

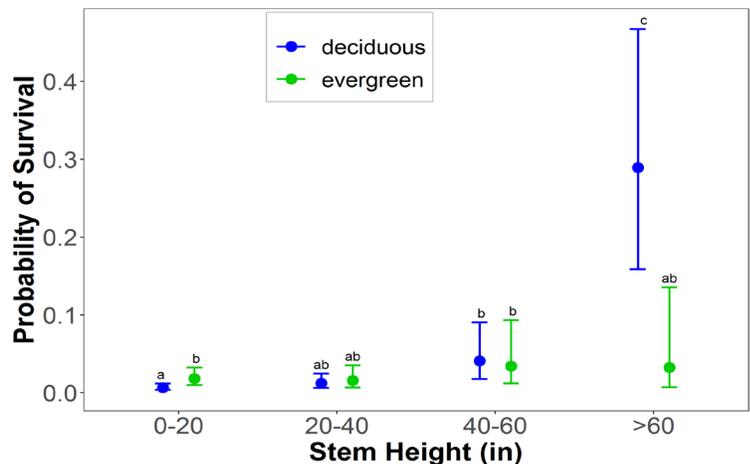
Long-term study of resprouting after fire reveals that five foot tall hardwoods can take the heat

Longleaf pine woodlands have some of the highest levels of biodiversity in the temperate world. They are maintained by frequent fires that keep hardwood trees in shrub form by periodically killing their above-ground portions (called “top-kill”), leaving rootstocks to resprout. In the absence of sufficient frequency or intensity of fire, shrub-form hardwoods often grow into the overstory, shading out groundcover plants and making it more difficult to apply prescribed fire. Larger gaps (1/4 acre or more) in longleaf pine canopy caused by lightning, wind (e.g. tornados, hurricanes), and forestry activities can become filled with taller hardwood trees. We hypothesized that a reduction of highly flammable longleaf pine litter in gaps could lead to lower fire intensity and less effective top-kill of shrub-form hardwoods. We monitored the number and height of shrub-form hardwood tree stems for seven years after experimental harvest that created a range of pine tree density conditions to understand how stand density affects top-kill of shrub-form hardwood trees.



In this gap, these well-established hardwoods (southern red oak and bluejack oak) will not be top-killed by the recent prescribed fire.

We found that shrub-form hardwood trees were 80% more likely to grow taller than 3 feet in gaps than in areas with higher pine tree density. We also found that deciduous hardwood tree species (e.g., southern red oak) taller than 5 feet were 8 times more likely to escape top-kill and become fire-resistant than similar-sized evergreen hardwoods (e.g., live oak or water oak) or smaller hardwoods whether evergreen or deciduous.



Graph shows that the probability of stems of deciduous hardwoods like southern red oak surviving a prescribed fire increases dramatically once they have become 60 inches (five feet) tall

Higher survival and taller hardwood trees in gaps supports the hypothesis that fires in gaps are less intense and less effective at keeping hardwoods in shrub form. We identified an important threshold for deciduous hardwoods at ~5 feet tall where they become resistant to typical prescribed fire in longleaf pine woodlands. These results suggest that land managers may need to choose fire weather conditions that result in higher intensity for prescribed fires in stands with large gaps.

MORE INFORMATION

Whelan, A., S. W. Bigelow, M. F. Nieminen, and S. B. Jack. 2018. Fire season, overstory density and groundcover composition affect understory hardwood sprout demography in longleaf pine woodlands. *Forests* 9: Article 423. <https://doi.org/10.3390/f9070423>

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KEY POINTS

Hardwoods in gaps were 80% more likely to exceed 3 feet in height than hardwoods under unbroken canopy.

After deciduous oaks (southern red, post, turkey, bluejack) reach 5 feet in height they are more likely to resist top-kill from prescribed fire.