

Prescribed Fire as a Tool to Reduce Tick Populations

In recent decades, forest tick populations and cases of tick-borne illness have expanded. Management to reduce tick populations has focused on reducing the numbers of animals that are hosts for ticks and spraying, but these efforts are at a small scale and difficult to implement for several reasons, including cost. A recent paper authored by Michael Gallagher and others, **“Can restoration of fire-dependent ecosystems reduce ticks and tick-borne disease prevalence in the eastern United States”** reviews and synthesizes research on ticks, their life cycle and habitat requirements, and makes a convincing argument that landscape burning for restoration of eastern forests and woodlands (pine and oak-dominated) can also reduce tick populations and thus the likelihood of disease transmission to humans and other animals.

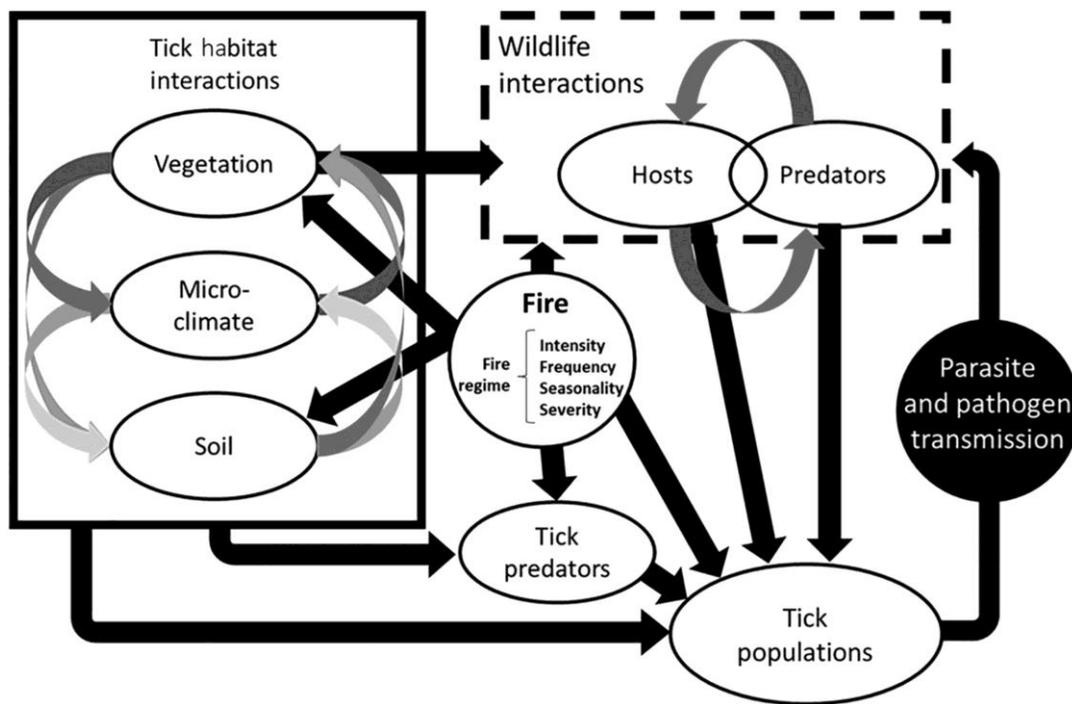


Figure 1 in paper. Conceptual model of fire’s direct and indirect effects on tick populations. Each factor varies spatially and temporally across landscapes and regions.

Tick habitat requirements

- Forest-dwelling ticks, at various life stages, spend a lot of time in the litter and duff layers and in the upper mineral soil. Residing in these areas, which are stable and moist, reduces the negative impacts of excessive drying and excessive heat and cold, all of which can result in reduced tick reproduction success and increased mortality.
- When it's time for a blood meal, ticks emerge from these moist habitats hydrated and thus ready for exposure to the elements as they climb on vegetation and wait to attach to an animal host.

Mesophication and tick habitat

- Without periodic fire or other management, most oak/pine forests become densely stocked, which increases ground layer moisture and humidity due to lack of solar radiation. These conditions of moderate temperature and increased humidity are beneficial to ticks.
- Also, without fire, many eastern forests are shifting in composition as mesophytes such as red and sugar maple, beech, and blackgum, as well as ericaceous shrubs, are becoming more abundant. Recent research has shown that the leaf litter of mesophytic species retains moisture to a much greater degree than that of oaks and pines, producing a moister litter layer – good tick habitat.

Prescribed fire effects on ticks

- Laboratory studies have shown that moderately high temperatures result in tick mortality or reduced fitness. Depending on fire season and intensity, ticks can be directly killed by the temperatures reached during a prescribed fire. Also, the blackened litter/duff layer after a fire can increase surface temperatures, which should reduce tick reproductive success and could even cause mortality in fire-caused openings with high solar radiation.
- By increasing solar radiation and consuming leaf litter and duff, prescribed fire has been shown to create drier conditions on the forest floor, thus increasing the probability of ticks becoming desiccated.
- In fact, recent research in longleaf pine, has shown significantly reduced tick populations in frequently burned sites, compared to unburned sites, as well as a reduced risk of disease transmission.

Conclusions and research needs.

- The authors conclude that frequent to periodic fire (1–20-year return interval) can create the drier and warmer surface conditions that can limit tick populations, in addition to direct mortality during the burns.
- They also suggest that higher-intensity fires, growing-season fires, or mechanical/chemical treatments coupled with fire are likely to have a greater negative impact on tick populations.
- The authors acknowledge that direct research on prescribed fire and ticks is limited and that much more work is needed to better understand the effects of fire on ticks as well their animal hosts and predators, especially studies on the long-term application of prescribed fire. However, they certainly present a thorough and compelling argument, from their review of the literature, that re-introducing a fire regime on appropriate landscapes, could limit tick populations and ultimately, the transmission of a number of serious diseases.

Authors

The lead author is [Michael Gallagher](#), is a Research Ecologist with the USFS Northern Research Station, stationed at Silas Little Experimental Forest in the Pine Barrens of New Jersey. Co-authors are Jesse Kreye, Assistant Research Professor of Fire and Natural Resources at Penn State, Erika Machtinger, Assistant Professor of Entomology at Penn State, Alexis Everland, Lead Fire Ecology Technician with Tall Timbers Research Station, also stationed in the Pine Barrens, Nathaniel Schmidt, a former Master's Student at Penn State, and Nick Skowronski, a Research Forester for the USFS Northern Research Station, located in Morgantown, WV (Nick also leads the [North Atlantic Fire Science Exchange](#)), which, like CAFMS, is one of the 15 regional fire science exchanges, funded by the [Joint Fire Science Program](#).

Link to the paper:

[Gallagher, M.R., Kreye, J.K., Machtinger, E.T., Everland, A., Schmidt, N. and Skowronski, N.S., 2022. Can restoration of fire-dependent ecosystems reduce ticks and tick-borne disease prevalence in the eastern United States?. *Ecological Applications*, 32\(7\), p.e2637.](#)



Check out the new CAFMS website!

We are thrilled to share the features on this new site with you. We hope you'll come here for all your Appalachian fire science and networking needs. Check out our [new research collection](#) and [fire science map](#) or view some recent presentations in our [video collection](#).

[Before you get started, make sure you sign up as a CAFMS member.](#) As a CAFMS member you'll receive our quarterly newsletter and we'll make sure you get essential updates on new science, jobs, events, and more. If you are already a member, please update your information at the link above to continue receiving our newsletter and stay informed.

We hope you enjoy exploring the site and that it's a great resource for you. If you happen to come across any issues, or can't find what you're looking for, reach out to Jen (jen@cafms.org).

Thanks for being a part of the Consortium!

Helen, Jen, & Todd

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7th Fire in Eastern Oak Forests Conference

May 16-18, 2023

Tyler, Texas - Holiday Inn Tyler Conference Center

Website: Coming soon!

The Fire in Eastern Oak Forests Conference is a major conference focused on fire in oak forests, woodlands, and savannas where noted experts in research and management gather to present state-of-the-art information, perspectives, and synthesis on key issues. This conference will emphasize topics relevant to management of oak-dominated forests, woodlands, and savannas and will be of interest to managers, scientists, landowners, consultants, and students.

This conference is particularly tailored to land managers and applications. The conference will feature invited presentations, an open poster session, management focused panel discussions, exhibits, and professional networking opportunities. The schedule will include a day of speakers and panel discussions, a field trip day, followed by a final day of speakers and panel discussions. Continuing Education Credits will be offered through the Society of American Foresters and The Wildlife Society.

Call for research and management posters

We anticipate inviting poster presentation submissions on any aspect of fire in eastern North American oak ecosystems. Research posters may relate to any aspect of fire science such as fire regimes, fire effects, fuels, GIS/remote sensing, hydrology, soils, wildlife, or human dimensions. Management posters may highlight specific fire-related projects and / or programs.

Key sponsors and supporters of this conference include:

- Oak Woodlands & Forests Fire Consortium
- Consortium of Appalachian Fire Managers and Scientists
- Joint Fire Science Program
- Texas Parks and Wildlife Department
- USDA Forest Service Northern Research Station



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- Longevity of Fuel Treatment Effectiveness Under Climate Change
- Fuels Treatment Effectiveness Across Landscapes
- Pre-Fire Management Actions for Reducing Post-Fire Hazards
- Social and Political Factors That Influence Fire Suppression and Rehabilitation Cost

Proposals are due by December 20, 2022. More information here:

https://www.firescience.gov/JFSP_funding_announcements.cfm

Fueling Collaboration Season 3

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Find past seasons recordings and register for this season here:

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Communications issues and tips on how to effectively talk about fire and build a collaborative network.



Fire and Water

The interconnections between fire, nutrient cycling, ecophysiology, and climate change.



Fire and Wildlife

The pros and cons of fire regarding effects on wildlife and matching fire dynamics to the needs of fire-dependent species.



Prescribed burning in the eastern WUI

Success stories, common themes, and lessons learned from RxB programs in the WUI.



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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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