Increased Risk of Catastrophic Wildfires: Global Warming's Wake-Up Call for the Western United States

NATIONAL WILDLIFE FEDERATION 2008

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More catastrophic wildfires just waiting to happen. This is the situation now facing the American West. Wildfire frequency and severity are increasing because of rising temperatures, drying conditions, and more lightning brought by global warming. When combined with decades of fire suppression that allowed unsafe fuel loads to accumulate, severe bark beetle infestations that are rapidly decimating trees, and ever expanding human settlements in and near forests, the result is increasing vulnerability to major fires.

Fire is a natural and beneficial part of many forest ecosystems, but the number and intensity of fires today is challenging fire managers and forest communities throughout the West. In 2007, for example, 3.2 million acres burned in the Great Basin region of Utah, Nevada, and Idaho, more than 1.1 million acres burned in the Northern Rockies, and a half million acres burned in Southern California. Together with more than a million acres that burned in southeastern Georgia and northern Florida earlier that year, 2007 was the second busiest fire season since 1960, with more than 9 million acres burned.[1]

The increase in big wildfires comes with greater losses and escalating firefighting costs. Property losses from wildfires have averaged more than $1 billion each year over the past decade.[2] Annual federal expenditures to prepare for and fight fires in 2007 were $3 billion, up from about $1 billion in 1999,[3] and typically less than half that for the 1970s, 1980s, and early 1990s.[4] The U.S. Forest Service now spends 45 percent of its annual budget on fire prevention and suppression, up from 20 percent in 2000.[5]

This new era of wildfires demands new approaches to managing our forests and fire risk. We must reduce the global warming pollution that feeds more fire activity. At the same time, it is critical to return our forests to more natural conditions and fire-cycles, step up protections for people and properties, and prepare to jumpstart new forest growth.

NATIONAL WILDLIFE FEDERATION

CONFRONTING GLOBAL WARMING

Report

Global Warming Makes Forests More Susceptible to Fire

The frequency of large wildfires and the total area burned have been steadily increasing in the Western United States.[6] Warmer springs and longer summer dry periods since the mid-1980s are linked to a four-fold increase in the number of major wildfires each year and a six-fold increase in the area of forest burned compared with the period between 1970 and 1986. The fire season stretches about 78 days longer and individual fires last about 30 days longer.

Global warming increases wildfire risk in several ways:

- **Longer fire seasons** will result as spring runoff occurs earlier, summer heat builds up more quickly, and warm conditions extend further into fall. Western forests typically become combustible within a month of when snowmelt finishes.[7] Snowpack is now melting 1 to 4 weeks earlier than it did 50 years ago.[8]

- **Drier conditions** will increase the probability of fire occurrence. Summertime temperatures in western North America are projected to be 3.6 to 9 degrees Fahrenheit higher by mid-century, enhancing evaporation rates, while precipitation is expected to decrease by up to 15 percent.[9] The Southwest will be hit particularly hard, perhaps shifting to a more arid climate.[10]

- **More fuel for forest fires** will become available because warmer and drier conditions are conducive to widespread beetle and other insect infestations, resulting in broad ranges of dead and highly combustible trees.[11] Higher temperatures enhance winter survival of mountain pine beetles and allow for a more rapid lifecycle. At the same time, moderate drought conditions for a year or longer can weaken trees, allowing bark beetles to overcome the trees' defense mechanisms more easily.

- **Increased frequency of lightning** is expected as thunderstorms become more severe.[12] In the western United States a 1.8 degree Fahrenheit increase in temperature is expected to lead to a 6 percent increase in lightning.[13] This means that lightning in the region could increase by 12 to 30 percent by mid-century.

The bottom line is that the overall area burned is projected to double by late this century across 11 western states if the average summertime temperature increases 2.9 degrees Fahrenheit, with Montana, Wyoming, New Mexico and Utah being hit particularly hard.[14] Alaska also is expected to see the area of forests burned increase by a factor of two or three, primarily due to longer growing seasons and shifts in vegetation.[15]

RECENT LARGE WILDFIRES IN THE WESTERN UNITED STATES

NAME	WHERE/WHEN	AREA BURNED	FIREFIGHTING COST
Lightning Seige	California/2008	1,132,000 acres	$300 million state lands costs
San Diego County	California/2007	410,000 acres	$11 million
Zaca	California/2007	240,000 acres	$120 million
Murphy Complex Wildland	Idaho, Nevada/2007	653,000 acres	$9.5 million
Milford Flat	Utah/2007	363,000 acres	$4 million
Alaskan wildfires	Alaska/2004	6,200,000 acres	$108 million
Cedar	San Diego/2003	280,000 acres	$32 million
Rodeo-Chediski	Arizona/2002	467,000 acres	$153 million
Biscuit	Oregon/2002	499,000 acres	$155 million
Haymen	Colorado/2002	137,000 acres	$40 million
Yellowstone National Park	Montana, Wyoming/1988	794,000 acres	$120 million

Past Forest Management Makes Forests More Susceptible to Fire

For thousands of years, recurring fires shaped virtually all of the forests and grasslands in the Western United States.[16] Many ecosystems have become "fire-dependent," meaning that they actually need fire to function properly.[17] For example, lodgepole pine cones are sealed with resin and only open when they are exposed to heat, such as during a fire, when conditions are best for seeds to germinate.[18] In ponderosa and other long-needle pine forests, frequent low-intensity ground firess remove seedlings, saplings, and fallen needles while also returning nutrients to the ground.[19] In other areas, more intense, less frequent fires spread into the forest canopy, resulting in a more diverse "mosaic" of different trees.

Since the end of World War II, forest management and fire policy have changed natural forest ecosystems in much of the West.[20] Fire suppression in some ponderosa pine and mixed conifer forests has produced older forests, which are more susceptible to fire, and has increased forest density, leaving greater levels of fuel available for catastrophic fires.[21] Furthermore, clear cutting of forests has made the problem worse by creating forests with trees of all the same age; such even-aged stands are a prime target for insect infestations.[22] These past practices have increased the likelihood of bigger, hotter fires than might naturally occur, with increased risks to people, property, and wildlife.

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National Aeronautics and Space Administration

Large Wildfires Put Unnatural Stress on Ecosystems


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While fires are a natural and beneficial element of many forest, grassland, and scrub-shrub ecosystems, drought-fueled wildfires can dramatically alter habitat for fish and wildlife.[23] The impact of major wildfires extends well beyond the immediate plant and animal mortality. Very hot, long-burning fires also significantly damage soils by destroying organic matter, breaking down soil structure, and reducing moisture retention.[24] These changes often cause extensive erosion and sedimentation in nearby streams and reduce groundwater discharge, which can affect regional water resources for some years after the fire.[25]

Severe crown fires—those intense fires that burn the tops of even the tallest trees—also threaten older stands of species that historically have been able to survive natural fire disturbances, such as ponderosa pine and Douglas fir in the Southwest and the mixed conifer forests of the Sierra Nevada.[26] Of particular concern, extensive heat from these fires will destroy seed banks for species not otherwise adapted to severe fires, which could ultimately alter the composition of entire forest ecosystems.

Similarly, an increase in the frequency of extreme wildfire events in scrub-shrub habitats will exacerbate the expansion of exotic invasive species such as cheatgrass.[27] This could lead to a rapid conversion of habitat types and place native species—including mule deer, pronghorn, and sage grouse—at risk.[28] The introduction of cheatgrass might even make some locations susceptible to more frequent fires.[29]


National Park Service

Fires Put Carbon Dioxide Back in the Atmosphere, Making Global Warming Worse

Forests are an important reservoir for carbon, both in the woody biomass of trees and in the soils and humus that accumulates on the forest floor. Indeed carbon dioxide accrued in forests during the 1990s removed one-third of the global warming pollution emitted to the atmosphere during that decade.[30] The carbon-storage capabilities of forests have led to a wide array of programs to offset fossil fuel emissions as well as the consideration of new management strategies to maximize carbon storage.[31]

Catastrophic wildfires can release tremendous amounts of carbon into the atmosphere, enhancing global warming until the forests can grow back and remove that carbon from the atmosphere again, a process that can take decades. The increasing wildfire activity poses a large risk to this stored carbon. In recent years, fires in the western United States have released carbon dioxide into the atmosphere equivalent to about 11 percent of their annual fossil fuel emissions.[32] In some Western states a fire spanning over just a couple months can emit nearly as much carbon dioxide as its total annual fossil fuel emissions.

Preparing for the Future: Reducing Risks and Preparing for Fires

As we move into a climate regime in the West characterized by more and bigger fires, widespread reliance on fire suppression will be insufficient for managing the risks. Furthermore, we now know that many of these forest ecosystems need to burn periodically to stay healthy and to keep fuels from building up to dangerous levels. A host of factors demand that we take a new look at how we manage fire risk and provide for sustainable forest management: global warming, better understanding of forest dynamics, and current beetle infestations that have left millions of acres of dead and dying timber. Addressing these challenges will require the coordinated efforts of forest managers, the forest products industry, homeowners, and local communities.

To address the increasing risk of large wildfires, we must:

Reduce global warming pollution to minimize future fire risk. To prevent the worst impacts of climate change and limit the impacts on communities and wildlife, we must reduce global warming pollution. The National Wildlife Federation recommends that policy makers, industry, and individuals take steps to reduce global warming pollution from today's levels by at least 2 percent per year, and by 20 percent by 2020. Science tells us that this is the only way to hold warming to no more than 2 degrees Fahrenheit in the next century.[33] This target is achievable with technologies either available or under development, but we need to start taking action now.

Facilitate the growth of uneven-aged forests. Because past fire suppression has allowed fuel loads to accumulate in our forests, we now need to intervene to reduce the potential for catastrophic fires. Forest management should work toward a forest stand structure with diverse age classes,

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lower fuel loads, and higher spacing. In some cases, meeting this objective will require federal land management agencies to adopt a more tolerant attitude towards fire as a natural part of healthy forest ecosystems. In these locations, management agencies should focus on restoration activities such as road reclamation and culver replacement to reduce the impacts of fire that do burn.

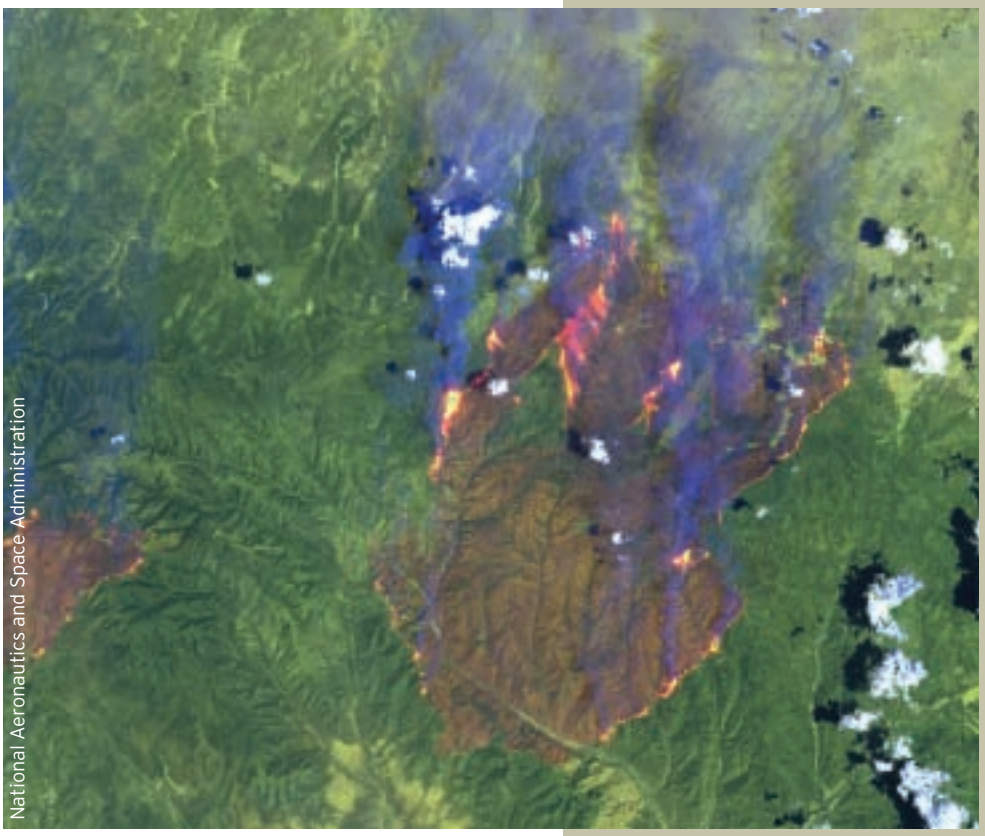
In other cases, it will be necessary to do some selective forest thinning to reduce fire risk. Such projects will need to be done in ways that are carefully limited, do not remove big old-growth trees, and do not introduce new problems into forests such as invasive species and habitat fragmentation. Thinning projects require a triage approach to focus on (1) the wildland-urban interface, where people and property are at most risk; (2) forests with especially high carbon storage, where a fire would release significant global warming pollution into the atmosphere; (3) important habitat for threatened and endangered species; (4) places with special cultural value; and (5) forests that play a key role in maintaining water supply.

Minimize damage to communities and homes from more frequent and larger wildfires. Land development in and near forests must be approached with the mindset that fires will naturally occur, much like development in regions prone to hurricanes, earthquakes, or floods accommodates those risks. Homes in the wildland-urban interface should be treated to reduce ignitability by installing flame-proof roofing and creating a buffer zone of at least 40 meters around individual structures.[34] Communities need to develop fire management strategies that use zoning and other land-use practices to minimize property losses. Likewise, mortgages and insurance need to reflect the public risk, especially when defending these risky properties diverts resources from fighting the bigger fires that can decimate forests.

Explore renewable energy opportunities using targeted forest thinning near urban areas. Given that wide swaths of forest are at heightened risk of burning, it makes sense to consider carefully thinning forests and using the salvaged biomass as fuel in

Ignacio Peralta

INNOVATIVE FOREST MANAGEMENT IN ARIZONA'S WHITE MOUNTAINS REDUCES FIRE RISK AND SPURS LOCAL ECONOMY



National Aeronautics and Space Administration

After the 2002 Rodeo-Chediski Fire burned 468,000 acres and 400 homes in the White Mountains of Eastern Arizona, local communities, business leaders, and tribes joined the U.S. Forest Service to formulate an innovative approach to forest management. The Apache-Sitgreaves National Forest identified 150,000 acres of ponderosa pine forests at the wildland-urban interface especially vulnerable to catastrophic fire and insect attacks. Under a 10-year contract, limbs, tree tops, and small trees will be removed from these designated areas and sold to produce bioenergy and other wood products.[36] A new 24-MW biomass energy plant is being constructed in the White Mountain region.[37] As of 2007, 13 Arizona businesses were working on the project, supporting 450 full-time jobs, and leading to over $12 million of spending in the local region.[38]

combined-cycle gasification plants, to create cellulosic ethanol, or for other wood products. If employed on a small-scale basis, with appropriate limitations on how many and what sorts of trees are removed from the forests, such projects could reduce the risks to people and property of large fires, provide an economic boost to local communities, reduce the reliance on fossil fuels, and have significant ecosystem benefits (see box).

Jumpstart forest regrowth after catastrophic, stand-replacing fires that leave terrain vulnerable to wind- and rain-driven erosion. If fires burn too hot, they can destroy the seed stock, making it difficult for vegetation to grow back quickly. In these cases it will be essential to intervene with prompt enrichment planting. The United States has a long history of such projects, ranging from the expansive reforestation efforts of the U.S. Civilian Conservation Corps in the 1930s to reseeding efforts following the 2002 Rodeo-Chediski fire in Arizona.[35] Forest regrowth is critical to preserve rich soil, maintain water retention benefits of forests, return carbon stocks to the forests, sustain healthy habitats, and provide ongoing recreational opportunities.

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Endnotes

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