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Cover Page Footnote

Figure 1 is supplied courtesy of the Forest History Society, Durham, NC

The Biltmore Forest School and the Establishment of Forestry Education in America

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The Biltmore Forest School, despite its unusual existence within the affluent Biltmore Estate, played a crucial role in the early 20th-century American forestry movement. Founded by Carl A. Schenck and supported by George Vanderbilt II, the school aimed to educate foresters and promote sustainable forest management. However, many aspects of the Biltmore experiment failed due to the new and untested nature of forestry science in America. This experiment exposed a fundamental divide in forestry education, with Gifford Pinchot advocating for conservation-centered teaching while Schenck believed in the economic viability of lumber production. Ultimately, the Biltmore Forest School offered valuable vocational education for young men but could not address the broader goals of forestry education. The emergence of other forestry schools in the early 20th century led to the school's demise. The larger purpose of forestry education was rooted in scientific forestry, focusing on profitable production, renewable yield, and forest improvement, principles echoed in modern forest conservation efforts. The Biltmore Forest School closed in 1914 due to low enrollment. That same year, George Vanderbilt died. His widow Edith eventually sold the forest, which grew to 500,000 acres, to the United States Forest Service. Edith Vanderbilt's vision of private forest land as a public trust contributed to the establishment of Pisgah National Forest, preserving the pioneering work of Vanderbilt, Schenck, and Pinchot in forest conservation for the benefit of the American people.

Keywords: Biltmore, forestry, education, silviculture

Introduction

The Biltmore Forest School was the innovation model for forestry education in America in the late 1800s. It was the first school in the United States to teach forestry as a distinct field of study and the first known school in America to offer an undergraduate degree using distance education as the medium of learning. The school was also the first to teach the practical principles of forest management in a lab setting with hands-on instruction and was the first school to manage a privately owned forest in the United States.

Forestry is a field of study in agricultural education in the United States. Students in agricultural education can choose to enroll in natural resources and environmental sciences courses in schools across America. In these courses, they will study aspects of the forestry industry. Students can learn the basics of the forestry industry and perhaps obtain employment as a forest technician, log grader, pulp and paper mill operator, or a host of other forestry-related occupations, including the teaching of agriculture (Advance



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CTE, 2018; Rayfield et al., 2017; Talbert et al., 2022). The United States government also recognizes the healthy relationship between forestry and agriculture. The federal government maintains a forest service within the United States Department of Agriculture and has done so since 1905. By 2007, the United States Department of Agriculture Forest Service (USDAFS) managed 193 million acres of national forests and grasslands (USDA Forest Service, 2018). However, this is insufficient in explaining why forestry became a field of study in the United States.

The demands upon forests were relatively small in the colonial period in the United States. Cutting operations were limited in scope, and the forest could regenerate new growth faster than the consumption of forest products. As the demand increased, forests could not regenerate by natural means sufficiently to meet the demand for forest products (Pinchot, 1891). The forests that comprised a large part of the Biltmore Estate struggled because of this same condition. The rate at which forest products were being consumed outstripped the capacity of the forest to renew itself. Trees require many years of growth to reach a merchantable size. As humans are a significant consumer of forest products, a good forestry education program is the answer.

Forestry has been practiced for thousands of years. Roman emperors selected forest stands and protected them for use in times of national defense. Some forests were reserved for religious purposes. Regular culling and thinning of these forest stands occurred (Fernow, 1913). The improper and wasteful practices used in cutting timber were condemned in literature as early as 465 BC when Artaxerxes I attempted to regulate lumbering on Mount Lebanon. By 333 BC, the cedars of Lebanon had been cleared from the mountain's Southern slope, as reported by Alexander the Great (Fernow, 1913). In the Christian Bible, the prophet Isaiah warned around 590 BC of the destruction of the great forests of Sharon, Carmel, and Bashan (Coogan et al., 2018). Theophrastus (390-286 BC) probably prepared the first known text on plant history. The early writers of agricultural practices, Cato (234-149 BCE) (Cato, 1934), Columella (4-70 A.D.) in *De Re Rustica* and *De Arboribus* (Columella, 1954; Forster, 1950), also wrote about the practice of healthy forest management.

The oldest attempts at extensive artificial reforestation did not begin until the eighteenth century. Frederick the Great ordered that a forestry department administer government forests in 1740. In 1817, the United States Congress enacted legislation to preserve public land in the Southeast to produce naval stores. Forestry grew most rapidly and extensively in Germany. Other countries soon followed Germany's lead. The French National Forest School began in Nancy in 1825 and was organized similarly to a military school. English men preparing to serve in the forests of India trained at the school (Fernow, 1913).

In 1873, the United States government began forestry by setting aside \$2000 to study forest conditions in the United States and its territories. In 1876, the United States Department of Agriculture surveyed forest resources in the United States. In 1887, Congress passed the Timber-Culture Act, requiring the planting and cultivating of a certain number of trees "as the consideration of a deed to a quarter-section" (Pinkett, 1970, p. 9) of the public domain. Nevertheless, by 1890, American forests still had no systematic forest management plan (Pinkett, 1970). President Benjamin Harrison created

the Yellowstone National Park Timber Land Reserve in Wyoming and the White River Plateau Timber Land Reserve in Colorado in 1891. As a result of President Harrison's action, the federal government protected 2.4 million acres of forest land, and more than 17.5 million acres were subsequently set aside for Yellowstone, Yosemite, Sequoia, and General Grant parks. The forestry movement was gathering momentum in the United States by the end of the nineteenth century.

Purpose and Procedure. This historical research project aimed to describe the events leading to the origin of forestry education in the United States, which was achieved by establishing the Biltmore Forest School. Historical research studies help interpret past events and how they influence the present (Rury, 2006). The historian examines artifacts and documents and makes inferences based on that examination. The essential element of historical research is interpretation. Gray (1964) proposed that our knowledge is based on past experiences. Researching our past helps us to gain a better understanding of the present time. In *A History of Histories*, John Burrow wrote that historical studies are "...a marker set down against the oblivion with which time threatens all human deeds" (Burrow, 2009, p. 11). The manuscript for this research project was prepared in a historical narrative format. This research project used primary sources of information such as personal correspondence, diaries, oral histories, manuscripts prepared by the individuals described in this paper, and data collected by state and federal agencies responsible for forestry education in the United States. Secondary sources included data from refereed journal articles and historical information from established institutions. Secondary sources were compared to selected primary sources to ascertain their accuracy. Sources of information were subjected to internal criticism for accuracy and external criticism for authenticity. Readers are cautioned to examine the findings of this paper from a historiographical perspective.

Method of Historical Analysis

Following the methods recommended by Schrag (2021), this section provides a historical analysis based on the research project's objective of describing the events leading to the establishment of forestry education in the United States by creating the Biltmore Forest School. As Rury (2006) aptly points out, historical research plays a pivotal role in interpreting past events and uncovering their impact on the present. I utilized artifacts and documents in this analysis, drawing inferences from sifting through these historical sources. A fundamental aspect of historical research is the art of interpretation. As Gray (1964) insightfully suggested, our contemporary knowledge is deeply rooted in past experiences. By delving into the annals of history, we gain a richer understanding of the present. This project adopts a narrative format in its presentation, providing a historical account of the establishment of the Biltmore Forest School and its role in shaping forestry education in America.

The primary sources harnessed in this research project include personal correspondence, diaries, oral histories, and manuscripts crafted by people whose contributions are explained in this paper. Additionally, data collected by state and federal

agencies responsible for overseeing forestry education in the United States offer an institutional perspective, adding depth to our understanding. Secondary sources, consisting of data from refereed journal articles and historical information from well-established institutions, augment the research findings. This research compared secondary sources to selected primary sources to validate their accuracy and reliability. Both primary and secondary sources have been subjected to rigorous internal and external criticism. I compared the sources to other credible sources for signs of tampering or manipulation to determine if they were authentic. The documents were further examined for consistency by examining the texts for a logical progression of thought and contradictions within the text. The language and tone of the source provided clues to emotional language or exaggerations. This critical examination ensures the accuracy of the information within these sources, safeguards against potential biases, and lends authenticity to the historical analysis presented in this paper.

The Carl Alwin Schenck Papers at North Carolina State University provided a significant number of primary sources for this study. The Schenck Collection provided a detailed look into the personal and professional life of Carl Alwin Schenck, the founder of the first American forestry school. The collection contains diaries recording personal notes, schedules, and appointments made by Schenck between 1890 and 1954. Therefore, information pertaining to Schenck's tenure at the Biltmore Estate and Forest, his administration of the Biltmore Forest School, and his numerous personal and professional travels are included in these journals. In addition to Schenck's diaries, the collection includes letters addressed to and from Schenck written between 1895 and 1955. The letters include professional correspondence, correspondence with former students from the Biltmore Forest School, and general correspondence. For most of his professional life, Schenck continued to correspond with many of his colleagues, many of whom are considered the founders of the forestry profession.

Writings, such as Schenck's field notes of logging operations throughout Europe and the United States, as well as several manuscripts of professional literature and poetry written by Schenck, are contained in this collection. Schenck's technical reports on European forests, his doctoral dissertation, miscellaneous publications, and a compiled collection of legends and fairy tales are also included here. Documents about Schenck's term as head forester at George Vanderbilt's Biltmore Estate and Forest, which contain general information regarding the house and forest, are included, as are technical reports, budgets, and maps compiled by Schenck. These materials provide an in-depth, detailed look into the inner workings of one of America's largest private homes.

The collection contains a wealth of archival information on the Biltmore Forest School, the first forestry school in the United States. In addition to general information on the school's history, the collection contains several publications produced by the school and describes the students' experiences there. Biographical information for many students is also included, most of which were written themselves for inclusion in *The Biltmore Immortals*. Correspondence from students to their families and classmates can also be found in this series. Photographs, including black and white prints, negatives, and albums, cover many topics, from personal to professional travel, the Biltmore Estate and Forest, and the Biltmore Forest School. These photographs include pictures of Schenck,

his spouse, forestry colleagues, the Vanderbilt family, and the Biltmore Forest School. Finally, the collection contains artifacts about Schenck's personal life and the Biltmore Forest School.

The materials within this comprehensive collection were meticulously subjected to internal and external critique. Internally, the collection's documents, diaries, correspondence, and writings underwent thorough scrutiny. This process involved a meticulous examination to identify potential biases, errors, and inconsistencies within the records. For example, in the case of Schenck's diaries, internal criticism required an evaluation of the consistency of personal notes, schedules, and appointments, verifying that entries aligned with the chronological and contextual flow of events. This scrutiny helped ensure the reliability of the personal insights provided by Schenck.

Similarly, Schenck's writings, including technical reports, field notes, and scholarly works, were examined for internal consistency and alignment with known facts. Any internal discrepancies were documented and considered within the broader historical context. External criticism involved assessing how well the records aligned with other primary and secondary sources and examining the sources' reputation and trustworthiness. For instance, Schenck's correspondence was cross-referenced with available records from his colleagues and contemporaries in forestry. By comparing his professional exchanges with others, I aimed to corroborate the accuracy of the information presented.

The Forest History Society in Durham, North Carolina, and the Library of Congress in Washington, DC, also provided several crucial secondary sources that assisted in the search for primary sources used in this research project. The Forestry History Society owns many photographs of the Biltmore Forest School, which could be examined and compared to the written record to add to the depth of understanding of the conditions of forests in Western North Carolina in the late 1800s and early 1900s. The Library of Congress houses a comprehensive collection of archival records related to Gifford Pinchot, a prominent figure in American conservation and forestry. These records include Pinchot's personal and professional correspondence, including letters to and from colleagues, conservationists, government officials, and peers in the forestry field. These letters offered insights into his interactions and discussions on environmental policy, forestry management, and conservation initiatives. The Pinchot records at the Library of Congress also included manuscripts of his books, articles, speeches, and reports related to forestry, conservation, and natural resource management.

One significant secondary source used in this study was "Biltmore Doings," a newsletter associated with the Biltmore Estate and the Biltmore Forest School. The newsletter served as a means of communication within the Biltmore Estate and the Biltmore Forest School community. It provided updates, news, and information relevant to the activities and events taking place on the estate, as well as the educational and research endeavors of the Biltmore Forest School. These newsletters would have covered many topics, including forestry practices, student activities, estate management, and more. They likely kept staff, students, and other interested parties informed about the latest developments and achievements in forestry, conservation, and the Biltmore Estate. These newsletters are housed within the Special Collections Research Center at North

Carolina State University. All of the above sources underwent internal and external criticism.

Findings

The Establishment of the Biltmore Estate and Forest. Malaria brought Maria Vanderbilt and her son George Washington Vanderbilt II to Asheville, North Carolina, in the winter of 1888. Mrs. Vanderbilt had suffered from the disease for some time. She came to Asheville to recuperate as the Southern Appalachians' altitude and climate were esteemed by the affluent members of Eastern society as exceptionally healthy and restorative (Covington et al., 2006). George Vanderbilt was the grandson of Cornelius Vanderbilt, the multimillionaire owner of steamships and railroads in the Gilded Age of the late nineteenth century. Vanderbilt was a millionaire at birth through the generosity of his deceased grandfather, and by his twenty-sixth birthday, inheritances had increased his wealth to more than eleven million dollars.

During his first winter stay in Asheville, North Carolina, George Vanderbilt explored the mountains and valleys South of Asheville. He developed an appreciation for the natural beauty of these southern highlands, eventually deciding against his family's objections to building a summer home in the area. The weather in Asheville is temperate and pleasant almost year-round (National Oceanic and Atmospheric Administration, 2018), making this an excellent location for Vanderbilt's summer home. Vanderbilt eventually purchased 125,000 acres of forestland along the French Broad River south of Asheville, North Carolina, and renamed it "Pisgah" after the biblical Hebrew word for the mountaintop.

Vanderbilt carved out a section of this newly purchased Pisgah Forest to establish the residence, formal gardens, and farms for his new estate – Biltmore (Chase, 2007). By the time Vanderbilt opened the doors to the Biltmore Estate in 1895, more than six years of construction had passed, and many more were to come before builders finished the house (Biltmore Corporation, 2018). Although the house and gardens consumed several hundred acres, forests still covered most of the estate in 1893. Nature study was one of Vanderbilt's hobbies, but he had not observed forestry at work in any of the European countries he had visited. However, he may have read about the subject in some gardening journals (Schenck, 1974). It was clear that he would need expert assistance to develop Biltmore's gardens and forests.

To construct these gardens, Vanderbilt engaged the services of Frederick Law Olmsted. Olmsted's charge was to create a horticultural park at Biltmore to rival New York's Central Park, with formal gardens, forests, and trails. Olmsted founded landscape architecture in the United States and was the nation's foremost park builder in the late 1800s. New York's Central Park, the Columbia Exposition at the Chicago World's Fair, and the Arnold Arboretum in Boston, Massachusetts, were projects completed by the master landscape architect. Olmsted advocated for protective forest management when forestry was not of interest to the American people. After a survey of the forests surrounding Biltmore, Olmsted declared them a disaster. The previous landowners, Appalachian mountain families, had resorted to cutting all of the best timber species,

leaving behind inferior species in the wake. Cattle were often grazed on deforested slopes, causing erosion and destroying the soil structure while trampling down and eating foliage (Pinkett, 1970). Vanderbilt had initially planned to have the whole estate as a park, but Olmsted convinced him to manage most of the property as forests (Alexander, 2005). He believed that carefully managed forests attracted people and made areas more favorable for settlement, and he understood the impact that forests had on the quality of the water supply. However, Olmsted was too busy developing the formal gardens and landscape around Biltmore and his other projects. The estate needed a professional forester. Olmsted was looking for someone who carried the same attitude of social responsibility as he did to manage Biltmore using the concepts of scientific forestry. In 1891, Olmsted recommended that Vanderbilt hire a promising young forester, Gifford Pinchot.

Gifford Pinchot. Gifford Pinchot was born in 1865 in Simsbury, Connecticut, to a wealthy family of merchants and landowners (Forest History Society, 2023b). Pinchot learned the value of forestry from his father, who earned his fortune speculating in land and timber interests. James Pinchot dabbled in forestry as a hobby, but his son Gifford saw it as a promising career (Balogh, 2002). Because he was independently wealthy, he could pursue the potentially risky career of forestry (Meyer, 1997). While his brother Amos managed the family business, Gifford went to Yale University for practical meteorology, botany, geology, and astronomy courses. However, Yale or any other American school or university did not offer forestry courses in the 1880s (Pinkett, 1970).

In 1884, Pinchot met Sir Deitrich Brandis, former inspector general for the British government's forests in India. Pinchot entered the French National Forest School at Nancy at Brandis' recommendation. He studied silviculture, forest economics, and forest law. The forests surrounding Nancy were managed like a field crop and protected from wildfire and harmful harvesting practices. Pinchot also had the opportunity to study under Brandis, a highly experienced forester who knew the value of scientific forestry, for six months (Balogh, 2002). Pinchot realized that conservation was the key to forest management and economic progress. For forest conservation to work, forest management must first protect and preserve natural resources. Second, forest resources should be used for the common good of all citizens, and Third, private industry must be prevented from monopolizing natural resources (Meyer, 1997). At any rate, Pinchot cut short his education at the national forest school in Nancy and returned home in 1890 to promote scientific forestry in the United States.

Pinchot found the state of American forests in deplorable condition. The general sense was that timber harvest should be done as quickly as possible to make the quickest possible profit. There was no emphasis on utilizing sound forestry management principles.

Pinchot spent a significant amount of time getting the issue into the newspapers and bringing attention to the problem in public discourse. However, he could not affect any significant change because the individuals harvesting timber were motivated by the quick profit. In *Breaking New Ground*, Pinchot wrote,

When I came home not a single acre of government, state, or private timberland was under systematic forest management anywhere on the most richly timbered of all continents....When the Gay Nineties began, the common word for our forests was "inexhaustible." To waste timber was a virtue and not a crime. There would always be plenty of timber....The lumbermen...regarded forest devastation as normal and second growth as a delusion of fools....And as for sustained yield, no such idea had ever entered their heads. The few friends the forest had were spoken of, when they were spoken of at all, as impractical theorists, fanatics, or "denudatics," more or less touched in the head. What talk there was about forest protection was no more to the average American than the buzzing of a mosquito, and just about as irritating. (Pinchot et al., 1998, p. 27)

If scientific forestry were going to take hold in America, he would have to take scientific forestry straight into the lumber industry. It was apparent to Pinchot that forestry advocates in the United States were wasting their time explaining the need for scientific forestry. The new forest management methods would have to prove effective to be adopted. In *Breaking New Ground*, he wrote, "They tried to stop the advance of one of the greatest, most necessary, and most thriving and driving of Industries simply by explaining to each other how wrong and ruthless it was" (Pinchot et al. 1998, p. 28).

In 1895, Bernhard Fernow, in the Forestry Division of the federal government, invited Pinchot to become his assistant. However, he strongly disagreed with Fernow's methods regarding the development of forestry education. Fernow approached forestry from an academic standpoint but believed that the economic forces behind the current state of affairs prevented scientific forestry from taking hold. This led Fernow to believe that the United States was not ready for scientific forestry. Pinchot thought otherwise. During his travels around the country in the 1890s, Pinchot stopped by George Vanderbilt's Biltmore Estate near Asheville and found that the location was suitable for testing forest management principles of a large enough scale to attract the interest and attention of the timber industry (Pinchot et al., 1998).

"Deplorable in the Extreme." Pinchot described the forests surrounding the Biltmore Estate as "deplorable in the extreme" (Pinchot, 1893, p. 14). The forest had suffered from a lack of management for years. Loggers harvested the best trees for lumber and firewood with no attempt to reseed harvested areas, and cattle grazed on the cutover areas and destroyed younger trees and seedlings. Wildfires removed the organic matter from the soil, presenting a significant problem. Frequent burnings by farmers cleared land for pasture, but the fires also destroyed the seedlings of valuable tree species and removed shrub vegetation that protected the mountain slopes from erosion (Price, 1900). The older harvestable trees could not be removed for fear of causing severe soil erosion. Furthermore, trees could not be removed if the expense of cutting exceeded the value one could derive from the lumber. These older trees were injuring the growth of the younger trees through competition for water, sunlight, and nutrients.

Vanderbilt's original land purchase for the Biltmore Estate totaled 3891 acres surrounding the main house and farms. Most of the forest was deciduous, with many trees

in the early growth stage. Observers noted that the forest gave a distinctive appearance due to haphazard timber cutting. Much of the timber stood on abandoned small farm plots in succession to a forest. White oak (*Quercus alba*) was the most abundant species, followed by red oak species of inferior quality. The old farm fields were chiefly Black Locust (*Robinia pseudoacacia*) and sassafras (*Sassafras albidum*) species. These species made good fence posts and grew prolifically in Pisgah Forest, but both lacked value as a source of structural lumber (Duncan & Duncan, 1988). Vanderbilt must have been pleased to learn from Pinchot that Pisgah Forest was situated in a region where soils, climate, and hydrology supported the growth of various tree species. This made the forest a suitable forest lab for Pinchot to experiment with tree plantings (Perkins et al., 1923)

Pinchot fell into his work passionately, calling Biltmore Forest "the first practical application of forest management in the United States" (Pinchot, 1893, p. 5). Pinchot traveled by horseback through the highlands, cataloging 72 tree species on the estate and assessing the condition of the forests (Pinchot, 1893). In the Appalachian Southern highlands, farmers scratched out a living on small farm plots and grazing livestock wherever the best forage existed. The forest provided food, shelter, and warmth for these people in the highlands. Their lack of understanding of forest management and consistent government policy for forest use meant that forests were in significant danger.

Pinchot combined the roles of forester and lumberman to develop a practical approach to forest management. He began a series of improvement cuttings and newly graded roads designed to curb soil erosion. His greatest challenge was getting the mountaineers on his work crews to follow his scientific forestry practices. Selective cuttings of low-grade species yielded cordwood and firewood while protecting the more valuable species. He constructed a sawmill to make construction-grade lumber. The cordwood and lumber initially coming out of Biltmore's forests were of inferior quality and did not compete well with other logging operations in the area. Pinchot sold most of the first year's production back to the estate to feed the furnaces of the brick kilns, the railroad, and the farm departments. By December 1893, the forestry department had yielded a net loss of \$172.59 for Vanderbilt. Table 1 describes the expenses and income of operating the Biltmore Forestry Department for 1892-93 (Pinchot, 1893).

Table 1*Biltmore Forestry Department Income and Expenses, 1892-93*

Item	Amount	
<u>Income from lumber sales</u>	\$	9,519.36
<u>Expenses</u>		
Forester salaries and crew	\$	4,677.29
Horse and mule labor	\$	1,786.28
Sawmill operations	\$	3,063.93
Office operations	\$	164.45
<u>Subtotal expense</u>	\$	9,691.95
Net Profit/Return to Management	\$	-172.59

Regardless of this financial setback and the difficulties of managing long-neglected woodlands, the improvement cuttings undertaken by Pinchot in that first year significantly improved the timber stand and accelerated favorable tree growth. Pinchot's scientific forestry improved the overall health of the forest. Because of the innovative work at Biltmore Forest, men interested in studying forestry were applying to Pinchot for work. Biltmore had acquired a reputation as the center of forestry in America. Foresters and forestry students came to Biltmore to learn practical and scientific forestry. So many potential students applied that Pinchot had to use form letters to answer inquiries.

Unfortunately for Pinchot, Vanderbilt's preoccupation with business matters had reduced his interest in scientific forestry. On February 22, 1895, Pinchot wrote to his old mentor Brandis,

The scientific value of this place does not seem to appeal to Mr. Vanderbilt as much as it did, nor as far as I see does he realize at all the ways in which a useful result in this direction is to be obtained. (Pinchot, 1895)

Pinchot left Biltmore in 1895 to work in the United States Department of Agriculture Division of Forestry. Before leaving, he sought Brandis again for advice on his replacement so that the work at Biltmore would continue. Brandis had just the person in mind, a young German protégé named Carl Alwin Schenck.

Carl Alwin Schenck. Carl Alwin Schenck was born in 1868 in Darmstadt Germany. Schenck graduated from the Institute of Technology in Darmstadt, Germany, at age 18, went on to study law, and earned a Doctor of Philosophy in 1895 from the University of Giessen in Hesse, Germany ("Inventory of the Forestry Lectures of Carl Alwin Schenck, 1904 - 1909," 2023). Like Pinchot, Carl Alwin Schenck learned the value of practical forestry from Dietrich Brandis (Schenck, 1974). Brandis was a strong

force in the life of the young Prussian student. He helped Schenck form most of his thinking and attitudes about forestry. Brandis believed that the "best college should be a college on wheels (Schenck, 1974, p. 10)." Brandis was instrumental in bringing forestry to Great Britain, installing it in the Indian colonies, and training virtually every forester of note along with his colleague Sir William Schlich, director of the English-Indian visitor program in Germany. When Brandis retired in 1891, Schenck became Schlich's secretary and was working in that role in 1894 when he received a letter from George Vanderbilt asking him to come to America to run the Biltmore Forest.

Your letter dated New York January 24, 1895 reached me here, occupied in studying the forestry of Southern France. Sir D. Brandis who very often told me about your interesting business at Biltmore, has not yet given me his impression of the situation as you call it. You will easily understand that my definite resolution depends on his advice... I hope very seriously that he will advise me to accept your proposition. For the work awaiting me at Biltmore is as far as I can see a most interesting one. (Schenck, 1895)

Brandis had a favorable opinion of Pinchot and his work and recommended that Schenck take the job at Biltmore. Schenck arrived in the United States on April 8, 1895, in the employ of George Vanderbilt. At Schenck's arrival, Biltmore forest was mainly a conglomeration of farms on nutrient-depleted soils. Although Pinchot efforts to manage the forest had yielded improvements in tree stands and erosion control, more than 100 years of mismanagement had allowed the growth and production of vulnerable tree species at the expense of healthy, more merchantable tree species. Soil erosion continued to be a problem, and the loggers in the region refused to adopt Pinchot's new management program. Pinchot's program for forest renovation had begun to turn the tide of mismanagement of the forest resources at Biltmore, but there was much more work to do (Schenck, 1974). Schenck began reforestation efforts, road building in Biltmore Forest, and a series of logging and sawmill operations.

The Biltmore Forest School. In that first year at Biltmore, Schenck began lecturing forestry apprentices on rainy days when they could not work in the forests. The forest division office served as a makeshift classroom. Schenck saw this as a way to improve the quality of forestry by encouraging the adoption of better practices. In his memoir, Schenck referred to forestry as "common sense applied to woodlands" (Schenck, 1974, p. 27). Sharing his common sense with apprentices was more than an opportunity; it was an obligation in Schenck's eyes. He used apprentices to cruise timber. They often peppered Schenck with questions about timber growth, harvest, and marketing in their work. After two years of lecturing apprentices, Schenck was ready to begin his school at Biltmore in 1898.

The school followed a plan involving lectures in the morning and fieldwork in the afternoon. Schenck followed Brandis' policy of providing instruction in the environment best suited for it, so the school often convened on horseback or the forest floor. Schenck paid Vanderbilt one-half of the profits from the school, in keeping with his policy of giving Vanderbilt one-half of all consulting and agent fees he earned per his contr

Figure 1

Photograph of Biltmore Forest School students on horseback in front of the school classroom building in Biltmore Forest. The photograph was provided courtesy of the Forest History Society, Durham, North Carolina (Forest History Society, 2023a).



Schenck found that experience was the best teacher and encouraged all his students to spend as much time as possible in the woods or the lumberyards. They should do this before entering federal service, where opportunities for this experience might not exist. "Forestry is a factory of trees based on an investment in trees, roads, logging facilities, teams, wagons, houses for employees, sawmills, lumberyards, and so on... (Schenck, 1974, p. 68).

Students had to learn all aspects of the industry during the one-year course of study and six-month internship (Alexander, 2005). Lectures were plentiful on all subjects related to forestry, but there were no lessons on physics, mechanics, chemistry, zoology, or mineralogy, nor did students get lessons in sociology or law. Thus, the Biltmore Forest School was more for students who already had this coursework completed at other universities. Schenck believed that the school offered a specific and high-quality

education in forestry. He did not attempt to compete with other schools offering a broader curriculum, primarily because he believed such broad schooling was unnecessary. In a letter to Gifford Pinchot, he wrote, "How gladly I would exchange all of my knowledge of entomology, pathology, chemistry, and mineralogy for the knowledge which my mill foreman or logging foreman possess" (Schenck, 1903a, p. 1).

Lecturers at the Biltmore Forest School. Schenck brought a host of notable speakers to the Biltmore Forest School. F.W. Newell, head of the United States Reclamation Service, spoke on irrigation practices; Collier Cobb, of the University of North Carolina, lectured on geology; St. George Sioussat, of the University of the South, spoke on economic issues (Lauderburn, 1907). Edgar D. Broadhurst, an attorney from Greensboro, North Carolina, lectured the students on the foundations of law related to land management. By 1908, Schenck had acquired three assistants to help with instructional duties – T.J. McDonald, R.G. Burton, and J.C. Richardson. Dr. H.D. House came down to Asheville from Columbia University to teach the rudiments of Botany. Professor George L. Clothier of the Mississippi State Agricultural College lectured on prairie plantings. Harry C. Oberholser of the United States Geological Survey spoke on Zoology, while Malcolm Ross of Guelph Agricultural College instructed students on farming and animal husbandry. F.D. Couden of the United States Bureau of Entomology lectured on forest insects, and Dr. William D. Murrell of the New York Botanical Garden discussed fungal diseases of trees. Professor Alfred Akerman of the University of Georgia, Dr. Hermann von Schrenck, a professional forest engineer from St. Louis, and S.C. Eaton lectured on forest policy, timber preservation, and lumber inspection (Biltmore Forest School, 1908).

The Working Field at Biltmore Forest School. Students at the Biltmore Forest School could expect to learn forest management principles "on the job." From November to April, Students marked trees for culling from the forest, graded the quality of firewood, estimated the costs of cutting and hauling lumber to market, made seed beds, planted seeds and seedlings, and learned to operate the sawmill machinery needed to convert logs into saleable lumber (Biltmore Forest School, 1908). In May, Schenck moved the school to the "Pink Beds," an area southwest of the Biltmore Estate known for a dense population of pink wildflowers, including mountain laurel (*Kalmia latifolia*) and rhododendron (*Rhododendron* sp.) (Blue Ridge National Heritage Area, n.d.). Students learned to estimate standing timber, conduct logging and milling operations, and practice surveying skills (Biltmore Forest School, 1908). The summer months were given to detailed instruction in lumber milling (Biltmore Forest School, 1908). In addition to their academic duties, students performed various other tasks, including road building, surveying, and bridge building. Figure 2 portrays early efforts by students to prevent erosion on steep slopes in Pisgah Forest.

Figure 2

Photograph of abatis-style structures utilized to curb erosion on long steep slopes in Pisgah Forest. Public domain image from the Biltmore Forest School (Biltmore Forest School, 1905)



Students admitted to the Biltmore Forest School were of robust health and capable of enduring hard labor. Schenck often required that students have experience in government work and lumbering as a condition of admission. Students had to be able to read and write and have a penchant for academic study. Every student's tenure at Biltmore began with a probationary period to determine mental and physical fitness for the work. Schenck granted no absences from school work or fieldwork. There was no athletic recreation because "The fieldwork gives the student sufficient outdoor exercise, so he does not need the athletics as a release from his intellectual work" (Biltmore Forest School, 1908, p. 16).

Once a student was admitted, he paid \$230.00 for tuition, fees, and textbooks. Lodging in the Asheville, North Carolina, area in the early 1900s varied, but an average cost of \$6.00 per week was the norm. In addition, students were expected to join the

school's forestry club, participate in its activities, pay for incidentals, and travel to and from the school. These costs averaged \$290 per student. Because Schenck's lectures were often delivered in the forest far from the Biltmore Forest School house, students were expected to keep a sound and sturdy horse for transportation.

Students were required to submit written reports on their subjects, and examinations were given at the end of each course. Students who completed the course of study with a cumulative 75% success rate earned a degree as a forest engineer from the school. During the entire period of its operation, the Biltmore Forest School admitted no women (Biltmore Forest School, 1908). Table 2 presents the school curriculum.

Table 2

Biltmore Forest School Curriculum, 1908-09

Subject	Scope of Lectures and Field Work	Percent of Total Curriculum
Silviculture	12 hours, 8 weeks	7%
Forest Mensuration	12 hours, 7 weeks	7%
Forest Surveying	12 hours, 2 weeks	5%
Forest Working Plans	12 hours, 3 weeks	4%
Lumbering and Technology	12 hours, 14 weeks	15%
Forest Finance	12 hours, 5 weeks	7%
Forest Protection	12 hours, 6 weeks	4%
Forest Policy	12 hours, 8 weeks	5%
Forest Work of the Federal Government	6 hours, 2 weeks	4%
Forest Planting in the Prairie States	Series of 12 lectures	1%
Physiological Anatomy of Plants	6 hours, 6 weeks	2%
General Morphology and Classification of Plants	6 hours, 16 weeks	6%
Wood Structure and Identification of Woods	6 hours, 4 weeks	5%
Classification, Distribution, and Field Identification of the Forest Trees of the United States	6 hours, 12 weeks	7%
Herbarium of Woody Plants	Independent practicum	4%
Fungus Diseases of Trees	10 lectures	1%
Preservation of Timber	10 lectures	1%
Forest Entomology	20 lectures	1%
Forest Zoology	12 lectures	1%
Propagation of Game and Fish	12 hours, 2 weeks	1%
Forest Geology	6 hours, 4 weeks	4%
Elementary Climatology	6 hours, 4 weeks	2%
Forest Geography	6 hours, 4 weeks	2%
Elementary Law	6 hours, 4 weeks	2%
Economics	12 hours, 3 weeks	2%

Note. Adapted from the Biltmore Forest School Announcement (Biltmore Forest School, 1908).

The Biltmore Forest School in Europe. In 1902, to encourage enrollment, Schenck offered a three-month trip through European forests for 350 dollars per student (Schenck, 1974). After 1909, the school traveled extensively throughout Europe, making Darmstadt, Germany, its winter headquarters. In addition to field trips and examinations, Schenck required each student to keep a diary (Jolley, 1970). One such student, Davis H. Estill, gave a sample of the type of instruction students received in this traveling school.

Wednesday, January 26 – This morning, we went to the Spessart Mts. in Bavaria. Our walk today through the snow was between 18 & 20 miles long. We went through the greatest oak forests in the world. Giant oaks of the finest quality were 450 years old. The exceedingly slow growth of these oaks produces the finest and most even growth of anywhere in the world. (Estill, 1910, as cited in Jolley, 1970, page 484)


The Biltmore Forest School graduated 400 students between 1898 and 1913. Many of these "Biltmore Immortals," as Schenck called them, became prominent foresters in government agencies and private industry (Alexander, 2005). By October 1913, more than 70% of forestry school graduates in the United States were educated at the Biltmore Forestry School (Schenck, 1959).

As the Biltmore Forest School grew, so did competition from other schools. By 1897, forestry education had been added to the curriculum in more than 20 universities. The first genuine attempt at a technical forestry course was at the Massachusetts College of Agriculture in 1887 (Fernow, 1913). Bernhard Fernow organized the forest school at Cornell University. The New York State College of Forestry at Cornell opened at approximately the same time as the Biltmore Forest School. One year later, in 1899, Gifford Pinchot helped finance and organize the School of Forestry at Yale University (Fernow, 1913; Graves, 1945). By 1903, the University of Michigan had opened a school of forestry. Figure 3 provides an example of an advertisement for the Biltmore Forest School in the journal *American Forestry*. The reader should note that the advertisement indicates significant competition from other forestry schools.

Figure 3

Advertisement for Biltmore Forest School and other forestry schools, *American Forestry Magazine*, February 1910. Public domain image (*American Forests*, 1910).

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In addition to the competitive pressure brought about by other forestry schools, the critics of the Biltmore Forest School also began to apply pressure. One critic, in particular, was Gifford Pinchot. Pinchot was establishing himself as head of the forestry division in the United States Department of Agriculture, and he was deeply concerned about the future of American Forests. Pinchot knew that the forest owner could earn more returns in the short term through ordinary lumbering. However, he also knew that applying scientific forestry provided a higher quality sustainable yield over time. The private forest owner is most interested in a financial return to land, labor, capital, and

management. The whole process of scientific forestry depends upon the strength of these financial returns. Overton W. Price, a Schenck protégé and Pinchot's deputy in the US Forest Service, keenly understood both men's positions on forestry. To Price, the growth and development of forestry education depended upon landowners' adoption of scientific forestry methods, as Pinchot proposed. To do this, they must be convinced that the methods are practical, simple, and thoroughly carried out, as proposed by Schenck (Price, 1902).

In the summer of 1903, Schenck had written to the editor of *Forestry and Irrigation*, H.M. Suter. He proposed that the Biltmore Forest School offer the Bachelor of Forestry and the Bachelor of Forest Engineer degrees to those who passed the examination requirements at the end of their year of study. Suter passed this information on to Pinchot, who disagreed strongly with the notion of the Biltmore Forest School as a degree-granting school. Pinchot tried establishing forestry education at Yale University, and the Biltmore Forest School seriously threatened its success. To Pinchot, the best use of the field laboratory at Biltmore was not as a degree-granting school. On July 20, 1903, Pinchot sent Schenck a copy of a letter he had sent George Vanderbilt encouraging him to stop the Biltmore Forest School from granting degrees.

It is not for me a question of whether Biltmore Forest has been or can be useful to forestry in the United States, for I entertain no doubt of its great value, but rather a question of how it can contribute most to that general progress in which we are all interested. I am satisfied that its line of greatest usefulness does not lie in the school but in utilizing the opportunity for field study, which it affords to them who already have some idea of forestry and are anxious to put themselves more completely in touch with certain phases of its practice on the ground (Pinchot, 1903b).

Pinchot's letter to Vanderbilt explained his opposition to the Biltmore Forest School in plain terms. The school's master, Schenck, had not collaborated enough with others in forest work, and thus, the school could not pretend to offer a relevant curriculum. Schenck was isolated from the forestry movement while at the Biltmore Forest School and was not sympathetic to the work of the United States Forest Service now in progress. Pinchot further explained that the Biltmore Forest School was a practical training ground for foresters and not sufficiently rigorous enough to serve as a prep school. As such, the school could not compete successfully with the professional schools now in colleges and universities. Pinchot ended his letter by asking that the Biltmore Forest School be discontinued and that the forest be preserved as a working forest laboratory (Pinchot, 1903a).

Schenck wrote back to Pinchot in Washington while in the field at Davidson's River, NC. In his response, Schenck explained to Pinchot that degrees at the Biltmore Forest School would be awarded sparingly and only to those who had completed examinations. Schenck reminded Pinchot that several students were in Pinchot's employ at the United States Forest Service, and their education came from a highly qualified and superior forester. Certainly, Schenck explained, he was a much better professor than the Harvard or Yale Forestry School faculty. Besides, Schenck explained, George Vanderbilt himself does not hold a college degree, so what is the problem with the Biltmore Forest

School awarding a few degrees on its own? Schenck's letter to Pinchot on July 31, 1903, explains Schenck's view on the matter:

As regards employment in government service, I fully see the advisability of employing only college graduates. The Biltmore Forest School does not intend to prepare young men for government service. It intends to prepare them for practical technical tasks, especially the management of forests owned by private individuals... I am trying and have tried hard to invite, especially the sons of wood-owning lumbermen to come to Biltmore because, here, I think, the means and ends of real forestry are practiced... (Schenck, 1903a).

Schenck finishes his letter to Pinchot with an invitation to come down to Asheville and visit the school. "I shall be greatly indebted to you for any advice which in connection with my work you think fit to give *after* [emphasis by Schenck] such an inspection" (Schenck, 1903a). In the end, George Vanderbilt settled the argument about the future of the Biltmore Forest School.

Market reversals in investments caused Vanderbilt to lose a fair portion of his fortune in 1901 and 1902, and he had to cut back on Biltmore's operational expenses. Furthermore, the Biltmore Forest had to begin showing a profit from the sale of timber and timber products. Financial troubles at Biltmore also slowed the progress of the forestry program. The school had no large donors, while Yale and other schools received numerous gifts and began to grow an endowment for professorships. Vanderbilt's financial crisis had reached severe proportions, requiring reductions in Biltmore house staff (Schenck, 1974).

On Saturday, April 24, 1909, the Biltmore Forest School at Biltmore Estate ended abruptly. Trouble had been brewing for months with C.D. Beadle, the estate superintendent. On that Saturday, Beadle accused Schenck of lying to Vanderbilt about some financial matter, and Schenck struck him several times before Beadle's assistants separated the two men. Schenck was charged with assault and battery and fined one dollar (Schenck, 1974). The fight with Beadle had been published in the papers nationwide, bringing negative press on the Vanderbilts. Vanderbilt was also angry when Schenck made a contract for the use of Biltmore Forest when Schenck knew that Vanderbilt was trying to sell the forest (Schenck, 1974). Vanderbilt fired Schenck in 1909, forcing Schenck to move his school out of Biltmore Forest to the adjacent town of Sunburst, North Carolina, and into buildings provided by the Champion Lumber Corporation (Maunder, 1959).

The Biltmore Forest School continued as a distance education program for four more years. Schenck established six working fields in Germany, France, New York State, North Carolina, Michigan, and Oregon. Students moved from field to field, inspecting forest operations and completing lab exercises. Schenck was appointed assistant professor at Darmstadt Tech and began associating with that school and the Biltmore Forest School. Schenck kept the school alive in the post-Biltmore years by selling textbooks, writing bulletins, and collecting student tuition for the traveling school (Schenck, 1974). Finally, low enrollment forced Schenck to close the traveling school on January 1, 1914, with the last issue of *Biltmore Doings*, a chronicle of the Biltmore Forest School odyssey. By the time the school closed shop, 83 American colleges and

universities were teaching forestry, and 21 other technical forestry schools were in operation.

Conclusion and Discussion

It is unusual that the Biltmore Forest School ever existed. The rising tide of Progressivism and the advocacy for worker's rights and social justice in the United States demanded such schools as the one at Biltmore Estate. However, Biltmore was the Elysian Fields of the grandson of Cornelius Vanderbilt, one of America's most famous "robber barons," representing the anti-thesis of the progressive movement. That such a school could survive in this environment is a testament to the work of its founder, Carl A. Schenck, and, in large portion, to the commitment of George Vanderbilt II to the study of natural resources. From the beginning, Schenck believed that the profitable conservation of forests meant educating the public about the benefits of forest management. He felt that forest management must rest on a scientific foundation and that the future of forests depended upon creating professional schools to train future foresters in the practical value of forest management.

Notwithstanding this, much of the Biltmore experiment failed. Plantings failed, logging techniques failed, and the school itself failed. Forestry was indeed a new and untried science in America. The role of forestry education in colleges and universities was also unclear at the beginning of the twentieth century. Gifford Pinchot theorized that forestry should be taught with conservation at its foundation. Pinchot believed that forest education should teach principles of management that cause forests to be beneficial to humanity without total consumption. Schenck held the antithetical view that no forest was of value unless it could be used for lumber production. "Nothing can be conserved that isn't worth conserving" (Schenck, 1974, p. 13). Schenck believed that the Division of Forestry in the United States Department of Agriculture had too narrowly defined the practice of forestry as silviculture. Schenck's theory was that forestry was "common sense applied to woodlands" (Schenck, 1974, p. 27), and as such, forestry education must include lumbering and sawmill operations. In his last letter to Biltmore Forest School students and alums, Schenck explained that landowners could not expect to conserve forest timber unless they could generate income from them in some fashion. Virgin forests were worthless in their present state. Only by being logged could forests hope to ensure their continued presence (Schenck, 1914). He believed that the federal and state governments were overprotecting forests and causing landowners to maintain them at a financial loss (Schenck, 1955).

In retrospect, the Biltmore Forest School provided a robust vocational education experience for young men during American history when they could provide the best service to forests. However, the concept of forest education was too valuable to be reserved solely for schools like the Biltmore Forest School. The explosion of forestry education in America in the early twentieth century and the resulting competition from these other schools was the actual cause of the school's demise. The school served a useful purpose, but its curriculum only touched a part of the larger purpose of forestry education. What, then, was this larger purpose?

In 1893, the Columbian Exposition opened at the Chicago World's Fair. The Biltmore Forest exhibit was the first forestry education exhibit in the United States (Goodwin, 1969; Pinkett, 1970), and Gifford Pinchot designed it. Pinchot's exhibit detailed the efforts of scientific forestry in the Biltmore experiment: efforts directed toward the goals of production at a profit, renewable and consistent annual yield, and general forest improvement. Almost 114 years later, the United States Forest Service released a virtually identical strategic plan for fiscal years 2007 through 2012. This plan details the conservation of forests, the protection of grasslands, and the sustainability of forests for public recreational use and timber production (United States Department of Agriculture, Forest Service, 2007).

In 1914, when Schenck closed the Biltmore Forest School, George Vanderbilt died unexpectedly, leaving the estate to his widow Edith. Edith Vanderbilt eventually sold the forest to the United States Forest Service, where, through subsequent land acquisitions, it grew to 510,119 acres by 2008 (Forest History Society, 2018). In her letter to David F. Houston, United States Secretary of Agriculture, she wrote,

Mr. Vanderbilt was the first of the large forest owners in America to adopt the practice of forestry.... I keenly sympathize with his belief that the private ownership of forest land is a public trust, and I probably realize more keenly than anyone else can do, how firm was his resolve never to permit injury to the permanent value and usefulness of Pisgah Forest...I make this contribution towards the public ownership of Pisgah Forest with the earnest hope that in this way I may help to perpetuate my husband's pioneer work in forest conservation and to ensure the protection use and enjoyment of Pisgah Forest as a National Forest, by the American people for all time (Vanderbilt, 1914).

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