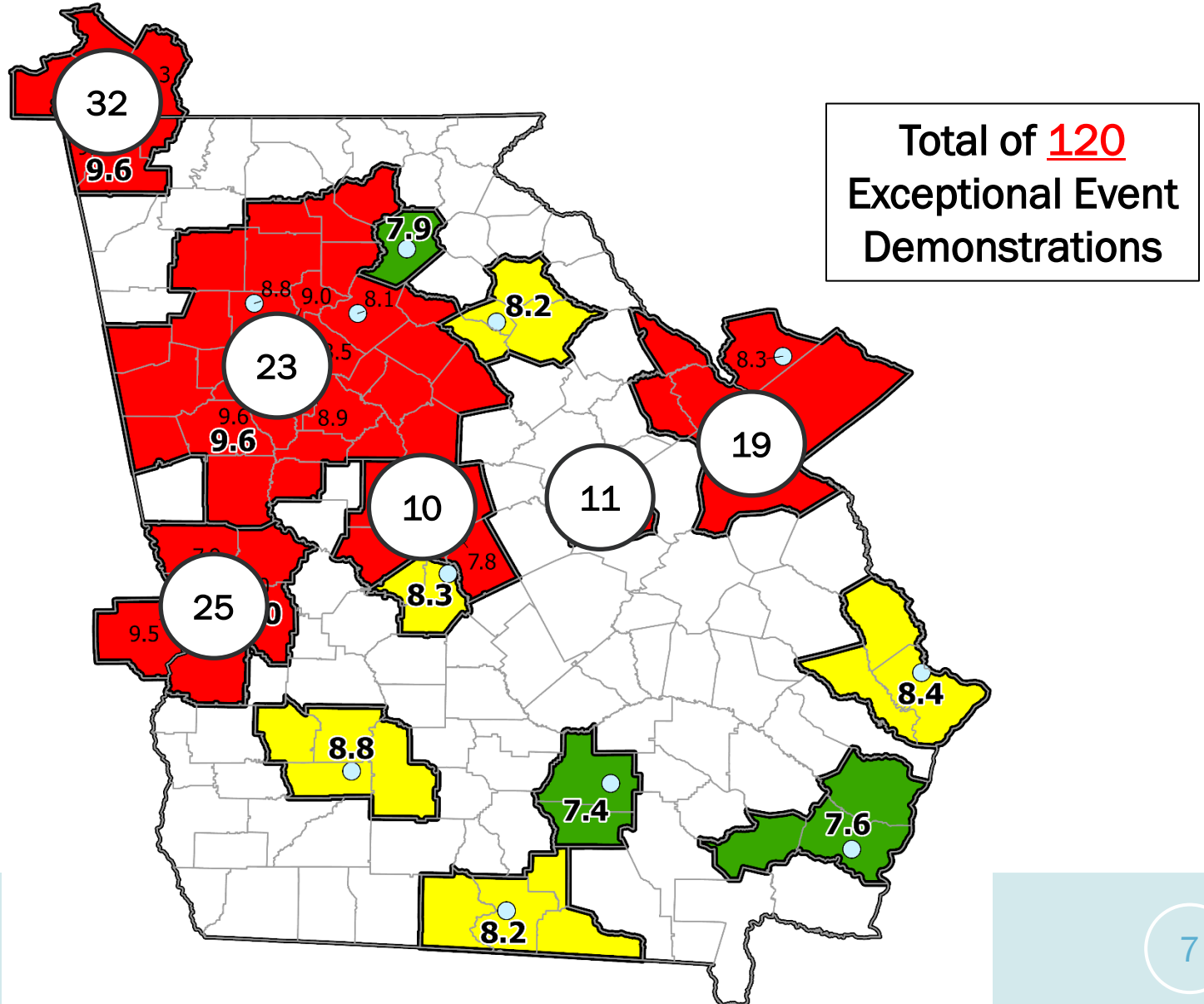


# ADJUSTED 2021-2023 DESIGN VALUES





# NUMBER OF EE DEMONSTRATIONS





# GFC PRESCRIBED BURNING

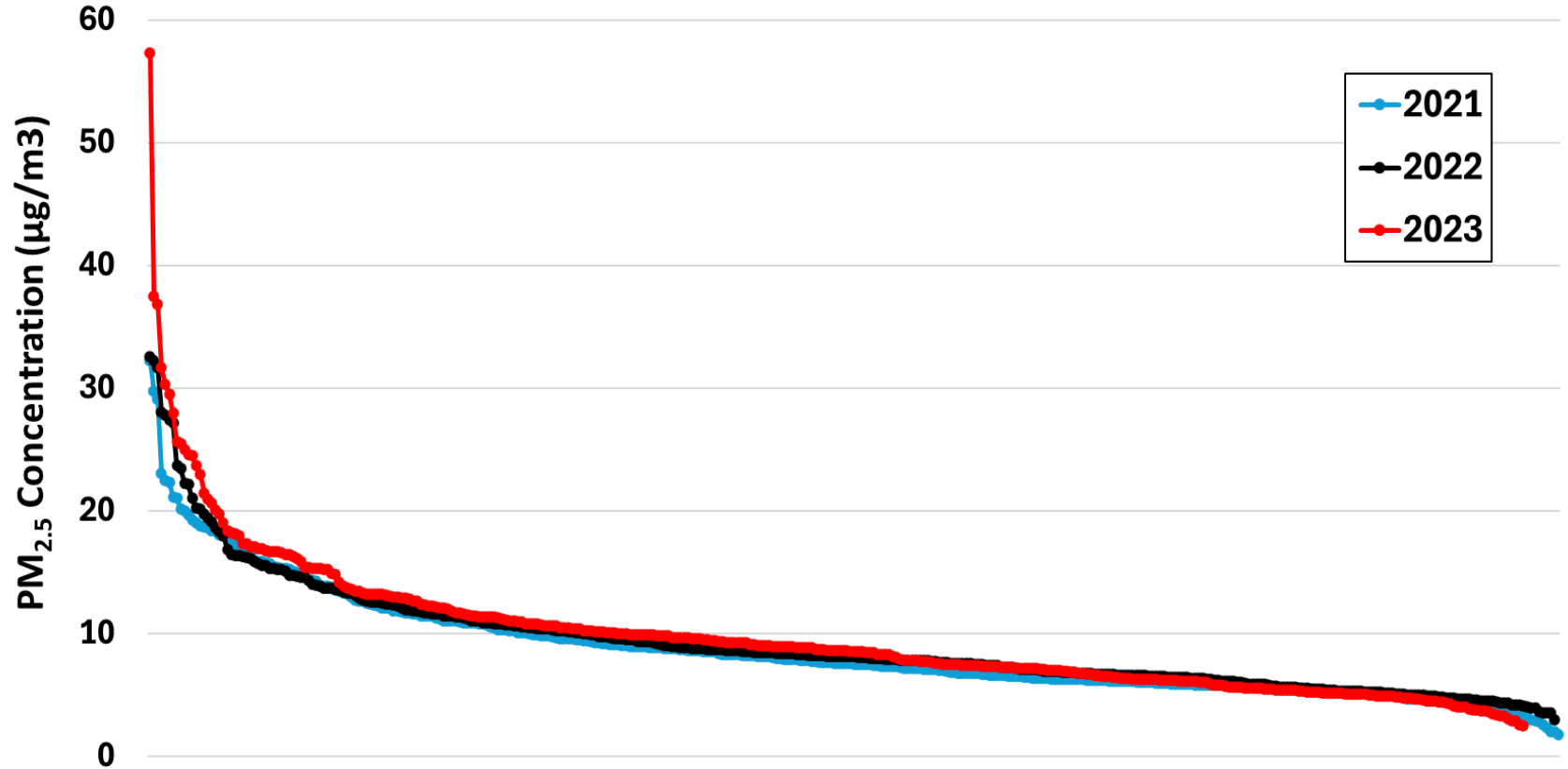
- Georgia has a certified Smoke Management Program.
- Georgia Forestry Commission (GFC) issues burn permits.
  - GFC restricts burning on poor dispersion days, on days when the wind is blowing towards sensitive locations, or poor air quality days (forecasted or measured).
  - Military bases do not require a burn permit.
- GFC would like to increase burn acres from 1.4M/year to 2.0M/year.
- EPD will need to submit ~60 EE demonstrations for 2023 and every year after forever...





# SANDERSVILLE 2021-2023

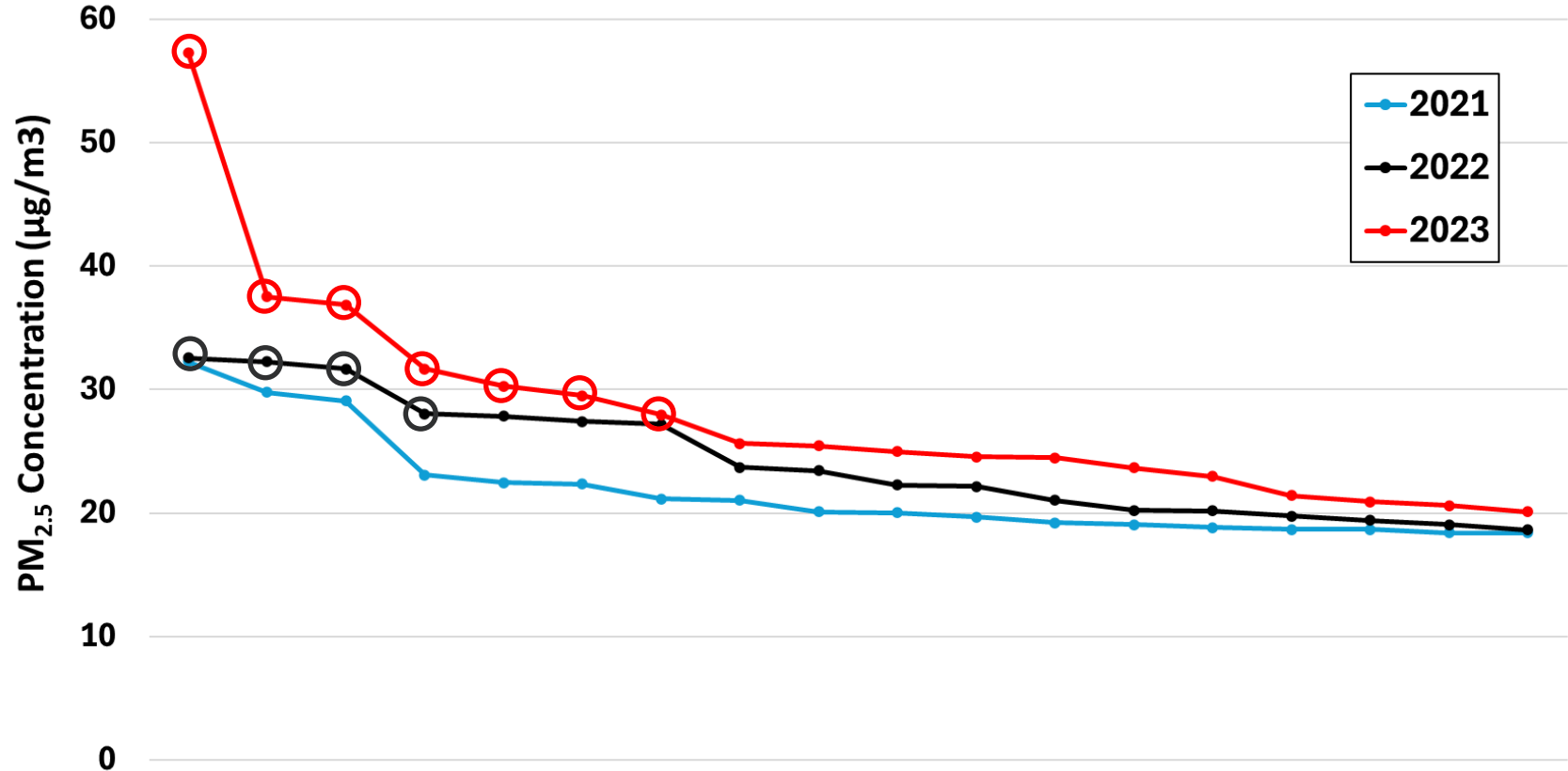
## FEM Adjusted PM<sub>2.5</sub> Concentrations





# SANDERSVILLE 2021-2023

## FEM Adjusted PM<sub>2.5</sub> Concentrations





# EXCEPTIONAL EVENT DAYS REMOVED

Date	Unadjusted 24-Hour Average ( $\mu\text{g}/\text{m}^3$ )	FEM Bias Adjusted 24-Hour Average ( $\mu\text{g}/\text{m}^3$ )
2022-01-31	40.02	32.58
2022-02-01	39.60	32.24
2022-02-15	38.89	31.67
2022-02-14	34.44	28.04

Date	Unadjusted 24-Hour Average ( $\mu\text{g}/\text{m}^3$ )	FEM Bias Adjusted 24-Hour Average ( $\mu\text{g}/\text{m}^3$ )
2023-03-08	70.38	57.31
2023-03-09	46.08	37.52
2023-07-18	45.28	36.86
2023-04-19	38.90	31.67
2023-07-17	37.20	30.29
2023-11-07	29.51	29.51
2023-01-11	34.33	27.95



# SANDERSVILLE DESIGN VALUES

Year	Unadjusted Annual Average ( $\mu\text{g}/\text{m}^3$ )	FEM Bias Adjusted Annual Average ( $\mu\text{g}/\text{m}^3$ )	Remove EE Annual Average ( $\mu\text{g}/\text{m}^3$ )	# EE Days Removed
2021	10.74	8.74	8.74	0
2022	11.35	9.24	9.00	4
2023	11.15	9.76	9.23	7
<b>AVERAGE</b>	<b>11.1</b>	<b>9.3</b>	<b>9.0</b>	

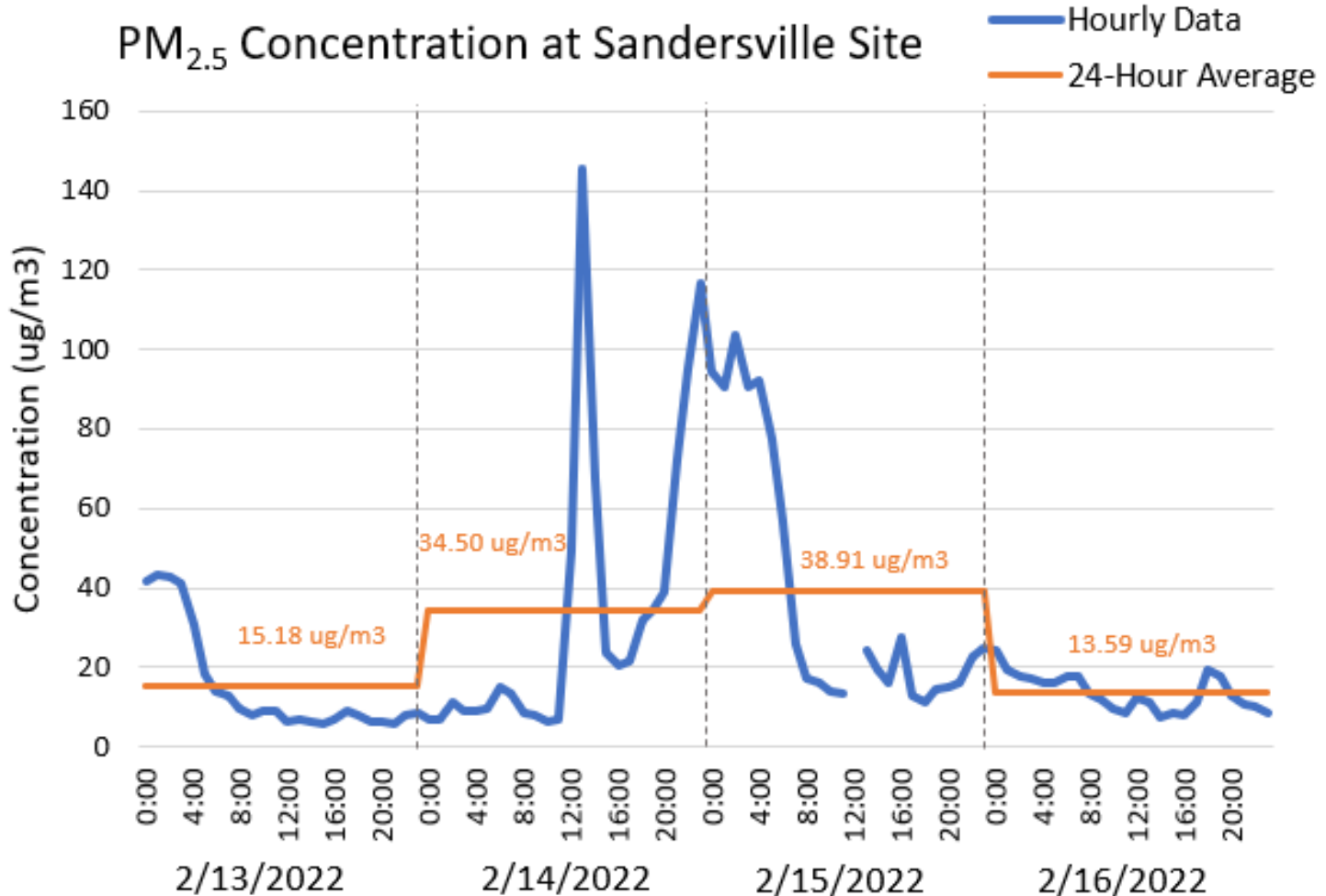


# **SANDERSVILLE**

## **FEBRUARY 14-15, 2022**

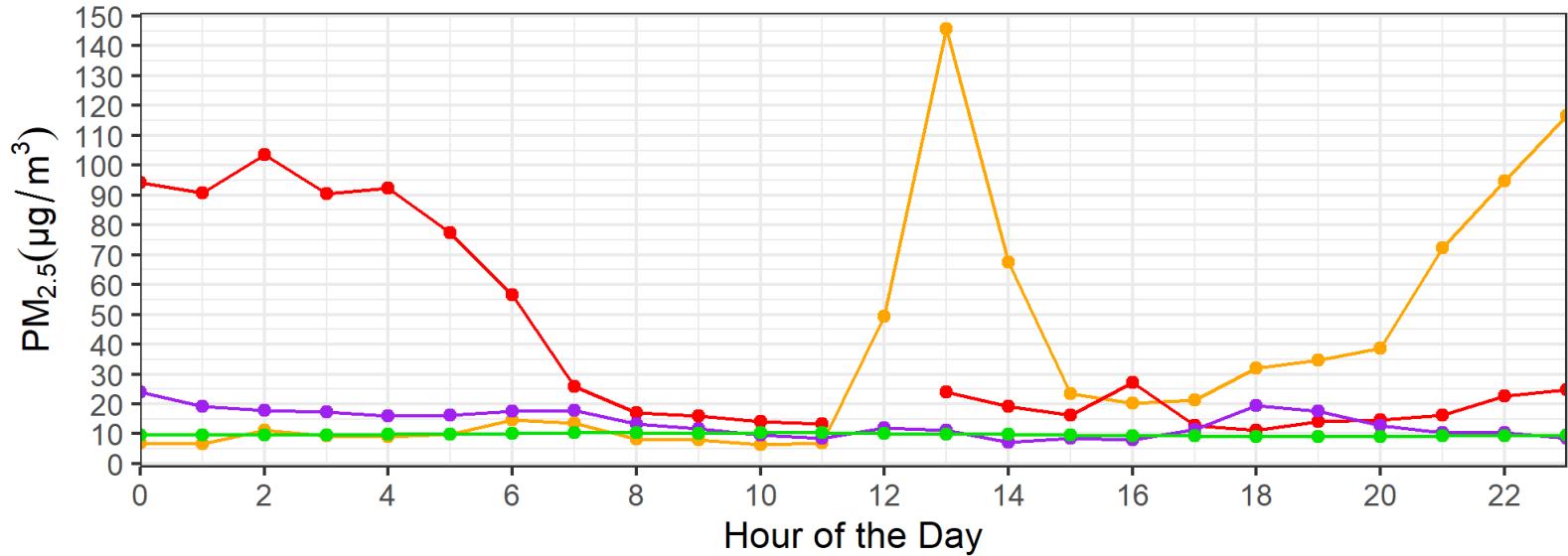


# TIME SERIES





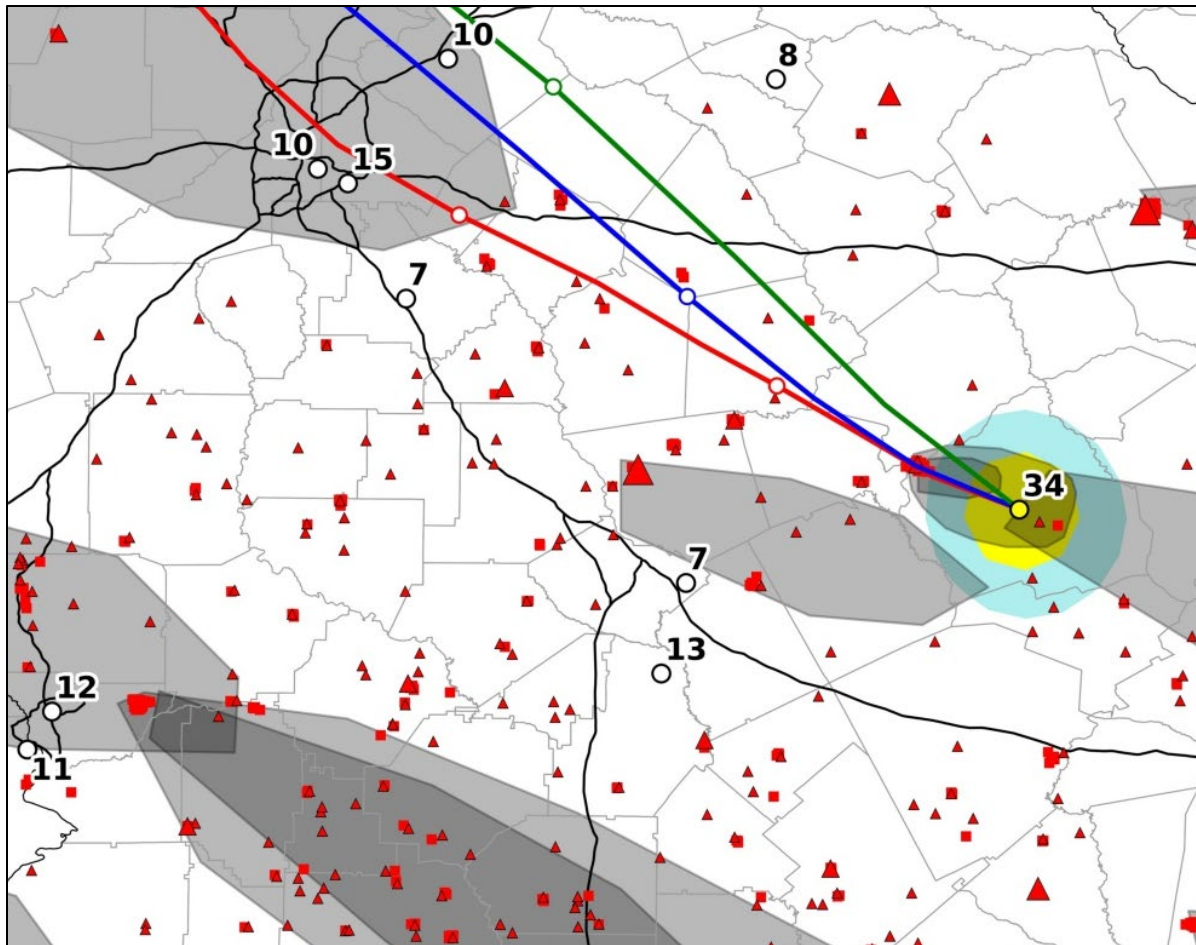
# COMPARISON TO SEASONAL AVERAGE



- February 14, 2022
- February 15, 2022
- February 16, 2022
- Seasonal Average



# TRAJECTORIES, HMS, BURN PERMITS



**24-Hour PM<sub>2.5</sub> ( $\mu\text{g}/\text{m}^3$ )**

- $\geq 41$
- 36 - 40
- 31 - 35
- 26 - 30
- $\leq 25$

**Burns Reported to GFC (acres)**

- ▲  $\leq 100$
- ▲ 101 - 200
- ▲ 201 - 500
- ▲ 501 - 1000
- ▲  $\geq 1001$

**HYSPLIT trajectories**

- 100m
- 500m
- 1000m

**HMS**

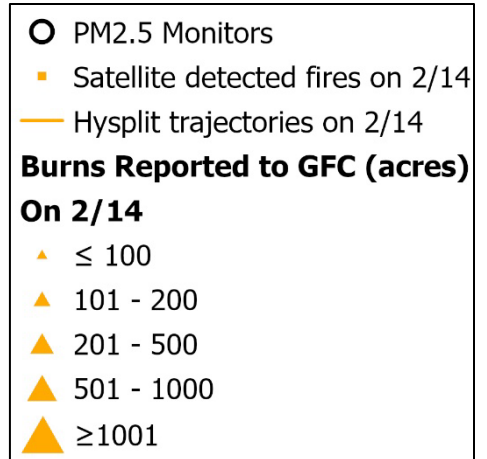
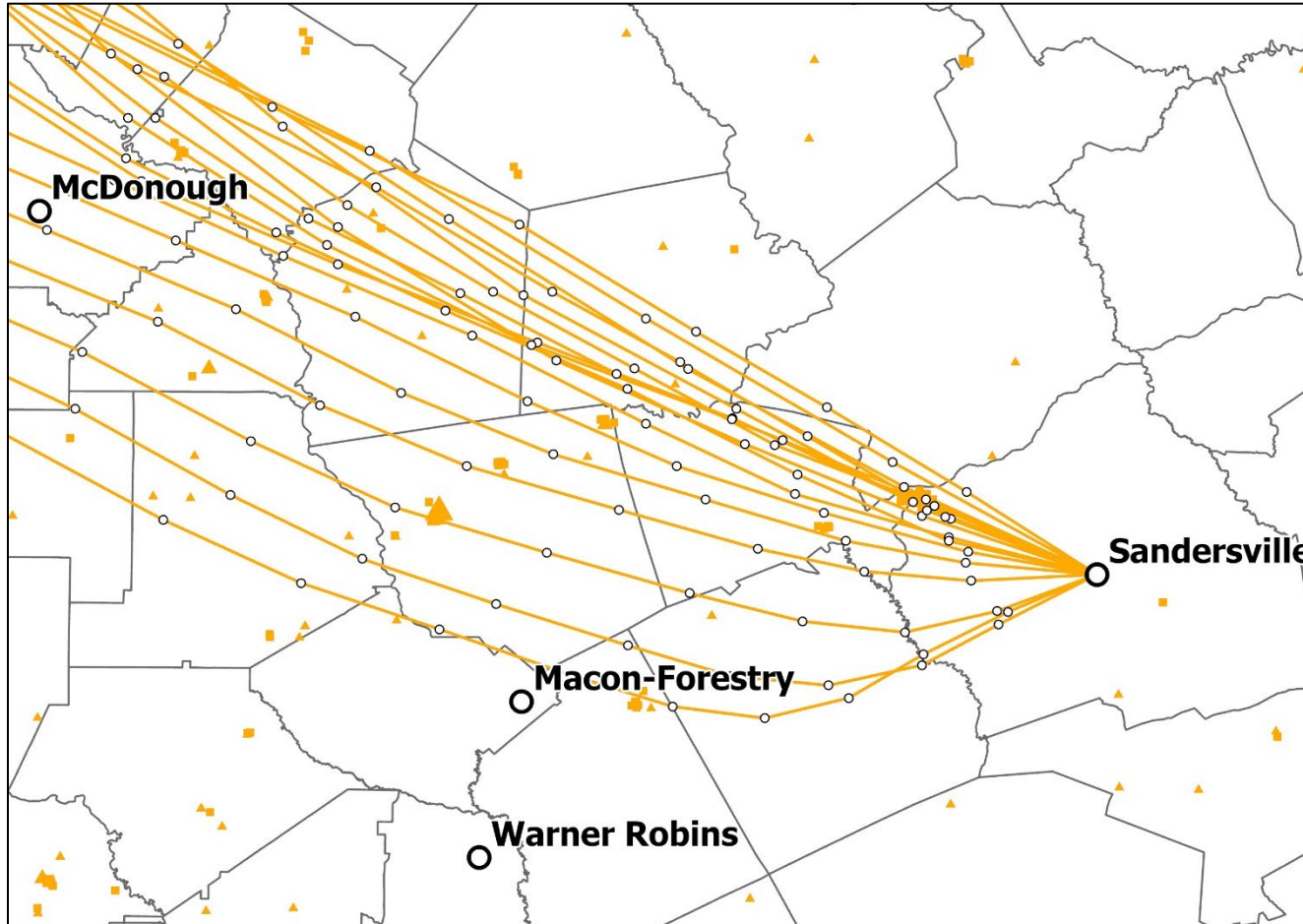
- Satellite detected fires on 02/14
- Satellite detected smoke on 02/14

**February 14 at 1:00 PM**



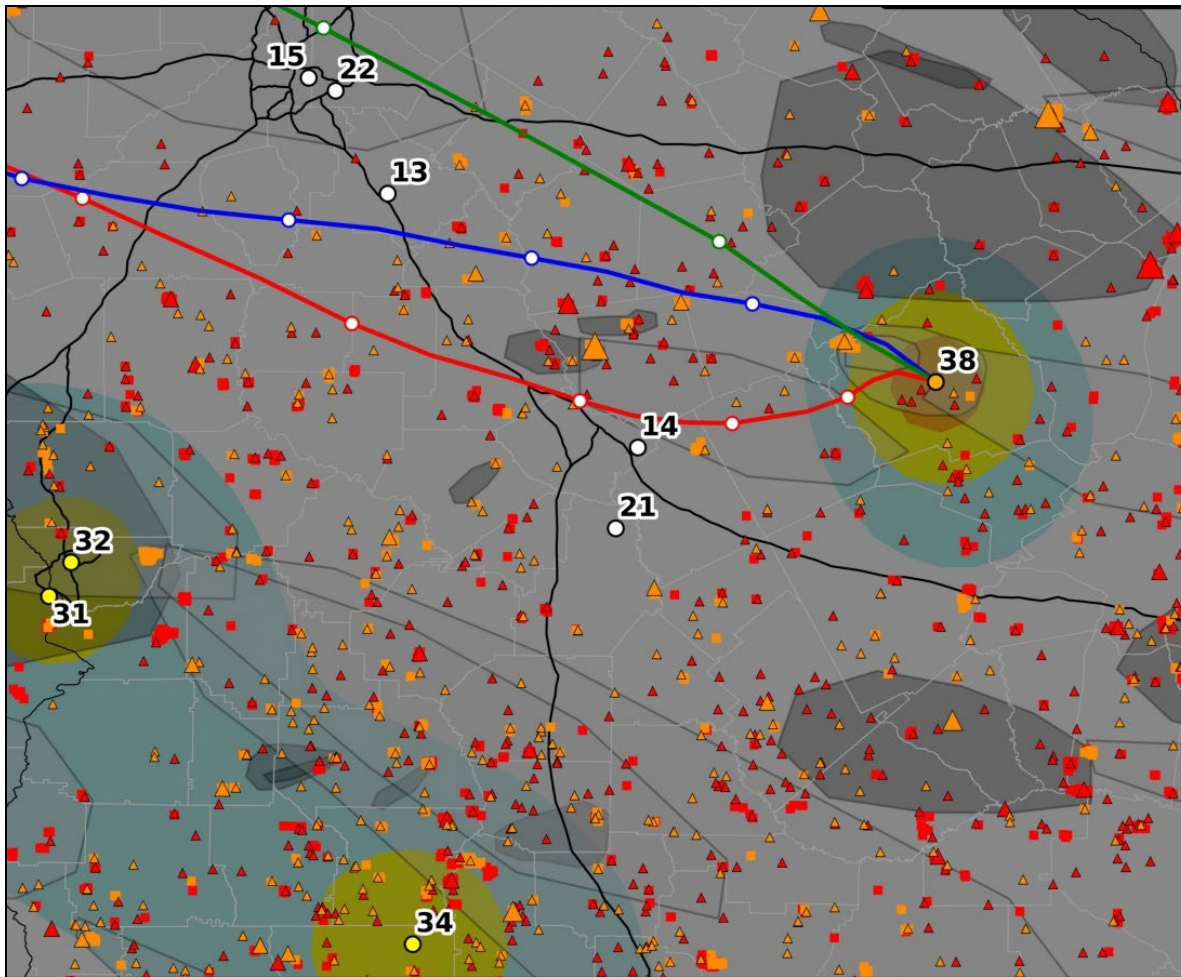


# TRAJECTORIES AND BURN PERMITS





# TRAJECTORIES, HMS, BURN PERMITS



**24-Hour PM<sub>2.5</sub> (µg/m<sup>3</sup>)**

- ≥ 41
- 36 - 40
- 31 - 35
- 26 - 30
- ≤ 25

**Burns Reported to GFC (acres)**

On 02/15	On 02/14
▲ ≤ 100	▲ ≤ 100
▲ 101 - 200	▲ 101 - 200
▲ 201 - 500	▲ 201 - 500
▲ 501 - 1000	▲ 501 - 1000
▲ ≥ 1001	▲ ≥ 1001

**HYSPLIT trajectories**

- 100m
- 500m
- 1000m

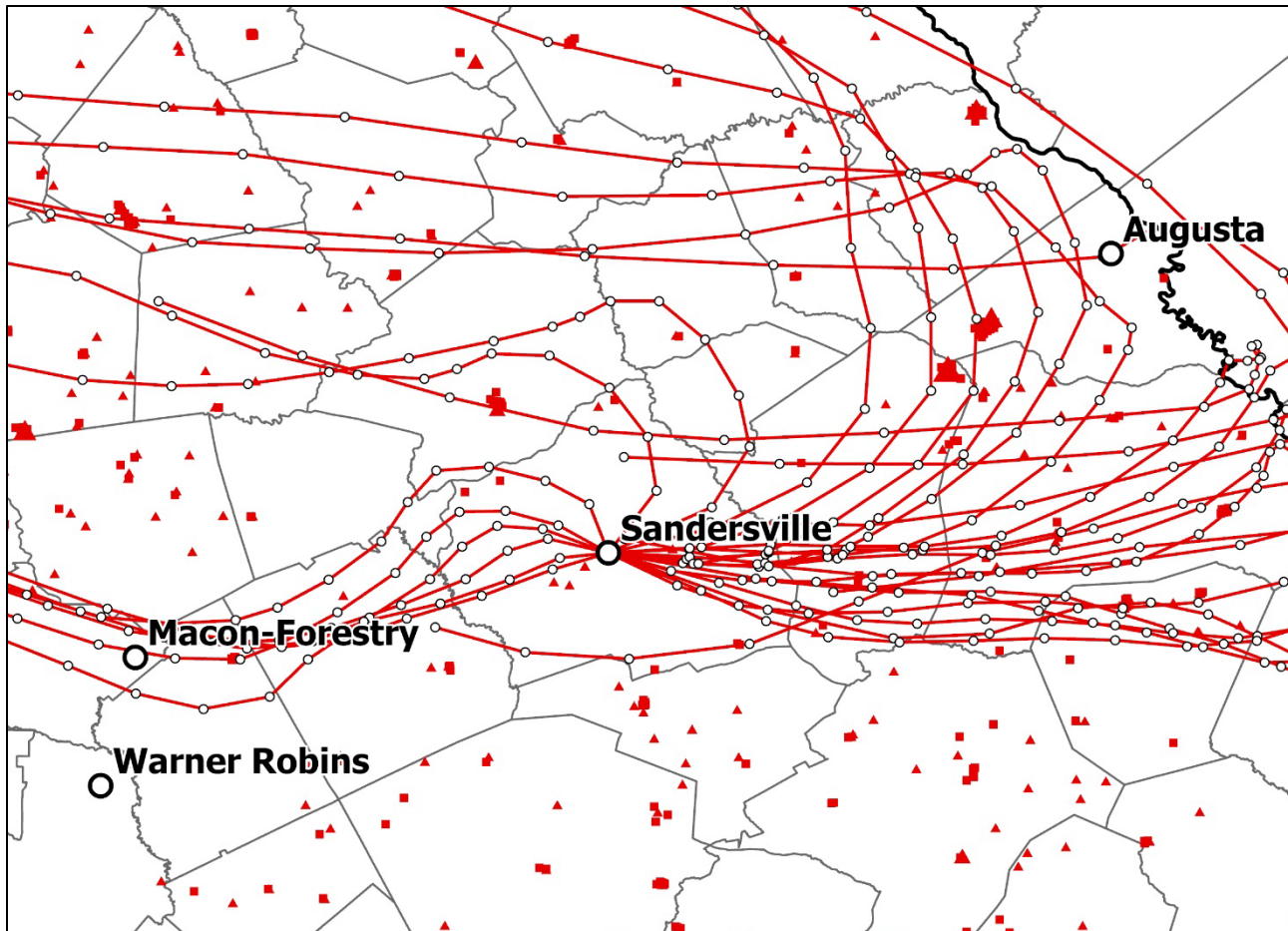
**HMS**

- Satellite detected fires on 02/15
- Satellite detected fires on 02/14
- Satellite detected smoke on 02/15
- Satellite detected smoke on 02/14

**February 15 at 2:00 AM**

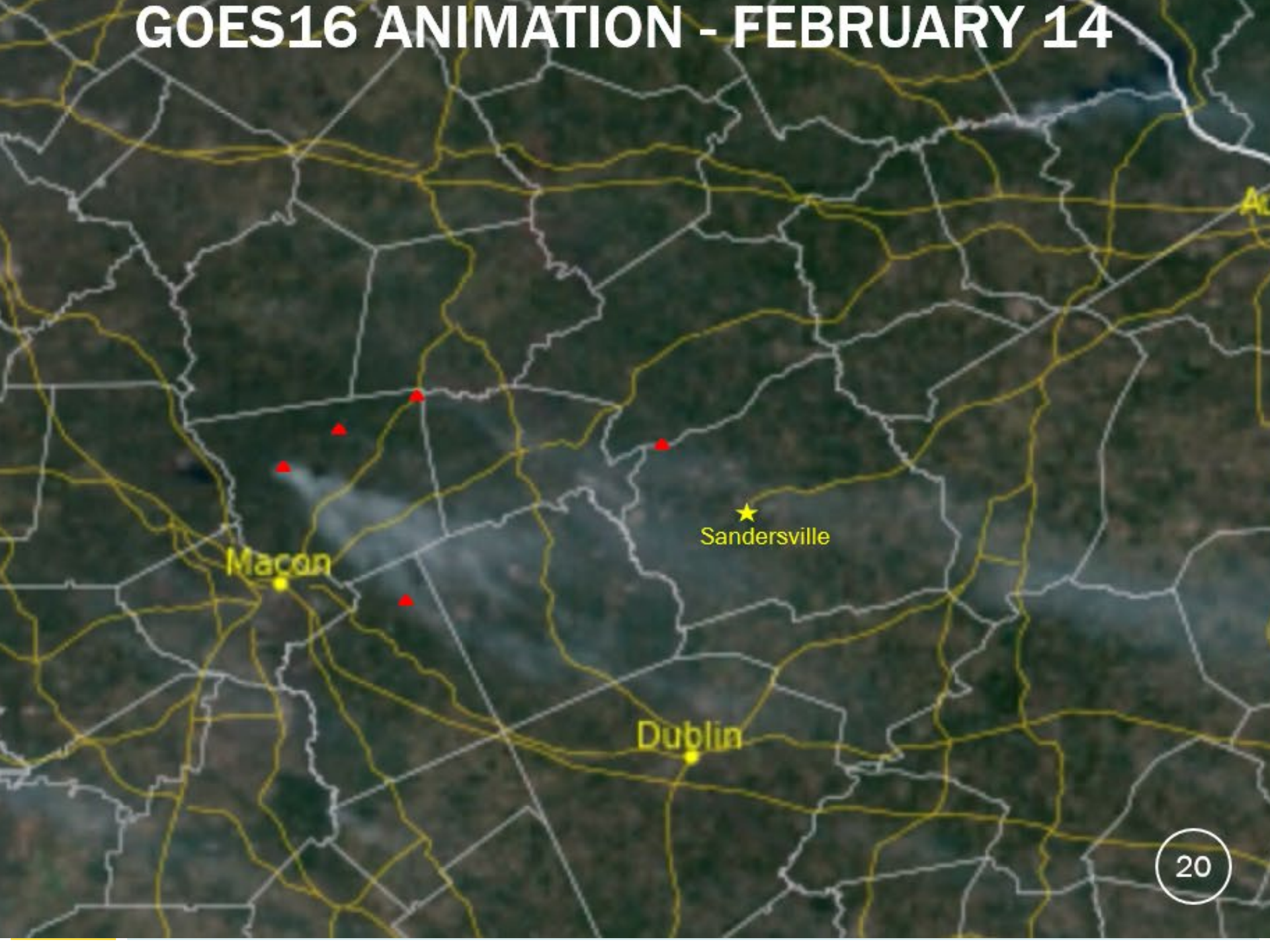


# TRAJECTORIES AND BURN PERMITS



- PM2.5 Monitors
- Satellite detected fires on 2/15
- Hysplit trajectories on 2/15
- Burns Reported to GFC (acres)**
- On 2/15**
- ▲ ≤ 100
- ▲ 101 - 200
- ▲ 201 - 500
- ▲ 501 - 1000
- ▲ ≥1001

# GOES16 ANIMATION - FEBRUARY 14



Macon

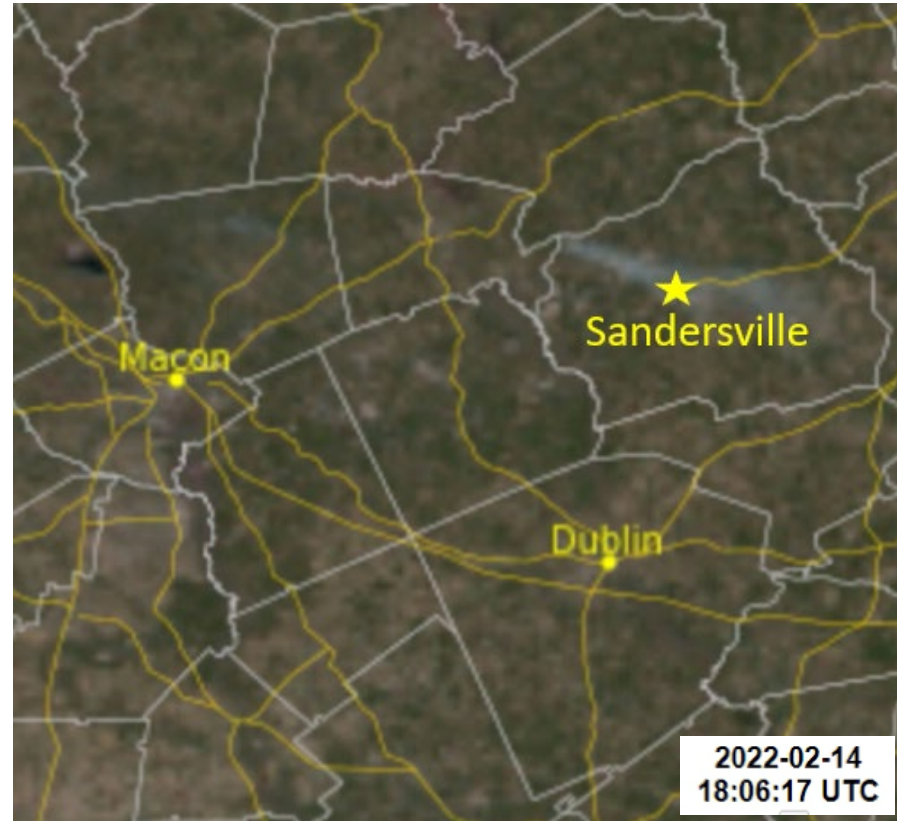
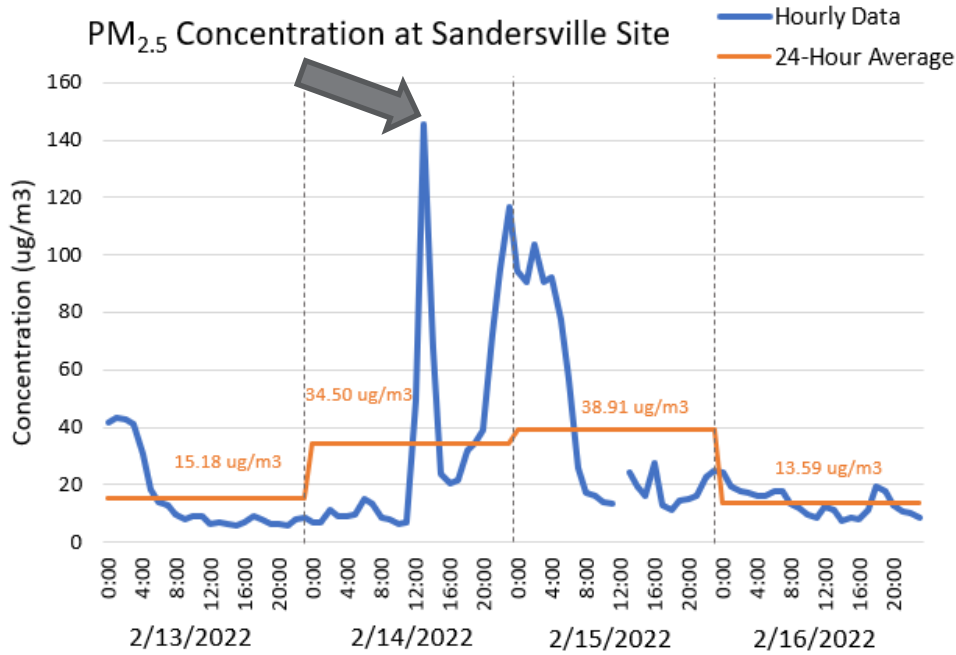
Sandersville

Dublin



# SANDERSVILLE - FEBRUARY 14 , 2022

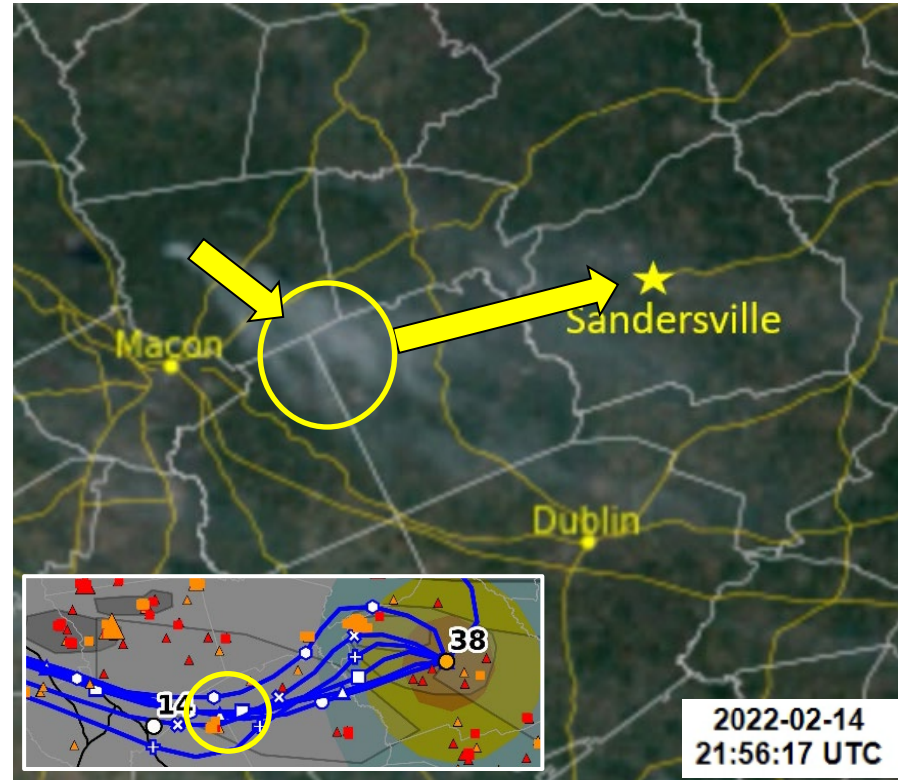
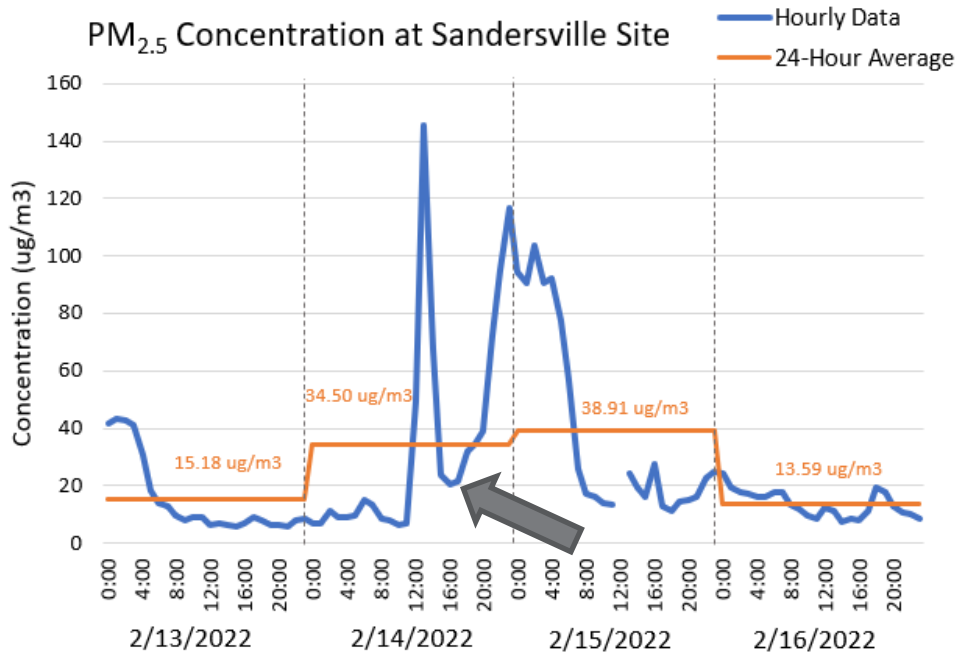
February 14, 1:06 PM





# SANDERSVILLE - FEBRUARY 14 , 2022

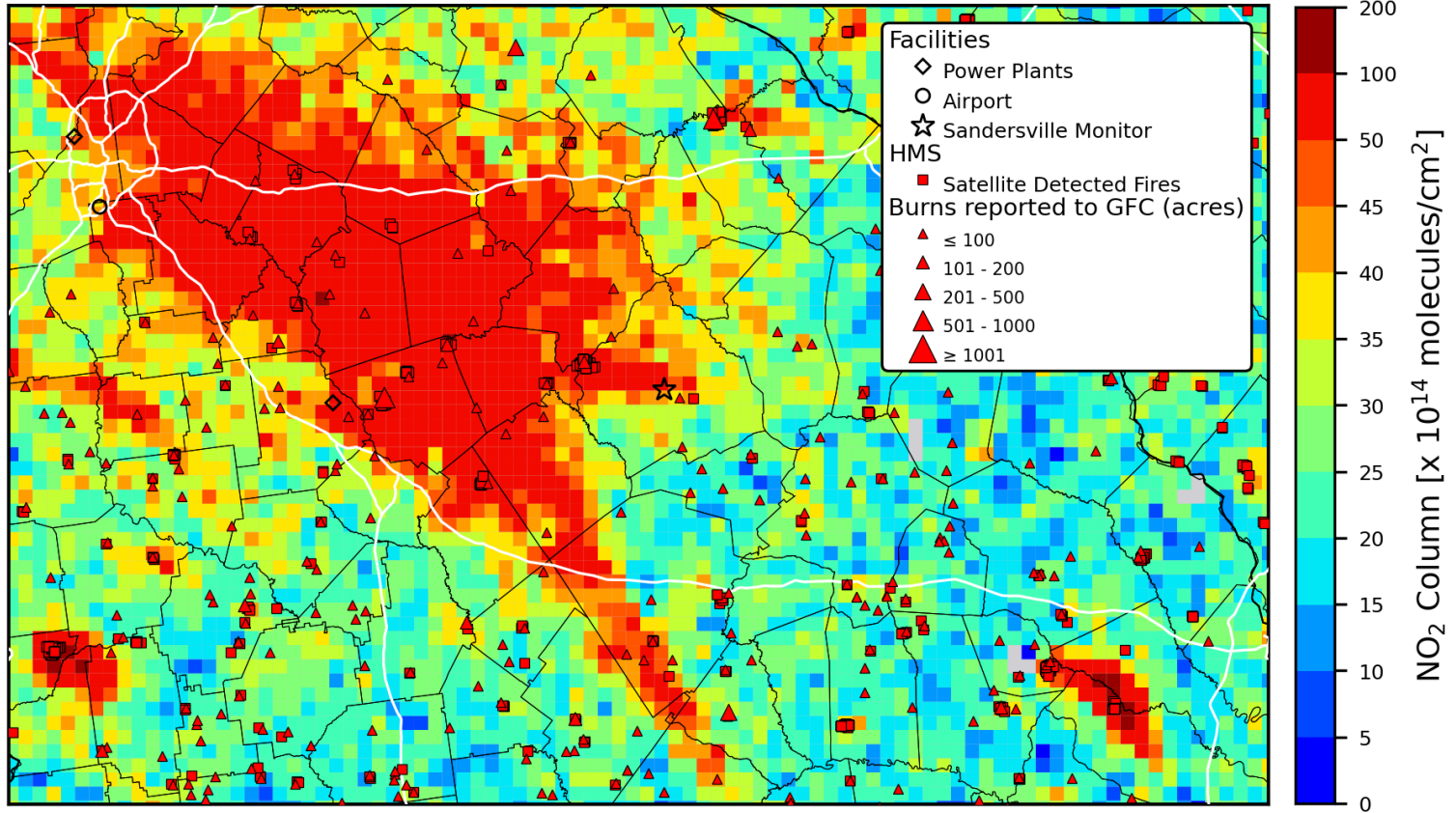
February 14, 3:56 PM





# TROPOMI NO<sub>2</sub> - FEBRUARY 14, 2022

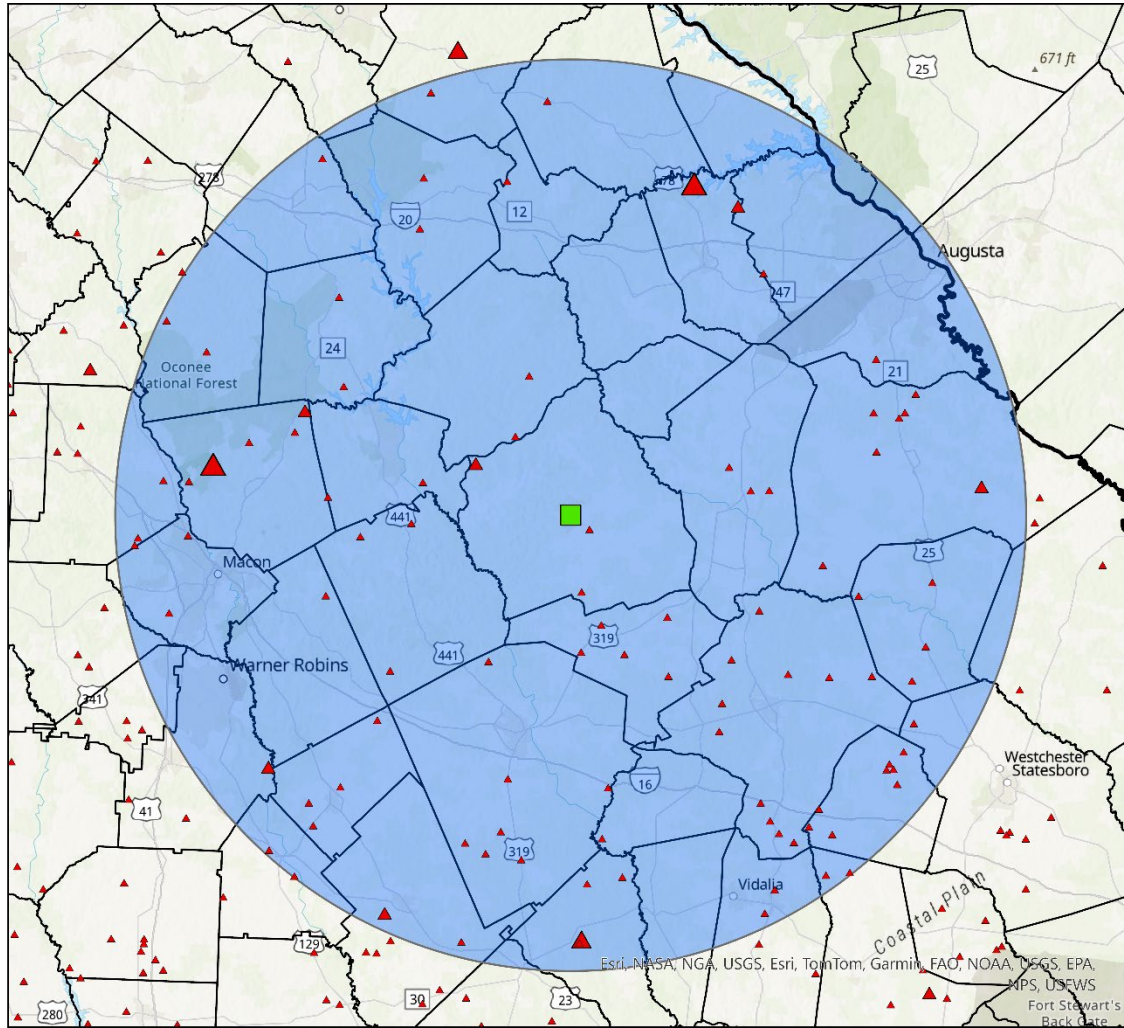
2022-02-14








1:30 PM EST



# GFC PERMITS - FEBRUARY 14, 2022



- Acres
-  ≤ 100
  -  101 - 200
  -  201 -500
  -  501 -1000
  -  ≥1001





# GFC PERMITS – FEBRUARY 14, 2022

## Top 20

COUNTY	SIZE	Burn_Purpose	LATITUDE	LONGITUDE
Jones	610	Silviculture	33.05586996	-83.64946724
Mcduffie	513	Silviculture	33.62945556	-82.52864167
Wheeler	300	Silviculture	32.13085963	-82.76524669
Burke	178	Silviculture	33.0354647	-81.84254273
Houston	176	Silviculture	32.45871362	-83.50279312
Dodge	175	Silviculture	32.17451051	-83.2241628
Jones	160	Silviculture	33.16473333	-83.43642778
Washington	150	Silviculture	33.0675871	-83.0321329
Mcduffie	110	Silviculture	33.58500983	-82.42389031
Tattnall	100	Agriculture	32.26333791	-82.1979173
Twiggs	100	Silviculture	32.7994666	-83.3775476
Monroe	100	Silviculture	32.8899525	-83.8283828
Jones	100	Silviculture	33.09904299	-83.5660269
Toombs	100	Silviculture	32.23339655	-82.31679178
Laurens	90	Silviculture	32.2853189	-82.9084566
Baldwin	81	Silviculture	33.02804769	-83.15559807
Emanuel	76	Silviculture	32.54512838	-82.45107522
Emanuel	75	Silviculture	32.60075505	-82.4454209
Putnam	65	Land Clearing	33.3905891	-83.3622145
Monroe	60	Silviculture	33.01961111	-83.76498611

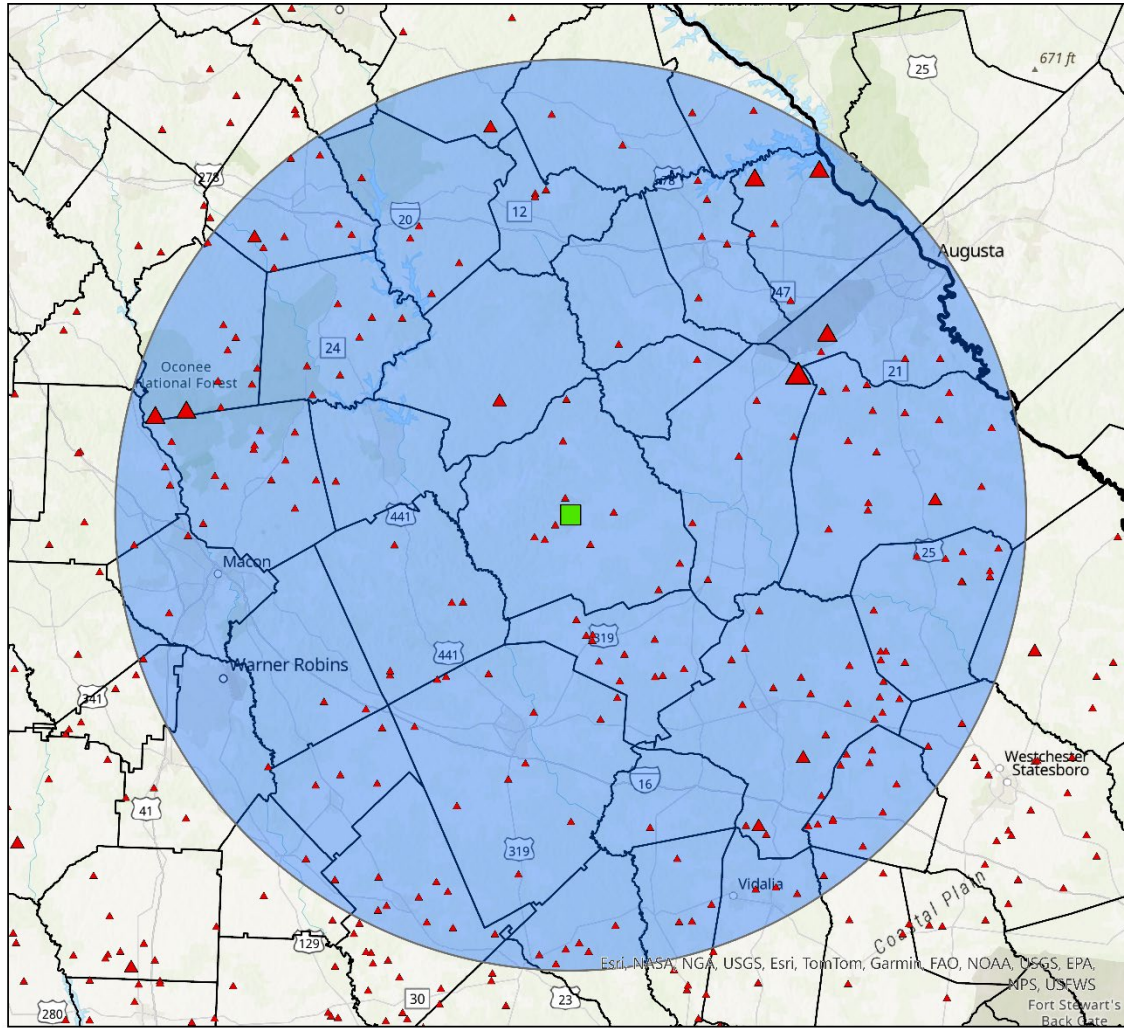
## Bottom 20






COUNTY	SIZE	Burn_Purpose	LATITUDE	LONGITUDE
Hancock	2	Land Clearing	33.12209313	-82.94030162
Toombs	2	Silviculture	32.18670019	-82.33943488
Candler	2	Agriculture	32.47340351	-82.05904372
Jones	1	Land Clearing	33.1214944	-83.45910935
Laurens	1	Silviculture	32.29594504	-82.99188602
Candler	1	Land Clearing	32.5088926	-82.0194364
Laurens	1	Land Clearing	32.44466475	-82.94317169
Emanuel	1	Land Clearing	32.3275789	-82.2735341
Bibb	1	Land Clearing	32.91197664	-83.70384959
Burke	1	Land Clearing	33.16960301	-82.03784217
Jefferson	1	Land Clearing	33.06817504	-82.43631337
Greene	1	Land Clearing	33.6298167	-83.1682649
Jenkins	1	Land Clearing	32.81644766	-82.12885796
Pulaski	1	Silviculture	32.2938868	-83.4965858
Monroe	1	Land Clearing	32.90466884	-83.82116405
Laurens	1	Land Clearing	32.4308006	-82.7088315
Bleckley	1	Silviculture	32.34435074	-83.39492223
Emanuel	0.5	Agriculture	32.36934204	-82.32976799
Wilkinson	0.5	Silviculture	32.918108	-83.2997279
Emanuel	0.5	Agriculture	32.6578591	-82.0955841

Total of 100 GFC permits issues in 100 km radius.



# GFC PERMITS - FEBRUARY 15, 2022



- Acres
-  ≤ 100
  -  101 - 200
  -  201 -500
  -  501 -1000
  -  ≥1001



# GFC PERMITS – FEBRUARY 15, 2022

## Top 20

COUNTY	SIZE	Burn_Purpose	LATITUDE	LONGITUDE
Jefferson	650	Silviculture	33.25766201	-82.2768854
Richmond	468	Silviculture	33.3376	-82.2092
Columbia	227	Silviculture	33.661599	-82.2326544
Jasper	203	Silviculture	33.16174677	-83.7157592
Jasper	203	Silviculture	33.16174677	-83.7157592
Emanuel	200	Silviculture	32.49771944	-82.2543111
Hancock	150	Silviculture	33.194256	-82.9792846
Oglethorpe	140	Silviculture	33.73521273	-83.0130749
Morgan	135	Silviculture	33.50802083	-83.5650609
Emanuel	120	Silviculture	32.36137778	-82.3561472
Candler	100	Silviculture	32.3600635	-82.2403231
Washington	100	Silviculture	32.91926324	-82.8667001
Monroe	95	Silviculture	33.04679655	-83.7615599
Wilkes	90	Silviculture	33.70246718	-82.6994377
Tattnall	80	Agriculture	32.26237482	-82.2029487
Monroe	80	Silviculture	32.89060247	-83.8297173
Montgomery	80	Silviculture	32.16713628	-82.5385253
Candler	80	Agriculture	32.36370109	-82.2183497
Morgan	80	Silviculture	33.6632088	-83.4838475
Wheeler	75	Silviculture	32.09760989	-82.8628067

## Bottom 20

COUNTY	SIZE	Burn_Purpose	LATITUDE	LONGITUDE
Dodge	1	Land Clearing	32.2383411	-83.3417157
Jones	1	Land Clearing	33.1214944	-83.4591093
Lincoln	1	Land Clearing	33.7687499	-82.5352188
Greene	1	Land Clearing	33.5104272	-83.1972729
Jones	1	Land Clearing	32.93680653	-83.6692115
Candler	1	Land Clearing	32.4814047	-82.1671153
Burke	1	Silviculture	33.12359627	-82.1573745
Jenkins	1	Land Clearing	32.8475515	-81.8874917
Candler	1	Agriculture	32.3212149	-82.1125963
Lincoln	1	Land Clearing	33.774539	-82.3901027
Washington	0.75	Land Clearing	32.94866106	-82.8426185
Burke	0.5	Land Clearing	33.2350296	-82.1144248
Mcduffie	0.5	Land Clearing	33.5099776	-82.4485447
Jones	0.5	Land Clearing	33.02773	-83.4064719
Jefferson	0.5	Land Clearing	33.20111157	-82.3736033
Mcduffie	0.5	Silviculture	33.53087533	-82.3901567
Jasper	0.5	Land Clearing	33.2143337	-83.5627646
Twiggs	0.25	Land Clearing	32.5771211	-83.2779279
Emanuel	0.15	Agriculture	32.34250951	-82.338383
Candler	0.1	Land Clearing	32.37462268	-82.1830182

Total of 198 GFC permits issues in 100 km radius.



# GFC PERMIT SUMMARY

Purpose	February 14	February 15
Silviculture	90.5%	86.7%
Agriculture	7.2%	9.8%
Land Clearing	2.6%	3.4%
Storm Debris	0.0%	0.0%

## Purpose of silviculture burns:

- Restore or maintain wildlife ecosystem.
- Hazard reduction to reduce the risk of wildfire.

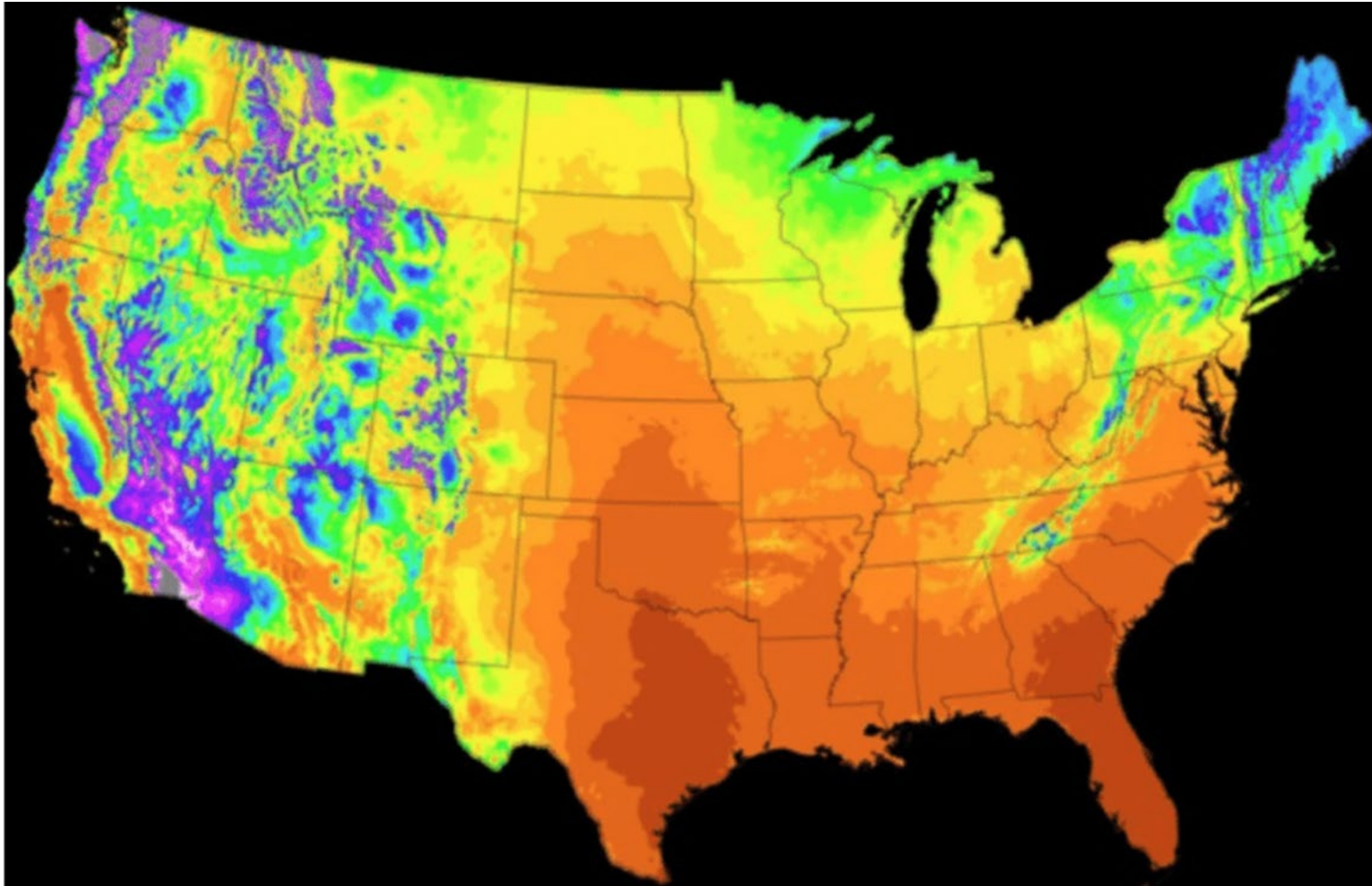


# NEXT STEPS

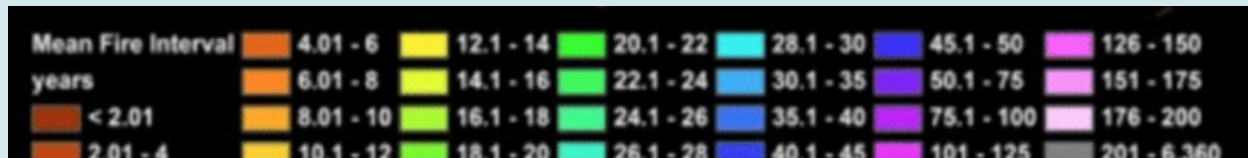
- **Identify the natural fire return interval or prescribed fire frequency needed to establish, restore, and/or maintain a sustainable and resilient wildland ecosystem.**
- **Identify the dominant fuel type burned.**
- **Describe the public notification process using the burn permit map on the GFC website.**
- **Do we need burn plans and post-burn reports?**



# FIRE RETURN INTERVAL MAP

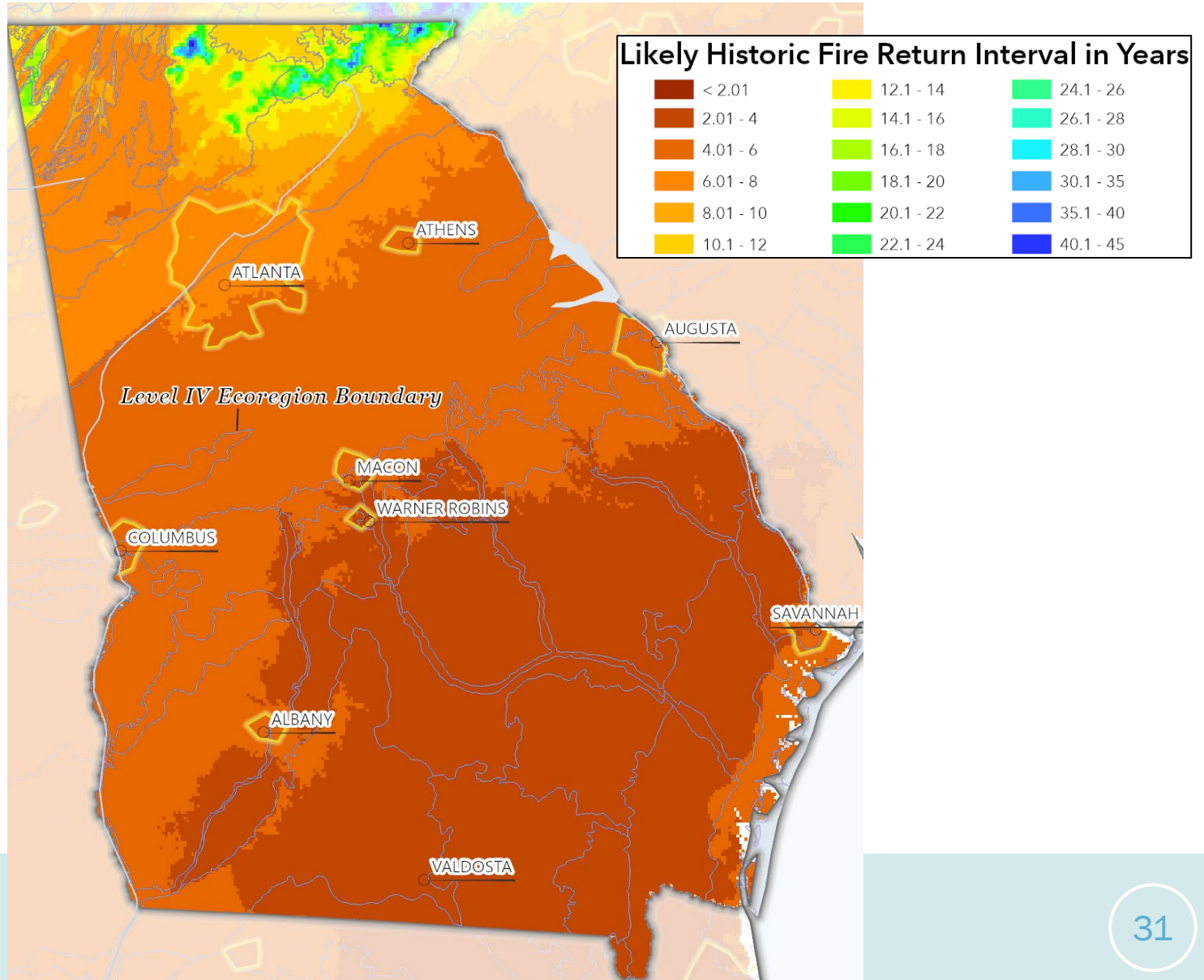


Guyette et al., 2012





# FIRE RETURN INTERVAL MAP



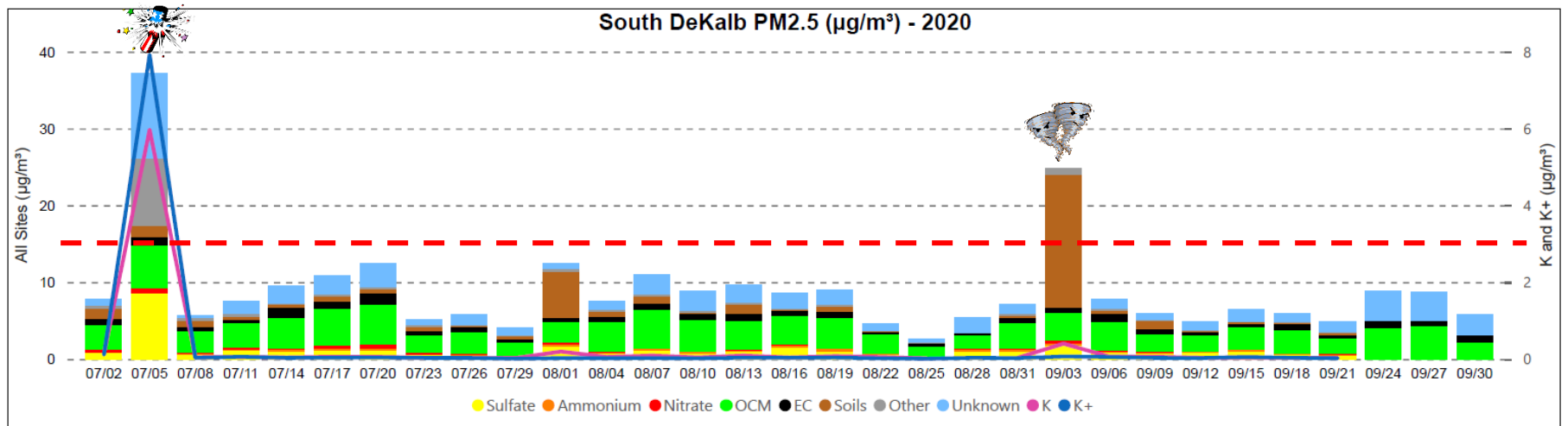
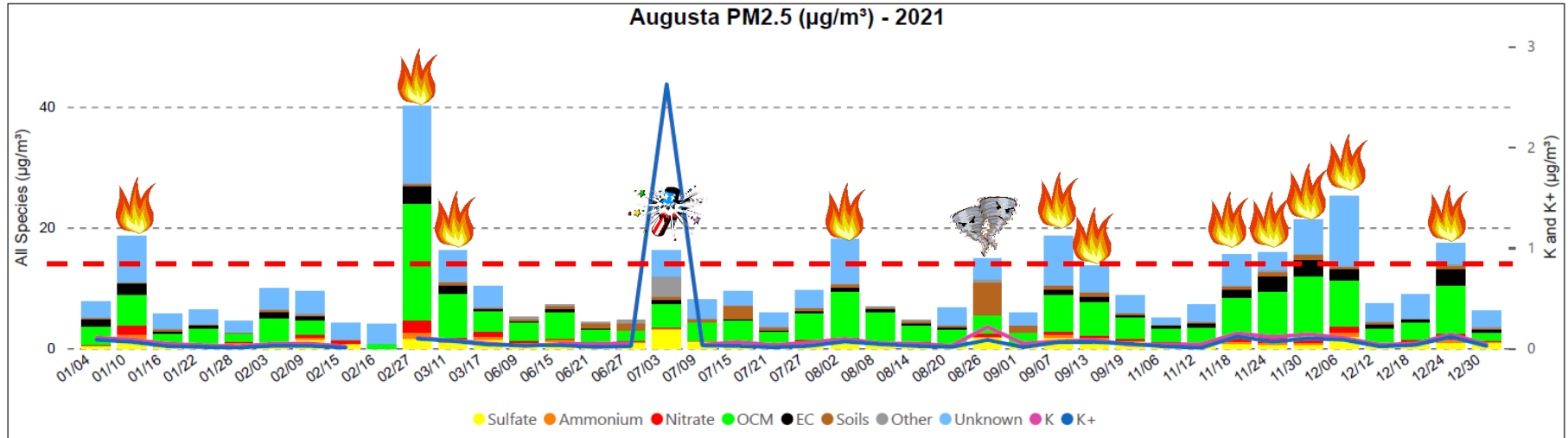


# PSD MODELING BACKGROUND





# SPECIATED PM<sub>2.5</sub> DATA



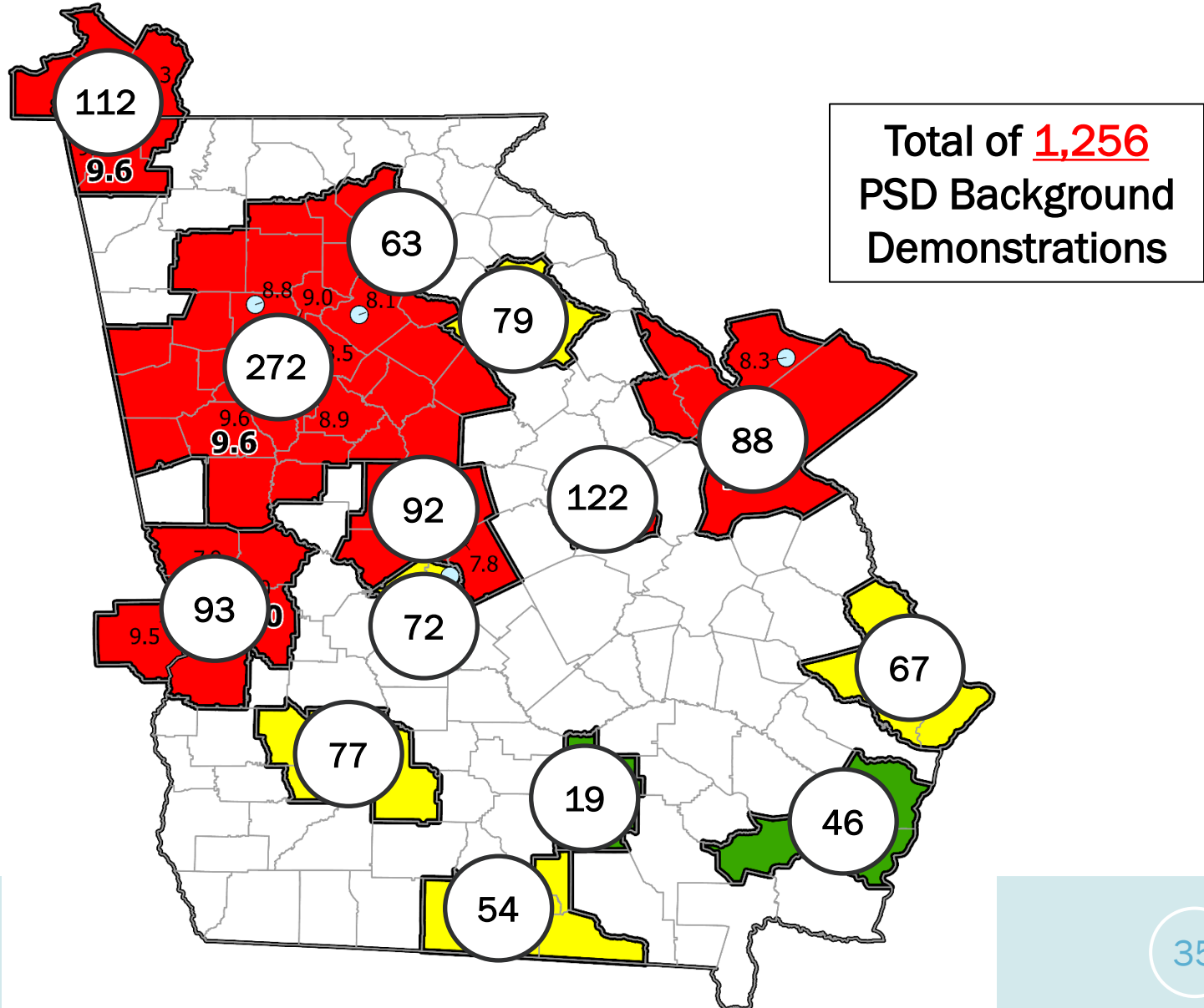


# ADJUSTMENT APPROACH

- Apply FEM bias adjustment factor to all FEM measurements prior to August 1, 2023 (Teledyne firmware install date in GA).
- For all monitors (regardless of DVs), examine all days above  $15 \mu\text{g}/\text{m}^3$ .
  - Address clear causal relations w/ HYSPLIT
  - Focus on 2021-2023 events
- Does not need EPA approval.
- Need backgrounds values 60 days after FR.



# NUMBER OF DEMONSTRATIONS





# CONTACT INFORMATION

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