Year 2022 Fires Workgroup Meeting: Beta version of inventory

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2022 FIRES WORKGROUP

Outline

- Mission of this Workgroup
- Beta version of the fires inventory
  - Key changes since alpha version
  - Activity and Tools used
  - Fire activity submitted by SLTs
  - Acres burned and Emissions
- Crop residue burns
- Pile Burns emissions (James Beidler)
- Next steps and update timeline to support 2022 Emissions Modeling Platform

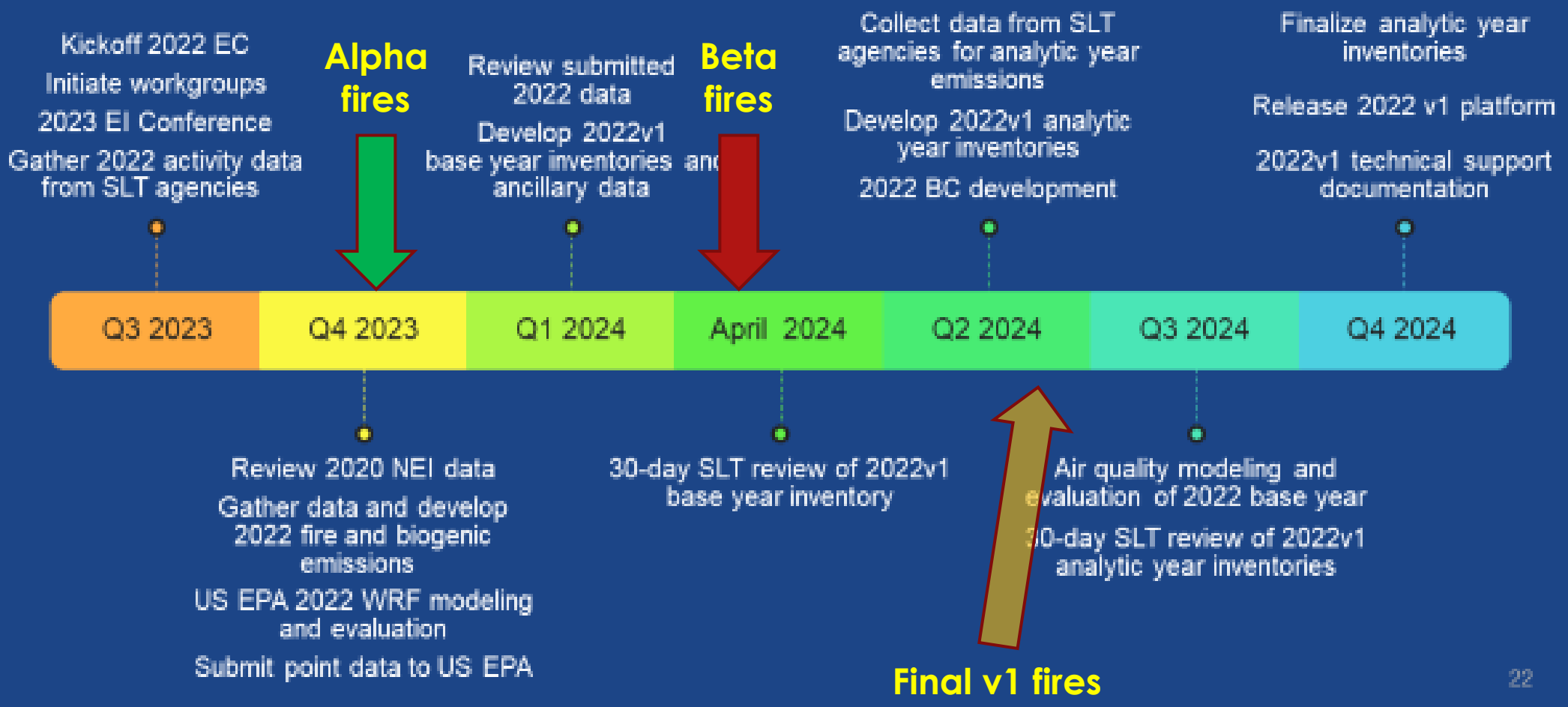
Mission of the 2022 Fires Workgroup

- The 2022 Fires workgroup is charged with delivering wildfire, prescribed fires and crop residue burn emissions datasets for use in air quality modeling
  - Criteria Air Pollutants (CAPs) and Hazard Air Pollutants (HAPs)
- Perform quality assurance/review of the fire emissions datasets and document any possible improvements that could be made during this Year 2022 effort
- Focus is on year 2022 base year emissions
- The workgroup will be led by two chairpersons: one EPA staffer (Jeff Vukovich) and one state/RPO staffer (Rhonda Payne WRAP/WESTAR)
- Workgroup chairpersons will provide progress briefings to the overall 2022 Collaboration team

Mission of the 2022 Fires Workgroup Documentation info

- Wiki site for the Workgroup: https://views.cira.colostate.edu/wiki/wiki/12211
- The Workgroup shall document the methodologies in Technical Support Document and in brief technical memos
  - used to generate the fire emissions dataset
  - any changes made to the fire emissions datasets during the 2022 Emissions Modeling Platform development
  - provide documentation of the review/quality assurance process carried out on the fire emissions dataset(s).
- EPA will be the lead on documentation, but Workgroup members are encouraged to review, add content and edit content during the Collaboration process

Timeline for 2022v1 Platform Development



30-day review of the fires inventory ends May 13, 2024; please send in your feedback by then

Timeline for 2022v2 Platform Development

Beta version Inventory Information: Activity and Tools Used

Key Changes to Beta Version

- Incorporated fire activity from 29 total SLTs (5 SLTs were in alpha)
- US Forest Service updated the SERA emissions factors to use in the BlueSky Pipeline system
- Pile burn methodology feedback received and incorporated
- Pile burn methodology extended to all known pile burns
- Process to classify landcover for HMS satellite detects now using a 240-meter resolution shapefile (alpha version used 120 m)
  - Used to better capture crop residue burns
- Crop residue burn emissions factors updated (Hall et al. 2022)
  - Significantly lower emissions factor for NH3 from recent publication
  - NOx, CO, and SO2 also changed for a subset of crops
  - https://zenodo.org/records/7013656#.YzC4MHbMKUk

2022 Beta version of inventory

- Released early April and posted here:
  - https://gaftp.epa.gov/Air/emismod/2022/v1/draft/fires/
- Includes wildland, prescribed, and crop residue burn emissions
- Tech memo available summarizing the beta version inventory is here:
- https://gaftp.epa.gov/Air/emismod/2022/v1/draft/fires/2022EMP_beta_version_fires_tech_memo.2024Apr12.pdf
- Detailed summaries provided (e.g. fireloc files for each state)
- Used fire activity data from:
  - Federal agencies and 29 SLTs
- Tools used:
  - Python modified-SMARTFIRE2 used for generating daily acres burned
  - Bluesky Pipeline (BSP) used for daily emissions

Activity data used: Federal agencies

- **NOAA HMS (Hazard Mapping System)** satellite detection
  - https://www.ospo.noaa.gov/Products/land/hms.html
- Incident Status Summary reports (**ICS-209**) daily incident report data
  - https://famit.nwcg.gov/applications/FAMWeb ; Mainly wildfires
- Wildland Fire Interagency Geospatial Services (**WFIGS**) Group Fire Perimeter data
  - Shapefiles acquired from: https://data-nifc.opendata.arcgis.com/datasets/nifc::wfigscurrent-interagency-fire-perimeters/about

  Mainly wildfires
- US Forest Service Activity Tracking System (**FACTS**)
  - Hazardous Fuel Treatment Activity shapefiles; mainly prescribed burns
- Department of Interior (DOI) fire activity data from National Fire Plan Operations and Reporting System (**NFPORS**)
  - Sent by DOI via direct communication; Prescribed burns only on DOI lands

Activity data used: State and tribal agencies

SLT	Wildfire	Prescribed burns	RX includes pile burns	Ag burns	Comments
Arizona	No	Yes	Yes	No	
Arkansas	Yes	Yes	Yes	Yes	
California	Yes	Yes	Yes	No	Added CALFIRE and CalMAPPER
Colorado	No	Yes	Yes	No	
Connecticut	Yes	Yes	No	No	
Delaware	No	Yes	No	Few	Ag data was sparse
Florida	Yes	Yes	Yes	Yes	
Georgia	Yes	Yes	No	Yes	meeting with GADNR about emissions
Idaho	No	No	No	Yes	
Iowa	Yes	Yes	Yes	No	
Kansas	No	Yes	No	No	Flint Hills only
Maine	Yes	Few	No	No	2 RX records total
Maryland	Yes	Yes	Yes	No	
Minnesota	No	Yes	No	No	
Missouri	No	Yes	No	Yes	small amount of data
Montana	No	Yes	Yes	No	
Nevada	No	Yes	Yes	No	
New Jersey	Yes	Yes	No	No	
New Mexico	Yes	Yes	No	No	
Nez Perce Tribe	No	Yes	Yes	Yes	working with Idaho on how best to use
North Carolina	Yes	Yes	No	No	has questions about activity/emissions
North Dakota	No	Yes	No	No	
Oklahoma	No	Yes	No	No	Flint Hills only
Oregon	Yes	Yes	Yes	No	
Pennsylvania	Yes	Yes	No	No	
South Carolina	Yes	Yes	Yes	Yes	
Texas	Yes	Yes	No	No	
Utah	No	Yes	Yes	No	
Virginia	Yes	Yes	No	No	
Washington	No	Yes	Yes	Yes	
Wyoming	Yes	Yes	Yes	No	

Python Smartfire2 and Agriculture burn processing for 2022 beta

WF = Wildfire
Rx = Prescribed burn

NOAA Hazard Mapping System (HMS) Detects

USDA Cropland Data Layer (CDL) + Fuel Characteristic Classification System FCCS combined (240m resolution)

Ag land detects, acres burned estimated

Non-ag and grassland detects

FL, GA, ID, SC, WA

Bluesky Pipeline Crops Module

Day-specific Ag burn Fire location, Acres Burned and Emissions

ICS-209(WF)
WFIGS (WF)
FACTS(WF/Rx)
DOI (Rx)

AR, AZ, CA, CO, CT, DE, FL, GA, ID, IA, KS, ME, MD, MN, MO, MT, NV, NJ, NM, NC, ND, OK, OR, PA, SC, TX, UT, VA, WA, WY, tribes

Python Modified SmartFire2

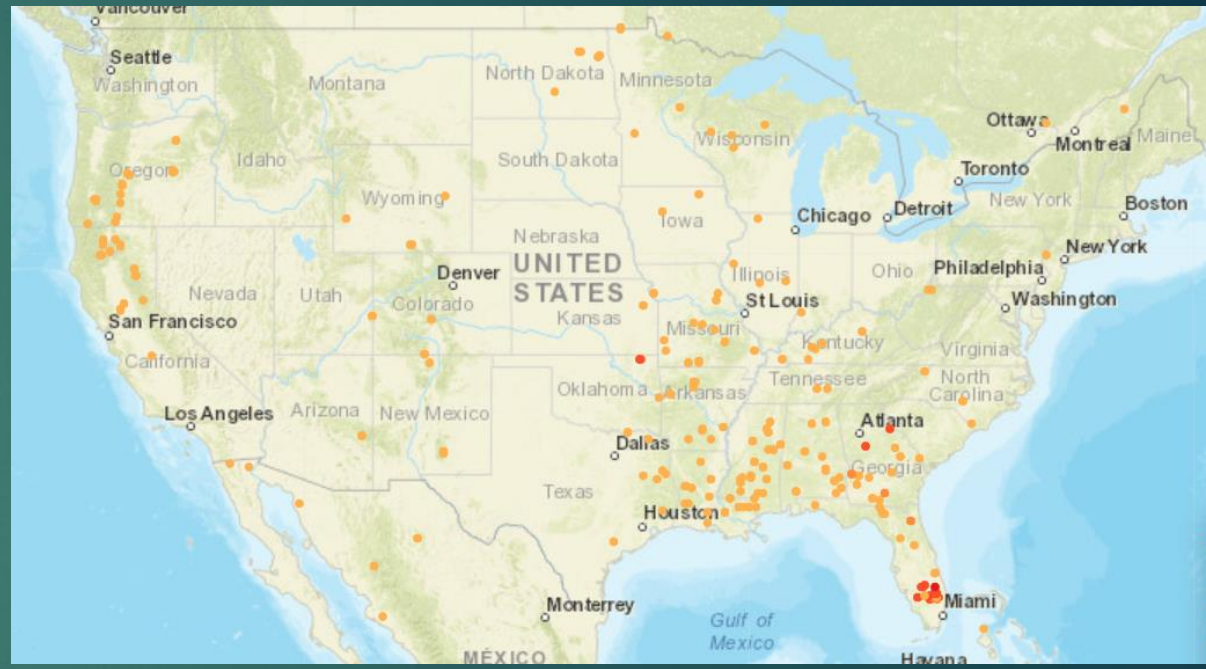
SLT data

NATIONAL AND FEDERAL DATA

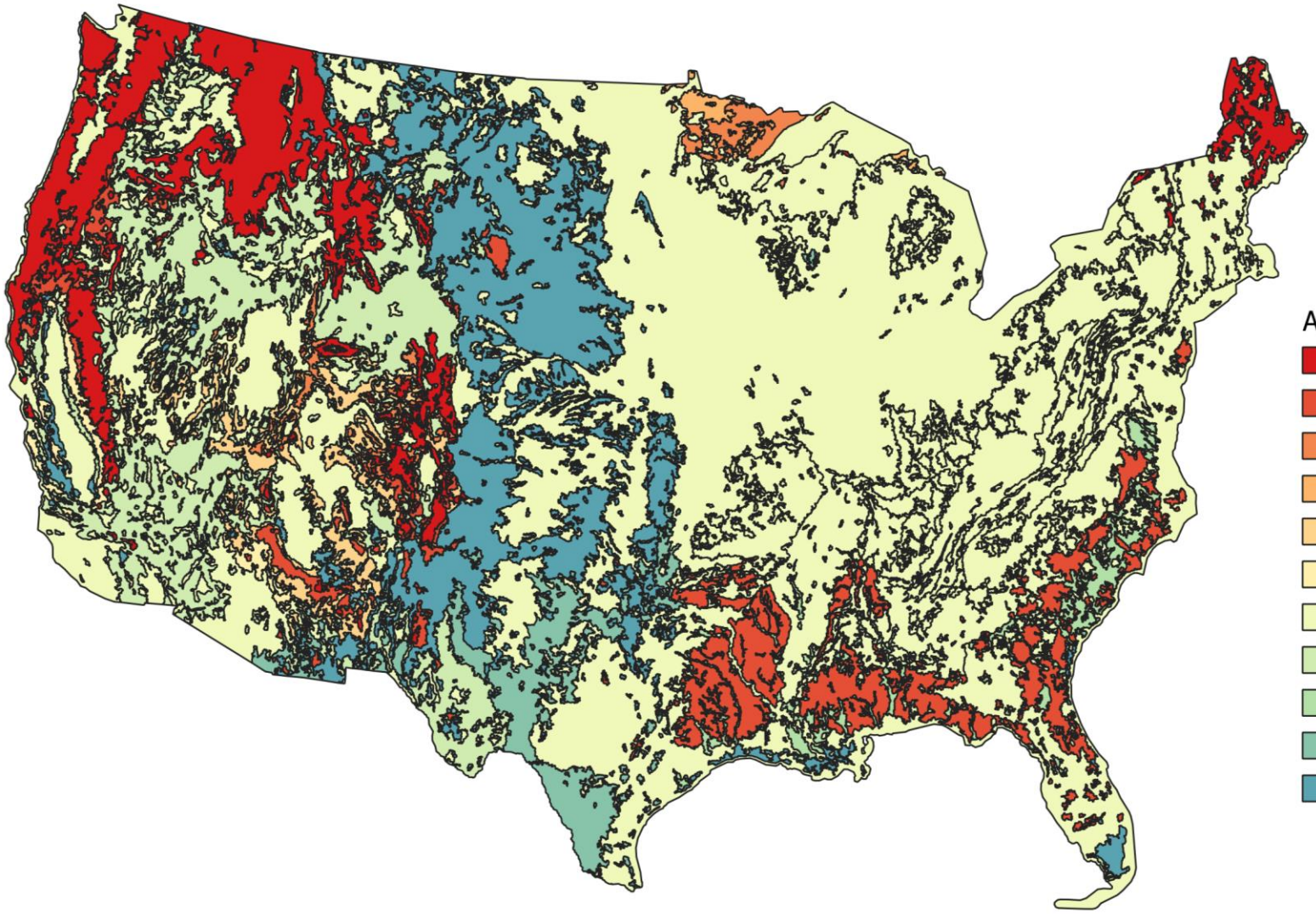
Day-specific Fire **lat-lon**, Type and Acres Burned

Hazard Mapping System fire detects

- Total detects for the year 2022 ~ 1 Million (after removing duplicates)
- After applying the USDA Cropland Data Layer, about 860,000 detects were labeled as wildland fire and ~ 145,000 detects determined to be on agricultural lands
- About 21,000 detects determined as taking place during annual Flint Hills prescribed burns (more info on this later in ppt)



2020 NEI Acres Per HMS Detect



Acres Per HMS Detect	
12	Closed_Conifer_Forest
15	Open_Conifer_Forests
18	Aspen
22	Boreal
27	Juniper
33	Pacific_broadleaved_Fores
39	Eastern_Deciduous_Forest
41	Other
57	Shrubland
59	Riparian
62	Savanna
	Grassland

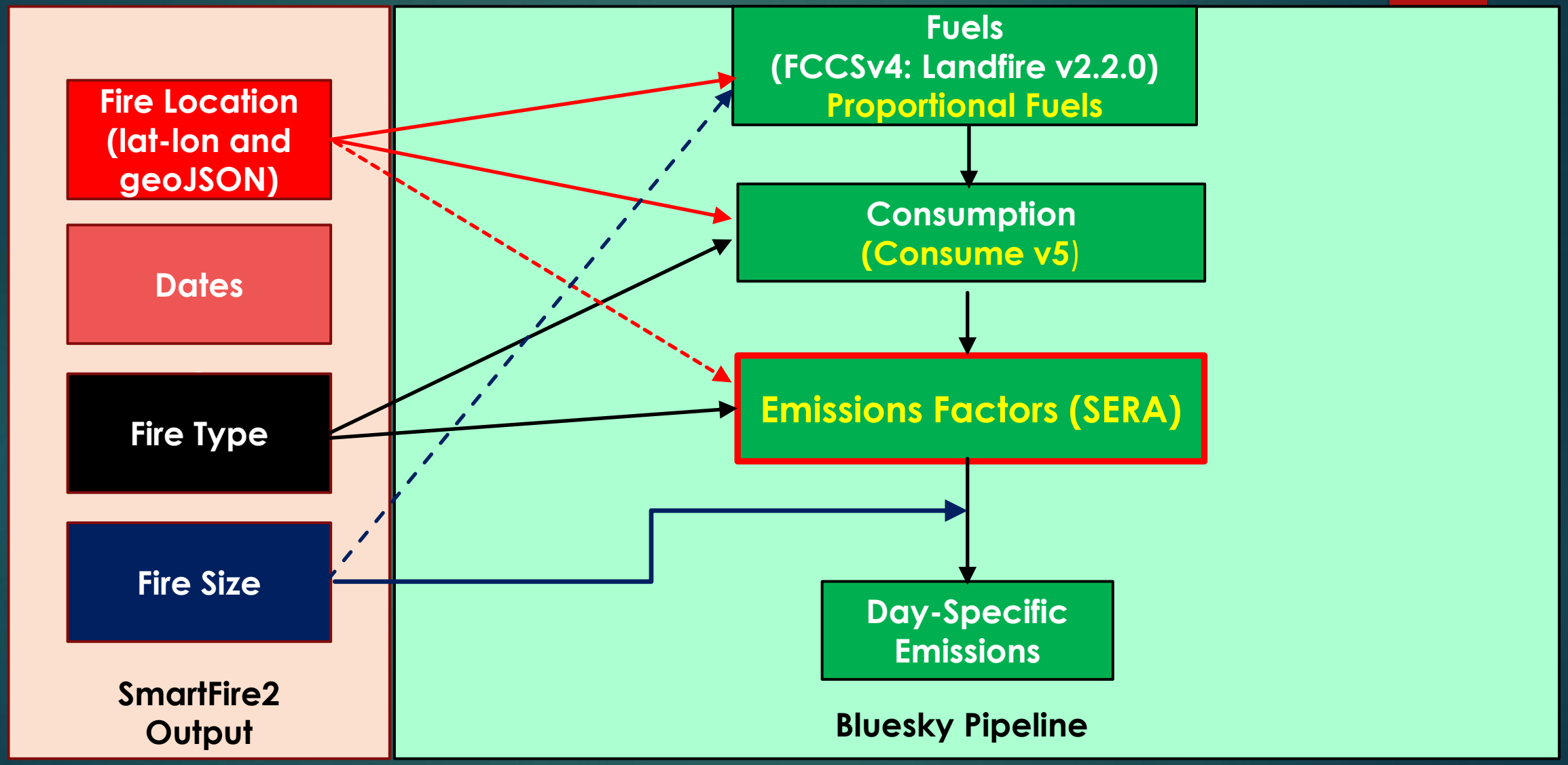
When we don't have actual documented fire activity and have to rely solely on HMS detect

Important changes since 2020NEI

- Moving from using Fire Emission Production Simulator (FEPSv2) emissions factors to Smoke Emissions Reference Application (SERA) emissions factors in Bluesky Pipeline
- Specifically estimating emissions for pile burns
  - Calculated outside BSP
- Crop burn module
  - Compatible with Bluesky Pipeline

Bluesky Pipeline (BSP)

- US Forest Service has significantly updated the Bluesky Framework and named the new system "Bluesky Pipeline"
- It is open source at https://github.com/pnwairfire/bluesky
- Currently, BSP version 4.2.13 used at EPA plus SERA update March 2024
- SERA factors can vary by phase, fire type, region, fuel type and more pollutants
  - https://depts.washington.edu/nwfire/sera/index.php
  - Consists of existing peer-reviewed emission factors (EFs) of 276 known air pollutants
  - Database enables the analysis and summaries of existing EFs, and creation of average EFs to be used in decision support tools for smoke management, including BSP
- SERA factors updated in beta version!

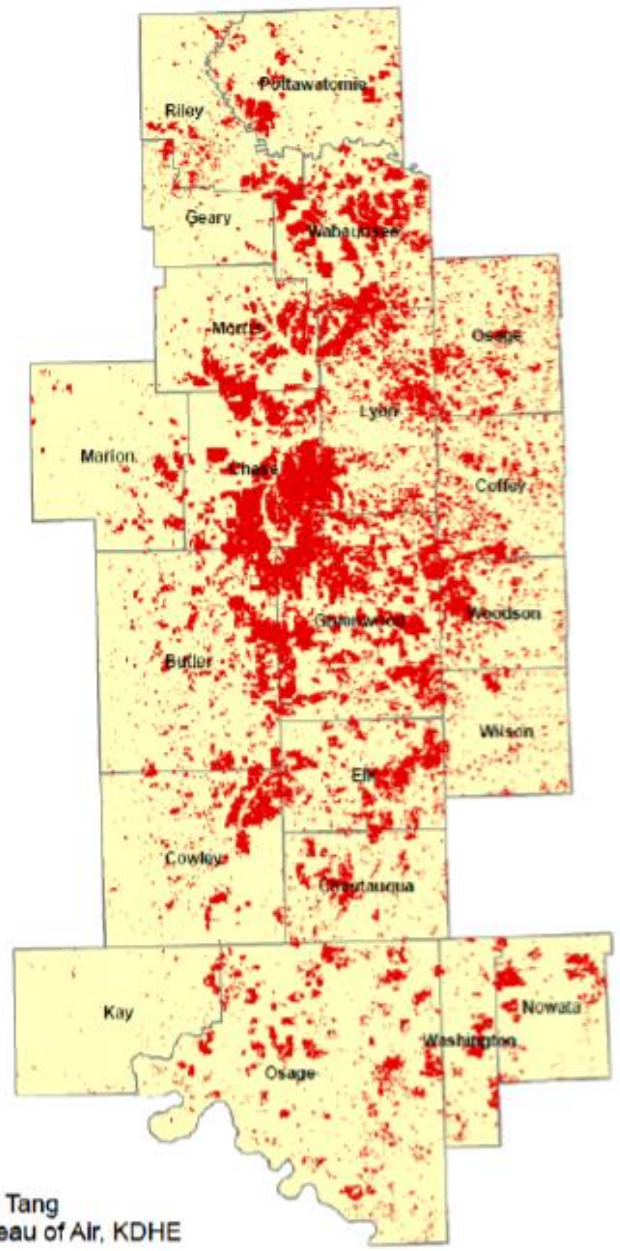


FCCS = Fuel Characteristic Classification System SERA=Smoke Emissions Reference Application

Estimating Area Burned Flint Hills Prescribed Burning Spring 2022

- Calculate emissions outside of BSP
- Use all "Grass" HMS detects in these counties for the time of the prescribed Burning
- Calculate per county acres per HMS detect for this time period. Range ~ 50 -160 acres per detect
- 2022 Total number of Flint Hills Detects: 21,008
- Use SERA grass emission factors to estimate pollutants except PM2.5
- PM2.5 from measurements in Flint Hills Amara Holder: 12.68 g/kg

Flint Hills Acreage Burned (February 14 – April 30, 2022)



County	Acres Burned
Butler	163,895
Chase	237,442
Chautauqua	57,901
Coffey	85,902
Cowley	88,095
Elk	109,933
Geary	17,035
Greenwood	315,605
Lyon	180,190
Marion	37,483
Morris	96,126
Osage (KS)	83,894
Pottawatomie	59,106
Riley	53,700
Wabaunsee	182,259
Wilson	33,592
Woodson	69,422
Nowata (OK)	43,507
Osage (OK)	156,297
Washington (OK)	30,842
Kay (OK)	10,533
Total	2,112,759

Yao Tang
Bureau of Air, KDHE

SERA Emission Factors Update: What Changed?

Region Average of Phase Average

Region	Species	Old EF (g/kg)	New EF (g/kg)	Diff	% Diff
N	CH4	2.32	2.37	0.05	2%
N	CO	75.47	76.04	0.58	1%
N	CO2	1655.82	1678.31	22.49	1%
N	NH3	0.90	0.81	-0.09	-10%
N	NOx	2.21	1.14	-1.06	-48%
N	PM2.5	10.21	10.21	0.00	0%
N	SO2	0.13	0.13	0.00	3%
SE	CH4	2.93	2.97	0.05	2%
SE	CO	80.74	79.96	-0.78	-1%
SE	CO2	1655.08	1651.71	-3.37	0%
SE	NH3	1.58	1.03	-0.55	-35%
SE	NOx	2.98	1.77	-1.21	-41%
SE	PM2.5	16.05	12.97	-3.07	-19%
SE	SO2	0.82	0.85	0.03	4%
W	CH4	3.12	4.88	1.76	57%
W	CO	78.14	101.57	23.43	30%
W	CO2	1576.98	1599.15	22.17	1%
W	NH3	0.92	1.35	0.43	47%
W	NOx	2.61	1.50	-1.11	-43%
W	PM2.5	10.12	12.73	2.61	26%
W	SO2	1.40	1.17	-0.23	-16%

NOx Reductions of 40-50%

PM2.5 change varies by region

Landcover Average of Phase Average

Landcover Class	Species	Old EF (g/kg)	New EF (g/kg)	Diff	% Diff
conifer forest	CH4	4.59	4.57	-0.01	0%
conifer forest	CO	100.55	102.99	2.44	2%
conifer forest	CO2	1602.79	1612.94	10.15	1%
conifer forest	NH3	0.86	1.02	0.16	18%
conifer forest	NOx	2.38	1.77	-0.61	-25%
conifer forest	PM2.5	19.81	13.49	-6.32	-32%
conifer forest	SO2	1.19	1.12	-0.06	-5%
forest	CH4	2.60	3.03	0.43	17%
forest	CO	86.49	92.88	6.39	7%
forest	CO2	1614.26	1650.87	36.61	2%
forest	NH3	1.03	0.86	-0.18	-17%
forest	NOx	1.28	1.28	-0.01	0%
forest	PM2.5	10.53	10.53	0.00	0%
forest	SO2	0.13	0.13	0.00	3%
grassland	CH4	2.49	2.97	0.48	19%
grassland	CO	62.96	73.58	10.63	17%
grassland	CO2	1601.40	1652.90	51.50	3%
grassland	NH3	0.88	1.08	0.21	23%
grassland	NOx	3.26	1.01	-2.25	-69%
grassland	PM2.5	11.14	11.31	0.17	2%
grassland	SO2	1.91	1.04	-0.86	-45%
mixed forest	CH4	2.51	4.57	2.06	82%
mixed forest	CO	69.73	102.99	33.27	48%
mixed forest	CO2	1660.00	1612.94	-47.06	-3%
mixed forest	NH3	1.37	1.02	-0.35	-26%
mixed forest	NOx	2.37	1.77	-0.60	-25%
mixed forest	PM2.5	10.81	14.33	3.52	33%
mixed forest	SO2	0.60	1.12	0.53	89%
shrubland	CH4	2.27	2.95	0.68	30%
shrubland	CO	85.27	76.30	-8.97	-11%
shrubland	CO2	1647.92	1649.36	1.44	0%
shrubland	NH3	1.83	1.48	-0.35	-19%
shrubland	NOx	3.10	1.97	-1.13	-36%
shrubland	PM2.5	9.96	11.56	1.60	16%
shrubland	SO2	0.74	0.74	0.00	0%

Largest NOx reductions in grasslands
Hardwood and mixed forest PM goes up or stays the same

Averages Across Combustion Phases

Phase	Species	Old EF (g/kg)	New EF (g/kg)	Diff	% Diff
average	CH4	2.88	3.61	0.73	25%
average	CO	78.64	87.82	9.18	12%
average	CO2	1623.99	1636.01	12.02	1%
average	NH3	1.18	1.11	-0.06	-6%
average	NOx	2.67	1.53	-1.14	-43%
average	PM2.5	12.51	12.32	-0.19	-1%
average	SO2	1.00	0.91	-0.09	-9%
flaming	CH4	2.24	2.88	0.64	29%
flaming	CO	65.17	76.73	11.56	18%
flaming	CO2	1667.82	1661.76	-6.07	0%
flaming	NH3	0.95	1.01	0.05	6%
flaming	NOx	2.57	1.62	-0.95	-37%
flaming	PM2.5	11.91	12.09	0.18	1%
flaming	SO2	1.01	0.91	-0.10	-10%
smoldering	CH4	5.50	5.85	0.35	6%
smoldering	CO	110.41	114.02	3.61	3%
smoldering	CO2	1517.19	1576.86	59.67	4%
smoldering	NH3	2.31	1.52	-0.80	-34%
smoldering	NOx	2.34	1.29	-1.05	-45%
smoldering	PM2.5	14.10	12.80	-1.30	-9%
smoldering	SO2	1.06	1.02	-0.04	-3%

NOx reductions in all combustion phases

Beta Version Inventory Information: Activity and Emissions Summaries

Contiguous United States (CONUS) Wildfire Season in 2022

Top 15 Wildfires according to NIFC

Name	State	StartDate	LastRepo	Size InAcres	Cause
Hermits Peak	NM	4/7	10/20	341,735	H
Black	NM	5/13	11/10	325,136	H
Double Creek	OR	8/30	10/21	171,532	L
Moose	ID	7/17	11/10	130,205	H
Cedar Creek	OR	8/4	11/24	127,311	L
Mosquito	CA	9/6	10/23	76,788	H
McKinney	CA	7/29	11/7	60,138	U
Cooks Peak	NM	4/17	5/31	59,359	U
Eastland Complex	TX	3/17	4/6	54,513	U
Borrega	TX	3/30	4/4	51,566	H
Cerro Pelado	NM	4/22	7/11	45,605	H
Road 702	NE	4/22	4/30	44,024	L
2022 SRFLightning Complex	CA	8/5	11/1	41,600	U
Willow Creek	OR	6/28	7/4	40,274	H
Total Top 15 CONUS fires				**1,569,786**	

- CONUS 4.4 M acres
- Quieter season chosen for regulatory modeling platform
- Recent avg is about 7M acres for CONUS
- NM most active
- Alaska wildfires burned over 3M acres in 2022

CONUS Totals by fire type

Variable	Wildfires alpha	Wildfires beta	beta-alpha	beta-alpha %diff
ACRES BURNED	4,064,137	4,682,907	618,769	15.2%
CO	5,617,040	6,891,516	1,274,477	22.7%
NH3	61,362	70,848	9,486	15.5%
NOX	62,437	71,361	8,924	14.3%
PM10	1,360,493	1,439,392	78,899	5.8%
PM2_5	1,256,350	942,729	-313,621	-25.0%
SO2	62,229	68,344	6,114	9.8%
VOC	1,742,786	1,859,049	116,263	6.7%

Variable	Prescribed burns alpha	Prescribed burns beta	beta-alpha	beta-alpha %diff
ACRES BURNED	14,380,363	13,766,506	-613,857	-4.3%
CO	8,453,683	8,101,652	-352,031	-4.2%
NH3	97,053	69,797	-27,256	-28.1%
NOX	155,284	136,625	-18,658	-12.0%
PM10	1,573,087	1,307,224	-265,863	-16.9%
PM2_5	1,359,391	1,187,090	-172,301	-12.7%
SO2	96,321	83,280	-13,041	-13.5%
VOC	2,179,027	1,670,843	-508,185	-23.3%

Emissions in tons

Doesn't include pile burns

CONUS Totals

Emissions in tons

Variable	Total alpha	Total beta	beta-alpha	beta-alpha %diff
ACRES BURNED	18,444,501	18,449,413	4,912	0.0%
CO	14,070,723	14,993,168	922,445	6.6%
NH3	158,415	140,645	-17,770	-11.2%
NOX	217,721	207,987	-9,734	-4.5%
PM10	2,933,580	2,746,616	-186,964	-6.4%
PM2_5	2,615,741	2,129,819	-485,922	-18.6%
SO2	158,550	151,624	-6,927	-4.4%
VOC	3,921,813	3,529,891	-391,922	-10.0%

About 46-47% of the PM2.5 for all CONUS emissions are from wildland fires for current 2022v1 draft emissions

Acres Burned: Top 10 states by fire type

Top 10 Wildfires: NIFC vs 2022 Acres Burned

State	NIFC Total	2022 alpha	2022 beta	Beta -NIFC
New Mexico	859,906	633,414	**961,722**	101,816
Texas	671,800	581,784	**715,792**	43,992
Oregon	456,082	454,506	**463,625**	7,543
Idaho	436,733	437,555	**453,920**	17,187
Oklahoma	385,133	237,937	**255,804**	-129,329
California	309,287	370,766	**348,357**	39,070
Washington	173,659	215,146	**183,236**	9,577
Florida	164,774	148,953	**147,098**	-17,676
Montana	137,509	135,353	**133,929**	-3,580
Arizona	124,165	165,937	**161,119**	36,954
TOTAL	3,719,048	3,381,352	**3,824,601**	105,553

Acres Burned: Top 10 states by fire type

Prescribed burns

State	Acres Burned alpha	Acres Burned beta	beta-alpha
Kansas	2,396,908	2,373,557	-23,351
Texas	1,748,310	1,518,769	-229,541
Florida	1,409,050	1,398,626	-10,424
Georgia	1,328,540	1,328,540	0
Oklahoma	1,130,886	1,087,916	-42,970
Alabama	898,014	817,908	-80,106
Louisiana	726,473	677,886	-48,587
Arkansas	597,967	747,137	149,170
Missouri	595,241	511,088	-84,154
Mississippi	514,540	432,660	-81,880
TOTAL	11,345,929	10,894,086	-451,844

CONUS emissions by combustion phase by fire type

Prescribed burn emissions	ALPHA Flaming (tons)	BETA Flaming (tons)	ALPHA % of total from flaming	BETA % of total from flaming	ALPHA Residual smoldering (tons)	BETA Residual smoldering (tons)	ALPHA % of total from residual smoldering	BETA % of total from residual smoldering	ALPHA Total (tons)	BETA Total (tons)
CO	6,969,768	6,646,567	82.4%	82.0%	1,483,915	1,455,085	17.6%	18.0%	8,453,683	8,101,652
NH3	88,895	61,691	91.6%	88.4%	8,157	8,107	8.4%	11.6%	97,053	69,797
NOX	153,437	135,036	98.8%	98.8%	1,846	1,590	1.2%	1.2%	155,284	136,625
PM10	1,325,475	1,064,653	84.3%	81.4%	247,611	242,571	15.7%	18.6%	1,573,087	1,307,224
PM2_5	1,149,485	981,521	84.6%	82.7%	209,906	205,569	15.4%	17.3%	1,359,391	1,187,090
SO2	92,053	79,104	95.6%	95.0%	4,268	4,176	4.4%	5.0%	96,321	83,280
VOC	1,860,945	1,357,706	85.4%	81.3%	318,082	313,136	14.6%	18.7%	2,179,027	1,670,843

Flaming mentioned above includes emissions from Flaming + from Smoldering during flaming phase

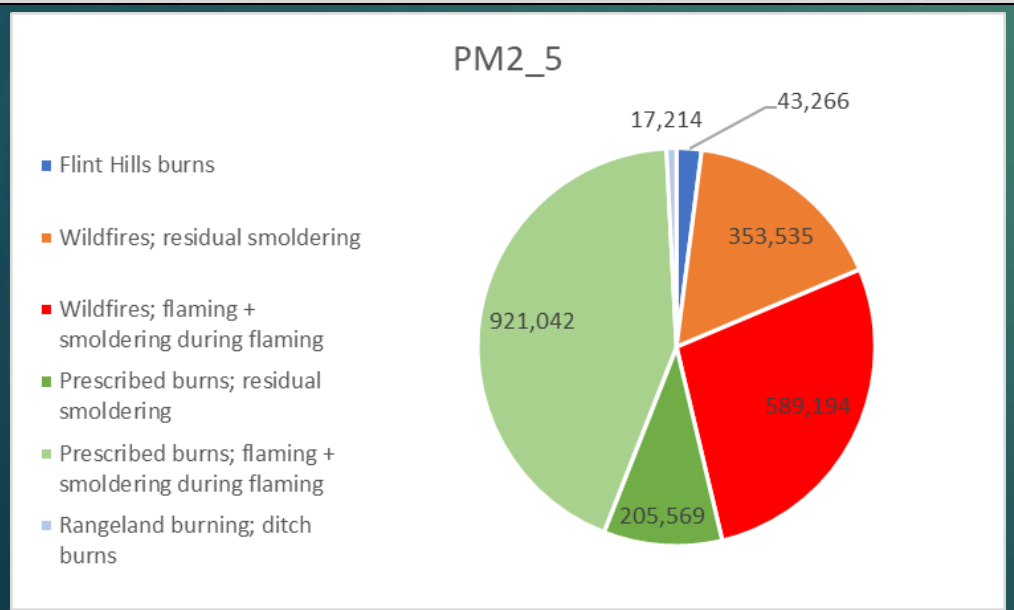
CONUS emissions by combustion phase by fire type

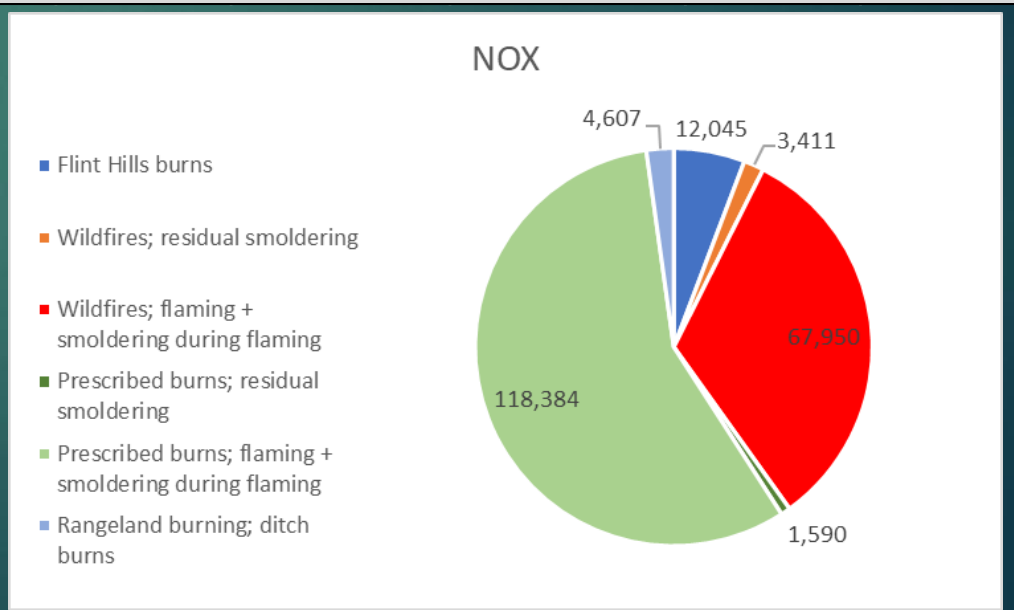
Wildfire emissions	ALPHA Flaming (tons)	BETA Flaming (tons)	ALPHA % of total from flaming	BETA % of total from flaming	ALPHA Residual smoldering (tons)	BETA Residual smoldering (tons)	ALPHA % of total from residual smoldering	BETA % of total from residual smoldering	ALPHA Total (tons)	BETA Total (tons)
CO	3,392,387	4,376,897	60.4%	63.5%	2,224,653	2,514,619	39.6%	36.5%	5,617,040	6,891,516
NH3	46,985	54,725	76.6%	77.2%	14,377	16,122	23.4%	22.8%	61,362	70,848
NOX	59,044	67,950	94.6%	95.2%	3,393	3,411	5.4%	4.8%	62,437	71,361
PM10	991,297	1,022,221	72.9%	71.0%	369,197	417,172	27.1%	29.0%	1,360,493	1,439,392
PM2_5	943,383	**589,194**	75.1%	**62.5%**	312,967	353,535	24.9%	**37.5%**	1,256,350	**942,729**
SO2	54,092	59,383	86.9%	86.9%	8,137	8,961	13.1%	13.1%	62,229	68,344
VOC	1,254,156	1,306,997	72.0%	70.3%	488,630	552,052	28.0%	29.7%	1,742,786	1,859,049

Flaming mentioned above includes emissions from Flaming + from Smoldering during flaming phase

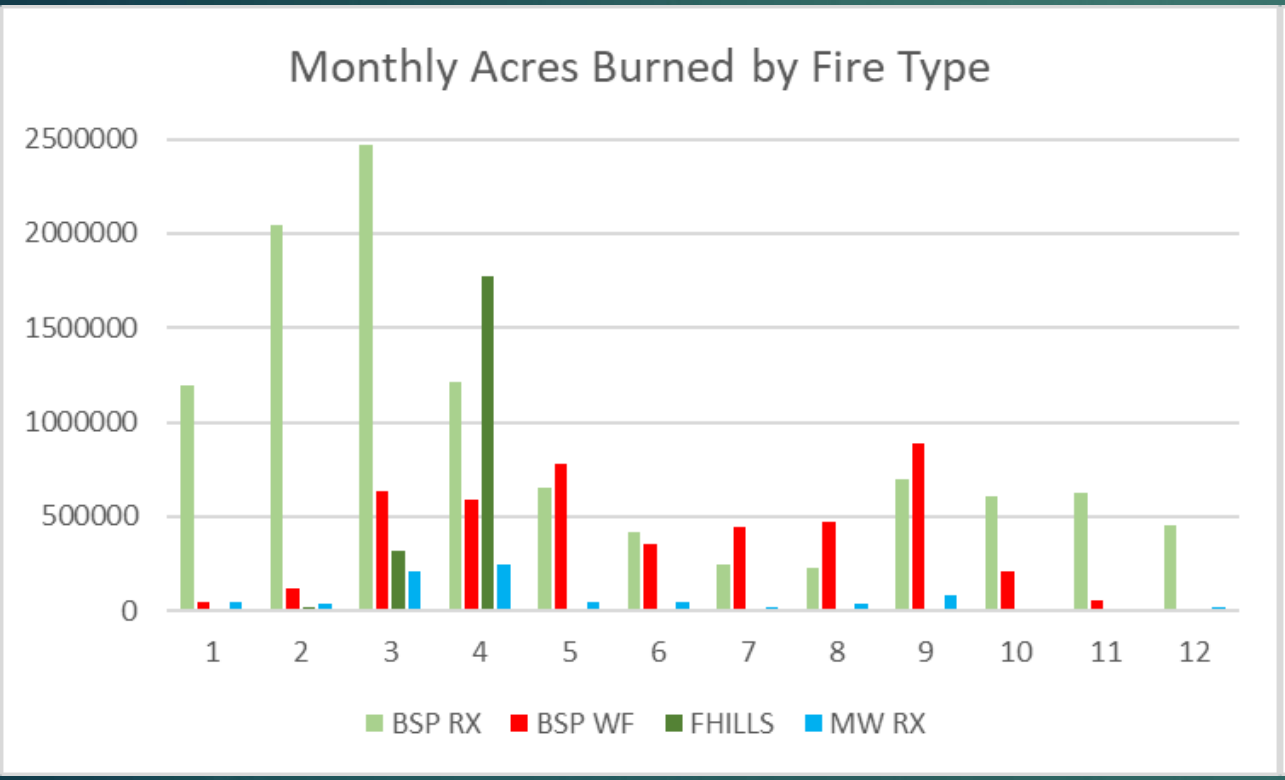
CONUS totals by SCC

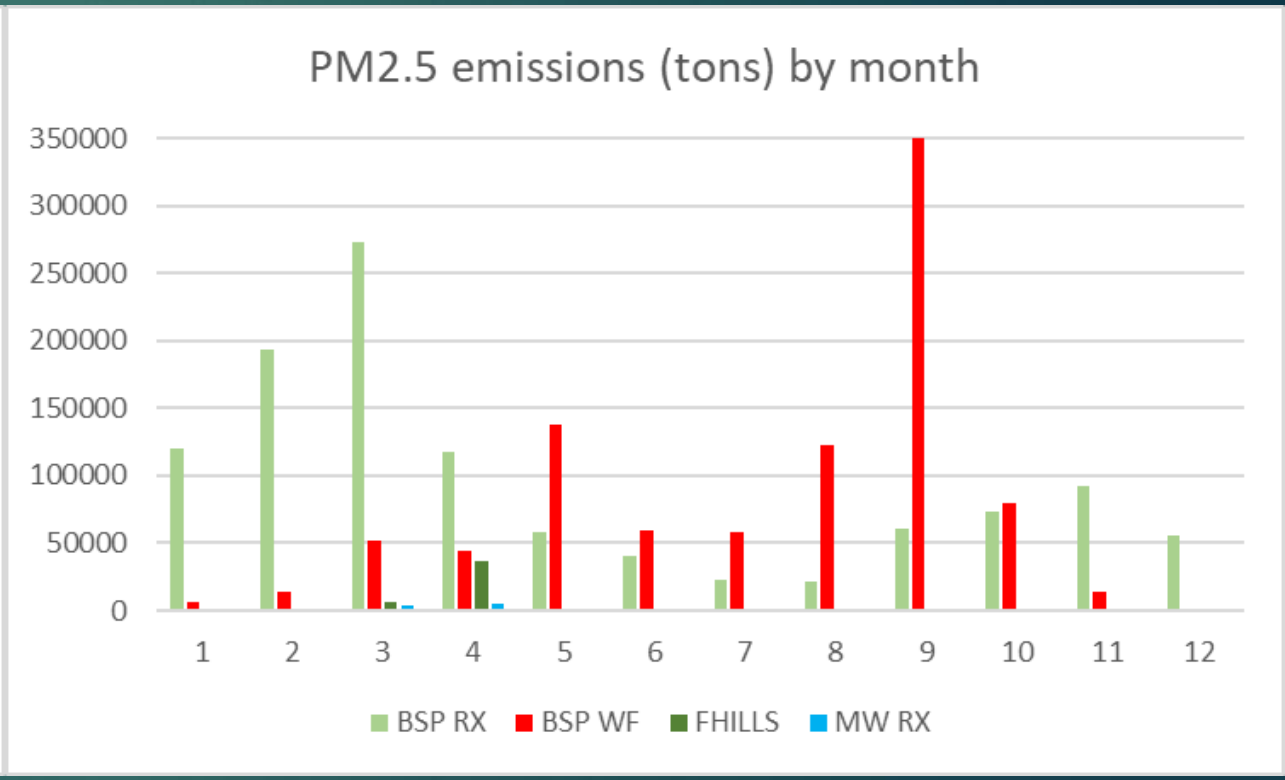
SCC	Description	ACRES BURNED	CO	NH3	NOX	PM10	PM2_5	SO2	VOC
2801500171	Flint Hills burns	2,112,759	219,194	3,105	12,045	45,014	43,266	4,299	73,786
2810001001	Wildfires; residual	0	2,514,619	16,122	3,411	417,172	353,535	8,961	552,052
2810001002	Wildfires; flaming + smoldering during flaming	4,682,907	4,376,897	54,725	67,950	1,022,221	589,194	59,383	1,306,997
2811015001	Prescribed burns; residual smoldering	0	1,455,085	8,107	1,590	242,571	205,569	4,176	313,136
2811015002	Prescribed burns; flaming + smoldering during flaming	10,845,652	6,343,535	57,398	118,384	1,003,091	921,042	73,161	1,255,699
2811020002	Rangeland burning; ditch burns	808,095	83,838	1,188	4,607	16,548	17,214	1,644	28,222
TOTAL		18,449,413	14,993,168	140,645	207,987	2,746,616	2,129,819	151,624	3,529,891





Monthly fire type analysis for CONUS

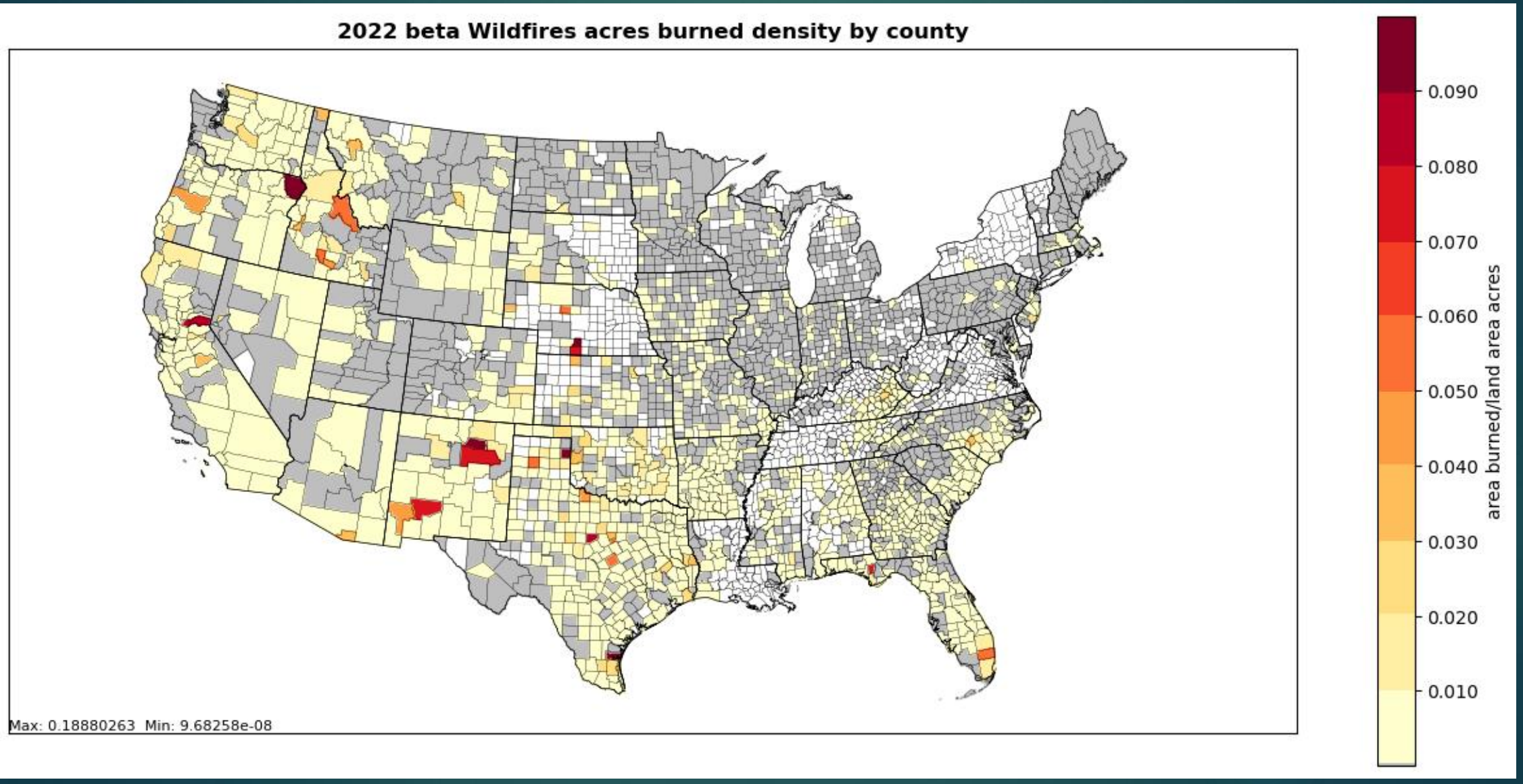


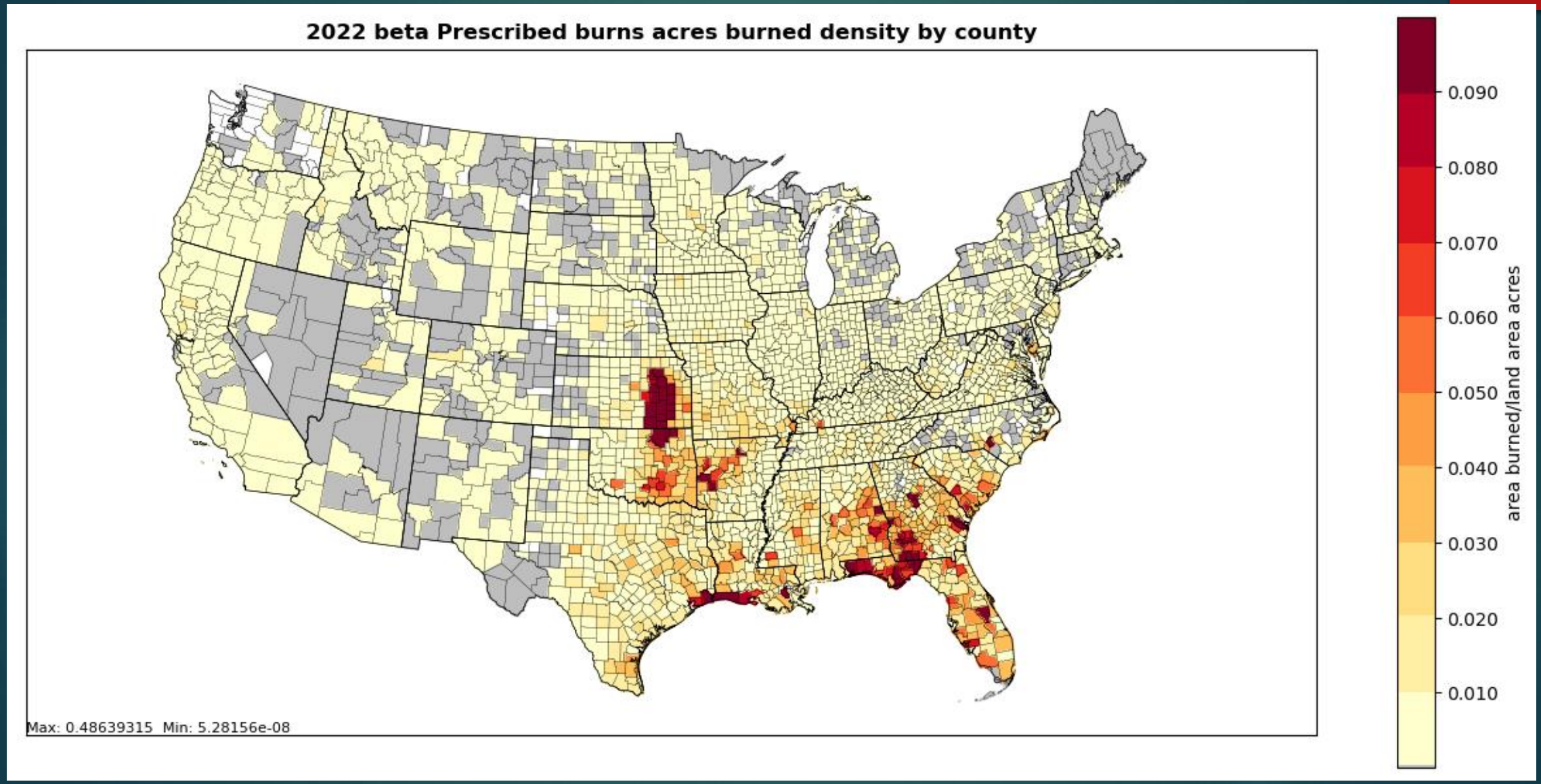


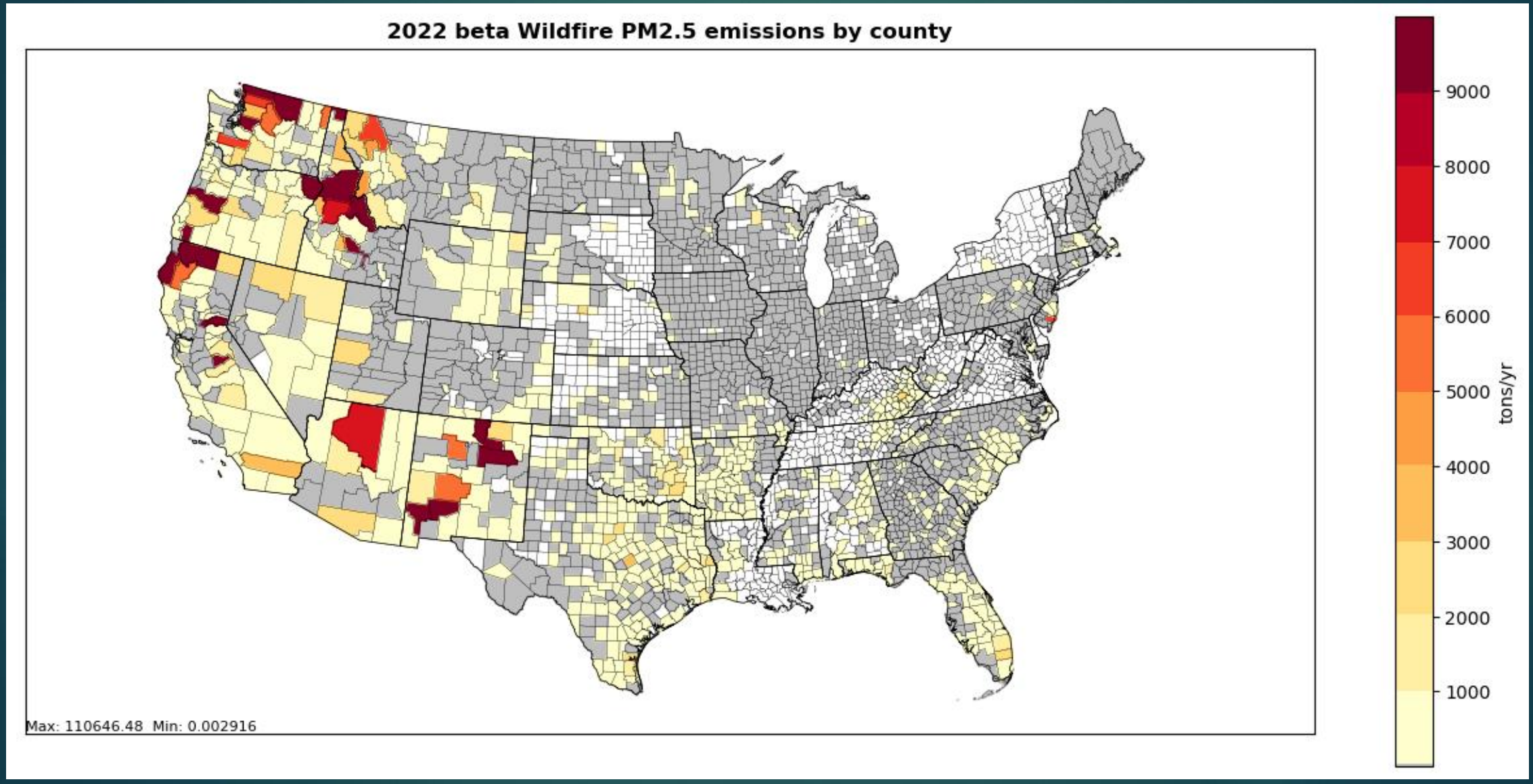
Situations where all we have for activity is HMS satellite information

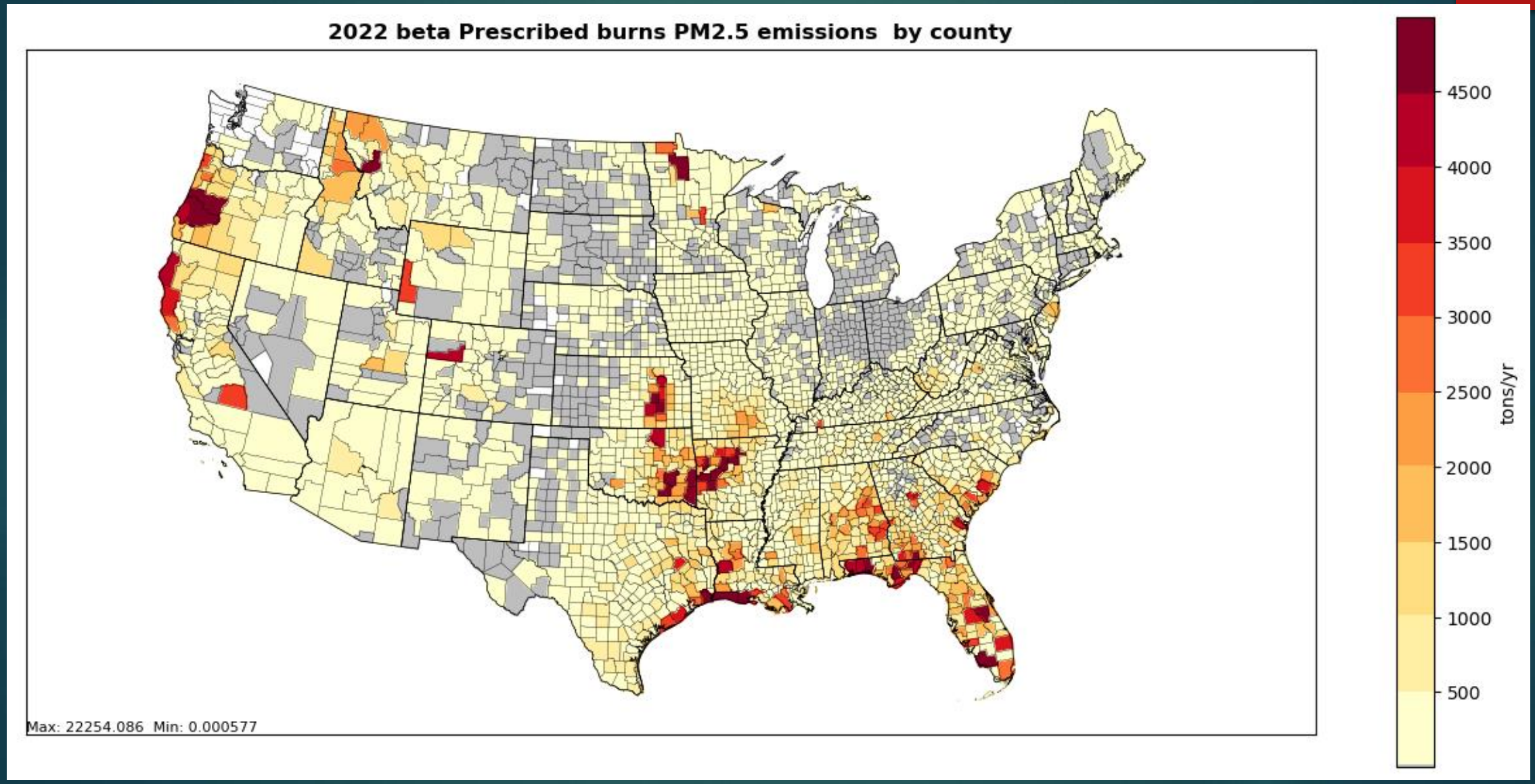
Fire Type	Total Acres Burned	HMS satellite detect only (acres)	Reconciled with activity data (acres)	% not reconciled with any activity
Prescribed burns	13,766,506	**6,697,023**	7,069,483	**48.6%**
Wildfires	4,682,907	206,727	4,476,180	4.4%

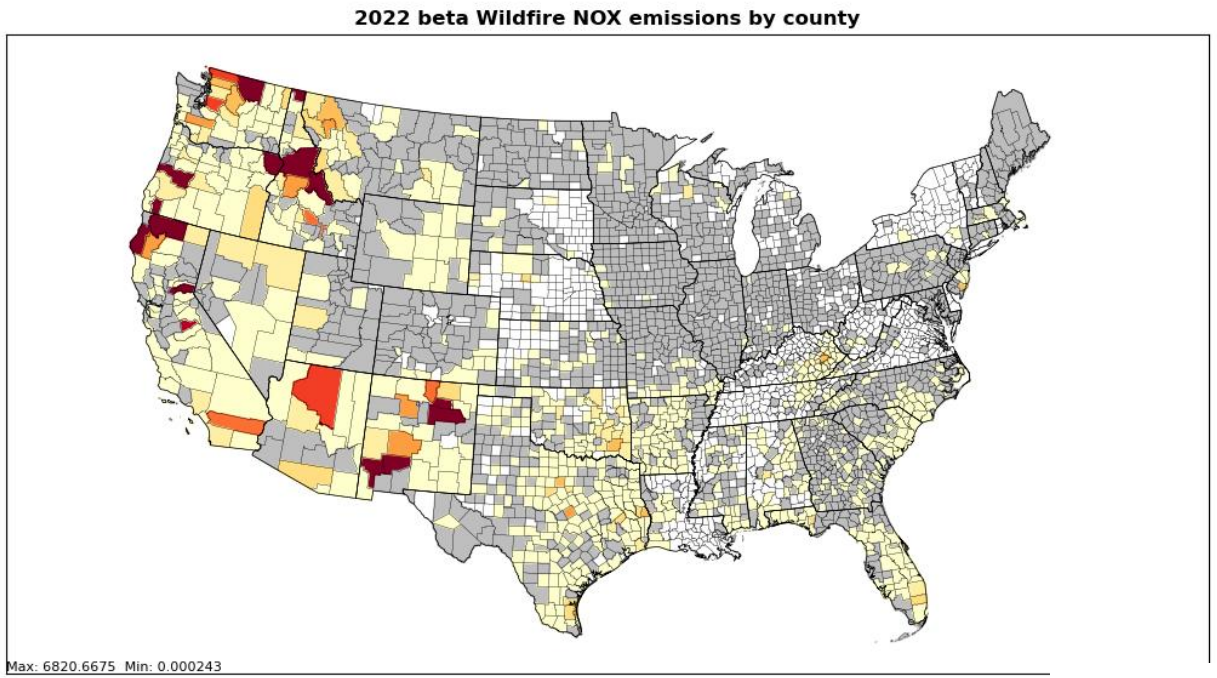
State	HMS satellite detect only (acres)	Total Prescribed burn acres	% HMS only reconciled
Texas	**1,397,649**	**1,518,769**	**92.0%**
Oklahoma	789,857	1,087,916	72.6%
Alabama	**729,858**	**817,908**	**89.2%**
Louisiana	**589,439**	**677,886**	**87.0%**
Kansas	496,555	2,373,557	20.9%
Missouri	**483,171**	**511,088**	**94.5%**
Mississippi	315,018	432,660	72.8%
Arkansas	228,486	747,137	30.6%
Iowa	167,224	199,376	83.9%
Tennessee	**165,525**	**174,912**	**94.6%**

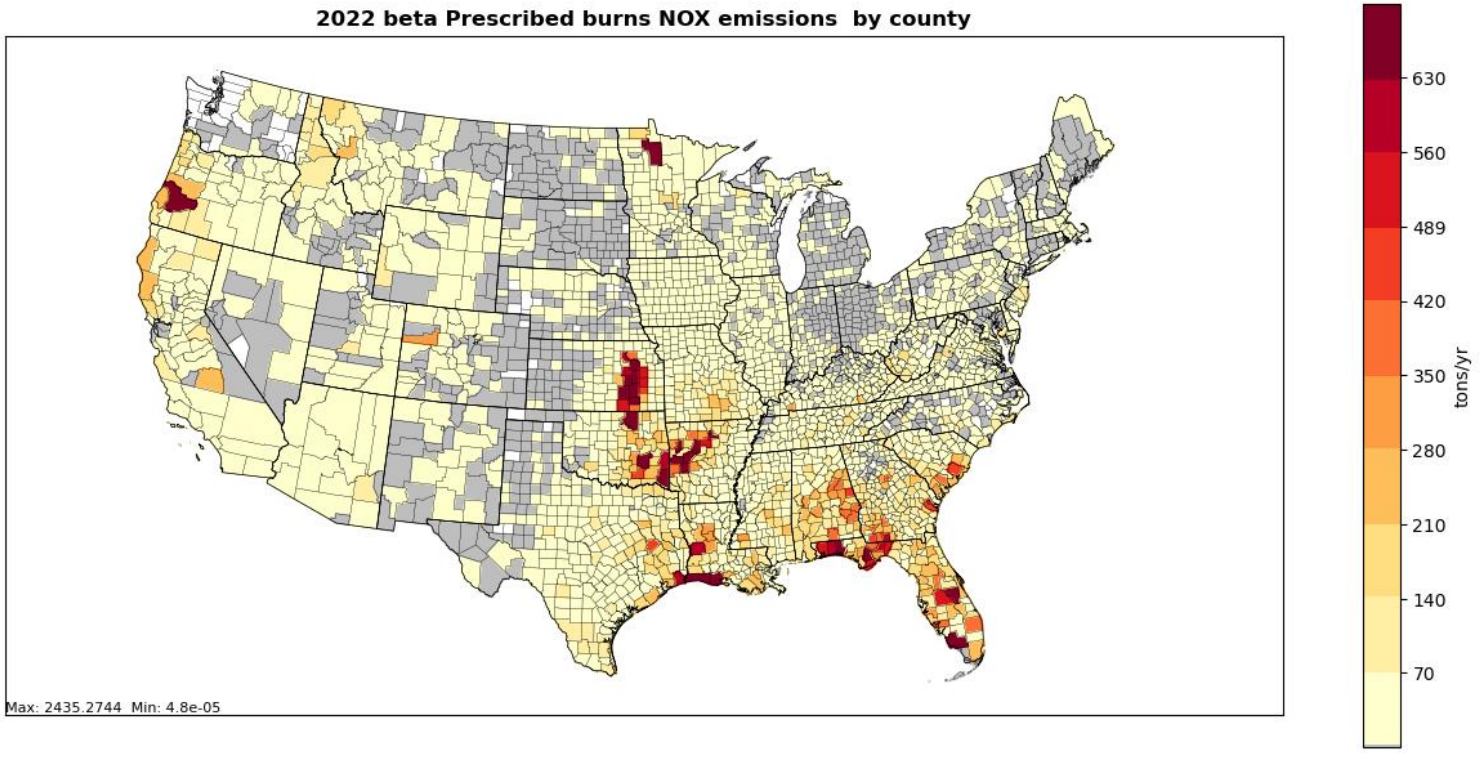

2022 beta Wildfires acres burned density by county
Max: 0.18880263 Min: 9.68258e-08
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
area burned/land area acres


2022 beta Prescribed burns acres burned density by county
Max: 0.48639315 Min: 5.28156e-08
area burned/land area acres
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010

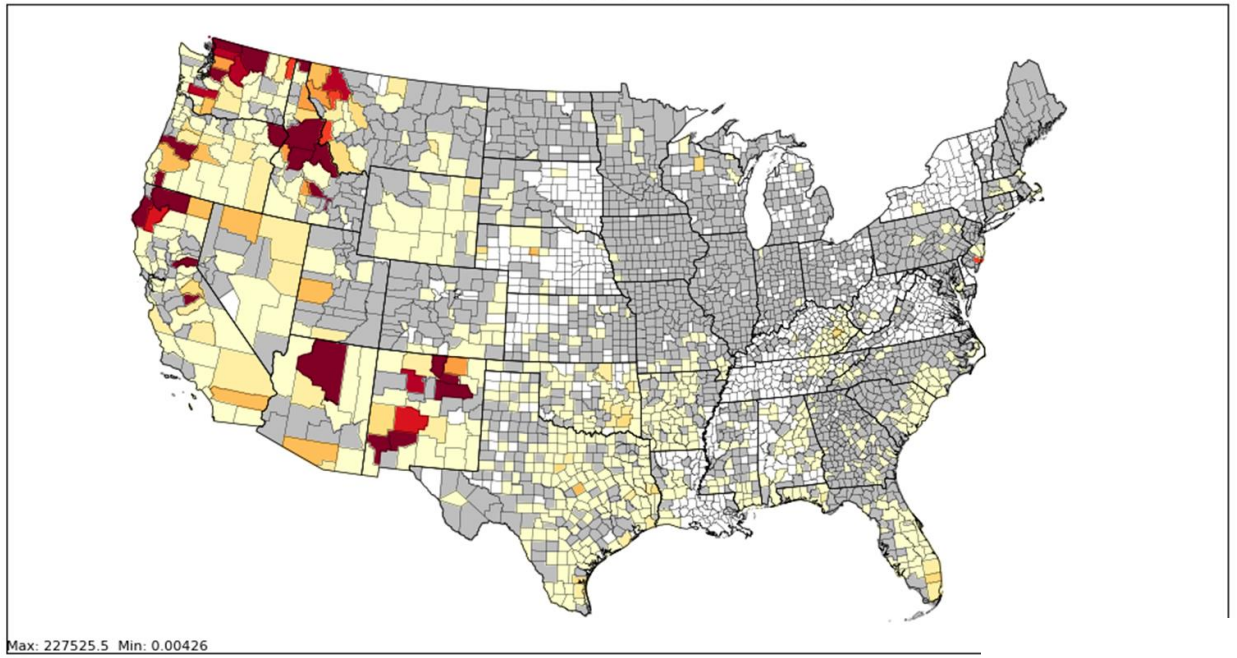

2022 beta Wildfire PM2.5 emissions by county
Max: 110646.48 Min: 0.002916
9000
8000
7000
6000
5000
4000
3000
2000
1000
tons/yr


2022 beta Prescribed burns PM2.5 emissions by county
Max: 22254.086 Min: 0.000577
4500
4000
3500
3000
2500
2000
1500
1000
500
tons/yr


2022 beta Wildfire NOX emissions by county
Max: 6820.6675 Min: 0.000243
900
800
700
600
500
400
300
200
100
tons/yr

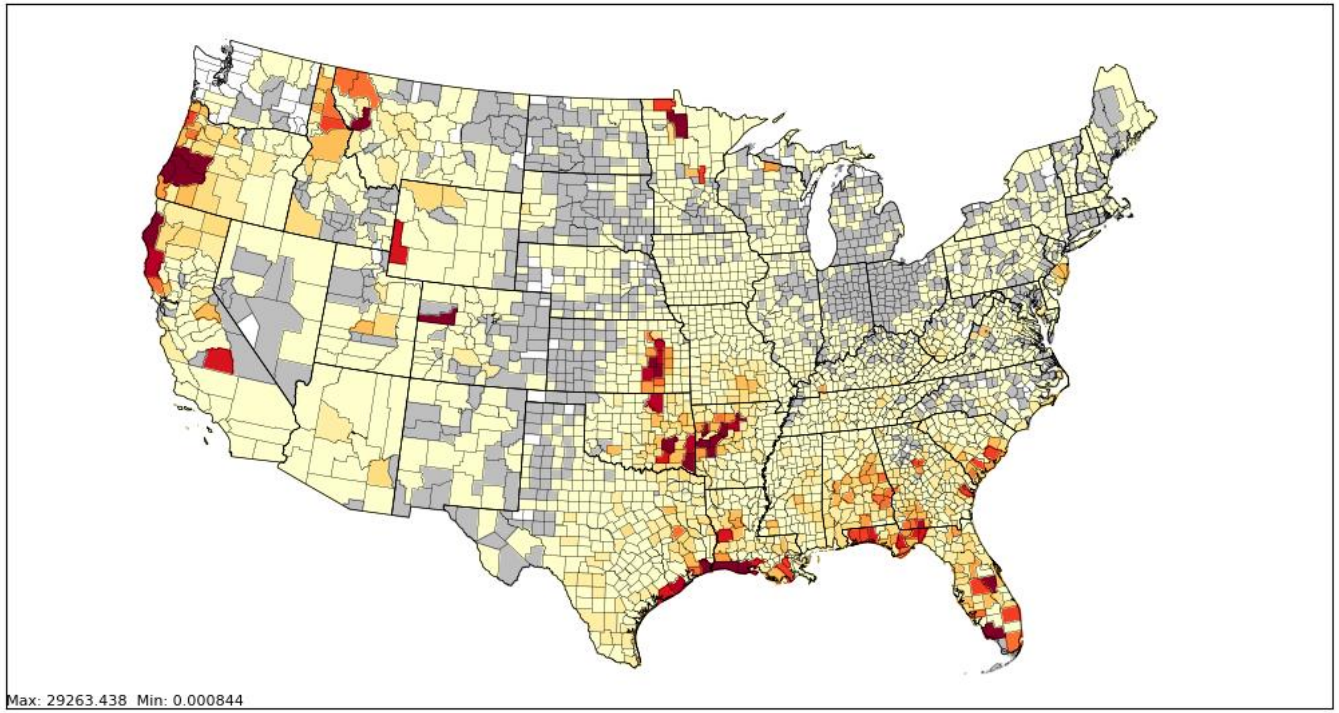

2022 beta Prescribed burns NOX emissions by county
Max: 2435.2744 Min: 4.8e-05
630
560
489
420
350
280
210
140
70
tons/yr

2022 beta Wildfire VOC emissions by county

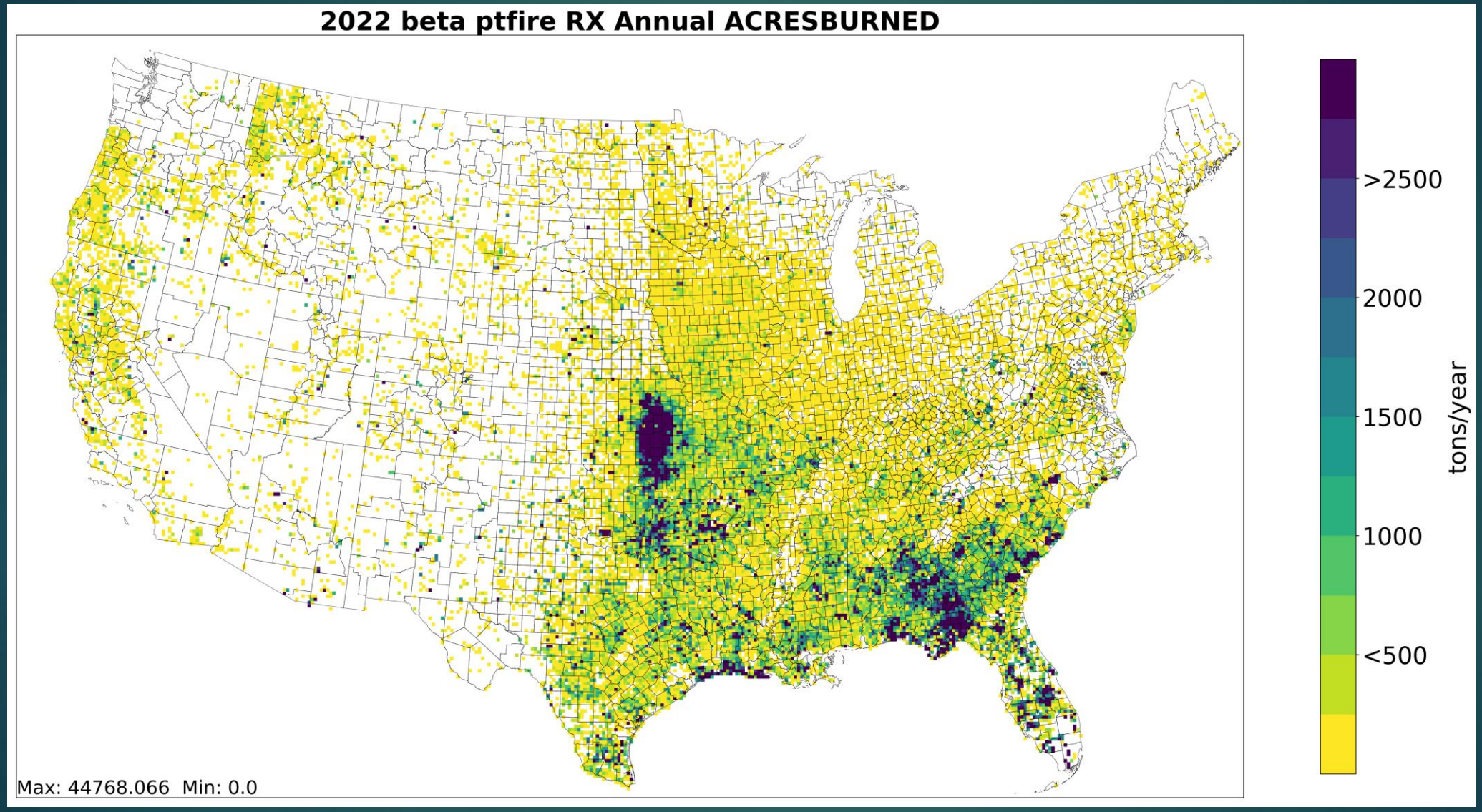


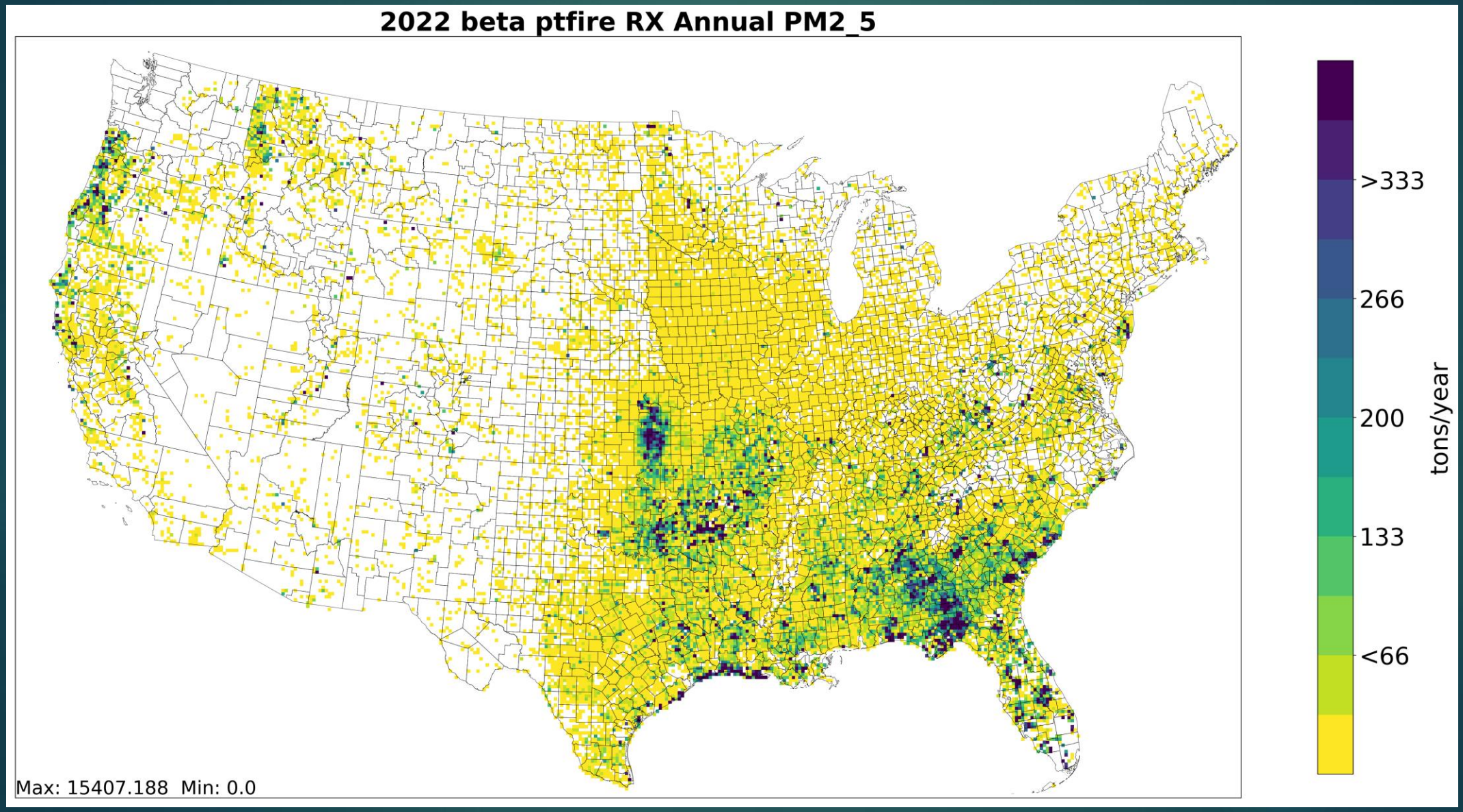
Max: 227525.5 Min: 0.00426

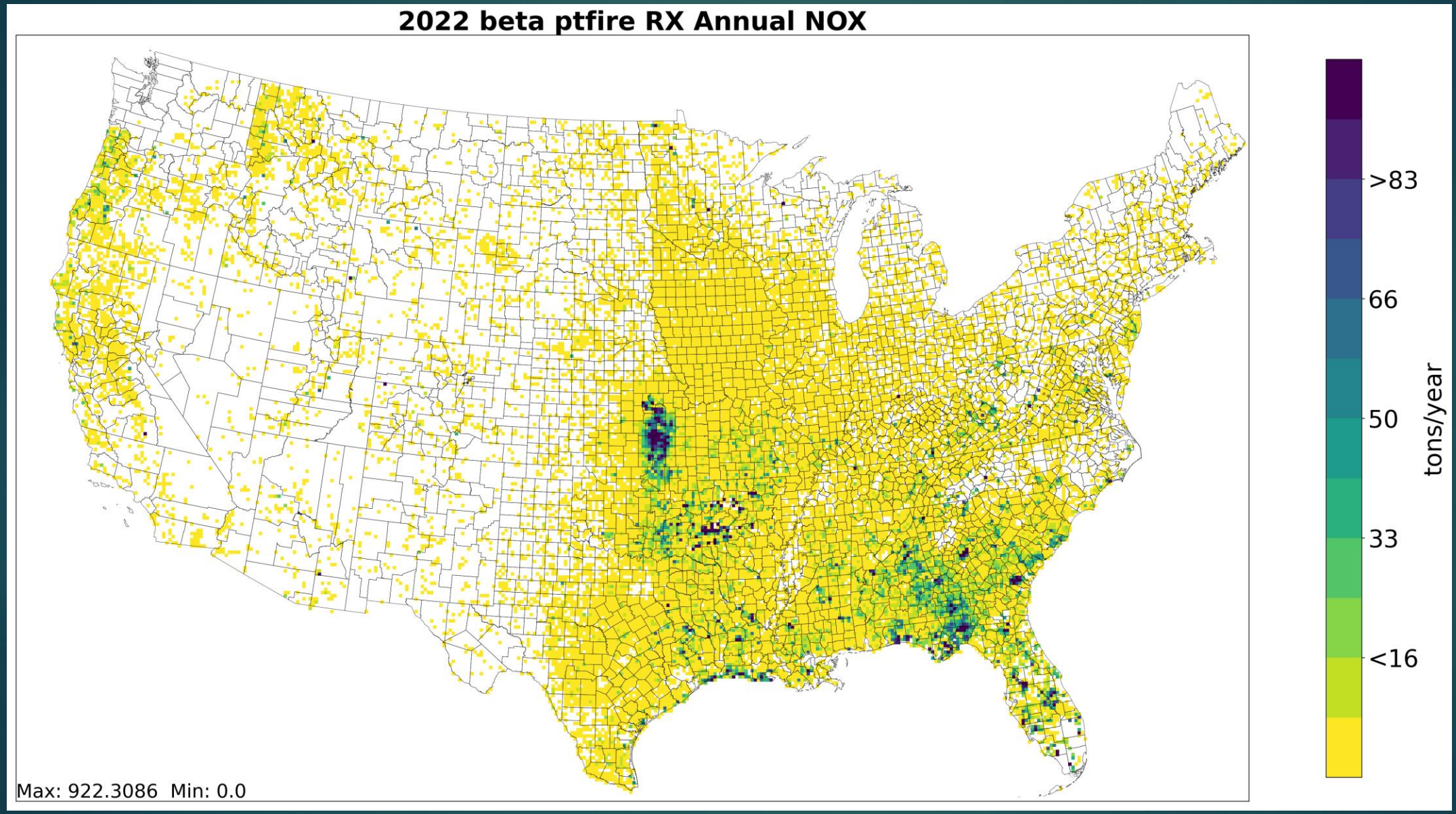
2022 beta Prescribed burns VOC emissions by county

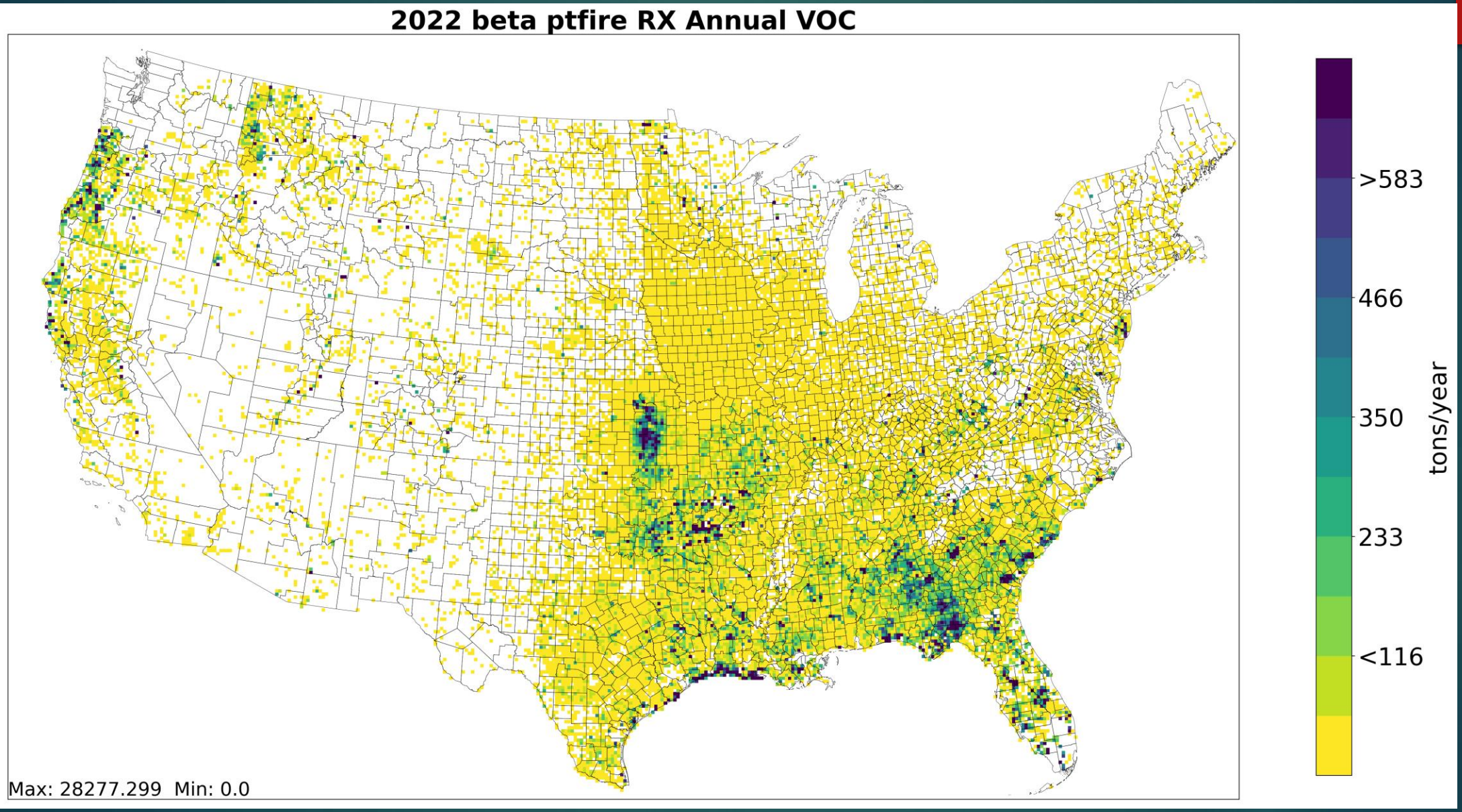


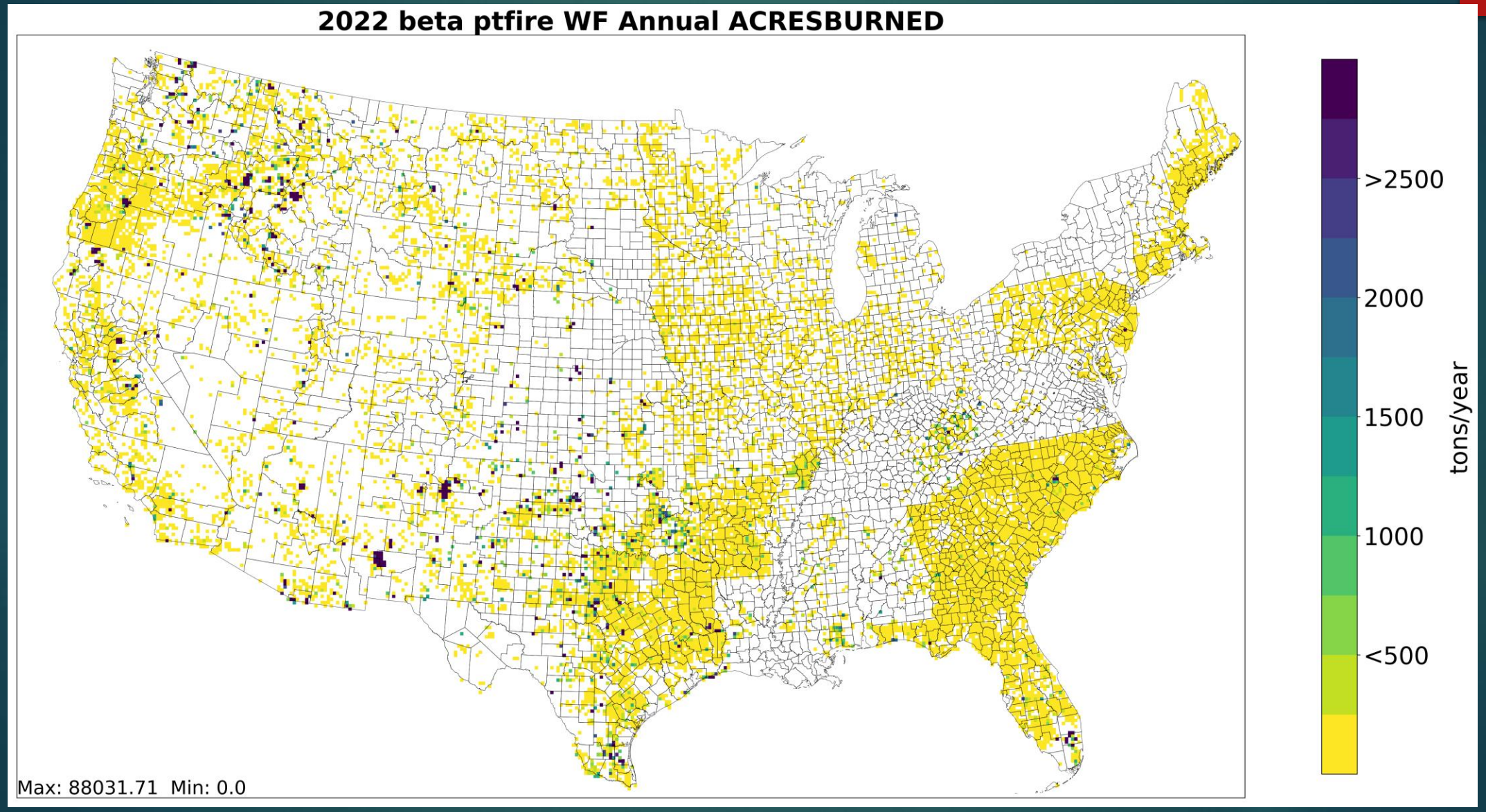
Max: 29263.438 Min: 0.000844

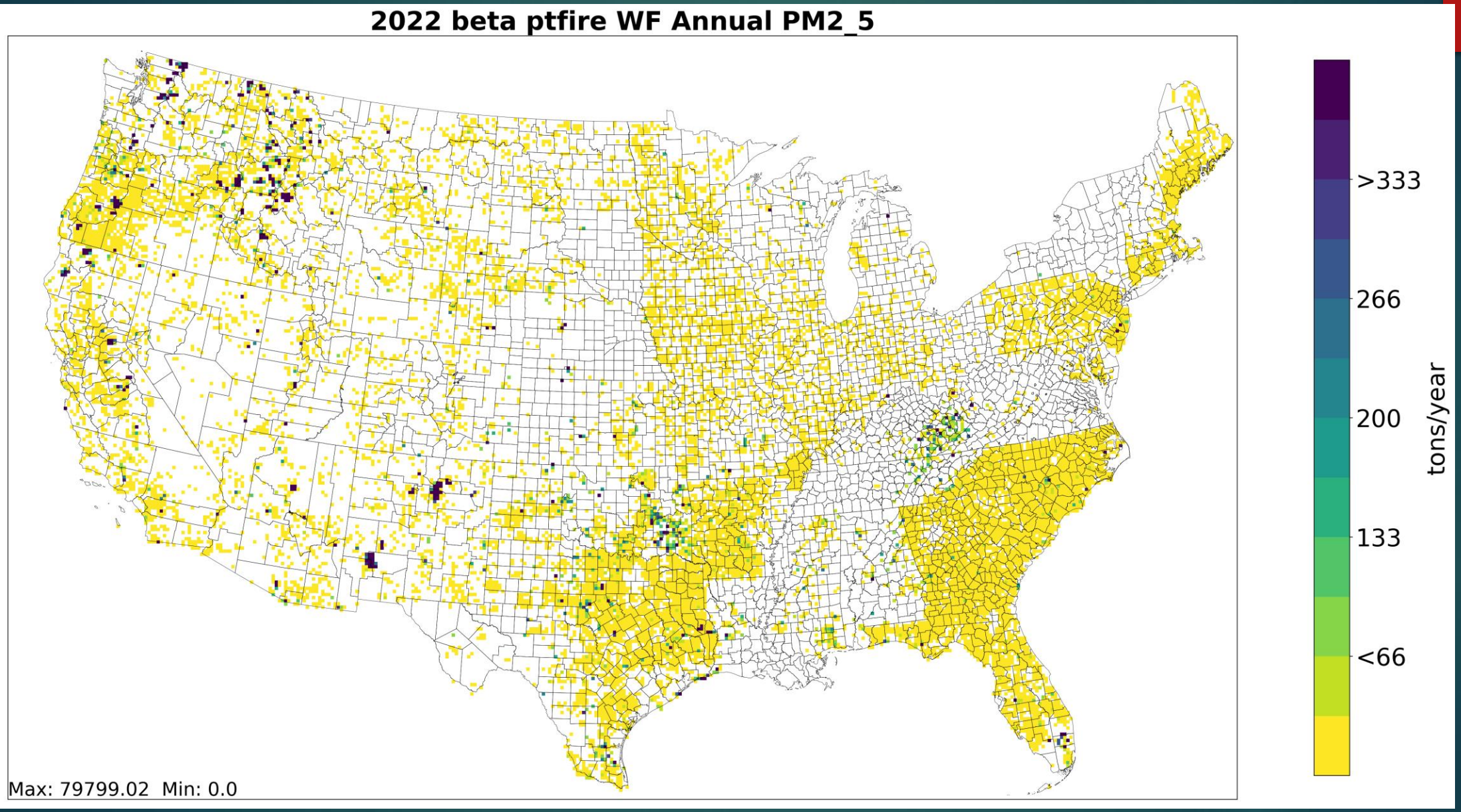

2022 beta ptfire RX Annual ACRESBURNED
>2500
2000
1500
1000
<500
tons/year
Max: 44768.066 Min: 0.0

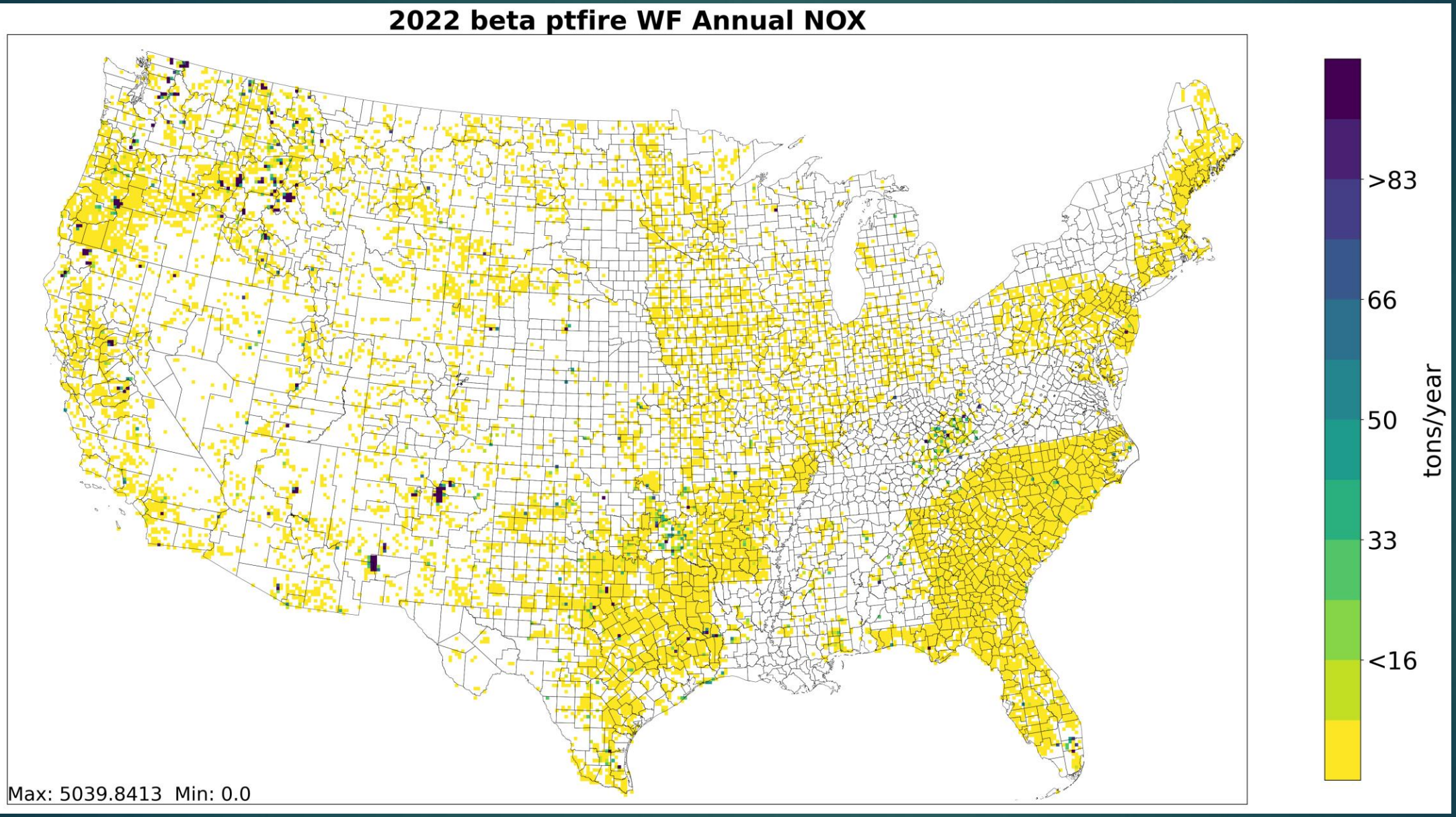

2022 beta ptfire RX Annual PM2_5
>333
266
200
133
<66
tons/year
Max: 15407.188 Min: 0.0

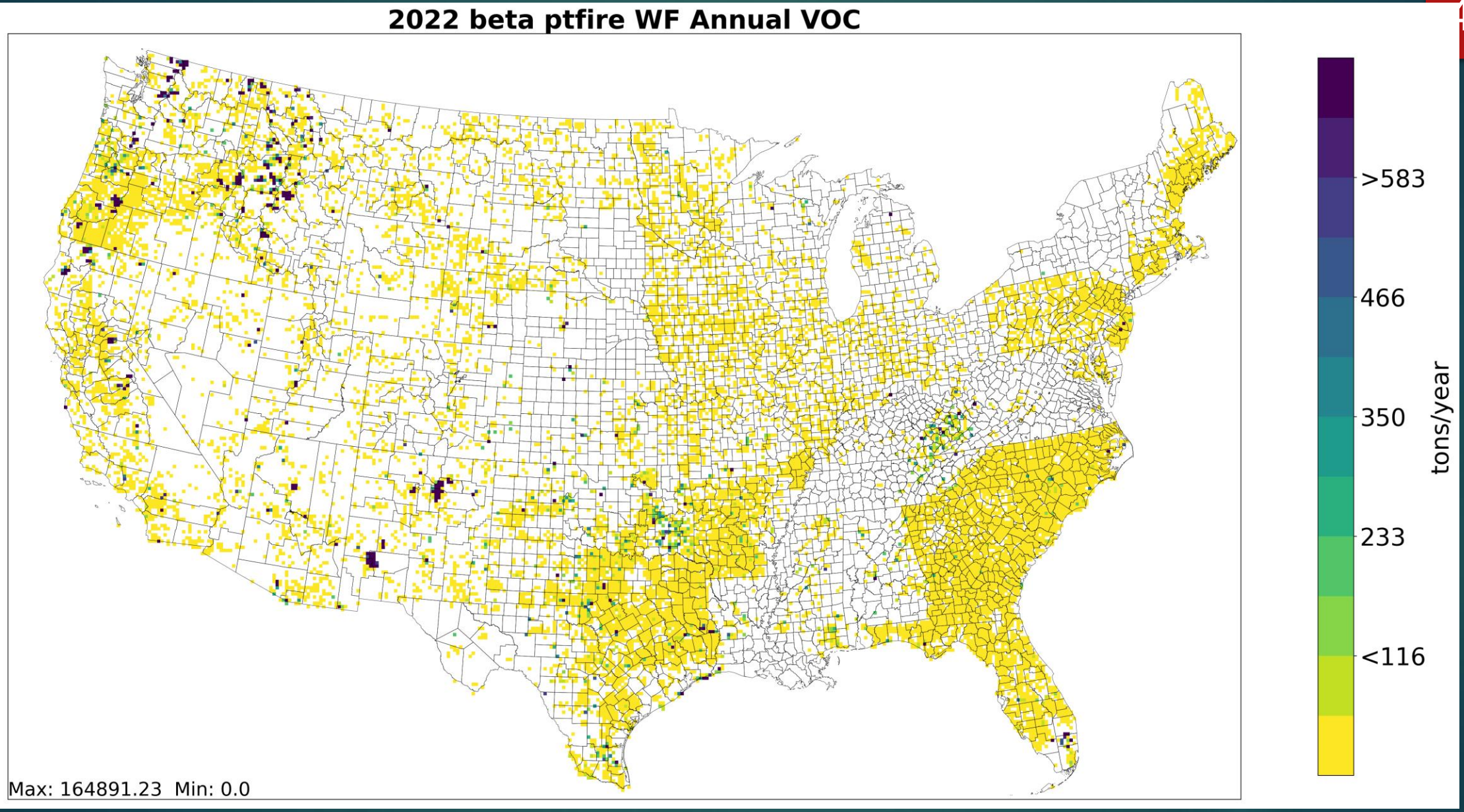

2022 beta ptfire RX Annual NOX
>83
66
50
33
<16
tons/year
Max: 922.3086 Min: 0.0


2022 beta ptfire RX Annual VOC
>583
466
350
233
<116
tons/year
Max: 28277.299 Min: 0.0


2022 beta ptfire WF Annual ACRESBURNED
>2500
2000
1500
1000
<500
tons/year
Max: 88031.71 Min: 0.0


2022 beta ptfire WF Annual PM2_5
>333
266
200
133
<66
tons/year
Max: 79799.02 Min: 0.0


2022 beta ptfire WF Annual NOX
Max: 5039.8413 Min: 0.0
>83
66
50
33
<16
tons/year


2022 beta ptfire WF Annual VOC
>583
466
350
233
<116
tons/year
Max: 164891.23 Min: 0.0

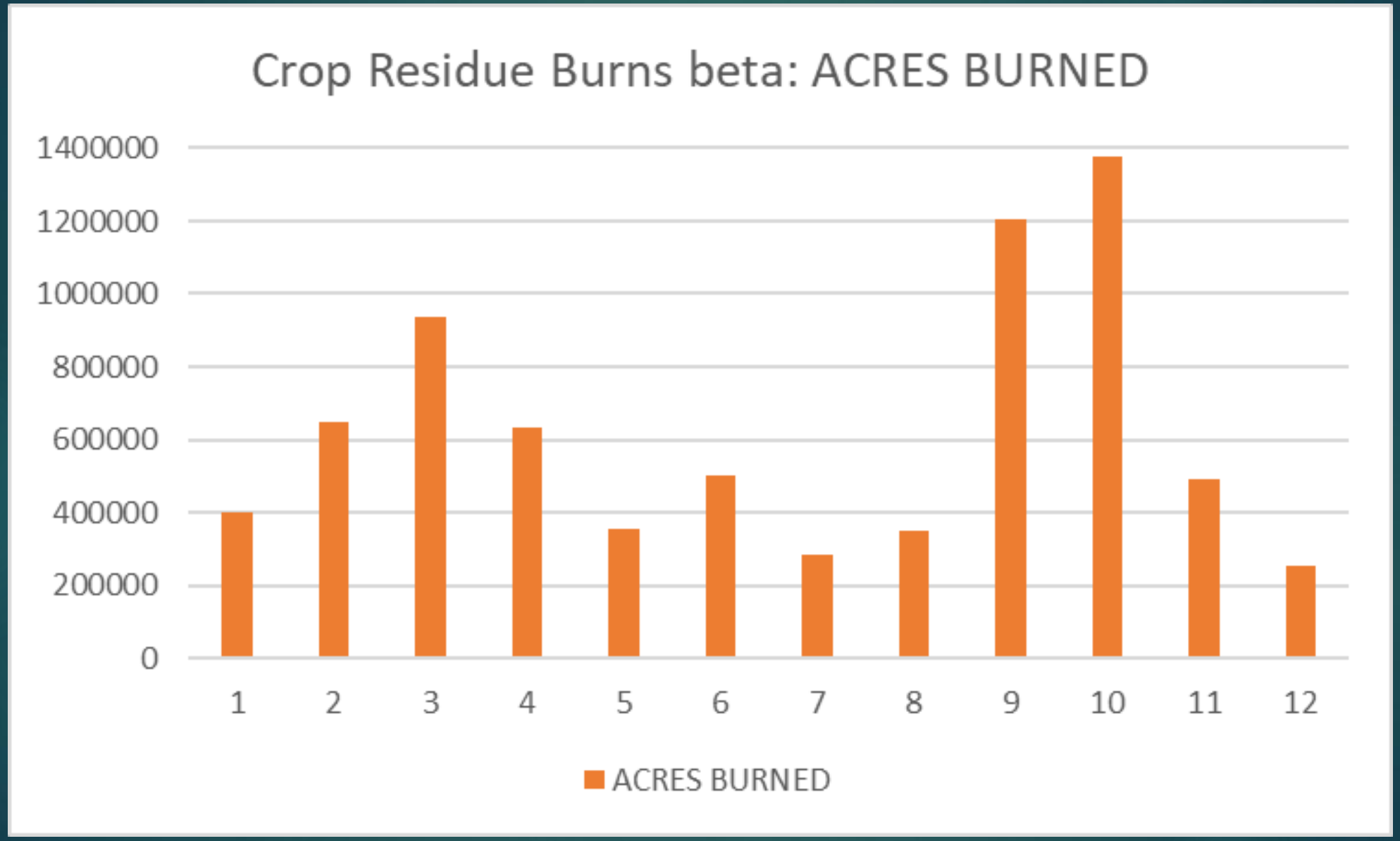
Agricultural or Crop Residue burns

Crop Reside Burns 2022

- Number of HMS detects and average crop field size by state used to get daily acres burned
  - 145,000 HMS detects in 2022 beta (122K in alpha)
- Sugarcane: use area harvested from USDA or LSU (Louisiana); use HMS detects to estimate acres/detect by state; use emission factors (from SPECIATE for PM2.5/VOC) to estimate emissions Texas: 114 acres/detect (25% green harvested); LA 28 acres/detect (62.5 % green harvested; FL 60 acres/detect)
- Crops Module added to Bluesky Pipeline that uses daily acres burned information as input and generate consumption estimates and applies emission factors to get resulting daily emissions for each burn
- 2022 Beta: 7.44M acres burned
  - alpha version 6.64M acres burned
  - 12% increase from alpha

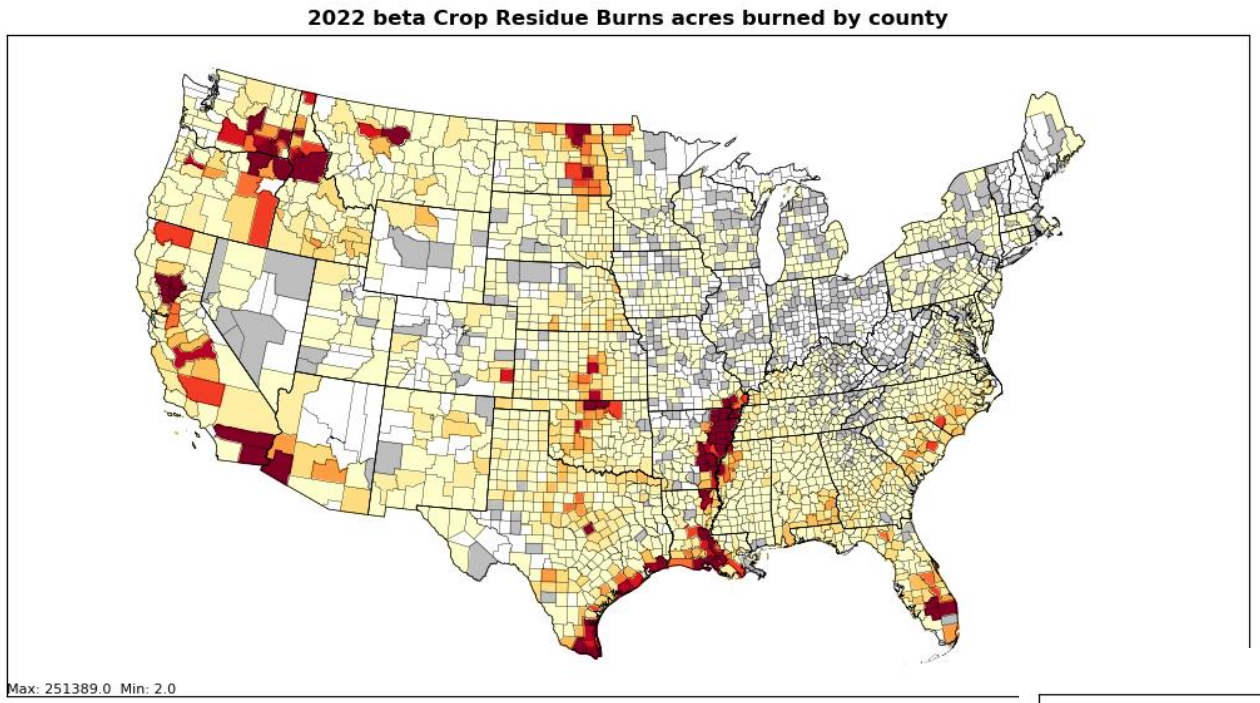
Crop Reside Burns 2022 emissions

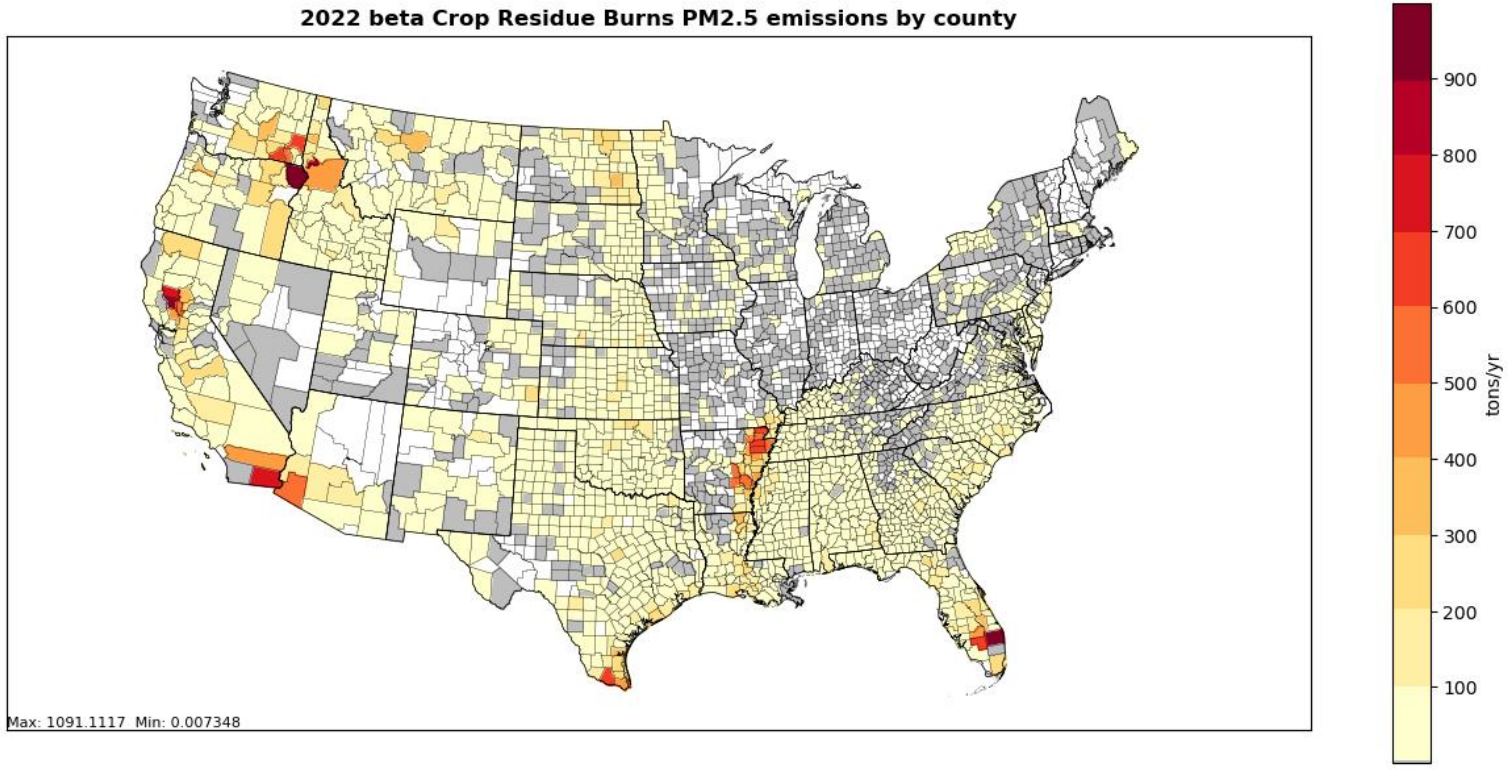
Pollutant	Alpha version	Beta version	%diff beta-alpha
CO	846,863	949,393	12.1%
NH3	172,988	10,649	-93.8%
NOX	37,179	40,089	7.8%
PM10	125,918	131,751	4.6%
PM2_5	85,522	82,575	-3.4%
SO2	15,123	12,763	-15.6%
VOC	141,279	138,193	-2.2%

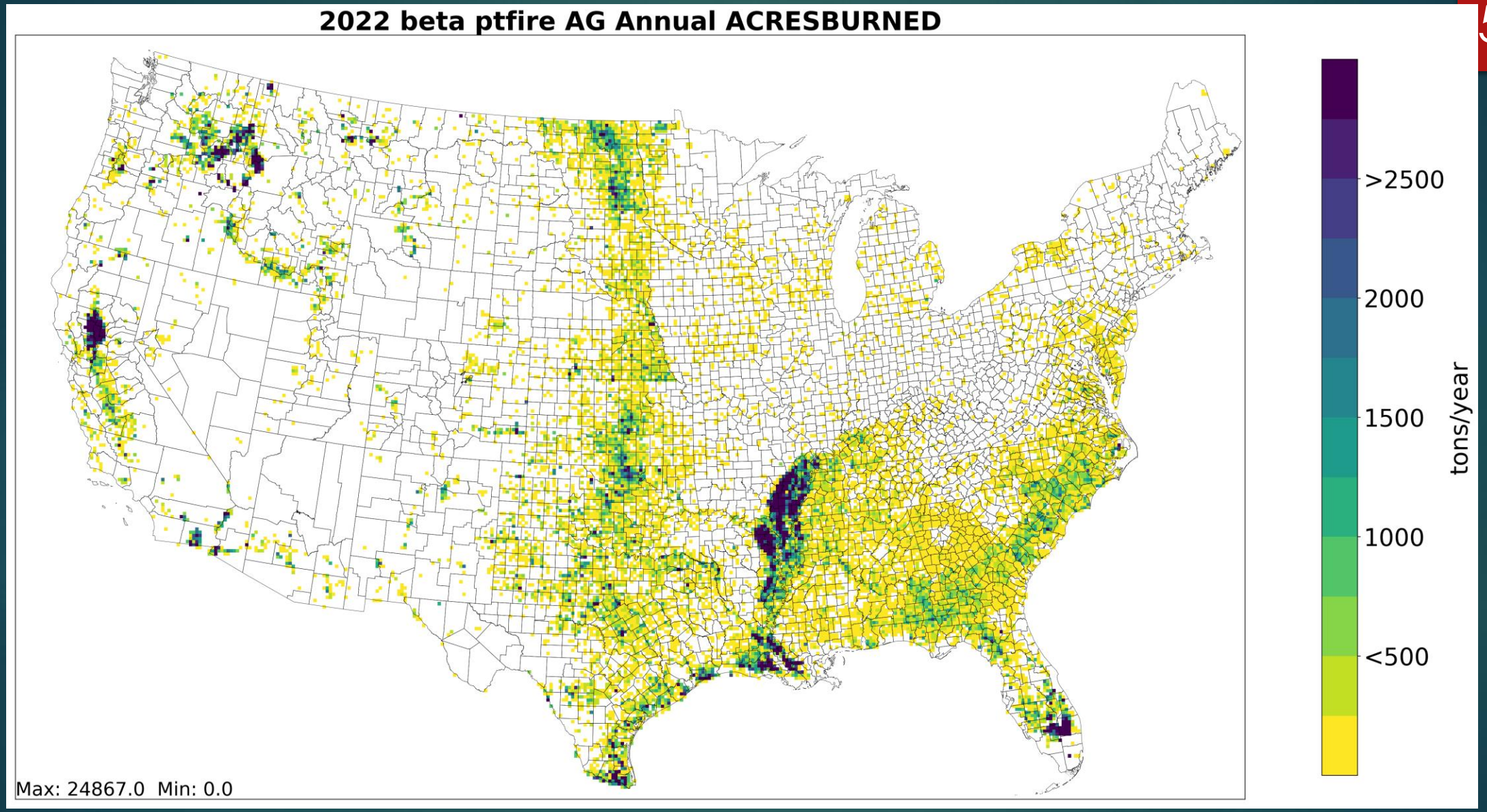

Crop Residue Burns beta: ACRES BURNED
1400000
1200000
1000000
800000
600000
400000
200000
0
1
2
3
4
5
6
7
8
9
10
11
12
ACRES BURNED

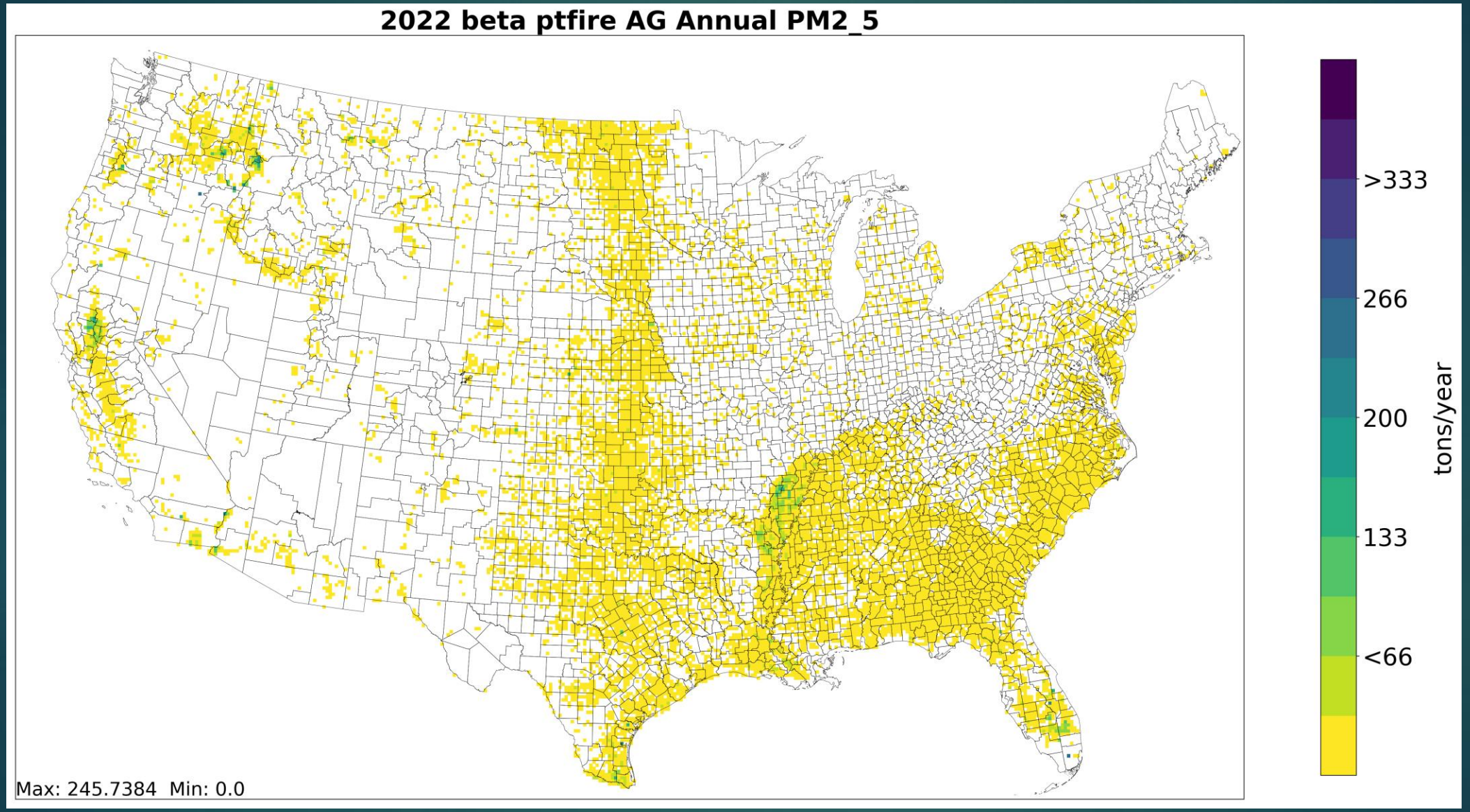
Crop Reside Burns 2022 emissions SCC totals

SCC	SCC description	Acres Burned	% of total
2801500000	Ag Field Burning - whole field set on fire;Unspecified crop type	1,194,311	16.1%
2801500141	Ag Field Burning - whole field set on fire;Field Crop is Soybeans	1,254,521	16.9%
2801500150	Ag Field Burning - whole field set on fire;Field Crop is Corn	860,261	11.6%
2801500160	Ag Field Burning - whole field set on fire;Field Crop is Cotton	488,355	6.6%
2801500171	Ag Field Burning - whole field set on fire;Field Crop is Fallow	895,223	12.0%
2801500220	Ag Field Burning - whole field set on fire;Field Crop is Rice	703,660	9.5%
2801500250	Ag Field Burning - whole field set on fire;Field Crop is Sugar Cane	524,073	7.0%
2801500262	Ag Field Burning - whole field set on fire;Field Crop is Wheat	1,200,422	16.1%
2801500264	Ag Field Burning - whole field set on fire;Winter Wheat and Soybeans	93,544	1.3%
2811020002	Prescribed Rangeland Burning; Pasture	221,153	3.0%
	Total	7,435,521	100.0%


2022 beta Crop Residue Burns acres burned by county
22500
20000
17500
15000
12500
10000
7500
5000
acres
Max: 251389.0 Min: 2.0


2022 beta Crop Residue Burns PM2.5 emissions by county
900
800
700
600
500
400
300
200
100
tons/yr
Max: 1091.1117 Min: 0.007348


2022 beta ptfire AG Annual ACRESBURNED
>2500
2000
1500
1000
<500
tons/year
Max: 24867.0 Min: 0.0


2022 beta ptfire AG Annual PM2_5
>333
266
200
133
<66
tons/year
Max: 245.7384 Min: 0.0

Pile burns emissions: Update by James Beidler

Next steps

Updated timeline to get to 2022v1

- 30-day review period for fires to end Monday May 13, 2024
- Use comments from 30-day review to further improve inventory to generate 2022v1 fire inventory (May – mid June 2024)
- EPA will consult with SLTs as needed to address comments until around mid-June 2024
- Workgroup Meeting #3 (July 2024)
- Possible Workgroup Meeting #4 (late 2024)
  - Technical Documentation feedback
  - Possible 2022v2 updates
  - Feedback from air quality modeling performance
  - Discuss possible BSP or other input data updates

To do list so far for 2022v1….

- Respond to Idaho, Georgia, North Carolina, USFS (Wickman) feedback
- Include Virginia fire activity
- Examine possible bad pile burn dimensions in a few states
- Remove crop residue burns that are part of wildfires
- Fix PM10 emissions (small amount missing; thanks Kansas!)
- Solar farm check
- Few wildfires need double checking

Any questions about 2022 fires please contact Vukovich.Jeffrey@epa.gov