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Forest History Today

A PUBLICATION OF THE FOREST HISTORY SOCIETY

2023–2024

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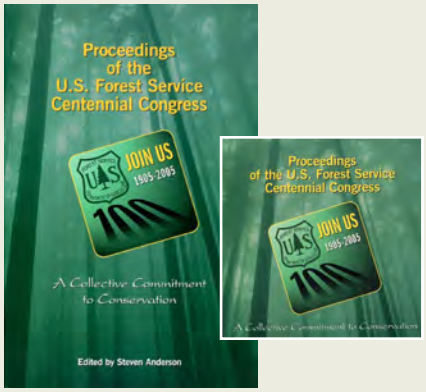

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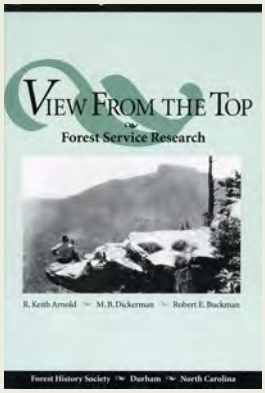

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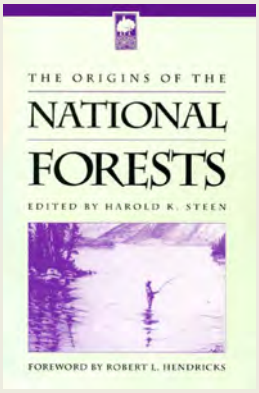

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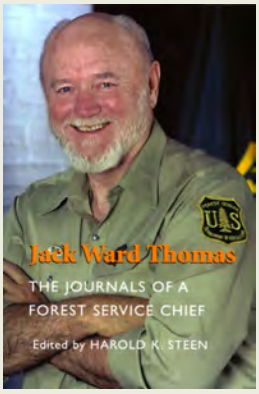

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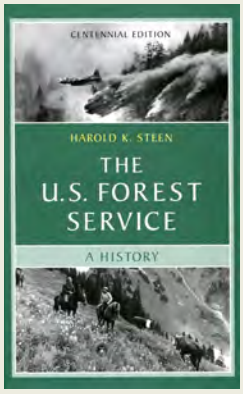

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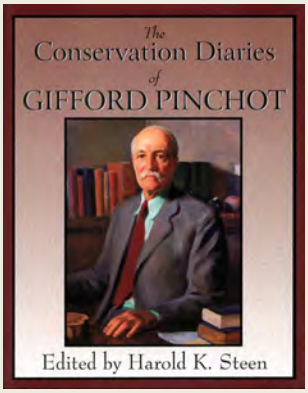

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Forest History Today Contents

Dear Friends of the Forest History Society

It is my great pleasure to welcome you to this special double issue of our forest history magazine, spanning 2023 and 2024, two remarkable years of discovery and reflection at the Forest History Society. As always, our goal is to bring to you the work we do at FHS by making the rich history of forests and conservation accessible to all. This magazine forms such an important part of what we do. And if you are like me, you still get special enjoyment from reading good writing in an actual paper publication that you can hold in your hands and flip the page to see what's next. Whereas our journal *Environmental History* is written primarily for scholars, here authors offer the very best scholarship for a broader readership that includes professional foresters and natural resource managers as well as interested lay readers who want to learn more about forest and conservation history. I hope you'll agree with us that the stories in this issue do just that, and we hope you enjoy them!

Within these pages, you will find a collection of articles that delve into the fascinating and varied history of forest and conservation history. From the rediscovery of Susie Barstow, a nineteenth-century landscape painter who Nancy Siegel tells us traveled the world to capture the beauty of forests, to exploring Aldo Leopold's time at the Yale Forest School Camp of 1907, a piece by Julie Dunlap, to examining the importance of tropical forestry in today's climate-challenged world, a contribution from forestry researcher Gary Hartshorn, this issue spans both time and geography in its coverage.

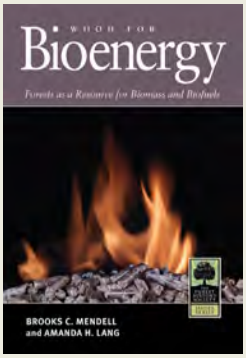
As we celebrate these remarkable stories, I want to take a moment to extend a heartfelt thanks to our long-time, loyal donors and also to welcome new readers! Your unwavering support and dedication make it possible for us to continue exploring and preserving the legacy of our forests. We know how much you look forward to receiving each issue, and we are equally excited to share this one with you. It is because of your generosity that we can continue to tell these important stories and ensure that the history of forests remains alive and accessible for future generations.

Thank you for all that you do for us. We hope you enjoy this special issue and look forward to sharing more with you as we look to the 2025 issue of *Forest History Today*.

With gratitude,

Tania Munz, *President & CEO*

FOREST HISTORY SOCIETY ISSUES SERIES



Wood for Bioenergy
by Brooks C. Mendell & Amanda Lang
88 pp; 10 photos; 18 figures

Today, as much of the world seeks to reduce dependence on fossil fuels, energy companies and nations alike are turning once again to our oldest renewable energy resource—wood. Both developing and industrialized countries are increasing their use of wood biomass as a direct substitute for fossil fuels for heating and producing electricity.

But using wood for bioenergy and biofuels is not without its issues. Of primary concern is if the wood needed for those purposes can be secured on a sustainable basis. And without sizable subsidies, it is not yet cost effective to convert wood to liquid fuel at a commercial scale. Other issues include the relation between biomass harvesting and carbon emissions, evaluating supply chain systems for energy markets, and the effect subsidies can have on the price of wood. By reviewing the historical context and contemporary issues surrounding this topic, ***Wood for Bioenergy: Forests as a Resource for Biomass and Biofuels*** provides a primer for teachers, policymakers, energy producers, landowners, forest managers, and journalists on this critical energy source.

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The Issues Series booklets bring a historical context to today's most pressing issues in forestry and natural resource management. Written by leading experts, each one presents a balanced overview of critical and often contentious issues. Attractive, informative, and aimed at the general reader, the booklets provide an excellent introduction to the novice or useful refresher for the experienced.

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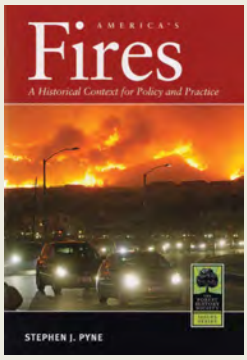
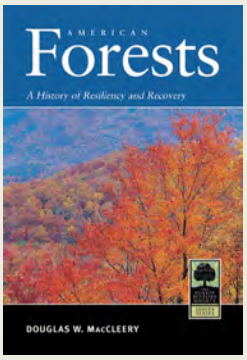
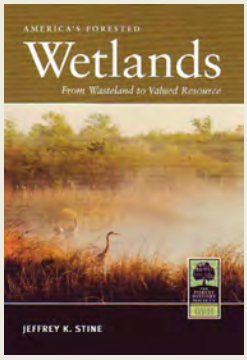


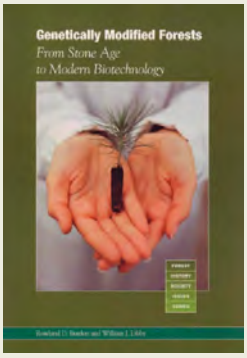
America's Fires
by Stephen J. Pyne
94 pp; 22 photos; 31 figures



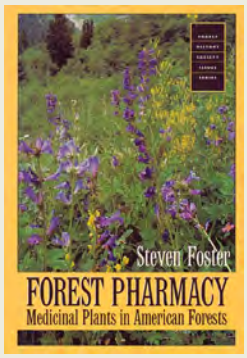
American Forests
by Douglas W. MacCleery
65 pp; 36 photos; 18 figures



America's Forested Wetlands
by Jeffrey K. Stine
96 pp; 28 photos; 7 figures



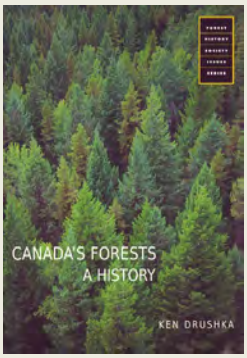
Genetically Modified Forests
by Rowland D. Burton & William J. Libby
79 pp; 36 photos



Forest Pharmacy
by Steven Foster
58 pp; 17 photos; 4 tables

Newsprint
by Thomas R. Roach
56 pp; 26 figures

Forest Sustainability
by Donald W. Floyd
80 pp; 21 photos; 11 figures



Canada's Forests
by Ken Drushka
105 pp; 17 photos; 14 figures

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I normally don't curate an issue with any theme in mind. But sometimes, one emerges after the issue is assembled. In this case, wildfire and fire control are the subjects of several articles. Douglas MacCleery starts us off with an examination of the relationship Indigenous peoples in the U.S. Southeast had with fire at the time of European colonial settlement. Jameson Karns and Michelle Steen-Adams bring us Harold Weaver, a fire ecologist who worked in what is today the U.S. Bureau of Indian Affairs. Weaver and his collaborators studied the effects of the traditional practice of forest burning and advocated for its use in the Pacific Northwest. Weaver, however, didn't limit himself geographically to that region. As you'll see, he moved around the western U.S., and he made an impact at conferences convened in the U.S. South. It was while working there that Raymond Conarro, a U.S. Forest Service forester with no formal training in fire ecology, coined the term "prescribed burning," writes frequent contributor Char Miller. Conarro, a contemporary of Weaver's, started his career in his home state of Pennsylvania before being sent to create national forests in Mississippi in the 1930s, and then was appointed chief of fire control for the agency's Southern Region, the same region MacCleery starts us off with five centuries earlier.

And sometimes articles come in that, without intention, are in conversation with each other. So it is with Curt Meine's piece about Aldo Leopold and the evolution of the conservationist's thinking on land, ethics, and justice. This article is significantly longer than the other features. What Curt has to say is of great import, and this article, reprinted from a new journal not yet widely available, warrants an exception to our standards. Complementing that article is Julie Dunlap's look at Leopold's time at the Yale Forest School summer camp, where what he learned laid the foundation for his work with the Forest Service and later as a professor of game management and a land ethicist.

One practice of Harold Weaver's that made him a trailblazer was returning to the same plots of land over and over again across several decades and using a camera to document the changes in the landscape. Starting in 1969 and for the next fifty years, Gary Hartshorn led a team that eventually included his coauthors Diana Lieberman and Milton Lieberman in doing something similar—conducting a permanent plots study in Costa Rica that Gary helped initiate. The diversity of tree species in this old-growth forest is now under threat from climate change. Their research may inform a plan to rescue the most vulnerable tropical tree species and the biodiversity of those forests.

Also documenting changes in the land were the landscape painter Susie Barstow and mining engineer–turned–forest conservationist John Birkenbine. Nancy Siegel tells us about Barstow, who depicted idyllic forest scenes from New England to Asia to Europe, and was well known and well respected in her lifetime. Tom Straka, who has contributed articles over the years about charcoal iron furnaces found in Pennsylvania and Utah, introduces us to Birkenbine, whose work in the charcoal iron industry took him around the entire country and gave him a window into what was happening on the ground. What he found was that the industry was being wrongly blamed for

deforestation when in fact, industry leaders, led by Birkenbine, were not only calling for sustainable forest management in the United States but had been practicing it for a generation before the federal government began doing so. What Barstow and Birkenbine have in common is that not long after their deaths, historians forgot them and their important contributions to their respective fields. Similarly, Susan Jewell rescues U.S. congressman John Lacey's legislative legacy from obscurity in the Portrait column.

In October 2024, destructive hurricanes roared across the southern Appalachian Mountains and smashed towns in the Carolinas and Tennessee. Asheville, North Carolina, suffered extensive damage. Given that Asheville is the birthplace of forestry in America—it is where the first professional forestry school opened its doors, among other "firsts"—we're reprinting Bill Alexander's 2011 Places column about the region to remind readers of that city's role, and to encourage you to help the people there and in all the areas devastated by this year's hurricane and wildfire seasons.

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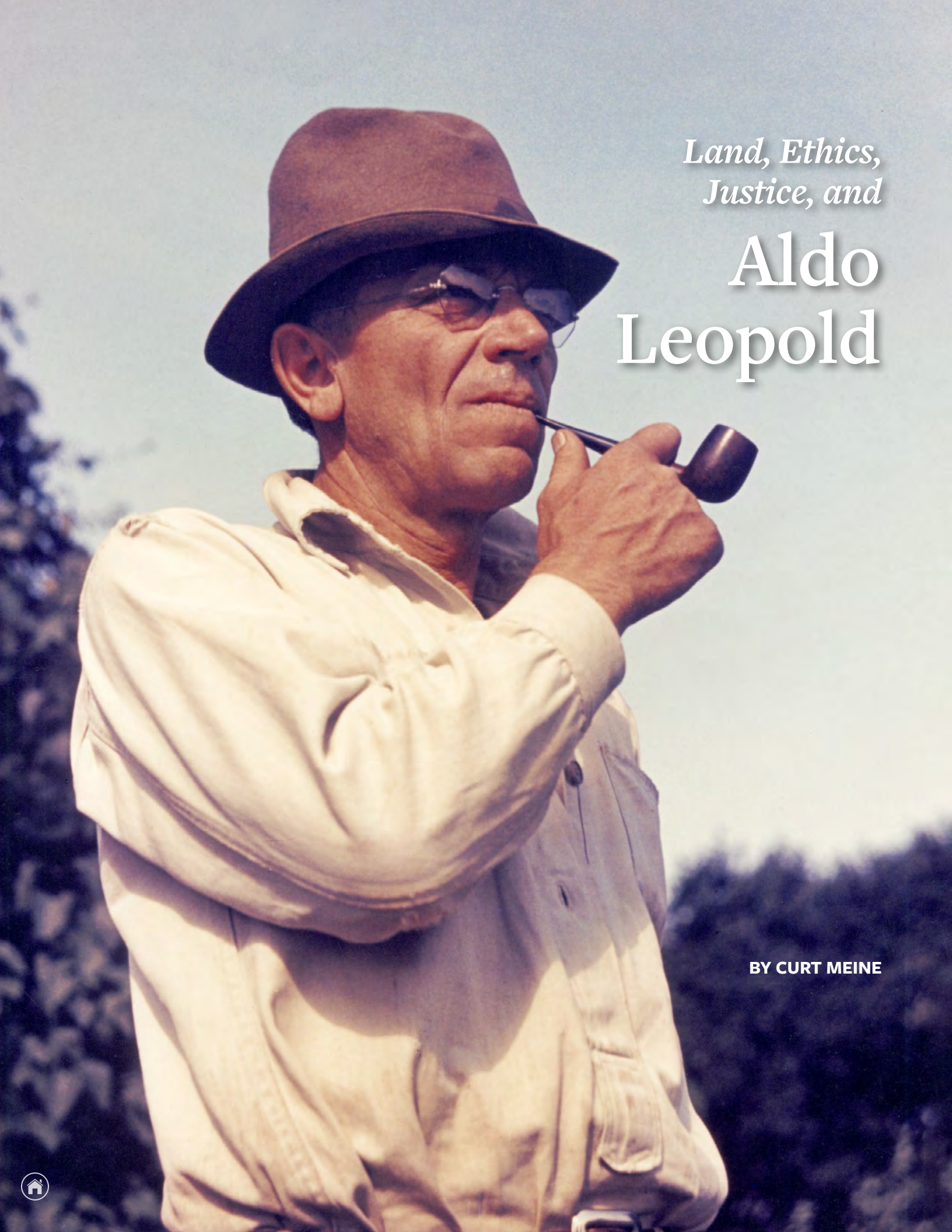
Forest History Today is published by the Forest History Society to keep readers apprised of the best forest history writing and of FHS activities. Please email article proposals to Jamie Lewis at: james.lewis@foresthistory.org.

ON THE COVERS

Front: Susie M. Barstow, *Wooded Interior*, ca. 1865, oil on canvas, 30 x 22 in. Collection of Thomas and Marilyn Tolska in memory of Jenni Tolska.

Back: University of Wisconsin–Madison, Aldo Leopold papers: 9/25/10-12: Student Course Materials

Articles appearing in this journal are abstracted and indexed in HISTORICAL ABSTRACTS and AMERICA: HISTORY AND LIFE.



Land, Ethics, Justice, and Aldo Leopold

BY CURT MEINE

Aldo Leopold scholar Curt Meine contends the conservationist's attitudes on race, social justice, and social progress are more complex than some claim, and offers suggestions for further exploration.

The legacy of racism, inequity, and injustice in the history of conservation and the contemporary environmental movement is being scrutinized as never before. The American ecologist, conservationist, and author Aldo Leopold (1887–1948) is among the influential historical figures whose attitudes and actions have been sharply criticized. Especially because Leopold was devoted to protecting wildlands and expressed concern about the impacts of human population growth, detractors have characterized him as callously misanthropic at best, racist and fascistic at worst. These representations can be weighed against Leopold's personal and professional record, and his views on such themes as the Native American experience, the eugenics movement of the early twentieth century, cultural diversity, and the rise of fascism. In his late years, and in the final formulation of his influential essay "The Land Ethic," Leopold was increasingly explicit in framing his value system as one grounded in a commitment to just human relations. Moreover, the ethic he expressed was not static and could not be exclusionary. It expanded the purview of ethical consideration in the conservation movement and provided new foundations for the expansion of environmental awareness in the mainstream of American society. Viewed in this way, Leopold may be regarded not as an apotheosis of conservation thinking, but as an essential transitional figure within a still broader, ongoing movement, informed by an ever-evolving ethic of care.

THOMAS COLEMAN, UNIVERSITY OF WISCONSIN-MADISON, ALDO LEOPOLD ARCHIVES, S02210

Aldo Leopold, around 1947.

RACE, HISTORY, AND CONSERVATION'S INFLECTION POINT

How are we to abide with one another, and with the land and waters that sustain us all, on the one Earth that embraces us all? How will we do so in a time of rapid and complex social and environmental change? How may we not merely survive, but thrive together, in all the communities to which we belong, including the whole community of life that gives us life?

And most important: In asking all these questions, who belongs to the *we*? For all who care about future generations and the living world, answers to these questions must contend with the record, and reality, of injustice and exclusion in American history and society, and globally as well. Awareness of the legacy of racism, sexism, classism, and other forms of injustice in conservation and the environmental movement is not new, but the urgency of the present reckoning is unprecedented. Critiques have examined themes such as genocide and the forced removal of Indigenous peoples from ancestral lands; support for eugenics among early conservationists; and the chronic lack of diversity in environmental professions and organizations.[1] As historian Dorceta E. Taylor has stated, "The [American] conservation movement arose against a backdrop of racism, sexism, class conflicts, and nativism that shaped the nation in profound ways."[2] Conservation stands now at an inflection point, where contemporary conservationists must recognize and overcome history's burdens in order to meet the future's needs.

Attention has also focused on the racial attitudes of key historical figures such as John Muir and Theodore Roosevelt. The critiques hold that these men, from their privileged positions, valued "pristine" lands but cared little about those who occupied, worked, or were removed from such lands, especially Indigenous, Black, and poor people. In this manner, such figures were complicit in the process of colonization, settlement, and erasure, even as they perpetuated the separation between humans and the rest of nature that lay at the root of our ecological crises. In response, others have sought to contextualize the experience of these and other figures and to lay out complexities behind their apparent attitudes.

The American ecologist and conservationist Aldo Leopold is among those who have come under increased scrutiny. Leopold assumed many roles across his career: naturalist, forester, advocate, scientist, teacher, and author. He was a transformative figure in twentieth-century environmental science, policy, and ethics. Trained as a forester, he contributed to the development of soil conservation, wildlife management, and other conservation professions. His work provided foundations for later interdisciplinary fields such as ecological restoration, conservation biology, environmental history, and ecological economics. His book *A Sand County Almanac*, published posthumously in 1949, has long been essential reading in courses on U.S. environmental history, policy, and literature.

Leopold was also a foundational figure in environmental philosophy, arguing that dominant Western ethical frameworks had to evolve and expand to embrace *land* (i.e., ecosystems, or "the environment") as "a community to which we belong."[3] He called this idea *the land ethic*. "This philosophy of land," he confessed in 1947, was not always clear to him. "It is rather

the end result of a life journey, in the course of which I have felt sorrow, anger, puzzlement, or confusion over the inability of conservation to halt the juggernaut of land abuse."[4]

Conclusions about Leopold's attitudes on race, social justice, and social progress should consider the totality of his life experience, acknowledging his faults as well as his evolving vision. Leopold's actions and the descriptions of his personality by contemporaries do not support the assertion that he was racist in his personal or professional life. They provide abundant evidence to suggest otherwise and to demonstrate constant evolution in his social attitudes and political stances. Leopold's record, however, is not without its flaws and biases. He was the product of institutions and a society built upon foundations of colonialism, oppression, and the Doctrine of Discovery, and he acknowledged the impact of these forces only to a limited degree. In his extensive published and unpublished writings, one will find occasional statements and phrasings that now read as clumsy, cringeworthy, and offensive. However, one will also find unalloyed condemnations of the impacts of imperialism, colonialism, and arrogant power.

Further scholarship is needed to enhance the narrative account of Leopold's social and racial attitudes. This essay does not aim or purport to offer a final word on these questions. It seeks to provide constructive framing and encourage critical reexamination that can help reconcile profoundly problematic histories with present and future needs.

ALDO LEOPOLD'S LIFE JOURNEY

Leopold's story, with all the shortcomings and advances it reveals, demonstrates how society has—and has not—addressed our systemic social and ecological crises. Leopold once wrote, "There are two things that interest me: the relation of people to each other, and the relation of people to land."[5] He understood that social and environmental challenges are intrinsically *connected*, and so must be progress in addressing them. Prior scholarship on Leopold has touched on his racial, social, and political attitudes, but new evidence, perspectives, and priorities invariably reframe the questions scholars ask. Which is as it should be. Such constant revisiting of prior assumptions and conclusions, in fact, characterized Leopold's own intellectual development. He was a scholar and scientist who deeply valued critical analysis, for "hewing to the facts, let the chips fall where they may."[6]

Especially because Leopold was devoted to protecting wildlands and expressed concern about the social and ecological impacts of human population growth, detractors have characterized him as a callous misanthrope at best, a racist and fascist at worst. It is true that Leopold was not as discerning on matters of social and economic justice as he was on conservation issues per se. He did not fully acknowledge the historic trauma and contemporary effects of Native American genocide, dispossession, and removal. Nor did he explicitly recognize that the consequences of land exploitation have for generations fallen disproportionately on the poor, and on Blacks, Indigenous people, and people of color. He was not (in today's terms) an active anti-racist, defender of indigenous rights, or advocate for civil rights. Leopold's limited perspective on race and social justice carried ethical blind spots.

However, Leopold was a lifelong reformer who understood the fundamental relationship between social and ecological well-being. He grew increasingly concerned across his career with the cultural roots and consequences of land commodification, exploitation, and degradation. Based on that understanding, he worked to advance an ethic of care that could bridge our need for justice and compassion toward one another and toward the living land. Such ethical development was fundamental to reforming cultural values, economic philosophy, and community relationships in order to achieve greater "harmony with land."[7] His work pointed toward the convergence of social and environmental concerns and actions that the world now so urgently needs.

We turn to history to inform our judgment and measure our progress. At the same time, in revisiting historic events, movements, and figures, we may interpret past events uncritically in terms of contemporary values and concepts, what historians call *presentism*. Born in 1887, Leopold came of age in a time, and within a dominant culture, marked by systemic racism, classism, and sexism. He joined an emerging conservation movement that bore those marks, but that has also included those who recognized the congruence of social justice and environmental reform. He did not live to experience the rise of the civil rights, women's rights, American Indian, peace, environmental, and environmental justice movements—much less the progressive intersection of these movements (and the reactionary response) that especially marks the current inflection moment.

By the early 1930s, Leopold was increasingly willing to express publicly his skepticism regarding all anthropocentric economic ideologies, which he saw as "competitive apostles of a single creed: *salvation by machinery*."[8] [Emphasis in original.] "There is a feeble minority called conservationists who are indignant about something," he wrote in 1934. "They are just beginning to realize that their task involves the reorganization of society, rather than

the passage of some fish and game laws."[9] He would explore the ethical foundations for that "reorganization of society" over the remainder of his career. In the few years Leopold had to live after World War II, he moved more consciously toward an integration of conservation's social, economic, and ecological dimensions under the rubric of *the land ethic* and its companion concept of *land health*.

REVIEWING THE RECORD

Recent characterizations of Leopold as "racist," a "white supremacist," or an "ecofascist" reflect particular claims that pertain not only to Leopold personally, but to the American conservation movement generally (and thus to Leopold as an iconic figure within it).[10] As I see it, labeling Leopold in this way oversimplifies the record, especially his wilderness advocacy, his integrative conservation vision, and his effort to understand human population pressure and technological power as factors in environmental change. It glosses over instructive details involving his very real flaws and failings, as well as his insights, on these questions. Finally, it fails to appreciate Leopold's ethical evolution, especially in the final years of his life, as he sought to comprehend the impacts and existential consequences of World War II.

Leopold and the Protection of Wildlands Over the last several decades, scholars in environmental history, environmental ethics, ecocriticism, Native American/Indigenous studies, and other fields have exhaustively deconstructed the "received" idea of wilderness. In parallel, conservation organizations and practitioners have been widely censured for a history of imposing protected areas on landscapes without the consent or participation of local inhabitants, especially Indigenous peoples.

As a progenitor of the idea of protecting large undeveloped landscapes, Leopold has been on the sharp receiving end of such criticism. His concept of wilderness, it is said, "not only bore traces of the racial theories of an earlier generation of American conservationists but also retained some of their class prejudices."[11] He "believed that when fewer individuals occupied an environment, they could better appreciate the ecological interactions taking place within it."[12] In promoting wilderness protection, Leopold "was operating off the assumption that some humans had a greater right to enjoy the beauty of nature than others."[13] The argument, in sum, is that Leopold's approach to conservation was beholden to, and driven by, a concept of wilderness that was (and remains) ahistorical, misanthropic, exclusionary, callous, and elitist.

Leopold's public advocacy on behalf of securing extensive areas of roadless public land—lands taken from their Native inhabitants over the previous four centuries, and that four decades later would be legally defined and codified as "wilderness"—began in his mid-thirties, while he was working for the U.S. Forest Service in the American Southwest in the early 1920s. His aim was to designate relatively undeveloped lands on the U.S. national forests as a novel "form of land use."[14] At a time when automobiles were first coming onto the landscape, the federal government was expanding funding for road and highway construction across the country. This was at the core of his early advocacy. In opposing the contemporary "Good Roads Movement," Leopold lamented "the tragic absurdity of trying to whip the March of Empire into a gallop."[15] He pushed to provide roadless lands with a special level of protection that left them open to hunting, fishing, camping, and other uses compatible with their less-developed character.

In 1921, in his first significant publication on the theme, Leopold advocated for reserving as "wilderness" the largest unfragmented landscape in the Southwest, on the Gila National Forest (established in 1905) in New Mexico. Leopold argued that "[h]ighest use demands its preservation." He even suggested that cattle ranches be included within such designated areas, arguing that they "would be an asset from the recreational standpoint because of the interest which attaches to cattle grazing operations under frontier conditions." Ranchers would benefit by being spared the burden of "new settlers and . . . hordes of motorists."[16] Leopold did not reference (much less make any parallel appeal to respect) the historic tenure, traditional land uses, and contemporary interests of the Chiricahua Apache or other Native communities of the region.

In this early phase of his advocacy, Leopold was motivated primarily by a desire to sustain "a distinctive environment which may, if rightly used, yield certain social values."[17] He recognized and admitted that not everyone shared such values, or his personal passion for wildland recreation. However, he held that

> It is the opportunity, not the desire, on which the well-to-do are coming to have a monopoly. And the reason is the gradually increasing destruction of the nearby wilderness by good roads. The American of moderate means can not go to Alaska, or Africa, or British Columbia. He must seek his big adventure in the nearby wilderness, or go without it.[18]

While thus arguing for more egalitarian access to recreational wildlands, Leopold's wilderness advocacy in the mid-1920s also partook of a neocolonial and exceptionalist view of American

FOREST HISTORY SOCIETY, FHS7592

Aldo Leopold started his forestry career in the American Southwest, a place he would write about throughout his career. He was in his first job as a forest assistant on the Apache National Forest in Arizona when this photo was taken in 1910.

history. In several articles, Leopold advanced a Turnerian appeal to the development of national character, i.e., of white settlers' experience of the Euro-American frontier—or, as he phrased it, "our pioneer environment." "For three centuries," he wrote, "that environment has determined the character of our development; it may, in fact, be said that, coupled with the character of our racial stocks, it is the very stuff America is made of. Shall we now exterminate this thing that made us American?"[19]

In making this argument, Leopold came face to face with its core paradox—but left that paradox unresolved. Even as he touted triumphalist "pioneer" values, he decried the loss of "the indigenous part of our Americanism"[20] and rebuked the modern American citizen who "has planted his iron heel on the breast of nature" and exercised a harsh "dominion over the earth."[21] Yet it was not the romantic illusion of an unpeopled wilderness (much less pride in its "conquest"), or a simplistic disdain for modernity or people, that initiated his activism. It was a broad and basic pragmatism. "Our system of land use," he wrote, "is full of phenomena which are sound as tendencies but become unsound as ultimates . . . The question, in brief, is whether the benefits of wilderness-conquest will extend to ultimate wilderness-elimination."[22]

Over the next two decades, Leopold's rationale for wildland protection evolved continually to embrace a broader range of historical, cultural, economic, biological, scientific, and spiritual values. The recreational and ethno-nationalist rationales receded. Ultimately he held that "the rich diversity of the world's cultures reflects a corresponding diversity in the wilds that gave them birth."[23] The cultural significance of wildlands was an expression, not of misanthropy or exclusivity, but of intellectual humility and humanity's continual "search for a durable scale of values."[24]

The experience of World War II honed the point in Leopold's thinking, even as the postwar boom in land development and resource extraction commenced. He wrote, with sarcastic reference to Hitler's Third Reich, that "The shallow-minded modern who has lost his rootage in the land assumes that he has already discovered what is important; it is such who prate of empires, political or economic, that will last a thousand years."[25] And yet Leopold could only dimly foresee how wildlands now provide a basis for biocultural restoration, for revitalizing communities and cultural connections in landscapes he knew, from Wisconsin prairies to Southwestern semi-arid rangelands to German forests, and well beyond.

Two core points deserve emphasis. First, Leopold did not adhere to a purist or absolute concept of pristine, idealized, "unpeopled" wilderness. It is a favorite trope of wilderness deconstructionists that conservation as a movement has been thoroughly beholden to this flawed "myth." It may well describe others who historically advocated for wilderness protection, and it was undoubtedly a primary motivation for a certain segment of the conservation and environmental movements over the decades. It does not, however, fit Leopold. Rather, Leopold held that "wilderness exists in all degrees"; that "wilderness is a relative condition"; that "as a form of land use [wilderness] cannot be a rigid entity of unchanging content, exclusive of all other forms."[26] He argued for a "flexible" concept of wildlands that could accommodate itself to, and blend with, other forms of land use.

This suggests the corollary second point: Leopold as a conservation thinker, scientist, advocate, and practitioner never focused exclusively on wildland protection. He consistently worked to integrate land protection with care for more populated landscapes, from farms, forests, and rangelands to whole watersheds and urban neighborhoods. The striking lyricism of Leopold's prose in *A Sand County Almanac* can lead readers to overlook the fact that, in the book's foundational first part, he was describing not a scenic, unpeopled, or "pristine" wilderness, but a mundane piece of Midwestern farmland, "first worn out and then abandoned by our bigger-and-better society."[27] He (along with his family, friends, and students) worked there and elsewhere to rebuild depleted wildlife populations and repair damaged ecosystems, providing foundations for modern conservation biology and ecological restoration. Leopold's vision of land conservation was all-embracing, extending across the entire continuum of land-use intensity, from the wildest lands to the most humanized. To this point, he proposed at the end of his life, significantly, not a *wilderness* ethic, but a *land* ethic. That ethic regarded *all* land as worthy and deserving of "love and respect."[28]

To the claim that access to wildness and the appreciation of "ecological interactions" was and should be exclusive, Leopold had a plain response:

> Like all real treasures of the mind, perception can be split into infinitely small fractions without losing its quality. The weeds in a city lot convey the same lesson as the redwoods; the farmer may see in his cow-pasture what may not be vouchsafed to the scientist adventuring in the South Seas. Perception, in short, cannot be purchased with either learned degrees or dollars; it grows at home as well as abroad, and he who has a little may use it to as good advantage as he who has much.[29]

It was a conviction Leopold affirmed throughout his years of writing, speaking, and teaching.

Leopold and Human Population

Recent critiques of Leopold have also focused on his views on human population, population density, and the environmental impacts of the growing human population. These critiques again pertain not only to Leopold, but reflect what has long been a central debate within conservation, the environmental movement, economic and political theory, international development, sustainability studies, and related fields. As regards Leopold, the judgments are harsh. That Leopold regarded "overpopulation" as "the root cause of environmental problems."[30] That his wilderness advocacy had "a disturbing corollary—a disdain for human population growth that culminated in a critique of providing food and medical aid to developing nations."[31] That Leopold was "more-than-a-little racist" and "fretted over the influx of Asian and other foreign immigrants to the United States."[32] Such statements, loosely sourced and offered without countervailing evidence, echo tensions over problematic attitudes that have long been part of environmental discourse, that have been perverted in odious ecofascist ideologies, and that continue to vex efforts to achieve a robust approach to ecosocial justice.

Leopold was an early leader in the development of population ecology and applied wildlife ecology (especially as related to land use). As such, he not surprisingly considered if and how these fields could provide perspective on the dynamics of human population growth and its ecological and social impacts. He mused in 1934 that wildlife research "may ultimately throw light on sociology, as well as conservation." "It is not unthinkable," he wrote, "that the present world-wide disturbances which we call revolution, depression, and real-politik are the preliminary rumblings of Nature over an unhealthy population density."[33] From time to time, Leopold conjectured in this way, arguing by analogy from wildlife populations to human society (while almost invariably adding cautionary qualifiers):

> Man thinks of himself as not subject to any density limit. Industrialism, imperialism, and that whole array of population behaviors associated with the "bigger and better" ideology are direct ramifications of the Mosaic injunction for the species to go [to] the limit of its potential, i.e., to go and replenish the earth. But slums,

> wars, birth-controls, and depressions may be construed as ecological symptoms that our assumption about human density limits is unwarranted . . . .[34]
>
> We now know that animal populations have behavior patterns of which the individual animal is unaware, but which he nevertheless helps to execute . . . . This raises the disquieting question: do human populations have behavior patterns of which we are unaware, but which we help to execute? Are mobs and wars, unrests and revolutions, cut of such cloth?[35] Violence [in land use] . . . would seem to vary with human population density; a dense population requires a more violent conversion [of land].[36]

Such expressions illustrate the degree to which Leopold's speculations reflected his times and his personal and professional experience. Amid the Great Depression, Dust Bowl, and World War II—which is to say, in a time like ours of multiple convergent crises—conservationists had to think in a more integrated way about social, economic, and ecological systems and disruptions. As a forerunner in applying emerging ecological principles and insights to the natural resource management fields, Leopold was invariably drawn to ponder these broader systemic connections and questions.

Leopold was aware that these questions carried him into sensitive territory, and he explored them cautiously. Significantly, he did not consider human population in isolation, but in relation to affluence, consumption, education, economics, politics, aesthetics, and especially technological change. In encouraging citizens to be more mindful about the impact of consumer choices, he redefined conservation as "our attempt to put human ecology on a permanent footing."[37] Leopold never advocated harsh or coercive measures of population control, or steps that could be construed as racially motivated. He regularly stressed that human progress was not a mere matter of increasing human numbers or density, but entailed the quality of life and (as we might now phrase it) ecological resiliency. This, he observed, ran "counter to pioneering philosophy, which assumes that because a small increase in density enriched human life, that an indefinite increase will enrich it indefinitely."[38]

These questions became more urgent, and more public, in the aftermath of World War II, reflected in the publication of best-selling books by two of Leopold's professional colleagues: *Road to Survival* and *Our Plundered Planet*.[39] In effect these two books both reflected and accelerated the globalization of conservation, preparing the way for the later environmental movement that would reframe consideration of human population growth. In that process, the intimately related questions of equity and justice would for some time be sequestered, held off in a separate realm. But one way of understanding the emergence of *sustainability* as an organizing concept starting in the 1980s is as a movement to reintegrate questions of population, environmental impact, and justice (global, intergenerational, and interspecies). Another generation later, environmental thinkers continue to do so under such rubrics as *right relationship, integral ecology*, and *resilient socio-ecological systems*.

There are plentiful examples, past and present, of scientists, scholars, policy makers, and advocates who regard human population—along with affluence, consumption, poverty, inequality, education, technology, women's rights, and globalization—as a complex factor in the calculus of conservation and development. As for the "disturbing corollary" involved in facing that complexity *while also valuing relatively less transformed socio-ecological systems* (i.e., wildlands), Leopold was (and is) hardly unusual in that endeavor. Still many others have shared Leopold's frustration with the moral *status quo*—and valued his call for a radically inclusive ethic that "changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it," recognizing the inherent value, dignity, and agency of all people and other species.[40] Those who explore, analyze, or hold such positions may well do so without being misanthropes, racists, nativists, or ecofascists.

Race, Conservation, and Leopold

Beyond these key themes in conservation and environmental history, what does Leopold's personal experience reveal of his views on race, justice, and social change? Leopold scholars (myself included) have emphasized how his scientific paradigms and ethical framework, and the affective content of his writing, evolved across his lifetime on a number of fronts. Coming to terms with the historic record on Leopold's social attitudes requires careful, objective, and comprehensive reading and is open to all who wish to explore the nuances of his intellectual and emotional growth. Several themes merit special consideration.

Native Americans and Leopold

Aldo Leopold has received criticism for being unaware of or actively antagonistic toward Indigenous peoples; for averting his eyes from the truth of Native American genocide; and for failing to account for the history of land alienation and appropriation. Some see in Leopold's consideration of land ethics an unacknowledged appropriation of Indigenous belief and value systems.

Others have noted that, in the text of *A Sand County Almanac*, Leopold largely ignored or overlooked the Native American experience. In his wilderness advocacy and in his work as an administrator and manager of public lands, Leopold rarely acknowledged the origins of the nation's public domain in the relentless seizing of land from Native American tribes over the previous four centuries of colonization and one hundred and fifty years of American nationhood. To the degree that Leopold was embedded in and failed to address this history of dispossession and trauma, he contributed to the erasure of Native land tenure and sovereignty in the mainstream of American public consciousness.

Leopold never summarized his views on the historical and contemporary circumstances of Native Americans (or Indigenous peoples elsewhere) in any single publication. However, Leopold had more direct interaction with Native Americans, and more to say about the reality of indigeneity and Native Americans in history and in the contemporary landscape, than at first appears. The documentary evidence is scattered throughout the archival and historical record. No scholar has yet taken on the large task of tracing, synthesizing, and analyzing this evidence.

Leopold spent his boyhood in Burlington, Iowa's "Flint Hills" (Sac/Fox *Shoquokon*), but he likely had no interactions there with native Sac and Fox (Oaakiiwaki/ Othakiwaki) people. Their removal occurred through the 1832 "Black Hawk Purchase" treaty, fifty-five years prior to Leopold's birth. Leopold did occasionally encounter Ojibwe (and perhaps other Anishinaabe) people in northern Michigan, where his family vacationed in his youth. Leopold's education at the Lawrenceville School in New Jersey, Yale University, and the Yale Forest School provided scant opportunity to learn about or acknowledge Native American history.[41]

Upon joining the U.S. Forest Service in 1909, Leopold was dispatched to the American Southwest. Over the next fifteen years, he interacted with Navajo (Dine) and Hopi (Hopituh Shi-nu-mu); with White Mountain (Dził Łigai Si'an N'dee), Jicarilla Dindei (Haisndayin), and other Apache tribes; and with the Puebloan communities of the Rio Grande basin. His actions and writings of the period present a decidedly mixed bag of responses. On the one hand, the inexperienced Leopold could complain about Apache hunters, and ignore the land claims of the Jicarilla Apaches while seeking to establish a waterfowl refuge. On the other hand, he spoke out forcefully against proposed national legislation that would have allowed the taking of Pueblo lands and the "possible disintegration of the Pueblo Indian communes." Leopold's stance on the latter revealed his general attitude at the time:

> This was, I hope, the ultimate impertinence of Boosterism in the Southwest. That the Indian culture and ours should have been placed in competition for the possession of this country was inevitable, but the cool assumption that this last little fragment must necessarily disappear in order that an infinitesimal percentage of soot, bricks, and dollars may be added to our own, betrays a fundamental disrespect for the Creator, who made not only boosters, but mankind, in his image.[42]

Leopold was well aware of his position of privilege and of what in his youth he termed "the advent of white-demoralization" of Native cultures.[43] The evidence is again dispersed across the archival record, but suggests a pattern of gradually increasing acknowledgment of cultural culpability. He recognized the legacy of colonialism and the Doctrine of Discovery, alluding in one essay to "the clank of silver armor and the cruel progress of the Cross."[44]

UNIVERSITY OF WISCONSIN–MADISON, ALDO LEOPOLD ARCHIVES, S01495 X25 0993

Aldo Leopold, ca. 1904. He was well aware of his position of privilege and of what in his youth he termed "the advent of white-demoralization" of Native cultures.

In his Wisconsin years, Leopold interacted somewhat more often with members of the Ho-Chunk (formerly Winnebago) Nation. His "shack" property lay near extant Ho-Chunk settlements. His writing began to reflect a more informed and circumspect view. Two trips into northern Chihuahua yielded an essay, "Song of the Gavilan" (first published in 1940), in which he suggested that "There once were men

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Aldo Leopold served as professor of game management at the University of Wisconsin from 1933 until his death in 1948.

capable of inhabiting a river without disrupting the harmony of its life. They must have lived in thousands on the Gavilan, for their works are everywhere."[45] In another 1940 essay, "Escudilla," Leopold reflected on his early experience in the Arizona Territory:

> "We spoke harshly of the Spaniards who, in their zeal for gold and converts, had needlessly extinguished the native Indians. It did not occur to us that we, too, were the captains of an invasion too sure of its own righteousness."[46]

In a somewhat parallel manner, Leopold's approach to land stewardship also shifted. In 1920, for example, he disparaged the use of traditional light burning—"Piute forestry"—in fire-adapted Southwestern landscapes, a relic of his early training as a forester.[47] He would soon begin to question his assumptions about the inherent destructiveness of fire.[48] By the mid-1930s, he identified fire as a basic tool of ecological restoration and engaged in early experiments in prescribed burning.[49] In this sense, his record indicates at least an embryonic appreciation of Traditional Ecological Knowledge.

Over the last two decades, scholars have contested the ways in and degrees to which Leopold's land ethic precepts may have reflected, ignored, or appropriated Indigenous knowledge and value systems. Environmental ethicist J. Baird Callicott, for example, held that there were (and are) close parallels between "The Land Ethic" and relational ethics in the Anishinaabe worldview and tradition. Others have responded that such a position irresponsibly and disrespectfully privileges a Leopoldian ethic over Indigenous systems of ethics.

Citizen Potawatomi philosopher and environmental justice scholar Kyle Powys Whyte has addressed these tensions most directly. Whyte writes that Leopold's example "does not provide a model of environmental

stewardship that many Indigenous peoples would identify with or find useful." Leopold's progressive narrative of expanding ethical inclusivity, he writes, "goes in the opposite direction of the narratives many Indigenous peoples would provide of their ethics." Whyte cautions that in drawing such parallels, ethicists must "push beyond linking abstract ideas" and focus on "bringing together . . . people who subscribe to . . . different ethics [for] more careful consideration of potential differences."[50] The moment is ripe for such consideration of contrasting ethical foundations, frameworks, aims, trajectories, and implications for environmental stewardship.

Cultural Diversity and Leopold

Leopold had frustratingly little to say directly about the experience of Asian, Black, or Hispanic/Latinx Americans per se, although again allusions and episodes may be found across the documentary record. There is no evidence that Leopold personally harbored racist attitudes. Although he was the product of a privileged background in a dominant white culture and segregated society, he was not oblivious to class, racial, ethnic, and religious divisions. Growing up at the turn of the twentieth century in a loosely progressive family of secular German background, he was exposed through his parents to the influences of German literature and liberalism. His father's business, the Leopold Desk Company, was noted in its time for its advanced labor policies. Leopold's youthful correspondence reveals clear awareness of his class privilege, and a broad generosity toward "others" whom he did encounter.

Leopold's cross-cultural marriage to Maria Alvira Estella Bergere, Catholic daughter of a prominent New Mexican family with a lineage that traced back to Mexico and Spain, was unusual in its time. Scholars have suggested that this contributed fundamentally to Leopold's appreciation of the cultural context of conservation. Estella Leopold Jr. notes that her mother, "fluently bilingual . . . handsome and dark-skinned," infused their family life with the food, music, and stories of her Hispanic background.[51] The five Leopold children, all of whom became acclaimed scientists, educators, and conservationists themselves, carried this mix of cultural influences. The marriage was traditional in the sense that Estella and Aldo worked inside and outside the home, respectively. Estella outlived her husband by twenty-five years. In the 1980s, daughter Nina recalled that over those years her mother "started being herself, rather than just Dad's wife. She became very strong in her political convictions, a very definite personality."[52]

In this context, it is worth noting that Leopold encouraged both his daughters, Nina and Estella, in their academic pursuits, and both ultimately became accomplished scientists, mentors, and environmental advocates. Leopold's graduate student Frances Hamerstrom was the first woman to earn a master's degree in wildlife management and the only woman to earn a graduate degree with Leopold. "He never held my sex against me," Hamerstrom recalled in the early 1980s.[53] Another student, Ruth Hine, applied to pursue studies with Leopold after the end of the war. Leopold, she recalled thirty-five years later, replied "that they didn't take women as graduate students in wildlife, but he put it in a way that didn't really bother me."[54] Soon after, however, he did accept another woman, Brina Kessell, as a PhD student. However, Leopold died before she could begin her studies with him.

In 1987, Leopold's son Luna described his father's manner of interacting with others. "Dad was as kind, considerate, and tolerant a person as any I have ever known. Practically never did he criticize anyone personally, even when he disagreed with that person. He treated even the most humble with the same respect as the most distinguished. This was especially noticeable when traveling—the porter in the train, the shoeblack, the waitress in a cafe—all were engaged in conversation, in which he might ask about the person's interests, avocation, or work."[55] Luna's retrospective testimonial, however subjective, is corroborated almost without exception by the accounts of those who observed Leopold personally and professionally.

These personal observations underline a key point about Leopold's changing perspective on the role of people and communities in carrying out conservation work on the land. The arc of Leopold's career clearly shows him moving away from the top-down and expert-driven approach to land and resource management that marked the early Progressive conservation movement, and toward ever more democratic and participatory land conservation processes. "The Land Ethic" was nothing if not a call for expansive and inclusive participation in environmental stewardship, from wild lands to "working" lands to urban lands, to the global biodiversity, atmospheric, and oceanic commons. A land ethic, as interpreted and extended since Leopold's time, has inspired innumerable community-based conservation efforts and locally driven movements, on behalf of everything from food sovereignty to watershed rehabilitation to urban land restoration. At the same time, it has provided foundations for a still emerging global ethic of care.

Eugenics and Conservation

The early conservation movement included many leading figures who

adhered to the ideology of eugenics and, implicitly or explicitly, white supremacy as an expression of scientific racism. In applying rational "science" to questions of the status and "improvement" of human populations, its proponents could claim eugenics as another front in the progressive movement of the day, validating their racist attitudes and antiimmigrant policies. The movement also existed of course outside the conservation world and was embraced across the traditional political spectrum.

In addition to such well-known adherents as Theodore Roosevelt and forester Gifford Pinchot, the eugenics movement counted as leaders some of the most prominent conservationists of the era—namely William Temple Hornaday, Madison Grant, and Henry Fairfield Osborn Sr., all associated with the New York Zoological Society and the American Museum of Natural History. Leopold was aware of the association of eugenics and conservation. Although a generation younger, he was acquainted with, and occasionally interacted with, several of these figures. This has been sufficient for some to regard reporting on these connections as a revelatory "outing" of Leopold.[56]

In my view, the more remarkable fact is that Leopold did *not* embrace the enthusiasm for eugenics demonstrated by so many key senior figures in the conservation movement that he himself would help to revolutionize. Leopold had an intermittent, deferential, and testy relationship with Hornaday, whose strict protectionist view of wildlife conservation ran counter to Leopold's more proactive and interventionist ecological approach. No documentary evidence has appeared to indicate that Leopold and Grant met or interacted. However, Leopold was aware of Grant's prominent conservation activities and writings. Both were members of the Boone and Crockett Club, the influential organization of sportsmen that Theodore Roosevelt cofounded in 1887. The only substantive reference to Grant in Leopold's archival papers involves that connection and dates from December 1930. The club was soliciting donations from its members for a ceremonial gift in Grant's honor. Leopold wrote in response, "I enclose my check for $5 for the Madison Grant cup. I have long admired his work and have read his publications with great interest."[57]

In this instance, Leopold may well have been holding his tongue in his cheek. In a 1922 article on one of his primary concerns at the time—advanced soil erosion and the degradation of Southwestern watersheds—Leopold wrote: "Pioneering . . . has absorbed the best brawn and brains of the Nordic race since the dawn of history. Anthropologists tell us that we, the Nordics, have a racial genius for pioneering, surpassing all other races in ability to reduce the wilderness to possession."[58] For some observers, this is a smoking-gun passage, citing it with the assumption that Leopold was an admirer of what the "Nordic races" had wrought. The phrase hearkened back to Grant's notorious 1916 book *The Passing of the Great Race*. Leopold invoked the term explicitly and intentionally. His reference to "anthropologists" in the passage indicates his awareness of Grant (and possibly Osborn) as prominent eugenicists.[59]

Reading the passage in its full context reveals that Leopold was no admirer of eugenicist ideology. He used the phrase ironically. Following his vivid description of deteriorating watersheds, Leopold concludes, "This, fellow citizen, is Nordic genius for reducing to possession the wilderness." The sarcastic tone was not anomalous. In another essay from the time, for example, Leopold mocks "our vaunted superiority"—*our* referring to the dominant culture to which he belonged, and which was hastily "crushing the last remnants" of roadless Southwestern landscapes.[60]

Germany, National Socialism, and Leopold Madison Grant's writing infamously inspired Adolph Hitler in his ideology and his rise to power. In 1935 Leopold observed the consequences first-hand. Leopold was forty-eight when he traveled to Germany and neighboring Czechoslovakia on a three-month fellowship to research the history of forestry and game management. During this trip, he confronted directly the ill effects of an overspecialized and harsh utilitarian approach to natural resource management. The experience also exposed him to the reality of the Nazi regime's authoritarian rule and its systemic racism and antisemitism. The trip, in sum, was a key turning point not only in Leopold's views on the historic tension between disciplinary and integrated approaches to conservation, but his broader views on culture and conservation.

Leopold's time in Central Europe yielded nine published articles as well as unpublished notes, reports, and manuscripts. His observations and publications have been revisited regularly in biographical studies and articles, by both German and non-German researchers. For the conservation professions, Leopold's take-home-to-America lesson was unequivocal. While still in Germany, he wrote:

> We have [in Germany] the unfortunate result of what might be called a too purely economic determinism as applied to land use. Germany strove for maximum yields of both timber and game, and got neither. She is now, at infinite pains, coming back to an attitude of respectful guidance (as distinguished

FOREST HISTORY SOCIETY, CLARENCE L. FORSLING COLLECTION, FORSLING409

Aldo Leopold's trip with a group of American foresters to Central Europe in 1935 had a huge impact on his conservation ethic. He is in the center, with binoculars, listening to a German forester talk about the Colditz Forest near Dresden, which was put under intensive forest management in 1822.

> from domination) of the intricate ecological processes of nature, and may end up by getting both.[61]

Leopold's optimism was premature, as during his trip he came to fathom the full depth of Germany's political degeneration. The "infinite pains" would not soon ease and would extend far beyond forestry and wildlife management. In general, Leopold confined his views on the political situation in Germany to unpublished (at the time) correspondence and manuscripts. He returned to the United States with a fatalistic expectation that war would soon come. The reality would become personal when, several years later, Leopold provided assistance from afar to the family of a German Jewish colleague who had escaped the concentration camps at Dachau and Buchenwald.

The implications of Leopold's direct encounter with fascism remain another underexplored area of scholarship. Its lasting impact on Leopold's worldview and on his conservation ethic, however, was clear. In both culture and conservation, society had to overcome—*dismantle* we would now say—self-destructive systems of dominance, oppression, and violence. The theme recurred with increasing regularity and urgency for the remainder of his life. In a 1939 article on conservation and agriculture, for example, he stated:

> Sometimes I think that ideas, like men, can become dictators. We Americans have so far escaped regimentation by our rulers, but have we escaped regimentation by our own ideas? I doubt if there exists today a more complete regimentation of the human mind than that accomplished by our self-imposed doctrine of ruthless utilitarianism.[62]

In "The Land Ethic," Leopold alluded specifically to contemporary fascism:

> In human history, we have learned (I hope) that the conqueror role is eventually

> self-defeating. Why? Because it is implicit in such a role that the conqueror knows, *ex cathedra*, just what makes the community clock tick, and just what and who is valuable, and what and who is worthless, in community life. It always turns out that he knows neither, and this is why his conquests eventually defeat themselves.[63]

Recent characterizations of Leopold as an "ecofascist" fail to account for Leopold's personal response to actual fascism. More broadly, they fail to examine how Leopold worked to reconcile and balance the individual and collective well-being of people in society and within entire ecological systems. Environmental philosopher Michael P. Nelson importantly notes, "It is of vital importance to note that when Leopold speaks of [the] 'extension of ethics,' he uses words like 'accretions' to refer to the land ethic. He goes to lengths to point out that the land ethic only 'enlarges the boundaries of the [moral] community,' and therefore our ethical obligations still include our 'fellow members.'"[64] Luna Leopold saw this reflected in his father's thinking as well, holding that "the idea of an ethical view of land was a gradual outgrowth of his concern for individual people, an extension of his innate feeling that all persons have good and interesting qualities that must be understood and respected."[65]

Postwar Prospects World War II was an unprecedented global ethical crisis for the generation that endured it. Coming out of the war experience, leading public figures—diplomats, journalists, writers, philosophers, cultural critics—would examine the forces of dehumanization, racism, and alienation from nature for insights into the human condition and the rise of twentieth-century totalitarianism. Such thinkers as Dietrich Bonhoeffer, Hannah Arendt, Hans Jonas, Albert Schweitzer, W. E. B. Du Bois, Jacques Ellul, and Lewis Mumford (among many others) grappled with these systemic theological and ethical issues. Mumford wrote in *The Conduct of Life* (1951):

> So habitually have our minds been committed to the specialized, the fragmentary, the particular, and so uncommon is the habit of viewing life as a dynamic inter-related system, that we cannot on our own premises recognize when civilization as a whole is in danger; nor can we readily accept the notion that no part of it will be safe or sound until the whole is reorganized.[66]

To affect that reorganization, national and international institutions had to reform themselves—or be created whole cloth. These years brought into being the United Nations and the Universal Declaration of Human Rights. In the United States, they marked the high-water mark of labor union membership and the stirring of the reinvigorated civil rights movement.

Even as the postwar "Great Acceleration" was commencing, leading conservationists were circling around similar points of convergence. In a 1944 article, "Post-War Prospects," Leopold stated that "The impending industrialization of the world, now foreseen by everyone, means that many conservation problems heretofore local will shortly become global."[67] He would live only three more years after the war, but it was a time of transformation in the conservation movement, and in the intensity of Leopold's personal response to the prospects for humanity and the ecosphere. The aforementioned books *Road to Survival* and *Our Plundered Planet* viewed that global future through a neo-Malthusian lens. In recent critiques, Leopold has been presented as engaging in this same school of "ethically questionable" thought, guilty of misanthropy by association especially with William Vogt.[68]

The recent critiques of Leopold on this point rarely if ever cite "The Land Ethic." This is an oddity, given that it is generally regarded as Leopold's last and most enduring contribution to conservation thought and probably the most widely read and closely scrutinized of all his writings. What such critiques miss is the thrust of Leopold's postwar ethical leap forward: his alarm at the prospect of new war-spawned research and technologies, untethered by ethical constraints, aligned with growth-at-all-costs economics, and oblivious to the health and resilience of human and ecological communities.

In a June 1947 speech "The Ecological Conscience" (a predecessor to "The Land Ethic"), Leopold bluntly stated: "Cease being intimidated by the argument that a right action is impossible because it does not yield maximum profits, or that a wrong action is to be condoned because it pays." He then made an explicit connection between exploitation of people and land. "That philosophy is dead in human relations, and its funeral in land-relations is overdue."[69] Global conflagration and the deployment of destructive technologies had tempered Leopold's characteristic progressive outlook. He wrote—albeit in the gendered language of the time—that "[i]t has required 19 centuries to define decent man-to-man conduct and the process is only half done; it may take as long to evolve a code of decency for man-to-land conduct."[70]

Such passages (among many others) reveal Leopold in his late years as anti-imperialist, anti-dominionist, and antifascist. If, as a pragmatist, he was not fully anti-capitalist, he was fundamentally opposed to

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The time spent at the "shack" on the family's land near Baraboo, Wisconsin, became essential to Aldo Leopold's writings about conservation. Back row: Aldo, Estella Bergere Leopold, Luna, and Starker; front row: Nina, Estella Jr.

the anthropocentric ethos of land commodification, expressed with particular violence through capitalism, but also through "all the new isms—Socialism, Communism, Fascism, and especially the late but not lamented Technocracy."[71] And if he was not directly or actively anti-racist, he was increasingly explicit in framing his value system as one grounded in a commitment to just human relations. That is what the Great Depression, the Dust Bowl, the rise of totalitarianism, the trauma of World War II, unleashed wartime technologies, and contemplation on the root causes of land abuse brought to the fore in Leopold's final expression of a land ethic. His rendering of a land ethic was essentially, in its own way, a postwar product.

THE LAND ETHIC AND SOCIAL EVOLUTION

Leopold died in April 1948 at sixty-one. *A Sand County Almanac* was published in the fall of 1949, with "The Land Ethic" as its capstone essay. Leopold would become closely identified with the term and the concept. However, he was careful *not* to claim it as his own and to build resilience into his call. He wrote, "I have purposely presented the land ethic as a product of social evolution because nothing so important as an ethic is ever 'written'." He understood that no one individual could compose an ethic; that any ethic is and must be a collective cultural effort, ever-emerging and always evolving "in the minds of a thinking community."[72]

That process began immediately among his contemporaries in conservation and included voices who explicitly drew connections between social reform and ecological wellbeing. Paul Sears, who succeeded Leopold as president of the Ecological Society of America, wrote in 1950, "It may be that we shall presently begin to use science in a new and worthier way, to give us our bearings, to help us understand the ecology of our own

species. To this end we must weave together all that we know of ourselves and of the physical world."[73] In 1954, as the Supreme Court was handing down its *Brown v. Board of Education* decision, Leopold's close colleague Olaus Murie, a leading wildlife biologist, remarked to his fellow professionals, "Thoughtful people are trying to understand our place in Nature, trying to build a proper social fabric, groping for a code of ethics toward each other and toward nature. The current controversies in the diverse field of conservation are an expression of this ethical struggle."[74] As the late Barry Lopez observed, "Leopold articulated an ethic . . . embedded in the lives of the people around him. And in *A Sand County Almanac* he gave it a setting in which many in his Anglo readership saw the outlines of something crucially important to ethical living, something they had not seen before."[75]

Leopold's book sold modestly at first, but became more readily available through paperback editions published as the modern environmental movement emerged in the 1960s and 1970s. The land ethic reached a new generation of adherents, at least some of whom saw, and fostered, connections between conservation and social justice movements. For example, Trappist monk, theologian, and social activist Thomas Merton, in a 1968 book review, commented that Leopold "understood that the erosion of American land was only part of a more drastic erosion of American freedom, of which it was a symptom."[76] In his speeches on the first Earth Day in 1970, Senator Gaylord Nelson (from Leopold's state of Wisconsin) stated, "Our goal is not just an environment of clean air and water and scenic beauty. The objective is an environment of decency, quality and mutual respect for all human beings and all living creatures."[77]

In these same years of evolving public environmental consciousness, other voices emerged to speak to the convergence of social justice, cultural change, and environmental ethics. Kiowa writer, poet, and artist N. Scott Momaday, who in 1969 became the first Native American to receive the Pulitzer Prize, provided his statement of "An American Land Ethic" in 1971: "We Americans need now more than ever before—and indeed more than we know—to imagine who and what we are with respect to the earth and sky. . . . We must live according to the principle of a land ethic. The alternative is that we shall not live at all."[78] The late ecofeminist scholar Karen Warren recalled first reading the opening of "The Land Ethic" in 1973. "I was a philosophy graduate student in a virtually all-male department, writing a doctoral dissertation in a field too young yet to have a name, on a topic deemed by fellow analytic philosophers to be outside the boundaries of professional respectability. Yet I persevered, and nearly twenty-five years later, I vividly recall the profound sense of awakening I felt when I read that opening line."[79]

In citing such voices (among many others who might be quoted), I do not mean to imply that any continuity between Leopold's framing of "The Land Ethic" and other or subsequent expressions of an environmental ethic is frictionless. Quite the contrary. This process is rife with contrasts, varied perspectives, competing priorities, and outright contradictions. The point in providing them is to illustrate that a land ethic (however labeled) was not static and *could not be* exclusionary. In Leopold's view, such an ethic explicitly embraced people as "member[s] and citizen[s]of the land community," and placed no conditions on that membership."[80] Its core tenets of ecological interdependency inherently subvert racist, classist, sexist, and white supremacist attitudes. In the broad arc of Western conservation history, the land ethic represented a move away from a colonial and anthropocentric view of the land, and toward something more aligned with Indigenous views on intergenerational obligations and kinship among all beings and communities.[81] It may now contribute to further progress in realizing an ethic of care, responsibility, and mutual thriving among people, and between people and land.[82]

Aldo Leopold was able to outgrow himself continually across his lifetime. That capacity reflected a simple fact about Leopold: he recognized dynamic connections in the living world, in human history, in human communities, and in the human mind. He accepted the responsibilities that come with that recognition and acted upon them. This allowed him ultimately to push conservation's boundaries of ethical consideration outward and provide new foundations for the dominant society's expanding environmental awareness. That said, he did not live long enough to reinforce all the connections that are now so urgent, overdue, and necessary—connections among all our diverse ecosystems and communities; connections across disciplines; connections among different belief systems; and connections between justice and conservation.

Leopold once defined conservation, "viewed in its entirety," as "the slow and laborious unfolding of a new relationship between people and land."[83] That "unfolding" predated Leopold and has never stopped in the decades since Leopold wrote those words. Contemporary scientists, scholars, and writers such as Momaday, Robin Kimmerer, and Kyle Powys Whyte remind us that the "new" relationship in fact has ancient foundations and now entails the reclamation of venerable Indigenous traditions of reciprocity between

people and land. As geologist and writer Lauret Savoy has asked, with reference to the African American experience of land relations and the development of her racial and environmental consciousness: "Did Aldo Leopold consider me?"[84] If in the past, conservation—and the ethical frames that have informed it—were all too monolingual and monochromatic and monocultural, they must now draw on diverse voices from cultures, knowledge systems, and faith traditions from throughout the world. Through all this, posterity may come to regard Leopold not as an apotheosis of conservation, but as an essential transitional figure within a still broader, ongoing movement, informed by an ever-evolving ethic of care.

PROGRESS AMID INTERSECTING CRISES

The scrutiny being given to Leopold and other notable figures in the history of conservation and environmentalism will, and must, continue. Perhaps archives will yield additional statements and evidence that further undermine their iconic status. So be it. Better real, limited, and fallible human beings than unimpeachable icons. The work of self-scrutiny applies to the present as well, in the active countering of the same elements of racism and injustice in our own lives that we identify in historic figures.

But this moment especially demands even more. We live amid accelerating and interconnected crises: global health and public health, climate disruption, biodiversity loss, water degradation, food insecurity, social and economic inequality, racism, and democratic governance under assault. The times require new ethical frames that address the structures and systems of environmental exploitation that Leopold and at least some of his contemporaries confronted. They call on us to connect that legacy to current efforts to change entrenched structures and systems of human exploitation and oppression.

The urgent need is to overcome institutional racism within and beyond the environmental movement. Conservationists, environmentalists, and society in general must move forward in tangible ways. More than thirty years have passed since the First National People of Color Environmental Leadership Summit brought the environmental justice movement into the national spotlight. We can no longer pretend that our intersecting crises are, or can be addressed as, separate "issues." We can no longer ignore the fact that their impacts fall unequally on different parts of the human community, or that these disparities are structural, racial, and gendered. And we can no longer put off addressing them until some indefinite future.

Progress requires engaging all our human ways of knowing and being—Indigenous and Western, urban and rural, scientific and artistic, economic and ethical, material and spiritual. As the late author and activist bell hooks stated, "to tend the Earth is always . . . to tend our destiny, our freedom, and our hope."[85] Our common future depends on forging an ethic that includes and reflects diverse voices, values, faith traditions, and knowledge systems. Leopold memorably wrote that "one of the penalties of an ecological education is that one lives alone in a world of wounds."[86] Those wounds are ecological *and* social, they are profoundly connected, and their common causes and consequences run deep. Recognizing those connections, in all their dimensions, is an essential step in moving toward healing and renewal.

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NOTES

1. Dorceta E. Taylor provides an essential historical overview in *The Rise of the American Conservation Movement: Power, Privilege, and Environmental Protection* (Durham, NC: Duke University Press, 2016). Karl Jacoby, in *Against Nature: Squatters, Poachers, Thieves, and the Hidden History of American Conservation* (Berkeley: University of California Press, 2014), details exclusionary practices behind the establishment of parklands. Ellen Griffith Spears' *Rethinking the American Environmental Movement Post-1945* (New York: Routledge, 2019) provides a more intersectional history of the environmental movement. Michelle Nijhuis' *Beloved Beasts: Fighting for Life in an Age of Extinction* (New York: W. W. Norton & Company, 2021) is a compact overview of the history of wildlife and biodiversity conservation.
2. Taylor, *Rise of the American Conservation Movement*, 9.
3. Aldo Leopold, *A Sand County Almanac and Sketches Here and There* (New York: Oxford University Press, 1949), viii.
4. Aldo Leopold, "Foreword," in *Companion to* A Sand County Almanac: *Interpretive and Critical Essays*, ed. J. B. Callicott (Madison: University of Wisconsin Press, 1987), 282.
5. Curt Meine, *Aldo Leopold: His Life and Work* (Madison: University of Wisconsin Press, 1988, 2010), 51.
6. Leopold, *A Sand County Almanac*, 154.
7. Luna B. Leopold, ed., *Round River: From the Journals of Aldo Leopold* (New York: Oxford University Press, 1953), 145; Qi Feng Lin, "Aldo Leopold's Unrealized Proposals to Rethink Economics," *Ecological Economics* 108 (Dec. 2014): 104–114.
8. Aldo Leopold, "The Conservation Ethic," in *The River of the Mother of God and Other Essays by Aldo Leopold*, eds. Susan Flader and J. B. Callicott (Madison: University of Wisconsin Press, 1991), 188. This passage appears in Leopold's article "The Conservation Ethic," first published in the *Journal of Forestry*. Q. F. Lin, in "Aldo Leopold's Life–work and the Scholarship It Inspired," *Socio-Ecological Practice Research* 2(1): 10–11, notes, the article "was reprinted in 1946 under the title 'Racial Wisdom and Conservation' in [the] *Journal of Heredity*. Leopold's conservation ethic was introduced in the preamble as providing an ecological basis for eugenics. How the article came to be republished here is unclear. There is no evidence that Leopold was aware of or acceded to this use of his article."
9. Leopold, "The Arboretum and the University," in *The River of the Mother of God*, 209–11.
10. Eve Andrews, "Why Does Environmentalism Have a Dark Side?" *Grist*, 29 August 2019, https://grist.org/article/why-does-environmentalism-have-a-dark-side/; Wanjiku Gatheru, "It's Time for Environmental Studies to Own Up to Erasing Black People," *Vice*, 11 June 2020. https://www.vice.com/en/article/its-time-for-environmental-studies-to-own-up-to-erasing-black-people/; and Mallika A. Nocco, et al., "Mentorship, Equity, and Research Productivity: Lessons from a Pandemic," *Biological Conservation* 255:108966, https://doi.org/10.1016/j.biocon.2021.108966.
11. Miles A. Powell, "'Pestered with inhabitants': Aldo Leopold, William Vogt, and More Trouble with Wilderness," *Pacific Historical Review* 84(2) (2015), 205.
12. Powell, "Pestered with inhabitants," 220–21.
13. Andrews, "Why Does Environmentalism Have a Dark Side?"
14. Aldo Leopold, "Wilderness as a Form of Land Use," in *The River of the Mother of God*, 134–42.
15. Aldo Leopold, "The River of the Mother of God," in *The River of the Mother of God*, 127.
16. Aldo Leopold, "The Wilderness and Its Place in Forest Recreational Policy," in *The River of the Mother of God*, 721.
17. Leopold, "Wilderness as a Form of Land Use," 135.
18. Aldo Leopold, "Conserving the Covered Wagon," in *The River of the Mother of God*, 130.
19. Leopold, "Wilderness as a Form of Land Use," 137.
20. Leopold, "Wilderness as a Form of Land Use," 138.
21. Leopold, "Conserving the Covered Wagon, 129.
22. Leopold "Wilderness as a Form of Land Use," 134.
23. Leopold, *A Sand County Almanac*, 188.
24. Leopold, *A Sand County Almanac*, 200.
25. Leopold, *A Sand County Almanac*, 200.
26. Leopold, "Wilderness as a Form of Land Use," 135–36.
27. Leopold, *A Sand County Almanac*, viii.
28. Leopold, *A Sand County Almanac*, viii.
29. Leopold, *A Sand County Almanac*, 174.
30. Prakash Kashwan, "American Environmentalism's Racist Roots have Shaped Global Thinking about Conservation," *The Conversation*, 2 September 2020, https://theconversation.com/american-environmentalisms- racist-roots-have-shaped-global-thinking-about-conservation-143783.
31. Powell, "Pestered with inhabitants," 195.
32. Andrews, "Why Does Environmentalism Have a Dark Side?"
33. Aldo Leopold, "The Game Cycle: A Challenge to Science," *Outdoor Nebraska* 9(4): 14.
34. Aldo Leopold, *Game Management* (New York: Charles Scribner's Sons, 1933), 49.
35. Leopold, *A Sand County Almanac*, 186.
36. Leopold, *A Sand County Almanac*, 220.
37. Leopold, "Land-use and Democracy," in *The River of the Mother of God*, 298.
38. Leopold, "A Biotic View of Land," in *The River of the Mother of God*, 270. In "The Land Ethic" in *A Sand County Almanac*, Leopold changed "pioneering philosophy" to "our current philosophy" (220).
39. William Vogt, *Road to Survival* (New York: William Sloane Associates, 1948) and Fairfield Osborn, *Our Plundered Planet* (New York: Little, Brown and Company, 1948).
40. Leopold, *A Sand County Almanac*, 204.
41. One youthful encounter did evidently leave a strong (if naïve) impression on Leopold. As a seventeen-year-old he had the opportunity to attend a lecture by Charles Eastman (Ohíye S'a), the prominent Santee Dakota (Isányathi) physician, writer, and reformer. "Some words and phrases which I have never heard anywhere else impressed me particularly," Leopold wrote to his mother. "He said, after speaking of the Indian's knowledge of nature, 'Nature is the gate to the Great Mystery.' The words are simple enough, but the meaning unfathomable." Curt Meine (ed.) *Aldo Leopold: A Sand County Almanac and Other Writings on Ecology and Conservation* (New York: Library of America, 2013), 705.
42. Leopold, "A Criticism of the Booster Spirit," in *The River of the Mother of God*, 102.
43. Meine, *Aldo Leopold*, 35.
44. Leopold, "The River of the Mother of God," 123.
45. Leopold, *A Sand County Almanac*, 150.
46. Leopold, *A Sand County Almanac*, 137.
47. Leopold, "'Piute Forestry' vs. Forest Fire Prevention," in *The River of the Mother of God*, 114–22.
48. Leopold, "Grass, Brush, Timber, and Fire in Southern Arizona," in *The River of the Mother of God*, 114–122.
49. In *Game Management*, Leopold wrote, "The central thesis of game management is this: game can be restored by the creative use of the same tools which have heretofore destroyed it—axe, plow, cow, fire, and gun" (vii).
50. Kyle Powys Whyte, "How Similar Are Indigenous North American and Leopoldian Environmental Ethics?" SSRN (March 1, 2015): http://dx.doi.org/https://doi.org/10.2139/ssrn.2022038.
51. Estella Leopold Jr., *Stories from the Shack: Sand County Revisited* (New York: Oxford University Press, 2016), 296.
52. Meine, *Aldo Leopold*, 528.
53. Sumner Matteson, *Afield: Portraits of Wisconsin Naturalists, Empowering Leopold's Legacy* (Mineral Point, WI: Little Creek Press, 2020), 214.
54. Matteson, *Afield*, 179. Ruth Hine, the first woman to earn a PhD in zoology at the University of Wisconsin, remained a close friend of the Leopold family, and credited Leopold's writing with "[having] had more of an effect on me than anything in my thinking." It is possible that Leopold

favored accepting only men as students in the immediate postwar rush of student applications under the G.I. Bill.

55. Thomas Tanner, *Aldo Leopold: The Man and His Legacy*, 3rd ed. (Ankeny, IA: Soil Conservation Society of America, 1987), 165).
56. Louise Fabiani, "When Wilderness was Strictly Whites-Only," *Pacific Standard*, 14 June 2017. https:/psmag.com/news/when-wilderness-was-strictly-whites-only. Gatheru, in "It's Time for Environmental Studies to Own Up to Erasing Black People," includes Leopold alongside Madison Grant and John Muir as "white supremacists that created the language of conservation to accommodate racialized conceptions of nature." S. Braun (Letter: Catt Hall in a Middle Ground, *Iowa State Daily*, 16 July 2020) similarly places Leopold in the company of William T. Hornaday in maintaining a "casual racism against Native peoples." Nocco et al. in "Mentorship, Equity, and Research Productivity," regard Leopold as an "ecofascist" with an "exclusionary legac[y]."
57. Aldo Leopold to W. Redmond Cross, 15 December 1930, Aldo Leopold Papers, Series 9/25/10–2: Organizations, Committees, UW Archives.
58. Aldo Leopold, "Erosion as a Menace to the Social and Economic Future of the Southwest," *Journal of Forestry* 44(9) (1946): 627. The passage was drafted in 1922 but not published until 1946; and also appears in a popular article "Pioneers and Gullies," in *The River of the Mother of God*, 106–133.
59. A cursory review of Leopold's archival papers does not provide any indication that Leopold was aware of the anthropologist Franz Boas, who countered the eugenicists' racist pseudoscience. See Charles King, *Gods of the Upper Air: How a Circle of Renegade Anthropologists Reinvented Race, Sex, and Gender in the Twentieth Century* (New York: Doubleday, 2019).
60. Leopold, "The River of the Mother of God," in *The River of the Mother of God*, 127.
61. Leopold, "Notes on Wild Life Conservation in Germany," *Game Research News Letter* 6(3)(1935), UW-Madison Department of Forest and Wildlife Ecology.
62. Leopold, "The Farmer as A Conservationist," in *The River of the Mother of God*, 259.
63. Leopold, *A Sand County Almanac*, 204.
64. Michael P. Nelson, "Holists and Fascists and Paper Tigers… Oh My!" *Ethics and the Environment* 1(2)(1996): 110.
65. Tanner, *Aldo Leopold*, 165. Luna offered similar remarks, refuting the charge of ecofascism, in his foreword to Robert A. McCabe's 1987 book *Aldo Leopold: The Professor* (Madison, WI: Rusty Rock Press): "Rather than interpreting the concept of the land ethic as an indication of disregard for the individual in favor of the species or the ecosystem, my view is quite different. I see the concept of the land ethic as the outgrowth and extension of his deep personal concern for the individual. Accepting the idea that the cooperations and competitions in human society are eased and facilitated by concern for others, he saw that the same consideration extended to other parts of the ecosystem would tend to add integrity, beauty, and stability to the whole."
66. Lewis Mumford, *The Conduct of Life* (New York: Harcourt, Brace and Company, 1951), 12.
67. Leopold, "Post-war Prospects," *Audubon Magazine* 46(1): 27.
68. Powell, "Pestered with inhabitants," 196.
69. Leopold, "The Ecological Conscience," in *The River of the Mother of God*, 346.
70. Leopold, "The Ecological Conscience," 345.
71. Leopold, "The Conservation Ethic," in *The River of the Mother of God*, 188.
72. Leopold, *A Sand County Almanac*, 225.
73. Paul B. Sears, *Charles Darwin: The Naturalist as a Cultural Force* (New York: Charles Scribner's Sons, 1950), 94.
74. Olaus J. Murie, "Ethics in Wildlife Management," *Journal of Wildlife Management* 18(3) (1954): 289.
75. Barry Lopez delivered these remarks on April 23, 2017, in the 1st Annual Leopold Lecture at the National Hispanic Cultural Center, Albuquerque, New Mexico. I am grateful to Dr. Pricilla Solis Ybarra for sharing her recording of Lopez's lecture.
76. Thomas Merton, "The Ecological Conscience," *The Catholic Worker* 34(5): 4.
77. Gaylord Nelson, "Partial Text for Senator Gaylord Nelson, Denver, Colo., April 22, 1970," UW-Madison Nelson Institute for Environmental Studies, http://www.nelsonearthday.net/docs/ nelson_26-18_ED.
78. N. Scott Momaday, *The Man Made of Words: Essays, Stories, Passages* (New York: St. Martine's Press, 1997), 47, 49.
79. Warren continues: "Unlike Leopold, I went on to develop a different position, ecofeminism, which explores important connections between the domination of women, people of color, children, the poor, Third World and indigenous peoples, and the domination of nonhuman nature. Unlike Leopold, I went on to argue that an environmental ethic which fails in theory or practice to reflect ecofeminist insights into the nature of these connections is inadequate. Still, it was Leopold's description of land as property and his association of land with 'slave-girls' which first inspired me to think not only about 'an ethic, ecologically' but about the gendering of human-nonhuman relationships." "The Legacy of Leopold's 'The Land Ethic,'" *Reflections* (August 1998), http://ruby.fgcu.edu/courses/bhalvers/ids3920/LeopoldEssay4.htm.
80. Leopold, *A Sand County Almanac*, 204.
81. Whyte notes that such comparisons "can be considered important today because they are a potential option for bringing together environmentalists of all heritages in North America based on a common ethical orientation." As noted above Whyte also cautions, critically, that "any potential comparison" necessarily entails "sobering acknowledgment of and openness to differences between Leopoldian and Indigenist ethics." See: "How Similar Are Indigenous North American and Leopoldian Environmental Ethics?"
82. Robin Kimmerer writes: "The next step in our cultural evolution, if we are to persist as a species on this beautiful planet, is to expand our protocols for gratitude to the living Earth. Gratitude is most powerful as a response to the Earth because it provides an opening to reciprocity, to the act of giving back." "Returning the Gift," *Center for Humans and Nature*, October 1, 2013, https://humansandnature.org/earthethic-robin-kimmerer.
83. Aldo Leopold, "Wisconsin Wildlife Chronology," *Wisconsin Conservation Bulletin* 5(11) (1940): 8.
84. Lauret Savoy, *Trace: Memory, History, Race, and the American Landscape* (Berkeley, CA: Counterpoint Press, 2015), 34. Savoy's book chapter as a whole constitutes a response to her question. She writes: "The scope of America's 'thinking community' remains narrow. A democratic dream of individual liberties and rights hasn't yet contributed to a 'co-ordinated whole'—whether human, biotic, or the land. Danger lies in equating theory with practice, or ideal with committed action, as personal responsibility and respect for others, and for the land, can be lost to lip service, disingenuous manners, and legislated gestures to an ideal."
85. Alison H. Deming and Lauret E. Savoy, (eds.) *The Colors of Nature: Culture, Identity, and The Natural World* (Minneapolis: Milkweed Editions, 2002), 15.
86. Leopold, *Round River*, 165.

BY JULIE DUNLAP

Camp Long Run

Aldo Leopold and the Yale Forest School Camp of 1907

[1907]

Milford - July 4, 1904.

My dear mama:- Left New Haven yesterday morning on the 10:30, after an exciting race to the Station on the deck of an express wagon. Arrived in New York at noon, where I accidentally met Jed Prouty. We had lunch together, did a little shopping, and at three took the ferry for our train on the Erie road. Right here let me extend my compliments to the road as the prettiest rootiest road in the country. But we didn't care any about that, as it was a glorious afternoon and beautiful country. It is a longer ride to

The lessons Aldo Leopold learned at the Yale Forest School summer camp would serve him well in his work as a scientist, conservationist, teacher, and ethicist.

Elk, Mexican gray wolves, and adventure recreationists still roam New Mexico's Gila Wilderness Area more than a century after Aldo Leopold envisioned its creation. In 1921, as a U.S. Forest Service assistant district forester in the Southwest, Leopold called for federal protection of the rugged and remote forest to benefit sportsmen of coming generations. He contended, "It will be much easier and cheaper to preserve, by forethought, what he needs, than to create it after it is gone."[1] Widely viewed as a rejection of forestry's founding wise-use principles, that statement was more precisely an assertion of higher uses than timber and grazing for the nation's public lands. Leopold's Gila proposal moved beyond, but also echoed, Forest Service Chief Gifford Pinchot's 1907 insight that natural resource decisions be guided by "the greatest good, for the greatest number, for the longest run."[2] With a time dimension added to a classic utilitarian axiom, Pinchot's Forest Service mission influenced Leopold's training and thinking for a lifetime. Both men defined conservation as a moral duty across generations.

Leopold belonged to the first generation of professional foresters educated in the United States at the zenith of Progressive Era conservation. While still a Yale undergraduate in 1907, the twenty-year-old boarded a train to the Yale Forest School's summer camp in Milford, Pennsylvania, for the first extensive field training of his chosen career. There he would formally embark on a lifelong search for the skills, concepts, relationships, and values essential for individuals and society to live on the land productively, responsibly, and—most important—perpetually. In a critique of Leopold's probing path toward an ecologically informed ethic, Curt Meine and Jed Meunier argue, "Forestry provided the foundation of Leopold's professional, intellectual, and ethical development."[3] His early lessons at forestry camp would profoundly influence his work as a scientist, conservationist, teacher, and ethicist, culminating in a land ethic based on long-term, intergenerational thinking. Forestry camp launched his journey from Pinchot's anthropocentric utilitarian philosophy of conservation toward a holistic and biocentric ethic for the long run.

Aldo Leopold's correspondence from the Yale Forest School camp to his family is charming, chatty, and revealing. His first letter home from the summer camp in Milford was inexplicably dated 1904.

"THE RIGHT TYPE OF MEN"

Deforestation had troubled Leopold since childhood. The family's Leopold Desk Company relied on local oak, cherry, and walnut, and the family observed that each passing year fewer pine rafts floated down the Mississippi River past their Burlington, Iowa, home. In 1904, as a senior at Lawrenceville School in New Jersey, he wrote an essay that echoed Progressive Era themes of resource conservation. Wood, Leopold argued, is a permanent necessity to the nation, "indispensable to our future welfare," yet timber famine loomed because "the lumber supply . . . once believed to be inexhaustible, is now almost used up." Like Pinchot, Leopold referred to forest crops and notes that Europeans had learned to harvest trees renewably whereas American lumbermen persisted in "careless and unnecessary methods in handling forest lands." The essay detailed "indiscriminate cutting" that left millions of treeless acres vulnerable to fire and erosion. "Where was yesterday a bountiful land," wrote the impassioned teenager, "is today a barren, lifeless, waste, destined to remain so for years to come or perhaps forever." The essay reveals Leopold's early adoption of human-centered conservation rhetoric and a precocious commitment to the prevailing view of a "rational forest policy": federal implementation of scientific forest management to check profit-driven resource abuse.[4]

In 1904, the only reputable training programs in forest management were a one-year course at the Biltmore Forest School, which emphasized lumbering and private forest management, and the graduate-level forestry school at Yale University. To train "the right type of men" to manage America's forests, Pinchot's family had endowed the school at his alma mater in 1900, and Gifford persuaded his friend and fellow Yale graduate Henry Graves to serve as director.[5] Graves and botanist James W. Toumey, the only other faculty member, scrambled to invent a curriculum; the Yale Forest School opened that September.[6]

The program built on students' required undergraduate courses in general science, presenting graduate-level introductions to forest measurement, planning, and silviculture.[7] With only limited fieldwork opportunities during the school year, in 1904 Yale added a mandatory summer term in the Pocono Mountains for entering students. Sited about a half-mile from Grey Towers, the Pinchot mansion in Milford, the camp offered a ten-week fieldwork immersion. The Pinchots granted use of more than 1,700 acres on the estate, provided tents for housing and erected a mess hall, clubhouse, classroom, and other structures. In town, the family built

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Aldo Leopold at Les Cheneaux, Michigan, in the summer of 1908, just before matriculating to the Yale Forest School.

Forest Hall, a bluestone edifice with classrooms and public lecture space seating 200.[8]

Establishment of the U.S. Forest Service in 1905 and the addition of dozens of new national forests boosted demand for trained foresters. To expedite graduations, Director Graves welcomed advanced undergraduates in Yale's Sheffield Scientific School to undertake the first year of a forestry master's during their senior year. Sheffield's civil engineering courses in particular offered math and mapping practice considered essential for technical foresters. The integrated program lasted only until 1910, but it allowed Leopold and other Sheffield students to complete their undergraduate and graduate degrees in four intense years.[9]

Shortly before Leopold matriculated to the Yale Forest School, the Forest Service issued a management guidebook, *The Use of the National Forests*, which became a basic text for Leopold and his classmates. *Use* readers were asked to imagine the nation a half-century hence, when more people and industry would demand more trees, water, and livestock forage. To be prepared, "The National Forests need more men," the *Use* book announced, "sound in body," "able to handle men well," and with "a good working knowledge of timber and lumbering, the live-stock industry, the land laws, and ordinary office work."[10] Another trait, held second only to good character, was the "forester's eye," "the power to note and understand, or seek to understand, what he sees in the forest." An essential part of the forester's equipment, the eye empowered him to "see what is wrong with a piece of forest, and what is required for its improvement," both now and decades later.[11]

Athletic, idealistic, and in love with the outdoors, Leopold itched to toss books aside and pack a trunk with blankets, rough "duds," and heavy boots.[12] In April, he wrote home eagerly, "My summer up at Milford is going to teach me many things."[13]

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THE MOST INTERESTING WORK

A dawn bird chorus woke Aldo Leopold to his first full day at camp on July 4, 1907. The day before, during the train ride from New York, he sat with "Mr. Graves, one of the instructors," the two of them botanizing from the window, which made "the time pass very pleasantly." He arrived at camp to find two rows of canvas tents, along leafy lanes marked "Broadway" and "Fifth Avenue," tucked into the woods one-half mile across the Sawkill Gorge from Grey Towers. After breakfast that first morning, he and his new campmates hiked to Sawkill Falls and dived into its deep, icy pool. "I cannot half describe what fun it is," Leopold wrote home, "but I haven't yelled so loud or enjoyed anything so much for years and years as I did that swim."[14]

One half-day each week was dedicated to dendrology, which forester Bernhard Fernow called "the main basis of the forester's art" in his 1902 textbook. Fernow, founder of Cornell's short-lived forestry program, said the biology of woody plants, their responses to climate and soil conditions, and their physical characteristics "must be known to secure the largest, most useful, and most valuable crop."[15] Though in later years Leopold would object to growing trees "like cabbages,"

Yale students at Sawkill Falls, a short walk from the summer camp, in 1908. The students built the dam to create a swimming hole. Leopold and his classmates would visit the swimming hole twice a day.

in 1907 he was keen to learn how it was done.[16]

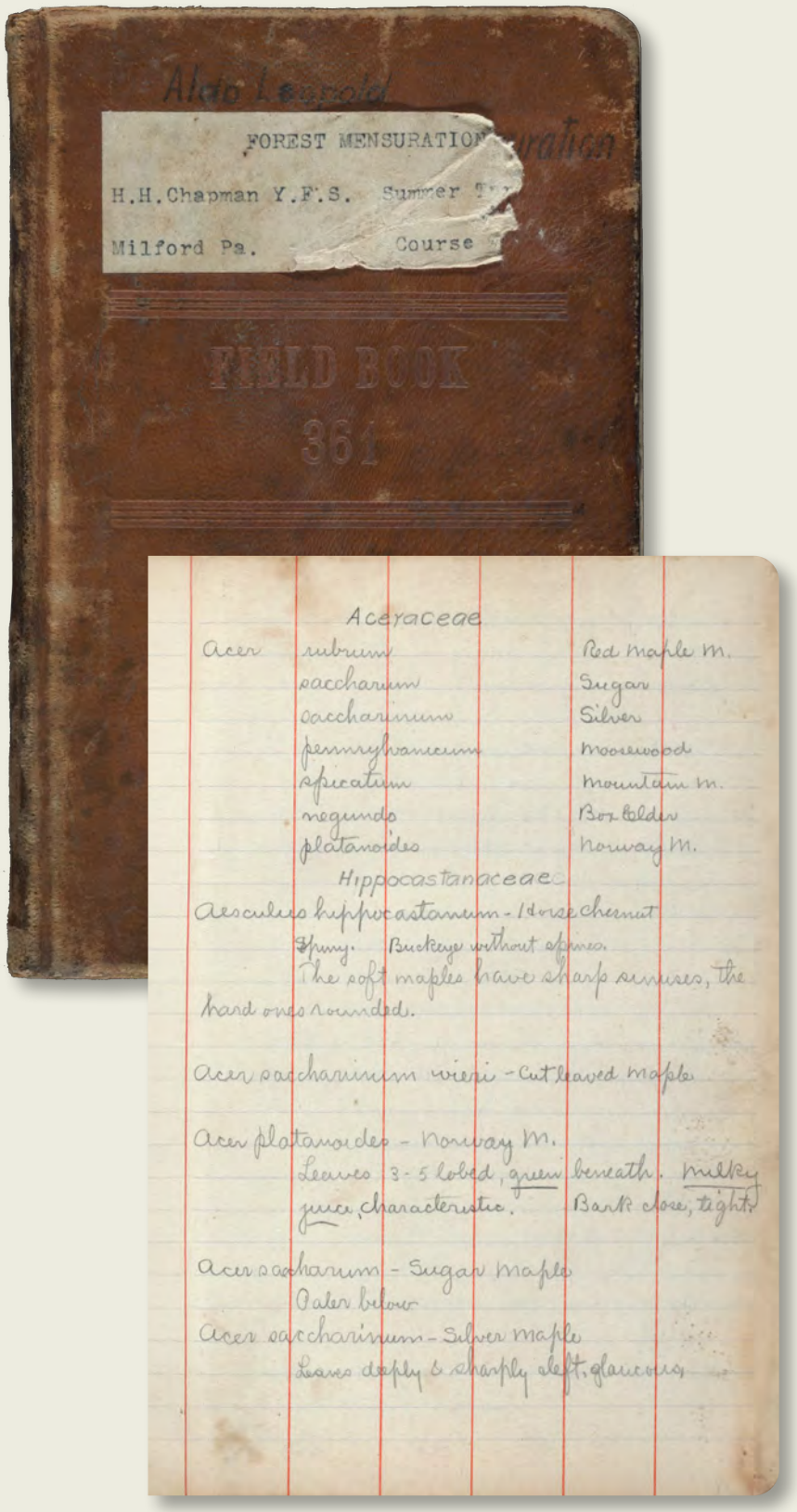
The school's dendrologist, Professor Toumey, was an innovator in silviculture.[17] Students warmed easily to the affable Midwesterner, trailing him around the estate and into the surrounding hills.[18] Identification of commercially valuable species was emphasized, but Toumey did not teach as if cellulose was "the basic forest commodity."[19] Knowledgeable about interactions among plants, soils, and climate, he highlighted effects of local conditions on tree survival and commercial yield and lectured on the roles of other plants in the forest community.[20] Leopold would not write extensively about ecology until the 1930s, but Toumey's Milford course description, as early as 1901, notes "some attention" would focus on "ecological study of the forests of the vicinity."[21]

Herbarium and lab work in New Haven had helped prepare Sheffield students for the long camp hours comparing oaks, chestnuts, pines, and hemlocks. Leopold also had the advantages of having planted trees with his grandfather, gardened with his mother, and hunted upland birds with his father. Nicknamed "the naturalist" in high school, in college he expressed surprise at some classmates' limited savvy afield.[22] "Many of the fellows not only are ignorant of the identity of things," Leopold confided to his father, "but fail to comprehend the way things hang together."[23]

As camp layered dendrology training on rich childhood experience, Leopold quickly developed his forester's eye. Toumey sharpened his ability to perceive conditions and assess the current state of plant life and nonliving forest components. Further, the training was preparing him to consider how past droughts, storms, and other events shaped today's woods, and to imagine how management choices, environmental forces, and happenstance could affect the landscape to come.

Leopold's understanding of "the way things hang together" would be encapsulated in maturity as "the odyssey of evolution."[24] Plant taxonomy lessons put into formal context his extracurricular readings of Darwin in high school and college.[25]

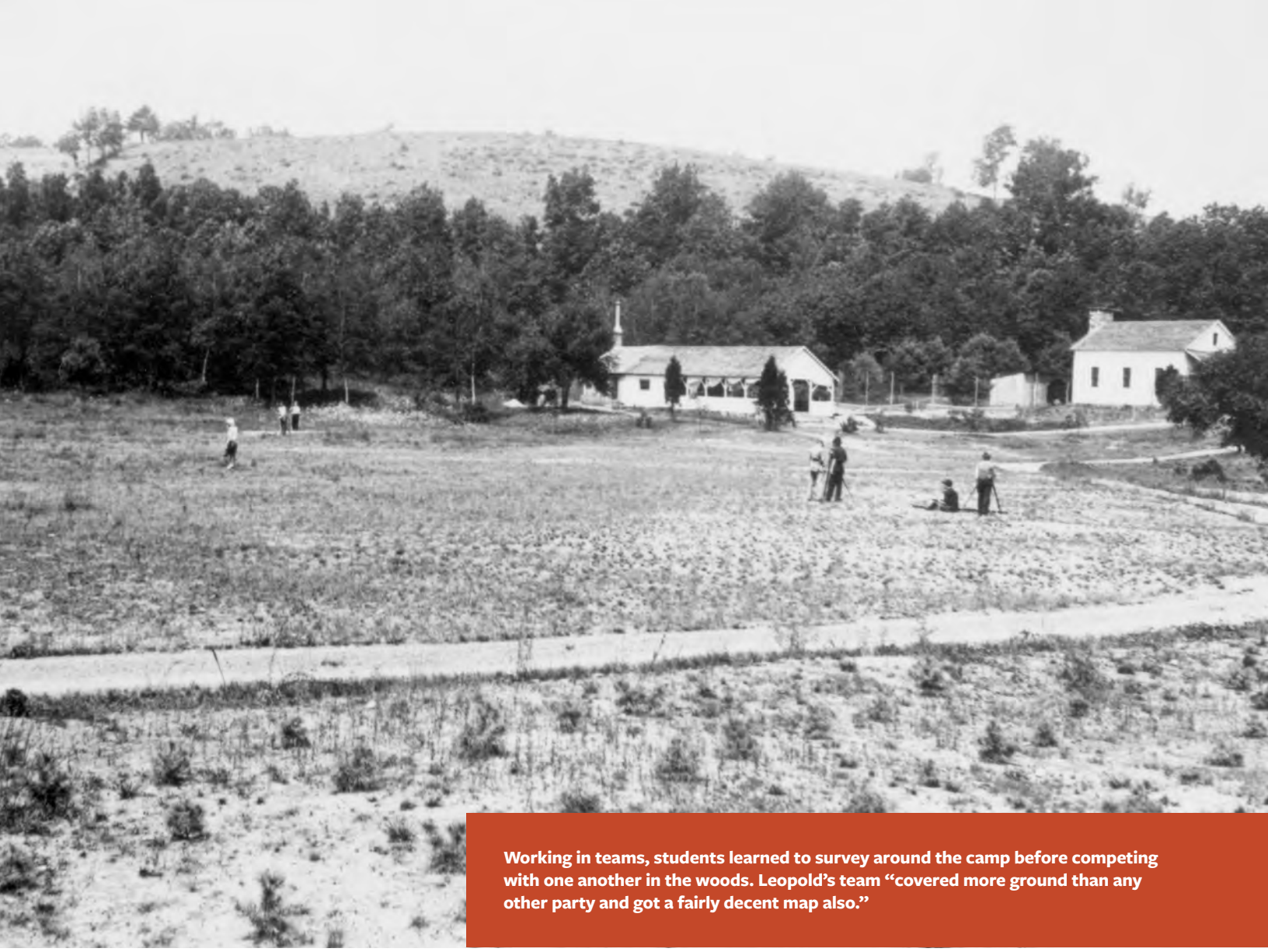
UNIVERSITY OF WISCONSIN–MADISON, ALDO LEOPOLD PAPERS: 9/25/10-12: STUDENT COURSE MATERIALS



Leopold made swift progress in learning the traits and habits of a hundred woody plants but struggled to memorize the "darn Latin names." The notebook from his Mensuration class contains long lists of plant names.

USDA FOREST SERVICE PHOTO, UNIVERSITY OF WISCONSIN–MADISON, ALDO LEOPOLD ARCHIVES, S0152

Evolutionary theory helped Leopold comprehend the interdependencies that Toumey pointed out, and also the vast reach of time required to develop such complexity at every biological level. He already grasped the idea that land is an interactive system with abiotic and biotic components, including wildlife, constantly reshaped by the struggle for existence. In high school, for example, he had pieced together how skunk cabbage blooms in spring woodlands attract flies, and flies brought hungry phoebes.[26] In Milford, he was learning to be a conscious manipulator of forest systems. But unlike those absorbed with maximizing annual timber yields, young Leopold recognized the



Working in teams, students learned to survey around the camp before competing with one another in the woods. Leopold's team "covered more ground than any other party and got a fairly decent map also."

forest as a tangled bank, dynamically intertwined through the millennia.

Two days a week, the students explored the tools and techniques of forest measurement, or mensuration, with Herman Haupt Chapman. A member of the school's class of 1904 and in only his second year of teaching, "Chappie" wrote about the direct experience each forester needed to predict the results of their work over "a generation or two," given the slow evolutionary processes behind America's wild native forests.[27] At least forty-five percent of students' time should involve outdoor application of "the science whose principles he has had ground into him at Yale."[28] The long-term goal was sustained use: "the forester must build not for present conditions but for those which can be forecast fifty years ahead when the new crops are ready to harvest."[29]

Chapman's quantitative discipline required students to calculate the volume of felled logs and standing trees, analyze and predict stand growth, and estimate the volume, worth, and growth potential of sample plots, preparatory skills for projecting timber values in large forests. In the woods with Chappie, Leopold learned to wield Biltmore sticks, calipers, hypsometers, and angle gauges with authority. Only six years later, as supervisor of the Carson National Forest in New Mexico, he would use a tool metaphor to remind his staff of their primary duty: to make responsible decisions about the forest's future. He wrote, "Our job is to sharpen our tools, and make them cut the right way."[30]

But in 1907 Aldo's most important mensuration tool was a notebook, essential for recording heights, diameters, and ages by species, calculating woodlot values in dollars and board feet, and planning cuttings to maximize long-term returns.[31] Leopold's neatly penciled notes and meticulous graphs reflect his commitment to deciphering the economic worth of standing oak, pine, and chestnut trees. Steady tree growth curves show something more: Leopold's emerging ability to use data to predict how forests change over time.

Wrangling with math, never Leopold's strong suit, detracted little from his enjoyment of mensuration. In a forest still graced with twenty-inch-diameter American chestnuts, a species that would virtually disappear in his lifetime, he said log scaling "fills me with an almost childish delight." Part of that pleasure derived from the teamwork. A day measuring mixed hardwoods with Franklin Moon and Rufus Maddox felt "very satisfactory" because "we all pull well together." He wrote home, "You don't know what a difference there is between congenial and uncongenial fellow-workers on a crew in the woods."[32] Turning tasks into friendly competitions, students competed to run the most accurate boundaries around sample one-acre plots. When Leopold's team bested Moon's, the winners' celebration "nearly rooted up the underbrush."[33] Working with others toward shared goals of land improvement would bring Leopold delights (and dilemmas) for the rest of his life.

As weeks passed, Leopold took pride in his growing skills and wrote home in admiration of his "very interesting" instructor. The letter recounted that as a government forester Chapman had resisted pressures to clear-cut public land in favor of leaving twenty percent of the trees for seed.[34] Decades later, in *A Sand County Almanac*, Leopold pointed to a preference for natural reproduction "on principle" as a hallmark of foresters enlightened by ecology and ethics.[35] Chappie's students learned to think analytically and with foresight, and Leopold probably spoke for many when writing home, "It is the most interesting work I have ever done, this estimating."[36]

Three full days a week were devoted to forest surveying. By 1907, thanks to forestry professionals, the rough outlines of the original forest reserves were being redrawn and new national forest borders finalized. "Every section of land is examined, mapped, and described," declared the *Use* book, "and the boundaries are drawn to exclude, as far as possible, everything which does not properly belong in a National Forest."[37]

Taught by a structural engineer, Sheffield School's John C. Tracy, the camp surveying course drilled proper handling of chains, compass, plane table, and transit, and demanded accuracy and speed in analyzing and mapping the landscape. In surveying too, Sheffield students had an edge over other campers. A fall 1906 workshop had exposed them to field instruments, and spring courses in mechanics, strength of materials, and timber construction had introduced them to Tracy.[38] Tracy's tough assignments launched students into a series of "Work Like the Devil Spells," and a single engineering problem might keep Leopold indoors all day.[39] Leopold found the subjects "hard but very interesting" and listened receptively when the professor argued that the most successful government foresters were, increasingly, civil engineers. Subsequent observations of channelized streams, drained marshes, and other engineered habitat degradation would reshape his views, but in 1907, he wrote approvingly, "I am glad our courses in that line are under a real hustler like Tracy."[40]

In a way, the demanding Tracy had fueled Leopold's expectations for forestry camp. "I am glad I am going to Milford next summer," he wrote home from New Haven in February 1907. "Tracy has persuaded me of late that I don't know a darn thing about anything."[41] Yet in the Poconos, Leopold warmed to his taskmaster. The professor still pushed students to meet high standards, but Leopold reported home that this time he "came out very well."[42] At the first campfire, Tracy gave a "wonderful" talk on Yale spirit.[43] One memorable night, instead of using the transit to shoot Polaris, Tracy's class trained it on a partial lunar eclipse.[44] A few nights later, when Tracy announced his departure for vacation, Leopold opined, "The old boy is certainly a wonderful man."[45]

The new surveying instructor's approach suited Leopold still better. "It is less tedious than the engineering methods," he wrote home, "being rough work and covering vastly more ground."[46] In early August, the crews spent days running valuation surveys of a 125-acre woodlot south of Grey Towers. He admired the "magnificent" white oaks but lamented his crew's inaccuracy, hoping that "perhaps the light will shine into their well-meaning craniums one of these days and then Crew 8 will improve its reputation for hustling."[47]

The course capstone was a multiday traverse down the Raymondskill. Covering fifteen to twenty square miles—fast—down the rugged creek tested the limits of their capabilities: "Our topography is rather difficult, as it includes some very high cliffs (400 feet). . . . There is also a big timbered section with crooked roads where long shots are impossible and progress slow."[48] Relishing another competition, Leopold's team trudged through drenching rains and plotted late into the night. In the end, "We covered more ground than any other party and got a fairly decent map also."[49] Leopold's high praise for his partner, Everett "Mac" MacDaniels, reflects the value both placed on field hardiness: "You can't kill Mac with mere work—he is a regular ox and never dies."[50]

Motivation to win and to excel physically and mentally stemmed from a keen sense of responsibility to himself, his family, and the public weal. "I have as good a chance as any man ever had," he wrote home, "so trust me to make good."[51] But preparing for the surveying exam was still tough, Leopold explained, because "a big red moon is just climbing over the black ridge of

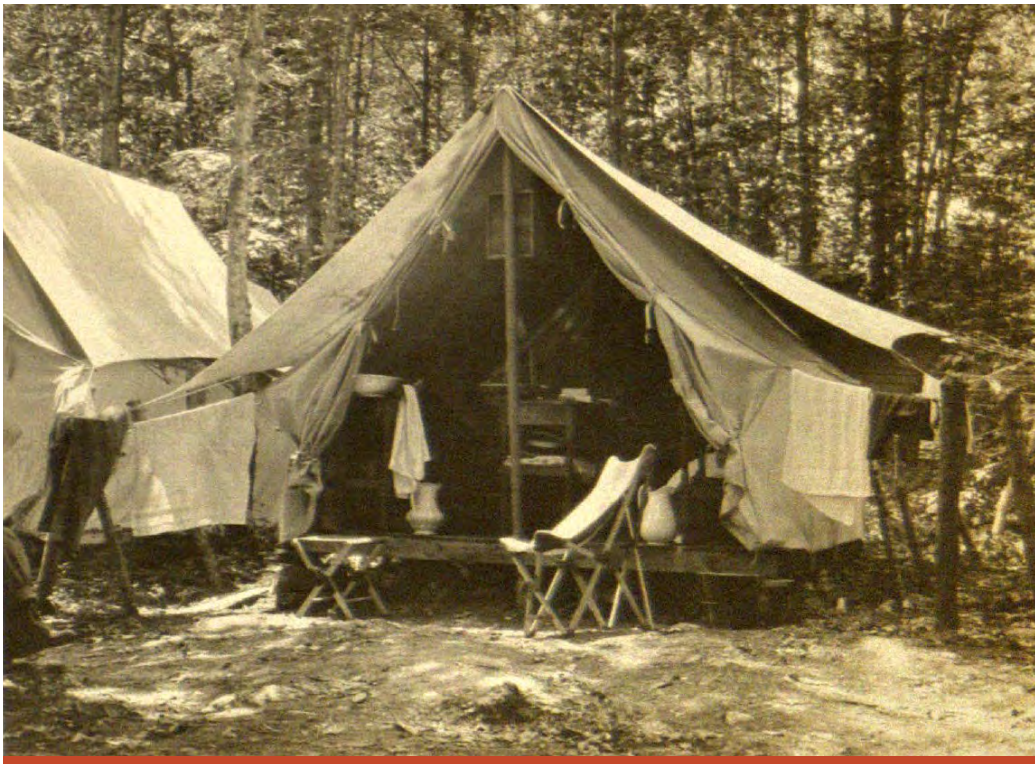
the Jersey mountains in the East, and nobody should study on such a night—not in summer time."[52]

Professor Graves must have spotted Leopold's merit and verve, choosing him for an independent assignment at the Milford Forest Experiment Station, a two-hundred-acre tract established by James Pinchot, Gifford's father.[52] One of the first such sites in the United States, the station reflected the elder Pinchot's own long view of forest science and education. "Much can be learned about the forest from studying it as it exists at the moment," wrote James Pinchot in a 1903 article about the camp, "but there are numbers of most important facts that can be learned only by observing the same tract of forest for many successive years."[53]

From the outset, Leopold reveled in his job of improvement cutting. Letters celebrate the sensory pleasure he found in sinking an ax into a pine, to "bring out the big aromatic chips so clean and white," and in his emerging prowess at felling trees.[54] A dead pitch pine is "all hell to chop" but "goes where you put it," while a chestnut "takes lots of care to keep from smashing the young growth."[55] As much as he enjoyed survey teamwork, Leopold savored his independence at the station, thinning sample plots in the cool evening hours or Sunday mornings. "I take my lunch over with me," he wrote, "and chop till dark falls over the pine woods."[56]

Leopold especially relished how improvement work sharpened his judgment. He wrote happily that "every two minutes I have to stop and figure out the pros and cons of some doubtful step."[57] Of course not every choice was the correct one. While thinning a chestnut coppice, Leopold hacked into a yellow jackets' nest, "several of whom, being conservative gentlemen, resented my proposed improvements in their little estate, and did not hesitate to let me know the trend of their opinions."[58] But biographer Curt Meine highlights the significance of this early training in practical decision making as Leopold evolved from a naturalist who loved and observed the woods, to a student mastering measurement tools, to an experienced practitioner manipulating the natural world.[59] Leopold later contended that conservation "is a matter of what a man thinks about while chopping, or while deciding what to chop." A conservationist is "one who is humbly aware that with each stroke he is writing his signature on the face of his land."[60]

JAMES LIPPINCOTT GOODWIN PHOTOGRAPHS, FOREST HISTORY SOCIETY



He wrote his mother that his tent "is in good condition, including the floor. Size about 8' x 10'. It is furnished with a good cot, a little table on which I am writing, two camp-stools and a stand for wash-outfit. . . . I am very comfortable indeed."

THE SPIRIT OF THE THING

Even as the camp honed technical competence and scientific thinking, it also prescribed active recreation on evenings, Sundays, and Wednesday afternoons. Physical hardiness, said Pinchot, was paramount for foresters who must "expect the roughest kind of life in the woods."[61] In 1907, James Pinchot installed tennis courts and supported improvements to the Sawkill Falls swimming hole. The pool, "just like heaven," offered the perfect venue to rouse before breakfast and revive after a sweaty day in the field.[62] The camp also sponsored a baseball team, with student and faculty players relishing a fierce rivalry with Milford. Leopold tried out unsuccessfully, "just for the spirit of the thing."[63]

Much of his free time was devoted to the "most *important* task" of "getting into perfect shape again physically."[64] A cross-country runner in college, he raced solo along Milford's shady roads or hiked alone up a rise behind camp to "My Hill." Occasionally camp friends might join a fishing trip or tramp in the woods, but usually he explored on his own. Observing foxes, Pileated Woodpeckers, and other

The Yale Forest School Class of 1909. Aldo Leopold is in the light colored suit in front.

familiar wildlife in Pennsylvania's forest reminded him of childhood adventures in Iowa, where he first developed "the desire to someday help out our poor ducks and other game in return for what they have been and will be to me."[65] In one letter, Aldo insisted, "we have it all here, second only to that of the old Mississippi itself."[66]

Like athletics, school campfires were intended to build lasting camaraderie. Every week or two, campers stacked oak and chestnut logs in front of the clubhouse for a bonfire.[67] Talks by faculty and visiting experts provided inspirational reminders of why the campers were working so hard to become foresters. As the evening wound down, everyone joined in singing traditional ballads and popular tunes, often with substitute lyrics poking fun at camp chow (*Oh, beans for lunch, and supper, too,/ I really think that once would do*), technical work (*Those stem analyses I'll ne'er forget. . . those volume curves divine*), and themselves (*You can bet your sunburned complexion/ We're the jolliest woodsmen in sight*).[68]

Leopold's classmate Rufus Maddox recalled that both work and play "contributed their special parts in individualizing the 1909 class members, and at the same time in converting them into a distinct

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entity in the Yale Forest School."[69] For Aldo Leopold, the shared values and fellowship built at camp helped lay a foundation for one of his most significant insights, that conservation is a collaborative enterprise. As reflected in the game cooperatives he founded in the 1930s, Leopold insisted on community as well as individual responsibilities to the land to assure its permanent protection.

THE BIOTIC ENTERPRISE

By late summer, water in the Sawkill was "colder'n Halifax."[70] Camp rhythms were also changing, as graphing, drafting, mapping, and other "indoor work" piled up.[71] One chilly morning, Leopold and Maddox built fires in the hall and the clubhouse, "so all the fellows are sitting around toasting themselves and studying, loafing, dreaming or writing according to need, temperament, or inclination."[72] Leopold had loved camp from the first day but was ready for New Haven and "hard brain work" to finish his Sheffield degree and tackle his first graduate forestry courses.[73] Fall letters from his Yale dorm confirm he felt prepared to dig deeper into dendrology, forest botany, and silviculture. The graduate curriculum still emphasized fieldwork: five half-days a week in the fall, and three days a week in spring in the first year, and four or five months in the woods in the second.[74] Ten weeks at a lumber camp near Doucette, Texas, in the summer of 1909 furnished final training in surveying, mapping, large-scale forest planning, and timber valuation, plus tours of logging operations and mills.[75] For Leopold, the Texas camp also offered a chance to handle longleaf and loblolly versions of his favorite tree.

Letters home from Texas are reminiscent of dispatches from Milford, with anecdotes, observations, worries about the Civil Service exam, and a few complaints (e.g., late delivery of gingerbread from Burlington).[76] They also reveal a new confidence in not only his abilities but also his prospective career. One telling note explains rejecting a job offer in Massachusetts state forestry; he was "bound for the Service, and no doubt about it."[77]

Leopold carried some limitations of his forestry training to his first job at the year-old Apache National Forest.[78] Without questioning, for example, he joined local campaigns to fight every fire and eliminate wolves and other livestock predators. But as he understood the forest better, he thought more independently. An article he wrote in 1918 conceded that handling timber was the forester's primary task but urged colleagues to help found a new science: game management. Allowing wild animals to vanish, without attempting management methods similar to forestry, "would be a sin against future generations."[79]

By 1928, when he left the Forest Service, Leopold's path away from anthropocentric utilitarian conservation is unmistakable. After conducting the first major game survey of the north-central states, he published the field's first textbook in 1933, the same year he became the nation's first professor of game management and research director for the new arboretum at the University of Wisconsin. *Game Management* presents tools and techniques (with tallies, maps, and growth curves recalling Milford camp notes) enabling land owners and managers to learn "the art of making land produce sustained annual crops of wild game for recreational use."[80] But his aims had changed, from producing sustained yields of quails and canvasbacks for recreationists to include restoring self-sustaining wildlife populations and habitats for their own sake. In *Game Management*, he explicitly recognizes esthetic and other values of non-game wildlife and urges land managers "to retain for the average citizen the opportunity to see, admire and enjoy" native birds and mammals.[81]

Leopold's graduate students learned the latest wildlife management and restoration methods he was pioneering at the arboretum, the Riley Game Cooperative, and his sand county farm. In some ways his tutelage resembled Chapman's in Milford, with demanding requirements for data collection,

record-keeping, and mathematical analyses coupled with creative imagining of the future landscape. Grouse and deer populations were assessed for trends, just as Milford students once compared growth in different age classes of pines, to discern problems. But influenced by Charles Elton and other ecologists, signs of trouble were analyzed as symptoms of larger ecological issues, evidence of impaired biotic community function. The aim had moved beyond individual resource development to improving land health, "the capacity of the land for self-renewal."[82] In the process, students developed an ecologist's equivalent of the forester's eye: an understanding of the woods and prairie as a dynamic whole over time, and an ability to imagine an abundant past and richer future. Their purpose had become to foster a healthy, self-renewing land organism.

A student exodus to serve in World War II gave Leopold time to write the essays that would comprise *A Sand County Almanac*. The writings illuminate further expansion of his values, as in "Wilderness" when he justifies wild land preservation on aesthetic, cultural, and scientific grounds. Wilderness, he says, is "a base datum of normality," crucial to long-term understanding of land health.[83] After forty years of study and experimentation on the land, Leopold writes most powerfully about evolved interconnections and the human duty to protect and repair them. Since Darwin, he says in "On a Monument to a Pigeon," we have known "what was unknown to all the preceding caravan of generations: that men are only fellow-voyagers with other creatures in the odyssey of evolution. This new knowledge should have given us, by this time, a sense of kinship with fellow-creatures; a wish to live and let live; a sense of wonder over the magnitude and duration of the biotic enterprise."[84]

Teaching wonder and "a warm personal understanding of land" were objects of Leopold's post-war undergraduate course, Wildlife Ecology 118. In contrast with the Milford camp, field tools were restricted to "eyes, ears, and notebook," and students who trailed him around campus and the arboretum were encouraged to enjoy the natural community and recognize their part in it. By 1947, he felt an urgency to reach beyond wildlife professionals to students in any discipline, using his teaching of ecological relationships as education toward forward-thinking land citizenship. "Once you learn to read the land, I have no fear of what you will do to it, or with it. And I know many pleasant things it will do to you."[85]

Leopold held that enduring land health relies on long-term, mountainlike thinking, on considering societal, evolutionary, even geological timescales before deciding on a course of action. His ethics remain relevant in the Anthropocene because they evolved past both the wise-use progressives and the hands-off preservationists of his day, toward a restorative vision of human-land relationships. As Leopold wrote in 1923, shortly before the establishment of the Gila Wilderness, "the privilege of possessing the earth entails the responsibility of passing it on, the better for our use, not only to immediate posterity, but to the Unknown Future, the nature of which is not given us to know."[86]

At camp in the Pennsylvania woods, he learned what and when to plant and chop, and how to lead crews in forest inventory, stand mapping, and land surveying. All were vital steps toward building a better tomorrow as then defined by wise-use conservationists. He and his classmates were consciously prepared with "the forester's long look ahead," as Gifford Pinchot said, for "the hardest kind of hard work . . . often for a distant result, the full flower of which they can not hope to live to see."[87] Those lessons did more for Leopold than whet his facility with a Biltmore stick or spark a passion for manipulating wildlife habitat to benefit hunters. His earliest professional education helped ingrain an expansive time horizon from which he could measure the success and shape the prospects of conserving the full biotic enterprise. His learning for the long run began in earnest at the Yale Forest School camp in 1907.

Julie Dunlap teaches about wildlife ecology and biological impacts of climate change at the University of Maryland Global Campus. Her most recent children's book is I Begin with Spring: The Life and Seasons of Henry David Thoreau (*Tilbury House*).

NOTES

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3. Curt Meine and Jed Meunier, "Introduction," in *Aldo Leopold on Forestry and Conservation: Toward a Durable Scale of Values*, ed. Curt Meine and Jed Meunier (Bethesda, MD: Society of American Foresters, 2017), 2.
4. Leopold, "The Maintenance of Forests 1904," in *The River of the Mother of God*, 37–39.
5. Gifford Pinchot, *Breaking New Ground* (Washington, DC: 1947; Island Press, 1998), 152.
6. James G. Lewis, "Trained by Americans in American Ways: The Establishment of Forestry Education in the United States, 1885–1911," PhD diss., Florida State University, 2001, 253. The Pennsylvania State Forest Academy opened in September 1903 but wasn't proven yet.
7. Edith Nye Macmullen, "Planting the Seed: The Origins of the Yale Forest School," *Forest History Today* Spring 1999: 15.
8. Lewis, "Trained by Americans in American Ways," 261; James Pinchot, "The Yale Summer School of Forestry," *World's Work* 8 (May–October 1903): 5391.

9. James W. Toumey, "The Yale Forest School: An Historical Sketch," in *Biographical Record of the Graduates and Former Students of the Yale Forest School* (New Haven, CT: Yale Forest School, 1913), 24.
10. U.S. Forest Service, *The Use of the National Forests* (Washington, DC: U.S. Department of Agriculture, 1907), 32–33.
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14. Letter to Clara Leopold, July 4, 1907, Leopold Papers, Box 6, Folder 2.
15. Bernhard Fernow, *Economics of Forestry* (New York: Thomas Y. Crowell, 1902), 100.
16. Aldo Leopold, *A Sand County Almanac* (1949; New York: Oxford University Press, 2020), 208.
17. Henry Graves, "James William Toumey," *Science* 75, no. 1953 (1932): 575–77.
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22. Meine, *Aldo Leopold*, 35.
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30. Aldo Leopold, "To the Forest Officers of the Carson 1913," in *The River of the Mother of God and Other Essays*, 43.
31. Leopold, Forest Mensuration Notebook for the Summer 1907 Course with Professor Herman H. Chapman, Leopold Papers, Box 2, Folder 2.
32. Letter to Clara Leopold, July 11, 1907(b), Leopold Papers, Box 6, Folder 2.
33. Letter to Carl Leopold Sr., July 25, 1907, Leopold Papers, Box 6, Folder 2. The Milford Experiment Station was established about five years before the Forest Service established its first such station, in 1908.
34. Letter to Clara Leopold, August 20, 1907, Aldo Leopold Papers, Box 6 Folder 2.
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36. Letter to Clara Leopold, July 11, 1907(b), Leopold Papers, Box 6, Folder 2.
37. *Use of the National Forests*, 8–9.
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39. Letter to Clara Leopold, January 20, 1907, Leopold Papers, Box 5, Folder 5.
40. Letter to Carl Leopold Sr., January 19, 1907, Leopold Papers, Box 5, Folder 5.
41. Letter to Clara Leopold, February 7, 1907, Leopold Papers, Box 5, Folder 5.
42. Letter to Carl Leopold, Sr., July 15, 1907, Aldo Leopold Papers, Box 6 Folder 2.
43. Letter to Clara Leopold, July 11, 1907(b), Leopold Papers, Box 6, Folder 2.
44. Letter to Carl Leopold Sr., July 25, 1907, Leopold Papers, Box 6, Folder 2.
45. Letter to Clara Leopold, July 31, 1907, Leopold Papers, Box 6, Folder 2.
46. Letter to Clara Leopold, August 30, 1907, Leopold Papers, Box 6, Folder 2.
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50. Letter to Carl Leopold Jr., September 2, 1907, Leopold Papers, Box 6, Folder 2.
51. Letter to Clara Leopold, July 11, 1907(a), Leopold Papers, Box 6, Folder 2.
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57. Letter to Clara Leopold, August 11, 1907, Leopold Papers, Box 6, Folder 2.
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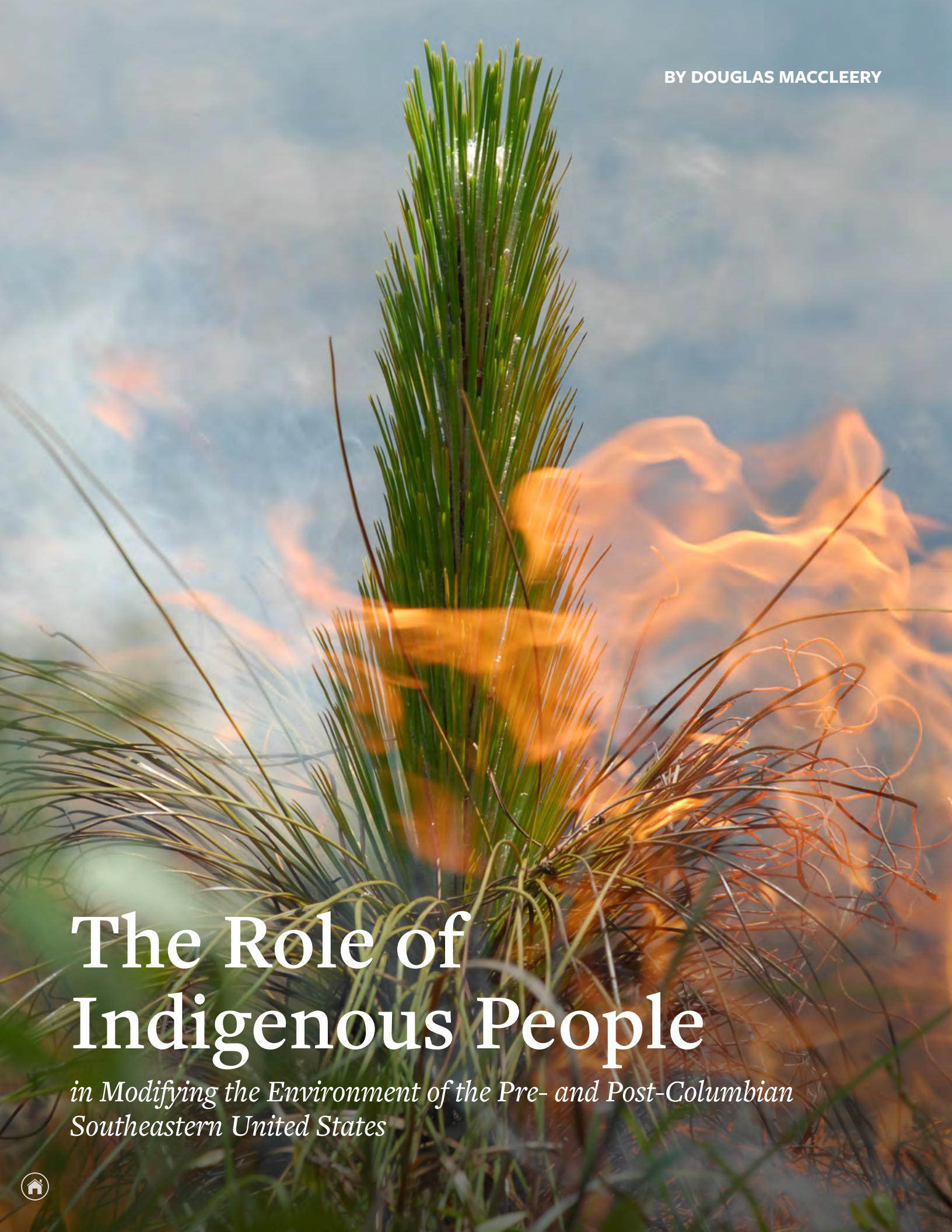


BY DOUGLAS MACCLEERY

The Role of Indigenous People

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

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

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

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

THE HUMAN FOOTPRINT ON THE REGION'S ECOLOGY

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

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

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

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

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

JOHN MAXWELL FOR USFWS

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

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

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

ECOSYSTEM CONDITIONS AT THE TIME OF EUROPEAN CONTACT

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

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

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

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

ECOLOGICAL EFFECTS OF DEPOPULATION

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

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

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

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

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

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

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

ECOLOGICAL CONDITIONS BETWEEN 1607 AND 1800

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

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

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

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

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

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

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

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

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

Craig Lorimer writes,

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

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

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

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

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

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

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

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

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

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

RICHARD, WWW.FLICKR.COM/PHOTOS/FROGBELLY

A longleaf pine savannah in eastern North Carolina.

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

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

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

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

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

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

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

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

RECONSTRUCTING THE PRECOLUMBIAN ENVIRONMENT

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

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

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

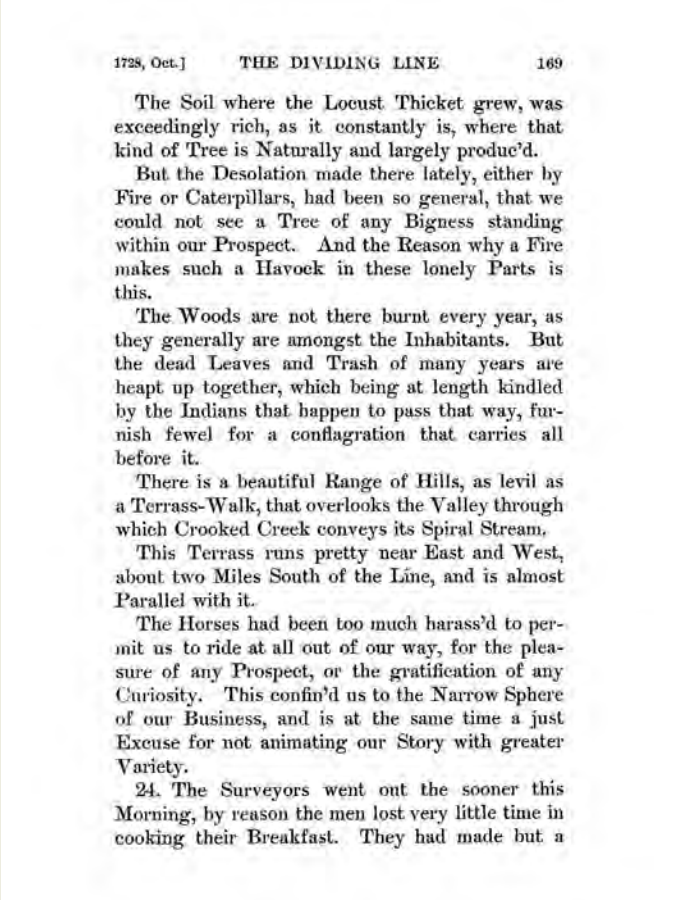
By their nature, eyewitness accounts are selective. Some writers had an agenda, perhaps seeking to make settlement seem economically more attractive or easier than it actually was. The routes they took—usually following rivers and streams and existing trails, where human influences on the landscape were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

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

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

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

COURTESY OF HATHITRUST



1728, Oct.] THE DIVIDING LINE 169

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

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

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

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

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

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

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

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

to occasional accidental or intentional fires.[75]

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

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

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

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

CONSERVATION AND RESTORATION

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

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

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

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

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

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

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Photography and Early Fire Ecology

The Life of Harold Weaver

BY JAMESON KARNS AND MICHELLE M. STEEN-ADAMS

BELOW: The view looking southeast across Quinault River from center of NE 1/4, Sec. 26, T. 23 N, R 10 W. Taken August 21, 1956 (left), and the same view taken May 12, 1972 (right), both by Harold Weaver.

Fire ecologist Harold Weaver was a pioneer in several ways. One of them was the practice of using his camera to document the ecological role of fire.

Tucked into the first footnote of the 1943 *Journal of Forestry* article was an unusual statement. Normally, such a citation gives nothing more than the author's professional title—in this case, "Forest supervisor, Colville Indian Reservation, Nespelem, Wash." This note added a disclaimer apparently required by the author's employer: "The author writes from a background of 17 years' of varied experience on the national forests and Indian reservations of the Pacific [Northwest]. This article represents the author's views only and is not to be regarded in any way as an expression of the attitude of the Indian Service on the subject discussed."[1]

That his employer, the Indian Service's Branch of Forestry, wanted distance from Weaver was one thing. The journal's editors also sought to distance the publication from what he had to say. The editor's note at the beginning of the article made clear that what followed—the hypothesis that "the complete prevention of forest fires in the ponderosa-pine region of the Pacific Slope has certain undesirable ecological and silvicultural effects"[2]—would be unpopular, controversial, and bordering on taboo. Weaver used photographs of forest stand conditions in field surveys to demonstrate that fire (both natural and human caused) performed essential ecological and silvicultural functions, such as forest regeneration, stand density management, and hazard reduction. His controversial assertion and approach—which also included fire history based on tree-ring information dating back hundreds of years—ultimately contributed to the establishment of present-day principles of fire ecology.[3]

The article appeared during what recently has been characterized as federal land management agencies'

FOREST HISTORY SOCIETY PHOTOGRAPH COLLECTION, WEAVER_48 (LEFT), WEAVER_49 (RIGHT)

"systemization-centralization stage" (1924–1970s), when forest laws and policies were designed to achieve forest protection through a centralized organizational structure and systematic procedures of fire monitoring, recordkeeping, mapping, and research.[4] This was also the era of the U.S. Forest Service's full embrace of fire suppression—formalized in 1935 with the so-called 10 a.m. policy, which directed foresters to suppress every wildfire by midmorning after its initial report. Other agencies, including Weaver's employer, quickly adopted it.[5]

Not everyone, however, was convinced that suppression was the best policy. Reassessing the ecological role of fire in western dry conifer forests quietly began in the late 1920s. Although Weaver was not the first to question the suppression policy, he was in the vanguard. He began to probe the forestry profession's (and the U.S. Forest Service's) established practice of fire suppression shortly after being hired by the Branch of Forestry of the Indian Service in 1928. He experimented with prescribed fire on the reservation lands of several Native American tribes in the Pacific Northwest and conducted inquiries about prescribed fire throughout his forty-year career (1928–1967), most of which was spent in that region.[6] Weaver's reasoning was disarmingly simple: his observations indicated that fire could have beneficial effects on the region's forests. He observed that under certain ecological conditions in dry conifer forest types, the effects on tribal forest resources were not catastrophic; to the contrary, on certain sites, fire reduced fuels and initiated understory reproduction of shade-intolerant pines.[7] This was the argument in his 1943 article. Weaver's chief challenge was how to convey to foresters the ecological and management insights from his years of observation and documentation. How he overcame that obstacle is part of his legacy.

Influencing Weaver's development of pathbreaking ideas in fire ecology and forest management are biographical factors—specifically, the interplay of his experience, beliefs, and knowledge with the federal agency, tribal reservations, and forestry associations of his professional life.[8] We use this framework to examine how his understanding of the role of wildfire developed. We consider three main influences: experiences during the early stages of his life, organizational factors of the agency for which Weaver worked, and collegial relationships with forest scientists, particularly entomologist F. Paul Keen and fire ecologist Harold Biswell.

CHILD OF THE BLUE MOUNTAINS

Harold Amos Weaver was born on March 18, 1903, and was raised in the small town of Sumpter, Oregon. Sumpter lies between the Wallowa-Whitman and the Umatilla national forests, in the Blue Mountains of northeastern Oregon.[9] In the late nineteenth century, the Weaver family had relocated from Indiana to this small mining community. Harold's parents, Amos and Edna, joined by Amos's brother Joseph, hoped to make their fortunes in the unexplored riches hidden in the Blue Mountains. Sumpter was a boom-or-bust mining town that experienced wide swings in economic and demographic conditions as gold deposits were discovered and exhausted. The Weaver brothers had purchased a small mining claim at the turn of the twentieth century in what is now the Buck Gulch Weaver Mine, just outside Sumpter.[10]

Harold Weaver attributed his love for forestry to his childhood in the Blue Mountains. He spent much of his youth exploring the forests around the town alone "with my dog and .22 rifle."[11] He was joined occasionally on these outings by one of his childhood friends, Brooks Hawley, who later became a historian of the area's gold mining industry.[12] The forest landscape Weaver explored was dominated by early- to mid-successional stands, which had developed after timber harvesting for construction of the railroad that connected gold deposits in the Sumpter Valley to Sumpter. As Weaver recalled,

> The foothills around Sumpter and lower elevations of the valley had been heavily cutover for yellow (ponderosa) pine, and large-scale logging by that time had migrated to Whitney and Bates, along the narrow gauge Sumpter Valley Railroad. Most of this cutover was restocking to pine . . . Later there came expeditions to the higher mountains. Most inspiring were views of the blue, seemingly endless forest covered ridges and isolated groups of higher, snow-flecked mountains. This background provided primary motivation for selection of forestry as a career.[13]

His explorations in the Blue Mountains came to an end early in his teenage years. His parents sent him to live with relatives in Goshen, Indiana, to attend high school.

At that time, the Weaver family faced a series of calamities that left them nearly destitute. The family's Buck Gulch mine yielded some promising deposits but not enough to support the family. Because the mine lacked a reliable water source, making large-scale operations impossible, the Weaver family invested a small fortune to construct a series of irrigation ditches that would connect their mine with Gray's Gulch, a local waterway.[14] The irrigation system was never completed to the satisfaction of Amos Weaver, and mining operations were limited by seasonal water flow. Harold Weaver recalled:

BAKER COUNTY (OREGON) PUBLIC LIBRARY HISTORIC PHOTO COLLECTION

The Weaver family cabin next to Buck Gulch Weaver Mine in Sumpter, Oregon, ca. 1909. Harold, Edna, and Amos Weaver, at the far left, are joined by community members.

My father was an active partner in ownership of a group of placer claims, and it was his responsibility to initiate mining at the earliest possible date in the spring after winter snow could be cleared from about five miles of water ditch and wooden flumes along steep mountain sides. Once water flowed the men worked day and night in hydraulic mining of a gold-bearing gravel deposit of an ancient river channel, high on a mountain slope. Usually, about July 4th, the water supply became inadequate for further mining.[15]

Seeking to diversify the family's livelihood, Amos began purchasing local farmland.[16] In 1917, however, Sumpter—already on hard times and declining along with the mining business—faced a disaster from which it never recovered.[17] A fire in a downtown hotel spread to most structures in the downtown district, destroying twelve blocks and leaving Sumpter "merely a city of chimneys and tottering brick and stone walls."[18] In the aftermath, Amos relocated his family to Riverside, California.

After completing high school, Weaver attended Oregon State College (now Oregon State University), where he earned a forestry degree. During the summers, he worked part-time as a forest surveyor in California and Oregon. Weaver was inducted into the college Forestry Honors Society.

After graduating in 1928, Weaver accepted a position as junior forester with the Klamath Division of the

Branch of Forestry of the Indian Service. He was stationed at a small forestry camp in the Beatty Precinct of Klamath County. As the only forester at the camp, Weaver supervised twenty forest laborers. The timing of the job offer was fortuitous: a year after he was hired, in October 1929, the stock market crashed, initiating the Great Depression and massive unemployment.

THE WILDFIRE QUESTION

Weaver's understandings about fire ecology evolved in the context of the administrative history of his employer and the Native tribes whose forest resources it managed.[19] Established in 1910, the Branch of Forestry of the Indian Service was authorized to manage tribal timber.[20] Two main principles of federal Indian policy guided the agency's forestry: first, that the sale of timber products on lands held by Indian landowners could benefit tribes,[21] and second, the doctrine of trust responsibility—based in the unique, historical relationship between the U.S. and Indian tribes—which established the obligation of the federal government to ensure the protection of tribal lands, resources, and assets, and to provide services to federally recognized tribes. The scope of tribal trust responsibility included provision of technical forestry services to administer, manage, and protect tribal timber from loss due to wildfire and insect outbreak, and thereby sustain tribal employment and income. Weaver sought to identify practices that could promote a sustained yield and maximize economic and employment returns for tribes.

From the time of its establishment and for the next half-century, the Forestry Branch held to a policy of wildfire suppression to protect tribal forest resources. It focused on forest conservation and protection from fire—particularly fires sparked by logging operations. After World War II, forest planning promoted sustained yield, with fire protection remaining a central activity.[22] As a junior employee, Weaver was expected to adhere to the suppression policy. In addition, his forestry training reinforced the fire suppression paradigm. In his undergraduate thesis, "Slash Disposal in the Western Yellow Pine Forests in Oregon," he had synthesized the literature on the best practices both to get rid of slash and to protect slash from fire, thereby promoting the continued productivity of ponderosa pine lands in Oregon and Washington—at the time, a hundred thousand acres of harvest area per year. Years later, reflecting on his undergraduate forestry training, Weaver observed, "I graduated from Oregon State in 1928, thoroughly imbued, at that time, with the incompatibility of pine forestry and fire."[23] It was his experiences during the first five years of his career that gave shape and cause to his life's work. Weaver's willingness to learn from experienced field staff and woodsworkers and his open-mindedness led him to challenge the fire suppression paradigm. His rethinking, spelled out in subsequent publications and presentations, had ripple effects in the agency and the community of professional foresters.[24]

Harold Weaver's first duty station for the Forestry Branch was at the Klamath Indian Reservation, in south-central Oregon.[25] Conversations with woodsmen of the area—people who had accrued knowledge through years of first-hand experience—exposed Weaver to viewpoints that ran counter to the forestry principles of his undergraduate training and of the profession:

> As a forester on the Klamath Indian Reservation in southern Oregon, I met a number of older, nontechnical woodsmen, who considered the policy of attempted total fire exclusion a serious mistake. None of them, however, could explain to my satisfaction how the forest could be regenerated under a regime of frequent light burning. I do recall that a logging superintendent told me that earlier fires were usually of lighter intensity, that they crept slowly about through the needles and dry grass, and that they spared many of the young trees.[26]

The local woodsmen's viewpoints lacked the credibility of the scientific, technical basis of professional knowledge. By the time Weaver was hired, the Forest Service had been conducting research on light burning in California for nearly two decades, and the results nearly always criticized it or favored fire suppression. In the early 1920s, agency leaders were openly condemning the practice of "light burning"—derisively calling it "Paiute forestry" in print to associate it with Native American burning practices—as a management tool and would continue trying to stamp out the practice until the 1970s.[27]

A 1930 meeting with Frederick Paul Keen, a Forest Service entomologist and forester, was a turning point in Weaver's understanding about the ecological role of fire in dry conifer forests of the Pacific West. Keen, a graduate of the University of California–Berkeley, had earned recognition among foresters for his pioneering research on bark beetles in pine forests.

Keen and Weaver developed a close and mutually beneficial professional relationship. Taking an interest in the Keen's bark beetle studies, Weaver began studying the insect's effects on the Klamath Indian Reservation in 1932 and generating data that Keen used in subsequent work.[28] Keen supported Weaver's view that recurring fire events benefited the area's forest

U.S. FOREST SERVICE, PACIFIC NORTHWEST REGION, STATE AND PRIVATE FORESTRY, FOREST HEALTH PROTECTION, COLLECTION: BUREAU OF ENTOMOLOGY, PORTLAND STATION COLLECTION, LA GRANDE, OREGON. IMAGE: PS-57

Meeting Paul Keen in 1930 proved a turning point in Harold Weaver's understanding of the ecological role of fire. In October 1930, Keen (standing) and Weaver visited the Klamath Indian Reservation, a place central to their work.

stands by moderating hazardous fuel accumulation and promoting conditions that favored understory pines rather than shade-tolerant forest species—a perspective that contradicted the forest management policy of the U.S. Forest Service. When Weaver asked how Keen had reached this conclusion, Keen responded by picking up his ax and taking Weaver into the woods.

> To my stock query concerning how the forest could be regenerated he (Keen) invited me to examine with him a nearby stand of pole-size reproduction. Though these trees had originated about the beginning of the century, a number, widely scattered, showed fire scars near the ground surface. Sectioning of these with a sharp axe revealed that there had been several fires, the first occurring when the trees were quite small.[29]

Weaver did not have much time to investigate these theories of "light burning" in Oregon, however: he was transferred from Klamath to Nespelem, Washington, promoted to forest assistant, and assigned to a unit in the new Civilian Conservation Corps (CCC). Established by President Franklin D. Roosevelt in March 1933, the CCC employed thousands of men in forest management, infrastructure projects, and fire suppression efforts on public lands.[30] Weaver's CCC unit was based out of the then-Colville Indian Agency. Native Americans probably constituted most, if not all, of the workers on the Colville CCC unit. The primary task for Weaver's crew was to inspect and mitigate bark beetle damage at the Klamath, Colville-Spokane, Warm Springs, and Yakima reservations. Weaver was pleased to learn that the project would involve collaboration with Keen.[31]

Weaver and the crew were granted a unique authority in the "battle to conserve the Indian's forests" against the "insect enemy": they were allowed to burn infested trees to "destroy such a high percentage of the destructive beetles that the aggressive character of the outbreak will be broken."[32]

WEAVER'S PHOTO DOCUMENTARY METHOD

To document the ecological role of fire, Weaver chose a surprisingly simple instrument: a 1930s Zeiss camera. His methods were simple and straightforward, yet effective. His goal was to document how fire affected forest regeneration and stand (and landscape) conditions over time. Rather than submit his work to journals of forestry or range management, he mostly chose to share his empirical insights with agency administrators.

Weaver identified regions in the Pacific Northwest that had been affected by "light burn," wildfires of low to medium severity. He would then hike to a nearby vista or clearing from which he could shoot the burned area. He used black-and-white Kodak film in his trusty Zeiss—he called it "the camera that never failed."[33] After taking images in varying apertures, Weaver recorded the location, time, date, camera settings, and personnel present—information he considered critical because he intended to photograph his study sites at least every ten years after their initial burn.[34]

With a series of photos in hand, he would develop and enlarge the negatives into large-print photographs that filled most of a standard 8.5-by-11-inch page. The images were then cropped with a small utility knife and mounted on sheets of cardstock, with captions giving the location and date. He then placed the sheets in a three-ring binder. The last page was reserved for a topographical map that he stenciled and colored. Reviewing these handmade field trip reports with minimal text, present-day readers can easily overlook that they are administrative documents. Indeed, the experience is akin to walking through a self-guided photo exhibit. To Weaver, the photos surveys were living documents that would never be completed: each site required continuing sequels.

Weaver's audience included both advocates and detractors of fire ecology. His goal was to present the effects of fire over time in a simple and approachable format. By providing a well-documented body of evidence to his supervisors and other forestry professionals, he won approval for the majority of his light burning projects.[35]

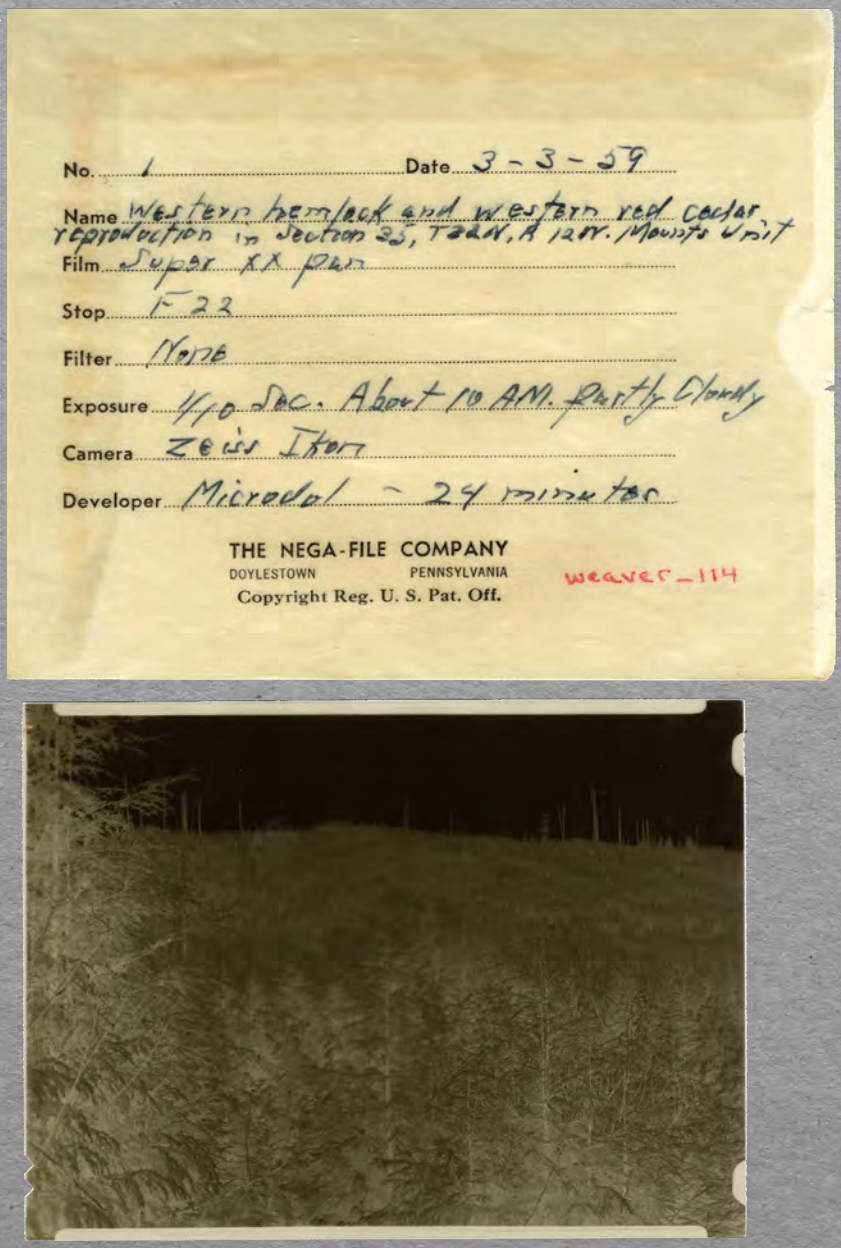
KEEN, BISWELL, AND TALL TIMBERS

For some Forestry Branch administrators, Weaver's photo survey reports prompted reconsideration about the ecological role of fire; however, his fellow foresters were not easily swayed. In the early 1940s, he began drafting the manuscript "Fire as an Ecological and Silvicultural Factor in the Ponderosa-Pine Region of the Pacific Slope." He knew that publishing a paper on the favorable aspects of forest fires would be difficult, but he was emboldened by his friend Paul Keen, who advised him to use the techniques from his binders—demonstrate and convey first-hand experience. Despite Weaver's hesitations, the article would become his most influential publication—and it helped forge an enduring friendship.

In "Fire as an Ecological and Silvicultural Factor," he used data from published studies by Keen in Oregon and two other researchers in California to make the case that fire was needed in ponderosa forests.[36] The tree-ring evidence they provided showed that fires occurred cyclically, and that fire—whether caused by

FOREST HISTORY SOCIETY, HAROLD WEAVER PHOTOGRAPH COLLECTION

Unnamed members of Weaver's CCC "spotting" and burning Native American crew. Klamath and Warm Springs Surveys, 1938.



An example of Harold Weaver's archival methods using Kodachrome negative slides. He recorded every detail, including time of day and weather conditions, when taking photographs so that he could easily take photos from the same spot years later.

lightning or humans—had helped to maintain a healthy ponderosa pine forest. He then explained why and how excluding fire had made stands prone to destructive pine beetles and severe fire, before offering examples of how light fires had beneficially thinned the forest. "Everywhere are the groups of thrifty mature, mature, and overmature trees with their tree-ring record of fires of long ago," he declared. "The evidence is there for those who care to investigate."[37]

Next came the visual evidence: four comparative photos from Washington and Oregon that enabled readers to draw the obvious conclusion. But in case they did not reach the same conclusion, he spelled it out: "The present deplorable and increasingly critical conditions in vast areas of the region are proof that foresters have not solved the silviculture problems of ponderosa pine, and to continue present policies will further aggravate an already serious situation." Correcting these conditions, he warned, "constitutes a growing challenge to the professional forester and is a job worthy of the best minds in forest research."[38]

It was Harold Biswell, a Forest Service researcher, who fit that description. Born in Fayette, Missouri, Biswell had been working in Georgia since 1942, "where he became acquainted with controlled burning in pinelands as it was being introduced in the 1940s."[39] In 1947, he received a teaching and research position in the Department of Forestry and Conservation at the University of California–Berkeley and would go on to advocate for the use of light burning.[40] When he arrived, however, Biswell found that prescribed fire was not an accepted practice in California's forests. Foresters offered no resistance to his studies on grasslands and shrublands, but the response to his fire ecology investigations changed when he shifted the focus to ponderosa pine forests.[41] State and federal fire suppression authorities were so outraged that Biswell was introducing controlled burning to students, researchers, and ranchers that they demanded the university stop him. They failed.[42]

All of that was in the future, however. On reading Weaver's 1943 article, Biswell wrote to him. "The Harolds," as they would come to be known, began a professional collaboration in which they would review each other's manuscripts and projects and commiserate with each other's trials.[43] (And they also developed a close friendship. Their families frequently vacationed together.) Weaver's photos provided a critical and integral component of Biswell's publications.[44] The duo became particularly influential with the researchers who attended the

FOREST HISTORY SOCIETY, HAROLD WEAVER PHOTOGRAPH COLLECTION

Three pioneers in fire ecology gather at the 1967 Tall Timbers Conference: Harold Weaver, Herbert Stoddard, and Harold Biswell. Stoddard worked in southern Georgia and northern Florida.

Tall Timbers Research Station fire ecology conferences, held in Florida starting in 1962. The conferences served as a forum outside the control of the forestry profession and the Forest Service (and even the federal government) for foresters and others to discuss burning techniques around the world.[45]

WEAVER'S LEGACY

By 1951, Harold Weaver had been promoted to a senior position in the Forestry Branch of the Bureau of Indian Affairs and had been reassigned to Arizona. However, his passion for the Pacific Northwest never dimmed. After three years in Arizona, Weaver took a position in the nation's capital as the assistant chief of the region. Weaver transferred once again in 1954 to serve as area forester of BIA's area in Portland, Oregon.[46] Unfortunately, the position kept him from the forests he loved. The position was primarily administrative, as he was tasked with "investigating economic aspects of planning for more intensive management of Indian reservation forests."[47] In this capacity, he wrote the "Weaver Reports," which are now widely recognized by the agency. The reports, a series of memoranda, called attention to the poor support for staffing of the BIA forestry division by comparing it with Forest Service districts of a similar size.[48] Additionally, during the 1960s, Weaver became more active with Tall Timbers publications and conference attendance. Though no longer on field duty, he also allocated time to update his forest survey photograph reports.

In 1967, after nearly four decades in forestry, Weaver retired. Reflecting on his career to colleagues, Weaver highlighted the importance of expanding forest fire research to include Native American and private landowner perspectives.[49] He understood that these landowners had varied and dynamic relationships with wildfire. As he summarized in a 1964 paper at a Tall Timbers conference, they had the ability to inform forestry "because we, as foresters, are still inexperienced" in the application of fire.[50]

As a pioneer in the field of fire ecology, how should foresters and historians engage with the legacy of Harold Weaver? His photo documentary and forest survey approach has been adopted by others with some success.[51] Over the years, Weaver's career-defining photo essays have migrated to three archives: the Forest History Society in Durham, North Carolina; the Bancroft Library in Berkeley; and the National Archives branch in Seattle. Weaver's rich archival record suggests that he hoped his work would serve as living documents that would be revisited and reassessed by each generation. As Weaver explained, "Before you begin to study the ecological role of fire in an area, be sure to gather information of fire history."[52] Perhaps this is the best way to honor the legacy of Harold Weaver—to continue reexamining and documenting changes in forests and sharing the findings, from which we can draw our own conclusions about the role of wildfire in forest management under current climatic and forest structural conditions.

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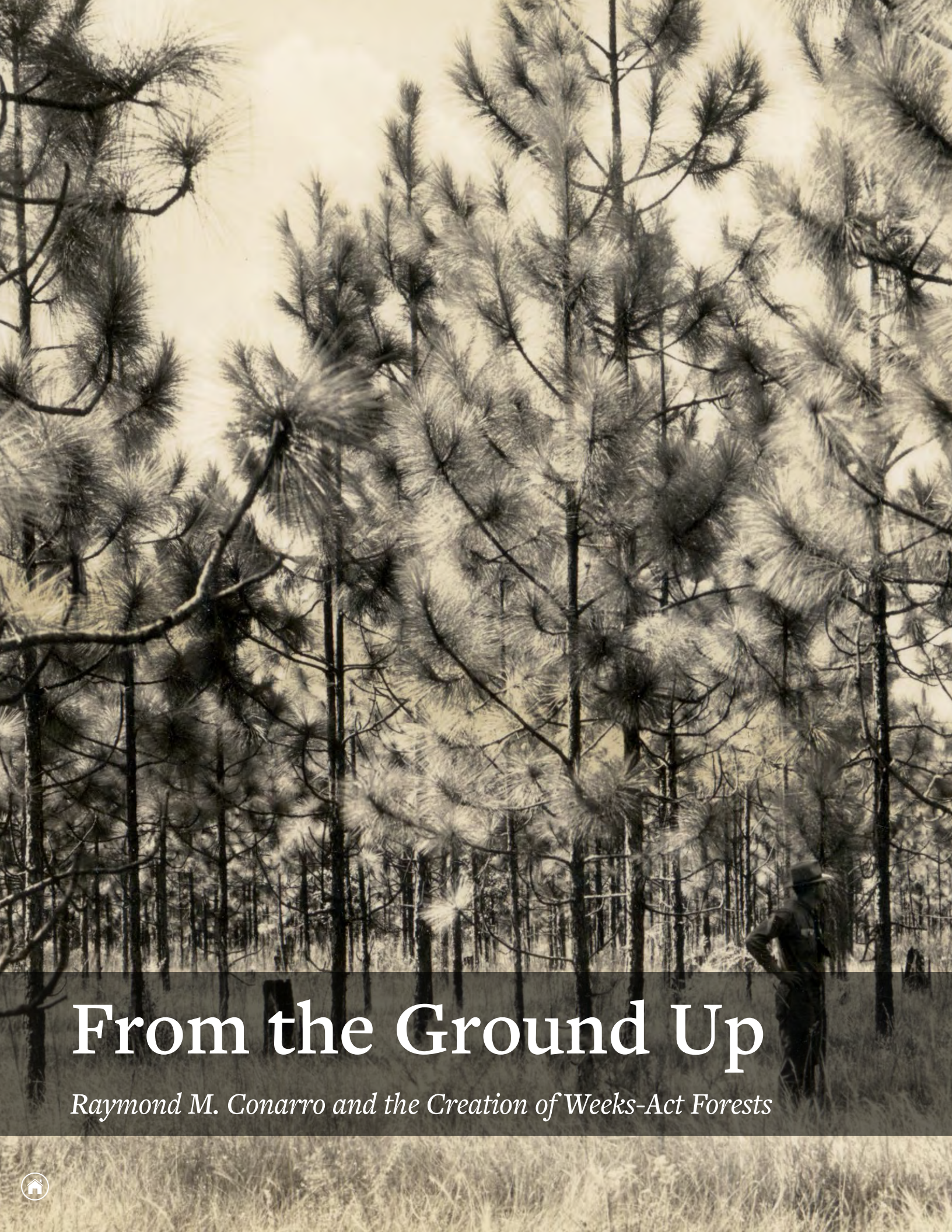
NOTES

1. Harold Weaver, "Fire as an Ecological and Silvicultural Factor in the Ponderosa-Pine Region of the Pacific Slope," *Journal of Forestry* 41, no. 1 (1943): 7.
2. Weaver, "Fire as an Ecological and Silvicultural Factor," 7.
3. Jan W. van Wagtendonk, "Introduction to H. Weaver's Article," *Fire Ecology* 10, no. 1 (2014): 1–2; Stephen F. Arno, "Slow Awakening: Ecology's Role in Shaping Forest Fire Policy," *Forest History Today* Fall 2017: 17–18.
4. The systemization-centralization stage was preceded by the establishment stage (1905–1924 for the U.S. Forest Service, 1910–1924 for BIA) and followed by the reevaluation stage (1970s–1990s). Michelle M. Steen-Adams, Susan Charnley, and Mark D. Adams, "Historical Perspective on the Influence of Wildfire Policy, Law, and Informal Institutions on Management and Forest Resilience in a Multi-ownership, Frequent-fire, Coupled Human and Natural System in Oregon, USA," *Ecology and Society* 22, no. 3 (2017), https://doi.org/10.5751/ES-09399-220323.
5. Stephen J. Pyne, *America's Fires: A Historical Context for Policy and Practice* (Durham, NC: Forest History Society, 2009), 35.
6. Weaver's professional appointments were junior forester (1928–1933); manager of Civilian Conservation Corps projects, based in the regional office in Spokane (1933–1940); forester of the Colville Agency (1940–1948); area forester, based in Phoenix (1948–1951); assistant chief, Branch of Forest and Range Management, based in Washington, DC (1951–1954); and area forester, attached to the Washington office but based in Portland, Oregon (1954–1967). Forest History Society, online finding aid for Inventory of the Harold Weaver Notebooks, 1942–1967, Forest History Society Archives, Durham, NC, https://foresthistory.org/research-explore/archives-library/fhs-archival-collections/inventory-harold-weaver-notebooks-1942-1967.
7. Harold Weaver Notebooks, "Field Trip to Warm Springs Reservation, June 9–11, 1958." For a fuller discussion, see Steen-Adams et al., "Historical Perspective."
8. The methodology that we have used to develop this biographical sketch draws on the subgenre of environmental biography. Aldo Leopold biographer Curt Meine defined this as the "exploration of individual lives in the context of landscape and lives, seeking insight from the connections between personality and place." See Curt Meine, "Bio(graphical) Diversity," *Conservation Biology* 17, no. 4 (August 2003): 1180.
9. The Blue Mountains, which span about fifteen thousand square miles mainly in northeastern Oregon and extend into southwestern Washington, constitute about one-sixth of the land area of Oregon and is the state's largest ecoregion. "Blue Mountains," *Oregon Encyclopedia*, https://www.oregonencyclopedia.org/articles/blue_mountains/.
10. J. T. Pardee, "Some Placer Gravels of Eastern Oregon," *Northwest Mining News* 6 (1909).
11. Harold Weaver, "Fire and Its Relationship to Ponderosa Pine," *Proceedings of the Seventh Tall Timbers Fire Ecology Conference* (Tallahassee: Tall Timbers Research Station, 1968), 128.

12. Brooks Hawley and Melvin L. Kathan, *Gold in Sumpter Valley* (Portland, OR: Cascade Printing Services, 1967); Brooks Hawley, *Gold Dredging in Sumpter Valley* (Baker, OR: Baker Printing and Lithography, 1977); U.S. Forest Service, Wallowa-Whitman National Forest, *Final Environmental Statement, Burnt Powder Planning Unit: A Land Management Plan* (USDA Forest Service, Pacific Northwest Region, 1979), 229–30.
13. Weaver, "Fire and Its Relationship to Ponderosa Pine," 128.
14. "Oregon-Sumpter," *Mining and Engineering World* 43 (1915).
15. Weaver, "Fire and Its Relationship to Ponderosa Pine," 127.
16. "Small Tracts Are Sold," *Sunday Oregonian*, June 22, 1913.
17. Ralph Friedman, *Oregon for the Curious* (Caldwell, ID: Caxton, 1972), 202.
18. Addison Bennett, "Old Town Mass of Ruins," *Sunday Oregonian*, October 21, 1917.
19. The Bureau of Indian Affairs provides services to federally recognized tribes and is responsible for the administration of reserved tribal lands ("Indian reservations") held in trust by the United States on behalf of American Indian, Indian tribes, and Alaska Natives. Established in 1824 as the Office of Indian Affairs of the War Department, the agency was transferred in 1829 to the newly created Department of the Interior. The agency has had several names: Indian Service, Indian Office, Indian Agency, and as of 1947, Bureau of Indian Affairs. In 2021, there were 574 federally recognized tribes and 324 reserved Indian lands (reservations, villages). Many federally recognized tribes do not have reserved lands. BIA administers fifty-five million acres of surface lands and fifty-seven million acres of subsurface mineral estates held in trust on behalf of American Indian, Indian tribes, and Alaska Natives. In addition to federally recognized tribes, there are state-recognized tribes and many tribes that do not have federally recognized status.
20. In 1909, Congress authorized funds ($100,000) to the Commissioner of Indian Affairs for forestry activities on Indian reservations, including "to advise the Indians as to the proper care of forests, and . . . timber operations and sales of timber" [act of March 3, 1909 (35 Stat. 783)]. The paternalistic language is noted. An act of June 25, 1910 (25 USC § 406), authorized the owner(s) "with the consent of the Secretary of Interior" to sell timber on Indian lands, "and the proceeds . . . shall be paid to the owner . . . for their benefit under regulations prescribed by the Secretary of the Interior." Theodore Catton, *American Indians and National Forests* (Tucson: University of Arizona Press, 2016), 48. Steen-Adams et al., "Historical Perspective"; Alan Newell, Richmond Clow, and Richard Ellis, *A Forest in Trust: Three-Quarters of a Century of Indian Forestry, 1910–1986* (Washington, DC: Litigation Support Services for the Division of Forestry, Bureau of Indian Affairs, 1986), 2–22.
21. In practice, the sale of tribal timber under Indian Service forest management often did not return anticipated benefits to tribes; indeed, adverse outcomes often occurred. Michelle M. Steen-Adams, Nancy Langston, and D. J. Mladenoff, "Logging the Great Lakes Indian Reservations: The Case of the Bad River Band of the Ojibwe," *American Indian Culture and Research Journal* 34, no. 1 (January 2010): 41–66.
22. In broad terms, the branch's administrative history can be divided into four periods: (1) Depression-era forestry, when the agency was developing and forest conservation and fire protection were emphasized (1910–1945); (2) post–World War II forestry, when forest planning to promote sustained yield became prevalent (1945–1960); (3) intensive forest management, when replanting and intensive harvesting sought to maximize forest yields (1960s); and (4) tribal self-determination and transition (1970s–present). Weaver's career spanned the first through third periods.
23. Weaver, "Fire and Its Relationship to Ponderosa Pine," 128.
24. Steen-Adams et al., "Historical Perspective"; H. A. Weaver, "Potential for Intensive Timber Management on the Warm Springs Indian Reservation, Oregon, Forestry 326-65, Pt. 1-H, Bureau of Indian Affairs," Archives of the Resource Management Division, Confederated Tribes of Warm Springs, Warm Springs, Oregon.
25. The Treaty of 1864 merged the Klamath, Modoc, and Yahooskin tribes into a single "Klamath Tribe" and onto the Klamath Reservation. In 1954, Congress passed the Klamath Termination Act—despite tribal and BIA protestations—resulting in the termination of federal government services to the tribe and eventual conversion of reservation lands to the National Forest System of the U.S. Forest Service. Robert Donnelly, "Klamath Indian Reservation," *The Oregon History Project*, 2003, https://www.oregonhistoryproject.org/articles/historical-records/klamath-indian-reservation/#.YZWvip7MI2w.
26. Weaver, "Fire and Its Relationship to Ponderosa Pine," 128.
27. In 1920, Chief Henry Graves and his associate chief and immediate successor, William Greeley, published articles in the industry journal *The Timberman* two months apart using the term in the titles. Pyne, *America's Fires*, 24, 29–30; Stephen Pyne, *Fire in America: A Cultural History of Wildland and Rural Fire* (Seattle: University of Washington Press, 1997), 103–10.
28. R. P. Keen, "Annual Report of the Forest Insect Conditions in Oregon and Washington," Bureau of Entomology, Portland, Oregon, 1934.
29. Weaver, "Fire and Its Relationship to Ponderosa Pine," 129.
30. David Carle, *Burning Questions: America's Fight with Nature's Fire* (Westport, CT: Praeger, 2002), 60.
31. "Annual Report of the Forest Insect Conditions."
32. "Indians Conserving and Rebuilding Their Resources through CCC-ID: Northwest Indians Attack Deadly Pine Beetle," *Indians at Work* 7, no. 9 (1940), 32–33.
33. Correspondence to H. Biswell, 1970, Harold H. Biswell Papers, Bancroft Library, University of California–Berkeley.
34. Harold H. Biswell, *Prescribed Burning in California Wildlands Vegetation Management* (Berkeley: University of California Press, 1989), 108.
35. Newell, Clow, and Ellis, *A Forest in Trust*, 279.
36. Weaver, "Fire as an Ecological and Silvicultural Factor," 7; Van Wagtendonk, "Introduction to H. Weaver's Article," 1.
37. Weaver, "Fire as an Ecological and Silvicultural Factor," 8–9.
38. Weaver, "Fire as an Ecological and Silvicultural Factor," 13–14.
39. Arno, "Slow Awakening," 18.
40. Carle, *Burning Questions*, 59.
41. Scott L. Stephens, Jan W. van Wagtendonk, James K. Agee, and Ronald H. Wakimoto, "Introduction to the Article by Harold Biswell: Prescribed Burning in Georgia and California Compared," *Fire Ecology* 17, no. 9 (2021): 1–2.
42. Arno, "Slow Awakening," 18.
43. Carle, *Burning Questions*, 59–60.
44. Harold Weaver, "Ponderosa Fire Management," *Tall Timbers Research Station* 2, Misc. Publication 2 (1973).
45. Pyne, *America's Fires*, 49.
46. Historically, the BIA administrative structure was organized in areas, with the area forester responsible for forestry operations in their area.
47. Harold Weaver, "Class of 1927," *Oregon State Forester* 15, no. 1 (1962): 6.
48. Newell et al., *A Forest in Trust*, 213–20.
49. Weaver, "Fire and Management Problems in Ponderosa Pine," *Proceedings of the Third Annual Tall Timbers Fire Ecology Conference* (Tallahassee: Tall Timbers Research Station, 1964), 61–79; Harold H. Biswell, "Research in Wildland Fire Ecology in California," *Proceedings of the Second Annual Tall Timbers Fire Ecology Conference* (Tallahassee: Tall Timbers Research Station, 1963), 63–97.
50. Weaver, "Fire and Management Problems in Ponderosa Pine," 78.
51. G. E. Gruell, *Fire in Sierra Nevada Forests: A Photographic Interpretation of Ecological Change since 1849* (Missoula: Mountain Press, 2001).
52. Van Wagtendonk, "Introduction to H. Weaver's Article," 1.



From the Ground Up

Raymond M. Conarro and the Creation of Weeks-Act Forests

U.S. FOREST SERVICE PHOTO 310739. FOREST HISTORY SOCIETY FH5238

Ray Conarro and others advocated for allowing fire in longleaf pine forests. This parcel on the DeSoto National Forest was photographed in 1935, the same year Conarro received permission to begin experimenting with what he later termed "prescribed burning."

How is it a forester from Penn's Woods was responsible for establishing national forests in Mississippi and introducing the phrase and concept of "prescribed burning" to the South?

BY CHAR MILLER

Something about land-inspector E. J. Schlatter's October 1933 report did not make sense. Raymond M. Conarro, who had arrived in Mississippi two months earlier to purchase lands that would become the state's first national forests, was more than a little surprised to hear Schlatter recommend eliminating an estimated 60,000 acres from the proposed Leaf River Purchase Unit. They were projected to be part of the DeSoto National Forest, but Schlatter thought otherwise. When Conarro asked why, Schlatter responded that the acreage in question "was completely denuded and that there was no evidence of restocking."[1] Conarro, who had been crisscrossing the state in search of large tracts of land that would form the nucleus of Mississippi's six national forests, suspected that Schlatter had been less than thorough in his analysis. Besides, as forest supervisor, Conarro's charge was to purchase as much land as possible, so "from an administrative standpoint" he opposed Schlatter's decision. Schlatter did not back down, and headed to regional headquarters in Atlanta to deliver his findings. "After thoughtful consideration of about five minutes duration," Conarro later recalled, he sent a telegram to regional forester Joseph Kircher urging him

not to accept Schlatter's assessment until Conarro had had a chance to conduct his own survey.[2] Minutes later, Conarro and a colleague were driving to the Leaf River site.

The speed with which Conarro read the situation, and then acted on his perception that something did not add up, is consistent with what he did when he arrived at the disputed acreage. He got down on his hands and knees and began to pull tufts of grass from one side to another. As he did so, he found what he was looking for. Longleaf pine seedlings were everywhere. Conarro estimated that the land acquisition crew had missed millions of them over the 60,000 acres, and that Schlatter "had not investigated the acquisition crew's work and had made up his mind on the basis of the crew's reports." With that, Conarro asked the regional forester for a rigorous, on-the-ground inspection under the aegis of the chief of the Regional Lands Division, which was granted. The final judgment confirmed Conarro's opinion that "Schlatter's recommendation was not based on fact."[3] Evidence mattered.

Especially when the job required Conarro to supervise the complex task of building a national forest from scratch and to juggle innumerable moving parts. Key among these was assessing the value of lands across the state; negotiating with their owners for an agreed-upon price; and securing the requisite deeds in advance of purchase. Detail-driven and diligent, organizational adept and unflappable, Conarro managed this process with dispatch. Between August 1, 1933, when he formally started working in Mississippi, and June 30, 1934, "we had examined, and the National Forest Reservation Commission had approved, land purchases in excess of 600,000 acres. This was and still is, the largest area ever purchased, or under purchase agreement, by any one Forest in such a short period of time."[4] Those first eleven months of Conarro's service in Mississippi, Regional Forester Kircher noted in 1940 when he announced that Conarro was being promoted to Chief of Forest Fire Control in the South, were legendary. "His job in the administration of the [Mississippi] national forests . . . especially in fire prevention and the restoration of tremendous acreage of burned and cut-over lands, has been outstanding in state and federal records."[5] Conarro, an agent of the Weeks Act, helped green up Mississippi.

HOME GROUND

Although the Mississippi terrain that Conarro tramped over had been devastated by fire, intense logging, and overgrazing, he was all too familiar with such battered landscapes, having grown up in Warren, Pennsylvania. Born there in 1895, Conarro came of age in this industrial boomtown, located in the northwestern part of the state, and which hugged the confluence of Conewango Creek and Allegheny River. Driving the local economy was innumerable cut-and-run logging operations that were able to strip even the most remote forests on the Allegheny Plateau because of an expanding highway and railroad network. By the early 1920s, when Conarro started with the Forest Service, the once thick stands of hemlock and beech were gone. As Gifford Pinchot noted in 1920 while directing the state's department of forestry, the once-large forests "have become small, the dense have become open, and the productive have become waste. . . . This is the Pennsylvania desert."[6]

The area was also known as Petrolia, and Warren was one of the epicenters of the world's first oil boom. Derricks were everywhere and they pumped thousands of barrels of oil annually; a goodly portion of that output found its way to the ten refineries in Warren that lined the banks of the town's two waterways. Employment was high, and outside investors racked up millions of dollars in profit. But environmental problems abounded, turning northwestern Pennsylvania into a sacrifice zone. Its air was toxic, rivers polluted, forests decimated, and the upper watersheds denuded. Each spring rains and snowmelt roared downhill to flood Warren and other river-hugging towns. Each summer, fires roared through the slash and other debris that careless loggers had left behind. Warren's growth and development had come at a substantial cost, as it did for the larger region, which, environmental historian Brian Black argues, became "the vanguard of sprawling refinery-scapes, toxic waste dumps, and the coal strip mines so prevalent a century later."[7]

These intertwined disasters formed the backdrop to Conarro's childhood and adolescence. Yet they also proved to be the source of his professional career. In 1921, he left his machinist job at a local iron works and signed on as a field assistant assigned to appraise land on offer to the Forest Service for potential inclusion in what would become the Allegheny National Forest. However minimally paid—Conarro received "the princely salary of $50 a month"—his work was critical to the larger mission to the 1923 establishment of a national forest in the cut-over Allegheny Plateau.[8]

That the federal agency was interested in a national forest in the region is not surprising. It had access to Weeks Act funding to buy up acreage in the headwaters of the creeks, runs, and streams that drained the rough, elevated terrain. An array of powerful people, ideas, and institutions helped identify the need for Pennsylvania's only national forest. But a lowly forest assistant was no less crucial to this process. Conarro had been hired by Loren Bishop, the new supervisor of the Allegheny who had transferred to

FOREST HISTORY SOCIETY PHOTO COLLECTION, R9_39577; U.S. FOREST SERVICE 39577

Cleared location for pressure plant on the Allegheny National Forest, taken in 1939.

Warren from his post as supervisor of Florida's Choctawatchie National Forest. As Bishop and a small crew of surveyors evaluated the Allegheny River drainage and identified the proposed boundary of the new forest, he advertised his interest in purchasing large tracts of land within the newly determined demarcation. The response revealed not only who were the largest landowners but also suggested why they were willing to sell. Logging operations dominated the list, and also lining up to talk with Bishop were a pair of chemical companies and South Penn Oil Company. Their collective interest in offloading their property from local tax rolls was a sign that the extractive boom that had drawn them to northwestern Pennsylvania had waned; but when they sold the land, they retained their subsurface mineral rights. The federal agency did not want them, according to Bishop: "Such rights are in no way necessary to the satisfactory working out of the National Forest program, and the vendors are encouraged to retain and develop them."[9] Subsequent forest supervisors would find that the presence of so many oil-and-gas operations would complicate effective stewardship of the forest. Later, when Conarro became supervisor of the Mississippi National Forests, he remembered Bishop's decision, and did the exact opposite.[10]

The real work began once Bishop had proposed sales totaling 200,000 acres. The agency authorized him to hire land assistants, including Conarro, to appraise the land. Beginning in late December 1921, Conarro helped assess the first of these properties, three tracts located within the west branch of Tionesta Creek. Because some sections had burned the previous spring, the team "spent considerable time studying area recovery and damage by the fire," to better account for the land's current price and future value. Over the ensuing months of arduous labor covering upwards of 300,000 acres, all but two of the land examiners had left. Conarro, who gained considerable insight into the economics and ecological aspects of forestry, remained.[11] His persistence meant he was at forest headquarters in Warren when the news broke on September 24, 1923, that President Calvin Coolidge had invoked the Weeks Act (1911) and the Organic Act (1891) to formally designate the Allegheny National Forest.[12] With that announcement, Conarro was appointed the sole district ranger for the 187,000-acre forest. The local boy had made good.

SOUTHERN FORESTS AND FORESTRY

So effective would Conarro be on the Allegheny that in 1927 he was named the assistant supervisor of

the Ouachita National Forest, which now spans the eponymous mountain range in western Arkansas and a smaller segment of eastern Oklahoma. The region had been heavily logged between 1906 and 1909, an intensive, large-scale harvesting that stripped off yellow pine and other valuable species and led to considerable erosion that damaged water quality.[13]

Conarro, who was coming from one of the newest national forests, and had never been south of the Mason-Dixon line, thus entered a different natural and human landscape. Established in 1907, the Ouachita was then the only shortleaf pine forest in the agency's inventory, and Conarro had had no experience with this species, the soils it grew in, or the sustaining climate. New, too, was the mounting tension between the Forest Service and local populations over rangers' attempts to control local communities' once-unfettered access to the region's forests and grasslands and the resources they contained. Arkansas was not Pennsylvania.[14]

A quick study, Conarro's work aligned with a key focus on the Ouachita: fire control. From Wilbur Mattoon, a former Ouachita forester, he would have learned about the role that fire played in the regeneration of shortleaf pine.[15] Conarro did not miss the traveling fire-education program that his colleague, Ranger James Wait, set up in 1925; Wait drove from one site to another in a government truck with the slogan "When the forests burn, you and your children lose" painted on its side. Later, in Mississippi, Conarro would promote a similar mobile-educational scheme focused on fire prevention, in which rangers drove what were dubbed "forestry showboats" to make the rounds from one public school to another, attracting crowds with movies and music.[16] The perceived need for this education was the same in both states—fires were a routine occurrence in Mississippi and Arkansas. The summer of 1929, Conarro's second on the Ouachita, was a dangerous fire season. Amid a lengthy drought, more than 35 major fires erupted on the Ouachita, the most significant of which torched an estimated 12,000 acres.[17] Cutting fire breaks, building lookout towers where possible, and organizing personnel and requisite resources to fight these and other outbreaks would been central to Conarro's work as the assistant supervisor.

The same would be true of his subsequent efforts on the Cherokee National Forest, to which he transferred in 1931 to become its assistant supervisor. The lands purchased were like those in the Ouachita Mountains: heavily culled, poorly managed, and fire-scarred. One Forest Service land examiner wrote in 1914 that most of his time was not spent assessing the value of land that would make up the Cherokee but fighting fires, "cattle owners and others being determined to burn the range."[18] Like the Allegheny, the Cherokee developed from two sources of willing sellers—large tracts from logging companies and other extractive industries (including smelters); and smaller lots from subsistence farm families. The impact of these purchases was evident in county-by-county data: in those jurisdictions that the Cherokee substantially overlay, the population had declined steadily since the forest's 1920 establishment. That said, the number of fires did not appear to decrease throughout the 1920s and 1930s: "Firefighting continued to engage the activities and funds of most Southern Appalachian forest supervisors."[19] As an assistant supervisor on the Ouachita and Cherokee, Conarro's normal workflow included managing the impact that firefighting had on the staff and budget. Among his innovations was the development of a chart that tracked fire-behavior data and correlated it with personnel requirements, for which he was commended: "His skillful attack on fire control problems and his grasp of fire prevention work won for him the unstinted praise of his superiors."[20]

That commendation—and the managerial abilities it praised—may have been a reason why in the immediate aftermath of Franklin D. Roosevelt's election in November 1932, Conarro was detailed to a special, short-term project. His charge was to make "a survey of the Tennessee River Basin downstream from Knoxville to the Ohio River," to be completed before the president's inauguration in March 1933.[21] For the president-elect, this was a vital river system. During the campaign, in fact, Roosevelt had linked the Tennessee with three other river systems in the country that he expected, if elected, would be developed at public expense and for the public good. To a large crowd in Portland, Oregon, in September 1932, the candidate offered what he called "a clear picture of four great government power developments in the United States—the St. Lawrence River in the Northeast, Muscle Shoals in the Southeast, the Boulder Dam project in the Southwest, and finally, but by no means the least of them, the Columbia River in the Northwest." However impressive the dam-and-hydropower infrastructure might be, the fact that it would be publicly owned—and not owned by private profiteers—was for Roosevelt its overriding purpose: "Each one of these will be forever a national yardstick to prevent extortion against the public and to encourage the wider use of that servant of the American people—electricity."[22] He brought the audience to its feet with this galvanizing promise: "Never shall the Federal Government part with its sovereignty or with its control over its

power resources, while I am President of the United States."[23]

Muscles Shoals, a key break point on the Tennessee River in northern Alabama, had been selected for a hydroelectric plant in World War I. The energy it would generate would power two nitrate plants. Although the dam would not be completed until after the war, industrialist Henry Ford recognized its potential and proposed to buy the dam and related facilities, thereby controlling its electricity and future nitrate production. Presidents Coolidge and Hoover were in support of privatizing Muscle Shoals, but progressives, including Senator George Norris of Nebraska and Gifford Pinchot, attacked any such monopolistic controls of a public utility.[24] Franklin Roosevelt agreed, and in a January 1933 visit to the site laid out the broad outlines of what would become the Tennessee Valley Authority. "Muscle Shoals gives us the opportunity to accomplish a great purpose," he declared, a basin-wide planning project that would "take in all of that magnificent Tennessee River from the mountains of Virginia down to the Ohio and the Gulf." And that would tie together "industry and agriculture and forestry and flood prevention . . . over a distance of a thousand miles so that we can afford better opportunities and better places for living for millions of yet unborn in the days to come."[25]

Tucked within Roosevelt's idealistic message was the roadmap that Conarro followed, tracing the river's course through the Volunteer State—from Knoxville, he drove southwest to Chattanooga and then swung into Alabama and passed Muscle Shoals, before curving north to Kentucky and the confluence with the Ohio River. He read the land and noted its problems and potential, a survey that served two purposes. The first was to ground truth state maps that identified "the agriculture and forest land of the Basin together with the apparent capacity of the soil to produce annual agricultural crops." The second was for Conarro's findings to be "used as data in the establishment of the Tennessee Valley Authority."[26] There was a personal takeaway, too: Conarro believed that the landscape-scale assessment he conducted along the Tennessee "proved to be good training for the tremendous task of Mississippi land purchases I was soon to assume."[27] Put another way, his TVA work was a mature expression of the lessons he had learned on the Allegheny, Ouachita, and Cherokee national forests—and the self-confidence he had earned. As land inspector E. J. Schlatter would discover on a hot August afternoon in Mississippi in 1933, Conarro knew what he was talking about.

Ray Conarro served as the forest supervisor of the national forests in Mississippi from August 1, 1933, to June 30, 1940. This undated photo appeared in his "Recollections."

RECOVERY

It was a good thing that Conarro also liked to talk and negotiate, because to build a Weeks Act forest from the ground up required a lot of negotiations. By their nature, these forests were political. Under the terms of their founding legislation, each state legislature had to pre-approve the possibility of federal purchases of land. In 1926, the Mississippi legislature gave its consent "to the acquisition by the United States by purchase or gift of such land in Mississippi, as in the opinion of the Federal government may be needed for the establishment of a national

forest or forests in the region, not to exceed 25,000 acres."[28] Two other steps were required: the newly established Mississippi Forestry Commission must agree to any potential purchases, and in deference to county boards of supervisors, the commission required the Forest Service to seek each county's consent. Adding to the impact of this requirement on Conarro's time was the reality that most of the purchase units he developed crossed multiple county lines. The Bienville Purchase Unit, which consisted of three subunits, was located in eight counties, the Biloxi was in three, the Chickasawhay in four, and the Leaf River in six. Once he received approval from the National Forest Reservation Commission to purchase the designated lands within these and other purchase units, Conarro met with each county board to secure its consent.[29]

He also conferred routinely with and had the backing of the state's congressional delegation. Congressman Wall Doxey was especially active in support of the national forests and served on the national forest commission; in one instance, he directly challenged a Forest Service decision not to bring the Holly Springs Purchase Unit to the commission's attention. Conarro recounted about the Holly Springs Purchase Unit that when Doxey discovered that Forest Service Chief Ferdinand Silcox "did not believe it had National Forest character," the congressman requested all Conarro's documentation and internal reports. With these in hand, Doxey placed the unit on the commission's agenda and then "insisted on its approval." Conarro shared Doxey's assessment of Holly Springs' value: "I personally believe that this Unit meets all of the Weeks Law and the Clarke-McNary Amendment requirements as well or better than any other Purchase Unit."[30]

Senator Pat Harrison, chair of the Senate finance committee, was another of Conarro's powerful allies. In particular, he interceded with President Roosevelt to provide additional funding for land purchases country-wide that the National Forest Reservation Commission would disperse (Doxey, for example, while serving as a commissioner, secured more than $3.5 million to buy one million acres for the Mississippi National Forests.)[31] Harrison was equally adept at channeling money to the state to establish thirty-four Civilian Conservation Corps camps, an investment of nearly $61 million that had a profound effect on the enrollees and the land. Twenty-five of these camps were under Conarro's purview, and the thousands of men—White and African American—planted millions of trees, built miles of new roads and fire breaks, erected hog-proof barbed wire fences and fire-lookout towers, seeded countless gullies and ravines, and established the W. W. Ashe Nursery. This latter facility, which annually produced millions of seedlings, ensured the rapid buildup of plantation forests, a hybridizing supplement to the natural regeneration of Mississippi's pineries.[32]

Even before Conarro and his staff hustled to develop Mississippi's national forests, he made certain to avoid a mistake that supervisor Loren Bishop had made on the Allegheny. "Having been born and raised in the oil and gas field section of Pennsylvania and employed in this same area the first six years of my Forest Service career, I became fully convinced that the oil and gas interests were not conducive to good forest management," Conarro wrote.[33] Those powerful companies and the mineral rights they maintained (and the unabridged right of access to them) further complicated the physical integrity of the Allegheny National Forest. When Conarro left the forest in 1927, "the area acquired and under purchase agreement was in the neighborhood of 300,000 acres," but that figure was misleading. "In this acreage only 134 acres were owned, or would be owned outright (fee simple) by the Government." The inholdings fragmented the forest, as did the complex structure of who owned what: "Some individuals and companies owned both oil and gas rights," but not all. In other cases, the oil rights were "owned by an individual or company" while others controlled the gas rights.[34] These complicated conditions, in which more than 90 percent of mineral rights were in private hands (and still are), has continued to trouble the forest's mission and management.[35]

Conarro was convinced that he could preemptively assert greater control over mineral rights that ran with the lands he planned to purchase for the Mississippi National Forests. In consultation with the regional forester, he prepared a mineral-reservation clause in the option-to-buy proposals that granted sellers a ten-year term to drill on the land they were selling. Because none of "the purchase units produced either oil or gas prior to the expiration of the ten-year expiration dates of mineral rights on over 800,000 acres of land owned by the Government . . . suddenly the Forest Service was in the oil and gas leasing business." By Conarro's estimate, that clause, which granted the federal agency the right to sell to the highest bidder any subsequent request for a prospecting permit, generated upwards of two million dollars annually. In 1947, however, Forest Service Chief Lyle Watts, and Clinton Anderson, who was President Truman's secretary of Agriculture, decided to give responsibility over mineral rights to the Bureau of Land Management. Watt's reasoning, which echoed that of Allegheny supervisor Bishop's twenty years earlier, was that the Forest Service "was a forestry organization, not a

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A Civilian Conservation Corps crew, equipped with dibbles and seedlings, planting trees on Mississippi National Forests in the 1930s.

mineral managing organization." Conarro's rebuttal was sharp: "The managing of underground minerals is, of course, land management, as present-day Forest Officers well know." What was worse, he fumed, was that the actions of Watts and Anderson caused Mississippi to lose "revenue of millions of dollars each year, and made it possible for oil and gas interests to obtain drilling rights simply by applying for such rights."[36]

As shrewd was Conarro's conviction that the Forest Service's aggressive fire-suppression policy needed to change. From the agency's beginning, fire was such an anathema that its leaders committed to full-on suppression in the 1930s with the so-called "10 A.M. Rule," requiring that all fires, once spotted, be put out by the next morning.[37] This policy ignored the observational and experimental evidence that indicated that some species required fire to regenerate. Among these was the longleaf pine, one of the dominant forests in the South, and whose fire adaptation English settlers and travelers had noticed since the eighteenth century.[38] Forest scientists like H. H. Chapman at Yale's forestry school had demonstrated the need for fire in longleaf forests.[39] Making the same case was federal Bureau of Animal Husbandry's S. W. Green. Since the early 1920s, Greene, in collaboration with the Forest Service's Southern Experiment Station, had been using a parcel of land in Pearl River County that abutted what would become the DeSoto National Forest. There, he assessed the relationship between fire, grass and grazing, and longleaf pine, discovering that once longleaf seedlings reached "post size," routine applications of fire would regenerate the associated grasslands without damaging the trees.[40]

Conarro noted that Greene's findings were "quite controversial among foresters, especially state fire protection agencies" because the "use of fire in woodland for any reason was taboo." That prohibition began to crack after Chapman set up a panel of likeminded fire researchers at the 1935 annual meeting of the Society of American Foresters, with Greene as one of the panelists. That same year Conarro, along with the supervisors of national forests in Texas and Louisiana, received permission from the regional forester to conduct controlled-fire experiments. Conarro, for example, "set up three areas of from 1,000 to 1,500 acres each, had plots established and plans made for periodic burning and study of results," an internal report noted later. "These plans were carried out and much valuable data collected. Conarro's vision and personal action to see that the experimental program was aggressively pursued contributed very importantly to the development of this important technique of longleaf pine management."[41]

Soon thereafter, Conarro, after being appointed chief of fire control for the Forest Service's Southern

Region in 1940, went public with his commitment to integrate fire into the management of national forests from Virginia to Texas, Florida to Kentucky. In a 1941 talk delivered to the Society of American Foresters, Conarro asked whether there was "a place for fire in the management of our southern forests?" His was a rhetorical query, because the answer was "obviously yes, providing [fire] is used strictly in accordance with a plan developed from facts determined by a survey and analysis correlated to available knowledge concerning weather influence and fire effects." Likening this approach to that which physicians utilized when assessing strategies for their patients' healthcare, Conarro adapted a medical term to describe this new form of fire-management—"Prescribed Burning." He coined the phrase because of what it defines ("burning to a prescription which prescribes the area to be burned, the degree of burn, the method and the time, simple, concise, effective"); and how this definition leaves "no room for criticism, for controversy, for misunderstanding." That last point may have been more optimistic than warranted, but he expected that the concept of prescribed burning would take the heat out of inflammatory claims that all fire anywhere was the enemy of forestry. "We should no longer consider that fire is 90 or 95 percent, or any other great percentage, of the South's forest problem, but that it is an effective tool, a vehicle upon which sound forestry practices can well rely."[42]

By arguing that henceforth forest management could not proceed without fire, Conarro put his peers on notice. Thirty years later, fire ecologist Gordon Langdon thought that the article marked "a subtle change in the philosophy of writers before 1941, when the term 'prescribed burning' was introduced by Ray Conarro, and of those writing subsequently."[43] Conarro's insights went beyond the theoretical, fire historian Stephen Pyne has noted: the forester's words took root. In 1943, the Florida National Forest gained agency approval to utilize prescribed burning, and fifteen years later, the National Park Service used fire to restore portions of the Everglades.[44]

SYSTEMATICS

Conarro's growing influence was not simply because he created a new term, no matter how smart, but because of his ability to think systematically. These qualities would be on full display when in 1943 the regional forester tapped him to assess work-plan procedures for rangers and supervisors. Conarro drew on his experience as a ranger and administrator to develop an array of new methods, and then traveled to every southern forest to educate his peers on their application. His wide-angled perspectives led the Washington Office to bring him north to develop best practices for communication, engineering, and automatic data processing.[45] During a 1955 detail to the Chief's Office to assist in compiling the national work-load data, for example, Conarro observed the methods then in use "to accumulate and record the statistical and expenditure data for the national forest road and trail system." His observations led to questions about the processes, which in turn grew into a critique: Current practices were "time consuming from the standpoint of manpower required and lapsed time in securing the required data." The remedy led Conarro, "on his own time," to devise "a method of doing this job with data processing machines." The resulting alterations in work-loads and flows were adopted across the agency and became one reason why in 1958 the Forest Service nominated him for a USDA Superior Service Award.[46]

There would be other honors. In 1968, six years after Conarro retired from the Forest Service and returned to Mississippi to work as a forest consultant, he was the recipient of two lifetime achievement awards. He was awarded the inaugural Silver Smokey from the National Association of State Foresters, the U.S. Forest Service, and the Advertising Council, given for outstanding wildfire prevention service regional (multistate) in scope for work over at least a two-year period.[47] From his professional colleagues in the Society of American Foresters' Gulf States chapter, he received the Distinguished Service to Forestry award.[48]

More significant than these nods to his professional accomplishments was what had happened to the denuded Mississippi forests he first encountered in 1933. By the early 1960s, the six Mississippi National Forests sustained much healthier, and more resilient and biodiverse ecosystems. On the DeSoto, this included some sections along the Leaf River where Conarro had uncovered thousands of longleaf seedlings hidden beneath the rough grass. In 1940, he oversaw the establishment of the 42,000-acre Leaf River Wildlife Management Area, which subsequently would be abutted by the Leaf River and Black Creek wilderness areas, designated in 1984. Conarro's prescription for good forest management, which required a judicious tending with fire, had helped bring these lands back to life.

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NOTES

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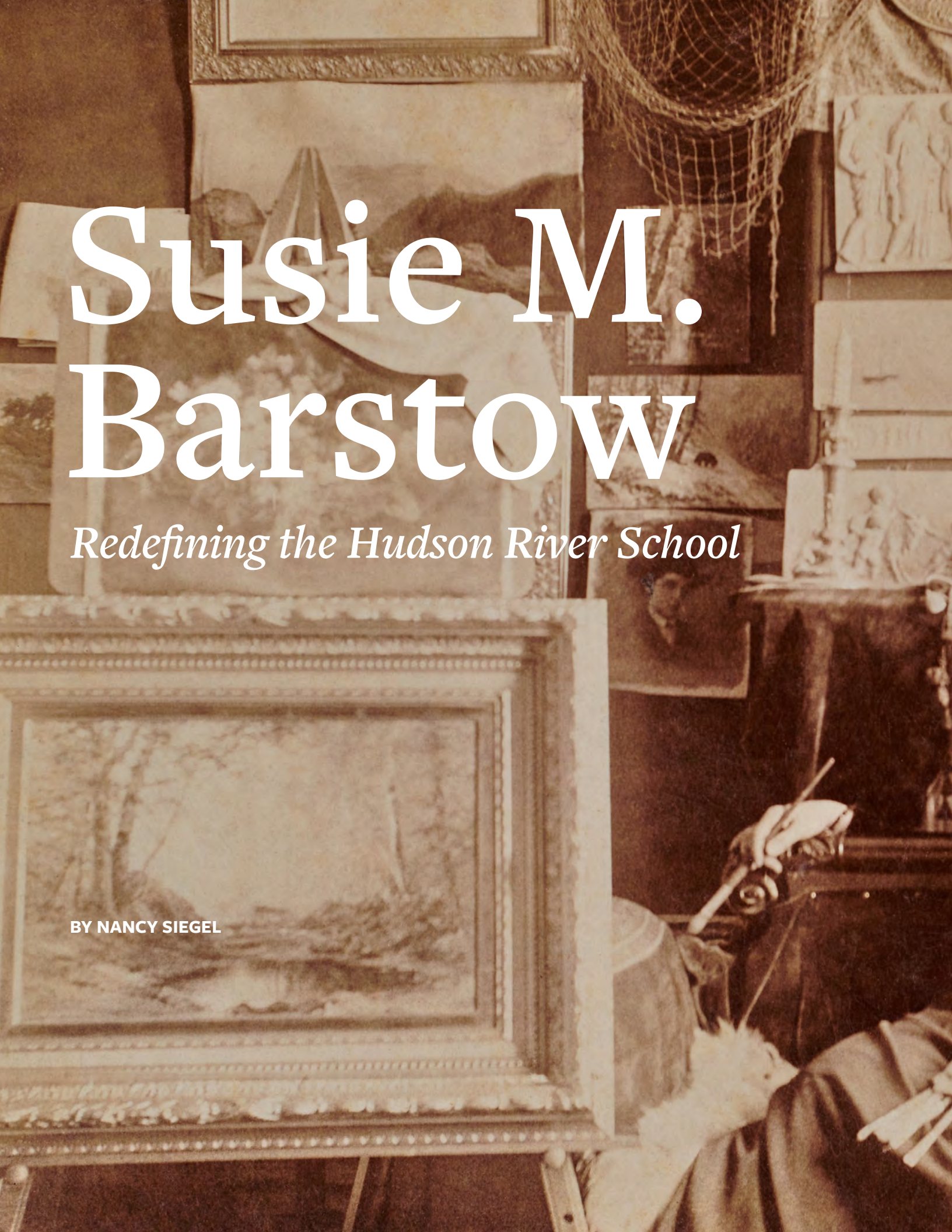


Susie M. Barstow

Redefining the Hudson River School

BY NANCY SIEGEL

Susie Barstow had national renown as a landscape painter when she died in 1923, but then was soon forgotten. Her work and legacy have only recently been recovered.

"Susie M. Barstow in Her Brooklyn Studio," 1891, by her niece Susie Barstow Skelding, 5 x 7 in. Private collection.

An artist of the Hudson River School of landscape painting, Susie Barstow maintained a studio in Brooklyn well known to many. In the December 28, 1890, issue of the *Brooklyn Citizen*, an art critic described it, in unintentionally pejorative language, as Miss Barstow's "dainty little studio." The studio was filled with her sketches and paintings of her favorite subject: the outdoors. An early member of the Appalachian Mountain Club, she frequented the Catskills, the Adirondacks, the White Mountains, and the lakes and mountains of Maine for inspiration. She made multiple excursions abroad to study art in Germany, Switzerland, and Italy and later traveled the globe in search of exquisite scenery to paint. Her travels and subject matter made her very much a part of both the Hudson River and Rocky Mountain Schools, whose leading male figures like Thomas Moran, Albert Bierstadt, and Sanford Gifford traveled far and wide in search of new sights to capture. But unlike those men, within a few decades of her death, Barstow and her work had been forgotten.

"Portrait of Susie M. Barstow," tintype, ca. 1870, 5½ x 4 in. Private collection.

RECOVERING BARSTOW'S LEGACY

By all accounts, Barstow's artistic legacy was well established at the time of her death in 1923. The *Brooklyn Daily Eagle* characterized Barstow as "one of the best-known Brooklyn artists," and when she died, an obituary in the same newspaper described her as a "prominent landscape artist, whose paintings won her wide renown" and a "woman of keen intellectual attainments."

Yet within a few decades, her achievements and reputation, along with those of fellow women artists, were written out of history. In an unexplainable moment of art historical amnesia, exhibitions of American landscape paintings failed to include works by women of the Hudson River School. With very few exceptions, Barstow and other female painters were all but forgotten; art historians neglected to mention them in catalogues, monographs, and essay collections. This historical scholarly bias against their abilities continued into the twenty-first century. A century has elapsed since Barstow's death; it is time to bring her art and life back into the narrative of American art.

EVOLVING STYLE

Susanna Moore Barstow was born in 1836 and raised in the upper-middle-class family of a well-respected tea merchant in New York. In her twenties, after attending the Rutgers Female Institute (1853) and the Cooper Union (1861), she began exhibiting her work. She joined the important art organizations of her day, including the Cosmopolitan Art Association. The early style of her painting can be characterized

as that of the Hudson River School—romanticized, site-specific compositions with secluded depictions of nature's beauty. As a professional artist, she exhibited at major venues alongside male colleagues and realized comparable prices for her paintings.

Well read, well educated, and well-traveled, Susie Barstow was a notable figure in the field of American landscape painting. She was interviewed often; she published her ideas about the value of experiencing nature directly, and lectured widely on the topic. In her handwritten notes for a lecture on the American landscape, Barstow recalled details from a visit to the Catskill Mountains:

> When I was a child I visited the Catskill Mts. As we saw them from the river on a hazy summer afternoon they lay like a delicate cloud—so delicate and dreamlike that it seemed as if a breath would blow them away. I hardly dared to look away from them fearing they might vanish. As we approached, their forms became more distinct but always vapory and unreal, seeming to belong to another world than the river and its wooded shores and villages.

FIGURE 1. Susie M. Barstow, ***Autumn Waterfall***, ca. 1880, oil on canvas, 6⅛ x 5 in. Private collection.

Throughout her extensive career, Barstow commanded the physical landscapes of New England and New York, the rigorous terrain of Yosemite in California, the demanding mountain ranges of Europe—actually, any mountain range she encountered that offered stunning vistas and marvelous views—all the while altering her long skirts and hiking garb so as not to be encumbered on these rugged explorations. In the August 3, 1889, issue of the *White Mountain Echo*, reporter Emily A. Thackray noted that Barstow had climbed as many as 110 peaks, including "all the principal peaks of the Catskills, Adirondacks, and White Mountains, as well as those of the Alps, Tyrol, and Black Forest, often tramping twenty-five miles a day, and sketching as well, often in the midst of a blinding snow-storm."

Barstow and fellow artists, including Jervis McEntee, Julie Hart Beers, and John William Casilear, were part of the second wave of the Hudson River school, when Reconstruction and post–Civil War economic growth fueled the art market, spurring demand for smaller, intimate scenes of the American landscape (*Figure 1*).

Artists responded enthusiastically to this call for parlor-sized compositions from a new and vibrant class of collectors who were eager to adorn their walls with scenes of the Catskills and the Green and White Mountains, depicting unspoiled rivers, lakes, streams, and wooded scenery—landscape seemingly untouched by progress or war, reflecting a nostalgic taste for a more peaceful past.

The prime of Barstow's career occurred between the 1870s and the end of the nineteenth century (*Figure 2*), artistically a time when

scholars have asserted that the Hudson River School had fallen out of fashion in favor of avant-garde European influences.

Barstow, however, understood popular taste, and her painterly style evolved continually across the nineteenth century. While some people were purchasing works in the now conservative mode of the Hudson River School, critics and collectors alike were praising an emerging style in which artists reconsidered John Ruskin's truth-to-nature philosophies. Channeled through the influence of Barbizon artists Jean-Baptiste-Camille Corot and Charles-François Daubigny, painters complemented direct observation with sentiment, softer lines, and more diffuse forms. Exploring changes in atmospheric conditions, these French artists produced immersive landscapes, moody and romantic compositions that capitalized on a spiritual communing with nature. Barstow was enormously influenced by their work (*Figure 3*), and by the paintings of Corot in particular.

She kept newspaper clippings explaining his studio methods in her paint box, which was filled with supplies that included camel-hair brushes, porcelain palettes, watercolors, and white flake pigment.

Barstow was ever curious to educate herself in both traditional and avant-garde artistic movements while always adhering to her passion for direct observation in nature. This outlook resulted in works that were praised, exhibited, and purchased throughout her extensive career, demonstrating her ability to commingle conservative and progressive styles popular with the American public. Her formal evolution is reflective of an artist who wished to remain relevant in the art world on both the East and West coasts, and her travels took her across the United States to capture the varied terrain.

TRAVELS AND EXPLORATIONS

As an artist of determination and determined independence with a passion for exploration, Barstow often left her traveling companions to hike and sketch on her own. She enjoyed bouts of wanderlust: using her Brooklyn home and studio as a place to unpack, paint, visit with family, and entertain friends; she would then take off for new adventures. Whether traveling alone, with friends, or sometimes with her students to places of immense beauty to sketch, Barstow would commonly hike eight, ten, or twelve miles, only then to sit down and commence the task at hand—to capture in detailed studies on paper or canvas the wondrous charm she encountered out of doors, inspired by the natural environment, especially the White Mountains of New Hampshire.

Like many of the Hudson River School painters, she traveled the world looking for new landscapes to capture. In 1901, she embarked on a two-year trip around the world, visiting Japan, China, India, and Egypt with her partner, Florence Nightingale Thallon, a fellow artist with whom she frequently lived and traveled for nearly two decades.

LIVING IN TUMULTUOUS TIMES

Susie Barstow's lifetime spanned a vast array of political upheaval, scientific advances, cultural events, celebrations, and American progress defined broadly as part of a changing world. She lived through the Civil War and the First World War. She experienced the horse-and-carriage era into the automobile age. Born during the infancy of photography, she saw the many technological advances that gave rise to a redefinition of realism—optical, social, and emotional. The photographic exposés of Jacob Riis, for example, were in line with her own commitment to social justice and charitable causes. Her works were exhibited on both sides of the East River, just as John A. Roebling was spanning the divide between Brooklyn and Manhattan with his Brooklyn Bridge (1869–83), making for easier travel between the two boroughs. She observed the birth of the skyscraper—an American architectural invention that rivaled the height of mountaintops, forever changing urban skylines.

She witnessed the shift from the telegraph to the telephone and the invention of the phonograph and the electric light bulb. She attended Chicago's Columbian Exposition in 1893, making watercolor sketches (*Figure 6*) and saving her entrance tickets as souvenirs. During her lifetime, motion and sound advanced in exciting ways: the roller coaster at nearby Coney Island, the airplane, motion pictures, and radio. The Museum of Natural History (1869), the Metropolitan Museum of Art (1870), the New York Public Library (1895), and the Brooklyn Museum of Art (1897) were all built during her lifetime and easily accessible from her home. And, of great importance to her, Barstow lived long enough to celebrate the ratification of the Nineteenth Amendment on August 18, 1920, which gave women the constitutional right to vote. What an incredible time in which to live and paint!

Throughout her 87 years, Susie Barstow was committed to expressing the majesty she found in nature.

FIGURE 2 (PREVIOUS SPREAD). **Susie M. Barstow, *Mountain Lake in Autumn*, 1873, oil on canvas, 20 x 30 in. Private collection.**

FIGURE 3 (OPPOSITE). **Susie M. Barstow, *Early October near Lake Squam*, 1886, oil on canvas on board, 14½ x 12 in. Lebanon Valley College Fine Art Collection.**

FIGURE 4 (OPPOSITE). Susie M. Barstow, *Fall, White Mountains*, ca. 1870s, oil on canvas, 13¼ x 11¼ in. Albany Institute of History & Art.

FIGURE 5 (RIGHT). Susie M. Barstow. *Untitled*, ca. 1880, oil on canvas removed from stretcher, 21 x 13 in. Collection of the Barstow Family Trust.


a Fernery Corner in Horticultural Building

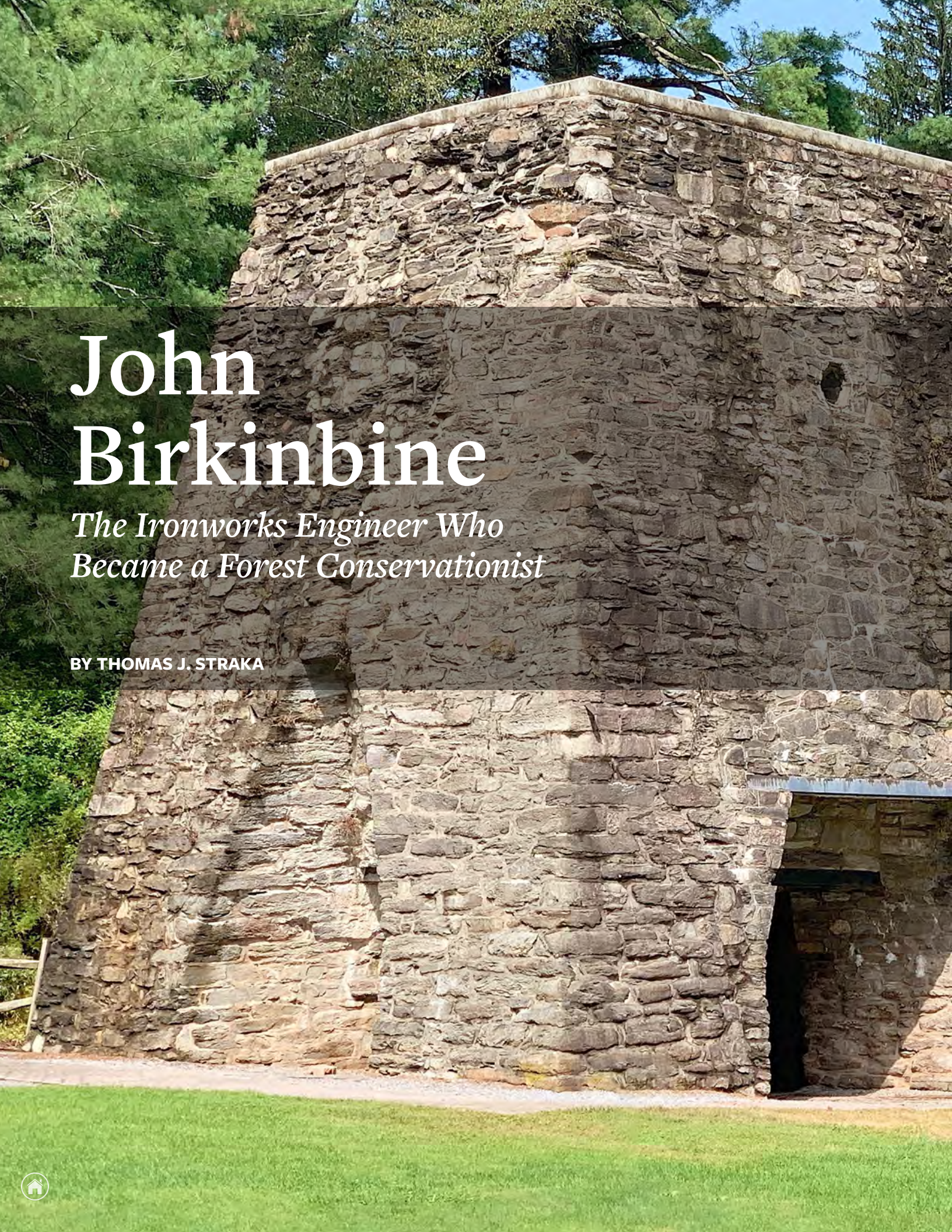
Barstow kept newspaper clippings explaining other artists' studio methods in her paint box. Susie M. Barstow, Paint Box, ca. 1860, wood and assorted artist's supplies, 5¼ x 11 x 9¾ in. Private Collection.

In her "dainty little studio," she captured the larger American landscape experience as it evolved across the nineteenth century.

Landscape paintings of exceptional quality by nineteenth-century women artists are now coming to light and to market while the work of scholars, gallerists, collectors, and museum professionals moves our knowledge and appreciation forward. The Baltimore Museum of Art, the Albany Institute of History & Art, and the New Britain (Connecticut) Museum of American Art, to name just a few of the museums that are acquiring and exhibiting works by previously unrepresented women artists, reflect the reprioritizing of paintings, watercolors, and drawings by Susie Barstow and her fellow female artists to illuminate an expanded, fulsome, and more-complete history of the Hudson River School.

Nancy Siegel is Professor of Art History and Culinary History at Towson University; she specializes in American landscape studies, print culture, and culinary history of the eighteenth and nineteenth centuries. This essay is adapted from an article originally published by Art Herstory *at https://artherstory.net/susie-m-barstow-redefining-the-hudson-river-school. All quotations can be found in her book,* Susie M. Barstow: Redefining the Hudson River School *(Lund Humphries Publishers, 2023).*

FIGURE 6 (OPPOSITE). Susie M. Barstow, *A Ferny Corner in Horticultural Building at the Columbian Exposition*, 1893, watercolor on paper, 10 x 8¼ in. Private collection.



John Birkinbine

The Ironworks Engineer Who Became a Forest Conservationist

BY THOMAS J. STRAKA

SPECIAL COLLECTIONS, LEHIGH UNIVERSITY

John Birkinbine (1844–1915), was an unsung early advocate for forest management.

COURTESY OF THE AUTHOR

That the wood-based charcoal industry was an impetus for the early forest conservation movement is as underappreciated as John Birkinbine.

In 1877, a thirty-two-year-old engineer was engaged to modernize an iron smelter in south-central Pennsylvania.[1] Like most charcoal-fueled ironworks, Pine Grove Furnace was surrounded by large tracts of forest that ensured a continuous energy supply.[2] But after more than a century of operation, timber was becoming scarce. At first the shutdowns due to fuel shortages had been intermittent; then operations halted entirely for several years. The furnace had to be renovated to accept coal and coke as a supplement to the dwindling supply of charcoal.[3]

John Birkinbine had learned the engineering profession from his father, a specialist in hydraulics. He was thus acquainted with the hydrologic consequences of forest destruction, like diminished stream flows and flooding.[4] At Pine Grove Furnace, he saw the economic effects of deforestation on a critical part of industrializing America.

In the American West, timber harvesting for charcoal used in gold and silver smelters cut vast forests of slow-growing pinyon pine and juniper—species that could not support a continuous wood supply.[5] In the East, however, iron producers created an industry association that supported sustained-yield forestry.[6] Birkinbine would become one of its leaders, edit its journal, and propound forest conservation. His standing in the charcoal iron industry put him in a position to champion the fledgling movement for management of the nation's forest resources.[7]

In 1879, a group of owners and managers of charcoal-fueled ironworks organized as the United States Association of Charcoal Iron Workers (USACIW), with Birkinbine as its secretary. The position included editorship of the *Journal of United States Association of Charcoal Iron Workers*, a new bimonthly publication that covered all aspects of the industry.[8]

The journal centered on charcoal iron furnace operations but included articles on timber supply, silviculture, and forest management. The first issue, published in April 1880, contained a defense of the industry, arguing that in terms of acres "denuded," the charcoal iron industry was a bit player compared with agriculture (fencing), railroads (ties), construction (lumber), and papermaking (wood pulp). The big difference, the article suggested, was that most of the charcoal lands were regenerated, whereas forests harvested for other purposes were abandoned.[9]

Birkinbine's third issue featured the first chief of the Department of Agriculture's Division of Forestry, Franklin B. Hough, who had recently conducted an inquiry into forest conditions across the country. Hough's third *Report on Forestry* included sections on the charcoal industry—the care of timberland for its production, a survey of charcoal iron furnaces, timber depredation by charcoal burners on public lands in the West[10]—and he had spoken at the charcoal iron association's first annual meeting about European silviculture and mensuration. The association's journal printed that presentation,[11] and the discussion

The Pine Grove Furnace stack can still be seen at Pine Grove Furnace State Park. The park is in Michaux State Forest, which comprises former charcoal iron furnace lands and contains thousands of historic charcoal pit hearths.

that followed showed members' keen interest in applied silviculture and forest fire prevention.[12] In two 1882 issues, Hough wrote about the need for forestry schools, and his book, *Elements of Forestry*, was reviewed.[13]

In addition to forest management topics, the journal devoted many pages to increasing the yield of charcoal production, thereby decreasing the demand for wood.[14] One article lauded "woodchopping as a fine art."[15] With its many papers on forests and forestry, the periodical almost qualifies as an early forestry journal.

Through the journal, Birkinbine networked with the emerging forestry community. One forestry pioneer whose work intersected with Birkinbine's—and whose path to professional forestry positions in the United States ran through the charcoal iron industry—was Bernhard E. Fernow.[16] Trained as a forester in Prussia, in 1876 Fernow followed his fiancé, Olivia Reynolds, to America. Finding neither a forestry profession nor employment for a forester, he worked at various non-forestry jobs until a Reynolds family friend, Rossiter W. Raymond, a consulting engineer with a relationship with the Cooper, Hewitt & Company, arranged employment for him at its ironworks in Pennsylvania and New Jersey.[17]

The "Hewitt" in the company name was Abram S. Hewitt, who, besides being an iron manufacturer with an interest in charcoal production and forestry, served as chairman of the Democratic National Committee, a U.S. congressman, and the mayor of New York City. When Fernow became the third chief of the Division of Forestry in 1886, his connections with the charcoal iron industry—and the influence of Abram Hewitt—likely aided his appointment.[18]

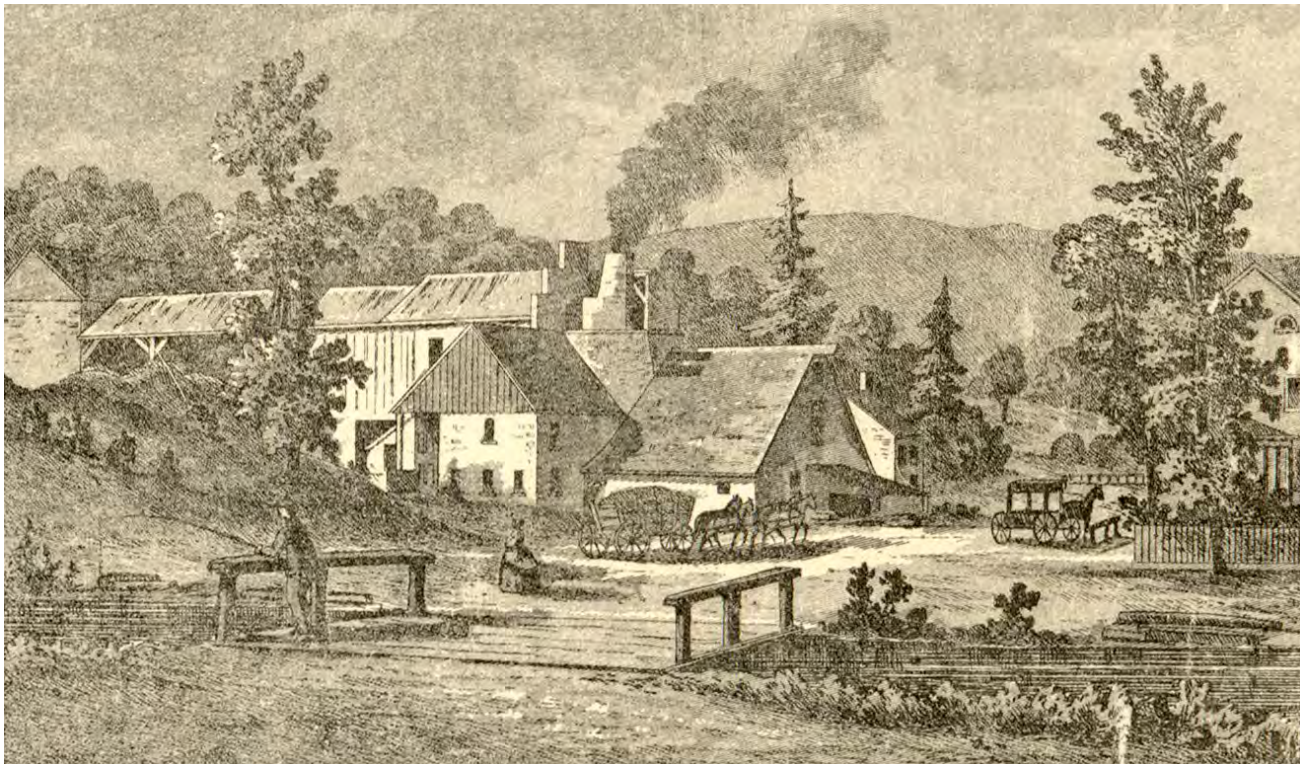
Well before Gifford Pinchot began to manage the forestland of Biltmore Estate in North Carolina in 1892,[19] Fernow began managing, in 1879, the source of the Lehigh Furnace's fuel: fifteen thousand acres on the south slope of Blue Mountain in east-central Pennsylvania. He worked on the furnace forest property until 1883 and then continued to manage it from off the property until 1887.[20] Thus began Fernow's charcoal iron industry connections—and his first chance in America to manage forestland. In 1896, a local newspaper reviewed one of his articles on silviculture and called him a "first class forester" who "put an end to the depredations that were being made upon the timbers."[21] Recent surveys on the former Lehigh Furnace lands show many old charcoal pits, plus remnant signs of early forest use and management.[22]

Through the American Institute of Mining Engineers (AIME), which he had joined, Fernow developed relationships with industry leaders who also had an interest in forestry. Three of those, each of whom served as president of the organization, were Rossiter Raymond, Abram Hewitt, and John Birkinbine. Raymond became one of Fernow's closest friends,[23] and Fernow even used the post-nominal letters M. E.[24] Fernow's early writings, representing some of the first professional forestry literature in the United States, appeared in the *Transactions of the American Institute of Mining Engineers*, the *Journal of the United States Association of Charcoal Iron Workers*, and the *Engineering and Mining Journal*.

Fernow and Birkinbine critiqued each other's papers at meetings of the USACIW and the AIME. At the February 1878 meeting of the latter, Fernow presented a paper titled "The Economy Effected by the Use of Red Charcoal." During the discussion that followed, Birkinbine remarked "upon the great importance of this subject." Immediately after, Raymond suggested the speaker deserved "special credit" for not proposing legislation to reduce forest waste, "something not expected from him as a late member of the Prussian Forest Department." At the mining engineers' October 1878 meeting, Birkinbine began his presentation, "The Production of Charcoal for Iron Works," with kind remarks on Fernow's paper and the hope that his own paper would encourage continued discussion of the topic. And at an 1888 meeting, Birkinbine addressed the relationship of forestry to the mining industry, with its regional effects on timber supply,[25] after which Fernow joined in discussion of Birkinbine's paper.[26]

The professional connections between forestry and the charcoal iron industry were strong enough that in 1882, Birkinbine felt slighted when members of the USACIW were not invited to the First American Forest Congress, held in Cincinnati. His comments in the journal on the snub are telling:

> Had those in charge of the late Forestry Congress sent an invitation to the United States Association of Charcoal Iron Workers, a suitable delegation would undoubtedly have been named to represent it, as was the case in the New York Tariff Convention of 1881. Forestry has been esteemed by the members of the Association as an important study in connection with the large tracts of land controlled by charcoal iron workers. At its first annual meeting, Professor Hough, Chief of the Forestry Bureau, by invitation, read a paper on the subject, and he, and the science he represents, were recognized by his election as an honorary member of the United States Association of Charcoal Iron Workers. Much of the space of our JOURNALS has been devoted to forestry discussion, and some of those JOURNALS were in the hands of those who organized the Forestry Congress.[27]



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The Lehigh Iron Furnace provided Bernhard Fernow his first opportunity to manage an American forest. The furnace was located near the Blue Mountain woodlands, its source of wood for charcoal fuel. This sketch is a detail from an 1862 map of Lehigh County, Pennsylvania, by G. A. Aschbach.

Fernow, who did attend the congress on behalf of the USACIW, produced two reports on the meeting that Birkinbine published.[28]

MINING'S VESTED INTEREST IN FOREST CONSERVATION

Like most of the earliest champions of forest conservation, Birkinbine had no formal training in forestry, calling himself an "earnest forestry enthusiast."[29] But his Pine Grove Furnace experience led him to develop a conservation philosophy, and the journal gave him a pulpit to preach the gospel of sustained-yield forestry as practiced on much of the charcoal iron industry's forest holdings.

Despite the industry's contention that it was at the forefront of sustained-yield forestry, the scars it left on the landscape drew public protests against natural resource exploitation. An 1884 article in a national weekly magazine highlighted charcoal burning as a forest destruction culprit in a color political cartoon, concluding, "Let the forests be saved, and the mischief that has already been caused by the wanton destruction be repaired, if it be not too late!"[30] Birkinbine responded in his journal:

> The great consumers of charcoal are iron works, which are established as permanent industries—the maintenance of a wooded area being a vital consideration. With the exception of a few districts, the fuel supply is generally made permanent by the proprietors of the iron works securing control of sufficient woodland to ensure this end, and the reproduction of forest growth is one of the duties of management. Therefore, while in one sense charcoal iron works are destroyers of forests, in another sense they are conservators of them. . . . The necessity of maintaining large areas of forest lands so as to keep up a supply of wood, makes the charcoal iron works, more than any other one other industry, the protectors of forest, and the estates of the charcoal iron plants in the older settled

> portions of the country have a marked influence on the streams and climate of the adjacent territory.[31]

Interest in forestry continued to grow among members of the USACIW and the mining associations. The AIME journal published a notice about "a new branch of engineering" that dealt with forestry:

> A need of which the American public in general, and many individuals and corporations in particular, have been for some time keenly yet vaguely aware, is the service of men capable of giving expert advice on all matters connected with the management of forests. On all sides, we hear that something must be done with regard to the timber supply and the waning forests of the country. . . . But experienced foresters can only decide, when and what and how. Under the advice of such men, unskilled proprietors and laborers of merely ordinary intelligence and fidelity can accomplish much in the redemption and preservation of valuable timber-species. . . . The time is coming, but it has not yet come, when slow-growing hard-wood forests can be planted and cultivated, so as to pay fair interest on the investment. . . . We are glad to notice that this branch of engineering is now beginning to be represented in this country, and that, as an evidence of this new departure, an office has been opened in this city by MR. BERNHARD E. FERNOW, whose contributions to various technical societies and to the *Charcoal Iron-Worker's Journal* and other journals have attracted general attention.[32]

In the late 1880s, the *Journal of the United States Association of Charcoal Iron Workers* was seen as a burden to the association, and the journal had to find alternative financial support and a new focus.[33] Birkinbine continued as editor, but his career path would need to take a turn. Although engineering and the charcoal iron industry might have seemed the logical direction, forestry would be where he spent the rest of his life.

BIRKINBINE AT THE PENNSYLVANIA FORESTRY ASSOCIATION

As his duties at the USACIW declined, Birkinbine leapfrogged to the Pennsylvania Forestry Association (PFA). He was a founder of the organization in 1886 and was elected secretary, vice president the next year, and president in late 1892, serving in that position until his death. His editorial skills leapfrogged with him, and he ran the editorial committee for the bimonthly *Forest Leaves* from its first issue. The association was one of the earliest state forestry organizations, consistently active and influential, and *Forest Leaves* was one of the first forestry journals.[34]

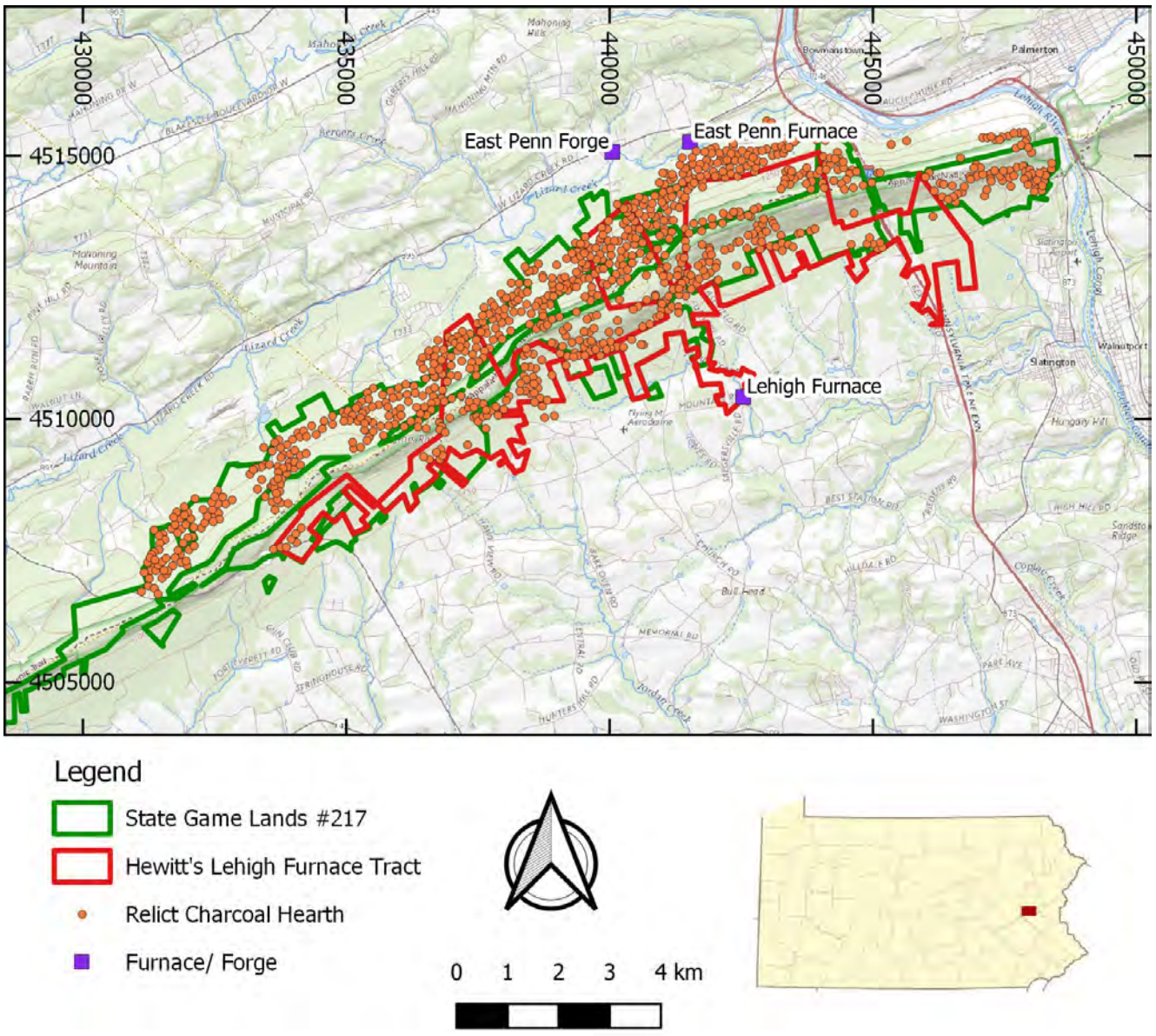
The "salutatory" in the first issue of *Forest Leaves* presented the conservation perspective of the new organization:

> The prevailing sentiment of those who organized the present movement, recognizes that trees like grain, grow for man's benefit, which when ripe should be cut and put to use. It however condemns the useless destruction of forests with the same emphasis that it would the waste of growing grain, and would encourage an equal interest in each, believing that a due proportion of forest is as essential to the public weal as a sufficiency of farm land. . . . Recognizing the large industrial interests dependent upon the forest of Pennsylvania, it would by reforestation of waste lands and preventing needless destruction, make these industries permanent.[35]

By this time, Birkinbine was a recognized forestry expert. In 1909, for example, when Lehigh University in Pennsylvania initiated a course of lectures in forestry, Birkinbine was chosen to give the inaugural lecture. The lectures appeared as articles in *Forest Leaves*,[36] and one was included in the U.S. Forest Service's 1940 selected bibliography of North American Forestry.[37]

Under Birkinbine, the PFA became a model for state forestry associations. Gifford Pinchot, first chief of the U.S. Forest Service, credited it as having been "instrumental in placing the State for which it is named in the first rank of forest progress."[38] From the start, the association had a strong forestry publication, distributed "in the interest of concerted action to popularize forestry in the State of Pennsylvania," and a focus on advancing the forestry cause "by concert of action, secure legislative enactments to prevent useless waste of our already reduced forests and encourage the propagation of new growth."[39] The association advocated for critical forestry needs, like a commission of forestry, and promoted forest conservation through education, teacher training workshops, and forest conservation essays.[40] In an address to the PFA, Birkinbine described the importance of focusing on children:

> The scheme of interesting the teachers of our schools offers a means of instilling love for and appreciation of the importance of forestry in the minds of those who in a few years will shape the policy of State and national



MAP BY BENJAMIN P. CARTER, MUHLENBERG COLLEGE

governments, and this method should be vigorously pursued, for we are enlisted in a work which is to benefit those who follow us more than they who are with us.[41]

LIDAR map of charcoal pit locations on the south slope of the Blue Mountain near Lehigh Furnace. Much of the 15,000 acres owned and controlled by the owners of Lehigh Furnace became a portion of State Game Lands No. 217 (furnace woodlands and game lands overlap). The concentration of charcoal pits gives a good idea of the location of woodlands managed by Fernow.

The charcoal iron industry, of course, was still in the PFA president's mind. In 1894, Birkinbine was asked to report to the Pennsylvania Forestry Commission, headed by J. R. Rothrock, on the woodlands owned by the charcoal iron industry. Although the "magnificent groves of a half century ago" no longer existed, he wrote, the charcoal woodlands comprised "considerable areas of coppice or small growths of timber," still serving a "good purpose in possibly influencing the climate and water

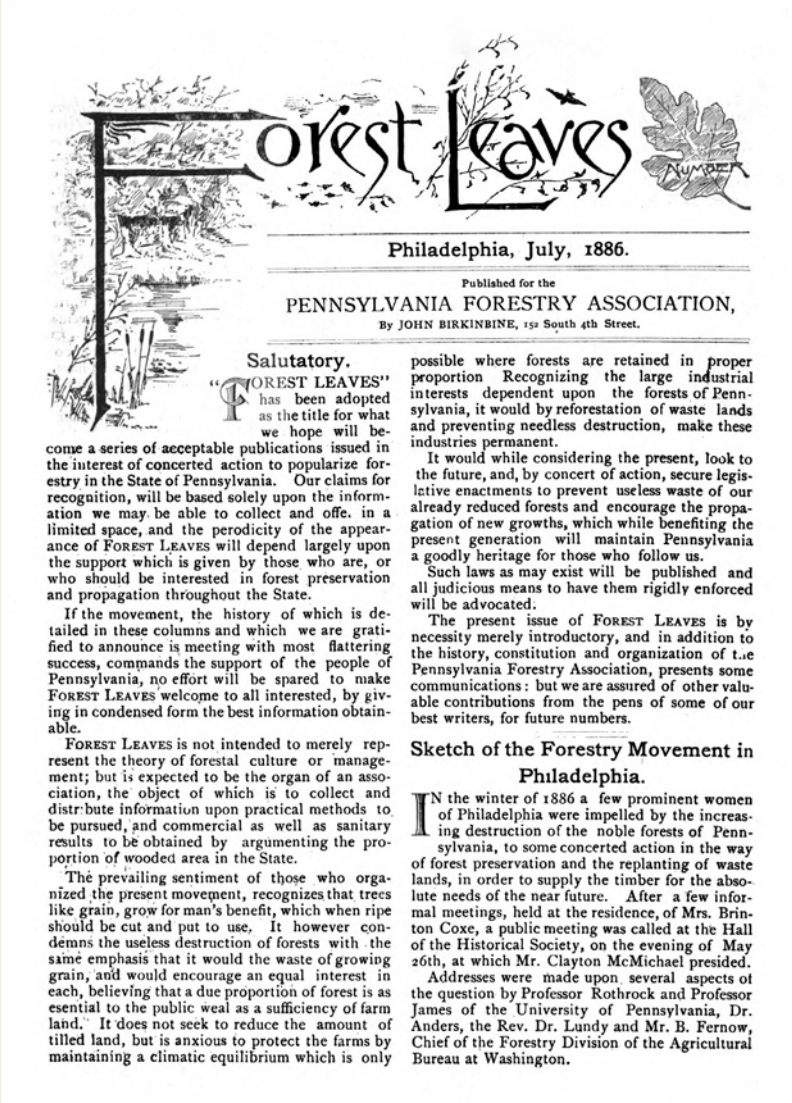
supply of adjacent territories." Efficiency of the iron furnaces had increased while the number of iron furnaces decreased, relieving pressure on these lands to supply wood. Birkinbine suggested that the owners of charcoal ironworks could be "true conservators of the forests" and repurposing these woods would "benefit the community at large."[42] Rothrock and the association began campaigning for public ownership of charcoal lands in ownership transition. Many of these forests became state parks, state forests, and game lands, often with "furnace" in their names.[43]

THE FORESTRY ENTHUSIAST'S PLACE IN HISTORY

When John Birkinbine died in 1915, *American Forestry*, the magazine of the American Forestry Association, called him "an ardent advocate of forest conservation" and lamented that "His death removes from active participation in the cause of forestry a man who had achieved a place as one of the leaders in the movement."[44] Usually mentioned only in passing in discussions of forest conservation history, he was clearly a leader in his own right and a central figure among America's forestry pioneers.

That the mining industry, and the wood-based charcoal industry in particular, was an impetus for the early forest conservation movement is as underappreciated as John Birkinbine. Its prodigious appetite for mining timber and charcoal made it an early advocate of forest conservation,[45] offering what one historian called "cautious support" to the forestry movement.[46]

Birkinbine lived at an inflection point in the American perception of forest resources. He was an early proponent of the then-novel triad of sustained-yield forestry, conservation, and utilization. His obituary in *Forest Leaves* summed up his approach:



Forest Leaves

Philadelphia, July, 1886.

Published for the
PENNSYLVANIA FORESTRY ASSOCIATION,
By JOHN BIRKINBINE, 152 South 4th Street.

Salutatory.

"FOREST LEAVES" has been adopted as the title for what we hope will become a series of acceptable publications issued in the interest of concerted action to popularize forestry in the State of Pennsylvania. Our claims for recognition, will be based solely upon the information we may be able to collect and offe. in a limited space, and the perodicity of the appearance of FOREST LEAVES will depend largely upon the support which is given by those who are, or who should be interested in forest preservation and propagation throughout the State.

If the movement, the history of which is detailed in these columns and which we are gratified to announce is meeting with most flattering success, commands the support of the people of Pennsylvania, no effort will be spared to make FOREST LEAVES welcome to all interested, by giving in condensed form the best information obtainable.

FOREST LEAVES is not intended to merely represent the theory of forestal culture or management; but is expected to be the organ of an association, the object of which is to collect and distribute information upon practical methods to be pursued, and commercial as well as sanitary results to be obtained by argumenting the proportion of wooded area in the State.

The prevailing sentiment of those who organized the present movement, recognizes that trees like grain, grow for man's benefit, which when ripe should be cut and put to use. It however condemns the useless destruction of forests with the same emphasis that it would the waste of growing grain, and would encourage an equal interest in each, believing that a due proportion of forest is as esential to the public weal as a sufficiency of farm land. It does not seek to reduce the amount of tilled land, but is anxious to protect the farms by maintaining a climatic equilibrium which is only possible where forests are retained in proper proportion Recognizing the large industrial interests dependent upon the forests of Pennsylvania, it would by reforestation of waste lands and preventing needless destruction, make these industries permanent.

It would while considering the present, look to the future, and, by concert of action, secure legislative enactments to prevent useless waste of our already reduced forests and encourage the propagation of new growths, which while benefiting the present generation will maintain Pennsylvania a goodly heritage for those who follow us.

Such laws as may exist will be published and all judicious means to have them rigidly enforced will be advocated.

The present issue of FOREST LEAVES is by necessity merely introductory, and in addition to the history, constitution and organization of the Pennsylvania Forestry Association, presents some communications: but we are assured of other valuable contributions from the pens of some of our best writers, for future numbers.

Sketch of the Forestry Movement in Philadelphia.

IN the winter of 1886 a few prominent women of Philadelphia were impelled by the increasing destruction of the noble forests of Pennsylvania, to some concerted action in the way of forest preservation and the replanting of waste lands, in order to supply the timber for the absolute needs of the near future. After a few informal meetings, held at the residence, of Mrs. Brinton Coxe, a public meeting was called at the Hall of the Historical Society, on the evening of May 26th, at which Mr. Clayton McMichael presided.

Addresses were made upon several aspects of the question by Professor Rothrock and Professor James of the University of Pennsylvania, Dr. Anders, the Rev. Dr. Lundy and Mr. B. Fernow, Chief of the Forestry Division of the Agricultural Bureau at Washington.

The influence of *Forest Leaves*, a prominent American forestry publication, extended well beyond Pennsylvania under John Birkinbine's thirty years of leadership.

"He believed in the conservation of forests, but also in their use and sustainability."[47]

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A Half Century of Tropical Forest Research *A Roadmap for the Future*

BY GARY HARTSHORN, DIANA LIEBERMAN, AND MILTON LIEBERMAN

In 1969, no one knew how vital tropical forests would become to the future of the planet. A study that began that year in Costa Rica has much to tell us about what may lie ahead.

In 1969, a year better remembered for Woodstock, Neil Armstrong's moon walk, and the breakup of the Beatles, a unique scientific venture was initiated, without fanfare, in a lowland rainforest in Costa Rica. The goal was simple: to tag, identify, and map a large sample of tropical trees and follow them over time, throughout their lives if possible. At that time, much was still unknown about tropical trees—even their lifespans were a matter of conjecture—and an understanding of the vital role of tropical forests for the well-being of the planet was still in its infancy.

The permanent plots study (which we called "PLOTS") began as the research project of University of Washington College of Forest Resources graduate student Gary Hartshorn, who tagged, identified, mapped, and measured the first 6,000 or so trees. This work, carried out at the La Selva Biological Station, which is run by the Organization for Tropical Studies (OTS), formed the baseline for what may now be considered "Time Zero."

THE LEAD-UP TO TIME ZERO

With funding from the National Science Foundation, OTS launched a comparative ecosystems research project in August 1968 with a month-long tropical dendrology field course taught by dendrologist Leslie Holdridge, a faculty member at Costa Rica's Instituto Tecnológico. Hartshorn was an invited participant in this short course, which ran in the Sarapiquí region at Finca La Selva, the property OTS had purchased from Leslie Holdridge four months earlier. Also participating in the short course was Hans Riekerk, a postdoctoral research fellow in forest soils at the University of Washington. After the course, Riekert stayed on at La Selva, where he set up a 200-by-200-m grid over the entire 587-ha (~1,500-acre) La Selva property.

Riekerk categorized the major landforms at La Selva and established three permanent forest inventory plots: Plot 1, 4.4 ha (11 acres) was on old alluvium in a formerly flooded river terrace; Plot 2, 4.0 ha (10 acres) was on low-lying swamp forest with a better-drained low hill; and Plot 3, 4.0 ha (10 acres), was on soil weathered from underlying bedrock with steeper slopes and dissected terrain.

Each plot was subdivided into 20-by-20-m subplots. All trees and lianas 10 cm (4 inches) or more in diameter at breast height were labeled with numbered aluminum tags, measured in diameter at breast height or above buttresses or stilt roots, mapped to the nearest meter, and identified by species or morpho-species (a provisional name). These initial efforts revealed the hyperdiversity for which tropical rainforests are justly famous: 269 tree species were recorded across these three plots. Contrast that with the checklist of native trees for the entire continental U.S. of just 881 species.[1]

The first inventory of the three Washington plots, as they were initially known, began in 1969 under Riekerk's supervision. When Riekerk left Costa Rica to join the forestry faculty at the University of Florida, Richard Grotefendt, a recent forestry graduate from Southern Illinois University, was brought on board to lead the ongoing forest inventory. Hartshorn returned to Costa Rica at the end of December 1969 to devote half his time to identifying the tagged trees on the three plots and the other half to his doctoral research on the demography of the tall canopy tree *Pentaclethra macroloba* (Mimosaceae). Hartshorn's major professor, William Hatheway, newly hired by the University of Washington, came to La Selva in early February 1970 to assist with the field identifications of the tagged trees. The initial inventory of the three permanent plots was completed in 1971.

FOLLOW-UP CENSUSES: 1982–1995

Beginning in 1981, Hartshorn was joined by co-investigators Diana Lieberman of the University of Ghana and Milton Lieberman of the University of California, Irvine, in collaboration with Rodolfo Peralta Lobo, a forest engineering graduate of the Instituto Tecnológico. In 1982 and at irregular intervals thereafter, the tagged trees were remeasured, deaths were recorded, and new recruits were tagged, identified, measured, and surveyed; from this work, information emerged regarding how fast trees grew, how and why they died, how long they lived, and where and under what conditions each species and its offspring best survived.

Each successive inventory amplified the value of the data set, establishing the long-term growth history of thousands of trees and expanding our understanding of tropical forest dynamics. Now foresters could begin to answer many questions: What factors determine the small-scale distribution of these tree species?[2] What are the rates of mortality and recruitment[3] and of stand turnover?[4] How are species distributed with respect to canopy closure?[5] How fast do tropical trees grow, and how long do they live?[6]

Among the findings: mortality was approximately balanced by

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An *Alsophila* fern tree on the 750 m plot, photographed in June 2020.

recruitment over a sixteen-year period, based on stem density, basal area, and biomass. Of 320 tree species in La Selva, 155 (48 percent) are classified as shade intolerant and depend on some form of canopy opening for regeneration. The proportion varies by stature: shade intolerance is seen in 63 percent of canopy species, 43 percent of subcanopy species, and only 38 percent of understory species. Very few of the shade-intolerant species require large gaps. And as adults, the great majority of tree species behave as generalists.

(Data sets and project details from the La Selva permanent plot inventories (1969–1995) are archived through Environmental Data Initiative at https://edirepository.org, ensuring free, open access for scientific colleagues and the public.[7])

UP THE MOUNTAIN

New questions emerged, and in 1985 the PLOTS project was expanded to include a large-scale elevational gradient, reaching from La Selva in the lowlands to the summit of the dormant Barva Volcano at 2,906 m, a distance of 35 km (~22 miles). The gradient passes through four life zones and two transitional zones of the Holdridge Life Zone system.[8]

Much of the study area is trackless wilderness, and of it is undisturbed old-growth forest within the Braulio Carrillo National Park. Notably, the study site represents the largest elevational transect in Central America having uninterrupted old-growth cover.[9] In fact, the establishment of the 48,000-ha (184-square-mile) Braulio Carrillo National Park, which ensures its continued protection, was in part inspired by the efforts of the PLOTS team and its local allies.

The first six Barva plots, each 1 ha, were set up in 1985 with participation by young volunteer "Venturers" from the British Operation Raleigh program,[10] led by John Proctor of the University of Stirling and Hartshorn; these plots were located at elevations of 100, 500, 1,000, 1,500, 2,000, and 2,600 m.[11] Between 1986 and 1988, five additional 1-ha plots were set up at elevations intermediate to the first six, at 300, 750, 1,250, 1,750, and 2,300 m.[12] A review of initial results showed little overlap in species composition among the first six plots, which were located at intervals of around 500 m elevation. Additional plots were therefore established at elevations intermediate to the existing plots, improving coverage and representation of the forest communities on the gradient. The plots were recensused in 1989 and 1995.

With this establishment of 11 Barva plots, the total number of permanent

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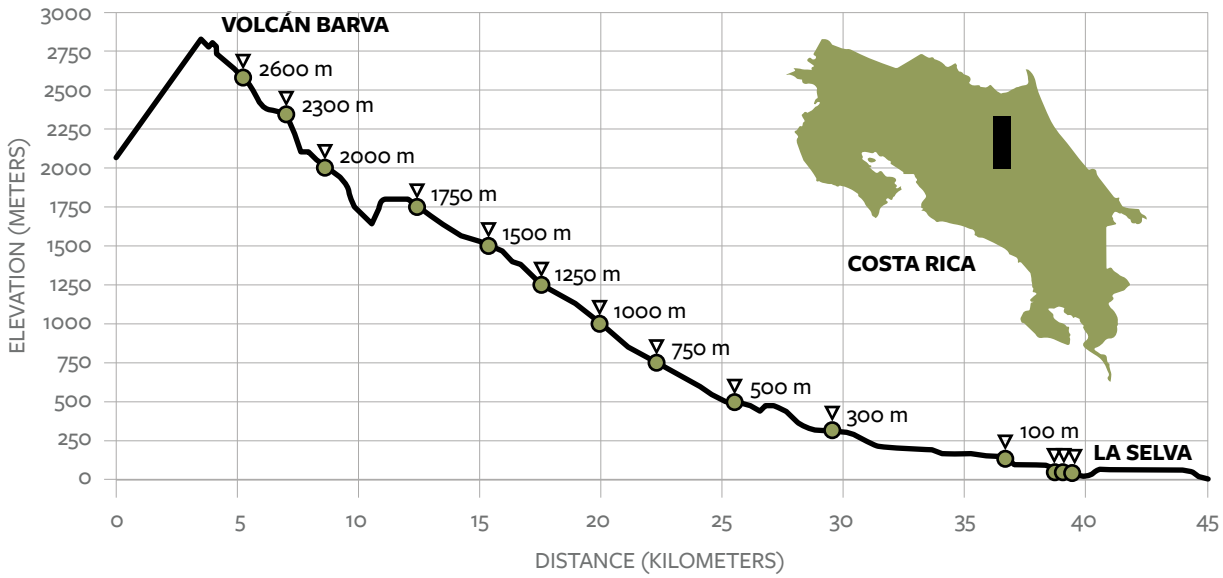
FIGURE 1. Topographic profile of study area between La Selva Biological Station and summit of Volcán Barva.



The location of each permanent forest inventory plot (from 30 m at La Selva to 2,600 m near the summit) is indicated by an arrow.

Conducting inventory in the Costa Rican rainforest is full of challenges. Much of the study area is in trackless wilderness, and many of the tree species were unknown to science before the study began. Recensusing during the Covid pandemic in 2020 was another challenge. Victor Robles assisted with that effort.

inventory plots grew to 14, the total plot area expanded from 12.4 to 23.4 hectares, the number of tagged trees more than doubled, and the number of tree species rose to nearly 700, many of which were new to science.[13] Diversity and canopy height were greatest in the foothills, at 300 m, and lowest at the summit, at 2,600 m. The inventories led to insights about the determinants of forest physical structure, diversity, life-form distribution, species composition, population structure, tree growth behavior, and forest dynamics.[14]

Environmental data were also collected to document the patterns of temperature, relative humidity, and other factors over the transect. On the Barva slope, the drop in mean temperature with elevation (moist lapse rate) is around 6.3°C per 1,000 m (3.5°F per 1,000 feet).[15] In other words, if it's a comfortable 20°C (68°F) in the lowlands at La Selva, it could be a chilly 3.8°C (38°F) at the summit of Barva. There is a close linear correspondence between elevation and mean temperature, such that one can be substituted for the other.

Information from the PLOTS project found application in the tropical forestry and conservation programs of private landowners, government agencies in the United States and Costa Rica, and NGOs such as FUNDECOR.

From both a theoretical and an applied perspective, one question was of particular interest: are tropical trees on this mountain broadly or narrowly adapted with respect to elevation? Because temperature decreases in a predictable manner with increasing elevation, the distribution of tree species reflects tolerance to varying temperatures—a pattern noted by Alexander von Humboldt in 1807.[16] The answer to the question is remarkable: most of the tree species in our study were not broadly adapted but occurred over a very limited vertical range of elevations and temperatures. Of the 524 tree species we mapped, 48 percent occurred within an elevational range of 200 m (~650 feet) or less.[17]

THE CURRENT INVENTORY . . . 50 YEARS ON

In 2018, colleagues at OTS urged us to carry out another inventory representing the fiftieth year of the project—keeping the PLOTS legacy alive and in effect rescuing a program that had been dormant for the last twenty years. The team agreed, and preparations began for mounting a wilderness field project. The answer to a new question was now within reach: as climate change affects tropical forest communities, which species will be winners and which will be losers?

Challenges soon arose, not least of which was the Covid-19 pandemic. Funding was scarce, international travel was suspended, and logistics were a nightmare. Since the last survey, access trails had become overgrown or lost, plots were difficult to relocate, and field shelters were either in disrepair or had disintegrated entirely: it *is* the tropics, after all. Purchase and resupply of basic field gear—diameter tapes, compasses, GPS units, flagging, PVC, rebar, tree tags, aluminum tree nails—were hampered by supply chain issues. Meetings between senior scientists and field technicians, whose (rubber) boots would be on the ground, had to be conducted by video conference. Climate change itself, with record

DIANA LIEBERMAN

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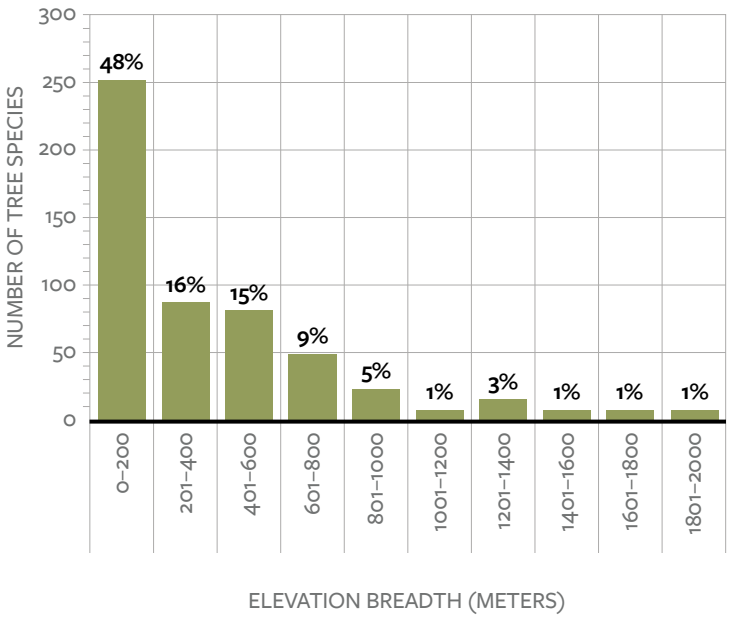
FIGURE 2. Elevational breadth (amplitude) of 524 tree species in permanent plots on Volcán Barva gradient.



Most species occur within a very narrow range of elevations. In our samples, 251 species (48% of the total) were found over a vertical range of 200 m or less. Altogether, 86 species (16% of the total) showed somewhat more breadth in their distribution, with up to 400 m in elevational range. No species was found across the entire gradient; the species with the greatest amplitude occurred at 45–2,000 m, an elevational difference of 1,955 m.

Orlando Vargas, Gary Hartshorn, Craig Brubakker, Enrique Salicetti, and Gilberth Hurtado take a break near the 300 m plot in March 2019. Gary has been conducting research on this land for more than fifty years.

floods and weather anomalies, impeded the fieldwork.

By April 2024, the collection of field data was complete, the painstaking, laborious work of tree identification and taxonomic revision was under way, and the follow-up stages of data entry, analysis, and preparation of the data set for archiving had begun. More than fifty years of fieldwork has produced a wealth of data, and the resulting publications have brought major findings before the community of scientists and decision makers.

Yet what of the original goal—to follow the trajectory of tropical trees over their lifetimes? Analysis of the PLOTS data has shown that some tropical tree species have a maximum lifespan of only 45 years, but others may reach 450 years of age.[18] Some short-lived, fast-growing species will have completed their lives during the time period encompassed by this study to date, but some forest giants that were tagged in 1969 might have first raised their crowns to the sun as long ago as the early 1500s. Viewed from this perspective, fifty years in the timescale of forests is but a beginning.

CLIMATE CHANGE: AN EXISTENTIAL THREAT TO TROPICAL TREE DIVERSITY

Climatic upheavals, sometimes with cataclysmic consequences, have occurred throughout Earth's history. This current episode is clearly the first

in which our human species can play a role in mitigating and managing the consequences of rapid warming.

Our work has established that many tropical tree species live within narrow ranges of elevation and thus occur within narrow temperature ranges.[19] Trees have long generation times, compared with other organisms, and they cannot move, which leaves them particularly vulnerable to rapidly changing climates: they can neither adapt quickly nor migrate to more favorable habitats.

Furthermore, unlike temperate zones, tropical climates show little seasonality with respect to temperature. Tropical species are thus normally exposed to, and likely to be adapted to, a much narrower range of temperatures than those living in the temperate regions. At La Selva, for example, the coldest month (January) might average 25°C (67°F), and the warmest month (October) might average 28°C (71°F). Thus, tropical trees are at even greater risk from global warming than temperate trees, which are annually exposed to, and thus adapted to, wide-ranging seasonal variations in temperature.[20]

So our work on the La Selva–Volcán Barva gradient now takes on new significance. Because temperature changes with elevation, the response of the tree species mapped with respect to elevation can be used as a surrogate or proxy of their response and potential vulnerability to climate change. The equivalence between temperature and elevation is applicable in both space (in terms of current species distributions on the Barva gradient) and time (in terms of the effects of climate change). A simple, preliminary prediction regarding one consequence of global warming is that the optimum elevation—representing the temperature "sweet spot"—for a given tree species on the Barva slope would be shifted or displaced upslope by 158 m for every 1°C increase in mean temperature.[21]

THE ELEVATIONAL GRADIENT AS A PROXY OF CLIMATE CHANGE

Analysis of tree species' responses to climate warming at high elevation must consider factors other than species-specific sensitivity to temperature, such as changes in stand density and consequent competition for resources. Though many nonclimatic factors can influence tree seed germination, growth, and survival, tree species with the narrowest elevational ranges are likely to be most at risk in the face of warming.[22]

Some tree species will be more vulnerable, and some more resilient, to warming. Our calculations indicate that with an increase of 1°C, equivalent to 158 m of elevation, 35 percent of tree species would find themselves entirely outside their preferred temperature window. With increases of 2° or 3°C, 58 percent or 70 percent of tree species, respectively, would be left outside their present range.

But how much warming is likely to happen? Current estimates are that Earth has warmed about 1°C (1.8°F) since the Industrial Revolution, by an average of 0.8°C (0.14°F) per decade since 1880; the rate of warming since 1981 is more than twice as fast: 0.18°C (0.32°F) per decade.[23] Climate scientists now project actual temperature increases of 2° to 6°C over the coming decades; the wide range of these forecasts is partly due to uncertainty about the extent and effectiveness of human mitigation. In the absence of sustained, coordinated, and ambitious efforts, the loss of tropical tree diversity—including species as yet unknown to science[24]—is likely to be nothing short of catastrophic. By some estimates, approximately 9,200 species of trees remain undiscovered, of 73,300 total species. The vast majority of these as-yet-undiscovered trees are likely to be in the tropics. Some of these missing species might well lie along the Barva transect.

CALL TO ACTION: TRIAGE, ASSISTED MIGRATION, AND RESCUE

Our PLOTS team proposes a program of "assisted migration" of targeted, at-risk tree species, relocating seeds and seedlings of species to sites higher on the gradient with cooler, more favorable temperatures. To efficiently maximize the number and diversity of species rescued, soil would also be moved and planted, with its intact seed banks and associated mycorrhizae.

Development of triage strategies to identify and target the most suitable species for rescue requires data on preferred elevation, elevational range, habitat preference, population density, rates of recruitment, growth behavior, and longevity—information that has been collated as part of the PLOTS project over the decades.

The focus of the project through its first fifty years has been the collection, analysis, publication, and archiving of data on tropical forest trees. It is now time for action: to capitalize on this wealth of information in real-world applications, and to plan and implement, as expeditiously as possible, the rescue of the most vulnerable tropical tree species and the biodiversity these forests represent. It's time for our understanding of these tropical forests to be repurposed for creating a roadmap to their rescue.

Our PLOTS program will, without a doubt, outlive us, a fraction of the full team of investigators. The future of the project should be calibrated in terms of the lifespan of tropical trees, not the lifespan of scientists or the timespan of a single forest inventory.

In 1969, no one knew how vital tropical forests would become to the future of the planet, nor could anyone

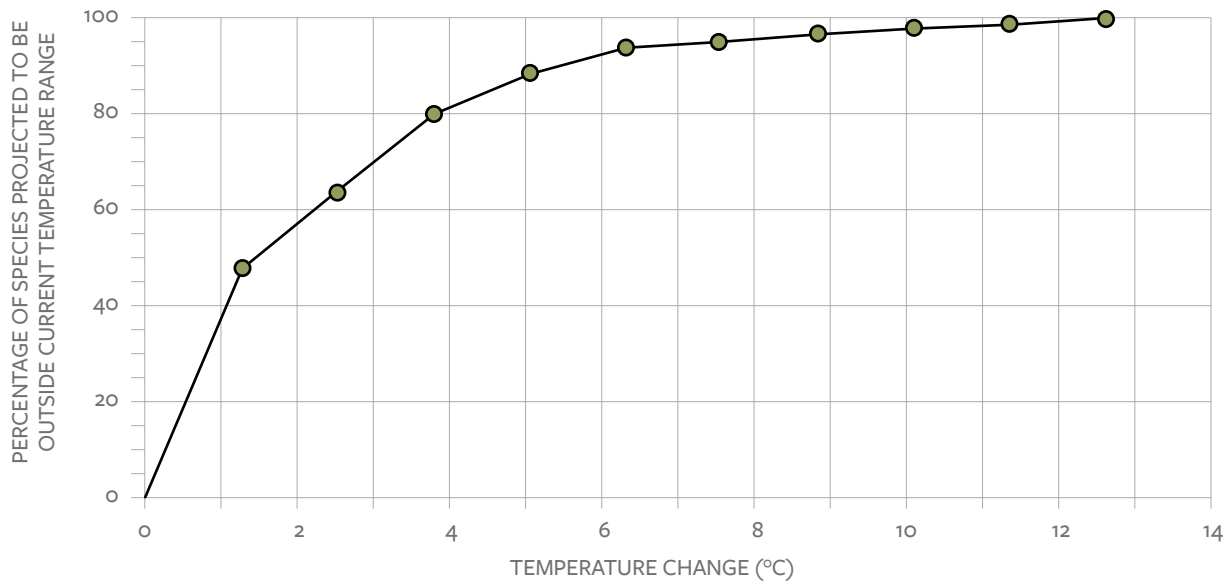
anticipate the urgent ecological challenges that the PLOTS project is now helping to remedy. As inventory work and assisted migration efforts continue, the results of this project should be magnified. One legacy of the PLOTS project will be the application of new knowledge for the benefit of our species and the rescue and repair of our planet in ways that cannot be known as of this time.

Gary Hartshorn is past president of the World Forestry Center, Portland, Oregon, and former executive director of the Organization for Tropical Studies. During his long and distinguished career in tropical forestry research, he has held leadership positions with the World Wildlife Fund and the Institute of Current World Affairs, published more than 250 scientific papers and technical reports, and worked on the ground in the forests of 35 countries. Diana Lieberman and Milton Lieberman have worked together as tropical biologists and educators for the past 55 years. Their publications range from tropical forest ecology to subtidal marine biology, seed dispersal by baboons and elephants, and the vegetation of sacred groves. They have held faculty positions at the University of Ghana, University of North Dakota and University of Georgia; their current academic affiliation is with California State University, Monterey Bay. In recognition of their conservation work, they were named "Guardaparques de Honor" by the Costa Rican government. The Liebermans' small coffee farm in the mountains of Costa Rica remains the epicenter for data management, analysis, and preparation of manuscripts for the PLOTS project.

ACKNOWLEDGMENTS

We are immensely grateful to the colleagues, technicians, and field assistants who have contributed so much to this project over the years. Access to the study sites and logistical support have been generously provided by the Organization for Tropical Studies and the Costa Rican National Park Service. The PLOTS project has received grant support from the National Science Foundation (BSR-8117507, BSR-8414968, EHR-9108770), NASA (NAGW-1033), the National Geographic Society, the Andrew W. Mellon Foundation, and the University of North Dakota; we are especially grateful for the continuing interest of the Organization for Tropical Studies, through which a fundraising campaign has been launched to rescue and maintain these vital and beautiful tropical forests.

FIGURE 3. **Estimated percentage of tree species outside their normal temperature range, by level of global warming.**



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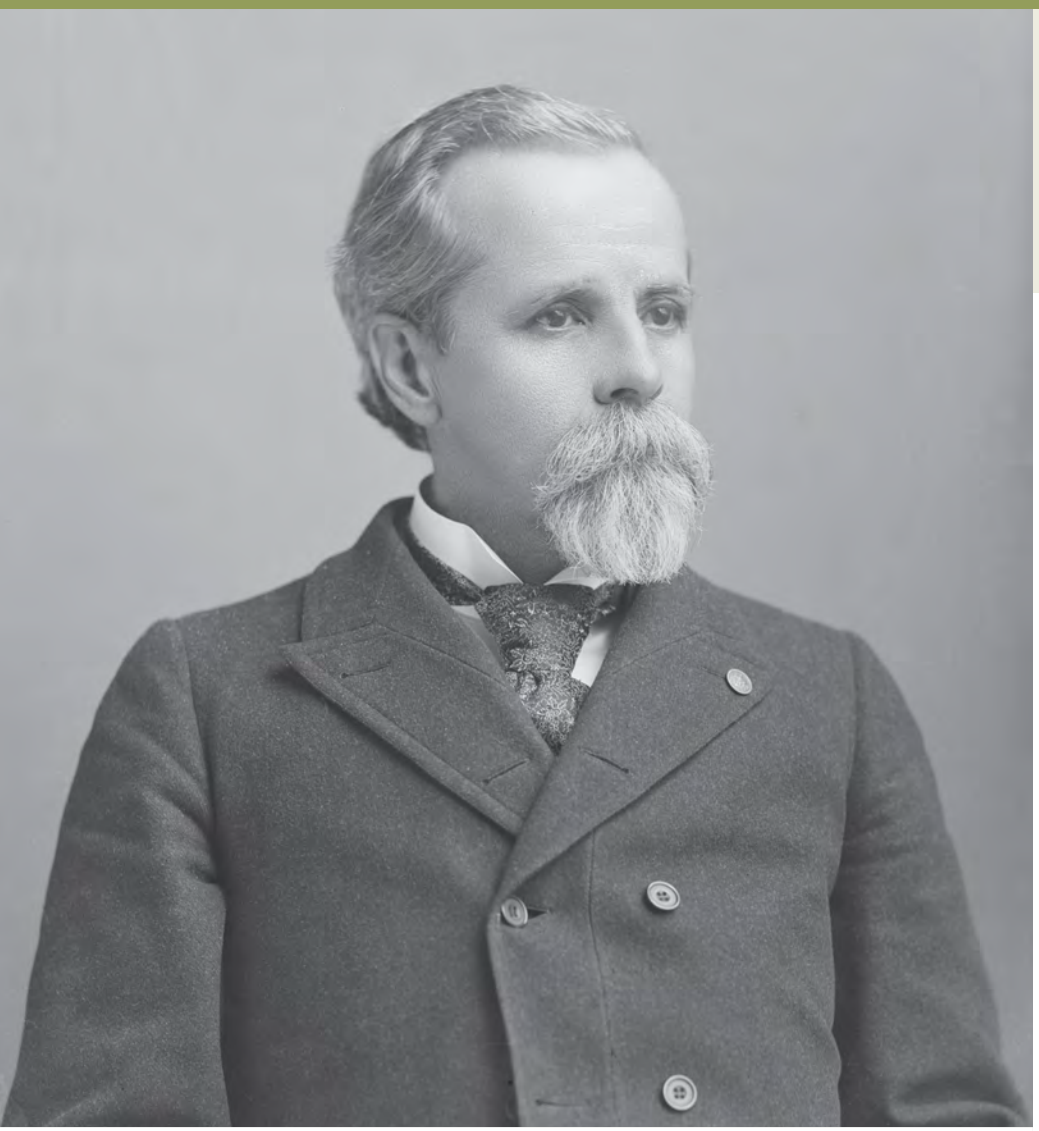
This estimate is based on the frequency distribution of elevational breadth of tree species (Figure 2), together with the temperature equivalent of that range for the Barva gradient. With an increase of 1°C, equivalent to a shift of 158 m of elevation, 35% of the tree species would find themselves entirely outside their temperature tolerance. With an increase of 2°C, 58% of tree species would be left outside their present temperature range. Current climate models predict a likely increase of 2° to 6°C in the coming decades.

NOTES

1. Christina Carrero et al., "Data Sharing for Conservation: A Standardized Checklist of US Native Tree Species and Threat Assessments to Prioritize and Coordinate Action," *Plants, People, Planet* 5 (2023): 600–16. The checklist of trees native to the contiguous United States can be accessed at https://mortonarb.org/science/projects/data-sharing-for-conservation-us-trees.
2. Milton Lieberman et al., "Small-Scale Altitudinal Variation in Lowland Wet Tropical Forest Vegetation," *Journal of Ecology* 73 (1985): 505–16. Tree species composition (269 species in 12.4 ha) varies continuously with elevation at a small scale, over a range of just 39 m. Stands on seasonally flooded sites differ in diversity and composition from those on higher ground. Milton Lieberman and Diana Lieberman, "Patterns of Density and Dispersion of Forest Trees," in *La Selva: Ecology and Natural History of a Neotropical Rainforest*, ed. Lucinda A. McDade et al. (Chicago: University of Chicago Press, 1994), 106–19. Analysis of spatial patterns of 104 populations belonging to sixty-five tree species found that 83 percent of the populations surveyed (representing fifty-nine species) were randomly dispersed, 5 percent (representing two species) showed a hyperdispersed pattern, and 13 percent (representing thirteen species) were clumped. Milton Lieberman and Diana Lieberman, "Nearest-Neighbor Tree Species Combinations in Tropical Forest: The Role of Chance and Some Consequences of High Diversity," *Oikos* 116 (2007): 377–86. The frequency of nearest-neighbor species pairs was analyzed for 5,060 trees in the La Selva plots; the overwhelming majority of pairs were found to occur at frequencies predicted from their individual abundances, as expected from a random-mixing probability model.
3. Gary Hartshorn, "A Matrix Model of Tree Population Dynamics," in *Tropical Ecological Systems: Trends in Terrestrial and Aquatic Research*, ed. F. Golley and E. Medina (New York: Springer-Verlag, 1975), 41–51. Population modeling of *Pentaclethra macroloba* (Mimosaceae), a dominant canopy species in the La Selva plots, was done using estimates of mortality, recruitment, and growth. Diana Lieberman et al., "Mortality Patterns and Stand Turnover Rates in Wet Tropical Forest in Costa Rica," *Journal of Ecology* 73 (1985): 915–24. Mortality was 2.03 percent per year; stand half-life, based on stem mortality, was thirty-four years. Mortality risk was independent of size for individuals ≥ 10 cm dbh. Of the dead individuals, 31 percent had fallen, 26 percent had died standing, 7 percent were buried under treefalls, and 37 percent had decomposed entirely in thirteen years, leaving no trace. Diana Lieberman et al., "Forest Dynamics at La Selva Biological Station, 1969–1985," in *Four Neotropical Rainforests*, ed. A. H. Gentry (New Haven, CT: Yale University Press, 1990), 509–21. Mortality was approximately balanced by recruitment over a sixteen-year period, based on stem density, basal area, and biomass.
4. Gary Hartshorn, "Tree Falls and Tropical Forest Dynamics," in *Tropical Trees as Living Systems*, ed. P. B. Tomlinson and M. Zimmermann (New York: Cambridge University Press, 1978), 617–38. In the La Selva plots, the rate of new gap formation ranges from 0.74 percent to 1.26 percent of the plot area per year. Stand turnover, based on rates of canopy gap formation, is estimated at 80–135 years. Diana Lieberman et al., "Mortality and Stand Turnover," 915–24.
5. Gary Hartshorn, "Neotropical Forest Dynamics," *Biotropica* 12 (Suppl.) (1980): 23–30. Of 320 tree species in La Selva, 155 (48 percent) are classified as shade intolerant and depend on some form of canopy opening for regeneration. The proportion varies by stature: shade intolerance is seen in 63 percent of canopy species, 43 percent of subcanopy species, and only 38 percent of understory species. Very few of the shade-intolerant species require large gaps. Robert L. Sanford Jr., H. Elizabeth Braker, and Gary S. Hartshorn, "Canopy Openings in a Primary Neotropical Lowland Forest," *Journal of Tropical Ecology* 2 (1986): 277–82. Canopy gaps, caused by tree falls and branch falls, are numerous in primary forest; gap size at La Selva ranged from 40 to 781 m^2 (median size, 110 m^2); most gaps are rather small. Milton Lieberman et al., "Canopy Closure and the Distribution of Tropical Forest Trees at La Selva, Costa Rica," *Journal of Tropical Ecology* 11 (1995): 161–77. Canopy closure was estimated above the crowns of 3,224 trees ≥10 cm dbh in 104 species; 90 species (86.5 percent of the assemblage) were distributed at random with respect to canopy closure, 9 occurred in more open conditions than expected by chance, and 5 were found in shadier conditions than expected by chance. As adults, the great majority of tree species behave as generalists.
6. Diana Lieberman et al., "Growth Rates and Age-Size Relationships of Tropical Wet Forest Trees in Costa Rica," *Journal of Tropical Ecology* 1 (1985): 97–109. Median diameter growth rates ranged from 0.35 to 13.41 mm per year. Maximum rates ranged from 0.95 to 14.62 mm per year. Projected lifespan ranged from 52 to 442 years. Mean longevity among the forty-five tree species studied is 190 years. Diana Lieberman and Milton Lieberman, "Forest Tree Growth and Dynamics at La Selva, Costa Rica (1969–1982)," *Journal of Tropical Ecology* 3 (1987): 347–58. Diameter growth behavior varies widely among tree species. Understory species grow slowly and consistently and have short lifespans; subcanopy trees grow slowly but live longer; shade-tolerant canopy species show variable and often rapid growth and are long-lived; and shade-intolerant canopy trees grow rapidly, show little variation, and have short lifespans.
7. Gary S. Hartshorn et al., "Long-Term Dynamics of Tropical Rain Forests in Permanent Inventory Plots, La Selva, Costa Rica (1969–1995), ver. 3," Environmental Data Initiative (2022). https://doi.org/10.6073/pasta/240bf29397facc19984740ee113ab2ed.
8. Leslie R. Holdridge et al., *Forest Environments in Tropical Life Zones: A Pilot Study* (New York: Pergamon, 1971), 6–15. For a description of the Holdridge life zone system, see Gary Hartshorn and Rodolfo Peralta, "Preliminary Description of Primary Forests along the La Selva–Volcan Barva Altitudinal Transect, Costa Rica," in *Tropical Forests: Diversity and Conservation*, ed. F. Almeda and C. M. Pringle (San Francisco: California Academy of Science, 1988), 281–95.
9. Colin Norman, "Virgin Rain Forest Reprieved," *Science* 227 (1985): 273.
10. Keith Hamylton Jones, ed., *Operation Raleigh: Expedition to Costa Rica, 15 February–13 May 1985* (London: Operation Raleigh, 1985): 21–23.
11. Angela Heaney and John Proctor, "Preliminary Studies on Forest Structure and Floristics on Volcán Barva, Costa Rica," *Journal of Tropical Ecology* 6 (1990): 307–20. Information for the first six plots included physiography, forest stature, species richness and composition, and profile diagrams. Rainfall was highest in midslope, at 1,000 m elevation, with 510 cm (204 inches) per year.
12. A review of initial results showed little overlap in species composition among the first six plots, which were located at intervals of around 500 m elevation. Additional plots were therefore established at elevations intermediate to the existing plots, improving coverage and representation of the forest communities on the gradient.
13. Diana Lieberman et al., "Tropical Forest Structure and Composition on a Large-Scale Altitudinal Gradient in Costa Rica," *Journal of Ecology* 84 (1996): 137–52. The 1988–89 inventory of 14 plots from 30 to 2,600 m elevation included 561 tree species in 91 families. Species composition varied continuously with elevation; there was no evidence of floristic zonation. Canopy height ranged from 24 to 47 m, maximum dbh from 67 to 185 cm, density from 425 to 654 stems per ha, basal area from 23 to 43 m2 per ha, and species richness from 29 to 149 species per ha. Diversity and canopy height were greatest

in the foothills, at 300 m, and lowest at the summit, at 2,600 m.

14. Kristina A. Schierenbeck et al., "Population Structure and Genetic Diversity in Four Tropical Tree Species in Costa Rica," *Molecular Ecology* 6 (1996): 137–44. High genetic variability and low genetic differentiation observed in these species over distances of 1–9 km on the slope of Volcán Barva reflect the effectiveness of pollen and seed dispersal. The populations across multiple plots are essentially panmictic. Genetic diversity is not affected by population density. Lieberman et al., "Tropical Forest Structure," 137–52.
15. There is a close linear correspondence between elevation and mean temperature, such that one can be substituted for the other. The moist adiabatic lapse rate of temperature on the slope of Volcán Barva is 6.3°C per 1,000 m of elevation (1986 data). The mean daytime temperature at 35 m above sea level is 27.1°C, and at 2,600 m is 10.9°C; the difference is 16.2° over 2,565 m, or 6.3° per 1,000 m.
16. Humboldt's contributions are reviewed by Jorge Antonio Gómez-Diaz et al., "Humboldt's Legacy: Explaining the Influence of Environmental Factors on the Taxonomic and Phylogenetic Diversity of Angiosperms Along a Neotropical Elevational Gradient," *Annals of Botany Plants* 15 (2022): 1–11.
17. Elevational breadth of a species is defined as the difference between the highest and lowest plot in which it is found, independent of the elevation itself; for example, a species with an elevational breadth of 250 m might occur on the lower slope between 500 and 750 m but might also be found higher on the gradient between 1,750 and 2,000 m.
18. Lieberman et al., "Forest Dynamics 1969–1985," 509–21; Lieberman et al., "Growth Rates and Age-Size Relationships," 97–109; and Lieberman and Lieberman, "Growth and Dynamics (1969–1982)," 347–58.
19. Lieberman et al., "Tropical Forest Structure," 137–52.
20. Daniel H. Janzen, "Why Mountain Passes Are Higher in the Tropics," *American Naturalist* 101 (1967): 233–49. Unlike temperate zones, tropical climates show little seasonality with respect to temperature. Tropical species are thus normally exposed to, and likely to be adapted to, a much narrower range of temperatures than those living in the temperate regions.
21. Based on the lapse rate (6.3°C per 1,000 m elevation), the mean temperature on Volcán Barva decreases 1°C with every 158 m in elevation. A simple, preliminary prediction regarding one consequence of global warming is that the optimum elevation—representing the temperature "sweet spot"—for a given tree species on the Barva slope would be shifted or displaced upslope by 158 m for every 1°C increase in mean temperature.
22. Walter Oberhuber et al., "Growth Trends of Coniferous Species along Elevational Transects in the Central European Alps Indicate Decreasing Sensitivity to Climate Warming," *Forests* 11 (2020): 132, https://www.mdpi.com/1999-4907/11/2/132. Analysis of tree species' responses to climate warming at high elevation must consider factors other than species-specific sensitivity to temperature, such as changes in stand density and consequent competition for resources.
23. Rebecca Lindsey and Luann Dahlman, "Climate Change: Global Temperature" (2023), https://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature. Earth's temperature has risen by an average of 0.8°C (0.14°F) per decade since 1880; the rate of warming since 1981 is more than twice as fast: 0.18°C (0.32°F) per decade.
24. By some estimates, approximately 9,200 species of trees remain undiscovered and unknown to science, of 73,300 total species. The vast majority of these as-yet-undiscovered trees are likely to be in the tropics. Some of these missing species might well lie along the Barva transect. Estimates of global tree species richness from Roberto Cazzolla Gatti et al., "The Number of Tree Species on Earth," *Proceedings of the National Academy of Sciences U.S.A.* 119 (2022), https://doi.org/10.1073/pnas.2115329119.



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John Fletcher Lacey was known as the "father of conservation legislation" because he was responsible for many of the first laws still on the books protecting wildlife, forests, cultural and historical artifacts, and extraordinary lands.

John Fletcher Lacey (1841–1913)

By Susan Jewell

John Fletcher Lacey may be the most influential conservation lawmaker in the U.S. Congress that you never heard of. The body of federal laws that he either wrote, introduced, sponsored, or convinced his colleagues to pass and presidents to sign earned him the title of "the father of conservation legislation."[1] How did this congressman from Iowa come to pioneer the nation's most enduring and significant conservation laws?

Lacey was born in New Martinsville in present-day West Virginia on May 30, 1841, and moved west with his family in 1855. The trip by steamboat on the Mississippi River to Keokuk, Iowa, and then by a horse-drawn wagon across the wild prairie to Oskaloosa, Iowa, afforded the 14-year-old lad one of the most memorable times of his life.[2] Wildlife was abundant, and especially captivating were the meadowlarks, whippoorwills, and myriad other wild birds that awakened a lifelong desire to protect all native birds. The family's move a year later to a farm on the Des Moines River near Cedar Bluffs further inspired his interest in conservation.

Lacey learned the trade of brick laying and attended Drake's Academy, although early in life his mother taught him. He never attended college but had a thirst for knowledge and read law books in the evenings. Even while serving in the Union Army during the U.S. Civil War, he carried law books in his saddlebags to study as time permitted. After the war ended in 1865, he was admitted to the Iowa Bar and immediately opened his own law office. He married Martha Newell, and eventually the couple had three daughters and a son, but only two daughters survived to adulthood.[3]

In his law practice, Lacey became legal counsel for the Rock Island Railroad. How did being a railroad lawyer lead to Lacey's role in conservation history? The interstate rail system was in its infancy at the time, and the Union Pacific and Central Pacific Railroads had linked up in 1869, thus completing the first transcontinental railway. The new transportation industry needed a compilation of laws regarding railway litigation stemming partly from the rail system crossing from one state to another. And so, the young lawyer wrote the first two volumes of *A Digest of Railway Decisions*.[4] The books reported all American cases in which

a railway company was a party and all other cases in which railway law was determined. Through his intense review of all cases, Lacey gained the knowledge of federal and state transportation laws that he applied when writing the first national law prohibiting interstate transportation of illegally taken and transported wildlife in the United States.

Lacey was elected to the Iowa House of Representatives, where he served from 1870 to 1872. During the following years, he continued his law practice and wrote the *Third Iowa Digest*, a volume of Iowa laws.[5] In 1888, Lacey was elected to the U.S. Congress, lost the subsequent election, but prevailed in 1892 and entered the Fifty-third Congress. He then served seven consecutive terms as the representative of the Sixth Congressional District of Iowa, ending in March of 1907 when he lost reelection.

During his eight terms, Lacey relentlessly pursued protections for natural and cultural resources. He became a member of the House Committee on Public Lands (now known as the House Committee on Natural Resources) in the Fifty-third Congress (1892–1893) and served as chair from 1895 to 1907. The Public Lands Committee presented him with the opportunity and power to advocate for protection of birds and other natural and cultural resources by combining his knowledge of federal and state laws with the need to protect the resources on a federal level.

At that time in the United States, market hunting and poaching of wildlife was rampant. To many people, the indiscriminate killing was even acceptable because the notion persisted that the continent's resources were inexhaustible. Hunters slaughtered the American bison by the thousands for their heads to adorn mantles, tongues to serve as culinary delicacies, and hides to make coats, but the carcasses were left to rot. More than 1.5 million hides were shipped east during the winter of 1872–73 alone. Once numbering perhaps 60 million animals and ranging from Alaska to Mexico and almost coast to coast, the population was reduced to a few thousand in just a few decades, concentrated at that time primarily in what is now Yellowstone National Park.

Adult herons and egrets were shot in their nests in Florida for their long, colorful plumes that were sent to cities to decorate ladies' hats. Passenger pigeons, once numbering in the billions and blotting out the sunlight by the sheer numbers of the birds in flight, were shot nearly to extinction for food. Moreover, Native American cultural sites and America's historical sites were pillaged for souvenirs. There were no federal laws to penalize the perpetrators for any of these travesties.

Other disturbing wildlife-related problems came to Lacey's attention. Biologists and economists at the U.S. Department of Agriculture (USDA) and other institutions had been studying the converse problem of people intentionally importing foreign mammals and birds to release into the wild, sometimes because they desired to see familiar wildlife from their homelands and sometimes because they sought to introduce additional food sources for people. A report by the USDA in 1898 alerted Lacey to the many potentially injurious (harmful) bird and mammal species that were being introduced into the country, whether intentionally by ship or inadvertently as ship stowaways.[6]

European starlings were first purposely imported and released in Central Park in New York City in 1877. English sparrows were also imported and released into various cities, such as New York, Boston, and Philadelphia, over several decades starting in 1850. These two highly adaptable species reproduced quickly and devoured large swaths of seeds, grains, and fruits grown by farmers. Both species expanded their ranges rapidly across Canada and the United States. Mongooses were introduced into the Hawaiian Islands around 1881 to rid the sugarcane plantations of rats. They soon contributed to the rapid extermination of native birds. The nonnative species usually had no natural enemies to keep their populations in check.

Lacey took on these challenges over his decades in Congress in his role with the Public Lands Committee, made even more difficult because he was broaching new federal law territory. As his contemporary and supporter William Hornaday (former director of the New York Zoological Society) acknowledged, Lacey "was the first American congressman to become an avowed champion of wild life."[7] Until Lacey came along, Congress had collectively considered the responsibility for the management of wildlife and public lands to be under the purview of the individual states, not that of the federal government. But Lacey saw it differently, and he knew how to appeal to members of Congress.

Another challenge was protecting forests from indiscriminate logging and destruction. Lacey, who had traveled to Europe twice and knew of the calamities caused by deforestation on that continent, endeavored to prevent that from happening in his homeland.[8] "We are threatened with continental baldness," Lacey postulated at the height of the forest conservation movement.[9] His involvement in forest conservation

legislation dates to his first term in Congress, in 1890, when he was not yet a member of the Committee on Public Lands. Lacey participated in drafting and promoting a bill in that committee that he correctly characterized as a first step toward a national system of forest reserves.[10] The Forest Reserve Act of March 3, 1891, was passed on the last day of Lacey's first term. This was Lacey's first work on a significant conservation law. Under this statute, presidents could set aside public lands as forest reserves (renamed national forests in 1907) to protect them from exploitive logging.[11] As committee chair, he championed the Transfer Act of 1905 that established the U.S. Forest Service but successfully opposed efforts in 1906 and 1907 to transfer the national parks to the Forest Service on preservationist grounds.[12]

The first national park, Yellowstone, had been established on March 1, 1872, under the exclusive administration of the secretary of the U.S. Department of the Interior. However, the laws protecting its resources were limited primarily to confiscating the looted objects and expelling the perpetrator from the premises. The wanton killing of bison and absconding with Native American artifacts continued after the boundaries were laid. Along came John Lacey, whose travels had acquainted him by personal investigation with nearly every one of the national parks; he had a particular appreciation of Yellowstone and sought to obtain more comprehensive protections for the park's resources.[13] "The Yellowstone Park is a great educator along the line of protection of wild life," he wrote in an article published in the *Boston Evening Transcript*.[14] Thus, he drafted and sponsored legislation that gave the government the authority to arrest, prosecute, fine, and jail poachers who stole or destroyed the birds, mammals, timber, minerals, and "wonderful objects within the park." This was the Yellowstone Park Protection Act, also known as the Lacey Act of 1894.[15] The law also increased the size of the park by 3,344 square miles, provided a legal definition for what a national park should be, provided for armed law enforcement, and became the foundation for the future laws and policies of the National Park Service, which was created in 1916. In effect, it also made Yellowstone the first national wildlife refuge. The Lacey Act of 1894 remains landmark legislation for natural resource protection.[16]

From his youth in rural Iowa, Lacey maintained a lifelong reverence for native birds. In addition to their beauty in visage and voice, he saw them as saviors from insects that destroy crops and attack game and domestic mammals. He also decried the wholesale slaughter of passenger pigeons, prairie chickens, and other game birds, and such game mammals as bison, beaver, deer, and elk. Some states started passing legislation to protect their wild birds and mammals from hunting, but those laws were limited to the wildlife within the respective states and sometimes were based on local whims, ignorance, and selfishness. Furthermore, there was no uniformity between states in neighboring geographical locations. Lacey set out to draft legislation to remedy the deficiencies. He knew the responsibility to protect game animals rested with the states, so his bill did not declare that the federal government ought to protect the wild animals. He also knew the legality of regulating interstate transport came from Article 1 of the U.S. Constitution, giving Congress the power "to regulate commerce . . . among the several states." Since interstate commerce was the responsibility of the federal government, Lacey would propose legislation to protect birds and game indirectly by prohibiting interstate (and international) transport of wild birds and game mammals in violation of state laws.[17] So, from 1892 to 1900, the congressman pursued the legislation that was his greatest ambition—prohibiting interstate commerce of wildlife taken and transported in violation of state laws.

However, there were major obstacles. He had to convince the other federal lawmakers that such a bill would benefit and not restrict their respective states. For this, he drew on his experience as a railroad lawyer. The railroads were the main interstate commerce arteries at the time, and few people knew the laws as well as Lacey. He drafted language making it unlawful to transport any wild birds or mammals from one state to another, as long as the state from which the animals were taken had an existing law protecting those animals.[18] Thus, there would be no additional regulations on the states, simply federal support of their own laws. State game wardens, he explained, desired such legislation to stop nefarious traffic in game animals killed in defiance of their state laws.[19]

In addition to prohibiting interstate transport of game killed in violation of local laws, Lacey included several other powers within the bill. One authorized the secretary of Agriculture to utilize the department to reintroduce birds that had become locally extinct or were becoming so in some parts of the United States, such as insectivorous and game birds. Another power granted allowed the secretary to control the importation of foreign wild birds and wild mammals.

COURTESY OF THE BOONE AND CROCKETT CLUB

Congressman Lacey is seated on the right in his Washington office in the late 1890s with several staff members.

This was to prevent invasions of harmful wildlife such as had already been manifested in the United States and other countries. Specifically, English sparrows, European starlings, fruit bats, and mongooses became prohibited from importation as a new designation called "injurious," and others could be designated by the secretary.[20] The law also made it unlawful for anyone to import into the United States any foreign wild mammal or bird except under special permit from the USDA.[21]

These purposes were all rolled into one bill that became known as the Bird Act or the Lacey Act of 1900. First introduced by Lacey in 1892, President William McKinley signed it on May 25, 1900, and it has been in effect in revised forms since then. The authority for enforcing the law was transferred from the USDA to the Department of the Interior in 1939. The law, especially the sections that evolved to support any conservation law of a local jurisdiction, a tribe, the United States, or a foreign country, and any wild animal or plant, has become one of the strongest conservation laws in the country.[22] With increasing activity in international and domestic wildlife trafficking, the law has evolved to become an important weapon to protect animals domestically and abroad.

With his dual roles on the House Committees on Public Lands and on Indian Affairs, another of Lacey's impressive lasting contributions to national conservation and culture

COURTESY OF THE BOONE AND CROCKETT CLUB

Congressman Lacey, shown standing by a bison skull in Texas in 1906, secured appropriations for reserves to save American bison herds in Yellowstone National Park and in what would become the Wichita Mountains Wildlife Refuge in Oklahoma.

is the Antiquities Act of 1906. After traveling to the Southwest to personally investigate the theft and destruction of archaeological sites, Lacey collaborated with archaeologist Edgar Lee Hewitt to draft and pass the law. Originally intended to preserve Indian remains on the pueblos in the Southwest, Hewett used Lacey's concept from the 1900 law to indirectly protect the sites by making it illegal to destroy property on federal lands, thus safeguarding irreplaceable ruins and artifacts.[23] The act authorizes the president to proclaim national monuments on federal lands that contain "historic or prehistoric landmarks and structures and objects of historic or scientific interest.[24] Until this act, only Congress could set aside such lands as national parks, which could be a lengthy process. However, under the Antiquities Act, a president could designate a monument more quickly. Not long after signing it, President Theodore Roosevelt made Devil's Tower the first national monument. The fourth was the Petrified Forest in Arizona, one of Lacey's favorite places. The site would "preserve the evidence of ancient forests just as he tried to protect modern stands of timber."[25] The law has been used to create 272 national monuments to date, many of which have become national parks.[26]

The powerful Lacey Act of 1900 was just the start of the congressman's bird protection efforts. He had justified the constitutionality for prohibiting interstate transport of wildlife, but he continued to urge legislation to enact a law to protect migratory birds from slaughter when flying to their northern breeding grounds. He argued that migratory birds did not belong to any state or country but were of concern to people

in their whole range, and thus the government should manage them if it could be done broadly.[27] The vastness of the geographic area and the difference in migration dates across the latitudes and seasons complicated legislation. However, Lacey suggested a general statute prohibiting the capture of migratory wildfowl while on their spring migration that should protect the birds, no matter the dates or locations. He prepared a bill that was limited to spring migration, but he was defeated for a ninth term in Congress before the bill had made its way through Congress. However, his expertise in the subject earned him an appointment by the secretary of Agriculture to the committee on conservation of national resources of the League of American Sportsmen to work on the Weeks-McLean migratory bird bill. That bill was approved by Congress only months before Lacey's death in 1913.[28] It became the foundation for the current Migratory Bird Treaty Act.

Lacey's contributions to the American people did not end with those just mentioned. Among other achievements, Lacey secured the passage of the Alaska Game Law to protect Alaskan game animals for subsistence use by the native peoples; a bill for the introduction of eggs of game birds for propagation; the first federal law to protect mine workers; and funding for preserves to protect the American bison from extinction. Much of the Department of the Interior's accomplishments in protecting the people, land, and water of the United States are due to authorities granted to the department by Lacey's laws.

Lacey was relentless in acquiring a broad knowledge of laws and conservation, and he pioneered in making that combination for the common good. His remarkable success in getting novel and innovative federal legislation passed was due to being the first member of Congress to recognize conservation as a national responsibility of that legislative body. The gentleman from Iowa never sought the spotlight and thus remains a relatively obscure but invaluable giant among conservation leaders.

Wildlife biologist Susan Jewell lives in Springfield, Virginia. She worked under the injurious wildlife provision of the 1900 Lacey Act for the U.S. Fish and Wildlife Service. She retired in 2024 after 31 years. She is also a freelance writer of environmental books and articles.

NOTES

1. PJ DelHomme, "B&C Member Spotlight–John F. Lacey," Boone and Crockett Club, 2022, https://www.boone-crockett.org/bc-member-spotlight-john-f-lacey.
2. *Iowa Conservationists: John F. Lacey*. Iowa National Heritage Foundation. June 10, 2016 in Blog. https://www.inhf.org/blog/blog/iowa-conservationists-john-f-lacey/.
3. L. H. Pammel, *Major John F. Lacey, Memorial Volume* (Cedar Rapids, Iowa: Iowa Park and Forestry Association, The Torch Press, 1915), 5. This edited volume combined recollections of close friends, some of Lacey's papers and speeches, and excerpts from his unpublished autobiography.
4. John F. Lacey, *A Digest of Railway Decisions, Comprising All Reported American Cases in which a Railway Company is a Party, And All Other Cases in which Railway Law is Determined* (Chicago: Callaghan and Company, 1875), and *A Digest of Railway Decisions. All American Cases Reported Since the Publication of the First Volume of This Digest in Which a Railway Company is a Party, and All Other Cases in which Railway Law is Determined, Vol. II* (Chicago: Callaghan and Company, 1884).
5. Pammel, *Memorial Volume*, 418.
6. T. S. Palmer, "The Danger of Introducing Noxious Animals and Birds," *Yearbook of Agriculture* (Washington, DC, Department of Agriculture, 1898).
7. Pammel, *Memorial Volume*, 12.
8. J. A. Larsen, "Some Pioneers and Leaders in American Forestry and Conservation," *Iowa Journal of Science* 34 (May 15, 1960): 529.
9. John F. Lacey, "Need of Forest Preservation," *Gunton's Magazine*, Vol. XXIV, No. 6 (January–June 1903): 84.
10. Pammel, *Memorial Volume*, 99.
11. Pammel, *Memorial Volume*, 90.
12. Samuel P. Hays, *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890–1920* (Pittsburgh, PA: University of Pittsburgh Press, 1959, 1999), 196.
13. Pammel, *Memorial Volume*, 9.
14. Quoted in Pammel, *Memorial Volume*, 171.
15. The law is officially called "An Act to protect the birds and animals in Yellowstone National Park, and to punish crimes in said park, and for other purposes." U.S. Statutes at Large, Vol. 28, p.73, Chap. 72. Approved May 7, 1894.
16. DelHomme, "B&C Member Spotlight–John F. Lacey."
17. Raymond Harris Thompson, "Edgar Lee Hewett and the Political Process: The Influence of Lacey," *Journal of the Southwest*, Summer 2000, Vol. 42, No. 2: 302.
18. U.S. Congress. Act of May 25, 1900, Ch. 553, 31 Stat. 187–89
19. U.S. Congress-House 1900. *Congressional Record* 4871 (April 30, 1900; statement of John Lacey), 4871 https://www.govinfo.gov/content/pkg/GPO-CRECB-1900-pt6-v33/pdf/GPO-CRECB-1900-pt6-v33-2-2.pdf
20. This part of the 1900 law is now amended and codified under Title 18, Chapter 3—Animals, Birds, Fish, and Plants, 18 U.S.C. 42.
21. Susan D. Jewell, "A Century of Injurious Wildlife Listing under the Lacey Act: A History," *Management of Biological Invasions* 11 (2020): 356–71.
22. Part of the 1900 law is now amended and codified under Title 16, Chapter 53—"Control of illegally taken fish and wildlife" (16 U.S.C. 3371–3378).
23. Thompson, "Edgar Lee Hewett and the Political Process," 282, 302.
24. Carol Hardy Vincent, *National Monuments and the Antiquities Act* Congressional Research Service, Washington, DC, January 2024), 1, https://sgp.fas.org/crs/misc/R41330.pdf.
25. Thompson, "Edgar Lee Hewett and the Political Process," 284, 313.
26. Vincent, *National Monument*s, 16.
27. Pammel, *Memorial Volume*, 178–79.
28. Annette Gallagher, "Citizen of the Nation: John Fletcher Lacey, Conservationist," *The Annals of Iowa* 46 (1981), 23.

Biltmore Estate, Asheville, North Carolina

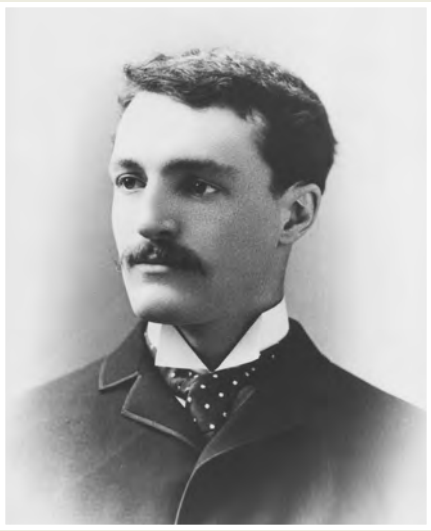
JAMES G. LEWIS

George Vanderbilt's estate in Asheville, North Carolina, is home to many "firsts" in American forestry history. Looking Glass Falls, once owned by Vanderbilt and now part of the Pisgah National Forest, is located near the former site of the first forestry school in the United States.

This article was first published in our special issue celebrating the centennial of the Weeks Act of 1911. In 2024, Hurricane Helene severely damaged Asheville, the Biltmore Estate, and surrounding region. It is reprinted with new information about the flood of 1916. We hope this serves to remind readers of the historical foundations that were laid there as the area now works to rebuild.

By Bill Alexander

The region comprising Biltmore Estate and Pisgah National Forest in the Blue Ridge Mountains of western North Carolina is deservedly known as the Birthplace of American Forestry. Its reputation is due in large part to the vision and conservation-mindedness of four pioneers of forestry in the late nineteenth century who saw the need for protecting large areas of forestland for public benefit. George Washington Vanderbilt, the founder of the Biltmore Estate in Asheville, North Carolina, embraced and invested in sustainable forestry at a time when it was not yet an accepted business for large landowners. Frederick Law Olmsted, America's "Father of Landscape Architecture," conceived and established the first program of forest management at Biltmore Estate in 1888 as a model for the country. Gifford Pinchot, the first American-born trained forester and Biltmore's first forester (1892–95), created and implemented at Biltmore the first comprehensive working plan for sustainable forest management in the United States. Carl Alwin Schenck, chief forester at Biltmore (1895–1909) and Pinchot's successor there, expanded the forest



FOREST HISTORY SOCIETY FHS299, FHS294, U.S. FOREST SERVICE

George Vanderbilt, Frederick Law Olmsted, and Gifford Pinchot were responsible for introducing landscape-scale forest management to the United States.

management program to encompass 125,000 acres and founded the Biltmore Forest School, the first in America to train professional foresters. The majority of Vanderbilt's land would become the core of the first national forest established in the eastern United States.

Across town from the Biltmore Estate, a group of concerned citizens drew inspiration from Vanderbilt's successes and in 1899 established the Appalachian National Park Association to lobby for protection of vast areas of the southern Appalachian region. Led by Chase P. Ambler, its secretary and treasurer, the association turned a regional interest into a national movement that culminated in the passage of the Weeks Act in 1911. Asheville is indeed where the forest preservation movement took root.

The Biltmore House is America's largest private residence and attracts more than a million visitors a year. Located near Asheville in the heart of the Blue Ridge Mountains, the 250wroom structure, designed by architect Richard Morris Hunt in the style of a French Renaissance chateau, and the world-class gardens and grounds, designed by America's preeminent landscape architect, Frederick Law Olmsted, are the main attractions to most visitors. Generally less known is that Biltmore and the former part of the estate known as Pisgah Forest are the "Cradle of Forestry" in America. The forest that covers more than two-thirds of the estate's nearly 8,000 acres today continues to be managed according to the same principles established at Biltmore by Vanderbilt, Olmsted, Pinchot, and Schenck.

When Vanderbilt first visited Asheville in 1888, eight years after the Western North Carolina Railroad had penetrated the rugged mountains into Asheville, the town was booming. Both the city and the surrounding area had a national reputation as a resort locale with the most healthful climate in the country. The region, with its picturesque mountain scenery, hot springs, and grand hotels boasting the latest in modern conveniences and recreational amenities, was widely promoted in large cities in both the North and the South. Newspaper advertisements, magazine articles, and other publications promoted Asheville and western North Carolina with appealing slogans like "Health-seeker's Paradise," "Poet's Dream," and "Madonna in the Mountains," and "The Land of the Sky"—one that has endured to this day.

Exploring the countryside, Vanderbilt found the air "mild and invigorating" and the climate to his liking. Such natural attributes spurred the building of resorts and sanitariums in Asheville and surrounding towns. Asheville's rapid growth brought one of the country's first and finest electric street railway systems, which connected the town to major resorts and attractions. By the close of the nineteenth century, the city boasted two light companies, a gas company, a telephone exchange, excellent public schools, and well-known finishing schools for girls and college preparatory schools for boys.

But the same railroad that brought tourists in was hauling logs out, thus contributing to the destruction of the very scenery that helped make Asheville an appealing destination. A desire to preserve the area's scenery and clean air moved a group of mostly local men to form the Appalachian National Park Association in 1899. Joined by representatives from seven neighboring states, the association pushed for the establishment of forest reserves and national parks in the southern Appalachians to protect the region's greatest asset, the land. Directors of the association included Schenck, estate superintendent Charles McNamee, and local newspaper publisher and former state senator Charles A. Webb. As secretary and treasurer, though, Ambler was the primary force behind its efforts. The group sought legislation that would allow the federal government to establish forest reserves in the East by buying up private land.

Olmsted, meanwhile, was advocating a halt to the thoughtless destruction of the nation's forests and promoting long-term, scientific management of forests as a wise investment for landowners, and Vanderbilt was buying up lands that had been slashed, burned, and overgrazed for more than a century, in the expectation that their condition could be improved over time. In Vanderbilt and his dream of a gentleman's country estate, Olmsted could realize his own dream.

Vanderbilt's initial thoughts were to turn most of his land into an extensive park like those he had seen in France and England. Olmsted, having made a thorough inspection of the land, told him much of it was too rough and poor for a proper park:

> You bought the place then simply because you thought it had a good air and because, from this point, it had a good distant outlook. If this was what you wanted you have made no mistake. There is no question about the air and none about the prospect. But the soil seems to be generally poor. The woods are miserable, all the good trees having again and again been culled out and only runts left. The topography is most unsuitable for anything that can properly be called park scenery. It's no place for a park. You could only get very poor results at great cost in attempting it.[1]

In 1891, Olmsted advised his young client,

> Such land in Europe would be made a forest; partly, if it belonged to a gentleman of large means, as a preserve for game, mainly with a view to crops of timber. That would be a suitable and dignified business for you to engage in; it would, in the long run, be probably a fair investment of capital and it would be of great value to the country to have a thoroughly well organized and systematically conducted attempt in forestry made on a large scale. My advice would be to make a small park into which to look from your house; make a small pleasure ground and garden, farm your river bottom chiefly to keep and fatten live stock . . . and make the rest a forest, improving the existing woods and planting the old fields.[2]

After surveying Vanderbilt's land holdings, Olmsted prepared reports in 1889 and 1890 describing the condition of the forest and offering detailed suggestions for improvement cuttings. One of the reports, "Project of Operations for Improving the Forest of Biltmore," may be one of the earliest written forest management prescriptions in the United States. In it Olmsted noted,

> The management of forests is soon to be a subject of great national, economic importance, and as the undertaking now to be entered upon at Biltmore will be the first of the kind in the country to be carried on methodically, upon an extensive scale, it is even more desirable . . . that it should, from the first, be directed systematically and with clearly defined purposes, and that instructive records of it should be kept.

His proposition of forestry, Olmstead believed, was the most important of all the ideas that he suggested to Vanderbilt. Forestry would make the best use of the greater part of the wealthy man's property, provide him with a useful occupation and a source of satisfaction for himself and his friends, and would also with time provide a return on his investment. Even more importantly, by demonstrating forestry on such a large scale, Vanderbilt would be "doing the country an inestimable service."[3]

Olmsted realized, however, that the long-term success of the forestry program would depend on professional guidance by a trained forester. He recommended that Vanderbilt hire Gifford Pinchot as his consulting forester. Pinchot was just beginning a career that would lead him to national prominence as the first chief of the U.S. Forest Service. Pinchot made a detailed study of the estate's woodlands and developed

FOREST HISTORY SOCIETY PHOTOGRAPH COLLECTION, FHS298

The Pisgah Forest's Pink Bed area, seen here around 1900, was purchased by George Vanderbilt and was the summer home of the Biltmore Forest School. More than 100 years later, the area, which is now the Pisgah National Forest, provides excellent recreational opportunities for thousands of visitors annually.

a long-term management plan with three primary objectives: profitable production, a nearly constant annual yield of forest products, and an improvement in the condition of the forest. His working plan would prove that forestry could be profitable while also improving the overall health and condition of a degraded forest. Pinchot also conducted an assessment of some large tracts of forested mountain land near and beyond Mount Pisgah, which Vanderbilt then purchased. The Pink Beds and other large tracts increased his land holdings to approximately 125,000 acres, or nearly 195 square miles.

In 1895, Pinchot left Biltmore to pursue his career as a consulting forester and was succeeded by Schenck, a young forester from Darmstadt, Germany, who had been recommended by Dietrich Brandis, an internationally renowned forestry expert and Pinchot's mentor. Years later, in retirement, Schenck pondered why Vanderbilt had wanted him as his forester. He had never been to the country, knew almost nothing of its forests, its people, its language, its customs, or its economy, and he did not feel properly prepared to answer the call. During his 14-year tenure as the forester at Biltmore, however, Schenck devised and implemented selection harvest plans and experiments in Vanderbilt's extensive Pisgah Forest tracts as well as continuing the management and improvement of Biltmore Forest begun by Olmsted and Pinchot. Through his many experiments with plantations of both conifers and hardwoods, much of the previously abused and exhausted farmland was transformed into productive forest. To facilitate management and protection of the extensive acreage of both the main estate and the Pisgah Forest holdings, Schenck hired a force of resident rangers, each assigned to a designated tract. Schenck was also responsible for building Vanderbilt's rustic Buckspring Lodge on Mount Pisgah and guiding Vanderbilt and his guests on camping and fishing expeditions.

FOREST HISTORY SOCIETY PHOTO COLLECTION, FHS337; U.S. FOREST SERVICE PHOTO 185843

Biltmore Forest School students prepare to leave the schoolhouse in the Pink Beds and spend an afternoon in the woods. School director and founder Carl Schenck is in front of the door in white.

With Vanderbilt's blessing, Schenck founded the Biltmore Forest School. The idea of a forestry school at Biltmore had been discussed but not pursued by Olmsted and Pinchot. Partly because of the lack of trained assistants and partly in response to the questions of his apprentices, Schenck became convinced that the time was right to begin a school.

The Biltmore Forest School opened on September 1, 1898. Schenck's forestry curriculum differed from that of the theory-oriented university curriculum proposed by Pinchot and a Prussian forester in the United States, Bernhard E. Fernow. Schenck taught practical forestry, combining classroom lectures with hands-on experience and fieldwork. He preached the philosophy that he practiced: "That forestry is best which pays best." (A month after the Biltmore School opened, Fernow opened a four-year program at Cornell University, and in the fall of 1900, with an endowment from the Pinchot family, Yale University established a two-year graduate program in forestry.)

The Biltmore Forest on the main estate and Vanderbilt's vast Pisgah Forest were the primary working fields for the school. The 12-month course followed by a six-month internship was designed to give students all the practical knowledge and experience needed to prepare them for the duties required of foresters, particularly in private industry but also for government agencies. The intensive training and close quarters fostered a spirit of camaraderie and a lasting devotion to Schenck.

The Biltmore Forest School graduated more than 300 men. More than half went directly into forestry work. Despite Pinchot's disapproval of Schenck's course of study, one student, Overton Price, became Chief Pinchot's second-in-command. Another graduate, Verne Rhoades, became the first forest supervisor on the Pisgah National Forest. Four students became regional foresters in the U.S. Forest Service, and 20 or more became forest supervisors or deputies; 12 or more became state foresters. Other graduates went into wood preservation, tree surgery, forest surveying, the timber industry, and international forestry consulting.[4]

FOREST HISTORY SOCIETY PHOTO COLLECTION, FHS290

The visitor orientation center at the Cradle of Forestry in America national historic site located in the Pisgah National Forest near Asheville, North Carolina, in 1988. From here it is a short walk to a reproduction of the schoolhouse.

In part because of a misunderstanding with Vanderbilt and a dispute with the estate superintendent, Schenck reluctantly resigned as forester at Biltmore in the summer of 1909. The Biltmore Forest School headquarters moved from the estate to the new logging village being built by Champion Fibre Company on the Pigeon River at Sunburst, upstream from Canton, North Carolina. From then until it closed in January 1914, the Biltmore Forest School became a traveling school and had six working fields: Germany, France, New York, North Carolina, Michigan, and Oregon.[5]

Within a year of Schenck's departure in 1909, George Vanderbilt signed a contract with the Toxaway Tanning Company in September 1910 for a 10-year timber lease with a land purchase option on a nearly 20,000-acre tract of the Pisgah Forest. In early 1911, Overton Price, now of the National Conservation Association, handled the contract negotiations and advised Vanderbilt on timber sale methods, grazing and fishing as sources of revenue, and other forest management issues.[6]

Efforts to sell Pisgah Forest to the federal government under provisions of the Weeks Act commenced in February 1912. The law enabled the government to buy cutover private lands to reforest in part to protect watersheds and prevent severe flooding. In late September, William L. Hall of the U.S. Forest Service was authorized by Biltmore to make detailed studies in Pisgah Forest "with a view to a decision as to its value for public purposes as a part of the Appalachian Forest Reserve"—even though timber rights on 69,326 acres had been offered to Carr Lumber Company of Falls Mills, Virginia, under a 20-year contract for $12 per acre. After Hall's inspection, Price thought the Forest Service might pay $6 an acre for it, a higher rate than what other landowners were receiving. Referring to Vanderbilt, he stated,

> He has at great expense to himself made what is virtually a park out of a body of forest land formerly remote and difficult to access. He has spent large sums in roads and trails, had paid bills for fire protection year after year, and in a very real sense has been a public benefactor.[7]

In March 1913 George and Edith Vanderbilt formally offered the federal government an option to purchase 86,000 acres of Pisgah Forest to create a national forest. The government declined. Inspector Hall cited five reasons that the government had decided not to exercise the option: the $6 price per acre was too high, the tract was too highly developed, the improvements were too costly to maintain and they were beyond the government's needs, there was no state legislation to protect fish and wildlife, and the cost of administering the Carr lumber contract would be prohibitive.[8]

After her husband's death at age 51, in March 1914, Edith Vanderbilt continued to work through estate superintendent Chauncey Beadle and Overton Price to sell Pisgah to the government and finally closed the deal by lowering the selling price to $400,000, just under $5 per acre. In 1916, the tract became the nucleus of the Pisgah National Forest, the first established under the Weeks Act.

In a May 1914 letter to the secretary of Agriculture, negotiating the sale of the Pisgah Forest tract, Edith Vanderbilt paid homage to her late husband:

> Mr. Vanderbilt was the first of the large forest owners in America to adopt the practice of forestry. He has conserved Pisgah Forest from the time he bought it up to his death, a period of nearly twenty-five years, under the firm conviction that every forest owner owes it to those who follow him, to hand down his forest property to them unimpaired by wasteful use.[9]

Price agreed. In the June 1914 issue of *American Forestry*, he praised Vanderbilt for his "conviction that the ownership of forest lands entails certain definite responsibilities to the public; for Mr. Vanderbilt was one of those who held that the private ownership of any resource necessary to the general welfare carries with it the moral obligation of faithful stewardship to the public."[10]

In the summer of 1916, two tropical storms converged on the region, dropping record amounts of rain that decimated Asheville and the surrounding region, killing more than 80 people and wiping away towns.[11] The death and destruction were unwanted reminders of why the Weeks Act and forest management were desperately needed in the eastern United States. Two months later the secretary of Agriculture designated the Pisgah tract and other lands, including land purchased under the Weeks Act in the Curtis Creek area of McDowell County in western North Carolina, as the Pisgah National Forest on September 29, 1916. On October 17, President Woodrow Wilson signed a proclamation confirming the boundaries.[12]

FOREST HISTORY SOCIETY PHOTO COLLECTION, FHS6931

U.S. Forest Service Chief Richard E. McArdle stands beside a sign marking the first forest tract purchased under the Weeks Act—Curtis Creek in McDowell County, North Carolina. The photo was taken as part of Weeks Act 50th Anniversary activities on the Pisgah National Forest, September 1961.

THE CRADLE OF FORESTRY IN AMERICA

By September 26, 1961, when the 50th anniversary of the Weeks Act was celebrated in Asheville and on the Pisgah National Forest, more than 20 million acres of forest and watershed lands had been acquired. Secretary of Agriculture Orville L. Freeman stated,

> Here, over 60 years ago forestry education had its start in this country. Here, scientific forestry was first applied on

an appreciable scale under the direction of Gifford Pinchot. A portion of Biltmore Forest became part of Pisgah National Forest—the first national forest unit established under the terms of the Weeks Law. Near here is the first tract of land purchased under the authority of that law.

Freeman reminded his audience of the site's place in history. "From this small beginning the professions of forestry and conservation and the concept of good forest land management has taken hold across the nation. These events of great historic significance should not be lost."[13]

At Freeman's direction, the Forest Service established the Cradle of American Forestry museum and a visitors center at the Pink Beds on State Highway 276; the intent was to preserve the birthplace of forestry and forestry education in America and to "stimulate interest in and knowledge of the management of forest lands under principles of multiple use and sustained yield and the development and progress of management of forest lands in America."[14]

Today the Cradle of Forestry in America is a 6,500-acre historic site within the Pisgah National Forest that commemorates the beginning of forest conservation in the United States. The site of the first forestry school and the beginnings of scientific forestry in America, it includes the Forest Discovery Center, with an interactive exhibit, plus two interpretive trails, seven historic buildings associated with the Biltmore Forest School and Pisgah Forest, a 1915 Climax logging locomotive, and an old sawmill. The schedule offers seasonal educational programs and family-oriented events.

BENT CREEK RESEARCH AND DEMONSTRATION FOREST

The Forest Service founded its first forest experiment station in 1908 in Arizona and by 1913 had established five more, all in the West. In 1916, Biltmore Estate superintendent Chauncey D. Beadle, with Edith Vanderbilt's approval, endorsed a cooperative project with the U.S. Forest Service to conduct experiments on the Biltmore plantations. The intent was to perform periodic thinnings and study the effects on growth rates and yield. The Appalachian Forest Experiment Station, set up in 1921 in Asheville, continued this research until 1970. (The name of the station was later changed to the Southeastern Forest Experiment Station and then to the Southern Research Station.)

The station had no permanent sample plots of its own, however, until a field station was established at Bent Creek on what had been part of Vanderbilt's Pisgah Forest tract. Initially just 1,100 acres, Bent Creek was the first experimental forest in the East and the third in the nation. In 1925 a small laboratory was constructed, and other facilities were added over the course of several years. Bent Creek soon had 17 buildings and a network of roads, trails, and research compartments and then acquired an additional 5,200 acres in 1935.[15]

The Bent Creek Research and Demonstration Forest is nine miles southwest of Asheville on Brevard Road (NC 191), near the entrance to the North Carolina Arboretum and access ramp to the Blue Ridge Parkway. Bent Creek is a place where professional foresters, resource managers, private landowners, and students can learn about forest management practices. It is also open to the public for recreation.[16]

Bill Alexander was the landscape and forest historian at Biltmore Estate in Asheville, North Carolina, in 2011.

NOTES

1. Frederick Law Olmsted to Frederick J. Kingsbury, 20 January 1891, Frederick Law Olmsted Papers, Manuscript Division, Library of Congress, Washington, DC.
2. Olmsted to Frederick J. Kingsbury, 20 January 1891.
3. "Project of Operations for Improving the Forest of Biltmore," no date, Biltmore Estate Archives, Asheville, NC.
4. "Fun Facts about the Biltmore Forest School," Cradle of Forestry Historic Site.
5. Carl Alwin Schenck, *Cradle of Forestry in America: The Biltmore Forest School, 1898–1913* (1954; Durham, NC: Forest History Society, 1998).
6. Correspondence files, Biltmore Estate Archives.
7. Correspondence files, Biltmore Estate Archives.
8. Correspondence files, Biltmore Estate Archives.
9. Correspondence files, Biltmore Estate Archives.
10. Overton Westfeldt Price, "Geo. W. Vanderbilt, Pioneer in Forestry," *American Forestry*, Vol. 20, No. 6 (June 1914), 424.
11. Heidi Coryell Williams, "Hell and High Water: The Flood of 1916," *Our State*, January 10, 2013, https://www.ourstate.com/flood-of-1916.
12. "Pisgah National Forest, North Carolina. By the President of the United States of America, A Proclamation." Copy in Biltmore Estate Archives. On August 29, 1912, the Burke-McDowell Lumber Company sold 8,100 acres to the federal government, the first-ever purchase under the Weeks Act. The tract is about 20 miles northeast of Asheville. The Blue Ridge Parkway passes through it.
13. U.S. Department of Agriculture, Office of the Secretary. "Remarks of Secretary of Agriculture Orville L. Freeman at Observance of the Weeks Law 50th Anniversary, Asheville, NC, September 26, 1961."
14. Public Law 90-398, July 11, 1968 [s. 2837], "Cradle of Forestry in America, Pisgah National Forest, NC Establishment—An Act."
15. "Appalachian Forest Experiment Station, 1921–1934," accessed at http://www.srs.fs.usda.gov/organization/history/app_stn_earlydays.htm.
16. U.S. Department of Agriculture, Forest Service, *Bent Creek Research and Demonstration Forest: Scientific Forestry for Informed Choices* (Asheville, NC, 1995), 3.

The Northern Spotted Owl

The northern spotted owl transformed how the U.S. federal government managed its forests.

By James G. Lewis

The Northern Spotted Owl (*Strix occidentalis caurina*) primarily inhabits old-growth forests of southwestern British Columbia in Canada to just north of San Francisco, California. Considered an important indicator species, nearly a half-century after studies showed its population was dropping, it remains threatened due to continued population decline from habitat destruction and competition from invasive species.

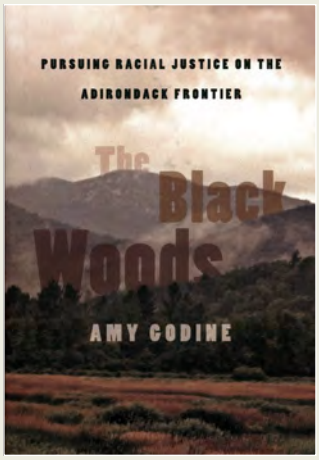
The Northern Spotted Owl achieved iconic status in the early 1990s when it became the focus of an intense controversy in the Pacific Northwest. In March 1991, a U.S. District Court judge ordered the U.S. Forest Service to halt its planned timber sales in Oregon and Washington until the agency developed a final plan to protect the threatened species. Virtually overnight, the spotted owl became the symbol and subject of a larger, very complex debate that seemingly pitted the management of old-growth forests against the thousands of jobs that timber provided the forest products industry. The resulting Northwest Forest Plan, approved in 1994 to protect the bird's habitat, forced the federal land management agencies to change how they managed their forested landscapes and helped usher in the era of ecosystem management.[1]

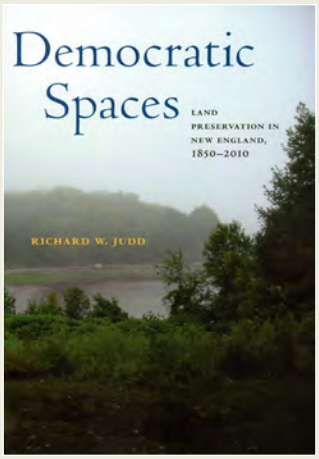
James G. Lewis is the editor of Forest History Today.

NOTES

1. K. Norman Johnson, Jerry F. Franklin, and Gordon H. Reeves, *The Making of the Northwest Forest Plan: The Wild Science of Saving Old Growth Ecosystems* (Oregon State University Press, 2023). 11–26.

BOOKS

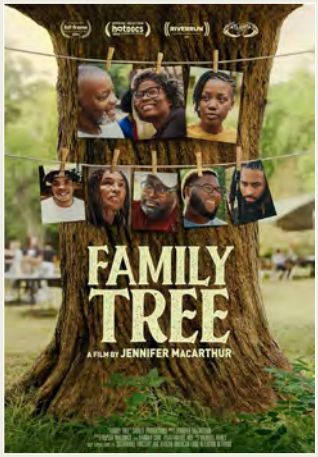


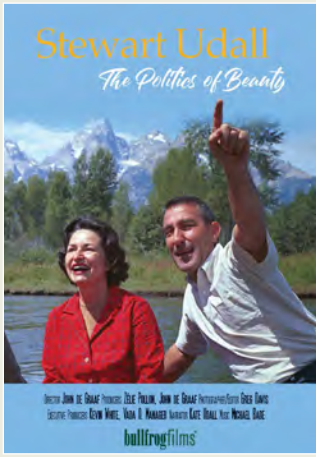


Each year, the Forest History Society recognizes a book that offers superior scholarship in forest and conservation history. The Charles A. Weyerhaeuser Award goes to an author or authors who have exhibited fresh insight into a topic and whose narrative analysis is clear, inventive, and thought-provoking. In 2023, Mark Kuhlberg won for his book, ***Killing Bugs for Business and Beauty: Canada's Aerial War Against Forest Pests, 1913–1930*** (University of Toronto Press, 2022). His book examines the beginning of Canada's aerial war against forest insects and how a tiny handful of officials came to lead the world with a made-in-Canada solution to the problem. Shedding light on a largely forgotten chapter in Canadian environmental history, Kuhlberg explores the theme of nature and its agency. The book highlights the shared impulses that often drove both the harvesters and the preservers of trees, and the acute dangers inherent in allowing emotional appeals instead of logic to drive environmental policy-making. It addresses both inter-governmental and intra-governmental relations, as well as pressure politics and lobbying. Including fascinating tales from Cape Breton Island, Muskoka, and Stanley Park, his work clearly demonstrates how class, region, and commercial interest intersected to determine the location and timing of aerial bombings.

In 2024, two authors were declared winners. Coincidentally, both books share a geographic focus on the United States' northeast. Amy Godine's ***The Black Woods: Pursuing Racial Justice on the Adirondack Frontier*** (Cornell University Press) documents how, in 1846 and 1847, three thousand Black New Yorkers were gifted with 120,000 acres of Adirondack land by Gerrit Smith, an upstate abolitionist and heir to an immense land fortune. On their new land they could hope to meet the $250 property requirement New York imposed on Black prospective voters in 1821, and gain a cherished right of citizenship, the ballot. Smith's suffrage-minded plan was endorsed by Frederick Douglass and New York's leading Black abolitionists. Smith's plan was prescient, anticipating Black suffrage reform, affirmative action, environmental distributive justice, and community-based racial equity more than a century before these were points of public policy. But when the response to Smith's offer fell radically short of his high hopes, Smith's zeal cooled. Timbuctoo, Freemen's Home, Blacksville, and other Black enclaves were forgotten. Local and regional historians have marginalized the Black experience for 150 years. Writer and independent scholar Amy Godine retrieves the robust story of Black pioneers who carved from the wilderness a future for their families and their civic rights, and returns these trailblazers and their descendants to their rightful place in the Adirondack narrative. In doing so, she brings a critical racial lens to environmental history.

If you take a contemporary map of New England and scale it to the township level, it reveals a dense pattern of protected areas around almost every town and city in the region. Regardless of size, whether rural and urban, these green spaces represent more than a century of preservation efforts on the part of philanthropic foundations, planning professionals, state agencies, and most importantly, community-based conservation organizations. Taken together, they highlight one of the most significant advances in land stewardship in U.S. history while offering a fresh and original perspective on conservation history. Richard Judd's





Democratic Spaces: Land Preservation in New England (University of Massachusetts Press) explains how these protected places came into being and what they represent for New Englanders and the nation at large. While early New Englanders worked to save local fish, timber, and game resources from outside exploitation, no land-stewardship organizations existed before the founding of the Trustees of Public Reservations in Boston in 1891. Across a century of dramatic change, New England preservationists through this and other, smaller community-based land trusts preserved open spaces for an ever-widening circle of citizens.

FILMS

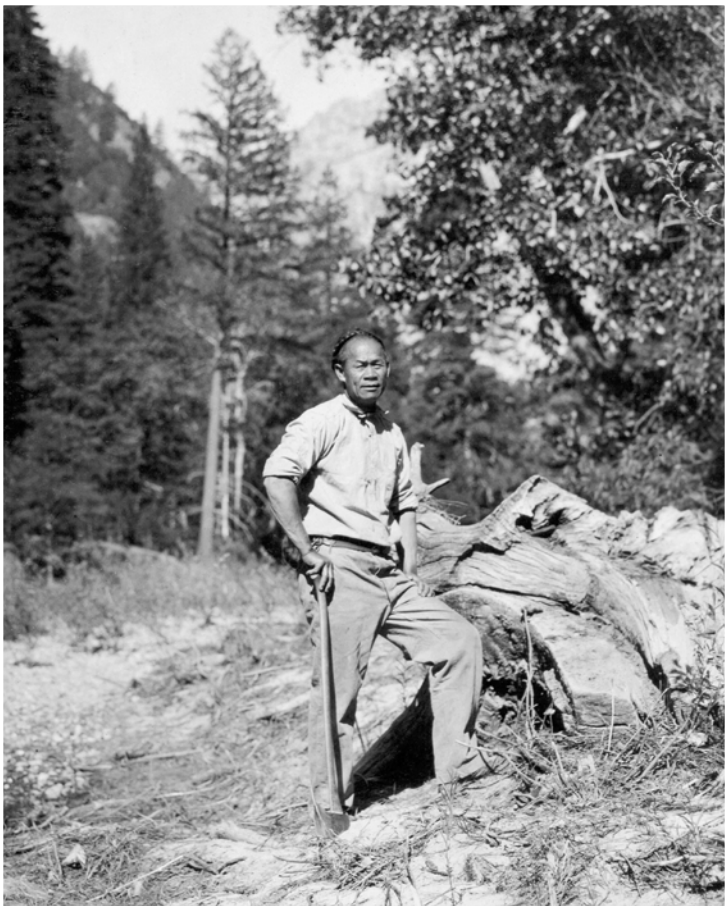
Family Tree (2024) explores sustainable forestry in North Carolina through the stories of two Black families working to preserve their land and legacy. First-time director Jennifer MacArthur's cinéma vérité approach reveals the considerable task of maintaining the land while navigating challenging family dynamics, unscrupulous developers, and changing environmental needs. Guided by forestry experts Sam Cook, Mavis Gragg, and Alton Perry, Tyrone and Edna Williams prepare their three sons to continue the family's legacy by teaching them to balance economic potential with environmental protection. Newer owners Nikki and Natalie Jefferies learn from the experts that the work they are doing together, and with their father, will have far-reaching consequences in the future. *Family Tree* is available on Amazon Prime.

Stewart Udall was one of the most prominent and effective secretaries of the Department of the Interior in American history. Yet his legacy is not well recognized. Director John de Graaf's feature-length film ***Stewart Udall: The Politics of Beauty*** (2022) effectively corrects that oversight by examining the trajectory of Udall's life from his childhood through his Mormon mission, his World War II service, his student years at the University of Arizona, his time in Congress, and then, most significantly, his years as Interior secretary under the Kennedy and Johnson administrations—the height of the environmental movement. Udall's work during and after his time in office provides an excellent introduction to modern environmental politics as we follow how his ideas changed from being an Arizonan favoring power dams to a national figure fighting to protect the country's natural wonders. After leaving office, he waged a long legal battle to win compensation for Navajo Indians and "downwinders" who acquired cancer from their exposure to radiation during the Cold War atomic bomb testing. His call for all Americans to move away from our emphasis on economic growth and consumerism toward quality of life, and a new political ethos centered on beauty, simplicity, appreciation of nature and the arts, and a recognition of Earth's limits is a message that still resonates today. Available for home purchase on Amazon; for screenings, visit bullfrogfilms.com/catalog/stew.html.

DIGITAL EXHIBITS

Two new digital exhibits produced by the Forest History Society, with support from the MillsDavis Foundation, bring to light two forgotten groups of woods workers in the American West. The story of ***Chinese Loggers in the American West***, curated by Shing Yin Khor, begins in 1848, when Chinese people began immigrating in large numbers to the United States. They established large Chinatowns on both American coasts and found employment in American industry, first in mining and railroads, and then in logging. The work was varied but always hard, and racial discrimination often made daily life that much harder. Despite the widespread Chinese presence in logging camps throughout the Sierra Nevada, the history and context of Chinese forest workers in the American West has only been documented by a few scholars, including Sue Fawn Chung and Yenyen Chen.

Reclaiming Maxville: The Legacy of African Americans in a Lumber Town explores the brief history of an unusual mill company town in northeastern Oregon. In 1923, the Bowman-Hicks Lumber Company of Kansas City, Missouri, moved to Wallowa County to establish a headquarters and lumber camp. Very quickly, Maxville grew to 400 residents, becoming one of the largest towns in the region. And despite Oregon Exclusion laws aimed at preventing African Americans from settling in the state, Maxville would attract both Black and White lumber workers, who together would navigate the intricacies of segregation to form an interracial community. Ten years after its establishment, the Great Depression and changing trends in the lumber industry forced closure of the company town and mill. More recently, descendants of Maxville residents have worked to reclaim their history. The exhibit was curated by Yolanda Hester and Elizabeth Flowers of Frameworks and Narratives LLC, with advisement from Gwendolyn Trice and Sierra Newby-Smith of the Maxville Heritage Interpretive Center. Both exhibits are available at foresthistory.org/digital-collections.



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LEFT: Tie Sing, a 21-year veteran cook of the U.S. Geological Survey, in Yosemite National Park, 1909.

BELOW: Residents of Maxville, Oregon.

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Dale Wierman
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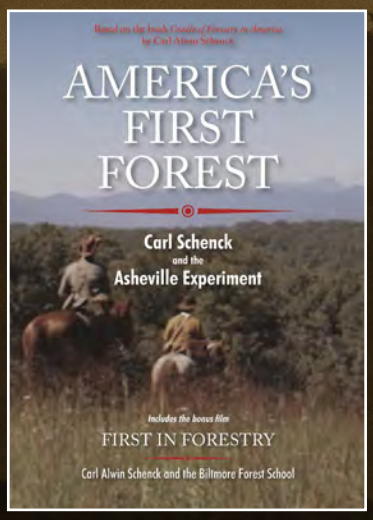
"I soon realized that German forestry was as impossible of success in the United States as was Indian or Swedish forestry. A brand-new sort of forestry was needed."

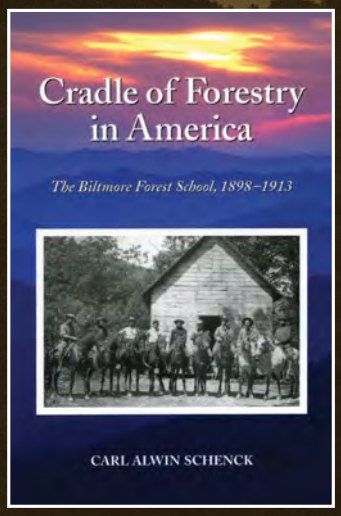
AMERICA'S FIRST FOREST

Carl Schenck & the Asheville Experiment

In 1895, at the magnificent Biltmore Estate nestled in North Carolina's Blue Ridge Mountains, German forester Carl Alwin Schenck began restoring the land using the "new" science of forestry. Then he established the Biltmore Forest School, the nation's first. Using a log cabin for their school house and George Vanderbilt's Pisgah Forest as their outdoor classroom, Schenck taught "his boys" how to manage a forest—and demonstrated how America could conserve *all* its forests. Based on Schenck's memoir *Cradle of Forestry in America*, the Emmy Award–winning documentary film *America's First Forest* tells the story of the birth of the American conservation movement through the efforts of one of its founders. The DVD includes this film and the 28-minute featurette *First in Forestry: Carl Alwin Schenck and the Biltmore Forest School*, adapted from *America's First Forest* and is ideal for classroom use.



DVD includes *America's First Forest* (55 min.) and *First in Forestry* (30 min.)
$24.95



Cradle of Forestry in America: The Biltmore Forest School, 1898–1913
by Carl Alwin Schenck, $14.95

To order the DVD and book, please visit AmericasFirstForest.org. Order both together and save!
Look for *America's First Forest* on public television stations around the country.

FOREST HISTORY SOCIETY

OFFICIAL SELECTION
Colorado Environmental Film Festival
2016

CRADLE OF FORESTRY
BFS
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IN AMERICA

Bainbridge, David A.: Two books written by donor: *Trees for America's Future* coloring book; *Acorns as Food: History, Use, Recipes, and Bibliography*.

Chappell, Nick: Several maps and posters dealing with national forests or natural resources.

Dierks Jr., Don: 17 boxes of materials from Dierks Forests. Includes materials documenting the history of this forest products company and its operations in Missouri, Arkansas, and Oklahoma. Features company publications, financial reports, photographs, maps, forest management studies, scrapbooks, company histories, news clippings, correspondence, materials surrounding its acquisition by Weyerhaeuser in 1969, other miscellaneous files, and more.

Duke Forest: Four boxes of forestry books.

Gerow Jr., Tom: 122 photos (and 15 slides) from Florida, North Carolina, and Georgia from 1992 to 2001 depicting logging operations (Georgia-Pacific), forest management, U.S. Forest Service operations, and more.

Greene, John: Five boxes of books, publications, conference proceedings, files, CDs/DVDs, and other materials on forestry and forest management.

Grosman, John: Two books: *A Forestry History of Ten Wisconsin Indian Reservations under the Great Lakes Agency: Precontact to the Present* by Anthony Godfrey; *The Forests of the Menominee: Forest Resource Management on the Menominee Indian Reservation, 1854–1992*.

Gunderson, Dave: 17 books: *Hellroaring: The Life and Times of a Fire Bum* by Peter Leschak; *Exposure* by Robert Bilott; *Gold Rush in the Jungle* by Dan Drollette Jr.; *Meltdown in Tibet* by Michael Buckley; *When Elephants Weep: The Emotional Lives of Animals* by Jeffrey M. Masson; *Noah's Choice: The Future of Endangered Species* by Charles Mann and Mark Plummer; *One Square Inch of Silence* by Gordon Hempton; *The Practice of the Wild: Essays by Gary Snyder; The Genius of Birds* by Jennifer Ackerman; *A Great Aridness: Climate Change and the Future of the American Southwest* by William DeBuys; *Rooted: The Best New Arboreal Nonfiction* edited by Josh MacIvor-Andersen; *Sightings: Extraordinary Encounters with Ordinary Birds* by Sam Keen; *Appointment at the Ends of the World: Memoirs of a Wildlife Veterinarian* by William B. Karesh; *The Northwoods Reader: A Love Affair with the U.P.* by Cully Gage; *Wild River Pioneers* by John Fraley; *The Rites of Autumn* by Dan O'Brien; *The Bear Dogs of Katahdin* by Steve Tetreault.

Harper, John: A folder of documents from donor's father, J. P. Harper. Includes a forest management plan for the Richmond Hill District, Georgia, 1964, and a listing of pulpwood prices from Great Northern Paper Company, 1967, and a pulpwood load calculator.

Hartshorn, Gary: 35 boxes of books and publications on tropical forestry–related topics collected during his career as vice president for the World Wildlife Fund, director for the Organization for Tropical Studies at Duke University, and as president of the World Forestry Center.

Holman, Bill: 17 boxes of Holman's personal binders and notebooks concerning his work for The Conservation Fund and on various conservation projects in North Carolina.

Howard, Jason: *Restoring Prairie, Woods, and Pond* by Laurie Lawlor, copy signed by author.

Isebrands, Jud: One book: *Interpreting the History of the Hugo Sauer Nursery and the Rhinelander Research Field Laboratory* (2023); and article "Reflections on the Contributions of Populus Research at Rhinelander, Wisconsin, USA."

Johnson, Norman: One book: *The Making of the Northwest Forest Plan* by K. Norman Johnson, Jerry F. Franklin, and Gordon H. Reeves.

Karakash, John: One book: *Snapshots from the Past: A Roadside History of Denali National Park and Preserve* (2017).

Langdale, Johnny: Three copies of the *AT-FA Journal* (American Turpentine Farmers Association) June 1963, August 1963, March 1964 issues.

Lock, William H.: Ten boxes of forestry books, reports, and publications. Materials cover forest management, forest insects, wildlife, and more.

Megalos, Mark: Complete archive of *National Woodlands* magazine, published by the National Woodland Owners Association.

Murk, Quinn: Two boxes of scrapbooks and publications covering the 1980 eruption of Mount St. Helens.

Rasmussen, Tom: Three boxes of historical Weyerhaeuser films, 8mm and 16mm; also digital versions of 20 historic films on a portable hard drive; an original artifact—a boom chain used on log rafts on the Mississippi River.

Robertson, Peter T.: Two volumes of Reuben B. Robertson's unpublished notes on the "Early Days of Canton Operation of Champion Fibre Company"; 1 box of Champion International Corp. annual reports, and shareholder statements, 1970s–1990s.

Smith, Brad W.: Four books: *Report on Forestry, 1882*; *Pulpwoods of the United States and Canada*, volumes 1 and 2; *Forest Products In Terms Of Metric Units* by A. Binek.

Smith, Carrie: One box of VHS tapes; 1 box of oral history transcripts;

1 box of oral history tapes; 5 boxes of Tahoe National Forest aerial photographs; oversize maps of the Olympic National Forest (1948), Central CA Forests (1955) and Northern CA Forests (1954).

Stine, Jeffrey: Ten early issues of *Environmental Review*, from 1977–1980.

Tjaden, Robert: *Tree Planters' Notes* issues 1978–1983; *Production and Transportation of Fuel from Sawmill Refuse* by G. Eugene Tower, 1942.

Wallinger, Scott: One box of various forestry and forest history books.

The Forest History Society Awards program enables the Society to recognize research and writing in forest and conservation history and to stimulate further research into our understanding of the relationships of people and forests. The following is a list of awards for 2023 and for 2024.

LEOPOLD-HIDY AWARD

The Aldo Leopold–Ralph W. Hidy Award honors the best article published in the journal *Environmental History* during the preceding year. The award is presented jointly by the American Society for Environmental History and the Forest History Society. The 2023 recipient is **Emily Brownell**, currently a lecturer in Environmental History and African History at The University of Edinburgh in the UK, for her article, "Reterritorializing the Future: Writing Environmental Histories of the Oil Crisis from Tanzania," 27, No. 4 (October 2022): 747–71.

Brownell's article challenges environmental historians to play a bigger role in narrating the events of postcolonial Africa and underscores the promise of doing so by reframing the oil crisis of the 1970s and 1980s as a political and social crisis in Tanzania that set in motion environmental transformations. With its economy crippled as a result of rising importation costs, Brownell argues Tanzania "reterritorialized its future" by pushing to reinvigorate Global South cooperation and fostering the development of local resources that were not predicated on continued access to cheap petroleum. It was a process, as she convincingly shows, that entangled political aspirations to sever dependence on the West with material environmental consequences for the nation.

The 2024 recipient is **Hayley Negrin** for her article, "Return to the Yeokanta/River: Powhatan Women and Environmental Treaty Making in Early America," 28, No. 3 (July 2023): 522–53. Her article offers new insight into the Treaty of Middle Plantation (1677) between the Powhatan people and the English. Departing from a tradition that has long interpreted the treaty as an indication of declining Powhatan power, Negrin turns her attention to an Algonquian Weoransqua named Cockacoeske, who, having survived Nathaniel Bacon's attempt to enslave her by hiding in the swamps of the Piankatank River, negotiated with representatives of the crown and eventually signed the treaty in a swirling line to represent the river of her birth. Tracing the multiple meanings of the treaty for the Indigenous signatories, Negrin demonstrates that Cockacoeske's signature offered a reminder to the English of the kinship and environmental relationships at stake as the plantation complex expanded in Virginia. Narrating the environmental history embedded in Cockacoeske's "signature" in collaboration with contemporary tribal historians, Negrin reframes the history of the treaty as one of Indigenous resilience and kinship with the environment. In doing so, she develops the concept of "environmental treaty making" in a way that underscores the previously unappreciated role that Indigenous women like Cockacoeske played when negotiating with colonial powers.

THEODORE C. BLEGEN AWARD

The Theodore C. Blegen Award recognizes the best article in the field of forest and conservation history that is not published in *Environmental History.* The 2023 winner was **Mark E. DeGiovanni Miller**, a professor of history at Southern Utah University, for his article "A River Again: Fossil Creek, Desert Fishes, and Dam Removal in the American Southwest." His work was published in the *Pacific Historical Review*, Volume 91, Number 2. Miller's article examines the pioneering campaign to remove the Childs-Irving dam and hydroelectric plants from Fossil Creek, an unusual perennial stream in the Arizona desert that harbored several rare fish species. Childs-Irving was one of the country's first two successful dam removals, the result of an emerging international restoration movement to reestablish free-flowing rivers and a model for removals to come. But, as Miller shows, the effort was initially complicated by both historic preservationists and green energy advocates who saw the dam as a historical structure that produced clean energy. The article is a wonderful case study that illuminates the complex forms of coalition and consensus building that eventually resulted in the dam's successful removal.

The 2024 winner is **Kara Murphy Schlichting**, an associate professor of history at Queens College, CUNY, for her article "The Narrowing of Broad Beach: Coastal Change and Public Beaches in Malibu, California," published in *Pacific Historial Review*, 92, No. 2, Spring 2023. This article examines conflicts over public access to Malibu's Broad Beach, highlighting how climate change–driven storms have eroded both the beach and property boundaries. Schlichting adeptly integrates twentieth-century conservation history with current environmental issues, offering a significant scholarly contribution to environmental and conservation

history by exploring both activist and regulatory perspectives.

JOHN M. COLLIER AWARD FOR FOREST HISTORY JOURNALISM

Established to honor the memory of the skilled journalist, working scholar, and prolific writer of articles and special features for forest industry press publications, the Forest History Society's John M. Collier Award encourages excellence in journalism that incorporates forest and conservation history. **Paige Williams**, an American journalist, author, and staff writer at *The New Yorker*, was the 2023 winner for her article, "Howl: Killing Wolves Has Become a Political Act" (April 4, 2022). The winning article discusses the reintroduction of wolves into Idaho back in the 1990s and its role as the object of political controversy ever since. With Idaho's long reputation of hostility toward the grey wolf, an aggressive new law allows people to hunt or trap as many as they can.

The 2024 winner is **Alec Luhn**, an award-winning climate journalist, for his article, "Rusting Rivers," published in *Scientific American* (January 2024). This article vividly explores the critical issue of tainted rivers with gripping, well-researched writing. Luhn uses a "quest adventure" narrative to tackle the mystery of polluted orange rivers, blending literary style with urgent environmental concerns. While it leaves some questions unresolved, particularly regarding the exact cause and solution, it compellingly addresses the impact of permafrost thawing and presents a thought-provoking examination of the situation.

CHARLES A. WEYERHAEUSER BOOK AWARD

The Charles A. Weyerhaeuser Award rewards superior scholarship in forest and conservation history. This award goes to an author who has exhibited fresh insight into a topic and whose narrative analysis is clear, inventive, and thought-provoking.

Mark Kuhlberg and his book, *Killing Bugs for Business and Beauty: Canada's Aerial War Against Forest Pests, 1913–1930*, won for 2023. *The Black Woods: Pursuing Racial Justice on the Adirondack Frontier* by **Amy Godine** and *Democratic Spaces: Land Preservation in New England, 1850–2010* by **Richard W. Judd** were cowinners in 2024. More can be learned about each of these books in the Media column.

F. K. WEYERHAEUSER FOREST HISTORY FELLOWSHIP

The F. K. Weyerhaeuser Forest History Fellowship is awarded annually to a student at the FHS university affiliate, Duke University, whose research is historical in nature and related to forestry, land use, or the environment. The 2023 recipient was **Arthur Braswell**, a PhD candidate in the Department of History, for his project, "Building the Forever Fort: Militarization and Race in South Carolina since 1917." Braswell's proposal focuses on Fort Jackson in South Carolina, and how it has been leveraged to both undermine and also perpetuate Jim Crow policies in the military and in the region. Braswell outlines an important environmental history–land use and land access thread of inquiry and analysis in the project. The longleaf pines that no longer dominate the Southeastern forest ecosystem still remain prominent in the 53,000-acre army base and insulated from suburban sprawl. The army's need for expansive forests to conduct maneuvers inadvertently aligned with the goals of modern conservation. Varied groups of constituents valued Fort Jackson and clashed about the limits it imposed on local development.

Brandon Hays, a PhD candidate in the Department of Ecology, was selected as the 2024 recipient for his project "Asian Elephants Rebounding from the Brink: Impacts on Tropical Forest Structure from Past to Present." The project examines how Asian elephants shape forest composition and structure. Researchers have shown that elephants alter forests by dispersing seeds, selectively trampling saplings, and dispersing nutrients through their dung. His work will focus on the impact of Asian elephants on tropical forest structure as well as how their presence affects carbon storage. Understanding the consequences of losing elephants is important, he argues, both for our understanding of Asian tropical forests and for our understanding of global carbon cycles and climate change.

WALTER S. ROSENBERRY FELLOWSHIP IN FOREST & CONSERVATION HISTORY

This fellowship provides a stipend to support the doctoral research of a graduate student attending a university in North America other than Duke University whose research contributes to forest and conservation history. Our winning student for 2023 was **George Andrei** from Indiana University in Bloomington. His dissertation project, "'Our Struggle for Existence': State-Building, Forestry, and Citizenship in Carpathian Romania, 1918–1940," follows the emergence of and conflicts over scientific-bureaucratic forestry as a major force shaping life and citizenship and forest use in rural Romania. Studying Romanian forestry from global and local perspectives,

he reveals the networks of scientific activism that connected Romanian foresters to peers in the United States, Europe, and the colonized world and how these connections led them to develop seemingly paradoxical notions of rural citizenship based on duty, commodification, and environmental stewardship. At the same time, he evaluates the purchase of modern forestry practices among highland- and mountain-dwelling villagers whose socioecological systems were fundamentally transformed through these practices.

Abby Cunniff from the University of California Santa Cruz was selected as the 2024 recipient. Cunniff's dissertation, "'Someone Has To Do It': Incarcerated Workers in California Forests," brings the subfields of environmental and forest history into conversation with both labor history and the history of incarceration in productive and interesting ways, with a timely focus on the history of fighting forest fires in California. Her project centers the experiences of incarcerated people on the front lines of fighting forest fires in California since 1943 and takes us from the World War II era through the rise of mass incarceration to our current era of climate change. Cunniff draws on an impressive range of sources, from the written testimonies of formerly incarcerated firefighters, to prison newspapers, to state and federal archival material, to historical scientific and technical literature.

FHS FELLOW AWARD

The Forest History Society bestows the honorary title of "Fellow of the Forest History Society" on persons who have provided many years of outstanding leadership and service to the Society or many years of outstanding sustained contributions to the research, writing, or teaching of forest, conservation, or environmental history. This honor is the Society's highest award and is only given occasionally, sometimes posthumously. The Society is proud to announce the following were named as FHS Fellows:

- Henry I. Barclay III (2022)
- Hayes D. Brown II (2022)
- L. Michael Kelly (2022)
- Edward W. Phares (2022)
- Steven Anderson (2023)
- Douglas W. MacCleery (2023)
- Curt Meine (2023)
- Michelle Steen-Adams (2023)
- Mark Wilde (2023)
- Lynn Wilson (2023)

The Forest Service and the Greatest Good: A Centennial History

Soft cover; 286 pages
3-DVD set $18.00
ISBN-13: 978-0-89030-065-7
$19.95 + shipping and handling

by James G. Lewis

The Forest Service and the Greatest Good takes an in-depth look at the Forest Service's conservation efforts during its first one hundred years. Jeffrey K. Stine of the Smithsonian Institution says, "It is a work of real clarity and substance that both reinforces *The Greatest Good* documentary film and extends its arguments and coverage."

The documentary film *The Greatest Good* is available as part of a three-DVD set, containing six hours of bonus materials, including extended interviews and more than forty short-subject films. The feature film includes the directors' commentary.

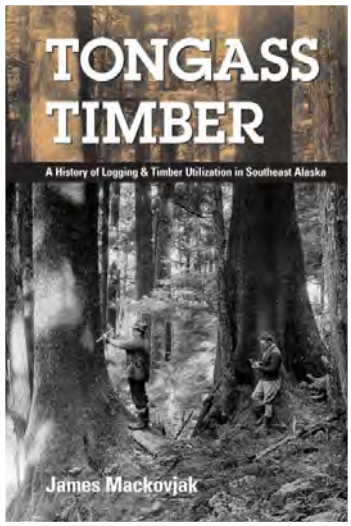
Order at ForestHistory.org/Greatest-Good-book or scan the QR code

Tongass Timber: A History of Logging & Timber Utilization in Southeast Alaska

By James Mackovjak

By the late 19th century, the forests of Southeast Alaska were being eyed for economic development and commercial interests had begun harvesting the high-quality Sitka spruce and other species in Alaska's panhandle. The arrival of high-intensity logging in the 20th century and the establishment of wood pulp mills beginning in 1954, and lasting more than four decades, exposed the environmental and economic limitations of an integrated wood products industry in Alaska.

In *Tongass Timber: A History of Logging & Timber Utilization in Southeast Alaska*, independent scholar and longtime Alaska resident James Mackovjak traces the history of the many attempts to develop the region's forests, revealing the forces that influence the present choices about forest management in Southeast Alaska.



Soft cover; 386 pp.; 77 figures; maps
ISBN-13: 978-0-8903-0074-9
$19.95 + shipping and handling

Order at ForestHistory.org/Tongass-Timber-book or scan the QR code

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From the FOREST HISTORY SOCIETY

Issues Series—$9.95 each

Books in the Issues Series bring a historical context to today's most pressing issues in forestry and natural resource management. These introductory texts are created for a general audience.

America's Fires: A Historical Context for Policy and Practice, Stephen J. Pyne
America's Forested Wetlands: From Wasteland to Valued Resource, Jeffrey K. Stine
American Forests: A History of Resiliency and Recovery, Douglas W. MacCleery
Canada's Forests: A History, Ken Drushka
Forest Pharmacy: Medicinal Plants in American Forests, Steven Foster
Forest Sustainability: The History, the Challenge, the Promise, Donald W. Floyd
Genetically Modified Forests: From Stone Age to Modern Biotechnology, Rowland D. Burdon and William J. Libby
Newsprint: Canadian Supply and American Demand, Thomas R. Roach
Wood for Bioenergy: Forests as a Resource for Biomass and Biofuels, Brooks C. Mendell and Amanda Hamsley Lang

Other Publications

Bringing in the Wood: The Way It Was at Chesapeake Corporation, Mary Wakefield Buxton, cloth $29.95, paper $19.95
Common Goals for Sustainable Forest Management, V. Alaric Sample and Steven Anderson (eds.), $24.95
Cradle of Forestry in America: The Biltmore Forest School, 1898–1913, Carl Alwin Schenck, $14.95
Forest Aesthetics, Heinrich von Salisch, trans. by Walter L. Cook Jr. and Doris Wehlau, $24.95
Forest and Wildlife Science in America: A History, Harold K. Steen (ed.), $14.95
Forest Management for All: State and Private Forestry in the U.S. Forest Service, Lincoln Bramwell, $10.95
Forest Service Research: Finding Answers to Conservation's Questions, Harold K. Steen, $10.95
From Sagebrush to Sage: The Making of a Natural Resource Economist, Marion Clawson, $9.95
Ground Work: Conservation in American Culture, Char Miller, $19.95
Jack Ward Thomas: The Journals of a Forest Service Chief, Harold K. Steen (ed.), $20.00
Lands Worth Saving: The Weeks Act of 1911, the National Forests, and the Enduring Value of Public Investment, James G. Lewis (ed.), $14.95
Millicoma: Biography of a Pacific Northwestern Forest, Arthur V. Smyth, $12.95
Pathway to Sustainability: Defining the Bounds on Forest Management, John Fedkiw, Douglas W. MacCleery, and V. Alaric Sample, $8.95
Plantation Forestry in the Amazon: The Jari Experience, Clayton E. Posey, Robert J. Gilvary, John C. Welker, and L. N. Thompson, $12.95
Proceedings of the U.S. Forest Service Centennial Congress: A Collective Commitment to Conservation, Steven Anderson (ed.), $24.95
The Chiefs Remember: The Forest Service, 1952–2001, Harold K. Steen, cloth $29.00, paper $20.00
The Forest Service and the Greatest Good: A Centennial History, James G. Lewis, paper $20.00
Tongass Timber: A History of Logging and Timber Utilization in Southeast Alaska, James Mackovjak, $19.95
View From the Top: Forest Service Research, R. Keith Arnold, M. B. Dickerman, and Robert E. Buckman, $13.00

Digital Media

America's First Forest: Carl Schenck and the Asheville Experiment (55 min.); *First in Forestry: Carl Alwin Schenck and the Biltmore Forest School* (28 min.), $24.95 (DVD)
The Greatest Good: A Forest Service Centennial Film (2005), $18.00 (3-DVD set includes two discs of bonus materials)
The Greatest Good film soundtrack (2005), $15.00 (Audio CD)
Timber on the Move: A History of Log Moving Technology (1981), $20.00 (DVD)
Up in Flames: A History of Fire Fighting in the Forest (1984), $20.00 (DVD)

All webinars are available for free at youtube.com/foresthistory.

For a list of oral history interviews available for purchase, visit: ForestHistory.org/ohi.

With DUKE UNIVERSITY PRESS

Changing Pacific Forests: Historical Perspectives on the Forest Economy of the Pacific Basin, John Dargavel and Richard Tucker, paper $5.00
David T. Mason: Forestry Advocate, Elmo Richardson, $8.00
Bernhard Eduard Fernow: A Story of North American Forestry, Andrew Denny Rodgers III, $9.95

With ISLAND PRESS

The Conservation Diaries of Gifford Pinchot, Harold K. Steen (ed.), cloth $29.00

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Crusading for Chemistry: The Professional Career of Charles Holmes Herty, Germaine M. Reed, $20.00

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George S. Long: Timber Statesman, Charles E. Twining, $19.95
Phil Weyerhaeuser: Lumberman, Charles E. Twining, $10.00
The U.S. Forest Service: A History (Centennial Edition), Harold K. Steen, cloth $30.00, paper $20.00

FOREST HISTORY *Society*

The Forest History Society is a nonprofit educational institution. Founded in 1946, it is dedicated to advancing historical understanding of human interactions with forested environments.

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more valuable historical documents and images of forest and conservation history were collected, preserved, and made accessible for the benefit of current and future generations.
Thank you from the staff and patrons!

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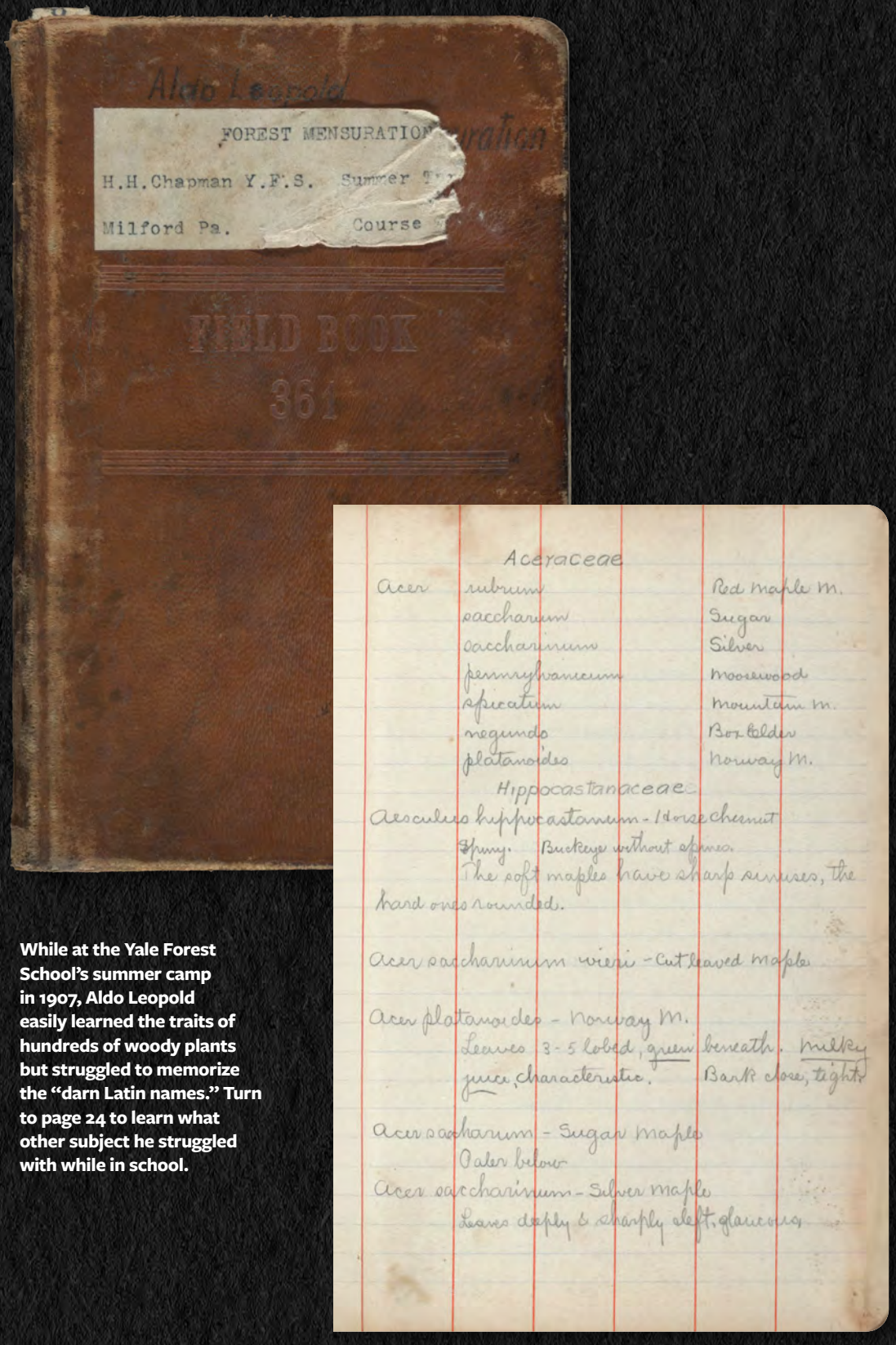

While at the Yale Forest School's summer camp in 1907, Aldo Leopold easily learned the traits of hundreds of woody plants but struggled to memorize the "darn Latin names." Turn to page 24 to learn what other subject he struggled with while in school.