YALE FOREST FORUM
SPEAKER SERIES SUMMARY

FALL 2025

YFF Review

A History of Scientific Forestry: From Extraction to Ecosystem Management

September 2025 – December 2025
New Haven, Connecticut, USA

Yale SCHOOL OF THE ENVIRONMENT
The Forest School

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Redwood milling, California. Image courtesy of USDA Lantern Slide Collection, Yale University Lantern Slide Collection.

Cover: Best Manufacturing Company trackless steam-powered traction engine hauling lumber log trailers on a timber forest road, 1899. Image courtesy of Charles Phelps Cushing.

Following page: Men ride logs downstream, Northern Michigan. Image courtesy of Beal, Yale University Lantern Slide Collection.

YALE FOREST FORUM AND *YFF REVIEW*

The Yale Forest Forum (YFF) is the convening hub of The Forest School at the Yale School of the Environment. YFF offers weekly webinar speaker series during the academic year to provide opportunities to hear from leaders in forest management, conservation, academia, and policy. Each YFF speaker series is organized around a key theme or challenge facing forests, forestry, and people. Guest speakers represent a wide range of perspectives and organizations, including government, NGOs, and businesses, and across scales from local to international. The *YFF Review* is a publicly available output of the series, summarizing key learnings and examples from the YFF speaker series.

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Falling the Twin of the General Noble, the World's Fair Tree, California. Image courtesy of Yale University Lantern Slide Collection.

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Introduction

By: Hassan Alzain

From September 4-December 4, 2025, the Yale Forest Forum convened the fall webinar speaker series “A History of Scientific Forestry: From Extraction to Ecosystem Management” with over 2,000 attendees. Co-hosted by The Forest School at the Yale School of the Environment, the Forest History Society, the Society of American Foresters, and the Department of Forest Resources at the University of Minnesota, the series brought together scholars and practitioners from multiple forestry disciplines. The webinars examined how forestry developed as a scientific field and how its ideas and institutions have shaped forest management in the modern time.

Scientific forestry emerged from early modern European efforts to regulate forests in response to growing demands for wood, land, and state authority. These efforts produced systems that emphasized measurement, planning, and professional expertise. As forestry practices spread through colonial expansion, industrialization, and higher education, they transformed forests into managed landscapes serving economic and political goals. These historical developments continue to influence how forests are governed and understood today.

Man stands on floating logs. Image courtesy of Yale University Lantern Slide Collection.

The objective of this series was to trace the historical roots of scientific forestry and to examine how its practices evolved across regions and centuries. Speakers explored forestry’s early legal and administrative foundations, its institutionalization in universities and government agencies, and its role in shaping forest use in Europe, South Asia, and North America. The series also examined how forestry responded to ecological change and shifting social priorities over time.

A central focus of the series was understanding how scientific forestry altered relationships between people and forests. The

webinars examined how professional forestry reshaped land use, labor systems, and community access to forest resources. They also explored how scientific approaches differed from Indigenous and traditional knowledge systems. These contrasts highlighted tensions between efficiency-driven management and place-based stewardship practices.

The series addressed several guiding questions. What were the primary systems of scientific forestry and how did they vary globally? How did these systems evolve in the United States? How did scientific forestry change cultural and ecological relationships with forests? What disciplines help interpret past forest practices and landscapes? Which forestry practices have persisted and why do they remain influential today?

Logger sleeps on barrel and rope. Image courtesy of Yale University Lantern Slide Collection.

This *Review* captures the series by outlining its historical scope and central questions. It provides context for understanding how scientific forestry developed and why its legacies matter. The following section summarizes the individual webinars and highlights their contributions to the broader history of forestry. Together, the summaries offer readers a foundation for engaging with contemporary forest management debates.

The series "A History of Scientific Forestry: From Extraction to Ecosystem Management," the second part of a three-part YFF forest history series, was facilitated by Gary Dunning (The Forest School at YSE), Tania Munz (Forest History Society), Terry Baker (Society of American Foresters), and Mike Dockry (Department of Forest Resources at the University of Minnesota). This series was co-developed and co-hosted by The Forest School at the Yale School of the Environment, the Forest History Society, the Society of American Foresters, and the University of Minnesota. All materials referenced in this document, including bios for speakers, readings, and webinar recordings, can be found on the Yale Forest Forum website.

From the Forest Laws to the Beginnings of Forestry Science in the English Atlantic, 1511–1691

WATCH SESSION RECORDING

Keith Pluymers

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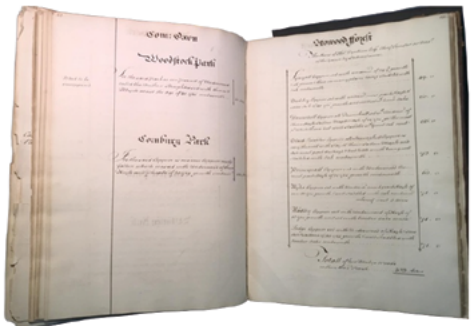
Presented: September 4, 2025

KEITH PLUYMERS, *Associate Professor, Department of History, Illinois State University*

Keith Pluymers, associate professor of history at Illinois State University, opened the Yale Forest Forum's fall series with a lecture on the early history of scientific forestry in the English Atlantic. He explained that for centuries, the Crown's Forest Laws determined who could graze animals, hunt game, or cut wood, treating woodlands primarily as legal and political entities. During the 16th and 17th centuries, however, this framework began to shift as officials increasingly measured, mapped, and predicted yields. These practices experimented with new forms of management that sought not only to regulate access but also to guarantee the perpetuity of forest resources.

Pluymers described how this transformation reflected urgent pressures. Shipbuilders demanded oak for masts, iron manufacturers required charcoal, and households across England depended on fuel and fodder. Surveying officers attempted to reconcile these competing needs with quantitative tools. One example Pluymers discussed is Roger Taverner's "Book of Survey" (1565), which translated living forests into tables and estimates of future growth.



Roger Taverner's 1565 "Book of Survey" demonstrates how foresters began quantifying woodlands as measurable resources, which Pluymers described as an early step toward sustainability practices.

By turning woodlands into inventories, forests became legible to the state. They could be budgeted, forecast, and allocated for preferred users such as shipwrights and ironworks. This marked a profound change in mindset, where forests were no longer only protected by

John Evelyn's "Sylva," published in 1664, became a landmark in the history of forestry. It combined scientific experimentation with the idea that planting and managing trees was a duty to both the nation and the future.

law but also managed as living systems that could be predicted and planned.

Yet these reforms often created new problems. In Ireland, crown plantations enclosed oak forests, accelerating deforestation even as they promoted replanting schemes. Across the Atlantic, Bermuda's colonial ordinances restricted cedar cutting, balancing survival on the island with the timber needs of English shipyards. In both contexts, sustainability was not a theoretical principle but a contested negotiation between local communities and imperial authorities, echoing European debates on enclosure and scarcity identified by historians Robson (2016) and Warde (2006).

Pluymers discussed how printed works reflected these anxieties. Arthur Standish's "New Directions of Experience" (1613) warned of catastrophic scarcity and called for ambitious planting programs. Half a century later, John Evelyn's "Sylva" (1664) gave voice to a new vision of forestry as a patriotic and scientific enterprise.

Evelyn's treatise emphasized planting at scale, proposing reforestation as the foundation of naval power and economic stability. His ideas foreshadowed a broader scientific approach to forestry, rooted in experimentation, replication, and the belief that sustainability required deliberate long-term intervention. For example, in New England, the 1691 Charter of the Province of Massachusetts Bay tied forest use to colonial governance.

Pluymers emphasized that these developments did not yet amount to a unified imperial science. Instead, they formed a patchwork of local experiments, intellectual projects, and crisis-driven policies. Sustainability in the English Atlantic emerged from conflict rather than harmony. It took shape in the struggles between law and measurement, between scarcity and abundance, and between local priorities and imperial ambitions. Over a century of surveying, planting, and debate laid the groundwork for modern forestry while also embedding the politics of access and exclusion. Pluymers's broader research, including his book "No Wood, No Kingdom," explores how fears of scarcity shaped English expansion and resource policies across the Atlantic.

“Wood Famine” and the Development of State Forestry in Early Modern France

WATCH SESSION RECORDING

Presented: September 11, 2025

KIEKO MATTESON, *Associate Professor and Department Chair, Department of History, University of Hawai‘i at Mānoa*

Kieko Matteson

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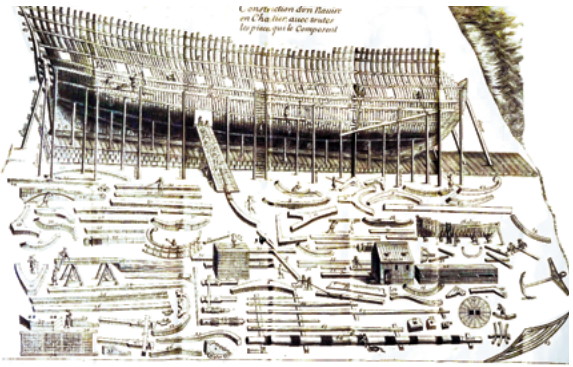
Kieko Matteson, associate professor and department chair of the Department of History at the University of Hawai‘i at Mānoa, opened her talk by explaining how wood was the backbone of early modern European societies. It provided fuel for households, raw material for tools and construction, and above all, oak for naval shipbuilding. As populations expanded and industries grew, demand placed unprecedented strain on forests. States recognized that wood was not simply a local resource but an asset critical to economic and military power. France, seeking to expand its naval presence and reinforce its status as a major European power, took the lead in transforming forests into regulated landscapes that served state objectives.

Matteson traced this transformation from Louis XIV’s 1669 Forest Ordinance to the Forest Code of 1827. These reforms reflected a shift from managing woodlands as shared commons to treating them as strategic resources measured and controlled by the central state. What began as a pragmatic effort to secure naval timber evolved into a comprehensive system of state forestry that reshaped landscapes and restricted local practices.

The Cassini map of 1744 shows forests across France in detail, illustrating how cartography supported centralized state surveillance of woodland resources. Image: Bibliothèque nationale de France.

The rise of absolutism in 17th-century France intensified this centralization. Jean-Baptiste Colbert, Controller-general of finances and Secretary of the Navy, understood that naval supremacy depended on reliable timber supplies. His leadership produced the 1669 Ordinance, which asserted state authority over harvesting and linked forest management directly to naval priorities. Matteson noted that constructing a single warship required thousands of trees, a scale that reveals how warfare and forestry were intertwined and underscores why French forest policy was closely tied to the state's strategic and military concerns.

Toulon's naval yard in 1670. Image: Album de Colbert, Service historique de la Défense.



Claude Caron's 1676 drawing of the construction of a ship shows the immense naval demand for timber, which drove the development of France's centralized forestry policies. Image: Bibliothèque nationale de France. Traité des bois servans à tous usages, Bibliothèque nationale de France.

Matteson emphasized that Enlightenment rationalism reshaped forestry into a more scientific discipline. European thinkers such as Hannß Carl von Carlowitz advocated sustained yield principles in his "Sylvicultura oeconomica" (1713). In France, Henri-Louis Duhamel du Monceau advanced systematic approaches that linked silviculture to naval architecture and industrial use. His treatises combined technical precision with practical application, reinforcing the belief that forests could be quantified, standardized, and managed like other elements of state infrastructure.

Above: Carlowitz's "Sylvicultura oeconomica" (1713). Image: Sächsische Landesbibliothek — Staats- und Universitätsbibliothek Dresden (SLUB).

Right (top and bottom): Duhamel du Monceau's "De l'exploitation des bois" (1764) illustrates the scientific foundations of forestry and its application to naval and industrial needs. Image: Bibliothèque nationale de France.

While the state expanded its authority, Matteson highlighted that rural communities paid the price. For centuries, villagers had relied on forests for fuel, grazing, and materials. The 1669 Ordinance curtailed many customary rights, but the 1827 Forest Code went further, severely limiting or even criminalizing sylvo-pastoralism and restricting practices such as gathering fallen branches for fuelwood. In woods like the Forêt de Chaux in Franche-Comté, traditional systems of selective timber harvesting (jardinage) gave way to strict extraction regimes like coppices-with-standards on highly regulated rotations. For rural populations, the forest shifted from a shared lifeline to a contested space of exclusion.

The legacy of this transformation extended into the 19th century with the establishment of the École royale forestière at Nancy in 1824. The school trained professional foresters, embedding standardized methods into state administration. Uniformed students and codified curricula symbolized forestry's rise as a bureaucratic and scientific discipline aligned with national priorities. Centuries-old trees like the Montaloyer Oak, dating to the era of the 1669 Ordinance, along with still-active sites of state silviculture like the Forêt de Chaux, remain witnesses to this history. As Matteson

Charcoal burning persists today in the Forêt de Chaux largely as an act of nostalgia for a bygone era of natural resource reliance. Every year on May 1, a volunteer association hosts a charcoal-making demonstration in honor of the woodcutters and charcoal burners, whose activities once dominated large swaths of the forest and were critical to France's industrial endeavors. Image: Kieko Matteson.

concluded, the so-called “wood famine” envisioned by Colbert was not so much a crisis of scarcity as it was a catalyst for the rise of modern forestry as an arm of state governance.

France’s efforts to regulate its forests underscore how control over woodlands was essential to state power in the early modern era. By tracing these dynamics, Matteson showed that forestry was never just about trees but about the institutions, communities, and objectives that shaped them within the context of state formation.

Students of the National Forestry School at Nancy in the 19th century show the professionalization of forestry, while the school’s historic entrance gate represents the institutionalization of forestry education in France. Images: AgroParisTech.

WATCH SESSION RECORDING

Martin Bemmann

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The Times, They're A-Changin': Industrialization, Globalization, and Forestry in Central Europe around 1900

Presented: September 18, 2025

MARTIN BEMMANN, *Lecturer, Department of History, University of Freiburg*

Martin Bemmann, lecturer in the department of history at the University of Freiburg, explained that between 1850 and 1914, Central Europe underwent a period of rapid transformation marked by industrialization, agricultural expansion, and integration into global markets. Timber demand rose sharply as factories, railways, and mines consumed unprecedented volumes of wood. Historians often describe this period as the "first globalization," when goods, people, and ideas circulated in new ways. For forests, this meant that wood was no longer just a regional resource but part of a continental system that tied management directly to industrial growth.

Bemmann emphasized how industrialization turned forests into pillars of economic infrastructure. Mines required pit props, railways demanded sleepers (or ties), and construction relied on timber for scaffolding. Records from the 1860s to the early 1900s show a steady increase in consumption, illustrating how industrial expansion depended on wood. This connection ensured that forestry became a discipline aligned with industrial rhythms and economic needs.

Forest management adapted accordingly. Even-aged spruce plantations spread across Central Europe, promising predictable yields and efficiency for industrial markets. By producing uniform stands, foresters hoped to deliver consistent volumes of timber and to stabilize supply for industries that depended on reliability. Yet this approach also narrowed ecological diversity, reflecting the growing link between forestry and commerce. Bemmann noted that this

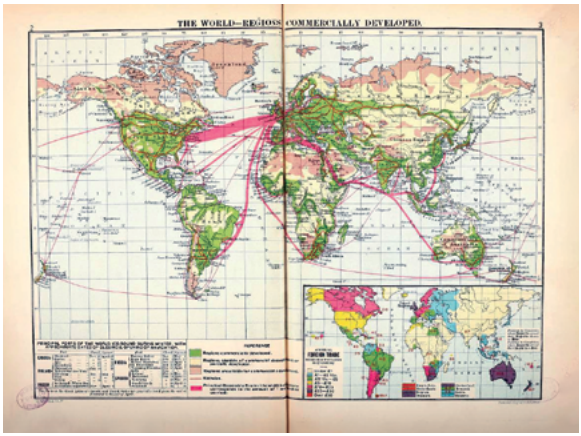
model became emblematic of the era, prioritizing predictable timber yields and economic performance, while narrowing ecological diversity. It highlighted how forestry practices were increasingly shaped by the demands of industrial modernity.

Even-aged spruce plantations illustrate how Central European forestry adapted to industrial requirements by emphasizing uniformity and predictable yields. Image courtesy of Waldwissen.net.

By the late-19th century, concerns spread that the world might face a timber famine. Expanding economies and rising populations seemed to be consuming wood faster than forests could regenerate. Government reports, international journals, and lectures by experts warned of imminent scarcity. Globalization amplified these fears. Steamship and railway networks connected continents, and at the turn of the 20th century, Central Europe was part of a vast international timber economy. Imports and exports of wood products stabilized supply but raised questions about dependence and sovereignty. Debates on whether or not domestic forestry could remain sustainable when tied to volatile global markets reshaped both practice and policy.

A storage yard for pit props in Essen, Ruhr Valley shows the scale of industrial timber demand driven by mining and energy production. Image courtesy of Wikimedia Commons.

Bemmann highlighted how industrial and global pressures reshaped forestry's intellectual foundations. At an international forestry congress in



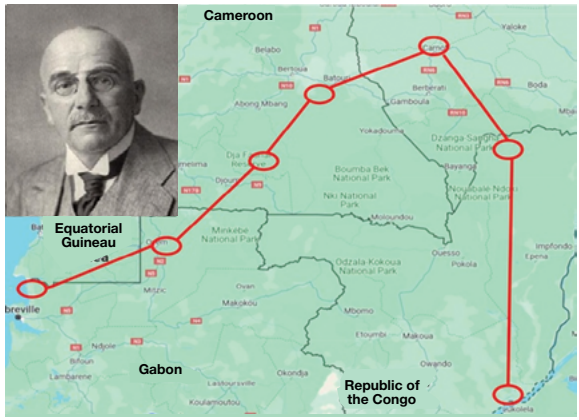
Steamship and railway networks around 1910 illustrate how globalization integrated timber into international markets, fueling both opportunities and anxieties about scarcity. Image: Philip's Chamber of Commerce Atlas (1912).

Delegates gather at Eberswalde in 1892 to establish the International Union of Forest Research Organizations, institutionalizing international collaboration in forest science. Image courtesy of Wikimedia Commons.

1890, Adolf von Guttenberg and Eugen Ostwald, forestry professors from Vienna and Riga, advanced new concepts of sustainability that moved beyond balance toward efficiency and rational allocation. German forester Max Pressler's treatises introduced mathematical tools for calculating yields, aligning forestry with the quantification demanded by industrial economies. The establishment of the International Union of Forest Research Organizations (IUFRO) in 1892 institutionalized transnational collaboration, creating a framework for shared knowledge and standardized practices.

Forestry also intersected with politics and expansion. The German Timber Trades Association, founded in 1875, reflected how market actors organized to influence supply and policy.

Professional forestry associations ensured that foresters participated in national debates, consolidating their authority as experts in both science and economics. Forestry's reach extended beyond Europe through colonial expansion. Expeditions such as Georg Escherich's journey to German Cameroon in 1913-14 showed how Central European practices were exported abroad, embedding silviculture into colonial economies and linking forestry to global networks of power and trade.



Georg Escherich's expedition to German Cameroon in 1913-14 illustrates how Central European forestry extended into colonial contexts, linking silviculture with global economic expansion. Image: Historisches Lexikon Bayerns. Map courtesy of Martin Bemmann.

As Bemmann concluded, the decades around 1900 reveal how forestry was increasingly shaped by industrial dynamics and international politics. By situating forestry within these global transformations, Bemmann underscored that its history is inseparable from the broader forces that defined modernity. His presentation also emphasized that understanding these origins is essential for recognizing how today's forestry debates remain entangled with questions of economics, governance, and global interdependence.

WATCH SESSION RECORDING

Local Knowledge, Global Influence: The Forestry Legacy of Sir Dietrich Brandis

Jameson Karns

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Presented: September 25, 2025

JAMESON KARNS, *Assistant Research Director, The West on Fire, University of Southern California*

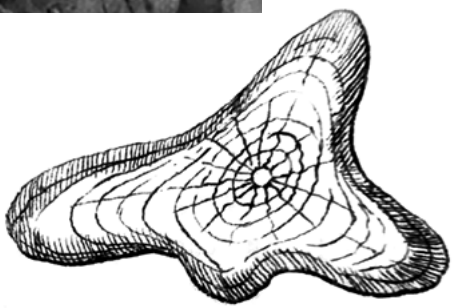
Jameson Karns, assistant research director at The West on Fire, delivered a webinar on Sir Dietrich Brandis (1824-1907, who is regarded as the "Father of Scientific Forestry" in South Asia). Karns explained how Brandis founded the British Imperial Forest Service and pioneered methods of fire ecology and forest management that drew on local knowledge rather than European models. His webinar situated Brandis within the broader history of colonial forestry, demonstrating how his work influenced institutions and policies across South Asia, Europe, and the United States. By presenting Brandis as both a scientist and mediator, Karns emphasized the global exchanges that defined 19th-century forestry.

Brandis began his career in Burma, where he faced the demands of colonial timber extraction alongside community practices. Teak was in high demand for shipbuilding, placing a strain on forests managed by customary systems. Karns noted that Brandis introduced survey methods while also recognizing the role of fire, which set him apart from administrators who dismissed local knowledge. Guided by the Burman Maung Tsaudun, Brandis conducted pioneering experiments on the relationship between fire and teak, marking an early contribution to the field of fire ecology. Rather than applying rigid rules, he sought to balance sustainable forestry yield with traditional practices, making him an early figure in addressing colonial expectations with South Asian realities.

Karns explained how Brandis institutionalized forestry through schools and professional services. He helped establish the British Imperial Forest Service and promoted training for British Indian foresters, envisioning a system led not only by Europeans but also by local experts. Syed Mir Mohsin Hussain, an Everest expedition veteran, collaborated with Brandis to develop a novel instrument for measuring tree height. Their invention, the Brandis Hypsometer, symbolized Brandis's commitment to combining precision with forestry field practicality. These initiatives made forests legible to the state through measurement and classification, reinforcing the dual role of forestry as science and governance.

Brandis's influence extended far beyond British India. By the late 19th century, his networks linked South Asian forestry with debates in Europe and the United States. Figures such as Gifford Pinchot, Henry Graves, and Carl Schenck, central to American forestry, trained under or corresponded with him. Karns highlighted how Brandis was not simply exporting European models but creating a hybrid approach informed by South Asian knowledge. His role as

Dietrich Brandis's mentorship shaped the early careers of American foresters, such as Gifford Pinchot (right), linking South Asia to the conservation movement in the United States. Image courtesy of Jameson Karns.



Brandis documented teak forests in Burma, like in this 1864 drawing, demonstrating the tension between colonial extraction and ecological knowledge. Image courtesy of Jameson Karns.

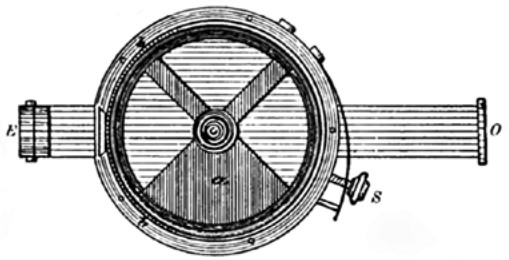


Fig. 14.—Brandis' Hypsometer and Clinometer. (The front lid removed, so as to show the wheel.)

The Brandis hypsometer standardized measurement practices, combining field pragmatism with scientific rigor. Figure courtesy of Jameson Karns.

mentor positioned him as a bridge between colonial forestry and the first generation of U.S. foresters, helping to globalize forestry as a scientific discipline.

Colonial-era depictions of fire, including this illustration of Mowgli and forester Mueller at a campfire, reflected tension between destruction and renewal, yet Brandis redefined fire as a tool for ecological balance. Image courtesy of the Kipling Society.

Known as the "Father of Scientific Forestry" in South Asia, Sir Dietrich Brandis's career exemplified the fusion of local knowledge with global forestry institutions. Image courtesy of Jameson Karns.

Fire was a recurring theme in Karns's webinar. Unlike many contemporaries who saw fire only as destructive, Karns noted that Brandis studied its ecological role. He observed how communities used controlled burns to maintain landscapes and argued that such practices could aid regeneration. This perspective foreshadowed modern fire ecology and challenged European notions of strict protection. By reinterpreting fire as a management tool, Brandis reframed forestry as the stewardship of dynamic systems rather than static preservation.

Karns concluded that Brandis' legacy remains visible in forestry institutions and programs worldwide. His synthesis of science and local knowledge offered a model of engagement that influenced colonial administration and international forestry. Known as the "Father of Scientific Forestry" in South Asia, Brandis exemplified how the discipline emerged through global exchange and contested practice. Revisiting his work, Karns stressed, reminds us that questions of sustainability, authority, and cultural knowledge continue to shape forestry today.

Autochthony and Forestry: Two Models of Place-Making Amongst the Trees

WATCH SESSION RECORDING

Ryan Hellenbrand

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Presented: October 2, 2025

RYAN HELLENBRAND, *Lecturer, The Nelson Institute for Environmental Studies and the American Indian & Indigenous Studies Program, University of Wisconsin–Madison*

Ryan Hellenbrand, lecturer at the University of Wisconsin–Madison, explored how cultural identity and ecological relationships shape forestry practices. His webinar examined autochthony, the belief that people originate from the land they inhabit, comparing how this principle defines the Menominee Nation's relationship to their forest with how German settlers in the 19th century claimed similar ancestral ties to wooded landscapes. Hellenbrand showed that both groups viewed forests as spaces of belonging and continuity, yet their approaches diverged sharply in purpose and outcome.

The Menominee Sustainable Development Institute (SDI) places autochthony at the center of its theoretical model that guides decisions about sustainable land management. Hellenbrand referenced Dockry et al. (2016), noting that the belief in being "people of the land" allowed the Menominee to balance economic, cultural, and ecological priorities while maintaining their forest for generations. Their management system combines traditional knowledge with technical expertise and has sustained one of the longest-standing examples of Indigenous forestry in North America.

"...the belief in being 'people of the land' allowed the Menominee to balance economic, cultural, and ecological priorities while maintaining their forest for generations."

Hellenbrand contrasted this Indigenous framework with the intellectual traditions brought by German foresters who arrived in the United States during the 19th century. These foresters introduced "scientific forestry," which they associated with national identity. Drawing on the work of German foresters such as Heinrich Cotta, Georg Ludwig Hartig, and Wilhelm Pfeil, they viewed the forest as a rational system to be measured and optimized for yield. While these methods professionalized forestry in the United States, they also reflected assumptions of control and ownership over the landscape.

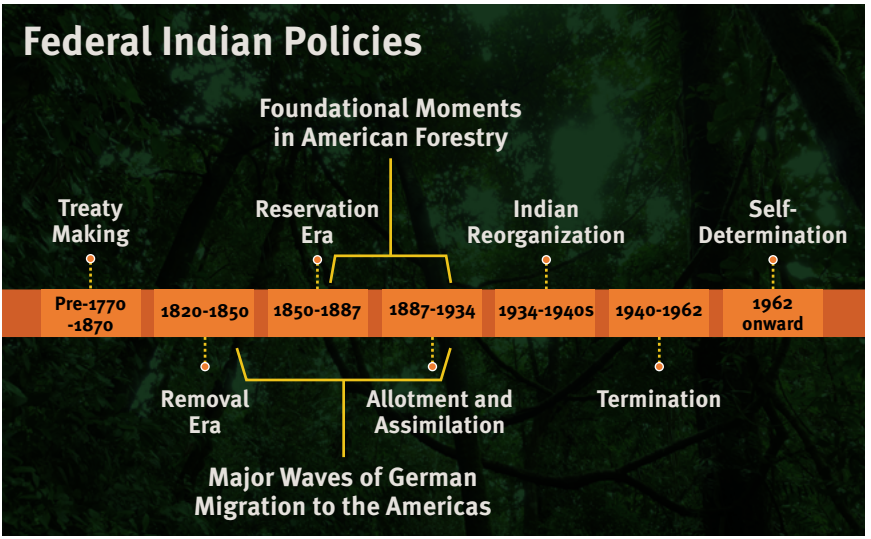
Fig. 2 Illustration of tensions among dimensions in the College of Menominee Nation Sustainable Development Institute's Model. Tensions are represented anywhere the model dimension's borders touch. An unlimited number of tensions can be illustrated by placing dimensions adjacent to each other. (CMN c. 1999)

The Menominee Sustainable Development Institute Model, developed by the College of Menominee Nation, includes six dimensions of sustainability — human perception, activity, and behavior; land and sovereignty; economics; natural environment; technology; and institutions — at its core and is surrounded by tensions where the borders touch. Figure: The College of Menominee Nation (c. 1999).

By the late 19th century, forestry had become a field where ideas of belonging and progress converged. Figures like Bernhard Fernow and Carl Alwin Schenck, both trained German foresters, shaped early forestry schools at Cornell, Penn State, and the Biltmore School in North Carolina. Hellenbrand explained that while these figures promoted sustainable forestry management, they also embedded European hierarchies into American forestry. In contrast to the Menominee model, which balanced ecological reciprocity with cultural responsibility, settler forestry often prioritized efficiency and expansion principles.

Hellenbrand showed how these contrasting models of "place-making" reveal the politics of forestry in the United States. For the Menominee, forests represented kinship and

responsibility. For settlers, they symbolized productivity and modernization. Federal Indian policies through the 19th and 20th centuries intensified these contrasts, influencing Indigenous communities while expanding settler resource management. Yet, through resilience and adaptation, the Menominee maintained control of their forest, demonstrating how Indigenous knowledge can coexist with modern forestry without losing their culture.



Key shifts in the United States' federal Indian policy framework, from treaty making to self-determination, shaped the political context within which Indigenous and settler forestry systems evolved. Figure courtesy of Ryan Hellenbrand.

In closing, Hellenbrand emphasized that forestry should be understood as both an ecological and cultural practice. The Menominee example illustrates how sustainability arises from relationships grounded in belonging, while the German model in America shows how claims to autochthony were used to justify authority and exclusion. By juxtaposing these histories, Hellenbrand invited reflection on what it means to live responsibly with forests today. His presentation underscored that lasting forest sustainability depends not only on science but also on the values that connect people to the land in a holistic manner.

WATCH SESSION RECORDING

Char Miller

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The Ideas that Grew Trees (and a Profession)

Presented: October 9, 2025

CHAR MILLER, *W.M. Keck Professor of Environmental Analysis and History, Pomona College*

Summary by: Hassan Alzain

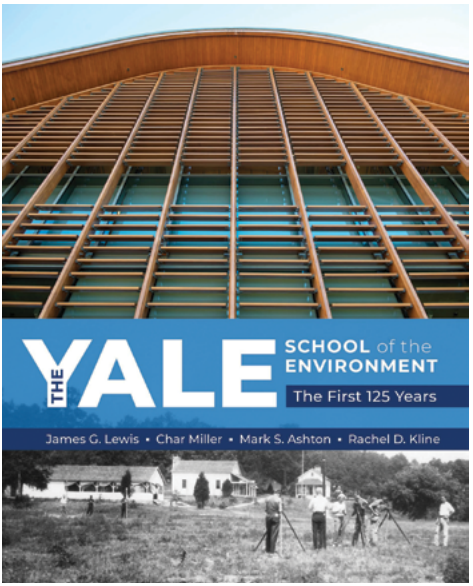
Char Miller, W.M. Keck Professor of Environmental Analysis and History at Pomona College, explored the intertwined histories of the Yale School of the Environment, the Society of American Foresters, and the U.S. Forest Service, institutions all founded between 1900 and 1905 that gave shape to what their founders called "scientific forestry." He emphasized that the term "scientific" captured a Progressive Era belief in expertise, training, and credentialed authority. The rise of forestry symbolized a broader cultural shift in which education and professional membership defined who was recognized as a specialist in the care of natural resources. Miller explained that this moment not only transformed forest management but also marked the emergence of science as a governing tool for public policy and advanced environmental decision-making.

Within this emerging movement, Miller highlighted early figures such as Bernhard Fernow, whose European training introduced sustained-yield principles and scientific planning to American forestry. Fernow's influence extended to education, policy, and federal reform, linking academic rigor with public service. Yet Miller noted that the process of professionalizing forestry was also one of exclusion: those without formal credentials or access to elite institutions were often marginalized. This division between the "inside" and "outside" groups defined who could claim the title of forester and who could not. He observed that these boundaries, set at the dawn of the profession, still shape conversations about expertise, equity, and representation in environmental fields today.

Miller situated these developments within the broader conservation movement of the early twentieth century. The creation of the U.S. Forest Service reflected the belief that scientific management and federal oversight were essential to preserve the nation's forests for the public good. However, he also acknowledged the contradictions in this model, including its tendency to centralize control and overlook Indigenous knowledge systems that had long sustained forest ecosystems. He noted that the U.S. Forest Service now recognizes that the national forests and grasslands occupy the ancestral lands of American Indian and Alaska Native peoples, emphasizing the need to integrate Indigenous stewardship and cultural understanding into the practice of modern forestry.

Bernhard E. Fernow (1851-1923), third Chief of the U.S. Division of Forestry and founder of the first university-level forestry program at Cornell University in 1898, helped establish the academic foundation for scientific forestry in the United States. Image courtesy of the Forest History Society.

Miller reflected on how the institutional growth of forestry mirrored the wider American trend toward professional organization and scientific authority. Forestry became a microcosm of the Progressive Era's focus on planning and expert management, a belief that rational systems could solve complex environmental and economic problems. He noted that this same reliance on expertise, while central to forestry's success, also produced hierarchies that continue to shape environmental decision-making. He explained that these institutional legacies helped build trust in state-led conservation but also limited the diversity of perspectives that informed early policies. Recognizing this tension, Miller emphasized that future conservation efforts should balance technical expertise with cultural understanding and social inclusion in an integrated manner.



Top: "The Yale School of the Environment: The First 125 Years" reflects the school's deep historical ties to forestry education and its continued leadership in advancing global forest stewardship and environmental sustainability. Image: Yale School of the Environment.

Bottom: "Our Forests, Our Future" commemorates the 125-year legacy of the Society of American Foresters, linking the founding era of scientific forestry to the ongoing mission of sustainable resource management. Image: Society of American Foresters.

In closing, Miller highlighted that the history of scientific forestry is not just about its successes but also about the voices it left out. He encouraged modern environmental professionals to revisit the origins of their field to understand how advanced expertise, system inclusion, and structural equity shall evolve together. By reflecting on the people and ideas that shaped the profession, Miller concluded, forestry can continue to grow as both a scientific discipline and a moral practice rooted in responsibility and shared stewardship. He urged that the challenge for today's generation is to ensure that the forests and the institutions managing them reflect the collective wisdom of all communities who depend on the land.

American Logging Capital and Technology Through Time and Space

WATCH SESSION RECORDING

Presented: October 30, 2025

JASON L. NEWTON, *Assistant Teaching Professor, Department of History, University of North Carolina at Charlotte*

Jason L. Newton

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Jason L. Newton, assistant teaching professor at the University of North Carolina at Charlotte, explored how technology, labor, and capital transformed the American logging industry from the 19th through the 20th century. Drawing from his book "Cutover Capitalism: The Industrialization of the Northern Forest," Newton examined how early loggers and sawyers developed practical and localized knowledge of the forest before the rise of formal forestry education. This experiential understanding allowed workers to adapt to the environmental conditions of northern woodlands, developing effective yet labor-intensive methods of cutting and transporting timber. Newton emphasized that this early form of forest management relied on lived experience and cooperation, revealing how working people built the foundations of American logging well before it became a scientific or bureaucratic field.

Newton traced how logging capital and technology expanded across the United States through distinct phases of industrialization. He surfaced three broad eras of technological change: the eotechnic era of water and wind power, the paleotechnic era of steam and coal, and the neotechnic era of electricity and internal combustion. These phases corresponded to major shifts in how timber was harvested, processed, and transported. Using examples such as the water box and log drives, Newton highlighted how early loggers harnessed natural forces like snow, ice, and spring freshets to move

Loggers in the Northern Forest relied on locally developed techniques and shared practical knowledge before formal forestry education advanced. Image courtesy of the New York State College of Forestry, Camp Log (1929).

timber downstream. Some of these methods had less negative environmental impacts compared to modern logging methods. This approach reflected a balance between ingenuity and adaptation, as laborers worked with natural systems to sustain both production and the forest's regenerative capacity.

"Logging was grueling work, often performed in isolated camps under extreme winter conditions. Workers consumed up to 8,140 calories a day to sustain their exertion, and injuries were frequent."

Newton also examined the physical and social dimensions of this labor system. Logging was grueling work, often performed in isolated camps under extreme winter conditions. Workers consumed up to 8,140 calories a day to sustain their exertion, and injuries were frequent. These camps functioned as small, self-sufficient communities built on cooperation, endurance, and shared skill. As industrialization advanced in the 20th century, steam- and gasoline-powered machinery replaced many manual methods, concentrating decision-making power in the hands of owners and engineers. Newton argued that this transition shifted the meaning of expertise from collective experience and craft to technical specialization, turning forestry from a community-based livelihood into a capital-intensive industry focused on profit and efficiency.

Lumbering spruce, falling, bucking or sawing apart, rounding edge, Mason Co., Washington. Image courtesy of Collier, Yale University Lantern Slide Collection.

Newton situated these changes within the broader history of American capitalism and regional development. Logging capital moved with the frontier, following new stands of timber from the Great Lakes to the Pacific Northwest. Each migration left behind cutover landscapes, reshaping rural economies and communities. Newton emphasized that this movement linked environmental degradation to economic expansion, revealing how forests were transformed into commodities within national and global markets. He described this as a working-class history of forestry, one that recognizes how industrial progress depended on the knowledge and labor of those most affected by it. By recovering these perspectives, Newton invited listeners to see forestry as a social, economic, and ecological system shaped by the intersections of work, technology, and environment.

Eotechnic-era logging technologies, such as the water box and log drives, used natural forces of ice, snow, and river current to move timber efficiently, blending labor ingenuity with environmental adaptation. Image courtesy of the Adirondack Experience, Blue Mountain Lake, New York (Catalog No. 1956.021.0001).

In conclusion, Newton reflected on the long-term lessons that the history of logging offers for modern environmental practice. He noted that the same tensions between productivity and sustainability persist today as industries seek to reconcile economic development with ecological care. Understanding the historical relationship between technology, labor, and the land, he suggested, can guide contemporary forestry toward more just and sustainable outcomes. Newton concluded that the story of American logging is not only one of industrial innovation but also of resilience and adaptation, advocating that forests and the people who work within them remain central to the nation's evolving environmental narrative.

WATCH SESSION RECORDING

Mike Dockry

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The Clash of Scientific Forestry and Traditional Knowledge on Tribal Lands

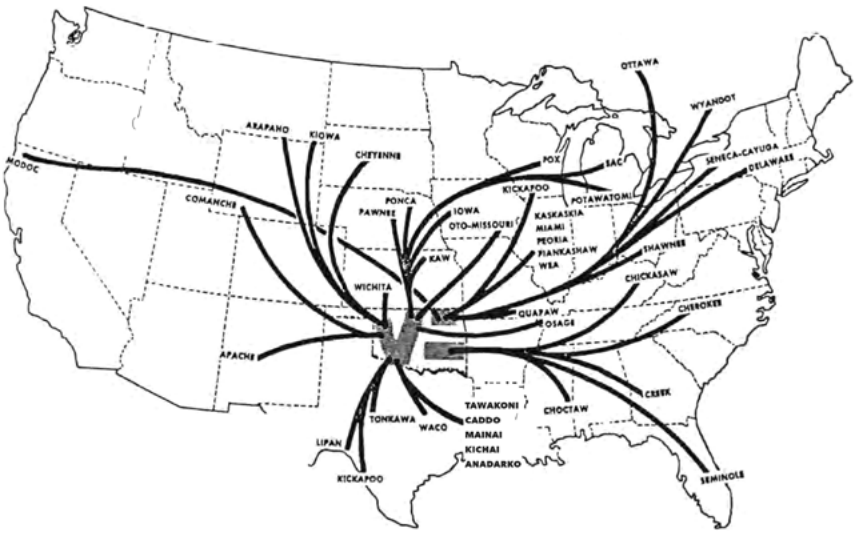
Presented: November 13, 2025

MIKE DOCKRY, *Associate Professor of Forest Resources, Department of Forest Resources, University of Minnesota*

Summary by: Hassan Alzain

Mike Dockry, associate professor of forest resources at the University of Minnesota, examined how the rise of scientific forestry in the United States conflicted with long-established Indigenous land-use practices and relationships. He began by outlining how early forestry institutions framed Native land stewardship as unscientific and inefficient, overlooking the complexity and intentionality of Indigenous ecological knowledge. Dockry emphasized that many Tribal nations maintained sophisticated systems of fire use, forest tending, and landscape care that supported both cultural life and ecosystem health. The emergence of formal forestry education in the 20th century introduced new models of authority that marginalized these systems, creating a hierarchy in which Western scientific approaches were prioritized while Indigenous expertise was ignored and actively suppressed.

Dockry connected this history to the long arc of displacement that forced Tribes far from their traditional homelands. He explained that the dispossession of land disrupted environmental knowledge that was formed over centuries of lived experience. When federal agencies later imposed standardized forestry practices, they did so without considering the diversity of Tribal ecosystems and governance systems. As a result, many management plans failed to support ecological resilience or cultural continuity. Dockry highlighted how these historical patterns of exclusion created lasting inequities in who was allowed to define legitimate forest science, shaping power dynamics that remain evident in contemporary land management institutions.



Movement of Indian Tribes into Oklahoma. Some of the Tribes—such as the Kiowa, Arapaho, Cheyenne, and Comanche—moved on their own volition; others were pressured to move; and some, such as the Seminole, were forcibly moved. Figure courtesy of the U.S. Public Health Service, Division of Indian Health.

Dockry turned to visual culture to illustrate these conflicts, focusing on the 1945 mural titled "The Epic of Minnesota's Great Forests." He discussed how the mural celebrated industrial logging and scientific control while portraying Indigenous peoples as marginal or absent. According to Dockry, such imagery reinforced narratives that erased Native stewardship and legitimized the authority of professional foresters. This erasure also appeared in popular illustrations, including those featuring Paul Bunyan, which framed the Northwoods as an empty wilderness awaiting industrial transformation. Dockry explained that these cultural representations largely influenced public perceptions, making it easier for policy makers to justify practices that excluded Native communities from their own landscapes.

Indigenous narratives have been used to reclaim land in the Northwoods. Image courtesy of the Minnesota Historical Society.

Despite this history, Dockry emphasized how Indigenous nations have reclaimed their knowledge systems and reasserted leadership in forestry. He described contemporary efforts in which Tribes apply cultural burning, community-based monitoring, and intergenerational teaching to restore forest health and enhance resilience. These practices, grounded in place-based knowledge, are increasingly recognized as essential for managing ecological uncertainty and climate impacts. Dockry noted that many Tribes are also reshaping forest education by creating programs that center Indigenous science alongside Western ecology, enabling professionals to understand forests as both cultural and ecological systems.

In closing, Dockry highlighted emerging directions in 21st century forestry that integrate diverse forms of knowledge to create healthier and more just landscapes. He pointed to expanding collaborations between Tribes, universities, and federal agencies that prioritize co-stewardship and respect for Tribal sovereignty. Dockry argued that the future of forestry depends on recognizing the value of Indigenous expertise and dismantling structures that have historically excluded it. By acknowledging past injustices and building new relationships rooted in reciprocity, he concluded, society can move toward forest management approaches that are more inclusive, resilient, and responsive to the needs of all communities connected to the land.

Her Roots Run Deep: Tracing Women's History in Forestry

WATCH SESSION RECORDING

Presented: November 20, 2025

RACHEL D. KLINE, *Principal Cultural Resources Team Lead, SWCA Environmental Consultants*

Rachel D. Kline

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Rachel D. Kline, Principal Cultural Resources Team Lead at SWCA Environmental Consultants, explained how women have shaped forestry from its earliest years despite longstanding structural barriers that limited their participation in traditional forestry roles. She highlighted how women served as educators, clerks, librarians, scientists, lookouts, and community leaders who expanded public understanding of forest stewardship. Their work helped bridge scientific forestry with social values that emphasized responsibility to people and place. Kline noted that early female naturalists and conservation writers cultivated widespread interest in forests, establishing a cultural foundation that guided later conservation reforms and inspired future generations to see forests as living, interconnected systems.

> **"Women in Native American and African American communities… shared environmental teachings that linked land care with cultural continuity. … Women were central to shaping how Americans understood forests, long before formal forestry programs began to acknowledge their contributions."**

Kline described how women in the late 19th and early 20th centuries built national conservation networks that combined scientific knowledge with public education. Figures such as Edith Mosher and many local teachers used field lessons, nature study curricula, and community programs to bring ecological learning into homes and schools. Women in Native American and African American communities also shared environmental teachings that

linked land care with cultural continuity. These efforts demonstrated that women were central to shaping how Americans understood forests, long before formal forestry programs began to acknowledge their contributions.

Kline then examined various women who broke into field roles that were typically unavailable to them. Hallie Daggett became the first female fire lookout for the U.S. Forest Service in 1913. Stationed in a remote mountaintop lookout cab on California's Klamath National Forest, Daggett carried out demanding patrol duties that required endurance, independence, and skill. Her work became a powerful example of women's capability in frontline forestry positions and challenged assumptions about who could protect and manage public lands. Daggett's service also underscored the role of field workers in shaping early fire detection systems.

Hallie Daggett, the first woman fire lookout in the U.S. Forest Service, stands outside her Klamath National Forest lookout cabin. Her appointment marked an exceptional early example of women serving in frontline forestry roles. Images courtesy of the U.S. Forest Service.

Kline also highlighted women who influenced forestry through public outreach and national advocacy. Margaret March-Mount became widely known for her educational campaigns that connected children and civic groups to forest protection. Her Pennies for Pines program encouraged the donations of small contributions that funded large-scale tree planting projects across the country. March-Mount used travel, lectures, and innovative storytelling to engage schools and women's organizations, helping plant millions of seedlings on public lands by the mid 20th century. Her work demonstrated how communication and community engagement shaped widespread support for conservation.

Kline concluded by emphasizing that women's involvement has been constant across research, policy, fieldwork, and community education. Over time, women advanced forest ecology, natural resource planning, fire management, and environmental history, helping diversify the perspectives that guide decision making today. Their contributions built a more inclusive understanding of forests as ecological and social systems that require a broad range of knowledge. Kline noted that recovering these histories is essential for recognizing the full spectrum of people who have shaped American forestry and for strengthening the future of conservation leadership for years to come.

Margaret March-Mount during her Pennies for Pines educational work, promoting tree-planting campaigns that supported reforestation across the national forests. Image courtesy of Forest History Society.

WATCH SESSION RECORDING

Changing Ideas of Forestry: Rethinking Old Growth

Nancy Langston

LEARN MORE

Presented: December 4, 2025

NANCY LANGSTON, *Distinguished Professor Emerita of Environmental History, Michigan Technological University*

Nancy Langston, distinguished professor emerita of environmental history at Michigan Technological University, examined how ideas about old-growth forests have shifted over the last century and why those changes matter for today's debates about restoration, fire, and climate adaptation. Focusing on the Blue Mountains of eastern Oregon, she explained that early U.S. Forest Service scientists believed they were using the best ecological research available to ensure fair access to scarce forest resources. They hoped scientific forestry would protect local communities that depended on timber, water, and grazing while also securing a stable future supply of harvestable wood and other forest resources. Langston argued that history is useful not because it offers an ideal landscape to return to, but because it shows how well-intentioned decisions can create unintended ecological problems. Understanding why past decision-makers acted as they did can help contemporary foresters navigate today's uncertainty without repeating the same mistakes.

Langston described how 19th-century settlers found open ponderosa pine forests with widely spaced trees adapted to frequent, low intensity fire. She noted that Paiute communities had managed these forests by encouraging fire, a practice later referred to by settlers as "Paiute Forestry" or "Cayuse Forestry." When federal foresters began administering the region in the early 1900s on behalf of the Bureau of Forestry, prior to the formal creation of the U.S. Forest Service in 1905, residents asked for federal oversight because private companies were rapidly buying up land and threatening community access. Foresters faced unfamiliar semi-arid, fire-adapted ecosystems and struggled to understand how fire, grazing, and timber

harvest interacted. Influenced by fears of a national timber famine, they defined old growth as decadent and wasteful and defined young, fast-growing stands as ideal. This view led to two pivotal choices that structured management in the Blue Mountains for decades: aggressive fire suppression and policies that encouraged liquidation of old-growth ponderosa pine in favor of regulated, rapidly growing forests.

Over time, those choices transformed the landscape. As frequent surface fires were excluded, dense layers of fir and lodgepole pine grew under the remaining ponderosa, changing species composition and increasing vulnerability to insects. By the late 20th century, defoliating pests, such as spruce budworm and Douglas fir tussock moth, were attacking large portions of the region's forests, and many stands saw high levels of infestation. The accumulation of dead and dying trees greatly increased fuel loads, so fires that once crept along the forest floor began to burn as intense crown fires that could kill entire stands. In 1991, the Forest Service publicly acknowledged that its own management practices had helped create a forest health crisis and needed to change.

Crown fire in a conifer forest illustrates the risk of high intensity wildfires in dense, fire suppressed stands. Image courtesy of the U.S. Forest Service.

Langston explained that different groups interpreted the crisis in very different ways. Many environmental advocates argued that the core problem was too much logging, road building, and soil disturbance, which simplified ecosystems and left behind dense fir stands prone to insects and fire. Some foresters, in contrast, claimed the crisis resulted from not enough management and blamed restrictions promoted by preservationists for preventing the intensive thinning and harvesting they believed were needed. Langston highlighted that neither explanation is complete. She emphasized how cultural

Comparison of an open, frequently burned ponderosa pine stand (top), and a dense, fire suppressed stand (bottom) shows how fuel build up alters forest structure. Image courtesy of the U.S. Forest Service.

ideals of efficiency and aversion to waste, combined with economic pressures and new technologies, pushed planners to favor large timber sales, railroad construction, and oversized mills that could not be sustained. These choices reshaped forest structure and local economies long before the crisis became visible.

In conclusion, Langston reflected on what this history means for contemporary adaptive management in a changing climate. Early silviculturists such as Frederick Ames called for monitoring harvests as experiments, but institutional and political constraints prevented the Forest Service from acting on what it learned. Today, new tools make it easier to track forest change, yet decision-makers still must confront uncertainty and conflicting social values. Langston argued that leaving heavily altered, low elevation forests entirely alone is unlikely to restore old-growth ponderosa pine because past fire exclusion, logging, and grazing have made them less resilient. Instead, adaptive ecosystem management must acknowledge ecological limits while also engaging diverse public values. Science can clarify likely outcomes and constraints, she concluded, but democratic debate about what kind of forests society wants will ultimately shape the future of old growth in the Blue Mountains and across the West.

Conclusion

By: Hassan Alzain

The fall 2025 Yale Forest Forum speaker series showed that scientific forestry developed through historically specific responses to scarcity, governance, and economic pressure. Across regions, forestry evolved as a system that sought to impose order, predictability, and control on forest landscapes. These approaches shaped institutions, policies, and ecological outcomes that continue to influence forest management today. Understanding these origins helps clarify why forestry practices remain contested and complex.

Flume tunnel, Allen sale, Deerlodge National Forest, Montana. Image courtesy of Yale University Lantern Slide Collection.

Several speakers examined the early European foundations of scientific forestry. **Keith Pluymers** traced the shift from forest laws to early forest science in the English Atlantic. **Kieko Matteson** examined how fears of wood scarcity drove centralized state forestry in France. **Martin Bemmann** explored how industrialization and globalization reshaped Central European forestry around 1900. Together, these talks highlighted forestry's deep connections to state power and economic development and to beliefs in rational natural resource management as instruments of nation building and identity.

Other speakers focused on the global circulation of goods, practical know-how, and forestry ideas. **Jameson Karns** examined Sir Dietrich Brandis's efforts to integrate local knowledge into colonial forestry in South Asia. **Ryan Hellenbrand** contrasted Indigenous and settler models of place making and forest stewardship. These sessions demonstrated how forestry practices were adapted, negotiated, and contested across cultural and political contexts.

The series also examined the institutional and industrial dimensions of forestry in the United States. **Char Miller** traced the professionalization of forestry through universities and organizations such as the U.S. Forest Service. **Jason L. Newton** explored how labor, technology, and capital shaped American logging systems. These talks revealed how forestry became both a scientific profession and an industrial enterprise.

Several speakers addressed perspectives historically marginalized within scientific forestry. **Mike Dockry** examined the conflict between scientific forestry and Indigenous knowledge on Tribal lands and efforts toward co-stewardship. **Rachel D. Kline** highlighted women's contributions to forestry through education, fieldwork, and advocacy. These sessions underscored the importance of recovering overlooked histories and knowledge systems.

Load of shortleaf yellow pine, Dierk's Lumber & Coal, DeQueen, Arkansas. Image courtesy of E.J. Davidson, Yale University Lantern Slide Collection.

The series concluded by examining how historical forestry practices shape present challenges. **Nancy Langston** explored changing ideas of old growth and forest health and their ecological consequences. Collectively, the speakers demonstrated why examining the history of scientific forestry is essential for better understanding our approaches to climate change, biodiversity loss, and forest governance. The series provided a foundation for more informed and inclusive approaches to forest management, inclusive of the history behind it.

Acknowledgements

We extend our sincere gratitude to the speakers who generously shared their time, scholarship, and professional expertise throughout the "A History of Scientific Forestry: From Extraction to Ecosystem Management" series. Their contributions provided critical historical, cultural, and ecological insights that enriched dialogue across forestry, history, ecology, sociology, and environmental studies. We also thank the series facilitators for their leadership and guidance in shaping a cohesive and intellectually rigorous program.

We are grateful to the series co-hosts, The Forest School at the Yale School of the Environment, the Forest History Society, the Society of American Foresters, and the University of Minnesota, for their collaboration and continued support. Finally, we thank the attendees whose participation and thoughtful questions contributed to a dynamic and meaningful exchange throughout the series.

Big trees, California. Image courtesy of Yale University Lantern Slide Collection.

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