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PROBLEMS CREATED BY THE DOUGLAS RESERVOIR IN EAST TENNESSEE[1]

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Douglas Dam is on the French Broad River, 33 miles upstream from Knoxville, and lies in the great valley of East Tennessee. It is one of the chain of lakes built by the Tennessee Valley Authority on the Tennessee River and its tributaries. The gates of Douglas Dam were closed February 19, 1943, less than thirteen months after its construction was authorized as a war emergency project a few days after Pearl Harbor. The speed with which the dam (202 feet high) was constructed was a record for a project of similar magnitude. This provided a short period for the people (525 families) of a rather densely populated agricultural area to relocate and readjust. One hundred and thirty-nine tracts were possessed four months after Pearl Harbor.

Probably no reservoir construction project in Tennessee received more resolute resistance on the part of local agricultural and food processing (canning) interests. The major individual holdings within the reservoir were those of large canning corporations used for growing vegetables. There was tile drainage and overhead irrigation systems on part of the area. During the confusion and uncertainty of the land acquisition and family relocation period, long-time considerations of soil conservation, such as they were, were thrown to the winds by the inhabitants. Many of the owners of remnant tracts felt that the Tennessee Valley Authority would buy all the reservoir border lands sooner or later anyway. This type of thinking is still being expressed in the area.

The land acquisition policy for the Douglas Reservoir project provided in general that the purchase of lands for reservoir purposes should be limited to the zone of reservoir fluctuation. The costs of road replacements were in many cases prohibitive and several times the value of the lands to be served. Access damage releases were secured to relieve the Tennessee Valley Authority and the county from further liability.

The reservoir created by Douglas Dam is 43 miles long and of highly irregular width because of the rough terrain, but it averages

[1]Acknowledgement is made to Loyal Durand, Jr., Professor of Geography, University of Tennessee, who gave valuable editorial assistance.

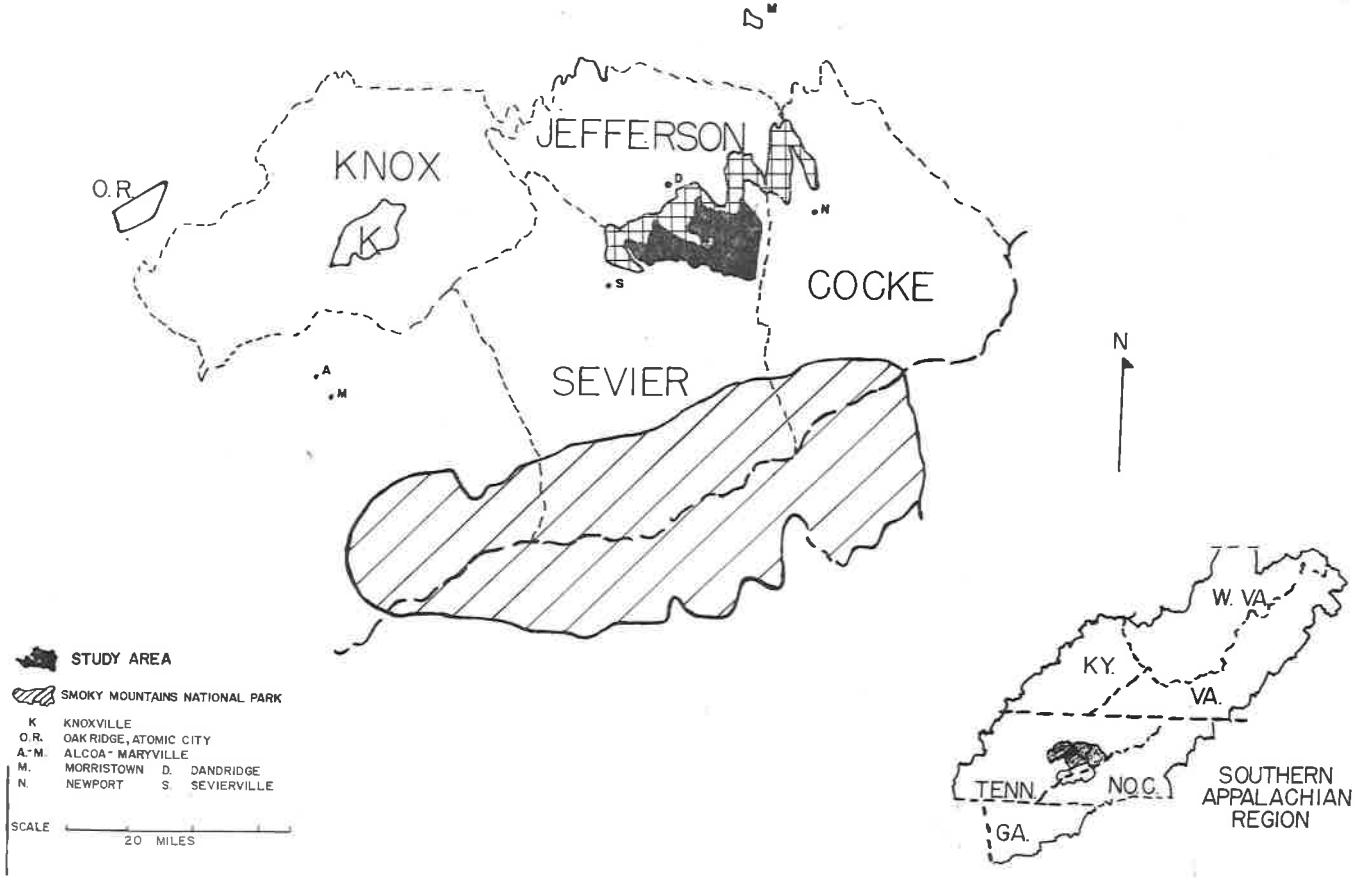

Fig. 1. Location of Study Area Bordering Douglas Reservoir.

about one and a half miles (Figs. 1 and 7). Numerous embayments enter tributary valleys, some of these being as long as eight miles. Furthermore, because this is mainly a storage reservoir, the surface fluctuates widely; on only rare occasions is the water at top level, and usually it is as much as 60 feet below the maximum possible; this results in fragmentation of landholdings by water at some times, and by a dry (but unusable) lake bed at other periods. Attempts to grow crops such as corn on the exposed lake bed involve considerable risk since the highest water levels of the year usually come in the early summer during the main growing season. Pumping water from the lake for irrigation has been carried on where some terrace land occurs near the lake above maximum pool level, but a receding water level on gently sloping shore lines late in the season poses a problem. For the most part steep shore lines preclude irrigation.

The Problem Area under Consideration— The Shale Hills on the South Side of Douglas Reservoir

A cross section of the French Broad Basin above the dam from

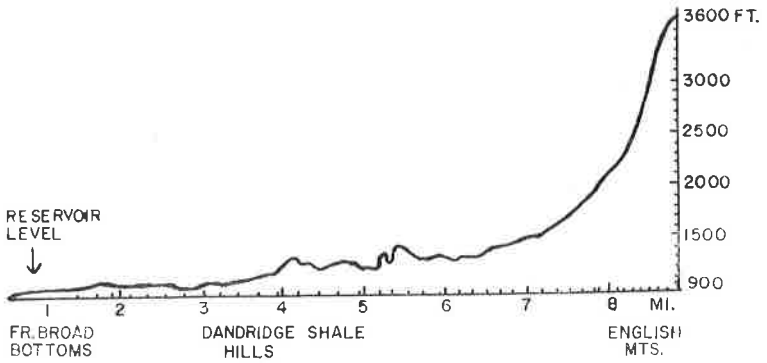

Fig. 2. Profile of South Douglas Reservoir Border Lands (Between Swann Island on the French Broad and highest point on English Mountain).

north to south shows (1) a belt of dolomite limestone north of the river, (2) a four to six mile belt of shale hills south of the river, and (3) a one to two mile steep (1,000-2,000 ft.) slope of resistant sandstone, quartzite, and conglomerate farther south known as English Mountain (Fig. 2).

The part of the border lands constituting the problem area is on the south side of the reservoir, comprises the shale section, contains 46,000 acres and about 2,000 inhabitants. The shale hills are erosion remnants, locally known as the Dandridge Knobs. They are exceedingly steep but are smoothly contoured and frequently symmetrical in profile (Fig. 3).

The peculiar problem-creating character of the soil lies in its high lime content which extends at even greater concentration into the subsoil and underlying raw shale. It naturally supports a good cover of blue grass and white clover. The inherent fertility of the soil gives

rise to problems because it has attracted cultivation of slopes too steep to hold unprotected soil. Its relative adaptability for pasture or forestry has never fully been resolved. Rapid siltation of the reservoir is also going on (Fig. 6).

The shale hills have never constituted a rich agricultural region. However, their problem became more severe with the construction and filling of the reservoir because: (1) rich flood plain and lowland soils, threading their valleys, were flooded; (2) the French Broad bottomland areas of the shale-knob farms were flooded; (3) the farms were left smaller in size (especially near the reservoir boundary); (4) the farms were fragmented by embayments; (5) neither the Tennessee Valley Authority nor the counties constructed access roads to the remaining farms (the former roads in the valleys were flooded) nor to the fragmented sections of the farms; (6) valley population, in part, was crowded to the knobs.

In summary, the reservoir has profoundly affected and complicated adjustments in the area. The situation was aggravated by the speed

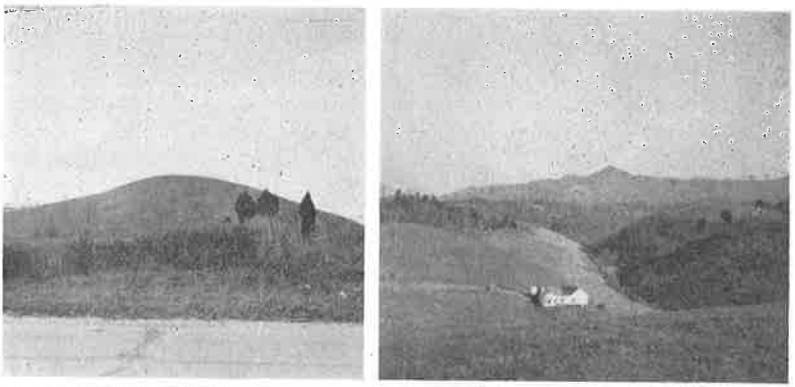

Fig. 3. Typical Dandridge Knob topography. Single knob in left background merging with terrace plain in foreground. Series of knobs on right, English Mountain in background.

of acquisition and the limitation of purchase area. Although a sincere effort was made to take care of obligations to the individual owners, provision for problems of future land use and settlement was not made. The remaining farms not purchased were left in irregular shapes and in many instances cut into several parts by projections of the reservoir. Access was impaired or totally destroyed, and there was very little land for growing crops (Fig. 4). On some of the peninsulas the average size of remnant tracts is 29 acres, one-third of the state average size of farm. We have the spectacle of uneconomic remnant tracts with houses on them inviting occupation.

Differences between the Northern and Southern Borders of the Reservoir

The problems of the shale hills south of the reservoir are at present

Fig. 4. Examples of peninsular isolation. Penetration of border lands by projection of reservoir. Abandoned highway is visible below foot bridge. The farmer in the boat is marketing condensery milk under difficulties.

in large part the result of the building of the reservoir, although the area has always faced certain natural handicaps.

In the first place, the reservoir functions as a barrier to the people south of it but not to those north of it, since the south side is on the opposite side of the lake from the Knoxville Metropolitan Area toward which the economy of both sides is oriented. As a result, accessibility of the north shore line has not been diminished. This is the side most in demand for resort and recreation purposes. Lakeshore frontage lots are held at premium prices.

Then there are physiographic differences. Bedrock of dolomitic limestone north of the reservoir through solution has permitted considerable underground drainage through caverns; this arrests surface run-off and dissection. The shale area is greatly dissected and badly eroded. Backwardness and inaccessibility of the area south of the river is sensed by the people north of the river when they refer to their neighbors from across the lake as coming from "South America."

The Shale Knob Problem Area South of the Reservoir

The Dandridge Shale Knobs have been under study by the writer since the creation of the reservoir. The area is a small sample of the hill lands of the Southern Appalachians, which have many common problems even though it lies in the Great Valley. Furthermore, added to the scene are the problems resulting from the building of the reservoir. Since 1950 study of the area has been made in co-operation with the Tennessee Valley Authority. A major aim of this cooperative study has been to consider various alternatives open to the people of the area.

The first phase of the study dealt with agricultural and industrial potentialities within or near the area. Budgetary analysis of a sample of farms showed considerable room for improvement of incomes. However, considering the number of people and the rising standard of living, any improvement possible under existing conditions would not be adequate. There was question then as to the stability of the canning industry after reservoir flooding. A census of employment was made which showed non-farm income about equal to farm income. There was some commuting to factory work in Knoxville and Alcoa, each 50 miles away.

This area is not far from the section known for moonshine stills, but in the study area itself there was no evidence of such activity. It does not compare with nearby mountain section for forest cover or mountainous topography. The Newport, Tennessee, area, which includes the study area, has been classed as a surplus labor area by the Atlanta Bureau of Employment Security.

The second phase of the study considers the alternative of the people in adjusting their local economy to that of the nation as a whole, which for most of them means response to the national labor market through migration. It is predicated on the hypotheses that the rate of adjustment has been slow and retarded, that the slow response

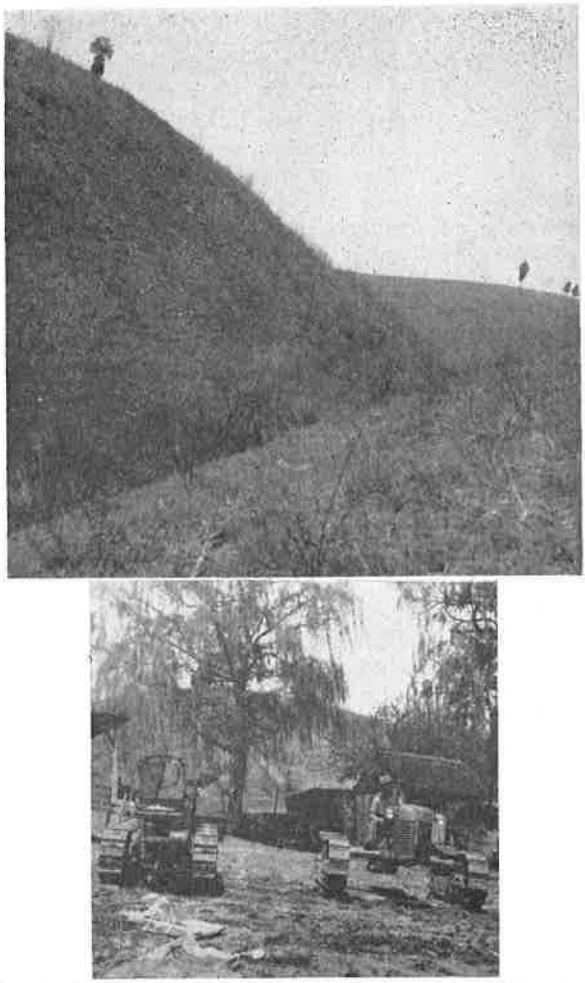

Fig. 5. Slope limitations on use of farm machinery on Dandridge Knobs. 65 per cent slope above; 50 per cent slope below. Cattle trails on the contour, "catwalks," are visible on the above slope. For use on 50 per cent slope narrow tread "baby" caterpillar tractor had to be discarded in favor of crawler wide-base type Oliver.

has been associated with a cultural orientation of the people, and this in turn is partly traceable to geographical isolation and certain physical limitations.

Two alternative objectives of resource organization and use considered for steep lands in the area were pasture or forestry. Forestry requires purchase of land in large blocks, scarcely feasible with present values attached to the land. Organization for pasture-livestock production has some physical difficulties to be overcome. Thus, in the study, and in the shale knob area itself, the dense human

population is an ever-present factor which cannot be overlooked, and the local population pressure is such that it must always be taken into account in planning for the wisest use of the Dandridge Knob area.

Physical Limits to Farm Consolidation

Following the creation of the reservoir one might look for eventual consolidation of remnant tracts into economic farm units. After ten years there has been little progress in this direction.

Compared with more level areas, a tremendous handicap is imposed on most farming operations in the shale knobs. Free movement of all sorts is hampered. Untold amount of extra energy is required to perform usual operations and activities connected with farming, marketing, and community life. Horse or mule-drawn mowing machines are operated today on 50% (45° angle) slopes; and if the surface is smooth, on slopes up to 60%, depending upon the courage of the rider. This sets the upper limit to pasture improvement since it is not feasible with present cost of labor to keep brush and sprouts down by hand tools which would be required on steeper slopes (Fig. 5).

Expanded acreage for livestock pasture on rough terrain brings on problems of supervision and overseeing. For instance, it is difficult to see from the farmstead what is happening to a herd of cattle or flock of sheep. Attacks of dogs, thievery, and encroachment on grazing ground is made easy. In one case, a flock of sheep on an island was discovered and exterminated by a pack of dogs which learned to swim across.

The lowland areas along the stream network once provided access routes and focal points such as farmsteads and stores for organizing the production and collecting of farm products. Flooded, they now are barriers to movement and the ridge tops are poor substitutes.

A low use of land results from limited accessibility. One peninsula without a road is growing up into brush and forest. Owners do not find it feasible to move in equipment or fertilizer. Dairying for A or B city market condensery milk production, which represents a high use in this area, has drawbacks, some prohibitive; one man took his condensery milk to the route wagon by boat for a while and then quit dairying (Fig. 4). Another, two miles from the nearest condensery route, went back to cream production. Lack of electric power service discourages milk production. Here too, where no telephone service exists, it would be impractical for dairymen to obtain artificial insemination service for breeding their cows.

Social and Institutional Disorganization Affecting Resource Use

Local farm leaders are gone who might have been counted on to spearhead farm and community improvement programs. The old economic and social structure has been so altered that the people still feel "lost" and frustrated. New alignments are forming slowly. The strips and fragments of remnant land on peninsulas are too small to

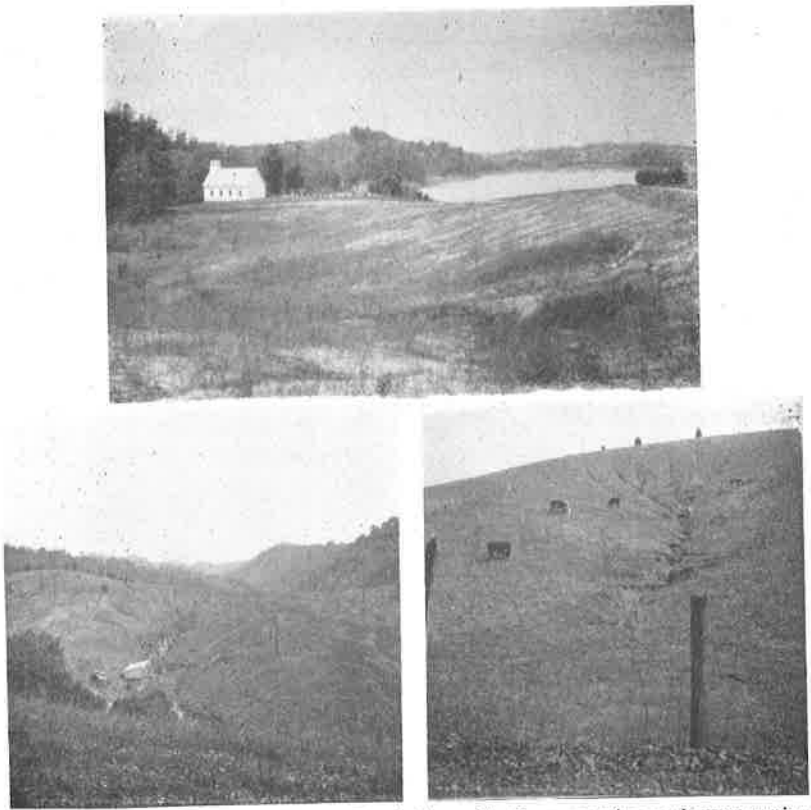

Fig. 6. Sheet and gully erosion on Dandridge soil. Over-cropping and over-grazing by cattle and pigs has contributed to removal of top soil. Partially abandoned Methodist church receives little support from flooded bottom land and eroded upland. Partially rehabilitated pasture on TVA test demonstration field at lower left.

support adequate economic and social community units. It takes a certain amount of community momentum to bargain successfully for modern facilities and services.

County lines have never been adjusted to the changed geography. For example, people on peninsular remnants of a former community now find themselves with a new community center (store, school, and church) in another county (Fig. 7). County agencies tend to neglect areas of this kind. The Soil Conservation Service which sets up districts along county lines has never been authorized to deal with the erosion problem area south of the reservoir which is shared by three counties. The rural power company serving Sevier County has not extended its lines across the county line into the peninsula belonging to Jefferson County.

Historical Background of Population Adjustments

The shale knob area, in common with many other hilly lands of the

Southern Appalachians, has been noted for a lag in speed of technological change. Historically, speed of adjustments in the study area has been partly determined by accessibility to Knoxville and other points of dynamic change such as where large factories have been established. The other factor has been certain characteristics of the people and culture which has responded slowly to outside stimuli. An industrial technician in 1880 referred to the primitive method of making iron in the nearby mountains as being due to "isolation from intimate relations with the outside world."

Before 1870 there was little geographic differentiation in the economic structure of East Tennessee, all sections having a self-sufficing economy, including Knox County where Knoxville is located. The commercial and industrial development of Knox County was very rapid after 1870, and the study area was soon to become hinterland. A landmark indicating the transition from a self-sufficing to a commercial economy was the legislative enactment in 1903 of a no-fence law. It marked the passing out of sheep for homespun woolen clothes production and the beginning of the trek of farm people to the textile mills of Knoxville and the Carolinas. The automobile appeared for the first time in the region in 1912, when in 1908 in Knoxville they were quite common.

Migration from the Shale Knob Area

The pre-World War I migration, and in fact much of the pre-Douglas Reservoir migration was to the textile mills of the Carolinas, to the textile mills and other factories of Knoxville, and to growing industrial communities such as Alcoa, Tennessee.

Whole families were moved to the Carolinas during the early 1920's. Moving expenses were borne by the mill companies which made a special effort to provide the migrants with good home living facilities and facilities for cows, chickens, and pigs. Because around 20 families were moved to one mill town at one time, home and community solidarity was largely preserved. Mills also financed movement of some families back to the area during the depression of the early 1930's.

Migration to the industrial North did not start until 1922. When it was about to gain momentum, the depression of the early thirties brought most of the migrants back home. Movement to the industrial North was not resumed until after World War II. Although the automobile factories of the Detroit area have been the great mecca, the men after a while prefer the small independent shops of the lake region.

Distance to Detroit from Knoxville, which represents the maximum radius of movement, is 540 miles, around fourteen hours driving time. Bus drivers report that London, Kentucky, 114 miles north of Knoxville, is about the southern limit of week-end commuting from Detroit. Despite this distance, men from the shale knob area, and from elsewhere in East Tennessee, still come home oftener and stay

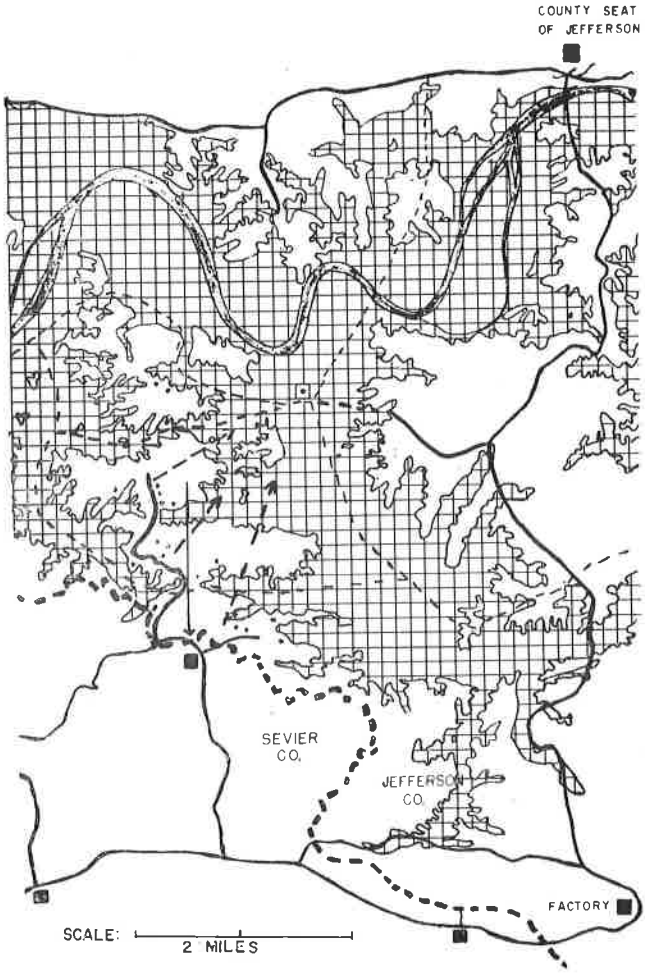

Fig. 7. Community disorganization created by lowland flooding. Inhabitants on the peninsular upland, in center of map, almost cut off by the lake, seek new community center in another county. Most of the year the lake level is sufficiently low so as to permit overland access to many of the areas which appear as islands.

longer than legitimate vacation and sick leaves permit. Absenteeism is the stigma attached to the southern worker in Detroit.

Entry is being made into Detroit by way of a boarding house owned by a young couple from the Douglas Reservoir Area who moved there in 1947. There are eight men from the area at present who live there very much at home. Others from the same area come and go making this their headquarters. The boarding house functions as a port of entry and as a disseminator of job information to the people back home. The first migrants in the early 1920's had a minimum of advance information and preparation. One man remarks that he went north in March as a boy to look for work without an overcoat or winter clothes. Knoxville has served as a stepping stone on the way to eventual industrial employment in the north.

Social distance and barriers against migrants in the cities of the industrial north are met not by "crashing the gates," but by setting up "Tennessee" social contacts outside. Adjustment problems of migrants from the Douglas Reservoir area are more difficult than those from other parts of the state where large blocks of people from communities have moved to the same destination, preserving family and community ties to some extent. The second generation of a community 100 miles to the west on the Highland Rim of Tennessee has practically moved en bloc to Detroit—the old home church is practically duplicated. Anticipating adjustment problems, the people of the shale knob area have moved as individuals or as childless couples for the most part and have little intention of making the large industrial city their permanent home.

Migration to Detroit and other cities of the industrial north has been affected by social distance as well as by geographical distance. People may be thrown together in a unit of space such as a factory or a street of a city, yet be widely separated by social or cultural barriers. The geographical distance from this area to Detroit has been more effectively transcended by the migrants than has been the social distance.

There exists in the area a mountain-yeoman complex which makes for stability of residence. This complex includes premium of present over future enjoyment, desire for certainty in expectations, avoidance of indebtedness, love of land, love of fishing and hunting, attachment to family and kinfolk, and preference for the sacred rather than the secular. Value placed on education is low, on religion high. The apprehensions of one mother are shared by many: "The farther north they get, it seems, the wickeder they get."

The attitude of a community is shown by this illustration: When given the choice by the Tennessee Valley Authority of relocation of, or a new road to, the old church and cemetery left stranded by embayments at the tip of a peninsula, the people of the community cast their vote in favor of relocation. The new road would have greatly enhanced the value of their lands remaining above the reservoir line, but the sacred in their lives predominated over the secular.

In the migration, young people from lower income groups are at first slower to adjust to new opportunities at a distance. But once a port of entry or beach head for a family or a social group is set up in the industrial city there is a minimum of resistance to continued migration within that social group. Geographical distance, important at first, thus becomes less and less a factor.

Rate of Migration from the Shale Knob Area

A check on the present location of 156 young people formerly registered in the elementary schools of the Dandridge Knobs showed that 44.2 per cent now 18 or over were still living in the community of birth. About one hundred miles west of this place, similar checks were made on 304 former pupils in two counties of the Highland Rim where land resources in relation to number of people were fairly comparable. Here the proportion remaining at home was 20.4 per cent. In other words, the area seems to be one of "retarded out-migration." Why? In large part, it is apparently owing to: (1) the mountain-yeoman complex of the inhabitants; (2) the housing and housing facilities at home, even on the present landholdings of substandard size, of a frequently fragmented form, of steep slopes, and soil of low quality; (3) geographical distance to work; (4) the social distance; and (5) the ban on small children in metropolitan apartment houses of the industrial north in association with surplus of dwellings, even if sub-standard, in the country at home—this discourages change of residence for people with large families; the adjustment to housing difficulties shows up in the predominance of relatively unattached adults among migrants.

Summary

In acquiring land for reservoir purposes a minimum amount was acquired by T.V.A. leaving a maximum amount of inaccessible upland to individuals, to cope with the problems on their own resources in an unorganized manner. This land, a problem for many years, has been further disadvantaged by the many problems stemming from isolation.

Economic separation of bottom land from upland has accentuated the problem of upland rehabilitation. Where bottom land was combined with upland in the same unit, the surplus from the bottom land was in position to provide feed for livestock in the upland and to subsidize soil conservation on the steeper slopes.

An inadequate land resource base is making it necessary for the people to intensify use of remnant land or turn to non-farm pursuits.

The original timber resource was largely removed by 1914. A high percentage of steep knobland was cleared for cultivation resulting in rapid removal of top soil. The process is still going on under excessive row cropping, resulting in unnecessary siltation of the reservoir.

Around a thousand acres of former pasture and crop land is growing up into brush and trees due to lack of access roads and

piece-meal ownership of remnants. Much more is remaining in a low use, because of poor roads, lack of power and telephones, and lack of organization among owners of remnant land in promoting a developmental program.

Rate of population adjustment to outside employment opportunities through migration has been slow. This is due in part to a mountain-yeoman complex which makes for stability of residence. The geographic distance from this area to the industrial north has been more effectively transcended by the migrants than has been the social distance.

NEWS OF TENNESSEE SCIENCE

The effects of radiation on parasites and their hosts are being studied by Dr. Arthur W. Jones and Dr. Honorico Ciordia of the University of Tennessee Zoology Department under a $7600 Atomic Energy Commission contract with the University. Dr. Jones and Dr. Ciordia are collaborating with Lt. Col. Bernard F. Trum of the Oak Ridge Experiment Station. The parasite selected for study is *Taenia pisiformis*, a tapeworm commonly found in dogs and rabbits. Since the tapeworm is constantly growing and reproducing it offers unusual advantages for studying growth and reproduction processes under controlled conditions.

The workshop in Conservation Education at the University of Tennessee, begun in the summer of 1953, was continued in the summer of 1954 for in service elementary and secondary public school teachers. The workshop was conducted by Dr. Fred H. Norris of the Botany department and Dr. W. W. Wyatt of the College of Education. The state Department of Conservation and the state Department of Fish and Game cooperated in this project. Field trips were made to Copper Hill and the Coweeta Hydrologic Research Station near Dillard, Georgia, and two weeks were spent camping at Big Ridge.

Dr. A. J. Sharp, head of the Department of Botany at the University of Tennessee, was a member of the staff of the University of Michigan Biological Station, Douglas Lake, Michigan, during the summer, 1954.

Dr. Alexander Hollaender, director of the Biology Division of the Oak Ridge National Laboratory, Dr. J. S. Kirby-Smith, also of the Division, and Dr. J. Gordon Carlson, consultant to the Division and head of the Department of Zoology and Entomology at the University of Tennessee, participated in the International Congress of Photobiology held in Amsterdam, The Netherlands, August 23-28, 1954; they took part in a symposium, "The Effect of Nonionizing Radiations on Genetic Elements of Cells." They also presented papers at the Symposium of Radiobiology in Liege, Belgium, August 30-September 1. Dr. Hollaender discussed "Studies on the Mechanism of the X-Ray Protection of E. Coli by Cysteamine." Dr. Kirby-Smith's topic was "The Relative Effectiveness of Various Ionizing Radiations on Chromosome Breakage in Tradescantia." Dr. Carlson discussed "The Relation of Dose and Mitotic Stage at Treatment to X-Ray-Induced Stickiness of Chromosomes."

An initial grant of $5200 has been awarded to Dr. H. A. Smith and Dr. C. A. Buehler of the University of Tennessee Chemistry Department by the United States Public Health Service to conduct research on the preparation of new compounds for possible use as antispasmodics, antihistamines and other medicinals.

Dr. R. R. Overman, professor of clinical physiology and director of the section of clinical physiology at the University of Tennessee Medical Units, has been awarded research grants totaling $67,749. Of this amount, $27,000 has been contributed by Memphis Maternal Welfare League, the University and the city of Memphis to provide equipment and nursing care for an eight-bed metabolic unit in the John Gaston Maternity Hospital. In this maternal

(Continued on page 265)