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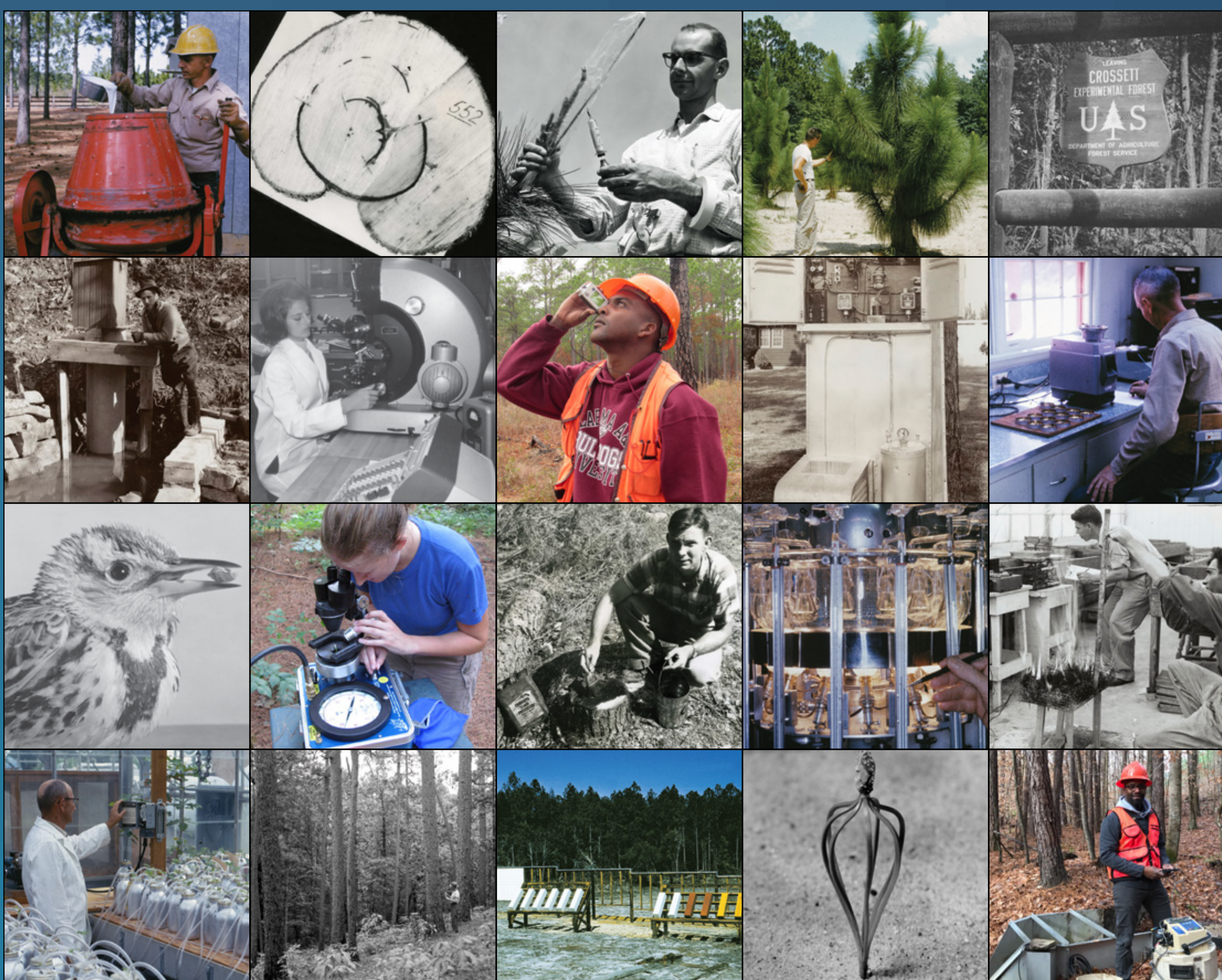
CELEBRATING 100 YEARS OF FOREST SCIENCE:
An Abridged History of the Southern Research Station

Don C. Bragg, Editor



ABSTRACT

In 2021, the Southern Research Station celebrated the 100th anniversary of its founding as the Southern and Appalachian Forest Experiment Stations. This volume includes 20 contributed articles on the history of these stations, spanning nearly the entire century. These include biographies on former and current staff members; essays on how the stations were organized, staffed, and led; early incarnations of the botany, forest survey, genetics, statistics, and publication programs; the establishment and operation of some experimental forests; and several accounts of how these stations' research supported local communities and industries. Although far from complete, these articles help illuminate the people, places, and programs that helped restore and rebuild southern forests, forestry, and associated communities into the dynamic and vibrant region experienced today.

Keywords: Administration, Appalachian Forest Experiment Station, employee roster, experimental forests, forest genetics and tree improvement, forest survey, hardwood management, pine silviculture, Southeastern Forest Experiment Station, Southern Forest Experiment Station, statistics, watershed research

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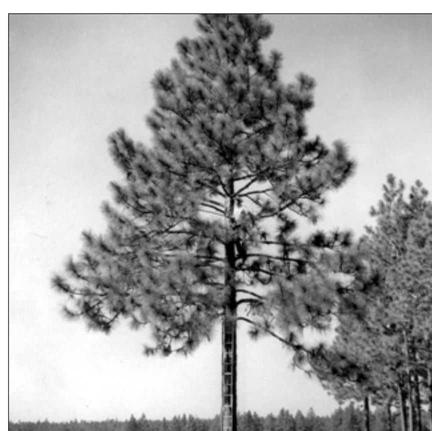

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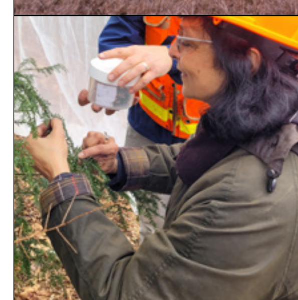


Preface—Celebrating 100 Years of Forest Science: an Abridged History of the Southern Research Station

Don C. Bragg

Don C. Bragg, Project Leader and Research Forester, U.S. Department of Agriculture, Forest Service, Southern Research Station, Monticello, AR 71655.

SETTING THE STAGE

As with all good science stories, the Southern Research Station (SRS) started with a problem. Well, a whole series of problems and many questions that needed answering! From its earliest roots as the Division and then Bureau of Forestry, U.S. Department of Agriculture's Forest Service had been beset by challenges that the fledgling profession of forestry had no answers for—at least none based on prior research. Indeed, for forestry to become the science-based discipline sought by its supporters, cultivation of that scholarship needed to begin—and begin immediately—in order to keep up with the demands of a timber-hungry society. The first head of the Bureau (and later first chief of the Forest Service), Gifford Pinchot, understood this, and his "Section of Special Investigations" started the ball rolling in 1901.

The Forest Service was joined by a few nascent forestry programs at institutions of higher education to build upon the very limited body of forestry research then available. Just 3 years after the Forest Service was created by the Transfer Act of 1905, what would soon become the Fort Valley Experiment Station opened in the mountains of New Mexico to study forestry practices in that ponderosa pine (*Pinus ponderosa*)-dominated landscape (Olberding 2008). Fort Valley was the first of a handful of small-scale research locations established in the Western United States during the coming decade, something that early agency scientists had advocated to better manage the many millions of acres in the charge of the Forest Service. And this was to just be the start—one of these advocates, Samuel Trask Dana, noted the agency's intention to study the "distinct forest problems peculiar [to the regions]", including "main station[s]" to be placed in the Appalachian hardwoods and southern pine regions (Dana 1909: 24).

"As with all good science stories, the Southern Research Station (SRS) started with a problem. Well, a whole series of problems and many questions that needed answering!

Yet this vision would take some time to mature, with a number of careful and limited first steps made to build support in Congress, state legislatures, industry, and even within the Forest Service. Although an increasingly popular discipline, forestry-related resources were scarce in the early decades of the agency, and far too few to support an ambitious program of research, regardless of how desperately it was needed. Progress was measured incrementally, with occasional advances tempered by slow overall progress. The Section of Special Investigations became part of the Office of Silvics, which continued to develop research directions and embarked on a number of larger projects. For example, the 1910 opening of the Forest Products Laboratory (FPL) in Madison, WI, culminated years of effort to research ways to improve the utilization of wood and develop new products from this renewable resource (Hall 1911).

Pinchot's successor as chief, Henry S. Graves, championed a number of advances in the agency's approach to and administration of research (Steen 1999, Williams 2000). Graves' support was vital to the early success of the FPL, some of whose early research efforts (e.g., on naval stores and chemical pulping of southern pines) would prove to be of major importance to southern forestry. Graves also changed the Office of Silvics into a "Branch of Research" with the same status as the agency's other branches, making science an important and formal component of the Forest Service. Work by the FPL and the rest of the Branch of Research during World War I further boosted the cause for agency science, and by 1920 support had grown sufficiently to take the next step needed—the development of regional forest experiment stations to support the ever-growing research needs. Chief among these was helping America address what seemed to be a looming crisis of a national "timber famine" (Clapp 1921).

"By the late 1920s, the Forest Service had adopted the multi-state experiment station model and soon stations were demarcated nationwide. In the coming years, research programs evolved—as did station boundaries—and the body of science ballooned.

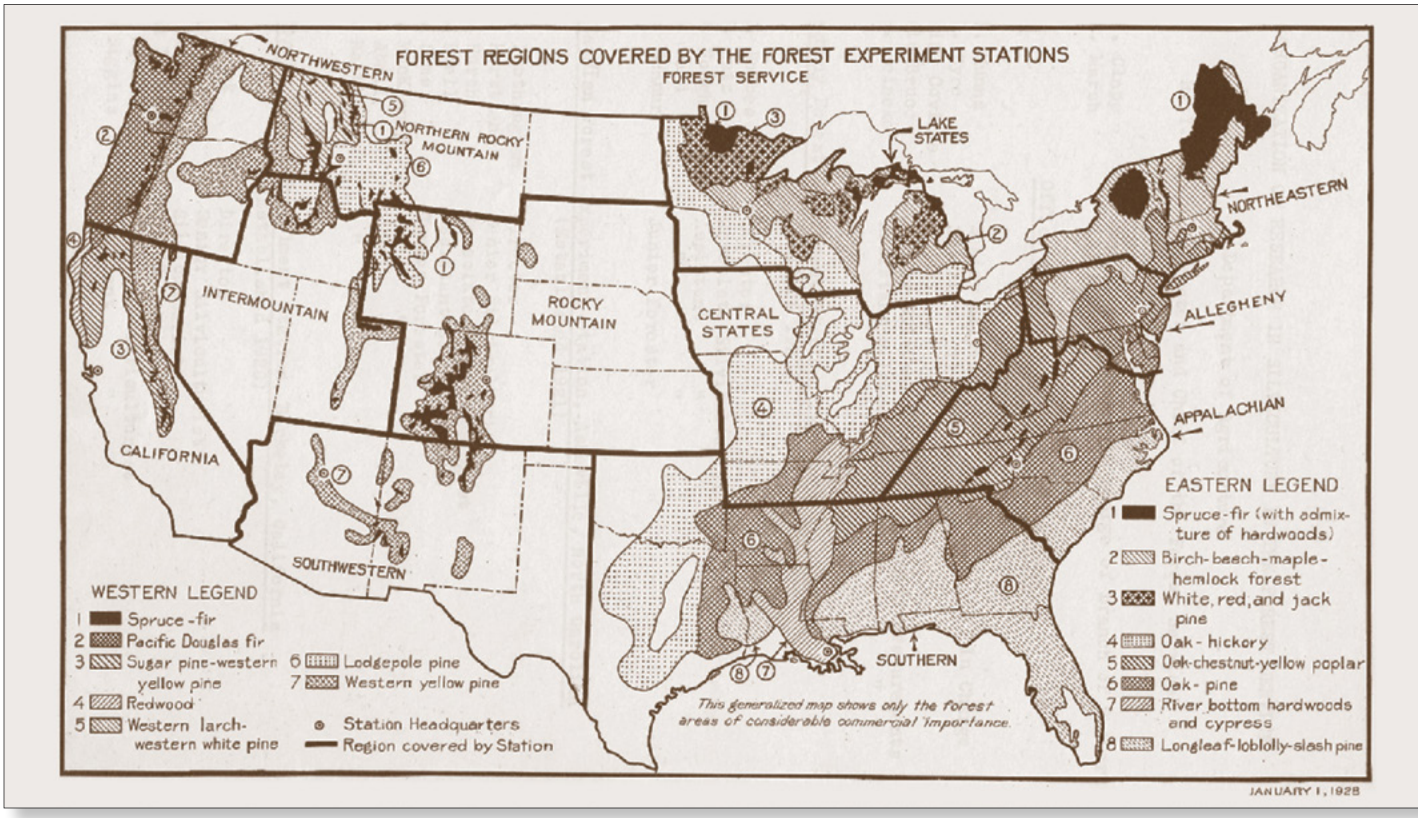
Prior to 1921, the studies that had been conducted in most parts of the country were opportunistic, poorly designed (by today's standards), and very limited in scope; they were also typically conducted by staff from distant offices with no permanent regional presence. This was particularly true for the South, which had less research support infrastructure than most of the rest of the country. As an example, the important early naval stores research work of Dr. Eloise Gerry was conducted by the Wisconsin-based FPL through occasional southern trips to the longleaf (*P. palustris*) and slash (*P. elliottii*) pine forests (Barnett 2019, Gerry 1922). Likewise, early agency researchers such as Dana, Wilbur Mattoon, W.W. Ashe, and other experts from the Washington Office traveled to Urania, LA, to install the first field tests of silvicultural treatments such as thinning young old-field southern pines (Bragg 2022).

Needless to say, the opening of the Southern and Appalachian Forest Experiment Stations (SOFES and AFES, respectively) on July 1, 1921, ushered in a new, local, more deliberative and organized approach to southern forest science.

THE BEGINNING OF 100 YEARS OF SOUTHERN FOREST SCIENCE

After some initial staffing and resource limitations for both Stations, a series of early successes in both science accomplished and attitudes changed led to steady, decades-long growth of southern forestry research. By the late 1920s, the Forest Service had adopted the multi-state experiment station model and soon stations were demarcated nationwide. In the coming years, research programs evolved—as did station boundaries—and the body of science ballooned. Events such as the Great Mississippi Flood of 1927, the Great Depression, and the start of World War II all reshaped Forest Service Research and Development (R&D) programs and priorities.

And the AFES and SOFES staffs continually proved they were up to the challenge! In addition to adding new staff, the advent of new tools (such as robust study design and statistical analysis), the development of a large-scale forest survey program, the opening of experimental forests, and the continued maturation of forestry as a discipline all spurred more and better science. By the time the AFES became the Southeastern Forest Experiment Station (SEFES) following a national



Map of forest experiment station boundaries and forest cover types in 1928.

R&D realignment on July 1, 1946, both Stations touted their quarter-century years of achievements in southern forest science (Demmon 1942, SEFES 1947).

Neither Station would rest on their laurels, however, and in the coming decades continued to build upon an impressive resume of sound research and effective knowledge transfer. As a direct consequence, the southern forest industry experienced a revitalization into the most prominent global producer of roundwood, a title it still holds to this very day. With the support of the research developed in large part by the South's forest experiment stations, southern forests once so exploited as to leave them as unrecognizable became productive stands once again, capable of sustaining both a timber-based economy as well as many other ecosystem goods and services.

The merger of the SEFES and SOFES in the mid-1990s to address administrative challenges and better leverage resources and personnel followed earlier (if smaller) restructurings to retain efficiencies and capacities. Over the decades, many hurdles were encountered, and numerous difficulties faced—an operation that spans such a big, diverse region with so many employees and interest groups inevitably experiences rough patches and even stumbles. While this adversity was rarely easy, the Station's willingness to change while still embracing and sustaining long-term programs of study paid dividends and remains fruitful today (e.g., Devall and Baldwin 1998).

AND HERE, TODAY...

As the SRS approached its 100th anniversary, the Station took a number of actions to commemorate this milestone. A centennial team was organized, Station funding provided, and efforts to generate as much on this century of

From left to right, an encapsulated history of longleaf pine forests in Louisiana (and most of the rest of the Southern United States)—from untouched old-growth to clearcut, overgrazed, and annually burned, to fully restocked condition. Photographs not of the same stand, but representative of forest trends.

history were made as could be mustered. Of course, as fate would have it, this effort occurred not only under the pressures of a fully engaged research program, but one suddenly complicated by a global pandemic!

Fortunately, the business of the Station's Southern Forest Research Centennial program was not strictly from scratch. A considerable amount of the Station's history was already available in one form or another, such as those provided on the silviculture (Reynolds 1980, Wakeley 1981), forest genetics and tree improvement (Wakeley 1975, Wakeley and Barnett 2016), wildlife research (Thill 2003), and other fields (e.g., Barnett 2016, 2019). These also include more specific accounts, such as those of the Crossett (Reynolds 1980) and Stephen F. Austin (Russell and others 2002) experimental forests, the Resistance Screening Center (Cowling and Young 2013), and recaps of multiple long-term studies (Devall and Baldwin 1998). Our work has been built upon broad shoulders! To these existing contributions, a number of authors stepped up and provided articles ranging from staff biographies, critical Station programs (from botany to statistics to publications to pine and hardwood silviculture to early forest surveys), experimental forests, forest genetics, and other elements of Station histories.

What follows in this centennial history of the SRS is indeed abridged—it would likely take dozens of writers many thousands of pages to provide a complete accounting! Of course, none of these Forest Service-based research narratives for the Southern United States are independent of the multitudes of outside collaborators, partners, and institutions that helped shape the development of the science and practice of forestry for more than a century. That level of history was never the intended goal of this program. Rather, we hoped to provide an expansion (if ever so slight) in the pool of knowledge related to the people, places, and programs that eventually manifested themselves as the Southern Research Station, with the hope that they will do some small semblance of justice to the amazing work that has happened over the past 100 years. And perhaps to inspire others to continue this documentary effort—certainly, there is plenty more to do!

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A History of the Alexandria Forestry Center Herbarium

James P. Barnett

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INTRODUCTION

The Alexandria Forestry Center (AFC) Herbarium developed as a result of early forest research influences in Louisiana. Specifically, U.S. Department of Agriculture, Forest Service research programs in the region during the early 1920s highlighted the need to identify and understand the significance of understory plants. Initially the issue was weed control in nurseries, but other needs soon developed. For example, the use of forests for cattle grazing raised issues related to the competition of cattle and wildlife for similar forage. To help understand these and other issues, scientists began identifying and documenting the plant species across the range. Over time, the collections themselves broadened, as did the people and organizations that used them. In the 1940s, the herbarium housing the collections was moved to the AFC. Here, the plant collections have continued to grow and are now serving the needs of both research and Kisatchie National Forest (KNF) botanists who have responsibility for identifying and protecting a wide range of plants on national forest lands.

"The Alexandria Forestry Center (AFC) Herbarium developed as a result of early forest research influences in Louisiana. Specifically, U.S. Department of Agriculture, Forest Service research programs in the region during the early 1920s highlighted the need to identify and understand the significance of understory plants.

BRIEF HISTORY OF REFORESTATION WORK IN LOUISIANA

In the late 1800s and early 1900s, the harvest of native pine (*Pinus* spp.) forests across the South was reaching its peak. By the time lumber industries moved westward into Louisiana, railroad logging had become very efficient, with little standing timber remaining as a seed source for regenerating new forests. Henry Hardtner, president of Urania Lumber Company, saw the need for reforestation of cutover land, and in 1913 dedicated 25,719 acres of cutover land for a reforestation reserve. Reforestation specialists from the Forest Service's Washington Office visited the reserve and proposed areas of experimentation.

When the Forest Service established the Southern Forest Experiment Station (SOFES) headquartered in New Orleans in 1921, reforestation technology was recognized as a critical research need. Philip C. Wakeley was hired in 1924 and given the responsibility for conducting reforestation research. Although research was established with help from Urania Lumber Company and the Great Southern Lumber Company in Bogalusa, LA, the death of Hardtner resulted in the focus of this research turning to Great Southern. As a result, preliminary pine seed, seedling, and planting technology developed from cooperative efforts with Great Southern.

In 1929, the KNF was established mostly from purchased cutover forest land. The onset of the Great Depression in the early 1930s created many problems, but also

Top: Some of the first pine seedling crops grown at the Stuart Nursery in the 1930s. These efforts resulted in over 8.8 million pine seedlings used to help reforest the region.

Inset: Civilian Conservation Corps (CCC) employees in 1935 weeding the Stuart Nursery beds by hand, a laborious effort.

a few opportunities. One such opportunity was the creation of the Stuart Nursery near Pollock in 1933 by the Forest Service. Labor, except for construction, was entirely by Civilian Conservation Corps (CCC) employees. In 1935, the Kisatchie permanent nursery staff consisted of a nurseryman (A.D. Read), assistant nurseryman (J.T. May), and a seed-extracting foreman (H.H. Muntz). SOFES research staff consisted of M.A. Huberman and A.D. McKellar, who were under the supervision of Wakeley. The SOFES's reforestation research efforts were transferred to the Stuart Nursery in collaboration with the KNF, and the nursery's production in 1934 numbered 8,887,000 pine seedlings.

Availability of CCC labor allowed extensive research trials at the Nursery and outplantings on the Palustris Experimental Forest. About 750,000 seedlings were planted in several hundred research studies. This early reforestation research program resulted in Wakeley's (1954) publication, *Planting the Southern Pines*; an earlier version of this document (Wakeley 1935) served as the guide for the CCC efforts to successfully reforest southern pines (Barnett 2013).

EARLY PLANT SPECIMEN COLLECTIONS

A major problem in the management of the new nursery—and related outplantings—was herbaceous growth and control. Even though the CCC labor was plentiful, removing weeds was very laborious and time consuming. The identification of the weeds became an early research initiative, and there was hope that with more knowledge of the plants, approaches could be developed that would reduce the magnitude of the problem.

Almost immediately after the SOFES opened, a herbarium was established in their New Orleans office, with collections made and accepted from across the South (and even other parts of the country). In 1934, McKellar began an effort to collect, identify, and photograph the common herbaceous plants of the Nursery and surrounding area, with hundreds of plants identified and photographed. During 1935, McKellar began to mount specimens and document the pertinent collection information on herbarium cards. By his own account, he was assisted in plant identification by "…Dr. L.J. Pessin, Miss Anna Haas, and Dr. C.A. Brown" (McKellar 1936).

During World War II, few personnel were available to maintain the Nursery and plant collection. However, in 1947, the SOFES established a research center at Alexandria. Range research was a major component of the program, and plant collections were reinstituted. The scope and mission of the herbarium changed to support the range research effort. In 1947, the staff, guided by Robert S. Campbell, began to collect and study plants on longleaf-bluestem (*P. palustris-Andropogon* spp.) ranges (Cassady and Mann 1954). Several eminent botanists, from institutions like the Smithsonian, U.S. Bureau of Plant Industry, and New York's American Museum of Natural History, contributed their services to identify plants from various families. About 80 of the most valuable forage grasses, grass-like plants, forbs, and shrubs were described and illustrated in the *Field Book of Forage Plants on Longleaf Pine-Bluestem Ranges* (Langdon and others 1952). This field book described the plants so that they could be readily identified, discussed their food value for cattle and game, and listed their special habits, values, and properties.

Research Center Leader, John Cassady, led this early range and plant identification work, assisted by a number of scientists that had some training in botany. For example, Walt Hopkins made many collections and photographed many plants for the unit's files and publications, and others (such as Gordon Langdon, Herb Muntz, and Miriam Bornhard) were involved in collections and plant identification. Even though early storage conditions were primitive by today's standards and fire destroyed some material in 1959 (when the entire building burned), their work has endured, and some of these early specimens are still maintained in the AFC Herbarium.

DEVELOPMENT OF THE AFC HERBARIUM

In the early 1960s, the SOFES established an independent range research work unit in Alexandria. Dr. Vinse Duvall led this program for many years. The assignment of botanist Harold Grelen to the unit resulted in the further development and expansion of the herbarium. Grelen not only led the development of the herbarium, but he began to train others, both scientists and technicians, on proper techniques for specimen collection, preparation, and storage. Alton Martin, a range technician, was trained over many years in plant identification, and he developed an exceptional ability to identify plants of the West Gulf region. Even after retirement, Martin continued to assist and train botanists new to the plants of the region. All of these men contributed to a later expansion of the earlier field book (Langdon and others 1952), which included exceptional drawings of the common plants of the region (Grelen and Duvall 1966).

Top: Star grass (*Hynoxis hirsata*) collected, mounted, and documented with herbarium card at the Stuart Nursery by A.D. McKellar in 1935.

Bottom: Center Leader John Cassady and scientists Herb Muntz, R.S. Campbell, and P.R. Wheeler in 1947. These scientists led the early range and plant identification work at AFC Herbarium.

Top: Botanist **Harold Grelen** played an integral role in the development of the herbarium, training scientists and technicians on proper techniques for specimen collection, preparation, and storage.

Bottom: **Alton Martin** recording types of vegetation preferred by white-tailed deer. This deer was one of several tamed for these evaluations.

The emphasis of Grelen and Duvall's book was plants that were important as forage for cattle and wildlife. Studies were conducted (e.g., Thill 1983) on the value of various plant communities in maintaining nutritious diets for range cattle and white-tailed deer (*Odocoileus virginianus*), so no effort was made to make a general collection of all plant species. The range research program within the SOFES was terminated in 1990, while responsibility for the herbarium was assigned to the forest management research work unit. Although the emphasis on plants more specific for forage needs continued, there was a shift in collections to include a wider range of understory plants in forests.

EXPANSION OF THE HERBARIUM AS A RESOURCE FOR THE KNF

As the use of the herbarium for research needs declined, botanical programs in the KNF began to increase. Botanists began to use the herbarium to meet some of their needs and plant collections began that had a much wider scope and emphasis. The KNF had increasing responsibility for identifying and protecting a wide range of plants on national forest lands, many of which were listed as sensitive by the regional forester, with some being candidates for Federal listing as threatened or endangered. In 1994, a letter of agreement between the SOFES and KNF was signed. The document established a formal sharing of responsibility for the herbarium. In the last few years, KNF botanists have taken leadership in maintaining the herbarium and adding new plant selections. The herbarium continues to grow and is now serving this expanding mission.

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Unlikely Pioneers in the Southern Forest Experiment Station: Tomatsu “Tommy” Kohara and Jasper Burnes

Don C. Bragg

Don C. Bragg, Project Leader and Research Forester, U.S. Department of Agriculture, Forest Service, Southern Research Station, Monticello, AR 71655.

Tommy Kohara might have been the first Asian-American to graduate from the LSU forestry program and may have been one of the first ones in not just the Southern United States, but possibly the entire Nation!

While the scientists and administrators of the South’s forest experiment stations receive the lion’s share of attention for their contributions to American forestry, they are not the only pioneers in the research and development of natural resource science. The Southern Forest Experiment Station (SOFES) employed many hundreds of persons during its 75 years of existence. A far from complete roster (Bragg and McDaniel 2023) represents the best current approximation of the professional-level staffing of the Station. Even though this roster is woefully deficient in terms of technical and support staff, it was possible to use this document and other sources to identify two individuals that represent early pioneers in the SOFES.

TOMATSU “TOMMY” KOHARA: THE FIRST ASIAN-AMERICAN SOFES EMPLOYEE?

Tomatsu “Tommy” Kohara (often given as “T.T. Kohara” on his photo credits) was born on July 27, 1916, in Omaha, NE, the second of five children born to Manabu and Saki (Tokio) Kohara. As a youth, Manabu Kohara had converted to Christianity and emigrated to the United States from his hometown of Kitsuki in southern Japan, arriving just before Christmas of 1903 to begin divinity school in Berkeley, CA (Kohara 2004). Nine years later, Saki Tokio arrived in California and eventually eloped with the elder Kohara. The Koharas soon moved across the United States with their growing family. By 1928, the family had settled in central Louisiana to work as truck farmers. Within 2 years, Manabu had left farming to open a photographic studio in downtown Alexandria (Simms and Johnson 2019).

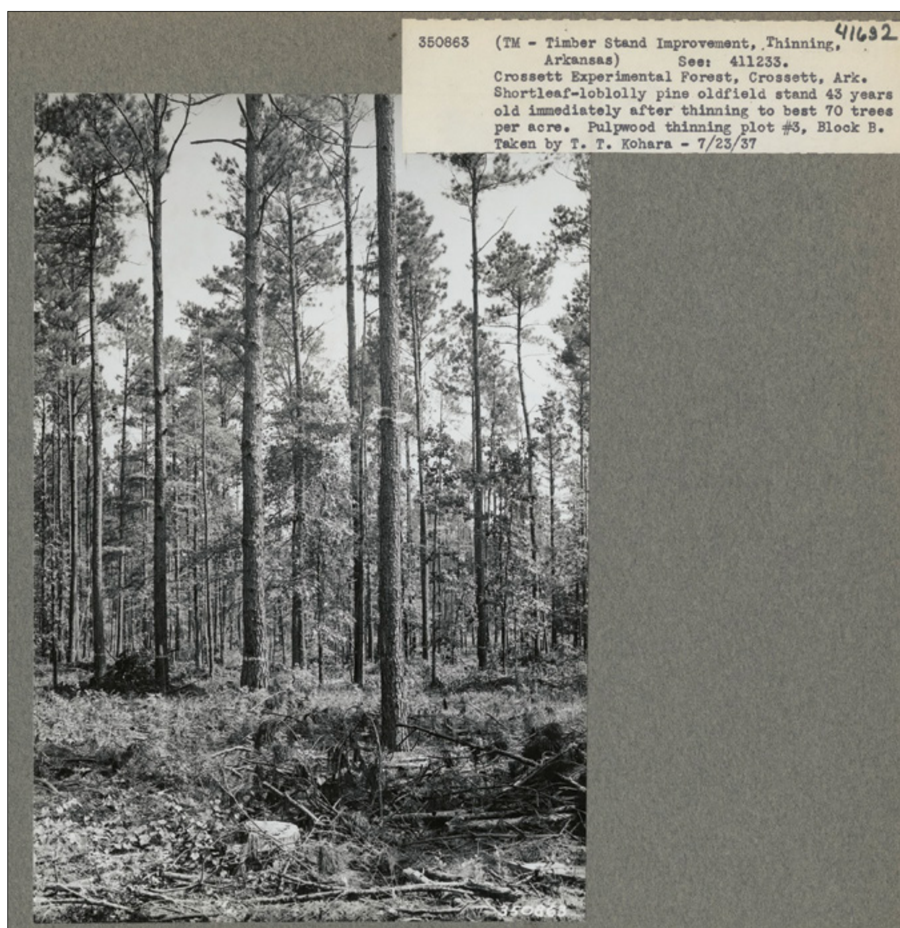
From various accounts, the entire Kohara family were “expert” photographers, so when Manabu died unexpectedly in late 1941, Saki took over the studio business and her children soon joined in the effort. But photography had not been the original career choice for either Kohara or his older brother Susumu (“Sammy”) Kohara; both eventually enrolled at Louisiana State University (LSU) as forestry students (interestingly, Tommy started 2 years earlier than the older Sammy). A review of past LSU forestry graduates in the program’s 1938 yearbook (*The Annual Ring*) showed no prior surnames of obvious Asian origin, suggesting that Tommy Kohara might have been the first Asian-American to graduate from the LSU forestry program and may have been one of the first ones in not just the Southern United States, but possibly the entire Nation!

It is unclear how minorities such as the Kohara brothers were treated as LSU forestry students; Louisiana was typical among States in the Jim Crow South of this period. *The Annual Ring* included a number of racial epitaphs. The banter that included mentions of Kohara was similar to that for his other white classmates: good-natured in its humor and content, if somewhat obscure in its references. One such quote includes a mention of Kohara needing a "long stay in some rest Sanatorium" after completing the forest engineering class in the 1938 summer camp and something about having to "grin and bear…[a] JKK party like Tomatsu had to do…" (Zachariah 1939: 32).[1]

Whatever these statements reference, it did not seem to stop Kohara from being an active participant in LSU's student life. He shared his family's skills in photography, and served as the photographic editor of *The Annual Ring* in the yearbook's inaugural 1938 issue, and then again the following year. Kohara was also in the LSU student chapter of the Society of American Foresters and a member of Alpha Zeta, a professional fraternity for students and professionals in the agricultural and natural resource professions.

The 1939 *Annual Ring* noted Kohara's work as a student assistant with the U.S. Department of Agriculture Forest Service. Regrettably, there is little in terms

[1] JKK was undefined in the text—perhaps it was an inside joke or referred to something else now lost to history.



An example of one of the many pictures taken by Tommy Kohara during his first brief stint (summer of 1937) with the SOFES. This image from the Crossett Experimental Forest shows the clarity, composure, depth of field, and contrast common in Kohara's work. (USDA Forest Service photo [negative #350863] taken on July 23, 1937)

of Forest Service documentation for what Kohara did during these years—or even when he started with the agency. This first stint with the agency may well have been the summer of 1937, after his second year at LSU. Kohara received photo credits for images he took for the Forest Service by at least July of 1937, perhaps as an unpaid student intern with the SOFES. Unfortunately, the Station's published annual reports provided only partial rosters during this period, and prior to 1939, these annual reports did not provide student worker names or many Station employees not in a professional series (Bragg and McDaniel 2023).[2] However, a different source confirms what the photo captions recorded. Russell R. Reynolds, the Crossett Experimental Forest's leader and a long-time SOFES scientist, recorded a daily work log between 1934 and 1951, and he documented spending most of the week between July 21 and July 28, 1937, with "Assistant Kohara" taking pictures of the experimental forest and the nearby lands and operations of the Crossett Lumber Company.

Another example of Kohara's early SOFES photographic work comes from the Station's studies on the lands of the Urania Lumber Company in central Louisiana. This picture, taken on August 16, 1937, shows a man in a loblolly pine (*Pinus taeda*) stand (likely SOFES researcher C.A. Bickford, as it is almost certain that Kohara was the photographer). Phil Wakeley noted in his early history of the SOFES than Bickford was a less than stellar photographer, having "…underexposed his pictures badly when using [a Harvey] meter because his pupillary opening was abnormally large and he could read a number or two higher on the meter than anyone else." (Wakeley and Barnett 2016: 112). In the next sentence, Wakeley went on to describe the Zeiss cameras they used as "superb" and that "…an occasional expert photographer like Tommy Kohara got pictures with them that have been published over and over again." Those photographs by Kohara clearly show his abilities to compose and develop images with good contrast, depth of field, clarity, and framing.

Photograph of a man, probably **C.A. Bickford**, standing in a recently thinned old field stand of loblolly pine in Winn Parish, Louisiana. USDA Forest Service photo [negative # 352115] taken by T.T. Kohara on August 16, 1937.

It is uncertain if Kohara did anything besides take photographs for the SOFES; no records have yet been found that describe all of his formal duties. Curiously, a biography of Kohara (Derr 1981: 19) based on an interview with him by someone who knew him for years, does not mention his 1937 stint. It specifically cites his first job in forestry was a 1-year temporary assignment on the Harrison Experimental Forest in southern Mississippi "…where, along with his other work, he took his first pictures of forests." Given his work in the summer of 1937 taking photographs of forests in Arkansas, Louisiana, Georgia, Mississippi, and likely elsewhere for the SOFES, this statement is not correct (and perhaps came from a memory faded by time).

Kohara's more formal position with the SOFES appears to have started at some point in 1939. He was listed in the Station's 19th annual report (SOFES 1940: 25), with a job title of "Under Field Assistant" with an "informal appointment" that appears to have officially ended on July 13, 1939. Kohara next appears in the 20th annual report (SOFES 1941: 29), still as an under field assistant, apparently hired through the Civilian Conservation Corps (CCC) program with terms of service from January 1, 1940, until May 17, 1940, and then again from June 17, 1940, until June 30, 1940. Though the Government relief funding that supported his employment

[2] For most of the 20th century, Forest Service practice for its directories and public rosters was to include only the most skilled technical, professional, and scientific staff members—not laborers (of any race or gender) and only rarely any clerical staff.

Scene of the Civilian Conservation Corps Camp F-8 outside of Pollock, LA. (USDA Forest Service photo [negative #348459] taken by T.T. Kohara on July 13, 1937)

with the SOFES ran out (leading him to go back to work at the family business [Derr 1981]), he may have gone on to have a promising career in the Forest Service—until World War II interrupted. Along with many of his peers during these slow economic times, having registered for the draft[3] in October of 1940, Kohara volunteered for the army on May 21, 1941, for what he thought would be a 1-year tour of duty as a company clerk (Derr 1981). As with most American soldiers of Japanese descent, once hostilities broke out (and following some training in Massachusetts and New York City), Kohara served in the European Theater as a photographer with the 3264th Signal Service Company. In this role, he took pictures on the front lines and behind the lines as the U.S. Army pushed through France and into Germany until he was discharged as a sergeant in late 1945 (Derr 1981).

Even after Kohara left the Forest Service, he continued to take forest and forestry related images, most prominently as a "Visual Aids Forester" with the Louisiana Forestry Commission, for which he worked from 1946 to 1956 (Derr 1981). In 1956, Kohara left the forestry profession to become the chief photographer for the *Alexandria Daily Town Talk* (a local newspaper), where he would remain until he retired a quarter-century later. During his long career (and regardless of employer), Kohara's pictures of nature and the people of central Louisiana would appear for decades in numerous magazines (e.g., *Forests & People* and *Forest Farmer*), books (e.g., Lowery 1960), newspapers, and other publications, including some by the SOFES. These photographs were not just sterile images of trees or forestry equipment or the impacts of pathogens; they often captured the many faces of people who worked in and enjoyed the natural environment of central Louisiana. Kohara's work also graced the cover of multiple issues of

[3] This information comes from his military registration card, available through a number of genealogy websites.

the Louisiana Forestry Association's magazine, *Forests & People* (Derr 1981). His photography helped to capture a critical time in the resource management history of the Southern United States, from the beginnings of science-based forestry practices to the drastic measures the Federal Government undertook to keep its people employed. Even today, Kohara's pictures are still helping to illustrate and frame forest-related research questions.

In his tribute to the people who worked to help resurrect the South's forests following the "big cut," Barnett (2016: 108) lauded Kohara—one of only two people he recognized for photography—for "…setting a standard for quality in forest photography that remains today." Given the accolades Kohara received following his passing on June 29, 1999, at his home in Alexandria, LA, the professional and personal contributions of this first-generation American son of Japanese immigrants cannot be overstated.

JASPER BURNES: PIONEERING AFRICAN AMERICAN WORKER AT CROSSETT

Jasper H. Burnes was born on July 15, 1896, in Sumpter Township, Bradley County, Arkansas, the eldest child of farmer George Burnes and Emma (Simon) Burnes.[4] Between the Civil War and World War I, Arkansas received a large influx of African Americans from further east, seeking better economic opportunities and the opportunity to acquire farmland (Matkin-Rawn 2013). Jasper Burnes' grandparents joined this migration in the 1870s. A decade later found the George Burnes family still on their Bradley County farm, with Jasper and six additional siblings. Early life for Jasper must have been hard in segregated Arkansas. Both his parents reported in the 1910 census that they could read and write but that none of their children of school age had attended school, and 13-year-old Jasper was listed as being illiterate.[5] When the unmarried younger Burnes later registered for the draft in June 1917, he listed his occupation as a self-employed farmer in the small community of Jersey (in southern Bradley County), and he signed his own name to the card.

Burnes did not stay with farming for very long. The 1920 census lists Burnes as a laborer in a lumber camp in River Township in Bradley County, joined by his wife Fannie E. (Pewford) Burnes and their 6-year-old son Arma in a rented house. During this period, the big timber cut in Arkansas was winding down, although old-growth pine and hardwood were still being harvested in this part of Bradley County. At some point during the 1920s, Burnes had moved his family to Stillions, a small sawmill community a little southeast of his 1920 residence. Stillions was named for a family who purchased a large amount of bottomland hardwood timber along part of Ashley County, Arkansas, and operated a sawmill there until around 1930 when it closed (Etheridge 1959; Moseley 2015). According to Crossett Experimental Forest Project Leader Russell R. Reynolds (1980: 9), Burnes was injured in a mill accident (probably at Stillions), causing him to have a "stiff leg."

[4] As is often the case, birthdates and name spellings are sometimes inconsistent in early public records. For instance, Burnes' family surname is given as both Burns and Burnes, and his birth year is given in most records as 1896. It is unclear why the spelling of his surname was changed to "Burns" by the 1920 census; the only written material I have found by his own hand was a brief, friendly note to Reynolds from early 1943 signed "From Jasper Burnes."

[5] It is unclear why Burnes was not reported by his parents as having attended school in the 1910 census. The 1940 census records, presumably, supplied by Burnes himself, noted that he had attended up to the 5th grade.

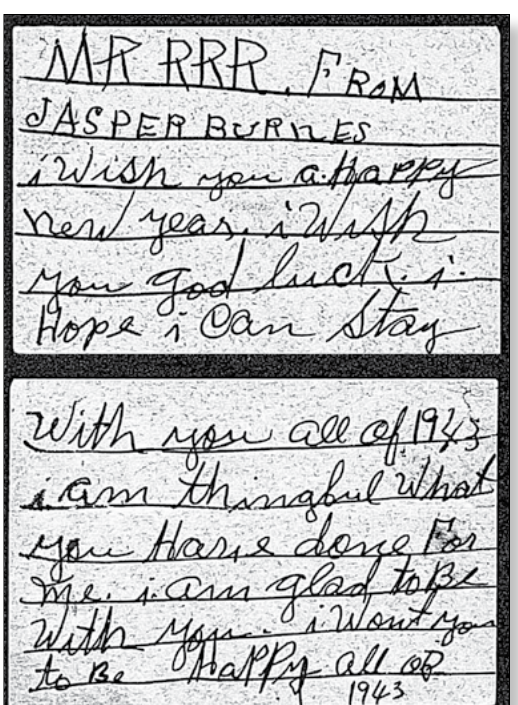
After the closing of the Stillions sawmill, life would have been difficult for the Burnes family, between his injury and limited economic opportunities in the area. Apparently, they continued to reside in the Stillions community for a while (Reynolds [1980: 9] described them as “stranded”). Perhaps Burnes worked on local farms or for the Crossett Lumber Company, which operated a large sawmill complex in the city of Crossett about 8 miles to the southeast. As with much of the country, the Great Depression further reduced employment opportunities in rural Arkansas, with Government relief programs often the only work available. Even then, those fortunate to get that work still had major challenges, as Reynolds (1980: 9–10) observed:

> *Conditions were so serious that the Stillions group had to walk 8 miles down the Rock Island railroad to Crossett each morning, leaving Stillions at about 4 a.m. We [the Forest Service] would pick them up at the Crossett Filling Station at 7 a.m. each day. The men would put in a 10-hour day. Then we transported them back to Crossett, and they walked the eight miles back to Stillions. They would arrive at Stillions at about 9 p.m. Here their families would have some eats ready for them. They would later fall exhausted into bed. Their wives would awaken them at 3 a.m. and they would start another long day. For all of this the men were paid $1.25 per day for a 4-day week … stiff leg and all, Jasper made the long walk twice a day in order to stay alive.*

> “*Most likely, Burnes was not the first African American employee of the SOFES, and he definitely was not the last—but his experience is no less part of the Station’s story of the many other research pioneers.*

As one of this Stillions group, Burnes’ work ethic must have impressed Russ Reynolds, as he continued to keep Burnes on the payroll once he was able to hire supporting staff at Crossett, noting “Jasper became a valuable permanent member of the Crossett Research staff and worked for the Government until his retirement many years later.” (Reynolds 1980: 10).

Handwritten note from Jasper Burnes to Russell Reynolds, from the archives of the Crossett Experimental Forest, Crossett, AR.


MR RRR. FROM
JASPER BURNES
i Wish you a Happy
new year. i Wish
you Good luck. i
Hope i Can Stay
With you all of 1943
i am thingful What
you Have done For
me. i am glad to Be
With you. i Wont you
to Be Happy all of
1943

Fortunately for Burnes and his wife, his employment by the SOFES also came with a much more convenient housing opportunity. As the facility at Crossett was developed, between 1935 and 1938 a small cabin on the far western edge of the administrative complex was constructed to house supporting workers; it would be known as “Laborers Cabin #1” in a June 1947 inventory of the facilities at Crossett. Built at a cost of only $118.50 at the time, this modest home apparently remained their residence until Burnes’ retirement. The 1940 census records show Burnes as a “laborer” employed as a “wage or salary worker in Government work” who had worked for 40 weeks in 1939 and earned $475. His employment status may have been a bit uncertain during World War II, as the Station’s resources were stretched thin and locations such as Crossett had limited operating budgets. Around New Year’s Day in 1943, Burnes penned a note to Reynolds expressing his gratitude for his assistance to that point and his desire to remain on the experimental forest for all of that year.

We actually know very little about Burnes’ work for the SOFES over the decades, although it likely consisted of physical labor to support field operations and maintenance of the Crossett Experimental Forest. Unlike the researchers who would come and go at Crossett, Burnes did not generate publications or design experiments or provide field tours. He may appear in some of the photographs taken of operations at Crossett Experimental Forest, a number of which show unidentified African American workers. As a non professional worker, Burnes was not listed in any SOFES annual reports or in the national Forest Service organizational directories between 1935 and 1966. Curiously, a separate list of Crossett Experimental Forest employees purportedly employed between 1939 and 1959, which included positions such as unskilled laborers—even those who were only employed for days or weeks—and Burnes is not listed there, either (Bragg and McDaniel 2023). This list is also incomplete and may have only included those whose time at Crossett had come and gone (but not then-current employees, as Burnes would have been).

Personnel records on Crossett staff are largely absent or unavailable before 1980, so it is unclear when Burnes retired, but it was before his death in June of 1972. Given Reynolds’ effusive praise of Burnes (he is the only such laborer so recognized in *The Crossett Story*), it would appear that Burnes was a vital part of that operation, even if not otherwise documented by the Forest Service. Most likely, Burnes was not the first African American employee of the SOFES, and he definitely was not the last—but his experience is no less part of the Station’s story of the many other research pioneers.

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Closure Crises for the Crossett Experimental Forest

Don C. Bragg

Don C. Bragg, Project Leader and Research Forester, U.S. Department of Agriculture, Forest Service, Southern Research Station, Monticello, AR 71655.

Left: Pine blown down across Crossett Experimental Forest office building, leaving a hole in the roof that led to ceiling and floor damage in the conference room. Notice the child's swing set; the Gammel family lived in the residence next to the office building. (USDA Forest Service photo by James D. Burton)

Center: Hole in the roof of the equipment depot building caused by a pine felled by the 1973 tornado. (USDA Forest Service photo by James D. Burton)

Right: Worker delimbing and bucking some of the large pines toppled by the 1973 tornado. (USDA Forest Service photo by James D. Burton)

Much to the chagrin of its long-time (founding) Project Leader and first scientist Russell R. Reynolds, the Southern Forest Experiment Station (SOFES) began planning to close the Crossett Experimental Forest (CEF) in the late 1960s. The Station's leadership had decided that the work on uneven-aged southern pine silviculture conducted at Crossett since the 1930s was no longer vital to their research portfolio, and other projects in tree improvement and genetics could be done elsewhere. The isolated, aging facility in southeastern Arkansas was also remote from the rest of the agency and thus was logistically challenging—and relatively expensive—to support.

As a long-standing and renowned researcher, Reynolds still had enough clout to keep the CEF from closing while he remained on payroll, but almost immediately after his retirement in 1969, the SOFES started winding down the work at the facility. Many studies were permanently closed, most staff were given directed reassignments to other locations, and some retired to avoid forced moves. After decades of operation, in a few short years the facility was vacated by Forest Service, although a few studies were maintained by faculty (primarily Dr. Timothy Ku) from the University of Arkansas-Monticello.

As the CEF was closing down, just before 3 a.m. on March 10, 1973, a small tornado touched down inside the headquarters compound. Some of the toppled trees struck buildings, producing significant roof damage.

According to an unpublished report, written for the CEF's files by Research Forester James D. Burton, no one was injured in this storm and while power was lost, the phone lines did not go down. This is remarkable, given the damage to the facility—and most fortunate for CEF Forest Superintendent Don Gammel, who lived on the headquarters compound and had trees down all around his residence! Burton arrived after the cleanup had begun; Gammel was supervising the "emergency work" efforts of Howard Holler, Joe T. Rhodes, Wayne Gulledge, and I.V. Childress to clear the debris and temporarily patch the large holes in the buildings.

In addition to the wind, a "brief, heavy fall" of hail accompanied the tornado, leading to extensive breakage of the south-facing windows in various buildings. While the storm brought an inch of rain that compounded the damage to some of the exposed conference room ceiling, the men were able to get the downed trees removed and the building perforations closed up quickly enough to keep a 2-inch rainfall later that same day from further damaging the main office building.

The 1973 tornado was not the only major natural disaster to crop up during the 1970s CEF closure. A widespread southern pine beetle (*Dendroctonus frontalis*) outbreak affected much of the region and did not spare the forests at Crossett. In the summer of 1974, aerial inspection flights had detected a number of beetle "spots" (areas with multiple tree deaths from the beetle) and on-the-ground surveys confirmed this threat to the CEF's mature, well-stocked forests (Overgaard and Denniston 1974). Two locations were of particular concern: one spot just up Arkansas Highway 133 from the headquarters and another in the middle of the Reynolds Research Natural Area. While no major outbreak ended up happening, the crisis was averted in part by a quick salvage of scores of dead and dying trees. As an aside, the resin-rich stumps of some of these salvaged pines (*Pinus* spp.) can still be found in the Reynolds Research Natural Area.

Pitch-soaked "rich pine" stump in the Reynolds Research Natural Area (2011) from a pine felled in the mid-1970s to help quell a southern pine beetle outbreak. (USDA Forest Service photo by the author)

By May of 1974, all SOFES staff who once reported to the CEF had left and Crossett was officially closed on July 1, 1974. As word got out that the facility had closed, a number of local residents wrote the agency to see if they could purchase the now-vacated buildings. Most sought to move these structures elsewhere; initially, these inquiries were politely but firmly rebuffed.[1] During this period there were also several episodes of vandalism, breaking and entering, and property theft on the vacant CEF. SOFES Research Forest Geneticist Hoy Grigsby, who had spent most of his career working at Crossett but had been transferred to the Alexandria Forestry Center in Pineville, LA, after the CEF had been closed, periodically checked on the facility when he returned to Crossett on the weekends (where he still had a home). During this closure period, Grigsby reported several instances of unexplained damage to the Ashley County Sheriff's office, but no major destruction ever occurred.

> *"The Station's leadership had decided that the work on uneven-aged southern pine silviculture conducted at Crossett since the 1930s was no longer vital to their research portfolio, and other projects in tree improvement and genetics could be done elsewhere.*

More curious than any of those damaging events, however, is the strange tale of James Rice. On April 18, 1975, a local Georgia-Pacific forester, Jim McGriff, contacted Gammel to report a "homesteader" had occupied one of the small storage buildings in the CEF headquarters compound. Gammel asked Ashley County Deputy Sheriff Houston Davidson and Grigsby to investigate. Grigsby reported to Gammel that he did indeed find a non-Forest Service padlock on the door to one of the storage buildings during his April 21 inspection of the CEF but could not locate the person who put the lock on that door. Deputy Davidson visited later that week and, after failing to find anyone on the site, removed the lock.

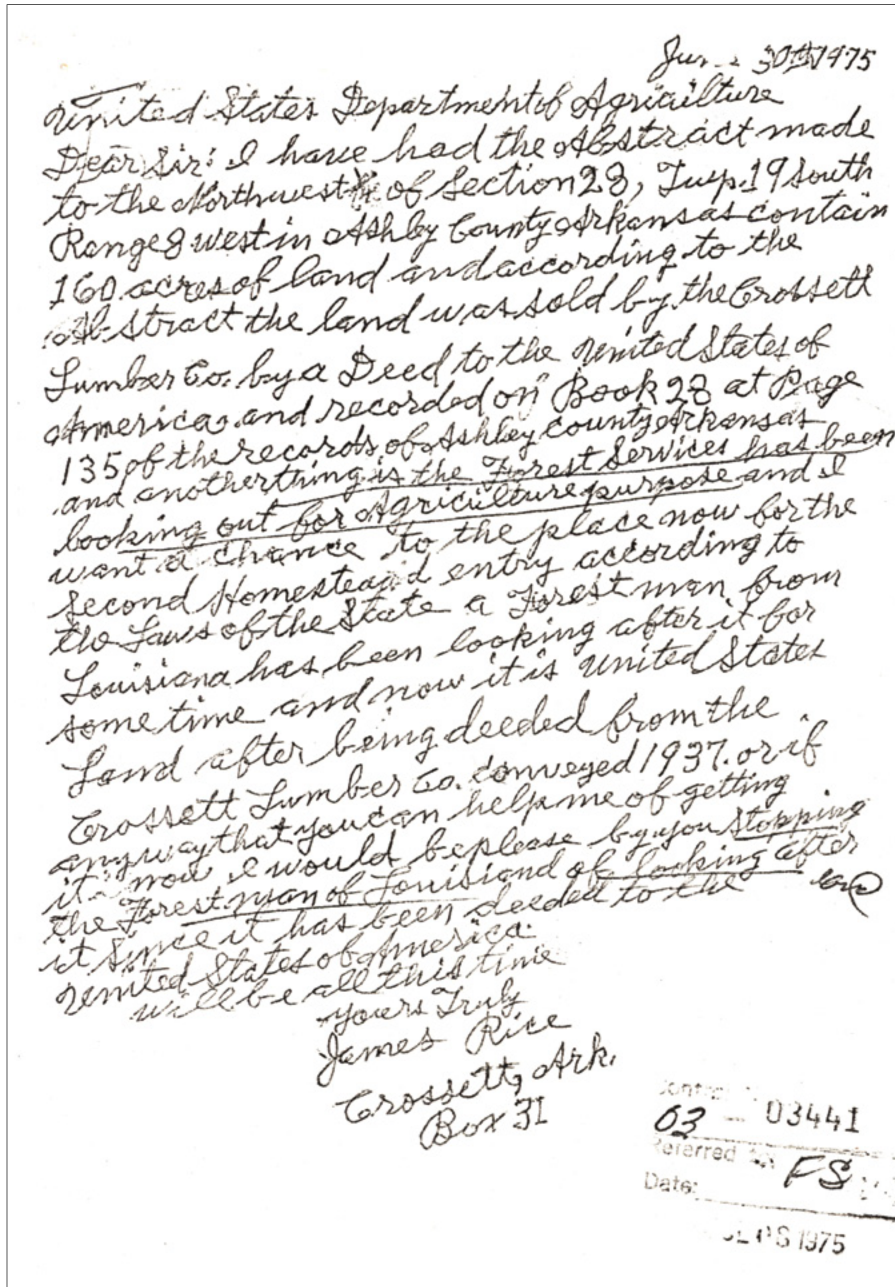
A couple weeks later on May 1, Gammel visited the CEF in person and found a new lock on the door. This time, however, Gammel was able to find the man responsible—James Rice. Rice was a local who claimed to a have document giving him title to the CEF property. When Gammel asked to see it, this document proved to be a certified copy of the patent for one of the parcels that eventually became the CEF. Rice had gone to the Ashley County Courthouse on March 26, 1975, and filed this copy to "register" his claim (which, of course, gave him nothing of the sort!). Gammel checked with the Ashley County Clerk and Abstract offices, and they both confirmed that such a recording gave Rice no rights to the CEF property. Gammel then returned to confront Rice with these new facts, and Rice agreed to remove his lock and himself from the CEF headquarters area. But that did not stop Rice's efforts altogether!

In a hand written letter sent to the U.S. Department of Agriculture on June 30, 1975, Rice stated that he sought this parcel of what he saw as unused Federal land through a "second homestead entry according to the laws of State." Rice also petitioned the Department to "…[stop] the Forest man of Louisiana of looking after [the property] since it has been deeded to the United States of America."

Rice wanted Gammel to cease his efforts to keep Rice from the property, but on July 15, 1975, Gerald W. Van Gilst, Director of the Lands office for the Forest Service, wrote for John R. McGuire (Chief of the Forest Service) to Rice explaining that his petition for the property was not valid because homesteading of national forest land was no longer possible. Van Gilst did suggest in his letter

[1] Editor's note: I have heard unconfirmed reports that at least one of the buildings—the log home Reynolds and his family lived in—was sold or given away during this period. The story goes that it was moved elsewhere in Ashley County, Arkansas, and turned into a hunting camp, and then burned to the ground at a later date. I have yet to find solid evidence that this happened.

Scanned letter from James Rice to the U.S. Department of Agriculture seeking to claim part of the Crossett Experimental Forest property.



Jun. 30th 1975

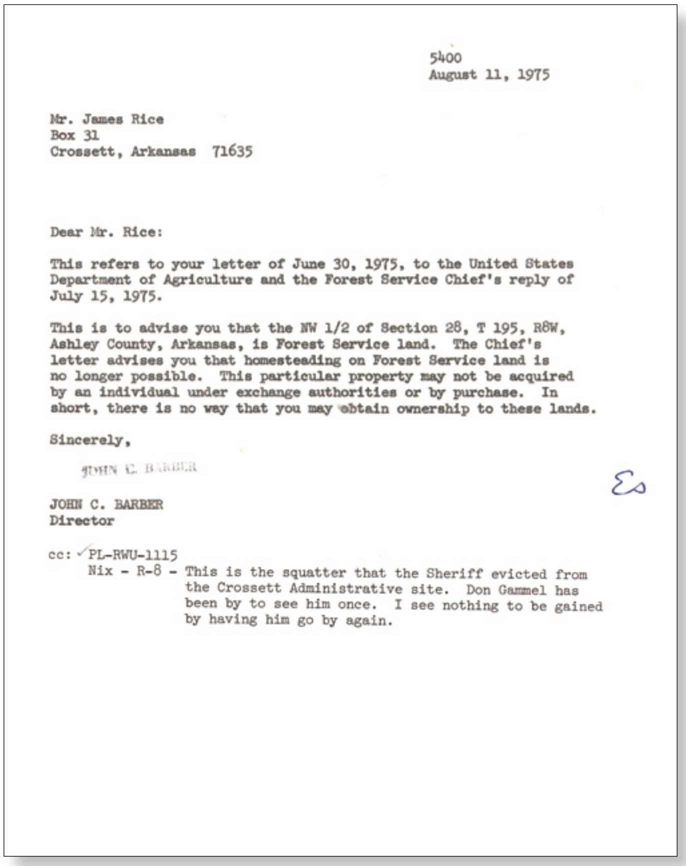
United States Department of Agriculture
Dear Sir: I have had the Abstract made
to the Northwest ¼ of Section 28, Twp. 19 South
Range 8 west in Ashley County Arkansas contain
160 acres of land and according to the
Abstract the land was sold by the Crossett
Lumber Co. by a Deed to the United States of
America and recorded on Book 28 at Page
135 of the records of Ashley County Arkansas
and another thing is the Forest Services has been
looking out for Agriculture purpose and I
want a chance to the place now for the
second Homestead entry according to
the Laws of the State a Forest man from
Louisiana has been looking after it for
some time and now it is United States
Land after being deeded from the
Crossett Lumber Co. conveyed 1937. or if
anyway that you can help me of getting
it now I would be please by you stopping
the Forest man of Louisiana of looking after
it since it has been deeded to the
United States of America
will be all this time
Yours Truly
James Rice
Crossett, Ark.
Box 31

Control: 03 – 03441
Referred to: FS
Date: ... 1975

that sometimes changes in ownership occur via land exchange.[2] John C. Barber, Director of the Southern Forest Experiment Station, also wrote Rice on August 11, 1975, to reiterate the point that Rice had no valid claim to homestead the property and that there was no possible way for him to acquire the CEF parcel via exchange.

Indeed, the only other party with a legitimate claim to the land of CEF was Georgia-Pacific Corporation (GP), the successor to the Crossett Lumber Company, which had originally offered the property to the Forest Service for an experimental forest. GP

[2] Larry Nix, who headed the Forest Service Southern Region's Program and Land Use Planning Office, in a note to Project Leader Gene Shoulders, rued the mention of land exchange in this letter, as it was not legally possible to do that in this case.



5400
August 11, 1975

Mr. James Rice
Box 31
Crossett, Arkansas 71635

Dear Mr. Rice:

This refers to your letter of June 30, 1975, to the United States Department of Agriculture and the Forest Service Chief's reply of July 15, 1975.

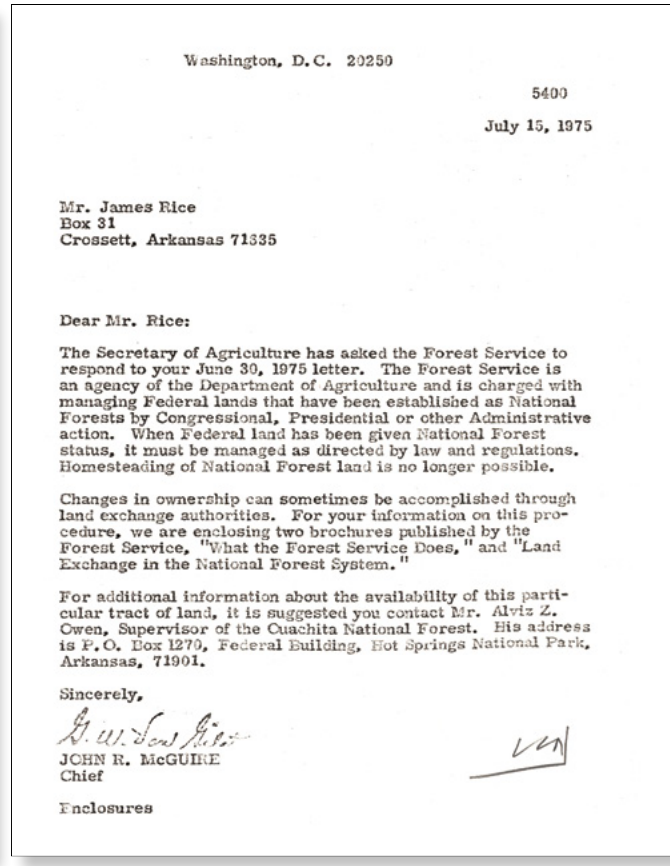
This is to advise you that the NW 1/2 of Section 28, T 19S, R8W, Ashley County, Arkansas, is Forest Service land. The Chief's letter advises you that homesteading on Forest Service land is no longer possible. This particular property may not be acquired by an individual under exchange authorities or by purchase. In short, there is no way that you may obtain ownership to these lands.

Sincerely,

JOHN C. BARBER

JOHN C. BARBER
Director

cc: PL-RWU-1115
Nix - R-8 - This is the squatter that the Sheriff evicted from the Crossett Administrative site. Don Gammel has been by to see him once. I see nothing to be gained by having him go by again.



Washington, D.C. 20250

5400

July 15, 1975

Mr. James Rice
Box 31
Crossett, Arkansas 71635

Dear Mr. Rice:

The Secretary of Agriculture has asked the Forest Service to respond to your June 30, 1975 letter. The Forest Service is an agency of the Department of Agriculture and is charged with managing Federal lands that have been established as National Forests by Congressional, Presidential or other Administrative action. When Federal land has been given National Forest status, it must be managed as directed by law and regulations. Homesteading of National Forest land is no longer possible.

Changes in ownership can sometimes be accomplished through land exchange authorities. For your information on this procedure, we are enclosing two brochures published by the Forest Service, "What the Forest Service Does," and "Land Exchange in the National Forest System."

For additional information about the availability of this particular tract of land, it is suggested you contact Mr. Alviz Z. Owen, Supervisor of the Ouachita National Forest. His address is P.O. Box 1270, Federal Building, Hot Springs National Park, Arkansas, 71901.

Sincerely,

JOHN R. McGUIRE
Chief

Enclosures

Left: Scanned letter from Gerald W. Van Gilst, Director of the Lands office for the Forest Service, written for John R. McGuire (Chief of the Forest Service), mentioning that James Rice's petition to the U.S. Department of Agriculture could not be granted because homesteading on national forest lands was no longer allowed.

Right: Scanned letter from John C. Barber, Director of the Southern Forest Experiment Station, to James Rice informing Rice of his inability to acquire the Crossett Experimental Forest property he sought.

threatened to reclaim the land and timber and had opposed the closing of the CEF from the moment it became aware of this plan in early 1974. In a curtly worded May 28, 1974, letter to SOFES Director Barber, GP Crossett Division Forestry Manager John E. Wishart informed the Forest Service that

> *… I [Wishart] find this to be a failure to use the lands given by the Crossett Lumber Company for the purpose for which these lands were granted to The United States of America and therefore in proper time these lands will revert to Georgia-Pacific.*

Wishart would go on to explain that what GP really wanted was for the SOFES to continue their research program in southern Arkansas, including at the CEF, even if most of the staff were moved to the nearby University of Arkansas-Monticello campus to be colocated with the only forestry school in the State (Bragg 2018). While the Forest Service did not plan to restart forestry research at Crossett or elsewhere in southern Arkansas, they did get a legal opinion on GP's claim on the CEF from the USDA's Office of General Counsel. Each of the two deeds that had originally transferred the property to the agency's control in the 1930s contained a reversionary clause that stipulated if the Federal government had quit using the lands for research purposes for a period of five consecutive years prior to January 1, 1984, that the lands and buildings would indeed revert to GP (as the legal successor to the Crossett Lumber Company).

Over the next several years, as the Forest Service debated over what to do with the CEF, they engaged with GP and other constituents over their options. By early

Crossett Project Leader Russell R. Reynolds receiving an award from Larry E. Lassen, Director of the Southern Forest Experiment Station, at the February 14, 1979, reopening of the Crossett Experimental Forest. Also pictured, from left to right: Robert Buckman, Deputy Chief for Research and Development, Forest Service; U.S. Senator Dale Bumpers; Lassen; Reynolds; Reverend Herman Reese, St. John's Lutheran Church in Crossett (behind flowers); John Wishart, Georgia-Pacific; and B.G. Gresham, Arkansas State Forester.

1977, the Forest Service decided to restart an active research program based out of the CEF, with a budget allocated to support the work at CEF and add staff—starting with Gammel, who was from the Crossett area. On February 27, 1978, SOFES scientist Jim Baker was named the new project leader for the CEF and on February 14, 1979, a rededication ceremony was held on the grounds of the headquarters, ending years of closure crises at Crossett.

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The 1931 Search for a New Experimental Forest in the Ouachita National Forest

W.G. Wahlenberg, Don C. Bragg, and Virginia L. McDaniel

W.G. Wahlenberg (deceased), formerly Associate Silviculturist, U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station, New Orleans, LA 70113.

Don C. Bragg, Project Leader and Research Forester, U.S. Department of Agriculture, Forest Service, Southern Research Station, Monticello, AR 71655.

Virginia L. McDaniel, Forestry Technician, U.S. Department of Agriculture, Forest Service, Southern Research Station, Hot Springs, AR 71902.

PREFACE

While the Appalachian Forest Experiment Station had established its first experimental forest at Bent Creek in 1925, the Southern Forest Experiment Station (SOFES) had no such designated area upon the passage of the McSweeney-McNary Forest Research Act of 1928 (which formally codified the development of experimental forests). With the approval of Regulation L-20 on August 7, 1930, the U.S. Department of Agriculture Forest Service provided the process and protocols for establishing a “comprehensive” system of experimental forests and ranges and natural areas on national forest lands (Clapp 1931: 1). In addition to authorizing forest research of a “broad scope,” the McSweeney-McNary Act “crystallize[d]” efforts to establish experimental forests to allow both for research and field-based demonstration of concepts (Clapp 1938: 834). Research in the shortleaf pine (*Pinus echinata*)-dominated forests on the Ouachita National Forest had started ramping up with the establishment of a “branch station” in Hot Springs, AR, in 1929 and an additional appropriation to the SOFES in FY1931 for additional management-oriented studies (SOFES 1930).

Within a few months of the publication of Regulation L-20, SOFES dispatched a three-person crew to scour the landscapes of the Ouachita National Forest in west-central Arkansas, apparently at the behest of J.C. Kircher, Regional Forester for the Eastern Region. The crew, W.G. (William Gustavus) Wahlenberg, Roy A. Chapman, and Carl F. “Ivy” Olsen were still early in their Forest Service careers but were deemed capable enough to be sent out to the remote Ouachita Mountains to evaluate these rugged lands for a prospective experimental forest. The author of this report, Wahlenberg, began working for the Forest Service in the Western United States in 1919 after receiving forestry degrees from the University of Maine and Yale University (Anon. 1976). For most of his early years, Wahlenberg worked as an assistant silviculturist with the Priest River Experiment Station (later, the Northern Rocky Mountain Forest Experiment Station), receiving an assignment to work on “forestation investigations” at the Savenac Nursery in northwestern Montana in 1920 (Wellner 1976). By 1929, Wahlenberg had moved to the SOFES and eventually became one of the Station’s experts in silviculture. Toward the end of his career, Wahlenberg moved to the Southeastern Forest Experiment Station in Asheville, NC, and expanded his pine work to include silviculture in hardwoods as well. While Wahlenberg worked on many different research projects during his long Forest Service career (he retired in 1956), he is best known for his two monographs on longleaf (*Pinus palustris*) and loblolly (*P. taeda*) pines (Wahlenberg 1946, 1960). Chapman, a 1927 University of Minnesota graduate, had worked for the SOFES as a temporary field assistant in 1926 and received a permanent assignment with the Station in 1929. According to Philip Wakeley’s early history of the Station, Chapman was particularly adept at statistics, having been trained specifically under Francis X. Schumacher in the Washington Office (after this Ouachita trip), as well as receiving additional training during his undergraduate years at Minnesota (Barnett and others 2023, Wakeley and Barnett 2011). Olsen is less well documented than either Wahlenberg or Chapman. Olsen worked with Wakeley as a planting assistant in the early 1930s; his later work with the SOFES appeared to focus on the study of wildfires (Alexander and Taylor 2010, Wakeley and Barnett 2011).

En route to the Ouachita region, this crew visited with a number of persons familiar with the region and local logging/milling practices. Along with various past and present Ouachita National Forest staff, they met with two notable men, one a former and one a future Forest Service employee. William Logan Hall left the Forest Service after World War I and started a consulting forestry business in the Hot Springs, AR, area by 1925 (Clepper 1960). Albert E. "Wack" Wackerman was working for the Crossett Lumber Company in extreme southern Arkansas and northern Louisiana. He would soon be employed by the Station and would help Russell R. Reynolds with the establishment of the Crossett Experimental Forest (Bragg 2012).

Wahlenberg and his crew were not impressed with the forest conditions they found on the Ouachita National Forest. After weeks of searching, Wahlenberg would include only 10 watersheds in his report, of which he thought only two (Rock Creek and Irons Creek) had any promise for development into experimental forests. However, even these two watersheds were ill-suited for silviculture studies. They were small, irregularly forested, and logistically challenging. Wahlenberg made this clear in his concluding paragraphs. He recommended establishing a center for research in conjunction with the Ouachita National Forest, but to hold off on reserving land for an experimental forest until a later date. At the behest of the agency, Wahlenberg followed up this first trip to the Ouachitas with a second in the latter half of May 1931. He did some additional tree classification work, thereby adding some observations (but no new possible locations) on the forest conditions of the area (app. A).

This recommendation apparently did not sit well with the Washington Office. On May 20, 1932, Edward N. Munns, Chief of the Forest Service's Division of Silvics, sent SOFES Director Elwood L. Demmon a terse letter complaining about their inability to recommend an experimental forest (app. B). Demmon responded back that Wahlenberg's reports had been forwarded to the Southern Region for their consideration and constructive criticism, for which little or no feedback had been provided. Munns' reply to Demmon on June 4, 1932, noted he did not consider Wahlenberg's suggested projects sufficient. His arguments against the two watersheds primarily considered (Rock and Irons Creeks) were "unconvincing" given the need for forest management recommendations in the "uneven-aged and ragged" stands depicted in Wahlenberg's forests.

Munns' interest in seeing an experimental forest in the Ouachita Mountains eventually prevailed. A few years later, H.G. Meginnis of the SOFES proposed to build the infrastructure and preliminary program of studies for what would become the Irons Fork Experimental Forest. The experimental forest opened in late 1936 but was not formally established until July 19, 1940. Even though the reports by Wahlenberg did not provide a rosy assessment of the areas examined on the Ouachita National Forest, there were many good insights into the current forest conditions of the Ouachita Mountains. Wahlenberg understood the challenges of establishing an experimental forest in this area. His observations on the impacts and risks of fire were also important and his contemporaries in the forests of Arkansas (Bruner 1930, Hall 1939) shared his concerns. The needs of the Ouachita National Forest for useful management advice had to be balanced with the expense and difficulty of the task (especially in the midst of the Great Depression).

Note: With the exception of some minor formatting changes, redevelopment of some figures for clarity, and corrections to obvious spelling errors, we changed very little of Wahlenberg's original 1931 report. For example, their use of underlining to make points of emphasis has been retained, as has their table and paragraph structures. When possible, brief biographical information for individuals mentioned and other insights are included as footnotes in this report. Some of the plates (photographs) were not placed *in the original document; several others were mentioned in the other plate captions but not actually present in the report. All maps and plates (photographs) are public domain images created by the original report contributors and are presented in in the best quality available. Due to their poor quality in the report copies available, the graphs were all redrafted using the originals as templates (so the proportions should be consistent).*

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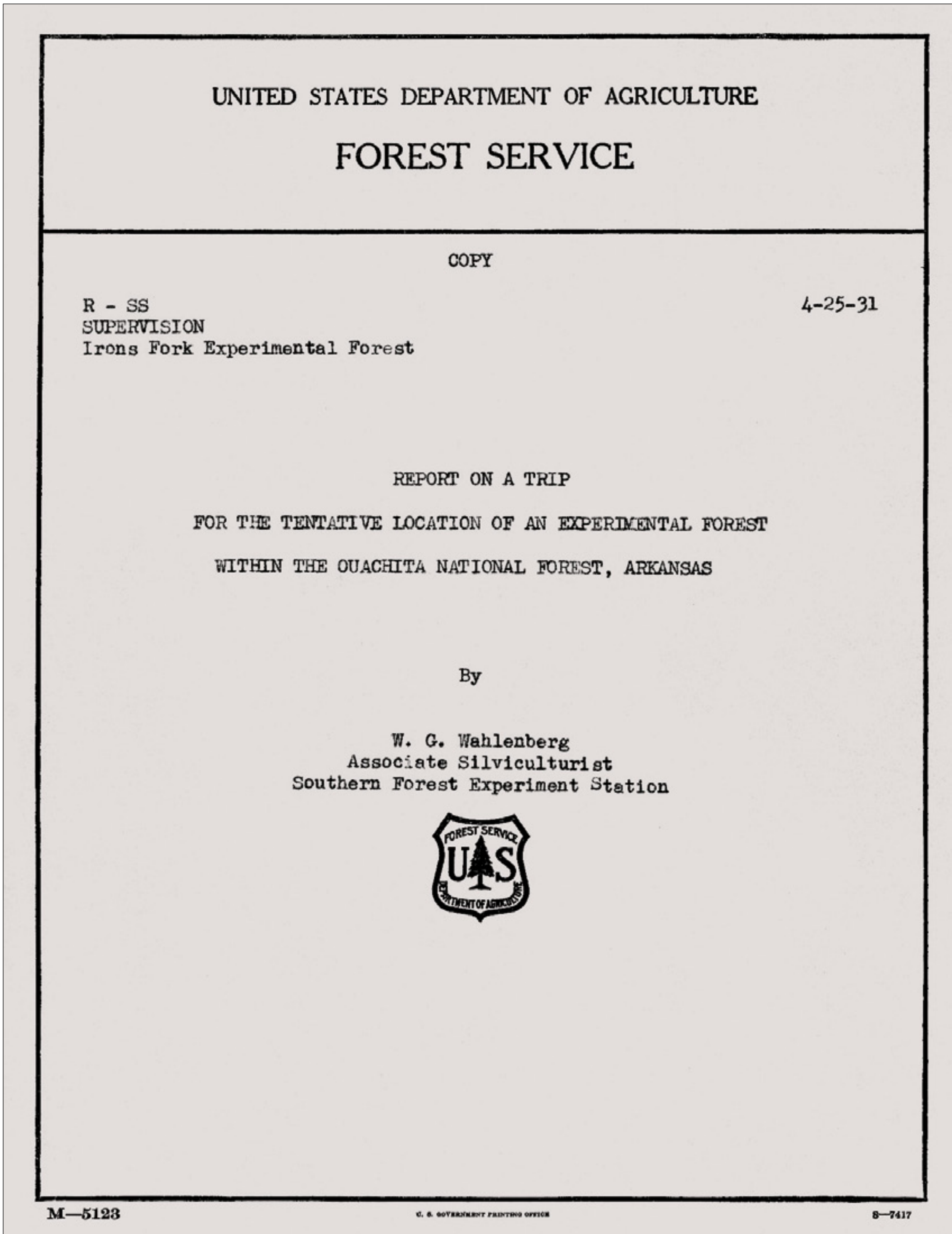

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

COPY

R - SS
SUPERVISION
Irons Fork Experimental Forest

4-25-31

REPORT ON A TRIP

FOR THE TENTATIVE LOCATION OF AN EXPERIMENTAL FOREST

WITHIN THE OUACHITA NATIONAL FOREST, ARKANSAS

By

W. G. Wahlenberg
Associate Silviculturist
Southern Forest Experiment Station

M—5123 U. S. GOVERNMENT PRINTING OFFICE 8—7417

Image of the title page for the original report by Wahlenberg.

R - SUPERVISION R-7
Branch Stations
Experimental Forests
Regional Forester,
Washington, D. C.

Washington, D. C.
Aug. 21, 1931

Dear Mr. Kircher:

The Acting Forester's letter of July 2 provided for the preparation of three final copies of the report on each Experimental Forest or Experimental Range. Upon further consideration it seems apparent that one copy of this report should be filed in the office of the Forest Supervisor, a second in the office of the Director of the Forest or Range Experimental Station, a third in the office of the Regional Forester and a fourth in the office of the Forester. It, therefore, will be desirable to prepare four copies of the final report rather than the three called for by the letter of July 2.

Very sincerely yours,
/s/ L. O. Kneipp
Acting Forester

P. S. This requirement also pertains to Cir. S-18 of August 14, 1931, "R - R-7, Natural Areas".

REPORT ON A TRIP FOR THE TENTATIVE LOCATION OF AN EXPERIMENTAL FOREST WITHIN THE OUACHITA NATIONAL FOREST, ARKANSAS

by
W. G. Wahlenberg
Associate Silviculturist
Southern Forest Experiment Station

INTRODUCTION

Objects of the Trip

1. Selection of a suitable area or areas for the concentration of experiments contemplated by the Southern Station. Such studies should gradually add to existing knowledge of basic silvical facts needed in management work.
2. Contacts with the National Forest personnel and other local foresters.
3. Preliminary observations on the growth of shortleaf pine.

PARTY, DATES, PERSONAL CONTACTS, AND FORESTRY NOTES

A three-man party, W. G. Wahlenberg, Roy A. Chapman, and C. F. Olsen, spent the period from January 21 to March 5, 1931 on the Ouachita National Forest.

In Baton Rouge (On January 19) we called on A. J. Streinz[1], formerly of the Ouachita, and discussed the possibility of finding suitable experimental areas and natural areas. At Perla, near Malvern (on January 21), we called on C. W. Strauss, of the Malvern Lumber Company, and a graduate of the Cornell forest school. On the 50,000 acres which the company controls, forestry investments have been cut to a minimum at this time because of the financial depression. However, they are experimenting with methods of silvicultural improvement through poisoning of the larger hardwood trees in pine stands. Mr. Strauss said that a commercial compound called “Boko” appears to be quite effective.

At Hot Springs we found Supervisor Shaw out of town. The protection and acquisition work of the Ouachita Forest were discussed with Conarro and Ochsner.[2] With Ochsner we visited a timber sale area being operated by the Dierks Lumber Company. This gave us our first definite picture of the virgin timber stands and some of the problems involved in the silvicultural marking of timber to be cut.

Three more days were spent in the field with Mr. Ochsner (January 22, 23, and 24) visiting three possible areas for experimental forests on the Jessieville and Womble ranger districts, and small experimental plots at Big Fork for the study of growth and brush disposal methods. This trip provided an opportunity for very helpful discussions of timber problems on the ground.

The experimental forest idea was also discussed later with Supervisor Shaw at Hot Springs and at Mena, and with each of the district rangers at their headquarters. These men all gave us the benefit of their ideas, and suggested that we examine certain areas believed to be most

[1] Augustine J. Streinz was a 1923 University of Minnesota forestry graduate who worked in various capacities for the Forest Service (including both the National Forest System and Research and Development) across the Southern United States.

[2] Ochsner is H.E. “Herb” Ochsner, who later became the assistant regional forester in charge of timber management for the Eastern Region.

promising. Thus the watersheds discussed in this report under the head of "Reconnaissance" were each selected on the basis of the knowledge of local forest officers. At Hot Springs we also called on William L. Hall[3] (March 5). He complimented the Ouachita Forest on its recent success in greatly increasing the efficiency of fire protection. When asked if he thought private forest interests could benefit from the results of silvicultural research conducted on the National Forest, he pointed out that although the higher and rougher parts of the forest are not at all typical of the surrounding country, many of the low ridges on the Ouachita are comparable with growing conditions outside the National Forest.

In his opinion the big problem of the region, aside from fire protection, is the proper management and utilization of second-growth stands.[4] Virgin timber problems are steadily diminishing. The mixed stands are important. As pure pine stands should be regarded ecologically as a temporary type, it is not wise to attempt complete conversion to pure pine. Gradual soil improvement will result from continued fire protection, of course, but the process will be hastened by the maintenance of a fairly complete cover, including some hardwoods.

Mr. Hall stated that the combination of grazing and forestry is not important in Arkansas, as in most situations silviculture represents the highest economic use of the land.

Regarding intermediate cuttings, he said that thinnings should not be made before the stand is 25 to 30 years old and the trees have a clear length of about one and one-half log. In order not to interfere with proper development of clear length and height, thinnings should not be heavy. Private operators can not figure on removing material smaller than pulp wood; that is, anything less than 3 or 4 inches at the small end of about 5 inches d.b.h. Fifty cents a cord is usually paid. The old rule of avoiding all cultural investments until they pay for themselves must be followed except in experiments.

Mr. Chapman was interested in obtaining Mr. Hall's ideas on poisoning of hardwoods. Hall felt that this work holds forth much promise. He said that because of the lateral diffusion of arsenic solutions in the sapwood, the girdling cuts need not be continuous. Light hacks that little more than sever the cambium are sufficient and make for a cheap operation. He also said that trees killed by poison do not have as bad an effect as girdled trees in increasing fire hazard, because, although the small twigs all drop off quickly, the larger branches [go to] pieces gradually while the tree as a whole remains standing.

In returning to New Orleans, we stopped at Sigman's stave mill at Monticello, Arkansas. The plant was not in operation, but there were 2 million staves in their yard, enough for 100,000 barrels at the rate of 19 to 20 staves per barrel. Much of this was red oak, which can be used for lard barrels without treatment. Impregnated with paraffin, it can be used also for tight cooperage for pickles, coca cola, etc. At Crossett, Arkansas (March 6), Wackerman[5] showed us a logging operation in a splendid stand of hurricane[6] timber. Cutting is done to an approximate limit of 13 inches d.b.h. and 10 inches in the top. Loblolly in

[3] William L. Hall was a Kansas State College graduate who originally started working for the U.S. Department of Agriculture, Division of Forestry in 1899 and then the Forest Service (between 1905 and 1919); by 1925 he had established himself as a private consulting forester in Hot Springs, AR, and remained there until his death in 1960 (Clepper 1960).

[4] It is clear from this report that both Hall and Wahlenberg were very much contemporary in their disdain of fire in southern pine ecosystems. They were focused on developing the commercial utility of managing shortleaf pine forests and viewing old-growth timber as a resource to be exploited (see also Hall 1939). This perspective influences the rest of this report and the ultimate recommendation of Wahlenberg against establishing a new experimental forest at that time on the Ouachita National Forest.

[5] Wackerman is Albert Edward Wackerman, a forester with degrees from the University of Minnesota and Yale University. Wackerman was working for the Crossett Lumber Company in Crossett, AR in 1931, but by 1933 would be working for the Southern Forest Experiment Station (Bragg 2012).

[6] This is a reference to tornado damage, not the larger tropical systems we currently call hurricanes.

favor over shortleaf for seed trees. Crooked trees and limbs from tops are sold to a mill at Bastrop for pulp wood at 50 cents per cord. Last year 500 fires burned over 12,000 acres, about 3 per cent of the holdings, and were held to an average size of 27 acres. The property comprises about 60 per cent pine and 40 per cent hardwoods. The mill of 80 million capacity now cuts about 55 million feet.

NOTES ON THE GENERAL FORESTRY SITUATION ON THE OUACHITA

The National Forest

The Forest is an irregular stand of virgin and second-growth shortleaf pine mixed in varying degrees with low-grade stands of oak, gum, and other hardwoods. Loblolly pine occurs to a very limited extent, and only in the eastern portion of the Womble district. The topography is rough, consisting of a series of low mountain ranges. The soil is thin and rocky, much of it a Hanesville stony loam.

Of the total timbered area of 618,541 acres, 381,496 acres are classed as old growth and 237,045 acres second-growth. However, some of the younger virgin timber is very similar to second-growth where openings in the stand have permitted relatively rapid development. Areas not producing in commercial quantities amount to 138,505 acres.

The total stand of pine is estimated at 858,983 M board feet and 234,000 cords, while the hardwood stand is estimated at 100,000 M board feet.

Form and Management

From the management standpoint, the Forest is essentially a many-aged group selection forest of shortleaf pine, with a deficiency of pole-sized trees. In many places the stand is even-aged by groups originating from hurricane or severe fire damage. The rotation adopted for the Hot Springs Working Circle[7] is 120 to 140 years. Trees 18 inches in diameter can be produced in this period. The cutting cycle for this Circle is 37 years.

Sale of Timber

Timber is sold largely to operators who purchase several million feet at a time, such as the Dierks, Caddo River, and Black Springs Lumber Companies. But the local topography, timber stands, and the rapidly-developing road system are such as to make small sales practicable. Small mills can often be located when sales of at least 200 M feet can be assured. In small experimental cuttings, logs can probably be hauled by motor truck to the mills in nearby towns.

Hardwoods

The hardwoods mixed with pine and occurring in pure stands on the upper slopes, particularly north slopes, are as a whole very defective and without prospect of any appreciable intrinsic value for many decades. Because the hardwoods can not pay the cost of independent logging, they can not be marketed at this time except insofar as the cost of removal may be charged to the stumpage price of pine removal in the same operation. Some of the oak is an exception to this. The best and most accessible of the oaks are now being sold for stave and heading material (Plate 1). In most instances only a small

[7] In forestry parlance, a "working circle" is a geographically centered planning unit in which management practices are generally standardized by forest type. At the time of this report, a working circle would have likely encompassed an entire ranger district (Hrubes 1976).

portion of the tree can be utilized because of branchy, poorly-formed tops, and because of rot and worm-holes in the timber (Plates 2 and 3). Future stands of hardwoods from present stands of sprouts reproduction will also be of doubtful value because of defects traceable to numerous fire scars resulting from fires that occurred during the last half of the nineteenth century.

Experiments in eliminating hardwoods from the stand by girdling or poisoning are under way. An area on Irons Creek (Oden District) that would benefit from such work is shown in Plate 4.

Injuries

Cumulative injury to standing pine timber by fire is considerable. Siggers[8] examined 60 stumps on the Big Fork area and found 49 percent with butt rot. In young growth, fires do most damage to shortleaf pines between 1 and 3 inches in diameter. Smaller trees frequently sprout and larger ones often escape death.

Normal losses from disease, insects, wind, etc. were not estimated. Windfall is not serious except as the result of hurricanes. Drouth in 1930 caused the loss of most one and two-year seedlings, and apparently injured or killed many over-mature hardwoods and some pines.

Fire Protection

Fires have been frequent since early settlement of the region at about the time of the Civil War, but during the last few years the National Forest organization has been giving intensive fire protection at a cost of about 5 cents per acre annually. Of the 300 fires

[8] Siggers is Paul V. Siggers, a forest pathologist with the U.S. Department of Agriculture's Bureau of Plant Industry, working with the Southern Forest Experiment Station.

Left: Plate 1. White oak heading bolts 25 inches long and cut from trees about 18 to 24 inches d.b.h. All sound wood for tight cooperage. Rock Creek, Mena District, Ouachita National Forest.

Right: Plate 2. Typical white oak with defective broken top. Rock Creek, Mena District, Ouachita National Forest.

Left: Plate 3. Low utilization of white oak for cooperage. Note rot in the stump cut. The whole tree yielded but one sound bolt. Rock Creek, Mena District, Ouachita National Forest.

Right: Plate 4. An area needing silvicultural improvement by the removal of hardwoods, poor in quality and over topping the pines. The man is standing by a pine 8.7 inches d.b.h. Irons Creek, Ouachita National Forest.

which occurred inside the National Forest boundaries in 1930, 181 were on Government land, and 146 of these were started by lightning. The area burned over was held to an average of 15 acres per fire. In 1929, 1.34 per cent of the forest burned, and in 1930 only 0.99 per cent, as contrasted with 60 to 80 per cent burned on adjacent lands outside the National Forest boundary.[9] Damage to the forest in 1930 was estimated as $4,399 based on appraisals and allowing $1 per acre on timber in the protection type. On areas where fire burns over 100 acres or more, grazing is prohibited during the next three years. Public knowledge of this policy seems to be effective in preventing the start of many fires.

Growth Rate

A study made in 1927-1928 by A. J. Streinz, P. H. Bryan, and H. E. Ochsner, of the U. S. Forest Service, indicated that trees must be cut within 20 feet of a neighboring tree in order to have any effect in increasing its growth. Average growth per cent of stands, however, is greatly increased, probably doubled, after cutting, because of the removal of the slower-growing trees. A general decrease in the rate of growth over the entire Forest during the past 20 years may be attributed to site deterioration caused by fire. The average growth per acre per year is estimated by the National Forest men to be 50 to 60 board feet.

[9] The stark contrast with the area burned outside of the national forest is telling. Contemporary sources from this period (e.g., Bruner 1930, Hall 1939) also report the frequency of fire on private lands of Arkansas, and the motivations behind many of these woods-burners. While generally thought to be antithetical to good forest management, the use of prescribed fire (or managed wildfire) has now been embraced on the Ouachita National Forest to help manage for desired natural communities such as shortleaf pine-bluestem (*Andropogon)* open forests. Southwide, higher acceptance by the public of prescribed fire in many pine-dominated communities goes back generations.

Weather Records

Weather records are taken at Hot Springs, Waldron, and Mena. The average annual rainfall is about 45 inches. Although winter and spring are apt to have the most rain, the monthly distribution is very irregular from year to year. The growing season between last and first killing frosts is approximately from the first week in April to the first week in November.

KIND OF AREA DESIRED FOR EXPERIMENTAL USE

The experimental forest area or areas should be (1) representative in character, (2) readily accessible, (3) well protected, and (4) probably should cover 4,000 to 5,000 acres.

1. An area typical of the National Forest as a whole, if it exists at all, would be difficult to find because of the very variable conditions on the Forest. Under such circumstances, the results of experiments conducted on a typical area would be difficult to apply. What is needed is a small watershed sufficiently representative of the major problems of the Forest to provide the necessary material for the grouping of several studies, if this proves possible. Thus, although the average site and stand conditions on the area selected should not depart too far from the average for the Forest as a whole, it is essential that other conditions also be considered. The smaller, more fully-stocked portions of the stand should resemble numerous stands on other areas. The usual slopes, types, sites, and mixtures of species, together with some cut-over and recently-burned areas, should be included.
2. A readily accessible area is regarded as one which can be reached within an hour's travel time from a headquarters town. The number of such areas is limited at present, but is steadily increasing with the progress of road-building and improvement. An area somewhat less accessible now might be acceptable, if it meets other requirements to a high degree, and if present plans for road development promise to make it more accessible during the next year or two.
3. Satisfactory protection exists for most of the National Forest areas. To have the benefit of the best possible protection, an experimental area should preferably be so located as to be surrounded by Government land, be close to a lookout tower, and be within easy reach of fire-fighting crews. The feasibility of trails or motor ways serving as fire breaks on ridges should be considered.
4. The instructions accompanying the 1930 amendment of regulation L-20, which provides for experimental forests, give the desirable range in size of such areas as 1,500 to 5,000 acres. Size should be governed primarily by the complexity of the type and the growth rate of tree species. It would seem that an area approaching the upper limit of the above range would be suitable on the Ouachita because of the great irregularity of stand conditions.

Reconnaissance

The first step in selecting an experimental forest was a trip to become familiar with the National Forest as a whole, and to visit numerous areas suggested by local men. A trip was made around the Forest, visiting eleven[10] possible experimental areas, as shown on the attached map. This was a quick inspection tour on which no systematic measurements

[10] This is how it was originally written, although the list that follows and the map that is referred to only shows 10 experimental areas visited.

were taken, but the tracts as a whole were judged ocularly as to their relative fitness for the purpose. This trip yielded the following information:

1. Little Bear Creek

This is an area in the Jessieville ranger district, north of Hot Springs. (Air line distance, 22 miles). The area may be reached by driving two hours from Hot Springs to the nearest point on the Bear Creek road. From there, it is necessary to walk an hour across the head of Sugar Creek to the divide on the south side of Little Bear Creek at a point about two and a half miles from the lookout tower. The road used is in such condition as not to be passable after heavy rains. To reach the mouth of Little Bear Creek by road would take about two hours and fifteen minutes, by car, from Hot Springs. There is a trail from there up the south side of the drainage area. It would be necessary to walk two to three miles on this trail to reach the nearest point on the drainage area that would be of interest for experiments. This would be on the ridge on the south side and about one and a half miles from the creek.

There would be no opportunity to make small sales of forest products from this area until the Dierks Lumber Company comes in with a railway in Dry Fork, connecting with a route along the Trace Creek road to Jessieville.

The area appears quite representative of the Forest, although no definite information was obtained on the extent of virgin and second-growth timber stands, cut-over area, etc. This tract may lack the better sites.

The area is well-protected, there being a lookout tower on the east edge of the area at the head of the creek. Crews for fire-fighting could reach the area within an hour's travel time.

This area comprises a little over 5,000 acres of land and is considered somewhat large for the purpose.

2. Irons Creek (not to be confused with Irons Creek on the Oden District)

This is a smaller area in the northeastern part of the Womble district. (Air line distance from Hot Springs, 23 miles). The area can be reached in about forty minutes from Hot Springs, turning off Highway No. 6 at Joplin School House. It is necessary to walk only a quarter mile to the area. An expenditure of fifteen to twenty dollars would make the road to the area passable for a car, while one hundred dollars would probably be sufficient to make a road passable, one-half mile into the area.

The removal of small quantities of timber from experimental plots could be handled easily. Local people will gladly take out anything of this kind that they can get. No second-growth stands were observed on this area, but there are some such stands on recently-acquired land in the vicinity.

The area seems to have more oak timber scattered throughout the stand than is the case on much of the forest, but may be typical of the Womble working circle in this respect. The north slopes appear quite typical of the forest. The south slope is a little short from top to bottom, making it difficult to bring out any comparison of upper and lower slope conditions. Both north and south slopes are cut up with spur ridges in a way that would make sample plot studies difficult. The irregularity of the stand would also add to the difficulty of sample plot work. The timber is somewhat better than the average for the Forest. Four-log trees are not uncommon.

This area has good protection from a nearby lookout tower. The Government has title to all of the land, with the exception of forty acres near the mouth of the creek.

This area covers only about 1,300 acres of land.

3. Montgomery Creek

This area is in the Womble district, very close to the ranger station at Norman. (Air line distance from Norman, 3 miles). It is easily accessible, the far end or head of the creek being only four miles from the ranger station by road.

The south side of this drainage has been cut over for oak and pine. On the south slope (on the north half of the area), only occasional fine specimens of pine were removed in 1912 and 1914. A stand of young and old mature pine remains. The stand in the center of the slope is very open, but not quite as irregular as on Irons Creek (Area No. 2 above). The lower part of the slope is less steep and has a stand consisting mostly of hardwood, and only occasional pines. Reproduction is poor, on account of a fire since cutting, probably ten to eleven years ago. Based on the measurement of three trees, height growth is not so good as on Irons Creek, being sixty-one feet in eighty-one years. As based on two trees, diameter growth appears good, about three inches in the last fifteen years. Upper slopes are steep and rocky, with scattered timber.

A nearby lookout tower and the accessibility of the tract provide excellent protection for this area.

This area covers about 2,000 acres of land.

4. Rock Creek

This area is in the Mena ranger district, 6 miles northwest of the town of Mena, by road. (Air line distance, 4 miles). The lower end of this area is readily accessible, within a half-hour's travel time from Mena.

The area is not at all typical of the National Forest as a whole, having much more extensive stands of young second-growth timber resulting from the destruction of a good deal of the virgin stand by hurricanes. This is especially true near the headwaters of this creek, where areas may be found that are relatively well-suited to experiments with young timber and pole-sized stands. In the bottoms, stands of red and white oak, black gum, and occasional beech extend part way up the slope. The lower slopes are very rocky, having canyon-like walls in many places. Further up the slope, these steep, very rocky sides become more gentle and the soil appears less rocky on the surface than that observed on other areas. The watershed divide is about 750 feet above the main creek. The virgin timber is very patchy, and unsuited for sample plot work. A strip of private land in the creek bottom has been largely cut over, but bears a thick stand of advanced reproduction. Title to this land probably can be acquired.

More detailed information concerning this watershed is given later in this report.

This area is well covered by lookouts. Three fire tower men can view the area. Fire crews could reach the tract promptly from Mena.

This area covers about 2,900 acres.

5. Caney Creek

This area is in the southern part of the Mena district, 19 miles from Mena, south of the Shady Ranger Station. (Air line distance from Mena, 13 miles). The area can be reached by driving one end a quarter hour from Mena and walking about one-half hour to reach stands that might be of interest for experimental use. It was necessary to make three fords at Cossatat Creek in order to reach Caney Creek. Two of these will be eliminated by a new road now under construction, but the third would be a barrier to a car in times of high water.

The north slope is relatively high from creek to ridge top, steep, rugged, and rocky. The pine stands scattered over much of the slope appear relatively even in distribution as compared with those previously seen, but the mixture of tree forms is great. Very old veterans do not seem to be abundant, but all other ages and sizes are mixed together, giving variety to each acre. Like most of the other areas, the irregularity of the stand is sufficient to make plot studies impractical, at least unless the plots are made very large. The topography on the south slope is broken up and the timber stand patchy. From the mouth of the creek, the ridge on both sides become noticeably lower and the slopes less steep. The sale of timber at the present time would necessitate removal of the logs to a portable mill five or six miles away.

This area, lying between Tall Peak and the Shady Ranger Station, has fair protection from fire.

This area is a long, narrow one, comprising about eight sections.

6. Short Creek

This drainage is in the same locality, lying immediately north of Caney Creek, and 18 miles from Mena. (Air line distance, 12 miles). It is a long, narrow area, covering about 3,800 acres.

The north slope is a very rocky, poor site, but not as much dissected as many. The opposite slope has very little pine. Near the center of the north slope, at one point, is a bend of scattered pine. In general, the soil is extremely thin and rocky, in many places being little more than talus slope, partially covered with leaves. The north slope bears evidence of a fairly recent sixty-acre fire. The very rocky nature of the surface soil is indicated by a gray color. The pines are young, or in the early mature class. The south slope bears a pine stand on its upper two-thirds. This appears to be a fair stand of two-log trees, but growing slowly.

Protection on this area, as for Caney Creek, should not be difficult. Short slopes make it relatively easy to keep fires of small size off.

7. Irons Creek

This area is in the Oden district, although included within the Mena working circle. It lies 19 miles northeast from the town of Mena, by road. (14 miles, air line). The area can be reached within one hour's travel by auto. A new road is planned to be built within the next year or two which will make it possible to reach the area in a shorter time.

The south slopes on this area have timber of average height, about three logs. Density of stocking appears to be above the average, due to closer spacing of timber in groups. Some of the groups of second-growth or advanced reproduction are very noticeable. There appears to be considerable immature and young mature timber also. Old mature and over-mature timber is possibly less abundant than on some of the other areas examined. However, the forest on this area appears to approach an all-aged stand more than any others seen. The watershed divide is about 700 feet above the main creek. There are numerous low ridges, more or less parallel to the direction of the main creek, but the main slopes appear to be less cut up by small spur ridges than on other areas. There is a narrow strip of the so-called protection type of hardwood forest on the upper part of the main south slope.

The north slope appears to present better material for sample plot work than the south slope. Three or four of the relatively low parallel ridges just south of the main slope have short, not very steep sides and stands of timber that are not typical of the main lower north slope. Part of the north slope is not representative, the stand being very patchy and scattered, but with less hardwood and more pine reproduction than on most such slopes. The area as a whole appears to have less hardwood than many of the other areas, especially those near the shady ranger station.

About 100 acres of cut-over land are included within this area. As in many places on the Ouachita National Forest, there seems to be a deficiency of pole-sized pine timber.

More detailed information concerning this area is given later in this report.

This area is well protected from fires, there being a lookout tower 2 miles northeast of the area.

The area covers about 2,800 acres.

8. Freedom Creek

Freedom Creek is in the Cold Springs district about 15 miles east of Waldron by road. (13 miles, air line). The road through Freedom Creek at present is passable, but very rough and poor. With the improvement of this road, this area may be protected as easily as the others already described.

The south slopes have a good but irregular stand of pine near the base, on the gentler slopes or foothills. The upper south slopes appear to have thin soil. Rock out cropping is extensive and conspicuous. Much of the stand consists of immature trees. On this area the north slope is more uniform and better stocked than in many places on the forest. The best north slope stands are near the east end of the area. This drainage appears to have fewer hardwoods than the vicinity of the Shady ranger station. As in other parts of the Cold Springs district, the bottomlands and lower slopes have more reproduction and good advanced growth of saplings and small poles than in other districts.

The area embraces about 5,400 acres, including at present considerable areas of land in private ownership along the creek. Many of the old farms are reverting to forest, however, and will probably be acquired for National Forest purposes. The timber on this area has been appraised for sale.

9. Ramsey Creek

This area lies north of Freedom Creek and northeast from Waldron, about 24 miles by road. (19 miles, air line). The new motorway to be built this year on Petit Jean Mountain will make the area easily accessible from Waldron, within an hour's driving time. When this new motorway has been constructed, the facilities for protection will then be very good.

The approach to Ramsey Creek and Pidgeon Creek, a tributary, is through Jack Creek. The area near where Ramsey and Pidgeon Creeks join Jack Creek might possibly be suitable for an experimental forest. Various slopes along Jack Creek were cut over about ten years ago, but are now well covered with advanced reproduction and young growth. The young stands of saplings are extremely dense in many places. A west slope of Jack Creek just north of the forks may be found representative of many conditions in this district, if not of the Forest as a whole. The north slope between Ramsey and Pidgeon Creeks is largely covered with hardwood, but has a small patch of pine on the lower part near the forks. The stand, however, does not appear to be suitable for sample plot work. Farther up Pidgeon Creek, the pine is scattered over more of the north slope, but here the percentage of hardwood is still high. The main part of this ridge is a northwest slope of Pidgeon Creek. The south slopes north of Jack Creek bear an exceptionally large percentage of pine, extending nearly to the top of the ridge, there being only a very narrow strip of protected type near the top.

The area as a whole covers about 5,400 acres, but it might be possible to pick out two or three thousand acres on Pidgeon and Ramsey Creeks for experiments.

10. Hole-in-the-Ground Creek

This area lies east of Irons Creek in the Oden district, and west from the Oden ranger station. (Air line distance from Mena, 19 miles). The road into this area is poor and not passable for a car much beyond the National Forest boundary.

The east part of this creek runs into a steep, rocky country with a very thin soil. The west fork is in similar country, with steep slopes, but has a better stand of pine. On both forks, the slopes are too steep to be representative, and are not suitable for plot studies. Hardwoods predominate near the tops of ridges. On the west slope, the pine stands are especially heavy along the brow of the ridge, where the slope breaks away to the north. This condition is common on the National Forest. Plate 5 shows some of the virgin timber near the creek bottom.

Protection for this area is fairly good, because it is small and not far from the ranger station.

The area embraces about 2,000 acres of land[11].

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[11] [Note: Plates 6, 7, and 8 show further examples of stand and site conditions, but give no specific mention of what watersheds they were located in.]

Left: Plate 5. Stand of old shortleaf pine showing several younger age classes. The man is standing by a 23-inch pine. Hole-in-the-Ground Creek, Ouachita National Forest, Arkansas.

Right: Plate 6. A rocky west slope with hardwood and shortleaf pine growth on [thin] soil. Ouachita National Forest, Ark.

Left: Plate 7. An irregular stand of shortleaf pine virgin timber with some advance reproduction. Man standing by a defective red oak. Irons Creek, Ouachita National Forest.

Right: Plate 8. Many-aged condition of shortleaf pine forest with good young growth typical of the Cold Springs Ranger District, Ouachita National Forest. On Cold Springs road, Scott County, near Sebastian County line, Arkansas. Sample plots, if used at all in mixed and irregular selection-form stands, such as this or the one shown in Plate 11, would have to be very large and of doubtful practical value. Contrast this view, representing conditions on the Ouachita National Forest, with Plate 13.

SELECTION OF TWO OF THESE AREAS FOR FURTHER STUDY

As may be assumed from the above brief descriptions, none of the ten areas considered stood out as preeminently suitable for an experimental forest. On none of them could the sample plot method of studying timber be applied without great difficulty.

Two areas were elected for further study, not because of any conspicuous superiority for the purpose, but rather because of less marked disadvantages. The other eight areas were each dropped from further consideration because of some outstanding limitation. The process of elimination was used as follows:

1. Little Bear Creek is not sufficiently accessible.
2. Irons Creek (Womble district) is too much above the average for the forest in site quality.
3. On Montgomery Creek, the whole south side is cut over.
4. Rock Creek, by itself, does not have enough virgin timber. It has good stands of young growth.
5. Caney Creek is extremely irregular and relatively inaccessible.
6. Short Creek is too rocky, the main slopes are too short, and there is not enough pine.
7. Ramsey Creek has somewhat less distinct disadvantages, but has no stands suitable for sample plots of timber, except possibly one west slope which is not representative of any considerable National Forest area.
8. On Freedom Creek, the stand of timber on the south slopes is too irregular on the lower portions and the soil is too thin and rocky on the upper portions. Furthermore, much of the timber has already been appraised for sale.
9. Hole-in-the-Ground is too steep and not representative of any important forest problems.

Thus, Irons Creek (on the Oden District) seemed to have fewest disadvantages. Aside from the disadvantage of irregular topography and irregular timber stands, which is common to most of the areas, its greatest limitation is the lack of sufficient young timber for future experiments.

As Rock Creek has just such stands and could be worked from the same headquarters, Mena, it was given further consideration together with Irons Creek.

SURVEY OF IRONS AND ROCK CREEKS

Roads

Driving as far as the roads are passable, Rock Creek is 6.3 miles from Mena and Irons Creek 19 miles. The center of either area can then be reached by walking about one-half hour. These travel times will be reduced as roads and trails are extended. There are no present road plans that will affect Rock Creek, but Irons Creek is to be made more accessible in the near future. A national forest road of high priority may be expected to improve the last few miles of the route to the area. This road will probably be located so as to pass through the NW1/4 of Section 17 (T 1 S, R 28 W) northward through the pass near the center of Section 8, and thence down into the head of Turner Creek. If Irons Creek should be selected as an experimental forest, the construction of this road will be especially desirable because it will shorten travel time and will not traverse any of the areas likely to be used for experiments.

The road will also facilitate the removal of small numbers of logs by truck. This would be desirable, as many small experiments would probably not remove sufficient timber to justify the location of a portable mill specifically for the purpose. At present, the cost of logging and truck hauling of very small lots of logs from either Irons or Rock Creek would probably equal their stumpage value.

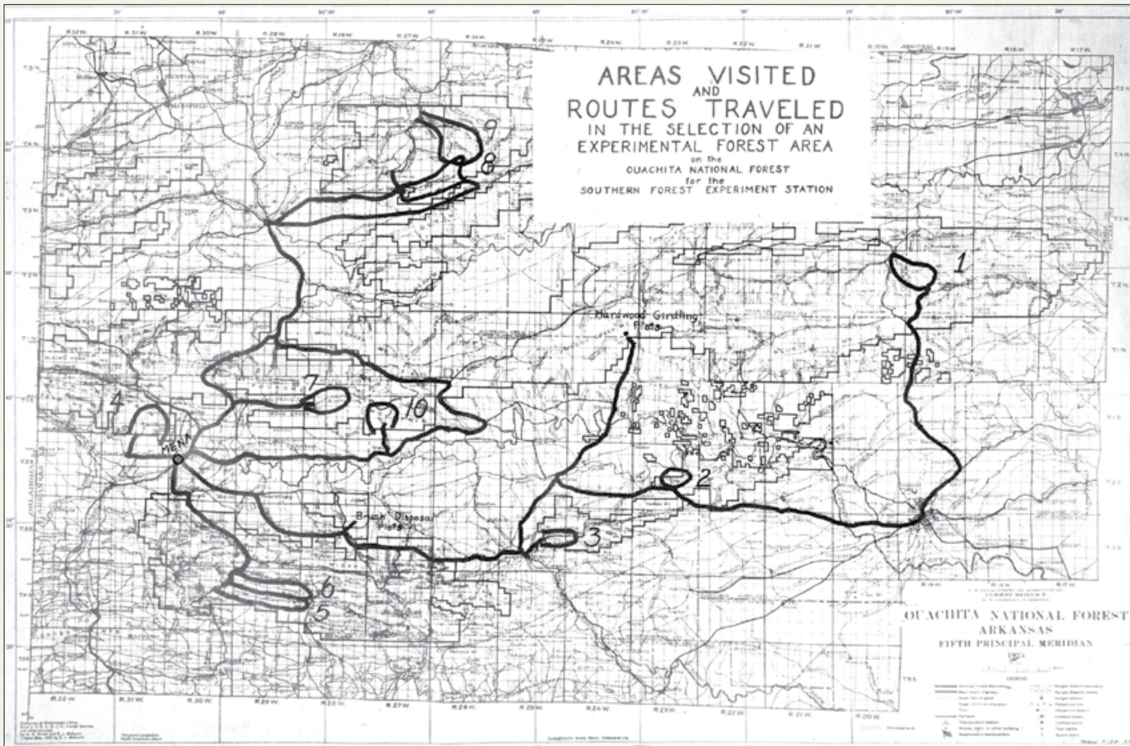
Another road having low priority in present plans may be constructed some time later following roughly the location of the present overgrown trail through the area as shown on the contour map. No specific estimates of the cost of such a road were made. As a rule, forest development road cost about $1,500 a mile, but mere auto trails can often be provided for one-tenth the cost. Such passable route to the interior of this area would increase its value for experimental use.

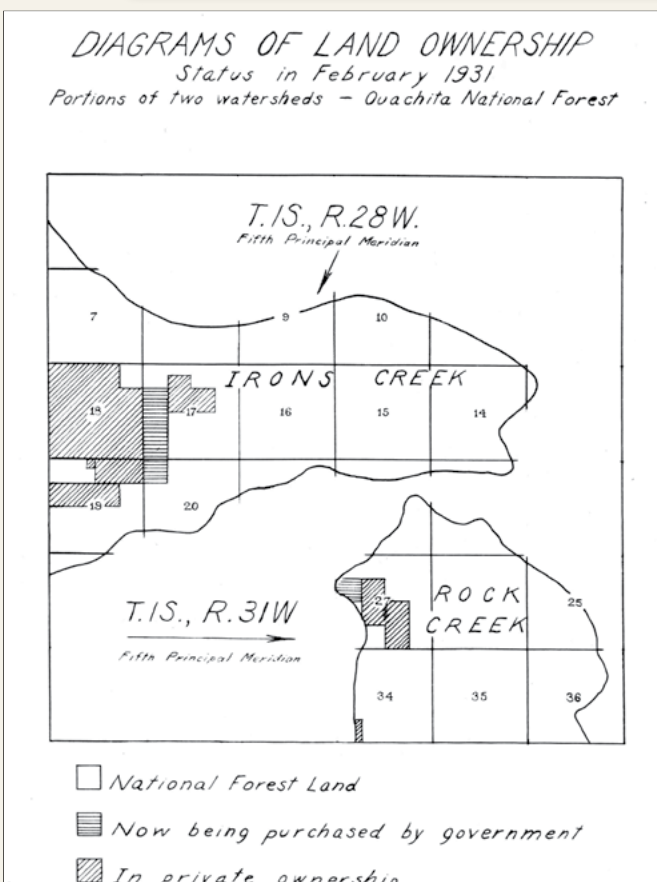
A third possibility is the construction of a motor way along the ridge in Sections 8, 9, 10, and 11, dividing Irons Creek from Turner and Rock Creeks on the north. This would increase facilities for fire protection and make the northern part of the area much easier to reach.

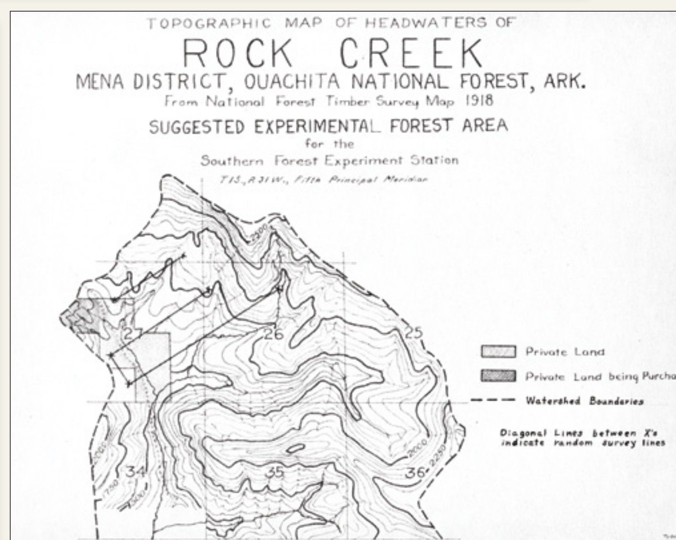
Maps and Descriptions

Attached to this report are the following:

1. Map of areas visited and routes traveled.
2. Diagram of land ownership, Rock and Irons Creek.
3. Contour map of Rock Creek. (Ouachita Timber Survey, 1918).
4. Contour map of Irons Creek. (Ouachita Timber Survey, 1918).
5. Type and drainage map of Irons Creek.(map 1,2,3,4,5)



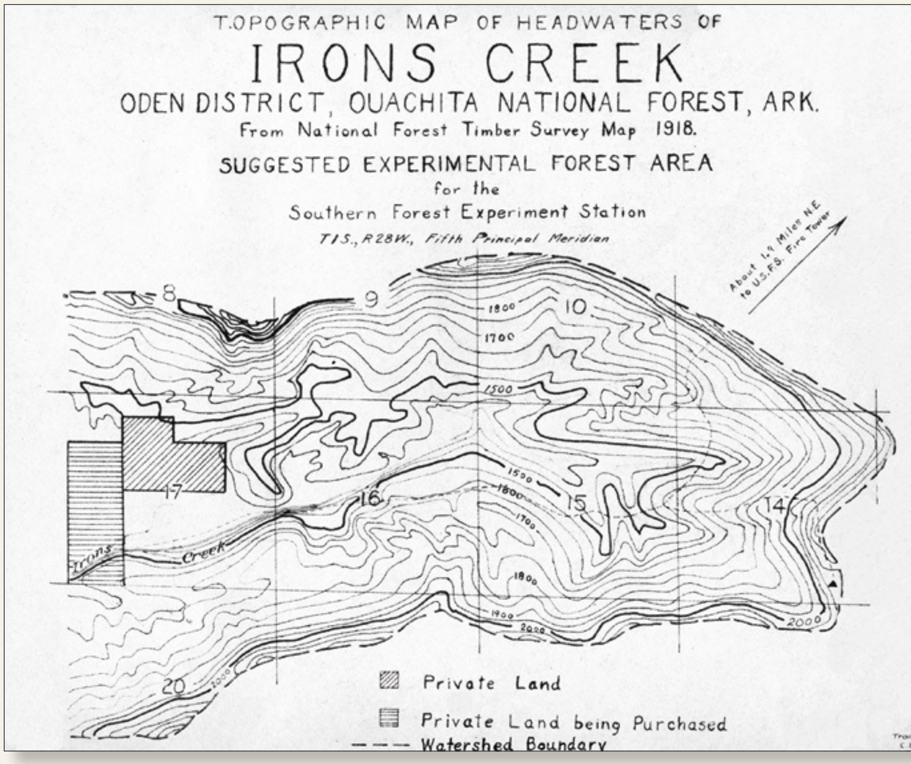


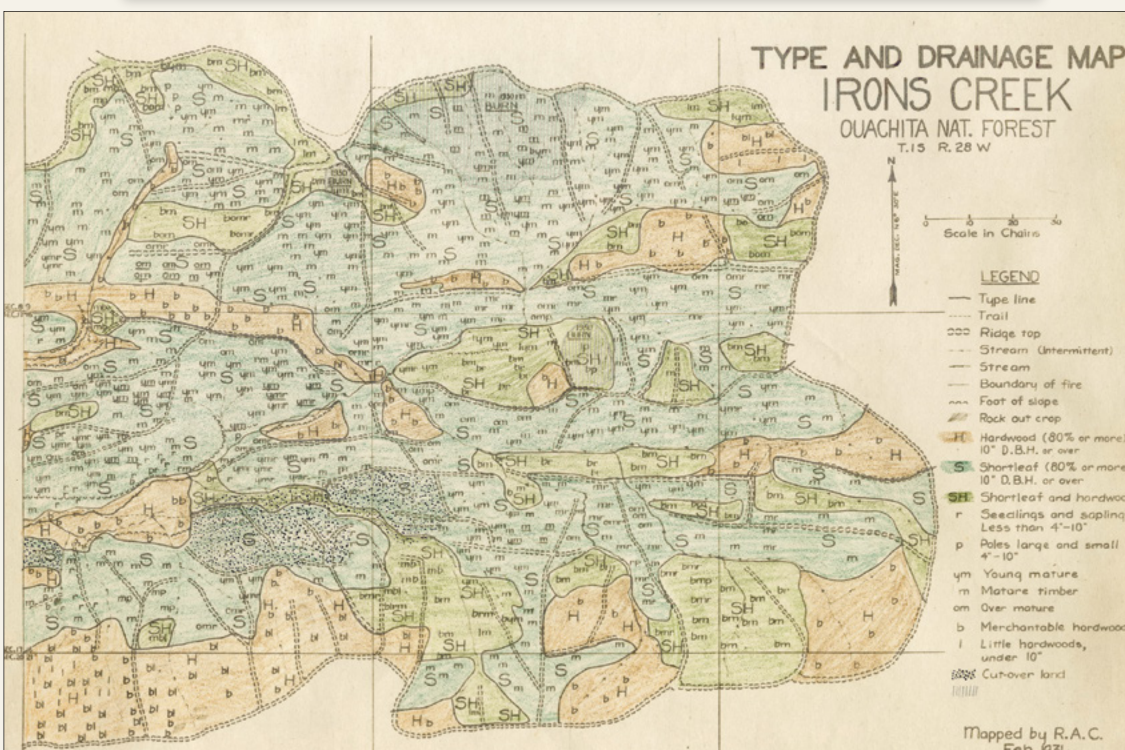


Top: Map 1. Map of areas visited and routes traveled. This travel map has been referred to in reporting the preliminary reconnaissance. It shows the location of the town of Mena, suggested as field headquarters.

Left: Map 2. Diagram of land ownership, Rock and Irons Creek. The land status diagrams show 160 acres of private land on Rock Creek that should be purchased if the area becomes an experimental forest. Irons Creek has no private land in the area contemplated for experimental use, east of Section 17.

Above: Map 3. Contour map of Rock Creek (Ouachita Timber Survey, 1918)





Top: Map 4. Contour map of Irons Creek (Ouachita Timber Survey, 1918). The contour map of Rock Creek shows topography rather too cut up to facilitate sample plot work. Irons Creek is better in this respect, and the general direction of the main ridges is east and west, like the majority of those in the Ouachita National Forest. Neither map shows the local details of topography which must be considered in sample plot studies.

Bottom: Map 5. Type and drainage map of Irons Creek. In constructing the type map, lines were run north and south twenty chains apart on Irons Creek, using staff compass and chain (3-chain steel tape). All lines "checked in" to control points within a quarter or half chain. This applies also to the traverse used to tie-in the survey with General Land Office corners.

The map shows the headwaters region of Irons Creek, the portion best suited for experimental use. Table 1 shows how the total acreage is divided between types and sections:

TABLE 1. SUMMARY OF AREAS
Irons Creek, Oden District, Ouachita National Forest, Arkansas. T-1-S, R-28-W. Section

Section No.	Shortleaf Pine	Shortleaf and Hardwoods	Hardwoods	Totals
	Acres			
9	276	96	39	412
10	334	37	51	422
11	43	27	31	100
14	136	82	91	309
15	345	233	62	640
16	449	38	155	642
21			121	121
22	42	27	45	114
23		14	12	26
Total	1626	553	607	2786
Burned over in 1930				110
Cut-over land				103

The figures are approximate because the type lines in many cases are not definitely distinguishable on the ground. The map clearly shows that the most extensive stands of hardwoods occur on the main north slope and the north sides of minor ridges. Scattered symbols give some conception of how the main age classes are scattered. Reproduction is fairly abundant, but not well distributed. It was entered on the map only where it formed a conspicuous part of the stand. With continued protection and selection cuttings there is no indication of any need for special studies of reproduction.

The cut-over area of 103 acres, being relatively small, about 4 per cent of the whole, would not lessen the value of this tract for experimental use.

The burned areas show covering 110 acres (about 4 per cent) are only the latest ones, those of 1930. These were light fires except on the steep slopes of draws.

No type map of Rock Creek was made, the Survey being confined to random lines, as shown on the contour map. This was done because the experimental use of only a part of Rock Creek is contemplated. A portion of the area having good young growth was selected as the best supplement available for the older stands on Irons Creek.

Observations on soil conditions can be stated briefly, as no systematic sampling was done on either watershed. Irons Creek soil appears to be a reddish-brown clay loam on the tops and on both north and south sides of the lower ridges. The north slope was observed to have less clay and to be more friable than the other situations. All samples were found to be strongly acid to a depth of 2-1/2 feet. On Rock Creek, the surface soil is a light brown sandy loam in the surface foot, more reddish and containing more clay below, having less surface rock than Irons Creek, but acid at all points, and otherwise quite similar to Irons Creek soil.

There are many mineral claims and prospects on the Ouachita National Forest. Most of these are for slate, but no good quality slate has yet been found. It contains small invisible fractures that make it go to pieces very quickly from weathering. No conflicts with prospecting interests are anticipated.

Recreation use of Irons and Rock Creeks had so far been confined to occasional hunting. Having free range, the hunters probably add less to the fire risk than would be the case if certain areas were posted against their trespass.

Collection of Field Data

On the Irons Creek area, temporary sample plots were taken regularly at 20-chain intervals. These were circular quarter-acre plots, 62 in all, thus covering 15-1/2 acres, or about 0.6 per cent of the total area of 2,786 acres.

All pines 4 inches and over, and all hardwoods 10 inches and over were tallied by 2-inch diameter classes. The numbers of all pines under 4 inches were estimated as seedlings less than 3 feet tall or saplings from 3 feet tall to 2.9 inches d.b.h. Numbers of small hardwoods, regardless of condition, falling in the 4 to 10 inch diameter range, were estimated and recorded as poles, although probably not over 10 per cent would be straight and sound enough to be utilized as poles.

No volume estimates were made in the field, but fairly complete measurements were made of trees on each plot. For several pines 6 inches or over in diameter, the following data were recorded by plots: d.b.h., total height (Abney level and tape), age, number of rings in last inch of radius, number of inches of radius in the last ten years, crown class, crown size, and shape of top. A few such measurements, with the exception of heights and crown descriptions, were taken on predominant hardwood species when the plots fall in areas typed as pure hardwood.

On Rock Creek, these data were collected on a more restricted portion of the area, while running the random lines. There, 44 plots (11 acres in all), spaced five chains apart, were recorded in similar manner.

This information, summarized on the following pages, was gathered primarily to aid in judging the suitability of the two areas for experimental forests. For this purpose, stand and site estimates, as compared with similar information for the National Forest as a whole, seem most important. However, the observations were made detailed enough to yield some further comparisons, and accurate enough to be of some value in planning future studies of growth.

The Forest Supervisor (office at Hot Springs, Arkansas) furnished average stand and site figures for the Oden Working Circle as representative of the National Forest as a whole. A comparison of these figures with those obtained on Irons and Rock Creeks is of interest.

Average Stand Comparisons

Table 2 and Figure 1 show how the areas compare as to numbers of trees per acre. The essential facts in the table may be most readily seen in the chart.

Rock Creek has three or four times as many pines per acre in the 4 to 8 inch class as Irons Creek. It also bears over twice as many pine saplings as Irons Creek. The presence of this young growth on the Rock Creek area, much of which came in following hurricane destruction of the previous stand, probably very large accounts for there being an average

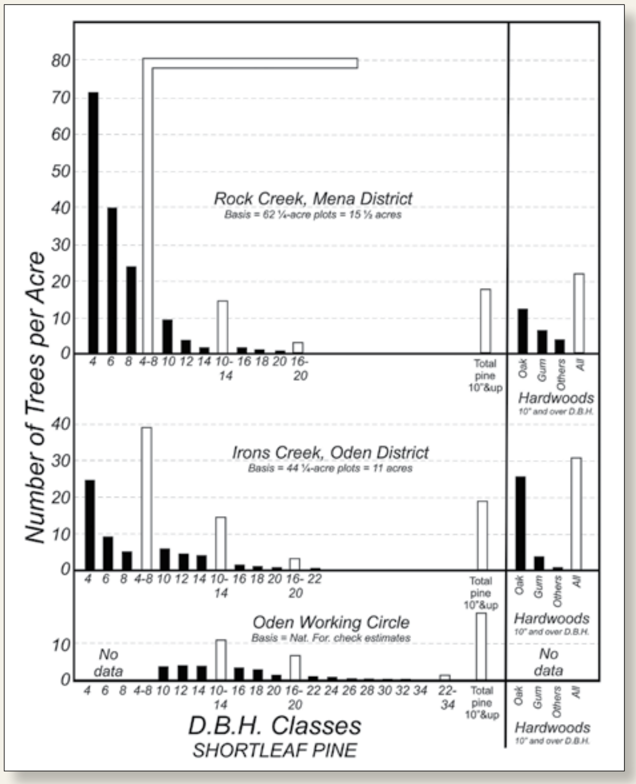


Figure 1. Stand charts, shortleaf pine and hardwoods, Ouachita National Forest.

of less than half as many pine seedlings per acre on Rock Creek as on Irons Creek. In the number of trees 10 inches and over in diameter, the two watersheds both average almost the same as the Oden Working Circle as a whole, about 18 per acre. The main difference in distribution by diameters is that the Oden figures indicate more and larger veteran trees than either of the small watersheds. On the other hand, ten-inch trees are about twice as abundant on Irons Creek and three times as abundant on Rock Creek as in the Oden Working Circle.

Regarding the average number of hardwood trees per acre, no useful comparisons are available. Although the stand table indicates that Irons Creek averages about nine more hardwoods per acre and has twice as much oak timber, this may be ascribed to the use on Rock Creek of random strips picked to represent the pine type rather than the hardwood type. Hardwoods were not adequately sampled on Rock Creek.

So far as the general character and distribution of pine is concerned, Irons Creek appears to be as nearly typical of the National Forest as any single small watershed that could be selected. Rock Creek alone is not typical. If both areas, the headwaters of Irons Creek and a portion of Rock Creek, could be reserved, a fair sample for experimental use would be secured.

SITE CONDITIONS AND RATES OF GROWTH

Site Quality

It would be desirable to have the average site quality of the experimental forest areas correspond closely with that of the National Forest as a whole.

Taking the Oden Working Circle as representative of the forest, the average site index was computed as 47 feet in 50 years. This is an average based on 130 dominant and co-dominate trees less than 100 years old, measured in National Forest check estimates. A similar average for Irons Creek, based on 45 measured trees in 9 scattered plots, is 46.4 feet in 50 years. The figure for Rock Creek, based on 29 trees in 9 plots, is 47.4 feet in 50 years. Variation in site quality is naturally greater over the larger areas. It was not computed for the Oden Working Circle, but for Irons Creek the index for the nine separate plots varied from 35 to 54, with a standard deviation of 6 feet. On Rock Creek, the index ranged from 41 to 51 feet, with a standard deviation of 5 feet.

Although Rock Creek shows a site index one foot greater, with a standard deviation one foot less than Irons Creek, probably the result of sampling a smaller area of slightly better sites, these small differences are not considered significant. The essential point is that in site quality the two areas correspond closely with each other and with the Oden Working Circle as a whole.

Growth Rates and Age Groups

Concerning the shortleaf pine timber only, the stand and site comparisons already made possibly furnish sufficient information for the purpose of selecting a suitable experimental forest area. However, some additional comparisons of the timber were made to show its rates of diameter growth. These studies will be of most use as a basis for further study of tree development, but as they may have some descriptive value here, some of the growth charts are included in this report.

TABLE 2. STAND COMPARISONS
Irons and Rock Creeks compared with the Oden Working Circle, Ouachita National Forest. (Stand Table figures in three forms)

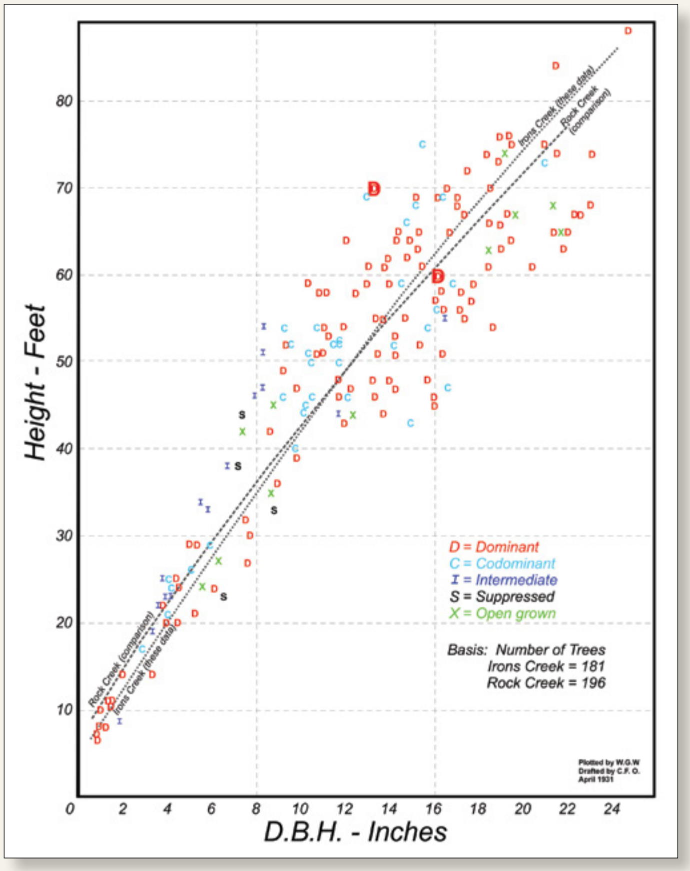
Shortleaf pine by diameters / Hardwoods by species group	Number trees per acre by diameter or species classes			Proportionate distribution by diameter or species classes			Diameter and species classes in terms of distribution on Oden W.C.		
	Irons Creek	Rock Creek	Oden W.C.	Irons Creek	Rock Creek	Oden W.C.	Irons Creek	Rock Creek	Oden W.C.
	------------ No. ------------			-------------- % -------------			-------------- % -------------		
Seedlings under 3'	92.7	49.9	--			--	--	--	--
Saplings 3'H. to 4"D	125.7	292.5	--			--	--	--	--
4" DBH	24.8	71.5	--	63.1	53.0	--	--	--	--
6" DBH	9.3	39.7	--	23.7	29.4	--	--	--	--
8" DBH	5.2	23.8	--	13.2	17.6	--	--	--	--
4-8" DBH	39.3	135.0	--	100.0	100.0	--	--	--	--
10" DBH	6.1	9.4	3.4	31.8	53.7	18.6	179.4	276.5	100.0
12" DBH	4.8	3.6	3.7	25.0	20.6	20.2	129.7	97.3	100.0
14" DBH	4.1	1.8	3.7	21.4	10.3	20.2	110.8	48.6	100.0
10-14" DBH	15.0	14.8	10.8	78.2	84.6	59.0	138.9	137.0	100.0
16" DBH	1.7	1.6	3.2	8.9	9.1	17.5	53.1	50.0	100.0
18" DBH	1.2	0.7	2.3	6.2	4.0	12.5	52.2	30.4	100.0
20" DBH	0.6	0.4	1.0	3.1	2.3	5.5	60.0	40.0	100.0
16-20" DBH	3.5	2.7	6.5	18.2	15.4	35.5	53.8	41.5	100.0
22-34" DBH	0.7	--	1.0	3.6		5.5	70.0		100.0
All pines 10" and up	17.5	18.3	100.0	100.0	100.0	104.9	95.6	100.0	
Hdwds 4-10" and up	34.2	34.4	--						
Hdwds over 10" DBH									
White oak	14.9	9.7	--	48.5	44.5	--	--	--	--
Red oak	10.8	2.4	--	35.2	11.0	--	--	--	--
All oaks	25.7	12.1	--	83.7	55.5	--	--	--	--
Black gum	3.4	4.0	--	11.1	18.3	--	--	--	--
Red gum	0.6	2.0	--	1.9	9.2	--	--	--	--
All gums	4.0	6.0	--	13.0	27.5	--	--	--	--
All oak & gums	29.7	18.1	--	96.7	83.0	--	--	--	--
Other hardwoods	1.0	3.7	--	3.3	17.0	--	--	--	--
All hdwds 10" & up	30.7	21.8	--	100.0	100.0	--	--	--	--

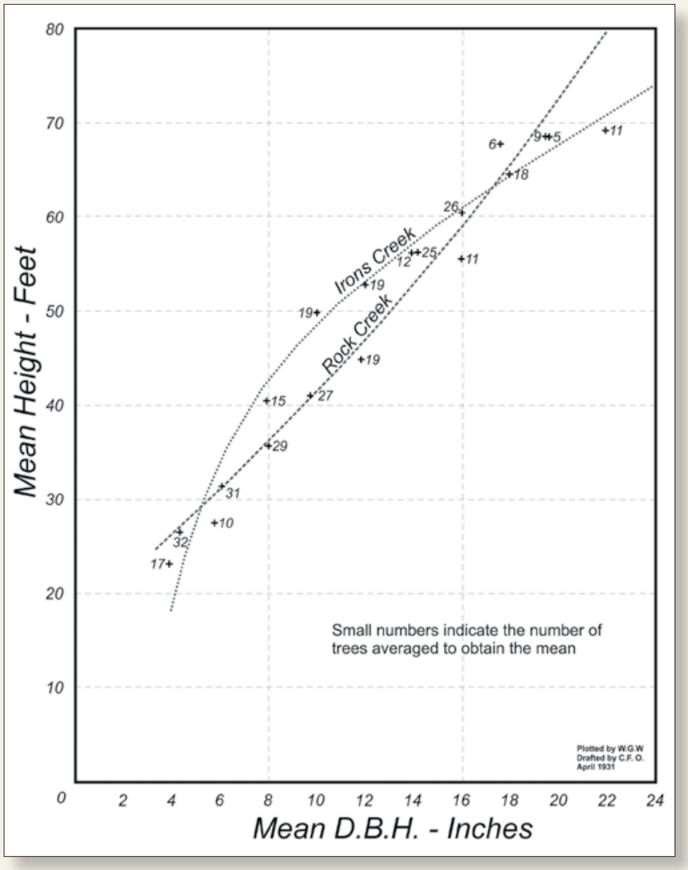
NOTE: Figures for seedlings and saplings are compiled from plot estimates. Other figures for pines on Irons and Rock Creeks are compiled from plot tallies of measured trees. Oden Working Circle data are taken from National Forest check estimates. The number of hardwoods 4-10" D.B.H. is based on estimates. Perhaps only 10 percent of these trees would have any value as poles. Many of the larger hardwoods are also defective.

Figure 2 shows how the individual tree measurements for Irons Creek scatter when height is plotted over diameter. The chart for Rock Creek was so similar that it is not reproduced here. Curves were drawn free-hand for both areas. For comparison, the Rock Creek curve is shown superimposed on the Irons Creek chart. The difference amounts to only a foot or two in height, Rock Creek showing the greater height for small diameters and Irons Creek the greater for the larger diameters. The smaller amount of rock in the surface soil on Rock Creek may account for the apparently more rapid early growth of the dominant stand there, while the later falling off may be due to differences in competition or local fire history.

In placing the curves, slightly greater weight was given to the dominant and co-dominant trees than to other crown classes, because the charts were used in site determination. Somewhat different curves result from the same data averaged by diameter classes, disregarding crown classes. Plotting averages more clearly defines the curves, as shown in Figure 3. Preference was given to this chart in making approximations of volume growth.

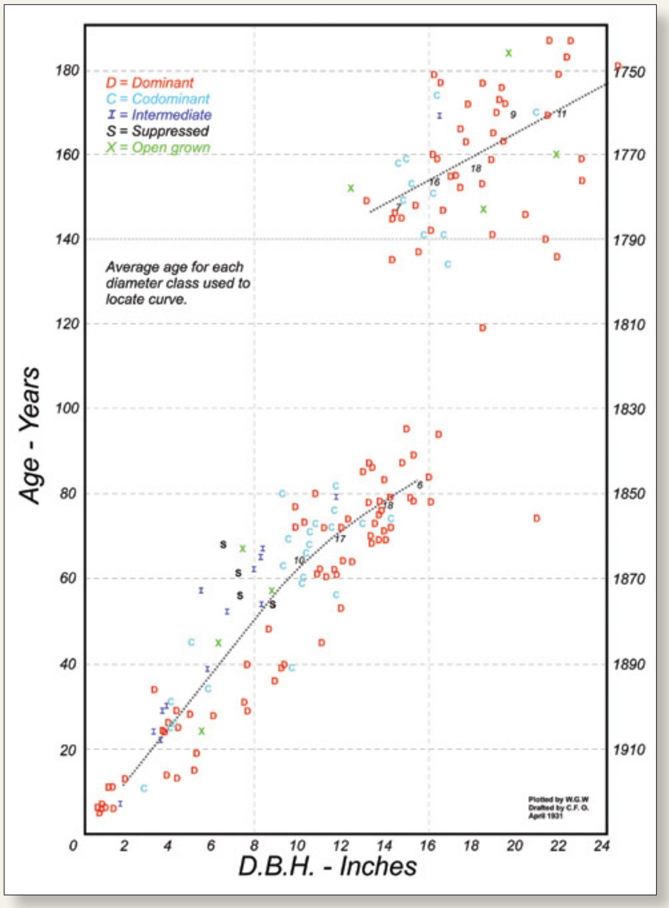
Similar charts were made to show the relation of age to diameter. The most important condition shown in Figures 4 and 5 is the distinct grouping in age classes. Irons Creek shows two age groups, one under 100 years; the other over 130 years. Rock Creek shows three groups by age 0 to 40, 50 to 70, and over 100 years. The age groups are made up of small patches of more or less even-aged stands, especially on Rock Creek. Thus, in Figure 5, no single curve could picture the true condition. Separate curves were not drawn because the two younger groups are so even-aged that existing variations in diameter

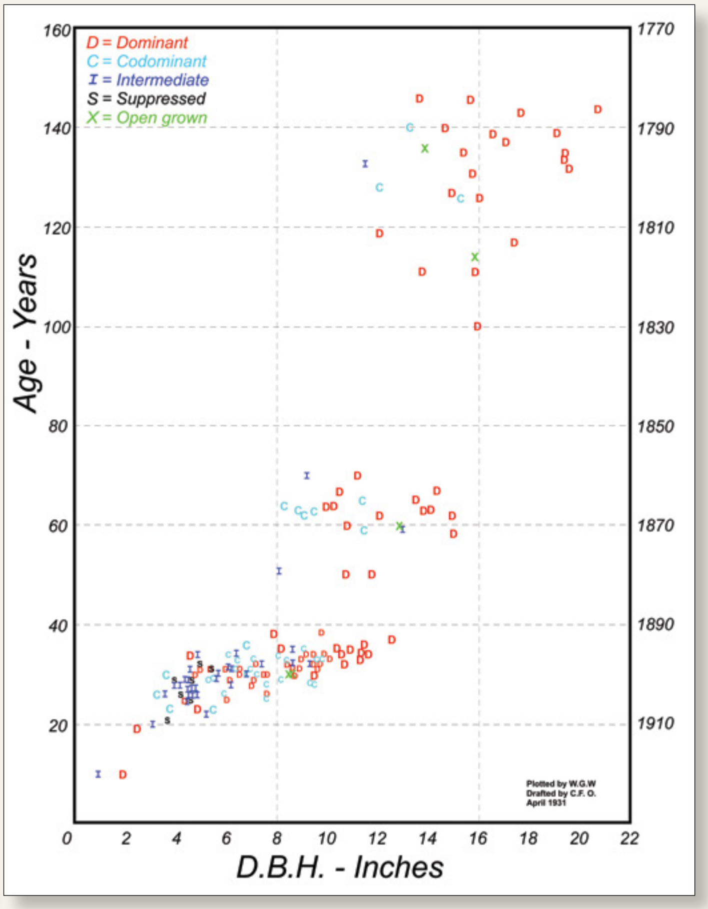




Left: Figure 2. Shortleaf pine height and crown class by d.b.h., Irons Creek, Oden District; and Rock Creek, Mena District, Ouachita National Forest, Arkansas.

Right: Figure 3. Shortleaf pine mean height by d.b.h., Irons Creek, Oden District; and Rock Creek, Mena District, Ouachita National Forest, Arkansas.





Left: Figure 4. Shortleaf pine age and crown class by d.b.h., Irons Creek, Oden District, Ouachita National Forest, Arkansas T1S R28W.

Right: Figure 5. Shortleaf pine age and crown class by d.b.h., Rock Creek, Mena District, Ouachita National Forest, Arkansas T1S R31W.

must be largely attributed to growing conditions rather than age. Forest fires undoubtedly played an important part in separating the age groups, although windfall from hurricane felled many stands. Fire history was studied by counting rings of tree growth fire scars on several of the older trees. Beginning at about the time of the Civil War, when the region was first settled, fires were frequent until about 1926. Fires burning between 1893 and 1926 were severe enough to scar the larger trees and occurred about every 6 years on Irons Creek and every 4 years on Rock Creek on the portions of these areas studied. Fires first started by the pioneer settlers were naturally most destructive because of the accumulated litter fuel and dense stand of young growth. These fires offer a very logical explanation for the existence of a distinct age class over 100 years old. The trees in that age class were large enough to be resistant to fires about 70 years ago. The cumulative effect of the numerous later fires has made the forest very patchy and irregular.

The typically irregular nature of much of the forest is shown in Plate 9. Plates 10 and 11 represent other irregular though better-stocked portions of the virgin forest.

The grouping of age classes was again shown in plotting height over age. Here, again, the points were so scattered that no curves could be drawn except with the help of averages. Then straight-line curves were located for each age group separately. These showed that on Irons Creek, trees about 35 years old grew in height about .6 foot per year, those twice as old .4 foot, and those in the 160-year class nearly .4 foot in height per year. These are averages based on such variable material that they would be useless except in indicating general trends. Rock Creek showed similar, though slightly more rapid height growth.

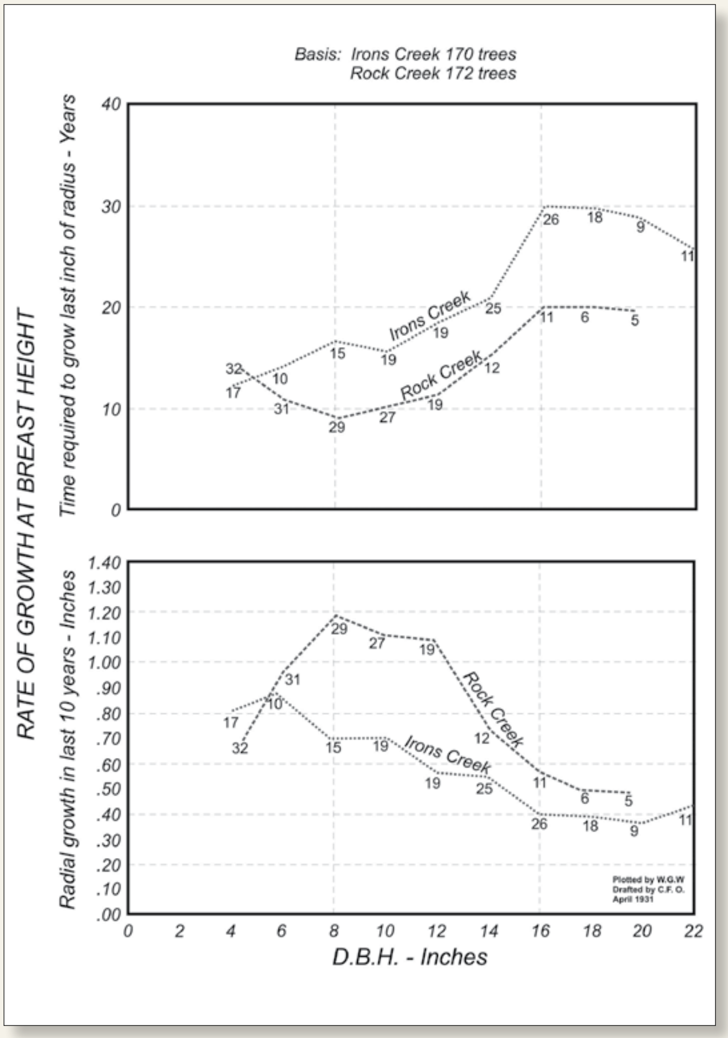
A comparison of the rates of radial growth on the two areas is shown in Figure 6. Apparently, the development from one 2-inch diameter class into the next has required from 5 to 10 years longer on Irons Creek than on Rock Creek.

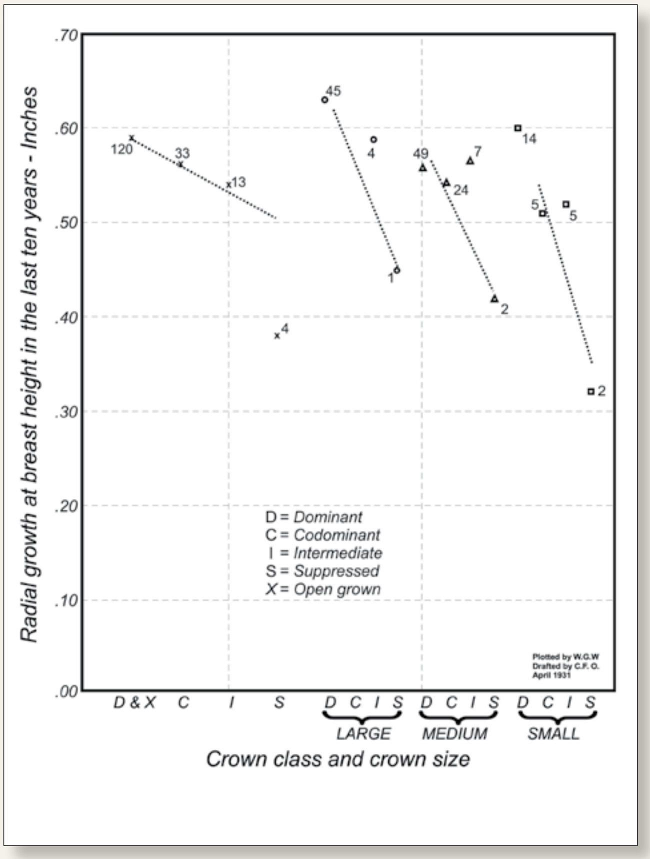
Figure 7 indicates slower radial growth for the inferior and smaller crown classes on Irons Creek.

Although no field estimates of volume were made, rates of volume growth were approximated by the use of the stand tables, growth curves already given, and a local volume table (Table No. 49, made by Jones in 1912).

Lacking data on rates of mortality, it was assumed that each diameter class contained the same number of trees ten years ago as at present. As there probably were more trees in several of the classes at that time, the estimated volume increment may not be sufficiently conservative for some purposes, yet accurate enough for the present description of the areas. The results are given in Table 3.

It may be seen that the volume growth per acre per year as compared to the 38 board feet for the Oden Working Circle as a whole, is only 91 per cent as much for Irons Creek





Left: Figure 6. Shortleaf pine growth rate by d.b.h., Irons Creek, Oden District; and Rock Creek, Mena District, Ouachita National Forest, Arkansas.

Right: Figure 7. Shortleaf pine radial growth by crown class and size, Irons Creek, Oden District, Ouachita National Forest, Arkansas. T1S R28W. Basis: 170 trees.

and 75 per cent as much for Rock Creek. This is largely due to fewer trees per acre, rather than site differences. Comparing the stand per acre in board feet with the Oden Working Circle, Irons Creek has about two-thirds and Rock Creek has one-third as much volume. This is gross volume, no deduction having been made for defect.

TABLE 3. APPROXIMATION OF VOLUME GROWTH
Based on stand tables, radial growth studies, and Jones volume table (No. 49), made in 1912, Ouachita National Forest.

PRESENT TIME					TEN YEARS AGO				VOLUME GROWTH		
DBH Class	Av. Ht. from curve	Av. vol. from v.table curves	Av. No. trees per A.	Av. Vol. per acre	Ave. DBH	Av. Ht. from curve	Av. vol. from v.table curves	Av. volume per A.	10 years	1 year	Per cent of Oden growth
in.	ft.	bd.ft.	No.	bd.ft.	in.	ft.	bd.ft.	bd.ft.	bd.ft.	bd.ft.	%
IRONS CREEK T 1 S, R 28 W, Oden District											
12	53.0	76.0	4.8	364.8	10.9	50.5	60	288.0	76.8		
14	57.0	121.0	4.1	496.1	12.9	54.8	97	397.7	98.4		
16	60.7	183.0	1.7	311.1	15.2	59.3	153	260.1	51.0		
18	64.3	271.0	1.2	325.2	17.2	62.9	233	279.6	45.6		
20	67.6	378.0	0.6	226.8	19.2	66.3	330	198.0	28.8		
22	70.7	515.0	0.7	360.5	21.2	69.6	457	319.9	40.6		
								1743.3	341.2	34.1	90.7
ROCK CREEK T 1 S, R 31 W, Mena District											
12	46.6	63.0	3.6	226.8	9.8	40.7	(37)	(133.2)	(93.6)		
14	52.5	107.5	1.8	193.5	12.6	48.5	78	140.4	53.1		
16	58.7	175.0	1.6	280.0	14.9	55.3	133	212.8	67.2		
18	65.2	276.0	0.7	193.2	17.0	60.8	219	153.3	39.9		
20	72.1	414.0	0.4	165.6	19.0	68.6	339	135.6	30.0		
								775.3	283.8	28.4	75.4
ODEN WORKING CIRCLE National Forest Check Estimates											
12	53.0	76.0	3.7	281.2	11.0	50.7	61	225.7	55.5		
14	57.0	121.0	3.7	447.7	12.9	54.8	97	358.9	88.8		
16	60.7	183.0	3.2	585.6	15.2	59.3	153	489.6	96.0		
18	64.3	271.0	2.3	623.3	17.4	63.3	242	556.6	67.7		
20	67.6	378.0	1.0	378.0	19.3	66.5	337	337.0	41.0		
22	70.7	515.0	0.5	257.5	21.3	69.7	464	232.0	25.5		
24	73.9	669.0	0.3	200.7	23.5	73.2	662	198.6	2.1		
								2398.4	376.6	37.7	100.0

NOTE: As the demonstration of results of practical forest management as a whole is not contemplated, the area will not necessarily be managed on a sustained yield basis, although the use of timber should be conservative. The withdrawal of three or four thousand acres for management by the experimental station should not noticeably interfere with local National Forest administration.



Left: Plate 9. Old field stand of shortleaf pine 50 feet high in 39 years near Cold Springs road, Scott County, Arkansas. The sample plot method of study is well adapted to stands of this kind, because they are pure, even-aged, regular, and well stocked. Comparable plots of relatively small size can often be installed. Unfortunately, such stands are not typical of any extensive areas in private ownership and are seldom found within the present boundaries of the Ouachita National Forest.

Center: Plate 10. Young mature stand of shortleaf pine showing group character of stand, Rock Creek, Ouachita National Forest. This picture illustrates a common condition on the Ouachita. Here, in order to clarify the proper policy in marking trees for cutting, the trees must be studied individually and in relation to small groups rather than in stands. The ordinary sample plot method is not well adapted to such a study.

Right: Plate 11. An even-aged stand of shortleaf pine, Irons Creek, Ouachita National Forest. Man boring tree 10.5 inches d.b.h, 48 feet tall and 70 years old. Here, there are 292 pines per acre ranging from 4 to 14 inches in diameter and 20 hardwoods from 10 to 14 inches in diameter. Although such stands exist over relatively small areas, studies of methods of commercial thinning by the sample plot method would be advisable in stands of this kind before many years have passed.

PURPOSES TO BE SERVED BY THE EXPERIMENTAL FOREST

The primary purpose of setting aside an experimental forest area on the Ouachita National Forest is to provide a place for the more intensive or long-time silvicultural studies that can be advantageously concentrated on a representative area.

The following list of silvicultural problems include those on which the Southern Station should work, either alone or in cooperation with the administrative organizations. They have been listed roughly in order as judged by their importance, urgency, and feasibility of obtaining results without excessive cost.

1. Mixed Type (Shortleaf-hardwoods)

Silvicultural improvement and liberation cuttings (m)

a. Girdling and poisoning of hardwoods, cleaning, thinning. Growth of pine following release from hardwoods (ME)
b. Accelerated growth study.

2. Second-growth pine, including young mature stands

Thinning (and pruning) (Mt)

a. Commercial Thinnings (5 inches d.b.h. and over)
b. mprovement Thinnings Methods of cutting young mature groups (Mc)

c. Tree classification (variation in growth rate as related to conspicuous characteristics, similar to Dunning's method of classification in California)
d. Accelerated growth study (on old sale areas)
e. Sample plot study of cutting in fully-stocked groups
f. Treatment of slow-growing understocked stands Rate of restocking of cut-over areas and old fields (Mr) Growth of understocked stands of different densities (ME) Fire injury (Pf)

3. Old Virgin Pine

Condition of residual stand (and volume per acre) (Me)
a. Tree classification as related to growth
b. Tree classification as related to seed production
c. Tree classification as related to mortality
d. Accuracy of strip estimates
e. Slash disposal

4. Hardwoods

Growth and reproduction of white oak (ME-Mr)
Utilization of inferior species (Mu)

The problems of the mixed type are placed first because so little is known at present of the relation between the pine and hardwoods in the mixed stands, where hardwoods are abundant, and in the pine stands, where there are also many hardwood trees. Second-growth problems are given precedence over virgin timber problems because their importance is increasing, and because the study of virgin timber, though important, has relatively more complications that might delay the accumulation of useful information until the need for it is largely past. Hardwood studies are placed last because they have such small value at present and promise so little in the near future.

The order of importance of projects listed under these headings is less clear. For instance, the Ouachita Forest might wish to see a study of fire damage at the top of the list. A thorough economic study on which to base the distribution of protection funds would be valuable, but is not contemplated by the Station. The idea of tree classification is made prominent for both virgin and merchantable second-growth, because it would appear to be better suited to the conditions than the usual sample plot method. Yet, it may be of limited value, and should be dropped unless a fairly clear and simple scheme like Dunning's can be devised.

The list, therefore, is tentative. It is given only to show our present conception of the silvicultural studies deserving attention during the next few years. Obviously, many of these problems could not be satisfactorily solved on any single or limited area. Photographs included with this report illustrate some of the material available for the study of these problems. Accompanying Plates 8 to 16 are some comments on problems and methods.

ADVANTAGES AND LIMITATIONS OF IRONS AND ROCK CREEKS

Briefly, the area on the headwaters of Irons Creek has these advantages:

1. It is believed to be as representative of the Ouachita Forest as a whole as any other single readily-accessible area of its size available.
2. It is nearly as accessible as could be expected of any such area, and will become more so with the consummation of present road construction plans.

3. It is well protected according to the present status of protection facilities for the National Forest. The area is surrounded by Government-owned land and is within two miles of a fire lookout tower. Protection can be improved by construction of a motor way on the ridge of the north boundary.
4. The size of the area, 2,786 acres, is sufficient to provide material for many desirable studies without undue cost or interference with National Forest administration.

Its limitations for the purpose must not be overlooked, even though most of them are common to any area than could be selected.

No one area can be typical of such varied conditions as exist on the Ouachita. Many experiments should not be concentrated on any one area, as to do so would make the results of very limited value in practice.

5. Very few areas on a forest so irregular as the Ouachita lend themselves to studies by the permanent sample plot method. Great difficulty in sample plot work is anticipated on Irons Creek. Sample plots of a size that are economical to handle can not deal with average conditions. They can only be applied to the relatively small and more uniform portions of the stand.
6. Irons Creek has very little young pole-sized timber—not enough for experiments.

Rock Creek is readily accessible and is so located as to receive better than average protection, but is not sufficiently representative of the National Forest to serve, by itself, as an experimental forest area. In conjunction with Irons Creek, it can be worked from the same headquarters, and it possesses just one outstanding feature of value. It has some of the small pole-sized stands in which Irons Creek is so deficient. A small area of five or six hundred acres within the watershed would be sufficient to fulfill this supplementary purpose. For administrative convenience, it might be advisable to reserve a larger area with more definite topographic boundaries. Such an area might include the 1785 acres at the headwaters of the drainage and shown on the contour map within Sections 22, 23, 25, 26, and 27.

CONCLUSION

These 1785 acres on Rock Creek, together with the 2786 acres on Irons Creek (as shown on the type map), or 4571 acres in all, are the best material we have yet been able to locate for an experimental forest on the Ouachita.

The proposed program of studies does not fit the material available well enough to insure that the bulk of the timber on the proposed experimental forests, is reserved, would be used for a considerable time, possibly resulting in deterioration on Irons Creek. Perhaps such a relatively small economic waste could be tolerated for the sake of research, yet it is doubtful if reservation of the proposed experimental forests could be justified where so few studies could be concentrated advantageously upon them.

By concentrating our research work on the Ouachita Forest at one or more centers, it may be possible to group together enough of our studies to justify the formal establishment of an experimental forest at a later date. Until this concentration proves to be practicable, it is recommended that final decision as to the reservation of an experimental forest on the Ouachita National Forest be deferred. (plate.12,13,14,15,16)

Top left: Plate 12. Stand of shortleaf pine timber on private land adjacent to the Ouachita National Forest. Man boring into tree 67 years old, d.b.h. 11.2 inches, height 61 feet, Irons Creek. Some such stands as this are being added to the national forest in the present program of acquisition. However, much of the land being acquired is less fully stocked because of frequent fires and long abuse.

Top right: Plate 13. Mature and over-mature stand of shortleaf pine showing typical flat top tree in the foreground, 19.4 inches d.b.h, and 53 feet high, and a 2-log tree rotten in the center, Irons Creek, Ouachita National Forest. These are 2 to 4-log trees averaging about 3 logs. Total heights probably range from 45 to 85 feet. Thirty-three pines from 8 to 26 inches in diameter and one 10-inch black gum were tallied on an acre. Permanent sample plots in such stands as this would be of most value in a study of the normal rates of mortality over a period of years. Such information is needed by the national forest in order to judge the effect of withholding mature and over-mature trees because of relative inaccessibility of stands, the desire to maintain cover, or "fire insurance" seed trees, or for the purpose of spreading the allowable cut over the period required to bring the growing stock of the forest to normal.

Right: Plate 14. Stand of young mature shortleaf pine lightly cut over 10 to 12 years ago showing good reproduction. Tree on the right: 119 years old grew 0.6 inch in the last 10 years and 0.18 inch in the previous decade. Tree in the center has 2 ½ logs to 8-inch top, total height 55 feet, age 121 years, growth 1.55 inches in 10 years following cutting and 0.5 inch in the decade before cutting, Rock Creek, Polk County, Ouachita National Forest. This situation suggests the possibility of learning something of the conditions under which accelerated growth may be expected after cutting by a study of old timber sale areas. In few, if any, situations on the Ouachita National Forest are there any acute problems in securing adequate natural reproduction. On the other hand, the problem of handling over-stocked stands of reproduction is becoming evident. See Plates 12, 20, and 21.[1]

[1] Only Plates 1 through 16 are in the original report copies we have. The other plates may have been deleted from the submitted report and the captions not corrected.

Left: Plate 15. Stand of small poles on Irons Creek. Man measuring tree 5 inches d.b.h., 32 years old, and 32 feet high. This stand is typical of many on the Cold Springs District, Ouachita National Forest, which are scarce on Irons Creek. This patch covers only about 1/10 acre. Such stands large enough for thinning plots have not been found on Irons Creek.

Right: Plate 16. Pole stand of shortleaf pine that has come in since cutting. Note stump near man in picture and large tree in foreground. Age of average dominant tree: 20 years; 4,000 trees per acre, Rock Creek, Ouachita National Forest, Arkansas. Stands like this and those shown in Plates 19 and 20 are common in some districts on the Ouachita National Forest. A study of growth rates and possible thinnings in such stands would be well worthwhile.

APPENDIX A
Follow-up report written by Wahlenberg

PROGRESS REPORT ON THE LOCATION OF AN EXPERIMENTAL FOREST IN THE OUACHITA MOUNTAIN REGION

by

W.G. Wahlenberg

June 17, 1931 This memorandum supplements the report of April 25, 1931 which gave the details of the first trip. Wahlenberg and Heyward have since spent thirteen days (May 18 to 30) on the Ouachita National Forest in starting tree classification work. At this time no more watersheds were examined specifically from the viewpoint of possible reservation for experimental use, but the trip afforded the opportunity for further observation of local conditions and discussion on the ground with Messrs. Demmon, Shaw, Hartman, Ochsner, and Paddock. Thus, although we have few new data at this time, it seems worth while to reiterate some of the thoughts expressed in the first report, bringing them up to date in an effort to crystallize our ideas.[12]

ORIGINAL OBJECTIVES

We set out to find a small watershed suitable for an experimental forest. Such a topographic unit was sought in preference to one designated by arbitrary boundaries or legal subdivisions, not only because it would facilitate special protection measures and logging operations, but also for the purpose of getting samples of all important conditions close together. If adequate samples of the desired conditions could be had on one reasonably small drainage, it would be ideal. Accordingly, we searched only for suitable watersheds.

The relative suitabilities of ten watersheds were compared as to character of timber sites and stands, accessibility, protection, and size. The last three points were relatively easy to judge, but suitable character involved many considerations. Presumably an experimental forest should be typical, or at least fairly representative, of the National Forest or general region it is to serve. This region comprises about two million acres of which 80 to 90 per cent will probably be publicly owned. Most of it is already within National Forest purchase boundaries where title to the land is steadily being acquired by the government. In looking for an experimental forest we kept in mind a small watershed which would represent (1) the principal conditions affecting timber growth, such as various aspects, slopes, exposures, soils, etc.—forest sites in the broadest sense—and (2) stands not too far above average stocking that would lend themselves to experimental treatment—that is sufficiently uniform in some places to permit finding fairly comparable experimental plots—while in other places providing samples of different conditions such as cut over land and recent burns. We hoped to include virgin shortleaf stands suitable for a study of methods of cutting by the usual sample plot method.

More attention was paid to virgin shortleaf pine than to pine second growth or hardwoods.

[12] There are some new names mentioned in this supplemental progress report. Heyward is probably Frank D. Heyward, who specialized in forest soils with the Southern Forest Experiment Station before moving on to other positions in Georgia and Louisiana. E.L. Demmon was the station director at this time; and Shaw, Hartman, and Paddock were not mentioned in Wakeley and Barnett (2011).

RESULT OF THE FIRST TRIP

Comparison of the ten apparently most promising watersheds revealed none suitable for the purpose. The hope of finding something really typical of a large area was abandoned, but it was hoped to find a fairly representative area, and one which was well stocked with virgin shortleaf pine, at least in part, so that sample plot studies could be made. In this, too, we were disappointed. All of the areas had only very irregular virgin stands of pine, none of the them suitable for studies of cutting by the customary sample plot method. The application of this method to average virgin conditions, of course, would not be utterly impossible, but the cost would be prohibitive because of the necessity for very large plots.

In this work no intensive study of reproduction is contemplated. The survey of Irons Creek indicated a sufficient number of seedlings and saplings already on the ground as advanced reproduction to make a satisfactory stand (see table 2 of the first report) provided they were well distributed. Further analysis of the data from this survey shows that the distribution is not sufficiently regular now (see table A.1 of this report), but reproduction in adequate amounts may well be expected to follow conservative cutting and silvicultural improvement work.

Table A.1. Distribution of advanced reproduction of shortleaf pine (up to 4" d.b.h.) and hardwoods (between 4" and 10" d.b.h.)

Cover type or general aspect	Shortleaf seedlings (0' to 3' high) per acre:			Shortleaf saplings (over 3' and under 4" d.b.h.) per acre:			No advanced pine repro-duction	Pine seedlings or saplings or both	Hardwoods 4" to 10" d.b.h. per acre		Basis: Number of ¼ acre plots
	None	0-200	Over 200	None	0-200	Over 200			Range	Ave. No.	
	%	%	%	%	%	%	%	%	No.	No.	No.
Shortleaf	29	50	21	38	38	24	21	79	0-180	32	34
Mixed	9	91	0	9	73	18	0	100	12-124	48	11
Hardwood	36	64	0	36	57	7	29	71	0-100	36	14
Northerly	29	63	8	29	54	17	21	79	0-100	32	24
Southerly	27	55	18	36	50	14	14	86	0-180	48	22
Flat	30	70	0	20	50	30	10	90	8-100	40	10
All plots	27	61	12	32	49	19	19	81	0-180	40	59

Estimated stand per acre based on counts on each of 59 quarter acre plots. Percentage of total plots having specified stand is shown. Irons Creek, T. 1 S, R. 28 W., Ouachita National Forest, Arkansas.

There is need for a survey of old sale areas, where the history is known, to show the extent and distribution of reproduction following cutting, but this can best be done extensively using temporary plots. The "stocked quadrat" method advocated by Haig (Jour. For., Vol. 29, No. 5, May 1931)[13] would be very suitable for this purpose. Because many areas have been satisfactorily restocked regardless of variations in methods of conservative cutting, the reproduction phase of methods-of-cutting studies on the Ouachita is considered much less important than the study of growth of the residual stand. Growth studies in remnants of the virgin pine stands also can best be made by the extensive examination of temporary plots or by the use of a classification of individual trees (similar to Dunning's, J.A.R. 36-9, 1928).[14] How we were forced to these conclusions can best be

[13] Haig, I.T. 1931. The stocked-quadrat method of sampling reproduction stands. Journal of Forestry. 29(5): 747–749.

[14] Dunning, D. 1928. A tree classification for the selection forests of the Sierra Nevada. Journal of Agricultural Research. 36(9): 755–771.

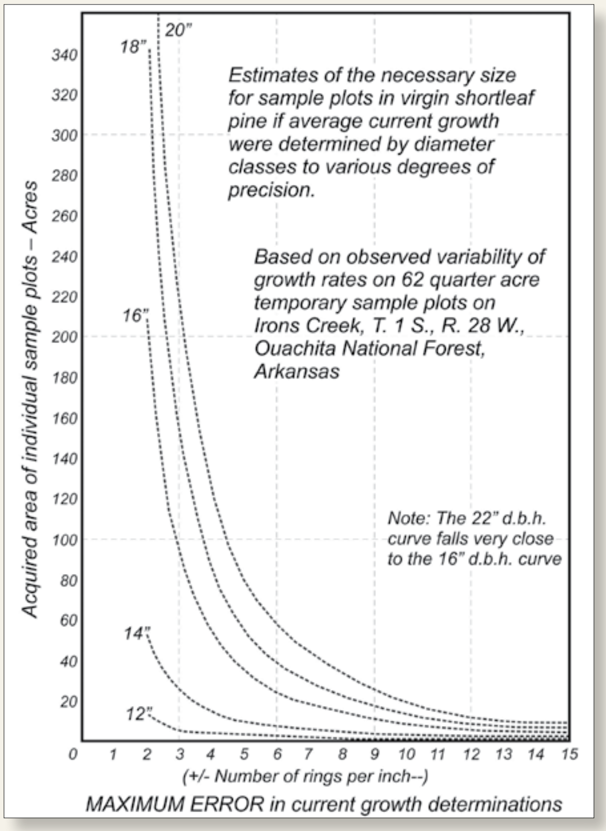


Figure A.1 Sample plot size estimation for virgin shortleaf pine based on diameter.

shown by a statistical analysis of the size of plots needed were we to attempt to study average virgin pine conditions by the permanent plot method. Irons Creek, at the head of Posey Hollow, is as nearly average as any area found. Here growth data were taken on 15½ acres contained in 62 quarter acre plots scattered regularly 20 chains apart over 2786 acres. The variability of current growth, as shown by the number of rings in the last inch of radius, was analyzed to show the number of trees needed in each diameter class in order to get results reliable within specified limits of accuracy. Then the average area which would have to be included in a plot to provide the required number of trees was computed from the general stand table (Table 2 of the first report) for the same tract. The method is shown in table A.2, and the results in table A.3, and figure A.1.

Table A.2. Illustration of method of estimating the necessary size of sample plots if the growth of virgin shortleaf pine is to be studied under average conditions on the Ouachita National Forest.

D.B.H. Class	Average number of trees per acre	Mean current growth --- No. of rings in last inch	Standard deviation (σ)	Standard error (S.E.) for Max. error of ± 2 rings. S.E. = M.E./3	Number of trees required $n = \sigma^2/(S.E.)^2$	Number of acres needed per plot
In.	Trees	Rings	Rings	Rings	Trees	Acres
12	4.8	18.5	5.25	0.6667	62	13
14	4.1	20.8	9.82	0.6667	217	53
16	1.7	29.8	12.60	0.6667	357	210
18	1.2	29.8	13.52	0.6667	411	343
20	0.6	28.7	11.43	0.6667	294	490
22	0.7	25.6	8.05	0.6667	146	208

Basis: Average stand table and variability in current growth as measured on 62 quarter acre temporary plots on Irons Creek, T. 1 S., R. 28 W.

Table A.3. Estimates of the number of trees and size of plots needed (before cutting) to yield average current growth data reliable within set limits of maximum error expressed in numbers of rings in last radial inch.

D.B.H. Class	Max E. = ± 2		Max. E. = ± 3		Max. E. = ± 5		Max. E. = ± 10		Max. E. = ± 15	
	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres
12	62	13	28	6	10	2	2	1	1	¼
14	217	53	96	24	35	8	9	2	4	1
16	357	210	159	93	57	33	14	8	6	4
18	411	343	183	152	65	55	13	14	7	6
20	294	490	131	218	47	78	12	20	5	9
22	146	208	65	93	23	33	6	8	3	4

These estimates show that the idea of applying different methods of cutting on different forty-acre tracts and keeping close records of results on only a ten-acre permanent plot within each forty would be useless. Errors in current growth averages could easily amount to 30% for the diameter classes with which we are most concerned (10” to 20” d.b.h.). The estimates, too, are conservative because they are based on the stand before cutting. Thus they are bare minima and would have to be increased to allow for the reduced stocking of residual stands. Manifestly we cannot have several hundred acres in each plot and keep accurate records on each tree as these estimates would seem to indicate.

It might be contended that if we disregard diameter classes and simply take a sample of the stand as a whole as a basis of comparison of different cutting methods, significant contrasts in subsequent total growth of whole plots might be determined. Possibly this could be done, but the results would be useless, as variation in stands is too great to permit application of such results elsewhere on the Forest.

Irregularity in virgin stands is obviously too great to permit the use of customary permanent plots for the study of average growth conditions. The method might be applied in a limited way to better stocked portions of young mature stands, but in most places there are small groups of virgin trees which could be more effectively handled on the basis of individual tree classification. Our first report gave a detailed description of Irons and Rock Creeks as possible experimental areas. At that time virgin timber was regarded as the main problem and we were still hoping to find a fairly typical area. Irons Creek was given most consideration because of the nature of its virgin stands. Rock Creek was selected as a convenient small watershed well stocked with small second growth. Now Irons Creek appears somewhat less suitable because relatively less importance is attached to the problem of the original stands. Rock Creek is not favored because other areas more suitable for studies in second growth, though not watershed units, have since been found.

Our failure to find a suitable area may be attributed in part to setting up too high ideals and hopes. It was also very largely due to an inadequate picture of local conditions to start with and a vague conception of the real problems and their relative importance. In lowering our sights we must also decide where to aim.

REVISED OBJECTIVES

A single experimental forest of less than 5000 acres in the Ouachita Mountain region cannot be expected to be fully representative of all the conditions with which local forest management must contend. Small areas suitable for useful experiments may be more easily selected if we abandon the idea of a topographic unit.

It would seem also that too much emphasis has been placed on the problems of virgin timber which will probably be largely cut out in about fifteen years. The needed information on rotation age, mortality, etc. can be had from temporary plots and a few long strips permanently marked for repeated observations. If such work, together with an attempt to clarify marking rules by means of tree classification, is all that needs to be done in virgin timber, no experimental areas need be specifically set aside for the purpose. It would be better to scatter the work on different parts of the forest. Such action would also fit in better with the ideas of administrative officers of the Ouachita.

Too little emphasis has been placed on the problems of second growth which is becoming conspicuous as advanced reproduction in many places. Improvement thinnings in sapling stands are badly needed. The technique has not been worked out, although practice has already begun under provisions of the Knudson Law[15] which provides for the investment of a portion of timber sale receipts for silvicultural improvement of cutting areas. Commercial thinning of young mature timber of hurricane origin also needs investigation.

Methods of making these intermediate cuttings should be worked out in relatively uniform even-aged stands of young timber by the establishment of permanent sample plots. The results should be useful in National Forest timber sale practice where small groups and clumps of similar stands are encountered.

The problems of the mixed type, though difficult to study, rank high in importance because so little is known of the interrelationship of pine and the hardwoods, and because the mixture is so extensive. Experiments to learn how to get rid of the present generation of worthless hardwood are underway. Successful control of the mixture should be followed by studies of accelerated growth in the pines released.

The list of problems in the first report (Apr. 25, 1931, pp. 34-35) is tentative. Criticism by the National Forest and Regional Office is invited. The sooner this program can be crystalized, the earlier it will be to select a suitable area, if one is desired and if it can be found at all.

The possibility of having a natural area reserved in connection with the experimental forest has been considered although no areas have been reported upon with this specific use in mind. Wahlenberg plans to give it some attention on his next trip to Arkansas.

It would seem best to reserve as a natural area some tract having a particularly well stocked stand of virgin pine. The more nearly average virgin stands on the Ouachita Forest are too badly understocked, too irregular, too defective, and too sad a remnant of abuse to be worthy of preservation. At least one relatively good stand of shortleaf should be set aside.

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[15] Actually the Knudson-Vandenberg (K-V) Act of 1930 established a trust fund to take a portion of timber sale receipts and reinvest them into the various activities in the timber sale area, including reforestation, wildlife habitat improvement, fuels reduction, noxious weed treatments, road improvements, and more.

Since hardwoods are a permanent part of the forest, the selection of a natural area should not disregard them. To be of most interest to botanists and ecologists, a natural area should not be "average" in this regard either.

Preferably it should include a large number of hardwoods species. Assuming that it may be possible to find a small natural area where past fires have been relatively infrequent, it might be well worth protection and reservation in order to illustrate the course of plant succession under conditions of less flagrant abuse.

These two objectives in the selection of natural areas would be difficult to combine in the same tract or with an experimental forest on the Ouachita. It would be better to have separate small areas, one in pure pine, the other in pure hardwood, and possibly a third in the mixed type. The last would be for the observation of the ecological relationship of pine and hardwood. As its qualifications would be less exacting, it could probably be taken adjacent to an experimental area, if one is selected.

The possibility of locating a suitable area for an experimental forest outside the National Forest purchase boundaries has not been seriously considered. From a protection standpoint it would be much better to keep the experiments inside. Much of the land outside has been cut over, or, being held for that purpose, is not for sale. Further inquiry into the situation should be made however, together with a last attempt to locate an area inside the national forest.

PROCEDURE

A trip to the Ouachita region is planned for the fall of 1931. As a last chance in locating an experimental area it is planned to view the forest from lookout towers or from an airplane, or both, following up any new prospects.

Inquire into the possibility of finding a suitable area outside.

Examine possible natural areas.

Revisit different districts, in company with local forest officers whenever possible, to locate suitable areas for carrying on our work with or without an experimental forest.

Proceed with a study of tree classes.

APPENDIX B
Correspondence between E.N. Munns and E.L. Demmon

R – SS May 20, 1932.
Branch Stations
Experimental Forests
Ouachita

Director,
Southern Forest Experiment Station, New Orleans, La.

Dear Demmon: I recently had a talk with Mr. Evans, of Forest Management in Region 7, concerning the possibility of an experimental forest on the Ouachita. Frankly, he and I are greatly disappointed in the fact that the Station has not been able so far to determine upon a suitable area. I very much hope that the selection of such an area will not be too long delayed. What are the Station's plans for a further consideration of the Ouachita? Do you contemplate soon making a further study on the ground, or is it your intention to let matter slide for the time being? I am asking because it may be that if a party is in Arkansas a month from now I might be able to go over some of the areas with you.

Very sincerely yours,
[signed] E.N. Munns
Chief,
Division of Silvics

R – SS
Branch Stations
Experimental Forests
Ouachita

May 27, 1932.

Assistant Forester,
Branch of Research, U. S. Forest Service, Washington, D. C.

Dear Sir: Reference is made to Mr. Munns' letter of May 20th relative to the establishment of an experimental forest on the Ouachita National Forest. One reason for the extended delay in selection of an experimental forest on the Ouachita Forest has been on account of the press of other work which seemed to us to take precedence. We have advised you of the consideration which was given the matter by Wahlenberg as a result of two special trips to the Ouachita Forest for that particular purpose. The results of those trips were contained in Wahlenberg's memoranda dated April 25, 1931 and June 17, 1931. Copies of Wahlenberg's memoranda were forwarded to Region 7 and we had hoped to have the benefit of their comments and criticisms, particularly on the tentative list of projects which, in our opinion, seemed to offer possibilities for intensive research. These suggestions are listed on pages 33 to 35 of Mr. Wahlenberg's memorandum dated April 25, 1931 (designated R – SS Supervision). We had not contemplated further consideration of work on the Ouachita until some time later on in the year. However, if it is possible for Mr. Munns to visit the Ouachita some time in the near future, we will make arrangements to spend a little time with him on the ground, discussing the possibilities of locating a suitable experimental forest area and at the same time conferring with the Administrative men. We would plan on having Wahlenberg and Bull[16] there at that time and I will plan to be there at the same time. We would appreciate it if we could have a little more definite information as to just when Mr. Munns could meet us in Arkansas. We could then make our plans accordingly.

Very truly yours,
Director

[16] Bull is Henry "Hank" Bull, who is described by Wakeley and Barnett (2011) as a specialist in pine thinnings who also worked in hardwood silviculture and dendrology with the Southern Forest Experiment Station.

R – SS
Branch Stations
Experimental Forests
Ouachita

June 4, 1932.

Director,
Southern Forest Experiment Station, New Orleans, La.

Dear Demmon: In reply to your letter of May 27: I have already furnished you with comments on Wahlenberg's memorandum of April 25, 1931. I do not believe I commented upon the tentative list of projects on pages 33-35. My feeling is that this proposed work does not constitute a series of projects as we look upon them, but a series of minor studies. My criticism of this proposed work is that it is not definitely tied together to make a comprehensive attack upon the big silvicultural problems of this Arkansas section. Wahlenberg's argument against the two areas with which his report chiefly deals, is unconvincing because I feel confident that sample plot work not only will be possible but is highly necessary in the uneven-aged and ragged forest such as is depicted in the series of photographs he includes. I shall let you know as soon as plans have matured whether it will be possible for me to participate in a trip to the Ouachita this summer.

Very sincerely yours,
[signed] E.N. Munns
Chief,
Division of Silvics

A Confidential Case Study on the Selective Logging Options for the Virgin Pine Forests of the Crossett Lumber Company

A.E. Wackerman and Don C. Bragg

A.E. Wackerman (deceased), formerly Forester, U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station, New Orleans, LA 70113.

Don C. Bragg, Project Leader and Research Forester, U.S. Department of Agriculture, Forest Service, Southern Research Station, Monticello, AR 71655

PREFACE

A.E. (Albert Edward) Wackerman—also known as "Wack"—played a significant role in the development of sustainable forestry in the Southern United States. A native of Cleveland, OH, and educated at the University of Minnesota and Yale University, Wackerman worked for a few years with the U.S. Department of Agriculture Forest Service, Lake States Forest Experiment Station before accepting a job as the Crossett Lumber Company's second professional forester in 1927 (Bragg 2012). For the next 5 years, Wackerman helped the company develop strategies to make the transition from exploitive lumbering to sustainable forestry.

Left: Image of A.E. "Wack" Wackerman, probably taken in the early 1930s in southern Arkansas.

Right: This example of the "high quality" virgin shortleaf (*Pinus echinata*) and loblolly (*Pinus taeda*) pines was once widespread on the lands of the Crossett Lumber Company, but by the early 1930s had become scarce. Gates Block in Ashley County, AR; man is probably Russell R. Reynolds. (USDA Forest Service photo taken by T.T. Kohara in July 1937)

His time on the company's payroll ended in 1932, when repeated Depression-related pay cuts prompted him to join the staff of the Southern Forest Experiment Station (SOFES) (Reynolds 1980). However, it is clear by the following unpublished, confidential report that Wackerman continued his working relationship with the Crossett Lumber Company.[1]

To better understand this relationship, some background is required. During the early days of the Forest Service, agency employees were encouraged to support lumber operations and other large landowners in their development of "working plans" to help landowners learn how to properly manage their forests and ensure the sustainability of local forest products industries. For almost 2 decades prior to Wackerman's arrival, the Crossett Lumber Company had considered a range of options to clearing their virgin timber and closing their Arkansas operations. Yet the Company had little information to make forest management decisions with—and given that they had a mill that required up to 30 million board feet of sawlogs annually, good information was required! The Crossett Lumber Company's initial forestry efforts involved increased log utilization, leaving some seed trees and smaller diameter pines on their cutover lands for future harvests, and better fire suppression efforts (Reynolds 1980, Watzek 1926, Williams 1925). However, these limited efforts did little but delay what appeared inevitable. It soon became evident that the Crossett Lumber Company was likely to cut out their land base (and quite probably close their Arkansas operations) within a decade.

Hence, the Crossett Lumber Company's desire to find an alternative forest management solution—and find it quickly! Wackerman's report represented a significant departure from their past efforts and a critical bridge between the company's past and future. His plan blended a reduced level of selective harvest from the company's dwindling virgin forest with pines cut from second-growth forests. This plan depended on some key changes to the southern pine timber industry during this pivotal period. First, the selective harvest of pines could be done at lower volumes using trucks to haul the logs to railroad landings, thereby avoiding the high expense of running railway tram lines into the stands being cut. Second, the mills could profitably turn second-growth trees into marketable boards—a marked change from earlier industry practice, which relied on high-quality old-growth timber. Finally, the uncut pines remaining were both the future timber crop and seed source for the next generation of trees, so their quality was important.

Although some Crossett Lumber Company officials remained skeptical for years, they adopted a version of this plan, and with the support of Russell R. Reynolds and others, were able to successfully transition into sustainable forestry. In addition to providing much needed data to support the implementation of silviculture in southern pine-dominated stands (Bond 1939, Kirkland 1933), Wackerman's initial confidential study spurred other related projects, primarily by Reynolds and Yale University faculty member Ralph C. Bryant (a longtime paid consultant for the Crossett Lumber Company), to further evaluate the management implications and outcomes of selective logging using trucks in second-growth southern pines, which quickly garnered regional and national interest (Reynolds 1980).

Wackerman worked on a similar working plan for at least one other company in southern Arkansas and northern Louisiana and played a major role in the development of the Crossett Experimental Forest and the mentoring of new scientist Reynolds. His stint with the SOFES was brief; in 1934 he left the Federal agency to start a job with the Southern Pine Association before moving on to be the first forester of the Seaboard Air Line Railway and then for the forestry faculty of Duke University, where he remained as a professor until his retirement in 1967 (Bragg 2012).

[1] Such confidential case study reports were not unusual; companies often did not want to share their internal business accounts and policies with their competitors.

Note: With the exception of some minor formatting changes, removal of internal page numbering references, insertion of some photographs as visual aids (the original contained none), and corrections to obvious spelling errors, I changed very little of Wackerman's original 1932 report. When possible, brief supplemental information for individuals mentioned and other insights are included as footnotes in this report.

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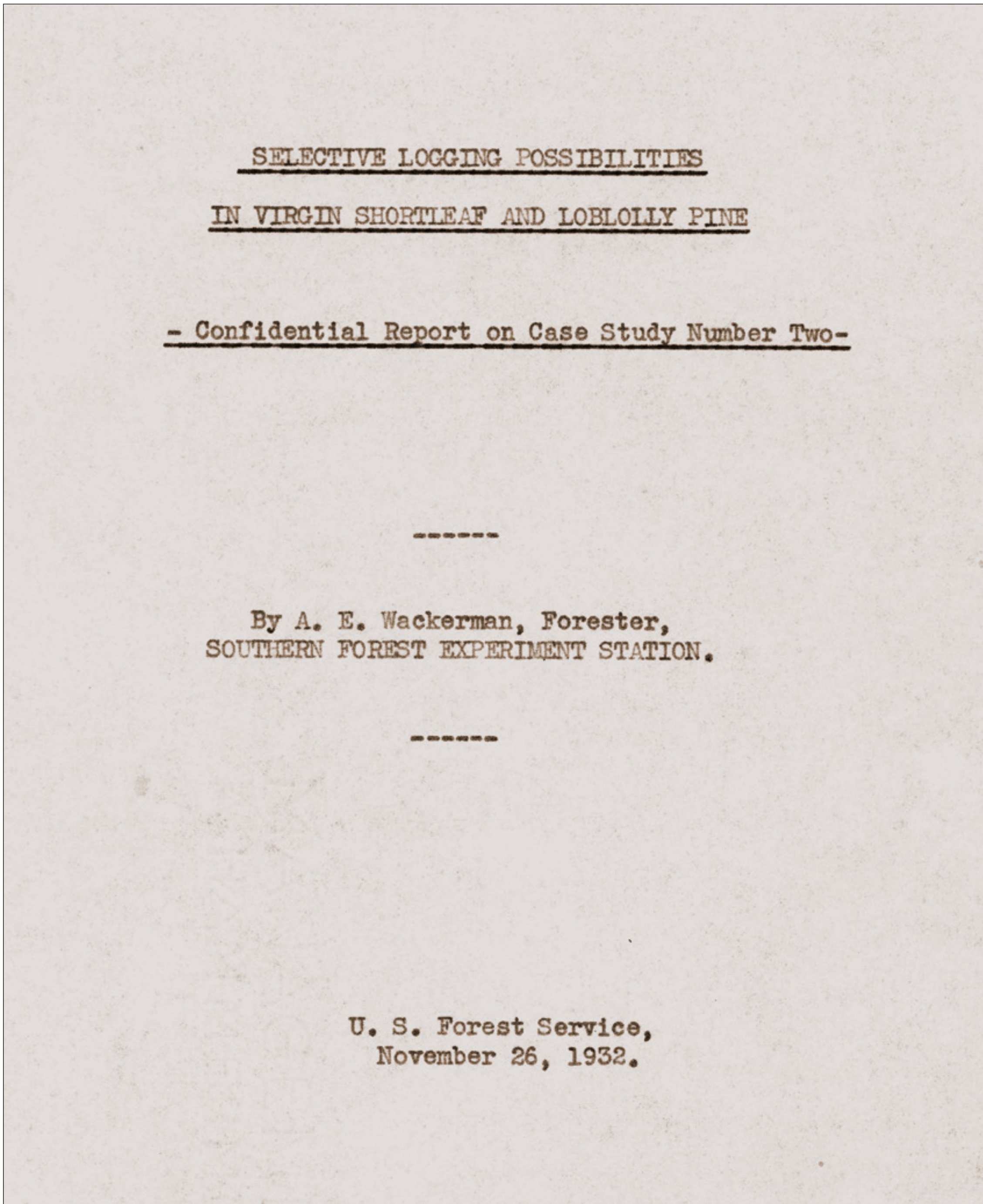

SELECTIVE LOGGING POSSIBILITIES

IN VIRGIN SHORTLEAF AND LOBLOLLY PINE

- Confidential Report on Case Study Number Two-

By A. E. Wackerman, Forester,
SOUTHERN FOREST EXPERIMENT STATION.

U. S. Forest Service,
November 26, 1932.

Image of the title page for the original report by Wackerman.

FOREWORD

Financial Aspects of Private Forestry is an economic study now being carried on at the Southern Forest Experiment Station to determine for the Southern Pine Region where and under what economic conditions private forestry promises to be profitable and where and under what economic conditions private forestry is unprofitable.

This study is divided into two main parts: first, county-wide surveys to give average forest conditions and an economic background in the various pine types, and second, detailed studies of forest under management and of various wood-using industries to obtain specific information regarding financial possibilities.

The Forest Service will publish a comprehensive report covering all phases of the study when it is completed. However, reports covering individual counties or certain phases of the study will be made available, as completed, to States or other agencies for publication as progress reports and for distribution to timberland owners. In these reports no information of a confidential nature will be divulged.

Progress reports generally represent the united efforts of all members of the Financial Aspects staff, usually both in field work and in office computation and composition. Authorship is therefore generally ascribed to the staff as a whole. However, authorship of certain progress reports is assigned to members who performed predominant parts in their preparation. The following members constitute the technical Financial Aspects staff: W.E. Bond, Forest Economist, in charge; A.E. Wackerman, Forester; A.R. Spillers, Junior Forester; R.R. Reynolds, Junior Forester; and F.A. Ineson, Field Assistant.

E.L. Demmon,
Director.

RE – SS
Financial Aspects of Private Forestry
(Case Study #2) November 26, 1932.

SELECTIVE LOGGING POSSIBILITIES IN VIRGIN SHORTLEAF AND LOBLOLLY PINE — CONFIDENTIAL REPORT ON CASE STUDY NUMBER TWO —

By A.E. Wackerman, Forester,

Southern Forest Experiment Station.

This report is a confidential analysis of the possibilities of selective logging in old-growth timber in the shortleaf-loblolly pine type prepared especially for the company upon whose holdings the study was undertaken.[2] Information obtained from this study of the financial aspects of growing timber will be averaged with that from other similar studies and presented in a comprehensive report for the entire South in which, however, no confidential information will be divulged.

This analysis of selective logging and timber management problems is based on the production of lumber as the main business of the company with incidental production of pulpwood and chemical wood. Any contemplated expansion or diversification of products, such as paper or paper board production, has not been considered, but such a program need not interfere with this plan although some modifications might be desirable.

The purpose of selective logging is to provide for the continuous production of timber from a given tract of timber land. The advantage of selective logging over logging all merchantable sawlogs is that in selective logging a cut can be made at more frequent intervals and that a much higher quality of timber is maintained. The amount of growth obtained on a forest area in a given length of time is practically in direct proportion to the amount of standing timber. Therefore, in maintaining a good stand of timber on the ground by practicing selective logging a sufficient amount of growth is produced to replace in a comparatively short time approximately the amount removed, and in virgin stands the growth is of virgin quality.

The company owns a tract of uncut timber of about 20,000 acres within 15 miles of this mill, composed mainly of virgin, culled virgin and second-growth, and old-field timber types. This is its sole remaining uncut area and its only source of supply of high-grade stumpage since the second-growth stands have not, as yet, reached advanced size and high quality.

This tract of timber, known by the company as its East Block, together with certain adjacent areas of advanced second-growth, has been examined in the field and carefully analyzed for timber stand and growth, and it has been found that if selectively logged, the area should produce for an indefinite length of time an approximate annual output of 10,000,000 feet board measure of high grade logs.

Selective logging requires a radical departure from present logging methods, especially in substituting truck haul for railroad spurs. However, the cost of logging should remain approximately the same as at present. A main line railroad spur is suggested through this tract, and it is estimated that the total cost of logging selectively would be about $5.08

[2] Kept anonymous for this report, this company was the Crossett Lumber Company, a large (with hundreds of thousands of acres of timberland), family-owned pine operation that founded the city of Crossett, AR, as a company town for its large sawmill operation, starting in 1899.

An example of the better stocked old-growth loblolly and shortleaf pine forest once held by the Crossett Lumber Company; this particular East Block stand averaged about 20,000 board feet of pine per acre. (USDA Forest Service photo taken by Leland J. Prater in 1942)

per thousand, as is shown in Table 4. If selective logging is adopted and at a later date the company desired to cut out, the block could be liquidated at no extra cost since the main line would be in place and spurs could be constructed.

The cost of growing timber to replace the amount removed by selective logging also appears reasonable. Including land and timber taxes, protection and administration, the indicated cost is only $1.38 per thousand for the first 10 years and $1.16 for the next 10 years. (See Table 3.)

The production of 10,000,000 feet from the East Block, however, is short of the present mill capacity and insufficient to carry overhead charges, and, therefore, additional stumpage must be found to make up the deficit. Assuming the mill capacity for pine to be 30,000,000 feet a year, or the output of one 2-band mill, approximately 20,000,000 feet of other stumpage must be provided each year. The company's second-growth lands should be capable of supporting this output if properly handled. Several possibilities may be considered but since it is not the purpose of this report to deal with second-growth timber as a whole they will only be mentioned. They are: (1) selective logging over entire second-growth area; (2) reservation of readily accessible timber for future selective logging with heavy cutting of outlying timber for the company mill or for portable mills with the possibility of selling the land after cutting; and (3) purchase of timber, logs, or lumber in large quantities.

A view of the large sawmill, mill pond, and rail line of the Crossett Lumber Company indicating the large volume of lumber produced (approximately 30,000,000 feet annually) by this operation. (USDA Forest Service photo taken by Leland J. Prater circa 1942)

Of these possibilities, the suggestion that outlying second-growth pine lands be logged heavily to meet the deficit incurred during the first 10 years of selective logging in the East Block, merits serious consideration. Such a program would add 10 years' growth to the reserved second-growth timber and at the end of the 10-year period these stands could be organized into permanent selective logging units readily accessible to the mill.

If, during the first 10-year period, only 2,000 feet per acre were cut from 100,000 acres of outlying second-growth timber, an annual production of 20,000,000 feet would be obtained. At the end of this period the second-growth stands tributary to the mill, with an area of, say, 200,000 acres, would be ready to cut and if they were growing only 100 feet per acre per year an annual selective cut of 20,000,000 feet would be indicated indefinitely.[3] As a matter of fact, growth would probably be two or three times this amount if the stands were permitted to build up for the next 10 years.

It is indicated, therefore, that should selective logging with an annual output of 10,000,000 feet from the East Block be adopted and a reorganization of land holdings effected whereby timber and land ownership would be concentrated in the mill area, a

[3] Indeed, the work of Russell R. Reynolds on the nearby Crossett Experimental Forest would quickly show that properly stocked and selectively managed uneven-aged stands of loblolly and shortleaf pine were capable of producing an annual production of 300 to 400 board feet (Doyle log rule) per acre per year for decades (e.g., Reynolds 1959, Reynolds and others 1984).

permanent production of 30,000,000 feet of pine each year could be provided. One-third of this production would be from high quality, selectively logged timber and, for the first ten years, two-thirds from woods-run second-growth timber. Later, with selective logging in the second-growth areas tributary to the mill, production from the second growth stands would be of better than woods-run quality.

A reorganization of land and timber ownership along the lines mentioned would not only be of advantage from a timber growing standpoint but it would also provide for a very considerable savings in taxes, protection, and administration with no apparent depletion of timber assets.

If selective logging in the East Block is not adopted and if only trees 12 inches d.b.h. and smaller with about two seed trees per acre are left uncut, as is the present practice, the East Block will be cut over within a few years and the last of the high grade pine stumpage will be gone. The company would then be dependent entirely on second-growth timber of ordinary second-growth quality.

TIMBER TYPES IN THE EAST BLOCK[4]

The map accompanying this report shows the location of the uncut East Block and certain adjacent second-growth areas which have been combined for working out a selective logging program.[5] The entire area will be designated the East Block in this report. The 10 selective logging units, which it suggested should be cut at the rate of one each year, and the timber types in color are also shown. A discussion of the timber types in the block follows, while a statement of the areas of timber types is given in Table 1.

1. Virgin timber is strictly old-growth pine of good quality and mostly of large size, with hardwood intermingled. Stands are dense to open and with varying amounts of younger trees. Considerable loss of old timber occurs each year due to windfall, lightning, and insects. Trees are mostly slow growing, especially in larger diameters.

2. Culled virgin or second growth timber is, as the name implies, culled virgin pine timber or second-growth pine timber following hurricanes or early cutting of better than average second-growth in quality.[6] The stands are made up mostly of medium sized trees with scattered old-growth trees and many younger trees coming into the merchantable stand. The trees are mostly fast-growing. Hardwood also is present. In units 8, 9 and 10 these stands are somewhat younger due to more recent cutting and consequently have less volume per acre.

3. Old-field timber is composed of even-aged pure pine stands in old fields and is generally of low to medium quality. The stands are mostly dense with growth slowing up as [a] consequence. Different stands may be of different ages, but most are from 40 to 60 years old. Considerable loss occurs among the smaller trees due to over-crowding.

4. Cut-over timber includes areas recently cut-over or with no merchantable timber in sight for 10 years and only a light cut in 15 to 20 years. It will develop good second-growth stands in 20 years if properly cared for. Some of these areas were cut-over because of recent hurricanes.

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[4] These vary basic timber types were commonly used by industry and early foresters to suggest the potential lumber production of a landowner's property and were replaced with more sophisticated systems in the coming years. Further discussion of these timber types can be found in other reports, including Chapman (1913).

[5] Regrettably, the map mentioned here as being attached was not included in the available copy of Wackerman's. In general, the East Block lay east of the city of Crossett, AR and south of the city of Hamburg, AR.

[6] The hurricanes mentioned here are not the tropical systems we currently think of with this term, but rather tornadoes.

5. Hardwood timber is chiefly of the uncut creek bottom type and is composed predominantly of oak and gum with some cypress and occasionally scattered pine.

6. No timber areas include abandoned fields with no merchantable timber but often with good stands of young trees and reproduction which are making rapid growth.

Of the above types only the virgin, culled virgin and second-growth, and old-field stands are merchantable and only these have been considered in calculating the rate of growth and allowable cut. Since the regulation of the cut of pine is the basic consideration, the present volume and growth of hardwoods have not, as yet, been determined.

Table 1. Area of timber types in East Block by units.

Unit number	Timber types						Total area
	Virgin	Culled virgin & 2nd growth	Old field	Cut-over	Hardwood	No timber	
	------------------- Number of acres --------------------						Acres
1	1,220	210	340	150	830	100	2,850
2	1,640	410	190	280	250	170	2,940
3	370	470	1,070	210	200	150	2,470
4	570	740	520		220	50	2,100
5	1,240	560	420	10	160	110	2,500
6	1,040	530	510	380	80	250	2,790
7	780	1,630	280		230	270	3,190
8	450	1,990	370	1,000		640	4,450
9		2,210	340	1,270		610	4,430
10		1,640	510	570		600	3,320
TOTAL	7,310	10,390	4,550	3,870	1,970	2,950	31,040

A thinned old field pine stand approximately 90 years old that has been cut at least once by the Crossett Lumber Company. (USDA Forest Service photo taken by Leland J. Prater in 1942)

Plan for Selective Logging

The basis of the plan of selective logging is to remove from the East Block each year 10,000,000 foot board measure of stumpage selectively logged from approximately one-tenth of the area. The map accompanying this report shows a suggested blocking up of the area into units for management purposes.

During the first year unit #1 would be cut selectively and dead and dying trees salvaged from the remainder of the area, making a total cut of 10,345,000 feet. During the second year unit #2 would be cut selectively and salvaged timber would be cut from the remaining uncut units with a total yield of 11,323,000 feet indicated. Selective logging would then proceed in regular order until all 10 units had been logged by the end of the 10th year. (See Tables 9 to 18 at end of the report.) By the 11th year the stands in unit #1 would have grown back to approximately their original volume and another selective cut would be made. During each succeeding year logging would move into the next unit and, so long as the program was strictly adhered to, cutting could go on indefinitely at a rate of 10,000,000 feet per year.

The amount of the selective cut proposed for the three most important classes of stands in the East Block; i.e., virgin, culled virgin and second-growth, and old-field; is based on a minimum cutting diameter of 24 inches for virgin, 20 inches for culled virgin and second-growth, and 17 inches for old-field stands. Cutting to these diameters would remove 4,200, 2,800, and 7,700 feet per acre, respectively, for each of the above mentioned classes of stands. Exceptions to this general average in units 8, 9 and 10 are given in the detailed discussion of the units.

While the stands could be cut to the diameters mentioned and produce the required growth, yet this would not be the most desirable practice since by arbitrarily cutting to

An exceptional example of a large shortleaf pine 190 years old that yielded several thousand board feet of lumber, including an 18-foot-long butt log that scaled 1,350 board feet (Scribner rule). Such trees were to be the first ones cut under Wackerman's selective logging system, as their size meant their growth was relatively slow. (USDA Forest Service photo taken by W.R. Mattoon on September 29, 1937) a given diameter, some trees of smaller size that should be cut because of poor form, crowded conditions, slow growth, or general unhealthiness would be left in the stand while larger trees that should be left to grow because of their good condition and capacity to grow would be cut along with the others above the cutting size.

Diameter limits have been used only to indicate the approximate volume that could be cut from the different classes of stands without depleting them below their capacity to replace, in 10 years, the amount of the cut. The indicated cut of 4,200, 2,800, and 7,700 feet board measure for virgin, culled virgin and second-growth, and old-field stands, respectively, should, therefore, be selected from the trees in the entire range of merchantable sizes; i.e., 13 inches d.b.h. or larger. This method would allow the forester to mark for removal faulty, slow growing, and crowded trees below the diameters mentioned and to preserve an equivalent amount in fast growing, properly spaced larger trees.

The effect of this form of selective cutting would be to considerably enhance the growth of the stands after logging. The average growth curves derived in this study for the three classes of stands and used to predict growth after selective cutting are based on the growth of all trees as they were found, but if the slowest growers were removed by the first cut, then the average growth for the remaining trees would be raised automatically and the amount [of] growth after cutting would be more than indicated.

The technique of marking the trees to be cut would need to be perfected by careful work in actually selecting trees for cutting. Marking should be done at least a year in advance of logging to prevent hurried work and to give a complete advance record of just what timber would be cut in the unit. This information could show the amount and quality of the timber to be cut by the forties and would help the logging foreman in planning his year's work, as he would want to log the more distant timber during good hauling weather and save the close-in timber for bad weather.

The details of this plan are shown in Tables 9 to 18, which indicate the amount to be cut in each of the units for the first 10 years and the amount of timber that will be available in each unit for the second selective cut.

The plan of cutting has been laid out in systematic order and unit boundaries, as shown, are based on approximately an equal distribution of timber. However, some units, notably 3 and 4, have a preponderance of old-field timber and a better balance of timber types in each unit might be possible if more detailed information were available. If a selective logging plan is adopted a more complete forest survey should be made of the East Block to obtain the information needed to draw up an accurate and sound management plan.

To work the area properly and to guarantee delivery of logs to the mill on schedule, a main line railroad spur capable of carrying a train of 30 or 40 cars with a loader should be constructed through the tract. The map indicates a possible location for the main line spur if it were to branch from the common carrier railroad at Bovine. As located on the plat, it would be desirable to build it into unit #1 the first year in order to use the track facilities for removing salvaged timber in the uncut units. As units 1, 2 and 3 were cut the track could be ripped up and the spur into units 6 and 7 constructed, and as they in turn were cut the track could be moved into units 9 and 10 if a track into that locality were needed. Probably 10 miles of steel would be required constantly.

Table 2 is a summary of the first 10 years of selective logging based on the stand and growth data obtained in the recent extensive examination of the area and, in units 8, 9 and 10, from the forest survey made by the company in 1928 and earlier. Units 9 and 10 do not have such heavy stands as occur in the uncut units and as a consequence there is no indicated surplus of available cut above 10,000,000 feet. However, the detailed data definitely indicate that the required 10,000,000 feet can be cut even if over-cutting should be necessary. The second cut will be made 18 years from now and in the interim much of the cut-over area not having merchantable timber today should produce stands of second-growth sufficient to maintain the cutting schedule.

Table 2. Summary of first ten years cut from East Block—by units.

Unit No.	Acres	Pine stand 1932	Growth before first selective cut: Total net	Growth before first selective cut: Merch. net	Stand at time of cutting	Amount available for selective cut: From 1932 stand	Amount available for selective cut: From growth	Amount available for selective cut: Total	Salvage cut for year from uncut units	Total output for year	Stand after cutting
	Number	Thousand feet board measure									
1	2,850	21,361			21,361	8,296		8,296	2,049	10,345	13,065
2	2,940	26,360	595	170	26,955	9,480	170	9,650	1,673	11,323	17,305
3	2,470	21,693	1,608	1,131	23,301	11,002	1,131	12,133	1,472	13,605	11,168
4	2,100	19,437	2,025	1,152	21,462	8,418	1,152	9,570	1,264	10,834	11,892
5	2,500	25,310	2,756	1,208	28,066	9,968	1,208	11,176	939	12,115	16,890
6	2,790	23,664	3,409	1,673	27,073	9,728	1,673	11,401	649	12,050	15,672
7	3,190	24,572	5,294	2,589	29,866	9,479	2,589	12,068	379	12,447	17,798
8	4,450	19,180	5,274	2,796	24,454	7,618	2,796	10,414	184	10,598	14,040
9	4,430	12,070	4,838	3,469	16,908	6,511	3,469	9,980	94	10,074	6,928
10	3,320	12,247	5,268	3,770	17,515	6,198	3,770	9,968		9,968	7,547
TOTAL	31,040	205,894	31,067	17,958	236,961	86,698	17,958	104,656	8,703	113,359	132,305

In setting up the schedules of timber growth and selective cut from fee land, no allowances were made for present stand or growth of timber owned by timber deed since, if the plan were put into effect, the deeds might expire before the selective cutting schedule. In some units timber deeds amount to a considerable area and if this plan is adopted all timber deeds should be bought in fee, if possible, and the stands put under management since any increase in timber capital would increase growth and provide for larger future cuts. In units 1, 2, and 10, especially, there are timber deeds that should be bought in fee if the plan is adopted. In addition, areas of cut-over land and vacant fields with no timber should be brought into merchantable timber production as soon as possible by strict fire protection and, if natural reproduction is too slow, by planting in order to increase the total growth.

The productiveness of the East Block at present probably is not more than 50 or 75 per cent of what it would be if it were fully timbered to well-managed forests. In other words, probably 15,000,000 feet could be cut from the block each year, after 20 years, instead of the 10,000,000 feet as at present. It will be noted from Table 1, page 8, that 3870 acres are cut-over with no present merchantable stands and that 2950 acres have no timber or only young, unmerchantable stands, totaling 6820 acres, of the 31,040 acres at present unproductive. This is 22 per cent of the area of the block. The opportunity for improvement is tremendous, hence the necessity for carefully planned selective logging and timber management.

While this report attempts to indicate the maximum returns from a scheme of selective logging as adapted to the lands described, there has been no effort to be over-optimistic. In fact, where a choice was possible, the conservative values have been used. Thus, growth after selective cutting is based on the present rate of growth when as a matter of fact the growth will, in all likelihood, be at a considerably more rapid rate since slow-growing trees will be cut and the opening of the stands will stimulate the growth of the remaining trees. Also, the indicated cut each year is in excess of 10,000,000 feet board measure but only 10,000,000 feet has been used as the basis of the program.

The calculations of growth after the first selective cut (Table 7) indicate that 84,325,000 feet are grown during the first 10 years instead of 100,000,000. While there may be an over cut during the first period, there is every indication that after selective logging has started, growth will speed up and more than replace the cut during the second 10-year period. The rate of growth at present is considerably less than is possible. In addition, the cut-over areas will begin producing stumpage during the second 10-year period. Timber deeds in the block have not been included in the cut and growth computation, and if these areas were acquired the deficit during the first 10 years would be less. Therefore, in figuring costs, growth has been taken 84,325,000 feet board measure during the first 10 years and as 100,000,000 feet thereafter.

The steps necessary to put this plan in effect would be, briefly, as follows:

1. Set aside the East Block as shown on the map for selective logging.
2. Make an accurate forest survey of the block using standard procedure.
3. Determine unit boundaries based on a 10-year cutting cycle.
4. Mark timber to be cut based on the information obtained by the forest survey as to stand and growth and following the general rules previously mentioned.
5. Construct a main line logging spur through the block and plan logging operations.
6. Acquire, as cheaply as possible, all forest lands in the block in fee including timber deeds.
7. Keep accurate cutting records by forties of timber removed in selective logging and stand left.
8. Give block adequate fire protection.
9. Permit no timber to go to waste and utilize all dead and dying trees before they deteriorate.
10. Produce pine pulpwood and hardwood chemical wood from woods refuse and inferior trees only.

TIMBER GROWING COSTS

Under this plan of forest management growth replaces the stumpage cut by selective logging and hence there would be no actual depletion except during the first 10-year period, when the cut would exceed growth by 15,675,000 feet, which amount, however, would be replaced later. Since the timber in the block carries a book value, it would be necessary, probably, for the company to deplete stumpage at the rate of 10,000,000 feet per year until the present stand or its equivalent amount had been written off. The timber grown, then would stand on the books at whatever costs were charged to it. A discussion of costs follows:

1. Taxes. The amount of the annual tax on timber and land is a direct charge to growing stumpage. Two classifications have been set up—one for the heavier timbered areas and one for the lighter timbered areas.

   Virgin, culled virgin, hardwood and old-field timber areas in the uncut portion of the East Block are taxed at $.25 per acre per year, and the second-growth, cut-over, and no timber areas at $.12 per acre per year. On the 31,040 acres in the block taxes amount to $6,120.70 per year.

2. Timber Expense. Any expense in connection with land lines and purchases or exchanges of land and timber or similar expense incurred in administering land ownership, is charged to the timber expense account. Past experience has shown this item to be about $.02 per acre per year. For the 31,040 acres in the unit the timber expense amounts to $620.80 a year.

3. Fire Protection. At a cost of $.05 per acre per year the block could be given adequate fire protection. It is essential that severe fires be eliminated altogether and that young growth be given complete protection. Light fires in some cases and at certain times probably would not be destructive but the protection budget should be adequate to control the fire situation at all times. Protection in selectively logged timber would be much less difficult than in heavy cutting with heavy logging debris or in open, cut-over, brushy areas.

   The protection cost for 31,040 acres at $.05 per acre would, therefore, amount to $1,552.00 per year, on average. In years when less than this amount is spent the surplus should be credited to protection for use in emergency years when heavier expenses are necessary.

4. Forest Management Expense. The technical administration of the forest management plan and selective logging program would require the services of a capable forester and one-half of his salary should be charged against this block. The forester would be responsible for drawing up the detailed plan and then marking the timber to be cut, designating the unit boundaries, administering fire protection, and keeping the cut, stand, and growth records and for revising the original plan if much revision becomes desirable.

Marking the trees for selective cutting is one of the most important jobs the forestry department would have and the services of a good man to be trained by forester would be needed continuously for this and other field work in the block. The salary of such a man probably would amount to $1,200 a year, half of which might be paid from the fire protection fund.

The estimated one-half of the forester's salary and expense is $2,500.00 per year. This, with a miscellaneous item of $250.00 to cover minor expenses that probably would be incurred in the field and office and the $600.00 marking cost, gives at total forest management expense of $3,350.00 per year.

The cost of the 10,000,000 feet of growth when all the items of cost previously mentioned are charged against it, is shown in Table 3. Most of the items of cost shown in the table are carried as a part of overhead by many lumber companies and even under this program it might be desirable to leave them as overhead, at least until the present timber capital has been liquidated. However, they are the items making up the actual cost of timber growing and if they are all charged to overhead the new stumpage would be obtained apparently free of cost and it would be difficult to know the financial status of the program. At least, a separate account should be kept for timber growing costs in the block and if they were then classified as overhead the total could be charged to the account.

If stumpage stands on the books today at, say, $4.00 per thousand feet and about 200,000,000 feet of stumpage is present, then the total timber investment $800,000.00. As growth replaced the cut, then, the timber investment in the block would be gradually reduced to a cost-of-growing level. At the end of 20 years, after the present stumpage had been entirely liquidated and replaced by growth, the timber investment would be about $254,000.00 based on an average growing cost of $1.27 per thousand for the 20-year period. At the end of 10 years, with a growing cost of $1.38 per thousand the timber investment would be $538,000.00 for 200,000,000 feet, a reduction in timber investment of $262,000.00, or an average reduction per year of $26,200.00 with no reduction in the productive capacity of the block for timber growing.

Table 3. Estimate of costs and returns from selective logging in East Block.

Annual Cost of Holding East Block for Continuous Production		
		Cost per Year
Area 31,040 acres		
(1) Taxes:		
(a) On virgin, culled virgin, old-field and hardwood timber areas: 18,430 acres @ $.25 per acre per year	$4,607.50	
(b) On cut-over and not timber areas: 12,610 acres @ $.12 per acre per year	$1,513.20	
TOTAL Taxes		$6,120.70
(2) Timber expense @ $.02 per acre per year		$620.80
(3) Fire protection @ $.05 per acre per year		$1,552.00
(4) Forest management expense		
(a) 50 per cent of forester's salary and expenses	$2,500.00	
(b) Timber marking	$600.00	
(c) Miscellaneous forestry expenses	$250.00	
TOTAL Forest Management cost		$3,350.00
TOTAL Cost Outlay per Year		$11,643.50
Annual Returns from Growing Stumpage in East Block		
		Growth per year
(1) From growth under selective logging		
First 10 years		8,432,000 bd.ft.
Second 10 years		10,000,000 bd.ft.
Cost per Thousand Feet Board Measure of Growing Stumpage in East Block		
		Cost per thousand bd.ft.
Annual total cost outlay	$11,643.50	
Annual return 1st 10 years	8,432,000 bd.ft.	
Cost per thousand feet grown		$1.38
Annual return 2nd 10 years	10,000,000 bd.ft.	
Cost per thousand feet grown		$1.16
Average cost per thousand board feet grown during 20 years		$1.27

LOGGING METHODS

Since the cut proposed under this plan is much less per acre than is now the practice, a different form of logging would need to be devised, based on selective logging and the removal of 4,000 feet board measure per acre.

It is obvious that unless logging spurs can be done away with that profitable selective logging is out of the question because of the reduced cut per acre. However, the fact that many operators are using trucks is a hopeful indication that a method can be devised, especially with such favorable logging conditions as exist in the East Block and because of its close location to the mill.

Some suggestions are given here to indicate how a selective logging operation might be carried on, but the company's logging department is in a better position to devise a workable system.

1. A permanent main line spur though the block should be constructed the first year at a cost of about $1,800 per mile for 11 miles, or a total of $19,800.00. The third or fourth year an additional 3 miles would be constructed in blocks 5, 6 and 7, making the total main line investment of $25,200.00. (See map for suggested location.)
2. Logs could be hauled to this main line by truck, preferably at a sliding scale contract price. Average haul would be about one mile.
3. Cutting could be done in the usual way but with extra care to avoid damage to trees not marked for cutting.
4. Loading on cars probably would be done in usual way unless a cheaper method could be devised. Since one day's output would hardly justify daily loading, if done as at present, a train probably could be loaded every other day.
5. The mainline haul could not be done by the loader locomotive on loading days. Since the logs would be coming from other locations, pine loading possibly could alternate from the East Block to other pine logging areas or the hardwood operation.
6. Numerous other logging details would need to be worked out but if the above method or other similar methods are practical the details could be handled.

LOGGING COSTS

The costs of marking the trees to be cut and the inspection of logging to see that the cutting instructions are followed has been charged against stumpage growth and is not a part of logging cost.

An estimate of selective logging costs is given in Table 4, including the cost of constructing the main line and depreciation of this line over a period.

Table 4. Estimate of cost of selective logging per thousand board feet in East Block.

Estimated Cost per Thousand of Selective Logging		
(1) Main line spur railroad		
14 miles main line spur complete at $1,800 = $25,200.00 Depreciate on life of 20 years		
Annual cut – 10,000 M ft. b.m. pine and about – 1,000 M ft. b.m. hardwood		
TOTAL – 11,000 M ft. b.m. annual production		
Annual depreciation charge	$1,260.00	
Interest on average invest ($13,230.00) @ 6%	$793.80	
TOTAL annual charge	$2,053.80	
Average per thousand feet		$.19
(2) Logging Costs		
Cutting	$.60	
Swamping	$.10	
Bunching and loading	$.65	
Truck haul (av. 1 mile) (contract)	$1.25	
Loading on cars, main line haul and trackage rights	$.80	
Supervision	$.50	
Scaling and clerical	$.15	
Supplies and repair	$.10	
General expense	$.10	
TOTAL	$4.25	
15% Margin (add)	$.64	
		$4.89
TOTAL estimated logging cost		$5.08

NOTE: See Table 19 for the basis of these estimates.

RESUMÉ OF METHODS OF DETERMINING VOLUMES AND GROWTH

To estimate the possibilities of selective logging in the East Block information on present stands and growth was necessary. The company had available a generalized timber type map showing the classes of stands. This map shows which forties or parts of forties are in virgin, culled virgin and second-growth, old field, cut-over, or hardwood timber types, and vacant areas with no merchantable timber.

This timber classification, however, did not give any information on the amount of timber on the ground or the run of tree sizes. To obtain this information it was necessary to make an extensive forest survey of the East Block proper by running sampling strips east and west across the block at one mile intervals. On these strips all trees were tallied by diameter and log height and increment borings taken from two trees at each 5-chain interval for growth determination. The information was kept separately for each timber type.

The data thus secured for each of the timber types, virgin, culled virgin and second-growth, and old-field were taken as the average of the types for the area as a whole and these averages were applied to the acreages of each type as shown by the company's type map. Table 5 summarizes the information obtained from the extensive survey.

The indicated board foot volumes for the various timber types are based on tree volume tables according to the International 1/8-inch log rule and show the approximate board measure volumes of the stands. Doyle-Scribner volume would be smaller than board measure, especially where many small trees are present. Since the selective cut, however, is obtained from large trees, as a rule, the board measure volume available for cutting should not be much in excess of Doyle-Scribner log scale. Board measure was used throughout this study because it gives a more consistent measure than log scale, which varies from the actual volume with tree and log size.

The stands of timber in units 9 and 10 and part of 8 were covered by a forest survey made by the company in 1928. This information is the basis for the stands shown in these units. Present volumes of these stands were obtained by adding the growth since 1928 at the same rate as is occurring in similar stands studied in 1932.

Table 6 gives the detailed basis, unit by unit, for computing net merchantable and unmerchantable growth prior to the first selective cut. All growth of trees over 23 inches for virgin, 19 inches for culled virgin and second-growth, and 16 inches for old-field has been considered merchantable and available for cutting, while growth in the trees below these sizes has been considered unmerchantable and not available for cutting.

Table 7 shows the amount of growth by units of the East Block after the first selective cut. It will be noted 84,325,000 feet of growth is indicated for the first 10 years following selective logging. A growth of 100,000,000 feet is necessary to maintain the stand of timber indefinitely so there is an apparent depletion of 15,675,000 feet during the first 10 years. However, as Table 2 shows, there is an indicated cut of 113,359,000 feet for the first 10 years, which is 13,359,000 feet in excess of the 100,000,000 feet output contemplated. If this surplus were not taken the growth deficit for the first 10 year period would be practically balanced. At the end of the first 10 years increased growth due to the removal of slow growing trees and the release of the remaining trees from crowding should easily bring growth up to the required 100,000,000 feet during the next 10 years.

The method of calculating growth for the three timber types, virgin, culled virgin and second-growth, and old-field, after selective logging is shown in Table 8, which gives the number of trees by diameters left after cutting and the number, by diameters, in 10 years.

Tables 9 to 18 give the detailed data for each of the ten units in the East Block under the selective logging program. They show for each type in the unit the present stand, growth, available cut, and the stand 10 years after selective logging.

Table 19 shows the basis used in approximating the cost of selective logging.

Table 5. Average pine stands and growth in East Block as determined from Extensive Survey in 1932 and applied to Units 1 to 7 and part of 8.1/

	Virgin	Culled virgin & 2nd growth	Old field	No timber
Acres tallied in survey	70.4	61.4	29.9	11.4
Average stand per acre B.M.				
13” & over D.B.H.				
Shortleaf	6,321	3,589	6,584	0
Loblolly	6,418	4,124	5,982	0
TOTAL pine stand	12,739	7,713	12,566	0
Average growth per acre B.M.				
13” & over D.B.H.				
Shortleaf	218	203	321	0
Loblolly	186	258	274	0
TOTAL pine stand	404	461	595	0
Average number of trees per acre				
13” & over D.B.H.				
Shortleaf	15.95	11.04	21.12	0
Loblolly	12.00	12.93	16.64	0
TOTAL pine stand	27.9	25.97	37.76	0
Hardwood	6.32	6.83	3.90	0

1/ Data on stand and growth in part of Unit 8 and all of Units 9 and 10 are based on forest survey information furnished by the company. See unit statements (Tables 16, 17, 18) for data on stands and growth by types in these units.

Table 6. Average present stand, growth, and loss per acre before first selective cutting in East Block by units and types.

						Losses					
Unit	Timber type[1/]	Average stand / acre 1932	Total growth /acre / year	Merch-antable growth	Un-merch-antable growth	Total loss	From merch. growth	From un-merch. growth	Total net growth	Net merch. growth	Net un-merch. growth
		Board Feet									
	V.	12,700	404	155	249	204	155	49	200	0	200
1	C.V.&S.G.	7,700	461	244	217	61	31	30	400	213	187
	O.F.	12,500	595	462	133	90	27	63	505	435	70
	V.	12,700	404	155	249	204	155	49	200	0	200
2	C.V.&S.G.	7,700	461	244	217	61	31	30	400	213	187
	O.F.	12,500	595	462	133	90	27	63	505	435	70
	V.	12,700	404	155	249	204	155	49	200	0	200
3	C.V.&S.G.	7,700	461	244	217	61	31	30	400	213	187
	O.F.	12,500	595	462	133	90	27	63	505	435	70
	V.	12,700	404	155	249	204	155	49	200	0	200
4	C.V.&S.G.	7,700	461	244	217	61	31	30	400	213	187
	O.F.	12,500	595	462	133	90	27	63	505	435	70
	V.	12,700	404	155	249	204	155	49	200	0	200
5	C.V.&S.G.	7,700	461	244	217	61	31	30	400	213	187
	O.F.	12,500	595	462	133	90	27	63	505	435	70
	V.	12,700	404	155	249	204	155	49	200	0	200
6	C.V.&S.G.	7,700	461	244	217	61	31	30	400	213	187
	O.F.	12,500	595	462	133	90	27	63	505	435	70
	V.	12,700	404	155	249	204	155	49	200	0	200
7	C.V.&S.G.	6,850	410	217	193	53	27	26	357	190	167
	O.F.	12,500	595	462	133	90	27	63	505	435	70
	V.	12,700	404	155	249	204	155	49	200	0	200
8	C.V.&S.G.	5,000	300	159	141	39	20	19	261	139	122
	O.F.	9,500	452	352	100	68	20	48	384	332	52
	V.										
9	C.V.&S.G.	4,400	264	176	88	34	17	17	230	159	71
	O.F.	6,900	328	255	73	44	13	31	284	242	42
	V.										
10	C.V.&S.G.	4,700	282	178	104	37	19	18	245	159	86
	O.F.	8,900	424	329	95	44	19	45	360	310	50

1/ V. = Virgin; C.V.&.S.G. = Culled virgin & second-growth; O.F. = Old field

Table 7. Growth in East Block after selective cutting.

For First Ten Years				
Unit number	Stand at time of selective cutting	Stand left after selective cutting	10 years' growth after selective cutting	Stand 10 years after selective cutting
	---------- Thousand feet board measure ----------			
1	21,361	13,065	6,767	19,832
2	26,955	17,305	8,636	25,941
3	23,301	11,168	8,367	19,535
4	21,462	11,892	7,962	19,854
5	28,066	16,890	9,493	26,383
6	27,073	15,672	9,195	24,867
7	29,866	17,798	11,772	29,570
8	24,454	14,040	9,923	23,963
9	16,908	6,928	5,806	12,734
10	17,515	7,547	6,404	13,951
TOTAL	236,961	132,305	84,325	216,630
Average for total area; 31,040 acres	7,634	4,262	2,717	6,979
Average for net merchantable timber area; 2,225 acres	10,650	5,946	3,790	9,736

Table 8. Method of determining growth per acre after selective logging by types. From 1932 Extensive Survey.

D.B.H.	Virgin			Culled virgin and 2nd growth			Old field		
	Stand now in number trees	Stand in 10 years		Stand now number trees	Stand in 10 years		Stand now number trees	Stand in 10 years	
		Number of trees	Volume in bd. ft.		Number of trees	Volume in bd. ft.		Number of trees	Volume in bd. ft.
13	3.64	4.91	822	4.41	5.60	809	5.86	7.09	1,155
14	3.40	4.10	846	3.42	4.67	875	6.55	7.11	1,443
15	3.57	3.86	995	3.13	4.38	1,023	5.08	6.70	1,711
16	2.75	3.78	1,147	2.95	4.05	1,114	4.48	6.53	1,958
17	2.01	3.47	1,206	2.31	3.19	1,034	17" &	5.24	1,841
18	2.12	2.56	1,048	2.01	3.16	1,223	larger	3.24	1,299
19	1.61	2.11	995	1.44	2.39	1,048	cuts		
20	1.69	1.92	1,006	20" &	2.06	1,005			
21	1.30	1.79	1,060	larger	1.36	745			
22	1.22	1.51	990	cut	.26	149			
23	.97	1.28	918						
24	24" &	1.12	887						
25	larger	0.31	268						
26	cut								
etc.									
TOTAL	24.28	32.72	12,188	19.67	31.12	9,025	21.97	35.91	9,407

Summary per acre

	Virgin	Young Virgin	Old Field
Stand before selective cut[1/]	12,739	7,713	12,566
Amount selectively cut	4,198	2,754	7,632
Residual stand	8,541	4,959	4,934
Stand 10 years after selective cut	12,188	9,025	9,407
Growth in 10 years	3,647	4,066	4,473
Growth per year	365	407	447

1/ See Table 5.

Table 9. First Year – Selective Cut Unit #1

Timber type	Acres	Pine stand of 1932	Total net growth before 1st selective cut	Stand at time of cutting	Amount available for selective cut: From 1932 stand	Amount available for selective cut: Merch. growth	Amount available for selective cut: Total	Stand after cutting	Growth during 10 yrs after cutting	Stand 10 yrs after cutting
	Number	Thousand feet board measure (b.m.)						Thousand ft. b.m.		
Virgin	1,220	15,494		15,494	5,124		5,124	10,370	4,397	14,767
Culled virgin & 2nd-growth	210	1,617		1,617	588		588	1,029	849	1,878
Old field	340	4,250		4,250	2,584		2,584	1,666	1,521	3,187
Cut-over	150									
Hardwood	830									
No timber	100									
TOTAL	2,850	21,361		21,361	8,296		8,296	13,065	6,767	19,832
TOTAL to cut from Unit #1 during first year:							8,296 M ft. b.m.			
Amount salvaged from Units 2 to 10 during first year:							2,049 M ft. b.m.			
TOTAL production first year:							10,345 M ft. b.m.			

Table 10. Second Year – Selective Cut Unit #2

Timber type	Acres	Pine stand of 1932	Total net growth before 1st selective cut	Stand at time of cutting	Amount available for selective cut: From 1932 stand	Amount available for selective cut: Merch. growth	Amount available for selective cut: Total	Stand after cutting	Growth during 10 yrs after cutting	Stand 10 yrs after cutting
	Number	Thousand feet board measure (b.m.)						Thousand ft. b.m.		
Virgin	1,640	20,828	335	21,163	6,888		6,888	14,275	6,053	20,328
Culled virgin & 2nd-growth	410	3,157	164	3,321	1,148	87	1,235	2,086	1,721	3,807
Old field	190	2,375	96	2,471	1,444	83	1,527	944	862	1,806
Cut-over	280									
Hardwood	250									
No timber	170									
TOTAL	2,940	26,360	595	26,955	9,480	170	9,650	17,305	8,636	25,941
TOTAL to cut from Unit #2 during second year:							9,650 M ft. b.m.			
Amount salvaged from Units 3 to 10 during second year:							1,673 M ft. b.m.			
TOTAL production second year:							11,323 M ft. b.m.			

Table 11. Third Year – Selective Cut Unit #3

Timber type	Acres	Pine stand of 1932	Total net growth before 1st selective cut	Stand at time of cutting	Amount available for selective cut: From 1932 stand	Amount available for selective cut: Merch. growth	Amount available for selective cut: Total	Stand after cutting	Growth during 10 yrs after cutting	Stand 10 yrs after cutting
	Number	Thousand feet board measure (b.m.)						Thousand ft. b.m.		
Virgin	370	4,699	151	4,850	1,554		1,554	3,296	1,398	4,694
Culled virgin & 2nd-growth	470	3,619	376	3,995	1,316	200	1,516	2,479	2,045	4,524
Old field	1,070	13,375	1,081	14,456	8,132	931	9,063	5,393	4,924	10,317
Cut-over	210									
Hardwood	200									
No timber	150									
TOTAL	2,470	21,693	1,608	23,301	11,002	1,131	12,133	11,168	8,367	19,535
TOTAL to cut from Unit #3 during third year:							12,133 M ft. b.m.			
Amount salvaged from Units 4 to 10 during third year:							1,472 M ft. b.m.			
TOTAL production third year:							13,605 M ft. b.m.			

Table 12. Fourth Year – Selective Cut Unit #4

Timber type	Acres	Pine stand of 1932	Total net growth before 1st selective cut	Stand at time of cutting	Amount available for selective cut: From 1932 stand	Amount available for selective cut: Merch. growth	Amount available for selective cut: Total	Stand after cutting	Growth during 10 yrs after cutting	Stand 10 yrs after cutting
	Number	Thousand feet board measure (b.m.)						Thousand ft. b.m.		
Virgin	570	7,239	349	7,588	2,394		2,394	5,194	2,202	7,396
Culled virgin & 2nd-growth	740	5,698	888	6,586	2,072	473	2,545	4,041	3,334	7,375
Old field	520	6,500	788	7,288	3,952	679	4,631	2,657	2,426	5,083
Cut-over										
Hardwood	220									
No timber	50									
TOTAL	2,100	19,437	2,025	21,462	8,418	1,152	9,570	11,892	7,962	19,854
TOTAL to cut from Unit #4 during fourth year:							9,570 M ft. b.m.			
Amount salvaged from Units 5 to 10 during fourth year:							1,264 M ft. b.m.			
TOTAL production fourth year:							10,834 M ft. b.m.			

Table 13. Fifth Year – Selective Cut Unit #5

Timber type	Acres	Pine stand of 1932	Total net growth before 1st selective cut	Stand at time of cutting	Amount available for selective cut: From 1932 stand	Amount available for selective cut: Merch. growth	Amount available for selective cut: Total	Stand after cutting	Growth during 10 yrs after cutting	Stand 10 yrs after cutting
	Number	Thousand feet board measure (b.m.)						Thousand ft. b.m.		
Virgin	1,240	15,748	1,012	16,760	5,208		5,208	11,552	4,898	16,450
Culled virgin & 2nd-growth	560	4,312	896	5,208	1,568	477	2,045	3,163	2,609	5,772
Old field	420	5,250	848	6,098	3,192	731	3,923	2,175	1,986	4,161
Cut-over	10									
Hardwood	160									
No timber	110									
TOTAL	2,500	25,310	2,756	28,066	9,968	1,208	11,176	16,890	9,493	26,383
TOTAL to cut from Unit #5 during fifth year:							11,176 M ft. b.m.			
Amount salvaged from Units 6 to 10 during fifth year:							939 M ft. b.m.			
TOTAL production fifth year:							12,115 M ft. b.m.			

Table 14. Sixth Year – Selective Cut Unit #6

Timber type	Acres	Pine stand of 1932	Total net growth before 1st selective cut	Stand at time of cutting	Amount available for selective cut: From 1932 stand	Amount available for selective cut: Merch. growth	Amount available for selective cut: Total	Stand after cutting	Growth during 10 yrs after cutting	Stand 10 yrs after cutting
	Number	Thousand feet board measure (b.m.)						Thousand ft. b.m.		
Virgin	1,040	13,208	1,061	14,269	4,368		4,368	9,901	4,198	14,099
Culled virgin & 2nd-growth	530	4,081	1,060	5,141	1,484	564	2,048	3,093	2,552	5,645
Old field	510	6,375	1,288	7,663	3,876	1,109	4,985	2,678	2,445	5,123
Cut-over	380									
Hardwood	80									
No timber	250									
TOTAL	2,790	23,664	3,409	27,073	9,728	1,673	11,401	15,672	9,195	24,867
TOTAL to cut from Unit #6 during sixth year:							11,401 M ft. b.m.			
Amount salvaged from Units 7 to 10 during sixth year:							649 M ft. b.m.			
TOTAL production sixth year:							12,050 M ft. b.m.			

Table 15. Seventh Year – Selective Cut Unit #7

Timber type	Acres	Pine stand of 1932	Total net growth before 1st selective cut	Stand at time of cutting	Amount available for selective cut: From 1932 stand	Amount available for selective cut: Merch. growth	Amount available for selective cut: Total	Stand after cutting	Growth during 10 yrs after cutting	Stand 10 yrs after cutting
	Number	Thousand feet board measure (b.m.)						Thousand ft. b.m.		
Virgin	780	9,906	955	10,861	3,276		3,276	7,585	3,216	10,801
Culled virgin & 2nd-growth	1,630	11,166	3,491	14,657	4,075	1,858	5,933	8,724	7,197	15,921
Old field	280	3,500	848	4,348	2,128	731	2,859	1,489	1,359	2,848
Cut-over										
Hardwood	230									
No timber	270									
TOTAL	3,190	24,572	5,294	29,866	9,479	2,589	12,068	17,798	11,772	29,570
TOTAL to cut from Unit #7 during seventh year:							12,068 M ft. b.m.			
Amount salvaged from Units 8 to 10 during seventh year:							379 M ft. b.m.			
TOTAL production seventh year:							12,447 M ft. b.m.			

Table 16. Eighth Year – Selective Cut Unit #8

Timber type	Acres	Pine stand of 1932	Total net growth before 1st selective cut	Stand at time of cutting	Amount available for selective cut: From 1932 stand	Amount available for selective cut: Merch. growth	Amount available for selective cut: Total	Stand after cutting	Growth during 10 yrs after cutting	Stand 10 yrs after cutting
	Number	Thousand feet board measure (b.m.)						Thousand ft. b.m.		
Virgin	450	5,715	643	6,358	1,890		1,890	4,468	1,894	6,362
Culled virgin & 2nd-growth	1,990	9,950	3,636	13,586	3,582	1,936	5,518	8,068	6,656	14,724
Old field	370	3,515	995	4,510	2,146	860	3,006	1,504	1,373	2,877
Cut-over	1,000									
Hardwood										
No timber	640									
TOTAL	4,450	19,180	5,274	24,454	7,618	2,796	10,414	14,040	9,923	23,963
TOTAL to cut from Unit #8 during eighth year:							10,414 M ft. b.m.			
Amount salvaged from Units 9 to 10 during eighth year:							184 M ft. b.m.			
TOTAL production eighth year:							10,598 M ft. b.m.			

Table 17. Ninth Year – Selective Cut Unit #9

Timber type	Acres	Pine stand of 1932	Total net growth before 1st selective cut	Stand at time of cutting	Amount available for selective cut: From 1932 stand	Amount available for selective cut: Merch. growth	Amount available for selective cut: Total	Stand after cutting	Growth during 10 yrs after cutting	Stand 10 yrs after cutting
	Number	Thousand feet board measure (b.m.)						Thousand ft. b.m.		
Virgin										
Culled virgin & 2nd-growth	2,210	9,724	4,066	13,790	5,083	2,811	7,894	5,896	4,864	10,760
Old field	340	2,346	772	3,118	1,428	658	2,086	1,032	942	1,974
Cut-over	1,270									
Hardwood										
No timber	610									
TOTAL	4,430	12,070	4,838	16,908	6,511	3,469	9,980	6,928	5,806	12,734
TOTAL to cut from Unit #9 during nith year:							9,980 M ft. b.m.			
Amount salvaged from Units 10 during ninth year:							94 M ft. b.m.			
TOTAL production ninth year:							10,074 M ft. b.m.			

Table 18. Tenth Year – Selective Cut Unit #10

Timber type	Acres	Pine stand of 1932	Total net growth before 1st selective cut	Stand at time of cutting	Amount available for selective cut: From 1932 stand	Amount available for selective cut: Merch. growth	Amount available for selective cut: Total	Stand after cutting	Growth during 10 yrs after cutting	Stand 10 yrs after cutting
	Number	Thousand feet board measure (b.m.)						Thousand ft. b.m.		
Virgin										
Culled virgin & 2nd-growth	1,640	7,708	3,616	11,324	3,444	2,347	5,791	5,533	4,565	10,098
Old field	510	4,539	1,652	6,191	2,574	1,423	4,177	2,014	1,839	3,853
Cut-over	570									
Hardwood										
No timber	600									
TOTAL	3,320	12,247	5,268	17,515	6,198	3,770	9,968	7,547	6,404	13,951
TOTAL to cut from Unit #10 during tenth year:							9,968 M ft. b.m.			
TOTAL production tenth year:							9,968 M ft. b.m.			

Table 19. Basis for estimated logging costs.

(Based on estimated 40,000 feet board measure cut pine per day)

		$ Per day	$ Per thousand feet of pine cut
(1) **Cutting** (contract) 4 crews of fallers @ $6.00 per day		24.00	.60
(2) Swamping 2 swampers @ $2.00 per day		4.00	.10
(3) **Bunching and loading** Teams: Depreciation @ $100 per team per year, 5 teams = $500 per year 10,000 M ft.b.m. cut, or $.05 per M		2.00	
Maintenance: Feed, etc. @ $1.20 per head per day 10 head =		12.00	.65
4 Teamsters @ $3.00 per day		12.00	
(4) **Truck haul** (average 1 mile) (contract) 4 trucks and drivers @ $12.50		50.00	1.25
(5) **Loading** on cars, main line haul, trackage rights: 30 cars every other day @ about 3 M ft.b.m. per car ($72.00 per train, loaders, etc. per day For pine and hardwoods, 88 M each trip)		32.00	.80
(6) **Supervision** Logging foreman	2,400		
Logging superintendent and executive supervision (pro rata)	2,600		
	5,000	20.00	.50
(7) **Scaling and clerical** Full time scaler @ $100 per month		4.00	
Part time clerical		2.00	.15
(8) **Supplies and repairs** Saws, axes, oil, etc.			.10
(9) **General expense** Hospital, insurance, and welfare			.10
			4.25
	Margin 15% (add)		.64
	TOTAL		4.89

A Brief Biography of Clement Mesavage

Don C. Bragg

Don C. Bragg, Project Leader and Research Forester, U.S. Department of Agriculture, Forest Service, Southern Research Station, Monticello, AR 71655.

Clement Mesavage scaling a large longleaf pine (*Pinus palustris*) in Georgia to check its form class. Mesavage spent much of his career in the field working on improving the data and technology related to mensuration and inventory. (USDA Forest Service photo taken by C.R. Lockard in July 1945)

Long-time Southern Forest Experiment Station (SOFES) researcher and administrator Clement Mesavage, Sr., was born on October 29, 1911 in Glen Lyon, PA and received his forestry education at Pennsylvania State University. After graduating in 1936 with a bachelor's degree (Anon. 1971), Mesavage first worked as a junior forester with the U.S. Department of Agriculture Forest Service's Allegheny Forest Experiment Station in Huntingdon County, PA and Wilkes-Barre, PA. A precocious researcher, Mesavage's first publication came the year he graduated with an article (Mesavage 1936) that described using the "Koch profile method" for visibility maps from topographic maps as a firefighting aid presaged both his career as a mensurationist and a practical forester working to develop new forestry tools.

Mesavage's early working years were in northeastern Pennsylvania, a region known for its anthracite coal production that had suffered many hardships during the Great Depression. His labors to assist landowners with their forest resources (Allegheny Forest Experiment Station 1940, Mesavage 1942)—aided by his brother and fellow forester Stanley—were credited by some with helping to boost congressional support for the Allegheny Forest Experiment Station (Schrepfer and others 1973). During his time in the Allegheny Forest Experiment Station, Mesavage began working with James W. "Jim" Girard, a legendary timber cruiser and assistant director of the Forest Service's national timber survey program. With abundant drive and plenty of experience, Girard was a self-taught Tennessean with only a sixth-grade education who literally wrote the book (Girard and Gevorkiantz 1939) on timber cruising. Mesavage (1942) adapted Girard's work on tree form class to generate volume tables for Allegheny tree species, and Mesavage and Girard later cooperated on a number of other volume tables.

Mesavage's move to the South came in 1943, when he transferred to the SOFES office in New Orleans, LA. In doing so, Mesavage joined I.F. Eldredge's forest survey staff to work on "forest depletion" (later called "growth and drain") and the SOFES's Products Supplies Survey, part of the Station's war support efforts. Although successful for its time, the Forest Service's initial (1930s) southern forest survey lacked the desired rigor and did not come with sufficient resources or even a directive to continue (Barnett 2023). By 1943, the Federal Government determined it needed a better and more complete—and continuous—assessment of the forest conditions and timber production in support of the war effort. With additional resources (including funding from the War Production Board), work began in 1943 and the efforts to revive and modernize the forest survey program continued into 1944 (SOFES 1944). Mesavage was one of the staff assigned to help the SOFES reorganize and re implement a southern forest survey (Anon. 1971).

During the war, Mesavage (1944) observed increasing requests received by the Station for forest growth and yield information and where to find timber. Following the end of World War II, the Nation transitioned back to peacetime production and concerns about timber scarcity returned. A modernized forest survey had improvements in theory and design to ensure rapid, low-cost data collection (SOFES 1944). Such tasks were well suited to Mesavage, who with a number of other SOFES staff formed a quantitative cadre that helped advance the rigor of southern forest science (Barnett and others 2023). For instance, they contributed to the Forest Service's national timber "reconnaissance" (USDA Forest Service 1946) that helped determine the growth and drain of forests across the South (SOFES 1945, Mesavage and Duerr 1946). According to SOFES (1945), these timber estimates were greatly facilitated by both improved sampling techniques and the volume tables developed by Mesavage and Girard, which increased the speed, accuracy, repeatability, and affordability of these measurements.

Top: The development of large-scale forest surveys, tools, and techniques to better quantify individual trees helped to both recover and sustain timber industry in places such as the Arkansas Ozarks. (USDA Forest Service photo taken by Clement Mesavage in 1951)

Bottom: Meeting of the Central Ozarks Branch advisory committee composed of representatives from local agriculture, forestry, and industry interests. (USDA Forest Service photo taken by Clement Mesavage in 1950)

Mesavage had taken Girard's approach to tree form class designation and developed it into a series of reasonably robust and applicable tables (Mesavage 1946). In using this generalized form class approach, the cubic foot (Mesavage 1947) and board foot (Mesavage and Girard 1946) volume tables were widely applicable and did not need to be custom developed for each stand or forest type. Yet this improved approach did not earn immediate acceptance in many quarters of the agency. Even though these publications eventually became used across the Eastern United States, according to Reynolds (1980) both Mesavage and Girard were disappointed that the Forest Service did not initially embrace their volume tables, delegating this work to a lesser status by not giving it a publication number and labeling it for "administrative use."

Perhaps this disappointment explains Mesavage's next career move. Following a post war realignment of experiment station territories, northern Arkansas was transferred from the Central States Forest Experiment Station to the SOFES. By January 1, 1946, the SOFES had set up an advisory committee for the Central

Ozarks Branch headquartered in Harrison, AR (Anon. 1956). At this time, the Central Ozarks Branch included only the Sylamore Experimental Forest, which had been established in late 1933 to study the hardwood-dominated forests of the region. In 1947, the Central Ozarks Branch needed a new leader after their former leader, Philip R. Wheeler, moved to New Orleans, LA to become the SOFES Forest Management Division Chief. About this same time, the SOFES pared back their efforts and staffing in forest survey work because of agency funding cuts (SOFES 1947).

While a person as accomplished as Mesavage could have stayed with the reduced SOFES forest survey, it may be that the disappointment over his volume table publications coupled with uncertainty about the agency's diminished interest in forest inventory work pushed him toward this new opportunity. Mesavage accepted the assignment as the SOFES's Research Center leader, a position he held until 1962. His efforts during this period included quantitative studies of species such as shortleaf pine (*Pinus echinata*), eastern redcedar (*Juniperus virginiana*), and oaks (*Quercus* spp.) (Maple and Mesavage 1958). Remarkably, little of this management-oriented research was published by Mesavage, although his contributions on eastern redcedar were significant and he probably turned some of his work over to others to complete (Arend 1946, Ferguson and others 1968).

Mesavage's duties at the Central Ozarks Branch also included expansions of the Station's experimental forests. During the post war period, the Federal Government broadened its efforts to use forestry as an opportunity to improve the economic circumstances of much of the rural parts of the Nation, especially where row crop agriculture provided few viable options, but timber production was possible (Barnett and Bragg 2023). The Ozarks had long been considered an area of need, with exploitive lumbering of the original forests of this region having long since depleted the forests. The 2,925-acre Sylamore Experimental Forest, formally established on March 28, 1934, was not sufficient to meet all the needs of the SOFES's planned research program in the Ozarks, so the search began for a new experimental forest. In 1949, the Forest Service purchased a small (~750 acre) parcel of land near the Buffalo River by Harrison, AR that met the research program needs. In September 1950, Mesavage hosted a ceremony for local foresters and dignitaries to dedicate the new Henry R. Koen Experimental Forest, named in honor of the former Ozark National Forest supervisor (Anon. 1950).[1] On October 22, 1954, the Sylamore Experimental Forest was re-established, with additional lands, bringing its area up to 4,180 acres.

Mesavage's research center in Harrison, AR also grew to encompass experimental forests in the Ouachita Mountains of Arkansas. Established on July 19, 1940, but inactive by the end of World War II, the Irons Fork Experimental Forest had had no meaningful research conducted on it for years. According to correspondence on file, in January 1956, Mesavage proposed reactivating work on the Irons Fork Experimental Forest, but by September of that year he had cooled to this remote forest, with its rugged and less-timbered slopes (Mesavage 1956). Mesavage soon identified a more suitable research site in the Ouachita National Forest, and in

Top: Example of some of the quantitative silvicultural studies being conducted on an experimental forest in northern Arkansas. (USDA Forest Service photo taken by Clement Mesavage circa 1950)

Bottom: Photograph of the entrance to the Henry R. Koen Experimental Forest, established as one of two experimental forests developed to be representative of the millions of acres of "depleted" hardwood forests of the Arkansas Ozarks. (USDA Forest Service photo taken by Clement Mesavage in 1950)

[1] The official establishment report for the Henry R. Koen Experimental Forest would be signed on September 17, 1951.

A stand of mature high-quality sweetgum (*Liquidambar styraciflua*) and tupelo gum (*Nyssa sylvatica*) in the Apalachicola River bottoms of northern Florida. (USDA Forest Service photo taken by Clement Mesavage in 1946)

1958 this location for watershed- and silviculture-based studies became the Alum Creek Experimental Forest.

Starting in the 1950s, Mesavage worked closely with Lewis R. Grosenbaugh, a fellow mensurationist who started his Forest Service career on the national forests in Arkansas. Together, they worked on ways to improve the cruising and sampling of various forest types, including Ozark hardwoods (Mesavage and Grosenbaugh 1956). This highlights another key aspect of his talent as a scientist; years later, Grosenbaugh's retirement memo mentioned Mesavage as first in a list of "foresters who grasped the potentialities and acted as exponents" of his pioneering mensuration (Grosenbaugh 1974: 5).

Following a reorganization of Forest Service research in 1962, the administrative structure of the Harrison Research Center was changed into one driven by research projects (Barnett and Bragg 2023). In June 1962, Mesavage was temporarily appointed as the forest management project leader, but only until E.R. Ferguson moved to the Harrison Research Center a few months later. In 1963, the Harrison-based Mesavage was charged with running the SOFES's newly established mensuration research project located in Hot Springs, AR (SOFES 1963). Mesavage's pursuit of adapting existing technology to improve forest mensuration is expressed repeatedly in his publications. For example, Mesavage (1965b) recognized the inherent weaknesses of using stand tables to estimate tree volumes—something he based much of his earlier work on—and helped Grosenbaugh adapt the sophisticated tools and analysis techniques related to 3P sampling and the use of dendrometers in a manner that field foresters could appreciate.

His capacity for technological adaptation was more than just academic or conceptual. For most of his career, Mesavage was a tinkerer, and built a number of tools to help make the sometimes arduous and physically demanding work of forest measurements easier and more repeatable. As an example, Mesavage (1942) designed a ternary chart that could be used to facilitate conversion of tree volumes between one Girard Form Class to another. In 1949, Mesavage received U.S. patent 2,471,491 for a tree volume calculator based on Girard's form classes. Later, Mesavage (1965a) published the design for a "taperscope" adapted from an Abney hand level to compare bole diameters to help identify merchantable tree height in standing timber. Mesavage developed some of the equipment and techniques that supported Grosenbaugh's work with 3P sampling (Mesavage 1965b, 1967a, 1969c). Mesavage was also key to the development of a number of modifications to the Barr and Stroud dendrometer (realized in the FP12 and FP15 models of that product) and Zeiss Telemeter Teletop instruments to make them more conducive to use in typical forest conditions (Mesavage 1967a, 1969b, 1969c). About this same time, Mesavage (1967b) "devoted much personal as well as official effort" to design a mechanical random number generator (for up to 5 numbers) that made randomization a much easier and less cumbersome task in the field (Grosenbaugh 1965). As with many of his fellow scientists, Mesavage was also an avid and capable photographer, with some of his pictures of forest conditions and study treatments appearing in Forest Service publications.

In June 1966, Mesavage left the SOFES to work as a forester with the Division of Timber Management for the Forest Service's National Forest System. In this capacity, Mesavage worked on the application of timber volume and value determination tests for use by field foresters (Anon. 1970, 1971). Although no longer in the research branch of the agency, he also continued to publish on some of his earlier studies, including a paper on the value of accurate bark thickness measurement (Mesavage 1969a). After 34 years, Mesavage retired from the Forest Service (Anon. 1970). On April 2, 1971, Mesavage died suddenly at his home in Harrison, AR of an apparent heart attack (Anon. 1971). Only 59 at his untimely death, Mesavage had left a remarkable legacy for the SOFES and the forestry profession.

> *"For most of his career, Mesavage was a tinkerer, and built a number of tools to help make the sometimes arduous and physically demanding work of forest measurements easier and more repeatable.*

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The First Publication Series of the Southern Forest Experiment Station

James P. Barnett

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INTRODUCTION

The first U.S. Department of Agriculture Forest Service regional experiment stations were created in 1921 with few guidelines and directives for their organization. Newly appointed, station directors used creativity in organizing their programs, including how to gain support and direction for the experiment stations. This was especially true for the Southern Forest Experiment Station (SOFES), which was established when much of the southern timber industry had cut out, or were on the verge of cutting out, their virgin forests.

While Reginald D. Forbes served as the first station director (from 1921 to 1927) of the SOFES, it was Elwood L. Demmon, Station Director from 1927 to 1944, who created much of the Station's organizational and administrative policies with little guidance from the Washington Office.

One early challenge was how to communicate the results of research studies. Early publications (a term used in its broadest sense) included Washington Office bulletins, reprints from scientific and trade journals, and mimeographed texts of the station director's trade-association speeches. An end-of-year list of these publications was sent out, making them available upon request. For example, the list for 1932 included 27 items, ranging from a rather trivial 1-page chart of *How Does a Tree Grow* to a substantive 210-page mimeographed monograph by Putman and Bull (1932), *The Trees of the Bottomlands of the Mississippi River Delta Region* that Philip Wakeley, Station scientist, suggested was "one of the two or three best research publications of the Station up to that time, and perhaps of all time" (Wakeley and Barnett 2016).

"The name "Occasional Papers" (OP) was adopted to give the reports distinction. Occasional Papers were produced at irregular intervals, as data worth releasing became available. There was no implied commitment to a publication deadline like that of an annual report, or of a monthly or periodic professional journal.

OCCASIONAL PAPERS

In 1932, Station Director Demmon conceived the idea of consecutively numbering all mimeographed releases from the SOFES. Demmon thought that numbering the releases in a named series would tie them together, emphasize their connection with the Station, and make the releases easier to be cited. During this time, other stations were publishing unnumbered technical reports or notes (Southeastern Forest Experiment Station 1947). The name "Occasional Papers" (OP) was adopted to give the reports distinction. Occasional Papers were produced at irregular intervals, as data worth releasing became available. There was no implied commitment to a publication deadline like that of an annual report, or of a monthly or periodic professional journal. There was no stated indication of space, length, or style, and the contents could be varied to fit the reported results. Furthermore, this gave the Station a flexibility in publishing that was an asset. For example, in 1951, it made possible the release (in three volumes, totaling 579 pages) of 800 copies of Wakeley's *Planting the Southern Pines*, in a form that effectively precluded the Washington Office from altering its contents (a plan reflecting Wakeley's earlier difficulty with their editors!) (Wakeley and Barnett 2016).

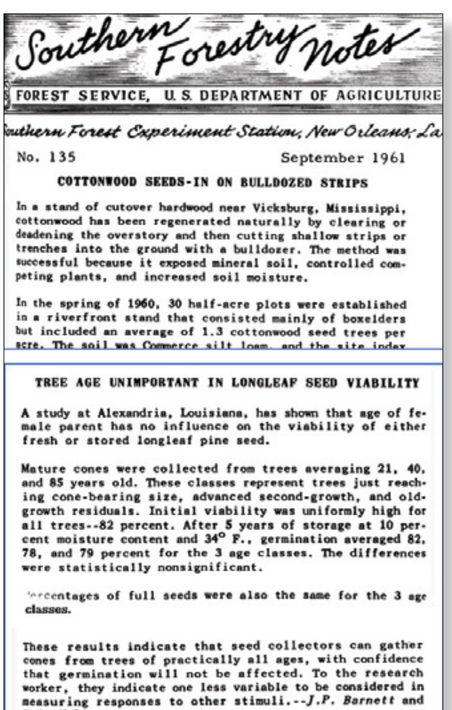
The first SOFES OP was entitled *Truck Logging of Pines in Mississippi and Louisiana* written by Russell R. Reynolds. Issued in July of 1933, this paper was not one of Reynolds' most important contributions. Indeed, Reynolds (1933) was described by Wakeley as "a scant ten pages in length, mimeographed, single-spaced without illustrations" (Wakeley and Barnett 2016). Because there had been 27 earlier publications of various types, Demmon numbered the first OP as 28. This decision reflects the stirring of an impulse toward the modern game of "creating an image."

The OP series proved to be a pioneer in this type of research release. The original crudeness of this publication series reflected the meagerness of facilities and resource limitations of that time. Over time, OP became increasingly well written, edited, designed, and printed. Not surprisingly, they developed a world wide circulation and have been frequently cited in leading textbooks and periodicals. Many OP have become classics in their field of research. OP offered a wide scope of important and influential topics, from Putnam and Bull's "magnificent" work[1] on the bottomland forests of the Mississippi River Delta; pine silviculture, protection, and health (Bickford 1943, Bond and others 1937, Thatcher 1960); forest products utilization (Carpenter 1950, Snow 1944); forest measurements (Avery 1957, Grosenbaugh 1954, Mesavage 1947); and other aspects of forest development (Langdon and others 1952, Lull and Reinhart 1955, Nelson 1938).

SOUTHERN FORESTRY NOTES

In 1939, the more informal Southern Forestry Notes (SFN) series was created to communicate with the forestry community and gain their respect and support. SFN's were "…published from time to time, with the purpose of making available to [those] interested in the management of forest lands in the South, timely and pertinent items of information gleaned from forest investigations in this and other forest experiment stations." (Southern Forest Experiment Station 1939). SFNs were widely mailed and included a section providing information on publications in other outlets.

The SFN was a mimeographed and folded sheet of paper (see the figure to the left for a partial example), usually with four printed pages (rarely did a note include two sheets, or eight pages). An issue typically had three articles, which were often very short. For example, my first publication regarding the role of tree age in longleaf pine seed viability was three short paragraphs from the same issue of SFN shown in figure to the left (Barnett and McLemore 1961). Although brief, this article was appropriate to communicate this tidbit of information and a citable publication (an important aspect for young researchers). Frequently published (142 were published between June 1933 and



Southern Forestry Notes

FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE

Southern Forest Experiment Station, New Orleans, La

No. 135 September 1961

COTTONWOOD SEEDS-IN ON BULLDOZED STRIPS

In a stand of cutover hardwood near Vicksburg, Mississippi, cottonwood has been regenerated naturally by clearing or deadening the overstory and then cutting shallow strips or trenches into the ground with a bulldozer. The method was successful because it exposed mineral soil, controlled competing plants, and increased soil moisture.

In the spring of 1960, 30 half-acre plots were established in a riverfront stand that consisted mainly of boxelders but included an average of 1.3 cottonwood seed trees per acre. The soil was Commerce silt loam, and the site index

TREE AGE UNIMPORTANT IN LONGLEAF SEED VIABILITY

A study at Alexandria, Louisiana, has shown that age of female parent has no influence on the viability of either fresh or stored longleaf pine seed.

Mature cones were collected from trees averaging 21, 40, and 85 years old. These classes represent trees just reaching cone-bearing size, advanced second-growth, and old-growth residuals. Initial viability was uniformly high for all trees--82 percent. After 5 years of storage at 10 percent moisture content and 34° F., germination averaged 82, 78, and 79 percent for the 3 age classes. The differences were statistically nonsignificant.

Percentages of full seeds were also the same for the 3 age classes.

These results indicate that seed collectors can gather cones from trees of practically all ages, with confidence that germination will not be affected. To the research worker, they indicate one less variable to be considered in measuring responses to other stimuli.--*J.P. Barnett* and *B.F. McLemore*.

This example of a Southern Forestry Note (number 135) had four short articles and a listing of recent Station publications that were available upon request; my article included three paragraphs over two pages (bottom of image).

[1] Demmon numbered and reissued the monograph by Putman and Bull as Occasional Paper 27 which had been published unnumbered the previous year. Wakeley called Putman and Bull's paper "magnificent" probably because of its outstanding technical quality, but also because a limited number were printed on glossy paper with excellent quality photographs for presentation purposes (Wakeley and Barnett 2016).

November 1962), SFNs were a highly effective communication tool that helped engage the public in the Station's research program and linked the reader to more meaningful research.

> *SFN's were "...published from time to time, with the purpose of making available to [those] interested in the management of forest lands in the South, timely and pertinent items of information gleaned from forest investigations in this and other forest experiment stations."*

CONCLUSIONS

By committing resources to produce quality publications, Demmon and his successors determined that both the OP and SFN series reflected favorably on the SOFES. Upon direction from the Washington Office's revision to the Forest Service's Research and Development Program, both series ended in late 1962. In part, they were replaced by some of the service wide publication series which continue to this day.

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Some Early Developers of Statistical and Mensurational Techniques at the Southern Forest Experiment Station

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The early forestry research of the Southern Forest Experiment Station (SOFES) emphasized searching for, observing, and describing conditions as an approach to producing sound results. While this produced numerous and useful results and improved our understanding of forests and forestry, without a true application of replication and control, this approach could only take science so far. Unfortunately, it was virtually all that was available when the Station first opened. In 1921, most sampling, experimental design, statistics, and mensuration[1] techniques had not yet been developed for forestry.

Within a decade, this shortcoming started to be addressed. Over the years, there were many men and some women in the Station who helped advance the science of applied statistics and forest mensuration, not just regionally but nationally. In addition to their contributions towards advancing southern forest science, Station staff worked hard to make these complex concepts both simple and useful for practitioners. Note that the people featured in this paper—Chapman, Grosenbaugh, Mesavage, and Freese—are only some of the most prominent contributors.

ROY A. CHAPMAN

Roy A. Chapman was recruited as a temporary field assistant by the SOFES in 1926 and given a permanent appointment in 1929. Chapman graduated from the University of Minnesota in 1927 and worked for a while for the U.S. Department of Agriculture Forest Service in the Western United States and Minnesota. Chapman was always ready with a good story or an amusing comment. When he transferred to the SOFES in 1929, the temperature was -40 °F as he left the cruising camp in Minnesota. When he arrived in New Orleans, the temperature was 85 °F. Chapman was quoted (Wakeley and Barnett 2016) as saying he “nearly got up and took off his long underwear right in the dining car.” Much of his early work with the SOFES related to silviculture, and Chapman proved to be a very independent but generously helpful man.

Roy Chapman was an early statistician and did much to improve the Southern Forest Experiment Station’s research program.

[1] In forestry, mensuration is defined as the branch of mathematics dealing with the measurement of trees or stands, including their products (Helms 1998).

Chapman was a statistician and an intensely practical one. Philip C. Wakeley, a pioneering SOFES researcher in reforestation techniques, described Chapman's first several years on the staff as a strong and stimulating influence on mensuration techniques, experimental design, and analytical procedures. In 1931, Chapman was detailed to Washington, DC, to train under Francis X. Schumacher. The assignment lasted for a full 3 years. During that period, Chapman met and formed a friendship with R.A. (later Sir Ronald) Fisher, the father of modern statistics. Fisher's published works on statistics and experimental design did much to shape Chapman's own later career. Chapman returned to the SOFES when numerous new studies and projects were getting underway as a result of President Franklin Delano Roosevelt's Great Depression-era relief program. With enthusiasm, know-how, and personality, he incorporated sound statistical but practical procedures into this new research (Wakeley and Chapman 1937).

Chapman was never a prolific scientist, with only a limited number of SOFES publications over the years (and mostly as a junior author). But he did contribute on several fronts, including work on refining tree volume derivations and a statistical test (Chapman 1938a, 1938b). He also played an important role in developing studies and ensuring their proper analysis. Indeed, Wakeley considered Chapman to be the SOFES's real director for scientific work during this period. Wakeley believed that Chapman's work saved the Station's statistical reputation, making the SOFES one of the foremost in incorporating statistics on such a scale (Wakeley and Barnett 2016). Furthermore, Chapman's influence on forestry research was much broader than his work for the SOFES. For instance, a prominent book on statistics and sampling that arose from his earlier collaboration with Schumacher did much to bring forestry research into a new era of competence (Schumacher and Chapman 1942). By January 1948, Chapman had left the SOFES for a position in the Washington Office in Research's Division of Forest Economics (as a biometrician), where he would continue working on mensuration issues.

"Lew" Grosenbaugh was a very creative scientist and did much to simplify stand measurements.

LEWIS R. 'LEW' GROSENBAUGH

The assignment of Lew Grosenbaugh after World War II continued to make the SOFES a leader in this field. Grosenbaugh earned a degree from Dartmouth College in 1934 and received a master's degree in forestry from Yale University in 1936. He began work with the Ozark National Forest in Arkansas. In 1946, he was reassigned to the SOFES in New Orleans where he served as a silviculturist and a mensurationist before becoming the Station's chief of the Division of Forest Management Research between 1951 and 1960. In 1961, Grosenbaugh was transferred to head the Forest Service's first pioneering unit in mensuration reporting directly to the Deputy Chief of Research and Development. The first headquarters of the unit was at the University of California, School of Forestry with fiscal and clerical services provided by the Pacific Southwest Experiment Station (Grosenbaugh 1999); the unit was moved to Atlanta in 1968. Grosenbaugh retired in 1974 as chief mensurationist. Upon his retirement he moved to Gainesville, FL, where he became an adjunct professor of the University of Florida's School of Forest Resources and Conservation.

As a researcher, three of his major accomplishments include:

- Introducing Bitterlich point-sampling to the United States, which is a technique for measuring timber stands that eliminated the need for laboriously measuring and marking plot boundaries (Grosenbaugh 1952a)
- Publishing a revolutionary concept of determining volumes of standing trees by measuring the length of the bole between changes in diameter (Grosenbaugh 1954)
- Devising a system of tree measurement (3P sampling) which can multiply the efficiency of field foresters on such work threefold (Grosenbaugh 1955, 1958)

Grosenbaugh was so brilliant that most foresters had difficulty in understanding his new concepts and related technologies. His mind simply operated at a higher plane than most of his contemporaries. A common joke at forestry group meetings was "you cannot understand his forestry ideas until he had three beers" (Anon. 1959). Yet he constantly sought opportunities to aid those who lacked his acuity. A good example of this is his publication *Shortcuts for Cruisers and Scalers* (Grosenbaugh 1952b).

"The early forestry research of the Southern Forest Experiment Station (SOFES) emphasized searching for, observing, and describing conditions as an approach to producing sound results.

Grosenbaugh also provided SOFES researchers with invaluable statistical support in the design and analysis of their studies. As mentioned earlier, the proper development of hypothesis tests, critical experiments, rigorous mensurational techniques, and appropriate consideration of the results using robust statistical designs was only a relatively recent development in science during the early years of the SOFES. The efforts of Chapman, Grosenbaugh, Freese, and other SOFES biometricians helped many researchers avoid poorly designed studies or inappropriate analyses and added considerable credibility to Forest Service research.

For his efforts, Grosenbaugh received many awards and recognitions over the years. While with the SOFES, he received the Superior Service Award of the U.S. Department of Agriculture in 1959 in recognition of his notable contributions in forest management and mensuration, and for excellent leadership in the conduct of forest management research. At a presentation in Grosenbaugh's honor in 1954, Philip A. Briegleb, President of the Society of American Foresters, said that

> *… his creative contributions to forest management are in daily use throughout the profession. The prestige of American forestry, at home and aboard, has been heightened by his accomplishments. In forest mensuration it would be difficult to name an individual whose work has had greater impact …* (Bell 2020b).

John Bell, a well-known biometrician, said of Grosenbaugh and several others highly regarded in this field, "If biometrics was a ladder Kim [Iles], Grosenbaugh and [George] Furnival would be standing on the top two rungs – then there are seven or eight empty rungs and the rest of us are scattered out all the way down" (Iles 2018). One of his former SOFES supervisors, Charles A. Connaughton, said of Grosenbaugh, *Along with Lew's ability to 'think ahead', he has almost limitless mental and physical energy. I'm concerned at times because Lew is spoken of only as a mensurationist. He's a well-rounded forester in field and office skills alike. In addition to the outstanding traits which I've described without many superlatives which are justified, Lew is a 'regular' fellow. He's liked by his associates and his company is sought after when the day is done, and relaxation takes the place of business.* (Barnett 2016)

Clement Mesavage was a practical and innovative field forester, researcher, and administrator.

CLEMENT MESAVAGE

Clement Mesavage arrived in New Orleans in 1943 to work with Inman F. "Cap" Eldredge's Southern Forest Survey staff (Bragg 2023). World War II had led to a push by the Federal Government to improve upon its approach to the regional and national assessment of forest conditions and wood production (considered vital to the war effort). Mesavage worked on a series of major improvements to how the SOFES would design and conduct a new round of large-scale forest inventories across the South (Mesavage 1944). He was particularly well placed to contribute to these improvements, given his work on tree form since graduating in 1936 with a forestry degree from Penn State University. In the late 1930s and early 1940s, Mesavage worked with noted timber cruiser James Girard (who was then the Forest Service's Assistant Director of the national Forest Survey program) to formalize and publish Girard's approach to tree form class, which was a novel improvement on tree volume estimation (Mesavage 1947, Mesavage and Girard 1946).

Mesavage accepted an assignment to lead the forestry research program of the SOFES in the Ozarks of northern Arkansas in 1947. In the years he served in this capacity (he held this position in Harrison, AR, until 1962), Mesavage worked on several topics, some with more of a silviculture focus, and others with more of a mensuration angle. He worked closely during this period with Grosenbaugh to improve upon timber cruising and sampling, a critical need in the complex hardwood-dominated forests of the rugged Ozarks. Their collaboration produced a number of useful outcomes, including a paper on cruising forests (Mesavage and Grosenbaugh 1956) and the development of technology and techniques for better timber estimates (Mesavage 1967, 1969a, 1969b). For instance, his support (Mesavage 1966) of the work of Grosenbaugh on the development of 3P sampling was of considerable value and led Grosenbaugh to later call Mesavage one of the "foresters who grasped the potentialities and acted as exponents" of his pioneering mensuration (Grosenbaugh 1974: 5).

In 1963, Mesavage administratively moved (his duty station remained in Harrison) from leading the Ozark Branch Station to running the SOFES's new mensuration unit based out of Hot Springs, AR. This work had occurred under the forest management part of the SOFES for a number of years prior to this point, largely as a more informal collection of scientists (such as Mesavage, Grosenbaugh, and Freese) who were working on various quantitative aspects from growth and yield and measuring technology as well as other topics (such as silviculture). A reorganization structured the Station's research into "specialized project assignments," which included the mensuration of southern pines and hardwoods as a more discrete unit under the broader forest management research project (Brieglab 1963). As such, the mensuration unit continued their work on developing quantitative tools and technology for forest managers. This suited Mesavage well. Although not a developer of sampling theory and methodology or advanced measuring techniques like Grosenbaugh, Mesavage helped both practicing foresters and forest researchers (Anon. 1970). Over his career, he developed or assisted in the development of methods and tools that made the implementation of quantitative silviculture easier and more reliable (e.g., Mesavage 1967, 1969a, 1969b).

Mesavage continued his work with the SOFES mensuration project until June of 1966, when he became a forester in the Division of Timber Management in the Forest Service's National Forest System. In this new job for the Washington Office (but still stationed in Arkansas), Mesavage continued to work on practical applications of mensurational techniques (especially for national forest managers) until his retirement from the agency in 1970.

FRANK FREESE, JR.

Frank Freese's publications did much to improve study design and analysis.

In a period when there were few foresters who had statistical training, Frank Freese, Jr. provided practical and simple publications that allowed foresters to use statistics in their research. A graduate of Yale University, Freese served as "a ground pounder" (infantryman) in World War II, and sweated through some tough campaigns, like the Battle of the Bulge. He emerged with a Silver Star, an ability to dig in frozen ground, and a practical approach to life (Bell 2020a). Freese was hired in 1954 to work in Grosenbaugh's forest management project in the SOFES. By 1958, Freese's position in the SOFES was as a biometrician under the station director's office. He remained there until 1962, when he moved to Hot Springs, AR, as a part of a new mensuration-focused unit. In 1966, Freese moved on to the Forest Service's Forest Products Laboratory in Madison, WI, where he spent the latter part of his career.

Like Chapman, Freese was not a prolific author. He did occasionally publish scientific articles while working for the SOFES (e.g., Freese 1960). More importantly, Freese wrote several short volumes that unraveled the complexity of statistics. The first, *A Guidebook for Statistical Transients* (and later updates and supplements, including Freese [1962, 1967]), was meant to teach the basics in a readable and simple style (Freese 1956). This publication became the text for researcher training sessions at the SOFES in the 1950s and 1960s. In an era when statistics and experimental design were rarely taught in forestry schools, Freese's books filled the gap. Not only did they convey in simple language the nature and use of statistics, they provided examples on how to conduct statistical analyses.

Compared to many largely unreadable (at least for non mathematicians) statistical texts, Freese's books are fondly remembered by those who used them. Indeed, the popularity of his original offering was reflected some 40 years later when *A Guidebook for Statistical Transients* was reprinted for everyone attending the 1997 Lake Tahoe meeting of a western mensuration group (Bell 2020a). Freese always had a modesty and genuine respect for people that came through in his writing. His books have been reprinted numerous times and are still commercially available.

OTHER QUANTITATIVE PEOPLE OF NOTE

In addition to these men, there were other noted mensurationists who passed through the SOFES on their way to further accomplishments. For instance, David Bruce ended up at the Pacific Northwest Experiment Station, but he started his career at the SOFES doing fire control work. He is the inventor of the wedge prism used in forest point sampling (Iles 2018). Another mensurational contributor, Thomas Eugene Avery, would eventually become well known for his books on forest measurements and aerial photography (Iles 2018), which have been updated many times (a revised version of his *Forest Measurements* is still in use today).

While the early years of the SOFES did not have any women mensurationists, various programs in the Station had numerous people who worked in supporting technical positions where they "crunched" the numbers. For example, according to the 1938 Forest Service Directory, the SOFES had as a part of the Forest Survey program a branch called "Mensuration, Computing and Tabulating" led by Philip R. Wheeler, with assistance from William S. Stover, Martha E. Nelson, Elmire A. Even, and Honora W. Cassens. At that time, the SOFES also employed Mary R. Craig and William G. O'Regan as "statistical clerks." Indeed, much of the work that SOFES scientists were able to complete and publish was *only* possible because of the unheralded contributions of many different people who worked behind the scenes.

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The First Southern Forest Survey

James P. Barnett

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The passage of the McSweeney-McNary Act of 1928 authorized a nationwide inventory of the Nation's forests. In part, such data were required to develop new markets, and the need for such development in the impoverished South was great. The virgin forests of the South had been aggressively harvested and the land lay barren due in part to the tax policies in most Southern States, which taxed cutover land at higher values than other real estate (Fickle 2001). Second-growth forests on some of these cutover lands were the pride of early foresters, but their nature, usefulness, and location were largely unknown.

In the late 1920s, timberland owners and managers began to understand that the second-growth pine (*Pinus* spp.) forests developing across the South could be profitable. A number of pioneers began to promote reforestation of cutover forests. Much of the initial effort was due to individuals such as Henry Hardtner at Urania Lumber Company, Col. W.H. Sullivan at Great Southern Lumber Company, and Austin Cary of the U.S. Department of Agriculture Forest Service (Carter and others 2015). However, products that could be made profitably from young pine trees were needed. Dr. Charles H. Herty, a noted chemist in Georgia, demonstrated that newsprint could be made from young southern pines. Herty began a promotional effort to convince southern landowners that there was value in these young stands (Reed 2010). The next step was to determine if there was sufficient raw material to support paper mill construction; hence, the first survey of the South's forests.

The Southern Forest Survey was undertaken to answer the questions of those interested in investing in forestry (Eldredge 1934, 1935). Responsibility for the survey of the southern forests in the Coastal Plain and Lower Mississippi River Valley was assigned to the Forest Service's Southern Forest Experiment Station (SOFES), headquartered in New Orleans. The challenge was huge—the SOFES was to conduct an inventory of forest resources on more than 200 million acres stretching from the Atlantic coast of South Carolina to the prairies of Texas.

Planning for the survey began in 1931 (Lentz 1931), as the survey was more than just a "super-sized" timber cruise. The fivefold objective of the survey was to:

- Inventory the present supply of timber and other forest products
- Learn the rate at which this supply was being increased through growth
- Determine the rate at which this supply was being diminished through industrial and local use, windfall, fire, and disease
- Determine the present requirements and probable future trends for timber and other forest products

"The Southern Forest Survey was undertaken to answer the questions of those interested in investing in forestry . . . The challenge was huge—the SOFES was to conduct an inventory of forest resources on more than 200 million acres stretching from the Atlantic coast of South Carolina to the prairies of Texas.

- Correlate these findings with existing and anticipated economic conditions so policies could be formulated for the effective use of land suitable for forest production (Eldredge 1934)

Station Director E.L. Demmon assembled a well-qualified staff to develop methods for conducting the survey and for recording and analyzing the data. He needed, however, an exceptional individual to lead and manage the enormous field operation. He soon realized that the most qualified person with the needed background and southern experience was Inman F. "Cap" Eldredge (Barnett 2016). Demmon assigned the task to Eldredge, who was fully capable of leading the monumental effort to determine the status of the South's forests.

Cap Eldredge was effective in advocating the value of the Forest Survey.

CAP ELDREDGE AND THE FIELD WORK

Eldredge had studied engineering at Clemson University but had entered the forestry program at Biltmore Forest School in 1903. After he was hired by the Forest Service in 1906, he worked in the West for a few years. In 1909, he was temporarily assigned to one of the newly created national forests in Florida. In the absence of the named forest supervisor, Eldredge served in that capacity for 8 years, instituting polices for administering about half a million acres of timberland (Maunder 1977). After the outbreak of World War I, Eldredge was commissioned and served in the U.S. Army as a captain in the 10th Engineers (Forestry), a pioneer forestry unit, in southern France. There, he got his nickname "Cap", which was used the rest of his life (Anon. 1963). After the war, Eldredge returned to the Forest Service, this time at the Washington Office. However, his assignments required frequent travel.

With a young family, Eldredge wanted less travel. In early 1926, he assumed the responsibility of managing Superior Pine Products Company's 208,000-acre Suwannee Forest in the longleaf pine (*P. palustris*) region near Fargo in southeastern Georgia. The town of Fargo was abandoned by the previous owner and was purchased by Eldredge's company. Most of the employees worked in naval stores or turpentine chipping camps and were a tough lot (Maunder 1977). Fargo had no law enforcement and was known as "Bad Man's Fargo." Not surprisingly, it became a sump into which all the hard characters of Florida and Georgia ended up when pursued by the law.

Under Eldredge's guidance, Fargo was tamed, and the Suwannee Forest became a proving ground for many forest practices including planting, thinning, and prescribed burning. Eldredge left the Suwannee Forest position in 1932 when he was selected to become the Station's regional survey director.

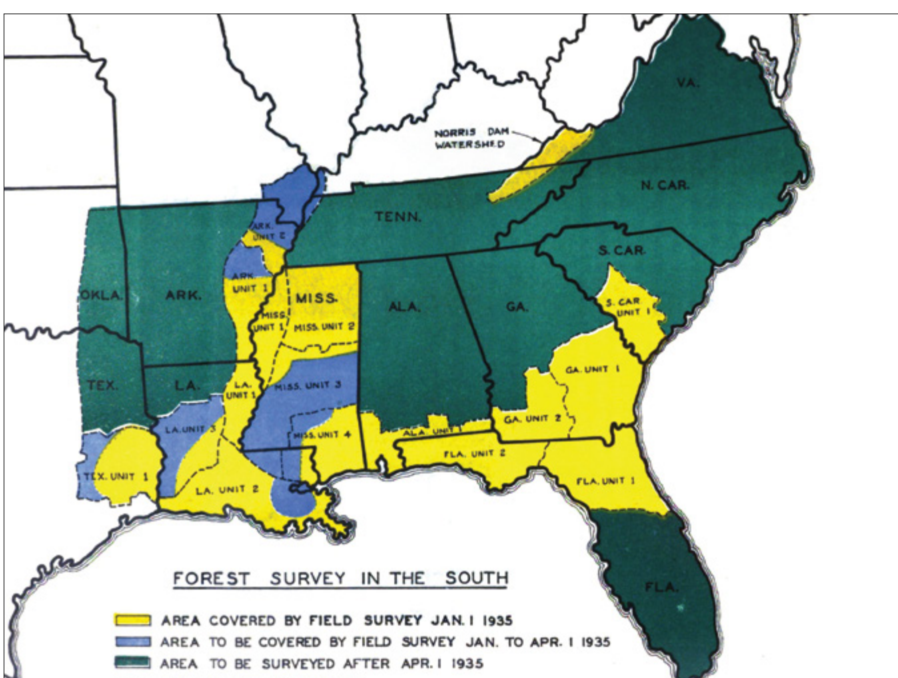
A technical forester who had earned a national reputation, Eldredge had a remarkable ability for understanding and knowing how to work with people on all levels. For example, Maunder (1977) quoted Eldredge as saying, "…turpentine operators…were the greatest, ablest and most energetic set of wood-burners that the Lord has ever smiled upon." A native of South Carolina, Eldredge was one of few southerners who at the time had gone into forestry (most foresters in the South at the time were northerners). So, he better knew the South's customs and way of life (Wakeley and Barnett 2016).

Conducting the Southern Forest Survey was a massive undertaking for the time. Led by Field Manager Mark Lehrbas, the field work was done by 25 three-man crews, each of which consisted of an expert timber cruiser and two assistants. Because of the Great Depression, many of the best timbermen in the South were available to work in these crews. The crews inventoried areas to be covered by the survey without regard to land occupancy or ownership. Quarter-acre sample plots were laid out at intervals of 660 feet on parallel compass lines 10 miles apart. On each sample plot, the trees were counted and measured, and classified by diameter classes and species. Growth rates of individual tree species, cull percentages, merchantable lengths, and other special data were obtained on randomly selected sample trees located on the sample plots. Forest growth and forest utilization specialists were assigned to conduct growth and utilization studies in each of the survey units (Eldredge 1934). Crews worked ably and vigorously under difficult conditions. For example, it was reported that swamps near Grand Lake and Morgan City, LA, were largely inventoried on the cruisers' hands and knees (Maunder 1977).

The survey work was carried out in geographic units of 4 to 10 million acres. Unit boundaries were established within a given State where the timber stand conditions, as well as factors governing social, economic, and industrial activities, were as uniform as possible throughout the unit. In southern Alabama, for example, a 4.5-million-acre survey unit was established to include most of the commercial range of the longleaf-slash pine timber type within the State. This unit also included most of the naval stores operations in Alabama.

The Southern Forest Survey began just as an interest in forestry was developing, and forest industries became its best supporters. While the survey was underway, Eldredge would meet with user groups to determine what kind of information they needed from the survey. For example, the pulp and paper folks wanted volume in cords as well as board feet. They also wanted data by species, sizes, geographic location, and stands per acre (Eldredge 1935).

Above: **Mark Lehrbas**, Field Manager for the measurement of field survey plots.



Left: 1935 map of the Forest Survey measurements units assigned to the Southern Forest Experiment Station.

Funding for this massive undertaking was primarily supplied via several of President Franklin Delano Roosevelt's "New Deal" programs. Amazingly, the field effort was completed in 4 years, although analysis and publication of the data took much longer. Eldredge's goal was to get some of the information out as quickly as possible. To do this, 40 people in New Orleans tabulated the data using the latest computing equipment available (Barnett 2018).

PHILIP R. 'PHIL' WHEELER AND THE DATA COMPILATION

While Eldredge, as Regional Survey Director, oversaw the conduct of the Southern Forest Survey, he did not have the training or expertise to develop plans for the survey's fieldwork or for analysis of the data collected. Philip R. Wheeler, Computing Chief, led the analysis of the data, and Robert K. Winters, the Survey's Executive Officer, was primarily responsible for the publication of the data in progress reports known as Forest Survey Releases (Eldredge 1935).

Phil Wheeler (right) with **Dr. R.S. Campbell**, an early range scientist in the Southern Forest Experiment Station.

Wheeler, a native of Grand Rapids and 1930 graduate of the University of Michigan, arrived at the Station in 1931 and joined the group planning the survey. Wheeler used guidance from Station Statistician Roy A. Chapman to develop practical field techniques and effective data analyses. This resulted in quality survey products that forestry investors needed to make decisions.

Wheeler was energetic, tenacious, and thorough in approach to the projects that came his way. Tall, thin, and brisk of speech, he gained wide respect for his leadership. He led a staff of 19 statistical experts and skilled computer specialists in summarizing and analyzing the tremendous mass of field data gathered in each survey unit by the field crews. For this computation work, electric sorting and tabulating machines were required. In the analysis of the data, it was estimated that more than half a million tabulating cards were used. The punched cards were retained to permit the reanalysis of survey data for special reports other than those originally planned (Eldredge 1934).

Wheeler later pioneered the use of computers in analysis of the data from the survey and led development of forest survey technology following World War II. In effectively providing data through his analysis and distribution of forest survey results, Wheeler helped foster the development of forest industry in the South.

PUBLICATION OF THE FIRST SOUTHERN FOREST SURVEY RESULTS

The amount of data was so massive that it was 1946 before all the results of the first Southern Forest Survey were analyzed and published. A steady stream of information came from the data analyses, and the Station published 55 Forest Survey Releases during the period from 1934 to 1946 (SFES 1946). When an analysis of survey data was completed for any unit, a preliminary report provided the following essential information (Eldredge 1934):

- Area classified as cultivated agricultural land, idle and abandoned agricultural land, pasture, railroads and other rights-of-way, towns, villages, waterways, marsh, and prairies
- Area by forest conditions and forest types, such as stands of old-growth longleaf pine, second-growth slash pine (*P. elliottii*), clear-cut loblolly pine (*P. taeda*), etc.

- Stand and stock tables showing, for the average acre, the number of trees and volume of trees in the various diameter classes
- Volume of new sawtimber by species, number of poles divided into three or more broad groups based on the American Standard Association pole classification system, number of pilings by length classes, volume of pulpwood and fuelwood, and an estimate of the present and potential supply of longleaf pine stumps for wood naval stores production
- In the naval stores region, the number of crops of turpentine cups in operation at the present, and the number of additional cups that could be hung on trees of operating size, and the future supply of timber available for turpentining
- Forest growth data
- An estimate of the rate at which existing timber supplies were being diminished through industrial use and natural losses

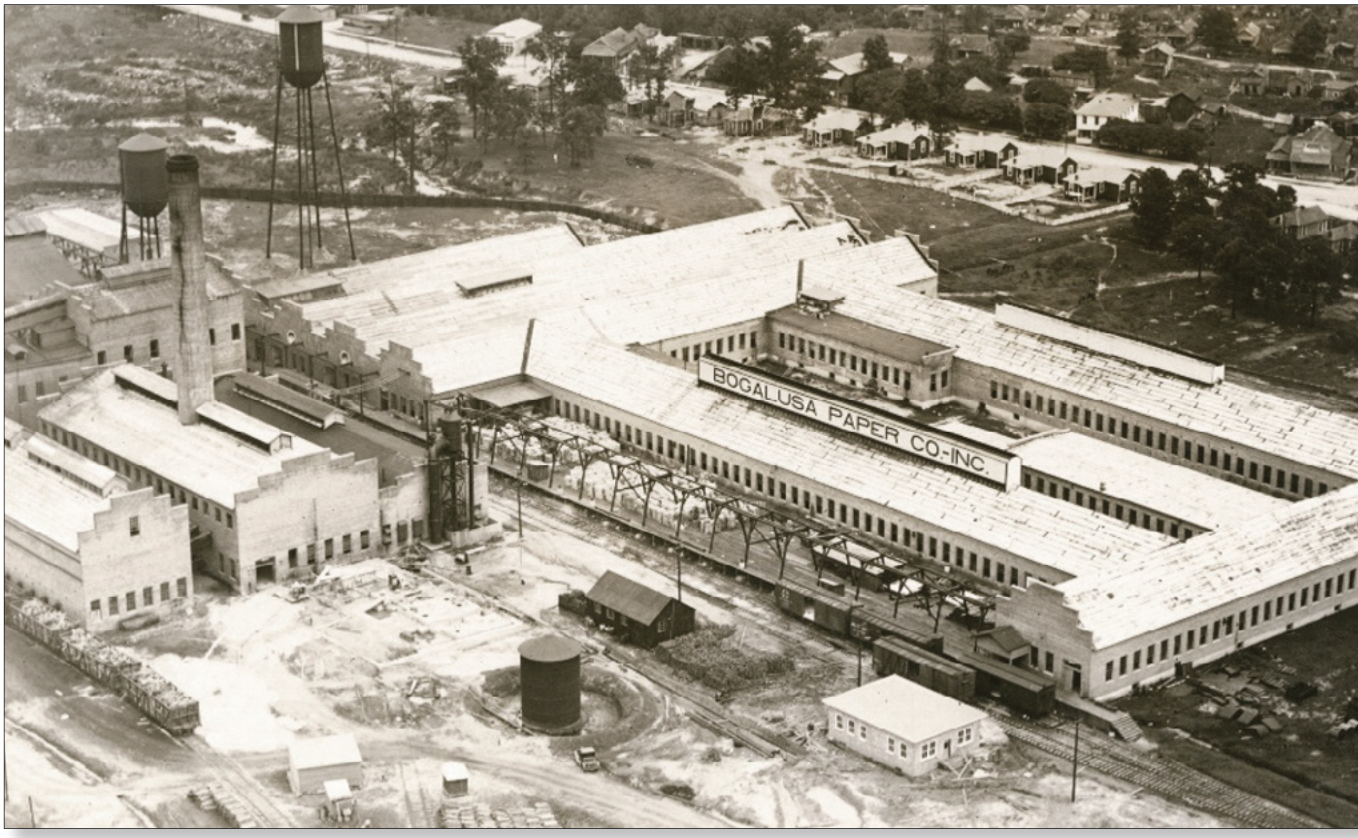
In addition, Eldredge spoke at professional forestry meetings and wrote articles for journals on the status of the survey (Eldredge 1934, 1935, 1942). He became a promoter of the potential of forestry in the South and encouraged industrial development (Eldredge 1937, 1939a, 1939b). Others involved in analysis of the survey data published articles touting the potential of the new forests to provide raw material for forest industries (e.g., Demmon 1943, Lentz 1931, Mesavage 1944, Winters 1937).

INDUSTRIAL IMPLICATIONS OF THE FIRST SOUTHERN FOREST SURVEY

The Southern Forest Survey probably had more to do with the rapid expansion of southern forestry than any other project (Eldredge 1952). After all, until the survey results were published in the 1930s and 1940s, it was not fully realized that a new forest of pine, hardwoods, and cypress (*Taxodium* spp.) was emerging from many of the cutover lands and abandoned farms of the South. Lumbermen, who were transitioning from old-growth timber to smaller and often lower quality logs from second growth, were encouraged. As they found ready markets for their timber products, lumbermen also realized that the new crop of trees was growing fast enough and of suitable quality. Besides introducing an optimistic note for a worried industry, this effort provided much-needed boosts for fire protection, longer forest land tenure, and forestry and foresters (Eldredge 1952).

The results of the survey had another and perhaps more significant result. As Eldredge later noted "…the amount of timber we had, how fast it was growing, how universally it was distributed, and what state of development it had reached… and that's what brought the pulp and paper industry south within the next few years" (Maunder 1977). The South's fledgling pulp and paper industry saw new opportunities for mills across the region as the first Southern Forest Survey identified locations where forest conditions would support their development. In the next 15 years, the number of plants increased fivefold and requests of areas that would support mills continued to develop (Eldredge 1935).

When the pulp and paper industry built its southern operations, a major aspect of the process was land acquisition to assure adequate pulpwood supplies.



One of the South's first paper mills using wood from young pine stands was developed by the Great Southern Lumber Company at Bogalusa, LA. (Photo courtesy of the Louisiana State University Archives)

Timberlands were purchased from lumber companies, land companies, and other private owners. Substantial areas were leased to supplement supplies produced on company land and acquired on the open market.

Yet for all these positive aspects of an expanding pulp and paper industry, concerns remained that this growing segment would follow the footsteps of the lumber industry, cutting over the lands and then moving on. F.A. Silcox, fifth Chief of the Forest Service, warned that building "new pulp and paper plants upon the thousands of lumber and other forest industries already established there means that, without some form of intelligent forest management, certain southern forest areas may be left in an unproductive condition for generations" (Fickle 2001). Silcox argued that indiscriminate cutting for pulp and paper would not leave enough sawtimber for the lumber industry.

To overcome many of these worries, the pulp and paper industry formed the Southern Pulpwood Conservation Association in 1939. The association sought to develop specific rules regarding pulpwood cutting and forest management and to undertake public education to promote forest conservation. The association also established pilot forests to demonstrate good forestry practices and assisted individual landowners in obtaining technical assistance from conservation foresters on matters such as timber harvesting and reforestation (Fickle 2001).

Most pulp and paper companies also hired conservation foresters who worked with private landowners to promote better harvesting practices and forestry activities such as fire prevention, tree planting, and thinning. Longtime consulting forester Zebulon White noted that the Southern Pulpwood Conservation Association "was one of the first ones that insisted that pulp companies with their land holdings practice acceptable forestry. The big seed tree programs—all of that started when they got together" (Fickle 2001). Walter Damtoft (quoted in Maunder 1977) stated that "the pulp and paper industry has been a great boon to the South. The consciousness of the real value of timber came with the pulp and paper industry." In the early 1950s, Lyle F. Watts, Chief of the Forest Service, said,

> *it was a great day for forestry in the South when paper from southern pine was made practical. That development brought the demand for small-sized trees that made intensive forestry possible, the dream of practicing foresters …*

THE FIRST SOUTHERN FOREST SURVEY'S LEGACY FOR THE SOUTHERN FOREST EXPERIMENT STATION

Forest Survey Releases were eagerly sought, and the Southern Forest Survey's growing reputation greatly enhanced that of the Station. Because of this, it could be argued that the Southern Forest Survey probably had more to do with the expansion of southern forest industry than any other project of the Station and greatly contributed to the development of sustainable forestry in the South (Barnett and Carter 2017). The success of the first Southern Forest Survey established the credibility of the Station in providing data to support the needs of forest industry and resulted in the need for additional periodic forest surveys, now known as the Forest Inventory and Analysis program. The Station's expertise in forest mensuration, developed in part for the Southern Forest Survey, set a precedent that continued for decades (Barnett and others 2023).

The first Southern Forest Survey also benefited those who worked on it. For their years of dedicated and fruitful service, Eldredge and Wheeler received many professional accolades. Eldredge was elected as a Fellow in the Society of American Foresters in 1942. In 1956, he received the Gifford Pinchot medal for distinguished service to forestry. During World War II, Wheeler served in important U.S. Coast Guard commands such a Captain of the Port of New Orleans and overseas duty in the Pacific. In 1947, Wheeler was appointed Chief, Division of Forest Management Research, and in 1952 was promoted to Chief of the Division of Forest Economics for the Station (Anon. 1970). Later, Wheeler received the U.S. Department of Agriculture's Superior Service Award and was awarded the Schlich Medal and fellow status by the Society of American Foresters (Anon. 1970).

Both men also continued serving the forestry community after their retirements. Eldredge worked as a consultant advising industry on optimum locations for establishing wood processing facilities and became a proponent for the rapidly developing pulp and paper industry in the South (Eldredge 1952). Upon his 1962 retirement from the Forest Service, Wheeler worked for the Southern Pine Association as analyst for the Southern Forest Resource Committee. In this role, he led development of the famous document entitled *The South's Third Forest* (Wheeler 1970), which laid out what has been described as the most ambitious program for timber resource development in history (Barnett 2016). This report called for doubling timber growth in the South prior to the year 2000 to meet anticipated needs for forest products, recreation, and other essentials, resulting in incentives and assistance for small landowners who held 70 percent of the region's forest land (Wheeler 1970).

"The first Southern Forest Survey also benefited those who worked on it. For their years of dedicated and fruitful service, Eldredge and Wheeler received many professional accolades. Eldredge was elected as a Fellow in the Society of American Foresters in 1942. In 1956, he received the Gifford Pinchot medal for distinguished service to forestry.

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An Abbreviated Administrative and Organizational History of the Southern Forest Experiment Station

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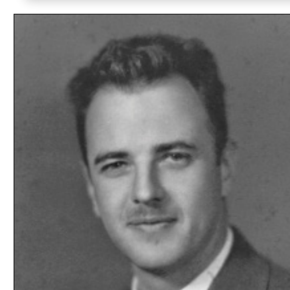
When established in 1921, the Southern Forest Experiment Station (SOFES) was headquartered in New Orleans, LA—a somewhat ironic choice, given the distance from New Orleans to the major southern forests and most of the Station's territory (Fickle 2001). According to Forbes (1925), New Orleans had originally been seen as a temporary Station headquarters, but further study into its relative advantages soon conferred its permanence. New Orleans was near some of the southern forests most devastated by lumbering and was a regional rail transportation hub, an important consideration at a period when travel was still difficult and time consuming. Just as importantly, U.S. Department of Agriculture Forest Service staff had begun some research in the nearby Louisiana locations of Bogalusa and Urania, providing a kernel upon which to expand the effort. It was for many of these same reasons that the Appalachian Forest Experiment Station (AFES) was headquartered in Asheville, NC.

As an agency, the Forest Service provided virtually no guidance regarding the organization and administration of its experiment stations at this time. Rather, each station developed as a function of both its location and the leadership of its director and limited staff. The SOFES offers prime examples of such influential leadership, having been shaped in its earliest years by men like Reginald D. Forbes (the first director) and his immediate successor, Elwood L. Demmon (see app., p. 161).

These regionally based forest research organizations derived their distinctive character from the ascendency of certain localized needs, attitudes, and ideas, as well as larger scale challenges. Indeed, one of these early SOFES staff members, Philip Wakeley, remarked that circumstances such as war and appropriations have overshadowed directorships and "more than one project worker has influenced Station events more than, and sometimes in spite of, his Director" (Wakeley and Barnett 2016).

The accomplishments during these early years of the Station's history by a small cadre of researchers were remarkable. Many of the details known about the first decades of SOFES administrative history come from Wakeley's "biased" history, written before his retirement. Wakeley also suggested six eras (to his retirement in 1964) for the SOFES to help understand its history (Wakeley and Barnett 2016). We have expanded upon his sixth era (to 1980) and added two more eras: a



Top: **Reginald D. Forbes** served as the first Director of the Southern Forest Experiment Station from 1921 to 1927.

Middle: **Elwood L. Demmon** replaced Reginald D. Forbes as Director of the Southern Forest Experiment Station in 1927 and served in that capacity until 1944. Demmon returned to the South as Director of the Southeastern Forest Experiment Station from 1951 until 1956.

Bottom: **Philip C. Wakeley** in 1935. Wakeley led reforestation research at the Stuart Nursey in Pollock, LA, using primarily Civilian Conservation Corps (CCC) labor.

seventh to cover the 28 years between Wakeley's retirement and the early 1990s and an eighth for the merger between the SOFES and the Southeastern Forest Experiment Station (SEFES) that produced the Southern Research Station (SRS).

1921–1927	Primitive Era
1928–1932	Era of Expansion and Recognition
1933–1938	Relief Era
1939–1945	Defense Era and World War II
1946–1959	Era of Territorial Research
1960–1980	Era of Renewed Functional Research
1981–1992	Era of Research Maturation
1992–1995	Era of the Merger

PRIMITIVE ERA: 1921–1927

In the Primitive Era, the potential for forestry to restore the South's aggressively harvested virgin forests started to be recognized. There was excitement due to the remarkable research advances that followed the work of a small cadre of scientists and professional foresters and the anticipation of even greater accomplishments. The Forest Service led the way during this period.

When the SOFES was first established, needed research into the southern pine forest types dictated the scientific direction and geographic footprint of the Station (Anon. 1921, Keller 1921). At this time, the SOFES territory included all of Alabama, Louisiana, Mississippi, and Florida, the coastal plains of South Carolina and Georgia, the southern pine-dominated lands of eastern Texas and southeastern Oklahoma, and the pineywoods of Arkansas south of the Arkansas River. However, the Station had no responsibility for conducting research in the hardwood types of its territory—that would develop in the next era.

Organization and management

Reginald Forbes was a 1913 forestry graduate of Yale University and served the SOFES as its first director (app.) until 1927, when he left to help form the Allegheny Forest Experiment Station. During the Primitive Era, Forbes managed the implementation of the research direction of the SOFES and hired the staff required to establish its programs. He did this from a sparsely furnished office in the Custom House on Canal Street in New Orleans. Room 323 contained Director Forbes's desk, Vera M. Spuhler (the only clerk with her own desk), a few chairs and filing cabinets, and a handful of books in a single glass-fronted bookcase.

Resources to support the newly opened SOFES's operations were very limited. Up to July 1, 1924 (then the beginning of the Federal fiscal year), SOFES annual appropriations had been $15,000 per year to cover staff salary, fleet, materials, and supply needs (Forbes 1925). Even when the Station's budget more than doubled to just under $39,000 in FY1925, resources would continue to constrain operations. For instance, two Model-T Fords were obtained in late 1924 for transportation. However, there was no per diem for travel; records of actual expenses had to be maintained on a sub-voucher to support any expenses over a dollar and such claims had to be sworn to before a duly constituted official.

Staff members furnished their own reference materials, and the researchers were also required to maintain a daily diary where activities and expenses were documented.[1] Wakeley describes having to swear to his account before a notary at 50 cents per oath or he could swear without charge before local postmasters (Wakeley and Barnett 2016). To conserve expenses, Wakeley—then in charge of reforestation research at Bogalusa, LA—was officially transferred to that location to avoid having to pay his per diem. As further evidence of the tight budget, when Wakeley requisitioned some paper clips for his office, Chief Clerk Spuhler sent him 12 in an envelope with a note encouraging him to use them carefully, as they were all she could allocate to the Bogalusa work center (Wakeley and Barnett 2016).

Staffing was also quite limited during the Station's earliest years. For much of this period, there were about as many lines of work as permanent members of the staff. For example, when Wakeley was hired in 1924, there were only six professional foresters (including Forbes, the Station Director), Chief Clerk Spuhler, Stenographer Alicia P. Nolan, and a few temporary field assistants on the Station's staff (Forbes 1925, Wakeley and Barnett 2016). Because much of the work required small crews, work trading was a feature of the Station's program.

"Despite the limited resources, staffing, and some shortcomings in their research techniques, a sound foundation was established during the Primitive Era.

Despite the limited resources, staffing, and some shortcomings in their research techniques, a sound foundation was established during the Primitive Era. Partnerships with other agency scientists (such as Drs. Austin Cary and Eloise Gerry), outside agencies (such as the U.S. Department of Agriculture Bureau of Soils and Bureau of Chemistry), various other Federal and State agencies, and key university collaborators (such as Professor H.H. Chapman of Yale University) expanded the reach and scope of the fledgling organization (Forbes 1925). Significant research activities began in a wide array of disciplines.

Field locations

In addition to the headquarters in New Orleans, the SOFES during the Primitive Era conducted most of its field-based research at a handful of locations across its territory, including cooperative ventures with the timber industry at Bogalusa and Urania, LA; McNeill, MS; and Starke, FL (Forbes 1925). Although these company-owned locations were important during the first decades of the Station, they would be closed later for various reasons, including establishment of new designated experimental forests. Other field stations on public lands would be established near the end of the Primitive Era, with a location named the Choctawatchee Branch Station near Pensacola, FL, selected in 1926 (SOFES 1927).

Research priorities and accomplishments

In his history of the SOFES, Wakeley described the Station as having five general areas of research in 1924. The first of these—mensuration, or the measurement of trees and stands—arose from the need to better understand the growth potential of southern pine forests. The other major research areas of this era included work in thinnings and reproduction cuttings, naval stores studies, fire, and reforestation efforts.

[1] These pocket-sized diaries were still available to scientists when the lead author arrived at the Station in 1961, but the requirement for their use had been discontinued years earlier.

Research priorities were set in part by station directors, Washington Office directives, the interests of individual investigators, and recommendations from an advisory council consisting of individuals from outside of the Federal Government, especially persons associated with the timber industry and State Government agencies. When exactly this council was established and chartered is unclear, but the SOFES annual report through 1925 (SOFES 1926) reported on its expansion with the addition of four new men appointed by the USDA Secretary (that advisory council was chaired by Urania Lumber Company's Henry Hardtner). Such outside advisory bodies would continue to be used by the Forest Service to help steer agency research for many years to come.

Mensuration—Station Director Forbes had a particular interest in measuring trees, and his efforts supported this interest. This included staff recruited to the SOFES, such as 1926 University of Minnesota graduate Roy A. Chapman. Chapman's 1926 arrival and subsequent work in the years that followed helped to bring about the adoption of statistical techniques by the Station. Chapman spent much of those early years with the experts who were developing statistical tools and techniques. He brought these advancements to the SOFES, making the Station a leader in these applications and thus adding greatly to the credibility of its research program (Wakeley 1980, Barnett 2016).

For example, the Station's first major accomplishment was in mensuration. With technical guidance from Donald Bruce of the Washington Office, a series of sample plots were established in even-aged, second-growth pine (*Pinus* spp.) stands throughout the South. The result of this major effort was the development of volume, stand, and yield tables for unmanaged second-growth stands of loblolly (*P. taeda*), longleaf (*P. palustris*), shortleaf (*P. echinata*), and slash (*P. elliottii*) pines.

The results from this study were published in a small handbook (Miscellaneous Publication 50, also known as "MP-50") easily carried in a pocket to facilitate its use in the field (USDA Forest Service 1929). MP-50 gave foresters and landowners the capability to understand the growth potential of the major southern pines and offered some of the first steps toward forest management in the pine forest types of the South. This little publication proved to be of such practical value and demand that the SOFES updated and reprinted it in 1976, and the material it contains continues to be used by managers and researchers to this very day.

Thinning and reproduction cutting—Studies of harvest and reproduction cutting of even-aged, second-growth loblolly and shortleaf pines by using natural regeneration were also installed at the Urania Branch Station, first under the direction of W.R. (Billy) Hine (Hine would leave in 1925 to become the State Forester of Louisiana). The first silviculture study of the SOFES was a thinning project at Urania with origins dating back to 1915, when Samuel Trask Dana (then with the Washington Office) worked with Henry Hardtner, head of the Urania Lumber Company, to install a series of small, unreplicated plots in even-aged loblolly and shortleaf pine-dominated old field stands (Bragg 2021b, Wakeley and Barnett 2016, Wyman 1922).

Related to the reforestation effort was a study on the negative influences of cattle and hogs on forests—this was a significant problem. Across the South, a primary use of cutover forests was for livestock grazing and there were no restrictions—

open range grazing was almost universally practiced. Hogs were considered a major threat to getting pine forests reestablished, especially for longleaf pine, which were particularly vulnerable to hog depredations. Apparently, the carrot-like roots of longleaf seedlings proved to be choice hog food, and Hardtner demonstrated that fencing areas was needed to achieve longleaf pine regeneration (Hardtner 1935).

Naval stores—By 1922, Lenthall Wyman had been dispatched to Florida to work on empirical research on the production of "gum" naval stores. Since at least 1700, naval stores (which included tar, pitch, resins, and other chemical compounds) had been a major product of southern pine forests—especially longleaf and slash pines (Barnett 2019). Originally extracted from deadwood or downed trees, by the early 1880s, standing live pines were "tapped" by cutting "boxes" in the base of a tree to collect the resin (gum) which flowed from these wounds. The turpentining practice resulted in the destruction of many southern pine forests, starting in North and South Carolina and then moving westward into Georgia, Alabama, and Florida, eventually reaching Louisiana and Texas by the early 1900s.

When the SOFES opened, improvements in techniques had largely eliminated the box collection system and moved to the use of gutters to collect the gum. Still, the practice was very damaging and frequently lethal to the trees. During his years in Florida, Wyman worked with naval stores producers to develop substantial savings in labor, reduce tree mortality, and made other significant impacts towards improving naval store operations. For example, one of his accomplishments was reducing the depth of the cuts into the tree cambium which reduced mortality and increased the tree's later usefulness for lumber. Wakeley and Barnett (2016) commented that by "…direct contact with key men in the naval stores industry, Wyman got his results into practice, and did so I feel sure, more quickly than he could have by whole batteries of publications. In a decade or less, he revolutionized the industry." Much of his research was summarized in a technical bulletin published by the Washington Office (Wyman 1932).

Fire—Fire was officially one of the most important initial research efforts of SOFES, and all early Station staff worked in this field. Hardtner had begun working towards fire suppression on Urania Lumber Company lands in 1913. Fire-related investigations at Urania began over the next few years in collaboration with specialists from the Forest Service's Washington Office. Before 1920, a series of treatments relating fire suppression and prescribed fire with southern pines (especially longleaf) would be installed and collectively became known as the Roberts plots (Barnett 2016, Chapman and others 2023, Wheeler 1963).

Wakeley commented, however, that most of the other fire research consisted of compiling long lists of fire-killed seedlings, brown foliage on saplings, and fire scars on living trees (Wakeley and Barnett 2016). After all, the general Forest Service policy adopted after the catastrophic fires of 1910 was "all fire is bad." Indeed, the SOFES annual reports during most of the 1920s decried the widespread losses to fire in most southern forests, and SOFES (1925) listed fire protection as the most important field of SOFES research to that date.

However, this perspective was not universally accepted. Yale University Professor H.H. Chapman, who had brought the Yale School of Forestry summer camp

Top: Extracting naval stores in Florida, 1936. (USDA Farm Security Administration photo by Dorothea Lange)

Bottom: Southern Forest Experiment Station scientists and colleagues at the Roberts plots, near Urania, LA, April 1940. From left: H.H. Chapman of Yale University; USDA Forest Service scientists C. Allen Bickford, H.H. Muntz, G.W. Trayer, Clarence L. Forsling, Roy A. Chapman, T.R. Traux, John Curry, and J.M. Hughes; and Lloyd Blackwell, who became the head of Louisiana Tech University's Department of Forestry.

to Urania in 1917, challenged the Forest Service's anti-fire doctrine, thereby compelling the SOFES to approach fire with greater objectivity. Chapman became a proponent of controlled use of frequent prescribed fire as a means of controlling wildfires and, more importantly, stimulating forest regeneration of southern pines (Chapman 1932). During this period, the Forest Service largely opposed the application of prescribed fire as a management tool, even in forest types such as longleaf pine that showed signs of dependence on frequent fire for its long-term success. Indeed, during its early decades of existence, SOFES leadership and researchers aggressively opposed research by Chapman and others that suggested the utility of fire in longleaf pine (Schiff 1962).

Eventually, Wakeley and others in the SOFES began a large study to evaluate Chapman's contentions of the value of frequent (but not annual) fire in longleaf pine. With one exception, they found Chapman's positions were correct. By mid-20th century, most southern foresters accepted Chapman's conclusions and became advocates of controlled or prescribed burning (Wakeley and Barnett 2016).

"At the time, the practice of growing seedlings and planting them was in its infancy . . . in 1920, Bateman, noting that longleaf pines were producing a large cone crop, convinced Sullivan to allow him to fence 10,000 acres of an area scheduled for harvest to protect the area from hogs. The effort was successful and became a beautiful stand of 10,000 acres of longleaf pine—a great example of a modified shelterwood regeneration system (Wakeley 1976)

Reforestation—During the Primitive Era, artificial reforestation, or forestation (as it was designated in the agency's jargon) began as a minor effort. Hardtner, who was also a proponent of reforestation, convinced W.H. Sullivan of the Great Southern Lumber Company of its potential and Sullivan began an aggressive program to develop the technology (Barnett and Carter 2017). At the time, the practice of growing seedlings and planting them was in its infancy. When Wakeley arrived at the SOFES in 1924, he was assigned to this study at Bogalusa to collaborate with the Great Southern Lumber Company.

Prior to Wakeley's arrival, Sullivan appointed J.T. Johnson as the Great Southern Lumber Company forester and F.O. "Red" Bateman as his chief ranger. Neither had any forestry training, but remarkably, they made real progress in the development of reforestation technology. As an example, in 1920, Bateman, noting that longleaf pines were producing a large cone crop, convinced Sullivan to allow him to fence 10,000 acres of an area scheduled for harvest to protect the area from hogs. The effort was successful and became a beautiful stand of 10,000 acres of longleaf pine—a great example of a modified shelterwood regeneration system (Wakeley 1976). When Wakeley was assigned to Bogalusa, Bateman had nursery and planting techniques for loblolly and slash pines pretty well under control. Although further developed by Wakeley, Bateman had worked out the essentials of the practices still employed: slit planting of bareroot seedlings grown at a moderate seedbed density, the planting tool or dibble, and the 6- by 8-foot planting spacing.

Problems remained with regenerating longleaf pine, however. Although it was the species most desired for reforestation, the problems related to seed production, seed quality, and survival during the grass stage limited successful reforestation efforts. Reforestation efforts with southern pines would continue to be a major research emphasis for the SOFES throughout its history.

ERA OF EXPANSION AND RECOGNITION: 1928–1932

Modest budget increases during the Primitive Era (the FY1929 SOFES budget was up to $41,200) allowed for additional if modest hiring of staff in the researcher, office, and other field support staff categories (SOFES 1929) (table 1). This modest growth would soon be swelled by legislative, economic, and social changes, such as the 1928 passage of the McSweeney-McNary Act. During the Era of Expansion and Recognition, the SOFES recruited an even broader group of researchers with specialized training in botany, ecology, economics, erosion control, hardwood management, physiology, plant pathology, statistics, and utilization. With this larger and better-trained staff, the Station pursued a number of new or expanded research questions. Although most of the work was still concentrated in the original lines of research, additional studies associated with the role of forests on flooding,[2] grazing impacts on pine regeneration, insects and diseases, hardwood forest conditions, forest economics, and the initial efforts to conduct large-scale forest surveys began during this era (e.g., SOFES 1929).

Table 1—Staff composition of the Southern Forest Experiment Station, 1928 and 1932

Agency	Class of employee	Number employed	
		1928	*1932*
Forest Service	Professional, director	1	1
	Professional, principal	–	1
	Professional, full grade	–	3
	Professional, associate	2	4
	Professional, assistant	2	6
	Professional, junior	4	16
	Professional, agent	1	1
	Professional, temporary field assistant	10	12
	Nonprofessional, field	1	1
	Nonprofessional, clerical	6	14
Bureau of Plant Industry	Professional, permanent	1	3
	Professional, temporary field assistant	–	2
Total		**28**	**64**

Source: Wakeley and Barnett (2016).

The Station, too, had gained recognition for its significant contributions to the application of forestry practices in the South. Visitors from around the world came to meet with SOFES scientists and tour their research projects (Wakeley 1980).

Wakeley described the attitude and capability of the SOFES scientists in the beginning of the era this way:

> *High aspirations, a yeasty intellectual ferment, improved perspective and a better grasp of experimental procedures marked the Second Era… Those of us already at the Station were learning much, both from our wealth of experimental material and from our past mistakes. New young recruits came from a great number of schools and varied greatly in points of view…* (Wakeley and Barnett 2016)

[2] This followed the widespread floods of the Lower Mississippi River Valley during 1927; this work later became part of the "forest influences" line of research.

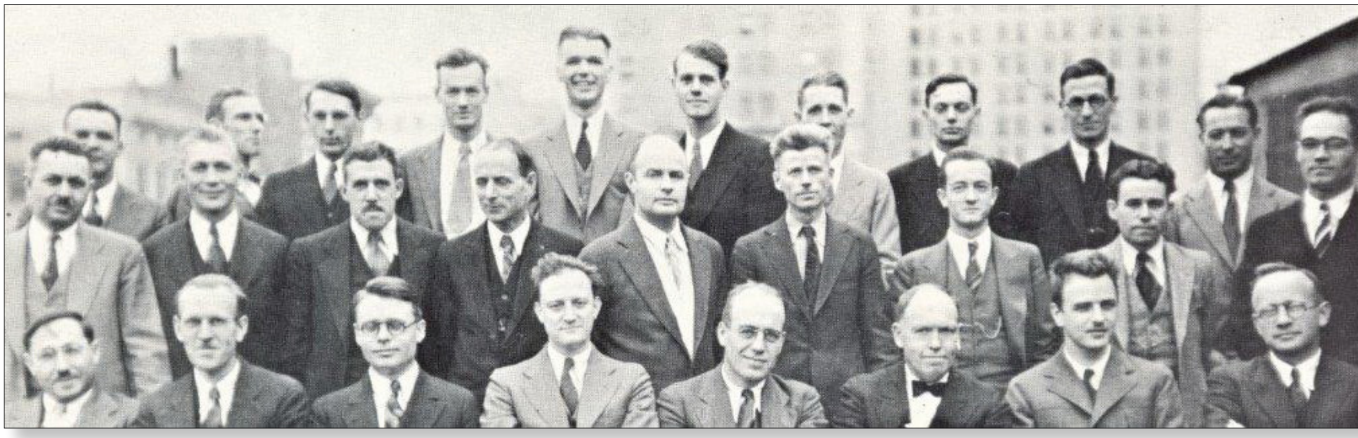
The group that met with Dr. Tor Jonson from Sweden at Bogalusa, LA, on September 15, 1925. From left, kneeling: R.D. Forbes, Director of the Southern Forest Experiment Station; Roy Hogue, State Forester of Mississippi; W.R. Hine, State Forester of Louisiana. Standing: J.K. Johnson, Great Southern Lumber Company; Norman Core, Louisiana Division of Forestry; Tor Jonson; Harry L. Baker, USDA Forest Service; Mr. Johansson (Jonson's interpreter); F.O. (Red) Bateman, Great Southern; and E.L. Demmon.

Their arrival was timely, as the Station grew from a staff of 23 in calendar year 1927, to 28 in 1928, to more than twice that number by 1932 (table 1).

Much of this growth was used to support the large-scale forest survey project that started during this era. The new staff were not all young recruits. During this expansion, the number of more senior (associate foresters or higher) researchers grew substantially, from two (not including the station director) in 1928 to eight in 1932. Over this same period, a dozen entry level or "junior foresters" were added and the clerical positions more than doubled to 14. Another area with large growth during this period was staff with plant pathology training, hired through the USDA's Bureau of Plant Industry (at this time, the Forest Service was not allowed to hire scientists with this specialty). Both the Forest Service and Bureau of Plant Industry also increased their temporary staff. These temporary field assistants were not given permanent status, but they too contributed greatly to the contributions of the Station (Wakeley 1980).

The establishment of the Rocky Mountain (in 1926) and Central States and Alleghany Forest (both in 1927) Experiment Stations refined the northern geographic boundaries for the SOFES and SEFES at the beginning of this era. By the end of 1930, the SOFES had grown from its initial (1921) location in Louisiana (New Orleans, with projects at Bogalusa and Urania) to a staff presence across much of its designated territory, including people and projects located at branch field stations in Mississippi (McNeill), Florida (Starke and Valparaiso), and Arkansas (Hot Springs) (SOFES 1930). Most of these "centers of work" were not the more permanent experimental forests, which would be established a few years later, but rather cooperative research locations on privately owned lands or in conjunction with certain national forests. This expansion also started to bring hardwood research projects into the Station's science portfolio.

Not all Station research efforts proved to be fruitful avenues of study—at least not as intended. For example, Wakeley (1980) reported that one of the biggest and most serious obstacles faced during the early years of the SOFES was an insistence on looking for support for the agency's policy against fire. Wakeley came to see the significant investment of limited Station resources on



Southern Forest Experiment Station professional staff (scientists and administrators) in 1932. Left to right, front row: L.J. Pessin, E.W. Gremmer, V.L. Harper, E.L. Demmon, G.H. Lentz, Lenthall Wyman, P.C. Wakeley, W.G. Wahlenberg. Second row: W.E. Bond, C.F. Olsen, R.B. Craig, P.V. Siggers, J.A. Putman, V.B. Davis, A.R. Spillers, H.G. Meginnis, R.K. Winters. Back row: Henry Bull, Allen Bickford, F.K. Beyer, Ellery Foster, J.A. Lubbe, P.R. Wheeler, J.W. Cruikshank, E.B. Faulks, R.R. Reynolds, M.M. Lehrbas.

searching for the detrimental consequences of fire rather than its potential as a management tool and fundamental process driving many southern ecosystems as a wasted opportunity.

Driving change at the Washington Office and station levels

As the agency's Research and Development program matured and grew, refinements came from both the national and station levels. One of the most substantial changes dictated by the Washington Office involved grouping the staff into separate subject areas called divisions. Originally, all work of the Station in protection, management, mensuration, naval stores, and reforestation were in one division, that of Silvical Research—later renamed Forest Management Research. Soon, separate Divisions of Economics and Forest Survey were established. Each division was headed by a division chief. At irregular intervals, other divisions were added and variously renamed and combined. For example, a Division of Station Management was created to help with the Station's administration. These separate divisions were the essential format of the Station until a major national reorganization of the Forest Service Research and Development program occurred in 1963.

After Demmon became SOFES Director in 1927, he implemented a series of major organizational and administrative changes in the Station. For instance, during the first 7 years of the Station, Head Clerk Vera Spuhler handled all the Station's accounts and related matters of payroll, property, and supplies. In 1928, Demmon created an executive assistant position to head all the clerical responsibilities. Jack Lubble, who came to the Station after 5 years as District Ranger on the Nebraska National Forest, was assigned as executive assistant. Lubble was also given an additional duty as the personnel officer for the growing station. Lubble studied the regulations affecting promotions and personnel actions and corrected instances where employees were stuck for years at one step in grade. Lubble intervened and corrected several injustices in staff pay involving both male and female employees (Wakeley and Barnett 2016).

In 1932, Demmon created a system of numbering station publications and gave them the distinction of being called Occasional Papers. With the development of the regional experiment stations, station directors had to establish numerous research protocols, including how to transfer research findings to their user groups. There was no uniform approach to accomplish this and the SOFES developed its own publication series. Over time, Occasional Papers became increasingly professionally written, edited, designed, and printed (Barnett 2023a). This publication series helped gain public recognition and support for the Station and continued until the Forest Service Research and Development program was reorganized in 1963.

Demmon also supported new efforts to expand upon the research infrastructure and invested in the human capital needed to further the science. Under his administration, the SOFES began the formal establishment of experimental forests that would come to dominate field research efforts. During the earliest years of the SOFES, the Station relied on cooperation with private landowners (such as the Urania Branch Station in central Louisiana) and informal arrangements with national forests to conduct field research. While workable on a limited scale, this approach proved challenging when a timber company went bankrupt, changed their management approach, or lost interest in collaborating. Early calls to develop formal experimental forests operated by the Forest Service went largely unheeded and lacked specific authorities until the McSweeney-McNary Forest Research Act of 1928 was passed into law. Regulations to codify the Act were completed in 1930 (Clapp 1931). In June 1931, the SOFES opened their first experimental forest—the Olustee—in the slash pine-dominated forests of northern Florida, largely to support naval stores research (SOFES 1933). Experimental forests became critical for numerous types of field research, especially long-term research.

Demmon also sent some of his staff to temporary or special assignments to improve their skills and bring what they learned back to the Station. On one of the most prominent of these details, Roy A. Chapman went to the Washington Office on an extended (between 1931 and 1934) tour with the forest measurements group. There, Chapman added to his quantitative skills and he (and others such as J.G. Osborne and C.A. Bickford, who would later go to this same detail) would bring back many of the new concepts in statistics and experimental design that helped modernize SOFES research. Wakeley (1980) specifically credited Chapman's detail with "revolutionizing" their experimental design, improving sampling techniques, and introducing the statistical concepts of analysis of variance and interactions, thereby improving the quality of the work done in the SOFES.

Southern Forest Survey

These quantitative skills would come in handy as the Station ramped up its field data collection. The passage of the McSweeney-McNary Act of 1928 authorized a "forest survey" to conduct a nationwide inventory of the Nation's forests to support multiple interests, including the development of new timber markets. Responsibility for the survey of southern forests was assigned to the SOFES. Conducting an inventory of forest resources on over 200 million acres stretching from the South Carolina coast to the prairies of eastern Texas and Oklahoma was a huge challenge, especially since such an effort had never been previously attempted.

During the mid-1920s, the SOFES had started conducting what were called extensive surveys to make larger-scale assessments of forest conditions.

While Wakeley dismissed this initial effort for its inefficiency and lack of useful information (Wakeley and Barnett 2016), it did indicate to the Station that such surveys would need to be better designed and implemented if they were to provide the information and management tools desired. This motivation would soon be upon the SOFES, as Congress had passed a special $25,000 appropriation for the Station to begin a forest survey of southern hardwood forests as a part of the nationwide survey effort, with the funds to be spent in FY1931 (SOFES 1930). The appropriation for the Southern Forest Survey effort would increase to $40,000 in FY1932 (SOFES 1932), which was more funds for the survey in one fiscal year than were appropriated for the entire SOFES in FY1926 (SOFES 1927).

"Cap" Eldredge was selected to lead the Southern Forest Survey of more than 200 million acres of southern forests beginning in 1932. The field surveys were completed in 4 years, but the analyses and publication of the results went on until 1946.

Station Director Demmon assembled a well-qualified staff to develop the methodologies needed to conduct the survey and for recording and analyzing the data. Planning and implementation of this survey began in 1931, with a focus on the bottomland hardwood forests of the Mississippi River alluvial plain (SOFES 1932). The first test cruises of the survey were done in a couple parishes in northeastern Louisiana using 10 survey lines, spaced 3 miles apart, across a little more than a half million acres between late March and mid-June of 1931 (SOFES 1932). This preliminary work suggested satisfactory results could be gotten from wider spaced transects. A system was formulated where compass lines were run 10 miles apart across each State from Tennessee southward to the tip of Florida. At every 660 feet on these lines, plots were established across each State, and a great deal of information was collected on each plot (Eldredge 1935).

These lines were laid out and plots were installed by 5 crews of 4 workers; 7 such groups of 20 workers were to be placed under a single supervisor. Southwide, this meant that there would need to be up to 140 workers in the woods, plus additional staff to process and analyze the field data. Not surprisingly, then, the success of this forest survey effort was greatly influenced by the quality of workers available. In the midst of the Great Depression, many of the best timber workers in the South were available for the job. Even still, the best crews in the field could not coordinate such an effort. To do this, Demmon needed an exceptional individual to lead and manage this enormous field operation. He soon realized that the best qualified person with the needed background and experience was Inman F. "Cap" Eldredge (Barnett 2016).

Eldredge was not just a desk worker—he was in the field about a third of the time following crews and trying to keep their morale up. Morale was critical because the job was tough. For instance, every river in the South was crossed many times. Eldredge commented, "Georgia, for instance, was 300 miles from top to bottom. Well, it took thirty lines there, so we crossed every damn river thirty times… In the total survey, we did something like 40,000 miles on foot" (Maunder 1977).

Forest economics

Perhaps the program that would benefit most from improvements to the knowledge of southern forests would be the economics work of the SOFES (indeed, the forest survey effort would be housed in the broader forest economics program of the Station in FY1931). As eager as the South was for more forest industries, it wanted only those industries that would use the timber resource to become a permanent part of the economic structure, having learned the

"... the Civilian Conservation Corps (CCC) and the Works Progress Administration (WPA) [relief programs] allowed the SOFES to hire additional staff ... expand and improve upon [its] research and administrative facilities, install and measure new studies, and disseminate its research to a broader audience (Wakeley 1980).

hard way about the negative impacts of the fleeting industry that harvested and milled the virgin timber. Eldredge (1939) commented, "…the forests of the South will provide a sound basis for a secure future—an ever-continuing succession of timber crops that will be a permanent resource for a permanent industry." This realization would bring about enduring communities, more prosperous railroads and other utilities, stable and broad tax bases, and a better standard of living for southerners (Demmon 1937).

Although elements of this topic existed from the very earliest days of the Station, the SOFES began specific forest economics-based research during FY1930, funded by about one-quarter of the $82,500 appropriated for that year (SOFES 1929). The program's initial focus was on studying the financial aspects of timber growing in southern pines, especially on the lands of small farmers and the forest products industry. Gradually, issues such as forest taxation, stumpage values, case studies of the practices of large lumber companies, the new public domain (arising from increased rates of tax delinquency due to the Great Depression), and county-level assessments of forest conditions and values were also studied (SOFES 1930, 1932).

RELIEF ERA: 1933–1938

The SOFES continued to evolve into the 1930s, as local and regional needs helped to dictate research priorities. Over the first decade, the Station's Southern Forest Research Advisory Council had expanded and continue to advise the Station of research directions of interest (SOFES 1935). This council included people from key industries, including L.J. Arnold of the Crossett Lumber Company (Arkansas), L.O. Crosby of the Goodyear Yellow Pine Lumber Company (Mississippi), Colonel D.T. Cushing of Great Southern Lumber Company (Louisiana), and Urania's Henry Hardtner; key academics including Yale Professor Chapman and chemist Charles H. Herty of Georgia; and State agency representatives including Alabama State Forester Colonel P.S. Bunker and E.O. Siecke of the Texas Forest Service. With such a substantial industry presence, it is not surprising that the Station's research emphasized their needs.

Industry needs were not the only consideration. The SOFES was also strongly shaped by the impacts of the Great Depression, which started in 1929 and continued throughout most of the 1930s. All facets of American society were affected, including those related to the SOFES (Wakeley describes some of the Great Depression's serious effects on employees in early 1933 in Wakeley and Barnett 2016). Several years of limited responses by President Herbert Hoover, which concentrated more on streamlining the Federal Government, did little to recover the economy. Soon, newly elected President Franklin Delano Roosevelt's administration began a multitude of New Deal relief programs to stimulate the economy.

While a number of these programs greatly influenced the SOFES, two were particularly important: the Civilian Conservation Corps (CCC) and the Works Progress Administration (WPA). These relief programs allowed the SOFES to hire additional staff (some temporary, some permanent), expand and improve upon their research and administrative facilities, install and measure new studies, and disseminate its research to a broader audience (Wakeley 1980). Wakeley (1980) cited the contributions of a number of these temporary staff in contributing

The Forest Service's Stuart Nursery was built and operated by Civilian Conservation Corps (CCC) crews with Kisatchie National Forest supervision and supported by Southern Forest Experiment Station research. It produced 27 million seedlings annually to support the planting needs of Forest Service-sponsored CCC camps.

"original observations and important suggestions" while doing "vast amounts of high-quality routine work" vital to the Station's success. This included critical work to support the increasingly sophisticated analysis that Station scientists were working on, including statistics and large-scale forest surveys. To this end, the SOFES employed a number of support staff (some temporary, some permanent) listed as statistical clerks and operators of computing or tabulating machines to help process the large volumes of data collected for these tables (as well as other early forest survey efforts).

Increased Federal spending and relief programs to aid the economy provided other benefits as well. By 1934, the Station's research infrastructure had added a number of major experimental forests (many of which are still in operation) and an herbarium was developed. The headquarters library that had only a handful of texts in 1921 had expanded to 2,000 bound books, 700 volumes of periodicals, 15,000 bulletins, and 5,000 miscellaneous reports by 1934, of which a large portion had been added that year (SOFES 1935).

With its tremendous potential for economic development, Eldredge (1942) summed up the status as "…forestry is as surely a part of the South's future as is agriculture, mining, and manufacture and in no less degree. Without it the South cannot achieve its manifest destiny—and the South is on the march."

Experimental forest expansion

Many of the SOFES's experimental forests (table 2) were created in the 1930s and brought into the system through Federal funding for forest rehabilitation and rural economic relief, during and after the years of the Great Depression. After the June 1931 installation of the Olustee Experimental Forest in northern

Florida as the SOFES's first formally designated experimental forest, Station leadership estimated it would take 16 additional such forests (of 3,000 to 10,000 acres in extent) distributed strategically across the South to address the research questions at hand (SOFES 1933).

Table 2—Experimental forests of the Southern Forest Experiment Station, established and in operation by 1939

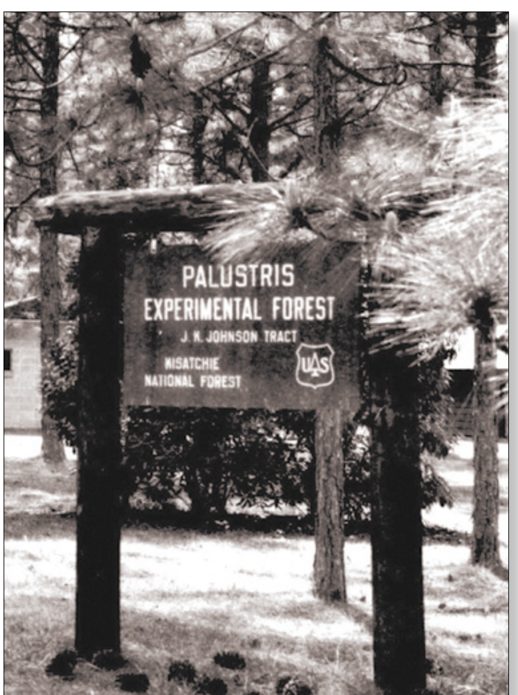
Name	Year initiated	Headquarters location	Original area
			(acres)
Camp Pinchot[1]	1936	Camp Pinchot, FL	Not listed
Chewalla	1936	Holly Springs, MS	2,500
Crossett	1934	Crossett, AR	1,680
Delta[2]	before 1939	Stoneville, MS	2,580
Harrison	1934	Saucier, MS	5,060
Hitchiti	before 1939	Round Oak, GA	4,735
Irons Fork	1936	Mena, AR	8,978
Olustee	1931	Olustee, FL	2,961
Palustris	1934	Pollock, LA	4,100
San Jacinto	1936	Huntsville, TX	2,150
Sylamore[3]	1933	Calico Rock, AR	2,800

[1] Camp Pinchot was listed in 1936 as an experimental forest to be developed but was not shown as such in 1939. In 1940, the entire Choctawhatchee National Forest, including Camp Pinchot, was turned over to the U.S. War Department and became Eglin Air Force Base.

[2] Operated in cooperation with the Mississippi Agricultural Experiment Station; it is unclear how much work was done here during this period.

[3] Technically, when the Sylamore Experimental Forest was established, it was part of the Central States Forest Experiment Station.

Sources: SOFES (1940, 1941).



Philip C. Wakeley was responsible for establishing the 2,500-acre Palustris Experimental Forest in 1935, later designed the K. Johnson Tract, to serve as an outplanting site for research studies conducted at the Stuart Nursery. Nearly 750,000 seedlings were outplanted in research studies on the forest during the 1930s. A 5,000-acre addition, named the Longleaf Tract was added to the forest in the mid-1950s, initially to support range research.

In these early years, experimental forests were dominated by silvicultural research related to the successful establishment, growth, yield, measurement, regeneration, and improvement of regional commercial timber species and their influence on watershed ecosystems. Over time, the value of experimental forests continued to grow. Having dedicated experimental forests became critical for the stability of research programs. As research programs changed, the need for some of the designated forests declined and they were closed; other events, such as World War II, also played a major role in the fates of some. Additional experimental forests were added over time, too, to support new programs.

The Stuart Nursery and reforestation research

One of the significant beneficiaries of the CCC and WPA was the SOFES's reforestation work. When the Great Southern Lumber Company at Bogalusa had cleared its last virgin longleaf pine and went into receivership during the Depression, the Station's reforestation research program that had been on their property was transferred to the village of Pollock in central Louisiana in 1934. Here the CCC was already providing support to the Kisatchie National Forest on a large tree seedling nursery (Carter and others 2015). Several nearby CCC camps, with 200 enrollees in each, helped build the Stuart Nursery and provided the needed workforce to grow and outplant pine seedlings (Barnett and Burns 2016). To support the development of this site, WPA employees designed and constructed offices, state-of-the-art cone and seed processing facilities, and equipment storage buildings. Starting from an old, abandoned farm in August of 1933, the Stuart Forest Nursery was designed to produce large volumes of seedlings quickly. From nearly 9 million longleaf, slash, and shortleaf pine seedlings produced in their first year of operations (Huberman 1935), the effort would eventually generate 25 million southern pine seedlings annually.

With funding from New Deal relief programs, the SOFES added significantly to its reforestation staff and expanded its work. For example, after years of limited help, the reforestation research program hired personnel to conduct studies at the Stuart Nursery and to evaluate seedling performance after outplanting (Wakeley 1980). During these years, Wakeley's staff planted nearly 750,000 seedings in research studies on the nearby Palustris Experimental Forest (Barnett and Burns 2016). The pioneering research done at the Stuart Nursery provided much of the information Wakeley used in the *Planting the Southern Pines* monograph that became the basis for the reforestation efforts across the South following World War II (Wakeley 1954).

Continued Southern Forest Survey and forest economics work

Remarkably enough, field work for the massive forest survey effort was completed in 1936; in 4 years the crews had completed the first systematic inventory of the South's forests. However, this was only the first step of the process. While Eldredge oversaw implementation of the first forest survey, he did not have the training or expertise to develop plans for the survey, nor for analyses of the data collected. Those tasks would fall to others, like Philip R. Wheeler, who directed various aspects of this important undertaking, and Robert K. Winters, who became primarily responsible for the publication of the data in the SOFES's Survey Releases (Eldredge 1935).

For more than a decade, a massive amount of useful information came from this forest survey data. The SOFES published 55 Forest Survey Releases during the period from 1934 to 1946 (SOFES 1946). These releases on results of the survey were eagerly sought and the survey's reputation was made and that of the Station enhanced (Barnett 2023b). Eldredge later commented: "the results were astounding… there was no idea of the amount of timber we had, how fast it was growing, how universally it was distributed, and what state of development it had reached… and that's what brought the pulp and paper industry south within the next few years" (Maunder 1977). The timing was impeccable as well; the South's forest survey started as interest in forestry was growing, and soon forest industry became the survey's best supporter. The forest survey probably had more to do with the expansion of the southern forest industry than any other project (Barnett 2023b). Although early SOFES foresters had predicted the economic potential of the developing forests on the economy the South (Bond 1933, Ziegler and Bond 1932), it was the forest survey data that provided the documentation needed to convince landowners and investors of the value of those forests.

As the Great Depression continued on, the forest survey and economics work continued to expand in an attempt to bolster local economies as well as the South's forest products industry. The economics of good versus poor management practices, including the relative profitability of trees of varying sizes, became an important line of research (SOFES 1933). Studies on the new public domain accumulating due to tax delinquencies remained a top priority, with a number of county-level case study projects to better document the specific circumstances of why some places had greater failure rates than others (SOFES 1933). By 1935, the Great Depression's depletion of Station resources led to reductions in some efforts, including limitations of forest economic efforts to certain regions and forest types. This also coincided with the establishment and development of a number of experimental forests that allowed for more detailed testing of some economic questions (SOFES 1936). Studies on taxes, the new public domain, and improving the economics of private forestry dominated the forest economics studies of the SOFES for the rest of this era.

Flood control surveys begin

The massive floods that affected much of the Ohio and Mississippi River valleys in early 1937 came just months after the passage of the Flood Control Act of 1936, which had started the Federal process of addressing the role of forest and farmland condition on influencing and regulating floods. The SOFES had a research line, called Forest Influences, that by this time had been investigating the major problems related to watershed protection, with an emphasis on stemming local erosion and bank stabilization projects using reforestation. In 1936, this less-than-a-decade-old program had limited staff but was starting to see more investment as the labor-intensive land reclamation work fit nicely with broader Federal work relief and farm improvement programs. This included the development of a new experimental forest, the Irons Fork in western Arkansas, to experimentally test a number of options in that forest environment. Extensive work was also being done in parts of northern Mississippi, which had suffered marked impacts in highly erodible loess soils affected by poor agricultural practices.

Starting in 1937, the SOFES received support to develop (and later expand) a major effort into a flood control survey project that would evaluate the conditions of a number of major watersheds in the region (e.g., Yazoo, Tombigbee, and Ouachita Rivers), with plans to expand into other watersheds (SOFES 1938). Over the next few years, the flood control survey program grew rapidly, so by the end of 1939, H.G. Meginnis (as lead of this program) had 24 persons reporting to him, several of whom were detailed to the SOFES from the Central States Forest Experiment Station (SOFES 1940). This explosive growth was dwarfed a year later, when the flood-control survey program staff list covered nearly two full pages and included 64 names (many of which were transfers from other stations or short-term detailers) (SOFES 1941). The flood control survey plans for 1941 were also ambitious, although global events soon curtailed this effort.

DEFENSE ERA AND WORLD WAR II: 1939–1945

After the German army overran Poland in 1939 and much of the rest of the world was engulfed by war, U.S. Government leaders began to gear up for America's inevitable involvement. The Army National Guard and the Reserves were mobilized, a draft was instituted, and Station employees began to leave for military service. These events led to a redistribution of Federal resources and alterations to Forest Service research priorities. For instance, the Irons Fork Experimental Forest, which had only recently been developed in the western Ouachita Mountains of Arkansas and formally established in 1940, lost most of the CCC and WPA workforce that had helped construct its infrastructure by 1941 (Bragg 2021a).

After the Japanese bombed Pearl Harbor and the United States entered the war, there was an immediate and drastic change in the focus of all Federal Government programs to outcomes that would support the war effort. For the Station, the work changed to gathering information about supplies, output, and requirements of forest products for defense for the War Production Board, among other projects. Station employees developed Russian dandelion (*Taraxacum kok-saghyz*) and goldenrod (*Oligoneuron* spp.) plants in nurseries for rubber production, worked to free airfields of undesirable vegetation, and measured infiltration rates related to airfield drainage. Other projects focused on improving camouflage for military installations, evaluating priority requests for logging and milling equipment, improving fire protection of critical areas, and controlling termites and decay in wood structures (Josephson 1989, Wheeler 1963).

During the early to mid-1940s, as people left the SOFES for military service or to support other aspects of the war effort, the remaining staff spread their efforts to continue some measurements and consolidated existing research. Even during the war years, legislation was passed to harvest sustainably, increase cooperative fire protection, and keep the forest surveys up to date (USDA Forest Service 1976). Furthermore, plant pathologists learned how carefully planned prescribed burns could control brown-spot needle blight (*Mycosphaerella dearnessii*), the worst disease of longleaf pine (Siggers 1945). A few SOFES research programs were able to grow their existing operations, as they were deemed consistent with war needs. For instance, the naval stores research program expanded. To increase production of gum naval stores for war needs, the Station intensified experiments with chemical stimulation of resin flow, and revolutionized naval stores techniques by introducing additional developments in this field (Barnett 2019). Efforts were made to increase logging production, but logging methods that left trees for future use and wasted as little as possible were also encouraged. Work on increasing pine wood production for supporting war industries also grew; for instance, in March 1942 the Crossett Experimental Forest (CEF) added 1,800 acres via a new lease with the Crossett Lumber Company to study even-aged southern pine silviculture.

“*Even during the war years, legislation was passed to harvest sustainably, increase cooperative fire protection, and keep the forest surveys up to date (USDA Forest Service 1976).*

The suspension of pre-war activities came at a cost: experimental forests were often neglected, temporarily closed, or even turned over to the military. Wakeley (1971) noted that of 750,000 seedlings planted in research studies on the Palustris Experimental Forest during the CCC era, all but 50,000 were destroyed by fire and hogs during the war years. SOFES programs such as forest influences research on topics such as road bank stabilization was shelved and the remaining research staff focused on projects related to the war effort (SOFES 1942). This ultimately led to the demise of the newly established Irons Fork Experimental Forest, which though not disestablished as an experimental forest until 1969, did not have its studies restarted nor was it ever staffed again (Bragg 2021a). Camp Pinchot and the rest of the Choctawhatchee National Forest in the panhandle of Florida were turned over to the U.S. War Department in 1940 and became Eglin Air Force Base.

Another major transition for the SOFES occurred when its long-time Station Director E.L. Demmon departed in 1944 to become station director of the Lake States Forest Experiment Station. During his 17 years as SOFES director, Demmon

Boundaries of the various Forest Service experiment stations in 1936 (top) compared to those in 1947 (bottom) following a major realignment in 1946. At that time, the Appalachian Forest Experiment Station name was changed to the Southeastern Forest Experiment Station.

had contributed to both the administration and research efforts of the Station. One of his major efforts over this period was to argue for fire suppression and against the use of burning in forests. In Demmon's mind, fire had too few redeeming qualities and too many negative consequences for standing timber to justify its application as a management tool. Unlike many station directors, Demmon published frequently and on a range of topics; although not typically in scientific outlets, his written contributions (nearly 70 during the time he was with the SOFES) helped to translate the Station's research into usable findings for landowners, managers, and policymakers. Demmon's successor, Charles A. Connaughton, would continue some of that station director-level involvement during his tenure.[3]

ERA OF TERRITORIAL RESEARCH: 1946–1959

The position of station director remained somewhat unsettled after Demmon's departure. His immediate replacement, Connaughton, served until June 1951 when he transitioned into the regional forester position in the Southern Region. Connaughton's replacement, Harold L. Mitchell, had been the director of the Central States Forest Experiment Station. Mitchell had worked at the Lake City, FL, naval stores research location of the SOFES during World War II until he became the Central States director in 1946. Mitchell left the SOFES to take charge of the Division of Silvicultural Relations at the Forest Service's Forest Products Laboratory in Madison, WI, in November 1953. Philip R. Wheeler served as acting station director until early 1954 when Philip A. Briegleb, former head of the Central States Forest Experiment Station, became SOFES director (SOFES 1954). Briegleb would remain in this position well into the next era of the SOFES.

This succession of station directors faced some considerable organizational challenges during this era. Toward the end of World War II, Forest Service research administrators in the Washington Office had evaluated the structure and function of their organization. One change involved developing a staff structure more like that of the military. Another outcome of this reorganization and the Station's programmatic growth was a significant realignment of the boundaries between the SOFES and the Appalachian Forest Experiment Stations in 1946. Prewar experience had demonstrated the difficulty in administrating the SOFES, which extended from coastal South Carolina to the prairies of central Texas. Traveling from the New Orleans headquarters to the eastern portion of the Station was difficult and time consuming. Following the 1946 reorganization, SOFES research in most of Florida and all of Georgia was transferred to the newly christened Southeastern Forest Experiment Station (SEFES), while the SOFES received northern Arkansas from the Central States Forest Experiment Station and Tennessee from the Central States and Appalachian Stations.

This new arrangement divided the southern pine forests of the coastal plain states between the two stations, which eventually resulted in some research coordination issues. A major loss for the SOFES was the transfer of ongoing naval stores research in Florida to the SEFES (Connaughton 1946). Because naval stores was such a major industry in the Southeastern United States, the SEFES would continue this line of research for another 4 decades (Barnett 2019).

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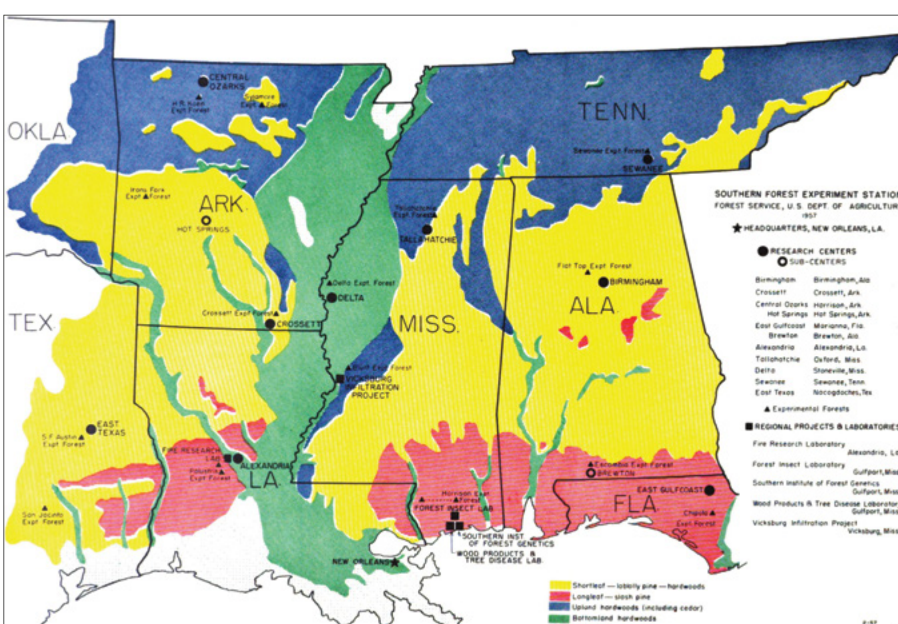
[3] Demmon would later return to the South as the director of the Southeastern Forest Experiment Station between 1951 and his retirement from the agency in 1956.

Even with this change in boundaries, the SOFES had grown appreciably from the institution's humble beginnings in 1921. Even though a few of the Station's experimental forests remained inactive after 1945, the SOFES still had a number in place (table 2), including the San Jacinto (eastern Texas); the Palustris (Louisiana); the Crossett, Irons Fork, and Sylamore (Arkansas); the Delta, Harrison, and Chewalla (Mississippi); and the Escambia (Alabama). The Station further developed facilities and research programs at a number of these experimental forests after the war, with capacity enhancements in the office buildings (including a fireproof safe) added in 1946–47 to the existing administrative site at the CEF. At the Palustris Experimental Forest, residences with supporting laboratory and workspaces were built on both the J.T. Johnson and Longleaf Tracts in the 1950s.

Growth in experimental forests and research centers

Additional experimental forests and supporting research locations were added during the Era of Territorial Research. By 1957, the SOFES had established new experimental forests and research centers in northern Arkansas (the Henry R. Koen Experimental Forest and Central Ozarks Center, with staff in Harrison and Hot Springs), central Louisiana (Alexandria Research Center), northern Mississippi (Tallahatchie Experimental Forest in Oxford), west-central Mississippi (Delta Experimental Forest in Stoneville and the Bluff Experimental Forest and Vicksburg Infiltration Project in Vicksburg), southern Mississippi (Forest Insect Laboratory, Southern Institute of Forest Genetics, and Wood Products and Tree Disease Laboratory, all in Gulfport), southern Alabama (Escambia Experimental Forest in Brewton), northern Alabama (Flat Top Experimental Forest and Birmingham Center in Birmingham), western Florida (East Gulfcoast Center and Chipola Experimental Forest in Marianna), and southern Tennessee (Sewanee Experimental Forest in Sewanee).



Forest types and research locations in the territory of the Southern Forest Experiment Station, 1957.

While most States saw increases in the Station's footprint, Mississippi had seen a particularly large increase in SOFES research projects, with some additional shuffling. For instance, the Chewalla Experimental Forest closed and was replaced by the Tallahatchie Experimental Forest. The Station constructed a new facility on the USDA complex in Stoneville, added the Bluff Experimental Forest and work on water infiltration into forest soils in Vicksburg, and built a large new office and laboratory facility in Gulfport to support several projects, including the increasingly prominent Southern Institute of Forest Genetics.

In addition to the Station's infrastructure, support for research programs continued to expand. Post-war economic growth enabled landowners to put large tracts of forest under intensive management. Not surprisingly, then, this era also witnessed the dramatically increased participation in forest research by State and private agencies and educational institutions. Until then, the Forest Service had conducted nearly all forest-related research. Between 1949 and 1952, nonfederal expenditures for forest management research in the South increased 55 percent (Federal expenditures remained unchanged during this period). Between 1953 and 1961, however, Federal research expenditures in the South increased about 75 percent (Demmon and Briegleb 1956).

Around 1945, the Forest Farmers Association Cooperative of Valdosta, GA, spearheaded a drive for a more comprehensive Federal research program to meet the increasing demands of forestry interests in the South. This move resulted in setting up about 20 research centers covering most of the forested area of the South (see also Demmon and Briegleb 1956). With the aid of local advisory committees and the cooperation of local organizations, these research centers became a major force in the technical advancement of southern forestry. The field research centers emphasized the most critical research needs of their surrounding territory. For example, the area served by the Alexandria Research Center in central Louisiana was better suited to grow timber than to any other land use (Cassady and Mann 1954). This meant that the development and prosperity of the region depended upon reforestation and improved stand management. The most pressing need was to get the huge area—over 7.1 million cutover acres in Louisiana and Texas alone—back into high production quickly and at a reasonable cost (reforestation would soon triple the South's pine timber production). Because most of this area was also used for grazing by open-range livestock, forest range improvement became an additional research focus.

Composed of a large and diverse scientific staff, these research centers were encouraged to establish research advisory committees to help develop science priorities. These local committees comprised the leading professional foresters, forest landowners, forest products manufacturers, and agricultural extension agents, tasked to help guide the research direction of the center (Committee on Government Operations 1956). Widely implemented across the USDA, these advisory committees became sources of political support for their programs and helped develop funding for program and facility improvements. The influence of some of these committees was sometimes so great that they could (and were) used to supervene the direction of station administrators (Barnett 2004).

The Alexandria Research Center advisory committee in the mid-1950s. Kneeling are Southern Forest Experiment Station staff, from left: J.T. Cassady, H.H. Muntz, F.A. Peevy, O.G. Langdon, D.O. Dryden, J. Williamson, A.E. Tassin, and H.J. Derr. Committee members standing from left: G.B. Hartmen, Long Bell Lumber; H.S. Redding, Kisatchie National Forest Supervisor; J.E. Mixon, Louisiana State Forester; P.E. King, Industrial Lumber Company; R.W. Hayes, Louisiana State University, School of Forestry; J.F. Kellogg, Consulting Forester; J.W. Duty, USDA Extension Service.

Expansion of research programs into new disciplinary areas

The forestry principles that the SOFES developed and advocated for were put into widespread practice. For example, improvements in forest management such as direct seeding and plotless timber cruising continued to increase the value of the forest resource of the South. With this success came new challenges, needs, and expectations. In addition to silviculture, other Station research centers emphasized forest survey, prescribed burning, bottomland hardwoods, pine-hardwood stands, forest range management, watershed management, and control of low-grade hardwoods (Connaughton 1946), and later forest genetics, wood products, forest influences (soils and erosion), forest health (insects and diseases), economics, and wildlife management. The expanded SOFES research programs included an increased emphasis on both identifying and solving problems as well as touting the rewards of protecting forest resources.

However, because these centers were geographically distant and their leaders tended to protect their turf, there was little coordination among them. Coordination issues also arose at a larger scale, a problem that would persist well into the future. The SOFES and SEFES were working with the same southern species and also needed to coordinate their research programs. Each station had an assistant director for planning and application and a portion of this person’s responsibility was to coordinate research between the two stations. To do this, research efforts were formalized and summaries of research study plans and reports were routed between them, helping to leverage their efforts and prevent duplication of research.

Although the SOFES had expanded its capacity for science, it was still necessary to work in concert with other institutions and organizations to expand forestry research. A good example of this included the development of southern tree improvement research. In addition to the leadership of the SOFES (centered at Gulfport, MS, but also at field locations such as the CEF), this effort also included private industry and universities. These were all coordinated by the Southern Forest Tree Improvement program which represented all interests in the research

(Wakeley 1957). Demmon and Briegleb (1956) summarized the situation at the end of this era by the statement,

> *how can we best obtain[the] … benefits that our 200 million-acre forest heritage can supply? … [by providing] the knowledge needed to succeed in this quest … The potential rewards are impressive, as is the determination of our people—forest owners, industries, research workers, and all—to do the job.*

Absorption of other USDA bureau staff

Another part of the agency's effort to streamline and improve station research was co-locating staff from other USDA bureaus at Forest Service research locations. By at least October of 1925, the AFES had two entomologists (R.A. St. George and A.H. McAndrews) from USDA's Bureau of Entomology and a pathologist (C.J. Humphrey) from USDA's Bureau of Plant Industry working in Asheville on forest-related problems. The SOFES was slower to have staff from those bureaus, but by October of 1928, the SOFES also had forest pathologists R.M. Lindgren and Paul V. Siggers from USDA's Bureau of Plant Industry working with them in the New Orleans office. During the decades that followed, a number of other scientists and support staff with these other USDA bureaus (the names of these bureaus and their focus changed somewhat over the years) continued to conduct research on entomological and pathological issues. Organizationally, because the entomological and pathological research specialties were found in these other USDA bureaus, they could not be filled by Forest Service staff. This changed in the early 1950s under a series of USDA reorganizations; by early 1954, the entomologists and pathologists of these former bureaus officially became Forest Service employees and continued their research careers at their respective forest experiment stations. Such transfers boosted the size and scope of Forest Service research in the South and helped to make it a more integrated part of southern forest science.

ERA OF RENEWED FUNCTIONAL RESEARCH: 1960–1980

Forestry research during the Cold War

Partners against fascism during World War II, the United States and its allies soon faced a new threat to their security: communism in eastern Europe, parts of Asia, and even the Americas. While much of this new Cold War revolved around nuclear and conventional military threats, these opposing camps also competed in other aspects of society, including research and development. For example, the American space program began in 1957 with the Soviet Union's launch of the first artificial satellite—a small beach ball-sized creation called Sputnik. This event took place under the backdrop of the Cold War and was seen as a threat to American security (Howell 2020). Within 5 years, new satellites were developed, both Soviet and American astronauts had been launched into space, and planning for lunar landing programs was underway.

The space race was also a way for a broad array of Federal agencies to boost their public relations, even if their core missions were only tangentially associated with space. Such was the case for the Forest Service's participation in the Moon Tree project. In 1970, then Forest Service Chief Ed Cliff approached Lt. Colonel Stuart

Roosa about taking seeds from a number of tree species into space with him when he commanded the Apollo 14 moon mission in early 1971. Roosa had been a smokejumper for the agency in the Western United States many years earlier. This effort, in large part public relations (and a small part science), eventually involved the SOFES. After their trip to space, the loblolly pine, sweetgum (*Liquidambar styraciflua*), and sycamore (*Platanus occidentalis*) seeds were germinated at NASA facilities in Houston, TX, and grown at the Southern Institute of Forest Genetics in May 1971. A few of these germinants—now dubbed "Moon Trees," since they orbited the moon as seeds—were planted at the Palustris Experimental Forest and the G.W. Andrews Forestry Sciences Laboratory.[4]

Such public relations efforts of the agency aside, the decades from 1960 to 1980 could be considered a golden era of southern forestry science. Federal forestry research blossomed during this era, thanks to considerable increases in science funding, during the late 1950s and early 1960s. Forest Service research efforts were also widely supported by forest industry, State governments, and universities. The SOFES's research program peaked both in the number of scientists and scope of the research agenda during this era. Research products were developed and put into immediate use by forest industry and other land managers. As the SOFES's funding support and research programs grew, each research center staff expanded to include more disciplines. For example, though the Alexandria Research Center in Louisiana was primarily focused on a reforestation mission and managed by a silviculturist, the staff expanded to include one or more from the following specialties: silviculturist, range specialist, botanist, plant physiologist, entomologist, geneticist, wood technologist, and wildlife specialist.

"... the decades from 1960 to 1980 could be considered a golden era of southern forestry science. Federal forestry research blossomed during this era ... research products were developed and put into immediate use by forest industry and other land managers.

This was not just a golden era for the SOFES, as research staff were being developed by some of the major forest industries and university research became an important contributor to forest science needs (Carter and others 2015). Collaborations, which included Forest Service researchers, developed in part through the establishment of cooperatives that shared common research and management agendas, were primarily focused on increasing forest yields. Examples of such efforts included cooperatives for tree improvement, nursery production, stand growth and yield, and stand fertilization.

Forest Service research reorganization

Although Forest Service research programs benefited from the growth of the previous era, it became increasingly evident that the SOFES's post-war organization was ill-suited for this expansion and the Station's center-based territorial approach had lost much of its effectiveness. By the late 1950s, the Forest Service research and development program began shifting away from center-based work to one organized around research projects (Williams 2000). In 1962, a major restructuring of the SOFES's research and development program was announced (SOFES 1963). Under this reorganization, the territorial research center concept was replaced by smaller research work units (RWUs), each with a narrower research focus. A total of about 20 RWUs were established by the

[4] Most of the information on the Moon Trees came from a 1971 letter from the Director of Timber Management Research, Carl E. Ostrom to SOFES Director R.L. Youngs and the NASA website: https://nssdc.gsfc.nasa.gov/planetary/lunar/moon_tree.html.

Station (Josephson 1989). Structurally, RWUs consisted of a project leader who supervised the program of study with a small number of scientists and support staff who worked on specific research assignments. At a higher level, the SOFES was administered through assistant station directors who reported to the station director. Each assistant director was responsible for supervising the technical research programs of five or six RWUs based on a combination of geographic and disciplinary criteria.

As the new RWUs were established, Washington Office and station leadership exerted more programmatic control, both by banning the hosting of research advisory committees as well as any contact with congressional legislators without permission. The diminished ability to develop rapport with congressional staff limited local Forest Service units from building congressional clout. This eased administrative problems for station leadership but became a problem years later when support was needed to maintain forestry research programs.

"The placement of the Louisiana-based offices of the three branches in one facility that was not on a university campus, have them share services, and develop close collaboration was a good trial of a unified organizational structure.

Alexandria Forestry Center: a trial in collaboration—During this era, Forest Service Chief Richard McArdle advocated for the establishment of RWUs at universities, which he thought would make them more productive. SOFES administrators offered a different model to consider in the pineywoods of central Louisiana. The national reorganization of the Forest Service research program in the early 1960s offered a unique opportunity in Pineville—why not take advantage of adequate congressional funding to locate all of the agency's branches together in one facility? Most likely, it was someone in the Washington Office, along with the support of the Southern Region's regional forester and the SOFES station director, who convinced Chief McArdle to allow for their colocation. The placement of the Louisiana-based offices of the three branches in one facility that was not on a university campus, have them share services, and develop close collaboration was a good trial of a unified organizational structure. It helped that a forestry triumvirate consisting of the Alexandria Research Center leader, forest industry under the banner of the Louisiana Forestry Association's executive director, and Louisiana Forestry Commission's state forester had developed sufficient political support in Washington to fund a new Forest Service research facility patterned after the agency's Forest Products Laboratory in Madison, WI (Barnett 2018, 2020).

No doubt, there had long been a real need to improve the agency's facilities and organization in the area. When the SOFES established a more formal research presence in the central Louisiana area just after the end of World War II, it took advantage of earlier work that had been done in the region at places like Urania, the Stuart Nursery, and the Palustris Experimental Forest (Cassady and Mann 1954). However, the SOFES's Alexandria Research Center and the Kisatchie National Forest (KNF) were both housed in inadequate rental space. To address this, a facility called the Alexandria Forestry Center (AFC) was developed to include a large complex of new research offices, laboratories, and support service buildings. A 14-acre site was obtained from Federal Government surplus at the Alexandria Veterans Administration Hospital. The AFC included a renovated three-story building (used as a nurses' quarters in the 1920s) to serve as the administrative offices for the KNF Supervisor's Office and the Forest Service's State and Private Forestry, Forest Health Protection (FHP) staff.

Above: The renovated Alexandria Forestry Center administrative office building for the Kisatchie National Forest and Forest Health Protection of State and Private Forestry.

Left: The Alexandria Forestry Center (AFC) campus at the time of its dedication (some facilities were still under construction). The complex of buildings at the top of this image is the Alexandria Veterans Administration hospital; the clear span building on the AFC campus is to the far right.

In addition to this renovated office building, new facilities were also constructed. Research facilities proved to be the largest component of the forestry center. These included a large office and laboratory building to house SOFES research units[5] and numerous research support structures, such as a headhouse and two greenhouses, a research insectary, a large clear span building with state-of-the-art equipment for

[5] The SOFES housed five separate RWUs at the AFC. These included Timber Management Research (later redesigned as Forest Management Research, or FMR), Forest Insect Research, Range Management Research, Forest Products Utilization Research, and Fire Behavior Research. However, the Fire Behavior RWU was transferred shortly after establishment because this research was consolidated into two national centers in Missoula, Montana, and Dry Creek (Macon), Georgia, both of which continued for decades. In its place, another FMR RWU was established at the AFC in 1969 that focused on intensive silviculture of southern pines. This was in part due to transfer of staff and projects from the closing projects at the Crossett Experimental Forest. The mission of this unit was to integrate the effects of fertilization, irrigation, tree improvement, and soil modification to optimize the productivity of southern pine forests (Shoulders 1967a, 1967b).

Forest Service Chief **Ed Cliff** speaking at the dedication of the Alexandria Forestry Center in September 1964.

wood utilization testing, and several other service buildings. Although parts of the AFC were still under construction, the facility was dedicated in September 1964 in a ceremony attended by many dignitaries including Forest Service Chief Ed Cliff.

To make this unified facility work, the AFC would be managed by a steering committee consisting of a representative from the KNF, FHP, and SOFES, with the chairperson rotating annually. The research representative would be named by the station director and typically was the most senior project leader, but sometimes this duty rotated among project leaders. The committee was scheduled to meet quarterly, and a major agenda item was distributing operational costs of managing the facility among the three organizations. The cost for shared administrative services at the AFC was distributed by the number of employees in each operating unit and facility and operational costs were allocated by the square footage of space occupied by that unit. Shared reception, contracting, and personnel responsibilities were provided by the KNF administrative officer and personnel officer (all personnel records were maintained by KNF). Facility operation and maintenance responsibilities were originally provided by a contract with the General Services Administration (GSA) and then the SOFES research units assumed responsibility for the facility management personnel. Eventually, it became more efficient for the KNF engineering staff to assume this responsibility.

Initially, some turf protection issues between KNF and SOFES leadership remained. But after a visit by the regional forester and station director, those issues were resolved. The shared services experiment worked well, and all the units involved began to appreciate the benefits of the effort. For example, the opportunity for SOFES employees to sit down with their personnel or contracting officers and resolve problems locally was effective and greatly appreciated. The interaction of SOFES, KNF, and FHP employees stimulated collaboration among both management and research programs, enhanced organizational productivity, and built esprit de corps. V.L. Harper, Deputy Chief for Research, praised the AFC complex as “one of the nation’s most productive” (Alexandria Daily Town Talk 1964). After a visit to the AFC, Chief McArdle also noted the high productivity of the AFC, and that the colocation had resulted in significant benefits to the entire Forest Service.

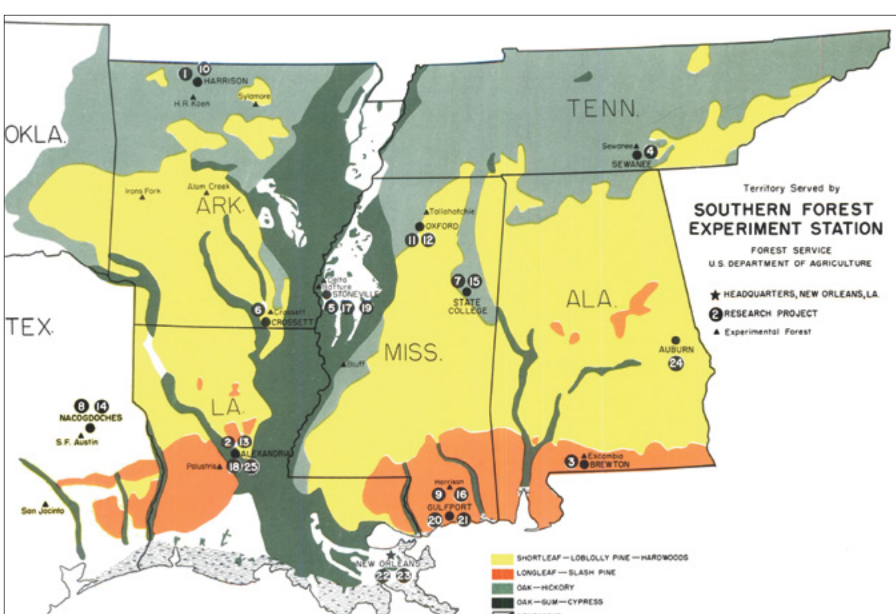
This effective integration at the AFC proved itself repeatedly over the years. For instance, in 1973, two chronic forest insect problems in the Eastern United States, spongy (formerly gypsy) moth (*Lymantria dispar*) and southern pine beetle (*Dendroctonus frontalis*) were sufficiently severe to become a national concern. As a result, in 1974 Congress passed legislation funding a 5-year, multi-agency research program to address these insect pest problems. The Southern Pine Beetle Research and Application Program was located at the AFC. Led by Program Manager Robert C. Thatcher, the program developed a close relationship with the Forest Insect RWU and funded cooperative research with numerous university scientists across the South. Due to insufficient office and laboratory space to house the new program’s specialists at the AFC, portable buildings were installed on the site (these temporary buildings were removed after the Southern Pine Beetle Program ended). In addition to producing many publications and a final report (Thatcher and others 1981), this program further showcased the Pineville location as a prominent center for forestry science and its application in the South.

Other research units and programs

While the RWUs at the AFC in Pineville were the SOFES's largest combined research effort at that time, other significant efforts were located across the Station's territory. By the late 1960s, SOFES research projects were located at Auburn, Brewton, and Tuskegee, AL; Sewanee, TN; Gulfport, Oxford, State College (Starkville), and Stoneville, MS; Pineville (AFC) and New Orleans, LA; Crossett and Harrison, AR; and Nacogdoches, TX.

While all SOFES locations housed multiple research projects within any given RWU, other large multiunit locations (such as those in New Orleans, Gulfport, and Stoneville) became the preferred model. For instance, in addition to being SOFES administrative headquarters, the New Orleans location had RWUs with assignments in economics, forest survey, and statistics (originally a support function, then developing into a formal unit). At Gulfport, the assignments were pine tree improvement and genetics, diseases of conifers, and protection of wood from termites. At Stoneville, the focus in three units was on the silviculture, insects, and diseases of hardwoods. In the late 1960s, the SOFES began a partnership with the Tuskegee Institute in Tuskegee, AL, to help develop the first forestry program at a historically black college to help address a grievous underrepresentation (only 0.3 percent at that time) of African Americans in the American forestry profession (USDA Forest Service 1970).

This staff and programmatic growth during this era also spurred a new building boom by the SOFES. In addition to the 1964 opening of the AFC in Louisiana, facilities to house researchers, support staff, and laboratories were built or expanded upon in the early 1960s at the CEF; in 1968 and 1969 in Oxford and Starkville, MS, respectively (USDA Forest Service 1969); in Nacogdoches, TX, in 1971 (USDA Forest Service 1971c); and in Auburn, AL, in 1975. According to a National Science Foundation report, as of June 1969, the SOFES had 105 research professionals (scientists, engineers, and any other staff primarily engaged in R&D



Distribution of research projects and experimental forests of the Southern Forest Experiment Station, 1969.

activities) and 188 other personnel (all other types of support staff), with a budget of just over $4.8 million (National Science Foundation 1970).

However, not all locations thrived during this era. Even with new facilities added earlier in the 1960s, the CEF underwent a decade of turmoil starting with the January 1, 1969, retirement of longtime Project Leader Russell R. Reynolds. Although the CEF had been a highly successful research location since it opened 35 years earlier, its research focus had long concentrated on naturally regenerated southern pine forests (especially using uneven-aged silviculture), which had started to fade in practice across much of the South after World War II. By the late 1960s, the SOFES had started pushing to end research at Crossett. When Reynolds retired, the last major obstacle to winding down CEF was removed, and the SOFES began to close studies and reassign CEF staff to other projects and locations. By 1974, Research Geneticist Hoy Grigsby was the last local SOFES staff member (allowed to remain due to his impending retirement) and the last remaining silviculture and tree improvement studies were closed or transferred to distant supervisors in Pineville or Gulfport, MS.

Unwilling to see decades of work at Crossett mothballed, the retired Reynolds and the forestry staff with Georgia-Pacific (who had purchased the Crossett Lumber Company, the CEF's primary industry partner and lease holder for the CEF lands) sought to convince the Forest Service to resume research activities. After years of internal debate, the agency agreed to restart work at the CEF, and by early 1979 had started restaffing the location. In a sort of compromise to meet Station preferences for administering its science programs, SOFES scientists would not be stationed at Crossett, but rather co-located with the forestry program at the University of Arkansas-Monticello about an hour away. Field technicians and other research support staff were stationed at Crossett and would help develop a new program focusing on supporting the forest management needs of small private landowners.

Front and back of logo for the Southern Forest Experiment Station 50th anniversary, celebrated in 1971.

Other events

50th anniversary of the Station—In 1971, the SOFES held a celebration of the 50th anniversary of the Station. Celebrations were planned for the New Orleans headquarters and the major field offices. At the time, the SOFES had grown to more than 100 scientists and 250 supporting personnel in laboratories scattered across its territory. Colloquially stated, the Station's research program was aimed at producing wood for American consumers, protecting forests against fire and pests, managing forested watersheds, providing forage for cattle and wildlife, opening and expanding forest products markets, and developing the recreation potential of forest land (USDA Forest Service 1971b).

To commemorate the occasion, an eight-page issue of the SOFES research update periodical was published that provided some of the history and early accomplishments of the Station, a vision of the future direction, and documentation by use of photos of former staff members who contributed so much to the early accomplishments of the Station (USDA Forest Service 1971b). The photos were printed with names below them, nothing more, but by their work they were remembered. It was also interesting that all the Station's directors to that point were still alive and able to gather for this commemoration; a picture of them appeared in the fall issue of that same periodical (USDA Forest Service 1971a).

Tower system on the Palustris Experimental Forest provides access to the crowns of loblolly pines to evaluate physiology in response to stand management treatments in support of climate change initiatives.

Biennial Southern Silvicultural Research Conference—In 1979, the Biennial Southern Silvicultural Research Conference (BSSRC) was developed to further improve coordination between the SOFES and SEFES and to build collaboration with forest industry, national forests, and university specialists (Barnett 2020). The first BSSRC was held in 1980 and the conference has been held biennially (to at least 2021). The BSSRC continues to be a highly regarded venue for coordinating research and meeting the needs of both research and management professionals, and a proceedings has been published with each conference to help build silvicultural knowledge in the South.

State and Private Forestry professional workshops—In the early 1970s, the Forest Service's State and Private Forestry (S&PF) deputy area began recruiting technology transfer specialists to help communicate the latest in research developments to forest industries, state organizations, and national forest land managers. Examples of this initiative include southern tree nursery workshops and tree improvement conferences. These meetings have been held biennially with published proceedings. To accomplish these efforts, the S&PF specialists partnered with the appropriate SOFES and SEFES research units and the Southern Region's forest management specialists.

In addition, the S&PF specialists helped develop other outlets for communicating the Station's research findings over the years, such as the *Tree Planters' Notes* publication for reforestation efforts. Other approaches of the SOFES in support of technology transfer included developing plans for individual tree species restoration. For example, Roger Dennington was one of the S&PF staff in Atlanta who led the effort in support of longleaf pine restoration. Working with Station scientists, this effort included driving tours on several experimental forests to provide information on the principles for restoring longleaf pine. These tours summarized current technology on regeneration, management, and utilization of longleaf pine, and promoted the species as an integral part of southern forestry.

ERA OF RESEARCH MATURATION: 1981–1992

While the previous era was one of tremendous advancement in all fields of forest science, the research maturation period represented the pinnacle of the SOFES's history. With adequate funding and excellent facilities, Station scientists made dramatic progress after 1960 in restoring the southern forests to a highly productive condition and in developing wood products for forest industry. There remained, however, even greater opportunities to understand the biology required to maximize the productivity of these new forests while maintaining other ecosystem values. This included the ability to use new technology to study the South's forests.

Station research had helped to rehabilitate the South's cutover forest land and make it productive again in a remarkably short period of time. A remarkable coalition of SOFES scientists, private industry foresters, and S&PF and university specialists developed southern forests into the most productive timber-growing region in the world and a major driver of the South's economy. Although research supporting these forest productivity and wood utilization efforts continued to provide for and refine this technology, the need for new initiatives became obvious. The questions coming up were equally or more difficult and public pressure began to steadily increase.

The evolving world of southern forest science

As shifts in the research program were instituted, support for forestry research in general began to decline. In a study of forestry research by the National Research Council (NRC) of the National Academy of Sciences, it became obvious that congressional support for forest research was declining (National Research Council 1990). To help overcome this deficiency, NRC recommended that a new research paradigm focused on the environment be adopted. Even though previous approaches to forestry research employing the conservation and preservation paradigms had been adequate to meet many past forest management goals, NRC considered them inadequate to guide forestry research into the future and called for major changes to how forestry research was organized, managed, and funded. The adoption of an environmental paradigm required forestry research areas to increase in both breadth and depth.

For example, new guidelines were being developed for managing the restored forests of the South. Timber harvesting and development of land for urban use increased substantially across the region, leading to questions about the health, productivity, and long-term sustainability of the forests (Wear and Greis 2004). This angle was relatively new to the SOFES; Forest Service scientists had long provided feedback and information on standard silvicultural practices on national forest lands (e.g., Burns 1989). While not always as vocal as other parts of America, Southerners also began rating environmental protection and noneconomic values of trees as top priorities to be considered on the same footing as the more traditional commercial uses of the forest. For example, urban pressures threatened to take far more forest out of sustainable management than land use conversion. Forest science then began to seek new ways to manage forests and communicate the value of that management in ways acceptable to urban neighbors (Sampson 2004). Efforts to evaluate the effects of climate change on forests, advancements in clonal and molecular genetics, the need for new forest products, the adverse effects of invasive species, protection for endangered species, and improvements in reforestation technology also began during this era.

As with much of the rest of the United States, forests in the South were touched by a number of environmental challenges during the 1980s and 1990s. The clearcutting controversies of national forests in the Western United States and West Virginia during the 1960s and 1970s led to the passage of major legislation that affected management practices nationwide (Williams 2000). Changes to Federal land policies and laws passed to protect wilderness, endangered species, clean water, cultural resources, and air quality during this era likewise had major impacts on national forest management. Consequently, affected land managers sought assistance from the SOFES to learn how to steward their timber and these other resources. Many examples of supporting research could be highlighted; the following are just a brief set of examples.

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Red-cockaded woodpeckers and endangered species research—The 1973 passage of the landmark Endangered Species Act (ESA) slowly started to impact public land management in the Southern United States. While the SOFES had studied aspects of game species and their management for decades by the early 1970s (Josephson 1989), the ESA affected a much broader sweep of species and habitats, with potentially important repercussions for forest management practices. The first, and likely most prominent southern species to become a controversy and the focus of SOFES research following the passage of the ESA was the evaluation and listing of the red-cockaded woodpecker (*Dryobates borealis*, RCW). The RCW depends on open, frequently burned old southern pine forests with large, live pines with advanced heartrot to provide foraging and nesting habitat. Such forests were once abundantly distributed across the Southern United States. By the early 1970s, decades of intensive silvicultural practices that led to more closed canopy forests with dense midstories, smaller, younger, healthier pine trees, along with reduced frequency of surface fires, had greatly reduced RCW habitat and its population had plummeted. Because some of the best remaining RCW habitat was found on public lands, especially military bases and national forests across the Coastal Plain, these lands were immediately placed in the spotlight when RCW was listed as an endangered species.

SOFES scientists were engaged early in the efforts to study RCW and the factors that led to its listing. During the 1980s and early 1990s, Station scientists Drs. Dick Conner and Craig Rudolph conducted key research in the biology and ecology of RCW in eastern Texas, including how management practices influenced the population dynamics of this endangered species (Conner and others 2001, Kulhavy and others 1995). The results of Conner and Rudolph's research, plus that of many other people across the region apparently succeeded in halting the decline of this species and encouraged a modest recovery, although the necessary changes to silvicultural practices on both public and private lands led to considerable concerns from land managers (concerns that linger to the present day).

Old-growth guidance for the Eastern United States—A major effort during the late 1980s into the 1990s involved Forest Service research stations in the Eastern United States working with the Southern and Eastern Regions of the National Forest System to develop guidelines for handling old-growth forests on public lands. This work followed a national reckoning on Forest Service land management practices that emerged during the 1980s around a number of topics, including timber harvesting, endangered species, mineral extraction, grazing, recreation, and old-growth forests. While the old-growth issue was largely one seen for the national forests in the Western United States, which still had large blocks of uncut old-growth timber being harvested, it was not absent from the much more heavily cutover Eastern United States. Loss of most of the frequently burned, open old-growth longleaf pine forests in the South had contributed significantly to declines of RCW and other species dependent on that stand condition, making the remnant stands all the more important (James 1995). The adoption of a new old-growth policy under the administration of Forest Service Chief F. Dale Robertson in 1989 was not limited to the Western United States but affected all of the agency's land base. This agency-wide policy directed that old-growth definitions were to be developed by forest type (or type group) to help land managers determine the extent and distribution of old-growth forests (Robertson 1990).

Shortly thereafter, the SOFES and SEFES joined the Southern and Eastern Regions, and The Nature Conservancy in what would become a multi-year effort to assemble teams of researchers and managers to review the available literature and develop a set of definitions. For much of the next decade, SOFES scientists used their research skills to craft a series of publications (issued following the merger that formed the SRS) that provided definitions of the approximately two dozen major forest types in the Eastern United States (White and Lloyd 1995) following a generally standardized format intended to bring managers the best available science for old forests of those types. SOFES researchers also contributed to an internal agency document (Region 8 Old-Growth Team 1997) that summarized these definition documents and provided national forest managers guidance (but not a policy or other mandate) on the application of this science.

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Ecosystem management comes to the Ouachita National Forest—Another good example of the research and management collaboration between the SOFES and the National Forest System that started during this era is found in the Ouachita Ecosystem Management Research Project. As noted earlier, clearcutting had become a major issue for the Forest Service, and by the late 1980s this challenge flared up on the Ouachita National Forest, a shortleaf pine-dominated landscape that stretches from central Arkansas into eastern Oklahoma. In the 1960s, Ouachita National Forest managers had joined their colleagues across much of the National Forest System in embracing clearcutting as the preferred silvicultural tool on public lands (Robertson 2004). The relatively shade-intolerant shortleaf pine seemed well suited for such practice on a large-scale (with clearcutting and replanting to shortleaf pine in most instances). Although not to the same extent as witnessed elsewhere, local environmental activists objected to the widespread use of clearcutting on the Ouachita National Forest, and eventually found a champion in their cause with Arkansas U.S. Senator David Pryor. Senator Pryor repeatedly reached out to Chief Robertson, who eventually offered to host the senator and other agency staff for a "walk in the woods" in August of 1990. Joining Pryor and Robertson was SOFES Project Leader Jim Baker, stationed in Monticello, AR. Baker and Robertson were classmates many years earlier at Arkansas A&M (today's University of Arkansas-Monticello), and together they were able to demonstrate to Pryor the potential of some of the limited New Perspectives (partial cutting) harvest projects that had just been installed on the Ouachita National Forest (Robertson 2004). By the end of that field day, Forest Service leadership had agreed to use the entire Ouachita National Forest as a New Perspectives Forest to test the still-evolving and largely unproven principles of ecosystem management at a large scale, with the SOFES spearheading a series of studies to investigate the impacts and potential of this change (Robertson 2004). Baker would step aside as project leader to be the Station's point person (team leader) on this multi-phase work, which would soon include hiring James Guldin to help direct the silvicultural studies and the involvement of numerous agency scientists such as Ron Thill (wildlife), Mike Shelton (silviculture), Allen Tiarks (soils), Margaret Devall (ecology), Rod Busby (economics), and others to conduct supporting research (Baker 1994).

Other administrative changes

During this era, administrative oversight of research programs by the Washington Office and station management peaked and began to decline. Early in the era, the programs of each project were overseen by members of the appropriate Washington Office staff and station assistant directors. In-depth meetings of unit scientists were held with user groups and detailed problem analyses were prepared and critically reviewed by station and Washington Office staff. Final project approval frequently took months. This level of detail seemed to be a carryover from years earlier when research scientists typically came with less thorough training.

Later in the era, budgetary issues began to reduce the time for oversight of project programs. The number of Washington Office staff and station assistant directors gradually declined. Also, the influence of industry user groups declined: their critical need for Forest Service research programs lessened.

ERA OF THE MERGER: 1992–1995

As earlier indicated, during the late 1980s and early 1990s, the entire Forest Service experienced considerable change in its administration, organizational structure, and even culture. This included alterations to how its operations were financed. Even though the 1990 NRC review called for significant increases in funding and supportive new forestry legislation, these changes did not occur. Between 1980 and 1995, appropriated funds for Forest Service Research and Development decreased when inflation was considered, the number of scientists had declined from 964 to 721, research locations from 86 to 76, and RWUs from 284 to 185 (National Research Council 2002).

Furthermore, the forest restoration effort in the South had been so effective that there was reduced need for continuing intensive forest productivity research. The need for forestry research in the South shifted to an environmental paradigm (National Research Council 1990). The suggested environmental paradigm would require forestry research to increase in issues such as how forests and climate affect each other; loss of biological diversity; growing demand for wood, wood fiber, and derivative chemical products; increasing demand for the preservation of pristine forested areas; and sustainable wood production integrated with protection of fish, wildlife, water, recreation, and aesthetic values.

To deal with the continuing reductions in this era, SOFES leadership began merging units, closing units and locations, and being selective in filling vacant scientist positions. However, these actions were insufficient to deal with a growing financial crisis and a more radical solution was proposed. Although it had been over 2 decades since the last major Forest Service Research and Development realignment had merged the Central States and Lake States Forest Experiment Stations to produce the North Central Research Station, it appeared that merging more experiment stations was the best option for the agency.

At least that was what was suggested by Forest Service leadership in FY1992. At that time, Chief Robertson proposed to merge the Rocky Mountain and Intermountain Forest Experiment Stations in the Western United States and the Southern and Southeastern Forest Experiment Stations in the Eastern United States (Klade 2006, USDA Forest Service 1993). While a change in administrations temporarily halted the effort (more so for the merger of the Rocky Mountain and Intermountain Stations, which occurred in May 1997), the Forest Service under new Chief Jack Ward Thomas eventually moved ahead with the merging of the Southern and Southeastern Stations (Hill 2000, Klade 2006). Most of the driving force for combining these sets of stations related to pressures to reduce some of the administrative staff and other redundancies, including the reduction of Senior Executive Service (SES) positions at the station director level. According to Klade (2006), the opportunity to reduce an SES position following the impending retirement of SOFES Director Tom Ellis was too good to pass up.

Although there were assurances that funding levels would continue for SOFES projects following any merger, it was obvious that continuing declines would occur. The closure of the Station resulted from the decline in need for the traditional ongoing research programs, not just those of the SOFES, but for the agency's overall programs. These results verified the coffee break discussions that had gone on for years.

Following Ellis' retirement in late 1992, SEFES Director Peter Roussopoulos assumed the helm of acting station director for the SOFES and remained in that acting capacity until the two stations were formally combined in January of 1995. What emerged was now known as the Southern Research Station, headquartered in Asheville, NC (the New Orleans headquarters office of the SOFES closed, although research work units would continue in that city until 2007). With this merger, the SOFES ceased to exist.

CONCLUSIONS

Carter and others (2015), paraphrasing Winston Churchill, said "never in the history of forestry have so many benefited so much from the work of so few." The 74-year history of the SOFES was a remarkable one but is not well known or appreciated by the public. With only a handful of professional foresters and few experienced researchers, despite little technical support and primitive working conditions, forestry made tremendous gains. In its first couple of decades, SOFES scientists helped develop the basic management guidelines that have resulted in great progress in restoring the South's forest lands (Sampson 2004).

Station researchers developed reforestation techniques, studied and began to understand the role of fire in forests, began surveys of southern forests that led to the development and expansion of forest industries, and learned how to control important insect pests and diseases. They also developed an understanding of the importance of statistical design and the value of tree improvement, developed methods of controlling soil erosion, refined the use of artificial regeneration and pine plantation management, and improved the efficiency of producing forest products.

Many of these SOFES studies were long term in nature and the dividends paid out by this approach—a relative rarity in resource research—are clear and still being realized (Devall and Baldwin 1998). While professional competence was an important factor in restoring and enhancing productivity of southern forests, natural resilience of forests also played a significant role. For example, although longleaf pine was found difficult to regenerate, other highly productive species, loblolly and slash pine, filled this gap and have been used to replace much of the old-growth longleaf pine. Wheeler (1970) concluded that the South's second forest "is a result of man and nature working together, and, in many respects, has been more prolific than the First."

"The 74-year history of the SOFES was a remarkable one but is not well known or appreciated by the public. With only a handful of professional foresters and few experienced researchers, despite little technical support and primitive working conditions, forestry made tremendous gains.

While today (2017 data) the South accounts for only about one-third of the Nation's forestland area and 25 percent of its softwood growing stock, in 2016 it supplied 61 percent of all softwood harvested in the United States (Oswalt and others 2019). The Southern Region's forests supply just over 11 percent of the global industrial roundwood (Oswalt and others 2019). The SOFES and SEFES were largely responsible for developing the underlying knowledge, tools, and techniques required to restore this productive forest land. Collaboration with forest industry, state, and university organizations have made southern forests sustainable. The SOFES scientists, support staff, and administrative employees who spend their careers working for the Station, can look back at their careers with pride in their accomplishments. The contributions of so many can be recognized in the beauty and productivity of forest stands that again occupy the landscape of the South.

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APPENDIX

Southern Forest Experiment Station Directors, 1921-1995

Name	Dates of Service
Reginald D. Forbes	1921–1927
Elwood L. Demmon	1927–1944
Charles A. Connaughton	1944–1951
Harold L. Mitchell	1951–1953
Philip A. Briegleb	1954–1963
Walter M. Zillgitt	1963–1966
Thomas C. Nelson	1966–1970
Robert L. Youngs	1970–1972
John C. Barber	1972–1976
Laurence E. Lassen	1976–1983
Thomas H. Ellis	1984–1992
Peter J. Roussopoulos	1992–1995*

*Peter J. Roussopoulos served as acting station director between 1992 and 1995, until the merger with the Southeastern Forest Experiment Station was completed in 1995.

Wakeley's Early History of Southern Forest Genetics

Philip C. Wakeley and James P. Barnett

Philip C. Wakeley (deceased), Retired as a Research Scientist in 1964, U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station, New Orleans, LA 70113.

James P. Barnett, Retired Chief Silviculturist and Emeritus Scientist, U.S. Department of Agriculture, Forest Service, Southern Research Station, Pineville, LA 71360.

PREFACE

Hired as a researcher in 1924, Philip C. Wakeley led the U.S. Department of Agriculture Forest Service, Southern Forest Experiment Station's development of reforestation, tree improvement, and genetics across the South during his remarkable 40-year career. Wakeley's seminal *Planting the Southern Pines* (Wakeley 1954) was built on some of his earlier works (Wakeley 1929, 1935) and provided foresters with the tools and technology to reforest the South and remains one of the most-cited references of the Forest Service. Wakeley's studies helped convince foresters and managers of the potential to use genetics to improve the productivity of southern pine plantations, and he long served as the leader of southern forest tree improvement and genetics.

After his retirement, Wakeley documented the early history of some of the major forestry advances by the Station (Wakeley 1980, Wakeley and Barnett 2016). This documentation effort includes the following paper, originally presented by Wakeley at Louisiana State University's 24th Annual Forestry Symposium in 1975 (Wakeley 1975) and reproduced here in its entirety.[1] This paper is Wakeley's look back at the early development of the genetics of southern pines that now drive the productivity of Southern forests. An understanding of Wakeley's contributions is important as we observe the 100th anniversary of the founding of what is today the Forest Service's Southern Research Station. The contributions of Wakeley provide the basis for the amazing progress that occurred in improving forest productivity during the mid to late 20th century. As Carter and others (2015), paraphrasing Winston Churchill, said of Wakeley and his colleagues, "never in the history of forestry have so many benefited so much from the work of so few."

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SOUTHERN FOREST GENETICS BEFORE 1951[2]

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In this country, up to 1950, professional forest geneticists were few and far between, and their meagerly supported work attracted little serious attention. Between 1924 and 1950 their main efforts were devoted to hybridizing poplars in the Northeast, chestnut in the East, and pines at the former Eddy Tree Breeding Station (now the Institute of Forest Genetics) at Placerville, California. Beginning in the early 1900's, professional foresters established provenance tests of ponderosa pine and Douglas-fir in the West and of Scotch pine and Norway spruce in the Lake States and the Northeast, and published both the early results of these tests and a number of speculative articles on other phases of forest genetics. In 1928 Carlos G. Bates, of the Lake States Forest Experiment Station, seriously proposed to American foresters the development of what we now call seed orchards (Bates 1928), but his proposal bore no fruit for more than twenty years.

None of the above-mentioned professional forest geneticists or interested foresters worked in the Southern Pine Region. I can speak with some authority on what was done in the South before 1951, because, not to mince words, I did most of it myself until 1942, when Keith W. Dorman swung into action. My efforts were pretty amateurish, but they did lay a foundation for research on geographic sources of seed, derive some basic information on pine species characteristics and hybridization of pines, and identify and preserve some useful breeding stock.

Early hybridization studies

Chronologically, events up to 1951 were as follows.[3] I began work at the Southern Forest Experiment Station in 1924 with an interest in geographic variation carried over from college days and an interest in hybrids whetted by H. H. Chapman's published description of Sonderegger pine, the natural cross between longleaf and loblolly (Chapman 1922). During the latter 1920's my interest in hybrids was increased by correspondence and contact with the staff of the Eddy Tree Breeding Station. Genetics, however, was no part of my official assignment, which consisted of seed, nursery, and planting research.

In the spring of 1925, in North Carolina, I made my first field identification of, and collected official Forest Service specimens of, Sonderegger pine, thus very greatly extending its known range, previously limited (Sudworth 1927) to Louisiana and Texas.

On October 21, 1925, I conducted Lloyd Austin, the original Director of the Eddy Tree Breeding Station, over the Great Southern Lumber Company's big commercial pine nursery and the Southern Forest Experiment Station's one-year-old experimental plantations at Bogalusa, Louisiana. This, my first personal contact with a professional geneticist engaged in forest tree breeding, was a liberal education to me and greatly increased my interest in forest genetics and paved the way for years of correspondence with and, ultimately, two personal visits to, the Station (later the Institute) at Placerville. At a request of Austin's

[2] This article has been reproduced as originally published with the exception of the addition of the bold-faced headings to help organize the content, some inserted footnotes and figures to help the reader, and a few other minor technical edits.

[3] 1951 is significant because that was the year tree improvement and genetics became a funded part of the Station's research program; prior to then those topics were pursued only if individual rresearchers were interested.

during this 1925 visit I supplied the Eddy Tree Breeding Station, during the next few years, with some of the southern pine seed used in its later work.

Partly as a result of Austin's visit in 1925, and partly on the further initiative of the Southern Forest Experiment Station, the Station and other agencies tested nearly sixty species of exotic pines in Florida, Louisiana, and Texas, from 1927 through the early Thirties, but not a single species proved able to survive the climate of the Gulf Coast States (Wakeley 1935).

In the fall of 1925, on direct orders from Col. W. B. Greeley, then Chief of the U.S. Forest Service, I helped collect or procure loblolly pine seed from Louisiana, Texas, Georgia, and Arkansas for the first provenance test of any southern tree species. I planted the stock from these four seed lots on two one-half-acre blocks at Bogalusa in the winter of 1926-1927, and followed the test through for the next 35 years (Wakeley and Bercaw 1965). As noted later, this pioneer provenance test had far-reaching results. It is a tribute to Greeley's foresight that he ordered the test put in before many of the American articles on seed source and other phases of forest genetics appeared in print. It was sheer luck, however, that loblolly pine, the one species from which we could get seed from several sources in the extremely poor seed year of 1925, turned out to be the southern pine species with the greatest range of geographic variation in resistance to fusiform rust. It was also by luck, rather than from statistical competence, that I incorporated sufficient replication in the experimental design to show the significance of the differences that developed.

At Bogalusa in 1926-1927, in addition to the loblolly seedsource stock, I planted 330 naturally-occurring Sonderegger pines culled from the Great Southern Lumber Company's longleaf pine nursery beds. The initial survival of these hybrid seedlings was good, and their early growth was rapid, but they soon showed them selves subject to the ills of both parent species—the brown spot needle blight affecting longleaf, and the rabbit-damage, tip-moth infestation, and fusiform-rust infection affecting loblolly. This Sonderegger pine test plot was the forerunner of others that I established near

This photo was used in early publications to illustrate the importance of genetic variation in loblolly pine.

Alexandria, Louisiana in the mid-30's and of much more extensive Sonderegger pine plantations established by the Southern Institute of Forest Genetics in the 50's. The various plantations yielded some basic information on inheritance, but Sonderegger pine has proved of little practical use except occasionally as an understock in establishing grafted longleaf pine seed orchards.

From 1928 through 1935 I selected and recorded, in 25 acres of experimental plantations at Bogalusa, southern pines of out standing form, growth-rate, and resistance to disease. Periodic remeasurements of the selected trees and of adjacent medium-quality and inferior trees, through 30 years in plantation, eventually yielded considerable basic data on growth rate and patterns of growth, made possible the selection of several trees of superior form and growth rate (and of others of aberrant form) for future breeding experiments, and in particular brought to light several longleaf pines with a strongly inherited resistance to brown spot needle blight in the juvenile stage (Derr and Melder 1970, Wakeley 1968, Wakeley 1971).

Longleaf x slash pine hybridization

In 1928 and again in 1929 I attempted to verify H. H. Chapman's assumption of the longleaf X loblolly parentage of Sonderegger pine (Chapman 1922) by crossing the assumed parents artificially by the technique then in use at Placerville. Both attempts failed, but in 1929 I did make a successful and fully authenticated artificial cross upon longleaf with slash pine pollen. The cross yielded about four dozen seeds, which I shared equally with the Eddy Tree Breeding Station. Because of inadequate nursery facilities in 1931, I got only two seedlings from my share of the seed; both are shown in figure 8 on page 1252 of the 1937 Yearbook of Agriculture (Schreiner 1938). (Both were later lost in plantation, one to brown-spot infection and the other to wind-breakage at a rust canker, though extensive production since 1950 has proved this hybrid less susceptible to brown spot than the longleaf parent and less susceptible to rust than the slash pine parent.) As of March 1975 (W. B. Critchfield, personal communication), 13 of the hybrids from the original 1929 controlled pollination are still alive in the Placerville arboretum.

Some botanist—Blakeslee?—produced an authenticated interspecific hybrid of two pines in the Northeast about 1911, a cross that my limited personal library has not enabled me to document. The Eddy Tree Breeding Station made successful controlled crosses of knobcone X Monterey pine in 1927. My controlled hybridization of longleaf X slash in 1929 appears to have been the first artificial cross of any southern pines, and only the third controlled hybridization of pines ever carried out.

Philip Wakeley checking the condition of the bud in a rapidly growing longleaf pine seedling in 1938. (USDA Forest Service photo taken by J.D. Guthrie in October 1938)

In 1931 I made successful controlled back-crosses on Sonderegger pine with pollen of both its parent species. This ended my hybridizing of southern pines until the U.S. Forest Service embarked on its present program of forest genetics research in 1950-1951, but familiarity with the back-crosses later helped me unravel the puzzle of a "hybrid swarm" discovered in a mixed longleaf-loblolly stand in western Louisiana.

The great expansion of the U.S. Forest Service planting program during Civilian Conservation Corps days increased the need for information concerning geographic sources of seed. In the winter of 1935-1936 I established a second provenance test, involving eight sources of longleaf, nine sources of slash, and two sources each of loblolly and shortleaf. The seedlings, far from comparable within species, were obtained where we could find them from beds in nurseries with acceptable records of seed origin, and were planted in one locality only. This test yielded no useful results.

Variations due to day length

Meanwhile, however, upon promise to the Southern Forest Experiment Station of a special allotment of $25,000 for provenance tests, I undertook, with seed from the exceptionally good 1935 seed crop, an ambitious, region-wide source-of-seed study of the same four principal southern pines. The allotment failed to materialize, but the Southern Station enlisted the help of voluntary cooperators in several different agencies throughout the South and launched the study without the special funds.

This region-wide study fared badly from the start. Cooperators supplied longleaf seed from 11 sources, slash seed from 10, loblolly seed from 11, and shortleaf from 10, but choice of sources depended less upon effective sampling of species ranges than upon where cooperators could be found. For each species, it was planned to plant stock of all sources at or near the point of origin of each and every seed lot but, in general, the cooperators were unable to contribute enough seed for this purpose. To make matters worse, nursery production of several lots of stock fell below expectations, fewer plantations were established than had been planned, and some of the plantings that were made were improperly executed or inadequately recorded. Finally, the Southern Station's own plantation for the study near Alexandria, Louisiana (which was the only one containing all 42 lots of seed collected) was destroyed by fire during World War II. For all immediate practical purposes, therefore, the study was a failure.

It did, however, have two important indirect results. First, the shortleaf pine seedbed producing the stock for the Alexandria plantation gave us our first insight into the remarkable north to south variation of this species in response to differences in day length during the growing season—a phenomenon to be even more strikingly demonstrated later on in loblolly pine (Perry and Wang 1957). Second, it enabled us to avoid the gross mistakes of 1935 through 1937 when we established the much more effective Southwide Pine Seed Source Study, with seed from the 1951 and 1955 crops (Kaufman 1971, Snyder et al. 1967, Wells and Wakeley 1966, 1970a and b).

High gum yield selections of longleaf pine

In 1935, T. A. Liefeld of the Southern Station began one of the few genetics studies in which I had no part. He collected wind-pollinated cones from two groups of longleaf pines near Lake City, Florida, one group having gum yields from slightly above average to two-thirds of average, and the other having yields from slightly above to fifty percent above average. Seedlings from the two lots of seed were planted on the Olustee Experimental Forest a year later. Micro-chipping of 17 progeny of the lowyielding and 17 progeny of the high-ielding mother trees showed significantly better gum yield from the progeny of the high-yielders (Mergen 1953), indicating the strong genetic control of gum yield in longleaf pine.

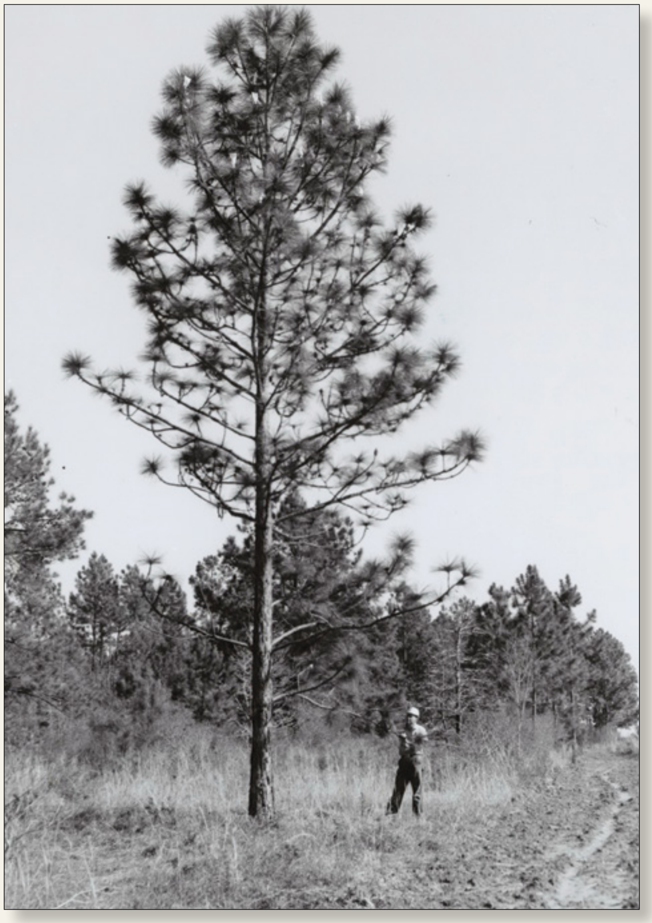
In the spring of 1936 the Forestry Division of the Tennessee Valley Authority began another project in which I had no part. This was the breeding of walnuts, hickories, chestnuts, oaks, honey locusts, black locusts, and persimmons to combine high productivity and quality of nuts, acorns, or other fruits with desirable timber qualities (Schreiner 1938). Also in 1936, the Appalachian (now the Southeastern) Forest Experiment Station began a study of inheritance in pine by planting seedlings from wind-pollinated seed from 122 individual loblolly seed trees, but without obtaining any conclusive results.

In 1924 Dr. Ernst J. Schreiner, in cooperation with the New York Botanic Garden, began hybridizing poplars for the Oxford Paper Company. Later, he was appointed Forest Geneticist at the Northeastern Forest Experiment Station, where he was assigned the preparation of an article on Improvement of Forest Trees for the 1937 Yearbook of Agriculture. He toured the United States and Canada, visiting genetics installations and interviewing other forest geneticists and a few interested foresters, to verify and expand the manuscript of this article. He interviewed me in New Orleans on December 10, 1936.

He included in the article (Schreiner 1938) the only photograph ever published of my 1929 longleaf X slash pine hybrids, together with notes on the provenance tests I had established up to that time. He also included, and credited to me, some suggestions on “the outstanding technical and practical problems that remain to be solved.” In view of the direction that southern tree improvement research and practice have taken since 1951, I derive considerable satisfaction from having made valid suggestions as early as 1936.

Brown spot disease resistant longleaf pine

In December 1937, Dr. Paul V. Siggers, while examining an unsprayed seedbed in an abandoned nursery, discovered a 2-year-old longleaf pine seedling with practically complete resistance to brown spot needle blight. It looked like a green whisk-broom standing on end among the thousands of almost completely brown or completely defoliated seedlings around it. He obtained it from the nursery operator and he and I planted it on the J. K. Johnson Tract near Alexandria, Louisiana. This



This longleaf pine was found in an abandoned nursery bed, was resistant to brown-spot needle disease, and was planted on the Palustris Experimental Forest. Control pollinated seeds from it were used in tree improvement studies to establish brown-spot resistant material in genetically improved seed sources. The tree was killed by a southern pine beetle infestation in the early 1980s, but its parentage lives on in many other established seed sources. (USDA Forest Service photo taken by R.W. Neelands in January 1961) tree, now known familiarly as "Father Abraham," survived and grew well, and has since been shown by exhaustive tests to transmit its brown-spot resistance to its progeny. It has therefore become a key tree in the important program of breeding for disease resistance in longleaf pine (Derr and Melder 1970).

Selection for high gum yield in slash pine

In 1942, Keith W. Dorman and co-workers began the first comprehensive and adequately supported program of breeding superior trees within one species of southern pine. They did it by selecting slash pines of exceptionally high gum yield in the vicinity of Lake City, Florida. The selection was on a comprehensive scale which was rigorous, exacting, and well-recorded, and this resulted in the discovery of twelve trees each of which produced two or more times as much gum as average trees of comparable size (Mergen and Pomeroy 1954).

Vegetative propagation of the selected high-yielders proved impracticable, but controlled cross-pollinations of high-yielders and similar controlled crosses of "check" trees of merely average yield resulted in a small plantation, by courtesy sometimes dubbed "the first southern pine seed orchard," on the Olustee Experimental Forest. The plantation is, of course, properly a progeny test. Ultimately, it demonstrated the strong inheritance of high gum yield in slash pine and gave impetus to the selection and breeding of southern pines for other economically important characteristics. About 1948 Dorman, who had transferred from the Southern to the Southeastern Forest Experiment Station, began selection and breeding for some of these other traits, with progeny tests at Calloway Gardens, near Hamilton, Georgia.

Pine seed source studies

Meanwhile, in 1944, I had published the results of the fifteenth-year remeasurement of the original loblolly seed-source study at Bogalusa, Louisiana. They showed that the growth of the "local" Livingston Parish, Louisiana, stock was significantly better than that of the Texas, Georgia, and Arkansas stocks, and that the Georgia stock was very significantly more susceptible to fusiform rust than were the three stocks of more westerly origin (Wakeley 1944). These findings attracted little attention at the time, both because everyone was preoccupied with World War II and, more specifically, because during the War forest planting was at a low ebb.

In 1949, however, when World War II was over and the pulp and paper industry was beginning to plant the southern pines on an unprecedented scale, Gaylord Container Corporation personnel helped me thin the loblolly seed-source plantation by removing every other tree in each row. Stacking the wood separately by geographic source of seed, showed significant differences in volume production from source to source. The trees from the Arkansas source, for example, had produced only 40 percent as much pulpwood per acre as those from the Louisiana source. Enlarged photographs showing the differences in tree heights and in volumes of stacked pulpwood (Wakeley 1954) when exhibited at a meeting of the Southern Pine Pulpwood Association, blew the question of geographic sources of southern pine seed wide open. Following the meeting, several pulp and paper companies cancelled large orders for seedlings that they had previously placed with State forest nurseries, because the States could not certify the geographic sources of the seed they had sown. Thenceforward, practically all forestry agencies in the South kept much better records of seed sources.

In 1948, Chronica Botanica Company published the English version of Bertil Lindquist's Genetics in Swedish Forestry Practice (Lindquist 1948). Although severely criticized by several professional forest geneticists both here and in Sweden, it was a strikingly illustrated and very persuasive little book. It was widely read by Federal, State, and industrial foresters, administrators, and executives, and apparently contributed greatly to an increased interest in, and to an outburst of enthusiasm and financial support for, forest genetics research and applied tree improvement throughout the United States, much of it along the lines suggested by Bates in 1928.

In the South, a very practical manifestation of this awakened interest was the organization, early in 1951, of the Committee on Southern Forest Tree Improvement. Several influential foresters, at least three of whom had attended the 1949 World Forestry Congress in Finland and had been impressed by recent northern European advances in forest genetics, joined forces in getting the Committee started, and its membership has always been broadly representative of forestry agencies and interests throughout the South. Through its active subcommittees, its own regular meetings, its arranging of region-wide general conferences, its sponsoring of more than thirty publications, and a brisk inter-member personal correspondence, the Committee has been an important stimulus to research and practice and an invaluable clearing-house for plans and information. In particular, it strongly supported the pioneering efforts of Dr. Bruce Zobel, Dr. Thomas O. Perry, and Dr. Keith W. Dorman in establishing grafted southern pine seed orchards through State, University, and pulpwood-industry cooperation (Kaufman 1971).

Although I was a charter member of the Committee, and served as Chairman of its Subcommittee on Geographic Source of Seed until my retirement from the U. S. Forest Service in 1964, I must turn the story over at this point to younger men who are still actively engaged in forest genetics research and tree improvement practice. They are far better qualified than I am to supply up-to-date information, guidelines, and directions to those who need them.

Wakeley's concluding thoughts

I should like, however, to conclude with two comments.

First, between 1953 and 1973--the latest year for which figures have been published -- the area of southern pine seed orchards increased from the acre or so of Dorman's purely nominal seed orchard on the Olustee Experimental Forest to 7,250 acres. These orchards are already so productive that several States and industrial concerns are sowing many (and in some instances all) of their nursery beds with genetically improved orchard seed. For a mere two decades this is a stupendous accomplishment.

Second, although interspecific hybrids have as yet played a negligible part in the southern pine tree improvement program, two of them, the longleaf X slash pine cross and the shortleaf X slash cross, have characteristics both of disease-resistance and of growth that make them very promising for use in many localities where incidence of fusiform rust is high. From studies of my own and co-workers (Wakeley et al. 1966, Harold J. Derr, personal communication) I feel confident that, with proper care, either of these hybrids can be mass-produced in orchards at somewhat but not excessively greater cost than the pure species already corning from our present orchards. With several "second generation" purespecies orchards already in the making, it seems to me that the time is ripe for a pilot-plant attempt at orchard production of at least one hybrid southern pine.

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Coweeta's Influences Reach Beyond its Watershed Boundary

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Meteorological data have been collected continuously at the same location by the Coweeta Hydrologic Laboratory since 1934. Left: circa 1934; Right: circa 1999.

In 1934, near the small town of Otto, NC, the Appalachian Forest Experiment Station, U.S. Department of Agriculture Forest Service, established the Coweeta Experimental Forest (later renamed the Coweeta Hydrologic Laboratory) (Ice and Stednick 2004, Lehman 2009). Much of the early scientific knowledge about how forests influence watershed water cycles was produced from studies at Coweeta. Indeed, much of today's forest hydrology science—the study of water movement in forests—originated from the research at Coweeta and other experimental forests across the United States (Ice and Stednick 2004).

As one of the world's oldest forest hydrological stations with the longest hydrologic records, Coweeta is regarded as a special "holy" place to visit and study for many international forest hydrologists—a once in a lifetime opportunity. For this reason, I take great pride to have done research at Coweeta and to be associated with its people.

Indeed, Coweeta's influences on my academic career have been profound, tracing all the way to the 1980s when I was a graduate student in Beijing, China. At that time, I never thought that I would professionally and personally become part of Coweeta's story! Collaborative work with Coweeta during the past 25 years has been the most rewarding part of my dream job with the Forest Service. Fully accounting for all the influences that Coweeta has had on me is a challenge, but one I would regret if I did not share my story during this occasion of the centennial celebration of the Southern Research Station (SRS).

A group photo of Coweeta's 75th anniversary celebration, November 4, 2009, Otto, NC.

This essay extends an invited presentation at Coweeta's 75th anniversary celebration symposium in which I reviewed the international influences of the science and scientists of Coweeta. Hosted by then-Project Leader Jim Vose, this 2009 event allowed pioneering scientists—and my academic heroes such as Wayne Swank, Lloyd Swift, Peter Black, John Stednick, and Tim Burt, just to name a few—to celebrate their great achievements and legacy at Coweeta.

THE COWEETA CONNECTIONS FROM AFAR

In 1981, there was an unusually open debate on the true hydrological effects of forests among two well-known academics in China (Huang 1981, Wang and Huang 1981). This controversial discussion centered around "correctly understanding the role of forests" and was led by Professor Bingwei Huang, a geographer and the director of the Institute of Geographical Sciences of the Chinese Academy of Sciences, and Professor Zhenru Wang, a tree physiologist and Duke University graduate teaching at my alma mater, Beijing Forestry University. Huang warned that a forest's hydrologic benefits should not be exaggerated while Wang stressed the large ecological functions of forests in precipitation formation and erosion controls.

This debate was triggered by the 1981 flood in the upper Yangtze River, a river with a similar length to the Mississippi River, which killed 1,369 people and left over 20 million homeless. Like many undeveloped countries, soil erosion problems were rampant throughout China in the 1980s due to years of deforestation and land exploitation. In particular, the Yellow River Basin, "the cradle of Chinese civilization," was known to have chronic sedimentation and flooding problems. In fact, the former USDA assistant chief of Soil Conservation Service W.C. Lowdermilk visited China in the 1920s, and his famous book *Conquest of the Land through Seven Thousand Years* describes the Yellow River as "China's Sorrow" (Lowdermilk 1948). Since the 1970s, foresters and soil conservationists in China recognized the problems and called for large-scale tree planting, aimed at slowing down the trend of land degradation and floods at the national scale (Sun and others 2006).

Unfortunately, the debate between Huang and Wang was inconclusive because there were few rigorous forest hydrologic studies in China at that time. Huang and Wang's arguments were mostly based on limited Western literature outside of China, including work done at Coweeta. The debate was later dubbed as "Fighting Civil War with Foreign Weapons" (Wei and others 2008). In retrospect, the controversy was not unique to China, because forest-water relations are complex and have been the subject of considerable speculation since at least the French Revolution (Andréassian 2004), and even today there remains globally many unknowns (Vose 2019).

The release of the book *Forest Hydrology and Ecology at Coweeta* (Swank and Crossley 1988) proved to be a milestone. This synthesis comprehensively documented the long-term forest hydrology and ecosystem-scale research conducted at Coweeta since the 1930s. Unfortunately, back in the middle 1980s, I had very limited access to Coweeta research before this "green book" was published. The "bible" that I used as a graduate student was the lengthy "Proceedings of Forest Hydrology Symposium" (Sopper and Lull 1967). There was perhaps one single copy in China and this book could only be read in the National Library in downtown Beijing. I was so happy that the library had such an important document published in the late 1960s when the "Cultural Revolution" (1966–1976) was at its height and most higher education and academic activities were halted.

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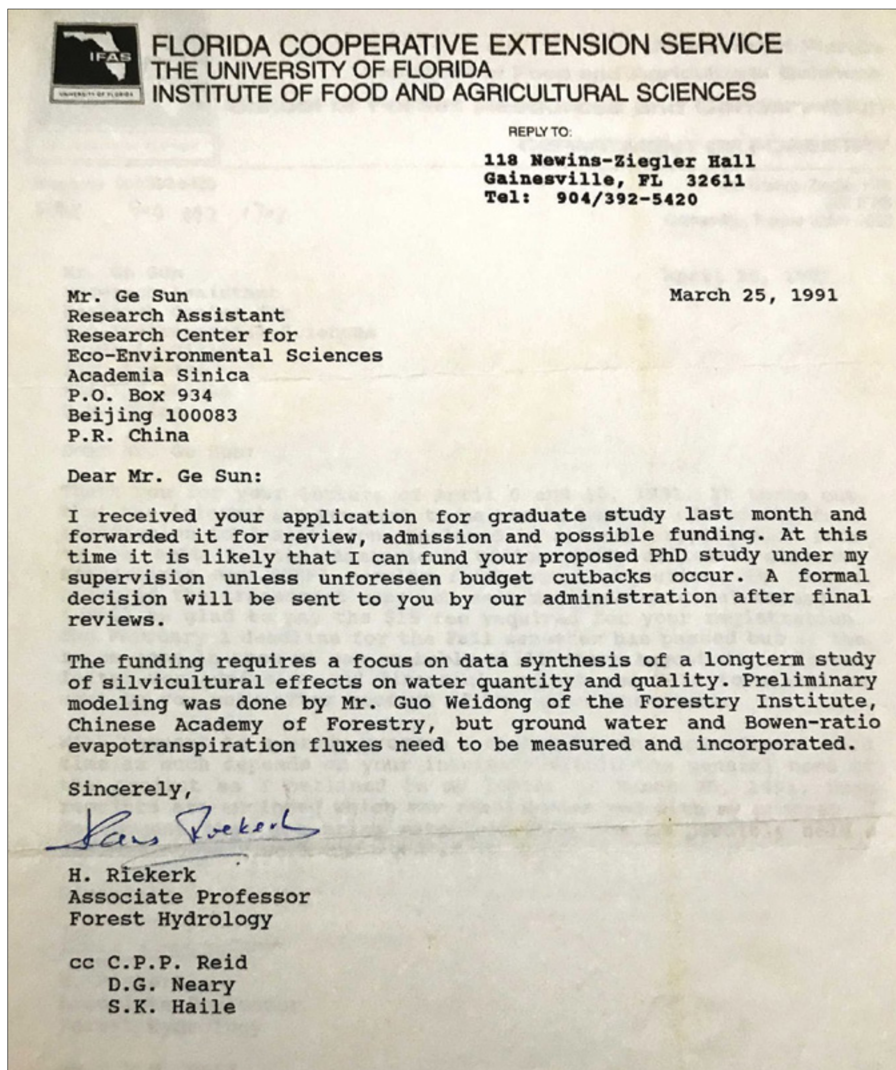
As one of a handful of graduate students focusing on forest hydrology in China in the late 1980s, I was amazed by the contradictions between limited Western forest hydrology literature (mostly from the United States and Australia) and what I was taught. Our rudimentary college textbooks were heavily weighted towards Russian and Japanese literature and our "traditional wisdoms" that view forests as benefiting water resources. The popular view was that since forests are like sponges, forests can "*Han Yang Shui Yuan*," meaning "forests retain flood water and release it slowly," and so planting trees will "gain" and store water like "green reservoirs." The zeal to use trees to solve water problems still exists today in many parts of the world and many lessons have been learned, especially in arid regions in China. However, even well-intentioned afforestation or reforestation programs can go wrong when our understanding of basic hydrologic science is not used to inform decisionmaking.

My master's thesis research in 1987 aimed at quantifying the hydrological functions of Chinese fir (*Cunninghamia lanceolata*) forests in southern China. To get more reading materials about hydrograph separation methods and to understand the Variable Source Areas theory that explains streamflow generation in humid regions, I sent Dr. John Hewlett a handwritten letter—the first one in English in my life. Hewlett was stationed at Coweeta during 1956–1964 and served as project leader during 1959–1964, before joining the faculty of University of Georgia where he retired in 1984. He was regarded by many as "the Godfather" of forest hydrology (Jackson and others 2005). To my delight, a month later I received a large yellow envelope from Hewlett. Inside were several reprints of Coweeta publications including a report of their famous soil moisture model (Hewlett and Hibbert 1963) and the *Science* paper on the effects of converting deciduous hardwoods to eastern white pine (*Pinus strobus*) (Swank and Douglass 1974). Hewlett also provided a copy of the cover page of his book *Principles* *of Forest Hydrology* (1982) published in Chinese (in Taiwan), writing me that he understood "… it might be difficult for you to get a copy of the translated one…". Since then, the relationships between China and the world certainly have changed, thanks to China's "open door" policy implemented in the early 1980s.

THE FLORIDA IMPAC

My life changed forever in the fall of 1991. I was fortunate to have the opportunity to start a doctoral program in forest hydrology and watershed management under Hans Riekerk and Dan Neary in the School of Forest Resources and Conservation at the University of Florida. My financial support was provided by the Intensive Management Practices Assessment Center (IMPAC), established in Gainesville in 1976 to assess various southern forest management practices for maximizing tree growth and to determine if these practices were ecologically, environmentally, and economically feasible (Comerford and others 1985). Neary worked as a soil scientist at Coweeta for several years before moving in 1981 to Gainesville as the project leader of IMPAC.



FLORIDA COOPERATIVE EXTENSION SERVICE
THE UNIVERSITY OF FLORIDA
INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES

REPLY TO:
118 Newins-Ziegler Hall
Gainesville, FL 32611
Tel: 904/392-5420

March 25, 1991

Mr. Ge Sun
Research Assistant
Research Center for
Eco-Environmental Sciences
Academia Sinica
P.O. Box 934
Beijing 100083
P.R. China

Dear Mr. Ge Sun:

I received your application for graduate study last month and forwarded it for review, admission and possible funding. At this time it is likely that I can fund your proposed PhD study under my supervision unless unforeseen budget cutbacks occur. A formal decision will be sent to you by our administration after final reviews.

The funding requires a focus on data synthesis of a longterm study of silvicultural effects on water quantity and quality. Preliminary modeling was done by Mr. Guo Weidong of the Forestry Institute, Chinese Academy of Forestry, but ground water and Bowen-ratio evapotranspiration fluxes need to be measured and incorporated.

Sincerely,

Hans Riekerk

H. Riekerk
Associate Professor
Forest Hydrology

cc C.P.P. Reid
D.G. Neary
S.K. Haile

Admission letter from Dr. Hans Riekerk to the author to start his doctoral program in forest hydrology in the School of Forest Resources and Conservation at the University of Florida.

My dissertation research synthesized the 2-decade-long accumulated hydrological data on the effects of various forest harvesting practices on pine flatwoods watershed hydrology. The Florida watershed study design followed the standard paired watershed methods developed at Coweeta. Measuring flow from small, poorly drained, flat watersheds in Florida proved to be more challenging than in the mountainous Coweeta watersheds. The first-order streams in these headwater watersheds are ephemeral and often stagnant, but the watersheds are periodically flooded by tropical systems. Furthermore, the water samples for chemical analysis needed to be refrigerated under the Florida heat (Ice and Stednick 2004).

Modeling the watershed hydrology was another goal of my graduate research. Initially, I was advised to investigate VASA, a computer simulator developed by Hewlett's group at the University of Georgia based on the Variable Source Area Concept (Bernier 1982, Troendle 1979). The model did well for the Piedmont landscape to model stormflow generation processes and had previously been tested with some success in Florida (Guo 1989). However, I ended up using a different modeling scheme to simulate the variably saturated areas on the heterogenous flatwoods landscape dominated by cypress (*Taxodium distichum*) swamps and slash pine (*P. elliotii*) plantations by explicitly tracking the shallow water table using a spatially distributed approach (Sun and others 1998a, 1988b). The shallow ground water table, rather than hillslope, controls surface and fast flow generation in the lower Coastal Plain. The shallow ground water table in pine flatwoods fluctuates appreciably on a subhourly basis in response to forest evapotranspiration (ET) or rainfall. My own studies on ground water table dynamics on Watershed 2 at Coweeta confirmed the saturated area in the hilly watersheds was rather small and the stormflow was generated from fast subsurface flow in the hilly watersheds (Sun and others 2008b). In comparison, the extent of the variable source area to explain stormflow generation in the lower Coastal Plain can be rather large (Sun and others 2002, 2008b).

FROM THE MOUNTAINS TO THE SEA

Knowledge gained at Coweeta has been widely used in modern watershed management both regionally and globally. While Coweeta's research has provided considerable knowledge, hydrologic processes in the Southern Appalachians may not be representative of other physiographic regions. Fortunately, the SRS also installed similar sites across the South, such as the Calhoun Experimental Forest in South Carolina in the Piedmont and the Santee Experimental Forest on the lower Coastal Plain in the 1960s. Both the Santee and Calhoun sites have significantly contributed to our understanding of water movement from the "Mountains to the Sea" and characterize the critical zones in the Southeast (Sun and others 2008a, 2008b). Most recently, SRS established the Experimental Forest and Range Network (EFN) by bringing together 19 field-based research sites under one umbrella. The goal of the EFN is to facilitate cross-site collaboration, leverage resources, and share data and expertise. The EFN also looks to answer emerging large-scale environmental challenges such as climate change, urbanization, and invasive species. Such a network-based, top-down approach allows scientists to work across traditional SRS work units and disciplinary boundaries to develop more powerful modeling systems and answer management questions that more limited studies cannot.

My own research has benefited greatly from SRS-wide collaborations. Over the decades, I have helped build various simulation models, including the Water Supply Stress Index hydrological model (WaSSI), as tools to estimate watershed water and carbon balances in the Southeastern United States and beyond (Sun and others 2011). The core of the WaSSI model is an ET submodel that provides a straight coupling of the water and carbon fluxes. The ET model development was the direct result of a close collaboration with former and current Coweeta scientists including Steve McNulty, Jim Vose, Chelcy Miniat, and Peter Caldwell. The generalized monthly scale empirical ET model was derived from field measurements of tree sapflow at Coweeta and eddy fluxes on the lower Coastal Plain of North Carolina led by research partners John King and Asko Noormets. These datasets covered a large climatic gradient from Coweeta's subtropical forests to semi-arid woodlands in Australia and grasslands on the Mongolia Plateau in northern China.

> *"The studies at Coweeta were some of the earliest to consider the interactions between hydrology and ecological processes. Using this field of ecohydrology, we have learned much about how water moves through the forests in the Appalachian Mountains.*

CONCLUSIONS

Today, Coweeta represents one of the crown jewels of the Forest Service's long-term research installations. Thanks to those early visionaries such as Charles R. Hursh, who set up the first weather station and built the first weir at Coweeta, continuous, often high-temporal-resolution weather and streamflow data for the past 9 decades have been recorded. The studies at Coweeta were some of the earliest to consider the interactions between hydrology and ecological processes. Using this field of ecohydrology, we have learned much about how water moves through the forests in the Appalachian Mountains. Over the years, in response to the public needs, the mission of this outdoor hydrological lab has shifted from research on the effects of forest cutting on flood and sedimentation to developing a process-based understanding of ecosystem functions and services at much broader scales. Furthermore, Coweeta has played a prominent role in advancing ecosystem sciences, developing sound watershed management practices, and helping to address global environmental issues such as climate change.

Coweeta's contribution and impacts extend far beyond its watershed boundaries, and it continues to inspire and shape forest science, scientists, and public policies. For instance, Chinese institutions and scientists have benefited tremendously from all of the exchange opportunities with Coweeta (and vice versa), such as the Chinese language textbook, *Watershed Ecosystem Process and Management* (Wei and Sun 2009), developed using many materials from Coweeta. The long-term integrated place-based approach exemplified by Coweeta remains relevant for contemporary watershed sciences in a human-dominated world. Solving many of the global challenges and problems facing sustainable development requires a clear understanding of the basic science of water—the foundation of the work at Coweeta.

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The 1932 *Urania Bible*

Roy A. Chapman, C. Allen Bickford, and Don C. Bragg

Roy A. Chapman (deceased), formerly Junior Forester, U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station, New Orleans, LA 70113.

C. Allen Bickford (deceased), formerly Junior Forester, U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station, New Orleans, LA 70113.

Don C. Bragg, Project Leader and Research Forester, U.S. Department of Agriculture, Forest Service, Southern Research Station, Monticello, AR 71655.

BACKGROUND

The Southern Forest Experiment Station (SOFES) had no formally designated experimental forests prior to the passage of the McSweeney-McNary Forest Research Act of 1928. This law legally authorized the establishment of experimental forests and with the August 1930 approval of Forest Service Regulation L-20, a process for the development of experimental forests on national forest lands emerged (Clapp 1931, 1938). While these formalized such facilities, the SOFES had not waited for these to begin such an effort—not by a long shot!

Almost a decade earlier, the SOFES had opened a field-based branch station in central Louisiana, following an earlier effort by the agency to cultivate a working relationship with the timber industry. Since at least 1909, U.S. Department of Agriculture Forest Service, Washington, D.C.-based staff such as William Willard Ashe, Wilbur R. Mattoon, and Samuel Trask Dana had worked on forestry issues with Henry Hardtner, a prominent lumberman in central Louisiana. Hardtner had started some of the first efforts by a southern industrialist to practice "perpetual forestry" on his Urania Lumber Company's extensive landholdings (fig. 1). By 1913, both Ashe and Mattoon had visited Hardtner's lands and saw his initial efforts to regenerate and protect his cutover, and both encouraged him further.

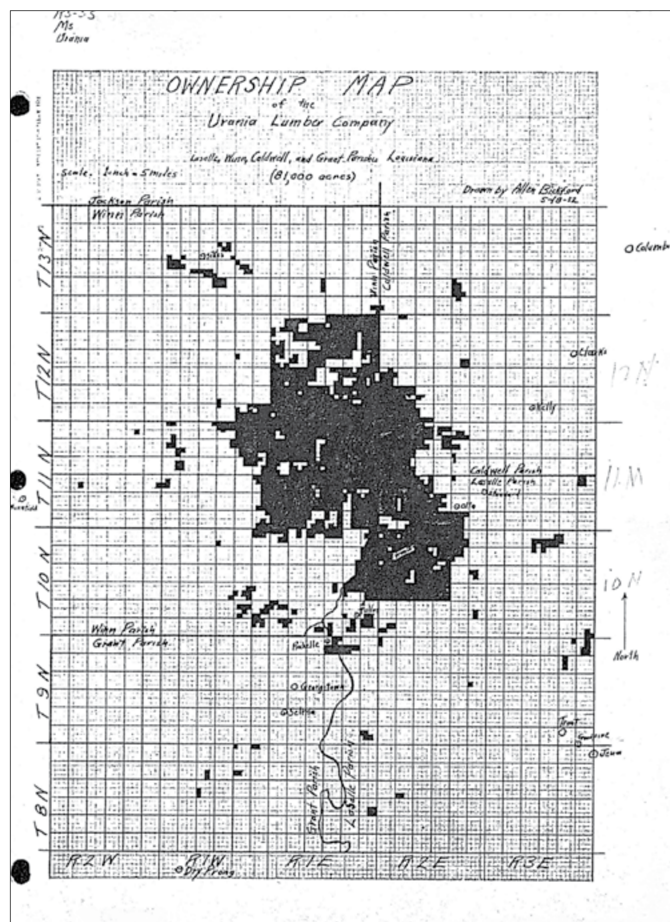


Figure 1—In 1932, the Urania Lumber Company owned about 81,000 acres of timberland in central Louisiana. In this 1932 hand-drawn map by C. Allen Bickford, company lands are shaded black, and were spread across four parishes.

Hardtner's willingness to experiment in forestry was novel for the time, as was his eagerness to reach out to the Forest Service and university academics—most notably, Yale Forestry School's Professor Herman Haupt Chapman. Some of Hardtner's first forestry efforts would be considered primitive by today's standards but were revolutionary at that time. When timber was to be "mined" and then the land resold or abandoned, his simple acts of retaining a couple seed trees per acre to restock the forest and protecting the developing stand from fire and feral hogs was a dramatic shift from an industry that focused on cutting out their timber quickly and then moving on when the last log was milled.

The prospects of getting someone in the southern timber industry interested in forestry had a strong appeal to the Forest Service, who had sought such champions for years. During its first decades, the agency had expended considerable resources in developing working plans for a number of lumber companies and other large landowners who were seeking to extend the life of their operation. In the South, some of these were published (e.g., Chapman 1905, Olmsted 1902, Reed 1905, Sherrard 1903). The agency also produced a number of less specific assessments of timber resources (e.g., Dunston 1910, Foster 1912, Zon 1905) that recommended conservative cutting to allow for a second cut as well as protective measures and better utilization of the timber. But all of these reports failed to detail how to do these steps, or more critically, how best to tend the forest to ensure a perpetual source of desirable timber.

To achieve this end, Hardtner set aside areas of his company's land for experimentation and demonstration projects. By 1915, Dana and others from the Forest Service had helped Hardtner set up a number of small plot-based studies designed to consider a handful of specific questions. When the SOFES was established in July 1921, operation of the Forest Service plots at Urania were transferred to the Station's staff in New Orleans, LA and the Urania Branch Station of the SOFES was born. Over the next decade, additional studies were established as a series of new investigators came onto the scene. All of these early studies were of limited scope, lacked most research controls, and suffered from inadequate replication, but also proved to be a valuable training ground for SOFES researchers and students from Yale University and many other institutions during those formative years. Numerous Forest Service and university academics built much of their careers around the work at Urania, including Yale's Chapman, whose work on longleaf pine (*Pinus palustris*) from central Louisiana (e.g., Chapman 1922, 1932a, 1932b, 1948, 1953; Chapman and Bulchis 1940) helped his career immensely. In addition to Chapman's Urania work, a number of scientific papers were published, and the silvicultural experiments on the use of prescribed fire in pine-dominated forests and thinning in old-field loblolly (*P. taeda*) and shortleaf pine (*P. echinata*) stands helped to shape early forestry programs across the region (Bragg 2021, Wakeley and Barnett 2016).

To help keep track of the work at Urania, a document was assembled from the records available and periodically updated as new studies were installed, existing ones were impacted by events such as wildfires, and old ones discontinued. This unpublished collection—eventually known by some as the *Urania Bible*—was maintained over the years. The version of the *Urania Bible* (there were at least two editions) introduced in this paper was compiled by Roy A. Chapman and C. Allen Bickford in 1932. Roy Chapman, a 1927 University of Minnesota graduate, had worked for the SOFES as a temporary field assistant in 1926 and received a permanent assignment with the Station in 1929. Roy Chapman was particularly adept at statistics, having been trained specifically under Francis X. Schumacher in the Washington Office, as well as receiving additional training during his undergraduate years at Minnesota (Barnett and others 2023, Wakeley and Barnett 2016). In 1948, Roy Chapman returned to the Washington Office to continue to work on biometric and mensuration topics for the remainder of his Forest Service career. Dartmouth (1925) and University of Idaho (1931) graduate Bickford started with the SOFES in 1931 and worked on the silvicultural use of prescribed fire until he transferred to the Northeastern Forest Experiment Station in 1947. Bickford retired from the agency in 1963 as a statistician before embarking on a second career as a faculty member at the State University College of Forestry at Syracuse University.

Chapman and Bickford's account—which they had titled *Forestry History of Urania Lumber Company's Holdings in Northern Louisiana*—is part a history of the Urania Lumber Company and part an account of SOFES's early trials and tribulations. More importantly, the document contains valuable information about the establishment and design of dozens of studies at this location, including directions in how to get to the plots and maps of the plots (fig. 2).

The 1932 edition was added to over the years and has contributions such as memos to the study files, unpublished progress reports, and submissions to journals from persons such as SOFES researchers Henry Bull and David Bruce as late as the 1940s. A lengthy section of projects in the Urania area were added after 1933; the last of these new study installations was by Bickford in November 1936. As can be seen in the example in figure 3, the studies installed after 1933 likely include some of the earliest replicated, statistically robust, formal field studies of the SOFES [see articles by Bragg (2021), Barnett and others (2023), McNab (2022), and McNab (2023) for more on these early statistically designed studies].

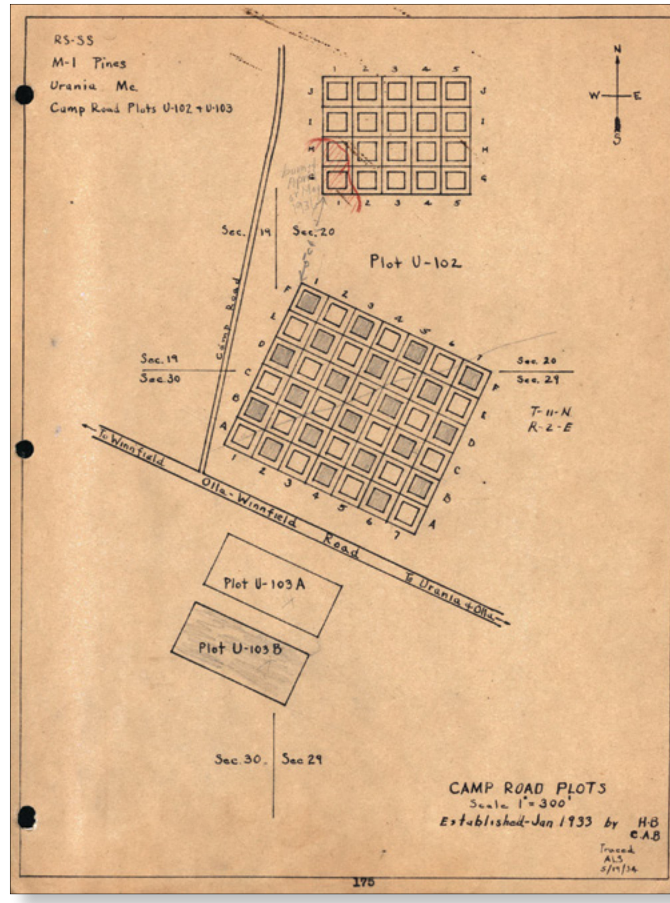


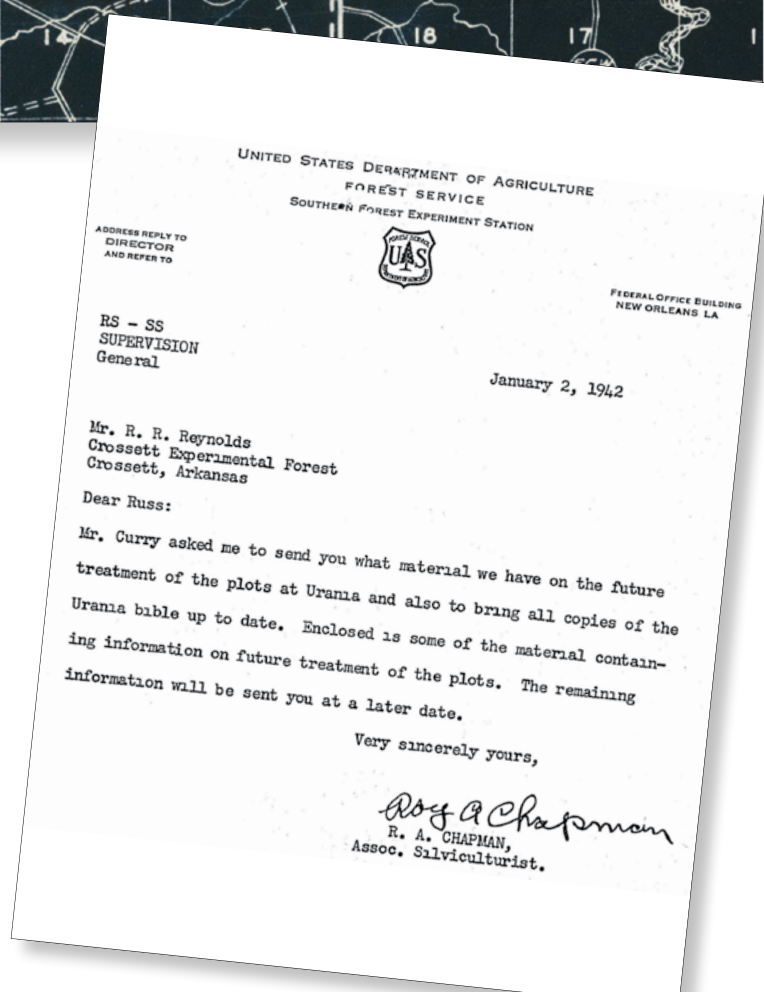
Figure 2—A zoomed-in view of the Urania Branch area, with study locations operated by the Southern Forest Experiment Station (to 1932). In this relatively small area, it is possible to see a series of individual and clustered plots (e.g., the McDow, Smith, Maye, DeMoss, Whitehead, and McDowell plots), as well as two large, fenced study areas (the Chapman and Greeley Forests). The full-sized map that this view was taken from covered 6 townships (over 138,000 acres).

In places, the text is brutally honest about the quality of the research work done—such as the Remarks and Recommendations section of the Holly Plot thinning work included at the end of this paper, which is an indirect critique of existing publications of this project (e.g., Wyman 1922). Their contribution is an irreplaceable window into some of the first field operations and early growing pains of the SOFES.

After Hardtner's tragic automobile accident death in 1935 and following the growth of Station research elsewhere, the SOFES invested less in the Urania Branch. The outbreak of World War II further dramatically realigned Station research priorities and reshaped the program for decades to come. By early 1942, the still-open studies in the Urania area were transferred to SOFES staff at the Crossett Experimental Forest, making remeasurements difficult (fig. 4). A number of these studies and sample plots were decommissioned during the late 1940s and into the 1950s, although a few were maintained into the early 1960s. However, the *Urania Bible* remained an indispensable tool for SOFES researchers then, and historians of forest science today.

Above: Figure 3—Experimental design and plot layout of what was likely one of the first statistically designed field studies of the Southern Forest Experiment Station (Camp Road Plot U-102), installed in January 1933 by Henry Bull and C. Allen Bickford. The shaded areas were untreated control plots; the unshaded ones (interior subplots) were one of seven different silvicultural treatments that included several hardwood control measures and different approaches to pine thinnings. While this particular design was not very efficient and had limited degrees of freedom, it was a clear improvement over most previous field studies, which lacked any kind of control or replications.

Right: Figure 4—Memo from Roy A. Chapman (in New Orleans) to Russell R. Reynolds (Crossett Experimental Forest) marking the transfer of the Urania-area studies to Reynolds' unit at the beginning of 1942. Note the importance still placed upon the *Urania Bible*.



UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
SOUTHERN FOREST EXPERIMENT STATION

ADDRESS REPLY TO
DIRECTOR
AND REFER TO

FEDERAL OFFICE BUILDING
NEW ORLEANS LA

RS - SS
SUPERVISION
General

January 2, 1942

Mr. R. R. Reynolds
Crossett Experimental Forest
Crossett, Arkansas

Dear Russ:

Mr. Curry asked me to send you what material we have on the future treatment of the plots at Urania and also to bring all copies of the Urania bible up to date. Enclosed is some of the material containing information on future treatment of the plots. The remaining information will be sent you at a later date.

Very sincerely yours,

Roy A Chapman
R. A. CHAPMAN,
Assoc. Silviculturist.

Note: With the exception of some minor formatting changes, redevelopment of some figures for clarity, and corrections to obvious spelling errors, I changed very little of Chapman and Bickford's 1932 edition of the Urania Bible*. All text in the following pages using the American Typewriter font is original; editorial notes and comments by myself use Source Sans Pro font. Outside of a series of maps attached to the end of the* Urania Bible*, no figures were included in the copy I have access to. The images included have been added by me from related work. This paper actually contains only the first 40 pages (approximately) of the 1932 edition; there are at least 180 pages of additional, detailed text describing the various studies that were not included in this volume for brevity's sake.*

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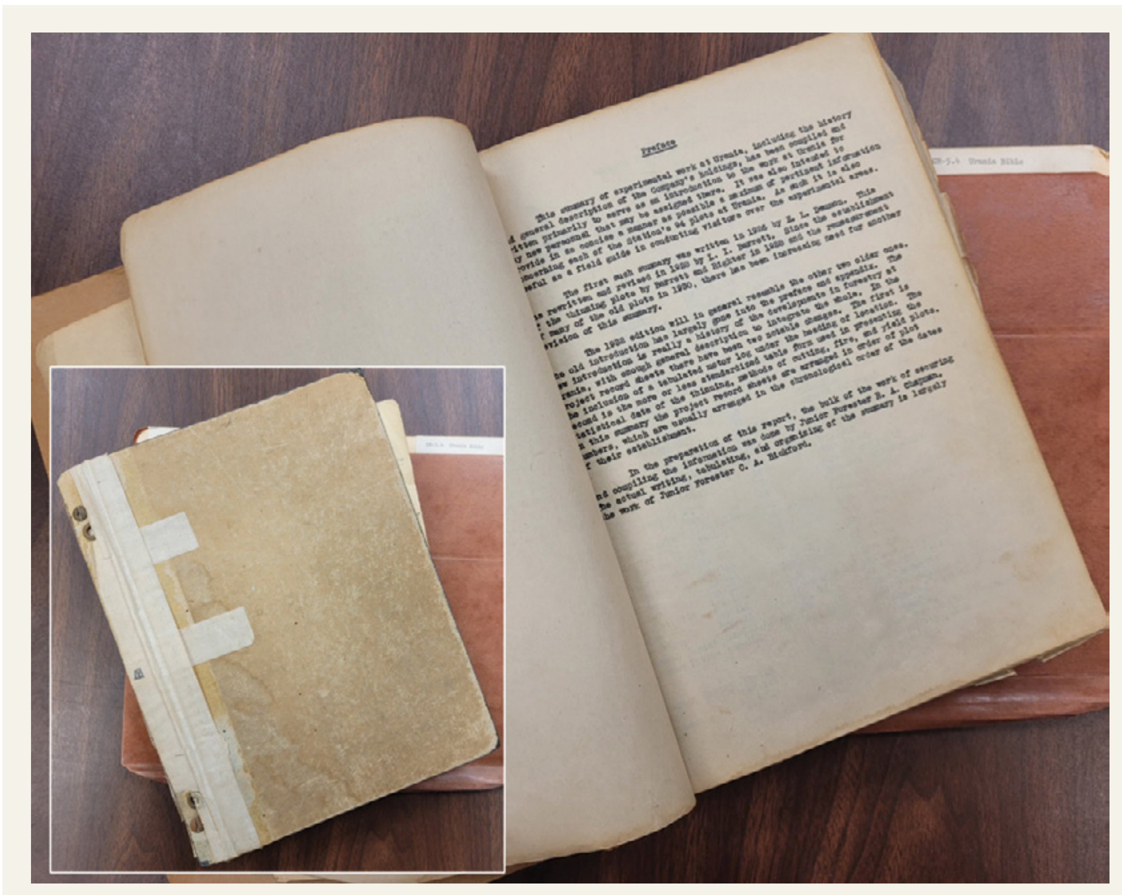

Image of the battered (well-used) 1932 version of the *Urania Bible* from the Crossett Experimental Forest archives. It is likely multiple copies of this volume were made, but we do not know how many. (USDA Forest Service photo from the archives of the Crossett Experimental Forest)

PREFACE

This summary of experimental work at Urania, including the history and general description of the Company's holdings, has been compiled and written primarily to serve as an introduction to the work at Urania for any new personnel that may be assigned there. It was also intended to provide in as concise a manner as possible a maximum of pertinent information concerning each of the Station's 94 plots at Urania. As such it is also useful as a field guide in conducting visitors over the experimental areas.

The first such summary was written in 1926 by E.L. Demmon. This was rewritten and revised in 1928 by L.I. Barrett. Since the establishment of thinning plots by Barrett and Righter in 1928 and the remeasurement of many of the old plots in 1930, there has been increasing need for another revision of this summary.

The 1932 edition will in general resemble the other two older ones. The old introduction has largely gone into the preface and appendix. The new introduction is really a history of the developments in forestry at Urania, with enough general description to integrate the whole. In the project record sheets there have been two notable changes. The first is the inclusion of a tabulated motor log under the heading of location. The second is the more or less standardized table form used in presenting the statistical data of the thinning, methods of cutting, fire, and yield plots. In this summary the project record sheets are arranged in order of plot numbers, which are usually arranged in the chronological order of the dates of their establishment.

In the preparation of this report, the bulk of the work of securing and compiling the information was done by Junior Forester R. A. Chapman. The actual writing, tabulating, and organizing of the summary is largely the work of Junior Forester C. A. Bickford.

Urania Branch
SOUTHERN FOREST EXPERIMENT STATION

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Supervision

May 25, 1932

FORESTRY HISTORY OF URANIA LUMBER COMPANY'S HOLDINGS IN NORTHERN LOUISIANA

By
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Southern Forest Experiment Station

PART I -- INTRODUCTION

The Urania Lumber Company owns approximately 100,000 acres of timberland in Louisiana, situated principally in the northwest part of LaSalle Parish, the east part of Winn Parish, and the southwest part of Caldwell Parish and including scattered holdings in Grant, Catahoula, Natchitoches, Bienville, and Rapides Parishes. The company's mill and office are situated at Urania, in the northwest part of LaSalle Parish, in north-central Louisiana. Urania is about 40 miles north of Alexandria, on the main highway to Monroe and on the main line of the Missouri-Pacific railroad between Alexandria and Little Rock.

The topography is gently rolling, with elevation above sea level varying between 60 and 300 feet, mostly between 100 and 200 feet. The climate is uniform and mild. Most of the rain comes in the early summer and in winter, the driest months being August, September, and October. At Alexandria the mean annual rainfall is 57 inches, and over a period of years has ranged between 42 and 78 inches. The mean annual temperature is 66 degrees F. and the absolute range is from 3 degrees to 109 degrees F. The normal growing season, or period between killing frosts, averages 242 days (9). Records of temperature and precipitation at Urania have been kept by the company since September, 1929. For 1930 and 1931, the average annual precipitation was 53.4 inches and the mean annual temperature was 65.8 degrees F.

The first white settlers came to Winn Parish about 1730. They took up land along the Red River and tributary streams, under French grants. The first settlers in what is now LaSalle Parish arrived about 1780, and took up land in the southernmost portion of the parish near Catahoula Lake, under Spanish grants. Because of its inaccessibility by water and the lack of roads, the area now owned by the Urania Lumber Company was not settled generally by whites until about 1850, although it is probably that white settlers appeared there about 1830. Settlers on the area came principally from Mississippi, Alabama, and Tennessee.

These pioneers were farmers in a small way only. At first they lived chiefly on fish and game. They cleared new land by "deadening" small patches of timber and grew only so much farm produce as they needed for themselves and their stock. Their main source of livelihood was stock-raising. The stock, chiefly cattle and hogs, were branded and allowed to roam at large through the piney woods and bottomlands, only the small patches under cultivation being fenced.

These first settlers moved from place to place, never owning any land and consequently paying no taxes. Gradually this floating population became more stable and turned to growing cotton and corn. The appearance of railroads in the region, in 1891, made established markets for farm products accessible and greatly stimulated the production of agricultural crops and the establishment of permanent communities. Lumbering became an important industry in this region during the last quarter of the nineteenth century. The appearance of outside capital in the rapidly expanding lumber industry, about 1890, temporarily accentuated the tendency toward agricultural expansion and permanent settlement, but later drew men off the farms to the sawmills by the attraction of regular wages over the uncertainty of seasonal farm crops. The boll-weevil, which first appeared about 1900, also led many men to leave farming. In 1926, oil developments repeated the effect of lumbering.

Opening up this region through railroads and lumbering brought the realization that there was much better farming land in other parts of the state and country. This knowledge resulted in the abandonment of many farms. Thus today only a very small portion (2 per cent, according to 1930 census figures) of the total land area is under cultivation. Probably 85 per cent of LaSalle Parish has never been under cultivation (9). Approximately 10 per cent of the Urania Lumber Company's holdings are abandoned fields that have come back to pine, chiefly loblolly.

Oil was found in 1926 in a field centering at Tullos, four miles south of Urania. This field is relatively small. Although there have been few gushers, most of the wells have produced abundantly. At present, over-production in the oil industry has caused abandonment of low-producing wells. There is fear, also, that this oil field may be nearing exhaustion.

Probably one-third of the total area of LaSalle and Winn Parishes might at some future time be suitable for agricultural development. The chief crops are cotton and corn. Some oats are grown. Grazing has been and will probably continue to be important locally, but the stock raiser has to face the uncertainties of forage production and the ravages of ticks. Under proper management, lumbering could continue indefinitely. The production of timber crops probably offers the highest use for most of the land in these parishes.

Urania today is a small[1/] though relatively prosperous community, dependent chiefly on the Urania Lumber Company for its existence.

[1/]About 500 people were living in the village of Urania in 1930, according to the census of that year. Possibly 600 more were living in the immediate neighborhood.

The oil-well pumps are heard continuously. The oil industry has left its mark along Chickasaw Creek, where escaping oil and refuse from the pumps have killed the vegetation and given it an appearance of desolation. Throughout the district some agriculture is still maintained, but little of it could be called commercial farming. The field crops are cotton, corn, and oats, with some vegetables for home consumption. Great numbers of razorback hogs roam the woods, which belong for the most part to the Urania Lumber Company, living on a rather inadequate supply of mast and roots. These hogs are half-wild and during the greater part of the year are too poor to make good food. In the fall and winter they become well-fattened, and their owners depend on them as a food supply during the winter. A few rather scrawny, tick-infested cattle, also, exist on the open range. The farmers have been accustomed for generations to having a free and open range accessible to their stock and resent strongly any curtailment of this traditional right, as they call it. Until recent years cattle owners burned over much of the country during the winter months. Burning of the woods has been greatly curtailed since about 1920, when general fire protection was established.

PART II -- PHYSICAL DESCRIPTION

The area around Urania lies within the upland soils province of the Gulf Coastal Plain region. Its soils are derived from outcrops of the Jackson and Cockfield formations of the Eocene period. They are sedimentary in origin.

The soil series may be grouped on the basis of their drainage about as follows[2/]:

First bottom	(21.1%)	Terrace	(7.2%)	Uplands	(71.7%)
Bibb	(1.6%)	Cahaba	(0.4%)	Caddo	(6.9%)
Meadow	(14.6%)	Kalmia	(1.3%)	Montrose	(4.8%)
Ochlockonee	(4.9%)	Myatt	(5.5%)	Norfolk	(41.6%)
				Orangeburg	(1.5%)
				Ruston	(2.1%)
				Sumter	(1.1%)
				Susquehanna	(13.7%)

[2/] The percentages given are approximations based on soil maps of Winn and LaSalle Parishes prepared by the United States Bureau of Chemistry and Soils. The classification “Meadow” was used in the soil study of Winn Parish and not in that of LaSalle Parish. C.F. Marbut, chief of the Division of Soil Survey, Bureau of Chemistry and Soils, state in a letter dated July 30, 1932 “It is possible that some Myatt in Winn Parish has been included in the Meadow…It is reasonable to expect that the first bottoms along these creeks in Winn Parish are Ochlockonee silt or fine sandy loam.”

The relative area in the various types in LaSalle and Winn Parishes as a whole is as follows: Sandy loam, 51%; silt loam, 24%; clay loam, 13%; clay, 9%; and sand, 3%.

Soils of the first bottom group are found along the principal streams—Castor, Funny Louis, Chickasaw, Flat, Beech, etc. The Ochlockonee is found immediately adjoining the streams and the Bibb is farther back toward the uplands. Unless too often flooded, the Ochlockonee series makes fair agricultural land. Nearly all of the soils of this first bottom group are forested, chiefly with moisture-requiring hardwoods such as red gum, beech, haw, magnolia, sycamore, blue beech, ironwood, holly, and cypress. Numerous vines and shrubs and some switch cane are found. On the Bibb series are found scattered loblolly pines. This type has never been cut clear, but has repeatedly been culled for the more valuable hardwoods. Thus the stands found in the bottoms are today very much as they have always been, except that there are not so many of the more valuable hardwoods of the larger sizes (2, 9).

The terrace soils are situated between the bottoms and the uplands. The Cahaba series occur chiefly as small hammocks in the bottoms and are very good agricultural land. The Kalmia series occur as hammocks in the first bottom and also as second-bottom terraces, while the Myatt is usually outside the bottoms. Land of the Kalmia series is successfully cultivated, but most of it is forested, chiefly with hardwoods and loblolly pine. Myatt is not suited to cultivation but is valuable chiefly for pasturage and forests. It is characterized by a stiff compact subsoil that is almost a hardpan. The forest species usually found are hardwood and loblolly pine, with pine predominating (2, 9).

The upland soils, more than half of which are Norfolk, are the most extensive group found in this region, composing the surface of more than 70 per cent of all the company’s holdings. They are generally well drained, but not well suited to agriculture. Throughout this soil group the original forest was longleaf pine with scattered individuals or groups of shortleaf pine and upland hardwoods, chiefly blackjack oak and red oak. Loblolly pine was sometimes found on soils of the Norfolk series, especially where moisture conditions were favorable. Shortleaf pine occurred chiefly on the Orangeburg, Montrose, Sumter, and Norfolk series. Hardwoods were most numerous on the Ruston, Susquehanna, Montrose, and Norfolk soils. Orangeburg, Ruston, and Caddo are the soils best suited to cultivation (2, 9). Since logging, longleaf pine has not generally reproduced; instead, shortleaf and loblolly, together with a variety of upland hardwoods, have taken large areas originally stocked with longleaf.

Ashe in 1909 (1) classified the company's holdings exclusive of the hardwood bottoms, as 80 per cent longleaf, 15 per cent shortleaf, and 5 per cent loblolly pine. The forest type map of the Urania lands made in 1931 by the Yale School of Forestry, covering an area of approximately 34,500 acres, indicates that the bottomland hardwoods occupy 19 per cent, longleaf 15 per cent, mixed pine and hardwoods 48 percent, shortleaf pine 2 per cent, and old-field pine stands 10 per cent. The indicated change in the proportion of longleaf between 1909 and 1931 is attributable in the main not to shrinkage of the area occupied by the longleaf type in the general region but to the fact that since 1909 the company has purchased mostly cut-over land of the mixed pine and hardwoods type or old fields. The chief forest types now are: bottomland hardwoods, mixed pine and hardwoods, old-field pine stands, longleaf pine, and shortleaf pine.

For practical purposes, bottomland hardwoods near Urania may be considered as a single type. However, two broad classes of hardwoods have been recognized. One of these types is found in the main bottoms of the larger streams, as Castor, Chickasaw, and Flat Creek. It varies in width up to a maximum of about a mile. In general it occupies the first bottoms, which are most subject to overflow. The other type occurs in the bottoms of the smaller tributary streams and branches, the outer margins of the main bottoms, and the lower slopes of the uplands. This type occupies in general the second bottoms, hammocks, and terraces, which are flooded very rarely.

In the first bottoms as a whole, red gum is probably the most important and most common tree; black gum is very nearly as common. In the understory blue beech is most common and hawthorn and holly are very common. Among the smallest trees, two-winged silverbell and winterberry are very common. Within the first bottoms there occur also subtypes, of which the most noteworthy is southern cypress. This subtype is found only where water normally stands on land bordering the main creeks and branches, and in sloughs, etc. Black willow, with occasional sycamore, is found on sites adjacent to the cypress sites but somewhat better drained. Another common group found within the first bottoms on slight mounds or terraces is made up of beech, evergreen magnolia, and loblolly pine, none of which occur in the first bottoms. The complete list of species for the first bottoms follows:

BOTTOMLAND TREE SPECIES[1]
Species found in the main bottoms, as those of the Castor, Flat, and Chickasaw, from 1/4 to 1 mile wide. (Listed alphabetically.)

Common	Occasional to frequent	Rare to uncommon
Carpinus caroliniana[1] Blue beech	Diospyros virginiana[1] Persimmon	Acer rubrum[1] Red maple
Crataegus spp.[1] Hawthorn	Fagus grandifolia[4] Beech	Asimina triloba[1] Pawpaw
Halesia diptera[2] Two-winged silverbell	Hicoria spp.[5] Hickory	Fraxinus americana White ash
Ilex decidua[2] Winterberry	Magnolia grandiflora Evergreen magnolia	Fraxinus pennsylvanica lanceolata Green ash
Ilex opaca[1] Holly	Morus rubra[1] Red mulberry	Gleditsia triacanthos Honey locust
Liquidambar styraciflua Red gum	Quercus mississippiensis[6] Bottomland post oak	Liriodendron tulipifera[9] Yellow poplar
Nyssa sylvatica Black gum	Quercus nigra Water oak	Ostrya virginiana[1] Hop-hornbeam
Taxodium distichum[3] Southern cypress	Quercus phellos Willow oak	Pinus taeda[4] Loblolly pine
	Quercus prinus[7] Swamp chestnut oak	Platanus occidentalis Sycamore
	Quercus rubra leucophylla[8] Swamp red oak	Quercus lyrata Overcup oak
	Salix nigra[3] Black willow	Symplocos tinctoria[1] Sweetleaf
	Ulmus alata Winged elm	Ulmus americana American elm
	Vaccinium arboretum[2] Tree huckleberry	

[1] Trees of the understory
[2] Technically trees, but usually shrubs, near Urania.
[3] Found only at stream banks.
[4] Confined to terraces above true main bottoms.
[5] Probably largely Hicoria leiodermis.
[6] May be a variety of Q. stellata
[7] Usually known locally as cow oak.
[8] Usually known locally as cherrybark oak
[9] Reported in Chickasaw bottoms.

In the second bottoms and terraces the key species are beech, evergreen magnolia, and loblolly pine. Beech and pine are common and magnolia is nearly always present. In general the second bottoms type is mainly a hardwood type, with beech and red gum as the most common species; black gum is common, also, and in the understory there are blue beech, holly, and sweetleaf. This type includes many diverse associations. It ranges from the borders of the swamps or first bottoms to the pine lands of the true uplands. Probably the most noteworthy subtype within the type is that known as a "pin oak flat." This occurs on poorly drained, nearly level areas outside the main bottoms. Standing water is common, especially within a few days after rain. It is in this subtype that nearly all the willow oak of the second bottoms is found. In other places occurs a beech and magnolia association which almost excludes other species from the main canopy. The complete list of species for this type follows:

[1] Editor's note: On scientific naming conventions from the original paper: some of these have been changed since this document was written. The genus for hickory, *Hicoria*, for example, is now *Carya*, and bottomland (delta) post oak, *Quercus mississippiensis,* is now *Quercus similis*.

INTERMEDIATE TREE SPECIES
Species found above small tributary branches, on lower slopes of the uplands, and at the outer margins of the main bottoms. (Listed alphabetically.)

Common	Occasional to Frequent	Rare to uncommon
Carpinus caroliniana[1] Blue beech	Acer rubrum[1] Red maple	Aralia spinosa[2] Devil's walking stick
Fagus grandifolia[4] Beech	Cornus florida[1] Dogwood	Asimina triloba1 Pawpaw
Ilex opaca[1] Holly	Crataegus spp.[1] Hawthorn	Diospyros virginiana[1] Persimmon
Liquidambar styraciflua Red gum	Halesia diptera[2] Two-winged silverbell	Fraxinus americana White ash
Nyssa sylvatica Black gum	Hamamelis macrophylla[2] Witch-hazel	Ilex vomitoria[2] Yaupon
Pinus taeda[4] Loblolly pine	Hicoria spp.[5] Hickory	Jun1iperus virginiana[1] Eastern red cedar
Symplocos tinctoria[1] Sweetleaf	Ilex decidua[2] Winterberry	Melia azedarach[9] Chinaberry
	Magnolia grandiflora Evergreen magnolia	Myrica cerifera[2] Wax-myrtle (bayberry)
	Morus rubra1 Red mulberry	Pinus echinata Shortleaf pine
	Ostrya virginiana[1] Hop-hornbeam	Platanus occidentalis Sycamore
	Oxydendrum arboreum[1] Sourwood	Prunus serotina Black cherry
	Quercus alba White oak	Quercus rubra Southern red oak[2]
	Quercus nigra Water oak	Quercus shumardii Shumard red oak
	Quercus phellos[4] Willow oak	Rhus copallina[2] Dwarf sumac
	Quercus prinus[7] Swamp chestnut oak	Taxodium distichum[3] Southern cypress
	Quercus rubra leucophylla[8] Swamp red oak	Ulmus americana American elm
	Quercus stellata[7] Post oak	
	Salix nigra[3] Black willow	
	Sassafras variifolium[1] Sassafras	
	Ulmus alata Winged elm	
	Vaccinium arboreum[2] Tree huckleberry	

[1] Trees of the understory
[2] Technically trees but usually shrubs, near Urania.
[3] Probably largely Hicoria leiodermis.
[4] Almost entirely on "pin oak flats" or glades.
[5] Locally known as cow oak.
[6] Usually known locally as cherrybark oak.
[7] Also present on this site is the bottomland post oak, which is either Quercus mississippiensis or a variety of Q. stellata.
[8] Found only at stream banks.
[9] Found only at old house sites.

A very conspicuous shrub that is almost invariably associated with this type and also with the upland types in the neighborhood of Urania, and that grows as large as several of the tree species included in these types, is French mulberry (Callicarpa americana).

It is in this type that loblolly pine seems to have attained its best development near Urania. It has grown, usually as scattered individuals in mixture with hardwoods, on the better-drained sites. These loblolly pines have grown very slowly, with long clean boles, and have produced lumber that has been sold with longleaf pine. They have been called Rosemary pine, locally, to distinguish the lumber from loblolly grown on the uplands. (All

[2] Editor's note: Listed by Chapman and Bickford as southern red oak, but *Quercus rubra* is more formally northern red oak, with southern red oak being *Quercus falcata*. Given the location, this is probably *Quercus falcata*.

the other southern pines, also, have been called Rosemary pine; in general, the name is most apt to be applied to shortleaf pine.) This loblolly pine, as well as much of the oak and red gum, has been cut out of most of the bottoms. Great quantities of the finest oak have been cut for export staves; red gum has been cut largely for figured veneer.

The remaining types, mixed pine and hardwoods, longleaf pine, shortleaf pine, and old-field pine, occur on the uplands. The species constituting the upland types are given in the following list:

UPLAND TREE SPECIES
Defined to include species found in the definite uplands. (Listed alphabetically.)

Common	Occasional to Frequent	Rare to uncommon
Liquidambar styraciflua Red gum	Acer rubrum[2] Red maple	Aralia spinosa[1] Devil's walking stick
Myrica cerifera[1] Wax-myrtle (bayberry)	Cornus florida[2] Dogwood	Diospyros virginiana[2] Persimmon
Pinus echinata Shortleaf pine	Crataegus spp.[2] Hawthorn	Fraxinus americana White ash
Pinus palustris Longleaf pine	Hicoria spp.[3] Hickory	Ilex vomitoria1 Yaupon
Pinus taeda Loblolly pine	Ilex opaca2 Holly	Juniperus virginiana4 Eastern red cedar
Quercus alba White oak	Nyssa sylvatica Black gum	Melia azedarach4 Chinaberry
Quercus marilandica Blackjack red oak	Rhus copallina[1] Dwarf sumac	Morus rubra2 Red mulberry
Quercus rubra Southern red oak	Sassafras variifolium[2] Sassafras	Ostrya virginiana2 Hop-hornbeam
Quercus stellata Post oak	Ulmus alata Winged elm	Platanus occidentalis Sycamore
	Vaccinium arboreum[1] Tree huckleberry	Prunus serotina Black cherry
		Quercus rubra leucophylla5 Swamp red oak
		Quercus velutina Black oak

[1] Technically trees but usually shrubs, near Urania.
[2] Trees of the understory.
[3] Probably largely Hicoria buckleyi arkansana and Hicoria alba.
[4] Found only at old house sites.
[5] Known also as cherrybark oak.

The mixed pine and hardwoods type varies considerably as to distribution of species, condition, etc. Pine, usually loblolly, is always predominant in the stand. However, considerable shortleaf and some longleaf are found. In places shortleaf pines are more numerous than loblolly pines. Southern red oak is the principal hardwood; other species often present are black gum and red gum. Also present, especially at old house sites, are eastern red cedar and chinaberry. Although some oak has been cut for ties, logging has generally removed only the pine, usually between 15 and 35 trees to the acre. Owing to the all-aged and many-sized character of the stand, enough small pines were left to restock the cut-over areas. Pine reproduction usually has been sufficiently complete and has developed rapidly.

In the original stand, the mixed pine and hardwood type occupied small areas only and was relatively unimportant. Now, it is the most prevalent type in the vicinity of Urania. The present composition of this type is closely similar to what it was in the original stand, except that red gum now makes up an appreciably greater proportion of the stand and that very little merchantable pine remains. With better market conditions in the industry, this type would be economically significant because of the dearth of merchantable pine and the rapidity of the growth of loblolly pine.

The pure longleaf type was by far the most important in the virgin stand. It occupied almost entirely the soils classified as “upland.” It was made up almost exclusively of longleaf pine. Blackjack oak, post oak, hickory, and shortleaf pine occurred as a very small part of the stand, with occasional red gums on the more protected and moister sites. In this type there were an average of 45 to 65 merchantable pine trees, or 15,000 to 20,000 board feet of pine timber, per acre, with practically no trees less than 8 inches in diameter. This type has been practically clear cut, only the defective pines and the blackjack oak being left. Subsequent to the cutting, it has in general changed over to the mixed pine and hardwood type, loblolly pine largely replacing longleaf.

Where hogs have been kept out and where seed supply has been adequate, longleaf has been able to maintain itself unless the site was especially suitable to loblolly or shortleaf. Elsewhere, there is practically no longleaf reproduction near Urania. Cut-over longleaf land that has restocked mainly to longleaf is now characterized by dense stands of young longleaf saplings with a few scattered shortleaf and loblolly pines in mixture and with a few old virgin longleaf trees that were left by the loggers as unmerchantable.

The shortleaf type is confined largely to the higher parts of the Orangeburg, Sumter, and Norfolk series and occupies a relatively restricted area. Species other than shortleaf that occur in this type include loblolly pine, red oak, post oak, and hickory. The original stand was all-aged, with from 25 to 40 merchantable pines to the acre. The best oaks were cut for ties. Areas originally occupied by this type have generally restocked abundantly with shortleaf. On occasional small areas oak brush has interfered with the shortleaf reproduction.

An example of a virgin longleaf pine stand (foreground) from central Louisiana (near Zimmerman in Rapides Parish) immediately prior to lumbering in the 1940s. Some of the pines in this stand have been “terpentined”. Note the open, grassy understory underneath these fairly widely spaced old pines—a characteristic of longleaf pine woodlands that developed with frequent surface fires. (USDA Forest Service photo taken by Leland J. Prater, circa 1942)

Top: An example of the severe and extensive cutover longleaf pine lands of central Louisiana (Vernon Parish) following lumbering, excessive fire, and heavy livestock grazing, with virtually no seed trees remaining. (USDA Forest Service photo taken by John T. Cassady in 1946)

Bottom: An old-field, loblolly pine-dominated stand that arose following failed lumbering on previously timbered uplands. This condition was commonly found on the Urania Lumber Company's lands. This image is of one of the Maxwell Plots on Urania property prior to getting a "French" thinning. (USDA Forest Service photo taken by E.N. Munns in January 1925)

Most of the old-field stands in the vicinity of Urania are nearly pure loblolly pine. In general the soil of cultivated fields abandoned for agriculture is admirably adapted to the seeding in of loblolly pine, and the pine develops rapidly during the first few years. Shortleaf is a frequently associated species, but the faster-growing loblolly are usually characterized by their coarse grain and numerous persistent large limbs. The lumber is distinctly inferior in quality, although it may be entirely suitable for pulpwood. Many hardwoods are found in these old-field stands, mainly as an understory. A study of the quality of lumber from these old-field pines has been made by R.D. Garver of the Forest Products Laboratory. A report on this study is now in preparation.[3]

[3] Editor's note: It is not clear if this report was ever published, remained internal, or was never completed. During this period, Raymond D. Garver (sometimes with co-authors) worked on a variety of southern pine and hardwood economic, wood quality, and lumber yield studies. One such contemporary article, Garver and Miller (1933) included as a part of its analysis old-field pines cut from an unidentified stand in northern Louisiana, but it is unknown if these are the same trees referred to in this passage.

PART III – FORESTRY DEVELOPMENTS AT URANIA

Henry E. Hardtner came to Urania, then known as Prestridge[3/], in 1896, and bought a sawmill from John Q. Prestridge.

[3/] The original name of the village was Maxwell.

At the same time he purchased 400 acres of cut-over land. In 1897 he renamed the town Urania, after the Greek muse of astronomy, who presided over the destinies of Agriculture and Forestry. Since 1897 Mr. Hardtner has done a great deal to make Urania approximate more closely the heavenly implications of its name.

In 1896 there were sawmills at Olla and Tullos and at many other points in northern Louisiana. In 1898 Mr. Hardtner organized the Urania Lumber Company, purchased the Caldwell or Atwood Violet Tract of 3,000 acres (now called the H.H. Chapman Forest) at $4 per acre, and built a railroad to it. This road is now known as the Natchez-Urania & Ruston Railroad. Additional land purchases have been made from time to time until in 1932 the company owns nearly 100,000 acres, believed to be sufficient to operate the present mill on a sustained yield basis. No formal management plan has ever been prepared for the company's forest land.

From time to time the company has sold cut-over land for agricultural purposes. In nearly every instance the purchaser has given up cultivation and the company has bought back the land.

When the Louisiana Department of Conservation was created, in 1908, Mr. Hardtner was selected as chairman of the conservation commission. In 1909, at Mr. Hardtner's request, the United States Forest Service sent Forest Examiner W.W. Ashe to Urania to report on the forestry possibilities of the Urania Lumber Company holdings (1).

In 1908 Mr. Hardtner attended the Conference of Governors at Washington, D.C. At that time he met Roosevelt, Pinchot, and others who greatly encouraged and stimulated his interest in forestry. Mr. Hardtner was the first landowner to take advantage of Section 13 of the Louisiana Reforestation Act (Act 261), approved in 1912, when on June 14, 1913, he entered 25,749 acres under contract with the State for 40 years at a valuation of $1 per acre per year. G.M. Tannehill and Q.T. Hardtner entered 2,440 acres the same year (August 12, 1913). This was considered such a complete departure from the usual behavior of landowners that newspapers throughout the country described it as an act of patriotism.

In 1910 Mr. Hardtner was elected representative to the Louisiana Legislature from LaSalle Parish. That same year Harry P. Gample, a lawyer of Winnfield, Louisiana, secretary of the conservation commission of which Mr. Hardtner was chairman, drew up a State forestry law providing for a severance tax on timber, which was approved as Act 196 of 1910. Mr. Gamble rendered a great service to the cause of conservation in framing this Act, which was the first severance tax law in the United States. An act of 1912 remedied some of the defects of this law. O.M. Grisham of Monroe, as attorney for Mr. Hardtner, drew up the reforestation contract that was approved by the attorney-general and the department of conservation.

In 1913 the United States Forest Service sent W.R. Mattoon to Urania to report on the forestry work there. Mr. Mattoon was very favorably impressed, as indicated by the report he submitted, dated January 22, 1914. (10) He commented specifically on the large areas

Part of what would become the first silvicultural research project of the Southern Forest Experiment Station within a decade (Bragg 2021), this thinning study in even-aged, old-field loblolly pine stands was initiated by Samuel Trask Dana in 1915. (USDA Forest Service photo taken by Samuel Trask Dana on January 27, 1915)

coming back to pine, particularly to loblolly and shortleaf, the adequacy of the seed trees, and the abundant longleaf seed crop of 1913.

Since 1915 Mr. Hardtner has cooperated with various forest research agencies. The United States Forest Service initiated experimental work at Urania in January, 1915, through S.T. Dana, assistant chief of forest investigations. The Yale School of Forestry held its spring camp at Urania in 1917, and has held camp there every year since except in 1918 and 1919. The Forestry Division of the Louisiana Department of Conservation, established in 1917, has cooperated in some of the investigative work underway at Urania. The Southern Forest Experiment Station has maintained branch headquarters at Urania ever since it was established in 1921. To assist these agencies in their programs Mr. Hardtner has set aside many areas for experimental purposes.

Elk Pasture, an area of 1,500 acres lying on both sides of the Missouri-Pacific railroad, was fenced in 1915. This area had been cut over about 1904 and in 1915 was very sparsely stocked, although there were many seed trees present. Under continuous protection from fire and hogs since 1915, it now supports an excellent stand of pine and hardwoods, mostly longleaf and loblolly pine. Four accidental fires have occurred on this area since it was fenced in 1915: a 25-acree fire in 1918, a 50-acre fire in October, 1929, a 30-acre fire in August, 1930, and a 33-acre fire in October, 1931. +60 acre fire Sept 1932[4] A small herd of elk was obtained from Wolf, Wyoming, in 1916 and put into the east half of this pasture. The elk have never reproduced and their numbers have steadily declined. Three were reported as remaining in 1932. Buffalo, also, were introduced, but they died out rapidly.

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[4] Editor's note: As a living document, the *Urania Bible* had many hand-written notes to add material and corrections for other parts of the typed manuscript. In this instance, the 60-acre fire in September 1932 in the Elk Pasture occurred after the manuscript had been typed, so this statement was inserted here. Using editorial discretion, some changes or corrections have been made seamlessly, while others were left apparent.

A picture of the cutover longleaf pine in the "Elk Pasture" area, showing in the distance a herd of Rocky Mountain elk brought from Wyoming in December 1915. (USDA Forest Service photo taken by W.R. Mattoon on May 1, 1916)

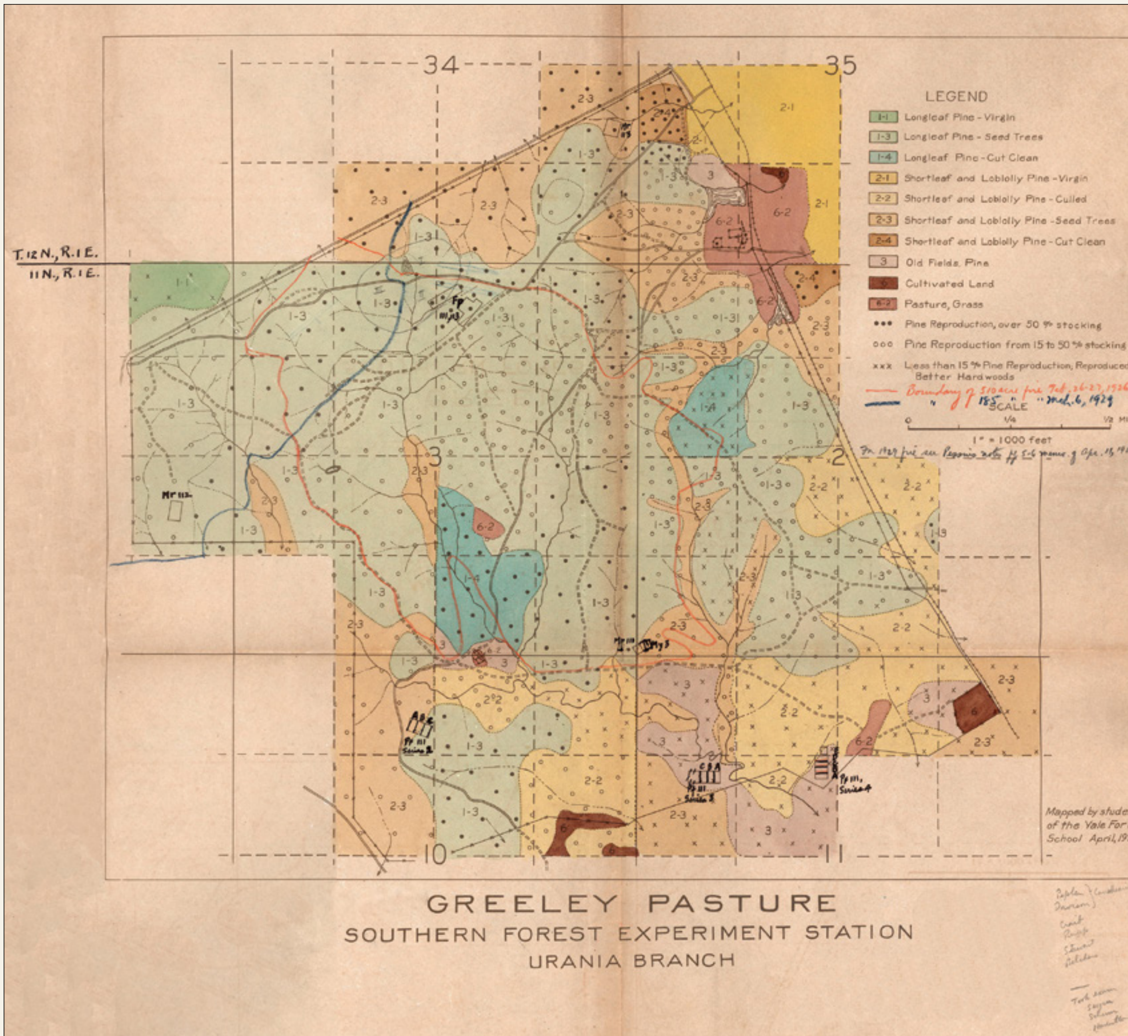
Deer Pasture, which has also been called the Violet Urania Forest, was fenced in 1915. (Named after Mr. Hardtner's daughter, Violet, it was called Deer Pasture because a small herd of deer were grazed here.)

This area of 20 acres lies between Urania proper and the Missouri-Pacific railroad tracks. It has been protected from fire since 1915, but not from hogs. It now supports a fine stand of loblolly pine, although the original stand was practically pure longleaf pine, as is evident from scattered virgin longleaf pine trees still standing.

The John M. Parker plot of 38 acres was fenced in 1916. John M. Parker was Governor of Louisiana from 1920 to 1924, and has always been actively interested in conservation and forestry. This area was originally forested with longleaf pine and when it was cut over many trees were left, which have since served as seed trees. A full stand of longleaf pine originated from the 1913 seed crop, about half of which was killed by fire in 1915. The area has been protected from fire and hogs since 1916 and now supports an excellent stand of young pine, mostly longleaf. There have been two small fires during this period—one of 25 acres in September, 1924, and one of 14 acres in September, 1931. In 1926 slash pine was planted on about two acres of the area covered by the 1924 fire.

In the fall of 1919 an area of 1,500 acres near Hinton was fenced named Greeley Pasture[5], after W.B. Greeley, then Forester of the United States Forest Service.

[5] Editor's note: The following handwritten note by CAB (Bickford), dated August 17, 1934, was included in the margin of this paragraph: "A note by Hine (unsigned) dated Oct. 20, 1924 reports the date of fencing Greeley Pasture as Oct 1920 and the authority as Tannehill. Tannehill's memory for dates is poor; he has also told me that this area was fenced in the fall after the armistice was signed which would be 1919, as typed." Hine was W.R.B. "Billy" Hine, a forester and forest assistant with the Southern Forest Experiment Station from its inauguration in 1921 until the fall of 1925, when he resigned to become the first state forester for Louisiana (Wakeley and Barnett 2016). The identity of "Tannehill" is uncertain, but is probably George Milton Tannehill, an early leader in the Urania Lumber Company who died in a tragic pedestrian accident in New Orleans, LA in April 1940.



A circa 1929 map of the Greeley Pasture drawn by the students of the Yale Forestry School in April 1926 and updated by Southern Forest Experiment Station staff over the years to add other pertinent information. According to the text of the *Urania Bible*, this area was leased to the Forest Service in 1923 for experimental purposes, 2 years before the Bent Creek Experimental Forest near Asheville, NC, was established.

In 1923 Greeley Pasture was leased to the United States Forest Service for a 30-year period at $1 per year, as an experimental area. This area was originally in longleaf and shortleaf pine, averaging about 15,000 board feet per acre; it was cut in 1909 and 1910, and a number of trees were left in cutting. Prior to 1920 it had burned over periodically and had been grazed by both cattle and hogs. Grazing by hogs probably accounts for the absence of longleaf seedlings at the time of fencing. Since 1920, it has been subject to light grazing by cattle and to occasional grazing by a few hogs. There have been seven accidental fires since 1920. Three of these fires were small ones near the south boundary, the dates of which are not certain. In 1923 a small fire set by a locomotive spark occurred north of the pond, near the north border of the pasture. On February 26 and 27, a fire presumably set by hunters burned over 510 acres in the north and central part of the pasture. A 50-acre incendiary fire occurred in the northeast part of the pasture on January 27, 1928. On March 6, 1929, 185 acres burned over in the northwest part of the pasture.

In 1928, at the suggestion of Professor H.H. Chapman of the Yale School of Forestry, an area of 1,234 acres was fenced for the purpose of testing on a large scale the effects of periodic controlled fires on the establishment, growth, and survival of longleaf pine. This area, named the H.H. Chapman Forest, originally supported an excellent stand of longleaf pine. This was cut between 1902 and 1904, many trees which at that time were not merchantable being left standing. It has been burned over periodically, the last fire before fencing occurring during a very dry period in September, 1924. In 1928 there was practically no pine reproduction on the area, except a small patch of young loblolly pine then 3 to 5 years old. The lack of longleaf reproduction was probably due to hogs, as the trees had borne several crops of seed since cutting took place. In October, 1928, this area was burned over just prior to the ripening of an excellent longleaf pine seed crop. A small control area of about 5 acres was left unburned. An area of 58 acres in the southwest portion of this forest was burned again in February, 1932, as the beginning of a series of experiments in periodic burning. On March 25 and 26, 1932, an incendiary fire burned over nearly all the unburned portion of the Chapman Forest, as well as a considerable area outside, decreasing the value of the experimental plots which had been established there by the Southern Station.

In 1929 an area of 4,000 acres west of Hinton was designated as the Bryant Forest, after Professor R.C. Bryant of Yale, and dedicated to management studies in mixed longleaf and shortleaf pine. It had been tentatively decided that shortleaf was more likely to reproduce satisfactorily. To avoid the expense of fencing, no effort was made to bring about longleaf regeneration, only shortleaf seed trees being left. This area was logged off in 1929.

The mill of the Urania Lumber Company was remodeled in 1928 and now has two band saws normally cutting about 70,000 board feet daily, or 18,000,000 board feet per year. The company regularly employees 175 men at the mill and 75 men on the logging operation. The men work 10 hours a day both at the mill end and in the woods; the mill runs a single shift daily. Urania is strictly a company town. The company's commissary is a general store that handles nearly all the kinds of goods needed by the community. The only independent establishments are the restaurant and barber shop.

The company bought a steam skidder in 1917, at a cost of about $17,000, but after using it in the woods for 10 years decided it was too costly a way to operate. The skidder is still in use, but it is now moving logs in the millyard and mule teams are being used in the woods operation.

In general it has been the practice of the Urania Lumber Company to cut to a fixed diameter limit. The limit was 8 inches in 1917 and 12 inches in 1928, and is now 14 inches. This standard has served as a flexible rather than a fixed guide. The choice of trees for cutting has invariably been made by the company's woods foreman, Francis Smith.

The fire-protection organization of the company is especially noteworthy. Protection work began in a small way in the immediate vicinity of Urania as early as 1913; in 1920 the company began active cooperation with the State, and in 1925 it instituted the present intensive system. A State fire tower was built in May, 1925, about 3 miles north of Urania, from which, except in very smoky weather, a large portion of the company's holdings is visible. The State, in cooperation with the United States Forest Service and the Urania Lumber Company, maintains resident farmers as wardens of the outlying districts. The wardens provided by the company occupy company land rent free for their protection work. The company officials know and understand the people with whom they have to deal and have generally obtained their cooperation in the fire-protection program. The result is that the company's annual burned acreage has been small since the present intensive system was initiated in 1925. Accurate information to area burned is not available. Fires have been small and infrequent near Urania; they have been larger on outlying areas. The year 1924 was a bad one because of a long-extended drought; since then, fires have been small and relatively few. The men who work for the company, those in the mill as well as the woods crews, are always available to suppress fires, and make it their practice to discourage others from setting fires.

In connection with the annual field work of the Yale School of Forestry seniors at Urania, Professor Chapman has carried on a number of investigations in the management of southern pine. He has recorded the results of some of these studies in a bulletin (3) on the natural reproduction of longleaf pine. The students have mapped about one and one-half townships (through 1931) in the vicinity of Urania for both topography and forest types; each year they are mapping additional areas. A list of the experiments by the Yale School of Forestry at Urania follows:

1. Losses through decadence of virgin longleaf pine, by number of trees, volume in board feet, and percentage of the original stand. Classified under wind, insects, fire, lightning, rot, drought. 200 acres measured annually. Initiated in 1920.
2. Development of natural stands of longleaf pine from seed. Four 1-acre plots. Parker Plot. Initiated in 1920.
3. Losses of longleaf pine seed trees on cut-over land from same causes. 1,034 trees. Records kept from 1917 on, but not complete for each year.
4. Growth of trees left on cut-over areas, longleaf pine with a few loblolly pines. 1,034 trees. Radial growth for 30 years since cutting. Heights, crown development, and volume growth. Stem analysis on 100 trees. Initiated in 1920.
5. Seed production on longleaf pine seed trees, differentiated by soil type, age, diameter, height, length of crown, volume of crown, isolation or crowding, rate of diameter growth, and relation of seed production to these factors. 1,034 trees. Complete records of cones and seed produced. Initiated in 1920.
6. Character and number of seed trees required for full stocking. 1,034 trees. Initiated in 1917.
7. Establishment of seedlings. Longleaf pine. Production of seed per acre, in numbers and pounds. Number of seedlings established in following spring, in percentage of seed produced. By soil types. Effect of burning previous to fall of seed. Effect of continuous fire protection previous to fall of seed. Effect of soil type. Effect of hardwood litter versus grass. Effect of hardwood shade. 52 plots of 1/100 acre each, established in 1917 and measured annually beginning in 1920.
8. Survival of longleaf pine seedlings. In absence of fire. Effect of competition of loblolly pine and of hardwoods. By soil types. 72 plots of 1/100 acre each established in 1917 (see 7). Effect of competition with pine grasses in the absence of loblolly pine, hardwoods, or brush. 11 plots of 1/100 acre each established in 1920. Burned September 1, 1924, but continued. 10 plots of 1/100 acre each established in 1925 on area unburned since 1916. Brown-spot disease on these plots.

9. Effect of grazing on longleaf pine reproduction and on the distribution and abundance of certain grasses on plots described in paragraphs 7 and 8. Initiated in 1920.

10. Roberts Plots U-8 and U-9, taken over in 1930 with consent of the Southern Station. Plot U-8, effect of complete fire protection since 1916 on longleaf pine reproduction established in 1920 or 1921. Plot U-9, effect of fire protection from 1918 to date on reproduction established in 1919. Freed from competition of loblolly pine and brush in 1930.

11. Removal of hardwood competition as a preliminary to growing longleaf pine seedlings. Elk Pasture Plots 1a, b; 2a, b; 3a, b. Plots 2a and 3a, hardwoods slashed down in June, 1928. 2a and b burned in spring of 1929. 3a and b burned in fall of 1928. Plots 2 and 3 burned accidentally in part in summer of 1930, and purposely in June, 1931. Brush not slashed on Plots 2b and 3b.

12. Use of fire as a means of obtaining healthy reproduction of longleaf pine seedlings.
    a. Plots 1, 2, and 3, Elk Pasture (several acres) established in 1928. Seed trees mapped. Burned (see 11) in 1928-29.
    b. Chapman Forest. Burned in fall of 1928—1.234 acres. 58 acres burned in February, 1932. Remainder burned accidentally in May, 1932. Plots established by Southern Forest Experiment Station.

13. Thinnings in natural reproduction of loblolly and longleaf pine. Spacing 10 x 10, 12 x 12, 15 x 15 feet. 1931. On forest growth sites. Elk Pasture.

14. Survival of loblolly pine seedlings established 1929 on grazed pasture land, carpet grass sod; 2 plots 6 x 66 ft. Tennis court in Elk Pasture. Initiated in 1929.

The United States Forest Service made its first contact with the Urania Lumber Company in 1909 when Forest Examiner W.W. Ashe visited the company's holdings and made a report (1). W.R. Mattoon visited Urania in 1913 on a similar mission (10). In 1915 S.T. Dana, then assistant chief of forest investigations, came to Urania and established the first permanent sample points in silviculture in the far South, four series of thinning plots and one fire and grazing plot. In 1920 these plots were reexamined by C.R. Tillotson, with the help of State Forester Forbes and State Ranger W.H. Thompson.

The United States Forest Service plots at Urania were taken over by the Southern Forest Experiment Station in July, 1921. Additional sample plots were centered at Urania, which was the first branch station of the Southern Forest Experiment Station. Forbes and Wyman established brush-disposal plots in September, 1921. Forest Assistant W.R. Hine was in charge of the work at Urania from the fall of 1922 to October, 1925, in cooperation with other staff members including L. Wyman and F.H. Miller. Hine was in residence there for a short period beginning February, 1923. Junior Forester L.I. Barrett was in charge of the Urania work from July, 1926, until December, 1928, when he was succeeded by Junior Forester F.I. Righter. In September, 1929, Righter turned over the Urania projects to Junior Forester R.A. Chapman.

Junior Forester C.A. Bickford worked with Chapman on the Urania project from July, 1931, until October 1, 1931. At various times from 1921 to date, other station men have helped in the establishment and reexamination of the many plots at Urania, as follows: E.L. Demmon, 1925-1926; L.J. Pessin, 1928-1930; V.L. Harper, 1928; W.G. Wahlenberg, 1930 to date; James L. Averell, 1930-1931; and Henry Bull, 1932. Local men including Togo McKeithen and Dave McCartney have been employed for routine work. Student assistants who have worked at Urania include H.W. Hicks, 1925; L.D. Lloyd, 1927; Eric Ostlin, 1927; J.W. Zehnder, 1929; R.H. May, 1929-1930; J.C. Craig, 1930; T.S. Coile, 1930-1931; F.W. Bennett, 1931; and M.A. Huberman, 1932.

A list of the projects with the Southern Forest Experiment Station has undertaken at Urania is given below:

Date Established	Kind of Study	Species	Name of Experimental Area	No. of Plots	Area in Acres
1915	Thinning, light & heavy	Loblolly	Maxwell, Castor	6	1.50
1915	Thinning, light & heavy	Shortleaf	Holly, Mayes	5	1.00
1925	Thinning, Accretion Cut	Loblolly	Deer Pasture	1	1.00
1925	Thinning, Light & Heavy	Loblolly	Maxwell	2	0.50
1927	Thinning, Hardwoods Cut	Shortleaf-Loblolly	Olla Tower	2	0.80
1928	Thinning, Light & Heavy	Loblolly	Isom Strange, Arnold, Nelson, Whitehead	9	1.936
1931	Thinning, Demonstration	Loblolly	Bronson	3	5.00
1921/1922	Brush Disposal & Methods of Cutting, Commercial Operation	Shortleaf-Loblolly-Hardwoods	Dulaney	12	34.30
1925	Methods of Cutting, for Pulpwood	Loblolly	Maxwell	2	0.52
1925	Methods of Cutting, Commercial Pulpwood Operation	Shortleaf-Loblolly-Hardwoods	Brown Paper Mill Company	1	0.30
1930	Methods of Cutting, Clearcut, diam. limit, Selection, & Accretion	Loblolly	Smith	5	5.15
1925	Cone Production	Longleaf-Shortleaf-Loblolly	Greeley Pasture	1	--
1929	Cone Production	Longleaf-Shortleaf-Loblolly	Chapman Forest	1	--
1923	Natural Reproduction	Longleaf,Loblolly, Shortleaf	Greeley Pasture	3	0.65
1927	Natural Reproduction	Loblolly	Elk Pasture	1	0.01
1928	Natural Reproduction	Longleaf Longleaf,Loblolly, Shortleaf	Greeley Pasture	3	0.47
1929	Natural Reproduction With and Without Fire	Longleaf	Chapman Forest	2	0.28
1932	Natural Reproduction Effect of Fire 3 Years Later.	Longleaf	Chapman Forest	1	0.15
1932	Natural Reproduction	Loblolly	Smith	1	--
1923	Method of Planting	Shortleaf-Loblolly	Greeley Pasture	3	2.32
1915	Hog Damage	Longleaf Reprod.	Roberts	2	0.50
1915	Fire Damage	Longleaf Reprod.	Roberts	2	0.50
1923	Fire Damage	Loblolly	Greeley Pasture	11	2.60
1923	Fire Damage	Loblolly	Elk Pasture	5	1.00
1924	Fire Damage	Loblolly	McDow	1	--
1925	Fire Damage	Shortleaf	Greeley Pasture	1	--
1925	Growth and Yield	Upland Hardwoods	Greeley Pasture	1	0.10
1925	Growth and Yield	Loblolly	Maxwell	1	0.45
1925	Growth and Yield	Loblolly	Cary	1	0.25
1930	Growth and Yield	Loblolly	McCartney	2	0.80
1930	Growth and Yield	Loblolly	Boyd	1	0.415
1932	Growth and Yield	Loblolly	DeMoss	1	2.00
1932	Growth and Yield	Loblolly	McDowell	1	1.00
			Total	94	65.5

Although many of these experiments were begun without adequate planning and were carried out under the handicap of inexperienced and frequently changing personnel, it is felt that they have furnished a variety of miscellaneous information as well as serving to train the staff. The thinning studies have usually been inconclusive. If there is an advantage in thinning, it is so slight as to be completely obscured where the plots were not strictly comparable when established. Of course, none of the studies are as yet completed, and later growth and analysis may bring out results [that are] today obscure. The fire and hog-grazing study of longleaf reproduction (Roberts Plots) has shown that longleaf pine reproduction can not survive where there are many hogs and that annual controlled winter fires materially retard the growth but are not, apparently, a serious factor in survival. The two original Roberts Plots on which all longleaf was destroyed by hogs (U-8, 9) reseeded to longleaf, but the reproduction has been unable to compete with the loblolly and shortleaf pine reproduction or has been retarded in growth by the heavy ungrazed grass.

The Dulaney plots were partially burned before the study was completed; nevertheless they showed that in this region brush disposal is not a major problem, because of the rapidity with which brush rots. The fire plots in second-growth loblolly indicate that annual controlled burning at any season ordinarily has very little effect on the growth or survival of loblolly pine. Exceptional conditions, such as a hot summer fire after a period of protracted drought where there has been no fire for 10 years can completely kill out a stand of young loblolly pine. In mature loblolly pine, however, a single hot fire, even after a period of protracted drought, does not seriously affect the survival of this species, although it cuts down the growth. Shortleaf pine, because of its sprouting ability, can withstand fire much better than loblolly pine. The study at Chapman Forest has indicated that a fire occurring just prior to a good seed crop can materially increase the number of longleaf pine seedlings established per acre over the number established on land protected from fire for several years. It remains to be seen how many of these seedlings will survive; both burned and unburned areas will be overstocked if all the seedlings now present survive.

The other studies at Urania have not run long enough to give definitive conclusions. To date Urania's most important contribution has been the training of new and inexperienced personnel.

The work at Urania should help solve many questions. Ashe (1) called attention in 1909 to the fact that longleaf was not satisfactorily restocking at Urania. Many factors complicate the longleaf reproduction problem in a region where other pines and hardwoods are found. Where hogs are plentiful there is no longleaf reproduction. Therefore, fencing is necessary if longleaf is to be grown. Longleaf produces an abundant supply of seed about once in 3 or 4 years. Squirrels and birds eat longleaf mast, and when the seed crop is small the rodents and birds get practically all of it.

The problem of fire in relation to longleaf pine establishment and survival is one of the most controversial problems connected with forestry practice in the South. At Urania, Professor Chapman of the Yale School of Forestry believes that controlled periodic winter burning is essential to the development of longleaf pine reproduction. While some believe that annual fires are essential, others believe that any fire is detrimental. It is known that on areas where the original stand was nearly pure longleaf pine, species susceptible to fire were notably absent. Given fire protection, loblolly will replace longleaf as the dominant species on some sites, even where there is an abundant supply of longleaf seed and no hogs. It is known too that annual winter fires materially retard height growth. It is possible that other factors are operating to crowd longleaf out of much of what was formerly longleaf land. Many of the Station's experiments are directed toward solution of vexing problems regarding the establishment of longleaf seedlings.

Apparently the most important research problems presented by the second-growth stands in the vicinity of Urania relate to the management of established stands of loblolly and shortleaf pine. One of these problems has to do with the effect of fire. Frequent fires do not materially affect second-growth loblolly and shortleaf, unless the fires occur after a protracted drought, during the vegetative season, or before the seedlings are well established. It is possible that periodic winter fires in loblolly and shortleaf pine would reduce the accumulated fire hazard and in some cases constitute a sound protective measure, particularly where an adequate fire-protection organization is not available. It is certainly necessary to protect loblolly and shortleaf from fire during the seedling stage.

Another problem that merits considerable attention is the management of second-growth shortleaf and loblolly pine other than old-field stands. The area in old fields near Urania is small (estimated at 10 per cent), and for that reason the chief forestry problems are concerned with second-growth mixed age stands on cut-over areas stocked in varying degrees of density.

Hardwood bottoms at Urania represent approximately one-fifth of the total forest area there and bottomland forests are a potential source of revenue, but no attempt has been made to ascertain methods of management for this type. Most of the bottomland hardwood stands have been culled of their more valuable species, and so are in a condition not nearly so productive as desired.

There are also some areas of upland hardwoods that merit study. Most of these areas have a large proportion of worthless species. Some attempt should be made to determine what to do with them.

In the general field of fire research, it is probable that much valuable information could be obtained by a fundamental study of inflammability, combustion, and relative hazards of different fuels. Specially, a record of wind velocity and actual fire temperatures at different points about and above the ground could be expected to give us much useful information.

The work at the Urania should center, however, around the determination of proper forest management practices for second-growth loblolly and shortleaf stands on cut-over areas.

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(9 Lounsbury, C., Rogers, R.F., and Bennett, H.H. Soil Survey of LaSalle Parish, Louisiana. U.S. Department of Agriculture, Bureau of Soils, 1920.

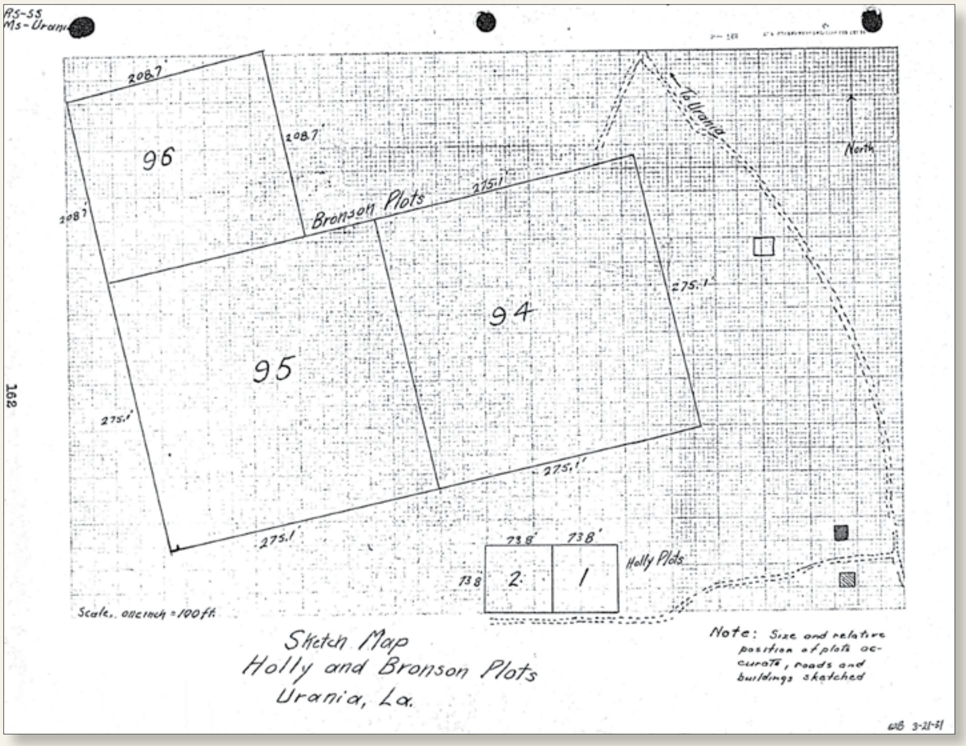
(10) Mattoon, W.R. Report on Urania Lumber Company. U.S. Forest Service. January, 1914.

[6] Editor's note: The actual title of this publication is *Factors determining natural reproduction of longleaf pine on cut-over lands in La Salle Parish, Louisiana*; the rest of the information is correct.

NOTE

The project record sheets (starting with page 35) and the succeeding sections of this report (the Appendix, Glossary of Local Terms, and the maps) were prepared prior to the final editing and typing of the "Forestry History of the Urania Lumber Company's Holdings in Northern Louisiana." This final typing of the "Forestry History, etc." was done in such a way that fewer pages were required than before, hence the lack of pages 33 and 34.

R.M.



Map of the Bronson (U-94, U-95, and U-96) and Holly (U-1 and U-2) plots, Urania Lumber Company. The small Holly Plots were the first two Forest Service plots at Urania, installed by Samuel Trask Dana in January 1915.

Branch station: Urania, Louisiana. Permanent Plots U-1 and U-2

Project: RS-SS, Mt-113. Holly Plots

Object of experiment: This study was made to test the effect of a moderate thinning "from below" on a 12-year-old even-aged stand of shortleaf pine.

Experimental area location: The plots lie in the NE1/4,SW1/4, Sec. 6, T. 10 N., R. 2 E.

Motor Log

Mileage	Notes	Mileage
0.0	Urania Commissary; drive west on dirt road past Company's office and cross railroad tracks	1.3
0.3	R by Mr. Quincy Hardtner's residence.	1.0
0.9	Left.	0.4
1.0	Left.	0.3
1.05	Straight through past house.	0.25
1.2	R at sign and drive between two houses.	0.1
1.3	Stop. Plot 1 is 50 feet west.	0.0

The land is owned by the Urania Lumber Company. See maps, pages 159, 160 and 162.

Forest type

Original type was probably longleaf pine; present stand is old-field shortleaf-loblolly pine. This site is considered good for shortleaf pine. The stand was 12 years old in January, 1915.

Species of tree studied

Second-growth, old-field shortleaf pine. Associated species are loblolly pine with mixed hardwoods in the understory.

Soil

Province – Interior Coastal Plain.
Series and type – Montrose silt loam.
Topography – gently rolling.
Elevation – 80 feet.
Drainage – N.W., good.
Litter – pine and hardwood.

History of area

Date of cutting is not definitely known, but the area was treeless in 1903 although not under cultivation. The area has never been burned and has been open to all classes of grazing until 1925 when it was fenced. The present stand seeded in naturally in 1903.

Record of experiment

Established: January 16-27, 1915, by S.T. Dana. Plots – two numbered U-1 and U-2, each plot 73.8 x 73.8 feet, containing 1/8-acre. No. 1 check plot; No. 2 moderately thinned, removing suppressed and intermediate trees.

Measurements: March, 1920, remeasured but not thinned by R.D. Forbes and C.R. Tillotson. October, 1924, remeasured by W.R. Hine, Averell and Tinker. January, 1925, thinned by E.N. Munns and W.R. Hine. January, 1930, remeasured and thinned by R.A. Chapman and R.H. May.

Reports: May 12, 1915, Establishment Report, S.T. Dana. November, 1922, Results from Sample Plots in Southern Pine Experiments. Journal of Forestry. Lenthall Wyman. October 11, 1927, Progress Report, L.I. Barrett and E.W. Gemmer.

Photographs: Plot 1, 22424-A, Jan., 1915; 45627-A, March 6, 1920; 242828, Feb. 7, 1930. Plot 2, 22420-A, Jan., 1915; 22425-A, Jan., 1915; 45628-A, March 6, 1920; 211221, Aug. 10, 1926; 241520, Nov. 16, 1929; 242829, Feb. 7, 1930; 247949, Jan., 1930.

Dates of remeasurement: The plots are to be remeasured at 5-year intervals; the next is scheduled for the winter of 1934-35.

Holly Plot U-1

	Number of Trees per Acre								Total	
	Crown Classes									
Year	Dom.	Codom.	Inter.	Suppr.	Total	Ave. D.B.H.	Range in D.B.H.	Ave. Height	B.A. per Acre	Total cu.ft. volume per Acre
					Loblolly pine					
1915	224	104	32	248	608	2.9	1"- 6"	24	28.1	228
1920	192	64	80	40	376	4.7	1"- 8"	35	45.3	586
1925	176	88	24	56	344	5.8	1"-10"	48	62.7	1,165
1930	112	96	64	16	288	6.9	3"-12"	56	74.9	1,630
1935										
					Shortleaf pine					
1915	248	568	328	2176	3320	1.8	1"- 5"	19	62.5	439 *667*[11]
1920	264	240	272	640	1416	3.5	1"- 7"	30	92.5	996 *1581*
1925	240	240	192	80	752	4.9	2"- 8"	42	97.0	1,663 2828
1930	80	216	120	144	560	5.6	2"- 9"	52	96.6	2,069 *3699*
1935[7]										*4350*[11]
									914-1247-871-651[11]	

[7] Editor's note: These numbers (in italics) were handwritten in the margins of this table, with no further explanation.

Holly Plot U-2

Year	Number of Trees per Acre – Crown Classes: Dom.	Codom.	Inter.	Suppr.	Total	Ave. D.B.H.	Range in D.B.H.	Ave. Height	Total B.A. per Acre	Total cu.ft. volume per Acre
					Loblolly pine					
1915[1]	20	32	32	144	226	1.7	0”- 5”	17	3.6	25
1915[2]	16	8	8	8	40	3.4	0”- 5”	24	2.6	21
1920	16	8	16	8	48	4.4	0”- 6”	34	5.1	67
1925[1]	16	8		64	88	6.6	0”- 8”	51	7.5	146
1925[2]	16	8		56	80	7.4	0”- 8”	53	7.2	146
1930[1]	16	8			24	8.6	7”-10”	61	9.7	236
1930[2]	16	8			24	8.6	7”-10”	61	9.7	236
1935[1]										
1935[2]										
					Shortleaf pine					
1915[1]	376	352	512	1712	2952	2.0	0”- 7”	18	66.2	580
1915[2]	368	176	48	128	720	3.6	0”- 7”	25	51.4	514
1920	264	120	224	152	760	4.8	0”-10”	36	95.8	1,492
1925[1]	264	176	136	144	720	5.8	0”-11”	47	130.2	2,670
1925[2]	264	160	80	32	536	6.4	2”-11”	50	118.9	2,516
1930[1]	120	208	104		432	7.6	4”-12”	59	135.9	3,438
1930[2]	120	184	32		336	8.0	4”-12”	60	116.5	2,997
1935[1]										*4044*[11]
1935[2]										

[1] Before thinning. [2] After thinning.

Remarks and Recommendations

The response to thinning in this study has been quite marked. The study might have been better with an isolation strip and mother plot.

It seems that a five-year interval between thinnings is not enough. In continuing the study, it may be advisable to investigate the use of a ten-year interval between thinnings.

A thinning in a stand as young as this (12 years old in 1915) does not yield enough to be economically sound, and at the same time probably reduces amount available for later thinning that may yield a slight profit.

These plots are so small that their results cannot be accepted without additional evidence.

No isolation strip. Plot 2 on better site.

RS – SS
M-1, Pines
Urania
Mt
Maxwell, U-5[8]

March 28, 1935

Notes on 1934-35 Thinning and Recommendations for Future Thinnings to Produce High-Quality Sawlogs

The trees marked for removal were the poorest trees in the stand. The thinning was largely from below, continuing the method of former thinnings, and aimed to leave between 200 and 250 trees per acre; 232 trees per acre, averaging 8.8 inches d.b.h., were actually left.

The plot should be rethinned [sic] every 5 or 10 years at the time of a remeasurement. Each time, cut only the poorest trees (poorest in vigor, quality, growth, and/or potential) but make no thinning whatever unless at least one cord per acre can be removed. Make the final cutting or harvest when the average d.b.h. is at least 24 to 30 inches.

The 1934 marking and the above recommendations were made jointly by Bull and C.A. Bickford.

Henry Bull,
Assistant Silviculturist

[8] Editor's note: It is unclear why Henry Bull inserted five pages of these short memos to the file on these thinning treatments and recommendations for the Maxwell Plots here in the section for these two Holly plots. There does not appear to be a direct link, and they are not in the same location at Urania. I reproduced this one here because it does provide a good (if brief) example of how the study information was updated in the *Urania Bible*.

APPENDIX[9]
To Urania Summary of 1932

Concerning the work:

In general, in numbering trees for permanent plot work, use outside white paint. Where trees are too small to use paint, metal tags are recommended. When the plot is near a house or travelled road, metal tags do not last, and to avoid confusion in the permanent records, do not assign a new number to the tree, but put on a new tag with the old number. Sometimes it may be advisable to make tree location maps for such plots. With painted numbers, repaint before the numbers become too obscure.

The corner stakes of the permanent plots are to be painted white in the upper portion and the plot number painted on each stake in black, also any additional special information that may be necessary. The paint on these stakes is to be freshened as needed.

Fire lines are to be raked each fall for the Holly, Maxwell, Mayes, Whitehead, Arnold, Nelson, Isom Strange, McCartney, and Boyd Plots. When possible, they should also be raked in the winter.

Mr. G.M. Tannehill and Mrs. Joe Wilson are very useful resources of information, Mr. Tannehill for general administration and roads, and Mrs. Wilson for local history and roads near the old Whitehead Place.

Unless otherwise stated, surveys are run with a Forest Service compass, using a magnetic declination of 7 degrees east.

Until notice to the contrary, all fires occurring where they may have some bearing on the relation of fire to longleaf pine will be mapped with a compass and pacing. Where it is thought a later striking contrast may appear, mark the boundary of the burn definitely.

Concerning travel:

Plot accessibility at Urania can become a truly vexing problem. Nearly all the plots require more or less travel on dirt roads. Some spots on almost any of these dirt roads can become practically impassable with surprisingly little rain. However, with practice and favorable moisture conditions, it is usually possible to drive to all of the plots at any time of the year. In general the summer is the driest time and the area is most accessible then; the winter is the wettest and in really wet weather, strangers should stay on paved or gravelled [sic] roads.

The paved Alexandria-Monroe highway is usable except when flooded by the Chickasaw or Little River. When it is flooded, the alternatives are boating or office work. The Olla-Winnfield road floods readily through Castor swamp; when there is any water flowing over the road on the Olla side of the bridge there is too much water on the other side to get through with an automobile. At such times use Motor Log #1 on page 154 to get to plots across the Castor.

The Hinton road is always driveable [sic] as far as Hinton, unless there are bridges out. Going into Greeley Pasture, stop at Mr. Reed's for information. His mule, Della, will pull a stuck car out if it is pullable.

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[9] Editor's note: This appendix starts on page 153 of the *Urania Bible*, continues to page 158, and appears to have been the last section of the original 1932 document. Pages 159 to 175 are a series of maps of the Urania area, including most plot locations and some plot layouts. The version of the *Urania Bible* in my possession has page number 176 up to hand-numbered page 218 inserted between pages 158 and these maps, and includes a few new studies added between September 6, 1934, and March 10, 1942.

The Flat Creek swamp is always bad to cross. When it is necessary to work on the other side of Flat Creek, walking is the most economical mode of travel. May 1, 1932, the best way to drive has been listed as the Motor Log to plots U-89, U-90, U-91, U-92, U-97, and U-99. For other routes see Motor Logs #2, 3, 4, and 5, pages 154-157. The state is building a new highway from Olla to Sikes (see map, page 159) which, when finished, will probably provide the best route to such plots as are on the other side of Flat Creek.

Miscellaneous Motor Logs[10]

GLOSSARY OF LOCAL TERMS

1. **Branch** – any small tributary to a creek, many of them frequently dry.
2. **Dump** – "fill" of road-building parlance further north.
3. **Glade** – a small depression, usually undrained, outside the main bottoms. Driving here can become very slippery but sticking is relatively rare.
4. **Hammock** – flat-topped ridge in or near the main bottoms, usually an island in high water, flooded only in extremely high water. Hammocks are frequently bordered by pin oak flats.
5. **Pin oak flat** – a depression on the order of a glade, but larger. The pin oak is truly willow oak, Quercus phellos. This a very common association on the borders of a principal bottom.
6. **Spring branch** – a branch fed by a spring, hence usually wet.

[10] Editor's Note: For brevity, these motor logs are not included in this paper.

A Brief and Biased Memoir of the Southern Institute of Forest Genetics

Ron Schmidtling

Ron Schmidtling (retired) Research Geneticist, and Emeritus Scientist, U.S. Department of Agriculture, Forest Service, Southern Research Station, Saucier, MS.

Looking back, I recall many fond memories of my association with the Southern Institute of Forest Genetics (SIFG) and the U.S. Department of Agriculture Forest Service. The SIFG was "activated" by the Forest Service's Southern Forest Experiment Station (SOFES) on August 29, 1954, to meet the following three purposes (Briegleb 1955):

- Focus a staff with specialized training using adequate laboratory and field facilities on some of the fundamental research questions and management problems related to forest genetics
- Conduct an "aggressive" program of tree improvement
- Serve as a repository of information on forest genetics work and its application, with an emphasis on the southern pines

After nearly 70 years of such work, the SIFG continues to serve in this capacity—and so much more! But let me start at the beginning, many years before my time. In the early days of southern forestry, vast areas were clearcut with little or no regard for regeneration. Natural regeneration was satisfactory in some areas but totally lacking in others. Very little planting occurred before the Civilian Conservation Corps (CCC) began wide scale planting during the Great Depression. In 1944, SOFES scientist Philip Wakeley estimated that fewer than 500 acres of southern pines (*Pinus* spp.) had been artificially regenerated successfully before 1920.

Seed source effects on forest plantation productivity received little attention in the United States before 1920. In contrast, since well before the turn of the 20th century, the importance of geographic seed source was known for European species.[1] In the United States, native seed collections for an extensive study of Douglas-fir (*Pseudotsuga menziesii*) seed sources were initiated in 1912 by Thornton T. Munger and colleagues (St. Clair and others 2020), and testing of ponderosa pine (*Pinus ponderosa*) seed sources in northern Idaho and Colorado began in 1916. Inspired by some of Luther Burbank's work with walnut (*Juglans* spp.) hybrids, lumberman James G. Eddy started the Eddy Tree Breeding Station at Placerville, CA, in 1925. In 1932, the facility became the Institute of Forest Genetics (IFG); in 1935, the IFG was donated to the Forest Service (PSWRS, no date).

"Seed source effects on forest plantation productivity received little attention in the United States before 1920. In contrast, since well before the turn of the 20th century, the importance of geographic seed source was known for European species.

[1] Personal communication (1995). Heinrich Melchior, Director, Institute of Forest Genetics, Grosshansdorf, Germany.

Top: **Philip C. Wakeley**.

Bottom: Example of how different sources of loblolly pine seed produced different yield performances.

THE PRE-HISTORY OF THE SIFG

The pre-history of southern tree improvement—including the SIFG—began with Philip Wakeley (Wakeley and Barnett 2016). Wakeley was hired in 1924 by the Forest Service to do basic research on the regeneration of the cutover southern forests. His undaunted drive led him to complete a monumental amount of research in basic silviculture, and his seminal manual, *Planting the Southern Pines* (Wakeley 1954), is still in use today. I met a then-retired Wakeley in 1968 when he came from his home in Syracuse, NY, to the SIFG to talk to Osborn "Ozzie" Wells about a pending publication. It was very interesting talking to Wakeley, as he had some fascinating stories to tell about the old days in the SOFES.

Although he had little formal training in genetics, Wakeley was aware of seed source effects. In 1926, he installed an important loblolly pine (*P. taeda*) provenance test near Bogalusa, LA, at Coburn Creek. The four loblolly seed sources used were from widely separated locations (southeast Louisiana, east Texas, central Georgia, and southeast Arkansas), and this was the first test of geographic differences in a southern pine. The magnitude of the seed source effect in loblolly pine was unknown before Wakeley published 15-year results indicating that growth and disease resistance varied widely among geographic sources (Wakeley 1944). Interestingly, there was no real replication, as Wakeley knew little about plot design and analysis of variance, but since the differences were so impressive, such analysis was not needed. The local (Louisiana) seed source from nearby Livingston Parish, LA, was clearly the best, not only for growth, but also for disease resistance. The Coburn Creek planting remained when I arrived at the SIFG in 1967, and the differences were still remarkable.

Wakeley also tried his hand at controlled pollinations and is credited with creating the first artificial southern pine hybrid in 1929, a cross between longleaf (*P. palustris*) and slash (*P. elliottii*) pines. He knew that the first natural southern pine hybrid (*Pinus* x *sondereggeri*) had been identified by Yale Professor H.H. Chapman a few years earlier (Chapman 1922)—a longleaf and loblolly cross named after the man Chapman credited with discovering the first example, V.H. Sonderegger (who eventually became the state forester of Louisiana).

Other early work included a large open-pollinated progeny test of loblolly pine installed in 1934 by A.L. McKinney and L.E. Chaiken of the Appalachian Forest Experiment Station (AFES). Substantial inherent differences were noted before the planting was flooded by the Santee Cooper Power and Navigation Project. Following earlier genetics-related projects by V.L. Harper and T.A. Liefeld, in the early 1940s, H.L. Mitchell, Albert Snow, Keith W. Dorman, and C.S. Schopmeyer, working at the USDA Naval Stores Research Laboratory in Olustee, FL, started selecting slash and longleaf pine for high naval stores yield (Mergen and Pomeroy 1954). Open- and controlled-pollinated seedlings from these selections were used to establish the first progeny tests in southern pines demonstrating the existence of individual tree genetic variation.

According to Clemens Kaufman, two events provided the impetus for the rapid expansion of genetics and tree improvement in the 1950s (Kaufman 1961). The first was the influence of several prominent foresters who attended the World Forestry Congress in Helsinki in 1949, where they became aware of the tremendous progress being made by tree breeders in Europe. The second event was an exchange of correspondence beginning in the fall of 1949 between the Forestry Relations Division of the Tennessee Valley Authority (TVA) and the SOFES on the possibility of establishing a regional seed source research program. The result was the first Southern Forest Tree Improvement Conference (SFTIC) held in Atlanta, GA, in January of 1951. The organizers were surprised when more than 80 people attended. Since then, the conferences have been held every other year, and the proceedings are major sources of information in genetics and tree improvement (see www.sftic.org for full access to all SFTIC proceedings). The Southern Forest Tree Improvement Committee formed later in 1951 to foster research and development in forest genetics and tree improvement. It has continued to be a guiding force in forest genetics and tree improvement research and technology transfer to the present day.

The original home of the Southern Institute of Forest Genetics when it was founded in 1954 at the Harrison Experimental Forest.

One product of the first SFTIC was the establishment of a subcommittee, headed by Wakeley, to install the Southwide Pine Seed Source Study (SPSSS), one of the most comprehensive provenance tests ever established. The results from Wakeley's first seed source test were dramatic, but the study only included loblolly pine and was planted only at one location: Bogalusa, LA. The SPSSS, on the other hand, was much more comprehensive. It was a very large undertaking, involving many cooperators across the Southeastern United States who collected seed and provided planting sites. All four major southern pine species were included: loblolly, slash, longleaf, and shortleaf (*P. echinata*). A total of 128 plantations were established, including seed from, and plantations in, 16 States, ranging from New Jersey and Pennsylvania south to Florida and west to Texas, Oklahoma, and Missouri.

This early work demonstrated that genetics played a significant role in the survival, growth, and timber yield of the Nation's forest trees and led to the establishment of several government research programs, including the SIFG. The recognition that forestry research, especially genetics work, is long term led to an understanding that continuity was important and the necessary long-term funding to support it was not likely assured through anything but a Federal program.

THE EARLY YEARS OF THE SIFG

The Harrison Experimental Forest (HEF), near Saucier in southern Mississippi, became the original home to the SIFG. Largely built by the CCC, the HEF was established in 1934 as a location for research on the regeneration and growth of southern pines.

By the time the SIFG was established, a great deal of research on the pathology of tree root diseases, brown spot needle blight (*Mycosphaerella dearnessii*), and fusiform rust (*Cronartium quercuum* f. sp. *fusiforme*) had also been done on the HEF under the direction of Paul Siggers and a technician named Norm Scarborough. This research facility was well suited for the new institute. What the SIFG also needed was a good leader. When it was founded, many people assumed that Philip Wakeley was the logical choice for the SIFG's project leader position. He was a hard-working scientist, a brilliant observer of nature, and certainly one of the most important pioneers in forest genetics. However, according to Bill Mann, one the SOFES project leaders at Pineville, LA, SOFES leadership wanted

Top: Southern and Southeastern Forest Experiment Station geneticists in 1958. Standing (left to right): Pieter Hoekstra, François Mergen, John Barber, Bob Allen, Phil Wakeley, Carl Ostrom, and Roland Schoenike; kneeling (left to right): Berch Henry, Davis McGregor, Keith Dorman, George Gruschow, and Ken Pomeroy.

Bottom: The original Harrison Experimental Forest headquarters building with greenhouse attached to the back.

to keep Wakeley in his office in New Orleans writing up all the research he had accomplished before he retired.

So, rather than choosing Wakeley, the SOFES turned to Berch Henry, a forest pathologist who had been with the USDA Bureau of Plant Industry, Soils, and Agricultural Engineering until early 1954. Henry was appointed project leader because of his considerable management skills—and this turned out to be a fortuitous choice.

Henry originally came south from Wisconsin to study root diseases of southern pines at the Forest Service's Ashe Nursery (located about 40 miles north of the HEF). He was also living at the HEF Lodge along with several other scientists over the years utilizing the provided residences.[2]

A gregarious person, Henry got to know all the important people of the State, including U.S. Senators James "Big Jim" Eastland and John Stennis. These senators from Mississippi, because of seniority, party affiliation, and sheer force of personality, were very powerful people in the U.S. Government. In particular, Senator Stennis was a friend to science in general and of forestry in particular. Henry became good friends with Senator Stennis, and even though Mississippi was still "dry," they were able to discuss business while having a drink or two at a local establishment. (Such relationships between Forest Service scientists and politicians are now frowned upon.)

Genetics research progressed at the HEF as the SIFG initiated projects. When Siggers retired, Scarborough worked for plant physiologist Bob Allen.[3] Facilities for seed extraction, pollen handling, and wood quality determination were developed, and a physiology laboratory was constructed for Allen (this eventually became the headquarters building for the HEF and SIFG). The headquarters is now the scientist office building, which also has an attached greenhouse.

Bob Echols arrived at the HEF in the 1950s and had a small lab in Allen's building for studies of wood traits. He was interested in the genetics of wood fiber length, and he built a microscope projection device dubbed the "ampliscope" that allowed measurement of the fibers from a slide using an ordinary ruler (Echols had a talent for building such devices). Echols transferred to the IFG in Placerville in the 1960s.

Bayne Snyder joined the unit after working on rubber tree (*Hevea* spp.) genetics in Sumatra in the early 1950s. He was very interested in longleaf pine and had established a large number of studies with Harold Derr of the SOFES silviculture unit in Pineville, LA. I am sure that Snyder was interested in longleaf because of its ecosystem desirability while knowing it was being replaced by slash and loblolly over much of its range. Another factor is that longleaf was almost completely ignored by the geneticists in the tree improvement programs because of the problems with regeneration. Snyder started an ambitious program of

[2] It was customary for the scientists and some staff to live at the experimental forests in those days. For instance, Siggers had lived in the HEF Lodge from 1942 to 1952, as did plant physiologist Bob Allen (in the Bidwell House), and technician Scarborough also lived on the HEF in the "L.H. Lott technician office" residences. The Lodge was demolished in the early 1960s because it needed extensive repairs, and it was no longer needed as a residence. The site is now occupied by a guest house built in the 1980s for visiting researchers.

[3] I know that Allen had fond memories of beginning his career at the HEF. I was present some years ago when his family came to spread his ashes around the area of the old lodge.

making controlled pollinations for several longleaf pine studies, including a 13-parent full diallel (we are currently collecting the 60-year data from that work). Establishing this study required climbing many large trees. Snyder was a thin, wiry guy who could climb a tree using Swedish tree-climbing ladders faster than anyone in the project, and he eventually wrote the Forest Service's manual for safe tree climbing.

Snyder stirred up some controversy in the 1960s and 1970s. The tree improvement cooperatives at North Carolina State University, Texas A&M University, and University of Florida all adopted single tree selection and using comparison trees for all southern pine species. Snyder pointed out that this method worked well for slash, loblolly, and shortleaf, but using comparison trees for longleaf pine was not warranted because one could not know how long each tree had been in the "grass" stage. (I recall a study where Wakeley followed a brown spot-infected longleaf pine in the grass stage for 35 years!) Snyder was not very good at oral presentations, and he offended Bruce Zobel, head of the North Carolina State University Forest Tree Improvement Cooperative, who was a superb salesman and advocate for tree improvement.

Snyder and Derr did a great deal of research on the inheritance of brown spot needle blight and early height growth. They discovered an interesting variant in an old longleaf pine nursery bed in Louisiana that was devastated by the disease: an individual seedling that popped up and started height growth, while every other seedling died. That individual—dubbed "Father Abraham"— proved to be truly resistant to brown spot and hence was used in hundreds of crosses.

Snyder and Derr also initiated a "mass selection" study where they collected seed from 500 mother trees and planted the seedlings in a progeny test. As I recall, selection from these were crossed and planted in next generation progeny tests (I do not remember if the results of this study were ever written up).

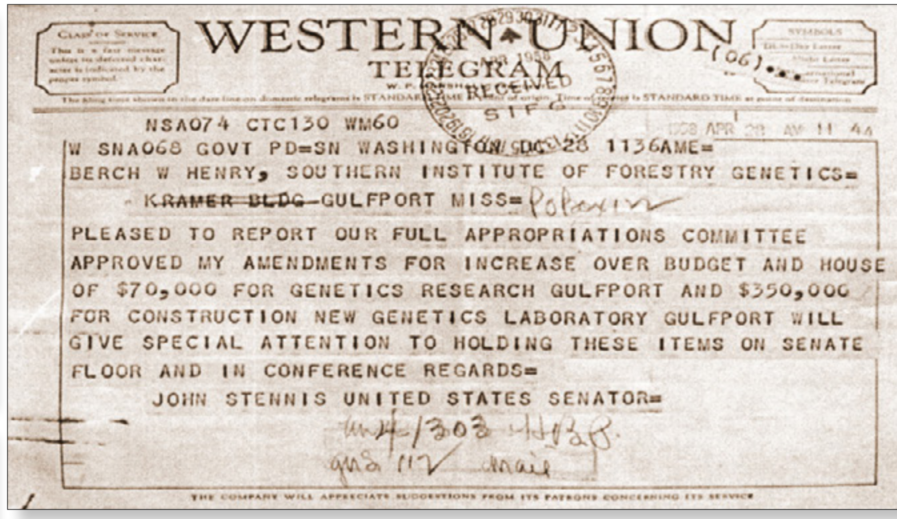
Snyder's work was heeded by many but had only a marginal effect on tree improvement in longleaf pine. His contributions may have been less obvious; when he retired in 1979, he had mentored numerous young scientists. For instance, after Gene Namkoong joined the SIFG in 1958, Snyder recognized his exceptional talent and encouraged him to further his education. Namkoong stayed with the project but moved to Raleigh, NC, to get his doctorate at North Carolina State University. Namkoong remained in Raleigh after graduation, still part of the SIFG, and formed his own "Pioneering Project" around 1972. Namkoong would later win the internationally renowned Marcus Wallenberg Prize in 1994, becoming the SIFG's most distinguished alumnus.

Space was always an issue with the growing SIFG. When roads were improved in the 1950s, several of the scientists moved into Gulfport, MS, and office space was obtained at the USDA complex on 25th Avenue (Highway 49) and 34th Street.[4] Following the Korean War armistice, forestry research and genetics enjoyed a rise in popularity, and Federal funding was obtained for a new building in Gulfport (on 34th Street a few blocks east of Highway 49) to house the SIFG and three other research projects. No doubt, Henry's personal relationship with Senator Stennis was a factor.

Top: The "Father Abraham" longleaf pine in January 1961. This tree was discovered in a Louisiana nursery that had been abandoned. Practically all other longleaf seedlings there had been destroyed by the brown spot needle blight. (USDA Forest Service photo [negative #504102] taken by R.W. Neelands)

Bottom: Left to right: Bayne Snyder, Gene Namkoong, and Ron Schmidtling at the Harrison Experimental Forest, 2001.

[4] This location later became part of the USDA Agricultural Research Service, and then the USDA Animal and Plant Health Inspection Service.



WESTERN UNION

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BERCH W HENRY, SOUTHERN INSTITUTE OF FORESTRY GENETICS=

~~KRAMER BLDG~~ GULFPORT MISS=

PLEASED TO REPORT OUR FULL APPROPRIATIONS COMMITTEE APPROVED MY AMENDMENTS FOR INCREASE OVER BUDGET AND HOUSE OF $70,000 FOR GENETICS RESEARCH GULFPORT AND $350,000 FOR CONSTRUCTION NEW GENETICS LABORATORY GULFPORT WILL GIVE SPECIAL ATTENTION TO HOLDING THESE ITEMS ON SENATE FLOOR AND IN CONFERENCE REGARDS=

JOHN STENNIS UNITED STATES SENATOR=

Top: Opening the new Southern Institute of Forest Genetics Laboratory on 34th Street in Gulfport, MS, October 1960. Left to right: Art Verral, Forest Pathologist; John Stennis, the Senior U.S. Senator from Mississippi; Berch Henry, Forest Pathologist and Southern Institute of Forest Genetics Project Leader; R.E. McArdle, U.S. Forest Service Chief; and H.R. "Mr. Johnny" Johnston, Entomologist.

Top right: An April 1958 telegram from U.S. Senator John Stennis to Berch Henry.

Middle: Gulfport Laboratory facility, likely taken in the 1960s.

Bottom: Greenhouses and other outbuildings at the Gulfport Laboratory facility.

The facility in Gulfport initiated a new era for the SIFG, beginning with its dedication in October 1960. Along with the SIFG, three other projects were housed in the new building: Forest Pathology (Glenn Snow, Project Leader), Decay of Wood Products (Rod DeGroot, Project Leader), and Wood Destroying Insects (H.R. Johnston, Project Leader). These other projects had also been housed at the USDA Bureau of Plant Industries facility on Highway 49 in Gulfport.

Not long after the Gulfport Laboratory facility opened, Henry was promoted to assistant director of the SOFES and stationed at the New Orleans headquarters about 75 miles from Gulfport. He did not move his family to New Orleans but left them living in Bayou View and commuted home on weekends. His family was quite active in the social affairs of the local Mississippi Gulf Coast community. I knew his wife Lori because of her involvement with the Gulf Coast Symphony Orchestra. She was also a good source of information about living at the HEF.

THE SIFG'S ERA OF EXPANSION

John Barber moved from the Macon, GA, research unit to replace Berch Henry as the SIFG's project leader. Barber ran a "tight ship." I was present during only the last month of his administration, but I certainly heard stories! One example of Barber's supervisory style involved Fred Jewell. Jewell was a talented plant pathologist who developed an effective way to test slash and loblolly pine seedlings for fusiform rust resistance in an inoculation chamber. Barber insisted that he follow up this work by doing massive screening to identify resistant families, but Jewell felt that this was plant breeding, not pathology research. Jewell left soon after for a faculty position at Louisiana Tech University.

Barber also clashed at times with supporting staff. At that time, there were probably 11 or 12 technicians at the HEF attached to various projects, and they told me tales about Barber as the boss. For example, Barber was a stickler for starting work when you arrived at the HEF, taking only a 15-minute break at the appointed time, a 45-minute lunch, and working until quitting time. Since all the supervisors were at the Gulfport Lab, adherence to the work schedules could be lax at times. On a cold day in winter, some staff would linger in the morning around the stove in the shop for some time before moving out into the field. They would, however, station someone to look out for any government vehicle

Lloyd Smith's 60-acre study of the effects of intensive culture on growth of slash, longleaf, and loblolly pines in Section 36 of the Harrison Experimental Forest at age 6 years. These trees are all the same age.

coming in the driveway. If such a vehicle would arrive, there would be a mad dash of everyone out the back door of the shop, quickly looking for a place to look busy. Nobody wanted to get caught in there around the stove by Barber, as the resulting conversation would be very unpleasant!

During this period (1950s and 1960s), Forest Service research was expanding, and the project was hiring scientists—so much so, that the project leaders for the four research projects housed at the Gulfport Lab were fighting for space. When I arrived at the end of June 1967 to start work at the SIFG, I occupied an office on the second floor. It had been vacated by Bob Allen, who had recently left for a faculty position at Clemson University. My office was next to Lloyd Smith's office. Smith was an old-time Ph.D. forester from Yale, 70 years of age but not ready to retire (I recall he had a daughter in medical school, which may have been a factor). Smith had done some great silviculture work at the McNeil Experimental Forest, an installation isolated from the rest of the De Soto National Forest, about 40 miles northwest of Gulfport. After that work was finished, the McNeil Experimental Forest was closed, and Lloyd and his technician, Horace Smith, were transferred to Gulfport. Immediately upon his arrival in 1960, Lloyd Smith set about planting a huge study (60 acres located in Section 36 of the HEF) involving intensive culture on longleaf, loblolly, and slash pines using parent trees of average and high specific gravity wood.

Lloyd Smith was a wonderful source of information for me. He had great knowledge of forestry, especially silviculture. Unfortunately, he died suddenly of a stroke about a year after I arrived. I inherited his gigantic study, which was a good part of my education in forestry because I was trained as a botanist, not a forester (prior to moving my wife and three small children to the Mississippi Gulf Coast, I had been teaching botany at Inter American University in San Juan, PR). The study provided a source of material for over a dozen publications.

Shortly after I started with the SIFG, Barber left for a staff position in Washington, DC. Dan Schmitt was appointed project leader. Schmitt's style of supervision was opposite of Barber's. Schmitt readily admitted that he "did not run a tight ship," but he was always there to advise. This leadership style suited me just fine. In my first month, Schmitt organized two trips for me to the other SOFES projects doing research in genetics, including those in Pineville, LA, Olustee, FL, and Macon, GA.

Nellie Rich, a technician in the entomology project, demonstrating how to determine if a shortleaf pine is shedding pollen by bumping it with a mallet (1971).

This was an orientation to get a feeling for what was being done in forest genetics and proved very useful for me, as I heard some highly divergent opinions about what I should be doing.

My office was not the only thing that I inherited from Allen. I also inherited his technician, Norm Scarborough, who had started working for the CCC with the Forest Service in 1937 (the same year I was born). One of the best forestry technicians in the South, Scarborough had learned all there was to know about forestry field research from Paul Siggers, which was of great benefit to me when I arrived. I remember talking to Allen some years later about how great Scarborough was, and he said, “He was indeed good, I worked for *him* for my first several years!” Years later I asked Schmitt why he assigned Scarborough to me, because there were plenty of scientists, senior to me, who would have liked to have him. Schmitt replied, “Ron, you came to us in woeful ignorance, I needed to give you someone good.” He was right! It was a great loss to me when Scarborough retired around 1972.

MORE SIFG SCIENTISTS

Bill Beland arrived about 6 months before I did and was working on reproductive physiology and genetics of sycamore (*Platanus occidentalis*). Beland was about my age, perhaps a little younger, and had been plagued by a hearing problem in one ear. By the time the presence of a tumor behind this ear was diagnosed, it was too late to do surgery. He retired around 1976 on disability and died a year later, leaving a widow and two small children. Ron Dinus arrived about 6 months after I did. He started working on the genetics of fusiform rust resistance in slash and loblolly pines. He was successful in research and developed a good reputation as a scientist. Warren Nance joined the project sometime after my arrival. Nance had a lot of interest in statistical analysis and computers. In the early days of my tenure, we had no methods for analyzing data beyond the Monroe Calculator. Nance, along with computer technician Tony Rayford, developed a system where we could use surplus time on the National Aeronautics and Space Administration (NASA) computers in Slidell, LA. We assembled our decks of punch cards and one of the technicians would run them over to Slidell in a weekly shuttle. We were lacking statistical software, so I did a lot of programing in Fortran and Basic to analyze the data for my various studies.

One of the Forest Service scientists who became part of the SIFG during this expansion period was entomologist Jack Coyne. An old-time forester and entomologist from Syracuse, NY, Coyne worked on southern pine beetle (*Dendroctonus frontalis*) infestations and the underlying host genetics, especially the role of terpenes in resistance. He located a number of “escapes” from southern pine beetle infestations where nearly every tree was killed but these survivors; these were propagated by grafting for our experimental clone bank and have been utilized in many experiments. He suffered from a serious heart disorder and had surgery to replace his heart valve with one from a pig. Coyne said he didn’t notice any difference except whenever a garbage truck went by, he had an urge to follow it. (He had a great sense of humor.) Another scientist was Bob Hare, who started his Forest Service career working on the physiology of fire resistance but was working in our project on rooting cuttings of pines. Hare would later be in charge of propagating the “Moon Trees” (described below). A third was

Ozzie Wells, who had been at the Gulfport Lab since the early 1960s.[5] He started his Forest Service career at the original IFG in Placerville before going back to school at Michigan State University for his doctorate. Wells wanted to return to Placerville, but the agency had a different plan: the Forest Service wanted him in Gulfport to carry on Philip Wakeley's work on the SPSSS.

Left: **Floyd Bridgwater** and right: **Osborn (Ozzie) Wells** circa 1970.

Wells had a very productive career, much of it from carrying on the SPSSS. That, of course, is the way long-term forest genetics research is done. Few of us will be around long enough to follow a study through a 30-, 40-, or 50-year rotation, or through several generations of breeding. However, Wells somewhat resented having a ready-made career, which was one of the things that prompted him to organize a new provenance study of monumental size. Interest was building in the South for growing hardwoods. Tree improvement had become very successful for southern pines and it was assumed that this same success could be obtained with hardwoods. However, some basic genetics information was needed. In the 1970s, Wells started making seed collections (which included sweetgum [*Liquidambar styraciflua*], sycamore, green ash [*Fraxinus pennsylvanica*], and cherrybark oak [*Quercus pagoda*]) and finding planting sites for a new series of provenance tests for hardwoods. Just as was needed for the SPSSS, this involved lining up a lot of cooperators under the auspices of the SFTIC. Up until 1976, a large nursery at the HEF was available for growing seedlings for these extensive experimental plantings.

Around this time, the SOFES made an administrative decision to establish a hardwood genetics research unit cooperation with Mississippi State University, so most of the hardwood genetics work (including the data and plantings) were transferred to Starkville, MS. Wells was offered the position of project leader, but he was not interested in relocating. D.T. "Tom" Cooper was an exception—he was already stationed at the Southern Hardwoods Lab in Stoneville, MS, since he was working on *Populus* genetics. Cooper came to the SIFG about the same time that I did but only worked there for several years before he resigned (he told me he was getting into the truck farming business). After a few years, another administrative decision was made. The hardwood genetics project was closed, and the research and young plantings were turned over to the forestry program at Mississippi State University. Suddenly, the SOFES was out of the hardwood genetics business—the research unit was born but died in infancy.

After 5 years as project leader, Dan Schmitt wearied of balancing administrative work with research and announced one day "if I am going to be a [expletive] administrator, then I am going to be an administrator." He took an assistant director position in the Forest Service's Northeastern Forest Experiment Station at Upper Darby, PA, in 1972. Dinus replaced Schmitt as project leader. The contrast in their management styles was sharp—while Schmitt had a laissez faire approach, Dinus tended towards a more autocratic style and clashed with some of his staff. During Dinus' tenure, the size of the project shrunk considerably as a number of scientists chose to retire (some early) rather than being given direct reassignments to move them elsewhere. For instance, Snyder was wrapping up some important work on the longleaf diallel but elected to depart instead. Dinus

[5] I became close friends with Wells—he and his wife Judy had two girls about the same age as our children, and we moved into a house in Long Beach across the street from them.

was not the only factor—decreasing budget allocations also played an important role in the contraction of the SIFG.

Dinus and I got along fine, and he supported my application for GETA[6] training to finish my Ph.D., and I was determined to remain productive. For example, while working temporary duty on my coursework at the University of Florida, I directed my technicians Herschel Loper and Horace Smith in their usual research work back at the HEF, published six papers, and presented work at two meetings. Dinus moved on around 1979 and took a lab director position with International Paper Company's brand-new forest genetics research unit near Corvallis, OR, to build a lab starting from scratch.

Dinus was replaced as project leader by Calvin Bey, a genetics researcher working on black walnut (*J. nigra*) who came from a hardwood genetics project of the North Central Forest Experiment Station in Carbondale, IL. Bey brought a calm and temperate demeanor to the position. Bey's express purpose in taking the SIFG's project leader position was to move upward into Forest Service management. After a few years, he took a position in Alaska as an "über" project leader (more than a project leader but not an assistant director). After a few years there, Bey took a staff position at the Washington Office. After Bey left, Wells was appointed project leader around 1984. Wells' management style was similar to Schmitt's. The bureaucratic work was a bother to Wells, and he had plenty of work to do managing his own research.

> *"As the newest thing in forestry, there was a lot of interest in genetics and tree breeding at this time. University forestry student groups were common in the summer, and we also had tour groups associated with national and international meetings, mainly affiliated with the International Union of Forestry Research Organizations (IUFRO).*

Margene Griggs was hired as a technician in 1973, with an M.S. degree, and worked on epidemiology of brown spot needle blight. She took a GETA transfer to the University of Florida around 1976 as I had earlier, finished the coursework and exams for the Ph.D., and then returned to Gulfport in 1978. She was promoted to a scientist grade. She and I cohosted the SFTIC in 1985 at Long Beach, MS. She resigned around 1990 and took a teaching position at Bob Jones University.

REMOTE SIFG SCIENTISTS, CHINESE VISITORS, AND "MOON TREES"

Over the years, we had scientists in the SIFG project who were remotely located. I have already mentioned Gene Namkoong and Tom Cooper. The SIFG also had Hoy Grigsby at the Crossett Experimental Forest (CEF) in Arkansas and a whole genetics subproject located at Normal, AL. Grigsby was an interesting character. He made a lot of plus-tree selections on the CEF and controlled crosses and planted several progeny tests. Just like Bayne Snyder, Grigsby was a great tree climber. He was also a clever innovator. I remember on one of my trips over there that he was having trouble with cone and seed insects but was having difficulty getting insecticides up into these tall pines. He solved his problem by installing a galvanized pipeline up the trees with spray nozzles at the top. He could connect his pump at the bottom and then spray the required dose in a few minutes. Grigsby eventually found out that the pipes needed to be grounded, because they acted like lightning rods. However, they did protect his breed trees from lightning. Grigsby was the last scientist at the CEF before it was closed in 1974;

[6] Editor's note: The "Government Employees Training Act" (GETA) was originally passed in 1958 to allow the Federal Government to pay for the furtherance of the education of their researchers. Thaddeus Harrington would describe this as a "wonderful law" that allowed the Forest Service to "develop our own experts from people we knew were producers" (Harrington 1999: 407).

he was allowed to spend some of his time there until he retired to continue some valuable experimental plantings that were in the area.[7]

In the 1990s, the SOFES began an outreach effort by opening a subproject at Alabama A&M University, an HBCU (Historically Black Colleges and Universities) institution. The team's goal was to get students there interested in doing forestry research, while doing some research themselves. That whole group seemed to be in a constant state of flux. At first around 1990, Sam Foster and Jane Ford-Logan made up the unit; they were later joined by Alex Diner and Jimmy Reaves. It finally became a separate project with Foster as project leader; later, Jimmy Reaves became project leader. By 2000, the whole subproject team had been scattered. Foster became an assistant director. Although he remained with the SIFG, Diner went to University of Florida, and Reaves went to the Forest Service's Washington Office. Later, Foster left the Forest Service to become dean of forestry at Mississippi State University, but he was there only a couple of years before he came back to the Forest Service (he eventually became the director of the Rocky Mountain Research Station).

The SIFG often had visitors, including international ones, that I recall. As the newest thing in forestry, there was a lot of interest in genetics and tree breeding at this time. University forestry student groups were common in the summer, and we also had tour groups associated with national and international meetings, mainly affiliated with the International Union of Forestry Research Organizations (IUFRO). Some of our most notable international visitors came from China. For example, after many years of contacts with Taiwanese foresters, we started getting visitors from the People's Republic of China. I remember one group of a dozen foresters from China and their interpreter (I expect he was also their "minder": someone with political connections who would make sure his charges did not misbehave). He spoke perfect English. He said he had trouble translating some of the terminology, because he did not know much about forestry. He also said that whenever he visited Hong Kong, he spoke English, because he did not know Cantonese (only Mandarin). In conversations with this interpreter, I found out that he had been in the Korean War. He was one of the millions of Chinese who came across the Yalu River when the Chinese entered the war on the side of North Korea. I was just a few years too young for service in the Korean War, but I knew a lot of veterans. I recall one comment that he made that "the Americans had excellent equipment but were not very determined soldiers." We discussed the background of World War II, General McArthur, politics, and more. It was very interesting hearing his perspective on the Korean conflict.

On a different occasion, one afternoon I was asked to play host to a very senior Chinese forester and a more junior forester who was his interpreter. Unfortunately, his interpreter only knew Mandarin and Spanish. The senior only knew Mandarin. They were on their way to a meeting in Mexico City, and decided to drop by Gulfport, not realizing that we did not speak Spanish in this area. I

Hoy Grigsby using a Swedish tree-climbing ladder to scale a superior loblolly pine on the Crossett Experimental Forest to install a spray device to protect cones from insect pests, March 1963. (USDA Forest Service photo [negative #505655] taken by Dan Todd)

[7] Once long-time CEF Project Leader Russell R. Reynolds retired, the SOFES began shutting down the CEF and assigning staff elsewhere. After Grigsby's retirement, it was discovered that the deed that transferred the CEF to the Forest Service contained a reversion clause if the agency was not conducting research on the property to the end of a 50-year period (in other words, January 1, 1984). See Bragg (2023) for some more details of the events during this closure period. While Grigsby's genetics projects on the CEF that were closed were never formally reopened, some remain to this day on the forest and continue to provide some new knowledge (see Bragg 2021).

enlisted the help of my wife Elaine, who also has a good knowledge of Spanish. We drove down the beach, went by to look at the shops in the mall, and stopped at other points of interest. We were explaining everything in Spanish, which the interpreter translated into Chinese for the older man, who then made comments and asked questions in Chinese, which the younger man translated into Spanish, which we translated into English in our heads, then back to Spanish, then to Chinese and back again. It was comical but exhausting, because Elaine and I seldom got a chance to speak Spanish. Another interesting observation: the elder visitor noticed a sign in one of the shop windows that said "30% off"—a concept he did not understand. In China, the price is the price. The concept of profit made no sense to him, as this was years before capitalism started creeping into the Chinese economy.

One of the things that generated a lot of publicity for the SIFG during its "heyday" was its affiliation with a publicity generated by the Forest Service's "Moon Trees" project. Around 1970, during Project Leader Schmitt's administration, then-Forest Service Chief Ed Cliff suggested to astronaut Stuart Roosa that he take some tree seeds to the moon and back on the Apollo 14 flight to see what effect it might have on growth. Roosa was interested in forestry and had been a smokejumper in his youth, so he agreed. Schmitt got a call from John Barber (then of the Washington Office's silviculture staff, formerly Project Leader of the SIFG), and he went scrambling for some loblolly pine, sycamore, and sweetgum seed. They were easily obtained at the HEF and sent to Cliff. The IFG in Placerville provided redwood (*Sequoia sempervirens*) and Douglas-fir seed. When the mission was over, the well-traveled seed were returned to us at the SIFG and to the IFG, germinated, and grown into seedlings—and earned the nickname "Moon Trees." I recall Bob Hare and Bill Beland took great care in handling the propagation. The seedlings germinated and grew normally. They were distributed around the world as part of the U.S. bicentennial celebration in 1975–1976.

Over time, people largely forgot about the Moon Trees project. Some 20 years later, a teacher in Arkansas found one of the loblolly pines with a plaque identifying it as a Moon Tree, which triggered a worldwide search for other surviving trees. Around 2010, I met Roosa's daughter Rosemary in the Gulfport Yacht Club's bar. I happened to be wearing an SIFG T-shirt, and she zeroed in on me. Rosemary had been out to the HEF, looking for loblolly pine Moon Trees that had been planted there. The HEF Forest Supervisor "Big Larry" Lott agreed to graft scions of the Moon Trees onto seedling rootstock and provide these to her. For this deed, Lott was featured in a February 28, 2011, article by a local paper (*The Sun Herald*). Another 15 minutes of fame for us from the Moon Trees project!

THE OTHER PROJECTS AFFILIATED WITH THE SIFG

I should include some history of the other research units colocated with the SIFG at Gulfport and elsewhere between 1960 and 1995, because we often worked closely with them and had plenty of social interactions as well. From playing bridge at lunch to playing volleyball on Sunday afternoon in Ozzie Wells' yard, we all got to know each other.

Most prominent among these other units was the forest pathology group, a logical fit as traditionally the most important approach to plant disease problems has been through genetics and resistance breeding. When I joined the SIFG, there were a number of scientists working in pathology. Glenn Snow came to Gulfport in 1957 and was their project leader when I arrived a decade later. Snow worked extensively on the search for genetic resistance to fusiform rust in southern pines. He and Fred Jewell had successfully developed a system for inoculating slash and loblolly pines with fusiform rust spores to look for resistant families. This was important work which led to the development of the resistance testing center on the Bent Creek Experimental Forest near Asheville, NC, and helped alleviate a major challenge to the widespread planting of loblolly and slash pine across much of the South.[8]

Rob Doudrick around 1990, in an old-growth longleaf pine stand in Flomaton, AL. Doudrick later became project leader and eventually Southern Research Station director.

I always take great pleasure in recounting a story about Snow and some visiting plant pathologists from Holland and Germany. They had been attending a forest pathology meeting and stopped to tour our research establishment. At lunch time, Snow decided to take them to An-Jac's Barbecue Restaurant to give them some local flavor at a well-known restaurant located only a few blocks from the Gulfport Lab. When they arrived, they went straight in and through the buffet line. When it came time to leave, Snow looked for someone to pay. It was then that he realized he wasn't in An-Jac's Restaurant—rather, he had stumbled upon a charity soup kitchen called "Feed My Sheep"! So, he left a donation and went back to the lab somewhat embarrassed.

Until he retired around 1980, Al Kais was examining spread of brown spot needle disease of longleaf pine. Ron Froelich was very nearly finished with his work on the silvicultural control of the root disease *Fomes annosus.* Felix Czabator, who retired around 1984, was examining mycelial growth of *Cronartium*. Charlie Walkinshaw had gone on a temporary assignment around that time. NASA's Lunar Receiving Laboratory in Houston, TX, needed someone who had a good knowledge of sterile technique. They had no idea what they might be introducing when they brought dust and rocks back from the moon. Walkinshaw and his colleagues determined that there was no apparent danger inherent in the moon rocks. After years of high-profile work at NASA, when he came back from Houston around 1985, Walkinshaw was never able to adjust to the mundane environment of Gulfport. In 1989, Snow hired Rob Doudrick to carry on his work with fusiform rust; Doudrick worked on genetic mapping and molecular cytogenetics. In 1990, after their long-time Project Leader Snow retired, the SOFES merged this unit with the SIFG.

The Wood Products Decay project long had a wide influence by conducting a number of long-term decay tests. For example, when you see a pile of logs being continuously sprayed with water to preserve them, this was because of the research carried on by this project. My favorite has always been the fence post line study, which has been going on more than 50 years. Several miles of fence posts, treated with various preservatives, were installed at 4-foot spacing. At measured intervals, a researcher would walk the fence line, kicking each post and recording whether or not it fell over.

The Wood Products Decay project was led by Rod DeGroot. DeGroot had a rather rigid, inflexible style of management. I only recall one other scientist in the project, Terry Amburgey. He had a lot of good ideas on speeding up

[8] Editor's note: See an excellent history of this Asheville screening center in Cowling and Young (2013).

testing of preservatives on wood decay, and he and I cooperated on a couple of studies on the decay susceptibility of wood samples of differing genetic and silvicultural backgrounds which produced two peer-reviewed publications. Amburgey eventually left for a faculty position at Mississippi State University. The Wood Products Decay project was closed before the Gulfport Lab shut down, and DeGroot transferred to the Forest Products Laboratory in Madison, WI. For years after his transfer, he would come down to the HEF in the winter to score decay studies.

The entomology project (Wood Destroying Insects, also known as the termite project) had a rather unique role in Forest Service research and development. This project had a congressional mandate to conduct long-term efficacy tests of all termite treatments for buildings. There must have been some real chicanery in the past in selling such treatments to have brought this kind of directive for a Government research project—especially one with a fat line-item budget. This testing activity, though no longer exactly research, occupied a great deal of the termite project's energy.[9] In 1967, H.R. "Mr. Johnny" Johnston was the termite project leader. Though short in stature, he was long in influence—he was the "Boss." Mr. Johnny retired shortly after I arrived, probably around 1970. He was replaced by a young scientist, Mike Haverty. He was an outgoing, friendly guy, with a dry, sometimes snarky, sense of humor. Haverty was a good project leader with an acerbic wit not appreciated by all. After a few years, Haverty transferred to a research unit in Berkeley, CA. It was no coincidence that his wife's family owned a vineyard in Napa Valley, right up the road from Berkeley. Haverty was replaced by the low-key and amicable Joe Mauldin.

"The entomology project (Wood Destroying Insects, also known as the termite project) had a rather unique role in Forest Service research and development. This project had a congressional mandate to conduct long-term efficacy tests of all termite treatments for buildings.

The entomology project was almost as large as the SIFG and also hired new scientists. U.S. Army veteran Lonnie Williams came about the same time that I did. He became very interested in using borate treatment in wood preservation, especially for use in log houses, which were popular at that time. He had a lot of support among users, but the administration was not impressed. He eventually resigned and pursued a career in consulting (wood products). Ray Beal was probably the most prominent scientist in the entomology project. He was *the* expert on termites, and hence did a lot of foreign travel consulting on termite control. I recall that his father was a Forest Service division chief in the Washington Office. I knew him fairly well, as his children went to school with mine, as well as those of Wells (one does get to know people through their children). Beal was sociable, playing bridge at lunchtime and volleyball on Sunday afternoon. Beal retired around 1990 and moved to a retirement village in Arkansas. He did a good bit of consulting after retiring. He was an avid tennis player and spent a great deal of time officiating at tennis tournaments.

C.E. "Skip" McDaniel transferred in from the nearby USDA Animal and Plant Health Inspection Service lab. He was an organic chemist who was doing some analysis of wood extractives as they are related to insect toxicity. He had a wonderful new mass spectrometer, so naturally I promoted a collaborative study of geographic variation of monoterpenes in shortleaf pine. McDaniel was a good cooperator. He took an early retirement when the project moved to Starkville, as he had family issues which did not allow him to leave the coast. He finished out

[9] Editor's note: This project, now part of the Durability and Wood Protection Research unit, was administratively transferred to the Forest Service's Forest Products Laboratory around 2014.

his retirement teaching chemistry at the community college. I still see McDaniel at the Gulfport Yacht Club occasionally. Susan Jones worked on the ecology of termite infestations. Some of her work was in Arizona, which was part of her dissertation research. She married a wildlife biologist and moved to Arizona.

I am somewhat hazy as to work that the other scientists in the unit were engaged in. I did not know chemist Fairy Lyn Carter and entomologist Virgil Smith very well. I recall that there was some research being done on the gut flora of termites, a logical thing to study since the termites were totally dependent on these microorganisms to digest the wood that they consumed. Brad Kard came to the project in the 1980s, and then left for a position at Oklahoma State University before 1995. Kard later rejoined the unit after it had moved to Starkville. Of all the scientists and technicians in the entomology project in Gulfport, the only one that I know of to take the transfer to Starkville was a senior technician, Ted Roland. Everyone else retired or resigned.

Most of the personnel in the Southern Institute of Forest Genetics in 1987. Left to right: Sonya Sonnier (Youth Conservation Corps), Jim Hamacher, Warren Nance (Project Leader), Francis Falvey (Senior Program), Tony Rayford, Louise Quinlan, Herschel Loper, Jim Grissom, Kaye Mansfield, Norris Bond, Jack Schoenewicz, Ron Schmidtling, and Holly Lee.

TRANSITIONS TO THE PRESENT DAY

Around 1987, Ozzie Wells retired to the ski slopes of Utah, and Warren Nance was appointed project leader. At the suggestion of the then-SOFES Station Director T.H. Ellis, the emphasis of the work of the SIFG shifted from quantitative genetics to molecular. Nance had been engrossed in the genetics of growth and yield, but soon realized the possibilities of using genetic markers in assisting breeding for disease resistance. There had been a program for restoring the disease-ravaged American chestnut (*Castanea dentata*) through hybridization with resistant Asiatic *Castanea* species; to support this nostalgia came research money.

C. Dana Nelson joined the project in 1987 and started working with Glenn Snow, Charlie Walkinshaw, and Rob Doudrick on fusiform rust genetics and with Nance and Doudrick on molecular genetics. Sometime later, Nelson was joined in this work by Tom Kubisiak and eventually Craig Echt. Kubisiak's Ph.D. work at Louisiana State University was partially supported by the unit where Nelson served as a committee member. The work initiated quantitative trait loci (QTL) mapping in hybridized pines using Random Amplified Polymorphic DNA (RAPD) markers. The use of RAPD markers was made possible by the recent invention of polymerase chain reaction (PCR), which Nance, Nelson, Kubisiak, and technician Glen Johnsen performed by manually moving microtubes repeatedly between water baths set at three different temperatures. Echt came to the SIFG through a circuitous route. First, he was employed at the Forest Service's Northern Institute of Forest Genetics in Rhinelander, WI. He left there to take a research position at the Forest Research Institute at Rotorua, New Zealand, returning years later when a change in that country's government caused the loss of funding and positions. When Echt returned to the United States, he took a term scientist position through support provided by an external grant to work on the molecular genetics of pondberry (*Lindera melissifolia*), an endangered shrub; he would later be permanently incorporated into our project.

Ron Froelich, after becoming a part of the SIFG in the merger with the forest pathology project, had finished his silvicultural project on *Fomes* and needed another project to help integrate his work. In February of 1991, we took a field trip to measure a loblolly planting in Maryland and a shortleaf planting in New Jersey

Four of the new laboratories on the Harrison Experimental Forest. Number Four (foreground) had a special solid microscope mount for Rob Doudrick's new fluorescent genetic mapping (molecular cytogenetics). This work was taken over by Nurul Faridi (stationed at Texas A&M University) when Doudrick left.

(the Maryland planting was successfully measured, but a snowstorm prevented the measurement of the New Jersey planting). Shortly after we returned, I departed for a short sabbatical at Oxford University in England to research provenance tests and long-term forestry studies in Europe. When I returned in October 1991, I learned that Froelich was seriously ill with a very aggressive case of cancer. He had been one of the healthiest people I knew, and there was no hint of trouble during our field trip. Even after trips to Houston, University of California-Los Angeles, and Minnesota seeking treatment, Froelich continued to decline and he died within a year.

As the push to go molecular ramped up, Nance felt the need to do some intensive study. His background was forestry and statistics, and he had little or no expertise in biochemistry and plant physiology. Nance decided to take an in-place sabbatical to intensively study the latest techniques in molecular genetics, and he set up a lab in a garage that had been converted to a laboratory. I was appointed acting project leader for fiscal year 1990 while Nance sequestered himself. When he emerged from his isolation, Nance was ready to conquer the world of molecular biology. Personally, I resisted shifting over to molecular, although I did make good use of allozymes in studying population genetics and diversity. I had a lot of work in the mill, of a traditional nature, that I felt I needed to finish. I subscribed to the notion there was no point in doing the research if the results were not disseminated in some way.

For years, a rumor circulated that the whole Gulfport establishment would be moved to Mississippi State University. As budgets tightened, this started to look like a real possibility, especially as the Gulfport Lab began needing serious repairs. One problem was the asbestos used in the construction. I could not believe that asbestos would be permitted in a government building built in 1960, but it was! There was already a movement afoot to transfer the entomology unit to Starkville and to move what was left of the wood decay unit to Madison, WI. Nance did not want to relocate to Starkville, so he set about figuring ways to move the genetics project back to the HEF, from whence it came. He knew that there was not enough space in the HEF buildings to establish molecular genetics laboratories. I think that he felt that he could preempt a move to Starkville by building labs at the HEF and moving before anyone knew we were missing. Nance took matters into his own hands and started five new lab buildings on the HEF, buying materials with project funds and using our technicians as carpenters, plumbers, and electricians. The money that was used for materials and subcontractors came to the project as a result of the salary savings after Froelich died.

Unfortunately, Nance did not go through the procedures required to construct buildings on Federal property. It would have taken a great deal of time, and he did not have the patience required. I think Nance operated under the old maxim that it was easier to ask forgiveness than get permission. While this effort may have been the salvation of the SIFG, it caused a lot of problems.

Nance retired in 1995, around the time the project vacated the Gulfport Lab completely. After Nance left, I became acting project leader again, and Jimmy Reaves was also acting for a short time. Other transitions also occurred during the mid-1990s. Nelson left the project in 1994 to take a research position at

International Paper's Southlands Experiment Forest and Research Lab in Georgia. That same year after receiving the Marcus Wallenberg Prize, Gene Namkoong retired from the Forest Service. Without the cachet of Namkoong's fame, support for his pioneering project at North Carolina State University was no longer available, so that effort was closed. This left Jim Roberds, his right-hand man, without a job. I arranged for him to be transferred to our unit while I was acting. I recall that Roberds and I wrote a letter to acting SOFES Station Director Pete Roussopoulos supporting Doudrick for the position of project leader of the SIFG, a position he was appointed to in 1996.

A 2001 field trip to the Longleaf Pine Diallel during an advisory visit by Gene Namkoong. Left to right: Floyd Bridgwater, Mike Stine (Louisiana State University), Brian Strom (Southern Research Station, Pineville, LA), Jim Roberds, Jennifer Myzewski, Bayne Snyder, Gene Namkoong, and Bill Cibula (NASA).

The Southern and the Southeastern Forest Experiment Stations began the process of merging in the early 1990s, and by 1996, they had merged into the Southern Research Station (SRS), headquartered in Asheville. Doudrick had a real talent for budgeting, so Roussopoulos had him frequently detailed to Asheville. In 1999, SRS permanently moved Doudrick to Asheville in an assistant director position. This was a gain for administration but a loss for science. "We barely got to know ye, Rob!" After a number of years, Doudrick moved to the Washington Office and served for a while as an assistant director with the North Central Forest Experiment Station before returning from the Washington Office to become the SRS's director in 2011. (As I began writing this tome in the summer 2021, Doudrick had announced his retirement.)

I once again became acting project leader, but only for a short time before the Station brought in Floyd Bridgwater who had transferred to College Station, TX, from Raleigh, NC, a short time earlier. Bridgwater's reign could be characterized as similar to Dan Schmitt's—laissez faire. I got along fine with Bridgwater, and I recall one incident that showed that Bridgwater was paying attention. I had a habit of attending two or three international or national meetings a year to give a paper on some aspect of my research. Bridgwater wondered how I could be doing that, and he decided that I must be giving the same paper over and over again. So, he checked up on me, only to find out that I always gave a paper with new results on a different subject. I always had enough work on the "back burner" to come up with a new paper to fit the theme of a meeting. We both had a chuckle when he recounted this story to me.

Around 2002, we hired a young Ph.D., Jennifer Myzewski, designated to replace me in some of my projects. She left the Forest Service for medical school.

After a good career, I retired in 2003. I began my career at the SIFG with the rank of GS-9 and after 36 years retired as a GS-15. My involvement with the SIFG continues to this day as an emeritus scientist, with no rank and not much clout but still doing some research. On occasion, I have continued to represent the work of the SIFG. For instance, I ran into Sam Foster in 2010 at the IUFRO Congress in Seoul, Republic of Korea (I gave a paper at the meeting, but I was there at my own expense). I remember his opening greeting: "Ron! I knew you were retired, but somehow, I expected to see you here!" He was the same, affable Sam.

I have also provided some institutional memory otherwise lost to time—such as when, around 2006, someone from SRS Headquarters called in a panic because they "lost" an experimental forest. The call was referred to me since I had been around the longest. "Do you know anything about the McNeil Experimental

Southern Institute of Forest Genetics personnel in 2008. Left to right: Ron Schmidtling, Dana Nelson, Yousry El-Kassaby (visiting scientist from the University of British Columbia), Tom Kubisiak, Milan Lstiburek (visiting from the Czech Republic), Craig Echt, and Jim Roberds.

Forest?" I explained to them that the McNeil had been closed around 1957, and the land was swapped for a tract contiguous to the De Soto National Forest around 1971. An old-timer's knowledge was useful. Case closed!

In 2005, Bridgwater retired to his fish camp on the coast of North Carolina. Nelson replaced him as project leader and continues to lead the research work unit, which includes the SIFG, the Southern Institute of Forest Productivity (team located at Research Triangle Park, NC), and the Institute of Forest Health (located at Lexington, KY). Currently, Nelson splits his time between the HEF and an office on the University of Kentucky campus. Kubisiak resigned around 2008, and Echt retired in 2018. Roberds also retired in 2008 but remained active in research and engaged with the current HEF staff. Jim Roberds recently passed away, while still active in research.

IN CONCLUSION

Today, the SIFG is a mere shadow of its former self. It has been and remains very productive, however. Over the years, the SIFG played an important role in the use of genetically improved planting stock that has become the standard industrial silvicultural practice across the Southern United States. Furthermore, real progress is being made in rescuing species such as the American chestnut through a combination of breeding and molecular manipulation, and somewhat similar work is progressing by many on critical projects such as seeking genetic resistance in ash trees to an exotic invasive insect, the emerald ash borer (*Agrilus planipennis*).

Getting research information out to the users is certainly important. The customary measure of research productivity is publications. I do not have a number for the SIFG, but I would estimate that our output would be measured in thousands. I do know that my personal resume contains well over a hundred publications, and I am a small part of the organization.

Finally, I must repeat the old cliché: "More work needs to be done." That is certainly true in genetics, as almost daily we learn of a new threatening climatic situation, or a disease or insect, whose virulence will be exacerbated by climate change.

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The first notion that I might write about the history of my work unit came when I read a dog-eared copy of Phil Wakeley's *A Biased History of the Southern Station* many years ago. This provided the impetus plus a part of my own title. Most important was a stash of old photos and documents that technician Charles Burdine encountered while composing a PowerPoint presentation of the history of the HEF, in his role as Experimental Forest Coordinator. Certainly, edits and suggestions by Don Bragg, Dana Nelson, and Nancy Koerth were very helpful.

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An Incomplete Roster of the Southern, Appalachian, and Southeastern Forest Experiment Stations, 1921–1995

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For the first 75 years of its century-long history, the Southern Research Station (SRS) consisted of two separate forest experiment stations. Both the Southern Forest Experiment Station (SOFES) and the Appalachian Forest Experiment Stations (AFES) opened in July 1921; after multiple boundary shifts and a renaming of the AFES to the Southeastern Forest Experiment Station (SEFES) in 1946 (SEFES 1946), they were finally merged in 1995 into the SRS. During these decades, many hundreds of people worked for these research stations. When most people think about staffing in U.S. Department of Agriculture Forest Service, Research and Development, they probably think of the scientists first, and then the administrators. In part, this is because most of the documentation available on station staffing focuses on the scientists and higher-level administrators. A complete roster of those who worked for the stations would have been dominated by people in supporting positions, whether field assistants, professional staff, clerks, business administrators, human resource professionals, maintenance staff, secretaries, analysts, equipment operators, laboratory technicians, or many other jobs. However, there is virtually no way to reconstruct full rosters because the needed personnel records simply no longer exist.

"For the first 75 years of its century-long history, the Southern Research Station (SRS) consisted of two separate forest experiment stations. Both the Southern Forest Experiment Station (SOFES) and the Appalachian Forest Experiment Stations (AFES) opened in July 1921.

Alternative sources of staffing information can be found—for instance, Forest Service organizational directories have been published by the agency since its inception and are a valuable source of personnel information. Unfortunately, these directories did not list every employee of the stations. This was per agency direction, which (until fairly recently) rarely listed people other than administrators, professional staff, and scientists. This practice was not specifically mentioned in these organizational directories until many years after the agency started publishing them. The first official acknowledgment of their incompleteness dates to the January 1949 organizational directory, which simply stated: "[The directory's] primary purpose is to present the names and headquarters of the Forest Service personnel responsible for various units, activities, and lines of work. It does not include all personnel." By the late 1960s, the wording changed slightly, but still contained the same message—the organization directory only listed those persons "chiefly responsible for the various units, key functions, lines of work, and research projects. THIS IS NOT A DIRECTORY OF ALL PERSONNEL." (their emphasis). When the first organizational directory that included the SRS was produced in 1995, the disclaimer at the end

Microbiologist **Thelma Perry** at work at the Alexandria Forestry Center in Pineville, AL.

of the document specified that the directory listed “personnel chiefly responsible for the various units, key functions, program managers, and/or research projects at the GS-11 and above level only. It also lists the support person that reports directly to the head of the unit only.”

A prominent example of this systemic exclusion is the case of Thelma J. Perry. Perry was a biological laboratory technician hired around 1970 by the SOFES to work in the Station’s forest health research program at the Alexandria Forestry Center in Pineville, LA. According to Blackwell and Sullivan (2022), Perry worked in a “highly independent” fashion and eventually was promoted to the professional position of microbiologist. She earned this recognition through her years of hard work and contributions to the mycological profession [for example, by authoring or co-authoring a number of scientific and technical publications, including Barras and Perry (1971), Blackwell and others (1986a, 1986b), Moser and others (1989), Levieux and others (1989), and Perry (1991)]. Although her work has been credited by some of her peers as groundbreaking and critical to research on the impacts of fungi carried by bark beetles (Blackwell and Sullivan 2022, Blackwell and others 2020), neither of her formal positions were included in any of the Forest Service organizational directories during her nearly three-decade long tenure with the agency. Interestingly, Perry was one of seven persons identified as members of the Southern Pine Beetle research work unit (SO-4501) in an agency-wide biodiversity research directory (Ruark and Nisley 1993), but this biodiversity directory was also inconsistent and incomplete in how other unit staffs were reported.

Robert Lewis, Jr., provides another example of this higher-level bias in the Forest Service organizational directories. Lewis started with the Forest Service in 1970 as a biological laboratory technician with the SOFES and would move on to become a research plant pathologist at Stoneville, MS, in 1976. He eventually held higher administrative positions, including station director for the Northeastern Forest Experiment Station between 1992 and 1997 and then later the deputy chief for Research and Development in the Washington Office. As a biological laboratory technician for 6 years, Lewis did not appear in any of the organization directories; his "emergence" only followed his ascension to a research scientist position.

How many other permanent employees were excluded from these sources is unclear and will never be known. That fact has not kept organizational directories from forming the basis of other reconstructed station rosters. For instance, Schrepfer and others (1973) developed, from unspecified sources (presumably organizational directories) a list of primarily professional staff of the Northeastern Forest Experiment Station and its predecessors from 1923 to 1973; Merz (1981) did the same for the Central States Forest Experiment Station. To be more inclusive, others have reconstructed rosters from more diverse sources. Rudolf (1985) produced a more complete approximation of the staffing of the Lake States Forest Experiment Station between 1923 and 1966 using organizational directories, a series of Station annual reports, and other internal Station documents. Perhaps knowing that their staffing records are inevitably incomplete, some recent histories have not even attempted to produce a roster, e.g., Ross (1998) and Klade (2006).

To bolster our efforts' completeness, we too have sought additional sources of Station employees. As an example, the SOFES and AFES annual reports from 1921 into the early 1940s included more complete listings of staff (often with lower grade and even temporary workers). We have also added a number of persons documented as Station employees in other outlets (see app., p. 244). For instance, a document from the archives of the Crossett Experimental Forest suggests how substantial the number of the "missing" may be. A list of employees (see table, p. 241) spanning two decades (1939–1959) of the Crossett Branch Station (creator unknown) was put together in about 1960 for unknown reasons. Even this list is incomplete; while a few researchers are noted, other Crossett scientists who worked during this period—including long-time Project Leader Russ Reynolds—are not included. Another curious absence from this Crossett list is a man named Jasper Burnes. Burnes had first started working on the Crossett Experimental Forest in the mid-1930s as a laborer with the Works Progress Administration, and according to Reynolds (1980), he ended up being a trusted employee who lived and worked on the Crossett Experimental Forest until he retired many years later (Bragg 2023). Yet Burnes does not show up on this list; the only documentation we found regarding his work with the Station comes from Reynolds (1980).

Even if perfectly inclusive, these published sources would not capture every employee, as some would be hired after they had gone to press and move (or quit) before the next volume was generated. It is clear that a number of those employed at Crossett were only there for days or weeks (see table, p. 241); their short tenure with the Station would have guaranteed that they did not appear in the agency's traditional personnel reports and directories. Sometimes global events affected staffing trends in ways that influenced their appearance in these directories and reports. For instance, large numbers of Forest Service personnel "disappeared" from the agency's roster during World War II as they entered either military service or moved into other civilian agencies in support of the war effort. Many of these returned to the Forest Service in 1945 after the formal organizational directory had been published for that year—fortunately for the

SOFES, their 1945 annual report issued at the end of the calendar year had most of these returnees listed. Prior to 1954, Forest Service directories included a number of staff that were formally part of different USDA bureaus, including the Bureau of Plant Industry (focusing on tree diseases) and Bureau of Entomology (forest insects). At the time, USDA rules required that the pathologists and entomologists in the larger agency be a part of these bureaus, rather than employees of the Forest Service, so they worked in close affiliation with the forest experiment stations on forest- or tree-related issues. In the early 1950s, USDA reorganizations changed this; by January 1954 these staff had formally become Forest Service employees. This roster includes these persons for their entire affiliation with the Forest Service, before and after this transition.

Finally, some of the challenges of assembling a list of employees had nothing to do with the decisions of the agency of who to include in organizational directories, and why, but rather more mundane technical issues. For example, we have not been able to find digital copies of some of the organization directories. This is partially due to the reality that no directories were published by the agency in 1947, 1955–1957, 1959, 1969, 1974, and 1996 (Forest History Society 2023) and we did not find alternative sources for some of those years. Note that there were also errors in the production of the original directories (e.g., some employees were given the wrong name, or their name was misspelled), others were difficult to read and may have been improperly transcribed for this roster-building effort, and others were absent or placed in the wrong location. Some staff had changed their names during this period (primarily, newly married women who took their husband's name), which may complicate their identification. In our attempt to reconstruct a roster of employees for these Stations from 1921 through 1995, we used any available information to identify those people who definitively worked at given time intervals. To do this, any reliable source of staffing has been used; most of this information comes from published Forest Service staff directories that were produced periodically (at least once, and sometimes multiple times in a given calendar year), while other information came from Station annual reports (e.g., SEFES 1946), other agency publications (e.g., Reynolds 1980, Ruark and Nisley 1993), and available unpublished materials, such as a "briefing book" (SOFES 1986) (see table, p. 241, and app., p. 244).

THE VALUE OF A RECONSTRUCTED (IF INCOMPLETE) ROSTER

So why make this effort? The Stations' rosters offer an important glimpse into the people (and their positions), places, programs, and circumstances surrounding them; this information is generally best gleaned from the annual Station reports (until they quit including annual lists of Station staff and close affiliates). For instance, it is possible to make informed assessments of some of the staffing benchmarks found within these Stations. Determining female participation in the Stations' early work is an excellent example of this roster effort. The first women to work for either the AFES or the SOFES were in clerical positions; in the AFES, this distinction fell to Josephine Laxton, who was listed as a forest clerk in the 1921 annual report. In the SOFES, Vera M. Spuhler was a senior clerk, a position she held (later, as Vera Lind) from 1921 until 1946. In addition to clerical work—which included stenography—women during the early Station years also could be found working with some of the nascent computational technology available, such as Calculating Machine Operators or Tabulating Equipment Operator, as well as Telephone Operator.

Women began to appear, albeit in a very limited sense, in the researcher positions in the AFES and SOFES by the 1930s. The first woman scientist in an experiment station (not including the agency's Forest Products Laboratory) was Margaret Cordelia Stoughton (Margaret Abell, after her 1931 marriage to fellow AFES scientist Charles Abell), who was appointed to the AFES as a junior forester in 1930 (McNab and O'Shields 2023). While Abell's historic position has been a well-documented first, less is known about the first woman scientist in the SOFES. According to the Forest Service organizational directories and Station annual reports, the first woman researcher (rather than office worker) in the SOFES was probably Mary L. Nelson, who was hired through a temporary Civilian Conservation Corps program in early 1938 as a junior plant physiologist. Nelson held this position until her resignation on April 30, 1940 (no reason was given for this departure). Although her tenure with the Station was short, she had a significant impact on some of the most prominent lines of research being conducted at that time. Wakeley (1981: 4–5) mentioned several of Nelson's contributions as important, noting: "…[the] work with seed made her the best team-mate I ever had in the forestation project." and then later "Laboratory Assistant Mary L. ("Polly") Nelson's epoch-making discovery of the role of light in the germination of southern pine seeds…[results that] were soon picked up and quoted all over the world." Regrettably, Nelson's revolutionary work appeared in only several low-profile publications (Nelson 1938, 1940a, 1940b) thereby limiting the broader recognition of her contributions. The fact that southern experiment stations hired women scientists in the 1930s, decades ahead of some of their peer stations [for instance, the first woman scientist in the Intermountain Station was not hired until 1975 (Klade 2006)] may be a delightful surprise to many!

"Women began to appear, albeit in a very limited sense, in the researcher positions in the AFES and SOFES by the 1930s. The first woman scientist in an experiment station (not including the agency's Forest Products Laboratory) was Margaret Cordelia Stoughton.

Ultimately, even an incomplete account of the persons working for the SOFES, AFES, and SEFES (see app., p. 244) is still a means to acknowledge those whose dedicated service created the foundations of the Station's century of research.

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Crossett Branch Station employee list, from as early as 1934 until late 1959 by name, job classification, and the period(s) they were employed.

Note that this list is not complete and may only represent people who had been hired and departed during this 25-year period. Some records had missing dates (signified by a “?”) and the meaning of “Int.” is unclear.

Last Name, First Name	Job Title	Dates Employed
Allen, Jessie	Forest Worker	July 20, 1952–October 31, 1955
Baker, Leon	Unskilled laborer	April 1–May 7, 1943
Barnett, Leroy	Carpenter	May 14–August 7, 1946
Barnett, Willie Mack	Carpenter	July 8–August 7, 1946
Bell, J.C.	Agricultural Aide	November 29–December 13, 1945
Berry, Roy H.	Agricultural Aide	August 21–September 7, 1946
Brewer, Ernest, Jr.	Woods Laborer	June 27–October 3, 1950
Bridges, Joe L.	Unskilled laborer	July 1, 1943–May 31, 1948 (Int.)
Bridges, Nathan	Unskilled laborer	September 15, 1947–February 21, 1948
Briggs, Luvelt	Unskilled laborer	August 4–September 15, 1947
Brooks, Davis	Faller-Bucker	June 30–September 11, 1953
Burns, Homer	Woods Laborer	May 31, 1949–April 13, 1951
Campbell, Benjamin C.	Senior Carpenter	March 6–June 28, 1944
Canada, Warner C.	Unskilled laborer	July 26–November 8, 1946 (Int.)
Canady, Johnny	Truck Driver	October 24, 1945–April 2, 1946
Carpenter, Elizabeth W.	Clerk-Stenographer	January 17, 1944–March 1, 1945
Cason, Robert	Unskilled laborer	August 2, 1945–January 24, 1946
Cason, Sam	Unskilled laborer	October 7–December 27, 1947
Childress, Festus C.	Unskilled laborer	January 5, 1945–December 13, 1946 (Int.)
Childress, Henry	Unskilled laborer	March 13–May 23, 1944; March 7–20, 1945
Childress, Roshell	Forest Worker	May 24–July 30, 1954
Childress, Vernon	Truck Driver	June 5–November 6, 1945
Crouch, Oscar S.	Unskilled laborer	April 24–October 14, 1944
Davidson, J. Herman	Unskilled laborer	March 4–April 2, 1946
Dawson, Grady	Truck Driver	September 16–October 29, 1948
Edwards, Louis G.	Faller-Bucker	February 21, 1949–June 30, 1951 (Int.)
Eldredge, Jr., Inman F.	Agricultural Aide	June 3–August 28, 1946
Elliott, Scipico W.	Woods Laborer	May 2, 1948–March 4, 1949
Evans, Frank	Unskilled laborer	February 7–May 23, 1944
Farrar, Charlie G.	Unskilled laborer	April 14–October 4, 1947
Forrest, William B.	Unskilled laborer	August 10–December 24, 1948
Fudge, Joe	Faller-Bucker	May 12, 1949–June 19, 1953
Gaidy, John W.	Unskilled laborer	August 15–October 10, 1947
Gaines, Edward M.	Forester	January 2, 1946–?
Gant, Columbus	Unskilled laborer	July 1, 1943–January 1, 1944
Gardner, Charles L.	Agricultural Aide	July 8–September 7, 1946
Garner, LeRoy	Agricultural Aide	July 15–September 7, 1946
Gilliam, Ed	Unskilled laborer	October 9, 1943–April 2, 1946
Gilliam, James B.	Unskilled laborer	January 21, 1943–February 27, 1945
Golden, Jr., James A.	Agricultural Aide	July 8–13, 1946
Goyne, John	Unskilled laborer	March 7–May 23, 1944
Green, Ossie Lee	Forest Worker	August 11, 1958–July 2, 1959

Last Name, First Name	Job Title	Dates Employed
Grice, D. Owen	Forestry Aide	June 27, 1945–January 26, 1951
Hankins, Carol Dean	Faller-Bucker	May 10–July 20, 1951
Harbison, Fred Edward	Unskilled laborer	August 25–December 10, 1948
Hargrove, Rafe	Faller-Bucker	November 1, 1950–April 30, 1951
Harper, Sammie J.	Minor Forest Guard; Patrolman; Fire Prevention Guard; Fire Suppression Guard	August 27, 1942–?; November 16, 1942–?; October 22, 1943–April 17, 1944; September 25, 1944–?
Hedge, H. Dewey	Unskilled laborer	August 10, 1948–January 26, 1949
Hedge, J.T.	Unskilled laborer	August 10, 1948–January 22, 1949
Hodge, Adrian L.	Agricultural Aide	August 23–September 7, 1946
Jackson, Lewis	Faller-Bucker	March 29, 1948–June 30, 1951 (Int.)
Jackson, Lyndal G.	Unskilled laborer	October 23–December 18, 1946
Jackson, Willis L.	Unskilled laborer	July 2, 1946–September 15, 1947
Jacobson, Ralph A.	Research Forester	June 1–October 21, 1956
Jones, David	Unskilled laborer	October 23, 1946–January 9, 1947
Jones, James H.	Forestry Aide (Research)	July 12–August 13, 1948
Jones, Tharmon Lee	Woods Laborer	March 9–May 13, 1949
Jones, Thomas F.	Unskilled laborer	October 28–December 18, 1946
Jones, Walter H.	Unskilled laborer	November 9, 1948–July 21, 1951 (Int.)
Jordan, Delmar D.	Mechanic & Welder	May 21–June 30, 1945
Kelley, Ervin	Unskilled laborer to Senior Forest Worker	February 11, 1946–September 26, 1959 (Int.)
Kelley, Patrick T.	Forestry Aide (Research)	July 1–August 27, 1948
Langford, Joe	Unskilled laborer	September 27, 1943–March 10, 1944
Lewis, Harold	Faller-Bucker	May 10, 1951–March 14, 1952
Lewis, James S.	Laborer	November 7, 1950–August 26, 1955
Lewis, Sherman M.	Forest Worker	November 7, 1950–August 30, 1955
Mann, Jr., William F.	Research Forester	September 5, 1948–December 4, 1951
Maxwell, Charlie	Unskilled laborer	July 11–December 21, 1944; July 3, 1945–April 2, 1946; July 18–December 31, 1946
Maxwell, Jake	Unskilled laborer	March 22, 1944–April 2, 1946
McKillop, Theodore D.	Agricultural Aide	July 1–August 31, 1946
Middlebrooks, Wayne Curtis	Faller-Bucker	June 17–July 18, 1952
Miller, Carl E.	Unskilled laborer	April 24, 1947–March 19, 1948
Miller, James E.	?	November 27, 1946–October 2, 1950
Miller, John A.	Truck Driver	May 6, 1946–September 2, 1948
Mitchell, Lacy	Truck Driver	November 28, 1955–May 27, 1957
Moore, Jr., Joseph	Woods Laborer	August 17, 1948–March 4, 1949
Moseley, Jayne L.	Clerk-Stenographer	February 13, 1942–January ?, 1944
Nichols, Dan	Unskilled laborer	June 7, 1943–January 26, 1944
Nolan, W. Franklyn	Forestry Aide	October 19, 1953–June 30, 1954
Norris, Thomas J.	Bricklayer	June 6–30, 1946
Orr, Aubrey E.	Unskilled laborer	July 1, 1946–January 31, 1947
Parker, Chester	Truck Driver	July 29–August 21, 1948
Pitts, Walles	Unskilled laborer	January 21, 1943–April 12, 1946
Radford, Isaiah J.	Unskilled laborer	July 1–September 15, 1947
Radford, Lee C.	Woods Laborer	January 30, 1950–August 8, 1958
Rainey, Luther M.	Forestry Aide	June 22–July 24, 1953
Rawls, Billy G.	Agricultural Aide	August 20–September 7, 1946
Rice, McDuffie	Carpenter, Unal.[?]	March 30–June 28, 1944

Last Name, First Name	Job Title	Dates Employed
Rickman, Enoch M.	Unskilled laborer	November 27, 1946–March 8, 1947
Rickman, Joseph M.	Unskilled laborer	November 25, 1946–March 8, 1947
Robertson, John H.	Agricultural Aide	August 28, 1946–?
Robins, Charles E.	Agricultural Aide	August 30, 1946–?
Ruff, Otis	Woods Laborer	April 20, 1948–October 30, 1950
Sanders, Tommie J.	Unskilled laborer	November 18–December 10, 1948
Seamans, Jack D.	Unskilled laborer	May 14–August 6, 1946
Simpson, Edmond	Unskilled laborer	January 25–March 31, 1943
Smith, Elizabeth B.	Clerk-Stenographer	February 16–17, 1942?
Smith, Harold W.	Unskilled laborer	October 13, 1948–September 16, 1949
Smith, Marcus W.	Carpenter	March 24–April 21, 1954
Spratt, John T.	?	April 18, 1945–May 28, 1954 (Int.)
Taylor, David H.	Unskilled laborer	? 1943–January 9, 1948 (Int.)
Therman, Tommy	Faller-Bucker; Woods Laborer	March 9–April 1, 1949; January 17, 1952–?
Thompson, Porter	Faller-Bucker	June 30–December 29, 1952
Traylor, John	Laborer	? 1937–September 2, 1950 (Int.)
Tucker, Chester	Unskilled laborer	March 11–September 3, 1946
Tucker, Eugene	Unskilled laborer	April 22–October 14, 1944; December 13, 1946–April 4, 1947
Tucker, Isaac	Woods Laborer	November 8, 1948–April 1, 1949
Tucker, James	Unskilled laborer	March 6–October 14, 1944; July 2–November 6, 1945; April 5–August 12, 1946
Tucker, Lewis	Laborer	? 1934–October 29, 1954 (Int.)
Tucker, Wash	Unskilled laborer	September 24–October 25, 1943
Tucker, Willie	Unskilled laborer	January 21, 1943–October 7, 1947 (Int.)
Turner, Jr., G. William	Clerk-Stenographer	January 13, 1939–January 21, 1942
Wahlenberg, William G.	Forester	?–June 16, 1946
Washington, George	Unskilled laborer	February 12, 1946–October 16, 1948
Washington, Lacy A.	Laborer, Truck Driver	January 21, 1947–November 1, 1956 (Int.)
Washington, Lonnie T.	Forest Worker	April 14, 1958–March 30, 1959
Washington, Vell	Unskilled laborer	January 21–March 31, 1943; March 7–June 30, 1944
Watson, John B.	Unskilled laborer	February 13–December 18, 1946
Wesson, Doyle	Truck Driver	April 10–May 14, 1946
Whitmore, Betty Lou	Plant Physiologist	May 20–September 3, 1958
Whitmore, Willie	Unskilled laborer	March 29–August 7, 1948
Williams, Ashley G.	Jr. Agricultural Aide	?–February 12, 1942
Williams, Charlie Lee	Faller-Bucker	May 29, 1943–October 24, 1952 (Int.)
Williams, Glover	Unskilled laborer	July 1–August 14, 1943
Williams, Jewel	Unskilled laborer	April 1–29, 1943
Williams, Sumler	Woods Laborer	February 21, 1949–May 26, 1951 (Int.)
Wilson, Frank	Unskilled laborer	August 4–November 15, 1947
Wright, Van	Truck Driver	August 10–21, 1948
Zahner, Robert	Research Forester	June 1, 1953–January 30, 1959

APPENDIX

Employees recorded in organizational directories and annual reports of the Appalachian Forest Experiment Station (AFES), Southern Forest Experiment Station (SOFES), and Southeastern Forest Experiment Station (SEFES) from 1921 through 1995, the first year of the combined Southern Research Station (SRS). Even though long (just over 2,000 names), this is an incomplete listing of all Station employees, as (for various reasons) many were not included in the following sources of this partial roster:

Forest Service organizational directories from 1921 through 1995 (incomplete)

AFES annual reports, 1921–1940 (incomplete)

SOFES annual reports, 1921–1968 (incomplete)SEFES (1946) 25th anniversary report, 1921–1946 (no list of employees, but several references to names in text)

Additional information has been taken opportunistically from other published references, such as SEFES (1946), Reynolds (1980), Ruark and Nisley (1993), and Ross (1998); other unpublished sources, such as an unpublished SOFES "Briefing Book" from April 1986 also provided names in this roster.

Aamot, Arthur L. (1939), AFES
Abel, George W. (1945-1948), SOFES
Abell, Charles A. (1928-1937), AFES
Abell, Margaret Stoughton (1931-1936), AFES
Abernathy, Malcolm D. (1958-1990), SEFES
Abney, Hoyt L. (1984-1991), SEFES
Abrahamson, Lawrence P. (1969-1972), SOFES
Achtemeier, Gary (1991-1995), SEFES & SRS
Adams, Billie M. (1986), SOFES
Adams, Clayton S. (1986), SOFES
Adams, Herbert E. (1959-1962), SEFES
Adkins, Carl W. (1983-1992), SEFES
Ahern, Paul (1935), SOFES
Aldrich, Robert C. (1949-1954), SEFES
Alexander, Billie Jo (1990-1992), SOFES
Alexander, Mary E. (1938-1939), SOFES
Alexander, Mary L. (1986), SOFES
Alig, Ralph J. (1985-1990), SEFES
Allen, Jessie (1952-1955), SOFES
Allen, Peter H. (1959), SEFES
Allen, Robert M. (1950-1966), SOFES
Alpine, Robert G. (1966), SEFES
Altobelis, Anthony T. (1960-1982), SEFES & SOFES
Amburgey, Terry L. (1969-1979), SOFES
Amman, Gene D. (1959-1966), SEFES
Anders, Dee Dee (1993-1995), SEFES & SRS
Anderson, Dorcas A. (1940), AFES
Anderson, Eric A. (1944-1946), SOFES
Anderson, George R. (1934), AFES
Anderson, Honora C. (1942-1944), SOFES
Anderson, Linda M. (1980-1985), SEFES
Anderson, Louis B. (1948-1958), SEFES
Anderson, Roger F. (1943), AFES
Anderson, Walter C. (1954-1985), SEFES & SOFES
Anderson, Walter M. (1966-1970), SOFES
Andrew, Louis E. (1958-1959), SOFES
Andrews, Harry R.D. (1940), SOFES
Andrews, Jr., R.S. (1934-1936), SOFES
Andrews, Robert D. (1934-1943), SOFES
Andries, Curtis D. (1986), SOFES
Angelo, Ruth H. (1935-1936), SOFES
Ansel, John M. (1953-1972), SOFES
Antonie, Alrick H. (1935-1938), SOFES
Applefield, Milton (1962-1972), SEFES
Araman, Philip A. (1988-1995), SEFES & SRS
Archinard, M. Madeleine (1937-1946), SOFES
Arend, John L. (1939-1949), SOFES
Arendt, Wayne J. (1990-1992), SOFES
Armstrong, Mary (1934), AFES
Arnold, Eileen B. (1954-1964), SOFES
Arnold, Ray A. (1986), SOFES
Arrowood, Gordon C. (1954-1966), SEFES
Asher, William C. (1959-1970), SEFES
Ashmore, Sam C. (1986), SOFES
Atkins, Joseph S. (1940), SOFES
Austin, Iretta C. (1936-1940), SOFES
Averell, J.L. (1930-1932), SOFES
Avery, Thomas E. (1958-1959), SEFES & SOFES
Ayres, Matthew (1993), SOFES
Babiak, C.A. (1934), SOFES
Babin, Madeleine A. (1948-1954), SOFES
Backus, H.G. (1934), SOFES
Baehr, Edwina M. (1958-1972), SOFES
Bailey, Felix (1935-1936), SOFES
Bailey, Jackie L. (1946), SOFES
Bailey, Philip M. (1984-1995), SEFES & SRS
Bailey, Robert L. (1971-1972), SOFES
Bailey, Wendell P. (1959-1984), SEFES
Baker, James B. (1971-1995), SOFES & SRS
Baker, John C. (1931), AFES
Baker, L.E. (1934), SOFES
Baker, Leon (1943), SOFES
Baker, Lowell F. (1938-1941), SOFES
Baker, Roger L. (1971-1990), SOFES
Baker, Whiteford L. (1939), AFES
Balch, R.E. (1927), AFES
Baldwin, Virgil C. (1980-1995), SOFES & SRS
Ballard, James J. (1941), AFES
Baradell, Eileen C. (1943-1953), SOFES
Barber, Frances L. (1938-1940), AFES
Barber, John C. (1952-1975), SEFES & SOFES
Barham, Robbie W. (1975), SEFES
Barnard, Joseph E. (1985-1995), SEFES & SRS
Barnes, Robert L. (1959-1964), SEFES
Barnett, Bernice M. (1988), SEFES
Barnett, James P. (1958-1995), SOFES & SRS
Barnett, Leroy (1946), SOFES
Barnett, Willie Mack (1946), SOFES
Barnette, R.M. (1930-1933), SOFES
Barras, Stanley J. (1966-1995), SOFES & SRS
Barrett, Leonard I. (1926-1942), AFES & SOFES
Barrows-Broaddus, Jane (1982-1988), SEFES
Bartuska, Ann M. (1985-1990), SEFES

Basnett, Douglas A. (1939-1949), SOFES
Bassett, John R. (1953-1966), SOFES
Baudendistel, Martin E. (1938-1943), SOFES
Baughn, Elizabeth (1945), SOFES
Baxley, Steven A. (1986), SOFES
Beal, A.H. (1928-1929), AFES
Beal, J.A. (1926-1929), AFES
Beal, Raymond H. (1958-1986), SOFES
Beale, C.B. (1927), AFES
Beaman, Robert M. (1934), AFES
Beard, James A. (1940), SOFES
Beasely, Frank P. (1934-1935), SOFES
Beasley, J. Lamar (1988-1990), SEFES
Beasley, Roy S. (1970-1976), SOFES
Beaton, Kay (1993-1994), SEFES
Beaufait, William R. (1953-1958), SOFES
Bechtold, William A. (1984-1995), SEFES & SRS
Beck, Donald E. (1966-1995), SEFES & SRS
Beeman, Robert (1936), AFES
Beichler, Samuel D. (1929-1940), AFES
Beland IV, James W. (1969-1972), SOFES
Belander, Roger P. (1969-1991), SEFES
Bell, J.C. (1945), SOFES
Bell, James E. (1987-1992), SOFES
Bell, Peggy O. (1982-1995), SOFES & SRS
Bell, Raymond G. (1943-1970), SEFES & SOFES
Bellamy, Thomas R. (1975-1981), SEFES
Bellau, Anna L. (1938), SOFES
Bellipanni, Vince, Jr. (1986), SOFES
Beltz, Roy C. (1969-1994), SOFES
Benally, Mary E. (1993-1995), SEFES & SRS
Benedict, James A. (1986), SOFES
Bengston, George W. (1961-1964), SEFES
Bennett, Anna B. (1980-1984), SOFES
Bennett, F.W. (1930-1933), SOFES
Bennett, Frank A. (1948-1975), SEFES
Bennett, William H. (1958-1972), SOFES
Berg, Erik (1995), SRS
Bergland, Elizabeth (1929-1941), SOFES
Berrang, Paul C. (1993-1995), SEFES & SRS
Berrigan, H.P. (1938), SOFES
Berry, Charles R. (1958-1987), SEFES
Berry, Janice B. (1981), SOFES
Berry, Roy H. (1946), SOFES
Bershinger, George R. (1934), AFES
Bertelson, Daniel F. (1971-1995), SOFES & SRS
Besley, Lowell (1933-1934), AFES
Best, Roger H. (1969-1995), SOFES & SRS
Bethune, James E. (1958-1966), SEFES
Bey, Calvin F. (1977-1982), SOFES
Beyer, Frank K. (1931-1933), SOFES
Bhattacharyya, Helen T. (1979-1984), SEFES
Bialas, Mary A. (1943-1976), SOFES
Bianca, Lino Della (1969), SEFES
Bibler, Gilbert S. (1934), AFES
Bickford, C. Allen (1931-1946), SOFES
Bidwell, C.B. (1932), AFES
Biesterfeldt, Robert C. (1966-1993), SEFES & SOFES
Birdsey, Richard A. (1981-1988), SOFES
Biswell, Harold H. (1941-1946), AFES
Bittenbring, Leonie F. (1945-1946), SOFES
Bivens, Donald L. (1986), SOFES
Bjorkman, Edwin (1934), AFES
Black, H.C. (1928-1929), SOFES
Black, James M. (1936), SOFES
Black, Peter E. (1958-1960), SEFES
Blackerby, James H. (1934-1937), AFES & SOFES
Blackmarr, Winfred H. (1969-1975), SEFES
Blackmon, Bobby G. (1969-1979), SOFES
Blair, Robert M. (1958-1983), SOFES
Blidberg, A.T. (1928), AFES
Blomquist, Richard F. (1966-1975), SEFES
Blythe, John D. (1942-1946), SOFES
Boerner, Q.R. (1928-1929), AFES & SOFES
Boggs, Henry P. (1940), AFES
Bois, Paul J. (1958-1966), SEFES
Bomberger, Elon H. (1932-1941), AFES & SOFES
Bonar, Ronald E. (1978-1979), SOFES
Bond, Norris H. (1986), SOFES
Bond, Walter E. (1930-1953), SOFES
Bonner, Franklin T. (1960-1995), SOFES & SRS
Boone, Sidney S. (1940), SOFES
Boulton, Jessie R. (1953), SOFES
Boutwell, Samuel A. (1934-1937), AFES
Bower, David R. (1959-1966), SOFES
Bowker, Michael (1992-1995), SEFES & SRS
Bowman, Gwendoline G. (1945), AFES
Bowman, Pam (1994-1995), SEFES & SRS
Boyce, Jr., John S. (1951-1960), SEFES
Boyce, Stephen G. (1970-1984), SEFES
Boyd, Blossie R. (1986), SOFES
Boydell, Robert K. (1945-1946), SOFES
Boyer, William D. (1958-1995), SOFES & SRS
Bradley, Kenneth W. (1961-1964), SEFES
Bradshaw, D.E. (1927-1932), AFES
Bradshaw, Herbert C. (1937-1954), SOFES
Brady, Homer A. (1966-1975), SOFES
Bramble, W.C. (1928-1930), AFES & SOFES
Bramlett, David L. (1966-1995), SEFES & SRS
Brandt, Marie M. (1938-1939), AFES
Branham, Susan J. (1985-1988), SOFES
Brasington, Jr., James J. (1948-1951), SOFES
Brater, Ernest F. (1934), AFES
Bratton, Harry B. (1940), SOFES
Breeden, Sonya (1977-1978), SOFES
Brendemuehl, Raymond H. (1958-1981), SEFES & SOFES
Brender, Ernst V. (1946-1972), AFES & SEFES
Brewer, Jr., Ernest (1950), SOFES
Brian, Helen W. (1959), SOFES
Bridges, Joe L. (1943-1948), SOFES
Bridges, John R. (1976-1989), SOFES
Bridges, Nathan (1947-1948), SOFES
Bridges, Patricia J. (1960-1979), SOFES
Bridgwater, Jr., Floyd E. (1979-1995), SEFES & SRS
Briegleb, Philip A. (1954-1962), SOFES
Briggs, Luvelt (1947), SOFES
Brinkman, Kenneth A. (1940-1948), SOFES
Briscoe, Charles B. (1969-1972), SOFES
Brissette, John C. (1985-1992), SOFES
Britton, Kerry O. (1991-1995), SEFES & SRS
Broadfoot, Walter M. (1946-1970), SOFES
Brock, Vivian K. (1986), SOFES
Brockway, Dale (1991), SEFES
Bromley, Willard (1930), AFES
Brooks, Robert L. (1937-1942), SOFES
Brooks, Davis (1953), SOFES
Brooks, Vicki D. (1992-1995), SOFES & SRS
Brown, Byron (1994-1995), SEFES & SRS
Brown, Derwood (1938-1940), AFES
Brown, Elmer L. (1952-1954), SEFES
Brown, Hilda J. (1959-1960), SEFES
Brown, James P. (1943), AFES
Brown, Mark J. (1984-1995), SEFES & SRS
Brown, Raiford F. (1932-1933), AFES & SOFES
Browning, Catherine (1933-1934), AFES
Bruce, David (1939-1959), SOFES
Bryan, Helen W. (1960-1961), SOFES
Bryan, Mackay B. (1948-1960), SEFES
Bryan, Milton M. (1939-1941), AFES
Bryan, William C. (1958-1979), SEFES
Bryant, Camille M. (1958-1972), SEFES

Bryce, R. (1934), SOFES
Bryce, Robert W. (1937), AFES
Bryram, George M. (1946), AFES
Buchanan, Thomas S. (1964-1970), SEFES
Buchanan, W.D. (1945), SOFES
Buehling, Stuart H. (1948-1952), SEFES
Buell, Jesse H. (1926-1944), AFES
Buford, Marilyn A. (1985-1995), SEFES & SRS
Buford, Rodney A. (1986), SOFES
Bull, Henry (1930-1951), SOFES
Bunch, Juanita F. (1969-1986), SOFES
Burgan, Robert E. (1988-1990), SEFES
Burke, Hubert D. (1946-1958), SOFES
Burke, Marianne K. (1994-1995), SEFES & SRS
Burkle, Joseph L. (1949-1953), SOFES
Burleigh, Thomas D. (1930-1945), AFES & SOFES
Burnes, Jasper (1930s-1960s?), SOFES
Burney, Harold W. (1949-1951), SEFES
Burnham, Chester F. (1958-1966), SOFES
Burns, Homer (1949-1951), SOFES
Burns, Russell M. (1952-1975), SEFES & SOFES
Burroughs, Jr., Edward R. (1969-1970), SOFES
Burrows, James O. (1986), SOFES
Burton, James D. (1959-1985), SOFES
Busby, Rodney L. (1985-1995), SOFES & SRS
Busch, Bettie C. (1931-1933), SOFES
Busch, T.N. (1930-1932), SOFES
Bussell, Jr., William H. (1953), SEFES
Bylin, Carl V. (1983-1988), SOFES
Byram, George M. (1937-1966), AFES & SEFES
Byrd, Allen M. (1938-1940), SOFES
Cahill, Ellen T. (1970-1983), SEFES
Cain, Michael D. (1982-1995), SOFES & SRS
Caird, Ralph W. (1929-1932), AFES
Cambrice, Cherlyn S. (1986), SOFES
Campbell, Benjamin C. (1944), SOFES
Campbell, Robert A. (1946-1966), AFES & SEFES
Campbell, Robert S. (1944-1962), SOFES
Campbell, Thomas E. (1969-1984), SOFES
Campbell, William A. (1948-1970), SEFES
Canada, Warner C. (1946), SOFES
Canady, Johnny (1945-1946), SOFES
Carlson, Charles A. (1953-1954), SOFES
Carnesi, Sandra R. (1969-1980), SOFES
Carow, John (1940-1946), AFES
Carpenter, Elizabeth W. (1944-1945), SOFES
Carpenter, Hannah M. (1937), SOFES
Carpenter, Jr., Benton E. (1959-1964), SOFES
Carpenter, Marjorie B. (1946), SOFES
Carpenter, Roswell D. (1945-1952), SOFES
Carr, Charles H. (1934-1937), AFES & SOFES
Carstens, Lester Erwin (1938-1940), SOFES
Carter, Charles E. (1960), SOFES
Carter, David C. (1986), SOFES
Carter, Fairie Lyn (1966-1984), SOFES
Carter, Martha H. (1976-1984), SOFES
Carter, Mason C. (1959), SEFES
Cartledge, Allan R. (1985-1995), SEFES & SRS
Cartlidge, Robert L. (1986), SOFES
Caskey, Claude H. (1934-1935), SOFES
Cason, Robert (1945-1946), SOFES
Cason, Sam (1947), SOFES
Cassady, John T. (1946-1966), SEFES & SOFES
Cassens, Honora W. (1938-1941), SOFES
Cassisa, Sarah R. (1945-1976), SOFES
Casson, Bettina (1986), SOFES
Cater, Fred W. (1940-1942), AFES
Cathey, Robert A. (1975-1995), SEFES & SRS
Center, Kelly (1950-1952), SOFES
Ceremello, P.J. (1940-1942), SOFES
Chaiken, Leon E. (1934-1952), AFES & SEFES
Chain, Michael L. (1986-1995), SOFES
Chamberlain, Bettie (1930), SOFES
Chambliss, Erwin S. (1986-1995), SOFES
Chandler, Robin K. (1994-1995), SEFES & SRS
Chapel, William L. (1948-1951), SEFES
Chapman, A. Dale (1928-1933), AFES & SOFES
Chapman, Roy A. (1929-1946), SOFES
Chappell, Thomas W. (1970-1976), SOFES
Chappelle, Daniel E. (1958-1963), SEFES
Cheek, James R. (1948-1952), SEFES
Chestnolvick, Peter W. (1937-1938), SOFES
Childress, Festus C. (1945-1946), SOFES
Childress, Henry (1944-1945), SOFES
Childress, Roshell (1954), SOFES
Childress, Vernon (1945), SOFES
Chipman, Mary A. (1993-1995), SEFES & SRS
Chipman, Mary F. (1985-1992), SEFES
Chostnolvick, P.W. (1934), SOFES
Christensen, Clyde (1929), SOFES
Christiansen, Neils B. (1959), SEFES
Christopher, Joe F. (1953-1976), SOFES
Church, R.H. (1934), SOFES
Clapp, George W. (1948-1951), SOFES
Clapper, Russell B. (1949-1953), SEFES
Clark III, Alexander (1970-1995), SEFES & SRS
Clark, Calian, Jr. (1986), SOFES
Clark, Edgar W. (1961-1979), SEFES
Clark, Stuart F. (1945-1951), SOFES
Clark, W.J. (1934), SOFES
Clarke, William E. (1944-1950), SEFES & SOFES
Clary, Warren P. (1976-1977), SOFES
Clawsom, James P. (1940-1941), AFES
Clayton, George E. (1940-1941), SOFES
Cleaves, David L. (1993-1995), SOFES & SRS
Cleckley, William O. (1986), SOFES
Clements, Hubert B. (1960-1984), SEFES
Clements, Ralph W. (1945-1980), SEFES & SOFES
Clifton, Gordon K. (1946), SOFES
Clutter, Jerome L. (1958-1962), SEFES
Cochran, C.R. (1930), AFES
Coggins, William P. (1934-1937), AFES & SOFES
Cohen, Jack (1991-1995), SEFES & SRS
Coile, T.S. (1930-1934), SOFES
Colbert, Jr., William M. (1945-1946), SOFES
Cole, Gordon D. (1971-1972), SOFES
Cole, Quinton (1985), SOFES
Cole, Steven N. (1986), SOFES
Collet, M.H. (1936-1939), SOFES
Colley, Amon L. (1962-1966), SOFES
Collins, Robert W. (1941-1945), AFES
Conatser, Robert M. (1976), SOFES
Cone, Jr., William H. (1940-1942), SOFES
Coning, Ruth E. (1945-1946), SOFES
Connaughton, Charles A. (1944-1951), SOFES
Conner, Richard N. (1978-1995), SOFES & SRS
Conner, Roger (1993-1995), SEFES & SRS
Connolly, Louis W. (1980), SOFES
Connor, Kristina F. (1993-1995), SOFES & SRS
Cook, Joan (1995), SRS
Cooke III, William (1995), SRS
Cooper, Donald T. (1975-1982), SOFES
Cooper, John W. (1946), SOFES
Cooper, Leo W. (1932-1934), SOFES
Cooper, Robert W. (1948-1975), SEFES
Copeland, Jr., Otis L. (1949-1953), SEFES
Cordell, H. Kenneth (1976-1995), SEFES & SRS
Cordell, James D. (1962-1984), SEFES
Cortright, Harry M. (1938-1942), SOFES
Cost, Noel D. (1966-1995), SEFES & SRS
Coster, Jack E. (1978-1980), SOFES

Costonis, Arthur C. (1969), SEFES

Cotrufo, Cosimo (1961-1986), SEFES

Cotton, Elizabeth S. (1937), SOFES

Coulter, C.H. (1928-1934), SOFES

Courville, Margaret A. (1990-1995), SOFES & SRS

Cox, Carl W. (1937-1939), SOFES

Coy, Ruth L. (1980), SOFES

Coyne, John F. (1946-1972), SOFES

Crafton, W.M. (1934), AFES

Craig, J.C. (1928-1930), AFES & SOFES

Craig, Joseph R. (1989-1995), SEFES & SRS

Craig, Locke (1939), AFES

Craig, Mary R. (1935-1940), SOFES

Craig, Ronald B. (1928-1951), AFES & SOFES

Crane, Michael B. (1986), SOFES

Cranston, Keith (1945-1946), SOFES

Craul, Philip J. (1964-1966), SOFES

Craver, Gerald C. (1990-1995), SEFES & SRS

Crawford, Jr., Hewlette S. (1958-1972), SEFES & SOFES

Crawford, Juanita (1986), SOFES

Creasman, Agnes M. (1945-1946), AFES

Creasman, Hugh C. (1933-1941), AFES

Creasman, W.O. (1934), AFES

Crews, Rosa (1995), SRS

Cristopher, Joe F. (1952), SOFES

Croker, Jr., Thomas C. (1946-1972), SOFES

Cromwell, Carroll W. (1940-1941), AFES

Croom, E. Lowell (1969), SEFES

Cross, J.K. (1934), SOFES

Croswell, S. Olive (1946-1977), AFES & SEFES

Crowell, William H. (1949-1954), SOFES

Crouch, Oscar S. (1944), SOFES

Crowl, John M. (1946), SOFES

Cruikshank, James W. (1930-1954), AFES & SOFES

Cruschow, George F. (1946), AFES

Cubbage, Frederick W. (1980-1994), SEFES & SOFES

Culbertson, C.C. (1986), SOFES

Cummings, W.H. (1929), AFES

Cunningham, G. Bryant (1975-1993), SEFES

Curran, Martin J. (1986), SOFES

Curry, John R. (1939-1946), SOFES

Curtis, Evelyn S. (1934-1939), AFES

Cushwa, Charles T. (1966), SEFES

Czabator, Felix J. (1958-1976), SOFES

Daley, R.K. (1930-1931), AFES

Dalton, Faye C. (1986), SOFES

Danese, Constance R. (1966), SOFES

Daniel, Howard E. (1969-1972), SOFES

Daniel, Roderick E. (1986), SOFES

Daniels, Herbert L. (1938-1942), SOFES

Dargle, Nancy (1995), SRS

Darwin, Jr., William N. (1969-1970), SOFES

David, William P. (1934-1935), SOFES

Davidson, A.W. (1932), SOFES

Davidson, Andrew H. (1946), SOFES

Davidson, J. Herman (1946), SOFES

Davies, Janie Ruth (1943), AFES

Davis, Johnie E. (1950-1951), SOFES

Davis, Paul L. (1938), AFES

Davis, Robert (1959), SEFES

Davis, Virgil B. (1931-1954), SOFES

Dawson, Diane W. (1978), SOFES

Dawson, Elizabeth L. (1940), AFES

Dawson, Grady (1948), SOFES

de Steiguer, J. Edward (1985-1994), SEFES

DeBarr, Gary L. (1969-1995), SEFES & SRS

Debele, C.M. (1934-1935), SOFES

DeBell, Dean S. (1969-1970), SEFES

Degroot, Rodney C. (1969-1975), SOFES

Delaneuville, Sharon (1995), SRS

Delavan, C.C. (1934-1935), SOFES

Dell, Tommy R. (1963-1991), SOFES

Della-Bianca, Lino (1958-1983), SEFES

Demlow, Douglas (1982-1983), SEFES

Demmon, Elwood L. (1925-1954), SEFES & SOFES

Derr, Harold J. (1946-1975), SOFES

DeShazor, Charles D. (1937-1940), SOFES

Desmond, Richard C. (1940-1941), AFES

Desselle, Lorraine V. (1977-1984), SOFES

deSteiguer, Joseph E. (1982-1995), SEFES & SRS

Devall, Ruth [Margaret] (1989-1995), SOFES & SRS

DeVall, Wilbur B. (1945-1946), SOFES

Deville, Melanie B. (1986-1995), SRS

Dickerhoof, H. Edward (1969-1976), SEFES

Dickerson, Bernard P. (1966-1975), SOFES

Dickson, James G. (1976-1995), SOFES & SRS

Dieterich, John H. (1966-1970), SEFES

Dietrich, Madeline E. (1940), AFES

Diller, J.D. (1930-1934), AFES & SOFES

Diner, Alexander M. (1991-1995), SOFES & SRS

Dinus, Ronald J. (1969-1976), SOFES

Dixon, John C. (1960-1963), SEFES

Dixon, Merlin J. (1966-1972), SOFES

Dobelbower, Kevin R. (1986-1988), SOFES

Dodt, Wayne O. (1969-1992), SOFES

Doerrie, Fred (1934), AFES

Dole, Jr., Norman E. (1941), AFES

Dolloff, C. Andrew (1988-1995), SEFES & SRS

Dominguez, Cristobal C. (1986), SOFES

Donaldson, Bryan G. (1988), SEFES

Donner, Bryan L. (1986), SOFES

Doolittle, Max L. (1966-1985), SOFES

Doolittle, Warren T. (1948-1954), SEFES

Dorman, Keith W. (1940-1972), SEFES & SOFES

Doss, Basil D. (1953-1954), SOFES

Doudrick, Robert L. (1991-1995), SOFES & SRS

Dougherty, Phillip M. (1992-1995), SEFES & SRS

Douglass, James E. (1958-1984), SEFES

Dowdell, James W. (1986), SOFES

Downey, E.J. (1927), AFES

Downing, Robert L. (1966-1972), SEFES

Downs, Albert A. (1937-1950), AFES & SEFES

Downs, Donald G. (1985-1995), SEFES & SRS

Doyle, Arlene T. (1986), SEFES

Doyle, Howard J. (1946), SOFES

Driscoll, Donald D. (1966-1972), SEFES

Drooz, Arnold T. (1960-1985), SEFES

Dubuar, James P. (1934), AFES

Duerr, William A. (1942-1951), AFES & SOFES

Duff, John E. (1969-1981), SEFES

Duffy, Isabel T. (1969-1972), SOFES

Duffy, Paul D. (1969-1990), SOFES

Duhe, Brenda P. (1986), SOFES

Duke, William B. (1946-1954), SOFES

Dumbroff, Erwin B. (1958-1964), SEFES & SOFES

Dumestre, Julia O. (1937), SOFES

Duncan, Don A. (1958), SOFES

Duncan, Donald P. (1940-1941), SOFES

Dunford, Earl G. (1946), AFES

Dutrow, George F. (1969-1986), SEFES & SOFES

Duvall, Vinson L. (1959-1980), SOFES

Dwinell, Lew David (1969-1995), SEFES & SRS

Dyer, Bertha M. (1971-1982), SEFES

Dyer, Glenda (1992-1995), SEFES & SRS

Dyksterhuis, Edsko J. (1938-1941), SOFES

Earles, Jacqueline M. (1969-1980), SOFES

Earley, John (1934-1936), SOFES

Easterling, Cecil A. (1940), AFES

Eaton, C.B. (1933-1937), AFES

Ebel, Bernard H. (1958-1982), SEFES

Echols, Robert M. (1958-1959), SOFES
Eckart, Robert B. (1986), SOFES
Eden, Robert L. (1940), SOFES
Edmondson, C.E. (1934), SOFES
Edmondson, Robert Y. (1934-1935), SOFES
Edwards, George J. (1986), SOFES
Edwards, John W. (1948), SEFES
Edwards, Jr., Mercer Boyd (1978-1995), SEFES & SRS
Edwards, Lannette G. (1992), SEFES
Edwards, Louis G. (1949-1951), SOFES
Edwards, Lucille D. (1946), SOFES
Eff, Samuel (1934), SOFES
Eggen, Susan E. (1986), SOFES
Eldredge, Inman F. (1932-1944), SOFES
Eldredge, Jr., Inman F. (1946), SOFES
Elliott, Ernest R. (1961-1995), SEFES & SRS
Elliott, Scipico (1948-1949), SOFES
Ellis, Thomas H. (1980-1992), SEFES & SOFES
Ellison, Lincoln (1933), SOFES
Englerth, George H. (1952-1953), SEFES
English, Donald (1992-1995), SEFES & SRS
English, Jr., Edwin S. (1946-1960), AFES & SEFES
Ernest, Albert D. (1934-1935), SOFES
Eskola, Elmer H. (1986), SOFES
Esser, Mary H. (1969-1980), SEFES
Etheridge, Joel L. (1986), SOFES
Evans, David L. (1991-1995), SOFES & SRS
Evans, Frank (1944), SOFES
Evans, Jessie (1932), SOFES
Evans, Lois J. (1977-1987), SOFES
Evans, Thomas C. (1932-1960), AFES & SOFES
Even, Elmire A. (1937-1942), SOFES
Even, Joyce J. (1989), SOFES
Everton, Carmen (1992-1995), SEFES & SRS
Ewing, Alfred M. (1934-1935), SOFES
Fahnestock, George R. (1958-1964), SOFES
Farmer, Jr., Robert E. (1962-1966), SOFES
Farrar, Charlie G. (1947), SOFES
Farrar, Jr., Robert M. (1958-1991), SOFES
Fasick, Clyde A. (1958-1972), SEFES & SOFES
Fassa, Alfred J. (1948-1951), SEFES
Fassnacht, Donald L. (1953-1970), SOFES
Fatzinger, Carl W. (1969-1995), SEFES & SRS
Faulkner, Joanne L. (1986-1995), SOFES & SRS
Faulks, Edward B. (1931-1940), AFES & SOFES
Fedde, Gerhard F. (1969-1982), SEFES
Fedde, Vicki H. (1978-1982), SEFES
Feheley, Jo Anne B. (1986), SOFES
Ferguson, Carol (1991-1995), SEFES & SRS
Ferguson, Edwin R. (1939-1975), SOFES
Ferguson, Robert B. (1980-1995), SOFES & SRS
Few, David V. (1986-1995), SOFES & SRS
Field, Richard C. (1976-1986), SEFES
Fierro, Charles J. (1989-1992), SOFES
Filer, Jr., Theodore H. (1963-1990), SOFES
Finger, Ernest L. (1971-1976), SOFES
Fins, Wallace L. (1963), SEFES
Fisher, Joseph B. (1988-1995), SOFES & SRS
Fisher, L.E. (1937), AFES
Flad, Marie M. (1931-1966), SOFES
Flebbe, Patricia A. (1988-1995), SEFES & SRS
Fleming, Burtt (1934-1938), AFES
Fletcher, Peter W. (1941-1950), AFES & SEFES
Floherty, Jr., F. (1934), SOFES
Fokos, Robert (1934), SOFES
Folckemer, Clarence E. (1958-1975), SEFES
Follweiler, A.D. (1928), AFES
Foltmer, Oliver H. (1938-1939), SOFES
Foltz, Grace M. (1933-1946), AFES
Fons, Wallace L. (1960-1962), SEFES
Forbes, Reginald D. (1921-1926), SOFES
Forbus, James K. (1985-1992), SEFES
Force, Norman F. (1948-1951), SEFES
Ford III, Samuel M. (1986), SOFES
Ford-Logan, James K. (1993), SEFES
Ford-Logan, Jane L. (1990-1995), SOFES & SRS
Forgey, Burl (1934), SOFES
Forgey, L.W. (1934-1937), AFES & SOFES
Forman, G.P. (1937), AFES
Forrest, William B. (1948), SOFES
Forsling, C.L. (1934-1937), AFES
Foster, A. Alfred (1954-1960), SEFES
Foster, Ellery A. (1932-1933), SOFES
Foster, James H. (1939-1952), SOFES
Foster, Jr., George Samuel (Sam) (1989-1995), SOFES & SRS
Fowler, William P. (1992-1995), SOFES & SRS
Fox, Susan (1994-1995), SEFES & SRS
Fraedrich, Stephen W. (1988-1995), SEFES & SRS
Francis, Jr., John K. (1976-1992), SOFES
Franklin, Cynthia K. (1981-1982), SEFES
Franklin, Edward Carlyle (1969-1980), SEFES
Franklin, Jasper S. (1966-1972), SOFES
Franzreb, Kathleen E. (1991-1995), SEFES & SRS
Freerksen, Jr., Howard F. (1986), SOFES
Freese, Jr., Frank W. (1949-1963), SOFES
Froelich, Ronald C. (1958-1992), SEFES & SOFES
Frothingham, Earl H. (1921-1943), AFES
Fudge, Joe (1949-1953), SOFES
Fuller, Eleanor M. (1982-1984), SEFES
Fuller, W.B. (1934), AFES
Furnival, George M. (1953-1954), SOFES
Gaby, Louis I. (1958-1986), SEFES
Gaidy, John W. (1947), SOFES
Gaines, Edward M. (1946-1951), SOFES
Gallacher, Marvel H. (1935-1937), SOFES
Gallegos, Deborah T. (1994), SOFES
Gallegos, Patrick J. (1994), SOFES
Gammage, John L. (1937-1954), SOFES
Gammel, Donald O. (1978-1986), SOFES
Gandy, Mitchell L. (1986), SOFES
Gansel, Charles R. (1969-1978), SEFES
Gant, Columbus (1943-1944), SOFES
Gardner, Charles L. (1946), SOFES
Garner, LeRoy (1946), SOFES
Gaudin, Louis P. (1938), SOFES
Gay, Jean (1990-1995), SEFES & SRS
Geary, Thomas F. (1975-1982), SEFES
Gemmer, Eugene W. (1928-1943), SOFES
Genberg, Margaret R. (1989), SOFES
Genn, L.D. (1932), SOFES
Genth, C.W. (1930-1932), AFES & SOFES
Gibbs, Carter B. (1958-1959), SOFES
Gibbs, Jr., Hilliard L. (1990-1995), SOFES & SRS
Gibbs, Linda (1993-1995), SEFES & SRS
Gibson, Daisy C. (1945), SOFES
Gidden, Charles S. (1948), SEFES
Gill, Voylene F. (1986), SOFES
Gillam, Victoria N. (1992), SOFES
Gilliam, Ed (1943-1946), SOFES
Gilliam, James B. (1943-1945), SOFES
Gillespie, Andrew J. (1990-1991), SOFES
Gillespie, Larry G. (1986), SOFES
Gingrich, Samuel F. (1981-1984), SEFES
Gittens, Louise (1995), SRS
Gladstone, Mary C. (1958-1963), SEFES
Glenn, L.D. (1930), SOFES
Gloger, Mary S. (1932-1935), SOFES
Glover, Joseph F. (1978-1995), SEFES & SRS
Godfrey, Nell V. (1985-1995), SEFES & SRS
Goelz, Jeffery C. (1990-1995), SOFES & SRS
Goforth, Marcus H. (1959-1962), SEFES

Goldben, Lucy B. (1980), SOFES
Golden, Jr., James A. (1946), SOFES
Gooding, Jr., Guy V. (1962-1964), SEFES
Goodrich, Beatrice E. (1940), AFES
Goodson, J. Wayne (1979), SEFES
Goodwin, Paul R. (1939), AFES
Goolsby, Arthur J. (1950-1960), SEFES
Gordon, Aaron (1933), AFES
Gordon, Jr., Seth E. (1961), SEFES
Gores, Henry (1937), AFES
Goyne, John (1944), SOFES
Grady, William J. (1939-1941), AFES
Grafman, Herman D. (1940-1941), SOFES
Graham, Joseph B. (1981-1982), SOFES
Graney, David L. (1969-1995), SOFES & SRS
Grano, Charles X. (1946-1970), SOFES
Granskog, James E. (1971-1995), SOFES & SRS
Granson, John E. (1940), SOFES
Gray, Elijah (1986), SOFES
Gray, Hubert W. (1937-1942), SOFES
Green, Ossie Lee (1958-1959), SOFES
Green, Rose (1944), AFES
Green, Ruby K. (1938-1939), SOFES
Greenburg, Cathryn (1994-1995), SEFES & SRS
Greene, Geoffrey E. (1948-1953), SEFES
Greene, John L. (1992-1995), SOFES & SRS
Greenlee, Fredna U. (1975-1993), SOFES
Gregory, Gustav Robinson (1945-1952), SOFES
Grelen, Harold E. (1958-1984), SOFES
Grice, D. Owen (1945-1951), SOFES
Griener, Lillian M. (1938), SOFES
Griffing, Charles G. (1971-1972), SOFES
Griggs, Margene M. (1981-1984), SOFES
Grigsby, Hoy C. (1958-1979), SOFES
Grimes, Charles F. (1986), SOFES
Griswold, Norman B. (1945-1951), SOFES
Groom, Leslie H. (1991-1995), SOFES & SRS
Grosenbaugh, Lewis R. (1946-1972), SEFES & SOFES
Gruschow, George F. (1940-1958), AFES & SEFES
Gudger, Mary P. (1931-1945), AFES
Guilkey, Paul C. (1958-1970), SEFES
Guinn, Faye H. (1986), SOFES
Guldin, James M. (1993-1995), SOFES & SRS
Guldin, Richard W. (1979-1984), SOFES
Guttenberg, Sam (1946-1976), SOFES
Gwinner, Myron W. (1960), SOFES
Haasis, Ferdinand W. (1921-1928), AFES
Hadley, E.W. (1923-1925), SOFES
Hagerty, Paul H. (1966-1970), SEFES
Haig, Irvine T. (1945-1951), AFES & SEFES
Haight, Robert G. (1989-1990), SEFES
Haines, Terry K. (1986), SOFES
Haines, William H.B. (1953-1980), SEFES
Hale, Jr., Jonathan P. (1935-1937), AFES & SOFES
Hall, Alan D. (1993-1995), SEFES & SRS
Hall, Robert T. (1940-1941), SOFES
Hallin, William (1928), AFES
Halls, Lowell K. (1950-1980), SEFES & SOFES
Halverson, Howard G. (1992-1995), SOFES & SRS
Hamaker, James M. (1986), SOFES
Hamilton, William A. (1969-1970), SEFES
Hampf, Fred (1941-1942), AFES
Haney, Glenn P. (1954-1970), SEFES
Hankins, Carol Dean (1951), SOFES
Hanley, Marion S. (1960), SEFES
Hanna, Marlene P. (1986), SOFES
Hanner, Leila M. (1958-1972), SEFES
Hansel, Carey (1933), AFES
Hanula, James (1992-1995), SEFES & SRS
Harahbarger, Thomas J. (1985), SEFES
Harbin, John R. (1984-1986), SEFES
Harbison, Fred Edward (1948), SOFES
Hardy, Charles E. (1940), SOFES
Hare, Robert C. (1959-1984), SOFES
Hargrove, Rafe (1950-1951), SOFES
Harlow, Richard F. (1966-1984), SEFES
Harms, William R. (1958-1995), SEFES & SRS
Harper, E.O. (1928), SOFES
Harper, Sammie J. (1942-1944), SOFES
Harper, Verne L. (1927-1937), SOFES
Harrington, Constance A. (1984-1989), SOFES
Harrington, Thaddeus A. (1953-1980), SEFES & SOFES
Harris, Beatrice N. (1948-1952), SEFES
Harris, John L. (1992), SOFES
Harrison, Richard F. (1969), SEFES
Harshbarger, Thomas J. (1971-1984), SEFES
Harvey, George M. (1952-1953), SOFES
Harwell, Clifford E. (1986), SOFES
Hastings, Felton L. (1969-1990), SEFES
Hatch, A.B. (1928), AFES
Hatchell, Glyndon E. (1959-1988), SEFES & SOFES
Hatfield, Ira T. (1935-1936), SOFES
Hauck, Charles A. (1966-1993), SEFES
Haverty, Michael R. (1975-1976), SOFES
Hawes, Edmund T. (1940), SOFES
Hawes, Norman E. (1934-1946), AFES & SOFES
Hawley, Norman R. (1946-1958), AFES & SEFES
Hay, Cyrus J. (1953), SOFES
Hay, Harold (1932), SOFES
Hayden, Aleta N. (1985-1986), SOFES
Hayes, G. Lloyd (1943-1946), AFES
Hayes, Jane L. (1990-1995), SOFES & SRS
Hayes, Nancy S. (1986), SOFES
Hayes, Ralph W. (1928-1930), SOFES
Haynes, James O. (1966), SOFES
Hayward, F.D. (1930), SOFES
Haywood, James D. (Dave) (1981-1995), SOFES & SRS
Hazelton, James A. (1940), SOFES
Heath, Delia K. (1985), SEFES
Hebb, Edwin A. (1949-1980), SEFES & SOFES
Hedgcock, George C. (1926-1927), AFES
Hedge, H. Dewey (1948-1949), SOFES
Hedge, J.T. (1948-1949), SOFES
Hedlund, Arnold (1949-1972), SOFES
Hedlund, Mary S. (1982-1983), SOFES
Heers, Erwin A. (1946), AFES
Hefner, James E. (1960-1969), SEFES
Heiges, Ann W. (1983-1990), SEFES
Heikkenen, Herman J. (1960-1961), SEFES
Helbush, Robert E. (1953-1954), SEFES
Helvey, Junior D. (1960-1970), SEFES
Hemingway, Richard W. (1971-1995), SOFES & SRS
Hendee, John C. (1979-1984), SEFES
Hendricks, Berry E. (1977-1982), SOFES
Hendrix, John W. (1938), AFES
Hendrix, Jr., Floyd F. (1961-1964), SEFES
Henley, John W. (1980-1986), SOFES
Henry, Berch W. (1949-1972), SOFES
Hepting, George H. (1933-1962), AFES & SOFES
Herndon, Effie C. (1929-1932), SOFES
Herrick, C.S. (1933), SOFES
Herring, George B. (1954), SOFES
Hertel, Gerald D. (1979-1984), SOFES
Hertzler, Richard A. (1934-1951), AFES & SEFES
Hestbeck, Fred M. (1943), AFES
Hewlett, John D. (1958-1963), SEFES
Heym, Douglas C. (1986), SOFES
Heyward, Jr., Frank D. (1931-1937), SOFES
Hibbert, Alden R. (1959-1964), SEFES
Hickey, Ronald A. (1938-1941), SOFES
Hickman, Clifford A. (1980-1991), SOFES

Hicks, Halsey M. (1934-1937), SOFES

Hicks, Thurman W. (1986), SOFES

Hicks, Vernon E. (1930-1936), AFES

Hicks, William T. (1938-1940), AFES

Higdon, J. Wayne (1940-1942), SOFES

Hill, Hazel C. (1946), AFES

Hill, Leland K. (1938-1939), AFES

Hill, Theda (1991-1995), SEFES & SRS

Hill, Violet S. (1959-1980), SEFES

Hills, F.G. (1928), SOFES

Hilmon, Junior B. (1958-1978), SEFES

Hine, W.R.B. (1921-1925), SOFES

Hines, Franklin D. (1986), SOFES

Hitt, Clyde (1959-1963), SEFES

Hobbs, Robert L. (1949-1950), SOFES

Hodge, Adrian L. (1946), SOFES

Hodge, W. Douglas (1983-1987), SOFES

Hodges, Gladys (1937-1938), AFES

Hodges, John D. (1960-1972), SOFES

Hodges, Jr., Charles S. (1958-1975), SEFES

Hoekstra, Pieter E. (1954-1964), SEFES

Hoffman, Clarence H. (1940-1944), AFES

Hoffman, William P. (1946-1948), SOFES

Holbrook, James H. (1983-1995), SEFES & SRS

Holdridge, Leslie R. (1938), SOFES

Holley, Jr., Daniel L. (1969-1970), SOFES

Holmes, Thomas P. (1991-1995), SEFES & SRS

Holt, William R. (1958-1962), SOFES

Hood, Frank C. (1953-1954), SEFES

Hook, Donald D. (1969-1970), SEFES

Hooper III, Robert G. (1971-1995), SEFES & SRS

Hoover, Marvin D. (1940-1953), AFES & SEFES

Hope, Terrell L. (1986), SOFES

Hopkins, Jr., Walter S. (1946-1954), SOFES

Horton, Jerome S. (1954), SOFES

Hough, A.F. (1926), AFES

Hough, Walter A. (1958-1994), SEFES & SOFES

Houpy, Ventura J. (1938-1941), SOFES

Houser, William E. (1934-1937), AFES & SOFES

Howard, Elaine T. (1975), SOFES

Howard, Lawrence E. (1937-1938), SOFES

Howard, Ralph W. (1978-1984), SOFES

Howell, A.H. (1928), AFES

Hse, Chung-Yun (1969-1995), SOFES & SRS

Huberman, Morris A. (1932-1937), SOFES

Huckenpahler, Bernard J. (1930-1954), AFES & SOFES

Huddleston, Harriet (1995), SRS

Hudgens, Thomas A. (1938-1939), SOFES

Huffines, Edna L. (1945-1946), AFES

Hughes, Jr., Henry W. (1937-1940), SOFES

Hughes, Ralph H. (1949-1972), SEFES

Hull, Henry (1948), SOFES

Humphrey, C.J. (1925), AFES

Hunnicutt, Thomas B. (1985-1990), SEFES

Hunnicutt, William E. (1954-1964), SEFES

Hunt, Effie C. (1933-1934), SOFES

Hunt, H. Wayne (1977-1988), SOFES

Huntley, Jimmy C. (1980-1985), SOFES

Huntsberry, Edward D. (1986), SOFES

Huppuch, Charles D. (1959-1960), SEFES

Hursey, T.P. (1935), SOFES

Hursh, Charles R. (1926-1951), AFES & SEFES

Huskin, D.C. (1934), AFES

Hutchinson, Samuel Blair (1943-1946), SOFES

Iff, Ronald H. (1977-1980), SOFES

Ike, Jr., Albert F. (1960-1970), SEFES

Ineson, Frank A. (1933-1942), SOFES

Isreal, Sarah E. (1946), AFES

Irvine, Peter B. (1986), SOFES

Jackson, Lewis (1948-1951), SOFES

Jackson, Lyndal G. (1946), SOFES

Jackson, Orlo M. (1941), AFES

Jackson, Willis L. (1946-1947), SOFES

Jackson, Winston J. (1930-1931), AFES

Jacobs, Dennis (1992-1995), SOFES & SRS

Jacobs, M. Paul (1971-1972), SOFES

Jacobson, A.G. (1933), SOFES

Jacobson, Ralph A. (1956), SOFES

Jacot, Arthur P. (1934-1936), AFES

Jagodowski, Joseph (1985-1994), SEFES

Jagow, Peter P. (1986), SOFES

James, George A. (1960-1972), SEFES

James, Lee M. (1946-1951), SOFES

Jamison, George M. (1937), AFES

Jamison, Jeanette M. (1980-1995), SOFES & SRS

Janssen, Paul L. (1952-1954), SOFES

Jarrett, George P. (1949-1960), SEFES

Jefferies, Lavinia T. (1943), AFES

Jemison, George M. (1938-1950), AFES & SEFES

Jester, Joseph R. (1937), AFES

Jewell, Frederick F. (1958-1964), SOFES

Johansen, Jr., Ragnar W. (1958-1986), SEFES

Johnson, Edward A. (1949-1953), SEFES

Johnson, Frank M. (1959-1963), SEFES

Johnson, Glen N. (1986), SOFES

Johnson, Harold R. (1937-1940), SOFES

Johnson, Harvey H. (1960), SEFES

Johnson, Horace E. (1966), SEFES

Johnson, J. Percy (1935-1936), SOFES

Johnson, J. William (1949-1952), SOFES

Johnson, Kathryn B. (1958-1963), SEFES

Johnson, Myrna E. (1986), SOFES

Johnson, Robert L. (1958-1987), SOFES

Johnson, S.J. (1928), SOFES

Johnson, Tony G. (1985-1995), SEFES & SRS

Johnson, Von J. (1980-1985), SEFES

Johnson, Wesley A. (1951), SOFES

Johnson, William A. (1949-1950), SOFES

Johnston, Carol E. (1993-1995), SOFES & SRS

Johnston, Edward A. (1954), SEFES

Johnston, Harmon R. (1934-1970), AFES & SOFES

Johnston, Marvin B. (1992-1995), SOFES & SRS

Jones, Alice S. (1975-1990), SEFES

Jones, Clark A. (1969), SOFES

Jones, David (1946-1947), SOFES

Jones, Earl N. (1940-1941), SOFES

Jones, Jr., Earl P. (1959-1993), SEFES

Jones, James H. (1948), SOFES

Jones, Susan C. (1986-1995), SOFES & SRS

Jones, Susan K. (1984-1992), SOFES

Jones, Tharmon Lee (1949), SOFES

Jones, Thomas F. (1946), SOFES

Jones, Walter H. (1948-1951), SOFES

Jordan, Delmar D. (1945), SOFES

Jorgensen, Jacques R. (1958-1986), SEFES & SOFES

Joy, Fred L. (1948-1949), SEFES

Joye, Marjorie G. (1944), SOFES

Judson, George M. (1946-1966), SOFES

Kaelin, Harold C. (1939-1941), SOFES

Kahler, Myron S. (1934-1936), SOFES

Kais, Albert G. (1962-1985), SOFES

Kaiser, Jr., Harold F. (1969), SOFES

Kard, Bradford M. (1988-1995), SOFES & SRS

Karnig, Jack J. (1953), SEFES

Kaufert, Frank (1928-1933), AFES & SOFES

Keefus, John E. (1939-1941), AFES

Keel, W.L. (1933-1935), SOFES

Keenan, Eugene E. (1953), SEFES

Keetch, John J. (1940-1970), AFES & SEFES

Keith, George C. (1981-1995), SOFES & SRS

Keller, Michael M. (1992), SOFES

Kelley, Ervin (1946-1959), SOFES
Kelley, Patrick T. (1948), SOFES
Kelley, Tyronne (1992-1994), SOFES
Kellogg, John F. (1939-1942), SOFES
Kellogg, Leonard F. (1926), AFES
Kelly, John F. (1985-1995), SOFES & SRS
Kelly, William A. (1939-1940), SOFES
Kennedy, Donald M. (1946), SOFES
Kennedy, Jr., Harvey E. (1969-1995), SOFES & SRS
Keonigshof, Gerald A. (1975-1986), SEFES
Kerr, Edward F. (1976-1979), SOFES
Kerst, John J. (1938-1942), SOFES
Ketcham, David E. (1960), SEFES
Kiefer, Helen M. (1938-1939), SOFES
Kiester, Alan R. (1985), SOFES
Kile, Billy W. (1986), SOFES
Kimberley, J.T. (1931), AFES
King, Anthony L. (1977-1980), SOFES
King, David B. (1952-1954), SOFES
King, Lillian B. (1930-1933), AFES
Kinn, Donald N. (1975-1995), SOFES & SRS
Kinne, Jr., Syndney B. (1941), AFES
Kislow, Cynthia J. (1978-1980), SEFES
Klawitter, Ralph A. (1958-1966), SEFES
Knight, D. Manley (1940-1943), SOFES
Knight, Fred B. (1951), SEFES
Knight, Herbert A. (1966-1987), SEFES
Knoepp, Jennifer D. (1991-1995), SEFES & SRS
Knorr, Philip N. (1940-1941), SOFES
Knowlton, Marta E. (1989-1991), SOFES
Koch, Peter (1963-1982), SOFES
Koch, W.W. (1928), SOFES
Koenigs, Jerome W. (1959-1977), SEFES & SOFES
Koger, Jerry L. (1981-1984), SOFES
Kohara, Tommy T. (1939-1940), SOFES
Kohler, M.S. (1934), SOFES
Korb, Linda A. (1980-1984), SOFES
Kormanik, Paul P. (1959-1995), SEFES & SRS
Korstian, Clarence F. (1921-1930), AFES
Koshi, Paul T. (1958), SOFES
Kossuth, Susan V. (1979-1989), SEFES
Koulichkow, Serge (1934), AFES
Kovner, Jacob L. (1952-1954), SEFES
Kowal, R. Joseph (1937-1963), AFES & SOFES
Kraus, John F. (1958-1986), SEFES
Kress, Lance W. (1987-1995), SEFES & SRS
Kriezel, Gary E. (1980-1981), SEFES
Krinard, Roger M. (1958-1988), SOFES
Krinard, Willough D. (1986), SOFES
Kriss, Paul B. (1944-1945), SOFES
Krochmal, Arnold (1971-1983), SEFES & SOFES
Krogfoss, Evelyn C. (1940-1942), AFES
Krogfoss, Oswald K. (1940-1942), AFES
Krueger, Daniel W. (1961-1964), SEFES
Krumbach, Jr., Arthur W. (1958-1962), SOFES
Kuhlman, Elmer George (1961-1994), SEFES
Kulman, Herbert M. (1958), SEFES
LaFarge, Timothy (1970-1982), SEFES
Lamb, Howard N. (1934-1940), SOFES
Lamb, Robert C. (1969-1972), SEFES
Landeau, Darryl G. (1990-1992), SOFES
Lane, Cleo B. (1975-1976), SOFES
Lang, Linda L. (1986), SOFES
Langdon, O. Gordon (1948-1982), SEFES & SOFES
Langford, Joe (1943-1944), SOFES
Langhoff, Jr., Charles H. (1937-1941), SOFES
Lannon, Keith (1995), SRS
LaRoche, Germain E. (1959), SEFES
Larsen, Camelia M. (1929-1944), SOFES
Larsen, N.J. (1929-1930), AFES
Larson, David E. (1951-1954), SOFES
Larson, Philip R. (1952-1954), SEFES
Larson, Robert W. (1949-1962), SEFES
Lassalle, Jr., Peter J. (1980-1995), SOFES & SRS
Lassen, Laurence E. (1975-1983), SOFES
Lau, John E. (1937-1966), SOFES
Lauria, N.J. (1933), SOFES
Lavdas, Leonidas G. (1977-1995), SEFES & SRS
LaVoy, Gerald C. (1975-1982), SEFES
Lawrence, James D. (1969-1970), SEFES
Lawson, Edwin R. (1958-1988), SOFES
Laxton, Josephine (1921-1943), AFES
Lee III, Robert E. (1952-1977), SEFES & SOFES
Lee, Hollie S. (1986), SOFES
Lee, Karen J. (1992-1995), SEFES & SRS
Lee, Linda L. (1975-1986), SOFES
Lee, Stephen E. (1986), SOFES
LeGrande, Jr., William P. (1946-1962), AFES & SEFES
Lehrbas, Mark M. (1931-1960), SOFES
Leininger, Theodor D. (1992-1995), SOFES & SRS
Lemieux, Francis J. (1934-1936), SOFES
Lemly, A. Dennis (1992-1995), SEFES & SRS
Lemon, Paul C. (1943-1948), AFES & SEFES
Lennartz, Michael R. (1975-1989), SEFES
Lentz, G.H. (1930-1933), SOFES
Lester, Orville (1928-1929), AFES
Lewis, Arnold D. (1959), SEFES
Lewis, Clifford E. (1960-1989), SEFES
Lewis, Gladys H. (1941), AFES
Lewis, Gordon D. (1963-1991), SEFES
Lewis, Harold (1951-1952), SOFES
Lewis, James S. (1950-1955), SOFES
Lewis, Jr., Robert F. (1970-1986), SOFES
Lewis, Sherman M. (1950-1955), SOFES
Lewis, W.E. (1937), AFES
Lick, Michael D. (1986), SOFES
Lieberman, Joseph A. (1941-1949), AFES & SEFES
Liefeld, Theodore A. (1931-1943), SOFES
Liegel, Leon H. (1979-1984), SOFES
Lightle, Paul C. (1958-1959), SOFES
Lillie, Robert M. (1975-1977), SOFES
Liming, F.G. (1932-1934), AFES & SOFES
Lind, Vera S. (1931-1946), SOFES
Lindenmuth, Jr., Anson W. (1946-1953), AFES & SEFES
Lindgren, Ralph M. (1928-1951), SOFES
Liner, Kathleen C. (1959-1980), SEFES
Lingafelter, Gregory S. (1970-1972), SEFES
Linn, E.R. (1935), SOFES
Lipe, Laura (1993-1995), SEFES & SRS
Little, C. Olin (1946), SOFES
Lloyd, F. Thomas (1969-1995), SEFES & SRS
Lloyd, Janie Ruth (1940), AFES
Lloyd, L.D. (1928), SOFES
Lobit, Hilda F. (1958-1972), SOFES
Lockard, Charles R. (1943-1949), SOFES
Locke, Craig (1939), AFES
Lockhart, Canady H. (1940), SOFES
Loeb, Susan C. (1991-1995), SEFES & SRS
Loessner, Jr., A.G. (1935), SOFES
Loftis, David L. (1978-1995), SEFES & SRS
Loftus, Jr., Nelson S. (1966-1979), SEFES & SOFES
Lohman, M.L. (1933-1934), AFES
Lohrey, Richard E. (1969-1989), SOFES
Lomieux, F.J. (1934), SOFES
Long, George V. (1985-1988), SOFES
Longhead, H.J. (1931), AFES
Loomis, Robert C. (1994-1995), SEFES & SRS
Loper, Orlo H. (1986), SOFES
Lora, Mary E. (1975-1976), SOFES
Lorentzen, Jr., Fritz (1949-1951), SEFES
Lorenz, JoAnn M. (1971-1972), SOFES

Lorio, Jr., Peter L. (1963-1995), SOFES & SRS
Lott, Larry H. (1986), SOFES
Lott, Lynn M. (1986), SOFES
Lotti, Thomas (1940-1961), AFES & SEFES
Loughead, Harvey J. (1930-1942), AFES
Lovern, Wayne M. (1966-1970), SOFES
Lovette, John H. (1942-1960), AFES & SEFES
Lowe, Carol A. (1983-1995), SOFES & SRS
Lowe, Joseph D. (1940), SOFES
Loyacano, Marybeth (1986), SOFES
Lubbe, John A. (1929-1942), SOFES
Lucas, Ben (1930), AFES
Lufburrow, Burley B. (1948), SEFES
Lugo, Ariel E. (1980-1992), SOFES
Lull, Howard W. (1953), SOFES
Lundgren, Margaret J. (1983-1989), SEFES
Lynch, Eugenia H. (1975-1982), SOFES
Lynn, Charles C. (1938-1940), SOFES
Lynn, Frances R. (1939-1941), AFES
Mackay, Bryan B. (1946), AFES
MacKichan, Kenneth A. (1936-1938), AFES
MacKinney, Arland L. (1927-1938), AFES & SOFES
MacNaughton, Jimmy V. (1969-1970), SOFES
Maddock, Stephen J. (1964-1966), SEFES
Maier, Chris A. (1992-1995), SEFES & SRS
Main, Robert R. (1970), SEFES
Maisenhelder, Louis C. (1944-1966), SOFES
Maki, T. Ewald (1932-1951), SOFES
Mallette, Eldon J. (1986), SOFES
Malveau, Edward J. (1981-1994), SOFES
Manchester, E.M. (1931-1934), AFES
Mandeville, Albert (1934), AFES
Mann, Jr., William F. (1940-1980), SOFES
Manney, Robert B. (1959-1962), SEFES
Manwell, Katherine L. (1938-1946), SOFES
Manwiller, Floyd G. (1966-1978), SOFES
Maple, William R. (1958-1972), SOFES
Marcus, Gwendolyn M. (1989), SOFES
Marion, Daniel A. (1990-1995), SOFES & SRS
Marshall, Eugene D. (1940), AFES
Marshall, Ruth (1930-1946), SOFES
Martin, George A. (1981-1983), SOFES
Martin, Jr., M. Alton (1986), SOFES
Martin, Robert E. (1961-1963), SEFES
Marx, Donald H. (1964-1993), SEFES
Mason, E.J. (1934-1935), SOFES
Mason, Garland (1981-1984), SOFES
Masson, George H. (1944-1945), SOFES
Mathews, Andrew C. (1946), AFES
Mathis, Ted L. (1989-1995), SEFES & SRS
Matthews, Frederick R. (1958-1988), SEFES
Maughan, William (1933-1934), AFES
Maul, David C. (1940), AFES
Mauldin, Joe K. (1969-1994), SOFES
Mauldin, Jr., William S. (1971-1978), SOFES
Maxwell, Charlie (1944-1946), SOFES
Maxwell, Jake (1944-1946), SOFES
May, Dennis M. (1986-1991), SOFES
May, Richard H. (1929-1930), SOFES
Mayer, Karl R. (1946), SOFES
Mayer, W.B. (1937), AFES
Mayo, James R. (1985-1995), SEFES & SRS
McAlister, Robert H. (1966-1995), SEFES & SRS
McAlpine, Robert G. (1958-1979), SEFES
McAndrews, A.H. (1925), AFES
McArdle, Richard E. (1937-1944), AFES
McBroom, William T. (1940), SOFES
McCarthy, E.F. (1921-1926), AFES
McCartney, David C. (1934), AFES
McCartt, G.M. (1981-1984), SEFES
McClay, Thomas A. (1948-1954), SEFES
McClung, Macky A. (1992), SOFES
McClure, Joe P. (1958-1988), SEFES
McClurkin, Douglas C. (1954-1984), SOFES
McConnell, William V. (1946), SOFES
McCormack, James F. (1946-1958), AFES & SEFES
McCoy, G.G. (1935), SOFES
McCracken, Francis I. (1969-1991), SOFES
McCulley, Robert D. (1940-1952), SEFES & SOFES
McDaniel, Clarence A. (1985-1995), SOFES & SRS
McDonald, Barbara (1994-1995), SEFES & SRS
McDonald, John K. (1966-1970), SEFES
McDonald, Timothy P. (1992-1995), SOFES & SRS
McDonnieal, Billy H. (1986), SOFES
McDowell, William S. (1934), AFES
McDuff, Wayne (1986), SOFES
McGee, Charles E. (1958-1988), SEFES & SOFES
McGilvray, John M. (1986-1995), SOFES & SRS
McGovern, Terry D. (1975-1978), SOFES
McGowan, Elaine P. (1958-1964), SOFES
McGregor, William H.D. (1954-1960), SEFES
McIntosh, Susan E. (1993-1994), SOFES
McKee, Jr., William H. (1969-1994), SEFES & SOFES
McKellar, A.D. (1935-1936), SOFES
McKevlin, Martha R. (1989-1995), SEFES & SRS
McKillop, Theodore D. (1946), SOFES
McKinn, James W. (1978), SEFES
McKinney, Jane B. (1971-1983), SEFES
McKnight, Joseph S. (1946-1969), SOFES
McLemore, Bobbie F. (1958-1986), SOFES
McLintock, Thomas F. (1958-1966), SEFES
McMahon, Charles K. (1975-1995), SEFES & SRS
McMillin, Charles W. (1966-1985), SOFES
McMinn, James W. (1969-1995), SEFES & SRS
McNab, William H. (Henry) (1971-1995), SEFES & SRS
McNasser, Karl W. (1958-1963), SEFES
McNees, Ralph E. (1970-1980), SEFES
McNulty, Steven G. (1994-1995), SEFES & SRS
McQuilkin, William E. (1937-1942), AFES
McReynolds, Robert C. (1959-1985), SEFES & SOFES
McWilliams, William H. (1986-1991), SOFES
Meadows, Barkley (1951), SOFES
Meadows, James S. (Steve) (1990-1995), SOFES & SRS
Medlars, Susan (1991-1993), SEFES
Meeker, Marilynn (1981-1987), SEFES
Meginnis, H. Glenn (1929-1964), SEFES & SOFES
Meier, Calvin D. (1991), SOFES
Mercer, D. Evan (1993-1995), SEFES & SRS
Mergen, Francios (1953-1954), SEFES
Merkel, Edward P. (1952-1979), SEFES
Merrick, Elliott T. (1948-1966), SEFES
Mershon, Wilson F. (1934-1937), AFES & SOFES
Mesavage, Clement (1943-1966), SOFES
Meskimen, George F. (1969-1984), SEFES
Metz, Louis J. (1951-1980), SEFES
Meyers, Jr., Clifford A. (1975-1976), SOFES
Michael, Jerry L. (1978-1995), SOFES & SRS
Middlebrooks, Wayne Curtis (1952), SOFES
Mignery, Arnold L. (1946-1972), SOFES
Miller, Carl E. (1947-1948), SOFES
Miller, F.H. (1922), SOFES
Miller, J.D. (1932-1933), AFES & SOFES
Miller, James E. (1946-1950), SOFES
Miller, James H. (1978-1995), SOFES & SRS
Miller, John A. (1946-1948), SOFES
Miller, Mitchell C. (1975-1991), SOFES
Miller, Patrick E. (1993-1994), SOFES
Miller, Thomas H. (1969-1991), SEFES
Miller, Willie E. (1986), SOFES

Mills, Coel W. (1936-1946), AFES & SOFES
Mills, Lucy B. (1946), AFES
Millsaps, Vera (1933), AFES
Minckler, Leon S. (1937-1946), AFES
Miner, Norman H. (1966), SEFES
Mirov, N.T. (1929-1930), SOFES
Mitchell, Harold L. (1942-1953), SOFES
Mitchell, Harry W. (1940-1941), AFES
Mitchell, Lacy (1955-1957), SOFES
Mobley, Howard W. (1980-1988), SOFES
Moehring, David M. (1959-1966), SOFES
Moffett, Edward D. (1986), SOFES
Mohn, Carl A. (1969), SOFES
Mook, Paul V. (1944-1948), SOFES
Mooney, David J. (1958-1960), SOFES
Moore, Alan (1991-1995), SEFES & SRS
Moore, Billy J. (1986), SOFES
Moore, Ellen G. (1986-1994), SOFES
Moore, Gordon E. (1969-1982), SEFES
Moore, Helen M. (1937), AFES
Moore, Jr., Joseph (1948-1949), SOFES
Moore, Kay S. (1977-1979), SEFES
Moore, Lincoln M. (1991-1992), SEFES
Moore, Virginia S. (1986), SOFES
Moore, William H. (1961-1980), SEFES
Morey, H.F. (1927-1928), AFES
Morgan, Dale (1975), SOFES
Morgan, David M. (1992-1995), SOFES & SRS
Morgan, Kenneth J. (1934), AFES
Morrill, George E. (1934-1942), AFES & SOFES
Morris, Pearle H. (1930-1932), SOFES
Morris, Robert C. (1949-1976), SOFES
Moseley, Jayne L. (1942-1944), SOFES
Moseley, Robert L. (1934-1937), AFES & SOFES
Moser, H.C. (1928), AFES
Moser, John C. (1959-1989), SOFES
Moss, Carol S. (1985-1987), SOFES
Moyle, Ralph C. (1953), SOFES
Muir, David M. (1995), SRS
Mullin, George B.P. (1958-1962), SEFES
Mullin, Joanna J. (1976-1989), SOFES
Mullins, Sarine L. (1937), SOFES
Munday, Eva W. (1975-1984), SEFES
Muntz, Herbert H. (1937-1964), SOFES
Murphy, Dorothy N. (1946), SOFES
Murphy, John R. (1986), SOFES
Murphy, Paul A. (1971-1995), SOFES & SRS
Murray, R.M. (1935), SOFES
Muse, Henry David (1981-1986), SEFES
Mushlitz, Kenneth L. (1985), SEFES
Musone, Joseph A. (1969-1970), SOFES
Myers, Earl C. (1940-1941), AFES
Myers, W.W. (1936-1937), AFES
Myhre, David W. (1959), SOFES
Nagel, William P. (1958), SEFES
Namkoong, Gene (1959-1994), SEFES & SOFES
Nance, Warren L. (1971-1994), SOFES
Nawrocki, Joseph C. (1946), SOFES
Neal, Jr., Robert L. (1959), SOFES
Neary, Daniel G. (1978-1992), SEFES
Neelands, Robert W. (1958-1964), SOFES
Neely, William T. (1940), SOFES
Nelson, Charles A. (1946), AFES
Nelson, Charles D. (Dana) (1988-1994), SOFES
Nelson, Irene J. (1970-1972), SOFES
Nelson, Isabell Louise (1938-1970), SOFES
Nelson, Jr., Arthur W. (1940), SOFES
Nelson, Jr., Ralph M. (1969-1986), SEFES
Nelson, Martha E. (1937-1962), SOFES
Nelson, Mary L. (1938-1940), SOFES
Nelson, Norman S. (1975-1995), SOFES & SRS
Nelson, Ralph M. (1927-1964), AFES & SEFES
Nelson, Richard W. (1935-1937), SOFES
Nelson, Thomas C. (1951-1969), SEFES & SOFES
Nes Smith, Otto W. (1986), SOFES
Nesbitt, William A. (1933-1943), AFES
Nevers, John R. (1934-1936), SOFES
Newsome, Lonnie (1986), SOFES
Nichols, Dan (1943-1944), SOFES
Nichols, Henry A. (1959-1970), SEFES
Nichols, Marian J. (1969-1994), SOFES
Nix, L.C. (1953-1954), SEFES
Nolan, Alicia P. (1924-1925), SOFES
Nolan, W. Franklyn (1953-1954), SOFES
Nolen, Michael J. (1986), SOFES
Nord, John C. (1969-1994), SEFES
Norman, Joan E. (1986), SOFES
Norris, Thomas J. (1946), SOFES
Norvelle, Silvia H. (1978-1984), SEFES
Nothstein, William L. (1927-1946), AFES
Nuite, Charles (1930), AFES
Oakes, William J. (1986), SOFES
Oatmark, H. Eugene (1961), SOFES
Ochs, Ronald G. (1987-1988), SEFES
O'Connor, Marcia F. (1981-1988), SEFES
O'Keefe, Charles T. (1959-1960), SEFES
O'Kelley, Donald G. (1935-1937), AFES & SOFES
Oliver, Wilbur N. (1959-1972), SEFES
Oliveria, Donna Jo S. (1986), SOFES
Oliveria, Forrest L. (1976-1979), SOFES
Olsen, Carl F. (1930-1940), SOFES
Olsen, Jr., David F. (1951-1978), SEFES
Olsen, Lucille P. (1931-1940), SOFES
O'Regan, William G. (1935-1940), SOFES
Orr, Aubrey E. (1946-1947), SOFES
Orr, Leslie W. (1958-1963), SOFES
Osborn, Robert M. (1950-1952), SOFES
Osborne, James G. (1931-1939), SOFES
Osborne, Martha R. (1946-1953), AFES & SEFES
Osgood, Jr., Eben A. (1958-1962), SEFES
Ostrom, Carl E. (1944-1954), SEFES & SOFES
Otrosina, William J. (1982-1995), SEFES & SRS
Outcalt, Kenneth W. (1980-1995), SEFES & SRS
Outcalt, Patricia A. (1985-1988), SEFES
Overholts, L.O. (1932), SOFES
Overton, Ronald T. (1979-1982), SOFES
Owens, Lucy E. (1975), SOFES
Pachence, Anthony M. (1959-1962), SEFES
Padgett, Jo A. (1981-1995), SEFES & SRS
Page, Rufus H. (1958-1964), SEFES
Pallin, Donald A. (1959), SOFES
Palmer, William M. (1938-1939), SOFES
Pappalardo, Adriana M. (1938), SOFES
Paris, Jr., George J. (1963-1964), SOFES
Parker, Chester (1948), SOFES
Parker, John M. (1940-1941), AFES
Parker, Opal J. (1966-1972), SOFES
Parks, Jr., Tommie E. (1946), AFES
Parr, William A. (1937), AFES
Parresol, Bernard R. (1989-1995), SOFES & SRS
Patchett, May M. (1928-1938), SOFES
Patric, James H. (1960-1964), SEFES
Patterson, Archie E. (1938-1946), SOFES
Patterson, Ruth (1933-1937), AFES
Pattillo, Joseph H. (1969), SEFES
Paul, James T. (1969-1990), SEFES
Paul, Raymond C. (1986), SOFES
Pawek, Hugo J. (1930-1931), AFES
Pawuk, William H. (1975-1980), SOFES
Payne, Brian R. (1969-1970), SOFES
Payne, Claire (1995), SRS

Payne, Thomas L. (1975-1978), SOFES
Pearson, Elisa M. (1926-1933), AFES
Pearson, Henry A. (1969-1991), SOFES
Pearson, Jack B. (1938-1940), SOFES
Pease, Truman E. (1931-1942), SOFES
Pechanac, Joseph F. (1958-1961), SEFES
Peevy, Fred A. (1945-1976), SOFES
Pegel, Aston D. (1985), SOFES
Pepper, William D. (1969-1995), SEFES & SRS
Perdue, James H. (1990-1995), SOFES & SRS
Perry, Joe D. (1958-1960), SOFES
Perry, Jr., John H. (1945-1960), SEFES & SOFES
Perry, Thelma J. (1970?-1995), SOFES & SRS
Person, Hubert L. (1945-1952), SOFES
Pessin, Louis J. (1927-1942), SOFES
Peter, Josephus K. (1979-1982), SOFES
Peter, Ralph K. (1958-1964), SEFES
Peters, George J. (1934), AFES
Peters, William J. (1979-1982), SEFES
Peterson, Kenneth M. (1958), SOFES
Peterson, L.E. (1931-1932), AFES
Pharo, James A. (1970-1977), SEFES
Phelps, C.E. (1930-1931), AFES
Phelps, Charles N. (1940-1942), SOFES
Phillips, Douglas R. (1975-1987), SEFES
Pickelsimer, H.A. (1937), AFES
Pierce, A.A. (1937), AFES
Pierce, L.T. (1933-1934), AFES
Pierce, Robert S. (1954), SOFES
Pierovich, John M. (1975-1979), SEFES
Pietri, Mildred T. (1938), SOFES
Pilcher, Earl J. (1940), SOFES
Pilcher, Victor (1940), SOFES
Pitcher, John A. (1978-1986), SOFES
Pitcher, Kenneth A. (1958), SEFES
Pitts, Walles (1943-1946), SOFES
Pleasonton, Alfred (1958-1978), SOFES
Plice, M.J. (1934), AFES
Plyler, William F. (1959-1975), SEFES
Plym, Katherine (1995), SRS
Poague, Lee E. (1958-1959), SOFES
Polak, David J. (1989-1995), SOFES & SRS
Polmer, Bonnie H. (1977-1980), SOFES
Polock, Felipe Torres (1986), SOFES
Polus, Gregory T. (1986), SOFES
Pomerening, Donald A. (1949-1951), SEFES
Pomeroy, Kenneth B. (1946-1954), AFES & SEFES
Poore, Steven R. (1980), SOFES
Popham, Thomas W. (1969-1982), SOFES
Porteck, Kevin G. (1986), SOFES
Poss, Patsy K. (1991-1995), SEFES & SRS
Powell, Alice F. (1939-1954), AFES & SEFES
Powell, Anita M. (1954), SOFES
Powell, Ireland M. (1938-1942), AFES
Powell, Janine (1995), SRS
Powell, R.E. (1937), AFES
Powers, Jr., Harry R. (1959-1990), SEFES
Presley, Nathan E. (1985-1991), SEFES
Pressgrove, Guy A. (1978-1979), SEFES
Prestemon, Jeff (1995), SRS
Price, Eddie W. (1975-1986), SOFES
Price, Harry B. (1959-1978), SOFES
Price, Luther E. (1934-1936), SOFES
Prokop, John F. (1971-1972), SEFES
Puettmann, Maureen (1992-1994), SOFES
Pugel, Anton D. (1986), SOFES
Punch, Louis E. (1969-1976), SOFES
Putnam, John A. (1928-1966), SOFES
Pye, John M. (1991-1995), SEFES & SRS
Pyke, Charles F. (1933), AFES
Queen, Opal J. (1992-1995), SEFES & SRS
Quick, T. Richard (1978-1995), SOFES & SRS
Quigley, Kenneth L. (1941-1942), AFES
Quinlan, Mable L. (1986), SOFES
Quinn, Diana (1991-1995), SEFES & SRS
Quinney, Dean N. (1969-1970), SEFES
Raber, Oran L. (1936-1940), SOFES
Radcliff, Roma L. (1985-1988), SEFES
Radford, Isaiah J. (1947), SOFES
Radford, Lee C. (1950-1958), SOFES
Ragland, Roland E. (1940), SOFES
Rainey, Luther M. (1953), SOFES
Randall, William K. (1970-1976), SOFES
Randolph, Jr., R.L. (1930), AFES
Ratleff, Joanna J. (1990-1995), SOFES & SRS
Rauscher, Michael (1995), SRS
Rawls, Billy G. (1946), SOFES
Rawls, Ike W. (1934-1960), SOFES
Rawls, Jimmie G. (1946), SOFES
Rayford, Anthony (1985-1994), SOFES
Rayl, Elsa M. (1937-1939), SOFES
Read, Ralph A. (1946-1952), SOFES
Reams, Gregory A. (1992-1995), SOFES & SRS
Reaves, Jimmy L. (1992-1995), SOFES & SRS
Redmond, A.L. (1937), AFES
Redon, Lillian M. (1932-1964), SOFES
Reed, Gary (1985-1986), SOFES
Reeve, John D. (1991-1995), SOFES & SRS
Regan, Mary C. (1925-1934), SOFES
Register, Carol (1995), SRS
Reinhart, Kenneth G. (1941-1954), AFES & SOFES
Reinsmith, Winton H. (1944-1945), SOFES
Reno, Joseph W. (1934-1935), SOFES
Renshaw, James F. (1934-1954), AFES & SEFES
Reuter, Marilyn (1982), SEFES
Reynolds, Dawn P. (1992-1995), SOFES & SRS
Reynolds, Patricia G. (1993-1994), SEFES
Reynolds, Russell R. (1930-1969), SOFES
Rials, Timothy G. (1989-1995), SOFES & SRS
Rice, McDuffie (1944), SOFES
Rich, Nely M. (1986), SOFES
Rich, Roger W. (1958-1961), SOFES
Richardson, Boone Y. (1963-1966), SOFES
Richey, Alve L. (1940-1941), AFES
Richmond, James A. (1975-1995), SEFES & SRS
Rickman, Enoch M. (1946-1947), SOFES
Rickman, Joseph M. (1946-1947), SOFES
Righter, F.I. (1928-1929), SOFES
Riley, M.M. (1933-1937), AFES
Ring, William C. (1937), AFES
Ringwood, James B. (1940-1943), SOFES
Ripley, Thomas H. (1959-1966), SEFES
Rippey, H.K. (1928-1929), AFES
Risner, Anne S. (1986), SOFES
Rivera, Carlos (1986), SOFES
Roane, Lillian E. (1938-1940), SOFES
Roberds, James H. (1975-1995), SEFES & SRS
Roberts, Donald R. (1963-1982), SEFES
Roberts, Eugene V. (1936-1942), AFES
Roberts, Kenneth L. (1940-1942), SOFES
Robertson, John H. (1946), SOFES
Robins, Charles E. (1946), SOFES
Robinson, Charles T. (1976), SOFES
Robinson, Conrad A. (1937), SOFES
Robinson, Edward L. (1964), SOFES
Robinson, Gregory (1948), SOFES
Robinson, T.M. (1934), AFES
Robinson, Vernon L. (1958-1984), SEFES
Rockwell, Dollie M. (1986-1991), SOFES
Rodenbach, Richard C. (1960-1962), SEFES
Rodgers, Stephen L. (1982-1985), SEFES

Rodriguez, Alberto (1986), SOFES
Rodriguez, Loharina (1986), SOFES
Roe, E.I. (1927), AFES
Roesch, Jr., Francis A. (1990-1994), SOFES
Roessler, Michael D. (1986), SOFES
Rogers, Bruce J. (1951), SEFES
Rogers, Earl J. (1937), AFES
Rogers, Ed L. (1934), AFES
Rogers, Steven L. (1980-1981), SEFES
Rogerson, Thomas L. (1966-1986), SOFES
Roland, Ted A. (1986), SOFES
Rollins, Douglas A. (1986), SOFES
Rollins, Mary G. (1969-1994), SEFES
Roman, Mildred (1986), SOFES
Romancier, Robert M. (1959-1966), SEFES
Romero, Hazel R. (1977-1982), SOFES
Roncadori, Ronald W. (1962-1966), SEFES
Rosa, John M. (1940), AFES
Roshto, Jerry D. (1986), SOFES
Ross, Eldon W. (1964-1984), SEFES
Rosson, Jr., James F. (1985-1995), SOFES & SRS
Roth, Elmer R. (1933-1958), AFES & SEFES
Rothenheber, Hazel B. (1940-1941), SOFES
Roussopoulos, Peter J. (1992-1995), SEFES & SRS
Roux, F.C. (1938), SOFES
Row, Clark (1959-1964), SOFES
Rowan, Samuel J. (1959-1985), SEFES
Rowbury, James G. (1940), SOFES
Rowland, Charles A. (1948-1950), SEFES
Royer, Larry A. (1984-1995), SEFES & SRS
Ruark, Gregory A. (1987-1992), SEFES
Rudis, Victor A. (1983-1995), SOFES & SRS
Rudolf, P.O. (1929-1932), SOFES
Rudolph, Daniel C. (Craig) (1991-1995), SOFES & SRS
Ruehle, John L. (1961-1991), SEFES
Ruff, Otis (1948-1950), SOFES
Rugg, Raymond F. (1986), SOFES
Rummell, Robert S. (1954-1958), SEFES
Rummer, Robert B. (1986-1995), SOFES & SRS
Rumsey, Robert L. (1969-1972), SOFES
Russ, Claris E. (1940-1944), AFES
Russell, Roy B. (1938), SOFES
Russell, Thomas E. (1958-1979), SOFES
Ruth, Elmer R. (1946), AFES
Ryan, Paul W. (1966-1983), SEFES
Ryberg, Milton E. (1948-1952), SEFES
Sackett, Stephen S. (1969-1972), SEFES
Salzman, Roberta L. (1944-1946), AFES
Sampson, George R. (1969-1970), SEFES
Sanchez, Felipe G. (1991-1995), SEFES & SRS
Sanchez, Mary J. (1990-1992), SOFES
Sand, Norbert H. (1946-1972), SOFES
Sanders, Carol L. (1983-1984), SOFES
Sanders, Jean (1993-1995), SEFES & SRS
Sanders, Tommie J. (1948), SOFES
Sandoz, Jr., Vernon J. (1980-1981), SOFES
Sandusky, Sylvia R. (1986), SOFES
Saucier, Joseph R. (1959-1994), SEFES
Saveland, James M. (1989-1994), SEFES
Scarborough, James H., Jr. (1986), SOFES
Scarbrough, Ben A. (1940), SOFES
Scarbrough, Norman M. (1937-1960), SOFES
Scatena, Frederick N. (1990-1992), SOFES
Schaill, H.A. (1936), AFES
Scheer, Robert L. (1958-1982), SEFES & SOFES
Scheffer, Theodore C. (1930-1934), SOFES
Scheld, Jr., Herbert W. (1966), SOFES
Scherer, Herbert H. (1966-1969), SOFES
Schillings, Paul L. (1970-1975), SOFES
Schlaegel, Bryce E. (1975-1985), SOFES
Schlesinger, Arthur (1945), SOFES
Schmidtling, Ronald C. (1969-1995), SOFES & SRS
Schmitt, Daniel M. (1964-1970), SOFES
Schmitt, Richard H. (1952), SEFES
Schmoldt, Daniel L. (1993-1995), SEFES & SRS
Schneider, Bertha H. (1937-1941), SOFES
Schneider, Carl E. (1934-1941), AFES & SOFES
Schnur, G. Luther (1952-1961), SOFES
Schoeneberger, Michele (1989-1991), SEFES
Schoenike, Roland E. (1953-1959), SOFES
Scholz, H.F. (1927-1928), AFES
Schomaker, Charles E. (1958-1960), SOFES
Schopmeyer, Clifford S. (1942-1954), SEFES & SOFES
Schreuder, Hans T. (1969-1979), SEFES
Schroeder, James G. (1966-1982), SEFES
Schubert, Thomas H. (1978-1980), SOFES
Schultz, A. Jay (1959-1960), SEFES & SOFES
Schultz, Robert P. (1966-1991), SEFES & SOFES
Schuster, Joseph L. (1961-1963), SOFES
Schweitzer, Helen (1937-1942), SOFES
Scott, C.O. (1935-1936), SOFES
Seagle, Walter D. (1948-1949), SOFES
Sealander, Irvin L. (1940), SOFES
Seamans, Jack D. (1946), SOFES
Searcy, Jr., Andrew (1975-1977), SEFES
Secrest, Herbert C. (1948-1953), SOFES
Secrest, John P. (1966), SOFES
Sedillo, Joe V. (1978-1979), SOFES
Segelquist, Charles A. (1969-1972), SOFES
Semmi, John C. (1934), SOFES
Sesco, Jerry A. (1985-1987), SEFES
Settel, Lee S. (1939-1942), SOFES
Seymour, H.O. (1937), AFES
Shaffer, Alice E. (1958-1970), SEFES
Shames, Leo M. (1941), AFES
Shaw, Luther (1934), AFES
Sheer, Robert L. (1983-1984), SEFES
Sheffield, Raymond M. (1981-1995), SEFES & SRS
Shelton, James H. (1934), AFES
Shelton, Joanne C. (1984-1995), SEFES & SRS
Shelton, Michael G. (1990-1995), SOFES & SRS
Shepard, Arthur L. (1934-1943), SOFES
Shepherd, Weldon O. (1941-1970), AFES & SEFES
Sheridan, Walter A. (1971-1972), SEFES
Shetter, W.L. (1929), AFES
Shipman, Robert D. (1953-1954), SEFES
Shivery, George B. (1924-1925), SOFES
Shope, Charlie L. (1937-1960), AFES & SEFES
Short, Henry L. (1966-1972), SOFES
Short, Robert M. (1940), SOFES
Shoulders, Eugene (1950-1990), SOFES
Shroeder, James G. (1983-1985), SEFES
Shull, Ralph A. (1949-1952), SOFES
Sibley, Elizabeth H. (1950-1952), SEFES
Siegel, William C. (1958-1993), SOFES
Siggers, Paul V. (1928-1951), SOFES
Sikes, Robert L. (1984-1995), SEFES & SRS
Silcocks, W.R. (1928-1929), SOFES
Silvey, Melody M. (1992-1995), SOFES & SRS
Simpson, Edmond (1943), SOFES
Sims, Ivan H. (1926-1948), AFES & SEFES
Sinclair, J.D. (1929-1932), SOFES
Sirois, Donald L. (1977-1990), SOFES
Sketo, Beulah F. (1986), SOFES
Skrehot, Donald J. (1960-1970), SEFES & SOFES
Sleeth, Bailey (1938-1941), SOFES
Slocum, Robert S. (1941), AFES
Sluder, Earl R. (1958-1995), SEFES & SRS
Sluzalis, Laurence (1930), AFES
Smalley, Glendon W. (1958-1988), SOFES
Smathers, George M. (1985-1986), SEFES

Smith, Albert A. (1944-1946), SOFES
Smith, Annie J. (1971-1972), SOFES
Smith, Elizabeth B. (1942), SOFES
Smith, Evelyn G. (1946), AFES
Smith, Gary W. (1986), SOFES
Smith, Glenn A. (1986), SOFES
Smith, Harold W. (1948-1949), SOFES
Smith, Harry F. (1934-1941), SOFES
Smith, James L. (1958-1959), SOFES
Smith, Marcus W. (1954), SOFES
Smith, Jr., Virgil K. (1958-1982), SOFES
Smith, Lera C. (1946), AFES
Smith, Lloyd F. (1940-1966), SOFES
Smith, Marquez J. (1937-1938), SOFES
Smith, Mary R. (1971-1972), SEFES
Smith, Michael L. (1986), SOFES
Smith, Norman G. (1948-1950), SEFES
Smith, Ray B. (1940), SOFES
Smith, Richard C. (1938-1940), SOFES
Smith, Richard H. (1953-1954), SEFES & SOFES
Smith, Walter R. (1989-1995), SOFES & SRS
Smith, Walton R. (1938-1966), AFES & SOFES
Smith, William H. (1948-1995), SEFES & SRS
Smith, Winston P. (1990-1995), SOFES & SRS
Smyly, Walter B. (1986), SOFES
Smythe, Richard V. (1966-1972), SOFES
Snow, Glenn A. (1958-1990), SOFES
Snow, Jr., Albert G. (1933-1952), AFES & SOFES
Snowden, Snowdie N. (1971-1972), SOFES
Snyder, E. Bayne (1958-1980), SOFES
Snyder, Harry M. (1941-1948), SOFES
Snyder, Nolan L. (1975-1995), SEFES & SRS
Snyder, Thomas E. (1935-1945), SOFES
Solomon, James D. (1960-1992), SEFES & SOFES
Sommers, Robert A. (1986), SOFES
Sontag, Harry O. (1952-1953), SOFES
Sorois, Donald L. (1976-1985), SOFES
Sossamon, Dora T. (1942-1949), AFES & SEFES
Souter, Ray A. (1993-1995), SEFES & SRS
Spada, Benjamin (1961-1963), SEFES
Spaine, Pauline C. (1987-1995), SEFES & SRS
Speaks, Diane B. (1986), SOFES
Spears, A. Glenn (1939-1941), SOFES
Spector, Albert H. (1946-1953), SOFES
Speers, Charles F. (1951-1972), SEFES
Spillers, Arthur R. (1929-1939), SOFES
Spratt, John T. (1945-1954), SOFES
Spuhler, Vera M. (1922-1930), SOFES
Squillace, Anthony E. (1959-1979), SEFES
St. George, R.A. (1925-1934), AFES
Stahelin, Rudolph (1943-1948), SOFES
Stangle, Charles M. (1986), SOFES
Stanturf, John A. (1993-1995), SOFES & SRS
Stark, Deborah A. (1992-1995), SEFES & SRS
Stauffer, Larry (1966), SOFES
Steagall, Mary V. (1986), SOFES
Stearns, Forest W. (1958-1960), SOFES
Steedley, Arthur G. (1935-1936), SOFES
Steele, C. Keele (1940-1941), AFES
Steele, Preston E. (1986), SOFES
Steensen, Jean K. (1975-1994), SEFES
Stefani, Darlene K. (1990-1995), SOFES & SRS
Stegall, Jr., Walter A. (1953-1962), SEFES
Steinbeck, Klaus (1966), SEFES
Steiner, Helen K. (1939-1940), AFES
Stelzer, Henry L. (1993-1995), SOFES & SRS
Stephenson, George K. (1940-1966), SEFES & SOFES
Sternitzke, Herbert S. (1948-1980), SOFES
Stevens, Ernest E. (1991-1995), SEFES & SRS
Stevens, Robert R. (1966), SOFES
Stevenson, George K. (1961), SOFES
Stewart, James L. (1975), SOFES
Stewart, Joseph T. (1946-1960), AFES & SEFES
Stickney, Pat (1995), SRS
Stokes, Bryce J. (1981-1995), SOFES & SRS
Stolte, Kenneth (1994-1995), SEFES & SRS
Stone, Bonnell (1930), AFES
Stone, Jr., Earl L. (1940-1941), SOFES
Stone, Robert N. (1971-1972), SEFES
Storey, Theodore G. (1958-1961), SEFES
Stoughton, Margaret C. (1930), AFES
Stover, William E. (1934-1954), SOFES
Stranksy, John J. (1958-1984), SOFES
Streetman, Clark H. (1934-1942), SOFES
Stringer, Charles A. (1986), SOFES
Stringer, Lillian M. (1986), SOFES
Strong, F.C. (1927), AFES
Stubbs, Jack (1958-1985), SEFES
Sullivan, Patricia A. (1993), SOFES
Suman, Reynold F. (1951-1953), SEFES
Sung, Shi-Jean (Susana) (1991-1995), SEFES & SRS
Surany, Paul (1963-1966), SEFES
Sutherland, William A. (1969-1982), SOFES
Sutton, Michael D. (1986), SOFES
Swafford, Charles A. (1969-1984), SEFES
Swafford, Jesse W. (1986), SOFES
Swank, Wayne T. (1969-1995), SEFES & SRS
Swarthout, Paul A. (1940-1941), SOFES
Swift, Jr., Lloyd W. (1958-1995), SEFES & SRS
Swindel, Benee F. (1962-1989), SEFES
Swofford, Thomas F. (1939), AFES
Sword, Mary Anne (1993-1995), SOFES & SRS
Swords, David A. (1978-1979), SOFES
Sylvester, E.J. (1937), AFES
Tangren, Charles D. (1971-1995), SEFES & SRS
Tansey, John B. (1983-1992), SEFES
Taras, Michael A. (1958-1979), SEFES
Taylor, Andrew J. (1986), SOFES
Taylor, Calvin C. (1962-1964), SEFES
Taylor, David H. (1943-1948), SOFES
Taylor, Dee F. (1959-1966), SEFES
Taylor, Earline C. (1939-1940), SOFES
Taylor, James F. (1969-1977), SEFES
Taylor, Jr., Heyward T. (1961-1969), SOFES
Taylor, Margaret J. (1962-1981), SEFES
Taylor, Robert E. (1953), SOFES
Tebo, L.B. (1953), SEFES
Terburg, Agnes G. (1929-1952), SOFES
Terranova, Floyd F. (1940), SOFES
Teuber, Kurt B. (1986), SOFES
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Margaret Stoughton Abell: The First Female Forest Service Forester Comes to the Appalachian Forest Experiment Station

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In 1930, Margaret Cordelia Stoughton became the first woman with a forestry degree to be hired by the U.S. Department of Agriculture Forest Service as a forester (Kline 2021). During this time, a female forester in America was a novelty and the media reminded readers of that fact at every opportunity in national newspapers and college magazines. After her assignment to the Appalachian Forest Experiment Station (AFES), Margaret's work—conducting research, publishing papers, and taking photographs—alongside other scientists was instrumental in the research conducted at the AFES. Herein, we trace her public life and scientific accomplishments during her tenure with the AFES.

Person believed to be Margaret Stoughton sitting on a 68-year-old chestnut oak (*Quercus montana*) being hand-hewed for railroad ties at a field research site in Bent Creek Experimental Forest. (USDA Forest Service photo taken by J.H. Buell)

BEFORE ASHEVILLE (1908–1930)

Margaret and her younger brother, George, were raised by Herbert and Elizabeth Stoughton in Osage, IA, a small town of 3,500 residents in the northeastern corner of the State. After high school, she attended Iowa State College to study forestry. Margaret was also very active in extracurricular activities, including serving as president of the Women's Athletic Association, member of the Forestry Club, and advertising manager of the *Ames Forester* (Iowa State College 1930). At the beginning of the Great Depression, a faculty advisor suggested she take statistics classes in the mathematics department under Professor George Snedecor, which could increase her employment opportunities for a government laboratory research job (Sinclair 2015). During the 1920s, Snedecor embraced the practical methods of data analysis in agricultural studies developed by the English mathematician, Ronald Fisher (Fisher 1925). Snedecor's statistical laboratory assisted other university researchers with study designs. Although no details of Stoughton's actual training with Snedecor can be found, Snedecor was well known for giving his students hands-on experience in the application of statistics to agricultural questions and teaching students how to use calculating machines to process large datasets (Cox and Homeyer 1975).

“Margaret graduated in 1930 with a Bachelor of Science degree in forestry (Iowa State College 1930), the only female forestry graduate in her class of 14 and the first woman to graduate as a forester at Iowa State (Waterloo Daily Courier 1930).

Hence, Snedecor's courses taken at Iowa State likely facilitated Stoughton's employment at the Forest Service. Given the scarcity of foresters with statistical and computational training, a person with such a background would have been appealing to Forest Service leadership, who recognized the importance of increasing the rigor of their science (Bruce 1999). For example, a few years earlier Joseph Kittredge, a Forest Service researcher with the Lake States Forest Experiment Station, strongly advocated for the same rapid advances in data analysis methods used by many disciplines at universities in forestry applications (Kittredge 1924). Kittredge's article likely caught the attention of F.X. Schumacher in the national office of the Forest Service in Washington, DC. Schumacher, a highly trained biometrician and head of the forest measurements section, was aware of Fisher's data analysis textbook, which was then being used to teach graduate-level courses in statistics at the U.S. Department of Agriculture Graduate School (Bruce 1999). Hiring new graduates with statistical skills was not unprecedented and encouraged by agency leadership (Bruce 1999). In 1929, the Southern Forest Experiment Station hired Roy A. Chapman in part to take advantage of his quantitative knowledge (Wakeley and Barnett 2016).

THE ASHEVILLE YEARS (1930–1937)

Margaret graduated in 1930 with a Bachelor of Science degree in forestry (Iowa State College 1930), the only female forestry graduate in her class of 14 and the first woman to graduate as a forester at Iowa State (Waterloo Daily Courier 1930). Margaret scored high on a Federal civil service exam and was offered a job performing data computations with the experiment stations branch of the Forest Service, which she immediately accepted (Sinclair 2015). When Margaret was assigned to the AFES, she was the first professionally trained female forester in the Forest Service (Kline 2021). Public interest items about a female forester in the Forest Service quickly received national and local attention. In August 1930, Margaret's photograph, with caption information about her being the first woman forester and stationed at the AFES, appeared as a news release in the Associated Press in Iowa and California newspapers (Des Moines Register 1930, Los Angeles Times 1930).

Information on her employment also appeared in the *Service Bulletin*, an agency newsletter for Forest Service employees. Under the heading "The Forest Service Feminine," readers were informed of five women in professional positions, one of which was Stoughton, who was not named and identified only as a forester (Edgerton 1931). Evidence of the rarity of women foresters was apparent when Margaret was approved for membership in the Society of American Foresters (SAF 1931). Under the heading of "Elections to Membership" the article went on to state: "The following *men* …" have been approved as members (italics added).[1] The two Asheville newspapers found many opportunities to remind readers that Margaret Stoughton was a female forester. In a February 1931 article about a hiking club, Margaret was listed as secretary and "… one of the few women foresters in America" (Asheville Citizen-Times 1931a). A note in another article by the *Asheville Citizen-Times* reported that the AFES had provided Margaret's photograph to the Associated Press, which had requested it for distribution to other newspapers through their news services (Asheville Citizen-Times 1931b). Under the heading "Miss Stoughton in Second Year Forestry Work," Margaret is identified as the second professional forester after Dr. Eloise Gerry at the Forest Products Laboratory in Madison, WI[2] (Asheville Citizen 1931a). With words about Margaret being a professional Federal forester, the Asheville Citizen (1931b) reported that she and Charles Abell, another junior forester at the AFES, were married on July 10, 1931 in the All-Souls Presbyterian Church of Asheville. Margaret's photograph provided to the Associated Press (Asheville Citizen-Times 1931b) (including a note that she was a forester) appeared several days later under the heading of "Recent Bride" (Asheville Citizen 1931c). Interestingly, it is unclear how the Abells skirted the anti-nepotism regulations of the agency (Kline 2021).

Hired as a junior forester, records of Margaret's work are limited. However, it is quite apparent that Margaret's work at AFES was not restricted to an office environment doing statistical calculations, as the civil service job description had implied. Evidence as a researcher is shown by her participation in the 1931 meeting of the Appalachian Forest Research Council (Asheville Citizen 1931d). Margaret had been originally assigned to study the management of mountain hardwood forests and phenology (AFES 1932). According to a bibliography of the publications of the AFES, she published five articles (three as lead author) during her tenure with the AFES (Southeastern Forest Experiment Station 1947) and was an active field participant in these studies. As an example, a large-scale, operational study of harvesting and regeneration had been installed by Jesse Buell. Margaret was a co-investigator on this work and a credited contributor to some of the articles produced (Buell and Abell 1935). Photographic documentation of study sites was also among her (and other researchers') field activities at the Bent Creek Experimental Forest (BCEF), 10 miles south

Recent Bride

Mrs. Charles A. Abell whose marriage took place Friday afternoon at All Soul's Episcopal church was formerly Miss Margaret Stoughton. She was the second woman to be appointed in the U. S. Forestry service.

Photograph above from the Asheville Citizen-Times described Margaret (now Abell) as the "second woman to be appointed [as a scientist] in the U.S. Forestry Service." An earlier photograph of Stoughton provided to newspapers by the Associated Press and printed in the Los Angeles Times (1930) with the caption:

"Margaret Stoughton— ASHEVILLE (N.C.) Aug. 15. Uncle Sam has called to his assistance in solution of forestry problems the keen mind of Margaret Stoughton, brilliant forestry graduate of Iowa State College. Miss Stoughton is the first junior woman forester in the United States. She is stationed at the Appalachian [F]orest [E]xperiment [S]ation here. Her home is in Osage, Iowa."

[1] Also included in the list of new SAF members was Leonard I. Barrett, whose 1936 silvicultural study in an old-growth stand in the Bent Creek Experimental Forest would be a first for the AFES (McNab 2023a).

[2] Not a forester by training, Dr. Eloise Gerry was a microbiologist located at the Forest Products Laboratory, in Madison, WI. She primarily performed laboratory studies of wood anatomy associated with oleoresin production from southern yellow pines.

Example of a monochrome photograph for documenting conditions and progress of studies at field research sites. Identification notes on the envelope enclosing copies of this photograph state: "Methods of cutting study, Bent Creek, Pisgah National Forest, N.C.; No. 254793. Repeat of 255757. General view of clear cutting. Brush burned on left half and left on right half. Part of [Bent Creek] woodyard at foot of hill." (USDA Forest Service photo taken by Margaret C. Stoughton)

of Asheville. A photograph taken by Margaret in May 1931 shows the clearcut harvesting treatment, and visible in the lower right corner is a stack of cut wood ready for loading and transport to a community woodyard in Asheville.[3]

A 1932 news item titled "On Capital Detail" stated that Margaret was in Washington on a special detail of 10 days doing computing work (Asheville Citizen 1932). The detail could have been related to her 1933 co-authored *Journal of Forestry* article (Nelson and others 1933). The publication reported research results as equations to predict effects of wildfire on hardwood sawtimber. Margaret's statistics classes at Iowa State likely facilitated her analysis of data from the study involving 317 trees of 5 species. Multiple linear regression was used to model the effects of heat from a spring wildfire on cambium damage in relation to tree diameter and species. The complex nature of the derived regression models is remarkable for its time. Margaret's contribution to the study is unknown but could have been substantial because she was included as co-author with two senior researchers. The data analysis necessary for this article would have been formidable, particularly considering that only a mechanical calculator was likely available to derive regression coefficients, evaluate model formulations, and determine standard errors. However, Bruce (1999) reported the Washington Office had bought a Hollerith machine that used tabulating cards, which "… was a gigantic improvement over computing with hand-operated mechanical calculators." Margaret's detail, therefore, probably included assisting with writing the highly technical manuscript. A later example of her innovative use of statistical methods is evident in her co-authored publication with Jesse Buell (Buell and Abell 1935). In that early example of projecting stand growth after partial cutting, it appears that Margaret derived the printed volume tables based

[3] Additional information related to the timber harvest treatments required for this study and its connection with the Asheville woodyard during the Great Depression is described in McNab 2023b.

A photograph of a black locust (*Robinia pseudoacacia*) seed tree growing in Glenn Gap on the Bent Creek Experimental Forest (BCEF). The two white objects in the background beyond the automobile are an instrument shelter and a rain gauge that were part of early watershed research at BCEF before the 1934 establishment of the Coweeta Hydrologic Laboratory. (USDA Forest Service photo taken by Margaret S. Abell)

on regression models rather than response curves fitted by hand to field data as was typical of that time.

Margaret's article (Abell 1933) in the *Ames Forester* is probably her best known and provides an example of her excellent writing skills. In this paper, she provided a vivid description of a "virtual" tour of the BCEF to view ongoing research studies and a reference to the "unemployment relief appropriations" for building Hard Times Road (in 1931). She also provided considerable detail on sites of several fire studies, which provides a connection with another of her publications on fire damage to trees and its correlation with heart rot (Abell 1932). Perhaps noteworthy in this article was that the editor of *Ames Forester* reminded readers of Margaret's gender and that she did field work (she made no mention of this herself). The editor also mentioned her work on the Capper Report[4] and stated that half of her time was occupied by computations. Later office reports found her assigned to studies on the silviculture of black locust (*Robinia pseudoacacia*), a species with highly desirable characteristics for fence posts and erosion control (Abell 1934, 1935a, 1936). Margaret also helped others with research, as noted in an informative footnote in Huckenpahler (1936) acknowledging her consultation on his data analysis. In 1937, she wrote an editorial letter to the *Journal of Forestry* (Abell 1937) responding to comments by Cummings (1937) on her earlier article (Abell 1935b) describing the modification of Craighead calipers for small trees.

[4] Following the heavy use of forest resources during World War I there was growing public concern about rapidly increasing timber prices and the potential for declining supply to meet immediate and future demand. In Senate Resolution 311 of 1920, Senator Capper of Kansas requested the Secretary of Agriculture provide facts about the present and future wood supply situation. The Forest Service response was entitled "Timber Depletion, Lumber Prices, Lumber Exports, and Concentration of Timber Ownership" or commonly known as the Capper Report. Margaret's actual role in the production of the Capper Report is unknown; she could have been involved in an update of the original data.

Margaret resigned from the AFES in May 1936 before the birth of her daughter, Jean Elizabeth (Harmon 1983). She apparently volunteered after resigning because she photographed one of her black locust study trees in September 1936.

AFTER ASHEVILLE (1937–2004)

In 1937, Margaret and Charles departed Asheville for the Shasta National Forest, in northwestern California. Although she no longer worked for the Forest Service, she never stopped being a forester. In 1982, the Willamette chapter of the Society of American Foresters recognized her for 50 years of continuous membership (SAF 1982); this time the SAF got it right—Margaret was not one of the *men*. The last place of residence for the Abells was Benton County, Oregon.

Charles died in 1997 at the age of 91 and Margaret in 2004 at the age of 95. Both Charles and Margaret are buried in the historical Crystal Lake Cemetery in Corvallis, OR. The National Register of Historic Places provides names of notable pioneers buried there (U.S. Department of Interior National Park Service 2004). However, as the pioneering woman forester in the Forest Service, Margaret Stoughton Abell is missing from the list—perhaps because women foresters are no longer unusual.

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The 1936 Long Branch Plots at Bent Creek: The First Statistically Designed Study of the Appalachian Forest Experiment Station

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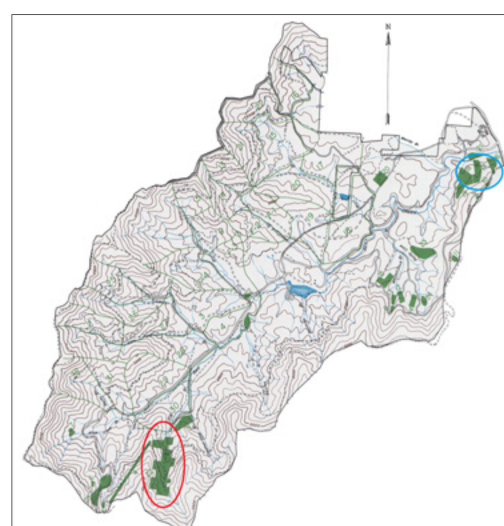
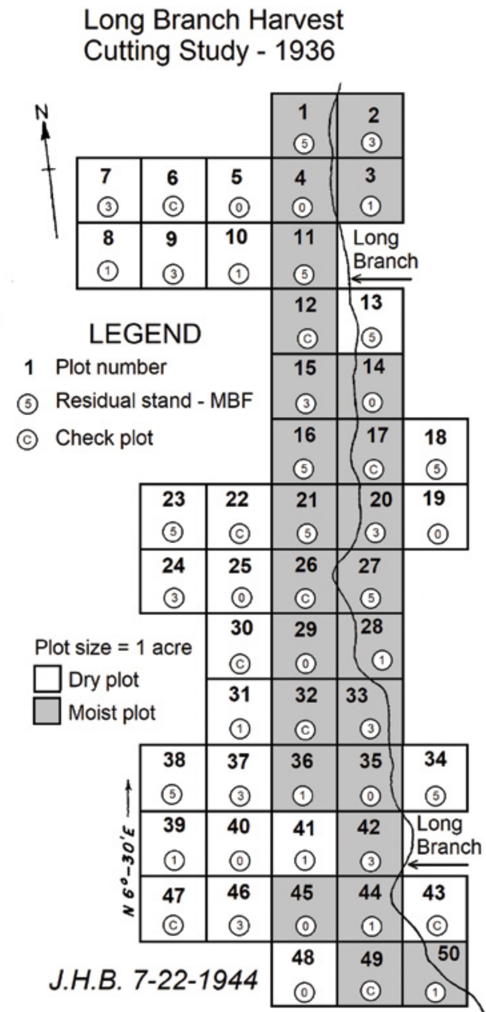
The first “designed” study conducted by the Appalachian Forest Experiment Station (AFES) marked a change from an observational to a science-based approach in the Station’s research field methods. Before the 1930s, American forest researchers generally applied silvicultural treatments across large areas and compared results using anecdotal observations. The large study areas, however, usually included unrecognized site (e.g., soil differences) or stand conditions (e.g., age differences), which could influence treatment results. During this period, field methods using replicated small plots for agricultural studies had been developed in England (Fisher 1925, 1935) and were strongly recommended for improving the quality of U.S. Department of Agriculture Forest Service research (Gevorkiantz 1935, Kittredge 1924). The Long Branch study was established in 1936 on the Bent Creek Experimental Forest (BCEF) by Leonard I. Barrett, a forester with a master’s degree from the University of Michigan, who likely had knowledge of Fisher’s study design methods.

The reason for Barrett’s Long Branch study originated 20 years earlier. In 1915, Earl Frothingham, forest examiner for the Forest Service, travelled throughout the Southern Appalachian Mountains conducting a study of cut over areas with the objective of evaluating stands for “… immediate silvicultural management” consisting of two options: either manage the present stand as potentially profitable or remove all remaining mature trees to release the existing seedlings and saplings to form a new stand (Frothingham 1917). When Frothingham was named the first director of the AFES in 1921, he outlined an initial plan of research emphasizing the restoration of degraded stands and prudent timber harvesting that maintained productivity (Asheville Citizen 1921). Two years later, he developed a working plan (Frothingham 1923) that provided a template for a series of long-term studies conducted by AFES. This working plan outlined silvicultural methods for the management of Appalachian forests and looked to determine both the growth and economic value of the residual unharvested stand of timber and the amount and composition of tree seedling reproduction. In 1930, Jesse Buell installed the first study of harvesting methods under Frothingham’s working plan using the traditional approach of large, unreplicated, treated areas (Buell 1930). In a publication reporting 20-year results from this study, Wahlenberg (1953: 874) commented the treatments are “… without the design needed for statistical analysis.”



Field location of Buell’s 1930 unreplicated harvest study (blue circle) and Barrett’s 1936 replicated harvest study (red oval) in Bent Creek Experimental Forest.



Left: This photograph was included with other records related to Barrett's Long Branch study in the Bent Creek Experimental Forest; however, the location where it was taken is unknown. The stand structure is likely representative of a portion of the old-growth stand of poorly formed sawtimber present on the study site. See footnote 1 for more information on the timber stand at the study site before the harvest treatment.

Right: Long Branch study site showing field layout of fifty, 1-acre treatment plots and visual assignment of half of the plots as either mesic or dry based on perceived soil moisture regimes. (Map based on original by J.H. Buell, July 22, 1944.)

Barrett's Long Branch study was the second harvesting study in the BCEF and used a design that permitted statistical analysis. Barrett's treatments were installed along both sides of Long Branch, a relatively high-elevation (3,000 feet) tributary stream of Bent Creek (Barrett 1936). Except for the loss of canopy American chestnuts (*Castanea dentata*) killed in the 1920s by the introduced parasitic fungus (*Cryphonectria parasitica*) and then later salvaged, this timber stand was described as "… virgin when the first silvicultural treatments were planned in 1936" (Wahlenberg 1954: 1).[1] Particularly important, the inventory records for the installation of the study include composition and diameter of trees before harvest. Wahlenberg (1954) stated,

> *Mixed with the oaks were some yellow-poplars 3 or 4 feet in d.b.h and more chestnut trees, some of them even larger. The chestnuts were nearly all infected and half of them dead from blight by 1930 and were removed for acid wood. Except for this salvage cutting the tract was virgin when the first silvicultural treatments were planned in 1936.*

[1] Research for this article revealed that the Long Branch cove was a previously unreported and largely undisturbed old-growth stand in BCEF.

A total inventory of all trees > 4.6 inches in diameter at breast height (d.b.h.) was made on the 50-acre tract during the summer, which included the diameter of all chestnut stumps. The early history of the Long Branch property during the 1800s was described by Nesbitt (1941). Objectives of the study were to examine the effects of varying levels of harvest on growth and epicormic sprouting of the remaining uncut trees.

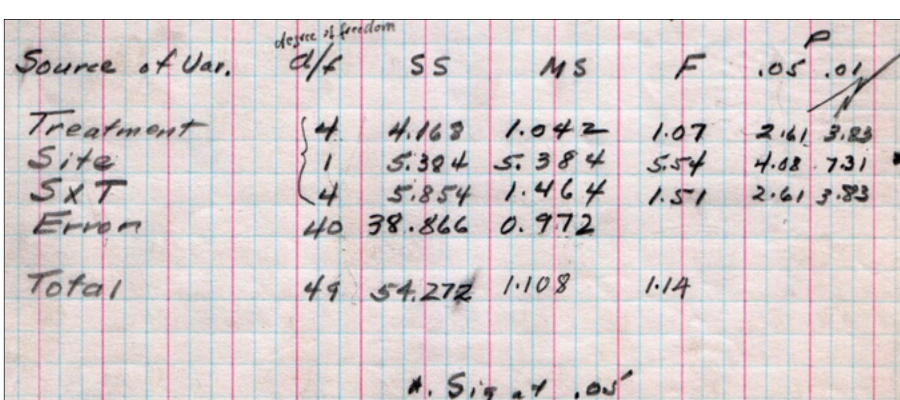
Unlike Buell's study, where each treatment was applied only once across a large area, Barrett's study was based on a statistical design of randomly assigned treatments and untreated controls replicated on many small plots. He tested 5 harvesting treatments replicated 10 times, resulting in fifty, 1-acre plots. Because the sample plots paralleled Long Branch, the study design recognized two classes of site quality as a natural source of variation that could influence tree growth of the harvest treatments: (1) moist sites near the stream, and (2) dry sites farther away. The harvest treatments compared the effects of five levels of merchantable tree volume (measured in board feet [BF]) remaining on each treatment plot: 0 BF; 1,000 BF; 3,000 BF; 5,000 BF; and control (no harvest). Trees smaller than 9.6 inches d.b.h. were not harvested. Because the 0 BF treatment did not harvest trees smaller than 9.6 inches d.b.h. (the minimum size for sawtimber at that time), for practical purposes, it could be described as a commercial clearcut. That type of harvest followed the first objective of Frothingham's 1923 work plan because smaller trees remained that would soon grow to sawtimber size. For comparison with a silvicultural clearcut (where all trees 1 inch and larger are cut) see the 1930 photograph taken by Margaret Stoughton of Buell's study (McNab and O'Shields 2023).

The first inventory of treatment results was made in January 1945, after 7 years of growth by the residual trees. Because Barrett had been appointed director of the Central States Forest Experiment Station in 1942 (U.S. Department of Agriculture 1942), Ernst V. Brender, a junior forester at the AFES, performed the first analysis of variance of data from a designed study (Brender 1946). His analysis indicated no differences in mean annual basal area growth among the five treatments, which ranged from 2.09 to 2.95 square feet per acre.

However, moisture class significantly affected mean annual basal area growth, which was greater on dry sites (2.88 square feet per acre) compared to moist sites (2.23 square feet per acre). Although Barrett's study design was appropriate in that it provided for testing the effect of site quality on tree growth, the finding of better growth on dry sites was probably contrary to expectations. Brender (1945)

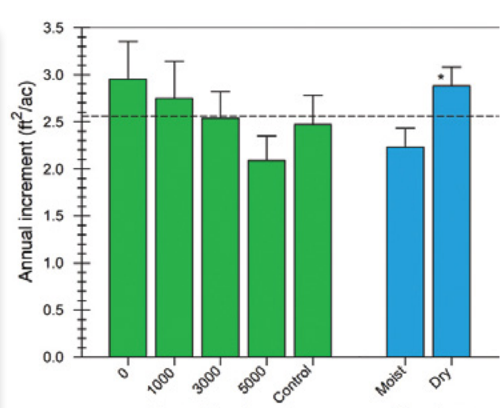
Left: The original analysis of variance made by Junior Forester E.V. Brender, on January 14, 1946, using preliminary data from the first replicated study of the Appalachian Forest Experiment Station in the Long Branch drainage of Bent Creek Experimental Forest (Brender 1946). Barrett's study design tested the effects on stand growth resulting from two primary sources of variation: (1) density after the harvest treatment, and (2) site soil moisture regime; and a secondary source of variation from the interaction of harvest treatment and site. The asterisk opposite site indicates it was the only significant source of variation affecting annual growth of the residual stand. The trimmed note in the upper right corner references the *F* values of the Treatment, Site, and S x T variables required for their significance at the *P* = 0.05 and *P* = 0.01 levels and states "Obtained from tables."

Right: Mean annual basal area increment in relation to residual sawtimber volume resulting from a preliminary analysis 7 years after treatments were installed on the Long Branch study plots. The overall mean annual basal area increment across all treatments was 2.56 square feet per acre (horizontal dashed line). The mean annual basal area increment was significantly greater (*P* = 0.05, asterisk) on dry sites (2.9 square feet per acre) than on moist sites (2.2 square feet per acre). The basal area increment did not differ among the residual stand board foot volume harvest treatments. Error bars are one of the standard error from the mean.



Source of Var.	d/f (degree of freedom)	SS	MS	F	P .05	P .01	
Treatment	4	4.168	1.042	1.07	2.61	3.83	
Site	1	5.384	5.384	5.54	4.08	7.31	*
SxT	4	5.854	1.464	1.51	2.61	3.83	
Error	40	38.866	0.972				
Total	49	54.272	1.108	1.14			

*. Sig at .05



"Although the Long Branch study ended after 20 years, the knowledge learned revealed the complex interactions of growth response between tree species and site quality and demonstrated the need for future well-designed silviculture studies in the Southern Appalachian Mountains.

commented (without explanation) that consideration could be given to changing the moisture classification of eight plots. Response variables of tree reproduction, volume increment, and epicormic sprouting were not analyzed until the study ended in 1952, 15 years after establishment.

Results from the Long Branch study were reported in two publications. Seven years after harvesting the Long Branch plots, Jemison and Schumacher (1948) used regression analysis to evaluate epicormic branching, which did not differ by harvest treatments, but was affected by tree species, site moisture class, and log position in the tree. Fifteen years after the harvest treatments, Wahlenberg (1956) focused on evaluation of treatments associated with sawtimber volume and value, which did not differ among harvest treatments or moisture classes. Although a hypothesis of growth response associated with moisture differences was never stated, study results for basal area increment were not provided; perhaps because they were the reverse of what was expected. New knowledge from this study included the influence of light on survival and growth of seedlings of shade-intolerant species, slow height growth of oak (*Quercus* spp.) seedlings, importance of advance reproduction, and destructive effects of browsing by white-tailed deer (*Odocoileus virginianus*) on seedlings of some species, particularly yellow-poplar (*Liriodendron tulipifera*).

CONCLUSIONS

In summary, Barrett's study revealed no silvicultural treatment differences associated with harvesting that were important for forest management. However, it was pioneering from a scientific perspective to provide a method for separating differences of treatment responses among biological and environmental sources of variation. Although the Long Branch study ended after 20 years, the knowledge learned revealed the complex interactions of growth response between tree species and site quality, and demonstrated the need for future well-designed silviculture studies in the Southern Appalachian Mountains. The findings from Barrett's study provided hypotheses for testing in a follow-up study on the Long Branch plots. The entire 50-acre study area was harvested in 1963 to evaluate the effects of silvicultural clearcutting and site quality on stand composition and development (McGee 1963).

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A Depression-Era Relief Program on Bent Creek Experimental Forest Yielded Firewood and a New Study

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As effects of the Great Depression increased in western North Carolina, the Pisgah National Forest (PNF) and the Asheville Unemployment Council (AUC) had a tree problem in common. The PNF needed to sell some trees so that a researcher at the Bent Creek Experimental Forest (BCEF) could install a study—but there were no buyers. The AUC needed to buy trees for their innovative employment relief program—but they had no money. A series of newspaper articles appearing in the *Asheville Citizen* (1930a–1930d, 1931a–1931h) and *Asheville Citizen-Times* (1930; 1931a, 1931b) described how the two groups worked together for a common solution.

Jesse Buell had finished laying out the first large-scale forest restoration study in the recently established BCEF near Asheville, NC (Buell 1930). The 35-acre study area consisted of four tracts, or woodlots, which had been privately owned for 50 years before being purchased by the Biltmore Estate in 1900. The woodlots were eventually sold to the U.S. Department of Agriculture Forest Service in 1914 when the PNF was formed (Nesbitt 1941). After many years of cutting timber for subsistence farming, these cutover woodlots were like many other areas in the Southern Appalachians with their limited potential for growing valuable, high quality sawtimber (Buell 1928). Following a master plan prepared earlier by Appalachian Forest Experiment Station (AFES), Director Earl Frothingham (Asheville Citizen 1921, Frothingham 1923), the objective of Buell's study was to

Left: Men from the Asheville community woodyard at work in the study area. (USDA Forest Service photo taken by J.H. Buell in March 1931)

Right: Mules provided by Buncombe County pulled logs from the woodlot to a processing area beside Bent Creek. (USDA Forest Service photo taken by J.H. Buell in February 1931)

Left: County trucks at the Asheville community woodyard on the bank of Bent Creek. (USDA Forest Service photo taken by J.H. Buell in February 1931)

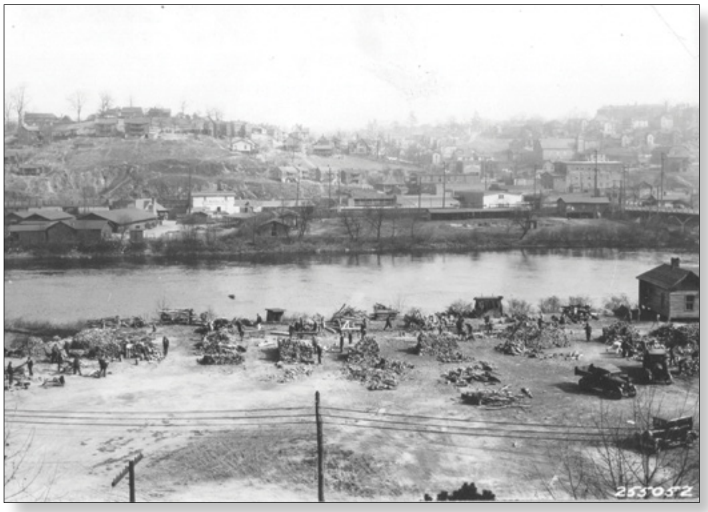
Right: Loading firewood on a county truck for the Asheville community woodyard. (USDA Forest Service photo taken by J.H. Buell in February 1931)

"… reveal a suitable method of preparing mountain hardwoods for continuous management" (Wahlenberg 1953: 874).

Improvement cutting was planned for three woodlots and one served as an uncut control area. In the woodlot where clearcutting was evaluated, the PNF arranged for a local farmer to cut the timber and take the harvested trees as payment for his work. Buell was evaluating other types of harvests on the other two woodlots. There, he kept the best trees as part of the next stand and marked all the others for cutting. The trees to be cut, however, were not large enough to be sawtimber but were suitable for firewood. When the PNF advertised timber for sale on the two woodlots, there were no buyers. Hence, Buell's problem—he needed the marked trees on those two woodlots to be cut during the winter so that the age of vegetation on the three woodlots would be the same when growth began next spring.

The AUC also had a problem. With the onset of the Great Depression, unemployment had increased in Asheville, NC with many needy families facing food shortages during the coming winter. The AUC met with a group of concerned citizens and civic organizations and formed the Woodyard Committee. The goal of the Woodyard Committee was to provide meaningful employment for needy families and not be a cost for the city. Their plan was simple: sell firewood to city residents. In lieu of payment to workers for cutting firewood, the Asheville woodyard would employ needy workers and the funds from firewood sales would be used to buy food supplies from local merchants. The Woodyard Committee said that each cord of wood sold would feed a family for a week. But there was a problem with their plan—because the gasoline needed for county and city trucks to haul the wood and food cost was about the same as the $5 per cord selling price of the firewood, there was no money left over to buy trees for cutting.

The *Asheville Citizen* newspaper did not report how the Forest Service and the Woodyard Committee solved their shared problems, but several scenarios are possible. PNF Supervisor, M.A. Mattoon was likely aware that timber on Buell's study area had not sold and perhaps as a member of a civic organization in Asheville, NC, he was also aware of the Woodyard Committee's need for firewood trees. Details of the agreement for transferring ownership of national forest timber on Buell's study area to the woodyard are unknown, but several legal scenarios are possible. Mattoon could have accepted a bid of $1 as



Left: The community woodyard at Smith's Bridge in Asheville, NC. All the work of sawing the wood to stove length was done by hand. (USDA Forest Service photo taken by J.H. Buell in February 1931)

Right: Loading city trucks with firewood to be delivered to consumers from Asheville community woodyard. (USDA Forest Service photo taken by J. H. Buell in February 1931)

appropriate value for the unmerchantable timber and sold it to the Woodyard Committee. Mattoon could have issued a permit to each person working at the woodyard allowing them to cut a cord of firewood. On December 18, 1930, the *Asheville Citizen* reported that firewood from BCEF would soon be hauled to the community woodyard at the YMCA football field (Asheville Citizen 1930d). In a series of articles, the newspaper described the relief plan and encouraged the purchase of firewood (Asheville Citizen 1930a–1930d, Asheville Citizen-Times 1930), provided progress reports of activities at the woodyard (Asheville Citizen 1931b, 1931d, 1931g, 1931h) and BCEF (Asheville Citizen 1931c, 1931f; Asheville Citizen-Times 1931a), and evaluated the success of the project (Asheville Citizen-Times 1931b).

The woodyard employed about 50 men at BCEF, who worked—safely, apparently, as no accidents were reported—under the supervision of an experienced foreman. Over the coming weeks, Buell photographed woodyard-related activities at BCEF and the community woodyard. Small crews of men felled the marked trees, trimmed branches, and cut fallen trees into 8–10 foot logs. Mules pulled logs and large branches to a nearby processing site, where they were sorted by size and loaded onto county-owned trucks for hauling to the Asheville woodyard. At the woodyard, up to 50 men would cut and split the long wood into firewood lengths and use city-owned trucks for delivery. Buell describes more fully this early example of Forest Service and community cooperation in the *Forest Worker* (Buell 1931b) and *American Forests* (Buell 1931a)

By early March of 1931, when weather had warmed and firewood sales had declined, the AUC reported that 1,000 men had been employed and 300 cords of firewood had been cut and sold. A basket of food provided weekly to each employed person consisted of more than a dozen items (see the table to the right). Federal Government officials inspecting unemployment relief programs praised the cooperation between the Forest Service and local governments as an excellent example for others to follow. The original firewood program had worked so well that plans were made for a similar project the next winter—but the old problem of needing free trees to cut once again faced the Woodyard Committee.

Food provided to each family in return for working 3 days cutting trees at Bent Creek Experimental Forest or processing firewood at the Asheville community woodyard

Food item	Amount	Cost[a]
Flour	12 pounds	5¢ per pound
Fatback	2 pounds	10¢ per pound
Meal	10 pounds	–
Tomatoes	2 cans	–
Pinto beans	5 pounds	5¢ per pound
Grits	5 pounds	–
Syrup	1 can	–
Oatmeal	2 pounds	–
Potatoes	15 pounds	3¢ per pound
Onions	10 pounds	–
Cabbage	2 heads	5¢ per head
Coffee	1 pound	25¢ per pound
Sugar	2 pounds	–
Lard	4 pounds	11¢ per pound
Butter	2 pounds	33¢ per pound

– = Cost not listed in the advertisement.
[a]Costs from a grocery store advertisement.
Source: Asheville Citizen (1931e).

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"Mr. Forest Service": Wilbur R. Mattoon and the Reforestation of the South

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Wilbur Reed Mattoon always seemed to be in motion. During his nearly 40-year career as a forest inspector, administrator, researcher, extension agent, and educator for the U.S. Department of Agriculture Forest Service, he crisscrossed the country. But he especially focused his energies on the Southern States, and his impact there was outsized in part because of his peripatetic approach to his work. "He had to travel a great deal," Elwood L. Demmon, former director of the Southern Forest Experiment Station recalled in 1959, "because that was part of his job" (Maunder 1959: 28). Mattoon's position was not just an occupation but a calling to expand knowledge about and application of forestry to abandoned and despoiled forest lands across the South; it was not by happenstance that he characterized his 1918 field trip to South Carolina as "missionary work for farm forestry" (Yale Forest School 1919). Mattoon's proselytizing was facilitated by his gregarious and outgoing nature. Demmon—who called him "Mr. Forest Service"—said that he did not know of anyone more friendly (Maunder 1959: 28). These personable qualities, when combined with his willingness to speak at any conference or demonstration site anywhere, meant that Mattoon gained "a lot of influence in getting forestry started where there had been no previous forestry program" (Maunder 1959: 27).

"Mattoon's position was not just an occupation but a calling to expand knowledge about and application of forestry to abandoned and despoiled forest lands across the South; it was not by happenstance that he characterized his 1918 field trip to South Carolina as "missionary work for farm forestry" (Yale Forest School 1919).

For all his visibility during his career, the formerly high-profile forester has all but disappeared from the historical record. The two best studies of the Federal agency for which Mattoon worked—Harold K. Steen's *The U.S. Forest Service: A History* (2004) and James G. Lewis' *The Forest Service and the Greatest Good: A Centennial History* (Lewis 2005)—make no mention of his pioneering work on large-scale forest regeneration on private lands or his hands-on advocacy of small-scale, farm-lot forestry. He is similarly absent from the best synthesis of the history of southern forestry, *Forestry in the U.S. South: A History* (Carter and others 2015). State-level studies of southern forests and forestry, notably James E. Fickle's monographs on Alabama (Fickle 2014) and Mississippi (Fickle 2001), identify other crucial influencers on reestablishing longleaf, shortleaf, loblolly, and slash pine (*Pinus palustris*, *P. echinata*, *P. taeda*, and *P. elliottii*, respectively) woodlands, but Mattoon, who was an indefatigable proponent of reforesting the region, garners no acknowledgment. Even internal Forest Service histories in which his activism is identified qualify its importance. Philip C. Wakeley, in his posthumously published memoir about his 40-year career in the Forest Service's Southern Research Station, noted that Mattoon's very mobility complicated his legacy. "Men like W.W. Ashe and W.R. Mattoon of the Forest Service and H.H.

The members of the Yale Forest School class of 1904 were a high-achieving group. Wilbur R. Mattoon is in the third row, sixth from the left. (Courtesy photo by Yale University Library, Manuscripts and Archives [RU 748; photographs of events, activities, and individuals, School of Forestry and Environmental Studies, Yale University])

Chapman of Yale were, to be sure, doing invaluable work in the South, but as transients, not as permanent residents" (Wakeley and Barnett 2016: 11).

There was nothing impermanent about Mattoon's impact, however, regardless of his residence, as a close analysis of his life and career reveals. Born in Harwich, MA, in 1875, the first-born son of a Methodist minister, Mattoon expected to follow in his father's footsteps. To that end, he attended two Methodist-funded institutions: the Cazenovia Seminary in upstate New York and Wesleyan University in Connecticut, graduating from the latter with a bachelor's degree in 1899. Yet his ministerial aspirations evolved while teaching high school in Michigan. After a 3-year stint in the classroom, he enrolled in the New York State College of Forestry at Cornell University, the Nation's first university-level program, then under the direction of Bernhard E. Fernow, former Chief of the USDA Division of Forestry. Although Mattoon was fascinated by his silvicultural and dendrological studies, the school closed after he completed his first year there following a controversial college-sponsored logging operation that led the State's Governor to pocket veto the State appropriations to the fledgling program (Hosmer 1950). With that, Mattoon transferred to the Yale Forest School, the Nation's first graduate program in forestry.

A member of the class of 1904, Mattoon quickly learned that his classmates shared his enthusiasm for the new science of forestry and the tantalizing prospects of the emerging profession. For many, Mattoon included, advancing forestry was a secular mission and judging from the arc of their careers, they proved able missionaries. Among other notables, in this 1904 Yale cohort was William B. Greeley, a future Chief of the Forest Service; Fred Besley, who became the first State forester of Maryland; Paul Redington, who would become California’s regional forester; Stuart Flintham, who was tapped to be the inaugural chief of Los Angeles County’s forestry and fire department; and Herman H. Chapman and Ralph C. Hawley, who became prolific researchers and influential professors at the Yale Forest School. Like most of his fellow graduates, Mattoon’s first gainful employment was in the Forest Service. Like them, too, he rose through the ranks quickly, beginning as an assistant forest inspector, then inspector, forest examiner, and forest supervisor. Much of his early work was in District (now Region) 3 and included setting up and managing New Mexico’s Fort Bayard Nursery, serving as the head of the regional silvics office and subsequently as supervisor of the Manzano and Zuni National Forests (both were later absorbed into the Cibola National Forest) and of the Tusayan National Forest (now part of the Kaibab National Forest, which abuts Grand Canyon National Park to the south) (Yale Forest School 1913).

In the latter half of 1907, Mattoon served as the acting supervisor of the Wichita National Forest in Oklahoma. The Wichita had been established as a forest reserve under the U.S. Department of the Interior in 1901 by President William McKinley; in 1905, it was transferred to the Forest Service (DeSpain 2000). While overseeing the Wichita, Mattoon launched his first investigation into the life history of the shortleaf pine, research that led him to conclude that this species might be critical to the reforestation of the oft-burned terrain in western Arkansas (Mattoon 1908). When he made this claim for shortleaf pine’s ability to regenerate once-wooded landscapes, Mattoon did not know that he had hit upon the central theme of his subsequent work in the region. The South’s seemingly unlimited potential for reforestation would define his professional activism until his death in March 1941.

That future began to be formulated in 1912, when Henry Graves, the founding director of the Yale Forest School before becoming the second chief of the Forest Service, brought Mattoon to Washington as a key member of the office of silviculture, with a focus on the South. This decision also worked out for the region because it would have been hard to miss the crying need for forestry and foresters in the South. After all, the post-Civil War era had witnessed the liquidation of ever-larger portions of the region’s wooded estate, from Virginia to Texas. This unrestrained harvest was fueled in part by northern investors such as Frederick Weyerhaeuser who sought a new source of wood after having clearcut the Upper Midwest. Investors were attracted by the South’s bargain-priced timberlands, often available for as little as $1.25 per acre (Healey 2013). Their access to these timber stands was facilitated by an ever-expanding railroad network, more sophisticated milling technology, and a rising demand for wood nationwide. Civil War antagonisms seemed not to matter in this context: “As for these investments of northern capital,” one Tennessean noted, “the South is glad to have them. We welcome the skilled lumberman and noisy mill” (Fickle 2014: 52).

A 1916 picture of longleaf pine lands near Vredenburgh, AL, where a heavy cut was made 3 years prior; because of annual fires, no seed trees remained. (USDA Forest Service photo [negative # 26846A] taken by Wilbur R. Mattoon)

Noise is what the South got, as loggers cut through vast tracts of old-growth pine and hardwood forests. Between 1880 and 1890, for example, regional output doubled, and by 1900, "the Gulf South was producing more than five billion board feet a year," writes historian Thomas R. Cox (Cox 2010: 252). Alabama was one of the epicenters of the new forested economy: in 1899, the State had 738 active sawmills and produced an estimated 1.1 billion board feet. Over the next decade, the South's productivity soared to more than 9.5 billion board feet (Cox 2010). Alabama kept pace with the regional output: in 1909, the State had 2,100 sawmills churning out 1.6 billion board feet of lumber.

The same pattern held for Mississippi. The celerity with which loggers descended on the Magnolia State, one observer reported, was akin to locusts gorging on a wheat field (Fickle 2001). Large milling operations turned out millions of board feet annually, a rate of production that boosted the State's ranking among its national competitors. But its speedy ascent generated considerable damage on the ground. A 1908 U.S. Bureau of Forestry report captured the "wanton waste of raw materials": "Inasmuch as cutting has been unusually severe…and since fire almost invariably follows lumbering, more than half the longleaf pine land of the State has been converted into a blackened and barren waste" (Holmes and Foster 1908: 3). The future implications were clear: "Over the larger part of the area there is little or no reproduction of the timber, which, when once gone, will not be replaced by a new growth which should now be coming on" (Holmes and Foster 1908: 3). This cut-out-and-get-out strategy also prevailed in the east Texas pineries. In 1869, the State ranked 24th in the Nation in terms of its timber production; a small number of mills managed approximately 107 million board feet. Less than 40 years later, it ranked third with nearly 700 mills producing more than 2.25 billion board feet. So quickly was the Piney Woods being harvested that, in 1904, University of Texas ecologist William L. Bray warned they would be logged out within a decade (Bray 1904). That worrisome data led him to advocate the implementation of national or State regulatory control of the Lone Star State's remaining forests.

Similarly concerned was B. Lawton Wiggins, Vice Chancellor of the University of the South in Tennessee, who committed to managing the campus's 10,000 forested acres to demonstrate that conservation paid, a commitment that gained credence in the 1903 U.S. Bureau of Forestry report, *Conservative Lumbering at Sewanee, Tennessee*. Noting that hitherto "lumbering at Sewanee has never been followed as a regular business," the agency observed that the university "has not, therefore, received the benefit of the specialization and intelligent management which come with long practice" (Foley 1903: 28). Developing a more conservative and sustainable approach would reap significant economic, social, and environmental benefits.

Those advantages, local and regional, gained fuller expression in 1910 at the inaugural Southern Conservation Congress. Held in Atlanta, it brought together foresters, politicians, mill owners, lumber executives, and conservation activists. The conferees confirmed that getting out the cut had devastated southern forests, producing a splintered terrain that was the source of significant downstream flooding. Forester Gifford Pinchot, who delivered one of the keynote addresses, focused in part on this upland-valley dynamic, noting that the "question of erosion was one of vital importance to the South, which…suffers from the loss of its soil to a greater degree than any other section of the United States." Conservation—the "application of common sense to the common problems that confront the people at large"—could change that situation; rigorously applied, it would stabilize the land, people, and economy (American Lumberman 1910: 56). The next day, former President Theodore Roosevelt averred that conservation would ensure a permanent prosperity for the present generation of southerners and their progeny: "It is our business to see that no private individual is allowed to waste the public heritage, and the public as a whole is vitally concerned with the soil and forests and the water of the land" (Roosevelt 1910). According to noted historian William D. Bryan, Roosevelt and Pinchot urged attendees "to usher in a new approach to nature, one in which conservation was a key part of the calculus of development" (Bryan 2018: 17).

Because the South's natural resources were invaluable to its rebuilding in the post-Civil War era, many business leaders, like those who convened in Atlanta in 1910, were drawn to the concept of permanence that was embedded in Roosevelt's and Pinchot's conceptions of conservation as ensuring an enduring prosperity. For many of the white elites in that audience, "profit and environmental quality" were not mutually exclusive (Bryan 2018: 3). Yet there was an exclusionary element to this vision for a New South. Conservation would help its proponents sustain the racial status quo, a criticism Black educators and intellectuals leveled against industrial capitalists who had secured much of the public land base in Southern States for their timber operations and by so doing cut their communities "out of the path of private land ownership, gutting the central promises of Reconstruction" (Bryan 2018: 30). Some timber company owners also exploited minorities and immigrant labor through a system of debt peonage linked to forest conservation (Reynolds 2013). African Americans paid a hefty price for a conservation ethos—permanence or sustainability of resources—that did not include them.

Mattoon contributed to this troubling ethic during his numerous travels across the South advocating conservation and reforestation. There is no evidence, for example, that he ever crossed the "color line" by addressing Black farmers, social organizations, or colleges, though he frequently spoke to their whites-only analogues. Nor is there any mention of the plight of rural Black southerners in his many articles and books; these same texts, by word and image, assume whites are their only audience.

Circumscribed, too, was conservation's on-the-ground application, at least in this respect. Mattoon's initial approach to the problem of reforestation on private lands in the South revolved around the large logging and milling companies that were responsible for some of the greatest damage. His goal, then, was to convince these entities that their future would require a very different land-management strategy if they expected to sustain their presence, profitability, and permanence—an approach consistent with historian Bryan's insights about which southerners would be most sympathetic to conservation. One who proved sympathetic to Mattoon's pitch for sustainability was lumberman Henry E. Hardtner of Urania, LA. The two met in the mill town in the early 1910s and quickly developed a strong working relationship. Hardtner knew that the rapid liquidation of the State's pineries could not last, and he was therefore receptive to the ideas of foresters W.W. Ashe and Mattoon about how reforestation—natural

Bronze tablet memorial dedicated May 15, 1939, in Hardtner Memorial Park, Urania, LA, to honor Henry E. Hardtner (1870–1935), known as the "father of reforestation." (USDA Forest Service photo, courtesy of the Forest History Society, Durham, NC)

and artificial—could sustain his Urania Lumber Company. In collaboration with the Forest Service, Hardtner launched a series of experiments in 1912 reseeding or planting seedlings on cutover land. He erected fences to keep out rooting hogs and established fire safety measures to protect his reforestation efforts. Perhaps most compelling and generative, Hardtner invited Yale foresters to establish a summer camp on his holdings to facilitate the training of its graduate students and encouraged the Forest Service's Southern Forest Experiment Station to create a substation in Urania (see also Chapman and others 2023). Professor H.H. Chapman, one of Mattoon's classmates at Yale, wrote admiringly about Hardtner following the lumberman's death in 1935: "His interest in forestry was not confined to immediate profits but sprang from a deep and genuine concern for what he termed his 'baby pines,'" a commitment to stewardship that "differed from practically all other southern lumbermen of the period" (Chapman 1939: 759).

Hardtner's land became a research and educational hub that Ashe, Mattoon, Chapman, and others utilized in their ambition to propagate the idea of forestry across the South. Mattoon, for example, used the successes at Urania to engage with other major players in the region's industrializing economy. Each field season, as he traversed the South, he encouraged the land departments of the very railroads on which he traveled, notably the Southern Railway System and the Seaboard Air Line Railroad, to adopt the conservation agenda of sustainable reforestation. By the 1920s, these and other railroads, as well as several larger lumber companies, were managing second-growth plantations of longleaf, shortleaf, and slash pine. To accelerate this transformation, Mattoon was also engaged with southern universities. For example, Mattoon sent slash pine seedlings to Clemson University's experimental station on the South Carolina coast for the first such demonstration plot (Mattoon 1916). The Georgia Forest School, established in 1906 by the University of Georgia as the first university-level program in the South, received slash pine seed that Mattoon and colleagues had gathered for germination in its nursery (Mattoon 1916).

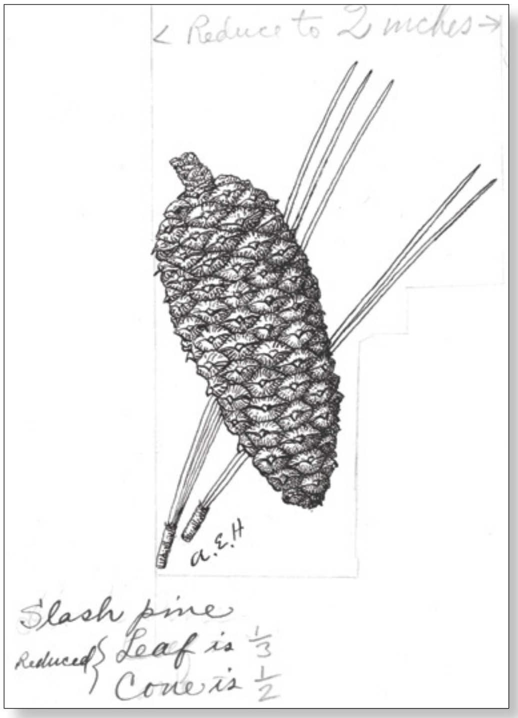
These educative initiatives dovetailed with Mattoon's interactions with state-level agencies. In 1917, he was appointed to co direct the new States Relations Service in the USDA and was given an expansive portfolio. An agency press release announced that,

> *Mr. Mattoon will supervise, inspect, and stimulate the foresters employed by the States Relations Service in the various states, develop new lines of effective demonstration…and extend co-operation among the various organization and agencies which can be of service in the general movement for the better development and more profitable utilization of the forest resources of the country.* (Yale Forest School 1917).

That ambitious agenda was one reason why he traveled so much and so consistently; in his first year of this work, he reported visiting 15 States (Yale Forest School 1918). It is also why Mattoon is often credited with helping create a groundswell of support for the legislative establishment of forestry departments, and by extension, state foresters, which could and did emerge as additional centers of conservation activism (Yarnell 2021).

These scaled-up and top-down initiatives, innovative as they were, did not constitute the sole thrust of Mattoon's educational mission or the people he sought to reach. He balanced these applied interventions with a steady stream of publications in professional journals, departmental bulletins, newspapers, and magazines that expanded and reinforced his pragmatic approach to the conservation of the South's natural resources. And these texts were aimed at the plight of small farmers, not the profitability of major corporations—the poor, not the well-to-do. It was this class that had borne the brunt of impermanence and paid a heavy price for unsustainable practices in agriculture and logging—a price exacted in damaged soils, eroded terrain, lost forest cover, ravages of floods and dust, and battered communities left behind when timber companies pursued a cut-out-and-get-out business strategy. The bottom-up solution to this top-down negligence, Mattoon wrote again and again, was to focus on those people left behind when mills shut down, or who tried to survive tilling soils stripped of their nutrients. These people and the vulnerable landscapes they inhabited were the subject of Mattoon's relentless promotion of small-scale reforestation—farm-lot forestry—on private property across the South.

Two rows of slash pines 6 to 8 inches in diameter and 30 to 35 feet tall in 1926, planted in Hampton County, SC. (USDA Forest Service photo taken by Wilbur R. Mattoon, courtesy of the Forest History Society, Durham, NC)



This ink drawing of slash pine by Annie E. Hoyle appeared in several of Wilbur R. Mattoon's *Common Forest Trees* guides. (USDA Forest Service photo, courtesy of the Hunt Institute for Botanical Documentation, Carnegie Mellon University, Pittsburgh, PA)

One reason for Mattoon's remarkable record as an author, publicist, and advocate, Demmon noted, was his ability to translate scientific knowledge to the public, to "take the findings of a research organization and put them into simple language that a farmer could understand" (Maunder 1959: 29). That is why Mattoon, although never formally attached to the Southern Forest Experiment Station, nevertheless proved vital to its mission. Consider Mattoon's series of articles in the *Forestry Quarterly* (which in 1917 was renamed the *Journal of Forestry*) in which he shared with other foresters the scientific data he had gathered about the silvicultural qualities, growth rates, and adaptability of slash pine, and the economic value it provided those who planted this hardy, fast-growing species in the "poorest, sandy soils and very poorly drained lands" (Mattoon 1916: 587). A number of these early success stories led Mattoon to conclude in 1916 that second-growth plantations of slash pine "point strongly to the profitableness for private capital of this form of investment on low-priced lands" (Mattoon 1916: 587).

To make the case that reforestation could boost farm families' economic fortunes, Mattoon also wrote a series of bulletins (e.g., Mattoon 1922a, 1922b) aimed at those he hoped to convince, as the title of one of these documents declares: "Southern Pines Pay" (Mattoon 1939). These species' value was contingent on numerous biological, climatic, and environmental factors, all of which Mattoon explored in individual primers focused on loblolly, longleaf, and shortleaf pines (Mattoon 1926a, 1926b, 1931). These pithy booklets—only one was longer than 40 pages—were accompanied by Mattoon's photographs that provided visual confirmation of the devastation of the original pineries of the South, the opportunities that the replanting of the particular species could bring, and the economic and social advantages reforestation would generate. "One often hears it said that the land will never come back to pine," he wrote in a USDA bulletin about longleaf pine. "To a great degree this statement has been justified, and it will be true so long as the prevailing practice continues and the prevailing sentiment maintains that the woods 'just will burn and must burn' (Mattoon 1922a: 36). To protect longleaf seedlings from fire and feral hogs and preserve a sufficient number of seed trees for successful regrowth—that was the goal. To achieve that end, Mattoon concluded, "becomes largely a matter of educating people," which was the precise purpose of these public-facing bulletins (Mattoon 1922a: 36).

Teaching the public was the rationale for another set of Mattoon's writings. Between the 1920s and 1940s, he published 17 State-centered, pocket guides to common trees. These often were collaborative projects, written in association with State forestry associations and brilliantly illustrated with woodcut prints of cones, needles, and leaves by Forest Service illustrator Annie E. Hoyle (Daytonius 1930). Some of these manuals, like the one produced for Florida, emphasized that timber was growing in scarcity and value, and therefore there was a pressing need to better understand regional tree species (Mattoon 1925). These guides also detailed how the boom in recreation in the United States was increasing support for conservation. "The rapidly increasing interest in outdoor life, stimulated perhaps by good roads, the automobile, the 'scout' movement, and the widened outlook resulting from the spread of education," Mattoon noted in *Common Forest Trees of Kentucky* (Mattoon 1923: 2), "encourages the rational treatment of our trees and forests." This was critical so that

> *our forests may continue to furnish the material so essential to the maintenance of the industrial and domestic life of the State and Nation, protect our farmsteads and mountain streams, and provide places of pleasure and recreation for our people. Indeed, the trees may justly be regarded as 'our best friends'.* (Mattoon 1923: 2).

He slightly modified that claim in the only urban-focused guide he published, this one about the city in which he resided, Washington, DC. That book's purpose was to teach city folk about the trees they might encounter on a stroll in Rock Creek Park or along the banks of the Potomac River, or as pedestrians walking any of the district's 300 miles of tree-shaded streets. His expectation was that these readers' newfound knowledge would lead them to appreciate, as did James Bryce, a former British ambassador to the United States, that "trees are an inherent part of the life of the city of Washington" (Mattoon and Alburtis 1926: 2).

His skill as a writer and photographer was why "we were always glad to see Mattoon and to work with him because we knew that he would help get our research results into use quicker than if we had to depend only on ourselves" (Maunder 1959: 28). This routine generosity was manifest in Mattoon's career-long willingness to meet people on their own terms and grounds, much as he did year after year at the countless demonstration workshops that annually filled his itinerary. One such moment is caught in a photograph of Mattoon taken in 1929. With his back to the camera, Mattoon faces a group of farmers in Macon County, NC, who had come to learn more about how to grow, thin, and harvest small stands of pine. Mattoon, as he often did, would have assured them that planting a similar grove would be a significant investment of their time and energy but one which would enhance their family's economic well-being and life chances. "Farm woodlands have been, many times, the means of lifting a mortgage from the farm," he noted approvingly, "or making the difference between profit and loss on the farm balance sheet" (USDA 1929). Face-to-face, peer-to-peer: this hands-on, grassroots approach was why Mattoon traveled as much as he did, though the real secret to his success, a colleague asserted, "was not so much the trees he planted as the thoughts he planted in the minds of common people" (Williams 1944: 242).

Wilbur R. Mattoon speaking at a woods meeting in North Carolina in November 1929. (Courtesy photo by North Carolina State University, University Archives Photograph Collection [image UA023.007]; Special Collections Research Center, North Carolina State University Libraries, Raleigh, NC)

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Earl H. Frothingham: Portrait of a Pioneering Researcher and the First Director of the Appalachian Forest Experiment Station

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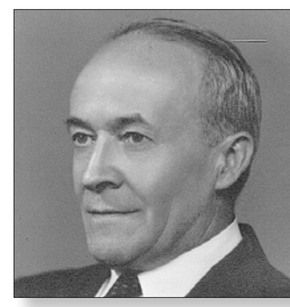
The U.S. Department of Agriculture's Forest Service faced an important decision in 1921. In July, the agency established the Appalachian Forest Experiment Station (AFES), headquartered in Asheville, NC. The immediate objective of the AFES was to study methods for increasing productivity of the heavily cutover forest lands that were being acquired for national forests. The agency needed a highly qualified forester to administer the new experiment station, someone with a research background and knowledge of local forest conditions as well as being a capable administrator and good communicator. Ultimately, that forester and first station director of the AFES was Earl Hazeltine Frothingham.



Earl Frothingham as director of the Appalachian Forest Experiment Station.

Surprisingly, only fragments of biographical information are available on this pioneer forest researcher and first station director of the AFES (e.g., Gaston 2016, Maunder 1971). The following summary of Earl's life, work, and legacy has been assembled from many different sources, but remains unfortunately incomplete.

FROTHINGHAM, THE STUDENT

Earl (often called "Andy"), the youngest of five children, was born to James Frothingham and Chloe Hazeltine on August 31, 1880 in Manchester, IA. The Frothingham family in America, however, had roots in New England. In the early 1630s, Earl's great-great-grandfather, William Frothingham, left New England to settle in Charlestown, MA. William Frothingham's descendants were prominent in the American Revolution and in government, portrait painting, and even literature—a great uncle of Earl's father was Washington Irving, the well-known 19th century author of *Rip Van Winkle* and *The Legend of Sleepy Hollow*. Earl's parents were from New York where his father was a Presbyterian minister. Church-related assignments caused the family to move to several midwestern States including Minnesota, Iowa, and lastly Illinois, where Earl attended Chicago's Hyde Park High School. After graduating high school, Earl enrolled in the University of Michigan where he received a B.A. in 1904 (with a forestry emphasis); 2 years later, Earl earned a M.S.F. from the newly opened forestry program at the University of Michigan (Detroit Free Press 1906).

An early event influenced his career path into postgraduate study in forestry (Maunder 1971). In a letter to Gifford Pinchot (Forest Service Chief when Earl was

Endangered male Kirtland's warbler (*Dendroica kirtlandii*) in a jack pine forest in Michigan. (Photo courtesy of Joel Trick, U.S. Fish and Wildlife Service)

hired and later his colleague in the national office), Earl stated: "I owe my first inclination toward forestry to an early passion for the study of birds" (Gaston 2016: 12). According to various accounts (Covert 1903, Frothingham 1903, Wood 1904, Wood and Frothingham 1905), Earl, as an undergraduate student museum assistant, heard the song of a bird he did not recognize while on a spring fishing trip to one of Michigan's jack pine (*Pinus banksiana*) forests. Earl and his friend collected a specimen of this bird which expert ornithologist, Norman Wood, identified as the previously assumed extirpated Kirtland's warbler (*Setophaga kirtlandii*). When questioned about taking a rare songbird, Brigham (1943: 105) recounts Earl's response, "It was there in some numbers and in full song. The song and the bird were new to me and I thought best to secure a specimen by which to identify it." When asked why he did not take more specimens, he said "I knew they had nests and hated to take breeding birds. I never thought of its being Kirtland's Warbler."

FROTHINGHAM, THE FOREST ASSISTANT

Shortly after receiving his graduate degree, Earl began work with the Forest Service on July 1, 1906, just a year after Congress had created the agency (Gaston 2016). His first duty station was in the Office of Forest Extension at the Dismal River National Forest in Halsey, NE. While employed at the Office of Forest Extension, he worked with Carlos Bates, another new hire who used innovative methods for the production of tree seedlings suitable for survival under harsh conditions in plantings established as plains windbreaks. In the fall of 1906, he and Bates were transferred to the Branch of Silviculture in the Washington Office where they worked in the Office of Silvics under the direction of Raphael Zon. Chief Pinchot had given Zon the responsibility to establish forest experiment stations (Young 2008).

Later in life, Earl believed his writing proficiency could have been a factor in being hired by the Forest Service (Maunder 1971). Writing proved to be a valuable skill at this stage in his career, as an important project of Zon's staff was to conduct studies to increase the productivity in heavily cutover eastern forest types. During summers, Earl and several assistants would collect field data, which he would summarize for publication during the winter (Maunder 1971). He wrote descriptive publications for forest communities of Douglas-fir (*Pseudotsuga menziesii*) (Frothingham 1909), aspen (*Populus* spp.) (Weigle and Frothingham 1911), second-growth mixed hardwoods (Frothingham 1912), eastern white pine (*Pinus strobus*) (Frothingham 1914), northern hardwoods (Frothingham 1915b), and eastern hemlock (*Tsuga canadensis*) (Frothingham 1915a). He also wrote management and marketing publications (Frothingham 1916, 1917d).

Earl was more than just a researcher, but some of his forestry work with the agency did not go smoothly. For instance, he was assigned a forest management project in 1912 on the 230,000-acre Menominee Indian Reservation in northeastern Wisconsin that ended up in the Federal Court of Claims many years later. In 1908, legislation introduced by Wisconsin Senator Robert M. La Follette allowed for a cooperative agreement between the U.S. Department of the Interior, charged with supporting and managing tribal lands through the Bureau of Indian Affairs (BIA) and the U.S. Department of Agriculture (through the Forest Service) to be developed to do a number of

The interior of the sawmill built in 1908 by the Forest Service for the Menominee Indians in northeastern Wisconsin. Earl Frothingham came to their reservation in 1912 to develop a management and timber cutting plan for the Tribe's forests, unaware of an earlier law that limited the way trees could be cut. Earl's more aggressive harvesting suggestions were adapted by the Forest Service into a plan that resulted in decades of litigation against the Federal Government, with the Menominee prevailing in court in 1950. (USDA Forest Service photo taken by E.A. Braniff in January, 1909)

projects on the Menominee Reservation. This law included Forest Service funding and the building of a sawmill to be owned and operated by the Tribe and fed by mature timber as designated by the Forest Service to be harvested from the Reservation. While this formal agreement was ended shortly after the mill was constructed due to disputes between the two Federal agencies, the Forest Service continued to provide forest management support. Earl, apparently unaware of the stipulations in the 1908 law and subsequent agreement, installed a 1.5-mile-long transect through the designated tract of almost 4 square miles to develop rules for harvesting, which loggers would follow under tribal supervision. After analyzing the results of his inventory on a limited (2,300 acres) area, Earl concluded the necessary level of harvesting to provide logs for the mill required clearcutting, rather than the lower volumes that would be yielded by selecting individual trees for harvest. Hence, Earl's harvesting rules specified that hardwoods of all sizes and pines larger in diameter than 15 inches would be cut, which the Forest Service then translated into a plan for the entire Menominee Reservation. The loggers contracted by BIA applied Earl's suggested rules with little oversight and much of the tract was cleared. The Menominee were unhappy with the results of the harvest and in 1935 filed a lawsuit [Menominee Tribe of Indians v. United States (Fed. Cl. 1950)] in the federal court of claims seeking damages from the Federal Government because the Forest Service had not followed provisions of the 1908 Act. Federal lawyers defended the actions of the Forest Service, but in 1950 the Court agreed with the Tribe and in 1951 awarded the Tribe a total of $8.5 million in damages (Davis 2000, Hoyt 1951, Monroe Evening Times 1951, Trosper 2007).

Earl Frothingham in his study of thinning an eastern white pine plantation at the Biltmore Estate, which had been planted by Carl Schenck in 1899.

FROTHINGHAM, THE FOREST EXAMINER

The Menominee case apparently did not hinder Earl's career—he did that job based on his limited understanding of the circumstances—and his work and productivity continued to help him advance in his career. For example, Earl was a pioneering voice for a suitable measure of forest site quality—an essential component of silviculture for assessing stand productivity. An active debate centered on a choice among methods based on composition of vegetative communities, culmination of stand volume, and tree height. Undoubtedly influenced by his former professor, Filibert Roth, at the University of Michigan for a site index system based on height (Roth 1916), Earl took up this cause and in a series of articles he reinforced the logic behind using site index (Frothingham 1918, 1921a, 1921c).

Further evidence of Earl's growing status with the agency is shown by his promotion to forest examiner around 1914 and assignment to an ambitious field project associated with the 1911 Weeks Act. The Weeks Act authorized the Forest Service to purchase private forest lands in the Eastern United States to protect headwater sources of navigable streams and to maintain those lands as national forests. Across much of this region, headwater forests had been heavily cutover, and managers needed better information to restore these areas to productivity, including replanting them, if necessary. Perhaps because of his experience with similar forest types, Earl was assigned to survey cutover areas purchased for national forests in the Southern Appalachians with the objective "… to find some definite basis for immediate silvicultural management" (Frothingham 1917c).

Beginning in early July of 1915 with one field assistant, Earl visited 50 cutover timber stands in national forest purchase areas of North Carolina, Virginia, and West Virginia. He stated in his work plan that each inventoried stand was considered "… as a diagnosis of the different unrelated sets of conditions found and was without any previously formed hypothesis" (Frothingham 1917b: 4). After talking with residents to determine when harvesting occurred, Earl established one or more quarter-acre sample plots and collected stand data on the sites prior to harvest. The data included what was cut (and what remained), how the sites were regenerating, what the future prospects of the developing stand were, and what method of cutting would give better results (and why). Initially, the cutover study was intended to run 2 years, but was suspended in mid-July of 1916 to allow for an investigation of the effects of intense rainfall from two hurricanes on sites treated with different harvesting practices (Asheville Citizen 1916, 1922). Subsequent evaluation of the first-year results of the cutover study indicated additional field work was not necessary to satisfy the objectives of the investigation. Earl organized the results of the cutover study in a report that was submitted to William L. Hall, Assistant Forester in charge of land acquisition for national forests, and summarized in a publication (Frothingham 1917a, 1917c). Earl's thorough study of forests in the Appalachians made him particularly knowledgeable and his perspective on the future needs of society from public lands would prove important in his next assignment.

FROTHINGHAM, THE STATION DIRECTOR

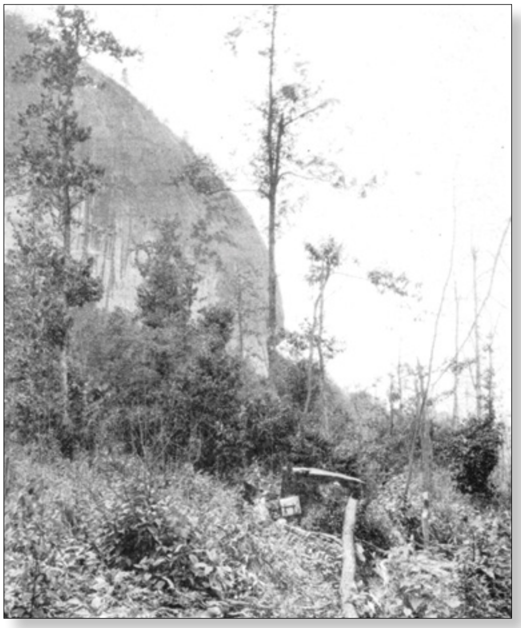
After years of internal efforts to formally expand the Agency's science program, by 1920 the Forest Service had secured the funding to develop two regional forest experiment stations in the Southeastern United States (Clapp 1921, Frothingham 1921b). Each would need the guiding hand of a capable administrator and knowledgeable researcher who shared the same vision for these stations. With a track record in research and the accomplishment of large projects—including work in the Southern Appalachians—Earl was named as station director of the newly established AFES in July 1921 (Asheville Citizen 1921a).

In addition to himself, the initial AFES staff consisted of three researchers (Clarence Korstian, Ferdinand Haasis, C.F. McCarthy) and one clerical assistant. The Station's very limited initial operating budget covered rent for office space—three small rooms on the second floor of the Asheville Citizen-Times newspaper building—and staff salary. With the budget and personnel constraints, Earl stated that the first field studies would begin immediately and would involve minimum requirements in time and expenses with attention given to site quality determination and forecasts of product yields (Asheville Citizen 1921c). Much of his early activities as station director involved communications about the complexities associated with the evolving discipline of agricultural research associated with trees, or silviculture, which he described as "… an art and a science …" of growing crops of trees (Frothingham 1923b). For instance, in a conference of largely agricultural researchers, Earl described in detail and ranked seven categories of forestry investigations (for example, insects, fire, site quality) (Frothingham 1923b). His top ranked priority was forest type studies, which he defined and justified:

> *The unit in forest management is the stand, rather than the species. The classification of forest societies (types) and physical environments (sites) therefore forms the basis for all other investigative work. In the Southern Appalachians the large number of species and the variety of habitats make this a particularly difficult matter.*

"The Station's very limited initial operating budget covered rent for office space—three small rooms on the second floor of the Asheville Citizen-Times newspaper building—and staff salary.

Earl was also well aware of the need for coordination and collaboration of the AFES research program with the broader forestry community (Frothingham 1921b). Earl almost certainly played a major role in the formation of the Appalachian Forest Research Council (AFRC) in 1925 (Anon. 1925). The purpose of the Council "… is not to conduct research work itself, but to stimulate and to coordinate the efforts of all agencies in the Appalachian region engaged in forest research, and to advise them in the selection of the problems to be undertaken" (Anon. 1925: 83). Meetings of the AFRC and participation of AFES researchers were the topic of many newspaper articles (Asheville Citizen 1925, 1931). An interesting contrast to the collaborative relationship of Earl's program of forestry research with the AFRC can be found with the Appalachian Logging Congress (ALC), which claimed membership of the leading southern lumbermen organizations. Several months after arriving in Asheville, Earl presented the AFES's research program at their annual meeting in Knoxville, TN and made a case for adopting harvesting and fire control practices that would maintain future stand productivity on cutover lands (Frothingham and McCarthy 1922, Knoxville Sentinel 1921). The



Forest conditions near Lookingglass Rock after the virgin stand had been harvested in 1913 and burned in May 1916. This photograph was taken later that summer at the location of sample plot no. 7 installed by Frothingham before the fire, on July 28, 1915, during his study of cutover areas (Frothingham 1917c). In 1923 Frothingham installed four contiguous permanent plots at plot no. 7 for a long-term study that continues to be inventoried.

ALC, however, was leery of so-called “scientific forestry methods” (Asheville Citizen 1921b), which seemed to be associated with controversial provisions of the recently introduced legislation that would reward States that enacted laws requiring fire control and sustainable forestry practices (Kellogg 1921).

In 1930, Earl and the AFES later made history within the first decade by hiring Margaret Stoughton, the first professional female forester in the Forest Service (Des Moines Register 1930, McNab and O’Shields 2023). In addition to being station director, Earl was also an active scientist. Noteworthy are four permanent plots that he and McCarthy established at Looking Glass Rock in 1923, where a virgin “cove hardwood” stand was harvested in 1913 and accidently burned in May 1916 (Frothingham 1923a). In an early example of replication of treatments, vegetation competing with saplings of desirable trees was removed from two plots; the other two plots were left as untreated controls. These four plots are believed to be the oldest permanent research plots in the Southern Appalachians and continue to be inventoried (Abell 1935, Della-Bianca 1971). To facilitate and expand upon field-based research in the area, in 1925, an area on the Pisgah National Forest near Asheville, NC was designated for the construction of field offices and laboratories; 2 years later, Earl and Merwin Mattoon, National Forest Supervisor, formally established the Bent Creek Experimental Forest as a place dedicated to research and demonstration (Asheville Citizen 1926, Forest Service 1927).

Earl and his staff responded to several noteworthy forest resource challenges while he was station director, such as the commercial loss of the American chestnut (*Castanea dentata*) to an introduced fungus (*Cryphonectria parasitica*) (Frothingham 1924, 1925). Later, Earl helped to conduct one of the first surveys of forest resources in the Southern United States (Frothingham and Nelson 1944). These large-scale surveys of forest conditions started in part with the 1923 Capper Report, which was led by the Washington Office but included administrative assignments for Earl and his staff (Abell 1933). The purpose of the report, called for by Senator Capper of Kansas, was to examine national timber depletion and forest ownership following World War I with a proposal for increasing the U.S. Government’s role in the practice of forestry on private lands to increase productivity. A decade later, the Copeland Report (USDA Forest Service 1933) addressed current and future problems of forest resources and management. The report required considerable input from all experiment stations and included a program of research proposed by Earl (Frothingham 1933a, 1933b, 1933c; Steen 1998). The Copeland Report recommended increasing public ownership of Eastern United States forests and better management of forest resources on private lands, with assistance by both State and Federal Governments. The work on these congressional reports was likely the stimulus for a dozen similarly formatted Forest Service bulletins in a national series on regional timber growing and logging practices; Earl wrote a bulletin for the Southern Appalachians (Frothingham 1931).

While station director of the AFES, Earl and his wife Helen (whom he had married in 1909 while a forest assistant) were an active part of the Ashville community. Earl was a member of Rotary, Civitan, and Pen and Plate Clubs and Helen’s name appeared frequently in Asheville newspapers in association with various groups, including the YWCA. The Frothinghams’ first home, a craftsman style bungalow in the historical Norwood Park subdivision, was built around 1923 and is included on the National Register of Historic Places (U.S. Department of Interior National Park Service 2008). By 1929 the Frothinghams had moved to a larger house in the upscale Biltmore Forest area of south Asheville (Asheville Citizen 1929).

FROTHINGHAM, THE SENIOR SILVICULTURIST

Earl requested to be changed from station director to senior silviculturist in the AFES in 1935 (Asheville Citizen 1935). As senior silviculturist, Earl published several papers that had been delayed by his duties as station director (Frothingham 1941, 1943). In 1940, he was a member of a committee of the Society of American Foresters tasked with compiling a history of American forestry to that point (Frothingham and others 1940).

FROTHINGHAM'S RETIREMENT AND LEGACY

Earl's wife, Helen, passed away in 1941 (Asheville Citizen 1941), which may have helped Earl decide to retire from the Forest Service on August 31, 1943 (Asheville Citizen 1943). During his long career, Earl had been a member of the Society of American Foresters (since 1908), serving as the Society's secretary and treasurer for several years and a member of its executive council. He was elected a fellow of the Society of American Foresters in 1942.

In 1943, Earl moved with his older sister, Frances, to Riverside, CA, where several of his siblings lived. Two decades later, an unusual dawn redwood (*Metasequoia glyptostroboides*) in the yard of his home in Riverside caught the attention of a local reporter who featured Earl and the tree in a newspaper article (McCall 1964). Otherwise, he led a quiet life in retirement.

Earl died on October 28, 1969, and was buried next to his sister Frances in Riverside Cemetery, Long Beach, CA. His brief obituary provides his name and time of employment but nothing factual about his work as a very young Forest Service employee: "Earl H. Frothingham, beloved brother of Miss Frances Frothingham, uncle of several nieces and nephews; he was employed by U.S. Forestry Service for 37 years" (Los Angeles Times 1969). Collectively, his publication record includes dozens of scientific articles, technical bulletins, reports, and other contributions. However, it is hard to overstate the contributions of Earl Hazeltine Frothingham, long-time station director and colleague of Gifford Pinchot and many other "first foresters" to the Forest Service, the AFES, and American forestry.

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In 2021, the Southern Research Station celebrated the 100th anniversary of its founding as the Southern and Appalachian Forest Experiment Stations. This volume includes 20 contributed articles on the history of these stations, spanning nearly the entire century. These include biographies on former and current staff members; essays on how the stations were organized, staffed, and led; early incarnations of the botany, forest survey, genetics, statistics, and publication programs; the establishment and operation of some experimental forests; and several accounts of how these stations' research supported local communities and industries. Although far from complete, these articles help illuminate the people, places, and programs that helped restore and rebuild southern forests, forestry, and associated communities into the dynamic and vibrant region experienced today.

Keywords: Administration, Appalachian Forest Experiment Station, employee roster, experimental forests, forest genetics and tree improvement, forest survey, hardwood management, pine silviculture, Southeastern Forest Experiment Station, Southern Forest Experiment Station, statistics, watershed research

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