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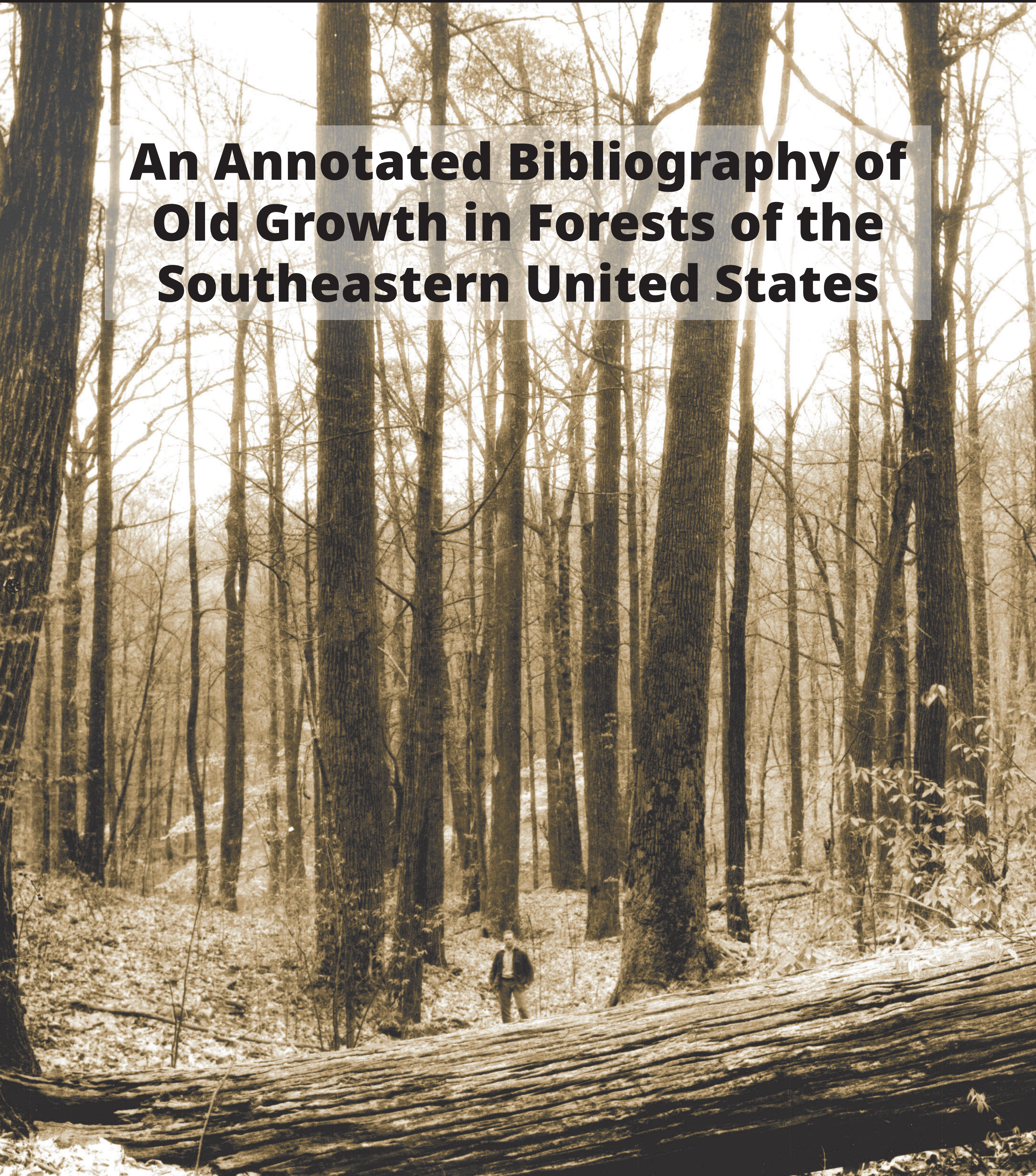
An Annotated Bibliography of Old Growth in Forests of the Southeastern United States



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Cover photo: Old-growth stand of poorly formed sawtimber, Bent Creek Experimental Forest, NC. (USDA Forest Service photo)

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Margaret Woodbridge, J. Davis Goode, and Don Bragg

We would like to dedicate this report to the memory of Don Bragg, an excellent mentor and friend who will be missed. (USDA Forest Service photo)

ACKNOWLEDGMENTS

We would like to thank Nancy Koerth and Duke Rankin for their helpful comments on an earlier version of this manuscript. Marty Spetich, Chris Schalk, Phillip Jordan, John Haffner, and others from the Southern Region old-growth guidance update team helped gather, curate, and evaluate these references. This research was supported by the U.S. Department of Agriculture, Forest Service's Southern Research Station and Southern Region.

> Go into the primitive forests at noonday, and however fiercely the sun may shine, you will find yourself enveloped in gloom. Gigantic trees obstruct your pathway, and as you cast your eyes upward, your head grows dizzy with their height. Here, too, are to be seen dead trunks, shorn of their limbs, and whitening in the blasts, that are as mighty in their size as the pillars of Hercules. Grape-vines larger than your body will, for some distance, creep along the ground, and then suddenly spring a hundred feet into the air, grasp some patriarch of the forest in its folds, crush, mutilate, and destroy it; and then, as if to make amends for the injury, throw over its deadening work the brightest green, the richest foliage, filled with fragrance, and the clustering grape. On the top of these aspiring trees, the squirrel is beyond the gunshot reach of the hunter.
>
> Thomas Bangs Thorpe
>
> "The Mississippi" (1854: 99)

CONTENTS

INTRODUCTION

As can be seen in the superlatives of antebellum writer and painter Thomas Bangs Thorpe, the old-growth forests of the Southeastern United States could be as spectacular as any in North America. Though New York-born-and-raised Thorpe's writings were largely of fictional characters, they reflected his own experiences and intimacy with the South from his years living in Louisiana. Both Thorpe's prose and artwork sought to encapsulate the romanticism of the region when the Nation was swept up in the concepts of Manifest Destiny and the visions of the wilderness expressed by the Hudson River School art movement. As Thorpe (1854: 5) noted in his preface,

> The southwest [as the Lower Mississippi River Valley and Texas were called then], with its primeval and evergreen forests, its unbounded prairies, and its many and continuous rivers, presents contributions of nature, which the pilgrims from every land, for the first time, behold with wonder and awe.

Thorpe's descriptions of these forests as "vast interior solitudes" and "primitive wilds" sparsely populated and largely untouched by human hands filled with ancient trees of spectacular size correspond with many other contemporary accounts (fig. 1, see also Warren et al. 2023).

No doubt, such historical descriptions and images continue to color our present-day notions of old growth in the Southeastern United States. But what is an old-growth forest, how can it be recognized, and how should old growth be managed on public lands? Even after decades of scientific research and philosophical considerations, these are not easy questions to answer (Gray et al. 2023). Older forests are now considered as especially critical on American public lands, particularly those managed by the U.S. Department of Agriculture, Forest Service and other Federal agencies (Gray et al. 2023, Pelz et al. 2023, USDA Forest Service 2023). Once the bane of the farmer—who sought to clear the trees to plant crops and graze livestock—and a boon for the lumberman, the rapidly vanishing old-growth forests became an increasingly complicated and controversial subject during

Figure 1—"The Beeches," a public domain image of this 1845 oil on canvas painting by Asher Brown Durand from the collection of the Metropolitan Museum of Art (https://www.metmuseum.org/art/collection/search/10786 [Date accessed: 13 October 2023]).

the 20th century. Though most of the old growth had been cut from the Eastern United States before 1950, many public lands in the West still had extensive, high-quality forests of intact, unmanaged old growth, and small pockets remained in the East.

The controversies surrounding timber harvesting in old growth on Federal lands in the Western United States that arose in the 1980s led to a number of initiatives by the Forest Service. In 1989, then-Forest Service Chief F. Dale Robertson issued a position statement to support congressional testimony by the agency on the management of old growth (USDA Forest Service 1990). In addition to creating a national agency policy on old growth, this position statement provided a very generic definition of old growth and directed that National Forest System (NFS) regions—with support from Forest Service Research and Development (R&D)—should develop their own regional definitions of old growth, conduct inventories of their lands using those definitions, and implement silvicultural treatments and ecosystem management to "maintain or establish desired old-growth values." In the Southern Region, this led to the formation of a team of NFS and R&D staff that worked together to produce a guidance document (USDA Forest Service 1997) on old growth that addressed this requirement by using the science then available.

Of course, much has changed since 1997. The state of the science related to old growth has advanced considerably over the past quarter-century, and new agency rules, regulations, and directions (such as the 2012 Planning Rule [Sherman 2012]) and Administration directives (such as Executive Order #14072 [Biden 2022]) coupled with continuously evolving societal interests and environmental changes have made the guidance document of the Forest Service (1997) of diminished utility and in need of updating. A formal team of Southern Region and Southern Research Station staff was chartered to work on this update in early 2022, and one of the main components of this effort was the development of a digital reference database to include many relevant old-growth-related resources from the scientific and technical literature that directly related to old-growth communities in the Southeastern United States, as well as other supplementary materials, such as historical photographs and maps of old-growth forests from the region.

Though the digital reference database is an inward-facing tool for the Southern Region, this annotated bibliography provides an indexed listing of these references, with some additional content and examples to help demonstrate their utility in addressing questions and management needs related to old-growth forests in the Southeastern United States.

METHODS

To accumulate these references, we requested library specialists at the National Forest Service Library to conduct a literature search based on the following terms: old growth, old forest, primeval forest, virgin forest, and late successional. These literature searches were further constrained to references that geographically occurred within the Southern Region (the 13 Southeastern States) or nearby States with forest types found in or directly comparable to those of the Region. Additionally, other Forest Service staff from the Southern Research Station and the Southern Region provided relevant references for consideration, and we found additional materials from our own searches of common online databases, including Google Scholar™, Treesearch, the National Archives, and Clarviate's Web of Science™. National-scale old-growth analyses were also included if the area of analysis included the Southern Region. Furthermore, this old-growth database and associated bibliography include a variety of reference materials in addition to scientific journal publications, including dissertations, theses, photographs, conference proceedings, conference presentations, reports, Forest Service publications (e.g., General Technical Reports), books, book chapters, online collections, and popular literature (e.g., newspaper and magazine articles). However, we did not use every possible reference that we encountered that mentioned old growth, nor did we choose to include every possible medium. For example, journal articles that merely mentioned old growth but provided no substantial nexus with the Southeastern United States or only mentioned old forests in passing were not included. Similarly, newspaper articles and other items in popular media that did not include any descriptors of old-growth stands, conditions, or quantitative characteristics were also excluded. We were also very selective in the illustrations included. For instance, even though Warren et al. (2023) suggested the value of historical landscape paintings for ecological research (including the further documentation of old-growth forest conditions from a period when they were still extensive), such materials require a degree of interpretation that would make them of limited utility for our purposes.

In addition to those possible old-growth-related resources we deliberately excluded, others were inevitably inadvertently missed. Even though multiple persons searched through various archival sources by using numerous search engines, libraries, scientific forums, and previously published works, we know we missed some references. These errors of omission could arise if our keyword searches failed to find them because the search terms used did not match the phrasing of the authors; or, some materials may not have been digitally indexed or cited in any other resource that could be cross-referenced and located (for example, old theses or dissertations). Furthermore, there are thousands if not millions of historical photographs of old-growth forests from the Southeastern United States that were not included. The photographs we included in this annotated bibliography are public domain, easily accessible, and had captions and other important metadata to give them at least some context. Finally, we had to choose a completion date upon which no additional resource finds would be added to ensure that this publication could be finalized. Hence, any new article on old growth published after October 1, 2023, was not included in this bibliography.

Citations are arranged alphabetically by the last name of the primary author. To accommodate specific research, management, or policy interests, references were indexed by forest type (as developed for the updated Southern Region old-growth guidance) and State. All references were annotated with a brief (approximately 2- to 3-sentence) summary outlining important information relevant to old-growth ecology, management, or policy. For photographs, the annotation is the caption provided by the photographer.

CHARACTERISTICS OF REFERENCES

This annotated bibliography contains 683 old-growth-related documents and 155 historical photographs. The majority of compiled references were journal articles (n = 461), followed by reports (n = 119) (fig. 2). The majority (n = 115) of reports

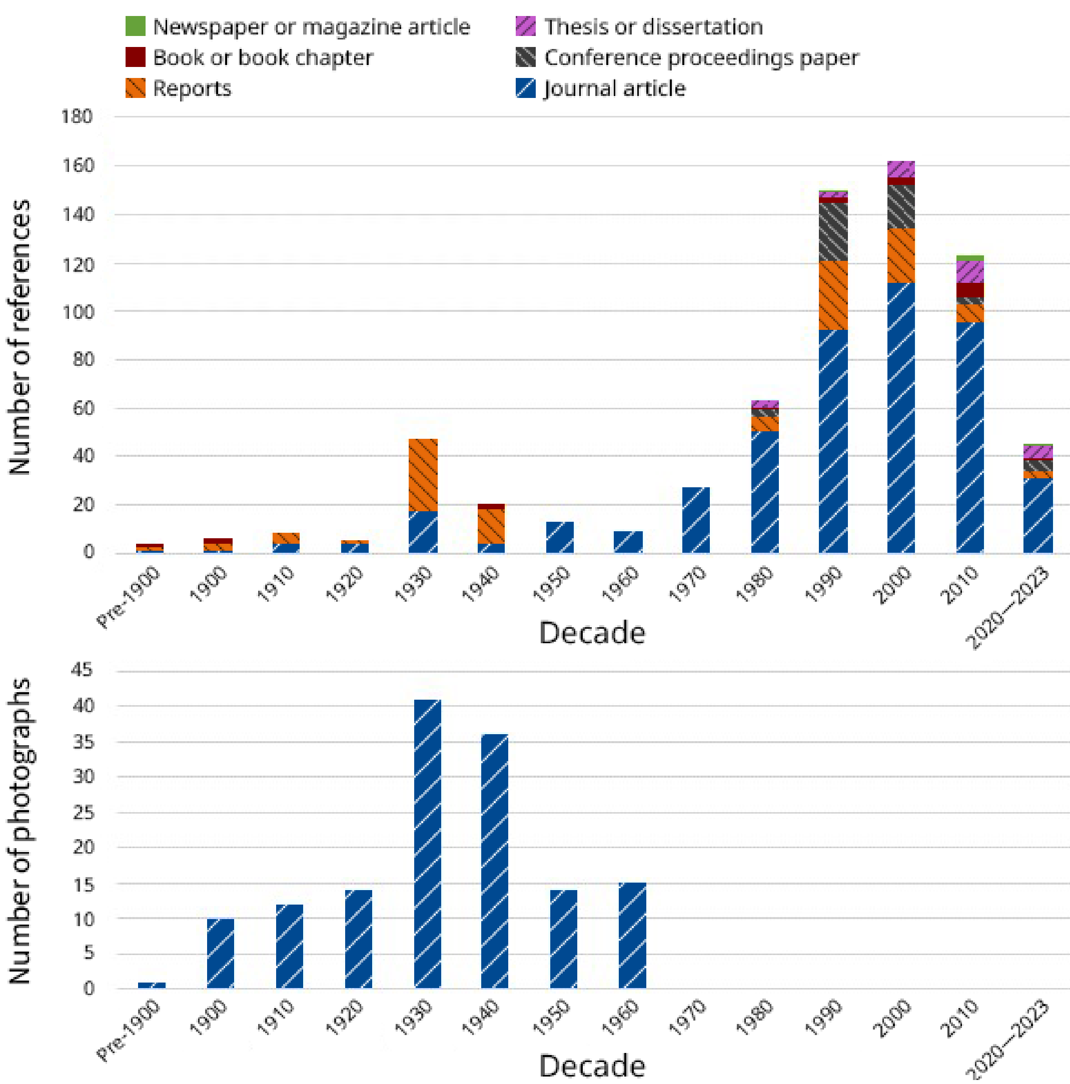

Figure 2—Frequency distribution of old-growth (top) references by decade of publication and reference type and (bottom) photographs by decade of publication.

were government documents such as General Technical Reports, Resource Bulletins, and Forest Survey Releases generated by the Forest Service, Southern Research Station, Southern Forest Experiment Station, and Appalachian Forest Experiment Station (prior to the consolidation of research stations). The Forest Survey Releases (mostly published between 1930 and 1950), describe forest conditions across the region prior to and immediately after widespread harvesting. Other government documents included those produced by the U.S. Department of the Interior, National Park Service, and Fish and Wildlife Service. Similarly, the majority of historical photographs depicting old-growth conditions were captured prior to 1960 (fig. 2). The lack of contemporary old-growth photographs corresponds to the minimal extent of current old growth and the lack of standardized collection and storage by photographers. In fact, most of the references published or photographed prior to 1970 were in the form of government documents or photographs. After 1970, the majority of references were journal articles (72 percent), reports (12 percent), and conference proceedings (10 percent). Relatively few references were books, book chapters, theses, dissertations, or newspaper or magazine articles.

References were unequally distributed across the Southern Region, including Puerto Rico (fig. 3). A gradual increase in reference frequency occurred along the west-to-east gradient within the Region, with western States (e.g., Texas and Oklahoma) contributing fewer references than eastern States (e.g., North Carolina and Tennessee). Puerto Rico had the fewest old-growth references (18 documents), and North Carolina had the greatest number of references (169 documents and 33 photographs). Additionally—although not depicted—the intrastate variability in reference frequency was considerable and largely stratified by physiographic province. For example, although 202 references were associated with North Carolina, the majority of studies occurred in the Blue Ridge and Piedmont, with fewer references from the Coastal Plain. Furthermore, a few notable and well-documented old-growth

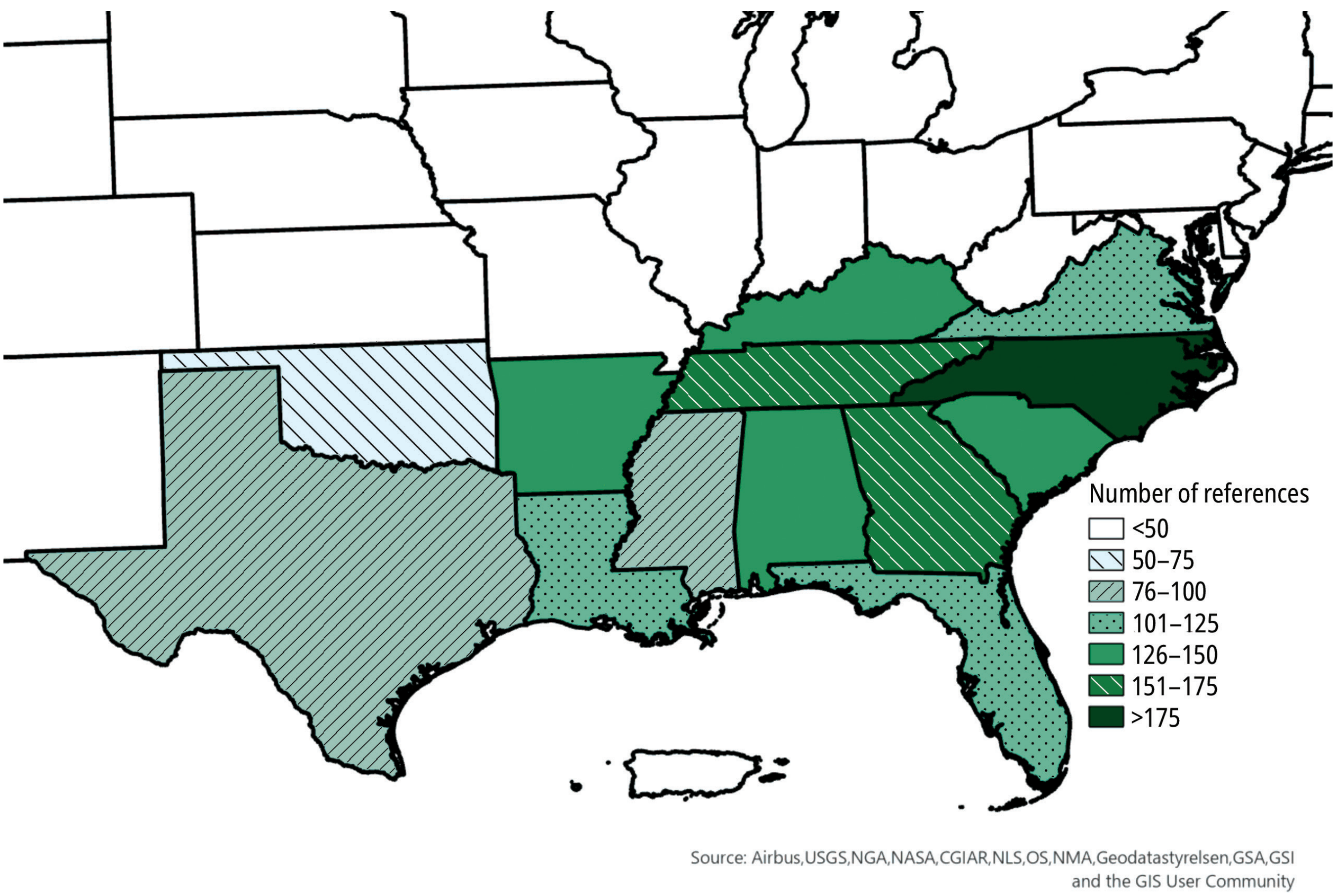

Figure 3—Number of old growth references across the 13 States and 1 Territory that compose the Forest Service's Southern Region.

locations contributed a relatively large number of references to the mixed mesophtyic and western mesophytic forest categories. These sites included the Lilley Cornett Woods in Kentucky, Joyce Kilmer Memorial Forest in North Carolina, and the Great Smoky Mountains National Park in Tennessee and North Carolina. Similarly, the studies conducted in Congaree Swamp National Park in South Carolina contributed a disproportionate number of references to the river floodplain hardwood forest old-growth community type.

A similar bias was documented when old-growth references were indexed by the Southern Region old-growth community types (fig. 4). In general, upland old-growth communities were better represented in the literature compared to bottomland forest communities. Of the bottomland community types, river floodplain hardwood forests were the best represented (135 documents and 8 photographs); however, each of the remaining bottomland community types had fewer than 75 associated references (hardwood wetland forest; seasonally wet oak-hardwood woodland; southern wet pine forest, woodland, and savannah; cypress-tupelo swamp forest; eastern riverfront forest). Hardwood wetland old-growth forest references were the least common in the literature (32 documents), and mixed mesophtyic and western mesophytic old-growth forests were the most common (225 documents and 33 photographs). Xeric community types, such as xeric pine and pine-oak forest and woodland (152 documents and 25 photographs), were generally well represented.

These discrepancies in distribution can be attributed to various factors, including barriers to access in the topographically complex mountainous regions, proximity to research institutes, population dynamics, and social and cultural forces, among others. Such biases should be considered when drawing broad-scale conclusions about these community types, given a disproportionately large part of our

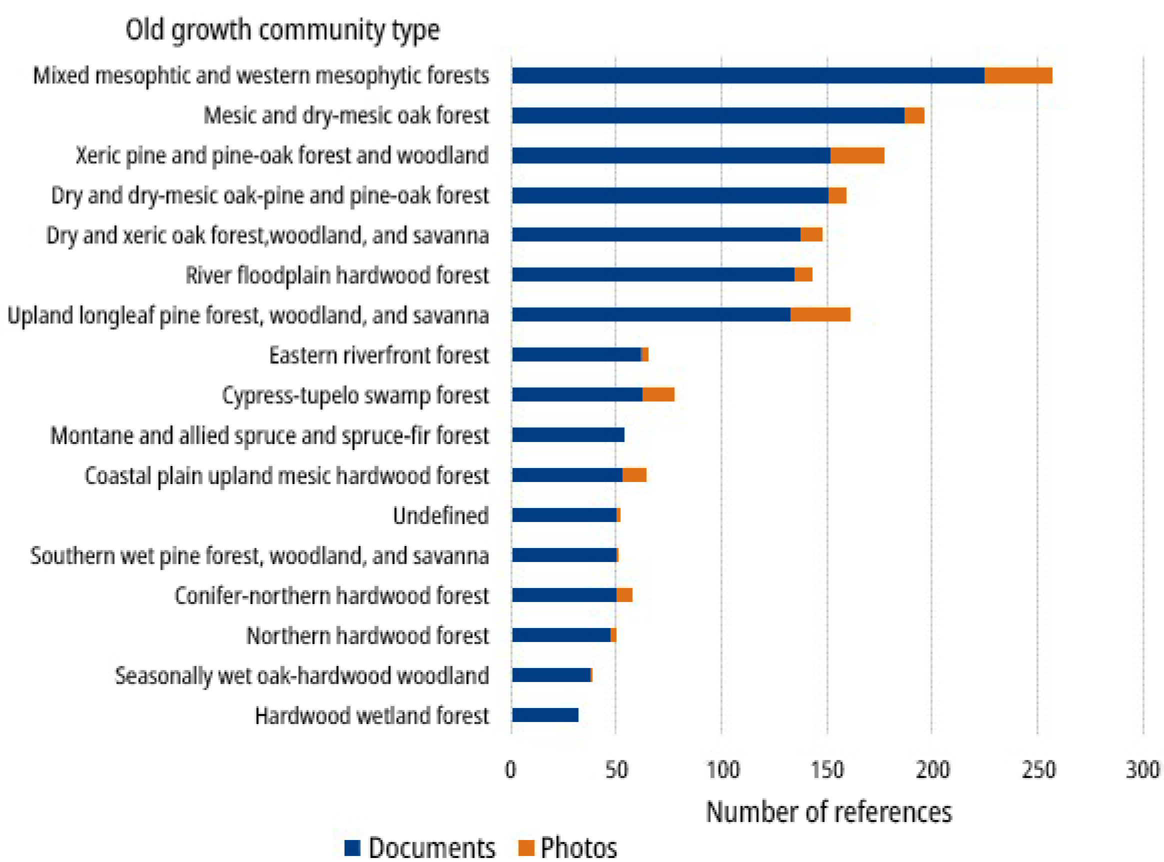

Figure 4—Number of references by old-growth community type, as described by the Southern Region old growth guidance (Bragg and Woodbridge et al., n.d.).

current knowledge on old growth is derived from a few areas in the region. This also suggests that additional research would be useful in a number of underrepresented old-growth forest communities.

EXAMPLES OF THE UTILITY OF THESE OLD-GROWTH REFERENCES

To help illustrate the opportunities presented in this bibliography, we present two examples of how the references can be used to inform management and planning needs. Each of these draws from citations included in this annotated bibliography, and though they are not designed to be prescriptive, each suggests how this information can be applied.

Example 1—Old-Growth Extent and Volume in the 1930s

The first Southern Forest Survey was conducted in the 1930s and took the better part of a decade to complete (Barnett 2023, Eldredge 1935). This project was among the first large-scale, systematic, statistically designed, and detailed field-based forest inventories conducted by the Forest Service. When this survey was completed, most of the reporting units (each covering from 2 to 10 million acres) included information on the extent of old-growth, partly cut old-growth, and second-growth forest coverage. Many of these survey reports also contained more detailed breakdowns of species or species groups, including tables with information on aspects such as average net volume per acre by species group and forest condition (old growth versus partly cut old growth versus second growth).

The Southern Forest Survey's standardized data collection allowed for comparisons across geographic regions for various aspects of the forest resource and the timber industry as they existed in the 1930s. At that time, this provided managers, policymakers, planners, and industrialists with new opportunities to understand the highly dynamic nature of the forests in the Southeastern United States. For instance, the naval stores industry had exploited virgin forests for centuries, but by the 1920s it was becoming clear that old longleaf (*Pinus palustris*) and slash (*Pinus elliottii*) pine—called "turpentine pines" by some—were disappearing and second-growth timber would need to replace those sources. Forest Service R&D provided naval stores operations the technology to utilize smaller and younger trees and related silvicultural studies supported the industry's management of second growth for the turpentine pines more capable of meeting production needs (Snow 1949).

But did sufficient forest resources remain in the "naval stores region" (fig. 5) to support the forest products industry? Although much of the pineywoods of the Coastal Plain had been devastated by exploitive turpentining, lumbering, agricultural land clearing, and wildfires, by the 1930s evidence of a recovery of naturally regenerated forests began to appear across the southern pine region. The results of the Southern Forest Survey (USDA Forest Service 1937) clearly showed that while the old-growth forest coverage had declined dramatically over the previous several decades, a second-growth forest was coming online and now constituted the majority of the region's coverage.

The original forest surveys of the Southeastern United States included forest coverage, composition, and timber volume estimates that also provide contemporary researchers valuable insights into old-growth stand conditions from a time period (early 1930s) when they still comprised a significant portion of the landscape. Table 1 provides the Southern Forest Survey's 1937 assessment of the amount of various forest type groups in the naval stores region, for which the uncut old growth comprised between 3 and 9 percent of this region's total forest cover, and partially cut old growth consisted of an additional 4 to 14 percent (USDA Forest Service 1937). Regionally, uncut turpentine pines extended across almost 732,000 acres, or about one-third of the remaining uncut old growth and approximately 1.7 percent of the region's forests at this time. The Southern Forest Survey (USDA Forest Service 1937) provided additional insights into stand-level conditions in these old-growth forests. Table 2 provides several different measures of stand volume—net sawtimber (in board feet) and total merchantable volumes in good ("sound", not cull) trees from the original

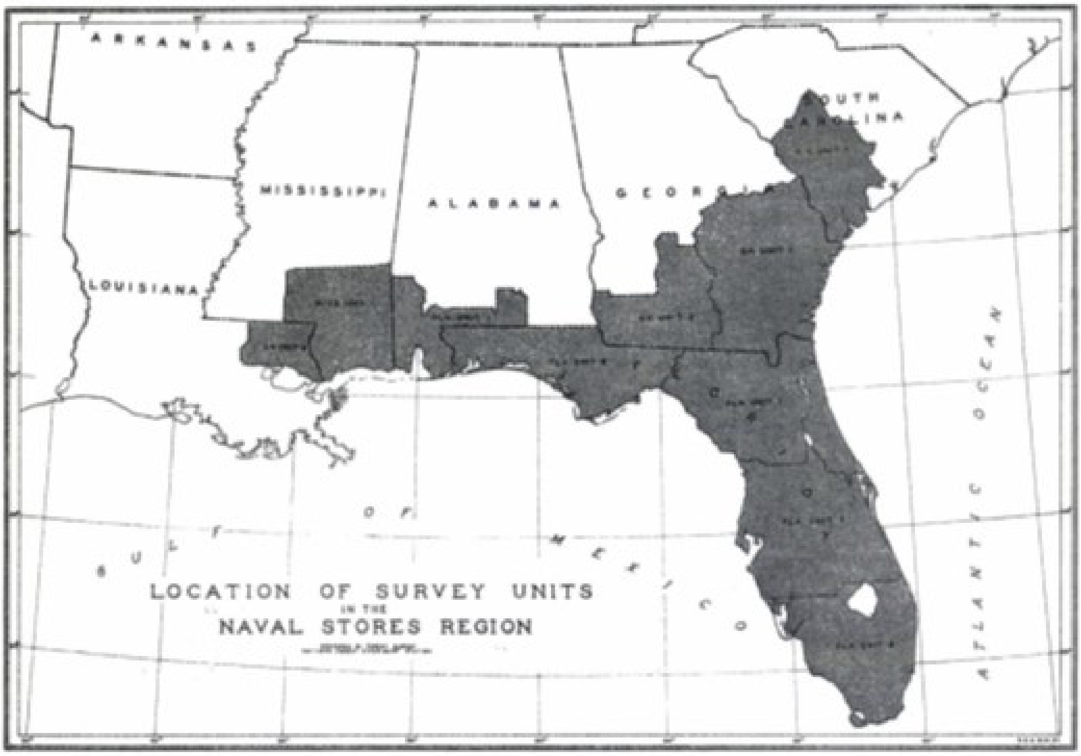

Figure 5—Map of the "naval stores region" designated by the Forest Service Southern Forest Experiment Station (USDA Forest Service 1937) showing the nine units included: South Carolina (SC1), Georgia (GA1 and GA2), Florida (FL1, FL2, and FL3; FL4 not included in this paper), Alabama (AL1), Mississippi (MS4), and Louisiana (LA4).

Table 1—A compilation of Southern Forest Survey (early 1930s) old-growth forest extent data from the nine units that composed the "naval stores region" as designated by the Southern Forest Experiment Station

	Southern Forest Survey species groups												
	Turpentine pines		Nonturpentine pines		Hardwood		Cypress		All old growth			Old growth	
Unit	Uncut[1]	PC[2]	Uncut	PC	Uncut	PC	Uncut	PC	Uncut	PC	All[3]	Uncut[4]	PC[4]
	thousand acres											*percent*	
SC1	16.1	61.8	103.6	66.8	80.4	83.6	17.7	21.7	217.8	233.9	2,993.0	7.3	7.8
GA1	105.1	420.3	82.5	98.1	202.3	106.6	28.8	69.3	418.7	694.3	7,056.2	5.9	9.8
GA2	20.8	245.3	29.5	51.8	41.6	84.7	4.8	24.8	96.7	406.6	3,014.0	3.2	13.5
FL1	174.2	429.7	77.3	49.6	261.8	240.5	123.8	150.6	637.1	870.4	7,297.7	8.7	11.9
FL2	148.5	283.7	32.1	44.8	136.0	226.2	45.6	92.9	362.2	647.6	6,017.5	6.0	10.8
FL3	166.6	145.0	4.9	2.5	20.6	29.7	47.0	56.1	239.1	233.3	6,170.0	3.9	3.8
AL1	57.0	292.7	12.5	31.3	66.4	79.6	14.0	26.5	149.9	430.1	2,985.9	5.0	14.4
M&L4	43.3	228.9	28.4	77.3	143.5	275.5	13.5	11.4	228.7	593.1	6,414.7	3.6	9.2
Total	731.6	2,107.4	370.8	422.2	952.6	1,126.4	295.2	453.3	2,350.0	4,109.0	41,949.0		

Turpentine pines = longleaf (*Pinus palustris*) or slash (*Pinus elliottii*) pine; nonturpentine pines = loblolly (*Pinus taeda*), shortleaf (*Pinus echinata*), pond (*Pinus serotina*), sand (*Pinus clausa*), or spruce (*Pinus glabra*) pine (alone or in mixture). Hardwoods are any hardwood species; cypress includes both baldcypress (*Taxodium distichum*) and pondcypress (*Taxodium ascendens*).

Unit codes: SC1 = South Carolina, Unit 1; GA1 = Georgia, Unit 1; GA2 = Georgia, Unit 2; FL1 = Florida, Unit 1; FL2 = Florida, Unit 2; FL3 = Florida, Unit 3; AL1 = Alabama, Unit 1; M&L4 = Mississippi and Louisiana, Units 4 (Unit 4s in both States were combined).

[1] Uncut = uncut old-growth stands from which <10 percent of the standing volume had been cut.

[2] PC = partly cut old growth where ≥10 percent of the standing volume had been cut and ≥1,000 board feet of old hardwood and pine, or ≥600 board feet of old pine, remained per acre.

[3] Includes all lands the Southern Forest Survey classified in that unit as forest, including old growth, second growth, and clearcut lands.

[4] Old-growth areas (both uncut and partially cut) divided by total unit forested area.

Source: USDA Forest Service (1937).

Table 2—A compilation of Southern Forest Survey (early 1930s) old-growth forest net sawtimber and total merchantable volume in sound (good) trees

Unit	Turpentine pines				Nonturpentine pines				Hardwoods				Cypress			
	ST	MV	CV	ODB	ST	MV	CV	ODB	ST	MV	CV	ODB	ST	MV	CV	ODB
	fbm[a]	*cds*[b]	*ft*^{3} [c]	*t/ac*[c]	*fbm*	*cds*	*ft*^{3}	*t/ac*	*fbm*	*cds*	*ft*^{3}	*t/ac*	*fbm*	*cds*	*ft*^{3}	*t/ac*
SC1	7,758	20.4	1,836	34.9	13,886	38.0	3,420	56.4	7,407	26.9	2,421	48.4	10,627	35.8	3,222	51.6
GA1	5,401	19.6	1,764	33.5	6,806	20.5	1,845	30.4	8,043	28.8	2,592	51.8	5,101	21.2	1,908	30.5
GA2	7,409	21.9	1,971	37.4	10,492	28.2	2,538	41.9	4,962	19.4	1,746	34.9	4,854	20.2	1,818	29.1
FL1	6,826	20.8	1,872	35.6	6,034	18.2	1,638	27.0	5,450	20.2	1,818	36.4	5,541	20.6	1,854	29.7
FL2	4,290	13.1	1,179	22.4	6,389	20.6	1,854	30.6	5,498	22.2	1,998	40.0	4,684	18.9	1,701	27.2
FL3	3,782	9.7	873	16.6	6,694	19.1	1,719	28.4	4,612	18.1	1,629	32.6	5,013	21.2	1,908	30.5
AL1	9,528	31.0	2,790	53.0	7,008	22.1	1,989	32.8	5,140	20.3	1,827	36.5	9,450	27.4	2,466	39.5
M&L4	15,035	39.6	3,564	67.7	9,486	28.5	2,565	42.3	6,883	23.6	2,124	42.5	14,852	43.3	3,897	62.4

Data are from the nine units that composed the “naval stores region” as designated by the Southern Forest Experiment Station.

Cords converted to cubic-foot volume and then oven-dried biomass in tons per acre. Oven-dried biomass reported in tons per acre (t/ac).

Turpentine pines = longleaf (*Pinus palustris*) or slash (*Pinus elliottii*) pine; nonturpentine pines = loblolly (*Pinus taeda*), shortleaf (*Pinus echinata*), pond (*Pinus serotina*), sand (*Pinus clausa*), or spruce (*Pinus glabra*) pine (alone or in mixture). Hardwoods are any hardwood species; cypress includes both baldcypress (*Taxodium distichum*) and pondcypress (*Taxodium ascendens*).

ST = sawtimber; MV = merchantable volume; CV = cubic foot volume; ODB = oven-dried biomass.

Unit codes: SC1 = South Carolina, Unit 1; GA1 = Georgia, Unit 1; GA2 = Georgia, Unit 2; FL1 = Florida, Unit 1; FL2 = Florida, Unit 2; FL3 = Florida, Unit 3; AL1 = Alabama, Unit 1; M&L4 = Mississippi and Louisiana, Units 4 (Unit 4s in both States were combined).

[a] Net sawtimber only (does not include cull trees) board foot measure (fbm) using International ¼-inch log rule, for pines and cypress >9 inches diameter at breast height (d.b.h.) and hardwoods ≥13 inches d.b.h.

[b] Total merchantable volume in standard cords (cds) for all sound (“good”) trees >5 inches d.b.h. up to a 4-inch minimum stem diameter. One standard cord is 4 feet by 4 feet by 8 feet, nominally 128 cubic feet.

[c] Cubic foot (ft^3) volumes and tons per acre (t/ac) not provided in Southern Forest Survey, but calculated for this annotated bibliography using a conversion to cubic feet from cords assuming one standard cord contains 90 cubic feet of solid wood and bark for all species (Williams and Hopkins 1968) and oven-dried weights (pounds per cubic foot) of wood and bark for stand types are as follows: turpentining pines = 38; nonturpentining pines = 33; hardwoods = 40; and cypress = 32 (adapted from Miles and Smith 2009: table 1B).

Source: USDA Forest Service (1937).

publication and cubic-foot volume and oven-dry biomass (both determined from the original total merchantable volume estimates). These data have limitations. For example, the average volumes presented for forest survey units did not include cull (highly defective) trees, which would have been common at this time. Furthermore, these stands were sampled at the end of the “Big Cut” (the initial era of commercial timber cutting) and therefore may have missed some of the highest volume stands that were likely some of the first to be cut. Both factors may indicate that these first Southern Forest Surveys may have underestimated wood volumes once present.

Nevertheless, valuable information can be found in these early 20th century references that can help contemporary researchers, managers, and planners. Two conditions of these old-growth stands immediately become apparent. First, there was considerable variation by survey unit in the volumes of timber. For example, Florida Unit 3 had almost four times less volume per acre than the Mississippi and Louisiana Units 4 (table 2). Though some of this may be due to differences in their exploitation (western pinelands were usually exploited later than eastern ones), evidence suggests that this disparity is more likely attributable to differences in site productivity and perhaps frequency of fire. For example, even into the late 1940s, Florida was recognized as one of the least used parts of the naval stores region; according to the 1930s forest surveys, all of the documented Florida units provided about two-thirds of the old-growth turpentine pines type (table 1, USDA Forest Service 1937, Wahlenberg 1946). Other observers noted that parts of southern Mississippi and southwestern Louisiana were well-known for having better stocked old-growth longleaf pine stands (e.g., Foster 1912, Harper 1920, Mattoon 1922, Wahlenberg 1946, Winters et al. 1943). This information indicates that a range of old-growth longleaf pine forest densities occurred across the region, and restoration projects focused on emulating historical forest conditions may want to account for this regional variation.

Second, regardless of forest survey unit, old-growth turpentine pine stands—even those in the better stocked Mississippi and Louisiana units—were considerably less well stocked than the site potential would allow for. The volumes reported for the remaining old-growth areas in these survey units do not include cull trees, which would have been relatively common; however, even if these were included, it is clear that fully stocked stands would have had much higher volumes. Mohr and Roth's (1897) monograph noted that most of the longleaf pine belt had typical stocking of 5,000 to 10,000 board feet per acre or less, and only a few stands had stocking that reached 15,000 to 20,000 board feet per acre; a particularly well-stocked stand in southwestern Louisiana had 35,000 board feet per acre. A later assessment of full stocking in even-aged second-growth longleaf pine by Mattoon (1922) suggested that mature (70-year-old) stands could range from 10,000 board feet per acre on poor sites to nearly 26,000 board feet per acre on good sites in trees at least 10 inches in diameter. Fully stocked second-growth longleaf pine yields at 70 years could be still higher (USDA 1929), from 29,000 board feet per acre on moderate sites (site index at 50 years [SI_{50}] = 80 feet) to as much as 69,000 board feet per acre on very good sites (SI_{50} = 110 feet).

These historical forest survey reports also offer somewhat greater details when considered at the survey unit level. Tables 3 and 4 are examples of this more refined information from the northeastern Florida unit (Ineson and Eldredge 1938, USDA Forest Service 1937). Table 3 provides a breakdown of the stand conditions (including uncut and partially cut old growth, second growth, and clearcut) by Southern Forest Survey species groups. Table 4 further decomposed each species group into the primary commercial subgroups (turpentine pines, both tapped ["worked"] and untapped ["round"]; nonturpentine pines; pulping hardwoods; nonpulping hardwoods; cypress [*Taxodium* spp.]) found in old-growth stands. Even though individual species are not included in table 4, the table does provide a sense of the variability in composition by forest species groups and suggests parameters for how contemporary restoration may want to consider species admixtures posttreatment.

Table 3—Descriptions of old-growth forests by stand condition and species groups for the northeastern unit (Unit 1) of Florida

Stand condition	Southern Forest Survey species groups									
	Turpentine pines		Nonturpentine pines		Hardwoods		Cypress		All	
	acres	*percent*	*acres*	*percent*	*acres*	*percent*	*acres*	*percent*	*acres*	*percent*
Old growth (UN)	174,200	2.4	77,300	1.1	261,800	3.6	123,800	1.7	637,100	8.7
Old growth (PC)	429,700	5.9	49,600	0.7	240,500	3.3	150,600	2.1	870,400	11.9
Second growth	3,342,100	45.8	424,900	5.8	827,900	11.3	128,500	1.8	4,723,400	64.7
Clearcut	1,001,400	13.7	33,200	0.4	22,000	0.3	10,200	0.1	1,066,800	14.6
All conditions	4,947,400	67.8	585,000	8.0	1,352,200	18.5	413,100	5.7	7,297,700	100.0

Inventoried between November 1933 and July 1934 by the Southern Forest Survey.

Turpentine pines = longleaf (*Pinus palustris*) or slash (*Pinus elliottii*) pine; nonturpentine pines = loblolly (*Pinus taeda*), shortleaf (*Pinus echinata*), pond (*Pinus serotina*), sand (*Pinus clausa*), or spruce (*Pinus glabra*) pine (alone or in mixture). Hardwoods are any hardwood species; cypress includes both baldcypress (*Taxodium distichum*) and pondcypress (*Taxodium ascendens*).

UN = uncut old-growth stands from which <10 percent of the standing volume was cut; PC = partly cut old-growth stands where ≥10 percent of the standing volume was cut and ≥1,000 board feet of old hardwood and pine, or ≥600 board feet of old pine, remained per acre. Second-growth stands (which could also be cut or partly cut) had been cutover and successfully regenerated; Clearcut = cleared stands not showing evidence of tree regeneration.

Sources: Ineson and Eldredge (1938: acreages from table 4, average net sawtimber volumes from table 5), USDA Forest Service (1937).

Table 4—Per acre volume descriptions for uncut old-growth forests by stand condition and species groups for the northeastern unit (Unit 1) of Florida

Old-growth forest type		Sawtimber Volume	Sawtimber Fraction	Total merchantable Volume	Total merchantable Fraction
		fbm[1]	*percent*	*cords*[2]	*percent*
Turpentine pine	**Turpentine pines round**	4,108	60.2	10.9	52.4
	Turpentine pines worked	1,459	21.4	3.8	18.3
	Nonturpentine pines	100	1.5	0.4	1.9
	Pulping hardwoods[3]	249	3.6	2.0	9.6
	Nonpulping hardwoods[4]	46	0.7	0.5	2.4
	Cypress	864	12.7	3.2	15.4
	Total	6,826	100.0	20.8	100.0
Nonturpentine pine	**Turpentine pines (all)**	238	3.9	0.7	3.8
	Nonturpentine pines	4,596	76.2	11.5	63.2
	Pulping hardwoods	554	9.2	3.1	17.0
	Nonpulping hardwoods	611	10.1	2.8	15.4
	Cypress	35	0.6	0.1	0.5
	Total	6,034	100.0	18.2	100.0
Hardwoods	**Pines (turpentine + nonturpentine)**	240	4.4	0.7	3.5
	Pulping hardwoods	2,723	50.0	11.1	55.0
	Nonpulping hardwoods	1,857	34.1	7.0	34.7
	Cypress	630	11.6	1.4	6.9
	Total	5,450	100.0	20.2	100.0
Cypress	**Pines (turpentine + nonturpentine)**	373	6.7	1.4	6.8
	Pulping hardwoods	250	4.5	2.4	11.7
	Nonpulping hardwoods	100	1.8	0.6	2.9
	Cypress	4,818	87.0	16.2	78.6
	Total	5,541	100.0	20.6	100.0

Inventoried between November 1933 and July 1934 by the Southern Forest Survey.

Turpentine pines = longleaf (*Pinus palustris*) or slash (*Pinus elliottii*) pine; nonturpentine pines = loblolly (*Pinus taeda*), shortleaf (*Pinus echinata*), pond (*Pinus serotina*), sand (*Pinus clausa*), or spruce (*Pinus glabra*) pine (alone or in mixture). Hardwoods are any hardwood species; cypress includes both baldcypress (*Taxodium distichum*) and pondcypress (*Taxodium ascendens*); round = not yet used for turpentining; worked = turpentine "face" cut into lower bole for naval stores production.

[1] Net sawtimber only (does not include cull trees) board foot measure (fbm) using International ¼-inch log rule, for pines and cypress >9 inches diameter at breast height (d.b.h.) and hardwoods ≥13 inches d.b.h.

[2] Total merchantable volume in standard cords for all sound ("good") trees >5 inches d.b.h. up to a 4-inch minimum stem diameter.

[3] Pulping hardwoods = sweetgum (*Liquidambar styraciflua*), blackgum (*Nyssa sylvatica*), bay (various species), red maple (*Acer rubrum*), magnolia (*Magnolia* spp.), and associated minor species that could be used for pulp.

[4] Nonpulping hardwoods = red and white oaks (*Quercus* spp.), ash (*Fraxinus* spp.), elm (*Ulmus* spp.), hickory (*Carya* spp.), holly (*Ilex opaca*), persimmon (*Diospyros virginiana*), and associated minor species not used for pulping.

Source: USDA Forest Service (1937: table 4).

Example 2—Old Growth, Uncut, and Partial, as Seen Through Historical Photographs

Not all of the reference materials in the database and associated bibliography are documents; we have also included metadata associated with a large number of photographs. Most of these images are from the National Archives' Forest Service collection of historical materials (NARA 2023). This collection contains many scanned prints of negatives that were gathered by Forest Service photographers from the late 1890s through the 1980s, taken to better document the forests, forestry practices, people, and communities associated with the agency and the lands it managed (Prater 1974). More than 600,000 of these images were officially incorporated into this numbered and documented system, many of which have been digitized by the National Archives and other entities over the decades.

These historical photographs are a rich source of information for people seeking descriptions of old-growth forests and old trees, both as intact examples and the postlumbering aftermath. This collection includes many digital images of old trees and old-growth stands from the Southeastern United States, including some examples from each State. Most of these include captions with critical information on topics such as location, photographer, date of the photograph, tree species, and conditions being described. For instance, figure 6 is an image of a "round" (untapped) old-growth longleaf pine stand from the turn of the 20th century in Georgia, showing no evidence of lumbering or turpentining. This stand, comprised almost entirely of longleaf pine, is relatively low in stocking (consistent with the volumes provided in tables 2 and 4), low in arboreal diversity, but with a groundcover dominated by grasses and forbs and frequently swept by fire (which helped to limit the woody plant coverage in these stands).

Until they were devastated by lumbering, turpentining, agricultural land clearing, wildfires, and other human activities, old-growth longleaf pine forests once dominated millions of acres across the Coastal Plain (Hanberry et

Figure 6—An example of an uncut longleaf pine stand in southern Georgia that had not yet been "boxed" (the trees are still considered "round" or unworked) for turpentine when the photograph was taken in 1903. Note the open, grassy understory, scorch marks on some of the lower pine boles, and low arboreal diversity in this stand—all very characteristic attributes of frequently burned virgin longleaf pine stands. (USDA Forest Service photo by E. Block, negative #40849)

al. 2023). The demise of longleaf pine was often gradual, with much of this ecosystem first degraded by naval stores extraction (fig. 7). By the time photography became possible, this activity had become a major economic engine for the Southeastern United States, with turpentine operations chipping the bark and wood of longleaf and slash pines to elicit the release of oleoresins from the live trees that would be gathered into a box or cup for later collection and processing into the valuable chemical constituents (Barnett 2019). While these naval stores operations were ongoing, the mature veteran pines were left onsite—they could be profitably tapped for oleoresins for years—but careless and reckless actions of these operations often led to premature death of the tapped trees (due to windthrow or fire, usually). These actions reduced the integrity of old-growth pine stands, although would not have eliminated them. However, later lumbering clearcut most

Figure 7—An example stand in Georgia where “faces” were “chipped” and “cupped” (also called “worked”) to extract naval stores from old-growth longleaf pines. This stand was considered uncut, because no trees were cut and removed. (USDA Forest Service photo by E. Block, 1903, negative #40171)

if not all trees (fig. 8), eliminating most of the potential pine seed sources; many stands were then used for livestock grazing or simply abandoned. These once-impressive stands quickly went from old growth to nonforest (pasture or farm fields, or young, early successional stands).

Some longleaf pine lands were spared this complete devastation when the owners decided to only partly cut the timber (fig. 9). A primitive silvicultural practice, this “conservative lumbering” left behind a portion of the stand, typically smaller trees, to grow large enough to support a later harvest in 10 to 20 years. As silviculture gradually developed in southern forests, some of these old-growth stands were largely cleared with a small number of seed trees retained to (hopefully) restock the cutover lands with a new crop of pines. In these partially cut lands, scattered veteran pines could often be found in later years, towering above the next generation (fig. 10). Such altered forests were no longer old growth but could have centuries-old pines intermixed with much younger specimens.

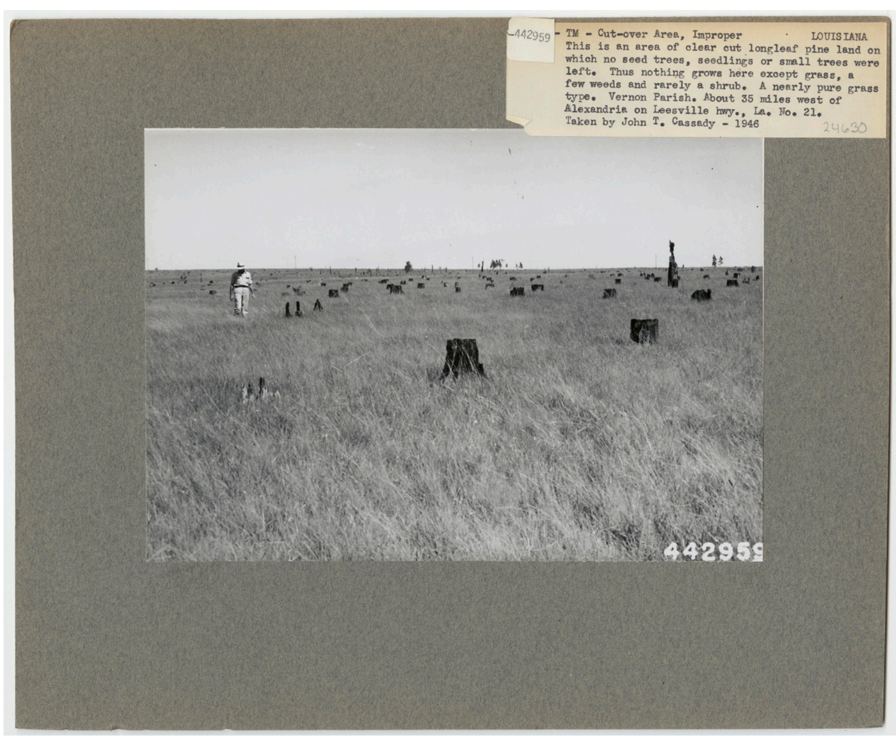

Figure 8—By the 1930s, much of the longleaf pine region looked like this clearcut landscape from central Louisiana, with many stumps but hardly a live tree visible to the horizon. (USDA Forest Service photo by John T. Cassady, 1946, negative #442959)

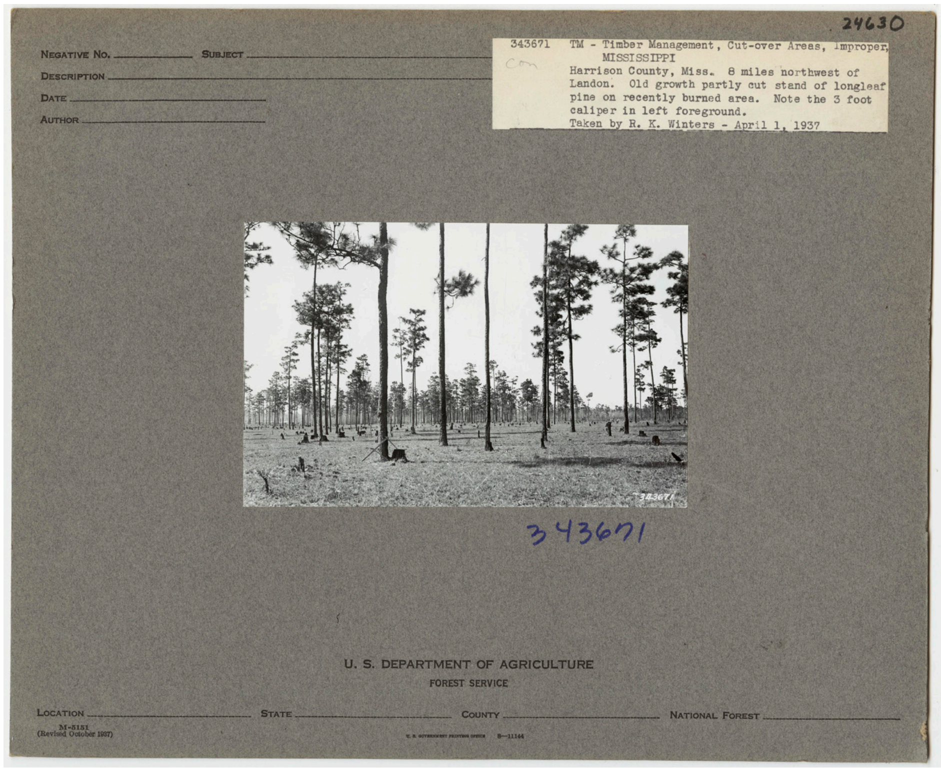

Figure 9—A partly cut stand of old-growth longleaf pine from southern Mississippi where a portion of the trees were left behind, including scattered but small "veterans" and some younger individuals, likely with the intention of returning for a second cut in a few years after these trees grew larger. (USDA Forest Service photo by R.K. Winters, 1937, negative #343671)

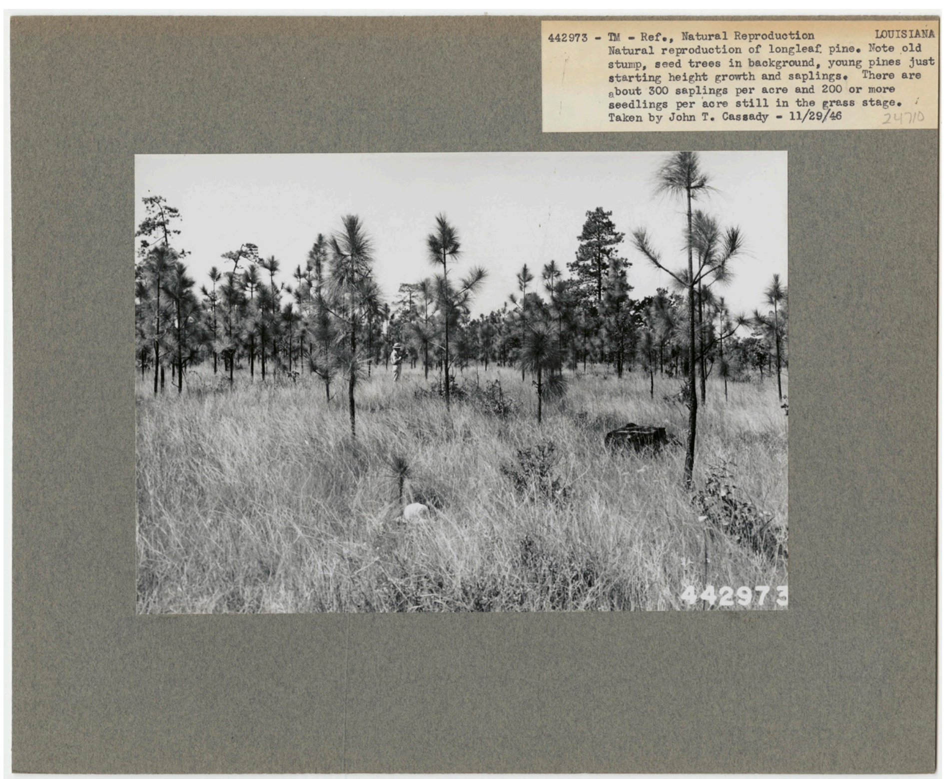

Figure 10—Natural longleaf pine regeneration in a stand produced when old seed trees (background horizon of the photograph) were retained. Note the old longleaf pine stump on the right side of the image; this stand in central Louisiana had been a virgin forest just a decade or so earlier. (USDA Forest Service photo by John T. Cassady, 1946, negative #442973)

CONCLUSIONS

With increasing interest in old-growth ecology and management, this annotated bibliography is a timely tool for furthering our understanding of the diverse and complex old-growth communities that occur across the Southeastern United States. We acknowledge that we did not capture all the published information relevant to old growth in the Southeastern United States. However, we hope that managers, planners, scientists, and other interested parties find this list of references useful to help support research and improve management of old growth in this region.

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Upland Longleaf Pine Forest, Woodland, and Savanna

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Seasonally Wet Oak-Hardwood Woodland

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Montane and Allied Spruce and Spruce-Fir Forest

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ANNOTATED DOCUMENTS

1. **Abell, C.A.; Abell, M.; Barrett, L.I.; Buell, J.H.; Frothingham, E.H.; Hursh, C.R.; Nelson, R.M.; Sims, I.H. 1935.** Forest improvement measures for the southern Appalachians. Tech. Bull. 476. Washington, DC: U.S. Department of Agriculture. 46 p.

   Provides instructions for timber stand improvement in the numerous forest types of the southern Appalachians. Provides insight into the number of old-growth stands from that period (1930s) that were culled—i.e., had "improvement and liberation cuttings"; these may have been the only treatments in those stands up to the present.

2. **Abella, S.R.; Shelburne, V.B. 2003.** Eastern white pine establishment in the oak landscape of the Ellicott Rock Wilderness, southern Appalachian Mountains. Castanea. 68(3): 201–210.

   Determines the distribution of eastern white pine in the old-growth oak-dominated Ellicott Rock Wilderness of South Carolina. Oak regeneration failure was widespread, but eastern white pine was the most abundant species in the small-diameter size class. Nearly all eastern white pine established after 1950. Results indicate that eastern white pine is experiencing range expansion to upland oak forests in the southern Appalachians.

3. **Abelleira Martínez, O.J. 2010.** Invasion by native tree species prevents biotic homogenization in novel forests of Puerto Rico. Plant Ecology. 211: 49–64. https://doi.org/10.1007/s11258-010-9771-4.

   Assesses the impacts of second-growth nonnative African tulip tree-dominated stands on biotic homogenization and native tree species establishment in Puerto Rico. Results indicate that substrate properties and natural disturbances enhance the establishment and growth of native species and prevent biotic homogenization.

4. **Abrams, M.D.; Copenheaver, C.A. 1999.** Temporal variation in species recruitment and dendroecology of an old-growth white oak forest in the Virginia Piedmont, USA. Forest Ecology and Management. 124(2/3): 275–284. https://doi.org/10.1016/S0378-1127(99)00071-7.

   Reconstructs historical development and successional history of an old-growth mixed-oak forest on the Virginia Piedmont that established in the mid-1700s. Notes a successional shift from white oak to red oak to mixed mesophytic species dominance over time. The disturbance history of the stand was characterized by frequent gap-scale disturbance with less frequent moderate-severity disturbance.

5. **Abrams, M.D.; Hanberry, B.B.; Ruffner, C.M. 2022.** A comparison of witness tree and contemporary compositions for old-growth forests at Savage Mountain, Maryland, and secondary forests of the northern Allegheny Mountains. Journal of the Torrey Botanical Society. 149(2): 151–158. https://doi.org/10.3159/TORREY-D-21-00039.1.

   Compares General Land Office witness tree descriptions from an area surrounding an old-growth forest at Savage Mountain, MD, with current stand-level surveys of old-growth and contemporary Forest Inventory and Analysis data from the area. Considers changes in species composition, such as loss of fire-tolerant oaks and increases in red maple, over time due to altered disturbance regimes and mesophication.

6. **Abrams, M.D.; Orwig, D.A.; Demeo, T.E. 1995.** Dendroecological analysis of successional dynamics for a presettlement-origin white-pine mixed-oak forest in the southern Appalachians, USA. Journal of Ecology. 83(1): 123–133. https://doi.org/10.2307/2261156.

   Analyzes stand development, succession, and canopy disturbance history using dendrochronological techniques in an old-growth eastern white pine-mixed oak forest in the Ridge and Valley of West Virginia. Highlights the impacts of the loss of American chestnut, fire exclusion, and the importance of asynchronous small-scale disturbance on contemporary stand structure and composition.

7. **Abrams, M.D.; Orwig, D.A.; Dockry, M.J. 1997.** Dendroecology and successional status of two contrasting old-growth oak forests in the Blue Ridge Mountains, U.S.A. Canadian Journal of Forest Research. 27(7): 994–1002. https://doi.org/10.1139/x97-042.

Quantifies stand succession and development with dendrochronological techniques in old-growth northern red oak-dominated (mesic) and chestnut oak-dominated (xeric) stands. Although both were oak dominated, the reconstructed successional and developmental pathways were divergent, wherein northern red oak experienced pulses of recruitment and chestnut oak experienced continuous recruitment. The northern red oak stand was projected to be replaced by mixed mesophytic species, and the chestnut oak stand was projected to be compositionally stable.

8. **Abrams, M.D.; Ruffner, C.M.; DeMeo, T.E. 1998.** Dendroecology and species co-existence in an old-growth *Quercus–Acer–Tilia* talus slope forest in the central Appalachians, USA. Forest Ecology and Management. 106(1): 9–18. https://doi.org/10.1016/S0378-1127(97)00234-X.

Reconstructs the disturbance history and recruitment patterns of an old-growth northern red oak-sugar maple-basswood forest on a talus slope in West Virginia. Stand structure was uneven-aged, with sugar maple dominant in the sapling layer. Fire-scarred samples indicated a history of fire in the stand, as well as synchronous releases suggestive of blowdowns.

9. **Abrell, D.B.; Jackson, M.T. 1977.** A decade of change in an old-growth beech-maple forest in Indiana. American Midland Naturalist. 98(1): 22–32. https://doi.org/10.2307/2424712.

Quantifies the stand dynamics over a 10-year period in an old-growth beech-maple forest in Indiana. Over time, beech importance declined and sugar maple importance increased.

10. **Adams, H.S.; Stephenson, S.L. 1989.** Old-growth red spruce communities in the mid-Appalachians. Vegetatio. 85(1–2): 45–56. https://doi.org/10.1007/BF00042254.

Provides a description of the stand composition and age structure of four old-growth red spruce stands in Virginia and West Virginia. Stands ranged in age from 164 to 201 years, and trees varied in decadal patterns of radial growth. A notable major decline in basal area and density occurred over the past half century.

11. **Aide, T.M.; Zimmerman, J.K.; Pascarella, J.B.; Rivera, L.; Marcano-Vega, H. 2000.** Forest regeneration in a chronosequence of tropical abandoned pastures: implications for restoration ecology. Restoration Ecology. 8(4): 328–338. https://doi.org/10.1046/j.1526-100x.2000.80048.x.

Quantifies the composition and structure of postagricultural abandonment tropical secondary forests in Puerto Rico and suggests restoration strategies. Results indicate that the secondary forests have a similar structure and species richness at stand age 40 compared to old-growth forests, but species composition remains distinct from old growth.

12. **Aldrich, P.R.; Parker, G.R.; Romero-Severson, J.; Michler, C.H. 2005.** Confirmation of oak recruitment failure in Indiana old-growth forest: 75 years of data. Forest Science. 51(5): 406–416. https://doi.org/10.1093/forestscience/51.5.406.

Describes 75 years of change to the diameter distribution of red and white oaks in old-growth forests of Indiana. Documents persistent evidence of oak regeneration failure, which is attributed to shade intolerance and altered disturbance regimes.

13. **Allen, B.P.; Pauley, E.F.; Sharitz, R.R. 1997.** Hurricane impacts on liana populations in an old-growth southeastern bottomland forest. Journal of the Torrey Botanical Society. 124(1): 34–42. https://doi.org/10.2307/2996596.

Assesses hurricane impacts on the liana population following Hurricane Hugo in old-growth bottomland hardwood forests in the Congaree Swamp National Monument, SC. Small trees with lianas were more likely to have been damaged by the hurricanes than trees with no lianas, and all trees that supported three or more lianas were more likely to have been damaged.

14. **Allen, B.P.; Sharitz, R.R.; Goebel, P.C. 2005.** Twelve years post-hurricane liana dynamics in an old-growth southeastern floodplain forest. Forest Ecology and Management. 218(1/3): 259–269. https://doi.org/10.1016/j.foreco.2005.08.021.

Assesses liana community response to changes in old-growth floodplain stand composition and structure following Hurricane Hugo. Liana density initially decreased after the hurricane but recovered to greater density 12 years posthurricane.

15. **Allen, B.P.; Sharitz, R.R.; Goebel, P.C. 2007.** Are lianas increasing in importance in temperate floodplain forests in the southeastern United States? Forest Ecology and Management. 242(1): 17–23. https://doi.org/10.1016/j.foreco.2007.01.027.

Compares long-term liana surveys in bottomland hardwood forests at an old-growth site (Congaree National Park) and a second-growth site (Savannah River Site). Monitoring lianas at Congaree National Park began after Hurricane Hugo in 1989. Liana density and size increased over time at both sites, but it was only significant at the Congaree National Park site. Lianas were also >10 percent of the stems at the Congaree National Park site and may influence forest dynamics in old-growth bottomland hardwoods.

16. **Álvarez Ruiz, M.; Lugo, A.E. 2012.** Landscape effects on structure and species composition of tabonuco forests in Puerto Rico: implications for conservation. Forest Ecology and Management. 266: 138–147. https://doi.org/10.1016/j.foreco.2011.10.044.

Compares tabonuco forest composition and structure between stands with variable levels of historical anthropogenic disturbance and environmental conditions. There is no direct mention of old growth, but undisturbed remnant stands were used as baselines for comparison. Results enhance understanding of historical landscape factors that influence species composition and hinder restoration efforts in this forest type.

17. **Anderson, R.C. 1991.** Presettlement forests of Illinois. In: Burger, G.V.; Ebinger, J.E.; Wilhelm, G.S., eds. Proceedings of the oak woods management workshop. Charleston, IL: Eastern Illinois University: 9–19.

Provides a description and map of the pre-European settlement vegetation of Illinois. Forests and savanna vegetation dominated hilly landscapes dissected by streams and ravines, and prairies dominated more level topography. Fire frequency was a greater influence on vegetation cover type than was topography.

18. **Anderson, R.C.; Anderson, M.R. 1975.** The presettlement vegetation of Williamson County, Illinois. Castanea. 40(4): 345–363.

Uses General Land Office records to reconstruct presettlement vegetation patterns in Illinois. Oak-hickory forests were the dominant vegetation type on rugged aspects. Species composition and stand structure values are also reported.

19. **Anderson, R.C.; White, J. 1970.** A cypress swamp outlier in southern Illinois. Transactions of the Illinois Academy of Science. 63: 6–13.

Compares stand structure and composition between an old-growth and a second-growth cypress swamp in southern Illinois. The stands were established around the same time, but the cutting in the second growth resulted in a greater density of tupelo compared to the old-growth site.

20. **Ashby, W.C.; Ozment, J.E. 1967.** Plant species of Beall's Woods, Wabash Co., Illinois. Transactions of the Illinois State Academy of Science. 60: 174–183.

A floristic inventory of four upland and four floodplain forests in Beall's Woods, IL.

21. **Ashe, W.W. 1922.** Reserved areas of principal forest types as a guide in developing an American silviculture. Journal of Forestry. 20(3): 276–283.

Argues for the establishment of "reserved areas" (unharvested locations) in parts of the southern Appalachians to help the development of American silviculture during this formative period. Although only limited mention of “virgin” forest is included, the author suggests that about 1.8 million acres of the national forests he mentions could serve as examples for uncut reserves in the early 1920s. He suggests that most of these “primitive” stands were uneven aged in their structure.

22. **Atwood, J.J.; Holmberg, N.J. 2018.** Bryophytes of Big Oak Tree State Park, Mississippi County, Missouri. Missouriensis. 36: 4–14.

Provides a survey of the rich and diverse bryophyte (mosses and liverworts) community in an old-growth bottomland hardwood remnant in southeastern Missouri.

23. **Austin, D.A.; van de Gevel, S.L.; Soulé, P.T. 2016.** Forest dynamics and climate sensitivity of an endangered Carolina hemlock community in the southern Appalachian Mountains, USA. Botany. 94(4): 301–309. https://doi.org/10.1139/cjb-2015-0222.

Quantifies the composition, structure, age, and climate-growth relationships in a high-elevation Carolina hemlock stand in North Carolina. Carolina hemlock had continuous establishment from 1850 to 2010. This species is sensitive to seasonal moisture availability, and climate change effects (increased warming) along with hemlock woolly adelgid impacts may influence future radial growth rates and the successional trajectory of these endangered systems.

24. **Auten, J.T. 1933.** Porosity and water absorption of forest soils. Journal of Agricultural Research. 46: 997–1014.

Compares soil porosity and water-absorbing capacity among old-growth, second-growth, grazed, and forest plantation sites in four States in the Central Hardwood region. Old-growth soil had 20 to 30 percent greater porosity in the upper 9 inches of the soil, a more platy structure, and greater absorption capacity. Also determines that these characteristics were quick to recover or often retained in second-growth forests without a history of grazing.

25. **Auten, J.T. 1941.** Notes on some old-growth forests in Ohio, Indiana and Illinois. Tech. Note 49. Columbus, OH: U.S. Department of Agriculture, Forest Service, Central States Forest Experiment Station. 8 p. https://doi.org/10.5962/bhl.title.121275.

Describes remnant old-growth stands interspersed throughout forests of the Central Hardwoods region in Illinois, Indiana, and Ohio. Includes descriptions of stand composition and structure, and site characteristics of eight forest types.

26. **Avilla, L.R.; Hines, B.; Elliott, C.L. 2022.** A survey of bats at Lilley Cornett Woods Appalachian Ecological Research Station, Letcher County, Kentucky, before the arrival of white-nosed syndrome. Journal of the Kentucky Academy of Science. 83(1–2): 1–9. https://doi.org/10.3101/kyac-83-01-02.

Surveys the bat population at Lilley Cornett Woods by using netting and echolocation techniques. Netting sampling identified five unique bat species and echolocation recorded nine unique bat species, including the endangered Indiana bat and gray bat, and the threated northern long-eared bat. The survey occurred prior to the arrival of white-nosed syndrome.

27. **Baecher, J.A.; Richter, S.C. 2018.** Environmental gradients in old-growth Appalachian forest predict fine-scale distribution, co-occurrence, and density of woodland salamanders. Ecology and Evolution. 8(24): 12940–12952. https://doi.org/10.1002/ece3.4736.

Assesses the relationship between natural disturbance-based environmental gradients and the population of two salamander species in the old-growth Lilley Cornett Woods on the Cumberland Plateau, KY. Environmental gradients of soil moisture and temperature, solar exposure, and slope position within the study area influenced the fine-scale distribution of both salamander species. Salamanders play an important role in forest health and ecosystem function; conservation of old growth is an important consideration for maintaining healthy populations, because the sensitivity of salamander populations to fine-scale disturbance may be greatly enhanced by anthropogenic disturbance.

28. Barden, L.S. 1979. Tree replacement in small canopy gaps of a *Tsuga canadensis* forest in the Southern Appalachians, Tennessee. Oecologia. 44(1): 141–142. https://doi.org/10.1007/BF00346412.

Studies gap replacement in an old-growth eastern hemlock forest in the Great Smoky Mountains National Park. Canopy tree replacement of shade-tolerant eastern hemlock was generally by less-tolerant birch, tulip poplar, and Frasier magnolia.

29. Barden, L.S. 1980. Tree replacement in a cove hardwood forest of the southern Appalachians. Oikos. 35(1): 16–19. https://doi.org/10.2307/3544722.

Assesses tree replacement dynamics in canopy gaps in an Appalachian cove forest in the Great Smoky Mountains National Park, TN. The cove hardwood stand maintained high richness and evenness through tree replacement in gaps created by endogenous disturbance. Predicts that the most shade-tolerant species, including eastern hemlock, sugar maple, basswood, and American beech will maintain canopy dominance through gap capture of small canopy openings.

30. Barden, L.S. 1981. Forest development in canopy gaps of a diverse hardwood forest of the southern Appalachian Mountains. Oikos. 37(2): 205–209. https://doi.org/10.2307/3544466.

Quantifies patterns of gap-phase succession in hardwood forests of the Great Smoky Mountains National Park, TN. Single-tree gaps were primarily captured by shade-tolerant species, but multitree gaps had a greater proportion of gaps captured by shade-intolerant species such as tulip poplar and northern red oak.

31. Barden, L.S. 1989. Repeatability in forest gap research: studies in the Great Smoky Mountains. Ecology. 70(3): 558–559. https://doi.org/10.2307/1940204.

Compares canopy gap studies in southern Appalachian forests, revealing multiple discrepancies in results, specifically in the estimated proportion of stand area composed of canopy gaps. Author argues for refining approaches to better quantify canopy gap dynamics and gap-phase succession in forests of the southern Appalachians.

32. Barnett, J.P.; Lueck, E.W. 2020. Sawmill towns: work, community life, and industrial development in the pineywoods of Louisiana and the New South. Gen. Tech. Rep. SRS-257. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 68 p. https://doi.org/10.2737/SRS-GTR-257.

Describes the advent of industrial-scale logging of old-growth pine forests as a means of economic recovery after the Civil War in the Southern United States.

33. Barnett, K.; Aplet, G.H.; Belote, R.T. 2023. Classifying, inventorying, and mapping mature and old-growth forests in the United States. Frontiers in Forests and Global Change. 5: 1070372. 25 p. https://doi.org/10.3389/ffgc.2022.1070372.

Uses Forest Inventory and Analysis data and a set of assumptions about the relationships among carbon density, site quality, and stand age to project the possible occurrence of old-growth forests across the United States, and produces a map. The authors report extensive areas of old growth across the Southeastern United States; upon closer examination this is largely a result of their decision to call the “onset” of old growth in loblolly-shortleaf pine stands at 34 to 49 years, longleaf-slash pine at 42 years, and oak-gum-cypress in productive sites at 90 years of age.

34. Barry, D.; Kroll, A.J. 1999. A phytosociological description of a remnant bottomland hardwood forest in Denton County, Texas. Texas Journal of Science. 51(4): 309–316.

Quantifies the composition and age structure of an old-growth bottomland hardwood forest in north Texas. The forest was dominated by hackberry, cedar elm, and green ash, with canopy trees >200 years of age.

35. **Barton, J.D.; Schmelz, D.V. 1987.** Thirty years of growth records in Donaldson's Woods. Proceedings of the Indiana Academy of Science. 96: 209–214.

Reports results from a third inventory of 30 years of stand dynamics in the old-growth oak-maple-beech-dominated Donaldson's Woods.

36. **Bartram, J.; Harper, F. 1942.** Diary of a journey through the Carolinas, Georgia, and Florida from July 1, 1765, to April 10, 1766. Transactions of the American Philosophical Society. 33(1). 120 p. [+ 22 plates]. https://doi.org/10.2307/1005551.

Reports field notes from John Bartram's travels through North Carolina, South Carolina, Georgia, and Florida in the 1760s, which includes basic descriptions of presettlement vegetation.

37. **Baskin, J.M.; Chester, E.W.; Baskin, C.C. 1997.** Forest vegetation of the Kentucky Karst Plain (Kentucky and Tennessee): review and synthesis. Journal of the Torrey Botanical Society. 124(4): 322–335. https://doi.org/10.2307/2997268.

Conducts a literature review on old-growth and second-growth forest vegetation of the Kentucky Karst Plain of Kentucky and Tennessee. Develops a conceptual model to describe the various successional and environmental relationships along a topographic-moisture gradient.

38. **Batista, W.B.; Platt, W.J. 1997.** An old-growth definition for southern mixed hardwood forests. Gen. Tech. Rep. SRS-9. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 11 p. https://doi.org/10.2737/SRS-GTR-9.

Provides definitions and associated characteristics of southern mixed hardwood forests, which occur throughout the southeastern Coastal Plain between floodplain forests and xeric pine forests, and was part of the larger effort to develop old-growth definitions for 35 forest types in the Eastern United States. Principal species are American beech, southern magnolia, and pines.

39. **Batista, W.B.; Platt, W.J. 2003.** Tree population responses to hurricane disturbance: syndromes in a south-eastern USA old-growth forest. Journal of Ecology. 91(2): 197–212.

Classifies tree populations into four groups based on response to hurricane disturbance in an old-growth southern mixed-hardwood forest in northern Florida. For example, spruce pine was characterized by "resilience syndrome" because it experienced high canopy mortality but inflated recruitment after disturbance. Ten species were classified.

40. **Batista, W.B.; Platt, W.J.; Macchiavelli, R.E. 1998.** Demography of a shade-tolerant tree (*Fagus grandifolia*) in a hurricane-disturbed forest. Ecology. 79(1): 38–53. https://doi.org/10.1890/0012-9658(1998)079[0038:DOASTT]2.0.CO;2.

Assesses American beech population stability and resistance to hurricane disturbance in a mixed-hardwood forest at Tall Timbers Research Station, northern Florida. Survival of medium-sized stems was the most important influence on beech population growth. Concludes that beech is resilient to hurricane disturbance in old-growth mixed-hardwood stands.

41. **Battaglia, L.L.; Collins, B.S.; Sharitz, R.R. 2004.** Do published tolerance ratings and dispersal factors predict species distributions in bottomland hardwoods? Forest Ecology and Management. 198(1/3): 15–30. https://doi.org/10.1016/j.foreco.2004.02.066.

Identifies regeneration strategies of common bottomland hardwood species by using a combination of shade tolerance and seed size and dispersal mode. A subset of data used in this analysis was collected from the old-growth bottomland hardwoods of the Congaree National Park, SC, and used to assess regeneration in relation to flooding and hurricane disturbance.

42. **Battaglia, L.L.; Sharitz, R.R. 2006.** Responses of floodplain forest species to spatially condensed gradients: a test of the flood-shade tolerance tradeoff hypothesis. Oecologia. 147(1): 108–118. https://doi.org/10.1007/s00442-005-0245-7.

Examines the distribution of bottomland hardwood seedlings in relation to the distance-to-water table and canopy openness in an old-growth bottomland hardwood forest in South Carolina. Shade-tolerant species occurred in drier, shaded areas, and shade-intolerant species were more common in wetter, open areas. Concludes that fine-scale environmental gradients are steep in bottomland hardwood forests, and these gradients influence woody plant distribution.

43. **Battaglia, L.L.; Sharitz, R.R.; Minchin, P.R. 1999.** Patterns of seedling and overstory composition along a gradient of hurricane disturbance in an old-growth bottomland hardwood community. Canadian Journal of Forest Research. 29(1): 144–156. https://doi.org/10.1139/x98-187.

Assesses disturbance impacts on old-growth bottomland hardwood communities in the Congaree Swamp National Monument after Hurricane Hugo. Greater damage occurred in loblolly pine-bottomland hardwood communities than in bottomland hardwood communities. Lack of loblolly pine in the regeneration layer indicates a successional shift away from pine dominance in posthurricane community recovery.

44. **Beane, N.R.; Heitzman, E.; Schuler, T.M. 2010.** Stand dynamics of an old-growth eastern hemlock-hardwood forest in West Virginia. Natural Areas Journal. 30(1): 64–72. https://doi.org/10.3375/043.030.0107.

Assesses the impacts of hemlock woolly adelgid on the eastern hemlock population in Cathedral State Park, WV, over a 6-year period. About 10 percent of hemlock trees were infested with hemlock woolly adelgid. This study may serve as reference for the temporal dynamics of hemlock woolly adelgid infestations in the Eastern United States.

45. **Beilmann, A.P.; Brenner, L.G. 1951.** The recent intrusion of forests in the Ozarks. Annals of the Missouri Botanical Garden. 38(3): 261–282. https://doi.org/10.2307/2394637.

Provides a description of the natural history, settlement patterns, and effects of disturbance on vegetation communities of the Ozark Mountains in Missouri. Also discusses natural succession patterns of grassland conversion to woodlands and forests, which is attributed to the strict fire exclusion policies at the time of publication.

46. **Bekins, N.M.; Brown, D.R. 2022.** Abundance of songbirds in eastern hemlock stands following chemical treatments for hemlock woolly adelgid. Northeastern Naturalist. 29(1): 133–152. https://doi.org/10.1656/045.029.0112.

Tests the efficacy of imidacloprid on hemlock resistance to hemlock woolly adelgid and its impact on avian indicator species in 65 sites located in the Appalachian Mountains, eastern Kentucky. None of the populations of the six indicator species of birds responded to the chemical treatment, although some bird species populations increased and decreased regardless of hemlock woolly adelgid treatment.

47. **Birdsey, R.A.; DellaSala, D.A.; Walker, W.S.; Gorelik, S.R.; Rose, G.; Ramírez, C.E. 2023.** Assessing carbon stocks and accumulation potential of mature forests and larger trees in U.S. federal lands. Frontiers in Forests and Global Change. 5: 1074508. 14 p. https://doi.org/10.3389/ffgc.2022.1074508.

Reports on a model in which Forest Inventory and Analysis data were used to consider the potential of using the two proxies, rate of carbon accumulation and tree diameter at breast height, to identify stands that were mature enough to consider as carbon storage options. Data were from plots located in a number of national forests (in the South, these included the Ouachita, Ozark-St. Francis, Pisgah, Nantahala, Cherokee, Jefferson, and George Washington National Forests). For the national forests in Arkansas and the Appalachian Mountains, stands mature enough for carbon storage were 35 to 40 years old and had 11- and 10-inch diameters, respectively. The authors did not intend that this approach be used to identify old-growth forests but rather as tool to help inform policy and management decisions.

48. Bishop, L.; Maxwell, J.T.; Rothrock, P.E. 2021. Old-growth attributes in a maturing secondary Indiana state forest: an opportunity for balanced management. Journal of the Torrey Botanical Society. 148(2): 132–153. https://doi.org/10.3159/TORREY-D-20-00015.1.

Assesses the rate in which mature second-growth forests accumulated old-growth characteristics in upland hardwood forests in Indiana with a history of anthropogenic disturbance. These forests were projected to attain “older growth” characteristics within the next 30 to 50 years barring significant disturbance. Forest age ranged from 100 to 130 years at time of sampling.

49. Blewett, M.B.; Potzger, J.E. 1951. The forest primeval of Marion and Johnson counties, Indiana, in 1819. Butler University Botanical Studies. 10(1/10): 40–52.

Compares forest conditions reconstructed from General Land Office surveys (based on witness tree attributes) to a detailed forest survey of an old-growth mixed mesophytic forest in Indiana.

50. Blozan, W. 1994. The importance of increment core samples and disturbance history in the evaluation of old-growth forests in Great Smoky Mountains National Park. Natural Areas Journal. 14(2): 140–142.

Highlights the use and interpretation of increment core samples in the study of release, suppression, and decay of old-growth trees in the Great Smoky Mountains. Provides a table of ages and diameters of old trees in the park, which notably highlights that the oldest trees sampled did not often have the largest diameter.

51. Boerner, R.E.J.; Cho, D.-S. 1987. Structure and composition of Goll Woods, an old-growth forest remnant in northwestern Ohio. Bulletin of the Torrey Botanical Club. 114(2): 173–179. https://doi.org/10.2307/2996127.

Quantifies the composition, structure, and environment-vegetation relationships in an old-growth forest in the Black Swamp, northwestern Ohio. The stand established after a stand-replacing disturbance 300 years prior, and tree species distributions were largely influenced by soil drainage conditions.

52. Boerner, R.E.J.; Kooser, J.G. 1991. Vegetation of Drew Woods, an old-growth remnant in western Ohio, and issues of preservation. Natural Areas Journal. 11(1): 48–54.

Describes the vegetation community and site characteristics of an old-growth sugar maple-white oak-dominated stand in Ohio. Records indicated that no cutting or other disturbance had occurred in the stand since 1855. Also discusses old-growth conservation in the context of isolated forest patch dynamics.

53. Boyce, S.G.; Cost, N.D. 1978. Forest diversity: new concepts and applications. Res. Pap. SE-194. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station. 36 p.

Assesses how measures of forest diversity varied based on different stages of forest development and harvesting and tending. For example, discusses the effects of timber management in old growth in relation to plant and animal diversity on page 14. Also provides examples of diversity in forests in various stages of development in the Pisgah and Nantahala National Forests, NC.

54. Bragg, D.C. 2002. Fuzzy set classification of old-growth southern pine. In: Doruska, P.F.; Bragg, D.C., eds. Proceedings of the 2001 Southern Mensurationists conference. Monticello, AR: Arkansas Forest Resources Center: 37–43.

Proposes and tests the efficacy of a fuzzy set ordination approach to improve old-growth classification by using reference loblolly pine-shortleaf pine-dominated ecosystems of the Upper West Gulf Coastal Plain. Concludes that this approach could be used to classify old growth along a gradient of structural and compositional parameters rather than by a binary classification.

55. **Bragg, D.C. 2002.** Reference conditions for old-growth pine forests in the Upper West Gulf Coastal Plain. Journal of the Torrey Botanical Society. 129(4): 261–288. https://doi.org/10.2307/3088699.

Uses a natural stand and historical records to identify reference conditions for old-growth pine restoration on the Upper West Gulf Coastal Plain. Reference conditions derived from many contemporary natural stands are constrained by historical forest management, fire exclusion, exotic species, and other ecological changes, which may preclude inferences of presettlement conditions. Presettlement pine stands had more shortleaf pine, structural and spatial complexity, and low basal area, with fewer large trees composing the majority of basal area.

56. **Bragg, D.C. 2004.** Composition and structure of a 1930s-era pine-hardwood stand in Arkansas. Southeastern Naturalist. 3(2): 327–344. https://doi.org/10.1656/1528-7092(2004)003[0327:CASOAS]2.0.CO;2.

Quantifies the composition and structure of a pine-hardwood stand that was inventoried in the 1930s. Results provide a snapshot of the composition and structure of an unmanaged, second-growth, mature forest along a minor stream terrace in southern Arkansas and can be used in restoration of similar terrace pine-hardwood ecosystems.

57. **Bragg, D.C. 2004.** Composition, structure, and dynamics of a pine-hardwood old-growth remnant in southern Arkansas. Journal of the Torrey Botanical Society. 131(4): 320–336. https://doi.org/10.2307/4126938.

Quantifies the composition, structure, and stand dynamics of an old-growth, mixed loblolly pine-shortleaf pine-white oak forest in southeastern Arkansas (Levi Wilcoxon Demonstration Forest). Canopy dominant pines were 100 to 150 years old, with some remnant individuals >200 years old. Without high-severity disturbance, canopy dominant pines and oaks are projected to be replaced by shade-tolerant species.

58. **Bragg, D.C. 2006.** Five years of change in an old-growth pine-hardwood remnant in Ashley County, Arkansas. Journal of the Arkansas Academy of Science. 60: 32–42.

Quantifies stand dynamics in the Levi Wilcoxon Demonstration Forest, an old-growth mixed pine-hardwood forest in southeastern Arkansas. In a 5-year period, a discreet windstorm indiscriminately removed pines from the canopy, and a drought negatively affected the hardwood midstory and overstory. Concludes that management intervention would be necessary to enhance pine recruitment and preserve historically representative composition and structure.

59. **Bragg, D.C. 2010.** Stand conditions immediately following a restoration harvest in an old-growth pine-hardwood remnant. Journal of the Arkansas Academy of Science. 64: 57–69.

Reports results from a postharvest inventory following a hardwood removal restoration cut in the old-growth, mixed pine Levi Wilcoxon Demonstration Forest, southeastern Arkansas. The restoration harvest resulted in a decrease in canopy tree richness and an increase in pine dominance, which better aligns the stand with presettlement virgin pine forests of the region. Historical stands had lower stocking, less biomass, and fewer hardwoods than present-day unmanaged pine stands.

60. **Bragg, D.C. 2013.** Composition, biomass, and overstory spatial patterns in a mature pine-hardwood stand in southeastern Arkansas. Castanea. 78(1): 37–55. https://doi.org/10.2179/12-033.

Assesses the composition, structure, and spatial patterns of trees in an old-growth pine-hardwood forest along a low stream terrace in southeastern Arkansas. High biomass of the stand was attributed to the large size of dominant loblolly pines and high wood density of the hardwoods (e.g., white oak). Trees were randomly distributed in the stand, but some species exhibited clustered spatial patterns.

61. Bragg, D.C. 2020. Eulogy for a sylvan sentinel: the Morris Pine of Ashley County. Arkansas Historical Quarterly. 79(2): 142–152.

Reports an account of the history of the "Morris Pine," a more than 275-year-old loblolly pine that grew in a small remnant stand of old-growth pine-hardwood in southern Arkansas until toppled by a windstorm.

62. Bragg, D.C. 2022. How a "fuzzy" approach to old growth can provide silvicultural clarity. In: Jain, T.B.; Schuler, T.M., comps. Foundational concepts in silviculture with emphasis on reforestation and early stand improvement: 2022 national silviculture workshop. Proc. RMRS-P-80. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 147–150.

Reports, in a brief article, how a fuzzy set approach to an old-growth definition may help improve efforts to identify and manage southern pines.

63. Bragg, D.C. 2023. Using a fuzzy view of old-growth longleaf pine to derive silvicultural clarity with restoration. Journal of Forestry. 121(5–6): 499–502. https://doi.org/10.1093/jofore/fvad028.

Provides various examples of the use of historical photographs of longleaf pine forests in various stages of development to illustrate a fuzzy set approach to old-growth identification and management. Provides examples and descriptions of how these photographs can be used to accelerate forest development and promote old-growth characteristics.

64. Bragg, D.C.; Riddle, J.D. 2014. Serendipitous data following a severe windstorm in an old-growth pine stand. Journal of the Arkansas Academy of Science. 68: 37–44. https://doi.org/10.54119/jaas.2014.6803.

Analyzes large loblolly and shortleaf pine samples killed in a windstorm in the Levi Wilcoxon Demonstration Forest, southeastern Arkansas, to assess the reliability of lumber volume estimates found in historical photographs and estimate the age of the largest pines in the forest. Results indicate that volumes estimated from historical photographs were close to the range calculated from the pine samples.

65. Bragg, D.C.; Shelton, M.G. 2011. Lessons from 72 years of monitoring a once-cut pine-hardwood stand on the Crossett Experimental Forest, Arkansas, U.S.A. Forest Ecology and Management. 261(5): 911–922. https://doi.org/10.1016/j.foreco.2009.12.021.

Synthesizes 72 years of observations at the Russell R. Reynolds Research Natural Area, a once-cut unmanaged pine-hardwood forest in southeastern Arkansas. Provides details of stocking patterns, stand dynamics, successional patterns, biomass dynamics, wildlife habitat, and other processes and patterns in this unmanaged stand. Most notably, the authors discuss this site's suitability as a reference condition for old-growth restoration.

66. Bragg, D.C.; Shelton, M.G. 2014. The value of old forests: lessons from the Reynolds Research Natural Area. In: Hayes, D.C.; Stout, S.L.; Crawford, R.H.; Hoover, A.P., eds. USDA Forest Service experimental forests and ranges: research for the long term. New York, NY: Springer: 61–84. https://doi.org/10.1007/978-1-4614-1818-4_3.

Highlights the benefits of the Reynolds Research Natural Area on the Crossett Experimental Forest, AR, as an example of passive forest management to achieve multiple ecosystem services and develop old-growth restoration strategies.

67. Bragg, D.C.; Stahle, D.W.; Cerny, K.C. 2012. Structural attributes of two old-growth Cross Timbers stands in western Arkansas. American Midland Naturalist. 167(1): 40–55. https://doi.org/10.1674/0003-0031-167.1.40.

Compares composition, structure, and spatial patterns of two uneven-aged, old-growth, xeric oak stands of the Cross Timbers in Arkansas. Oldest trees dated to >200 years of age, and differences in stand structure were attributed to site conditions.

68. Bratton, S.P. 1975. A comparison of the beta diversity functions of the overstory and herbaceous understory of a deciduous forest. Bulletin of the Torrey Botanical Club. 102(2): 55–60. https://doi.org/10.2307/2484413.

Calculates beta diversity and assesses changes in herbaceous and canopy composition along environmental gradients in an American beech forest in the Great Smoky Mountains. Both vegetation layers changed along a moisture gradient from dry-convex south-facing slopes to wet concave north-facing slopes. The beta diversity of the understory was higher on the dry end of the moisture gradient but converged with the overstory layer towards the mesic end of the gradient.

69. Bratton, S.P. 1976. Resource division in an understory herb community: responses to temporal and microtopographic gradients. American Naturalist. 110(974): 679–693. https://doi.org/10.1086/283097.

Investigates ground flora response to microenvironmental gradients (seasonal change and microtopography) in two old-growth Appalachian cove hardwood stands in the Great Smoky Mountains National Park. Microtopography and seasonal change were the primary drivers of niche differentiation and species richness in the herbaceous layer.

70. Bratton, S.P. 1976. The response of understory herbs to soil depth gradients in high and low diversity communities. Bulletin of the Torrey Botanical Club. 103(4): 165–172. https://doi.org/10.2307/2484490.

Compares herbaceous plant distribution in relation to soil depth between an old-growth northern hardwood stand in the Adirondack Mountains, NY, and an Appalachian Cove forest in the Great Smoky Mountains National Park, TN. The herbaceous response between sites was similar, but the increased species diversity in the Appalachian Cove forest was likely in response to environmental gradients unrelated to soil depth.

71. Braun, E.L. 1936. Forests of the Illinoian till plain of southwestern Ohio. Ecological Monographs. 6(1): 89–149. https://doi.org/10.2307/1942995.

Provides an extensive description of the vegetation and site characteristics of forests on the Illinois till plain of southwestern Ohio. Page 99 discusses the primary forest composition prior to widespread disturbance, of which a few areas up to 100 acres still occurred at the time of publishing. Braun considered the beech association to be a climax community.

72. Braun, E.L. 1938. Deciduous forest climaxes. Ecology. 19(4): 515–542. https://doi.org/10.2307/1930931.

Discusses the geographic extent and geoecology of the forest climax associations of the central deciduous region. Beech-maple occurred in the northern range, oak-hickory in the western range, oak-chestnut in the eastern range, and mixed-mesophytic in the southcentral range.

73. Brewer, J.S. 2001. Current and presettlement tree species composition of some upland forests in northern Mississippi. Journal of the Torrey Botanical Society. 128(4): 332–349. https://doi.org/10.2307/3088666.

Examines and compares composition and structure of old-growth (>150 years old) and second-growth (40 years old) upland oak forests in central Mississippi. Makes further comparisons of these forests to witness tree data collected by General Land Office surveyors in the 1830s. One old-growth forest was more compositionally similar to the second-growth forest than the historical witness tree composition. The abundance of sweetgum in the midstory of old growth and the absence of sweetgum in historical records indicates that fire was an important driver of presettlement forest composition.

74. **Brewer, J.S. 2015.** Changes in tree species composition and stand structure in a mature upland oak-dominated forest reflect difference in recruitment, survival, and longevity. Natural Areas Journal. 35(4): 550–556. https://doi.org/10.3375/043.035.0407.

Compares the diameter distributions of dominant tree species to assess regeneration dynamics over time in old-growth upland oak forests on the campus of the University of Mississippi. Found a weak trend towards replacement of oaks by nonoaks based on analysis of diameter distributions.

75. **Brose, P.; Tainter, F.; Waldrop, T. 2002.** Regeneration history of three Table Mountain pine/pitch pine stands in northern Georgia. In: Outcalt, K.W., ed. Proceedings of the eleventh biennial southern silvicultural research conference. Gen. Tech. Rep. SRS-48. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 296–301.

Reports on a dendrochronological analysis of three ridgetop pine communities in northern Georgia to document the existing composition and structure, ascertain when the different species became established, and compare their establishment dates with the occurrence of disturbance or drought.

76. **Brose, P.H.; Waldrop, T.A. 2006.** Fire and the origin of Table Mountain pine-pitch pine communities in the southern Appalachian Mountains, USA. Canadian Journal of Forest Research. 36(3): 710–718. https://doi.org/10.1139/x05-281.

Analyzes the age structure, species recruitment trends, and radial growth patterns of old-growth Table Mountain pine-pitch pine stands in the southern Appalachian Mountains. Regeneration events corresponded with low-intensity surface fire and canopy openings.

77. **Brown, D.R.; Weinkam, T. 2014.** Predicting bird community changes to invasion of hemlock woolly adelgid in Kentucky. Southeastern Naturalist. 13(SI6): 104–116.

Surveys birds in eastern hemlock and associated forest types across the Appalachian Mountains, KY, during the early stages of infestation when hemlock woolly adelgid impacts were minimal. Results revealed four bird species may be negatively affected by hemlock woolly adelgid-related decline. Also predicted threshold eastern hemlock density necessary to promote bird community stability.

78. **Brown, E.; Ferguson, P.F.B. 2019.** A structured decision making analysis to increase a red-cockaded woodpecker population and balance stakeholder objectives for a national forest. Journal for Nature Conservation. 48: 77–90. https://doi.org/10.1016/j.jnc.2019.01.010.

Presents results from a structured decisionmaking analysis to manage for red-cockaded woodpeckers in the Talladega National Forest, AL. The goal was to manage for old-growth-like conditions preferred by the species while also meeting stakeholder objectives. Cavity availability limited the number of woodpeckers at the focal sites. Prescribed burning, followed by midstory removal, would meet stakeholder objectives while also increasing installation of cavities.

79. **Brown, H. 2000.** Wildland burning by American Indians in Virginia. Fire Management Today. 60(3): 29–39.

Discusses historical evidence for the use of fire by Native Americans in Virginia. Four purposes: agriculture, hunting, range management, and travel, are described. Also notes the difficulty in reconciling the various sources of evidence (historical materials, statistical records and land surveys, studies in old-growth forests, archaeology, and palaeoecological studies).

80. **Brown, K.A.; Scatena, F.N.; Gurevitch, J. 2006.** Effects of an invasive tree on community structure and diversity in a tropical forest in Puerto Rico. Forest Ecology and Management. 226(1–3): 145–152. https://doi.org/10.1016/j.foreco.2006.01.031.

Assesses the effects of the invasive tree, Rose apple, on the community structure, species composition, and successional trajectory of primary and secondary forests in the Luquillo Mountains, PR. Rose apple density was highest in secondary forests and negatively correlated with species richness. Rose apple was better able to colonize disturbed sites and once it attained canopy dominance, was able to alter community structure and successional pathways.

81. **Brown, S.; Schroeder, P.; Birdsey, R. 1997.** Aboveground biomass distribution of US eastern hardwood forests and the use of large trees as an indicator of forest development. Forest Ecology and Management. 96(1–2): 37–47. https://doi.org/10.1016/S0378-1127(97)00044-3.

Calculates and compares aboveground biomass density with an emphasis on large diameter trees (>70 cm) as an indicator of mature or old-growth conditions. Uses old-growth data from published studies and Forest Inventory and Analysis (FIA) data from oak-hickory and maple-beech-birch stands. Old growth had a greater amount of aboveground biomass than FIA units, which suggested that FIA units are in various stages of development and recovery from disturbance but have the potential to sequester and store significant amounts of carbon if left unharvested.

82. **Bryant, W.S. 1978.** An unusual forest type, hydro-mesophytic, for the Inner Blue Grass Region of Kentucky. Castanea. 43(2): 129–137.

Reports on a vegetation survey of an uncommon hydro-mesophytic forest type in Kentucky developed after abandonment of a river channel during the Pliocene. Old-growth characteristics were not present in the forest, because mean age of canopy codominant pin oak was 138 years at time of sampling.

83. **Buck, P. 1964.** Relationships of the woody vegetation of the Wichita Mountains Wildlife Refuge to geological formations and soil types. Ecology. 45(2): 336–344. https://doi.org/10.2307/1933846.

Quantifies the relationship between vegetation and soil types in 52 undisturbed stands in the Wichita Mountains Wildlife Refuge, OK. Post oak was dominant across soil types and geological formations; blackjack oak-dominance was restricted to two soil categories. Some sites supported local dominance of typically subordinate species, such as sugar maple on north-facing slopes.

84. **Burns, J.N. 2015.** Mapping ancient baldcypress forests for conservation at Black River, North Carolina. Fayetteville, AR: University of Arkansas, Fayetteville. 55 p. M.A. thesis.

Uses high-resolution aerial imagery to locate potential areas of old-growth baldcypress along the Black River, NC. Identifies 400 ha of previously unidentified old growth that contained trees over 1,000 years of age.

85. **Burrascano, S.; Keeton, W.S.; Sabatini, F.M.; Blasi, C. 2013.** Commonality and variability in the structural attributes of moist temperate old-growth forests: a global review. Forest Ecology and Management. 291: 458–479. https://doi.org/10.1016/j.foreco.2012.11.020.

Synthesizes structural variability of moist temperate old-growth forests. Includes studies from Tennessee and Virginia. Global data are displayed in table format with attributes including location, dominant tree taxa, age, basal area, and other relevant structural metrics.

86. **Burton, J.A. 2009.** Fire frequency effects on vegetation of an upland old growth forest in eastern Oklahoma. Stillwater, OK: Oklahoma State University. 78 p. M.S. thesis.

A two-chapter thesis on the effects of 20 years of fire at variable intervals on woody plant (chapter 1) and herbaceous plant (chapter 2) community dynamics. Frequent fire increased post oak and blackjack oak sapling density but reduced woody plant diversity. Frequent fire also increased herbaceous plant abundance and diversity.

87. **Burton, J.A.; Hallgren, S.W.; Palmer, M.W. 2010.** Fire frequency affects structure and composition of xeric forests of eastern Oklahoma. Natural Areas Journal. 30(4): 370–379. https://doi.org/10.3375/043.030.0401.

Assesses the effects of fire frequency on woody plant species richness and stand structure in a post oak-blackjack oak stand in the Cross Timbers of Oklahoma. Increased fire frequency had a negative effect on sapling and shrub richness. Two fires per decade increased species richness but reduced oak dominance.

88. **Busing, R.T. 1989.** A half century of change in a Great Smoky Mountains cove forest. Bulletin of the Torrey Botanical Club. 116(3): 283–288. https://doi.org/10.2307/2996817.

Quantifies stand dynamics of a rich cove forest in the Great Smoky Mountains National Park over a 54-year period (1935–1989). Notably, the loss of American chestnut increased the dominance of sugar maple and eastern hemlock.

89. **Busing, R.T. 1992.** Old-growth forest plot for long-term vegetation monitoring at Albright Grove, Great Smoky Mountains National Park - 1992 data summary. Gatlinburg, TN: National Park Service. [unknown] p.

Reports results from a resampling of an old-growth hemlock-hardwood stand in the Great Smoky Mountains National Park.

90. **Busing, R.T. 1993.** Three decades of change at Albright Grove, Tennessee. Castanea. 58(4): 231–242.

Quantifies stand dynamics over a 30-year period in Albright Grove, an old-growth cove forest in the Great Smoky Mountains National Park, TN. In the original 1962 inventory, American chestnut composed the majority of standing deadwood. Species composition changed little, and basal area and biomass increased over time. Stand dynamics were largely driven by canopy gaps.

91. **Busing, R.T. 1994.** Canopy cover and tree regeneration in old-growth cove forests of the Appalachian Mountains. Vegetatio. 115(1): 19–27. https://doi.org/10.1007/BF00119383.

Relates tree regeneration patterns to canopy cover in Appalachian cove stands in the Great Smoky Mountains National Park. Reproduction by seed and sprouting had a greater density in openings, but shade-intolerant reproduction was highly dependent on canopy gaps. Eastern hemlock experienced high regeneration success under a closed canopy. A 0.04-ha gap size threshold resulted in a sharp increase in regeneration density.

92. **Busing, R.T. 1998.** Composition, structure and diversity of cove forest stands in the Great Smoky Mountains: a patch dynamics perspective. Journal of Vegetation Science. 9(6): 881–890. https://doi.org/10.2307/3237053.

Quantifies the composition, structure, and spatial patterns of trees in multiple old-growth southern Appalachian cove stands in the Great Smoky Mountains National Park. Canopy tree turnover and patch turnover were not spatially uniform in old-growth cove stands, providing evidence against the spatial segregation hypothesis.

93. **Busing, R.T. 1998.** Structure and Dynamics of Cove Forests in the Great Smoky Mountains. Castanea. 63(3): 361–371. https://www.jstor.org/stable/4033984.

Compares stand biomass, woody debris volume, large snag density, species equitability, tree size diversity, and gap size diversity between second growth and old growth Appalachian cove forests. The study conducted over decades notes changes in secondary growth stands but no marked changes in old-growth stands were observed.

94. **Busing, R.T. 2005.** Tree mortality, canopy turnover, and woody detritus in old cove forests of the southern Appalachians. Ecology. 86(1): 73–84. https://doi.org/10.1890/04-0410.

Reports rates of canopy tree mortality and woody debris input in seven old-growth Appalachian cove stands in the Great Smoky Mountains National Park. The rate of canopy tree mortality was positively related to tree size and found to be greater than the global average.

95. **Busing, R.T.; Clebsch, E.E.C.; White, P.S. 1993.** Biomass and production of southern Appalachian cove forests reexamined. Canadian Journal of Forest Research. 23(4): 760–765. https://doi.org/10.1139/x93-100.

Calculates aboveground biomass and net primary production in young (42 to 63 years old) and old-growth Appalachian cove stands in the Great Smoky Mountain National Park, TN. Old stands had

greater estimated aboveground biomass than young stands, and eastern hemlock-dominated old-growth stands had the greatest estimated biomass.

96. **Busing, R.T.; White, P.S. 1993.** Effects of area on old-growth forest attributes: implications for the equilibrium landscape concept. Landscape Ecology. 8(2): 119–126. https://doi.org/10.1007/BF00141591.

Assesses the effects of sampling area (grain size) on structural and compositional attributes in an old-growth hemlock-hardwood forest in the Great Smoky Mountains National Park, TN. Sampled a total of 3 ha, and attributes exhibited high deviation at grain sizes <0.02 ha. Standard deviation decreased rapidly with increased grain size. Results have implications for ensuring stand variability is captured in sampling designs.

97. **Busing, R.T.; White, P.S.; Mackenzie, M.D. 1993.** Gradient analysis of old spruce-fir forests of the Great Smoky Mountains circa 1935. Canadian Journal of Botany. 71(7): 951–958. https://doi.org/10.1139/b93-107.

Quantifies historical (circa 1930s) vegetation-environment relationships in old-growth spruce-fir stands in the Great Smoky Mountains. Elevation, slope aspect, solar radiation, and topographic position influenced the tree stratum. Basal area and mixed composition coincided with increased elevation.

98. **Busing, R.T.; White, P.S. 1997.** Species diversity and small-scale disturbance in an old-growth temperate forest: a consideration of gap partitioning concepts. Oikos. 78(3): 562–568. https://doi.org/10.2307/3545618.

Compares sapling species composition and abundance in gap, gap border, and nongap subplots in a southern Appalachian rich cove hemlock-hardwood forest in the Great Smoky Mountains National Park. Intolerant species had a higher abundance in gaps, and the gap-partitioning hypothesis applied to some, but not all intolerant species. The density hypothesis had more explanatory power than the gap-partitioning hypothesis for sapling patterns in this old-growth cove forest.

99. **Butler, R.B.; Crosby, M.K.; Hodges, B.N. 2018.** Fifty-five years of change in a northwest Georgia old-growth forest. Castanea. 83(1): 152–159. https://doi.org/10.2179/16-113.

Quantifies stand dynamics of an old-growth mixed pine-hardwood forest in north Georgia over a 55-year period. Results revealed a decrease in oak dominance, an increase in red maple and tulip poplar dominance, and a lack of pine reproduction. Without intentional management, the stand was projected to transition to an oak-hickory forest.

100. **Butler, S.M.; White, A.S.; Elliott, K.J.; Seymour, R.S. 2014.** Disturbance history and stand dynamics in secondary and old-growth forests of the southern Appalachian Mountains, USA. Journal of the Torrey Botanical Society. 141(3): 189–204. https://doi.org/10.3159/TORREY-D-13-00056.1.

Compares disturbance characteristics (type, rate, magnitude) between secondary and old-growth mixed-oak forests in the southern Appalachian Mountains. Across all stands, synchronous recruitment periods occurred in the 1840s (hurricane), 1900–1940s (logging and chestnut blight), and 1960s (drought and insects). Frequent localized disturbances were also detected, which highlighted the importance gap-phase succession in these systems.

101. **Cain, M.D.; Shelton, M.G. 1996.** The R.R. Reynolds Research Natural Area in southeastern Arkansas: a 56-year case study in pine-hardwood overstory sustainability. Journal of Sustainable Forestry. 3(4): 59–73. https://doi.org/10.1300/J091v03n04_06.

Documents the stand dynamics of a second-growth pine-hardwood forest that originated from a diameter-limit cutting of an old-growth forest. Data are reported from eight inventories that occurred between 1937 and 1993. In that period, pine density decreased, and hardwood density increased, and thus succession was predicted to favor future hardwood dominance without catastrophic disturbance or management intervention.

102. **Cain, S.A. 1931.** Studies on virgin hardwood forest: I. Density and frequency of the woody plants of Donaldson's Woods, Lawrence County, Indiana. Proceedings of the Indiana Academy of Science. 41: 105–122.

Reports on an early inventory of woody plant composition and structure in Donaldson's Woods, IN, an old-growth remnant dominated by white oak, hickory, and tulip poplar.

103. **Cain, S.A. 1934.** Studies on virgin hardwood forest: II. A comparison of quadrat sizes in a quantitative phytosociological study of Nash's Woods, Posey County, Indiana. American Midland Naturalist. 15(5): 529–566. https://doi.org/10.2307/2419922.

Uses an old-growth hardwood forest in Indiana to determine the minimum quadrat area for sampling, primarily in a comparison of the common methods at the time of publication, which were largely based on species-area curves and frequency class distributions.

104. **Cain, S.A. 1935.** Bald cypress, *Taxodium distichum* (L.) Rich., at Hovey Lake, Posey County, Indiana. American Midland Naturalist. 16(1): 72–82. https://doi.org/10.2307/2419877.

Describes the composition and structure of an old-growth, baldcypress-dominated forest at the northern extent of its range in Hovey Lake, IN.

105. **Callaway, R.M.; Clebsch, E.E.C.; White, P.S. 1987.** A multivariate analysis of forest communities in the western Great Smoky Mountains National Park. American Midland Naturalist. 118(1): 107–120. https://doi.org/10.2307/2425633.

Classifies 12 forest types in relation to environment and topography in Great Smoky Mountains National Park with multivariate techniques. Does not provide a direct discussion of old growth, but some classified forest types, such as hemlock-silverbell-beech, are described as more likely to have developed with infrequent or no anthropogenic disturbance.

106. **Campbell, J.E.; Fox, J.F.; Acton, P.M. 2012.** Terrestrial carbon losses from mountaintop coal mining offset regional forest carbon sequestration in the 21st century. Environmental Research Letters. 7(4): 045701. 6 p. https://doi.org/10.1088/1748-9326/7/4/045701.

Quantifies the potential impact of future coal mining on the carbon budget of the southern Appalachian forest region in Kentucky, Tennessee, Virginia, West Virginia, and Ohio. Results predicted that forests will be converted from net carbon sinks to net carbon sources in the future unless mining operations are reduced or eliminated.

107. **Cancalosi-Dean, N. 2023.** An age, size, and climate response study of old growth shortleaf pine in the McCurtain County Wilderness Area, Oklahoma. Fayetteville, AR: University of Arkansas-Fayetteville. 75 p. M.S. thesis.

Uses dendrochronology and other historical information to study the age, size, and climate response of an old-growth forest in the McCurtain County Wilderness Area, eastern Oklahoma.

108. **Canterbury, G.E.; Martin, T.E.; Petit, D.R.; Petit, L.J.; Bradford, D.F. 2000.** Bird communities and habitat as ecological indicators of forest condition in regional monitoring. Conservation Biology. 14(2): 544–558. https://doi.org/10.1046/j.1523-1739.2000.98235.x.

Develops a bird community index as an indicator of the extent in which a bird community is affected by forest disturbance, specifically in loblolly pine-shortleaf pine forests in various stages of development on the Piedmont.

109. **Carpenter, S.B.; Rumsey, R.L. 1976.** Trees and shrubs of Robinson Forest, Breathitt County, Kentucky. Castanea. 41(4): 277–282.

Provides an inventory of tree species in a second-growth, mixed-mesophytic forest (Robinson Forest), eastern Kentucky. The inventory was compared to the old-growth, mixed-mesophytic forests of nearby Lilley Cornett Woods. Documented greater tree species diversity in Robinson Forest, which is attributed to historical disturbance.

110. Cerny, K.C.; Stahle, D.W.; Bragg, D.C. 2016. A frontier shortleaf pine stand in the old-growth Cross Timbers of Oklahoma. Journal of the Torrey Botanical Society. 143(3): 224–238. https://doi.org/10.3159/TORREY-D-15-00043.1.

Quantifies the composition and age structure of an old-growth oak-shortleaf pine stand in eastern Oklahoma, outside of the continuous native distribution of shortleaf pine. Hypothesizes that shortleaf pine naturally colonized the site during the previous 250 years.

111. Chapman, H.H. 1909. An experiment in logging longleaf pine. Forestry Quarterly. 7(4): 385–395.

Studies logging in old-growth longleaf pine stands, eastern Texas. Provides some descriptions of stand conditions and forest health issues, such as redheart fungus and fire. Documents stand volumes in pure, even-aged, longleaf stands of this area between 100 and 320 years old and growth rates for individual trees and stands.

112. Chapman, H.H. 1909. A method of studying growth and yield of longleaf pine applied in Tyler Co., Texas. Proceedings of the Society of American Foresters. 4(2): 207–220.

Provides limited summaries on a series of nine 40-acre plots in old longleaf pine forests. Includes descriptions of stand structure as a function of broad age categories (veteran, mature, young merchantable, and immature), age-tree size relationships, and stand-level volume estimates (board feet) for stands between 100 and 320 years old.

113. Chapman, H.H. 1913. Part 1: Possibilities of a second cut. In: Prolonging the cut of southern pine. Yale Forest School Bull. 2. New Haven, CT: Yale University Press: 1–22. https://doi.org/10.5962/bhl.title.43511.

Includes information on the age-class distribution in a virgin, mixed shortleaf-loblolly pine forest.

114. Chapman, H.H. 1914. The measurement of increment on all-aged stands. Proceedings of the Society of American Foresters. 9(2): 189–203.

Focuses on an effort to estimate yield from uneven-aged stands. Includes tables of data from a 20-acre shortleaf-loblolly pine stand in Arkansas. Data include diameter and volume distributions for stems up to 37 inches in diameter at breast height. Reports ages up to 200 years for trees >32 inches in diameter at breast height.

115. Chapman, H.H. 1923. The recovery and growth of loblolly pine after suppression. Journal of Forestry. 21(7): 709–711.

Documents the growth patterns of six cut loblolly pines from a small bottomland forest in Louisiana. These trees were 143 years old but had been suppressed for the previous 60+ years, in contrast to 20 additional loblolly pines that had not been suppressed and had reached a similar size in 76 years.

116. Chapman, J.I.; McEwan, R.W. 2012. Tree regeneration ecology of an old-growth central Appalachian forest: diversity, temporal dynamics, and disturbance response. Journal of the Torrey Botanical Society. 139(2): 194–205. https://doi.org/10.3159/TORREY-D-11-00065.1.

Examines understory woody plant dynamics and response to fire over a 10-year period to assess the potential oak-to-maple shift in Big Everidge Hollow, a watershed in the Lilley Cornett Woods on the Cumberland Plateau, southeastern Kentucky. Results provide weak support for the oak-to-maple hypothesis, because oak populations were relatively stable over the 10-year period.

117. Chapman, J.I.; McEwan, R.W. 2013. Spatiotemporal dynamics of α- and β-diversity across topographic gradients in the herbaceous layer of an old-growth deciduous forest. Oikos. 122(12): 1679–1686. https://doi.org/10.1111/j.1600-0706.2013.00544.x.

Quantifies the influence of topography on the ground flora diversity and spatiotemporal dynamics in Big Everidge Hollow, an old-growth mixed mesophytic forest on the Cumberland Plateau, KY. The increased environmental heterogeneity as a function of topography promoted ground flora diversity across space and time.

118. Chapman, J.I.; McEwan, R.W. 2016. Thirty years of compositional change in an old-growth temperate forest: the role of topographic gradients in oak-maple dynamics. PLOS ONE. 11(7): e0160238. 17 p. https://doi.org/10.1371/journal.pone.0160238.

Assesses stand dynamics of an old-growth mixed mesophytic stand in the Lilley Cornett Woods, KY, over a 30-year period. Documents declining oak and hickory recruitment over time, and increased maple and beech abundance in subcanopy layers. Authors predicted slow succession toward beech-maple dominance.

119. Chapman, J.I.; McEwan, R.W. 2018. The role of environmental filtering in structuring Appalachian tree communities: topographic influences on functional diversity are mediated through soil characteristics. Forests. 9(1): 19. 16 p. https://doi.org/10.3390/f9010019.

Quantifies the relationship between tree functional diversity and topography in the old-growth Big Everidge Hollow in the Lilley Cornett Woods, KY. Upper slope positions with dry, nutrient-poor soils supported chestnut oak communities with less functional diversity; mid and lower sloped communities supported mixed mesophytic communities (sugar maple, basswood, eastern hemlock, and beech) with greater functional diversity. Topography, elevation, and edaphic conditions influenced plant community functional diversity.

120. Chapman, J.I.; McEwan, R.W. 2018. Topography and vegetation patterns in an old-growth Appalachian forest: Lucy Braun, you were right! In: Barton, A.M.; Keeton, W.S., eds. Ecology and recovery of eastern old-growth forests. Washington, DC: Island Press: 83–98. https://doi.org/10.5822/978-1-61091-891-6_5.

Analyzes the spatial and temporal trends of species phylogenetic and functional traits along a topographic gradient in the old-growth Big Everidge Hollow in the Lilley Cornett Woods, KY. Results indicate that tree communities on dry, nutrient-deficient sites were functionally clustered, which provides supporting evidence for Lucy Braun's hypothesis of topographic, elevation, and edaphic controls on species distribution in mixed-mesophytic forests.

121. Chapman, J.I.; Perry, K.L.; McEwan, R.W. 2012. Changing flora of an old-growth mesophytic forest: previously undetected taxa and first appearance of non-native invasive species. Journal of the Torrey Botanical Society. 139(2): 206–210. https://doi.org/10.3159/TORREY-D-11-00085.1.

Reports results from an additional sampling of the vascular flora of Big Everidge Hollow in the Lilley Cornett Woods, KY. Identifies 23 new records, with a notable invasion by several nonnative species in the stand.

122. Chester, E.W.; Noel, S.M.; Baskin, J.M.; Baskin, C.C.; McReynolds, M.L. 1995. A phytosociological analysis of an old-growth upland wet woods on the Pennyroyal Plain, southcentral Kentucky, USA. Natural Areas Journal. 15(4): 297–307.

Describes the stand composition, structure, and site characteristics of an old-growth upland wet woods on the Interior Low Plateau of southern Kentucky. Old-growth characteristics included high trees species richness and diversity, high tree density and basal area, uneven-aged structure, diverse herbaceous layer, and limited evidence of disturbance.

123. Cho, D.S.; Boerner, R.E.J. 1991. Canopy disturbance patterns and regeneration of *Quercus* species in two Ohio old-growth forests. Vegetatio. 93(1): 9–18. https://doi.org/10.1007/BF00044920.

Investigates the abundance of oaks, spatial patterns of oak regeneration, and canopy disturbance history of two old-growth deciduous forests in Ohio dominated by sugar maple, beech, and oaks. The disturbance regime was characterized by frequent canopy gaps, which promoted late-successional species such as maple and beech. Oak seedlings were abundant and similar in gap and nongap areas, but few oak saplings or small-diameter individuals were present. Results provide further evidence for oak regeneration failure.

124. Cho, D.S.; Boerner, R.E.J. 1991. Structure, dynamics, and composition of Sears Woods and Carmean Woods State Nature Preserves, north-central Ohio. Castanea. 56(2): 77–89.

Quantifies the composition, structure, site conditions, and stand dynamics of two old-growth beech-maple stands in Sears Woods and Carmean Woods, OH. The gap-scale disturbance regime favors continued beech and maple dominance and reduced oak and ash dominance over time.

125. Cipollini, M.; Felch, P.; Dingley, N.R.; Maddox, C. 2019. Changes in tree canopy, understory vegetation, and fuel composition after 10 years of restoration management in an old-growth mountain longleaf pine forest. Natural Areas Journal. 39(2): 197–211. https://doi.org/10.3375/043.039.0207.

Assesses and compares montane longleaf pine composition, structure, fuels, and recruitment patterns over a 10-year period between unmanaged stands and stands in which fire was recently reintroduced. Management increased longleaf pine recruitment and decreased downed woody fuels.

126. Cipollini, M.L.; Culberson, J.; Strippelhoff, C.; Baldvins, T.; Miller, K. 2012. Herbaceous plants and grasses in a mountain longleaf pine forest undergoing restoration: a survey and comparative study. Southeastern Naturalist. 11(4): 637–668. https://doi.org/10.1656/058.011.0406.

Assesses the impacts of restoration activities (prescribed fire, hardwood control, harvesting) on ground flora cover and diversity in a montane longleaf pine stand on the campus of Berry College in north Georgia. The restored old-growth stand had greater ground flora diversity and cover compared to an unmanaged old-growth stand.

127. Clark, S.L.; Hallgren, S.W. 2003. Dynamics of oak (*Quercus marilandica* and *Q. stellata*) reproduction in an old-growth Cross Timbers forest. Southeastern Naturalist. 2(4): 559–574. https://doi.org/10.1656/1528-7092(2003)002[0559:DOOQMA]2.0.CO;2.

Assesses oak reproduction strategies in old-growth post oak-blackjack oak stands of the Cross Timbers. Oak reproduction was enhanced by fire and primarily composed of stump and root sprouts.

128. Clark, S.L.; Hallgren, S.W. 2004. Can oaks be aged from bud scars? Southwestern Naturalist. 49(2): 243–246. https://doi.org/10.1894/0038-4909(2004)049<0243:COBAFB>2.0.CO;2.

Compares bud scar counts with age from ring counts for post oak and blackjack oak <100 cm in height in northcentral Oklahoma. The majority of estimates from frequency of bud scars were underestimates of within 2 years of actual age. Deer browsing increased error estimates.

129. Clark, S.L.; Hallgren, S.W. 2004. Characterization of an old-growth forest in the Cross Timbers of Oklahoma. [Abstract]. In: Spetich, M.A., ed. Upland oak ecology symposium: history, current conditions, and sustainability. Gen. Tech. Rep. SRS-73. U.S. Department of Agriculture, Forest Service, Southern Research Station: 160.

Delineates three old-growth post oak-blackjack oak stands in the Cross Timbers of Oklahoma to examine changes in species composition and structure across an edaphic gradient. Assesses how these stands conformed to old-growth models. Concludes that the stands analyzed had unique structures compared to other old growth in the Eastern United States.

130. Clark, S.L.; Hallgren, S.W.; Stahle, D.W.; Lynch, T.B. 2006. Characteristics of the keystone ancient forest preserve, an old-growth forest in the Cross Timbers of Oklahoma. Natural Areas Journal. 26(4): 329–329.

Describes three old-growth stands in the northeastern portion of the Cross Timbers region in Oklahoma. Post oak experienced continuous recruitment for 200 years, and eastern redcedar was the longest lived species (>400 years). Authors highlight that old-growth of the Cross timbers may not align with typical models of old-growth development in the Eastern United States.

131. **Clark, S.L.; Torreano, S.J.; Loftis, D.L.; Dimov, L.D. 2007.** Twenty-two year changes in regeneration potential in an old-growth *Quercus* forest in the mid-Cumberland Plateau, Tennessee. In: Buckley, D.S.; Clatterbuck, W.K., eds. Proceedings of the 15th central hardwood forest conference. e-Gen. Tech. Rep. SRS-101. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 527–535.

Results from a 22-year reinventory of an old-growth oak stand on the Cumberland Plateau to determine stand dynamics and evaluate regeneration potential of oak. Oak regeneration failure was documented, with sugar maple, white ash, and tulip poplar projected to replace oak in the canopy over time.

132. **Clebsch, E.E.C.; Busing, R.T. 1989.** Secondary succession, gap dynamics, and community structure in a southern Appalachian cove forest. Ecology. 70(3): 728–735. https://doi.org/10.2307/1940223.

Compares forest succession and gap dynamics between second-growth and old-growth Appalachian cove stands in the Great Smoky Mountains National Park, TN. Common old-growth species were absent from the second-growth stand 15 years postestablishment. By year 40, old-growth dominants were present in the understory of the second-growth stand. The computer simulation model used in this study predicted old-growth composition and structure to recover by stand age 200. Differences in gap size and frequency were also compared in the two stands.

133. **Cline, J.M. 2021.** Age-related morphology of montane populations of shortleaf pine (*Pinus echinata*) and longleaf pine (*Pinus palustris*) in the Uwharrie Mountains, North Carolina, USA. Greensboro, NC: University of North Carolina at Greensboro. 33 p. M.A. thesis.

Uses dendrochronological techniques to assess if several simple measures of tree morphology (e.g., height of lowest living branch, bark thickness, and stem sinuosity) were correlated with the age of pines up to 200+ years old.

134. **Coates, D.T.; Jenkins, S.E.; Ebinger, J.E.; McClain, W.E. 1992.** Woody vegetation survey of Barkhausen Woods, a closed canopy sand forest in Mason County, Illinois. Erigenia. 12: 1–6.

Describes vegetation composition and structure of Barkhausen Woods, a closed-canopy oak-hickory forest in Illinois. Authors considered this stand old growth, because no evidence of logging or grazing were present at the time of sampling. Discusses that the forest was at one time more open, driven by frequent fire.

135. **Coates, D.T.; Lyman, K.J.; Ebinger, J.E. 1992.** Woody vegetation structure of a post oak flatwoods in Illinois. Castanea. 57(3): 196–201.

Describes the composition and structure of a post oak flatwoods in southern Illinois. Black oak, blackjack oak, white oak, and hickories were also present in the inventory. Does not discuss tree age or old-growth status of the stand.

136. **Cobbe, T.J. 1943.** Variations in the Cabin Run Forest, a climax area in southwestern Ohio. American Midland Naturalist. 29(1): 89–105. https://doi.org/10.2307/2420981.

Describes the "climax" vegetation communities and site characteristics of an old-growth forest in southwestern Ohio. Community types included oak-hickory, white oak-red oak, red oak-chestnut oak, maple-red oak, and maple.

137. **Collins, R.J.; Copenheaver, C.A.; Kester, M.E.; Barker, E.J.; DeBose, K.G. 2018.** American chestnut: re-examining the historical attributes of a lost tree. Journal of Forestry. 116(1): 68–75. https://doi.org/10.5849/JOF-2016-014.

Assesses and compares the structural attributes of American chestnut trees by using pre and postblight descriptions from a variety of historical resources. Postblight descriptions of individual tree characteristics included greater tree height and tree diameter than preblight descriptions. The maximum tree height and diameter found in the historical literature was 120 feet and 17 feet, respectively.

138. Conley, L.R. 2011. Bat species diversity in old-growth vs. second growth forests in Lilley Cornett Woods, Letcher County, Kentucky. Richmond, KY: Eastern Kentucky University. 26 p. M.S. thesis.

Uses mist netting and acoustic sampling to compare bat assemblages across old-growth and secondary-growth mixed mesophytic forests. From the acoustic surveys, the tricolored bat was the most frequently detected species in the old-growth forest and the little brown bat was the most frequently detected species in the second-growth forest.

139. Conner, R.N.; Rudolph, D.C.; Schaefer, R.R.; Saenz, D.; Shackelford, C.E. 1999. Relationships among red-cockaded woodpecker group density, nestling provisioning rates, and habitat. Wilson Bulletin. 111(4): 494–498.

Studies provisioning rates of red-cockaded woodpeckers in the context of habitat quality in low-density and moderate-density populations. Provisioning rates did not differ between populations; the moderate-density population had more nesting attempts. Old-growth pines were present around clusters of the moderate-density population and absent around clusters of the low-density population.

140. Conner, W.H.; Mihalia, I.; Wolfe, J. 2002. Tree community structure and changes from 1987 to 1999 in three Louisiana and three South Carolina forested wetlands. Wetlands. 22(1): 58–70. https://doi.org/10.1672/0277-5212(2002)022[0058:TCSACF]2.0.CO;2.

Quantifies the stand dynamics over a 10-year period and along a soil moisture gradient in periodically flooded bottomland hardwood and baldcypress-tupelo stands in Louisiana and South Carolina. Reports results on changes in tree density, basal area, ingrowth, and mortality.

141. Conner, W.H.; Mixon, W.D., II; Wood, G.W. 2005. Maritime forest habitat dynamics on Bulls Island, Cape Romain National Wildlife Refuge, SC, following Hurricane Hugo. Forest Ecology and Management. 212(1–3): 127–134. https://doi.org/10.1016/j.foreco.2005.03.008.

Quantifies the impacts of Hurricane Hugo on an old-growth maritime forest on Bulls Island, SC. Loblolly pine was nearly completely removed from the canopy, but its density increased by a magnitude of 10 after the hurricane. After the storm, live oak density and basal area declined, and sabal palm density and basal area doubled. The hurricane altered the successional trajectory of this old-growth maritime forest.

142. Cook, E.R.; Meko, D.M.; Stahle, D.W.; Cleaveland, M.K. 1999. Drought reconstructions for the continental United States. Journal of Climate. 12(4): 1145–1162. https://doi.org/10.1175/1520-0442(1999)012<1145:DRFTCU>2.0.CO;2.

Reconstructs continental-scale historical drought occurrence from tree ring chronologies, 1700 through 1978. Also quantifies regional-scale patterns, and local droughts were highlighted, including a severe drought in the Southeastern United States that occurred in 1986.

143. Copenheaver, C.A.; Keyser, T.L. 2016. Frequency of sprout-origin trees in pre-European settlement forests of the southern Appalachian Mountains. Canadian Journal of Forest Research. 46(8): 1019–1025. https://doi.org/10.1139/cjfr-2016-0078.

Uses General Land Office Survey records of witness tree architecture as a proxy for reproduction from root sprouting to reconstruct regeneration patterns in the four physiographic provinces of the southern Appalachian Mountains. Hickory, red maple, and sycamore had the highest proportion of sprouting occurrence in the witness tree data.

144. Copenheaver, C.A.; Pulice, M.J.; Lawrence, N.J.W.; Raso, C.H.; Cankaya, E.C.; Wan, H.; Poling, B.T. 2017. Dendroarchaeology reveals influence of early-European settlement on forest disturbance regimes in the Appalachian Mountains, USA. Ecoscience. 24(1–2): 33–40. https://doi.org/10.1080/11956860.2017.1354579.

Reconstructs canopy disturbance and establishment of a white oak forest prior to widespread European settlement with chronologies from historical structures. The structures were constructed from white oak logs harvested in 1845, and the trees established between 1720 and 1789. These historical analogs can be used to better understand patterns of disturbance and development prior to widespread harvesting in the Eastern United States.

145. **Copenheaver, C.A.; Seiler, J.R.; Peterson, J.A.; Evans, A.M.; McVay, J.L.; White, J.H. 2014.** Stadium Woods: a dendroecological analysis of an old-growth forest fragment on a university campus. Dendrochronologia. 32(1): 62–70. https://doi.org/10.1016/j.dendro.2013.09.001.

Reconstructs canopy disturbance history and quantifies composition and structure of a remnant old-growth white oak stand on the campus of Virginia Polytechnic Institute and State University.

146. **Cowell, C.M. 1995.** Presettlement Piedmont forests: patterns of composition and disturbance in central Georgia. Annals of the Association of American Geographers. 85(1): 65–83.

Reconstructs preindustrial logging tree species composition with witness tree data from the Georgia Piedmont to determine the environmental and disturbance impacts of historical vegetation patterns. Topography, soil texture, and fuel moisture influenced tree species composition. Results support evidence for large-scale disturbance impacts on historical vegetation dynamics.

147. **Cowell, C.M. 1998.** Historical change in vegetation and disturbance on the Georgia Piedmont. American Midland Naturalist. 140(1): 78–89. https://doi.org/10.1674/0003-0031(1998)140[0078:HCIVAD]2.0.CO;2.

Compares presettlement and contemporary second-growth Piedmont forest composition and structure. Presettlement forests were composed of xerophytic, fire-tolerant pine, post oak, and black oak; postsettlement forests were mesophytic with less fire-tolerant white oak, yellow-poplar, and hickories. Changes in composition over time corresponded to changes in the regional disturbance regimes from frequent fire to gap-phase succession processes.

148. **Cox, J.A.; Jones, C.D. 2007.** Home range and survival characteristics of male Bachman's sparrows in an old-growth forest managed with breeding season burns. Journal of Field Ornithology. 78(3): 263–269. https://doi.org/10.1111/j.1557-9263.2007.00113.x.

Evaluates the effects of prescribed fire conducted during the breeding season on Bachman's sparrow habitat fidelity in old-growth longleaf pine in Georgia. Breeding season fire had no significant effect on habitat fidelity and home range of male Bachman's sparrows.

149. **Crankshaw, W.B.; Qadir, S.A.; Lindsey, A.A. 1965.** Edaphic controls of tree species in presettlement Indiana. Ecology. 46(5): 688–698. https://doi.org/10.2307/1935008.

Quantifies the relationship between soil and tree species in Indiana using General Land Office records and modern county soil maps. Soil characteristics (e.g., thickness of A and B horizons) were related to the location of >70,000 bearing trees. The most important soil characteristics affecting tree distributions were depth of horizons, percentage of nitrogen, and percentage of clay.

150. **Crosby, M.K.; Butler, R.B.; Hodges, B.N. 2020.** Red maple composition in an old growth forest 50 years following disturbance. In: Bragg, D.C.; Koerth, N.E.; Holley, A.G., eds. Proceedings of the 20th biennial southern silvicultural research conference. e-Gen. Tech. Rep. SRS-253. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 287–291.

Reports results from a 50-year resampling of old-growth mixed oak-pine and chestnut oak stands in the mountains of northern Georgia. The initial sampling (in 1969) occurred following an ice storm. The focus of the resampling effort was to monitor red maple demographics and stand succession. The ice storm facilitated an increase in red maple and hickory dominance. There was no sapling pine recruitment and minimal oak recruitment. Management intervention, such as prescribed fire, was constrained by the semiurban location of the forest.

151. **Crow, T.R.; Grigal, D.F. 1980.** A numerical analysis of arborescent communities in the rain forest of the Luquillo Mountains, Puerto Rico. Vegetatio. 40(3): 135–146. https://doi.org/10.1007/BF00228477.

Uses cluster analysis and ordination to identify major associations in secondary and primary lower montane rainforests in the Luquillo Mountains, PR. Results indicate eight major forest types that were influenced by past land use and topographic position.

152. **Cruikshank, J.W. 1938.** Forest resources of northeast Texas. Forest Survey Release 40. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 25 p.

Reports on first Forest Service forest survey of northeastern Texas (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: shortleaf pine, loblolly pine, upland and bottomland hardwoods.

153. **Cruikshank, J.W. 1939.** Forest resources of southwest Louisiana. Forest Survey Release 43. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 38 p.

Reports on first Forest Service forest survey of southwestern Louisiana (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: longleaf pine, shortleaf pine, loblolly pine, pine-hardwoods, upland and bottomland hardwoods (including baldcypress).

154. **Cruikshank, J.W. 1940.** Forest resources in the Tennessee Valley of north Alabama. Forest Survey Release 49. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 39 p.

Reports on first Forest Service forest survey of northern Alabama (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: pine, pine-hardwood, upland and bottomland hardwoods.

155. **Cruikshank, J.W. 1940.** Forest resources of north central Alabama. Forest Survey Release 50. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 36 p.

Reports on first Forest Service forest survey of northcentral Alabama (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: pine (longleaf pine and shortleaf pine), pine-hardwood, upland and bottomland hardwoods.

156. **Cruikshank, J.W. 1940.** Forest resources of the northern Coastal Plain of North Carolina. Forest Survey Release 5. Asheville, NC: U.S. Department of Agriculture, Forest Service, Appalachian Forest Experiment Station. 48 p. https://doi.org/10.5962/bhl.title.122587.

Reports on first Forest Service forest survey for the northern Coastal Plain of North Carolina (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: loblolly pine, pond pine, longleaf pine, mixed oaks, upland and bottomland hardwoods.

157. **Cruikshank, J.W. 1940.** Forest resources of the Piedmont Region of North Carolina. Forest Survey Release 6. Asheville, NC: U.S. Department of Agriculture, Forest Service, Appalachian Forest Experiment Station. 55 p. https://doi.org/10.5962/bhl.title.122505.

Reports on first Forest Service forest survey of the Piedmont of North Carolina (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: shortleaf pine-hardwood, loblolly pine-hardwood, Virginia pine-hardwood, upland and bottomland hardwoods.

158. **Cruikshank, J.W. 1940.** Forest resources of the Southern Coastal Plain of North Carolina. Forest Survey Release 4. Asheville, NC: U.S. Department of Agriculture, Forest Service, Appalachian Forest Experiment Station. 46 p. https://doi.org/10.5962/bhl.title.122610.

Reports on first Forest Service forest survey of the southern Coastal Plain of North Carolina (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: loblolly pine-hardwood, longleaf pine, upland and bottomland hardwoods.

159. **Cruikshank, J.W. 1941.** Forest resources of the mountain region of North Carolina. Forest Survey Release 7. Asheville, NC: U.S. Department of Agriculture, Forest Service, Appalachian Forest Experiment Station. 55 p. https://doi.org/10.5962/bhl.title.122571.

Reports on first Forest Service forest survey of the mountain region of North Carolina (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: cove hardwoods, shortleaf pine-hardwoods, upland hardwoods, eastern white pine-hardwoods, spruce-fir, and hemlock-hardwoods.

160. **Cruikshank, J.W. 1943.** The forest situation in the Coastal Plain of Virginia. Forest Survey Release 12. Asheville, NC: U.S. Department of Agriculture, Forest Service, Appalachian Forest Experiment Station. 45 p. + Appendix. https://doi.org/10.5962/bhl.title.122458.

Reports on first Forest Service forest survey of the Coastal Plain of Virginia (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: loblolly pine, shortleaf pine, baldcypress, upland and bottomland hardwoods.

161. **Cruikshank, J.W.; Eldredge, I.F. 1939.** Forest resources of southeastern Texas. Misc. Publ. 326. Washington, DC: U.S. Department of Agriculture. 37 p. + maps. https://doi.org/10.5962/bhl.title.65579.

Reports on first Forest Service forest survey of southeastern Texas (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: longleaf pine, shortleaf pine, upland and bottomland hardwoods.

162. **Curry, C.C. 1960.** Early timber operations in southeast Arkansas. Arkansas Historical Quarterly. 19(2): 111–118. https://doi.org/10.2307/40025494.

Provides a historical description of timber harvesting in southeastern Arkansas from the 1830s through 1890s.

163. **Davis, E.M. 1931.** The defects and some other characteristics of virgin-growth and of second-growth commercial shortleaf pine lumber. Journal of Forestry. 29(1): 54–63.

Assesses various characteristics of virgin and second-growth shortleaf pine and loblolly pine in mills across the Southeastern United States. Comparative information includes lumber grade yields, heartwood content, growth rate, knottiness and other defects, which may provide insight into differences in stand conditions. For example, the greater amount of heartwood and heartrot in the virgin forest was a key factor in supporting red-cockaded woodpecker populations.

164. Davis, J.G.; Chapman, J.I.; Wu, S.-Y.; McEwan, R.W. 2015. Spatiotemporal dynamics of coarse woody debris in an old-growth temperate deciduous forest. Forest Science. 61(4): 680–688. https://doi.org/10.5849/forsci.14-156.

Quantifies the spatiotemporal trends of coarse woody debris from 1989 through 2012 at Big Everidge Hollow in the Lilley Cornett Woods on the Cumberland Plateau, KY. Results indicate that coarse woody debris inputs were steady over time and spatially stochastic across each of the three slope positions assessed.

165. Davis, J.R.; Boyle, S.A.; Khan, A.A.; Gay, A.L.J.; Grisham, J.M.; Luque, L.E. 2012. Snake parasitism in an urban old-growth forest. Urban Ecosystems. 15(3): 739–752. https://doi.org/10.1007/s11252-012-0234-7.

Characterizes parasites of snakes in an old-growth forest fragment (Overton Park, Memphis, TN). Snakes infected with fecal parasites were closer to the forest edge than snakes that were not infected.

166. Davis, M.B. 2003. Old growth in the East: a survey. Revised ed. Mount Vernon, KY: Appalachia-Science in the Public Interest. 273 p.

Reports on a spatially extensive survey of old growth in the Eastern United States, covering all states from Wisconsin, Minnesota, Iowa, Illinois, Missouri, Oklahoma, and Texas to the East. Document is organized by State, region, and old-growth forest. For each old-growth forest, the size, composition, site characteristics, and anthropogenic disturbance history are reported.

167. Davis, V.B. 1940. A cursory survey of the forest resource of the east Texas post oak belt. Forest Survey Release 52. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 9 p.

Reports on first Forest Service forest survey of the east Texas post oak belt (mid-1930s). Although no estimates of old growth were made, this survey includes volume estimates of forest type by product class condition for noncommercial (referred to here as scrub hardwood), commercial hardwood, and pine. It also classifies vegetation types by evidence of fire. Author noted that 93 percent of the survey unit was classified as noncommercial scrub hardwoods, which were primarily used as fuel wood and fence materials.

168. de Graauw, K.K.; Hessl, A.E. 2020. Do historic log buildings provide evidence of reforestation following depopulation of Indigenous Peoples? Journal of Biogeography. 47(3): 630–642. https://doi.org/10.1111/jbi.13769.

Uses dendrochronological dating of historical log structures and live trees from old-growth forests of the central Appalachian Mountains to test the previously published hypothesis that reforestation occurred during the 16th and 17th centuries, following depopulation of Indigenous Peoples. Results reveal that reforestation in upland forests of the central Appalachian Mountains was a legacy of Indigenous land-use practices.

169. Delcourt, H.R. 1981. The virtue of forests, virgin and otherwise. Natural History. 90(6): 33–39.

Discusses historical settlement patterns and timber harvesting of virgin forests in the Southeastern United States. The global carbon cycle is also highlighted in the context of old growth, emphasizing the importance of old-growth forests in this region as an important global carbon sink.

170. Dennis, J.V. 1988. The great cypress swamps. Baton Rouge, LA: Louisiana State University Press. 232 p.

Examines old-growth cypress swamps across the Southeastern United States. The book includes photographs of old-growth swamps and a discussion of what ancient cypress swamps looked like. It also includes discussions of flora and fauna that may be extinct or threatened with extinction due to loss of habitat associated with old-growth cypress swamps.

171. DeSantis, R.D.; Hallgren, S.W.; Stahle, D.W. 2010. Historic fire regime of an upland oak forest in south-central North America. Fire Ecology. 6(3): 45–61. https://doi.org/10.4996/fireecology.0603045.

Reconstructs fire history of xeric oak forests of the Cross Timbers from 1705 through 2005. Anthropogenic ignition was more common than natural ignition, and anthropogenic forces were important drivers of the increase in fire frequency from the 18th to 21st century.

172. DeSelm, H.R. 1994. Vegetation results from an 1807 land survey of southern middle Tennessee. Castanea. 59(1): 51–68.

Compiles vegetation data from an 1807 survey of the southeastern Highland Rim and southern Central Basin, TN. Vegetation types and forest structure elicited from these surveys are compared to contemporary inventories of forests in the same region.

173. Devall, M.S. 1998. An interim old-growth definition for cypress-tupelo communities in the Southeast. Gen. Tech. Rep. SRS-19. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 13 p. https://doi.org/10.2737/SRS-GTR-19.

Provides definitions and associated characteristics of cypress-tupelo communities that occur on the Coastal Plain northward along the Mississippi River and its major tributaries, as part of the larger effort to develop old-growth definitions for 35 forest types in the Eastern United States. These communities occur on lowland sites characterized by frequent flooding. This definition is considered interim because research on these communities was underdeveloped at the time of publication.

174. Devall, M.S.; Parresol, B.R.; Smith, W.P. 2001. The effect of herbivory by white-tailed deer and additionally swamp rabbits in an old-growth bottomland hardwood forest. In: Hamel, P.B.; Foti, T.L., tech. eds. Bottomland hardwoods of the Mississippi Alluvial Valley: characteristics and management of natural function, structure, and composition. Gen. Tech. Rep. SRS-42. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 49–64.

Assesses the effects of herbivory (white-tailed deer and swamp rabbits) on herbaceous and woody species in a bottomland hardwood forest in southeastern Arkansas. After 3 years, understory plant species composition and abundance were significantly altered by herbivores.

175. Devall, M.S.; Ramp, P.F. 1992. U.S. Forest Service Research Natural Areas and protection of old growth in the South. Natural Areas Journal. 12(2): 75–85.

Introduces the Forest Service Research Natural Areas (RNA) program: its establishment, objectives, and role in old-growth conservation on national forests in the Southern United States. Also describes several RNAs in Mississippi, Alabama, and Arkansas. Includes photographs of old growth in the Red Gum RNA, MS, and the Bee Branch RNA, AL.

176. Devall, M.S.; Rudis, V.A. 1991. Older stands characterized and estimated from sample-based surveys. In: Henderson, D.; Hedrick, L.D., eds. Restoration of old growth forests in the Interior Highlands of Arkansas and Oklahoma. Morrilton, AR: Winrock International and Hot Springs, AR: Ouachita National Forest: 121–138.

Applies old-growth metrics gleaned from existing literature to contemporary inventory data to determine the amount of old growth in the Interior Highlands of Arkansas and Oklahoma.

177. Devall, M.S.; van Deusen, P.C.; Reams, G.A. 1999. Defining old growth in the Southeast: example of cypress. In: Miller, G.L., ed. The value of old growth forest ecosystems of the Eastern United States. Asheville, NC: University of North Carolina at Asheville: 81–85.

Describes the Forest Service approach and progress made in development of old-growth definitions for forests of the Southern United States (before the 1997 old-growth guidance was released). Authors provide an example of an old-growth definition for cypress-tupelo forests.

178. **Diamond, D.D. 1997.** An old-growth definition for western juniper woodlands: Texas Ashe juniper dominated or codominated communities. Gen. Tech. Rep. SRS-15. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 10 p. https://doi.org/10.2737/SRS-GTR-015.

Provides definitions and associated characteristics of western Ashe juniper woodlands of the southern and eastern Edwards Plateau and the Lampasas Cut-Plain, TX, as part of the larger effort to develop old-growth definitions for 35 forest types in the Eastern United States.

179. **Diamond, D.D. 1998.** An old-growth definition for southwestern subtropical upland forests. Gen. Tech. Rep. SRS-21. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 7 p. https://doi.org/10.2737/SRS-GTR-21.

Provides definitions and associated characteristics of southwestern subtropical upland forests that occur in the Lower Rio Grande Valley of southern Texas, as part of the larger effort to develop old-growth definitions for 35 forest types in the Eastern United States. The dominant species was Texas ebony, and the most common secondary species was anacua.

180. **Diamond, D.D.; Rowell, G.A.; Keddy-Hector, D.P. 1995.** Conservation of Ashe juniper (*Juniperus ashei* Buchholz) woodlands of the central Texas Hill Country. Natural Areas Journal. 15(2): 189–197.

Introduces conservation concerns of old-growth Ashe juniper woodlands in the Central Texas Hill Country. Also describes the four ecological site types that support Ashe juniper communities and the issues intertwined with rangeland management.

181. **Diamond, J.M.; Ross, M.S. 2020.** The changing age structure of a tropical hardwood hammock forest: an ecological history of North Key Largo derived from aerial photography. Florida Scientist. 83(2): 75–81.

Uses available historical records and aerial photographs to reconstruct the environmental history of North Key Largo, with an emphasis on conservation of tropical hardwood hammocks. These stands were able to escape intensive anthropogenic disturbance (e.g., farming), which makes North Key Largo one of the best examples of old-growth tropical hardwood hammocks.

182. **Dickson, J.G. 1991.** Birds and mammals of pre-Colonial southern old-growth forests. Natural Areas Journal. 11(1): 26–33.

Provides an extensive description of the wildlife community composition in precolonial old-growth forests of the Southern United States. Abundant and diverse wildlife communities occurred across different forest community types.

183. **Dodds, K.J.; Smallidge, P.J. 1999.** Composition, vegetation, and structural characteristics of a presettlement forest in western Maryland. Castanea. 64(4): 337–345.

Compares the vegetation structure and composition of a mature mixed hardwood forest in western Maryland to structural indicators of old growth of the same type to determine old-growth status and potential past human disturbance. The stands had various old-growth indicators such as age, basal area, and coarse woody debris volume.

184. **Douglas, D.D.; Brown, D.R.; Pederson, N. 2013.** Land snail diversity can reflect degrees of anthropogenic disturbance. Ecosphere. 4(2): 28. 14 p. https://doi.org/10.1890/ES12-00361.1.

Samples snail population abundance and diversity in three old-growth forests and three second-growth forests in three ecoregions of Kentucky to further develop faunal indicators of old growth. The old-growth forests were Lilley Cornett Woods, Blanton Forest State Nature Preserve, and Floracliff State Natural Preserve. Findings indicate that old growth had greater snail diversity than younger forest and that anthropogenic disturbance is a strong influence of snail community stability.

185. **Drewa, P.B.; Thaxton, J.M.; Platt, W.J. 2006.** Responses of root-crown bearing shrubs to differences in fire regimes in *Pinus palustris* (longleaf pine) savannas: exploring old-growth questions in second-growth systems. Applied Vegetation Science. 9(1): 27–36. https://doi.org/10.1111/j.1654-109X.2006.tb00653.x.

Assesses the effects of fire season and intensity on the resprouting response of different shrub species in second-growth longleaf pine savannas. Concludes that past dormant season fires may have contributed to the increased abundance of some shrub species in existing old-growth savannas, and that growing season fire may be more effective in decreasing stem densities depending on fire conditions.

186. Druckenbrod, D.L.; Dale, V.H.; Olsen, L.M. 2007. Forest conservation in the Cumberland Plateau and Mountains: assessing distribution and structure of landform forest associations. In: Buckley, D.S.; Clatterbuck, W.K., eds. Proceedings of the 15th central hardwood forest conference. e-Gen. Tech. Rep. SRS-101. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 317–324.

Proposes a regional-based conservation approach for the mixed mesophytic forests of the Cumberland Plateau. The approach quantifies the desired ecological conditions of the northern Cumberland Plateau and characterizes existing forest conditions across the landscape by using predictive vegetation mapping and remote sensing classification. Also compares the structure and composition of current natural forest to old-growth forests to determine which attributes could be managed to enhance old-growth features.

187. Druckenbrod, D.L.; Shugart, H.H. 2004. Forest history of James Madison's Montpelier plantation. Journal of the Torrey Botanical Society. 131(3): 204–219. https://doi.org/10.2307/4126951.

Uses dendrochronology and historical records to reconstruct the establishment dates and disturbance history of the "Big Woods" old-growth forest on James Madison's Montpelier plantation. Establishment and canopy disturbance events coincided with changes in land use and ownership.

188. Duerr, W.A.; Evans, T.C.; Morrill, G.E. 1943. The forest situation in Piedmont Virginia. Forest Survey Release 13. Asheville, NC: U.S. Department of Agriculture, Forest Service, Appalachian Forest Experiment Station. 83 p. https://doi.org/10.5962/bhl.title.122584.

Reports on first Forest Service forest survey of the Piedmont, VA (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: loblolly pine, shortleaf pine, cove hardwoods, mixed oaks, upland and bottomland hardwoods.

189. Duever, M.J.; McCollom, J.M. 1993. Hurricane Hugo effects on old-growth floodplain forest communities at Four Holes Swamp, South Carolina. In: Brissette, J.C., ed. Proceedings of the seventh biennial southern silvicultural research conference. Gen. Tech. Rep. SO-93. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station: 197–202.

Quantifies hurricane damage in an old-growth floodplain forest in Four Hole Swamp, SC. Higher elevation forests (mixed hardwood-pine) experienced greater damage than lower elevation cypress-tupelo forests. Pines were most susceptible to hurricane-related damage.

190. Duffy, D.C.; Meier, A.J. 1992. Do Appalachian herbaceous understories ever recover from clearcutting? Conservation Biology. 6(2): 196–201. https://doi.org/10.1046/j.1523-1739.1992.620196.x.

Compares herbaceous communities of nine old-growth mixed mesophytic forests to nine second-growth mixed mesophytic forests that were harvested 45–87 years prior. Neither herbaceous richness nor cover achieved the levels found in old-growth comparison sites. Concludes that 1) 87 years may not be sufficient to recover, 2) herbaceous communities will not recover within the cutting cycles of these forests, or 3) pit and mount microtopography can be developed by death of second-growth trees to offer unique habitat for herbs.

191. Edmondson, A. 2019. Analysis and conservation of native forests at Kessler Mountain Fayetteville, Arkansas. Fayetteville, AR: University of Arkansas, Fayetteville. 40 p. M.A. thesis.

Quantifies the composition and structure of two old-growth stands in a 384-acre preserve on Kessler Mountain, AR. One stand was dominated by post oak-northern red oak, and the other stand was chinkapin oak-sugar maple. The oldest oak trees were 250–300 years old. Oak regeneration failure was documented in both stands.

192. Edwards, P.; Huber, C.; Wood, F. 2004. Ozone exposures and implications for vegetation in rural areas of the central Appalachian Mountains, U.S.A. Environmental Monitoring and Assessment. 98: 157–174. https://doi.org/10.1023/B:EMAS.0000038184.65332.f6.

Assesses vegetation response to ozone metrics in various rural locations throughout Virginia, West Virginia, and Kentucky (including the Lilley Cornett Woods) from a period between 1988 and 1999. Most negative growth response was attributed to drought as opposed to ozone levels at most sites.

193. Elliott, K.J.; Vose, J.M.; Knoepp, J.D.; Johnson, D.W.; Swank, W.T.; Jackson, W. 2008. Simulated effects of sulfur deposition on nutrient cycling in Class I wilderness areas. Journal of Environmental Quality. 37(4): 1419–1431. https://doi.org/10.2134/jeq2007.0358.

Models the effects of sulfate deposition on two old-growth and one second-growth forest in the Blue Ridge Mountains, NC (Joyce Kilmer, Shining Rock, and Linville Gorge). Sulfate deposition contributed to the accelerated loss of calcium, magnesium, and potassium. Results indicate that many old-growth forests may be particularly sensitive to atmospheric sulfate deposition. Site-specific sensitivity was related to the soil's ability to neutralize chronic and acute acid deposition.

194. Elliott, K.J.; Vose, J.M.; Rankin, D. 2014. Herbaceous species composition and richness of mesophytic cove forests in the southern Appalachians: synthesis and knowledge gaps. Journal of the Torrey Botanical Society. 141(1): 39–71. https://doi.org/10.3159/TORREY-D-13-00054.1.

Synthesizes existing information (as of 2014) on the herbaceous layer in mesophytic cove forests in the southern Appalachian Mountains. Herbaceous community assembly was highly complex, and species presence and abundance were heavily influenced by disturbance. Can be used by managers and planners for decision making in restoration and conservation of the herb layer in this forest type.

195. Engstrom, R.T.; Hiers, J.K.; Robertson, K.M.; Varner, J.M.; Cox, J.; O'Brien, J.J.; Pokswinski, S. 2022. Long-term recovery of selected indicator species following soil disturbance and compaction in an old-growth longleaf pine (*Pinus palustris*) woodland. Natural Areas Journal. 42(1): 89–97. https://doi.org/10.3375/21-23.

Assesses the impacts of past anthropogenic soil disturbances on soil conditions and understory vegetation patterns in the old-growth forest of the Wade Tract, with differences still significant after 40+ years of recovery.

196. Engstrom, R.T.; Sanders, F.J. 1997. Red-cockaded woodpecker foraging ecology in an old-growth longleaf pine forest. Wilson Bulletin. 109(2): 203–217.

Discusses and compares habitat requirements and foraging range for red-cockaded woodpeckers in old-growth and second-growth forests. Red-cockaded woodpeckers preferentially foraged on large trees, and old-growth structure provided high-quality habitat.

197. Fail, J., Jr. 1991. A 29-year resurvey of permanent plots in a northwest Georgia virgin forest. Castanea. 56(3): 176–180.

Reports on a 29-year reinventory of permanent plots in an old-growth, oak-hickory-pine forest in the Ridge and Valley Province of northwestern Georgia. Shortleaf pine, tulip poplar, and shagbark hickory decreased in importance and red maple and chestnut oak increased in importance. Also notes an increase in basal area and a decrease in stem density.

198. **Farge, K.W. 2018.** Passive restoration of forest structure and composition in bottomland hardwood forests in Texas. Natural Areas Journal. 38(2): 168–182. https://doi.org/10.3375/043.038.0207.

Assesses passive reforestation techniques, such as colonization via natural seed dispersal, in cutover bottomland hardwood stands in east Texas with the intent to accelerate old-growth structure required by certain migratory bird species. Compares restoration techniques to a nearby old-growth site. Passive reforestation has potential to restore some desired old-growth characteristics, such as uneven-aged structure, snags, and species richness of woody plants.

199. **Fasth, B.G.; Harmon, M.E.; Sexton, J.; White, P. 2011.** Decomposition of fine woody debris in a deciduous forest in North Carolina. Journal of the Torrey Botanical Society. 138(2): 192–206. https://doi.org/10.3159/TORREY-D-10-00009.1.

Assesses rates of decomposition of fine woody debris (<15 cm) as a function of soil surface, species, and piece size. Documents significant interaction effects and species-specific trends of fine woody debris decomposition rates.

200. **Faulks, E.B. 1938.** Forest resources in the longleaf pine region of Mississippi and east Louisiana. Forest Survey Release 39. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 37 p.

Reports on first Forest Service forest survey in the longleaf pine region of Mississippi and eastern Louisiana (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: longleaf pine, bottomland hardwoods, and baldcypress.

201. **Faulks, E.B. 1939.** Forest resources of the northern Coastal Plain of South Carolina. Forest Survey Release 1. Asheville, NC: U.S. Department of Agriculture, Forest Service, Appalachian Forest Experiment Station. 30 p. https://doi.org/10.5962/bhl.title.122517.

Reports on first Forest Service forest survey of the northern Coastal Plain, SC (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: loblolly pine, longleaf pine, upland and bottomland hardwoods.

202. **Faulks, E.B.; Spillers, A.R. 1939.** Forest resources of the southern Coastal Plain of South Carolina. Forest Survey Release 3. Asheville, NC: U.S. Department of Agriculture, Forest Service, Appalachian Forest Experiment Station. 34 p. https://doi.org/10.5962/bhl.title.122476.

Reports on first Forest Service forest survey of the southern Coastal Plain, SC (mid-1930s). Includes estimates of the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: longleaf pine, slash pine, loblolly pine, mixed oaks, and bottomland hardwoods.

203. **Fischer, A.F.; Kerr, A.F.; Stadtmiller, L.R. 1911.** Three Yale Forest School student working plans from 1911. Transcribed by Lewis, J. Forest History Society. 14 p.

Provides working plans for Texas, including qualitative descriptions of uncut shortleaf and mixed hardwood stands in 1911.

204. **Flatley, W.T.; Bragg, L.M.; Bragg, D.C. 2023.** Dynamic fire regimes and forest conditions across three centuries in a shortleaf pine-oak forest in the Ouachita Mountains, Arkansas, USA. Annals of the Association of American Geographers. 113(6): 1365–1382. https://doi.org/10.1080/24694452.2023.2189937.

Uses dendrochronology to consider how past fire history affected overstory recruitment patterns over the past three centuries in an old-growth shortleaf pine-oak stand, Ouachita National Forest. Includes discussion of how fire return intervals varied over time.

205. Flatley, W.T.; Lafon, C.W.; Grissino-Mayer, H.D.; LaForest, L.B. 2015. Changing fire regimes and old-growth forest succession along a topographic gradient in the Great Smoky Mountains. Forest Ecology and Management. 350: 96–106. https://doi.org/10.1016/j.foreco.2015.04.024.

Quantifies the influence of the presuppression fire regime on contemporary vegetation patterns in old-growth forests of the southern Appalachian Mountains using dendrochronological techniques. Yellow pine, chestnut oak, and white pine-oak stands established immediately after fire exclusion began; xerophytic species established during the frequent-fire period (1700–1909). Cove forests with and without historical fire differed in age structure and composition.

206. Flebbe, P.A. 1999. Trout use of woody debris and habitat in Wine Spring Creek, North Carolina. Forest Ecology and Management. 114(2): 367–376. https://doi.org/10.1016/S0378-1127(98)00367-3.

Inventories large woody debris, trout habitat, and brook and rainbow trout abundance in Wine Spring Creek in the Nantahala National Forest, NC. Compared to similar streams in old-growth forests, Wine Spring Creek had less large woody debris and fewer pools and riffles inhabited by trout.

207. Foley, J. 1902. A working plan for southern hardwoods, and its results. In: Yearbook of the United States Department of Agriculture for 1901. Washington, DC: Government Printing Office: 471–476.

Provides a brief description of forest conditions found on the property of the University of the South in Sewanee, TN, circa 1900. Notes that many of the cove hardwood forests at that time were still virgin timber, which were described as being fairly dense stands of tall, straight, and large trees, most of which were old and some so "overripe as to be decaying." On the plateau, the University property was largely cutover and frequently burned, dominated by "open growth of poor specimens of inferior species" with only scattered large tulip poplar, American chestnuts, and white oaks, suggestive of the former forests.

208. Forbes, R.D. 1930. Timber growing and logging and turpentining practices in the southern pine region. Tech. Bull. 204. Washington, DC: U.S. Department of Agriculture. 115 p.

Provides historical stand descriptions of various old-growth southern pine forests (e.g., longleaf pine on pages 7, 9, 21–22, 36, 41, 56; shortleaf pine on pages 19–22, 50; loblolly pine on pages 11, 19–22; slash pine on page 11).

209. Ford, S.A.; Kleinman, J.S.; Hart, J.L. 2017. Spatial patterns of canopy disturbance, structure, and species composition in a multi-cohort hardwood stand. Forests. 8(3): 93. https://doi.org/10.3390/f8030093.

Reconstructs canopy disturbance history, cohort establishment dates, spatial patterns, and stand structure in an old-growth, multiaged hardwood stand in the Oakmulgee Ranger District of the Talladega National Forest. The stand established in the 1770s but the largest recruitment event occurred in 1945 and was a result of a detected standwide disturbance event. The spatial heterogeneity of stand structure was influenced by the spatial patterns of historical canopy disturbance. To accelerate old-growth composition and structure, entries could be patterned after the disturbances documented in this stand.

210. Foster, D.R.; Fluet, M.; Boose, E.R. 1999. Human or natural disturbance: landscape-scale dynamics of the tropical forests of Puerto Rico. Ecological Applications. 9(2): 555–572. https://doi.org/10.1890/1051-0761(1999)009[0555:HONDLS]2.0.CO;2.

Uses aerial photographs from 1936 and 1989, a geographic information system, a model of topographic exposure to hurricane winds, and historical data to document landscape-level forest dynamics in the Luquillo Experimental Forest, eastern Puerto Rico. Primary forests in 1936 comprised 5060 ha, which included 380 ha of Tabonuco, 2350 ha of Colorado, 135 ha of Dwarf, and 2195 ha of Palm forest. As of 1994, about 4000 ha of primary forest remained.

211. **Foster, E. 1934.** The use of aerial photographs in mapping ground conditions and cruising timber in the Mississippi River bottom lands. Occas. Pap. 37. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 7 p. https://doi.org/10.5962/bhl.title.127729.

Uses aerial photographs to map Mississippi River bottomland forests. The author acknowledges that the identification of old growth with this technique was not possible in 1934.

212. **Foti, T.L.; Glenn, S.M. 1991.** The Ouachita Mountain landscape at the time of settlement. In: Henderson, D.; Hedrick, L.D., eds. Restoration of old growth forests in the Interior Highlands of Arkansas and Oklahoma. Hot Springs, AR: Winrock International and Hot Springs, AR: Ouachita National Forest: 49–65.

Uses General Land Office survey notes and other historical narratives to describe the predominantly old-growth forests of the Ouachita Mountains region in Arkansas and Oklahoma at the time of Euro-American settlement.

213. **Fountain, M.S. 1991.** Tree and non-tree dimensions of an old-growth shortleaf pine stand: Lake Winona Research Natural Area. In: Henderson, D.; Hedrick, L.D., eds. Restoration of old growth forests in the Interior Highlands of Arkansas and Oklahoma. Winrock International and Hot Springs, AR: Ouachita National Forest: 147–152.

Provides basic statistics on an old-growth shortleaf pine-dominated stand in the Ouachita National Forest.

214. **Fountain, M.S.; Sweeney, J.M. 1985.** Ecological assessment of the Roaring Branch Research Natural Area. Res. Pap. SO-213. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 15 p.

Describes virgin hardwood and shortleaf pine forests, including the overstory, shrub, and herbaceous layer.

215. **Fountain, M.S.; Sweeney, J.M. 1987.** Ecological assessment of the Lake Winona Research Natural Area. Res. Pap. SO-235. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 14 p.

Describes vegetation and site characteristics of the 113-ha Lake Winona Research Natural Area (LWRNA) in the Winona Ranger District of the Ouachita National Forest, AR. The LWRNA was dominated by shortleaf pine (150–200 years old) and oaks. However, shortleaf pine was absent from the regeneration layer, and the successional trajectory indicated greater oak dominance over time.

216. **Fox, J.F. 1977.** Alternation and coexistence of tree species. American Naturalist. 111(977): 69–89. https://doi.org/10.1086/283138.

Assesses tree species dominant-subordinate alternation and coexistence mechanisms in multiple old-growth forest throughout North America. Quantifies these relationships in two forest types in the Forest Service's Southern Region: spruce-fir and live oak-water oak.

217. **Fralish, J.S.; Crooks, F.B.; Chambers, J.L.; Harty, F.M. 1991.** Comparison of presettlement, second-growth and old-growth forest on six site types in the Illinois Shawnee Hills. American Midland Naturalist. 125(2): 294–309. https://doi.org/10.2307/2426234.

Compares forest composition and structure between presettlement, second-growth and old-growth forests on six different site conditions in Illinois. Presettlement, second, and old growth were similar on rocky south-facing slopes and ridgetops. Presettlement forests were more similar to second growth on high and low north-facing slopes. Old-growth and presettlement forests were dissimilar as a function of historical fire in presettlement forests and preservation in old-growth forests. Disturbance (or lack of disturbance) had long-lasting effects on old-growth composition and structure in these systems.

218. **Fraser, J.S.; Knapp, L.S.P.; Graham, B.; Jenkins, M.A.; Kabrick, J.; Saunders, M.; Spetich, M.; Shifley, S. 2023.** Carbon dynamics in old-growth forests of the Central Hardwoods Region, USA. Forest Ecology and Management. 537: 120958. 14 p. https://doi.org/10.1016/j.foreco.2023.120958.

Compares changes in species diversity and composition, stem density (basal area), quadratic mean diameter, aboveground carbon, and forest floor carbon content among a series of old-growth stands over a 20-year period. Analysis allowed for consideration of how site productivity and disturbance may affect carbon storage in old-growth stands, as well as presents some options to manage aging second-growth stands for old-growth characteristics.

219. **Fraterrigo, J.M.; Turner, M.G.; Pearson, S.M. 2006.** Interactions between past land use, life-history traits and understory spatial heterogeneity. Landscape Ecology. 21(5): 777–790. https://doi.org/10.1007/s10980-005-5955-z.

Compares the variability of understory herbaceous plant abundance in the southern Appalachian Mountains between stands with a history of farming and logging and stands with no human disturbance (possibly old growth but not clearly stated). Has implications for the effects of human disturbance on soil nutrient availability and herbaceous plant distribution.

220. **Fraver, S. 1994.** Vegetation responses along edge-to-interior gradients in the mixed hardwood forests of the Roanoke River Basin, North Carolina. Conservation Biology. 8(3): 822–832. https://doi.org/10.1046/j.1523-1739.1994.08030822.x.

Quantifies the distance of edge effects on vascular plant composition and cover from the forested edge of an agricultural field along transects into the mixed hardwood forest. Distance of edge effects varied by aspect, with a greater penetration of edge effects on south-facing edges compared to north-facing edges.

221. **Galbraith, S.L.; Martin, W.H. 2005.** Three decades of overstory and species change in a mixed mesophytic forest in eastern Kentucky. Castanea. 70(2): 115–128. https://doi.org/10.2179/0008-7475(2005)070[0115:TDOOAS]2.0.CO;2.

Assesses stand dynamics over a 28-year period in the old-growth stands of the Lilley Cornett Woods, KY. Basal area and the importance values of maple and hemlock increased, and the importance values of oaks decreased. Results support the trend of oak decline in eastern forests.

222. **Garver, R.D.; Miller, R.H. 1933.** Selective logging in the shortleaf and loblolly pine forests of the Gulf States Region. Tech. Bull. 375. Washington, DC: U.S. Department of Agriculture. 54 p.

Provides limited descriptions and some photographs of virgin shortleaf pine-dominated stands in eastern Texas and westcentral Arkansas. Briefly describes stand histories and apparent disturbances—including fire—and how they may respond to certain silvicultural practices.

223. **Gault, K.E.; Walters, J.R.; Tomcho, J., Jr.; Phillips, L.F., Jr.; Butler, A. 2004.** Nest success of southeastern American kestrels associated with red-cockaded woodpeckers in old-growth longleaf pine habitat in northwest Florida. Southeastern Naturalist. 3(2): 191–204. https://doi.org/10.1656/1528-7092(2004)003[0191:NSOSAK]2.0.CO;2.

Studies nesting biology of the threatened southeastern American kestrel in old-growth longleaf pine forests on Eglin Air Force Base, FL. Southeastern American kestrels nest in previously inhabited red-cockaded woodpecker cavities. These kestrels require old-growth longleaf pine composition, structure, and function for high-quality habitat.

224. **Gerschutz, A.D. 2009.** Changes in old-growth and second-growth eastern hemlock (*Tsuga canadensis*) communities in the southern Appalachians after the introduction of the hemlock woolly adelgid, *Adelges tsugae*. Chapel Hill, NC: University of North Carolina at Chapel Hill. 114 p. M.S. thesis.

Characterizes early-stage impacts of hemlock woolly adelgid on old-growth and second-growth eastern hemlock stands in the Great Smoky Mountains National Park, Joyce Kilmer Memorial Forest, and Ellicott Rock Wilderness Area.

225. **Gilbert, J.C.; Kush, J.S.; Barlow, R.J. 2015.** Destroyed virgin longleaf pine stand lives-on digitally. In: Holley, A.G.; Connor, K.F.; Haywood, J.D., eds. Proceedings of the 17th biennial southern silvicultural research conference. e-Gen. Tech. Rep. SRS-203. U.S. Department of Agriculture, Forest Service, Southern Research Station: 463–466.

Describes a geographic information system database with stand attributes of an 80-acre old-growth longleaf pine stand in Flomaton, AL, that was clearcut in 2008. The database can be used as a resource to reconstruct stand dynamics of old-growth longleaf pine.

226. **Gilhen-Baker, M.; Roviello, V.; Beresford-Kroeger, D.; Roviello, G.N. 2022.** Old growth forests and large old trees as critical organisms connecting ecosystems and human health. A review. Environmental Chemistry Letters. 20(2): 1529–1538. https://doi.org/10.1007/s10311-021-01372-y.

Reviews old-growth characteristics, with an emphasis on large trees and their benefits for ecosystem preservation, climate issues, and therapeutic potential. Highlights the nontimber-related attributes of large old trees, including biomedical, social, spiritual, and historical benefits.

227. **Gilliam, F.S.; Platt, W.J. 1999.** Effects of long-term fire exclusion on tree species composition and stand structure in an old-growth *Pinus palustris* (longleaf pine) forest. Plant Ecology. 140(1): 15–26.

Quantifies the composition, structure, and longleaf regeneration patterns in a fire-excluded, old-growth longleaf pine stand in the Sandhills of North Carolina. Longleaf pine recruitment quickly diminished after fire exclusion on mesic sites but remained high for circa 60 years postfire exclusion on xeric sites. Fire exclusion resulted in a high density of hardwoods and a significant reduction in longleaf pine regeneration. Makes comparisons between this site (Boyd tract) and the frequently burned Wade tract in Georgia.

228. **Gilliam, F.S.; Yurish, B.M.; Goodwin, L.M. 1993.** Community composition of an old growth longleaf pine forest: relationship to soil texture. Bulletin of the Torrey Botanical Club. 120(3): 287–294. https://doi.org/10.2307/2996993.

Examines old-growth longleaf pine composition in relation to elevation and soil characteristics on the Boyd Tract in the Sandhills of North Carolina. Sampling was stratified by two site types: mesic uplands and xeric lowlands. Soil texture influenced hardwood species distribution in the old-growth stand, but not longleaf pine abundance. Upland sites had soils more likely to support oak-hickory forests of the Piedmont.

229. **Glitzenstein, J.S.; Harcombe, P.A.; Streng, D.R. 1986.** Disturbance, succession, and maintenance of species diversity in an east Texas forest. Ecological Monographs. 56(3): 243–258. https://doi.org/10.2307/2937076.

Studies an old, partially cut pine-hardwood stand in the Big Thicket region of southeastern Texas by using dendrochronology and size distributions to examine succession, disturbance, and tree recruitment over a 200-year period.

230. Goebel, P.C.; Hix, D.M. 1996. Development of mixed-oak forests in southeastern Ohio: a comparison of second-growth and old-growth forests. Forest Ecology and Management. 84(1–3): 1–21. https://doi.org/10.1016/0378-1127(96)03772-3.

Uses old-growth mixed-oak forests as a benchmark to compare the composition, structure, and stand dynamics of multiple relatively undisturbed adjacent second-growth forests on south slopes in Ohio. Forests were primarily mixed-oak dominated, with shade-tolerant species in the understory.

231. Goebel, P.C.; Hix, D.M.; Olivero, A.M. 1999. Seasonal ground-flora patterns and site factor relationships of second-growth and old-growth south-facing forest ecosystems, southeastern Ohio, USA. Natural Areas Journal. 19(1): 12–29.

Compares ground flora communities between second- and old-growth (>150 years old) mixed oak forests during three sampling periods (early spring, late spring, and summer). In each sampling period, ground flora richness, diversity, and cover were higher in old-growth stands.

232. Goessling, J.M.; Rebois, K.; Godwin, J.C.; Birkhead, R.; Murray, C.M.; Hermann, S.M. 2017. Differences in fluctuating asymmetry among four populations of gopher tortoises (*Gopherus polyphemus*). Herpetological Conservation and Biology. 12(2): 548–555.

Assesses fluctuating asymmetry (i.e., the deviation of an individual from perfect bilateral symmetry, which can be an indicator of genetic or environmental stress) among four gopher tortoise populations in the old-growth Wade Tract, Gopher Island, Conecuh National Forest, and southeastern Mississippi. Fluctuating asymmetry was highest in tortoise populations in a fire-suppressed second-growth loblolly pine plantation in Mississippi, and lowest in second-growth mixed pine-oak stands in the Conecuh National Forest.

233. Golden, M.S. 1981. An integrated multivariate analysis of forest communities of the central Great Smoky Mountains. American Midland Naturalist. 106(1): 37–53. https://doi.org/10.2307/2425133.

Uses multivariate approaches to identify and analyze vegetation and vegetation-site relationships in the Great Smoky Mountains National Park. Results yielded 19 unique forest community types that were related to elevation, topography, disturbance history, and American chestnut mortality.

234. Goode, J.D. 2023. The influence of disturbance on the creation and maintenance of *Quercus-Pinus* mixedwoods. Tuscaloosa, AL: University of Alabama. 171 p. Ph.D. dissertation.

Characterizes the influence of historical and contemporary disturbance (wind and low-intensity surface fire) on shortleaf pine neighborhood composition and structure at various spatial scales in an old-growth mixed oak-shortleaf pine forest on the Cumberland Plateau, TN.

235. Goode, J.D.; Barefoot, C.R.; Hart, J.L.; Dey, D.C. 2020. Disturbance history, species diversity, and structural complexity of a temperate deciduous forest. Journal of Forestry Research. 31(2): 397–414. https://doi.org/10.1007/s11676-018-0746-y.

Quantifies the compositional diversity, structural complexity, and disturbance history of a second-growth white oak stand on the Cumberland Plateau, AL. Stand structure was multiaged, and the younger cohort established after selective harvesting. Results indicate some evidence of old-growth structure and may offer insight into the development of upland oak stands with a history of selective harvesting.

236. Goode, J.D.; Hart, J.L.; Dey, D.C.; Torreano, S.J.; Clark, S.L. 2021. Spatial patterns of canopy disturbance and shortleaf pine in a mixedwood forest. Forest Science. 67(4): 433–445. https://doi.org/10.1093/forsci/fxab017.

Quantifies spatial distribution of shortleaf pine-dominated neighborhoods in an old-growth oak-dominated stand on the Cumberland Plateau, TN. Shortleaf pine neighborhoods were spatially clustered, and this pattern was a function of historical canopy disturbance patterns.

237. Goode, J.D.; Narayanan, A.; Phillips, D.L.; Hart, J.L.; Torreano, S.J.; Dey, D.C. 2022. Intermediate-severity disturbance impacts in a mixedwood forest: a multi-scale analysis. Forest Ecology and Management. 526: 120582. 16 p. https://doi.org/10.1016/j.foreco.2022.120582.

Assesses the impacts of an intermediate-severity wind disturbance on shortleaf pine-dominated neighborhood composition and structure in an old-growth mixed oak-shortleaf pine forest on the Cumberland Plateau, TN.

238. Grace, S.L.; Hamrick, J.L.; Platt, W.J. 2004. Estimation of seed dispersal in an old-growth population of longleaf pine (*Pinus palustris*) using maternity exclusion analysis. Castanea. 69(3): 207–215. https://doi.org/10.2179/0008-7475(2004)069<0207:EOSDIA>2.0.CO;2.

Estimates seed dispersal distance in an old-growth longleaf pine stand (Wade Tract) in southwestern Georgia. Approximately 80 percent of seeds had more than one maternal parent, and peak seed dispersal occurred between 35 and 60 m from the parent tree. Results indicate that longleaf pine seeds may be dispersed at greater distance than previously reported in the literature, especially in old-growth populations.

239. Grace, S.L.; Platt, W.J. 1995. Effects of adult tree density and fire on the demography of pregrass stage juvenile longleaf pine (*Pinus palustris* Mill.). Journal of Ecology. 83(1): 75–86. https://doi.org/10.2307/2261152.

Quantifies the survival, growth, and density of pregrass stage longleaf pine seedlings in relation to proximity to adult longleaf pine on the Wade Tract in southern Georgia. Longleaf pine seedling density and survival was higher at greater distances from mature longleaf pine. Longleaf pine seedlings were larger and had higher rates of survival in areas of lower needle litter accumulation, which was likely a function of lower fire intensity.

240. Greenberg, C.H.; McLeod, D.E.; Loftis, D.L. 1997. An old-growth definition for western and mixed mesophytic forests. Gen. Tech. Rep. SRS-16. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 14 p. https://doi.org/10.2737/SRS-GTR-16.

Provides definitions and associated characteristics of western mesophytic forests of the Interior Low Plateau, southern Central Lowland, Ozark Plateaus, Ouachita physiographic provinces, and northern Coastal Plain along the Mississippi River, and mixed mesophytic forests of the southern Appalachian Mountains. This was part of the larger effort to develop old-growth definitions for 35 forest types in the Eastern United States.

241. Greenberg, C.H.; Simons, R.W. 1999. Age, composition, and stand structure of old-growth oak sites in the Florida high pine landscape: implications for ecosystem management and restoration. Natural Areas Journal. 19(1): 30–40.

Quantifies composition and age structure of understory xeric oaks in the high pine system of Florida. Some turkey oak and sand post oak established prior to 1900 and were variable in size, which indicates that historical fire frequency and intensity was variable and thus allowed these xeric oaks to reach and maintain tree sizes in various densities across the high pine landscape.

242. Grell, A.G.; Shelton, M.G.; Heitzman, E. 2004. Influences of elevation on overstory species composition in an old-growth bottomland hardwood-loblolly pine forest in southern Arkansas. In: Connor, K.F., ed. Proceedings of the 12th biennial southern silvicultural research conference. Gen. Tech. Rep. SRS-71. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 528–530.

Quantifies the relationship between elevation and species composition and structure in an old-growth bottomland hardwood-loblolly pine forest in Arkansas. Differences in species assemblages were influenced by subtle elevational variation.

243. Grell, A.G.; Shelton, M.G.; Heitzman, E. 2005. Changes in plant species composition along an elevation gradient in an old-growth bottomland hardwood-*Pinus taeda* forest in southern Arkansas. Journal of the Torrey Botanical Society. 132(1): 72–89. https://doi.org/10.3159/1095-5674(2005)132[72:CIPSCA]2.0.CO;2.

Quantifies the relationship between elevation and species composition and structure in an old-growth bottomland hardwood-loblolly pine forest in Arkansas. Differences in species assemblages were influenced by subtle elevational variation.

244. Griffin, R.D.; Stahle, D.W.; Therrell, M.D. 2005. Repeat photography in the ancient Cross Timbers of Oklahoma, USA. Natural Areas Journal. 25(2): 176–182.

Uses long-term repeat photography to document landscape change in an old-growth forest on steep uplands of the Cross Timbers, OK.

245. Griscom, H.P.; Griscom, B.G.; Siderhurst, L. 2014. Spatial dynamics of canopy trees in an old growth eastern hemlock forest in the central Appalachian Highlands. Natural Areas Journal. 34(1): 99–104. https://doi.org/10.3375/043.034.0111.

Assesses spatial patterns of eastern hemlock trees by age and size in an old-growth forest at Cathedral State Park, WV. Age classes were spatially distinct, and older trees were significantly closer to the stream, which was thought to act as refugia from wind disturbance.

246. Guldin, J.M. 1991. Silvicultural practices applied to old-growth stand management. In: Henderson, D.; Hedrick, L.D., eds. Restoration of old growth forests in the Interior Highlands of Arkansas and Oklahoma. Winrock International and Hot Springs, AR: Ouachita National Forest: 171–190.

Provides a general discussion of the silvicultural aspects of managing for old growth, from no treatment to various activities to enhance, restore, or otherwise alter stand composition and structure.

247. Guldin, J.M.; Smith, J.R.; Thompson, L. 1990. Stand structure of an old-growth upland hardwood forest in Overton Park, Memphis, Tennessee. In: Mitchell, R.S.; Sheviak, C.J.; Leopold, D.J., eds. Ecosystem management: rare species and significant habitats: Proceedings of the 15th annual natural areas conference. Bull. 471. Albany, NY: New York State Museum, University of the State of New York: 61–66.

Describes the composition, structure, and gap-phase succession of an old-growth urban forest in Memphis. Authors were hesitant to commit to an old-growth designation because early successional trees occurred in the overstory. The stand lacked oaks in the sapling and small-diameter size class, which was partly attributed to competition from nonnative species. Advance reproduction of oak was abundant in the seedling size class. Authors suggested that nonnative species control would help restore the gap-phase ecological process by which oaks and other desirable species regenerate.

248. Guyon, L.J.; Rolfe, G.L.; Edgington, J.M.; Mendoza, G.A. 2003. A comparative analysis of the diversity of woody vegetation in old-growth and secondary southern Appalachian cove forests. In: Van Sambeek, J.W.; Dawson, J.O.; Ponder, F., Jr.; Loewenstein, E.F.; Fralish, J.S., eds. Proceedings of the 13th central hardwood forest conference. Gen. Tech. Rep. NC-234. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station: 75–87.

Compares woody vegetation between old-growth and second-growth southern Appalachian cove forests. Old-growth stands were dominated by eastern hemlock and second-growth stands were dominated by tulip poplar. Second-growth stands supported greater overstory and understory woody plant species richness.

249. Haasis, F.W. 1923. Significance of a 255-year age class in an eastern Kentucky forest. Journal of Forestry. 21(7): 700–704.

Describes a prominent 240- to 260-year-old age class in oak-dominated upland stands in southeastern Kentucky that had a scattering of older individuals between 270 and 400 years old, which the author believed may have resulted following a major drought and coincident fire(s).

250. Hale, P.M. 1883. The woods and timbers of North Carolina. New York, NY: E.J. Hale and Son. 272 p. https://doi.org/10.5962/bhl.title.32704.

Provides a variety of brief accounts, including reports from local correspondents, on the virgin forests of many counties in North Carolina. These include descriptions of tree size [such as "swamp pines" (loblolly, presumably) from "5 to 7 feet in diameter" from Pender County (p. 254b)]. Provides mostly superficial accounts of species composition and stocking in these old forests, along with some relative proportions of original to second-growth forest.

251. Hall, R.B.W.; Harcombe, P.A. 2001. Sapling dynamics in a southeastern Texas floodplain forest. Journal of Vegetation Science. 12(3): 427–438. https://doi.org/10.2307/3236857.

Quantifies the temporal variability of sapling recruitment and mortality in a mature floodplain forest in Texas. Recruitment and mortality dynamics were attributed to flooding, drought, and soil moisture availability.

252. Hall, T.F.; Penfound, W.T. 1939. A phytosociological study of a cypress-gum swamp in southeastern Louisiana. American Midland Naturalist. 21(2): 378–395. https://doi.org/10.2307/2420543.

Describes a virgin cypress-gum and pure gum swamp in the Pearl River Valley, LA. Discusses historical ecology, site and soil characteristics, and vegetation composition and structure.

253. Hall, T.F.; Penfound, W.T. 1939. A phytosociological study of *Nyssa biflora consocies* in southeastern Louisiana. American Midland Naturalist. 22(2): 369–375. https://doi.org/10.2307/2420315.

Describes a nearly pure old-growth swamp tupelo stand on Gum Creek, a tributary of the Pearl River, LA. Trees in the stand were circa 200 years old in 1938.

254. Hall, T.F.; Penfound, W.T. 1943. Cypress-gum communities in the Blue Girth Swamp near Selma, Alabama. Ecology. 24(2): 208–217. https://doi.org/10.2307/1929701.

Describes vegetation composition and site characteristics of an old-growth cypress-tupelo and pure cypress swamp in the floodplain of the Alabama River. Basal area ranged from 336 to 481 square feet per acre.

255. Halpin, P.N. 1990. Planning Considerations for the Long-Term Reestablishment of Old-Growth Forest Stands in The George Washington National Forest: 208–217. https://doi.org/10.2307/1929701.

Describes vegetation composition and site characteristics of an old-growth cypress-tupelo and pure cypress swamp in the floodplain of the Alabama River. Basal area ranged from 336 to 481 square feet per acre.

256. Hamel, P.B.; Buckner, E.R. 1998. How far could a squirrel travel in the treetops? A prehistory of the southern forest. In: Wadsworth, K.G., ed. Transactions of the 63rd North American wildlife and natural resources conference. Washington, DC: Wildlife Management Institute: 309–315.

Suggests time periods as potential candidates for the natural condition of southern forests: pre-English colonies settlement (circa 1607), late glacial times, and pre-European settlement (circa 1492). Concludes that no specific past time period can be said to represent the true natural condition of southern forests because human activity has shaped them for millennia.

257. Hamel, P.B.; Foti, T.L., eds. 2001. Bottomland hardwoods of the Mississippi Alluvial Valley: characteristics and management of natural function, structure, and composition. Gen. Tech. Rep. SRS-42. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 109 p. https://doi.org/10.2737/SRS-GTR-42.

Proceedings from a symposium on bottomland hardwood forests of the Mississippi Alluvial Valley as part of the Natural Areas Conference in 1995. Old-growth-related papers estimate the amount of old growth (p. 28), assess bird (p. 65) and mammal populations (p. 83) in old growth, and offer long-term perspectives on bottomland hardwood old growth (p. 106).

258. Hammond, D.H.; Varner, J.M.; Fan, Z.; Kush, J.S. 2016. Long-term stand dynamics of old-growth mountain longleaf pine (*Pinus palustris*) woodlands. Forest Ecology and Management. 364: 154–164. https://doi.org/10.1016/j.foreco.2015.12.029.

Assesses stand dynamics of two old-growth montane longleaf pine stands in northeastern Alabama over a 15-year period.

259. Hamrick, J. 2020. Our future has its roots in the past. Forest History Today. 26(1&2): 34–39.

Discusses history of a virgin longleaf pine stand and shortleaf pine stand in east Texas visited by Yale students and faculty in 1909 and 1911, respectively. The students developed a management plan that was largely ignored by the lumber companies at that time, but the historical data collected from the virgin pine forests were later used to restore presettlement pine composition and structure in the Cooks Branch Conservancy, an approximately 5,750-acre conservation area about 50 miles south of the original longleaf and shortleaf pine stands.

260. Hamrick, J.L.; Godt, M.J.W.; Gonzales, E. 2006. Conservation of genetic diversity in old-growth forest communities of the southeastern United States. Applied Vegetation Science. 9(1): 51–58. https://doi.org/10.1111/j.1654-109X.2006.tb00655.x.

Assesses genetic diversity of species with different life forms that occur in two old-growth community types: longleaf pine and oak-hickory-pine. Dominant species such as northern red oak and longleaf pine maintained within-population genetic diversity, but the genetic diversity of some understory species was more variable between populations. Concludes that conservation of old-growth plant communities may want to account for heterogeneity in individual traits and environmental conditions to ensure long-term fitness of populations and species.

261. Hanberry, B.B.; Bragg, D.C.; Hutchinson, T.F. 2018. A reconceptualization of open oak and pine ecosystems of eastern North America using a forest structure spectrum. Ecosphere. 9(10): e02431. 22 p. https://doi.org/10.1002/ecs2.2431.

Develops a canopy closure model to clarify the difference in autoecology, site conditions, and disturbance regimes that drive open versus closed canopy forests in eastern North America, with an emphasis on historical open-canopy, frequent-fire forests.

262. Hanberry, B.B.; Brzuszek, R.F.; Foster, H.T., II; Schauwecker, T.J. 2019. Recalling open old growth forests in the Southeastern Mixed Forest province of the United States. Ecoscience. 26(1): 11–22. https://doi.org/10.1080/11956860.2018.1499282.

Quantifies the historical composition of the Southeastern Mixed Forest province using General Land Office witness tree records. Mixed oak-pine systems were historically ubiquitous across the region, but, in contemporary forests pine composition increased and upland oaks decreased. These historical oak-pine forests experienced conversion to pine plantations and broadleaved forests. Old-growth oak-pine forests maintained by frequent fire were determined to be distinct ecosystems that merit restoration and conservation.

263. **Hanberry, B.B.; Coursey, K.; Kush, J.S. 2018.** Structure and composition of historical longleaf pine ecosystems in Mississippi, USA. Human Ecology. 46(2): 241–248. https://doi.org/10.1007/s10745-018-9982-1.

Uses General Land Office surveys to reconstruct historical composition, structure, and extent of longleaf pine in Mississippi prior to widespread logging and fire exclusion and compares these data to contemporary longleaf pine conditions. Results indicate a reduction in existing longleaf pine density, and an increase in broadleaf density and total tree density, which suggests conversion from open woodlands to closed-canopy forests.

264. **Haney, J.C.; Lydic, J. 1999.** Avifauna and vegetation structure in an old-growth oak-pine forest on the Cumberland Plateau, Tennessee (USA). Natural Areas Journal. 19(3): 199–210.

Compares breeding bird populations between old-growth and second-growth mixed pine-hardwood stands on the Cumberland Plateau, TN. Old-growth structural attributes, such as abundance of snags, supported a higher density of breeding birds. Also provides a description of the vegetation composition and structure of this old-growth remnant. Shortleaf pine (>200 years old) stratified above white oak and northern red oak.

265. **Hanula, J.L.; Engstrom, R.T. 2000.** Comparison of red-cockaded woodpecker (*Picoides borealis*) nestling diet in old-growth and old-field longleaf pine (*Pinus palustris*) habitats. American Midland Naturalist. 144(2): 370–376. https://doi.org/10.1674/0003-0031(2000)144[0370:CORCWP]2.0.CO;2.

Compares diet of red-cockaded woodpecker nestlings on or near an old-growth longleaf pine site in Georgia to an old-field site in South Carolina. Cockroaches were the most common prey item fed to nestlings across both sites. Nestlings across both sites had a high degree of dietary overlap, suggesting that old trees on old-growth sites support similar prey as young trees on old-field sites.

266. **Hanula, J.L.; Franzreb, K.E.; Pepper, W.D. 2000.** Longleaf pine characteristics associated with arthropods available for red-cockaded woodpeckers. Journal of Wildlife Management. 64(1): 60–70. https://doi.org/10.2307/3802975.

Assesses availability of arthropod prey for red-cockaded woodpeckers on longleaf pine trees in the Escambia Experimental Forest, AL, and the Blackwater State Forest, FL. Longleaf pines surveyed ranged from 20 to 100 years old. Abundance of arthropods increased with bark thickness and tree diameter but decreased with basal area. Arthropod biomass peaked in stands at 65 to 70 years old, but biomass per hectare was highest in younger stands.

267. **Harcombe, P.A.; Marks, P.L. 1983.** Five years of tree death in a *Fagus-Magnolia* forest, southeast Texas (USA). Oecologia. 57(1-2): 49–54. https://doi.org/10.1007/BF00379561.

Tracks tree and sapling mortality in a mixed loblolly pine-hardwood forest in Texas. The overstory was dominated by loblolly pine, American beech, southern magnolia, and oak. The majority of tree mortality remained standing and was primarily killed by beetles or wind. The successional trajectory indicated replacement of loblolly pine and oak by beech and magnolia.

268. **Hardt, R.A.; Swank, W.T. 1997.** A comparison of structural and compositional characteristics of southern Appalachian young second-growth, maturing second-growth, and old-growth stands. Natural Areas Journal. 17(1): 42–52.

Compares stand composition and structure among old-growth, maturing second-growth, and young second-growth stands in three sites in the southern Appalachian Mountains: Ellicott Rock Wilderness, Walker Cover Research Natural Area, and Coweeta Hydrologic Laboratory. Results showed variability in species composition, deadwood loading, diversity, and other stand structural metrics.

269. Harms, W.R. 1996. An old-growth definition for wet pine forests, woodlands, and savannas. Gen. Tech. Rep. SRS-2. Asheville, NC: U.S. Department of Agriculture, Forest Service Southern Research Station. 7 p. https://doi.org/10.2737/SRS-GTR-2.

Provides definitions and associated characteristics of wet pine forests, woodlands, and savannas as part of the larger effort to develop old-growth definitions for 35 forest types in the Eastern United States. Primary tree species were longleaf pine, slash pine, and pond pine. Sites were seasonally wet, with sandy soils of low organic matter content. Low-intensity fire was an important component of the disturbance regime in these systems.

270. Harper, R.M. 1912. Botanical evidence of the age of certain ox-bow lakes. Science. 36(935): 760–761. https://doi.org/10.1126/science.36.935.760.

Describes the author's experiences examining old cypress across the Southern United States and the development of the flat top in baldcypress, which he thought formed at 100 to 300 years of age.

271. Harper, R.M. 1914. The coniferous forests of eastern North America. Popular Science Monthly. 85: 338–361.

Describes the major conifer types found across eastern North America (primarily the United States), from the boreal forests in the north to the subtropical pine and cypress stands of southern Florida, west to the Great Plains. Only a few passing references to old-growth stands, but describes virgin longleaf pine forests as being so open as to be able to see about a quarter-mile in every direction, with the understory being carpeted by grasses or low shrubs. Describes fire as the primary mechanism of this openness and provides multiple photographs of old-growth conifer forests, especially longleaf, shortleaf, and slash pines.

272. Hart, J.L.; Buchanan, M.L.; Clark, S.L.; Torreano, S.J. 2012. Canopy accession strategies and climate-growth relationships in *Acer rubrum*. Forest Ecology and Management. 282: 124–132. https://doi.org/10.1016/j.foreco.2012.06.033.

Quantifies canopy accession strategies and climate-growth relationships of red maple in an old-growth upland oak forest on the Cumberland Plateau, TN. The majority of red maple established in a 20-year window between 1940 and 1960 and in a gap environment without suppression, prior to recruitment into the canopy.

273. Hart, J.L.; Clark, S.L.; Torreano, S.J.; Buchanan, M.L. 2012. Composition, structure, and dendroecology of an old-growth *Quercus* forest on the tablelands of the Cumberland Plateau, USA. Forest Ecology and Management. 266: 11–24. https://doi.org/10.1016/j.foreco.2011.11.001.

Quantifies woody species composition, structure, and radial growth, and reconstructs canopy disturbance history of a multiaged, old-growth, oak-dominated forest, with a minor pine component, on the Cumberland Plateau, TN. Disturbance history reconstruction indicates that oaks recruited via gap-phase regeneration, and pines established in patches that corresponded to canopy disturbance.

274. Hart, J.L.; Cowden, M.M.; Torreano, S.J.; Vestal, P.R. 2015. Disturbance, succession, and structural development of an upland hardwood forest on the Interior Low Plateau, Tennessee. Natural Areas Journal. 35(4): 557–573. https://doi.org/10.3375/043.035.0408.

Quantifies composition, stand structure, canopy disturbance history, and oak establishment and canopy accession patterns to document processes that resulted in the structural conditions of an upland hardwood forest in Tennessee. The forest established in the mid-1800s and exhibited structural characteristics that were similar to those reported from other old-growth forests in the region.

275. Hart, J.L.; Grissino-Mayer, H.D. 2009. Gap-scale disturbance processes in secondary hardwood stands on the Cumberland Plateau, Tennessee, USA. Plant Ecology. 201(1): 131–146. https://doi.org/10.1007/s11258-008-9488-9.

Examines gap-scale disturbance processes and patterns in a second-growth oak-hickory stand on the Cumberland Plateau, TN. Gap fraction was similar to values reported from old growth in the same region, but gap size was smaller than old-growth estimates. Because of the smaller size, gaps were projected to close from lateral canopy expansion rather than understory gap capture. Results reveal differential gap-phase succession processes between second growth and old growth.

276. **Hart, J.L.; Horn, S.P.; Grissino-Mayer, H.D. 2008.** Fire history from soil charcoal in a mixed hardwood forest on the Cumberland Plateau, TN, USA. Journal of the Torrey Botanical Society. 135(3): 401–410. https://doi.org/10.3159/08-RA-013.1.

Uses macroscopic charcoal samples to reconstruct the fire history of an upland mixed oak-hickory forest on the Cumberland Plateau, TN. Results revealed that the site experienced at least five fires over the last 6,700 years, and that fire effects were likely patchy at a fine spatial scale.

277. **Hart, J.L.; Kupfer, J.A. 2011.** Sapling richness and composition in canopy gaps of a southern Appalachian mixed *Quercus* forest. Journal of the Torrey Botanical Society. 138(2): 207–219. https://doi.org/10.3159/TORREFY-D-11-00006.1.

Quantifies sapling community dynamics in canopy gaps in a second-growth southern Appalachian mixed oak forest. Reports information on gap size, gap formation mechanisms, and the effects of site characteristics on sapling composition. Oak and hickory saplings were most abundant in small gaps on xeric sites.

278. **Hart, J.L.; van de Gevel, S.L.; Grissino-Mayer, H.D. 2008.** Forest dynamics in a natural area of the southern Ridge and Valley, Tennessee. Natural Areas Journal. 28(3): 275–289. https://doi.org/10.3375/0885-8608(2008)28[275:FDIANA]2.0.CO;2.

Documents composition, structure, and stand dynamics of a second-growth upland oak-tulip poplar site in the Ridge and Valley physiographic province of eastern Tennessee. Discusses stand dynamics in the context of agricultural abandonment, loss of American chestnut, fire, and succession towards mesophytic species dominance.

279. **Hartnett, D.C.; Krofta, D.M. 1989.** Fifty-five years of post-fire succession in a southern mixed hardwood forest. Bulletin of the Torrey Botanical Club. 116(2): 107–113. https://doi.org/10.2307/2997194.

Assesses forest succession and stand dynamics over a 55-year period in a southern mixed hardwood stand in central Florida. When fire was excluded from the stand in 1930, longleaf pine experienced radial growth decline and regeneration failure and was replaced by a cohort of sweetgum and other hardwoods.

280. **Hebb, E.A.; Clewell, A.F. 1976.** A remnant stand of old-growth slash pine in the Florida panhandle. Bulletin of the Torrey Botanical Club. 103(1): 1–9. https://doi.org/10.2307/2484742.

Describes the vegetation composition and stand structure of an old-growth slash pine stand in Florida. The understory was composed of broadleaved evergreens with a notable lack of pine reproduction, which was attributed to lack of fire. Authors posited that, without management intervention the old-growth canopy will be succeeded by a sweetbay-blackgum community.

281. **Heitzman, E.; Shelton, M.G.; Grell, A. 2004.** Species composition, size structure, and disturbance history of an old-growth bottomland hardwood-loblolly pine (*Pinus taeda* L.) forest in Arkansas, USA. Natural Areas Journal. 24(3): 177–187.

Quantifies the composition, structure, and radial growth patterns of a 16-ha old-growth bottomland hardwood-loblolly pine stand in southcentral Arkansas. The oldest cohort of oak-hickory and pine recruited in the 1860s following a stand-level disturbance event.

282. **Held, M.E.; Bryant, W.S.; Winstead, J.E. 2006.** Thirty years of recovery in a tornado-damaged forest in northern Kentucky. Journal of the Kentucky Academy of Science. 67(2): 81–86. https://doi.org/10.3101/1098-7096(2006)67[81:TYORIA]2.0.CO;2.

Examines stand dynamics and posttornado recovery patterns of an old-growth mesic hardwood forest in northern Kentucky over a 30-year period. By 2004, the stand had nearly recovered to pretornado composition.

283. **Held, M.E.; Jones-Held, S.; Winstead, J.E. 1998.** Forest community structure and tornado damage in an old-growth system in northern Kentucky. Castanea. 63(4): 474–481.

Quantifies stand dynamics and recovery patterns of an old-growth maple forest in Kentucky following a tornado. Over time, the catastrophic windstorm decreased species diversity and increased sugar maple across the seedling, sapling, and canopy layers.

284. **Held, M.E.; Winstead, J.E. 1975.** Basal area and climax status in mesic forest systems. Annals of Botany. 39(5): 1147–1148. https://doi.org/10.1093/oxfordjournals.aob.a085038.

Examines forest systems considered to represent climax stands in the central region of the eastern deciduous forest of North America and found a remarkably consistent basal area (30 m^2/ha). Discusses variability in basal area across the region of interest, and calls for consistent sampling approaches so that robust comparisons can be made. Also acknowledges the influence of site productivity on basal area growth.

285. **Helm, A.C.; Nicholas, N.S.; Zedaker, S.M.; Young, S.T. 1991.** Maritime forests on Bull Island, Cape Romain, South Carolina. Bulletin of the Torrey Botanical Club. 118(2): 170–175. https://doi.org/10.2307/2996858.

Describes composition and structure of an old-growth maritime loblolly pine stand and live oak stand prior to hurricane disturbance in 1989. Average age of loblolly pine was 107 years. These forests were considered "salt spray climax" because of dominant species resistance to salt spray injury. Subsequent published articles describe the impact of the hurricane and damage to these old-growth stands.

286. **Helmer, E.H. 2004.** Forest conservation and land development in Puerto Rico. Landscape Ecology. 19: 29–40. https://doi.org/10.1023/B:LAND.0000018364.68514.fb.

Summarizes islandwide land use-land cover change in Puerto Rico between 1977 and 1992, and then models the likelihood of development based on land cover type. Results have implications in management and planning of the forest reserve system in Puerto Rico.

287. **Hendrix, F.F., Jr.; Campbell, W.A. 1970.** *Phytophthora* and *Pythium* species from old growth forest sites in Kentucky, North Carolina, and Tennessee. [Abstract]. Phytopathology. 60(9): 1295. https://doi.org/10.1094/Phyto-60-16.

Collects soil samples to isolate *Pythium* and *Phytophthora* fungus community composition in four old-growth southern Appalachian forests. [Abstract from paper accepted for presentation at the sixty-second annual meeting of the American Phytopathological Society, Hot Springs, AR, 1970, October 4–8.]

288. **Hendrix, F.F., Jr.; Campbell, W.A.; Chien, C.Y. 1971.** Some Phycomycetes indigenous to soils of old growth forests. Mycologia. 63(2): 283–289. https://doi.org/10.1080/00275514.1971.12019109.

Samples microfaunal soil fungi (*Phytophthora* and *Pythium*) in four old-growth southern Appalachian forests in Kentucky, Tennessee, and North Carolina.

289. **Hepting, G.H.; Chapman, A.D. 1938.** Losses from heart rot in two shortleaf and loblolly pine stands. Journal of Forestry. 36(12): 1193–1201.

Examines the rate of heart rot in two old-growth shortleaf and loblolly pine stands in eastern Texas. Stands were both uneven aged, with pines up to 150–250 years old and predominantly shortleaf pine, with <8 percent loblolly pine. These virgin stands had high rates of heart rot (mostly red-heart), primarily attributed to frequent fires that damaged the lower bole.

290. **Heyward, F. 1939.** The relation of fire to stand composition of longleaf pine forests. Ecology. 20(2): 287–304. https://doi.org/10.2307/1930747.

Provides a stand table (diameter at breast height by species) of a virgin (150- to 200-year-old) longleaf pine stand in Georgia and a culled stand of old growth (age not given) in southern Alabama, and describes how both stands were affected by either fire suppression or continued frequent fire.

291. **Hicks, W.T. 1939.** Forest resources of the Piedmont region of South Carolina. Forest Survey Release 2. Asheville, NC: U.S. Department of Agriculture, Forest Service, Appalachian Forest Experiment Station. 31 p. https://doi.org/10.5962/bhl.title.122469.

Reports on first Forest Service forest survey of the Piedmont region, SC (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: shortleaf pine, loblolly pine, Virginia pine, upland and bottomland hardwoods.

292. **Hirth, D.H.; Harris, L.D.; Noss, R.F. 1991.** Avian community dynamics in a peninsular Florida longleaf pine forest. Florida Field Naturalist. 19(2): 33–64.

Studies the avian community in an old-growth longleaf pine forest in central Florida that had been "turpentined" in the early 20th century and had cattle grazing and regular controlled burning up to 1960, then no grazing and little burning until the late 1970s.

293. **Hogan, J.A.; Zimmerman, J.K.; Thompson, J.; Nytch, C.J.; Uriarte, M. 2016.** The interaction of land-use legacies and hurricane disturbance in subtropical wet forest: twenty-one years of change. Ecosphere. 7(8): e01405. 18 p. https://doi.org/10.1002/ecs2.1405.

Assesses effects of hurricane disturbance and patterns of recovery over a 21-year period in forests of different stages of development and land-use history in the Luquillo Forest Dynamics Plot in northeastern Puerto Rico. Patterns of damage and recovery differed between stands with variable land-use legacies.

294. **Holt, E.G. 1920.** Bachman's warbler breeding in Alabama. Auk. 37(1): 103–104. https://doi.org/10.2307/4072965.

Describes the nesting site of Bachman's warbler as being in a small burned-over area surrounded by old-growth bottomland hardwood forest in Bear Swamp, southern Autauga County, AL.

295. **Holt, J.P. 1974.** Bird populations in the hemlock sere on the Highlands Plateau, North Carolina, 1946 to 1972. Wilson Bulletin. 86(4): 397–406.

Presents results from a census of bird species abundance over a 25-year period in three forest types on the Blue Ridge in North Carolina: mesic shrubland, hemlock-hardwood, and old-growth eastern hemlock. Bird density and species richness were greatest in the intermediate-stage oak-hickory forest.

296. **Holt, J.P. 2000.** Changes in bird populations on the Highlands Plateau, North Carolina (USA), 1946–1995, with emphasis on neotropical migrants. Natural Areas Journal. 20(2): 119–125.

Conducts a survey of birds across four periods (1946–1947, 1959–1960, 1971–1972, 1993–1995) and three forest types (intermediate-age hemlock hardwood, old-growth hemlock, and intermediate-age hardwood forest) in North Carolina's Highlands Plateau. More recently, the old-growth site (4.8 ha) was surrounded by extensive development and became an isolated fragment. Neotropical migrants declined over time across all forest types, including the old-growth hemlock site. Resident species and short-distance migrants remained stable or increased over time in the old-growth site.

297. **Hooper, R.G. 1988.** Longleaf pines used for cavities by red-cockaded woodpeckers. Journal of Wildlife Management. 52(3): 392–398. https://doi.org/10.2307/3801579.

Surveys young (<80 years old) and old (>100 years old) longleaf pines in the Osceola, Ocala, and Francis Marion National Forests used and not used for cavities by red-cockaded woodpeckers. Red-cockaded woodpeckers preferred to use older trees to excavate cavities because they were more prone to be infected with heart rot. These results support past recommendations of providing red-cockaded woodpeckers older longleaf pine (95+ years old) for cavity excavation.

298. **Hooper, R.G. 1996.** Arthropod biomass in winter and the age of longleaf pines. Forest Ecology and Management. 82(1): 115–131. https://doi.org/10.1016/0378-1127(95)03675-X.

Surveys longleaf pine trees for arthropod availability for red-cockaded woodpeckers in the Francis Marion National Forest in the winter. Longleaf pines ranged in age from 22 to 127 years old. Total arthropod availability increased with tree age up to 86 years, after which it declined. Dead limbs on older trees also had greater arthropod biomass.

299. **Hutton, J.M.; Price, S.J.; Richter, S.C. 2017.** The diet of the Cumberland Plateau salamander (*Plethodon kentucki*) in an old growth forest of southeastern Kentucky. American Midland Naturalist. 178(1): 144–150. https://doi.org/10.1674/0003-0031-178.1.144.

Examines the diet of the Cumberland Plateau salamander in the old-growth, mixed mesophytic Lilley Cornett Woods, KY. Results also provide insight into insect communities in the study area.

300. **Igelman, J. 2019.** To cut or not to cut? Disagreement over US Forest Service's plans for trees. Carolina Public Press. https://carolinapublicpress.org/28928/to-cut-or-not-to-cut-disagreement-over-us-forest-services-plans-for-trees/. [Date accessed: 13 September 2022].

Describes a disagreement between environmental conservancy groups and the Forest Service regarding the presence of old growth in planned harvest units of the Southside Project on the Nantahala and Pisgah National Forests. The project faced steep opposition from many stakeholders.

301. **Ineson, F.A.; Eldredge, I.F. 1938.** Forest resources of northeastern Florida. Misc. Publ. 313. Washington, DC: U.S. Department of Agriculture. 40 p. + maps. https://doi.org/10.5962/bhl.title.65592.

Reports on first Forest Service forest survey of northeastern Florida (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species, including turpentine and nonturpentine pines, hardwoods, and baldcypress.

302. **Jackson, B.C., Jr. 2008.** Assessing species composition in second growth and old growth rich coves of the southern Appalachians. Raleigh, NC: North Carolina State University. 199 p. Ph.D. dissertation.

Compares plant community composition and diversity between second-growth (70 years old) and old-growth (>125 years old) Appalachian rich cove forests in North Carolina. Documents no differences in species area curves or species diversity between second growth and old growth, but cover and abundance was greater in old growth than in second growth.

303. **Jackson, B.C.; Pittillo, J.D.; Allen, H.L.; Wentworth, T.R.; Bullock, B.P.; Loftis, D.L. 2009.** Species diversity and composition in old growth and second growth rich coves of the southern Appalachian Mountains. Castanea. 74(1): 27–38. https://doi.org/10.2179/07-017.1.

Compares species diversity and composition between second-growth (70 years old) and old-growth (>125 years old) southern Appalachian rich cove forest. Plant diversity and species-area relationships were similar in old growth and second growth, but cover and abundance were greater in old growth than in second growth.

304. **Jackson, J.A.; Jackson, B.J.S. 1986.** Why do red-cockaded woodpeckers need old trees? Wildlife Society Bulletin. 14(3): 318–322.

Discusses the importance of old-growth forests for red-cockaded woodpeckers. The authors outline the characteristics and importance of old trees for cavity excavation and foraging habitat.

305. **Jackson, M.M. 2013.** Influence of climate and logging history on native forest herbs and their pollinators in the southern Appalachians. Madison, WI: University of Wisconsin-Madison. 180 p. Ph.D. dissertation.

Investigates the interacting effects of logging history and climate on the herbaceous layer and pollinators in the southern Appalachian Mountains of North Carolina. Herbs in logged stands had decreased recruitment, greater spatial variability, higher mortality, and greater biomass allocation to leaves. Pollinator abundance was greater in young forests and adjacent to logging roads.

306. **Jackson, M.M.; Pearson, S.M.; Turner, M.G. 2013.** Performance and population dynamics of a native understory herb differ between young and old forest stands in the southern Appalachians. Forest Ecology and Management. 304: 444–454. https://doi.org/10.1016/j.foreco.2013.05.049.

Assesses performance and population dynamics of yellow fairybells (an herb) between recently logged (20–40 years) and old logged (>90 years) southern Appalachian stands. Population growth rates were higher in older stands, and germination and survival did not differ. Results indicate that the logging history impacted plant performance beyond the plant establishment stage.

307. **Jacot, A.P. 1935.** Molluscan populations of old growth forests and rewooded fields in the Asheville Basin of North Carolina. Ecology. 16(4): 603–605. https://doi.org/10.2307/1932590.

Compares molluscan populations in forest types at various stages of development and succession in the southern Appalachian Mountains of North Carolina. Old growth supported the highest density of molluscan species, and stands near old growth and with greater amounts of shelter supported molluscan repopulation, and fire did not negatively impact molluscan populations.

308. **Jenkins, M.A.; White, P.S. 2002.** *Cornus florida* L. mortality and understory composition changes in western Great Smoky Mountains National Park. Journal of the Torrey Botanical Society. 129(3): 194–206. https://doi.org/10.2307/3088770.

Assesses dogwood mortality over a 20-year period in multiple southern Appalachian forest types in the Great Smoky Mountains National Park. Heavy mortality was attributed to dogwood anthracnose, and mortality dynamics differed among forest types.

309. **Jerath, M.; Bhat, M.; Rivera-Monroy, V.H.; Castañeda-Moya, E.; Simard, M.; Twilley, R.R. 2016.** The role of economic, policy, and ecological factors in estimating the value of carbon stocks in Everglades mangrove forests, South Florida, USA. Environmental Science and Policy. 66: 160–169. https://doi.org/10.1016/j.envsci.2016.09.005.

Evaluates the economic and ecological challenges in old-growth mangrove protection for climate change mitigation in south Florida. Provides estimates of total organic carbon storage in old-growth mangroves compared to other forest types, and values stored carbon. Also discusses public perception of carbon management in these systems.

310. **Jetton, R.M.; Hastings, F.L.; Hain, F.P. 2009.** Arthropod diversity associated with old and secondary growth eastern hemlock (*Tsuga canadensis*) in the Great Smoky Mountains National Park. Journal of the North Carolina Academy of Science. 125(2): 70–77.

Compares diversity and abundance of arthropods between old-growth and second-growth eastern hemlock stands prior to hemlock woolly adelgid infestation in the Great Smoky Mountains National Park. Spider and insect abundance was greater in second-growth hemlock stands, but arthropod species diversity and evenness did not differ between old growth and second growth.

311. **Johnson, E.D.; Spector, T.; Hiers, J.K.; Pearson, D.; Varner, J.M.; Bente, J. 2018.** Defining old-growth stand characteristics in fragmented natural landscapes: a case study of old-growth pine in Florida (USA) state parks. Natural Areas Journal. 38(1): 88–98. https://doi.org/10.3375/043.038.0109.

Identifies and inventories potential old-growth southern pine remnants in Florida, which are rare in the State, to enhance conservation efforts of these systems. Also provides management recommendations and urges caution in reintroducing fire in long-unburned stands.

312. **Johnson, P.S. 2004.** Thinking about oak forests as responsive ecosystems. In: Spetich, M.A., ed. Upland oak ecology symposium: history, current conditions, and sustainability. Gen. Tech. Rep. SRS-73. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 13–18.

Discusses oak forest development and disturbance in the Eastern United States.

313. Johnson, P.S.; Shifley, S.R.; Rogers, R. 2002. Silvicultural methods for multi-resource management. In: The ecology and silviculture of oaks. Wallingford, UK: CABI Publishing: 380–423. https://doi.org/10.1079/9780851995700.0380.

Reports on silvicultural methods for multiresource management in oak-dominated ecosystems. Includes a section on old-growth oak forests, and discusses stand-level characteristics, silvicultural options, and how to manage stands in transition to old growth, including treating second-growth stands to develop some old-growth characteristics.

314. Johnston, D.W.; Odum, E.P. 1956. Breeding bird populations in relation to plant succession on the Piedmont of Georgia. Ecology. 37(1): 50–62. https://doi.org/10.2307/1929668.

Assesses breeding bird populations in 10 forests in different stages of succession in upland ecosystems of the Piedmont of Georgia, from grasslands to oak-hickory forests (considered climax in this study). The old-growth oak-hickory forests had been undisturbed for 150–200 years. Documents a positive relationship between breeding bird density, diversity, and successional status.

315. Jones, P.D.; Hanberry, B.; Demarais, S. 2009. Stand-level wildlife habitat features and biodiversity in southern pine forests: a review. Journal of Forestry. 107(8): 398–404.

Reviews the characteristics of coarse woody debris and snags in southern pine forests, and wildlife relationships with coarse woody debris and snags in those forests. Identifies gaps in this research area, including coarse woody debris and snag dynamics in southern pine forests as well as identifying the broader diversity of species that use these snags or woody debris (i.e., expands beyond a single species or taxon).

316. Jones, R.H. 1997. Status and habitat of big trees in Congaree Swamp National Monument. Castanea. 62(1): 22–31.

Surveys floodplain forests of the Congaree Swamp National Monument to determine status of former champion trees after hurricane Hugo impacted the forest. Of the 30 original champion trees, only 2 remained. In the survey, 29 individuals of 25 species were newly identified as State champion size. Most of the big trees occurred in broad, low flat areas or sloughs.

317. Jones, S.M. 1988. Old-growth forests within the Piedmont of South Carolina. Natural Areas Journal. 8(1): 31–37.

Locates and samples 40 old-growth, upland hardwood stands in the Piedmont of South Carolina. Identifies five community types ranging from xeric upper slopes to mesic lower slopes. These old-growth stands may serve as reference conditions for old-growth restoration and management in the Piedmont.

318. Jones, S.M. 1988. Old-growth, steady state forests within the Piedmont of South Carolina. Clemson, SC: Clemson University. [pages unknown]. Ph.D. dissertation.

Full dissertation of project published in Jones (1988) article in the Natural Areas Journal.

319. Jones, S.M.; Van Lear, D.H.; Cox, S.K. 1981. Composition and density-diameter pattern of an old-growth forest stand of the Boiling Springs Natural Area, South Carolina. Bulletin of the Torrey Botanical Club. 108(3): 347–353. https://doi.org/10.2307/2484714.

Quantifies the overstory composition and structure of an old-growth sweetgum-tulip poplar-loblolly pine-dominated stand in the upper Coastal Plain of South Carolina.

320. Jones-Held, S.; Held, M.E.; Winstead, J.E.; Bryant, W.S. 2019. Immediate and delayed effects of severe winds on an old-growth forest in Kentucky: a forty-year retrospective. Forests. 10(3): 271. 17 p. https://doi.org/10.3390/f10030271.

Quantifies stand dynamics over a 40-year period following severe wind damage in the old-growth Dinsmore Woods, KY. Basal area of the canopy recovered to predisturbance levels, but delayed mortality over time resulted in a dense shrub layer that reduced regeneration of canopy species.

321. Jurney, D.H.; Stahle, D.W. 2004. Old-growth wooded pasture in the Ozarks. In: Spetich, M.A., ed. Upland oak ecology symposium: history, current conditions, and sustainability. Gen. Tech. Rep. SRS-73. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 42–52.

Uses paleoecological and other historical approaches to reconstruct forest composition and past climate in the Ozark Mountains of Arkansas. Also describes old-growth oak forests adjacent to abandoned agricultural fields and old-field succession.

322. Kalisz, P.J.; Dotson, D.B. 1989. Land-use history and the occurrence of exotic earthworms in the mountains of eastern Kentucky. American Midland Naturalist. 122(2): 288–297. https://doi.org/10.2307/2425915.

Compares the presence of native and exotic earthworms based on land-use history in mixed mesophytic forests on the Cumberland Plateau in eastern Kentucky. Undisturbed forests supported native earthworm assemblages. Exotic taxa were more likely to occur on severely disturbed sites or sites with a history of logging.

323. Kalisz, P.J.; Powell, J.E. 2000. Invertebrate macrofauna in soils under old growth and minimally disturbed second growth forests of the Appalachian Mountains of Kentucky. American Midland Naturalist. 144(2): 297–307. https://doi.org/10.1674/0003-0031(2000)144[0297:IMISUO]2.0.CO;2.

Compares invertebrate macrofauna biomass between second growth and old growth and among topographic positions in mixed mesophytic forests on the Cumberland Plateau in eastern Kentucky. Macrofaunal biomass (beetle larvae, earthworms, millipedes, fly larvae, centipedes, spiders, and ants) did not differ between old-growth and second-growth forests. Earthworm biomass was greater on lower and protected slopes, and lower on dry south-facing slopes, ridges, and ravines.

324. Karki, L.; Hallgren, S.W. 2015. Tree-fall gaps and regeneration in old-growth Cross Timbers forests. Natural Areas Journal. 35(4): 533–541. https://doi.org/10.3375/043.035.0405.

Studies gap-phase succession and tree replacement patterns in the Cross Timbers region of Oklahoma. Results indicate compositional stability of the three most dominant canopy tree species (post oak, blackjack oak, and black hickory), with abundant regeneration of these species in both gap and nongap sites, which was attributed to sprouting response from frequent fire.

325. Kelly, J.F.; Pletschet, S.M.; Leslie, D.M., Jr. 1993. Habitat associations of red-cockaded woodpecker cavity trees in an old-growth forest of Oklahoma. Journal of Wildlife Management. 57(1): 122–128. https://doi.org/10.2307/3809008.

Quantifies habitat structure of red-cockaded woodpecker cavity-tree sites versus noncavity-tree sites in a mixed shortleaf pine-hardwood forest in southeastern Oklahoma. Cavity-tree sites had shorter hardwoods, less hardwood basal area, and more pine saplings. Concluded that hardwood density may be the most influential factor in cavity tree selection and habitat preference.

326. Kennedy, H.E.; Nowacki, G.J. 1997. An old-growth definition for seasonally wet oak-hardwood woodlands. Gen. Tech. Rep. SRS-8. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 6 p. https://doi.org/10.2737/SRS-GTR-008.

Provides definitions and associated characteristics of seasonally wet oak-hardwood woodlands, as part of the larger effort to develop old-growth definitions for 35 forest types in the Eastern United States. These woodlands occur throughout the Eastern United States on river bottomlands and isolated depressions that become seasonally flooded for short periods. Principal species were pin oak, willow oak, white oak, water oak, laurel oak, and Nuttall oak.

327. **Kincaid, J.A.; Parker, A.J. 2008.** Structural characteristics and canopy dynamics of *Tsuga canadensis* in forests of the southern Appalachian Mountains, USA. Plant Ecology. 199(2): 265–280. https://doi.org/10.1007/s11258-008-9431-0.

Provides baseline data on eastern hemlock stand composition and structure prior to hemlock woolly adelgid infestation in the eastern part of Great Smoky Mountains National Park. Also uses dendrochronological techniques to compare disturbance history and recruitment patterns between two stands. These data may be useful for restoration efforts of eastern hemlock communities affected by hemlock woolly adelgid.

328. **Kindscher, K.; Holah, J. 1998.** An old-growth definition for western hardwood gallery forests. Gen. Tech. Rep. SRS-22. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 12 p. https://doi.org/10.2737/SRS-GTR-022.

Provides definitions and associated characteristics of western hardwood gallery forests, as part of the larger effort to develop old-growth definitions for 35 forest types in the Eastern United States. These forests occur from Saskatchewan to northern Texas. Cottonwood and willow were the dominant species. Old-growth reference stands primarily occurred outside of the Forest Service's Southern Region.

329. **King, D.A. 2001.** Stem orientation is related to growth rate, leaf dimensions, and the deciduous habit in temperate forest saplings. Canadian Journal of Botany. 79(11): 1282–1291. https://doi.org/10.1139/b01-106.

Relates sapling stem orientation to extension rate under various light levels (e.g., understory versus full light) and between deciduous and evergreen species in the southern Appalachian Mountains in Virginia and the Lilley Cornett Woods in Kentucky. Various responses were detected between evergreen and deciduous species and among shade versus full-light conditions. Deciduous species were more sinuous and evergreen species were more erect in both light environments.

330. **King, D.A. 2005.** Architectural differences in saplings of temperate versus tropical angiosperms; consequences of the deciduous habit? Canadian Journal of Botany. 83(11): 1391–1401. https://doi.org/10.1139/b05-109.

Compares sapling architecture of deciduous tree species on sites in the Southeastern United States (including Lilley Cornett Woods) and tropical evergreen species of Central America and Australia. Documents various architectural responses between deciduous and evergreen species as a function of species adaptations and phenology, as well as factors that were geographically specific.

331. **King, D.A.; Wright, S.J.; Connell, J.H. 2006.** The contribution of interspecific variation in maximum tree height to tropical and temperate diversity. Journal of Tropical Ecology. 22(1): 11–24. https://doi.org/10.1017/S0266467405002774.

Assesses maximum tree height for species of temperate deciduous forests (including Lilley Cornett Woods and Great Smoky Mountains National Park), and a subtropical and tropical forest. Includes histograms of maximum heights by site, as well as height characteristics of subcanopy stems.

332. **King, S.L.; Antrobus, T.J. 2005.** Relationships between gap makers and gap fillers in an Arkansas floodplain forest. Journal of Vegetation Science. 16(4): 471–478. https://doi.org/10.1111/j.1654-1103.2005.tb02387.x.

Assesses gap-phase succession in a frequently flooded floodplain forest in Arkansas. Shade-intolerant species (primarily Nuttall's oak) were replaced by shade-tolerant red maple, ash, and elm species. Canopy gaps did not support self-replacement of canopy dominant species in this floodplain forest.

333. **Kirkman, L.K.; Mitchell, R.J. 2006.** Conservation management of *Pinus palustris* ecosystems from a landscape perspective. Applied Vegetation Science. 9(1): 67–74. https://doi.org/10.1111/j.1654-109X.2006.tb00656.x.

Reviews the management paradigms from second-growth and old-growth longleaf pine stands, to determine if silvicultural and restoration studies of second-growth longleaf pine provide context for conservation models. Concludes that traditional definitions of old growth that focus on the overstory may preclude other important features of longleaf pine ecosystems that would otherwise indicate high conservation value.

334. **Kleinman, J.S.; Ford, S.A.; Hart, J.L. 2017.** Catastrophic wind and salvage harvesting effects on woodland plants. Forest Ecology and Management. 403: 112–125. https://doi.org/10.1016/j.foreco.2017.08.006.

Assesses the impacts of compound disturbance (wind and salvage harvesting) on the woody plant community in a second-growth, fire-maintained longleaf pine stand on the Fall Line Hills, AL. Salvage harvesting reduced ground flora diversity, which was attributed to harvest-mediated reductions in habitat heterogeneity and resource availability. The authors suggest that salvage operations leave some patches unharvested to enhance stand-scale diversity.

335. **Knapp, B.O.; Walker, J.L.; Wang, G.G.; Hu, H.; Addington, R.N. 2014.** Effects of overstory retention, herbicides, and fertilization on sub-canopy vegetation structure and functional group composition in loblolly pine forests restored to longleaf pine. Forest Ecology and Management. 320: 149–160. https://doi.org/10.1016/j.foreco.2014.03.021.

Assesses silvicultural treatment effects on vegetation structure and composition of converting loblolly pine to longleaf pine. Suggests retaining moderate basal area of loblolly pine to reach multiple restoration objectives, such as desirable vegetation structure and fuels to carry prescribed fire.

336. **Knebel, L.G. 1999.** Changes in old growth hemlock forests of the Cataloochee watershed in the Great Smoky Mountains National Park: preparing for the arrival of the hemlock woolly adelgid (*Adelges tsugae*). Cullowhee, NC: Western Carolina University. 80 p. M.S. thesis.

Describes the effects of hemlock woolly adelgid on second-growth and old-growth hemlock in the southern Appalachian Mountains from a permanent network of plots established in 1990 and resampled in 2004 (in the Great Smoky Mountains National Park, Joyce Kilmer Memorial Forest, and Ellicott Rock Wilderness). Introduction of hemlock woolly adelgid resulted in increased species richness in old growth and decreased species richness in second growth.

337. **Kreiter, S.D. 1995.** Dynamics and spatial pattern of a virgin old-growth hardwood-pine forest in the Ouachita Mountains, Oklahoma, from 1896 to 1994. Stillwater, OK: Oklahoma State University. 141 p. M.S. thesis.

Compares long-term dynamics of the McCurtain County Wilderness Area in eastern Oklahoma by using General Land Office survey notes and a contemporary field sampling. Discusses changes in forest composition over a century, including how fire suppression affected the success of species like fire-tolerant shortleaf pine and fire-intolerant hardwoods. Also examines landscape-level changes from 1955 to 1990 in this same study area.

338. **Kressuk, J.M.; Goode, J.D.; Bhuta, A.A.R.; Hart, J.L.; Kleinman, J.S.; Phillips, D.L.; Willson, K.G. 2020.** Composition and structure of a montane longleaf pine stand on the Alabama Piedmont. Southeastern Naturalist. 19(2): 436–446. https://doi.org/10.1656/058.019.0223.

Describes the composition, structure, and establishment trends of a montane longleaf pine stand in the Alabama Piedmont. Although the stand was cutover in the 1930s, remnant old-growth individuals were present that established in the late 1700s. These individuals represent an important genetic and structural legacy and were the source for natural regeneration for the existing stand.

339. **Kucera, C.L.; McDermott, R.E. 1955.** Sugar maple-basswood studies in the forest-prairie transition of central Missouri. American Midland Naturalist. 54(2): 495–503. https://doi.org/10.2307/2422584.

Describes stand composition of a mature, old forest with white oaks >150 years old and an overstory of northern red oaks succeeding to sugar maple and American basswood as well as other shade-tolerant tree species.

340. **Kupfer, J.A.; Kirsch, S.W. 1998.** Heterogeneity of forest characteristics in primary and secondary forest stands on the Third Chickasaw Loess Bluff, Tennessee. Physical Geography. 19(1): 35–54. https://doi.org/10.1080/02723646.1998.10642639.

Compares the nonspatial and spatial components of stand structural heterogeneity between primary and secondary mesophytic forests on the loess bluffs in western Tennessee. Secondary forests had greater canopy tree density and fewer understory trees. The primary stand had greater variability in stand structure. Unlike the primary stand, the secondary stand did not display gap-phase replacement.

341. **Kush, J.S. 2009.** Obituary for Flomaton: one less virgin longleaf stand (Alabama). Ecological Restoration. 27(3): 247–248. https://doi.org/10.3368/er.27.3.247.

Describes the harvesting (2007 or 2008) of the old-growth longleaf pine at Flomaton Natural Area in southern Alabama. Author recalls that the forest was once a virgin stand of old-growth longleaf pine; however, it underwent several decades of fire suppression before it was restored in 1995. Author suggests preservation and management of longleaf pine for it to be functional in the ecosystem.

342. **Kush, J.S.; Gilbert, J.C.; Lupo, C.; Zhou, N.; Barlow, B. 2013.** Impact of fire in two old-growth montane longleaf pine stands. In: Guldin, J.M., ed. Proceedings of the 15th biennial southern silvicultural research conference. e-Gen. Tech. Rep. SRS-175. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 111–114.

Assesses impact of reintroducing fire on the composition, structure, and stand dynamics of two old-growth montane longleaf pine stands in the Mountain Longleaf National Wildlife Refuge, AL. Results have implications for fire severity after fuels accumulate during extended periods of fire exclusion, including through canopy tree mortality.

343. **Kush, J.S.; Meldahl, R.S. 1998.** An old-growth longleaf stand in south Alabama: study of an endangered ecosystem. Alabama Agricultural Experiment Station. Highlights of Agricultural Research. 45(1): 3–4.

Provides a brief introduction to the historical extent and ecology of longleaf pine in the Southeastern United States. Then, highlights a virgin longleaf pine in south Alabama and the efforts to reintroduce fire as the primary means to restore desired stand structure and function.

344. **Kush, J.S.; Meldahl, R.S. 2000.** Composition of a virgin stand of longleaf pine in south Alabama. Castanea. 65(1): 56–63.

Describes composition and structure of a fire-excluded (for 45 years) old-growth longleaf pine forest in southern Alabama. Data were collected in advance of the reintroduction of fire and may be used as a baseline to monitor fire effects.

345. **Kush, J.S.; Meldahl, R.S.; Avery, C. 2004.** A restoration success: longleaf pine seedlings established in a fire-suppressed, old-growth stand. Ecological Restoration. 22(1): 6–10. https://doi.org/10.3368/er.22.1.6.

Assesses annual (6 years) longleaf pine natural seedling response to restoration treatments in the old-growth longleaf pine forests of the Flomaton Natural Area, AL. Canopy gaps supported greater longleaf pine seedling density. Also presents guidelines for restoring fire in long-unburned stands.

346. **Kush, J.S.; Varner, J.M.; Meldahl, R.S. 1999.** Slow down, don't burn too fast... Got to make that old-growth last. In: Kush, J.S., comp. Longleaf pine: a forward look: Proceedings of the second Longleaf Alliance conference. Andalusia, AL: Longleaf Alliance: 109–111.

Urges caution in the reintroduction of long-unburned old-growth longleaf pine stands. Enhanced fuel can accumulate under large trees and fine roots grow into nutrient rich duff layer, which, upon the reintroduction of fire can result in lethal fire temperatures and canopy tree mortality. Offers suggestions for restoring fire in long-unburned stands.

347. **Lacki, M.J.; Baker, M.D. 1998.** Observations of forest-interior bird communities in older-growth forests in eastern Kentucky. Journal of the Kentucky Academy of Science. 59(2): 174–177.

Surveys and compares forest interior bird communities in an old-growth and an adjacent second-growth forest in Kentucky. The second-growth forest had a marginally higher species richness (n = 2). Table 1 lists species and abundance in each of the two forests. These data can be used to monitor bird community dynamics through time and may offer a baseline for bird population recovery in forests in various stages of development.

348. **Lafon, C.W.; DeWeese, G.G.; Flatley, W.T.; Aldrich, S.R.; Naito, A.T. 2022.** Historical fire regimes and stand dynamics of xerophytic pine–oak stands in the southern Appalachian Mountains, Virginia, USA. Annals of the American Association of Geographers. 112(2): 387–409. https://doi.org/10.1080/24694452.2021.1935206.

Constructs fire chronologies from four older pine-oak stands in the Appalachian Mountains from living and dead pines and oaks that were used to document fire histories from Euro-American settlement through the present.

349. **Landers, J.L.; Boyer, W.D. 1999.** An old-growth definition for upland longleaf and south Florida slash pine forests, woodlands, and savannas. Gen. Tech. Rep. SRS-29. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 15 p. https://doi.org/10.2737/SRS-GTR-29.

Provides definitions and associated characteristics of upland longleaf and south Florida slash pine old-growth forests, woodlands, and savannas, as part of the larger effort to develop old-growth definitions for 35 forest types in the Eastern United States.

350. **Laport, R.G.; Smith, D.; Ng, J. 2020.** Remnant American chestnut (*Castanea dentata*) near the historical western range limit in southwestern Tennessee. Castanea. 85(2): 232–243. https://doi.org/10.2179/0008-7475.85.2.232.

Describes discovery of residual American chestnut individuals in oak-hickory and beech-maple forests in southwestern Tennessee. This discovery extends the range of extant American chestnut. The majority of individuals were seedling and sapling size, <10 cm in diameter at breast height and <10 m in height.

351. **Lehrbas, M.M.; Eldredge, I.F. 1941.** Forest resources of south Georgia. Misc. Publ. 390. Washington DC: U.S. Department of Agriculture. 5 p. + maps. https://doi.org/10.5962/bhl.title.65689.

Reports on the first Forest Service forest survey for Units 1 and 2 of southern Georgia (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: longleaf pine, slash pine, bottomland hardwoods, and baldcypress-tupelo.

352. **Lenart, M.T.; Falk, D.A.; Scatena, F.N.; Osterkamp, W.R. 2010.** Estimating soil turnover rate from tree uprooting during hurricanes in Puerto Rico. Forest Ecology and Management. 259(6): 1076–1084. https://doi.org/10.1016/j.foreco.2009.12.014.

Assesses soil turnover rates and models drivers of tree uprooting as a result of a Category 3 hurricane across Puerto Rico. Soil turnover by uprooting occurred at a higher rate than other soil turnover mechanisms. There is no discussion of old growth, but some sites are described as “primary forests.” The authors did not assess the potential effect of stand development on soil turnover rates. Results have implications for soil profile development, carbon dynamics, and other soil properties.

353. **Lennartz, M.R. 1988.** The red-cockaded woodpecker: old-growth species in a second-growth landscape. Natural Areas Journal. 8(3): 160–165.

Provides an overview of the habitat requirements for old-growth conditions of red-cockaded woodpecker. Also discusses red-cockaded woodpecker as an example of a species that could persist in second-growth forests that are subjected to particular management techniques.

354. Levenson, J.B.; Jackson, M.T. 1980. The groundlayer of the beech-maple forest: species composition and community structure. In: Garrett, H.E.; Cox, G.S., eds. Proceedings of the 3rd central hardwood forest conference. Columbia, MO: University of Missouri Press: 219–237.

Samples ground flora vegetation in 21 old-growth beech-maple stands in Indiana, Michigan, and Ohio. Of the 174 species documented, 108 were herbaceous plants. Virginia creeper and sugar maple had the highest density and frequency across stands.

355. Levine, M.T.; Feller, I.C. 2004. Effects of forest age and disturbance on population persistence in the understory herb, *Arisaema triphyllum* (Araceae). Plant Ecology. 172(1): 73–82. https://doi.org/10.1023/B:VEGE.0000026036.32013.7a.

Compares sexual reproduction and clonal growth of the understory herb jack-in-the-pulpit between second-growth and mature experimental forests of the Smithsonian Environmental Research Center, MD. Sexual reproduction was greater in canopy gaps of both young and mature forests, but clonal growth did not differ between forest development stages. Results suggest that sexual reproduction of this species is resource dependent, and clonal growth is resource independent.

356. Levy, H.E. 2020. Community dynamics of cavity-nesting birds in old-growth longleaf pine forests. Athens, GA: University of Georgia. 140 p. M.S. thesis.

Evaluates habitat characteristics and nesting conditions for red-cockaded woodpecker in old-growth longleaf pine stands.

357. Liu, K.-b.; Lu, H.; Shen, C. 2008. A 1200-year proxy record of hurricanes and fires from the Gulf of Mexico coast: testing the hypothesis of hurricane-fire interactions. Quaternary Research. 69(1): 29–41. https://doi.org/10.1016/j.yqres.2007.10.011.

Reconstructs historical hurricane-fire interactions from the past 1,200 years using paleoecological approaches. Results indicate that historical hurricanes were typically succeeded by severe, stand-replacing fire that decreased tree cover and increased shrub cover.

358. Livingston, M. 1990. “Environmental Air Force” battles clear-cutting. The State. 1990 July 15; Sect. D: 6.

Describes a flight over the Chattahoochee and Sumter National Forests, with private citizens and a Forest Service employee, that was undertaken to visualize and bring attention to clearcutting on national forests. The pilot managed an “environmental air force” that gave legislators, the media, and environmentalists a birds-eye view of environmental controversies.

359. Lockhart, B.R.; Guldin, J.M.; Foti, T. 2010. Tree species composition and structure in an old bottomland hardwood forest in south-central Arkansas. Castanea. 75(3): 315–329. https://doi.org/10.2179/08-028.1.

Describes the composition, structure, and diversity of a bottomland hardwood forest dominated by sweetgum and oaks in southern Arkansas. Based on models of bottomland hardwood succession and eastern old-growth definitions, this forest was best described as old pioneer transitioning to old growth.

360. Lockhart, B.R.; Kellum, J.E. 2006. A complex stand on the White River National Wildlife Refuge: implications for bottomland hardwood old growth. Journal of the Arkansas Academy of Science. 60(1): 181–184.

Quantifies the species composition and structure of an old-growth bottomland hardwood forest in the Lower Mississippi Alluvial Valley in eastern Arkansas. This study was prompted by the possible sighting and recordings of the ivory-billed woodpecker, which requires old-growth bottomland hardwood habitat. Concludes that old-growth attributes were abundant, such as large-diameter trees, snags, and coarse woody debris.

361. Loeb, S.C.; O'Keefe, J.M. 2006. Habitat use by forest bats in South Carolina in relation to local, stand, and landscape characteristics. Journal of Wildlife Management. 70(5): 1210–1218. https://doi.org/10.2193/0022-541X(2006)70[1210:HUBFBI]2.0.CO;2.

Evaluates the important local, stand, and landscape factors influencing bat habitat use in northwestern South Carolina. More forest openings were found in mature and old-growth stands, which is probably the reason more bat activity was recorded in these stands compared with mid-successional stands. Also, a greater number of roosting locations were found in old-growth stands. Primarily, these stands had more snags, hollow trees, and cavities for bat roosting and maternity activities.

362. Lorimer, C.G. 1980. Age structure and disturbance history of a southern Appalachian virgin forest. Ecology. 61(5): 1169–1184. https://doi.org/10.2307/1936836.

Reconstructs the canopy disturbance regime and age structure of a montane hemlock-hardwood forest in the Joyce Kilmer Memorial Forest, NC. The forest was uneven-aged, and individual tree species had irregular age distributions, with several prominent peaks. Radial growth was greater during peak recruitment, which was attributed to disturbance larger than single-tree gaps.

363. Lotti, T.; Evans, T.C. 1943. The forest situation in the mountain region of Virginia. Forest Survey Release 15. Asheville, NC: U.S. Department of Agriculture, Forest Service, Appalachian Forest Experiment Station. 70 p. https://doi.org/10.5962/bhl.title.122455.

Reports on first Forest Service forest survey of the mountain region of Virginia (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: shortleaf pine, pitch pine, northern and upland hardwoods.

364. Lowney, C.A.; Graham, B.D.; Spetich, M.A.; Shifley, S.R.; Saunders, M.R.; Jenkins, M.A. 2016. Two decades of compositional and structural change in deciduous old-growth forests of Indiana, USA. Journal of Plant Ecology. 9(3): 256–271. 256. https://doi.org/10.1093/jpe/rtv050.

Assesses stand dynamics and structural and compositional stability of multiple old-growth forests over a 19-year period in Indiana. Observed a general pattern of increased sugar maple dominance and decreased oak dominance across stands.

365. Lucas, J.S.; Loeb, S.C.; Jodice, P.G.R. 2015. Roost selection by Rafinesque's big-eared bats (*Corynorhinus rafinesquii*) in a pristine habitat at three spatial scales. Acta Chiropterologica. 17(1): 131–141. https://doi.org/10.3161/15081109ACC2015.17.1.011.

Quantifies roost selection of Rafinesque's big-eared bats at three scales (tree, stand, and landscape) in Congaree National Park, SC. Tree and stand characteristics were the best predictors of roost selection for maternity colonies and individuals. Bats preferred larger, hollow trees as roost sites.

366. Lugo, A.E. 1994. Preservation of primary forests in the Luquillo Mountains, Puerto Rico. Conservation Biology. 8(4): 1122–1131. https://doi.org/10.1046/j.1523-1739.1994.08041122.x.

Describes environmental and historical setting of the Caribbean National Forest, which contains the only primary tropical forests in Puerto Rico. The forest is also a UNESCO Biosphere Reserve. Presents arguments for and against preservation of primary forests.

367. Maguire, D.A.; Forman, R.T.T. 1983. Herb cover effects on tree seedling patterns in a mature hemlock-hardwood forest. Ecology. 64(6): 1367–1380. https://doi.org/10.2307/1937491.

Quantifies the relationship between the herbaceous layer, tree seedling density, and soil characteristics in an old-growth hemlock-hardwood stand. Patches of herbaceous plants influenced tree seedling density and tree canopy foliage influenced the distribution of herb patches. Highlights the importance of considering the herbaceous layer as a critical component of forest ecosystems, and authors suggest including the herbaceous community in models of forest dynamics.

368. Martin, W.H. 1975. The Lilley Cornett Woods: a stable mixed mesophytic forest in Kentucky. Botanical Gazette. 136(2): 171–183. https://doi.org/10.1086/336799.

Describes the vegetative communities in the Lilley Cornett Woods on the Cumberland Plateau, KY. Describes nine distinct forest communities in the tract including sugar maple-basswood-tulip poplar, beech, beech-buckeye, beech-sugar maple, beech-white oak, hemlock, white oak, chestnut oak, and mixed oak.

369. Martin, W.H. 1992. Characteristics of old-growth mixed mesophytic forests. Natural Areas Journal. 12(3): 127–135.

Uses data published from previous studies of old-growth mixed-mesophytic forests, including those found in the Great Smoky Mountains National Park, Joyce Kilmer Memorial Forest, Savage Gulf, Thumping Dick's Cove, Fall Creek Falls, and Lilley Cornett Woods, to develop and quantify the characteristics of old-growth mixed-mesophytic forests. Characteristics included 1) high richness and diversity of species; 2) uneven-aged structure; 3) several large canopy trees; 4) large, commercially important trees; 5) oldest trees >200 years old; 6) density of 250 trees/ha; 7) basal areas averaging 25 m^2/ha; 8) logs and snags; 9) tree-fall gaps by windthrow; 10) old-growth-obligate plant and animal taxa; 11) undisturbed soils; and 12) no evidence of human disturbance.

370. Martin, W.H.; Henderson, D.E.; Hedrick, L.D. 1991. Defining old-growth deciduous forests: seeing the forest and the trees. In: Henderson, D.; Hedrick, L.D., eds. Restoration of old growth forests in the Interior Highlands of Arkansas and Oklahoma. Winrock International and Hot Springs, AR: Ouachita National Forest: 139–145.

Provides a list of 12 characteristics for old-growth hardwood forests applicable to the Interior Highlands. Characteristics included 1) high richness and diversity of species, dominants and communities; 2) uneven-aged stand structure with multiple size classes; 3) several large canopy trees; 4) large, high quality, commercially important trees; 5) trees at least 200 years old; 6) at least 250 overstory trees per hectare (100 trees per acre); 7) overstory basal area at least 25 m^2/ha (approximately 110 square feet per acre); 8) presence of logs and snags; 9) windthrow gaps; 10) other plants and animals that prefer old growth; 11) undisturbed soils and soil macropores; and 12) little or no evidence of human disturbance.

371. Martin, W.H.; Shepherd, C. 1973. Trees and shrubs of Lilley Cornett Woods, Letcher County, Kentucky. Castanea. 38(4): 327–335.

Reports on a 1973 inventory of the trees and shrubs of the old-growth Lilley Cornett Woods, KY. Identified 72 unique tree and shrub species.

372. Martinuzzi, S.; Gould, W.A.; Vierling, L.A.; Hudak, A.T.; Nelson, R.F.; Evans, J.S. 2013. Quantifying tropical dry forest type and succession: substantial improvement with LiDAR. Biotropica. 45(2): 135–146. https://doi.org/10.1111/j.1744-7429.2012.00904.x.

Assesses the suitability of light detection and ranging (LiDAR) classification of tropical dry forest composition and successional status. LiDAR-derived variables of vegetation structure, particularly those describing vertical canopy structure, were better predictors of successional status (i.e., secondary versus old growth) than multispectral techniques.

373. Massad, T.J.; Williams, G.L.; Wilson, M.; Hulsey, C.E.; Deery, E.; Bridges, L.E. 2019. Regeneration dynamics in old-growth urban forest gaps. Urban Forestry and Urban Greening. 43: 126364. 10 p. https://doi.org/10.1016/j.ufug.2019.06.007.

Assesses gap dynamics and species recruitment in an old-growth urban forest in Memphis, TN. Canopy trees were about 185 years of age at the time of sampling. Seedlings had higher growth and survival rates in gaps than under a closed canopy.

374. Mattoon, W.R. 1915. Life history of shortleaf pine. Bull. 244. Washington, DC: U.S. Department of Agriculture. 46 p. https://doi.org/10.5962/bhl.title.108486.

Describes the silvics of shortleaf pine. Includes photographs, individual tree characteristics, and stand structural metrics of old-growth shortleaf pine prior to widespread lumbering.

375. **Mattoon, W.R. 1915.** Shortleaf pine: its economic importance and forest management. Bull. 308. Washington, DC: U.S. Department of Agriculture. 67 p. https://doi.org/10.5962/bhl.title.108229.

Describes the economic importance (e.g., stumpage value) and management approaches to maximize growth and yield of shortleaf pine (as well as various management alternatives). Much of the data used in the analyses were from old-growth shortleaf pine stands.

376. **Mattoon, W.R. 1915.** The southern cypress. Bull. 272. Washington, DC: U.S. Department of Agriculture. 74 p. https://doi.org/10.5962/bhl.title.109095.

Describes the importance, range, wood properties, economic value, silvics, and management of southern baldcypress prior to widespread lumbering.

377. **Mattoon, W.R. 1922.** Longleaf pine. Bull. 1061. Washington, DC: U.S. Department of Agriculture. 50 p. https://doi.org/10.5962/bhl.title.109235.

Describes silvics, economics, harvesting, and regeneration of longleaf pine throughout its range. Includes historical photographs of cutover old-growth longleaf pine stands, turpentine production, and longleaf pine in its various growth stages.

378. **Mayer, P.M. 2008.** Ecosystem and decomposer effects on litter dynamics along an old field to old-growth forest successional gradient. Acta Oecologica. 33(2): 222–230. https://doi.org/10.1016/j.actao.2007.11.001.

Identifies the controls of mass loss and nitrogen flux in forest floor litter along a successional gradient from old-field, transitional, and old-growth forests in the Cross Timbers, OK. Old growth had distinctive litter loss rates and efficient nitrogen cycling compared to old-field or transition forests. Concludes that old-growth functions related to litter loss and nitrogen cycling may not be immediately realized in restored forests.

379. **McAuliffe, S.; Ackerman, J.D.; Tremblay, R.L. 2019.** Land use legacy for a tropical myco-heterotroph: how spatial patterns of abundance, reproductive effort and success vary. Journal of Plant Ecology. 12(2): 367–375. https://doi.org/10.1093/jpe/rty029.

Assesses the impacts of anthropogenic land-use history on reproductive success of a myco-heterotrophic orchid in a tropical rainforest after 80 years of recovery. Orchid abundance was greatest in the least historically disturbed sites.

380. **McCarthy, B.C.; Bailey, D.R. 1996.** Composition, structure, and disturbance history of Crabtree Woods: an old-growth forest of western Maryland. Bulletin of the Torrey Botanical Club. 123(4): 350–365. https://doi.org/10.2307/2996783.

Quantifies composition, structure, and disturbance history of an old-growth mixed Appalachian hardwood forest on the Allegheny Plateau in western Maryland. Discusses evidence-based claims that this stand is among the most representative of pre-European settlement vegetation in Maryland.

381. **McCarthy, B.C.; Hammer, C.A.; Kauffman, G.L.; Cantino, P.D. 1987.** Vegetation patterns and structure of an old-growth forest in southeastern Ohio. Bulletin of the Torrey Botanical Club. 114(1): 33–45. https://doi.org/10.2307/2996387.

Compares composition, structure, and soils within and among five forest community types in Hawk Woods, an old-growth forest on the Allegheny Plateau in southeastern Ohio. Projects oak replacement by maple over time.

382. **McComb, W.C.; Muller, R.N. 1983.** Snag densities in old-growth and second-growth Appalachian forests. Journal of Wildlife Management. 47(2): 376–382. https://doi.org/10.2307/3808510.

Compares snag densities among three forest communities and between second-growth and old-growth structure. Provides species-specific snag formation, as well as differences between community type and stand structure. Second-growth forests had a greater density of small-diameter snags, but large-diameter snag density was similar between second growth and old growth.

383. McEwan, R.W.; Muller, R.N. 2006. Spatial and temporal dynamics in canopy dominance of an old-growth central Appalachian forest. Canadian Journal of Forest Research. 36(6): 1536–1550. https://doi.org/10.1139/x06-046.

Assesses spatial patterns, temporal trends, and environmental drivers of succession in Lilley Cornett Woods by community type (mixed mesophytic, oak, and beech). Maple increased in importance and oaks decreased in importance over time in upper slope positions. Mixed mesophytic communities were stable over time. Documents a transition from beech dominance to eastern hemlock dominance in the beech community type.

384. McEwan, R.W.; Muller, R.N. 2011. Dynamics, diversity, and resource gradient relationships in the herbaceous layer of an old-growth Appalachian forest. Plant Ecology. 212(7): 1179–1191. https://doi.org/10.1007/s11258-011-9896-0.

Quantifies herbaceous layer composition and diversity in relation to resource gradients and across the growing season in the old-growth, mixed mesophytic Lilley Cornett Woods, KY. Diversity and abundance were linked to complex resource gradients driven by soil nutrients, light availability, and topography.

385. McEwan, R.W.; Muller, R.N.; Arthur, M.A.; Housman, H.H. 2000. Temporal and ecological patterns of flowering dogwood mortality in the mixed mesophytic forest of eastern Kentucky. Journal of the Torrey Botanical Society. 127(3): 221–229. https://doi.org/10.2307/3088759.

Investigates patterns of dogwood anthracnose-related mortality in old-growth (Lilley Cornett Woods) and second-growth mixed-mesophytic forests in eastern Kentucky. There were no clear differences in anthracnose-related mortality between old growth and second growth. A greater density of dogwood seedlings was found in old growth compared to second growth, but the second-growth forest had a greater density of mature dogwood. Also documents a positive relationship between dogwood density and anthracnose occurrence.

386. McEwan, R.W.; Muller, R.N.; McCarthy, B.C. 2005. Vegetation-environment relationships among woody species in four canopy-layers in an old-growth mixed mesophytic forest. Castanea. 70(1): 32–46. https://doi.org/10.2179/0008-7475(2005)070[0032:VRAWSI]2.0.CO;2.

Examines woody plant and environment relationships stratified by vertical strata in the old-growth Lilley Cornett Woods. Oaks dominated canopy positions and were more common on upper slopes; maples were abundant in the midstory across an array of environmental conditions.

387. McEwan, R.W.; Paratley, R.D.; Muller, R.N.; Riccardi, C.L. 2005. The vascular flora of an old-growth mixed mesophytic forest in southeastern Kentucky. Journal of the Torrey Botanical Society. 132(4): 618–627. https://doi.org/10.3159/1095-5674(2005)132[618:TVFOAO]2.0.CO;2.

Inventories the vascular flora in Big Everidge Hollow, an old-growth forest on the Cumberland Plateau in eastern Kentucky. Documents 263 unique species from 176 genera and 82 families. Documents only one nonnative species, which provides evidence for the ecological integrity of this old-growth remnant.

388. McEwan, R.W.; Pederson, N.; Cooper, A.; Taylor, J.; Watts, R.; Hruska, A. 2014. Fire and gap dynamics over 300 years in an old-growth temperate forest. Applied Vegetation Science. 17(2): 312–322. https://doi.org/10.1111/avsc.12060.

Uses dendrochronological techniques to reconstruct fire history and gap dynamics over a 300-year period in an old-growth forest. Mean fire interval was 9.3 years and mean canopy disturbance return interval was 5.2 years. Concludes that fire and canopy disturbance played an important role in stand development of this old-growth forest.

389. **McGarvey, J.C.; Thompson, J.R.; Epstein, H.E.; Shugart, H.H., Jr. 2015.** Carbon storage in old-growth forests of the mid-Atlantic: toward better understanding the eastern forest carbon sink. Ecology. 96(2): 311–317. https://doi.org/10.1890/14-1154.1.

Calculates carbon storage. Old-growth forests in the mid-Atlantic have significantly higher carbon storage potential than nearby second growth, and even some other old-growth forests in the Eastern United States. Tulip poplar stands had the most carbon stored as live tree biomass and oak-dominated stands had more carbon stored in coarse woody debris.

390. **McGee, C.E. 1984.** Heavy mortality and succession in a virgin mixed mesophytic forest. Res. Pap. SO-209. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 9 p.

Assesses mortality patterns and succession in Dick's Cove, an old-growth mixed mesophytic forest on the Cumberland Plateau, TN. Documents high oak and hickory canopy tree mortality, possibly attributed to complex environmental interactions characteristic of oak decline. Results indicate succession towards sugar maple dominance with the loss of canopy oaks and hickories.

391. **McGee, C.E. 1986.** Loss of *Quercus* spp. dominance in an undisturbed old-growth forest. Journal of the Elisha Mitchell Scientific Society. 102(1): 10–15.

Reports regeneration failure of oaks and hickories in an old-growth mixed mesophytic forest on the Cumberland Plateau in Tennessee. Oaks and hickories were projected to be replaced by sugar maple, ash, and tulip poplar without intervention or disturbance.

392. **McKevlin, M.R. 1996.** An old-growth definition for evergreen bay forests and related seral communities. Gen. Tech. Rep. SRS-3. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 14 p. https://doi.org/10.2737/SRS-GTR-003.

Provides definitions and associated characteristics of evergreen bay forests of the Coastal Plain as part of the larger effort to develop old-growth definitions for 35 forest types in the Eastern United States.

393. **McLeod, D.E. 1988.** Vegetation patterns, floristics, and environmental relationships in the Black and Craggy Mountains of North Carolina. Chapel Hill, NC: University of North Carolina at Chapel Hill. 222 p. Ph.D. dissertation.

Samples plant community composition and structure and examines vegetation-environment relationships of the Black and Craggy Mountains, NC, across 156 sample plots in 17 vegetation types. The environmental gradients that influenced vegetation were elevation, topographic-moisture, and soil nutrients-pH. Old-growth and secondary stands were sampled to compare successional trends.

394. **McWilliams, W.H.; Lord, R.G. 1988.** Forest resources of east Texas. Resour. Bull. SO-136. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 61 p. https://doi.org/10.2737/SO-RB-136.

Assesses quantitative forest resources of east Texas. Includes values on changes in forest cover over time, stand structure dynamics, and harvesting activity. Notably, the area of pine plantations doubled between 1975 and the time of publication, and the area of understocked stands that developed after pine harvesting increased.

395. **Meadows, J.S.; Nowacki, G.J. 1996.** An old-growth definition for eastern riverfront forests. Gen. Tech. Rep. SRS-4. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 7 p. https://doi.org/10.2737/SRS-GTR-4.

Provides definitions and associated characteristics of eastern riverfront forests, as part of the larger effort to develop old-growth definitions for 35 forest types in the Eastern United States. Three types of these forests were most common: eastern cottonwood, black willow, and sycamore-pecan-green ash-sugarberry. These forests occurred from the forest-prairie margin east to the Atlantic coastline. Representative old-growth stands occurred in the Delta National Forest, MS, and the Kisatchie National Forest, LA.

396. Meier, A.J.; Bratton, S.P.; Duffy, D.C. 1995. Possible ecological mechanisms for the loss of vernal-herb diversity in logged eastern deciduous forests. Ecological Applications. 5(4): 935–946. https://doi.org/10.2307/2269344.

Describes five possible mechanisms for loss of herbaceous diversity and slow herbaceous community recovery rates in harvested southern Appalachian forests. Formulated hypotheses based on results from a literature review and empirical studies in Upper Ivy Creek, Pisgah National Forest; Sosebee Cove, GA; Great Smokey Mountains National Park; and Walker Cove, Pisgah National Forest.

397. Meldahl, R.S.; Kush, J.S.; Boyer, W.D.; Oberholster, C. 1995. Composition of a virgin, old-growth longleaf pine stand. In: Edwards, M.B., comp. Proceedings of the eighth biennial southern silvicultural research conference. Gen. Tech. Rep. SRS-1. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 569–572.

Collects data to quantify composition, structure, and fuel prior to reintroducing fire in a 40- to 50-year fire-excluded old-growth longleaf pine stand in southern Alabama. Fire exclusion resulted in hardwood encroachment and lack of longleaf pine in the seedling and sapling layer.

398. Messick, R.E., Jr.; Davis, S.L. 2022. Global importance of imperiled old-growth forests with an emphasis on the southern Blue Ridge Mountains. In: DellaSala, D.A.; Goldstein, M.I., eds. Imperiled: The encyclopedia of conservation. Vol. 3. Imperiled ecosystem services and conservation case studies. Amsterdam, Netherlands: Elsevier: 563–573. https://doi.org/10.1016/B978-0-12-821139-7.00031-3.

Reviews the extent, status, condition, and threats to areas identified within as old-growth forests in the southern Blue Ridge Mountains. Notes that large-scale analyses often fail to delineate old-growth communities in the Blue Ridge Mountains, because remnants are small and disjunct.

399. Metz, L.J. 1960. The de la Howe old-growth forest in Piedmont shortleaf pine. Journal of Forestry. 58(10): 807–808, 810.

Discusses shortleaf pine age in old-growth Piedmont stands, littleleaf disease occurrence, and stand history for this location.

400. Milby, A.W.; Metzgar, J.S. 2021. Bryophyte diversity of on-campus old-growth and secondary-growth forests in Montgomery County, Virginia. Northeastern Naturalist. 28(4): 566–576. https://doi.org/10.1656/045.028.0414.

Inventories bryophyte communities in an urban old-growth forest and a second-growth forest on the campus of Virginia Polytechnic Institute and State University. The second-growth tract had a marginally higher bryophyte species richness.

401. Miller, L.R.; Sullivan, T.J. 2015. Preliminary lichen inventory of Overton Park, Memphis, Tennessee. Evansia. 32(1): 25–29. 25. https://doi.org/10.1639/079.032.0105.

Inventories the lichen community in Overton Park, an urban old-growth mixed oak forest in Memphis.

402. Mitchell, R.; Engstrom, T.; Sharitz, R.R.; De Steven, D.; Hiers, K.; Cooper, R.; Kirkman, L.K. 2009. Old forests and endangered woodpeckers: old-growth in the Southern Coastal Plain. Natural Areas Journal. 29(3): 301–310. https://doi.org/10.3375/043.029.0309.

Discusses the conservation value of old-growth longleaf pine and floodplain forests in the Southeastern United States as important habitat for red-cockaded and ivory-billed woodpeckers. Also reviews old-growth status and values, threats, and management and conservation challenges.

403. **Mohr, C.; Roth, F. 1897.** The timber pines of the southern United States together with a discussion of the structure of their wood. Bull. 13. Washington, DC: U.S. Department of Agriculture, Division of Forestry. 176 p. https://doi.org/10.5962/bhl.title.24792.

Provides information on the silvics and management of southern yellow pines in response to exploitative logging practices at that time in the Southeastern United States. Contains historical photographs of old-growth stands (e.g., Plate 12).

404. **Moore, C.T.; Conroy, M.J. 2006.** Optimal regeneration planning for old-growth forest: addressing scientific uncertainty in endangered species recovery through adaptive management. Forest Science. 52(2): 155–172. https://doi.org/10.1093/forestscience/52.2.155.

Develops a forest growth model for the Piedmont National Wildlife Refuge with the objective to perpetuate old-growth forest habitat for the red-cockaded woodpecker. Suggests adaptive management practices and robust monitoring to maintain old-growth habitat for threatened and endangered species.

405. **Morbeck, G.C. 1915.** Logging shortleaf pine in Arkansas. Ames Forester. 3(1): 92–118.

Describes various remnant shortleaf pine stands prior to widespread harvesting in southeastern Arkansas. Includes historical photographs of old-growth stand conditions, including shortleaf pine-hardwood mixtures. Also provides an extensive economic analysis of harvesting practices in the region.

406. **Moser, W.K.; Wade, D.D. 2005.** Fire exclusion as a disturbance in the temperate forests of the USA: examples from longleaf pine forests. Scandinavian Journal of Forest Research. 20(Suppl. 6): 17–26. https://doi.org/10.1080/14004080510041048.

Discusses the impacts of fire in longleaf pine, broken down by the four stages of stand development: stand initiation, stem exclusion, understory reinitiation, and old growth (p. 23). Provides important considerations for fire in old growth, including duff consumption, ladder fuels, fire seasonality, ignition patterns, and atmospheric conditions.

407. **Muller, R.N. 1982.** Vegetation patterns in the mixed mesophytic forest of eastern Kentucky. Ecology. 63(6): 1901–1917. https://doi.org/10.2307/1940129.

Compares composition and structure between old-growth (Lilley Cornett Woods) and 35-year-old second-growth, mixed mesophytic forests on the Cumberland Plateau, KY. Basal area was similar, but this was attributed to fewer large stems in the old growth and more smaller stems in the second growth. Size-class distributions were also similar between the forests.

408. **Muller, R.N. 1983.** Forest regrowth on the Cumberland Plateau and implications for productive management. Southern Journal of Applied Forestry. 7(4): 208–212. https://doi.org/10.1093/sjaf/7.4.208.

Assesses the potential impacts of hemlock woolly adelgid on various eastern hemlock stands in southeastern Kentucky (including Lilley Cornett Woods) by using vegetation assessments and Forest Vegetation Simulator predictions 20 years into the future with and without the effects of the adelgid. Without adelgid impacts, stands were predicted to change little over time, but with adelgid impacts, stands were projected to experience hardwood conversion.

409. **Muller, R.N. 2003.** Landscape patterns of change in coarse woody debris accumulation in an old-growth deciduous forest on the Cumberland Plateau, southeastern Kentucky. Canadian Journal of Forest Research. 33(5): 763–769. https://doi.org/10.1139/x02-210.

Assesses coarse woody debris dynamics in the old-growth mixed-mesophytic Lilley Cornett Woods in Kentucky over a 10-year period. Coarse woody debris composition was not linked to overstory composition, not strongly associated with canopy gap dynamics, and the amount of coarse woody debris was temporally variable, which suggests that the intensity of disturbance was variable through time.

410. Muller, R.N.; Liu, Y. 1991. Coarse woody debris in an old-growth deciduous forest on the Cumberland Plateau, southeastern Kentucky. Canadian Journal of Forest Research. 21(11): 1567–1572. https://doi.org/10.1139/x91-218.

Calculates volume, mass, and distribution of coarse woody debris in an old-growth mixed-mesophytic forest in Big Everidge Hollow, KY. The majority of coarse woody debris mass was composed of oaks, beech, and American chestnut.

411. Muller, R.N.; Martin, W.H. 1983. Autumn leaf fall and nutrient return in an old-growth and a second-growth forest in eastern Kentucky. Botanical Gazette. 144(4): 552–558. https://doi.org/10.1086/337410.

Collects and compares leaf litter composition and nutrient loads in old-growth and second-growth mixed-mesophytic forests in Kentucky. Found no significant differences in leaf fall biomass or composition. Results indicate that species composition was a greater source of variability in leaf fall biomass than stage of stand development.

412. Murch, W.P. 2016. LiDAR-assisted extraction of old growth baldcypress stands along the Black River of North Carolina. Fayetteville, AR: University of Arkansas. 69 p. M.S. thesis.

Develops a light detection and ranging (LiDAR)-derived decision-tree algorithm to detect potential old-growth baldcypress by using calculated metrics from known old-growth stands on the Black River in North Carolina. These methods could be applied to detect other old-growth stands in the Forest Service's Southern Region; collection of ground truth data is encouraged.

413. Murphy, P.A.; Nowacki, G.J. 1997. An old-growth definition for xeric pine and pine-oak woodlands. Gen. Tech. Rep. SRS-7. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 7 p. https://doi.org/10.2737/SRS-GTR-007.

Provides a definition and associated characteristics of old-growth xeric pine and pine-oak woodlands, as part of the larger effort to develop old-growth definitions for 35 forest types in the Eastern United States.

414. Murphy, S.J.; McCarthy, B.C. 2012. Evidence for topographic control of tree spatial patterning in an old-growth, mixed-mesophytic forest in southeastern Ohio, USA. Journal of the Torrey Botanical Society. 139(2): 181–193. https://doi.org/10.3159/TORREY-D-12-00001.1.

Assesses the effects of topography (northern versus southern aspects) on the spatial pattern of trees in an old-growth, mixed mesophytic forest in Ohio. Trees were spatially aggregated on south-facing aspects and randomly distributed on north-facing aspects. These differences were attributed to the dominance of sugar maple on north-facing aspects and beech on south-facing aspects. Concludes that topography may partially control tree spatial patterns in old-growth, mixed mesophytic forests.

415. Myers, B.R.; Walck, J.L.; Blum, K.E. 2004. Vegetation change in a former chestnut stand on the Cumberland Plateau of Tennessee during an 80-year period (1921–2000). Castanea. 69(2): 81–91. https://doi.org/10.2179/0008-7475(2004)069<0081:VCIAFC>2.0.CO;2.

Quantifies the stand composition and structure of a previously American chestnut-dominated stand on the Cumberland Plateau, TN, over an 80-year period. Tulip poplar and maples increased in importance, and oaks increased in canopy dominance but were largely absent in subcanopy layers.

416. Nicholas, N.S.; Zedaker, S.M.; Eagar, C. 1992. A comparison of overstory community structure in three southern Appalachian spruce-fir forests. Bulletin of the Torrey Botanical Club. 119(3): 316–332. https://doi.org/10.2307/2996764.

Compares the composition, structure, and stand dynamics of high altitude spruce-fir stands in Virginia, North Carolina, and Tennessee. Stands at Mt. Rogers (VA) and Black Mountains (NC) were second growth, and stands at Great Smoky Mountains National Park (TN, NC) were old growth. Two of the three sites had evidence of spruce-to-Frasier fir succession. Also discusses balsam woolly adelgid-induced fir mortality.

417. Nixon, E.S.; Marietta, K.L.; Littlejohn, R.O.; Weyland, H.B. 1980. Woody vegetation of an American beech (*Fagus grandifolia*) community in eastern Texas. Castanea. 45(3): 171–180.

Describes the composition and structure of an old-growth mesophytic forest dominated by American beech in east Texas.

418. Nixon, E.S.; Willett, R.L.; Cox, P.W. 1977. Woody vegetation of a virgin forest in an eastern Texas river bottom. Castanea. 42(3): 227–236.

Describes the woody plant community in a bottomland hardwood forest in Texas. Communities were stratified by flats and ridges, which were separated by an elevational gradient of <2 m. Principal species included American hornbeam, Carolina ash, water oak, and red maple.

419. Noel, J.M.; Platt, W.J.; Moser, E.B. 1998. Structural characteristics of old- and second-growth stands of longleaf pine (*Pinus palustris*) in the Gulf Coastal region of the U.S.A. Conservation Biology. 12(3): 533–548. https://doi.org/10.1111/j.1523-1739.1998.96124.x.

Compares structure of an old-growth xeric longleaf pine stand to second-growth xeric and flatwoods longleaf pine stands. Notably in the old-growth stand, canopy openings from canopy tree mortality facilitated establishment and recruitment of younger longleaf pine. This process was largely absent in the xeric second-growth stands.

420. Noss, R.F. 1991. Effects of edge and internal patchiness on avian habitat use in an old-growth Florida hammock. Natural Areas Journal. 11(1): 34–47.

Assesses the effects of edge and interior forest conditions on bird habitat use in an old-growth mesic hardwood hammock in Florida. Bird abundance was greater at the edge, in canopy gaps, or in other areas of dense vegetation than in interior forest conditions. Edge effects were less important for bird communities in old growth because they contained more habitat in various stages of succession compared to second growth.

421. Nowacki, G.J.; Trianosky, P.A. 1993. Literature on old-growth forests of eastern North America. Natural Areas Journal. 13(2): 87–107.

Provides 749 citations (as of 1993) related to old growth in the Eastern United States. Numbered citations were cross-referenced with common forest types and selected old-growth sites in tables 1 and 2, respectively.

422. Nuttle, T.; Haefner, J.W. 2007. Design and validation of a spatially explicit simulation model for bottomland hardwood forests. Ecological Modelling. 200(1/2): 20–32. https://doi.org/10.1016/j.ecolmodel.2006.07.010.

Incorporates spatially explicit data on seed production and dispersal into a predeveloped model of bottomland hardwood forest development. The refined model was an individual tree-based, spatially explicit forest simulator to track stand dynamics over time. Model performance was assessed using data collected from multiple reference old-growth and second-growth stands in the Mississippi Alluvial Valley.

423. Odum, E.P. 1949. Small mammals of the Highlands (North Carolina) Plateau. Journal of Mammalogy. 30(2): 179–192. https://doi.org/10.2307/1375269.

Surveys small mammals across various cover types, including an old-growth hemlock forest. Compares an old-growth hemlock stand and a logged hemlock stand, which revealed almost identical relative abundance of the small mammals captured. Species collected in the old-growth hemlock stand included the cinereus shrew, the smoky shrew, northern short-tailed shrew, eastern chipmunk, American red squirrel, North American deermouse, golden mouse, and Carolina red-backed vole. Also reports that an eastern woodrat was collected in the old-growth stand by a previous survey.

424. Odum, E.P. 1950. Bird populations of the Highlands (North Carolina) Plateau in relation to plant succession and avian invasion. Ecology. 31(4): 587–605. https://doi.org/10.2307/1931577.

Compares bird community composition in three plots of different cover types on the Highlands Plateau of North Carolina including a mesic shrubland, intermediate-age hemlock-hardwood forest, old-growth hemlock forest, xeric shrubland, second-growth deciduous forest, and mature oak-chestnut forest. Trees in the old-growth hemlock stand were more than 400 years old and 3–4 feet in diameter. The old-growth hemlock stand supported high numbers of birds (331 pairs per 100 acres across all species). The black-throated blue, Blackburnian, and Canada warblers had higher relative abundance on both hemlock sites, compared to the other sites surveyed.

425. **Olano, J.M.; Palmer, M.W. 2003.** Stand dynamics of an Appalachian old-growth forest during a severe drought episode. Forest Ecology and Management. 174(1): 139–148. https://doi.org/10.1016/S0378-1127(02)00033-6.

Assesses stand dynamics of an old-growth sugar maple-beech-basswood stand in the Walker Cover Research Natural Area, NC, in response to severe drought. Reports drought-induced species-specific patterns of mortality and diameter-growth response.

426. **Olmsted, F.E. 1902.** A working plan for forest lands near Pine Bluff, Arkansas. Bull. 32. Washington, DC: U.S. Department of Agriculture, Bureau of Forestry. 48 p. https://doi.org/10.5962/bhl.title.66123.

Provides a forest management plan for pine and bottomland hardwood stands near Pine Bluff, AR. Considers diameter-limit cutting of merchantable pines, seed-tree regeneration harvests, favoring loblolly pine over shortleaf pine, and harvest recommendations for bottomland hardwoods. Includes some images of preharvest stand conditions. Based on this plan, most of the merchantable timber was slotted to be harvested, so most forest in this region of Arkansas can be assumed to be second growth.

427. **Oosting, H.J.; Billings, W.D. 1939.** Edapho-vegetational relations in Ravenel's Woods, a virgin hemlock forest near Highlands, North Carolina. American Midland Naturalist. 22(2): 333–350. https://doi.org/10.2307/2420313.

Describes the vegetation and soil characteristics of an old-growth hemlock stand (Ravenel's Woods) in Macon County, NC. Within the site, there were two distinct forest types: the ***Rhododendron*** type and the ***Vaccinium*** (formerly ***Polycodium***) type, which differed in their dominant trees as well as their occurrence. The ***Rhododendron*** type occurred along streams and the ***Vaccinium*** type occurred on the interstream low ridges. The soil composition was also discussed in detail.

428. **Oosting, H.J.; Billings, W.D. 1951.** A comparison of virgin spruce-fir forest in the northern and southern Appalachian system. Ecology. 32(1): 84–103. https://doi.org/10.2307/1930974.

Compares old-growth spruce-fir stand composition, structure, and site characteristics between its southern (Great Smoky Mountains National Park) and northern (White Mountains) range.

429. **Oosting, H.J.; Bourdeau, P.F. 1955.** Virgin hemlock forest segregates in the Joyce Kilmer Memorial Forest of western North Carolina. Botanical Gazette. 116(4): 340–359. https://doi.org/10.1086/335878.

Describes the vegetation composition, structure, and site characteristics of old-growth eastern hemlock stands in Joyce Kilmer Memorial Forest. Compares composition and structure between a recently cutover hemlock stand (Ravanel's Woods) and the old-growth hemlock stand at Joyce Kilmer.

430. **Orwig, D.A.; Abrams, M.D. 1991.** Effect of stand age and soils on forest composition at Spotsylvania Battlefield, Virginia. [Abstract]. In: McCormick, L.H.; Gottschalk, K.W., eds. Proceedings of the 8th central hardwoods forest conference. Gen. Tech. Rep. NE-148. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 591.

Surveys and compares woody vegetation in 28 stands at Spotsylvania Battlefield, VA. All stands were second growth, with Virginia pine stands occurring on deep, well-drained eroded soils, and oak-hickory stands occurring on well-drained and poorly drained soils. All stands established <150 years prior to sampling. Documents oak regeneration failure.

431. Oswalt, C.M.; Oswalt, S.N.; Brandeis, T.J. 2010. Big trees in the southern forest inventory. Res. Note SRS-19. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 33 p. https://doi.org/10.2737/SRS-RN-19.

Uses Forest Inventory and Analysis (FIA) data to identify the largest documented trees by genus and species in each State of the Southern Region (except Oklahoma). Presents trees and associated attributes in numerous tables at the end of the manuscript. Authors caution that the coarse sampling design implemented by FIA may not have captured the largest tree in each State.

432. Outcalt, K.W. 1997. An old-growth definition for sand pine forests. Gen. Tech. Rep. SRS-12. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 8 p. https://doi.org/10.2737/SRS-GTR-012.

Develops old-growth definitions for sand pine forests, as part of the larger effort to define 35 old-growth types in the Eastern United States. Old-growth attributes of sand pine included mean diameter at breast height of 14 inches, mean height of 55 feet, and mean age of 55 years. The old-growth stage was relatively short in these sand pine systems because of the short lifecycle of sand pine and disturbance.

433. Outcalt, K.W. 1997. An old-growth definition for tropical and subtropical forests in Florida. Gen. Tech. Rep. SRS-13. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 8 p. https://doi.org/10.2737/SRS-GTR-013.

Provides a definition and associated characteristics of old-growth tropical and subtropical forests in Florida, as part of the larger effort to develop old-growth definitions for 35 forest types in the Eastern United States.

434. Palmer, M.W. 1987. Diameter distributions and the establishment of tree seedlings in the Henry M. Wright Preserve, Macon County, North Carolina. Castanea. 52(2): 87–94.

Quantifies diameter distributions of dominant tree species in an old-growth hemlock-birch stand in Revenel's Woods, NC. Silver birch and eastern hemlock did not have a negative exponential diameter distribution typical of old growth, which was attributed to the dense shrub layer that may have prevented woody plant establishment.

435. Pan, Y.; Chen, J.M.; Birdsey, R.; McCullough, K.; He, L.; Deng, F. 2011. Age structure and disturbance legacy of North American forests. Biogeosciences. 8(3): 715–732. https://doi.org/10.5194/bg-8-715-2011.

Uses national-level inventories, historical fire information, and other satellite-based imagery to produce a continental-scale estimate of forest age for North America. Although not very specific to the Southern United States, this study found very low percentages of stands that were more than a century old.

436. Parker, A.J.; Parker, K.C.; Wiggins-Brown, H. 2000. Disturbance and scale effects on southern old-growth forests (USA): the sand pine example. Natural Areas Journal. 20(3): 273–279.

Discusses the importance of disturbance in sand pine forests, which is an early succession, small-sized, short-lived, and disturbance-dependent species. Thus, its old-growth characteristics are unique. Considers a landscape-level management framework for old-growth sand pine stands within a matrix of younger stands.

437. Parker, G.R. 1989. Old-growth forests of the Central Hardwood Region. Natural Areas Journal. 9(1): 5–11.

Reviews the status, characteristics, management problems, and research needs for old-growth forests in the Central Hardwoods Region. High-quality old growth is rare in this forest region.

438. Parker, K.C.; Jensen, C.; Parker, A.J. 2014. The growth response of slash pine (*Pinus elliottii*) to climate in the Georgia Coastal Plain. Dendrochronologia. 32(2): 127–136. https://doi.org/10.1016/j.dendro.2014.03.003.

Examines radial growth patterns and develops growth-climate models for old-growth slash pine in the Wormsloe State Historic Site, Savannah, GA. Late winter and spring moisture was critical for earlywood development, and latewood development was influenced by cool, wet summers and hurricane-related precipitation.

439. Pascarella, J.B.; Aide, T.M.; Serrano, M.I.; Zimmerman, J.K. 2000. Land-use history and forest regeneration in the Cayey Mountains, Puerto Rico. Ecosystems. 3(3): 217–228. https://doi.org/10.1007/s100210000021.

Assesses the effects of land-use history on forest structure in the Cayey Mountains, PR. Compares postagricultural secondary forest to old growth and found that secondary-forest basal area and richness recovered to old-growth levels after 25–35 years, but species composition remained distinct from old growth.

440. Patterson, T.W. 2013. Comparing growth and morphological characteristics of North Carolina longleaf pine stands. Greensboro, NC: University of North Carolina at Greensboro. 88 p. M.A. thesis.

Studies the morphological characteristics and growth response to climate of old-growth longleaf pine in several stands in North Carolina.

441. Patterson, T.W.; Knapp, P.A. 2016. Observations on a rare old-growth montane longleaf pine forest in central North Carolina, USA. Natural Areas Journal. 36(2): 153–161. https://doi.org/10.3375/043.036.0206.

Describes the composition, structure, and spatial patterns of a 24-ha old-growth montane longleaf pine stand in the Uwharrie Mountains, NC.

442. Pederson, N. 2010. External characteristics of old trees in the Eastern Deciduous Forest. Natural Areas Journal. 30(4): 396–407. https://doi.org/10.3375/043.030.0405.

Describes six architectural indicators of old trees in eastern deciduous forests that may prove helpful in the identification of potential old-growth forests. Indicators included smooth bark, low stem taper, stem sinuosity, crowns with large diameter twisting limbs, low crown volume, and low ratio of leaf area to trunk volume. Also describes the ecological conditions that increase the likelihood of finding old trees.

443. Pederson, N.; D'Amato, A.W.; Orwig, D.A. 2007. Natural history from dendrochronology: maximum ages and canopy persistence of rarely studied hardwood species. In: Buckley, D.S.; Clatterbuck, W.K., eds. Proceedings of the 15th central hardwood forest conference. e-Gen. Tech. Rep. SRS-101. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 695–701.

Uses dendrochronological analyses to present new findings on the maximum age of four common tree species found throughout the central hardwood forest region. Reports maximum ages were red maple, 300 years; black birch, 361 years; shagbark hickory, 354 years; cucumbertree, 348 years. Results indicate that these rarely studied species can live much longer than previously thought.

444. Pederson, N.; Tackett, K.; McEwan, R.W.; Clark, S.; Cooper, A.; Brosi, G.; Eaton, R.; Stockwell, R.D. 2012. Long-term drought sensitivity of trees in second-growth forests in a humid region. Canadian Journal of Forest Research. 42(10): 1837–1850. https://doi.org/10.1139/x2012-130.

Compares the efficacy of using tree-ring chronologies for dendrohydrological reconstructions from samples collected in old-growth and second-growth stands in various sites in eastern Kentucky (Blanton's Forest and Lilley Cornett Woods). "Nonclassical chronologies," i.e., those collected from random, second-growth trees, had similar radial growth patterns to those of old-growth samples, which emphasized the utility of nontraditional dendrochronological and drought reconstruction techniques.

445. **Pederson, N.A.; Jones, R.H.; Sharitz, R.R. 1997.** Age structure and possible origins of old *Pinus taeda* stands in a floodplain forest. Journal of the Torrey Botanical Society. 124(2): 111–123. https://doi.org/10.2307/2996579.

Quantifies stand and age structure of old-growth floodplain loblolly pine in the Congaree Swamp National Monument. Old-growth stands were >200 years old and had a two-aged structure. Pines were spatially clustered, which suggested historical gap-phase regeneration.

446. **Pelz, K.A.; Hayward, G.; Gray, A.N.; Berryman, E.M.; Woodall, C.W.; Nathanson, A.; Morgan, N.A. 2023.** Quantifying old-growth forest of United States Forest Service public lands. Forest Ecology and Management. 549: 121437. 9 p. https://doi.org/10.1016/j.foreco.2023.121437.

Develops an approach to estimate the extent of old-growth forest on National Forest System lands using regional old-growth definitions applied to Forest Inventory and Analysis (FIA) program data. For the Southern Region, 1997 old-growth community types were crosswalked with FIA forest types, and stands were considered old growth if plots exceeded minimum compositional and structural thresholds outlined in the 1997 old-growth community types. The analysis estimated 472,000 ha and 9 percent of the forested land in the Southern Region to be old growth.

447. **Penfound, W.T.; Watkins, A.G. 1937.** Phytosociological studies in the pinelands of southeastern Louisiana. American Midland Naturalist. 18(4): 661–682. https://doi.org/10.2307/2420659.

Provides detailed, stand-level descriptions of some old-growth longleaf pine and slash pine-pondcypress communities of the Florida Parishes of southeastern Louisiana from the mid-1930s. Includes both tree condition descriptions as well as accounts of understory vegetation and provides some contrasts with second-growth pine stands in that same area.

448. **Peppers, K.C. 2004.** Old-growth forests in the western Cross Timbers of Texas. Fayetteville, AR: University of Arkansas. 171 p. Ph.D. dissertation.

Provides a description of the composition, structure, and stand dynamics of the old-growth Cross Timbers in west Texas. Also develops a predictive model to locate old growth in the western Cross Timbers of Texas.

449. **Perry, R.W.; Thill, R.E.; Leslie, D.M., Jr. 2007.** Selection of roosting habitat by forest bats in a diverse forested landscape. Forest Ecology and Management. 238(1): 156–166. https://doi.org/10.1016/j.foreco.2006.10.008.

Studies the summer roost selection of bats across multiple forest stands in the Ouachita Mountains of central Arkansas. Five of the six bat species (big brown, northern long-eared, red, Seminole, and eastern pipistrelle) studied preferred to roost in older stands (>100 years old) of mixed-pine hardwood forest relative to the other types of forest stands (e.g., young pine).

450. **Peters, R.; Platt, W.J. 1996.** Growth strategies of main trees and forest architecture of a *Fagus-Magnolia* forest in Florida, USA. Vegetatio. 123(1): 39–49. https://doi.org/10.1007/BF00044886.

Quantifies the growth strategies of six common species in an old-growth forest in northern Florida to analyze canopy architecture and predict forest development. American beech was predicted to become the dominant canopy tree species in the absence of hurricane disturbance. With disturbance, sweetgum and spruce pine were predicted to increase in dominance.

451. **Petranka, J.W.; Brannon, M.P.; Hopey, M.E.; Smith, C.K. 1994.** Effects of timber harvesting on low elevation populations of southern Appalachian salamanders. Forest Ecology and Management. 67(1): 135–147. https://doi.org/10.1016/0378-1127(94)90012-4.

Compares the relative abundance and species richness of salamanders across forest stands ranging from <40 years old to >120 years old. Salamanders were lost or reduced to low numbers when mature

stands were clearcut. Cites unpublished data that Southern Appalachian salamanders appeared to reach their highest densities in old-growth forests.

452. **Petranka, J.W.; Murray, S.S. 2001.** Effectiveness of removal sampling for determining salamander density and biomass: a case study in an Appalachian streamside community. Journal of Herpetology. 35(1): 36–44. https://doi.org/10.2307/1566020.

Surveys the salamander community in an old-growth forest at Walker Cove, Great Craggy Mountains, Buncombe County, NC. Captures of most species declined over time. Estimates density and wet biomass of salamanders to be 18 486 individuals/ha and 16.53 kg/ha, respectively. Values were 14 times greater than previous estimates of salamander biomass in forest ecosystems.

453. **Petruccelli, C.A.; Sakulich, J.; Harley, G.L.; Grissino-Mayer, H.D. 2014.** Structure and dynamics of an old-growth pine-oak community in the southern Appalachian Mountains, Georgia, U.S.A. Southeastern Geographer. 54(2): 161–182. https://doi.org/10.1353/sgo.2014.0010.

Documents the composition, structure, stand age, and recruitment patterns of an old-growth shortleaf pine-chestnut oak stand in northwestern Georgia. The oldest shortleaf pines exceeded 220 years in age. With fire exclusion, red maple and mockernut hickory were projected to increase in dominance over time, and oak and pine were projected to decline in dominance.

454. **Phillips, D.L.; Goode, J.D.; Hart, J.L. 2022.** Spatial patterns of stand structure and canopy disturbance in a fire-maintained *Pinus palustris* woodland. Applied Vegetation Science. 25(2): e12657. 11 p. https://doi.org/10.1111/avsc.12657.

Quantifies the spatial patterns of stand structure and reconstructed historical canopy disturbance with dendrochronological techniques in a multiaged, fire-maintained longleaf pine woodland. The oldest cohort of longleaf pine was >200 years old. Results have potential use for restoring or accelerating development to achieve old-growth spatial patterns in longleaf pine stands.

455. **Phipps, R.L. 2005.** Some geometric constraints on ring-width trend. Tree-Ring Research. 61(2): 73–76. https://doi.org/10.3959/1536-1098-61.2.73.

Simulates radial growth patterns of canopy-sized white oak from a second-growth forest in Illinois and an old-growth forest in Kentucky. Suggests that ring-widths of samples from second-growth forest should reveal a decreasing ring-width trend for an extended period of time after reaching the canopy, whereas old-growth samples should reveal an increasing ring-width trend for an extended period of time after reaching the canopy.

456. **Pinder, J.E., III; Rea, T.E.; Funsch, D.E. 1999.** Deforestation, reforestation and forest fragmentation on the Upper Coastal Plain of South Carolina and Georgia. American Midland Naturalist. 142(2): 213–228. https://doi.org/10.1674/0003-0031(1999)142[0213:DRAFFO]2.0.CO;2.

Assesses rates of deforestation and reforestation on the upper Coastal Plain of Georgia and South Carolina between 1974 and 1991 by using remote-sensing techniques.

457. **Platt, W.J.; Doren, R.F.; Armentano, T.V. 2000.** Effects of Hurricane Andrew on stands of slash pine (*Pinus elliottii* var. *densa*) in the everglades region of south Florida (USA). Plant Ecology. 146(1): 43–60.

Compares hurricane damage between old-growth and second-growth rockland slash pine stands in the Florida Everglades. Hurricane winds differentially affected larger trees, but slash pine was generally resistant to mortality. Old-growth stands experienced less damage than did second-growth stands. Patterns of mortality were spatially clustered, indicating that uneven-aged stand structure will develop over time with subsequent disturbance.

458. **Platt, W.J.; Evans, G.W.; Rathbun, S.L. 1988.** The population dynamics of a long-lived conifer (*Pinus palustris*). American Naturalist. 131(4): 491–525. https://doi.org/10.1086/284803.

Studies the demography and spatial distribution of an old-growth longleaf pine population on the Wade Tract in Georgia. The population had an uneven age structure with young trees being highly

aggregated; old trees were less aggregated. Large gaps were absent, indicating that recruitment occurred steadily over 250 years. The lack of other tree species in the area was attributed to longleaf pine ability to convert a local disturbance of lightning strikes into a widespread disturbance of ground fires, promoting continued existence and establishment of longleaf pine while excluding other tree species.

459. **Platt, W.J.; Rathbun, S.L. 1993.** Dynamics of an old-growth longleaf pine population. In: Hermann, S.M., ed. The longleaf pine ecosystem: ecology, restoration and management: Proceedings of the 18th Tall Timbers fire ecology conference. Tallahassee, FL: Tall Timbers Research Station: 275–297.

Reports on a detailed study of the population dynamics of an old-growth longleaf pine stand (the Wade Tract). Includes aspects such as mortality, recruitment, patch dynamics, tree growth rates and patterns, and catastrophic natural disturbance.

460. **Plummer, G.L. 1975.** 18th century forests in Georgia. Bulletin of the Georgia Academy of Science. 33: 1–19.

Uses information from original land surveys from the late 1700s to early 1800s to understand aspects of Georgia's vegetation.

461. **Potzger, J.E.; Friesner, R.C. 1934.** Some comparisons between virgin forest and adjacent areas of secondary succession. Butler University Botanical Studies. 3(2/5): 85–98.

Describes and compares old-growth and second-growth stands that were 1) selectively harvested and 2) clearcut 70 years prior in an oak-hickory forest in Indiana. Both secondary forests were projected to return to oak-hickory dominance, with little indication of common mixed-mesophytic succession in those disturbed stands. Documents gap-phase regeneration in old-growth oak-hickory.

462. **Provencher, L.; Litt, A.R.; Gordon, D.R.; Rodgers, H.L.; Herring, B.J.; Galley, K.E.M.; McAdoo, J.P.; McAdoo, S.J.; Gobris, N.M.; Hardesty, J.L. 2001.** Restoration fire and hurricanes in longleaf pine sandhills. Ecological Restoration. 19(2): 92–98. https://doi.org/10.3368/er.19.2.92.

Assesses interactive effects of prescribed fire and multiple hurricanes on longleaf pine plant and wildlife communities on Eglin Air Force Base. Frequent prescribed fire increased the likelihood of longleaf pine survival and dominance, inhibiting succession towards hardwoods in hurricane-prone systems.

463. **Putnam, C. 1988.** The development and application of habitat standards for maintaining vertebrate species diversity on a national forest. Natural Areas Journal. 8(4): 256–266.

Describes the process used by the Mark Twain National Forest in Missouri to develop and apply habitat standards to maintain vertebrate diversity. Suggests a desired amount of old-growth habitat and associated characteristics (e.g., snags, layered vegetation, etc.). Table 3 displays the amount of unique species associated with old-growth habitat compared to other habitat conditions.

464. **Putz, F.E.; Sharitz, R.R. 1991.** Hurricane damage to old-growth forest in Congaree Swamp National Monument, South Carolina, U.S.A. Canadian Journal of Forest Research. 21(12): 1765–1770. https://doi.org/10.1139/x91-244.

Assesses hurricane damage in the old-growth Congaree Swamp National Monument and found that damage was more severe in mixed bottomland forest than cypress-tupelo swamps.

465. **Pyle, C. 1985.** Vegetation disturbance history of Great Smoky Mountains National Park: an analysis of archival maps and records. Research/Management Rep. SER-77. Atlanta, GA: U.S. Department of the Interior, National Park Service, Southeast Region. 69 p.

Uses historical records to catalog anthropogenic disturbance (logging, farming, and fire) in the Great Smoky Mountains National Park prior to establishment. "High in virgin forest attributes" areas in the park were identified as those without records of disturbance. Page 25 contains tables with estimates of virgin forests in the park standardized to 1984 park boundaries.

466. **Pyle, C. 1988.** The type and extent of anthropogenic vegetation disturbance in the Great Smoky Mountains before National Park Service acquisition. Castanea. 53(3): 183–196.

Identifies areas of potential virgin forests in the Great Smoky Mountains National Park prior to National Park Service acquisition. Methods were based on absence of written records concerning human-related disturbance and mapped land-use records. Records disturbance events including corporate logging, concentrated settlement, diffuse disturbance, and other miscellaneous disturbance (e.g., fire). Results indicate that 20 percent of the park had no record of disturbance.

467. **Pyle, C.; Schafale, M.P. 1985.** History of disturbance in spruce-fir forests of the SARRMC intensive study sites—Mt. Rogers National Recreation Area, Black Mountains, and Great Smoky Mountains. Southern Appalachian Spruce-Fir Ecosystem Assessment Program. 67 p.

Provides an overview of disturbance in the southern Appalachian spruce-fir zone and a description of three intensive study sites chosen by the Southern Appalachian Research/Resource Management Cooperative for their Spruce-Fir Ecosystem Assessment Program. Table 1 provides an overview of common disturbance agents and the timing, effect, and spatial scale of disturbance.

468. **Pyle, C.; Schafale, M.P. 1988.** Land use history of three spruce-fir forest sites in southern Appalachia. Journal of Forest History. 32(1): 4–21. https://doi.org/10.2307/4005019.

Describes the historical land-use and disturbance history of two spruce-fir sites in North Carolina: Great Smoky Mountains National Park and the Black Mountains, and one spruce site in Virginia: Mt. Rogers. Shows disturbance type and extent on maps on pages 7 and 9.

469. **Quarterman, E.; Keever, C. 1962.** Southern mixed hardwood forest: climax in the southeastern Coastal Plain, U.S.A. Ecological Monographs. 32(2): 167–185. https://doi.org/10.2307/1942384.

Describes the pine-hardwood and post-pine hardwood forests in the southern pine belt of the Coastal Plain. Identifies 93 hardwood or pine-hardwood-dominated stands on mesic sites and analyzes the woody vegetation. The authors consider the southern mixed hardwood forest type to be in a climax state.

470. **Quarterman, E.; Turner, B.H.; Hemmerly, T.E. 1972.** Analysis of virgin mixed mesophytic forests in Savage Gulf, Tennessee. Bulletin of the Torrey Botanical Club. 99(5): 228–232. https://doi.org/10.2307/2484607.

Describes the composition and structure of a virgin mixed mesophytic cove forest on the south Cumberland Plateau, TN. Aspect was a primary driver in community differences, with north-facing aspects supporting basswood, eastern hemlock, sugar maple, and tulip poplar and south-facing aspects supporting chestnut oak, mockernut hickory, northern red oak, tulip poplar, and white oak.

471. **Racine, C.H. 1966.** Pine communities and their site characteristics in the Blue Ridge escarpment. Journal of the Elisha Mitchell Scientific Society. 82(2): 172–181.

Describes the pine and pine-oak communities and associated site and soil characteristics that occurred on a Blue Ridge escarpment. Provides no direct mention of old growth, but discusses succession and climax stage of these stands.

472. **Radzio, T.A.; Cox, J.A.; O'Connor, M.P. 2017.** Behavior and conspecific interactions of nesting gopher tortoises (*Gopherus polyphemus*). Herpetological Conservation and Biology. 12(2): 373–383.

Studies gopher tortoise nesting and conspecific interactions at the Wade Tract, an old-growth longleaf pine site in southwestern Georgia. Describes the behavior of nesting females while excavating and constructing nests. Also observes abandonment of nests by females in response to conspecific interactions.

473. **Rankin, W.T.; Tramer, E.J. 2002.** The gap dynamics of canopy trees of a *Tsuga canadensis* forest community. Northeastern Naturalist. 9(4): 391–406. https://doi.org/10.2307/3858552.

Reconstructs the canopy gap history and related historical gap formation to tree establishment with dendrochronological techniques in an eastern hemlock-dominated forest in southeastern Ohio. Of the 80 gaps identified, 13 coincided with initial tree growth. Also develops a gap affinity index by measuring the distance in time and space between the first year of growth to the nearest canopy gap. Shade-intolerant species had high gap affinities and shade-tolerant species had low gap affinities.

474. **Reams, G.A.; Nicholas, N.S.; Zedaker, S.M. 1993.** Two hundred year variation of southern red spruce radial growth as estimated by spectral analysis. Canadian Journal of Forest Research. 23(2): 291–301. https://doi.org/10.1139/x93-039.

Assesses radial growth trends in old-growth red spruce. Results provide counterevidence for age-related growth decline in old-growth red spruce.

475. **Reams, G.A.; Van Deusen, P.C. 1998.** Detecting and predicting climatic variation from old-growth baldcypress. In: Mickler, R.A.; Fox, S., eds. The productivity and sustainability of southern forest ecosystems in a changing environment. New York: Springer: 701–716. https://doi.org/10.1007/978-1-4612-2178-4_38.

Highlights the benefits of old-growth baldcypress tree-ring chronologies in reconstructing past climate and historical weather events, especially in the context of contemporary climate change. Presents a novel method for detecting hurricane signals and seasonal precipitation patterns by using a Bayesian approach.

476. **Reed, F.W. 1905.** Report on an examination of a forest tract in western North Carolina. Bull. 60. Washington, DC: U.S. Department of Agriculture, Bureau of Forestry. 32 p. https://doi.org/10.5962/bhl.title.85309.

Describes an approximately 16,000-acre property in the mountains of western North Carolina that was still >90 percent virgin forest at the time of publishing. Provides detailed descriptions of hemlock-dominated bottomland forests, chestnut-dominated slope forests, sugar maple-dominated slope forests, and spruce-fir dominated mountaintop forests. Includes tables of major species compositions by diameter class for large sample areas of each forest type. Also includes many good photographs of examples of these historical old forests.

477. **Reed, F.W. 1905.** A working plan for forest lands in central Alabama. Bull. 68. Washington, DC: U.S. Department of Agriculture, Forest Service. 71 p. + maps. https://doi.org/10.5962/bhl.title.66742.

Describes an inventory of approximately 35,000 acres of virgin forest in Coosa County, of which >75 percent was in longleaf pine (montane), and approximately 63,000 acres of virgin forest in Bibb County, of which 89 percent was in longleaf pine (rolling hills). Also discusses fire, grazing, and diameter-limit harvesting. Provides historical photographs of old-growth longleaf pine throughout. Also provides an inventory of “creek land” in each tract with associated species present.

478. **Reid, J.L.; Evans, J.P.; Hiers, J.K.; Harris, J.B.C. 2008.** Ten years of forest change in two adjacent communities on the southern Cumberland Plateau, U.S.A. Journal of the Torrey Botanical Society. 135(2): 224–235. https://doi.org/10.3159/08-RA-015.1.

Compares composition changes and successional trajectories in two distinct forest communities on the Cumberland Plateau: upland and cove. Both sites had a history of either intensive (upland) or selective (cove) harvesting, thus old-growth-related inference was cautioned. Results showed that red maple and sugar maple increased in importance over time in upland and cove forests, respectively.

479. **Rentch, J.S. 2010.** Relationship between treefall direction, slope-aspect, and wind in eight old-growth oak stands in the Central Hardwood Forest, USA. Journal of the Torrey Botanical Society. 137(4): 391–400. https://doi.org/10.3159/10-RA-011.1.

Reports that the direction of treefall gaps in old-growth, oak-dominated stands under a frequent gap-scale disturbance regime were variable and unpredictable, and largely not influenced by slope-aspect and wind speed.

480. **Rentch, J.S. 2011.** Do trees fall downhill? Relationship between treefall direction and slope-aspect and wind in eight old-growth oak stands in the central hardwood forest. In: Fei, S.; Lhotka, J.M.; Stringer, J.W.; Gottschalk, K.W.; Miller, G.W., eds. Proceedings of the 17th central hardwood forest conference. Gen. Tech. Rep. NRS-P-78. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station: 646–647.

Examines the relationship between direction of treefall and slope aspect, and prevailing wind in eight old-growth stands where single-tree canopy gaps characterized the dominant disturbance regime. The author also notes that the consistencies in mean asymmetry between current gap border trees and nonborder trees suggests that all canopy trees are now, or have been, gap border trees in the study stands.

481. **Rentch, J.S.; Fajvan, M.A.; Hicks, R.R., Jr. 2003.** Oak establishment and canopy accession strategies in five old-growth stands in the central hardwood forest region. Forest Ecology and Management. 184(1–3): 285–297. https://doi.org/10.1016/S0378-1127(03)00155-5.

Examines the relationship between direction of treefall and slope aspect, and prevailing wind in eight old-growth stands where single-tree canopy gaps characterized the dominant disturbance regime. The author concludes that though trees fall downhill and downwind, variation in treefall and wind direction is highly variable, and crown asymmetry is an important influence on direction of fall.

482. **Rentch, J.S.; Fajvan, M.A.; Hicks, R.R., Jr. 2003.** Spatial and temporal disturbance characteristics of oak-dominated old-growth stands in the central hardwood forest region. Forest Science. 49(5): 778–789. https://doi.org/10.1093/forestscience/49.5.778.

Uses dendrochronological approaches to quantify the spatial and temporal canopy disturbance characteristics in oak-dominated, old-growth stands in Ohio, Pennsylvania, and West Virginia. Provides insight into old-growth oak development and stand dynamics. Frequent fire and canopy openings of various sizes influenced the continued dominance of oak in these forests.

483. **Rentch, J.S.; Hicks, R.R., Jr. 2005.** Changes in presettlement forest composition for five areas in the central hardwood forest, 1784–1990. Natural Areas Journal. 25(3): 228–238.

Reports on a regional analysis of presettlement forest composition in stands where old-growth remnants occurred in three States: Ohio, Pennsylvania, and West Virginia. Timber harvesting and fire exclusion resulted in the abundance of fire-intolerant stem recruitment in these systems.

484. **Rice, E.L.; Penfound, W.T. 1959.** The upland forests of Oklahoma. Ecology. 40(4): 593–608. https://doi.org/10.2307/1929813.

Provides an extensive quantitative inventory and description of the distribution of "relatively undisturbed" forest types in 61 of the 77 counties in Oklahoma. Results from this inventory could provide targets for old-growth restoration and management in the State.

485. **Richards, J.D.; Hart, J.L. 2011.** Canopy gap dynamics and development patterns in secondary *Quercus* stands on the Cumberland Plateau, Alabama, USA. Forest Ecology and Management. 262(12): 2229–2239. https://doi.org/10.1016/j.foreco.2011.08.015.

Quantifies gap-phase succession in a second-growth mesic oak stand in Alabama. Most gaps closed by lateral crown expansion of canopy trees. As stand development progresses toward complex stage or old-growth stage, the authors speculated that understory recruitment may become the primary gap closure mechanism.

486. Richards, R.H.; Shifley, S.R.; Rebertus, A.J.; Chaplin, S.J. 1995. Characteristics and dynamics of an upland Missouri old-growth forest. In: Gottschalk, K.W.; Fosbroke, S.L.C., eds. Proceedings of the 10th central hardwood forest conference. Gen. Tech. Rep. NE-197. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 11–22.

Studies an upland oak old-growth stand transitioning over time to maple dominance. Includes species dominance information over time and other aspects of forest dynamics.

487. Ricker, M.C.; Lockaby, B.G.; Blosser, G.D.; Conner, W.H. 2016. Rapid wood decay and nutrient mineralization in an old-growth bottomland hardwood forest. Biogeochemistry. 127(2–3): 323–338. https://doi.org/10.1007/s10533-016-0183-y.

Identifies factors related to wood decomposition rates and nutrient dynamics in an old-growth floodplain forest at Congaree Swamp National Park, SC. Carbon content decreased over time. Decomposition was primarily influenced by invertebrate activity, with rapid turnover rates and diminished carbon storage and increased mineralized nitrogen and phosphorous, which was found to support forest net primary productivity.

488. Ridgway, R. 1872. Notes on the vegetation of the lower Wabash Valley. American Naturalist. 6(11): 658–665. https://doi.org/10.1086/271027.

Reports on an 1871 inventory of an old-growth bottomland hardwood forest in the Wabash Valley, IL. Gives species-specific average tree dimensions, including height and circumference.

489. Robertson, F.D. 1990. Position statement on National Forest old-growth values. In: Joint oversight hearing on the National Forest planning process as provided in the National Forest Management Act of 1976. Washington, DC: 101st Congress, First Session: 115–117.

Establishes the framework for current guidance on old growth used by all Forest Service Regions in a position statement on old growth in national forests, issued October 11, 1989, by U.S. Department of Agriculture, Forest Service Chief F. Dale Robertson.

490. Robertson, K.M.; Platt, W.J.; Faires, C.E. 2019. Patchy fires promote regeneration of longleaf pine (*Pinus palustris* Mill.) in pine savannas. Forests. 10(5): 367. 16 p. https://doi.org/10.3390/f10050367.

Assesses influence of patchy fire effects on longleaf pine regeneration in an old-growth longleaf pine savanna in Georgia. Longleaf pine seedlings were spatially clustered in unburned areas and canopy gaps, which was associated with a buffering mechanism in which fire-free patches allowed for the establishment, survival, and recruitment of longleaf pine juveniles.

491. Robertson, P.A.; Weaver, G.T.; Cavanaugh, J.A. 1978. Vegetation and tree species patterns near the northern terminus of the Southern Floodplain Forest. Ecological Monographs. 48(3): 249–267. https://doi.org/10.2307/2937230.

Compares stand composition, structure, and species distribution between old-growth and second-growth bottomland hardwood sites on the Mississippi River alluvial floodplain in Illinois. Old-growth species distribution and vegetation-environment relationships may be representative of other Southern Floodplain Forests found in the Forest Service's Southern Region.

492. Romme, W.H.; Martin, W.H. 1982. Natural disturbance by tree falls in old-growth mixed mesophytic forest: Lilley Cornett Woods, Kentucky. In: Muller, R.N., ed. Proceedings of the fourth central hardwood forest conference. Lexington, KY: University of Kentucky: 367–383.

Provides canopy gap characteristics in an old-growth mixed-mesophytic forest, including number of gaps, size of gaps, interannual frequency, gap formation mechanisms, and gapmaker species-specific trends. Because the disturbance regime was characterized by frequent, small canopy gaps, the authors proposed a "shifting mosaic steady-state" stage of development.

493. Rosen, D.J.; Miller, W.L. 2005. The vascular flora of an old-growth Columbia Bottomland Forest remnant, Brazoria County, Texas. Texas Journal of Science. 57(3): 223–250.

Surveys the vascular flora of an old-growth bottomland hardwood forest in east Texas. Documents 356 unique species.

494. Rosenberg, D.K.; Fraser, J.D.; Stauffer, D.F. 1988. Use and characteristics of snags in young and old forest stands in southwest Virginia. Forest Science. 34(1): 224–228. https://doi.org/10.1093/forestscience/34.1.224.

Quantifies the types of snags across stands of three age classes (60–79 years; 80–99 years; 100+ years) in oak-hickory forests in Virginia. The oldest stands had more larger snags (>17 cm in diameter at breast height). The larger snags were also more likely to be utilized by birds for foraging. Taller snags were used more frequently by birds than shorter snags. Nesting cavities were also more likely to occur in larger snags.

495. Ross, M.S.; Ogurcak, D.E.; Sah, J.P.; Ruiz, P.L. 2010. Using Florida Keys reference sites as a standard for restoration of forest structure in Everglades tree islands. International Journal of Forestry Research. 2010: 176909. 8 p. https://doi.org/10.1155/2010/176909.

Compares old-growth hardwood tree hammock composition and structure to frequently disturbed hardwood tree hammocks in south Florida. The old-growth hammocks studied here can be used to target restoration of second-growth hammocks. For example, underplanting and exotic species control are two management techniques that may accelerate hammock composition and structure towards old-growth conditions.

496. Rother, M.T.; Huffman, J.M.; Guiterman, C.H.; Robertson, K.M.; Jones, N. 2020. A history of recurrent, low-severity fire without fire exclusion in southeastern pine savannas, USA. Forest Ecology and Management. 475: 118406. 9 p. https://doi.org/10.1016/j.foreco.2020.118406.

Reconstructs fire history using dendrochronological techniques in three reference longleaf pine sites in southern Georgia and northern Florida that experienced continuous low-intensity fire, despite 20th century fire exclusion practices. Results revealed that biennial and annual fire intervals were most common, and that most fires were ignited by humans during the dormant and early growing season.

497. Rudis, V.A. 2001. Composition, potential old growth, fragmentation, and ownership of Mississippi Alluvial Valley bottomland hardwoods: a regional assessment of historic change. In: Hamel, P.B.; Foti, T.L., tech. eds. Bottomland hardwoods of the Mississippi Alluvial Valley: characteristics and management of natural function, structure, and composition. Gen. Tech. Rep. SRS-42. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 28–48.

Provides estimates of old-growth forest composition and extent in the Mississippi Alluvial Valley using Forest Inventory and Analysis data and historical records. Suggests management activities to restore and perpetuate bottomland hardwoods in the Mississippi Alluvial Valley.

498. Runkle, J.R. 1981. Gap regeneration in some old-growth forests of the eastern United States. Ecology. 62(4): 1041–1051. https://doi.org/10.2307/1937003.

Quantifies gap-phase succession, including overstory-understory interactions, in mixed-mesophytic forests in Joyce Kilmer Wilderness Area and the Great Smoky Mountains National Park.

499. Runkle, J.R. 1982. Patterns of disturbance in some old-growth mesic forests of eastern North America. Ecology. 63(5): 1533–1546. https://doi.org/10.2307/1938878.

Provides an overview of gap-phase succession in multiple old-growth mesic forests in the Eastern United States, in which the disturbance regime was characterized by frequent canopy openings of small size. The gap-closure mechanism was primarily sapling recruitment, not lateral canopy closure. Canopy gaps favored shade-tolerant taxa recruitment. Also provides the land area in gaps, and the annual frequency of gap formation and closure, which may be of use to managers attempting to emulate the patterns of disturbance in these old-growth systems.

500. **Runkle, J.R. 1991.** Gap dynamics of old-growth eastern forests: management implications. Natural Areas Journal. 11(1): 19–25.

Contains tangible management implications for artificially creating canopy gaps in young forests to accelerate succession and development towards old-growth composition and structure. Provides details on gap size, formation rates, and deadwood management in old-growth of the southern Appalachian Mountains.

501. **Runkle, J.R. 2000.** Canopy tree turnover in old-growth mesic forests of eastern North America. Ecology. 81(2): 554–567. https://doi.org/10.1890/0012-9658(2000)081[0554:CTTIOG]2.0.CO;2.

Resamples old-growth stands in the southern Appalachian Mountains to assess stand dynamics. In the stands sampled in the Forest Service's Southern Region, tree density decreased and basal area increased in the 14- to 15-year window between samples.

502. **Runkle, J.R.; Yetter, T.C. 1987.** Treefalls revisited: gap dynamics in the southern Appalachians. Ecology. 68(2): 417–424. https://doi.org/10.2307/1939273.

Resamples canopy gaps to refine gap-phase successional trajectories in old-growth mesic forests in the Great Smoky Mountains National Park. Woody plants in gaps were typically not able to capture gaps before lateral canopy closure but were able to persist until new gaps formed. Concludes that vegetation in a canopy gap documented at any point in time may be a good indicator of future overstory composition.

503. **Schade, L.D. 2017.** Natural lands: 'holy remnants' for sanctuary, good health. Lexington Herald-Leader. December 8, 2017; Sect. A: 7.

Highlights the spiritual and similar nontimber-related value of old-growth forests, by using the old-growth mixed mesophytic Blanton Woods in Kentucky as an example of these ecosystem services provided by old growth.

504. **Scheff, R.J., Jr. 2012.** The development of old-growth structural characteristics in second-growth forests of the Cumberland Plateau, Kentucky, U.S.A. Richmond, KY: Eastern Kentucky University. 100 p. M.S. thesis.

Compares stand structure and composition between second-growth (younger and older mature stands) and old-growth (Lilley Cornett Woods) forests in the Daniel Boone National Forest, including numerous characteristics such as dead wood, species composition, basal area, and diameter distributions. Also provides silvicultural options to increase old-growth characteristics in second-growth stands.

505. **Schlesinger, W.H. 1978.** Community structure, dynamics and nutrient cycling in the Okefenokee cypress swamp-forest. Ecological Monographs. 48(1): 43–65. https://doi.org/10.2307/2937359.

Describes community structure and nutrient dynamics in an assortment of baldcypress stands in various stages of development in the Okefenokee Swamp, GA.

506. **Schmidtling, R.C.; Hipkins, V. 1998.** Genetic diversity in longleaf pine (*Pinus palustris*): influence of historical and prehistorical events. Canadian Journal of Forest Research. 28: 1135–1145. https://doi.org/10.1139/x98-102.

Uses an old-growth stand in southern Alabama to consider the genetic diversity of longleaf pine.

507. **Schuler, T.M.; Fajvan, M.A. 1999.** Understory tree characteristics and disturbance history of a central Appalachian forest prior to old-growth harvesting. Res. Pap. NE-710. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 12 p. https://doi.org/10.2737/NE-RP-710.

Reports on a dendrochronological analysis of a second-growth mixed mesophytic forest to reconstruct the date of old-growth logging, as detected by standwide release events in the chronology. Once the authors were confident on the date of logging, they quantified the age and size-class structure

of the surviving understory of the old-growth forest. The old-growth understory was dominated by seedling-sized individuals that experienced an isolated period of recruitment following old-growth harvesting. Reconstructed oak seedling abundance was much greater than contemporary oak seedling demographics in contemporary mesic forests. Also found evidence of gap-scale recruitment, which provides evidence that uneven-age regeneration techniques may have some merit.

508. **Schuler, T.M.; Ford, W.M.; Collins, R.J. 2002.** Successional dynamics and restoration implications of a montane coniferous forest in the central Appalachians, USA. Natural Areas Journal. 22(2): 88–98.

Contains relevant management targets to enhance or accelerate desired old-growth composition, structure, and function in second-growth, high-elevation red spruce stands. Specifically, standing deadwood and large living trees were among the most important structural attributes lacking in second-growth stands compared to old-growth stands.

509. **Schuler, T.M.; Gillespie, A.R. 2000.** Temporal patterns of woody species diversity in a central Appalachian forest from 1856 to 1997. Journal of the Torrey Botanical Society. 127(2): 149–161. https://doi.org/10.2307/3088692.

Assesses changes in woody plant composition and diversity over a 131-year period. Refers to old growth as prelogged forest conditions. Old-growth species composition was more evenly distributed than second-growth composition, which was composed of a high density of shade-tolerant taxa. None of the disturbance regimes evaluated enhanced desirable oak reproduction.

510. **Schwarz, G.F. 1907.** The longleaf pine in virgin forest: A silvical study. New York, NY: John Wiley & Sons. 135 p. https://doi.org/10.5962/bhl.title.36339.

Reports on a science-based assessment of forest conditions for virgin longleaf pine. Includes detailed cover type descriptions, stand tables, and many pictures and other descriptions of old longleaf pine forests. Provides extensive accounts of the impacts of fire, catastrophic wind, feral hogs, lumbering, and turpentining on longleaf pine forests.

511. **Schweitzer, C.J.; Dey, D.C. 2011.** Forest structure, composition, and tree diversity response to a gradient of regeneration harvests in the mid-Cumberland Plateau escarpment region, USA. Forest Ecology and Management. 262(9): 1729–1741. https://doi.org/10.1016/j.foreco.2011.07.020.

Assesses the effects of different harvesting intensities and a midstory removal cutting on stand composition over time in oak-dominated forests on the Cumberland Plateau. Although stands were not old growth, results may have implications for restoring old-growth upland oak composition and structure.

512. **Shaffer, J. 2009.** Prioritization of old-growth forest conservation on the Pisgah National Forest. Durham, NC: Duke University. 35 p. M.E.M. and M.S. thesis.

Develops a prioritization model to locate small, medium, and large patches for potential old-growth preservation in the Pisgah National Forest. Some patches selected by the model were not old growth, but could be managed to develop old-growth composition and structure. Model has potential old-growth policy and management applications.

513. **Shanks, R.E. 1954.** Plotless sampling trials in Appalachian forest types. Ecology. 35(2): 237–244. https://doi.org/10.2307/1931122.

Compares fixed-radius and variable-radius (recently introduced in the United States at the time of publication) sampling methods in two forest types in the Great Smoky Mountains National Park. Drew similar inferences from all sampling methods, but each had advantages or disadvantages based on the objectives of the inventory. Presents summary tables that could be of use as a reference for old-growth conditions, although the study was not specific to old growth.

514. Sharitz, R.R.; Allen, B.P. 2009. Quantify change in the old-growth forests of Congaree National Park. Unpublished final contract report to the U.S. Department of the Interior, National Park Service. Aiken, SC: University of Georgia, Savannah River Ecology Laboratory. 48 p.

Describes the impacts of Hurricane Hugo on the old-growth forests of Congaree National Park, including recovery patterns of different woody plant strata.

515. Shear, T.; Young, M.; Kellison, R. 1997. An old-growth definition for red river bottom forests in the eastern United States. Gen. Tech. Rep. SRS-10. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 9 p. https://doi.org/10.2737/SRS-GTR-10.

Claims that true old-growth forests do not exist in red river basins on the Coastal Plain because of past exploitive logging, agriculture, and resulting changes in geomorphic processes in these river basins. Therefore, authors proposed the term "older growth" to describe bottomland pine-hardwood stands that have some characteristic old-growth attributes, but lack true old-growth structure because of ubiquitous historical disturbance in these systems.

516. Shifley, S.R.; Roovers, L.M.; Brookshire, B.L. 1995. Structural and compositional differences between old-growth and mature second-growth forests in the Missouri Ozarks. In: Gottschalk, K.W.; Fosbroke, S.L.C., eds. Proceedings of the 10th central hardwood forest conference. Gen. Tech. Rep. NE-197. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 23–36.

Provides a comparison between Missouri Ozark stands recognized as old growth with those observed as second growth, including differences based on stand structure, diameter distributions, species composition, and downed dead wood.

517. Shotola, S.J.; Weaver, G.T.; Robertson, P.A.; Ashby, W.C. 1992. Sugar maple invasion of an old-growth oak-hickory forest in southwestern Illinois. American Midland Naturalist. 127(1): 125–138. https://doi.org/10.2307/2426328.

Describes changes occurring in a small old-growth oak-hickory forest experiencing successional changes following a long period of fire suppression. Provides some stand table and tree recruitment information, as well as estimates of amount of dead trees.

518. Simons, T.R.; Shriner, S.A.; Farnsworth, G.L. 2006. Comparison of breeding bird and vegetation communities in primary and secondary forests of Great Smoky Mountains National Park. Biological Conservation. 129(3): 302–311. https://doi.org/10.1016/j.biocon.2005.10.044.

Assesses bird community abundance and diversity between primary and second-growth forests in the Great Smoky Mountains National Park. Bird and vegetation community structure were largely similar in both primary and secondary forests. However, some breeding bird species were different between the two forest types. The lack of difference between bird community characteristics may be attributed to the proximity of secondary forests to large tracts of primary forests in the park.

519. Skillen, E.L.; Pickering, J.; Sharkey, M.J. 2000. Species richness of the Campopleginae and Ichneumoninae (Hymenoptera: Ichneumonidae) along a latitudinal gradient in eastern North American old-growth forests. Environmental Entomology. 29(3): 460–466. https://doi.org/10.1603/0046-225X-29.3.460.

Quantifies parasitic wasp abundance and diversity across a latitudinal gradient in old-growth forests of Florida, Georgia, Maryland, and Ontario. Species richness was greatest in the midlatitudes, but diversity was greatest in Georgia and Florida.

520. **Skojac, D.; Devall, M.S.; Parresol, B.R. 2003.** Additions to the flora of Cleveland County, Arkansas: collections from Moro Bottoms Natural Area, a state-protected old-growth bottomland hardwood forest. SIDA. 20(4): 1731–1736.

Provides an annotated list of 38 vascular flora species with associated habitat descriptions. The authors collected species in windthrow gaps in Moro Bottoms Natural Area, an old-growth bottomland hardwood site in Arkansas.

521. **Small, C.J.; McCarthy, B.C. 2005.** Relationship of understory diversity to soil nitrogen, topographic variation, and stand age in an eastern oak forest, USA. Forest Ecology and Management. 217(2): 229–243. https://doi.org/10.1016/j.foreco.2005.06.004.

Assesses herbaceous community and soil nitrogen dynamics across edaphic, topographic, and seasonal gradients in young (<10-year-old) and mature (>125-year-old) mixed-mesophytic stands in Ohio. Changes in soil and vegetation with increased nitrogen deposition were found to be site specific. Suggests that changes in soil nitrogen with increased atmospheric nitrogen deposition could influence understory community dynamics and thus overstory recruitment patterns.

522. **Smith, G.F.; Nicholas, N.S. 1999.** Post-disturbance spruce-fir forest stand dynamics at seven disjunct sites. Castanea. 64(2): 175–186.

Compares stand dynamics in old-growth and second-growth spruce and spruce-fir stands along an elevation gradient in the southern Appalachian Mountains. Results reveal that the legacy of logging on spruce-fir stand composition and structure can persist for decades.

523. **Smith, G.F.; Nicholas, N.S.; Zedaker, S.M. 1997.** Succession dynamics in a maritime forest following Hurricane Hugo and fuel reduction burns. Forest Ecology and Management. 95(3): 275–283. https://doi.org/10.1016/S0378-1127(97)00014-5.

Examines secondary succession following interacting disturbances. Hurricane Hugo largely eliminated old-growth loblolly pine and altered the successional trajectory of stands on Bull Island, SC. Notably, disturbance accelerated the spread and establishment of the nonnative, invasive Chinese tallow. After the disturbance, some old-growth pine and Chinese tallow sites were treated with prescribed fire.

524. **Smith, K.G.; Lehmann, M. 2014.** Friedrich Gerstäcker's natural history observations in Arkansas, 1838–1842. Arkansas Historical Quarterly. 73(1): 17–30.

Provides the first detailed descriptions of old-growth bottomland forests in eastern Arkansas (circa 1840), from an acclaimed writer and avid hunter, Friedrich Gerstäcker. He describes them as a mosaic of very large trees, forest openings, and nearly impenetrable thickets. Dominant tree species were oaks, particularly overcup oak, hickories, tupelo, red mulberry, persimmon, pawpaw, and baldcypress.

525. **Smith, O.D., Jr.; Henderson, D.E.; Hedrick, L.D. 1991.** Older stands of the Ozark-St. Francis National Forests: type, extent, location, and condition. In: Henderson, D.; Hedrick, L.D., eds. Restoration of old growth forests in the Interior Highlands of Arkansas and Oklahoma: Proceedings of the conference. Morrilton, AR: Winrock International and Hot Springs, AR: Ouachita National Forest: 115–120.

Describes the process for developing an old-growth plan on the Ouachita National Forest starting in the late 1970s, including the identification of and management for old growth. Uses 1990 data to produce tables (acreages) of candidate stands by district, forest type, and stand size.

526. **Smith, W.P.; Hamel, P.B. 1991.** Old-growth temperate deciduous forests: legacy or legend. Natural Areas Journal. 11(1): 4–6.

Provides an overview of a symposium on the characteristics and management of old-growth forests in the Southeastern United States, held during the 16th Natural Areas Conference, in Knoxville, October 17–20, 1989. Four of the papers were included in this issue of Natural Areas Journal.

527. **Smith, W.P.; Hunt, H.E.; Townley, W.K. 2001.** A comparison of breeding bird communities and habitat features between old-growth and second-growth bottomland hardwood forest. In: Hamel, P.B.; Foti, T.L., tech. eds. Bottomland hardwoods of the Mississippi Alluvial Valley: characteristics and management of natural function, structure, and composition. Gen. Tech. Rep. SRS-42. U.S. Department of Agriculture, Forest Service, Southern Research Station: 65–82.

Characterizes bird species composition, relative abundance, and habitat affinities in an old-growth stand and adjacent second-growth tracts in Moro Bottoms Natural Area, AR. Bird species richness and diversity were greater the old-growth bottomland hardwood forest than in an adjacent second-growth tract. Canopy openings provided critical habitat for certain species in the old-growth forest, and may increase bird community diversity.

528. **Smith, W.P.; Zollner, P.A. 2001.** Seasonal habitat distribution of swamp rabbits, white-tailed deer, and small mammals in old growth and managed bottomland hardwood forests. In: Hamel, P.B.; Foti, T.L., tech. eds. Bottomland hardwoods of the Mississippi Alluvial Valley: characteristics and management of natural function, structure, and composition. Gen. Tech. Rep. SRS-42. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 83–98.

Details wildlife habitat in old growth and managed bottomland hardwoods. Swamp rabbits, white-tailed deer, and other small mammals had a greater abundance and species richness in old-growth bottomland hardwood forests compared to second-growth and young forests.

529. **Sole, J.D.; Lassetter, S.; Martin, W.H. 1983.** The vascular flora of Lilley Cornett Woods, Letcher County, Kentucky. Castanea. 48(3): 174–188.

Inventories the vascular flora in the mixed mesophytic Lilley Cornett Woods in old growth, second growth, and old fields. Documents a total of 516 species from 92 families and 297 genera.

530. **Southern Appalachian Man and the Biosphere Cooperative. 1996.** The Southern Appalachian Assessment: Terrestrial technical report. Report 5 of 5. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. 248 p.

Assesses all lands covered in this part of the southern Appalachian Mountains, including old growth then present on the national forests in this region. Uses both the Forest Service's Southern Region 1997 guidance document and geographic information systems to develop an estimate of almost 1.1 million acres of possible old growth in over 13,000 locations in the region by the forest types present (much of this old forest area was imputed from geographic information rather than field-based assessments). Dedicates part of appendix C to discussing how these national forests inventoried their possible old growth at that time, including estimates by forest types with a series of maps displaying likely old-growth locations by districts from Alabama to Virginia.

531. **Spetich, M.A.; Jenkins, M.A.; Shifley, S.R.; Wittwer, R.F.; Graney, D.L. 2022.** Characteristics of dry-mesic old-growth oak forests in the eastern United States. Earth. 3(3): 975–1009. https://doi.org/10.3390/earth3030057.

Characterizes and compares stand composition and structure of old-growth dry-mesic oak forests across physiographic regions in the Eastern United States. Presents management options based on the synthesis of existing literature.

532. **Spetich, M.A.; Parker, G.R. 1998.** Distribution of biomass in an Indiana old-growth forest from 1926 to 1992. American Midland Naturalist. 139(1): 90–107. https://doi.org/10.1674/0003-0031(1998)139[0090:DOBIAI]2.0.CO;2.

Quantifies biomass over a 66-year period in an old-growth oak-hickory forest in Indiana to determine long-term biomass dynamics and variability of biomass with spatial scale. Documents an increase in deadwood biomass with time and a decrease in oak biomass in conjunction with an increase in maple biomass.

533. **Spetich, M.A.; Parker, G.R.; Gustafson, E.J. 1997.** Spatial and temporal relationships of old-growth and secondary forests in Indiana, USA. Natural Areas Journal. 17(2): 118–130.

Uses a landscape ecology and geographic information systems approach to characterize the extent, distribution, shape, and edges of old-growth forest in the central hardwoods region of Indiana. Most old-growth remnants were isolated and within 600 m of a nonforest edge. Authors suggested increasing connectivity of old-growth patches.

534. **Spetich, M.A.; Shifley, S.R. 2017.** Guidelines for sampling aboveground biomass and carbon in mature central hardwood forests. In: Kabrick, J.M.; Dey, D.C.; Knapp, B.O.; Larsen, D.R.; Shifley, S.R.; Stelzer, H.E., comps. and eds. Proceedings of the 20th central hardwood forest conference. Gen. Tech. Rep. NRS-P-167. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station: 258–264.

Provides recommendations for number and size of sampling plots required to estimate biomass and carbon storage in old-growth forests of the central hardwoods region. Plot sizes of 0.01, 0.04, or 0.09 ha were most appropriate, and these recommendations were variable based on disturbance.

535. **Spetich, M.A.; Shifley, S.R.; Parker, G.R. 1999.** Regional distribution and dynamics of coarse woody debris in Midwestern old-growth forests. Forest Science. 45(2): 302–313. https://doi.org/10.1093/forestscience/45.2.302.

Compares coarse woody debris loading between second- and old-growth sites and across a site productivity gradient in four midwestern States. Old-growth sites had greater deadwood volume, and deadwood volume in old-growth sites was positively correlated with site productivity. The ratio of dead to live trees was greater in old growth than in mature second growth.

536. **Spillers, A.R. 1939.** Forest resources of central Georgia. Forest Survey Release 41. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 29 p.

Reports on first Forest Service forest survey of central Georgia (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: upland pine, pine-hardwood, upland oak, and bottomland hardwoods.

537. **Spillers, A.R. 1939.** Forest resources of north central Georgia. Forest Survey Release 44. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 28 p.

Reports on first Forest Service forest survey of northcentral Georgia (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: pine, pine-hardwood, upland oak, tulip poplar, and sweetgum.

538. **Spillers, A.R. 1939.** Forest resources of north Georgia. Forest Survey Release 45. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 29 p.

Reports on first Forest Service forest survey for northern Georgia (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: upland pine, pine-hardwood, and mixed mesophytic.

539. **Spillers, A.R. 1939.** Forest resources of southeast Alabama. Forest Survey Release 47. U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 32 p.

Reports on first Forest Service forest survey of southeastern Alabama (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: pine, pine-hardwood, upland and bottomland hardwoods.

540. **Spillers, A.R. 1940.** Forest resources of west central Alabama. Forest Survey Release 48. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 30 p.

Reports on first Forest Service forest survey of westcentral Alabama (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: loblolly pine, shortleaf pine, longleaf pine, mixed oaks, upland and bottomland hardwoods.

541. **Spond, M.D. 2007.** Ancient cypress-tupelo forest at the Dagmar Wildlife Management Area, Arkansas. Fayetteville, AR: University of Arkansas. 85 p. M.A. thesis.

Describes an old-growth cypress-tupelo swamp in Arkansas that had evidence of selective harvesting. Old-growth bald-cypress individuals dated to >1,000 years old. Despite evidence of logging, the author posited that this old-growth cypress-tupelo swamp was among the best preserved old-growth relicts in Arkansas.

542. **Stahle, D.W. 1996.** Tree rings and ancient forest relics. Arnoldia. 56(4): 2–10.

Highlights the extent and status of relatively unknown old-growth forest remnants across the United States. These old-growth remnants often contain nonmerchantable timber and have poor growth form that is due to poor site quality. Reviews models and other approaches developed by dendrochronologists to identify potential locations of remnants based on soil, geologic, and topographic characteristics.

543. **Stahle, D.W. 2002.** The unsung ancients. Natural History. 111(1): 48–52.

Highlights uncommon old growth in North America with an emphasis on systems with smaller tree size and poorly formed tree architecture. These old-growth systems have been relatively untouched by the saw, because they historically contained nonmerchantable timber and occurred on unproductive sites. Includes color photographs of example ecosystems, such as post oak-red cedar in the Forest Service's Southern Region.

544. **Stahle, D.W.; Chaney, P.L. 1994.** A predictive model for the location of ancient forests. Natural Areas Journal. 14(3): 151–158.

Develops a predictive model to help locate noncommercial old-growth remnants based on soil type, geology, and topography. These remnant forests ranged from 0.5 to 1,000 ha in area and typically occurred on steep, rocky, infertile soils. Old growth was found on 18.7 percent of the area predicted by the model.

545. **Stahle, D.W.; Cook, E.R.; White, J.W.C. 1985.** Tree-ring dating of baldcypress and the potential for millennia-long chronologies in the Southeast. American Antiquity. 50(4): 796–802. https://doi.org/10.2307/280168.

Describes tree-ring dating of baldcypress from remnant old-growth stands in the Southeastern United States and proposes the potential use of baldcypress to create millennia-long tree-ring chronologies in the region.

546. **Stahle, D.W.; Edmondson, J.R.; Howard, I.M.; Robbins, C.R.; Griffin, R.D.; Carl, A.; Hall, C.B.; Stahle, D.K.; Torbenson, M.C.A. 2019.** Longevity, climate sensitivity, and conservation status of wetland trees at Black River, North Carolina. Environmental Research Communications. 1(4): 041002. 9 p. https://doi.org/10.1088/2515-7620/ab0c4a.

Discovers old-growth baldcypress that dated to over 2,000 years old. Discusses the paleoclimate reconstruction value of tree-ring chronologies from these extremely old samples. Reports concern for the conservation of these old-growth cypress swamps due to stressors such as logging, biomass harvesting, and water quality degradation. Stresses the importance of conservation measures for these old-growth ecosystems, which were among the oldest remnant old-growth in North America.

547. Stahle, D.W.; Griffin, R.D. 2005. The Ancient Cross Timbers Consortium. In: Bennett, K.P., tech. coord. Moving toward sustainable forestry: lessons from old growth forests: proceedings of the 6th eastern old growth forest conference. Durham, NH: University of New Hampshire, Cooperative Extension: 17–18.

Highlights the state of the science at the time of publication on the Cross Timbers region of Arkansas, Texas, and Oklahoma. Includes estimates of old-growth extent in the region.

548. Stambaugh, M.; Guyette, R.; Putnam, C. 2005. Fire in the pines: A 341-year fire and human history at Big Spring Pines Natural Area, Ozark National Scenic Riverways. Park Science. 23(2): 43–47.

Uses dendrochronological techniques to reconstruct a composite fire chronology of shortleaf pine in a protected natural area. The intent was to document fire regimes during Native American occupation (intermediate frequency), Euro-American settlement and agricultural periods (most frequent fires), and postfire suppression (after 1930; no fires).

549. Stambaugh, M.C.; Marschall, J.M.; Abadir, E.R. 2020. Revealing historical fire regimes of the Cumberland Plateau, USA, through remnant fire-scarred shortleaf pines (*Pinus echinata* Mill.). Fire Ecology. 16(24): 24. 15 p. https://doi.org/10.1186/s42408-020-00084-y.

Uses dendrochronological techniques to describe historical fire regimes in old live and dead shortleaf pine remnants across the Cumberland Plateau. Some of the surviving shortleaf pines were 200–300 years old, which highlights the value of such old trees in describing fire regimes and past climates.

550. Stambaugh, M.C.; Muzika, R.-M.; Guyette, R.P. 2002. Disturbance characteristics and overstory composition of an old-growth shortleaf pine (*Pinus echinata* Mill.) forest in the Ozark Highlands, Missouri, USA. Natural Areas Journal. 22(2): 108–119.

Describes a stand of multiaged shortleaf pine up to 325 years old in the Missouri Ozarks. Includes forest structure and composition information and a description of disturbance (especially fire) history, shortleaf pine recruitment history, and likely future conditions.

551. Stokes, T.A.; Samuelson, L.J.; Kush, J.S.; Farris, M.G.; Gilbert, J.C. 2010. Structure and diversity of longleaf pine (*Pinus palustris* Mill.) forest communities in the Mountain Longleaf National Wildlife Refuge, northeastern Alabama. Natural Areas Journal. 30(2): 211–225. https://doi.org/10.3375/043.030.0208.

Samples a long-unburned old-growth montane longleaf pine site in northeastern Alabama. Monitors vegetation and fuel loading dynamics after initiation of a prescribed fire program. Notes lack of longleaf pine regeneration and high fuel loads.

552. Stokstad, E. 2007. Gambling on a ghost bird. Science. 317(5840): 888–892. https://doi.org/10.1126/science.317.5840.888.

Discusses the potential rediscovery of the ivory-billed woodpecker in the Big Woods of Arkansas, the subsequent search for evidence of its occurrence, and the debate over its continual survival. Highlights the species' reliance on old-growth bottomland hardwood forests in the Southeastern United States.

553. Stover, W.S. 1942. Forest resources of the delta section of Mississippi. Forest Survey Release 53. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 28 p.

Reports on first Forest Service forest survey of the Mississippi delta (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: bottomland hardwoods, mesic oaks, and other seasonally wet hardwoods.

554. **Subedi, S.C.; Ross, M.S.; Sah, J.P.; Redwine, J.; Baraloto, C. 2019.** Trait-based community assembly pattern along a forest succession gradient in a seasonally dry tropical forest. Ecosphere. 10(4): e02719. 17 p. https://doi.org/10.1002/ecs2.2719.

Quantifies the plant traits and functional strategies that influenced forest succession in dry-tropical forests in southern Florida. These forests were nutrient-stressed, salt-stressed, and moisture-limited. Trees in old-growth forests displayed traits that enhanced survival and resilience to the resource-depleted stands in which they occurred.

555. **Switzer, G.L.; Shelton, M.G.; Nelson, L.E. 1979.** Successional development of the forest floor and soil surface on upland sites of the East Gulf Coastal Plain. Ecology. 60(6): 1162–1171. https://doi.org/10.2307/1936964.

Uses a chronosequence of natural origin pine and pine-hardwood stands to consider different forest floor conditions as succession progressed. The study includes five pine-dominated stands classified as veteran (100–150 years old) and six oak-hickory-pine stands between 150 and 240 years old.

556. **Talley, S.M.; Lawton, R.O.; Setzer, W.N. 1996.** Host preferences of *Rhus radicans* (Anacardiaceae) in a southern deciduous hardwood forest. Ecology. 77(4): 1271–1276. https://doi.org/10.2307/2265596.

Examines the distribution of *Rhus radicans* (poison ivy), a root-climbing liana, among potential host tree species in an old-growth mixed mesophytic forest on the southern Cumberland Plateau of northern Alabama, USA. Poison ivy preferred shagbark hickory and northern red oak as host species over eastern redcedar, sugar maple, and sassafras.

557. **Tanner, J.T. 1986.** Distribution of tree species in Louisiana bottomland hardwood forests. Castanea. 51(3): 168–174.

Provides size-class distributions for old-growth bottomland hardwood forests in northern Louisiana from data gathered between 1937 and 1939 when the author was documenting some of the last known ivory-billed woodpeckers.

558. **Tanner, J.T. 2003.** The ivory-billed woodpecker. Mineola, NY: Dover Publications, Inc. 144 p.

Discusses ecology, natural history, and conservation of the ivory-billed woodpecker. Discusses the habitat of the ivory-billed woodpecker and its preference for old-growth bottomland hardwood forests as well as its distribution across these forests in the Southeastern United States. Also discusses the decline of the ivory-billed woodpecker resulting from timber harvesting in old-growth bottomland hardwood forests.

559. **Tanner, J.T.; Hamel, P.B. 2001.** A long-term view of old-growth deciduous forests. In: Hamel, P.B.; Foti, T.L., tech. eds. Bottomland hardwoods of the Mississippi Alluvial Valley: characteristics and management of natural function, structure, and composition. Gen. Tech. Rep. SRS-42. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 106–109.

Highlights the importance of old-growth conservation, with an emphasis on the characteristics and history of bottomland old-growth in the Southeastern United States. Suggests that management can promote old-growth composition, structure, and function and emphasizes the importance of larger stands of old growth.

560. **Texas Game, Fish and Oyster Commission. 1945.** Principal game birds and mammals of Texas: Their distribution and management. Austin, TX: Texas Game, Fish and Oyster Commission. 149 p.

Discusses the change in food and forage availability for white-tailed deer (*Odocoileus virginianus*) and the resulting declines in population size as a result of harvesting old-growth forests in east Texas.

561. Therrell, M.D.; Stahle, D.W. 1998. A predictive model to locate ancient forests in the Cross Timbers of Osage County, Oklahoma. Journal of Biogeography. 25(5): 847–854. https://doi.org/10.1046/j.1365-2699.1998.00224.x.

Develops a predictive model based on soil and topographic characteristics in an attempt to locate potential sites where undisturbed forests in the Cross Timbers Region may occur. Authors explain that the true extent and ecological value of the old-growth forests that compose Cross Timbers may not be fully known.

562. Thompson, R.L.; Jones, R.L.; Abbot, J.R.; Denton, W.N. 2000. Botanical survey of Rock Creek Research Natural Area, Kentucky. Gen. Tech. Rep. NE-272. Newton Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. 23 p. https://doi.org/10.2737/NE-GTR-272.

Surveys the vascular flora of a 77-ha, narrow gorge of old-growth hemlock-mixed mesophytic forest in the Daniel Boone National Forest. Provides a useful baseline reference for plant abundance, richness, associations, habitats, and life forms.

563. Traylor, C.R.; Caterino, M.S.; Ulyshen, M.D.; Ferro, M.L.; McHugh, J.V. 2022. Assessing the old-growth dependency of two saproxylic beetle species in the southern Appalachian Mountains. Insect Systematics and Diversity. 6(3): 5. 13 p. https://doi.org/10.1093/isd/ixac012.

Compares abundance of two saproxylic beetle species in old-growth and second-growth forests in the Great Smoky Mountains National Park. Old-growth forests served as refugia for beetle species and allowed for a “spillover” effect for certain species to begin to recolonize second-growth forests. Deadwood abundance was found to be an important indicator of beetle abundance.

564. Traylor, C.R.; Ulyshen, M.D.; McHugh, J.V. 2023. Forest age drives saproxylic beetle biodiversity in the southeastern United States. Biological Conservation. 285: 110238. 11 p. https://doi.org/10.1016/j.biocon.2023.110238.

Compares beetle species richness and community composition between old (mature in 1938) and young (established after 1938) forests in the Georgia Piedmont. Older forests supported greater beetle species richness and less species turnover than did young forests. Also includes a comparison of coarse woody debris loading and composition between forest age classes.

565. Tucker, G.E. 1991. Pre-settlement vegetation of the Ozark National Forest. In: Henderson, D.; Hedrick, L.D., eds. Restoration of old growth forests in the Interior Highlands of Arkansas and Oklahoma. Morrilton, AR: Winrock International and Hot Springs, AR: Ouachita National Forest: 67–75.

Provides a brief account, using a variety of old sources, of the historical forests in the Ozark Mountains in northern Arkansas at the time of Euro-American settlement, which would mostly have been old growth.

566. Turchin, P.; Davidson, J.; Hayes, J.L. 1999. Effects of thinning on development of southern pine beetle infestations in old growth stands. Southern Journal of Applied Forestry. 23(4): 193–196. https://doi.org/10.1093/sjaf/23.4.193.

Quantifies the relationship between southern pine beetle infestation growth and intertree spacing in old-growth pine stands. Thinning (one-fourth of basal area removed) and severe thinning (one-half of basal area removed) significantly reduced the spread of southern pine beetle infestation. Hardwood removal was also tested and found to decrease infestation spread, but this effect was not significant.

567. Turner, L.M. 1935. Catastrophes and pure stands of southern shortleaf pine. Ecology. 16(2): 213–215. https://doi.org/10.2307/1932427.

Reconstructs the establishment date of three old-growth shortleaf pine stands in southern Arkansas. Stand structure was even-aged and author speculated that stands established after catastrophic, stand-replacing tornadoes.

568. Tuttle, J.P. 2018. Disturbance, fine-scale environment, and forest change in Great Smoky Mountains National Park. Chapel Hill, NC: University of North Carolina at Chapel Hill. 209 p. Ph.D. dissertation.

Discusses how disturbance history, including the comparison of old-growth forests to those that were logged, interacts with environmental gradients to structure southern Appalachian forests

569. Tuttle, J.P.; White, P.S. 2016. Structural and compositional change in Great Smoky Mountains National Park since protection, 1930s–2000s. In: Greenberg, C.H.; Collins, B.S., eds. Natural disturbances and historic range of variation: Type, frequency, severity, and post-disturbance structure in central hardwood forests USA. Cham, Switzerland: Springer: 263–294. https://doi.org/10.1007/978-3-319-21527-3_10.

Discusses the impact of natural and anthropogenic disturbance on old-growth forest community dynamics in the Great Smoky Mountains National Park from 1930 to 2000. Despite protection of these old-growth communities, diffuse anthropogenic disturbances such as exotic pests, changes in the fire regime, and herbivory have combined to affect old-growth forests in the Great Smoky Mountains National Park. Concludes that it may be important to consider these diffuse disturbances in management and conservation of old growth.

570. Tyrrell, L.E. 1991. Old-growth forests on National Park Service lands: NPS views and information. Great Lakes CPSU Rep. 91-1. Madison, WI: Great Lakes Cooperative Park Studies Unit, University of Wisconsin-Madison. 54 p.

Conducts a survey to assess the extent, characteristics, and management of old-growth forests on National Park Service lands. Survey results indicate that the National Park Service had no unified definition of old growth, and lack of disturbance and tree age were the most commonly identified characteristics of old growth. Notably, more than half of National Park Service units did not have old-growth management plans at the time of the survey.

571. Tyrrell, L.E. 1992. Characteristics, distribution, and management of old-growth forests on units of the U.S. National Park Service: results of a questionnaire. Natural Areas Journal. 12(4): 198–205.

Assesses the contemporary status, extent, understanding, and conservation challenges of old-growth occurring on National Park Service-managed lands. The National Park Service had no unified definition or management strategy for old growth, and old-growth conservation and management was not a top priority of the agency at the time of the survey.

572. Tyrrell, L.E. 1996. National Forests in the eastern region: land allocation and planning for old growth. In: Davis, M.B., ed. Eastern old-growth forests: Prospects for rediscovery and recovery. 2nd ed. Washington, DC: Island Press: 245–273.

Outlines the development of old-growth definitions and planning in the Forest Service's Eastern Region on National Forest System lands, including the historical context. Also outlines forest type groups in national forests by State.

573. Tyrrell, L.E.; Nowacki, G.J.; Crow, T.R.; Buckley, D.S.; Nauertz, E.A.; Niese, J.N.; Rollinger, J.L.; Zasada, J.C. 1998. Information about old growth for selected forest type groups in the eastern United States. Gen. Tech. Rep. NC-197. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 507 p. https://doi.org/10.2737/NC-GTR-197.

Provides an extensive resource of the stand composition, structure, and other attributes of all old-growth forest type groups in the Eastern United States. Compiles and synthesizes previously existing literature to provide a range of compositional and structural metrics such as live tree basal area and standing dead tree density for tangible old-growth management targets. Report does not include States in the southernmost portion of the Forest Service's Southern Region.

574. **U.S. Department of Agriculture, Forest Service. 1935.** Pulping and nonpulping cordwood volume in Survey Unit #2, Mississippi. Forest Survey Release 11. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 9 p.

Reports on Forest Service forest survey of unit #2 in Mississippi (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of cordwood volumes (in board feet) by the primary timber species: upland pine, pine-hardwood, upland and bottomland hardwoods.

575. **U.S. Department of Agriculture, Forest Service. 1936.** Southern Forest Survey: Forest resources of the Norris Dam Watershed. Unit Report 1. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 65 p. + map.

Reports on first Forest Service forest survey of the Norris Dam watershed of Tennessee and North Carolina (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary forest types: mixed mesophytic and pine-hardwood.

576. **U.S. Department of Agriculture, Forest Service. 1937.** Southern Forest Survey: Forest resources of southwest Arkansas. Forest Survey Release 27. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 21 p.

Reports on first Forest Service forest survey of southwestern Arkansas (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species.

577. **U.S. Department of Agriculture, Forest Service. 1937.** Southern Forest Survey: Volumes on average acres in the principal units of the naval-stores region. Forest Survey Release 29. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 17 p.

Reports on Forest Service forest survey summarizing the forest resources of the naval stores region of the Coastal Plain in South Carolina, Georgia, Florida, Alabama, Mississippi, and Louisiana (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary turpentine species: longleaf and slash pine. Also provides amount and volumes of old-growth nonturpentine pine, pulping hardwoods, nonpulping hardwoods, and baldcypress.

578. **U.S. Department of Agriculture, Forest Service. 1938.** Southern Forest Survey: Forest resources of central and south Florida. Forest Survey Release 38. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 30 p.

Reports on first Forest Service forest survey of northern Alabama (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: longleaf pine, slash pine, baldcypress, and mixed oaks.

579. **U.S. Department of Agriculture, Forest Service. 1938.** Southern Forest Survey: Forest resources of the north Arkansas Delta. Forest Survey Release 32. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 21 p.

Reports on first Forest Service forest survey of the Arkansas Delta (mid-1930s). Includes estimates for the amount of old growth (acreage and average increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species.

580. U.S. Department of Agriculture, Forest Service. 1938. Southern Forest Survey: Forest resources of northwest Florida. Forest Survey Release New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 33 p.

Reports on first Forest Service forest survey of northwestern Florida (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: longleaf pine, slash pine, loblolly pine, hardwoods, and baldcypress.

581. U.S. Department of Agriculture, Forest Service. 1938. Southern Forest Survey: Forest resources of northwest Louisiana. Forest Survey Release 31. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 21 p.

Reports on first Forest Service forest survey of northwestern Louisiana (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: shortleaf pine, loblolly pine, mixed pine-hardwood, upland and bottomland hardwoods.

582. U.S. Department of Agriculture, Forest Service. 1938. Southern Forest Survey: Forest resources of the Ouachita Mountain region of Arkansas. Forest Survey Release 36. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 27 p.

Reports on first Forest Service forest survey of the Ouachita Mountains, AR (mid-1930s). Includes estimates for the amount of old growth (acreage for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species.

583. U.S. Department of Agriculture, Forest Service. 1938. Southern Forest Survey: Forest resources of southeast Oklahoma. Forest Survey Release 37. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 25 p.

Reports on first Forest Service forest survey of southeastern Oklahoma (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: pine, pine-hardwood, upland and bottomland hardwoods.

584. U.S. Department of Agriculture, Forest Service. 1938. Southern Forest Survey: Forest resources of southwest Alabama. Forest Survey Release 35. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 35 p.

Reports on first Forest Service forest survey of southwestern Alabama (mid-1930s). Includes estimates for the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: longleaf pine, slash pine, loblolly pine, baldcypress, and hardwoods.

585. U.S. Department of Agriculture, Forest Service. 1992. Old-growth forest management. Briefing Book. Washington, DC: U.S. Department of Agriculture, Forest Service. [unknown] p.

Contains a description of old growth on national forests, interested parties, and recent actions taken to increase acreage of old-growth forests reserved from timber harvests.

586. U.S. Department of Agriculture, Forest Service. 1996. Final environmental impact statement (FEIS) for the revised land and resource management plan: National Forests and Grasslands in Texas. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. 247 p. + maps.

Describes the role of old growth in various prescriptions and stand conditions for national forests and grasslands in Texas. Places old growth in context of the various alternatives considered, including projected acreages of old growth (152,254 acres under the preferred alternative 8).

587. U.S. Department of Agriculture, Forest Service. 1996. Revised land and resource management plan: National Forests and Grasslands in Texas. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. 226 p.

Provides a limited discussion on old growth, with the exception of appendix I, which was added in June 1999. This supplement contains 26 pages specifically on old growth as it was found at that time on the national forests and grasslands in Texas (although little is said about old growth on the Caddo and Lyndon B. Johnson National Grasslands). Discusses both potential old growth by forest type and area of stands at least 95 years old by forest type and forest, although it is unclear how many of these acres would meet the 1997 Southern Region old growth guidance for age and other characteristics.

588. U.S. Department of Agriculture, Forest Service. 1997. Guidance for conserving and restoring old-growth forest communities on National Forests in the Southern Region. R8-FR-62. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. 117 p. + appendices.

Provides guidance developed by the Forest Service's Southern Region, with the assistance of the Southern Research Station, on what was known about old-growth conditions in 16 identified forest community types found across the Southeastern United States. Provides brief summaries of the old-growth forest community types (these definitions were also expanded upon and published separately as Forest Service General Technical Reports), in addition to guidance on how to incorporate old growth into forest plan revisions and implementation in forest plans.

589. U.S. Department of Agriculture, Forest Service. 1999. Final environmental impact statement for the revised land and resource management plan for National Forests in Florida. Atlanta, GA: Southern Region, USDA Forest Service. [irregular pagination].

Provides an assessment of the abundance and role of old growth under the various alternatives considered for this version of the National Forests of Florida forest plan. Provides a table of the acreage of existing possible old growth found on the Apalachicola, Ocala, and Osceola National Forests by age criteria and timber management suitability for the forest types found on these forests, and projects the likely area of old growth under the different alternatives.

590. U.S. Department of Agriculture, Forest Service. 1999. Final environmental impact statement: Revised land and resource management plan: Kisatchie National Forest. Pineville, LA: U.S. Department of Agriculture, Forest Service, Southern Region. [irregular pagination].

Describes how old growth was integrated into the Final Environmental Impact Statement of the Kisatchie National Forest, including how it would vary with different alternatives. The final preferred alternative (alternative modified D) included just over 81,000 acres to be designated and managed as old-growth forest patches, with an additional 215,000 acres containing attributes characteristic of unmanaged old growth that could be found on lands not considered appropriate for timber production by this alternative.

591. U.S. Department of Agriculture, Forest Service. 1999. Revised land and resource management plan: Kisatchie National Forest. Pineville, LA: U.S. Department of Agriculture, Forest Service, Southern Region. [irregular pagination].

Describes old growth in the forest planning process for the Kisatchie National Forest. Has a section (appendix E) dedicated to old growth on the forest as it was found when this plan was developed (by ranger district and community type), with estimates of existing and future old growth. Also provides more detailed descriptions (attributes) of the primary old-growth types found on this forest.

592. U.S. Department of Agriculture, Forest Service. 2002. Croatan National Forest land and resource management plan. Management Bulletin Manage. Bull. R8-108A. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. 142 p.

Describes the forest plan's intentions to manage and restore old-growth forests across the Croatan National Forest, particularly given the scarcity of old growth in the dominant forest types.

593. **U.S. Department of Agriculture, Forest Service. 2002.** Final environmental impact statement for the revised land and resource management plan for the Croatan National Forest. Manage. Bull. R8-108C. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. 531 p.

Describes the nature of old growth on this national forest as a function of the various alternatives considered. Alternative E, the preferred alternative, had the most current and future old growth, although for a number of land types no old growth was expected to occur or develop. Notes that the vast majority (about 97 percent) of the slightly more than 10,000 acres of existing old growth were in pond pine-dominated, peat-mantled forested wetlands, with <2 percent in longleaf pine-dominated forests.

594. **U.S. Department of Agriculture, Forest Service. 2004.** Chattahoochee-Oconee National Forests land and resource management plan: Appendix D. Old growth strategy. Manage. Bull. R8-113A. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. 18 p.

Reports on the strategy for old growth as part of the 2004 land and resource management plan for the Chattahoochee-Oconee National Forest. Nine of the 16 old-growth cover types occurred in these forests. Provides the minimum age and basal area, and diameter at breast height of the largest trees and acres of cover by forest type.

595. **U.S. Department of Agriculture, Forest Service. 2004.** Final environmental impact statement for the land and resource management plan: Chattahoochee-Oconee National Forests. Manage. Bull. R8-113B. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. [irregular pagination].

Provides an account of old growth under the different alternatives considered for these national forests, including the selected alternative (alternative I). Contains an extensive discussion in chapter 3 on old growth, from the history of the 1997 guidance to how this was implemented for the various considered alternatives. Also addresses how old-growth areas were determined for this forest plan and the various management prescriptions related to this forest condition, with projections for future amounts of old growth under different alternatives.

596. **U.S. Department of Agriculture, Forest Service. 2004.** Final environmental impact statement for the revised land and resource management plan: Cherokee National Forest. Manage. Bull. R8-114B. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. 535 p.

Describes how old growth was incorporated in the revised forest plan for the Cherokee National Forest, including how it was evaluated under the different alternatives being considered. Provides estimates for possible old growth in the forest in 2004 and the likely future old growth under different alternatives.

597. **U.S. Department of Agriculture, Forest Service. 2004.** Final environmental impact statement for the revised land and resource management plan: Sumter National Forest. Manage. Bull. R8-116B. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. [irregular pagination].

Describes the current and future roles and status of old growth in the Sumter National Forest as a function of different alternatives. Includes forest community roles, management strategies, and possible future outcomes (area predictions, including maps), dependent on species sensitive to old growth.

598. **U.S. Department of Agriculture, Forest Service. 2004.** Final environmental impact statement: Land and resource management plan for the Daniel Boone National Forest. Manage. Bull. R8-117B. Winchester, KY: U.S. Department of Agriculture, Forest Service, Southern Region. [irregular pagination].

Addresses old growth as one of the main issues (Issue #2) facing this national forest, including its role as one of the prescription areas in the forest plan by alternatives (including the preferred alternative C-1, which allocated just over 15,000 acres in the designated old-growth prescription). Also considers old growth as one of the more important biological elements on the national forest, and evaluates how different alternatives would have affected this resource (including projections into the future).

599. **U.S. Department of Agriculture, Forest Service. 2004.** Land and resource management plan: Chattahoochee-Oconee National Forests. Manage. Bull. R8-113A. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. [irregular pagination].

Describes the status and management considerations for old growth in these national forests as related to this forest plan. Includes a section dedicated to the background, community types, goals and objectives, restoration, and standards of management for old growth (and other management areas) on the Chattahoochee-Oconee National Forest.

600. **U.S. Department of Agriculture, Forest Service. 2004.** Land and resource management plan for the Daniel Boone National Forest. Manage. Bull. R8-117A. Winchester, KY: U.S. Department of Agriculture, Forest Service, Southern Region. [irregular pagination].

Provides an extensive discussion of designated old growth currently found on the national forest, as well as plans to manage this resource into the future (a prescription for old growth). Also describes the extent of likely and possible old growth in other prescription areas across the forest.

601. **U.S. Department of Agriculture, Forest Service. 2004.** Land and resource management plan, Land Between the Lakes National Recreation Area. Management Bulletin R8-119A. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. 113 p.

Mentions that mature forests in the Land Between the Lakes National Recreation Area generally range between 60 and 90 years old and thus did not meet the age criteria set for any relevant cover types identified in the 1997 Southern Region old-growth guidance. However, also states that until a formal old-growth inventory was completed, 35,200 acres of "Core Areas" were classified as future old-growth.

602. **U.S. Department of Agriculture, Forest Service. 2004.** Revised land and resource management plan: Cherokee National Forest. Manage. Bull. R8-114A. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. 463 p.

Describes the place of old growth in the forest planning process for the Cherokee National Forest. Contains a section (appendix D) dedicated to the national forest's old-growth strategy when this plan was developed, with estimates of possible and future old growth (including maps). Also provides more detailed descriptions (attributes) of the primary old-growth types found on this forest.

603. **U.S. Department of Agriculture, Forest Service. 2004.** Revised land and resource management plan: Jefferson National Forest. Manage. Bull. R8-115A. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. [irregular pagination].

Reports on the revised resource and land management plan for the Jefferson National Forest in Virginia, West Virginia, and Kentucky. Contains plans for existing and future old growth, divided into three prescription types: old growth not associated with disturbance (e.g., mixed mesophytic), old growth dependent on fire (e.g., xeric pine), and old growth associated with disturbance (e.g., dry-mesic oak).

604. **U.S. Department of Agriculture, Forest Service. 2004.** Revised land and resource management plan: National Forests in Alabama. Manage. Bull. R8-112A. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. [irregular pagination].

Includes a section detailing the background, community types, and management for old growth on the national forests in Alabama. Identifies 7,700 acres of National Forest System land in Alabama that met the minimum age requirement to be considered old growth, and 214,800 acres of land unsuitable for timber production for old-growth management. Table 2.9 (page 40 in chapter 2) shows the current possible old growth by community types for the national forests in Alabama by management area.

605. **U.S. Department of Agriculture, Forest Service. 2004.** Revised land and resource management plan: Sumter National Forest. Manage. Bull. R8-116A. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. [irregular pagination].

Describes the role of old growth in the forest resource management plans of the Sumter National Forest, including the forest community types as well as how this resource may be impacted by timber management and other activities in the various prescriptions.

606. **U.S. Department of Agriculture, Forest Service. 2005.** Final environmental impact statement for the revised land and resource management plan: Ozark-St. Francis National Forests, Arkansas. Manage. Bull. R8-125B. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. [irregular pagination].

Describes the potential role of old growth in Ozark-St. Francis National Forest lands under the various considered alternatives, including lands considered suitable or unsuitable for timber management. Provides a section on old growth, including how they defined this condition (based on the 1997 regional guidance document) and a table with the possible areal coverage of old growth on these national forests in 2005 and projected into the future under different alternatives.

607. **U.S. Department of Agriculture, Forest Service. 2005.** Revised land and resource management plan: Ouachita National Forest, Arkansas and Oklahoma. Manage. Bull. R8-124A. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. 175 p.

Focuses on old growth on the Ouachita National Forest and includes four tables (appendix D). These tables include a preliminary inventory of possible old-growth acreage (using the 1997 Southern Region old-growth guidance cover type and age categories) as indicated in the Continuous Inventory of Stand Conditions database as of September 2003 (table D.1); minimum area in which restoration of old-growth characteristics will be featured (by their management area types, table D.2); potential old growth and other rare upland community types in Management Area 6 (rare types MA, table D.3); and an estimate of maximum potential future old-growth area for dry-mesic forest and woodland for selected management areas (table D.4).

608. **U.S. Department of Agriculture, Forest Service. 2005.** Revised land and resource management plan: Ozark-St. Francis National Forests. Manage. Bull. R8-125A. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. [irregular pagination].

Describes the nature of old growth in the forest types found on the Ozark-St. Francis National Forest, including the coverage in these various types and how old-growth patches will be managed relative to other management areas. Also notes the occurrence of some old growth in natural areas in these forests, and defines a specific old-growth management area (3.F) in lands considered suitable for timber management and the silvicultural prescriptions permitted in 3.F (including one designed to create old-growth conditions).

609. **U.S. Department of Agriculture, Forest Service. 2006.** Monongahela National Forest: Land and resource management plan. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. [irregular pagination].

Clarifies the identification, status, characteristics, and management of existing and potential old growth in the Monongahela National Forest (appendix B). Old growth was limited to small, scattered patches within the larger landscape of 70- to 90-year-old stands. Management plan includes old-growth development on sites where management activities were prohibited or limited.

610. **U.S. Department of Agriculture, Forest Service. 2014.** Environmental impact statement for the revised land and resource management plan, George Washington National Forest. Manage. Bull. R8-143D. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. 502 p.

Describes the role of old growth and likely outcomes of management of this resource in the various alternatives evaluated in this document. Estimates the future possible extent of old growth for the forest under the various alternatives.

611. U.S. Department of Agriculture, Forest Service. 2014. Final environmental impact statement for the land and resource management plan: National Forests in Mississippi. Manage. Bull. R8-144B. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. 391 p.

Describes the current extent and future distribution and role of old-growth forests by community types under the different alternatives considered for the 2014 forest plan for the national forests in Mississippi.

612. U.S. Department of Agriculture, Forest Service. 2014. Land and resource management plan: National Forests in Mississippi. Manage. Bull. R8-144A. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. 202 p.

Discusses the role of old growth in the forest types found in the national forests in Mississippi, including extent, locations, and desired future conditions. Appendix D of this volume focuses on old-growth management and monitoring strategies for these national forests by ranger district and community type.

613. U.S. Department of Agriculture, Forest Service. 2014. Revised land and resource management plan: George Washington National Forest. Manage. Bull. R8-143A. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. [irregular pagination].

Describes the desired conditions and place of old growth in the forest planning process for the George Washington National Forest. Includes a section (appendix B) dedicated to the national forest's old-growth strategy when this plan was developed, with estimates of possible future old growth. Also provides more detailed descriptions (attributes) of the primary old-growth types found in this forest, and notes how the forest was an "aging" forest growing into old-growth age criteria.

614. U.S. Department of Agriculture, Forest Service. 2017. Final environmental impact statement for the final revised land management plan: Francis Marion National Forest. Manage. Bull. R8-151B. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. 371 p.

Describes old growth in the Francis Marion National Forest in relation to various alternatives, including aspects such as current and likely future conditions, management options, presence and role in various forest community types, and restoration goals.

615. U.S. Department of Agriculture, Forest Service. 2017. Final revised land management plan: Francis Marion National Forest. Manage. Bull. R8-151A. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. 256 p.

Describes the role of old growth in the plans of the Francis Marion National Forest, including current and anticipated future conditions in the various ecosystems of this forest.

616. U.S. Department of Agriculture, Forest Service. 2022. Final environmental impact statement for the land management plan: Pisgah and Nantahala National Forest. Manage. Bull. R8-161. Atlanta, GA: U.S. Department of Agriculture, Forest Service, Southern Region. [irregular pagination].

Proposes five alternatives in the environmental impact statement for the revised land and resource management plan of the Nantahala and Pisgah National Forests. Old-growth relevant information begins on page 3-383, including the planned designated old-growth network by patch size under each of the five management alternatives.

617. U.S. Department of Agriculture, Forest Service. 2023. Mature and old-growth forests: definition, identification, and initial inventory on lands managed by the Forest Service and Bureau of Land Management. FS-1215a. Washington, DC: U.S. Department of Agriculture, Forest Service. 63 p.

Develops a process to identify and inventory mature and old-growth forests on lands managed by the Forest Service and the U.S. Department of the Interior, Bureau of Land Management, in fulfillment of Section 2(b) in Executive Order 14072. Uses Forest Inventory and Analysis (FIA) data and other imputations and assumptions to work with existing regional definitions for old growth. Produces mature and old-growth forest acre estimates for these Federal lands by using FIA forest type groups. For the Southern Region, develops definitions for forest types (reference 588). Results by FIA forest type were not always specific to the Southern Region, because types could be found in multiple regions. One example of a type unique to the Southern Region, the longleaf-slash pine group, produced an estimate of 138,918 acres (±15 percent [standard error]) of old growth and 529,552 acres (±7 percent [standard error]) of mature forest.

618. **U.S. Department of the Interior, Fish and Wildlife Service. 2003.** Recovery plan for the red-cockaded woodpecker (*Picoides borealis*): second revision. Atlanta, GA: U.S. Department of Interior, Fish and Wildlife Service. 296 p.

Discusses the importance of old-growth pine forests and trees of this species to maintain nesting cavities. Also discusses the importance of managing for old-growth characteristics using silvicultural practices and prescribed burning.

619. **Ulyshen, M.D.; Horn, S.; Pokswinski, S.; McHugh, J.V.; Hiers, J.K. 2018.** A comparison of coarse woody debris volume and variety between old-growth and secondary longleaf pine forests in the southeastern United States. Forest Ecology and Management. 429: 124–132. https://doi.org/10.1016/j.foreco.2018.07.017.

Documents highly variable coarse woody debris volume across old-growth sites in the Coastal Plain of Florida and Georgia. Variability was attributed to fire regime, wind disturbance, and soil factors. Heartwood volume was a significant indicator of old-growth conditions.

620. **Ulyshen, M.D.; Pokswinski, S.; Hiers, J.K. 2020.** A comparison of bee communities between primary and mature secondary forests in the longleaf pine ecosystem. Scientific Reports. 10(1): 2916. 9 p. https://doi.org/10.1038/s41598-020-59878-4.

Compares bee community composition between primary and second-growth longleaf pine ecosystems in southern Georgia and northern Florida. They found no significant differences in bee species richness, diversity, evenness, or abundance between primary and secondary forests, but bee community composition did differ. Concluded that old-growth longleaf pine is not critical habitat for sensitive bee species, but acknowledged limitations in sampling methods used and suggested that more research was necessary to draw sound conclusions about old-growth effects on bee populations.

621. **Valentine, J. 2011.** Southern Appalachian celebration: In praise of ancient mountains, old-growth forests, and wilderness. Chapel Hill, NC: University of North Carolina Press. 152 p.

Provides photographs of landscapes of the southern Appalachian Mountains in a large-format book. Old-growth forests were of particular interest to the photographer and author of the book.

622. **van de Gevel, S.L.; Hart, J.L.; Grissino-Mayer, H.D.; Robinson, K.W. 2009.** Tree-ring dating of old-growth longleaf pine (*Pinus palustris* Mill.) logs from an exposed timber crib dam, Hope Mills, North Carolina, U.S.A. Tree-Ring Research. 65(1): 69–80. 69. https://doi.org/10.3959/2007-14.1.

Uses dendrochronological techniques to crossdate a historical structure preserved at the bottom of a now-drained lake in North Carolina. Creates a chronology from the samples, spanning the years 1597 to 1825. The dated series can be used for climate and disturbance history reconstruction.

623. **van de Gevel, S.L.; Hart, J.L.; Spond, M.D.; White, P.B.; Sutton, M.N.; Grissino-Mayer, H.D. 2012.** American chestnut (*Castanea dentata*) to northern red oak (*Quercus rubra*): forest dynamics of an old-growth forest in the Blue Ridge Mountains, USA. Botany. 90(12): 1263–1276. https://doi.org/10.1139/b2012-100.

Quantifies tree species composition, structure, and stand dynamics of a high-elevation northern red oak stand that developed in response to chestnut blight and other natural and anthropogenic disturbances.

624. **Van Lear, D.H.; Waldrop, T.A. 1995.** Coarse woody debris considerations in southern silviculture. In: Edwards, M.B., comp. Proceedings of the eighth biennial southern silvicultural research conference. Gen. Tech. Rep. SRS-1. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 63–72.

Discusses the ecological importance of coarse woody debris (CWD), different forms of input (gap-phase dynamics versus episodic events), and CWD loss (decay versus consumption by fire). Simulates fuel loadings based on specific questions posed by authors. Results have implications for CWD management in old-growth forests in the Southeastern United States.

625. **Vankat, J.L.; Blackwell, W.H., Jr.; Hopkins, W.E. 1975.** The dynamics of Hueston Woods and a review of the question of the successional status of the southern beech-maple forest. Castanea. 40(4): 290–308.

Tests the well-developed hypothesis (at the time of publication) that the successional trajectory of the southern portion of the beech-maple forest will transition to mixed mesophytic forest type. Results indicate that both beech and maple were compositionally stable, refuting the hypothesis of successional shifts in beech-maple forests in Ohio.

626. **Varner, J.M., III; Kush, J.S. 2004.** Remnant old-growth longleaf pine (*Pinus palustris* Mill.) savannas and forests of the southeastern USA: status and threats. Natural Areas Journal. 24(2): 141–149.

Estimates contemporary extent of old-growth longleaf pine woodlands and savannas in the Southeastern United States. Found 15 old-growth stands across four of nine States in the range of longleaf pine. Authors highlighted the importance of restoration and conservation of longleaf pine ecosystems.

627. **Varner, J.M.; Kush, J.S.; Meldahl, R.S. 1999.** Old-growth montane longleaf pine forest age structure: a preliminary assessment. In: Kush, J.S., comp. Longleaf pine: a forward look: Proceedings of the second Longleaf Alliance conference. Rep. 4. Andalusia, AL: Longleaf Alliance: 170–174.

Reports on a dendrochronological analysis of the age structure of multiple old-growth montane longleaf pine stands in Alabama. Redheart disease was documented in many samples, which resulted in a lack of confidence in the establishment date of some samples. Notably, a greater incidence of redheart was found in montane longleaf pine samples than in Coastal Plain samples.

628. **Varner, J.M., III; Kush, J.S.; Meldahl, R.S. 2000.** Ecological restoration of an old-growth longleaf pine stand utilizing prescribed fire. In: Moser, W.K.; Moser, C.F., eds. Proceedings of the 21st Tall Timbers fire ecology conference: Fire and forest ecology: innovative silviculture and vegetation management. Tallahassee, FL: Tall Timbers Research Station: 216–219.

Assesses vegetation response and quantifies abiotic stand dynamics upon the reintroduction of fire in an old-growth, long-unburned longleaf pine stand in southern Alabama.

629. **Varner, J.M., III; Kush, J.S.; Meldahl, R.S. 2003.** Structural characteristics of frequently-burned old-growth longleaf pine stands in the mountains of Alabama. Castanea. 68(3): 211–221.

Assesses stand structure, establishment history, and recruitment trends in two frequently burned montane longleaf pine stands in Alabama.

630. **Varner, J.M., III; Kush, J.S.; Meldahl, R.S. 2003.** Vegetation of frequently burned old-growth longleaf pine (*Pinus palustris* Mill.) savannas on Choccolocco Mountain, Alabama, USA. Natural Areas Journal. 23(1): 43–52.

Assesses vegetation dynamics in two frequently burned old-growth montane longleaf pine stands in the desired future condition in Alabama.

631. Varner, J.M., III; Kush, J.S.; Meldahl, R.S. 2006. Characteristics of sap trees used by overwintering *Sphyrapicus varius* (yellow-bellied sapsuckers) in an old-growth pine forest. Southeastern Naturalist. 5(1): 127–134. https://doi.org/10.1656/1528-7092(2006)5[127:COSTUB]2.0.CO;2.

Assesses individual and stand-level characteristics that influenced sapsucker preference for individual trees in an old-growth longleaf pine stand in Alabama. Individual tree characteristics, such as diameter at breast height, were more important predictors of sapsucker preference than were stand-level predictors, such as basal area.

632. Vose, J.M.; Bolstad, P.V. 2007. Biotic and abiotic factors regulating forest floor CO_2 flux across a range of forest age classes in the southern Appalachians. Pedobiologia. 50: 577–587. https://doi.org/10.1016/j.pedobi.2006.10.006.

Measures forest floor carbon dioxide (CO_2) flux in three southern Appalachian stands with different age structures: 20 years old, 85 years old, and old growth. Stand age structure had no significant effect on CO_2 flux.

633. Wackerman, A.E.; Bragg, D.C. 2023. A confidential case study on the selective logging options for the virgin pine forests of the Crossett Lumber Company. In: Bragg, D.C., ed. Celebrating 100 years of forest science: an abridged history of the Southern Research Station. Gen. Tech. Rep. SRS-272. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 67–95. https://doi.org/10.2737/SRS-GTR-272.

Reports on a previously unpublished case study of silvicultural recommendations made for an Arkansas-based lumber company to help with cutting old-growth loblolly-shortleaf pine stands in the West Gulf Coastal Plain. Contains brief descriptions of stand-level attributes of “virgin” and “culled virgin” pine-dominated stands on this ownership as well as a few historically appropriate Forest Service photographs of these old stands.

634. Wahlenberg, W.G. 1946. Longleaf pine: Its use, ecology, regeneration, protection, growth, and management. Washington, DC: Charles Lathrop Pack Forestry Foundation in cooperation with U.S. Department of Agriculture, Forest Service. 429 p.

Provides an extensive resource highlighting the then current (1945) state of knowledge regarding longleaf pine ecology and management.

635. Wahlenberg, W.G.; Bragg, D.C.; McDaniel, V.L. 2023. The 1931 search for a new experimental forest in the Ouachita National Forest. In: Bragg, D.C., ed. Celebrating 100 years of forest science: an abridged history of the Southern Research Station. Gen. Tech. Rep. SRS-272. U.S. Department of Agriculture, Forest Service, Southern Research Station: 25–66 https://doi.org/10.2737/SRS-GTR-272.

Reports on a previously unpublished project from the early 1930s that discusses the search for a new silviculture-based experimental forest in the shortleaf pine-dominated woodlands of the Ouachita National Forest. Most of the forest areas considered at this time were old-growth pine, and this report contains historical photographs of these virgin stands. Two of the better candidate locations are also described in greater detail, including a size-class distribution (by shortleaf pine and hardwoods), pine height and diameter growth rates by diameter comparison, and a comparison of pine age (ring count, in years) as a function of diameter.

636. Waldrop, T.A.; Brudnak, L.; Rideout-Hanzak, S. 2007. Fuels on disturbed and undisturbed sites in the southern Appalachian Mountains, USA. Canadian Journal of Forest Research. 37(6): 1134–1141. https://doi.org/10.1139/X06-302.

Samples fuels across a wide range of forest types, topographic positions, and disturbance regimes in southern Appalachian forests in four States. Disturbance history (e.g., frequent fire) was a more influential driver of differences in fuels than was topography or aspect.

637. Walker, J. 1993. Longleaf pine forests and woodlands: old growth under fire! In: Miller, G.L., ed. The value of old growth forest ecosystems of the eastern United States. University of North Carolina at Asheville: 33–40.

Highlights the attributes of old-growth longleaf pine, ecological importance of the understory plant community, importance of fire, and management strategies to prioritize old growth.

638. Walters, J.R.; Daniels, S.J.; Carter, J.H., III; Doerr, P.D. 2002. Defining quality of red-cockaded woodpecker foraging habitat based on habitat use and fitness. Journal of Wildlife Management. 66(4): 1064–1082. https://doi.org/10.2307/3802938.

Examines habitat quality for red-cockaded woodpeckers in the context of habitat and fitness variables in North Carolina as well as through an extensive literature review. Group size was positively correlated to density of old-growth pines. Also suggests that high-quality foraging habitat contains old-growth pines, at least at low densities.

639. Walters, R. 2016. Stewardship plan for Virginia Tech's old-growth forest near Lane Stadium. Blacksburg, VA: Virginia Tech. 347 p. M.F. thesis.

Describes the conditions of an old-growth oak-dominated stand (Stadium Woods) on the Virginia Polytechnic Institute and State University campus that may have >300-year-old white oaks and offers a management plan for this campus resource.

640. Ward, J.S.; Parker, G.R. 1989. Spatial dispersion of woody regeneration in an old-growth forest. Ecology. 70(5): 1279–1285. https://doi.org/10.2307/1938187.

Investigates patterns of woody regeneration in relation to canopy gaps, secondary canopy, and primary canopy in an old-growth lowland oak forest in Indiana.

641. Watson, H. 1957. Alabama's virgin pine timber. Southern Lumberman. 195(2441): 105–106.

Describes an unmanaged stand of loblolly and shortleaf pine near Troy, AL, with no recent history of fire.

642. Weaver, G.T.; Ashby, W.C. 1971. Composition and structure of an old-growth forest remnant in unglaciated southwestern Illinois. American Midland Naturalist. 86(1): 46–56. https://doi.org/10.2307/2423684.

Describes the composition, structure, and stand dynamics of an old-growth oak-hickory forest in Illinois and found that sugar maple was projected to increase in dominance as a result of altered disturbance regimes and selective harvesting practices.

643. Webster, C.R.; Jenkins, M.A. 2008. Age structure and spatial patterning of *Trillium* populations in old-growth forests. Plant Ecology. 199(1): 43–54. https://doi.org/10.1007/s11258-008-9410-5.

Maps and records height and age of *Trillium* populations in three old-growth southern Appalachian cove forests. Determined that *Trillium* was spatially aggregated and compositionally stable. Results may serve as a baseline for comparing herbaceous communities in forests at different stages of development.

644. Webster, J.D.; Adams, D.L. 1972. Breeding bird censuses in old-growth deciduous forests. Proceedings of the Indiana Academy of Science. 82: 198–206.

Completes a census of bird populations in multiple old-growth forest types in the central hardwoods region. Mentions the recent (at the time of publication) extirpation of American chestnut and its effects on bird populations. Bird species diversity was highest in western lowland forest types and lowest in upland oak-chestnut forest types.

645. Weideman, M. 2003. New consortium aims to save primeval woodlands. Frontiers in Ecology and the Environment. 1(10): 515.

Reports on the establishment of Ancient Cross Timbers Consortium for Research in 2003, a society which aimed to save old-growth woodlands in the Midwest by reaching out to landowners to encourage conservation and preservation. Includes percentage of old-growth forests in the Cross Timbers ecosystem, estimates area of old-growth forest with post oak and eastern redcedar trees that survived in eastern Oklahoma, and focuses on the preservation efforts of the newly established consortium.

646. **West, D.C.; Doyle, T.W.; Tharp, M.L.; Beauchamp, J.J.; Platt, W.J.; Downing, D.J. 1993.** Recent growth increases in old-growth longleaf pine. Canadian Journal of Forest Research. 23(5): 846–853. https://doi.org/10.1139/x93-110.

Documents an increase in mean annual growth increment in both 150-year-old and 200- to 400-year-old longleaf pine from 1950 to 1987. Authors attributed increased horizontal growth in old longleaf pine to increased atmospheric carbon dioxide.

647. **Westfall, J.A.; Morin, R.S. 2013.** A cover-based method to assess forest characteristics using inventory data and GIS. Forest Ecology and Management. 298: 93–100. https://doi.org/10.1016/j.foreco.2013.02.036.

Uses data collected from the Forest Inventory and Analysis program in Pennsylvania to assign tree crown size to individual trees and link to individual tree traits. Applies this method to identify areas of old growth.

648. **Whipple, S.A. 1980.** Population dispersion patterns of trees in a southern Louisiana hardwood forest. Bulletin of the Torrey Botanical Club. 107(1): 71–76. https://doi.org/10.2307/2484854.

Quantifies spatial patterns and interactions of four dominant tree species in an uncut hardwood forest in Louisiana. Documents generally clumped patterns in smaller stems, and dispersed patterns in large stems, which was hypothesized to be a function of size-induced mortality patterns.

649. **White, D.A. 1987.** An American beech-dominated original growth forest in southeast Louisiana. Bulletin of the Torrey Botanical Club. 114(2): 127–133. https://doi.org/10.2307/2996121.

Describes the woody plant community in what was thought to be an old-growth (>150 years old) American beech, spruce pine, southern magnolia, and sweetgum stand in southeastern Louisiana.

650. **White, D.L.; Lloyd, F.T. 1995.** Defining old growth: implications for management. In: Edwards, M.B., comp. Proceedings of the eighth biennial southern silvicultural research conference. Gen. Tech. Rep. SRS-1. U.S. Department of Agriculture, Forest Service, Southern Research Station: 51–62.

Describes the Forest Service Eastern Old-Growth Definition Project. Develops a framework for defining forest types of the Southeastern United States using examples from dry and dry-mesic oak-pine old-growth forests in the region.

651. **White, D.L.; Lloyd, F.T. 1998.** An old-growth definition for dry and dry-mesic oak-pine forests. Gen. Tech. Rep. SRS-23. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 42 p. https://doi.org/10.2737/SRS-GTR-23.

Defines dry and dry-mesic oak-pine forests in the region, as part of the larger effort to develop old-growth definitions for 35 forest types in the Eastern United States. Describes old-growth forests of this type in each of the physiographic provinces of the region (Piedmont, Coastal Plain, etc.).

652. **White, P.S. 1987.** Natural disturbance, patch dynamics, and landscape pattern in natural areas. Natural Areas Journal. 7(1): 14–22.

Reviews the importance of understanding natural disturbance and patch dynamics in natural areas. Places specific emphasis on spatial scales in which these processes operate, with larger preserves being more resilient.

653. **White, P.S.; MacKenzie, M.D.; Busing, R.T. 1985.** A critique on overstory/understory comparisons based on transition probability analysis of an old growth spruce-fir stand in the Appalachians. Vegetatio. 64(1): 37–45. https://doi.org/10.1007/BF00033452.

Models compositional stability of an old-growth spruce-fir forest using transition probability analysis. Based on techniques used to assess overstory-understory relationships, authors concluded that the stand was in compositional equilibrium under a gap-scale disturbance regime.

654. **White, P.S.; MacKenzie, M.D.; Busing, R.T. 1985.** Natural disturbance and gap phase dynamics in southern Appalachian spruce-fir forests. Canadian Journal of Forest Research. 15(1): 233–240. https://doi.org/10.1139/x85-041.

Quantifies the frequency and extent of canopy gaps and gap-phase succession of spruce, fir, and yellow birch.

655. **White, P.S.; Tuttle, J.P.; Collins, B.S. 2018.** Old-growth forests in the southern Appalachians: dynamics and conservation frameworks. In: Barton, A.M.; Keeton, W.S., eds. Ecology and recovery of eastern old-growth forests. Washington, DC: Island Press: 63–82. https://doi.org/10.5822/978-1-61091-891-6_4.

Discusses the disturbance regimes that influenced old-growth development in the southern Appalachian Mountains; describes the structural variability of old growth using data collected between 1930 and 1990; and proposes a framework for evaluating, delineating, and conserving old growth in the region.

656. **White, Z.W.; Karr, B.L.; Baker, J.B.; Monaghan, T. 1984.** Loblolly pine, with an emphasis on its history. In: Karr, B.L.; Baker, J.B.; Monaghan, T., eds. Symposium on the loblolly pine ecosystem (West Region). Starkville, MS: Mississippi Cooperative Extension Service, Mississippi State University: 3–16.

Reviews the historical loblolly pine resource. Includes photographs and descriptions of virgin stands of loblolly pine and individual old specimens of this species.

657. **Whittaker, R.H. 1956.** Vegetation of the Great Smoky Mountains. Ecological Monographs. 26(1): 1–80. https://doi.org/10.2307/1943577.

Provides an extensive description of the vegetation and vegetation-environment relationships of the various forest community types of the Great Smoky Mountains National Park.

658. **Williams, A.B. 1936.** The composition and dynamics of a beech-maple climax community. Ecological Monographs. 6(3): 317–408. https://doi.org/10.2307/1943219.

Provides a detailed description and inventory of vegetation dynamics and site conditions in a beech-maple community in Ohio.

659. **Williams, D.A.; Wang, Y.; Borchetta, M.; Gaines, M.S. 2007.** Genetic diversity and spatial structure of a keystone species in fragmented pine rockland habitat. Biological Conservation. 138(1-2): 256–268. https://doi.org/10.1016/j.biocon.2007.04.024.

Uses remote sensing techniques to evaluate the sustainability and genetic variability of second-growth, old-growth, and hurricane-damaged rock pine ecosystems in southern Florida. Individuals between fragments had less genetic similarity than did individuals within fragments, and no genetic erosion was found. Thus, old-growth slash pine that occurs in fragmented ecosystems may continue to serve as a viable seed source for natural regeneration of these stands.

660. **Williams, T.M.; Shelley, D.C.; Song, B. 2017.** GIS analysis of historical maps: a case study from an 1885 survey of the Congaree River. Mathematical and Computational Forestry and Natural-Resource Sciences. 9(2): 3–16.

Georeferences a historical map of the Congaree River in South Carolina that was drawn in 1885. Authors overlaid the historical map on the contemporary river channel to evaluate channel migration over time.

Flooding and channel migration disturbed forest ecosystems that occurred on the floodplain. These findings have implications for old-growth forest management in the Congaree River floodplain.

661. **Williamson, G.B. 1975.** Pattern and seral composition in an old-growth beech-maple forest. Ecology. 56(3): 727–731. https://doi.org/10.2307/1935509.

Quantifies patterns of succession and species-specific relationships in an old-growth beech-maple forest. Authors concluded that old-growth beech-maple forests occur as a mosaic of species in different seral stages.

662. **Wilson, C.R. 2003.** Woody and arboreal habitats of the green salamander (*Aneides aeneus*) in the Blue Ridge Mountains. Contemporary Herpetology. 2003(2): 1–10. https://doi.org/10.17161/ch.vi1.11967.

Describes several reports of the green salamander in arboreal habitats in the Blue Ridge Mountains. Moist and cool soils of old-growth forests are important for the green salamander. Authors suggested the loss of old-growth forests and the loss of the chestnut tree could be reasons that this species of salamander is now considered rare. Preservation of old-growth forests in the Blue Ridge Mountains is important for the survival of disjunct populations of the green salamander.

663. **Winterringer, G.S.; Vestal, A.G. 1956.** Rock-ledge vegetation in southern Illinois. Ecological Monographs. 26(2): 105–130. https://doi.org/10.2307/1943286.

Describes characteristics of plant communities occurring on rock outcrops in the Shawnee Hills of Indiana. Documents common tree species, including eastern redcedar, blackjack oak, and winged elm. Authors linked differences in plant communities to variability in soils, moisture availability, geology, and level of exposure.

664. **Winters, R.K. 1939.** Forest resources of the south Arkansas delta. Forest Survey Release 46. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 24 p.

Reports on first Forest Service forest survey for the southern Arkansas Delta (mid-1930s). Includes estimates of the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species—primarily bottomland, seasonally wet types.

665. **Winters, R.K. 1939.** Forest resources of the south Louisiana delta. Forest Survey Release 42. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 20 p.

Reports on first Forest Service forest survey for the southern Louisiana Delta (mid-1930s). Includes estimates of the amount of old growth (acreage and growth increment for both uncut and partly cut) by forest type as well as estimates of old-growth volumes (in board feet) by the primary timber species: pine-hardwoods, upland and bottomland hardwoods.

666. **Winters, R.K.; Putnam, J.A.; Eldredge, I.F. 1938.** Forest resources of the north-Louisiana delta. Misc. Publ. 309. Washington, DC: U.S. Department of Agriculture. 49 p. + maps. https://doi.org/10.5962/bhl.title.65584.

Reports on a 1938 survey of the forest resource in the Louisiana Delta, which estimated timber volume, incremental growth rates, and harvesting rates. To inform policy, authors discuss pressing issues in bottomland hardwood management at the time, which included the need for timber stand improvement, harvesting at economic maturity, fire suppression, and forestry research and education.

667. **Wiseman, J.B., Jr. 1982.** A study of the composition, successional relationships and floristics of Mississippi River floodplain forests in parts of Washington, Bolivar and Sharkey counties, Mississippi. Mississippi State, MS: Mississippi State University. 268 p. Ph.D. thesis.

Describes old-growth characteristics of bottomland forest in the Mississippi River floodplain. Samples trees, saplings, and seedlings at multiple sites and documents community compositional differences.

668. Witsell, T. 2003. A floristic inventory of old growth pine-oak-hickory stands in Hot Springs National Park. Tech. Rep. NPS/HTLN/P6370010494. Republic, MO: National Park Service. 64 p.

Identifies old-growth remnants in Hot Springs National Park with the following criteria: uneven-aged structure, large canopy trees, large commercially important trees (shortleaf pine, white oak, northern red oak), deadwood, windthrow gaps, and absence of evidence of harvesting. Trees ranged from 130 to 200 years old based on field ring counts. Also conducts a vascular flora inventory, and woody plants outnumbered herbaceous plants, which was thought to be a legacy of fire exclusion. Documents nonnative invasive plants as well.

669. Wohl, E.; Polvi, L.E.; Cadol, D. 2011. Wood distribution along streams draining old-growth floodplain forests in Congaree National Park, South Carolina, USA. Geomorphology. 126(1–2): 108–120. https://doi.org/10.1016/j.geomorph.2010.10.035.

Measures in-stream and stream-adjacent coarse woody debris on transects in and adjacent to floodplain stands of old-growth loblolly pine, baldcypress, sweetgum, and green ash. Coarse woody debris loads were less than those typical of old-growth temperate forests, which was attributed to transport capacity and rapid decay rates.

670. Woodall, C.W.; Kamoske, A.G.; Hayward, G.D.; Schuler, T.M.; Hiemstra, C.A.; Palmer, M.; Gray, A.N. 2023. Classifying mature federal forests in the United States: the Forest Inventory Growth Stage System. Forest Ecology and Management. 546: 121361. 14 p. https://doi.org/10.1016/j.foreco.2023.121361.

Develops a classification system (Forest Inventory Growth Stage System) using Forest Inventory and Analysis program data to identify mature forests on Federal lands in support of Presidential Executive Order 14072. Results indicate that approximately 45 percent of Forest Service and Bureau of Land Management forest lands were mature, but authors cautioned that estimates are unverifiable and opportunity exists to refine the classification system.

671. Woodbridge, M. 2020. Long-term landscape-scale impact of early 20th century logging on plant communities in the southern Appalachians. Syracuse, NY: State University of New York. 194 p. Ph.D. dissertation.

Examines the long-term impact of early 20th century clearcutting on plant communities in the southern Appalachian Mountains. Compares landscapes that experienced clearcutting to communities with no history of harvesting. The effects of clearcutting on plant communities were still evident 70 years postharvest, with a notable homogenization of plant community composition.

672. Woodbridge, M.; Dovciak, M. 2022. Logging legacies in a plant biodiversity hotspot: altered distribution and abundance patterns of the shrub layer in the southern Appalachians. Forest Ecology and Management. 516: 120245. 9 p. https://doi.org/10.1016/j.foreco.2022.120245.

Assesses the impact of logging history and topographic factors on the cover of dominant shrub taxa in the Great Smoky Mountains National Park. Dominant shrub taxa cover was greater in stands with no history of logging, and cover varied across topographic gradients.

673. Woodin, H.E. 1955. Moorefield Woods: old-growth beech in Switzerland County, Indiana. American Midland Naturalist. 54(2): 504–507. https://doi.org/10.2307/2422585.

Describes a park-like forest with very large old-growth beech trees (largest was 46.6 inches in diameter at breast height). Maples were selectively harvested, and no advance reproduction was present at time of sampling.

674. Wu, X.; McCormick, J.F.; Busing, R.T. 1999. Growth pattern of *Picea rubens* prior to canopy recruitment. Plant Ecology. 140(2): 245–253. https://doi.org/10.1023/A:1009723326707.

Reconstructs red spruce canopy recruitment strategies in an old-growth spruce-fir forest in the Great Smoky Mountains. Prior to recruitment into the canopy, the majority of red spruce experienced periods of suppression. These periods of growth release and suppression were likely characteristic of old-growth spruce-fir forests, in which the disturbance regime was dominated by frequent small openings and less frequent large openings.

675. **Wuenscher, J.E.; Valiunas, A.J. 1967.** Presettlement forest composition of the River Hills region of Missouri. American Midland Naturalist. 78(2): 487–495. https://doi.org/10.2307/2485246.

Uses General Land Office surveys to determine presettlement forest composition of the River Hills region of Missouri with a focus on determining the extent of sugar maple in white oak-dominated forests. Sugar maple was unevenly distributed in presettlement forests, but ubiquitous in contemporary white oak forests. This historical pattern was hypothesized to be a function of the historical frequent fire regime.

676. **Wyatt, J.L. 2009.** Recovery and resilience of Appalachian herbs. Winston Salem, NC: Wake Forest University. 218 p. Ph.D. dissertation.

Focuses on recovery of Appalachian cove forest herbaceous communities 100–150 years after logging. The major conclusion was that herbaceous communities do not recover to predisturbance composition after >100 years postlogging. Mature Appalachian cove forests cannot be used as a baseline for herbaceous layer recovery, because the ecological processes that influence herbaceous community organization do not have sufficient time to manifest.

677. **Wyatt, J.L.; Silman, M.R. 2009.** Trait based community assembly of Appalachian herbs: the impact of logging on species coexistence. [Abstract]. In: Abstracts of the 94th Ecological Society of America annual meeting. Ecological Society of America. https://eco.confex.com/eco/2009/webprogram/Paper18935.html. [Date accessed: 19 August 2024].

Outlines the use of a trait-based approach in evaluating how processes change in the herbaceous layer following logging. Understory light environment filtered herbaceous species coexistence at fine spatial scales in old-growth forests. Concluded that harvesting influenced herbaceous community composition in Appalachian cove forests for an extended period, and herbaceous communities in old-growth forests were driven by unique ecological processes not evident in mature forests with a legacy of harvesting.

678. **Wyatt, J.L.; Silman, M.R. 2010.** Centuries-old logging legacy on spatial and temporal patterns in understory herb communities. Forest Ecology and Management. 260(1): 116–124. https://doi.org/10.1016/j.foreco.2010.04.010.

Compares herbaceous communities between mature (>100 years since harvest) and old-growth forests and found that herbaceous communities in a mature forest had yet to recover from harvesting. Recommends that herbaceous communities in stands <100 years of age not be considered fully developed and representative of old-growth conditions.

679. **Wyatt, J.L.; Silman, M.R. 2014.** Long-term effects of clearcutting in the southern Appalachians. In: Gilliam, F.S., ed. The herbaceous layer in forests of eastern North America. New York, NY: Oxford University Press: 412–437. https://doi.org/10.1093/acprof:osobl/9780199837656.003.0018.

Outlines the processes and patterns driving changes in richness, abundance, and composition of the herbacous layer in rich cove forests in the southern Appalachian Mountains. Harvesting had lasting impacts on the recovery of understory herbaceous communities for up to 150 years, and old-growth communities supported higher herbaceous species richness and diversity than mature southern Appalachian cove forests.

680. **Yetter, T.C.; Runkle, J.R. 1986.** Height growth rates of canopy tree species in southern Appalachian gaps. Castanea. 51(3): 157–167.

Measures and models sapling height growth in natural disturbance-created canopy gaps in old-growth Appalachian cove forests on the Nantahala National Forest, Pisgah National Forest, and Joyce Kilmer Wilderness Area. Sapling height growth was largely species specific and influenced by gap age and topography.

681. Yost, E.C.; Johnson, K.S.; Blozan, W.F. 1994. Delineation of old-growth oak and eastern hemlock in Great Smoky Mountains National Park. Park Science. 14(4): 14–16.

Identifies and delineates 86 stands totaling 926 ha of old-growth mesic, submesic, subxeric, and xeric oak, and eastern hemlock in Great Smoky Mountains National Park in response to proliferation of spongy (formerly gypsy) moth and hemlock woolly adelgid.

682. Zhao, D.; Allen, B.; Sharitz, R.R. 2006. Twelve year response of old-growth southeastern bottomland hardwood forests to disturbance from Hurricane Hugo. Canadian Journal of Forest Research. 36: 3136–3147. https://doi.org/10.1139/x06-204.

Evaluates hurricane damage on bottomland hardwood stand composition and structure under varying levels of damage. Results indicate that old-growth bottomlands were not resistant to hurricane disturbance. Disturbance severity varied and differential impacts were documented among woody plant strata. Tree and sapling density recovered to levels greater than predisturbance densities. Species composition in the sapling and tree layer decreased in similarity with time since disturbance.

683. Zobel, D.B. 1969. Factors affecting the distribution of *Pinus pungens*, an Appalachian endemic. Ecological Monographs. 39(3): 303–333. https://doi.org/10.2307/1948548.

Describes the geographic range of Table Mountain pine and the environmental drivers of the species distribution. Table Mountain pine primarily occurs in the Blue Ridge and Ridge-and-Valley on western to southern aspects in rocky, nutrient poor soils. Table Mountain pine stands are fire-adapted and may frequently occur on dry rock outcrops and steep shale slopes in the absence of fire and anthropogenic disturbance. Old-growth trees on these sites are often nonmerchantable, have poor growth form, and small-diameter individuals may be >100 years of age.

684. Zwicker, S.M.; Walters, J.R. 1999. Selection of pines for foraging by red-cockaded woodpeckers. Journal of Wildlife Management. 63(3): 843–852. https://doi.org/10.2307/3802797.

Studies the size and age of trees used for foraging by red-cockaded woodpeckers relative to position on the landscape. Use exceeded availability for trees that were 60+ years old and 25 cm in diameter at breast height. Red-cockaded woodpeckers strongly selected old-growth trees (100+ years old) for foraging, even though they were infrequent on the landscape.

ANNOTATED PHOTOGRAPHS

Captions exactly as written on photograph (i.e., not edited or formatted).

P1 **Abell, C.A.** **95-GP-4422-264808** **1932**
Curly yellow poplar veneer log cut from a single tree in Spivey Basin.
Georgia, Union County
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7102925

P2 **Abell, C.A.** **95-GP-5404-268386** **1932**
Spruce forest on Middle Creek. Black Mountain - Shrubs are *R. catawbiense*.
Pisgah National Forest
Montane and allied spruce and spruce-fir forest
https://catalog.archives.gov/id/7048916

P3 **Adams, D.W.** **95-GP-5367-96652** **Unknown year**
Virgin stand of mixed hardwoods and pine
Ouachita National Forest
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7048178

P4 **Adams, S.B.** **95-GP-249-10025A** **1911**
Live Oak grove set aside as a forest-reserve by the Navy Dept. in 1837 for use as ship timbers.
Florida, Santa Rosa County
Coastal plain upland mesic hardwood forest
https://catalog.archives.gov/id/7003886

P5 **Allen, R.** **95-GP-5384-521354** **1964**
Large eastern hemlock (*Tsuga canadensis*) (L) (Carr.) trees in Rock Creek National Area.
Daniel Boone National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7048602

P6 **Allen, R.** **95-GP-5384-521359** **1964**
Large hemlock in the foreground, yellow-poplar in the background at night.
Daniel Boone National Forest
Conifer-northern hardwood forest
https://catalog.archives.gov/id/7048598

P7 **Barbour, W.R.** **95-GP-1370-405527** **1940**
[Shortleaf pine] Tree falling. Taken on A.E. Webb timber sale, about 3 miles east of Piedmont, Alabama. Sale made April 25, 1940, located in Duggar Mt. compartment. Estimated 1800 M of yellow pine. Stumpage: longleaf $10.35, shortleaf and loblolly $9.60. Virginia [illegible] $2.00. Number of men employed 12-15, all local residents (contract specifies that at least 50% of labor must come from within a 20 mile radius). Slabs at mill sold for fuel, all utilized (mill uses gasoline power). When necessary to long-butt logs to get clear timbers, butt cuts are made into paving blocks and shingles. Mill principally saws dimension stock, much of it on special order. An excellently run operation, with close utilization.
Talladega National Forest
Xeric pine and pine-oak forest and woodland; dry and dry-mesic oak-pine and pine-oak forest; upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7017440

P8 **Barbour, W.R.** **95-GP-1409-405545** **1940**
White oak tree has been felled and several crosscuts removed. Tree yield 15 54” cuts, which gave 583 staves. Volume of merchantable portion 3,630 bd. ft., stumpage $78.41. Wm. H. Coleman Co. hardwood sale of 1/18/38. On sale area an estimated 800M of white oak and 1,586M of other hardwoods. White oak sale price $21.50 plus 10₵ per M silvicultural deposit; other species range from $2.10 to $20.10. Six men work on white oak stave portion of sale and 14 on sawtimber portion. 14 of 20 hired locally. Staves are sledded from woods to Northwest Road, trucked to R.R. at Town Creek, and shipped to New Orleans, Mobile, and Savannah. Most are for export trade.
Black Warrior National Forest
Mesic and dry-mesic oak forest
https://catalog.archives.gov/id/7017728

P9 **Barbour, W.R.** **95-GP-5385-405995** **1940**
Virgin longleaf pine forest near Flatwoods, property of Bentley Lumber CO. Age 100-150 years. This is one of the few remaining virgin longleaf forests left in Louisiana, and probably typical of vast areas that were destructively logged and are now having to be reforested by planting.
Kisatchie National Forest
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7048621

P10 **Barbour, W.R.** **95-GP-5377-337846** **Unknown year**
Virgin forest on north slope of Blood Mountain.
Chattahoochee National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7048451

P11 **Barrett, L.I.** **95-GP-5377-256717** **1931**
Virgin northern red oak in Spivy Basin, Union County. Lot 245, Dist. 16. This timber is on north sloping bench land at an elevation of 3,000 feet.
Georgia, Union County
Mesic and dry-mesic oak forest
https://catalog.archives.gov/id/7048453

P12 **Barrett, L.J.** **95-GP-5377-256718** **1931**
Virgin yellow poplar (*Liriodendron tulipifera*) also called Tulip Tree, in Spivy Basin.
Georgia, Union County
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7048452

P13 **Blake, F.M.** **95-GP-5405-198278** **1925**
Hardwoods on Kimsey Creek
Nantahala National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7048919

P14 **Block, [E.]** **95-GP-5377-40845** **1903**
Round or untapped timber.
Georgia
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7048461

P15 **Block, [E.]** **95-GP-5377-40846** **1903**
Round or untapped timber.
Georgia
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7048460

P16 **Block, E.** **95-GP-1299-25395** **1901**
Fallen timber in deadening eight years after girdling. Summit of Blue Ridge near Pinola.
North Carolina
Conifer-northern hardwood forest
https://catalog.archives.gov/id/7017054

P17 **Block, E.** **95-GP-1417-40092** **1903**
Sawing off the tops of trees.
Georgia
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7017787

P18 **Block, E.** **95-GP-1631-40094** **1903**
Hauling logs by mule team.
Georgia
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7019167

P19 **Block, E.** **95-GP-4275-40145** **1903**
Dipping the cup.
Georgia (near Ocilla)
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7037403

P20 **Brewster, D.R.** **95-GP-1540-299031** **1935**
Current cutting old growth hardwood timber White River bottoms. Large red gum log, 40" diameter small end, being hauled on 8-wheel wagon with 6 mules.
Arkansas, Monroe County
River floodplain hardwood forest
https://catalog.archives.gov/id/7018610

P21 **Burns, F.** **95-GP-3401-28197A** **1916**
Baldcypress (*Taxodium distichum*) in Edenborn Brake. The property of the Ascension Red Cypress Company.
Louisiana
Cypress-tupelo swamp forest
https://catalog.archives.gov/id/7030388

P22 **Chapman, R.A.** **95-GP-5385-407209** **1926**
Old growth stand of longleaf pine. On Bogalusa-Franklin highway, Louisiana.
Louisiana
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7048618

P23 **Damtoft, W.J.** **95-GP-3449-34192A** **1917**
Two large Cucumber Trees along trail up Little Santeetlah Creek
Nantahala National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7030773

P24 **Davis, C.** **95-GP-1312-414102** **1941**
Forest Ranger George Schaeffer marks a veteran poplar in the North Georgia Lumber Company's sale area.
Chattahoochee National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7017186

P25 **Davis, C.** **95-GP-1378-414090** **1941**
A saw crew checks this veteran white pine to be sure that it is marked for cutting. The Appalachian Forest Products Mill located near Clayton, Georgia, is the first sustained sawmill established in North Georgia. It depends on national forest land for a majority of its cut.
Chattahoochee National Forest
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7017525

P26 **Davis, C.** **95-GP-1378-414091** **1941**
Saw crew tackling big pine. The Appalachian Forest Products Mill located near Clayton, Ga., is the first sustained sawmill established in north Georgia. It depends on national forest land for a majority of its cut.
Chattahoochee National Forest
Dry and dry-mesic oak-pine and pine-oak forest
https://catalog.archives.gov/id/7017524

P27 **Davis, C.** **95-GP-3829-426715** **1941**
Forester Ray Brandt measures a mature white oak ready for harvesting.
Ozark National Forest
Dry and xeric oak forest, woodland, and savanna
https://catalog.archives.gov/id/7033719

P28 **Davis, C.** **95-GP-5377-411621** **1941**
One of the few remaining stands of virgin loblolly pine on the Armuchee Ranger District. The mountain slopes of this area were once covered with fine stands of timber as shown, but clear cutting and forest fires have taken a heavy toll of this resource. Under Forest Service management the remaining timber will be marked selectively and sold only when it has reached maturity.
Chattahoochee National Forest
Dry and dry-mesic oak-pine and pine-oak forest
https://catalog.archives.gov/id/7048445

P29 **Davis, C.** **95-GP-5377-419302** **1941**
A stand of virgin longleaf timber, owned by Mrs. Dan Well of Kirkland, Georgia, Atkinson County. The tree being measures is 22" in diameter and contains 4 merchantable 16' logs.
Georgia
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7048443

P30 **Davis, C.** **95-GP-3829-426744** **1943**
Forester Ray Brandt cruising mature stand of white oak timber.
Ozark National Forest
Dry and xeric oak forest, woodland, and savanna
https://catalog.archives.gov/id/7033718

P31 **Davis, C.** **95-GP-736-426778** **1943**
Photographed from overlook at White Rock Recreational Area.
Ozark National Forest
Dry and xeric oak forest, woodland, and savanna
https://catalog.archives.gov/id/7009337

P32 **Doolittle, W.T.** **95-GP-5377-453505** **1948**
View of mature white pine along the road between the bridges of Mulky Creek and Coopers Creek.
Toccoa Experimental Forest
Dry and dry-mesic oak-pine and pine-oak forest
https://catalog.archives.gov/id/7048441

P33 **Heim, F.** **95-GP-3833-518381** **1968**
Karl Stoneking, Assistant Ranger, Lake George Ranger District, using increment borer in large loblolly pine
Ocala National Forest
Coastal plain upland mesic hardwood forest
https://catalog.archives.gov/id/7033786

P34 **Hursh, C.R.** **95-GP-1619-248998** **1930**
Virgin Yellow Poplar log, 44 inches top diamet[e]r 16 feet log. Stony Fork.
Natural Bridge National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7019093

P35 **Kohara, T.T.** **95-GP-5367-350894** **1937**
Near Louisiana State Line 3 miles south of White Station, Ashley County, Ark. Typical virgin hardwood stand of Tensas Delta Country of Arkansas & Louisiana. Stand overmature and quite defective. Lands of the Crosset Lumber Co.
Arkansas
River floodplain hardwood forest
https://catalog.archives.gov/id/7048172

P36 **Kohara, T.T.** **95-GP-5367-350914** **1937**
Good example of high quality virgin shortleaf loblolly pine on lands of the Crossett Lumber Co. Gates Block, Ashley Co., Crossett, Arkansas
Arkansas
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7048171

P37 **Lehrbas, M.M.** **95-GP-3842-268464** **1932**
Jackson Point, new batture. Line 6. Red gum 58 inches D.B.H., 155 ft. high. (4 M. ft. approx.)
Mississippi, Coahoma County
River floodplain hardwood forest
https://catalog.archives.gov/id/7033841

P38 **Lindsey, [T. H.]** **95-GP-5405-5337** **Unknown year**
Cypress swamp showing bald cypress (large tree in center), Red Maple, Black Gum, and White Bay
North Carolina, Buncombe County
Cypress-tupelo swamp forest
https://catalog.archives.gov/id/7048931

P39 **Lindsey, [T.H.]** **95-GP-5405-5315** **Unknown year**
Beech (left) wild cherry (center) yellow buckeye.
North Carolina
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7048933

P40 **Lindsey, T.H.** **95-GP-1359-6203** **[1898]**
Logging Camp on Big Creek.
North Carolina
Conifer-northern hardwood forest
https://catalog.archives.gov/id/7017384

P41 **Littlehales, E.F.** **95-GP-5377-499683** **1957**
Sosbee Cove poplar stand. This area has been set aside by the Forest Service as a memorial to former Ranger Arthur Woody.
Chattahoochee National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7048431

P42 **Lockard, C.R.** **95-GP-1786-425857** **1943**
Lands of the Southern Lumber Company, in Northwestern Bradley County, Arkansas, showing a fine specimen of old-growth shortleaf pine, approximately 120 feet tall. The stand was overmature and had large amounts of redheart. It was given a shelterwood cutting in 1937 with the result that the area is now well covered with young pine seedlings. The original stand ran about 25,000 board feet per acre and the residual stand now contains about 8,000 board feet.
Arkansas
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7020643

P43 **Lockard, C.R.** **95-GP-1373-464590** **1948**
Dierks Lumber and Coal Co. Chain saw felling hickory.
Arkansas
Dry and xeric oak forest, woodland, and savanna
https://catalog.archives.gov/id/7017471

P44 **Lockard, C.R.** **95-GP-1373-464591** **1948**
Dierks Lumber and Coal Company. Chain saw felling hickory.
Arkansas
Dry and dry-mesic oak-pine and pine-oak forest
https://catalog.archives.gov/id/7017470

P45 **Lockard, C.R.** **95-GP-256-464571** **1951**
Pakenham (live) Oaks.
Louisiana
Coastal plain upland mesic hardwood forest
https://catalog.archives.gov/id/7003913

P46 **Magazine of the American Forestry Association** **95-GP-267-321105** **1936**
Baldcypress (*Taxodium distichum*), the biggest tree in Oklahoma.
Oklahoma
Cypress-tupelo swamp forest
https://catalog.archives.gov/id/7003957

P47 **Mattoon, W.R.** **95-GP-1417-16886A** **1913**
Veteran Cypress 50” at top of first log. In locality with few Cypresses but all are veterans. Associates are Gums (?) Bay & Maple
Georgia, Okefinokee Swamp
Cypress-tupelo swamp forest
https://catalog.archives.gov/id/7017788

P48 **Mattoon, W.R.** **95-GP-1602A-477699** **1913**
Veteran cypress 50” at top of first log. In locality with few Cypresses but all are veterans. Associates are Gums (?), Bay & Maple.
Georgia, Okefinokee Swamp
Cypress-tupelo swamp forest
https://catalog.archives.gov/id/7019026

P49 **Mattoon, W.R.** **95-GP-1602A-489245** **1913**
Cypress Lumber Co. 8 ft d.b.h. Cypress tree estimated at over 1200 years of age. Mr. E. S. Mann in view. Supt. of woods work.
Georgia
Cypress-tupelo swamp forest
https://catalog.archives.gov/id/7019025

P50 **Mattoon, W.R.** **95-GP-13-174465** **1923**
White oak - being measured - by one in the class of Forestry.
Georgia
Mesic and dry-mesic oak forest
https://catalog.archives.gov/id/7001060

P51 **Mattoon, W.R.** **95-GP-4267-186818** **1924**
Turpentine - longleaf pine. Shows faces ‘drawn in’ after it was allowed to get too wide.
Alabama
Dry and dry-mesic oak-pine and pine-oak forest
https://catalog.archives.gov/id/7037178

P52 **Mattoon, W.R.** **95-GP-1304-223496** **1927**
Red Gum - also called Sweet Gum. 4 feet gall badly injured by fire.
Texas
River floodplain hardwood forest
https://catalog.archives.gov/id/7017086

P53 **McLean, F.T.** **95-GP-5385-79699** **1908**
Ridge type of forest, in the Cypress region, composed of Sweet Gum, Water & Live Oaks Hackberrys and other.
Louisiana, St. Martin Parish
River floodplain hardwood forest
https://catalog.archives.gov/id/7048630

P54 **Morin, W.H.** **95-GP-5393-381134** **1939**
View of red gum.
Mississippi
River floodplain hardwood forest; seasonally wet oak-hardwood woodland; eastern riverfront forest
https://catalog.archives.gov/id/7048763

P55 **Muir, B.W.** **95-GP-256-353090** **1937**
Pakenham Oaks (De la Ronde Oaks) planted in the 1780s by Pierre Denis de la Ronde. The Battle of New Orleans, in the War of 1812, between General Pakenham and General Jackson was fought close by. General Pakenham's headquarters were just below the plantation house and the General himself mortally wounded in the battle, died under a group of live oaks, which, however, form no part of the famous row. (Mr. Popham at right)
Louisiana
Coastal plain upland mesic hardwood forest
https://catalog.archives.gov/id/7003918

P56 **Muir, B.W.** **95-GP-333-352594** **1937**
Joyce Kilmer Memorial in Joyce Kilmer Forest.
Nantahala National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7004364

P57 **Muir, B.W.** **95-GP-3849-352590** **1937**
Mr. Wiese examining giant tree in Joyce Kilmer Memorial Forest.
Nantahala National Forest
Conifer-northern hardwood forest
https://catalog.archives.gov/id/7033879

P58 **Muir, B.W.** **95-GP-4445-352932** **1937**
Removing cypress logs from the logging train at the mill. Timber cut by the Montague Lumber Co. in gum swamp on the Osceola National Forest Service Sale.
Osceola National Forest
Cypress-tupelo swamp forest
https://catalog.archives.gov/id/7103126

P59 **Muir, B.W.** **95-GP-5111-352588** **1937**
Scene in Joyce Kilmer Memorial Forest.
Nantahala National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7109691

P60 **Muir, B.W.** **95-GP-5111-352589** **1937**
Trail through Joyce Kilmer Memorial Forest.
Nantahala National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7109689

P61 **Muir, B.W.** **95-GP-5111-352591** **1937**
CCC trail maintenance crew in Joyce Kilmer.
Nantahala National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7109690

P62 **Muir, B.W.** **95-GP-5158-352618** **1937**
Virgin timber along Sassafras Ridge Road.
Cherokee National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7110191

P63 **Muir, B.W.** **95-GP-275-367242** **1938**
Mr. Evans Hawes in charge of I & E at the Roanoke Office posing beside the famous thousand year old arborvitae (Northern white cedar) tree at Natural Bridge. This is located on private land but is close to the Natural Bridge District of the Jefferson National Forest.
Virginia
Unknown forest type
https://catalog.archives.gov/id/7003986

P64 **Muir, B.W.** **95-GP-5156-372824** **1938**
A view along the Forest Service Road adjacent to the Huger Recreational Area. Note the immense live oak trees which seem to be dripping with Spanish moss.
Francis Marion National Forest
Coastal plain upland mesic hardwood forest
https://catalog.archives.gov/id/7110177

P65 **Muir, B.W.** **95-GP-5156-372981** **1938**
The beautiful avenue of the live oak trees which line the Forest Service road near the Huger Recreational Area and the Santee Experimental Forest Station. Note the profuse Spanish moss hanging from the tree limbs.
Francis Marion National Forest
Coastal plain upland mesic hardwood forest
https://catalog.archives.gov/id/7110176

P66 **Muir, B.W.** **95-GP-5367-371234** **1938**
Sandy Flats, showing virgin shortleaf pine. Mr. Redington and Mr. Ames walking down a firebreak.
Ozark National Forest
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7048195

P67 **Muir, B.W.** **95-GP-5367-371235** **1938**
Virgin stand of hardwoods near Sandy Flats Firebreak.
Ozark National Forest
Dry and xeric oak forest, woodland, and savanna
https://catalog.archives.gov/id/7048194

P68 **Muir, B.W.** **95-GP-5416-372841** **1938**
A magnificent stand of loblolly pine in the Wadboo Creek sale area. Photo taken before cutting.
Francis Marion National Forest
Coastal plain upland mesic hardwood forest
https://catalog.archives.gov/id/7049170

P69 **Muir, B.W.** **95-GP-5416-372998** **1938**
A beautiful stand of loblolly pine before cutting in the Whiskanboo Creek sale area. Mr. Orrie Hanson, Assistant Ranger, is standing between two giant trees in the center of the picture.
Francis Marion National Forest
Coastal plain upland mesic hardwood forest
https://catalog.archives.gov/id/7049161

P70 **Muir, B.W.** **95-GP-867-371077** **1938**
A view up the White River from City View Bluffs showing the cliff in the left of the picture.
Ozark National Forest
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7011738

P71 **Muir, B.[W.]** **95-GP-40-372862** **1938**
Assistant Ranger Orrie Hanson counting the rings on a giant loblolly pine stump near Whisenboo Creek, Tuxbury Lumber Company sale area. This tree is over 125 years old and measured more than five feet in diameter.
Francis Marion National Forest
Dry and dry-mesic oak-pine and pine-oak forest
https://catalog.archives.gov/id/7001443

P72 **Muir, B.[W.]** **95-GP-5115-372724** **1938**
Photo showing nature trail with large hemlock and rhododendron bushes at the Chattooga Fish Hatchery and Recreational Area, in the mountain district of Sumter National Forest.
Sumter National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7109724

P73 **Muir, B.W.** **95-GP-5425-382663** **1939**
A stand of virgin oak timber on the Clark tract near Anthony Creek. Figure standing beside large oak tree to denote size.
Monongahela National Forest
Mesic and dry-mesic oak forest
https://catalog.archives.gov/id/7049356

P74 **Muir, B.W.** **95-GP-1404-420663** **1942**
Woodsmen felling a large hemlock on the D. W. Newcomb sale along the Hite Hollow Road in the Deerfield Ranger District. The bark is to be used for tannic acid.
George Washington National Forest
Conifer-northern hardwood forest
https://catalog.archives.gov/id/7017662

P75 **Muir, B.W.** **95-GP-5376-451155** **1948**
Eighty-year old virgin longleaf stand at Evergreen Church.
Osceola National Forest
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7048409

P76 **Muir, B.W.** **95-GP-5392-451302** **1948**
The Tatum Tract, 1,000 acres of virgin longleaf pine about 125 yrs. old. Two miles S. of Hattiesburg, Miss., just W. of Rt. 49.
Mississippi, Forrest County
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/search?page=1&q=95-GP-5392-451302

P77 **Neelands, [R.W.]** **95-GP-1096-515644** **1966**
Family group on hiking trail in Craggy Mt. Scenic Area. Ranger Helton Carmichael and family.
Pisgah National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7014569

P78 **Neelands, R.[W.]** **95-GP-256-489396** **1959**
The ‘lock Breaux’ live oak (*Q. virginiana*) in Taft is claimed to be the oldest known live oak. It is the largest in this area with a height of 74 feet, crown spread of 176 feet, and DBH of 11 feet, 6.2 inches.
Louisiana
Coastal plain upland mesic hardwood forest
https://catalog.archives.gov/id/7003912

P79 **Neelands, R.W.** **95-GP-5367-497022** **1960**
A 90-year-old stand of pure shortleaf pine, reported to be one of the finest such stands in the county. Near town of Rosebud; owned by Lt. Col Gifford, (ret.)
Arkansas, White County
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7048187

P80 **Neelands, R.W.** **95-GP-5126-511014** **1965**
Scenic Drive through virgin shortleaf pine area.
Ouachita National Forest
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7109801

P81 **Nelson, A.W.** **95-GP-5367-397759** **1940**
Virgin bald cypress growing in grassy lake.
Arkansas, Hempstead County
Cypress-tupelo swamp forest
https://catalog.archives.gov/id/7048179

P82 **Nelson, A.W.** **95-GP-5367-397775** **1940**
Large tupelo gums in the overflow lands near Cypress Lake, Hempstead County.
Arkansas, Hempstead County
Cypress-tupelo swamp forest
https://catalog.archives.gov/id/7048193

P83 **Peters, J.G.** **95-GP-1635-49637** **1904**
A skid wagon loaded with longleaf pine logs. A method of skidding logs; used either for short logs or long hauls.
Louisiana, Calcasieu Parish
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7019183

P84 **Peters, J.G.** **95-GP-5385-49639** **1904**
Note scrubby characteristics of trees, Virgin Forest. Hilly country. Longleaf Pine. (*Pinus palustris*).
Louisiana, Vernon Parish
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7048632

P85 **Plymale, C.A.** **95-GP-5367-192041** **1924**
Virgin stand of shortleaf pine, Iron Fork.
Ouachita National Forest
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7048166

P86 **Prater, L.J.** **95-GP-5404-469777** **1952**
Cove hardwood type in the Dryman Fork Area. Large tree on right is sugar maple, center foreground is buckeye.
Coweeta Hydrologic Laboratory
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7048900

P87 **Prater, L.J.** **95-GP-1333-479053** **1955**
Dist. Assistant John Whitmore marking a 40” hemlock for cutting on the Reed’s Creek Timber Sale.
Jefferson National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7017247

P88 **Prater, L.J.** **95-GP-736-504849** **1963**
Looking across to Cameron Bluff from a point near Dripping Springs Picnic Area on west end of Mount Magazine.
Ozark National Forest
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7009339

P89 **Prater, L.J.** **95-GP-4276-421420** **[1942]**
A virgin longleaf pine stand owned by the Bentley Lumber Co. at Zimmerman, La. Turpentining operations have been carried on in this area which is about to be logged.
Louisiana
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7037416

P90 **Prater, L.J.** **95-GP-1482-421424** **Unknown year**
Logging R.R. crew distributing rail panels for laying a new logging spur in the Bentley Lumber Co. tract of longleaf pine west of Zimmerman, La. A crew of 9 men lifts 20 panels of rail and lays a similar number in an 8 hour day.
Louisiana
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7018151

P91 **Prater, L.J.** **95-GP-1482-421435** **Unknown year**
Logging train with load of logs for the mill of the Bentley Lumber Co at Zimmerman, La. passing in front of an uncut portion of the longleaf pine stand being cut by this company.
Louisiana
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7018149

P92 **Prater, L.J.** **95-GP-1760-421434** **Unknown year**
View looking across a clear-cut longleaf pine stand in the foreground with an uncut portion of the same stand in the background. Logging train with a load of logs from this operation shown on its way to the mill at Zimmerman, La. Logging being done by the Bentley Lumber Co.
Louisiana
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7020276

P93 **Rowland, C.A.** **95-GP-1708-398682** **1940**
Log loading, Gennett Lumber Company sale, Henson Gap Unit.
Chattahoochee National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7019742

P94 **Russell, C.E.** **95-GP-5422-21930** **Unknown year**
View in Dismal Swamp, showing Bald Cypress and Black Gum.
Virginia
Cypress-tupelo swamp forest
https://catalog.archives.gov/id/7049263

P95 **Shaffer, W.H.** **95-GP-5394-352407** **1937**
Virgin stand of Pine and Hardwood Faulk Tract.
Missouri
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7048783

P96 **Shaffer, W.H.** **95-GP-1871-394733** **1940**
Interior of 100-year-old shortleaf pine stand showing hardwood understory. No signs of recent burning. Along Highway 27 N.C., 2 miles north of Mt. Holly, North Carolina.
North Carolina
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7021551

P97 **Shipp, [E.S.]** **95-GP-4273-226732** **1928**
Wood rider with crew putting up cups.
Choctawhatchee National Forest (transferred to the War Department in 1940 and is currently home to Eglin Air Force Base)
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7037338

P98 **Shipp, E.S.** **95-GP-5405-27324A** **1916**
Big Poplar in cove.
Nantahala National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7048925

P99 **Shipp, E.S.** **95-GP-5405-27330A** **1916**
Mountain Oaks on Colt Ridge.
Nantahala National Forest
Dry and xeric oak forest, woodland, and savanna
https://catalog.archives.gov/id/7048923

P100 **Shipp, E.S.** **95-GP-5405-27336A** **1916**
Mountain Oaks on Colt Ridge.
Nantahala National Forest
Dry and xeric oak forest, woodland, and savanna
https://catalog.archives.gov/id/7048922

P101 **Shipp, E.S.** **95-GP-5111-176460** **1923**
Trail scene on Mt. Mitchell ¾ mile below crest.
Pisgah National Forest
Conifer-northern hardwood forest
https://catalog.archives.gov/id/7109694

P102 **Shipp, E.S.** **95-GP-5405-176492** **1923**
Virgin stand of Beech, Big Ivy District.
Pisgah National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7048921

P103 Shipp, E.S. 95-GP-5425-219064 1927
Virgin Spruce on Spruce Knob.
Monongahela National Forest
Montane and allied spruce and spruce-fir forest
https://catalog.archives.gov/id/7049350

P104 Shipp, E.S. 95-GP-4273-226744 1928
Raking timbers as a fire protection measure. (Note: Trees are no longer (1940) raked on National Forests)
Choctawhatchee National Forest (transferred to the War Department in 1940 and is currently home to Eglin Air Force Base)
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7037337

P105 Shipp, E.S. 95-GP-4273-226745 1928
Putting on 'lead' or 'heal' streak. Virgin timber.
Choctawhatchee National Forest (transferred to the War Department in 1940 and is currently home to Eglin Air Force Base)
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7037336

P106 Shipp, E.S. 95-GP-5376-226666 1928
Virgin Longleaf Pine Niceville Ranger District.
Choctawhatchee National Forest (transferred to the War Department in 1940 and is currently home to Eglin Air Force Base)
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7048420

P107 Shipp, E.S. 95-GP-3829-261568 1932
A veteran shortleaf, 8 years old - reproduction - awaiting to replace it, along Fairchild Trail, Alum Fork.
Ouachita National Forest
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7033722

P108 Shipp, E.S. 95-GP-5367-261547 1932
Interior virgin shortleaf pine stand, Alum Fork.
Ouachita National Forest
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7048167

P109 Shipp, E.S. 95-GP-5422-269235 1932
Virgin hemlock, Ramsey's Draft.
George Washington National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7049247

P110 Shipp, E.S. 95-GP-5425-317562 1935
Virgina white oak, Meadow Creek
Monongahela National Forest
Mesic and dry-mesic oak forest
https://catalog.archives.gov/id/7049343

P111 Shipp, E.S. 95-GP-5425-334800 1937
Virgin timber CRB & Lumber Co. - Gauley River. Red spruce, Eastern hemlock and hardwoods.
West Virginia
Montane and allied spruce and spruce-fir forest; northern hardwood forest
https://catalog.archives.gov/id/7049346

P112 Shipp, E.S. 95-GP-5405-15537A Unknown year
The head of a hardwood cove on Bryson Branch, Red Oak and Chestnut.
North Carolina
Mesic and dry-mesic oak forest
https://catalog.archives.gov/id/7048928

P113 Streator, S.V. FHS3244 * ca. 1910
Stand of old growth timber (probably white oak, misidentified as yellow poplar) with river in background, ca. 1910. Two men are visible at center, one on a donkey; second donkey or horse farther right.
Virginia
Mixed mesophytic and western mesophytic forests; mesic and dry-mesic oak forest
http://prestohost26.inmagic.com/Presto/pl/YzRmOGVlNDAtMmY0YS00YjI2LTk2ZjYtZjgzMmJlNDk1OWY2LjMxMTQ=

* Forest History Society Photograph Collection, 701 William Vickers Ave., Durham, NC 27701.

P114 Taylor, O.L. 95-GP-5404-443125 1946
Virgin timber at entrance of Big Ivey Camp ground.
Pisgah National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7048907

P115 Todd, D. 95-GP-1466-469304 1951
Truckload of hemlock logs as it passes through proposed Falls Branch Scenic Area, where 160 acres of this type of timber will be preserved for the view of future generations. Load scaled 2540 board feet. Trees cut were 300 years old.
Cherokee National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7018054

P116 Todd, D. 95-GP-5377-501614 1960
Typical live oak forest, draped with Spanish moss, along the Georgia coastal areas and islands along the coast. This scene is on Jekyll Island.
Georgia, Glynn County
Coastal plain upland mesic hardwood forest
https://catalog.archives.gov/id/7048430

P117 Todd, D. 95-GP-3694-505725 1963
Visitor to Bee Branch Scenic Area on the Bankhead N.F., gazes up at this towering yellow poplar, 80 inches in diameter and 150 feet high, largest of its kind in Ala.
William B. Bankhead National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7032748

P118 **Todd, D.** **95-GP-5099-505726** **1963**
Scenic foottrail, Bee Branch Scenic Area, leading from the picnic area down to the natural rock bridge in the canyon. Towering white oaks and other hardwoods line the route. Bankhead N.F.
William B. Bankhead National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7109619

P119 **Todd, D.** **95-GP-867-505696** **1963**
Scenic view down White River from the high cliffs known as City Rock Bluff, on the Sylamore District. This is the river famous for its float fishing trips. With its origin on the Ozark N.F. of Arkansas, this interesting river flows west, then north into Missouri, and finally southeastward back into Arkansas and on into the Miss.
Ozark National Forest
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7011731

P120 **Todd, D.O.** **95-GP-5392-458886** **1948**
Virgin shortleaf pine about 5 miles east of Bagley tower. This is one of the few remnants of the magnificent shortleaf stands that once covered the Holly Springs NF and were cut off long before government acquisition. This points to the value of timber growing in an area where denudation, row cropping, and vast erosion have left much of the country a tragic wasteland.
Holly Springs National Forest
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7048751

P121 **Todd, D.O.** **95-GP-1377-458748** **1949**
"Swampers" prepare to fell a huge cypress marked for cutting on a national forest timber sale area.
Apalachicola National Forest
Cypress-tupelo swamp forest
https://catalog.archives.gov/id/7017515

P122 **Todd, D.O.** **95-GP-1549-458752** **1949**
Forest officer Alvis Owen scales a cypress log from national forest sale area in hardwood lowlands along Ochlockonee river.
Apalachicola National Forest
Cypress-tupelo swamp forest
https://catalog.archives.gov/id/7018733

P123 **Todd, D.O.** **95-GP-3828-458294** **1949**
Ranger Del W. Thorson measures a 34-inch shortleaf pine in proposed "natural area".
Ouachita National Forest
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7033712

P124 **Todd, D.O.** **95-GP-3833-458747** **1949**
Forest officers and timber operator size up a huge cypress in the hardwood lowlands along the Ochlockonee river.
Apalachicola National Forest
River floodplain hardwood forest; cypress-tupelo swamp forest
https://catalog.archives.gov/id/7033789

P125 **Todd, D.O.** **95-GP-5126-458293** **1949**
Forest road through virgin shortleaf pine forest in proposed "natural area" on Jessieville District.
Ouachita National Forest
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7109808

P126 **Todd, D.O.** **95-GP-5362-458590** **1949**
This longleaf pine at about 2,000 feet on Cheaha Mountain is possibly at the highest altitude of any natural green longleaf in the world; this species usually confines itself to lower altitudes and latitudes. Longleaf grows naturally and well, however, over most of the lower slopes of the Talladega N.F., and some planting is being done. Some Virginia pine is found on the upper slopes, while shortleaf and loblolly are found at virtually all elevations.
Talladega National Forest
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7048075

P127 **Todd, D.O.** **95-GP-5377-458499** **1949**
Forest Ranger Ted Seely measures the height of a tall yellow poplar in Soesby Cove on the Blue Ridge District.
Chattahoochee National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7048438

P128 **Todd, D.O.** **95-GP-1395-465101** **1950**
Timber Cutter notches a large sugar maple for felling. One of a series on the selection, marking, cutting, hauling, and milling of sugar maple in the "Big Ivy" section of the Pisgah NF. This area, almost in the shadow of Mt. Mitchell, contains some fine stands and some magnificent specimens of the sugar maple, as well as other hardwoods, and fringes of conifer on the higher slopes. All maple over 12 inches d.b.h. is now being cut because of sap-streak disease.
Pisgah National Forest
Conifer-northern hardwood forest
https://catalog.archives.gov/id/7017613

P129 **Todd, D.O.** **95-GP-3564-465099** **1950**
TM Asst. Seaborn Johnson, of the Pisgah Supervisor's staff, examines this large sugar maple, nearly 4 feet d.b.h. and containing nearly 2000 board feet of lumber. Series of the selection, marking, cutting, hauling, and milling of sugar maple in the "Big Ivy" section of the Pisgah NF. This area, almost in the shadow of Mt. Mitchell, contains some fine stands and some magnificent specimens of the sugar maple, as well as other hardwoods, and fringes of conifers on the higher slopes. All maple over 12 in. d.b.h. is now being cut because of sap-streak disease.
Pisgah National Forest
Northern hardwood forest; conifer-northern hardwood forest; mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7031598

P130 **Todd, D.O.** **95-GP-5404-465133** **1950**
Check plot of northern hardwoods, largely sugar maple - on Big Ivy road to remain uncut for comparison with selectively cut stands and observe natural effects of sap streak disease in sugar maple.
Pisgah National Forest
Northern hardwood forest
https://catalog.archives.gov/id/7048902

P131 **Todd, D.O.** **95-GP-333-471123** **1952**
Visitors at the plaque in Joyce Kilmer Memorial Forest, near Robbinsville, N.C.
Nantahala National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7004359

P132 **Todd, D.O.** **95-GP-5404-471023** **1952**
High quality residual stand of longleaf pine on Ellis Lake Road. This stand is 100-120 years old. Some of the larger and better trees of the original stand had been cut out before FS acquisition. Present volume of stand pictured is estimated at 15 MBM per acre. There are some 22,000 acres of longleaf pine of various age groups on the 158,000 [acre] Croatan National Forest.
Croatan National Forest
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7048899

P133 **Todd, D.O.** **95-GP-5404-471033** **1952**
Pocosin series. Pons pine grows to larger sizes as the swamp emerges from low to high pocosin. Note the characteristic twisted shapes, due to recurrent fire damage as trees grow up.
Croatan National Forest
Southern wet pine forest, woodland, and savanna
https://catalog.archives.gov/id/7048894

P134 **Todd, D.O.** **95-GP-763-471124** **1952**
Visitors (Mr. & Mrs. W. J. Gray) admire the towering hemlocks and poplars along the plaque trail in Joyce Kilmer Memorial forest.
Nantahala National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7009883

P135 **Todd, D.O.** **95-GP-1378-481523** **1956**
Felling a 38-inch yellow-poplar with a one-man power saw on a timber sale.
Chattahoochee National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7017519

P136 **Todd, D.O.** **95-GP-5151-498320** **1960**
Scenic forest road on Winding Stair Mtn. Trees are shortleaf pine, principal timber tree in the Kiamichi Mtns of eastern Okla.
Ouachita National Forest
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7110120

P137 **Todd, D.O.** **95-GP-699-498309** **1960**
View from Flatside Pinnacle, unique rocky peak 1500 feet high, affording extensive views of the forested Ouachitas. Note the wind-tortured shortleaf pines clinging to crevices in the rocks. This peak has been set aside as an Observation Site, in the expanding recreation program.
Ouachita National Forest
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7008943

P138 **Todd, D.O.** **95-GP-1917-498554** **1961**
70-year-old white pine plantation, said to be the oldest under management in the US. First forestry school in the US was established on the estate early in this century. Gifford Pinchot was once forester here.
North Carolina, Biltmore Estate
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7022083

P139 **Todd, D.O.** **95-GP-1104-508563** **1964**
Two visitors on the trail in Big Thicket Scenic Area admire the fine grove of trees, beech, pine, oak. There are several miles of well-developed trails in the 1130-acre area, with more than 60 species of trees, and countless shrubs, wildflowers and wildlife. The whole area will be preserved in a natural condition for the enjoyment of present and future generations of nature lovers.
Sam Houston National Forest
Dry and dry-mesic oak-pine and pine-oak forest
https://catalog.archives.gov/id/7014650

P140 **Todd, D.O.** **95-GP-5385-459153** **Unknown year**
Virgin loblolly pine on the Winn District near Saline Lake, Kisatchie N.F. This stand contains about 30 MBM per acre. At 1949 prices it is worth about $40 per tree as piling.
Kisatchie National Forest
Coastal plain upland mesic hardwood forest
https://catalog.archives.gov/id/7048615

P141 **Unknown** **95-GP-3440-5323** **1901**
Old badly formed Sal in young growth. Characteristic of a large part of the Sal forests. Trees were forme[r]ly maltreated, (pollarded etc.) & the old growth is now very poor.
North Carolina
Mesic and dry-mesic oak forest; dry and xeric oak forest, woodland, and savanna; xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7030683

P142 **Unknown** **95-GP-5404-320000** **1936**
Old growth hardwoods on Santella Creek, Andrew Gennet Tract. Graham Co., N.C.
Nantahala National Forest
Mixed mesophytic and western mesophytic forests
https://catalog.archives.gov/id/7048915

P143 **Unknown** **95-GP-249-305163** **Unknown year**
Southern cypress of very large size near Longwood, Seminole County. Reported as 17 feet in diameter at 1 foot above ground.
Florida, Seminole County
Cypress-tupelo swamp forest
https://catalog.archives.gov/id/7003888

P144 **Unknown** **95-GP-3440-71212** **Unknown year**
Large old Chestnut on eastern slope of Pisgah Range Pisgah Forest, North Carolina
Pisgah National Forest
Mesic and dry-mesic oak forest; dry and xeric oak forest, woodland, and savanna; xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7030679

P145 **Wait, J.M.** **95-GP-1278-196805** **1926**
Fire scarred white oak.
Ozark National Forest
Dry and xeric oak forest, woodland, and savanna
https://catalog.archives.gov/id/7016911

P146 **Wait, J.M.** **95-GP-4618-250494** **1930**
On this site 21 out of the 22 trees were fire damaged at the base.
Kisatchie National Forest
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7104411

P147 **Welborn, I.** **95-GP-5393-395606** **1940**
North from camera point #8. Shows virgin stand of longleaf, loblolly and shortleaf pine sold to Crosby Lumber Company and soon to be cut over selectively.
Homochitto National Forest
Dry and dry-mesic oak-pine and pine-oak forest; upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7048761

P148 **White, D.G.** **95-GP-1609-19735A** **1914**
Very fine grained longleaf pine logs. Note amount of heart. Homochitto Lumber Co.'s holdings.
Mississippi
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7019062

P149 **Williams, A.B.** **95-GP-5419-406520** **1940**
Virgin longleaf state highway park on State Highway 184 between Bronson and Hemphill, Texas.
Sabine National Forest
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7049198

P150 **Williams, W.K.** **95-GP-5367-423017** **1942**
Virgin cypress timber on Golightly farm, Turrell, Arkansas.
Arkansas
Cypress-tupelo swamp forest
https://catalog.archives.gov/id/7048192

P151 **Williamson, A.W.** **95-GP-1609-13173A** **1912**
Three of four cuts from cotton wood tree scaling 9000' B.M.
Mississippi
Eastern riverfront forest
https://catalog.archives.gov/id/7019063

P152 **Winters, R.K.** **95-GP-1760-273788** **1932**
Logging area of Brewer-Neinstedt Lumber Company. Palmetto - St. Landry Parish - Selective cut bottomland hardwood area belonging to above company. Principal species - now in stand are - Swamp Chestnut Oak - *Quercus prinus* - *Quercus nigra* - Black Oak - Red Oak *Quercus rubra* - This area is fairly heavily grazed - but is reproducing satisfactorily. Principal species of reproduction are *Fraxinus americana Quercus rubra pagodaefolia* - *Quercus prinus* an[d] *Ulmus americana*.
Louisiana, St. Landry Parish
River floodplain hardwood forest
https://catalog.archives.gov/id/7020282

P153 Winters, R.K. 95-GP-5385-295438 1934
Very defective remnant stand of old growth cypress with excellent stand of water hyacinth.
Louisiana, St. Martin Parish
Cypress-tupelo swamp forest
https://catalog.archives.gov/id/7048625

P154 Winters, R.K. 95-GP-1765-343671 1937
8 miles northwest of Landon. Old growth partly cut stand of longleaf pine on recently burned area. Note the 3 foot caliper in left foreground.
Mississippi, Harrison County
Upland longleaf pine forest, woodland, and savanna
https://catalog.archives.gov/id/7020327

P155 Woods, E.W. 95-GP-5394-433515 1944
General view of virgin shortleaf pine stand in Shannon County showing lack of pine reproduction.
Missouri
Xeric pine and pine-oak forest and woodland
https://catalog.archives.gov/id/7048779

Source: U.S. National Archives and Records Administration, National Archives Catalog; Record Group 95: Records of the Forest Service; Photographs Relating to National Forests, Resource Management Practices, Personnel, and Cultural and Economic History, circa 1897 through circa 1980. https://catalog.archives.gov/id/651890.

Woodbridge, M.; Goode, J.D.; Bragg, D. 2025. An Annotated Bibliography of Old Growth in Forests of the Southeastern United States. Gen. Tech. Rep. SRS-279. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 145 p. https://doi.org/10.2737/SRS-GTR-279.

What is an old-growth forest? How can it be recognized? And how should old growth be managed? Even after decades of research and thoughtful considerations, these are not easy questions to answer. To aid in this effort, we conducted a search for available literature pertaining to old-growth forests, including historical and current information on its characteristics, scientific articles, dissertations, books, newspaper articles, government reports, and historical photographs of old growth in the Southeastern United States. This search resulted in an annotated compilation of citations categorized by State and forest type. This annotated bibliography is intended to be a reference for members of the scientific community, land managers, and conservationists who are interested in old-growth forests in the region.

Keywords: old growth, annotated bibliography, historical photographs, scientific literature, old-growth forest.

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