

A BIASED EARLY HISTORY OF THE W. W. ASHE NURSERY

By

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The J. Y. Stuart Nursery was established on the Kisatchie National Forest, near Pollock, LA., in 1933. The site was a wornout farm with a heavy textured soil. The land was acquired with the acquisition of the N. F. The first seedling crop was produced in 1934. It soon became evident that this nursery could not provide all of the seedlings needed for planting on the coastal National Forests.

Plans for the establishment of a pine tree nursery in southern Mississippi were formulated during the summer of 1935. An intensive search for a suitable location on N. F. land began in August; and continued until the first of December when a site near Brooklyn was selected. No one involved in the selection of the nursery site had ever worked in a nursery or knew very much about the development and operation of a nursery.

The site selected was on a plateau which extended from northwest to southeast with a county road (Beaverdam Road) following the ridge through the property. The topography varied from flat to gently rolling to steep on each side of the ridge. The soil types were then classified as Orangeburg and Ruston sandy loam. These were good agricultural soils with good internal drainage. The gradient ranged from about one to five percent.

The site was once covered by a fully stocked stand of longleaf pine - the best of which had been cut earlier in the century. The area had been partially logged three or four times since the original logging. In 1935, the ground cover consisted of a few residual cull longleaf trees; plus a dense mixed age stand of longleaf pine saplings; and a dense stand of wire grass. There were about two to three hundred old stumps per acre.

An area of about 80 acres west of the road was selected as the seedbed area. The site was burned over by a hot fire and a topographic survey was made in December, 1935. About 1/5 of the area should never have been in the seedbed area. There were better seedbed areas south of the selected area; and also east of Beaverdam Road. Unfortunately, these areas were not considered.

EARLY DEVELOPMENT

During the C.C.C. era, engineers and architects were located in the Forest Supervisor's Office and in the Regional Office. These men made plans for the physical development of the nursery. Purchase orders were issued in December, 1935, for building materials and miscellaneous supplies. R. K. Jayne, an electrical technician, was sent down from Jackson to receive material and to serve as clerk and time keeper.

On January 6, 1936, I, Jack T. May, arrived in Hattiesburg to take charge of the new nursery. I found one man and an 80 acre track of forest land that had been burned over. The goal for 1936 was the production of 30 million pine seedlings.

Three sources of labor were: (1) from a C.C.C. Camp located 14 miles from the nursery, (2) E.R.A. workers, later known as *W.P.A.*, who were paid 30 cents an hour, (3) local labor - mostly farmers who were paid 20 cents an hour. Heavy equipment such as trucks, tractors, etc., were available from the Ranger District and the C.C.C. Camp.

The immediate priorities were: (1) develop a work force, (2) to clear the seed bed area of stumps, trees, and roots, (3) to construct a combination shop and storage building and provide a temporary office, (4) to find a source of water for both domestic and for irrigation purposes, (5) to delineate compartment boundaries and build a road around the units, (6) to obtain the necessary equipment and supplies to sow a seedling crop, (7) to install an irrigation system.

CLEARING

Trees and snags were cut with cross cut saws. Small stumps were pulled using chains and a tractor. Large stumps were blasted and some were burned. There were more than 400 stumps per acre in some areas. A fleet of 10 trucks was used to remove poles, branches, stumps, brush and other debris. After removal of trees and stumps, the area was scarified or subsoiled using a road ripper. Disk plows and then turning plows followed the scarification. Roots were picked up by hand. At times, more than 100 men were working on clearing.

BUILDING CONSTRUCTION

Plans and/or blue prints for buildings were provided by architects and engineers from the Forest Supervisor's Office. Two very competent carpenters were employed to handle the construction activities. (Mr. Ted Barefield and Mr. Strickland). Local laborers were used as helpers.

WATER

A 4 inch test well was started during January; using a Forest Service well drilling rig. A combination of C.C.C. labor and local labor worked a 24 hour shift until drilling was completed. Water bearing sand was reached at 613 feet and extended down to 722 feet. The static head was 142 feet. Drilling was completed on February 4. Under intensive testing, the well produced a continuous flow of 100 gallons a minute.

The possible sources of irrigation water were: (1) a large well, (2) Black Creek - 1 1/4 miles from the nursery, (3) a reservoir on a nearby branch. The decision made was to go with a well.

Drilling of an 8 inch well began about March 15 and was completed on April 13. It was 716 feet deep; with 109 feet of water bearing sand. The capacity was 350 gallons of water per minute. A 40 h.p. turbine pump was installed on May 27, 1936.

A 2 1/2 mile, 11,500 volt transmission line was run from the Mississippi Power Company line to a transformer bank at the main well. Secondary transmission lines were laid underground to all facilities.

The domestic water system was tied directly to the irrigation system. An 1,800 gallon pressure tank was installed in the domestic well-house and an automatic switch (40 to 95 pounds range) was attached to the tank and motor. A booster pump was installed on the main line. The entire water system was completed in August, 1936.

ROAD SYSTEM - SEEDBED COMPARTMENTS - IRRIGATION LINES

A survey of the site for seedbed compartments and roads was made as site preparation continued. Eight compartments, 956 feet long and 421 feet wide, were staked out and separated by roads. The roads were 24 feet wide from center of ditch to center of ditch.

Materials for the underground water main and for the overhead sprinkler system were delivered in March.

The six inch underground water main was located on the west side of the center-road. Lateral lines were laid underground to the east side of the road. There were 17 overhead sprinkler lines located 56 feet apart in each compartment. A lead goose neck was used to connect the water lines to the risers. The sprinkler lines were 415 feet in length and were operated by Skinner Automatic Oscillators. The 56 foot spacing provided for nine 56 inch seedbeds; 16 inch alleys between beds; and a 40 inch alley under the riser lines. The irrigation system was connected to the domestic water system to provide irrigation for germination.

EQUIPMENT AND SUPPLIES

The Forest Supervisor, R. M. Connaro, was very keen on the efficient use of labor and on the development of labor saving devices. This led to the modification of some standard equipment and the development of new equipment.

Regular field equipment including plows, harrows, tillers, cultipackers, seeders, spray machines, etc., were purchased in February, 1936. The Hazard and Williamson seeders were used for sowing pine seed. Burlap and latter cotton fabric, 56 inches wide, were used for a ground cover; and were fastened to the ground with 10 inch long, #9 telephone wire.

A bed smoothing drag was made with 3" x 12" x 56" boards.

A burlap laying device was developed that could be attached to the seeder - so that seeding and covering were a continuous operation.

A Dodge truck frame and motor was modified to straddle the seed beds. The gears were changed to reduce the speed. The Unit, called a GO-Devil, was used to pull the bed drag, the seeder and burlap laying device, the spray machines, the cultivator, etc.

A seedling or seedbed cultivator was later made and patented. This machine may be used again if herbicides are phased out.

SUPERVISORY/PERSONNEL

By March 1, a few local men had been selected for key positions. Their names should be on a permanent plaque at the nursery as they managed most operations until the nursery was closed for W.W. II. Duncan McGinnis - A pre-med student turned mechanic and inventor. He could make almost anything that could be made in a shop. Dick Essary - A top flight tractor driver and equipment operator. Sid Morrow - An excellent labor foreman and a good equipment operator. Red Mapp - A good foreman and all around utility worker.

The next set of priorities included the steps necessary to get a crop of seedlings and the cultural activities involved in managing the crop.

SEED SUPPLY

Seed for the 1936 crop of seedlings were received from the Kisatchie, the Florida and the Ozark National Forests. Seed quality was low. There were no germination tests. 5,000 pounds of longleaf seed from the Kisatchie N. F. were winged; and were sown by hand. Field germination was about 50 percent. 2,315 pounds of longleaf seed from Florida were dewinged and were sown with the Williamson Seeder. Field germination was about 10 percent. Field germination of shortleaf seed was 32 percent; slash pine seed was 29 percent; and loblolly pine seed was 9 percent. There was no stratification.

SEEDBED PREPARATION

Seedbed preparation began about March 1 and involved the following: (1) lining out or staking out alleys or paths, (2) plowing alleys with a 16 inch middle buster pulled by a 15 h.p., A. C. tractor, (3) potato hooking the beds to remove roots and break up clodes, etc., (4) tilling the soil with an Ariens Tiller, (5) shaping and levelling the beds with a wood drag, (6) lining out of individual beds with a chalk line, (7) cleaning of alleys, (8) final levelling of beds with a rake. This entire operation was labor intensive.

SOWING DATES

Sowing Dates and Average Number of Days Before Burlap Removal

Species	Sowing Dates	Seed Used Lbs.	Average Number of Days Under Burlap
Longleaf	March 4 to 17	7,904	27
Shortleaf	March 14 to 23	300	20
Loblolly	March 23 to 30	485	36
Slash	March 31 to May 2	3,545	17
Black locust	May 16 to June 17	228	

By the standards of 1990, the sowing and field germination would be dismal operations. Seed quality was very low. This quality of seed today would be discarded. There was very little irrigation during the germination period. Germination was slow and erratic. The burlap could not be removed until most of the germination was complete. There was always a small percent of seedlings removed with the burlap or cotton fabric.

Weather records were not available until October, 1936. There were four showers in March and four in April. There was no rain from April 28 to May 16. June was hot and dry with one shower on June 14. Irrigation was started on June 3 using the 4 inch well pump; and continued for 24 hours a day, except for one break, until July 4.

BIRD CONTROL

Doves and crows were serious pests to germinating seed and young seedlings. A permit was obtained to shoot at birds in the early day light hours and in the evening. Double barrel, 12 gauge shot guns were used during bird patrol. The guns had a range of about 200 feet. The seedbeds were 410 feet long. A small black boy, called Crowbait, was employed for morning and evening patrol.

INSECTS

Red ants and white grubs were the only insect pests in 1936. The only control was carbon bisulfide - which sometimes killed more seedlings than pests.

DISEASES

Brown spot needle blight of longleaf and slash pine seedlings was controlled with Bordeaux mixture - which was prepared on the site.

WEEDS

Weed populations were sparse during the entire 1936 growing season because most of the weed and grass seeds had been destroyed by the hot December burn. Most of the weeds and grasses were annuals. There were no weed or grass seed stored in the soil as a result of cultivation. The seedbed or seedling cultivator was used where seedlings were in drills; and this eliminated most small weeds and grasses. Other weeds and grasses in the seedbeds were removed by hand weeding. The alleys were cleaned by using a sweep on a Georgia stock. Weeds outside the seedbeds and alleys were eliminated by hoeing.

DICK ALLEN

A young junior college student named Dick Allen lived in Brooklyn and was employed in June at a salary of 20 cents an hour. He became interested in Forestry as a profession. A call to Professor Gordon Marckworth at the University of Georgia got him a job working in the School Denmark Nursery and enrollment at the University - where he finished about 1938 or 39. He was then employed by the Mississippi Forest Commission to build the Mt. Olive Nursery. The state had a little money; but no equipment. The Ashe Nursery cooperated by letting the state use the needed equipment at night, when not in use. The state in turn hired Dick Essary to handle the equipment. Dick Allen later became a Regional Vice President of Weyerhaeuser Company and then State Forester of Mississippi.

MAINTENANCE OF SOIL FERTILITY

Cover crops of cow peas and soy beans were planted on 28 acres of newly cleared land in July. The fields were fertilized with 300 pounds of 6-10-7 per acre. The peas formed a complete cover in 30 days and began to bloom in 45 days. They formed a dense mass of ground cover and had to be double disked before they could be turned under with the turning plow.

CONE COLLECTION - 1936

A total of 16,836 bushels of pine cones were delivered to the nursery in the fall plus 40 pounds of black locust seed. 13,574 bushels were collected around Brooklyn and Clara, Mississippi.

CONSTRUCTION AND IMPROVEMENTS - 1936

Construction was a continuing process during the year. In addition to the water system, power supply and road system, the following improvements were started and mostly completed in 1936.

1 Office building; four rooms with sleeping facility.

2 Equipment depots; 32' x 60'

1 Extractory building; 24' x 70'

5 Cone curing sheds; 20' x 75'

2 Portable tool houses

2 Portable latrines

1 Oil house

1 Implement shed

1 Residence - Completed in January 1937

1 Garage - 2 car - Completed in January 1937

1 Nursery fence

1 Telephone system

1 Wash and grease rack

1 Gasoline station

Fire protection system for all buildings

Lightening protection system for all buildings

1936 SEEDLING CROP

85 life history plots were established in May. Counts were made monthly through September. Mortality during the growing season averaged 8 percent with the heaviest loss in the shortleaf seedlings.

By today's standards, the 1936 seedling crop would not be a good one. The longleaf seedlings were the best. Seedlings with a 1/4 inch root collar diameter were considered good plantable trees. The other species had short stems (6 inches +); but good root systems. The shortleaf pine seedlings did not begin good height growth until mid September.

LIFTING AND DISTRIBUTION

Lifting began on November 25, 1936. The lifter or undercutter was a specially designed machine. It consists of a 12 inch cutting blade mounted on a frame attached to the back end of a Model 35 Caterpillar road tractor - with a 72 inch tread. The weight and pull of the device is supported by the drawbar frame. The blade was raised and lowered by means of a straight arm ratchet and a wheel lift. The tractor driver and one man operate the unit. The lifter blade loosens the soil so that theoretically the trees could be pulled easily from the soil. However, the longleaf, loblolly and shortleaf pine seedlings has such extensive lateral root systems that lifting forks had to be used to prevent damage to the lateral roots. Seedlings were lifted, graded, counted and root pruned in the field. The Savanac baling tables were used to form the standard Forest Service bales. A Signode strapping machine, using 3/8 inch wire was used for the first time in a southern forest tree nursery.

The total number of seedlings shipped in the 1936-37 season was 20,553,000.

Slash pine	10,876,000
Longleaf	7,443,000
Shortleaf	1,281,000
Loblolly	549,000
Black locust	401,000

About 80 percent of the seedlings shipped were grade 2 and about 20 percent might have been grade 1. The June 10 inventory showed a count of 33,703,000 seedlings. A 10 percent mortality during the growing season left about 30,333 M. Approximately 32 percent of the total number of seedlings were culled during the grading process. Considering the fact that there was no fertilization of the area prior to seedbed preparation and no fertilization of the seedlings during the growing season; this is not an unreasonable loss.

BLACK ROOT ROT

One problem developed that could not be explained. The slash pine seedlings grown in the northeast quarter of compartment 4 were stunted, unthrifty and had a copper color foliage. Roots were brown or appeared to be burned; and were very brittle. This was the first nematode - fungi complex reported in a southern forest tree nursery. More about this later. It turned out to be the black or cotton root rot - which later became prevalent through the southern region.

NURSERY DEDICATION

On November 17, 1936, the nursery was formally dedicated *as* the W. W. Ashe Nursery - with a public dedication and celebration. Mr. Ashe was a botanist and dendrologist who became Chief of Acquisition for the southern region. Most of the National Forests in Mississippi were acquired while he held this position. I was on one of the acquisition crews during this period; and had the opportunity to spend some time in the field with him. His family had settled Asheville, N.C.

THE ASHE NURSERY - 1937

This year was different from 1936 - when construction was given priority over other activities, except producing a crop of pine seedlings.

The major improvements were the construction of more cone sheds - 20' x 75'; completion of the road system to form a lake north of the seedbed area; construction of a bath house for the Ashe Lake Recreational Area; and development of a clay tennis court back of the nurseryman's residence. (This was never shown on any records.)

Two major events were: (1) the first Southern Forest Tree Nursery Conference was held at the Ashe Nursery, (2) Wes Sentell came to the Ashe as an Assistant Nurseryman. (I think this is correct.)

During C. Y. 1937, efforts were extended toward development of standard nursery procedures for the Ashe. These included seedbed preparation, sowing, cultivation, disease and insect control, seedling distribution, soil management practices, cone handling, seed extraction and seed handling.

SEED

The quality of seed in 1937 was far superior to that of the 1936 seed. Sand flat germination tests were made for each seed lot. Seed from one seed lot each of slash, loblolly and longleaf pine were stratified. Range of germination percents based on sand flats versus field counts were:

Species	Sand Flats	Field Counts*
Longleaf	62 - 78	29 - 45
Slash	37 - 57	37 - 42
Loblolly	18 - 43	27 - 30
Shortleaf	42	34

Some seedlings were killed by damping-off fungi, pulled up by birds or were stuck to the burlap and destroyed before the counts were made.

SEEDBED PREPARATION, SOWING, MULCHING AND IRRIGATION

These activities were improved over 1936. Sowing dates for pine species were:

Species	Dates	No. of lbs of seed sown
Longleaf	February 11 to March 11	15,748
Slash	March 12 to March 23	1,882
Loblolly	March 10 to March 23	141
Shortleaf	March 23	21

Four species of hardwoods were sown in 1937.

Rainfall was heavy during March and April with 8.0 and 7.3 inches, respectively. This caused a severe attack of damping-off under the burlap; especially for longleaf. Estimated loss was about six million seedlings. A dry May (0.8 inch of rain) controlled the spread of damping-off.

Rainfall was abundant from June through October - with an average of 6.1 inches a month. The seedlings were irrigated twice in July.

LIFE HISTORY PLOTS

Plots were laid out within one to three days after the burlap was removed. Counts were made twice each month from April through September. The first count included all established seedlings. A few seedlings died between the first and second counts; but a few seeds germinated and the plants became established. Mean mortality percents during the period were: Longleaf - 6.6; Slash - 8.0; Loblolly - 6.1; and Shortleaf - 16.1.

WEED CONTROL

The most serious weed pests were bermudagrass, milkweeds and smilax. The Ashe cultivator was used three times - which eliminated small weeds and grasses. Hand weeding was used to remove larger weed pests.

INSECTS AND DISEASES

White grubs were less of a problem than in 1936. A bug trap was located near the office to attract the May beetles. Red harvester ants were a minor problem. Calcium cyanide (cynagos) was partially effective in controlling colonies or nests of ants.

1937 was the year of the plant pathologists. Dr. Carl Hartley, Mr. Howard Lamb and Dr. Bailey Sleeth of the Bureau of Plant Industry inspected the nursery and got involved in the disease problems.

Damping-off had killed about six million seedlings. Dr. Hartley stated that control measures were not necessary when less than 15 percent of the stock was affected. However, Mr. Lamb established a series of plots using four chemicals: aluminum sulfate, ferrous sulfate, semasan and a formalin solution. The dry weather in May checked the spread of damping-off. Mr. Lamb continued the study in the fall with fall sown longleaf. He used six chemicals and a check. The seedbeds were watered regularly after sowing. Frequent freezing delayed germination and prevented germination. The seed germinated during a warm spell in December and burlap was removed 41 days after sowing. Damping-off did not develop; and it was impossible to determine what the effects of any chemicals might be.

Brown spot needle blight was controlled on all species using four applications of Bordeaux mixture. The blight did develop on some seedlings that received only three applications.

Fusiform Rust (*Cronartium cerebrum*) was found on slash, loblolly and shortleaf pine seedlings. About 5 percent of the seedlings were affected - with the swelling about 1/2 inch above the ground line.- Dr. Hartley recommended cutting of all oaks within 1/4 mile of the nursery. It was also suggested that where small oak samplings were present that the area be burned during the spring after the leaves came out; as this might destroy the leaves before spores could form.

The black root rot found in 1936 did not show up in 1937. Dr. Hartley suggested that the problem could be a phosphate deficiency. The problem area in compartment 4 received 100 pounds of 0-8-0 per acre prior to sowing of the 1938 seedling crop.

SOIL MANAGEMENT

During 1936, it became apparent that the nursery soil was highly erodible. Heavy rains caused erosion and loss of top soil. Small terraces were thrown up on the cover crop area in February and March, using the three bottom turning plow.

Originally, the nursery was established for a 1 - 1 rotation. Low seedling yields per acre made it necessary to have seedlings follow seedlings in some areas.

The cover crop area was fertilized and seeded to cow peas in mid April. A dry May resulted in slow growth. The peas were plowed under in July. A second crop was sown in August. The second crop was cut in early October and left on the ground for a surface mulch during the winter months. Material harvested from sample plots showed yields of about 4.1 to 7.7 thousand pounds of green matter per acre for the early crop and about 3.0 thousand pounds per acre for the second crop. This converts to about 1+ tons of dry matter per acre.

Winter vetch and Italian rye were sown on one-half acre in compartment 7 on September 15. Vetch was also sown on the upper valleys of the terraces and in some of the seedbed alleys - to slow down movement of water.

It became apparent in 1937 that more organic matter was needed. A compost pit was dug south of the seedbed area. Crushed sugar cane stalks from local farms were composted using a mixture of fertilizers and a soil cover.

The small terraces built in the spring could not hold under heavy rains. During August and September, a system of wide terraces were put in the cover crop areas. They were 20 feet wide and about 20 inches high - with rounded tops so they could be crossed with tractors, sowing machines, cultivators, etc.

EXPERIMENTS AND CULTURAL STUDIES

Several studies were established during the year - some involving cooperation with other agencies. Studies and results were:

1. Over winter storage of longleaf pine seed. Use dry cold storage.
2. Year long storage of seed in nursery warehouses. Not for longleaf.
3. Stratification of slash, loblolly and shortleaf pine at 32 degrees F. Increased germination in 40 days was: Loblolly - 46%, Shortleaf - 35%, Slash - 7%.
4. Date of sowing. Longleaf can be fall sown.
5. Correlation of lab germination with field germination. Only 1/2 of the viable longleaf seed may be expected to produce plantable seedlings. Other species gave better results.
6. Life history plots.

7. Damping-off studies.
8. Top pruning. Cutting succulent tops of larger loblolly and slash pine seedlings to obtain uniform stem heights. Clipping of needles of longleaf pine; leaving 4 to 6 inches.
9. Root pruning. Horizontal undercutting in late July at a depth of 5 to 6 inches. Reduced height growth and stem diameter growth. Slowed root growth.
10. Nursery practices with southern hardwoods. Species: Nuttall oak, cow oak, cottonwood cuttings and black locust.

SIZE AND DEVELOPMENT OF SEEDLINGS

Longleaf seedlings were excellent. The poorest stock in 1937 compares favorably with the best stock in 1936. Based on specifications from the new Planting Handbook, the longleaf seedlings were in the following grades.

Grade 1	1/2 inch diameter root collar	40 percent
Grade 2	3/16 inch diameter root collar	50 percent
Grade 3	less than 3/16 inch diameter root collar	10 percent

The slash pine culls were about the same size as the plantable seedlings shipped in 1936.

Grade 1	3/16 inch diameter root collar	20 percent
Grade 2	1/8 inch diameter root collar	60 percent
Grade 3	less than 1/8 inch root collar	20 percent

The loblolly and shortleaf seedlings did not develop into good seedlings. About 60% were grade 2 seedlings and about 40% were culls.

In the fall inventory, seedlings were graded as plantable and culls. The inventory showed a total of 22,779,000 plantable seedlings. A total of 21,595,000 seedlings were shipped. This was only 184 thousand less than the October inventory.

SEEDLING DISTRIBUTION

Seedlings were undercut or lifted with the Ashe lifter, put in tubs, loaded on dollies and transported to the basement of Number 6 cone shed. All seedlings except longleaf were graded and counted into bundles of 100 and then baled in the standard Forest Service bales. A specially trained crew of 20 men graded the slash, loblolly and shortleaf species - to remove seedlings infected with fusiform rust. Approximately 0.4% of the shipped seedlings were diseased. The longleaf seedlings were graded. The count was determined by seedbed inventory.

A 20 foot long table with two 16 inch belts was built to speed the grading. A mechanical counter and a root pruner were located at the discharge end. Most of the longleaf was graded on this table.

C. Y.'s 1938 AND 1939

Changes in operations after 1937 were gradual.

In the winter and spring of 1938, wide terraces were established in compartments from which seedlings had recently been removed.

Fertilization of cover crops was increased to include more phosphorus and potassium. Since the crops were legumes, they were supposed to be nitrogen fixing, but nitrogen was included in the fertilization. Some of the sugar cane residue from the syrup mills was partially decomposed. It was scattered over the surface of the cover crop area and chopped with the disc plow prior to sowing of the legume cover crop. This procedure appeared to be as effective and more practical than composting the sugar cane stalks. Within a period of two years, all of the sugar cane residue within an economical radius of the nursery had been used.

Pre-sowing fertilization of seedbeds and summer fertilization of seedlings were initiated. Seed testing and seed stratification became routine operations.

The use of higher quality seed plus stratification plus the judicious use of irrigation during the germinating period reduced the length of time that burlap was left on the seedbeds.

Fall sowing of longleaf became a standard procedure. Fresh seed were sown as soon as possible after extraction. Longleaf seedlings would develop 6+ inch tap roots within 2 to 3 weeks after seed germination.

The use of burlap or cotton fabric as a seedbed cover or mulch reduced germination of weed seeds. The seven drill cultivator effectively controlled the establishment of a dense weed population within the seedbeds. Hand weeding was used to eliminate weeds not removed by the cultivator.

Bordeaux mixture was used effectively to control brownspot on longleaf pine needles and fusiform rust on the shortleaf species. One problem did develop during the period this mixture was used. Excess solutions would drain down the road ditch and onto the seedbeds. A toxic level of copper accumulated at the ends of some seedbeds.

Clipping of longleaf needles and the top pruning of loblolly and slash pine became standard procedures - where needed.

Cone handling and seed extraction operations have not been discussed. Complete facilities were constructed in 1936 and 1937. These were described by Raymond G. Rietz and C. W. Torgeson, engineers from the Forest Products Laboratory in Project L-284-J5 report.

In 1939, two new compartments, containing 20 acres, were added to the seed production area.

I left the nursery in June, 1940, to go to the Florida National Forest in Tallahassee, Florida.

Production during the four years were:

1936	22,779	M
1937	21,595	M
1938	17,138	M
1939	18,053	M (proposed)

Wes Sentell became nurseryman in 1940 and continued until the nursery was closed for W.W. II.

POST WAR PERIOD

Wes Sentell came back to the nursery for a short time after the war. Then he left the Forest Service for a position in industrial forestry. Jerry Erambert was transferred down from the Ozark Nursery. Clarence Waller became a part of the staff.

In 1946, the nursery was opened on a limited basis. The root rot problem had become serious. There were no satisfactory answers.

Dr. Earl L. Stone, Jr., of the Department of Agronomy, Cornell University, was invited to serve as a collaborator on the Ashe Nursery problem. The summary of his observations indicates three requirements:

1. Adequate fertilization practices. He recommended heavy applications of phosphorus.
2. Maintenance of organic matter and soil tilth.
3. Erosion control.

In 1946 or 47, Dr. Berch Henry, pathologist from the Southern Station was assigned to the nursery. He made extensive tests of the soil and plants for pathogens. He isolated the cause of the root rot. It was caused by a nematode - pathogen complex. The two most effective controls were EDB (ethelene dibromide) and MB (methel bromide). EDB was less expensive and easier to apply.

The Forest Service established a Regional Seed Testing Laboratory at the Ashe in the early 1950's. Later the lab was moved to Macon, Georgia - when the Georgia Forestry Commission agreed to underwrite the cost of the operation of the lab.

I did not get involved with the Ashe again until about 1957 when the Auburn Department of Forestry began making soil analyses for forest tree nurseries.

By 1957, the root rot complex had changed so that EDB was no longer effective in controlling the brown root rot. Methyl bromide began to replace EDB. Another Pathogen, Pythium spp., began to develop as a problem. It invaded the soil soon after fumigation. Shortleaf pine and sand pine were very susceptible to Pythium; especially at the Ashe Nursery.

Meanwhile, Dr. Pien, from Germany, visited the Ashe Nursery during a period that he was visiting other nurseries in the U. S. His family had operated a forest tree nursery on the same site for more than 200 years. He suggested that the Ashe and other nurseries should establish a dairy adjacent to the nursery to provide manure for the maintenance of soil productivity.

About 1957, there was a bumper crop of longleaf pine cones. The Forest Service and the Mississippi Forestry Commission got overly enthused and collected about 100,000 bushels of cones; or about four times the extraction capacity. Cones were stored in all available buildings in the area and in open piles. There was a rapid deterioration of cones and seed quality. The result was that about 2/3's of the seed were no good.

In 1970, I made an intensive study of the Ashe Nursery and made recommendations for changes in soil management. This collaboration continued until 1973.

About 1980, there was another expansion of seedbed areas and a reworking of some of the original compartments. The Ashe should continue as a viable nursery as long as there is a need for seedlings.