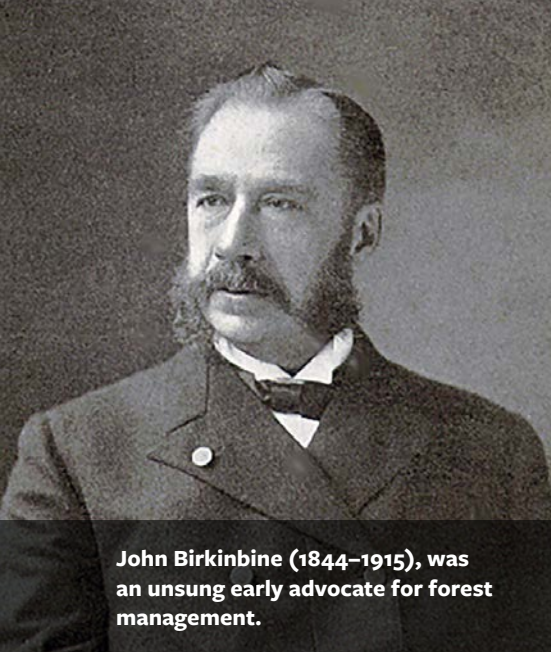


A large, multi-story stone tower with a flat top, surrounded by green trees and a grassy lawn. The tower is constructed from dark, irregularly shaped stones. The top of the tower is a flat, light-colored concrete or stone cap. The tower is set against a backdrop of dense green trees. The foreground is a well-maintained green lawn. The overall scene is bright and sunny.

John Birkinbine

*The Ironworks Engineer Who
Became a Forest Conservationist*

BY THOMAS J. STRAKA



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



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 West¹⁰—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.

SPECIAL COLLECTIONS, LEHIGH UNIVERSITY

COURTESY OF THE AUTHOR

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

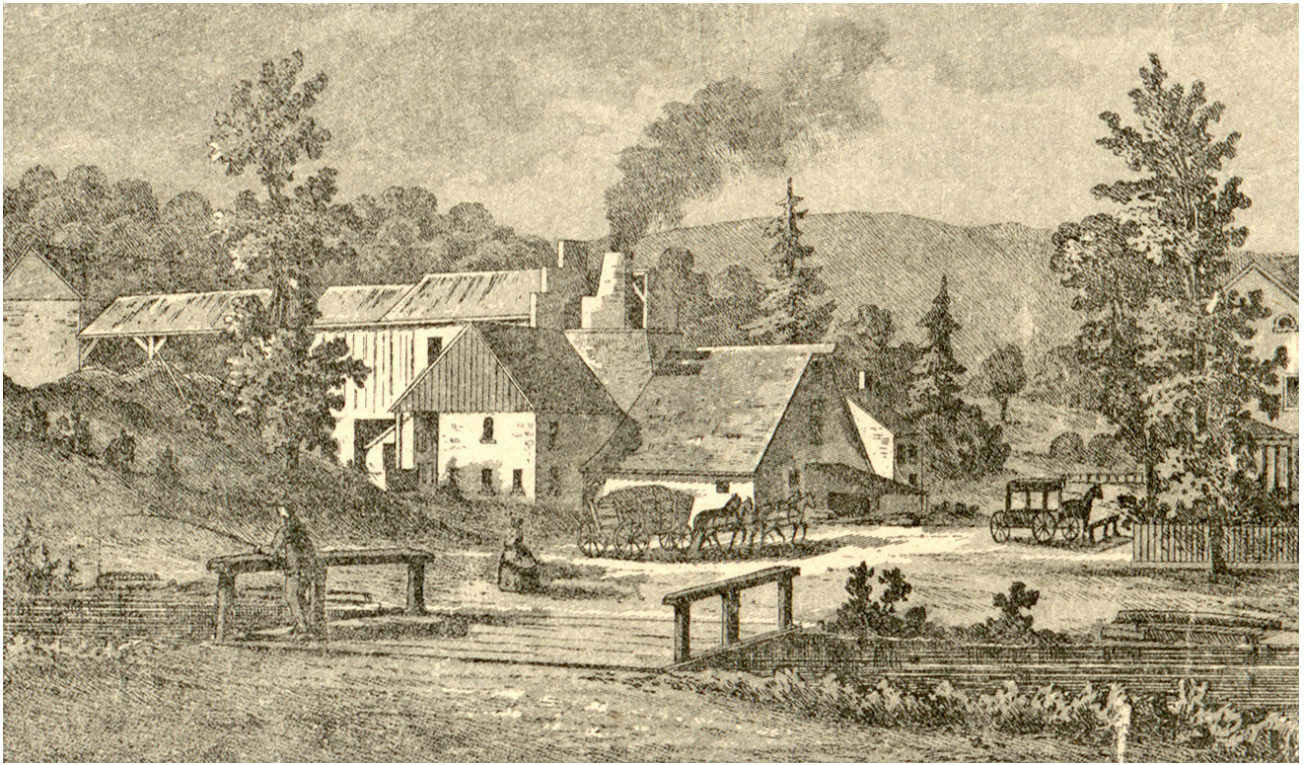
Through the American Institute of Mining Engineers (AIME), which he had joined, Fernow developed relationships with industry leaders who also had an interest in forestry. Three of those, each of whom served as president of the organization, were Rossiter Raymond, Abram Hewitt, and John Birkinbine. Raymond 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



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.

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.

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 hardwood 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:

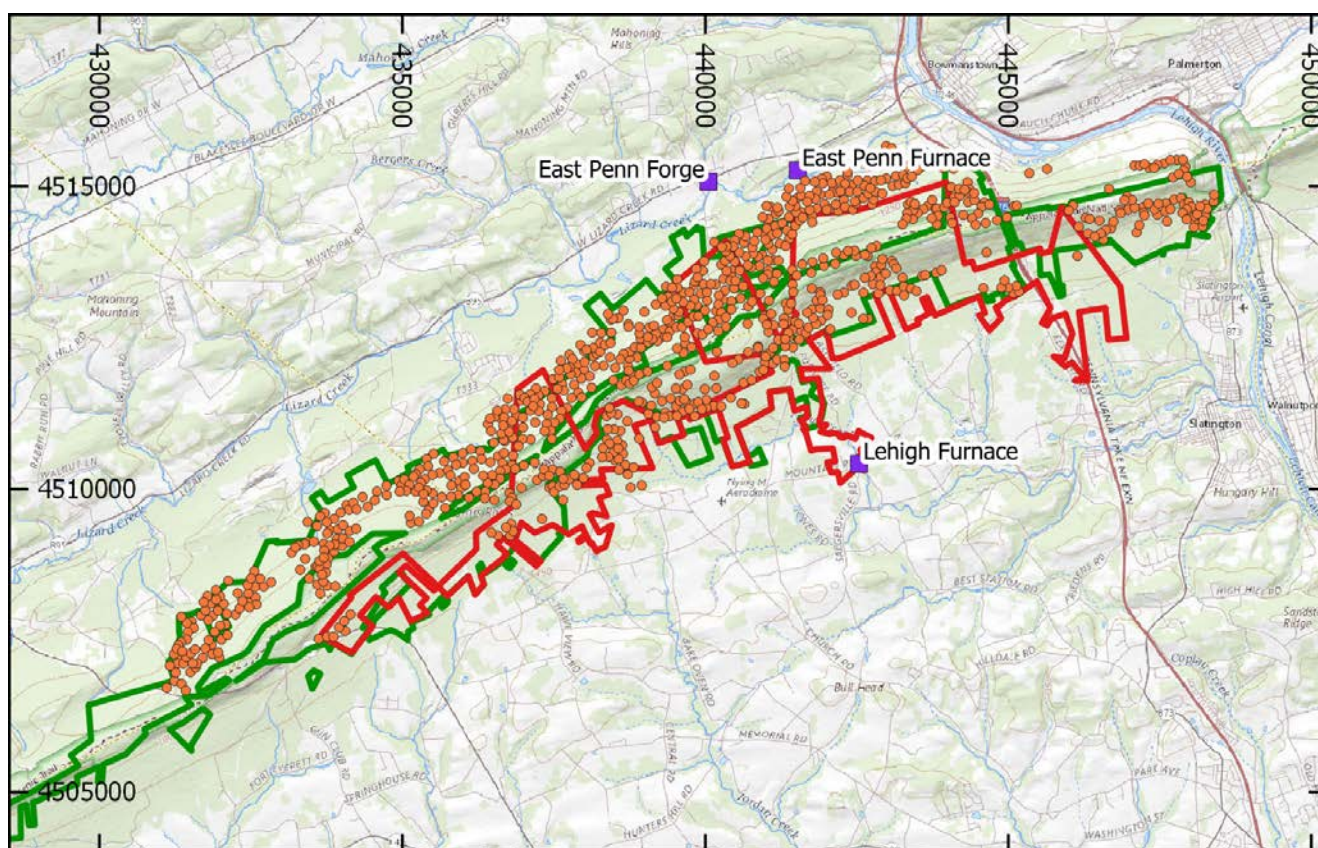
The prevailing sentiment of those who organized the present movement, recognizes that trees like grain, grow for man's benefit, which when ripe should be cut and put to use. It however condemns the useless destruction of forests with the same emphasis that it would the waste of growing grain, and would 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



Legend

- State Game Lands #217
- Hewitt's Lehigh Furnace Tract
- Relict Charcoal Hearth
- Furnace/ Forge



0 1 2 3 4 km



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

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,

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.

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

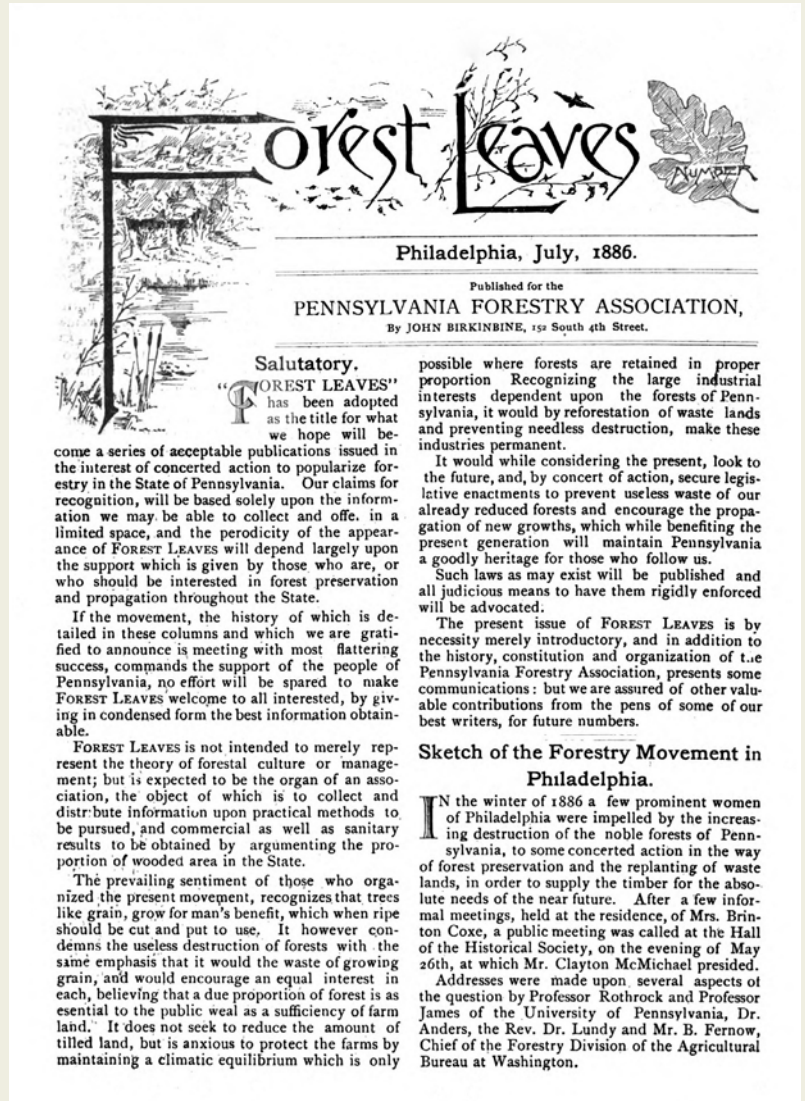
supply of adjacent territories.” Efficiency of the iron furnaces had increased while the number of iron furnaces decreased, relieving pressure on these lands to supply wood. Birkinbine suggested that the owners of charcoal ironworks could be “true conservators of the forests” and repurposing these woods 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:



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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NOTES

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Department of Conservation and Natural Resources, 2022); “Death of John Birkinbine,” *Iron Trade Review* 56, no. 20 (May 20, 1915): 1026.

2. Lenore Embrick Flower, *History of Pine Grove Furnace* (Carlisle: Cumberland County Historical Society, 2003), 12–13. In 1877 the extent of the South Mountain Mining and Iron Company (owner of the ironworks) was given as 20,000 acres.
3. John Birkinbine, “Experiments with Charcoal, Coke and Anthracite in the Pine Grove Furnace, PA,” *Transactions American Institute of Mining Engineers* (hereafter *TAIME*) 8 (1879–1880): 168–77.
4. F. L. Bitler, “John Birkinbine,” *Forest Leaves* 15, no. 3 (June 1915): 34–35; “Death of John

- Birkinbine,” *Iron Age* 95, no. 20 (May 20, 1915): 1144.
5. Rossiter W. Raymond, *Silver and Gold: An Account of the Mining and Metallurgical Industry of the United States, with Reference Chiefly to the Precious Metals* (New York: J. B. Ford, 1873), 385.
 6. Robert B. Gordon, *American Iron, 1607–1900* (Baltimore: Johns Hopkins University Press, 1996), 40–42.
 7. Thomas J. Straka, “The Charcoal Iron Industry and Pennsylvania Forestry,” *Pennsylvania History: A Journal of Mid-Atlantic Studies* 91, no. 4 (Autumn 2024): 507–16.
 8. Gordon, *American Iron*, 41–44.
 9. “The Denudation of Our Forests,” *Journal of the United States Association of Charcoal Iron Workers* [hereafter *JUSACIW*] 1, no. 1 (April 1880): 33–38.
 10. Samuel Trask Dana, *Forest and Range Policy: Its Development in the United States* (New York: McGraw-Hill, 1956), 80–83; Franklin B. Hough, *Report on Forestry* (Washington, DC: Government Printing Office, 1882), 5, 60–68.
 11. Franklin B. Hough, “On the Importance of Giving Timely Attention to the Growth of Woodlands for the Supply of Charcoal for Metalurgical Uses,” *JUSACIW* 1, no. 3 (November 1880): 67–80.
 12. Franklin B. Hough, “Discussion on Forestry, October 21, 1880,” *JUSACIW* 2, no. 1 (January 1881): 36–43.
 13. Franklin B. Hough, “Our Schools and Our Forests,” *JUSACIW* 3, no. 1 (March 1882): 43–50; “Elements of Forestry,” *JUSACIW* 3, no. 4 (September 1882): 200–02.
 14. John Birkinbine, “Our Fuel,” *JUSACIW* 2, no. 2 (April 1881): 67–79.
 15. “The Ax—Woodchopping as a Fine Art,” *JUSACIW* 4, no. 4 (August 1883): 263–64.
 16. Andrew Denny Rodgers III, *Bernhard Eduard Fernow: A Story of North American Forestry* (Durham, NC: Forest History Society, 1991), 17–34.
 17. Charles Edgar Randall, “FERNOW, The Man Who Brought Forestry to America,” *American Forests* 70, no. 4 (April 1964): 14–16, 44, 46; “Chronological Events in the Life of B. E. Fernow,” *Journal of Forestry* 21, no. 4 (April 1923): 336–37. Raymond was a mining engineer who earned an appointment as United States Commissioner of Mining Statistics, a position requiring him to report on the mining regions of the American West. He was among the first in the mining industry to take up the cause of forest conservation. Unlike in the eastern United States, charcoal production in the West was pure woodland exploitation. Raymond also published in Birkinbine’s journal: Rossiter W. Raymond, “Timber Destruction in the Rocky Mountains,” *JUSACIW* 2, no. 4 (August 1881): 198–99.
 18. Rodgers, *Bernhard Eduard Fernow*, 23–25, 105, 108–10.
 19. Harold T. Pinkett, “Gifford Pinchot at Biltmore,” *North Carolina Historical Review* 34, no. 3 (July 1957): 346–57. If the Biltmore property in North Carolina was the “cradle of forestry” in America, Pennsylvania’s charcoal iron forestland was forestry’s “receiving blanket.” Pinchot and Fernow were intertwined in the origins of American forestry. See Harold T. Pinkett, “Forestry Comes to America,” *Agricultural History* 54, no. 1 (January 1980): 4–10.
 20. Rodgers, *Bernhard Eduard Fernow*, 25.
 21. “Chapter on Forestry,” *Morning Call* (Allentown, PA), April 9, 1896.
 22. Benjamin P. Carter, “Identifying Landscape Modification Using Open Data and Tools: The Charcoal Hearths of the Blue Mountain, Pennsylvania,” *Historical Archaeology* 53, no. 2 (June 2019): 432–43.
 23. Dempsey, “Cautious Support,” 93–105. There are many examples of the friendship between Fernow and Raymond. *Fernow’s Brief History of Forestry* was dedicated to “My Friend of Many Years, ROSSITER W. RAYMOND, whose warm personal interest and enthusiastic patriotism from their beginnings inspired my labors in forwarding forestry in the United States.” Fernow’s first son was named Rossiter, and his biography notes that in the course of his entire career, he “had no closer friend than Raymond.” See Rodgers, *Bernhard Eduard Fernow*, 22, 24.
 24. Bernhard E. Fernow, “The National Forestry Congress,” *JUSACIW* 3, no. 3 (July 1882): 126.
 25. B. E. Fernow, “The Mining Industry in Its Relation to Forestry,” *TAIME* 17 (1888–1889): 264–75; John Birkinbine, “The Production of Charcoal for Iron Works,” *TAIME* 7 (1878–1879): 149–58.
 26. “Discussion,” *TAIME* 6 (1877–1878): 204–06; 7 (1878–1879): 155–58.
 27. John Birkinbine, Comment following article on National Forestry Congress, *JUSACIW* 3, no. 3 (July 1882): 132–33.
 28. Bernhard E. Fernow, “The National Forestry Congress,” *JUSACIW* 3, no. 3 (July 1882): 126–32; “The Montreal Congress,” *JUSACIW* 3, no. 4 (September 1882): 223–26.
 29. John Birkinbine, “Our Natural Resources, Their Conservation and Utilization,” *Journal of the Franklin Institute* 167, no. 1 (January 1909): 13.
 30. “Cartoons and Comments,” *Puck* 14, no. 357 (January 9, 1884): 290. See Thomas J. Straka and James G. Lewis, “History on the Road: Catoctin Mountain Park,” *Forest History Today* (Fall 2017): 68–73, which reproduces the cartoon. The caption on the cartoon is “Preserve Your Forests from Destruction, and Protect Your Country from Floods and Drought.”
 31. John Birkinbine, “Forest Destruction,” *JUSACIW* 5, no. 1 (February 1884): 3–4.
 32. “A New Branch of Engineering,” *Engineering and Mining Journal* 36, no. 10 (September 8, 1883): 142.
 33. John Birkinbine, “Minutes of the Ninth Annual Meeting of the Association of the United States Charcoal Iron Workers,” *JUSACIW* 8, no. 2 (1889): 69–75.
 34. John Ise, *The United States Forest Policy* (New Haven: Yale University Press, 1920), 95–96.
 35. “Salutatory,” *Forest Leaves* 1, no. 1 (July 1886): 1.
 36. John Birkinbine, “Forestry and Engineering,” *Forest Leaves* 12, no. 6 (December 1909): 88–94.
 37. E. N. Munns, *A Selected Bibliography of North American Forestry*, Vol. I, USDA Miscellaneous Publication No. 364 (Washington, DC: Government Printing Office, 1940), 60.
 38. Gifford Pinchot, “Progress of Forestry in the United States,” in *Yearbook of the United States Department of Agriculture, 1899*, ed. George William Hill (Washington, DC: Government Printing Office, 1900), 304.
 39. “Salutatory,” 1.
 40. Peter Linehan, “The Teacher and the Forest: The Pennsylvania Forestry Association, George Perkins Marsh, and the Origins of Conservation Education,” *Pennsylvania History: A Journal of Mid-Atlantic Studies* 79, no.4 (Autumn 2012): 520–36.
 41. John Birkinbine, “Address of Mr. Birkinbine,” *Forest Leaves* 4, no. 7 (February 1894): 100–03.
 42. J. N. O. Birkinbine, “Charcoal Industry,” in *Annual Report of the Pennsylvania Department of Agriculture, Part II, Division of Forestry*, Forestry Commission of Pennsylvania (Harrisburg: Clarence M. Busch, State Printer of Pennsylvania, 1896), 118–24.
 43. Lester A. DeCoster, “Penn’s Sylva: Forests Regained,” *American Forests* 101, no. 9 (Autumn 1995): 43–47; see Lester A. DeCoster, *The Legacy of Penn’s Woods: A History of the Pennsylvania Bureau of Forestry* (Harrisburg: Pennsylvania Historical and Museum Commission, 1995) for a broad discussion of charcoal iron industry woodland in terms of forest destruction and the transition of these lands into state forests and parks.
 44. “John Birkinbine Dead,” *American Forestry* 12, no. 6 (June 1915): 712.
 45. William Reid, B. C. Hollingsworth, and H. H. Wilson, “The Use of Timber in Mining,” *Forestry: An International Journal of Forest Research* 25, no. 2 (1952): 92–103.
 46. Stanley Dempsey, “Cautious Support: Relations between the Mining Industry and the Forest Service, 1891–1991,” in *The Origins of the National Forests: A Centennial Symposium*, ed. Harold K. Steen (Durham, NC: Forest History Society, 1992), 93–105.
 47. Bitler, “John Birkinbine,” 34–35.