Ignis **Newsletter of the Oak Woodlands and Forests Fire Consortium**

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INSIDE THIS ISSUE

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Our Mission:

To provide fire science to resource managers, land-owners, and the public about the use, application and effects of fire within the region

- Visit oakfirescience.com
- Find us on Facebook
- Follow us on Twitter
- Watch us on *Vimeo*

THROUGH THE SMOKE

As we progress through the COVID-19 pandemic, straining to see and get to the other side, it seems similar to trying to look through the smoke of a wildland fire. Questions regarding the potential/likely unseen hazards, opportunities, and potential for growth may apply to both settings. Also similar is that for forward progress to occur, there is an absolute necessity for appropriate preparation, foresight, agility, creativity, and willingness to adapt as changing conditions necessitate.

The Oak Woodlands & Forests Consortium (OWFFC) is striving to peer through this smoke as well, seeking to chart our path forward strategically, while maintaining situational awareness in terms of hazards and opportunities for growth. We, along with our sibling organizations in the JFSP Fire Science Exchange Network are learning (and sharing) lessons that we believe are increasing our capacity, efficiency, and impact towards meeting our mission of increased access and consideration of relevant science in fire management.

Primary among these lessons are those relating to virtual learning. Virtual learning has taken a giant leap forward since March 2020. In many cases, this includes vastly improved accessibility, function, and acceptance of virtual learning by fire management and science organizations. For example, over the past two years we (with partners) have hosted three new virtual workshops (access the recordings and materials for all HERE), none of which would have seemed reasonable or feasible for a virtual format before 2020. Participation in our webinars (see recordings HERE) and special collaborations (e.g., Fueling Collaboration panel

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Moving fire forward...

RESEARCH HIGHLIGHT:

Reviewing fire, climate, deer, and foundation species as drivers of historically open oak and pine forests and transition to closed forests

Brice B. Hanberry, Marc D. Abrams, Mary A. Arthur, J. Morgan Varner

Frontiers in Forests and Global Change, 12 May 2020.

In this review, authors assessed four hypothesized drivers of widespread forest community changes (**fire exclusion, precipitation, white-tailed deer densities,** and **loss of American chestnut** (*Castanea dentata*)) which have been observed across the eastern US over the last century. Across this region, historically fire-maintained open oak and pine dominated woodlands and savannas with robust and diverse herbaceous groundlayers have transitioned to closed-canopy forests comprised of increased numbers and species of fire-sensitive trees with groundlayers depauperate of herbaceous vegetation. In addition to increased woody stem density and species composition changes in former woodlands and savannas, former grasslands and shrublands have been invaded by trees and transitioned to forests.

Management Implications

- Eastern US historical fire regimes were dominated by frequent, low-severity fires.
- Regionwide fire exclusion implemented circa 1900 as a primary driver of changes in eastern US forest ecosystems provides a unifying explanation for increased tree density, species composition shifts, and tree encroachment.
- Misplaced focus on the incorrect drivers of ecosystem change may lead to management inefficiencies and loss of biodiversity.

Fire exclusion

This hypothesis suggests that in frequent-fire regimes, fire-tolerant species preferentially survive relative to fire-sensitive species, tree density is limited by the top-killing of small trees, and a continuous bed of fine and flammable fuels (e.g., herbaceous vegetation, upland oak litter) would be promoted and create a positive fire-feedback loop. For this to be supported, it is expected that following fire suppression, fire-tolerant oaks and pines should decrease in composition and fire-sensitive species composition and tree densities should increase.

Increased precipitation

This hypothesis proposes that increased precipitation since the late 17th century is responsible for overall increased tree survival. In particular, that increased survival of drought-sensitive trees led to changes in structure and species composition of eastern US forests, and facilitated tree encroachment into formerly open areas. To be supported, it is expected that wetter landscapes would contain more drought-sensitive tree species, and drier landscapes would contain more drought-tolerant species. Additionally, it is expected that drought would kill drought-sensitive species and reduce overall tree densities. **...Cont'd on Page 3**

Characteristic structure of open forests (panel A), which have an overstory tree layer and herbaceous layer, and closed forests (B), which have trees throughout the vertical profile to the canopy, replacing the herbaceous layer. Photos from stands in Missouri treated by prescribed burns (A) or without treatment (B), courtesy of C. Kinkead.

Research brief, continued

Conversely, periods of increased precipitation (pluvial) and decreased drought would cause increased survival of drought-sensitive species and increase tree densities.

Increased white-tailed deer densities

This hypothesis suggests that the near elimination of white-tailed deer in the eastern US in the late 1800s, and reductions of free-ranging pigs and cows, allowed for increased tree densities due to lack of browsing pressure. For this hypothesis to be supported, it is expected that in areas and times of reduced browsing pressure, increases in tree densities, in particular preferred browse species, would occur, and tree density would decrease with increasing deer density.

Loss of American chestnut

This hypothesis suggests that the sudden, widespread loss of American chestnut (caused by non-native chestnut blight (*Cryphonectria parasitica*)) led to major transitions to eastern US forests due to an abrupt increase in available growing space, which was then occupied by fire-sensitive tree species. For this hypothesis to be supported, it would be expected that the historical distribution and level of dominance of A. chestnut, would be similar to the spatial extent and degree of observed forest community transition.

Review findings

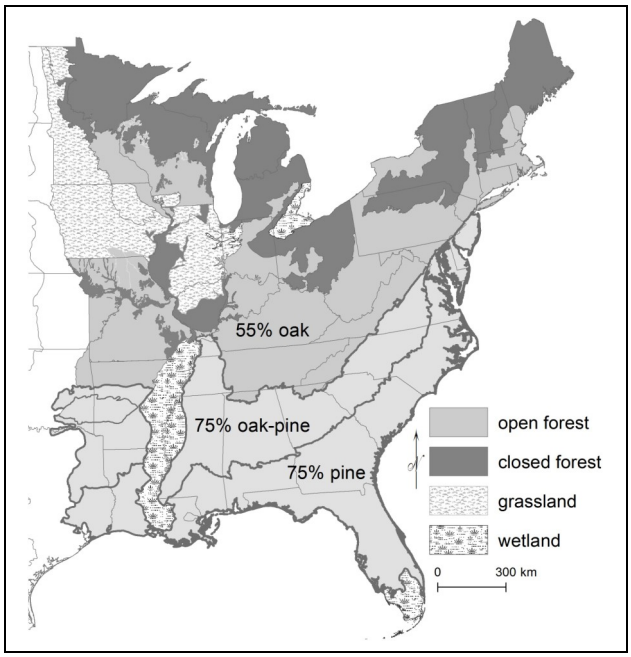
While the changes observed in eastern US forests initially appear to be connected to coincident changes in precipitation and deer density, the study authors concluded that fire and fire-exclusion offer the most parsimonious and consistent explanation to the shifts in forest density and composition observed since the early 1900s.

Climate has long been considered an explanatory factor for vegetation community patterns (e.g., 'plant hardiness zones'). Though reconstructions of drought conditions for the past 500 years have detected increased occurrence of pluvials and decreased drought in the eastern US since the 1870s, analyses considering an expanded record of drought (1000 years) do not show drought conditions to have been statistically different during the 1900s. Additional contradicting evidence for this proposed driver includes that the shifts in tree species have followed along lines of fire-tolerance rather drought-tolerance traits (e.g., increased prevalence of drought-tolerant, fire-sensitive eastern red cedar (*Juniperus virginiana*)), and that tree density has increased, and coverage expanded, during periods of drought and increased precipitation.

While the last major pulse of oak recruitment and the first pulse in fire-sensitive species coincided with the lowest point of browsing pressure, the authors' review casts doubt on its suitability as an explaining factor. Contradicting evidence includes that the densities of nearly all tree species increased regardless of browsing preference of tree species, that the current high levels of deer across the eastern US are not reducing forest densities or promoting increased levels of fire-tolerant tree species, and also that modeling studies have shown deer densities to not be related to tree stocking levels (amount of growing space occupied by trees).

Similarly, the loss of A. chestnut does not sufficiently or consistently explain the observed ecosystem changes. Primary among contradicting evidence is that the changes have occurred across the entire eastern US, while the range of A. chestnut was mostly along the Appalachian Mountain ranges. Additionally, oak species (especially *Quercus alba* and Q. *montana*) were prominent associates of A. chestnut and comprised a larger proportion of the forests, and therefore were better poised to occupy the growing space made available rather than fire-sensitive tree species.

Frequent and widespread wildland fire provides an efficient explanation for the open conditions of pre-Euro-settlement forests in the eastern US, which were dominated by fire-adapted tree species. Supporting evidence for the fire-exclusion driver hypothesis includes the continuous dominance of fire-tolerant vegetation communities (e.g., oak/pine woodlands) for thousands of years, including periods of different climate conditions (e.g., Medieval Warm Period (~950-1250 AD) and Little Ice Age (~1300-1850 AD)). Multiple lines of evidence (fire scar and charcoal records, written accounts) indicate that historical fire regimes across much of the eastern US were dominated by frequent, low-severity surface fires until fire-exclusion practices were implemented in the early 1900s. Similarly, the changes in tree density and species composition observed since the early 1900s are consistent with fire exclusion being a primary driver of increased tree density and shifts in species composition.



Estimated extent of open forests in the eastern United States based on historical tree surveys from 1620 to 1900. Variation was caused by environmental gradients and anthropogenic burning regimes.

Download a printable version of this research brief **HERE**

From pg 1: continued

discussion series) is at all-time highs, and yet we continuously hear from our fire management and research colleagues that it is critical we consider creative ways to gather in-person again.

As the shape of the landscape beyond the pandemic starts to materialize and become visible, we face important decisions and opportunities as individuals and organizations. Currently, we are laying the foundation for our next year of activities and products development. Chief among our decisions is to determine what elements of virtual learning have improved our program and should be carried forward, and when, how, and for what purposes will we once again meet in-person? As individuals, we will all be wrestling with decisions on similar topics, that will have major implications on how the world of fire management and science looks on the other side of the pandemic. We look forward to seeing you all there to keep *moving fire forward*!

HEADS UP!

2021-22 Webinar recordings are now available online

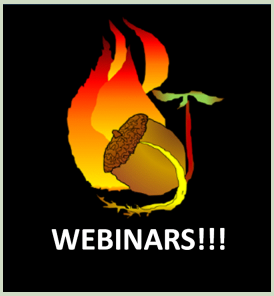
Dr. Joseph Veldman, Texas A&M University

Relevance of the old-growth grassland concept to tropical savanna conservation and restoration *CLICK HERE* to watch recording

Ron Salemme, University of Illinois

Invasive grass-fire feedbacks in Shawnee National Forest

CLICK HERE to watch recording



Dr. Erica Smithwick, Pennsylvania State University

Firescapes of the mid-Atlantic: challenges and opportunities for implementing prescribed burning as a land management strategy

** Cohosted with the North Atlantic Fire Science Exchange **

CLICK HERE to watch recording

Reintroducing the Brown-headed Nuthatch to the Missouri Ozarks

Virtual Workshop Recording

NOW AVAILABLE ONLINE!

This virtual workshop includes 3 scientific presentations and a panel discussion. It tells a fire science management success story, where long-term restoration of shortleaf pine-oak woodlands at landscape scale set the stage for returning the brown-headed nuthatch to the Missouri Ozarks!

Click HERE to view recordings

Photo: Noppadol Paothong, Missouri Department of Conservation

Moving fire forward...

SPOTLIGHT

In an effort to introduce you to new people and information from the region, we interview fire practitioners and researchers about timely topics. In this issue, we ask these questions of Brice Hanberry, with the USDA Forest Service Rocky Mountain Research Station.

Brice Hanberry is a Research Ecologist with the Rocky Mountain Research Station of the USDA Forest Service. Her research focuses on collective evidence of historical fire influence on ecosystems and transition in ecosystems with fire exclusion.

What are some of the greatest fire research needs for the oak ecosystems in the eastern U.S.?

BH: The greatest fire research needs relate to treatments that will control sprouting non-oak tree species. Interesting research topics would be the historical extent of woodlands in the eastern U.S. and the long-term historical coexistence of oaks and American beech.

What is your biggest concern regarding the use of fire to manage woodlands and forests?

BH: Aside from social issues, an ecological concern of applying fire is unintended consequences, for example damage to isolated rare species or established oak trees that have never been exposed to fire.

In your opinion what is the greatest advantage to using prescribed fire when managing woodlands and forests?

BH: The greatest advantage to using prescribed fire when managing woodlands and forests is that prescribed fire is a whole system disturbance and some plant, fungi, and insect species respond to fire, or smoke, differently than to similar woodland structure created by mechanical or chemical applications.

FUELING COLLABORATION
PANEL DISCUSSION SERIES

USFS Northern Research Station and the JFSP Fire Science Exchange Network

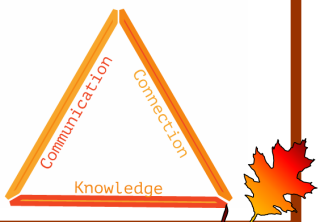
JOIN US FOR THIS SEASON'S FINAL SESSION, MARCH 17, 2022: "THINKING BEYOND FUEL REDUCTION," *CLICK HERE*

SEASON ONE (2020-2021): ALL FOUR RECORDINGS AVAILABLE, CLICK HERE

- Pairing Historical Fire Regimes with Silviculture
- Using Fire Seasonality to Open the Burn Window
- Timber Management and Prescribed Fire
- Fire and Climate Change

SEASON TWO (2021-2022): RECORDINGS COMING SOON, CLICK HERE

- Fire and the Carbon Cycle
- Fire and Timber Management in Mixed Woods
- Smoke is NOT Just Smoke
- Fire and the Wildland Urban Interface in the eastern U.S.
- Thinking Beyond Fuel Reduction



UPCOMING EVENTS

March 1 &2, 2022: Smoke Tools Virtual Workshop
For more information, CLICK HERE

March 3, 2022: Webinar: Results and Recommendations from the Southeast Prescribed Fire Training Needs Survey
For more information, CLICK HERE

March 3-5, 2022: Women Woodland Owners Virtual Conference
For more information, CLICK HERE

March 9, 2022: Estimating Property-Level Carbon Storage using NASA's GEDI Lidar
For more information, CLICK HERE

March 17, 2022: Fueling Collaboration: Thinking beyond fuel reduction
For more information, CLICK HERE

March 22-24, 2022: IAFC's Wildland-Urban Interface Conference
Reno, NV. For more information, CLICK HERE

April 1, 2022: Prescribed burn certification training by Mo. Department of Conservation
St. Louis/Warrenton, MO. For more information, CLICK HERE

May 24-27, 2022: Southern Blue Ridge FLN / CAFMS Joint Workshop
Dillard, GA.

October 4-7, 2022: Fire Ecology Across Boundaries: Connecting Science and Management
Florence, Italy. For more information, CLICK HERE

December 6-8, 2022: 7th Fire in Eastern Oaks Conference
For more information, CLICK HERE

Please contribute your event announcements. Send information to: oakfirescience@gmail.com

Moving fire forward...