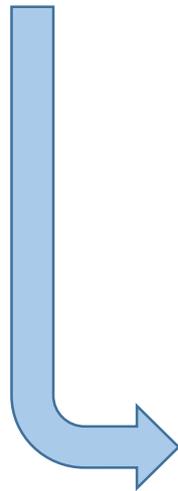




**National Ambient Air Quality Standards (NAAQS 101)
Webinar for Communities
June 27, 2017**

Today's webinar:

National Ambient Air Quality Standards (NAAQS)



Future webinars:

NAAQS Designations – July 25, 2017

NAAQS Implementation – August 30, 2017



Congress designed the Clean Air Act to protect public health and welfare from different types of air pollution caused by diverse sources.

Dense, visible smog in many of the nation's cities and industrial centers helped prompt passage of the 1970 legislation.

Subsequent revisions in 1977 and 1990 were designed to improve the Act's effectiveness and to target newly recognized air pollution problems.

EPA is required under the Clean Air Act to establish NAAQS



Primary Standards: Health-based

- Considers populations that may be at increased risk

Secondary Standards: Welfare-based

- Includes effects on soils, water, crops, vegetation, man-made materials, animals, wildlife, weather, visibility and climate

- The CAA does not permit consideration of cost of implementation in setting the level of the NAAQS
- CAA requires the EPA to receive input from an independent scientific review committee (Clean Air Scientific Advisory Committee) and the public

EPA has set air quality standards for six common "criteria pollutants":

- particulate matter
- ozone
- sulfur dioxide
- nitrogen dioxide
- carbon monoxide
- lead

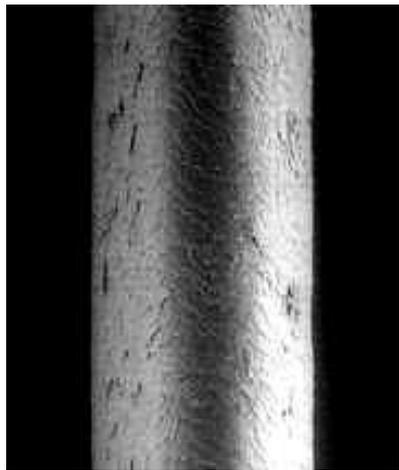


These have numerous and diverse sources and can reasonably be anticipated to endanger public health and welfare.

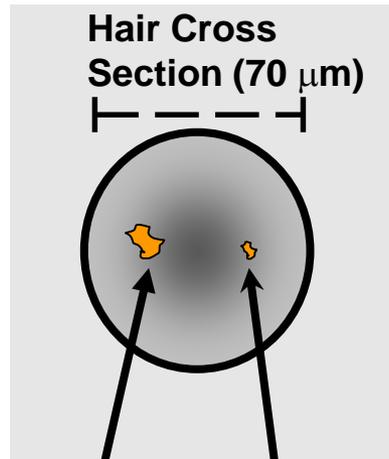


Particulate Matter

- Particles come in many sizes and shapes and can be made up of hundreds of different chemicals
- Some particles are emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks, or fires



Human Hair
(70 μm diameter)



PM₁₀
(10 μm) PM_{2.5}
(2.5 μm)

- Most particles form in the atmosphere as a result of complex reactions of chemicals such as sulfur dioxide and nitrogen oxides, which are pollutants emitted from power plants, industries, and automobiles

Particulate Matter Health and Environmental Effects

- Studies have linked exposures to fine particulate matter with serious cardiovascular and respiratory effects, such as:
 - Heart attacks and strokes, in some cases resulting in death
 - Worsened asthma and impaired respiratory development
- Populations at increased risk include people with heart or lung disease, older adults and children, and people with low socioeconomic status
- Particulate matter also contributes to reduced visibility and can harm the environment by changing the natural nutrient and chemical balance of the soil



Good Visibility Day



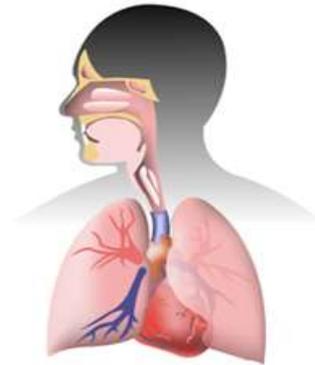
Bad Visibility Day

Ozone

- Ozone is a gas that is present both in the Earth's upper atmosphere (stratospheric) and at ground level (tropospheric)
- Stratospheric ozone occurs naturally in the upper atmosphere, where it forms a protective layer that shields us from the sun's harmful ultraviolet rays
- Ozone at ground level is a harmful air pollutant because of its effects on people and the environment, and it is the main ingredient in “smog”
 - It is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NO_x) and volatile organic compounds (VOC)
 - These pollutants emitted by cars, power plants, industrial boilers, refineries, chemical plants, and other sources chemically react in the presence of sunlight to form ozone

Ozone Health and Environmental Effects

- Ground-level ozone can cause health effects such as:
 - Reduced lung function, respiratory symptoms, and inflamed and/or damaged airways
 - Aggravated lung disease, including asthma, emphysema and bronchitis
 - Premature death (in some cases)
- Populations at increased risk include:
 - People with asthma or other lung diseases,
 - Children and older adults,
 - People who are active outdoors, and
 - People with diets deficient in certain nutrients and people with certain genetic variants
- Ozone can also have environmental effects, including causing damage to vegetation including visible leaf injury and reduced above ground growth



Nitrogen Dioxide and Sulfur Dioxide

- Nitrogen dioxide (NO₂) and sulfur dioxide (SO₂) are highly reactive gases.
 - NO₂ and SO₂ contribute to formation of particulate matter
 - NO₂ contributes to the formation of ground-level ozone
 - The primary sources for NO₂ are on- and off- highway vehicles and power plants. The primary sources of SO₂ are power plants and other industrial facilities
- NO₂ and SO₂ are both linked to adverse effects on the respiratory system. People with asthma are at increased risk
 - NO₂: Aggravation of asthma symptoms; contribution to the development of asthma
 - SO₂: Reduced lung function and respiratory symptoms
- NO₂ and SO₂ can also impact the environment by causing injury to vegetation and ecosystems

Carbon Monoxide and Lead

- Carbon monoxide (CO) is a colorless, odorless gas emitted from combustion processes. Nationally, particularly in urban areas, the majority of CO emissions to ambient air come from mobile sources
- CO can cause harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues. At extremely high levels, CO can cause death
- Lead (Pb) is a highly toxic metal that is known to be harmful to human health
 - Lead exposure can cause cognitive function decrements in children (as measured by reduced IQ, decreased academic performance and poorer performance on tests of executive function)
 - In addition, lead exposure can cause decreased attention, increased impulsivity and hyperactivity and may also lead to conduct disorders in children and young adults.
- Lead can also cause effects on reproduction and development of organisms in the environment

Primary Standards: Health Based

The Clean Air Act requires the EPA to set primary standards that, in the “judgment of the Administrator” are “requisite” to protect public health with an “adequate margin of safety”

Includes consideration of populations that may have increased risks for health effects. For example: children, older adults, people with pre-existing disease, etc.



As mentioned earlier, here are some examples of health effects that may be related to exposure to criteria air pollutants:

- Respiratory effects: respiratory symptoms, changes in lung function
- Cardiovascular effects: atherosclerosis, heart attacks
- Reproductive/developmental effects: low birth weight, preterm labor
- Cancer
- Mortality

Secondary Standards: Welfare Based

The Clean Air Act requires the EPA to set secondary standards to “protect the public welfare from any known or anticipated adverse effects”

- Examples of effects that can impact public welfare include:
 - Decreased visibility
 - Reduction in growth and damage to vegetation
 - Soiling or damage of man-made objects, such as buildings and monuments



Science is the foundation of the NAAQS

Integrated Science Assessment (ISA) provides a comprehensive evaluation of the body of scientific evidence for health and welfare effects related to ambient air pollution

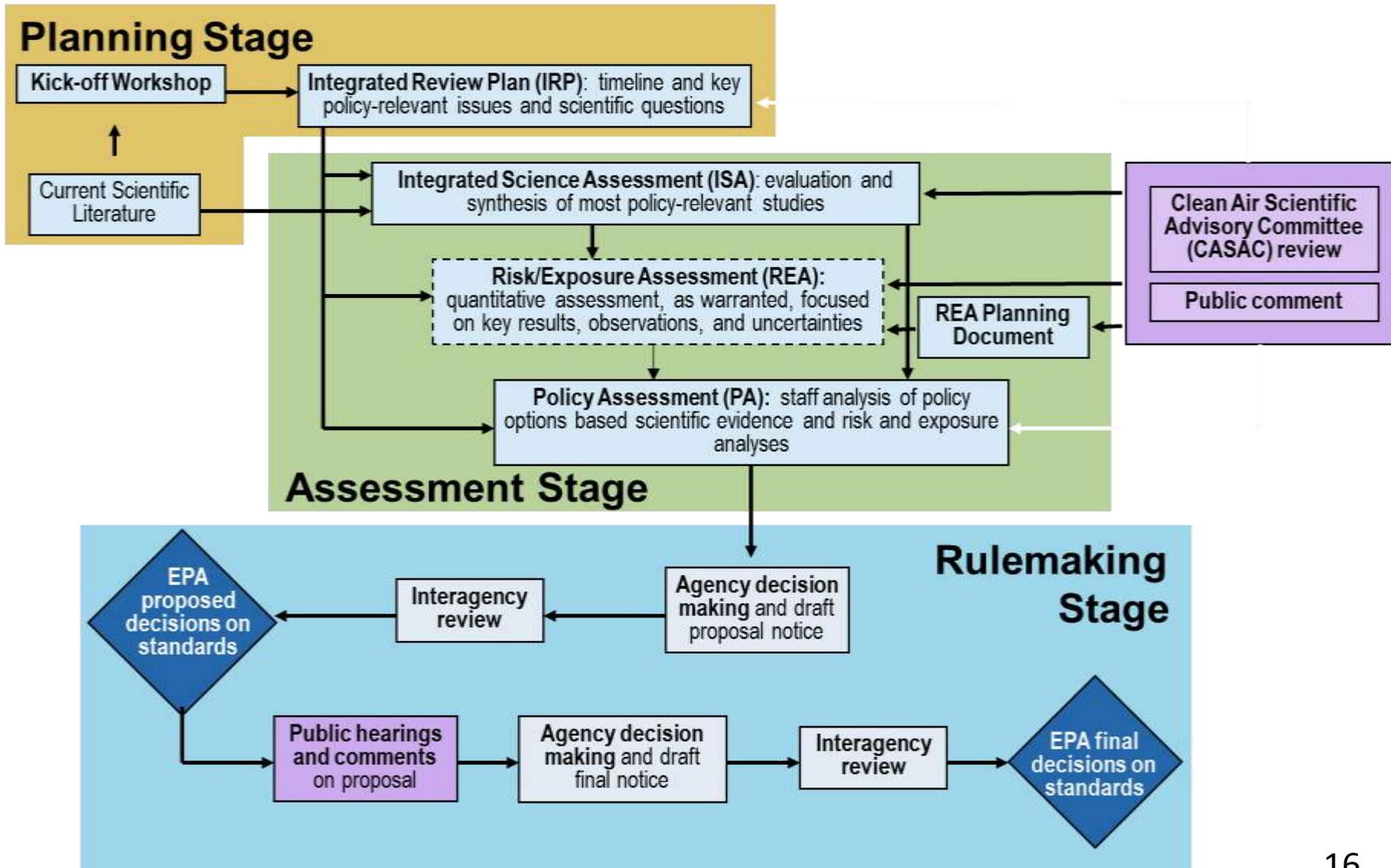
Integrates evidence across disciplines

- Atmospheric chemistry
- Studies evaluating health effects
- Studies evaluating welfare effects

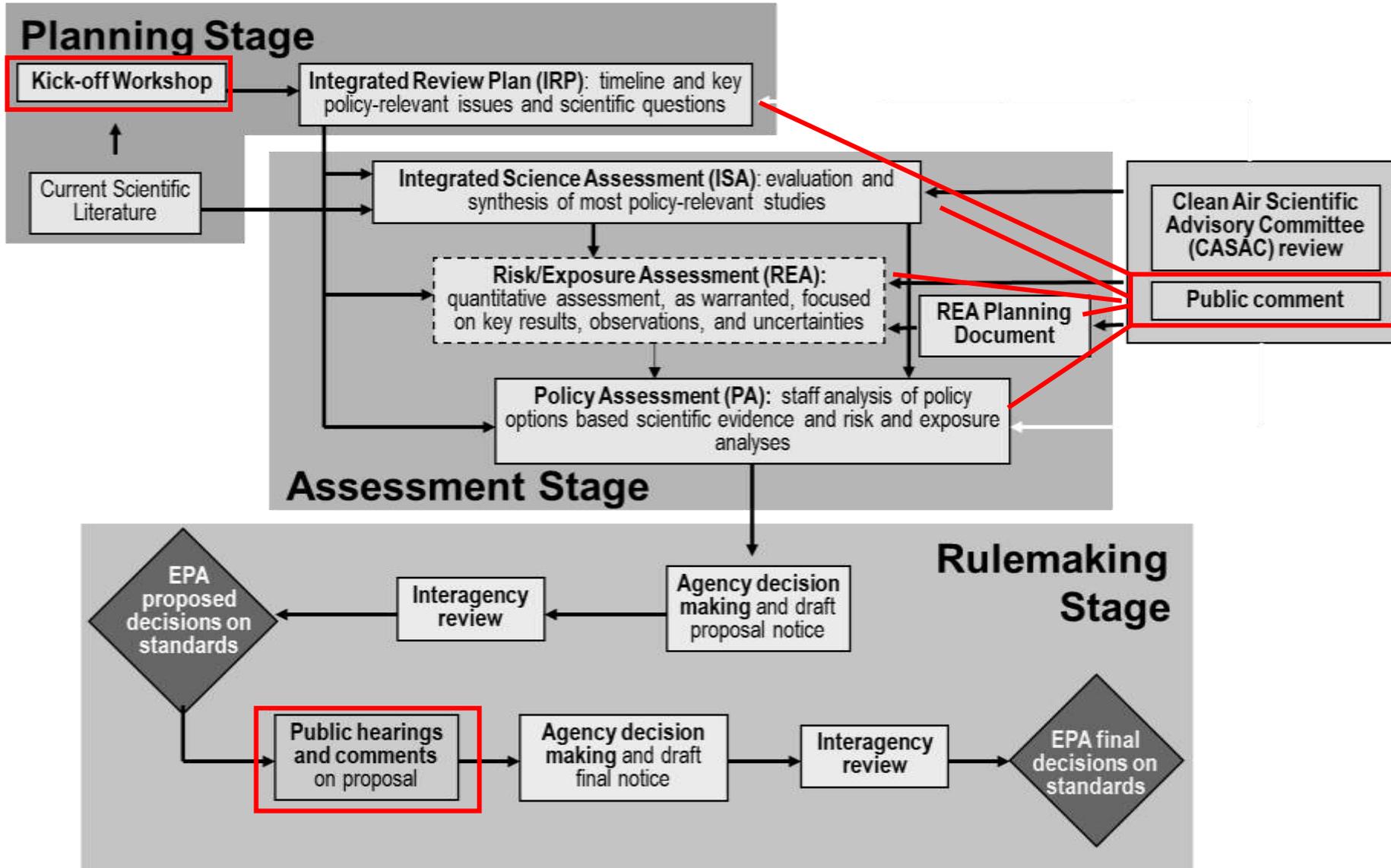


The scientific evidence is the basis for informing judgments about the impacts of air pollution on public health and welfare and informing policy decisions on adequacy of the current standards

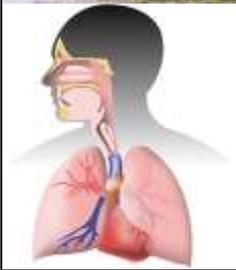
Overview of NAAQS Process



Opportunities for Input



Air Quality Management Partnership



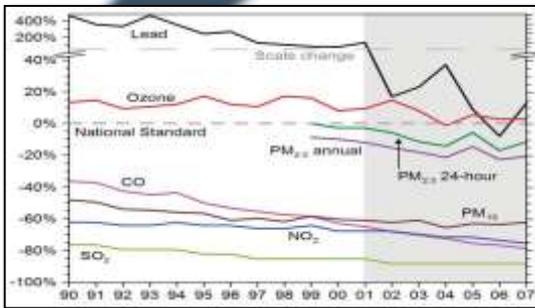
**EPA reviews/revises
NAAQS and
monitoring requirements**



**EPA designates
nonattainment
areas**



**Air agency assesses expected improvement
from federal measures,
and develops additional control
strategies to attain standards**



**Ongoing evaluation by EPA and air agency:
air quality monitoring, tracking emissions**



**Air agency submits plan to EPA and
implements control strategies
through regulatory and**

Summary of the NAAQS*

Pollutant		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide		primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead		primary and secondary	Rolling 3 month average	0.15 µg/m ³	Not to be exceeded
Nitrogen Dioxide		primary	1-hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		primary and secondary	Annual	53 ppb	Annual Mean
Ozone		primary and secondary	8-hour	0.070 ppm	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution	PM _{2.5}	primary	Annual	12 µg/m ³	Annual mean, averaged over 3 years
		secondary	Annual	15 µg/m ³	Annual mean, averaged over 3 years
		primary and secondary	24-hour	35 µg/m ³	98th percentile, averaged over 3 years
	PM ₁₀	primary and secondary	24-hour	150 µg/m ³	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide		primary	1-hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

*For more information, visit <https://www.epa.gov/criteria-air-pollutants/naqs-table>

Public Health Messaging: Tools and Resources

Air Quality Index (AQI)

- The Air Quality Index (AQI) is EPA's color-coded tool for telling the public how clean or polluted the air is
- It recommends steps people can take to reduce their daily exposure to pollution
- Pollutant-specific health effects and cautionary statements address question "who will be affected"
- Based on health information supporting EPA's air quality standards (www.epa.gov/ttn/naaqs)
- Cities and states use the AQI for reporting and forecasting air quality
- You can get daily AQI data and annual summary reports from the AirData website: <https://www.epa.gov/outdoor-air-quality-data>

Dose = Concentration x Ventilation Rate x Time

C - be active outdoors when air quality is better

V - take it easier when active outdoors

T - spend less time being active outdoors



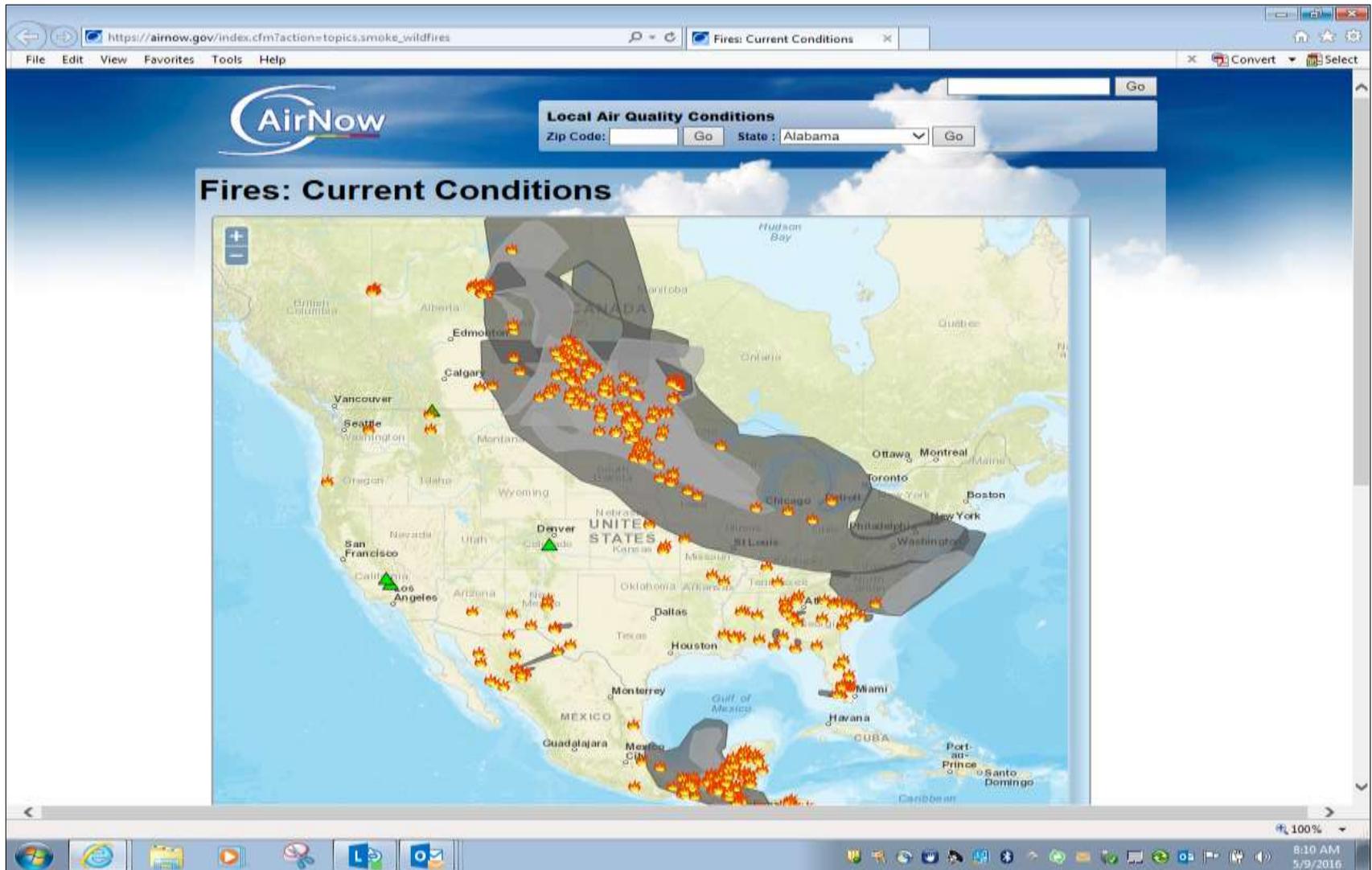
AQI Categories and Health Messages

Level of Health Concern	Index Value	Message
Good	0 to 50	Air quality is considered satisfactory, and air pollution poses little or no risk.
Moderate	51 to 100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151 to 200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201 to 300	Health alert: everyone may experience more serious health effects.
Hazardous	301 to 500	Health warnings of emergency conditions. The entire population is more likely to be affected.

AirNow Website (www.airnow.gov)

The screenshot shows the AirNow website interface. At the top, there is a search bar for "Local Air Quality Conditions" with fields for "Zip Code" and "State" (set to "Alabama"). Below this is a navigation menu with "Forecast", "Current AQI", "AQI Loop", and "More Maps". The main content area features a "Today's AQI Forecast" for Monday, April 25, 2016, with a map of the United States showing air quality levels. A legend below the map includes categories: Good, Moderate, URG, Unhealthy, Very Unhealthy, and Hazardous. A "Highest 5:" section lists top AQI locations: Yuma, AZ (130), Imperial Valley, CA (123), Coachella Vly, CA (101), Nipomo, CA (98), and Cincinnati, OH (95). On the right side, there are several sections: "Fires: Current Conditions" with a "Click to see map" link (circled in red), "U.S. Embassies and Consulates", "Announcements" (including a "Spring Challenge" starting April 15), "Air Quality Basics" with a "Health" link (circled in red), and a "Popular Links" section with icons for Apps, Facebook, Webcams, Videos, Airflow on Google Earth, EnviroFlash Email, Widgets, RSS, Twitter, and Developer Tools.

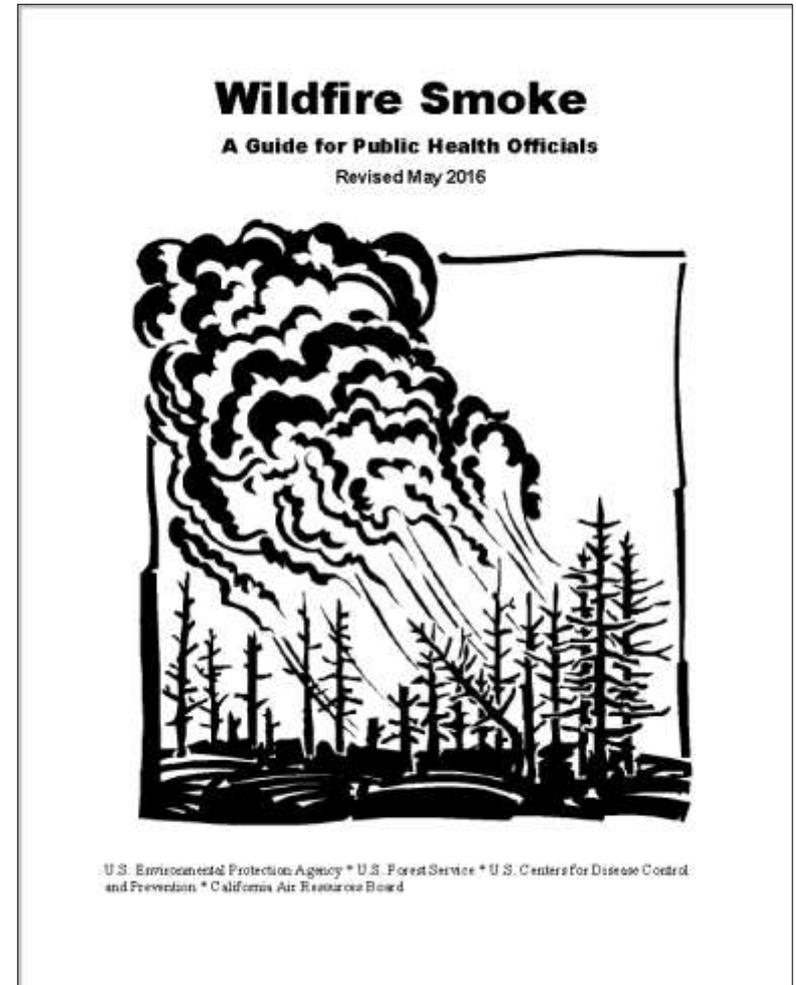
Fires: Current Conditions



May 9, 2016

Wildfire Guide 2016

- Primarily a federal/California document; housed on AirNow website
- Updated air quality and health information
- Evidenced-based exposure reduction measures
- Entirely new section on communicating air quality
 - Uses “Current PM” levels from AirNow
 - Uses satellite information on Fires: Current Conditions page
 - Visual range information updated
- New fact sheets about children’s health
- Information about new interagency Wildland Fire Air Quality Response Program



https://www3.epa.gov/airnow/wildfire_may2016.pdf

Wildfire Guide 2017 – Example Draft Fact Sheets

EPA United States Environmental Protection Agency

WILDFIRE SMOKE FACTSHEET

Prepare for Fire Season

If you live in an area that is regularly affected by smoke or where the wildfire risk is high, prepare for fire season. Know how to get ready before a wildfire. Know how to protect yourself from smoke exposure during a wildfire.

Being prepared for fire season is especially important for the health of children, older people with heart or lung disease.

Prepare Before a Wildfire

- **Stock up** so you don't have to go out when it's smoky. Have several days of medications on hand. Buy groceries that do not need to be refrigerated or cooked, because cooking can add to indoor particle levels.
- **Create a "clean room"** in your home. Choose a room with as few windows and doors as possible, such as a bedroom. Use a portable air cleaner and avoid indoor sources of pollution.
- **Buy a portable air cleaner** before there is a smoke event. High-efficiency particulate air (HEPA) filter air cleaners, and electrostatic precipitators that do not produce ozone, can help reduce indoor particle levels.
- **Understand** how you will receive alerts and health warnings, including air quality reports and public service announcements, from local officials.
- **If you have heart or lung disease**, check with your doctor about what you should do during smoke events.
- **If you have asthma or lung disease**, update your respiratory management plan.
- **Have a supply of N95 respirators**. Learn how to use them from your local health department or online.
- **Organize your important items** ahead of time and know where to go in case you have to evacuate.

EPA United States Environmental Protection Agency

WILDFIRE SMOKE FACTSHEET: Indoor Air Filtration



Exposure to Particle Pollutants

Indoor sources of particulate matter (PM) come from combustion events such as smoking, candle burning, cooking and wood-burning. During a wildfire event, outdoor PM can increase indoor PM levels well above the levels normally found. As outlined in the Guide, reducing indoor sources of pollution is a major step to lower the concentrations of PM indoors. Further reductions in indoor PM can be achieved using one of the filtration options discussed below.

Filtration Options

There are two effective options for improving air filtration in the home: upgrading the central system filter, or using high efficiency portable air cleaning appliances. Before discussing filtration options, it is important to understand the basics of filter efficiency.

Filter Efficiency

The most common industry standard for filter efficiency is known as the Minimum Efficiency Reporting Value, or MERV rating. The MERV scale for residential filters ranges from 1-20. The higher the MERV rating the greater the percentage of particles captured as the air passes through the filter media. Higher MERV (higher efficiency) filters are especially effective at capturing very small particles that can most affect health.

Central Air System Filter

The filter used in the central heating/cooling system of the home can effectively reduce indoor PM. A home typically will have a low MERV (1-4)

Portable Air Cleaners

Portable air cleaners are self-contained air filtration appliances that can be used alone or in concert with an enhanced central filtration to effectively remove particles. Their effectiveness in reducing PM depends on several factors such as the size of the air cleaner, the filter efficiency, how frequently the unit is turned on and at what fan speed. Portable air cleaners fitted with high efficiency filters can reduce indoor PM concentrations by as much as 85% or more.

Portable Air Cleaners: How to Choose

There is a wide variety of air cleaners on the market ranging in price from about \$50 to \$3,000. However, air cleaners under about \$200 typically do not clean the air well and would not be helpful in a wildfire situation.

Types of Air Cleaners

Most air cleaners fall under two basic categories: mechanical and electronic. Mechanical air cleaners

EPA United States Environmental Protection Agency

PEHSU Pacific Environmental Health Science University

WILDFIRE SMOKE FACTSHEET

Children and Families

Background

- **Wildfires** expose children and women of reproductive age to a number of environmental hazards, e.g., fire, smoke, psychological stress, and the byproducts of combustion of wood, plastics, and other chemicals released from burnings structures and furnishings.
- **During the acute phase of wildfire activity**, the major hazards are fire and smoke.
- **Children, Pregnant Women**, individuals with pre-existing lung or cardiovascular diseases (e.g., asthma), impoverished populations are especially vulnerable to hazards due to wildfires.

Environmental Hazards

- **Wildfire Smoke**: Consists of very small organic particles, liquid droplets, and gases such as carbon monoxide (CO), carbon dioxide (CO₂) and other volatile organic compounds (VOCs), such as formaldehyde and acrolein. The actual content of the smoke depends on the fuel source.

Health Effects from Smoke

- Symptoms from smoke inhalation can include chest tightness, shortness of breath, wheezing, coughing, respiratory tract and eye irritation and burning, chest pain, dizziness, or lightheadedness and other symptoms.
- Underlying conditions such as allergies and asthma symptoms may be exacerbated.
- The risk of developing cancer from short-term exposures to smoke is vanishingly small.

Recommendations

Prepare Before Wildfire Season

- **Stock up** so you don't have to go out when it's smoky. Have several days of medications on hand. Buy groceries that do not need to be refrigerated or cooked, because cooking can add to indoor particle levels.
- **Create a "clean room"** in your home. Choose a room with as few windows and doors as possible, such as a bedroom. Use a portable air cleaner and avoid indoor sources of pollution.
- **Buy a portable air cleaner** before there is a smoke event. High-efficiency particulate air (HEPA) filter air cleaners, and electrostatic precipitators that do not produce ozone, can help reduce indoor particle levels.
- **Organize your important items** ahead of time and know where to go in case you have to evacuate.



Wildfire Smoke Sense App



- The number and intensity of wildfires are growing in the US, posing a health threat for communities
- Smoke is made up of a complex mixture of gases and fine particles produced when wood and other organic materials burn. The biggest health threat from smoke is from fine particles
- Communities will be able to use the **Smoke Sense App** to get information on air quality and learn about ways to protect their health from smoke exposure
- The app will be used in a study to determine effective health risk communications strategies to educate people impacted by wildfire smoke
 - Beta testing of the app began in April 2017

Air Sensor Toolbox

- Low cost air quality sensors are an emerging technology and are now commercially available in a wide variety of designs and capabilities
- While they're not yet suitable for regulatory use, these new sensors offer communities several benefits
 - People can use these sensors to easily collect highly localized, real-time data
- EPA's Air Sensor Toolbox provides information on how to select and use low-cost, portable air sensor technology and to understand the results from these monitoring activities (<https://www.epa.gov/air-sensor-toolbox>)
 - We recommend that communities carefully evaluate the quality of sensors and the associated data
 - Also included on the website are links to community air monitoring projects using sensor technology

Resources

- Information about air pollution and the Clean Air Act:
<https://www.epa.gov/clean-air-act-overview>
- Information about each of the NAAQS:
<https://www.epa.gov/criteria-air-pollutants/naaqs-table>
- Information about the AQI:
<https://airnow.gov/index.cfm?action=aqibasics.aqi>
- To search for AQI in your area, visit:
<https://airnow.gov>
- Link to EPA's Air Sensor Toolbox:
<https://www.epa.gov/air-sensor-toolbox>.
- Learn more about smoke and your health:
<https://www.airnow.gov/index.cfm?action=smoke.index>