To the Graduate Council:

I am submitting herewith a thesis written by Robert A. Manlove entitled "Spatial Changes in Cropland Harvested in Eight Southeastern States, 1939 to 1974." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Geography.

T. H. Schmudde, Major Professor

We have read this thesis and recommend its acceptance:

Accepted for the Council:

Vice Chancellor
Graduate Studies and Research

SPATIAL CHANGES IN CROPLAND HARVESTED IN EIGHT SOUTHEASTERN STATES, 1939 TO 1974

A Thesis

Presented for the

Master of Science

Degree

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Robert A. Manlove

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ABSTRACT

Between 1939 and 1974 cropland harvested in the Southeast declined from slightly more than 50,000,000 acres to about 32,000,000 acres. The purpose of this research is to identify those areas in the Southeast, using county data, where cropland harvested has changed significantly since 1939 and to evaluate how the character of the land surface may have interacted with the changing nature of Southeastern agriculture to bring about the present patterns of cropland harvested.

Definite patterns of change in the acreage of cropland harvested appeared in the Southeast (defined here as Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Tennessee). The largest area of heavy proportional losses of acreage occurred in an area extending from northwestern Alabama across northern Georgia and South Carolina into western North Carolina. Other relatively large areas of heavy losses included much of southern Mississippi and southwestern Alabama, central Arkansas and Louisiana, and much of northern Arkansas. Losses were proportionally light on most of the Coastal Plain from southwestern Georgia through North Carolina. The alluvial Mississippi lowland and the Louisiana Coastal Prairies stood out as an area where the acreage of cropland harvested increased. By 1974 cropland harvested in the study area had not only decreased, but had also become concentrated in two major areas—the Mississippi lowland and the Coastal Plain.

The patterns of change were found to be associated fairly closely with the nature of slope in the study area. All the counties experiencing an increase in cropland harvested were found on terrain classified as some type of plain (more than 50 percent of the land area gently sloping), and of these approximately 94 percent were found where the land is classified as smooth or flat plains (more than 80 percent gently sloping). However, heavy proportional decreases occurred in association with every type of land surface in the Southeast; approximately 60 percent of the counties in the study area undergoing heavy loss had terrain classified as irregular plain. Severe erosion in the recent past was also found to be related to heavy losses of cropland harvested, especially on the irregular plains of the Georgia and South Carolina Piedmont.

The patterns of change in the Southeast were also affected by certain agricultural developments. Technological changes, especially mechanization, tend to reduce subsistance agriculture. Furthermore, the conversion to tractor power made flat lands even more desirable than they once had been for crop production, not only because machinery is more easily operated on such lands, but also because the formation of large fields is facilitated where there are large tracts of flat land. Additionally, the increased importance of livestock affected spatial changes in cropland harvested in the Southeast. Cattle, in particular, successfully competed with crops for land throughout much of the study area, but such areas as the Mississippi lowlands and the Coastal Prairies experienced a reduction in cattle. Although government programs such

as acreage allotments and the soil bank led to a reduction in the acreage of certain crops, they do not seem to have had a discernible impact on the overall patterns of change.

Consideration was given to certain aspects of forestry in the Southeast. A few rather large areas where land is neither excessively steep nor has the soil been subjected to severe erosion lost proportionally heavy amounts of cropland harvested. Examples include much of southern Mississippi and central Arkansas and Louisiana. In these areas forestry expanded at the expense of cropland. Appreciable amounts of land were given over to forests largely because the physical environment presented some obstacle to crop cultivation, for the most part the poor chemical properties of the soils.

Technology alters the way in which man perceives the land and the way in which he uses it. With improved agricultural technology, the problems of low inherent fertility or poor natural drainage have become less important hinderances to crop cultivation. But the nature of the land surface, specifically extensive flat or gently sloping land, appears to have become an increasingly important factor in the location of modern crop agriculture.

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CHAPTER I

INTRODUCTION

According to the United States Census of Agriculture, total farm land in the United States reached its greatest extent in 1949, amounting to about 1.158 billion acres. Between 1949 and 1974 it diminished to approximately 1.017 billion acres. Cropland harvested, on the other hand, reached its maximum extent in 1929. During the first two decades of the twentieth century, cropland harvested increased as farm land in the United States expanded. There was additionally the incentive for farmers in this country to produce more crops because of the high demand for American Agricultural products in Europe during the First World War. The demand for American farm products overseas became weaker as European nations recovered from the war, and the prices farmers received for their goods fell. Although they received less for their products, farmers were faced with increased costs for equipment and supplies, and the Agricultural Depression of the 1920's began almost a decade before the Great Depression of the 1930's.[1] Census data show that by 1929 cropland harvested in the United States reached approximately 359 million acres. However, by 1934 cropland harvested fell to less than 300 million acres, much of this decrease being due to millions of acres of crop failure, most of which was associated with drought in the Great Plains

[1]U.S. Bureau of Census, Census of Agriculture, 1959, Vol. 5, Graphic Summary of Land Utilization (Washington, D.C.: U.S. Government Printing Office), p. 7.

wheat farming areas.[2] The acreage devoted to crops in the United States remained smaller during the 1930's than it had during the previous decade, allowing for crop failure, although there was an increase in the farm population brought about by the Great Depression. Then, because of the increased demand for farm products during the Second World War, cropland harvested in the United States expanded during the first half of the 1940's. Probably because of wartime shortages of manpower and machinery, it did not rise to the level it had reached in 1929.

There are several rather obvious reasons behind the general decrease in harvested cropland in the United States. First the era of expansion was over, that is, there was little virgin land left for new development; the cities drew large numbers of people from rural areas; the federal government bought up some marginal land and placed it in national forests; with the encouragement of the government there was an increased use of conservation measures; during the 1930's the Roosevelt administration instituted price supports and acreage restrictions for a number of crops; additionally, a decrease in subsistence farming reduced the acreage of cropland harvested in this country.[3] Although agriculture suffered economically during the 1920's and 1930's, agricultural technology had made significant progress. Commercial fertilizers were improved and their use increased. Hybrids and new varieties of

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[2]Ibid.

[3]U.S. Bureau of the Census, Census of Agriculture, 1945, Graphic Summary of Land Utilization in the United States (Washington, D.C.: U.S. Government Printing Office), p. 23.

such crops as corn, wheat, and cotton were developed as were certain pesticides. Such developments, of course, made per acre yields higher, meaning that farm operators could increase their output of certain crops without actually expanding their acreage. Finally the increase of farm machines had a notable impact on the acreage of cropland harvested. In the 1920's the all-purpose tractor was developed, eliminating the necessity of having one tractor for breaking ground and another for cultivation and making mechanization feasible for large numbers of farmers.[4] According to the Census of Agriculture, the number of tractors in the United States rose from about 229,000 in 1919 to approximately 1,567,000 in 1939. The use of the tractor meant that much of the acreage that had been used to grow feed for work stock could be eliminated or converted to other use, frequently to pasture. Census data show that by 1959 only about six million acres of harvested cropland were still being used to produce feed for horses and mules. In 1919 there had been approximately eighty-one million acres used to feed work animals, meaning that about seventy-five million acres had been diverted to some other use.[5]

The acreage changes in cropland harvested in the United States were not simply a matter of general decrease, they were also a matter of regional shifts within the country. Generally there was a reduction of harvested cropland in the east and an increase in the west. Total acreage declined for the nation as a whole when western acreage ceased to expand

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[4] A. A. Stone, Farm Tractors (New York: John Wiley and Sons, Inc., 1932), p. 6.

[5] Census of Agriculture, 1959.

at a greater rate than eastern acreage contracted.[6] In the east different sections underwent reductions at various times. New England and New York state both began losing acreage before the turn of this century. During the 1920's and 1930's there were decreases in eastern Ohio, most of Michigan, southern Indiana and Illinois, and the areas around Chicago, Detroit, and Cleveland.[7]

In the states of Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Tennessee, hereafter called the Southeast, maximum acreage of cropland harvested was reached in 1939. There were not, however, uniform increases within the area during the twentieth century up to that time. Both Tennessee and South Carolina attained peak acreage in 1934. During the 1920's and 1930's acreage increased notably in the Mississippi Valley and on the North Carolina Coastal Plain, and there were decreases in the southern Appalachians, the Georgia Piedmont, and in northwestern Arkansas.[8] In the two decades prior to the Second World War, the acreage planted to crops in the Black Belt declined as the area changed from a cotton region to one of cattle and diversified crops.[9]

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[6]O. E. Baker, "Regional Shifts in Crop Acreage Shown by the Census Have Been Extensive," Yearbook of Agriculture 1932 (Washington, D.C.: U.S. Government Printing Office, 1932), p. 483.

[7]Census of Agriculture, 1959.

[8]Baker, p. 480.

[9]Glenn N. Sisk, "Agricultural Diversification in the Alabama Black Belt," Agricultural History, XXVI (April, 1952), p. 42.

By 1939 cropland harvested in the Southeast stood at about 50.1 million acres. Since that time it has decreased to approximately 32.1 million acres, a reduction of 36.0 percent. At the same time, total farm land fell from approximately 138.5 million acres to nearly 94.3 acres, a 31.9 percent decrease. Proportionally, cropland harvested has undergone a slightly greater reduction than has total farm land, and it accounts for a somewhat smaller percentage of farm land than it did in 1939, 36.2 percent compared to 34.0 percent in 1974. The change in acreage here has not been uniform. As indicated in Table I, only Arkansas shows an increase in cropland harvested; its reduction ranges from 10.5 percent in Louisiana to 60.7 percent in Alabama.

TABLE I

CROPLAND HARVESTED IN THE SOUTHEAST, 1939 AND 1974

State	Acreage 1939 (Rounded)	Acreage 1974 (Rounded)	Change in Acres	Percent Change
Alabama	7,112,000	2,794,000	-4,318,000	(60.7)
Arkansas	6,610,000	6,639,000	+29,000	0.4
Georgia	8,803,000	4,161,000	-4,642,000	(52.7)
Louisiana	4,052,000	3,628,000	-424,000	(10.5)
Mississippi	6,953,000	4,793,000	-2,160,000	(31.1)
N. Carolina	6,125,000	4,075,000	-2,050,000	(33.5)
S. Carolina	4,322,000	2,251,000	-2,071,000	(47.9)
Tennessee	6,159,000	3,746,000	-2,413,000	(39.2)
Total	50,136,000	32,087,000	-18,049,000	(36.0)

Source: U.S. Census of Agriculture, 1939 and 1974.

Both Arkansas and Louisiana began to increase their acreage of harvested cropland after 1959, with the former reaching its greatest acreage in 1969. Although the other Southeastern states

continued to lose acreage between 1964 and 1969, Arkansas, Louisiana, and Mississippi gained enough acreage that the entire region showed a slight increase during that time. Between 1969 and 1974, every state in the Southeast except Arkansas increased acreage, with the result that about 1.8 million acres were added in the five-year period. Finally, between 1964 and 1974,cropland harvested in the Southeast grew by about 2.2 million acres.

As illustrated in Figure 1, the reduction of cropland harvested in the Southeast may not only have ceased, but it is possible that the trend may have been reversed. Another point to be noted from Figure 1 is that although total farm land has diminished at almost as great a rate as has harvested cropland, the two land uses may change independently of each other. Between 1939 and 1949 farm land increased by about 8.7 million acres, according to census data, but cropland harvested decreased by approximately 6.7 million acres. Yet between 1964 and 1974 farm land was reduced by approximately 21.4 million acres even though cropland harvested was increased by over 2 million acres. It is obvious that some of the reduction in the acreage of harvested cropland in the Southeast is a direct result of the area's decrease in total farm land. On the other hand, changes in cropland harvested have also resulted from causes other than quantitative changes in total farm land.

As in the rest of the United States, changes in cropland harvested in the Southeast were not simply a matter of a general reduction but also involved shifts from one section to another. For example, although the Georgia and South Carolina Piedmont has lost considerable acreage, the

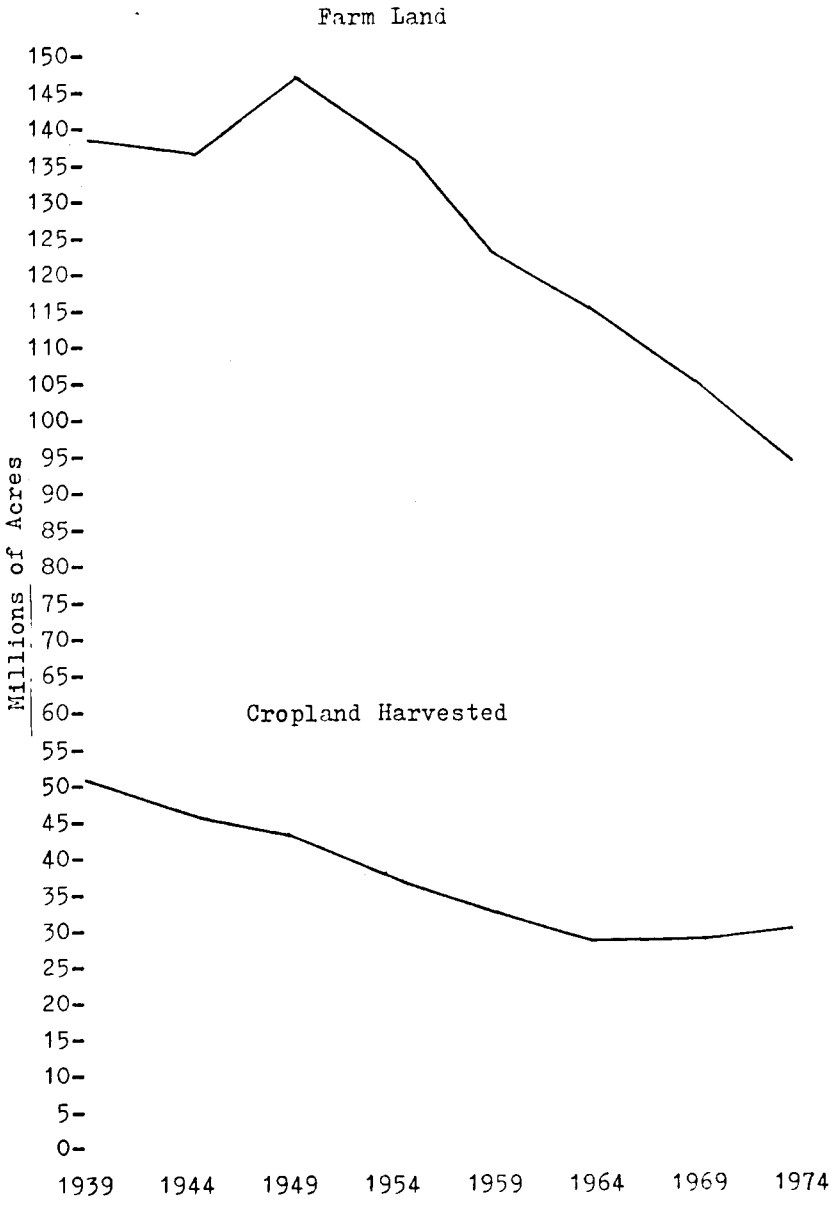

Figure 1. Decrease of Farm Land and Cropland Harvested in the Southeast from 1939 through 1974.

Source: U.S. Census of Agriculture, 1940 through 1974.

alluvial Mississippi lowlands have gained acreage even prior to 1930. Additionally, the Census of Agriculture shows that large parts of the North and South Carolina Coastal Plain have remained relatively stable.

A. PURPOSE

In an article entitled "Loss and Abandonment of Cleared Farm Land in the Eastern United States," appearing in the September, 1968, Annals of the Association of American Geographers, John Fraser Hart concluded that physical impediments to agriculture, such as unproductive soils or steeply sloping and irregular terrain, were the primary factors behind the reduction of all cleared farm land in the eastern part of this country since 1910.[10] Although there have been other reasons, for example, urban growth, acquisition of land by forest industries, or government programs such as the Soil Bank, the greatest decrease of such land has been brought about, directly or indirectly, because of a changing evaluation of the physical environment by changes in the practices and economics of agriculture. Hart's ideas are applicable to this research, but it should be noted that his article was concerned with total cleared farm land rather than only cropland harvested. There could, of course, be an increase in cleared farm land in a specific area because land in pasture was enlarged even though harvested cropland was reduced and although such an occurrence is rare, harvested cropland could increase in spite of an overall decrease in cleared land. In addition, a

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[10] John Fraser Hart, "Loss and Abandonment of Cleared Farm Land in the Eastern United States," Annals of the Association of American Geographers, LVIII (September, 1968), p. 418.

reduction of cropland harvested does not always indicate a general agricultural decline; it may also be indicative of agricultural adjustments to the land, to economic forces, or to certain innovations.

The purpose of this research is to identify those counties in the Southeast where cropland harvested has changed since 1939 and to evaluate how the character of the physical environment, especially the land surface, may have interacted with the changing nature of Southeastern agriculture to bring about changes in the patterns of cropland harvested there. The following hypotheses will be tested:

1. In those counties where the land surface is favorable to the use of machinery and erosion hazards are least, cropland harvested will have increased or will have decreased at a rate below the regional average.

2. In those counties where the land surface is unfavorable to the use of machinery and erosion hazards are greatest, cropland harvested will have decreased at a rate greater than the regional average.

The study area for this research is made up of the eight previously mentioned Southeastern states. Florida has been excluded because the nature of agriculture in most of the peninsula is considerably different from that of the rest of the Southeast. Furthermore, it seems unnecessary to include the northern counties of Florida because the study area is sufficiently large and varied for the purpose at hand.

At this point it may be useful to make the distinction between "cropland" and "cropland harvested." Total cropland includes cropland harvested, cropland used only for pasture, and cropland not harvested and not pastured. Cropland harvested makes up about 70 percent of total

cropland nationally and according to the Census of Agriculture includes "all land from which any crops are harvested . . . land from which hay is cut, land in berries or other small fruits . . . orchards, vineyards, nurseries, and greenhouses. Land where mature crops are hogged off or grazed are considered cropland harvested."[11] Land where two or more crops are harvested annually is counted only once. Cropland harvested does not include crop failure, which is usually of minor significance in the eastern United States. As a measure of how agricultural land is used, cropland harvested provides a more useful set of data for this research than total cropland does.

B. SURVEY OF THE LITERATURE

In geographic literature there seems to be relatively little that deals directly with the problem addressed by this research. O. E. Baker's article published in the Annals of the Association of American Geographers of 1921, "The Increasing Importance of the Physical Conditions in Determining the Utilization of Land for Agriculture and Forest Production in the United States,"[12] noted the influence of the environment on land use in the United States, including the relationship between terrain and the use of agricultural machinery. In "Adjustment of Agriculture to its

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[11] Census of Agriculture.

[12] O. E. Baker, "The Increasing Importance of the Physical Conditions in Determining the Utilization of Land for Agriculture and Forest Production in the United States," Annals of the Association of American Geographers, XI (1921), 17-46.

Environment,"[13] H. H. Bennett dealt with the problem of soil erosion in this country. John Fraser Hart's previously cited "Loss and Abandonment of Cleared Farm Land in the Eastern United States"[14] and an earlier article, "Loss of Farm Land in Kentucky,"[15] are concerned with the relationship between the physical environment and the loss of cleared farm land, as is Merle C. Prunty's "Idle Land Phenomena in Madison County, Georgia,"[16] which appeared in the Southeastern Geographer in 1961. In "Relationship between Cash Grain Farming and Land Forms,"[17] J. J. Hidore demonstrated statistically a high positive correlation between cash grain farming and the presence of flat land in the Midwest.

A number of works not only provided information useful to this research, but at least touched on the problem indirectly. Prunty's "Some Contemporary Myths and Challenges in Southern Rural Land Utilization"[18] and Arnold Siniard's "Cropping Patterns in the Mid-South"[19]

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[13]H. H. Bennett, "Adjustment of Agriculture to its Environment," Annals of the Association of American Geographers, XXXIII (1943), 163-198.

[14]Hart, "Loss and Abandonment of Cleared Farm Land."

[15]John Fraser Hart, "Loss of Farm Land in Kentucky," Southeastern Geographer, IV (1964), 1-10.

[16]Merle C. Prunty, "Idle Land Phenomena in Madison County, Georgia," Southeastern Geographer, I (1961), 39-49.

[17]J. J. Hidore, "Relationship between Cash Grain Farming and Land Forms," Economic Geography, XXXIX (January, 1963), 84-89.

[18]Merle C. Prunty, "Some Contemporary Myths and Challenges on Southern Rural Land Utilization," Southeastern Geographer, X (November, 1970), 1-12.

[19]L. Arnold Siniard, "Cropping Patterns in the Mid-South," Southeastern Geographer, X (November, 1970), 59-71.

and "Certain Spatial Aspects of American Soybean Culture"[20] have been valuable to this research, as has Prunty and C. S. Aiken's "The Demise of the Piedmont Cotton Region."[21] An article by Hart published in 1977, "The Demise of King Cotton,"[22] and the article "Recent Changes in Agrarian Land Use in Georgia"[23] by Sanford H. Bederman are both concerned to a limited extent with aspects of the problem considered here. Howard F. Gregor's book, Agricultural Geography: Themes in Research,[24] contains sections about environmental influences on agriculture and agricultural adjustment to those influences. Additionally, Edward C. Higbee's American Agriculture: Geography, Resources, and Conservation[25] provided considerable information.

With respect to essentially nongeographic literature, the Department of Agriculture's Soils, the Yearbook of Agriculture, 1957[26]

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[20]L. Arnold Siniard, "Certain Spatial Aspects of American Soybean Culture," Southeastern Geographer, XIII (May, 1973), 1-11.

[21]Merle C. Prunty and C. S. Aiken, "The Demise of the Piedmont Cotton Region," Annals of the Association of American Geographers, LXII (June, 1972), 283-306.

[22]John Fraser Hart, "The Demise of King Cotton," Annals of King Cotton," Annals of the Association of American Geographers, LXVIII (September, 1977), 307-322.

[23]Sanford H. Bederman, "Recent Changes in Agrarian Land Use in Georgia," Southeastern Geographer, X (November, 1970), 55-61.

[24]Howard F. Gregor, Agricultural Geography: Themes in Research (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1970).

[25]Edward C. Higbee, American Agriculture: Geography, Resources, and Conservation (New York: John Wiley and Sons, 1958).

[26]U.S. Department of Agriculture, Soil, Yearbook of Agriculture, 1957 (Washington, D.C.: U.S. Government Printing Office, 1957).

supplied material about agriculture and its related management problems in the study area. F. J. Marschner's Land Use and its Patterns in the United States[27] was useful, especially its aerial photographs showing differing land uses throughout much of the study area. Some of the aspects of mechanization just prior to the Second World War were discussed by R. S. Kifer, B. H. Hart, and Albert A. Thonbrouger in "The Influence of Technical Progress in Agricultural Production"[28] in the Yearbook of Agriculture, 1940. Background information about cattle raising in the Southeast was taken largely from Stewart H. Fowler's Beef Production in the South.[29] A Short History of Agricultural Adjustments[30] by Wayne D. Rassmussen, Gladys L. Baker, and James S. Ward supplied material concerning such government programs as acreage allotments. Most of the information dealing with erosion in this research was taken from four sources: "Rainfall Erosion"[31] by Dwight D. Smith and Walter

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[27]F. J. Marschner, Land Use and its Patterns in the United States (Washington, D.C.: U.S. Government Printing Office, 1959).

[28]R. S. Kifer, B. H. Hart, and Albert A. Thonbrouger, "The Influence of Technical Progress on Agricultural Production," Yearbook of Agriculture 1940 (Washington, D.C.: U.S. Government Printing Office, 1940).

[29]Stewart H. Fowler, Beef Production in the South (Danville, Illinois: The Interstate, 1969).

[30]Wayne D. Rassmussen, Gladys L. Baker, and James S. Ward, A Short History of Agricultural Adjustment, 1935-1975. Economic Research Service, United States Department of Agriculture, Agricultural Information Bulletin, No. 391, Washington, D.C., March, 1971.

[31]Dwight D. Smith and Walter H. Wischmeir, "Rainfall Erosion," Advances in Agronomy, XIV (1962), 109-144.

Wischmeir, Soil Erosion: A National Menace[32] by H. H. Bennett and W. R. Chapline, "Erosion on Cultivated Lands"[33] by B. D. Blakely, J. J. Coyle, and J. W. Steele, and Control of Water Pollution from Cropland[34] by B. A. Stewart et al.

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[32]H. H. Bennett and W. R. Chapline, "Soil Erosion: A National Menace," United States Department of Agriculture Circular No. 33, Washington, D.C., April, 1928.

[33]B. D. Blakely, J. J. Coyle, and J. W. Steele, "Erosion on Cultivated Land," Soils, the Yearbook of Agriculture, 1957 (Washington, D.C.: U.S. Government Printing Office, 1957), 290-307.

[34]B. A. Stewart et al., Control of Water Pollution from Cropland, Agricultural Research Service, U.S. Department of Agriculture and Office of Research and Development Environmental Protection Agency, Vol. I (Washington, D.C.: U.S. Government Printing Office, 1975).

CHAPTER II

PATTERNS OF CHANGE IN CROPLAND HARVESTED 1939 THROUGH 1974

The main purpose of this chapter is to locate those counties in the Southeast that gained and lost acreage of cropland harvested between 1939 and 1974. It is primarily descriptive in nature, and reasons behind the changes will be discussed in a following chapter. In mapping areas of change, four different time periods will be considered, 1939 to 1949, 1949 to 1964, 1964 to 1974, and 1939 to 1974. The second time period is of fifteen instead of ten years. Since data are taken from the Census of Agriculture, it was not possible to use equal time intervals between 1939 and 1974 unless five-year intervals are used. The use of two ten-year and one fifteen-year interval was considered preferable to the use of six five-year intervals.

Figure 2 represents the distribution of cropland harvested in the Southeast in 1939, its maximum extent. The most notable large area of concentration of harvested cropland occurred on the Coastal Plain, extending from the vicinity of North Hampton County, North Carolina, to southeastern Alabama. The Coastal Plain was followed by the Mississippi lowlands-Loess Plains section of Arkansas, Tennessee, and Mississippi. The concentration of harvested cropland in eastern Louisiana was rather light at that time. There were also a number of secondary cropland areas such as the Coastal Prairies of Louisiana, the Tennessee Valley in northern Alabama, the Piedmont (especially in

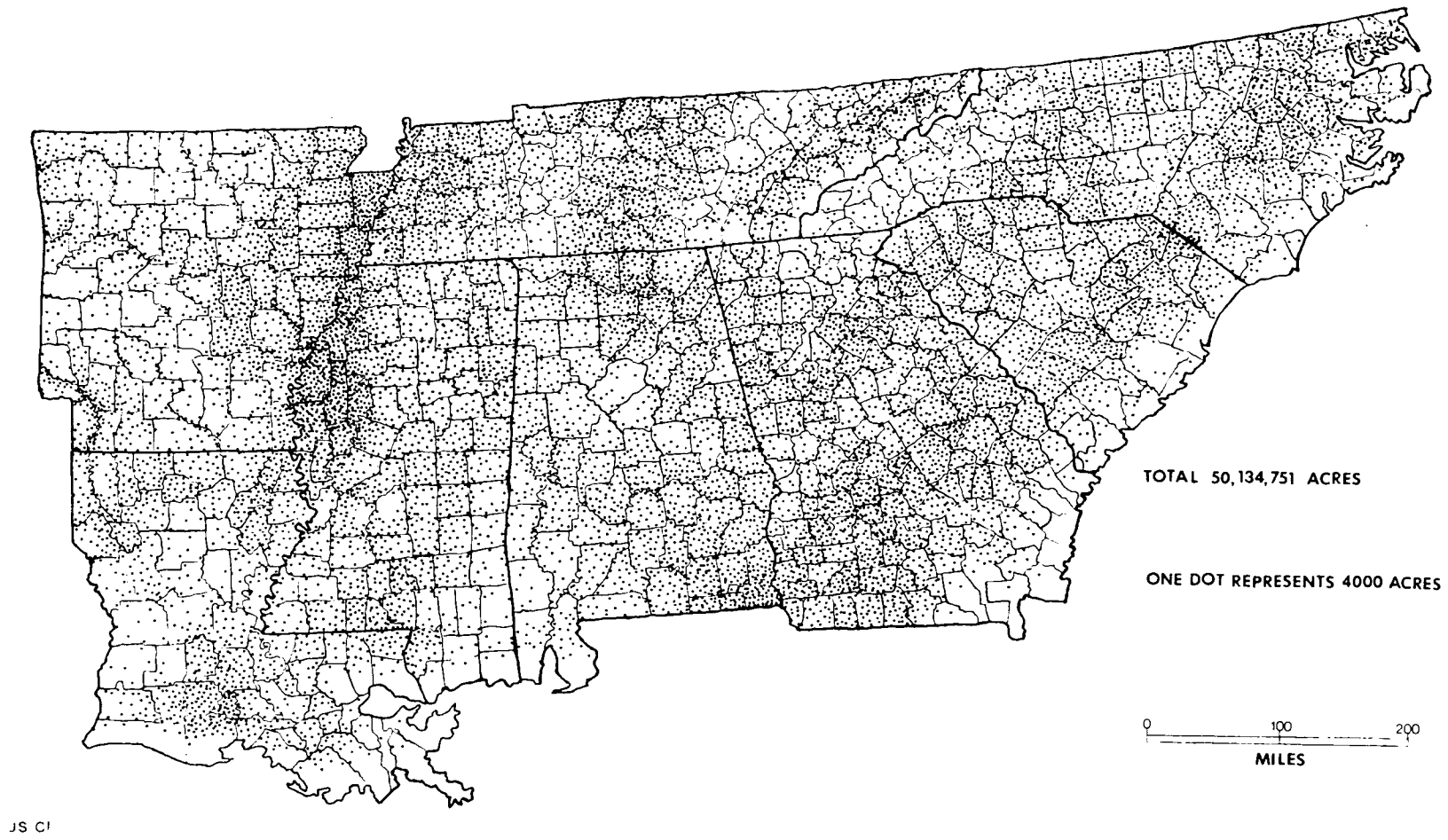

Figure 2. Cropland Harvested in the Southeast, 1939.

Source: U.S. Census of Agriculture, 1940.

South Carolina), much of middle Tennessee, and the northern part of the Valley and Ridge.

On the other hand, there were areas where there was little cropland harvested. The most extensive was in heavily forested counties of the Outer Coastal Plain, particularly in southeastern Georgia. There was noticeably little cropland harvested in the Southern Appalachians, on the Cumberland Plateau, and on much of the Western Highland Rim. Also, the highly industrialized area of Central Alabama contained relatively little harvested cropland. Much of central and western Arkansas and Louisiana, as well as the lower portion of the Atchafalaya Basin, showed a sparse distribution of cropland harvested.

A. CHANGES BETWEEN 1939 AND 1949

Between 1939 and 1949 cropland harvested in the Southeast fell from 50,134,754 acres to 43,360,083 acres, a reduction of about 13.5 percent. Figure 3 is a choropleth map of the changes in harvested cropland during that time. Data for each county were taken from the 1940 and 1950 Census of Agriculture. Those counties experiencing decreases were divided into three classes based on the mean reduction of acreage in the study area. Counties that lost less than 13.5 percent were considered as having experienced a slight decrease, those that lost from 13.5 to 27 percent a substantial decrease, and those that lost more than 27 percent, or twice the mean, a heavy decrease. All counties that gained acreage were mapped and placed in a fourth class. In Table II, for example, fifteen counties in Alabama experienced a slight decrease (less than 13.5 percent loss of cropland harvested) for an aggregate loss of 146,000 acres,

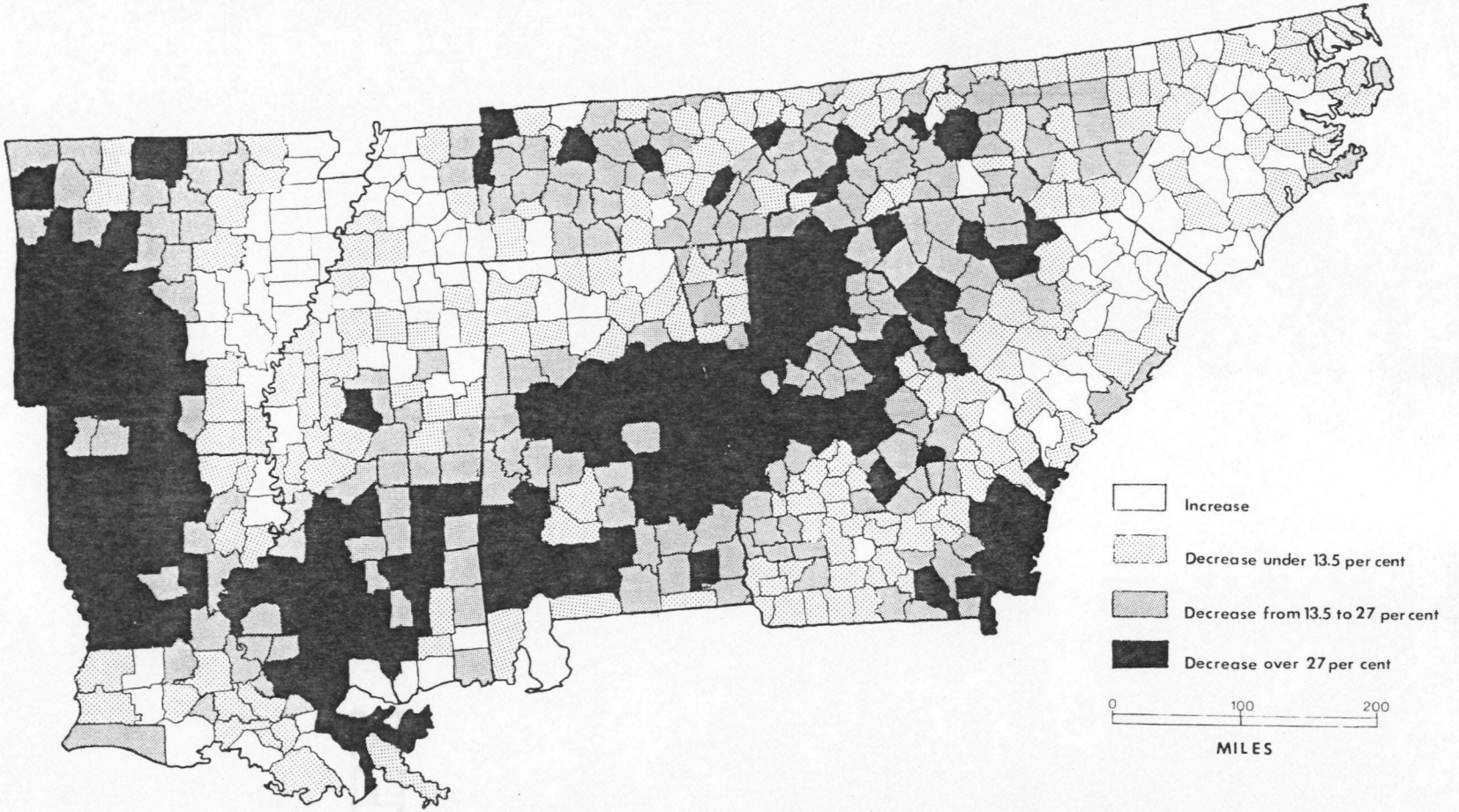

Figure 3. Changes in Cropland Harvested, 1939-1949.

Source: U.S. Census of Agriculture, 1940 and 1950.

TABLE II

CHANGES IN CROPLAND HARVESTED, 1939-1949
(County Data)

State	Counties with Slight Decrease		Counties with Substantial Decrease		Counties with Heavy Decrease		Counties with Increase	
	Number	Acreage	Number	Acreage	Number	Acreage	Number	Acreage
Alabama	15	146,000	21	752,000	26	526,000	6	43,000
Arkansas	10	66,000	18	264,000	29	664,000	18	314,000
Georgia	43	265,000	50	546,000	64	880,000	2	7,000
Louisiana	14	94,000	11	143,000	25	714,000	9	48,000
Mississippi	22	133,000	22	283,000	20	536,000	18	134,000
N. Carolina	41	197,000	28	236,000	5	35,000	24	124,000
S. Carolina	11	95,000	13	233,000	7	126,000	15	93,000
Tennessee	30	101,000	43	480,000	7	151,000	18	149,000
Total	186	1,096,000	206	2,957,000	183	3,631,000	104	911,000

Source: U.S. Census of Agriculture, 1939 and 1949.

twenty-one counties classified as substantial decrease lost collectively 752,000 acres, twenty-six counties that underwent a heavy decrease lost 526,000 acres, and six counties that increased acreage gained a total of 43,000 acres.

Not only do those counties which experienced heavy proportional decreases cover a large portion of the study area, they account for the greatest absolute acreage decline of any class. However, as might be expected, some of the counties that had heavy proportional decreases underwent rather small reductions in absolute acreage. For example, the ten counties of heavy decrease in southeastern Georgia experienced a combined loss of some 37,000 acres; at the same time, Poinsette County, Arkansas, added over 61,000 acres.

A comparison of Figures 2 and 3 (pages 16 and 18) indicates that those areas of heavy concentration of harvested cropland in 1939 were those that, for the most part, either gained or had slight losses between 1939 and 1949. Proportionally as well as absolute, counties in the Mississippi lowlands gained more acreage than did those on the Coastal Plain. Losses were relatively light, however, on the Cumberland Plateau and Eastern Highland Rim in Tennessee, as well as in some of the mountain counties in North Carolina.

Data taken from the 1940 and 1950 Census of Agriculture indicate that patterns of change in the western part of the study area are associated largely with decreases of corn acreage and increases and shifts in cotton acreage. The counties of western Arkansas and Louisiana and southern Mississippi had heavy losses chiefly because of a large

reduction of corn acreage along with a moderate decrease in cotton acreage. Acreage restrictions on cotton were lifted from 1944 through 1949, and census data show that most of the counties undergoing increases did so largely by adding cotton acreage. This was the case not only in the Mississippi lowlands but apparently in those counties in northern Alabama that gained or underwent slight losses as well.

According to the 1940 and 1950 Census of Agriculture, the acreage of rice in Arkansas and Louisiana increased, as did sugar cane in Louisiana. Peanut acreage in Alabama declined, however, which may in part explain the reduction of harvested cropland in southeastern Alabama.

In the eastern part of the study area, corn acreage was not reduced to the extent that it was in the west. An examination of census data indicates that it increased in many of the Coastal Plain counties. Cotton was also increased in many of the counties of the North and South Carolina Coastal Plain. Additionally, there were slight increases in tobacco acreage in some of those same counties. On the Piedmont, especially in Georgia and South Carolina, cotton was reduced. A comparison of acreage figures taken from the 1940 and 1950 Census of Agriculture shows that on the Cumberland Plateau, in the northern Valley and Ridge, some of the mountain counties, and most of the northern tier of counties in the North Carolina Piedmont decreases were less than the regional average because of an increase in hay acreage even though most other crops were reduced.

B. CHANGES BETWEEN 1949 AND 1964

During the time between 1949 and 1964 agriculture in the Southeast became increasingly mechanized, per acre yields of most crops increased, livestock became much more important, acreage restrictions on cotton were re-instituted, and the Soil Bank came into being. All of the above contributed to a general decrease in harvested cropland in the southeast. By 1964 cropland harvested amounted to 29,967,000 acres, a reduction of about 30.9 percent from the 1949 level.

In Figure 4, the data were mapped on the same basis as in Figure 3 (page 18), except that the class intervals were changed, substantial decreases being between 30.9 and 61.8 percent and heavy decreases being greater than 61.8 percent. The absolute values for each class are given in Table III.

In the entire eastern half of the study area only three counties gained acreage. The combined total of their increase was a little over 11,000 acres. However, for the most part, losses on the Coastal Plain were below average. In the western part of the study area, the Mississippi lowlands gained considerable acreage, especially in Arkansas. Also, significant increases were made in the Louisiana part of the Mississippi lowlands. The greatest area of heavy loss occurred on the Piedmont, especially in Georgia and South Carolina. In the west, many of the counties in central Arkansas and Louisiana experienced heavy losses.

Census data show that, to a great extent, the counties that underwent increases did so through increased acreage in soybeans. The statement is true for the two counties in North Carolina that gained acreage as well

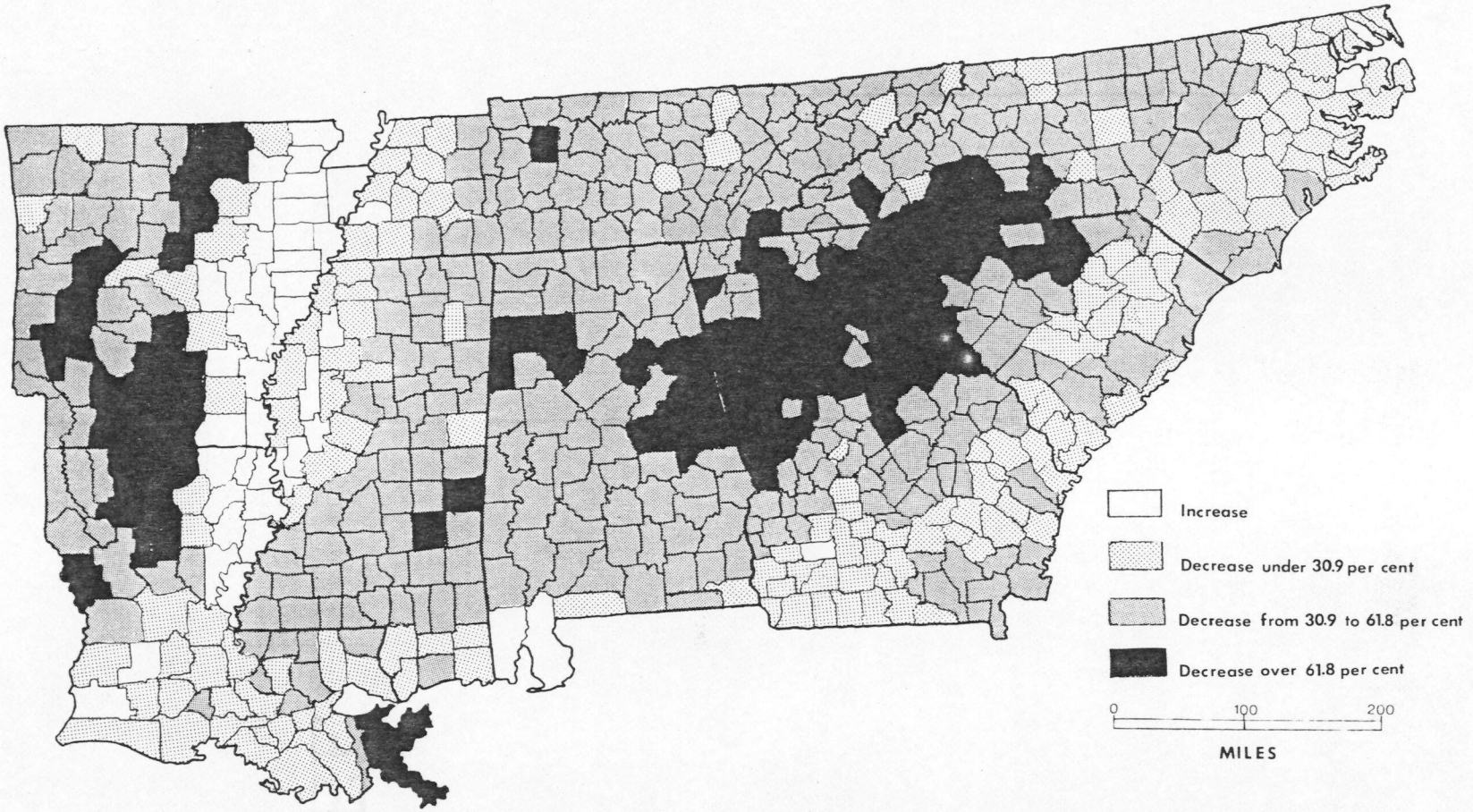

Figure 4. Changes in Cropland Harvested, 1949-1964.

Source: U.S. Census of Agriculture, 1950 and 1964.

TABLE III

CHANGES IN ACREAGE OF CROPLAND HARVESTED, 1949-1964
(County Data)

State	Counties with Slight Decrease		Counties with Substantial Decrease		Counties with Heavy Decrease		Counties with Increase	
	Number	Acreage	Number	Acreage	Number	Acreage	Number	Acreage
Alabama	2	67,000	51	2,251,000	11	466,000	2	44,000
Arkansas	9	53,000	27	542,000	18	467,000	21	1,210,000
Georgia	37	475,000	60	1,290,000	61	1,386,000	1	4,000
Louisiana	27	117,000	16	354,000	10	197,000	11	191,000
Mississippi	20	215,000	55	1,529,000	2	66,000	5	73,000
N. Carolina	36	508,000	57	1,092,000	5	204,000	2	7,000
S. Carolina	15	281,000	17	641,000	14	774,000	--	--
Tennessee	16	221,000	75	1,704,000	2	42,000	2	10,000
Total	162	1,937,000	342	9,404,000	123	3,600,000	44	1,549,000

Source: U.S. Census of Agriculture, 1950 and 1964.

as for those in the western part of the study area. The one county in Georgia that added harvested cropland did so apparently through increased hay acreage.

C. CHANGES BETWEEN 1964 AND 1974

During the 1964-1974 decade, cropland harvested in the Southeast increased by more than two million acres, a gain of 7.1 percent. In 1970 the acreage restrictions on upland cotton were lifted. The Soil Bank program came to an end in 1966. Additionally, the production of certain crops, especially soybeans, became increasingly profitable. All of the above mentioned factors may well have contributed to the reversal of the trend of decline of previous years.

Because cropland harvested increased during the most recent decade, it was necessary to modify the selection of class intervals when mapping areas of change. The counties that lost acreage were classified as follows: those that lost less than 25 percent of their 1964 acreage as slight decrease, those that lost between 25 and 50 percent as substantial decrease, and those that lost more than 50 percent as heavy decrease. Again, counties that gained acreage were all placed in one class. The data are presented in Table IV and the areas of change are depicted in Figure 5.

Perhaps the most notable feature of Figure 5 is the large portion of the study area covered by those counties that added harvested cropland. It should be pointed out that census figures show that in some counties, for example many of those in central Louisiana and in the area covered by Polk County, Tennessee, through Chattooga County, Georgia, the actual increase of acreage was very small, ranging from less than forty acres

TABLE IV

CHANGES IN ACREAGE OF CROPLAND HARVESTED, 1964-1974
(County Data)

State	Counties with Slight Decrease		Counties with Substantial Decrease		Counties with Heavy Decrease		Counties with Increase	
	Number	Acreage	Number	Acreage	Number	Acreage	Number	Acreage
Alabama	33	189,000	17	123,000	1	7,000	15	123,000
Arkansas	16	59,000	8	31,000	--	--	51	642,000
Georgia	53	95,000	36	107,000	9	30,000	61	442,000
Louisiana	19	53,000	5	27,000	2	18,000	38	1,054,000
Mississippi	25	83,000	13	106,000	2	60,000	42	642,000
N. Carolina	39	730,000	16	99,000	5	8,000	40	326,000
S. Carolina	15	91,000	9	45,000	2	7,000	20	139,000
Tennessee	42	130,000	18	127,000	1	10,000	34	396,000
Total	241	830,000	122	665,000	25	140,000	301	3,764,000

Source: U.S. Census of Agriculture, 1964 and 1974.

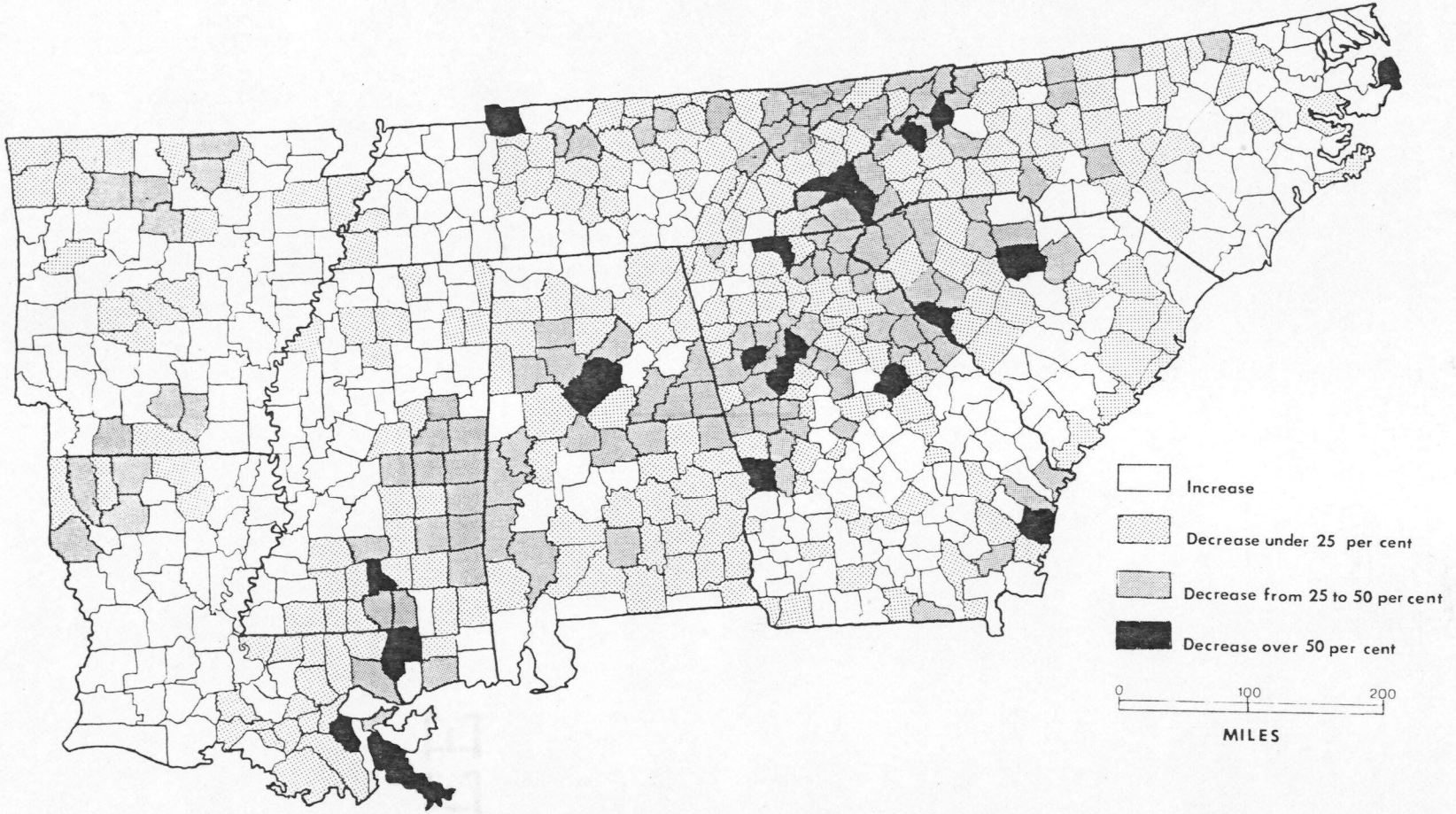

Figure 5. Changes in Cropland Harvested, 1964-1974.

Source: U.S. Census of Agriculture, 1964 and 1974.

in Winn Parish, Louisiana, to a little over two thousand-three hundred acres in Gordon County, Georgia. The greatest acreage increases took place in Louisiana in the Mississippi lowlands and on the Coastal Prairies.

Data published in the 1964 and 1974 Census of Agriculture indicate that in some counties in Arkansas, Louisiana, Mississippi, and in west Tennessee cotton acreage increased. Several counties on the Coastal Plain added acres of corn. But for the most part, counties that gained harvested cropland did so through the addition of soybean acreage. In Arkansas and Louisiana soybeans spread up the Red and Ouachita River Valleys and along the Arkansas and White River Valleys. The counties in middle Tennessee and northern Alabama that experienced increases did so primarily as a result of increased soybean acreage. Soybean acreage grew in the Mississippi-Alabama Black Belt and on the Coastal Plain. However, in the northern Valley and Ridge Census of Agriculture figures show that there was a notable decrease in soybean acreage in the face of an appreciable increase in the number of cattle there.

D. CHANGES BETWEEN 1939 AND 1974

Between 1939 and 1974 the study area lost more than eighteen million acres of cropland harvested, a decrease of approximately 36 percent. The patterns of change are represented in Figure 6. The basis for dividing counties into different classes is the same as that which was used in the first two time periods. The values for each class are given in Table V.

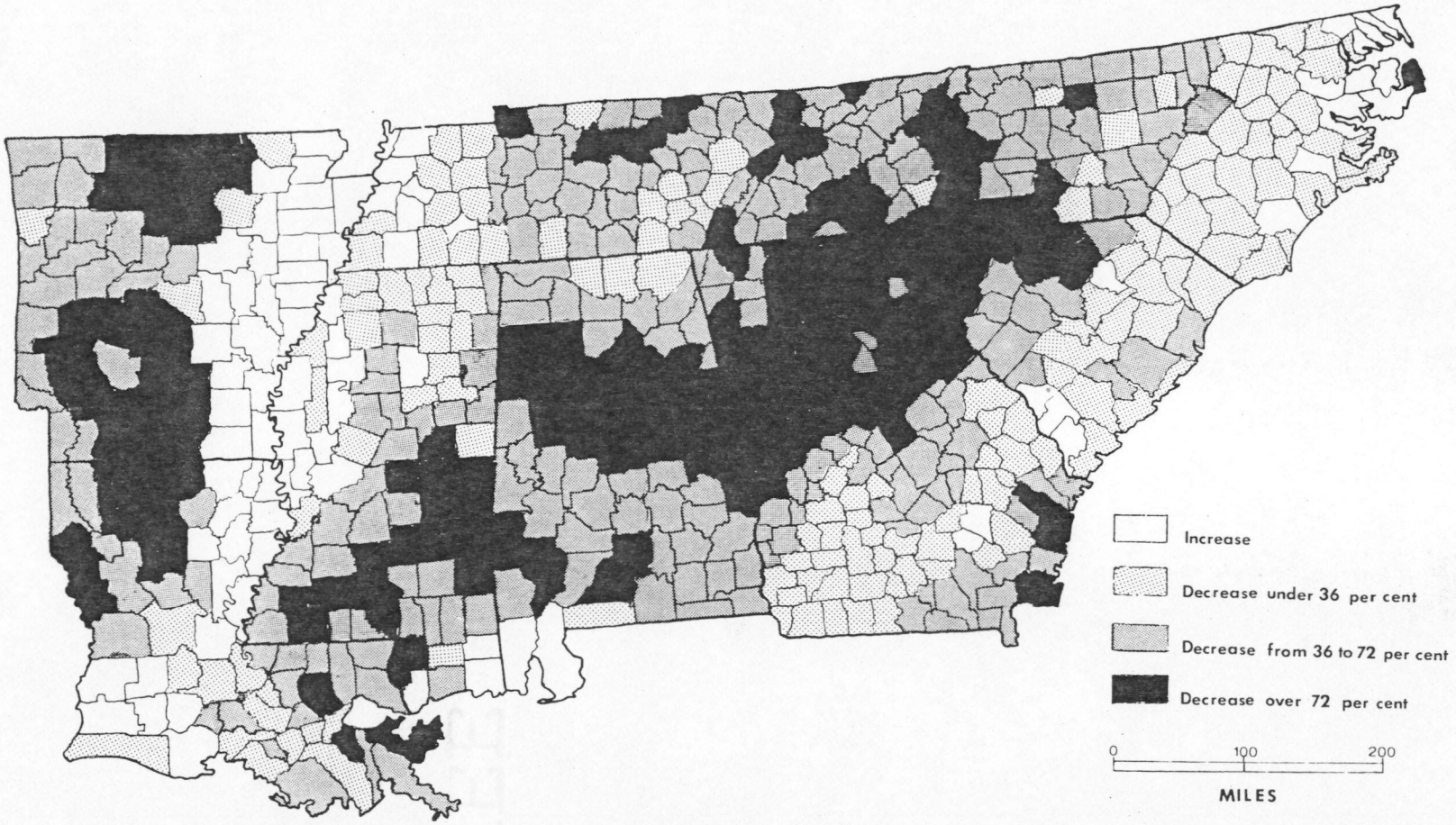

Figure 6. Changes in Cropland Harvested, 1939-1974.

Source: U.S. Census of Agriculture, 1940 and 1974.

TABLE V

CHANGES IN ACREAGE OF CROPLAND HARVESTED, 1939-1974
(County Data)

State	Counties with Slight Decrease		Counties with Substantial Decrease		Counties with Heavy Decrease		Counties with Increase	
	Number	Acreage	Number	Acreage	Number	Acreage	Number	Acreage
Alabama	4	182,000	35	2,516,000	26	1,669,000	2	74,000
Arkansas	5	89,000	21	873,000	25	952,000	24	1,954,000
Georgia	40	751,000	48	1,340,000	69	2,554,000	2	4,000
Louisiana	12	92,000	23	620,000	12	676,000	17	976,000
Mississippi	18	373,000	32	1,100,000	18	120,000	14	373,000
N. Carolina	35	537,000	37	1,222,000	16	380,000	12	101,000
S. Carolina	15	384,000	10	460,000	16	1,243,000	4	20,000
Tennessee	20	259,000	54	1,828,000	12	523,000	9	218,000
Total	149	2,672,000	260	9,959,000	194	9,117,000	84	3,711,000

Source: U.S. Census of Agriculture, 1940 and 1974.

In Figure 6 there is one major area of gain and slight loss: the Mississippi lowlands, Coastal Prairies, and Loess Plains. A much smaller, secondary area, is made up of a few counties on the Gulf Coast of Mississippi and Alabama. In the eastern part of the study area, the Coastal Plain from southwestern Georgia through North Carolina stands out as an area of slight decrease, with a number of counties, especially in eastern North Carolina, showing acreage increases. There is also a secondary area of slight decrease made up chiefly of counties in middle Tennessee and northern Alabama. The most significant area of heavy decrease extends from western Alabama across the northern half of Georgia and western South Carolina into western North Carolina and east Tennessee. This particular section lost more than five and one-half million acres of harvested cropland. Southwestern Alabama-southern Mississippi also underwent heavy losses, as did central Arkansas and Louisiana. Losses were also heavy in the eastern Ozarks. There were considerably smaller areas where the reduction of harvested cropland was proportionally high, as in much of the western Valley and Ridge and in middle Tennessee along the Cumberland River.

Figure 7 represents the distribution of cropland harvested in the Southeast in 1974. It differs from Figure 4 (page 23) primarily in degree rather than kind. The greatest concentration of harvested cropland in 1974 was found in the Mississippi lowlands-Loess Plains-Coastal Prairies portion of the study area, with eastern Louisiana being considerably more prominent than it had been in 1939. Although the Coastal Plain remained important, it became secondary to the Mississippi

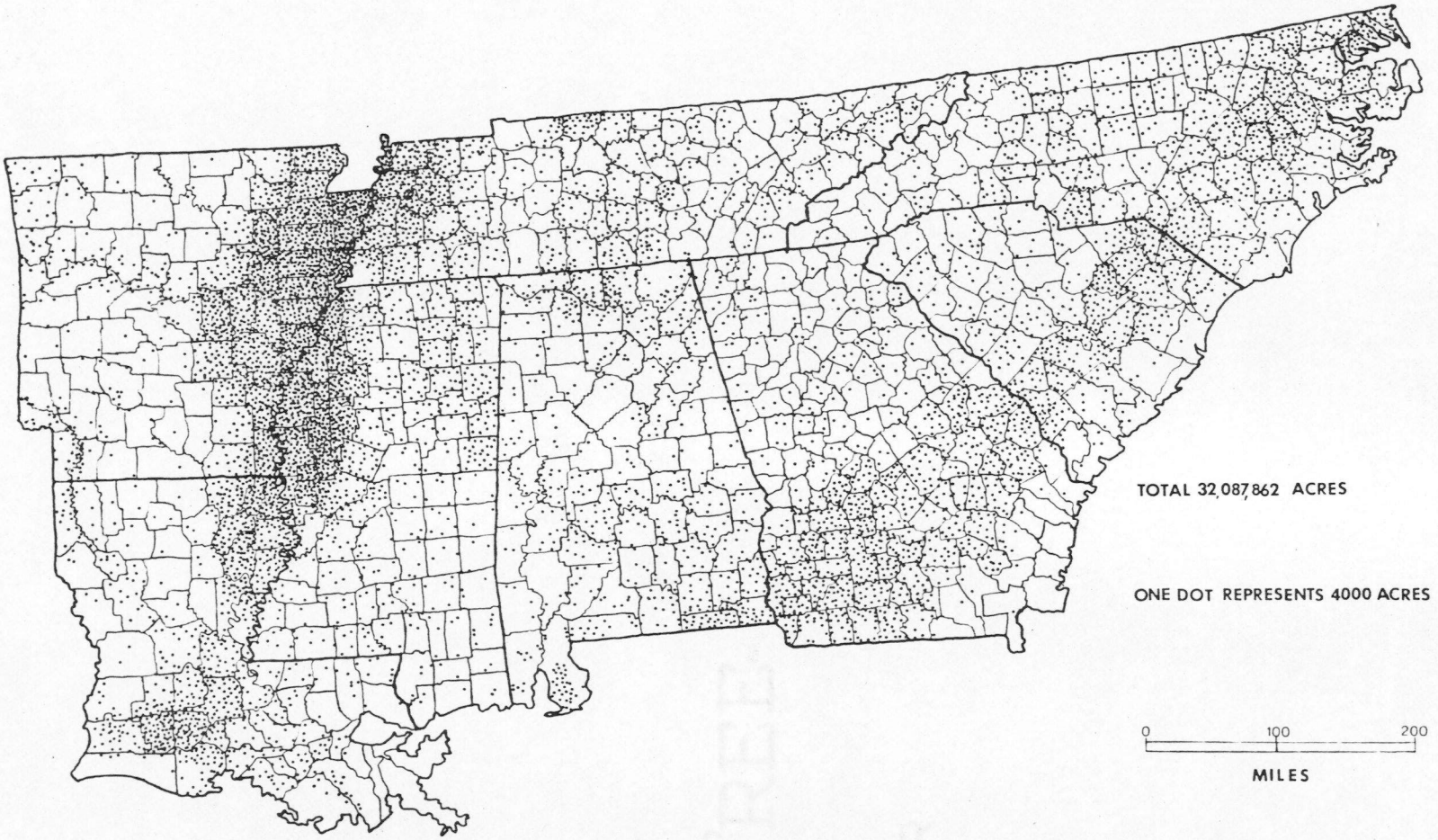

Figure 7. Cropland Harvested in the Southeast, 1974.

Source: U.S. Census of Agriculture, 1974.

lowlands. In 1974 the Coastal Plain stood out mainly because areas adjacent to it lost so much acreage. The areas of secondary concentrations of cropland became less distinct by 1974. Not only did harvested cropland in the Southeast decrease, but it also became more concentrated in two major areas.

CHAPTER III

MAJOR REASONS FOR THE PATTERNS OF CHANGE

This chapter is divided into two major sections. The first is a consideration of the ways in which certain characteristics of the physical environment are associated with the patterns of change of cropland harvested in the Southeast between 1939 and 1974. The second deals with the effects of major agricultural changes—technological advances, the increased importance of livestock, and such government programs as acreage restrictions and the Soil Bank—and with certain aspects of forestry. Although the primary focus of this research has been on environmental factors, the others must be given attention because, for the most part, they have exerted considerable influence on the patterns of change. In addition, these elements are included in this chapter since none, with the exception of government programs, is entirely divorced from an association with the physical environment.

A. CHARACTERISTICS OF THE PHYSICAL ENVIRONMENT ASSOCIATED WITH THE PATTERNS OF CHANGE

For the purpose of this research, three aspects of the physical environment are considered with respect to their relationship to the changes in cropland harvested occurring in the study area. They are soils, the land-surface form, specifically slope, and the erosion hazard, which is itself related to soils and slope. It should be added here that because of the scale employed in this research, certain generalizations

will be made that may not be applicable to individual counties or other small areas within the region.

Soils

As a general rule the soils of the Southeast are of a low to moderate natural fertility. Low inherent fertility and cultural practices which exhausted the nutrients in soils that were at one time at least moderately fertile may well have had a limiting effect on the acreage of land in crops in the Southeast. In fact, the paucity of harvested cropland in such areas as southeastern Georgia or the Cumberland Plateau in Tennessee, as illustrated in Figure 2 (page 16) may have resulted largely because the soils there are of very low fertility. Low fertility, however, is no longer the deterrent to crop production it formerly was because of the availability of low cost commercial fertilizers. Soils of low inherent fertility offer a less costly option for crop production than those having physical or terrain deficiencies. It seems unlikely that the overall patterns of change of cropland harvested between 1939 and 1974 were directly affected to an appreciable extent because of problems of low soil fertility.

Although the two properties are actually inseparable, it is often convenient to discuss chemical and physical properties of the soil individually. Not only may the latter be more important agriculturally, they are also less amenable to manipulation by management. Although a soil may be enhanced structurally through the addition of organic matter, it is difficult to maintain even moderate levels of organic

matter in many of the soils of the Southeast primarily because of rapid decay rates under the high energy and moisture conditions and the good aeration of many of these soils.

It is, of course, impossible in a practical sense to modify soil texture, which in turn strongly affects water-holding capacity, perhaps the most important physical characteristic of the soil for agriculture. By and large, crops get the water they require from available moisture in the soil, rather than directly from rainfall. During the summer, when the water demands of plants are high, temporary shortages may occur. Generally the problem is not so much that of losing a crop as it is in maintaining high yields. The hazard from inadequate soil moisture storage has been approached only indirectly, through supplementary irrigation, a practice that is excessively expensive and time consuming for the ordinary farmer. According to census data, by far the most supplementary irrigation in the study area is employed in the Mississippi lowlands and on the Louisiana Coastal Prairies. Carleton B. Barnes and F. J. Marschner delimited two areas elsewhere in the Southeast where low water-holding capacity presents a serious impediment to crop cultivation.[35] In the east, there are some separated areas corresponding to the Sand Hills of North and South Carolina. In the west, there is one, covering part of southwestern and central Louisiana and part of central Arkansas, including the Ouachita River Valley. Though somewhat

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[35]Carleton P. Barnes and F. J. Marschner, "Our Wealth of Land Resources," Land, the Yearbook of Agriculture, 1958 (Washington, D.C.: U.S. Government Printing Office, 1958), p. 13.

smaller, it corresponds roughly to the area of central Louisiana and Arkansas, exclusive of the Ouachita Hills, that experienced a heavy proportional loss of cropland harvested between 1939 and 1974.

On a small scale, drainage problems are associated with both the land-surface and the soils. The flattest parts of the Southeast have the poorest drainage. The most extensive and intensive measures to combat drainage problems have been undertaken in the Mississippi lowlands, where aid from various levels of government and financing through drainage district organizations has been used to modify the poor natural drainage.[36] Although the numerous swamps and marshes in southern Louisiana and on the Outer Coastal Plain from Georgia through North Carolina have no doubt had a limiting effect on cropland harvested, the problem of excessive water does not seem to have inhibited the increased acreage of harvested cropland in the Mississippi lowlands. However, added crop acreage apparently came later in eastern Louisiana than eastern Arkansas because drainage enterprises came later to Louisiana.[37]

Land-Surface Form

Because the land-surface is, in a practical sense, unalterable it is, perhaps, the most important aspect of the physical environment with respect to agriculture in the Southeast. The land-surface in the study area varies greatly, ranging from flat plains, such as the Mississippi lowlands, to low mountains, such as the Bostons or the Southern Appalachians.

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[36]Robert W. Harrison, Alluvial Empire (Little Rock: Pioneer Press, 1961), p. 178.

[37]Marschner, Land Use and its Patterns in the United States, p. 239.

Of all the characteristics of the land-surface form, slope seems to be the most significant to this research. The use of farm machinery becomes more difficult as slopes become steeper. Additionally, in those areas where there is little gently sloping land, as in hills or mountains, the formation of large fields is often inhibited, making the use of machinery less practical than it is in flatter areas. In addition, thinner soils are usually associated with steeper slopes although no attempt has been made here to demonstrate such an association. Furthermore, other factors being equal, the problem of erosion becomes greater as slopes become steeper.

Figure 8 is derived from Edwin H. Hammond's map Classes of Land-Surface Form in the Forty-Eight States, U.S.A. Here only the areas of different slope classes have been mapped, the differentiating characteristic being the percentage of the area in gently sloping land, ranging from less than 20 percent in the hills and low mountains to more than 80 percent in the smooth and flat plains. Gentle slope is defined as less than 8 percent inclination, a figure which lies "within the range of inclination in which the difficulty of machine cultivation increases rapidly and the erosion of cultivated soils becomes troublesome."[38] It should be noted that since differences in local relief have been omitted from Figure 8, there is no distinction between smooth plains (more than 80 percent of the area gently sloping and local relief from one hundred to three hundred feet) and flat plains

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[38]Edwin H. Hammond, "Analysis of Properties in Land Form Geography: An Application to Broad-Scale Land Form Mapping," Annals of the Association of American Geographers, LIV (March, 1964), p. 16.

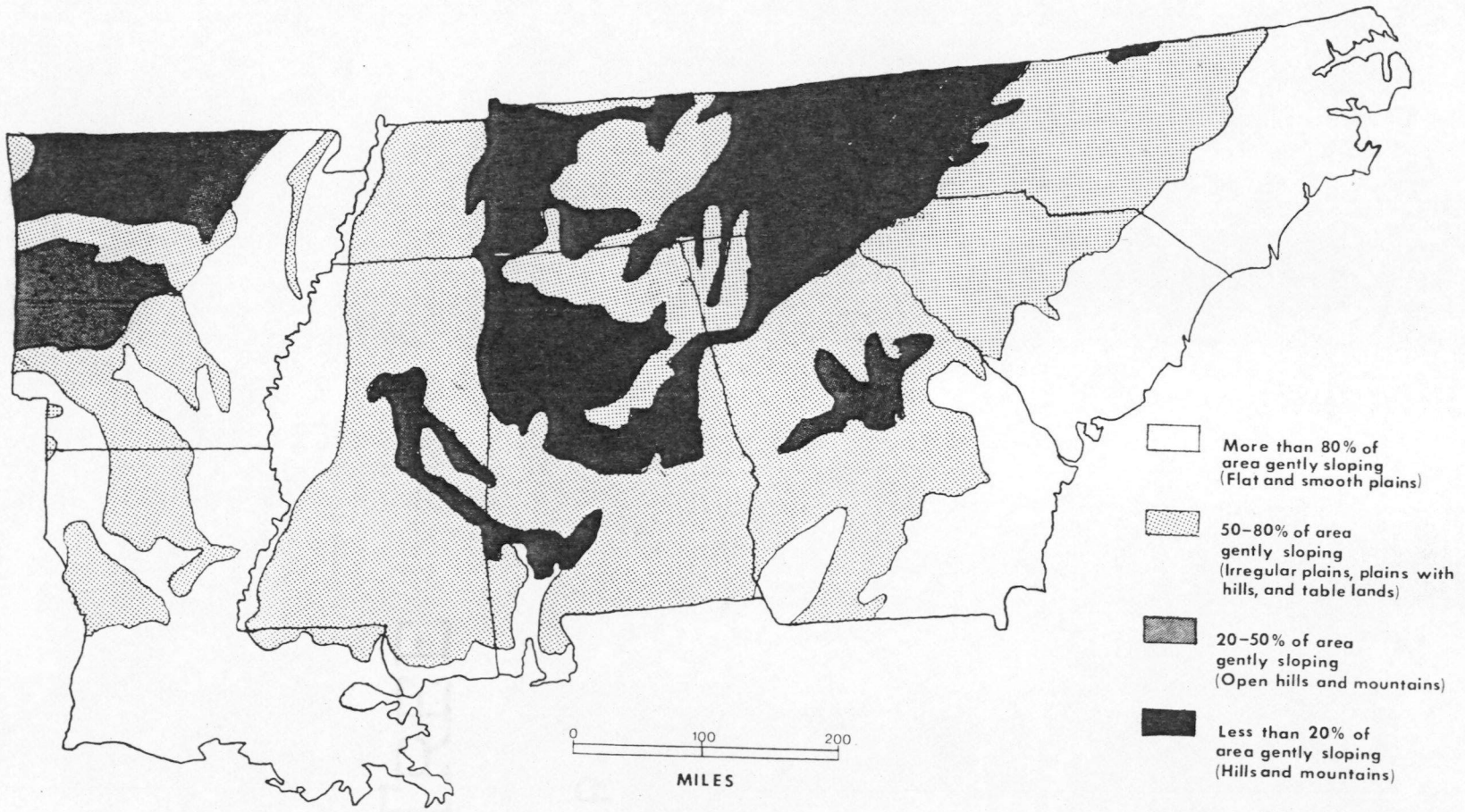

Figure 8. Slope.

Source: Edwin H. Hammond, Classes of Land-Surface Form, 1963.

(more than 80 percent of the area gently sloping and local relief of less than one hundred feet). Smooth plains coincide roughly with the Red River Valley in the western part of the study area and with two different segments of the Inner Coastal Plain in the eastern part. In addition, the distinction between such land form types as high hills and low mountains is not made in Figure 8, as in northern Arkansas, where the Boston Mountains are classified the same as the hills which border them. Because of the omission of the criteria of local relief and profile type, the tablelands of the Southeast are mapped in the same class as irregular plain or plains with hills. For example, the tablelands of the Cumberland Plateau and Eastern Highland Rim are not differentiated from the plains with hills of the Nashville Basin.

A comparison of Figures 6 (page 29) and 8 indicates a markedly strong association between those areas where the acreage of cropland harvested increased between 1939 and 1974 and those areas in the Southeast where gently sloping land predominates. Of the counties which added acreage, all were classified as some type of plain, that is, more than 50 percent of their area being in gently sloping land. Furthermore, with the exception of four counties in west Tennessee and one in northern Mississippi that added acreage, all the counties in the Southeast showing increased acreage were found totally or partially in those areas classified as flat and smooth plains (more than 80 percent of these areas is gently sloping). A total of eighty-four counties increased their acreage. The terrain of 100 percent of these is classified as plains, and of these seventy-nine or 94 percent are on terrain classified as flat or smooth plains, the remaining 6 percent being on irregular plains.

In considering those counties where the decrease of cropland harvested has been less than the regional average, again the association with gently sloping land is readily apparent. Of the counties that experienced a slight loss, only one, Henderson County, North Carolina, which is chiefly open mountains, is not found either entirely or partially in an area classified as some type of plain or tableland. In the east most of these counties, although not all, are found on the Coastal Plain, where more than 80 percent of the land is gently sloping. In the west they are associated primarily with irregular plains and tablelands.

In a model relating the decrease of cropland harvested in the Southeast between 1939 and 1974 to variations in slope, one might logically expect that the greatest proportional losses would be shown taking place in the areas of high hills and mountains (less than 20 percent of the area gently sloping). The absolute decrease in these areas, however, may be small since there was actually little acreage in 1939. The open hills and mountains (20 to 50 percent of the area gently sloping) would probably undergo a substantial loss, with the irregular plains being chiefly an area of slight proportional loss. A comparison of Figures 6 (page 29) and 8 indicates that there are certain deviations from such a model. One hundred and ninety-four counties experienced a heavy proportional decrease (a loss of more than 72 percent of the 1939 acreage level). Of these, one hundred seventeen or 60.3 percent are classified as being entirely of partially on irregular plains or plains with hills. Perhaps the most significant is the large area of heavy loss

associated with irregular plains, found mainly on the Georgia and South Carolina Piedmont, followed by a smaller area in southern Mississippi. In short, the association between slope and areas where cropland harvested has increased is more pronounced than it is between slope and areas where it has decreased.

The Erosion Hazard

The removal of topsoil by water on cleared land is one of the most serious management problems farm operators in the Southeast face. Prior to the 1930's, substantial tracts of cropland were abandoned in such places as the Loess Plain of Mississippi and in the Piedmont because of severe erosion.[39] In the Southeast, farm operators have frequently increased the erosion hazard by practicing clean cultivation and by largely avoiding crop rotation. Because erosion removes the chemically active part of the soil, the residual material is more inert and less responsive to fertilizers. As a result of the adverse effects of such soil loss, crop yields in the Southeast (and in other parts of the country) did not improve despite agronomic advances made during that decade.[40] The perception of many of the soils of the Piedmont as being critically infertile was largely due to lowered productivity through erosion rather than to their inherent chemical properties.[41]

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[39]Bennett and Chapline, "Soil Erosion: A National Menace," p. 2.

[40]Ibid.

[41]Higbee, American Agriculture, p. 313.

Although rainfall erosion is highly variable over even relatively small areas, soil loss can be fairly accurately predicted where the values of a number of interrelated variables are known. Where rainfall is sufficient to produce runoff, the amount of soil loss on agricultural land will vary with the soil's erodability, the steepness and length of slope, the cover of vegetation and agronomic practices, and various erosion control methods.[42]

To be more specific, soil is less subject to erosion when its properties are those that increase infiltration rates and permeability and those that resist the dispersion, splashing, and transporting forces of rainfall and runoff. As a rule, soils with a high proportion of coarse materials are more permeable and less erodable than are those with a high proportion of fine materials. Also increased amounts of organic matter aid in aggregation of particles and lead to a marked reduction of erodability. As mentioned earlier, the maintenance of organic matter in the soil remains a management problem in the Southeast.

In general where slopes are steeper, the erosion hazard is greater, except under a dense cover of vegetation. Under row crops the relationship between soil loss and increasing slope steepness is curvilinear. In addition, other factors being equal, increased slope length means greater soil loss toward the lower parts of the slopes, greater length permitting greater accumulation and more channelization of runoff, increasing the capability of the runoff to detach and

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[42]Stewart et al., Control of Water Pollution from Cropland, p. 32.

transport soil particles.[43] The importance of the length and steepness of a given slope can be greatly modified by the erodability of the soil covering it. Sandy, highly permeable soils in parts of the Southern Appalachians have reportedly been cultivated on slopes as steep as 20 percent without serious erosion, whereas certain silt loams in the Valley and Ridge have undergone noticeable erosion on slopes of 2 percent or less.[44]

The cover of vegetation has a profound effect on erosion. Under natural conditions of dense vegetation even the steepest slopes in the Southeast have experienced little accelerated soil erosion. Row crops, especially corn, cotton and soybeans, offer little protection at best and are little better than fallow when planted up and down the slope. Relatively simple practices, such as stubble or straw mulching, can significantly reduce soil loss from land planted to row crops. In addition minimum tillage practices can reduce runoff and erosion, by bringing about large aggregate or clod size and in reducing compaction compared to ordinary tillage practices.

The effects of erosion can be lessened through the employment of certain control practices. Contour tillage is relatively simple and inexpensive, but is most effective on slopes no steeper than 6 percent.[45] Terracing, which combats erosion by reducing slope length, is a more

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[43]Ibid., p. 34.

[44]Bennett and Chapline, p. 15.

[45]Stewart et al., p. 41.

effective practice for reducing soil loss. Its chief disadvantage is its expense of construction, and it is not recommended where slopes are greater than 12 percent.[46]

Anti-erosion practices can reduce soil loss, but, of course, cannot prevent it. In general, erosion control practices are most effective in areas of gentle slope. Under certain conditions, ordinary practices may not be economically feasible. For example, where soil has been so severely eroded that even with the application of six hundred pounds of fertilizer, per acre yields are lower than those once obtained with the application of three hundred pounds, and the nature of the land surface is such that terracing is the only really effective method for combating further erosion on cropland, then the costs of producing crops on such land may make their cultivation impractical. The conversion of severely eroded land to pasture or woodland is often the only suitable erosion control practice. Such conversion to alternate use has been an important and successful conservation method in the Southeast. Soils in the Georgia Piedmont, for instance, which are highly erodable when planted to row crops and suffered decreased productivity under cotton largely because of erosion, but when planted to grass and fertilized, they proved to be more than adequate for pasture.[47]

Figure 9 is taken from the U.S. Soil Conservation Service's map of soil erosion in the United States as of 1934 and is an indicator of the

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[46]Blakely, Coyle, and Steele, "Erosion on Cultivated Land," p. 297.

[47]Higbee, p. 316.

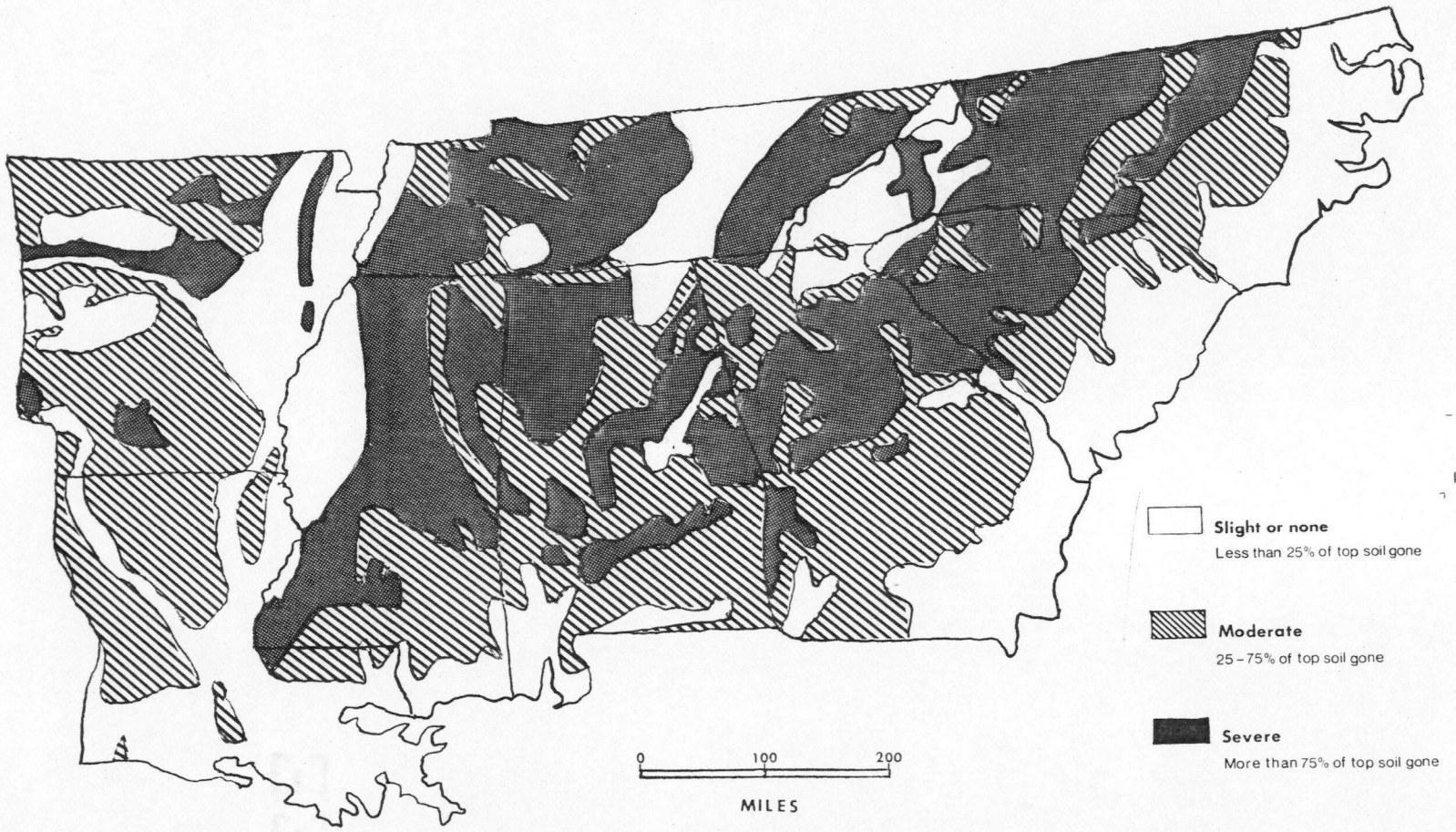

Figure 9. Generalized Soil Erosion.

Source: U.S. Soil Conservation Service, 1934.

variability of the erosion hazard within the study area. There are two different types of areas that escaped significant accelerated erosion: those such as the Mississippi lowland or the Coastal Plain, where the flatness of the land inhibited the process, and those such as the Boston Mountains or the Cumberland Plateau, where there was little crop cultivation. A comparison of Figures 6 (page 29) and 9 indicates that there is considerable correspondence between areas that had suffered severe erosion by 1934 and areas in the Southeast that underwent heavy proportional losses in cropland harvested between 1939 and 1974. The patterns of change illustrated in Figure 6 appear to have been affected to a greater extent in the eastern part of the study area than they were in the west. The most notable coincidence of severe erosion and the heavy proportional loss of harvested cropland is on the Piedmont, especially on the irregular plains of Georgia and South Carolina.

B. MAJOR AGRICULTURAL DEVELOPMENTS ASSOCIATED WITH THE PATTERNS OF CHANGE

Agriculture in the Southeast has undergone numerous changes, many of which have had a direct impact on the patterns of change of cropland harvested. A discussion of all these developments is not within the range of this research. However, three, which were believed at the outset of this research to have had the greatest impact on the spatial extent of cropland harvested will be discussed briefly.

Technological Changes

A variety of technological changes have affected the patterns of change of cropland harvested in the Southeast since 1939, for example the use of commercial fertilizers, improved varieties of certain crops, the use of pesticides, and the development of sophisticated equipment for tillage and for harvesting such crops as cotton, corn, and soybeans. The most important technological development from the standpoint of this research is probably mechanization, especially the conversion to tractor power.

The increase in the number of tractors in the study area has been dramatic. According to the Census of Agriculture, there were approximately 78,000 tractors on Southeastern farms in 1939; by 1974 the number stood at about 643,000. As the number of tractors increased, the number of work animals decreased, meaning that the acreage used to produce their feed could be diverted to other uses. Mechanization, of course, placed a premium on the flat land of such places as the Mississippi lowlands and the Coastal Plain for crop production. In addition, certain other aspects of the conversion to tractor power, which frequently had a negative effect on the acreage of cropland in the study area, bear mentioning here.

Technological developments encouraged commercial and discouraged subsistence agriculture, not only because they required substantial investments, but also because they placed increased emphasis on cash transactions. Farmers could not supply themselves with such items as

gasoline or agricultural chemicals on the farm, but had to purchase such items. Especially in those areas where subsistence farming was prevalent, the increased use of tractor power led to an increased consolidation of land holdings.[48] Such commercial operations as there were in those areas took over numerous subsistence farms. As a result, total cropland harvested was often reduced although cropland harvested per farm may have increased.

As a matter of economics, mechanization was more practical on large farms than on small ones. In 1940 it was estimated that the investment in tractors and related equipment on a nine hundred and fifty acre cotton plantation would amount to about the same as the investment in animals and equipment for operating the same plantation with mules, but on smaller farms mechanization would require a greater investment than would mule power.[49] A given set of equipment is most economical with a certain acreage, the relative cost of machinery being higher with less acreage. Additionally, costs per hour of operating tractors decrease as total hours of operation increase. That is, it costs less per hour to operate a tractor one thousand hours a year than it does to operate it one or two hundred hours. Mechanization was economically more feasible and attractive in areas where farms were not only large, but also where large portions of them were devoted to crop production.

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[48] Ibid.,

[49] R. S. Kifer, B. H. Hart, and Albert A. Thonbrouger, "The Influence of Technical Progress on Agricultural Production," Yearbook of Agriculture 1940 (Washington, D.C.: U.S. Government Printing Office, 1940), p. 528.

In an article entitled "The Demise of the Piedmont Cotton Region," by Merle C. Prunty and Charles S. Aiken published in the Annals of the Association of American Geographers in June, 1972, a further point was made with respect to mechanization.[50] In the 1930's agricultural specialists put forth the information that the terrain of the Piedmont was unsuited to the use of tractors. Again in the 1950's farmers were told that the terrain was unsuited to the use of the mechanical cotton picker. Yet farmers there who persisted in growing cotton were able to use the mechanical picker as well as tractors and other equipment. The perception of the terrain made it appear less favorable to the use of machinery than it actually was; as a result, it was the perceptions rather than the actual nature of the land-surface in much of the Piedmont that prevented many farmers from mechanizing, causing some reduction of cropland harvested there.[51]

The Growth of Livestock Raising

The importance of livestock in the Southeast between 1939 and 1974 has increased considerably. From the standpoint of this research, the most important livestock changes have been those associated with beef cattle. Hog production is most important in the study area on the Coastal Plain, from southeastern Alabama through North Carolina and in the western half of Tennessee. Its major areas have changed little since 1939. Spatial changes in Southeastern dairy farming have been of no

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[50] Prunty and Aiken, "The Demise of the Piedmont Cotton Region," p. 299.

[51] Ibid.

particular importance in this research. There has been a several fold increase in the number of broiler chickens raised in the Southeast, their production leading to a sharp reduction in cropland harvested in many counties. Although chicken farming requires little acreage, farmers often tend to concentrate all their efforts on broiler raising and may leave substantial tracts of cropland idle.[52]

As shown in Table VI, cattle in the Southeast have increased in number by approximately 110 percent. The proportional increase is even greater when only beef cattle are considered. In 1939 beef cattle made up about 55 percent, but by 1974 they accounted for approximately 94 percent of the total. There was an absolute reduction of the number of

TABLE VI

CATTLE AND CALVES IN THE SOUTHEAST, 1939 AND 1974

State	Number 1939 (Rounded)	Number 1974 (Rounded)	Change	Percent Change
Alabama	890,000	2,204,000	1,314,000	147.6
Arkansas	982,000	1,960,000	978,000	99.6
Georgia	803,000	2,023,000	1,220,000	157.9
Louisiana	1,052,000	1,516,000	464,000	44.1
Mississippi	1,140,000	2,270,000	1,130,000	99.1
N. Carolina	540,000	1,020,000	480,000	88.9
S. Carolina	275,000	590,000	315,000	114.5
Tennessee	1,109,000	2,751,000	1,642,000	148.6
Total	6,790,000	14,333,000	7,543,000	110.8

Source: U.S. Census of Agriculture, 1940 and 1974.

[52]Prunty, "Idle Land Phenomena in Madison County, Georgia," p. 46.

milk cows in the Southeast, probably associated with a decrease in subsistence rather than with a decline in commercial dairy farming.

In Beef Production in the South, Stewart H. Fowler listed several reasons behind the increased importance of beef cattle in the Southeast.[53] Cattle offered a logical alternative to crop production in areas where cotton had declined. In parts of the Southeast cattle came to be recognized as superior to crops from a conservation standpoint. Markets improved and the number of efficient meat packing facilities in the Southeast increased. The cattle fever tick was eradicated in 1950. New breeds, based on Indian cattle, were developed, as were controls for parasites and feed supplements to correct mineral deficiency associated with southern grasses. Southern farmers developed large acreage tracts of improved pasture. Additionally, the use of the trench silo provided an economical means of feed storage.

In this research the significance of cattle raising is the way it has affected land use. Of particular interest are the changes in the distribution of pasture in the Southeast. However, the 1940 Census of Agriculture does not give data for all land pastured, and the 1945 data are not comparable to later data. The 1974 Census of Agriculture gives data for land pastured but only for farms with sales of more than twenty-five hundred dollars annually. As a result the 1974 and earlier data are not completely comparable, and the twenty-five hundred dollar a year minimum no doubt understates the acreage of land pastured and especially

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[53]Fowler, Beef Production in the South, p. 25.

in counties in such places as western Arkansas or east Tennessee. According to the Census of Agriculture, land pastured in the Southeast stood at about 9.9 million acres in 1950. Land pastured for farms with sales of more than twenty-five hundred dollars annually in 1974 amounted to 8.7 million acres. Had all land pastured been given in 1974, the difference would probably be less. Although woodland pastured has decreased, cropland used for pasture only has remained nearly the same, being somewhat over fifteen million acres in both 1939 and 1974. That particular measurement is actually a part of total cropland rather than pasture. Since total farm land has decreased at a much greater rate than has pasture, pasture has come to occupy proportionally a greater amount of farm land than it previously did.

In 1939 cattle were very sparsely distributed throughout much of the Southeast. They were found in rather high numbers in middle Tennessee, east Tennessee, northwestern Arkansas, southern Louisiana, and the Alabama-Mississippi Black Belt. A comparison of Figures 10 and 11 shows cattle have increased and remained most concentrated in middle and east Tennessee and have increased greatly in the Black Belt and in northwestern Arkansas. They have also notably increased in southeastern Louisiana-southern Mississippi and in the Red and Arkansas River valleys. All of the above were prominent in 1939. By 1974, however, the number of cattle had greatly increased in the Piedmont, as well as in northern Alabama and in central Mississippi. Much of the Coastal Plain experienced a slight increase, except for southwest Georgia and southeastern Alabama where cattle numbers increased sharply. On the other



Figure 10. Cattle and Calves in the Southeast, 1939.

Source: U.S. Census of Agriculture, 1940.

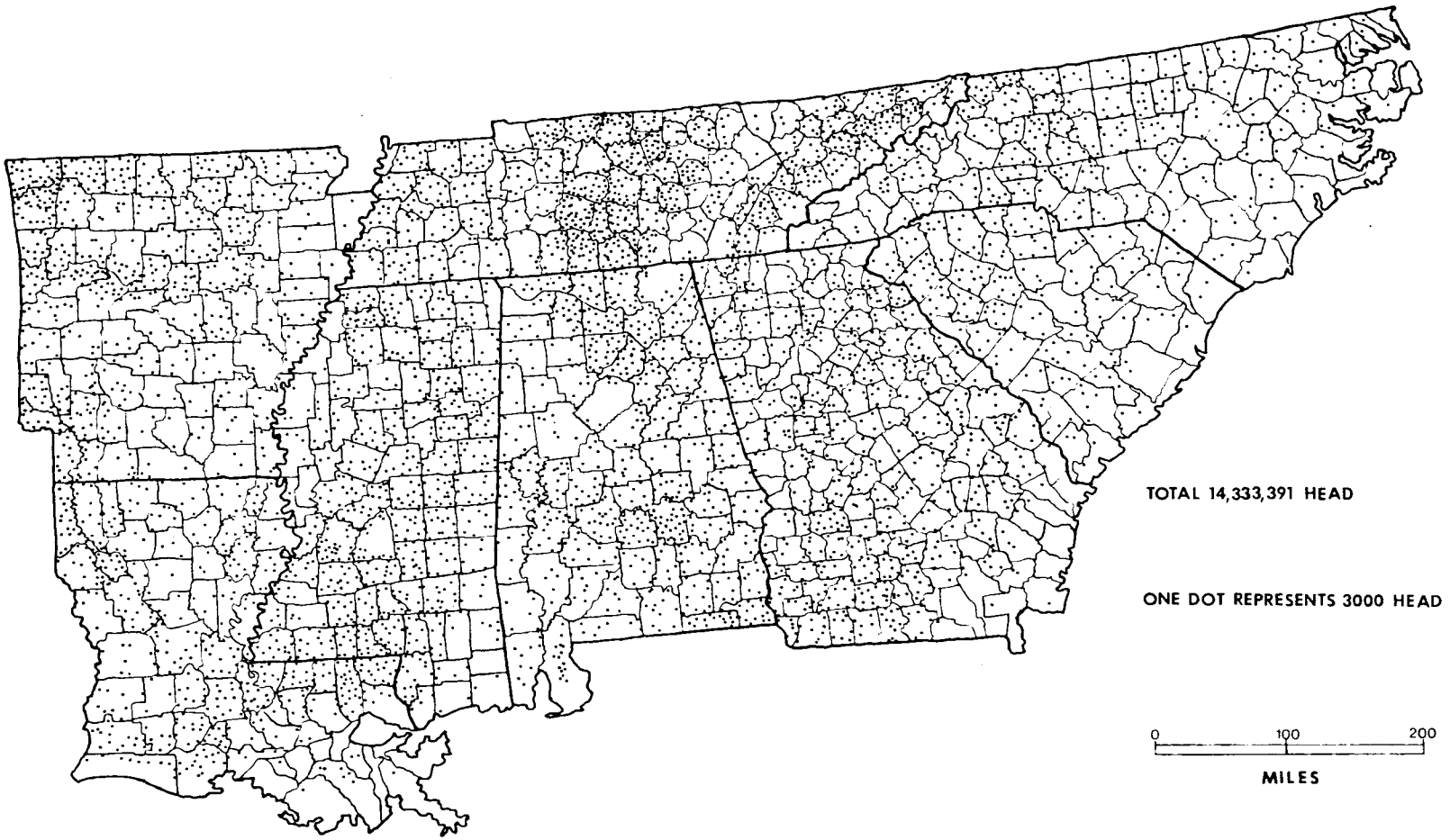

Figure 11. Cattle and Calves in the Southeast, 1974.

Source: U.S. Census of Agriculture, 1974.

hand, cattle declined in the Mississippi lowlands and the Coastal Prairies in Louisiana.

Cattle raising has been most competitive with cropland on the irregular plains, on the smooth plains (more than 80 percent of the land gently sloping and a local relief of one hundred to three hundred feet) and in the areas of hills and tablelands. In areas of general agricultural decline, as in central Arkansas and Louisiana and southeastern Georgia, cattle raising has not made appreciable gains. The conversion from crop to cattle production requires a significant investment, as does the conversion from mule to tractor power, and cattle have not had a major impact in those areas where farmers lacked sufficient capital or credit to make the conversion.

With the exception of parts of southwestern Georgia, for the most part there was little competition for land use between cattle and crops on the flat plains, especially in most of the Mississippi lowlands, crop being far more successful. However, there was considerable competition in the Mississippi lowlands in Louisiana. Between 1940 and 1950 much new land was cleared and put into drainage enterprises to create pasture, an acre of such land producing about three hundred and seventy-five to four hundred and twenty pounds of beef per year.[54] When the price of beef fell in the early 1960's, pasture was converted to cropland as soybean culture moved southward from Arkansas.[55] Furthermore, much the same thing

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[54]Harrison, Alluvial Empire, p. 319.

[55]Siniard, "Changing Cropping Patterns in the Mid-South," p. 67.

happened in the Coastal Prairies where soybeans came to surpass pasture for rotation with rice, causing a reduction in cattle numbers.[56]

Government Programs

Beginning with Franklin D. Roosevelt's first term in 1933 and continuing through the present, numerous government programs have had various direct and indirect effects on harvested cropland. Only two are given consideration here, the acreage allotment-price support system begun with 1933 Agricultural Adjustment Act and the Acreage Reserve and Conservation Reserve Programs known as the Soil Bank.

Acreage allotments are a means of reducing the supply of agricultural commodities and stabilizing their production. The mechanics of determining allotments is not within the scope of this paper, but in brief farmers agree to reduce the acreage of a specific crop in return for a minimum price from the federal government. A national acreage allocation is established for specified crops, then it is allocated among different states, and finally among different farms. Acreage restrictions for the most part have become more stringent with time, but there have also been times when they have been relaxed or lifted, as during the Second World War, and, as previously mentioned, acreage restrictions on upland cotton were lifted in 1970.[57]

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[56]Quentin A. L. Jenkins, George E. Dickinson, and William D. Hefferman, Social Factors Related to the Rapid Adoption of Soybeans by Louisiana Farmers, Louisiana State University and Agriculture and Mechanical Bulletin 646, July, 1970, p. 4.

[57]Rassmussen, Baker, and James, A Short History of Agricultural Adjustment, p. 5.

The overall impact of federal acreage allotments on the patterns of change depicted in Figure 6 (page 29) is extremely difficult to evaluate. Obviously they have led to the reduction in acreage of particular crops. When ten million acres of a given crop are planted in one year, for example, and in the following year only eight million are allotted, then, of course, its acreage will be reduced. It may be also that to a certain extent the patterns in the Southeast have been affected by acreage allotments. For instance, large farms, such as those in the Mississippi lowlands, could expand their cotton acreages when restrictions were lifted and retain larger allotments when restrictions were reinstated.[58]

Considering a number of facts, it does not seem that acreage allotments actually had an important impact on the extent of cropland harvested in the study area. According to data taken from the Census of Agriculture, corn acreage was reduced by over seventeen million acres, a loss largely unaffected by acreage allotments. Also, such areas as western Louisiana, central Arkansas and Louisiana, northern Arkansas, and southwestern North Carolina experienced heavy proportional losses which were probably not related to crop allotments. Furthermore, the near-disappearance of cotton acreage in the Piedmont, which in itself had a major impact on the patterns of change between 1939 and 1974, examined by Prunty and Aiken, was found to be related to the loss of agricultural

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[58]Hart, "The Demise of King Cotton," p. 311.

leadership and the decline of such enterprises as cotton ginning rather than to the effects of acreage restrictions.[59]

The first phase of the Soil Bank, the Acreage Reserve Program, was begun in 1956 and was discontinued in 1958. The program was designed to reduce acreages of crops that already were under federal acreage allotments. Farmers who participated received payments from the federal government to decrease the acreage or specific crops below established allotments. In 1958 the Conservation Reserve Program began, under which farmers received rental payments from the federal government to withhold cropland from production for periods of three, five, or ten years. The Conservation Reserve applied to all crops, not just those under the allotment program.

According to information in Agricultural Statistics, the last year land could be put into Conservation Reserve was 1960 and its peak year as well, at which time government sources indicate that it reached over four million acres in the Southeast.

Department of Agriculture data reprinted in Hart's "Loss and Abandonment of Cleared Farm Land in the Eastern United States," indicate that the heaviest concentrations of Soil Bank acreages were in the Piedmont of Georgia and South Carolina and on the Inner Coastal Plain from southeastern Alabama to southern North Carolina.[60] The Coastal Plain in North Carolina, much of the Mississippi lowlands, and the Coastal Prairies

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[59]Prunty and Aiken, "The Demise of the Piedmont Cotton Region," p. 298.

[60]Hart, "Loss and Abandonment of Cleared Farm Land," p. 431.

lost very little acreage to the program. Also counties that had very little cropland, as would be expected, had little acreage in the Soil Bank, for example those in the mountains, in central Alabama, and in southeastern Georgia. In general, what might be considered the worst and the best lands had the least acreage in the Conservation Reserve Program, with the most acreage occurring in the intermediate areas.

Partly because contractural arrangements were temporary, it is difficult to determine the impact that the Soil Bank has had on cropland harvested in the Southeast. As land went into the Conservation Reserve, it was also released, and without knowing the final disposition of Soil Bank land, it is impossible to know the full effect of the program. In northern Georgia, for example, most of the Soil Bank land was evidently planted to forests, meaning, of course, it would not return to cropland,[61] but by 1966 in Louisiana the amount of Soil Bank land planted to trees in the Mississippi lowland parishes ranged from none in Tensas to three hundred sixty-five acres in Morehouse.[62] It is possible that much of the land in the Mississippi lowlands generally that went into the Conservation Reserve program did so as corn acreage and was released as soybean acreage, in which case the patterns of changes would be little affected.

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[61]Prunty, "Some Contemporary Myths and Challenges," p. 10.

[62]R. R. Foil and R. G. Merrifield, Planted Forests of Louisiana, Louisiana State University and Agricultural and Mechanical College, Bulletin 611, June, 1966, p. 12.

C. CERTAIN ASPECTS OF FORESTRY

A number of nonagricultural forces have had a varying impact on the acreage of cropland harvested in the Southeast since 1939. Such activities as the exploitation of mineral resources, the placing of land in military reservations, the expansion of state parks, highway construction, the growth of cities (along with increased industrialization), the increase in the rural-nonfarm population, and forestry have all had a negative effect on the acreage of harvested cropland in the Southeast. Despite the importance each factor may have had in an individual county or certain small areas, only the last three are felt to be of significance in the study area as a whole. The effect of the growth of the rural nonfarm population is beyond the range of this thesis. The same statement is applicable to urban growth. It is obvious, however, from an examination of Figure 6 (page 29) that although proportional losses of cropland harvested were heavy in some of the most populous counties, many of the highly urbanized counties are not distinctive from surrounding areas.

Somewhat over one-half the total land area of the Southeast is forested. Figure 12 illustrates the percentage of commercial forest land in each county about 1950 from various reports published by the United States Forest Service. The changes depicted in Figure 13 are based on data taken from the Forest Service's A Forest Atlas of the South for 1969. Counties where the acreage change was sufficient to move them into the next higher or lower class indicated on Figure 12 were mapped on Figure 13; none increased or decreased enough to change more than one

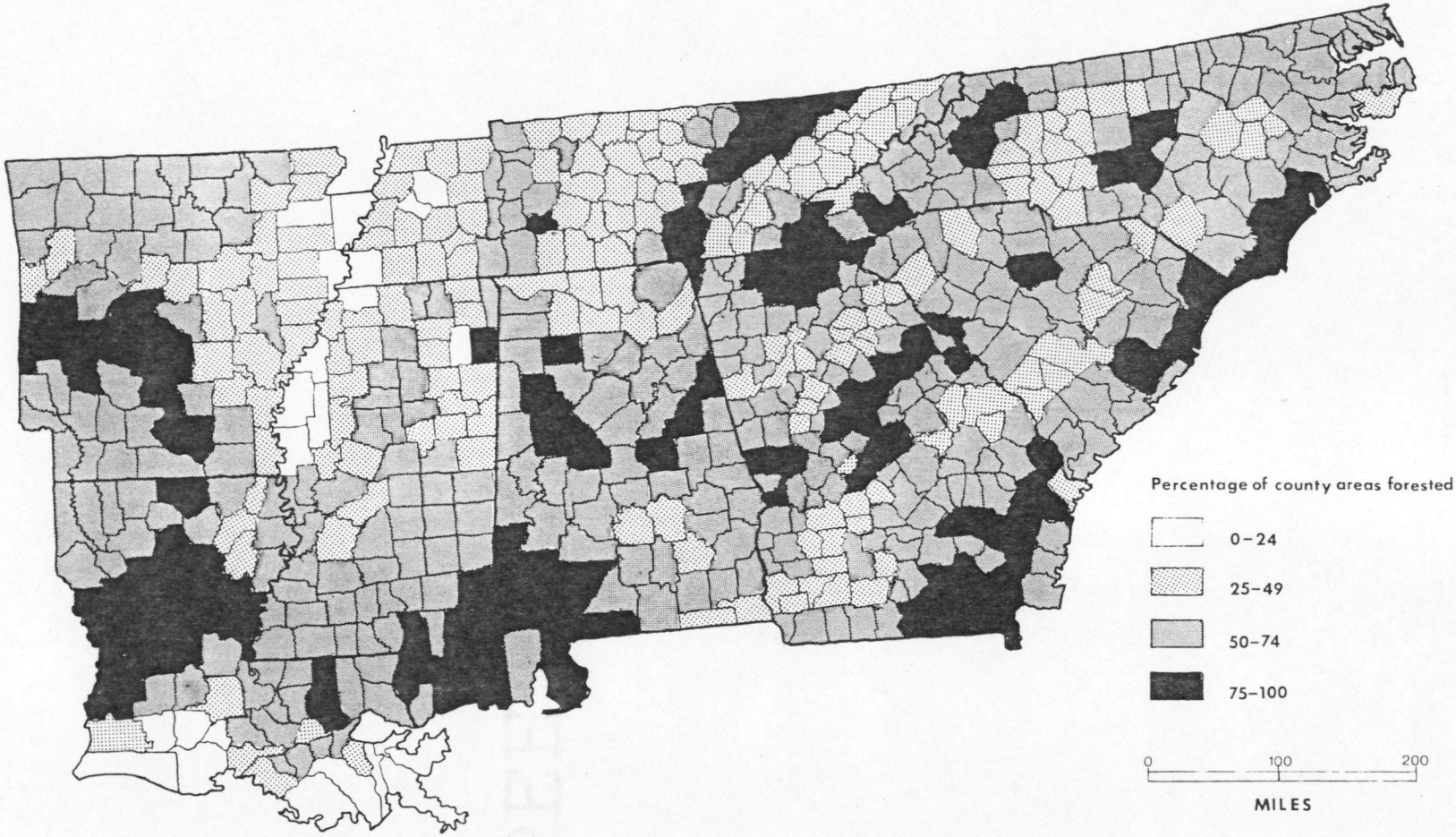

Figure 12. Percentage of County Areas in Commercial Forests about 1950.

Source: U.S. Forest Service.

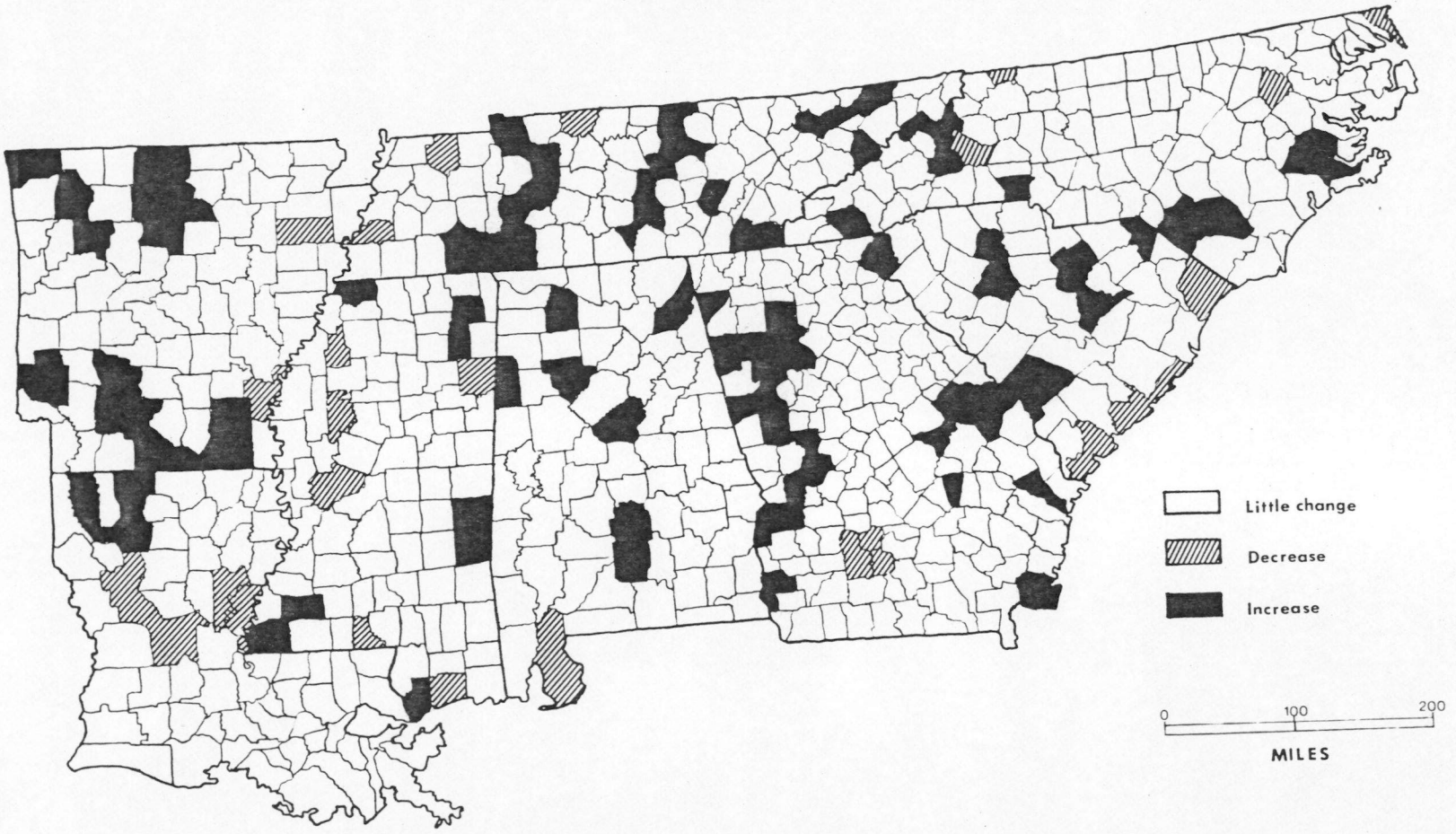

Figure 13. Change in Forested Acreage, 1950-1969.

Source: U.S. Forest Service.

class. There is some correspondence between areas where forest acreage increased between 1950 and 1969 and areas of heavy proportional loss of cropland harvested between 1939 and 1974, as in western Georgia or central Arkansas and Louisiana. In addition some counties that lost forest land also gained cropland, as in the Mississippi lowlands. In general there is some correspondence between areas where there is relatively little forested land and areas of increase in cropland harvested. However, much of the Valley and Ridge contains a rather low proportion of forested land because of the importance of pasture there rather than harvested cropland. Areas shown in Figure 12 as being the most heavily forested coincide fairly closely with areas shown in Figure 6 (page 29) as having experienced heavy proportional losses of cropland harvested, with notable exceptions occurring on the North Carolina Coastal Plain, as well as in some Georgia counties.

The Forest Service divides the private ownership of forests into three groups: farmers, forest industries, and miscellaneous owners. According to the Census of Agriculture, farm woodland in the Southeast, which reached its peak in 1954 at just under sixty-three million acres, declined from 51.5 million acres in 1939 to 26.9 million acres in 1974, 47.7 percent reduction.

As a general rule, farm woodland is not necessarily the most important type of ownership in counties where forested land is proportionally heaviest although the census shows that in these same counties farm woodland accounts for a high percentage of farm land. According to Forest Service data, ownership of land by forest industries

corresponds rather closely to the highest classification shown in Figure 12, as in central Arkansas and Louisiana or southeastern Georgia. In addition forest industry owned land is proportionally high in most of southern Mississippi even though many of the counties there do not fall within the highest class interval. Miscellaneous ownership for the most part seems to vary directly with the total amount of forested land. Owners in this group include increasing numbers of rural nonfarm people, investors in rural property, and various nonforest industries, such as mining interests.

Between 1964 and 1974, there were slight increases in cropland harvested in some of the heavily forested counties of Louisiana and Arkansas. Additionally, some of the counties on the Georgia Coastal Plain where considerable land is owned by forest industries showed some cropland increases. In those same counties, according to the Census of Agriculture, farm woodland fell by a greater amount than harvested cropland increased. It is very unlikely that any gains in cropland harvested were accomplished at the expense of forest industry owned land or even from miscellaneous owned land.

During the 1940's and 1950's the acreage of forested land in the Southeast not only expanded, but the percentage of such land held by forest industries and miscellaneous owners increased. Merle C. Prunty wrote in the early 1950's that the primary demand for forest land came from paper mills wishing to maintain their supply of raw materials and

from private individuals who recognized the possibility of good economic returns from the investment in Southeastern forests.[63]

In a sense, areas of commercial forests present obstacles to agriculture beyond those involved with land clearing. When the demand for forest products is high, forest industries are interested not only in retaining their holdings, but in expanding them. There is often a general deterioration of agriculture, as well as a diminution of harvested cropland, associated with a strong commercial forest industry; however, there are exceptions. Yet as a rule there is some physical limitation with respect to crop production on land where commercial forestry is most important in the Southeast. The presence of large areas of swamps on the Outer Coastal Plain in Georgia or South Carolina, for instance, has tended to encourage forestry even though the technology for draining swamps has existed for many years. The economic risk of growing crops on former swamp land is often considered so great that forestry becomes an attractive alternative to farming.[64] In the Southern Appalachians or the Boston Mountains, for instance, the terrain has obviously been a decisive factor in the presence of large areas of forests. Yet in other areas, such as the Outer Coastal Plain of Georgia, southern Mississippi or central Arkansas and Louisiana, commercial forest land has prevailed over cropland largely because of soil-related problems.

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[63]Merle C. Prunty, "Land Occupance in the Southeast: Landmarks and Forests," Geographical Review, XLII (July, 1952), p. 443.

[64]Higbee, p. 318.

And with the exception of parts of central Arkansas and Louisiana the problems are associated with the chemical properties of soils. Many of the more important commercial forest areas in the Southeast are where soils are extremely infertile. Along with low inherent fertility, there is often a poor response to fertilizer and extremely high acidity, as in southeastern Georgia. The physical environment placed certain constraints on agriculture in various areas, which in part encouraged the establishment of commercial forest zones in the Southeast. Within these zones, advances in agricultural technology had little effect on land use. That is to say, the development of commercial fertilizer did not reverse the trend of declining cropland, which had begun before 1939 in most of these areas, nor did the use of tractors or other agricultural machinery. Technological advances, in fact, contributed to the reduction of cropland harvested in many of these same areas in that it led to a reduction of subsistence.

CHAPTER IV

CONCLUSIONS

A. SUMMARY OF THE SPATIAL CHANGES IN CROPLAND HARVESTED, 1939 TO 1974

The major points brought in the second chapter of this research are as follow:

1. Between 1939 and 1949 cropland harvested in the Southeast fell from 50,134,754 to 43,360,083 acres, or 13.5 percent reduction. The largest area of heavy proportional loss (more than twice the regional average) took place in western and central Arkansas and Louisiana. The greatest increases, in both proportional and absolute terms, occurred in the Mississippi lowlands north of Louisiana.

2. From 1949 through 1964, cropland harvested in the study area was reduced by 30.9 percent. The largest area of counties experiencing heavy losses during this time is mainly in the Georgia and South Carolina Piedmont. On the other hand, there were substantial increases in the Mississippi lowlands, inclusive of Louisiana.

3. In contrast to the previous times, cropland harvested increased by more than two million acres or 7.1 percent between 1964 and 1974. Numerous counties experienced small gains. Again, the most substantial increases were in the Mississippi lowlands.

4. By 1974 cropland harvested in the Southeast became concentrated in two major areas. In the west, the Mississippi lowlands stand out largely through the addition of acreage. In the east, the Coastal Plain

remains significant largely through the retention of a relatively high proportion of its 1939 acreage.

B. CONCLUSIONS

The following points have been considered with respect to the impact they have had on the patterns of change of cropland harvested in the Southeast.

1. The extent of soil erosion in the Southeast by the 1930's had an effect on changes of cropland harvested in the years that followed. In the eastern part of the study area especially, severe erosion led to the reduction of crop acreage and the conversion of considerable land to alternate uses.

2. Mechanization, especially the conversion to tractor power, has had an effect on the patterns of change between 1939 and 1974. The use of tractors was more practical and more feasible economically in areas of large farms and in areas where harvested cropland made up a large portion of total farm land. Additionally, mechanization led to a decrease of subsistence.

3. Cattle have competed successfully with crops for land use in most of the study area, but have had little impact on parts of the Coastal Plain and have decreased in importance in the Mississippi lowlands and the Louisiana Coastal Prairies because of expanding crop acreage.

4. Federal acreage allotments have led to notable reductions in the acreage of specific crops, but they do not seem to have had much effect on the overall patterns of change since 1934. Although the Soil Bank

caused considerable retrenchment, it seems unlikely that the general pattern of change was noticeably altered by the program.

5. The expansion of forest land has led to a contraction of cropland harvested in parts of the Southeast. Where commercial forestry has taken over much land, the environment has often placed impediments on agriculture—irregular terrain and steeply sloping land, extensive swamps, large areas of unproductive soils.

The first hypothesis was stated as follows: those counties where the land surface is most favorable to the use of machinery and erosion hazards are least will either have gained the most or lost the least acreage of cropland harvested between 1939 and 1974. It is, in fact, apparently valid from only an examination of Figure 8 (page 39). As stated in the second chapter, only those counties where the land is classified as plains increased their acreage. Additionally, with the exception of a few counties in West Tennessee and one in northern Mississippi which are on an irregular plain, these same counties are on flat plains. Furthermore, with only one exception, counties that lost proportionally the least cropland harvested, i.e., less than the regional average, are found on plains or tablelands.

The importance that resource users attach to the nature of the land surface is apparent when one considers certain other adverse qualities for agricultural use. In the Mississippi lowlands, for example, soils are generally inherently fertile, but are deficient in organic matter; much of the area suffers from drainage problems; the rate of evapotranspiration is so great that supplemental irrigation is necessary in a fairly large

part of the area; flooding, also, has long been a problem there although more so along the smaller streams than along the Mississippi River itself. The flatness of the land, however, lessens the hazard of erosion and encourages the formation of large fields and facilitates the operation of large-scale agricultural machinery. Of course, the flatness of the land is not the only consideration here. If it were, then much of the Coastal Plain would have increased its acreage as did the Mississippi lowlands. There was more competition for land use on the Coastal Plain. Forests took considerable acreage, and in southwestern Georgia cattle numbers increased. And too, for the period of this research, there was simply more land available for cropland expansion in the Mississippi lowlands. One must also bear in mind that agricultural systems often tend to perpetuate themselves. The general agricultural expansion in the Mississippi lowlands was based on a crop producing system. Cropland expansion there in part has been brought about because farm operators are oriented toward crops rather than livestock.

The second hypothesis was stated as follows: those counties where the land surface is least favorable to the use of machinery and erosion hazards are greatest will have lost proportionally the most acreage of cropland harvested between 1939 and 1974. As Figure 8 (page 39) illustrates, the heaviest proportional losses occurred in counties of virtually every type of land surface, with slightly over 60 percent of the counties experiencing heavy proportional decreases having terrain classified as irregular plains and plains with hills. It should be pointed out here that large proportional losses in counties that had very

little harvested cropland in 1939 were of little actual significance. Where losses were relatively heavy, the nature of the land surface hazard of erosion were often not necessarily the most apparent contributing factor in such declines, nor do areas that are similar with respect to those two criteria necessarily experience similar changes in cropland harvested acreages. The Loess Plains of West Tennessee and northern Mississippi and the irregular plains of the Piedmont of Georgia and South Carolina are alike in slope and have both been subjected to severe erosion. But the Loess Plains stand out as an area of slight decrease with a few counties experiencing decreases, whereas the Piedmont is an area of heavy proportional decrease. In the latter area when cotton virtually disappeared, it was not replaced by another crop. Livestock, broiler production as well as cattle, increased greatly in importance. Furthermore, forestry expanded and the growth of cities and related industrial expansion pulled large numbers of people away from agriculture. In West Tennessee and northern Mississippi, alternatives to agriculture are much fewer than on the Piedmont, and, as in the Mississippi lowlands, farmers are oriented toward crop production.

In the beginning of this research it was felt that chemical properties of the soil probably had little or no effect on the patterns of change of cropland harvested between 1939 and 1974. However the role of such properties, though largely indirect, was probably underestimated. Parts of the Southeast where the soil inherently is the feast fertile, as in central Arkansas and Louisiana or in southeastern Georgia, are important commercial forest areas. The low fertility of the soils in

such places encouraged the growth of commercial forestry at the expense of agriculture, leading to a reduction of harvested cropland. In addition, it is difficult to say to what extent the physical properties of soil in such areas as the Sand Hills of North and South Carolina, or central Arkansas and Louisiana have led to a reduction of cropland harvested. In the latter area, the section where soils are of an extremely low water-holding capacity is a rather small part of a large forested area, where losses of cropland harvested have been heavy.

Despite certain irregularities, changes in cropland harvested between 1939 and 1974 were, in general, much as might be expected based on considerations of the nature of the land surface and the erosion hazard in the face of the changing nature of agriculture in the Southeast. Still, certain areas experienced losses greater than one might expect. For instance, considering the general suitability of the Alabama Black Belt to crop production, its above average proportional loss of cropland seems excessively high. Also, the large area of smooth plains in the western part of the study area, roughly the Red River Valley, lost substantial harvested cropland. In both cases the competition between cattle and crops for land seems to have accounted for the decrease.

The use of the land is dependent to a great extent on the way in which it is perceived. Such perception, in turn, is greatly influenced by the level of technology of the time. Advances in agriculture technology can be classified as land saving or labor saving. In the first class are such things as commercial fertilizers, improved varieties of plants and breeds of livestock, and improved drainage and

techniques of supplemental irrigation. In the second are tractors and other machinery and herbicides. Land use other than cropland has been affected. For example, much of the Southeast other than Tennessee was considered inferior for raising beef cattle, but with new breeds, improved grasses, and feed supplements, the Southeast became an important producer of feeder cattle. Such problems as poor drainage and soils of low inherent fertility have become less important as impediments to crop production, but the levelness of the land itself has become a more important asset to agriculture with widespread mechanization. That is to say, the relationship between the nature of the land surface and agriculture in the Southeast has changed to a large extent because of certain technological advances. However, such advances have not freed farm operators from their dependence on the environment, but have rendered the dependence somewhat altered. In short, the condition of the land surface, the way it is perceived with respect to agriculture, and the erosion hazard have, to varying degrees, influenced farm operators' decisions to increase or decrease the acreage of land planted to crops.

C. PREDICTIONS AND POSSIBILITIES FOR FURTHER RESEARCH

Predictions

It seems unlikely, based on what this research has shown, that by the 1984 Census of Agriculture there will be significant alterations of the established patterns of cropland harvested in the Southeast. Of course, such changes will occur, will be affected to a marked degree by

fluctuations in the prices farmers receive for crops and livestock. No reversal of existing trends in large areas is expected. For instance, there will probably be no increases in the Georgia Piedmont or the Ouachitas. Increases will probably occur in the Mississippi lowlands, but surely at a decreased rate. In northeastern Arkansas and extreme west Tennessee (the land area of Lake County, Tennessee, being over 80 percent cropland harvested) the density of harvested cropland is so great that any expansion seems almost impossible. In fact, any increase in alternate land use would probably lead to some reduction of cropland harvested, as apparently was the case in Mississippi and Craighead Counties, Arkansas, between 1964 and 1974. Yet despite substantial increases in the past decade, there is still much land available for expansion in the Mississippi lowland counties of Louisiana. Considering changes that occurred between 1964 and 1974 and the nature of the land, it seems likely that significant increase may take place in the Red River Valley. The previous statement is also applicable to the Eastern Highland Rim in Tennessee. There also may very well be increases on the Coastal Plain, especially in those counties between Albermarle and Parmlico Sounds.

Possibilities for Further Research

It was not the purpose of this study to examine changes of harvested cropland in the Southeast on an especially large-scale. Within counties, or indeed on individual farms, a variety of forces not considered here may have influenced farm operators' decisions regarding land use.

Furthermore, within individual counties major shifts could have occurred which went entirely unnoticed in this research. Finally, on a relatively small scale, there are a number of factors beyond the scope of this paper, many of which may be worth consideration in explaining the changes in cropland harvested in the Southeast since 1939. They are presented as follows:

1. Considering the extensiveness of forestry in the Southeast, its impact on other land use should be examined, with regard especially to the direct acquisition of agricultural land by forest industries.

2. Many farm operators in northeastern Arkansas are of fairly recent mid-western origin. Certain agricultural methods seem to have been spread from there into West Tennessee, Mississippi, and Louisiana, and possibly to other parts of the Southeast. How this influence affected the perception of the land and growth of cropland harvested in parts of the Southeast, especially in the Mississippi lowlands, should be examined in detail.

3. Further research could be done to determine if the growth and changes in the distribution of the rural nonfarm population may have altered the patterns of change in cropland harvested between 1939 and 1974.

4. For the most part, this research has avoided an examination of economic factors related to cropland changes in the Southeast. Further research could be done with respect to the amount of investment needed per acre or per farm compared to the return on investment from livestock or crops with respect to how such considerations have affected the

decisions of resource users. Further research also could be done to determine if the counties where agriculture was the most viable economically in 1939 were those where cropland harvested increased the most by 1974 and on the other hand, if counties where agriculture was economically the least viable in 1939 were those where cropland harvested decreased the most by 1974.

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