Land Letter
THE NATURAL RESOURCES WEEKLY REPORT

7. CLIMATE: Damage, pollution from wildfires could surge as western U.S. warms -- study *(08/06/2009)*

Eryn Gable, special to E&E

Wildfires in the western United States could scorch about 50 percent more land by 2055 than they do now, causing a sharp decline in the region's air quality, a new **study** predicts.

This potential increase in wildfire destructiveness and fire-related pollution is forecast by computer models calculating the effects of moderate global warming on western U.S. wildfire patterns and atmospheric chemistry. As fires and smoke increase, the health of people living in the region could suffer and visibility in national parks such as Yellowstone and Glacier could worsen, the study's authors say.

"This, for the first time, shows an important consequence of climate change on the air we breathe," said Loretta Mickley, a research associate at Harvard University's School of Engineering and Applied Sciences who focuses on climate change and smog. "We've looked at city smog and how that would react to climate change, but this is the first time we've looked at how climate change could bring about changes in forest fires, which in turn could dirty the air significantly."

Higher temperatures caused by climate change will dry out underbrush so that wildfires last longer, do more damage and emit more smoke, Mickley said. The modeling also suggests that the greatest increase in total forest area burned -- from 75 percent to 175 percent -- will be in the Pacific Northwest and Rocky Mountains.

New research by Harvard University atmospheric scientists suggests that Western wildfires will become more widespread and destructive and will produce more smoke as climate change pushes regional temperatures higher. Photo courtesy of the Fish and Wildlife Service.

Lastly, the researchers found that the worsening fire conditions in the West will aide in the formation of particularly hazardous smoke particles known as organic carbon aerosols -- basically tiny airborne particles of incinerated wood. Such particles would increase on average by about 40 percent by 2050 and are expected to create more summer air pollution in parts of Northern California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Texas, Washington and Wyoming.

The study, which was funded by U.S. EPA and NASA, will appear in the *Journal of Geophysical Research Atmospheres*, published by the American Geophysical Union.

Previous studies have probed the links between climate change and fire severity in the West and elsewhere, but the Harvard study represents the first attempt to quantify the impact of future wildfires on the air we breathe, said Jennifer Logan, a senior research fellow who led the research.

"No one had really looked at this before," Logan said. "There were indications that fires would be worse as the climate warms, but no one had looked at air quality."

Gabriele Pfister, an atmospheric scientist with the National Center for Atmospheric Research who has studied the effects of fires on air quality and climate, said the study provides a good picture of the effects to human health from increased fires associated with climate change in the future. "It gives us an estimate of what could happen," she said.

The researchers used a 25-year record of observed meteorology and fire statistics to identify meteorological factors that best predicted burns in each of the West's ecosystems. To see how these meteorological factors would change in the future, the researchers then ran a global climate model out to 2055, following a scenario of moderate warming of the earth's average surface temperature of about 3 degrees Fahrenheit by 2050.

As a last step, the researchers used an atmospheric chemistry model to better understand how change in wildfire activity would affect air quality. This model, combining their predictions of areas burned with 2050 meteorological data, revealed key findings

about smoke and other particles emitted by future wildfires.

Logan said the study focused on the western United States because there is more data on fires in the West, thanks to tracking efforts by the federal government and a database on fires compiled by the University of California at Merced. The team next plans to focus on future wildfires and air quality over densely populated areas in California and the southwest United States.

Trend toward bigger fires

Wildfires have already increased in size, frequency and intensity since the mid-1980s in the United States, a result of past fire suppression policies combined with warming temperatures and droughts. Recent studies have found that warmer weather has lengthened the traditional fire season, leaving fuels more dried out and leading to more serious conflagrations once a fire ignites.

Climate change and past fire suppression efforts have also allowed pests such as pine beetles to kill more trees, producing more fuel for fires.

The federal government's Quadrennial Fire Review, released earlier this year, noted that the 10-year average of fire activity has now doubled from 3.78 million wildfire acres in the 1990s to 7.15 million acres from 2000 to 2008. Total wildfire acres exceeded 8 million acres four years out of the five years from 2004 to 2008, with a modern-day record of 9.8 million acres burned in 2006.

The fire review notes that climate change is expected to lead to even more acreage being burned. "There is a high likelihood that wildland fire activity will exceed the established 8-10 million wildfire acre plateau reached over the past five years and move up into a new 10-12 million wildfire acre range by the start of this coming decade," the review states.

Fires themselves are also expected to contribute to climate change, as greenhouse gases such as carbon dioxide are released through the burning of trees and other vegetation. Additionally, the loss of trees and underbrush resulting from fires is expected to increase reflectivity in the winter in some ecosystems, which could exacerbate warming.

If the researchers' predictions are correct, more and bigger fires coupled with deteriorating air quality seems unavoidable unless steps are taken to reverse warming trends, the researchers said. And diminished air quality predicted by the study could lead to smoggier skies and adversely affect people suffering from lung and heart conditions such as asthma and chronic bronchitis.

"This is what we would call a climate penalty on good air quality," Harvard University's Mickley said.

That "climate penalty" could diminish the effectiveness of efforts to reduce air pollution across the United States, the researchers said. And the consequences of increasing levels of organic carbon aerosols remain largely unknown, since there is no established "safe" level of these pollutants.

The researchers hope their work could help policymakers gauge how severe that penalty might become and take action to prevent it from worsening. "Our finding puts more pressure on policymakers to do something about these long-lived greenhouse gases," Mickley said.

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