SLO COUNTY apcd | Air Pollution Control District
San Luis Obispo County

TO: Board of Directors, Air Pollution Control District

FROM: Gary E. Willey, Air Pollution Control Officer

DATE: January 26th, 2022

SUBJECT: Report on 2020 Air Quality in San Luis Obispo County

SUMMARY

The attached Annual Air Quality Report includes information and graphical charts on air quality measurements made throughout the county during 2020.

RECOMMENDATION

It is recommended that your Board review, receive and file the attached report.

DISCUSSION

Unprecedented wildfire smoke impacted air quality in San Luis Obispo County significantly in 2020.

Ozone trends ticked upwards during 2020. There were 23 days exceeding the federal and state 8-hour ozone standards as compared to 3 in 2019. All sites saw an increase in hours above 65 parts per billion (ppb).

For particulate matter with an aerodynamic diameter smaller than 10 microns (PM_{10}), average annual concentrations and exceedances of standards increased at all sites in the network. The 24-hr California state standard was exceeded on 79 days and the federal standard was exceeded 4 times, compared to 54 days exceeding the California standard and zero exceeding the federal standard in 2019.

$PM_{2.5}$ annual averages increased at all sites. There were 15 exceedances of the federal $PM_{2.5}$ 24-hour standard compared to zero in 2019.

The historic 2020 wildfire season which burned over four million acres across the state of California resulted in unprecedented impacts on air quality throughout the state. The widespread nature and magnitude of the fires resulted in smoke impacts statewide and cycles of poor air quality as weather conditions allowed smoke to accumulate then clear during late August and into early November.

In 2020, the APCD issued press releases on August 18th and 21st, September 3rd, 8th, and 11th, and October 1st warning of smoke impacts, ashfall, and elevated ozone concentrations. This included a request issued on August 21st in conjunction with the San Luis Obispo County Public Health Department to stop all non-emergency outdoor work in North County due to hazardous air quality associated with wildfire smoke.

Wildfire smoke impacts on PM levels were record breaking. Prior to 2020 the highest 24-hr PM_{10} concentration measured in the county was 178 µg/m^3 at the now closed Arroyo Grande monitoring station on April 14th, 2002. This record was broken on 3 separate days in 2020, twice at Atascadero and three times at Paso Robles. The new record high 24-hr PM_{10} concentration in the county stands at 367 µg/m^3 measured on August 20th at Paso Robles.

Similarly, the previous highest 24-hr $PM_{2.5}$ concentration ever measured in the county was 57 µg/m^3 at Atascadero on January 1st, 2001. This record was broken on 10 separate days in 2020 with every $PM_{2.5}$ monitoring station in the network exceeding the previous record at least once. The new record 24-hr $PM_{2.5}$ concentration for the county is 242 µg/m^3 measured on August 20th at Atascadero.

The State of California is petitioning U.S. EPA to designate the wildfire exceedances as "Exceptional Events" so they may be excluded from attainment status determinations.

Outside of wildfire impacts, windblown dust continued to be a source of high particulate matter in the South County. The CDF and Mesa 2 monitoring stations recorded 54 and 53 violations of the California PM_{10} 24-hr average concentration respectively, with many influenced by windblown dust.

Mitigations at the Oceano Dunes State Vehicle Recreation Area (ODSVRA) were analyzed for effects on downwind PM_{10} concentrations. Using the same methodology as the previous Annual Air Quality Reports, it is estimated that the dust controls in place in 2020 yielded a 28.4% decrease in event-day PM_{10} at CDF compared to the baseline year of 2017. This is the largest improvement observed so far, and it is likely due to the approximately 90 acres of new dust controls installed in 2020 and the 7-month suspension of vehicular activity that was imposed in response to the global COVID-19 pandemic.

There were no exceedances of the standards for nitrogen dioxide or sulfur dioxide at any station this year.

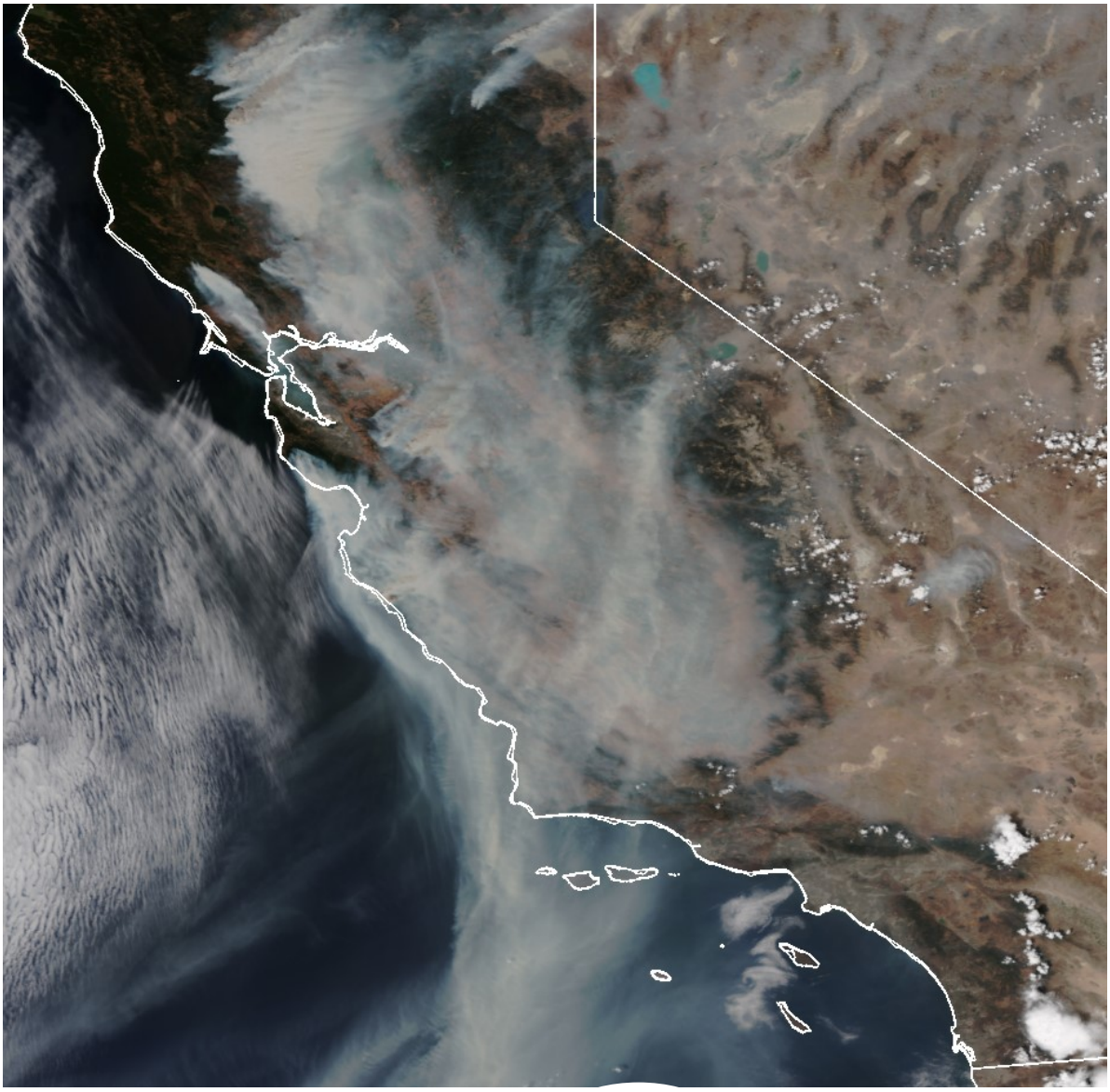
OTHER AGENCY INVOLVEMENT

No other agency was involved in the preparation of this report. Air quality data collected by the APCD is regularly reported to the California Air Resources Board and the Federal Environmental Protection Agency.

FINANCIAL CONSIDERATIONS

There are no financial considerations associated with your Board's consideration of this report.

ANNUAL AIR QUALITY REPORT | 2020



SLO COUNTY apcd | Air Pollution Control District
San Luis Obispo County

2020 Annual Air Quality Report

January 26, 2022

SAN LUIS OBISPO COUNTY
AIR POLLUTION CONTROL DISTRICT

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Executive Summary

Air quality in San Luis Obispo County generally declined from 2019 to 2020 driven by unprecedented wildfire smoke impacts:

- **Ozone** trends ticked upwards during 2020. There were 23 days exceeding the federal and state 8-hour ozone standards as compared to 3 in 2019. All sites saw an increase in hours above 65 parts per billion (ppb) (Figure 8) while design values[1] for Carrizo Plains, Red Hills, and Paso Robles increased (Figure 9).
- **For particulate matter with an aerodynamic diameter smaller than 10 microns (PM_{10})**, average annual concentrations and exceedances of standards increased at all sites in the network (Figures 10-12). The 24-hr California state standard was exceeded on 79 days and the federal standard was exceeded 4 times, compared to 54 days exceeding the California standard and zero exceeding the federal standard in 2019.
- **$PM_{2.5}$** annual averages increased at all sites (Figure 13). There were 15 exceedances of the federal $PM_{2.5}$ 24-hour standard (Table 5) compared to zero in 2019.

The historic 2020 wildfire season which burned over four million acres across California resulted in unprecedented impacts on air quality throughout the state. The widespread nature and magnitude of the fires resulted in smoke impacts statewide and cycles of poor air quality as weather conditions allowed smoke to accumulate then clear during late August and into early November.

The San Luis Obispo County Air Pollution Control District (APCD) issued press releases on August 18th and 21st, September 3rd, 8th, and 11th, and October 1st warning of smoke impacts, ashfall, and elevated ozone concentrations. This included a request issued on August 21st in conjunction with the San Luis Obispo County Public Health Department to stop all non-emergency outdoor work in North County due to hazardous air quality associated with wildfire smoke.

Wildfire smoke impacts on PM levels were record breaking. Prior to 2020 the highest 24-hr PM_{10} concentration measured in the county was 178 $\mu g/m^3$ at the now closed Arroyo Grande monitoring station on April 14th, 2002. This record was broken on 3 separate days in 2020, twice at Atascadero and three times at Paso Robles. The new record high 24-hr PM_{10} concentration in the county stands at 367 $\mu g/m^3$, measured on August 20th at Paso Robles.

Similarly, the previous highest 24-hr $PM_{2.5}$ concentration ever measured in the county was 57 $\mu g/m^3$ at Atascadero on January 1st, 2001. This record was broken on 10 separate days in 2020 with every $PM_{2.5}$ monitoring station in the network exceeding the previous record at least once. The new record 24-hr $PM_{2.5}$ concentration for the county is 242 $\mu g/m^3$, measured on August 20th at Atascadero.

Outside of wildfire impacts, windblown dust continued to be a source of high particulate matter in the South County. The CDF and Mesa 2 monitoring stations recorded 54 and 53 violations of the California PM_{10} 24-hr average concentration standard respectively, with many influenced by windblown dust. This compares to 51 and 36 exceedances in 2019.

There were no exceedances of the standards for nitrogen dioxide or sulfur dioxide at any station this year.

[1]The U.S EPA defines the ozone design value as the fourth highest daily maximum 8-hour average concentration, averaged over a three-year period. Design values are used to designate and classify nonattainment areas, as well as to assess progress towards meeting National Ambient Air Quality Standards (NAAQS).

Appendix A presents an analysis of the effects of the Oceano Dunes State Vehicle Recreation Area (ODSVRA) dust controls on downwind PM_{10} concentrations. Using the same methodology as the previous Annual Air Quality Reports, it is estimated that the dust controls in place in 2020 yielded a 28.4% decrease in event-day PM_{10} at CDF compared to the baseline year of 2017. This is the largest improvement observed so far, and it is likely due to the approximately 90 acres of new dust controls installed in 2020 and the 7-month suspension of vehicular activity that was imposed in response to the global COVID-19 pandemic.

Appendix B presents an "infographic" summarizing the main points from this annual report.

The air quality database for San Luis Obispo County is a public record and is available from the APCD office in various forms, including comprehensive records of all hourly or other sample values acquired anywhere in the county. Data summaries are published in Annual Air Quality Reports, like this one. Summary data appear weekly in the Saturday edition of The Tribune, a local newspaper. Ambient monitoring data is added to separate archives maintained by EPA and CARB. Summary data from San Luis Obispo County can be found in EPA and CARB publications and on the world wide web at the following websites:

www.slocleanair.org
APCD website
www.arb.ca.gov
CARB website
www.epa.gov
US EPA website
www.airnow.gov
Air Quality Index site

Air Quality Monitoring and Data

Air quality in San Luis Obispo County was measured by a network of 10 permanent ambient air monitoring stations in 2020; their locations are depicted in Figure 1. The San Luis Obispo County Air Pollution Control District (APCD) owned and operated six permanent stations: Nipomo Regional Park (NRP), Morro Bay, Atascadero, Red Hills, Carrizo Plain, and the CDF fire station on the Nipomo Mesa. The California Air Resources Board (CARB) operated stations in San Luis Obispo and Paso Robles. Two stations are owned by third parties but operated by APCD: Mesa2, located on the Nipomo Mesa and owned by the Phillips 66 refinery, and Oso Flaco, located within the ODSVRA and owned by the California Department of Parks and Recreation. See Table 2 for a summary of the pollutants monitored at each station.

APCD prepares an *Ambient Air Monitoring Network Plan* every year. This document is an evaluation of the network of air pollution monitoring stations in the county. The annual review is required by 40 CFR 58.10 and helps ensure continued consistency with the monitoring objectives defined in federal regulations. Each report is a directory of existing and proposed monitors in the county network and serves as a progress report on the recommendations and issues raised in earlier network reviews. They are available online at http://www.slocleanair.org/air-quality/monitoring-stations.php.

Air quality monitoring is subject to rigorous federal and state quality assurance and quality control requirements, and equipment and data are audited periodically to ensure data validity. Gaseous pollutant levels are measured every few seconds and averaged to yield hourly values. Particulate matter ($PM_{2.5}$ and PM_{10}) is sampled hourly. All monitoring instruments are U.S. Environmental Protection Agency (EPA)-approved Federal Equivalent Methods (FEMs) or Federal Reference Methods (FRMs).

The 2020 data reviewed in this report were extracted from the EPA's Air Quality System (AQS) database. Prior to being uploaded to AQS, all data were thoroughly reviewed and validated by the collecting agency (i.e., CARB for data from Paso Robles and San Luis Obispo and APCD for all other sites). The raw data and computer code used to compile the statistics and generate the graphs in this report are available upon request.

Figure 1: Map of Monitoring Stations in San Luis Obispo County

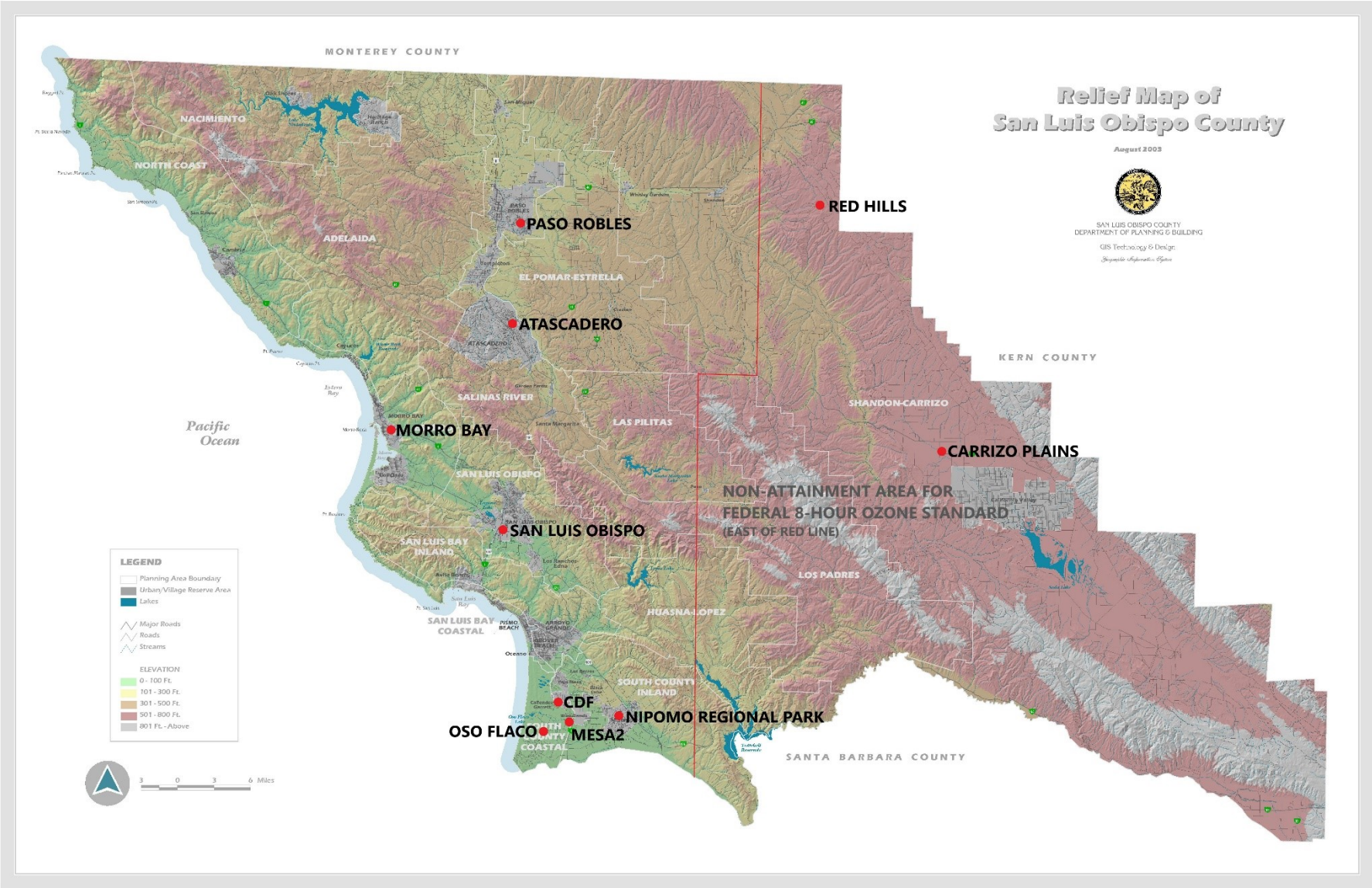


Table 1: Ambient Air Quality Parameters Monitored in San Luis Obispo County in 2020

	O_3	NO	NO_2	NO_x	SO_2	PM_{10}	$PM_{2.5}$	WS	WD	ATM
APCD Permanent Stations										
Atascadero	X	X	X	X		X	X	X	X	X
Morro Bay	X							X	X	
Nipomo Regional Park	X	X	X	X		X		X	X	X
Red Hills	X							X	X	X
Carrizo Plain	X							X	X	X
CDF						X	X	X	X	
CARB Stations										
San Luis Obispo	X					X	X	X	X	X
Paso Robles	X					X		X	X	X
Operated by APCD										
Mesa2					X	X	X	X	X	X
Oso Flaco						X		X	X	X

Abbreviations and Chemical Formulas:

NO	Nitric Oxide	SO_2	Sulfur Dioxide	PM_{10}	Particulates < 10 microns	WS	Wind Speed
NO_2	Nitrogen Dioxide	O_3	Ozone	$PM_{2.5}$	Particulates < 2.5 microns	WD	Wind Direction
NO_x	Oxides of Nitrogen					ATM	Ambient Temp

Ambient Air Pollutants Of Local Concern

Ozone

Ozone (O_3) is a gas that is naturally found near the earth's surface at low concentrations, typically 10 to 40 parts per billion (ppb). It is also a principal component of photochemical smog, produced when precursor pollutants such as volatile organic compounds and nitrogen oxides react under the influence of sunlight. Ozone precursors are emitted by many human activities, but industrial processes and motor vehicles are primary sources. The chemistry of atmospheric ozone is complex, and in the absence of sunlight, ozone is destroyed by reaction with the same precursor molecules that fuel its formation during the day. As a result, ozone concentrations typically increase as sunlight intensity increases, peaking midday or in the afternoon and gradually declining from there, typically reaching their lowest levels in the early morning hours and just before sunrise, as shown in Figure 2, below.

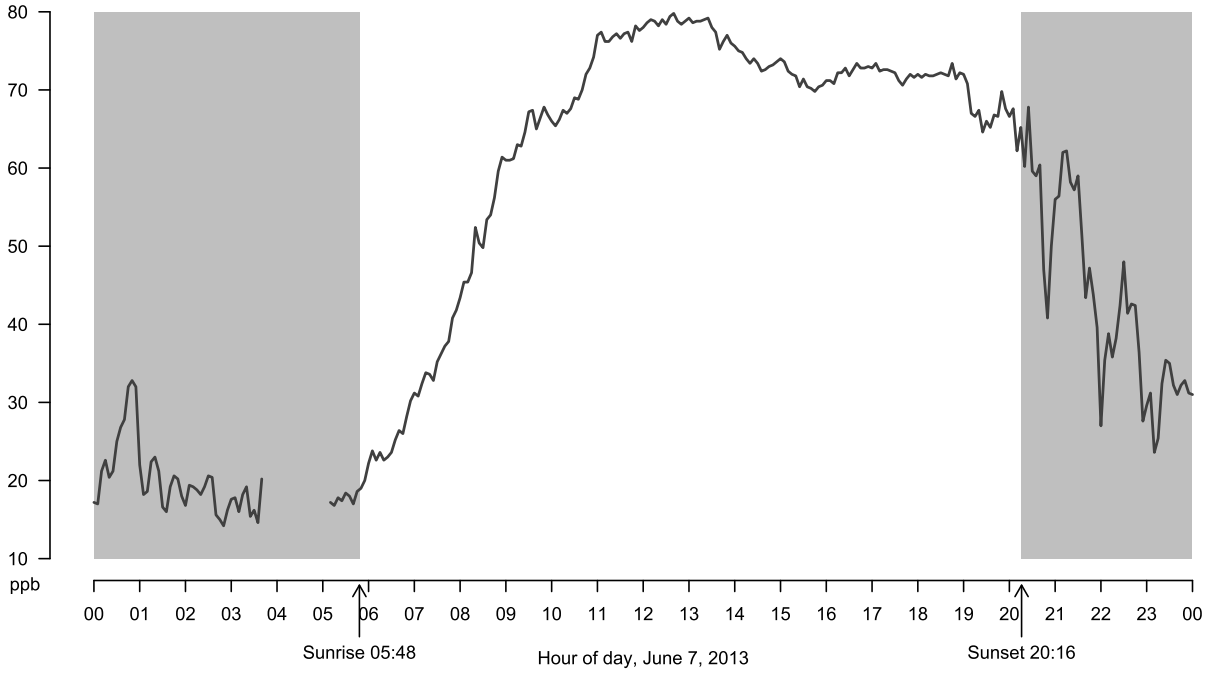


Figure 2: Example of Diurnal Ozone Pattern from Carrizo Plain

As a pollutant, ozone is a strong oxidant gas that attacks plant and animal tissues. It can cause impaired breathing and reduced lung capacity, especially among children, athletes, and persons with compromised respiratory systems; it can also cause significant crop and forest damage. Ozone is a pollutant of particular concern in California where geography, climate, and emissions from industrial and commercial sources and millions of vehicles contribute to frequent violations of health-based air quality standards.

While ground level ozone is harmful to plants and animals and is considered a pollutant, upper level (stratospheric) ozone occurs naturally and protects the earth from harmful ultra-violet energy from the sun.

Particulate Matter

Ambient air quality standards have been established for two classes of particulate matter: PM_{10} (inhalable particulate matter less than 10 microns in aerodynamic diameter), and $PM_{2.5}$ (fine particulate matter 2.5 microns or less in aerodynamic diameter). Both consist of many different types of particles that vary in

their composition and toxicity. $PM_{2.5}$ tends to be a greater health risk since these particles can get lodged deep in the lungs or enter the blood stream, causing both short and long-term damage. Diesel exhaust, combustion products from industry and motor vehicles, and smoke from open burning produce much of the $PM_{2.5}$ found in outdoor air as well as a significant portion of PM_{10}. Other PM_{10} sources include dust from mineral extraction and production, and from soils disturbed by demolition and construction, agricultural operations, unpaved roads, off-road vehicle recreation and other activities.

In addition to its harmful health effects, particulate matter can also greatly reduce visibility.

Nitrogen Dioxide, **Sulfur Dioxide**, **and Carbon Monoxide**

Nitrogen dioxide (NO_2) is the brownish-colored component of smog. NO_2 irritates the eyes, nose and throat and can damage lung tissue. Sulfur dioxide (SO_2) is a colorless gas with health effects similar to NO_2. Both pollutants are generated by fossil fuel combustion from mobile sources such as vehicles, ships, and aircraft and at stationary sources such as industry facilities, homes, and businesses. SO_2 is also emitted by petroleum production and refining operations. These pollutants can create aerosols, which may fall as acid rain causing damage to crops, forests, and lakes. They can also exacerbate asthma and harm the human respiratory system.

Carbon monoxide (CO) is a colorless and odorless gas that can interfere with the ability of red blood cells to transport oxygen. Exposure to CO can cause headaches, fatigue, and even death. CO results from fuel combustion of all types, but motor vehicles are by far the chief contributor of CO in outdoor air.

State and National Ambient Air Quality Standards

CARB and the U.S. EPA have adopted ambient air quality standards for six common air pollutants of primary public health concern: ozone, particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide, sulfur dioxide, carbon monoxide, and lead.[2] These are called "criteria pollutants" because the standards establish permissible airborne pollutant levels based on criteria developed after careful review of medical and scientific studies of the effects of each pollutant on public health and welfare.

The National Ambient Air Quality Standards (NAAQS; see Table 2) are used by EPA to designate a region as either "attainment" or "nonattainment" for each criteria pollutant. A nonattainment designation can trigger additional regulations aimed at reducing pollution levels and bringing the region into attainment. For most pollutants, the NAAQS allow a standard to be exceeded a certain number of times each calendar year without resulting in a nonattainment designation. Additionally, exceedances caused by exceptional events (see below) may be excluded from attainment/nonattainment determinations at the discretion of the EPA.

In May 2012, the EPA designated the eastern portion of San Luis Obispo County as marginally nonattainment for the 8-hour ozone standard. This was based on data from enhanced monitoring over the previous decade that revealed previously unrecognized high ozone levels in that region; the western portion of the county retained its attainment status. (See the red line in Figure 1 for the boundary between the attainment and nonattainment areas.) In October 2015, the ozone standard was lowered from 75 to 70 ppb, and in April 2018, the EPA designated the eastern portion of the county as a marginal nonattainment zone for the new standard with an attainment determination scheduled for August 2021. As of the date of this report, this decision is awaiting EPA's review and concurrence of two exceptional event demonstrations discussed below. The county is currently designated as attaining all other NAAQS.

The California Ambient Air Quality Standards are generally more restrictive (i.e. lower) than the NAAQS, and typically are specified as not to be exceeded. Thus, a single exceedance is a violation of the applicable standard and triggers a nonattainment designation. As a result, San Luis Obispo County is designated as a nonattainment area for the state one-hour and 8-hour ozone standards, as well as the state 24-hour and annual PM_{10} standards. The county is designated as attaining the state annual $PM_{2.5}$ standard.

State and federal standards for NO_2 have never been exceeded here. The state standard for SO_2 was exceeded periodically on the Nipomo Mesa until 1993. Equipment and processes at the facilities responsible for the emissions were upgraded as a result, and the state SO_2 standard has not been exceeded since that time. The federal SO_2 standard has only been exceeded once, in 2013, when maintenance activities at these facilities resulted in emissions exceeding the 1-hour standard of 75 ppb. (This standard was established in 2011.) State CO standards have not been exceeded in the county since 1975. The county has never been required to conduct lead monitoring.

Exceptional Events

Exceptional events are unusual or naturally occurring events that can affect air quality but are not reasonably controllable or preventable and are unlikely to reoccur at a particular location. Examples include wildfires and tornadoes. Air quality monitoring data influenced by exceptional events can sometimes be excluded from regulatory determinations related to violations of the NAAQS, if recommended by APCD and CARB and approved by the EPA. The EPA will only review exceptional event demonstrations that could directly affect upcoming regulatory decision relating to the NAAQS.

[2] In addition to these six pollutants, California also has standards for hydrogen sulfide, sulfate, vinyl chloride, and visibility reducing particles.

Under the 2015 Ozone NAAQS, all marginal nonattainment areas are subject to an attainment deadline of August 2021. As such, EPA will be reviewing ozone data from the Red Hills monitoring station covering the 2018 through 2020 time period to make a regulatory decision on whether Eastern San Luis Obispo County has achieved attainment by that deadline; if EPA determines that attainment has not been achieved, the area will be reclassified as moderate nonattainment and APCD may need to update its Clean Air Plan.

The eastern portion of San Luis Obispo was on track to reach attainment by the date set forth in the current regulation, but extreme fire impacts in 2020 along with impacts in 2018 directly impacted ozone concentrations across the county. APCD worked collaboratively with CARB to create exceptional event demonstrations that propose excluding key 2018 and 2020 impacted data from the upcoming regulatory determination.

APCD identified five days in 2018 and twenty-four days in 2020 in which ozone levels at the Red Hills monitoring station were elevated due to wildfire smoke impacts. APCD, in conjunction with CARB, subsequently submitted an Exceptional Event Initial Notification to the EPA on March 15th detailing the 29 days identified. In accordance with EPA interpretation of the Exceptional Event Rule, only the dates necessary to reach attainment status will be submitted with the demonstrations. As such, only a total of 9 days of ozone data from Red Hills across the two years are being requested to be removed from regulatory determinations.

The submission to EPA titled, *"Exceptional Events Demonstration for Ozone Exceedances-Eastern Portion of San Luis Obispo County, California August 2018 Wildfire Events,"* details the clear relationship between elevated ozone concentrations and wildfire smoke impacts at the Red Hills station on August 3rd, 4th, 6th, and 7th of 2018. This demonstration was submitted to EPA on September 3rd and the public comment period ended on October 4th, 2021.

The *"Exceptional Events Demonstration for Ozone Exceedances- Southern California 2020 Wildfire Events"* submission provides a detailed demonstration of clear wildfire smoke impacts on ozone concentrations at the Red Hills monitoring station on August 20th, 21st, September 30th, October 1st and October 2nd. This document was submitted to EPA on December 8th with a 30-day public comment period open from December 10th through January 10th, 2022.

If EPA concurs with both exceptional event demonstrations, the Red Hills design value will be lower than what is reflected in Figure 9. The 2018 design value would decrease from 72 to 71. The 2019 design value would decrease from 70 to 69 and the 2020 design value would decrease from 73 to 70. These design value reductions would result in the Red Hills site achieving the 2015 Ozone NAAQS by the August 2021 regulatory deadline.

Both exceptional event documents are currently awaiting a final decision from EPA.

Table 2: Ambient Air Quality Standards for 2020 and Attainment Status*

A standard exceedance *occurs when a measured pollutant concentration exceeds (or in some cases, equals) the applicable standard prescribed by state or federal agencies. It does not necessarily constitute a violation.*

A standard violation *may occur following a single or cumulative series of standard exceedances. Criteria constituting a violation are unique for each pollutant.*

A nonattainment designation *occurs when a state or federal agency formally declares an area in violation of a standard. Typically, CARB performs designations annually. Several years often pass between EPA designations.*

	Averaging Time	California Standard†	National Standard†
Ozone (O_3)	8 Hours	**70 ppb**	**70 ppb**
	1 Hour	**90 ppb**	
Respirable Particulate Matter (PM_{10})	24 Hours	**50 μg/m³**	150 μg/m³
	1 Year‡	**20 μg/m³**	
Fine Particulate Matter ($PM_{2.5}$)	24 Hours		35 μg/m³
	1 Year‡	12 μg/m³	12 μg/m³
Carbon Monoxide (CO)	8 Hours	9.0 ppm	9 ppm
	1 Hours	20 ppm	35 ppm
Nitrogen Dioxide (NO_2)	1 Year‡	30 ppb	53 ppb
	1 Hour	180 ppb	100 ppb
Sulfur Dioxide (SO_2)	3 Hours		500 ppb (secondary)
	1 Hour	250 ppb	75 ppb (primary)
Lead (Pb)	3 Month		0.15 μg/m³
	30 Day	1.5 μg/m³	

* San Luis Obispo County (in whole or in part) is designated as nonattainment for the standards in **boldface print** as of December 2021.

† For clarity, the ozone, SO_2, and NO_2 standards are expressed in parts per billion (ppb), however most of these standards were promulgated in parts per million (ppm). When comparing to the national PM_{10} and $PM_{2.5}$ standards, federal regulations state that measurements shall be rounded to the nearest 10 μg/m³ and 1μg/m³, respectively. Thus, for PM_{10}, 24-hour averages between 150 and 154 μg/m³ are not considered exceedances of the standard, even though they are greater (or equal to) 150 μg/m³.

‡ This standard is calculated as a weighted annual arithmetic mean.

Wildfire Impact Summary

In the summer and fall of 2020, the extreme wildfire season led to widespread smoke impacts throughout the state. Smoke and haze blanketed the state for extended periods of time leading to increased particulate matter and ozone concentrations across the state and San Luis Obispo County. This led to increased violations of NAAQS and CAAQS at sites across the county.

The fires and local air quality impacts began in earnest following expansive lightning producing thunderstorms between August 15th-18th. This event produced over 1,000 lightning strikes and sparked dozens of fires across the state, including the August Complex, CZU Lightning Complex, SCU Lightning Complex, LNU complex and SQF complex. Leading into September, heat waves combined with Diablo and Santa Ana winds facilitated rapid growth of ongoing fires and rapid spread of newly sparked fires across the state. The widespread nature and magnitude of the fires resulted in smoke accumulation over the state and periods of poor air quality spanning from August through early November. Many major fires impacted air quality in the region, and it is difficult to trace impacts to an individual fire due to widespread smoke accumulation. Major fires in 2020 of note are summarized below.

Table 3: Major Active Wildfires during Air Quality Impact Events

Fire	Source	Start Date	Containment	Total Acres
Red Salmon Complex	Lightning	7/27/2020	11/23/2020	144,698
Lake Fire	Lightning	8/12/2020	9/28/2020	31,089
Hills Fire	Lightning	8/15/2020	8/24/2020	2,121
CZU Lightning Complex	Lightning	8/16/2020	9/22/2020	86,509
August Complex	Lightning	8/16/2020	11/11/2020	1,032,648
River Fire	Lightning	8/16/2020	9/4/2020	48,088
LNU Lightning Complex	Lightning	8/17/2020	10/2/2020	363,220
Holser Fire	Investigating	8/17/2020	9/6/2020	3,000
North Complex Fire	Lightning	8.18.2020	12/3/2020	318,935
Salt Fire	Investigating	8/18/2020	8/24/2020	1,789
Woodward Fire	Investigating	8/18/2020	10/2/2020	4,929
Carmel Fire	Vehicle	8/18/2020	9/4/2020	6,905
SCU Lightning Complex	Lightning	8/18/2020	10/1/2020	396,624
Dolan Fire	Unknown	8/19/2020	12/31/2020	124,924
SQF Complex	Lightning	8/19/2020	1/6/2021	174,178
Creek Fire	Investigating	9/4/2020	12/24/2021	379,895
Bobcat Fire	Investigating	9/6/2020	11/8/2020	115,796

The August Complex in the Coast Range over Northern California consisted of 38 separate fires sparked on August 16th and 17th. The fire ultimately became the largest wildfire in California history burning 1,032,648 acres before reaching containment on November 1st. The CZU Lightning complex began in Santa Cruz and San Mateo Counties on August 16th and grew to 86,509 acres before reaching full containment on September 22nd. The SCU Lightning Complex also began on August 16th and grew to 396,624 acres before reaching full containment on October 1st, 2021. The SCU complex spanned portions of Contra Costa, Alameda, Santa Clara, Stanislaus, San Joaquin and Merced counties. The SQF complex was discovered on August 19th and attributed to a lightning strike. This complex grew to 131,087 acres prior to reaching 100% containment on January 6th, 2021. The Dolan Fire also began on August 18th from unknown causes in the Ventana Wilderness section of Los Padres National Forest in Monterey County. The fire grew to 128,050

acres and did not reach 100% containment until December 31st due to steep and inaccessible terrain. The Creek fire was sparked on September 4th and grew by between 20,000-50,000 acres per day for the first 4 days. This rapid growth produced extreme heat and smoke generating a large pyro-cumulus cloud that extended 50,000 ft into the atmosphere and spawned an EF-1 tornado. The Creek fire ultimately grew to encompass 379,895 acres before reaching full containment on December 24th. Many other large and small fires were burning across the state and affected the air quality throughout the region, however, these fires had some of the most direct impacts.

Initial impacts to local air quality began on August 18th and lasted through August 22nd, associated with the lightning sparked complex fires. During this period there were 5 days that exceeded the 8-hr state and federal ozone standards, along with all exceedances of the California state one-hour ozone standard. Atascadero, Carrizo Plains, and Paso Robles all recorded their 1st, 2nd, and 3rd highest 8-hr ozone averages of the year, while Red Hills recorded its 1st highest 8-hr average ozone concentrations of the year. Paso Robles and Atascadero recorded their 3 highest 24-hr average PM_{10} concentrations along with Atascadero's 3 highest 24hr average PM_{10} and $PM_{2.5}$ concentrations. San Luis Obispo recorded its 2nd highest PM_{10} concentration of the year and 3rd highest $PM_{2.5}$ average concentration.

Smoke cleared the region before building back in at the end of August and through the first half of September with another round of impacts on local air quality beginning on August 30th with Carrizo Plains recording its 4th highest 8-hr ozone concentration of the year and continued through September 6th with 6 exceedances of the Federal 8-hr ozone standard. September 6th saw the highest 8-hr and 1-hr ozone concentrations of the year in San Luis Obispo and the 4th highest at Paso Robles. Smoke aloft began to increase substantially while a deep marine layer along the coast limited large-scale impacts from occurring at the surface. Paso Robles continued to exceed the California state 24-hour PM_{10} standard on September 7th, 8th, 9th and 10th. Smoke became more widespread on the 11th with Atascadero, San Luis Obispo and Paso Robles also exceeding the state 24-hr PM_{10} standard.

Surface level smoke impacts continued to increase into September 12th with impacts peaking between September 13th to the 15th. The three highest 24-hr average $PM_{2.5}$ concentrations of the year were recorded at CDF along with the two highest average concentrations at Mesa 2 and San Luis Obispo. On September 13th Oso Flaco recorded its 2nd highest 24-hour average PM_{10} concentration. On September 14th San Luis Obispo, CDF, and Oso Flaco recorded their highest 24-hour average PM_{10} concentrations of the year and Mesa 2 recorded its second highest. The federal ozone 8-hr standard was exceeded four times at the Red Hills monitoring station and once at the Carrizo Plains monitoring station between the 14th to the 17th including Red Hills 4th highest 8-hr ozone concentration.

Moving into the end of September and through October smoke impacts became largely associated with the Creek Fire near Shaver Lake and the SQF complex in Sequoia National Forest although other fires continued to contribute. An additional 6 exceedances of the federal ozone 8-hr standard occurred at Red Hills station and two at Carrizo Plains between September 29th through October 3rd. Light smoke returned on October 6th and lasted through October 8th with Red Hills recording another exceedance of the federal ozone standard.

Light smoke from the Creek Fire and SQF fire began to creep back into the far eastern portions of the county on October 14th. Red Hills recorded two exceedances of the federal 8-hour ozone standard on October 16th and 17th before smoke cleared the region on the 18th.

In late October smoke from the Creek and SQF complex fire began to filter back into the region. The California PM_{10} 24-hr average concentration standard was violated an additional 9 times between October

26th and November 5th before an approaching weather system cleared the last of the smoke from the region. The final two exceedances of the federal and state 8-hr ozone standard occurred on October 31st and November 1st at the Red Hills monitoring station.

In total the wildfire smoke influences helped to elevate ozone concentrations and particulate matter across the county from mid-August through early November. They likely influenced all 23 exceedances of the federal and state 8-hr ozone standards and were responsible for all 3 exceedances of the California state 1-hr ozone standard. 37 exceedances of the California PM_{10} 24-hr standard were likely influenced by wildfire smoke along with an additional 4 exceedances influenced by wildfire smoke combined with windblown particulates. All exceedances of the federal $PM_{2.5}$ 24-hr standard were directly related to wildfire smoke impacts.

Ozone and Gaseous Pollutant Summary

In 2020, the 8-hour state and federal ozone standard (70 ppb) was exceeded on a total of 23 days, compared to 3 days in 2019. Exceedances occurred on 22 days at the Red Hills monitoring station, 8 days at the Carrizo Plains monitoring station, 3 days at the Atascadero monitoring station and 2 days at the Paso Robles monitoring station. There were no exceedances at the San Luis Obispo, Nipomo Regional Park, and Morro Bay monitoring stations. The 23 exceedances of the 8-hour state and federal ozone standard occurred between August 18th and November 1st. This compares to 3 exceedances in 2019. The 2020 exceedances were likely all caused by extreme ozone production downwind of the wildfires.

The state 1-hour standard (90 ppb) was exceeded on 3 days: twice at Carrizo Plains, and once at Red Hills, Paso Robles, and Atascadero. All exceedances of the state one-hour standard occurred between August 18th and the 21st during a period of extreme wildfire smoke impacts in Northern San Luis Obispo County. The top three 8-hr ozone concentrations at Atascadero, Paso Robles, and Carrizo Plains along with the 1st highest at Red Hills occurred during these 4 days in August.

Standards for nitrogen dioxide and sulfur dioxide were not exceeded this year.

Table 3 lists the highest hourly (and for ozone, 8-hour[3]) values recorded in 2020 for ozone, sulfur dioxide, and nitrogen dioxide at the stations where they are monitored. Concentrations are in parts per billion (ppb). The sample date appears under each pollutant value in the format "month/day." Values that exceed federal standards are shown in **bold**, and those exceeding state standards are underlined.

Table 4: Highest Measurements for Gaseous Pollutants in 2020 (ppb)

Station	O_3 1-hour			O_3 8-hour				SO_2 1-hour			NO_2 1-hour		
	1st	2nd	3rd	1st	2nd	3rd	4th	1st	2nd	3rd	1st	2nd	3rd
Paso Robles	92 08/18	86 08/21	81 08/20	**73** 08/18	**72** 08/21	70 08/20	70 09/06						
Atascadero	92 08/21	90 08/20	89 08/18	**78** 08/21	**73** 08/20	**71** 08/18	61 08/17				33 12/04	30 12/09	29 12/21
Morro Bay	72 10/15	67 10/02	66 10/01	58 10/15	57 10/01	54 11/05	52 10/13						
San Luis Obispo	72 09/06	67 10/15	65 10/01	61 09/06	61 10/15	57 10/01	57 10/02						
Red Hills	126 08/21	88 10/01	86 10/02	**106** 08/21	**81** 10/01	**81** 10/02	**80** 09/16						
Carrizo Plain	117 08/21	93 08/22	89 08/19	**98** 08/21	**79** 08/22	**74** 08/18	**73** 08/30						
Nipomo Regional Park	67 10/03	66 10/02	66 10/01	64 10/02	62 10/01	59 05/06	58 10/15				23 01/31	20 01/15	20 11/16
Mesa2, Nipomo								2 02/20	2 03/31	2 05/05			

[3] The daily maximum 8-hour averages in Table 3 and Figures 3 and 4 are calculated according to the 2015 revisions to the 8-hr ozone standard specified in 40 CFR 50 Appendix U, Section 3(c). Specifically, "[t]he daily maximum 8-hour average O_3 concentration for a given day is the highest of the 17 consecutive 8-hour averages beginning with the 8-hour period from 7:00 a.m. to 3:00 p.m. and ending with the 8-hour period from 11:00 p.m. to 7:00 a.m. the following day (i.e., the 8-hour averages for 7:00 a.m. to 11:00 p.m.)."

Visual Ozone Summary

Figures 3 and 4 depict the ozone values from each station where it was monitored in 2020. The maximum 8-hour average for each day is shown for each site; exceedances of the 70-ppb standard are shown in red with the day of month printed beside them. The heavy "stair step" line marks the monthly median. The vertical axis extends to the annual maximum; units are ppb.

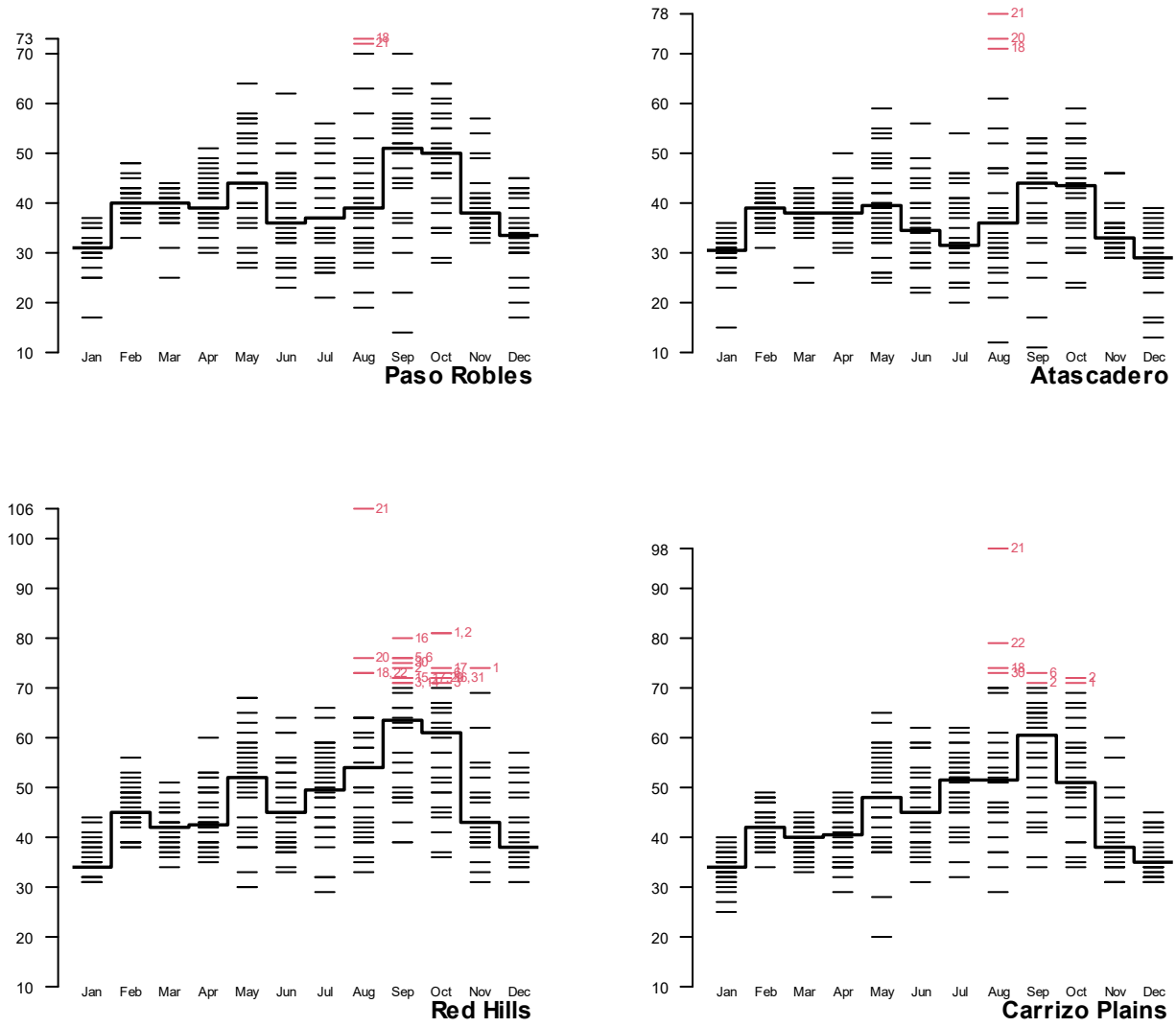


Figure 3: Daily Maximum 8-Hour Average for 2020 (ppb)

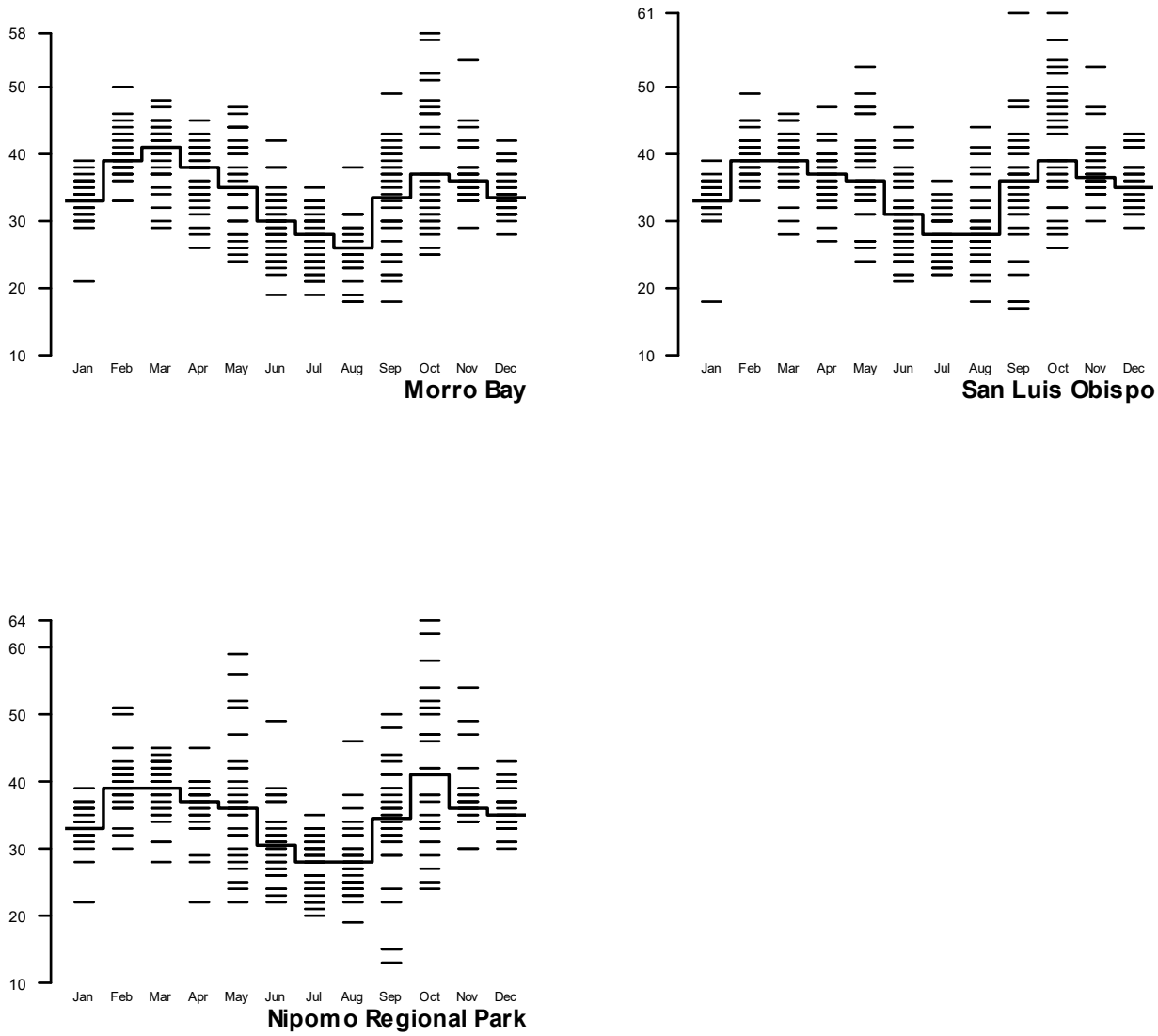


Figure 4: Daily Maximum 8-Hour Average for 2020 (ppb)

Particulate Matter Summary

Particulate concentrations increased throughout the county during 2020, with $PM_{2.5}$ and PM_{10} annual average concentrations increasing at all stations. Like 2019, CDF, NRP, and Mesa 2 all exceeded the annual PM_{10} California standard with addition of Paso Robles in 2020 due to wildfire smoke.

Impacts were record breaking: prior to 2020 the highest 24hr $PM_{2.5}$ concentration ever measured in the county was 57 $\mu g/m^3$ at Atascadero on January 1st, 2001. This record was broken on 10 separate days with every $PM_{2.5}$ monitor in the county exceeding the previous record on at least 2 days. The highest 24hr $PM_{2.5}$ concentration at the county now stands at 242 $\mu g/m^3$—more than quadrupling the previous record. The highest previous 24hr PM_{10} concentration was 178 $\mu g/m^3$ measured on April 4th, 2002, at the now closed Arroyo Grande monitoring station. This record was broken on 3 days, twice at Atascadero and three times at Paso Robles. The new county record for 24hr PM_{10} concentrations stands at 367 $\mu g/m^3$- more than doubling the previous record.

In 2020, exceedances of the federal 24-hour PM_{10} standard (150 $\mu g/m^3$) occurred on 4 days: twice at Atascadero and four times at Paso Robles. Exceedances of the federal 24-hour $PM_{2.5}$ standard (35 $\mu g/m^3$) occurred on 15 days. The standard was exceeded 11 days at Atascadero, 10 at San Luis Obispo, 8 at CDF and 7 at Mesa 2. This compares to zero exceedances in 2019. In 2020, the exceedances all occurred between August 17th and October 4th when heavy wildfire smoke was impacting the region.

Exceedances of the California 24-hour PM_{10} standard (50 $\mu g/m^3$) were observed on 79 days: 54 days at CDF (51 in 2019), 53 at Mesa2 (36 in 2019), 34 at Paso Robles, 20 at NRP, 13 at Atascadero, 12 at Oso Flaco, and 11 at San Luis Obispo.[4] Of the 79 county-wide exceedances, at least 37 were very likely influenced by wildfire smoke and 5 days were associated with the transport of pollution from the San Joaquin Valley. This compares to compares to 54 days exceeding the California standard and zero exceeding the federal standard in 2019. In 2020, there were no exceedances of the federal or state annual average $PM_{2.5}$ standards (both 12 $\mu g/m^3$) although the annual averages increased at all sites in the network.

Wildfire smoke largely drove exceedances of the federal and state PM_{10} and $PM_{2.5}$ standards that occurred between August 18th through the beginning of November.

Transport from the San Joaquin Valley resulted in exceedances of the California state PM_{10} 24-hr standard on July 5th, 6th and 7th. Strong northeasterly winds aloft transported pollution from the San Joaquin Valley into the region. A diurnal wind pattern along the coast caused surface winds to shift out of the NW and strengthen during the afternoon causing windblown particulates from the ODSVRA to combine with already elevated PM_{10} concentrations from transport resulting in these exceedances.

Outside of wildfire smoke and transport events wind-blown dust originating from the Oceano Dunes State Vehicular Recreation Area (ODSVRA) continued to cause elevated PM_{10} and $PM_{2.5}$ this year. In general, elevated particulate levels at CDF, Mesa2, and Nipomo Regional Park are typically associated with windblown dust events from the ODSVRA, including this year's 1st and 3rd highest 24-hour PM_{10} averages at Mesa 2 and the 3rd highest at CDF.

[4] CARB and EPA apply different conventions to the handling of significant digits. The CARB website (https://www.arb.ca.gov/adam/topfour/topfour1.php) thus counts 56 exceedances of the state PM_{10} standard at CDF, 54 at Mesa2, 35 at Paso Robles, 17 at Nipomo Regional Park, 15 at Oso Flaco, 11 at Atascadero, and 11 at San Luis Obispo. The CARB database, which is populated in real time with raw data, may also contain values that were later invalidated.

The highest concentration of the year at Nipomo Regional Park occurred on December 7th and was associated with the grading and spreading of dirt and gravel to create an auxiliary parking area for the newly installed sports complex at Nipomo Regional Park. This was a localized event that only impacted the Nipomo Regional Park monitoring station.

Table 5 lists the highest 24-hour concentrations recorded in 2020 and the dates on which they occurred, as well as the annual averages for PM_{10} and $PM_{2.5}$. Concentrations are in $\mu g/m^3$. Values exceeding federal standards are shown in **bold**; those exceeding state standards are underlined.

Table 5: PM_{10} and $PM_{2.5}$ Summary for 2020 ($\mu g/m^3$)

Station	Highest 24-hour PM_{10}			Annual Average PM_{10}‡	Highest 24-hour $PM_{2.5}$			Annual Average $PM_{2.5}$‡
	1st	2nd	3rd		1st	2nd	3rd	
Paso Robles	**367** 08/20	**280** 08/21	**182** 08/19	23.6				
Atascadero	**245** 08/21	**239** 08/20	148 08/19	17.2	**242.1** 08/20	**236.2** 08/21	**135.8** 08/19	9.77
San Luis Obispo	131 09/14	95 08/19	89 10/02	15.8	**113.7** 09/14	**68.2** 09/13	**65.8** 08/19	7.92
CDF, Arroyo Grande	117 09/14	106 10/02	91 06/07	28.0	**88.3** 09/14	**61.9** 09/13	**57.6** 09/15	9.07
Nipomo Regional Park	103* 12/07	99 10/02	92 09/14	22.1				
Oso Flaco	107 09/14	83 10/02	69 09/13	19.6				
Mesa2, Nipomo	111 02/16	108 09/14	100 05/05	27.5	**84.5** 09/14	**62.6** 09/13	**54.4** 10/02	9.48

‡ Weighted arithmetic mean as calculated by an AMP450 AQS report.

*Nipomo Regional Park maintenance was performing grading work and spreading gravel

Note: The state PM_{10} 24-hour standard is 50 $\mu g/m^3$ and the state PM_{10} annual average standard is 20 $\mu g/m^3$.

Visual $PM_{2.5}$ and PM_{10} Summaries

Figures 5 and 6, below, show the 24-hour $PM_{2.5}$ and PM_{10} values from the stations where these pollutants were measured in 2020. As with the ozone plots in the previous section, these show daily concentrations by month for each site; exceedances of state and federal standards are shown in red with the day of month printed beside them. The heavy "stair step" line marks the monthly median. The vertical axis extends the annual maximum; units are $\mu g/m^3$.

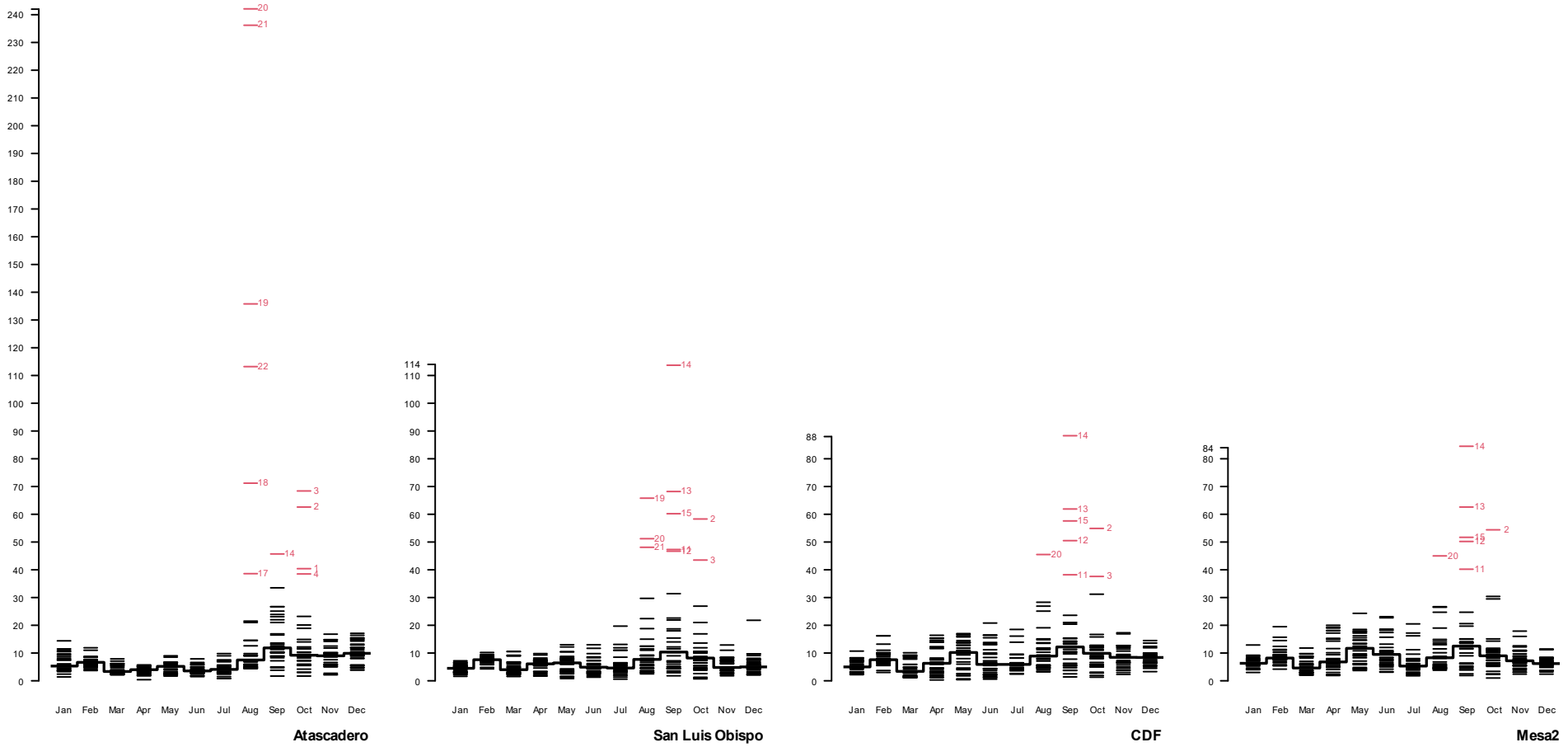


Figure 5: Daily $PM_{2.5}$ Values for 2020 ($\mu g/m^3$)

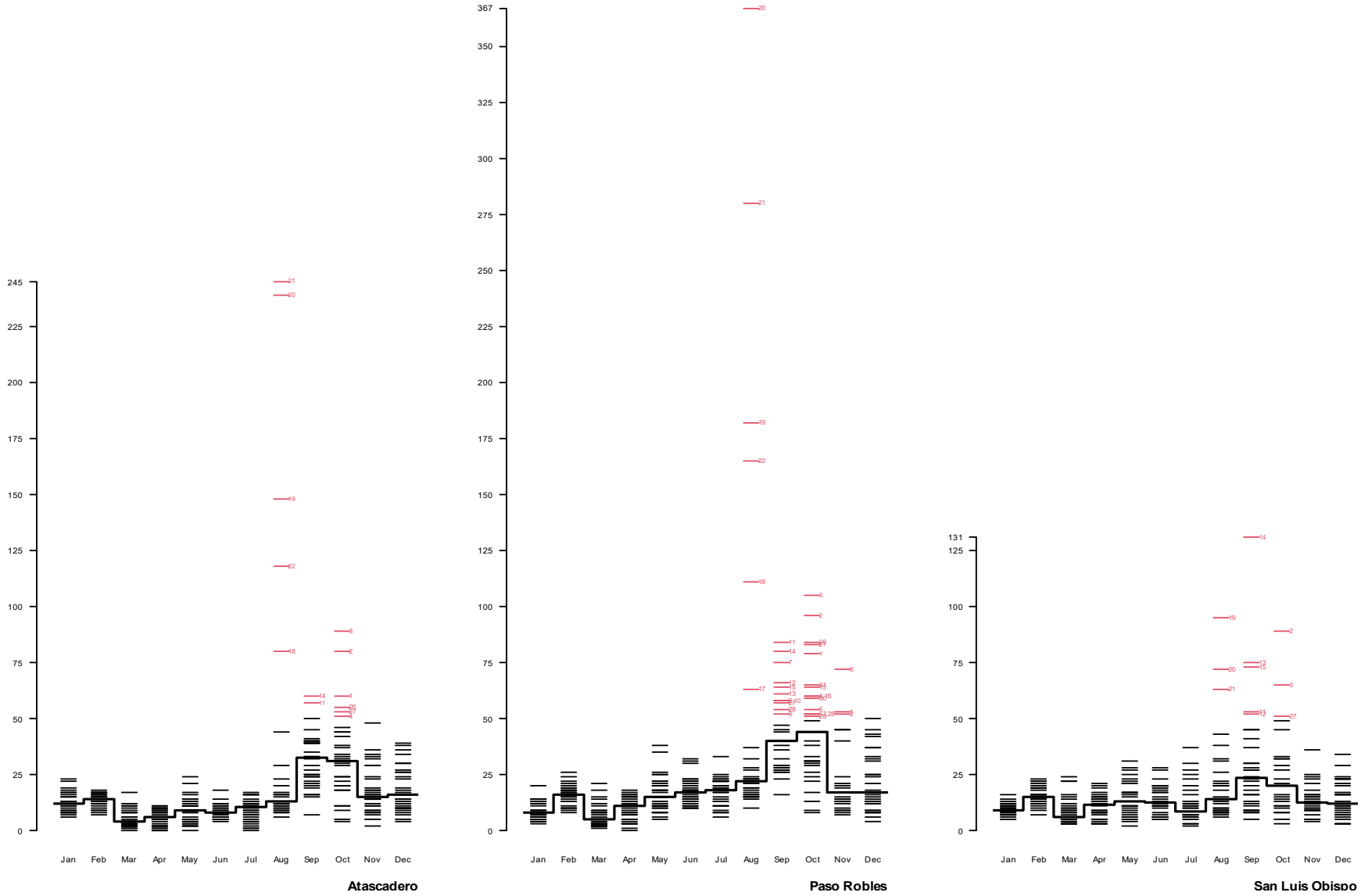


Figure 6: Daily PM_{10} Values for North County and San Luis Obispo 2020 ($\mu g/m^3$)

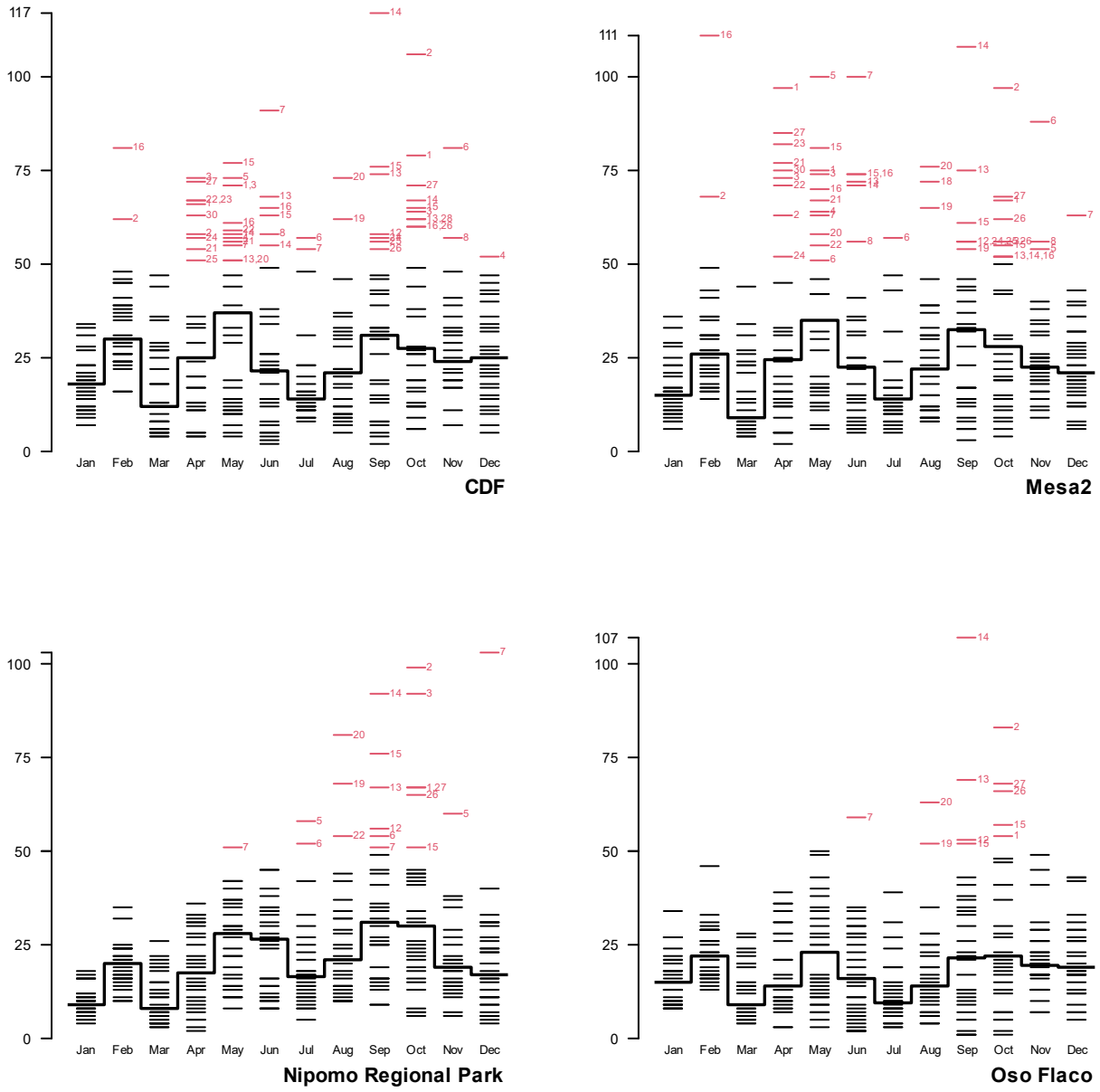


Figure 7: Daily PM_{10} Values for South County 2020 (µg/m³)

10-Year Trends

Ozone

Figure 7, below, depicts the total number of hours each year during which the ozone concentration was at or above 65 ppb. This is a useful indicator for trends, even though there are no health standards for single-hour exposure to this level of ozone. Figure 8 shows ozone design values over the same period. Design values are used by EPA to determine whether an area attains a federal standard. For ozone, the design value is calculated by averaging the 4th highest annual 8-hour average over three consecutive years. For example, a 2016 design value is the average of the 4th highest 8-hour averages from 2014, 2015, and 2016. Only design values meeting data completeness requirements are included; the dashed red line indicates the federal 8-hour standard, which changed from 75 to 70 ppb in 2015.

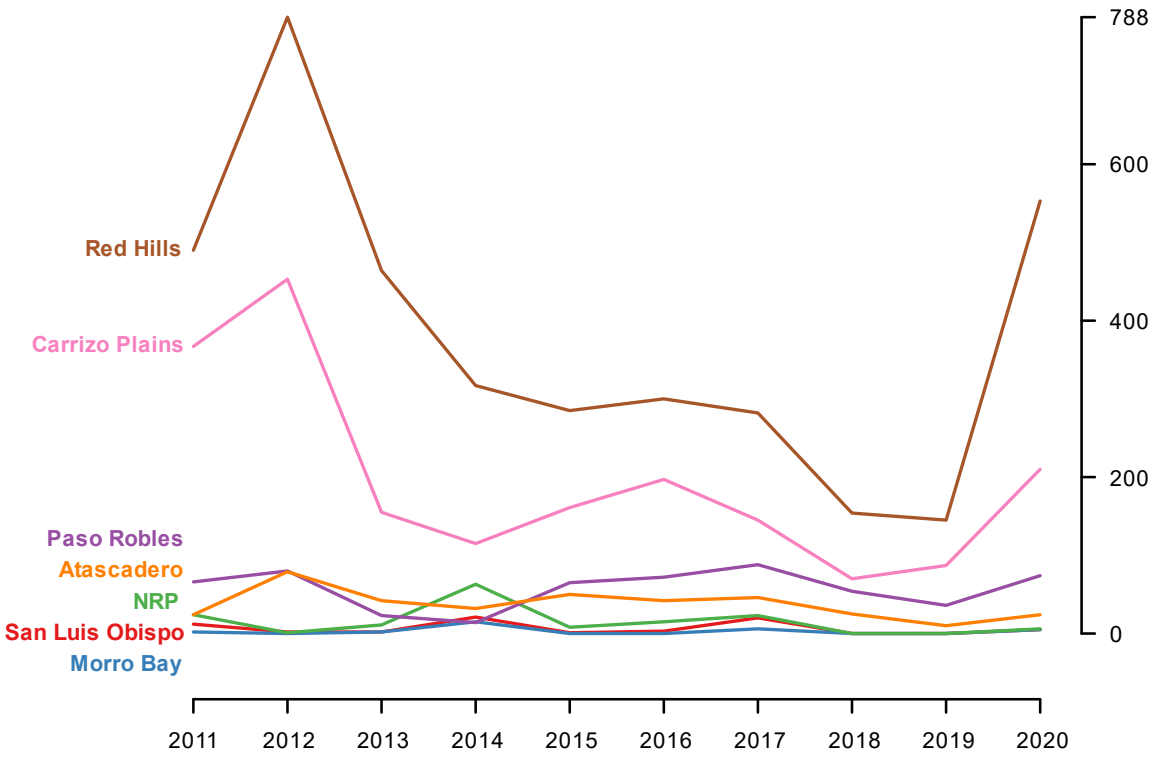


Figure 8: Hours At or Above 65 ppb Ozone, 2011-2020

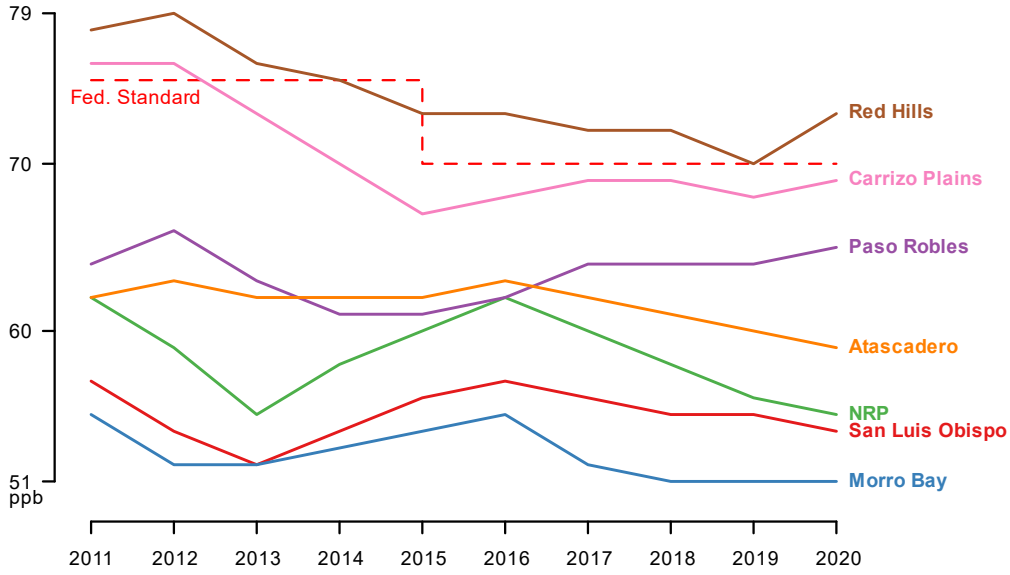


Figure 9: Ozone Design Value Trends, 2011-2020*

*The Red Hills design values for 2018, 2019, and 2020 represent the current design values prior to decisions about the exceptional event demonstrations currently before the EPA. If EPA concurs with both exceptional events the Red Hills design values will decrease from 72 ppb in 2018 to 71ppb, from 70 ppb in 2019 to 69ppb and from 73 ppb in 2020 to 70 ppb. These design value reductions would result in the Red Hills site achieving the 2015 Ozone NAAQS by the August 2021 regulatory deadline.

Particulate Matter

Figure 9 shows the number of exceedances of the state 24-hour PM_{10} standard (50 μg/m^3) at each site by year. Years missing more than 10% of daily values are omitted.

Figure 10 plots the total number of hours each year when PM_{10} was at or above 50 μg/m^3 during the hours when people are most likely to be active (10 am to 4 pm). This metric is intended to illustrate trends in population exposure, even though there are no health standards for single-hour exposure to this level of PM_{10}. Years missing more than 10% of daily values are omitted.

Figure 11 depicts annual average PM_{10} concentrations over the past 10 years;[5] years with partial data are omitted. The red dashed line marks the state standard for the annual average (20 μg/m^3).

Figure 12 shows trends in $PM_{2.5}$ annual averages for the four sites where it is measured. Data for the past 10 years are shown, and years with partial data are omitted. The red dashed line marks the 12 μg/m^3 state and federal $PM_{2.5}$ standard for the annual average.

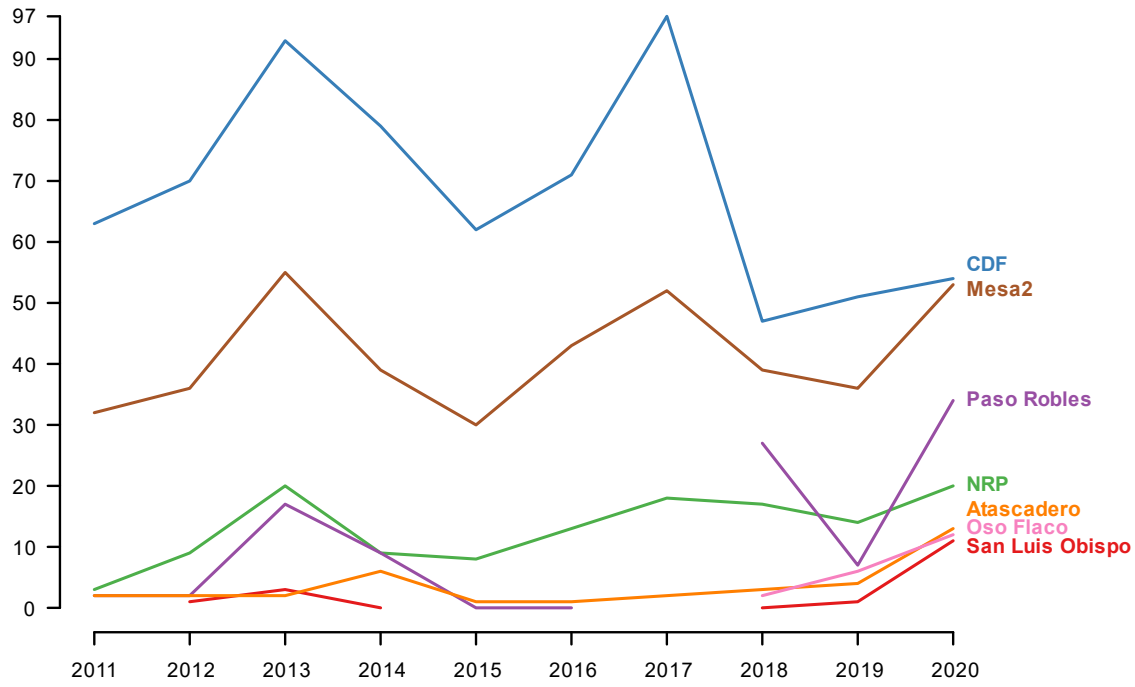


Figure 10: Exceedances of the California 24-hour PM_{10} Standard, 2011–2020

[5] In general, these are seasonally weighted averages as calculated by AQS. For years when sampling methodology changed or a site was moved, the average depicted is the time-weighted average of the methodologies or locations.

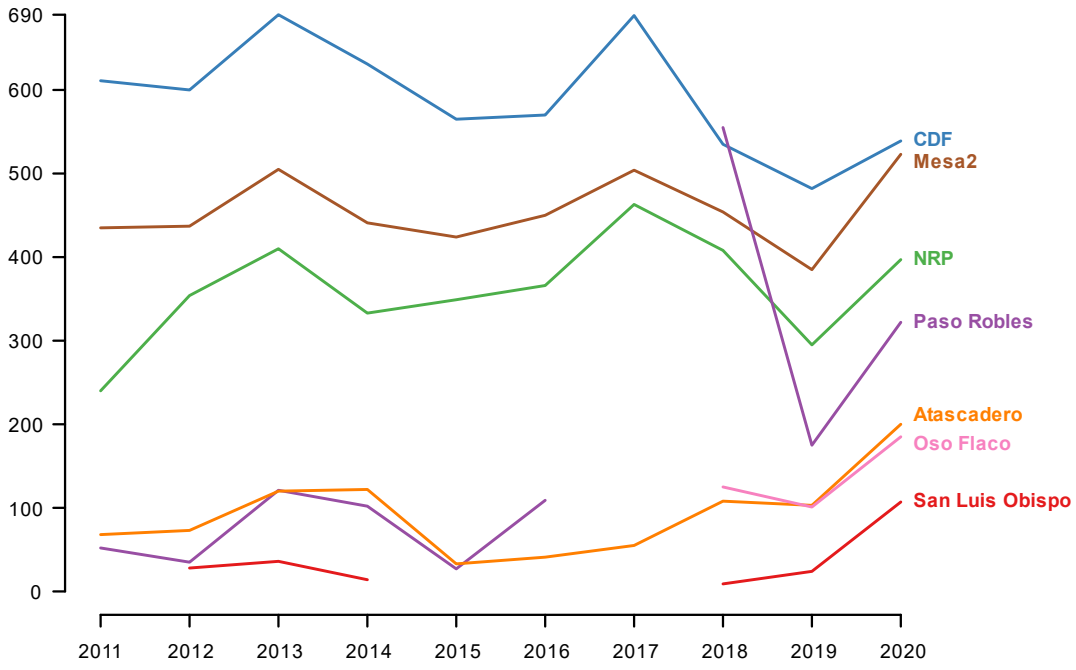


Figure 11: Hours At or Above 50 μg/m³ PM_{10} between 10 a.m. and 4 p.m., 2011–2020

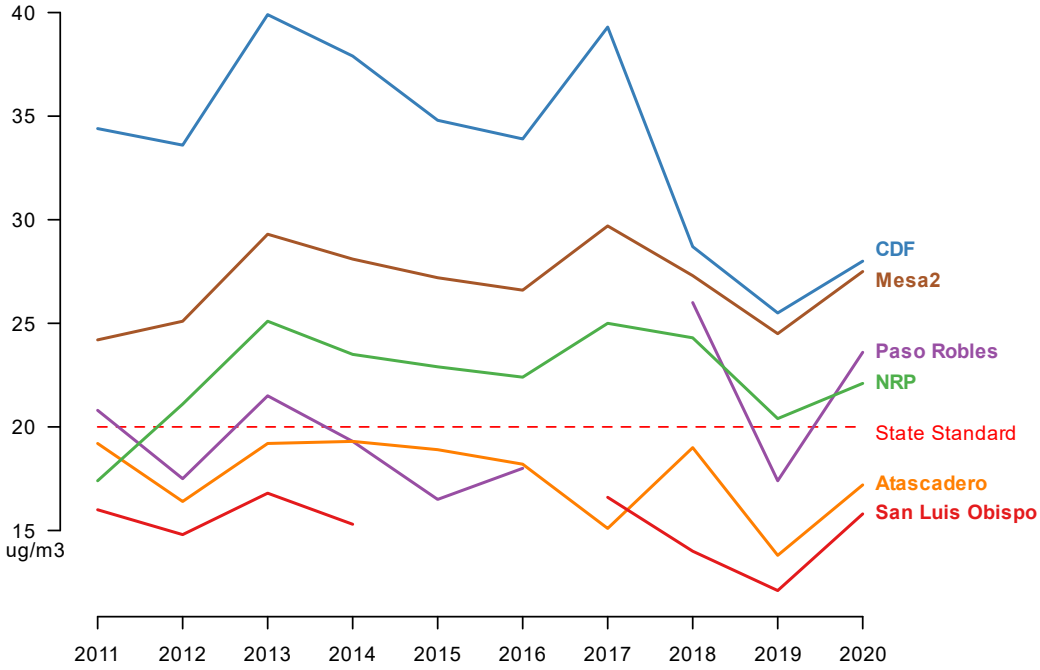


Figure 12: PM_{10} Annual Averages, 2011–2020

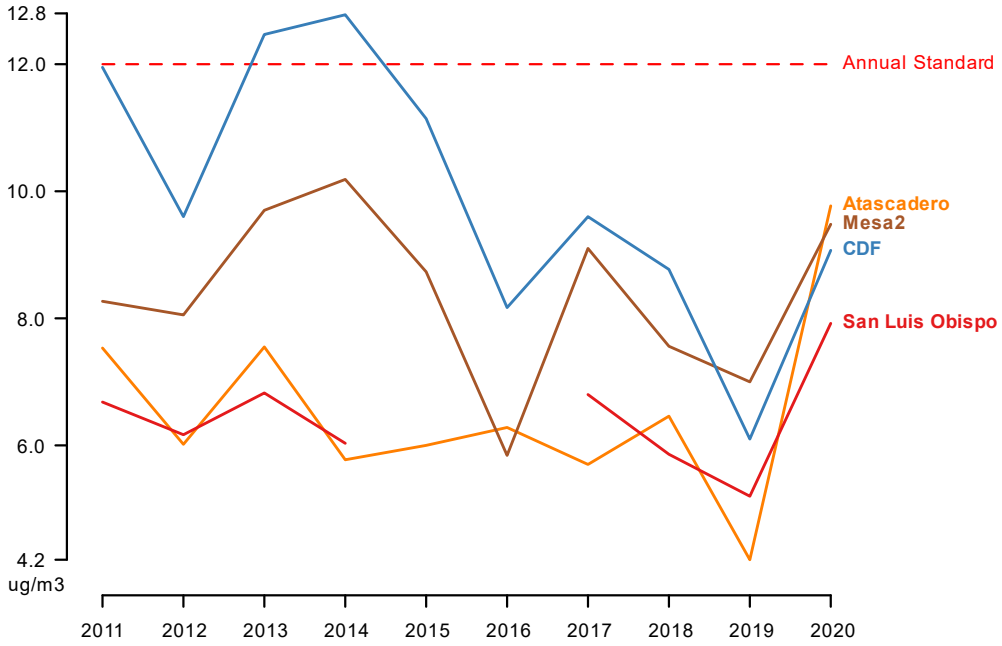


Figure 13: $PM_{2.5}$ Annual Averages, 2011-2020

Appendix A: Assessing the Effectiveness of ODSVRA Mitigations

Introduction

Windblown dust from the Oceano Dunes State Vehicle Recreation Area (ODSVRA) remains the predominant air quality challenge affecting South San Luis Obispo County, causing dozens of exceedances of the state PM_{10} standard each year in the region. For more than a decade, APCD has been engaged with the California Department of Parks and Recreation (State Parks) to resolve the issue and improve the region's air quality; these actions are chronicled on APCD's website.[6] To date, State Parks has completed multiple dust control projects, both permanent and temporary.

To gauge the effectiveness of these controls, recent Annual Air Quality Reports[7] have analyzed trends in particulate matter on the Nipomo Mesa. The 2018 Report was the first to conclude that State Parks' dust mitigations had resulted in a statistically significant improvement in the air quality at CDF. Specifically, it found that wind event day PM_{10} at CDF was lower by 22.4% in 2018 as compared to 2017. In other words, in 2018, PM_{10} levels at CDF were 22.4% lower on wind event days than what they would have been if the 2018 mitigation projects had not been undertaken and instead the smaller projects of 2017 remained.

The 2019 Report found a non-significant 7.6% improvement in event-day PM_{10} relative to the baseline year of 2017, meaning that event-day PM_{10} at CDF actually *increased* in 2019 compared to 2018. (See Figure A1, below.) This apparent increase in event-day PM_{10} at CDF was potentially due to the fact 1) the total areal extent of dust control projects decreased from 2018 to 2019 (see Table A1), 2) some wind fencing erected in 2018 may have become significantly inundated with sand or otherwise degraded, making it less effective than it was previously, and 3) approximately 50 acres of wind fencing was removed in September 2019 and eventually replaced with vegetation, but in the meantime—including the month of October, which was very windy—these 50 acres were uncontrolled.

This Appendix updates the analysis for 2020, using the same methodology employed in the 2017, 2018, and 2019 Reports.

Background and Methodology

From 2011 to 2019, the annual number of exceedances of the state PM_{10} standard at CDF varied from as few as 47 to as many as 97. Downwind PM_{10} concentrations are potentially influenced not only by the mitigations, but also by non-ODSRVA sources (notably wildfire smoke and dust transported from the San Joaquin Valley), and—most importantly—meteorology, especially the strength and direction of onshore winds. It is the wind that drives the actual dust emissions, so, all else being equal, windier years are expected to be dustier and have more PM_{10} exceedances than less windy years.

Appendix A of the 2017 Annual Air Quality Report proposed a "Difference-in-Differences" approach to disentangling the potential effects of the mitigations from meteorology and other factors. In a nutshell, this method looks at the ratio of PM_{10} concentrations between CDF and Oso Flaco on wind event days, and then asks whether that ratio changes from one year to the next. Comparing to Oso Flaco implicitly controls for inter-annual variations in meteorology and non-ODSVRA PM_{10} sources. This is because the mitigation measures are upwind of CDF but not Oso Flaco, so changes in the mitigations should affect CDF but not Oso Flaco. Meanwhile, both sites should experience approximately the same trends in meteorology, and they should be similarly influenced by wildfires and regional particulate matter events. 2017 is used as the

[6] https://www.slocleanair.org/air-quality/oceano-dunes-efforts.php;

[7] San Luis Obispo County Air Pollution Control District, Annual Air Quality Reports for 2015-2019, all available at https://www.slocleanair.org/library/air-quality-reports.php.

baseline to compare other years to, since it had the least amount of mitigation and is thus the closest possible scenario to a fully unmitigated baseline.

For this analysis, a wind event day is defined as any day when the hourly wind speed at 15:00 at the S1 Tower within the ODSVRA exceeds 9.445 m/s and the hourly wind direction at 13:00 at CDF is between 289.5 and 360 degrees. Any day that was obviously influenced by wildfire smoke or San Joaquin Valley dust transport was excluded from the analysis. While there were numerous such days in 2020, only one—July 6—also met the criteria for being a wind event day and was thus excluded from the analysis. See the 2017 Annual Air Quality Report for a more complete description of the methodology. The CDF and Oso Flaco data used in this analysis are fully validated, but the S1 Tower data used in this analysis was obtained from State Parks, and its validation status is unknown. It was used as-is.

Results

Applying the methodology to the 2020 data yields a statistically significant 28.4% improvement in event-day PM_{10} at CDF compared to the baseline year of 2017 (95% CI: 13.9 to 40.4%; p-value: 0.0007). This is depicted in Figure A1, below, which shows boxplots of the ratio of CDF to Oso Flaco PM_{10} on wind event days. Table A1 summarizes these results along with those from previous years.

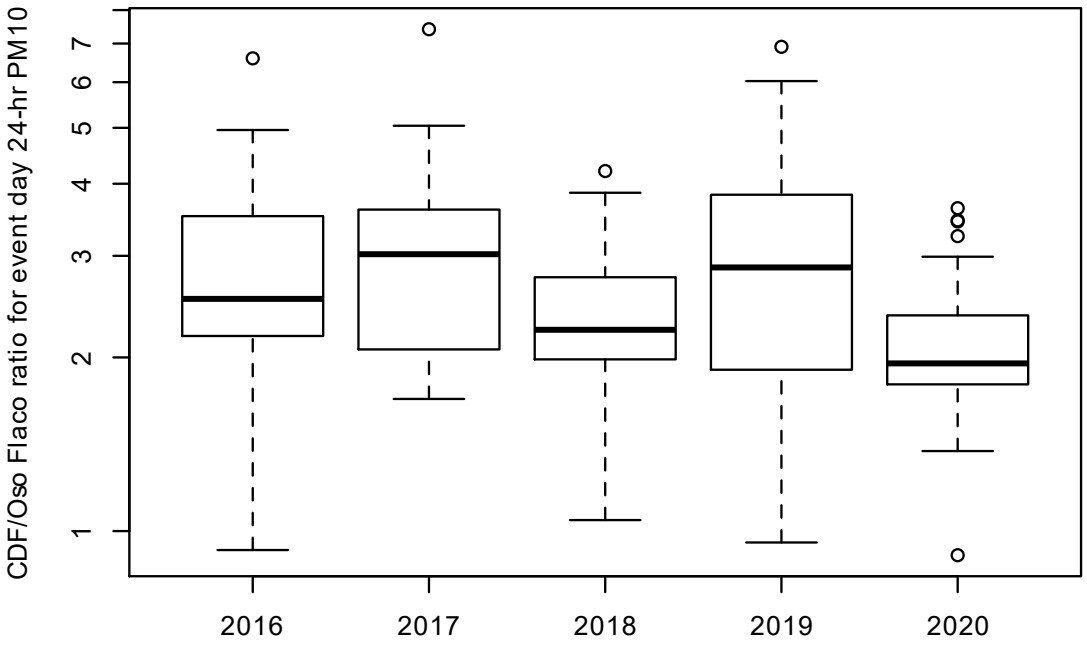


Figure A1: Ratio of 24-hr PM_{10} at CDF to Oso Flaco on wind event days, by year

Table A1: Summary of Changes in Wind Event Day PM_{10} Ratios

Year	Total Dust Mitigation Extent (approx. acres)[8]	Change, vs 2017 baseline, in Ratio of Event-Day PM_{10} (CDF vs Oso Flaco)		
		Percent Change	95% Confidence Interval	P-value
2020	230.2	- 28.4%	-13.9% to -40.4%	0.0007
2019	137.8	- 7.6%	+23.2% to -30.7%	0.593
2018	146.9	- 22.4%	-7.4% to -34.9%	0.006
2017	55.3	0 %	n.a.	n.a.
2016	76.8	- 12.7%	+16.8% to -38.4%	0.363

Discussion

The analysis for 2020 shows the greatest improvement yet in wind event day PM_{10} levels at CDF. As shown in Figure A1 and Table A1, relative to 2017, 2018 saw 22.4%, 2019 saw lesser improvement—and was thus somewhat worse than 2018—and 2020 shows a 28.4% improvement. The improvement seen this year is likely due to the approximately 90 acres of new dust controls, and the temporary suspension of vehicular activity that was imposed in response to the global COVID-19 pandemic. The ODSVRA was closed to public vehicular traffic from March 27 through October 30, 2020, coinciding with most of the spring and fall windy seasons.

The improvement observed for 2020 can be compared with the air quality changes modeled for CDF in State Parks' 2021 Annual Report and Work Plan (ARWP),[8] though this is somewhat of an apples-to-oranges comparison. As discussed in Section 2.2.3.1 of the ARWP, for the mitigations on the ground in 2020, the model predicts 41.9% lower PM_{10} levels at CDF relative to a 2013 baseline. The modeling uses a different baseline (2013) than the difference-in-differences analysis (2017), and there were fewer acres of controls in the model's baseline year (4.7 versus 55.3 acres), so it is expected that the model would predict a greater improvement than observed in the difference-in-differences analysis. Another important difference is that the model assumes that no dust is emitted from areas with dust controls; in fact, wind fence arrays are somewhat less than 100% effective—especially in the first few rows of fences—and revegetation projects take several years to mature and reach full effectiveness. This also suggests that the model will over-predict the improvement in air quality at CDF for 2020. Given these differences, the 28.4% improvement calculated here, compares favorably with the 41.9% improvement predicted by the air quality model.

These results are also consistent with the observation that for 2020 there were far fewer hours at CDF with PM_{10} concentrations greater than 300 $\mu g/m^3$ than any previous year, as shown in Figure A2, below. This is despite 2020 having the worst wildfire smoke impacts of any year on record. Of the 4 hours that exceeded 300 $\mu g/m^3$, only one occurred during the period when the park was closed to vehicles. Thus, high hourly PM_{10} values coincide with recent off-road activity.

[8] Mitigation acreage is from State Parks' 2021 Annual Report and Work Plan, Conditional Approval Draft, October 1, 2021. Available online at https://storage.googleapis.com/slocleanair-org/images/cms/upload/files/2021ARWP_CondAppDraft_withAttach_20211001.pdf. .

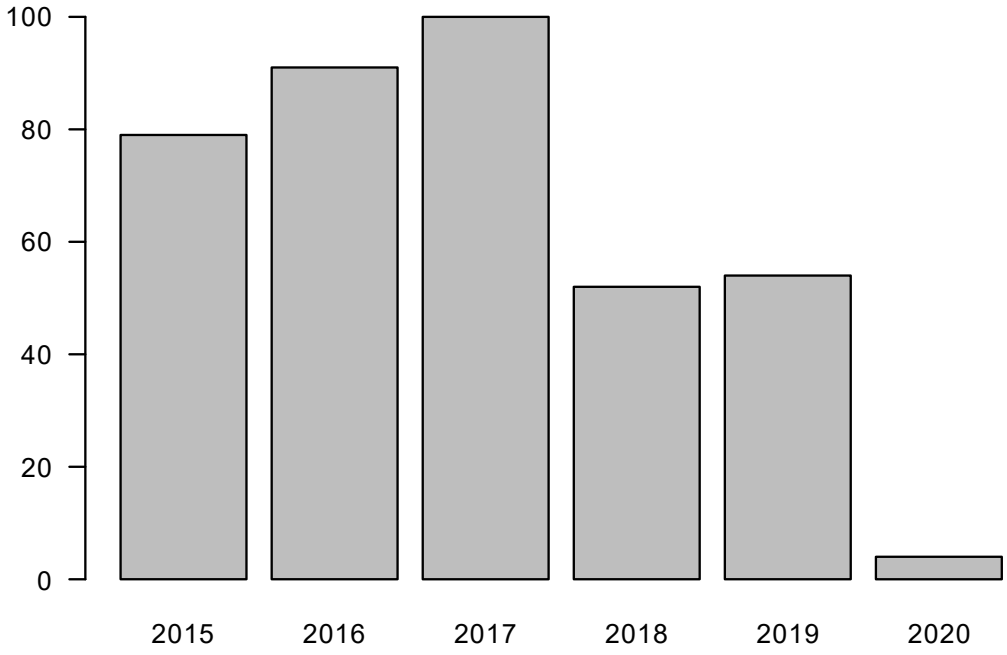
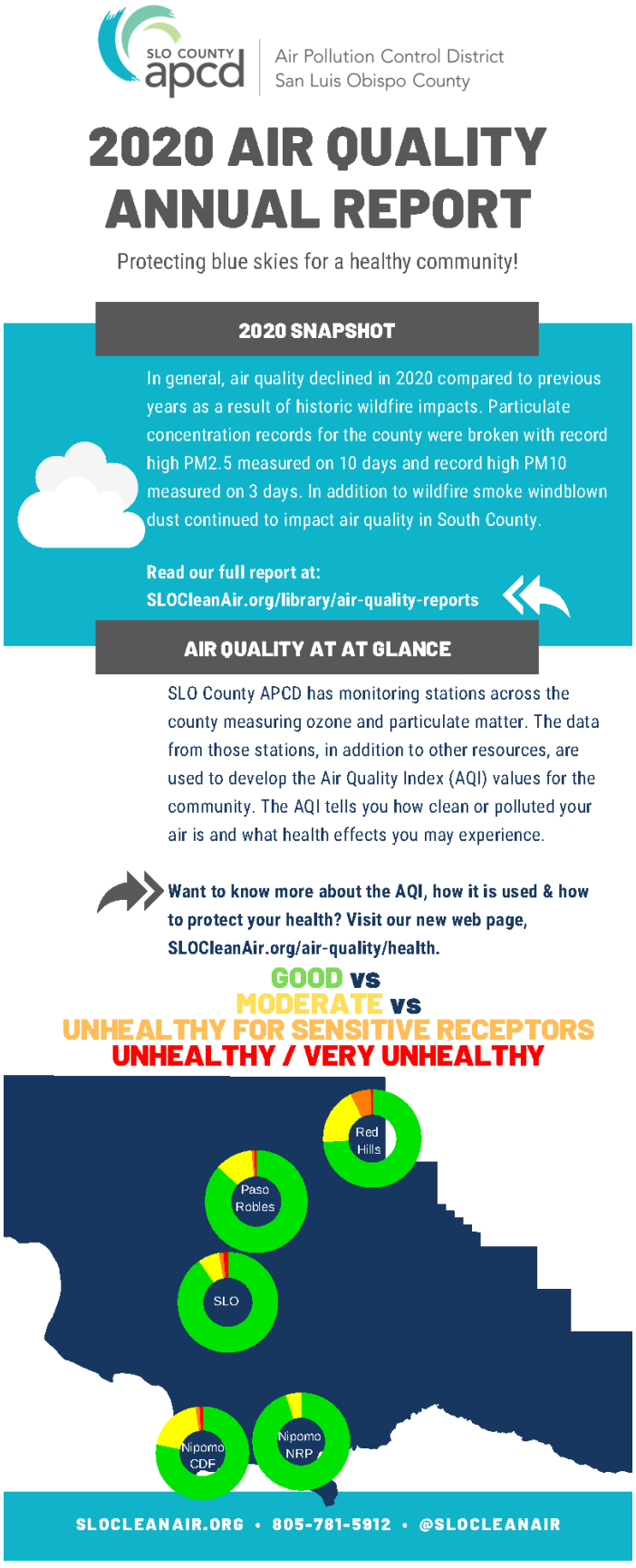


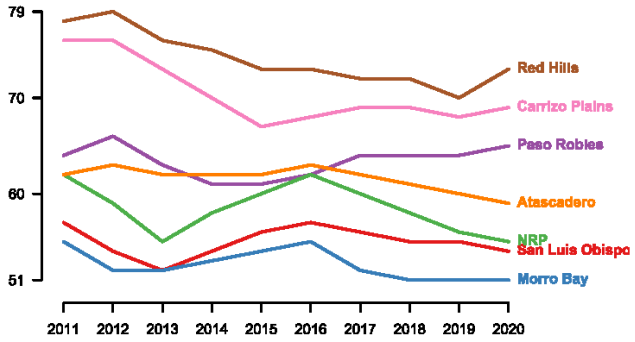
Figure A2: Hours at CDF Greater than 300 µg/m³

Appendix B: Infographic Summarizing 2020 Air Quality



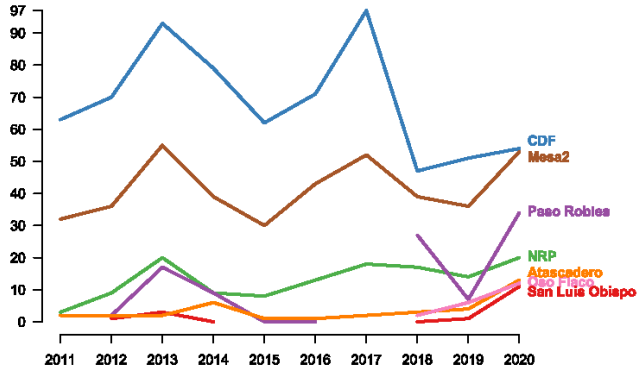
OZONE TRENDS

Wildfire impacts led to increased ozone design values at Red Hills, Carrizo Plains and Paso Robles. There were 23 exceedances of the Federal 8-hour ozone standard (70ppb) up from 3 in 2020.



PARTICULATE MATTER TRENDS

PM levels across the county increased in 2020 largely driven by substantial wildfire impacts. All site in the network saw an increase in the number of exceedances of the California PM10 24hr standard and increases in the annual average concentrations. Particulate pollution remains high on the Nipomo Mesa and the SLO County APCD staff, governing board, and hearing board continue to work with all stakeholders to resolve this issue.



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