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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



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FALL, FUELS, AND REFLECTION

Leaves and temperatures are falling across the oak woodlands, and with this annual occurrence, so too comes important end of year programmatic reporting, assessment, and reflection. Similar to leaf-fall providing fuel for future ‘good’ fire to improve ecological conditions, regular assessment of accomplishments (and challenges), in relation to previous years and those of peers, provides an opportunity to adjust and to be ready for the next year. Here, we highlight select accomplishments and products produced during our last program year (federal fiscal year 2022).

- Three field tours, providing opportunities for communication between fire managers and researchers
- Four webinars providing opportunity for transfer of needed fire-science topics by experts (see our entire collection of recorded webinars [HERE](#))
- Four interactive panel discussions (Fueling Collaboration; recordings [HERE](#) (and register here for the upcoming session too!))
- Four quarterly newsletters, [research briefs](#), and [virtual fire-science demonstration sites](#)
- Fire-science interpretive signs to be displayed at prescribed fire management sites on the Hoosier National Forest (see these signs [HERE](#), and see our collection of such signs [HERE](#))
- New semi-technical document intended for non-fire professionals: *Fire in Eastern Oak Forests – A Primer*, [HERE](#) (contact us if you would like hardcopies)

In addition to these events and products, we hosted exhibits at regional conferences, further developed and improved our [website](#), supported regional fire managers to attend fire-science events, presented at conferences, and contributed to a national prescribed fire assessment. These, and all of our efforts, are guided by (and benefit from) continuous input provided by partners, board members, post-event surveys, and our own program assessments.

As we look forward to the next year, we anticipate an exciting upcoming year of fire-science delivery. Please consider your role in this effort - contact us for help, contribute feedback, add your voice to the discussions, and propel us in ‘moving fire forward’ through improved fire-science communication and delivery in the Oak Woodlands region!



Fire-science outreach efforts (e.g., interpretive signs, small field tours) that are tailored to the specific needs of a region provide fire-ecology and management information otherwise hard to access. Photo credits: Craig Harper (top), Mike Stambaugh (bottom).

Moving fire forward...



RESEARCH HIGHLIGHT:

Can restoration of fire-dependent ecosystems reduce ticks and tick-borne disease prevalence in the eastern United States?

[Michael R. Gallagher](#), [Jesse K. Kreye](#), [Erika T. Machtinger](#), [Alexis Everland](#), [Nathaniel Schmidt](#), [Nicholas S. Skowronsk](#)

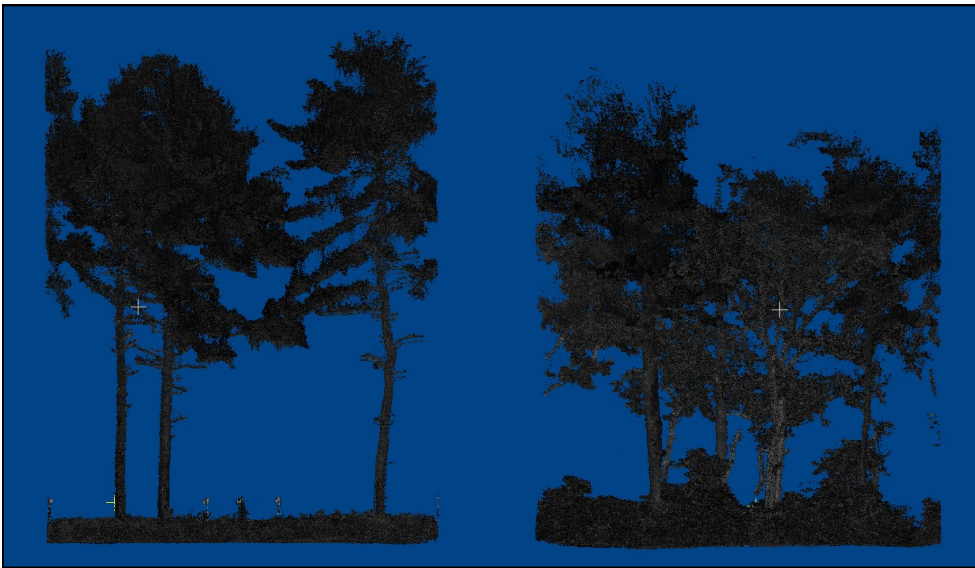
[Ecological Applications](#), October 2022

In this paper, the authors describe how fire suppression in eastern US forests has greatly expanded microclimatic conditions favoring tick abundance and pathogen transmission. They propose an ecologically-based tick population control strategy as an alternative to current tick management focused on wildlife host control, spraying acaricides or fungal tick pathogens, and individual practices of tick avoidance. They provide evidence of the direct and indirect effects of prescribed fire on tick populations, habitat, and hosts, and propose that tick control can be an additional outcome of recurring prescribed fire for ecological restoration.

More than a century of fire suppression in the eastern US forests has resulted in the replacement of fire-adapted species by shade-tolerant species at higher densities. This process (forest mesophication) has been widely documented throughout the region and is considered to be a degradation of once widespread, more open ecosystems. These structural and compositional changes have affected forest microclimates and greatly expanded conditions that favor tick survival and interactions with their wildlife hosts. For example, short periods of dry conditions can induce tick population mortality and restrict

Management Implications

- Restoration of degraded eastern US forests through prescribed fire may have public health benefits by reducing tick populations and disease transmissions.
- Fire intensity, severity, frequency, seasonality, and spatial variation have differential effects on tick species and life stages; more work is needed to incorporate tick population control into forest restoration objectives.
- Tick control by prescribed fire will require recurring fire and should not be considered as a single treatment.



Differences in forest structure observed by a terrestrial laser scanner (TLS) for a frequently burned pitch pine forest (left) and a fire-excluded pitch pine forest (right). The more open understory in the frequently burned forest features shorter vegetation and warmer, drier conditions that are less hospitable to ticks.

(Photo: Michael Gallagher)

host-searching behaviors (questing), but litter accumulation increases forest floor humidity, and increased shrub density stabilizes understory temperatures at optimal ranges for tick survival and questing.

Currently, more than 75% of US vector-borne human disease cases are tick-borne. The diseases are primarily carried by three tick species: black-legged tick (*Ixodes scapularis*), lone star tick (*Amblyomma americanum*), and dog tick (*Dermacentor variabilis*). Black-legged ticks carry the pathogens for Lyme disease, babesiosis, anaplasmosis, ehrlichiosis, and other diseases. Lone star ticks transmit pathogens that cause tularemia and other diseases, and are the likely source of alpha-gal syndrome. Dog ticks transmit Rocky Mountain spotted fever and tularemia. Ticks require a blood meal from a vertebrate host at each life stage in a 2-year cycle. Though developmental phenologies vary among tick

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Moving fire forward...

Research brief, continued

species, in general, the larval stage is most vulnerable to temperature and moisture extremes. Pathogens are acquired when ticks feed upon a reservoir species (a host infected with the pathogen); most commonly, white-footed mice, eastern chipmunks, and shrews. Other vertebrates, including white-tailed deer, wild turkey, and racoon are not reservoir species, but serve to spread and amplify tick populations.

The authors argue that the absence of wildland fire has been overlooked as a contributor to tick population spread and cite numerous studies of direct and indirect effects of prescribed fire on ticks, their hosts, and predators. Their conceptual model illustrates these interactions and feedbacks among ticks, other organisms, and their environment. Direct effects of flaming and smoldering combustion include mortality from increased temperatures or oxygen deprivation in vegetation, litter, and soil. Indirect effects of fire include reduction or removal of sheltering and questing habitats and

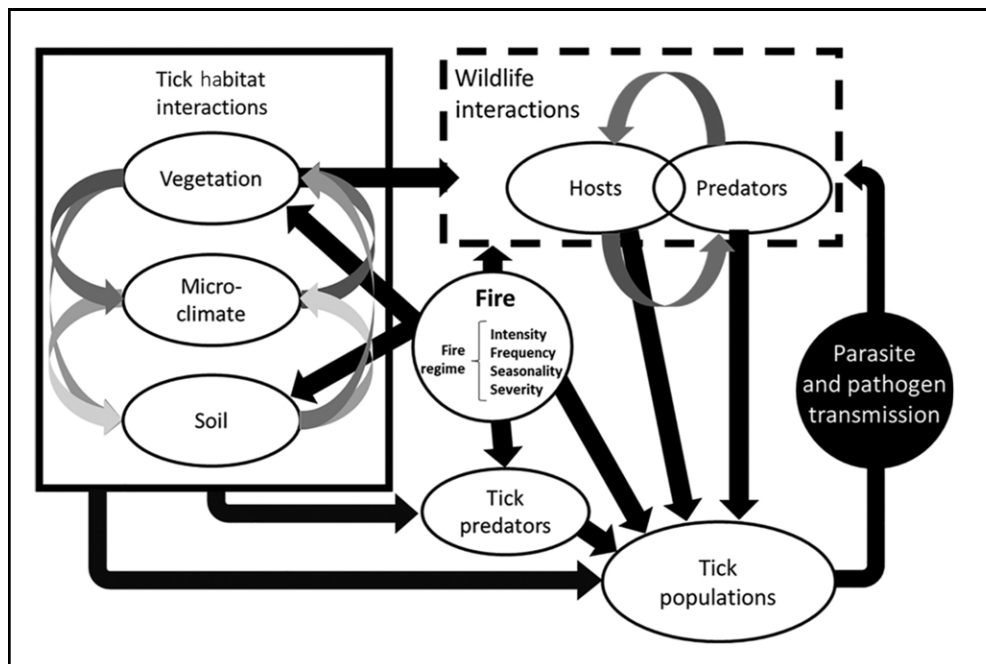
the subsequent increased frequency of lethal temperature and moisture fluctuations. Indirect effects can also include increased abundance of tick predators, including fire ants and bobwhite quail, or decreases in host populations such as shrews and cotton rats.

Conditions achieved by prescribed fire for forest restoration will require maintenance with a suitable fire regime. However, fire intensity, severity, frequency, seasonality, and spatial variation can have differential effects on tick species, their life stages, and their host populations. The authors suggest suitable fire return intervals likely range between 1 - 20 years, depending on location, based on studies supporting this range for eastern US forests. Dormant season burns may need to be more frequent or intense to affect ticks in the litter, while growing-season fires can target questing ticks. The authors note that adjusting prescribed fire applications in wildland-urban interface areas where human contact with ticks is elevated

could help guide development of prescribed fire treatments for tick control.

To build mechanistic models to guide development of tick population control objectives for fire prescriptions, more research is needed to better understand tick and host ecology, the direct and indirect effects of fire on ticks and their interactions with hosts, and the long-term effects of prescribed burning on tick populations and disease transmission. Specific examples of needed research include how the timing of fire alters direct heating effects on ticks, how fire behavior effects differ among forest types or restoration stages, the magnitude of change needed to produce desired microclimate or vegetation structure, and where geographically various approaches are most effective. In particular, understanding the interacting effects of fire regime components and how fires influence future fires will maximize the utility of decision-support tools.

Public concern about the spread of existing and novel tick-borne diseases, and wider public acceptance of prescribed fire as a management tool presents an opportunity to include tick population control into prescribed fire and restoration objectives. The authors recognize the limits of prescribed fire for tick control, particularly in residential areas where fire is not a common management tool, and in severely degraded forests where fire exclusion has led to major community and environmental shifts, requiring mechanical or herbicide interventions. Tick reduction through application of prescribed fire depends on a long-term process and should not be considered as a single treatment or a limited number of treatments.



Conceptual model of fire's direct and indirect effects on tick populations. Each factor varies spatially and temporally across landscapes and regions.

Download a printable version of this research brief [HERE](#)

Figure reprinted with permission from [Ecological Applications](#).

Moving fire forward...

HEADS UP!

2022 Fall-Winter Fire Science Webinar Series



November 8, 2022: Michael Gallagher, US Forest Service Northern Research Station
Can restoration of fire-dependent ecosystems reduce ticks and tick-borne disease prevalence in the eastern United States? [Details HERE](#)



November 29, 2022: Arjum Adhikari, Oklahoma State University
Management and climate variability effects on the understory vegetation productivity along forest-savanna continuum. [Details HERE](#)



December 6, 2022: Scott Abella, University of Nevada
Conserving and restoring oak ecosystems in northwestern Ohio through deer management, prescribed fires, and delayed mortality of competing trees. [Details HERE](#)



January 17, 2023: Virginia McDaniel, US Forest Service, Southern Research Station
Diversity Explodes with Another Boring Burn. [Details HERE](#)



February 7, 2023: Brice Hanberry, US Forest Service, Rocky Mountain Research Station
How is fire ecology different from classical ecology? [Details HERE](#)



Registration required for all webinars.

*Webinars qualify for credits from: **The Wildlife Society & Society of American Foresters***

Research Funding Opportunity

The [Joint Fire Science Program](#) (JFSP) 2023 Funding Opportunity Announcements (FOAs) are now open through December 20, 2022. See the full announcement [HERE](#).

2023 TOPIC AREAS

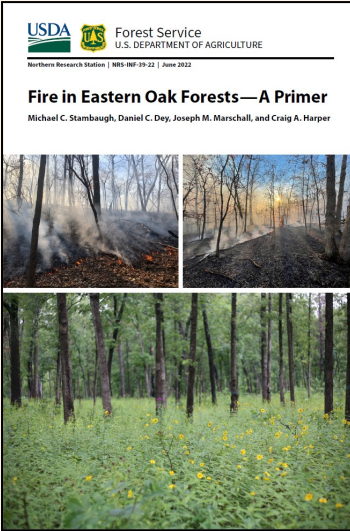
- Regional Science Exchange
- Graduate Research Innovation ([GRIN](#)) Award
 - Pre-fire management actions for reducing post-fire hazards
 - Longevity of fuel treatment effects under climate change
 - Fuels treatment effectiveness across landscapes
- Social and political factors that influence fire suppression and rehabilitation costs



Moving fire forward...



**Now available: "Fire in Eastern Oak Forests—A Primer"
A semi-technical booklet for non-fire professionals**



- Is burning in forests good or bad?
- Fire's role in oak ecosystems
- History of fire in the eastern US
- Comparing prescribed fire and wildfire
- Why fire in eastern oak forests is essential
- Costs and benefits of burning
- Fire management into the future

Download the pdf:
[CLICK HERE](#)



**PRESCRIBED FIRE PRESENTATION
NOVEMBER 30, 2022 10 A.M.—1 P.M.**

SHAWNEE, OK

PRESENTER: JOHN WEIR, OSU EXTENSION



- **BENEFITS OF FIRE**
- **PRESCRIBED FIRE AS A LAND MANAGEMENT TOOL**
- **FORMING A PRESCRIBED BURN ASSOCIATION**



**ABSENTEE SHAWNEE
TRIBE
AGRICULTURAL
DEPARTMENT**

FOR MORE INFORMATION
[CLICK HERE](#)

**Southern Missouri Prescribed Fire Training Exchange (TRESX)
February 27 — March 10, 2023
Vicinity of Springfield, Missouri**

*Sharpen your prescribed fire
and fire science skills!*

To attend, participants must have prior training or prior completion of online courses and have completed an arduous pack test.

Complete this [application form](#)
by November 11, 2022

For more information: Ryan Gauger
(rgauger@tnc.org or 812-599-2562)

Unfamiliar with TRESX?
[CLICK HERE](#) for more information.

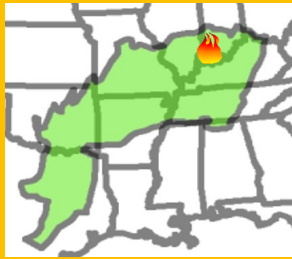


This training conducted through a cooperative agreement between The Nature Conservancy, USDA Forest Service, and agencies of the Department of the Interior.



Moving fire forward...

FIRE SCIENCE
HOT SPOTS



In this feature, we bring into focus fire science on-the-ground

Boone Creek Barrens

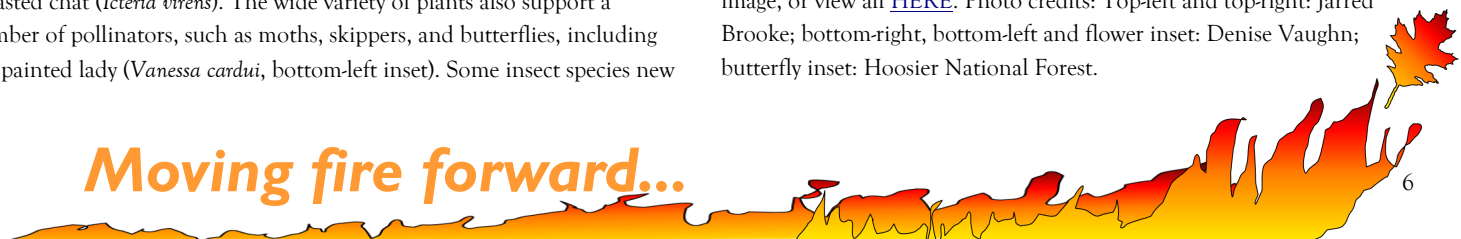
At the [Boone Creek Barrens](#) in the Hoosier National Forest in southern Indiana, prescribed fire is used to maintain several rare barrens natural communities. Often steep and rocky, barrens are fire dependent; they typically have widely spaced, stunted trees and prairie-like groundcover. Elsewhere on the Hoosier, fire suppression has resulted in maple and beech gaining dominance (top-left image), with these shade-loving species in some places overtaking oaks and hickories, which historically dominated Indiana forests. But, due to restoration efforts, oaks prevail once again in the Boone Creek Barrens, including species less common nearby, like blackjack and post oak. Here, some 855 acres have been burned every three to five years since 2003. Use of prescribed fire (top-right image) promotes open woodlands (bottom-left image) where sufficient sunlight comes through the barrens' canopy for groundcover to thrive (bottom-right image).



In spring and summer, the barrens bloom with colorful wildflowers, such as blazing star (*Liatrix spicata*), white wild indigo (*Baptisia alba*), and downy phlox (*Phlox pilosa*, bottom-right inset). The barrens provide habitat for bird species of concern, including ruffed grouse (*Bonasa umbellus*) and yellow-breasted chat (*Icteria virens*). The wide variety of plants also support a number of pollinators, such as moths, skippers, and butterflies, including the painted lady (*Vanessa cardui*, bottom-left inset). Some insect species new

to science have been discovered in these barrens. Uncommon plants found here include rattlesnake master (*Eryngium yuccifolium*), winged elm (*Ulmus alata*), low-bush blueberry (*Vaccinium angustifolium*), and big bluestem (*Andropogon gerardii*). Click on each photo for a full-size downloadable image, or view all [HERE](#). Photo credits: Top-left and top-right: Jarred Brooke; bottom-right, bottom-left and flower inset: Denise Vaughn; butterfly inset: Hoosier National Forest.

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 Katherine Medlock with The Nature Conservancy.

What are some of the greatest fire research needs for the oak ecosystems in Tennessee?

KM: There are so many research needs it is hard to pick just one. The foremost research needs I see include: 1) Connections of freshwater/watershed management to restoration of our fire-adapted forests; 2) Completing fire history work in areas where it is not done yet such as the Cumberland Plateau; 3) The benefits and trade-offs of growing season burns.

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

KM: My biggest concern about the use of fire to manage woodlands and forests is that we simply don't have enough resources to implement the management we know we need. Land managers are increasingly more and more constrained in their ability to implement prescribed fire in the right place at the right time. We need the time and resources to implement prescribed fire in a thoughtful and deliberate manner at a landscape scale.

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

KM: Fire is a natural part of our landscape. The variation in fire effects across the landscape create and maintain a natural mosaic that cannot be replicated in any other way. In short, using prescribed fire as a management tool promotes and preserves the incredible biodiversity of Tennessee and the Appalachians.

Katherine Medlock is

The Nature Conservancy's Southern Appalachian Program Director. She is passionate about conservation of the Appalachian Mountains, the landscape of her heart. She has worked for TNC for 18 years, most of that time spent as the East Tennessee Program Director. During that time, her work centered on multi-party collaborative efforts aimed at forest restoration. Katherine has been an active member of the Southern Blue Ridge Fire Learning Network and an advocate for the ecologically appropriate use of prescribed fire for more than a decade. Katherine is also dedicated to TNC's freshwater conservation work, having received her master's degree in aquatic ecology. She lives in Knoxville with her 11-year-old son, where they enjoy hiking, camping, and fishing together.



FUELING COLLABORATION

PANEL DISCUSSION SERIES—SEASON 3

Hosted by the USFS Northern/Southern Research Stations and the JFSP Fire Science Exchange Network.

NOVEMBER 10, 2022 - 11 AM EST

Talking about Fire

DECEMBER 15, 2022 - 11 AM EST

Fire and Water

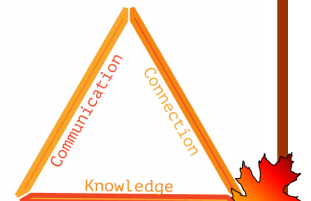
JANUARY 19, 2023 - 11 AM EST

Fire and Wildlife

FEBRUARY 16, 2023 - 11 AM EST

Prescribed Burning in the Eastern WUI

For details and registration, click [HERE](#). SAF credits available

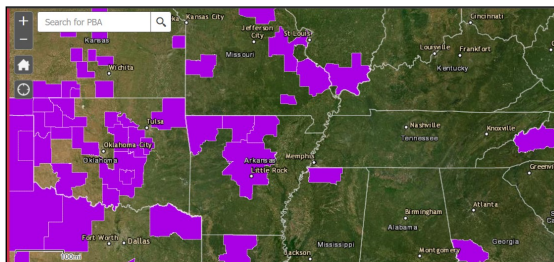


Moving fire forward...



**FIFTH NATIONAL COHESIVE
WILDLAND FIRE
MANAGEMENT
STRATEGY WORKSHOP**
ASHEVILLE, NC. NOV. 14-18, 2022.
For more information [CLICK HERE](#)

Prescribed Burn Associations (PBAs): Neighbors helping neighbors to put fire on the ground



Now available: a new interactive map shows PBA locations throughout the US. Find one in your area. Nothing there? You could help one get started. [Here's how.](#) Three informational meetings for new PBAs are now planned in Missouri and Oklahoma. (See calendar below.)

View the PBA map: [CLICK HERE](#)

UPCOMING EVENTS

November 8, 2022: Webinar: Can restoration of fire-dependent ecosystems reduce ticks and tick-borne disease prevalence in the eastern United States?

For more information, [CLICK HERE](#)

November 10, 2022: Webinar: Fueling Collaboration: Talking about Fire

For more information, [CLICK HERE](#)

November 14-18, 2022: 5th National Cohesive Wildland Fire Management Strategy Workshop

Asheville, NC. For more information, [CLICK HERE](#)

November 29, 2022: Webinar: Management and climate variability effects on the understory vegetation productivity along forest-savanna continuum

For more information, [CLICK HERE](#)

November 30, 2022: Prescribed Fire Presentation: Fire Benefits, Forming a PBA

Shawnee, OK. For more information, [CLICK HERE](#)

December 1, 2022: Prescribed Burn Association Interest Meeting

Hollister, MO. For more information, [CLICK HERE](#)

December 2, 2022: Prescribed Burn Association Interest Meeting

Mack's Creek, MO. For more information, [CLICK HERE](#)

December 6, 2022: Webinar: Conserving and restoring oak ecosystems in northwestern Ohio through deer management, prescribed fires, and delayed mortality of competing trees

For more information, [CLICK HERE](#)

December 15, 2022: Webinar: Fueling Collaboration: Fire and Water

For more information, [CLICK HERE](#)

December 15, 2022: Prescribed Burn Training Workshop

St. Princeton, MO. For more information, [CLICK HERE](#)

January 17, 2023: Webinar: Diversity Explodes with Another Boring Burn

For more information, [CLICK HERE](#)

January 19, 2023: Webinar: Fueling Collaboration: Fire and Wildlife

For more information, [CLICK HERE](#)

February 7, 2023: Webinar: How is fire ecology different from classical ecology?

For more information, [CLICK HERE](#)

February 16, 2023: Webinar: Fueling Collaboration: Prescribed Burning in the Eastern WUI

For more information, [CLICK HERE](#)

February 27-March 10, 2023: Southern Missouri Prescribed Fire Training Exchange

Springfield, MO. For more information, email [HERE](#)

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

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