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THE FORESTRY PROGRAM
of the
TENNESSEE VALLEY AUTHORITY

by

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submitted in partial fulfillment of the
requirements for the degree of Bachelor
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PREFACE

The TVA is a vast project, planning for long time development. Since a forester's work is essentially based on long time planning, the project interests most foresters. Here is an opportunity to prove the importance of forests in controlling floods and in checking erosion to protect power plants and dams from silting. Here is an opportunity to show the proper correlation of land use with the local industries. For these reasons I was interested, and thinking others might also be interested, I have written this paper.

If the entire project were to be adequately covered, it would take volumes. I have tried to limit this paper only to the forestry program and enough of the rest to make it clearly understood. Because the project is yet young, it was rather difficult to obtain any definite information other than theories and initial practices. Only with time can the value of the project be ascertained, provided nothing develops to prevent its being carried to fruition.

The author would have had great difficulty in presenting a complete picture of the subject without the help of R. A. Vogenberger, Director of Forest Education, and of Arthur F. Boulter, Warm Springs Foundation. He feels extremely grateful for their help as well as that of Allan Harrison, a fellow student who has worked on the project.

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Chapter I

BACKGROUND OF THE TVA PROGRAM

The average American citizen is well acquainted with city "slums" and is almost invariably in favor of any program aimed at their improvement. Only recently, however, has the term been applicable to neighborhoods outside of the city. Surely the communities like those in the Tennessee Valley in which people are living in unbelievable poverty can be termed slums and are as deserving of improvement as any city slum.

President Roosevelt seemed to have had this in mind when he announced the TVA project. He instigated one of the broadest, most complex experiments in conservation this nation has ever witnessed. The project cannot be accurately condemned or praised, for it is a permanent laboratory rather than an emergency relief proposition. No one can say how much it will cost. So far Congress has given the TVA $151,000,000, but $34,000,000 more will be needed before 1940 to finish the work now going on, plus $144,000,000 for dams to be completed by 1944.

> "To curb and deepen 650 miles of the Tennessee River and to shackle it with generators by which to judge the rate of private power plants, to show the mountaineers how to read and reason in a civilized state and the factory workers how to live in the country, to develop the resources of the valley without the waste of former United States pioneering--these are the TVA's aims."

This paper will attempt to show some of the ways in which forestry is making its basic influence felt in the project.

The Valley

It would be wise first to present enough of a description of the valley with its people to understand the work being done, and the possibilities it presents.

Physical Features

The entire watershed of the Tennessee River is embraced, covering some 40,800 square miles, an area about the size of Pennsylvania or four-fifths that of England. From its source in Virginia, the river flows southwesterly into Tennessee, with tributaries stretching from North Carolina and Georgia. After crossing a good part of northern Alabama, it turns northward over the corner of Mississippi; recrosses Tennessee, and enters Kentucky, emptying into the Ohio River at Paducah. In 1933 it was estimated that the river was carrying a load of silt of 11,000,000 tons annually.

The headwaters of the Tennessee lie in rough mountainous land that continues to the south and west in the southern Appalachians. Here, with the Great Smokies, several peaks rise above 6000 feet in elevation. From Chattanooga westward to Muscle Shoals the river drains the less mountainous Cumberland Plateau, which finally is displaced by the more level country of the Central Basin.

Over such a wide area consisting of such a diversity of topography there is quite a variant climate. That of eastern Tennessee and western North Carolina in the mountains is much

like that of New England, while the southern sections are considerably milder. Most of the area has a mild climate generally free from extremes due to the tempering effect of the hot and cold winds by bordering mountain ranges. Moist winds from the Gulf produce a high average annual precipitation, 40 to almost 100 inches in some places. The average frostless growing season is well over 200 days except in the northern altitudes.

Mr. H. H. Bennett, of the U.S.D.A., has stated that there has probably been proportionately more land destruction by erosion in the Tennessee Valley than in any other part of the country.

> "Practically every slope cultivated long enough for the stumps to have decayed showed evidence of either clay subsoil or gullies all the way from Birmingham, Alabama, nearly to Bristol, Tennessee. In one section twelve miles long it was estimated that eighty-five per cent of all the cultivated land as far as one could see to east and west had been ruined by gullying. Part of the remainder was still covered with the fine hardwoods that once occupied all of this splendid area. Much of it originally was of the best type of upland to be found anywhere in the eastern part of the nation, the Decatur silt loam. Throughout a distance of 300 miles, largely limestone country and originally highly productive, not a single instance was observed where anything had been done to check the wholesale devastation by gullying and sheet washing, aside from the throwing of a bit of brush into an occasional gully."

The situation was particularly bad in the western part of the state. Here the topography is typical farm country with a high percentage of level or slightly rolling land of good soil. It is composed of sand and clay in such admixture that on slopes it erodes very readily. Areas badly cut by gullies so large that a small house would be lost to view in them were not uncommon. A person might think he were in some devastated part of China.

People

More than 2,000,000 people live within this 40,000 square mile area; and another 6,000,000 in the surrounding country are indirectly affected. The population is rural rather than urban.

The people are of old English, Scottish, and Irish pioneer stock with a very small percentage foreign born. Social and economic differences seem to vary with geographic location and soil fertility, with their consequent effect on prosperity. Good houses, farms, schools and roads are found in progressive industrial and agricultural communities. In contrast, the hill people are living in shacks and subsisting largely on corn bread and "sow belly". One old man was encountered back in the hills of the Norris region who had never in his life been away from home even to the nearest village of Tazewell, 15 miles or so away. It is not surprising to know that tales have arisen of Elizabethan English being spoken and of the singing of ancient Old World ballads.

These people have been termed as "hospitable, proud, salty, independent, illiterate and desperately poor." The average annual income for a farmer in many counties is only $45 a year. Most families have many children.

An interesting survey was made in connection with relocating families whose homes were to be flooded by the dammed-up waters. It found that the wants of an average family include:

20 acres of crop land	
Tight five-room house	
1 horse	Chickens
1 cow	1 radio
1 hog	1 automobile

Plenty of children
Some old-fashioned religion
Access to movies
A reasonable chance for a little neighborly litigation.

The relatively dense population is thus barely supported by the unfertile soils. Housing, schooling, transportation, communication, and social conditions are very inferior. Health standards and sanitation are in a sorry state. Pellagra and tuberculosis, promoted by malnutrition, and a consequential malaria problem complete the picture.

Mining and Industry

Minerals of many kinds are found in the area. There is even yet a potential wealth of iron, coal, potash, asphalt, baurite, sulphur, asbestos, graphite and gas. There are also commercial deposits of copper, zinc, manganese, lead and barite. Limestones, marbles, Cumberland sandstones, and clays provide a wealth of building material, while the coexistence of limestone and shale has great cement potentialities.

Textile mills are concentrated in Knoxville and Chattanooga, the leading manufacturing cities, although they do occur elsewhere. Wood-using industries are widespread. Iron and steel products are made to some extent, especially in the cities just mentioned. At Alcoa, Tennessee, the Aluminum Company of America has a large hydroelectric plant handling Arkansas and South American ores. Wheat mills are generally distributed. Near Knoxville are several quarries.

Forests

With the exception of some stands in the Great Smoky Mountains National Park, and in the Blue Ridge Mountains in western

North Carolina and north Georgia, the virgin timber has largely been removed, leaving heavily cut and burned-over second growth. County surveys indicate a preponderance of cordwood and below cordwood condition classes over sawtimber.(1) Forest types and tree species are greatly varied. The forest vegetation at high elevations, e.g., the Great Smoky Mountains, is like that of northeastern United States and adjacent territory in Canada, containing spruce, balsam, beech, birch, and maple. White Pine, Table Mountain pine and hemlock come in further down the slopes. At still lower elevations the woodlands change to the temperate zone hardwoods, including several species of oaks, yellow poplar, basswood, wild black cherry, black gum, cucumber and black locust. Here are also fouund the softwoods; shortleaf pine, hemlock, Virginia scrub pine, red cedar and pitch pine. A mixed stand of such trees as oak, hickory, and pine is characteristic of the main valley floor north of Chattanooga. The lower valley in Alabama contains the southern coastal plain type of forest in which loblolly pine, oaks, and sweet and black gums predominate with an occasional tupelo or cypress swamp. This rugged area is particularly adapted to forestry with its variety of widely distributed valuable tree species, long growing season, abundant rainfall, and soils and topography favorable to timber production although unsatisfactory for agriculture.

Industries based on the forest recource are represented in practically every town in east Tennessee, and this is in some

(1) Saw timber - minimum of 1000 bd. ft. per acre in trees 14 inches d.b.h. Cordwood - minimum of 4 cords per acre in trees 6 inches and over d.b.h.

cases the only type of industry in entire counties. A timber industry on an extended scale has a natural setting in this region with its accessible lumber supply available to large markets within a 200-300 mile radius. Wood products are utilized in the following types of establishments: sawmills, pulp and paper mills, hardwood distillation plants, tanneries, wood-preserving plants, cross tie and pole producers, veneer plants, dimension plants, furniture factories, manufacturers of caskets, boxes, crates, flooring, pencils, vehicles, agricultural implements, and wood turning. Chattanooga, Knoxville, and Johnson City are lumber and furniture manufacturing centers of considerable import.

The strong effect of forestry on farm incomes is shown by the following figures from the Census of Agriculture, 1930: In 1929, the value of the cut from farm woodlands in the Tennessee Basin was $16,115,000 or $2.40 per acre of farm woodland. This is one-twelfth the value of field and orchard crops for that year; for western North Carolina the figure was one-fifth. Many farmers depend on forestry as their only source of income.

The TVA Plan

A given community to function must either (1) supply its own essentials, as in handicraft communities, or (2) have something to exchange for its essentials.

> "The goods come first in any culture. Tangible goods are based on natural resources, soil, water, and minerals--lodged in that thin crust of the planet between the air belt and lava belt. The whole economic pyramid, the existence of man on earth, rests on resources and without resources collapses."

When a land cannot adequately support its people, then the people should be ousted, or else fed, or they must be reconditioned. Reconstruction means building up the soil, restoring the forest and grass cover, checking erosion, reconditioning the fisheries, controlling the rivers, encouraging wild life and recreation areas, supply cheap energy, especially from water power, establishing a certain number of new industries, but not enough to result in wasteful duplication, maintaining a large program of public works, particularly in the field of conservation, and to provide local cash income.

Roosevelt's administration chose reconstruction, utilizing the war time monster Muscle Shoals. The President's purpose in the TVA has been said to be: "He saw the watershed as a geographic and hydrologic unit; he wanted to make the people in that watershed more comfortable, and he wanted to set up a series of yardsticks to measure power facilities, rural electrification, flood control, erosion control, progressive agriculture; yardsticks hopefully to be applied to other regions and to make other people more comfortable there."

Perhaps the best introduction to the plan is President Roosevelt's message which accompanied the TVA bill, quoted in part as follows:

> "The continued idleness of a great national investment in the Tennessee Valley leads me to ask the Congress for legislation necessary to enlist this project in the service of the people.
>
> "It is clear that the Muscle Shoals development is but a small part of the potential public usefulness of the entire Tennessee River. Such use, if envisioned in its entirety, transcends mere power development; it enters the wide fields of flood control, soil erosion, afforestation, elimination from agricultural use of marginal lands, and

distribution and diversification of industry. In short, this power development of war days leads logically to national planning for a complete river watershed, involving many states and the future lives and welfare of millions. It touches and gives life to all forms of human concerns.

"I suggest, therefore, to the Congress legislation to create a Tennessee Valley Authority--a corporation clothed with the power of government but possessed of the broadest duty of planning the proper use, conservation, and development of the natural resources of the Tennessee River drainage basin and its adjoining territory for the general, social and economic welfare of the Nation. This authority should be clothed with the necessary power to carry these plans into effect. Its duty should be the rehabilitation of the Muscle Shoals development and the coordination of it with the wider plans.

"Many hard lessons have taught us the human waste that results from lack of planning. Here and there a few wise cities and counties have looked ahead and planned. But our Nation has 'just grown'. It is time to extend planning to a wider field, in this instance comprehending in one great project many states directly concerned with the basin of one of our greatest rivers.

"This in a true sense is a return to the spirit and vision of the pioneer. If we are successful here we can march on, step by step, in a like development of other great natural territorial units within our borders."

The bill provided for:

1. Maximum navigation of the Tennessee River.
2. Maximum flood control.
3. Maximum generation of electric power consistent with flood and navigation control.
4. Investigation of a proper use of marginal lands.
5. Studies of a proper method of reforestation.
6. Recommendations for "the economic and social well-being of the people living in said river basin."

This program resolves itself into a circle of integral parts. In order to have year-round navigation, the waters must be controlled both at floods and ebbs. Dams and reservoirs are essential for this, but they will soon fill up without the control

of erosion. That needs forest and cover crops and scientific agriculture, which is dependent upon obtaining a cheap fertilizer. This can only be obtained by using electric furnace and cheap power. This goes back to the dams and starts the cycle all over again.

Then there is a large amount of incidental work in connection with making the large reservoirs. First there is the resettlement program for the families either inundated or stranded; there is also the extensive replacement of railroads, roads, schools, and recreation areas. The prevention of mosquito breeding is a very important problem in order to keep down malaria. There also ties in the fish and wild life preservation, with purification of streams polluted by city sewers and industrial wastes.

Beside Wilson Dam at Muscle Shoals, river dams in the Tennessee River and three in its tributaries are planned. Their cost will be in the neighborhood of one-third of a billion dollars or the cost of six battleships. They will employ skilled labor for eight years. They should develop a year-around power of 660 kilowatts. ?

Organization

During the summer of 1936 there were 13,000 workers, including: engineers, foresters, erosion experts, ecologists, geologists, physicists, chemists, agronomists, medical and sanitation experts, educational experts, and others. The majority represent manual and clerical occupations. The organization tapers off through the technical and administrative

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positions till final authority is reached in a board of three directors.

General TVA Organization

The authority is an unusual government organization. Although it is responsible to the chief executive and the legislature, it is not so closely regulated as are government establishments generally. Considerable flexibility is required to handle such an intricate technical problem, and this is provided by the sort of autonomy characteristic of the private corporation. The interior organization is similar. A measure of initiative must be granted the many divisions operating in widely separated technical fields; but the organization is so arranged as to coordinate them all in the execution of one major task.

By act of Congress on May 18, 1933, the administration is placed in the hands of a Board of three Directors, appointed by the President with Senate approval. They supervise the various phases of the program through the Coordination Division. Activities are divided into three main groups or services: (1) Management (2) Engineering, Construction and Operation(3) Planning and Demonstration. Under the last heading are found the following divisions: (a) Agricultural, (b) Industrial, (c) Land Planning, (d) Engineering, Planning, and Geology, (e) Social and Economic, (f) Forestry. The various division heads form a Planning Council whose functions are mainly advisory.

Organization of the Forestry Division

The following is a rough organization table of the Forestry Division, showing the main sub-divisions and their functions. Activities are widespread over the valley requiring in the spring of 1936 a total staff of 108 people.

Organization and Functions of the TVA Forestry Division

Administration - Chief Forester, Assistant Chief Forester

- Forest Management Planning Section
  - Forest Classification
  - Management Plans for TVA lands
  - Aid to outside agencies
- Watershed Protection Section
  - Planning of engineering and vegetative phases of erosion control work.
    - Supervision of operations of CCC camps - the Labor force
    - Nurseries, Clinton, Tenn. and Muscle Shoals - Planting stock
- Forest Development Section
  - Administration of TVA forest lands
  - Wild life development
  - Forest Tree crop nursery
  - Forest education

Chapter II

PROTECTION OF THE WATERSHED--MAIN PURPOSE

To prevent dams from collecting silt and filling up, soil erosion must be reduced to a minimum. The most important factors affecting run-off and erosion are: climate, rock and soil composition, soil depth, land slope, and the vegetative cover.

The washing away of the soil by water first produces "sheet erosion". This is not as noticeable as the more advanced forms, but is characterized by the loss of a layer of topsoil over an area, with the resulting reduction in the height of the surface, the protrusion of root crowns, and the appearance eventually of barren or "galled" spots on the unproductive subsoil exposed. Erosion is an accelerative process on the less resistant subsoil. Run-off next concentrates to form a series of "shoestring" gullies. These eventually broaden and deepen to form well developed watercourses - the characteristic gully.

The Influence of Vegetative Cover on Run-off and Soil Erosion

"A clear trickle of water through the leaf mold of forests" is the goal of the forester. Streams draining cleared land always have been muddy, and those in forests invariably run clear.

Whether the effect of rain is favorable or unfavorable depends on the character of its run-off. Sub-surface run-off,

or that which enters the soil, furnishes water for plant growth, and constant streamflow for man's use. A good deal of it collects in underground reservoirs. Surface run-off, on the other hand, wears away the land as it plunges down hill, swelling streams and rivers to cause a multitude of evils.

The component of forest cover most important in affecting run-off is the leafy litter. Rain falling on bare ground forms a muddy solution. The suspended particles enter and fill the minute spaces in the soil, thus severely limiting the penetration of water. The forest litter acts as a receiving medium, and permits clear water to percolate into the soil. Almost unlimited amounts of water can be absorbed if it is free from suspended material. This has been illustrated by many experiments.

One authority determined the rate at which clear water would percolate through certain columns of soil based on tests conducted over a seven-day period. He then introduced sediment of less than two percent by weight, which caused the rate of percolation to fall to ten percent of his former figure within six hours. What is even more important, the effect was permanent, and the normal rate of percolation could not be restored by subsequent applications of pure water. The application of artificial rain to sloping tanks of typical California soils taken from bare soils, from which the litter had been burned, a run-off three to sixteen times as great as that from which the litter had been burned. Bare

sample plots of sandy clay loam produced 23 times the amount of eroded material that the same soil did when litter covered, and for fine sandy loam and clay loam, the figures were 160 and 1,196 times respectively.

Litter also has some secondary effects which are important. It acts as a sponge, and absorbs and holds considerable moisture. Frozen soil is non-porous; therefore run-off from early spring rains is apt to be serious. Litter has a beneficial effect in retarding both the rate and depth of soil freezing. The other elements in the forest cover contribute to its favorable effect. Standing leafy vegetation intercepts precipitation, retaining a considerable amount, and breaking the fall of the remainder. Humus promotes a flocculent structure of good tilth in the soil with its resulting maximum water-holding capacity.

Of the various types of vegetative cover, the forest is best in preventing excess run-off and erosion. A study of the proportion of total summer rain which ran off various covers on certain silt loam uplands in Wisconsin with slopes averaging 36 percent showed as follows: hardwood forests of varying density averaged 28 percent; uncultivated wild pastures of native grasses 7 percent; cultivated hay fields 17.7 percent; small grain fields, and fallow land, 25 percent.

Land Abuses Which are Promoting Erosion in the Valley

While the limestone soils of the fertile valley lands are among the most productive in the United States, agriculture

has extended to the submarginal hillsides. While it takes centuries to develop one inch of fertile humus in this country, the entire topsoil covering is being eroded from these "perpendicular" farms in three to ten years. The rural population is prolific and non-migratory, and cultivation is going higher and higher on the slopes as a result of the pressure. Lumbering and mining operations, which formerly took part of the burden from agriculture, are now largely non-existent, having depleted their resources. Corn fields are found on the non-productive shale and limestone gravels high on the ridge sides. One passing through the area will see cultivation practiced at slopes dangerously close to 100 percent. A misstep on the part of the man behind the plow would certainly send him tumbling off his farm, and he would never stop till he reached the bottom unless he was so fortunate as to lodge in a gully on the way down. It is a wonder that there hasn't developed a race of men with one leg shorter than the other, from working at such an angle, following a plow hitched to mountain goats.

The amount of soil eroded from lands exposed to heavy rainfall at such an angle is tremendous. It has been stated that severe showers during the early spring months when the land has been freshly plowed may often take 40 to 50 tons of soil from an acre. After a few years, all that remains is a barren subsoil, and the farmer transfers his operations to another sloping field and repeats the process.

The remedy is to take this steep land out of open cultivation. Slightly eroding land of reasonable slope can remain in agriculture with the use of proper methods; or it can be devoted to pasture. One procedure only is effective on the steeper slopes, and those lands which have lost their top-soil; that procedure is reforestation.

Overgrazing

Open cultivation is not the only abuse to which the steep hillsides are subjected. Those areas which are left in grass are customarily used as pasture for such cattle and horses as the impoverished hillside farmer may possess. Landholdings are not large and the grazing is therefore limited. Sod consumption is apt to be in excess of its growth, and a very sparse covering results. A grazing animal naturally does not toil up and down the slope; he feeds on succeeding contour lines, producing well-defined paths or "bovine terraces" at right angles to the slope. The constant treading on these reduces the grass, and when the trails are of some depth, heavy rains tend to break off the angle formed at several points on the slope. From this a gully forms, working up and down the hill. Obviously, grazing must be eliminated from the worst inclines, and must be limited to a reasonable number of animals on the lesser slopes.

Extent of Application of Corrective Forestry Practices

Erosion Control Engineering

While final control depends upon vegetation, certain engineering operations are necessary to check run-off until

plantings have sufficiently developed to become effective.

A survey is made to determine the amount of run-off that must be cared for and the location of all dams and diversion ditches. After the size of drainage ditches and spillway notches for the check dams have been determined, one gully is selected to care for all the run-off. Check dams are constructed to check run-off velocity and prevent further deepening and widening. They are made of various materials - brush, wire, logs, planks, rock and masonry - depending on the need for permanency and the size required. Spillway notches and wings in these structures are so constructed as to handle the calculated amount of run-off in the gully.

Diversion ditches, with a base of not less than three feet and with a grade of not over one percent, are then laid out and built so as to carry the water away from the heads of all gullies except the one already referred to. The construction of such structures as soil-saving dams and flumes is rather the exceptional. Dams will eventually silt up, but within two or three years grass and tree plantings will have become well enough established to replace these structures.

The gullied and eroded areas below the diversion ditches and the banks of the controlled gully are then plowed in, so that the steep banks are reduced to at least a one-to-one slope and so that a good seed-bed will be provided for the grass, legumes, and trees which are to be planted.

Staked down brush paving and a mulch of straw or woods litter have been found a valuable aid. This material is used on gully sides, and bottoms and on eroded areas generally to prevent further erosion and as a protection for plantings. The application of brush paving to gullies has much reduced the number of dams necessary, as it acts as a protective medium between the flowing water and the soil.

Sod Production

The method of obtaining an immediate covering on a bare area is to plant it to grass. Sufficient moisture is generally not available on badly eroded lands. To provide moisture after it has been seeded, the area is covered with straw mulching or brush paving. The soil beneath the paving remains moist and soft while exposed places bake hard in the sun. Besides their effectiveness in water-holding, upon their decay these materials provide fertility for growing plants.

The grass mixture used consists of rye grass, perennial lespedeza, several annual lespedezes, sweet clover, red top and orchard grass. The purpose of these grass plantings is to hold the soil until simultaneous tree plantings take hold sufficiently to provide adequate soil protection.

Reforestation Practice

Certain pioneer tree species are planted with the grass at 3' x 3' or 6' x 6' depending on the soil conditions. Black locust is the most widely used. It seems especially suited

for erosion work because it is very hardy, grows rapidly and has a broad surface root system. When only two or three years old its roots may run a distance of twenty-five feet. In addition, it has a remarkable sprouting capacity which enables it to reproduce itself without planting. These characteristics make for rapid soil binding and the tree itself has high economic value in that it enriches the soil, matures quickly and yields finer posts of high value.

Pines are planted on the less badly eroded areas and in sandy spots. In addition to the pines (Shortleaf, Virginia, and Loblolly), red cedar is used for pioneer purposes. In favorable places where some topsoil remains, a few of the better climax species are seed spotted--black walnut, blight resistant Asiatic chestnut, various oaks, and yellow poplar. These will eventually, by reproduction, convert the area from a locust or pine to a mixed hardwood stand. The entire procedure results indirectly in a mixed hardwood forest. The soil is too poor to plant the climax species direct. Therefore, pioneer species are planted to act as nurse trees to the climax species. The former are, in turn, protected in their early development by the grasses.

It is estimated that 800,000 acres in the Tennessee Valley require reforestation, which will necessitate 800,000,000 seedlings. Two nurseries have been established to furnish the planting stock. Clinton Nursery at Clinton, Tennessee, has a capacity of ten to fifteen million seedlings on its

147 acres, and is situated to supply the 500,000 acres above Chattanooga; Muscle Shoals Nursery at Wilson Dam, Alabama, has an eight to ten million seedling capacity to supply the 300,000 acres below Chattanooga.

In 1933 there were gathered from four National Forests included in Va., W. Va., N.C. and Arkansas 10,000 bushels of pine cones and pods by the CCC:

600 bu.	of yellow poplar seed pods	producing	2,000,000	trees
4,000 bu.	of shortlead pine cones	"	10,000,000	"
2,600 bu.	Virginia pine "	"	8,000,000	"
2,900 bu.	Black Locust pods	"	6,000,000	"

Organization of Erosion Control Operations

Many of these operations are performed on private lands. With a view to developing understanding and cooperation among the farmers, community meetings are first held at which a TVA Forestry Division representative explains the erosion control program. Farmers wishing to have their property treated make application on forms obtained from the county agent or supplied to them at the meeting. A TVA forester then makes an examination of the land and renders a report making one of the following recommendations:

1. No action -
   a. Recommended cessation of misuse will prevent erosion.
   b. On account of lack of cooperation
2. Agricultural extension and education through the County Agent - better crop rotation, etc.
3. Engineering only - diversion ditches, terrace outlets, paving, mulching.
4. Reforestation only - erosion not critical.
5. Engineering and reforestation - critical erosion, poor land.
6. Purchase - area a menace in private hands because of poor soil, steep slope and critical erosion.

After a written agreement has been drawn up with the landowner, the CCC Camp Engineer makes a sketch map showing the area drained; the TVA Forestry Division Sub-District Engineer then visits the area, drawing in the location and specifications of check dams on the map, and also staking out their location on the ground. The latter official also inspects the work during the construction. Planning is kept ahead of the work crews, who begin operations at the top of the inclines and work down.

After signing his agreement, the farmer is expected to supply whatever material he has on hand, such as straw and logs. His teams are to be available gratis, and in some instances he supplies fence posts and wire. However, he is not required to buy any of these materials. That he shall protect the area from fire and grazing is also part of the agreement; and if there are other fields above the one treated, he is required to so manage them as to prevent gullies developing and extending down the hillside again to undo the erosion control operations.

It is planned to develop a method of procedure which will place the erosion control program on a labor basis independent of the CCC. The Watershed Protection Section is encouraging farmers to undertake erosion control on their own lands themselves. Demonstrations and exhibits will be made available to illustrate the correct methods. The land owner can then go ahead on his own initiative, with the Forestry Division furnishing planting stock from its nurseries and technical advice.

A CCC camp is restricted to a 25 mile radius in its operations, and this means that the present arrangement can handle but a small part of the 40,000 square miles in the Valley. In addition, the CCC assignments fluctuate greatly. The allotment in this area may be reduced to 26 main camps with 4 side camps but has been up to 38 camps of 200 men each.

Correlation of Agriculture with Forestry

Agriculture and Forestry are closely associated in correcting land abuse in the valley. Proper methods of agriculture are effective in erosion control. Much slightly eroding land can remain in farming if it is properly handled. Terracing is recommended for slopes under 15 percent. In case of slopes above 15 percent, strip cropping will check undue runoff--the alternation of strips of tilled land with strips of hay to catch water and sediment. Crop rotation and the use of fertilizers will also aid in maintaining the soil in good condition.

Important in this connection is the establishment at Norris of a tree crop nursery for the purpose of developing a tree crop agriculture on hilly lands. If the farmer is to be persuaded to refrain from plowing his hillside for corn, he must be given something to put in its place, and tree crops seem to be the answer.

Such trees as black walnut, hickory, persimmon and pawpaw will do good service in broadening the typical mountain

diet from corn and pork, besides providing a cash crop. Experiments are being conducted to develop walnuts with improved cracking qualities. Large marketable persimmons can be obtained by grafting the large Japanese variety on the tasty wild native stock. A good crop of corn on those mountain farms would be 30 bushels to the acre, which in 1936 brought a price of $.80 to $1.00 a bushel. The poorer lands yield from 0 to 10 bushels an acre. In 1934 the price of corn was down to $ .30. The native persimmon, grafted to improved varieties, would produce 100 bushels to the acre with a wholesale value of $3 to $4 a bushel.

Honey locust pods are one-third sugar and have a higher value as stock feed than corn. The use of these trees and others producing most will take part of the burden from grazing land. Fruits of succeeding maturities can furnish cattle and hog food throughout the year. The pecan, hickory, and their combinations, the hican, along with the walnut, have the additional advantage of bearing early in life--on the average within five years. Many of these crops can be either sold when the market is right or consumed on the farm. On forest fringes and fences, the planting of berry-bearing bushes will provide food for game birds; such a procedure is part of the wild life program. These and other fruits, like the persimmon, are of obvious advantage to the poultryman.

Inventory Activities of the Forest Management Planning Section

Before an adequate plan for land use can be prepared for a region, a number of general surveys must be made to determine

the various physical, social, and economic factors and their interrelation.

A valley-wide classification of the forest resource, county by county, has been undertaken by the Forestry Division. These county reports begin with a general description of the territory, considering topography, soils, climate, natural resources and social and economic conditions. Forest resourced are analyzed as to their physical characteristics (forest types and condition classes, growth and volume) and forest land ownership and use. Wood-using plants are tabulated and such factors as size, type, requirements, and amounts, kinds, and sources of raw material are estimated. The section on Land Use Trends and Problems includes management, eroding and submarginal lands, taxation, public ownership trends, farm forest communities, and recreation. The contribution of the forest to employment is also determined. The county is a convenient unit for the field survey, but these reports will be taken collectively to determine regional problems. They will permit future concentration on areas of special concern.

Semi-intensive watershed surveys are also being conducted with the aid of aerial mosaics and planimetric maps. Here a forester visits each area, using a section of an aerial photograph as a field sheet. Orienting the mosaic with the ground, he examines the area and notes down descriptive information indicative of its present condition and optimum future use in

the form of a standard set of code numbers. Taking off parts of this information successively, a series of separate maps are prepared back at the field office to indicate Industry and Transportation, Forest Cover and Condition Classes, and Sources of Supply of Forest Products. Finally a composite of all these maps is prepared to indicate the Potential Land Use.

In connection with land use, a quotation of Mr. Arthur E. Morgan, Chairman of the TVA board might indicate their attitude:

> "Our laws of land ownership should be changed so that if a man is handling his land in such a way that will destroy it, the part he cannot take care of should be taken away from him and given to someone who will farm it properly, or be planted by the government to some growth that will prevent soil erosion. A man has no natural right to inherit good land and pass on a waste of gullied hillsides to those who come after him. We are not complete owners of the soil, but only trustees for a generation."

Chapter III

SOCIAL AND ECONOMIC FACTORS LINKED WITH FORESTRY IN THE AREA

Forestry is not a separate entity by itself, but reaches into numerous other fields. Technically speaking, forestry is in the last analysis applied Botany. The far reaching effects this application can have, for good or evil, in the fields of economics and sociology are astounding.

The Development of Farm Forest Communities

Government forest acquisition in the western United States is mainly concerned with eliminating private timber exploitation and instituting sustained yield management. The problem is not quite so simple in the East, for a relatively numerous population is found living on the land. Rather than extinguish settlement in the forests, the relocation of these people to desirable homesteads within the forest will spread benefits all around. The seasonal character of farm work will provide a labor force in off seasons to develop the forest, and wages earned in woods work will tend to eradicate the poverty-stricken communities formerly dependent solely on farming.

A number of such community sites have been selected in the Norris Lake Forest, the first large forest area to come into TVA ownership. Factors of communication; access to educational, church, social, and health facilities; and the quality of the agricultural land were considered in their choice, in addition to administrative needs. In addition to obtaining good living conditions and fair rates of pay, the men and women are trained in preparation for the life they are to pursue. The housewife learns the various homemaking arts, including cooking, preserving and canning. The man, a forester-farmer, learns practical forestry, the care and use of tools and equipment, agriculture and first aid. Existing houses are being renovated to provide comfortable homes.

Their work will be varied and interesting, each man devoting some 50 to 150 days per year to forestry and related tasks. In the beginning, most of the labor is on installation jobs, such as construction and renovation of buildings, and the erection of fencing. A start has already been made on planting and stand improvement, lumber salvage operations, erosion control, road construction, telephone line construction, fish and wild life work, and other development tasks. Maintenance activities are required in every forest area, such as fire prevention and control, road and trail maintenance, and grazing regulation.

Because of the depleted condition of the growing stock and the occurrence of large amounts of chestnut and defective material, the program of cutting for the first ten years will be mainly of a salvage and improvement character. Detailed inventory of some 54,000 acres in several of the forest units, including the Norris Town Forest, show that over 24 percent of the merchantable-size timber is composed of dead chestnut, scarlet oak, sassafras, and other less desirable species.

In addition, all stands contain certain amounts of overmature timber requiring early removal. In the heaviest stands, averaging 3,500 board feet per acre, overmature trees comprise on the average 56 percent of the volume; in stands averaging 2,500 board feet, 36 percent; in stands averaging 1,500 board feet, 11 percent; and in cordwood stands (averaging 7 cords per acre), 1 percent.

The cutover the first ten years will therefore remove on the average from 80 percent of the volume of the heaviest stands to 25 percent of the volume of the cordwood stand.

After the first ten-year period, during which the growing stock will have been improved through the above measures, cutting will be based on annual growth capacity, supplemented by such thinning and stand improvement operations as are required and as can furnish usable materials for manufacture, sale, or forest homestead consumption.

Stabilization of the Timber Industry

There is a general dearth of secondary wood manufacturing establishments in the valley. Of 700 wood-using industries, nearly 500 were found to be sawmills, which are of an impermanent character. Only 75 plants actually manufactured finished products. The Tennessee Valley Authority is studying the location , condition, and means of utilization of timber supplies to promote wood-using industries. This will provide employment for local labor, establish stable community life, increase public revenues, and promote industry generally by raising the buying power of the valley population.

The large supply of low grade timber is particularly adapted to small-wood utilization, and there is an immediate opportunity for this type of industry. The character of the forest makes the operation of the small portable saw mill economical. A good deal of the more desirable species are now in an immature condition due to past exploitation, but with

their future maturity, large-scale commercial lumbering may be expected to return as a primary industry.

Recreational Values

The wealth of wild life inhabiting the forests and streams before the coming of the white man was extraordinary. Trappers and traders dealt actively in skins and furs between 1690 and 1750. It was not unusual for one operator to take $1600 to $1700 in one season--enormous sums in those times. This resource has gradually disappeared with our advancing civilization. Now a definite program of wild life and fisheries development is getting under way under the auspices of the TVA Forestry Division. Aggressive development on a sustained yield basis will be the rule, rather than passive protection. The TVA has already embarked on a planned wild life development operation in company with the U. S. Biological Survey, the Bureau of Fisheries and the State Game and Fish Commissions. Special licenses and closed seasons will be necessary during the rehabilitation work. Game refuges, bird sanctuaries and fish rearing areas are planned to put the production of upland game, migratory wildfowl, big game, and fur-bearing animals on a self-sustaining, financially profitable basis.

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