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

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PREFACE

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

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

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

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 However, it is clear by the following unpublished, confidential report that Wackerman continued his working relationship with the Crossett Lumber Company.[1]

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

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

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

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

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

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

REFERENCES

Bond, W.E. 1939. Costs and returns of managing 100,000 acres of shortleaf and loblolly pine for sustained yield. Occasional Pap. 79. New Orleans: U.S. Department of Agriculture Forest Service, Southern Forest Experiment Station. 15 p.

Bragg, D.C. 2012. The founding fathers of the Crossett Experimental Forest. Forest History Today. 18: 40–44.

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

Kirkland, B.P. 1933. Status and opportunities of private forestry. In: A national plan for American forestry. Letter from the Secretary of Agriculture transmitting in response to S. Res. 175. Vol. 1. 73rd Congress, 1st Session, Document No. 12. Washington, DC: Government Printing Office: 891–984.

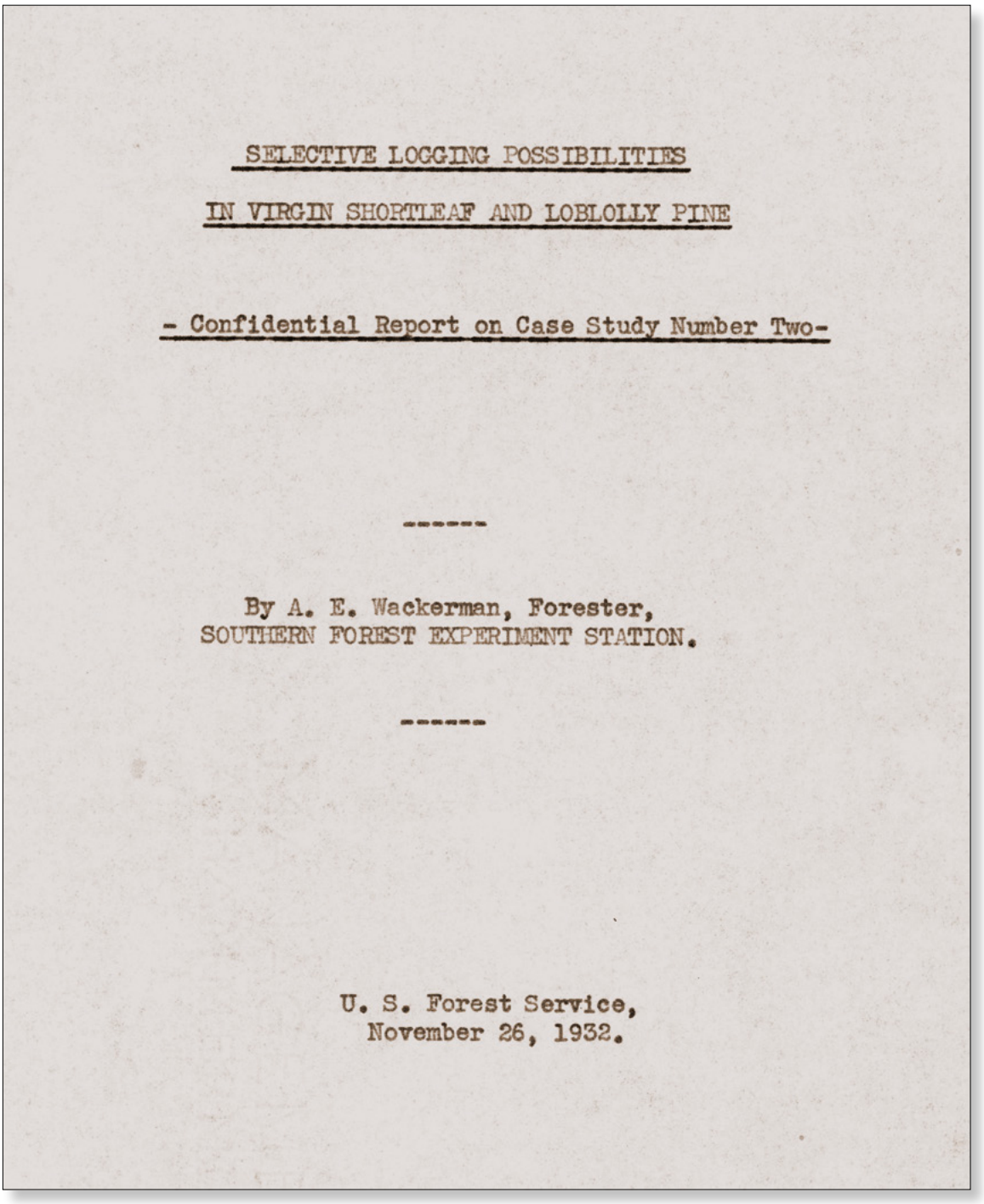
Reynolds, R.R. 1959. Eighteen years of selection timber management on the Crossett Experimental Forest. Tech. Bull. 1206. Washington, DC: U.S. Department of Agriculture Forest Service. 68 p.

Reynolds, R.R. 1980. The Crossett story: the beginning of forestry in southern Arkansas and northern Louisiana. Gen. Tech. Rep. SO–32. New Orleans: U.S. Department of Agriculture Forest Service, Southern Forest Experiment Station. 40 p.

Reynolds, R.R.; Baker, J.B.; Ku, T.T. 1984. Four decades of selection management on the Crossett Farm Forestry Forties. Bull. 872. Fayetteville, AR: University of Arkansas, Division of Agriculture, Agricultural Experiment Station. 43 p.

Watzek, J.W., Jr. 1926. Reforestation and the lumber industry. In: Proceedings of the eighth Southern Forestry Congress. College Station, TX: Texas A&M University Press: 63–68.

Williams, W.K. 1925. Improved logging practice in shortleaf pine. In: Holmes, J.S., ed. Proceedings of the seventh Southern Forestry Congress. Durham, NC: The Seeman Printery, Inc.: 53–58.



SELECTIVE LOGGING POSSIBILITIES

IN VIRGIN SHORTLEAF AND LOBLOLLY PINE

- Confidential Report on Case Study Number Two-

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

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

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

FOREWORD

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

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

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

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

E.L. Demmon,
Director.

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

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

By A.E. Wackerman, Forester,

Southern Forest Experiment Station.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

TIMBER TYPES IN THE EAST BLOCK[4]

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Plan for Selective Logging

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

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

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

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

An exceptional example of a large shortleaf pine 190 years old that yielded several thousand board feet of lumber, including an 18-foot-long butt log that scaled 1,350 board feet (Scribner rule). Such trees were to be the first ones cut under Wackerman's selective logging system, as their size meant their growth was relatively slow. (USDA Forest Service photo taken by W.R. Mattoon on September 29, 1937)

a given diameter, some trees of smaller size that should be cut because of poor form, crowded conditions, slow growth, or general unhealthiness would be left in the stand while larger trees that should be left to grow because of their good condition and capacity to grow would be cut along with the others above the cutting size.

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

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

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

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

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

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

Table 2 is a summary of the first 10 years of selective logging based on the stand and growth data obtained in the recent extensive examination of the area and, in units 8, 9 and 10, from the forest survey made by the company in 1928 and earlier. Units 9 and 10

do not have such heavy stands as occur in the uncut units and as a consequence there is no indicated surplus of available cut above 10,000,000 feet. However, the detailed data definitely indicate that the required 10,000,000 feet can be cut even if over-cutting should be necessary. The second cut will be made 18 years from now and in the interim much of the cut-over area not having merchantable timber today should produce stands of second-growth sufficient to maintain the cutting schedule.

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

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

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

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

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

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

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

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

TIMBER GROWING COSTS

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

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

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

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

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

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

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

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

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

The cost of the 10,000,000 feet of growth when all the items of cost previously mentioned are charged against it, is shown in Table 3. Most of the items of cost shown in the table are carried as a part of overhead by many lumber companies and even under this program it might be desirable to leave them as overhead, at least until the present timber capital has been liquidated. However, they are the items making up the actual cost of timber growing and if they are all charged to overhead the new stumpage would be

obtained apparently free of cost and it would be difficult to know the financial status of the program. At least, a separate account should be kept for timber growing costs in the block and if they were then classified as overhead the total could be charged to the account.

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

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

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

LOGGING METHODS

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

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

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

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

LOGGING COSTS

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

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

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

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

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

RESUMÉ OF METHODS OF DETERMINING VOLUMES AND GROWTH

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Table 7. Growth in East Block after selective cutting.

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

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

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

Summary per acre

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

1/ See Table 5.

Table 9. First Year – Selective Cut Unit #1

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

Table 10. Second Year – Selective Cut Unit #2

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

Table 11. Third Year – Selective Cut Unit #3

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

Table 12. Fourth Year – Selective Cut Unit #4

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

Table 13. Fifth Year – Selective Cut Unit #5

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

Table 14. Sixth Year – Selective Cut Unit #6

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

Table 15. Seventh Year – Selective Cut Unit #7

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

Table 16. Eighth Year – Selective Cut Unit #8

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

Table 17. Ninth Year – Selective Cut Unit #9

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

Table 18. Tenth Year – Selective Cut Unit #10

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

Table 19. Basis for estimated logging costs.

(Based on estimated 40,000 feet board measure cut pine per day)			
		$ Per day	$ Per thousand feet of pine cut
(1) **Cutting** (contract) 4 crews of fallers @ $6.00 per day		24.00	.60
(2) Swamping 2 swampers @ $2.00 per day		4.00	.10
(3) **Bunching and loading** Teams: Depreciation @ $100 per team per year, 5 teams = $500 per year 10,000 M ft.b.m. cut, or $.05 per M		2.00	
Maintenance: Feed, etc. @ $1.20 per head per day 10 head =		12.00	.65
4 Teamsters @ $3.00 per day		12.00	
(4) **Truck haul** (average 1 mile) (contract) 4 trucks and drivers @ $12.50		50.00	1.25
(5) **Loading** on cars, main line haul, trackage rights: 30 cars every other day @ about 3 M ft.b.m. per car ($72.00 per train, loaders, etc. per day For pine and hardwoods, 88 M each trip)		32.00	.8o
(6) **Supervision** Logging foreman	2,400		
Logging superintendent and executive supervision (pro rata)	2,600		
	5,000	20.00	.50
(7) **Scaling and clerical** Full time scaler @ $100 per month		4.00	
Part time clerical		2.00	.15
(8) **Supplies and repairs** Saws, axes, oil, etc.			.10
(9) **General expense** Hospital, insurance, and welfare			.10
			4.25
	Margin 15% (add)		.64
	TOTAL		4.89