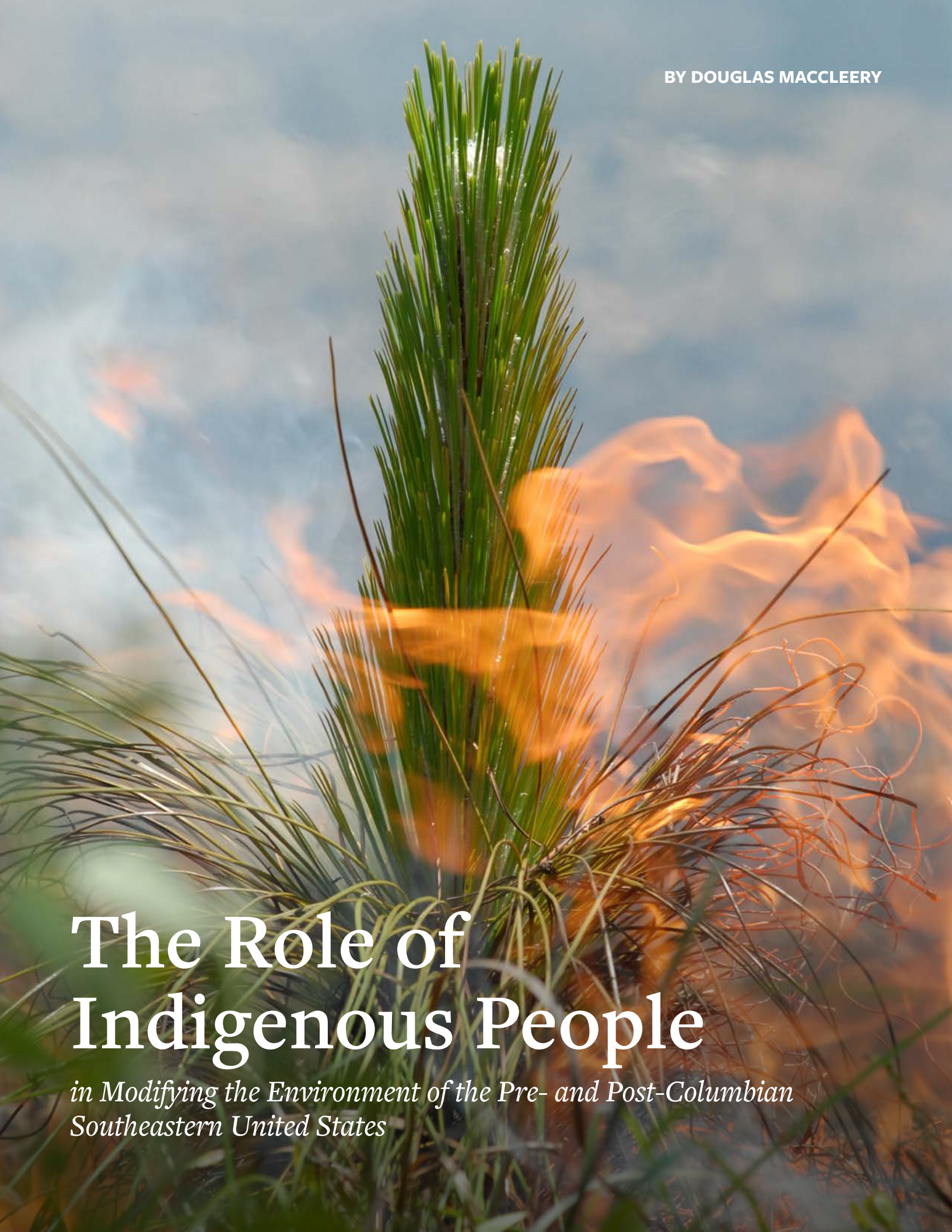


BY DOUGLAS MACCLEERY

The Role of Indigenous People

in Modifying the Environment of the Pre- and Post-Columbian Southeastern United States

Because humans have been affecting the composition, structure, and pattern of plant and animal communities in the Southeast for the past seven thousand years, understanding ecological history is central to planning for the future.

"The greatest inconvenience we experienced," wrote a surveyor in 1811, "arose from the smoke occasioned by the annual custom of the Indians in burning the woods. Those fires scattered over a vast extent of country made a beautiful and brilliant appearance at night; particularly when ascending the sides of the mountains."[1]

What the surveyor observed on the boundary between North Carolina and Georgia—that the Indigenous people of the U.S. Southeast were fostering biotic diversity and affecting ecosystems through their activities—had been happening for millennia. Before European contact in the 1500s, Natives in relatively high population densities were using fire to improve agriculture and hunting, and the local plant communities and climatic conditions were particularly conducive to the application of fire.[2] Many rare and endemic species found today in the Southeast today have evolved, in part, because of human-based disturbances that are no longer commonplace. Even after the Native American population of the Southeast (and virtually everywhere in the Americas) had declined, Indigenous people continued to have a major effect on the region's ecology.

THE HUMAN FOOTPRINT ON THE REGION'S ECOLOGY

The U.S. Southeast—defined here as the region bounded on the south by Louisiana and Florida, on the east by the Atlantic seaboard, on the north by Virginia, West Virginia, Kentucky, and Missouri, and on the west by Missouri, Arkansas, and Louisiana—harbors some of the most diverse plant and animal communities in the United States.[3] The impressive variety of biotic life arises because the Southeast served as a glacial refuge during past ice ages, possessed a warm, favorable climate throughout most of the Holocene, and has a large degree of physiographic variation, including the Southern Appalachians, Piedmont, and Coastal Plain. People had begun to move into the Southeast by approximately 10,500 BCE, during the Clovis period.[4] At that time, the northern portion of the Southeast was characterized by boreal plant communities (e.g., spruce-fir forests) and associated wildlife. Pleistocene megafauna, including mammoths and mastodons, also existed in the Southeast. By about 9000 BCE, North American glaciers had retreated and the Southeast's climate moderated such that species currently characteristic of the region were in place.[5]

Initially, the ecological effects of humans were likely relatively modest, although Clovis peoples likely contributed to the extinction of the Pleistocene megafauna.[6] Both Clovis and paleo-Indians used fire, most likely to enhance game habitat and assist in hunting.[7] Hunting and gathering, facilitated by the use of fire, continued to be the primary subsistence activities during the Archaic cultural phase (8000–1000 BCE). In a study of North Carolina, archaeologist Travick Ward noted that signs of the Archaic cultures "covered the Piedmont landscape, leaving a network of tracks that is hard to miss . . . The broad alluvial valleys, the rolling upland hills, and the banks of small streams were all occupied, visited, or utilized at some point during the 6,000- to 7,000-year span of the Archaic period."[8]

Eastern North America began to see the initial development of agriculture around 3000 BCE, based on isolated evidence for domestication of single species. By about 1800 BCE, at least five seed-bearing plants had been domesticated and formed a coherent Indigenous agricultural complex[9]: bottle gourd (*Lagenaria siceraria*); two varieties of chenopod, or goosefoot (*Chenopodium berlandieri*); marsh elder, or sumpweed (*Iva annua*); squash (*Cucurbita pepo*); and sunflower (*Helianthus annuus* var. *macrocarpus*). In addition, three other cultigens appear as widely used food crops: erect knotweed (*Polygonum erectum*), little barley (*Hordeum pusillum*), and maygrass (*Phalaris caroliniana*).[10] Domestication of these plants made eastern North America one of the western hemisphere's five centers of independent agricultural development, along with Mesoamerica and three areas in South America.[11]

By 1800 BCE, plants were being domesticated over a broad area, including what is now Kentucky, Tennessee, Illinois, Ohio, Missouri, Arkansas, and Alabama.[12] By the middle Woodland Period (250 BCE–200 CE), eastern North America witnessed the emergence of fully developed agricultural economies, including Hopewellian societies in what is now southern Ohio. Plant domestication allowed these societies to thrive and support the construction of large mounds and geometric earthworks, often in the shape of animals, birds, and serpents, and to create beautiful and elaborate art objects whose meaning eludes modern archaeologists.

Maize (*Zea mays*) was not introduced to eastern North America until about 200 CE, almost twenty-five hundred years after

JOHN MAXWELL FOR USFWS

Fires remove competing woody vegetation and release nutrients, allowing the rich diversity of plant and animal species found in longleaf ecosystems to thrive.

local domestication of marsh elder, squash, and sunflower,[13] and it did not become a major food source until after 800 CE. Intensive maize agriculture then quickly spread.[14] Maize displaced several of the plants domesticated earlier and became a major component in the diet of Native peoples through much of eastern North America, from northern Florida to Ontario.[15] Widespread maize cultivation after 800 is also coincident with the rise of Mississippian chiefdoms, large settlements (e.g., Cahokia), and the evolution of complex societies.

The spread of maize agriculture allowed population growth and increased the use of fire, most likely for agricultural clearing.[16] A sediment core taken near the Little Tennessee River contained an order-of-magnitude increase in charcoal abundance after 1000.[17] This period also witnessed an increase in the pollen record of species associated with disturbance (e.g., ragweed, ambrosia).[18] A modest but steady decline in the abundance of freshwater mussels (*Epioblasma* spp.) is associated with premaize agriculture, likely because of direct exploitation and increasing stream sedimentation, which rose by an order of magnitude after maize became a major crop.[19]

ECOSYSTEM CONDITIONS AT THE TIME OF EUROPEAN CONTACT

It is difficult to accurately determine the ecological conditions of the Southeast ca. 1500 because only a few Europeans who traveled through parts of the Southeast recorded their observations. Among the most important were the chroniclers of the Hernando de Soto expedition of 1539–42, which pillaged, plundered, and inadvertently spread European diseases from Tampa Bay north toward what is now North Carolina, west and southwest along the Appalachians, west across the Mississippi River, then down to the Gulf of Mexico.[20]

Even with its large numbers—six hundred men, two hundred horses, three hundred swine—the expedition moved with relative ease throughout the southeastern landscape. De Soto chroniclers wrote frequently of expansive agricultural fields and open, parklike forests.[21] Describing Indigenous agricultural fields in northern Florida, one wrote that the expedition marched through "some great fields of corn, beans, and squash and other vegetables" which had been sown on both sides of the "road" and were "spread out as far as the eye could see" across two leagues of the cultivated plain. This single field may have covered sixteen square miles.[22]

De Soto chroniclers also recorded dense populations, especially in productive river valleys. In what is now Clark County, Alabama, one reported that the area "was thickly settled in numerous towns with fields extending from one to another, a pleasant place with fertile soil and good meadows along the rivers. Talisi was a large town, and on both sides of the river were other towns, many corn fields, and an abundance of grain." Farther on, another de Soto chronicler reported that the land was "so fertile and thickly populated that on some days the Spaniards passed 10 or 12 towns, not counting those that lay on one side or the other of the road."[23]

Once arriving at the Mississippi River, de Soto found a landscape teeming with humans; the river itself was lined with Native villages. Eerily, by the time the next explorer, the Frenchman La Salle, passed through this area more than a century later, the entire valley had been radically transformed.[24] Where de Soto had observed scores of villages, expansive agricultural fields, and high human populations, La Salle saw mostly forest and very few people or villages. The country had been substantially depopulated in part by European diseases, and the ecology of the area had substantially changed.[25]

ECOLOGICAL EFFECTS OF DEPOPULATION

The first wave of Native depopulation caused by smallpox hit shortly after 1500—before even the de Soto expedition. This was followed by successive waves of other "Old World" diseases, including measles, malaria, typhus, and diphtheria. The pandemics, which encompassed all of the Americas, took place largely out of the sight of Europeans. While in more recent decades researchers have challenged "the idea that disease is solely responsible for the rapid Indigenous population decline," Coquille scholar Dina Gilio-Whitaker has written, "other aspects of European contact . . . had profoundly negative impacts on Native peoples' ability to survive foreign invasion: war, massacres, enslavement, overwork, deportation, the loss of will to live or reproduce, malnutrition and starvation from the breakdown of trade networks, and the loss of subsistence food production due to land loss."[26]

Taken *in toto*, the result was that by 1800, Native populations were a shadow of their former numbers—perhaps just ten percent or less—and social structures had been disrupted.[27] Landscapes cleared for agriculture or routinely burned had two or more centuries to recover before the first waves of permanent Euro-American immigrants poured over the Appalachians and found landscapes that were more "pristine" than they had been in more than a thousand years.[28] Many English settlements and agricultural fields were located on Indigenous village sites abandoned because of epidemics—sites that were more easily cleared and were commonly the best agricultural lands.

The (often quite rapid) regrowth of forest on extensive old fields

and the absence of Native hunters undoubtedly led to a resurgence of many wildlife species. Indeed, some species moved into new areas: bison, for example, were not present east of the Mississippi before 1500.[29] The de Soto expedition did not report seeing one bison (which surely they would have remarked had the animals been observed), even though they traversed many areas where a century later bison were abundant. The bison's migration east was likely the result of favorable habitat conditions in old fields, grasslands, and canebrakes in the relative absence of human predation.[30]

By 1700, bison ranged as far south as Florida and as far east as Virginia and Pennsylvania.[31] Like other large ungulates, bison in the Southeast transformed many areas as they browsed in large herds and created large wallows and well-worn migration corridors and traces, some of which remain visible today.[32]

Other wildlife species undoubtedly expanded to fill the habitat niche created by human population decline in the Southeast after 1500. The enormous abundance of passenger pigeons in the eighteenth and nineteenth centuries may well have represented a "bubble population" that expanded enormously as large areas of mast-producing forest regenerated and matured after 1550. Evidence of passenger pigeon remains is not abundant in human middens during the Mississippian period, suggesting a much higher abundance after 1600 than before.[33]

Changes in the terrestrial plane likely affected the climate. The substantial regrowth of forests in the Americas after the major population declines of the sixteenth and seventeenth centuries and its effects on removing huge amounts of carbon dioxide from the atmosphere probably contributed to global cooling during the Little Ice Age.[34]

ECOLOGICAL CONDITIONS BETWEEN 1607 AND 1800

Eyewitness reports on the ecological conditions in the East and Southeast became more common after 1600. Many writers took note of extensive "ancient Indian" plantations and abandoned fields extending for miles along rivers, whose use likely predated the epidemics.[35] Even so, these narratives also consistently suggest that despite the much-reduced population levels of the early 1600s, Native peoples continued to influence ecological systems through both agriculture and widespread burning, which created and maintained large areas as semipermanent prairies, oak and pine savannas, canebrakes, and other fire-adapted vegetation types.

Reasons attributed by early observers for burning by Indigenous people varied but included improving conditions for wildlife (especially white-tailed deer), hunting and driving game, facilitating travel, improving visibility around and defensibility of villages, killing trees and preparing sites for agriculture, managing forests for mast (acorns, chestnuts, and other nuts), enhancing the production of berries, creating material for homes (such as saplings and cane), and even amusement.[36]

Burning by humans generally occurred in the fall and spring, whereas natural fires ignited by lightning were more common from late spring into summer. Both the extent and timing of Native American burning transformed the landscape in ways that natural ignitions could not have accomplished.[37] A variety of evidence, including lightning strike occurrence and historical records, indicates that most of the fires in the Southeast during the pre-European settlement period were of human origin.[38]

On the relative importance of human versus natural fires on the Piedmont, biologist Lawrence Barden wrote,

> It is significant that all reported historical observations of actual fires were made during the dormant season of the year (January 1701 by William Lawson, February and March 1720 by Mark Catesby, October 1728 by William Byrd). During these months, thunderstorms and lightning-caused fires in southeastern North America are extremely uncommon. Neither of the explorers who traveled through the Piedmont during months of frequent thunderstorms reported seeing fires.[39]

Some of the most detailed descriptions of pre-European ecological conditions in the Southeast come from botanist William Bartram, who traveled throughout the Southeast from 1773 to 1777. The most common ecological conditions reported by Bartram (and by subsequent writers) were open forests, interspersed with grasslands and meadows, with extensive cane lands along the rivers. As Bartram descended the west side of the Nantahala Mountains in today's North Carolina, for example, he traveled "through spacious high forests and flowery lawns."[40] His journals contain numerous references to "delightful groves" of open-grown "stately forests" of "oak, ash, mulberry, hickory, walnut, elm, sassafras, locust, etc.," as well as "vast open forests" continuing for many miles.[41] References to dense forests of late successional species are rare indeed.

Descriptions of open forests were also very common in the notes of other early observers. John Smith commented that around Jamestown, Virginia, "a man may gallop a horse amongst these woods any waie, but where the creekes and Rivers shall hinder." Andrew White, on an expedition along the Potomac in 1633, observed that the forest was

"not choked with an undergrowth of brambles and bushes, but as if laid out by hand in a manner so open, that you might freely drive a four-horse chariot in the midst of the trees."[42]

Such observations of the open nature of both coastal forests and the forests west of the Appalachians are typical. Many early observers spoke of the ease of riding a horse or driving a wagon under the forest canopy. Archaeologist Erhard Rostlund concluded that "the open, parklike appearance of the woodlands, undoubtedly the most common type of forest in the ancient Southeast, was mostly the work of man."[43]

Craig Lorimer writes,

> The low importance of shade-tolerant species over extensive areas of the Piedmont and Ridge and Valley provinces in presettlement times provides indirect but important evidence on presettlement fire frequency. Tolerant species appear quite capable of dominating the overstories on many sites, so we must consider why these strong successional trends did not also take place in presettlement times. If fire was indeed the principal factor restricting the occurrence of these species, then the rarity of late-successional forests on the uplands suggests the influence of fire may have been widespread and pervasive.[44]

The pollen record of the Southeast is unambiguous: early successional or fire-adapted tree species, such as oaks, pines, hickory, and chestnut, dominated forests for thousands of years.[45] Human agency was undoubtedly a factor in maintaining this ecological condition.

Frequent forest burning did more than reduce the undergrowth and improve the habitat for preferred species. In many cases it created openings and grasslands where forests otherwise would have existed. Early literature contains many references to treeless areas, often referred to as barrens, plains, meadows, or savannas. Bartram wrote of "vast meadows," "extensive savannas," and "large grassy plains," some of them many miles in length.[46]

Many grasslands were relatively small, from a few to several hundred acres, but others were extensive. Bartram reported that the Alachua Savanna in northern Florida was "a level green plain, above 15 miles over, 50 miles in circumference, with scarcely a tree to be seen."[47] In Kentucky, a vast grassland on the Pennyroyal Plateau measured approximately 155 miles long and 12 miles wide.[48]

Virginia's Shenandoah Valley—a broad valley between the Blue Ridge and Allegheny Mountains—was one vast grass prairie that covered more than a thousand square miles. Native Americans burned the area annually.[49] After the cessation of burning by Native peoples, much of this area promptly reverted to forest, and the early white settlers had to clear forests on land that had only recently been prairie.[50]

From his home east of the Shenandoah Valley, Thomas Jefferson—a keen student of both ecology and Native peoples—wrote in 1813 about the Native Americans' use of fire to aid their hunting. "It has been practised by them all; and to this day, by those still remote from the settlements," he told John Adams. In his lifetime, according to Jefferson, "white inhabitants" in Virginia also used this technique, and "This is the most probable cause of the origin and extension of the vast prairies in the western country."[51] R. C. Anderson writes that the eastern prairies and grasslands "would mostly have disappeared if it had not been for the nearly annual burning of these grasslands by the North American Indians."[52]

Two southeastern ecosystems—canebrakes and pine savannas—have particularly interesting histories involving Native uses, intentional burning, fire suppression, and restoration efforts.

Canebrakes Cane (*Arundinaria gigantea*) is the only native bamboo of the Americas. Dense, mature stands of cane, known as canebrakes, were a major feature of the landscape of the Southeast at the time of European settlement.[53] Canebrakes develop best in wet areas, alluvial plains, and bottomlands, where cane can reach a height of thirty feet and form dense stands with as many as sixty-five thousand culms per acre. Individual culms can be the diameter of a man's leg. Cane grows rapidly and requires fire frequency on a seven- to ten-year cycle. Too-frequent burning discourages cane and leads to its replacement with more fire-tolerant species of grass, but an absence of fire is also detrimental. Because of fire suppression, this habitat type has been virtually eliminated from the landscape.

Indigenous people valued cane for food, shelter, baskets, and tools, especially weapons.[54] The Seneca tribe so valued cane that its destruction by whites was considered a provocation to war.

The extensive area of cane reported in the seventeenth century was likely the result of depopulation in the 1500s: cane expanded to occupy large areas of abandoned agricultural fields, especially in alluvial areas. It was reported throughout the Southeast and as far north as Delaware and Illinois. It is difficult to estimate the extent of canebrakes in the Southeast in 1700, but early accounts made note of their vast extent. Early travelers along the rivers of the Southeast often reported canebrakes extending for many miles along the shoreline.

RICHARD, WWW.FLICKR.COM/PHOTOS/FROGBELLY

A longleaf pine savannah in eastern North Carolina.

In his journal written during his exploration of the Tombigbee River in 1772, surveyor and naturalist Bernard Romans reported that "we encamped . . . on a high bank, where for the first time we saw the rich ground clear of large canes."[55] William Bartram repeatedly remarked on canebrakes during his southeastern travels, describing "vast cane meadows," "widespread cane swamps," and "an endless wilderness of canes." On the lower Tombigbee River in 1775, Bartram noted canes as "thick as a man's arm, or three or four inches in diameter; I suppose one joint of some of them would contain above a quart of water."[56]

The area of canebrakes declined rapidly in the eighteenth century as a result of Euro-American expansion into the Southeast. Factors included overgrazing by cattle, increased fire frequency, and displacement by agriculture. The first wave of European settlers in the region largely comprised cattlemen who treated the area as open range. Cattle found cane nutritious and overgrazing followed. Cattlemen also set frequent fires to promote young, nutritious grass, perhaps converting canebrakes to more fire-tolerant species. The next wave of European settlers was farmers, who often considered the vigor of cane an indicator of agricultural productivity.[57] They eradicated vast areas of cane to plant cotton, tobacco, and other crops.

Having been reduced to less than two percent of their former range, canebrakes are today considered a critically endangered landscape.[58] The loss of canebrakes is considered one of the factors contributing to the extinction of the Backman's warbler, a migratory bird that bred in swampy blackberry and canebrakes of the southeastern and midwestern United States and wintered in Cuba; it was last reliably sighted in the 1960s.[59]

Pine Savannas The Atlantic Coastal Plain was dominated by magnificent open stands of pine at the time of European contact. Within the primary range of the fire-tolerant longleaf pine, only small areas of fire-intolerant southern mixed broadleaved forests (beech, magnolia, semievergreen oaks) grew in specialized habitats not subject to frequent fires.[60] Longleaf pine was estimated to cover about 92 million acres from Florida to southern Virginia. North of Virginia, pitch pine predominated on the Coastal Plain.[61] The longleaf pine–wiregrass community is very much a fire-dominated plant community. Estimated fire frequency was in the two- to three-year range.[62] In the southern portion of the range of longleaf pine, lightning fires

during the summer season are very common.[63] In this part of the southern Coastal Plain, natural firebreaks are uncommon: numerous tracts of forest—from hundreds to more than one thousand square kilometers—have not even a single natural firebreak.[64] Natural fire alone is sufficient to maintain longleaf pine in many parts of the southern Coastal Plain: according to a 1964 study, Florida had 1,146 lightning fires in 1962 and 1,048 in 1963.[65]

But burning by Indigenous people was likely a major factor in extending the range of longleaf and other southern pines into more topographically dissected areas where it would not otherwise have occurred.[66] Longleaf covered extensive parts of the Piedmont that would most likely have had broadleaved vegetation without human burning.[67] Longleaf pine also often took over agricultural fields abandoned because of pandemics and dislocation.[68] Naval stores—tar, pitch, turpentine—harvested from longleaf pine were a major source of income during the early colonial period.

Today, longleaf occupies a tiny fraction of its former range. Grazing (especially by hogs), logging, fire suppression, and conversion to agriculture have all contributed to its decline.[69] By the early 1990s, Frost estimated, about 2.6 million acres remained in naturally regenerated longleaf pine,[70] and of that, only about 674,000 acres, less than 0.7 percent of the original range, remains in a condition similar to the classic open-grown, fire-maintained longleaf pine–wiregrass community—now considered a critically endangered ecosystem.[71]

The precipitous decline in range has threatened species associated with the longleaf pine ecosystem: red-cockaded woodpecker, gopher tortoise, other reptiles, insects, and plants. In 1995 Noss et al. counted an enormous number of rare plants (191 taxa) and animals (at least 41 taxa in Florida) associated with longleaf pine and wiregrass (*Aristida stricta*) in the Southeast. Of those species, 27 are federally listed as endangered or threatened and another 99 are proposed for listing by the U.S. Fish and Wildlife Service or are candidates for listing.[72]

RECONSTRUCTING THE PRECOLUMBIAN ENVIRONMENT

Conservation biologists and other resource managers seeking to reconstruct the historical range of variation in the Southeast face serious challenges. The first is whether to include the role of Indigenous people. The vast wealth of evidence points to the conclusion that virtually the entire Southeast was a humanized landscape at the time of first European contact.

Because humans have been affecting the composition, structure, and pattern of plant and animal communities in the Southeast for the past seven thousand years, excluding the effects of people on the historical range of variation would be problematic. But including them also raises potentially vexing issues. Should the time frame be just before European diseases depopulated the Americas (around 1500), or afterward, the time of European settlement (1600–1800)?

If one is willing to paint with a very broad brush, the ecological conditions prevailing in the Southeast at the time of initial Euro-American settlement (around 1650) can be conjectured from a wealth of first-hand accounts. The Coastal Plain would have been dominated by large, open-grown stands of longleaf pine with an admixture of other southern pines, interrupted by grasslands and prairies that occasionally reached several square miles. These pine forests would have been subject to frequent lightning and human-set fires.

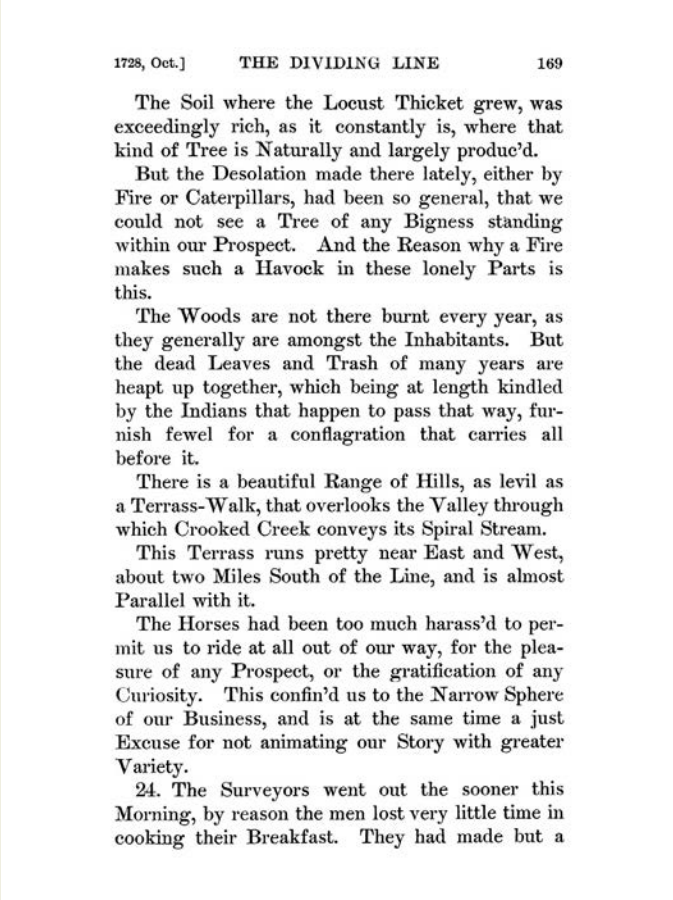
By their nature, eyewitness accounts are selective. Some writers had an agenda, perhaps seeking to make settlement seem economically more attractive or easier than it actually was. The routes they took—usually following rivers and streams and existing trails, where human influences on the landscape were the greatest—may not have been truly representative of the landscape. But the sheer number of eyewitness accounts, many by individuals having no particular economic interest in coloring their accounts, is impressive. When independent observations of the ecological conditions in the Southeast are largely consistent, they must be taken seriously.

Of particular value are early accounts by land surveyors, such as William Byrd (1728), who were required to survey land lines on predetermined compass lines. Byrd noted that unlike lands next to Indigenous settlements, which are "burnt every year," forests in the mountains and more distant areas may go many years without fire.[73] But even in such areas, with "dead Leaves and Trash of many years heapt up together," fires will eventually "be kindled by the Indians that happen to pass that way, furnishing fewel for a conflagration that carries all before it."[74]

A relatively dense network of trails provided both good access and conduits for human influences:

> Maps of known Indian trails, such as those in Massachusetts (Russell 1980), Pennsylvania (Wallace 1965), and the Southeast (Myer 1971), show that relatively few stands would have been located more than 15 miles from the nearest Indian trail. This would have rendered many stands in otherwise sparsely settled areas subject

COURTESY OF HATHITRUST



1728, Oct.] THE DIVIDING LINE 169

The Soil where the Locust Thicket grew, was exceedingly rich, as it constantly is, where that kind of Tree is Naturally and largely produc'd.

But the Desolation made there lately, either by Fire or Caterpillars, had been so general, that we could not see a Tree of any Bigness standing within our Prospect. And the Reason why a Fire makes such a Havock in these lonely Parts is this.

The Woods are not there burnt every year, as they generally are amongst the Inhabitants. But the dead Leaves and Trash of many years are heapt up together, which being at length kindled by the Indians that happen to pass that way, furnish fewel for a conflagration that carries all before it.

There is a beautiful Range of Hills, as levil as a Terrass-Walk, that overlooks the Valley through which Crooked Creek conveys its Spiral Stream.

This Terrass runs pretty near East and West, about two Miles South of the Line, and is almost Parallel with it.

The Horses had been too much harass'd to permit us to ride at all out of our way, for the pleasure of any Prospect, or the gratification of any Curiosity. This confin'd us to the Narrow Sphere of our Business, and is at the same time a just Excuse for not animating our Story with greater Variety.

24. The Surveyors went out the sooner this Morning, by reason the men lost very little time in cooking their Breakfast. They had made but a

A page from William Byrd's account, first published in 1901, discussing the use of fire by Indigenous people.

to occasional accidental or intentional fires.[75]

Even after maize agriculture allowed Indigenous populations to concentrate near productive coastal and alluvial areas, there is ample evidence that upland areas and areas more distant from settlements continued to be used (and burned). John Smith wrote that when the Native Americans of coastal Virginia go hunting,

> they leave their habitations, and reduce themselves into companies, as the Tartars doe, and goe to the most dessert [uninhabited] places with their families, where they spend their time in hunting and fowling up towards the mountains, by the heads of their rivers, where there is plentie of game . . . Having found the Deere, they environ them with many fires, and betwixt the fires they place themselves.[76]

The ecological conditions become increasingly complex as one moves inland, east to west. The Piedmont would have had open forests of longleaf and other pines on sandy and well-drained soils, with open-grown broadleaf–pine forest mixtures or pure broadleaved forests on the heavier soils. Again, the open, parklike forests of the Piedmont would have been interrupted by extensive prairies and grasslands in some areas. Many of the alluvial areas in both the Piedmont and the Coastal Plain would have been cultivated. Extensive canebrakes likely originated on agricultural fields abandoned after disease pandemics. Some alluvial areas would have been open bottomland hardwood forests.

The ecology of the Appalachians is even more complex, based on soils, aspect, and the history of human intervention. Open forests of widely spaced, mature, early successional tree species—oaks, hickory, black locust, American chestnut—were created by frequent underburning by Indigenous people. Again, small to large prairies would exist in some areas.

CONSERVATION AND RESTORATION

Although undoubtedly oversimplified, the conjectural landscape of the Southeast in 1650 leads to two conclusions: (1) the current ecological conditions in the Southeast are dramatically different than they were in 1650; and (2) those 1650 conditions were dramatically different than they would have been without ten millennia of human use and management.

Differences in ecological conditions today versus 1650 are due not only to four centuries' worth of land-use changes but also to altered disturbance regimes. Even many old-growth forests and protected and "natural" areas exhibit vegetation conditions at odds with what would have been expected in pre-European landscapes. Intact forests everywhere in the Southeast are witnessing increases in shade-tolerant species, such as mountain laurel, rhododendron, beech, and maple. Without active human intervention, these species will replace southern pines, oaks, hickories, and other shade-intolerant species that have dominated the Southeast's landscape

for the past seven thousand years or more.[77]

Additional evidence of the ecological effects of altered disturbance regimes is the tally of rare and endemic plant and animal ecotypes and species in the Southeast. A predominance of the endangered ecosystems in the South are either wetland ecosystems or frequent fire–dominated ecosystems, such as prairies, pine savannas and barrens, tropical hardwood hammocks, and oak-pine shrub forests.[78] The U.S. Forest Service's Ozark-Ouachita Highlands Assessment lists twenty-one rare communities (ten forest and woodland types, four shrubland types, and seven grassland types). Many of these are rare because of limited distribution (caused by habitat conversion) or limited ecological niche (e.g., talus). But fire exclusion is listed as a factor in the decline of nine of the twenty-one rare communities.[79]

Further evidence for the role of fire comes from a review of the sixty-seven threatened, endangered, and candidate plant species on National Forest System lands in the Southeast. Of these plant species, forty-three percent (twenty-nine species) require fire to maintain the community in which they reside or to support some specific aspect of their life history. Another twenty-seven percent (eighteen species) tolerate fire in their ecosystem without long-term harm. For another twenty-four percent (sixteen species), fire is not a factor because their habitats essentially never experience fire (e.g., aquatic species). Only six percent of the threatened, endangered, and candidate plant species (a total of four) on National Forest System lands in the Southeast are adversely affected by fire.[80]

Resource managers are largely powerless to counter the ecological effects of the land-use changes that have occurred in the Southeast over the past four centuries. But they are not powerless in recognizing the ecological effects of altered disturbance regimes and addressing them through management activities. An understanding of natural and human influences on the development of historical landscapes is critical to effectively planning and executing projects designed to restore or conserve rare and endemic species and ecosystems in the Southeast.

Douglas MacCleery is the author of American Forests: A History of Resiliency and Recovery *(Forest History Society, 2011) and a former member of the FHS Board of Directors. He is retired from the U.S. Forest Service and has served as USDA deputy assistant secretary for Natural Resources and the Environment.* *The author thanks Greg Nowacki, regional ecologist in the Eastern Region of the U.S. Forest Service, for reviewing and commenting on earlier drafts of this paper. Some material in this paper comes from the author's contribution to Chapter 6 of* Historical Environmental Variation in Conservation and Natural Resource Management, *edited by John A. Wiens, Gregory D. Hayward, Hugh D. Safford, and Catherine M. Giffen (John Wiley & Sons, 2012).*

NOTES

1. Catharine Van Cortlandt Mathews, *Andrew Ellicott: His Life and Letters* (New York: Grafton Press, 1908), 223.
2. Michael Williams, *Americans and Their Forests: A Historical Geography* (New York: Cambridge University Press, 1989), 34–35.
3. Wayne Owen, "The History of Native Plant Communities in the South," in *Southern Forest Resource Assessment: Technical Report*, ed. David N. Wear and John G. Greis (Asheville, NC: U.S. Forest Service, Southern Research Station, 2009), 635.
4. Cynthia Fowler and Evelyn Konopik, "The History of Fire in the United States," *Human Ecology Review* 14, no. 2 (Winter 2007): 165.
5. Paul B. Hamel and Edward R. Buckner, "How Far Could a Squirrel Travel in the Treetops? A Prehistory of the Southern Forest," in *Transactions of the 63rd North American Wildlife and Natural Resources Conference* (Washington, DC: Wildlife Management Institute, 1998), 311; P. A. Delcourt and H. R. Delcourt, *Quaternary Ecology: A Paleoecological Perspective* (New York: Chapman and Hall, 1991).
6. Hamel and Buckner, "How Far Could a Squirrel Travel," 310.
7. Hamel and Buckner, "How Far Could a Squirrel Travel," 310; Fowler and Konopic, "History of Fire," 165–66.
8. Travick Ward, "A Review of Archaeology in the North Carolina Piedmont," in *The Prehistory of North Carolina: An Archeological Symposium*, ed. Jeffrey J. Crow and Mark A. Mathias (Raleigh: North Carolina Division of Archives and History, 1983), 53–82.
9. Bruce D. Smith, "Eastern North America as an Independent Center of Plant Domestication," *PNAS* 103, no. 33 (2006): 12223–28.
10. Bruce D. Smith, *Rivers of Change: Essays on Early Agriculture in Eastern North America* (Washington and London: Smithsonian Institute Press, 1992), 8; Bruce D. Smith and Richard A. Yarnell, "Initial Formation of an Indigenous Crop Complex in Eastern North America at 3800 B.P.," *PNAS Early Edition* (April 3, 2009).
11. Smith and Yarnell, "Initial Formation," 6561. Worldwide, agriculture developed independently in perhaps ten places.
12. Smith, *Rivers of Change*, 163–64.
13. Smith and Yarnell, "Initial Formation," 6561.
14. Smith, *Rivers of Change*, 203.
15. Smith, *Rivers of Change*, 163–64.
16. P. A. Delcourt et al., "History, Evolution, and Organization of Vegetation and Human Culture," in *Biodiversity of the Southeastern United States: Lowland Terrestrial Communities*, ed. W. H. Martin, S. G. Boyce, and A. C. Echternacht (New York: John Wiley and Sons, 1993), 47–79.
17. P. A. Cridlebaugh, American Indian and Euro-American Impact on Holocene Vegetation in the Lower Little Tennessee River Valley (Knoxville: University of Tennessee, 1984), 225.
18. H. R. Delcourt, "The Impact of Prehistoric Agriculture," *Trends in Ecology & Evolution* 2, no. 22 (1987): 39–44; H. R. Delcourt and P. A. Delcourt, "Pre-Columbian Native American Use of Fire," *Conservation Biology* 11, no. 4 (1997): 1010–14.
19. Evan Peacock et al., "Prehistoric Decline in Freshwater Mussels Coincident with the Advent of Maize Agriculture," *Conservation Biology* 19, no. 2 (2005): 547–51.
20. D. H. Thomas et al., *The Native Americans: An Illustrated History* (Atlanta: Turner Publishing, 1993); Charles C. Mann, *New Revelations of the Americas before Columbus* (New York: Knopf, 2005), 465.
21. John R. Swanton, "Final Report of the United States de Soto Expedition Commission," H. Doc. 71, 76th Cong., 1st sess., 1939; Erhard Rostlund, "The Myth of a Natural Prairie Belt in Alabama: An Interpretation of Historical Records,"

Annals of the Association of American Geographers 47 (1957): 392–411.
22. Henry Dobyns, *Their Number Became Thinned: Native American Population Dynamics in Eastern North America* (Knoxville: University of Tennessee Press, 1983), 138.
23. Rostlund, "Myth of a Natural Prairie Belt," 395.
24. Mann, *New Revelations*.
25. G. A. Young and M. P. Hoffman, eds., *The Expedition of Hernando de Soto* (Fayetteville: University of Arkansas Press, 1993), 1541–43; Mann, *New Revelations*; Francis Parkman, *France and England in North America* (New York: Library of America, 1983), 1865–92.
26. Dina Gilio-Whitaker, *As Long As Grass Grows: The Indigenous Fight for Environmental Justice, from Colonization to Standing Rock* (Boston: Beacon Press, 2019, 40).
27. Dobyns, *Their Number Became Thinned*, 322; William Cronon, *Changes in the Land* (New York: Hill and Wang, 1985); Thomas et al., *Native Americans*; Delcourt et al., "History, Evolution, and Organization."
28. Craig G. Lorimer, *Causes of the Oak Regeneration Problem* (Knoxville: General Technical Report SE-84, Southeastern Forest Experiment Station, USDA Forest Service, 1992); Delcourt et al., "History, Evolution, and Organization"; Rostlund, "Myth of a Natural Prairie Belt," 409.
29. E. Rostlund, "The Geographic Range of the Historic Bison in the Southeast," *Annals of the Association of American Geographers* 50 (1960): 405; Ted Franklin Belue, *The Long Hunt: Death of the Buffalo East of the Mississippi* (Mechanicsburg, PA: Stackpole Books, 1996).
30. Rostlund, "Historic Bison," 406; Belue, *Long Hunt*; Valerius Geist, *Buffalo Nation: History and Legend of the North American Bison* (Stillwater, MN: Voyageur Press, 1998).
31. Rostlund, "Historic Bison," 405; Belue, *Long Hunt*.
32. Belue, *Long Hunt*.
33. Thomas W. Neumann, "The Role of Prehistoric Peoples in Shaping Ecosystems in the Eastern United States: Implications for Restoration Ecology and Wilderness Management," in *Wilderness and Political Ecology: Aboriginal Influences and the Original State of Nature*, ed. C. E. Kay and R. T. Simmons (Salt Lake City: University of Utah Press, 2002), 141–78.
34. A. Koch et al., "Earth System Impacts of the European Arrival and Great Dying in the Americas after 1492," *Quaternary Science Reviews* 207 (March 1, 2019): 13–14.
35. William Bartram, *Travels of William Bartram*, ed. Mark Van Doren (New York: Dover Publications, 1955), 414.
36. Fowler and Konopic, "History of Fire," 167–68; Bartram, *Travels*, 139, 154.
37. Fowler and Konopic, "History of Fire," 173–74.
38. Craig G. Lorimer, "Historical and Ecological Roles of Disturbance in Eastern North American Forests: 9,000 Years of Change," *Wildlife Society Bulletin* 29, no. 2 (2001): 425–39; Lawrence S. Barden, "Historic Prairies in the Piedmont of North and South Carolina, USA," *Natural Areas Journal* 17, no. 2 (1997): 152.
39. Barden, "Historic Prairies," 151–52.
40. Bartram, *Travels*, 295.
41. Rostlund, "Natural Prairie Belt," 401–403 passim.
42. Williams quotes Smith and White in *Americans and Their Forests*, 44.
43. Rostlund, "Natural Prairie Belt," 408.
44. Lorimer, "Historical and Ecological Roles," 425–39.
45. P. A. Delcourt and H. R. Delcourt, *Quaternary Palynology and Vegetational History of the Southeast United States* (Knoxville: University of Tennessee, 1985), 28; H. R. Delcourt, "The Impact of Prehistoric Agriculture and Land Occupation on Natural Vegetation," *Trends in Ecology & Evolution* 2, No. 22 (Feb. 1987): 39–44; W. A. Watts, "Late-Quaternary Vegetation History," *Quaternary Research* 13 (1980): 187–99.
46. Quoted in Rostlund, "Natural Prairie Belt," 401–402.
47. Quoted in Rostlund, "Natural Prairie Belt," 408.
48. Lorimer, "Historical and Ecological Roles," 432.
49. D. H. Van Lear and T. A. Waldrop, *History, Uses, and Effects of Fire in the Appalachians*, General Technical Report SE54 (USDA Forest Service, Southeastern Forest Experiment Station, 1989); H. U. Maxwell, *The Use and Abuse of Forests by the Virginia Indians* (Williamsburg, VA: William and Mary College, 1910), 73–103.
50. Rostlund, "Natural Prairie Belt," 409.
51. Thomas Jefferson to John Adams, May 27, 1813, in *The Writings of Thomas Jefferson*, ed. Andrew A. Lipscomb (Washington, DC: Thomas Jefferson Memorial Association, 1903), vol. 13, 248–49.
52. R. C. Anderson, "The Historic Role of Fire in the North American Grassland, in *Fire in North American Tallgrass Prairies*, ed. S. L. Collins and L. L. Wallace (Norman: University of Oklahoma, 1990), 818.
53. This section draws from S. G. Platt and C. G. Brantley, "Canebrakes: An Ecological and Historical Perspective," *Castanea* 62, no. 1 (March 1997): 8–21.
54. P. B. Hamel and M. U. Chiltoskey, *Cherokee Plants and Their Uses: A 400-Year History* (Sylva, NC: Herald Publishing, 1975), 71.
55. Bernard Romans, *A Concise Natural History of East and West-Florida* (New York, 1775), 321.
56. Bartram, *Travels*, 329.
57. Platt and Brantley, "Canebrakes," 8–21.
58. R. F. Noss, E. T. Laroe III, and J. M. Scott, *Endangered Ecosystems of the United States: A Preliminary Assessment of Loss and Degradation*, Biological Report 28 (Washington, DC: U.S. Department of the Interior, 1995), 50.
59. P. B. Hamel, *Bachman's Warbler: A Species in Peril* (Washington, DC: Smithsonian Institute Press, 1986), 110; J. V. Remsen, "Was Bachman's Warbler a Bamboo Specialist?" *Auk* 103 (1986): 216–19.
60. C. C. Frost, "Four Centuries of Changing Landscape Patterns in the Longleaf Pine Ecosystem," *Proceedings of the 18th Tall Timbers Fire Conference* (1993), 17–43.
61. Frost, "Four Centuries," 20.
62. Frost, "Four Centuries," 21.
63. E. V. Komarek, "The Natural History of Lightning," *Proceedings of the 8th Tall Timbers Fire Ecology Conference* (1968): 169–97; M. L. Murphy and R. L. Holle, "Where Is the Real Cloud-to-Ground Lightning Maximum in North America?" *Weather Forecast* 20, no. 2 (2005), 125–33.
64. Frost, "Four Centuries," 21.
65. Komarek, "The Natural History of Lightning."
66. Frost, "Four Centuries," 21.
67. Frost, "Four Centuries," 21.
68. Fowler and Konopic, "History of Fire," 167.
69. Frost, "Four Centuries," 17.
70. Frost, "Four Centuries," 19.
71. Noss et al., *Endangered Ecosystems*, 13.
72. Noss et al., *Endangered Ecosystems*, 56–58.
73. William Byrd, *The Writings of Colonel William Byrd*, ed. J. S. Bassett (1901; New York: Burt Franklin, 1970),169.
74. Craig G. Lorimer, "Causes of the Oak Regeneration Problem," in *Oak Regeneration: Serious Problems, Practical Solutions. A Symposium at Knoxville, Tennessee, September 8–10, 1992*, ed. David L. Loftis and Charles E. McGee, General Technical Report SE-84 (Asheville, NC: Southeastern Forest Experiment Station, 1992), 29.
75. Byrd, quoted in Lorimer, "Oak Regeneration Problem," 27.
76. Quoted in Lorimer, "Oak Regeneration Problem," 29.
77. Katherine J. Elliott and Deidre Hewitt, "Forest Species Diversity in Upper Elevation Hardwood Forests in the Southern Appalachian Mountains," *Castanea* 62, no. 1 (1997): 32–42; C. W. Hedman and D. H. Van Lear, "Vegetative Structure and Composition of Southern Appalachian Riparian Forests," *Bulletin of the Torrey Botanical Club* 122:2 (1995): 134–44.
78. Noss et al., *Endangered Ecosystems*, 5.
79. USDA Forest Service, *Ozark-Ouachita Highlands Assessment: Terrestrial Vegetation and Wildlife*, General Technical Report SRS-35 (Asheville, NC: Southern Research Station, 1999), 71–72.
80. Owen, "History of Native Plant Communities."