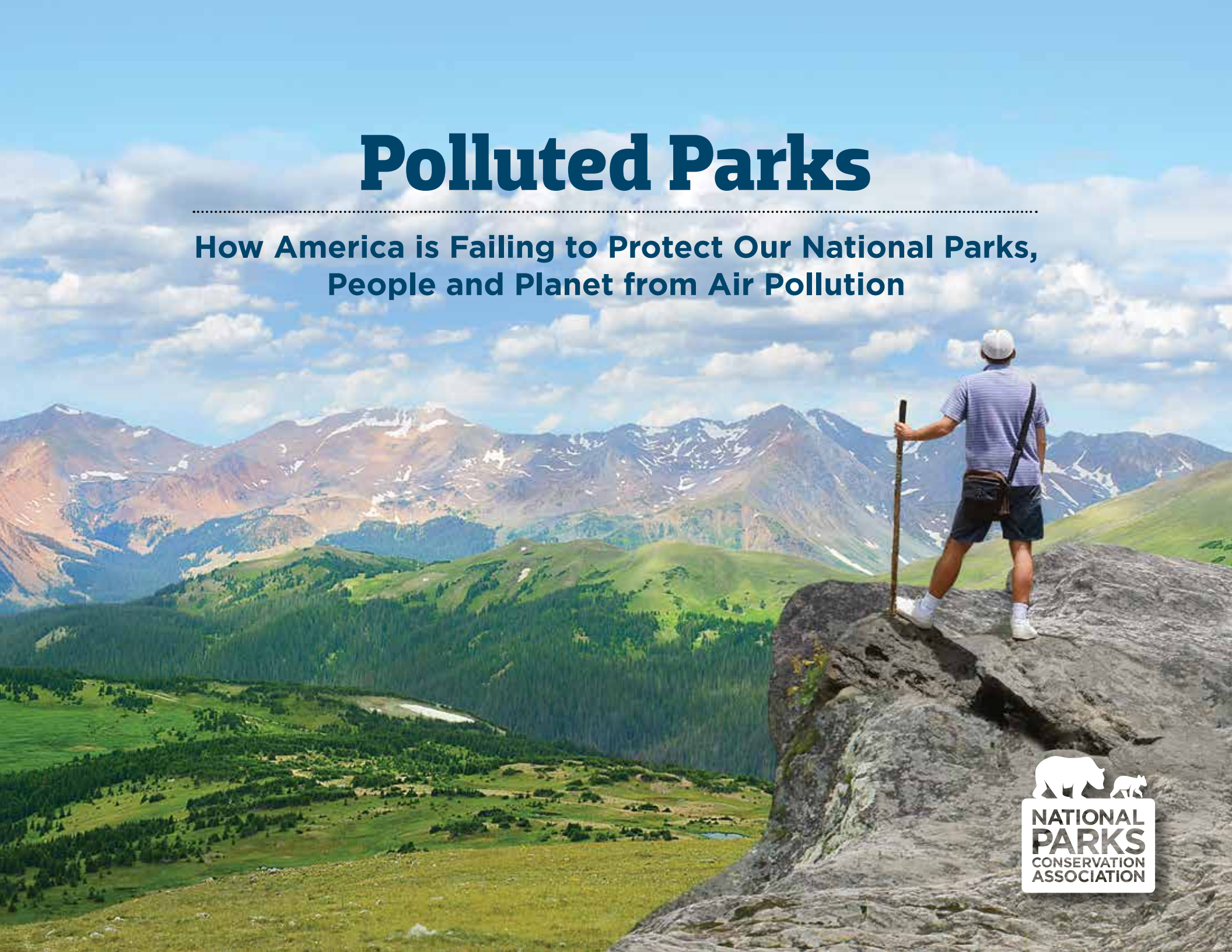
Polluted Parks

How America is Failing to Protect Our National Parks, People and Planet from Air Pollution



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Executive Summary

Like all living things, national parks need clean air and a healthy climate to thrive.

The effects of air pollution and climate change are not unique to national parks—they also wreak havoc on our communities. To understand how pollution affects America's more than 400 national parks and their more than 330 million visitors each year, this report assesses the damage from air pollution by evaluating four categories: **unhealthy air, harm to nature, hazy skies** and **climate change.**

The key finding of our report is that 96 percent of the 417 national parks assessed are plagued by significant air pollution problems in at least one of the four categories. Among other things, we found that 85 percent of national parks have air that is unhealthy to breathe at times, and nearly 90 percent of parks suffer from haze pollution. At 88 percent of parks, air pollution deposits into soils and waters, damaging sensitive species and habitat. We also found that climate change is a *significant concern* for 80 percent of our national parks, though all parks are affected at some level.

In addition to our analysis, we feature the stories of a community activist, young conservationist, organizer, historic landscape and outdoor recreation leader with firsthand experiences dealing with the effects of air and climate pollution across the country. These five stories reveal a common theme: The problems of pollution afflict the well being of people and our parks. And fossil fuels and industrial air pollution are the source of most of these problems.

96 Percent of the 417 National Parks Assessed are Plagued by Significant Air Pollution Problems in at Least One of these Categories

UNHEALTHY AIR

85%

National parks that have air that is unhealthy to breathe at times

HARM TO NATURE

88%

National parks where air pollution is damaging sensitive species and habitat

HAZY SKIES

89%

National parks that suffer from haze pollution

CLIMATE CHANGE

80%

National parks where climate change is a *significant concern*

Fortunately, there are clear and feasible solutions: mitigating pollution and transitioning to clean energy. To get there, we will need policies supported by all levels of government to benefit our air, parks and climate.

This year, as NPCA celebrates a century of working to protect places of unparalleled natural wonder, historic significance and cultural value, we also commit to a future for our parks that is grounded in principles of justice and equity. With this commitment in mind, we are pledging to act on fair solutions for clean air and a healthy climate for everyone. This mission is more important now than ever before.

We hope you will join us.

NATIONAL PARKS CONSERVATION ASSOCIATION
100 YEARS

For 100 years, the nonpartisan National Parks Conservation Association has been the leading voice in safeguarding our national parks. NPCA and its 1.3 million members and supporters work together to protect and preserve our nation's most iconic and inspirational places for future generations. For more information, visit www.npca.org.

II

Introduction

Introduction

America's national parks have a unique power to bring people together and bridge differences. More than a century ago, leaders in our nation recognized the importance of protecting our precious natural and cultural heritage for the benefit and enjoyment of future generations. Today, national parks continue to preserve our stories and reflect our democracy, but they are being polluted.

Air pollution is harming public health, obscuring views and degrading our nation's most precious park sites, from Glacier National Park in Montana to the Natchez Trace Parkway in Tennessee to Cuyahoga Valley National Park in Ohio. Unfortunately, air pollution also drives the most serious problem of our time—climate change.

While most air pollution doesn't originate in national parks, it can travel hundreds of miles from its source, thereby affecting all parks—even remote ones—and distant communities. Much of this pollution begins with extracting fossil fuels, including oil, gas and coal, and burning them in power plants and vehicles. Additionally, industrial-scale agricultural operations harm the air, like in California's Central Valley communities as well as in Sequoia and Kings Canyon National Parks and César E. Chávez National Monument.

Pollution also harms community health, having the gravest effects on communities of color and people of lower socioeconomic status. It also undermines local economies, driving up healthcare costs and making it harder for kids to learn and play and adults to work.

In Bakersfield, California, Gema Perez, a mom, urban activist and park lover, frets about the dirty air that chokes off views of the mountains and harms her family's lungs when they are outside trying to enjoy the safe spaces her community has worked hard to create. Amy Roberts, CEO of the Outdoor Industry Association, represents businesses that depend on our country's natural resources to provide recreational opportunities, and whether it's lower snowpack or intensified wildfires, she is keenly aware of the effects of air pollution and climate change on a daily basis.

To address the challenges of air pollution, it's critical we consider justice and equity while working to reduce emissions, transition to appropriately sited renewable energy, build smart infrastructure that uses clean energy, and conserve our natural landscapes.

A note on our analysis

Using a variety of data and relying heavily on National Park Service information, NPCA created a summary index for each category (unhealthy air, harm to nature, hazy skies and effects of climate change). The following codes are used to describe the scale of concern in each of the four categories.

- *Significant Concern*
- *Moderate Concern*
- *Little to No Concern*
- *No data available*

Top Pullman National Monument in Chicago, IL embodies rich African American labor history as the first planned U.S. industrial community. ©Jim Roberts | Dreamstime

IN OUR ANALYSIS, WE EVALUATED 417 NATIONAL PARKS. THESE INCLUDE:

National Parks Protected Under the Clean Air Act

Cultural Sites, Preserved for the Stories They Tell About Our Nation's History

Seashores, Trails, Battlefields and Memorials

III

How Air Pollution Affects People and National Parks

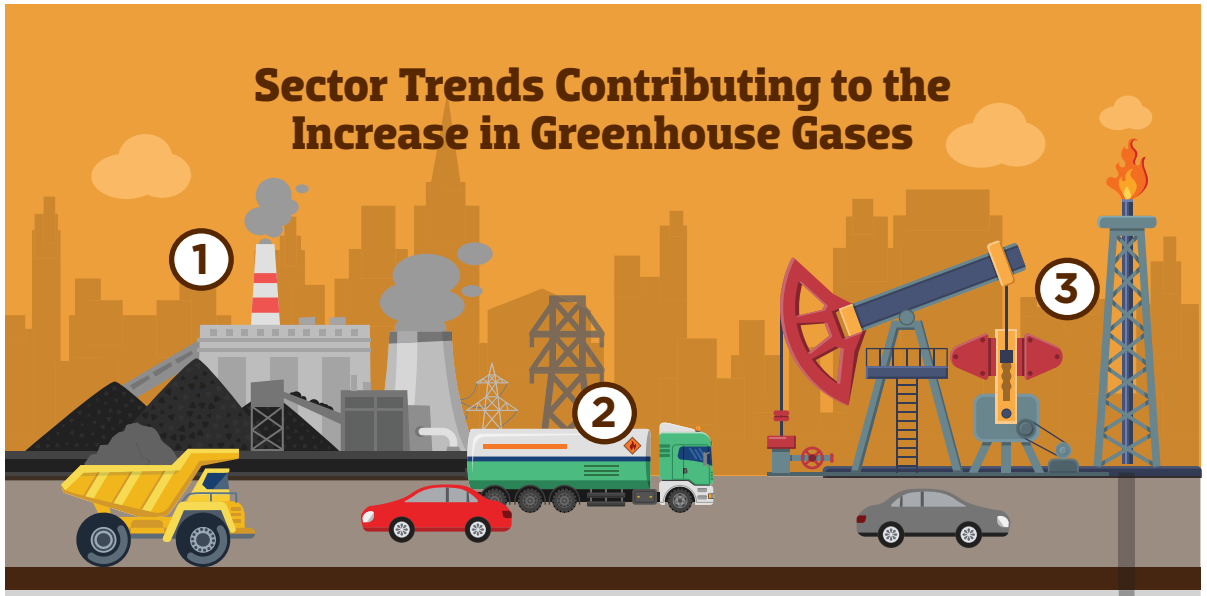
How Air Pollution Affects People and National Parks

Nearly every national park is affected by air pollution and climate change in adverse ways. Climate change is intensifying flooding, drought and wildfires, haze is obscuring miles of scenic views, unhealthy air is triggering asthma attacks in sensitive populations and in healthy adults who exercise outdoors, and pollution is devastating sensitive waterways and wildlife habitat. While the Clean Air Act has steadily reduced pollution over the past five decades, in just two years, the Trump administration's policies have contributed to reversing this trend.

Today, air pollution is on the rise, enforcement actions against polluters have plummeted by 85 percent, the Environmental Protection Agency (EPA) is pushing an anti-science agenda, and the United States is exiting the Paris Agreement, the global climate treaty. A 2018 study by two Harvard University researchers conservatively estimates that recent EPA rollbacks to public health and environmental safeguards will result in over 80,000 deaths every 10 years.

As a result, our national parks continue to suffer from air pollution and show increased strain and worsening symptoms instead of the relief promised by Congress for our most iconic lands through the Clean Air Act. The key findings of this analysis show the pervasive effect of pollution across the National Park System.

As described in the pages that follow, ninety-six percent, or 401 of the 417 national parks assessed show air pollution is a *significant concern* in at least one of four categories: **unhealthy air, harm to nature, hazy skies** and **effects of climate change.** Many parks suffer from the negative effects of air pollution in more than one of these categories.



Climate pollution, or "greenhouse gases," rose 3.4 percent in 2018, the second-biggest leap in two decades. This includes carbon dioxide from coal plants and vehicles and methane from oil and gas development, emitted across the transportation, building and power sectors.

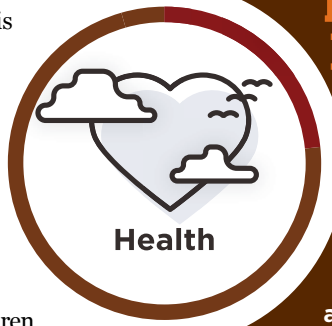
1. **COAL-FIRED POWER PLANTS:** Pollution from the power sector was on the decline from 2007-2017; however, in 2018, emissions data showed a 1.9 percent increase in pollution from coal plants.

2. **TRANSPORTATION:** In the past two years, the transportation sector has become the greatest overall source of greenhouse gas pollution in the country.

3. **OIL AND GAS DEVELOPMENT:** If development of oil and gas in the U.S. continues unabated, drilling into new reserves could release the equivalent of the lifetime carbon dioxide pollution of 1,000 coal-fired power plants.

Unhealthy Air

Ozone is a gas produced when other pollutants react under sunlight. Above the Earth, ozone is beneficial. But at the ground level, ozone pollution is harmful to living things. For people and wildlife, ozone makes it harder to breathe by inflaming and irritating our lungs. It can cause asthma attacks, irritate sufferers' throats and airways, and cause tightness in the chest; it is particularly dangerous when breathing heavily. For sensitive populations and anyone exercising outdoors, as well as children and the elderly, exposure is especially dangerous. On a global scale, ozone is also a greenhouse gas that contributes to climate change. Although ozone is not the only pollutant that threatens human health in the parks, it is one of the most widespread. Health effects due to particulate matter or other non-ozone pollutants have not been included in this assessment.

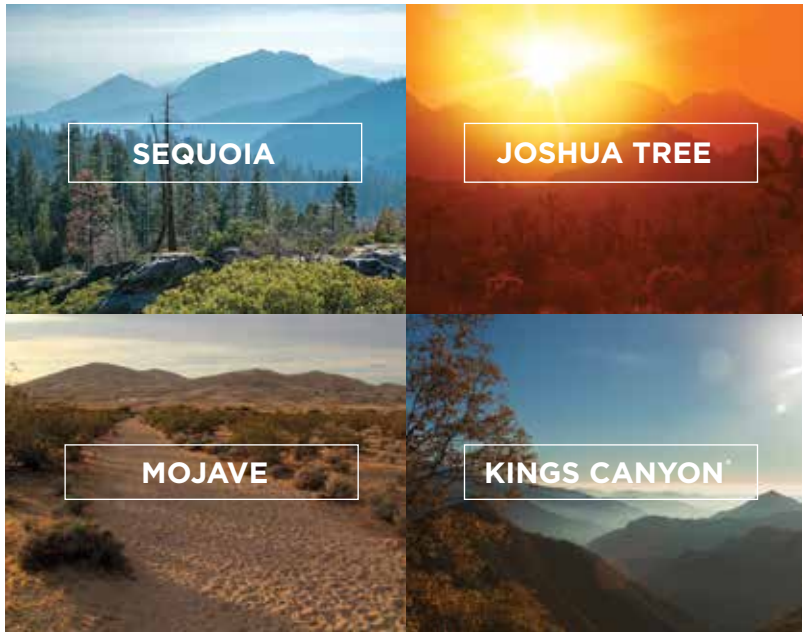


We found that eighty-five percent of national parks (354 parks) have air that is unhealthy to breathe at times. At 87 parks, ozone levels are a *significant concern*, and another 267 parks have a *moderate* level of concern.

In 2018, four parks--Sequoia, Kings Canyon and Joshua Tree National Parks and Mojave National Preserve—had unhealthy air for most park visitors and rangers to breathe for more than two months of the year, mostly in the summer months. These are among our nation's most polluted national parks. Much of the air pollution in these parks comes from vehicles and the agriculture industry in the San Joaquin Valley—one of the most polluted areas in the nation—where residents are frequently exposed to unsafe air.

FOUR OF OUR MOST POLLUTED NATIONAL PARKS

Sequoia, Kings Canyon and Joshua Tree National Parks and Mojave National Preserve regularly struggle with air that is unhealthy for park visitors and rangers to breathe.



Air pollution levels in some of our most iconic national parks are comparable to, and at times even higher than, levels in densely populated cities such as Los Angeles and Houston.

AIR POLLUTION & HUMAN HEALTH

While air pollution affects everyone, those exercising outdoors, children, the elderly and anyone with asthma or other respiratory illnesses are especially at risk.

Harm to Nature

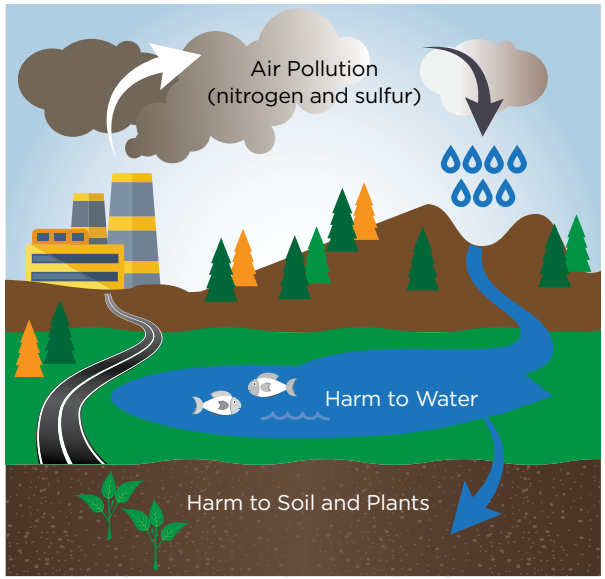
Air pollution has a widespread effect on plants, animals and entire ecosystems. Ozone pollution stifles tree and crop growth and causes leaves of common tree species to blacken and wither. Nitrogen and sulfur pollution that comes through rain, snow or fog can cause changes to soil and water chemistry which affects plants' and animals' ability to survive in an area.

Our findings show that air pollution is harming sensitive species and habitat at 88 percent of national parks (368 parks). At 283 parks, the problem is of a *significant concern* and in 85 parks, the concern level is *moderate*.

Ozone occurs naturally in the atmosphere, but human-caused air pollutants that produce ozone at the ground level are highly damaging for plants, slowing growth and increasing vulnerability to diseases and insect damage. Emissions of nitrogen and sulfur are deposited onto the ground when they are washed out of the air by rain, snow and other precipitation. High concentrations of these pollutants can cause acidification, over-fertilization and other changes to soil and water chemistry; these processes can change the number and types of plants and animals able to survive in an area.

At Rocky Mountain National Park, flowering plants are being replaced by grasses. The park's high-elevation environment is highly vulnerable to nitrogen because of the ecosystem's shallow soils and short growing seasons. Additionally, the increase in nitrogen, which results from increased pollution from oil and gas development in the region, can change the types of plants that grow on the tundra. As levels of nitrogen increase, grasses take over footprints of alpine flowers and reduce habitat for some animals at Rocky Mountain National Park.

Above: North American Elk rest on hillside in Rocky Mountain National Park, CO ©barizklina | Shutterstock



How Pollution is Deposited in Water and Soil

Air pollution is a *significant* or *moderate concern*, harming sensitive species and habitat at 88 percent of parks.

Emissions of nitrogen and sulfur make their way to the ground when they are washed out of the air by rain, snow and other precipitation. High concentrations of these pollutants can cause acidification, over-fertilization and throw natural systems out of balance, harming the soil, water and health of plants and animals trying to survive in an area.

Hazy Skies

Visible pollution, or haze, consists of tiny particles and gases in the air that make it harder to see things in the distance. Haze pollution cuts down on how far you can see and how clear the views are at national parks.

Our analysis found that not one single national park of those reviewed in the lower 48 is free of haze pollution—and at 89 percent of parks (370 parks), visibility impairment is either a *moderate* or *significant concern* (304 and 66 parks respectively). On average, visitors to national parks miss out on 50 miles of scenery because of air pollution—a distance equivalent to the length of Rhode Island.

At eighty-nine percent of parks (370 parks), visibility impairment is either a *moderate* or *significant concern* (304 and 66 parks respectively).

When the air at a national park isn't clean, visitation drops by at least 8 percent, harming local economies and indicating that air quality directly affects public use and enjoyment of our national parks. Yosemite, Everglades, Acadia and Joshua Tree national parks are just a few of our nation's greatest wild places that experience widespread effects from air pollution even if sometimes they don't appear to be polluted. National parks and wilderness areas should have clear air, but sadly many struggle with hazy skies. Many protected areas are still centuries away from achieving naturally clean air quality.

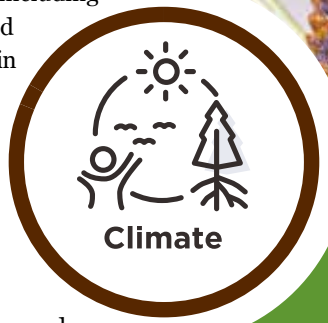
A Work In Progress: Great Smoky Mountains National Park

Great Smoky Mountains National Park is, well, smoky. The term refers to the bluish mist that naturally hangs over the mountains, rather than the white or yellowish haze pollution that is commonly seen at the park. It's the fate of this human-caused haze that makes the Great Smoky Mountains a symbol of both the successes of the Clean Air Act and the continued need for progress.

Air pollution obscures scenic park views—in some cases obliterating more than 90 miles in visibility.

Effects of Climate Change

The effects of climate change vary across national parks but cover all geographic locations, including coastal areas affected by rising oceans and increasingly powerful storms, and mountain ranges experiencing widespread melting of glaciers and lower snowpack. From microorganisms to large mammals, wildlife species are struggling to adapt. National parks are particularly vulnerable to changes in climate because of their sensitive natural environments and related risk of exposure to things like increased drought, flooding, fires and invasive species as well as sensitivity of plants, animals (and their sometimes-limited ability to adapt to new habitat), water, glaciers, and historic and cultural resources.



In analyzing scientific studies, we found that climate change is a *significant concern* for 80 percent of our national parks (335 parks). These parks are experiencing changes in climate through extreme trends in temperature, precipitation, or early onset of spring.

Many unique and sensitive wildlife species face plummeting populations and possible extinction as they struggle to cope with the rapidity of change.

For example, Everglades National Park is part of a unique subtropical peatland environment that requires excess fresh water to support the myriad life that thrives there. Because water depth means a healthy, thriving ecosystem and drives essential peat accumulation, rising sea levels—of even just a few centimeters—can inundate freshwater habitats. As a result, rare tropical orchids and herbs, pine forests, and freshwater marshes are at risk that in turn support many species of wildlife, birds and amphibians.

In Mt. Rainier National Park, melting of the Nisqually glacier is directly responsible for infrastructure damage along the park's historic Nisqually Road. As the glacier retreats, it leaves behind boulders, sediment and debris that washes more easily downstream during storms, tearing apart the river banks that form the base of the road.

As temperatures rise in Yellowstone National Park, pine beetle populations are exploding. As the beetles feast, more whitebark pine trees are dying than ever before. Since pine seeds are a critical source of nutrition for Grizzly bears, the death of these trees threatens their survival and the larger food chain.

Temperatures in national parks are warming at twice the rate of the U.S. as a whole, threatening the very existence of namesake features at Glacier, Joshua Tree and Saguaro National Parks.

Risks to National Parks as a Result of Climate Change

Gema Perez's Story

She fought for her neighborhood park. That was just the beginning. Community activist Gema Perez experiences air quality challenges in California's San Joaquin Valley and nearby national parks

In a modest neighborhood on the outskirts of Bakersfield, California, the driving rhythm of a Zumba class pulses through the air of Stiern Park. Gema Perez fought hard to clean up this park near her home. She loves her community parks and nearby national parks, too. Stiern Park used to host gangs, drugs and trash. Now kids play on the new playground while Gema leads their moms through workouts. They're all breathing heavily.

On a clear day, Gema can see across the San Joaquin Valley—the Sierra Nevada to the east, the California Coast Ranges to the west. But most days, all she sees is haze. "Two or three times a month there are people who can't join us for Zumba because of the air," Gema says.

On a clear day, when Gema and her family visit nearby national parks like Sequoia, Kings Canyon and Yosemite, she can see the valley's vast dairies, like the one where her husband works. She can see thousands of acres of almonds and tangerines, as well as oil fields and refineries, truck-filled distribution hubs and heavy streams of traffic on Interstate 5 and Highway 99.

There aren't a lot of clear days.

The bowl of the San Joaquin Valley contains some of the worst air pollution in the nation. It blankets Bakersfield and César E. Chávez National Monument. It rises into the deceptively green national parks that overlook the Valley, obscuring scenic views and rolling over the mountains into Joshua Tree National Park a couple hundred miles away. Most visitors to Sequoia and Kings Canyon are missing upward of 90 miles from the views they should be able to enjoy.

Still, Gema's family loves to escape to national parks several times a year to play, picnic, hike and camp. "The parks," she says, "are a place to be free, to breathe clean air. We believe the air is clean because there are so many trees there, so far from the cities. I think a lot of us are wrong in that."

Among cities, Los Angeles has the nation's worst ozone pollution. At times, ozone pollution is even worse in Sequoia National Park, 200 miles north of Los Angeles. In between lies Bakersfield.

Gema and her family moved to Bakersfield nearly two decades ago. Her community is tightly knit. But it is nonetheless a disadvantaged place where industries push into neighborhoods. Dangers come in many forms. One of Gema's daughters survived an attempted kidnapping. Her other daughter developed asthma. Agricultural workers like her husband frequently come home from work with red and watering eyes.

"Decision-makers pay less attention to our areas," Gema notes. "We go to areas that are more affluent and white and we see the differences. The decision-makers, they are not interested—or are not aware—of the conditions in disadvantaged communities."

Alongside other mothers, she began organizing to make her community safer and healthier and eventually formed the Greenfield Walking Group. "We needed to be physically active and have a safe place where we could come together," Gema explains. Today her group is a vital partner in improving community health. According to Gema, that includes the air: "Sometimes the open air hurts our throats. It's something that we've learned to deal with, but we know it's affecting us."

Gema has met with her elected representatives and testified before the California Air Resources Board, asking for better regulations. "They were listening," she says. "But I have not seen any changes, especially in the oil industry."

So the Greenfield Walking Group continues to partner with **like-minded organizations**, encouraging people from other communities to speak up, too. Gema says, "That way they can see we are all experiencing problems with air pollution—from our communities to our national parks."

Hyperlinks on this and following pages are highlighted in green. For those reading the printed version, please see the corresponding online pdf at npca.org.

Previous Page (Top Left): Gema Perez stands in front of the playground in Stiern Park, Bakersfield, CA ©Mark Rose • (Top Right): Hazy skies over Sequoia National Park, CA ©Haveseen | Dreamstime **Right:** Oil rigs and drilling infrastructure ©Hanhanpeggy | Dreamstime

Solutions: Holding Government Responsible and the Oil and Gas Industry Accountable for its Pollution

The Trump administration has grossly limited public process and environmental review of new oil and gas leases while fast-tracking development proposals, including one from the Bureau of Land Management in California that would open 1.6 million new acres to drilling. The proposed plan could lead to the development of fracking sites near **Yosemite**, Sequoia and Kings Canyon National Parks, César E. Chávez National Monument, and Santa Monica Mountains National Recreation Area, further degrading air quality in Gema's community. The administration has likewise offered a record number of leases to **develop oil and gas**, already 50 percent more in its first two years than the Obama administration did in eight years. Many leases are across Western public lands, including in the Uintah Basin, an area that includes **Dinosaur National Monument** and already exceeds national ozone standards.

From Alaska to Virginia, new **pipelines** and related development fuel our national dependence on oil and gas. The proposed Alaska Liquefied Natural Gas line would carry and process gas from the North Slope to southcentral Alaska, releasing emissions that may threaten air quality in Denali, Gates of the Arctic and Lake Clark National Parks. The highly contentious and controversial Atlantic Coast Pipeline poses direct threats to the Blue Ridge Parkway and the Appalachian Trail.

Oil and gas production emits methane, volatile organic compounds, nitrogen oxides and other pollutants that harm our air and exacerbate climate change. The administration's **rollback of methane pollution rules** would increase emissions by more than 40 percent. Even Royal Dutch Shell is calling on the administration to tighten rules and regulate existing and future methane pollution. Fortunately, states including Wyoming, Pennsylvania, Colorado, California and New Mexico have initiatives to reduce pollution from the oil and gas sector.

NPCA is taking a stand in these matters to hold government and polluters accountable by engaging in public rulemakings and state policy initiatives, empowering communities to speak up against harmful policies, using stories and imagery to explain the risks to parks, and filing legal action to uphold the law.

Amy Roberts' Story

Wildfires. Haze. Melting ice. How one industry is affected by air pollution and climate change. The Outdoor Industry Association's Amy Roberts in Colorado has an insider's view of recreation, her local national park and consumer activism

The acrid smell and stinging haze of wildfires is nothing new to Amy Roberts. She grew up on the Front Range of the Rocky Mountains, and most recently has seen and smelled it outside her office in Boulder, Colorado. But to smell it in Oregon while hiking Mount Hood National Forest—a much wetter and more temperate area, now drought-stricken—that's new. From the base of the glacier, Amy can see it, too. Haze shrouds what should be an awe-inspiring view.

"It's pretty clear, the number of wildfires we're seeing is connected to climate change," Amy observes.

"Lower snowpack in the winters impacts the amount of water in rivers in the summers. We're in drought condition in summer a lot earlier."

Climate change is what keeps Amy up at night, and not just because she's the executive director of the Outdoor Industry Association. "Climate change impacts our industry," she says. "But it's also a threat to humanity. Air quality in the parks is just one symptom."

Back home in Colorado, the same pollution sources that drive climate change are creating smog—it's visible in Rocky Mountain National Park, one of the country's most visited parks. The views are often obscured by air pollution from oil and gas development, coal plants and mining on the Front Range, as well as from nearby Denver.

"Energy development does create jobs, but it can also be short-term or cyclical. It may permanently scar the landscape and affect the viewshed," Amy says.

"If you preserve these areas for sustainable use like recreation, that returns long-term economic value. The businesses that come to these rural areas to support outdoor recreation are less boom and bust."

The Outdoor Industry Association that Amy leads represents more than 1,300 businesses nationwide. They're part of an outdoor recreation economy that produces $887 billion in consumer spending and 7.6 million jobs, a lot of that in and around national parks.

Amy recently heard an interview with a guide from Colorado Mountain School about how climbs like the ones near Longs Peak are dependent on good snow conditions. An avid climber, Amy has seen for herself the worsening changes the guide described.

She hears it, too, from brand ambassador athletes such as Conrad Anker and Jimmy Chin, recounting,

"They've been going to these parks for years to climb and explore and reporting back that rivers aren't running as high as they used to, snowfields and glaciers are receding. Those changes make activities more dangerous. Rockfall is more prominent, snowfields aren't as stable to climb on and parks are closed due to wildfire. Winter starts late and ends early. When you don't have that snowpack, then rivers aren't full, and summer activities around paddling, rafting and fishing are all impacted."

The loss of recreational opportunities impacts more than just guides and gear suppliers. Hotels, gear retailers and restaurants in gateway communities like Rocky Mountain's Estes Park are affected, too. Fewer climbers mean fewer visitors needing a place to stay and eat. From air pollution to shriveling snow fields and rivers to wildfires, both the causes and the symptoms of climate change are impacting Outdoor Industry Association members and their communities.

Looking back, some of Amy's favorite childhood memories came from hiking with her uncles in Rocky Mountain. Memories like hers are now shared widely on social media. Social media also makes it much easier for brands to reach consumers, enabling a dialogue that wasn't possible when communication was more one-way.

"Our industry was established by companies whose founders believe they have a responsibility to the landscape and to preserve national parks for future generations. They're willing to step out and speak to their consumers around the importance of voting on climate change issues, the national monuments debate and asking their representatives to properly fund the National Park Service," Amy says.

She concludes, "Our National Park System is so uniquely American. Clean air in our parks is something we should all be able to rally around, both Republicans and Democrats."

Previous Page (Top Left): Amy Roberts ©Outdoor Industry Association • (Top Right): Chasm Lake on Longs Peak in Rocky Mountain National Park, CO ©John Sternig | Dreamstime **Right:** Coal-fired power plant ©Jim Parkin | Shutterstock

Solutions: Fighting Coal Pollution to Make Way for Clean Energy

Coal plants from Nebraska to Texas continue to muddy skies from Rocky Mountain to Big Bend National Parks. Across the Intermountain West, the massive energy company PacifiCorp owns multiple coal plants, including **Hunter and Huntington in Utah**. These plants spew climate pollution and harm air quality in eight of the region's most iconic national parks, including Bryce Canyon, Canyonlands and Arches National Parks. In Wyoming, PacifiCorp's Dave Johnson, Jim Bridger and Wyodak coal plants degrade the air quality in Yellowstone and Grand Teton National Parks.

These are just some of the power plants harming parks—parks that the businesses of the Outdoor Industry Association rely on. Over the past several years, NPCA has litigated and negotiated with energy companies and other stakeholders to retire and transition more than 25 coal-fired power plants, making space for clean energy. Most recently, an agreement between **NPCA, Sierra Club and the energy company Entergy** resulted in a settlement that will bring two Arkansas coal plants, amongst the dirtiest in the nation, offline. This will deliver improved air quality to places like Buffalo National River and Hot Springs National Park.

NPCA will continue to take actions to reduce dirty coal plant pollution in support of clean energy by holding the government and polluters accountable for complying with our nation's clean air laws.

Akiima Price's Story

Clean air in parks matters – even when you're hungry. Organizer Akiima Price knows the realities of connecting underserved communities of color to DC's urban parks

There's a story they still tell in the dense urban neighborhoods around Kenilworth Park and Aquatic Gardens in Washington, D.C., about a boy who died in a landfill that used to loom between the aquatic gardens and the shore of the Anacostia River. In 1968, while playing with friends in the landfill, the seven-year-old got caught in the open-air trash fires that used to burn here.

From 1942 to 1970, black smoke billowed over homes and schools in the low-income communities of color that surrounded that landfill. The toxic clouds blew in through open windows.

Akiima Price was born near here. "As a child," she remembers, "we moved from an apartment to a suburban townhouse where people were trying to move up and out of public housing. There was a dirt field behind our house, and we played in that dirt field and a sewer tunnel. We saw foam but didn't know it was waste. We played and caught butterflies."

Today the landfill is gone and Akiima is back, working as a contractor with the National Parks Foundation. She helps connect the surrounding communities with the beautifully revitalized aquatic gardens and Anacostia Park, both part of National Capital Parks-East.

"Historically, there's a disconnect between the people and the parks," she explains. "These communities suffer from pretty jarring statistics around crime and poverty."

Akiima has developed park-based programs that range from reconnecting ex-prisoners with their families to gospel choir performances to after-school and day camps for children. The camps provide environmental education, field trips and experiential learning. The agenda also includes something to eat. For some children, it may be their only food of the day. "They put nets in ponds and see what's living there," Akiima says. "Or they just come and have a meal and just *be*..."

But while the landfill's drifting smoke plumes are a thing of the past, the air is still not clean. Six-lane highways choke off the parks and communities Akiima is bringing together. Overhead, jets take off from and descend toward Reagan National Airport. Freight trains rumble between rowhouses. Trucks downshift into industrial sites next to apartments and churches.

According to Akiima, when a child needs food and safety, concerns about air quality are secondary. "The clean air part is on the side," she says. "The natural experience you have when you come into a green space, that's the biggest thing. A lot of people lead stressed lives. A lot of it is getting out of your environment, the option of a safe space."

But add a compromised environment on top of food insecurity and danger, and together they conspire to make children's lives exponentially harder. Polluted air makes a park unsafe for a child with asthma, which occurs at higher rates among children living in poverty. "There have been times the kids with asthma can't come to camp in the park because their parents won't let them outside," Akiima says. "We just don't do certain things in the summer months because of the heat and air quality factor. On Code Red days we are not going to have camp."

So, while it may be especially important for disadvantaged children and their families to get outside and experience nature, it isn't always healthy for them to do so.

The history of polluting activities around the parks in this part of the city is typical—polluters cluster in communities without a voice. "Some people get hot and mad," Akiima says. "But most assume that's just the way it is. They're so used to being disrespected."

The solution, she believes, starts with building a diverse network of partners, including the parks, the people, environmental groups and social service organizations. She describes the process: "If we can take a family that's working with a food program and connect them with a watershed group for a river trip, they come to see the park as their feel-good place. And they care about what happens to it."

As constituencies for urban parks grow, they then advocate for clean air in those parks. And that empowers vulnerable communities to advocate for clean air for themselves.

Solutions: Maintaining Scientific Integrity in Federal Rulemaking

During the last two years, the EPA has consistently limited and **downgraded science** in policymaking and enforcement. The agency is taking **steps to limit consideration of peer-reviewed science** in developing rules, hampering the ability of federal land managers such as the National Park Service to assess the impact of pollution to national parks. Meanwhile, the agency is undercutting scientific integrity by removing scientists from air quality advisory committees and review panels, replacing them with politicians and industry representatives, or disbanding some panels entirely. These science-driven advisory bodies were designed to operate independent of political and corporate influence to ensure that science—not politics or money—governs health and environmental laws.

The Trump administration is also rolling back rules previously supported by science. For example, EPA is undercutting public health protections from mercury and other airbourne toxins by **dismantling a rule** that requires power plants to sharply limit toxic pollution. Industry has complied with the rule since 2016, and it sharply drove down mercury pollution. This pollution causes neurological defects in babies and children at high levels, and at lower levels, it can harm brain, heart, kidney and lung function for people of all ages. These toxins also acidify our waterways and harm wildlife. The agency has also proposed delaying implementation of a rule to

reduce woodstove emissions that would result in a nearly 70 percent reduction in fine particle pollution and volatile organic compounds, despite the fact that manufacturers are poised to meet the 2020 deadline.

NPCA is backing federal legislation in support of scientific integrity, opposing rules and directives that limit the role of science in policy making, and using our platforms to demonstrate the way scientists and science are fundamental to national park protection.

Previous Page (Top Left)**:** Akiima Price in Kenilworth Aquatic Gardens, Washington DC ©Ismael Gama | NPCA • (Top Right): Summer scene in Kenilworth Park and Aquatic Gardens during Lotus and Water Lily Festival ©krblokhin | iStock • **Above** (Top Right): Pollution monitors in parks help track air quality ©Phuchit | Dreamstime • (Bottom RIght): Ranger addresses volunteers replanting native longleaf pine trees that are vital to the ecosystem in Big Thicket National Preserve, TX. ©Angela Gonzales | NPCA

Chris Liu's Story

His generation didn't break the climate. But here's why he hopes they can fix it. Conservationist Chris Liu looks to the future—his own and for national parks in the Pacific Northwest

An oil refinery's complex maze of pipes and flare stacks roar on the shores of the vast Puget Sound. BP Cherry Point is Washington state's largest refinery, emitting fumes as it processes some of the dirtiest crude oil from around the world. To the east, threatened bald eagles soar above North Cascades National Park. Down the coast, Chris Liu hikes with a friend through Olympic National Park.

Chris is on his way up from Texas for a new job, and his friend is along for the ride. Olympic is the first place they've stopped since crossing the state line. Camping in the backcountry, Chris is astounded by the park's diversity—old growth rainforests, snow-capped peaks, tide pools on the beach. Olympic seems pristine. But taking in the view from an alpine hillside, he notices haze obscuring the distance. At nearby Mount Rainier National Park, he sees signs with information on air pollution.

Chris didn't discover his love of natural places until college. His immigrant parents had focused on working to give their children opportunities in education and jobs, not outdoor recreation. But then a college buddy invited him to a family cabin near a national park, and he realized,

"You feel at peace with yourself away from the distractions of our modern lifestyles. It's a chance to connect with friends and myself and unplug from the day to day." He went on to complete his college degree in finance. But his passion became conservation.

Chris followed his passion across the country, serving as an ambassador for Texas State Parks, building bridges and trails at Crater Lake National Park, and now working for the National Park Service's Cultural Landscapes program in Seattle.

On a hike with his new work team, one of his co-workers brings along her baby girl in a backpack carrier. The baby looks around at the trees, cooing and babbling. To Chris, she sounds awe-struck—a response that he can relate to. His thoughts turn to the future: "That's definitely something I would want to foster in my family one day."

But the shadow of climate change hangs over that hope. As the planet warms and ecosystems change, some species are already facing extinction. Scientists project that by 2030 or 2040, the glaciers in North Cascades and other parks will be gone.

Chris wishes things could stay as they are now for his own future family. "But I know the reality is, it's not

going to stay the same," he says. "I feel bad for other species who call this place home. I feel bad for the parks. But national parks are supposed to be protected at the highest level. They're the canary in the coal mine. Makes you wonder how bad things are outside the parks where things aren't so well-protected."

Less than 100 miles from Olympic and North Cascades, the BP Cherry Point refinery has received a permit to expand. Chris soon learns that the permit fails to require the best pollution control measures, which would have reduced harmful air pollution at the parks, not to mention nearby communities.

"When you have a refinery so close that it harms the air quality of the area by emitting dangerous fumes, it doesn't seem right that we would allow that to continue, let alone get worse," Chris says. "I don't like that the state issued a permit to build more—and affecting my ability to enjoy the parks in the future."

Sometimes, an older person will apologize to Chris for leaving his generation a world that's facing such daunting climate challenges.

But Chris doesn't like to point fingers. "We just have to move forward and try our best to find solutions," he says, and describes the path forward: "We have to acknowledge that what the scientists are saying is real. Being engaged with our political representatives is important. Our generation has new innovative ideas. We have the drive—our kids and grandkids can't enjoy the same kind of world if we don't do what we have to do to fix it."

Previous Page (Top Left): Chris Liu in Washington, DC ©NPCA (Top Right): Summer landscape atop Hurricane Ridge in Olympic National Park, WA ©Jerryway | Dreamstime **Above Right:** Diablo Lake in North Cascades National Park, WA ©Galyna Andrushko | Dreamstime

Solutions: Using National Parks as a Catalyst for Pollution Reduction

By 2021, all states must create new plans to comply with the Clean Air Act's Regional Haze Rule. These plans must detail how polluters will be required to reduce their emissions to clean up hazy skies in national parks and wilderness areas across the country. These emission reductions must occur by 2028, which is about when the climate scientists on the Intergovernmental Panel on Climate Change estimate we must sharply limit pollution to avoid the worst effects of climate change.

Unfortunately, the EPA's new, non-binding directives open doors for states to ignore controllable air pollution by shifting blame for air quality degradation from sources like coal plants and oil and gas development to other sources of pollution, such as wildfires and international emissions. Passing the buck to other countries to absolve U.S. polluters from accountability is unacceptable and will result in dirtier air in our national parks. EPA has also stated intentions to **"streamline" the process** for state haze plans, a likely signal for limiting public input. These actions could needlessly threaten park waters, wildlife and landscapes and forever change how people like Chris Liu experience these places.

In Washington state, **British Petroleum's Cherry Point refinery**, already a contributor to haze at North Cascades and Olympic National Parks, is expanding and should be a focus in upcoming state's haze plan. Likewise, in North Dakota, the newly permitted **Davis refinery** threatens Theodore Roosevelt National Park's air quality.

And in **California's Central Valley**, industrial agriculture and many other pollution sources contribute to some of the worst air in the nation, which in turn contributes to regional haze in surrounding national parks.

Thankfully, the Clean Air Act currently remains intact, and states must comply with it, which means park pollution must be reduced. Because the sources of pollution that harm human health, park skies and the climate are often one and the same, states and stakeholders could create comprehensive plans to tackle multiple problems efficiently within the regional haze planning framework. Such plans could make coal plant retirements enforceable, establish sharp limits on oil and gas emissions, and advance other mechanisms to reduce air pollution in Class I airsheds.

NPCA will continue protecting national parks by identifying the sources of pollution harming parks and advancing policy, technical and legal solutions for mitigating these problems.

Harriet Tubman's Story

This is how parts of American history disappear. How climate change is affecting the legacy of Harriet Tubman, the Underground Railroad and a national park's landscape on Maryland's Eastern Shore

On Maryland's Eastern Shore, a sweeping expanse of marshland stretches to meet the sky. Each day as the tide rolls in, water creeps across an increasing number of roads, cutting off rural villages. In time, the water silently slips away before returning with the next high tide.

Twenty years ago, these roads were usually dry. Today, residents who live in southern Dorchester County plan their drives to work around the tides. Some are dispatchers in the county's 911 call center. "Flooding is a way of life now," says Anna Sierra, who once directed emergency services here.

The rhythm of the tides has always been part of the daily lives of the people in this place. Amanda Fenstermaker, the county's director of tourism, lists them: "First the Native Americans, then the Europeans, then enslaved Africans and their descendants like Harriet Tubman.

So, the landscape holds a deep history and is a natural platform to discuss both cultural and environmental issues.

"But," she adds, "we know anecdotally from residents that the landscape is changing." One thing leads to another: Air pollution leads to climate change, which leads to sea level rise, which leads to inconveniently flooded roads, then loss of cultural sites and eventually an entire landscape—and its history along with it.

Somewhere in this landscape, around 1822, Harriet Tubman was born into an enslaved family. She grew up working: checking muskrat traps, laboring in fields and forests, hauling timber on the canal. In 1849, she escaped. Traveling mostly alone at night, she made it to Philadelphia. She secretly returned here 13 times over the next 10 years, navigating the marshes, fields and forests as a conductor on the Underground Railroad. She risked her life to help friends, family and strangers escape north to freedom.

During the Civil War, she served the Union Army as an armed scout and a spy. She led an armed expedition that liberated more than 700 enslaved people. After the war, she fought for women's suffrage as well as the rights of minorities, the disabled and the aged.

One hundred and one years later, Congress set aside some of the landscape she escaped from, designating a national park to celebrate her legacy.

For Anna Sierra, a woman in the typically male-dominated field of emergency management, Harriet Tubman represents what women can do when they take it upon themselves to be empowered and do the right thing. Sierra likes to eat her lunch in Harriet Tubman

Underground Railroad National Historical Park. She likes to sit there and just be, absorbing that inspiration.

"Harriet Tubman is an American hero," agrees Dr. Sacoby Wilson, an associate professor and director of community engagement, environmental justice and health at the University of Maryland-College Park.

But even before the park was created in 2014 to uphold Harriet Tubman's legacy, rising sea levels had already begun to flood the roads and threaten the sites and landscapes that tell her story.

"If we lose those heritage sites along the Underground Railroad," Wilson warns, "we're losing part of American history. When we forget the past, we're doomed to forget the evils of the past and what it took to overcome them. This park is a beacon for what we need today and for our future. We wouldn't let any of the parks that preserve the history of the Revolutionary War disappear. We should protect the Harriet Tubman Underground Railroad National Historic Park the same way."

Dorchester County does have a flood mitigation plan. It has identified projects to protect what's at risk of being lost, from cultural sites to vulnerable communities. "But sadly," Sierra points out, "those projects take money, and Dorchester is pretty impoverished. We're very limited from a financial perspective in what we can accomplish."

And so, each day, the water creeps higher.

"Climate change doesn't cause environmental injustice. It reveals it," says Wilson. "We must invest in fighting climate change, and we must do a better job of equity in disaster preparation, response and recovery to protect people who don't have a voice. Harriet Tubman fought for the most vulnerable. By fighting for this park, we're honoring Harriet Tubman's spirit."

Solutions: Changing the U.S. Direction on Climate Change

Over the past two years, the EPA has taken strident actions to advance the Trump administration's "energy dominance" agenda by dismantling commonsense rules to limit greenhouse gas pollution from dirty, outdated energy sources. In 2017, the Trump administration moved to withdraw the United States from the Paris Agreement—a global treaty committing nations to a variety of measures, including developing renewable energy, reducing carbon emissions, sequestering pollution through conservation of forests, and building climate resilience. Fortunately, others are stepping forward to make up for this backward move: 17 individual states and over 500 cities, counties and tribal communities have committed to meet these Paris Agreement goals.

EPA is rolling back regulations that place sound and necessary limits on carbon dioxide pollution from existing power plants, the largest stationary source of climate pollution, and repealing requirements for new power plants to have the best emission controls. The agency is also weakening national standards for pollution from oil and gas development, including methane, a potent greenhouse gas, and volatile organic compounds, despite overwhelming public support to control and profit from this wasted gas. The EPA is gutting clean car rules—popular with Americans and even vehicle manufacturers. These standards aimed to clean up vehicle tailpipe pollution and removing them could result in 6 billion tons more climate-warming pollution in the atmosphere by 2025.

NPCA works to defend critical clean air and climate laws like these. We call on our members and supporters to engage in public policy making processes and tell stories of how our parks and people who love them are hurt by pollution. NPCA is also encouraging lawmakers to keep our commitments to the Paris Agreement as we demand a change in our nation's direction on climate policy.

PARKS AT RISK

The changing climate poses a threat to the fundamental character of national parks. Glacier National Park's glaciers, for instance, are rapidly melting and are expected to disappear altogether within a few decades.

Previous Page (Top Left): Harriet Tubman Statue in Boston, MA ©Heidi Besen | Shutterstock • (Top Right): Eastern Shore Maryland wetland ©Jcmiller73 | Shutterstock **Above:** Glacier National Park's Salamander Glacier sits on a ledge above the greatly diminished Grinnell Glacier. 1938 ©T.J. Hileman, courtesy of Glacier National Park Archives 2015 ©Lisa McKeon | USGS

IV

Solutions for Clean Air and a Healthy Climate

Achieving solutions for clean air and a sustainable climate requires all of our participation.

Here are some actions national parks are taking:

- The National Park Service consistently **monitors** the air quality in over 350 national parks. Using a variety of monitoring devices, the agency tracks ozone, the buildup of sulfur and nitrogen in waters and soils, and visibility conditions and trends. It also monitors other pollutants such as mercury and other toxins. Air monitoring is key to understanding how pollution affects parks and visitors.
- The National Park Service studies the **economic**, **nature**, **visibility** and **human health** impacts of pollution on national parks and translates its findings into useable and useful information for the public. For example, the agency **tweets** air quality health advisories for certain parks and explains how animals show symptoms of toxic mercury exposure.
- The National Park Service has participated in and supported robust efforts by NPCA and city transit agencies, to improve public access for traditionally underrepresented, diverse, urban Jamaica Bay-area communities in New York to Gateway National Recreation Area by increasing public transportation options, which will in turn reduce single-use vehicles.
- At Thomas Edison National Historical Park, the National Park Service, with help from National Parks Foundation, **installed electric vehicle charging stations** for visitor use.
- At Acadia National Park, the local community and park worked together to establish a shuttle service at the park. This decreased more than 2.5 million private vehicle trips at the park and prevented more than 23,000 tons of greenhouse gases emissions since 1999.
- Three pilot programs are underway, at Grand Teton, Yosemite and Denali National Parks, to substantially reduce landfill waste. Since 2017, the parks and their concessionaires have offset over 9,000 million metric tons of greenhouse gas emissions by diverting waste from landfills through recycling, composting and avoided use.
- In Florida, the National Park Service partnered with Florida Power and Light to establish the **"Everglades Solar Initiative"** in which solar panels were installed on the Shark Valley Visitor Center in Everglades National Park.

Right (Top to Bottom): The Homestead Trolley provides free guided rides to Everglades and Biscayne National Parks, FL ©Al Diaz | NPCA • Electric car charging station at Ernest Coe Visitor Center in Everglades National Park, FL ©John Adornato II | NPCA • Children take part in citizen science project, Gateway National Recreation Area, NY ©Ed Lefkowicz • Community efforts in reducing waste at Denali National Park as part of the Zero Landfill Initiative, AK ©Denali Education Center

Achieving solutions for clean air and a sustainable climate requires all of our participation.

Here are 10 actions you can take to protect national parks:

1. Write to Congress and tell them to right the direction of our national air and climate policies and hold EPA accountable to its mission to protect public health and the environment.

2. Urge local, state and federal government representatives to **return to the tenets** of the **Paris Agreement** and speed up the transition away from coal and gas to renewable energy.

3. Call New Mexico's governor to encourage her state's new efforts to reduce methane pollution from oil and gas development and **ask Utah's governor** to join the growing list of states addressing this climate problem.

4. Submit written comments on proposed state and federal rulemakings, speaking out for park protection, clean air and a healthy climate. **Join NPCA's email list** to learn about opportunities.

5. Testify at a public hearing on a state or federal rule to tell your story of why clean air and a healthy climate matter to you. **Follow NPCA on social media** to learn about opportunities.

6. Write an op-ed or letter to the editor demanding EPA return to its mission in service of the environment and public health by abandoning roll-backs, implementing the Clean Air Act and advancing regulations to stave off the worst of climate change.

7. Look for opportunities in your day-to-day life to **carpool, walk, bike, or take a bus or train** instead of driving.

8. Consider installing solar panels on your home and supporting NPCA at the same time!

9. Get involved with NPCA by attending a **civic voice workshop**, becoming a member or volunteering with us.

10. Vote!

Left (Top to Bottom): NPCA advocates on Capitol Hill for Spring 2019 Lobby Day ©NPCA • Bike rider at Golden Gate National Recreation Area, CA ©Pniesen | Dreamstime • Residential solar installation ©Luckydoor | Dreamstime • East Central High School service-learning weekend in Big Bend National Park with NPCA, TX ©Chloe Crumley | NPCA

Resources and Analytical Methods

Analytical Methods

The national park air and climate analysis in this report relies on data from a variety of studies regarding park conditions.

Hazy Skies

Visibility data are from the National Park Service. The agency calculated its visibility estimates by averaging data between 2012 and 2016 from each visibility monitoring site with at least three years of complete annual data. Using these data, the analysis evaluates how far you can see in national parks without haze pollution versus actual air quality conditions from 2012 to 2016. The "floor" is the state of natural visibility. It is compared against a three-year average of monitored visibility data. Whether visibility on a particular day is *little to no concern, moderate concern* or a *significant concern* depends on the difference between the floor and the monitored visibility data.

A deciview (dv) is the measurement for how far out you can see. If a source of pollution, such as a coal-fired power plant, is responsible for more than 1 dv of air quality degradation, it is said to "cause" visibility impairment. However, a polluting source may be partially responsible for hazy skies for contributions of 0.1 dv of impairment or lower. If the difference between the floor and the monitored data is greater than 8 dv between an average day and a hazy day, it is listed as *significant concern*; between 2 and 8 dv is a *moderate concern*; and less than 2 dv is *little to no concern*. This is detailed in NPS's Air Quality Analysis Methods document.

Unhealthy Air

The National Park Service compiles information about the levels of ozone—also known as smog—in the parks. The agency uses interpolation to assess some park units because the agency doesn't have air monitors at all of the parks. The agency uses distance weighting of data in efforts to represent parks that do not have monitoring data. For parks without a monitor, the agency describes impacts as "trends." Where parks have a monitor, impacts are described as "conditions."

This report uses the National Park Service's interpolation to estimate the five-year average fourth-highest maximum eight-hour average ozone concentrations in parts per billion (ppb), a standard measure that has been developed to reflect the level of threat to human health. The EPA finalized the most recent national ambient air quality standard for ozone of 70 ppb in 2015—meaning that if ozone levels are above those concentrations, ozone is deemed unhealthy according to a robust body of science. For our health analysis, if the five-year average value is greater than or equal to 71 ppb it is listed as *significant concern*; between 55 and 70 is a *moderate concern*; and less than or equal to 54 is *little to no concern*. This is detailed in the National Park Service's Air Quality Analysis Methods document. This approach comes from EPA's Air Quality Index, and the National Park Service uses the same cut points as EPA.

Harm to Nature

Nature data is based on information regarding ozone and nitrogen and sulfur wet deposition. The ozone metric measures how ozone affects vegetation, giving heavier weight to the levels of ozone most likely to affect plants as well as the times when that damage is likely to occur (e.g., during the day and during the growing season). This metric is better at estimating the harm to vegetation than the human health standard. Nitrogen and sulfur wet deposition are measures of how much of these pollutants are deposited onto the ground when they are washed out of the air by rain, snow, or other precipitation. High levels of wet deposition of these pollutants can cause acidification, over-fertilization, and other changes to soil and water chemistry; these changes can affect the number and type of plants and animals that are able to survive in the area.

The rating is a summary compilation of these three data sets and reflects the worst rating of the park in any of these three categories. For example, if the park is listed as significant concern for nitrogen wet deposition, but moderate concern for sulfur wet deposition and ozone, it is listed as significant concern for nature.

Effects of Climate Change

Climate data in this report comes from three studies dealing with climate change in national parks. Two studies include measures of temperature and precipitation relative to historic conditions (see Resources section*). A third study, looks at two metrics related to early spring onset condition—first leaf index and first bloom index—in recent years as compared to historic conditions.

A park is listed as *significant concern* if a statistically significant or extreme temperature or precipitation trend or spring onset condition is identified in any of the three studies. Because the three studies use different metrics and years of data, the ratings reflect the finding showing the worst impacts of climate change at a given park. This assessment follows the rubric used in two of the three studies assessing exposure to climate change in that a metric is considered extreme if recent conditions are greater than the 95th percentile

or less than the 5th percentile of historic conditions; if a less extreme change was noted (75-95th percentile or 5-25th percentile), the condition is listed as *moderate concern*.

No Data

This report assesses all available data listed above for all 417 national parks assessed. However, there are some data gaps for some parks. There are three reasons for parks having "no data": interpolation only works for the contiguous United States, limiting the ability to assess island and Alaska parks; there were no data provided for trails; and a handful of newer parks do not have data because data collection processes predated parks being added to system.

Ratings

We assigned levels of concern for each park based on the criteria described above within each of the four categories: harm to nature, hazy skies, unhealthy air and effects of climate change. The summary figure of 96 percent reflects the degree of harm from air pollution and climate change across all of the 417 national parks assessed, indicating the highest level to which any one issue rises at the park - e.g., if a park is ranked as being of *significant concern* in any one category, that park is included as being of *significant concern* in the summary figure.

Our analysis uses the most recently available data to represent current conditions. The damage described to plants, animals, human health and a variety of other natural and cultural resources is happening right now, across our parks. The report highlights present day concerns facing national parks and our communities, demonstrating both the need and opportunity to achieve clean air and a healthy climate.

For a complete listing of national park ratings, please visit https://www.npca.org/pollutedparks.

Resources

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Credits

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