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thesis entitled

Land Utilization as Influenced by Rural
Zoning Ordinances in Relation to Land
Character ⁱⁿ Selected Rural-Urban
Fringe Areas in Southern Michigan
presented by

Everette L. Duke

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LAND UTILIZATION AS INFLUENCED BY RURAL ZONING ORDINANCES IN
RELATION TO LAND CHARACTER IN SELECTED RURAL-URBAN
FRINGE AREAS IN SOUTHERN MICHIGAN

By
Everette L. Duke

A THESIS

Submitted to the School of Graduate Studies of Michigan
State University of Agriculture and Applied Science
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ABSTRACT

The spread of residential, commercial, and industrial developments from urban centers into adjacent unincorporated areas has reached significant proportions within comparatively recent years. One of the many problems posed by this trend is the removal of land from agricultural production.

In view of the fact that the population is increasing rapidly, it is important that the better agricultural lands be reserved for the future production of food and fiber by protecting them against the encroachment of non-agricultural uses as much as possible. This can be accomplished to a large extent in the state of Michigan since counties and townships have been granted the necessary powers by the State Legislature through rural zoning enabling acts to zone the unincorporated portions of their areas.

Thirty-four townships of Southern Michigan were investigated in order to obtain some idea of the disposition being made of the better agricultural lands through the zoning process in that section of the State. The protection of good farm land in the southern portion of the State is especially important, as far as the State is concerned, because here the suburbanization force is at its greatest and here, also, are the best lands and climate for general agricultural purposes.

The use-districts as set forth in the zoning ordinances of the townships were correlated with the suitability of the land in the districts for agriculture on the basis of six agricultural land classes: Class I

embracing the best agricultural soil types, Class V the poorest, and Class VI those which could not be classified on the basis of soil type alone.

The unincorporated portions of the townships involved in the study total approximately 662,000 acres. Although nearly one-half of this amount consists of Class I and Class II agricultural land, not a single acre has been zoned specifically for agricultural purposes.

However, many townships have created so-called "agricultural" districts, but in each case various non-agricultural uses are permitted in addition to agriculture. Approximately 64 per cent of the total area involved in the study is included in such districts. But even when these districts are considered as primarily agricultural in nature, there is still about 30 per cent of the Class I and Class II land which may be considered as essentially lost for agricultural purposes.

It was also found that only slightly over one-half of the total area zoned as "agricultural" districts consists of the top two agricultural land classes, and that more than 28 per cent of these districts is made up of the two poorest agricultural land classes. This is especially significant inasmuch as more than 39 per cent of the total area included in the non-agricultural districts is Class I and Class II land.

The results of the study in general imply two problem situations: (1) much good agricultural land is not adequately protected against the encroachment of non-agricultural uses, and (2) many townships have not given due consideration to the character of their lands, and their adaptability for certain uses, in drawing up zoning ordinances.

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INTRODUCTION

Statement of the Problem

The spread of residential, commercial, and industrial developments from urban centers into adjacent unincorporated areas is a phenomenon which has reached significant proportions within comparatively recent years--especially since World War II. Dwellings occupying individual lots or acres, residential subdivisions, factories, commercial enterprises, and shopping centers are common sights just beyond the city limits of practically any sizable metropolis.

One of the many problems posed by this lateral spreading out of the population is that of the removal of land from agricultural production. Agriculture is unable to compete successfully for long with the highly intensive uses in these rapidly growing built-up areas--called "rural-urban fringes" and similar terms. The development of these areas takes place without regard for land character; good and poor quality agricultural land are consumed indiscriminately.

That the amount of land being taken out of agricultural production through this suburbanization trend is significant, is evidenced by the numerous references which have been made to the situation in the literature. Following are selected observations made within the last decade and a half on the increasing demand for land for non-agricultural purposes and the resulting effect upon agriculture.

In some areas the most important factor contributing to the curtailment of the amount of land used for agricultural purposes is the demand for land for other uses, largely related to residential, industrial, and certain types of recreational activities. When land becomes important for these more intensive uses, people are generally

willing to pay higher prices for land.

When the major factor in farm land values is connected with expectations of future land uses rather than with the current returns in agriculture, it becomes almost impossible for a producer dependent on the farm for his living to carry on stable farming. (Rezman 1941)

Some of the best vegetable, citrus, walnut, and alfalfa soils in Southern California have already been subdivided into residential lots. We all realize that good sound development of a community is very beneficial, but in today's mad scramble for homes, we must guard against over-development and the removal of land from agriculture which might better be left in food production for the good of the community. (Martin 1946)

. . . the urbanization of rural Connecticut poses several agricultural problems. It has greatly affected the pattern of land use. In some areas, the demand for rural residential property has raised land values to the point where only the most efficient commercial farmers can afford to stay in business. Farms are being taken out of cultivation and put to non-agricultural uses. Building lots, golf courses, ski runs, business and manufacturing developments, highways and reservoirs are among the uses to which farm land is now being put. (McKain and Whetten 1949)

There is considerable evidence, based on census data, that the movement of land out of agriculture in Massachusetts has been by far the most important shift in land use over a period of years. . . .

Considerable changes have taken place . . . in the demand for rural land. This expresses itself largely in the more rapid expansion of the use of land for part-time farming, housing accommodations in rural areas, and facilities for recreational development. All these forces have been in operation for some time in rural areas but have become more prominent in the postwar period. (Rozman and Sherburne 1950)

By adequate zoning and related measures, suburban expansion in many communities could no doubt be directed toward the less fertile agricultural lands. The national interest is served by maintaining the food producing capacity of our soils. We are doing something about soil erosion. Perhaps tomorrow we may find a way to keep the better soils on the expanding urban fringe producing food. (Solberg 1951)

With a growing population, pressures on land are greatly increasing, and while there is still an abundance of land in America it is being exploited at a heedless rate under the present pattern of private ownership. The ease with which agricultural land can be transformed into recreational areas, housing developments, and steel plants without any apparent awareness of the consequences on the part of real estate agents, government officials, and business executives, is

enough to dismay those of us who are concerned with conservation.
(Appel 1952)

The impact of . . . multiple pressures on the agricultural community of the urban fringe is often devastating. Prices of land rise beyond the reach of operating farmers; taxes reflect speculative land values that may never be realized; special assessments for schools, water supply, sewers, or other improvements are voted by the nonfarm landowners, and development costs are thereby shifted to farm lands which may not be ripe for suburbanization for decades. Tax pressures, consequently, may force premature subdivision of good farms or may end in tax foreclosure. A rural community's capacity to produce food may be as effectively destroyed by the erosion of premature suburbanization as by the erosion of its soils. (Solberg 1952)

While land for urban use is neither scarce quantitatively nor monopolized, there has been in most countries a growing competition for land for various uses. With the march of industrialization and urban expansion, land once devoted to agriculture, cattle grazing, or woodland, has entered the market for homes, factories, stores, offices, recreation, transportation and the requirements of defense and decentralization. In countries where domestic food and raw materials production are crucial to their economies, the contraction of productive land has become an increasingly serious threat. (Abrams 1953)

The population of San Francisco continues to overflow in San Mateo County. Many thousands of acres once in agriculture on the sandy loam soils of Colma, Daly City, and South San Francisco are now occupied by residential development. These soils were once the most productive in the county. . . .

The area east of Skyline Boulevard, once in various types of agriculture, is now largely suburban. . . .

Recently there was announced a plan for a housing development project in the San Pedro Valley. Around 650 acres of highly productive irrigated farm land are found there. . . .

It is rather interesting to note that in the immediate vicinity of the above described areas there are many thousands of acres of land which are non-tillable or have limited agricultural value. To date, only the best farm land has been taken by non-farm uses. (Sciaroni and Alcorn 1953)

Concomitant agricultural and industrial development is generally sharpening the competition for land, particularly in densely populated zones surrounding production centres. Many metropolitan areas are now facing the dilemma as to whether land should remain agricultural or should be utilized for industrial, commercial, residential or recreational purposes. (United Nations 1953)

Rurbanization occupies land with little regard for its character, need or utility for other purposes. It gobbles up good farm land for residence, industry or commerce--land that perhaps should have been dedicated to agriculture for the next 50, 100, or even 1,000 years!

The total of such land already devoured in the United States runs into millions of acres. (Wolfanger 1955)

The above observations will serve to emphasize the fact that much good agricultural land is being lost to non-agricultural uses in those areas which are feeling the effects of suburbanization adjacent to metropolitan centers. As population continues to increase, as all predictions and projections indicate, it is only logical to assume that there will be demands for additional food and fiber and at the same time more space will be required for residential, commercial, industrial, recreational, and transportation expansions. This poses a perplexing problem, which will become more acute as time passes, of producing an ever-increasing supply of food on a constantly diminishing area of agricultural land. How long can this continue? Can technological advancements in agriculture continue to meet the challenge as in the past? Is it not time to start thinking about protecting good agricultural lands?

Object of Study

Michigan counties and townships have the means by which they can guide the use of land on the unincorporated portions within their boundaries. The State Legislature has passed rural zoning enabling acts empowering these civil divisions to zone their unincorporated areas. With some conscientious effort and planning, then, the better agricultural lands in Michigan can be largely protected against the invasion of non-agricultural uses which accompany suburbanization.

The object of this study is to obtain a picture of the disposition of agricultural lands in those townships which have adopted zoning ordinances in Southern Michigan. It aims to ascertain the relation of the

land uses as influenced by zoning ordinances in those townships to the suitability of the land for general agricultural purposes. In other words, it attempts to answer the questions: What is happening to the better agricultural lands in Southern Michigan? Are they being protected and reserved for agricultural production? or are they being left open for the encroachment of non-agricultural uses?

Protection of better agricultural lands for agricultural purposes is especially important in Southern Michigan for two reasons: (1) the majority of the population of the State is concentrated in this area and consequently the suburbanization trend is more pronounced here than in any other section, and (2) the soils and climate in this portion are better adapted for general agriculture than elsewhere in the State.

Before proceeding with the details of the investigation, it may be well to consider briefly the rural-urban fringe and zoning in general. The following sections present something of the characteristics, growth, and problems of the rural-urban fringe and the nature, historical background, and functions of zoning.

The Rural-Urban Fringe

Description

Wehrwein (1942) has defined the rural-urban fringe as "the transition zone between the city with its highly intensive land uses and the farming area where people live the rural way of life." He further characterizes it as being without inner or outer boundaries which can be accurately mapped, yet being a transition zone that is fairly easily recognized. Salter (1940), moreover, suggests that the fringe itself consists of recognizable zones. He has divided the territory surrounding an urban center

into a series of three belts, all of which comprise the rural-urban fringe, as follows:

(1) The Subdivision Belt. This zone is closest to the city and begins at the outer limits of fully developed city streets. Most of the land is platted for future development as urban residence, but actual residential construction is scattered. There may be some small acreages used for intensive cultivation or part-time farming and some miscellaneous purposes.

(2) Rural Residence Belt. This belt is adjacent to the subdivision belt and is usually wider. Also, there is much less land platting and proportionately more cultivation. Part-time farms and rural residences on small acreages are the main land uses.

(3) City's Outer Fringe. Beyond the subdivision and residential zones "lie the tapering threads of the city's outer fringe." This zone may extend for a considerable distance into what may appear to be completely rural territory, but scattered throughout will be found many non-agricultural uses, some of which stem directly from the urban center. Traffic-attracted commercial uses may be strung for miles along the main highways, interspersed with part-time farms, rural residences, retirement homes, public and private recreational areas, etc. Often the last threads of a city's fringe will extend far enough to overlap those of some other city or cities.

Rate of Growth

Rate of Growth As Compared With Core Cities. The rate of growth of the rural-urban fringe has been exceedingly high within comparatively recent years, and has usually exceeded the rate of growth of the core cities.

Roterus and Hughes (1948) make some interesting observations on this point.

Between 1930 and 1940 the core cities of metropolitan districts grew at a rate less than one-third as fast as the areas outside. The cities of Philadelphia, Cleveland, and St. Louis actually experienced losses while their metropolitan districts, as defined by the United States Bureau of the Census, had substantial gains. Since 1940 the superior rate of growth of the fringe areas over the core cities has continued. In Flint, Michigan, for example, the city merely maintained its population from 1930 to 1947, while the surrounding fringe area doubled its population.

According to Martin (1953), in forty-three of the largest metropolitan districts, the rate of increase for the period 1930 to 1940 was 14.5 times more rapid in the unincorporated areas than in the central cities.

Actual Rate of Growth Not Readily Determined. The true picture of the decentralization process has probably been obscured to some extent. Tax Institute Incorporated (1947) has pointed out that there are at least three factors which have tended to obscure the real momentum of the dispersal trend, namely: (1) the census classification of urban and rural; (2) the way cities are constantly enlarging their areas, thus recapturing temporarily some of the population that had moved away from the city; and (3) the war-induced congestion of many cities may have tended to obscure the long-term trend.

Development Is World-Wide

The growth of the rural-urban fringes at a problem rate is by no means confined to the United States. This situation is common to practically every nation, the seriousness of the problem depending upon the degree of development of the country. Abrams (1953) has indicated the world-wide nature of the situation.

Outside some cities one may see land fronting on newly laid out streets, a home here and there, and weeds and grass sprouting in the empty lots. . . . Cook County, Illinois, in the United States, a tiny fraction of a single state, has enough vacant lots to accommodate 14 million people. . . .

Proper control of development on the outskirts of Paris and other large cities is one of the thorny problems in France. Suburban sprawl with its twin evil, ribbon development, has long been one of the United Kingdom's problems . . . Peripheral settlements have sprung up in various cities of South and South-East Asia. Sprawling suburbs of single-family homes have cropped up side by side with good modern apartments and subsidized housing projects in Latin America.

The limits of growth once hopefully set by Patrick Geddes for Tel Aviv in Isreal have been shattered under the impact of immigration. In many smaller towns in Isreal, peripheral housing developments on public land make for greater density in the outskirts than in the centre of town

In Africa, south of the Sahara, though there is no land shortage it is feared that the impact of current development will impair the fertility of the soil and sharply reduce food production required for local needs. An authority asserts that in India, suburban development has been absorbing arable land on the outskirts of cities. . . . In Costa Rica, valuable coffee fincas (plantations) on the country's most fertile soil are being destroyed by uncontrolled urban expansion.

Causes of Growth

Improved Modes of Transportation. The improvement in modes of transportation, mainly the automobile and paved roads, is the primary cause of the rapid rural-urban growth. Tilton (1931) states that the "extension of paved highways and the remarkable utility of the motor car have obviously been the dominant factors in modifying . . . markedly the rural character of the county." Ehrlichman (1952) says, "The change from public transportation to the use of private automobiles represents the power behind suburban development." Andrews (1942) also remarks, "Within recent years the arrival of automobiles and good roads have 'greased the ways' for decentralization of urban population. This form of transportation since it was rapid and infinitely flexible in its coverage, greatly enlarged the immediate 'living room' of many cities and made more normal growth possible outside the confines of the compact city."

Natural Attraction of the Country. Another factor which has contributed to the growth of the rural-urban fringe is the natural attraction which the

country holds for many people. Tilton (op. cit.) says, "The scenic assets of the countryside have always encouraged men to leave the congested city. Many who move into the open country do so wholly because they want the peculiar satisfaction which comes from closer contact with trees and growing things, from opportunities to enjoy the fields and the natural landscape."

Moreover, Tax Institute Incorporated (op. cit.) declares that "people did not come to the city in the first place because they liked living in the city, but because the city offered them the means of a livelihood." Thus, "they are moving out of the city, not primarily because of high taxes or for some of the other reasons frequently advanced, but because they want to live in the country."

Coming of City Conveniences to the Country. The coming of conveniences such as electricity, gas, and the telephone to the country and the development of means for providing running water in rural homes and the septic tank method of sewage disposal have greatly influenced the migration of city dwellers to the open spaces. In fact, as Tilton (op. cit.) says, "every advance of science and improvement of our social equipment makes possible a more widespread distribution of population beyond the limits of cities." According to Tax Institute Incorporated (op. cit.), "we may anticipate the continued spreading out of the population, due to individual desires for the good things of country life, which no longer need be accompanied by pioneer hardships."

Less Strict Building Standards Outside City Limits. The usually less strict building standards outside of city limits have been a great incentive for many of the numerous subdivisions which have sprung up in the rural-urban fringe. As Graves (1952) puts it, "there is a premium to the subdivider

who goes out to build and sell, and get out from under." Many single residences have also been located in the rural-urban fringe rather than in the core city because individuals usually find it more difficult to meet the building standards required by the city.

Likewise, economics may partially explain the development of these subdivisions on the better agricultural lands rather than on those which are less suited for agricultural purposes. Martin (1946), in discussing the removal of good agricultural land from cultivation for the development of subdivisions in California, expresses the belief that the combination of "the present high cost of building and the price ceilings placed on new construction" is a situation which "forces new home construction on to flat lands, where many of the most fertile soils are located." For, "here the cost of building roads, installing water mains, sewers and other utilities, and the actual costs of building the houses are less than it would cost on hilly or uneven lots."

Offers Advantages to Industry. Considerable growth of the rural-urban fringe is due to the advantages which it offers to industrial concerns. Arpke (1942) and Wehrwein (op. cit.) have listed abundant light, cheaper land, lower taxes, plenty of room on which to erect the characteristic one-story factory buildings, recreational areas, parking space and easy accessibility by workers, and less congestion due to the movement of raw materials and freight by trucks as some of the inducements to the development of industry in fringe areas. Moreover, the decentralization of industry causes a certain amount of involuntary migration of population in addition to that which is due to individual decisions (Tax Institute Incorporated, op. cit.).

Atomic Energy Developments. The development of atomic energy may have had some effect on the growth of the rural-urban fringe and will probably have

considerably more in the future. Reed (1950) remarks, "The mere words 'atomic bomb' suggest a motive to the dispersion of urban population more powerful than any which has preceded it."

Likewise, Tax Institute Incorporated (op. cit.) points out that we cannot ignore "the impact of the atomic energy development upon our whole way of life." It goes on to state, "It is true that people have always been willing to live on the side of a volcano, and probably relatively few individuals will leave the city for this reason, but it is likely that this development will bring about a certain amount of industrial decentralization, particularly in connection with plants producing military supplies." It states also that some population dispersal may be encouraged in the future by governmental authorities as a safeguard against atomic warfare or other developments in military science.

Miscellaneous Reasons. In a study made of the rural-urban fringe about Eugene, Oregon, an attempt was made to discover the reasons why residents of the fringe prefer that location to the city proper (Faust 1942). The answers most frequently volunteered to the question, "What are the reasons for your choice of suburban location rather than a location within the city limits?" were, in order: lower rents; acreage for subsistence gardening or farming; cheaper land, site, or location; freedom from building and land-use regulations; lower taxes; to be near employment or business; "like the country."

Other suggestions have also been offered. Andrews (op. cit.) states, "From a purely sociological point of view the large cities have, with their noise, dirt, and crowding become increasingly less desirable places in which to live." Tableman (1952) suggests that the lack of suitable building lots inside the city may be one of the causes of outward movement.

Problems

Inadequacy of Local Government. One of the major problems of the rural-urban fringe is the inadequacy of local government for dealing with the situations which arise. Arpke (op. cit.) states that the principal difficulties in the fringe arises from the attempt to carry on a distinctly urban development without the benefit of recognized political controls and facilities.

Tilton (op. cit.) has described the adjustment which local rural governments have had to make.

So long as the county remained predominantly agricultural in outlook, its problems of government were the simple ones of grading the roads, maintaining order, collecting taxes, distributing groceries to the poor, and occasionally making repairs to the courthouse or jail. But since city growth has been spreading into the open country, the county has a new set of problems. It has had to enlarge its functions to provide in unincorporated districts the kind of services and improvements that municipalities are expected to provide.

Adjustment of the Inhabitants. According to Andrews (op. cit.), the multiple invasion of what he terms the urban-fringe "may be said to involve . . . a radical shift in the general cultural pattern, a conflict of opinions in local government, and a basic change for the area in the means of getting a living." Specifically, for those citizens of areas into which fringe urbanization enters he feels that "urbanization may force a disruption of the mode of living, a change of economic activity, new governmental problems, and a readjustment of values as citizens in a transition area." Whereas, those people who move their residence or business to the fringe "face difficulties of adjustment to a new and shifting environment in which new considerations, new neighbors, and an unstable pattern of facilities and institutions predominate."

Martin (op. cit.) also describes the adjustment problem of the inhabitants in the rural-urban fringe.

Here is a dynamic population mass seeking to adjust to a habitat that is rural yet urban, by techniques which are neither rural nor urban. As producers, as consumers, as functional members of the great urban division-of-labor complex, fringe dwellers are organized around and symbiotically integrated with the population of the urban centers; yet, as citizens, as social beings, as families, they are not of the city. Their habitat reflects in its discord of land uses the flux of their culture and the inconsistencies of their efforts to combine rural and urban ways of life.

Misconception of Economic Advantages of Living in the Rural-Urban Fringe.

A problem situation of the rural-urban fringe is the fact that people often have a misconception of the savings afforded by a home in the fringe.

Higher insurance costs because of the lack of adequate fire and police protection in the fringe may tend to offset the advantages of lower rents and taxes.

Moreover, the differential cost of transportation of the fringe dweller as compared with the city dweller may be significant. Gilbert (1942) cites the results of a fringe area study in which it was found that: (1) the fringe dweller's business and occupational interests still center in the near-by urban center; (2) with the exception of groceries, gasoline, and oil, retail purchases are made almost entirely in the downtown retail section; and (3) cultural activities which enlist the interest of the fringe dweller--churches, lodges, service groups--are predominantly city-made institutions. As he points out, "it will be seen at once that places of employment, shopping activities, and cultural affiliations require frequent trips from the fringe to the city center." The expense involved is probably greater than people usually realize.

Gilbert (Ibid) also points out that tax savings in the fringe, which it appears people commonly expect, are not likely to be realized.

In so far as migration to the fringe has been influenced by the prospect of tax saving, the advantage, slight and illusory as it is,

may be only temporary and shortlived. As population in the fringe thickens and the community assumes the aspect of a town, citizens will not be content with the sacrifice of essential services which an organized municipality can afford. One of two methods of escape will be the result. The suburban area will seek annexation to the adjacent city and the differential of tax rates will disappear, or a separate municipality will be organized with the prospect of an even higher rate of taxation than that which prevails in the city proper. Comparable services, for a time at least, will cost more than they do in the more compact residential areas within the city limits.

Premature Subdivisions. The development of speculative and premature subdivisions in fringe areas has created many serious problems. Not only has land been unnecessarily withdrawn from agricultural production, but communities have experienced considerable financial loss. The Pennsylvania Department of Commerce State Planning Board (1940) explains what can happen.

If such subdivision is allowed to occur without a real need, or a likelihood of settlement in the locality subdivided, the results are frequently very serious for the community involved. The area so subdivided is withdrawn from agricultural use and becomes unproductive. The laying out of streets and the provision for future public services may add greatly to a community's expenses. Such land frequently becomes tax delinquent, and in many cases, because of accumulated charges on the subdivider or the holders of lots, becomes the subject of expensive legal action, and a source of loss to the community.

Difficulty of Planning. A problem of primary importance in the rural-urban fringe is the fact that planning is made extremely difficult by the complexity of factors which influence land use in such areas. Salter (op. cit.) has written on the importance of this situation.

In the rural-urban fringe areas, the factors affecting land use are particularly complex, shifting, and powerful. A serious attempt to plan recommended uses of the land necessarily involves the analysis of competing and conflicting influences arising from very diverse sources. The most significant motivations that may alter the land pattern may arise, not from within the locality affected, but from without it. Such forces are usually extremely powerful as compared with the normal influences operating on land uses in purely agricultural communities. High and concentrated investments, large-scale enterprises, and very large groups of people may be associated with a relatively small land area.

Effect Upon Core Cities. The rapid growth of rural-urban fringes can have important effects upon core cities. Reed (op. cit.) remarks that due to the population dispersion "nucleus cities have lost many of their best citizens and have been obliged to meet ever-increasing governmental costs with withering revenues. Likewise, Ehrlichman (op. cit.) in speaking of suburban development, states, "This inexorable trend . . . has rolled up such huge force as to endanger real estate values in the heart of our great cities and is causing a revolutionary shifting of tax sources to a dangerous degree."

Roterus and Hughes (op. cit.) have listed some general effects which settlement of population in fringe areas may have on central cities, as follows:

1. Of prime importance today is the fact that so many people work inside and live outside the city. Furthermore, the city's amusements attract nonresidents along with residents. Traffic control, police protection, streets, sanitary inspection, and other municipal services to persons (rather than property) go free of charge to these non-taxpayers.
2. Lots within the city which have been improved with utilities at general expense to the city remain vacant.
3. The normal difficulty of judging future capital improvement needs is greatly aggravated when fairly reliable population predictions for the urban area as a whole are complicated by completely unpredictable population changes within and without the legally established corporate limits.
4. Authorities cannot exercise proper control over fringe health and crime conditions which tend to permeate the entire urban area.
5. The city may make comprehensive master plans for its metropolitan district but little can be accomplished without the tools of planning--zoning, subdivision control, and mapped street laws.
6. City taxpayers often carry the load of financing county government, which serves chiefly the area outside the corporate limits of the city.

Zoning

Definition

Zoning in General. Zoning has been defined in several ways but the basic meaning remains the same. The definition most often quoted is that of

Bassett (1936) which states: "Zoning is the regulation by districts under the police power of the height, bulk, and use of buildings, the use of land, and the density of population." This police power has been defined by Johnson and Walker (1941) as "the great general power of government through which a state may, without compensation or inducement, regulate individual conduct and the use of private property in the interest of a paramount public welfare." In the case of zoning, this power is usually delegated to local political subdivisions through enabling acts passed by the state legislature.

Hurlburt (1940) says, "Zoning attempts to establish a pattern of land utilization in conformity to the adaptability of resources to particular uses. Zoning is a tool for implementing balance between population and resources, it is a method of guiding population distribution and redistribution, as well as a method of extending public control over the use of land."

Rural Zoning. Rural zoning is merely the application of basic zoning principles to unincorporated areas. Penn, et. al. (1940) define rural zoning as "a legal mechanism by which local units of government can create districts and regulate the broad use of land and property for various purposes, including agriculture, forestry, recreation, and residence, in order to promote the general welfare of the community." Mason (1945), in speaking of rural zoning as one of the many programs to be considered in the development of a master plan for a county, remarks that "zoning can do more than prevent obvious abuses in land use; it can be used to preserve lands for future urban expansion, and as a broad instrument for guiding the overall development of the unincorporated areas of the county."

History

Began in Germany. According to Green (1952), "zoning had first appeared on the continent of Europe late in the nineteenth century." He states, "When the walls about old German and Austrian fortress cities were removed, they were frequently replaced by parks and boulevards encircling the city. Beyond these parks, rings of apartment houses were built, and still farther out from the center of the city were rings (or 'zones') of single-family residences."

The Eno Foundation for Highway Traffic Control (1952) also gives Germany credit for being the first to employ the zoning principle: "Zoning or 'districting' as it was known in 1884 in Germany at the time of its conception, sought only to remedy the human congestion of severely crowded centers of population. Varying degrees of population concentration were obtained by dictating the size of buildings in proportion to the lot area they occupied."

Regulations Preceding Zoning in the United States. Although actual city zoning ordinances were not enacted until at least 1885 in the United States, there were regulatory measures in the interest of public safety banning gunpowder mills and storehouses to the outskirts of settlements along the Atlantic Coast during early colonial days because explosions and fires were frequent at such establishments (Solberg 1952). Hendrickson (1935) states, "Instances of the regulation of the use of land or the restriction of certain uses to specified districts date back to the time of the Massachusetts Bay Colony. In 1692 the legislature provided that the selectmen should 'assign some certain places in each of said towns (Boston, Salem, and Charlestown) for the erecting and setting-up of slaughter-houses

for the killing of all meat, still-houses, and houses for trying tallow and currying leather.'"

First Ordinances in the United States Outgrowth of Racial Prejudice in

California. Modesto, California enacted the first city zoning ordinance in the United States in 1885 (Rowlands and Trenk 1936 and Whitnall 1931).

This first ordinance and others which followed rapidly in California cities seem to have been the outgrowth of racial prejudice against the Chinese, a feeling which was running very high during this period in California.

Pollard (1931) in speaking of the situation says,

Principles of different natures often materially aid a new movement. It may sound foreign to our general ideas of the background of zoning, yet racial hatred played no small part in bringing to the front some of the early districting ordinances which were sustained by the United States Supreme Court, thus giving us our first important zoning decisions.

Basing their objection on the fire hazard, the lack of drainage, the nuisance resulting from water turned into the streets, and the moral hazard presented by the congregation of persons at such places, the city authorities enacted ordinances prohibiting laundries from being maintained or operated in certain sections of the city, except after certain permits had been received.

While the ordinances did not specifically mention Chinese laundries, they were so drafted that in effect they were directly aimed at the existence and the operation of such establishments conducted by the Chinese.

Whitnall (op. cit.) also emphasizes the part racial prejudice played in the establishment of these first ordinances. In speaking of the early Chinese laundry cases, he says, "It is questionable if the strictly legal phases of those cases would have been similarly received by the courts under any other circumstances than those under which such high feeling of racial prejudice prevailed generally in California during that period."

"Encouraged by the support of the laundry cases found in the appellate courts," other California cities, particularly San Francisco,

Sacramento, and Los Angeles, soon enacted ordinances restricting other types of occupations such as dance halls, livery stables, slaughter houses, saloons, pool halls, and any occupations which might become nuisances in the line of city development (Pollard op. cit.). Pollard goes on to state that "this line of California cases definitely established the right of municipal authorities to restrict practically any kind of business, the operation of which might be a menace, harming public safety, sanitation, or morals, or the public generally, within the city boundaries."

Other Developments of the Early Period. In 1892, the Massachusetts Legislature enacted the first set of height regulations to be upheld by the United States Supreme Court (Green op. cit.). These regulations provided that buildings fronting on certain streets in Boston should not be over 125 feet high. Later, in 1903, a building height district ordinance was instituted in Boston (The Eno Foundation for Traffic Control op. cit.).

A Federal statute was enacted in 1899 limiting the heights of buildings by zones in Washington, District of Columbia, and in 1904 incomplete zoning ordinances were passed in Baltimore limiting the heights of buildings, although not upheld by the courts until 1908 (Pollard op. cit.) Pollard states, however, that Los Angeles was the most fully zoned city of the early period, the first ordinance of importance being passed in 1909.

The Eno Foundation for Traffic Control (op. cit.) also states that Los Angeles was the first to enact zoning regulations applying to the whole city but remarks that "the legislation was incomplete and discretionary in that its principal purpose was to exclude certain undesirable industrial developments from residential areas."

First Comprehensive Zoning Ordinance. New York City is invariably cited as setting the precedent in modern comprehensive ordinances of American

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cities. The New England Regional Planning Commission (1937) says, "In 1916, New York became the first city in America to promulgate a comprehensive urban zoning plan in a single ordinance. Whitnall (op. cit.), in speaking of the development of zoning, states,

From a historical standpoint, the most real advance in the subject was consummated in 1916 in New York. Prior to 1916, the subject of "use control" was the sole consideration. New York introduced the element of height and area, or bulk, regulations. The important point is that out of the New York situation there came the comprehensive zoning ordinance from which all subsequent laws were largely patterned.

Two thousand, or more, city zoning ordinances are now in effect throughout the United States (Haar and Rodwin 1953).

Development of Rural Zoning. Prior to 1925 all zoning ordinances were adopted for incorporated urban areas. However, in this year Los Angeles County, California, adopted a zoning ordinance for the unincorporated town of Altedena and in 1927 adopted a new ordinance for the entire county (Hendrickson op. cit.). The Wisconsin Legislature passed a state enabling act in 1923, but it was not until 1927 that Milwaukee County enacted a zoning ordinance and became the first county to enact an ordinance under a county-zoning enabling act (Hendrickson op. cit. and Rowlands and Trenk op. cit.).

The Wisconsin county zoning enabling act was the first comprehensive statute under which all counties could zone and was designed to permit the county to regulate suburban territory outside the jurisdiction of city ordinances (Albers 1940). In 1929 this act was amended to permit any county board to determine the areas within which agriculture, forestry, and recreation might be conducted in order to meet the land-use situation which had arisen in the sparsely settled cut-over region of northern Wisconsin (Albers Ibid). Under this amended statute Oneida County,

Wisconsin, became the first county in the United States to enact an ordinance dealing with essentially rural and undeveloped land (Hendrickson op. cit. and Rowlands and Trenk op. cit.). Henderson and Upchurch (1943) state that this was "an attempt to prevent excessive school, road and other public costs which result from isolated settlement and to direct agricultural settlement away from poor land."

Rural zoning is possible in most states today. Solberg (op. cit.) says 38 states have passed a total of 175 enabling laws empowering any or designated classes of counties, towns or townships, or other local units of government to zone unincorporated areas. By 1949, however, only a total of 173 counties in 23 of the 38 states had adopted rural zoning ordinances (Solberg Ibid).

In Michigan 6 counties and at least 200 townships have zoned to date, with several other townships working on, or showing interest in, zoning ordinances. County and township zoning in Michigan is authorized by Acts 183 and 184, respectively, of the Public Acts of the 1943 State Legislature as amended (Michigan Department of Economic Development 1949).

Need For Rural Zoning in the Rural-Urban Fringe
Supports A Planning Program. Zoning can have an important function in the planning program of a rural-urban community because it gives authority to any plans which may be developed. Black (1938) recognizes the importance of "informed judgment and public opinion" as "a planning commission's chief tools for realizing its plan," but insists that "practical public planning cannot lean too heavily upon enlightened public opinion; the vicious and selfish minorities need to be brought into line by sharper tools than public disapproval." Thus, he says, "For such recalcitrants the legal compulsions of zoning alone can serve."

Fringe Growth is Haphazard Without Zoning. Salter (1945) expresses the need for zoning in the rural-urban fringe in this manner:

Without county zoning around a city's edge, the nuisance uses which may be restricted by the city's ordinances are dumped into the periphery area; residential, commercial, and industrial uses are established in such fashion as to hinder the wholesome expansion of the urban residential area; street and transportation patterns are laid out which may make impossible an efficient system to serve the metropolitan area as a whole; and agricultural and other land uses may be knocked out of existence long before there is any real need for the land for other purposes.

The need for zoning, or some form of public control, in the orderly development of the rural-urban fringe is expressed precisely by Hurlburt (op. cit.) when he says that, "ultimately, rural sub-developments without some form of public control become homogeneous only in their heterogeneity."

Reduces Traffic Hazards. Zoning can play an important part in increasing the safety and efficiency of today's overworked highways. The Eno Foundation for Highway Traffic Control (op. cit.) remarks, "Congestion and hazard on rural roadways is now known to be dependent to a large degree upon the uncontrolled use of adjoining land areas. The multiplicity of individual driveways and increased traffic interchange that is fostered by such undirected expansion impairs the ability of the roadway as a traffic mover." However, it points out that "those areas wherein commercialization along the highway right-of-way is directed and contained through invocation of the zoning concept are invariably more safe and efficient traffic movers than those roadways along which commercial population is allowed to take place without regulation."

Zoning Most Effective As Part of An Over-All Planning Program

Zoning in itself is not a cure-all for the many ills of the rural-urban fringe; it is most effective only when used in conjunction with

other supplementary and complementary measures in an over-all planning program. As the Pennsylvania Department of Commerce State Planning Board (1949) puts it: "Zoning . . . is only one of the several devices by which a community may direct its development along desired lines. The enforcement of sanitary and building codes, the control of subdivision, the provision of proper facilities for residence, business, or industry, are all fully as important as any restrictive measures aimed to prevent a single land-owner or group of owners from destroying the character of a neighborhood for immediate profit."

Procedure Employed in Study

The zoning ordinances used in the study were obtained from the various township offices by post. Each township in Southern Michigan, about which there was information indicating that it had adopted a zoning ordinance, was requested to supply a copy of its zoning ordinance. Of the ordinances received, the number that could be used in the study was narrowed down to thirty-four by two factors: first, it was necessary that a map showing the location of the boundaries of the various use-districts stipulated in the ordinance accompany the text, and, second, only those townships could be studied which were located within areas for which Soil Survey reports were available.

In order to correlate the land character with the uses authorized by the zoning ordinances, the boundaries of the use-districts as indicated on the zoning map of each township were either drawn directly on the soil type map of the Soil Survey report for the area or were drawn on a transparent vellum overlay which could be used with the soil type map. Then the acreages of the various soil types in each use-district were estimated,

section by section, using a transparent grid which had 64 squares per square inch (the soil type maps used are one inch to the mile).

There was a total of 123 soil types and miscellaneous land classifications encountered in the townships studied. To facilitate the presentation and discussion of results and to emphasize the main point of interest--the disposition of land suitable for agriculture--the various soil types and land classifications were grouped into classes according to their natural suitability for general agricultural purposes. This was done with the help of Mr. Ivan F. Schneider, Associate Professor of Research in Soil Science of Michigan State University, who has many years' experience working with Michigan soils.

Six classes were set up: Class I being the best suited for agriculture, Class V the least suited, and Class II, Class III, and Class IV gradations in between. Class VI was set up as a special category to include those lands (all of which happen to be organic soils) that could not be placed in a particular class on the basis of soil type alone. In other words, the soils in Class VI are of such a nature that one would have to examine them in the field in order to classify them because characteristics such as drainage, depth, underlying materials, etc., are deciding factors. (See Appendix for complete list of soil types encountered and the classes into which they were placed.)

RESULTS AND DISCUSSION

"Agricultural" Districts

The townships studied total more than a thousand square miles. Although the Township Rural Zoning Act empowers townships to "provide by ordinance for the establishment of zoning districts . . . within which . . . the use of land for agriculture . . . may be encouraged, regulated or prohibited," and further asserts that "the provisions of the zoning ordinance shall be based upon a plan designed . . . to encourage the use of lands in accordance with their character and adaptability and to limit the improper use of land," not a single acre in the 34 townships, all of which have zoning ordinances, has been zoned exclusively for agriculture. Yet the study revealed that 31.6 per cent of the total area of the townships comprises Class I agricultural land, and 16.0 per cent is made up of Class II agricultural land.

Agriculture is, of course, being carried on in every one of the townships, and usually on all the land classes, but always under the shadow of some degree of suburbanization. Every ordinance tolerates at least some degree of segmentation of its first and second class lands in permitting residential use along with agricultural use of these land classes, not directly as such, but by placing no limits upon the use of these land classes for either agricultural or residential uses. In other words, portions of the townships are designated as "agricultural" zoning districts in the zoning ordinance, but the uses of land permitted in them specify residential as well as agricultural uses, and this regardless of land quality or character.

Some districts, nevertheless, must be considered as offering some protection to agriculture. In these districts the competition to agriculture is somewhat reduced since only certain other stipulated uses are permitted. The extent to which competition is reduced, however, is often very slight since the uses which are permitted in addition to agriculture and related practices are generally quite numerous. For example, several of the following uses may be permitted in the so-called "agricultural" district of any one township:

Multiple dwellings, boarding houses, rooming houses, hotels, tourist courts and motels, and trailer parks

Hospitals, clinics, and sanitoriums

Private clubs, fraternities, and lodges

Public parks, playgrounds, country clubs, golf courses, and recreation areas

Public garages

Public utility buildings, transformer stations, telephone exchanges, and broadcasting stations

Airports and landing fields

Mining of peat, marl, stones, gravel, or any mineral

Exploration for or production of natural gas or petroleum

Categorical Organization of Zoning Ordinances

The general pattern followed by the townships in setting up the zoning ordinances investigated has usually been as follows. The districts were arranged in a series of descending categories. One residential district is selected as the highest category in which the uses permitted are generally quite limited. In the "lower" categories which follow, the uses permitted are those allowed in each preceding district plus a variety of

new uses. By the time the "agricultural" district is set up the uses have often become so numerous that the name of the district loses its true significance. Rather than being a true agricultural zone, it merely designates the use for most of the land area, and is a "catch-all" for many uses. Current planners, however, feel that this early pattern of formulating use-districts is a poor method of influencing proper land use and generally agree that each use-district should have its own specific uses.

Factors Limiting the Creation of Agricultural Zoning Districts

However, these "agricultural" districts are being used primarily for agricultural purposes and will be for some time in the future. Thus, it is significant that the zoning ordinances have often failed to include much of the better agricultural land in such districts while at the same time including large acreages of the poorer class land. Why has this happened? Although the scope of this study did not include determining the causes of what seem to be instances of improper zoning, there is little question but that at least four situations have influenced the zoning process in many cases.

First, zoning ordinances probably often have been drawn up without the benefit of an adequate land inventory. Without a thorough understanding of the nature of the land resources within a township it is impossible for a zoning board to satisfactorily delineate districts and describe the uses to be permitted in them. Even without considering the necessity for conserving agricultural land for the future, good planning for present land use would demand that the best agricultural land, where possible, be

devoted to agricultural purposes if there is to be an agricultural district in the township.

Second, in some cases zoning boards have not realized or understood the importance of zoning land according to its natural adaptability for certain uses. No doubt, some use-districts have been formed simply on the basis of what "seems" best or have been the result of requests or pressures from various individuals or groups without consideration of the suitability of the land for the uses stipulated.

Third, even when zoning boards have been aware of the character of the land and the uses for which it is best suited, pressures from groups which are affected have likely often influenced the location of district boundaries and the uses which are permitted within these boundaries. Feeling that any zoning ordinance is better than none, zoning board members have probably at one time or another granted concessions against their better judgment. For instance, farm land owners realizing their land, even though it is top grade agricultural land, is located in an area which will presently be in demand for residential development, will naturally be against anything which will tend to minimize their chances of taking advantage of speculative land prices.

Fourth, zoning boards, feeling that they were inadequately equipped to deal with the legal aspects of zoning, have often turned the preparation of their ordinances over to attorneys. Of course, the resulting zoning ordinances can usually meet all legal tests, but factors such as land character and its suitability for certain uses have generally not been considered.

Broad Land Divisions Represented in the Townships Studied

In order that the reader might obtain a clearer picture of the general land character of the various townships, the broad land division (or divisions) into which each township falls has been indicated in the presentation of results for individual townships. Following is a brief description of all the land divisions involved as outlined by Schneider (1954).

✓ Level to Rolling Clay Loam to Silty Clay Loam Soils

These soils are mainly formed from clay loam to silty clay loam glacial tills. The drainage varies from well to imperfect depending upon the topography which is level to rolling. Locally, slopes are steep enough to make water erosion a problem. "The soils are deep, relatively high in fertility, and durable under cultivation except on the steeper slopes."

Level, Poorly Drained Loams, Silt Loams, and Clay Loams

The soils of this division were developed from loam, clay loam, or silty clay loam parent material under poor natural drainage conditions. The topography is nearly level except for some low depressions and narrow sandy ridges. The contents of organic matter, nitrogen, and lime are relatively high and the soils have good natural fertility, are moisture retentive, and are durable under cultivation. Naturally poor drainage and the maintenance of good soil structure are indicated as the principal hazards to excellent crop production.

Rolling to Extremely Hilly Well Drained Sands to Sandy Loams

The land in this division occupies moranic areas and is rolling to extremely rough. Consequently, water erosion is a serious problem on

these light soils. "The value of the land for farming is greatly reduced by the sandy soils and unfavorable slopes." However, some smaller areas of loam and clay loam soils are scattered throughout the prevailing lighter textured soils.

✓ Level to Hilly Dry Sands

These soils are mainly deep sands which are well to excessively drained. They have a low organic matter content and are strongly acid in reaction. Organic soils and lakes are dispersed throughout the division. "The topography ranges from level plains to extremely hilly uplands. The limiting factors for agricultural use are low natural fertility, low moisture-holding capacity and wind erosion."

Mixed Wet and Dry Sands with Organic Soils

The soils of this division are mixed wet and dry sands with closely associated peats. "The combination of wetness and sandy textures results in a very low value for general farm crops. The soils are used for truck crops and small fruits where the climate is favorable. In the vicinity of the larger cities, the land is used for rural residences and for small part-time farms."

Level to Rolling Clay Loams, Silty Clay Loams and Clays

These soils have been mainly formed from clay loam, silty clay loam, silty clay, or clay parent materials. They are moderately well to imperfectly drained depending upon the topography which is level to rolling. "The soils are deep, high in fertility, and durable under cultivation except on the steeper slopes. The tightness of the clay which reduces the rate of water movement through soil and the maintenance of good soil structure on the surface are problems in the use of this land for cropping purposes."

Level Poorly Drained Loams, Silt Loams, Clay Loams and Clays

The soils of this division were developed under very poor drainage conditions from loamy parent materials. The topography is predominantly nearly level, but low swells and sandy ridges are fairly common. The soils are durable under cultivation and have good natural fertility, being high in organic matter, nitrogen, and lime. "The principal hazards for crop production are the poor drainage and maintenance of good soil structure."

Level to Rolling Loams

These soils are derived from loam glacial till and are well to imperfectly drained depending upon the topography. The soils are generally favorable for tillage operations being predominantly level to rolling in topography, although slopes may be excessively steep locally. "The soils are deep, relatively high in fertility, and durable under cultivation except on the steeper slopes. Under a good system of management, the soils can be maintained in a good state of productivity."

Level to Rolling Well Drained Sandy Loams

Light colored sandy loams, light loams and loamy sands are the main soils in this division. The topography is generally level to rolling, but many of the level outwash areas may be strongly pitted. These soils are usually acid and low in organic matter content. "The soils are easily tilled, moderately productive and are responsive to manure and commercial fertilizers. They are adaptable to a wide variety of crops. They are not excessively droughty, but the lack of moisture-holding capacity, combined with the natural low fertility, is probably the greatest limiting factor in crop yields."

Rolling to Steeply Sloping Well Drained Loamy Sands and Sandy Loams

"This land division is characterized by rolling to rough terrain with lakes, swamps and marshes in the basin-like associated areas. The topography is not well adapted to large fields and tractor tillage, and much of the land has depreciated in value on the steeper cultivated slopes because of soil erosion."

Level Poorly Drained Sands and Sandy Loams Over Loams to Clays

The main soils of this division have 18 to 42 inches of mixed wet and dry sand and sandy loam material overlying materials which range in texture from loams to clays. However, there are fairly large areas without the sandy overlying material and areas with deeper drier sands. On the same farm, or even in the same field, a complex pattern of these conditions may exist. Drainage is the principal practice necessary for the profitable use of this land for agriculture, and the variable thickness of the sand overburden presents a problem in the establishment of tile drainage systems.

Organic Soils (Mucks and Peats)

"This organic soil division includes areas which are largely occupied by muck or peat in sufficiently large bodies to be delineated on the soil association map. Smaller areas of organic soils are found, however, in most of the other broad land divisions."

Relation of Zoning Districts to Agricultural

Land Classes in the Townships Studied

The results for individual townships are given in detail below. The presentation is organized on a county basis. (See Appendix for population

figures by decades from 1900 to 1950 for the counties, townships, and related urban centers involved in the study as reported by the Federal Census Bureau.)

Bay County - Hampton Township

This township falls within the "Level, Poorly Drained Loams, Silt Loams, and Clay Loams" land division. The division and the major soil association of the division which occur in the township are represented by the symbol I-21 on the map of "Major Michigan Soil Associations" by Schneider and Whiteside (See Appendix).

Hampton Township adjoins Bay City to the east of the city and has several miles of frontage on Saginaw Bay. In spite of this seemingly conducive situation for residential development the township has had surprisingly little increase in population since 1900, and actually had fewer inhabitants in 1950 than in 1930. It appears that a rapid increase may be just beginning since the population increased 26.6 per cent during the decade 1940 to 1950. This is in comparison with 18.0 per cent and 9.5 per cent for Bay County and Bay City respectively for the same period.

Class I and Class II land comprise about 84 per cent of Hampton Township (TABLE I). The Soil Survey (1931) of Bay County shows that approximately three-fourths of the township is made up of four soil types: Wisner loam (Class I agricultural land) 39.2 per cent, Wauseon fine sandy loam (Class II) 16.7 per cent, Essexville sandy loam (Class II) 14.0 per cent, and Thomas loam (Class I) 6.6 per cent.

The zoning ordinance, which was adopted in 1941, protects none of this considerable amount (more than 14,000 acres) of good agricultural land for agricultural purposes. Instead, about four-fifths of the township is

zoned for residential purposes and the remainder is classed as unrestricted and commercial districts (TABLE I). The failure to set up some type of agricultural district is especially significant when it is considered that at the time of the adoption of the ordinance the population of the township was only slightly more than 3,000 persons. Certainly, the pressure for residences was not so great as to exclude any consideration of agriculture.

TABLE I
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF HAMPTON TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Residential	85.2	81.6	90.3	89.6	26.8	72.3	79.5
Unrestricted	6.1	13.9	7.7	4.2	73.2	24.2	14.2
Commercial	8.7	4.5	2.0	6.2	--	3.5	6.3
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	53.1	30.8	2.9	3.4	8.0	1.8	

Calhoun County - Battle Creek Township

This township falls within two land divisions: (1) "Level to Rolling Well Drained Sandy Loams" (V-37 and V-36 on map), and (2) "Rolling to Steeply Sloping Well Drained Loamy Sands and Sandy Loams" (W-39).

Battle Creek Township abuts the city of Battle Creek to the southwest. The general area, as well as the county as a whole, has experienced considerable growth since the turn of the century. Since 1900, the

population of the township has multiplied 15 times, that of the city of Battle Creek 2.6 times, and of Calhoun County 2.4 times. The population of Battle Creek Township almost doubled during the last decade.

According to the Soil Survey (1916) about 60 per cent of the township consists of two Class II soil types: Bellefontaine loam (38 per cent) and Fox loam (22 per cent). There are also considerable acreages of "Muck and Peat" (Class VI)--more than 7 per cent of the township. TABLE II shows that almost two-thirds of the total acreage is Class II agricultural land.

Through the zoning ordinance (adopted 1947) some of the better agricultural land is partially protected from the invasion of non-agricultural uses. The "agricultural" district, which includes almost half of the township, contains almost three-fourths of the Class I land and over one-half of the Class II. However, residential uses and mining are also permitted in this district. It is also noteworthy that, though small in extent (about 400 acres), none of the Class IV and Class V land is zoned for agricultural use (TABLE II).

Eaton County - Windsor Township

This township is made up of the "Level to Rolling Loams" land division (T-34).

Windsor Township is located immediately off the southwest corner of Lansing Township which is in Ingham County. In spite of its close proximity to the Lansing metropolitan area it is still predominantly rural. In 1950 the population was about 2,600 people. This was approximately a 75 per cent increase over the 1900 figure and only a 24 per cent increase over the 1940 total. The population of Eaton County has increased even

TABLE II
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF BATTLE CREEK TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural	73.4	53.3	14.4	--	--	52.8	48.5
Residential	17.4	43.0	31.8	61.2	100.0	23.2	37.9
Industrial	8.5	--	50.8	38.8	--	22.5	10.6
Commercial	0.7	3.7	3.0	--	--	1.5	3.0
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	11.1	64.6	14.4	1.9	0.6	7.4	

less rapidly, having increased a little more than 26 per cent since the turn of the century.

The 1930 Soil Survey of Eaton County indicates that over 63 per cent of Windsor Township is made up of two Class I soil types: Miami loam (43.0 per cent) and Conover loam (20.7 per cent). More than 80 per cent of the entire township is Class I and Class II agricultural land (TABLE III).

Although such a large proportion of the township is made up of high quality agricultural land, and the township is dominantly rural, the zoning ordinance (adopted 1949) offers only partial protection to the township's agricultural land. Among the other uses permitted in this district are residences, mining, and airports and landing fields.

Ingham County - Lansing Township

This township falls within the "Level to Rolling Loams" land division (T-34).

TABLE III
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF WINDSOR TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural	90.2	83.7	60.5	50.0	100.0	95.91	86.9
Small Farms	9.0	15.3	38.4	39.0	--	3.96	12.1
Residential	0.3	0.8	1.1	5.1	--	0.09	0.5
Commercial	0.5	0.2	--	5.9	--	0.04	0.5
TOTALS	100.0	100.0	100.0	100.0	100.0	100.00	100.0
Per cent of Township in each Class	66.6	14.2	6.0	3.0	0.1	10.1	

Lansing Township completely surrounds the city of Lansing except for a portion in the southern part of the township where the Lansing city limit extends to the township boundary. Census figures show that population growth has been very rapid in this township since the turn of the century. Since 1900, its population has multiplied 13.0 times as compared with 5.6 for the city of Lansing or 4.3 for Ingham County.

The unincorporated portion of the township comprises more than 12,000 acres. Approximately 64 per cent of this amount is Class I and Class II agricultural land. According to the Soil Survey (1933) of the area, almost two-thirds of the township consists of four soil types: Conover loam (Class I) 21.4 per cent, Miami loam (Class I) 17.6 per cent, Hillsdale sandy loam (Class II) 17.3 per cent, and Brookston loam (Class I) 7.6 per cent. The predominant soils, then, are generally well-suited for agricultural purposes.

TABLE IV shows the distribution of the agricultural land classes among the use-districts stipulated in the "Lansing Township Zoning Ordinance No. 8" of 1945. Although the "agricultural" district makes up 47.1 per cent of the township, it contains only 37.9 per cent of the Class I land and 43.5 per cent of the Class II land. However, this district includes more than one-half of the Class III land (primarily Bellefontaine sandy loam, Griffin loam, and Fox sandy loam) and one-half of the Class IV land (primarily Oshtemo loamy sand, Wallkill loam, and Washtenaw loam) and all of the Class V land (Greenwood peat). Through the zoning ordinance, then, the non-agricultural districts are allotted more of the best agricultural land and less of the poorer agricultural land than the "agricultural" district. Moreover, residential uses and mining are permitted in this district along with agriculture.

TABLE IV
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF LANSING TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Small Farm and Agricultural	37.8	43.5	51.1	51.6	100.0	77.8	47.1
Residential	49.3	40.7	37.7	38.4	--	17.9	41.1
Light Industrial	7.5	13.5	5.9	6.9	--	4.0	7.8
Commercial	<u>5.4</u>	<u>2.3</u>	<u>5.3</u>	<u>3.1</u>	<u>--</u>	<u>0.3</u>	<u>4.0</u>
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	46.6	17.5	12.7	11.3	1.1	10.8	

Jackson County - Blackman Township

This township is made up of three broad land divisions: (1) "Level to Rolling Well Drained Sandy Loams" (V-36), (2) "Rolling to Steeply Sloping Well Drained Loamy Sands and Sandy Loams" (W-39), and (3) "Organic Soils" (Z-43).

Blackman Township is situated immediately north of the city of Jackson. Suburbanization has been quite rapid as evidenced by the population growth. Since 1900, the population of Blackman Township has multiplied more than seven and a half times as compared with just a little over two times in each case for the city of Jackson and Jackson County.

The Soil Survey (1926) of Jackson County reveals that over two-thirds of this township is Class I and Class II agricultural land (TABLE V). Three soil types make up over 67 per cent of the township: Hillsdale loam (Class I) 28.0 per cent, Hillsdale sandy loam (Class II) 25.0 per cent, and Brookston loam (Class I) 14.2 per cent.

However, the 1952 zoning ordinance of Blackman Township reserves none of this better agricultural land specifically for agricultural uses. Instead, about 94 per cent of the township is zoned as a combination "Residential and Agricultural" district. This district embraces the greatest portion of all classes of land (TABLE V).

Jackson County - Leoni Township

Three broad land divisions make up this township: (1) "Level to Rolling Well Drained Sandy Loams" (V-36), (2) "Rolling to Steeply Sloping Well Drained Loamy Sands and Sandy Loams" (W-39), and (3) "Organic Soils" (Z-43).

Leoni Township is located a short distance to the east of the city of Jackson. Considering the period from 1900 to 1950, the population of this

TABLE V
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF BLACKMAN TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Residential and Agricultural	95.0	92.1	88.8	100.0	100.0	97.6	94.0
Industrial	3.5	5.3	8.9	--	--	1.3	4.2
Commercial	<u>1.5</u>	<u>2.6</u>	<u>2.3</u>	<u>--</u>	<u>--</u>	<u>1.1</u>	<u>1.8</u>
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	42.2	26.3	12.7	3.5	0.2	15.1	

township has not increased quite as rapidly as that of Blackman Township, the populations having multiplied 5.9 and 7.6 times, respectively, during that period. However, this trend has been reversed during recent years; from 1940 to 1950 the population of Leoni Township increased 43.1 per cent as compared with 24.1 per cent for Blackman Township.

The Soil Survey (1926) shows that the soils of this township are less well adapted for agriculture than those of Blackman Township. Class I and Class II land together make up only about one-fourth of its land area (TABLE VI). Over 70 per cent of the township consists of three soil types: Fox sandy loam (Class III) 30.9 per cent, Hillsdale sandy loam (Class II) 21.2 per cent, and Rifle peat (Class VI) 19.3 per cent.

The zoning ordinance, which was adopted in 1953, makes no attempt to reserve this relatively scarce amount of better agricultural land specifically for agricultural uses. Rather, it sets aside a broad "Residential

and Agricultural" district in which residential and agricultural uses are permitted to compete equally without regard for land character. Over 95 per cent of the township is contained in this district (TABLE VI).

TABLE VI
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF LEONI TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Residential and Agricultural	98.1	99.3	91.5	99.2	98.4	95.0	95.2
Industrial	0.9	--	5.7	0.1	--	4.3	3.3
Commercial	<u>1.0</u>	<u>0.7</u>	<u>2.8</u>	<u>0.7</u>	<u>1.6</u>	<u>0.7</u>	<u>1.5</u>
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	3.3	22.1	36.1	8.3	2.1	28.1	

Kalamazoo County - Comstock Township

This township falls within two land divisions: (1) "Level to Rolling Well Drained Sandy Loams" (V-37) and (2) "Rolling to Steeply Sloping Well Drained Loamy Sands and Sandy Loams" (W-39).

Comstock Township is adjacent to Kalamazoo Township which surrounds the city of Kalamazoo. Since 1900, its population has increased 3.8 times as compared with 2.9 times for Kalamazoo County and 2.4 for the city of Kalamazoo.

TABLE VII shows that Class I and Class II land comprise about 50 per cent of the township. According to the Kalamazoo County Soil Survey (1922)

several soil types are important in this township. The predominant ones are: Fox loam (Class II) 28.2 per cent, Fox sandy loam (Class III) 17.5 per cent, Rodman gravelly sandy loam (Class IV) 9.91 per cent, Muck (Class VI) 9.72 per cent, Fox silt loam (Class I) 8.2 per cent, and Warsaw loam (Class II) 7.1 per cent.

The Comstock Township zoning ordinance ("with amendments corrected to June 10, 1953") makes no specific provision for any type of agricultural district. Agriculture is permitted throughout but has to compete with various non-agricultural uses. TABLE VII shows the districts which have been set forth and the distribution of the agricultural land classes among them.

TABLE VII

DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF COMSTOCK TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Residential	99.7	79.9	86.0	78.2	--	93.8	85.0
Industrial	0.3	16.4	11.6	16.0	--	5.4	12.2
Commercial and Industrial	--	1.6	1.3	5.1	--	0.1	1.5
Business	--	2.1	1.1	0.7	--	0.7	1.3
TOTALS	100.0	100.0	100.0	100.0	--	100.0	100.0
Per cent of Township in each Class	10.7	41.1	28.6	9.9	--	9.7	

Kalamazoo County - Kalamazoo Township

Two land divisions make up this township: (1) "Level to Rolling Well Drained Sandy Loams" (V-37) and (2) "Rolling to Steeply Sloping Well Drained Loamy Sands and Sandy Loams" (W-39).

Kalamazoo Township completely surrounds the city of Kalamazoo. Hence, suburbanization has been quite pronounced. Since 1900, the population has multiplied more than fourteen times and has more than doubled since 1930. Its rate of growth has been much more rapid than for either the city of Kalamazoo or Kalamazoo County.

The Soil Survey (1922) indicates that over two-thirds of the township is Class I and Class II agricultural land (TABLE VIII). The most extensive soil types in these classes are: Fox loam (Class II) 32.9 per cent, Warsaw silt loam (Class I) 10.5 per cent, Fox gravelly loam (Class II) 9.0 per cent, and Fox silt loam (Class I) 6.8 per cent. Muck (Class VI) and Rodman gravelly sandy loam (Class IV) are also important types, making up 12.5 per cent and 9.0 per cent of the township respectively.

The 1947 zoning ordinance of Kalamazoo Township has not provided a single district for agricultural purposes as such. Instead, the entire township has been zoned for residential, industrial, and commercial uses. TABLE VIII shows the distribution of the various land classes among these uses.

Kalamazoo County - Schoolcraft Township

This township falls within the "Level to Rolling Well Drained Sandy Loams" land division (V-37,38).

Schoolcraft Township is located in the southern part of Kalamazoo County with another township intervening between it and Kalamazoo Township. Consequently, it has not felt the effects of suburbanization as much as

TABLE VIII
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF KALAMAZOO TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Residential	86.8	89.1	83.0	85.2	--	68.9	85.1
Industrial	9.9	7.9	13.9	11.2	--	28.6	11.8
Commercial	<u>3.3</u>	<u>3.0</u>	<u>3.1</u>	<u>3.6</u>	<u>--</u>	<u>2.5</u>	<u>3.1</u>
TOTALS	100.0	100.0	100.0	100.0	--	100.0	100.0
Per cent of Township in each Class	17.4	50.6	10.5	9.0	--	12.5	

Kalamazoo Township or Comstock Township. Census figures show that its population increase has been at an even slower rate than that of the city of Kalamazoo or Kalamazoo County. Its population has increased only about 66 per cent since the turn of the century.

Class I and Class II land together make up 63 per cent of Schoolcraft Township (TABLE IX). According to the 1922 Soil Survey of Kalamazoo County over 99 per cent of the township consists of five soil types: Warsaw silt loam (Class I) 28.8 per cent, Muck (Class VI) 23.6 per cent, Fox loam (Class II) 17.7 per cent, Warsaw loam (Class II) 16.3 per cent, and Fox sandy loam (Class III) 12.9 per cent.

In spite of the fact that the township is predominantly rural and that almost two-thirds of its land is well suited for agriculture, the zoning ordinance, which was adopted in 1951, has zoned none of this land for agricultural purposes. The township has been zoned only for residential, commercial, and industrial uses as indicated in TABLE IX.

TABLE IX
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF SCHOOLCRAFT TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Residential	70.3	83.6	99.1	--	100.0	85.4	82.3
Commercial and Industrial	29.5	14.6	0.9	--	--	12.3	16.5
Commercial	0.2	1.8	--	--	--	2.3	1.2
TOTALS	100.0	100.0	100.0	--	100.0	100.0	100.0
Per cent of Township in each Class	28.8	34.4	13.1	--	0.1	23.6	

Kent County - Gaines Township

This township falls within three broad land divisions: (1) "Level to Rolling Clay Loam to Silty Clay Loam Soils" (H-19), (2) "Level to Hilly Dry Sands" (O-28), and (3) "Level to Rolling Loams" (T-34).

Gaines Township is located in the southern part of Kent County and is far enough from the city of Grand Rapids so as not to be greatly affected by suburbanization. The rate of growth of its population has only been slightly greater than that of Kent County or the city of Grand Rapids. Since 1900, the population of Gaines Township has increased 2.5 times as compared with 2.2 times for Kent County and 2.0 times for the city of Grand Rapids. However, within the last decade the population of this township increased about 71 per cent.

Approximately 66 per cent of the township is Class I agricultural land (TABLE X). The 1926 Soil Survey of Kent County shows that over 55

per cent of this township consists of three Class I soil types: Kent silt loam 23.1 per cent, Isabella loam 17.0 per cent, and Miami loam 15.1 per cent.

Through the zoning ordinance (adopted in 1950) the township has partially protected the majority of this better agricultural land for agricultural purposes. An "agricultural" district has been created covering approximately 89 per cent of the township which includes more than 96 per cent of the Class I and Class II land (TABLE X). However, this district is open to the uses which are permitted in the residential districts and, also, "tourist cabins, tourist courts and motels, and trailer coach parks" are allowed.

TABLE X

DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF GAINES TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural	96.8	96.7	89.2	51.3	45.8	99.6	89.0
Residential	0.6	--	6.9	45.6	47.1	--	7.9
Industrial	1.8	--	2.1	--	3.5	--	1.8
Commercial	0.8	3.3	1.8	3.1	3.6	0.4	1.3
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	65.9	1.2	17.1	6.4	7.1	2.3	

Kent County - Grand Rapids Township

This township is made up of two land divisions: (1) "Level to Rolling

Clay Loam to Silty Clay Loam Soils" (H-19) and (2) "Rolling to Extremely Hilly Well Drained Sands to Sandy Loams" (N-27).

Grand Rapids Township adjoins the city of Grand Rapids on the northeast. In spite of its location, the growth of its population has not been especially rapid. Although the population has multiplied 3.4 times since the turn of the century, during the last decade it had only a 52 per cent increase. This was less than Gaines Township experienced (71 per cent) which is situated at a greater distance from an urban center.

TABLE XI shows that about one-half of the township is Class I land and about one-third is Class V land. The 1926 Soil Survey of Kent County indicates that approximately 63 per cent of the township is made up of two soil types: Kent silt loam (Class I) 33.1 per cent and Coloma sand (Class V) 30.4 per cent.

In a situation of this type, where there is an admixture of good and poor quality agricultural land, zoning can be especially beneficial in guiding land use. However, the township's zoning ordinance (adopted 1935) makes no provision for reserving the better agricultural land for agricultural purposes. Instead, over 97 per cent of the township is zoned for residential uses and the remainder as commercial and industrial or local business uses (TABLE XI).

Kent County - Wyoming Township

Three broad land divisions comprise this township: (1) "Rolling to Extremely Hilly Well Drained Sands to Sandy Loams" (N-27), (2) "Level to Hilly Dry Sands" (O-28), and (3) "Level to Rolling Clay Loams, Silty Clay Loams and Clays" (R-31).

Wyoming Township abuts the southwest corner of the city of Grand Rapids. It has experienced considerably more suburbanization than either

TABLE XI
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF GRAND RAPIDS TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Residential	99.26	95.5	99.5	87.3	94.8	98.8	97.5
Commercial and Industrial	0.71	4.5	--	12.7	3.6	0.8	1.9
Local Business	<u>0.03</u>	<u>--</u>	<u>0.5</u>	<u>--</u>	<u>1.6</u>	<u>0.4</u>	<u>0.6</u>
TOTALS	100.00	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	49.4	2.4	5.2	1.5	33.5	8.0	

of the other two townships studied in this county. Since 1900, its population has increased 8.5 times.

TABLE XII shows that only about 15 per cent of the township is Class I and Class II land whereas 44.8 per cent is Class V land and 27.5 per cent is Class III. According to the 1926 Soil Survey, approximately three-fourths of the township consists of four soil types: Plainfield sand (Class V) 30.3 per cent, Oshtemo sandy loam (Class III) 19.8 per cent, Coloma sand (Class V) 14.5 per cent, and Isabella loam (Class I) 10.2 per cent.

It is interesting to note that this highly urbanized township has zoned (1954) about 43 per cent of its area as an "agricultural" district. In 1950 its population was 28,977, a figure which is greater than that for any other township investigated. This "agricultural" district includes 87.9 per cent of the Class I land and 98.6 per cent of the Class II land.

However, it also includes 56.7 per cent of the Class IV land (TABLE XII). In addition to agriculture and related uses, uses of the residential district, municipal uses, and various athletic and recreational uses are permitted in this district.

TABLE XII
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF WYOMING TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural	87.9	98.6	25.4	56.7	37.7	31.5	43.1
Residential	--	1.4	41.1	20.4	44.1	40.3	34.8
Industrial	10.9	--	23.3	17.4	9.2	13.4	13.9
Open	1.2	--	6.3	1.6	6.7	13.8	5.8
Commercial	--	--	3.9	3.9	2.3	1.0	2.4
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	13.6	1.9	27.5	6.4	44.8	5.8	

Lenawee County - Adrian Township

Two land divisions make up this township: (1) "Level to Rolling Clay Loams, Silty Clay Loams and Clays" (R-31) and (2) "Level to Rolling Well Drained Sandy Loams" (V-37).

Adrian Township partially surrounds the city of Adrian to the north. The city is a small one (population about 18,400 in 1950), thus, suburbanization has not been very rapid in the township. This is reflected in the census reports which reveal that the population of the township has increased approximately 52 per cent since 1900. This is in comparison

with 91 per cent for Adrian City or 34 per cent for the whole of Lenawee County.

This township is generally well suited to farming. Over 85 per cent of its area is Class I and Class II agricultural land (TABLE XIII). The Soil Survey of Lenawee County shows that two soil types comprise approximately 70 per cent of Adrian Township: Fox loam (Class II) 38.2 per cent and Hillsdale loam (Class I) 32.3 per cent.

However, the zoning ordinance, which was adopted in 1953, protects none of this large amount (about 19,500 acres) of better agricultural land specifically for agricultural purposes. Instead, 99 per cent of the township is zoned as a "Residential and Farming" district (TABLE XIII). This district includes the majority of all land classes.

TABLE XIII

DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF ADRIAN TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Residential and Farming	99.5	99.8	96.9	97.9	--	100.0	99.3
Commercial	<u>0.5</u>	<u>0.2</u>	<u>3.1</u>	<u>2.1</u>	<u>100.0</u>	<u>--</u>	<u>0.7</u>
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	46.47	39.28	8.64	2.46	0.02	3.13	

Macomb County - Ray Township

The "Level Poorly Drained Loams, Silt Loams, Clay Loams and Clays" land division (S-32) make up this township.

Ray Township is located in the north central portion of Macomb County. It is not very close to any large urban center and this is reflected in its rate of growth. Its population increased only 23 per cent from 1900 to 1950. This is considerably less than the increase for Macomb County as a whole which was 456 per cent for the same period.

The land of this township is well adapted for agricultural purposes; 46.5 per cent is Class I land, 24.5 per cent is Class II land and there is no Class V land (TABLE XIV). According to the 1923 Soil Survey, three soil types make up over two-thirds of the township: Brookston loam (Class I) 43.7 per cent, Nappanee silty clay loam (Class II) 15.4 per cent, and Newton loamy fine sand (Class IV) 9.1 per cent.

The township's zoning ordinance (adopted 1951) makes no attempt to create districts according to the suitability of the land for agricultural and non-agricultural uses. Approximately 99.7 per cent of the township has been classed as an "Agricultural and Residential" district (TABLE XIV) in which the two uses are allowed to compete equally throughout regardless of land character.

Macomb County - Richmond Township

This township falls within the "Level Poorly Drained Loams, Silt Loams, Clay Loams and Clays" land division (S-32).

Richmond Township lies in the extreme northeast corner of Macomb County. The township has not experienced much increase in population--having only 1.2 times as many people in 1950 as in 1900. The county as

TABLE XIV
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF RAY TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural and Residential	99.7	99.6	99.8	99.6	--	--	99.7
Commercial	<u>0.3</u>	<u>0.4</u>	<u>0.2</u>	<u>0.4</u>	--	--	<u>0.3</u>
TOTALS	100.0	100.0	100.0	100.0	--	--	100.0
Per cent of Township in each Class	46.5	24.5	19.3	9.7	--	--	

a whole has increased its population 5.6 times over the same period. The demand for land for non-agricultural purposes in this township should not be excessive.

A 1923 Soil Survey of Macomb County shows the township as consisting of broad acreages of Class I soils--Brookston (52 per cent) and Conover (28 per cent) being the predominant Class I soils. Approximately 80 per cent of the township is Class I land (TABLE XV).

However, the township's zoning ordinance places over 93 per cent of the township in a combination "Agricultural and Residential" district (TABLE XV). This means that approximately 19,000 acres of Class I agricultural land are left essentially unprotected for agricultural purposes.

Macomb County - Shelby Township

This township is made up of three broad land divisions: (1) "Level Poorly Drained Loams, Silt Loams, Clay Loams and Clays" (S-32), (2) "Level

TABLE XV
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF RICHMOND TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural and Residential	94.4	83.5	89.7	96.5	--	--	93.2
Industrial	5.2	16.4	8.0	3.2	--	--	6.3
Commercial	<u>0.4</u>	<u>0.1</u>	<u>2.3</u>	<u>0.3</u>	<u>--</u>	<u>--</u>	<u>0.5</u>
TOTALS	100.0	100.0	100.0	100.0	--	--	100.0
Per cent of Township in each Class	80.4	7.4	9.5	2.7	--	--	

to Rolling Loams" (T-34), and (3) "Level Poorly Drained Sands and Sandy Loams Over Loams to Clays" (X-40).

Shelby Township is located in the west central portion of Macomb County. It is one township removed from the Pontiac metropolitan area in Oakland County. Since 1900 its population has multiplied 3.4 times and has more than doubled during the decade from 1940 to 1950.

Less than 12 per cent of the township is Class I and Class II agricultural land and more than 62 per cent is Class IV. However, there is no Class V land (TABLE XVI). According to the 1923 Soil Survey, over two-thirds of the township consists of four soil types: Plainfield loamy sand (Class IV) 22.7 per cent, Newton loamy fine sand (Class IV) 19.9 per cent, Fox gravelly sandy loam (Class III) 15.0 per cent, and Berrien loamy fine sand (Class IV) 11.2 per cent.

The township's zoning ordinance (as amended to June 1, 1951) preserves none of the better agricultural land, which is scarce in this township, especially for agricultural uses. Over 91 per cent of the township is zoned as "Agricultural and Residential" which includes the majority of all land classes (TABLE XVI). In this district agriculture has to compete with residences for the good and poor agricultural land alike.

TABLE XVI
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF SHELBY TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural and Residential	97.9	96.5	72.0	98.63	--	100.0	91.7
Industrial and Mining	--	--	15.0	--	--	--	3.8
Commercial	2.1	3.5	6.9	1.35	--	--	2.9
Industrial	--	--	6.1	0.02	--	--	1.6
TOTALS	100.0	100.0	100.0	100.00	--	100.0	100.0
Per cent of Township in each Class	4.1	7.6	25.5	62.4	--	0.4	

Macomb County - Sterling Township

Two land divisions comprise this township: (1) "Level Poorly Drained Loams, Silt Loams, Clay Loams and Clays" (3-32) and (2) "Level Poorly Drained Sands and Sandy Loams Over Loams to Clays" (X-40).

Sterling Township is located in the southwest portion of Macomb County and is relatively close to the Lake St. Clair urbanized area and also the Birmingham-Bloomfield Hills built-up area in Oakland County. Since 1900, the population of the township has increased 240 per cent.

Sterling Township has 46.7 per cent Class IV land and 41.8 per cent Class I and Class II land combined (TABLE XVII). The 1923 Soil Survey indicates that approximately 70 per cent of the township consists of three soil types: Berrien loamy fine sand (CLASS IV) 32.7 per cent, Conover loam (Class I) 22.9 per cent, and Nappanee loam (Class II) 15.9 per cent.

The township's zoning ordinance, which became effective in 1949, allots 84.2 per cent of the township for combined agricultural and residential uses without setting aside any land specifically for agriculture. The remainder of the township (15.8 per cent) is zoned for industrial and commercial uses. These districts include 13.5 of the Class I land and 18.2 per cent of the Class II land (TABLE XVII).

TABLE XVII
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF STERLING TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural and Residential	86.5	81.7	82.8	84.3	--	100.0	84.2
Industrial	12.6	17.5	15.0	15.1	--	--	14.9
Commercial	0.9	0.8	2.2	0.6	--	--	0.9
TOTALS	100.0	100.0	100.0	100.0	--	100.0	100.0
Per cent of Township in each Class	24.74	17.02	11.54	46.66	--	0.04	

Macomb County - Washington Township

This township falls within two broad land divisions: (1) "Level

Poorly Drained Loams, Silt Loams, Clay Loams and Clays" (S-32) and (2) "Level to Rolling Loams" (T-34).

Washington Township is located in the northwest portion of Macomb County. It has not been greatly affected by suburbanization. Its population has increased only 76 per cent since 1900.

TABLE XVIII shows that Class I and Class III are the predominant land classes--Class I being 44.7 per cent of the township and Class III 24.3 per cent. Class I and Class II land together make up 57 per cent of the township. The Macomb County Soil Survey (1923) shows that approximately one-half of this township consists of three soil types: Miami loam (Class I) 22.2 per cent, Conover loam (Class I) 15.9 per cent, and Bellefontaine sandy loam (Class III) 12.7 per cent.

However, Washington Township, similar to the other townships studied in this county, groups agricultural and residential uses into a single use-district. This district includes 84.5 per cent of the township and the majority of all land classes (TABLE XVIII).

Muskegon County - Egleston Township

Three land divisions make up this township: (1) "Level to Hilly Dry Sands" (O-28), (2) "Mixed Wet and Dry Sands with Organic Soils" (P-29), and (3) "Organic Soils" (Z-43).

Egleston Township is adjacent to Muskegon Township on the east. The latter partially surrounds the city of Muskegon. Suburbanization in this township has been quite pronounced. The population has increased 12.4 times since 1900, 4.2 times since 1930, and 2.3 times since 1940.

The township has very little good agricultural land; Class I and Class II land together make up less than 1 per cent of the total area, whereas Class IV and Class V land combined make up over 84 per cent (TABLE

TABLE XVIII

DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF WASHINGTON TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural and Residential	90.1	88.3	69.9	89.5	--	77.5	84.5
Mining	7.0	10.0	29.8	3.8	--	16.3	12.7
Industrial	2.7	--	0.3	5.6	--	6.2	2.3
Commercial	0.2	1.7	--	1.1	--	--	0.5
TOTALS	100.0	100.0	100.0	100.0	--	100.0	100.0
Per cent of Township in each Class	44.7	12.4	24.3	15.8	--	2.8	

XIX). The Muskegon County Soil Survey (1924) shows that more than two-thirds of the township is made up of Plainfield loamy sand (Class IV) alone.

The Eggleston Township zoning ordinance (adopted 1949) has seemingly wisely zoned only 7.5 per cent of the township as an "agricultural" district (TABLE XIX). This so-called "agricultural" district is essentially an open district, however, since "this ordinance shall not apply to such agricultural districts."

Muskegon County - Laketon Township

Two broad land divisions make up this township: (1) "Level to Hilly Dry Sands" (O-28) and (2) "Mixed Wet and Dry Sands with Organic Soils" (P-29).

Laketon Township is located on Lake Michigan immediately north of the city of Muskegon. However, it has experienced less suburbanization than

TABLE XIX
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF EGLESTON TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Residential	--	66.7	6.5	93.6	97.4	19.1	81.3
Resort	--	--	57.1	1.8	--	71.2	10.6
Agricultural	100.0	33.3	36.4	3.9	1.4	9.7	7.5
Commercial	--	--	--	0.7	1.2	--	0.6
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	0.6	0.2	8.8	75.2	9.3	5.9	

Egleston Township. Since 1900 the population of Laketon Township has only multiplied 4.5 times as compared with 12.4 for Egleston Township.

Most of the township's soils are not well adapted for general agriculture. Class I, Class II, and Class III agricultural land together comprise only 9.1 per cent of the township (TABLE XX). The 1924 Soil Survey of the area shows that almost two-thirds of the township consists of three soil types: Plainfield loamy sand (Class IV) 34.5 per cent, Saugatuck sand (Class V) 16.1 per cent, and Bridgman fine sand (Class V) 13.1 per cent.

The township's zoning ordinance (adopted 1950) zones the entire township for residential and commercial uses (TABLE XX). Since agriculture is permitted and good agricultural land is scarce (slightly under 1,000 acres of Class I and Class II land), it might have been wise to create some small agricultural districts.

TABLE XX
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF LAKETON TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Residential	100.0	100.0	97.8	98.6	99.7	98.6	99.0
Commercial	--	--	2.2	1.4	0.3	1.4	1.0
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	0.8	7.5	0.8	58.0	29.2	3.7	

Muskegon County - Sullivan Township

This township falls within two land divisions: (1) "Level to Hilly Dry Sands" (O-28) and (2) "Mixed Wet and Dry Sands with Organic Soils" (P-29).

Sullivan Township is situated in the south central part of Muskegon County. It has experienced less suburbanization than either Eggleston Township or Laketon Township. Its population has increased only 2.3 times since the turn of the century, and the total population in 1950 was only slightly more than 1,000 persons.

This township has very little good agricultural land. Class I and Class II land together make up approximately three per cent of the township, whereas the total for Class IV and Class V land comprises almost 90 per cent (TABLE XXI). The Muskegon County Soil Survey (1924) shows that two soil types make up about 77 per cent of the township: Plainfield loamy sand (Class IV) 39.5 per cent and Saugatuck sand (Class V) 37.4 per cent.

The township has zoned (in 1949) about one-half of its area for residential purposes, about one-third for "agriculture", and slightly more than one-eighth for forestry. Though small in extent, most of the Class I and Class II land have been zoned for "agriculture", but 43.3 per cent of the Class V land is also included in this district. It is especially noteworthy that the forestry districts include essentially Class IV and Class V land (TABLE XXI).

TABLE XXI
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF SULLIVAN TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Residential	6.4	--	34.6	56.2	50.6	50.4	50.8
Agricultural	93.6	100.0	62.9	19.5	43.3	49.6	34.8
Forestry	--	--	1.0	23.6	6.0	--	13.9
Commercial	--	--	--	0.5	0.1	--	0.3
Industrial	--	--	1.5	0.2	--	--	0.2
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	1.5	1.6	6.3	48.1	41.6	0.9	

Ottawa County - Allendale Township

Three broad land divisions make up this township: (1) "Level to Rolling Clay Loam to Silty Clay Loam Soils" (H-19), (2) "Level to Hilly Dry Sands" (O-28), and (3) "Mixed Wet and Dry Sands with Organic Soils" (F-29).

Allendale Township is centrally located in Ottawa County. It is not near any large urban center and this is reflected in the rate of its population growth. Since 1900, the population has increased only slightly more than 16 per cent.

Class IV and Class V land make up approximately 54 per cent of the township and Class I and Class II land comprise about 26 per cent (TABLE XXII). According to the 1922 Soil Survey of the area, a little over one-half of the township consists of two poor agricultural soil types: Plain-field sand (Class V) 40.3 per cent, and Newton loamy fine sand (Class IV) 12.0 per cent.

The township's zoning ordinance (adopted 1949) stipulates an "agricultural" district which makes up about two-thirds of the township. In general, this district includes a proportional amount of each land class, instead of having more of the better agricultural land and less of the poor quality land (TABLE XXII).

Ottawa County - Blenden Township

Three land divisions comprise this township: (1) "Mixed Wet and Dry Sands with Organic Soils" (P-29), (2) "Level to Rolling Clay Loams, Silty Clay Loams and Clays" (R-31), and (3) "Organic Soils" (Z-43).

Blenden Township is located in the central portion of Ottawa County adjacent to Allendale Township. It has experienced even less population growth than the latter, its population having increased only 10 per cent since 1900.

Roughly, three-fourths of the township is Class IV and Class V agricultural land and about 22 per cent is Class I and Class II land (TABLE XXIII). The Ottawa County Soil Survey (1922) shows that two soil types

TABLE XXII
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF ALLENDALE TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural	69.3	67.0	61.1	71.9	64.7	73.2	66.1
Residential	30.1	29.2	22.0	25.8	30.7	14.1	27.8
Industrial	--	1.8	16.9	--	1.2	11.9	3.9
Commercial	0.6	2.0	--	2.3	3.4	0.8	2.2
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	8.9	17.9	15.6	12.3	41.7	3.6	

make up about two-thirds of the township: Newton loamy fine sand (Class IV) 37.5 per cent, and Plainfield sand (Class V) 28.9 per cent.

The township's zoning ordinance (adopted 1950) has placed 96.7 per cent of the township into an "agricultural" district which includes the vast majority of all land classes (TABLE XXIII). The uses permitted in the residence district are also permitted in this district.

Ottawa County - Crockery Township

This township is made up of three land divisions: (1) "Level to Rolling Clay Loam to Silty Clay Loam Soils" (H-19), (2) "Level to Hilly Dry Sands" (C-28), and (3) "Mixed Wet and Dry Sands with Organic Soils" (P-29).

Crockery Township is located in the north central part of Ottawa County. It is predominantly rural and has had only a 34 per cent increase in population since 1900.

TABLE XXIII
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF BLENDON TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural	98.6	97.6	--	97.73	94.56	99.0	96.66
Residential	0.3	1.7	--	1.76	3.89	--	2.38
Commercial	1.1	0.7	--	0.49	1.50	1.0	0.93
Industrial	--	--	--	0.02	0.05	--	0.03
TOTALS	100.0	100.0	--	100.00	100.00	100.0	100.00
Per cent of Township in each Class	4.2	18.0	--	40.5	34.8	2.5	

About one-fourth of the township is Class I and Class II agricultural land and approximately two-thirds is Class IV and Class V land (TABLE XXIV). The 1922 Soil Survey for the area shows that five soil types are fairly important, comprising a little over 71 per cent of the township: Plainfield loamy fine sand (Class IV) 23.0 per cent, Saugatuck sand (Class V) 15.4 per cent, Nappanee silty clay loam (Class II) 12.0 per cent, Plainfield sand (Class V) 10.7 per cent, and Newton loamy fine sand (Class IV) 10.2 per cent.

The Crockery Township zoning ordinance (adopted 1950) creates an "agricultural" district which comprises 73.2 per cent of the township. This district includes only 78.3 and 72.6 of the Class I and Class II agricultural land respectively, whereas, the residential district which makes up about 24.5 per cent of the township includes 21.7 per cent and 26.4 per cent of these two land classes (TABLE XXIV). Moreover, the uses

permitted in the residential district are also permitted in the "agricultural" district.

TABLE XXIV
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF CROCKERY TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural	78.3	72.6	82.5	72.3	71.4	85.3	73.2
Residential	21.7	26.4	17.5	25.6	24.4	13.2	24.4
Commercial	--	0.9	--	1.9	3.7	1.5	2.1
Industrial	--	0.1	--	0.2	0.5	--	0.3
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	2.2	23.5	5.5	33.3	32.3	3.2	

Ottawa County - Park Township

Two broad land divisions make up this township: (1) "Level to Hilly Dry Sands" (0-28) and (2) "Mixed Wet and Dry Sands with Organic Soils" (P-29).

Park Township is located in the southwest corner of Ottawa County on the shore of Lake Michigan. It is also near the small city of Holland (population 15,858 in 1950). Consequently, it has experienced a greater increase in population than either of the other townships studied in this county. Its population has increased 300 per cent since 1920 and approximately 73 per cent during the decade from 1940 to 1950.

This township is extremely poorly suited for general agriculture. Over 90 per cent of its area is Class V land (TABLE XXV), and according to

the 1922 Soil Survey, three soil types make up all of this amount:

Bridgman fine sand (44.8 per cent), Saugatuck sand (30.4 per cent), and Plainfield sand (16.0 per cent). There is no Class I agricultural land in the township and only 1.2 per cent is Class II land.

About 73 per cent of the township has been zoned (1946) as an "agricultural" district (TABLE XXV), but the uses of the residential district are also permitted in this district.

TABLE XXV

DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF PARK TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural	--	100.0	--	83.0	72.11	68.3	72.70
Residential	--	--	--	17.0	25.94	27.9	25.37
Commercial	--	--	--	--	1.93	3.8	1.91
Industrial	--	--	--	--	0.02	--	0.02
TOTALS	--	100.0	--	100.0	100.00	100.0	100.00
Per cent of Township in each Class	--	1.2	--	3.6	91.2	4.0	

Ottawa County - Robinson Township

This township is made up of two land divisions: (1) "Level to Hilly Dry Sands" (O-28) and (2) "Mixed Wet and Dry Sands with Organic Soils" (P-29).

Robinson Township is adjacent to Allendale Township in the north central portion of Ottawa County. Since 1900, its population has increased 76 per cent as compared with 86 per cent for the whole of Ottawa County.

Similarly to Park Township, Robinson has no Class I agricultural land and Class IV and Class V land together make up more than 92 per cent of its area (TABLE XXVI). The 1922 Soil Survey reveals that about four-fifths of the township consists of two soil types: Plainfield sand (Class V) 48.6 per cent and Newton loamy fine sand (Class IV) 31.1 per cent.

The township's zoning ordinance (adopted 1949) zones 71.6 per cent of the township as an "agricultural" district which also permits uses of the residential districts (TABLE XXVI).

TABLE XXVI

DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF ROBINSON TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural	--	78.1	78.2	75.4	68.9	78.1	71.6
Residential	--	21.3	3.9	23.7	28.6	19.3	26.2
Commercial	--	0.6	--	0.8	1.3	2.6	1.2
Industrial	--	--	17.9	0.1	1.2	--	1.0
TOTALS	--	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	--	2.2	1.4	31.8	61.0	3.6	

Ottawa County - Spring Lake Township

Two broad land divisions comprise this township: (1) "Level to Hilly Dry Sands" (O-28) and (2) "Mixed Wet and Dry Sands with Organic Soils" (P-29).

Spring Lake Township is in the extreme northwest corner of Ottawa County on the shore of Lake Michigan and is adjacent to the city of Grand

Haven. Since the turn of the century, its population has increased 213 per cent as compared with 101 per cent for the city of Grand Haven.

Over 96 per cent of the township is Class IV and Class V agricultural land (TABLE XXVII). According to the 1922 Soil Survey of Ottawa County, about 85 per cent of the township consists of four soil types in these two classes: Bridgman fine sand (Class V) 27.9 per cent, Plainfield sand (Class V) 22.0 per cent, Saugatuck sand (Class V) 18.5 per cent, and Plainfield loamy fine sand (Class IV) 16.9 per cent.

Similarly to the other townships studied in this county, Spring Lake Township's zoning ordinance (1952) creates an "agricultural" district which permits residential uses in addition to agriculture and related practices. This district includes 47.8 per cent of the township (TABLE XXVII).

TABLE XXVII
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF SPRING LAKE TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural	42.0	--	--	46.8	47.7	62.3	47.8
Residential	53.3	--	--	34.5	42.8	35.2	40.7
Industrial	--	--	--	16.4	7.3	--	9.2
Commercial	4.7	--	--	2.3	2.2	2.5	2.3
TOTALS	100.0	--	--	100.0	100.0	100.0	100.0
Per cent of Township in each Class	0.9	--	--	24.3	72.1	2.7	

Saginaw County - Buena Vista Township

This township falls within the "Level, Poorly Drained Loams, Silt Loams, and Clay Loams" land division (I-20,21).

Buena Vista Township adjoins the northern part of the city of Saginaw. Suburbanization has not been very rapid in this township since its population has increased only about 94 per cent since 1900. This is in comparison with 89 per cent for Saginaw County and 119 per cent for the city of Saginaw during the same period.

The Saginaw County Soil Survey (1933) reveals that approximately three-fourths of the township consists of four Class I soil types: Brookston loam 25.5 per cent, Wisner clay loam 21.5 per cent, Thomas clay loam 15.5 per cent, and Brookston clay loam 12.6 per cent. Class I and Class II land together make up more than 91 per cent of the township (TABLE XXVIII). The township in general, then, is well suited for agriculture.

The township's zoning ordinance (adopted 1952) has classed 83 per cent of the township as an "agricultural" district (TABLE XXVIII), but the uses permitted in the residential and commercial zones and various recreational uses are also permitted in this district. However, it is noteworthy that this so-called agricultural district, which comprises some 19,500 acres, includes about 17,800 acres of Class I and Class II agricultural land.

Saginaw County - Carrollton Township

This township falls within the "Level, Poorly Drained Loams, Silt Loams, and Clay Loams" land division (I-21).

Carrollton Township is located directly north of and adjoining the city of Saginaw. Its rate of growth has been slightly less than the city

TABLE XXVIII
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF BUENA VISTA TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural	83.4	74.6	88.5	64.6	--	85.7	83.0
Residential	11.1	9.8	8.4	33.8	--	1.6	11.0
Recreational	3.0	4.6	3.1	1.6	100.0	2.1	3.1
Industrial	2.1	11.0	--	--	--	10.6	2.6
Commercial	0.4	--	--	--	--	--	0.3
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	88.9	2.5	2.6	1.9	0.1	4.0	

of Saginaw, its population having increased 102 per cent since 1900 as compared with 119 per cent for the latter.

Approximately three-fifths of the township is Class I and Class II agricultural land (TABLE XXIX). The Soil Survey (1933) of the area shows that about 79 per cent of the township is made up of five soil types: Brookston silt loam (Class I) 19.8 per cent, Wisner clay loam (Class I) 17.9 per cent, Wauseon loamy fine sand (Class III) 14.2 per cent, Essexville loamy fine sand (Class II) 14.1 per cent, and Granby loamy fine sand (Class IV) 13.2 per cent.

Carrollton Township's zoning ordinance (adopted 1953) stipulates no agricultural district although agriculture is permitted in the other districts. Instead, 83.2 per cent of the township is zoned as residential and the remainder as various industrial and commercial districts (TABLE XXIX).

TABLE XXIX
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF CARROLLTON TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Residential	94.9	69.4	92.1	98.0	2.7	--	83.2
Industrial	4.3	26.3	7.4	--	97.3	--	15.5
Commercial	0.8	4.3	0.5	2.0	--	--	1.3
TOTALS	100.0	100.0	100.0	100.0	100.0	--	100.0
Per cent of Township in each class	45.2	14.1	18.1	13.9	8.7		

Saginaw County - Saginaw Township

The "Level, Poorly Drained Loams, Silt Loams, and Clay Loams" land division (I-20) makes up this township.

Saginaw Township abuts the western part of the city of Saginaw. It has experienced more population growth than either of the other townships studied in this county. Since the turn of the century, its population has multiplied 4.7 times.

According to the 1923 Soil Survey, approximately 55 per cent of the township is made up of three Class I soil types: Brookston loam (20.1 per cent), Kawkawlin fine sandy loam (17.9 per cent), and Kawkawlin loam (16.9 per cent). All of the Class I soil types together comprise 71 per cent of the township (TABLE XXX).

The township's zoning ordinance (adopted 1951) places 86.3 per cent of this good agricultural land in an "agricultural" district which

comprises 84.5 per cent of the township (TABLE XXX). However, in this district various residential and recreational uses are also allowed.

TABLE XXX
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF SAGINAW TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural	86.3	56.4	87.5	78.12	85.6	--	84.5
Residential	12.3	43.6	12.5	21.17	12.4	--	14.3
Commercial	1.3	--	--	0.68	--	--	1.1
Industrial	0.1	--	--	0.03	2.0	--	0.1
TOTALS	100.0	100.0	100.0	100.00	100.0	--	100.0
Per cent of Township in each Class	71.0	0.4	5.3	22.0	1.3	--	

Washtenaw County - Ann Arbor Township

Two broad land divisions make up this township: (1) "Level to Rolling Clay Loams, Silty Clay Loams and Clays" (R-31) and (2) "Level to Rolling Loams" (T-34).

Ann Arbor Township essentially surrounds the city of Ann Arbor. Its population growth, however, has been at a slower rate than that of the city of Ann Arbor or Washtenaw County. Since 1900, its population has multiplied 2.7 times as compared with 3.3 times for the city of Ann Arbor and 2.8 times for Washtenaw County.

A little over one-half of the township is Class I agricultural land and slightly more than one-third is Class III agricultural land (TABLE

XXXI). The Washtenaw County Soil Survey (1930) shows that two soil types make up almost two-thirds of this township: Miami loam (Class I) 43.0 per cent and Bellefontaine sandy loam (Class III) 20.8 per cent.

The township's zoning ordinance (1946) places about three-fourths of the Class I agricultural land into an "agricultural" district which includes 69 per cent of the township (TABLE XXXI). However, residential and recreational uses are also permitted in this district.

TABLE XXXI
DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF ANN ARBOR TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural	76.1	66.7	58.1	66.2	--	75.1	69.0
Residential	22.2	--	33.8	29.4	--	23.9	26.7
Park	0.4	18.3	6.7	1.6	--	1.0	2.8
Commercial	1.3	15.0	1.4	2.8	--	--	1.5
TOTALS	100.0	100.0	100.0	100.0	--	100.0	100.0
Per cent of Township in each Class	53.7	0.6	35.4	6.6	--	3.7	

Washtenaw County - Pittsfield Township

This township falls within the "Level to Rolling Clay Loams, Silty Clay Loams and Clays" land division (R-31).

Pittsfield Township is located directly south of and adjoining Ann Arbor Township. It has experienced considerably more population growth than Ann Arbor Township, its population having increased 5.1 times since 1900 as compared with 2.7 times for the latter.

The 1930 Soil Survey of Washtenaw County shows that one Class I soil type, Miami silt loam, makes up over one-half of the township. All of the Class I soil types together make up 62.6 per cent of the township (TABLE XXXII).

The Pittsfield Township zoning ordinance (adopted 1950) creates an "agricultural" district which makes up 86.9 per cent of the township. This district includes about 85 per cent of the Class I agricultural land, but various other uses (residential, recreational, etc.) are also permitted.

TABLE XXXII

DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF PITTSFIELD TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural	85.2	93.6	64.1	95.5	94.7	97.7	86.9
Residential	9.8	5.9	30.3	2.0	1.8	1.8	9.2
Commercial	2.8	--	2.8	1.8	3.5	0.1	2.2
Industrial	2.2	0.5	2.8	0.7	--	0.4	1.7
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	62.6	8.7	7.2	10.0	1.3	10.2	

Washtenaw County - Superior Township

This township is made up of four land divisions: (1) "Level to Rolling Clay Loams, Silty Clay Loams and Clays" (R-31), (2) "Level Poorly Drained Loams, Silt Loams, Clay Loams and Clays" (S-32), (3) "Level to Rolling Loams" (T-34), and (4) "Level to Rolling Well Drained Sandy Loams" (V-37).

Superior Township adjoins Ann Arbor Township on the east and is just north of the city of Ypsilanti. Its population has grown at a very rapid rate, especially within recent years--during the decade from 1940 to 1950 its population increased 5.4 times.

Approximately 64 per cent of the township is Class I and Class II agricultural land (TABLE XXXIII). The 1930 Soil Survey of Washtenaw County shows that about 54 per cent of the township consists of three soil types: Miami silt loam (Class I) 27.4 per cent, Miami loam (Class I) 15.9 per cent, and Nappanee silt loam (Class II) 10.8 per cent.

The Superior Township zoning ordinance (adopted 1951) classes 93.8 per cent of the township as "agricultural" (TABLE XXXIII). This district, of course, includes the majority of all land classes. However, "one-family detached dwellings other than farm dwellings" are also permitted in this district.

Washtenaw County - Ypsilanti Township

Three broad land divisions comprise this township: (1) "Level to Rolling Clay Loams, Silty Clay Loams and Clays" (R-31), (2) "Level Poorly Drained Loams, Silt Loams, Clay Loams and Clays" (S-32), and (3) "Level to Rolling Well Drained Sandy Loams" (V-37).

Ypsilanti Township almost completely surrounds the city of Ypsilanti. Its population growth has been greater than any other township studied in Washtenaw County. Since 1900 its population has multiplied 11.9 times (3.5 times from 1940 to 1950) as compared with 2.5 times for the city of Ypsilanti or 2.8 times for Washtenaw County.

Class III and Class IV agricultural land make up 72.0 per cent of the township and Class I and Class II make up 22.1 per cent (TABLE XXXIV).

TABLE XXXIII

DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF SUPERIOR TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural	98.2	91.8	87.6	88.8	85.1	91.3	93.8
Residential	0.4	5.9	6.2	5.9	14.9	2.6	3.1
Garden Homes							
Residential	1.4	0.3	4.6	0.4	--	1.0	1.7
Small Farms							
Residential	--	1.7	1.4	4.2	--	5.1	1.2
Commercial	--	0.3	0.2	0.7	--	--	0.2
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	49.7	14.2	19.6	11.9	0.3	4.3	

According to the Soil Survey (1930) of the area, approximately one-half of the township consists of six Class III and Class IV soil types:

Plainfield loamy sand (Class IV) 11.2 per cent, Ottawa loamy fine sand (Class IV) 8.8 per cent, Griffin loam (Class III) 8.5 per cent, Oshtemo loamy sand (Class IV) 7.7 per cent, Fox sandy loam (Class III) 6.9 per cent, and Gilford sandy loam (Class III) 6.9 per cent.

The township's zoning ordinance (adopted 1949) provides for an "agricultural" district which comprises 52.2 per cent of its total area. This district includes 59.4 per cent of the Class I agricultural land and 87.1 per cent of the Class II land (TABLE XXXIV). However, various uses permitted in the residential districts are also permitted in this district.

TABLE XXXIV

DISTRIBUTION OF AGRICULTURAL LAND CLASSES AMONG
THE USE-DISTRICTS OF YPSILANTI TOWNSHIP

	Per cent of Class in each Use-district						Per cent of Township in each Use- district
	I	II	III	IV	V	VI	
Agricultural	59.4	87.1	44.5	45.9	75.0	60.4	52.2
Residential	40.3	11.5	44.9	36.7	25.0	33.8	37.2
Industrial	--	--	9.6	15.6	--	5.4	9.4
Commercial	0.3	1.4	1.0	1.8	--	0.4	1.2
TOTALS	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Per cent of Township in each Class	11.7	10.4	35.4	36.6	0.6	5.3	

The Thirty-Four Townships in Toto

As mentioned earlier, not one of the townships studied has adopted a zoning ordinance that sets up a district in which only agriculture and related practices are permitted. However, it has also been indicated that in many instances so-called "agricultural" districts have been created which offer some degree of protection to agriculture against the invasion of non-agricultural uses whether intentional or not. Moreover, the primary use in these districts is agriculture and will probably continue to be so on an appreciable part for a long time. On this basis TABLE XXXV and TABLE XXXVI have been set up to summarize the results of the study. All districts which have been classed as "Agricultural" or "Agricultural and Residential", or similarly so, are designated as agricultural districts.

TABLE XXXV

DISTRIBUTION OF AGRICULTURAL LAND CLASSES BETWEEN AGRICULTURAL
AND NON-AGRICULTURAL DISTRICTS IN ALL TOWNSHIPS STUDIED

Land Classes	Agricultural Districts		Non-agricultural Districts		Class Totals	
	Acres	Per cent of Class Totals	Acres	Per cent of Class Totals	Acres	Per Cent of Total Area
Class I	158,895	76.0	50,264	24.0	209,159	31.6
Class II	62,491	59.0	43,455	41.0	105,946	16.0
Class III	55,708	60.3	36,699	39.7	92,407	14.0
Class IV	72,988	58.9	51,030	41.1	124,018	18.7
Class V	48,461	54.8	39,939	45.2	88,400	13.4
Class VI	25,509	60.8	16,471	39.2	41,980	6.3
District Totals						
Acres	424,052		237,858		661,910	
Per cent of Total Area		64.1		35.9		

TABLE XXXVI

PER CENT OF AGRICULTURAL AND NON-AGRICULTURAL
DISTRICTS OCCUPIED BY EACH AGRICULTURAL
LAND CLASS IN ALL TOWNSHIPS STUDIED

Land Classes	Agricultural Districts	Non-agricultural Districts
Class I	37.5	21.1
Class II	14.8	18.3
Class III	13.1	15.4
Class IV	17.2	21.5
Class V	11.4	16.8
Class VI	6.0	6.9
TOTALS	100.0	100.0

TABLE XXXV shows that the unincorporated portions of the 34 townships comprise approximately 662,000 acres. Of this amount, about 424,000 acres (64.1 per cent) have been zoned for "agricultural" purposes and almost 238,000 acres (35.9 per cent) for non-agricultural uses. Approximately 315,000 acres (47.6 per cent) of the total area are Class I and Class II agricultural land and more than 212,000 acres (32.1 per cent) are Class IV and Class V land. However, only 67.5 per cent of the Class I and Class II land has been placed in the so-called "agricultural" districts, whereas those districts include 56.8 per cent of the Class IV and Class V land.

TABLE XXXVI presents the per cent composition of the agricultural and non-agricultural districts by agricultural land classes. Considering all of the "agricultural" districts, only 52.3 per cent of their total area is Class I and Class II land, whereas 28.6 per cent is Class IV and Class V land. This means that only about one-half of the land zoned as "agricultural" is actually well-suited for agriculture, while more than one-fourth of the land area of those districts is poorly adapted for general agricultural purposes. On the other hand, Class I and Class II agricultural land make up 39.4 per cent of the non-agricultural districts and only 37.2 per cent of these districts consists of the two poorest agricultural land classes.

Some Economic and Physical Limitations in Zoning Land

Solely for Agricultural Use

Of course, it is not possible, or even desirable, to zone every acre of Class I and Class II land for agricultural purposes or, similarly, to exclude all Class IV and Class V land from such use. Factors such as location and demand may be sufficiently important in some instances as to

minimize any consideration of land character. Also, a limited amount of Class IV and Class V land may be economically utilized in a farming program for permanent pasture or farm woodlot.

Moreover, it is a general characteristic of Southern Michigan that within a relatively small area several soil types of the various land classes may be encountered. Certainly, it would not be feasible to sort out all of the small areas of Class IV and Class V land which may be dispersed throughout a broad area of generally good agricultural land and zone them for non-agricultural purposes. Likewise, it would not be practical to select a few acres of first-class agricultural land which are scattered throughout a broad area of generally poor quality agricultural land and dedicate them to agricultural use. However, it is not likely that these situations can account for the large amount of seemingly poor zoning encountered in this study.

Implications

The results of the study have two important implications. First, many townships have drawn up their zoning ordinances without adhering to the basic principle of good land use, in fact of the zoning enabling act itself: to guide the use of land, insofar as possible, in accordance with its suitability for certain uses. This is important even without considering the desirability or necessity of preserving good farm land for future agricultural use. Considering all of the townships studied as a whole, more than 28 per cent of the areas zoned for "agriculture" is not suited for general agricultural purposes, while more than 39 per cent of the areas zoned for non-agricultural uses is good agricultural land.

Second, the removal of good agricultural land from agricultural production has important implications for the future. In view of the fact that the population is expected to increase indefinitely and that non-agricultural developments will continue to occupy more and more land, it seems extremely important that the best agricultural lands should be protected and reserved as much as possible for future production of food and fibre. There is a total of slightly more than 315,000 acres of Class I and Class II agricultural land in the townships involved in this study. However, about 93,700 of these acres, or 29.7 per cent, have already been essentially lost for agricultural purposes. Moreover, the remainder of this good farm land is by no means completely protected from the encroachment of various non-agricultural uses.

SUMMARY

Within comparatively recent years the spread of residential, commercial and industrial developments from urban centers into adjacent unincorporated areas has reached significant proportions. Consequently, much land is being removed from agricultural production.

Since the population is rapidly increasing, it is important that the better agricultural lands be protected as much as possible from the encroachment of non-agricultural uses and reserved for the future production of agricultural products. This is possible to a large degree in Michigan since the State Legislature, through rural zoning enabling acts, has granted counties and townships of the State the power to zone the unincorporated portions of their areas.

Thirty-four selected townships in Southern Michigan were investigated to determine the disposition they have made of their better agricultural lands by means of the zoning ordinances they have adopted. As far as the state is concerned, it is doubly significant that some attempt should be made to protect good farm land in this portion because here the suburbanization force is at its greatest and here, also, are the best soils and climate for general agricultural purposes.

For each township the use-districts stipulated in the zoning ordinance were correlated with the natural suitability of the land for general agriculture on the basis of six agricultural land classes: Class I including those soil types best suited for agriculture, Class V those least suited, and Class VI those which could not be readily classified on the basis of soil type alone.

The unincorporated portions of the townships studied total almost 662,000 acres. Almost 48 per cent of this amount is Class I and Class II agricultural land. Yet, not a single acre has been zoned specifically for agricultural purposes.

Many of the townships investigated have created so-called "agricultural" districts, but in each case various non-agricultural uses are permitted in addition to agriculture. However, almost 30 per cent (93,719 acres) of the Class I and Class II land has been zoned "away" from agriculture even if those districts are considered as truly agricultural in nature.

Approximately 64 per cent (424,052 acres) of the total area of the thirty-four townships has been included in such "agricultural" districts. Almost 29 per cent of this amount is Class IV and Class V agricultural land. This is especially significant in view of the fact that about 39 per cent of the non-agricultural districts (which embrace 237,858 acres) consists of Class I and Class II land.

The implications of the results, then, are two-fold: (1) much good agricultural land is not adequately protected against the encroachment of non-agricultural uses and (2) many townships have drawn up zoning ordinances without giving due consideration to the character of their lands and their suitability for certain uses.

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APPENDIX

CLASSIFICATION OF SOIL TYPES AND MISCELLANEOUS SOIL

CLASSES ENCOUNTERED IN STUDY

Class I

Brookston loam
Brookston silt loam
Brookston clay loam
Clyde loam
Clyde clay loam
Colwood silt loam
Conover loam
Crosby loam
Fox silt loam
Hillsdale loam
Homer loam
Homer clay loam
Hoytville clay loam
Isabella loam
Isabella silty clay loam
Kawkawlin fine sandy loam
Kawkawlin loam
Kent silt loam
Miami loam
Miami silt loam
Morley loam
Pewamo clay loam

Class I Continued

Poygan clay loam
Selkirk loam
Selkirk silt loam
Thomas loam
Thomas clay loam
Tuscola very fine sandy loam
Tuscola silt loam
Wabash loam
Warsaw silt loam
Wisner loam
Wisner clay loam

Class II

Allendale fine sandy loam
Bellefontaine loam
Berrien clay loam
Brady loam
Bronson loam
Essexville loamy fine sand
Essexville sandy loam
Fox gravelly loam
Fox fine sandy loam
Fox loam

CLASSIFICATION OF SOIL TYPES AND MISCELLANEOUS SOIL

CLASSES ENCOUNTERED IN STUDY CONTINUED

Class II Continued

Gilford loam
 Hillsdale sandy loam
 Isabella sandy loam
 Maumee loam
 Maumee silty clay loam
 Nappanee loam
 Nappanee silt loam
 Nappanee silty clay loam
 Newton loam
 Newton silty clay loam
 Toledo silty clay
 Warsaw loam
 Waukesha loam
 Wauseon fine sandy loam

Class III

Allendale sandy loam
 Bellefontaine sandy loam
 Bellefontaine fine sandy loam
 Berrien sandy loam
 Berrien fine sandy loam
 Brady sandy loam
 Bronson sandy loam
 Cadmus sandy loam

Class III Continued

Fox gravelly sandy loam
 Fox sandy loam
 Genessee fine sand
 Genessee fine sandy loam
 Gilford sandy loam
 Granby sandy loam
 Griffin fine sandy loam
 Griffin loam
 Griffin clay loam
 Newton sandy loam
 Oshtemo sandy loam
 Oshtemo loam
 Plainfield sandy loam
 Plainfield fine sandy loam
 Waukesha sandy loam
 Wauseon loamy fine sand

Class IV

Arenac fine sand
 Arenac loamy sand
 Arenac loamy fine sand
 Bellefontaine loamy sand
 Berrien loamy sand
 Berrien loamy fine sand

CLASSIFICATION OF SOIL TYPES AND MISCELLANEOUS SOIL

CLASSES ENCOUNTERED IN STUDY CONTINUED

Class IV Continued

Coloma loamy sand
 Coloma loamy fine sand
 Genesee very fine sandy loam
 Genesee loam
 Genesee silt loam
 Granby loamy fine sand
 Newton loamy sand
 Newton loamy fine sand
 Oshtemo loamy sand
 Ottawa loamy fine sand
 Plainfield fine sand
 Plainfield loamy sand
 Plainfield loamy fine sand
 Rodman gravelly sandy loam
 Rodman sandy loam
 Wallkill loam
 Washtenaw loam

Class V

Bridgman fine sand
 Coastal beach
 Coloma sand
 Coloma fine sand
 Eastport sand

Class V Continued

Greenwood peat
 Kerston Muck
 Made land
 Marsh
 Mines, Pits, & Dumps
 Plainfield sand
 Saugatuck sand
 Wallace fine sand

Class VI

Burned muck
 Carlisle muck
 Houghton muck
 Muck
 Muck & Peat
 Rifle peat

FEDERAL CENSUS POPULATION FIGURES BY DECADES FROM 1900 TO 1950

FOR THE COUNTIES, TOWNSHIPS, AND RELATED URBAN CENTERS

INVOLVED IN THE STUDY

	1950	1940	1930	1920	1910	1900
BAY COUNTY	88,461	74,981	69,474	69,548	68,238	62,378
Hampton Township	3,857	3,046	4,211	3,511	3,025	3,319
Bay City	52,523	47,956	47,355	47,554	45,166	27,628
CALHOUN COUNTY	120,813	94,206	87,043	72,918	56,638	49,315
Battle Creek Township	15,105	7,844	6,334	2,079	1,064	1,008
Battle Creek City	48,666	43,453	43,573	36,164	25,267	18,563
EATON COUNTY	40,023	34,124	31,728	29,377	30,499	31,668
Windsor Township	2,628	2,114	1,798	1,334	1,347	1,497
INGHAM COUNTY	172,941	130,616	116,587	81,554	53,310	39,818
Lansing Township	17,627	14,274	8,518	2,815	1,760	1,353
Lansing City	92,129	78,753	78,397	57,327	31,229	16,485
JACKSON COUNTY	107,925	93,108	92,304	72,539	53,426	48,222
Blackman Township	12,903	10,401	7,583	2,825	1,746	1,695
Leoni Township	8,468	5,918	4,794	2,076	1,408	1,438
Jackson City	51,088	49,656	55,187	48,374	31,433	25,180
KALAMAZOO COUNTY	126,707	100,085	91,368	71,225	60,427	44,310
Comstock Township	6,442	4,315	4,439	2,281	1,918	1,694
Kalamazoo Township	27,252	16,827	13,339	5,587	3,050	1,904
Schoolcraft Township	3,542	2,575	2,551	2,342	2,577	2,138
Kalamazoo City	57,704	54,097	54,786	48,487	39,437	24,404
KENT COUNTY	288,292	246,338	240,511	183,041	159,145	129,714
Gaines Township	3,302	1,930	1,631	1,343	1,311	1,342
Grand Rapids Township	9,241	6,069	5,460	5,260	4,598	2,748
Wyoming Township	28,977	20,396	18,277	6,501	5,964	3,396
Grand Rapids City	176,515	164,292	168,592	137,634	112,571	87,565
LENAWEE COUNTY	64,629	53,110	49,849	47,767	47,907	48,406
Adrian Township	2,600	2,728	1,759	1,503	1,665	1,708
Adrian City	18,393	14,230	13,064	11,878	10,763	9,654
MACOMB COUNTY	184,961	107,638	77,146	38,103	32,606	33,244
Ray Township	1,671	1,439	1,370	1,194	1,240	1,363
Richmond Township	2,804	2,512	2,302	1,914	2,171	2,275

FEDERAL CENSUS POPULATION FIGURES BY DECADES FROM 1900 TO 1950

FOR THE COUNTIES, TOWNSHIPS, AND RELATED URBAN CENTERS

INVOLVED IN THE STUDY CONTINUED

	1950	1940	1930	1920	1910	1900
MACOMB COUNTY CONTINUED						
Shelby Township	5,930	2,946	2,184	1,544	1,497	1,726
Sterling Township	6,509	3,648	2,462	1,729	1,675	1,915
Washington Township	3,507	2,822	2,468	2,300	1,893	1,993
East Detroit City	21,461	8,584	5,955	--	--	--
Mount Clemens City	17,027	14,389	13,497	9,488	7,707	6,576
MUSKEGON COUNTY						
Egleston Township	121,545	94,501	84,630	62,362	40,577	37,036
Laketon Township	3,941	1,716	948	324	377	319
Sullivan Township	1,901	1,077	639	333	343	419
Muskegon City	1,020	660	542	479	413	447
	48,429	47,697	41,390	36,570	24,062	20,818
OTTAWA COUNTY						
Allendale Township	73,751	59,660	54,858	47,660	45,301	39,667
Blendon Township	1,663	1,377	1,325	1,307	1,489	1,429
Crockery Township	1,849	1,709	1,590	1,730	1,700	1,680
Park Township	1,763	1,412	1,243	1,239	1,387	1,318
Robinson Township	3,412	1,974	1,470	851	--	--
Spring Lake Township	1,281	1,041	816	794	899	729
Grand Haven City	5,524	3,392	2,827	2,091	1,920	1,765
Holland City	9,536	8,799	8,345	7,205	5,856	4,743
	15,858	14,616	14,346	12,183	10,490	7,790
SAGINAW COUNTY						
Buena Vista Township	153,515	130,468	120,717	100,286	89,290	81,222
Carrollton Township	6,938	4,556	3,026	5,149	3,737	3,581
Saginaw Township	3,943	3,239	3,009	2,498	2,128	1,952
Saginaw City	5,876	3,254	2,222	1,524	1,454	1,244
	92,918	82,794	80,715	61,903	50,510	42,345
WASHTENAW COUNTY						
Ann Arbor Township	134,606	80,810	65,530	49,520	44,714	47,761
Pittsfield Township	2,795	2,414	1,707	1,051	989	1,036
Superior Township	5,369	3,198	2,294	1,017	970	1,050
Ypsilanti Township	7,181	1,321	988	778	917	1,039
Ann Arbor City	14,630	4,153	2,618	1,083	1,082	1,233
Ypsilanti City	48,251	29,815	26,944	19,516	14,817	14,509
	18,302	12,121	10,143	7,413	6,230	7,378

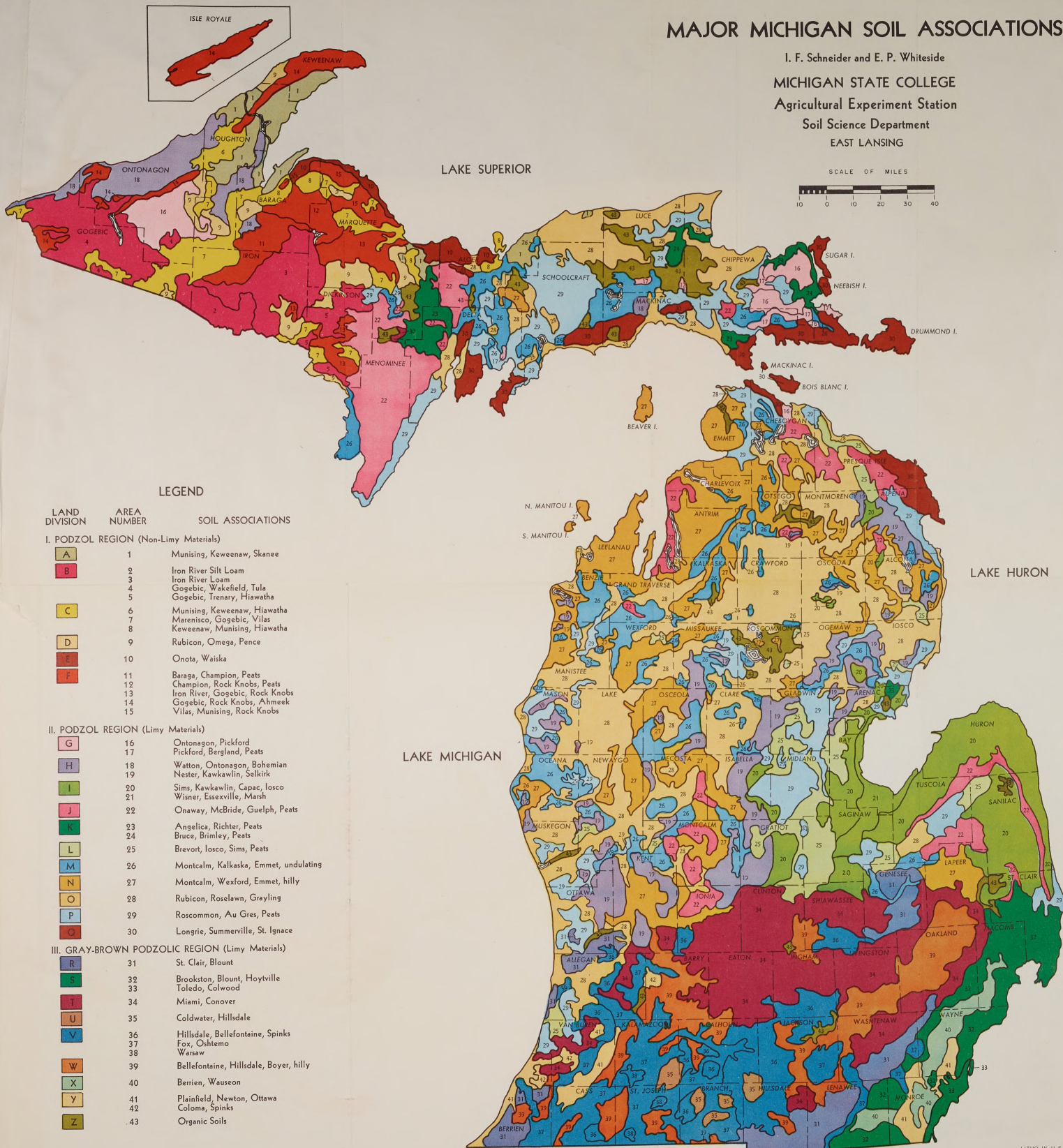
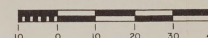
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MAJOR MICHIGAN SOIL ASSOCIATIONS

I. F. Schneider and E. P. Whiteside

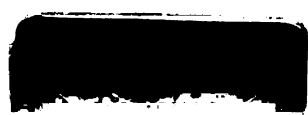
MICHIGAN STATE COLLEGE
Agricultural Experiment Station
Soil Science Department
EAST LANSING

SCALE OF MILES



LITHO IN U.S.A.

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ROOM USE ONLY

Jan 7 '67

~~NOV 24 1966~~

~~SEP 27 1962~~

~~CC 11 1961~~

~~JUN 7 1963~~

~~JUN 8 1963~~

~~FEB 22 1965~~

~~NOV 11 1965~~

~~NOV 2 1967~~

~~FEB 18 1971~~

~~MAR 1 1962~~

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