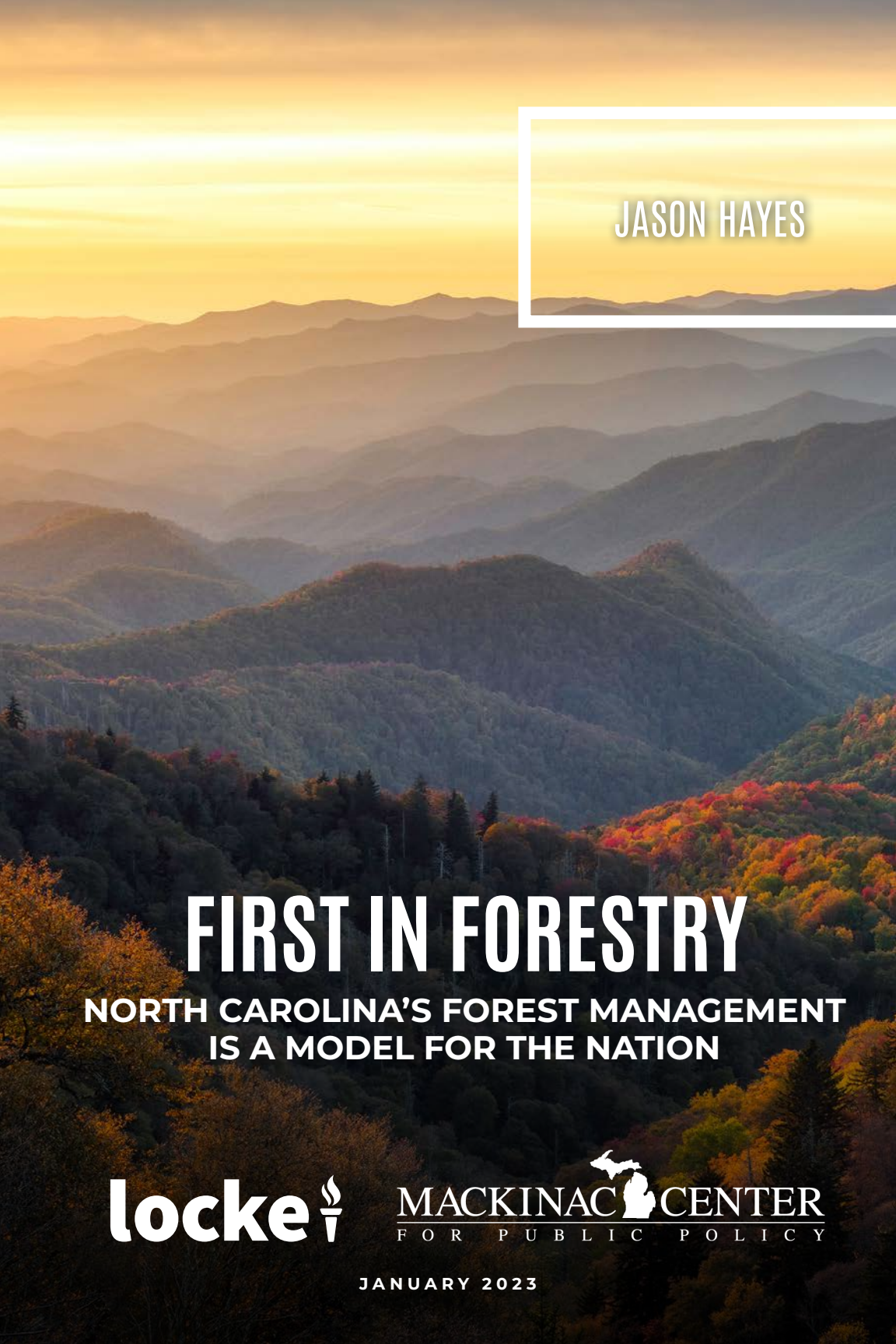


JASON HAYES

FIRST IN FORESTRY

NORTH CAROLINA'S FOREST MANAGEMENT IS A MODEL FOR THE NATION

locke

MACKINAC CENTER FOR PUBLIC POLICY

JANUARY 2023

First in Forestry

North Carolina's Forest Management
is a Model for the Nation

4800 Six Forks Road, Suite 220
Raleigh, NC 27609
(919) 828-3876 | johnlocke.org

v 1.0.0, January 2023

Contents

Executive Summary

As "the birthplace of American Forestry," North Carolina is often recognized for its early role in establishing research-backed forest management techniques, and it continues to offer a refreshing perspective. The state's land administrators clearly understand that proper forest management requires something other than simplistic prescriptions for preservation and restrictions on all but non-motorized recreation. Discussions with state and federal agencies, private industry, and elected officials across North Carolina reveals an appreciation of the value of mixing active harvesting and the production of wood products, controlled burns, spacing and thinning operations, conservation, outdoor recreation, heritage values, and wilderness protection on North Carolina's public lands.

State and federal forest managers recognized in the past that these many and varied activities played an essential role in managing both a healthy and viable economy and natural areas of the Tar Heel State. Now, these activities remain an essential aspect of economic stability and forest management today and will continue to be important well into the future.

Introduction

Previous research on public land management has detailed a persistent problem with preservationist attitudes of imposing a de facto "leave-it-alone" management style on many national forests. Due to the increased politicization of the forestry and environment, driven by well-meaning but misguided conceptions of what constitutes a natural, healthy habitat, officials and the public remain ignorant about the efforts of the first generations of foresters and land managers. Those early foresters learned the importance of active and collaborative forest management that fosters multiple uses of natural lands. But preservationist ideologies have, over the past several decades, pushed land managers to lock up many publicly owned lands.

As a result, the goal for many of our federally controlled and managed forests is "pristine," which aims to avoid human intervention as much as possible and leave our natural landscape alone, which results in old growth. This approach largely restricts their use to primitive backcountry recreation. But forest ecology should not be twisted into a tool for a political environmentalism that demands forests reach and then stop

"Thankfully, many government agencies are recognizing the errors imposed by political environmentalism and preservationist mindsets."

at some arbitrary and static state. It fails to account for what happens when wild, untamed forests pose a threat to lives and property in the event of a fire. When this happens, national forests no longer act as healthy and thriving ecosystems with a diversity of age classes (the forests and what's growing in them) and stand structure. Instead, they become overgrown, overmature, and a magnet for wildfire and disease or pest infestations.

Thankfully, many government agencies are recognizing the errors imposed by political environmentalism and preservationist mindsets. They are shifting away from the "pristine" model back to strategies that promote a healthy, diverse ecology for our national parks and wildlife areas. They are also cooperating with other stakeholders to better manage these forests for the public as a whole and to reintroduce multiple public uses.

In many ways, North Carolina is setting a positive example for what active and collaborative forest management should look like.

At both the state and federal levels, agency officials in North Carolina appear to have retained the lessons learned by early American foresters. They have maintained a clear understanding of the value active management has in supporting healthy and viable public forests. The state's 2020 "Forest Action Plan," produced by the North Carolina Forest Service, clearly supports the idea of seeking out a diverse spectrum of stakeholders for collaborative input and comment on forest management. These managers are then working to include stakeholders' views as they develop management plans that can be used on the ground. Similarly, the U.S. Forest Service's (USFS) "Nantahala and Pisgah National Forests Land Management Plan"—which was published in January 2022 and reflects the most recent priorities for North Carolina's national forests—presents

an updated and well-balanced perspective on forest management.

North Carolina's public forests contain many examples of balanced and multiple uses, just as they did when the area's first professional foresters were designing management plans. These uses include ongoing harvests of forest products for lumber and manufactured wood products; creative silviculture prescriptions that target a mix of age classes and diverse stand structures; reintroducing prescribed fire on a regular basis; and active spacing and thinning forests to reduce the threats of wildfire, disease, or infestation.

"Public land managers also clearly state that forested areas should serve several other valuable purposes as well: conservation, outdoor recreation, hunting and fishing, and providing various ecosystem services such as water purification, air quality improvements, and wildlife habitat."

Public land managers also clearly state that forested areas should serve several other valuable purposes as well: conservation, outdoor recreation, hunting and fishing, and providing various ecosystem services such as water purification, air quality improvements, and wildlife habitat. Industry, community, and elected officials trust that multiple use plans will play a much bigger role in western counties, which are largely made up of federal lands. Therefore, any restrictions on forest use can have severely negative impacts on their economic and social health, including closure of forestry-focused businesses such as sawmilling, furniture manufacturing, etc.

As federal plans do, the state-level Forest Action Plan also recognizes the value of urban forests for the ecosystem services they provide, which includes reducing air pollution, nutrient cycling, filtering water, as well as

their aesthetic and recreational values. Both the state and federal plans also recognize the value of the state's extensive privately owned forest lands and push strongly for public officials to work collaboratively with private landowners.

NORTH CAROLINA – THE BIRTHPLACE OF AMERICAN FORESTRY:

"Cradle of American Forestry"[1]

North Carolina has historically had a strong interest in forestry and management, as the state is often referred to as the "Cradle of American Forestry" or "first in forestry."[2] The state gained this moniker largely due to the actions of two men, George Washington Vanderbilt and Carl Alwin Schenck.

Soon after visiting the area around Asheville, George W. Vanderbilt, grandson of railroad and shipping magnate Cornelius Vanderbilt, purchased 125,000 acres in what is now the Pisgah National Forest. Vanderbilt purchased the land with the intention of transforming the area into "a beautiful pastoral landscape,"[3] part of which is now the land surrounding the magnificent Biltmore Estate.

American forestry icon Gifford Pinchot took his first forestry job in 1891, when he was hired to help Vanderbilt create a sustainable forest plan for his estate and to implement a new form of scientific forestry management. Pinchot was eager to work with a private landowner, who wanted to practice scientific, profitable, and sustainable forestry, where harvesting trees did not preclude preserving the larger forest.[4] But Pinchot also

had a strong interest in making the management of the nation's forests a priority of the federal government. When he was pulled away, Pinchot reached out to his teachers and mentors in the German forest industry, asking them to recommend another trained forester to manage the Vanderbilt estate. They recommended Carl Schenck as "daring and dynamic, with an abundance of self-confidence." Vanderbilt agreed and brought Schenck on as his chief forester.

Vanderbilt gave Schenck two projects after hiring him in 1891: Repair the land and make sustainable forest management a profitable occupation. As Schenck set about devising a plan for repairing the land, he ran into difficulties. A significant portion of the Vanderbilt estate had been cleared for agricultural purposes and then abandoned. In addition, rebuilding the South after the Civil War, as well as the industrial revolution, led to an increased demand for lumber. Nationally, excessive harvesting threatened to bring on a timber famine, and forest managers realized that any expectations for an endless supply of timber were unrealistic.

Vanderbilt tasked Schenck with using a relatively new science called "silviculture"[5] to return the cleared areas of the estate to a forested condition. This new approach would replace unrealistic expectations that,

Figure 1: The North Carolina General Assembly approved the production and sale of a "First in Forestry" license plate to recognize the state's role as the birthplace of professional forestry in the U.S.

JASON HAYES

Figure 2: "Cradle of Forestry Overlook" from the Blue Ridge Parkway. Photo taken March 31, 2022, in the Pisgah National Forest, near Asheville, NC.

regardless of the intensity of harvesting, forests would always readily and naturally regenerate. It held that properly managing forests would allow something to remain for future generations.

But professional differences existed between Pinchot and Schenck, and they soon clashed over their preferred approaches. Pinchot had planned an extensive cut of tulip poplar (*Liriodendron tulipifera*) in the Big Creek area, expecting that the large trees could be quickly sold for a profit.[6] Schenck believed building roads to practice what he would call a "permanent forestry" approach, where limited harvests were taken over a longer time, was the better option. Pinchot's view prevailed, and they harvested a large section of the area. Schenck considered the project a failure, arguing that the "the primeval beauty of Big Creek had been destroyed." He bemoaned, "the financial loss incurred by our brand of forestry amounted to many thousands of dollars."[7] Pinchot disagreed. He believed the project was a success because they were able to sell logs, and seeds from the harvested trees had allowed

"The industrial revolution's rush for resources had been paired with a poor understanding of ecology, resulting in overharvesting."

natural regeneration to occur.

These early conflicts highlighted the steep learning curve that Schenck had tackled and the reality that his European training failed to prepare him for work in the Southeastern United States. He explained that "from a German viewpoint, the forest might have been designated 'a chaos of trees' belonging to a large number of species. Many of them unknown to me." In response, he developed a "brand new sort of forestry;" a uniquely American approach to forestry and conservation.[8]

Another lesson, which current forest managers are re-learning today, involved the notions of shared stewardship and moving past conflict to cooperation. Schenck quickly learned that he needed to collaborate with various stakeholders to effectively manage the area. He regularly encountered residents who lived nearby and used the estate for recreation. Though he first viewed these locals as trespassers, Schenck began to understand and incorporate their intimate knowledge of the lands into his forest management plan.

Vanderbilt hired Schenk to make managing his tens of thousands of acres into a sustainable and profitable business while at the same time restoring the forest's health. The industrial revolution's rush for resources had been paired with a poor understanding of ecology, resulting in overharvesting. But, if successful, Vanderbilt's plan would support multiple uses of the land. The estate would have a well-managed forest that provided ongoing income. It would also serve as a sportsman's paradise, where visitors could engage in outdoor recreation, like hunting and fishing.

Schenck's explanation of mixed uses presents a balanced, realistic view that can be used today:

> *"I'm a forester, and, as a forester, I am meant to raise trees, partly by planting, partly by lending nature a helping hand. I am a lumberman. I cannot help being a lumberman. Without lumbering, no cash dividend is obtainable from forest investments. Therefore, I cut the trees, though I do not cut all the trees, for the reason that it pays better not to cut all of them."*[9]

"But ongoing overharvesting on private lands around the country had prompted Pinchot and then-President Theodore Roosevelt to publicly attack many private landowners as 'enemies of the nation.'"

Soon after he began his work on the Vanderbilt estate, Schenck recognized that he would need to teach more people about the profession of forestry. He took on several apprentices — "the sons of lumbermen and landowners" — training them as foresters in both a classroom and an on-the-ground format.[10] In 1898, they became the first class of the Biltmore Forestry School, the nation's first forestry school, which operated for more than a decade, with 400 students eventually graduating from the program.

Due to differences with Schenck, Pinchot started his own forestry school in 1900. Having left Vanderbilt's employ, he had become convinced that the nation's forests should be managed by government agencies, rather than private landowners. Schenck, by contrast, wanted his students to work for private landowners. But ongoing overharvesting on private lands around the country had prompted Pinchot and then-President Theodore Roosevelt to publicly attack many private landowners as "enemies of the nation." In a heated discussion on the Biltmore estate, Pinchot referred to Schenck as an "antichrist" for teaching his students about lumbering rather than his preferred views of "scientific forestry."[11]

Schenck also faced other troubles. His efforts to practice reforesting

were hard-pressed to compete against the less-expensive but damaging style of cut-and-move-on forestry that was practiced across the nation. Vanderbilt, increasingly motivated by a need to make a profit, decided to call an end to the experiment and asked Schenck to find a buyer for his land. Schenck resisted, believing his style of forestry could still be profitable.

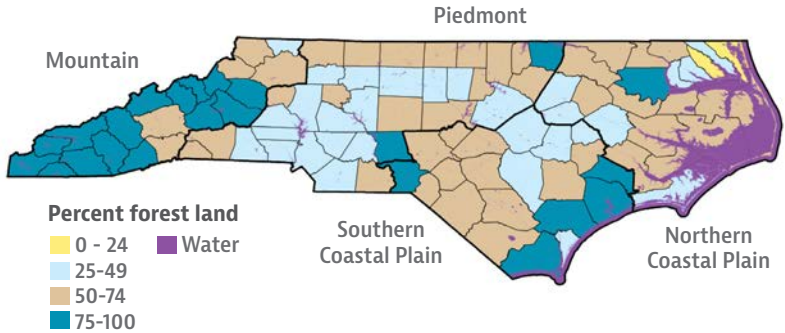
After a contract dispute with the Biltmore's general manager in April 1909, Schenck resigned and took his forestry school on the road, teaching in both North America and Europe. Hampered by the inability to offer degrees, he faced declining enrollment. It was during Schenck's itinerant program of educating new foresters that Congress enacted the Weeks Act.[12] This 1911 law set aside $9 million in federal funding to purchase 6 million acres of forested land for conserving and managing it in national forests. In 1914, Vanderbilt offered to sell most of his estate to the federal government, but he died soon after. The federal government did not purchase the land until two years later, in 1916, and the 86,700-acre portion it bought formed the early "nucleus of the Pisgah National Forest."[13,14]

Schenck returned to Germany in 1913 and entered the army. In the 13 years he worked with Vanderbilt, they both remained strong advocates of the idea that private landowners could and should play a pivotal role in managing and conserving forests.[15] This idea remains as valid then as it does today.

ROLE OF FORESTS IN NORTH CAROLINA'S ECONOMY [16]

The U.S. Forest Service (USFS) estimates that in 2021, North Carolina had 18,700,424 acres of forested land, representing 54% of the total land area of the state — 60% of the total land area if water surfaces are not included.[17] Despite ongoing forest management activities, this amount is a slight increase from the 18,587,541 acres the USFS reported a decade earlier. Of the state's 100 counties, 68 have over 50% forest cover. Twenty-three have greater than 75% forest cover.[18]

Figure 3: Survey units and percentage of land in forest by county[19]

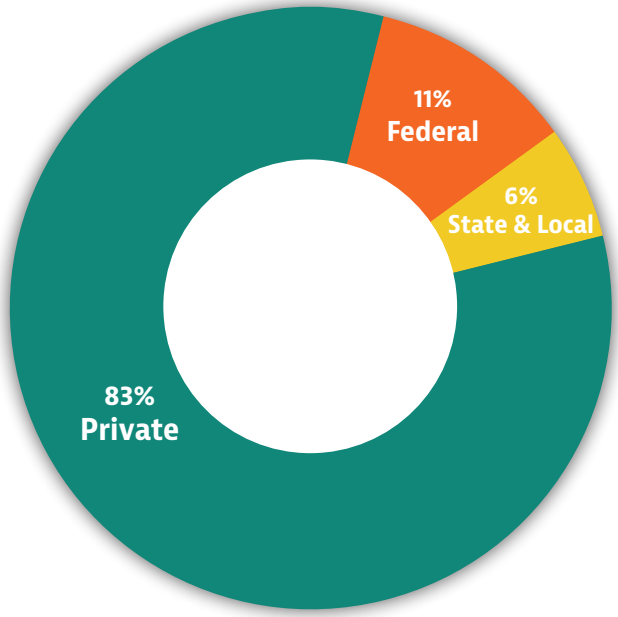


Most of the forested area in the state — almost 83% — is privately owned. That percentage is up slightly from the 2011 number of 79%.[20] The federal government owns and manages just over 11% of forested lands. State and local governments own or manage just over 6%. So, a total of 17% of forested land in the state is publicly owned and managed. A similar figure was reported by the USFS in 2011, when 15% of all forested lands were publicly owned.[21]

The federal forest service also reports that 391,208 acres of the state's forested lands are treated each year by harvesting, spacing, or thinning. A further 103,655 acres of forested lands are disturbed by fire, and 134,201 acres are disturbed by storms, droughts, or other weather events.[22]

The North Carolina State College of Natural Resources reports that in 2019, the state's forest sector was directly responsible for almost 2% of

Figure 4: Private, state, and federal land ownership in North Carolina



SOURCE: US FOREST SERVICE

the state's economic output and $21.6 billion in industrial output.[23] The forest sector was also listed as the top employer in the manufacturing sector, with 73,632 direct jobs generating $4.28 billion in total payroll.

"North Carolina's forest sector contributes $34.94 billion to the state's economy, sustaining over 148,017 jobs and producing $1.41 billion in international exports."

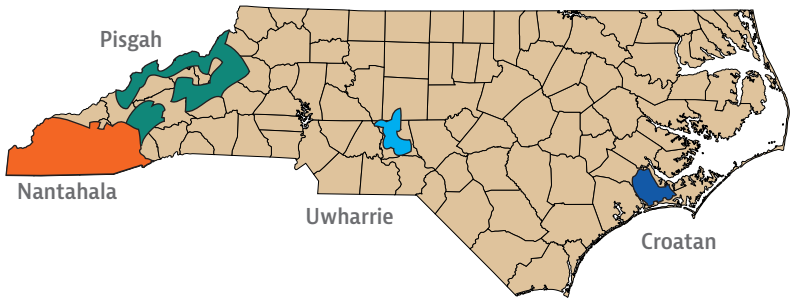
NC State Extension also reports that when direct, indirect, and induced effects are added, North Carolina's forest sector contributes $34.94 billion to the state's economy, sustaining over 148,017 jobs and producing $1.41 billion in international exports. The school also reports that the state's forest sector generated $266.8 million in state and local taxes and $874.5 million in federal taxes.

THE FOUR FORESTS:

Pisgah, Nantahala, Croatan, Uwharrie

North Carolina's four national forests total more than one million acres and represent a wide diversity of forest ecosystems, from mountainous, broadleaf forests to coastal estuaries and longleaf pine. They range in elevation from sea level to over 5,800 feet and offer a broad mix of recreational opportunities, economic and social benefits, wildlife habitat, and heritage and historical values.

Figure 5: National Forests in North Carolina



SOURCE: U.S. FOREST SERVICE.[24]

Pisgah National Forest

This region in Western North Carolina was first characterized as "Mount Pisgah" by the Rev. James Hall in 1776 during an expedition into the area. Seeing a land that was rich with resources, Hall called it "Pisgah," a reference to the peak from which Moses was allowed to see the promised land.[25] The forest is described by the U.S. Forest Service (USFS) as "a land of mile-high peaks, cascading waterfalls, and heavily forested slopes."[26] It features a mix of hardwood forests, many hiking trails and outdoor recreation opportunities, as well as numerous rivers and streams, scenic outlooks, and the Forest Heritage Scenic Byway (U.S. Highway 276).[27] Pisgah National Forest, which occupies much of this region, is also the site of the Cradle of Forestry in America Heritage Site. It honors the country's first forestry school, created and operated by C.A. Schenck while he worked as the chief forester on Vanderbilt's estate, the Biltmore.

JASON HAYES

Figure 6: Two original school buildings from the "Cradle of Forestry in America" & Biltmore School of Forestry started by G.W. Vanderbilt and C.A. Schenck. Photo taken March 31, 2022, in the Pisgah National Forest, near Asheville, NC.

The USFS also lists Pisgah National Forest as "home to the first tract of land purchased under the Weeks Act of 1911, which led to the creation of the national forests in the eastern United States."[28] The initial portion, or "nucleus" of the forest, is also listed as an 86,700-acre tract that was purchased "for a fraction of its value" from Edith Vanderbilt, George W. Vanderbilt's widow. She viewed the sale as a means of continuing her late husband's work to conserve and properly manage the area.[29] The federal forest service reports that Pisgah National Forest currently covers more than 500,000 acres.

JASON HAYES

Figure 7: Pink Beds Loop Trail taken March 31, 2022, in the Pisgah National Forest near Asheville, NC.

Nantahala National Forest

Named after the Cherokee word meaning "land of the noon day sun," Nantahala National Forest is the largest of the four national forests in North Carolina, at 531,148 acres. Elevations in the forest range from 1,200 feet on the Hiwassee River to the peak of Lone Bald, at 5,800 feet.[30] This forest was formed in 1920 under the Taft administration from purchases approved by the Weeks Act. Like Pisgah, Nantahala is made up primarily of hardwood forests, with numerous rivers, streams, waterfalls, and caves. Its 600-plus miles of hiking trails offer opportunities for outdoor recreation, camping, off-road vehicle use, and horseback riding.[31]

Croatan National Forest

JASON HAYES

Figure 8: Great Lake Rd. in the Croatan National Forest – Showing the area's Longleaf Pine (Pinus palustris) overstory, photo taken March 26, 2022.

Croatan National Forest is, in the words of the U.S. Forest Service, the "only true coastal forest in the East."[32] It is made up of a mix of pine forests, saltwater estuaries, and "pocosins," a type of low-lying wetland basin with poorly drained, thick, acidic soils that have built up over millennia.[33] The forest was named after the Native American tribe living in the region in the late 16th century, when European colonists first settled in the area. It is perhaps most famous for being the location of the infamous lost colony of Roanoke.[34] Bordered by water on three sides – Rogue Sound to the south and the Neuse River to the north and east — the forest provides a mix of recreational activities, such as hiking, camping, kayaking, canoeing, and fishing. The forest also supports diverse wildlife populations and plant life: white-tailed deer, black bear, wild turkeys, various wading birds, alligators, and carnivorous plants like the Venus flytrap, sundew, and pitcher plant.[35] There are four designated wilderness areas within the forest. The Cherry Point Marine Corps Air Station is located along the northern boundary, encompassing the town of Havelock.

Uwharrie National Forest

JASON HAYES

Figure 9: Uwharrie National Forest, just east of the Tuckertown Reservoir on NC Highway 8 / 49, near New London, NC, photo taken March 22, 2022.

"The Uwharrie Purchase Unit of the forest was initially obtained by the federal government in 1934 as part of a program to rehabilitate abandoned or unused agricultural land and to resettle farmers."

Described as the smallest of the nation's national forests — just under 52,000 acres — in the least densely populated area of the state, the Uwharrie National Forest has still been nicknamed the "land of many uses."[36,37] That name originates from its abundance of natural resources. Mixed long-leaf pine and oak-hickory forests offer numerous recreational opportunities: hunting and fishing, water-based recreation, hiking, off-road vehicle trail riding, and horseback riding. The area also boasts a rich cultural history, with the Town Creek Indian Mound, the reconstructed Pee Dee village, and numerous burial areas located in the nearby town of Mount Gilead.[38] Evidence of the area's past industrial activity, including logging, mineral quarries, metal mining, and agricultural activity, remains.[39] The "Gold Mine Trail" reminds hikers of this past. Companies like Troy Lumber Co. — family-owned and in operation for almost 80 years — continue to produce millions of board feet annually.[40]

Located in the Piedmont, the forest is a mix of public and privately owned land, sitting on some of the oldest mountain ranges in North America. The Morrow Mountains, believed to have been as high as 20,000 feet at one time, have been worn down to their current height of approximately 1,000 feet over the Piedmont Plateau.[41] The Uwharrie Purchase Unit of the forest was initially obtained by the federal government in 1934 as part of a program to rehabilitate abandoned or unused agricultural land and to resettle farmers. In 1961, President John F. Kennedy officially set the area aside as Uwharrie National Forest.[42]

FEDERAL PRESENCE

The Congressional Research Service reports that the federal government owns 7.8% of the state's total acreage, which can be distinguished from the 11% of federally owned forested land previously noted in this paper and reported by the United States Department of Agriculture, the department where the USFS resides.[43] The rate of ownership is just slightly higher than the 5.8% of North Carolina's neighbors.

Despite this relatively limited level of federal ownership, some of North Carolina's western counties have significantly higher levels of federal land. In western Graham County, for example, 76% of the total area is made up of federally owned land.[44] Local officials and residents in other western counties face challenges due to the high rate of federal land ownership, which is similar to the issues experienced by those living in western states.

Table 1: Federal land ownership in Southern states

State	% owned by federal government
Alabama	2.7
Arkansas	9.4
Florida	12.9
Georgia	5.2
Kentucky	4.3
Louisiana	4.7
Mississippi	5.1
North Carolina	7.8
Oklahoma	1.5
South Carolina	4.5
Tennessee	4.8
Texas	1.9
Virginia	9.3
West Virginia	7.4

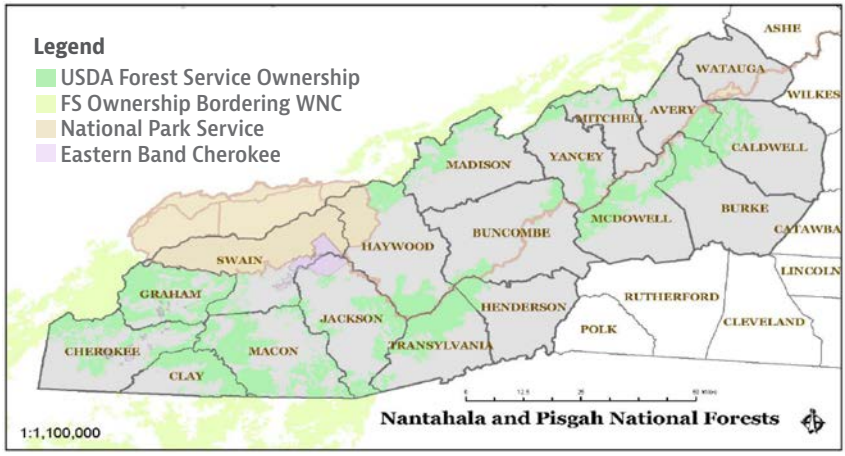
When federal lands make up a large portion of a county's area, it has a greater impact on the community. They depend on commercial activity that occurs directly on federal lands for income and to support the county's budget through services related to forestry, hunting, fishing, and general outdoor recreation. When harvesting or other forest management activities are limited by federal managers or regulations, counties and townships can be forced to rely only on federal transfers known as payments in lieu of taxes (PILT) to cover basic expenses.

In interviews, elected officials discussed how local obligations to respond to crises on federal lands affect their budgets. According to state representatives, local or county fire, sheriff, and emergency medical personnel are often the default first responders when a wildfire occurs in a national forest, or a search-and-rescue operation is required there. PILT

dollars that have been apportioned across counties by state agencies do pay for a portion of those costs, they say. But if PILT money proves insufficient in a year with several wildfires or other issues, county tax reserves must cover the shortfalls. This leaves taxpayers on the hook for additional expenses.[45]

Tight budgets at the county level due to state and federal regulations result in restrictions that can harm local communities. If federal managers do not allow active forest management or multiple uses of a national forest, the economic health of the county is heavily impacted.[46]

Figure 10: Map showing the relative levels of federal ownership / management in western counties of North Carolina



SOURCE: USDA — U.S. FOREST SERVICE.[47]
NOTES: NANTAHALA AND PISGAH NATIONAL FORESTS ARE SHOWN, AS ARE WESTERN NORTH CAROLINA COUNTIES, NATIONAL PARK SERVICE, AND TRIBAL LANDS.

Elected officials and business representatives in western counties backed up their concerns by describing the impact of business closures and the job loss within the communities. With limited access to major transportation routes and a small, or dwindling workforce, many of these rural communities struggle to compete in the national and global economy. Small changes in policy can, therefore, make the difference between economic success and failure. The imposition of minimum

wage laws, unreasonably strict state environmental regulations, and the requirements imposed by federal agencies can raise costs for these businesses to the point where they must relocate or close.

Interviews with local experts exposed the impact of the 2014 closure of the Stanley Furniture plant in Robbinsville, in North Carolina's Graham County. Despite having invested over $9 million in upgrades, Stanley chose to close this facility, which produced its Young America line of furniture.[48] While the facility was closer to U.S. markets than its Chinese competitors were — which mitigated some of its shipping costs — low profit margins and high labor costs made it impossible to keep the plant open. In the interviews with state legislators, it was noted that federal policies limited access to forested areas, limiting the ability to harvest close to the areas where milling capacity exists. With the increased shipping costs and decreased stability of supply of forest products locally, competing firms, based in China, could offer far lower labor costs. The closure of the Stanley plant resulted in the loss of up to 400 jobs.[49]

Such legislative restrictions can be the final nail in the coffin for a struggling business in a small western county.

According to the 2020 census, the town has a total population of 597.[50] The area near the town was described as having a "very small workforce, about 3,500 to 3,800 people." These 400 jobs represented almost 70% of Robbinsville's total population or approximately 11% of the area's total workforce. Robert F. Mulligan, the head of the economics department at nearby Western Carolina University, called the closure devastating, explaining that the job losses would spike the area's unemployment rates from 11% to over 22%.[51] Mulligan did not expect the closure to have a large impact on Western North Carolina overall, but he predicted the impact on Graham County would be severe.[52]

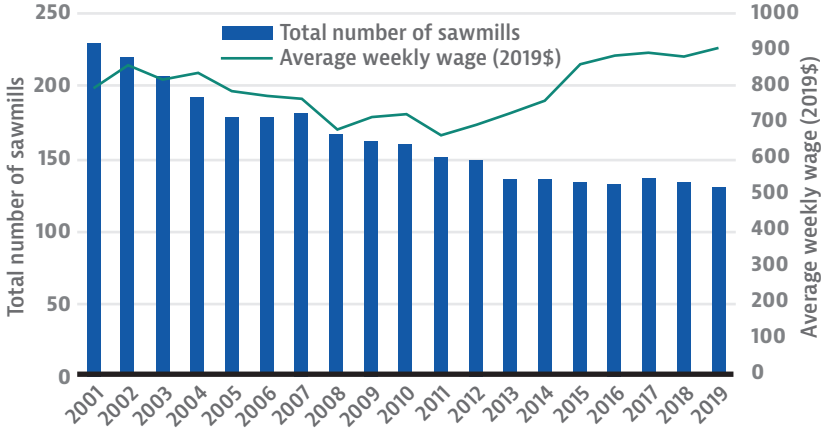
Fortunately, soon after the Stanley Furniture facility closed, another company, Oak Valley Hardwoods, purchased the plant and converted it to a kiln operation for drying rough cut hardwood lumber that is sold around the world.[53] The company reported that it expects to create "up

to 114 jobs," which would help to mitigate but not fully replace, the jobs lost when the Stanley plant closed. Local media and the company website indicate that the Oak Valley business is still operating in the area.[54,55] The example of the Robbinsville plant demonstrates the massive local impacts that restricting access to nearby national forests can have on small town economies.

Discussions with industry representatives indicated similar potential impacts on the state's milling capacity — including the number of sawmills operating — in North Carolina.[56] NC State Extension research tells a mixed tale on this issue.

The number of sawmills, which receive raw logs to be processed into dimensional lumber, such as 2x4s for construction, has declined drastically in North Carolina. The state has lost "over 100 independent companies over the last two decades due to a combination of closures, mergers and other factors."[57] Quoting the Bureau of Labor Statistics, NC State Extension reports that North Carolina had 229 sawmills operating in 2011. This number had decreased to 125 in 2021.

Figure 11: Total number of sawmills, and the average weekly wage of sawmill employees in North Carolina



SOURCE: NC STATE EXTENSION

"The data indicates that North Carolina's sawmill industry remains in a state of flux. While those still employed by the industry are earning more, the number of both sawmills and jobs in the industry have declined rapidly over the past few years."

NC State Extension also explains total employment in the sawmill industry in 2012 was approximately 4,075. That number rose to "about 4,500" in 2018. The Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages indicates that the 125 sawmills still in operation directly employ a total of 3,556 people, indicating a loss of almost 1,000 jobs.[58] At the same time, NC State Extension shared that the average weekly wages of those sawmill workers still on the job have increased to $905 weekly in 2019, up approximately 36% from the 2011 weekly wage of $665.[59] Current BLS data indicates those 2021 wages were $1,246 weekly, a further 38% increase.[60]

The data indicates that North Carolina's sawmill industry remains in a state of flux. While those still employed by the industry are earning more, the number of both sawmills and jobs in the industry have declined rapidly over the past few years.

GOOD NEIGHBOR AUTHORITY AND SHARED STEWARDSHIP

The ever-present threat of job losses due to mill and business closures makes it paramount that federal land managers consider and actively seek out collaborative input from local businesses, community leaders, elected officials, and other stakeholders. The federal program known as the Good Neighbor Authority (GNA), for example, involves state and local interests in managing and making a living from these federally managed lands. "Conflict to Cooperation," a 2018 report published by the Mackinac Center*, highlighted an early concept of the GNA program, which was at least partially based on an idea promoted by James G. Watt, the Secretary of Interior under President Ronald Reagan from 1981 to 1983.[61] Watt advocated for federal agencies to act as good neighbors to states.

That early concept was built into the 2014 Farm Bill and Appropriations Act, and then extended by Congress in the 2018 Agriculture Improvement

---

* The Mackinac Center, a public policy research organization located in Midland, MI, employs the author of this paper.

Act, to allow for a greater number of GNA projects.[62] The program sought "to encourage federal agencies to recognize the importance and value of working collaboratively with state governments in managing federal lands. … Under the GNA program, state and federal governments are able to cooperatively ensure that essential forest and watershed organizational activities are being carried out. With their new ability to organize at a much larger scale — with private lands, state lands, and now some federal lands open to management opportunities — state foresters are able to manage at a landscape or ecosystem-wide level," the Mackinac report concluded.[63]

By the end of the second quarter of 2021, the U.S. Department of Agriculture had signed "314 [Good Neighbor Authority] agreements in thirty-eight states," according to a July 2021 USDA memorandum on the status of GNA agreements with the U.S. Forest Service. Six of these agreements were signed with the state of North Carolina: one focused on watershed management, one on wildlife management, and four classified as "other."[64]

The U.S. Department of Agriculture's Shared Stewardship is an "outcome-based investment strategy" that uses tools like GNA to achieve many of the outcomes discussed above: addressing the risks associated with wildfire, forest pest infestations, disease and invasive species.[65] As part of the program, the USDA has committed to work with state and tribal governments, private landowners, and other stakeholders to cross political and departmental boundaries and recognize the priorities that all participants in the agreement share.[66] The department described a list of objectives for its Shared Stewardship concept in its 2018 report, "Toward Shared Stewardship Across Landscapes."

This list of objectives includes:[67]

- Working with states to set priorities and co-manage risks, like wildfire, across broad landscapes. This type of collaborative effort allows states to play a leading role in coordinating planning, connecting with stakeholders, and drawing up plans for working

across jurisdictional boundaries.

- Using new tools like improved remote sensing, information science, fire simulation, and new mapping technologies to improve ways to anticipate the risks of fire and plan for investments in land management.

- Working with other stakeholders to develop ways of measuring broadly agreed-upon outcomes.

- Using changes in the 2018 Agriculture Improvement Act to "get more work done on the ground." Expanding National Environmental Policy Act-based categorical exclusions for wildfire treatments. Making use of Good Neighbor Authority to manage road maintenance and construction. Signing 20-year stewardship contracts that are more likely to promote long-term private investments than traditional annual appropriations have been able to accomplish.

- Reforming internal Forest Service processes that have caused the process predicament† and stalled active management with lengthy and complex NEPA-based environmental reviews or other regulatory impediments. It also provides forest managers with more flexibility to alter management prescriptions and capitalize on changing market conditions for forest products.

- Using all active management tools, including prescribed fire,

† "Conflict to Cooperation" explained the process predicament as being driven by "a strong and dynamic tension between 'human first' and 'nature first' attitudes in public land management. Often that tension, paired with stakeholder pressures and litigation threats, can compel federal land managers to limit proposed or ongoing activities, effectively playing it safe and moving management toward a de facto preservationist end. That is because, when conflicts arise over appropriate uses, competing priorities can make it costly and difficult for federal land managers to settle on an approach that can deal with various conflicts and issues. As result, managers often choose to just hold off on making any decisions."

mechanical treatments, and timber sales. An example of mechanical treatments is its use to reduce the "fire-deficit" before reintroducing fire to a portion of a forest.‡

- Using risk-based responses to help "learn to live with fire" and respond better and more efficiently to wildfires (i.e., moving beyond 100% immediate suppression).

- Especially in states like North Carolina, where private and state ownership together make up almost 90% of the land base, focus on co-managing fire risk with other stakeholders. Involve state officials to improve outcomes across jurisdictional boundaries, target wildfire response by doing the "right work in the right places at the right scale." Use every possible active forest management tool — timber sales, mechanical treatments and prescribed fire — to mitigate uncontrolled wildfires.

In September 2019, the U.S. Department of Agriculture signed a Shared Stewardship Memorandum of Understanding with the Natural Resources Conservation Service, the North Carolina Department of Agriculture and Consumer Services, the North Carolina Forest Service and the N.C. Wildlife Resources Commission. This agreement establishes a framework for federal and state offices to cooperate. It also commits the two governments to work collaboratively on a variety of mutually agreed-upon ecological and land management goals, including: "restoring fire-adapted communities and reducing the risk of wildfire; identifying, managing, and reducing threats to forest and ecosystem health; and conserving working forest land."[68]

---

‡ Fire deficit refers to the reduced amount of land burned each year as a result of fire suppression and exclusion policies. In many cases, these fire exclusion and suppression policies prevented fires from happening naturally at regular intervals, for many decades. This policy has allowed fuel loads — grasses, brush, small trees, and dead and down wood — to become so dense that the incautious reintroduction of fire could result in a catastrophic and uncontrollable fire. In these cases, using mechanical treatments to break up or reduce fuel loading prior to reintroducing prescribed fire reduces the risks of fire escaping.

THE NANTAHALA AND PISGAH NATIONAL FORESTS LAND MANAGEMENT PLAN

The 1976 National Forest Management Act mandates that forest plans be updated on a 10- to 15-year cycle. Therefore, in January 2022, the U.S. Forest Service (USFS) released the "Nantahala and Pisgah National Forests Land Management Plan"[69] and an accompanying "Final Environmental Impact Statement for the Land Management Plan."[70] Together, the two documents update the previous 1994 plan and represent the USFS's latest vision for these two forests. They also set up the template for how managers will achieve it.

The purpose of the plan is to provide "the vision, strategy, and constraints that guide integrated resource management, provide for ecological sustainability, and contribute to social and economic stability in the forests and on the broader landscape."[71] Forest plans operate at a broad level and do not prescribe specific management activities or site prescriptions.

Forest plans are now developed under the 2012 amendment to the National Forest System Management Planning Rule. This amendment requires the USFS to continue planning for multiple uses while also

protecting the condition and productivity of the national forests. The rule further requires national forests to be managed for the betterment of both "human communities and natural resources."[72] It requires plans to be developed as "an iterative process utilizing best available scientific information, regional guidance, internal feedback, and collaboration with a wide variety of government agencies, federally recognized tribes, non-governmental organizations, and interested citizens." The Environmental Impact Statement of each plan gives specific examples of how it will affect the "physical, biological, and social resources of the Nantahala and Pisgah National Forests."[73]

The Pisgah/Nantahala management plan is consistent with many of the recommendations offered in this paper and by previous research. The USFS on a mix of active and collaborative forest management techniques, as it also requires multiple uses of the forest, maintaining the forests' ability to provide ecosystem services, and protecting the integrity of ecosystems within the two forests. A reader's guide to the plan and EIS provides a list of what the plan is meant to accomplish.[74] The desired tasks include the following:

- Maintain a focus on multiple uses of the forests, including harvesting, outdoor recreation, wildlife, water, and wilderness
- Improve forest health and resiliency by increasing forest restoration and management to ensure a diverse mix of plant species and forests of varying ages
- Improve or maintain wildlife habitat
- Protect surface and groundwater quality
- Enhance recreational opportunities
- Ensure access to the forest
- Contribute to local economies
- Sustain scenic and cultural resources

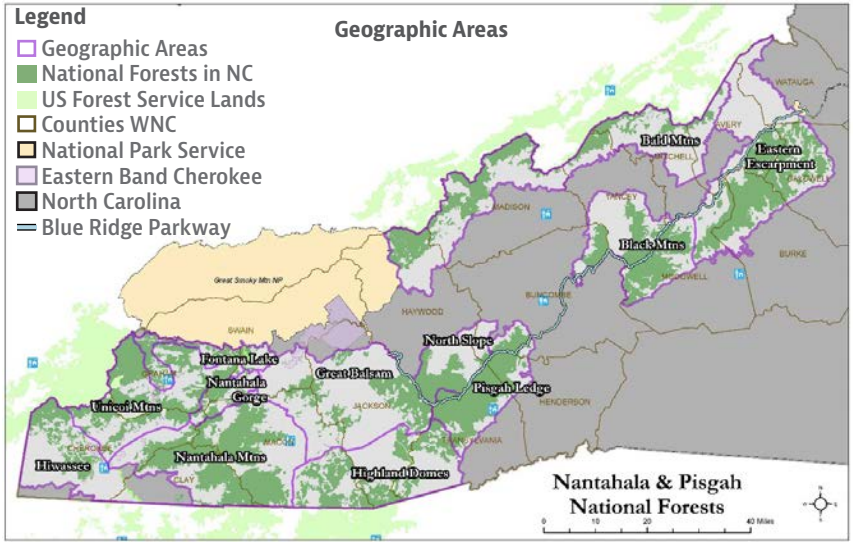
- Protect and manage existing administrative and congressionally designated areas
- Advise policymakers and citizens on future land allocations for wilderness, wild and scenic river, and special-interest area designations
- Acknowledge the value of partners in collaborative management efforts
- Continue to seek input from the public, governments, federally recognized tribes, and the best available science

The Forest Service highlights areas in which the new plan departs from the previous agenda. First, it focuses on achieving a desired condition(s) for eleven different ecozones across the two forests. Where previous plans had worked to achieve Forest Service-wide standards or guidelines, the new plan considers forest-specific targets, such as "the dominate [sic] vegetation composition, vegetation structure (canopy to herbaceous layers), landscape position, relevant ecological processes, and examples of a few (but not all) associated wildlife species."[75] A notable focus within the Ecosystem Management approach is the Forest Service's determination to "maintain the diversity of plant and animal" species, focus on native species, and ensure healthy populations of "wildlife, fish, and plants commonly used by the public for hunting, fishing, trapping, gathering, observing, and subsistence."[76] Once again, this focus on human use and public access to forest resources demonstrates a commendable shift away from the process predicament and the more preservationist attitudes that have tended to critique human use of public lands and demand limits on that use.

Second, the management plan focuses on the "place," or how people use and prioritize places in or aspects of the forest. Based on public input, this management focus breaks the forests into twelve distinct geographic areas or landscapes. Once again, the value of human use played a key role in determining these areas. The plan was informed by landscape characteristics such as vegetation, forest types, and hydrology,

but its authors note the landscape descriptions were "defined by scenic character and public use."[77] Additional refinements further highlighted human use: cultural and historical values, recreation, and local communities.

Figure 12: Geographic areas of the Nantahala and Pisgah national forests



SOURCE: NANTAHALA AND PISGAH NATIONAL FORESTS LAND MANAGEMENT PLAN, P. 145.

Third, the management plan prioritizes extensive dialogue with interested, federally recognized tribes, acknowledging and valuing areas of special significance to the tribes, as well as consulting their "traditional ecological knowledge." Before Europeans settled in North America, some areas within the two national forests were part of the Cherokee and Creek tribal lands and "46 documented pre-contact and historic Native American towns" existed within the boundaries of the forests. The plan calls for a collaborative approach between state and federal leaders and tribal leaders as they seek to manage forests.

Organized into two tiers, the plan includes various objectives that build on the USFS's growing trust in collaboration. Tier 1 objectives are those

that the USFS believes can be met within the first ten years of the plan, given current budgets and capacity. Tier 2 objectives highlight how Shared Stewardship and collaborative efforts can expand Forest Service efforts to meet key ecological, social, or economic goals in the forests. As the plan says, "Tier 2 objectives reflect additional outcomes that may be possible with added capacity of partners and partner resources."

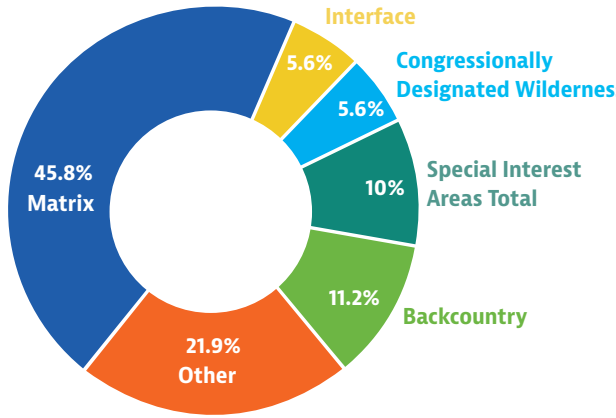
Keeping with the themes of Shared Stewardship, collaboration, and the need to target multiple uses of the national forests, the plan also highlights the need to expand relationships with local governments. As described in the discussion about the Stanley furniture plant in Robbinsville, this updated plan identifies the potentially profound impact forests have on town and county economies and targets far higher levels of public involvement. It also seeks to address the need for well-designed and designated-use trails. It is important to take into account the impacts that certain recreational activities, like mountain biking and horseback riding can have on the environment, and to construct purpose-build trails and use appropriate mitigation strategies. By doing so, managers can reduce impacts and maintenance and repair costs, while still addressing public demand for the activities and associated infrastructure.

To maintain the ecological health of the forests as well as their multiple and historic uses, the plan acknowledges both the value of timber harvesting and the value of protecting the forests' old-growth characteristics. First, the plan sets out a framework for estimating the potential area available for harvesting, along with the age of the forest, its condition and topography, road access (existing and potential), and available harvesting equipment. With this estimate in hand, managers can understand the type, quality, and amount of forested area that might be available for harvest.

There is a total of 1,043,636 acres in both forests. USFS Planner Michelle Aldridge says that the maximum potential area for harvesting, called the "suitable base" in the plan, comes to 459,175 acres, approximately 44% of the total area of the two forests. Aldridge then confirmed that "just because acres are calculated as suitable or are included in the matrix or

interface management areas, doesn't mean they're going to be cut."[78] Instead, Aldridge says, it is important to understand the plan's annual objectives, so as to avoid misunderstandings. The Tier 1 timber-cutting goal for the forests is 1,200 acres per year, or 0.26% of the suitable area and 0.1% of the total area. If additional resources, such as Good Neighbor Authority, make it feasible to pursue Tier 2 goals, that number would increase to 3,200 acres annually, or 0.7% of the total area of the suitable base, or 0.3% of the total area. Over the 15-year life of the plan, that would mean harvesting 48,000 acres, or 10.4% of the suitable base, or 4.6% of the total area.

Figure 13: Western NC Forest Management Area Acreage within the Nantahala and Pisgah National Forests Land Management Plan



SOURCE: US DEPARTMENT OF AGRICULTURE'S FOREST SERVICE
NOTES: SPECIAL INTEREST AREAS ARE SEPARATE MANAGEMENT AREAS, UNLESS CONTAINED WITHIN A MORE RESTRICTIVE MANAGEMENT AREA. BY ANNA DEEN FOR CPP.

There has been some public comment and pushback against the plan. According to one complaint, "There are just no rules requiring that the rare, underrepresented or exemplary values found at the site-specific level be prioritized." Sometime in the future, the argument continues, a new road or area planned for harvesting could harm a sensitive area or a rare species. In response, Aldridge said, "Timber harvests are not random acts. They are part of carefully designed silvicultural prescriptions

for restoring healthy forests." Aldridge's comment and additional input from other forestry experts involved in developing the plan are consistent with something collaborative efforts commonly find. Projects like these are long-term efforts, and initial plans are a foundation that must be built on over time. As reported in "Extinguishing the Wildfire Threat":[79]

- Trust takes time: "Unseen decisions" can slow the overall process.
- Collaboration is slow: the dynamic of collaboration often appears sluggish in the early planning stages, but long-term results show that it does speed up the final approval.
- Stakeholder involvement must continue over time, and it is strengthened as USFS staff engage with all stakeholders.
- Transparency and open communication improve stakeholder trust and involvement.
- Encouraging stakeholders to respond to public objections strengthened their commitment to the final agreement.
- The public's participation, in addition to that of the existing stakeholder group, is part of the process.

Another public comment recognized the long-term and adaptive nature of the planning process. "Forestry is a lesson in adaptive management. You make the best decisions based on the outcomes you want to see and watch over time. You have to monitor it and adjust and adapt." Another comment reiterated the idea that building stakeholders' trust is a difficult task, but one that could be achieved with new methods. "If we keep doing projects like we have in the past, we're going to have problems. But that's the point of the plan, that we won't keep doing projects like we have in the past."[80]

Where concerns about potential harvesting in an area of older forest exist there are ways of maintaining old-growth characteristics. The use of the term "characteristics" reveals that forest managers have moved beyond demands that only old forests, maintained in a static and ostensibly

"The new plan for Nantahala and Pisgah National Forests represents a positive shift in the management of public lands. North Carolina's forest administrators appear to have made a committed effort to value both multiple uses and collaborative efforts."

pristine state, can provide quality wildlife habitat, ecosystem services, or other values. In addition to retaining some areas of older forest, managers can mix planning with silviculture and harvesting techniques — active management — to reproduce or create the valuable characteristics and desired aspects found in old-growth.

For example, planning documents can specify that harvests will leave areas with older trees and irregular boundaries in patches or leave older trees in strips along streams. During harvests, equipment operators or fallers can be instructed to retain a specified number of large legacy trees per acre. They can be told to create snags (standing dead trees), and to create various layers of vertical structure by clipping trees at designated heights but not removing them. They can also be instructed to create openings in the stems of some retained trees to encourage cavities and heart rot, which benefit cavity-dwelling birds and furbearers. Skidding or yarding patterns can be set up to reduce ground impacts to ensure that moss, lichen, understory plants, and advanced regeneration can also be retained or protected. Site preparation can be designed to ensure that downed, coarse woody debris is retained at specified levels across harvesting areas for soil stability, as habitat for small mammals, and to promote the dispersal of fungal mycorrhiza.[81]

The new plan for Nantahala and Pisgah National Forests represents a positive shift in the management of public lands. North Carolina's forest administrators appear to have made a committed effort to value both multiple uses and collaborative efforts. They have relied on input from the public, local and state governments, businesses, sportsmen

and fishermen, tribal authorities, outdoor recreation interests, and other stakeholders. Federal forest managers appear to have remembered many of the lessons learned by North Carolina's first foresters. As mentioned in the "Extinguishing the Wildfire Threat" report, "For many years, the forest industry has been cast as a despoiler of forest ecosystems rather than an essential partner in proper management of healthy and viable forests." The updated plan recognizes the need for active management, moving beyond the mistaken, but "popular perception of harvesting activities as inherently destructive." Instead, it embraces the reality that "proper forest management and continued forest health must necessarily include some form of industrial activity, harvesting, and the use of prescribed fire." [82]

North Carolina's forest managers have clearly progressed beyond the negative view of the forest industry, if they ever held it. They have recognized that the health of the forest and the human economies that rely on it depend on active management and use of our forested lands. At the same time, they have also recognized the value of, and included requirements for, traditional uses, conservation and preservation of specific areas, wildlife management, and outdoor recreation.


RISK OF WILDFIRE

Elected officials expressed their concern that increasing levels of brush and overmature trees results in a high risk of wildfires. This concern mirrors discussions covered in previous Mackinac Center research. The 2018 study, "Conflict to Cooperation: Collaborative Management of Federal Lands in Michigan," was completed in partnership with Montana's Property and Environment Research Center and reveals the problem with overgrowth:

> *Many national forest lands have been stuck in the process predicament and left in an increasingly unmanaged state while permitting and planning activities drag out for years or even decades. Unmanaged and overgrown lands have become a safety hazard and entry point for disease and insect infestations. Dead and dying forests, with heavy loads of shrubs and grasses, become magnets for fires in drier seasons, risking the forests themselves, as well as adjacent state lands and private properties.*

> *The best method of managing this "tinder box of old-growth trees ravaged by disease and insects" is through actively removing heavy fuel loads, by spacing and thinning overgrown stands, removing dead or dying trees and lessening thick brush and grass. Failing that active and deliberate style of forest management, recent history has demonstrated, another form of fuel removal and forest renewal will occur. If human managers cannot or will not reduce fuel loads in federal forests, then age, wildfire, disease, and pest infestations will do it for them, often with substantial costs for both national forest budgets and adjacent property owners.*[83]

That discussion was continued in the Mackinac Center's 2020 study, "Extinguishing the Wildfire Threat: Lessons from Arizona," which was completed in partnership with Arizona's Goldwater Institute.

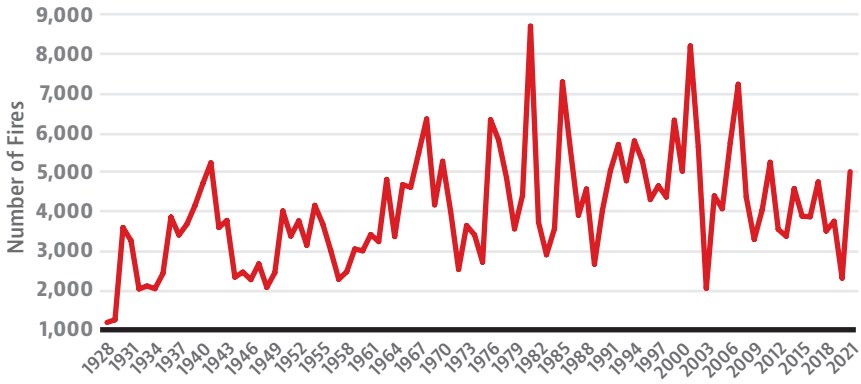
> *Over the past few decades, well-meaning but ultimately mistaken forest management policies have sought to "protect" forests and public lands by closing them off to any but the most primitive human uses, such as limited outdoor recreation. However, as a growing body of research in this area demonstrates, attempting to administer national forests as pristine wilderness — with little to no human activity apart from fire suppression — has allowed our public lands to become dangerously overgrown, overmature, and prone to disease, insect infestations, and fire. One subject interviewed for this report described these fire-prone forests as a primary health and safety issue — perhaps the single greatest threat — facing one county in Arizona.*[84]

The USDA's Shared Stewardship efforts also warn of the dangerous outcomes found in our recent history of fighting every instance of fire within fire-adapted landscapes. They warn of "the cascading effects of more than a century of fire exclusion and fuel build ups, changes in land use, extended drought, warming temperatures, and the spread of invasive species."[85,86] While forests in Eastern states are not as prone to the

massive wildfires as those seen in Western states, they are not wholly immune to this threat.

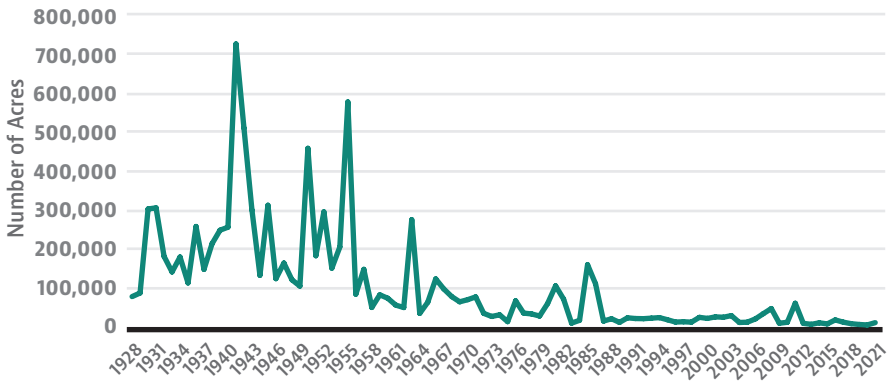
The number of wildfires experienced each year in North Carolina has trended slightly higher since the 1920s, but the number of acres burned has declined drastically.[87]

Figure 14: North Carolina Fire Statistics: 1928 - Present



SOURCE: NORTH CAROLINA FOREST SERVICE.

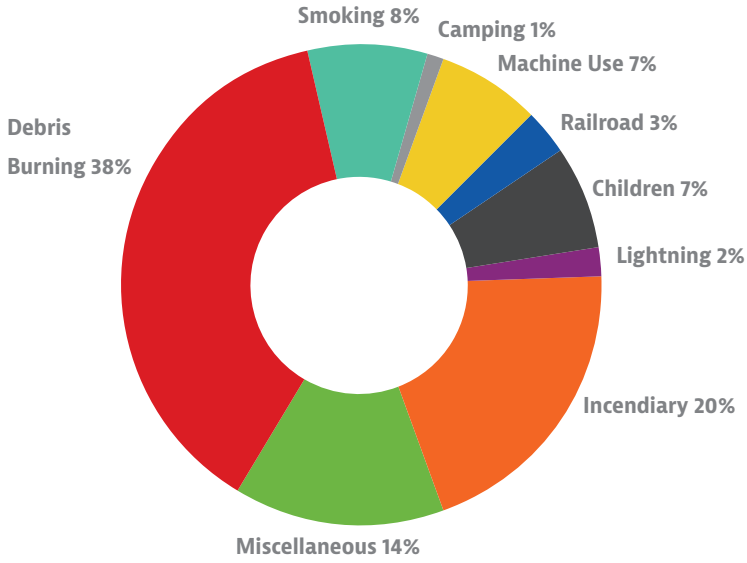
Figure 15: North Carolina Fire Acreage Statistics: 1928 - Present



SOURCE: NORTH CAROLINA FOREST SERVICE

NC Forest Service data indicate that the vast majority of fires in the state have human origins, specifically debris burning. Only 2% are caused by a natural source, like lightning strikes.

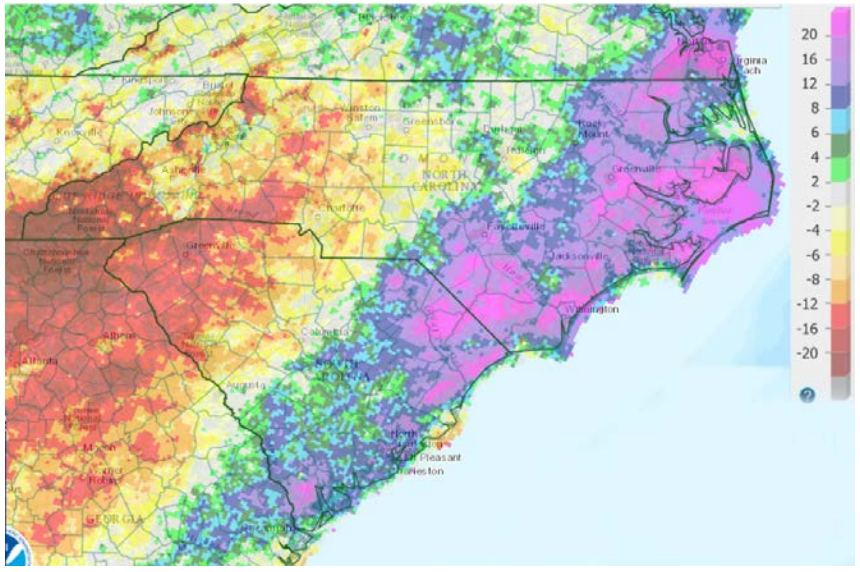
Figure 16: Fires by Cause since 1970



SOURCE: NORTH CAROLINA FOREST SERVICE

The number and extent of fires can vary dramatically from year to year in North Carolina. A dry summer, especially one that follows a wet spring, can increase the number of acres that are prone to burning. U.S. Forest Service (USFS) staff confirmed in an interview that the 2016 was a particularly bad year.[88] Online media and magazine reports indicated that almost 1,600 firefighters had worked on 20 separate fires. The fires were reported to have burned a combined area of "more than 40,000 acres" across the western portions of the state.[89,90] NC Forest Service records give an updated number, now showing a total of 20,776 acres burned in 3,872 fires in 2016. National Weather Service records indicate that through July and August 2016, the state experienced "a long streak of unusually persistent heat," as well as limited rainfall in the western portion of the state, which is where the greatest number of fires were reported.[91]

Figure 17: National Weather Service 2016 Rainfall Departure from Normal Map for North Carolina, showing far less than normal precipitation in the western portion of the state



SOURCE: NATIONAL WEATHER SERVICE WILMINGTON, NC.

The National Weather Service reports that while "2017 was one of the warmest years in history," higher temperatures were limited to January, February, and April, and "there was no extreme summer heat." Across the Carolinas, summer temperatures were described as "typical."[92] Precipitation was far more abundant; "departures from normal" were "as large as +8 to +12 inches across isolated spots of eastern North and South Carolina." While the number of fires in 2017 increased to 4,763, the number of acres burned that year dropped off precipitously to 15,041. From 2018 through 2021, according to the NC Forest Service, fewer than 14,000 acres were burned annually.

Table 2: North Carolina Fire Statistics 2011-2021[93]

Year	Number of Fires	Acres Burned
2011	5,265	63,547
2012	3,551	11,992
2013	3,374	9,451
2014	4,593	13,327
2015	3,886	10,587
2016	3,872	20,776
2017	4,763	15,041
2018	3,507	11,089
2019	3,757	9,094
2020	2,302	7,829
2021	5,025	13,816

SOURCE: NORTH CAROLINA FOREST SERVICE

"Short-lived but severe drought"[94] conditions existed in the spring of 2021, largely because March through May was "one of the driest springs across eastern North and South Carolina since local records began in 1871."[95] This was a reversal of the previous year, which had been ranked as the "state's second-wettest year on record," resulting in the lowest number of fires and smallest area burned in a decade.[96,97] In response, the North Carolina Forest Service instituted burn bans in 26 southeastern counties, set up an incident management team, and restricted certain activities in national forests.[98] Increased rains, including Tropical Storm Elsa, and colder temperatures persisted through the later part of the summer, and the threat of large wildfires receded.[99]

The 2016 and 2021 fires, and early 2022 drought, are reminders of the potential threats weather can be to heavily forested states. Loss of life and the destruction of public and private property are real concerns when wildfire strikes. Given the significant amount of wildland urban

interface in the state, which increases the likelihood of high human and financial costs from wildfires, North Carolina is uniquely pressed with addressing these challenges.


WILDLAND URBAN
INTERFACE

Wildfires in the Western U.S. can be extremely large and cause immense damage. Often a single fire will span hundreds of thousands of acres, or more than the entire area burned over a period of several years in North Carolina.[100] But a key reason for North Carolina's particular interest in forest management is the growing number of people living close to or in wooded areas. With a high density of people and homes within the state's forested areas, even a small fire can do a great deal of damage. The U.S. Department of Agriculture reports that North Carolina is ranked first in the nation for the amount of land that is in the Wildland Urban Interface (WUI): just over 20,940 square miles.[101] In addition, it's fourth in the nation for the number of homes, 2.25 million, and fourth for the number of people, 4.84 million, who live in that specially designated area. WUI is broken up into two distinct types. "Intermix WUI refers to areas where housing and wildland vegetation intermingle, while interface WUI refers to areas where housing is in the vicinity of a large area of dense wildland vegetation."

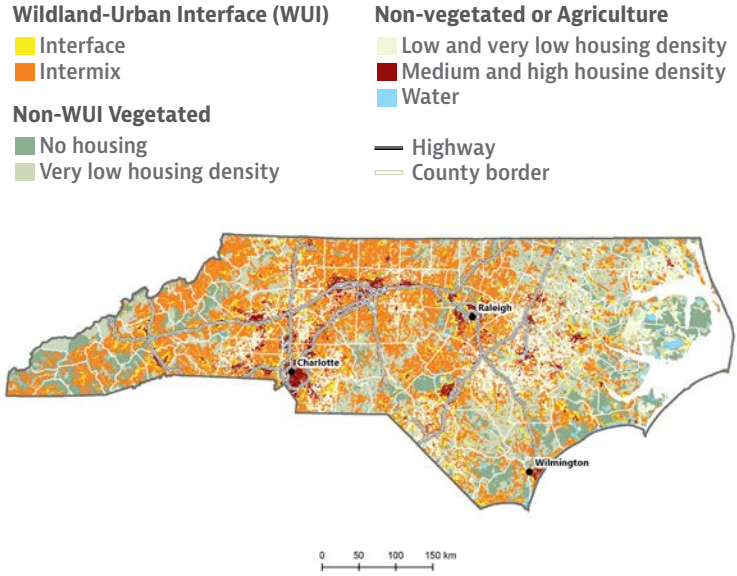
As demonstrated by the 2018 Camp Fire that struck the Sierra foothills in Northern California and destroyed much of the town of Paradise and killed 86, fires in the WUI can lead to a loss of life and extensive property damage. As also noted previously, the majority of wildfires in the state of North Carolina are caused by people — most often by burning debris.[102] WUI accounted for 30.7% of the state's landmass in 1990 and 39.4% in 2010. Given this growth, it is reasonable to expect wildfire impacts to grow. Those impacts make the need for properly and actively managing forests to reduce the threat of wildfire ever more pressing.[103]

Table 3: North Carolina Change in Wildland Urban Interface 1990-2010[104]

	Square miles			Percent		
	1990	**2000**	**2010**	**1990**	**2000**	**2010**
WUI	16,523.2	19,261.9	21,218.6	30.7	35.8	39.4
Intermix	13,922.8	16,176.5	17,928.3	25.9	30.1	33.3
Interface	2,600.4	3,085.3	3,290.4	4.8	5.7	6.1
Non-WUI	37,295.9	34,557.3	32,600.5	69.3	64.2	60.6
Total	**53,819.2**	**53,819.2**	**53,819.2**			

The report "Conflict to Collaboration" described the key role of federal land managers, especially when much of the state's WUI is intermixed or interfaces with federally owned and managed forests. Former U.S. Secretary of the Interior Ryan Zinke supported the active management of federal lands — including commercial and noncommercial harvesting, spacing, thinning, prescribed burns and other measures — as a means of reducing the combined threats of wildfire, disease, or infestation coming from federal lands. In a 2018 meeting, Zinke described the need for the federal government "to be a 'business partner rather than an adversary' and a 'better neighbor' with the states." Zinke explained how many of the problems coming from fire hazard, weeds, and invasive species were coming from federal lands.[105]

Figure 18: 2010 Map of Wildland Urban Interface in North Carolina. Source: University of Wisconsin-Madison Silvics Lab[106]



SOURCES: UNITED STATES CENSUS BUREAU, 2010 TIGER BLOCKS. MULTI-RESOLUTION LAND CHARACTERISTICS CONSORTIUM, 2011 NATIONAL LAND COVER DATASET (NLCD). CONSERVATION BIOLOGY INSTITUTE, PROTECTED AREAS DATABASE (PAD) VERSION 2.

CONTACTS: MIRANDA H. MOCKRIN, USDA FOREST SERVICE, MHMOCKRIN@FS.FED.US. VOLKER C. RADELOFF, UNIVERSITY OF WISCONSIN-MADISON, RADELOFF@WISC.EDU.


PRESCRIBED BURNS

One extremely effective method to reduce fire hazard in the WUI and throughout forested areas is prescribed burns. State-level elected officials spoke of the need to expand their use, especially in western portions of the state.[107] They described personal experiences of seeing the impact of more active prescribed burns in Transylvania County (also a western county) than in Buncombe and Haywood counties. Verbal reports from these elected officials explained that some areas had not been burned in over 25 years, leading to increasingly overmature and unhealthy stands that suffered from pine bark beetle[108] and wooly adelgid[109] infestations.

Their accounts also described personal experiences of decreased hunting success for game species such as white-tailed deer (Odocoileus virginianus) or ruffed grouse (Bonasa umbelius) due to increasing levels of brush, which can make it hard for wildlife to move and can also reduce usable habitat.

JASON HAYES

Figure 19: Croatan National Forest, photo taken March 26, 2022. The photo shows a just-burned area immediately off Highway 70 at the exit of the national forest, near New Bern, NC.

During meetings with the author, U.S. Forest Service (USFS) representatives enthusiastically supported prescribed fire as a useful and welcome tool, calling it the easiest option to use.[110] USFS documents on shared stewardship support prescribed burns, while also recommending making greater use of other options, like timber sales and mechanical treatments.[111] NC State Extension reports that regular "good fire" intervals will "improve wildlife habitat."[112] Similarly, the NC Wildlife Resources Commission plainly states that prescribed burns are "one of the best and most cost-effective methods of managing for wildlife habitat."[113]

NC State Extension explains that beginning around 60 years ago, wildlife biologists like Herbert Stoddard warned that removing the role of fire from North Carolina's natural areas would have profound negative impacts on wildlife habitat, as well as plant and animal diversity. Stoddard said, "One of the most harmful things modern man has done to birds

has been his attempt to exclude fire from fire-type pine forests. Within a few years most forests choke up with brush, lose their prairie-like vegetation, and can no longer support birds dependent on periodic burning for their food supply and proper cover."[114]

Some state agencies also work to expand public understanding and acceptance of prescribed burns. Mascots such as "Burner Bob," used by the Georgia Department of Natural Resources to "promote the benefits of prescribed burning," compares to the popularity of the Smokey Bear mascot, used for decades by the USFS.[115, 116]

Figure 20: Poster of Smokey Bear pointing at the reader and saying, "Only You." Source U.S. Forest Service.[117]

Figure 21: "Burner Bob," a pro-prescribed burning mascot used by the Georgia Department of Natural Resources.

JASON HAYES

Figure 22: Photo taken March 26, 2022, at the exit of Croatan National Forest, near New Bern, NC, soon after a prescribed burn was completed. The photo shows how a light, controlled burn is able to reduce the amount of grass and pine needles, allowing longleaf pine seeds to reach the area's sandy soils. Note the green shoots coming up within a few days of the completed burn.

The Nantahala and Pisgah National Forests Land Management Plan explains that fire has been critical in the development and evolution of Western North Carolina's forests. It says, "Aggressive fire suppression, coupled with an array of other disturbances (e.g., logging and chestnut blight), has changed the historic composition and structure of the

forests."[118] In North Carolina and neighboring states, longleaf pine was once abundant and spread over 90 million acres. It is now restricted to about 5% of its former range. NC State Extension notes the same type of restrictions have harmed the reproduction of the state's oak savannas and Piedmont prairies; arguing that North Carolina's natural areas developed as a result of regular fires.[119] "For thousands of years, much of North Carolina burned every 1 to 10 years either at the hands of humans or from natural lightning ignitions." But the advent of strict fire suppression policies in the early 1920s substantially changed the nature of the forests. Many of the area's fire-dependent plant and animal species would "almost disappear" as a result of the new policy.

This finding reinforces earlier work about the harms caused by keeping frequent, low-level burns from having a restorative influence on fire-dependent ecosystems. We reported in the "Extinguishing the Wildfire Threat" study from the Mackinac Center: "A multidecadal national effort to immediately extinguish wildfire has encouraged the growth and retention of the grasses, shrubs, and small-diameter trees that used to be removed by a mix of industrial activity and the regular, low-intensity, natural fire regime. Therefore, well-meaning attempts to reduce wildfire damage have had the perverse impact of worsening those effects when fire eventually arrives and cannot be immediately controlled." [120] In "Conflict to Cooperation," we noted, "Unmanaged and overgrown lands have become a safety hazard and entry point for disease and insect infestations. Dead and dying forests, with heavy loads of shrubs and grasses, become magnets for fires in drier seasons, risking the forests themselves as well as adjacent state lands and private properties."[121]

In fire-adapted areas, North Carolina's forest managers now prescribe larger or repeated "restoration burns" to "recreate the ecological role of fire in a controlled manner," and return an area to a fire-adapted state.[122,123] Managers can then use "maintenance burns" on regular intervals to enhance the habitat of specific plant and animal species,[124] like white-tailed deer and turkeys, which benefit the most from a fire frequency of 3-5 years. Quails benefit from burns as often as once per

year. The most effective burns are tailored to retain a mix of burned and unburned areas. They provide a mix of plant, shrub, and tree types that a variety of species can use.[125]

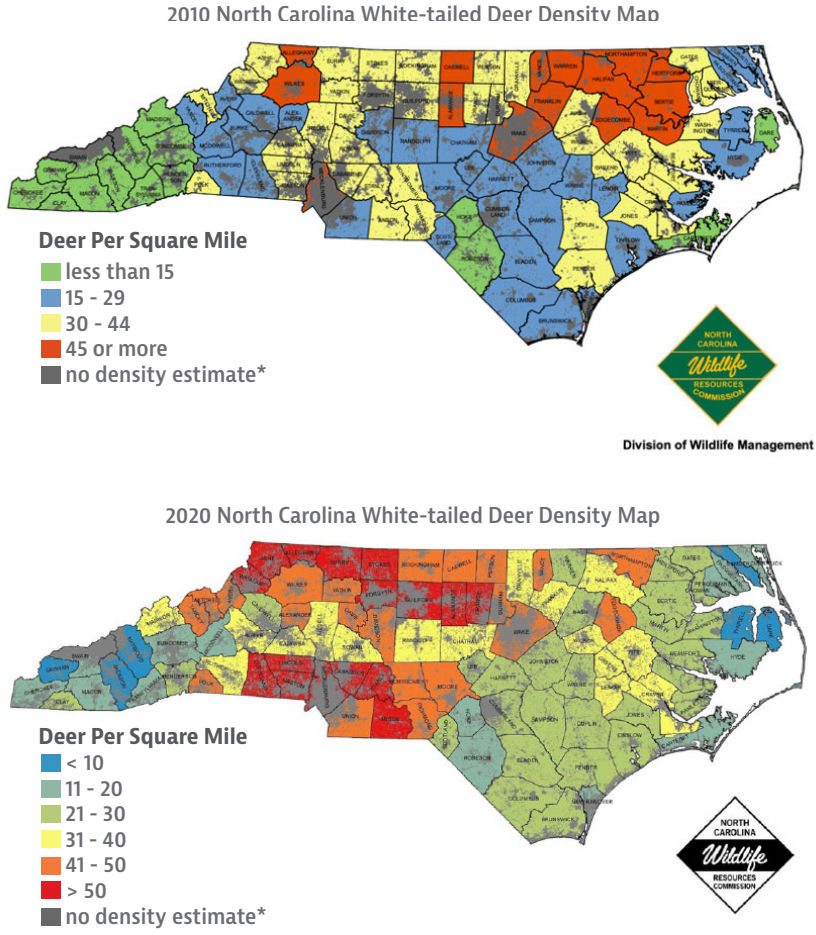
NC State Extension provides additional guidance for burning in upland hardwood stands, such as those found in the western counties of the state. Pine-dominant stands flourish under a regular fire regime. But drier, south-facing slopes with oak-dominant overstories in western hardwood forest burn naturally less often, at once per decade. As hardwood species like tulip poplar, American beech, water oak, and red maple have thinner bark, they are more likely to be killed by an intense fire, so timing is essential, with prescribed burns limited to wetter seasons. Timed and managed properly, burns in these areas can reduce shrub and other ladder fuels, remove thick litter layers, increase shrub branching, and increase the production of oak seedlings, acorns, and other fruits. Doing this improves habitat and browsing opportunities for deer.[126]

Use of prescribed burns to improve wildlife habitat

Regular, small burns are known to help maintain an open, savanna-like condition in many of the state's forests, which improves habitat for many wildlife species. Some portions of the state's national forests have grown older and denser, with anecdotal evidence from elected officials and media comments suggesting a decrease in the number of white-tailed deer.[127,128] These sources note some portions of the national forests in Western North Carolina have not been thinned, treated or burned in as long as 25 years, and sportsmen are seeing reduced success in hunting. Despite these reports, NC Wildlife Resource Commission data seems to indicate that the number of antlered bucks per square mile (as determined by hunting success reports) has grown. Reports from Buncombe County indicate that there were 0.53 antlered bucks per square mile and 448 animals harvested in 2011-2012. Ten years later, hunters in the county reported in a similar time period 1.78 antlered bucks per square mile and a total of 1,101 animals harvested. Similarly, Haywood County reported 0.23 antlered bucks per square mile and 129 animals harvested

in 2011-2012, but 0.96 antlered bucks per square mile and 438 animals harvested in 2021-2022.[129] The number of animals harvested increased by over 145% in Buncombe County and 240% in Haywood County when compared to the 2011 and 2021 seasons.

Figure 23: NC Wildlife Resources Commission White-Tailed Deer Density maps from 2010 and 2020 show increases in overall density of white-tailed deer across the state[130]

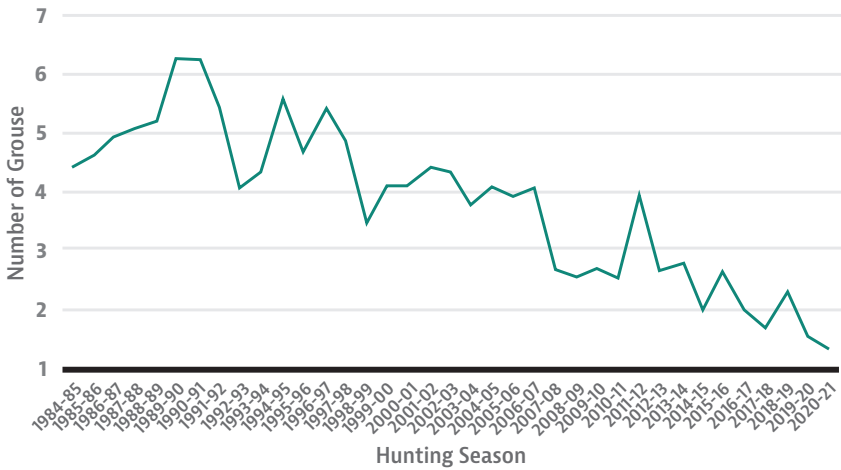


* Where harvest data are not available to produce density estimates because hunting is limited or prohibited: includes federal and state parks, municipal boundaries, water bodies, and human density greater than 1 person per 2 acres.

But there is anecdotal evidence of declining grouse populations,[131] bolstered by reports from the NC Wildlife Resources Commission. It notes that habitat changes over the past several decades have been "detrimental to small game." The commission explains that some species, like squirrels, can thrive in maturing forest conditions. But bobwhite quail and grouse species require young (or early seral) forest conditions, and their populations have declined. Ruffed grouse drumming surveys, a way to measure the number grouse, found "slightly lower rates" in 2021 in the Nantahala and Pisgah National Forests. Surveys that year also found "considerably lower" drumming rates on state-owned game lands, and some data report lower rates on privately owned land in Ashe and Alleghany counties.[132]

Similarly, the 2020-2021 NC Avid Grouse Hunter Survey reported ongoing declines in grouse populations, as reported by NC hunters.[133] The average number of grouse flushed per hunting trip has declined from just over 4 per trip in 1984 to just over 1 per trip in 2021.

Figure 24: Average Number of Grouse Flushed Per Hunting Trip 1984-85 through 2020-21
North Carolina Avid Grouse Hunter Survey

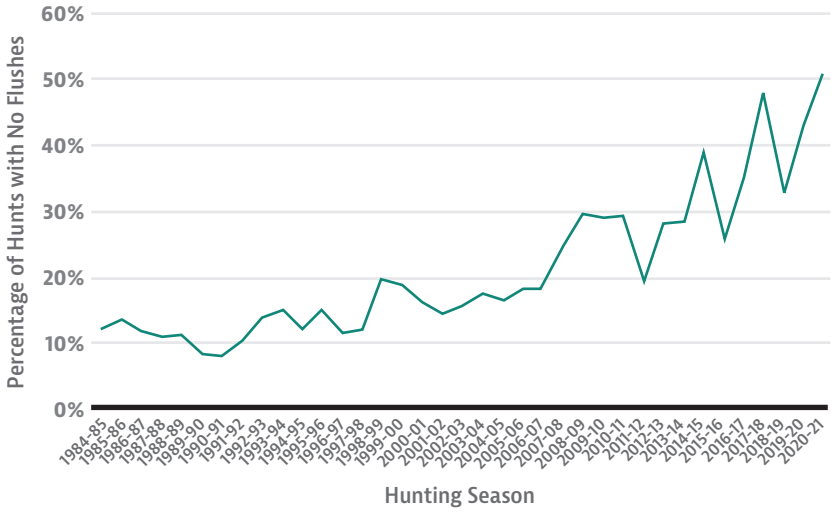


SOURCE: NC WILDLIFE RESOURCES COMMISSION.

The percentage of grouse hunting trips where hunters reported no flushes increased from just over 10% in 1984 to over 50% in 2021.

Reports about another bird species confirm a declining quality in forests. "Quail populations are at or near record low levels," says Christopher D. Kreh, an upland game bird biologist with the North Carolina Wildlife Resources Commission (NCWRC).[134] Kreh and others blame "habitat loss."

Figure 25: Percentage of Hunts With No Grouse Flushed, 1984-85 through 2020-21
North Carolina Avid Grouse Hunter Survey



SOURCE: NC WILDLIFE RESOURCES COMMISSION.

On a positive note, the NC Wildlife Resources Commission reports that population declines in these species are not necessarily permanent. Active forest management — harvesting, spacing, thinning, using prescribed fire — can improve habitat conditions. It does so by creating early successional conditions and benefits from the fact that "small game populations are often quick to respond due to their high reproductive rates and ability to colonize new areas."[135]

Policy Prescriptions

Implementing the following policy changes at the state and federal level will bolster existing forest restoration and active, collaborative forest management activities in North Carolina.

- State legislators should give clear direction to state agencies: They should be encouraged to recognize and manage for the reality that unmanaged or overgrown public lands represent a threat to the health and well-being of humans, wildlife and natural areas.
- As a natural outgrowth of this direction, state legislators should promote existing Good Neighbor Authority and Shared Stewardship agreements. Where feasible, policymakers should encourage additional opportunities and agreements to promote active forest management, reduce the risk of wildfire/pest and disease infestations, and promote North Carolina's private forest industry.
    - » State and federal officials in North Carolina understand the value of collaborative processes. State legislators can make these processes more frequent and effective by stating their support

and, where feasible, directing existing funding toward them. Long-term results from previous efforts demonstrate that permitting timelines can be reduced as a result of effective collaboration.

- State legislators should publicly recognize the state's forest industry as a valuable contributor to forest and economic health in North Carolina. They should ensure that regulation and legislation does not unreasonably inhibit or raise costs on North Carolina's forest industry through unnecessarily burdensome or repetitive environmental requirements.
  - » Policy changes can make a significant difference between the industry thriving or declining, especially in western counties that have already seen substantial declines in milling capacity and employment. The closure of the Stanley furniture plant in Robbinsville and reduced statewide milling capacity serve as excellent examples of how incautious policy can pair with increasing international competition to do serious economic and social harm.
- State legislators should work with other states and nations to ensure that regulations aid (or do not unreasonably restrict) the export or transportation of forest products, such as biomass pellets, to out-of-state markets.

Conclusion

North Carolina is recognized as "first in forestry" or as the "birthplace of American forestry" thanks to early foresters like Gifford Pinchot and Carl Schenck. These two men laid out much of the initial framework for the modern science of silviculture and forest management in America. Given the complexity of the forests they were charged with managing and their European training — completed in very different forest conditions than they encountered in North Carolina — they learned quickly the value of adaptation. The knowledge Schenck passed on to others demonstrates that managing for multiple uses of the forest, including both timber harvesting and conservation, is possible: We can both use and perpetuate the forest.

The efforts and the steep learning curve Pinchot, Shenck and others navigated still influence forest managers. That is because foresters and public land managers in North Carolina have not shied away from recognizing the need for active management, for the health of both the economy and forests. In contrast, public land managers in other states have often been stymied and stalled by the process predicament and

political environmentalism that seeks to bring forest management to a halt, through regulation, litigation, or both.

Stopping active forest management in favor of preservation and restricting access to public lands has done significant damage. Locking public lands up in protected areas, removing active forest management, and excluding controlled burns ensured that North Carolina's forests became overmature, overgrown, and increasingly at risk for disease and catastrophic wildfires.

The recently released land management plan for Nantahala and Pisgah national forests makes a serious effort at opening these public lands up to widespread public use. Forest managers have focused on collaborating with a broad list of stakeholders: government, industry, native groups, sportsmen/fishermen, outdoor recreation interests, environmental groups and others. The new management plan walks a difficult line of maintaining the health of national forests while continuing human use for economic, social, and environmental benefits. Whether the plan succeeds in properly managing the state's national forests will rely heavily on the ability of these government agencies to turn plans into reality when they make decisions about forest management.

Where other states and other national forests still deal with preservationist attitudes, political environmentalism, and the environmental problems that result, North Carolina's example presents the possibility of moving beyond the process predicament to a far more effective form of forest management.

Endnotes

1 Information in this section of the paper is derived chiefly from two videos on North Carolina's forest history. Bonesteel Films / Forest History Society, "First in Forestry: Carl Schenck and the Biltmore Forest School" (Forest History Society, June 25, 2020), https://perma.cc/S7H5-PDZ7. Bonesteel Films / Forest History Society, "America's First Forest: Carl Schenck and the Asheville Experiment" (Forest History Society, Dec. 7, 2016), https://perma.cc/SE5C-6GB2.

2 "'First in Forestry' License Plate" (North Carolina Forest Service, March 6, 2014), https://perma.cc/W9NQ-KVKZ.

3 "The Vanderbilt Family" (The Biltmore Company, 2022), https://perma.cc/2STK-NCT8.

4 James G. Lewis, "The Pinchot Family and the Battle to Establish American Forestry" *Pennsylvania History: A Journal of Mid-Atlantic Studies* 66, no. 2 (1999): 23, https://www.jstor.org/stable/27774186.

5 "FSM 2400 - Forest Management Chapter 2470 – Silvicultural Practices" (U.S. Department of Agriculture - Forest Service, 2014) https://perma.cc/Q39G-33UY. In this document, the Forest Service describes silviculture as "the art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis."

6 "Liriodendron Tulipifera" (North Carolina Extension Gardener Plant Box, 2022), https://perma.cc/XE9J-VAHS.

7 Schenck noted the loss of an undetermined "many thousands of dollars." To provide context, estimating an average annual inflation rate of 2.83%, a loss of USD $10,000 in 1895, would be equivalent to approximately USD $344,000 in 2022. A $50,000 loss in 1895 would be equivalent to approximately $1.7 million in 2022.

8 Bonesteel Films / Forest History Society, "First in Forestry: Carl Schenck and the Biltmore Forest School" (Forest History Society, June 25, 2020), https://perma.cc/S7H5-PDZ7.
Bonesteel Films / Forest History Society, "America's First Forest: Carl Schenck and the Asheville Experiment" (Forest History Society, Dec. 7, 2016), https://perma.cc/SE5C-6GB2.

9 Ibid.

10 James G. Lewis, "The Pinchot Family and the Battle to Establish American Forestry" *Pennsylvania History: A Journal of Mid-Atlantic Studies* 66, no. 2 (1999): 23, https://www.jstor.org/stable/27774186.

11 Ibid.

12 “Weeks Act Centennial 2011” (US Forest Service — Lands and Realty Management, Feb. 15, 2011) https://perma.cc/2NRJ-X9BP.

13 Joe L. Morgan, “Vanderbilt, George Washington” (Dictionary of North Carolina Biography, 1996), https://perma.cc/8XRP-TU4Y.

14 “Pisgah National Forest” (John Locke Foundation - North Carolina History Project, 2016), https://perma.cc/V7KY-6EF7. More than one purchase date is listed for the sale of Pisgah. The U.S. Forest Service lists Pisgah as “home to the first tract of land purchased under the Weeks Act of 1911.” — See: https://perma.cc/3XHN-SXFG. Similarly, the Forest History Society lists March 27, 1911 as the purchase date for 13 separate “purchase units” that were designated as a result of the Week’s Act. Pisgah is listed as one of those 13 initial purchase units — see: https://perma.cc/LS75-J4A4. The Nantahala and Pisgah National Forest Land Management Plan notes that Pisgah National Forest was established in 1916. See "Nantahala and Pisgah National Forests Land Management Plan" (U.S. Department of Agriculture - Forest Service, 2022), https://perma.cc/72SP-BSE2. Pg. 12.

15 Bonesteel Films / Forest History Society, "America’s First Forest: Carl Schenck and the Asheville Experiment" (Forest History Society, Dec. 7, 2016), https://perma.cc/SE5C-6GB2.
“Beautiful Pisgah Forest Was Vanderbilt’s Pet” (New York Tribune, May 31, 1914), https://perma.cc/J973-ZS25.

16 Rajan Parajuli and Robert Bardon, "Economic Contribution of the Forest Sector in North Carolina" (NC State Extension, 2021), https://perma.cc/942S-6ZT8.

17 "Forests of North Carolina, 2021" (USDA Forest Service - Forest Inventory and Analysis, June 2, 2022), https://tinyurl.com/3z6kc8zn.

18 Mark J. Brown and Barry D. New, "North Carolina, 2011 Forest Inventory and Analysis Fact Sheet" (USDA Forest Service, 2013), https://perma.cc/F7WU-VGUD.

19 Ibid.

20 Ibid'

.21 "Forests of North Carolina, 2021" (USDA Forest Service - Forest Inventory and Analysis, June 2, 2022), https://public.tableau.com/views/FIA_OneClick_V1_2/Factsheet?%3AshowVizHome=no.

22 Ibid'

23 Rajan Parajuli and Robert Bardon, “Economic Contribution of the Forest Sector in North Carolina” (NC State Extension, 2021), https://perma.cc/942S-

6ZT8.

24 "Forest Service Schedule of Proposed Actions - North Carolina" (US Forest Service), https://perma.cc/2EH9-3K52.

25 See Deuteronomy 34:1-5. See also, "Pisgah National Forest" (John Locke Foundation - North Carolina History Project, 2016), https://perma.cc/V7KY-6EF7.

26 "Nantahala and Pisgah National Forests Draft Record of Decision" (U.S. Department of Agriculture - Forest Service, January 2022), https://perma.cc/54DR-W8ZB.

27 "Pisgah National Forest" (ExploreAshville.Com, 2022), https://perma.cc/85AX-X7NK.

28 "Pisgah National Forest" (U.S. Department of Agriculture - Forest Service), https://perma.cc/3XHN-SXFG.

29 James Lewis, "The Gift of the Pisgah National Forest" (Forest History Society, Oct. 17, 2016), https://perma.cc/2GQU-NMRV.

30 "Nantahala National Forest" (U.S. Department of Agriculture - Forest Service), https://perma.cc/D28W-2E5Y.

31 "Nantahala National Forest" (Great Smoky Mountains — North Carolina, 2020), https://perma.cc/2YK5-PQDD.

32 "Croatan National Forest" (U.S. Department of Agriculture - Forest Service), https://perma.cc/QMF9-PY3T.

33 "What Is a Pocosin?" (National Ocean and Atmospheric Administration, April 1, 2022), https://perma.cc/A4YW-8EH3.

34 Thomas J. Farnham, "Croatan National Forest" (Encyclopedia of North Carolina, 2006), https://perma.cc/X554-B8EK.

35 "Carnivorous Plants: North Carolina's State Treasures" (The Nature Conservancy, Aug. 19, 2019), https://perma.cc/QC3X-AN9A.

36 "Uwharrie National Forest" (U.S. Department of Agriculture – Forest Service), https://www.fs.usda.gov/recarea/nfsnc/recarea/?recid=48934.

37 Sarah Perry, "An American Wilderness" (Our State Magazine, Nov., 2013), https://perma.cc/T39T-5R5B.

38 "The Pee Dee Indians" (John Locke Foundation - North Carolina History Project, 2016), https://perma.cc/P9NA-Z6AD.

39 Alan Hodge, "Pint-Sized Paradise" (Our State Magazine, Sep., 1993), https://perma.cc/M24W-3A7B.

40 Sarah Perry, "An American Wilderness" (Our State Magazine, Nov., 2013), https://perma.cc/T39T-5R5B.

41 Angelyn H. Patteson, "Uwharrie National Forest" (Encyclopedia of North Carolina, 2006), https://perma.cc/KC63-QRL9.

42 Sarah Perry, "An American Wilderness" (Our State Magazine, Nov., 2013), https://perma.cc/T39T-5R5B.

43 Ross W. Gorte et al., "Federal Land Ownership: Overview and Data" (United States: Congressional Research Service, 2020), https://crsreports.congress.gov/product/pdf/R/R42346.

44 NC Rep. Karl Gillespie, interview by author, March 24, 2022.

45 NC Rep. Mark Pless, interview by author, March 31, 2022.

46 Sarah Curry, "Federally Owned Land and N.C. Counties" (The Carolina Journal, July 28, 2015), https://perma.cc/BTP4-LBZ8.

47 "Nantahala and Pisgah National Forests Land Management Plan" (U.S. Department of Agriculture - Forest Service, 2022), https://perma.cc/72SP-BSE2.

48 Gwen Albers, "Stanley Furniture Shuttering at End of June, 'devastating' Local Area" (Carolina Public Press, June 24, 2014), https://perma.cc/9YW4-GT-VH.

49 Dale Neal, "When the Last Factory Leaves a Mountain Town" (Citizen Times, Aug. 13, 2014), https://perma.cc/5SVD-DZ52.

50 "Total Population in Robbinsville Town, North Carolina" (United States Census Bureau, 2020), https://perma.cc/DQL6-T296.

51 Gwen Albers, "Stanley Furniture Shuttering at End of June, 'devastating' Local Area" (Carolina Public Press, June 24, 2014), https://perma.cc/9YW4-GT-VH.

52 Stanley Furniture is reported to have continued to struggle for financial viability until 2018, when it was sold to Churchill Downs, LLC. See: Thomas Russell, "Stanley Furniture Completes Sale to Churchill Downs LLC: Shareholders Approve Sale in March 2 Vote" (Furniture Today, March 2, 2018), https://www.furnituretoday.com/furniture-retailing/stanley-furniture-completes-sale-churchill-downs-llc/.

53 Gwen Albers, "After Stanley's Demise, Charlotte Company Sets Sights on Graham County" (Carolina Public Press, Dec. 3, 2014), https://perma.cc/C7RP-QPQF.

54 Jack Igelman, "Graham County: Where the National Forest Drives the Economy" (Carolina Public Press, June 25, 2018), https://perma.cc/BF3P-G6R2.

55 "Oak Valley Hardwoods - Locations" (Oak Valley Hardwoods), https://perma.cc/2FDX-242Q.

56 John Hatcher, interview by author, March 24, 2022. Hatcher is executive director of the NC Forestry Association.

57 Rajan Parajull, "The North Carolina Sawmill Industry: A Closer Look" (NC State Extension, Sept. 14, 2020), https://content.ces.ncsu.edu/the-north-carolina-sawmill-industry-a-closer-look.

58 "Quarterly Census of Employment and Wages — NAICS 321113 Sawmills, All

Counties in North Carolina" (U.S. Bureau of Labor Statistics, last modified date March 9, 2022), https://data.bls.gov/cew/apps/table_maker/v4/table_maker.htm#type=2&st=37&year=2021&qtr=A&own=5&ind=321113&supp=0.

59 Rajan Parajull, "The North Carolina Sawmill Industry: A Closer Look" (NC State Extension, Sept. 14, 2020), https://content.ces.ncsu.edu/the-north-carolina-sawmill-industry-a-closer-look.

60 "Quarterly Census of Employment and Wages — NAICS 321113 Sawmills, All Counties in North Carolina" (U.S. Bureau of Labor Statistics, last modified date March 9, 2022), https://data.bls.gov/cew/apps/table_maker/v4/table_maker.htm#type=2&st=37&year=2021&qtr=A&own=5&ind=321113&supp=0.

61 Jason Hayes, "Conflict to Cooperation: Collaborative Management of Federal Lands in Michigan" (Midland, MI, 2018), https://www.mackinac.org/conflict_to_cooperation.

62 "Good Neighbor Authority," US Department of Agriculture - US Forest Service, https://www.fs.usda.gov/managing-land/farm-bill/gna (accessed June 1, 2022).

63 Jason Hayes, "Conflict to Cooperation: Collaborative Management of Federal Lands in Michigan" (Mackinac Center for Public Policy, 2018), https://perma.cc/XD29-W8VM.

64 Chris French, "Status of Good Neighbor Authority in the U.S. Forest Service - FY21 Second Quarter" (Washington, DC: USDA Forest Service, 2021).; Received memo via USFS email correspondence with Mackinac Center, September 2021.

65 "Toward Shared Stewardship Across Landscapes: An Outcome-Based Investment Strategy" (U.S. Department of Agriculture - Forest Service, Aug., 2018), https://perma.cc/R79Z-5Z7S.

66 "Shared Stewardship" (U.S. Department of Agriculture - Forest Service), https://perma.cc/X43J-BA3N.

67 This list is excerpted from the Executive Summary of "Toward Shared Stewardship Across Landscapes: An Outcome-Based Investment Strategy" (U.S. Department of Agriculture - Forest Service, Aug., 2018), https://perma.cc/R79Z-5Z7S.

68 "Memorandum of Understanding between North Carolina Department of Agriculture and Consumer Services - NC Forest Service, the NC Wildlife Resources Commission, and the US Department of Agriculture" (U.S. Department of Agriculture - Forest Service), https://perma.cc/2S64-QMWY.

69 "Nantahala and Pisgah National Forests Land Management Plan" (U.S. Department of Agriculture - Forest Service, 2022), https://perma.cc/72SP-BSE2.

70 "Nantahala and Pisgah National Forests Final Environmental Impact Statement" (U.S. Department of Agriculture - Forest Service, January 2022), https://

perma.cc/6BDP-TYPU.

71 "Nantahala and Pisgah National Forests Land Management Plan" (U.S. Department of Agriculture - Forest Service, 2022), https://perma.cc/72SP-BSE2.

72 "2012 Forest Planning Rule" (U.S. Department of Agriculture - Forest Service, 2012), https://perma.cc/L8AT-CT8F.

73 "Nantahala and Pisgah Forest Plan Revision Reader's Guide" (U.S. Department of Agriculture - Forest Service, 2022), https://perma.cc/2QW9-DPTP.

74 This list is excerpted from the "Nantahala and Pisgah Forest Plan Revision Reader's Guide" (U.S. Department of Agriculture - Forest Service, 2022), https://perma.cc/2QW9-DPTP.

75 "Nantahala and Pisgah National Forests Land Management Plan" (U.S. Department of Agriculture - Forest Service, 2022), https://perma.cc/72SP-BSE2. See page 52.

76 Ibid, 64.

77 Ibid, 145.

78 Jack Igelman, "Details of Western NC National Forest Plan Drawing Objection" (Carolina Public Press, March 7, 2022), https://perma.cc/G78M-Y72K.

79 Jason Hayes, "Extinguishing the Wildfire Threat: Lessons from Arizona" (Goldwater Institute, 2020), https://perma.cc/9FGG-TPAG. See page 9.

80 Jack Igelman, "Details of Western NC National Forest Plan Drawing Objection" (Carolina Public Press, March 7, 2022), https://perma.cc/G78M-Y72K.

81 Jerry F. Franklin et al., "Ecological Characteristics of Old-Growth Douglas-Fir Forests" (U.S. Department of Agriculture - Forest Service, February 1981), https://perma.cc/2YFZ-MF6B.

82 Jason Hayes, "Extinguishing the Wildfire Threat: Lessons from Arizona" (Goldwater Institute, 2020), https://perma.cc/9FGG-TPAG.

83 Jason Hayes, "Conflict to Cooperation: Collaborative Management of Federal Lands in Michigan" (Mackinac Center for Public Policy, 2018), https://perma.cc/XD29-W8VM.

84 Jason Hayes, "Extinguishing the Wildfire Threat: Lessons from Arizona" (Goldwater Institute, 2020), https://perma.cc/9FGG-TPAG.

85 "Toward Shared Stewardship Across Landscapes: An Outcome-Based Investment Strategy" (U.S. Department of Agriculture - Forest Service, Aug., 2018), https://perma.cc/R79Z-5Z7S.

86 Ted O'Neill, "Study: Poor Forest Management, Not Climate Change, to Blame for Wildfires" (The Center Square, Oct. 6, 2020), https://perma.cc/9ZT5-HLUC.

87 "North Carolina Wildfire Statistics: 1928-Present" (North Carolina Forest Service, 2021), https://perma.cc/Z6ZD-J9JQ.

88 US Forest Service Supervisor James Melonas, interview by author, March 31, 2022.

89 "The Worst Wildfire In North Carolina History Is Devastating The State" (Only In Your State, Nov. 15, 2016), https://perma.cc/GZ3V-TN2F. See also: Carolyn Mooney, "Worst Wildfire in North Carolina History" (Roaring Earth, undated), https://roaring.earth/worst-wildfire-in-north-carolina-history/.AbigailMargulis, "Man Charged with setting wildfires in Macon County" (Citizen Times, Nov. 30, 2016). https://www.citizen-times.com/story/news/crime/2016/11/30/man-charged-setting-wildfires-macon-county/94667206/.

90 Travis Hall, "Wildfire Update: More than 40,000 Acres on Fire in Western North Carolina" (Blue Ridge Outdoors, Nov. 14, 2016), https://perma.cc/VK4W-BP9R.

91 Tim Armstrong, "2016 Climate Summary for Southeastern North Carolina & Northeastern South Carolina" (National Weather Service, Jan. 1, 2017), https://perma.cc/55TN-UBAJ.

92 Tim Armstrong, "Climate Summary for 2017 across Southeastern North Carolina & Northeastern South Carolina" (National Weather Service, Jan. 2, 2018), https://perma.cc/TAS8-RDRZ.

93 "North Carolina Wildfire Statistics: 1928-Present" (North Carolina Forest Service, 2021), https://perma.cc/Z6ZD-J9JQ.

94 Tim Armstrong, "Weather and Climate Summary for 2021 across Northeastern South Carolina and Southeastern North Carolina" (National Weather Service, Jan. 2, 2022), https://perma.cc/5DHH-S43A.

95 Tim Armstrong, "Spring Drought of 2021" (National Weather Service, July 25, 2021), https://perma.cc/7XXA-C5D5.

96 "Moderate Drought Returns to Southeastern North Carolina" (CoastalReview.Org, May 13, 2021), https://perma.cc/V7U7-JTXH.

97 "North Carolina Wildfire Statistics: 1928-Present" (North Carolina Forest Service, 2021), https://perma.cc/Z6ZD-J9JQ.

98 "Burn Ban Issued for 26 North Carolina Counties Due to Hazardous Forest Fire Conditions" (North Carolina Forest Service Newsdesk - 2021, May 24, 2021), https://perma.cc/44B8-3GYC.

99 Tim Armstrong, "Weather and Climate Summary for 2021 across Northeastern South Carolina and Southeastern North Carolina" (National Weather Service, Jan. 2, 2022), https://perma.cc/5DHH-S43A.

100 For example, Inciweb.nwcg.gov reports the 2021 Bootleg Fire in Oregon burned 413,717 acres before it was considered contained on October 1. (See: https://perma.cc/D5LC-53CY). Similarly, the 2021 Dixie Fire burned 963,309 acres in Northern California until it was considered contained on October

30. (See: https://perma.cc/68WU-YHRH).

101 Sebastian Martinuzzi et al., "The 2010 Wildland-Urban Interface of the Conterminous United States" (U.S. Forest Service, June, 2015), https://perma.cc/336T-DG3C.

102 "North Carolina Fire Statistics: Fires by Cause" (North Carolina Forest Service, 2018), https://perma.cc/55MG-8PA7.

103 The NC Forest Service has also put together information in its "Resist Wildfire North Carolina" (https://perma.cc/H8GF-CVEN) website that provides educational materials and other information on living in the WUI and how residents can "take the initiative in working to protect their property and neighborhoods before a wildfire occurs."

104 Voker Radeloff, Miranda Mockrin and David Helmers, "Mapping Change in the Wildland Urban Interface (WUI) 1990 - 2010: State Summary Statistics June 2018" (University of Wisconsin-Madison Silvis Lab, 2018), https://perma.cc/QL25-ZGRT.

105 Jason Hayes, "Conflict to Cooperation: Collaborative Management of Federal Lands in Michigan" (Mackinac Center for Public Policy, 2018), https://perma.cc/XD29-W8VM.

106 "Wildland-Urban Interface (WUI) Change Map - 1990-2010" (University of Wisconisn-Madison Silvis Lab, 2022), https://perma.cc/EH28-TK78.

107 NC Rep. Karl Gillespie, interview by author, March 24, 2022, and NC Rep. Mark Pless, interview by author, March 31, 2022.

108 Steve Pettis, Jr., "Pest Alert: Pine Bark Beetles" (NC Cooperative Extension, May 15, 2020), https://perma.cc/2HHS-M94R. NC Cooperative Extension explains that older and diseased pine trees release pheromones that attract these three species of pine bark beetles. The beetles attack trees by boring into the bark and then tunneling through the cambium, effectively girdling and eventually killing the tree. Southern Pine Bark Beetle (*Dendroctonus frontalis*) tends to attack the upper third of a tree. Those attacks further weaken the tree, drawing in the Ips Beetle *(Ips calligraphus / Ips grandicollis / Ips avulsus*), which focuses on the midsection of a tree. Finally, Black Turpentine Beetle (*Dendroctonus terebrans*), the largest of the three species, attacks the lower trunk, causing "great runs of sap to ooze out." Most trees will succumb to these attacks within a few years.

109 Steven Frank et al., "Hemlock Woolly Adelgid" (NC State Extension Publications, Sept. 23, 2019), https://perma.cc/NJ9L-EVNZ. NC State Extension explains that the Hemlock Woolly Adelgid is a reddish-purple insect, measuring approximately 1/32" and believed to have originated in Asia. Both the adult and nymph stages produce a white, cotton-wool-like covering that is about 3 mm around. All life stages of these pests shelter within these wooly

masses at some point in their development and feed on by sucking sap from stems and needles. As numbers of the adelgid increase on a tree or bush, they slow the growth and cause any new growth, or existing leaves to turn gray and die. Infested (and untreated) trees typically are defoliated and die within a few years.

110 James Melonas, interview by author, March 31, 20220. Melonas, a US Forest Service supervisor, noted that there is a broad consensus on the use of prescribed fire on "dry sites," but recognized that there are "differing opinions" on the use of prescribed fire on wetter or high areas.

111 "Toward Shared Stewardship Across Landscapes: An Outcome-Based Investment Strategy" (U.S. Department of Agriculture - Forest Service, August 2018), https://perma.cc/R79Z-5Z7S. See pg. 12.

112 Jennifer Fawcett, Christopher Moorman and Terry Sharpe, "Using Fire to Improve Wildlife Habitat" (NC State Extension Publications, April 7, 2021), https://perma.cc/DFD6-QF9W.

113 "Prescribed Burns Benefit Wildlife" (North Carolina Wildlife Resources Commission, March 9, 2015), https://perma.cc/763E-TT75.

114 Jennifer Fawcett, Christopher Moorman and Terry Sharpe, "Using Fire to Improve Wildlife Habitat" (NC State Extension Publications, April 7, 2021), https://perma.cc/DFD6-QF9W.

115 Jennifer Fawcett, Christopher Moorman and Terry Sharpe, "Using Fire to Improve Wildlife Habitat" (NC State Extension Publications, April 7, 2021), https://perma.cc/DFD6-QF9W.

116 "The Story of Smokey Bear" (U.S. Department of Agriculture - Forest Service, 2014), https://www.fs.usda.gov/features/story-smokey-bear.

117 "Only You" (U.S. Forest Service Smokey Bear Collection, 1989), https://perma.cc/VP55-U6CN.

118 "Nantahala and Pisgah National Forests Land Management Plan" (U.S. Department of Agriculture - Forest Service, 2022), https://perma.cc/72SP-BSE2. It is important to note, however, that logging need not have played a significant role in the alteration of historical stand structures as contemporary silvicultural practices can easily design a cutting and reforestation plan that ensures desired species compositions are maintained and regenerated.

119 Jennifer Fawcett, Christopher Moorman and Terry Sharpe, "Using Fire to Improve Wildlife Habitat" (NC State Extension Publications, April 7, 2021), https://perma.cc/DFD6-QF9W.

120 Jason Hayes, "Extinguishing the Wildfire Threat: Lessons from Arizona" (Goldwater Institute, 2020), https://perma.cc/9FGG-TPAG. See page 5.

121 Jason Hayes, "Conflict to Cooperation: Collaborative Management of Federal

Lands in Michigan" (Mackinac Center for Public Policy, 2018), https://perma.cc/XD29-W8VM. See page 11.

122 "Prescribed Burns Benefit Wildlife" (North Carolina Wildlife Resources Commission, March 9, 2015), https://perma.cc/763E-TT75.

123 "Nantahala and Pisgah National Forests Land Management Plan" (U.S. Department of Agriculture - Forest Service, 2022), https://perma.cc/72SP-BSE2.

124 "Prescribed Burns Benefit Wildlife" (North Carolina Wildlife Resources Commission, March 9, 2015), https://perma.cc/763E-TT75.

125 Jennifer Fawcett, Christopher Moorman and Terry Sharpe, "Using Fire to Improve Wildlife Habitat" (NC State Extension Publications, April 7, 2021), https://perma.cc/DFD6-QF9W.

126 Ibid.

127 NC Rep. Mark Pless, interview by author, Jason Hayes, March 31, 2022.

128 Derek Lacey, "Final Nantahala and Pisgah Forest Plan Charts Course for Recreation, Timber, Climate Change" (The Palm Beach Post, Jan. 24, 2022), https://perma.cc/K5F4-HC9F. Representatives of the N.C. Fish and Wildlife Conservation Council note "steep declines in whitetail deer populations and grouse populations on our national forest lands."

129 "White-Tailed Deer Harvest Reports" (North Carolina Wildlife Resources Commission, 2022), https://perma.cc/7GXS-P9VE.

130 "White-Tailed Deer Distribution and Peak Rut Maps" (North Carolina Wildlife Resources Commission, 2022), https://perma.cc/X4GW-Y7LC.

131 NC Rep. Mark Pless, interview by author, March 31, 2022.

132 Chris Kreh, "Ruffed Grouse Drumming Survey 2021" (North Carolina Wildlife Resources Commision, 2021), https://perma.cc/T56F-KGTF.

133 Chris Kreh, "2020-21 North Carolina Avid Grouse Hunter Survey" (North Carolina Wildlife Resources Commission, 2021), https://perma.cc/R2RM-JK2C.

134 Curtis Niedermier, "North Carolina Quail Hunting Forecast, 2019" (Quail Forever Inc., Oct. 2, 2019), https://perma.cc/J62E-5TLY

135 "Ruffed Grouse" (North Carolina Wildlife Resources Commission, 2022), https://perma.cc/CRH7-WVJ8.

About the Author

Jason Hayes is the director of environmental policy for the Mackinac Center for Public Policy. Located in Midland, Michigan, and founded in 1987, the Mackinac Center is a nonpartisan research and educational institute that is dedicated to advancing liberty and opportunity for all people through research and education.

Jason has spent almost three decades studying and working in environmental and energy policy. He worked as a backcountry ranger in British Columbia's provincial parks, as a forester in British Columbia's boreal forest, and researched National Parks management and grizzly bear biology with the Fraser Institute in Calgary, Alberta. He spent over a decade researching and communicating energy and environmental policy with the Canadian and American energy industry. In July 2016, Jason moved to the Mackinac Center to head up its Environmental Policy Initiative.

Jason holds a Master of Environmental Design (Environmental Science) degree from the University of Calgary, a Bachelor of Science in Natural Resource Conservation from the University of British Columbia and a Technical Diploma in Renewable Resource Management from Selkirk College.

Jason also serves as an adjunct faculty member at Northwood University, teaching Environmental Science, and as a policy advisor to the Heartland Institute on issues of energy and environmental policy.

FOR MORE INFORMATION, CONTACT

Jon Sanders
Director of the Center for Food, Power, and Life
John Locke Foundation
jsanders@lockehq.org
919-828-3876

Jason Hayes
Director of Environmental Policy
Mackinac Center for Public Policy
hayes@mackinac.org
989-631-0900

THE JOHN LOCKE FOUNDATION

4800 Six Forks Rd., #220
Raleigh, NC 27609
919-828-3876
johnlocke.org

johnlockefoundation @johnlockenc
John Locke Foundation johnlockefoundation1 johnlockefoundation

MACKINAC CENTER
FOR PUBLIC POLICY

140 West Main Street, P.O. Box 568
Midland, Michigan 48640
989-631-0900
mackinac.org