Wildfires May Double Erosion across a Quarter of Western U.S. Watersheds by 2050

Baltimore, MD, USA: In recent years, wildfires have burned trees and homes to the ground across many states in the western U.S., but the ground itself has not gotten away unscathed.

Wildfires, which are on the rise throughout the west as a result of prolonged drought and climate change, can alter soil properties and make it more vulnerable to erosion. A new study shows that the increase in wildfires may double soil erosion in some western U.S. states by 2050, and all that dirt ends up in streams, clogging creeks and degrading water quality.

"It's a pretty dramatic increase in sediment [entering streams]," write United States Geological Survey (USGS) geologist Joel Sankey and his colleagues, who will speak on the subject on Wednesday, 4 November, at the meeting of the Geological Society of America in Baltimore, Maryland. "The sediment can have a wide range of effects on a lot of watersheds, many of which are headwater streams and important for water supply in the West."

Wildfires whipping across a landscape can burn away ground cover and vegetation, leaving soils exposed and easily erodible by precipitation. In other cases, fires can cause soil surfaces to harden. Instead of gently percolating underground, rain water and melted snow can rush across these hardened surfaces, gaining enough power to erode loose sediments.

Sankey and his colleagues wanted to estimate how projected increases in wildfires would change erosion throughout the West between the start of the 21st century and 2050 -- the first assessment of fire-induced erosion, said Sankey.

The scientists used computer models to simulate future wildfire activity across the West between now and 2050. The models incorporated how climate change may alter the number and size of wildfires. Then, the scientists used a second set of models to estimate the amount of erosion that would result within a year of these wildfires.

"The burned simulations are based on three different climate and wildfire scenarios, and we also used three different erosion models," said Sankey. "We feel we have a nice combination of models to do these forecasts."

The models predicted erosion would increase by at least 100 percent in a quarter of western U.S. watersheds between the start of the 21st century and 2050, a surprisingly large increase in the amount of sediment to enter local streams, according to Sankey. In addition, two-thirds of western watersheds are projected to experience at least a 10 percent increase in erosion by the middle of the 21st century.

The amount of sediment entering creeks after fires increased with the proportion of the watershed that was burned and if the area burned repeatedly, said Sankey.

All that extra dirt can reduce water quality. Soils contain minerals, nutrients and metals, often considered toxic if consumed in large quantities by humans or fish.

Large loads of sediment can even dam rivers, changing the course of a creek through its valley. And if the sediment settles in a reservoir, the reservoir will fill with dirt instead of water, severely shortening the lifespan of the water reserve.

Restoring forests and improving water quality for human consumption or stream habitat for aquatic animals after a fire is costly, said Sankey, but it may be something water municipalities in the west need to prepare for.

In the future, other members of the research team who are co-authors on the study with Sankey will use the erosion results to identify specific communities or watersheds that will be the most prone to fire-induced erosion in the future.

For example, some of the largest predicted increases in erosion occurred in northern California and the mountainous areas of southern California, regions where fire will likely greatly increase. The Colorado Front Range also may experience a large predicted uptick in erosion, a result of small increases in fire initiating high volumes of sediment loss across the steep slopes of the mountains.

"We can identify municipalities that are future hotspots and figure out how fire and erosion impact that individual community," said Sankey. "The next team can work with more detailed, finer-scale models and estimate what conditions will look like in these watersheds."

WHAT:
Session No. 331
T54. Geomorphology and Hydrology of Wildland Fires
Session link: https://gsa.confex.com/gsa/2015AM/webprogram/Session37896.html

Paper 331-2: Predicting Future, Post-fire Erosion and Sedimentation for Watersheds of the Western USA
Abstract link: https://gsa.confex.com/gsa/2015AM/webprogram/Paper261700.html

WHERE & WHEN:
Wednesday, 4 November 2015: 1:30-5:30 PM
Room 307 (Baltimore Convention Center)
Presentation Time: 1:55 PM

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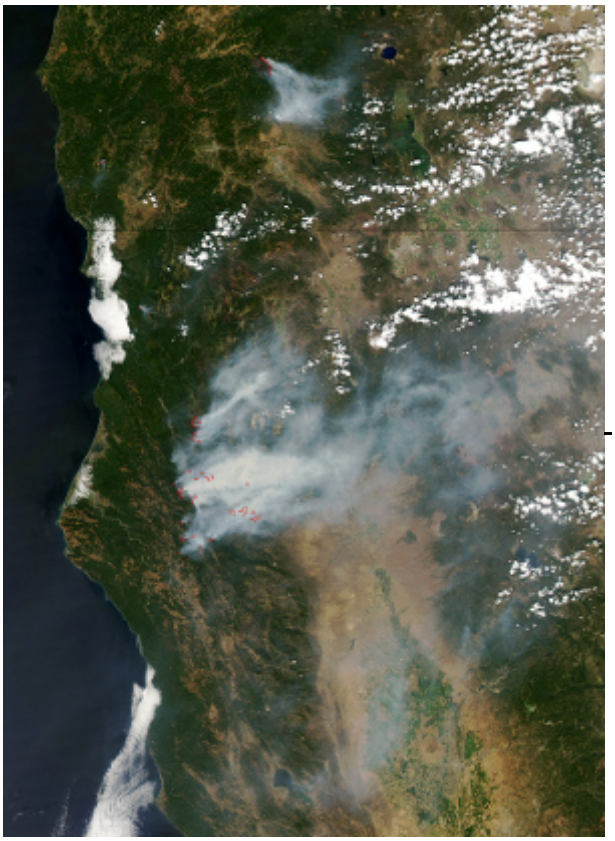

Image: Wildfires in the western U.S. NASA MODIS image acquired 5 Aug. 2015.

USGS watershed regions map

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