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Quarterly Newsletter

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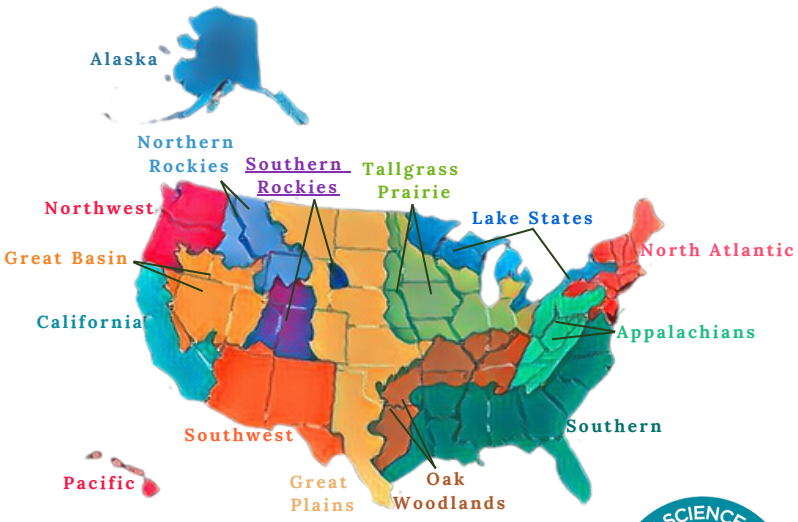
CONSORTIUM OF APPALACHIAN FIRE MANAGERS AND SCIENTISTS

CAFMS strives to increase and accelerate the flow of fire science and improve land management strategies by connecting fire managers and scientists throughout the Appalachian region.

Newsletter Highlights



Research Brief

Oak Regeneration Response to Frequent Growing-Season Burns After a Shelterwood with Reserves Harvest

In 1999, an influential study by Patrick Brose and David Van Lear reported oak and hickory regeneration success could be improved by conducting a shelterwood harvest followed by a single prescribed fire several years later (Brose and Van Lear 1998). Fire was more effective when it was higher-intensity and conducted in the growing season (late spring or late summer) because non-oak competitors, primarily yellow-poplar and red maple, experienced greater mortality than oaks and hickories.

Implementing a higher-intensity burn in the growing season is challenging, limited by weather and fuel conditions, as well as rules and regulations governing prescribed fire application. Managers who have attempted to apply the shelterwood-burn system have experienced mixed outcomes for oak regeneration, likely caused by variations in site quality, the initial density and size of oak regeneration compared to that of competitors, and the timing and intensity of the prescribed fire. However, there is limited information on whether several, frequent low-intensity fires could accomplish similar objectives as a single higher-intensity burn.

A new paper by a team of researchers from the University of Tennessee examines tree regeneration outcomes 13 years after a shelterwood with reserves harvest, which was followed by frequent growing-season burns. The 2025 paper is titled, "**Effects of growing season fire timing on oak regeneration**", and was published in the journal *Fire Ecology*; the authors are Mark Turner, Jacob Bones, Spencer Marshall, and Craig Harper. These same study sites were used to examine deer and turkey habitat and use – that component of the study was also featured in a **CAFMS research brief** in 2024.

Spring early growing-season burn

Fall late growing-season burn

Study Site:

The study was conducted at Chuck Swan State Forest in the Ridge and Valley physiographic province in east Tennessee. Study sites were on south- and west-facing slopes and supported mature oak-dominated forests. Mesophytic species were also common in the midstory, understory, and seedbank, and included yellow-poplar, red maple, beech, blackgum, and black cherry.

Experimental Treatments:

- Shelterwood with reserves harvests in 2010 removed about 50% of tree basal area and increased understory light to an average of 30% of full sunlight. Nearly all residual overstory trees were oaks.
- Four 4-acre treatment units were installed at each of four study sites:
  - Control (CON). No cutting or fire.
  - Shelterwood with reserves harvest (SW) with no prescribed fire.
  - Shelterwood with reserves harvest + early growing-season fire (EGS; mid-April to early May, after leaf-out)
  - Shelterwood with reserves harvest + late growing-season fire (LGS; September-October, prior to leaf drop)
- Six fires were conducted on each EGS and LGS unit with an average return interval of 2.2 years. The EGS burns were more complete and burned with moderate intensity, whereas the LGS burns were lower-intensity on average with less-complete coverage.

Field Methods:

- In 2023, the research team installed four study plots in each unit (64 plots total) to document post-treatment composition and abundance of tree regeneration (stems less than 4.5 feet tall) and the midstory (stems 4.5 feet tall to 4.5 inches diameter-at-breast- height [DBH]).
- Tree species were grouped to test for differences among treatments: red oaks (mostly black and northern red), white oaks (nearly all *Quercus alba*), mesophytes (yellow-poplar, red maple, beech, blackgum, black cherry), sassafras, and sumac.
- Understory light levels were measured as a percentage of full sunlight using ceptometers.

Key Findings, Year 13:

Control (no cutting, no fire):

- Understory light levels were 3.2% of full sunlight and 95% of midstory stems were mesophytes. Although oak understory stems were moderately abundant, the density of mesophytes was 3.5X that of oaks.

Shelterwood harvest with reserves with no fire:

- By year 13, the midstory in these stands had become dense, and the understory was heavily shaded (2.6% of full sun). The midstory was dominated by mesophytes, and oaks comprised only 1.1% of stems.
- The understory stratum was overtopped by a dense midstory. Mesophyte stems were significantly more abundant than all other species groups, and their density was >2X that of oaks.

Shelterwood harvest with reserves with early growing-season fires:

- Fires maintained open understory conditions (28% of full sun) with no midstory (no stems > 4.5 feet tall) as the last fire occurred in the spring of 2023, just prior to data collection.
- White oak understory stem density was greater than control but did not differ for the red oak group. The density and proportion of mesophyte seedlings was much reduced, whereas the density of all oak understory stems was approximately 1.5X that of mesophytes. However, fire-adapted sumacs were by far the most abundant group, comprising about 40% of all understory stems, followed by sassafras, also a fire-adapted species.

Shelterwood with reserves harvest with late growing-season fires:

- Similar to the EGS treatment, LGS fires sustained open understory conditions (38% of full sun) and the midstory was absent.
- Red oak understory stem density was significantly greater than in all other treatments (>4,000 stems per acre), and mesophytic regeneration was reduced. There were more total understory oak stems than sassafras stems, but there were 1.5X more understory sumac than oak stems.


Control. No cutting, no fire.


Shelterwood w/reserves, no fire.


Shelterwood w/reserves, + early growing-season fires.


Shelterwood w/reserves, + late growing-season fires.

Take Home Points:

- Without fire, the shelterwood with reserves harvest resulted in a dense midstory dominated by mesophytes; a poor outcome if sustaining oak is a priority. Also, the open understory condition, which provides improved habitat for deer and turkey (Turner and others, 2024), was rapidly lost in the absence of fire.
- In general, the abundance of understory oak stems was not greatly increased in the burn units. Red oak stems were most dense following repeated early fall burns, and white oak stems were more dense following repeated spring burns compared to the control unit without canopy reduction or fire.
- One major impact of repeated fires in either season was the density of **mesophytes was significantly reduced**, compared to the control and shelterwood-only treatments.
- Despite being less-intense and having reduced coverage, late growing-season burns were as effective at reducing mesophytes as early growing-season burns. Managers using fire during this period can accomplish their objectives with reduced risk of intense fire that could damage overstory trees.
- Prescribed fire during any season often promotes the establishment of sumac, which was essentially absent without fire in this study. Sumacs have hard-coated seeds that can persist for decades in the seedbank. Germination is stimulated by fire and once established, sumacs sprout vigorously after additional fires and grow rapidly in high-light conditions. Sumac density was reduced following LGS fire compared to EGS fire, which may be a consideration for some forest managers.
- The authors emphasize that if the fire-return was lengthened or ceased with the objective to regenerate oaks, the oak stems would have much less competition from mesophytes, which tend to outcompete oaks without fire, during midstory redevelopment. Although abundant sumac and sassafras compete with oak regeneration, surviving oaks may be trained by these species and should outgrow and overtop these species, which are typically confined to the lower midstory strata.

Links to Paper:

- Turner, M.A., Bones, J.T., Marshall, S.G. and Harper, C.A., 2025. Effect of growing season fire timing on oak regeneration. *Fire Ecology*, 21(1), p.6.
  https://doi.org/10.1186/s42408-025-00350-x.
  https://www.appalachianfire.org/_files/ugd/696505_ba36e26cf95a4565b66e43a541c838b6.pdf

Related Research:

- Brose, P.H. and Van Lear, D.H., 1998. Responses of hardwood advance regeneration to seasonal prescribed fires in oak-dominated shelterwood stands. *Canadian Journal of Forest Research*, 28(3), pp.331-339.
  https://doi.org/10.1139/x97-218
- Turner, M.A., Bones, J.T., Marshall, S.G. and Harper, C.A., 2024. Canopy reduction and fire seasonality effects on deer and turkey habitat in upland hardwoods. Forest Ecology and Management, 553, p.121657.
  https://doi.org/10.1016/j.foreco.2023.121657
  https://www.appalachianfire.org/_files/ugd/696505_8c88571cbed34ad6833301a9c1f6c9a7.pdf

About the Authors:

The lead author, Mark Turner, recently earned a PhD at the University of Tennessee; his doctoral dissertation was titled “Evaluating the effects of forage availability and landscape composition on white-tailed deer morphometrics across the eastern U.S.” Mark is now an Assistant Professor in the Department of Natural Resource Ecology and Management at Oklahoma State University. Craig Harper, a professor and the Extension Wildlife Specialist at the University of Tennessee, was Mark’s major professor; to learn more about Dr. Harper’s work, **click here**.

2024 Publications

Papers published in 2024 that focus on fire science in the Appalachians.

- Craycroft, J. and C. Schweitzer (2024). "Case study of UAS ignition of prescribed fire in a mixedwood on the William B. Bankhead National Forest, Alabama." *Fire Ecology* 20(1): 33. https://doi.org/10.1186/s42408-024-00263-1
- Cuprewich, S. A. and M. R. Saunders (2024). "Evaluating the impact of prescribed surface fire on seedlings in the Central Hardwood Region, USA." *Forestry* 97(1): 94-106. https://doi.org/10.1093/forestry/cpac064
- Dong, Z. and R. A. Williams (2024). "Characterization of Wildland Fuels Based on Topography and Forest Attributes in North-Central Appalachia."*Fire* 7(4): 145. https://doi.org/10.3390/fire7040145
- Ford, B. T., et al. (2024). "Wildland Fire Rate of Spread Estimation Using an Autonomous Unmanned Aerial System: A Case Study." AIAA SCITECH 2024 *Forum*. https://doi.org/10.2514/6.2024-0093
- Howie, N. A., et al. (2024)."Prescribed fire effects on understory woody plants and fuels in Quercus-Pinus mixedwoods." *Canadian Journal of Forest* Research(ja). https://doi.org/10.1139/cjfr-2024-0027
- Hutchinson, T. F., et al. (2024). "Sustaining eastern oak forests: Synergistic effects of fire and topography on vegetation and fuels." *Ecological Applications* 34(3): e2948. DOI: 10.1002/eap.2948
- Keyser, T. L. and C. H. Greenberg (2024) "Season of burn has minimal effect on groundlayer community structure and composition in an Appalachian mixed-oak forest." *Restoration Ecology* 32(4): e14131. doi: 10.1111/rec.14131
- Nowacki, G. J. and M. A. Thomas-Van Gundy (2024). "Using witness trees as pyro-indicators to depict past fire environments across the eastern United States." *Fire Ecology* 20(1): 13. https://doi.org/10.1186/s42408-024-00247-1
- Ochs, A. E., et al. (2024). "Population-level effects of prescribed fires on terrestrial salamander." *Forest Ecology and Management* 560: 121842. https://doi.org/10.1016/j.foreco.2024.121842
- Pile Knapp, L. S., et al. (2024). "Managing forward while looking back: reopening closed forests to open woodlands and savannas." *Fire Ecology* 20(1): 72. https://doi.org/10.1186/s42408-024-00312-9
- Reed, S. P., et al. (2024). "Multiple disturbances, multiple legacies: Fire, canopy gaps and deer jointly change the forest seed bank." *Journal of Ecology*. https://doi.org/10.1111/1365-2745.14459
- Robbins, Z.J., et al. (2024). "Fire regimes of the Southern Appalachians may radically shift under climate change." *Fire Ecology* 20(1): 1-17. https://doi.org/10.1186/s2408-023-002310-1
- Rudolph, A. J., et al. (2024). "A decades-long case study: Understanding the effects of mesophication on the forest community with emphasis on Carya spp. dynamics." *Journal of the Torrey Botanical Society*. https://doi.org/10.3159/TORREY-D-24-00017
- Saladyga, T., et al. (2024). "Pine woodland fire dynamics mirror industrial history at New River Gorge National Park and Preserve, West Virginia, USA." *Trees, Forests and People*: 100676. https://doi.org/10.1016/j.tfp.2024.100676
- Smithwick, E. A., et al. (2024). "Barriers and opportunities for implementing prescribed fire lessons from managers in the mid-Atlantic region, United States." *Fire Ecology* 20(1): 77. https://doi.org/10.1186/s42408-024-00315-6

- Speer, J. H., et al. (2024). "The Effect of Fire on Multiple Tree Species in the Eastern Deciduous Forest." *Fire* 7(1): 22. https://doi.org/10.3390/fire7010022
- Turner, M. A., et al. (2024). "Canopy reduction and fire seasonality effects on deer and turkey habitat in upland hardwoods." *Forest Ecology and Management* 553: 121657. https://doi.org/10.1016/j.foreco.2023.121657
- Vachula, R. S., et al. (2024). "Central Appalachian paleofire reconstruction reveals fire-climate-vegetation dynamics across the last glacial-interglacial transition." *Quaternary Science Reviews* 338: 108805. https://doi.org/10.1016/j.quascirev.2024.108805
- Wilk, A. J. and W. E. Peterman (2024). "Impacts of wildfire burn severity on plethodontid salamander populations of Great Smoky Mountains National Park." *Herpetologica* 80(2): 199-208. https://doi.org/10.1655/Herpetologica-D-23-00050
- Williams, G. and J. S. Brewer (2024). "Causes of a seedling recruitment advantage for an encroaching oak over a historically dominant oak in a fire-restored open oak woodland." *Forest Ecology and Management* 556: 121733. https://doi.org/10.1016/j.foreco.2024.121733

View plain language research brief summaries and peer reviewed publications on our website:

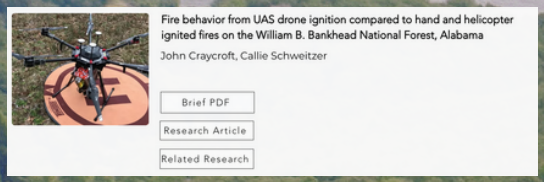
https://www.appalachianfire.org

Publications

2024 Top Appalachian Fire Science Publications

Amphibians & Reptiles	Fact Sheets/ Briefs
Bats	Fire and Fire Surrogate Study
Birds	Fire History
Chemistry/ Nutrients	Fire Techniques
Chestnut	Fuels
Climate & Weather	Insects/Arachnids
Controlled Burns	Mammals
Editorial/Public Outreach	Mortality
Cultural Burning	Oak

Research Briefs



Fire behavior from UAS drone ignition compared to hand and helicopter ignited fires on the William B. Bankhead National Forest, Alabama

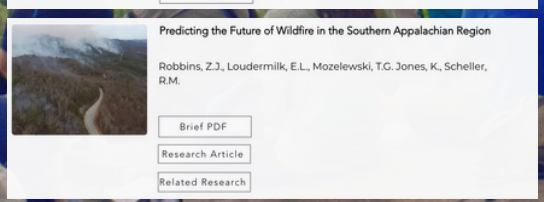
John Craycroft, Callie Schweitzer

Brief PDF | Research Article | Related Research

Contrasting Effects of Prescribed Fire and Wildfire on Terrestrial Salamanders

Ochs et al.; Wilk et al.,

Brief PDF | Research Article | Related Research



Predicting the Future of Wildfire in the Southern Appalachian Region

Robbins, Z.J., Loudermilk, E.L., Mozelewski, T.G. Jones, K., Scheller, R.M.

Brief PDF | Research Article | Related Research

23rd Biennial Southern Silvicultural Research Conference.

March 18 - 20, 2025
Greenville, SC

The Biennial Southern Silvicultural Research Conference (BSSRC) provides a forum for scientists and practitioners and graduate and undergraduate students broadly engaged in forestry and southern silviculture to report their study results, present new concepts and techniques, discuss topics of mutual interest, coordinate cooperative efforts, and stay current on developments in the field. For decades, the BSSRC and its published proceedings have been invaluable sources of information on current and developing trends in southern silviculture.
For more information visit the **BSSRC** website.

Southern Blue Ridge Fire Learning Network Annual Workshop

May 20 - 22, 2025
Dillard, GA

The 19th annual Southern Blue Ridge Fire Learning Network Workshop will be hosted this year in Dillard, GA, featuring the Georgia Blue Ridge landscape. The FLN helps people work together to increase the capacity and social capital needed to build ecosystem and community resilience. The FLN landscape collaboratives engage in a range of multiagency, community-based projects to restore landscapes that depend on, or are susceptible to, fire.
For more information visit the **Southern Blue Ridge FLN** website.

Northeast - Midwest Prescribed Fire Science and Management Workshop

July 8 - 10, 2025
Blended Learning Excursion with Multiple Field Trips across the NE-MW Region

Sponsored by the Northeast Regional Strategy Committee (NE RSC), a regional organization chartered by the national Wildland Fire Leadership Council (WFLC) to coordinate and support implementation of the National Cohesive Wildland Fire Management Strategy across the 20 Northeast and Midwest states. This workshop provides a forum for wildland fire management partners to share region-wide, science based, fire ecology information oriented toward expanding and maintaining the use of prescribed fire.
For more information visit **NE-MW Conference** website.

Southern Blue Ridge TREX

November 3rd - 16th, 2025

Pickens, SC

Applications will be opening soon and will be announced on the **SBR TREX website** as well as the **Consortium of Appalachian Fire Managers and Scientists Website** and **Facebook Page**.

The Southern Blue Ridge Prescribed Fire Training Exchange (SBR TREX) began in 2018. The objective of this two-week TREX program is to facilitate peer-to-peer, experiential learning for prescribed fire professionals and others interested in advancing their understanding of innovative tools to restore fire-adapted ecosystems. Participants learn, practice, and share knowledge, skills, and experience in a unique, hands-on training environment focused on the ecological, social, communications, monitoring, and operational dimensions of planning and implementing ecologically-based prescribed fire.

Trainings

- Maine Prescribed Fire Training Exchange (TREX) September 14 - 26, 2025 - Application Period Ends: May 1, 2025. **Application**
- 2025 Virginia Interagency Fire Academy - Registration ends March 31, 2025: **Registration**
- Virtual NWCG RT - 130 Fire Refresher Sponsored by the Great Plains Fire Learning Network: **Contact Chad Bladow, cbladow@tnc.org**

Webinars

- **March 5, 2025**: Oak Silviculture and Fire. **Registration**
- **March 19, 2025**: The Role of Microscale Habitat Features in Ecological Forestry. **Registration**
- **March 19, 2025**: Applied Ecological Silviculture. **Registration**
- **March 26, 2025**: LANDFIRE Office Hours: Project Level Fuels Management Planning Using Quantitative Wildfire Risk Assessment in IFTDSS: **Registration**

Resources

- Georgia Forestry Commission Hurricane Helene Resources: **Website**
- South Carolina Forestry Commission Learn to Burn Field Day - March 5, 2025: **Info**

We value your continued support and feedback!

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Website: [www.appalachianfire.org]

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Some things we have been up to lately