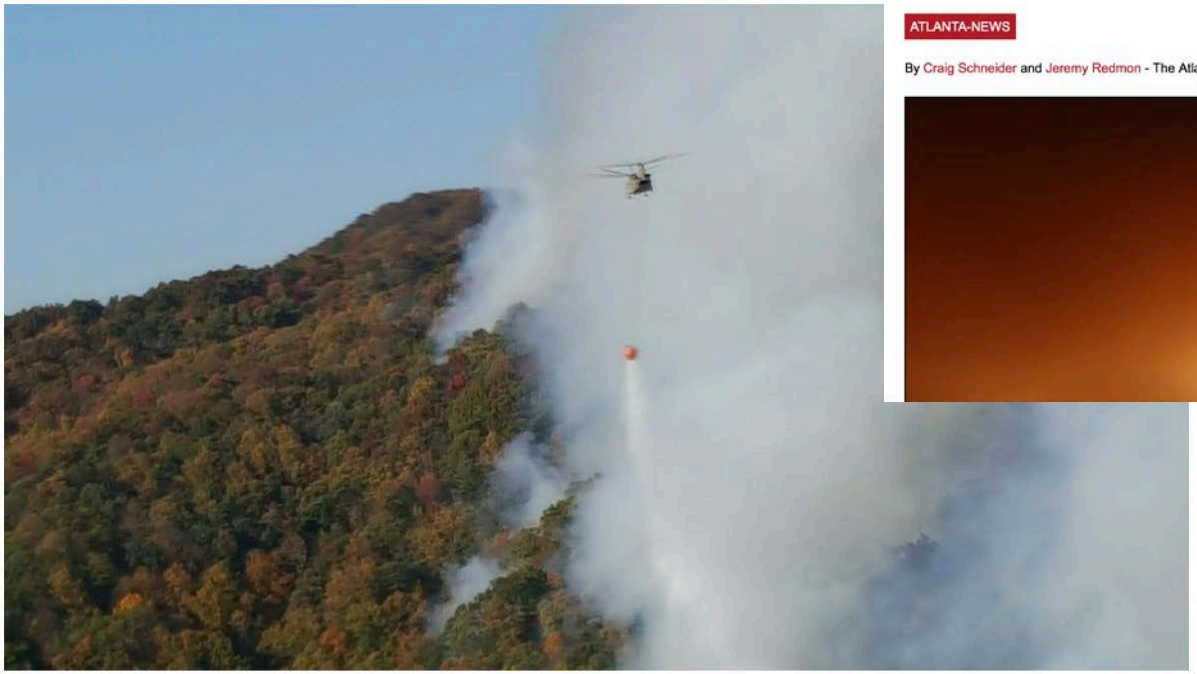
What's Happened Since The 2016 Wildfires?

Helen H. Mohr

- Public Outreach and Learning Opportunities
- Research



A National Guard helicopter dumps water on a forest fire in Pickens County in South Carolina in early November.

The National Guard/Flickr (CC BY 2.0)

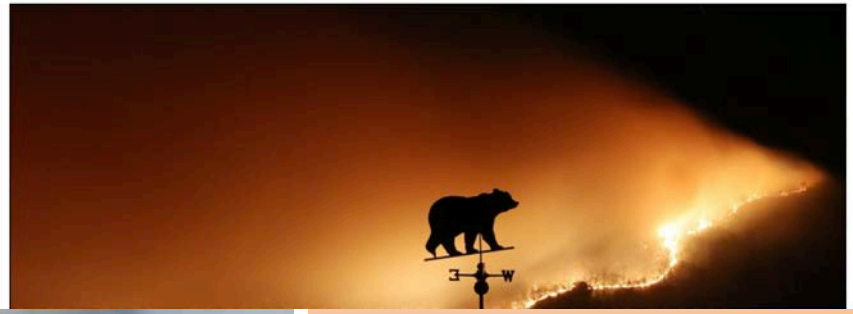
As record Appalachian wildfires fizzle out, scientists look to learn from the destruction

By Jessica Boddy | Dec. 21, 2016 , 7:00 AM

Raging wildfires in Georgia and across the Southeast a new normal?

ATLANTA-NEWS

By Craig Schneider and Jeremy Redmon - The Atlanta Journal-Constitution



Experts discuss the future of wildfires in Western North Carolina. Wochit

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ASHEVILLE - It only takes a spark to set a fire as the region saw during the fall of 2016, when more than 150,000 acres were charred in the Southeast.

But fire officials and experts in the field are changing

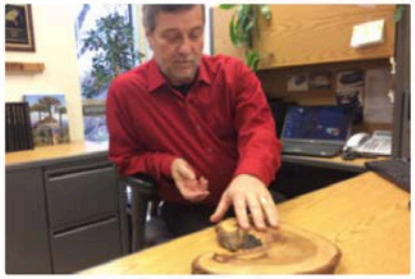
Panel: Party Rock fire should spur ecological diversity

Gatlinburg's Inferno: Why It Started, How It Spread, and What Needs to Happen Next

In Cover Stories by Thomas Fraser / December 7, 2016 / Leave a Comment

Read more about the Gatlinburg fire here.

A tree segment helps explain why an initially slow-burning wildfire turned ridges and hillsides in and around Gatlinburg into a deadly hellscape last week.



Thomas Fraser

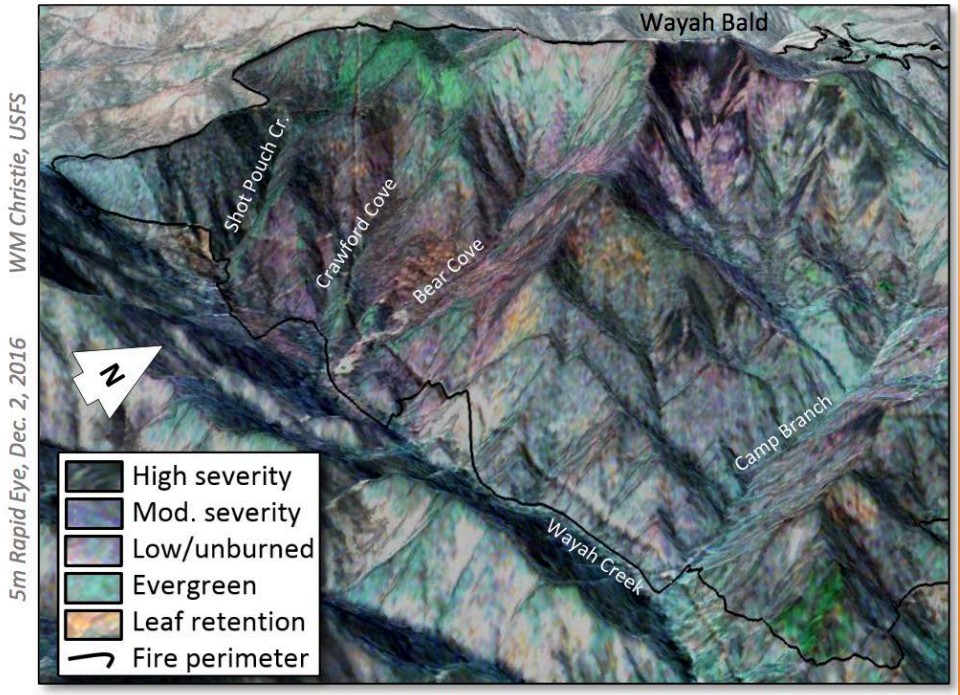
UNIVERSITY OF TENNESSEE OFFICE OF GEOGRAPHY PROFESSOR HENRI GRISSINO-MAYER

The 180-year-old tree ring from Great Smoky Mountains National Park, displayed in the University of Tennessee office of geography professor Henri Grissino-Mayer, shows the seasons the pine was affected by fire. The last indication of a forest fire was 1934. That blaze, sparked the same year the national park was established, charred at least 10,000 acres.

Now *this* is a courthouse. Here in Sevier County to learn more about the county commission and its response to residents who lost their homes in the Gatlinburg firestorm of November 2016! #MountainTough #Gatlinburgwildfire #wildlandurbaninterface

"I'm not going to blame anybody," he said. "What we need is a better awareness, better communication. We need new codes, we need people to understand and be educated about what they're living in and what's around them."

Field Trip Guide to the 2016 Camp Branch Fire and Wayah Bald



A bird's eye view of the Camp Branch Fire

Last fall's fire gives birth to a spring transformation for Table Rock, Pinnacle Mountain

Views: 1567

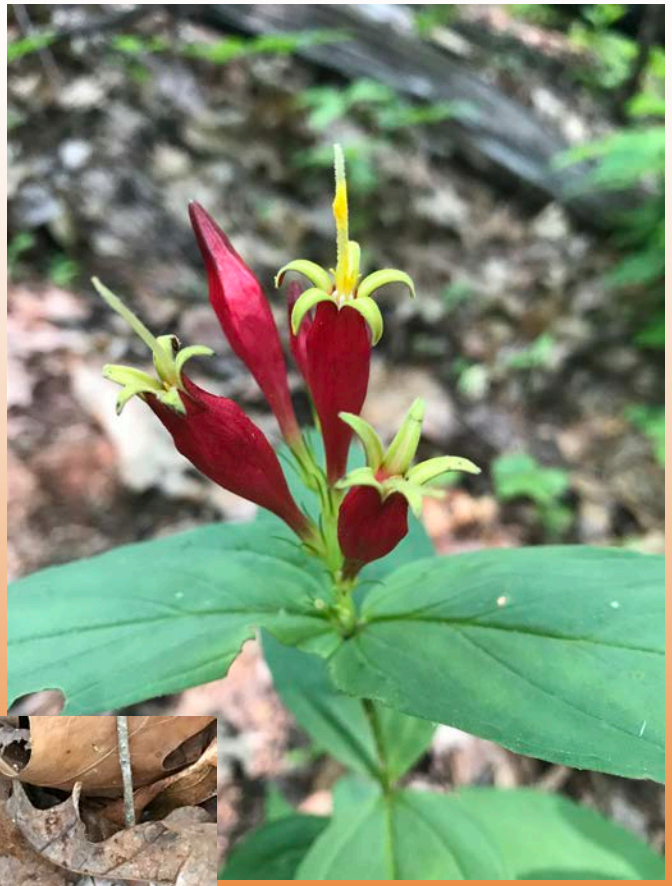
Table Rock Media Day 6 months after the fire

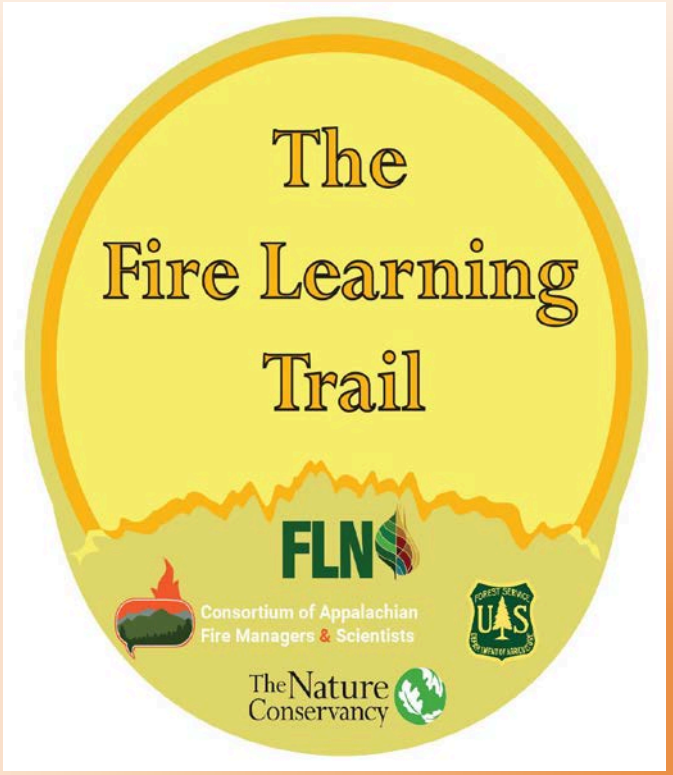
SHARE LINES

"The bears are back, the deer are back, everything is back, and they're thriving."

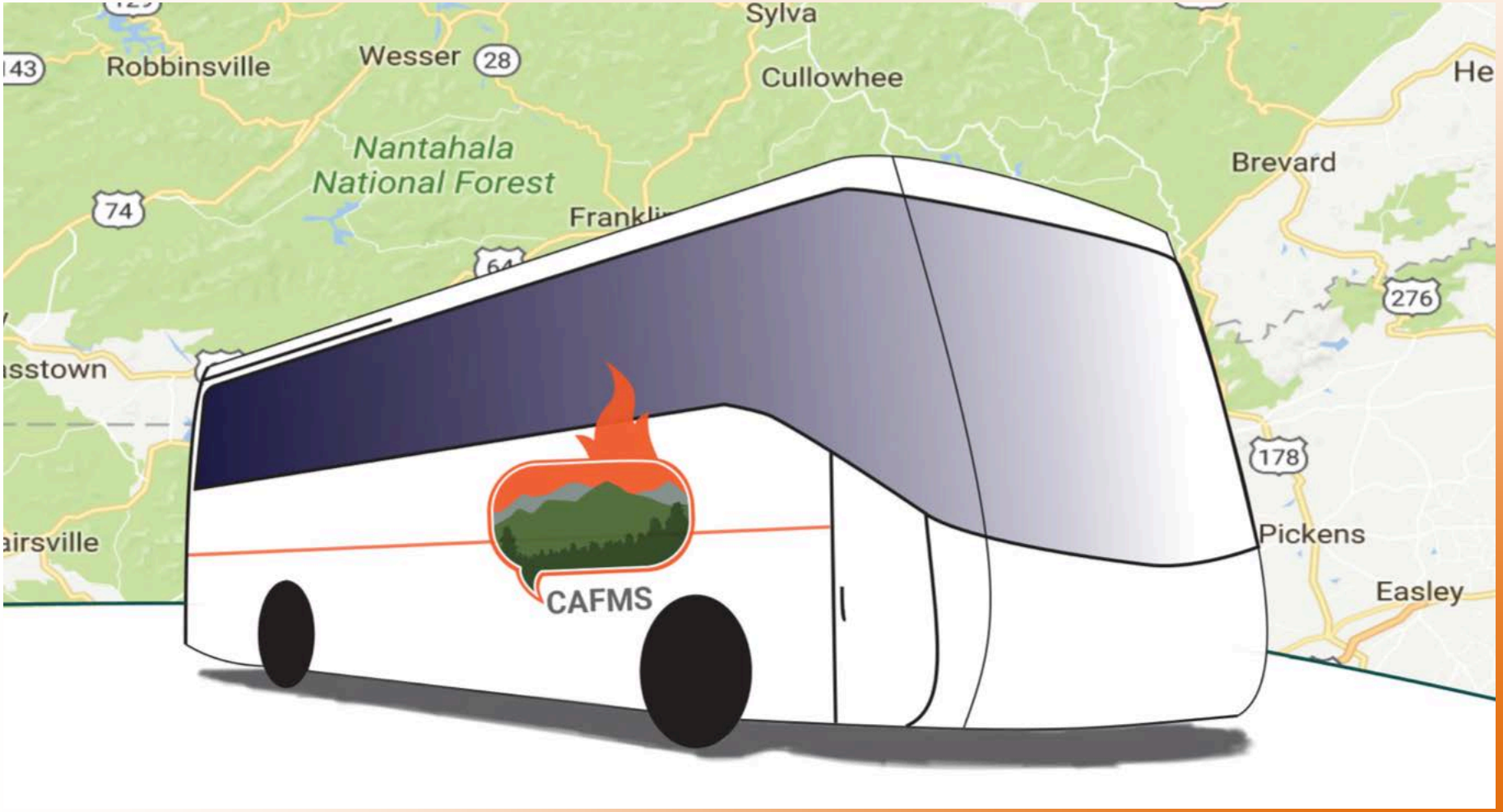
"People forget that wildfire is natural. It's nature's way of clearing out the old undergrowth to make room for the new."

"We're looking at an out-of-whack environment."



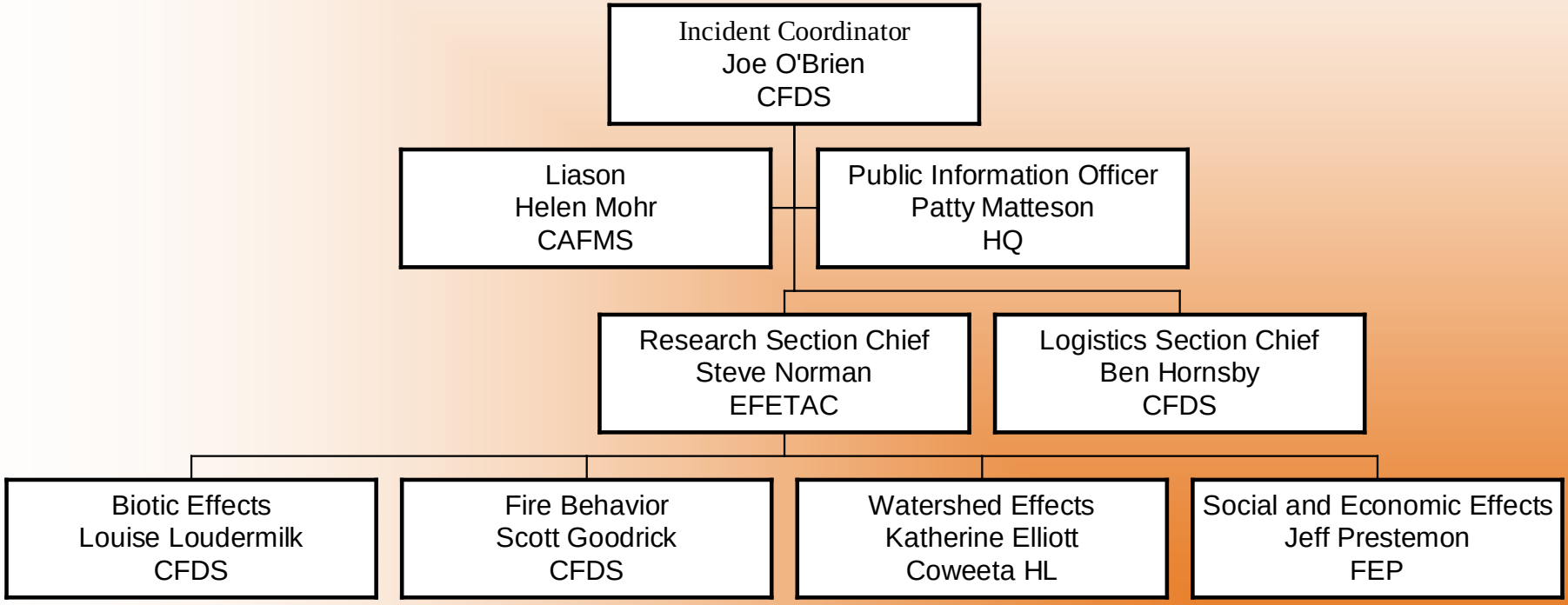

The
Fire Learning
Trail
FLN
Consortium of Appalachian
Fire Managers & Scientists
The Nature
Conservancy

CAFMS Bus Tour



Research

USFS Southern Research Station



Fire Behavior

Title	SRS Scientist	Incident or Site	Collaborators	Status
Climatology of fire weather conditions for Appalachians. How unusual was this event?	Marcus Williams	Regional	University of Georgia	Ongoing
Understanding the interaction of fire with a strong cold front.	Marcus Williams	Regional	University of Georgia NRS	Initial work started. Completion contingent on funding.
Examine the role of vortices in the spread of the Gatlinburg fires.	Scott Goodrick	Sevier County Fires	Los Alamos National Laboratory	Proposed
Examine the role of spotting in the spread of the Gatlinburg fires.	Scott Goodrick	Sevier County Fires	Los Alamos National Laboratory	Proposed

Watershed

Title	SRS Scientist	Incident or Site	Collaborators	Status
Effects of the 2016 large wildfires on streams (quality and quantity), soils, and vegetation (mortality and recovery).	Katherine Elliot	Nantahala RD, Camp Branch and Tellico Fires	NC State University, University of Minnesota	Ongoing
Effects of large wildfires on stream chemistry: synoptic survey.	Jennifer Kneopp	Region – GA and NC	University of NC	Ongoing
Effects of large wildfires on stream biota.	Andy Dolloff	Region - NC		Proposed

Economics and Social Aspects

Title	SRS Scientist	Incident or Site	Collaborators	Status
Understanding local public opinion about wildfire, control, and impacts.	John Schelhas	Region	University of Georgia	Proposed
Social-Ecological Vulnerability related to property ownership and increased fuels.	Cassandra Johnson Gaither	Region	University of Georgia	Proposed
What harvesting operations are needed to fulfill reforestation/salvage efforts, and can the local industry answer this demand?	Dana Mitchell	Counties of the affected region	Dennis Hazel, NCSU and/or Jack Swanner	Proposed
A cadastral analysis of private landowners most affected by wildfires.	Steve Norman	Region	State Agencies	Ongoing
How much spending was done by the USFS and DOI bureaus to suppress wildfires in the region?	Karen Abt	Region	NCSU, USFS, F&AM, DOI, OWF	Proposed
What was the scope of wildfire related to civilian and responder morbidity and mortality?	Jeff Prestemon	Region	Kondo-NRS, Norman-SRS, Butry-NIST	Ongoing

Economics and Social Aspects

Title	SRS Scientist	Incident or Site	Collaborators	Status
What were the wildfire prevention efforts undertaken in advance of and during this wildfire season in the region?	Jeff Prestemon	Region	Maureen Brooks-USFS Region 9	Proposed
What was the economic impact of the wildfires in the region, including damages to resources and structures and the losses incurred in the local economy?	Karen Abt	Region	Brandeis-SRS	Ongoing
What is the history of fuels management in the affected region, what is the evidence that fuels management affected or could have affected the extent of the wildfires, and what economic parameters of fuels management in these types of ecosystems and ownership patterns?	Jeff Prestemon	Region	State Agencies, Beth Buchanan USFS R8 Fire Ecologist	Ongoing
How are wildfires of different causes in the region ignited what determines their spread, and what roles to humans play in these ignitions and spread, from a historical perspective.	Jeff Prestemon	Region	SRS-Norman, Goodrick	Proposed

Biotic

Title	SRS Scientist	Incident or Site	Collaborators	Status
Post-fire recovery of culturally-significant non-timber forest products across a gradient of fire severity.	Michele Baumflek	Cherokee Fires	Eastern Band of Cherokee, FIA	Proposed
Breeding bird response to burn severity in the Southern Appalachians	Katie Greenberg	Tellico, others	NC State	Onging in 2017. Future work dependent on funding
Influence of the 2016 wildfires on soil biota in the Southern Appalachian mountains of Northern GA.	Mac Callaham	Rough Ridge, Rock Mountain, Chimney tops 2	Georgia College and State University	Proposed
Impact of the 2016 wildfires on bat habitat and bat habitat use.	Mac Callaham	Rough Ridge	University of Georgia	Proposed
Improving post-fire severity assessments using cross-seasonal imagery.	Susan Loeb	Tellico, others	SRS	Proposed
Landscape response to varying fire severity in the Appalachians.	Steve Norman	All large fires	OSU	Ongoing

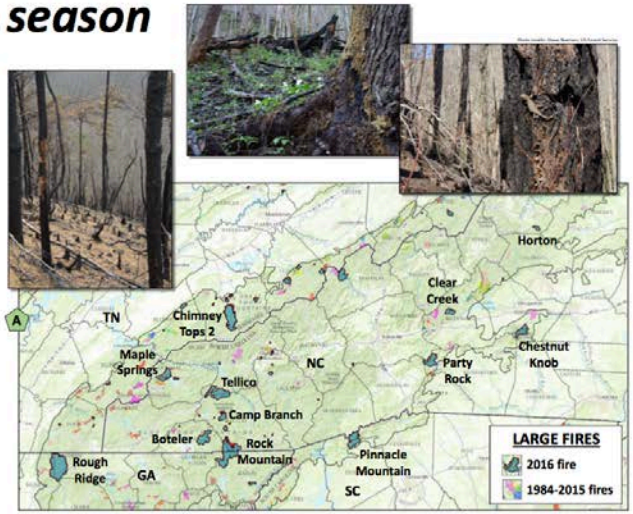
Biotic

Title	SRS Scientist	Incident or Site	Collaborators	Status
Landscape response to varying fire severity in the Appalachians.	Louise Loudermilk	Region	OSU	Proposed
Characterizing the 2016 fire footprint compared to past wildfires and fuels treatments in forests of the Southern Appalachians.	Steve Norman	All large fires and region		Ongoing
Identifying anthropogenic and topographical characteristics of human caused wildfires in the Appalachians.	Louise Loudermilk	Region		Proposed
Potential changes in combustion chemistry tied to extreme drought.	Mac Callaham	Region	Tall Timbers	Ongoing
Characterizing pre-fire forest structure with LiDAR	Bill Hargrove	GSMNP, NC fires	Oak Ridge National Laboratory	Ongoing
Delayed post-fire mortality related to forest floor consumption and severity.	Joseph O'Brien	GSMNP, Rock Mountain	University of Georgia, Tall Timbers	Ongoing
The interactions between drought stress and post-fire mortality.	Joseph O’Brien	Region	University of Georgia, Tall Timbers	Proposed

The extreme fall 2016 wildfire season of the Southern Appalachians

Steven P. Norman
Danny C. Lee
William W. Hargrove

US Forest Service
Southern Research Station
Asheville NC

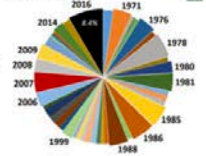


The seasonality of Appalachian wildfire

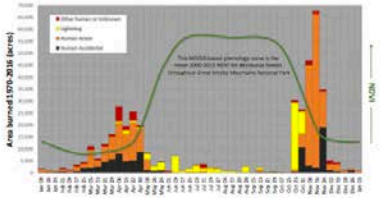
There is abundant historical and paleo evidence of fire in the Southern Appalachians, but until the fall of 2016, widespread large, long-duration fires were thought to be unlikely. From mid-October through November of 2016, a rash of human-ignited fires (and at least two large lightning fires) burned over 140,000 acres **[A]**. These fires were not just remarkable for the land area burned, but for their smoke and duration, the more mesic and rocky sites that burned, and the extreme fire behavior that was sometimes observed. The fire season came to a climatic close when hurricane force winds forced the Chimney Tops 2 Fire from Great Smoky Mountain National Park into nearby communities where it damaged or destroyed over 2000 homes, injured hundreds and caused death to 14.

Most wildfires and prescribed fires occur in the late winter to early spring, prior to the growing season. Until 2016, the majority of the area burned on public lands since 1970 was also early in the year. Increased moisture during the growing season keeps fires small, despite the warmer temperatures of summer. Summer humidity contributes to a largely bimodal fire seasonality with peaks in spring and fall with fires that are predominantly of human origin **[B]**. Even prior to 2016, the annual predictability of area burned was much greater in spring **[C]** than fall **[D]**. Remarkably, as much area burned in October and November of 2016 as had during all 46 prior fall seasons combined **[D]**.

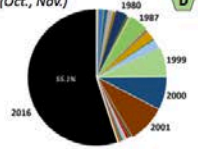
AREA BURNED IN SPRING *(Mar., Apr.)* **C**



B **THE SEASONALITY OF WILDFIRE IGNITIONS**



AREA BURNED IN FALL *(Oct., Nov.)* **D**

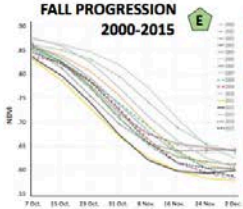


Fall fuel phenology

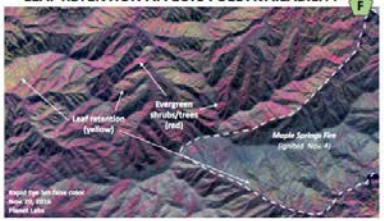
Vegetation phenology broadly controls the cessation of the spring and the onset of the fall fire seasons **[B]**, so it seems possible that variation in the timing of these seasonal transitions could temper the timing and duration of these two fire seasons. From high-frequency MODIS satellite data since 2000, fall declines in the Normalized Difference Vegetation Index (NDVI) vary by over 2.5 weeks **[E]**. Research from Great Smoky Mountains National Park indicates that leaf senescence, which is captured by NDVI, is accelerated by summer drought and delayed by fall warmth. These conditions could affect the onset and duration of the fall fire season by affecting both fuels and fire behavior.

Leaves of xeric species like oaks typically linger long after senescence. In 2016, abscission may have been further delayed from the lack of storms. By late November, leaf retention persisted on dry, protected, oak-dominated slopes according to high resolution imagery **[F]**. According to fire responders, continuously falling leaves made it more challenging to retain the integrity of control lines, and then, when winds picked up late in the season, mobilized leaves contributed to fire spread. This dynamic may have helped move fire into portions of the landscape that are generally more difficult to burn, such as mesic or boulder-dominated sites.

FALL PROGRESSION 2000-2015 **E**



LEAF RETENTION AFFECTS FUEL AVAILABILITY **F**



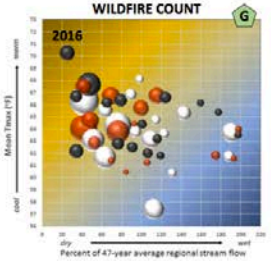
Acknowledgements:
Bill Christie, Stephanie Worley-Finley, US Forest Service

The role of drought, heat and ignitions

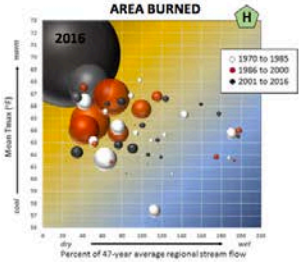
The fall of 2016 experienced a warm drought that was particularly severe in the southwestern half of the Southern Appalachian region. While drought is known to increase fire activity across many natural systems, this fire regime is driven by human ignitions such that the role of climate is less clear. In the graphs below, the x-axes reflect the average October-November flow for 10 unimpounded watersheds across the region. The y-axes show the mean maximum October-November temperature for three NOAA Climate Divisions (NC1, TN1, and GA2; *ftp.ncdc.noaa.gov*). Sphere diameter shows the relative count **[G]** or area burned **[H]** during a given year's fall fire season. Fire data is for the region's five National Forests and Great Smoky Mountains National Park, where wildfire records are generally reliable back to 1970.

The count of fall fires **[G]** increases when the season is warm and dry, particularly when fires during the early 1970s are ignored because arson ignitions were more common then. Area burned **[H]** shows a much greater dependence on drought-temperature conditions, but *extreme seasonal fire weather is no guarantee of a large area burned*. This unexpected result may reflect differences in where human ignitions occur with respect to large landscape fuels patches. Moreover, this nuanced relationship between drought, heat and ignitions suggests opportunities for targeted wildfire prevention.

WILDFIRE COUNT **G**



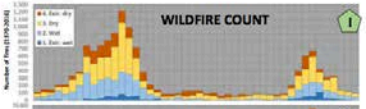
AREA BURNED **H**



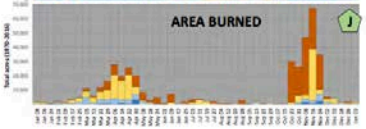
Since 1970, ignitions were common in spring and fall when the Palmer Drought Severity Index (PDSI) was wet (0 to 2.5), dry (-2.5 to 0) or extremely dry (<-2.5) **[I]**. In contrast, less area was burned in spring when it was wet, while extreme drought is the typical condition when fall wildfires ignite **[J]**.

The sensitivity of the Southern Appalachian fall fire season to drought and temperature is of particular concern, given seasonally-high human caused ignitions, predictions of a warmer future climate, the potential for long-duration smoke and its health effects, and an expanding wildland-urban intermix.

WILDFIRE COUNT **I**



AREA BURNED **J**



https://www.forestthreats.org/products/posters/Norman_IALE2017_SAppFire.pdf

Don’t Fear the Fire: An Education Initiative for Prescribed Burning after Drought

Joe O’Brien – USFS Southern Research Station

- USDA Southeast Regional Climate Hub
- Models suggest more intense rainfall and more frequent droughts – these conditions may have a large impact on forest management as these activities may be delayed or halted due to concerns about drought tree stress
- Objective: to increase understanding and use of prescribed fire as a tool by land managers and provide science-based recommendations that a properly designed prescription and subsequent application of fire within the prescription will enhance forest resilience to drought, nor will it increase tree-killing bark beetles

University of Tennessee

Initiated a collaborative effort to build a multi-agency and multi-institution fire center.

- Science and Technology center funded by NSF
- Funding would be for 10 years then would have to be self sufficient
- 20-30 collaborators

- *Karen Hughes and others* – NSF rapid grant – A Survey of Post-Fire Ascomycete and Basidiomycete Fungi in Eastern Deciduous Forests
- *Jessica Giacomini and Cory Blair* American Black Bear Movements in Response to Wildfire in Eastern Tennessee
- *Benjamin Fitzpatrick* Effects of the 2016 Chimney Tops 2 Wildfire on Stream Salamander Abundance and Diversity
- *Jennifer Schweitzer, John Schwartz, Karen Hughes and others* Integrated Wildlife-Urban Interface and Fire on Soil Biogeochemistry and Microbial Communities
- *Jennifer Franklin* Fire Effects on Cambial Injury in Shrubs
- *Charles Lafon, Henri Grissino-Mayer and Sally Horn* Fire history work

Clemson University

Other Research

- *Richard Baird* – Mississippi State University – Effects of Fire on Pathogens and Mycorrhizae Associated with Forest Trees and Woody Vegetation in Fire Damaged Areas of GSMNP Using Illumina Sequencing and Field Plot Collecting of Fleshy Fungi
- *Jeff Hatten and Michael San Clements* – Oregon State University and University of Colorado – Fire Effects on Soil and Aquatic Organic Matter in a Southern Appalachian Hardwood Forest: A Rapid Assessment across the Terrestrial-Aquatic Interface Following the GSMNP Fire of 2016
- *Emily Snider* – University of NC – Plant Community Response to the Chimney Tops 2 Fire in the Upland Yellow Pine Stands and Heath Balds on Mt. LeConte
- *Thomas Givnish* – University of Wisconsin – Plant Ecology on the Cove Hardwood Trail