# Wildfire intensity impacts water quality and its treatment in forested watersheds

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The recent Thomas Fire in California was the largest wildfire in the state's modern history. It scorched nearly 282,000 acres between December 2017 and January 2018, and serves as a reminder of how devastating such events can be. Now, researchers report that wildfires in forested watersheds can have a variable but predictable impact on the substances that are released from soils and flow into drinking water sources. The new research provides important insights for water utilities evaluating treatment options after severe wildfires.

The researchers will present their work today at the 255th National Meeting & Exposition of the American Chemical Society (ACS).

"Wildfires can have dramatic effects on watersheds, in addition to destroying personal property," Fernando L. Rosario-Ortiz, Ph.D., says. "But perhaps less obvious are their potential effects on drinking water sources, caused by altering soils and the fundamental processes of forested watersheds. We find that these fires can cause many substances to be released from soil into drinking water sources, leading to contamination. The nature and amount of the substances depend on the severity of the fire."

Forested watersheds supply nearly two-thirds of U.S. drinking water sources and billions of consumers worldwide, according to the National Research Council. Healthy urban and rural forested watersheds absorb rainfall and snow melt, slow storm runoff, filter pollutants and provide critical habitats for fish and wildlife. In addition, forested watersheds

provide recreational opportunities and help support local economies.

Following a wildfire, significant changes can occur in source water quality, which can impact water treatment processes. These changes include enhanced mobilization of nutrients, sediments and dissolved organic carbon (DOC), which can impact the ability of drinking water utilities to produce water that meets Environmental Protection Agency (EPA) standards. Utilities need accurate information regarding these impacts and how to respond to them.

Rosario-Ortiz and his team at the University of Colorado, Boulder have been studying the relationship between soil transformation and wildfires since 2012, when two wildfires burned the Upper Cache la Poudre River watershed in northern Colorado. The team simulated wildfires of different severities in the laboratory by heating soils to different temperatures and then analyzed the results.

"Up to a point, the warmer the soil gets, the more carbon- and nitrogen-containing compounds are released from soils," Rosario-Ortiz says. "These compounds, which are generally characterized as DOC, can react with chemicals used to purify water and be transformed into disinfection byproducts, or DBPs, which you don't want in drinking water." In fact, the level of permissible DPBs is regulated by EPA. "But we were surprised to find that as a wildfire increases in severity, the amount of DOC released by the soil decreases, and instead you could end up with more sediments in the source waters," Rosario-Ortiz says.

Now his team is studying how the release of organic compounds from soil into water changes during wildfires. "We found that there is an enhanced release of compounds with a lower average molecular weight, containing both more oxygen and nitrogen functionalities, compared with typical conditions," Rosario-Ortiz reports. "The results from this work will help us better understand the overall effects that wildfires have

on water quality and ultimately on the production of potable water."

Rosario-Ortiz expects his research to find increasing application as the number and severity of wildfires increases due to climate change, extreme droughts, land disturbances and increased fuel loads.

**More information:** Title: Assessing the Impact of Wildfires on Source Water Quality and Treatment

**Abstract**
The impacts of wildfires on source water quality and treatment have become an emerging area of interest to utilities. Wildfire can cause significant changes to watersheds that serve as sources of potable water and can impact both water quality and quantity. For example, the Cache La Poudre (CLP) watershed in Northern Colorado was impacted by the High Park fire, which burned from June 9th through July 1st of 2012. Following this wildfire, a series of projects were designed and conducted to 1) Evaluate the impact that the wildfire had on the properties of dissolved organic matter (DOM), specifically with respect to disinfection byproduct formation; 2) Establish the condition under which the source water could be effectively treated; and 3) Evaluate potential ways in which utilities could assess impacts on water quality and treatment performance. Overall, the effects of wildfire include enhanced nutrient release, mobilization of DOC and DBP precursors and overall enhancement in chemical addition to treat the impacted source waters.

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