

Introduction to PM_{2.5} and Arizona's Proposed Boundary Recommendations for the 2024 Primary Annual PM_{2.5} NAAQS

September 19 and 20, 2024



Clean Air, Safe Water,
Healthy Land for Everyone



Revisions to the Particulate Matter NAAQS

Clean Air Act §109 directs the Environmental Protection Agency Administrator to propose and promulgate “primary” and “secondary” air quality standards

Clean Air Act §109(d)(1) requires EPA to review existing air quality criteria every 5 years

EPA last completed a review of the particulate matter (PM) standards on December 18, 2020

On February 7, 2024, EPA announced a final rule for the reconsideration of the National Ambient Air Quality Standards for particulate matter

Primary Annual PM_{2.5} NAAQS lowered level from 12.0 µg/m³ to 9.0 µg/m³ (3 year average)

16202 Federal Register / Vol. 89, No. 45 / Wednesday, March 6, 2024 / Rules and Regulations

ENVIRONMENTAL PROTECTION AGENCY
40 CFR Parts 50, 53, and 58
[EPA-HQ-OAR-2015-0072; FRL-8635-02-OAR]
RIN 2060-AV52
Reconsideration of the National Ambient Air Quality Standards for Particulate Matter
AGENCY: Environmental Protection Agency (EPA).
ACTION: Final rule.

SUMMARY: Based on the Environmental Protection Agency’s (EPA’s) reconsideration of the air quality criteria and the national ambient air quality standards (NAAQS) for particulate matter (PM), the EPA is revising the primary annual PM_{2.5} standard by lowering the level from 12.0 µg/m³ to 9.0 µg/m³. The Agency is retaining the current primary 24-hour PM_{2.5} standard and the primary 24-hour PM₁₀ standard. The Agency also is not changing the secondary 24-hour PM_{2.5} standard, secondary annual PM_{2.5} standard, and secondary 24-hour PM₁₀ standard at this time. The EPA is also finalizing revisions to other key aspects related to the PM NAAQS, including revisions to the Air Quality Index (AQI) and monitoring requirements for the PM NAAQS.

DATES: This final rule is effective May 6, 2024.

ADDRESSES: The EPA has established a docket for this action under Docket ID No. EPA-HQ-OAR-2015-0072. All documents in the docket are listed on the <https://www.regulations.gov> website. Although listed in the index, some information is not publicly available, e.g., CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the internet and will be publicly available only in hard copy form. Publicly available docket materials are available electronically through <https://www.regulations.gov>.

FOR FURTHER INFORMATION CONTACT: Dr. Lars Perlmitt, Health and Environmental Impacts Division, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Mail Code C539-04, Research Triangle Park, NC 27711; telephone: (919) 541-3037; fax: (919) 541-5315; email: perlmitt.lars@epa.gov.

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Projected Timeline



September/October 2024

Draft boundary recommendations and technical support document posted; public hearing announced and comment period begins

January 7, 2025

Final boundary recommendations and response to comments submitted to Governor

February 7, 2026

EPA designations are made final (may take up to one additional year)

February 7, 2024

Revised PM2.5 NAAQS Promulgated

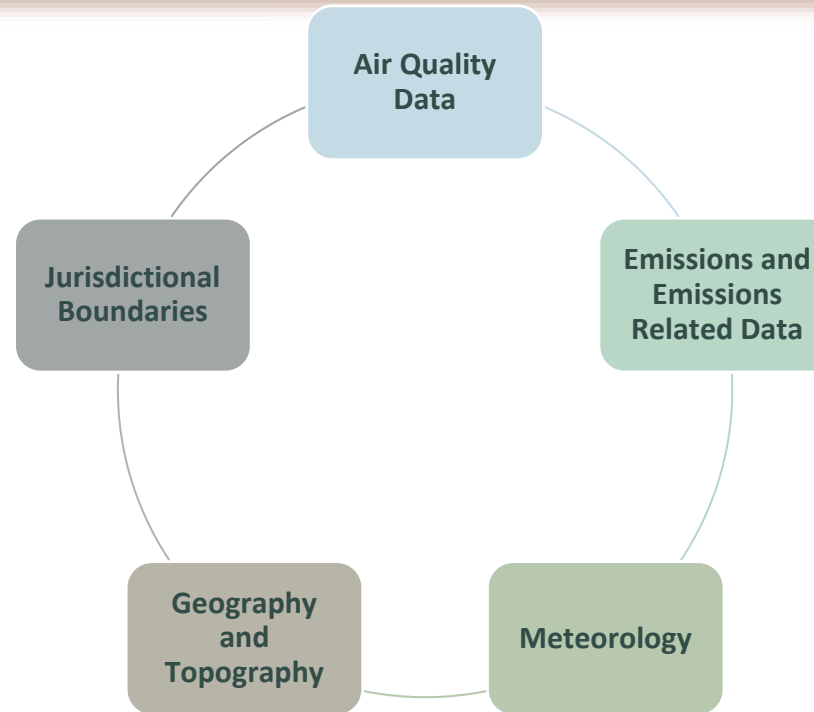
October/November 2024

Comment period ends and public hearing held

February 7, 2025

Governor submits recommendations to EPA

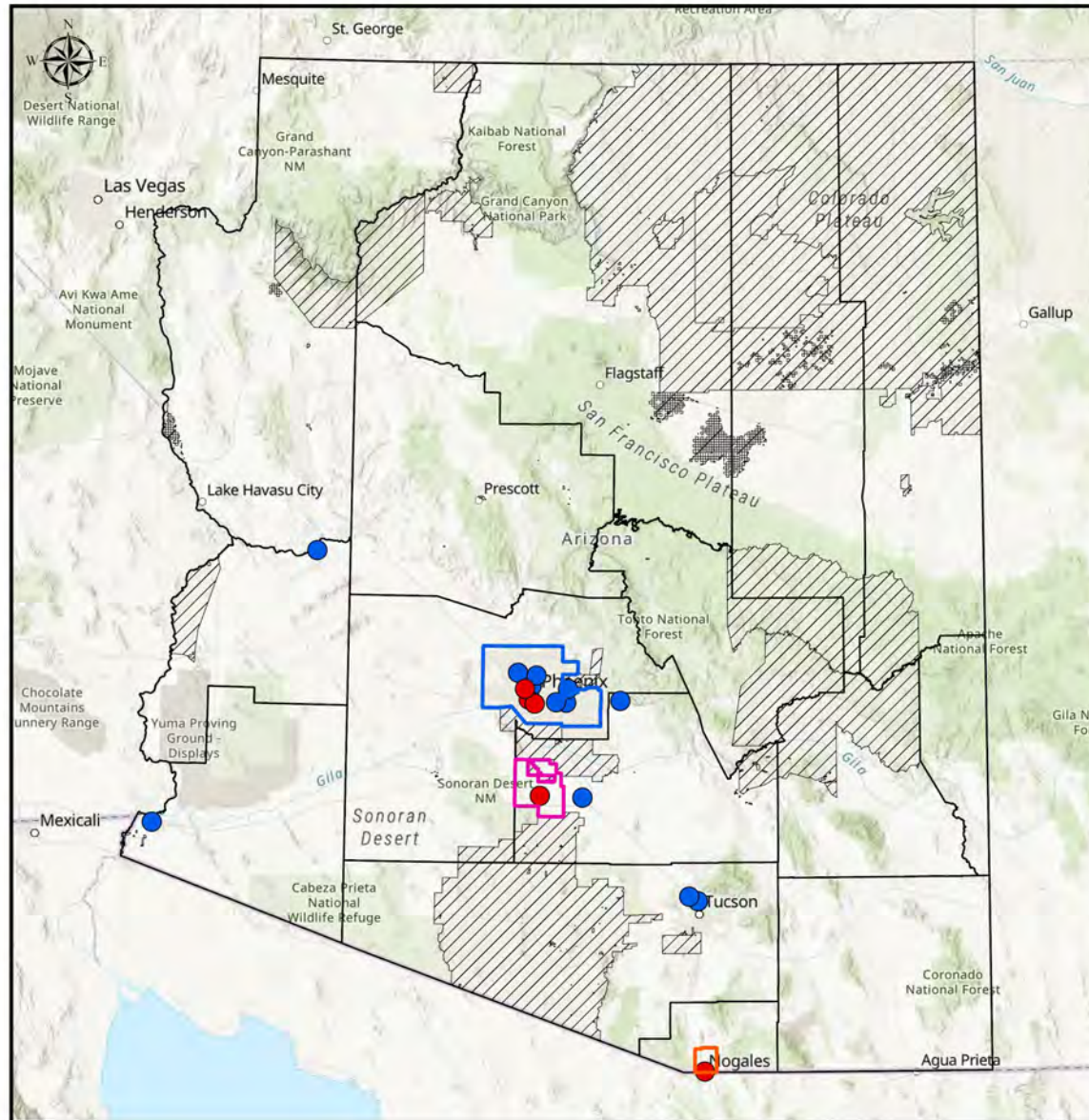
Five-Factor Analysis and Weight-of-Evidence



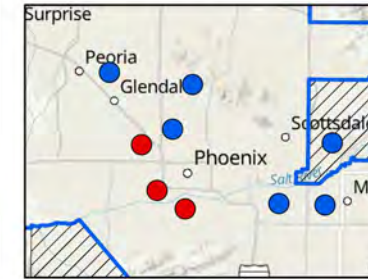
Weight-of-Evidence: Refers to the believability or persuasiveness of evidence for its probative value.

- EPA recommends that States evaluate the five factors together and use a weight-of-evidence approach for this analysis.
- “The guiding principle for this evaluation is to include within the boundaries of the nonattainment area, any nearby areas with emissions of PM_{2.5} or PM_{2.5} precursors that have the potential to be transported to the violating monitor.”

Arizona PM_{2.5} Monitoring Data and Proposed NAA



Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation



Legend

- Maricopa Proposal
- Santa Cruz Proposal
- Pinal Proposal
- Violating PM_{2.5} Monitor (2021-2023 DV)
- Attaining PM_{2.5} Monitor (2021-2023 DV)
- Tribal Land
- Counties

0 25 50 100 Miles

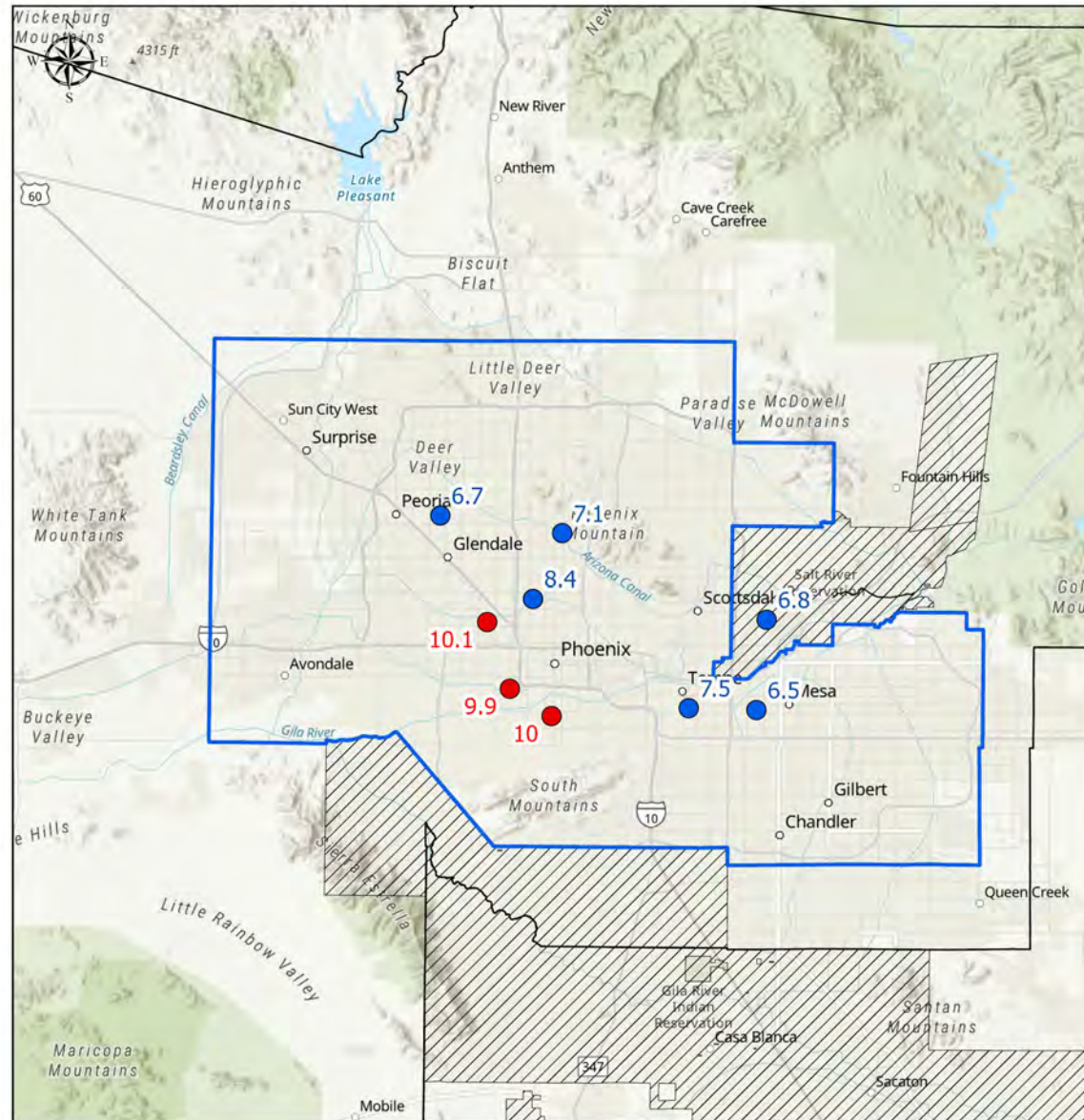


This map is for general reference only and may not be all inclusive. ADEQ program's data collection efforts are ongoing. More detailed information and specific locations can be obtained by contacting the Arizona Department of Environmental Quality.



Maricopa County Nonattainment Area Analysis

Maricopa County NAA – Air Quality Data



Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation

Legend

- Maricopa Proposal
- Counties
- Tribal Land
- Attaining PM_{2.5} Monitor (2021-2023 DV)
- Violating PM_{2.5} Monitor (2021-2023 DV)

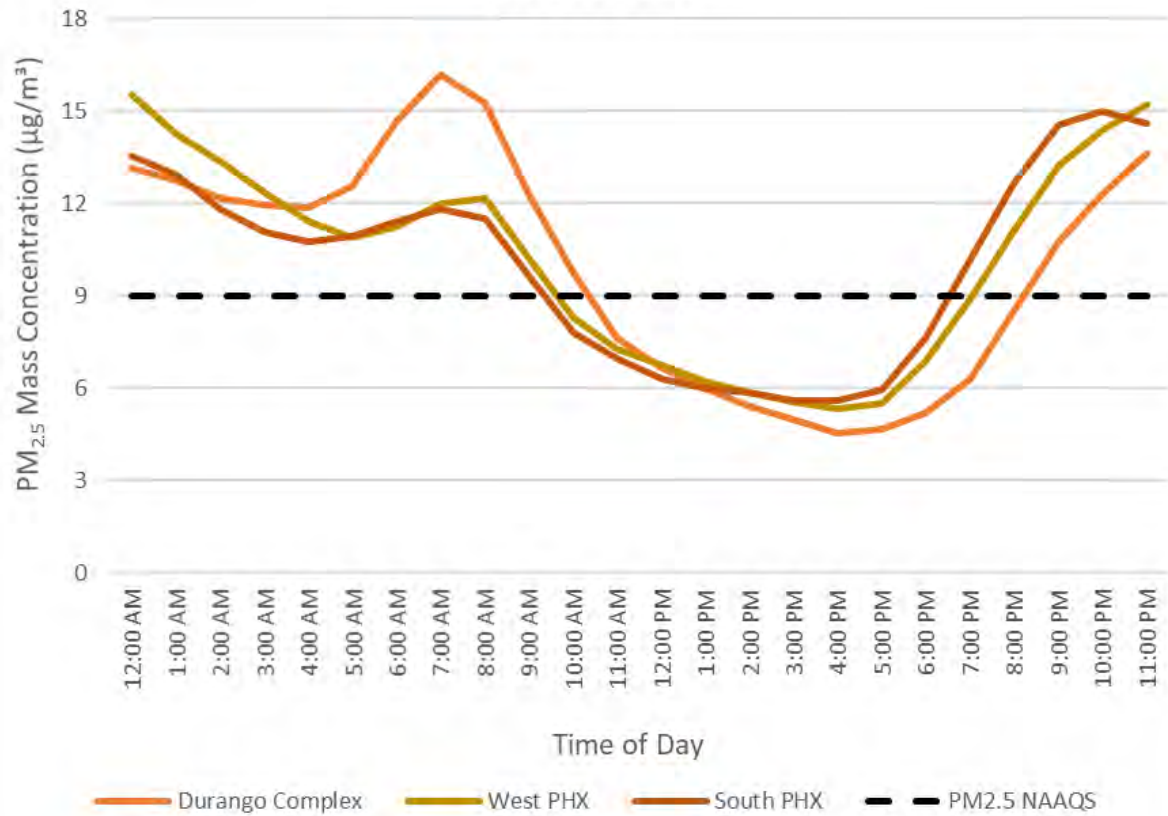
0 5 10 Miles



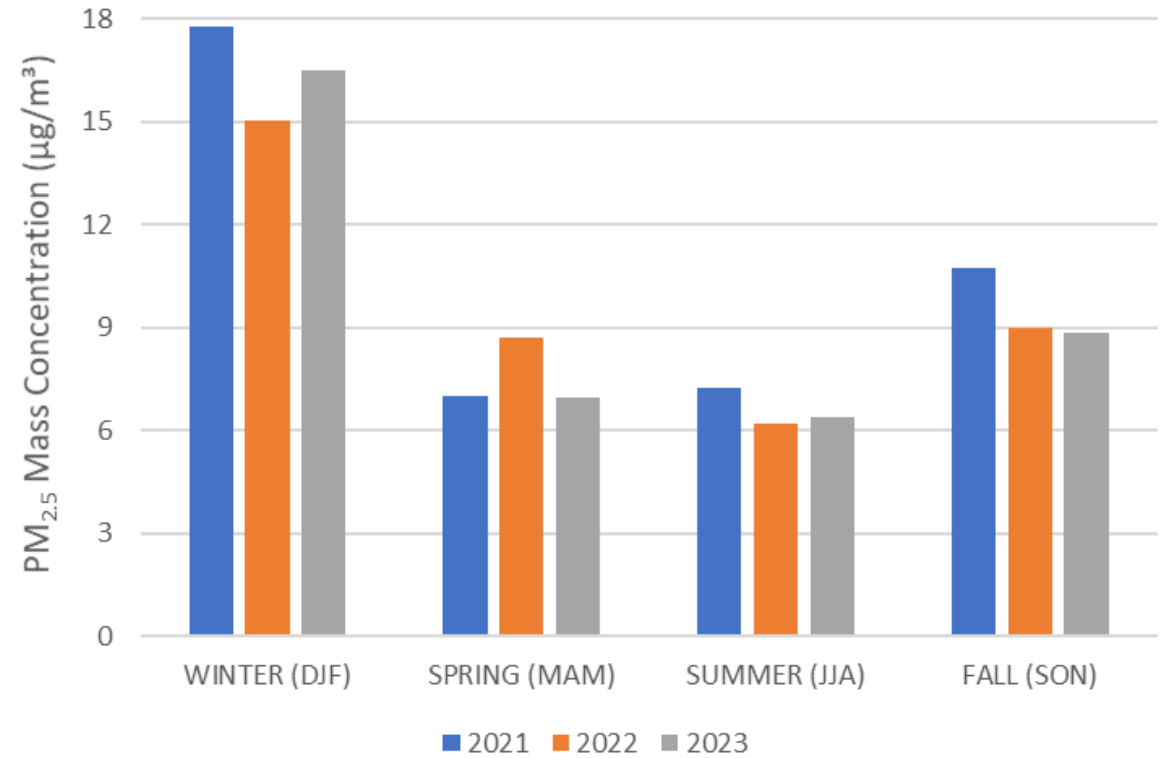
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Maricopa County NAA – Air Quality Data

Maricopa County Violating Monitors
Daily Average of the Hourly Sample Value
2021 to 2023

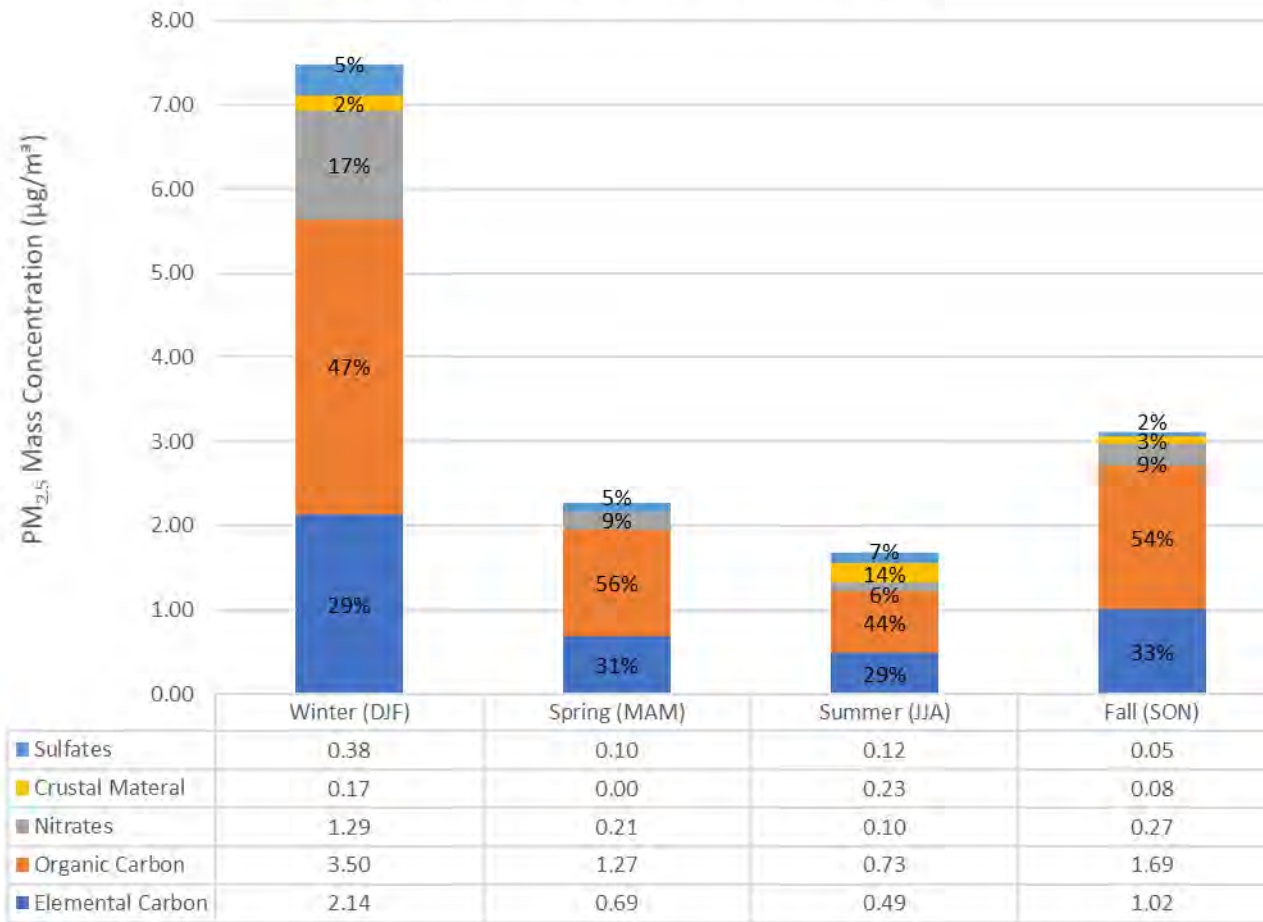


Maricopa County Violating Monitors
Seasonal Averages of the Daily Arithmetic Mean
December 2020 to November 2023

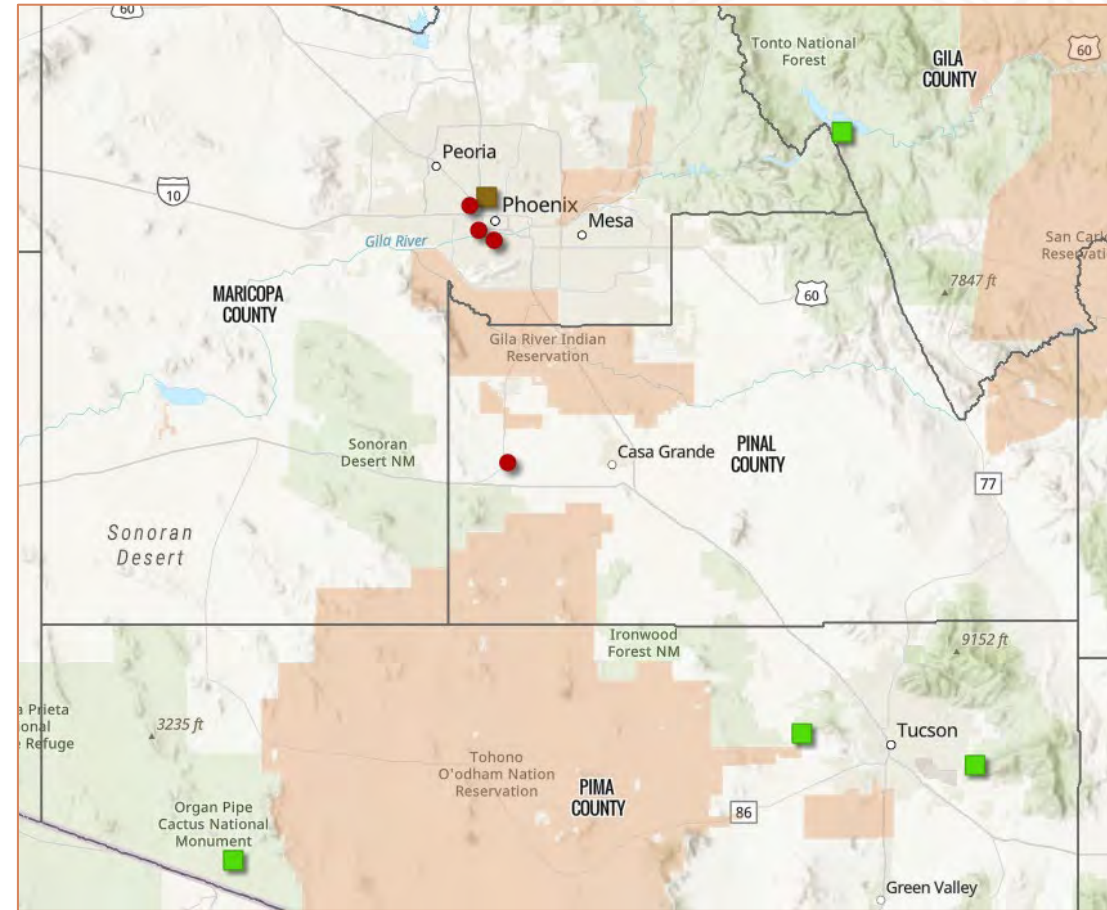


Maricopa County NAA – Air Quality Data

Maricopa County's Urban Increment (CSN JLG)
of PM_{2.5} Speciation Seasonal Averages
from December 2020 - November 2023



Seasonal Average: 51% 16% 12% 21%



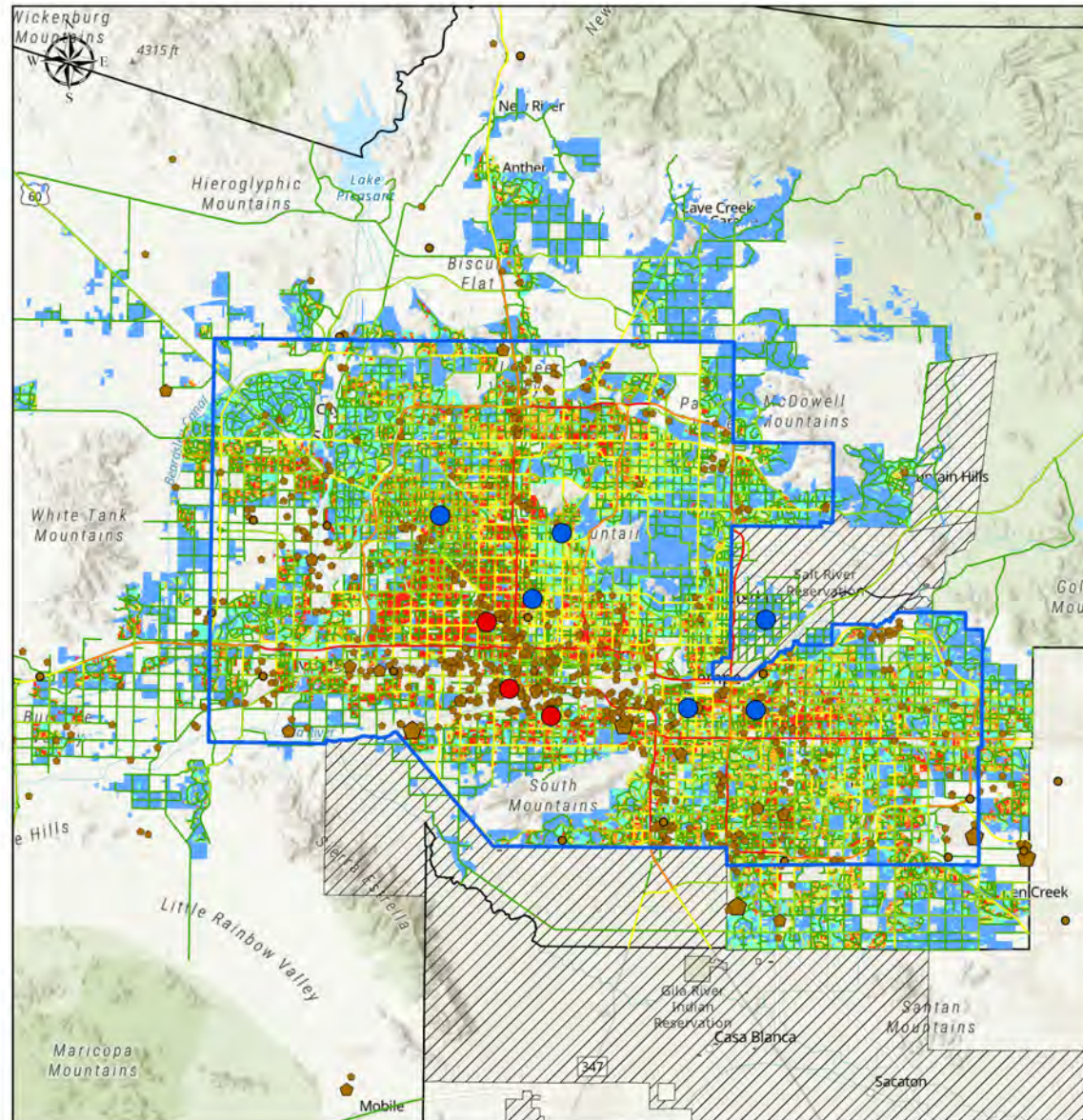
Maricopa County – Emissions



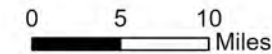
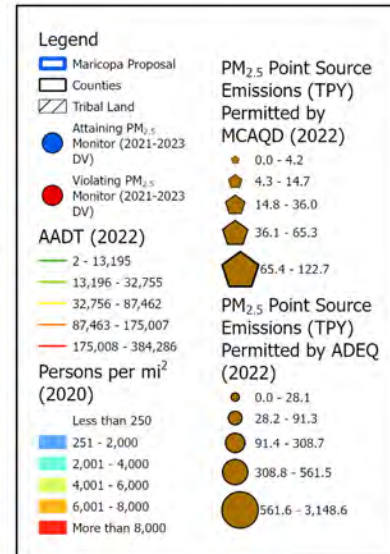
Maricopa County PM_{2.5} Source Sector Emissions from the 2020 NEI and MCAQD 2020 PEI Errata Adjustments Indicated with an Asterisk*

Source	Source Sector Category	Emissions (tpy)	% of Total PM 2.5 Emissions
Nonpoint* = 85.6%			
	Crops & Livestock Dust	1,314.9	8.3%
	Wildfires	5,247.3	33.1%
	Commercial Cooking*	1,296.8	8.2%
	Construction Dust	750.6	4.7%
	Paved Road Dust*	2,081.3	13%
	Unpaved Road Dust*	595.3	3.8%
	Comm/Institutional - Natural Gas, Oil, Other	8.6	0.1%
	Industrial Boilers, ICEs - Natural Gas, Oil, Other	184.0	1.2%
	Residential Natural Gas, Oil, Other	3.8	0.0%
	Residential Wood Burning*	1,615.3	10.2%
	Misc. Industrial Processes	268.7	1.7%
	Misc. Non-Industrial Not Elsewhere Classified	154.4	1.0%
	Locomotives	21.8	0.1%
	Waste Disposal	39.7	0.3%
Point = 5.0%			
	Airports	136.6	0.9%
	Landfills	19.8	0.1%
	EGUs	566.0	3.6%
	Misc. Point Sources	64.7	0.4%
Nonroad = 5.7%			
	Equipment - Diesel	610.8	3.8%
	Equipment - Gasoline	281.1	1.8%
	Equipment - Other	19.3	0.1%
Onroad = 3.7%			
	Diesel Vehicles	217.2	1.4%
	Non-Diesel Vehicles	370.7	2.3%
Grand Total		15,868.5	100.0%

Maricopa County NAA – Emissions

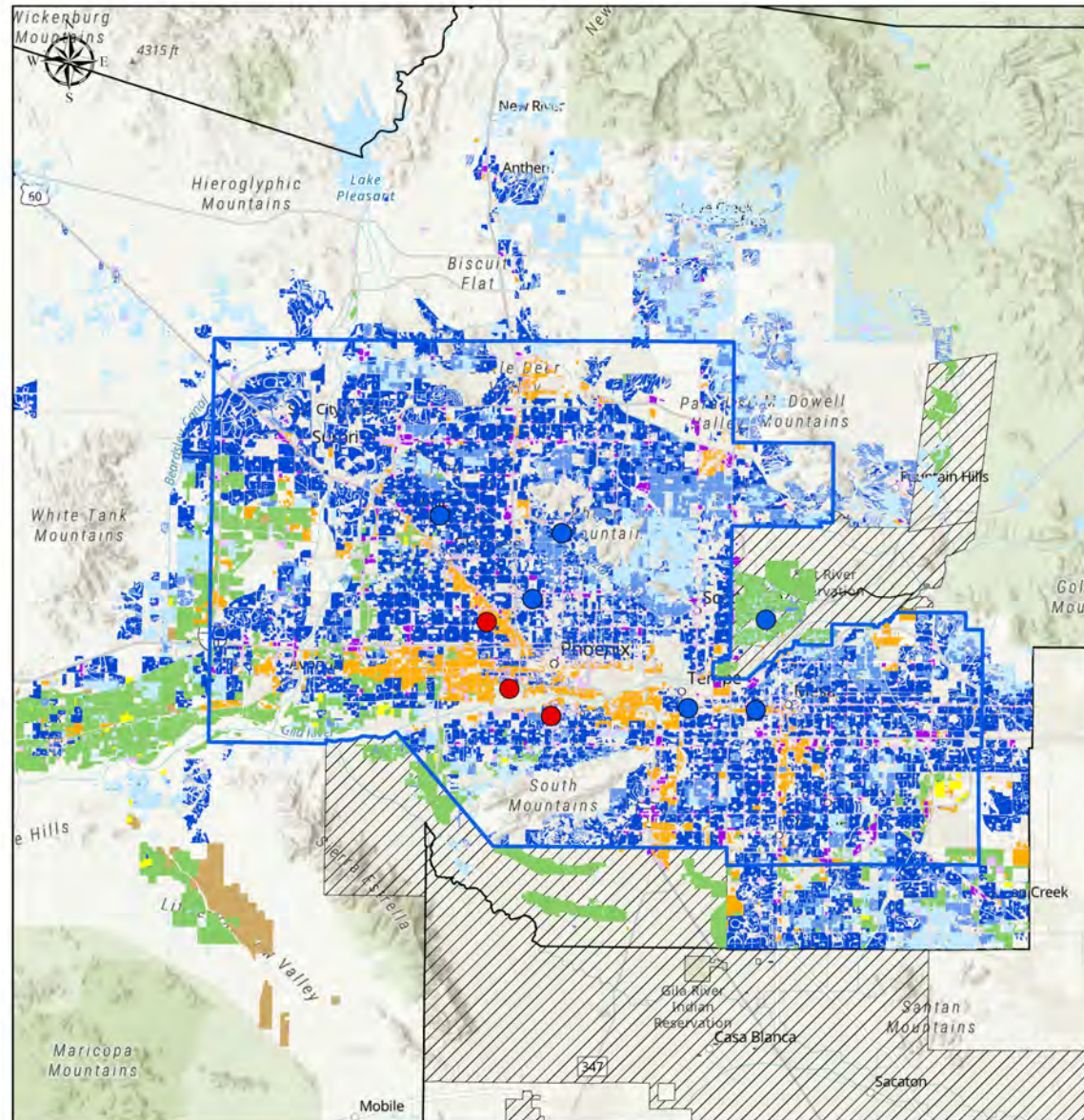


Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation

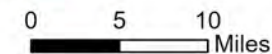
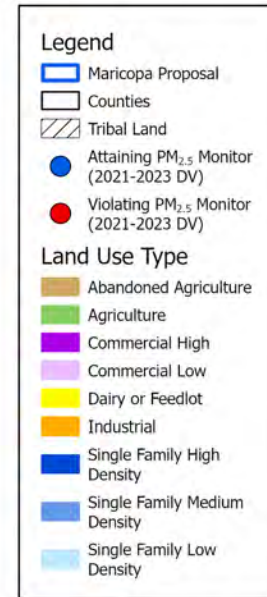


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Maricopa County NAA – Emissions



Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation



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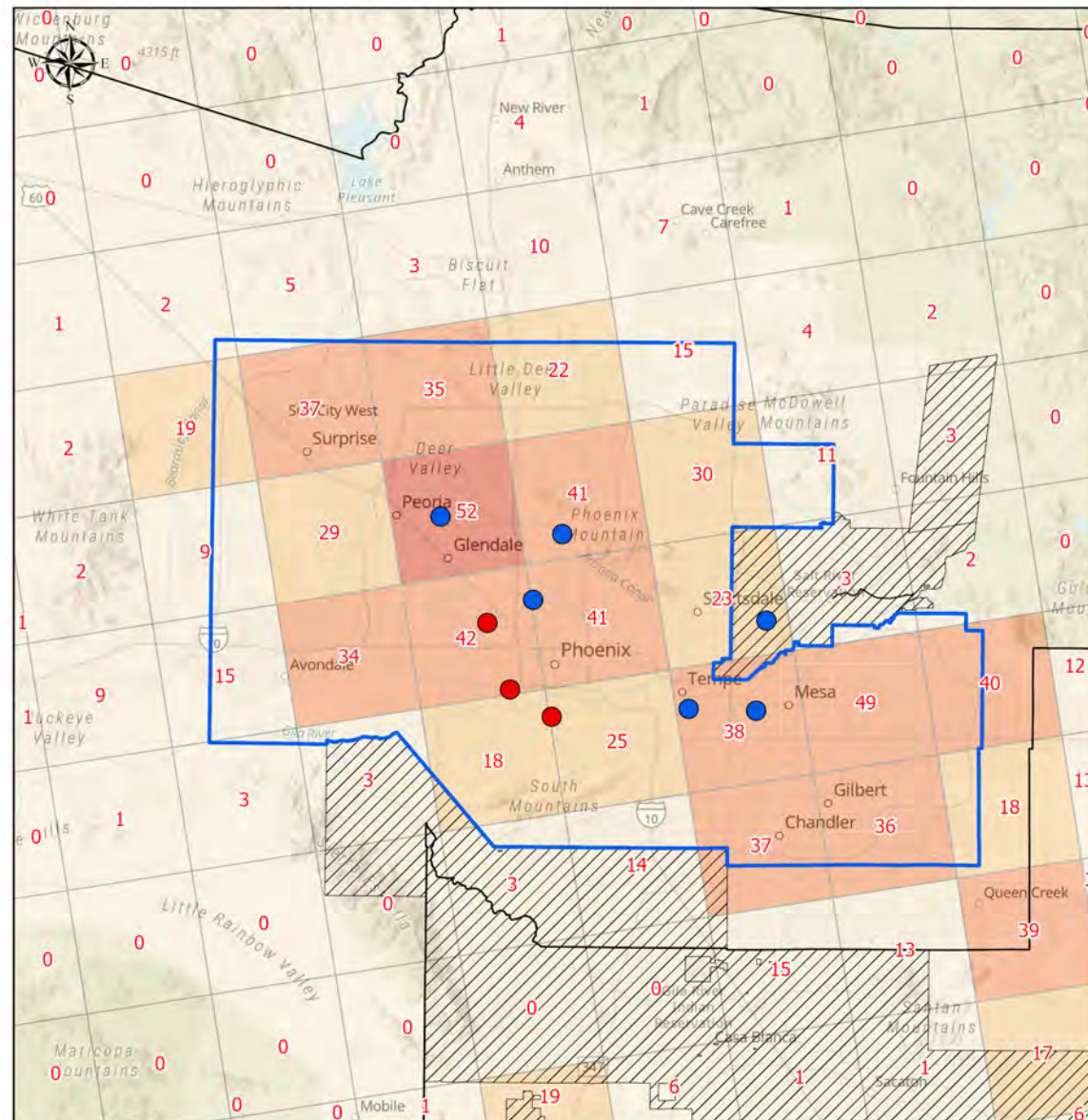
Maricopa County NAA – 2022 Gridded Emissions

The 2022 emission modeling platform is based on the 2020 National Emission Inventory with updates to reflect 2022 emissions.

Gridded emissions are generated through the application of spatial surrogates to allocate county level emission estimates to each 12 km grid cell.

Gridded emissions were generated for $PM_{2.5}$ and $PM_{2.5}$ Precursors (e.g., NO_x , SO_2 , VOC , NH_3) in tons per year for the following source sectors:

- Residential wood combustion
- Area fugitive dust
- Nonpoint
- Nonroad



Draft 2024 Primary Annual $PM_{2.5}$ NAAQS Boundary Recommendation

Legend

- Maricopa Proposal
 - Counties
 - Tribal Land
 - Attaining $PM_{2.5}$ Monitor (2021-2023 DV)
 - Violating $PM_{2.5}$ Monitor (2021-2023 DV)
- Residential Wood Combustion $PM_{2.5}$ (tpy)
- 0 - 17
 - 18 - 33
 - 34 - 50
 - 51 - 66
 - 67 - 83

0 5 10 Miles

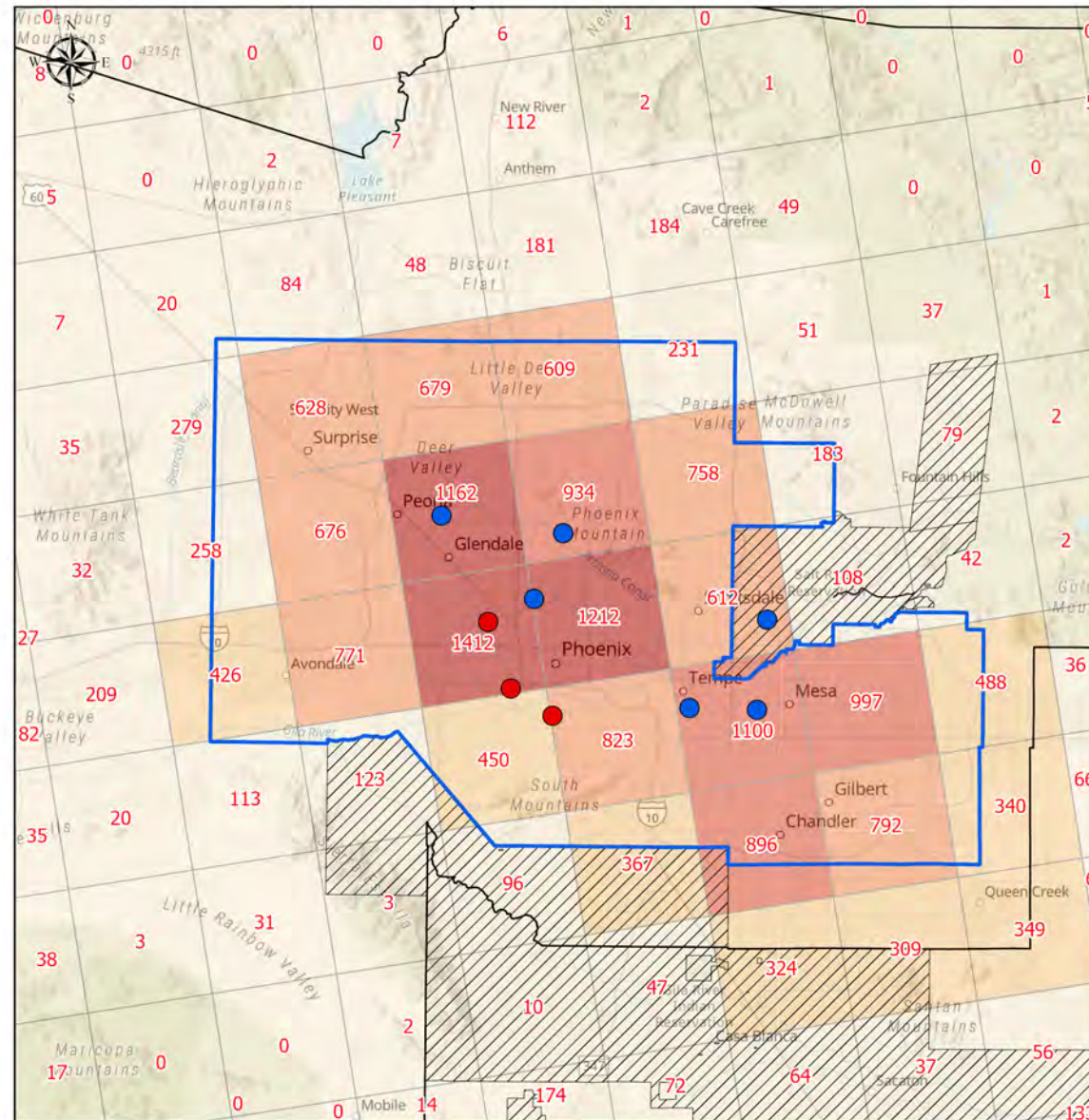
Maricopa County NAA – 2022 Gridded Emissions

The 2022 emission modeling platform is based on the 2020 National Emission Inventory with updates to reflect 2022 emissions.

Gridded emissions are generated through the application of spatial surrogates to allocate county level emission estimates to each 12 km grid cell.

Gridded emissions were generated for PM_{2.5} and PM_{2.5} + PM_{2.5} Precursors (e.g., NO_x, SO₂, VOC, NH₃) in tons per year for the following source sectors:

- Residential wood combustion
- Area fugitive dust
- Nonpoint
- Nonroad



Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation

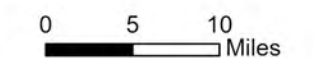
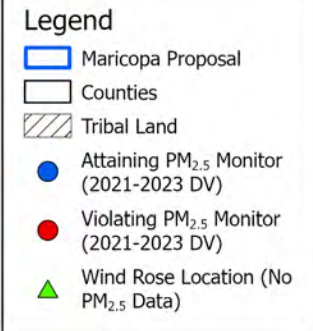
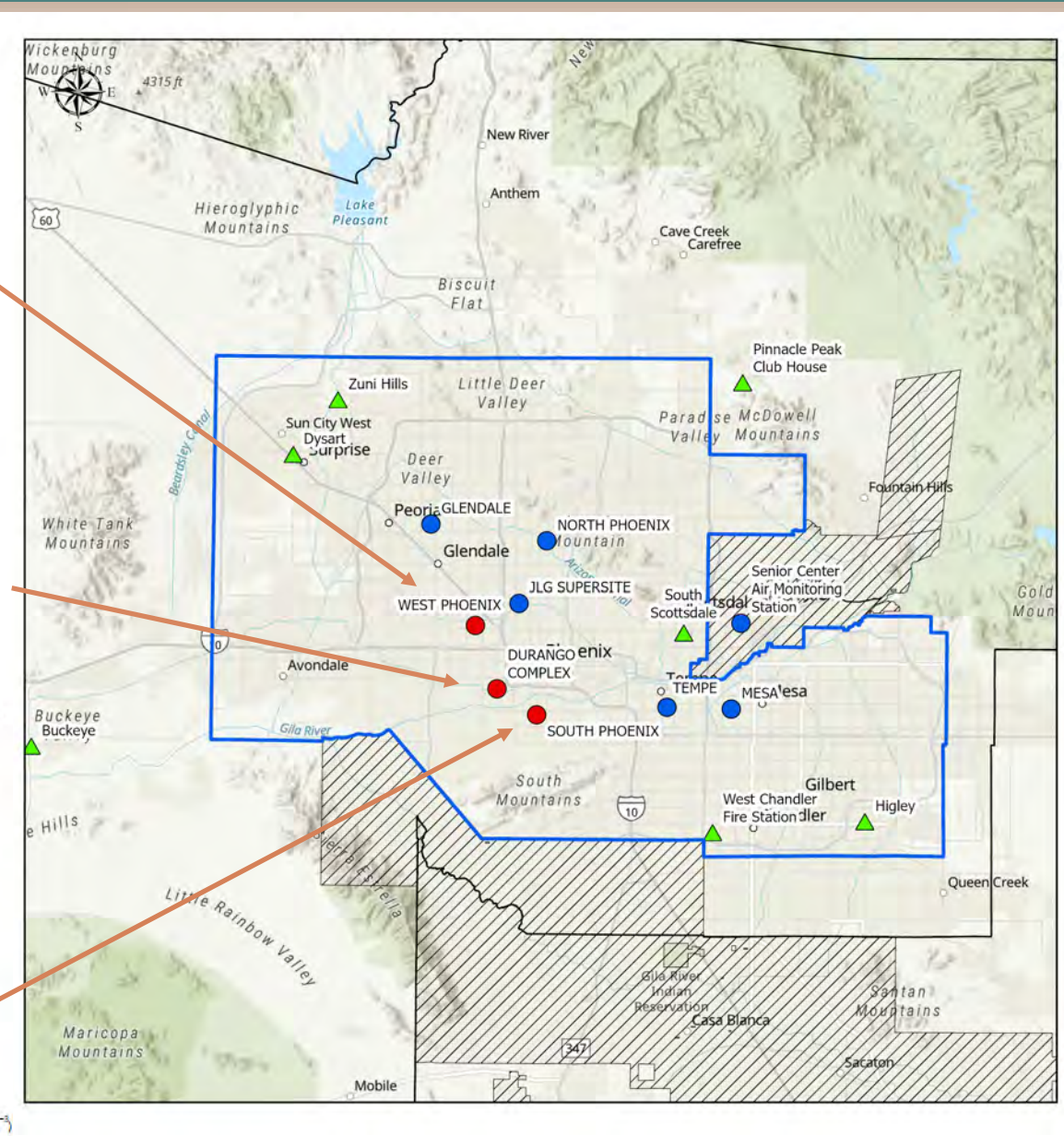
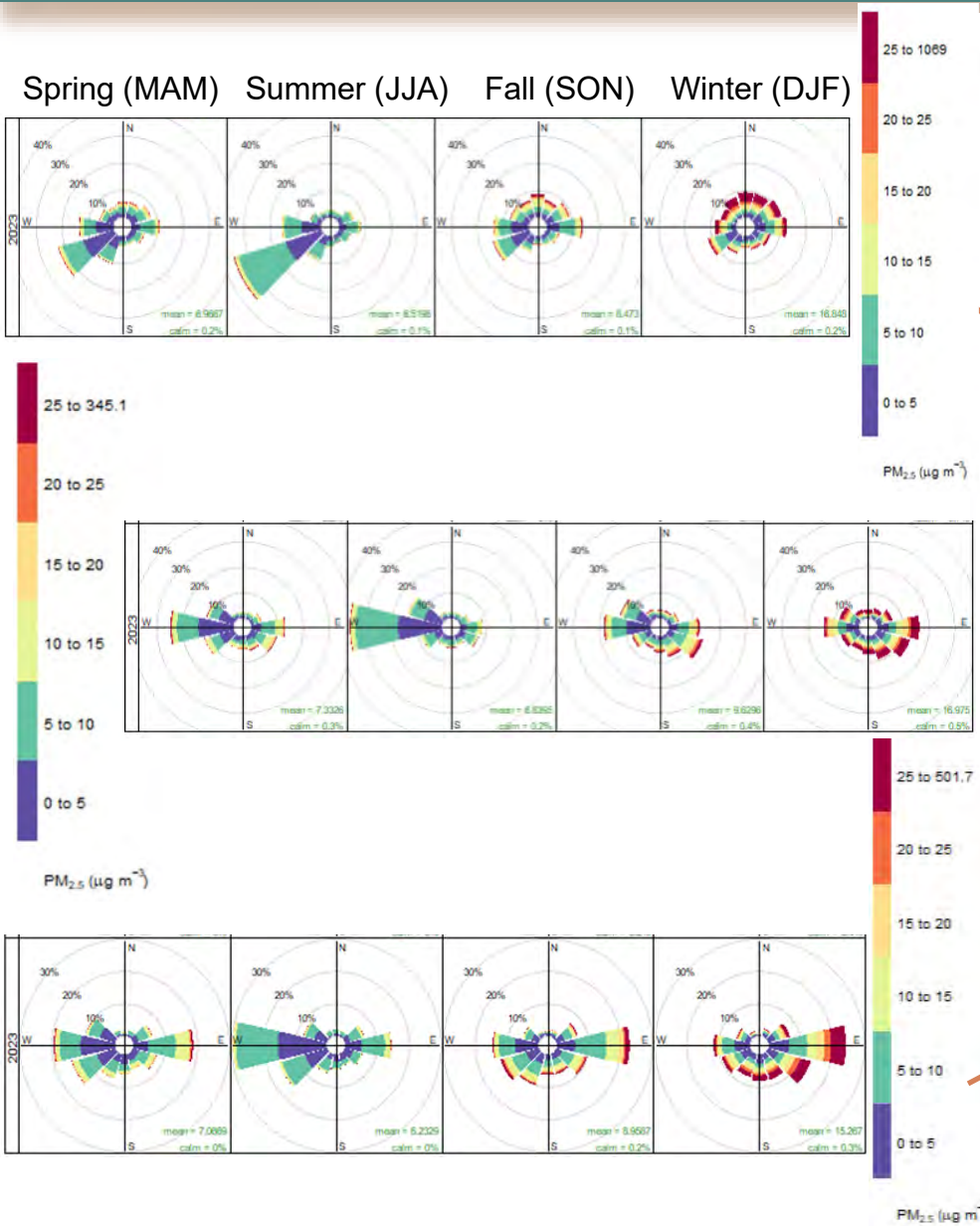
Legend

- Maricopa Proposal
 - Counties
 - Tribal Land
 - Attaining PM_{2.5} Monitor (2021-2023 DV)
 - Violating PM_{2.5} Monitor (2021-2023 DV)
- Nonpoint PM_{2.5} and Precursors (tpy)
- 0 - 282
 - 283 - 565
 - 566 - 847
 - 848 - 1,130
 - 1,131 - 1,412

0 5 10 Miles

Maricopa County NAA – Meteorology

Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation

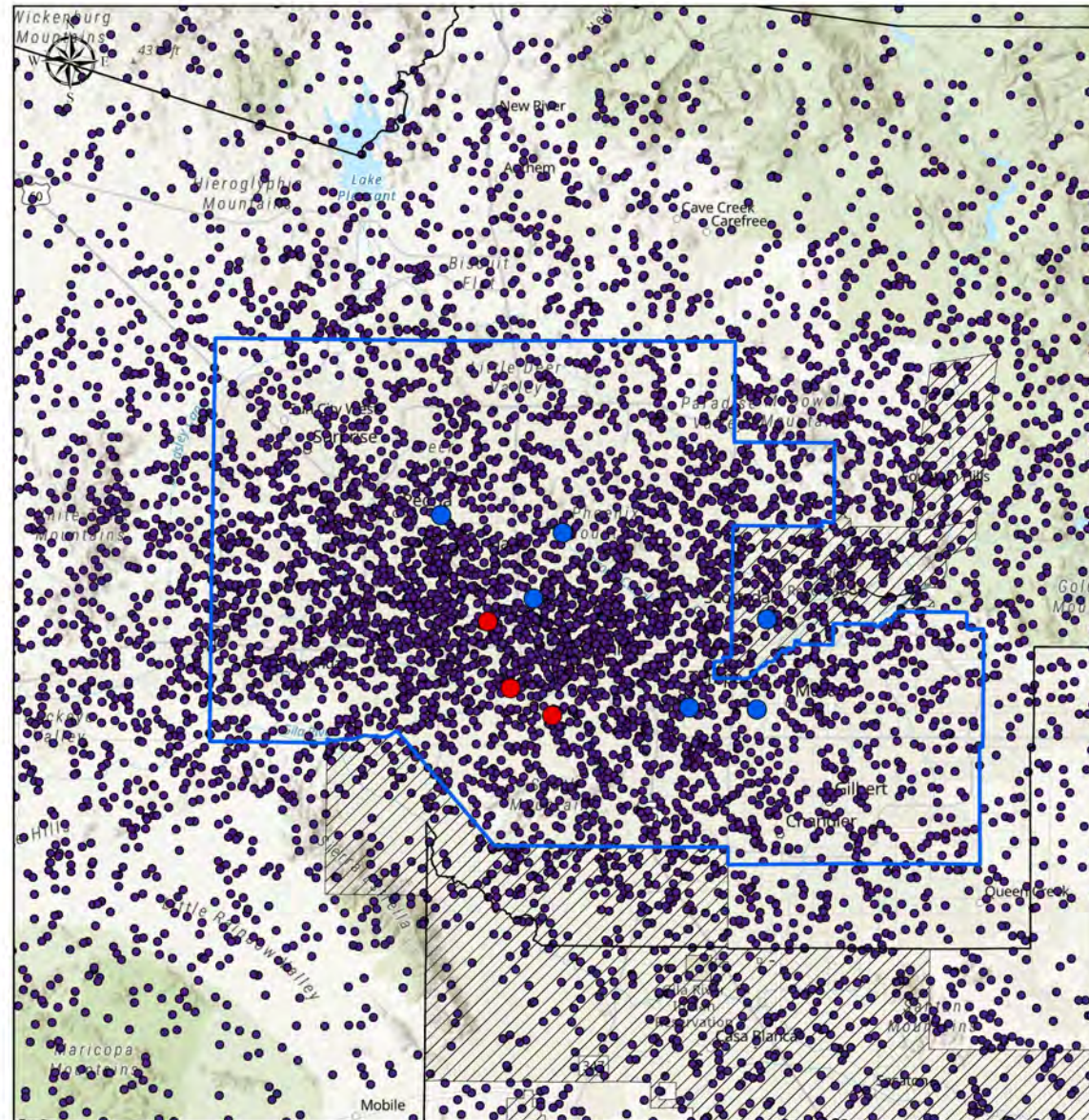


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Maricopa County NAA – HYSPLIT Trajectory Model

Back trajectories were ran twice a day from 2021-2023 at a starting height of 500 meters above ground level. The parcels were released during the two peak hourly averages of PM_{2.5} concentrations experienced at each monitor. Data was then filtered to only days with a 24-hour average exceeding 9.0 µg/m³

Monitor	Morning	Evening
West Phoenix	8:00 AM	11:00 PM
South Phoenix	7:00 AM	10:00 PM
Durango Complex	7:00 AM	11:00 PM



Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation

Legend

- Maricopa Proposal
- Counties
- Tribal Land
- Attaining PM_{2.5} Monitor (2021-2023 DV)
- Violating PM_{2.5} Monitor (2021-2023 DV)
- West Phoenix HYSPLIT Backtrajectory Endpoints Days Above 9.0 µg/m³

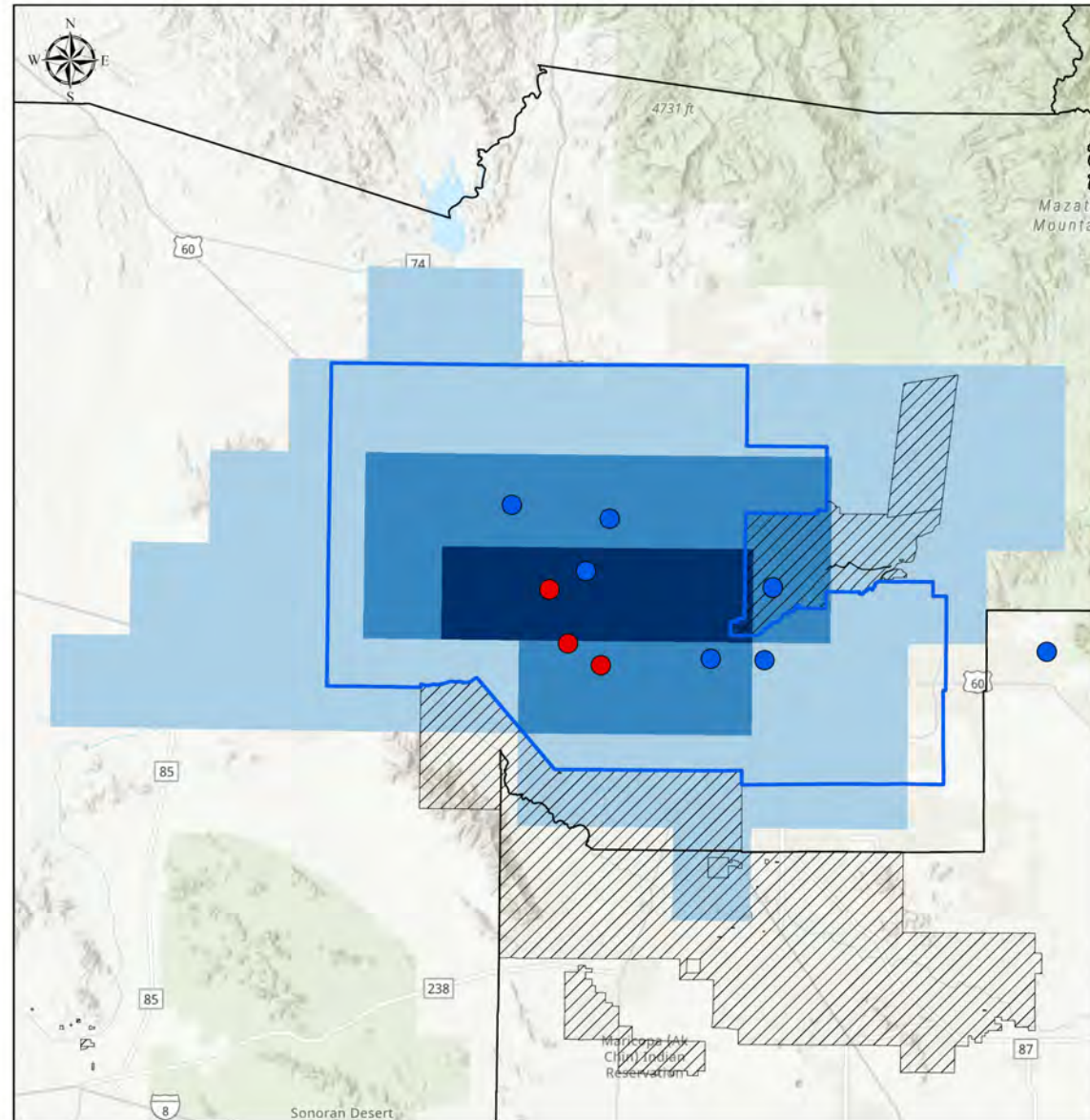
0 5 10 Miles

Maricopa County NAA – HYSPLIT Kernel Density

ADEQ utilized the kernel density geoprocessing tool to generate kernel density estimates for the days between 2021-2023 with a 24-hour PM_{2.5} concentration above 9.0 ug/m³ for each violating monitor.

Kernel density estimation (KDE) calculates the density of point features around each output raster cell and was used by EPA to visualize HYSPLIT back trajectory results for the 2012 PM_{2.5} NAAQS revision.

The KDE was run using a cell size of 0.1 decimal degrees which is approximately 11.1 km and roughly equivalent to the 12 km grid resolution at which HYSPLIT was run (e.g., NAM 12 km).



Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation

Legend

- Maricopa Proposal
- Counties
- Tribal Land
- Attaining PM_{2.5} Monitor (2021-2023 DV)
- Violating PM_{2.5} Monitor (2021-2023 DV)

West Phoenix HYSPLIT Kernel Density Days Above 9.0 µg/m³

- <25% of the maximum density
- 25% - 50%
- 50% - 75%
- >75% of the maximum density

0 5 10 Miles

Maricopa NAA – Comparison to Other Boundaries

Historic Phoenix Area Nonattainment Area Sizes

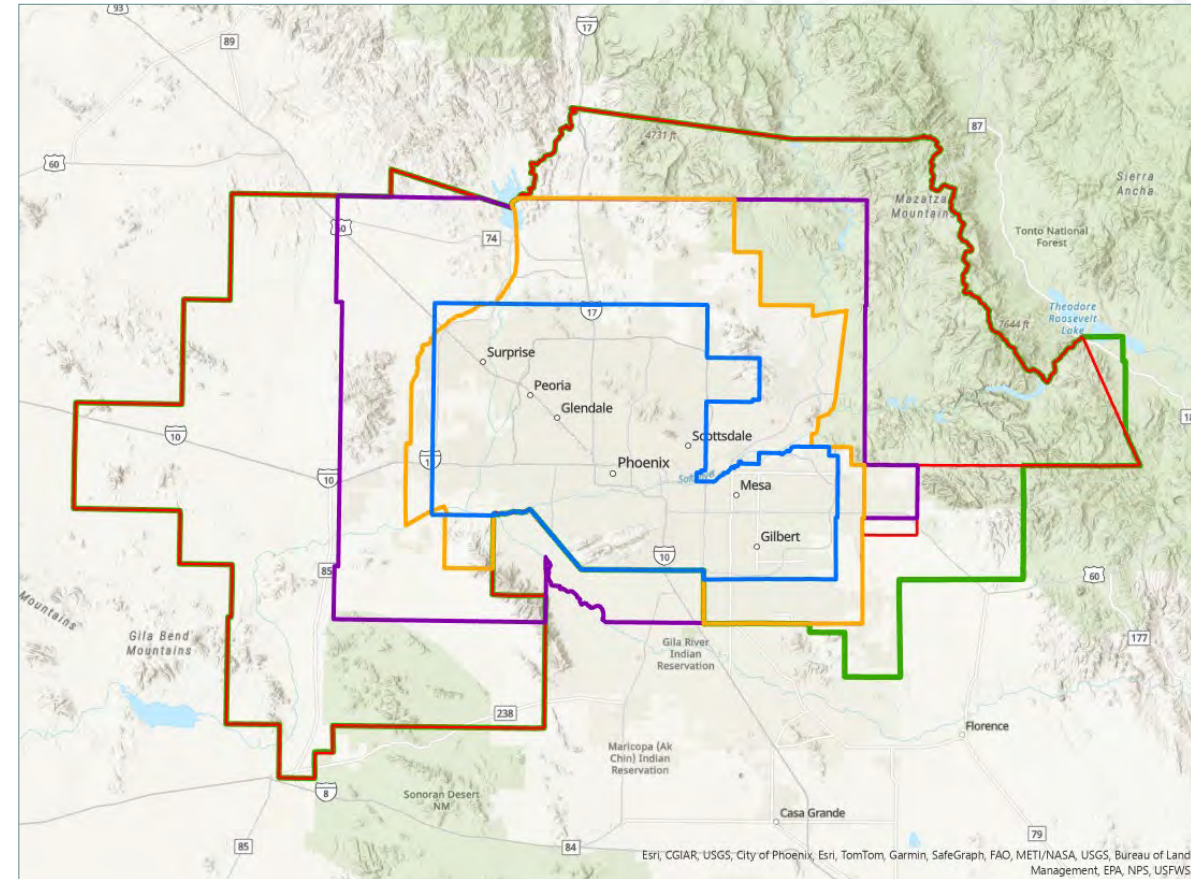
2015 Ozone = 5,290 square miles (green/brown)

2008 Ozone = 5,019 square miles (red/brown)

1987 PM₁₀ = 2,865 square miles (purple)

1971 CO = 1,813 square miles (yellow)

2024 Proposed PM_{2.5} = 1,070 square miles (blue)

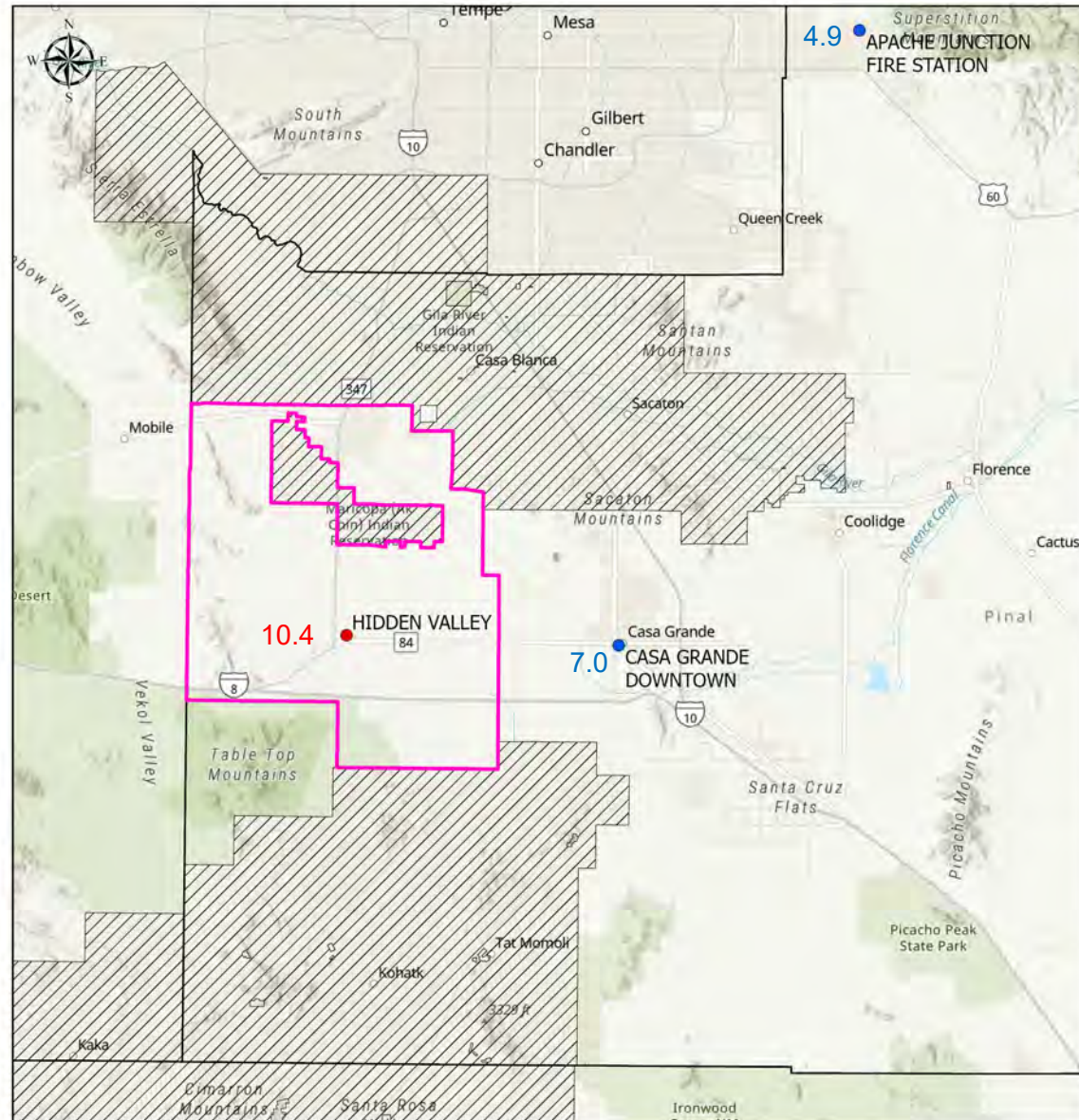




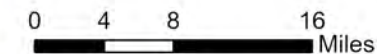
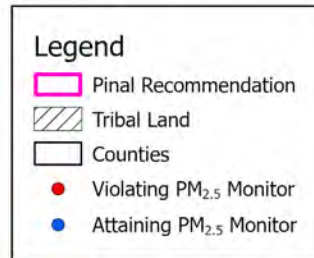
Pinal County Nonattainment Area Analysis

- 40 CFR § 58.30: “PM_{2.5} measurement data from monitors that are not representative of area-wide air quality but rather of relatively unique micro-scale, or localized hot spot, or unique **middle-scale** impact sites are not eligible for comparison to the annual PM_{2.5} NAAQS.”
- PCAQD is making the request to EPA in their 2024 Air Monitoring Network Plan to exclude the Hidden Valley site from comparison to the Annual PM_{2.5} NAAQS. (Public Hearing on June 11, 2024)
- ADEQ to recommend to designate Pinal County as attainment if EPA approves the § 58.30 request, or recommend retaining the existing 2006 West Central Pinal PM_{2.5} NAA boundary if EPA does not approve the request.

Pinal County – Air Quality Data



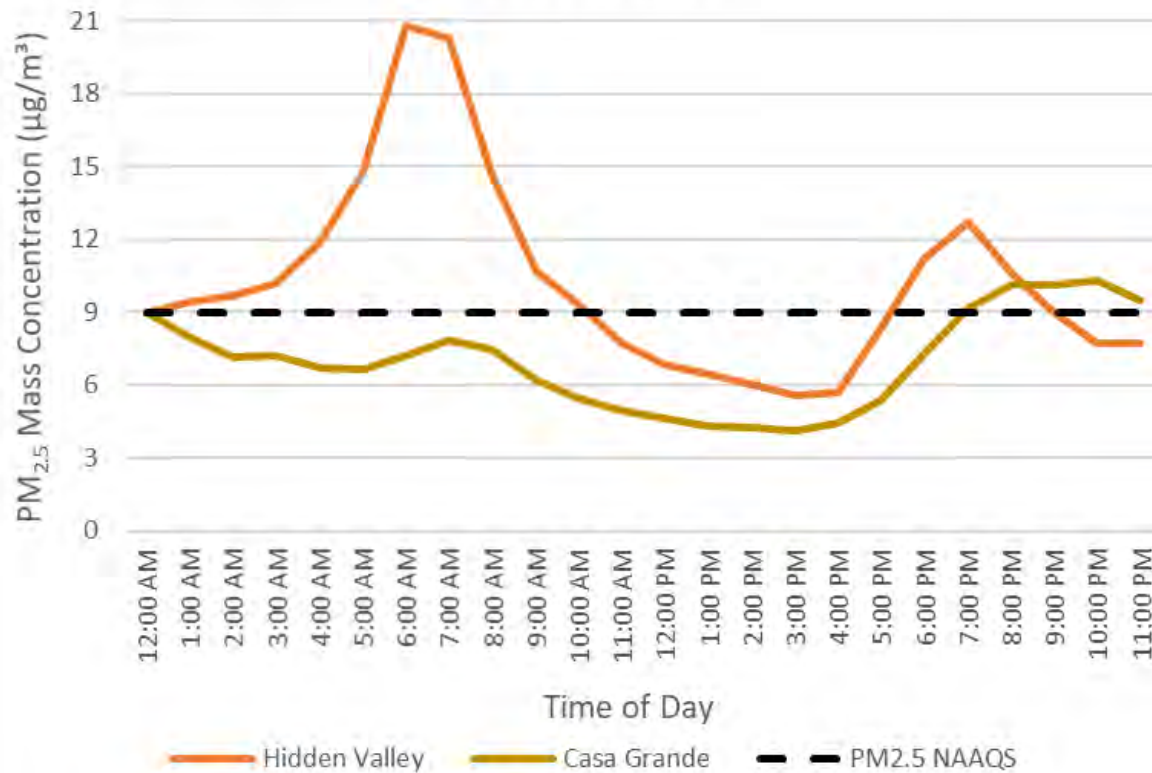
Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation Pinal County



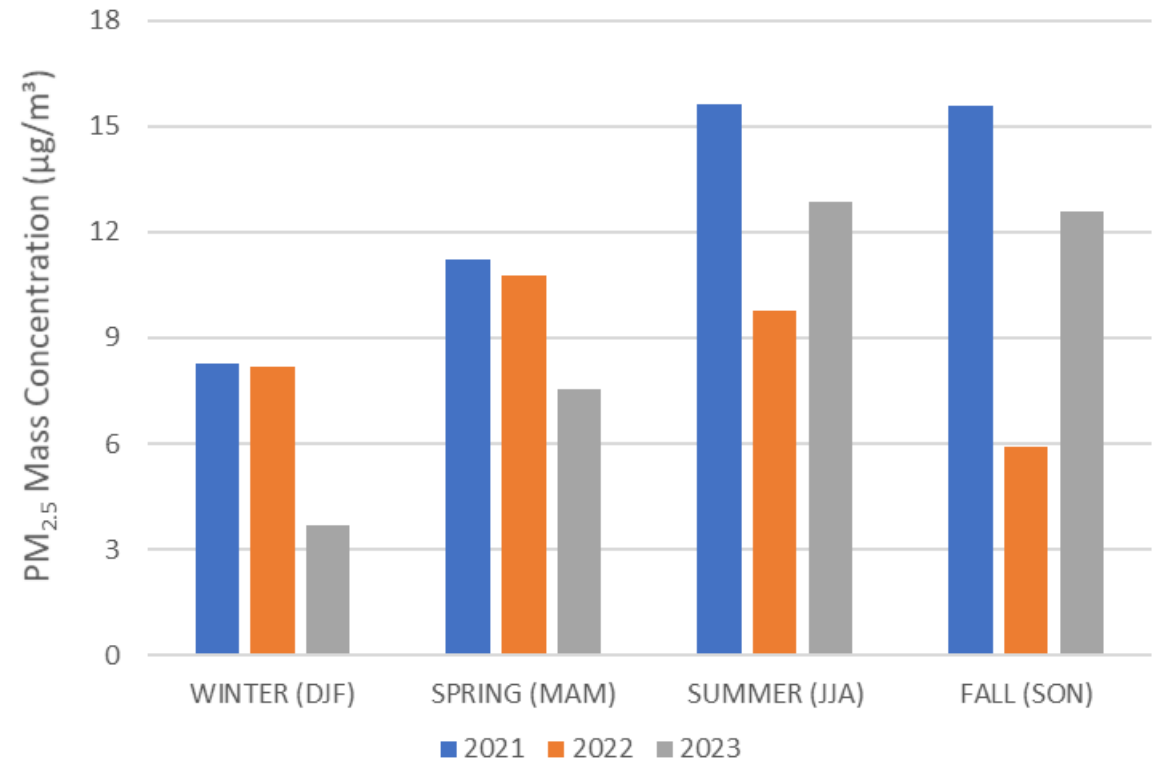
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Pinal County – Air Quality Data

Pinal County Monitors
Daily Average of the Hourly Sample Value
2021 to 2023



Hidden Valley Monitor
Seasonal Averages of the Daily Arithmetic Mean
December 2020 to November 2023



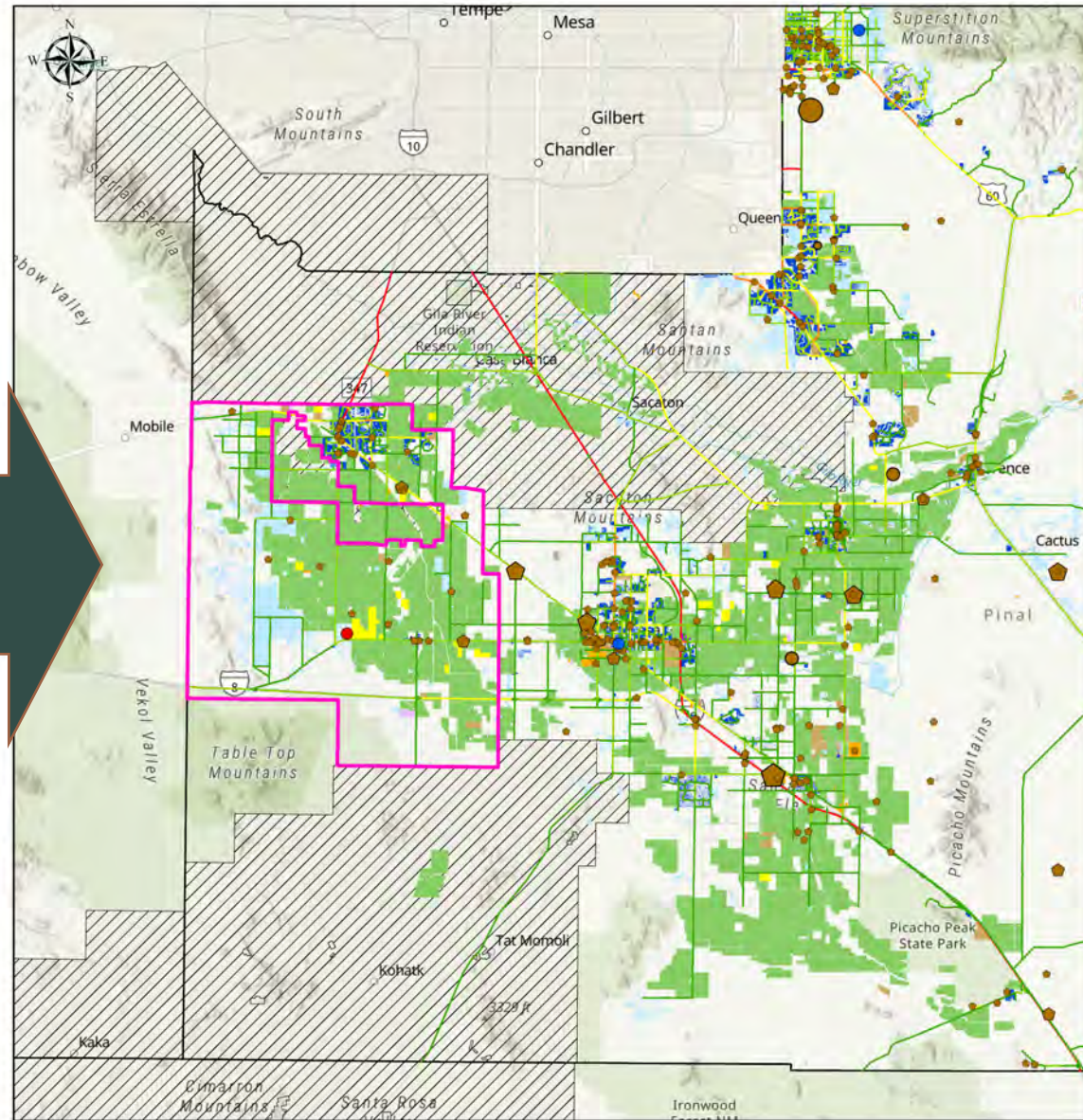
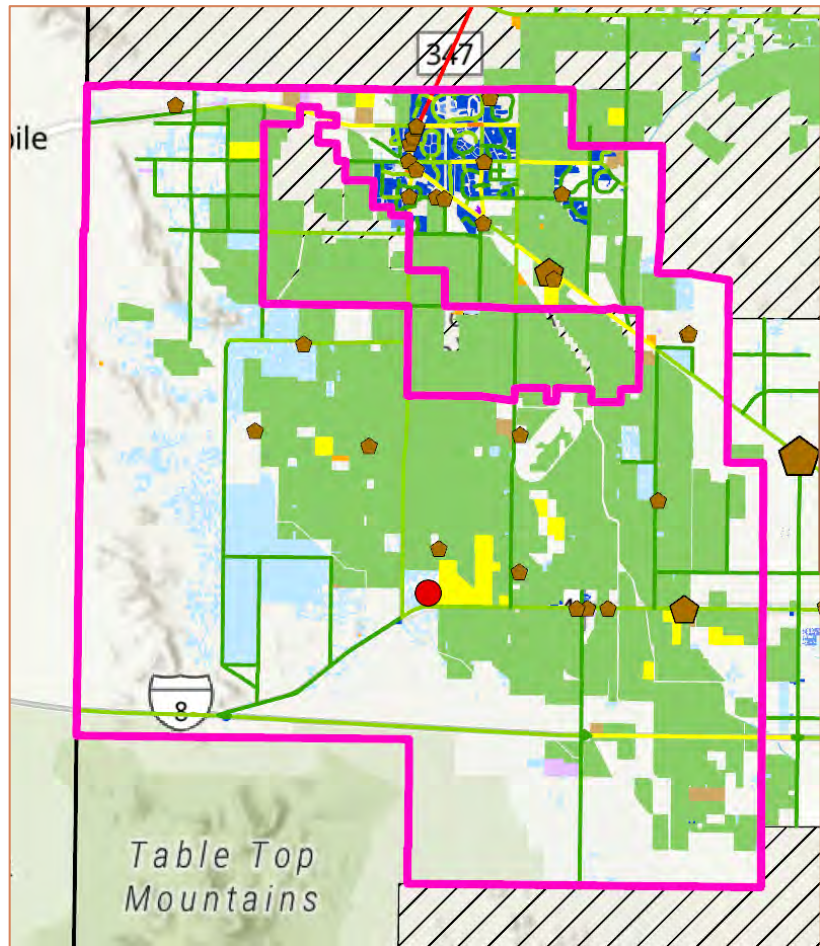
Pinal County – Emissions



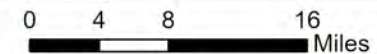
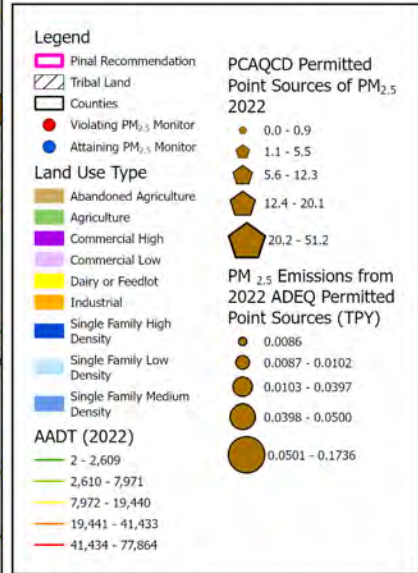
Pinal County Primary PM_{2.5} Source Sector Emissions from the 2020 NEI

Source	Source Sector Category	Emissions (tpy)	% of Total PM 2.5 Emissions
Nonpoint = 94.3%			
	Wildfires	3,104.0	50%
	Crops & Livestock Dust	1,220.2	20%
	Construction Dust	464.6	7%
	Waste Disposal	270.3	4%
	Residential Wood Burning	212.7	3%
	Commercial Cooking	151.0	2%
	Mining	135.5	2%
	Unpaved Road Dust	119.5	2%
	Agricultural Field Burning	89.2	1%
	Paved Road Dust	52.3	1%
	Locomotives	20.5	0%
	Misc. Area Sources	14.2	0%
	Misc. Industrial & Comm/Institutional Processes	3.8	0%
Point = 2.4%			
	Misc. Point Sources	148.0	2%
Nonroad = 1.2%			
	Equipment - Diesel	51.9	1%
	Equipment - Gasoline	24.4	0%
	Equipment - Other	0.5	0%
Onroad = 2.1%			
	Diesel Vehicles	94.3	2%
	Non-Diesel Vehicles	37.9	1%
Total		6,214.9	100%

Pinal County NAA – Emissions



Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation Pinal County



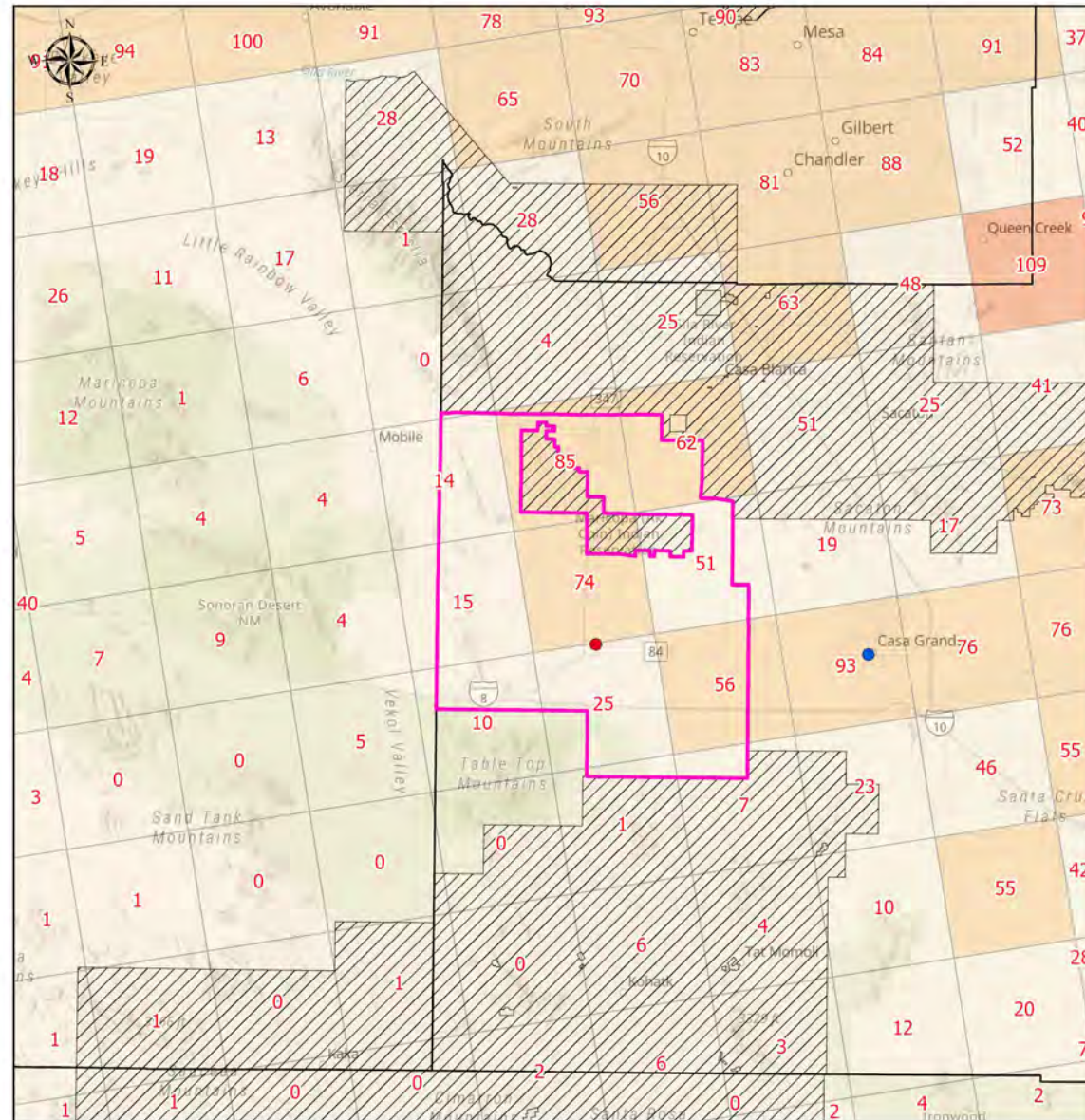
Pinal County NAA – 2022 Gridded Emissions

The 2022 emission modeling platform is based on the 2020 National Emission Inventory with updates to reflect 2022 emissions.

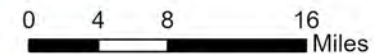
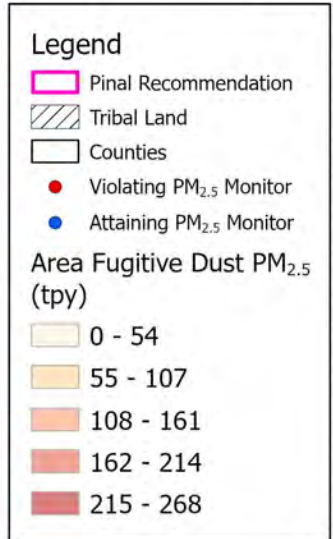
Gridded emissions are generated through the application of spatial surrogates to allocate county level emission estimates to each 12 km grid cell.

Gridded emissions were generated for PM_{2.5} and PM_{2.5} + PM_{2.5} Precursors (e.g., NO_x, SO₂, VOC, NH₃) in tons per year for the following source sectors:

- Residential wood combustion
- Area fugitive dust
- Nonpoint
- Nonroad

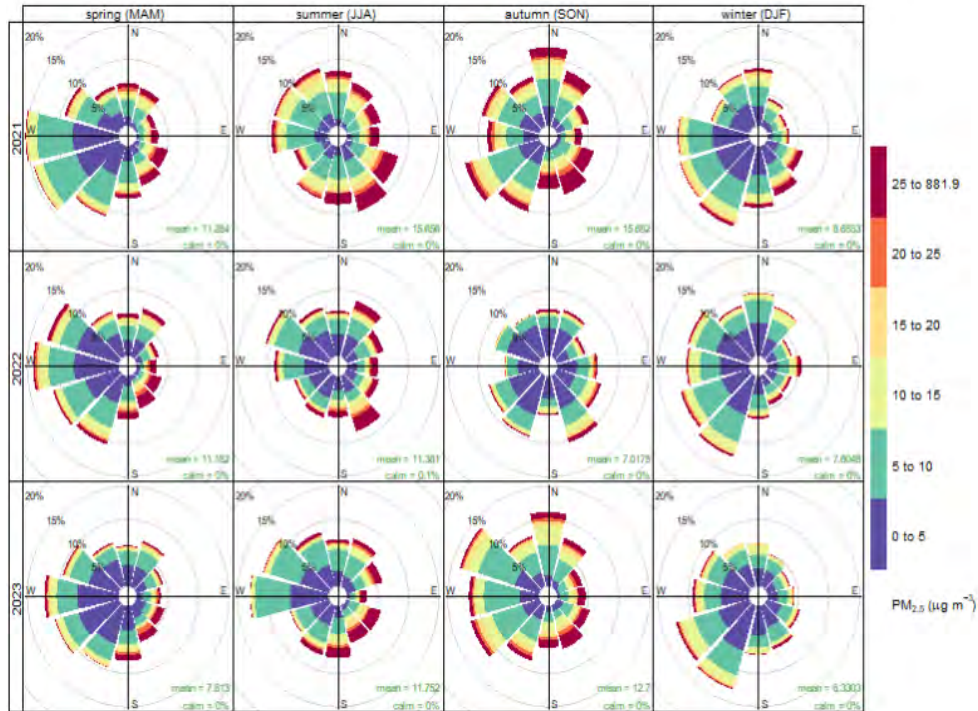


Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation Pinal County

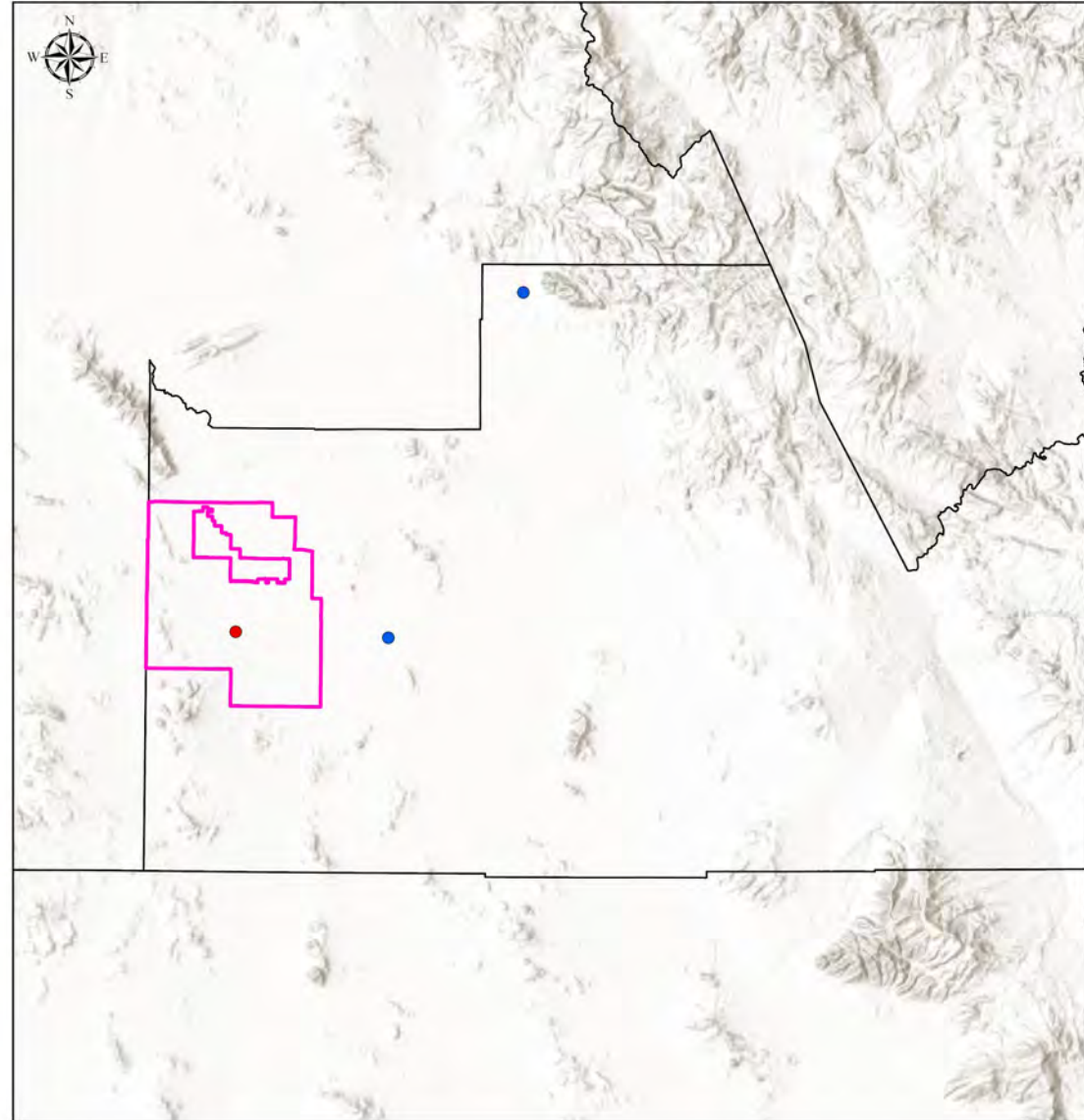


Pinal County NAA – Meteorology & Topography

Hidden Valley



Frequency of counts by wind direction (%)



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Legend

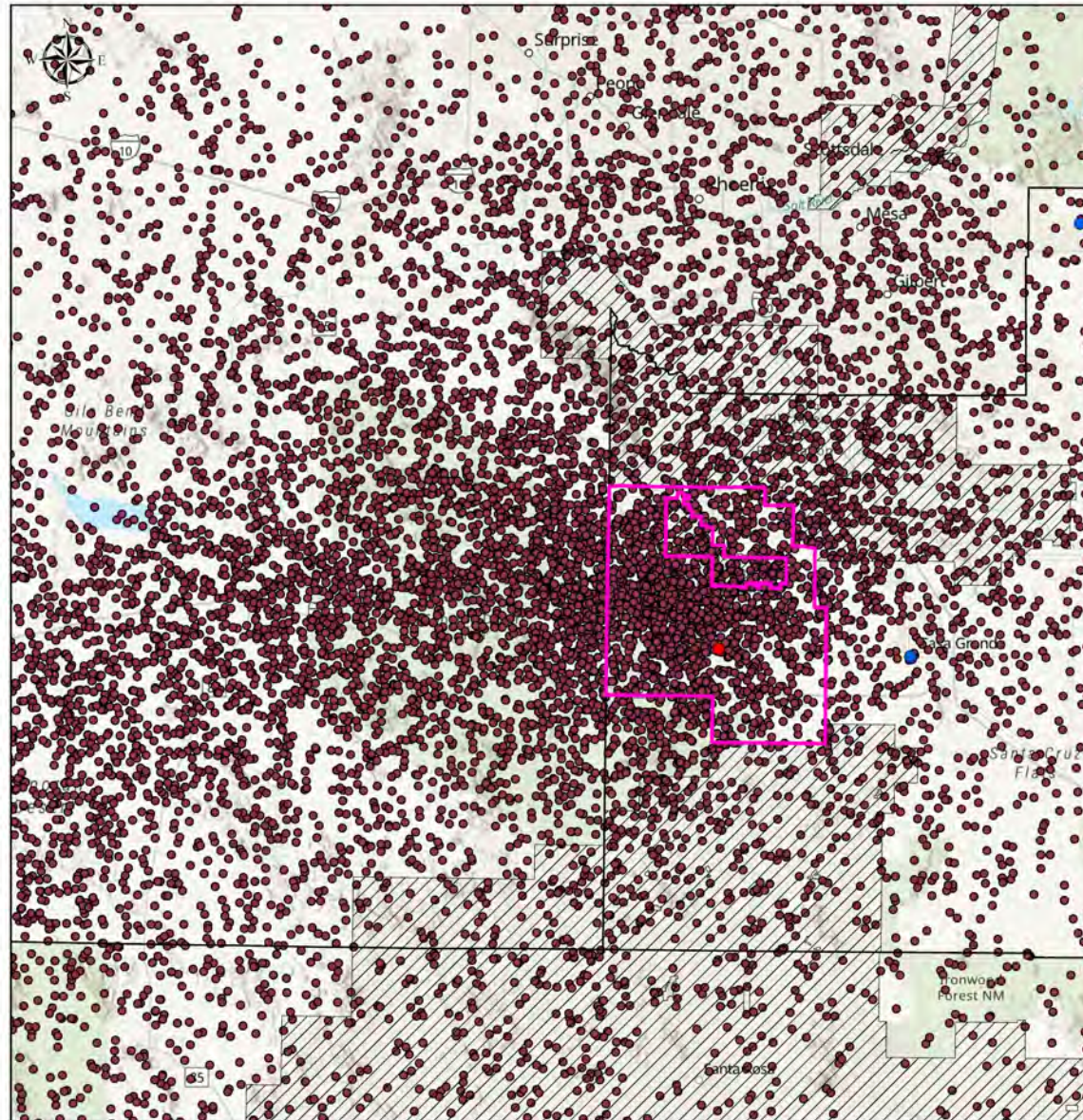
- Pinal Recommendation
- Counties
- Violating PM_{2.5} Monitor
- Attaining PM_{2.5} Monitor

0 5 10 20 Miles

Pinal County NAA – HYSPLIT Trajectory Model

Back trajectories were ran twice a day from 2021-2023 at a starting height of 500 meters above ground level. The parcels were released during the two peak hourly averages of PM_{2.5} concentrations experienced at each monitor. Data was then filtered to only days with a 24-hour average exceeding 9.0 µg/m³

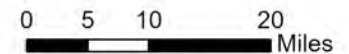
Monitor	Morning	Evening
Hidden Valley	6:00 AM	7:00 PM



Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation Pinal County

Legend

- Pinal Recommendation
- Tribal Land
- Counties
- Violating PM_{2.5} Monitor
- Attaining PM_{2.5} Monitor
- Hidden Valley HYSPLIT Back Trajectory Endpoints Days Above 9.0 µg/m³



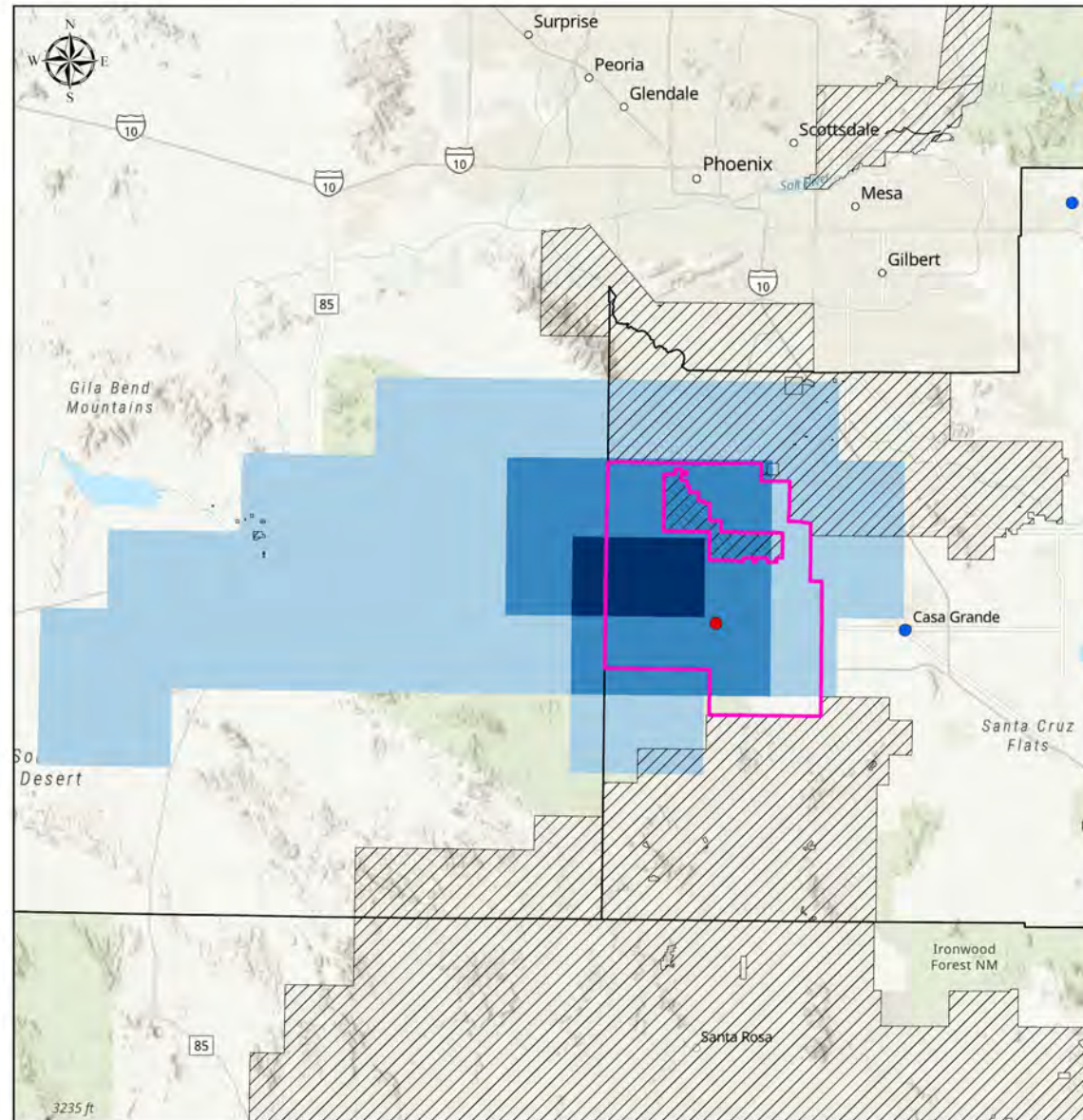
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Pinal County NAA – HYSPLIT Kernel Density

ADEQ utilized the kernel density geoprocessing tool to generate kernel density estimates for the days between 2021-2023 with a 24-hour PM_{2.5} concentration above 9.0 ug/m³ for each violating monitor.

Kernel density estimation (KDE) calculates the density of point features around each output raster cell and was used by EPA to visualize HYSPLIT back trajectory results for the 2012 PM_{2.5} NAAQS revision.

The KDE was run using a cell size of 0.1 decimal degrees which is approximately 11.1 km and roughly equivalent to the 12 km grid resolution at which HYSPLIT was run (e.g., NAM 12 km).



Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation Pinal County

Legend

- Pinal Recommendation
- Tribal Land
- Counties
- Violating PM_{2.5} Monitor
- Attaining PM_{2.5} Monitor

Hidden Valley HYSPLIT Above 9.0 Kernel Density

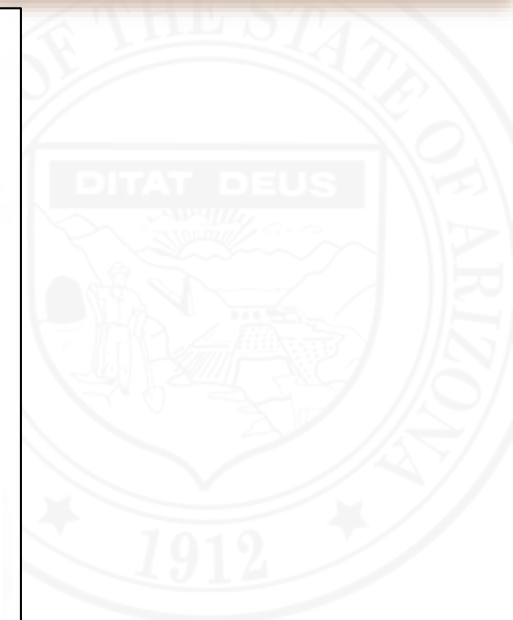
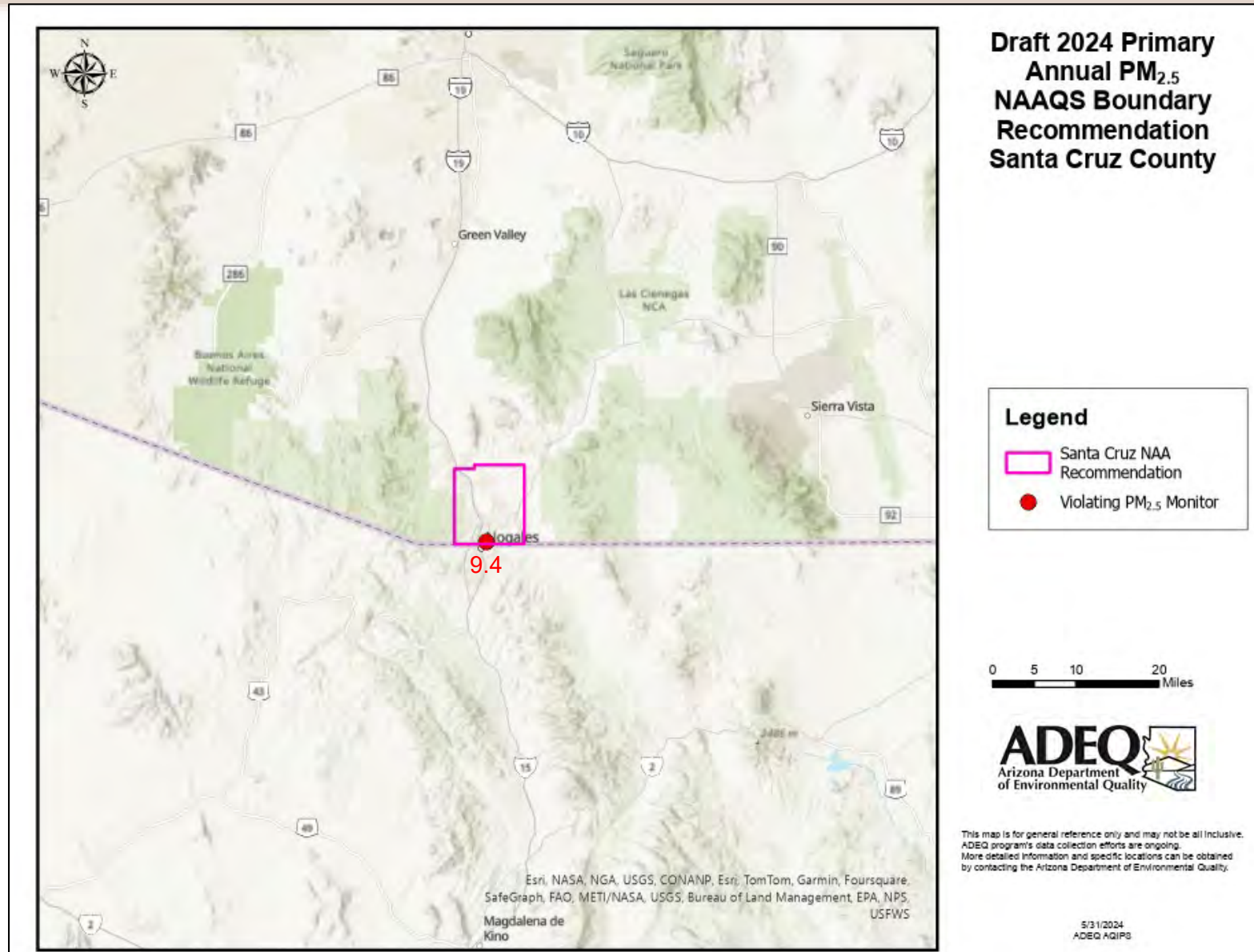
- <25% of the maximum density
- 25%-50%
- 50%-75%
- > 75% of the maximum density

0 5 10 20 Miles

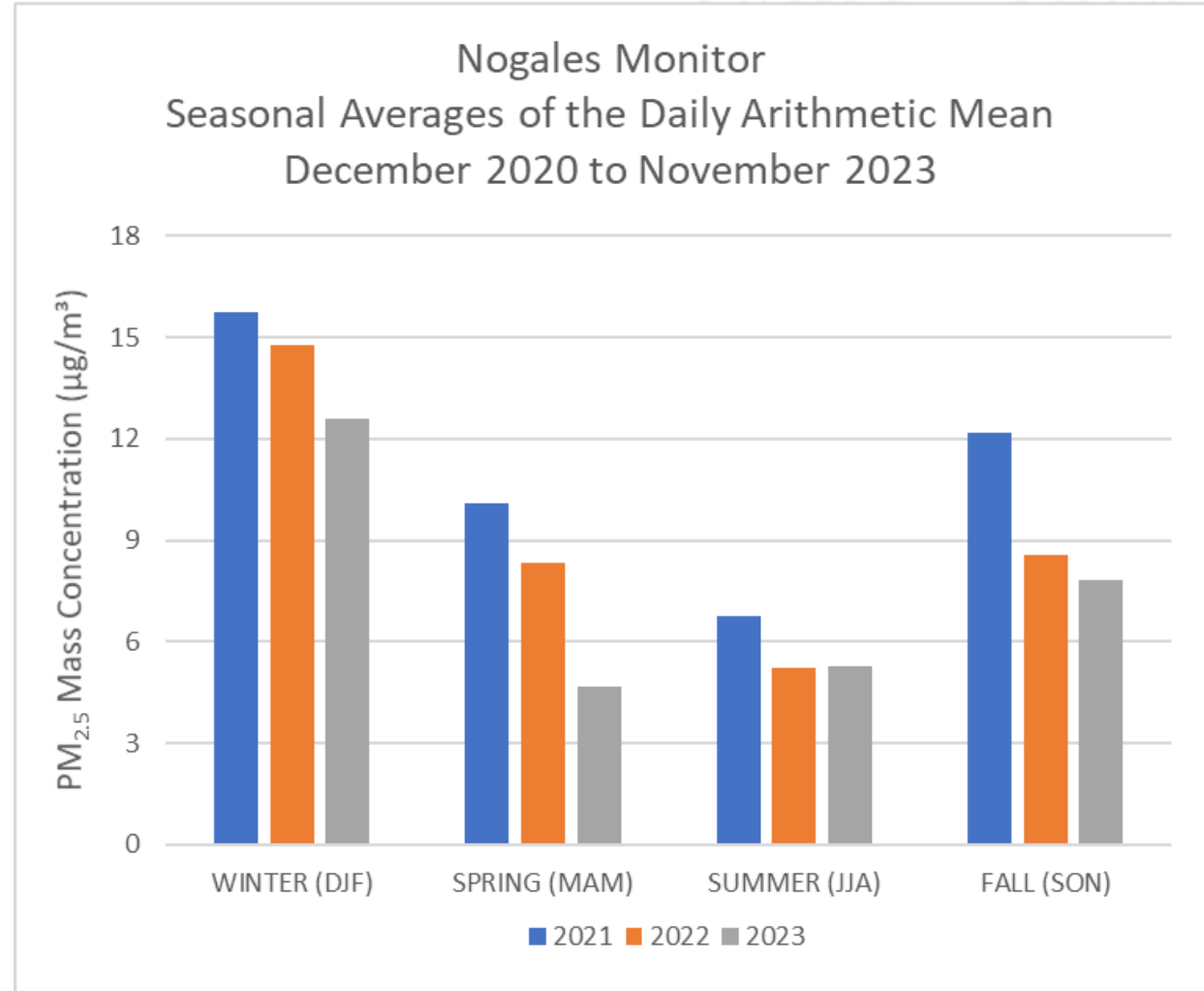
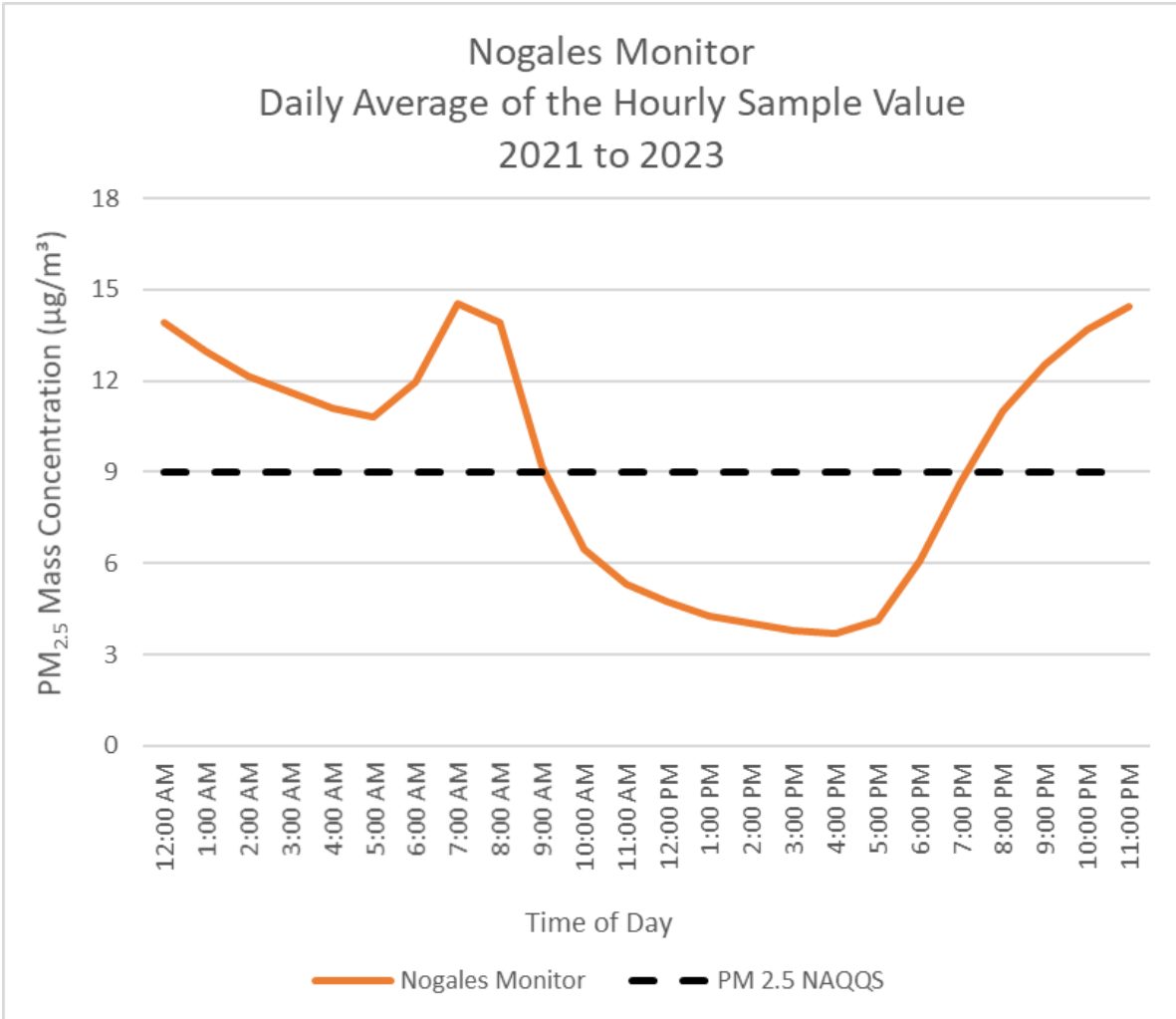


Santa Cruz County Nonattainment Area Analysis

Santa Cruz County – Air Quality Data



Santa Cruz County NAA – Air Quality Data

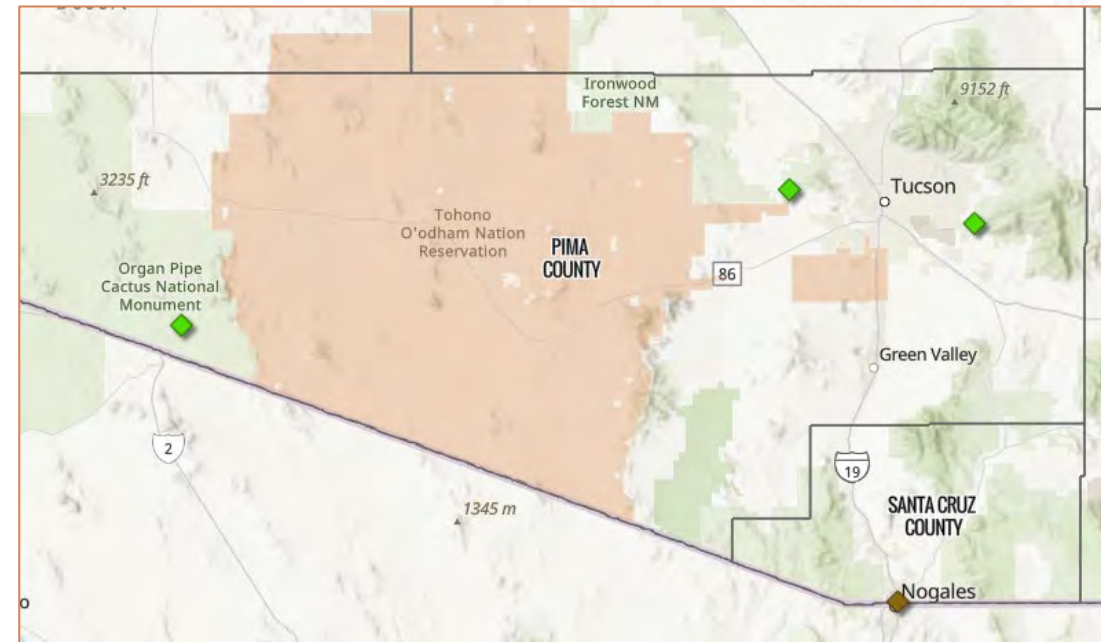


Santa Cruz County NAA – Air Quality Data

Nogales Urban Increment
of PM_{2.5} Speciation Seasonal Averages
from March 2021 - November 2023



Seasonal Average: 46% 15% 10% 28%



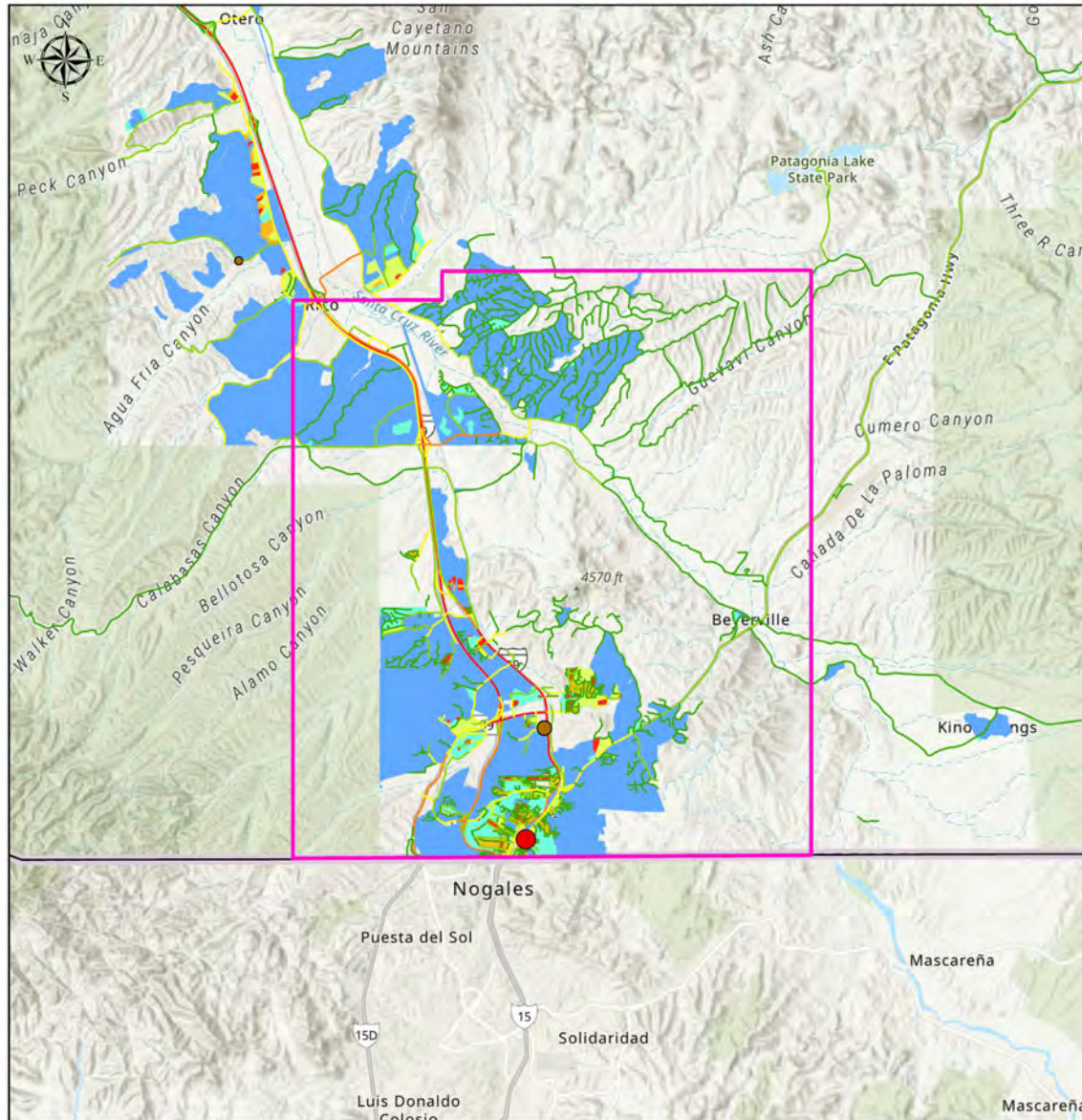
Santa Cruz County – Emissions



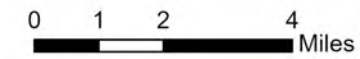
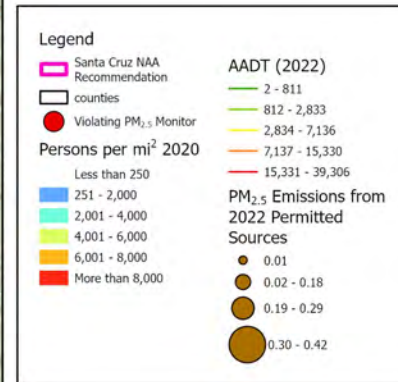
Santa Cruz County PM_{2.5} Source Sector Emissions from the 2020 NEI

Source	Source Sector Category	Emissions (tpy)	% of Total PM 2.5 Emissions
Nonpoint = 85.1%			
	Crops & Livestock Dust	45.7	21.4%
	Wildfires	12.1	5.7%
	Commercial Cooking	29.9	14.0%
	Construction Dust	12.3	5.8%
	Paved Road Dust	7.9	3.7%
	Unpaved Road Dust	13.6	6.4%
	Misc. Industrial Processes	3.0	1.4%
	Residential - Natural Gas or Other	0.1	0.0%
	Residential Wood Burning	26.4	12.4%
	Misc. Other Nonpoint	1.9	0.9%
	Locomotives	0.8	0.4%
	Waste Disposal	27.6	13.0%
Point = 1.9%			
	Airport	3.6	1.7%
	EGU	0.4	0.2%
Nonroad = 3.0%			
	Equipment - Diesel	3.1	1.5%
	Equipment - Gasoline	3.1	1.4%
	Equipment - Other	0.1	0.1%
Onroad = 10.1%			
	Diesel Vehicles	14.5	6.8%
	Non-Diesel Vehicles	6.9	3.3%
Grand Total		213.3	100.0%

Santa Cruz County – Emissions



Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation Santa Cruz County



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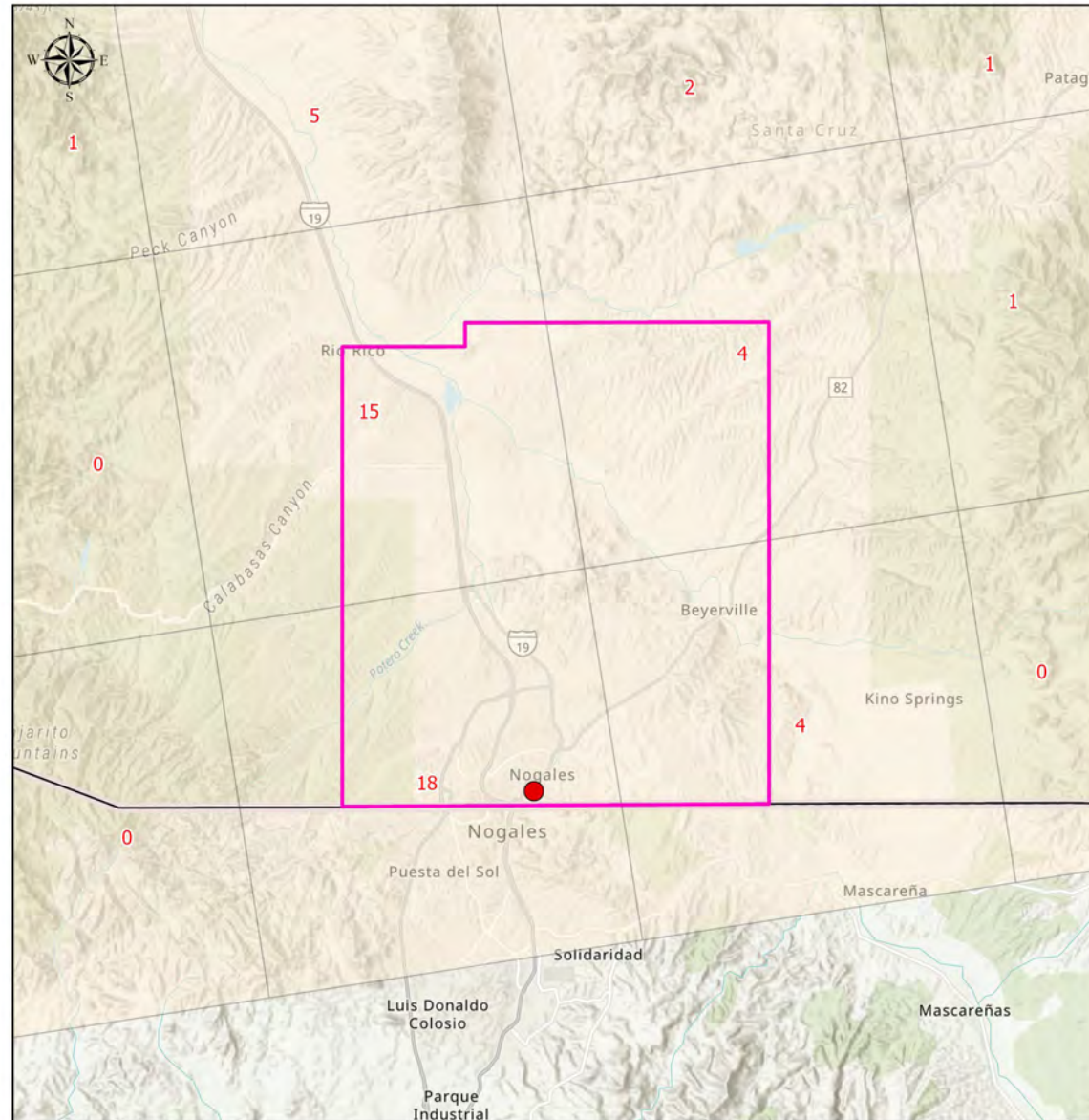
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Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation Santa Cruz County

Legend

□ Santa Cruz NAA Recommendation

□ counties

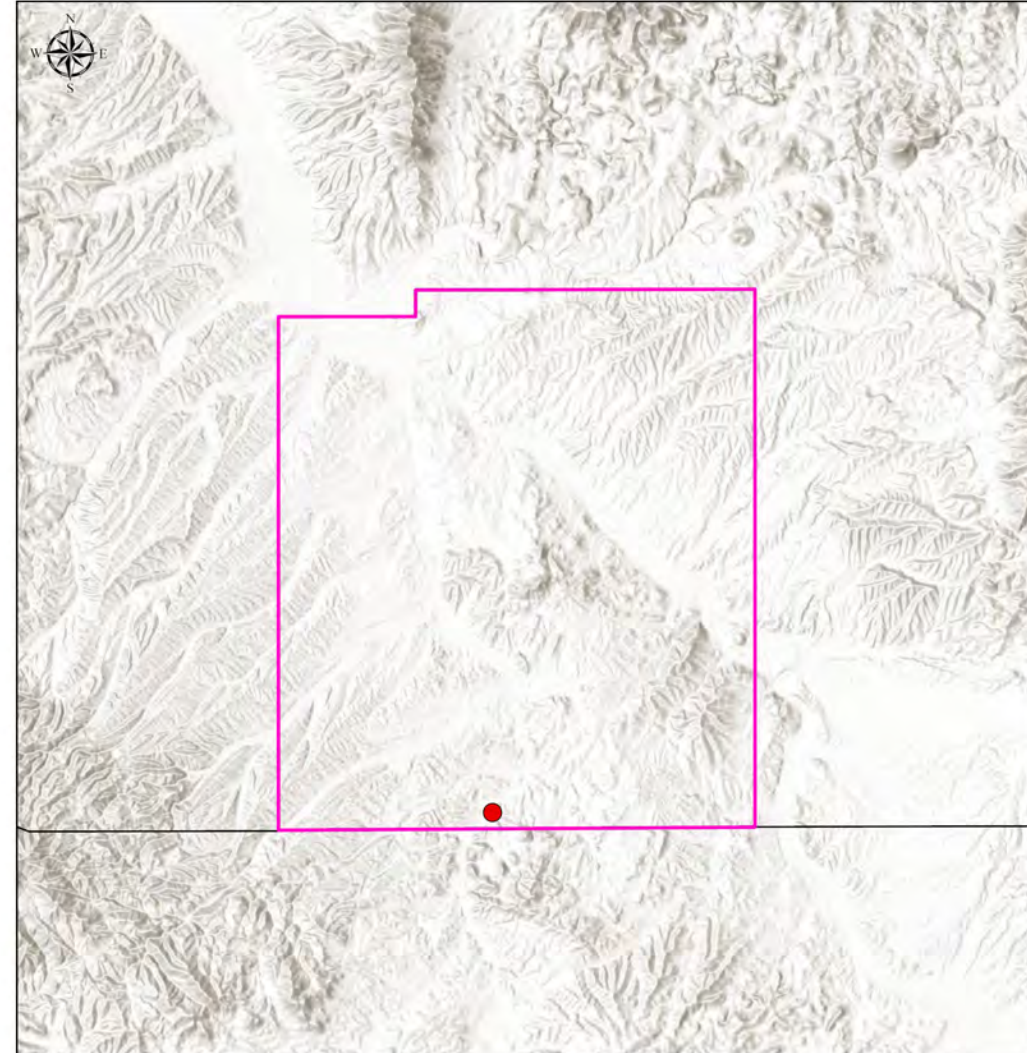
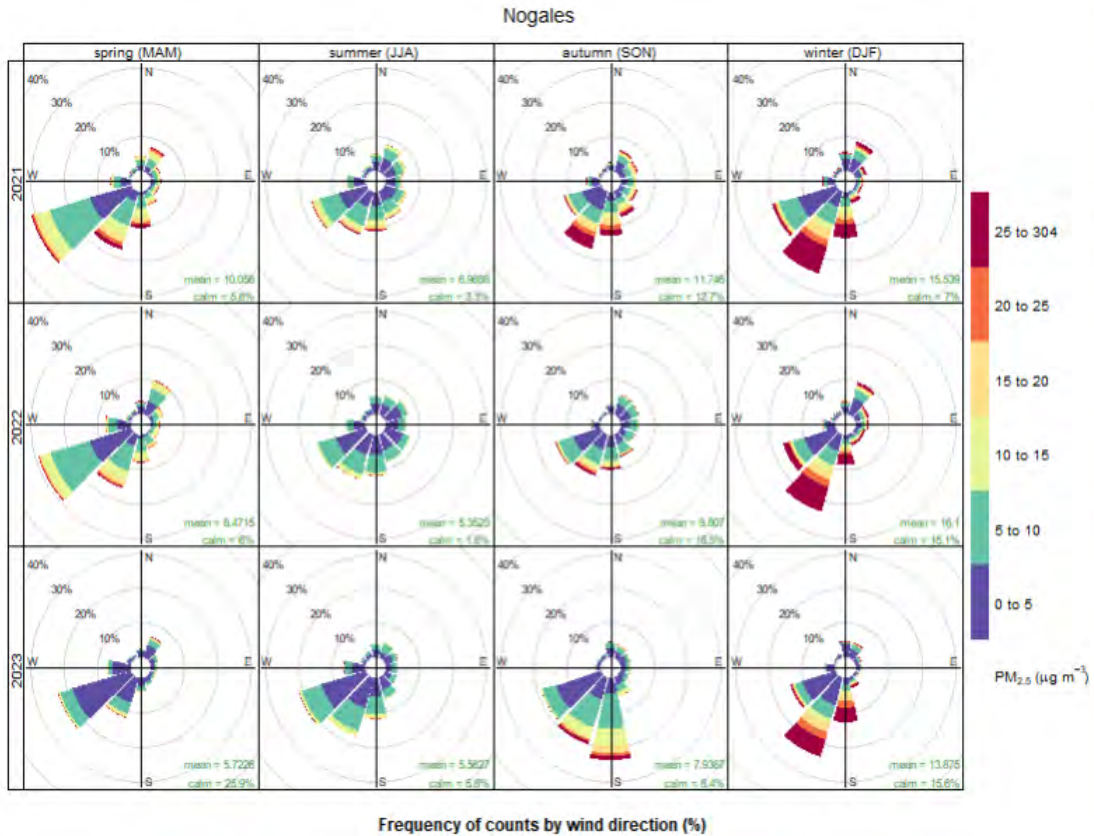
● Violating PM_{2.5} Monitor

Residential Wood Combustion PM_{2.5} and Precursors (tpy)

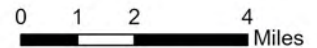
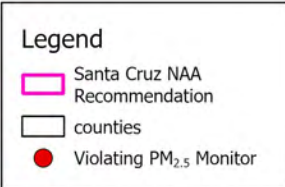
0 - 37
38 - 74
75 - 111
112 - 148
149 - 185

0 1 2 4 Miles

Santa Cruz County NAA – Meteorology & Topography



Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation Santa Cruz County

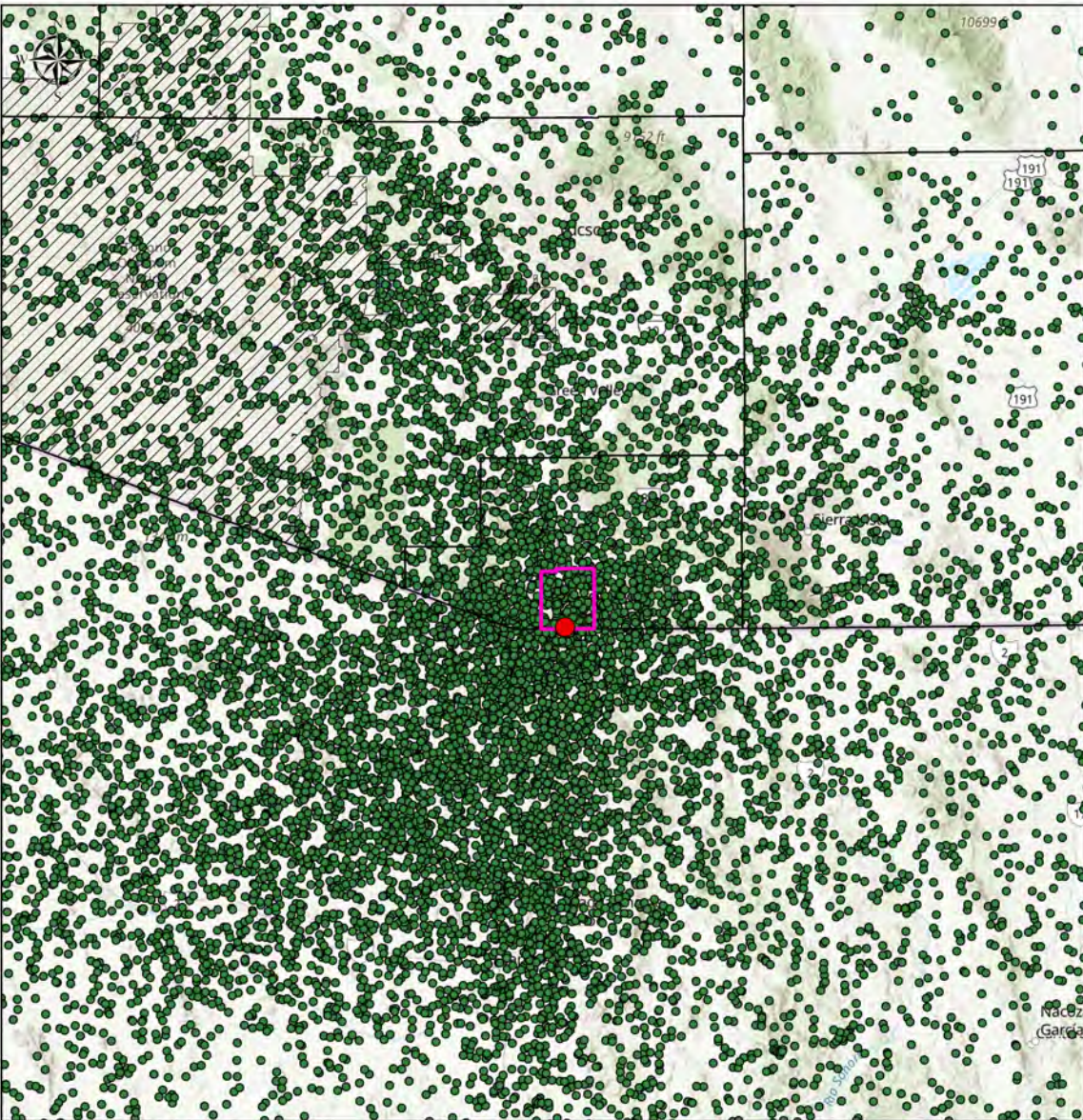


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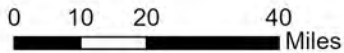
Monitor	Morning	Evening
Nogales Post Office	7:00 AM	11:00 PM



Draft 2024 Primary Annual PM_{2.5} NAAQS Boundary Recommendation Santa Cruz County

Legend

- Santa Cruz NAA Recommendation
- Tribal Land
- counties
- Violating PM_{2.5} Monitor
Nogales Post Office
- HYSPLIT Back Trajectory Endpoints
Days Above 9.0 µg/m³



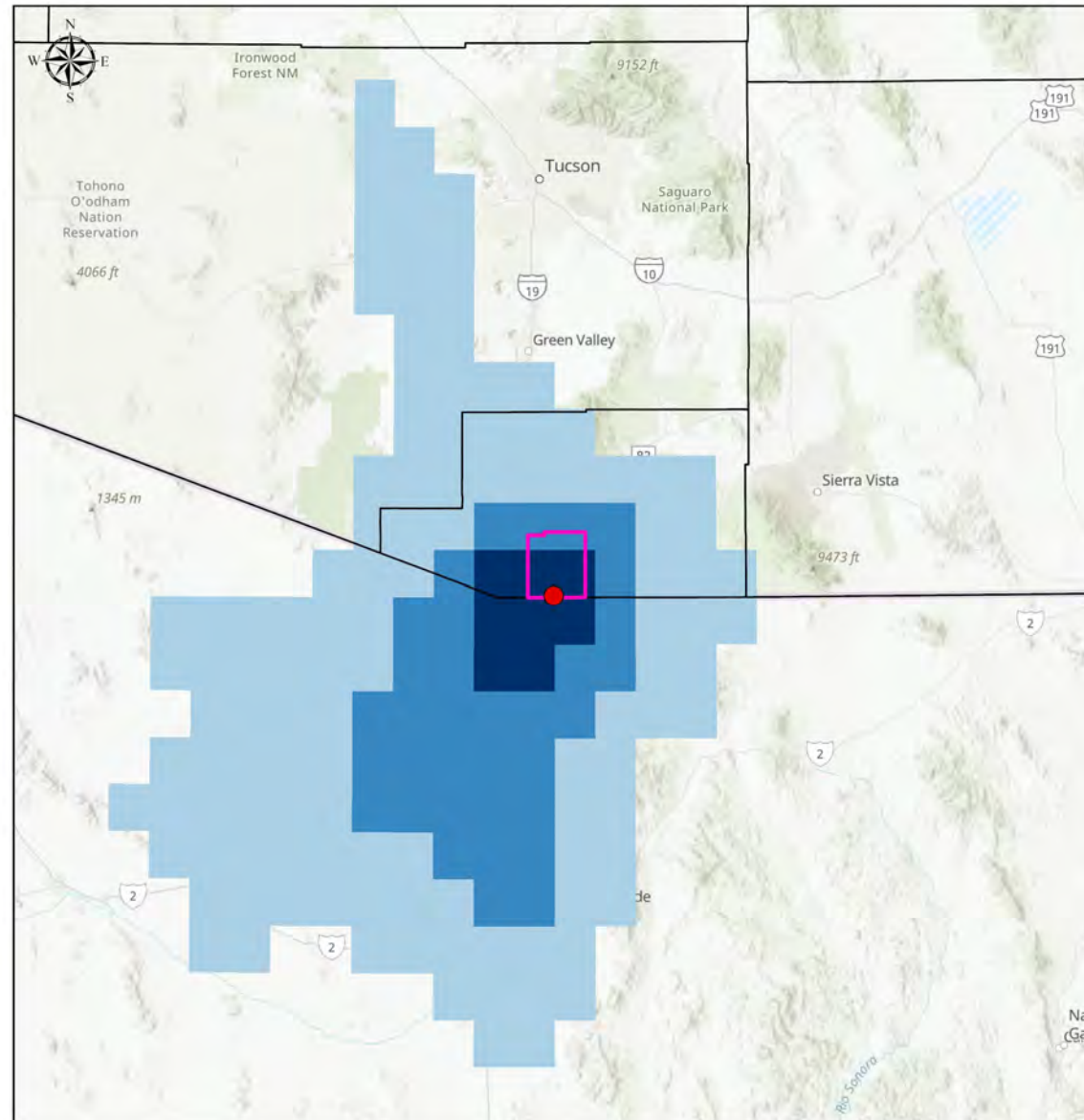
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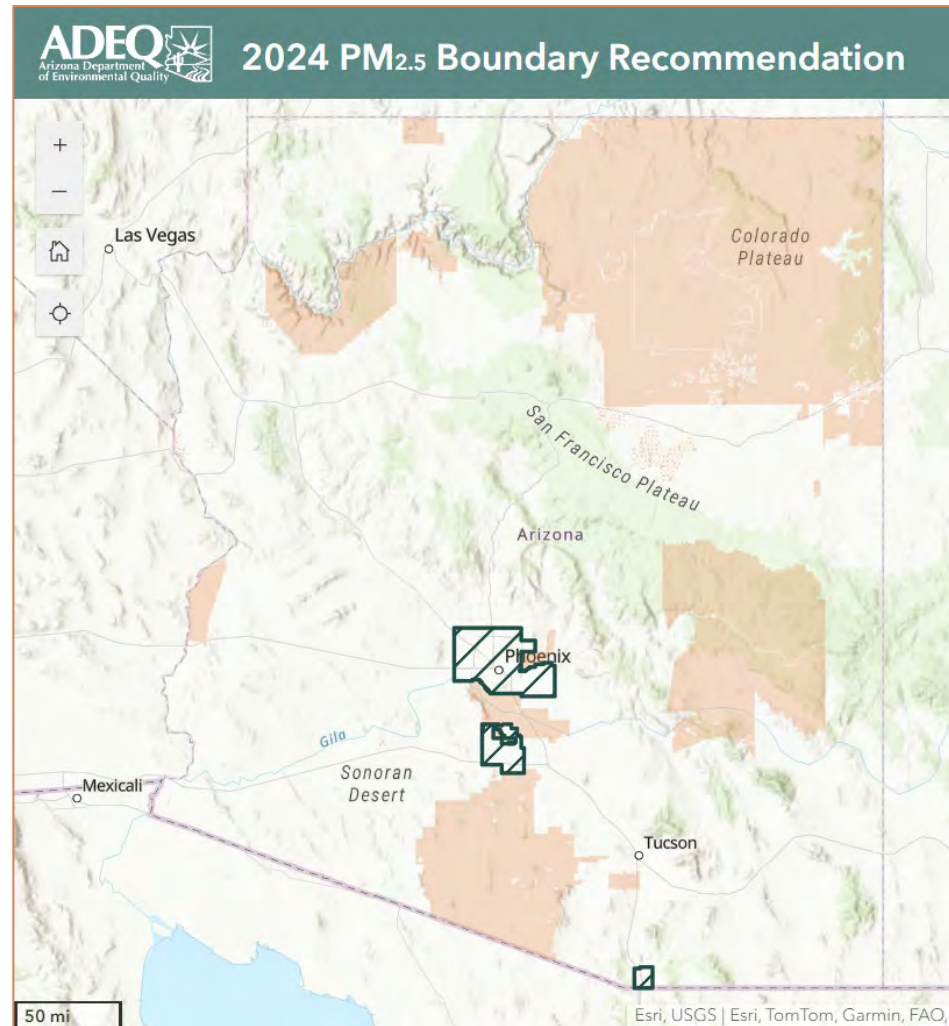
Draft 2024 Primary Annual $PM_{2.5}$ NAAQS Boundary Recommendation Santa Cruz County

Legend

- Santa Cruz NAA Recommendation
 - counties
 - Violating $PM_{2.5}$ Monitor
- Nogales PO HYSPLIT Above 9.0 Kernel Density**
- <25% of the maximum density
 - 25% - 50%
 - 50% - 75%
 - >75% of the maximum density

0 10 20 40 Miles

ADEQ 2024 PM_{2.5} Boundary Recommendation GIS Tool



Important Dates

- The formal public comment period begins on September 23, 2024 and will close on October 24, 2024.
- The PM_{2.5} Boundary Recommendation Public Hearing will be held on Thursday, October 24, 2024 at 11 AM.
- The Arizona Governor's recommendations for the revised 2024 PM_{2.5} primary annual NAAQS are due to EPA by Feb. 7, 2025.

Contact Information and Updates

Air Quality Improvement Planning
airplanning@azdeq.gov

To receive information and updates about the boundary designation process, including meeting opportunities, subscribe to ADEQ's PM_{2.5} Boundary Designations email list.



bit.ly/SubscribePM25



Clean Air, Safe Water,
Healthy Land for Everyone
