



# SOUTHERN Fire Exchange

Uniting Fire Science and Natural Resource Management



## FIRE LINES

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## Effects of Repeated Growing Season Burns in the Piedmont Region

An article recently published in *Forests* shares results from a long-term study in central Georgia that compared the effects of repeated prescribed fires on the structure and composition of mixed pine-hardwood forests (Reilly et al. 2016). At 3 study sites in the Piedmont National Wildlife Refuge, 24 plots about 1 hectare each were burned 2 to 4 times within an 8-year period. The low intensity burns, with strip-head fire ignition, occurred during 1 of 4 six-week long burn windows from early April to mid-September. Varying when the burns took place allowed the researchers to assess if the effects on structure and composition differed when fires were applied at different times in the growing season. To collect data on structure and composition, a sample of overstory trees were identified and measured on each plot at the beginning of study in 1997 and at end of study in 2005. In addition, midstory saplings (0.25–11.6 cm diameter at breast height) were identified and measured along sample transects in 1997, 2001, and 2005. The plots consisted of loblolly pine, mesic hardwood species such as red maple and sweetgum, and upland hardwood species such as oaks and hickories.



While sapling density decreased with repeated fire, this long-term study observed limited changes to overstory structure and composition. Photo: Chet Buell, NCSU.

### Key Results

- \* While there were differences among species groups, the most observable change was that the overall density of saplings significantly decreased during the study period.
  - The density of pine saplings significantly decreased from 1997 to 2001, but not from 2001 to 2005.
  - The density of mesic hardwood species significantly decreased over both time periods. However, the authors note the final density was still relatively high because of resprouting.
  - The density of oak-hickory saplings did not significantly decrease, again due to resprouting.
- \* Limited changes were observed regarding overstory structure and composition, with slight increases reported in basal area, a decrease in density, and an increase in quadratic mean diameter. However, overstory changes may occur in the long-term as a result of decreased sapling density which may limit recruitment in the future.
- \* There was little evidence that the timing of the growing season burn influenced forest structure or composition after 3 to 4 burns. *Continued on page 3*

## More on Shortleaf Pine Integrity: Post-fire Resprouting

In our [March 2015 Fire Lines newsletter](#), we summarized a research publication that demonstrated the role of frequent prescribed fire in maintaining shortleaf pine in ecosystems where it is mixed with loblolly pine and where, without fire, natural regeneration would be dominated by hybrids and backcrosses between the two species rather than shortleaf pine. A 2016 publication in *Forest Ecology and Management* describes a likely mechanism for how frequent fire maintains shortleaf pine genetic integrity (Bradley et al., 2016).

The study conducted in southeastern Oklahoma focused on the ability of shortleaf, loblolly, and hybrid seedlings to resprout after fire or clipping and relationships between resprouting and a basal stem crook at or near ground line. Seedlings were grown from seed in open field plots, then subjected to carefully designed burns, or stem clipping above dormant buds, at 12, 17, and 24 months after seeding. Several other manipulative treatments were applied to a subset of seedlings to evaluate fire effects on exposed or protected dormant buds. *Continued on page 3*

## Duff Consumption and Post-Fire

### Longleaf Pine Mortality

Reintroducing fire to long unburned longleaf pine stands has been problematic in the South as well as in several other pine ecosystems around the country. What may appear as successful prescribed burns can lead to significant pine mortality in the following two to three years. Many research studies have focused on this issue in the last 15 years to identify fire effect mechanisms and possible burn prescriptions to mitigate the mortality. A recent paper by Varner, Kreye, Hiers and O'Brien in the Proceedings of the 18<sup>th</sup> Biennial Southern Silvicultural Research Conference synthesized all the preceding research and arrived at the following conclusion:

Duff generally burns through smoldering combustion, ignited by surface fires, slow-burning pine cones, or other woody fuels. This ignition and combustion can occur even with duff moisture content at or above 60%. Tree mortality is particularly likely when duff is consumed around the base of the trees, where the duff is usually deeper and generally drier than it is near the drip lines. The cause of pine mortality is apparently not related to heating of the tree cambium, but rather to duff and soil heating that consumes, kills, or injures fine roots, thus reducing water uptake and sap flow. Greatest tree mortality occurs with lower duff moisture (not moist or wet) and in the larger tree size classes.

Accordingly, greatest success in avoiding pine mortality has been with prescriptions that include moist or wet duff conditions, but it is at the expense of removing only a small portion of the duff layer. All prescriptions need to take into account the great variability in duff moisture and thickness across the forest floor.

[Click here](#) for the short and easy-to-read synthesis paper in the Proceedings. We encourage you to download it and dig out some of the other findings that may be useful to you.



Smoldering combustion of duff near the base of the tree can damage fine roots, ultimately leading to tree mortality. Photo: Joseph O'Brien, USFS

### SFE Webinar Update

Join us for three upcoming webinars in February and March. And if you missed one of our webinars in January, they are available to be viewed at your convenience on the SFE YouTube page:

- ⇒ [Restoring Fire's Role in Fire Adapted Communities](#)
- ⇒ [Lessons in Creating & Maintaining Prescribed Burn Associations](#)

#### [How Important Is It to Mimic Natural Fire Regimes in the Southeastern Coastal Plain?](#)

February 9, 1pm Eastern

Presenter Reed Noss will discuss natural fire regimes for the southeastern Coastal Plain and how current management practices may or may not mimic important aspects of those fire regimes. [Click here](#) to register for this webinar.

#### [Next Generation Fire Modeling for Advanced Wildland Fire Training: An Introduction](#)

February 23, 1pm Eastern

James Furman and Brett Williams will introduce FIRETEC and discuss the model simulations, which were specifically designed by fire managers to answer important fire behavior questions and challenge assumptions. [Click here](#) to register for this webinar.

#### [Historical Fire and the Species that Coevolved with it in the South: What Should We Be Doing with Fire Now?](#)

March 29, 1pm Eastern

Cecil Frost will share detailed maps of pre-colonial fire frequency for sites in the southeastern U.S. and discuss opportunities for regional fire management strategies now and in the future. [Click here](#) to register for this webinar.

## UPCOMING EVENTS

Visit the [SFE Calendar](#) to learn more about upcoming events. To add an event to our calendar, [email us](#) the information.

### Webinars

[How Important Is It to Mimic Natural Fire Regimes in the Southeastern Coastal Plain?](#)

February 9, 1pm Eastern

[These Once \(and Future\) Conflagrated Prairies](#)

February 16, 12pm Eastern

[Common Denominators for Escaped Prescribed Fires in the Lake States](#)

February 16, 1pm Eastern

[A Four-Step Approach to Planning for Wildfire in the WUI](#)

February 16, 2pm Eastern

[Next Generation Fire Modeling for Advanced Wildland Fire Training: An Introduction](#)

February 23, 1pm Eastern

[Indoor Air Quality During Wildland Fires](#)

February 23, 1pm Eastern

[Historical Fire and the Species that Coevolved with it in the South](#)

March 29, 1pm Eastern

### Workshops and Conferences

[Red Hills Fire Date \(rescheduled\)](#)

February 19, 2017

Tallahassee, FL

[Fire and Longleaf Workshop](#)

February 21-23, 2017

Garnett, SC

[Northeast Oklahoma TREX](#)

March 13-17

Vinita, OK

[IAFC 2017 Wildland-Urban Interface Conference](#)

March 21-23, 2017

Reno, NV

[A Century of Wildland Fire Research](#)

March 27, 2017

Washington DC (online viewing available)

[Fire and Longleaf Workshop](#)

March 28-30, 2017

Cheraw, SC

[Cohesive Strategy Workshop](#)

[All Hands, All Lands: Implementation Rooted in Science](#)

April 25-27, 2017

Reno, NV

[Prescribed Burning Workshop](#)

May 16-18, 2017

Florien, LA

[Sustaining Oak Forests in the 21st Century through Science-based Management](#)

Knoxville, TN

October 24 - 26, 2017

[2017 AFE International Fire Congress](#)

November 28-December 2, 2017

Orlando, FL



## Effects of Repeated Growing Season Burns in the Piedmont Region

*Continued from page 1*

For managers in Piedmont mixed pine-hardwood forests that are seeking to promote red-cockaded woodpecker habitat, the authors suggest that the application of repeated low-intensity growing season fires alone may not be sufficient to achieve specific management goals and that mechanical thinning may be necessary to reduce basal area of hardwoods in the overstory. Similarly, annual burns or higher intensity fires may be necessary to achieve desirable low levels of midstory development.

[Click here](#) to view the full article, which is available through open access.

Reilly, M., Outcalt, K., O'Brien, J., & Wade, D. (2016). Effects of Repeated Growing Season Prescribed Fire on the Structure and Composition of Pine-Hardwood Forests in the Southeastern Piedmont, USA. *Forests*, 8(1), 8.

**“Although repeated growing season burning alters midstory structure and composition, burning alone is unlikely to result in immediate shifts in overstory composition or structure in mixed pine-hardwood forests of the southeastern Piedmont region.”**

## More on Shortleaf Pine Integrity: Post-fire Resprouting

*Continued from page 1*

The dormant buds on the loblolly pine stems were several centimeters above the soil surface. All loblolly pine seedlings were top killed by fire on the three burn dates and only two (7%) seedlings resprouted after the 24-month fire. Both of the resprouting loblolly had basal crooks which the authors concluded may have been due to the way newly germinated seedlings were planted in the test since loblolly pine does not characteristically display a stem basal crook. Similarly, all hybrid seedlings were top killed by fire on the three dates; only 3% resprouted and one of the two resprouts had a strong basal crook. A portion of the hybrid seedlings displayed at least a weak basal crook that does not lower the dormant buds to the soil surface. By contrast, although all shortleaf seedlings were also topkilled, between 50 and 70 percent of the seedlings resprouted, primarily from dormant buds on the basal crook when it was at or below the soil surface. Seedlings with the crook slightly elevated so that the fire burned beneath the crook did not resprout. Interestingly, both loblolly and shortleaf seedlings that were clipped only, and not exposed to fire, resprouted from dormant buds below the clip line.

The authors conclude: “The basal crook of shortleaf pine, and the fire tolerance that it confers, makes it a crucial trait for the resiliency of the forests of the southeastern United States.” They also suggest that the location of the basal crook should be considered when planting nursery-grown seedlings, so that it is located right at ground line to protect buds for resprouting in case prescribed fire is used in new plantations to control natural loblolly and hybrid seedlings.

[Click here](#) for the full article, which is available through the U.S. Forest Service’s TreeSearch.

Bradley, J.C., R.E. Will, J.F. Stewart, C.D. Nelson, and J.M. Guldin. (2016). Post-fire resprouting of shortleaf pine is facilitated by a morphological trait but fire eliminates shortleaf × loblolly pine hybrid seedlings. *Forest Ecology & Management* 379:146-152.



A shortleaf pine seedling, resprouting at the basal crook. Photo: Rodney Will, Oklahoma State University

## Invasives and Burn Plans

Do you consider invasive plants when preparing your burn plans? Whether you are using a simple one-page plan or a detailed multiple page format, the presence of invasives in your burn area should be reckoned with. They can be mentioned in your stand description and special precautions sections, and identified spatially on the burn map. Depending on the species, fire may enhance the spread of invasive species, provide an opening for control in concert with other practices after the burn, or even provide a measure of control with the right fire intensity and ignition pattern. Fortunately, there are valuable resources with information on fire effects on invasives to help you plan wisely.

Of course, you need to know what species you have first. If you are unsure, [Nonnative Invasive Plants of Southern Forests: A Field Guide for Identification and Control](#) and [Invasive Plants of the Thirteen Southern States](#) provide descriptions and pictures to help you identify the problem species. Other resources on the Invasives.org website focus on effect of fires and other control methods on different species and how fire might be used as part of a control strategy: [Invasive Plant Responses to Silvicultural Practices in the South](#) focuses on 13 of the most important invasive plants in the region and [Prescriptions for Specific Nonnative Invasive Plants](#) includes 31 species. Another very thorough description of species, management strategies, and control procedures for 56 species is [A Management Guide for Invasive Plants in Southern Forests](#). These publications focus not only on fire, but on all the possible control methods and combinations that may be important for reducing the invasive species after your burn. That may be the best time to step in and control the species before it grows back.

Two other resources provide far greater detail and summaries of relevant research involving fire and invasive species. Through the [Fire Effects Information System](#) you can locate research summaries for most of the individual invasive species. In 2008, the individual species information was compiled in [Wildland Fire in Ecosystems: Fire and Nonnative Invasive Plants](#). Chapter 6 in that publication covers the Southeast.

## NEWS AND REMINDERS

### **PRESCRIBED FIRE TRACKING AND FIRE EFFECTS SAMPLING**

The South Atlantic Landscape Conservation Cooperative, Peninsular Florida Landscape Conservation Cooperative, and NatureServe are working together to develop a strategy to track prescribed fire in one central database and to create standard protocols for collecting fire effects data. To learn more about this project and to share information about how you are currently tracking prescribed fire data and fire effects, [click here](#).

### **WANT MORE SHORLEAF PINE RESEARCH?**

Check out the [January issue](#) of the Oak Woodlands and Forests Fire Consortium's newsletter for two articles on shortleaf pine and fire.

### **FLORIDA GOPHER TORTOISE APP**

If you are in Florida, consider downloading the "Florida Gopher Tortoise" smartphone app to help the Florida Fish and Wildlife Conservation Commission biologists document where gopher tortoises live. [Click here](#) for more information, including an interactive map with user-submitted photos.

### **RED HILLS FIRE FESTIVAL**

The rescheduled [Red Hills Fire Festival](#) will be held February 19, 11am to 3pm Eastern. This event is a collaboration between many organizations in Florida and Georgia to spread awareness about prescribed fire and healthy forests. The festival will be at Tall Timbers Research Station and include live prescribed fire, equipment demonstrations, wagon ride tours of healthy forests, fire talks with experts, kids' activities, food vendors, and live music.

### **ALL HANDS, ALL LANDS: IMPLEMENTATION ROOTED IN SCIENCE**

Registration is now open for the [National Cohesive Wildland Fire Management Strategy Workshop](#), which will be held April 25-27, 2017 in Reno, NV. If you want to submit a proposal, there are just a few days left to do so; the deadline is February 11, 2017.

### **WILDFIRE COMMUNITY PREPAREDNESS DAY**

Start planning now for [Wildfire Community Preparedness Day](#) on May 6, 2017. To assist with local projects to reduce wildfire risk, \$500 grants are available through National Fire Protection Association's partnership with State Farm. The deadline to apply is Friday, March 3. The NFPA website has several resources to help you plan activities, including [past successful projects](#) and a [recent webinar](#) with tips and grant information.



The Southern Fire Exchange is funded through the Joint Fire Science Program, in agreement with the United States Forest Service, Southern Research Station. This institution is an equal opportunity provider.

## **AFE's Orlando Fire Congress: Calls for Proposals Open!**

**November 28 - December 2, 2017 | Orlando, Florida**

The [7<sup>th</sup> International Fire Ecology and Management Congress](#) will feature a wide variety of presentations, posters, training workshops, special sessions, attached meetings, and opportunities to join small groups to address key management issues and policies. The Call for Proposals is now open, and there are several ways for you to participate directly in the meeting as a speaker or special meeting organizer. Even if you don't submit a proposal, mark the dates on your calendar now and plan to attend this rich and rewarding professional experience.

Topics for Workshops, Special Session, and Presentations include, but are not limited to:

- 20/20 Vision: Looking Back, Looking Forward
- Fire Ecology & Effects
- Fire Management and Use
- Fire Modeling
- Climate Change & Fire History
- Restoration & Resiliency
- GIS and Remote Sensing
- Policy Issues
- Case Studies and Lessons Learned
- Education & Communication
- Living with Fire - Cultural, Socio-Economic, Health
- Smoke Management & Modeling

Proposal deadlines vary by session type, with the earliest due date being April 1 for Special Sessions. It's not too soon to propose a Special Session focused on specific topics! [Click here](#) for information on the different session types and instructions.

### **Just Announced! Rx310 will be offered at AFE Fire Congress in Orlando**

In this unique offering of Rx310, Introduction to Fire Effects, students will have the opportunity to interact with fire researchers and managers from around the world, as well as to learn about the fire systems and topics most important to them. Students will attend introductory presentations on fire ecology and effects as well as select conference presentations and the poster session on recent and current fire related research. Students will participate fully in the conference, armed with a series of questions and discussion topics to be addressed during plenary and concurrent sessions. The course will conclude with a field visit to local burn units and the opportunity to discuss real management challenges and opportunities. [Click here](#) for course information.

## **FEIS: What Species Reviews and Fire Regime Syntheses Are Most Needed?**

The [Fire Effects Information System \(FEIS\)](#) would like your input! FEIS ecologists write syntheses about fire effects on individual species and about fire regimes in the United States to help managers, planners, and scientists find, read, and use the best available science. During the recent FEIS webinar series hosted by the [Fire Science Exchange Networks](#), the most frequently asked question was, "How do you decide what syntheses to write and update?" One way they decide what to write is based upon manager requests. **FEIS would like to know what Species Reviews and Fire Regime Syntheses are most needed in your area.** Please email [ilanalabrahamson@fs.fed.us](mailto:ilanalabrahamson@fs.fed.us) with your suggestions.

## **Request for U.S. Post-Fire Tree Mortality Data**

Do you have data on tree mortality due to wildland fire? If so, you can contribute to a new Joint Fire Science Program project examining tree mortality due to wildland fire in the U.S. The team of researchers is interested in U.S. datasets that at minimum include year of fire, county, state, and individual tree records of species, DBH, and crown injury (some measure of crown scorch, kill, and/or consumption).

These datasets will be aggregated into an archived database of post-fire tree mortality and used to 1) validate existing predictive post-fire mortality models and 2) examine the influence of pre-fire climate to improve predictions of post-fire tree mortality. The archived data product will be made publicly available within one year of project completion (approximately 2020). [Click here](#) for additional project detail. Contributors will receive authorship of the formally published archived data product and, at minimum, acknowledgement of contribution in published articles. Please contact C. Alina Cansler, [ccansler@fs.fed.us](mailto:ccansler@fs.fed.us), (406) 829-6980 for additional information or questions.