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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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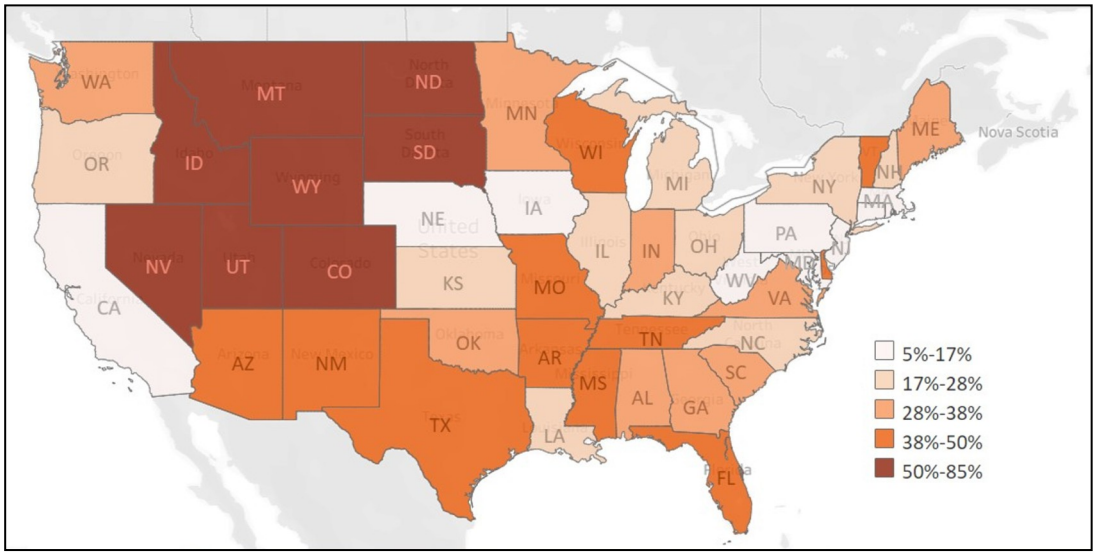
FORESTS, FIRE, AND PEOPLE

By Esther D. Stroh

Oak Woodlands & Forests Fire Consortium

A common way to describe forests and woodlands is by using names of the dominant trees, such as "oak-hickory," "beech-maple," etc. We use these names because when we look at a forest or woodland, what we see most immediately are the trees. In resource management plans, the names are usually more specific such as "shortleaf pine - post oak woodland." As site specificity increases at finer scales, shrubs and/or herbaceous species are included in names recognized by the US National Vegetation Classification System. Herbaceous species are needed to accurately describe desired native vegetation for a given location, which may be included in the objectives of a prescribed burn program. The herbaceous layer contains less than 1% of the biomass in a temperate forest, but it can represent 90% or more of the plant species richness (Gillam 2007). Herbaceous species are therefore an important part of forest structure and function; maintaining, increasing, or restoring native herbaceous diversity are important measures of prescribed burn success in Eastern US forests and woodlands.

Prescribed fire influences herbaceous diversity by increasing ground layer light levels through reduced litter and midstory tree and shrub density; a patchy burn can foster habitat heterogeneity and provide a wider range of conditions for herbaceous species to occupy. Prescribed fire can control invasive species, release native seeds present in the seed bank, and provide sites for seeds arriving through wind or animal-mediated dispersal. This is particularly important in heavily fragmented forests of urban and suburban areas of the Eastern ...Cont'd on p.4



Percent change in area in the Wildland-Urban Interface 1990-2020. 2023, USDA Northern Research Station StoryMap

Moving fire forward...

RESEARCH HIGHLIGHT:

Plant richness increases with surrounding habitat and management burns over 30-years in suburban forest understories

Philip P. Johnson, Scott Kobal, Wendy Leonard, and Emily S. Minor

Urban Forestry and Urban Greening, July 2023

In this study, authors used existing data to examine thirty years of change in the herbaceous plant community of suburban forest preserves in DuPage County, Illinois, part of the Chicago metropolitan area. They investigated species richness, species gains, and species losses in relation to previous prescribed burns and analyzed the amount and configuration of forested habitat in the surrounding landscape. In addition, they examined the spatial scales at which the landscape factors have the greatest effect.

The authors used existing data collected between 1986 and 2016 by the Forest Preserve District of DuPage County at approximately 5-year intervals from 34 permanently marked plots in 16 forest preserves. Of the 34 plots, the authors classified 28 as burned if they had burned at least once (burn status); most were burned every 3–5 years. The authors analyzed the suite of native herbs (forbs, grasses, ferns, sedges, and non-woody vines) identified in each survey to examine the effects of time, burn status, and their interaction on herb richness. They also compared the species list of the first and most recent survey of each plot to determine species gained and lost over 30 years.

Management Implications

- Richness of native herbaceous species and the number of species gained in suburban forests are greater in burned sites compared to unburned sites.
- The amount of forested habitat (but not its configuration) surrounding plots was positively related to current herbaceous richness and species gains over 30 years.
- Results suggest that white-tailed deer (and their management) may play a large role in suburban forest herbaceous richness.

Surrounding forest habitat was extracted from an intersection of the National Land Cover Database forest classes with parcels in the Chicago Metropolitan Agency for Planning 2013 land use inventory dataset classified as conservation areas. This excluded forested areas not considered natural areas, such as residential areas with substantial canopy cover. The authors calculated the amount and configuration (degree of fragmentation) of these habitat areas surrounding the plots at 37 nested spatial scales from 0.3 to 4 km (~0.2 – 2.5 miles) using 0.1 km (~0.06 mile) increments.

The herbaceous understory of a fire-managed site in DuPage County, IL, USA. (Photo: Philip Johnson)

Analyses focused on 1) whether richness changed over time and if change was associated with burn status; 2) whether current richness or species turnover are best explained by burn status, the amount of surrounding habitat, habitat configuration, or a combination of these; and 3) at which spatial scale habitat amount, configuration, or both, affect current species richness or turnover over 30 years.

Native herb richness increased over time in burned plots but not in unburned plots. A mixture of 93 shade tolerant and

...Cont'd on Page 3

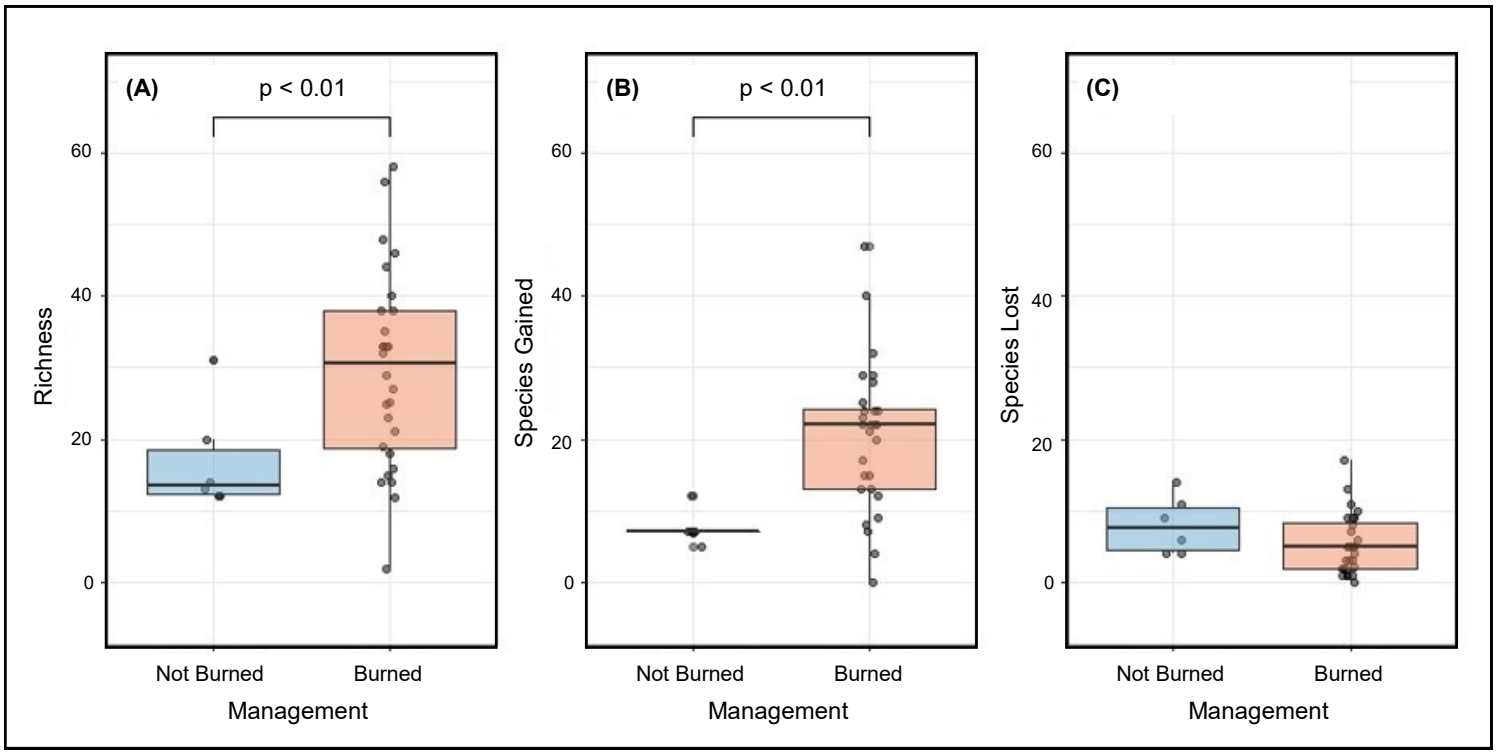
Research brief, continued

intolerant species were gained exclusively in burned sites, and two species were gained solely in unburned sites. Species richness and gains were greater in burned plots compared to unburned plots, but species losses over 30 years did not differ (see figure below). Species richness and gains, but not species losses, were positively related to the amount of forest habitat within 0.9 km (~0.6 mile) of a plot, but the configuration of forest habitat was not a predictor of any response variable at any scale.

The native species gained at burned sites could result from increased microsite heterogeneity, which is important for understory diversity, but the authors caution that increased native herb richness should not be interpreted as restoration. These forests, like others in suburban and urban areas, contain many non-native plant species, especially shrubs. Additionally, more research is needed to determine whether increased richness indicates dispersal from offsite sources, increased detection of native herbs, or release from the existing seed bank.

The authors suggest that seed dispersal by white-tailed deer may explain the observed spatial scale of species richness and gains in plots. Particular species gained in the plots such as Canada goldenrod (*Solidago canadensis*), and several sedges (*Carex* spp.) are known to be dispersed by white-tailed deer; however, deer herbivory can suppress both woody and herbaceous species and spread non-native and invasive species. Any potentially positive effect of deer on herb richness in suburban forests likely depends on intensive deer management.

The authors note the challenges of analyzing data not collected in a controlled experiment, but they point out that similar data exist across the US and are currently underutilized. Funding shortages typically limit agency monitoring activities, posing difficulties in analysis of long-term effects. This is especially true for understory herbs, which were not included in the public land survey and lack that historic baseline. It may be possible to supplement existing datasets with free, publicly collected, citizen science data.



(A) Current native herb richness in long-term monitoring sites managed with prescribed burns or not burned over 30 years in suburban forests of DuPage County. (B) Number of native herb species gained over ~30 years in long-term monitoring sites that were burned and unburned. (C) Number of native herb species lost over ~30 years in burned and unburned sites. Brackets and p-values refer to prescribed burn management having an effect on the observed response. Prescribed burn management had no effect on the number of native herb species lost over ~30 years.

Download a printable version of this research brief HERE

Figure reprinted with permission from Urban Forestry and Urban Greening

Continued from pg. 1

US, which are frequently invaded by non-native shrubs, vines or herbs, a condition exacerbated by decades of fire suppression.

Maintaining herbaceous diversity with prescribed fire presents problems in forests of urban and suburban areas, known as the wildland-urban interface (WUI). Although prescribed fire reduces fuel loads and reduces the risk of catastrophic fire, public concerns about smoke effects on air quality and proximity of fire to population centers often limit burn windows or willingness of resource managers to conduct burns in the WUI. While generally thought of as a Western US concern, recent data show a 38-50% increase in WUI area from 1990-2020 for some states in the Oak Woodlands and Forests Fire Consortium region (see figure on Page 1). Currently, local agencies and nonprofit groups implement prescribed burns and inform the public about their conservation benefits in Central-US population centers such as Chicago, St. Louis, Little Rock, and Kansas City.

As population continues to grow and WUI areas of the Central US expand, the fire-science information needs of local governments and resource management agencies will also expand – not only to reduce wildfire risk, but also to improve forest and woodland habitats for the multitude of plant and animal species they support.

Specially trained crews carry out controlled burns in the forest preserves in spring and fall. (Photo: Forest Preserve District of DuPage County, IL)

FOR FURTHER READING

Gilliam, F.S., 2007. The ecological significance of the herbaceous layer in temperate forest ecosystems. BioScience 57, 845–858.

Moving fire forward...

HEADS UP!

2023 Fall Fire Science Webinar Series

October 10, 2023: Dr. Shishir Basant, Texas A&M University
Are hydrological services overlooked in our advocacy for savanna restorations? Inferring grassland hydrology from woody encroached savannas. Watch Recording HERE

October 24, 2023: Dr. Mac Callaham, US Forest Service Southern Research Station
The dangers of duff: How long-term fire exclusion can put "fire-tolerant" trees at risk.
Watch Recording HERE

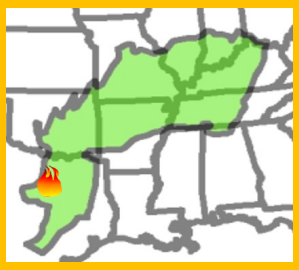
December 19, 2023: Raven Lawson and Bryan Rupar, Central Arkansas Water
Forests, Fires, and Faucets: How a drinking water utility uses forest management as a key source water protection strategy. Watch Recording HERE

January 23, 2024: Dr. Michael Saunders, Purdue University.
Prescribed Fire and Timber Quality. Watch Recording HERE

Recordings of all 2023 Fall Webinars are now available online

Moving fire forward...

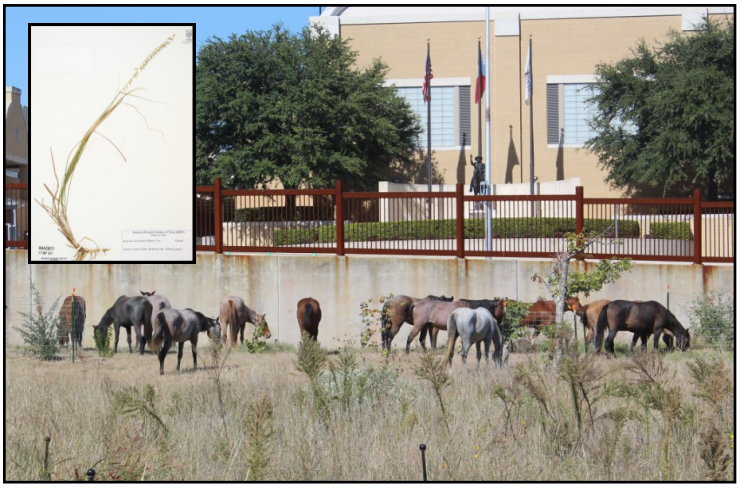
FIRE SCIENCE
HOT SPOTS



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

Fort Worth Botanic Garden - Botanical Research Institute of Texas

The 120-acre campus of the Fort Worth Botanic Garden - Botanical Research Institute of Texas (FWBG-BRIT) is situated in the Cultural District of Fort Worth, Texas. In 2011, BRIT moved into a new building, and an adjacent 2-acre area was seeded as prairie to replace the footprint of a former building and parking lot. Stands of iconic grasses, such as Indiangrass (*Sorghastrum nutans*), little bluestem (*Schizachyrium scoparium*), eastern gamagrass (*Tripsacum dactyloides*), and the state grass of Texas, sideoats grama (*Bouteloua curtipendula*), can now be found among other native plants. The BRIT Prairie was envisioned to be not only a showcase of native grasses, but also an opportunity to demonstrate the natural disturbances essential to maintain a prairie ecosystem. After years of discussing the possible use of fire, the first prescribed burn was conducted in January 2021 by the Fort Worth Park & Recreation Department (PARD) and the Fort Worth Fire Department's Wildland Fire Division (FWFD). Subsequent burns took place in March and December of 2023 reflecting a desired fire return interval of 2 to 3 years. The burns have also provided valuable experience in prescribed fire planning and implementation in this challenging urban landscape where smoke management is a major issue. PARD recently hosted an urban prescribed fire workshop attended by representatives from many cities in the Dallas-Fort Worth metropolitan area. A 14-acre woodland prescribed burn planned for this year on FWBG-BRIT grounds will further expand the knowledge base for the use and science of prescribed fire in urban settings.



Top-left: The skyline of downtown Fort Worth overlooks a BRIT Prairie burn, located within the Great Plains-Cross Timbers ecotone. **Top inset:** Smoke management for even a 2-acre burn is a concern in an urban area that demands very specific weather conditions and ignition techniques to allow for adequate smoke dispersion. **Top-right:** PARD and FWFD personnel gain valuable prescribed fire experience that will benefit the fire management of other urban parks in the region. **Bottom-left:** BRIT staff collecting data to study the vegetative community's response to fire management. **Bottom-right:** Horse grazing as a natural disturbance was implemented on the BRIT Prairie prior to the adoption of prescribed fire management. **Bottom inset:** A pressed specimen of sideoats grama from the BRIT Herbarium, collected from Fort Worth's Rock Creek Ranch Park, which is also planned to be managed with prescribed fire. Click on each photo for a full-size downloadable image, or view all HERE. Photo credits: top-left by Kyle Clay (FWFD), top-right by Tiana Rehman (BRIT), bottom-left by Cameron Barlow (BRIT), bottom inset press of sideoats grama collected by Gabriela P. Wolfe et al. and courtesy of Botanical Research Institute of Texas Herbarium (Catalog No. BRIT899457), all others by BRIT Press.

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 Jared Hall, Resource Specialist with the City of Fort Worth, TX, Park and Recreation Department.

Jared Hall is a Natural Resource Specialist for the City of Fort Worth Park and Recreation Department. He manages natural areas owned by the City using various combinations of Aldo Leopold's five land management tools. The City owns land across 5 counties located in the Cross Timbers ecoregion, so the forested communities he manages range from upland Cross Timbers savannahs to bottomland hardwood forests. Addressing invasive species is a primary focus of his, so prescribed fire is heavily used, given the cost effectiveness and overall benefit to the plant and wildlife communities that are not seen with other land management tools.

What are some of the greatest fire research needs for oak woodlands and forests in the Cross Timbers region of Texas?

JH: Being located in an urban setting, we battle a wide range of exotic species that escape cultivation. Control measures for many feral urban plant species are understudied, and the information that can be found in the literature is often contradictory. Future research should focus on identifying species that can be nuisance in urban settings and the most cost-effective ways to combine prescribed fire and other land management tools to suppress those species. Additionally, more information on ways to limit smoke impacts and soil disturbances when burning activity fuels following more aggressive brush reduction tactics would be useful.

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

JH: My biggest concern is that oak woodlands and forests will continue to be ignored by urban prescribed fire practitioners as other urban burn programs establish and grow. Most active urban prescribed fire programs in our area solely target grasslands because of challenges and complexities associated with burning forested fuel models in urban settings, compared to grasslands. It is nearly impossible to burn a woodland of any size and meet local air quality restrictions in nonattainment zones. Most of our oak woodlands and forests are ignored and largely degraded as an artifact of these challenges.

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

JH: The greatest advantage that helps me maintain support from my leadership is the return on investment. Many governmental agencies are limited by their budget so prescribed fire allows us to treat more acres each year that we wouldn't otherwise be able to afford to treat with mechanical and chemical applications. Fire is also the most noticeable of our management tools and properly conducted prescribed burns taking place right in front of the public brings far more awareness of prescribed fire's benefits, which leads to educational opportunities and public support rather than outcry.

Moving fire forward...

FUELING COLLABORATION

PANEL DISCUSSION SERIES—SEASON 4

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

NOVEMBER 16, 2023 - 11 AM EST

Fire History as a Bridge Between Ecological Knowledge Systems

DECEMBER 14, 2023 - 11 AM EST

The Future is Smoky

JANUARY 18, 2024 - 11 AM EST

Phenology of Fire: Listening to the Plants and Animals

FEBRUARY 15, 2043 - 11 AM EST

Successfully Bridging the Gap: Eastern US Models of Fire Science and Management Collaboration

For details, registration, and to view recorded discussions, click HERE

UPCOMING EVENTS

February 15, 2024: Fueling Collaboration—Phenology of Fire: Listening to the Plants and Animals. *For more information,* CLICK HERE

February 29, 2024: Webinar: Emerging Technologies in Wildland Fire

For more information, CLICK HERE

March 6, 2024: Webinar: Fire and Traditional Knowledge in the Lake States

For more information, CLICK HERE

March 26-28: IAFC Wildland Urban Interface Conference

Reno, NV. For more information, CLICK HERE

April 3, 2024: Webinar: Fire and Traditional Knowledge Beyond the Lake States

For more information, CLICK HERE

April 15-19, 2024: 7th International Fire Behavior and Fuels Conference

Idaho, Ireland, and Australia. For more information, CLICK HERE

May 1, 2024: Webinar: Fire and Game Species

For more information, CLICK HERE

August 19-22, 2024: Northeast-Midwest Prescribed Fire Science and Management Workshop

Albany, NY. For more information, CLICK HERE

October 7-10, 2024: International Oak Symposium / Knoxville, TN

Knoxville, TN. For more information, CLICK HERE

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

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