

# AirNow's Fire and Smoke Map

## Frequently Asked Questions

**About the map:** The AirNow [Fire and Smoke Map](#) is designed to provide the public additional information on levels of particle pollution (PM<sub>2.5</sub>) in the air during fires. The map does this by bringing together information from permanent air quality monitors that report to AirNow, temporary monitors, information on fire locations and smoke plumes, and special smoke statements, where available. In addition, data from low-cost sensors provides information in areas where there are no official air monitoring stations.

The map was developed through a collaborative effort between the U.S. Forest Service (USFS)-led Interagency Wildland Fire Air Quality Response Program and the U.S. Environmental Protection Agency's (EPA) AirNow program. Map development work was conducted through an agreement with the University of Washington's School of Environmental and Forest Sciences. The agencies are continuing to pilot improvements to the map as we work toward our joint goal of sharing actionable information about wildfire smoke with the public. We welcome your feedback. Email us at [firesmokemap@epa.gov](mailto:firesmokemap@epa.gov).

### Notes and disclaimers:

- The data on the AirNow Fire and Smoke Map are intended to help individuals make decisions to protect their health during fires.
- If there is a wildfire in your area, please stay tuned to local authorities for the latest information on fire and smoke safety.
- EPA will not use the data on this map to make regulatory decisions.
- Mention of trade names or commercial products does not constitute EPA or USFS endorsement or recommendation for use.

For information on how to use the Fire and Smoke Map, please see the User Guide available on the [map](#)

### Follow the links below for questions about:

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[Protecting Yourself from Wildfire Smoke](#)

[Using the PM<sub>2.5</sub> Trend Information](#)

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## Information Available on the Map

### What pollutants are reported on the map?

The Fire and Smoke Map shows fine [particle pollution \(PM<sub>2.5</sub>\)](#) from permanent AirNow monitors, temporary monitors deployed by agencies for smoke events, and low-cost sensors made by PurpleAir. Users can click or tap on the layer icon (it looks like this ) on the upper right of the map to select/deselect map layers showing the different data sources.

To see other pollutants, visit the [AirNow interactive map](#), which shows ozone, PM<sub>2.5</sub>, and PM<sub>10</sub> data that official outdoor air quality air monitoring stations report to AirNow.

### What do the colored shapes on the map indicate?

<b>Air Quality (PM<sub>2.5</sub>)</b>	AirNow uses three shapes to show the type of air measurement device that is reporting data to the Fire and Smoke Map:
<input checked="" type="checkbox"/> ● Permanent Monitors	<ul style="list-style-type: none"><li>• Circles represent the permanent, regulatory-grade monitors that are used to report outdoor air quality to the public on AirNow.gov. These are generally operated by state, local, or tribal air quality experts and stay in place for many years.</li><li>• Triangles represent temporarily located monitors (such as E-BAMS or E-Samplers) that agencies have placed to monitor smoke or other events.</li><li>• Squares represent low-cost sensors from PurpleAir.</li></ul>
<input checked="" type="checkbox"/> ▲ Temporary Monitors	
<input checked="" type="checkbox"/> ■ Low Cost Sensors <i>( Not for regulatory purposes )</i>	
<small>shows only fine particulates.</small>	
<b>Fire Information</b>	For each of the shapes, the map shows air quality in the color codes of the <a href="#">U.S. Air Quality Index</a> . The color is determined using EPA's <a href="#">NowCast</a> .
<input checked="" type="checkbox"/> 🔥 Large Incidents	
<input checked="" type="checkbox"/> 📡 Satellite Detections	
<b>Smoke Plumes</b>	
<input checked="" type="checkbox"/> 🌫️ Smoke Plume Extent	

### What do the colors of the icons mean?

The colors show the US. Air Quality Index (AQI) category, as calculated using EPA's [NowCast](#). The [AQI](#) is EPA's color-coded tool for communicating air quality to the public. To see the AQI categories, click on the AQI Legend on the bottom left corner of the map. Note: If an icon is gray, that indicates that data is not available (this could occur for several reasons).

### What can I learn from the map about my location besides the current AQI category?

A quick glance at the Fire and Smoke Map will show you the latest [NowCast Air Quality Index \(AQI\)](#) category for monitor or sensor location. But there's a lot more information available:

- New on the map in 2021 is a "dashboard" to give you quick access to key information you can use to help plan your activities: the current AQI category at a monitor or sensor location; information about actions to consider taking; and information showing whether air quality is getting better or worse. Just click on a monitor or sensor to pull up the dashboard.

- You also can select different map layers, using the layer icon in the upper righthand corner of the map, to see fire locations and smoke plumes, and to select an aerial or terrain map view.
- By using the icons on the left side of the map, you can find out whether smoke statements are available for the area of interest. These include [smoke forecast outlooks](#), which are issued by the U.S. Forest Service for large wildland fires on which Air Resource Advisors have been deployed.

### **What is the difference between the “NowCast AQI” tab and the “Concentration” tab and under Recent History on the Dashboard pop-ups?**

The AQI tab for each monitor or sensor displays the hourly Nowcast AQI value as well as the AQI color for the past 10 days. For low-cost sensors, the NowCast is applied after the sensor data are corrected.

The Concentration tab shows the PM<sub>2.5</sub> concentration value for the current hour as well as the recent trend in concentrations over the past several days. For low-cost sensors, the concentrations shown have been corrected using the EPA correction equation.

## **Protecting Yourself from Wildfire Smoke**

What actions can I take to protect myself from wildfire smoke?

Wildfire smoke can affect your health in many ways, but there are a number of different steps you can take to help protect yourself -- ranging from limiting outdoor activities to wearing masks to filtering indoor air via air conditioning or HEPA filters. Learn more about how wildfire smoke affects you and what you can do through at [How Smoke from Fires Can Affect Your Health](#), or get more detailed information in the [Wildfire Guide Factsheets](#).

## ***New in 2021: Using the PM 2.5 Trend information***

### **How can I find the PM2.5 trend?**

To see the trend, click on the sensor or monitor you’re interested in. You’ll see a “dashboard” that shows a trend icon. Click on that icon for more detail.

### **Why does the monitor/sensor dashboard show the PM2.5 trend?**

We’ve added PM2.5 trend information to the dashboard in response to feedback we received during the 2020 sensor data pilot. Air quality can change rapidly during a fire and map users expressed interest in seeing more real-time air quality information to help them make decisions about their outdoor activities. The PM2.5 trend describes how conditions have changed recently – usually over the last 30 minutes.

### **What’s the difference between the trend information and the colors I see on the monitor/sensor icons on the Fire and Smoke Map?**

The trend information you see when you click or tap on a monitor or sensor describes the most recent air quality information (usually gathered over the past 30 minutes) and can help give you an idea whether air quality near that location is stable, improving or getting worse.

The overall Fire and Smoke Map shows hourly particle pollution (PM<sub>2.5</sub>) levels in the color-coded categories of the Air Quality Index (AQI). The AQI for particle pollution is a 24-hour index that is tied to national standards for particle pollution (also called particulate matter) and the scientific studies behind them. To show the most recent hour of air quality as the AQI, AirNow uses a formula called a “NowCast” to estimate the AQI for the current hour.

### **Should I use the NowCast or the trend information?**

While the trend information may more closely align with what you see outside your window than the NowCast, you should use them both to make decisions. When you click on a monitor or sensor on the map, you’ll see both current air quality, calculated using the NowCast, and the trend. The NowCast AQI category tells you who should take precautions to protect their health. The trend information shows you whether air quality for the past 30 minutes has been stable, improving or worsening at your location. You can use that to guide short-term activities, such as opening or closing windows, or going outside to walk the dog.

### **Is the PM 2.5 trend a forecast of the next NowCast category?**

No. The PM<sub>2.5</sub> short-term trend is not a forecast of NowCast categories. The trend shows what has recently been observed (usually in the past 30 minutes) at the location you have selected. The color code and category included in the trend show what the NowCast AQI category would be in the next few hours IF conditions continue to remain at these levels. If conditions change, the NowCast may not reach this category.

### **Why do sensors and monitors in an area sometimes show different trends?**

Sometimes observations in an area can show different PM<sub>2.5</sub> trends. Sensors and monitors can reflect only the conditions at their specific location, but smoke can vary considerably -- even over small distances and times. This is particularly true as smoke plumes move in and out of an area. This can cause different trends at sensors or monitors in the same area – and can result in different NowCast AQI categories, too.

### **How is the PM<sub>2.5</sub> trend calculated for a low-cost sensor?**

For a low-cost sensor, only data from that sensor is used to determine a trend. All 10-minute rolling averages received in the past 20 minutes from PurpleAir are recorded (note the 10- minute average from 20 minutes ago represents the time period from 30 to 20 minutes ago). Each 10-minute average is considered a separate data point and is converted into an AQI category based on its value. The range of these 10-min AQI categories is then used to evaluate the PM<sub>2.5</sub> trend.

### **How is the PM<sub>2.5</sub> trend calculated for permanent and temporary monitors?**

Calculation of PM<sub>2.5</sub> trend for a permanent or temporary monitor is based on the recent data available from the nearest low-cost sensors, provided they are within 10 kilometers of the monitor. Up to three

low-cost sensors are used. Where no low-cost sensor has been identified nearby, the last available hourly measurement from the monitor itself is used, provided it is no more than an hour old.

### **Why is the PM<sub>2.5</sub> trend listed as “not available?”**

Calculating the PM<sub>2.5</sub> trend requires having timely data. For instance, we need 10-minute data from the most recent 30 minutes (in real time) in the case of low-cost sensors and permanent/temporary monitors with sensors within 10 km. For permanent/temporary monitor with no nearby low-cost sensors, we need an hourly measurement within the last hour to report a trend. Sometimes due to data lags or other issues no such data is available; in this case the PM<sub>2.5</sub> trend is listed as “not available.”

### **What do the PM<sub>2.5</sub> trend labels mean?**

Depending on the situation, the PM<sub>2.5</sub> trend label can be stable, increasing, decreasing, or variable. The trend graphic (see below) also shows the AQI category range for the data used to determine the trend.

Here are descriptions of the trend categories.

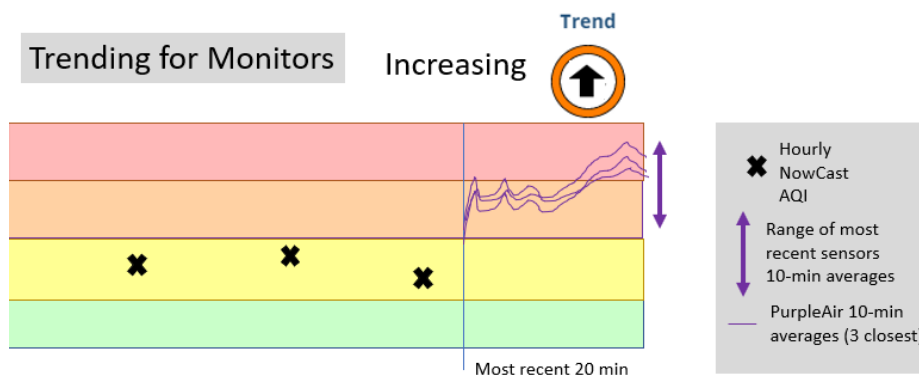
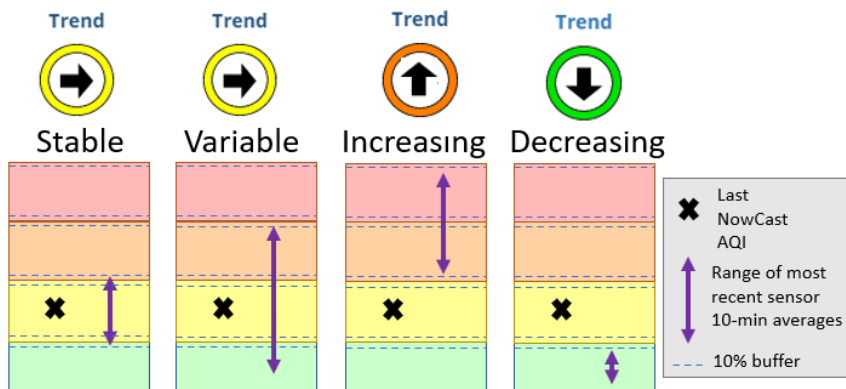
*Stable:* The trend is stable if the most recent data values are all within the range of the current NowCast AQI category. This indicates that the most recent conditions have remained similar to those reported by the current NowCast AQI.

*Variable:* The trend is variable if the most recent data show that air quality has shifted both above and below the current the NowCast AQI category.

*Increasing:* The trend is increasing if the most recent data values are all within AQI categories above the current PM<sub>2.5</sub> NowCast category.

*Decreasing:* The trend is decreasing if the most recent data values are all within AQI categories below the current PM<sub>2.5</sub> NowCast category.

To minimize the possibility that small fluctuations in air quality are mis-interpreted as an increasing or decreasing trend, we use a 10 percent “buffer” around each NowCast AQI breakpoint. This means we do not label a trend as increasing or decreasing until data show PM<sub>2.5</sub> concentrations are 10 percent higher than the concentration breakpoint between two NowCast AQI categories.



**In the written description of the trend, how is the PM<sub>2.5</sub> trend range of AQI categories determined?**

The written trend description states the full range of AQI categories observed in the past 30 minutes. It is possible that rapid changes in air quality may result in 30 minutes of data that span several AQI categories. If this happens, the PM<sub>2.5</sub> trend description will list the full range of categories observed (e.g. GOOD-MODERATE). The PM<sub>2.5</sub> trend icon circle color will always represent the category within this range that is the closest to the current NowCast AQI category at the sensor or monitor. This may be the same as the current NowCast AQI if that category was observed in the recent data.

**Differences Between the Fire & Smoke Map and Other Maps**  
**Why should I use the Fire and Smoke Map?**

The Fire and Smoke map brings you a host of fire-related information all in one place, including:

- Air quality info from permanent, regulatory-grade monitors operated by experts from state, local and tribal air quality agencies
- Air quality info from temporary monitors operated by agencies' experts.
- Crowd-sourced air quality info from low-cost sensors, corrected to be more comparable with the data reported by the permanent monitors that report to AirNow.
- Fire locations

- Smoke plume locations
- Smoke forecast outlooks for large fires.

In 2021, EPA and the U.S. Forest Service have expanded the information available when you click or tap a monitor or sensor icon. We've added a dashboard that gives you quick access to key information you can use to help plan your activities: the current AQI category at a monitor or sensor location; information about actions to consider taking; and information showing whether air quality is getting better or worse. You also can find a map showing the monitor or sensor location, and ID information about the particular monitor or sensor you have selected.

### **Is sensor data used on other maps on AirNow – or just the Fire and Smoke Map?**

USFS and EPA are providing the sensor data on the Fire and Smoke Map to give the public additional information they can use to make individual decisions to protect their health during fires. Sensor data is not currently used on other maps on the AirNow website and is not used to generate the current NowCast Air Quality Index (AQI) or the forecast AQI shown on the “dial” on the AirNow home page or AirNow app. The data on the map is not used for regulatory purposes.

### **What is the difference between the AirNow Fire and Smoke Map and the PurpleAir map?**

While you may use both websites to learn more about air quality in your area, the AirNow Fire and Smoke Map allows you to compare current air quality from low-cost sensors, permanent monitors that report to AirNow, and temporary monitors – and to see all of that information in one place. In addition, the Fire and Smoke Map features fire location, basic fire information (if available), and smoke plume information.

In addition, the maps may look different because of:

#### ***Differences in sensor data processing:***

USFS and EPA take several steps before sensor data appear on the Fire and Smoke Map:

1. Remove some sensors or data
  - a. Remove sensors labeled as “indoors”
  - b. Remove questionable data from when the two internal sensors, labeled channels A and B, disagree
2. Correct the sensor data to make it comparable to the data from the regulatory monitors
  - a. Aggregate sensor data to an hourly average;
  - b. Apply a [correction equation](#) to the data to reduce the bias in the sensor data; and
  - c. Apply the [NowCast](#), the calculation EPA uses to show data in the context of the Air Quality Index, which is a 24-hour index.

#### ***Differences in PM<sub>2.5</sub> averaging times:***

When clicking on individual sensors on the Fire and Smoke Map, you can view the hourly Nowcast for the past several days, along with 1-hour, and 10-minute averages in PM<sub>2.5</sub> concentrations.

The PurpleAir map shows outdoor and indoor sensors. Users can also choose to view the data in different averaging times (down to 2-minute averages), to apply several corrections and conversions, or

view additional data such as PM<sub>10</sub>, particle count, temperature, and relative humidity data. Viewing data at different averaging intervals and using different corrections can cause differences between the maps. In addition, PurpleAir uses a different color scale to display their data.

To learn more, watch our video at <https://www.youtube.com/watch?v=5prwx1U9GY&t=484s>

## Sensors and Sensor Data Used in the Map

### What is an air sensor?

Air sensors, also known as low-cost sensors, are a class of non-regulatory technology for measuring pollutants in the air. This term often describes an integrated set of hardware and software that uses one or more “sensing elements” (also sometimes called sensors) to detect or measure pollutant concentrations. Air sensors are lower in cost, portable, and generally easier to operate than the regulatory monitors widely used in the United States. Learn more about sensors at <https://www.epa.gov/air-sensor-toolbox>.

### Is my air quality likely to be similar to the nearest monitor or sensor?

The NowCast Air Quality Index or PM<sub>2.5</sub> concentration reported by a monitor or sensor represents the air quality at the monitor/sensor location for a given day and time. Whether air quality where you are is exactly the same depends on many factors including how far away you are from the monitor/sensor location, meteorological conditions like wind speed and wind direction, geographic features like terrain, the location of PM<sub>2.5</sub> sources, and the size and amount of the particles emitted.

If PM<sub>2.5</sub> concentrations are fairly stable, no significant winds are present, and no PM sources are near or between you and the monitor/sensor, you may expect that your air quality may be similar to the monitor/sensor several kilometers away. However, if PM<sub>2.5</sub> concentrations are highly variable,

if smoke plumes are in the area, or if PM sources are nearby, and/or if there is significant terrain like mountains/hills and valleys, there may be larger differences in air quality between your location and the nearest monitor or sensor. You may even see this type of difference when comparing two nearby sensors.

### Where does the sensor data on the map come from?

The sensor data comes from PurpleAir, which crowdsources data from that company’s particle pollution sensors and shows the data on a map. Only PurpleAir sensors that are registered as outdoor and display publicly will appear on the AirNow Fire and Smoke Map. EPA and USFS perform quality control screening and then apply some [data processing](#) steps, a [scientific correction equation](#) to reduce bias in the sensor data, and the [NowCast](#), the calculation used show the data in the context of the Air Quality Index.

### Why are no sensors shown for my area?

There are several possible reasons why no sensor appear on the map for your area. There may be no publicly available sensors in your area, the sensors in your area failed to meet the quality control screening criteria developed for the Fire and Smoke Map, or the sensor data is temporarily unavailable or offline. Newly registered sensors also may not appear on the map for up to 48 hours. Sensors



identified by state, local, or tribal agencies as problematic (such as sensors that are strongly influenced by local pollution sources, sensors that have shown erroneous data for a long time compared to other nearby sensors, or sensors believed to be mis-labeled or mis-located) may be removed from the map. It also is possible that the state, local or tribal agency responsible for air quality in your area has chosen not to have sensor data shown on the Fire and Smoke Map for your area. To date, only one state has chosen not to show PurpleAir data on the map.

### **Does EPA recommend PurpleAir sensors?**

EPA does not endorse any particular commercial product. Mention of trade names or commercial products does not constitute EPA or USFS endorsement or recommendation for use.

### **Why are only PurpleAir sensors displayed on the map?**

Sensor data was added to the Fire and Smoke Map during a pilot phase in 2020 using the PurpleAir sensor as a test. At the time, EPA and more than 30 state, local, and tribal air agency partners were operating these sensors side-by-side with highly robust and accurate regulatory monitors in more than 70 locations throughout the U.S. to evaluate their performance. Additionally, EPA conducted similar comparisons during smoke events in several locations throughout the U.S. The PurpleAir sensors were assessed because their use was growing exponentially, resulting in an extensive network of publicly reporting sensors worldwide, and EPA and our air monitoring partners needed to better understand how to interpret the data produced. Additionally, EPA conducted similar comparisons during smoke events in several locations throughout the U.S.

Using all of the collocation data collected, from typical ambient conditions AND smoke impacted conditions, EPA researchers used a scientific approach to develop a [correction equation](#) for PM<sub>2.5</sub> data from PurpleAir sensors to make the data more comparable to the permanent and temporary monitors. This work allowed for a consistent view of air quality across the various monitoring types shown on the map. Work is now underway to determine how additional sensor types can be added to the map in the future.

*Note: Low-cost sensor data is being provided by PurpleAir and is subject to the capabilities and limitations of that system. Use of any data provider or system does not constitute endorsement or recommendation of that system. Mention of trade names or commercial products does not constitute EPA or USFS endorsement or recommendation for use.*

### **Where can I learn more about how EPA uses sensor data on the Fire and Smoke Map?**

Please visit [Technical Approaches for the Sensor Data on the AirNow Fire and Smoke Map](#) to view a series of video segments providing detailed information on key features of the Fire and Smoke map, how it compares to other data sources, and how the air sensor data is processed and presented using the extended U.S.-wide correction equation, along with links to additional resources.

### **Does EPA have plans to incorporate other sensors into the Fire and Smoke Map?**

EPA is currently working to develop a process to allow other sensors to appear on the map. While that work is underway, it would be advantageous for manufacturers and others to continue collecting data

side-by-side with highly robust and accurate regulatory monitors (known as collocated data), to demonstrate performance and comparability.

Because the Fire and Smoke Map is most widely used during wildfire and smoke events, it is imperative that collocation data be collected during smoke impacted times when concentrations may be very high. Because the map is always available, collocations capturing typical ambient conditions throughout the U.S. are also valuable. EPA's [Performance Testing Protocols, Metrics, and Target Values for Fine Particulate Matter Air Sensors Report](#) provides guidance for setup and reporting of sensor performance by collocation.

Sensors are most valuable when they can fill in data gaps which could mean deployments in rural or remote locations and in locations without readily available or intermittent power or cellular connectivity. Sensor manufacturers may wish to consider these issues when designing sensor devices or data quality assurance or correction methodologies.

For additional information, visit [Air Sensor Performance Targets and Testing Protocols](#).

### **Are state, local, or tribal air agencies responsible for the sensors?**

State, local, and tribal air agencies are not responsible for the accuracy and performance of the sensor data. The Fire and Smoke Map shows publicly available PM<sub>2.5</sub> (fine particle pollution) data provided by the PurpleAir data feed. Many PurpleAir sensors are run by community groups and individuals. Little is known about the sensors' locations, including how accurate the user-reported GPS coordinates are or how close sensors are to any localized sources of pollution, or how the sensors are operated or maintained. That's why you should use the sensor data on the map for informational purposes only.

### **Sensor limitations**

#### **Is sensor data as good as data from regulatory monitors?**

While low-cost sensors are useful for providing general information about air quality, air sensors have a number of limitations that could include occasionally reporting questionable data points and a bias that may result in data that systematically over- or under-estimates the actual pollutant concentration. For the Fire and Smoke Map, we quality control sensor data to remove questionable data points and apply a correction equation to remove bias in the sensor data before showing sensor information on the map. These steps make the sensor data more comparable to data from permanent and temporary monitors. EPA does not use sensor data for regulatory purposes, and it should not be used for official daily AQI reporting.

You can learn more about key considerations about PurpleAir Sensors and Crowdsourced Data here: <https://www.youtube.com/embed/5prwx1U9GY?&start=1520&end=1906>

#### **Is EPA planning to use sensor data to determine whether areas are meeting National Ambient Air Quality Standards?**

No. For compliance with the National Ambient Air Quality Standards (NAAQS) compliance, methods must meet the applicable requirements in the Code of Federal Regulations (CFR) - Part(s) of Title 40, Protection of Environment (see, e.g. 40 CFR Parts 50, 53, and 58). Technical requirements include

detailed sampling, siting, and quality assurance requirements. Only data from federal reference or equivalent method (FRM/FEM) monitors are used in a regulatory context.

### **What are the limitations of low-cost sensors?**

Sensor data can have a number of limitations and uncertainties, including limitations in measurement technology, data bias and inaccuracy, sensor failure, and unknowns about siting and crowdsourcing.

Despite these limitations and uncertainties, EPA and USFS believe that sensor data is valuable during localized smoke episodes. Sensors report more frequently than regulatory-grade air quality monitors, and there are thousands of them, meaning they can provide air quality information in areas where there are no official monitoring stations. While a minor fraction of the sensors used in the Fire and Smoke Map may have issues, our experience indicates that data from most crowdsourced sensors will be of value for reporting air quality during wildfires.

#### ***More detail***

Sensor data limitations include:

- *Measurement technology* -- Sensors, including the PurpleAir sensor, typically measure particles using light scatter, operate at lower flowrates, and do not dry the sampled particles like permanent and temporary monitors. This can lead to inaccuracies compared to permanent and temporary monitors.
- *Bias and inaccuracy* -- EPA scientists have found that air sensors report data that overestimates or underestimates pollutant concentrations compared to the permanent or temporary instruments that are operated in the same location. PurpleAir sensors, without the use of the EPA correction equation, measure the same trends in PM<sub>2.5</sub> concentrations as collocated monitors, but they tend to overestimate the PM<sub>2.5</sub> mass concentrations.

For the sensor data used in the Fire and Smoke Map, EPA has applied an extended U.S.-wide correction equation, developed by EPA scientists, that reduces the bias in the sensor data correcting for the overestimation. This corrected data is more comparable to the permanent and temporary monitor data giving the public a more consistent picture of air quality with additional information especially in areas where there are no regulatory monitors.

- *Sensor failure* -- Sensor failure is often indicated by the sensor not reporting, or a large disagreement between the independent measurements made by two internal sensors within the PurpleAir device, labeled channels A and B. EPA and USFS take [quality control steps](#) to compare the data from the A and B channels to check for disagreement. These steps will likely remove data from failed sensors or those that are influenced by inlet debris or insects.
- *Siting and crowdsourcing unknowns* For most low-cost air sensors, little is known about where a sensor is placed including how accurate the reported locations is, if it was appropriately labels as an outdoor sensor, how close a sensor is to localized sources of pollution (such as dusty roads) or other interferences. Air sensors may be operated by anyone, and we lack information about their maintenance or operation.

- To learn more about how to best site and install your air sensor, visit the air sensor toolbox (<https://www.epa.gov/air-sensor-toolbox/guide-siting-and-installing-air-sensors>).

## Sensor Data Processing and the U.S-Wide Correction Equation

### How is the sensor data processed to be shown on the fire and smoke map?

- a) For 10-min averaged data
  1. 10-minute rolling averages of PM<sub>2.5</sub> (from both the A and B channel sensors) and relative humidity are received from PurpleAir's application programming interface (API)
  2. The data point is valid if the A and B channel PM<sub>2.5</sub> measurements are within either 5 micrograms per cubic meter or 70% relative percent difference
  3. The A and B channels are averaged
  4. The extended U.S.-wide correction equation is applied (see question below)
  
- b) For 1-hr averaged data
  1. 10-minute rolling averages of PM<sub>2.5</sub> (from both the A and B channel sensors) and relative humidity are received from PurpleAir's API
  2. The measurements are averaged up to an hour
  3. The hour is considered complete if at least four of the six 10-minute windows in an hour are reported by the sensor and the sensor reported within the last 20 minutes.
  4. The data point is valid if the A and B channel PM<sub>2.5</sub> measurements are within either 5 micrograms per cubic meter or 70% relative percent difference
  5. The A and B channels are averaged
  6. The extended U.S.-wide correction equation is applied (see question below)
  
- c) For NowCast averaged data
  1. The last 12 hours of corrected PurpleAir hourly averaged data are used (methods described in b above)
  2. A weighted average is generated based on the [NowCast](#) algorithm

### What is the extended U.S.-wide correction equation?

The extended U.S.-wide correction is a mathematical equation, developed by EPA scientists, that reduces the bias in the sensor data so that sensor data is more comparable with data from permanent and temporary monitors. This correction was built based from comparisons between sensors and permanent/temporary monitors across the U.S. during typical ambient time, smoke impacted times, and during extreme smoke episodes during the 2020 wildfire season. You can learn more about EPA's work to update the U.S.-wide correction here: <https://www.youtube.com/embed/G7CNziDkUok?&start=1641>

*More detail:*



The extended correction is a piecewise regression that corrects for bias and relative humidity at low concentration and the nonlinearity of PurpleAir response at higher concentration. Although originally developed on the cf\_1 data it is being implemented on the cf\_atm data since 10-minute averages are

not currently available for the cf\_1 data. Additional details on the correction can be found on the air sensor toolbox (<https://www.epa.gov/air-sensor-toolbox/technical-approaches-sensor-data-airnow-fire-and-smoke-map>).

Low Concentration $PA_{cf\_atm} < 50 \mu\text{g}/\text{m}^3$	$PM_{2.5} = 0.52 \times (PA_{cf\_atm}) - 0.086 \times RH + 5.75$
Mid Concentration $50 \mu\text{g}/\text{m}^3 \leq (PA_{cf\_atm}) < 229$	$PM_{2.5} = 0.786 \times (PA_{cf\_atm}) - 0.086 \times RH + 5.75$
High Concentration $PA_{cf\_atm} \geq 229 \mu\text{g}/\text{m}^3$	$PM_{2.5} = 0.69 \times (PA_{cf\_atm}) + 8.84 \times 10^{-4} \times PA_{cf\_atm}^2 + 2.97$

## Fire Information Shown on the Map

### What is the data source for the large fire incidents on the map?

Active large fire incidents from the U.S. National Interagency Fire Center’s active incident feed are shown as fire icons (shown as  for large incidents and  for satellite-detected fires). Clicking on a fire icon displays information about the fire. Note that these incidents may not have updated for several days due to the nature of the reporting systems used. Additional information on these incidents is available through the InciWeb system (<https://inciweb.nwcg.gov>). While the information presented by this feed can be several days old, it does provide important management information including the fire name, overall fire size, and containment.

### How are fire and smoke plumes detected in my area?

Fire and smoke plume detections are from the NOAA’s Hazard Mapping System Fire and Smoke Products. Trained analysts manually integrate data from various automated fire detection algorithms with information from satellite instruments, including NASA’s Geostationary Operational Environmental Satellite (GOES) Imager, NOAA’s Advanced Very High Resolution Radiometer (AVHRR) and NASA’s Moderate Resolution Imaging Spectroradiometer (MODIS). The analyst outlines smoke plumes that are detected by the satellites, resulting in a quality-controlled display of fire locations and smoke plumes. The smoke plumes are updated every few hours.

Both the fire detections and the smoke plume data are generated by the Hazard Mapping System. Note that the information on fire position should be used as general guidance and for strategic planning, not for tactical decisions, such as the activation of a response to fight these fires and evacuation efforts, without other information to corroborate the fire's existence and location.

## General Questions

### What is the NowCast?

The [NowCast](#) is the calculation that EPA uses to relate hourly readings from air quality monitors to the U.S. Air Quality Index (AQI). EPA uses the NowCast to show you current air quality using the AQI colors and scale (the AQI for particle pollution is a 24-hour index). The NowCast for particle pollution shows you air quality for the most current hour available by using a calculation that involves multiple hours of past data. It uses longer averages during periods of stable air quality and shorter averages when air quality is changing rapidly, such as during a wildfire. [See the calculation.](#)

### What is the difference between the NowCast AQI and the hourly PM<sub>2.5</sub> concentration?

The [NowCast AQI](#) shows air quality for the most current hour available by using a calculation that involves multiple hours of past data. The NowCast uses longer averages during periods of stable air quality and shorter averages when air quality is changing rapidly, such as during a wildfire. The PM<sub>2.5</sub> value is a 1-hour average concentration measured by an air quality monitor.

### What are Special Smoke Statements?

The Interagency Wildland Fire Air Quality Response Program provides Air Resource Advisors (ARAs) that work with Incident Management Teams responding to large wildfires. Most large and persistent wildfires have ARAs assigned. ARAs analyze, summarize, and communicate smoke impacts to incident management teams, air quality regulators, public health agencies, and the public. ARAs issue these Special Smoke Statements (also known as Smoke Outlooks) for areas where smoke from wildfires may be of concern and they have been deployed. At this time, only Special Smoke Statements issued by ARAs are provided in the map. However, additional information on smoke impacts can be available at your state, tribal, or local air quality agency. [Learn more about ARAs and what they do.](#)

### Where can I find additional information about smoke affecting the air quality near me?

For additional information about wildfire smoke and air quality near you, please contact your state, tribal, or local air quality agency and/or local public health agencies for additional air quality information and air quality alerts.

### Have additional questions?

Email us at [firesmokemap@epa.gov](mailto:firesmokemap@epa.gov)