

## Scientists find ozone causes forests to use more water, reducing availability in the Southeast

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U.S. Forest Service and Oak Ridge National Laboratory (ORNL) scientists have found that rising levels of ozone, a greenhouse gas, may amplify the impacts of higher temperatures and reduce streamflow from forests to rivers, streams, and other water bodies. Such effects could potentially reduce water supplies available to support forest ecosystems and people in the southeastern United States.

Impacts of ozone, a global scale pollutant, on forests are not well understood at a large scale. This modeling study indicates that current and projected increases in ozone in the 21st century will likely enhance the negative effects of warming on watersheds, aggravating drought and altering stream flow. Using data on atmospheric water supply and demand and statistical models, researchers with the Forest Service and ORNL were able to show what effects ozone can have on stream flow in dry seasons. Published in the November issue of the journal <u>Global</u> <u>Change Biology</u>, the study suggests that ozone has amplified the effects of warmer temperatures in reducing streamflow in forested watersheds in the southeastern United States.

"From previous studies, we know a lot about ozone's influences on crops and leaves of young trees. However, no studies have investigated the impacts of ozone on water flow in large forested watersheds," says Ge Sun, research hydrologist with the Forest Service Eastern Forest Environmental Threat Assessment Center. "Our studies show that ozone



has a possible connection in the reduction of streamflow in late summer when flow is generally lowest, particularly in areas with high <u>ozone</u> <u>levels</u> such as the <u>Appalachian Mountains</u> in the Southeast."

Researchers developed models based on 18 to 26 years of data and observed streamflow in response to climate and <u>atmospheric chemistry</u> during the growing season. The research team evaluated individual and interactive effects of ozone on late season streamflow for six southeastern <u>forested watersheds</u> ranging in size from 38 acres to more than 3,700 square miles. Estimates of ozone's influence on streamflow ranged from 7 percent in the area of lowest ozone in West Virginia to 23 percent in the areas of highest exposure in Tennessee.

The findings from this study along with a wide range of previous field studies challenge assumptions derived from small controlled studies that ozone exposure reduces water loss from trees and forests. The present study of mature forests under moderate ozone exposure shows that those ecosystems may react in a different way than can be predicted by shortrange, intensive studies.

"We're predicting that forests under high ozone conditions will use more water instead of less, as was previously assumed," says Samuel "Sandy" McLaughlin, scientist emeritus from the ORNL Environmental Sciences Division. "The concern is that ozone-induced increases in plant water loss could aggravate drought impacts on forests, and reduce the water available for people and stream life dependent on water flow during the dry seasons."

More information: <u>onlinelibrary.wiley.com/doi/10 ...</u> <u>012.02787.x/abstract</u>



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