



March 23, 2021

Volume 11 Issue 1

## High Severity Wildfire Impacts Water Yield and Water Quality in Southern Appalachian Watersheds.

The 2016 wildfires in the southern Appalachians were unprecedented in recent times. In NC, SC, GA, and TN, 21 large wildfires burned more than 150,000 acres. A recent paper in the journal Hydrological Processes, titled "[Watershed-scale vegetation, water quantity, and water quality responses to wildfire in the southern Appalachian mountain region, United States](#)", authored by Peter Caldwell, Katherine Elliott, Ning Liu, James Vose, David Zietlow, and Jennifer Knoepp, examines vegetation, water yield, and water quality after the 2016 wildfires.

### Study Location and Methods

- Nantahala National Forest, NC: oak-hickory dominated mature forest watersheds with moderate to high coverage of evergreen shrubs.
- 2 burned watersheds within the 14,175-acre Tellico Fire and 2 burned watersheds within the 3,236 acre Camp Branch Fire; each burned watershed was paired with a nearby and similar unburned watershed.
- Plots were established in each watershed to measure vegetation, the forest floor, and soil nitrogen.
- For the burned watersheds, fire severity (derived from plot data and satellite imagery) was estimated and mapped.
- Each watershed was instrumented in February 2017 to record streamflow and water quality, which were followed through December 2018.



## Key findings

- For all watersheds, tree mortality occurred at higher rates than occurs in typical prescribed fires. Fire severity was greatest in the Tower watershed in the Camp Branch Fire, where 65% of the land burned at high severity. Mean tree mortality and BA loss across all burned plots was 41% and 17%, respectively.
- Where high severity fire occurred, duff consumption and mineral soil exposure was extensive.
- Water yield (streamflow) response was greater in these burned sites than when similar BA loss have occurred after timber harvest, possibly due to duff consumption which increased water flow overland and reduced infiltration into the soil.
- Stream concentrations of soil cations and anions (Ca, K, Mg, Cl, SO<sub>4</sub>) were also elevated in the short term, but did not exceed the water quality standards for trout streams.
- Nitrogen (ammonium and nitrate) and phosphorus levels in streams were also elevated, especially in the high severity Tower watershed; this had not been found in previous studies of stream water after prescribed fire.
- In the Tower watershed, stream nitrate levels were even greater than in previous studies in which entire watersheds were clearcut.

## Take home points:

- Where high severity fire occurred, the water yield and nitrogen and phosphorus increases were consistent with that found in high-severity western fires.
- Because the threat of high-severity wildfire is expected to increase in the southern Appalachians due to climate change, the authors state that the results of this study indicate that:  
***“it will become increasingly important to manage fuel loads through prescribed fire...to minimize negative impacts on water quantity and quality”***

The lead author, [Peter Caldwell](#), is a Research Hydrologist with the USDA Forest Service, Southern Research Station, stationed at the [Coweeta Hydrological Laboratory](#) in western NC.

Pete stated the following, concerning the study:

*“This was a rare opportunity to examine the effects of moderate and high severity fire on vegetation, water quantity and water quality in the southern Appalachians, and was made possible only through the input and support of the USDA Forest Service Nantahala Ranger District. Shortly after a fire-ending rain event, Coweeta Hydrologic Laboratory scientists met with Nantahala Ranger District staff to identify potential watersheds with a range of burn severity within burned areas. Water quality samples were collected within days of that event allowing us to assess early water quality responses to the fires. The Coweeta Hydrologic Laboratory is continuing fire research in the southern Appalachians with a paired watershed experiment that will quantify the benefit of prescribed fire on productivity, water yield, and biodiversity at the watershed scale.”*

# Get Out Your Calendars!



**Southern Blue Ridge FLN**

**Workshop 15 - Virtual**

**May 18 & 20, 2021**

**More information here soon:**

<http://www.sbrfln.com/>



<https://www.iawfonline.org/event/4th-annual-national-cohesive-wildland-fire-management-strategy-workshop/>

**Save the date for the Southern Blue Ridge TREX it will be Oct. 25 - Nov. 5, 2021. Registration opens in June.**

**For more SBR TREX info and updates, you can always go to our website: <https://apfire.wixsite.com/sbtrtex>**





# Celebrating 10 Years of Wildland Fire Science Delivery through the Fire Science Exchange Network

In 2010, the Joint Fire Science Program (JFSP) established a network of regional fire science exchanges across the United States to facilitate information exchange among fire researchers and fire, fuel, natural resource, and land managers. This year, the JFSP celebrates 10 years of national collaboration through the exchanges. These 15 members of the Fire Science Exchange Network deliver the most relevant wildland fire science information to federal, state, local, tribal, and private stakeholders.



## Creating Pathways for Active Knowledge Exchange

The Fire Science Exchange Network fosters dialogue between scientists and managers to help frame fire management questions and research needs.

Key objectives of the Fire Science Exchange Network:



Share information and build relationships



Highlight applicable research



Translate the science



Demonstrate research on the ground

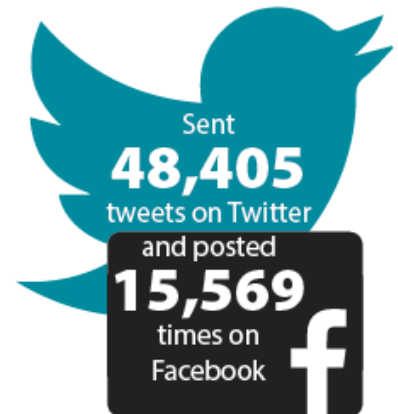


Identify new research, synthesis, and validation needs



Support adaptive management

## Accomplishments (2010-2020)



## Active participants within the 15 exchanges include:



States



Federal  
agencies



Nongovernmental  
organizations



University faculty,  
researchers, and  
students



Private  
landowners



Tribal  
nations



Consultants



Counties/  
boroughs/  
parishes



Cities  
and local  
communities



Regional  
authorities



Private  
associations

# Fueling Collaboration

A series of interactive panel discussions designed to encourage collaboration between fire managers and researchers. This discussion series will be built on questions from the registered attendees. Our first four discussions gave attendees a chance to get the latest in fire science and management and answers to their burning questions. Stay tuned for Season 2, starting winter 2021.



Did You Miss the Fueling Collaboration Series? Check out the recordings here:

<https://apfire.wixsite.com/fuelingcollaboration>

## Thanks to all of You for Taking our Survey!



### Communicate with Us!

facebook



Find us on twitter @APfirescience or find us on Facebook by searching Consortium of Appalachian Fire Managers and Scientists.

### Join CAFMS:

The consortium is for all land managers and researchers in the region who deal with any aspect of fire. To join, simply provide us with some contact information at the web site listed below.

[www.apalachianfire.org](http://www.apalachianfire.org)

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