*Low intensity fire moving through a longleaf pine forest degraded by decades of fire-suppression.* *Image by John Kush*

# The Legacy of Smokey's Message: Problems in Fire-Starved Longleaf Pine Forests

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The sun casts a reddish hue through a column of smoke that curls above the gnarled, flattened tops of ancient longleaf pine trees. The forest below hisses and crackles as a fire inches its way along a carpet of golden grasses. Somewhere among the grasses, a gopher tortoise lazily bites down upon and plucks a ripe blackberry from a low hanging bush. With seeming indifference to the approaching fire, the tortoise leisurely makes its way to a burrow opening in the sandy ground and slides down into the darkness and safety below. As the fire continues its march through the web of grasses, a myriad of insects flush to find shelter high along the rough bark of the surrounding longleaf pine trees. With the white flash of its belly, a phoebe flies in from seemingly empty space, grabs a fleeing grasshopper and quickly melts back into the refuge of the forest and out of the sight of prowling Cooper's hawks.

This drama (albeit contrived for this story) has unfolded in the longleaf pine woods for thousands of years and stretched across thousands of acres. In the past several decades, however, the precipitous decline of beneficial fires from Alabama's landscape has caused considerable harm to many of our forests. Of those ailing forest types, longleaf pine forests in Alabama have declined significantly. In response to this decline a growing interest in reviving longleaf pine forests has developed. The largest obstacle in retelling the longleaf pine story appears to be problems that originate from the legacy of a well-intentioned fire prevention program that has resulted in many unintended consequences. This article will explore the fire suppression legacy and provide suggestions for the successful reintroduction of fire to longleaf pine forests that have not seen fire in decades.

In 1935, I.F. Eldredge, Regional Director of the Forest Survey of the South, acknowledged that there is "evi-

*(Continued from page 17)*

dence on the ground and in the history of the region to prove that this great (longleaf) pine forest was ushered into this world and has grown into its present development constantly subjected to the influence of wholesale periodic burning." In the unbroken, primal landscape of Alabama, fires once frequently moved through these longleaf pine woods like a gentle swell on the ocean's surface. In forests kept open by frequent fire, streams of light radiated through a cathedral of majestic longleaf pine trees to a congregation of grasses, flowers, ground sparrows, tortoises and the like. Without burning, vines and hardwood sprouts clawed their way out of the ground and tried to gain an advantageous position in the forest. Slowly, a longleaf pine forest starved of fire closes in around itself. Without fire, the grasses and sun-loving flowers of the longleaf pine forest languish and slowly die. Without fire, ground sparrows, tortoises, and countless fire-dependent animals move elsewhere in search of suitable habitat. Without fire, the longleaf forest eventually pines away.

In the early 20th century, the emerging field of forestry, whose roots were planted firmly in the tamed forests of Europe, refused to grant its support to the perpetuation of fire in the longleaf pine woods. Despite Gifford Pinchot's acknowledgment that longleaf pine should be placed "at the head of all the trees of my acquaintance in its capacity to resist fire," fire was widely viewed as a destructive force by this newly formed forestry community. In 1928, the American Forestry Association would lead the first organized crusade to stamp out fire with the Southern Forestry Educational Project. Next, the torch was passed to the U.S. Forest Service and their spokesman, Smokey Bear, in 1944. From there, state forestry and wildlife agencies picked up the mantra that preventing fires was necessary to protect the forest and its inhabitants. As one of the most successful ad campaigns in North America, the anti-fire message moved beyond suppressing malicious burning by arsonists to suppressing all forest fires. Further, the fight to gain control of malicious burning morphed from an attempt to suppress fires to a suppression of scientific evidence in support of fire. The crescendo of the argument is best summed up by a discussion in a 1940s Journal of Forestry article which stated: "the present need is that all agencies, scientists and laymen alike put forth every bit of energy in fighting the forest fire menace and do nothing to give encouragement to wood burners in any section of the United States."

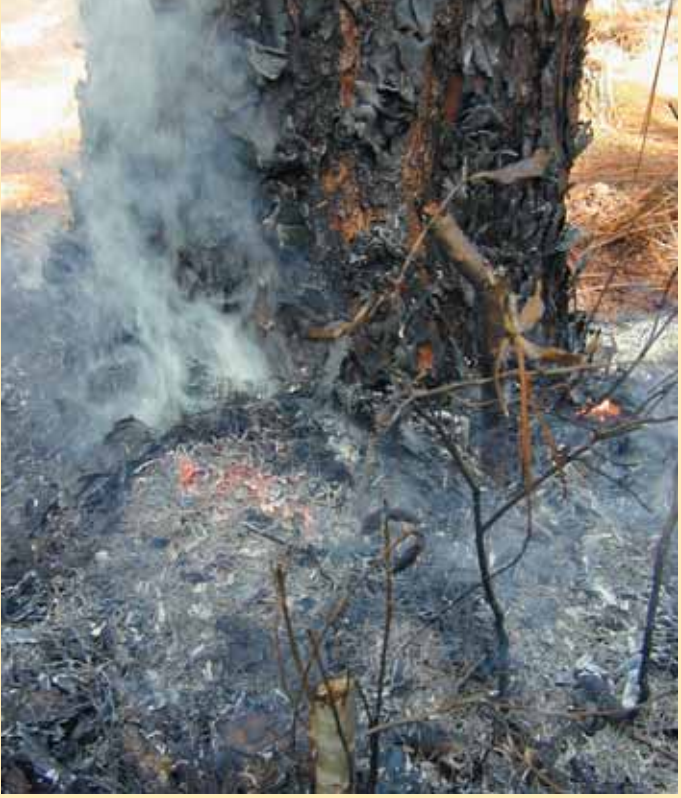
The recent increase in wildfire size and activity across western forests is testimony that Smokey Bear's message of fire suppression has, in fact, unintentionally made the wildfire threat more serious. Many agree today that a policy which attempted to remove all fires from forests has merely replaced frequent, beneficial fires with infrequent, catastrophic fires. Perhaps in recognition of flaws in its campaign, Smokey's message was quietly updated in 2001 to reflect the distinction between wildfires and forest fires. Likewise, the Alabama Forestry Commission has shifted from an earlier position of absolute fire suppres-

Image by USDA Forest Service, Southern Research Station

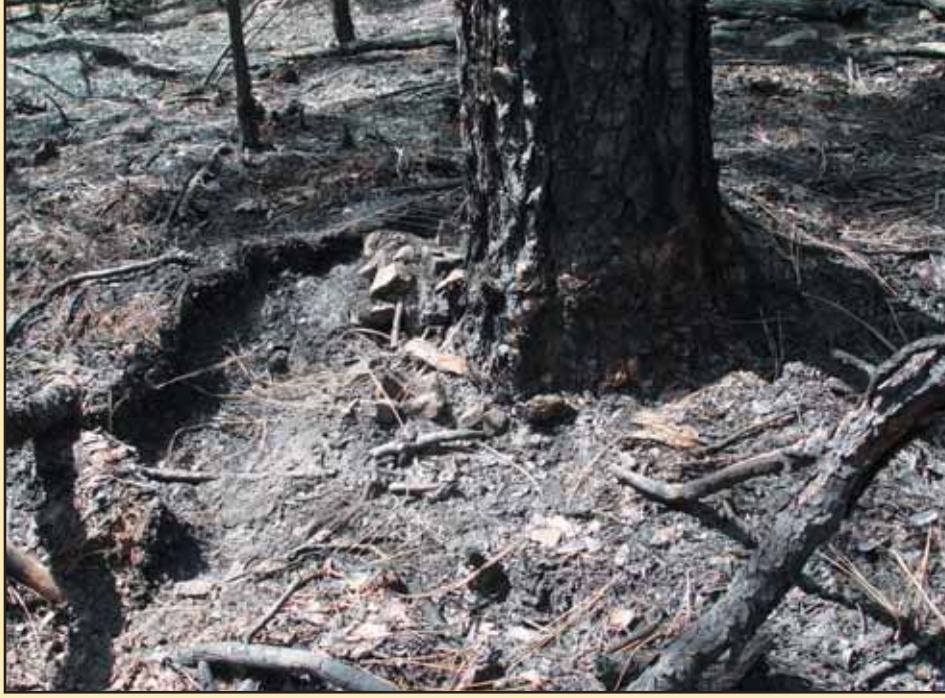
Image by John Kush

Image by Morgan Varner, Humboldt State University

*Top: Longleaf pine forest in the early 20th century near Flomaton, Alabama, maintained by frequent, low-intensity fire. Bottom: As it looked in 1995 having gone through several decades of fire-suppression.*



*Although large conflagrations are devastating to longleaf pine forests that have gone without fire for multiple decades, low-intensity fires that burn under dry conditions in degraded longleaf pine forests can smolder in the organic duff layer and result in upwards to 60% of the old longleaf pine dying.*



*Post smolder.*

*Image by Bill Garland US F&W*

sion to being among one of the most progressive states in promoting prescribed burning through training and cost-share assistance. However, for many landowners in Alabama, the legacy of Smokey's message has become reality. Regretfully, many Alabama landowners have discovered that catastrophic fires are not limited to forests of the Western United States.

On a warm Alabama spring evening in the waning years of the 20th century, a small, innocuous ember floated from a smoldering pile of garbage and gently settled on a soft pedestal of pine needles in a nearby forest stand. Nobody could say for sure when it happened, but at some point later in the afternoon, a wisp of smoke began to twist up out of the ground where the ember had landed. Minutes, or perhaps hours later, from where the smoke had appeared, a small flame stood up out of the pine needles and began a slow dance through the woods. As the temperatures cooled in the evening, the fire slowed and eventually bedded down next to ancient longleaf pine trees for the night. It would not be until the next morning that fire was discovered. The forest, called the Flomaton Natural Area, was a 50-acre impenetrable jungle of briars and brush with many old, scattered longleaf pines. However, when the local volunteer fire department arrived, they were probably relieved to find that the fire that had slowly fingered its way into the woods was contained on all sides by dirt roads. Likewise, since the flame had moved into the humus layer and was obviously running low on strength, there was little need to call dispatch and tell them it was going to be a late evening. The last puffs of smoke were expelled later that day with little human intervention. By all accounts that afternoon, an angry conflagration had been avoided and the patriarchal longleaf pines were saved.

For weeks after the fire, the forest seemed to take on a new life. In places, the fire opened up the otherwise impassable thicket of briars and brush, allowing several varieties of flowers to sprout from the ashes. Although the last fire that these longleaf pines had seen was several decades prior, they were veterans of countless fires in the past and stood seemingly unaffected by the disturbance.

Though it wasn't immediately evident from the fire at the Flomaton Natural Area, the lifeline of these longleaf pine trees had been severed. The result of a

*(Continued on page 20)*

*Image by John Kush*

*Dead longleaf pine trees resulting from a smoldering fire.*

# The Legacy of Smokey's Message: Problems in Fire-Starved Longleaf Pine Forests

*(Continued from page 19)*

seemingly unimpressive, smoldering fire had been the consumption of most of the trees' fine roots. Although by all outward appearances, the longleaf pines looked verdant and healthy; with most of their fine roots gone, the pines struggled to survive on diminishing resources and still fend off insects and pathogens. Two years after the fire, the contest for life was lost to unremitting attacks by small, wood-boring beetles. Longleaf pines that were alive well before Alabama was a state, longleaf pines that had survived incalculable natural and manmade disturbances, were now dead.

When the last of the trees dropped its needles, two years after the spring wildfire, it was determined that no longleaf pine greater than 18" diameter survived the fire and no longleaf pine greater than 80 years old survived (including one tree more than 360 years old). For several years, the ghostly masts that were once trees stood as indicators to a problem that many other land managers across the range of longleaf pine were about to realize. The problem revealed by the wildfire at the Flomaton Natural Area was that a fire-deprived longleaf forest responds differently to fire than it did historically, when fire was a frequent visitor.

In 1889, a Florida resident made a farsighted prediction: "the total abolition of forest fires in the South would mean the annihilation of her grand (longleaf) lumbering pineries." As a consequence of an over-zealously applied policy of total fire suppression, many of the mature, remnant longleaf pine stands seen today are unhealthy, decadent, and at risk of catastrophic fire. Although these mature longleaf trees have been able to persist on the landscape, decades of fire suppression has created a forest unable to repopulate itself. Today, most natural resource professionals recognize the necessity of fire to restore degraded longleaf pine forests. However, what is not as well recognized is that the biggest threat to the restoration of these stands is the inappropriate reapplication of fire. Regardless of the land ownership, there are numerous instances where fire (either prescribed or wild) set under the wrong conditions has resulted in longleaf pine stands with many dead, mature trees.

The first step in restoration of degraded longleaf pine stands must be the recognition that fire set under the wrong conditions will put these forests at risk. As the risk is understood today, longleaf pine stands as young as 50 years old that have gone through a few decades of fire suppression are vulnerable. The telltale sign of a potential problem is longleaf pine trees that have accumulated spongy mounds of pine straw and humus (also called duff) around their base. Often this mound of duff is several inches deep and contains many of the trees' fine roots. Duff that is dry enough to allow fires to smolder for hours will result in the slow death of longleaf pine trees (as witnessed at Flomaton Natural Area). In fact, under the aforementioned conditions, small

## Prescription to the Successful Re-introduction of Fire to Longleaf Pine Forests

- Recognize the potential problem before burning.
- Burn under conservative conditions.
- Give priority to the controlled reduction of humus layer through a series of burns.
- Burn when the lower duff layer is wet, within two days of approximately 1" of rain.
- Avoid the use of a slow-moving backing fire; use a strip fire or grid-ignition fire.
- Avoid or minimize crown scorch on longleaf pine.
- Conduct a mop-up operation by putting water on smoldering hot spots around trees.
- If in doubt, ask a professional.


*Several inches of accumulated and spongy organic debris (duff) mounded around this 50-year-old longleaf pine's base is a telltale warning that smoldering fires can result under dry conditions. Great care must be taken under this situation to slowly remove this mounded debris over several burns.*

Image by John McGuire

*With great patience exercised, nine conservative prescribed burns slowly reduced the duff buildup and helped to restore this 60-year-old, south Georgia longleaf pine forest from its fire-suppressed condition seen twelve years ago (above) to its open and park-like longleaf woods today (below).*

Image by John McGuire

fires that smolder can be as catastrophic as large fires that reach up into the trees' crowns.

The second step in restoration of degraded longleaf pine stands needs to be a rethinking of the short-term goals of prescribed burning. In most fire reintroduction situations, managers implement burning prescriptions that emphasize thinning out hardwood stems that have encroached into the forest midstory. Under nearly all of these prescriptions, appreciable mortality of overstory longleaf pine has occurred. Instead of attempting to control midstory hardwoods, the focus of the first several burns in fire reintroduction must be to ensure the controlled, slow reduction of duff around the base of the older trees. Burning under conservative conditions (i.e., cool, saturated duff conditions) where only the litter layer is dry enough to ignite, prevents smoldering and allows the slow reduction of duff to occur over time. When the accumulated duff material is eventually brought down to bare mineral soil after multiple burns, then the burn prescription window can be widened to satisfy other needs such as hardwood control, wiregrass flowering, etc.

Finally, forest practitioners must exercise patience. Far too often, managers feel compelled to show immediate results in restoration. Some have advocated raking to bare mineral soil around the base of remnant, old longleaf pine trees to reduce the threat of smoldering fires. If fine root loss is the chief culprit in mortality (which many scientists believe), then raking will only expedite the destruction of fine roots. Likewise, the removal of small diameter and un-merchantable "woody biomass" will create an open-forest vista almost instantly. However, removal of midstory biomass will not eliminate the threat of catastrophic, smoldering fires. Additionally, observations suggest that disruption of the humus layer around old longleaf pine by mechanical equipment creates mortality in a similar fashion as smoldering fires.

The message of Smokey Bear has created many paradoxes in the longleaf pine woods of Alabama. There will always be a need to control wildfires. In today's litigious society, we can no longer allow fires to burn unchecked as they did for thousands of years. Likewise, the legacy of Smokey's message has changed the relationship of longleaf pine forests and fire. In the fire-starved landscape, fires set under a range of conditions that were once beneficial to longleaf pine forests are now catastrophic. At the same time, there is no substitute for frequent burning that is able to create the environment required by many plants and animals found in healthy longleaf pine forests. The key to bridging these contradictions appears to be a redefining of how fire is used in fire-starved longleaf pine stands. Success is achieved by redefining short-term goals, slowing down, and burning conservatively. It is vital to remember that it takes decades to grow an old forest. However, if that forest is degraded through fire suppression, it can take only one afternoon to destroy it through a fire set under the wrong conditions.

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