LAND UTILIZATION IN TENNESSEE

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Owing to the special fitness of the soil, climate, and other natural factors of this region for the production of fruits and vegetables, representatives of the Department of Interior, together with state officials, selected in 1934 a tract of land containing 12,000 acres in Cumberland County as a homestead project.[14] This land three years ago was all in forest but about one-half is suitable for truck farming and much of it has been cleared. The land has been divided into more than 250 farms which vary in size from 2.5 acres to 25 acres. Homes and barns have been built from wood and sandstone secured on the land. The Federal Government furnished the money for developing the project, which money is to be paid back over a period of years at a low rate of interest. On the average the farm and buildings complete cost the owner approximately $2,500 in cash and 200 days of labor, but they have a value greater than this amount. Only dependable families which have a reasonable expectancy of 20 to 25 years of active service have been selected from the thousands who made application. The soil of this tract is a very good trucking type, particularly suited for the growing of potatoes, early vegetables, small fruits, poultry, and light farming. By selecting good seed, improving the live stock, and following a scientific crop rotation, good yields and a fair living can be expected from the farms of this project.

While the number of live stock units per square mile for the entire state is 44, and that of the Commercial Live Stock and Crop Farming Region is 79, the number for this region is only 16. This means only four live stock units for every 160 acres of land, a number apparently too low for grazing to be one of the main activities of the region. This paradoxical situation, however, is revealed through field work done by the author in the region which shows that many of the cattle, sheep, and hogs ranged on the grass and nuts of this region are the property of stockmen who live in the two adjoining regions. Consequently, these animals are reported to the census bureau by people who live on the Highland Rim and in the East Tennessee Valley, and this region does not get statistical credit for the live stock it supports. Even though the soil is rather poor, the rainfall of the region is relatively heavy and a carpet of nutritious wild grasses grow in the open woodlands. These grasses furnish excellent pasture for cattle and sheep

[14]O. E. Van Cleave, Commissioner, *Tennessee*. Nashville: The Department of Agriculture, 1934, pp. 92-93.

through the late spring and early fall. The oaks and hickory trees yield crops of acorns and nuts which supply "mast" for hogs during the late fall and early winter. Partnership cabins and round-up pens are scattered throughout the region where the animals are corralled and salted at regular intervals.

The law of the region permits open ranging of live stock—a condition which forces the owners of the crop land to fence out the live stock in order to save their crops. The open range system has also given rise to the practice of burning the woods each spring to clear away dead leaves, grasses, and underbrush, and supposedly to give the grass a better chance to grow. Such fires have two bad effects. They destroy humus needed for the improvement of the light soils, and they kill many seedlings and small trees. Thus it is quite clear that there is a rivalry between the stockmen on the one hand and the farmers and foresters on the other hand. Furthermore, this transhumance industry is becoming more hazardous and risky to the stockmen as more and better roads are built to and through the region, for live stock thieves are able to go into the region with trucks and steal the animals by the truckload. Although the animals are labeled and branded, the thieves can market the live animals in distant cities, or they can slaughter them and sell the carcasses in the nearby cities of Nashville, Chattanooga, and Knoxville.

While the light sandy soils of this region are not strong enough to produce large yields of farm crops, they are sufficient for the growth of trees. The region was originally covered with a dense growth of hard and soft wood trees, and more than three-fourths of it is still classed as forest land. A very large portion of the timber, particularly the better grades, has already fallen under the lumberman's axe. The quality and value of the remaining stand are well shown by the average land value for the entire region, a figure of only approximately five dollars per acre (Fig. 4, *E*). Large land holders and coal and lumber companies bought thousands of acres of this virgin timber land for fifty cents and one dollar per acre during the first two decades of this century. The best timber of the region was scattered along the dissected margins of the plateau and along valleys and ravines which are carved in its table-like surface, for in the low lands the soil is better, the moisture is greater, and there is more protection from the strong winds. Owing to the great variety of species and the wide range in types of trees, the lumber, crosstie, spoke, stave, headding, shuttle, tanbark, charcoal, mine timber, and chemical wood products industries have all thrived in the region. Because most of the timber land is owned by outside capital and because most of the wood has left the region either as raw material or in a primary stage of manufactured goods, the natives have benefitted little from this valuable natural resource. Their greatest value has come in the form of wages for the cutting of the trees and working in the mills sawing lumber and cutting wood products. Most of the

region has been cut over, and owing to the poorness of the soil, the coolness of the climate at an elevation of 2,000 feet and more above sea level, the annual occurrence of forest fires for the improvement of the grazing lands, and the slow growth of the young trees, it has a very low value as forest land.

Information is not available as to whether the products of the forests or mines are more valuable. It is known, however, that this belt is by far the most important mineral region in the state. The two most valuable minerals underlying the region, in order of importance, are coal and iron ore. Although coal measures underlie virtually all the Cumberland Plateau, the principal commercial fields lie along the margins of the region where deep stream dissection and the fault escarpments of Walden's Ridge and Sequatchie Valley have exposed the coal seams at many points facilitating drift mining. The relative ease of mining the coal is further augmented by the fact that the coal bearing strata lie almost horizontal to the surface of the land. Coal was first mined in the region more than a hundred years ago, but relatively little was produced prior to 1860. For convenience, the region is divided into two fields: one lying north of the Tennessee Central Railroad and the other south of it. More than fifty workable seams of coal have been recognized in the two fields, but only twenty have reached commercial importance.[15] The largest producing fields lie along the eastern escarpment in Morgan, Anderson, and Campbell counties, where the high-grade bituminous coal is taken from tunnel mines which open on the steep slopes of the escarpment and deep V-shaped valleys. The most productive fields along the western escarpment lie in Overton, White, and Grundy counties, in which equally as good facilities for mining are present. Coal is transported from the entrance of the mines to the valleys below by tramways, where it is dumped into coal tipples. From the tipple house, the coal is loaded into the railroad car by gravity. Valleys, carved by small streams which lead from the crest of the plateau in the coal producing fields to the Highland Rim and East Tennessee Valley, offer the best avenues of invasion for railroads over which the coal is hauled from the mines to the places of consumption. The largest of these depressions is Sequatchie Valley, which is served throughout its entire length with a branch line railroad and a hard-surfaced highway. Most of the coal, however, moves into the valley of East Tennessee, where it is consumed for the heating of homes and for the production of steam in the most important manufacturing region in the state.

Coal mining is the most important mineral industry in the state, and most of it is mined in this region. A total of slightly more than four million short tons of coal were produced in 1935, the value of which was about seven and one-half million dollars, or an average of $1.79 per ton.[16] Nearly five million dollars was paid to the 7,287

[15]K. E. Born, *op. cit.*, p. 50.
[16]K. E. Born, *op. cit.*, pp. 56-57.

workers who labored in the 128 producing mines. In more normal years the value of coal produced in Tennessee exceeds $10,000,000.

The principal iron deposits of the state lie in a narrow belt which skirts the eastern base of the Cumberland Plateau and Walden's Ridge. For several miles near the south end of Walden's Ridge, these ore deposits extend under the ridge and outcrop along the western base in Sequatchie Valley. The ores of this belt are all red hematite as typified by those mined at Rockwood in Roane County. The deposits extend all the way from Chattanooga to Cumberland Gap, but the outcrop is not continuous because thrust faults have buried the formation below older rocks at irregular intervals. The entire belt has a total of 60 miles whose outcrops have a quality and thickness sufficient for commercial mining.[17] The chief producing centers have been Rockwood, Dayton, and La Follette along the eastern base of the mountain and Inman in Sequatchie Valley. But little ore has been mined in this belt since 1929, mainly, because of the economic depression. No data are available for iron production here in the last few years, but the operators of the mines at Rockwood plan to resume production in the near future.

As previously stated, La Follette with its 2,600 people is the only urban center which has a population in access of 2,500. This town is located in Campbell County and is dominantly a coal mining and iron smeltering center. Accordingly, a very high percentage of the gainful workers are employed in some phase of these two activities. Pikeville, Dunlap, and Jasper, the county seats of Bledsoe, Sequatchie, and Marion counties respectively, are all located in Sequatchie Valley, the finest agricultural belt in the entire region. The function of these towns, therefore, is related not only to the products of the mines and forests but also to those of the rich valley farms.

Railroad and highway mileage is very low as might be expected in any mountain region whose elevation and lack of passes are sufficient to act as a barrier to through transportation rights of way (Figs. 8, *A* and 8, *B*). Because of the northeast-southwest direction of the plateau, there are only one east-west railroad and three east-west hard-surface highways in this part of the state. All four of these cross the southern half of the region. Numerous railroad branch lines, however, lead from the Highland Rim, Valley of East Tennessee, and Sequatchie Valley into the margins of the region, in which they tap the coal and iron ore mines and the best timber belts. The densest part of the railroad pattern lies in the northeastern part of the plateau, where most coal and iron ore have been produced.

The Manufacturing and Commercial Farming Region

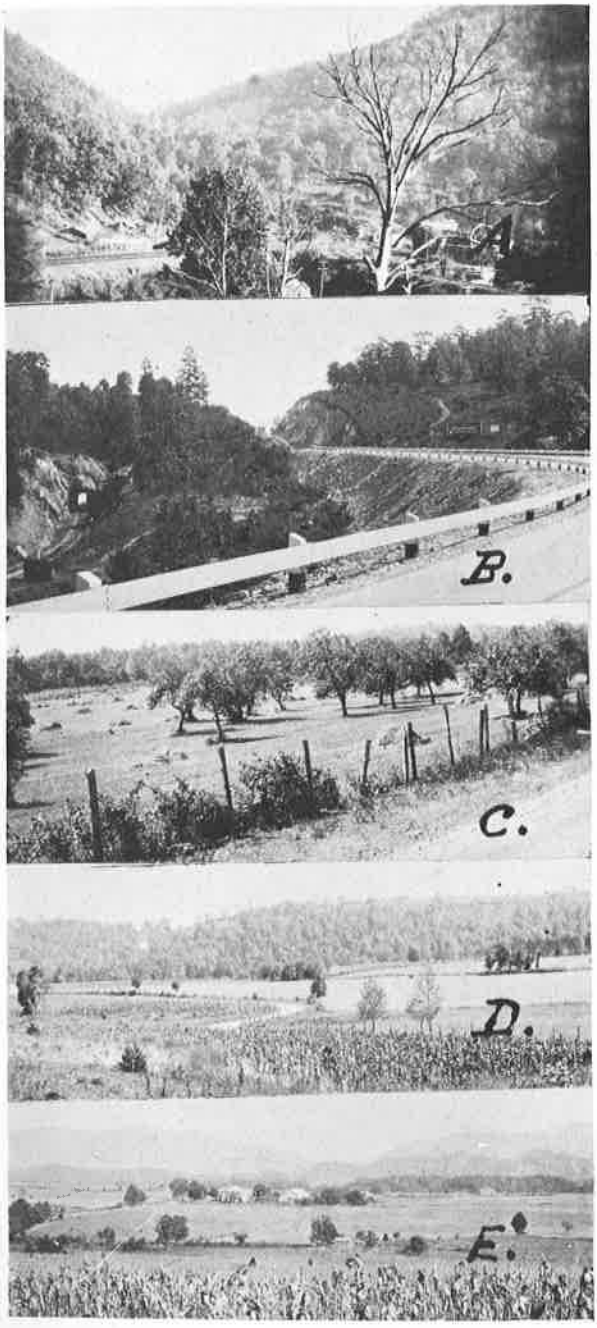
The Manufacturing and Commercial Farming Region contains about 21 per cent of the total area of the state, and corresponds rather generally with the physiographic province known as the East Ten-

[17] *Ibid.*, p. 65.

nessee Valley (Figs. 5, *D* and 5, *E*). The region is the largest one in the state, for it embraces all or part of twenty-seven counties. Only the western part of the ten counties lying along the North Carolina boundary, however, belong to this region because the eastern portion of these counties composes the narrow mountainous strip known as the Forest-Mining Belt, a belt containing about four per cent of the area of the state. Owing to the fact that this eastern tier of counties is divided between two human-use regions, it is necessary, when quoting statistics concerning East Tennessee, to refer to all the land in the two regions. Although the ratios and percentages of population, live stock, and land-use for the entire area are approximately true for the Manufacturing and Commercial Farming Region, which contains about 84 per cent of the total acreage, there are certain discrepancies which exist; for most of the people and crop lands of the ten eastern counties lie in the valley, whereas the bulk of the forest lands of these counties lies in the mountainous belt.

The density of population for the twenty-seven counties is 57 per square mile, not including Chattanooga, Knoxville, and Johnson City (Fig. 1, *A*). This density, which is higher than that in any other region of the state, reflects a type of natural environment containing better and more varied natural resources, a situation favoring more economic adjustments of man to his natural milieu. The population pattern presents a ribbon-like appearance which extends lengthwise to the Valley with an increasing density from the margins toward the center as well as from the ends to the center. The high percentage of urban population is evidenced by the fact that only 32 per cent of all gainful workers are engaged in agriculture. It is further evidenced in that this region is the most important manufacturing part of the state. With manufacturing and commercial live stock farming as the two outstanding activities, it is not surprising to learn that Negroes compose only four per cent of the population, although they range from 14 to 27 per cent of the total population in the other three major agricultural regions of the state. In each of the other regions there is considerable acreage planted in such commercial crops as cotton

Fig. 8. *A,* Cumberland Gap in the northeast corner of the Cumberland Plateau near the point where Tennessee, Kentucky, and Virginia meet. Since the days of Daniel Boone, the white man has utilized this pass in his western trek from the East Tennessee Valley. *B,* Tennessee Central Railroad and U. S. Highway 70 reaching the top of the Cumberland Plateau from the East Tennessee Valley near Rockwood. In an effort to lessen the grade, man has brought the railroad through an outlying ridge by tunneling and the highway by excavating. *C,* One of the better mountain farms on the Cumberland Plateau, thirteen miles west of Crossville. Note that corn, hay, and apples are all produced in the same field. *D,* Typical ridge and valley structure which constitutes the floor of the Valley of East Tennessee. This view was taken eight miles northeast of Athens. Although the entire lowland is utilized for crops, most of the ridge in the distance is covered in forest. *E,* East side of East Tennessee Valley, five miles east of Maryville. Excellent corn, hay, wheat, and pasture land in the foreground and the Unaka Range in the distance.


A.
B.
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and tobacco, which require a great deal of hand labor. The acreage of such crops in this region is small.

The ratio of land in farms in this region is 66 per cent, the same ratio as in the Forest-Mining-Subsistence Farming Region. The amount of land in cultivation in the two regions is 26 and 24 per cent respectively. In almost every way except the amount of land in farms and in cultivation, however, these two regions are markedly unlike. In the allocation of farm land, the regions are particularly dissimilar. Of the farm land in this region 36 per cent is in cultivation, 31 per cent in pasture, 37 per cent in woods, and 6 per cent is utilized for other purposes (Figs. 2 and 3). As compared with the other three major farm regions of the state, the ratios of land in pasture and in woods are high, while the ratio in cultivation is much lower. This allocation of farm land is related to a type of topography where much of the land is unsuitable for the plow; for this region, which is part of the Great Appalachian Valley, has within its own limits a series of smaller ridges and valleys running parallel to the longer axis of the Great Valley (Fig. 8, *D*). The most favorable relief and soils for agricultural purposes lie on the floors of these small valleys. Less favorable lands occupy the rolling uplands and the lower slopes, whereas most of the forest and waste lands are on the upper slopes and rugged spots of the ridges. In the northeastern part of the region, the linear ridges give way somewhat to a knobby type of topography, where the hills, often covered with fertile soil, are, in many cases, cultivated to their summits. The soil pattern of the region is very complex. The most productive soils are limestone of the Knox dolomite and Chickamauga formations, the first of which occupies between one-third and one-fourth of the entire area. The limestone soils are usually red in color and of a loam or silt loam type containing varying amounts of chert. They are very fertile and occupy the floors of the smaller valleys and lower portion of the slope lands. Much of the upland soils are shales and sandstones, which erode very easily and are far less productive. Case, presumably on the basis of soils and relief, has divided the agricultural lands of the region into four classes: (1) the productive flood plains, (2) the prosperous limestone valleys and rolling uplands, (3) the moderately productive shale valleys and less rugged uplands, and (4) the little utilized uplands.[18] The prevailing crops in the productive flood plains which occupy less than one per cent of the region are corn and hay; in the second and third classes wheat takes a prominent part in the crop combination, especially in the northeastern part of the region. The fields included in the third classification are much smaller and more irregular. The leguminous crops requiring a soil with a high lime content give way largely to those crops requiring much less lime. The area of fertile soil in the fourth class is quite limited. On the spots which are the

[18]Earle C. Case, *The Valley of East Tennessee*. Nashville: Division of Geology, 1925, p. 6.

most conveniently located to markets are found orchards, truck gardens, and tobacco. On the less favorable ones, subsistence cropping is carried on.

Although the crop combination of this region consists of all the principal crops grown in the state, the bulk of the acreage is given to three subsistence crops: namely, corn 34 per cent, hay 25 per cent, and wheat 8 per cent (Fig. 3). That subsistence crops should occupy the bulk of the acreage in a crop combination where live stock are the chief source of the farmers' income is not a maladjustment on the part of the agriculturists, nothwithstanding the fact that much of the land is very productive. To the contrary, such a combination is partly responsible for the fertility of the soil at present, and a scientific conservation program will demand its continuation in the future. On a whole, the soils are better and the relief is more favorable for farming in the northern part of the valley than in the southern part. Accordingly, the percentage of corn, hay, wheat, and oats acreage, particularly the two latter, is greater in the northern part where the land has a higher value (Fig. 8, *E*). The upper half of this valley is the leading wheat and oats producing region in the state, although much of the acreage is on the poorer shale soils of the slopes and uplands where the yield is low. Wheat fits into a suitable crop rotation and serves as a nurse crop for the legumes during the period of their early growth. Furthermore, it makes an excellent cover crop which lessens soil erosion during the winter months. Although corn occupies first place in acreage in this region, it is on the decline. The yield of corn is highest in the areas where the acreage is lowest, for in such areas corn is planted only on the most desirable lands. This region leads the state in the percentage of cultivated land in hay, a crop which ranks next to corn in acreage. Hay land will probably increase in the future, for the growing live stock industry of the region calls for more summer meadows as well as more hay for winter feed.

In addition to the subsistence crops of the region, Burley tobacco occupies from 1 to 3 per cent of the cultivated land in nineteen counties lying in the upper part of the valley, and reaches 6 per cent in Green County where the Knox dolomite soils are well suited to its growth. A small amount of cotton is grown in the extreme lower end of the region, but even here it is relatively unimportant in the crop combination. The one exception is in Polk County, where it occupies 19 per cent of the cultivated land. Obviously, this part of the valley is on the margin of the cotton region. Considerable acreage is allocated to the growing of fruits and vegetables for the density of population, particularly urban population, is relatively high. In the rural areas and in the small urban centers the vegetables and small fruits are grown by the consumers in home gardens, whereas those grown for the occupants of the larger urban centers are produced by market gardeners. This region is also important for truck farming, and is the leading fruit region in the state. Peaches and strawberries

are the two most important fruits grown. Dayton, Cleveland, and Sale Creek are the centers of the three major strawberry producing areas; and Roane, Rhea, Bradley, Hamilton, Knox, Campbell, and Anderson counties lead in the production of peaches. The peach orchards are located on the slope lands of the hills and elongated ridges lying along the west side of the Great Valley (Fig. 9, *A*). Many of the slopes are too steep for cultivated crops, but they provide good atmospheric drainage, a condition which greatly lessens the danger of killing the young fruit in the early spring. Some of the peaches and strawberries are consumed in Chattanooga, Knoxville, and other urban centers of the region, but the bulk of them are rushed by fast express trains to the large cities of northeastern United States.

The climatic and edaphic factors of this region are well suited to the production of live stock, and more than half of the farm land is utilized either directly or indirectly for producing farm animals. Many of the slope lands which are too steep for cultivated crops are used to good advantage for pasturing cattle and sheep, for their soils grow excellent blue grass. The growing season ranges from 180 to 200 days, the rainfall is ample for excellent meadows, the winters are cool and do not require expensive housing facilities, and the region is conveniently located with respect to the consuming markets in the cities of northeastern United States. Accordingly, a small area of which Hamblen County is the center has more than 74 live stock units per square mile, and all the central part of the northern end of the region has more than 50 live stock units per square mile (Fig. 4, *D*). The entire region has an average of 43 live stock units per square mile, a number the same as that for the entire state and one surpassed only by the Central Basin. That the number of mules only slightly exceeds the number of horses, and that cattle dominate among farm animals is what might be expected with the particular environmental complex this region contains (Table 1). As to the type of cattle, beef animals have been more numerous in the past, but with the coming of good highways dairy animals have made a phenomenal gain, particularly in the vicinity of the larger urban centers.

Tennessee leads the South in the production of poultry, and the area of greatest production is a belt lying between Bristol and Knoxville with Morristown and Greeneville as the two major shipping points. Favorable soil, climate, and drainage conditions, together with the desirable location of the region with respect to the markets of New York and other eastern cities, are, apparently, outstanding reasons for the development of the industry to the point where 600 to 1,000 carloads of eggs and poultry are shipped from the region to New York City alone each year. Direct rail routes between this region and the consuming centers have done much to augment the industry. Knoxville, with its large hatching incubators, one of which has a capacity for more than 300,000 eggs, ships baby chicks to many parts of the United States. Probably no one thing has done more to help develop

the poultry industry of this region than the School of Agriculture at the State University at Knoxville.

Since only 42 per cent of all gainful workers in this region are engaged in agricultural work, it is quite evident that there are important human activities other than that of farming. Furthermore, the title of the region implies that manufacturing as well as agriculture is of outstanding importance. For a region to be important in manufacturing, it should have (1) an adequate supply of raw materials, either at hand or accessible by cheap transportation, (2) a good supply of steam coal or ample inexpensive hydroelectric power, (3) skilled laborers to work in the factories, (4) capital with which to buy raw materials and to pay the workers, and (5) good markets, either close at hand or accessible by cheap transportation. These needs, separately and as a group, are fairly well met in this region. Although coal is not mined in commercial quantities within the region, large amounts are taken from mines which are entered from the escarpment separating the Great Valley and the Cumberland Plateau. Likewise, most of the iron ore produced in the state has been taken from a narrow belt lying along the base of the same escarpment. Mining and quarrying within the region are limited mainly to marble in the Knoxville district; zinc at Mascot; limestone for cement at Kingsport, Knoxville, and Chattanooga; aluminum in Hamilton County; and clay for bricks and pottery around all the larger urban centers in the region. The chief raw material that is brought into this region from a long distance for manufacturing is bauxite from Arkansas and South America. Streams rushing down the steep escarpments on each side of the valley, as well as the Tennessee River itself, have been harnessed for producing cheap hydroelectric power. This power is carried to the manufacturing sites over transmission lines. Even though the forests of the valley floor were sufficient for producing raw material for the woodworking plants in the past, they are no longer able to meet these needs. Many of the high round-top hills and elongated ridges are still forested, but much of the raw material for the woodworking plants now comes from the two adjacent mountain regions, where isolation has retarded the cutting of the timber.

Among the many types of factories present, the most important include the textile, metallurgical, woodworking, food, aluminum, and cement establishments. Types of manufacturing of lesser importance include the copper, zinc, and marble plants. Since manufacturing requires a large number of workers but relatively little land area, most of it is localized in urban centers. Consequently, land utilized for manufacturing and for urban centers will be analyzed jointly. Urban centers in this region consist of Chattanooga in the lower part of the valley with 120,000, Knoxville in the Central part with 105,000, and Johnson City in the upper part with 25,000. Kingsport and Bristol, each with 12,000 people, are also located in the upper end of the valley. Cleveland, Elizabethton, Morristown, Greeneville, Athens, Alcoa, and

Maryville each has between 5,000 and 10,000; and Harriman, Lenoir City, Etowah, Rockwood, Newport, and Loudon each has between 2,500 and 5,000 population. Regardless of which factor is the "cause of" and which is the "result of," the region contains more urban population and more manufacturing than any other region in the state.

Chattanooga, the largest city in the region, is located in the southern end of the valley at the point where the Tennessee River cuts its way through Walden's Ridge to the west. Although it is surrounded by Missionary Ridge and Signal, Lookout, and Raccoon mountains, it stands opposite gaps and passes in the mountains, which make it highly accessible by river, railroad, and highways, and therefore the second most important transportation center in the state. The fertile soil around the city produces excellent crops of fruits, vegetables, and forage crops for poultry and dairy cattle. These products, together with the coal, waterpower, and raw materials previously described, have been highly instrumental in making possible the development of an important manufacturing center. The metallurgical industry is the leading one in the city, and in the heavy metallurgical factories are made boilers, sawmill outfits, oil well machinery, hoisting machines, coke shovels, hay balers, sewer pipe, and bath tubs. In the light metallurgical factories are made hundreds of small metal implements. Back in the predepression days when considerable iron ore was mined at Dayton, Rockwood, and La Follette, the city was an important smeltering center, but during the last few years this industry has dwindled to insignificance. The textile industry is also very important in Chattanooga, for it has several large hosiery mills and is said to be the largest mercerizing city in the South. With the gradual and continued shift of a larger and larger part of the textile industry southward from New England to the Middle Atlantic States, it is expected that the textile industry of Chattanooga and other urban centers in this region will increase in relative importance. The woodworking plants produce lumber, building materials, furniture, and iceboxes. Owing to the passing of much of the better timber, woodworking factories which produce primary materials are on the decline; whereas those making high-priced finished goods such as furniture, cabinets, and finishing materials are holding their own. The leading chemical products are patent medicines. Factories for which electrical power is better suited than steam receive their power from the hydroelectric plants on the Tennessee and Ocoee rivers not far away. On the periphery of the city is the Signal Mountain Portland Cement Company, which is one of the largest in the state. At this site, limestone, shale, and clay; coal for fuel; and a city market are all found close together. Clark states that "the manufacturing output of Chattanooga is almost as large and valuable as that of Memphis, and, in

proportion to size, it is the most progressive industrial city in the state."[19]

Chattanooga is the commercial center for the lower end of the region as well as the adjacent part of Georgia. The principal retail and wholesale part of the city stretches along two north-south streets just south of the point where Market Street bridge spans the Tennessee River and where the banks of the river become considerably lower. This site was conveniently located for receiving and shipping freight by water in the early days and was easy to reach from either side of the river. The old residential part of the city occupies the lowlands, while the newer residential subdivisions are climbing up the slopes of the surrounding highlands. The former is characterized by a gridiron street pattern, whereas the winding and irregular street pattern of the latter bespeaks a different type of relief. Important among the institutional lands are those utilized by Baylor and McCallie preparatory schools and the University of Chattanooga.

Near the geographic center of the region is Knoxville, located at the point where the French Broad and Holston rivers converge to form the Tennessee. Within a radius of 100 miles of the city are much of the best farming land of the state and virtually all the raw materials of East Tennessee. Accordingly, Knoxville has developed into an important manufactural center. In fact, the district of which Knoxville is the industrial center is referred to as the "Ruhr of America." The textile industry in which 11 per cent of all gainful workers are employed takes the lead, with hosiery and underwear knitting mills holding first place. In other textile mills are made cotton yarn and articles of clothing. The metallurgical plants make coal mining machinery, furnaces, stoves, plows, and structural iron and steel. From the standpoint of labor, the textile mills are parasitic in nature on the metallurgical industry for many women and girls, whose husbands and fathers are employed in the iron and steel works, are employed in the textile mills at minimum wages. The woodworking plants manufacture lumber, veneering, building materials, furniture, cabinets, caskets, and boxes, and correspondingly the food mills manufacture flour, meal, and feed for live stock.

The excellent quality and abundant quantity of crystallized limestone underlying much of the region have given rise to a marble industry of great magnitude. Tennessee stands second both in quality and quantity of marble produced in the United States. Because of the proximity of the principal quarrying district, Knoxville has developed one of the largest marble-finishing and polishing plants in the country. From this plant marble of various colors is shipped to all parts of the United States for structural, ornamental, and monumental purposes. Although the output of Tennessee marble during

[19]F. A. Clark, "Market Areas of Tennessee," *The Tennessee Teacher*. Vol. IV (1936), December, p. 20.

the depression years amounted to less than a million dollars, nearly seven million dollars' worth was produced in 1929.

Owing to the central location of Knoxville in a region with highly productive soils and abundant natural resources, it has become a commercial center of marked importance. The retail and wholesale establishments not only supply the people within the city but also those throughout the surrounding trade territory. Likewise other commercial concerns collect agricultural products and raw materials from the same territory. Important among the institutional lands of Knoxville are those utilized by the University of Tennessee, and the central officers of the Tennessee Valley Authority. Other undescribed land uses are not unlike those in the other three large cities of the state.

Johnson City and Elizabethton, whose limits almost touch, are located in the northern end of the region near the center of what is known as "Happy Valley," immortalized by the Taylor family, two sons of which served as governor of Tennessee. These towns are rapidly becoming commercial and industrial centers of prominence as indicated by the fact that Johnson City doubled in population between 1920 and 1930 and Elizabethton more than trebled her population. The extremely fertile soil and other natural resources of Happy Valley have much to do with the high purchasing power of the occupants of the region, and this in turn is the answer to the commercial importance of the towns. Of first rank among the manufacturing establishments are the woodworking plants. Johnson City, by virtue of its location relative to hardwood forests, is the third largest hardwood center and market in the state. The large Glantzstoff Corporation, which produces rayon from wood pulp, owes its location to an abundant supply of soft wood timber. The large flour and feed mills get their grains for raw material from nearby farms, but the huge Bemberg Corporation must import the cotton linters which it manufactures into a high-grade silk yarn. The value of cotton linters per unit of weight, however, is such that the raw material is a minor factor in the location of the factory. Neither of these towns is without its educational facilities, for Johnson City contains one of the three teachers colleges of the state, and on the outskirts of Elizabethton is Milligan College with its beautiful campus overlooking Watauga River.

The next two towns in size in this region are Bristol and Kingsport, each located on the northern border of the region. In fact, nearly half of the 21,000 people in Bristol live on the Virginia side of the boundary line. This town functions chiefly as a commercial, residential, and educational center. It is the home of King College. Because of the commercial role it has acquired, it is referred to in the literature of the state as "The Shopping City of the Appalachians." Kingsport, located on the banks of the Holston River just below the point where it is joined by the Watauga, also doubled its population

between 1920 and 1930. The most unique feature concerning this town is that its street pattern and land uses were all planned at the time it was first laid out. Accordingly, it is far more beautiful than the average town of its size. Kingsport is primarily an industrial town, for its growth is closely geared to the Borden Mills, Tennessee Eastman Corporation, and the Kingsport Press. The Borden Mills manufacture cotton cloth for the binding of books; and the Kingsport Press, which makes its own paper from pulp ground from its own forests, is said to be one of the largest book publishing establishments in the world. That the Tennessee Eastman Corporation, which manufactures chemicals for the Eastman Kodak Company, operates one of the largest distillation plants in the country also reflects the abundant supply of forest products in the surrounding countryside. Since 1920, when it took over its plant from the Federal Government, it has made a phenomenal growth. Today the plant has 78 buildings spaced over 375 acres of land, in addition to its 40,000 acres of timber land.

Cleveland, Morristown, Greeneville, Athens, and Maryville are all county seat towns, each with a population of between 5,000 and 10,000. These towns are surrounded by rich agricultural land, and therefore each is a collecting and distributing center for agricultural and commercial products. The poultry industry of Morristown and the tobacco business of Greeneville are commercial items not only of local but also of regional and inter-regional importance. Each of these towns also has industrial plants, which, in the main, depend on raw material from the surrounding countryside. Cleveland has more than a score of factories, including a large stove and range plant and mills for manufacturing woolen goods. Important institutional lands in these towns include those utilized by Maryville College at Maryville, Tennessee, Wesleyan College at Athens, and Tusculum College at Greeneville.

Alcoa, a town of slightly over 5,000, differs in function markedly from those just described. It is located just north of Maryville in Blount County, near the point where the Little Tennessee River reaches the flat lands from the steep slope of the Unaka Mountains, and owes its growth to the location and development of one corporation, the Aluminum Company of America. The industrial importance of Alcoa is reflected by its name, a name formed by grouping the first letters of the name of the company. About one-third of the virgin aluminum produced in America is smeltered at Alcoa. The bauxite ore, from which the pig aluminum is made, comes from Arkansas and South America to St. Louis, where it is changed to aluminum oxide, and from St. Louis the oxide is taken to Alcoa. Cryolite, which is used as a flux, comes from Greenland. Why bring heavy raw materials from afar to Alcoa to be manufactured? The answer is cheap waterpower. The company built three dams across the Little Tennessee River where the gradient is steep, and installed at each site a large dynamo for converting mechanical power into electrical power.

This electrical power is transported over transmission lines to Alcoa where it is used in the smeltering plant, carbon plant, sheet mill plant, aluminum bronze powder plant, and a plate mill. All these plants are owned and operated by the Aluminum Company of America, which employs more than half of the gainful workers of the town.

Harriman, Lenoir City, Etowah, Rockwood, Newport, and Loudon are small towns with populations ranging between 2,500 and 5,000. Newport and Loudon are county seat towns and function accordingly. It will be recalled that Rockwood is a mining and iron smeltering town located at the foot of the escarpment which forms the eastern side of the Cumberland Plateau. Although the smeltering industry has been insignificant during the last seven years, Rockwood has been one of the three most important smeltering centers in the state. Harriman, located opposite a pass in the Cumberland plateau where two railroads cross, is a route center. Lenoir City, located on the north bank of the Tennessee River, near the point where it is crossed by the main Chattanooga-Knoxville highway, is also a route town. It is located in a rich agricultural region, and therefore functions as an agricultural market. The industrial development of Lenoir City is closely related to the fact that it is a river town. It has plants for manufacturing railway cars, cotton goods and hosiery, lumber, tool handles, and shuttles; and mills for making flour, meal, and feeds. Mascot, in Knox County, is primarily an industrial town, and is said to have the largest ore crushing plant in the South for the production of zinc. The plant secures its zinc ores from the "Knox dolomite" formation, where geologists believe the sediments were deposited by waters of meteoric origin.

In a highly developed region like the East Tennessee Valley a relatively high percentage of transportational lands are to be expected. The Tennessee River south of Knoxville has been navigable for small boats and barges, and logs and small river crafts have been floated down many of the tributary streams. The Tennessee Valley Authority is now constructing a dam across the Tennessee at the Chickamauga landing, a few miles north of Chattanooga, and present plans of the Authority call for the construction of similar dams at Watts Bar and Coulter Shoals. The completion of these dams with other similar ones downstream will give a nine-foot channel from Knoxville to the Gulf of Mexico. The railroad net is closely spaced with three main lines running parallel throughout the entire length of the region. Chattanooga and Knoxville are the two principal rail centers in the region with the Johnson City-Elizabethton foci next in importance. The density of the highway net is equally as great as that of the rail pattern. The trellis pattern south of U. S. 70 contains four parallel roads which runs lengthwise of the valley. North of U. S. 70 the highway net becomes more dense but the pattern is highly irregular. The variation in the road pattern reflects the variation in surface configuration—a configuration where elongated ridges rise two to

three hundred feet above the valley floor in the southern part, and where irregular spaced and round-top hills of similar heighth stand out in the landscape of the northern part. Owing to the mountain barriers on each side of the valley, transportation line, both highway and rail, tie the region with Virginia to the northeast and Georgia and Alabama to the southwest much more firmly than to the adjacent regions of the state on the east and west.

The Forest-Mining Belt

The Forest-Mining Belt is a long narrow strip which extends along the eastern boundary of the state, and is coextensive with the physiographic province known as the Unaka Range (Figs. 5, *D* and 5, *E*). It will be recalled from a description of the preceding region that approximately half of each of the ten counties bordering North Carolina is in this region, and that the other half of each is in the Manufacturing and Commercial Farming Region. The exception to this general statement is that virtually all of Unicoi County and about three-fourths of Polk County are in the Forest-Mining Belt. Data are not available for depicting exact population conditions and specific land uses of this mountainous belt, but it is possible to study the data of Unicoi County as a sample of the entire region. The density of population of this county, not including the town of Erwin, is 45 per square mile. Reconnaissance field work indicates that this density is considerably above that of the average of the entire region. The sparse population reflects the highly mountainous condition of the belt, and the distribution pattern indicates that the most favorable places for man are along the foothills and in the small coves and valleys which extend back into the mountains (Fig. 9, *B*). In most cases, the homes and land holdings of these mountain people are small, and meat secured by hunting and fishing forms a considerable portion of their diet.

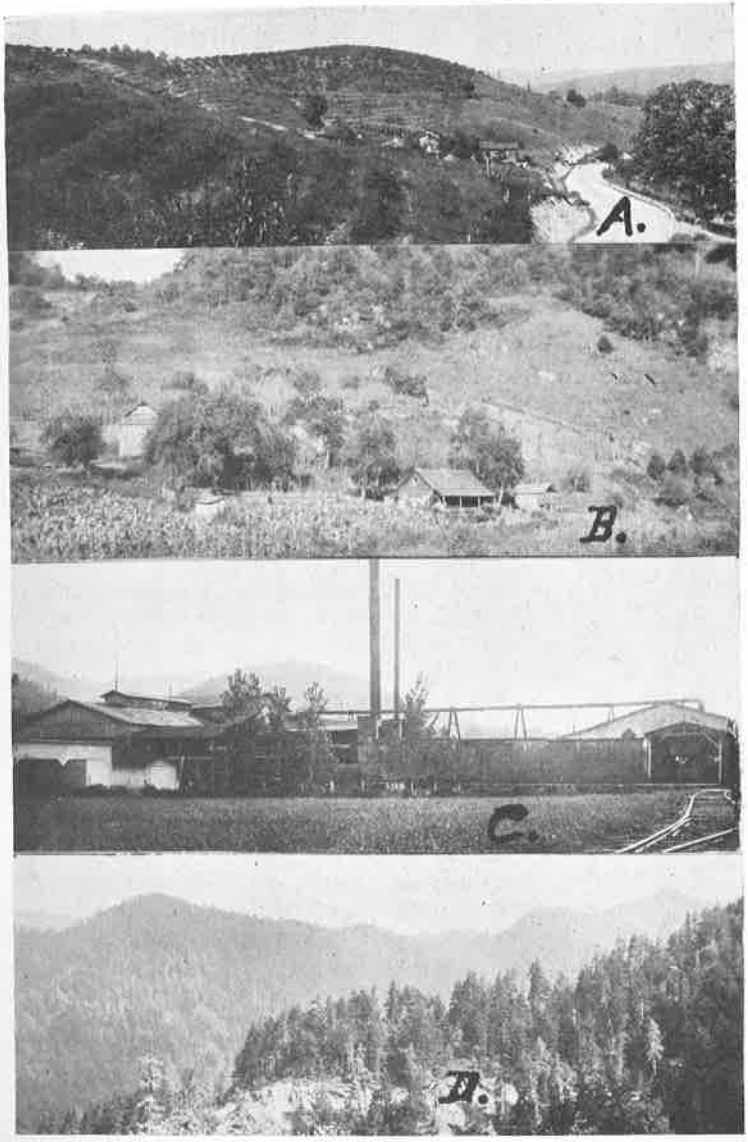
The ratio of Negroes to the total population is only one-tenth of one per cent, a figure probably not far from the average of the region, and one which represents a subsistence type of livelihood. Unicoi County has 34 per cent of its land in farms, and 9 per cent in cultivation, but it is believed that these figures are too high for the entire region. These ratios help to explain why only a third of all gainful workers in Unicoi County are engaged in agriculture. Of the farm land in this county, about 40 per cent is in woods, 28 per cent is in cultivation, 28 per cent is in pasture, and 4 per cent is utilized for other purposes. Of the cultivated land, 25 per cent is in corn, 20 per cent is in hay, 4 per cent is in wheat, and 2 per cent is in tobacco. It is believed that this crop combination is quite representative of the cultivated land throughout the belt, except in Polk County, where 19 per cent of the cultivated land is in cotton. With the exception of cotton, virtually all the remaining acreage is used for producing subsistence

crops. Agricultural products are not sufficient to meet local needs, for, although the total live stock units per square mile are only 14, these animals must obtain a considerable portion of their forage from indigenous vegetation.

The Unaka Range is a westward extension of the Blue Ridge. This mountain system is very old and erosion has been working on it for a long time. Although the tops of many of the mountains have become somewhat rounded, they are covered with forests. On the higher parts of the mountains are virgin forests and on the lower parts are second-growth forests, a situation which shows that man satisfies his needs in the most accessible parts first. While the region contains both coniferious and deciduous trees, considerably more of the deciduous trees have been cut, for, in general, they grow on the lower slopes of the mountains. More than 150 square miles, however, lying along the crest of the Unaka Range contain virgin timber which has never been molested by man. The principal woodworking establishments found in the region are sawmills, which rip the huge logs into lumber of desired measurements. Townsend, twenty miles east of Maryville, is a good example of a sawmill town (Fig. 9, *C*). It is located at the base of the escarpment, where gravity may be taken advantage of in bringing the logs to the mill. A branch railroad line has been built to the town from Maryville, over which lumber is started on its way to Knoxville and other markets in the valley. The slabs, edgings, and other waste material from the logs are shipped away to be ground into paper pulp. In addition to the lumber industry, charcoal, tanbark, dye wood, and wood pulp industries have thrived on the soft and hardwood trees of the region. The finest timber lands in the region today are located in the most inaccessible places. Consequently, devising plans for transporting fine saw logs from precipitous cliffs to accessible roads in the valleys below have taxed the ingenuity of the most skilled loggers of these mountain forests.

The value of all the forest land of this region, however, is not determined by the amount of commercial products it contains, for the best use of much of the Great Smoky Mountains is for recreational purposes. Fully cognizant of this use, the Federal Government passed an act in 1926 which provided for the purchase of 200,000 acres of this mountain land for establishing a National Park. Tennessee and North Carolina each contains about an equal amount of the park area. The park lands are high, rugged, covered with forests,

Fig. 9. *A*, West side of East Tennessee Valley, one mile east of Kingston. The steep slopes have been terraced and are utilized for peach orchards. *B*, Small mountain form in Forest-Mining Belt, ten miles east of Erwin. Note particular location of tobacco, corn, pasture, and woods lands. *C*, Large sawmill at Townsend, located at the foothills of the Unaka Range, twenty miles east of Maryville. *D*, Great Smoky Mountain National Park. Looking west from Tennessee-North Carolina line, thirty miles east of Maryville. The dominance of coniferous trees bespeaks the high altitude at this point.


A.
B.
C.
D.

and lie in the heart of the Unaka Range. Since they have been changed but little by man, they still contain their virgin plants and wild animal life. There are known to exist in the park more than 150 varieties of trees, and the great variety of wild animals are sure to remain, for they can be hunted only with a camera. The gentle-eyed deer and the curiosity-prompted bear are to become friends, rather than victims, of man in this area where the air is perfumed with the fragrance of the wild honeysuckle, rhododendron, sand myrtle, and mountain laurel which border the roaring streams and beautiful waterfalls that are never to be harnessed by man. The crest of the mountains stand about 6,000 feet above sea level and approximately 5,000 feet above the valley floor below (Fig. 9, *D*). Mt. Le Conte reaches its head 6,595 feet high, Mt. Guyot 6,621 feet, and Clingman's Dome, 6,642 feet. Because of the high altitude of the park, it is referred to as the "Land of the Sky." The park is today an important summer resort, for it is visited annually by more people than any other National Park in the United States. To make it more accessible to tourists, a 100-mile scenic highway has been built from Knoxville. The most beautiful part of this circular route lies within the limits of the park where the right-of-way follows the gorge-like canyon of Little River. Leading from this scenic highway near Gatlinburg is the Newfound Gap road, which leads to the top of the mountain at the Tennessee-North Carolina line.

The metallic minerals of this region are limited largely to iron ore and copper. The iron-ore belt extends along the base of the escarpment, but veins occur in pockets whose amount and character are very uncertain. Accordingly, the cost of mining has been high and the output small. Owing to the relatively small output as compared with the iron belt lying on the opposite side of the valley, most of the ore has been shipped away for smeltering. No ore has been mined in this belt during the last decade, and, in fact, its commercial importance has always been rather insignificant as compared to the belt at the foot of the Cumberland Escarpment.

The copper center of this region lies in the southeast corner of Polk County. The ore occurs in the Ducktown Basin, a basin four miles wide and six miles long. The ore bodies range from a few feet to 300 feet in width, and have been mined to a vertical depth of 1,600 feet. Two companies, the Tennessee Copper Company and the Ducktown Chemical and Iron Company, are now operating in the basin. Operation first began in 1847, but the output was very small during the first 40 years owing to the lack of cheap transportation. The completion of a railroad into the region in 1890 marked the beginning of the period of heavy production. The value of copper produced in the region in 1935 was a little more than a million dollars, or a little less than half the amount produced in 1929. This region is so mountainous and poor that little was said for a long time about the sulphur fumes which were allowed to escape from the copper smelter-

ing plant and to kill the trees and grass. After all the vegetation had been killed for quite a distance away, and great gullies began to form on the steep slopes, steps were taken to do something about the escaping poisonous fumes. The problem was finally solved by using the sulphur fumes for manufacturing sulphuric acid. This by-product industry soon proved to be a very valuable one and in 1935 it brought into the treasury of the producing companies one and one-half times as much money as the copper itself. Much of the sulphuric acid is used in phosphate plants for the production of commercial fertilizers. Since the poisonous sulphur fumes have ceased to be turned loose in the air, vegetation is slowly reappearing in the basin, but it is still classed as one of the largest man-made deserts in the country.

The only urban center in this region with more than 2,500 people is Erwin, the county seat of Unicoi County, which has a population of about 3,600. This town is located on the Nolichucky River at a point just above where it cuts through a big ridge to enter the Valley of East Tennessee. Erwin is a route town, for the valley of the Nolichucky is one of the few places where both highway and railway have been able to ascend the escarpment from the Valley of East Tennessee. By virtue of its location relative to an abundant supply of fine timber, Erwin is an important woodworking center. In the vicinity of the town is a type of clay used for making fire and building brick, and lower grades of pottery and porcelain wares. Ball clay from the Paris district in West Tennessee, and kaolin from the southern states are shipped to Erwin to be used in making the higher grades of pottery and porcelain wares. The ceramic industry at Erwin has had a gradual development and today this little mountain town is one of the leading centers of its kind in the South.

Land used for transportational purposes in this region was nil until the forests and mines began to be worked. A marked development in transportational lands, particularly highways, has gone hand-in-hand with the development of the region for recreational purposes. The state and national governments have cooperated in the highway program, and today the crest of the Great Smokies, as well as many other places of interest in it, may be reached easily by automobile on fine roads free from tolls. Cambria, Newport, and the Johnson City-Elizabethton foci are the points from which railroads ascend the escarpment of the Unakas.

Trends in Land Utilization

As might be expected, the use of land in Tennessee is not static but dynamic. A summary of this dynamic factor helps to show the trends in various land uses of the state. First of all, the land in farms in 1930 was only 88 per cent of what it was in 1900. This percentage will be reduced still further with the completion of the submarginal land program in the state. In the allocation of farm

land the ratios of cultivated land and pasture land have become slightly smaller, for there was an 8 per cent increase in number of farms during this period. Of the six main crops in the state, the hay, tobacco, and cotton acreage increased during this 30-year period, 126, 115, and 68 per cent respectively. Conversely, the corn, wheat, and oats acreage decreased 20, 81, and 87 per cent respectively. The phenomenal increase in the acreage of tobacco and cotton reflects on the part of the farmers a marked trend from subsistence to commercial crops. This trend is also portrayed through the change in hay acreage, for the increase in it is commensurate with the increase and growth of the live stock industry, an industry which during the last third of a century has become more and more of a commercial nature. It is not difficult to see why corn, which was grown partially as a commerical crop before tobacco, cotton, and live stock attained their present commercial prominence, has decreased in acreaage approximately one-fifth. Patently, this change in corn acreage has not been uniform over the state, for the greatest decrease has been in the tobacco and cotton areas. The most marked decrease in crop acreage in the state has been that utilized by the small grains, wheat and oats. In 1910 there were from two to a dozen binders and one or more threshing machines in every good farming community in the state. At present wheat and oats cannot be grown for seed in the majority of these same communities, owing to the lack of these farming implements. It is rather difficult to establish satisfactory reasons why the acreage in small grains has decreased so much. Certainly one reason is found in the age and population of the state, for wheat, particularly, is an extensive crop more often found along the frontier of a young country with a sparse population than in an older one with a medium to dense population.

The number of live stock units of horses, mules, cattle, and swine in 1930 was only 92 per cent of what it was in 1900—a situation explained in part by the invention and use of the internal combustion engine. The number of horses and swine was, in each case, only about half what it was at the beginning of the century, whereas the number of mules increased 26 per cent and the number of cattle 17 per cent. The horse has served the farmers of the state as a riding and buggy animal as well as a farm animal, while the mule has served him exclusively as a work animal on the farm. Thus it follows that while the horse has been replaced to a considerable degree by the automobile, the number of mules has increased in spite of the increased sales in tractors and trucks. The trend from swine to cattle in the food animals is in harmony with a decrease in corn land and an increase in pasture land. Furthermore, it is in accordance with the recent growth and development of the dairy industry of the state, and with a change from pork to beef in the diet of many rural people, partly as a result of the rural electrification program.

Another change in the land utilization of the state is closely related to the population growth and to the urbanization movement. In 1900 the population of the state was 2,020,616, but by 1930 this figure had increased 29 per cent. The ratio of people living in towns of more than 2,500 people in 1900 was 16 per cent, whereas in 1930 it was 34 per cent. As in most other cities of our country, the growth of urban centers in Tennessee may be attributed largely to the growth and expansion of the commercial and manufactural activities in the state. The actual amount of urban acreage is still small as compared to the rural acreage, but, with one-third of the total population of the state crowded on these small areas, the value, intensity of usage, and relative importance of each acre are many times that of the rural land.

The changes in land utilization most likely to occur in Tennessee during the next decade are changes which will be in harmony with the new conservation program inaugurated by Governor Browning, and the land planning program effectuated by the Tennessee Valley Authority. If the state planning and conservation program is to be a success, a complete survey of the state must be made in order to determine for what use each acre of land is best suited. With this information at hand, state, county, and local authorities should be able to work out a cooperative plan whereby more and more of the land in the state may be made to produce the greatest possible yield for the largest number of its inhabitants.