Southern pine beetle impacts on forest ecosystems

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Research by USDA Forest Service Southern Research Station (SRS) scientists shows that the impacts of recent outbreaks of southern pine beetle further degraded shortleaf pine-hardwood forest ecosystems in the southern Appalachian region. The authors suggest that cutting and burning these sites reduces heavy fuel loads, improves soil nutrient status, and opens the canopy for restoration of these shortleaf pine communities.

In an article published in the June issue of journal Forest Ecology and Management, research ecologist Katherine Elliott and fellow scientists from the SRS Coweeta Hydrologic Laboratory examine the effects of three treatments to restore shortleaf pine-hardwood forests in areas where southern pine beetle attacks have killed most of the overstory pines.

Historically, frequent fire maintained the pine-hardwood ecosystems of the southern Appalachians as open grassy savannas with widely spaced oaks and shortleaf pines, a grassy understory, and relatively clear midstory. The interactions of past land use, fire exclusion, drought, and southern pine beetle outbreaks have severely impacted these ecosystems.

"Over the past century, these ecosystems have been on a trajectory of increased loss of pines in the overstory, lack of regeneration of both pines and oaks, loss of ground layer plants, and the expansion of the evergreen shrub mountain laurel in the midstory," says Elliott. "The latest outbreak of southern pine beetle, a native insect, killed more

overstory pines, further damaging the ecosystem while adding fuel for fire."

For the study, the researchers selected eight 12 to 15-acre study sites in pine-hardwood ecosystems where a large number of the pines had been killed by southern pine beetle. They tested the effects of burning only, cutting and burning on sites with droughty soils, and cutting and burning on sites with medium soil moisture. Two years after the treatments, they reported increased soil nutrient availability, greater herbaceous plant cover and diversity, and more native bluestem grasses.

Unfortunately, they found only a few pine seedlings in the understory after the treatments. "In our study, poor pine regeneration may have been due to drought, poor seed production, and hardwood competition in the understory," says Elliott. "Poor seed production was not unexpected, since southern pine beetles killed almost all of the overstory pines before the treatments."

The researchers found that though oak regeneration increased on all the burned sites, other hardwood species increased as well. The researchers suggest that without further intervention, oaks will not succeed into the overstory due to competition from faster growing hardwoods.

This study showed that cutting followed by prescribed fire can reduce fuel loads, increase soil nutrient availability, open the canopy by reducing trees in the overstory, and stimulate vegetative growth. These cut-and-burn treatments have positioned these degraded ecosystems on a restoration trajectory.

"Further silvicultural treatments are needed to fully restore these sites to shortleaf pine/bluestem communities," says Elliott. "Additional follow-up treatments could include planting pine seedlings, using thinning or herbicides to reduce competition from faster growing red maple and

sassafras sprouts and shrubs, and repeated burning to maintain open woodland for native grass and other plant cover."

"Land managers need information on treatment options that will reduce the heavy fuel from dead and dying trees, and they need information on how to most effectively restore these forests," says Elliott. "We will continue to work with land managers on applying and refining these treatments in their efforts to fully restore shortleaf pine/native bluestem grass ecosystems."

"Without the partnership and support from the National Forests of North Carolina, Tennessee, and Georgia this research would not be possible or as relevant," she adds. "For this study, the Ocoee Ranger District, Cherokee National Forest was responsible for implementing the treatments and they worked closely with the researchers to make it all happen." In return, researchers provide the information to the National Forest partners and others by onsite tours and workshops.

This research was partially funded by the Joint Fire Science Program, which supports scientific research on wildland fires and distributes results to help policymakers, fire managers and practitioners make sound decisions.

More information: Access the full text of the article: www.srs.fs.usda.gov/pubs/40511

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