Smokey Bear is Dead: A New Era of Wildfires in the Western U.S.

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Fire has always been a part of the natural ecology — many plant species evolved in direct response to it and couldn’t survive without it; when the sap of some pine cones melts, for example, seeds are released. But the reflexive practice of putting out all fires, which has dominated national policy for so many decades, has turned much of the American West into a tinderbox. On June 30, in the deadliest incident in wild-land firefighting in decades, 19 of the country’s most highly trained, highly skilled firefighters died in a fire near Yarnell, Ariz. While awaiting the findings from a federal investigation (expected this month), many have asked whether unexpected changes in the wind’s direction and speed, which abruptly exposed the men to the fire, were simply the most immediate factors contributing to their deaths. The Phoenix New Times, for instance, reported that the team should not have been deployed at all that day because its members may have already reached the maximum number of consecutive days they were allowed to be in the field. What’s clear, however, is that the buildup of flammable materials in the area and the ongoing drought in the Southwest contributed to the fire’s intensity. And it was a fire the firefighters were combating there in order to protect a housing subdivision on the outskirts of town.
High-Intensity 'Megafires' a New Global Danger

A 2011 United Nations report that examined eight recent megafires cited the "cumulative effects of global warming," particularly the onset of "more pervasive, worldwide drought," as a factor in all but one of the fires. Hot, dry, windy conditions also contributed to their intensity.

Another key element is how land is used, including decades spent protecting sprawling new communities in the developed world’s fire-prone areas by aggressively putting out all wildfires.

That policy, called suppression, is politically safe, but has failed in every country naturally prone to fire that has tried it, according to ASU’s Pyne, a fire historian.

"As a temporary fix, when you’re facing a nominal fiscal emergency, or some other issue, when the smoke is on the horizon, and the TV cameras are out, it seems like an easy solution to call in the troops, bring in the airplanes and the helicopters, bomb it away, and then the problem is gone. All we’ve done is put it off," said Pyne.
Are recent large fires a result of fire suppression during the ‘Smokey Bear’ era of the ~1950’s-1980’s?

- Millennial-scale evidence from the W. USA shows large fires a part of many forest ecosystems (even in dry forests) thousands of years ago.
  - Large fires burned in the past due to climate and vegetation-driven forcings
  - These records do not support the inference that recent ‘mega-fires’ result from human suppression; rather that these fires result from recent warming, combined with fuel accumulation due to a number of factors (including millennial-scale pine expansions, buildup of fuels during the cool, wet LIA and 1950’s-1980’s, invasive species and fire suppression)

- Recent (~1985-today) ‘mega’ fires also correspond with a markedly warmer climate, and severe drought.

- Even though fire is a natural part of ecosystems, will our forests and rangelands recover given the new boundary conditions of the Anthropocene?
Late Holocene arrival and expansion of pines, development of fuel loads

Wet/cool conditions promote vegetation growth

But variable climates with severe, multidecadal droughts

Large, debris flows and inferred stand-replacing fires in a range of ecosystems (ponderosa, doug fir, lodgepole pine, pinion)

Millennial-scale evidence of climate-driven severe fires throughout a range of ecosystems
Methods: radiocarbon date charcoal from alluvial deposits and use characteristics of fire-related deposits to develop longer records of fire and fire-related sedimentation events. . .
then compare fire records with records of vegetation change developed from pollen, middens, and charcoal macrofossils
Modern pine forests are relatively young: the development of these fuels likely plays a role in both past and modern fire activity.

- Ponderosa pine arrives in S.F. Payette (Pierce et al., 2004)
- Lodgepole Pine arrives in Sawtooth Mountains (Whitlock et al., 2010)
- Pinyon pine expands at City of Rocks (Weppner et al., 2013)
Medieval “Variable” Period 900-1300 AD combined with arrival of pines and development of fuel loads drive large fires.

- Wet conditions in Sierras (Graumlich, 1993), White Mtns (Leavitt, 1994), Great Basin (Adams, 2003)
- Fire-related debris flows in Idaho ponderosa, Yellowstone and Salmon River

Cook et al., 2004, *Science*
South Fork Payette ponderosa pine

Small sheetfloods ~1600-1900 AD supports evidence from SW ponderosa forests of frequent, low intensity fires

Large debris flows during multi-decadal droughts

Pierce et al., 2004, Nature
Long-term fire history reconstructions from SW USA also show climate variability as primary driver of fire activity.

Variable climate, dry winters, large amplitude multi-decadal oscillations, large fire events.

Frechette and Meyer, 2009, *The Holocene*
Recent large stand-replacing fires are burning ‘dinosaur’ forests of inherited fuels during VARIABLE and DRY climate intervals.

- Burned Lodgepole pine/mixed conifer forest at MFSR
- Burned Ponderosa pine/mixed conifer forest at SFPR
- Burned pinyon-juniper at CIRO
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Millennial-scale evidence of climate-driven severe fires throughout a range of ecosystems
Late Holocene development of fuel loads

Wet/cool conditions during the LIA and ~1960s-1980’s promote vegetation growth and reduce fire size

Anthropogenic warming and severe drought in W. USA, longer fire seasons

Introduction of invasive species, human ignitions, prior fire suppression

Large, stand-replacing fires and debris flows in a range of ecosystems (ponderosa, doug fir, lodgepole pine, pinion, sagebrush steppe)
Influence of active fire suppression is confounded by climate variability

Source: Kunkel and Pierce 2010, Climate Change
Distribution of ponderosa pine and forest susceptibility to longer fire seasons

Thompson et al., USGS, Atlas of Tree Distributions

Westerling et al., 2006, Science
Map of Large Fire (>100,000 acres) 1981-2013

Map created by Thomas Wuerzer
Map created by Thomas Wuerzer
Cheatgrass is driving a new era of fire regimes in sagebrush steppe ecosystems.
2007 Murphy Complex Fire: 653,000 acres
Mike Pellant photo
Fire scientists fight over what Western forests should look like

by Peter Brown

Blackened stumps surround Cheesman Lake in Colorado 10 years after the 2002 Hayman fire, the largest in the state’s recorded history, swept through the area. A controversial new study says severe fires like this one are more normal than previously thought.

Related Stories

West of 100: Fire & Brimstone

Are big, severe wildfires normal?

NEWS - From the September 17, 2012 issue

By Emily Guerin

Mark Williams and Bill Baker stand amid ponderosa pines in the mountains west of Fort Collins, Colo., holding a copy of a 19th century book on wildfires. They are the fire managers for the area with the
Burning controversy

• Bill Baker and Mark Williams, *Global Ecology and Biogeography* 2012
  “Spatially extensive reconstructions show variable-severity fire and
  heterogeneous structure in historical western United States dry forests”
  – mixed conifer and ponderosa forests in northern Arizona, Colorado's Front
    Range and eastern Oregon
  – compiled surveyors hand-written descriptions, combined them with tree-ring
    data from the lines the surveyors walked.
  – Results: dense trees and severe crown fires were common even before
    European settlement.
  – Argue that the severity of many recent megafires, like Arizona's 2002 Rodeo-
    Chediski fire, which burned 190,000 acres, is actually pretty normal.” (HCN,
    Sept 17, 2012)

• "A set of laws, policies and initiatives that aim to uniformly reduce fuels
  and fire severity is likely to (have) adverse effects on biological diversity,“
  Baker and Williams.

• "It's very important that we take a more regional geographic approach and
  not apply what we know from one system to another,“ Rosemary Sherriff,
  Humboldt State University, But "it's hard to get that across, because the
  idea of park-like ponderosa pine is widespread."

• Wally Covington, “"There is no 'Southwestern' model. That is horseshit.
  Everywhere you go, you find ponderosa pine that is open and park-like."
“contrary to the conclusions of W&B, the preponderance of scientific evidence indicates that conservation of dry forest ecosystems in the West and their ecological, social, and economic values is not consistent with a contemporary disturbance regime of large, high severity fires, especially under a changing climate.”
Forest Fire Research Questions the Wisdom of Prescribed Burns

By JIM ROBBINS
Published: September 17, 2012

MISSOULA, Mont. — On a forested mountainside that was charred in a wildfire in 2003, Richard Hutto, a University of Montana ornithologist, plays a recording of a black-backed woodpecker drumming on a tree.

The distinctive tattoo goes unanswered until Dr. Hutto is ready to leave. Then, at the top of a tree burned to charcoal, a woodpecker with black feathers, a white breast and a yellow slash on its crown hammers a rhythmic response.

“This forest may have burned,” says Dr. Hutto, smiling, “but that doesn’t mean it’s dead. There’s a lot going on.”

The black-backed woodpecker’s drum signals more than the return of life to the forest. It also may be an important
In some areas, recent studies show prescribed fire reduce future wildfire severity...
“Part of the area the Wallow Fire consumed was a patch that Covington's team from Northern Arizona University had previously thinned out. They'd removed small trees, snags, even shrubs from a hillside. Right next to it, they'd left an overgrown patch intact. One side treated, the other not. When the fire hit, it didn't matter.”

When I visit the site with ecologist Michael Stoddard from NAU's Ecological Research Institute, it's clear that the Wallow Fire overwhelmed the team's best efforts at preparing the forest. "The intensity of this fire was just so massive," Stoddard says with a touch of awe in his voice, "it was just whipping through the trees. It didn't care how continuous these trees were."

http://www.npr.org/2012/08/24/159374096/is-it-too-late-to-defuse-the-danger-of-megafires
A warming climate, invasive species, and human factors have produced a new era of fire regimes that may be incompatible with conservation of current forest and rangeland ecosystems.

Source: Hostetler, Bartlein and Holman, Atlas of Climatic Controls of Wildfire in the Western United States, USGS Report 2006-5139
Temperature as a potent driver of regional forest drought stress and tree mortality

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As the climate changes, drought may reduce tree productivity and survival across many forest ecosystems; however, the relative influence of specific climate parameters on forest decline is poorly understood. We derive a forest drought-stress index (FDSI) for the southwestern United States using a comprehensive tree-ring data set representing AD 1000–2007. The FDSI is approximately equally influenced by the warm-season vapour-pressure deficit (largely controlled by temperature) and cold-season precipitation, together explaining 82% of the FDSI variability. Correspondence between the FDSI and measures of forest productivity, mortality, bark-beetle outbreak and wildfire validate the FDSI as a holistic forest-vigour indicator. If the vapour-pressure deficit continues increasing as projected by climate models, the mean forest drought-stress by the 2050s will exceed that of the most severe droughts in the past 1,000 years. Collectively, the results foreshadow twenty-first-century changes in forest structures and compositions, with transition of forests in the southwestern United States, and perhaps water-limited forests globally, towards distributions unfamiliar to modern civilization.
BURN OUT

Forests in the American west are under attack from giant fires, climate change and insect outbreaks. Some ecosystems will never be the same.

BIGGER BLAZES

The area burned by wildfires each year in the United States varies because of weather, but the trend is upwards and 2012 is well above average.

Record warmth and drought fed large western fires

La Niña conditions suppressed rainfall across southern states

As of 13 September 2012
How well can past records of fire inform our understanding of fire activity in a no-analog future?

Williams et al., 2012, Nature Climate Change
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Why, then, is prior management still identified as a primary driver of recent ‘mega-fires’?

- Prior fire suppression and fuel accumulation may contribute to some of the recent, large fires.
- We messed it up, so we can fix it through management (don’t just stand there, do something!)
- Western forests are burning at an alarming rate. Some of them may not grow back. This is disturbing from an ecological and societal perspective.
- Management creates jobs and revenue.
Federal Wildfire Appropriations to the Forest Service and Department of the Interior, 1994–2012

- Source: Congressional Research Service Report RL33990, Federal Funding for Wildfire Control and Management. - See more at: http://headwaterseconomics.org/wildfire/fire-cost-
Funding provided by NSF EPSCoR, the Bureau of Land Management, and Boise State University.
Average Annual Cost of Protecting Homes from Wildfires in Montana -

- http://headwaterseconomics.org/wildfire/fire-suppression-costs#sthash.NIWjpr70.dpuf