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New Tree-Ring Fire Histories from the Appalachians



CAFMS supported the development and publication of the 2017 report *“Fire history of the Appalachian region: a review and synthesis”*, authored by Charles Lafon and others, the first comprehensive look at fire history in the region, based on recent research findings. The report has been widely distributed and used to inform and support prescribed burn programs. Soon after the review/synthesis, a significant addition to that body of work was published, a 2018 paper titled *“Wave of fire: an anthropogenic signal in historical fire regimes across central Pennsylvania”*, written by Michael Stambaugh, Joseph Marschall, and others. Their extensive study of fire-scarred pines at 12 sites provided a detailed picture of more than 300 years of wildland fire in the Appalachians of that state, including a consistent increase in fire frequency as human populations expanded with Euro-American settlement. In the past year, three new Appalachian fire history studies were published, based on fire-scarred pines in the mountains of Maryland, West Virginia, and Virginia. These new papers, summarized below, add to our increasing knowledge of historic fire regimes in Appalachian pine-oak ecosystems.

Howard, L. F., G. D. Cahalan, K. Ehleben, B. A. M. El, H. Halza, and S. DeLeon. 2021. Fire history and dendroecology of Catoctin Mountain, Maryland, USA, with newspaper corroboration. *Fire Ecology* 17:1-13.

Study site/methods

- The study was conducted at Catoctin Mountain Park, MD, a National Park Service property in the Blue Ridge Province. The current overstory is dominated by oaks (chestnut, scarlet, black).
- The team searched xeric slopes and collected samples from 27 living and dead pitch pines with fire scars to develop a dendrochronology fire history.
- Historic newspaper articles from nearby towns were also systematically searched to document specific fire days, which were related to weather conditions.

Key findings

- 58 fires were documented from 1702 to 1951, with an area-wide (composite) fire frequency of 3 to 6 years; nearly all fire scars (>95%) occurred in the dormant-season (between annual growth rings).
- Newspaper articles provided evidence of 33 fires on or near Catoclin Mountain from 1837 to 1960, also showing a return interval of 3 to 6 years. For 16 fires that were documented in both the tree-ring record and newspaper articles, weather records showed that the dormant-season fires occurred during dry periods, when there had been, on average, 12 days without significant rain.
- On the fire history site, today's closed-canopy forest is dominated by shade-tolerant blackgum in the midstory/sapling layer with little or no oak and pine regeneration. The authors conclude that decades of fire suppression coupled with excessive deer browsing have contributed to this condition. They suggest the reintroduction of fire and reduction of deer populations to restore open woodlands and favor oak and pine regeneration.

Lead author Lauren Howard is an Associate Professor of Biology at Arcadia University in Glendale, PA. He is also a Community Representative for the North Atlantic Fire Exchange.

Saladyga, T., and R. S. Maxwell. 2021. A multi-century fire history from the Potomac Highlands of West Virginia. *Southeastern Geographer* 61:258-278.

Study site/methods

- The research took place in the Short Mountain Wildlife Management Area, managed by the West Virginia Division of Natural Resources, located in the Ridge and Valley Province in West Virginia's eastern panhandle.
- Wood samples were collected from 57 fire-scarred yellow pines (living trees, snags, stumps) in five separate sites (1 to 7 acres) to develop annual fire histories; species were pitch, Table Mountain, and Virginia pine.

Key findings

- 84 fires were documented, spanning the years 1739 to 2011; 76% of scars were formed in the dormant season.
- For individual sites, fires occurred on average every 7 to 15 years, with a composite fire frequency (fire occurring in any of the 5 sites) of 4 years. In contrast to most studies in the region, fires continued to occur in the suppression era, at least at two of the sites, but were less likely to burn multiple sites, suggesting smaller fires.
- Similar to other studies, there was not a strong link between fire and annual climate, with fires occurring in both dry and wet years.
- As the authors note "*These findings provide a new context for using prescribed fire as a broader management strategy for pine-oak forests in the Potomac Highlands.*"

Lead author Tom Saladyga is an Associate Professor of Geography at Concord University in Athens, WV, where he runs the Environmental Geography Lab.

Lafon, C. W., G. G. DeWeese, W. T. Flatley, S. R. Aldrich, and A. T. Naito. 2021. Historical fire regimes and stand dynamics of xerophytic pine–oak stands in the southern Appalachian Mountains, Virginia, USA. *Annals of the American Association of Geographers*:1-23.

Study site/methods

- This large study was carried out at four sites, each with four pine-dominated (Table Mountain, pitch) stands within a larger matrix of oak forest, in the Ridge and Valley Province in Jefferson National Forest, VA.
- Across the four sites, 237 fire-scarred yellow pines were used to develop a variety of fire frequency measures, and to determine fire-climate relationships. Also, all trees in each stand were cored to document stand dynamics and species composition through time.

Key findings

- Fire was frequent from the mid-to-late 1700s until the suppression era (ca. 1930s). For the 16 individual stands, mean fire intervals ranged from 4 to 10 years, while the mean composite fire interval for each of the four sites ranged from 2 to 4 years. 72-90% of scars were formed in the dormant-season or very early in the growing-season. At two sites more frequent scarring was associated with dry years – likely fall droughts.
- Unlike the “wave of fire” reported by Stambaugh, Marschall and others in PA, fire frequency remained similar before and after Euro-American settlement in these landscapes, until the suppression era, when few fires were recorded.
- There was some evidence of high severity fires that established cohorts of pine seedlings. Stand histories show that when fires were frequent, yellow-pine establishment was dominant. In the early suppression period, establishment shifted primarily to oaks and then later included more mesophytic species (blackgum, red maple, white pine).
- Results of this and other work in the southern Appalachians lead the authors to conclude that “*frequent burning was maintained by large-extent fires, ignited by people and lightning that burned across the mountain slopes and spread through a flammable vegetation mosaic to encompass the pine stands and surrounding hardwood forests*”

Lead author Charles Lafon is a Professor in the Department of Geography at Texas A&M University.

SAVE THE DATE

MAY 24-27, 2021 – DILLARD, GA

5 Years Since the Fires of 2016

Join us for 4 days of management and research outcomes since the fall 2016 wildfires. The Southern Blue Ridge FLN and CAFMS are putting together a joint workshop. How has management changed in the wake of the fires and what new research has emerged since the fires?

Do you have outcomes to share? Let us know by emailing helen@cafms.org

New Publications in 2021

- Arthur, M. A., J. M. Varner, C. W. Lafon, H. D. Alexander, D. C. Dey, C. A. Harper, S. P. Horn, T. F. Hutchinson, T. L. Keyser, and M. A. Lashley. 2021. **Fire ecology and management in eastern broadleaf and Appalachian forests**. Pages 105-147 in *Fire Ecology and Management: Past, Present, and Future of US Forested Ecosystems*. Springer. <https://www.fs.usda.gov/treearch/pubs/63454>
- Beals, K. K., A. E. Scarce, A. T. Swystun, and J. A. Schweitzer. 2022. **Belowground mechanisms for oak regeneration: Interactions among fire, soil microbes, and plant community alter oak seedling growth**. *Forest Ecology and Management* **503**:119774. <https://www.sciencedirect.com/science/article/pii/S0378112721008653>
- Bhuta, A. A., and L. M. Kennedy. 2021. **Woody plant dynamics in a foundation conifer woodland of the Appalachian foothills, Alabama**. *Southeastern Naturalist* **20**:498-520. <https://bioone.org/journals/southeastern-naturalist/volume-20/issue-3/058.020.0313/Woody-Plant-Dynamics-in-a-Foundation-Conifer-Woodland-of-the/10.1656/058.020.0313.full>
- Carpenter, D.O., M.K Taylor, M.A. Callaham, J.K. Heirs, E.L. Loudermilk, J.J. O'Brien, and N. Wurzbarger. 2021. **Benefit or liability? The ectomycorrhizal association may undermine tree adaptations to fire after long-term fire exclusion**. *Ecosystems* **24**:1059-1074. <https://www.fs.usda.gov/treearch/pubs/63061>
- Dems, C. L., A. H. Taylor, E. A. Smithwick, J. K. Kreye, and M. W. Kaye. 2021. **Prescribed fire alters structure and composition of a mid-Atlantic oak forest up to eight years after burning**. *Fire Ecology* **17**:1-13. <https://link.springer.com/article/10.1186/s42408-021-00093-5>
- Dey, D. C., M. C. Stambaugh, and C. J. Schweitzer. 2021. **Learning to live with fire: managing the impacts of prescribed burning on eastern hardwood value**. *Fire Management Today*. 79 (1): 52-60. **79**:52-60. <https://www.fs.usda.gov/treearch/pubs/62084>
- Hahn, G. E., T. A. Coates, W. M. Aust, M. C. Bolding, and M. A. Thomas-Van Gundy. 2021. **Long-term impacts of silvicultural treatments on wildland fuels and modeled fire behavior in the Ridge and Valley Province, Virginia (USA)**. *Forest Ecology and Management* **496**:119475. <https://www.fs.usda.gov/treearch/pubs/63499>
- Hauer, C. L., J. Shinskie, R. Picone, D. McNaughton, J. D. Lambrinos, and J. Hovis. 2021. **Effects of prescribed fire on site occupancy of Allegheny woodrats (*Neotoma magister*) in a mixed-oak forest in south-central Pennsylvania**. *Natural Areas Journal* **41**:104-113. <https://bioone.org/journals/natural-areas-journal/volume-41/issue-2/043.041.0205/Effects-of-Prescribed-Fire-on-Site-Occupancy-of-Allegheny-Woodrats/10.3375/043.041.0205.full>
- Howard, L. F., G. D. Cahalan, K. Ehleben, B. A. M. El, H. Halza, and S. DeLeon. 2021. **Fire history and dendroecology of Catocin Mountain, Maryland, USA, with newspaper corroboration**. *Fire Ecology* **17**:1-13. <https://link.springer.com/article/10.1186/s42408-021-00096-2>
- Kane, J. M., J. K. Kreye, R. Barajas-Ramirez, and J. M. Varner. 2021. **Litter trait driven dampening of flammability following deciduous forest community shifts in eastern North America**. *Forest Ecology and Management* **489**:119100. <https://www.sciencedirect.com/science/article/pii/S0378112721001894>
- Keyser, T. L., B. S. Collins, and C. H. Greenberg. 2021. **Response of taxonomic and functional diversity to disturbance severity in temperate hardwood forests**. *Applied Vegetation Science* **24**:e12538. <https://www.fs.usda.gov/treearch/pubs/62208>

- Lafon, C. W., G. G. DeWeese, W. T. Flatley, S. R. Aldrich, and A. T. Naito. 2021. **Historical fire regimes and stand dynamics of xerophytic pine–oak Stands in the southern Appalachian Mountains, Virginia, USA.** *Annals of the American Association of Geographers*:1-23. <https://www.tandfonline.com/doi/full/10.1080/24694452.2021.1935206>
- McDaniel, J. K., H. D. Alexander, C. M. Siegert, and M. A. Lashley. 2021. **Shifting tree species composition of upland oak forests alters leaf litter structure, moisture, and flammability.** *Forest Ecology and Management* **482**:118860. <https://www.sciencedirect.com/science/article/pii/S0378112720316297>
- Morin, D. J., L. Schablein, L. N. Simmons, J. H. Lorber, and M. K. Smith. 2021. **Identifying coarse-and fine-scale drivers of avian abundance following prescribed fires.** *Forest Ecology and Management* **485**:118940. <https://www.sciencedirect.com/science/article/pii/S0378112721000293>
- Oakman, E. C., D. L. Hagan, T. A. Waldrop, and K. Barrett. 2021. **Understory community shifts in response to repeated fire and fire surrogate treatments in the southern Appalachian Mountains, USA.** *Fire Ecology* **17**:1-15. <https://link.springer.com/article/10.1186/s42408-021-00097-1>
- Saladyga, T., and R. S. Maxwell. 2021. **A multi-century fire history from the Potomac Highlands of West Virginia.** *Southeastern Geographer* **61**:258-278. https://www.researchgate.net/profile/Tom-Saladyga/publication/353732687_A_Multi-Century_Fire_History_from_the_Potomac_Highlands_of_West_Virginia/links/610e6c700c2bfa282a2bae12/A-Multi-Century-Fire-History-from-the-Potomac-Highlands-of-West-Virginia.pdf
- Schweitzer, C., and D. C. Dey. 2021. **Coproducing science on prescribed fire, thinning, and vegetation dynamics on a National Forest in Alabama.** *Fire Management Today* **79**:43-51. <https://www.fs.usda.gov/treesearch/pubs/62086>
- Varner, J. M., J. M. Kane, J. K. Kreye, and T. M. Shearman. 2021. **Litter flammability of 50 southeastern North American tree species: evidence for mesophication gradients across multiple ecosystems.** *Frontiers in Forests and Global Change*:153. <https://www.frontiersin.org/articles/10.3389/ffgc.2021.727042/full>
- Vaughan, M. C., D. L. Hagan, W. C. Bridges, M. B. Dickinson, and T. A. Coates. 2021. **How do fire behavior and fuel consumption vary between dormant and early growing season prescribed burns in the southern Appalachian Mountains?** *Fire Ecology* **17**:1-16. <https://www.fs.usda.gov/treesearch/pubs/63504>
- Zhao, A., A. H. Taylor, E. A. Smithwick, M. Kaye, and L. B. Harris. 2021. **Simulated fire regimes favor oak and pine but affect carbon stocks in mixed oak forests in Pennsylvania, USA.** *Forest Ecology and Management* **494**:119332 <https://www.sciencedirect.com/science/article/pii/S0378112721004205>

Join us for a Virtual Field Trip!

CAFMS presented our first virtual field tour to the Association of Fire Ecology's Fire Congress in November. On this tour we explored two different sites in western NC that are currently managed with controlled burns. We showcased the partnerships that make these burns happen and discussed special considerations including WUI, fire effects, and wildfire interactions. We're looking forward to creating a series of virtual field trips for all our members to learn from. If you have a fire managed site that you'd like to showcase, contact Jen Bunty (jen@cafms.org)

<https://www.youtube.com/watch?v=AJ-ABAARGaO>

Fueling Collaboration....

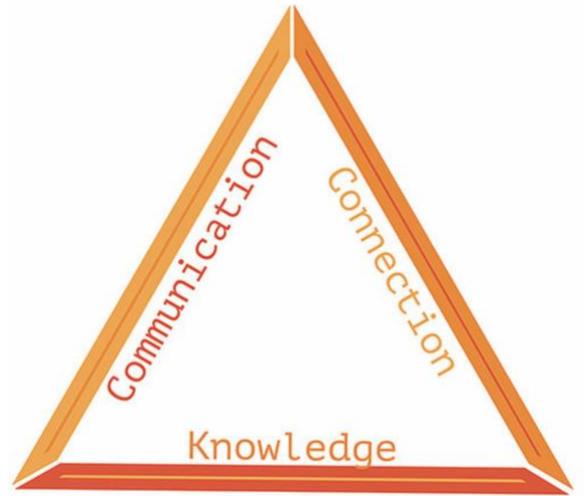
Season 2

If you missed the first series of Fueling Collaboration that occurred this past winter, then you are in luck. There is another series going on now.

These are interactive panel discussions designed to encourage collaboration between fire managers and scientists. The series is built on questions from the registered attendees.

To register for season 2 or view recordings of past sessions:

<https://www.fuelingcollab.com>



Fire and the Carbon Cycle

Nov. 18, 2021 - Exploring the dynamic role that fire plays in soil nutrient cycling, carbon dynamics, and other ecosystem processes.



Fire and Timber Management in Mixed Woods

Dec. 16, 2021 - Challenges and opportunities for using prescribed fire in oak-pine forests that have both timber and natural community management values.



Smoke is NOT Just Smoke

Jan. 20, 2022 - What are the messages we should be communicating? What are the tools that can help us assess impacts?



Fire and the Wildland Urban Interface in the eastern U.S.

Feb. 17, 2022 - How wildfire, prescribed fire, and climate change intersect in the WUI of the East.



Thinking Beyond Fuel Reduction

Mar. 17, 2022 - Prescribed fire is more than an alternative to wildfire. We'll discuss some of the benefits of controlled burns besides fuel reduction.

Request for Research Needs

Do you have ideas for research needs in the Appalachian region?

If so, we would like to hear from you! We are compiling a list of research needs to submit to the Joint Fire Science research needs database. Please send your ideas to helen@cafms.org.



**WE Wish You All a
Joyous Holiday Season!**

Communicate with Us!



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

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