



Curriculum Resource Guide for Educators

WASHINGTON'S SMOKE SEASON:

INTEGRATING THE IMPACT OF AIR POLLUTION IN K-12 CURRICULUM

May 18th, 2025 | 4:30 - 6:30 PM
Educational Service District 105
33 S. 2nd Ave., Yakima, WA 98902



WASHINGTON STATE DEPARTMENT OF
NATURAL RESOURCES

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Acknowledgements



As wildfires grow in frequency and intensity, their resulting smoke and air pollution pose an escalating threat to public health—especially for Washington’s most vulnerable communities. This workshop was created to equip educators with evidence-based strategies for integrating themes of air pollution, environmental justice, and global competence into their classrooms.

We extend our deepest gratitude to **Stephanie King**, Educator at Granger High School and our 2024 World Educator, in partnership with **Ryan Hauck**, Global Classroom Director at the World Affairs Council, for designing and facilitating this important workshop. Stephanie’s unwavering dedication to environmental education and student empowerment continues to inspire, and we are proud to celebrate her contributions both in and beyond the classroom. She brings dynamic leadership to her school and the broader educational landscape.

In addition to teaching English Language Arts and coordinating dual-credit opportunities through the University of Washington’s College in the High School program, she coaches girls’ soccer at both middle and high school levels, volunteers extensively, and serves as a role model for holistic, student-centered education.

We also thank our guest experts from the **Washington State Department of Natural Resources**:

- **Matthew Dehr**, Lead Wildland Fire Meteorologist, leverages his background in emergency management and U.S. Air Force service to support wildfire preparedness and response.
- **Nathan Santo Domingo**, Air Resource Specialist, brings expertise from the Wildland Fire Management Division and holds a degree in Atmospheric Science from UW.
- **Carolyn Kelly**, Air Resource Specialist, previously served as Program Manager for the National Tribal Air Association and has years of field coordination experience.
- **Mason Friedman**, Wildfire & Smoke Meteorologist, supports both wildfire and prescribed fire work and is also a UW Atmospheric Science alum.

Finally, a heartfelt thank you to all our attendees. Your commitment to this work makes a difference, and we could not do it without you!

How to Use This Guide



Visual Media



Audio/Podcast



Charts/Graphs/Infographics



Lesson Plans/Activities

GLOBAL CLASSROOM WANTS TO KNOW
HOW YOU HAVE USED THIS RESOURCE
PACKET IN YOUR CLASSROOM!

EMAIL GC@WORLD-AFFAIRS.ORG

AND TELL US YOUR STORY!



Users can explore additional resources by clicking on any image or graphic throughout the guide, which will direct them to dedicated landing pages. These pages provide valuable materials for use in presentations or curriculum development.

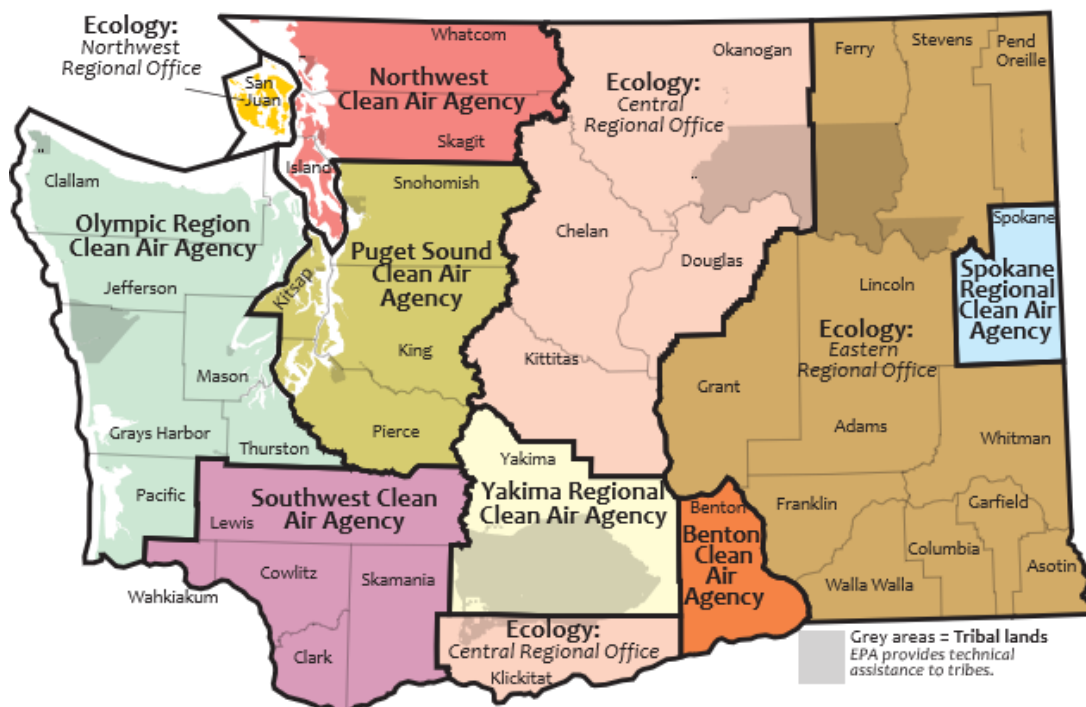
Click on the image above to discover more about the Global Classroom Program!

If you haven't already, **SUBSCRIBE** to our [Global Classroom Bi-Weekly Newsletter](#) for updates on our upcoming programs, professional development and virtual opportunities for teachers and students.

Interested in becoming a member of the World Affairs Council—Seattle? Please learn more about our [K-12 Educator Memberships](#) today!

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Outlining Standards

A Note on Learning Standards Presented in this Guide

Three sets of standards have been linked to each of the learning objectives in this packet. The **Washington State K-12 Social Studies Learning Standards** and the accompanying Grade Level Requirements are the social studies standards for WA State.

The **College, Career, & Civic Life C3 Framework for Social Studies State Standards** are the standards published by the National Council for the Social Studies. Guiding the packet as a whole is the Framework for Global Learning created by the Asia Society and the Council of Chief State School Officers titled *Educating for Global Competence: Preparing Our Youth to Engage the World* (2011).

Cross-objective standards are listed at the beginning of the packet, and content-specific standards can be found after each learning objective.

The standards provided have been selected for relevance, but are not exclusive: many other standards, such as Common Core, may be applicable to the resources and learning objectives identified in this packet. The intention for this packet's organization is to provide educators with an idea of resources available and possible uses for resources. Users should feel free to create their own learning objectives and to select resources according to the specific needs of their classrooms.

WASHINGTON STATE K-12 SOCIAL STUDIES LEARNING STANDARDS

There are five EALRs in Social Studies, one for each of the discipline areas: civics, economics, geography, and history, and a fifth for social studies skills.

(1) Social Studies EALR 1: CIVICS

The student understands and applies knowledge of government, law, politics, and the nation's fundamental documents to make decisions about local, national, and international issues and to demonstrate thoughtful, participatory citizenship.

(2) Social Studies EALR 2: ECONOMICS

The student applies understanding of economic concepts and systems to analyze decision-making and the interactions between individuals, households, businesses, governments, and societies.

(3) Social Studies EALR 3: GEOGRAPHY

The student uses a spatial perspective to make reasoned decisions by applying the concepts of location, region, and movement and demonstrating knowledge of how geographic features and human cultures impact environments.

(4) Social Studies EALR 4: HISTORY

The student understands and applies knowledge of historical thinking, chronology, eras, turning points, major ideas, individuals, and themes on local, Washington State, tribal, United States, and world history in order to evaluate how history shapes the present and future.

(5) Social Studies EALR 5: SOCIAL STUDIES SKILLS

The student understands and applies reasoning skills to conduct research, deliberate, and form and evaluate positions through the processes of reading, writing, and communicating.

Outlining Standards

COLLEGE, CAREER, & CIVIC LIFE C₃ FRAMEWORK FOR SOCIAL STUDIES STATE STANDARDS

The C₃ Framework is organized into the four Dimensions, which support a robust social studies program rooted in inquiry.

The four Dimensions are as follows

- (1) Developing questions and planning inquiries;
- (2) Applying disciplinary concepts and tools;
- (3) Evaluating sources and using evidence;
- (4) Communicating conclusions and taking informed action

DIMENSION 1: DEVELOPING QUESTIONS AND PLANNING INQUIRIES	DIMENSION 2: APPLYING DISCIPLINARY TOOLS AND CONCEPTS	DIMENSION 3: EVALUATING SOURCES AND USING EVIDENCE	DIMENSION 4: COMMUNICATING CONCLUSIONS AND TAKING INFORMED ACTS
Developing Questions and Planning Inquiries	<ul style="list-style-type: none"> Civics Economics Geography History 	<ul style="list-style-type: none"> Gathering and Evaluating Sources Developing Claims and Using Evidence 	<ul style="list-style-type: none"> Communicating and Critiquing Conclusions Taking Informed Action

Dimension 2 has four disciplinary subsections: (1) **Civics**; (2) **Economics**; (3) **Geography**; (4) **History**. Each disciplinary subsection has three to four additional categories, which provide an organizing mechanism for the foundational content and skills within each discipline.

C₃ Framework Organization

CIVICS	ECONOMICS	GEOGRAPHY	HISTORY
Civic and Political Institutions	Economic Decision Making	Geographic Representations: Special Views of the World	Change, Continuity, and Context
Participation and Deliberation: Applying Civic Virtues and Democratic Principles	Exchange and Markets	Human-Environment Interaction: Place, Religions, and Culture	Perspective
Processes, Rules, and Laws	The National Economy	Human Populations: Spatial Patterns and Movements	Historical Sources and Evidence
	The Global Economy	Global Interconnections: Changing Spatial Patterns	Causation and Argumentation

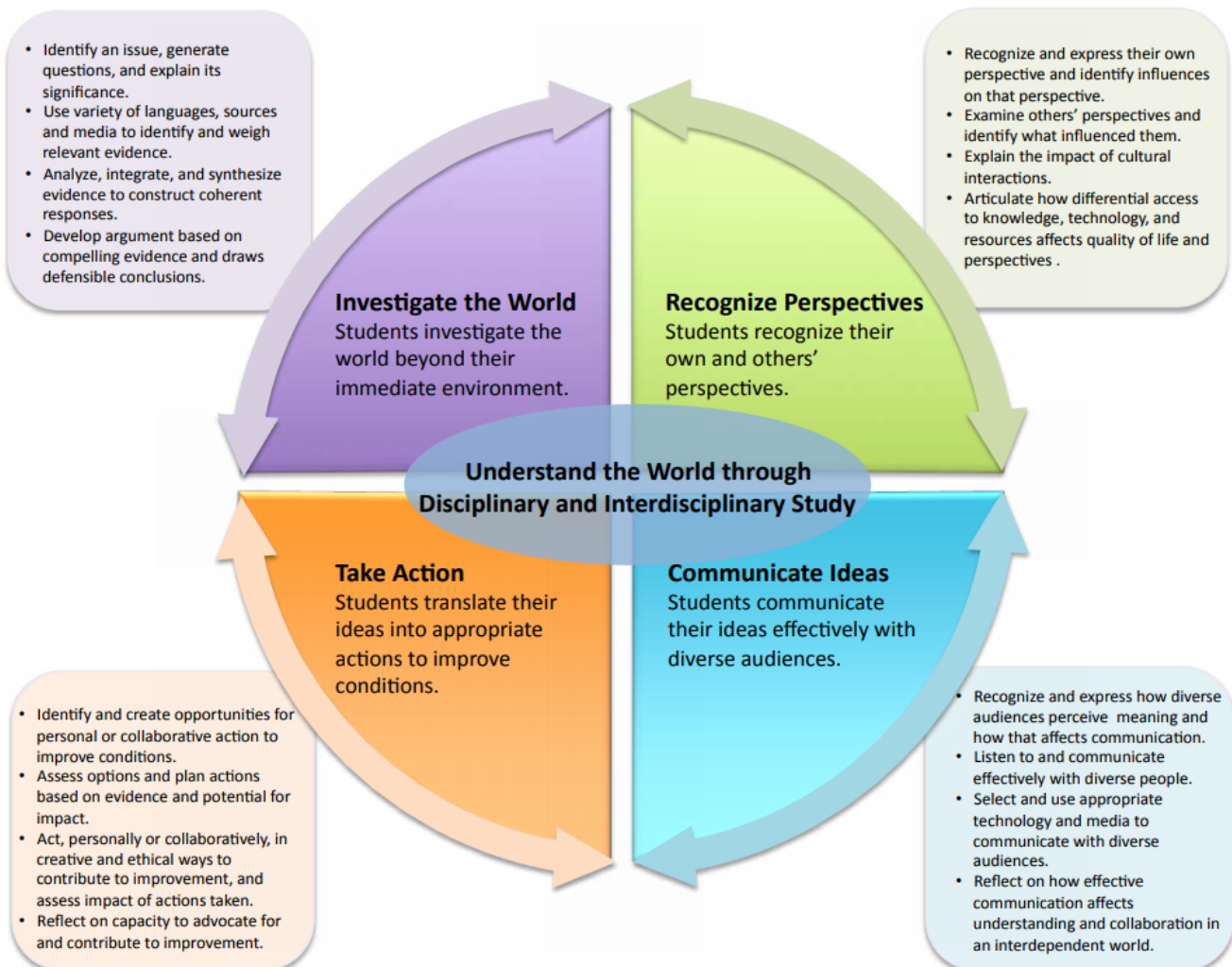
Educating For Global Competence

Frameworks taken from *Educating for Global Competence: Preparing Our Youth to Engage the World* (Asia Society and the Council of Chief State School Officers 2011).

“Global competence is the capacity and disposition to understand and act on issues of global significance” (Chapter 2).

Globally competent students are able to perform the following four competences:

1. **Investigate the world** beyond their immediate environment, framing significant problems and conducting well-crafted and age-appropriate research.
2. **Recognize perspectives** others’ and their own, articulating and explaining such perspectives thoughtfully and respectfully.
3. **Communicate ideas** effectively with diverse audiences, bridging geographic, linguistic, ideological, and cultural barriers.
4. **Take action** to improve conditions, viewing themselves as players in the world and participating reflectively.



Introduction To Workshop Facilitators

Ryan Hauck

Ryan Hauck is a teacher at Glacier Peak High School in Snohomish, WA. As a teacher of comparative politics and international studies, he is often applauded for bringing the world into his classroom by engaging students around the importance of living in an increasingly interconnected, interdependent world. Over the last 15 years, Ryan has worked closely with the World Affairs Council and hosted numerous International Visitor Program delegations at his school. He has traveled to South Africa and Swaziland, returning to write curriculum for other teachers to use. Ultimately, Ryan wants his students to think critically about world issues, acquire the skills needed to be globally competent in the 21st century, and become actively engaged citizens locally, nationally, and internationally.



Stephanie King



Stephanie King, our 2024 World Educator, is a dynamic force at Granger High School, where she imparts her passion for English Language Arts while also guiding students towards University of Washington transcripts through the College in the High School program. Beyond academics, Stephanie is deeply involved in the school community, serving as a coach for both middle and high school girls' soccer teams and dedicating herself to extensive volunteer work. With a lineage rooted in education—her parents being public school teachers—Stephanie's commitment to the field runs deep. She's not only a respected educator within her own school but also plays a pivotal role at the state level as a member of the Bridge to College leadership team and as Washington's representative for the NEA Foundation's Global Learning Fellowship. Stephanie's impact extends far beyond her classroom walls. She's a skilled grant writer, securing funds for various educational initiatives within her district, and her experiences as a Fulbright Teacher for Global Classrooms in Morocco are documented on her website, inspiring others with her international perspective. Through partnerships with news outlets and organizations, she champions student writing, amplifying their voices on broader platforms. Her dedication to embedding global competencies into her curriculum has earned her recognition through fellowships with prestigious institutions like the Library of Congress, Pulitzer, and American University. But perhaps most importantly, Stephanie understands that education is about fostering connections and creating inclusive environments where all students feel valued. She prioritizes building relationships, taking time every Monday morning to engage with her students about their lives outside of school. Stephanie's commitment to social emotional learning and equity is evident not only in her classroom but also in her role as a leader in professional development nationwide. By promoting these values, she ensures that education goes beyond just academics, fostering holistic growth and empowering students to thrive in a diverse and interconnected world.

Introduction to Workshop Panelists

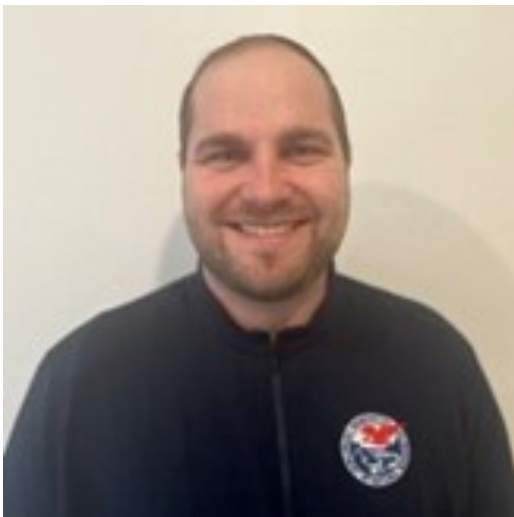
Matthew Dehr serves as the lead wildland fire meteorologist for the Washington State Department of Natural Resources, where he applies his expertise in operational meteorology and emergency management to enhance public safety during wildfires and weather-related disasters.

Previously, Matthew served as a Weather and Environmental Science Officer in the U.S. Air Force, stationed in Louisiana, Japan, and North Dakota, and honorably separated at the rank of Captain. A passionate leader in the weather community, he thrives in fast-paced environments, bringing critical forecasting and decision-making skills to high-stakes situations. He spent 2 years in Japan, biked RAMROD twice, and recently became a 4-cat household.



Carolyn Kelly is an Air Resource Specialist at the Washington State Department of Natural Resources. She worked for 5 years as the Smoke Management Field Coordinator for WA DNR before leaving for 2 years to work as the Program Manager for the National Tribal Air Association and joined the Smoke Team in 2024. Originally from the East Coast, Carolyn now lives in Olympia, WA with her delightful cat, Kitten

Mason Friedman, DNR Wildfire & Smoke Meteorologist in the Wildland Fire Management Division (which includes both wildfire AND prescribed fire). 2019 graduate of the University of Washington Atmospheric Science program. He enjoys hiking and ice hockey in his free time!



Nathan Santo Domingo is an Air Resource Specialist at the Washington State Department of Natural Resources. He works with the Smoke Team as part of the Wildland Fire Management Division. He is a 2018 graduate of the University of Washington Atmospheric Science program. In his free time, he enjoys concerts, skiing, pickleball, and going to sporting events.



Key Terms

[Air Quality Index \(AQI\)](#): “online, color-coded index created by the U.S. Environmental Protection Agency (EPA) that communicates whether the relative air quality and air pollution level in a given area is healthy or unhealthy.”

[Particulate Matter \(PM_{2.5}, PM₁₀\)](#): “is a type of air pollution that consists of airborne suspensions of extremely small solid or liquid particles, such as soot, dust, smokes, fumes, and mists.”

[Wildfire Smoke](#): “is comprised of a mixture of gaseous pollutants (e.g., carbon monoxide), hazardous air pollutants (HAPs) (e.g., polycyclic aromatic hydrocarbons [PAHs]), water vapor, and particle pollution. Particle pollution represents a main component of wildfire smoke and the principal public health threat.”

[Ozone Pollution](#): “refers to the presence of high levels of ground-level ozone (O₃) in the atmosphere. It is a secondary air pollutant formed through chemical reactions between nitrogen oxides (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight.”

[Climate Change](#): “periodic modification of Earth’s climate brought about as a result of changes in the atmosphere as well as interactions between the atmosphere and various other geologic, chemical, biological, and geographic factors within the Earth system.”

[Carbon Emissions](#): “are the release of greenhouse gases, mainly carbon dioxide, into the atmosphere. These emissions come from burning fossil fuels, manufacturing cement, and other human activities.”

[Fossil Fuels](#): “any of a class of hydrocarbon-containing materials of biological origin occurring within Earth’s crust that can be used as a source of energy.”

[Deforestation](#): “the clearing or thinning of forests by humans.”

[Greenhouse Gases](#): “any gas that has the property of absorbing infrared radiation (net heat energy) emitted from Earth’s surface and reradiating it back to Earth’s surface, thus contributing to the greenhouse effect.”

[Health Impacts \(Respiratory & Cardiovascular\)](#): “The biggest health threat from smoke is from fine particles. These microscopic particles can get into your eyes and respiratory system – whether you are outdoors or indoors, where they can cause health problems such as burning eyes, runny nose, and illnesses such as bronchitis. Fine particles can also aggravate chronic heart and lung diseases - and even are linked to premature deaths in people with these conditions.”

[Vulnerable Populations](#): “are groups and communities at a higher risk for poor physical, psychological, or social health. These barriers are further intensified due to social, economic, political, and environmental components. Limitations due to illness or disability can also influence the vulnerability of a population.”

Key Terms

[Environmental Justice](#): “social movement seeking to address the inequitable distribution of environmental hazards among the poor and minorities.”

[Traditional Ecological Knowledge \(TEK\)](#): “s the on-going accumulation of knowledge, practice and belief about relationships between living beings in a specific ecosystem that is acquired by indigenous people over hundreds or thousands of years through direct contact with the environment, handed down through generations, and used for life-sustaining ways. This knowledge includes the relationships between people, plants, animals, natural phenomena, landscapes, and timing of events for activities such as hunting, fishing, trapping, agriculture, and forestry. It encompasses the world view of a people, which includes ecology, spirituality, human and animal relationships, and more.”

[Prescribed Fires](#): “form of land management in which fire is intentionally applied to vegetation. Prescribed fires are conducted under desired conditions to meet specific objectives, such as to restore fire regimes in adapted ecosystems or to limit the amount of dry brush in an area prone to wildfires.”

[Mitigation Strategies](#): “are proactive measures businesses, projects, and individuals take to minimize the impact of potential risks and uncertainties. These strategies aim to identify, assess, and address risks before they occur or escalate into significant problems. Risk mitigation solutions involve implementing preventive actions, developing contingency plans, and establishing controls to reduce the likelihood and severity of risks.”

[Adaptation Measures](#): “are actions taken to reduce the negative impacts of climate change. These measures can include building sea walls, changing crop varieties, and improving infrastructure.”

[Air Monitoring Technology](#): “uses electronic devices to measure air pollutants and environmental factors. This data can be used to improve air quality and protect public health.”

[Policy & Legislation \(Clean Air Act, State Regulations\)](#): “U.S. federal law, passed in 1970 and later amended, to prevent air pollution and thereby protect the ozone layer and promote public health. The Clean Air Act (CAA) gave the Environmental Protection Agency (EPA) the power it needed to take effective action to fight environmental pollution.”

[Community Preparedness](#): “is a process that involves people in a community working together to prepare for and respond to disasters. The goal is to build resilience so that communities can withstand and recover from disasters.”

Learning Objectives

By engaging with this resource, educators will be able to:

1. Identify the major causes and effects of air pollution and wildfire smoke in Washington State.
2. Analyze how climate change contributes to longer and more intense wildfire seasons.
3. Interpret AQI data to assess air quality conditions and make informed health decisions.
4. Examine the disproportionate impact of air pollution on marginalized and vulnerable communities.
5. Explore Indigenous fire management practices and how they contribute to sustainable land stewardship.
6. Evaluate policies and community actions that aim to reduce air pollution and protect public health.
7. Propose personal and collective strategies for mitigating the impacts of air pollution and wildfire smoke.
8. Develop a local action plan or awareness campaign to educate their community about air quality and public health.



Understanding Air Pollution: Sources, Types, Impacts



[Air Pollution Basics \(BASC\) | Air Knowledge, A Partnership Program of U.S. EPA](#)

"The Air Pollution Basics curriculum is intended for newly hired federal, state, local, and tribal air professionals, as well as individuals who want to learn more about how air pollution affects our world. Learners should be familiar with the content covered in this curriculum before taking courses under the curricula that relate to specific air agency job functions."



[Introduction to Air Quality | Center for Science Education](#) (2025)

"Students learn about the sources and impacts of major types of air pollution."



[Air Pollution: How We're Changing the Air | Center for Science Education](#) (2025)

"Air pollution is created when harmful substances, in the form of gases, liquids, or solids, enter the air. There are natural processes that create air pollution— such as sulfur and chlorine gases from volcanic activity, smoke and ash from wildfires, dust storms, and biological decay — but most pollution enters the air from human-made (anthropogenic) sources."

[Air Pollution and Your Health | National Institute of Environmental Health Sciences](#) (February 26, 2025)

"Air pollution is a familiar environmental health hazard. We know what we're looking at when brown haze settles over a city, exhaust billows across a busy highway, or a plume rises from a smokestack. Some air pollution is not seen, but its pungent smell alerts you."

[Educational Resources Related to Air Sensor Technology | United States Environmental Protection Agency](#) (January 22nd, 2025)

"Air sensor technologies are increasingly being used by a variety of audiences and offer opportunities for educational enrichment. EPA developed several presentations that provide background information on air quality, air pollution sources, and air sensors. Additionally, EPA and collaborators developed educational activities and curriculum which are available to the public. These resources may be used in group settings such as classrooms or community workshops, in other educational settings, or by individuals exploring on their own. These materials may also be adaptable for a variety of age groups from elementary school students to adults."

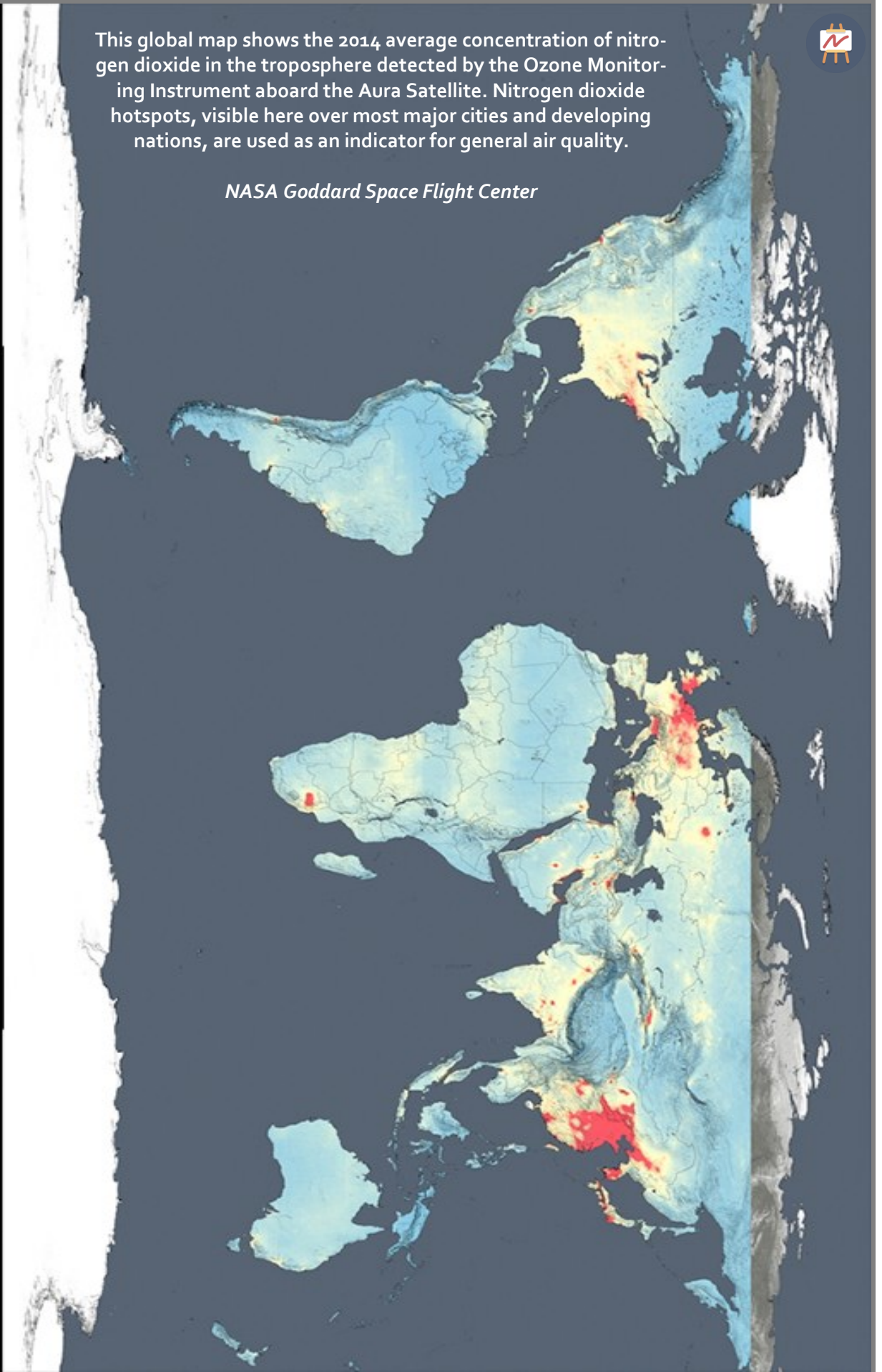
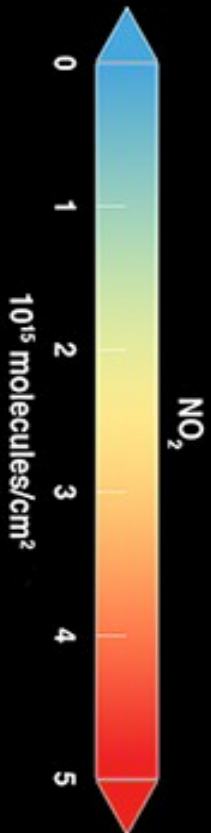
Did You Know?

"Over the past decade, fine particle pollution in Seattle has risen by over 17%, exacerbating health issues such as asthma and respiratory problems." <https://www.axios.com/local/portland/2024/08/21/oregon-wildfire-season-record-breaking>



This global map shows the 2014 average concentration of nitrogen dioxide in the troposphere detected by the Ozone Monitoring Instrument aboard the Aura Satellite. Nitrogen dioxide hotspots, visible here over most major cities and developing nations, are used as an indicator for general air quality.

NASA Goddard Space Flight Center



Understanding Air Pollution: Sources, Types, Impacts



[Air Pollution, Grades 4-12+ | National Geographic](#) (November 15th, 2024)

“Air pollution consists of chemicals or particles in the air that can harm the health of humans, animals and plants. It can even damage buildings. Pollutants in the air take many forms. They can be gasses, solid particles or liquid droplets.”



[Air Pollution for Kids | Learn about the Causes and Effects of Air Pollution](#) (March 30, 2021)

“Air is all around us and we need it to survive. In this video we will learn about air pollution, what causes it, some of the bad effects air pollution can have on us and the atmosphere, and how we can all do things to help keep our air clean. It's important for kids to understand the importance of keeping our air quality clean and there are many ways we can do that.”

[Environmental and Health Impacts of Air Pollution: A Review](#) (February 19th, 2020)

“One of our era's greatest scourges is air pollution, on account not only of its impact on climate change but also its impact on public and individual health due to increasing morbidity and mortality. There are many pollutants that are major factors in disease in humans. Among them, Particulate Matter (PM), particles of variable but very small diameter, penetrate the respiratory system via inhalation, causing respiratory and cardiovascular diseases, reproductive and central nervous system dysfunctions, and cancer. Despite the fact that ozone in the stratosphere plays a protective role against ultraviolet irradiation, it is harmful when in high concentration at ground level, also affecting the respiratory and cardiovascular system. Furthermore, nitrogen oxide, sulfur dioxide, Volatile Organic Compounds (VOCs), dioxins, and polycyclic aromatic hydrocarbons (PAHs) are all considered air pollutants that are harmful to humans. Carbon monoxide can even provoke direct poisoning when breathed in at high levels. Heavy metals such as lead, when absorbed into the human body, can lead to direct poisoning or chronic intoxication, depending on exposure. Diseases occurring from the aforementioned substances include principally respiratory problems such as Chronic Obstructive Pulmonary Disease (COPD), asthma, bronchiolitis, and also lung cancer, cardiovascular events, central nervous system dysfunctions, and cutaneous diseases. Last but not least, climate change resulting from environmental pollution affects the geographical distribution of many infectious diseases, as do natural disasters. The only way to tackle this problem is through public awareness coupled with a multidisciplinary approach by scientific experts; national and international organizations must address the emergence of this threat and propose sustainable solutions.”

Understanding Air Pollution: Sources, Types, Impacts

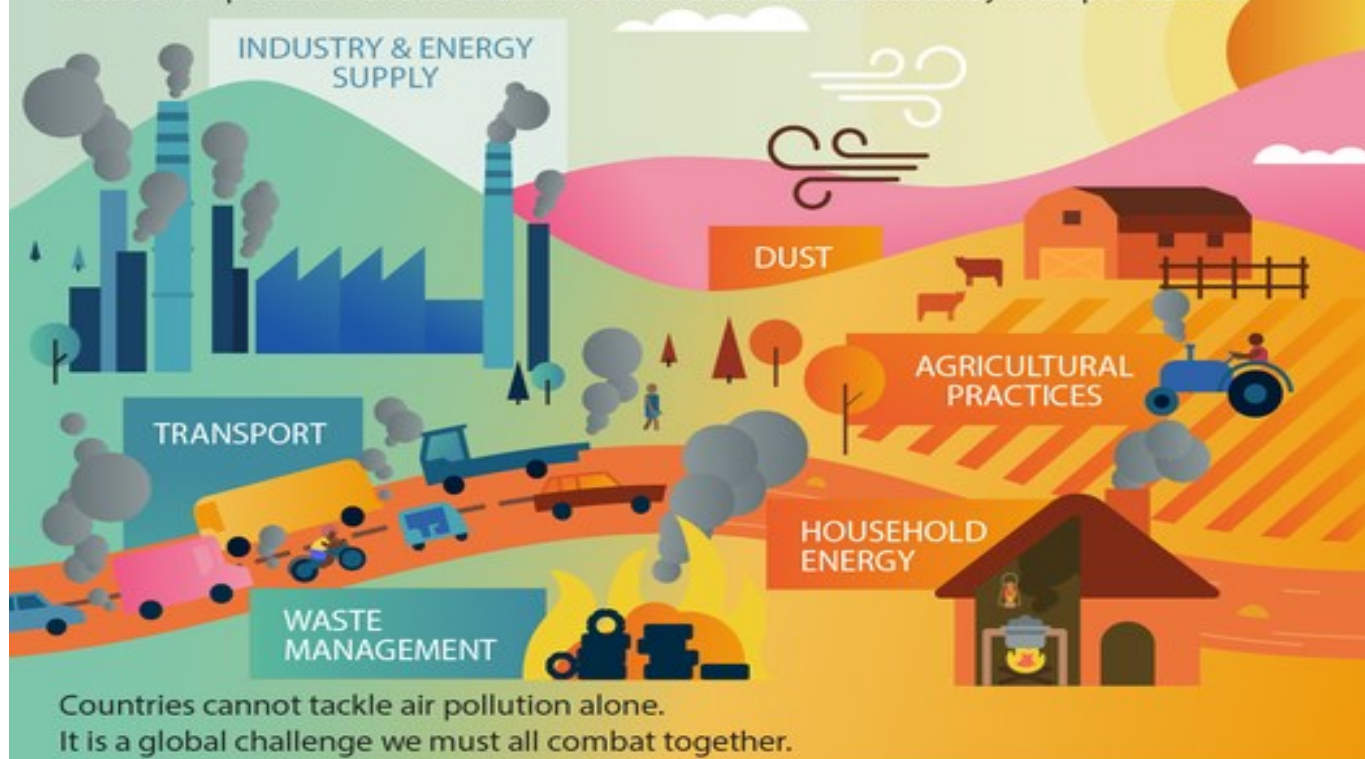
[What's Air Got to Do with It? Properties & Quality](#) (December 11th, 2020)

"Students are introduced to the concepts of air pollution, air quality, and climate change. The three lesson parts (including the associated activities) focus on the prerequisites for understanding air pollution. First, students use M&M® candies to create pie graphs that express their understanding of the composition of air. Next, they watch and conduct several simple experiments to develop an understanding of the properties of air (it has mass, it takes up space, it can move, it exerts pressure, it can do work). Finally, students develop awareness and understanding of the daily air quality using the Air Quality Index (AQI) listed in the newspaper or online. In an associated literacy activity, students explore the environmental history timeline."



WHAT ARE THE SOURCES OF AIR POLLUTION?

Outdoor air pollution affects urban and rural areas and is caused by multiple factors:



CLEAN AIR FOR HEALTH

#AirPollution



The Science of Wildfires

[Wildfires and Climate Change, Interactive Website | NASA](#)

"Earth's warming climate is amplifying wildland fire activity, particularly in northern and temperate forests. When fires ignite the landscape, NASA's satellites and instruments can detect and track them. This information helps communities and land managers around the world prepare for and respond to fires and also provides a rich data source to help scientists better understand this growing risk."



[Wildfires and Climate Change](#)

"The Union of Concerned Scientists provides an infographic illustrating how climate change is fueling wild-fires, detailing the contributing factors and potential solutions."

[A Review of the Occurrence and Causes for Wildfires and Their Impacts on the Geoenvironment](#) (August 22nd, 2024)

"Wildfires have short- and long-term impacts on the geoenvironment, including the changes to biogeochemical and mechanical properties of soils, landfill stability, surface- and groundwater, air pollution, and vegetation. Climate change has increased the extent and severity of wildfires across the world. Simultaneously, anthropogenic activities—through the expansion of urban areas into wildlands, abandonment of rural practices, and accidental or intentional fire-inception activities—are also responsible for a majority of fires. This paper provides an overall review and critical appraisal of existing knowledge about processes induced by wildfires and their impact on the geoenvironment."



[Climate Change Indicators: Wildfires | U.S. EPA](#) (June 2024)

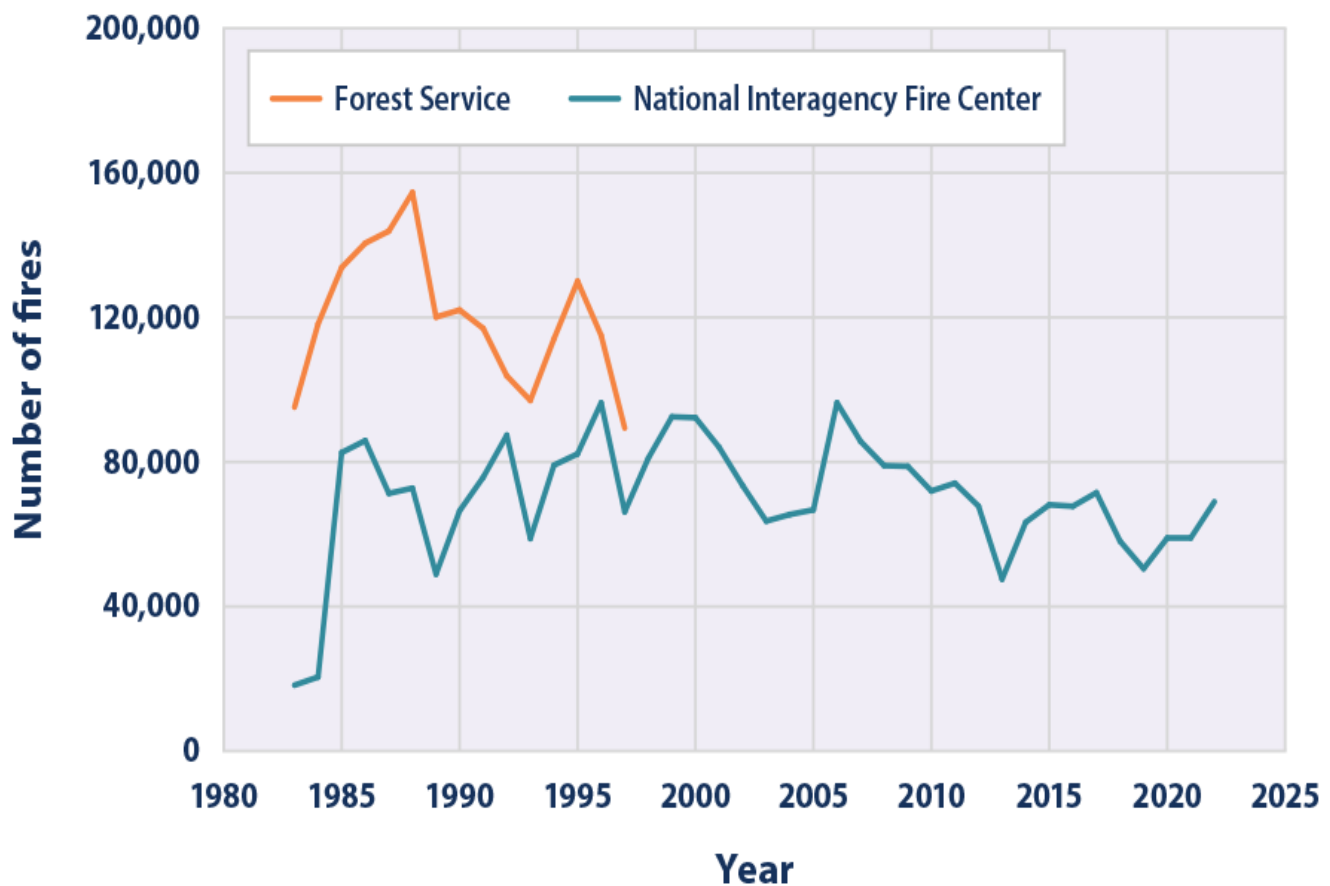
"This indicator tracks the frequency, extent, and severity of wildfires in the United States."

FAST FACT

"The 308,000 acres burned [in 2024] were more than the 151,000 in 2023 and 174,000 in 2022, but less than the 674,000 in 2021 and 842,000 in 2020, according to data provided by the Washington State Department of Natural Resources. "The unique sagebrush scrub habitat of the Columbia Basin in Washington was heavily affected by the 2020 fires, devastating populations of the endemic Columbia Basin pygmy rabbit and endangered greater sage-grouse."

<https://www.seattletimes.com/seattle-news/environment/the-2024-wildfire-season-appears-to-be-over-in-wa-heres-the-damage/>

The Science of Wildfires



[Why Wildfires Are Burning Hotter and Longer | Smithsonian Magazine](#) (December 20th, 2023)

"The 2023 United Nations Climate Change Conference, or COP28, begins this week in Dubai. A new topic on the agenda this year is how wildfires are emerging as a serious health risk not just to those in their immediate vicinity, but even to people thousands of miles away. Last summer, smoke from Canadian wildfires drifted not only as far south as the mid-Atlantic region of the United States, but even across the Atlantic Ocean.

We speak with John Vaillant, whose book *Fire Weather: A True Story from a Hotter World* recounts a 2016 wildfire in Fort McMurray, Canada that dislocated tens of thousands of people and caused billions of dollars in damage. That natural disaster seemed like a terrifying outlier when Vaillant began his reporting, but 2023's unprecedented fire activity suggest that Fort McMurray was merely the shape of things to come. John explains how climate change is making wildfires hotter and harder to contain. Next, we're joined by photojournalist Andria Hautamaki, who observed a "prescribed burn" in Plumas County, California. Andria shares how these kinds of carefully planned, intentionally set fires can be a useful tool for preventing more destructive blazes."

The Science of Wildfires



[E5: Wildfires—and How We're Changing Them | Climate Portal](#) (November 2nd, 2023)

"If you live in the U.S. Mountain West, the Pacific Coast of the Americas, or large parts of Australia or southern Europe, there's a good chance a major wildfire has passed near you in the last five or six years—maybe one more intense than anything you've ever heard of in your area. But why exactly are wildfires getting worse? Is climate change entirely to blame? And what should we be preparing for next? Dr. Daniel Swain is a climate scientist who studies the dynamics and impacts of the Earth's changing climate system. His research embraces "climate complexity" by accounting for the nuanced spatial, temporal, and intensity characteristics of our planet's response to increasing greenhouse gas concentrations."

[WA State Wildfires 2010-2020](#) (March 16th, 2023)

"From 2010 to 2020 there were 483 Wildfires in Washington state. A total of 4,290,026 acres were burned."

[Explainer: How Climate Change is Affecting Wildfires Around the World](#) (July 14th, 2020)

"Since this article was first published, the western US has also faced intense fires, with the state of California experiencing its worst fire season since modern records began. The states of Oregon and Washington have also seen a spike in large wildfires in 2020."



Health Impacts of Smoke Exposure



[Health Effects from Smoke | Department of Ecology State of Washington](#)

"Smoke from wildfires, wood stoves, outdoor burning, agricultural burning, and prescribed fires (used to manage forests) causes poor air quality that can hurt your health. We make daily burn decisions to help keep the air clean."

[Wildfire Smoke Information | Department of Ecology State of Washington](#)

"Wildfire smoke is a major threat to human health. Smoke from wildfires is the largest source of particle pollution in Washington. Breathing in smoke causes wheezing and coughing, heart and lung disease, and death. The number of acres burned by wildfires is increasing as climate change reduces winter snowpack and produces hotter and drier summers. We monitor air quality conditions and forecast smoke levels. We also work with the Washington Departments of Natural Resources and Health, the U.S. Forest Service, and the National Weather Service to track wildfire smoke and protect people who live in Washington."

[Smoke From Fires | Washington State Department of Health](#)

"Outdoor smoke contains very small particles and gases. These particles can get into your eyes and lungs where they can cause health problems. The main sources of outdoor smoke in Washington are: wildfires, wood stoves, pellet stoves, and fireplaces, agricultural burning, Prescribed fires (used to manage forests)."

Health Impacts of Smoke Exposure

[The Health Effects of Wildfire Smoke](#)

“The UW Department of Environmental & Occupational Health Sciences (DEOHS) has a long history of leading research into the impacts of wildfires on human health. Through our research and outreach activities, DEOHS faculty and students are building our understanding of how wildfire smoke can damage our health and the best ways to protect people and communities from harm.”

[Washington Smoke Blog](#)

“Welcome to the Washington Smoke blog, a partnership between state, county, and federal agencies, and Tribes. We coordinate to collectively share information for Washington communities affected by wildfire smoke.”

[Examining the Health Impacts of Short-Term Repeated Exposure to Wildfire Smoke](#)

“The objective of this project is to estimate the health effects (e.g., respiratory and cardiovascular diseases, hospitalization and emergency room visits) of short-term exposures repeated over days to weeks to wildfire-specific air pollution (e.g., hourly or daily variations, smoke wave) and to use this information to help educate communities and mitigate health risks in extreme events like wildfires. Updated estimates of health effects of short-term repeated exposure to wildfires will inform the California Air Resources Board’s (CARB’s) analysis of the health burdens from extreme events like wildfires. They will also help CARB estimate the impacts of policies meant to reduce the risk of wildfire and mitigate the impacts from smoke exposure.”



[Thirdhand Smoke Resource Center, Infographics](#)

“These infographics were created by the Thirdhand Smoke Resource Center and other trusted partners.”



Health Impacts of Smoke Exposure

[Health Effects Attributed to Wildfire Smoke](#) (January 30th, 2025)

“Although particle pollution is a principal public health threat from short-and longer-term exposure to wildfire smoke, it is important to keep in mind that wildfire smoke is a complex mixture that consists of other pollutants that have also been shown to lead to a variety of health effects. The health effects of particle pollution exposure can range from relatively minor (e.g., eye and respiratory tract irritation) to more serious health effects (e.g., exacerbation of asthma and heart failure, and premature death).”

[Your Questions About Wildfire Smoke and Health, Answered](#) (January 9th, 2025)

“Wildfire smoke can travel long distances and affect the air quality far beyond the immediate vicinity of the fire. In 2023, smoke from wildfires in Canada spread along the eastern coast of the U.S. and beyond, prompting officials to issue air quality warnings in places including New York, North Carolina, and Ohio.”



[Recommendations for Wildfire Smoke and Respiratory Viruses](#) (June 2024)

“This guidance will help air quality and public health officials in Washington state respond to wildfire smoke events when respiratory virus (COVID-19, Respiratory Syncytial Virus or RSV, influenza) transmission is also a concern. It indicates how wildfire smoke is impacted by the additional presence of respiratory viruses. Additional resources are included for each topic. This guidance provides baseline recommendations. Please also follow any local health jurisdiction, workplace, business, or school policies, which may provide additional guidance specific to their setting or community.”

Environmental Justice & Air Quality



[Environmental Health Chat](#)

"This podcast series explores how environmental exposures affect our health. Each episode highlights ways researchers work in partnership with community groups to understand and address environmental health issues."



[Children's Environmental Health Network Resources](#)

"This network provides lesson plans, teacher guides, and online environmental resources for educators, focusing on children's environmental health and safety."



[Environmental Justice Research Lab Infographics](#)

"The University of Southern California's Environmental Justice Research Lab offers infographics on topics such as air pollution and health, climate crisis impacts, and the effects on women's and children's health."

[Examining Air Pollution Exposure Dynamics in Disadvantaged Communities through High-Resolution Mapping](#) (August 2024)

"This study bridges gaps in air pollution research by examining exposure dynamics in disadvantaged communities. Using cutting-edge machine learning and massive data processing, we produced high-resolution (100 meters) daily air pollution maps for nitrogen dioxide (NO₂), fine particulate matter (PM_{2.5}), and ozone (O₃) across California for 2012–2019. Our findings revealed opposite spatial patterns of NO₂ and PM_{2.5} to that of O₃. We also identified consistent, higher pollutant exposure for disadvantaged communities from 2012 to 2019, although the most disadvantaged communities saw the largest NO₂ and PM_{2.5} reductions and the advantaged neighborhoods experienced greatest rising O₃ concentrations. Further, day-to-day exposure variations decreased for NO₂ and O₃. The disparity in NO₂ exposure decreased, while it persisted for O₃. In addition, PM_{2.5} showed increased day-to-day variations across all communities due to the increase in wildfire frequency and intensity, particularly affecting advantaged suburban and rural communities."



[Community Conversation Podcast - Environmental Pollution on Your Doorstep Education](#) (March 19th, 2024)

"In this episode, we speak with two local changemakers Arjoire Arberry-Baribeault with Beyond Toxics and Kelly Ferguson, science teacher with Kalapuya High School about environmental pollution and the impact on the community of West Eugene. We will hear how Beyond Toxics partnered with Kalapuya High School to take positive actions towards sharing out information and processing trauma through the power of ART! Trigger Warning: Childhood Cancer will be discussed in this episode."

Environmental Justice & Air Quality

[Air Quality Equity in US Climate Policy](#)
(June 20th, 2023)

"The United States government has indicated a desire to advance environmental justice through climate policy. As fossil fuel combustion produces both conventional pollutants and greenhouse gas (GHG) emissions, climate mitigation strategies may provide an opportunity to address historical inequities in air pollution exposure. To test the impact of climate policy implementation choices on



air quality equity, we develop a broad range of GHG reduction scenarios that are each consistent with the US Paris Accord target and model the resulting air pollution changes. Using idealized decision criteria, we show that least cost and income-based emission reductions can exacerbate air pollution disparities for communities of color. With a suite of randomized experiments that facilitates exploration of a wider climate policy decision space, we show that disparities largely persist despite declines in average pollution exposure, but that reducing transportation emissions has the most potential to reduce racial inequities."



[Focus on Air Pollution – This Month's PopEd Theme](#) (January 3rd, 2022)

"With ties to both environmental and human health, geography, and social and environmental justice, air pollution is a topic that touches all of our lives and can be investigated by students in both local and global contexts. For the next two months, we'll be diving into the topic of air pollution, and there is no shortage of issues to explore. We'll be sharing PopEd classroom materials, as well as resources from other reputable organizations, that encourage learning about acid rain, the Clean Air Act, impacts of transportation, indoor air pollution and more. We'll dig into questions like: Is the Clean Air Act considered a success? What are the causes and effects of acid rain? How can we reduce sources of air pollution? And of course, how can we make air pollution an integrated and engaging topic for K-12 learners?"

FAST FACT

"The passage of House Bill 1498 allows firefighters to call an interagency dispatch center directly and request aircraft, cutting out the need for additional phone calls and saving time during the initial attack phase of a wildfire." <https://www.seattletimes.com/seattle-news/environment/the-2024-wildfire-season-appears-to-be-over-in-wa-heres-the-damage/>

Environmental Justice & Air Quality



[Environmental Justice and Climate, Air Pollution, and Economic Decisions in the U.S. Power Sector | UC Davis Energy](#) (October 20th, 2021)

"Electricity generation is a large contributor to PM_{2.5} air pollution. However, the demographic distribution of its resulting exposure is largely unknown. We estimate the health effects from air pollution from electricity generation in the US, for each of the seven Regional Transmission Organizations, for each US state, by income and by race. Exposures are higher for lower-income than for higher-income, but disparities are larger by race than by income. Geographically, we observe large differences between where electricity is generated and where people experience the resulting air pollution health consequences: for 36 US states, most of the health impacts are attributable to emissions in other states. Then, we discuss the issue of improved air quality and human health, which are often discussed as "co-benefits" of mitigating climate change, yet they are rarely considered when designing or implementing climate policies. We have developed and implemented a model that optimizes emissions reductions costs from the U.S. power sector for climate and health benefits under retirements and new plant construction decisions. We determine the best locations for replacing power plants with new wind, solar, or natural gas to meet a CO₂ reduction target in the United States. We employ a capacity expansion model with integrated assessment of climate and health damages, comparing portfolios optimized for benefits to climate alone or both health and climate. The model estimates county-level health damages and accounts for uncertainty by using a range of air quality models (AP₃, EASIUR, and InMAP) and concentration–response functions (American Cancer Society and Harvard Six Cities). We find that reducing CO₂ by 30% yields \$21–68 billion in annual health benefits, with an additional \$9–36 billion possible when co-optimizing for climate and health benefits. Total health benefits equal or exceed climate benefits across a wide range of modeling assumptions. Our results demonstrate the value of considering health in climate policy design and the need for interstate cooperation to achieve additional health benefits equitably."

[Climate Policy, Environmental Justice, and Local Air Pollution](#) (October 2020)

"This paper explores linkages between U.S. climate policy, environmental justice (EJ), and local air pollution. Policy proposals recently introduced by Democrats place EJ concerns at the heart of the climate policy agenda.¹ To gain insight into how this policy imperative could be implemented, we draw lessons from recent legislative and regulatory experiences in California. In 2006, California began a path-breaking experiment to incorporate EJ concerns into an ambitious climate change mitigation agenda. We review this experience to date, noting some early pitfalls and subsequent course corrections. We base this analysis on our own research and policy engagement. We do not represent or claim to speak for the EJ community."

Air Quality Monitoring & Data Literacy

[Wildfire Smoke and Your Patients' Health: The Air Quality Index](#)

"Air agencies across the U.S. use the Air Quality Index (AQI) to communicate about air quality. The AQI is a nationally uniform color-coded index developed by EPA for reporting and forecasting daily air quality. The AQI reports the most common ambient air pollutants that are regulated under the Clean Air Act, including ozone and particle pollution (PM₁₀ and PM_{2.5}). The AQI informs the public about air quality in the area, tells who may be affected, and provides steps to take to reduce exposure when pollution levels are unhealthy."

[Air Quality Index: Using Air Quality Information to Protect Yourself from Outdoor Air Pollution](#) (September 18th, 2024)

"Ever hear your local weather forecast say that tomorrow will be a "code orange" day for air pollution? That's the Air Quality Index at work. The Air Quality Index, or AQI, is the system used to warn the public when air pollution is dangerous. The AQI tracks ozone (smog) and particle pollution (tiny particles from smoke, power plants and factories, vehicle exhaust, and other sources), as well as four other widespread air pollutants. Newspapers, radio, television, and websites report AQI levels year-round. Keeping track of the current air quality information in your area can help you take steps to protect yourself, children, and others from unhealthy levels of air pollution."

[Air Quality Index Explained: How AQI Affects Our Environment](#) (August 12th, 2024)

"The Air Quality Index (AQI) is a crucial tool used by the Environmental Protection Agency (EPA) to measure air quality. It provides a simple, easy-to-understand way to communicate how polluted the air currently is or how polluted it is forecast to become. Understanding the AQI is essential for protecting public health and the environment."

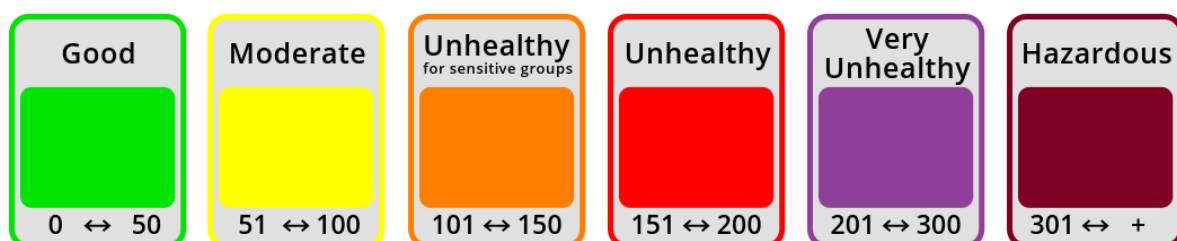


[Breathing Easy: The Air Quality Index and What It Means](#) (July 23rd, 2024)

"With the smoky conditions outside, we turn to the Air Quality Index. It can be confusing to understand, so we had Meteorologist Lauren Brand explain it to us."



Air Quality Index (AQI)



Air Quality Monitoring & Data Literacy



[Breathing Easy: The Air Quality Index and What It Means](#) (July 23rd, 2024)

"With the smoky conditions outside, we turn to the Air Quality Index. It can be confusing to understand, so we had Meteorologist Lauren Brand explain it to us."



[How Is Air Quality Measured? | Britannica](#) (May 13th, 2024)

"Smog. Pollen. Wildfire smoke. Even something as simple as breathing can be complicated by outside forces. How do we measure changes to the air we breathe to survive? The air quality index was created by the U.S. Environmental Protection Agency to communicate whether the air quality and air pollution level in an area is healthy or unhealthy."

[Communicating Air Quality Index Information: Effects of Different Styles on Individuals' Risk Perception and Precaution Intention](#) (October 8th, 2021)



"Air Quality Index (AQI) is information about atmospheric pollutants, which is essential for governments to inform the public about the current air quality and poten-

Name	Index Value	Advisory
Good	0 to 50	None
Moderate	51 to 100	Usually sensitive individuals should consider limiting prolonged outdoor exertion.
Unhealthy for Sensitive Groups	101 to 150	Children, active adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion.
Unhealthy	151 to 200	Children, active adults, and people with respiratory disease, such as asthma, should avoid outdoor exertion; everyone else should limit prolonged outdoor exertion.
Very Unhealthy	201 to 300	Children, active adults, and people with respiratory disease, such as asthma, should avoid outdoor exertion; everyone else should limit outdoor exertion.
Hazardous	301 to 500	Everyone should avoid all physical activity outdoors.

tial health risks. By analyzing the AQIs from 11 countries (regions), we discovered considerable variations in the design of AQI information, which may open up room for unintended interpretation from the public. Therefore, as an attempt to address the inefficiency of some common styles of AQI information in promoting the public's precaution against bad air and better design such information, an online experiment with a 2 (descriptor: neutral vs. negatively valenced) × 2 (target groups in AQI warning messages: vague vs. specific) factorial design was conducted to test the effects of such information on individuals' risk perception and precaution intention. The results indicated that AQI information with a neutral descriptor was associated with lower self-risk perception and precaution intention levels than with a negatively valenced one. Among the individuals not included in the at-risk groups, those who read the warning messages with vague target groups had a higher third-person perception toward smog risk than those targeting specific population groups. Practical and theoretical implications are discussed."

Air Quality Monitoring & Data Literacy



[Evaluating the U.S. Air Quality Index as a Risk Communication Tool: Comparing Associations of Index Values with Respiratory Morbidity Among Adults in California](#) (November 17th, 2020)

"The Air Quality Index (AQI) in the United States is widely used to communicate daily air quality information to the public. While use of the AQI has led to reported changes in individual behaviors, such behavior modifications will only mitigate adverse health effects if AQI values are indicative of public health risks. Few studies have assessed the capability of the AQI to accurately predict respiratory morbidity risks."



[Air Quality Index \(AQI\) - What It Means for You](#) (February 9th, 2017)

"In the United States, the Environmental Protection Agency (EPA) has developed an Air Quality Index, also known as the AQI, which is used to report daily air quality conditions. It is a tool used by various agencies to provide the public with timely and easy-to-understand information on local air quality and whether air pollution levels pose a health concern."



[MEECS Air Quality | Air Quality Index: Video Lesson 8](#) (July 31st 2016)

"In this lesson, students to access daily information about air quality. Students answer the essential question: What can the Air Quality Index (AQI) tell us about conditions outdoors?"

Indigenous Fire Stewardship

[Fire Stewardship | Indigenous Leadership Initiative](#)

"Indigenous fire stewardship restores the land and asserts Indigenous Nations' inherent rights to care for their territories."



[Cultural Burning](#)

"In today's world of increasingly frequent catastrophic wildfires, it can be hard to think of wildfire as beneficial. However, Indigenous people have used controlled burning for thousands of years to reduce the risk of catastrophic fire, enhance access to food and plant materials, and sustain healthy and resilient ecosystems. Such practices are referred to as "cultural burning" due to their importance in many Native American cultures. This lesson will introduce students to the role of cultural burning in traditional Indigenous land management practices and to actions the Confederated Tribes of Siletz Indians, and many other Tribes across North America, are taking to revive and expand this important practice on Tribal, state, and federal lands. Students will explore the topic of cultural burning through a classroom game, discussion, and data interpretation activity."



[Cultural and Prescribed Fire Youth Education](#)

"The new FireSmart BC Education Program is a free, all-in-one teaching resource to introduce students in grades K-12 to FireSmart concepts, including how to make homes and communities more resilient to wildfire."



[British Columbia FireSmart | Education Program \(Grades 7-9\)](#)

"In this lesson, students identify important lessons from Indigenous Peoples' traditional knowledge and practices that could help prevent wildfires and protect communities from them."

[Northwest Fire Science Consortium | A JFSP Fire Science Exchange Network](#)

"The Northwest Fire Science Consortium is a multi-disciplinary, multi-institutional network consisting of federal and state agencies, non-governmental organizations, universities, and private landowners within Washington and Oregon."

Did You Know?

"Through prescribed burns, thinning and other methods – more than 800,000 acres of forests in seven years, well ahead of the goal of restoring 1.25 million acres in 20 years on federal, state, tribal and private lands."

<https://www.spokesman.com/stories/2024/oct/11/wildfires-torch-over-300000-acres-in-washington-th/>

Indigenous Fire Stewardship

[Pre-Contact Indigenous Fire Stewardship: A Research Framework and Application to a Pacific Northwest Temperate Rainforest](#) *(June 25th, 2024)*

"Fire is a key disturbance process that shapes the structure and function of montane temperate rainforest in the Pacific Northwest (PNW). Recent research is revealing more frequent historical fire activity in the western central Cascades than expected by conventional theory. Indigenous peoples have lived in the PNW for millennia. However, Indigenous people's roles in shaping vegetation mosaics in montane temperate forests of the PNW has been overlooked, despite archaeological evidence of long-term, continuous human use of these landscapes. In this paper, we present a generalizable research framework for overcoming biases often inherent in historical fire research. The framework centers Indigenous perspectives and ethnohistory, leveraging theory in human ecology and archaeology to interpret fire histories. We apply this framework to place-based, empirical evidence of Indigenous land use and dendroecological fire history. Our framework leads us to conclude that the most parsimonious explanation for the occurrence of historical high fire frequency in the western Cascades is Indigenous fire stewardship. Further, our case study makes apparent that scholars can no longer ignore the role of Indigenous people in driving montane forest dynamics in the PNW."

[Blending Indigenous and Western Science: Quantifying Cultural Burning Impacts in Karuk Aboriginal Territory](#) *(April 15th, 2024)*

"The combined effects of Indigenous fire stewardship and lightning ignitions shaped historical fire regimes, landscape patterns, and available resources in many ecosystems globally. The resulting fire regimes created complex fire–vegetation dynamics that were further influenced by biophysical setting, disturbance history, and climate. While there is increasing recognition of Indigenous fire stewardship among western scientists and managers, the extent and purpose of cultural burning is generally absent from the landscape–fire modeling literature and our understanding of ecosystem processes and development. In collaboration with the Karuk Tribe Department of Natural Resources, we developed a transdisciplinary Monte Carlo simulation model of cultural ignition location, frequency, and timing to simulate spatially explicit cultural ignitions across a 264,399-ha landscape within Karuk Aboriginal Territory in northern California. Estimates of cultural ignition parameters were developed with Tribal members and knowledge holders using existing interviews, historical maps, ethnographies, recent ecological studies, contemporary maps, and generational knowledge. Spatial and temporal attributes of cultural burning were explicitly tied to the ecology of specific cultural resources, fuel receptivity, seasonal movement patterns, and spiritual practices. Prior to colonization, cultural burning practices were extensive across the study landscape with an estimated 6972 annual ignitions, averaging approximately 6.5 ignitions per Indigenous fire steward per year. The ignition characteristics we document align closely with data on historical fire regimes and vegetation but differ substantially from the location and timing of contemporary ignitions. This work demonstrates the importance of cultural burning for developing and maintaining the ecosystems present at the time of colonization and underscores the need to work collaboratively with Indigenous communities to restore ecocultural processes in these systems."

Indigenous Fire Stewardship

[Indigenous Fire Practices Shape Our Land](#) (March 17th, 2024)

“For many millennia, fire was integral to many Indigenous peoples’ way of life. Native Americans, Alaska Natives, and Native Hawaiians used fire to clear areas for crops and travel, to manage the land for specific species of both plants and animals, to hunt game, and for many other important uses. Fire was a tool that promoted ecological diversity and reduced the risk of catastrophic wildfires.”

[Indigenous Fire Stewardship for Fire Management and Ecological Restoration in the Pacific Northwest](#) (Fall 2023)

“Resilience to wildfires is declining in forests of the western US, in part because of the loss of biodiverse forest structures that buffer the severity of fire impacts. Indigenous fire stewardship (IFS) plays a critical role in the maintenance of North American forest resilience. The displacement and genocide of Indigenous peoples and their cultural practices, including the prohibition of IFS, have coincided with fire exclusion and suppression policies implemented by federal and state agencies, and have led to the diminishment of this management practice that has existed since time immemorial.”



Indigenous Fire Stewardship



[How the Indigenous Practice of 'Good Fire' Can Help Our Forests Thrive](#) (April 5th, 2022)

"2018's Camp Fire grew into the state's deadliest and most destructive fire on record, devastating the towns of Paradise and Concow. Last year the state suffered the Dixie Fire, raging for months through five Northern California counties on its way to becoming the single-largest blaze in state history."

[The Right to Burn: Barriers and Opportunities for Indigenous-Led Fire Stewardship in Canada](#) (March 31st, 2022)

"Indigenous fire stewardship enhances ecosystem diversity, assists with the management of complex resources, and reduces wildfire risk by lessening fuel loads. Although Indigenous Peoples have maintained fire stewardship practices for millennia and continue to be keepers of fire knowledge, significant barriers exist for re-engaging in cultural burning. Indigenous communities in Canada have unique vulnerabilities to large and high-intensity wildfires as they are predominately located in remote, forested regions and lack financial support at federal and provincial levels to mitigate wildfire risk. Therefore, it is critical to uphold Indigenous expertise in leading effective and socially just fire stewardship. In this perspective, we demonstrate the benefits of cultural burning and identify five key barriers to advancing Indigenous fire stewardship in Canada. We also provide calls to action to assist with reducing preconceptions and misinformation and focus on creating space and respect for different knowledges and experiences. Despite growing concerns over wildfire risk and agency-stated intentions to establish Indigenous Peoples as partners in wildfire management, power imbalances still exist. The future and coexistence with fire in Canada needs to be a shared responsibility and led by Indigenous Peoples within their territories."

[Indigenous Fire Stewardship](#) (2019)

"This chapter addresses Indigenous Fire Stewardship and cultural burning using several case studies applicable to wildland fire management in the Wildland-Urban Interface. Indigenous fire stewardship practices had the highest influence around settlements (e.g. permanent villages, seasonal camps) and travel corridors (i.e. trails and roads) that linked with more intensively managed habitats containing food, material-fiber/basketry, wildlife/prey, and other desired resources. Frequent and diversified Indigenous burning coupled with natural ignitions reduced fuel loading, which often lowered the intensity and resultant severity of subsequent fires. As such, lower fuel load continuity, increased proportion of fire-adapted vegetation, and heterogeneous habitats (mosaics) greatly reduced the threat of and impacts of non-desired wildfires."

Indigenous Fire Stewardship

[Maintaining the Mosaic: The Role of Indigenous Burning in Land Management](#) (November 2001)

"This article highlights the findings of the literature on aboriginal fire from the human-and the land-centered disciplines and suggests that the traditional knowledge of indigenous peoples be incorporated into plans for reintroducing fire to the nation's forests. Traditional knowledge represents the outcome of long experimentation with application of fire by indigenous people, which can inform contemporary policy discussions."



Policy & Solutions, Locally & Globally

[London-Wide Ulez Cut Pollution Most in the Areas that Opposed It](#) (March 7th, 2025)

"A new report estimates that nitrogen dioxide emissions fell by 14 per cent in the city's outer boroughs during the expanded scheme's first year."

[US State Department Kills Global Air Monitoring Program Researchers Say Paid for Itself](#) (March 5th, 2025)



"The State Department's air quality program eventually became an example of a smart, efficient diplomacy that boosted American soft power while bringing about real-world changes. "I've never seen an initiative of the US government have such an immediate, dramatic impact in a country," Gary Locke, a former US ambassador to China, told the Washington Post back in 2013. The project was so successful that it was featured on the website of the National Museum of American Diplomacy."

[Quantifying US Air Pollution Policy: How Political and Regional Factors Influence Pollutant Mitigation](#) (May 5th, 2024)

"Air pollution control in the United States has evolved into a comprehensive policy system spanning from the federal to the state level over time. A unified quantitative analysis of policy intensity can shed light on the policy evolution across different levels, the influence of partisan and regional factors on policy, and the relationships with emissions of major pollutants. By harnessing the policy text of the Clean Air Act (CAA) at the federal level and State Implementation Plans (SIPs) at the state governments (1955–2020), we deployed a Natural Language Processing approach to define a policy intensity index to systematically quantify the US air policy landscape. Our findings highlight that the 1970 CAA amendment carries the most vigorous intensity as it established a holistic control system for the first time. Subsequent years witnessed a general trend of partisan polarization, eventually leading to a gradual convergence between red and blue states. Blue states demonstrated a closer alignment with federal directives and a superior efficacy in pollutant reduction. Regionally, the Northeast displays the highest overall policy intensity, and the West exhibits the highest coordination with the federal benchmarks, making these regions outperform others in air pollution control. Our study not only discusses policy implications for air pollutant reductions considering partisan and regional differences but also provides a novel measurement tool to quantify policies for assessing disparities and synergies."

Policy & Solutions, Locally & Globally

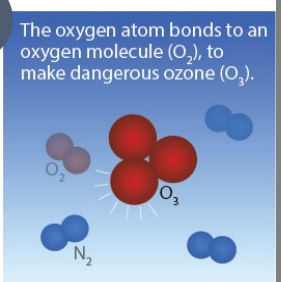
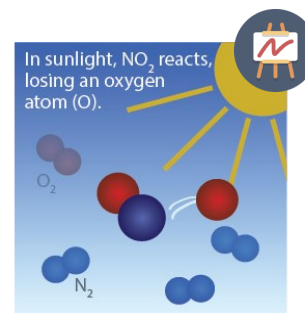
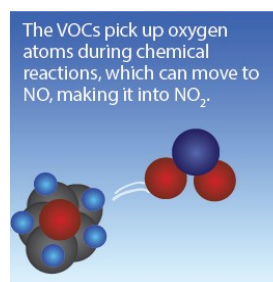
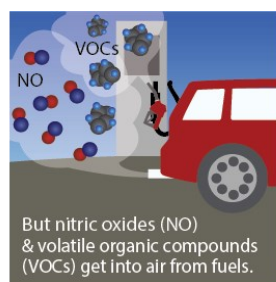
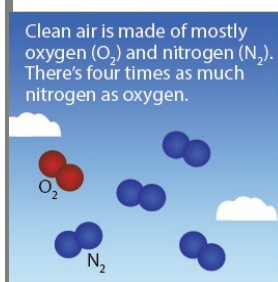


[Webinar: Leveraging Air Pollution Research Advancements for Environmental Health Policy Decisions](#)
(December 16th, 2022)

"As part of the White House Year of Evidence for Action Forum Series, the White House Office of Science and Technology Policy (OSTP), in collaboration with the White House Office of Management and Budget (OMB) and the Health Effects Institute, hosted this Evidence Forum webinar. The event showcased how researchers can ensure their work is relevant and useful for policy decisions around air pollution exposure and health inequities. New and emerging air pollution monitoring, modeling, and remote-sensing technologies are rapidly becoming available. There are expanding opportunities for researchers to work directly with communities to conduct impactful work that informs policy actions and addresses environmental injustices at all levels of government. The program highlighted the work of researchers who are actively applying air quality science and technology data and tools to environmental justice policy questions. It included discussions with agency and community leaders who have effectively leveraged these innovative research activities for environmental justice policy decisions."

[Reducing Global Air Pollution: The Scope for Further Policy Interventions](#) (September 28th, 2020)

"Over the last decades, energy and pollution control policies combined with structural changes in the economy decoupled emission trends from economic growth, increasingly also in the developing world. It is found that effective implementation of the presently decided national pollution control regulations should allow further economic growth without major deterioration of ambient air quality but will not be enough to reduce pollution levels in many world regions. A combination of ambitious policies focusing on pollution controls, energy and climate, agricultural production systems and addressing human consumption habits could drastically improve air quality throughout the world. By 2040, mean population exposure to PM_{2.5} from anthropogenic sources could be reduced by about 75% relative to 2015 and brought well below the WHO guideline in large areas of the world. While the implementation of the proposed technical measures is likely to be technically feasible in the future, the transformative changes of current practices will require strong political will, supported by a full appreciation of the multiple benefits. Improved air quality would avoid a large share of the current 3–9 million cases of premature deaths annually. At the same time, the measures that deliver clean air would also significantly reduce emissions of greenhouse gases and contribute to multiple UN sustainable development goals."



Policy & Solutions, Locally & Globally

[Air Pollution Control Strategies Directly Limiting National Health Damages in the US](#) (February 19th, 2020)

“Exposure to fine particulate matter (PM_{2.5}) from fuel combustion significantly contributes to global and US mortality. Traditional control strategies typically reduce emissions for specific air pollutants and sectors to maintain pollutant concentrations below standards. Here we directly set national PM_{2.5} mortality cost reduction targets within a global human-earth system model with US state-level energy systems, in scenarios to 2050, to identify endogenously the control actions, sectors, and locations that most cost-effectively reduce PM_{2.5} mortality. We show that substantial health benefits can be cost-effectively achieved by electrifying sources with high primary PM_{2.5} emission intensities, including industrial coal, building biomass, and industrial liquids. More stringent PM_{2.5} reduction targets expedite the phaseout of high emission intensity sources, leading to larger declines in major pollutant emissions, but very limited co-benefits in reducing CO₂ emissions. Control strategies limiting health damages achieve the greatest emission reductions in the East North Central and Middle Atlantic states.”



[Climate Change Resources | Infographics](#)



“When information is complicated, as it often is in climate change, infographics have often succeeded in providing simple and direct ways of clarifying those facts visually by illustrating the message in a way that makes it more accessible, persuasive, and engaging than text alone.”

Personal & Community Actions, Locally & Globally



[Puget Sound Clean Air Agency](#)

"Puget Sound Clean Air Agency jurisdiction covers King, Kitsap, Pierce, and Snohomish counties. These four counties are home to more than 4.1 million people, over half the state's population. Every day we work to protect public health, improve neighborhood air quality, and reduce our region's contribution to climate change."

[Stand Up For Clean Air](#)

"You can help protect our nation's air quality. From reducing emissions to advocating for change, small actions can make a big, collective difference."

[What You Can Do to Help Improve Air Quality](#)

"One person can make a difference in Missouri's air quality. Reducing the amount of dangerous emissions from vehicles benefits our outdoor air. You can safeguard Missouri's air quality by taking the following steps."

[Personal Actions to Protect Our Air](#)

"Our cars, lawn and garden equipment, and other products (e.g., paints and cleaners) are all responsible for ozone pollution. Ozone is a volatile and reactive compound. When ozone forms faster than it can break down, levels become high. Ozone levels can become high anytime, but ozone forms faster with warm temperatures, especially when summer days are hot, sunny, stifling, and with little wind. Because of the geography of the Front Range, ozone levels tend to be higher in the Denver Metro Region than in other parts of Colorado."

[Air Quality Partnerships with Communities](#) (February 26th, 2025)

"EPA's Region 5 office works with communities across the Midwest to use our programs and regulatory authorities to address air quality concerns and interests. We welcome working with citizens, governments, and organizations who are interested in actions to improve air quality and address climate change."

Personal & Community Actions, Locally & Globally

[10 Tips to Protect Yourself from Unhealthy Air](#) (September 18th, 2024)

"Here are some simple, effective tips for protecting you and your family from the dangers of outdoor air pollution."

[Personal-Level Actions to Reduce Air Pollution Exposure in the WHO European Region](#) (February 2nd, 2024)

"This report summarizes evidence and information and formulates practical advice on personal-level actions to reduce exposure to ambient air pollution. It covers personal actions such as reducing the amount of time spent in polluted outdoor environments, adjusting the location and timing of physical activity, using air cleaners, wearing face coverings, and mobility options (transport, active transportation, routes, driving style and vehicle settings). Each topic is evaluated according to a uniform set of criteria, ranging from effectiveness to personal costs and social factors. Most of the evidence available to inform the advice derives from western European and North American studies. Although evidence on effectiveness and on health risks/harms can be considered applicable across settings, evidence on economic, social or feasibility factors is less so. Consequently, the applicability of the advice presented in this report should be carefully considered at national level, especially in settings outside western Europe."

[Engaging Communities in Addressing Air Quality: A Scoping Review](#) (September 19th, 2022)

"Exposure to air pollution has a detrimental effect on health and disproportionately affects people living in socio-economically disadvantaged areas. Engaging with communities to identify concerns and solutions could support organisations responsible for air quality control, improve environmental decision-making, and widen understanding of air quality issues associated with health. This scoping review aimed to provide an overview of approaches used to engage communities in addressing air quality and identify the outcomes that have been achieved."

Did You Know?

"From 1980–2024, there were 36 confirmed weather/climate disaster events with losses exceeding \$1 billion each to affect Washington. These events included 13 drought events, 3 flooding events, 1 freeze event, 1 severe storm event, 15 wildfire events, and 3 winter storm events. The 1980–2024 annual average is 0.8 events (CPI-adjusted); the annual average for the most recent 5 years (2020–2024) is 2.2 events (CPI-adjusted)."

<https://www.ncei.noaa.gov/access/billions/state-summary/WA>



WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

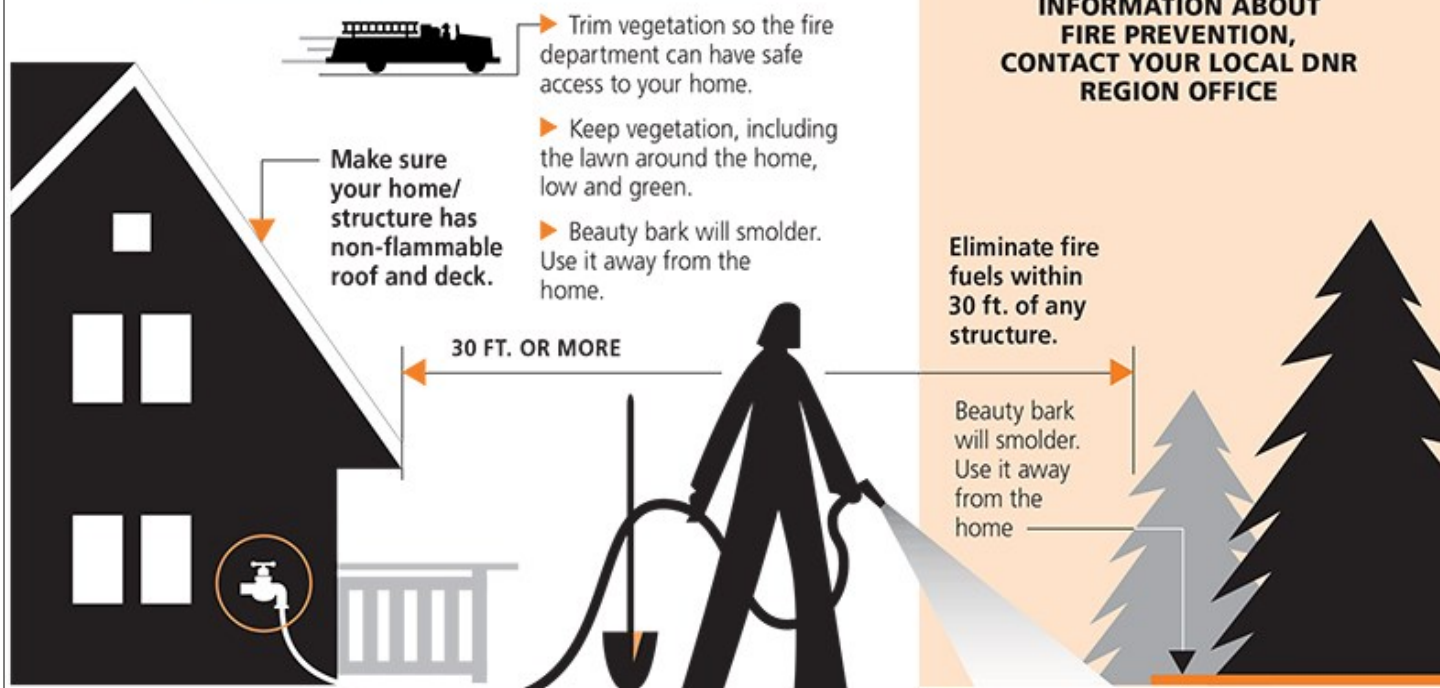
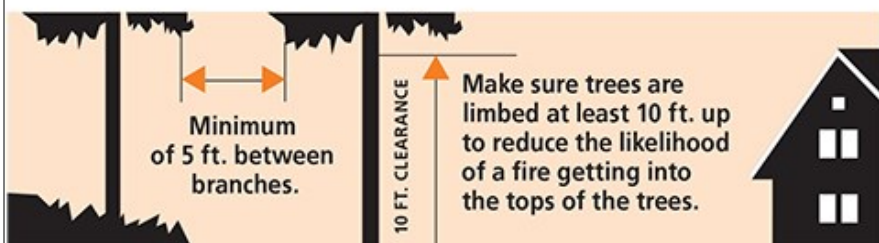
Fire Prevention



Defend Your Home from Wildfire

NO COST EVALUATION

* If you live in
DNR's Northeast Region,
509-684-7474 or
DNR's Southeast Region,
509-884-3472, DNR
foresters can come out and
assess your home at
no cost.



**FOR MORE
INFORMATION ABOUT
FIRE PREVENTION,
CONTACT YOUR LOCAL DNR
REGION OFFICE**



dnr.wa.gov

**TO REPORT A FIRE, PLEASE
CALL 1-800-562-6010**



WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

Prevención de Incendios



Defienda Su Casa de Incendios Forestales

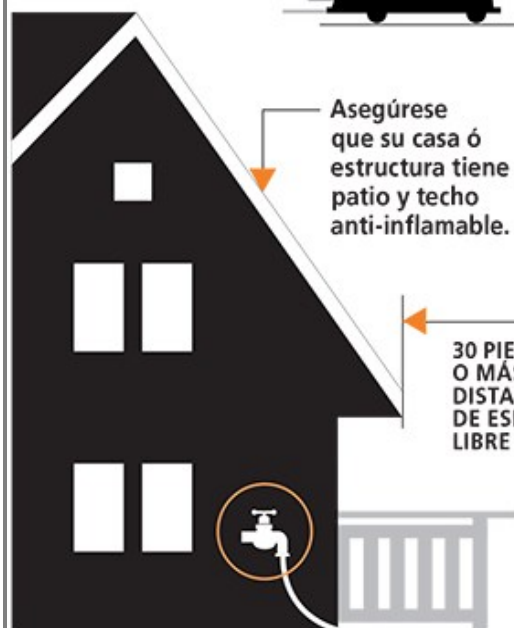
EVALUACIÓN GRATIS

* Si vive en la **Región Noreste de DNR** (Departamento de Recursos Naturales), **509-684-7474** (inglés) o en la **Región Sudeste de DNR**, **509-925-8510** (inglés), y no está seguro de cuán segura es su casa contra incendios, personal de DNR puede venir a evaluar su casa sin costo alguno.



Deje 5 pies (1,5 metros) de espacio libre entre las ramas

Corte las ramas hasta por lo menos 10 pies (3 metros) para evitar que las llamas de fuego lleguen a la copa del árbol.



Asegúrese que su casa ó estructura tiene patio y techo anti-inflamable.

▶ Recorte el césped y vegetación para que los bomberos puedan llegar a su casa sin problemas.

▶ Mantenga la vegetación y césped alrededor de su casa bien cortado y verde.

▶ No use material orgánico (hojas, partículas de corteza (beauty bark), paja, etc.) cerca de su casa. Estos arden fácilmente.

30 PIES (9 M.) O MÁS DISTANCIA DE ESPACIO LIBRE



PARA MÁS INFORMACIÓN SOBRE PREVENCIÓN DE INCENDIOS, COMUNÍQUESE CON LA OFICINA REGIONAL DE DNR MÁS CERCANA

Elimine materiales combustibles dentro de 30 pies (9 metros) de cualquier estructura.

No use material orgánico (hojas, partículas de corteza (beauty bark), paja, etc.) cerca de su casa. Estos arden fácilmente.



dnr.wa.gov

PARA REPORTAR UN INCENDIO, POR FAVOR LLAME AL 1-800-562-6010 (INGLÉS)

Personal & Community Actions, Locally & Globally

[10 Things You Can Do to Help Reduce Air Pollution Today](#) (October 7th, 2020)

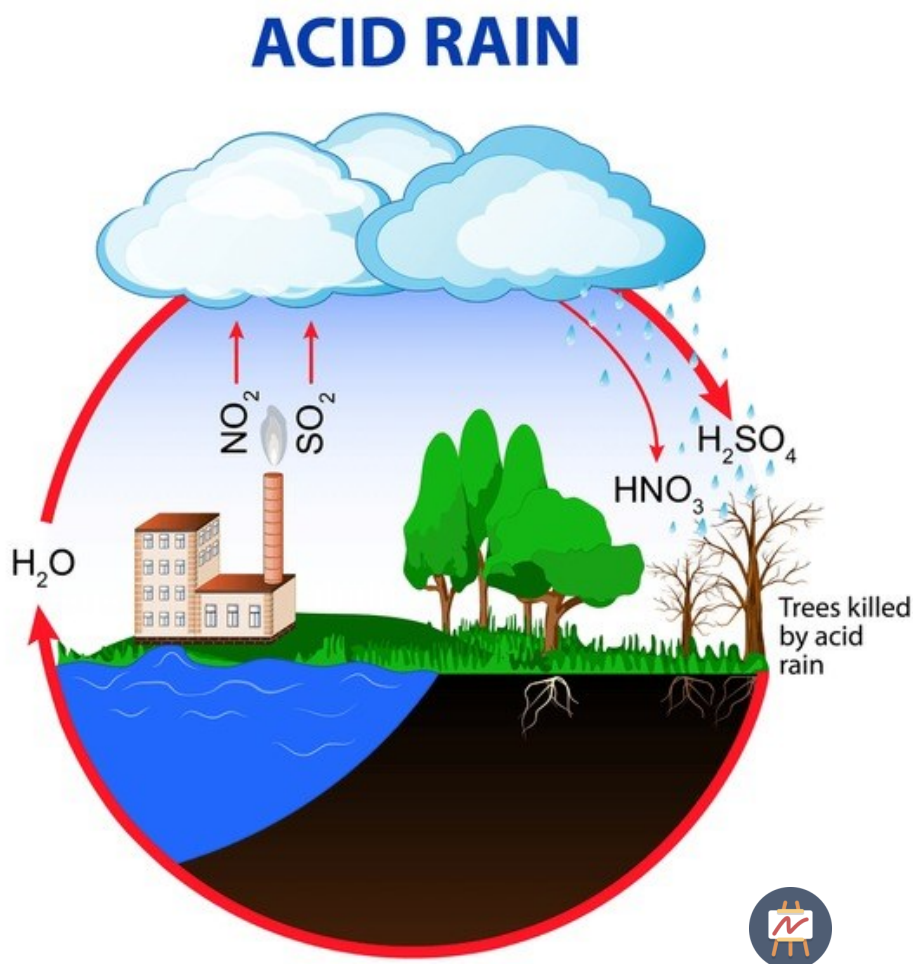
“While a large part of the pollution may come from industries and companies that are outside of our control, there are still many things we as individuals can do to make a difference to our air quality. Here, we answer your most commonly asked questions about air pollution and share ten practical ideas that you can do now to start reducing your impact.”

[Improving Air Quality in Your Community](#) (February 21st, 2016)

“Communities like yours are essential to protecting our environment and improving public health. EPA is committed to finding ways to help build the capacity of communities to improve their quality of life. This Web site presents ideas on what communities can do to improve local air quality. Many communities have successfully engaged in these activities and made improvements to their local air quality.”

[Simple Solutions to Help Reduce Air Pollution](#) (September 19th, 2011)

“There are simple steps you can take in your everyday life to help improve air quality. Every time you drive to work or school, use your heater or air conditioner, clean your windows or even style your hair, you make



Cross-Curricular Connections



[Lesson Plans, Teacher Guides and Online Resources for Educators](#)

"Find an array of environmental and science-based lesson plans, activities and ideas below from EPA, other federal agencies and external organizations."



[5 Ways to Teach About Air Pollution](#)

"Reducing air pollution activities will not only benefit in terms of human health, but it will reduce the amount of toxic pollution affecting other species and help combat climate change. If you are looking to start off the school year with some new resources that easily integrate into your lesson plans, then look no further! The topic of air pollution fits into a number of different subjects, including history, social studies, science, and math."

[Citizen Science](#)

"In citizen science, the public participates voluntarily in the scientific process, addressing real-world problems in ways that may include formulating research questions, conducting scientific experiments, collecting and analyzing data, interpreting results, making new discoveries, developing technologies and applications, and solving complex problems. In crowdsourcing, organizations submit an open call for voluntary assistance from a large group of individuals for online, distributed problem solving."



[Why Study Air Pollution, High School and Middle School Air Quality Education Program](#)

"Students will examine the topic of air pollution, its possible solutions, and the government agencies that are responsible to deal with environmental issues."



[Social Studies Unit Plans](#)

"Incorporating climate change and environmental issues into social studies lessons can be a challenge. These SubjectToClimate unit plans were developed by our content developers to provide social studies teachers with free, detailed lesson plans that are packed with reliable resources, engaging activities, fun games, and more. The lesson plans are made by teachers, for teachers!"

Cross-Curricular Connections



[Air Pollution Activities Environment Issues Special Education Types of Pollution](#)

"This unit on Air Pollution and Air Quality examines things that will help keep our air clean and healthy. It was specifically designed for students with special learning needs, especially autism...There are many opportunities for students to engage in repeated information on how our choices will impact the air for everyone, including plants and animals. This repetition helps students make connections to this important and often abstract information."



[Pollution Lesson, Page 3](#)

An array of air quality and pollution lesson plans and activities for students.

[Groundbreaking Air Pollution Study Marks 30 Years](#) (January 4th, 2024)

"The Harvard Six Cities Study, which had a profound impact on efforts to curb air pollution in the U.S., turned 30 in December. The study found that fine particulate pollution was linked with mortality at much lower levels than previously thought."



[Teaching Air Pollution: An Integrated Approach for High School Classrooms](#) (February 15th, 2022)

"Air pollution has ties to environmental and human health, geography, Earth's systems, and social justice, and is a topic that touches all of our lives. Not only can it be investigated in local and global contexts, but a cross-curricular study of air pollution is a meaningful way to integrate 21st century skills into high school classrooms. In this webinar, PopEd staff shares teaching materials that explore topics like acid rain, causes and effects of air pollution, impacts of transportation, and more. We cover and provide lesson plans and specific strategies for classroom implementation."

EVACUATION TIPS

Level 1 means be ready. Be alert. There is a threat in your area.

Level 2 means get set to leave at a moment's notice. Have an emergency kit. Know your plan and meeting place. If you have mobility or medical issues, consider leaving. If you have livestock or large animals, move them.

Level 3 means go. Leave now. You are in immediate danger. Even if you don't see the danger, follow your plans and leave. Delay could cost lives. If you stay, you may not be rescued.

Report a forest fire: 911 and 800-562-6010 (on DNR lands)

<https://mil.wa.gov/wildfire>

Cross-Curricular Connections



[ClimateBits: Unhealthy Air](#) (August 8th, 2019)

"This video explains how air pollution negatively affects the health of people around the world. Scientists estimate that this unhealthy air is currently one of the top 10 causes of death worldwide, especially in densely populated nations like India and China. From space, Earth observing satellites such as NASA's Terra, Aqua, Aura, and Suomi NPP provide estimates of the concentrations of airborne particulate matter smaller than 2.5 micrometers, commonly referred to as PM_{2.5}. The small size of PM_{2.5} allows it to travel deep into our lungs and infiltrate our circulatory system, leading to a myriad of health impacts and even pre-mature death. Observations combined with computer models of global air pollution patterns are used in conjunction with population and healthcare data to estimate the impact on public health. PM_{2.5} concentrations are highest in densely populated cities and developing nations where emissions standards are loose or poorly enforced. Reducing fossil fuel usage would clean up our air, improve our health, and mitigate climate change."

Fast Fact

"The Washington Department of Natural Resources ([Opens an external site](#)) protects 2.5 million acres of state-owned land and 10 million acres of land in private ownership through legislative directive. The department fights approximately 900 wildland fires per year across the state, about 70 percent are in Eastern Washington."

<https://mil.wa.gov/wildfire>



Thank You to Our Partners



WASHINGTON STATE DEPARTMENT OF
NATURAL RESOURCES