

LAND USE CHANGES IN THE AREA
SURROUNDING SALINA, KANSAS, 1965-1980

by

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CHAPTER 1

INTRODUCTION

Throughout the world, megalopolises, cities, towns, and industrial complexes have risen on agricultural land, forested land, grassland, wetland, or even in desert areas if location, topography, and human needs could be met. In other words, acres once used for non-urban purposes were switched to other, more intensive, uses. In the United States, especially between the end of World War II and the mid-1970s, massive immigration from rural areas, and emigration of urbanites to suburbia, have created pressure for conversion of land use located at the edge of cities. Consequently, land use shifts and their impacts may have important implications on the supply and productivity of land.

Problems Associated with Land Use Changes

In the United States as well as other areas of the world, our land use patterns are constantly changing. Such dynamic processes may affect the quality of life in urban areas, as well as having an impact on farm lands, forests, and the environment in rural areas.

Large-scale development, whether scattered or leapfrogging over the countryside, can destroy natural open space needed for recreation and wildlife habitat.¹ The changes threaten to create the deterioration of the environment.² As industries, residential tracts, and shopping centers are built on the urban fringe, the resulting traffic increases air pollution and associated problems. While the tributary areas of rivers and creeks are developed for

urban uses, the slow seepage of storm runoff through the soil is substituted by the rush of water off of asphalt, carrying with it oil, lead, animal wastes, and other pollutants. These impacts increase the demands for additional public services to meet the escalating growth.³

The social impacts of land use changes in the periphery of urban areas are important. Rapid increases in land costs have accompanied urban growth.⁴ Such growth results in land speculation along with associated changes in land value. In addition, land speculation causes large amounts of land to be held idle, reducing the efficiency of land utilization. Landowners who suspect that their land may be urbanized in the future are reluctant to make investments that would maintain or increase its productivity as farm or forest.⁵ In addition, in some areas, although the cost of housing is escalating constantly, single-family homes are built on lots of two to five acres or more. This low density settlement consumes large amounts of land that might be better used in the future at higher density ratios.

As land values rise because of growing development potential, the burden of higher property taxes increases the pressure on owners.⁶ Farms will eventually be put up for sale if they are not economically viable. In addition, owing to low soil productivity or other reasons, land that is expensive to farm tends to go out of agricultural production. At the same time, farmers on the urban fringe observe development occurring. Therefore, many hope to sell their land at the same price as the market value of urban development land, and thus hold off making costly new investment. Consequently, pressure is placed on the agricultural land adjacent to the urban zone forcing its conversion to urban uses.

In the United States, the conversion of prime agricultural land to other uses is of strong concern.⁷ The farmland resource base decreased by 129 million acres from 1960 to 1980.⁸ During the period 1967 to 1975 alone, 6.2 million acres of agricultural land in soil classes I-II were converted to urban and built-up areas (Table 1-1).⁹ In other words, the United States has been converting non-urban land to urban uses at the rate of about two million acres per year — of which about 800,000 acres is from the prime agricultural land resource base. Thus, prime agricultural land represents 32 percent of all agricultural land lost to other uses in the eight year period. Almost seven out of ten acres converted had some capability for production. Furthermore, land switched from field crops to other agriculture is a reversible conversion that can be switched back to its former use under proper market conditions. However, land switched to urban use is generally switched "forever".¹⁰

The nation does not have an infinite supply of good agricultural land. With the loss of agricultural blocks of prime agricultural land, other lands must be pressed into farming use. The result, no doubt, will be declining yields, higher costs, greater environmental hazards, and the loss of those acres which may have more efficiently met society's needs in agricultural production.

In Kansas, an area of extensive agricultural lands, such dynamic processes are taking place unchecked around urban areas. One example is found at Salina, in the heart of a major agricultural region. The quality of the land bordering Salina is high, yet this same land is being rapidly converted to non-agricultural uses.

TABLE 1-1
CONVERSION OF AGRICULTURAL LAND
IN THE UNITED STATES, 1967-1975

Capability Class	Converted to Urban Areas (Acres)	Converted to Water Areas (Acres)	Total Converted	
			Areas	Percent
Land Capability Classes I-II	6,200,000	1,191,000	7,391,000	32
Land Capability Classes III-IV	6,128,000	1,862,000	7,990,000	34.5
Land Capability Classes V-VIII	4,044,000	3,637,000	7,681,000	33.5
Total	16,372,000	6,682,000	23,055,000	100.0

SOURCE: Linda K. Lee, "A Perspective on Cropland Availability", Agricultural Economic Report No. 406, U.S. Department of Agriculture, Washington, D.C. (1978), pp. 14-15; Tables 8 and 9.

Statement of The Problem

Current information on problems of land use changes at the local level are not readily available. The Soil Conservation Service and other government agencies provide data which has valuable insight for large scale land use, but this information does not provide data for detailed analysis of conversion required for rational land use decisions at the local level. It is, therefore, the purpose of this thesis to examine characteristics of land use changes in the area surrounding Salina, Kansas. To accomplish this task the study will center on three problem areas:

- (1) The type of changes that have taken place between 1965-1980,
- (2) The relationship between areas of most intense land use changes and those of prime environmental quality (based upon availability of high quality environmental variables e.g., high soil capability); and,
- (3) The relationship between the changes taking place and existing institutional variables put forth to direct such dynamics.

Location of The Study Area

Salina, the seventh largest city in Kansas,¹¹ is located near the geographical center of the United States in the north central section of Kansas. It is in Saline County, which is one of the leading agricultural counties in Kansas and a trading center for many of the surrounding counties (Figure 1-1).¹² The junction of Interstate Highways 70 and 135 are located at Salina, making the city an important transportation center for central Kansas. In addition, Salina is a major agricultural marketing

center in a region which produces livestock, feed, and grain for national and international markets. The resource base of the area is enhanced by several sources of water resulting in a large amount of floodplain in the Salina area, e.g., the Salina River to the north, Mulberry Creek to the west, Dry Creek to the south-west, and Smoky Hill River along the eastern edge of the city.¹³

Justification

Geographers have been concerned about the study of land use and changes in land use patterns for a number of years. In his article "The Four Traditions of Geography", William D. Pattison identified "man-land" relations as one of the research-interest areas in geography.¹⁴ In so doing, he suggested the strong inter-relationship between man and land and the significance to geographers of studying land use variables and dynamics.

With the continued loss of agricultural land and the variety of impacts associated with conversion of land on the rural-urban fringe, there is an increasing concern among legislators, planners, geographers, environmentalists, and agriculturalists; there is also an expanding need for information on the dynamics of land use patterns. It is hoped that this research will provide land use planning and resource managers with another information source in analyzing this issue.

Preservation of Prime Agricultural Land

The concern for prime agricultural land is most frequently aroused by the problem of a continuing and deepening world crisis in food and fibers.¹⁵ The world continues to rely on the U.S.

for food exports. And the recently accelerating withdrawal of agricultural land for urban and other non-agricultural uses has also been used to justify the preservation of prime agricultural land.¹⁶

To preserve the vital land resource there are land use control techniques that can be implemented to slow the rate of land conversion. The most important form of governmental land use control in urban areas is zoning,¹⁷ which preserves farmland with the adoption of minimum lot size regulations. Also, comprehensive plans implemented by the government could reduce the impacts of land use dynamics on prime agricultural lands. In addition, transfer of development rights, purchase of farmland development rights, agricultural districts, and differential assessment attempt to reduce the tax burden farmers making possible a slower loss of agricultural land.

To preserve more effectively the prime agricultural land, it appears necessary to reinforce the cooperation among landowners and users, local and state governments, and the federal government. Additionally, a closer cooperation and budget coordination among USDA agencies with conservation program responsibilities is needed to control urbanization of agricultural land and reduce the consumption of prime agricultural land. Such control techniques as mentioned here will be evaluated in more detail in Chapter 5.

Literature Review

Owing to the growth of population and urbanization, many researchers are concerned about land use changes. Most of these studies, however, emphasize large regions of land use changes rather than specific dynamics. Five examples of studies are those

by Faltermayer, Clawson, Hart, Sommers, and Furuseth. Faltermayer, in "Redoing America",¹⁸ suggests that land use dynamics resulted in major impacts on the environment. Faltermayer also suggests that from the very earliest days people developing the lands of the United States showed little concern for environmental design. This attitude was a result of the sheer immensity of the country and the engendered feeling that every resource was inexhaustible, including land.

In addition, Faltermayer points out that public policy is the important force in determining whether cities will improve or decline, whether the suburbs grow rapidly or slowly, whether the people breathe good air or bad air. He suggests that planning is obviously increasing in popularity in rural as well as in urban areas. He believes that for effective planning, not only must the smaller suburbs merge to form more efficient units, but a metropolitan government must plan for the entire region. Nevertheless, urban growth and the decline of farming occur not because of grand plans, laws, or ordinances, but because of hundreds of little individual decisions. Therefore, everyone has responsibility to reduce the environmental problem caused by land use changes.¹⁸

The suburbanization process is one of the most important land use changes going on in the United States at the present time. In Clawson's "Suburban Land Conversion in The United States: An Economic and Governmental Process",¹⁹ the nature of the process of suburban growth and development in the United States as a whole is examined. Through illustrated case studies, Clawson deals with urbanized areas of the north-eastern United States in the postwar period and discusses the future of urban and suburban

growth in the United States.

Clawson believes that public programs of many kinds, the provision of public services, land developers, and land speculators are all engaged in changing land from some open or relatively unused state to a developed and used one. The process of postwar suburban land conversion has produced a large amount of good housing and rather pleasant neighborhoods; however, it has also been wasteful in its use of land. In addition, no suburban land exists whose rent or price is at an agricultural alternative level with suburban sprawl, and the associated steeply rising land prices.¹⁹

According to Clawson, the public processes of planning, zoning, and subdivision control are designed to bring some order into the land market. City planning has, however, shown little concern with the processes of urban and suburban growth and change, but rather an interest in developing a plan at some future specific date. Thus a communication gap exists between the planners and the general public, and between them and the other officials in government.

Clawson stresses that suburbs will continue to spread outward, with a great deal of idle or vacant land intermingled among the developed subdivisions. Simultaneously, more extensive mobile home parks might be built in the suburbs to make room for some of the lower-income families. To control more effectively the land use in suburban areas various measures, e.g., better planning, zoning, coordination of public improvements, or land taxation, can be used to improve the present processes of suburban land conversion.

Changing land use impact on available farming is another

major theme of past research. In Hart's study, "Loss and Abandonment of Cleared Farm Land in The Eastern United States",²⁰ for example, the author describes geographical variations in the loss and abandonment of farm land between 1910 and 1959 in 31 states of the eastern United States. Hart, a geographer, also examines factors which influenced land abandonment in different areas. These factors included growth of urban areas, coal strip mining, development of competitive disadvantages for a regionally dominant crop, governmental programs, land acquisition by forest industries, and such physical impediments to effective agriculture as climatic handicaps, rough surface features, and unproductive soils. However, Hart concluded that the major cause for the permanent loss of cleared farmland was urban expansion.

To provide a more satisfactory explanation for the complex geographical patterns of loss and abandonment of land, census data were used to compute the variety of statistics indicating farmland loss and abandonment, but the census data could not document the conversion of farmland to other land uses. Hart mentioned that there are some approaches to preserve farmland, such as planning. However, as long as urban people love the countryside and farmers are unwilling to consider land exclusively for farm use, the control of conversion of good farmland to urban structures will be very difficult.

Other geographers such as Sommers and Furuseth have also studies changing land use. Sommers, in "The Spatial Character of Land Use",²¹ suggests that urban encroachment upon rural land is a major land use issue. Usually, prime agricultural land is the land that often provides the best sites for urban development. In addition, Sommers points out that conflicts concerning the control of the land and degradation of the environment are significant land

use problems that must be dealt with today and in the future. In response to these problems, Sommers suggests that it is necessary to retain the sprawl of new housing and other urban structures onto open land surrounding the city.²¹

In "The Structure of Agricultural Land Conversion in Washington County, Oregon", Furuseth used air-photos to analyze the agricultural land conversion in Washington County, Oregon.²² Furuseth found that urban land development and agricultural operations were competing for the same higher quality land resources in the study area. Thus, the rapid urbanization resulted in increasing loss of prime resources. Furthermore, Furuseth suggests that the resulting increased intensity of farming a smaller land base, due to the loss of prime agricultural land, requires greater use of scarce fossil fuels and would increase air and water pollution.²²

Plan of Study

In the next chapter, before looking at land use changes in the Salina area from 1965 to 1980, the basic procedures for analysis will be discussed. It is also necessary to indicate the influence of land resource characteristics in the study area; this presentation is provided in Chapter Three. Chapter Four describes land use in each study period, and the changes in the three periods. Chapter Five examines the impacts of land use dynamics on prime agricultural land, and suggests solutions to stabilizing the loss of prime agricultural land. Chapter Six summarizes and concludes the study.

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CHAPTER 2

DATA ACQUISITION AND ANALYTICAL PROCEDURES

Remote sensing was used as a tool to analyze the changes in land use from 1965 to 1980. This involved photo acquisition, interpretation, and field checking, which assisted in the air-photo interpretation process. Next came the analysis of the land use information that had been gathered. The final step involved interviewing land use management officials to further the data analysis process.

Air Photo Acquisition and Characteristics

The photographs were acquired through the U.S. Department of Agricultural Stabilization and Conservation Service (ASCS), Aerial Photography Field Office. The approximate format of all air photos used in this study was 9" x 9". The aerial print scale of these air photos, however, was not uniform. The scale of those made in 1965 and 1971 was the same, 1:20,000 or 1" to 1667' but the scale of the 1980 air photos was 1:40,000 or 1" to 3333'. Overall, the air photographs were of good quality. Nevertheless, some land use types were difficult to identify because of inadequate photo resolution.

Air Photo Interpretation

Owing to their flexibility in revealing a variety of historical land use information, photo-interpretation techniques were used as a tool for data acquisition. A first step in interpretation was the adapting of a land use and land cover classification system which had been devised for use with remote

sensor data by the United States Geological Survey in 1976.¹

After initial examination and evaluation of land uses existent in the Salina area, it was determined that given the land use mix of the area, the applicability of the USGS land-use scheme was limited. Therefore, the unnecessary categories from the USGS land use and land cover classification system were omitted.

Several basic characteristics of features shown on the aerial photographs contributed to the land use identification process.² The characteristic shape of an object is an important characteristic in interpretation, since it allows for frequent and conclusive identification. Size of objects on aerial photographs, either relative or absolute, is a function of the photographic scale. If sizes were not considered in the interpretation, certain objects on aerial photographs might have been misinterpreted. Tone is a result of the brightness of the object being photographed in black and white photography. Because of tonal differences, the shapes, patterns, and texture of objects could be recognized. Pattern is an important characteristic to aid in identifying the interrelationships of the cultural and natural features. The shadow of an object is a useful clue for identification if objects are small and their tones are unclear. Site of objects in relation to other features could also help in identification. For example, a parking area is generally expected to be found in close proximity to a shopping center. Texture, which refers to the degree of coarseness or smoothness exhibited by photo images, can also be a useful key to identification. Using these interpretation factors, the land use and land cover classification system was thoroughly developed for air-photo interpretation (Appendix 2).

Stereopair photos of the area were studied using a stereoscope in order to obtain a general idea of the topography and land use,³ and a transparent overlay of suitable size was used for land use mapping. Although this process was efficient and economical, there were some problems in the process of photo-interpreting. For example, duplex dwellings were mistaken for single-family buildings; administrative and service uses were mistaken for commercial; a petroleum depot was misinterpreted as a granary.

Field Checking

Since there were limitations in air-photo interpretation, it was essential to visit the study area to perform a ground check to assist in the identification of land use.⁴ Field checking allowed the researcher to determine uncertain categories of land use and cover types. At the same time, ground photographs were used to assist in photographic interpretation where necessary.

Although field checking was a valuable tool, there were some limitations to this technique. The aerial photographs were taken in 1965, 1971, and 1980; however, the field checking was restricted to the present time (1982). If field checking was needed to explain certain problems of interpretation for 1965, the researcher was restricted to ground checking of present land use and comparing it to the photographs of 1965. As long as the land utilization of the judged area did not change, the past land use was determined to be in accordance with the present land use. However, the past land use could not be judged by means of the present use when it was different from the former one.

The seasonal period of the photography presented another

problem. Field checking was not always done in the same season as the air-photos. Accordingly, the different signature of land types for the season of the air photos conflicted with that experienced during field checking. For example, the vegetation and grass appear lush on the air photos, which were taken in summer. During ground checking, however, the deciduous trees and grass showed the withering effects of winter. Such problems certainly influenced the effectiveness of field checking.

The main difficulty in extensive field checking was that it took more time than actual aerial photo viewing. Moreover, one field checking trip was not enough. In the interpretation process it was necessary to make field checks several times.

Analysis of Data

After land use acreage and change information had been gathered, the subsequent step was the analysis of data. First of all, these data were summarized in tabular form to facilitate the analysis of land use changes in the study area. To show effectively the changes in the relative distribution of land within the study area, the changes from 1965 to 1971 and from 1971 to 1980 and the percentage of converted land were included for each land use type. Moreover, the statistical comparison made the characteristics of land use dynamics more concrete and systematic, as for example, by illustrating how many acres of prime agricultural land had been taken for residential development.

A second component of analysis was assessing the capability of land as it related to use change. The land use changes were examined to determine whether they were in accordance with degrees of soil capability. Also, the acreages of converted Classes I, II, and III soils were used to indicate the impacts of land use

changes on the prime agricultural land. In addition, possible social influences were considered in the land use changes. For example, information on land value and governmental policies in Salina were used to assist in the analysis of land use changes.

Interview of Land Use Management Officials

Besides the land use acreage and change information, support information was gathered through the interviewing of land use management officials associated with the U.S. Soil Conservation Service (SCS) and the local planning department. These officials were interviewed in order to understand their concerns about the problem with the amount of land use changes taking place around Salina. In addition, the officials suggested solutions to the problem regarding urban growth and land use changes in the future were noted.

FOOTNOTES

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CHAPTER 3

LAND RESOURCE CHARACTERISTICS IN THE STUDY AREA

The circumstances and dynamics of land use are directly or indirectly influenced by the land resource characteristics of an area. In the study area there are a variety of land resource characteristics affecting land utilization and land use changes, e.g., topography, soils, land capability, irrigation suitability, land value, and administrative controls.

Topography

For general urban development, the topography of an area can be one of the more significant limiting factors, e.g., the need for avoiding areas with slopes exceeding 15 percent. The topography in the study area, however, is primarily influenced by the processes of an alluvial plain.¹ In other words, the general character of the study is a plain of low relief and slope is generally not a major limiting factor. There are few areas with slopes exceeding the recommended limit of 15% that are used for conventional housing and general urban development.² The urban areas with steep slopes, are located in clusters adjoining the river flood plain and are relatively few in number and small in size.

Soils

The characteristics of soils may also influence land utilization. In the study area there are a variety of soils, although only two major types dominate. Most of the soils in the study area are silty loams and silty clay loams.³ The major types

are: Detroit Silt Loam, Detroit Silty Clay Loam, Hall Silt Loam, Langley Silt Loam, New Cambria Silt Clay Loam, and Sutpher Silty Clay. Soils in the study area have one of three characteristics: (1) a high potential for shrink-swell, (2) excellent suitability for agriculture, and (3) ability to accommodate sewage lagoons and septic tanks.⁴

Soils which have shrink-swell problems exist throughout the study area. However, these soils are especially widespread in the western portion of the study area and south of the Saline River. They are generally less frequently found in the north, east, and south portions. Since substantial structural damage to both roadways and building foundations result from expansion as the soils absorb water, certain considerations must be incorporated into the development of areas with high shrink-swell potential.

Soils designated as prime agricultural land are found in large areas in all portions of the study area. But they are interrupted by narrow strips of non-prime agricultural land. In addition, the soil characteristics suitable for sewage lagoons and septic tanks occur relatively infrequently, and are generally small in size.

Land Capability

The purpose of land capability classification is to show the soil's suitability for housing, crops, grazing, forestry, and wildlife. Researchers have grouped soils in the study area into land capability classes using the Soil Conservation System, USDA (see Appendix 3).⁵ According to this land classification system, the majority of the land in the study area has good capability for agricultural purposes. Generally, Class I

land, which is expected to produce high yields under good soil and crop management, can be found in all areas (see Figure 3-1). Such lands also have the easiest residential development capabilities, since development can occur with small amounts of land alteration.

Class II land can be used for tilled crops, but under slight risks of erosion or other minimal limitations. This land is located primarily in the northwest, west, and southwest parts of the study area.

Class III land can be used for tilled crops, but under moderate risks of erosion or other moderate limitations. It is found intermixed with Class I and Class II land, and is most extensive in the eastern portion of the study area.

In addition, only narrow strips of Class IV land are present in the study area. This class of land has severe limitations or high risks of soil damage when used for cultivation, and when so used requires special management. Spatially, this kind of land interrupts land of Class I, II, and III. Land of Class VI and Class VII, which is unsuitable for cultivation, exists only in very small quantities in the study area.

Irrigation Suitability

Irrigation suitability directly influences land utilization. In the study area ground water supplies for irrigation purposes are ample, especially in the valleys of the Saline and Smoky Hill Rivers.⁶ The wells are dug through the silts and clays of the terraces to the water-bearing beds of sand and gravel beneath. In addition to the irrigation from the ground water source, the major streams, e.g., the Saline and the Smoky Hill Rivers, are potential sources of good irrigation water. In the study area there are ponds and reservoirs which can be used for

irrigation. Overall, the water available for irrigation is plentiful and easily obtained in the study area.

Administrative Controls and Political Processes

Influencing Land Use

To better protect the welfare, safety, and health of the public, the courts have upheld the right of a governing body, under the Tenth Amendment of the United States Constitution, to guide development and to control the use of land within its jurisdiction. In so doing, political considerations inevitably influence the land use in certain areas, e.g., directly through state and local government policies and indirectly through the federal government controls.

Federal Controls

The administrative controls at the federal level have increasingly affected land use. One early example is the amended Federal Power Act of 1935. Under this act, it was necessary that the development of hydroelectric plant should be contingent upon consideration of other beneficial uses.⁷ According to the Flood Control Act of 1936, it is required that benefit-cost analysis be employed to weigh the impacts of a proposed project to whomever they may occur.⁸ Also, through the Bankhead-Jones Farm Tenant Act of 1937,⁹ the Secretary of Agriculture was given the right to develop a program of land conservation so as to correct maladjustments in land use. Although these eariler acts have had some influence on current land use patterns, the federal controls over land use have risen considerably since the mid-1960's. In 1966 the Federal-Aid to Highway Act was amended.¹⁰ Under this amendment public parks, conservation areas, and historic sites were guarded from unnecessary intrusion of federally assisted

roads. In addition, the Interstate Land Sale Full Disclosure Act was passed by Congress in 1968.¹¹ This act provided that everyone who offered lots for sale to persons in other states needed to file a registration statement with the Department of Housing and Urban Department. Owing to the indirect policy guidance over land use decision making, all obvious information on the physical and financial condition of the project was revealed by the seller. In the same year the National Flood Insurance Act of 1968 was passed,¹² making flood insurance available to owners of coastal and riverine property. The act was intended to minimize the exposure of additional structures to flood damage.

The National Environmental Policy Act of 1969 also represented major federal action affecting human action that influence environmental quality. Such action was subject to appraisal of its environmental consequences.¹³ Since environmental impacts directly or indirectly affect land usage, the implementation of the National Environmental Policy Act of 1969 influenced land use decisions.

In 1976 both the National Forest Management Act and the Federal Land Policy and Management Act illustrated growing concern about economic values and economic rationality of natural resource services.¹⁴ These acts attempted to resolve resource conflicts, and thus public land management was directly related to these two acts. Subsequently, the Soil and Water Resources Conservation Act of 1977 indicated a new awareness and concern about the nation's resources.¹⁵ The purpose of this act was to conserve the capacity of the nation to produce food and fiber. In addition the Food and Agricultural Act of 1981 consisted of conservation provisions and authorizations for creating conservation programs for special

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areas. Under this act farmers, especially those who cultivate the critically erosive lands, would be compensated for using less erosive cropping systems.

Policies at The State Level

With respect to Kansas, some state policies and political processes have influenced land utilization, and even changes in land use types. In 1967 the state of Kansas accepted a Comprehensive Air Quality Act, which attempted to provide:

(1) comfort and convenience to inhabitants of the state, (2) guided economic and social development of the state, and (3) enjoyment of the state's natural attractions.¹⁷ In addition to the Air Quality Act the state of Kansas also has various statutes to inhibit water pollution, e.g., a Water Pollution Act, a Water Supply and Sewage Act, ect..¹⁸ Owing to the adoption of Air and Water Controls, industrial developers had to seek ways to avoid violating the Air and Water Acts. Feed lot operations, for example, caused water pollution. Thus, the location of feed lots were restricted to certain areas.

Another political process influencing land utilization was a state constitutional amendment proposed to the Kansas legislature in 1974. According to the amendment, the legislature defines land use in agricultural production as agricultural land, of which agricultural income may be the basis of appraised land value and taxes.¹⁹ Subsequently, the proposal for differential assessment of farmland in Kansas was assigned to a legislative interim committee for future study. In 1976 a Kansas Constitutional amendment was ratified to permit the Kansas Legislature to enact tax legislation for implementing an agricultural land valuation scheme.²⁰ Under this scheme the actual or potential agricultural income of land is considered for taxation rather than the fair

market value of the land. Nevertheless, up to the present time the state of Kansas has had no laws to provide some form of real property tax relief for farmers. Such a tax relief program might decrease conversions of agricultural land to non-agricultural uses due to tax-motivated sales.²¹ In other words, the state of Kansas has not yet adopted a specific program for differential assessment of farmland. However, the guidelines for such a program have existed in the state for years.

Additionally, the state of Kansas has had a program to bring down estate taxes for families, especially farm families. Furthermore, the implementation could lower the rate at which agricultural land is converted to non-agricultural uses. Under the program, land is assessed according to its value for agriculture. However, a deferred tax is levied if the land use changes or certain other conditions are violated. The advantage of the program to the farmer is a postponement of taxes until he changes use, so that the end result is that he is discouraged from selling.

Local Level Controls

Although administrative controls and political processes at the federal and state level are influential, local level controls are also very significant. Of particular importance is the comprehensive plan, authorized by state statutes, K.S.A. 12-704a, which allows the Planning Commission to make a comprehensive plan.²³ The comprehensive plan provides not only the instructions for the development of land in private ownership but also the policies for provisions of public facilities. Simultaneously, the comprehensive plan assists the planning commission in making decisions concerning zoning and plotting of land in the planning area. Indeed, the political processes at the state level directly

affect land utilization in the study area, but the policies at the local level play a more significant role in land development decisions.

In the city of Salina, the policies of the local government provide guidelines for new urban development as well as limitations for rural development.²⁴ The development policies at the local level attempt to restrict development to areas with few environmental hazards and therefore try to minimize the loss of natural resources, including prime agricultural land, to urbanization. In addition the local plan states that "residential development shall be avoided in the 100-year flood plain".²⁵ The plan also limits land use which creates subsequent amounts of traffic noise or odor, by separating these districts away from single-family residential areas. Eventually, the plan calls for non-conforming commercial and industrial uses in residential areas to be phased out and replaced with more appropriate land uses.

With respect to the policies for guidelines of industrial land use, the law states that not only shall new industrial use be separated from surrounding non-industrial uses, but also industrial development shall not be permitted in areas which will result in substantial, long-term environmental damage. In addition, heavy industrial uses are encouraged on the margins of the community, away from existing or projected residential growth areas. At the same time, the local government is encouraged not to neglect consideration of parks and recreational land. The policies also specify that certain areas of natural scenic beauty should be preserved by development restrictions or through land or easement acquisition.

In brief, urban population growth has always been

concentrated on the fringe of urbanized areas where most of the vacant land suitable for industrial development and for building new houses is found. Nevertheless, administrative controls and political processes have attempted to guide the pattern of development both directly and indirectly in the study area.

Land Value

Location, situation, land control rights, and the factors of production are some of the variables influencing the appraised value of land.²⁶ In the study area, the value of urban land is generally higher than that of rural land. In the urban area land value is related to location and situation. Generally, the closer the land is to the central business district, the higher its net earning potential, and thus the higher the land value. In addition, land in areas of new residential development may have higher value than vacant land in depressed residential zones.

In rural areas the land has value in proportion to its fertility and proximity to the market place. This is illustrated in Table 3-1 which shows various grades of land determined by fertility and proximity to markets. For example, open rural land has a different value than cultivated rural land, and irrigated cultivated land of high natural fertility has a higher value than irrigated cultivated land of lower quality. In general, the normal acreage values of open and cultivated land are higher than those of pasture land and waste land. Based on the data illustrated on Table 3-1, the normal acreage value in open and cultivated land is more than twice that in pasture land.

Current Land Use Types

Given the geographic variables that influence land use, it is now important to assess current land use types in the Salina

TABLE 3-1

NORMAL ACREAGE VALUES, SALINE COUNTY, KANSAS, 1969

<u>OPEN & CULTIVATED LAND</u>			<u>PASTURE</u>		
Irrigated	Grade		Tame Pasture	Grade	
	A	\$ 500		A	\$ 230
	B	450		B	210
	C	400		C	190
	D	350		D	165
	E	310		E	140
Bottom Cultivated	Grade		Native Pasture	Grade	
	A	\$ 400		A	\$ 125
	B	370		B	110
	C	340		C	100
	D	310		D	90
	E	280		E	80
Upland Cultivated	Grade		Timber or Woods	Grade	
	A	\$ 250		A	\$ 90
	B	230		B	70
	C	210		C	50
	D	185		D	30
	E	160		E	10
			Waste Land	\$	5

Source: United Appraisal Company, Cost Data for Re-evaluation of Real Estate, Saline County, Kansas, 1969,
 (Cleveland, Ohio: United Appraisal Company, 1969)
 p. 134

study area. Present land use information was aggregated into the broad categories of residential, parks and recreation, public and semi-public, commercial, industrial, highways, railroads, and agricultural or vacant uses.²⁷ The results of land use computation for the study area are presented in Table 3-2.

Residential

Approximately 5,200 acres of land (12.4%) in the study area are used for residential purposes. This category includes all land on which the major structures serve as one or more dwelling units. This category can be divided into three sub-categories: single-family, multi-family, and mobile homes. In the urban area the vast majority of land is devoted to single-family land use. Single-family dwellings can be found anywhere in the urban area; however, mobile homes are distributed solely on the rural-urban fringe. Generally, larger parcels of land are utilized for multi-family dwellings.

Parks and Recreation

This category accounts for 873.4 acres of land (2.1%) in the study area. It includes land used for both active and passive recreational activities including all land maintained generally in its natural state, landscaped or otherwise developed for recreational use. This type of land use is mainly distributed in the east portion of the city near the Smoky Hill River.

Public and Semi-Public

Public and semi-public uses made up 607.4 acres of land (1.5%) in the study area. Included are land and buildings owned by governmental agencies (city, county, state or federal) or by religious, educational, or civic groups (excluding lands used for recreational purposes). Aggregated in this pattern are such uses as schools, cemeteries, private schools, etc.. In the city, this

TABLE 3-2

EXISTING LAND USE IN THE AREA SURROUNDING SALINA, KANSAS, 1980

Land Use Types	Area		%of Total Land
	Acres	Hectares	
Residential			
*SF (111)	4638.4	1877.4	11.11
MF (112)	347.5	140.6	0.83
MH (113)	205.7	83.1	0.49
Sub-total	5191.6	2101.1	12.43
Parks and Recreation			
*PK (171)	336.2	136.0	0.81
GC (175)	522.9	211.7	1.25
CA (176)	14.3	5.8	0.03
Sub-total	873.4	353.5	2.09
Public and Semi-Public			
*EDU (124)	275.7	111.5	0.66
ASU (125)	169.0	68.4	0.40
CT (173)	82.9	33.6	0.20
WD (174)	79.8	32.1	0.19
Sub-total	607.4	245.6	1.45
Commercial			
*CBD (121)	63.8	25.8	0.15
SSC (122)	470.3	190.1	1.13
SIS (123)	132.4	53.6	0.32
REC (126)	20.7	8.4	0.05
PD (151)	15.9	6.4	0.04
GN (152)	57.4	23.2	0.14
JY (153)	28.7	11.6	0.06
Sub-total	789.2	319.1	1.89
Industrial			
*FI (131)	98.9	40.0	0.24
PI (132)	617.0	249.6	1.48
Sub-total	715.9	289.6	1.72

TABLE 3-2 (Continued)

Land Use Types	Area		% of Total Land
	Acres	Hectares	
Transportation			
*HW (141)	789.0	319.3	1.89
RR (142)	330.0	133.5	0.79
AP (143)	2786.3	1127.6	6.67
Sub-total	3905.3	1580.4	9.35
Agricultural and Vacant			
*CL (211)	23431.6	9482.7	56.12
PL (212)	3306.0	1337.9	7.92
BCF (231)	6.3	2.6	0.01
FS (241)	541.9	219.3	1.30
UDL (172)	192.8	78.1	0.46
Sub-total	27478.6	11120.6	65.81
Forest Land			
*DFL (411)	988.2	400.0	2.37
MFL (431)	232.7	94.3	0.56
Sub-total	1220.5	494.3	2.93
Water			
*RV (511)	741.2	300.0	1.78
LK (521)	63.8	25.8	0.15
RSV (531)	165.9	67.0	0.40
Sub-total	970.9	392.8	2.33
Total Area	41753.2	16897.0	100.00

* : see Appendix 2 for index of classification
 Basis: Aerial photos, scale 1:20,000.

type of land use is distributed in a scattered manner.

Educational uses of land make up approximately half of the acreage, and are located in the south part of the city.

Commercial

This category accounted for 789.2 acres of land (1.9% of total land) in the study area. This includes land occupied by buildings for merchandising. The primary purpose of the land is for the wholesale or retail sale of goods and services. Included are grocery stores, business offices, hotels and motels, clothing, car sales and service. This land use can be found in all areas of the city.

Industrial

This category comprises all land which is occupied by buildings, materials, or equipment, where the primary use is for storage, transportation, or manufacturing of a product. Approximately 715.9 acres of land (1.7% of total land) are utilized for industrial purpose in this study area. Examples include manufacturing, constructional yards, heavy equipment or material storage, and warehousing. In general the larger amount of industrial land is located in areas near the Union Pacific Railroads, thus located to the immediate north and northeast of the central business district.

Transportation

This category consists of highways, railroads, and airports. It accounts for 3,905.3 acres of land (9.4% of total land) within the study area. In this category of land use airport facilities, located in the southwest portion of the city, make up the greatest percent.

Agricultural or Vacant

The vast majority of land in the study area is devoted to

this land use type, which accounts for 27,478.6 acres of land (65.8% of total land). This category is defined as the land on which none of the above uses are performed. It includes all completely undeveloped land without structures, and land used for agricultural purposes. Of particular importance is cropland, which occupies more than half of the total land in the study area. Both cropland and pasture land are distributed on all sides of the study area.

Forest Land

This category includes deciduous forest land and mixed forest land. Forest land accounts for 1,220.5 acres (2.9% of total land) in this study area. In general the majority of the forest land is located in very narrow strips along streams in the study area. The primary component of this land use type is deciduous forest.

Water

Rivers, lakes, and reservoirs account for 970.9 acres of land (2.3% of total land) in the study area. The lakes and reservoirs are generally found in the southeastern part of the study area along the Smoky Hill River.

In summary, the results of the land use survey indicate that there are 41,753.2 acres in the study area. Of this total, 28.9% is intensively used, while some 68.7% is used for extensive purposes e.g., agricultural land, vacant land, and forest land. While agriculture and vacant is the dominant land use type, the second largest land use type is for residential purposes, accounting for slightly less than half of the area of developed land within the study area. In addition to agricultural, vacant, and residential, it should be noted that a relatively large amount of land is utilized for transportation activities (9.4%). Parks

and recreation, commercial activities, industrial uses, and public and semi-public land uses account for a small portion of land in the study area.

FOOTNOTES

1. The Salina City Planning Commission, Salina, Kansas, Comprehensive Plan, Salina City of Planning and Community Department (August, 1980), p. 32.
2. Ibid. pp. 32-33.
3. Soil Conservation Service, USDA, and Kansas Agricultural Experiment Station, Soil Survey, Saline County, Kansas, Series 1950, No. 4, (Washington D.C.: The Superintendent of Documents, U.S. Government Printing Office, January, 1959), pp. 11-105.
4. The Salina City Planning Commission, Salina, Kansas, Comprehensive Plan, Salina City of Planning and Community Department (August, 1980), p. 30.
5. Soil Conservation Service, USDA, and Kansas Agricultural Experiment Station, Soil Survey, Saline County, Kansas, Series 1950, No. 4, (Washington D.C.: The Superintendent of Documents, U.S. Government Printing Office, January, 1959), pp. 136-145.
6. The Salina City Planning Commission, Salina, Kansas, Comprehensive Plan, Salina City of Planning and Community Department (August, 1980), pp. 33-34.
7. Rutherford H. Platt, Land Use Control: Interface of Law and Geography, Resource Papers for College Geography, No. 75-1, (Washington, D.C.: The Association of American Geographers, 1976), p. 12.
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9. Charles M. Lamb, Land Use Politics and Law in The 1970's, (Washington, D.C.: The George Washington University, 1975), p. 30-31.
10. Rutherford H. Platt, Land Use Control: Interface of Law and Geography, Resource Papers for College Geography, No. 75-1, (Washington, D.C.: The Association of American Geographers, 1976), p. 12.
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14. Emery N. Castle, "Land, People, and Policy: A National View", Journal of Soil and Water Conservation, Vol. 37, No. 1 (Jan.-Feb., 1982), p. 20.

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16. Clayton W. Ogg, James D. Johnson, and Kenneth C. Clayton, "A Policy Option for Targeting Soil Conservation Expenditures", Journal of Soil and Water Conservation, Vol. 37, No. 2 (Mar.-Apr., 1982), p. 68.
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19. Bryan E. Nelson, "Differential Assessment of Agricultural Land in Kansas: A Dicussion and Proposal", The University of Kansas Law Review, Vol. 25, No. 2 (1977), p. 230.
20. Ibid, p. 245.
21. Robert J. Gray, National Agricultural Lands Study, Final Report, United States Department of Agriculture, Council on Environmental Quality, Department of Housing and Urban Department, (Washington, D.C.: New Exective Office Building, 1981), p. 67.
22. Ibid, p. 68.
23. The Salina City Planning Commission, Land Use Plan, Salina, Kansas, Salina City of Planning and Community Department (1974), p. 2.
24. The Salina City Planning Commission, Salina, Kansas, Comprehensive Plan, Salina City of Planning and Community Department (August, 1980), pp. 45-55.
25. Ibid, p. 47.
26. Sanders A. Kahn and Frederick E. Case, Real Estate Appraisal and Investment, Second Edition, (New York: John Wiley and Sons), p. 53.
27. The Salina City Planning Commission, Salina, Kansas, Comprehensive Plan, Salina City of Planning and Community Department (August, 1980), pp. 19-20.

CHAPTER 4

LAND USE DYNAMICS

The utilization of land is a dynamic process. Land use patterns owe their dynamics to time and circumstances. Usually, the utilization of land changes with the changing needs and desires of people. With remote sensing as a tool, three maps were made to show the distribution of land use in 1965, 1971, and 1980. In addition, for the purpose of examining dynamic characteristics, two maps of land use changes were produced from the three land use maps.

Description of Land Use in 1965, 1971, and 1980

Since past land use conditions and activities exerted such a strong influence on present growth and type of development, it is necessary to complete the descriptions of land use in each study period year (1965, 1971, and 1980).

Land Use in 1965

Figure 4-1 shows that in 1965 the vast majority of land was devoted to non-urban uses in the study area, and, of course, a smaller amount of land was occupied for urban uses. Based on the USGS Classification system,¹ urban area includes residential, commercial and service use, industrial, transportation, industrial and commercial complexes, and other urban land uses. Non-urban uses include agricultural land, bare ground, forest land, and water.

Agricultural: In the study area the largest single category of land use was cropland (Table 4-1). The 1965 Land Use Map (Figure 4-1) indicates that cropland could be found in

substantial quantities on all sides of Salina. Pasture land (8.8%³⁹ of total land), however, was distributed predominantly in the area southeast and east of the city around the old municipal airport, which is located east of the Smoky Hill River. In addition, farmsteads, including rural residential dwellings, were scattered on all sides of the area surrounding Salina.

Other non-urban: The areas of deciduous forest land and mixed forest land (2.9% of total land) consisted of very narrow strips along streams (Figure 4-1). Such uses made up most of the other non-urban land uses. With respect to the land utilization for water, the rivers occupied more land than lakes and reservoirs.

Residential: In 1965 the vast majority of urban land was devoted to single-family dwellings, which was the second largest single category of land use (9.7% of total land). These structures were primarily distributed around the central business district. In contrast, there was no residential district surrounding the waste dump, and few single-family dwellings surrounding the cemetery (Figure 4-1).

Multi-family dwellings were generally located in a very scattered manner and were limited to moderately-sized tracts, although there was one large tract of duplex dwellings near the airport. Nevertheless, the multi-family land use was located predominantly in the eastern portion of Salina, where the most scenic park areas existed, and in the central section of the city, where the most intensive land use occurred.

The land use of mobile homes was not intermixed with other residential land uses in the study area. All the mobile homes were located in the western edge of the city; some of them were distributed near Highway 81, and some near Dry Creek. Overall, the

TABLE 4-1

LAND USE IN THE AREA SURROUNDING SALINA, KANSAS, 1965

Land Use Types	Area		% of Total Land
	Acres	Hectares	
Residential			
*SF (111)	4052.0	1639.8	9.70
MF (112)	310.8	125.8	0.74
MH (113)	106.8	43.2	0.26
Sub-total	4469.6	1808.8	10.70
Commercial and Service			
*CBD (121)	63.8	25.8	0.15
SSC (122)	248.7	100.6	0.60
SIS (123)	108.4	43.9	0.26
EDU (124)	227.9	92.2	0.54
ASU (125)	130.7	52.9	0.31
REC (126)	20.7	8.4	0.05
Sub-total	800.2	323.8	1.91
Industrial			
*FI (131)	94.1	38.1	0.23
PI (132)	361.8	146.4	0.87
Sub-total	455.9	184.5	1.1
Transportation			
*HW (141)	742.8	300.6	1.78
RR (142)	330.0	133.5	0.79
AP (143)	2937.7	1188.9	7.04
Sub-total	4010.5	1623.0	9.61
Industrial and Commercial Complexes			
*PD (151)	15.9	6.4	0.04
GN (152)	57.4	23.2	0.14
JY (153)	9.6	3.9	0.02
Sub-total	82.9	33.5	0.20

TABLE 4-1 (Continued)

Land Use Types	Area		% of Total Land
	Acres	Hectares	
Other Urban Land			
*PK (171)	269.4	109.0	0.64
UDL (172)	283.7	114.8	0.68
CT (173)	82.9	33.6	0.20
WD (174)	36.7	14.8	0.09
GC (175)	275.8	111.6	0.66
CA (176)	14.3	5.8	0.03
Sub-total	962.8	389.6	2.30
*CL (211)	24558.7	9938.6	58.82
PL (212)	3672.6	1486.3	8.80
BCF (231)	44.6	18.1	0.11
FS (241)	518.0	209.6	1.24
BG (332)	116.3	47.1	0.28
DFL (411)	954.8	386.4	2.29
MFL (431)	264.6	107.1	0.63
RV (511)	741.2	300.0	1.77
LK (521)	63.8	25.8	0.15
RSV (531)	36.7	14.8	0.09
Total Area	41753.2	16897.0	100.00

* : see Appendix 2 for index of classification
 Basis: Aerial photos, scale 1:20,000.

locations of residential land uses in 1965 generally corresponded with current zoning.

Commercial and service: Interestingly, in 1965 the area of the central business district, which contained the most intensive concentration of commercial activities, occupied but one-fourth of the area used for shopping, with suburban shopping centers dominating (Table 4-1). Characteristically, the suburban shopping centers were surrounding by single-family areas. In addition, educational land use and administrative and service use could generally be found throughout Salina, although the administrative land use was particularly concentrated in the area around the central business district.

Industrial: In general, processing industries (0.9% of total land), e.g., flour milling, saw milling etc., were found along the railroads (including the Union Pacific, the Missouri Pacific, and the Atchision, Topeka, and Santa Fe) in 1965. The largest concentration of industrial use was immediately north and northeast of the central business district along the railroad tracks.

Transportation: The major concentration of rail lines was in an east-west corridor immediately north of the central business district. Moreover, there was one major east-west and two major north-south highways (1.8% of total land). There was also a large amount of land utilized for the airports, which were located in the east and southwest sections of the study area.

Other urban: Commercial and industrial complexes were few in number and small in size in 1965. Mostly, examples of this type of land use were located along or near the railroads. Parks were not evenly distributed across the city. The majority of park space

was concentrated along the Smoky Hill River. Also, cemeteries, a waste dump, and a golf course were some distance from the central business district.

Land Use in 1971

Between 1965 and 1971 some land use additions and transformations occurred. The supplementary descriptions for the land use additions and transformations in 1971 include the following:

Agricultural: More land was devoted to pasture land, as cropland was declining in 1971. Table 4-2 shows that cropland occupied approximately six times as much area as pasture land, which occupied about the same acreage as the total for single-family dwellings.

Other non-urban: Bare ground (0.03% of total land) hardly existed in the study area in 1971; however, it can be found that more land, primarily located in the southeast of the study area along the Smoky Hill River, was devoted to the new reservoir sites at that time.

Residential: The single-family land development was located predominantly in the south area surrounding Salina, although some new single-family dwellings were developed south and east of the city. In addition, the development of multi-family and mobile homes was minimal.

Commercial and service: By 1971 more commercial activities had shifted to suburban shopping centers, which then occupied approximately five times as much area as that for the central business district (Table 4-2). The land occupied by suburban shopping centers generally corresponded with the current zoning except for the area of suburban shopping centers located near Dry

TABLE 4-2

LAND USE IN THE AREA SURROUNDING SALINA, KANSAS, 1971

Land Use Types	Area		% of Total Land
	Acres	Hectares	
Residential			
*SF (111)	4147.7	1678.5	9.93
MF (112)	310.8	125.8	0.74
MH (113)	114.8	46.4	0.28
Sub-total	4573.3	1850.7	10.95
Commercial and Service			
*CBD (121)	63.8	25.8	0.15
SSC (122)	318.8	128.9	0.76
SIS (123)	108.4	43.9	0.26
EDU (124)	275.7	111.5	0.66
ASU (125)	140.3	56.8	0.34
REC (126)	20.7	8.4	0.05
Sub-total	927.7	375.3	2.22
Industrial			
*FI (131)	94.1	38.1	0.23
PI (132)	471.8	109.9	1.13
Sub-total	565.9	229.0	1.36
Transportation			
*HW (141)	789.0	319.3	1.89
RR (142)	330.0	133.5	0.79
AP (143)	2786.3	1127.6	6.67
Sub-total	3905.3	1580.4	9.35
Industrial and Commercial Complexes			
*PD (151)	15.9	6.4	0.04
GN (152)	57.4	23.2	0.14
JY (153)	9.6	3.9	0.02
Sub-total	82.9	33.5	0.20

TABLE 4-2. (Continued)

Land Use Types	Area		% of Total Land
	Acres	Hectares	
Other Urban Land			
*PK (171)	269.4	109.0	0.65
UDL (172)	251.8	101.9	0.61
CT (173)	82.9	33.6	0.20
WD (174)	43.1	17.4	0.10
GC (175)	522.9	211.7	1.25
CA (176)	14.3	5.8	0.03
Sub-total	1184.4	479.4	2.84
*CL (211)	23694.7	9589.1	56.75
PL (212)	4147.6	1678.5	9.93
BCF (231)	38.2	15.5	0.09
FS (241)	529.2	214.1	1.27
BG (332)	14.3	5.8	0.03
DFL (411)	948.4	383.9	2.27
MFL (431)	243.8	98.7	0.59
RV (511)	741.2	300.0	1.78
LK (521)	63.8	25.8	0.15
RSV (531)	92.5	37.3	0.22
Total Area	41753.2	16897.0	100.00

* : see Appendix 2 for index of classification
 Basis: Aerial Photos, Scale 1:20,000

Creek, which was planned for expansion of residential use.

Industrial: Processing industries (1.1% of total land) were generally distributed along the rural-urban fringe, not located at a distance from the city. Furthermore, these industries were found mainly in the northwest areas surrounding Salina (Figure 4-2), but not in the east and southeast part of the study area.

Transportation: In 1971, Highway 81 had been completed (Figure 4-2), accounting for 1.9% of total land (Table 4-2). In addition, the old municipal airport which was located in the east part of the study area had been converted to a golf course.

Other urban: Because of the new golf course which was located between the two older ones, the land occupied by golf courses (1.3% of total land) was only second to the area in single-family residences, highways, and airports.

Land Use in 1980

The supplementary description in 1980 were made up as follows:

Agricultural: Pasture land occupied approximately 70% of land used for single-family dwellings (11.11% of total land, Table 4-3) in 1980. In addition, beef cattle feedlots only occupied 0.01% of total land. This may be related to associated water or air pollution, which violates the Kansas Air and Water Act.

Other non-urban uses: There were new reservoirs established in the east of the study area along the Smoky Hill River (Figure 4-3).

Residential: In addition to the large number of new single-family dwellings, the number of mobile homes had multiplied rapidly by 1980. The new mobile home sites were located in the

TABLE 4-3

LAND USE IN THE AREA SURROUNDING SALINA, KANSAS, 1980

Land Use Types	Area		% of Total
	Acres	Hectares	
Residential			
*SF (111)	4638.4	1877.4	11.11
MF (112)	347.5	140.6	0.83
MH (113)	205.7	83.1	0.49
Sub-total	5191.6	2101.1	12.43
Commercial and Service			
*CBD (121)	63.8	25.8	0.15
SSC (122)	470.3	190.1	1.13
SIS (123)	132.4	53.6	0.32
EDU (124)	275.7	111.5	0.66
ASU (125)	169.0	68.4	0.40
REC (126)	20.7	8.4	0.05
Sub-total	1131.9	457.8	3.71
Industrial			
*FI (131)	98.9	40.0	0.24
PI (132)	617.0	249.6	1.48
Sub-total	715.9	289.6	1.72
Transportation			
*HW (141)	789.0	319.3	1.89
RR (142)	330.0	133.5	0.79
AP (143)	2786.3	1127.6	6.67
Sub-total	3905.3	1580.4	9.35
Industrial and Commercial Complexes			
*PD (151)	15.9	6.4	0.04
GN (152)	57.4	23.2	0.14
JY (153)	28.7	11.6	0.06
Sub-total	102.0	41.2	0.24

TABLE 4-3 (Continued)

LAND USE IN THE AREA SURROUNDING SALINA, KANSAS, 1980

Land Use Types	Area		% of Total Land
	Acres	Hectares	
Other Urban Land			
*PK (171)	336.2	136.0	0.81
UDL (172)	192.8	78.1	0.46
CT (173)	82.9	33.6	0.20
WD (174)	79.8	32.1	0.19
GC (175)	522.9	211.7	1.25
CA (176)	14.3	5.8	0.03
Sub-total	1228.9	497.3	2.94
*CL (211)	23431.6	9482.7	56.12
PL (212)	3306.0	1337.9	7.92
BCF (231)	6.3	2.6	0.01
FS (241)	541.9	219.3	1.30
BG (332)	0	0	0
DFL (411)	988.2	400.0	2.37
MFL (431)	232.7	94.3	0.56
RV (511)	741.2	300.0	1.78
LK (421)	63.8	25.8	0.15
RSV (531)	165.9	67.0	0.40
Total Area	41753.2	16897.0	100.00

* : see Appendix 2 for index of classification
 Basis: Aerial Photos, Scale 1:20,000

southwest of the city, corresponding with current zoning.

Commercial and Service: In 1980 suburban shopping centers occupied approximately eight times as much area as the central business district, and approximately four times as much as that for small isolated stores (Table 4-3).

Industrial: In general, the processing industries were not established along rivers. Such location is possibly related to the desire to avoid water pollution from these types of industries.

Other urban uses: According to the current zoning regulations, the new park spaces which were located at the east and south end of the city are zoned for residential use; also, expansion of the waste dump is zoned for agricultural use.

Characteristics of Land Use Dynamics

Maps and tabular forms of land use changes were made to assist in the analysis of land use changes. There were two different period comparisons of land use changes; from 1965 to 1971 and from 1971 to 1980.

According to the figures presented in Table 4-4, urban land use has increased at the rate of about 76.3 acres per year from 1965 to 1971. Urban land was converted from non-urban land between 1971 and 1980 at the rate of about 115.1 acres per year. Overall, the conversion of non-urban land to urban use was 1,493.7 acres from 1965 to 1980, accounting for the rate of about 99.6 acres per year in the study area.

Based on the data illustrated in Table 4-4, the land uses of single-family, suburban shopping centers, processing industries, airport, golf course, cropland, pasture land, and bare ground

TABLE 4-4

LAND USE CHANGES IN THE AREA SURROUNDING SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971		Change 1971-1980		Change 1965-1980		Average Per Year	
	Area		Area		Area		Average Per Year	
	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares
Residential								
*SF (111)	+95.7	+38.7	+490.7	+198.9	+586.4	+237.6	+39.1	+15.8
MF (112)	0	0	+36.7	+14.8	+36.7	+14.8	+2.4	+1.0
MH (113)	+8.0	+3.2	+90.0	+36.7	+98.9	+39.9	+6.6	+2.7
Net Change in Use	+103.7	+41.9	+618.3	+250.4	+722.0	+292.3	+48.1	+19.5
Commercial and Service								
*CBD (121)	0	0	0	0	0	0	0	0
SSC (122)	+70.1	+28.3	+151.5	+61.2	+221.6	+89.5	+14.8	+6.0
SIS (123)	0	0	+24.0	+9.7	+24.0	+9.7	+1.6	+0.6
EDU (124)	+47.8	+19.3	0	0	+47.8	+19.3	+3.2	+1.3
ASU (125)	+9.6	+3.9	+28.7	+11.6	+38.3	+15.5	+2.5	+1.0
REC (126)	0	0	0	0	0	0	0	0
Net Change in Use	+127.5	+51.5	+204.2	+82.5	+331.7	+134.0	+22.1	+8.9
Industrial								
*FI (131)	0	0	+4.8	+1.9	+4.8	+1.9	+0.3	+0.1
PI (132)	+110.0	+44.5	+145.2	+58.7	+255.2	+103.2	+17.0	+6.9
Net Change in Use	+110.0	+44.5	+150.0	+60.6	+260.0	+105.1	+17.3	+7.0

TABLE 4-4 (Continued)

Land Use Types	Change 1965-1971		Change 1971-1980		Change 1965-1980			
	Area		Area		Average Per Year			
	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares
Transportation								
*HW (141)	+46.2	+18.7	0	0	+46.2	+18.7	+3.1	+1.3
RR (142)	0	0	0	0	0	0	0	0
AP (143)	-151.4	-61.3	0	0	-151.4	-61.3	-7.0	-2.8
Net Change in Use	-105.2	-42.6	0	0	-105.2	-42.6	-7.0	-2.8
Industrial and Commercial Complexes								
*PD (151)	0	0	0	0	0	0	0	0
GN (152)	0	0	0	0	0	0	0	0
JY (153)	0	0	+19.1	+7.7	+19.1	+7.7	+1.3	+0.5
Net Change in Use	0	0	+19.1	+7.7	+19.1	+7.7	+1.3	+0.5
Other Urban Land								
*PK (171)	0	0	+66.8	+27.0	+66.8	+27.0	+4.5	+1.8
UDL (172)	-31.9	-12.9	-59.0	-13.8	-90.9	-36.7	-6.1	-2.5
CT (173)	0	0	0	0	0	0	0	0
WD (174)	+6.4	+2.6	+36.7	+14.7	+43.1	+17.3	+2.9	+1.2
GC (175)	+247.1	+100.1	0	0	+247.1	+100.1	+16.5	+6.7
CA (176)	0	0	0	0	0	0	0	0
Net Change in Use	+221.6	+89.8	+44.5	+17.9	+266.1	+107.7	+17.8	+7.2
Total Change Urban Land from Non-Urban Uses	+457.6	+185.1	+1036.1	+419.1	+1493.7	+604.2	+99.6	+40.3

TABLE 4-4 (Continued)

Land Use Types	Change 1965-1971		Change 1971-1980		Change 1965-1980		Average Per Year	
	Area		Area		Area		Area	
	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares
*CL (211)	-864.0	-349.5	-263.1	-106.4	-1127.1	-455.9	-75.1	-30.4
PL (212)	+475.0	+192.2	-841.6	-340.6	-366.6	-148.4	-24.4	-9.9
BCF (231)	-6.4	-2.6	-31.9	-12.9	-38.3	-15.5	-2.6	-1.0
FS (241)	+11.2	+4.5	+12.7	+5.2	+23.9	+9.7	+1.6	+0.6
BG (332)	-102.0	-41.3	-14.3	-5.8	-116.3	-47.1	-7.8	-3.1
DFL (411)	-6.4	-2.5	+39.8	+16.1	+33.4	+13.6	+2.2	+0.9
MFL (431)	-20.8	-8.4	-11.1	-4.4	-31.9	-12.8	-2.1	-0.9
RV (511)	0	0	0	0	0	0	0	0
LK (521)	0	0	0	0	0	0	0	0
RSV (531)	+55.8	+22.5	+73.4	+29.7	+129.2	+52.2	+8.6	+3.5

+ : The acreages increased from 1965 to 1971, 1971 to 1980, and 1965 to 1980
 - : The acreages decreased from 1965 to 1971, 1971 to 1980, and 1965 to 1980

* : see Appendix 2 for index of classification

Basis : Aerial photos, scale 1:20,000

converted their former characters at the highest rates during 1965 to 1971. From 1971 to 1980 the higher rate of land use change included the categories of single-family, mobile homes, suburban shopping centers, processing industries, parks, cropland, pasture land, and reservoirs.

The Change in Single-Family Land Use

From 1965 to 1980, the increased acreages of single-family land use was the largest conversion of urban land use. According to the data, the area in single-family residences increased at a rate of 39.1 acres per year during the period of 1965-1980. In addition, the data (Table 4-4) indicate that the area devoted to single-family dwellings was increasing in the study area, since the development of single-family land in the period of 1971-1980 was approximately five times as much as that in the period of 1965-1971.

In the period of 1965-1971, the increased single-family land use was primarily converted from pasture land on the rural-urban fringe, accounting for 80% of single-family land use change (Table 4-5). This may be due to pasture land being located at some distance from existing development and being of a usually lower cost, causing it to be more attractive to land investors and speculators. In addition, the new single-family development occupied some cropland and undeveloped land in the areas surrounding Salina.

The location of single-family development was also related to soil characteristics. The shrink-swell soils, which may cause structural damage of building foundations, are less frequently found in the east and south part of the study area. Thus the increased development of single-family dwellings were concentrated

TABLE 4-5

THE CHANGE OF RESIDENTIAL LAND USE IN THE AREA SURROUNDING SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971		Change 1971-1980		Change 1965-1980	
	Area		Area		Area	
	Acres	Hectares	Acres	Hectares	Acres	Hectares
The Change of Single-Family						
*CL (211) to SF (111)	+15.9	+6.4	+215.1	+87.3	+231.0	+93.7
PL (212) to SF (111)	+76.6	+31.0	+243.8	+98.8	+320.4	+129.8
MFL (431) to SF (111)	0	0	+4.8	+1.9	+4.8	+1.9
UDL (172) to SF (111)	+12.8	+5.2	+43.0	+17.3	+55.8	+22.5
SF (111) to SSC (122)	0	0	-9.6	-3.8	-9.6	-3.8
SF (111) to ASU (125)	-9.6	-3.9	0	0	-9.6	-3.9
SF (111) to PI (132)	0	0	-6.4	-2.6	-6.4	-2.6
Net Change in Use	+95.7	+38.7	+490.7	+198.9	+586.4	+237.6
The Change of Multi-Family						
*CL (211) to MF (112)	0	0	+33.5	+13.5	+33.5	+13.5
PL (212) to MF (112)	0	0	+3.2	+1.3	+3.2	+1.3
Net Change in Use	0	0	+36.7	+14.8	+36.7	+14.8

TABLE 4-5 (Continued)

Land Use Types	Change 1965-1971		Change 1971-1980		Change 1965-1980	
	Area		Area		Area	
	Acres	Hectares	Acres	Hectares	Acres	Hectares
The Change of Mobile Homes						
*CL (211) to MH (113)	+14.4	+5.8	+25.5	+10.3	+39.9	+16.1
PL (212) to MH (113)	0	0	+51.0	+20.6	+51.0	+21.6
FS (241) to MH (113)	0	0	+3.2	+1.3	+3.2	+1.3
DFL (411) to MH (113)	0	0	+8.0	+3.2	+8.0	+3.2
UDL (172) to MH (113)	0	0	+3.2	+1.3	+3.2	+1.3
MH (113) to PL (212)	-6.4	-2.6	0	0	-6.4	-2.6
Net Change in Use	+8.0	+3.2	+90.9	+36.7	+98.9	+39.9
Total Change	+103.7	+41.9	+618.3	+250.4	+722.0	+292.3

+ : The acreages increased from 1965 to 1971, 1971 to 1980, and 1965 to 1980
 - : The acreages decreased from 1965 to 1971, 1971 to 1980, and 1965 to 1980
 * : see Appendix 2 for index of classification
 Basis: Aerial photos, scale 1:20,000

in the south and east of areas surrounding Salina from 1965 to 1971 (Figure 4-4).

During the period of 1971-1980, the land use for new single-family development was primarily converted from cropland (43.8%) and pasture land (49.7%). Since undeveloped land within the urban area may have higher value than pasture land and cropland on the urban-rural fringe, the development of single-family dwellings from undeveloped land in the city was few in number and small in size. Although other land was converted to single-family residences, there were also losses of single-family land. This was primarily a product of conversion to suburban shopping centers and to processing industries.

The Land Use Change Map (Figure 4-5) indicates that the new single-family development was located primarily in areas of easy transport, convenient to commerce and service. In addition, Figure 4-5 shows that the increased single-family land use developed toward the same direction as that in the period of 1965-1971. The distribution of single-family development may be related to government policy at the local level, which stated that residential development should avoid the 100-year floodplain. In order to avoid encroachment on the 100-year floodplain — which is especially widespread west, north, and northeast of the study area — the growth of single-family land use occurred toward the south and east of the areas on the urban-rural fringe. In addition, local policy requires that single-family land use areas should be protected from any activity involving an excessive level of noise, pollution, or traffic volume. Therefore, single-family dwellings did not grow along highways or railroads, nor develop in the areas adjacent to processing industries. Instead, most of

them were predominantly located in the west rural-urban fringe.

The Change in Land Used for Mobile Homes

The land converted for mobile home use appears to be accelerating in the period of 1971-1980. According to the data, the change rate in the period of 1971-1980 was approximately eight times as much as that in the period of 1965-1971.

From 1971 to 1980, the increase in area devoted to mobile homes was primarily at the expense of pasture land (56.1% of net change in mobile home land use), and secondly at the expense of cropland (28.1% of net change in mobile home land use). Such land development may be a result of availability of lower cost pasture land, with few zoning restrictions needed for lower income families.

The addition of mobile homes occurred in the eastern part of the area surrounding Salina during the period of 1965-1971. By contrast, the land used for mobile homes increased in the west part of the city from 1971 to 1980. This different land distribution may have resulted from the local level policy. Based on the comprehensive plan since 1974, mobile home developments were encouraged to be within one mile of convenience shopping and an elementary school, and have direct access to collector or arterial streets. Since highways, suburban shopping centers, and schools were predominantly located in the west of the city, the location of mobile home development was changed from east to west of the areas on the urban-rural fringe.

The Change in Commercial and Service Use

Due to Salina's historic significance as a retail trade center, suburban shopping centers have become another important development on the rural-urban fringe. Such development appears to be accelerating. According to the data gathered for this study,

the land used for suburban shopping centers increased at the rate of 11.7 acres per year in the period of 1965-1971; however, it grew at the rate of 16.8 acres per year in the period of 1971-1980. In addition, it can be determined that land used for single-family dwellings and by suburban shopping centers were inter-related. This is evident when comparing the land use change maps (Figure 4-4, and Figure 4-5).

From 1965 to 1971 the land use change map (Figure 4-4) indicates that suburban shopping centers were generally in areas adjacent to single-family residences and near major roads. Suburban shopping center growth generally takes place in or near areas of good accessibility after enough single-family development has taken place to create a sufficient market.

The map of land use changes from 1971 to 1980 (Figure 4-5) indicates that the major areas of suburban shopping centers development generally corresponded with growth of residential land use, although some increase in land already used for suburban shopping centers occurred. Since suburban shopping centers primarily provide goods and services to local residents, it appears natural that the development of suburban shopping centers accompanied the growth of single-family housing. From 1971 to 1980, suburban shopping centers developed primarily at the expense of cropland (Table 4-6). This land conversion was different from that of single-family and mobile homes, which developed generally at the expense of pasture land. As the land for suburban shopping centers may have higher net earning potentials and thus higher land values, the choice of location for suburban shopping centers development was a more important consideration than land converted to residential structures.

TABLE 4-6

THE CHANGE OF COMMERCIAL AND SERVICE LAND USE IN THE AREA SURROUNDING SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971		Change 1971-1980		Change 1965-1980	
	Area		Area		Area	
	Acres	Hectares	Acres	Hectares	Acres	Hectares
The Change of Suburban Shopping Centers						
*CL (211) to SSC (122)	+35.0	+14.2	+74.9	+30.0	+109.9	+44.5
PL (212) to SSC (122)	+8.0	+3.2	+14.4	+5.8	+22.4	+9.0
DPL (411) to SSC (122)	+1.6	+0.6	0	0	+1.6	+0.6
MFL (431) to SSC (122)	0	0	+17.5	+7.1	+17.5	+7.1
SF (111) to SSC (122)	0	0	+9.6	+3.8	+9.6	+3.8
PI (132) to SSC (122)	+6.4	+2.6	+22.3	+9.0	+28.7	+11.6
UDL (172) to SSC (122)	+19.1	+7.7	+12.8	+5.2	+31.9	+12.9
Net Change in Use	+70.1	+28.3	+151.5	+61.2	+221.6	+89.5
The change of Small Isolated Stores						
*CL (211) to SIS (123)	0	0	+14.4	+5.8	+14.4	+5.8
PL (212) to SIS (123)	0	0	+6.4	+2.6	+6.4	+2.6
FS (241) to SIS (123)	0	0	+3.2	+1.3	+3.2	+1.3
Net Change in Use	0	0	+24.0	+9.7	+24.0	+9.7
The Change of Educational						
*CL (211) to EDU (124)	+41.4	+16.7	0	0	+41.4	+16.7
MFL (411) to EDU (124)	+6.4	+2.6	0	0	+6.4	+2.6
Net Change in Use	+47.8	+19.3	0	0	+47.8	+19.3

TABLE 4-6 (Continued)

Land Use Types	Change 1965-1971		Change 1971-1980		Change 1965-1980	
	Area		Area		Area	
	Acres	Hectares	Acres	Hectares	Acres	Hectares
The Change of Administrative and Service Land Use						
*CL (211) to ASU (125)	0	0	+12.7	+5.2	+12.7	+5.2
PL (212) to ASU (125)	0	0	+8.0	+3.2	+8.0	+3.2
SF (111) to ASU (125)	+9.6	+3.9	0	0	+9.6	+3.9
UDL (172) to ASU (125)	0	0	+8.0	+3.2	+8.0	+3.2
Net Change in Use	+9.6	+3.9	+28.7	+11.6	+38.3	+15.5
Total Change	+127.5	+51.5	+204.2	+82.5	+331.7	+134.0

+ : The acreages increased from 1965 to 1971, 1971 to 1980, 1965 to 1980
 - : The acreages decreased from 1965 to 1971, 1971 to 1980, 1965 to 1980
 * : see Appendix 2 for index of classification
 Basis : Aerial photos, scale 1:20,000

The Change of Processing Industrial Land Use

From 1965 to 1980, the development for processing industries was encouraged in rural-urban fringe areas by access to rail transportation and/or arterial highways. In general, the establishment of all transportation facilities profoundly affected use of adjacent rural lands, such as with processing industries. Aside from this, the land use change map (Figure 4-4) indicates that most of the new processing industry land was simply an expansion of original industrial land, found generally close to the residential areas in the west of the city, but separated from residential areas wherever possible by major roads, streams; or other buffers. Possibly, the processing industries developed where they avoided violating the Air and Water Quality Act of 1967, while the industrial growth took place in or near areas of good accessibility as the result of a labor force created from residential areas.

From 1965 to 1971, most of the new development of processing industrial land inevitably encroached on cropland (95.7 percent of net change in processing industrial use) due to the simple expansion of original industrial land (Table 4-7). Simultaneously, the processing industrial sites were encouraged in areas of gentle slope and low relief, land also suitable for cropland.

During the period of 1971 to 1980, the new development of processing industries was located primarily at some distance from urban areas including the existing residential growth (Figure 4-5). This is possibly related to the policies stating that new industrial use should be separated from surrounding non-

TABLE 4-7

THE CHANGE OF INDUSTRIAL LAND USE IN THE AREA SURROUNDING SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971		Change 1971-1980		Change 1965-1980	
	Area		Area		Area	
	Acres	Hectares	Acres	Hectares	Acres	Hectares
The Change of Fabricating Industrial *MFL (431) to FI (131)	0	0	+4.8	+1.9	+4.8	+1.9
Net Change in Use	0	0	+4.8	+1.9	+4.8	+1.9
The Change of Processing Industrial *CL (211) to PI (132) PL (212) to PI (132) BCF (231) to PI (132) MFL (431) to PI (132) SF (111) to PI (132) PI (132) to SSC (122)	+105.2 +1.6 +6.4 +3.2 0 -6.4	+42.6 +0.6 +2.6 +1.3 0 -2.6	+68.5 +65.4 +12.8 +14.4 +6.4 -22.3	+27.7 +26.4 +5.2 +5.8 +2.6 -9.0	+173.7 +67.0 +19.2 +17.6 +6.4 -28.7	+70.3 +27.0 +7.8 +7.1 +2.6 -11.6
Net Change in Use	+110.0	+44.5	+145.2	+58.7	+255.2	+103.2
Total Change	+110.0	+44.5	+150.0	+60.0	+256.0	+105.1

+ : The acreages increased from 1965 to 1971, 1971 to 1980, and 1965 to 1980
 - : The acreages decreased from 1965 to 1971, 1971 to 1980, and 1965 to 1980
 * : see Appendix 2 for index of classification
 Basis : Aerial photos, scale 1:20,000

industrial uses. In addition, such land uses create pollution, noise, or odor and thus were not compatible with residential areas. New growth of processing industries has also been encouraged toward the east and south of the study area since 1971 in order to avoid areas subject to 100-year floods and soils with shrink-swell problems. Interestingly, the development of processing industries didn't occur in the areas near the golf course and along the Smoky Hill River. Such direction of growth may be a result of local policy which attempts to preserve certain areas of natural scenic beauty.

For the most part, the growth of processing industrial land from 1971 to 1980 was on newly developed areas (converting 47.2 percent from cropland and 45.0 percent from pasture land). This may be related to local policy intended to separate industrial development from non-industrial urban land use. Thus the industrial land development occurred at the expense of pasture land and cropland at some distance from the existing residential areas.

The Change in Golf Course Land Use

Another increase in land use was associated with the development of a golf course, which was the largest single category of land development from 1965 to 1971. The golf course was developed at the expense of pasture land (38.7% of golf course land development), and part of an airport (61.3% of golf course land development, Table 4-8). Since a larger airport was established in the southwest part of the study area, the smaller and older airport was available for the development of a golf course. Additional incentive was provided in view of the fact that the new golf course was located between the other two golf courses, and in the vicinity of large park spaces and the Smoky

TABLE 4-8

THE CHANGE OF OTHER URBAN LAND USE IN THE AREA SURROUNDING SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971		Change 1971-1980		Change 1965-1980	
	Area		Area		Area	
	Acres	Hectares	Acres	Hectares	Acres	Hectares
The Change of Parks						
*CL (211) to PK (171)	0	0	+27.0	+10.9	+27.0	+10.9
PL (212) to PK (171)	0	0	+39.8	+16.1	+39.8	+16.1
Net Change in Use	0	0	+66.8	+27.0	+66.8	+27.0
The Change of Undeveloped Land						
*CL (211) to UDL (172)	0	0	+8.0	+3.2	+8.0	+3.2
UDL (172) to SF (111)	-12.8	-5.2	-43.0	-17.3	-55.8	-22.5
UDL (172) to MH (113)	0	0	-3.2	-1.3	-3.2	-1.3
UDL (172) to SSC (122)	-19.1	-7.7	-12.8	-5.2	-31.9	-12.9
UDL (172) to ASU (125)	0	0	-8.0	-3.2	-8.0	-3.2
Net Change in Use	-31.9	-12.9	-59.0	-23.8	-90.9	-36.7
The Change of Waste Dump						
*CL (211) to WD (174)	+6.4	+2.6	+36.7	+14.7	+43.1	+17.3
Net Change in Use	+6.4	+2.6	+36.7	+14.7	+43.1	+17.3

TABLE 4-8 (Continued)

Land Use Types	Change 1965-1971		Change 1971-1980		Change 1965-1980	
	Area		Area		Area	
	Acres	Hectares	Acres	Hectares	Acres	Hectares
The Change of Golf Course						
*PL (212) to GC (175)	+95.7	+38.8	0	0	+95.7	+38.8
AP (143) to GC (175)	+151.4	+61.3	0	0	+151.4	+61.3
Net Change in Use	+247.1	+100.1	0	0	+247.1	+100.1
Total Change	+221.6	+89.8	+44.5	+17.9	+266.1	+107.7

+ : The acreages increased from 1965 to 1971, 1971 to 1980, and 1965 to 1980
 - : The acreages decreased from 1965 to 1971, 1971 to 1980, and 1965 to 1980
 * : see Appendix 2 for index of classification
 Basis: Aerial photos, scale 1:20,000

Hill River.

The Change in Cropland

The rural-urban fringe in Salina was undergoing conversion of cropland to urban and suburban entities from 1965 to 1980. According to the figures included in Table 4-9, 67.6% of the cropland was lost to urban development (which is an irreversible land use), 8.1% of the cropland was lost to reservoir land use, and 24.1% of the cropland was lost to other agricultural uses and forest land (both reversible land use). In addition, the enticement of a pristine, rural environment and relatively low land values possibly stimulated urbanization in the cropland areas between 1965 and 1980. The data indicate that there were approximately 40.9 acres of rural cropland converted to urban uses each year from 1965 to 1971, which was less than that in the period, 1971-1980 (57.4 acres of cropland per year).

During the period, 1965-1971, the growth of processing industries on the rural-urban fringe and the development of single-family dwellings profoundly affected the use of adjacent rural cropland. Based on the data, 42.9% of total change from cropland to urban use was developed for processing industries, and 37.0% was developed for single-family land use. This was possibly related to farms and associated animals creating a nuisance activity in the suburban setting and suburbanites encouraging the farmers to sell the agricultural land for urban development.

From 1965 to 1971 pasture land gain from cropland (674.3 acrea) was much greater, although cropland gain was also substantial (Table 4-9). Most of the change may be resulted from rising values of land. The burden of higher property taxes forced farmers to convert good cropland to pasture land or to urban uses

TABLE 4-9

THE CHANGE OF CROPLAND IN THE AREA SURROUNDING SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971		Change 1971-1980		Change 1965-1980	
	Area		Area		Area	
	Acres	Hectares	Acres	Hectares	Acres	Hectares
*PL (212) to CL (211)	+90.9	+36.8	+701.4	+283.8	+792.3	+320.6
FS (241) to CL (211)	+6.4	+2.6	0	0	+6.4	+2.6
BG (332) to CL (211)	+15.9	+6.5	0	0	+15.9	+6.5
CL (211) to SF (111)	-15.9	-6.4	-215.1	-87.3	-231.0	-93.7
CL (211) to MF (112)	0	0	-33.5	-13.5	-33.5	-13.5
CL (211) to MH (113)	-14.4	-5.8	-25.5	-10.3	-39.9	-16.1
CL (211) to SSC (122)	-35.0	-14.2	-74.9	-30.3	-109.9	-44.5
CL (211) to SIS (123)	0	0	-14.4	-5.8	-14.4	-5.8
CL (211) to EDU (124)	-41.4	-16.7	0	0	-41.4	-16.7
CL (211) to ASU (125)	0	0	-12.7	-5.2	-12.7	-5.2
CL (211) to PI (132)	-105.2	-42.6	-68.5	-27.7	-173.7	-70.3
CL (211) to HW (141)	-27.1	-11.0	0	0	-27.1	-11.0
CL (211) to PK (171)	0	0	-27.0	-10.9	-27.0	-10.9
CL (211) to UDL (172)	0	0	-8.0	-3.2	-8.0	-3.2
CL (211) to WD (174)	-6.4	-2.6	-36.7	-14.7	-43.1	-17.3
CL (211) to PL (212)	-674.3	-272.8	-361.8	-146.4	-1036.1	-419.2
CL (211) to FS (241)	-12.8	-5.2	-9.6	-3.9	-22.4	-9.1
CL (211) to BG (332)	-3.2	-1.3	0	0	-3.2	-1.3
CL (211) to DFL (411)	0	0	-22.5	-9.1	-22.5	-9.1
CL (211) to MFL (431)	-4.8	-1.9	0	0	-4.8	-1.9
CL (211) to RSV (531)	-36.7	-14.9	-54.3	-21.9	-91.0	-36.8
Total Change	-864.0	-349.5	-263.1	-106.4	-1127.1	-455.9

+ : The acreages increased from 1965 to 1971, 1971 to 1980, and 1965 to 1980
 - : The acreages decreased from 1965 to 1971, 1971 to 1980, and 1965 to 1980
 * : see Appendix 2 for index of classification
 Basis : Aerial photos, scale 1:20,000

as land values rose because of growing development potential on the rural-urban fringe. In addition, land speculators possibly bought cropland from farmers, and then converted it to pasture land in order to reduce property taxes.

From 1971 to 1980 a high proportion of the urbanized land had been used previously for crop production. A significant amount of cropland was a prime target for the development of single-family dwellings, accounting for 41.7% of total change from cropland to urban uses (Table 4-9). Suburban shopping centers and processing industries were also developed at the expense of cropland.

Between 1971 and 1980, although pasture land gain was substantial from cropland, cropland gain from pasture land was much greater. The difference from 1965 to 1971 may have been partially related to the program of deferred estate taxes. That program removed some of the financial incentive for speculators to convert cropland to pasture land or idle land, and finally to urban development. In addition, it may have reduced the burden of property taxes on farmers so that the rate at which cropland was converted to pasture land was lower from 1971 to 1980.

The Change in Pasture Land

It appears that pasture land was consumed for urbanization at accelerating rates in the areas surrounding Salina. The data in Table 4-10 indicate that the rate of urban land development from pasture land between 1971 and 1980 (48 acres per year) was more rapid than in the period, 1965 to 1971 (32.7 acres per year). Such an increase could be viewed as a problem associated with rising land values. As land values rose because of growing

TABLE 4-10

THE CHANGE OF PASTURE LAND IN THE AREA SURROUNDING SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971		Change 1971-1980		Change 1965-1980	
	Area		Area		Area	
	Acres	Hectares	Acres	Hectares	Acres	Hectares
*CL (211) to PL (212)	+674.3	+272.8	+361.8	+146.4	+1036.1	+419.2
BG (332) to PL (212)	+89.3	+36.1	0	0	+89.3	+36.1
MFL (431) to PL (212)	+8.0	+3.2	0	0	+8.0	+3.2
MH (113) to PL (212)	+6.4	+2.6	0	0	+6.4	+2.6
PL (212) to SF (111)	-76.6	-31.0	-243.8	-98.8	-320.4	-129.8
PL (212) to MF (112)	0	0	-3.2	-1.3	-3.2	-1.3
PL (212) to MH (113)	0	0	-51.0	-20.6	-51.0	-20.6
PL (212) to SSC (122)	-8.0	-3.2	-14.4	-5.8	-22.4	-9.0
PL (212) to SIS (123)	0	0	-6.4	-2.6	-6.4	-2.6
PL (212) to ASU (125)	0	0	-8.0	-3.2	-8.0	-3.2
PL (212) to PI (212)	-1.6	-0.6	-65.4	-26.4	-67.0	-27.0
PL (212) to HW (141)	-14.3	-5.8	0	0	-14.3	-5.8
PL (212) to PK (171)	0	0	-39.8	-16.1	-39.8	-16.1
PL (212) to GC (175)	-95.7	-38.8	0	0	-96.7	-38.8
PL (212) to CL (211)	-90.9	-36.8	-701.4	-283.8	-792.3	-320.6
PL (212) to FS (241)	-4.8	-1.9	-14.3	-5.8	-19.1	-7.7
PL (212) to DFL (411)	0	0	-25.3	-10.2	-25.5	-10.3
PL (212) to MFL (431)	-4.8	-1.9	-17.7	-7.1	-22.5	-9.0
PL (212) to RSV (531)	-6.3	-2.5	-12.7	-5.3	-19.0	-7.7
Total Change	+475.0	+192.2	-841.6	-340.6	-366.6	-148.4

+ : The acreages increased from 1965 to 1971, 1971 to 1980, and 1965 to 1980
 - : The acreages decreased from 1965 to 1971, 1971 to 1980, and 1965 to 1980
 * : see Appendix 2 for index of classification
 Basis : Aerial photos, scale 1:20,000

development potential on the urban-rural fringe, pasture land was usually lower in cost than cropland and therefore was often acquired by land developers for urban development.

In brief, land in virtually all types of agricultural use was subject to conversion to urban uses. However, cropland and pasture land were transformed to urban uses at a faster rate and in larger amounts than other non-urban land use types. In the process of land use change, the final products of conversion in almost all cases were residential use, suburban shopping centers, and industrial use. In addition, the direction and distribution of such land development was directly or indirectly related to topography, soils, land values, and government policies.

FOOTNOTES

1. J.R. Anderson, et al., A Land Use and Land Cover Classification System for Use with Remote Sensor Data, Geological Survey Professional Paper 964, (Washington, D.C.: U.S. Government Printing Office, 1976), pp. 1-28.

CHAPTER 5

IMPACTS OF LAND USE DYNAMICS ON PRIME AGRICULTURAL LANDS

In Salina, urban development has resulted in problems associated with loss of prime agricultural land. Along with the increasing magnitude of land conversion on the rural-urban fringe has been the loss of the better quality soil resources, due to the irreversible conversion of agricultural land to residential uses. Consequently, the development of urban land uses generated the permanent loss of prime agricultural land in the areas surrounding Salina from 1965 to 1980. According to the data, 93.3% of total converted acreage of urban land uses, or 1,393 acres, were soils in Classes I-III, which are those suitable for regular cultivation. Soils in Class IV, which are too shallow, steep, or eroded for cultivation were only minimally affected (3.1% of total converted acreage of urban land use was soils in Class IV).

Computing The Losses of Prime Agricultural Lands

The losses of prime agricultural land had to be computed before the characteristics of the losses of prime agricultural land were examined. In order to compute the lost acreages of prime land resources associated with land use dynamics, maps of land capability (Figure 3-1), land use changes from 1965 to 1971 (Figure 4-4), and land use changes from 1971 to 1980 (Figure 4-5) were compared.

To better illustrate the characteristics of higher quality soil losses, land use transformations and additions were compared with soil capability classes, e.g. Classes I, II. After

the land use data by soil capability classes had been acquired, these data were summarized in tabular form to facilitate the examination of loss characteristics of prime land resources.

Examining The Characteristics of Loss of Prime Agricultural Lands

Throughout the city, many acres once used for agricultural purposes were switched to other uses between 1965 to 1980. The rate and magnitude of those conversions are increasing. Although land converted to other agricultural uses is a reversible land change, land switched to urban uses generally is irreversible.

On the basis of soil capability, the city faced an increasing magnitude of land conversion associated with high quality agricultural land resources (soil capability Classes I, II, and III - Tables 5-1 and 5-2). According to the data, the losses of prime agricultural land resources to urban uses increased at a rate of 71 acres per year in the period of 1965-1971, accelerating to an average conversion of 107 acres per year in the period of 1971-1980. Based upon the existing trend, it is anticipated that more and more additional acres of higher quality agricultural land will be lost to urban development in the future.

Not only is the conversion rate from agriculture to urban uses accelerating, but the scale of development has unique characteristics. Large-scale conversion activities of urban land use were generally concentrated on prime soils, while smaller scale developments occurred on marginal soils (Table 5-3).

Between 1965 and 1980, a majority of the loss of prime

TABLE 5-1

LAND USE ADDITIONS BY SOIL CAPABILITY CLASS IN THE AREA SURROUNDING SALINA, KANSAS, 1965-1971

Land Use Types	Soil Capability class													
	Acres							Hectares						
	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua		
Residential														
*SF (111)	+49.4	+8.0	+28.7	+8.0	+3.2	-1.6	+20.0	+3.2	+11.6	+3.2	+1.3	-0.6		
MF (112)	0	0	0	0	0	0	0	0	0	0	0	0		
MH (113)	0	0	0	+3.2	+4.8	0	0	0	0	+1.3	+1.9	0		
Net Change in Use	+49.4	+8.0	+28.7	+11.2	+8.0	-1.6	+20.0	+3.2	+11.6	+4.5	+3.2	-0.6		
Commercial and Service														
*CBD (121)	0	0	0	0	0	0	0	0	0	0	0	0		
SSC (122)	+39.8	0	+3.2	0	0	+27.1	+16.1	0	+1.3	0	0	+10.9		
SIS (123)	0	0	0	0	0	0	0	0	0	0	0	0		
EDU (124)	+44.6	0	+3.2	0	0	+9.6	+18.0	0	+1.3	0	0	+3.9		
ASU (125)	0	0	0	0	0	0	0	0	0	0	0	0		
REC (126)	0	0	0	0	0	0	0	0	0	0	0	0		
Net Change in Use	+84.4	0	+6.4	0	0	+36.7	+34.1	0	+2.6	0	0	+14.8		
Industrial														
*FI (131)	0	0	0	0	0	0	0	0	0	0	0	0		
PI (132)	+73.3	+31.9	+1.6	+3.2	+6.4	-6.4	+29.7	+12.9	+0.6	+1.3	+2.6	-2.6		
Net Change in Use	+73.3	+31.9	+1.6	+3.2	+6.4	-6.4	+29.7	+12.9	+0.6	+1.3	+2.6	-2.6		

TABLE 5-1 (Continued)

Land Use Types	Soil Capability Class												
	Acres						Hectares						
	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua	
Transportation													
*HW (141)	+22.3	+20.7	+3.2	0	0	0	+9.0	+8.4	+1.3	0	0	0	
RR (142)	0	0	0	0	0	0	0	0	0	0	0	0	
AP (143)	0	0	0	0	0	-151.4	0	0	0	0	0	-61.3	
Net Change in Use	+22.3	+20.7	+3.2	0	0	-151.4	+9.0	+8.4	+1.3	0	0	-61.3	
Industrial and Commercial Complexes													
*PD (151)	0	0	0	0	0	0	0	0	0	0	0	0	
GN (152)	0	0	0	0	0	0	0	0	0	0	0	0	
JY (153)	0	0	0	0	0	0	0	0	0	0	0	0	
Net Change in Use	0	0	0	0	0	0	0	0	0	0	0	0	
Other Urban Land													
*PK (171)	0	0	0	0	0	0	0	0	0	0	0	0	
UDL (172)	0	-4.8	0	0	0	-27.1	0	-1.9	0	0	0	-11.0	
CT (173)	0	0	0	0	0	0	0	0	+1.3	0	0	0	
WD (174)	+3.2	0	+3.2	0	0	0	+1.3	0	+34.9	0	0	+61.3	
GC (175)	+9.6	0	+86.1	0	0	+151.4	+3.9	0	0	0	0	0	
CA (176)	0	0	0	0	0	0	0	0	0	0	0	0	
Net Change in Use	+12.8	-4.8	+89.3	0	0	+124.3	+5.2	-1.9	+36.2	0	0	+50.3	
Total Change Urban Land	+242.2	+55.8	+129.2	+14.4	+14.4	+1.6	+98.0	+22.6	+52.3	+5.8	+5.8	+0.6	

TABLE 5-1 (Continued)

Land Use Types	Soil Capability Class													
	Acres							Hectares						
	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua		
*CL (211)	-401.6	-82.9	-298.1	-31.9	-49.5	0	-162.5	-33.6	-120.6	-12.9	-19.9	0		
PL (212)	+218.4	+41.5	+167.3	+15.9	+31.9	0	+88.4	+16.8	+67.7	+6.4	+12.9	0		
BCF (231)	-6.4	0	0	0	0	0	-2.6	0	0	0	0	0		
FS (241)	-3.2	0	+9.6	0	+4.8	0	-1.3	0	+3.9	0	+1.9	0		
BG (332)	-63.7	-12.8	-23.9	-1.6	0	0	-25.8	-5.2	-9.7	-0.6	0	0		
DPL (411)	-3.2	-1.6	0	0	0	-1.6	-1.3	-0.6	0	0	0	-0.6		
MFL (431)	-14.4	0	-3.2	0	-3.2	0	-5.8	0	-1.3	0	-1.3	0		
RV (511)	0	0	0	0	0	0	0	0	0	0	0	0		
LK (521)	0	0	0	0	0	0	0	0	0	0	0	0		
RSV (531)	+31.9	0	+19.1	+3.2	+1.6	0	+12.9	0	+7.7	+1.3	+0.6	0		

+ : The acreages increased from 1965 to 1971

- : The acreages decreased from 1965 to 1971

* : see Appendix 2 for index of classification

Basis : Aerial photos, scale 1:20,000

TABLE 5-2

LAND USE ADDITIONS BY SOIL CAPABILITY CLASS IN THE AREA SURROUNDING SALINA, KANSAS, 1971-1980

Land Use Types	Soil Capability Class													
	Acres							Hectares						
	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua		
Residential														
*SF (111)	+270.9	+39.8	+143.4	+29.7	+23.9	-8.0	+109.7	+16.2	+58.1	+8.4	+9.7	-3.2		
MF (112)	+11.2	+3.2	+15.9	+6.4	0	0	+4.5	+1.3	+6.4	+2.6	0	0		
MH (113)	+67.0	+12.7	+3.2	0	+8.0	0	+27.1	+5.1	+1.3	0	+3.2	0		
Net Change in Use	+349.1	+55.7	+162.5	+27.1	+31.9	-8.0	+141.3	+22.6	+65.8	+11.0	+12.9	-3.2		
Commercial and Service														
*CBD (121)	0	0	0	0	0	0	0	0	0	0	0	0		
SSC (122)	+73.3	+30.3	+11.2	0	0	+36.7	+29.6	+12.3	+4.5	0	0	+14.8		
SIS (123)	+16.0	+4.8	+3.2	0	0	0	+6.5	+1.9	+1.3	0	0	0		
EDU (124)	0	0	0	0	0	0	0	0	0	0	0	0		
ASU (125)	+14.3	0	+6.4	0	0	+8.0	+5.8	0	+2.6	0	0	+3.2		
REC (126)	0	0	0	0	0	0	0	0	0	0	0	0		
Net Change in Use	+103.6	+35.1	+20.8	0	0	+44.7	+41.9	+14.2	+8.4	0	0	+18.0		
Industrial														
*FI (131)	0	0	0	0	0	+4.8	0	0	0	0	0	+1.9		
PI (132)	+138.7	+14.4	+1.6	+6.4	0	-15.9	+56.1	+5.8	+0.6	+2.6	0	-6.4		
Net Change in Use	+138.7	+14.4	+1.6	+6.4	0	-11.1	+56.1	+5.8	+0.6	+2.6	0	-4.5		

TABLE 5-2 (Continued)

Land Use Types	Soil Capability Class											
	Acres						Hectares					
	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua
Transportation												
*HW (141)	0	0	0	0	0	0	0	0	0	0	0	0
RR (142)	0	0	0	0	0	0	0	0	0	0	0	0
AP (143)	0	0	0	0	0	0	0	0	0	0	0	0
Net Change in Use	0	0	0	0	0	0	0	0	0	0	0	0
Industrial and Commercial Complexes												
*PD (151)	0	0	0	0	0	0	0	0	0	0	0	0
GN (152)	0	0	0	0	0	0	0	0	0	0	0	0
JY (153)	0	+4.8	0	+14.3	0	0	0	+1.9	0	+5.8	0	0
Net Change in Use	0	+4.8	0	+14.3	0	0	0	+1.9	0	+5.8	0	0
Other Urban Land												
*PK (171)	+50.9	+4.8	+11.1	0	0	0	+20.6	+1.9	+4.5	0	0	0
UDL (172)	-22.3	-1.6	0	-14.3	0	-20.8	-9.0	-0.6	0	-5.8	0	-8.4
CT (173)	0	0	0	0	0	0	0	0	0	0	0	0
WD (174)	+33.5	+1.6	+1.6	0	0	0	+13.5	+0.6	+0.6	0	0	0
GC (175)	0	0	0	0	0	0	0	0	0	0	0	0
CA (176)	0	0	0	0	0	0	0	0	0	0	0	0
Net Change in Use	+62.1	+4.8	+12.7	-14.3	0	-20.8	+25.1	+1.9	+5.1	-5.8	0	-8.4
Total Change Urban Land	+653.5	+114.8	+197.6	+33.5	+31.9	+4.8	+264.4	+46.4	+79.9	+13.6	+12.9	+1.9

TABLE 5-2 (Continued)

Land Use Types	Soil Capability Class											
	Acres						Hectares					
	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua
*CL (211)	-306.0	+55.7	-33.5	+22.3	-1.6	0	-123.8	+22.5	-13.5	+9.0	-0.6	0
PL (212)	-392.2	-165.7	-205.6	-60.6	-17.5	0	-158.7	-67.0	-83.2	-24.5	-7.2	0
BCF (231)	-6.4	-11.2	0	-14.3	0	0	-2.6	-4.5	0	-5.8	0	0
FS (241)	-1.6	0	+14.3	0	0	0	-0.6	0	+5.8	0	0	0
BG (332)	-14.3	0	0	0	0	0	-5.8	0	0	0	0	0
DPL (411)	+25.4	+6.4	+11.2	+4.8	-8.0	0	+10.3	+2.6	+14.5	+1.9	-3.2	0
MFL (431)	-11.1	0	+9.6	0	-4.8	-4.8	-4.5	0	+3.9	0	-1.9	-1.9
RV (511)	0	0	0	0	0	0	0	0	0	0	0	0
LK (521)	0	0	0	0	0	0	0	0	0	0	0	0
RSV (531)	+52.7	0	+6.4	+14.3	0	0	+21.3	0	+2.6	+5.8	0	0

+ : The acreages increased from 1971 to 1980

- : The acreages decreased from 1971 to 1980

* : see Appendix 2 for index of classification

Basis : Aerial photos, scale 1:20,000

TABLE 5-3

LAND USE ADDITIONS BY SOIL CAPABILITY CLASS IN THE AREA SURROUNDING SALINA, KANSAS, 1965-1980

Land Use Types	Soil Capability Class													
	Acres							Hectares						
	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua		
Residential														
*SF (111)	+320.3	+47.8	+172.1	+28.7	+27.1	-9.6	+129.7	+19.4	+69.7	+11.6	+11.0	-3.8		
MF (112)	+11.2	+3.2	+15.9	+6.4	0	0	+4.5	+1.3	+6.4	+2.6	0	0		
MH (113)	+67.0	+12.7	+3.2	+3.2	+12.8	0	+27.1	+5.1	+1.3	+1.3	+5.1	0		
Net Change in Use	+398.5	+63.7	+191.2	+38.3	+39.9	-9.6	+161.3	+25.8	+77.4	+15.5	+16.1	-3.8		
Commercial and Service														
*CBD (121)	0	0	0	0	0	0	0	0	0	0	0	0		
SSC (122)	+113.1	+30.3	+14.4	0	0	+63.8	+45.7	+12.3	+5.8	0	0	+25.7		
SIS (123)	+16.0	+4.8	+3.2	0	0	0	+6.5	+1.9	+1.3	0	0	0		
EDU (124)	+44.6	0	+3.2	0	0	0	+18.1	0	+1.3	0	0	0		
ASU (125)	+14.3	0	+6.4	0	0	+17.6	+5.8	0	+2.6	0	0	+7.1		
REC (126)	0	0	0	0	0	0	0	0	0	0	0	0		
Net Change in Use	+188.0	+35.1	+27.2	0	0	+81.4	+76.0	+14.2	+11.0	0	0	+32.8		
Industrial														
*FI (131)	0	0	0	0	0	+4.8	0	0	0	0	0	+1.9		
PI (132)	+212.0	+46.3	+3.2	+9.6	+6.4	-22.3	+85.8	+18.7	+1.2	+3.9	+2.6	-9.0		
Net Change in Use	+212.0	+46.3	+3.2	+9.6	+6.4	+7.5	+85.8	+18.7	+1.2	+3.9	+2.6	-7.1		

TABLE 5-3 (Continued)

Land Use Types	Soil Capability Class													
	Acres							Hectares						
	I	II	III	IV	VI	Ua		I	II	III	IV	VI	Ua	
Transportation														
*HW (141)	+22.3	+20.7	+3.2	0	0	0		+9.0	+8.4	+1.3	0	0	0	
RR (142)	0	0	0	0	0	0		0	0	0	0	0	0	
AP (143)	0	0	0	0	0	-151.4		0	0	0	0	0	-61.3	
Net Change in Use	+22.3	+20.7	+3.2	0	0	-151.4		0	+8.4	+1.3	0	0	-61.3	
Industrial and Commercial Complexes														
*PD (151)	0	0	0	0	0	0		0	0	0	0	0	0	
GN (152)	0	0	0	0	0	0		0	0	0	0	0	0	
JY (153)	0	+4.8	0	+14.3	0	0		0	+1.9	0	+5.8	0	0	
Net Change in Use	0	+4.8	0	+14.3	0	0		0	+1.9	0	+5.8	0	0	
Other Urban Land														
*PK (171)	+50.9	+4.8	+11.1	0	0	0		+20.6	+1.9	+4.5	0	0	0	
UDL (172)	-22.3	-6.4	0	-14.3	0	-49.7		-9.0	-2.5	0	-5.8	0	-19.4	
CT (173)	0	0	0	0	0	0		0	0	0	0	0	0	
WD (174)	+36.7	+1.6	+4.8	0	0	0		+14.8	+0.6	+1.9	0	0	0	
GC (175)	+9.6	0	+86.1	0	0	+151.4		+3.9	0	+34.9	0	0	+61.3	
GA (176)	0	0	0	0	0	0		0	0	0	0	0	0	
Net Change in Use	+74.9	0	+102.0	-14.3	0	+103.5		+30.3	0	+41.3	-5.8	0	+41.9	
Total Change Urban Land	+895.7	+170.6	+326.8	+47.9	+46.3	+6.4		+326.4	+69.0	+132.2	+119.4	+18.7	+2.5	

TABLE 5-3 (Continued)

Soil Capability Class													
	Acres						Hectares						
	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua	
*CL (211)	-707.6	-27.2	-331.6	-9.6	-51.1	0	-286.3	-11.1	-134.1	-3.9	-20.5	0	
PL (212)	-173.8	-124.2	-38.3	-44.7	+14.4	0	-70.3	-50.2	-15.5	-18.1	+5.7	0	
BCF (231)	-12.8	-11.2	0	-14.3	0	0	-6.2	-4.5	0	-5.8	0	0	
FS (241)	-4.8	0	+23.9	0	+4.8	0	-1.9	0	+9.7	0	+1.9	0	
BG (332)	-78.0	-12.8	-23.9	-1.6	0	0	-31.6	-5.2	-9.7	-0.6	0	0	
DFL (411)	+22.2	+4.8	+11.2	+4.8	-8.0	-1.6	+9.0	+2.0	+4.5	+1.9	-3.2	-0.6	
MFL (431)	-25.5	0	+6.4	0	-8.0	-4.8	-10.3	0	+2.6	0	-3.2	-1.9	
RV (511)	0	0	0	0	0	0	0	0	0	0	0	0	
LK (521)	0	0	0	0	0	0	0	0	0	0	0	0	
RSV (531)	+84.6	0	+25.5	+17.5	+1.6	0	+34.2	0	+10.3	+7.1	+0.6	0	

+ : The acerages increased from 1965-1980

- : The acerages decreased from 1965-1980

* : see Appendix 2 for index of classification

Basis : Aerial photos, scale 1:20,000

agricultural land was associated with development of commercial, industrial, and residential uses (84%). Most significant among these three types of conversions, was the change from prime agricultural land to residential uses (47 percent). Smaller amounts of prime lands were lost from the agricultural sector for development of parks, a waste dump, a golf course, forest land, and reservoirs.

During the period from 1965 to 1980, land transformation resulted in the losses of prime land resources on all categories of non-urban land use. Cropland, however, was the primary category to lose the higher quality soils; pasture land was second. According to the study, 67.9% of the losses of prime land resources resulted from the conversion of cropland, and 21.4% of prime land resource losses resulted from the change of pasture land.

Impacts of Single-Family Land Development on Prime Agricultural Land

Between 1965 and 1980, the development of single-family dwellings primarily consumed the higher quality soils on rural-urban fringe (94% of net change in use). In addition, most of the growth of single-family land on prime land resources was at the expense of cropland or pasture land (accounting for 40% of prime land resources lost from cropland and 55% of prime land resources lost from pasture land - Table 5-4). Such growth is a result of population increase and economic growth in Salina.

From 1965 to 1971, the land use of single-family dwellings developed primarily on prime pasture land (80%), and a smaller amount of single-family development occurred at the expense of prime cropland and undeveloped land. This may result from the cheaper land value and easier development of pasture land.

TABLE 5-4

THE CHANGE OF RESIDENTIAL LAND USE BY SOIL CAPABILITY CLASS IN THE AREA SURROUNDING
SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971						Change 1971-1980					
	Acres						Acres					
The Change of Single-Family	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua
*CL to SF	+6.4	+3.2	+3.2	+3.2	0	0	+125.9	0	+76.5	+6.4	+6.4	0
PL to SF	+43.0	0	+25.5	+4.8	+3.2	0	+127.5	+39.8	+63.7	0	+12.7	0
MF to SF	0	0	0	0	0	0	0	0	0	0	+4.8	0
UDL to SF	0	+4.8	0	0	0	+8.0	+17.5	0	+3.2	+14.3	0	+8.0
SF to SSC	0	0	0	0	0	0	0	0	0	0	0	-9.6
SF to ASU	0	0	0	0	0	-9.6	0	0	0	0	0	0
SF to PI	0	0	0	0	0	0	0	0	0	0	0	-6.4
Net Change in Use	+49.4	+8.0	+28.7	+8.0	+3.2	-1.6	+270.9	+39.8	+143.4	+20.7	+23.9	-8.0
The Change of Multi-Family												
*CL to MF	0	0	0	0	0	0	+9.6	+3.2	+15.9	+4.8	0	0
PL to MF	0	0	0	0	0	0	+1.6	0	0	+1.6	0	0
Net Change in Use	0	0	0	0	0	0	+11.2	+3.2	+15.9	+6.4	0	0

TABLE 5-4 (Continued)

Land Use Types	Change 1965-1971						Change 1971-1980					
	Acres						Acres					
The Change of Mobile Homes	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua
*CL to MH	0	0	+6.4	+3.2	+4.8	0	+25.5	0	0	0	0	0
PL to MH	0	0	0	0	0	0	+36.7	+11.1	+3.2	0	0	0
FS to MH	0	0	0	0	0	0	+3.2	0	0	0	0	0
DFL to MH	0	0	0	0	0	0	0	0	0	0	+8.0	0
UDL to MH	0	0	0	0	0	0	+1.6	+1.6	0	0	0	0
MH to PL	0	0	-6.4	0	0	0	0	0	0	0	0	0
Net Change in Use	0	0	0	+3.2	+4.8	0	+67.0	+12.7	+3.2	0	+8.0	0
Total Change	+49.4	+8.0	+28.7	+11.2	+8.0	-1.6	+349.1	+55.7	+162.5	+27.1	+31.9	-8.0

+ : The acreages increased from 1965 to 1971 and 1971 to 1980
 - : The acreages decreased from 1965 to 1971 and 1971 to 1980
 * : see Appendix 2 for index of classification
 Basis : Aerial photos, scale 1:20,000

Between 1971 and 1980, not only was there an increasing loss of higher quality pasture land converted to single-family land use (51%), but also cropland lost about the same amount of prime land resources to the development of single-family land use as pasture land (45%). This may relate to the decreasing availability of cheaper pasture lands and thus the increasing exploitation of the cropland resource.

It appears that the single-family land use was directed toward development in a southern and eastern direction from Salina, where the Class I and Class III soils are primarily located. Such single-family land development will continue to consume larger amounts of higher quality land resources in the study area, and in addition such development will stimulate commercial and industrial growth in or near areas of sufficient residential development.

Impacts of Commercial and Service Land Use Development on Prime Agricultural Land

Since the land use of suburban shopping centers generally grew in areas adjacent to single-family residences, the land development of suburban shopping centers also generated similar impacts on higher quality land resources. According to the data illustrated in Table 5-5, the development of suburban shopping centers affected, with increasing magnitude, prime agricultural land resources.

Although most of the growth of suburban shopping centers was at the expense of better quality soils on cropland and pasture land during the period of 1965 to 1980, higher quality soils used for cropland experienced more intensive pressure for suburban shopping center development (70%) than did prime pasture land.

TABLE 5-5

THE CHANGE OF COMMERCIAL AND SERVICE USE BY SOIL CAPABILITY CLASS IN THE AREA SURROUNDING
SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971						Change 1971-1980					
	Acres						Acres					
The Change of Suburban Shopping Centers	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua
*CL to SSC	+35.0	0	0	0	0	0	+51.0	+23.9	0	0	0	0
PL to SSC	+4.8	0	+3.2	0	0	0	+1.6	+6.4	+6.4	0	0	0
DPL to SSC	0	0	0	0	0	+1.6	0	0	0	0	0	0
MFL to SSC	0	0	0	0	0	0	+17.5	0	0	0	0	0
SF to SSC	0	0	0	0	0	0	0	0	0	0	0	+9.6
PI to SSC	0	0	0	0	0	+6.4	0	0	0	0	0	+22.3
UDL to SSC	0	0	0	0	0	+19.1	+3.2	0	+4.8	0	0	+4.8
Net Change in Use	+39.8	0	+3.2	0	0	+27.1	+73.3	+30.3	+11.2	0	0	+36.7
The Change of Small Isolated Stores												
*CL to SIS	0	0	0	0	0	0	+9.6	+4.8	0	0	0	0
PL to SIS	0	0	0	0	0	0	+3.2	0	+3.2	0	0	0
FS to SIS	0	0	0	0	0	0	+3.2	0	0	0	0	0
Net Change in Use	0	0	0	0	0	0	+16.0	+4.8	+3.2	0	0	0

TABLE 5-5 (Continued)

Land Use Types	Change 1965-1971						Change 1971-1980					
	Acres						Acres					
The Change of Education	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua
*CL to EDU	+38.2	0	+3.2	0	0	0	0	0	0	0	0	0
MFL to EDU	+6.4	0	0	0	0	0	0	0	0	0	0	0
Net Change in Use	+44.6	0	+3.2	0	0	0	0	0	0	0	0	0
The Change of Administrative and Service Use												
*CL to ASU	0	0	0	0	0	0	+12.7	0	0	0	0	0
PL to ASU	0	0	0	0	0	0	+1.6	0	+6.4	0	0	0
SF to ASU	0	0	0	0	0	+9.6	0	0	0	0	0	0
UDL to ASU	0	0	0	0	0	0	0	0	0	0	0	+8.0
Net Change in Use	0	0	0	0	0	+9.6	+14.3	0	+6.4	0	0	+8.0
Total Change	+84.4	0	+6.4	0	0	+36.7	+103.6	+35.1	+20.8	0	0	+44.7

+ : The acreages increased from 1965 to 1971 and 1971 to 1980

- : The acreages decreased from 1965 to 1971 and 1971 to 1980

* : see Appendix 2 for index of classification

Basis : Aerial photos, scale 1:20,000

Impacts of Processing Industrial Land Development on Agricultural Land

As with residential and commercial development, the development pressures of processing industries were concentrated on the better quality agricultural land between 1965 and 1980. It is likely that the industrial sites were not encouraged to occur in areas with soil problems and steep slopes, and thus the acreage of higher quality agricultural land continued to decline because of the development of processing industries.

From 1965 to 1971, the land transformation of processing industries was primarily at the expense of prime cropland (90% - Table 5-6). This may relate to the fact that more of the new processing industrial land was simple expansion of original industrial land. Thus the expansion of original industrial land inevitably developed at the expense of better quality soils on cropland in the areas surrounding the original industrial land.

Between 1971 and 1980, the primarily loss of higher quality land resources to the processing industrial land development was at the expense of cropland (41%), and pasture land (42%). Because of the local policies for industrial land development, the cheaper pasture land was converted, as it was located at some distance from existing processing points.

Impacts of Other Urban Land Use Changes on Prime Agricultural Land

The expansion of other urban land uses, e.g., highways, parks, a waste dump, and golf course also generated impacts on higher quality cropland and pasture land, although they did not result in substantial losses of prime agricultural land (Table 5-7 to Table 5-9). The data showed that the land development of parks

TABLE 5-6

THE CHANGE OF INDUSTRIAL LAND USE BY SOIL CAPABILITY CLASS IN THE AREA SURROUNDING
SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971						Change 1971-1980					
	Acres						Acres					
The Change of Fabricating Industries	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua
*MFL to FI	0	0	0	0	0	0	0	0	0	0	0	+4.8
Net Change in Use	0	0	0	0	0	0	0	0	0	0	0	+4.8
The Change of Processing Industries												
*CL to PI	+62.1	+31.9	+1.6	+3.2	+6.4	0	+57.4	+3.2	+1.6	+6.4	0	0
PL to PI	+1.6	0	0	0	0	0	+60.0	+4.8	0	0	0	0
BCF to PI	+6.4	0	0	0	0	0	+6.4	+6.4	0	0	0	0
MFL to PI	+3.2	0	0	0	0	0	+14.3	0	0	0	0	0
SF to PI	0	0	0	0	0	0	0	0	0	0	0	+6.4
PI to SSC	0	0	0	0	0	-6.4	0	0	0	0	0	-22.3
Net Change in Use	+73.3	+31.9	+1.6	+3.2	+6.4	-6.4	+138.7	+14.4	+1.6	+6.4	0	-15.9
Total Change	+73.3	+31.9	+1.6	+3.2	+6.4	-6.4	+138.7	+14.4	+1.6	+6.4	0	-11.1

+ : The acreages increased from 1965 to 1971 and 1971 to 1980
 - : The acreages decreased from 1965 to 1971 and 1971 to 1980
 * : see Appendix 2 for index of classification
 Basis : Aerial photos, scale 1:20,000

TABLE 5-7

THE CHANGE OF TRANSPORTATION LAND USE BY SOIL CAPABILITY CLASS IN THE AREA SURROUNDING
SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971						Change 1971-1980					
	Acres						Acres					
The Change of Highways	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua
*CL to HW	+4.8	+19.1	+3.2	0	0	0	0	0	0	0	0	0
PL to HW	+14.3	0	0	0	0	0	0	0	0	0	0	0
DFL to HW	+3.2	+1.6	0	0	0	0	0	0	0	0	0	0
Net Change in Use	+22.3	+20.7	+3.2	0	0	0	0	0	0	0	0	0
The Change of Airport												
*AP to GC	0	0	0	0	0	-151.4	0	0	0	0	0	0
Net Change in Use	0	0	0	0	0	-151.4	0	0	0	0	0	0
Total Change	+22.3	+20.7	+3.2	0	0	-151.4	0	0	0	0	0	0

+ : The acreages increased from 1965 to 1971 and 1971 to 1980
 - : The acreages decreased from 1965 to 1971 and 1971 to 1980
 * : see Appendix 2 for index of classification
 Basis : Aerial photos, scale 1:20,000

TABLE 5-8

THE CHANGE OF INDUSTRIAL AND COMMERCIAL COMPLEXES BY SOIL CAPABILITY CLASS IN THE AREA
SURROUNDING SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971						Change 1971-1980					
	Acres						Acres					
The Change of Junk Yard *BCF to JY	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua
	0	0	0	0	0	0	0	+4.8	0	+14.3	0	0
Net Change in Use	0	0	0	0	0	0	0	+4.8	0	+14.3	0	0

+ : The acreages increased from 1965 to 1971 and 1971 to 1980
 - : The acreages decreased from 1965 to 1980 and 1971 to 1980
 * : see Appendix 2 for index of classification
 Basis : Aerial photos, scale 1:20,000

TABLE 5-9

THE CHANGE OF OTHER URBAN LAND USE BY SOIL CAPABILITY CLASS IN THE AREA SURROUNDING
SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971						Change 1971-1980					
	Acres						Acres					
The Change of Parks	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua
*CL to PK	0	0	0	0	0	0	+11.1	+4.8	+11.1	0	0	0
PL to PK	0	0	0	0	0	0	+39.8	0	0	0	0	0
Net Change in Use	0	0	0	0	0	0	+50.9	+4.8	+11.1	0	0	0
The Change of Undeveloped Land												
*CL to UDL	0	0	0	0	0	0	0	0	+8.0	0	0	0
UDL to SF	0	-4.8	0	0	0	-8.0	-17.5	0	-3.2	-14.3	0	-8.0
UDL to MH	0	0	0	0	0	0	-1.6	0	0	0	0	0
UDL to SSC	0	0	0	0	0	-19.1	-3.2	0	-4.8	0	0	-4.8
UDL to ASU	0	0	0	0	0	0	0	0	0	0	0	-8.0
Net Change in Use	0	-4.8	0	0	0	-27.1	-22.3	-1.6	0	-14.3	0	-20.8
The Change of Waste Dump												
*CL to WD	+3.2	0	+3.2	0	0	0	+33.5	+1.6	+1.6	0	0	0
Net Change in Use	+3.2	0	+3.2	0	0	0	+33.5	+1.6	+1.6	0	0	0

TABLE 5-9 (Continued)

Land Use Types	Change 1965-1971						Change 1971-1980					
	Acres						Acres					
The Change of Golf Course *PL to GC AP to GC	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua
	+9.6 0	0 0	+86.1 0	0 0	0 0	0 +151.4	0 0	0 0	0 0	0 0	0 0	0 0
Net Change in Use	+9.6	0	+86.1	0	0	+151.4	0	0	0	0	0	0
Total Change	+12.8	-4.8	+89.3	0	0	+124.3	+62.1	+4.8	+12.7	-14.3	0	-20.8

+ : The acreages increased from 1965 to 1971 and 1971 to 1980
 - : The acreages decreased from 1965 to 1971 and 1971 to 1980
 * : see Appendix 2 for index of classification
 Basis : Aerial photos, scale 1:20,000

onto prime land resources was at the expense of cropland (40%) and pasture land (60%) from 1971 to 1980, the development of a waste dump onto higher quality land resources was at the expense of a cropland (100%) from 1965 to 1980; and the land development of golf course onto prime land resource was at the expense of pasture land (100%) from 1965 to 1971. Thus, such land development contributed to undermining the agricultural economy in areas where farming existed.

Impacts of Other Land Use Dynamic Process on Cropland

Urban expansion was undeniably the major cause for the permanent losses of higher quality cropland resources (66.5%) from 1965 to 1980 (Table 5-10). In addition 23% of the conversion of better quality soils in the category of cropland switched to pasture land, which is generally considered to be a transformation to less intensive use.

During the period of 1965 to 1971, the vast majority of good quality cropland was converted (68%) to pasture land. Such conversions may have been a result of rising wages which increased the cost of farm labor, thus tempting farmers to switch their cropland to pasture land. In addition the farmer may have continued to farm on a part-time basis where there was opportunity (e.g., if he acquired an urban job). Nevertheless, the final product of conversion in almost all cases was to residential, commercial, and industrial land uses. Such conversion to urban development was partially a result of ineffective land use controls.

It was clear that greatly accelerated urban land development consumed large amounts of prime resources (especially cropland — 86.8%) between 1971 and 1980. Of particular importance

TABLE 5-10

THE CHANGE OF NON-URBAN LAND USE BY SOIL CAPABILITY CLASS IN THE AREA SURROUNDING
SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971						Change 1971-1980					
	Acres						Acres					
	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua
The Change of Cropland												
*PI to CL	+39.8	+25.5	0	+25.5	0	0	+248.7	+172.1	+204.0	+68.5	+8.0	0
FS to CL	+6.4	0	0	0	0	0	0	0	0	0	0	0
BG to CL	+11.1	+4.8	0	0	0	0	0	0	0	0	0	0
CL to SF	-6.4	-3.2	-3.2	-3.2	0	0	-125.9	0	-76.5	-6.4	-6.4	0
CL to MF	0	0	0	0	0	0	-9.6	-3.2	-15.9	-4.8	0	0
CL to MH	0	0	-6.4	-3.2	-4.8	0	-25.5	0	0	0	0	0
CL to SSC	-35.0	0	0	0	0	0	-51.0	-23.9	0	0	0	0
CL to SIS	0	0	0	0	0	0	-9.6	-4.8	0	0	0	0
CL to EDU	-38.2	0	-3.2	0	0	0	0	0	0	0	0	0
CL TO ASU	0	0	0	0	0	0	-12.7	0	0	0	0	0
CL to PI	-62.1	-31.9	-1.6	-3.2	-6.4	0	-57.4	-3.2	-1.6	-6.4	0	0
CL to HW	-4.8	-19.1	-3.2	0	0	0	0	0	0	0	0	0
CL to PK	0	0	0	0	0	0	-11.1	-4.8	-11.1	0	0	0
CL to UDL	0	0	0	0	0	0	0	0	-8.0	0	0	0
CL to WD	-3.2	0	-3.2	0	0	0	-33.5	-1.6	-1.6	0	0	0
CL to PL	-277.3	-59.0	-261.4	-47.8	-28.7	0	-161.0	-70.1	-110.0	-17.5	-3.2	0
CL to BG	-3.2	0	0	0	0	0	0	0	0	0	0	0
CL to FS	-3.2	0	-4.8	0	-4.8	0	-9.6	0	0	0	0	0
CL to DFL	0	0	0	0	0	0	-11.1	-4.8	-6.4	0	0	0
CL to MFL	0	0	0	0	-4.8	0	0	0	0	0	0	0
CL to RSV	-25.5	0	-11.1	0	0	0	-36.7	0	-6.4	-11.1	0	0
Net Change in Use	-401.6	-82.9	-298.1	-31.9	-49.5	0	-306.0	+55.7	-33.5	+22.3	-1.6	0

TABLE 5-10 (Continued)

Land Use Types	Change 1965-1971						Change 1971-1980					
	Acres						Acres					
The Change of Pasture Land	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua
	CL to PL	CL to PL	CL to PL	CL to PL	CL to PL	CL to PL	CL to PL	CL to PL	CL to PL	CL to PL	CL to PL	CL to PL
BG to PL	+277.3	+59.0	+261.4	+47.8	+28.7	0	+161.0	+70.1	+110.0	+17.5	+3.2	0
MFL to PL	+55.8	+8.0	+23.9	+1.6	+8.0	0	0	0	0	0	0	0
MH to PL	0	0	+6.4	0	0	0	0	0	0	0	0	0
PL to SF	-43.0	0	-25.5	-4.8	-3.2	0	-127.5	-39.8	-63.7	-1.6	-12.7	0
PL to MF	0	0	0	0	0	0	-1.6	0	0	0	0	0
PL to MH	0	0	0	0	0	0	-36.7	-11.1	-3.2	0	0	0
PL to SSC	-4.8	0	-3.2	0	0	0	-1.6	-6.4	-6.4	0	0	0
PL to SIS	0	0	0	0	0	0	-3.2	0	-3.2	0	0	0
PL to ASU	0	0	0	0	0	0	-1.6	0	-6.4	0	0	0
PL to PI	-1.6	0	0	0	0	0	-60.6	-4.8	0	0	0	0
PL to HW	-14.3	0	0	0	0	0	0	0	0	0	0	0
PL to PK	0	0	0	0	0	0	-39.8	0	0	0	0	0
PL to GC	-9.6	0	-86.1	0	0	0	0	0	0	0	0	0
PL to CL	-39.8	-25.5	0	-25.5	0	0	-248.7	-172.1	-204.0	-68.5	-8.0	0
PL to FS	0	0	-4.8	0	0	0	0	0	-14.3	0	0	0
PL to DFL	0	0	0	0	0	0	-14.3	-1.6	-4.8	-4.8	0	0
PL to MFL	0	0	-4.8	0	0	0	-8.0	0	-9.6	0	0	0
PL to RSV	-1.6	0	0	-3.2	-1.6	0	-9.6	0	0	-3.2	0	0
Net Change in Use	+218.4	+42.5	+167.3	+15.9	+31.9	0	-392.2	-165.7	-205.6	-60.6	-17.5	0

TABLE 5-10 (Continued)

Land Use Types	Change 1965-1971						Change 1971-1980					
	Acres						Acres					
	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua
The Change of Beef Cattle Feetlots												
*BCF to PI	-6.4	0	0	0	0	0	-6.4	-6.4	0	0	0	0
BCF to JY	0	0	0	0	0	0	0	-4.8	0	-14.3	0	0
Net Change in Use	-6.4	0	0	0	0	0	-6.4	-11.2	0	-14.3	0	0
The Change of Farmsteads												
*CL to FS	+3.2	0	+4.8	0	+4.8	0	+9.6	0	0	0	0	0
PL to FS	0	0	+4.8	0	0	0	0	0	+14.3	0	0	0
FS to MH	0	0	0	0	0	0	-3.2	0	0	0	0	0
FS to SIS	0	0	0	0	0	0	-3.2	0	0	0	0	0
FS to CL	-6.4	0	0	0	0	0	0	0	0	0	0	0
FS to RSV	0	0	0	0	0	0	-4.8	0	0	0	0	0
Net Change in Use	-3.2	0	+9.6	0	+4.8	0	-1.6	0	+14.3	0	0	0
The Change of Bare Ground												
*CL to BG	+3.2	0	0	0	0	0	0	0	0	0	0	0
BG to PL	-55.8	-8.0	-23.9	-1.6	0	0	0	0	0	0	0	0
BG to MFL	0	0	0	0	0	0	-12.7	0	0	0	0	0
BG to CL	-11.1	-4.8	0	0	0	0	0	0	0	0	0	0
BG to RSV	0	0	0	0	0	0	-1.6	0	0	0	0	0
Net Change in Use	-63.7	-12.8	-23.9	-1.6	0	0	-14.3	0	0	0	0	0

TABLE 5-10 (Continued)

Land Use Types	Change 1965-1971						Change 1971-1980					
	Acres						Acres					
The Change of Deciduous Forest Land	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua
*CL to DFL	0	0	0	0	0	0	+11.1	+4.8	+6.4	0	0	0
PL to DFL	0	0	0	0	0	0	+14.3	+1.6	+4.8	+4.8	0	0
DFL to MH	0	0	0	0	0	0	0	0	0	0	-8.0	0
DFL to SSC	0	0	0	0	0	-1.6	0	0	0	0	0	0
DFL to HW	-3.2	-1.6	0	0	0	0	0	0	0	0	0	0
Net Change in Use	-3.2	-1.6	0	0	0	-1.6	+25.4	+6.4	+11.2	+4.8	-8.0	0
The Change of Mixed Forest Land												
*CL to MFL	0	0	0	0	+4.8	0	0	0	+9.6	0	0	0
PL to MFL	0	0	+4.8	0	0	0	+8.0	0	0	0	0	0
BG to MFL	0	0	0	0	0	0	+12.7	0	0	0	0	0
MFL to SF	0	0	0	0	0	0	0	0	0	0	-4.8	0
MFL to SSC	0	0	0	0	0	0	-17.5	0	0	0	0	0
MFL to EDU	-6.4	0	0	0	0	0	0	0	0	0	0	-4.8
MFL to FI	0	0	0	0	0	0	0	0	0	0	0	0
MFL to PI	-3.2	0	0	0	0	0	-14.3	0	0	0	0	0
MFL to PL	0	0	0	0	-8.0	0	0	0	0	0	0	0
MFL to RSV	-4.8	0	-8.0	0	0	0	0	0	0	0	0	0
Net Change in Use	-14.4	0	-3.2	0	-3.2	0	-11.1	0	+9.6	0	-4.8	-4.8

TABLE 5-10 (Continued)

Land Use Types	Change 1965-1971						Change 1971-1980					
	Acres						Acres					
The Change of Reservoirs	I	II	III	IV	VI	Ua	I	II	III	IV	VI	Ua
	+25.5	0	+11.1	0	0	0	+36.7	0	+6.4	+11.1	0	0
	*CL to RSV	0	0	+3.2	+1.6	0	+9.6	0	0	+3.2	0	0
	PL to RSV	+1.6	0	0	0	0	+4.8	0	0	0	0	0
	FS to RSV	0	0	0	0	0	+1.6	0	0	0	0	0
	BG to RSV	0	0	0	0	0	0	0	0	0	0	0
	MFL to RSV	+4.8	0	+8.0	0	0	0	0	0	0	0	0
Net Change in Use	+31.9	0	+19.1	+3.2	+1.6	0	+52.7	0	+6.4	+14.3	0	0

+ : The acreages increased from 1965 to 1971 and 1971 to 1980

- : The acreages decreased from 1965 to 1971 and 1971 to 1980

* : see Appendix 2 for index of classification

Basis : Aerial photos, scale 1:20,000

was the large amount of single-family land development encroaching on better quality cropland in the southern area surrounding Salina. In addition, cropland acreage of higher quality soils was also lost to growth of suburban shopping centers and processing industrial land uses on the southern rural-urban fringe.

These cropland losses are considered as a major factor influencing the growing problem of prime land resource losses in the study area. Such losses are forcing farming practices to more marginal lands with lower productive capability. Thus more land will be required in the future to meet current levels to crop production.

Impacts of Land Use Dynamics on Pasture Land

A number of higher quality soil acreages inter-changed between cropland and pasture land from 1965 to 1980. However, more prime land resources were switched from cropland to pasture land between 1965 and 1980. This is especially true in the period of 1965-1971. Some of the converted higher quality soils transformed from cropland to pasture land during 1965 and 1971 were increasingly switched to the urban uses by developers during the 1971 to 1980 period. The converted prime land resources from cropland to pasture land to urban uses were primarily used for growth of residential land use on the rural-urban fringe.

Beyond changes of pasture land to cropland and residential lands, a variety of other land use changes resulted in the losses of higher quality pasture land. The development of a golf course, for example, made up approximately half of the losses of better quality soils on pasture land between 1965 and 1971.

Land is both a finite resource and the basic resource for the region's food production capability. Generally, prime

agricultural land resources were a major target for urbanization in the city from 1965 to 1980. Normally the cropland and pasture land consumed by urban development on rural-urban fringe were on level terrain and well-drained soils. Thus, the depletion of the prime land resources can have a significant impact on future agricultural production, since the impact of land use dynamics on prime agricultural land resulted in more intensive farming of a smaller land resource base.

Possible Solutions

The losses of prime agricultural land on the rural-urban fringe might be viewed as social losses, since the prime agricultural land on the rural-urban fringe produces crops as well as providing valuable open spaces. Also, increasing shortages of food and fiber will be inevitably associated with the losses of prime agricultural land if the city continues to allow urban and other development to consume its prime agricultural land resources over a long period. In view of these, such land use control techniques as transfer of development rights, purchase of farmland development rights, agricultural districts, and differential assessment could be considered as possible solutions to the problem so as to make up for deficiencies of zoning, subdivision regulation, etc.. Such possible solutions will be discussed briefly.

Transfer of Development Rights (TDR's)

TDR's suggest that development rights on land in a designated preservation area may be purchased by developers and transferred to a designated development area. Under this type of

program, the densities of development on the non-preserved lands within development districts might be made higher in order to absorb the growth which is deflected from the preservation zone.¹ However, the use of these rights is limited only by the comprehensive land use plan for that particular area.

Purchase of Farmland Development Rights

When farmers and non-farmer owners of farmlands sell to the government their rights to develop their land, this technique is referred to as purchase of farmland development rights.² Under the program, the landowners still retain ownership and control of their farmlands. Furthermore, farmers who sell their development rights still keep their land on the tax rolls until the development rights are transferred to government, then they can be taxed only on the agricultural use value.

Agricultural Districts

Agricultural districts are defined as the specific tracts which are designated for the purpose of long-term agricultural uses.³ Under the program farmers are allowed to retain their ownership of the land. Also, the farmers who voluntarily form agricultural districts receive several benefits and assurances which improve the conditions for farming. Using the technique, the probability of selling farmland at greater than farm values in the foreseeable future is not great in rural and semi-rural areas.

Differential Assessment

Differential assessment calls for assessing property tax based on the farm use value of land rather than on its market value.⁴ There are three basic types of differential assessment: preferential assessments, deferred taxation, and restrictive

agreement.

Under the preferential assessments law, land use in agriculture is assessed on the basis of its agricultural value, and there is no penalty if the land is put into another use at some later time. Under deferred tax laws, assessments are based on the value as farmland. If the land use changes or certain other conditions are violated, a deferred tax or a roll-back is levied. Restrictive agreements are agreements between state or local governments and the landowner, which restrict the use of lands to agricultural purposes for a specific period of time in exchange for use value assessments. After the restrictive agreement period ends, the landowner can freely alter the use of his land without roll-back or penalty. Generally, restrictive agreements are more likely to influence land use because there is penalty of land use change in a specific time period of the restrictive agreement.

Based on a rapid land conversion and losses of prime agricultural land in the Salina area, those types of land use control techniques which would be a possible solution to the problem should be attempted. Such land use control techniques may be effective in preserving prime agricultural land. It is believed by the researcher that transfer of development rights would be most effective in controlling the loss of agricultural land in the Salina area. TDR's are based on a compensating mechanism regarding the land use market. Development rights, restricted at one location, can be sold or transferred (by land owners in the restricted area) to a development zone. Such a process has the potential of slowing the conversion of prime agricultural land to urban development in potential restrictive

zones around Salina. Other control techniques, such as purchase of farmland development rights, differential assessment, and agricultural districts, are capable of slowing growth, but have been proven to be not as effective in controlling the loss of agricultural land.⁵

Response of Local Officials

The interview of land use management officials in Salina reflected their concerns about the problem with the amount of land use change taking place around the city. To better understand their response for the problem associated with land use dynamics, the same questions (see Appendix 5) were asked in a personal interview. The U.S. Soil Conservation Service and the City of Salina Planning and Community Development Department provided interview information. The findings of the interviews suggest that the City Planning and Community Development Department and the U.S. Soil Conservation Service had different points of view.

The local U.S. Soil Conservation Service officials recognize the problem associated with land use changes taking place around Salina. In addition, the S.C.S. views the impact of land use dynamics on prime agricultural land as significant. In an interview with the U.S. Soil Conservation Service, the local official repeatedly emphasized that they work closely with the local planning and zoning commissions. Also, the U.S. Soil Conservation Service mentioned that they are not responsible for the policies concerning preservation of prime agricultural land, however, they said that the City Planning and Community Development Department has some policies concerned with the preservation of prime agricultural land. As for the growth direction toward the south of the city, they are still researching

the reasons.

The City Planning and Community Development Department, however, sees a potential problem in the future regarding urban growth and land use changes, but current changes are not viewed today as a big problem around Salina. Nevertheless, they have some policies concerned with the preservation of prime agricultural land. Such policies include a restricting of development to areas with few environmental hazards, and minimizing the loss of natural resources, including prime agricultural land, to urbanization. Since the policies discourage residential development from occurring in areas subject to the 100-year floodplain, the urban growth is encouraged to develop toward the eastern direction. In addition, they mentioned that prime agricultural land was easier to obtain for urban development; therefore, the growth is mainly in the southern area of Salina (an area of extensive prime agricultural lands).

FOOTNOTES

1. Mark B. Lapping, "Policy Alternatives for The Preservation of Agricultural Land Use", Journal of Environmental Management, Vol. 5 (1977), pp. 283-284.
2. Ibid, pp. 282-283.
3. Joseph P. Sullivan, "Agricultural Districts: The New York Experience in Farmland Preservation", Land Use: Tough Choice in Today's World, (Soil Conservation Society of America, 1977), p. 122.
4. Thomas F. Hady, "Differential Assessment Program for Agricultural Land", Land Use: Tough Choices in Today's World, (Soil Conservation Society of America, 1977), p. 114.
5. Mark B. Lapping, "Policy Alternatives for The Preservation of Agricultural Land Use", Journal of Environmental Management, Vol. 5 (1977), pp. 283-284.

CHAPTER 6

SUMMARY AND CONCLUSION

Summary

In the United States, the land use patterns are constantly changing because of rapid urbanization. Such land use dynamics have resulted in environmental hazards, increasing land value, and an accelerating loss of prime agricultural land. Of particular importance is the impact of the latter, including declining yields and higher food costs. Such a loss of prime agricultural land is well illustrated in the Salina rural-urban fringe. In view of this, the purpose of this thesis was to examine characteristics of land use changes in the area surrounding Salina, Kansas from 1965 to 1980.

High quality air-photos in 1965, 1971, and 1980 provided the primary means for calculating land use acreages and change information using an adoption of the USGS land use and land cover classification system to the study area. Since there were some limitations in the process of photo-interpretation, field checking assisted in the identification of land use. Nevertheless, there still were some limitations in field checking, e.g., the restriction to the present time.

In the study area, the general character of topography is a plain of low relief and thus slope is generally not a major limiting factor for urban development. Some soils, however, such as those with high potential for shrink-swell generate substantial structural damage to both roadways and building foundations, and

may limit urban development. Generally, they are less frequently found in the north and south portion of the study area, but are widespread in the western portion of the study area and south of the Saline River.

The land in the study area has good capability for agricultural purposes based on the land capability classification system. Generally, Class I land can be found in all areas, and covers large areas in the study area. Class II land is primarily located in the northwest, west, and southwest parts of the study area. Class III land is generally found intermixed with Class I land and Class II land, but most extensively in the eastern portion of the study area. In addition, Class IV and Class VI land exists in smaller quantities and narrow strips in the study area.

Administrative controls and political processes have also influenced land use in directly through federal government controls and directly through state and local government policies. The development policies at the local level are especially restrictive to development in areas with few environmental hazards so as to minimize the loss of natural resources, including prime agricultural land, to urbanization, and, to discourage urban development from occurring in areas subject to 100-year floodplain. In addition to government policies, land value also affected the land use in the study area. Generally, the value of urban land was higher than that of rural land. Also, the rural land had different values between open and cultivated land, pasture land, and waste land. In other words, the normal acreage values in open and cultivated land were higher than those in pasture land and waste land.

In the study area, the rapid urbanization from 1965 to 1980 stimulated accelerating conversion of non-urban land to urban uses. This is especially true for single-family areas, the final product of conversion in almost all cases. From 1965 to 1980, the land development of single-family residences generally occurred in the south and east portion of the study area on the rural-urban fringe. The new single-family dwellings, primarily transformed from cropland and pasture land, were predominantly located in the areas of easy transport and convenience to commerce and service, although they did not grow adjacent to highways and railroads nor develop in the areas adjacent to processing industries. In addition, the location of single-family dwellings were associated away from soils with the potential shrink-swell problem, lower land values in cropland and pasture land, and where government policies restricted urban development.

After sufficient single-family development had taken place to create an adequate market and labor force, the growth of suburban shopping centers and processing industries generally followed. Suburban shopping centers developed primarily at the expense of cropland, although the quality varied from lower cost pasture land to higher cost cropland. However, the land development of processing industries were generally at the expense of pasture land and cropland since 1971, although it primarily consumed cropland in the period from 1965 to 1971.

The development of residential land, the siting of processing industries, the growth of suburban shopping centers, and the establishment of all transportation facilities profoundly affected use of adjacent rural land. Cropland and pasture land were two types most affected by urban development, since these lands were usually lower in cost, easily developed, and thus most

susceptible to purchase by land investors and developers.

In the study area, urban land uses and agricultural operations were competing for the same higher quality land resources from 1965 to 1980. Primarily, the land development of single-family, suburban shopping centers, and processing industries resulted in the permanent losses of higher quality land resources in all categories of non-urban land on the Salina rural-urban fringe. It is particularly true that cropland was the primary category to lose the higher quality soils, with pasture land second. Generally single-family land development will continue to consume larger amounts of higher quality land resources on the Salina rural-urban fringe. Such losses of prime agricultural land result in more intensive farming of a smaller land resource base, forcing farming practices to maintain more marginal lands with lower productive capability.

In view of the impacts associated with land use dynamics, such land use control techniques as transfer of development rights , purchase of farmland development rights, and agricultural districts could be considered as possible solutions to the problem. Further, those land use control techniques may be effective in preserving prime agricultural land, since farmers are allowed to retain their ownership of land and receive several benefits to improve the conditions for farming.

Conclusion and Recommendation

It seems obvious that an increasingly detailed knowledge of land resource is necessary for planning commissions to guide public and private land use decisions. Understanding the past and present land use patterns and change information can effectively

aid managers of land resources for planning in the future. The technique of remote sensing certainly provides accessible and precise land information in an economical and time efficient manner.

Although there is substantial quantities of prime agricultural land in the area surrounding the city today, the accelerating losses of prime agricultural land associated with land use dynamics has had a major impact in the area. Although the city is encouraging urban development toward the eastern direction where Class III land is more extensive, the growth is mainly in the southern direction from Salina, so that development consumes more Class I land. In view of this, it is recommended that the city redirect and redevelop policies to more adequately preserve the prime agricultural land resource.

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A P P E N D I C E S

APPENDIX 1

AIR PHOTO ACQUISITION

The process of acquiring the necessary aerial photos of the study area involved three steps. First of all, the air photo index was acquired at the U.S. Department of Agricultural Stabilization and Conservation Service (ASCS), Aerial Photography Field Office, 2222 West, 2300 South, P.O. BOX 30010, Salt Lake City, Utah. Thereupon, the needed air photos of the study area were determined after review of the 1965 photo index sheets, 1971 photo index sheets, and 1980 photo index sheets. In accordance with the code or symbol, roll number, and exposure number (Table 1), the black and white air photos were obtained at the same ASCS provided good tonal contrast, wide exposure latitude, satisfactory resolving power, and low graininess. Such qualities were excellent for interpreting land use changes.

TABLE 1

Date	Code	Photo Roll No.	Exposure No.
08/13/65	AYK	1FF	149 thru 156
10/03/65	AYK	2FF	122 thru 129
10/03/65	AYK	2FF	90 thru 97
06/27/71	AYK	4MM	2 thru 10
06/27/71	AYK	3MM	275 thru 283
06/27/71	AYK	3MM	150 thru 158
06/27/71	AYK	3MM	118 thru 126
07/02/80	40	20169	280-108 thru 280-112
07/02/80	40	20169	280-45 thru 280-50
07/02/80	40	20169	280-29 thru 280-34

APPENDIX 2

LAND USE AND LAND COVER CLASSIFICATION SYSTEM

- 111 Single-Family Residential. The category is identified by rectangular or L-shaped houses; yards separated by fences or differences in lawn; lots landscaped with trees and shrubs;¹ moderate density; open areas between buildings; and, relatively small structures.
- 112 Multi-Family Residential. The category is characterized by the rectangular or square houses, relatively large structures, and parking lots.
- 113 Mobile Homes. The category is characterized by the area having a "herringbone", a paved driveway which is narrow and immediately adjacent to the street and end of the mobile home. Usually, the area in the category is less than 20 acres, however, individual structures are small and rectangular on individual lots 1/4 acres or less.²
- 121 Central Business District. In the category, the key identifications are large number of stores; large multistory buildings; parking lots or parking structure; central location within city; absence of general vegetation; presence of traffic-restricted open mall; selected landscaping, absence of residential areas, absence of industrial areas; presence of mass-transportation facilities or vehicles; little bare land/large proportion of land converted; possible evidence of renewal or conversion of land use; focal point of transportation network; and, no or very little on-street parking.³

- 122 Suburban Shopping Centers. This category is usually characterized by large open areas with large central structures containing major retail establishment and many smaller shops and stores; extensive parking areas marked off in traffic lanes and car divisions; located in settled suburban area with large lot residence subdivision surrounding it; at major focal point of transportation network or on major highway; absence of natural vegetation; landscaped and planned grounds; public transportation-facilities; and, no on-street parking.⁴
- 123 Small Isolated Stores or Centers. The category is identified by small structures or converted residences; parking facilities; modification, on-street parking; and, presence of general vegetation.⁵ It is usually surrounded by residential land use, frequently indistinguishable from residences except for signs; and, not located at transportation network focal point.
- 124 Educational. The key for identification is educational buildings having an independent identification and campus with open spaces, playgrounds, etc..⁶
- 125 Administrative and Service Use. This category consists of government administrative buildings, semi-public institutions including large dispensaries, post offices, pump-houses, etc..⁷
- 126 Recreation. This category is characterized by drive-in theaters having their own parking areas and grounds.⁸
- 131 Fabricating Industries. They are engaged in the production on assembly of finished goods from materials usually produced by the processing industries. The area is

characterized by medium to large buildings, no equipment outside, storage in medium-sized buildings, and medium-sized parking lots.⁹

132 Processing Industries. The most common characteristics of the processing industries on aerial photographs are stockpiles of raw materials. They may be in outdoor piles, in covered buildings, in ponds or tanks, or in a variety of closed and open storage units. Also, there usually will be evidence on aerial photographs of transporting facilities, e.g., conveyor belts, mobile cranes, and railroad cars.¹⁰

141 Highways. The highways include right-of-ways; areas used for interchanges and service and terminal facilities; wide, cleared right of way; and, curves are also smooth and broad. Routes cut across established patterns of field and town. Construction is made without minor obstacles such as hills and swamps, which may be distinguished by cuts and fills.

142 Railroads. Rail facilities include stations, parking lots, roundhouse, repair and switching yards, and related areas. Width of line is determined by number of tracks, a single-track system being narrower than highways: the direction of line is changed by long smooth curves.

143 Airport. This category includes the runways, intervening land, terminals, service buildings, navigation aids, fuel storage, parking lots, and a limited buffer zone. It is characterized by large cleared space without fields, fences, or other obstructions, long light-toned graded runways, and planes on field.

151 Petroleum Depot. The category is characterized by many irregular cylinders in size. The cylinders are arranged in

- the same row. They are associated with circular shadows; light cylinders; gray tone ground around the cylinders; not parking lot; and, nearness to a main road.
152. Granary. The category is identified by many higher cylinders which are arranged in thr row; many large buildings in the same row, path, gray tone ground around the cylinders and buildings; and, no parking lots. The cylinders present dark tones; the buildings present light tones.
- 153 Junk Yard. The identifications are irregular patterns; concentration of junk cars; intermixed light and dark tones; coarse texture; and nearness to a main road.
- 171 Parks. This category is characterized by concentration of trees; baseball diamonds; swimming pools; tennis courts; playgrounds; and, meandering side walks. It may cover several square miles on the edge of the city, or a city block size. The shape is square in a gridiron street system, or irregular in peripheral urban areas.
- 172 Undeveloped Land. Land not grouped under the categories of other urban uses is classified under this group.
- 173 Cemeteries. The category is identified by cremation or burial grounds having sheds and organized pyres.¹¹ Trees are scattered in the areas, the street layout is well-defined.
- 174 Waste Dump. This category is identified by cleared land, irregular pattern, and some heavy equipment present. The major identification is a land fill.
- 175 Golf Course. There are buildings and large parking lot to aggregate at a certain side of the area. Also there are

many gray circles and irregular vegetation in patterns relation to whole field. There is no uniform color and regular size and shape in this category.

- 176 Camping Area. This category is characterized by concentration of trees, no buildings, near the major road, and irregular shapes. The texture is not smooth.
- 211 Cropland. The category is characterized by varied field size, homogenously smooth to coarse texture, greatly varied tone, the presence of drill or plow marks, the characteristic patterns of dead furrows.¹²
- 212 Pasture Land. The category is identified by varied field size, uniform to mottle patterns, smooth to fine texture, presence of row pattern, plant cover, grazing animals.¹³
- 231 Beef Cattle Feedlots. In this category, a large cattle shed is surrounded by a path; a herd of cattle may be present; and, ground around cattle shed is usually light because of absence of grass due to trampling by cattle. Usually, it is closed to main road.
- 241 Farmsteads. The category includes rural residential land. Ground around houses usually dark because of presence of grass; houses are often set among trees; where other farm buildings may be in the open. Farmsteads are smaller than adjacent barns, but larger than other buildings of farm group. Soils or haystacks nearby may be indicated by shadows. Farm driveways do not end at houses, but continue on barns. The shapes of barns are distinctly boxlike, with peaked or rounded roofs, marked by their shadows.
- 332 Bare Ground. The category is identified by light color because of the absence of grass and vegetation. The pattern

is irregular, the texture is coarse.

- 411 Deciduous Forest Land. The trees are clustered together and dark in tone. In other words, crowns are compact, dense, large and dark.
- 431 Mixed Forest Land. In this category, some trees have rounded crowns, some have cone-shaped crowns.
- 511 Rivers. Rivers are seldom confused with other linear features because of their irregular shapes, varying width, and complete dependence on topography. Usually, they appear in tone dark.
- 521 Lakes. Trees or grass surrounded lakes. The category is characterized by dark in tone, varied field size, homogenously smooth texture.
- 531 Reservoirs. The category include dams and artifical lakes. The category is identified by varied field size, dark in tone, presence of facilities.

FOOTNOTES

1. Ribert D. Baker, J.E. Desteiguer, Douglas E. Grant, Michael J. Newton, "Land-Use/Land-Cover Mapping from Aerial Photographs", Photogrammetric Engineering and Remote Sensing, Vol. 45, No. 5 (May, 1979), p.667.
2. Ibid, p. 668.
3. Gary K. Higgs, "Application of Remote Sensing in Urban Analysis", Introduction to Remote Sensing of The Environment, ed., Benjamin F. Richason, Jr., (Dubuque, Iowa: Kendall/Hunt Publishing Company, 1978), p. 307.
4. Ibid, p. 307.
5. Ibid, p. 307.
6. N.C. Gautam, "Aerial Photo-Interpretation Techniques for Classifying Land Use", Photogrammetric Engineering and Remote Sensing, Vol. 42, No. 6 (June, 1976), p. 820.
7. Ibid, p. 820.
8. Ibid, p. 820.
9. James J. Flannery, "Application of Remote Sensing in Industrial Analysis", Introduction to Remote Sensing of The Environment, ed., Benjamin F. Richason, Jr., (Dubuque, Iowa: Kendall/Hunt Publishing Company, 1978), p. 374-377.
10. Ibid, pp. 369-374.
11. N.C. Gautam, "Aerial Photo-Interpretation Techniques for Classifying Urban Land Use", Photogrammetric Engineering and Remote Sensing, Vol. 42, No. 6 (June, 1976), p. 820.
12. Robert D. Baker, J.E. Desteiguer, Douglas E. Grant, Michael J. Newton, "Land-Use/Land-Cover Mapping from Aerial Photographs", Photogrammetric Engineering and Remote Sensing, Vol. 45, No. 5 (May, 1979), p. 667.
13. Ibid, p. 666.
14. Charles E. Olson, Jr., "What Is Photographic Interpretation", The Surveillant Science Remote Sensing of The Environment, ed., Robert K. Holz, (Boston: Houghton Mifflin Company, 1973), p. 100.

APPENDIX 3

LAND CAPABILITY CLASSIFICATION IN THE STUDY AREA

Land Capability Classification	Soil Types
Class I	Detroit Silt Loam, 0 to 2% Slopes; Detroit Silt Loam, Overwash Phase, 0 to 2% Slopes; Detroit Silty Clay Loam, 0 to 2% Slopes; Fore Silty Clay Loam, Deep Over Silt, 0 to 2% Slopes; Hall Silt Loam, 0 to 2% Slopes; Hobbs Silt Loam, 0 to 2% Slopes; Hobbs Silt Loam, 0 to 2% Slopes, eroded; Humbarger Silt Loam, 0 to 2% Slopes; Langley Silt Loam, 0 to 2% Slopes; Marydel Loam, Poorly Drained Variant, 0 to 2% Slopes; Marydel Loamy Fine Sand, 0 to 2% Slopes; Marydel Silt Loam, 0 to 2% Slopes; Muir Silt Loam, 0 to 2% Slopes; Roxbury Silty Clay Loam, 0 to 2% Slopes; Salemsburg Silt Loam, 0 to 2% Slopes; Tobin Silt Loam, 0 to 2% Slopes.
Class II	Berg Silt Loam, 0 to 2% Slopes; Bonaccord Silty Clay Loam, 0 to 2% Slopes; Lockhard Silt Loam, 0 to 2% Slopes; Longford Silt Loam, 0 to 2% Slopes; Niles Silt Loam, 0 to 2% Slopes; Solomon Clay, 0 to 2% Slopes; Sutphen Silty Clay, 0 to 2% Slopes; Wabash Silty Clay Loam, 0 to 2% Slopes; Arkansas Fine Sandy Loam, 0 to 2% Slopes.
Class III	Albion Loam, 2 to 6% Slopes; Berg Silty Clay Loam, 2 to 6% Slopes, severely eroded; Detroit Silt Loam, 2 to 6% Slopes; Ebenezer Silt Loam, 2 to 6% Slopes; Ebenezer Silty Clay Loam, 2 to 6% Slopes, eroded; Elmo Silt Loam, 2 to 6% Slopes; Fore Clay, 0 to 2% Slopes; Fore Silty Clay Loam, Deep Over Silt, 2 to 6% Slopes; Hall Silt Loam, 2 to 6% Slopes; Hall Silt Loam, 2 to 6% Slopes, eroded; Humbarger Silt Loam, 2 to 6% Slopes; Humbarger Silt Loam, 2 to 6% Slopes, eroded; Humbarger Silt Loam, 2 to 6% Slopes, severely eroded; Idana Silt Loam, 2 to 6% Slopes; Kipp Silt Loam, 2 to 6% Slopes; Lancaster Loam, 2 to 6% Slopes;

APPENDIX 3

LAND CAPABILITY CLASSIFICATION IN THE STUDY AREA

Land Capability Classification	Soil Types
Class III	Lancaster Loam, 2 to 6% Slopes, eroded; Lincoln Loamy Fine Sand, 2 to 6% Slopes; Lockhard Silt Loam, 2 to 6% Slopes; Lockhard Silt Loam, 2 to 6% Slopes, eroded; Longford Silt Loam, 2 to 6% Slopes; Niles Silt Loam, 2 to 6% Slopes; Niles Silty Clay Loam, 2 to 6% Slopes, eroded; Pratt Fine Sandy Loam, 2 to 6% Slopes; Shellabarger Loam, 2 to 6% Slopes, eroded; Smolan Silt Loam, 2 to 6% Slopes; Smolan Silt Loam, 2 to 6% Slopes, eroded; Westfall Silt Loam, 2 to 6% Slopes, eroded.
Class IV	Benfield Silty Clay Loam, Shallow Phase, 2 to 6% Slopes; Bonaccord Silty Clay Loam- Solonetz Complex, 0 to 2% Slopes; Edalgo Silt Loam, 2 to 6% Slopes; Humbarger Loam, 2 to 6% Slopes; Humbarger Loam, 2 to 6% Slopes, eroded; Idana Silt Loam, 2 to 6% Slopes, eroded; Kipp Silty Clay Loam, 2 to 6% Slopes, eroded; Lancaster Loam, Shallow Phase, 2 to 6% Slopes; Langley Silt Loam- Solonetz Complex, 0 to 2% Slopes; Yordy Silty Clay Loam, 2 to 6% Slopes, eroded; Yordy Loam, Shallow Phase, 2 to 6% Slopes.
Class VI	Detroit Silty Clay Loam, 2 to 6% Slopes; Edalgo Silt Loam, 6 to 12% Slopes; Fore Clay, 2 to 6% Slopes; Hedville Loam, 2 to 6% Slopes; Hobbs Silt Loam, 2 to 6% Slopes; Kipp Silty Clay Loam, 6 to 12 Slopes, severely eroded; Kipson Shaly Silt Loam, 2 to 6% Slopes, eroded; Kipson Silt Loam, 2 to 6% Slopes; Kipson Silt Loam, 6 to 12% Slopes; Kipson Silt Loam, Over 12% Slopes.

APPENDIX 3

Land Capability Classification	Soil Types
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Class VII	Alluvial Land
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Source: Soil Conservation Service, USDA, and Kansas Agricultural Experiment Station, Soil Survey, Saline County, Kansas, Series 1950, No. 4 (Washington D.C.: The Superintendent of Documents, U.S. Government Printing Office, January, 1959), pp. 136-145.

APPENDIX 4

THE CHANGE OF OTHER LAND USES IN THE AREA SURROUNDING SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971		Change 1971-1980		Change 1965-1980	
	Area		Area		Area	
	Acres	Hectares	Acres	Hectares	Acres	Hectares
The Change of Highways						
*CL (211) to HW (141)	+27.1	+11.1	0	0	+27.1	+11.1
PL (212) to HW (141)	+14.3	+5.8	0	0	+14.3	+5.8
DTL (411) to HW (141)	+4.8	+1.9	0	0	+4.8	+1.9
Net Change in Use	+46.2	+18.7	0	0	+46.2	+18.7
The Change of Airport						
*AP (143) to GC (175)	-151.4	-61.3	0	0	-151.4	-61.3
Net Change in Use	-151.4	-61.3	0	0	-151.4	-61.3
The Change of Junk Yard						
*BCF (231) to JY (153)	0	0	+19.1	+7.7	+19.1	+7.7
Net Change in Use	0	0	+19.1	+7.7	+19.1	+7.7
The Change of Beef Cattle Feedlots						
*BCF (231) to PI (132)	-6.4	-2.6	-12.8	-5.2	-19.2	-7.8
BCF (231) to JY (153)	0	0	-19.1	-7.7	-19.1	-7.7
Net Change in Use	-6.4	-2.6	-31.9	-12.9	-38.3	-15.5

APPENDIX 4

THE CHANGE OF OTHER LAND USES IN THE AREA SURROUNDING SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971		Change 1971-1980		Change 1965-1980	
	Area		Area		Area	
	Acres	Hectares	Acres	Hectares	Acres	Hectares
The Change of Farmsteads						
*CL (211) to FS (241)	+12.8	+5.2	+9.6	+3.2	+22.4	+9.1
PL (212) to FS (241)	+4.8	+1.9	+14.3	+5.8	+19.1	+7.7
FS (241) to MH (113)	0	0	-3.2	-1.3	-3.2	-1.3
FS (241) to SIS (123)	0	0	-3.2	-1.3	-3.2	-1.3
FS (241) to CL (211)	-6.4	-2.6	0	0	-6.4	-2.6
FS (241) to RSV (531)	0	0	-4.8	-1.9	-4.8	-1.9
Net Change in Use	+11.2	+4.5	+12.7	+5.2	+23.9	+9.7
The Change of Bare Ground						
*CL (211) to BG (332)	+3.2	+1.3	0	0	+3.2	+1.3
BG (332) to PL (212)	-89.3	-36.1	0	0	-89.3	-36.1
BG (332) to MFL (431)	0	0	-12.7	-5.2	-12.7	-5.2
BG (332) to RSV (531)	0	0	-1.6	-0.6	-1.6	-0.6
BG (332) to CL (211)	-15.9	-6.5	0	0	-15.9	-6.5
Net Change in Use	-102.0	-41.3	-14.3	-5.8	-116.3	-47.1
The Change of Deciduous Forest Land						
*CL (211) to DFL (411)	0	0	+22.5	+9.1	+22.5	+9.1
PL (212) to DFL (411)	0	0	+25.3	+10.2	+25.3	+10.2
DFL (411) to MH (113)	0	0	-8.0	-0.6	-8.0	-0.6
DFL (411) to SSC (122)	-1.6	-0.6	0	0	-1.6	-0.6
DFL (411) to HW (141)	-4.8	-1.9	0	0	-4.8	-1.9
Net Change in Use	-6.4	-2.5	+39.8	+16.1	+33.4	+13.6

APPENDIX 4

132

THE CHANGE OF OTHER LAND USES IN THE AREA SURROUNDING SALINA, KANSAS, 1965-1980

Land Use Types	Change 1965-1971		Change 1971-1980		Change 1965-1980	
	Area		Area		Area	
	Acres	Hectares	Acres	Hectares	Acres	Hectares
The Change of Mixed Forest Land						
*CL (211) to MFL (431)	+4.8	+1.9	0	0	+4.8	+1.9
PL (212) to MFL (431)	+4.8	+1.9	+17.7	+7.1	+22.5	+9.0
BG (332) to MFL (431)	0	0	+12.7	+5.2	+12.7	+5.2
MFL (431) to SF (111)	0	0	-4.8	-1.9	-4.8	-1.9
MFL (431) to SSC (122)	0	0	-17.5	-7.1	-17.5	-7.1
MFL (431) to EDU (124)	-6.4	-2.6	0	0	-6.4	-2.6
MFL (431) to FI (131)	0	0	-4.8	-1.9	-4.8	-1.9
MFL (431) to PI (132)	-3.2	-1.3	-14.4	-5.8	-17.6	-7.1
MFL (431) to PL (212)	-8.0	-3.2	0	0	-8.0	-3.2
MFL (431) to RSV (531)	-12.8	-5.1	0	0	-12.8	-5.1
Net Change in Use	-20.8	-8.4	-11.1	-4.4	-31.9	-12.8
The Change of Reservoirs						
*CL (211) to RSV (531)	+36.7	+14.9	+54.3	+21.9	+91.0	+36.8
PL (212) to RSV (531)	+6.3	+2.5	+12.7	+5.3	+19.0	+7.8
FS (241) to RSV (531)	0	0	+4.8	+1.9	+4.8	+1.9
BG (332) to RSV (531)	0	0	+1.6	+0.6	+1.6	+0.6
MFL (431) to RSV (531)	+12.8	+5.1	0	0	+12.8	+5.1
Net Change in Use	+55.8	+22.5	+73.4	+29.7	+129.2	+52.2

+ : The acreages increased from 1965 to 1971, 1971 to 1980, and 1965 to 1980
 - : The acreages decreased from 1965 to 1971, 1971 to 1980, and 1965 to 1980
 * : see Appendix 2 for index of classification
 Basis: Aerial photos, scale 1:20,000.

APPENDIX 5

THE INTERVIEW QUESTIONS

1. Do you see a problem with the amount of land use changes taking place around Salina? _____

2. If so, have you any solution to the problem? What are you doing about problem? _____

or
If not, then do you see potential problem in the future regarding urban growth and land use changes? _____

3. Do you have policies concerned with the preservation of prime agricultural land? _____

4. In my study I find that growth is mainly in the southern direction from Salina. Why is this so? _____

LAND USE CHANGES IN THE AREA
SURROUNDING SALINA, KANSAS, 1965-1980

by

MEI-HUEY LIANG

B.S., Chinese Cultural University, 1977

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the
requirements for the degree

MASTER OF ARTS

Department of Geography

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1982

ABSTRACT

This thesis examined characteristics of land use changes in the area surrounding Salina, Kansas from 1965 to 1980. The study centered on the type of changes that have taken place from 1965 to 1980; the relationship between areas of most intense land use changes and those of prime environmental quality; and the relationship between the changes taking place and existing institutional variables put forth to direct such dynamics. In the research, remote sensing was used as a tool to acquire land use acreage and change information, and these data were summarized in tabular form to facilitate the analysis of land use changes.

Although the general character of the landscape in the study area is a plain of low relief, the soils with a high potential for shrink-swell restrict the urban development to the areas of better environmental quality. In addition, governmental policies discourage residential development on the 100-year floodplain. Because of these restrictions, single-family land development occurred south and east of the city of Salina. In addition, the growth of land in commercial and industrial uses occurred in or near areas of good accessibility after sufficient residential development had taken place to create a sufficient market and labor force. Thus, rapid urbanization was generally toward the south and east, and it was primarily at the expense of cropland and pasture land on the rural-urban fringe.

Most of the cropland and pasture land consumed for urban development, e.g., for single-family residences, suburban shopping centers, and processing industries, was high in land capability (Classes I, II, and III). Such loss of prime agricultural land

was generally considered as irreversible. In conclusion, the continuing loss of prime agricultural land to urban development will most likely result in more intensive farming of a smaller land resource base, and force farming practices to more marginal lands with lower productive capability.

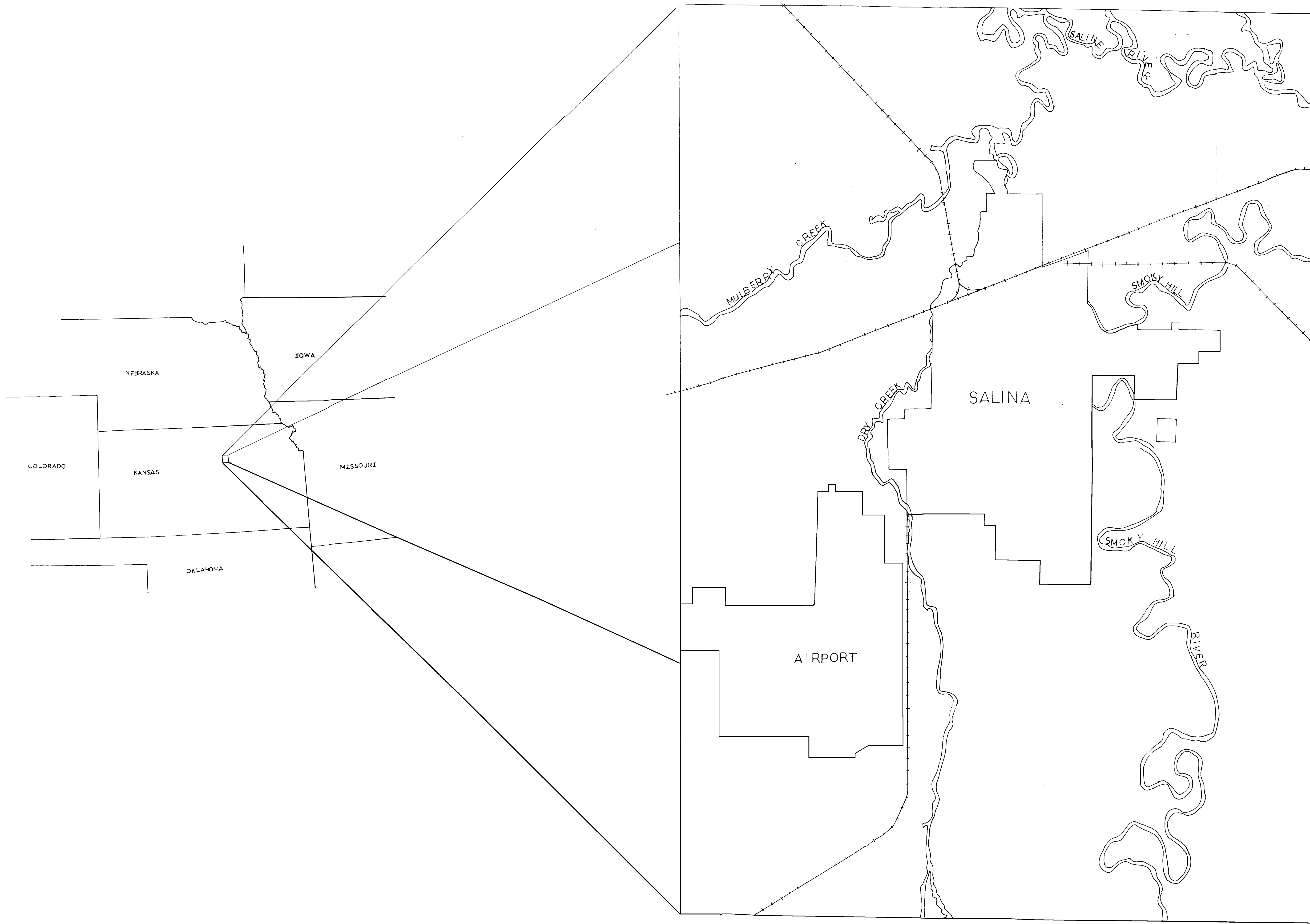
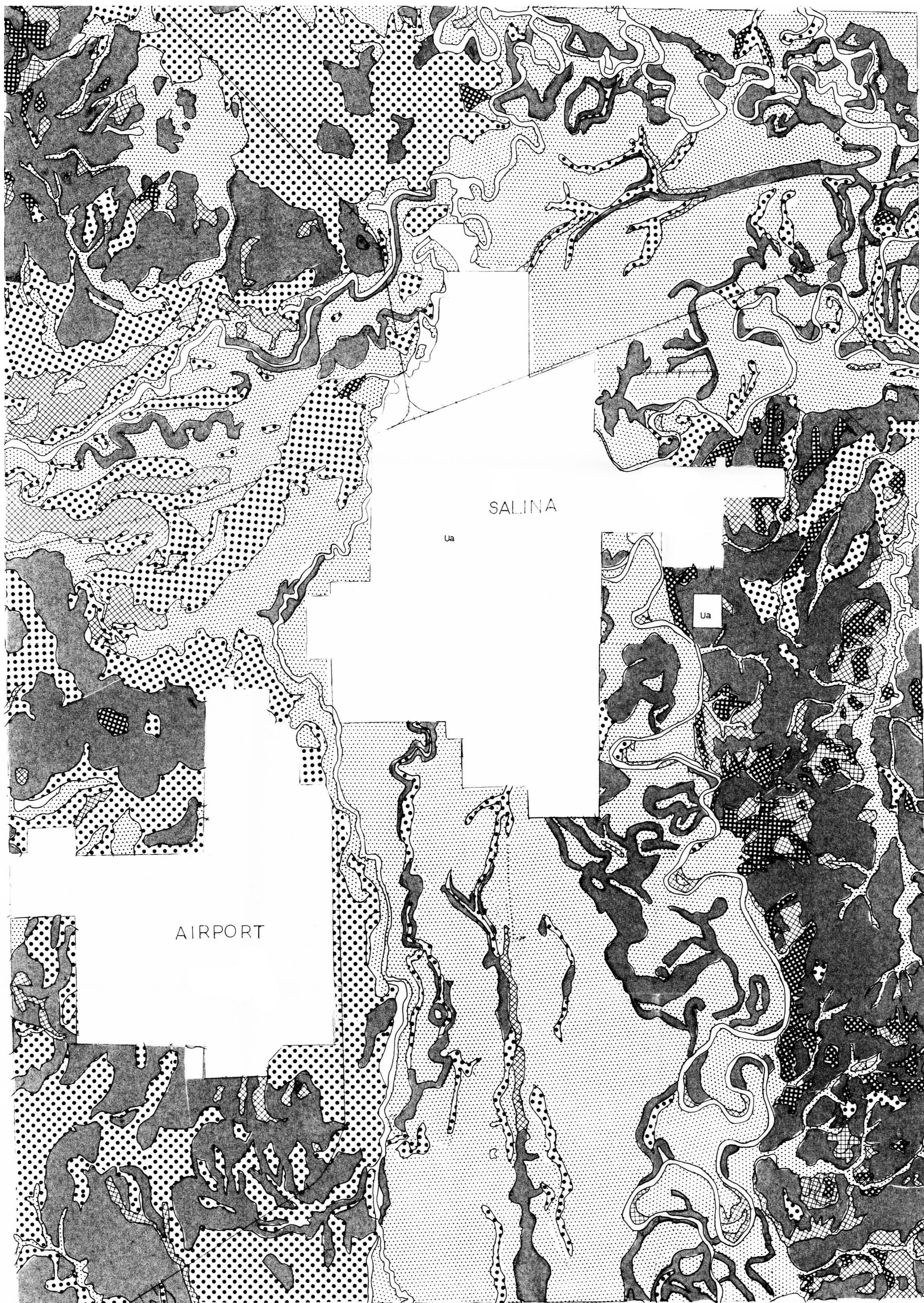


FIGURE I-1 GEOGRAPHICAL LOCATION MAP
SALINA, KANSAS





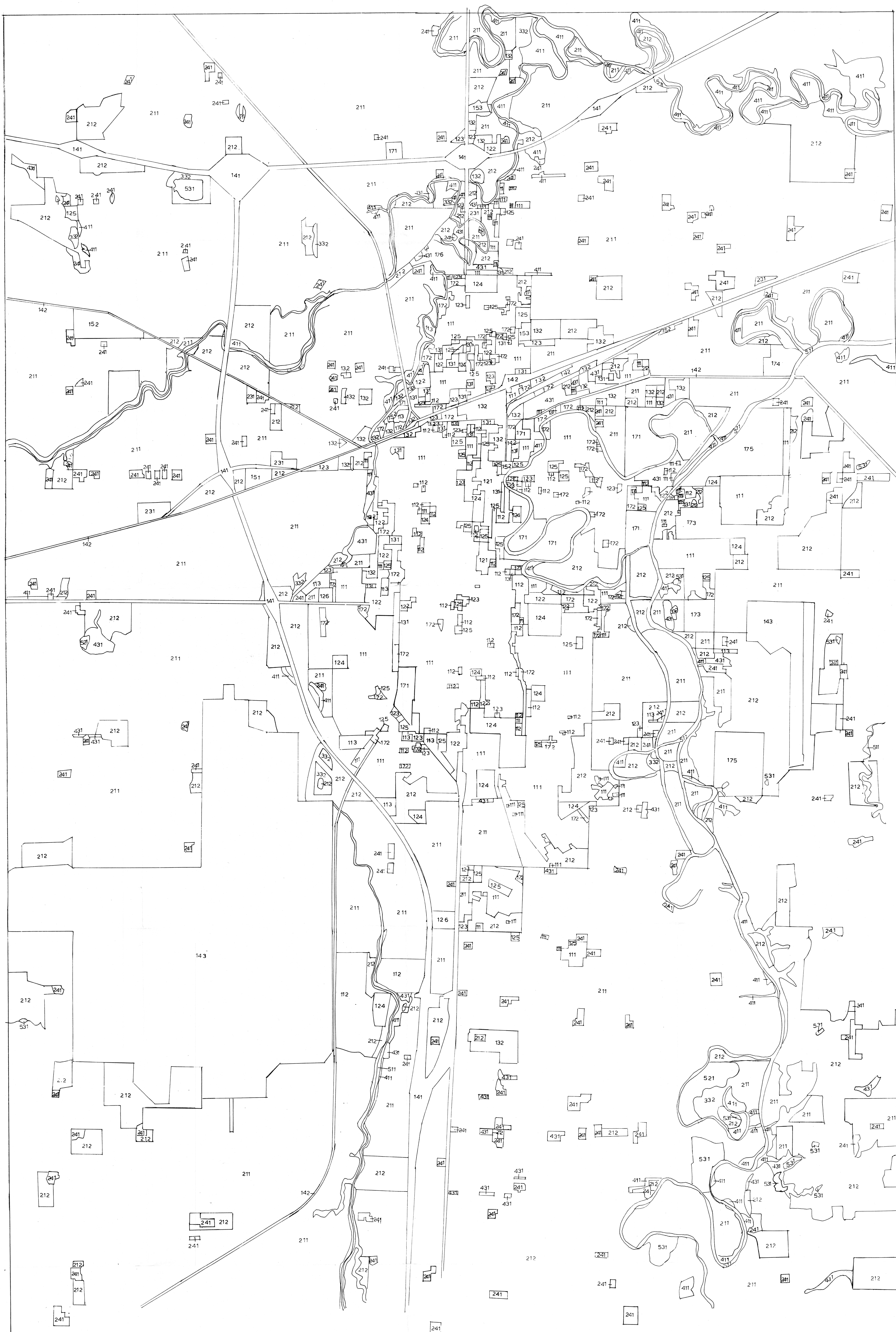
LAND CAPABILITY

-  Class I Land
-  Class II Land
-  Class III Land
-  Class IV Land
-  Class VI Land

Scale 1:31,680
5000 0 5000 10,000 Feet



FIGURE 3-1
LAND CAPABILITY CLASSES IN
SALINA, KANSAS

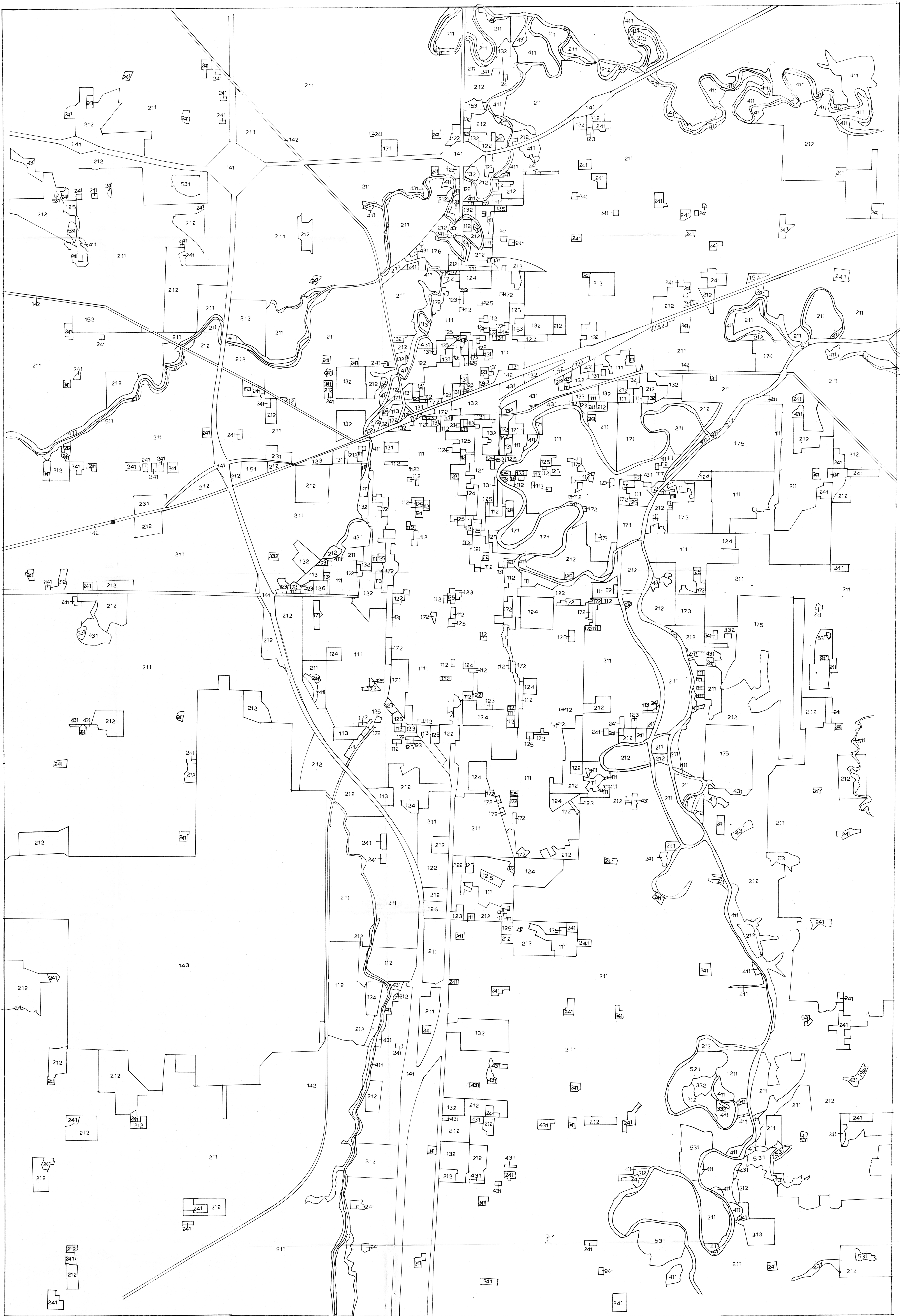


LEGENDS

- 111 Single-Family
- 112 Multi-Family
- 113 Mobile Homes
- 121 Central Business District
- 122 Suburban Shopping Centers
- 123 Small Isolated Stores
- 124 Educational
- 125 Administrative and Service Use
- 126 Recreation
- 131 Fabricating Industries
- 132 Processing Industries
- 141 Highways
- 142 Railroads
- 143 Airport
- 151 Petroleum Depot
- 152 Granary
- 153 Junk Yard
- 171 Parks
- 172 Undeveloped Land
- 173 Cemeteries
- 174 Waste Dump
- 175 Golf Course
- 176 Camping Area
- 211 Cropland
- 212 Pasture Land
- 231 Beef Cattle Feedlots
- 241 Farmsteads
- 332 Bare Ground
- 411 Deciduous Forest Land
- 431 Mixed Forest Land
- 511 Rivers
- 521 Lakes
- 531 Reservoirs

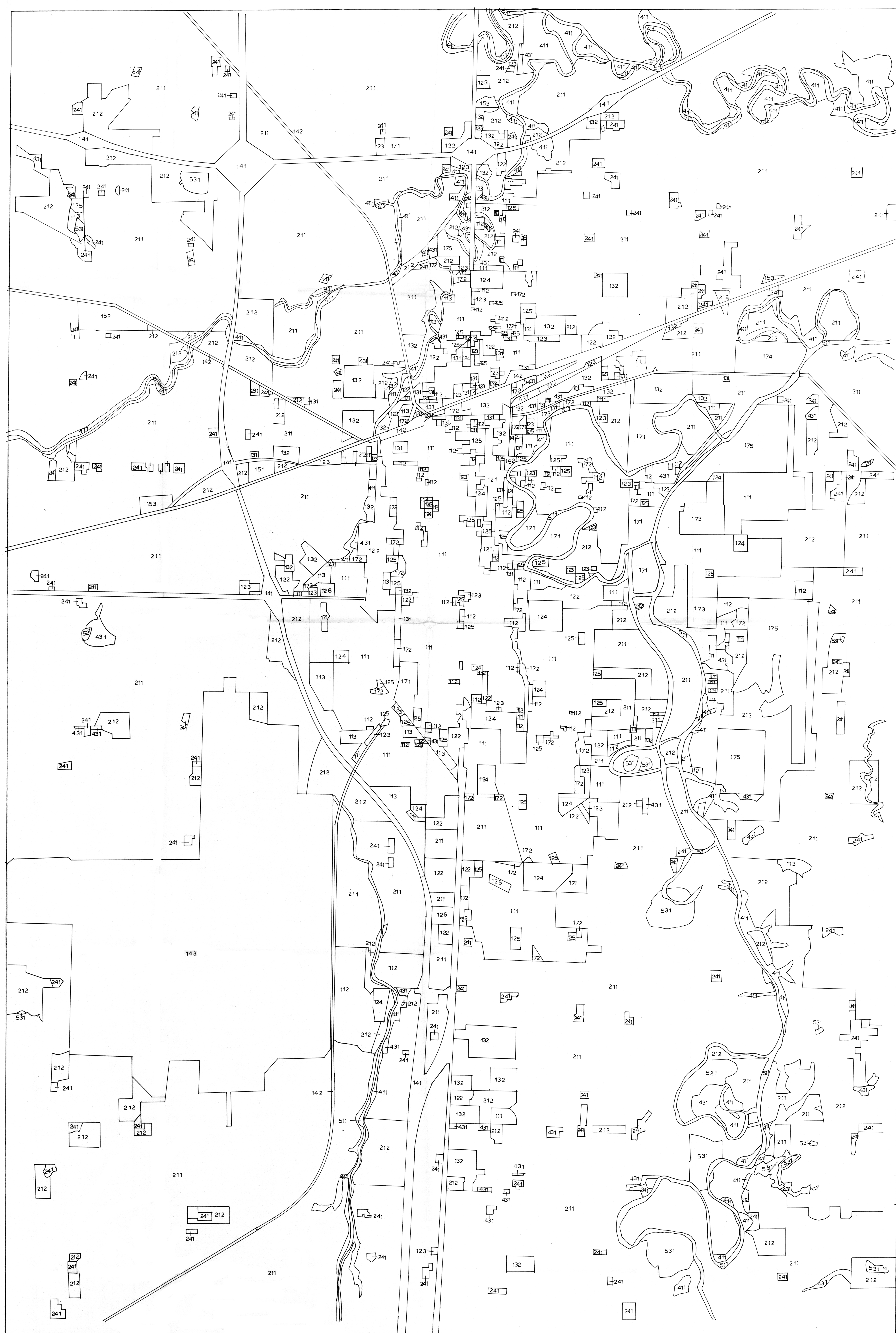
Scale 1:20,000
1" = 1667' 3334 Feet

FIGURE 4-1
LAND USE IN SALINA, KANSAS, 1965



- LEGENDS
- 111 Single-Family residential
 - 112 Multi-Family residential
 - 113 Mobile Homes
 - 121 Central Business District
 - 122 Suburban Shopping
 - 123 Small Isolated Stores
 - 124 Educational
 - 125 Administrative and Service
 - 126 Recreation
 - 131 Fabricating Industries
 - 132 Processing Industries
 - 141 Highways
 - 142 Railroads
 - 143 Airport
 - 151 Petroleum Depot
 - 152 Granary
 - 153 Junk Yard
 - 171 Parks
 - 172 Undeveloped Land
 - 173 Cemeteries
 - 174 Waste Dump
 - 175 Golf Courses
 - 176 Camping Area
 - 211 Cropland
 - 212 Pasture Land
 - 231 Beef Cattle Feedlots
 - 241 Farmsteads
 - 332 Bare Ground
 - 411 Deciduous Forest Land
 - 431 Mixed Forest Land
 - 511 Rivers
 - 521 Lakes
 - 531 Reservoirs
- Scale 1:20,000
1 1667 3334 Feet

FIGURE 4-2
LAND USE IN SALINA, KANSAS, 1971



LEGENDS

- 111 Single-Family Residential
- 112 Multi-Family Residential
- 113 Mobile Homes
- 121 Central Business District
- 122 Suburban Shopping Centers
- 123 Small Isolated Stores
- 124 Educational
- 125 Administrative and Service Use
- 126 Recreational
- 131 Fabricating Industries
- 132 Processing Industries
- 141 Highways
- 142 Railroads
- 143 Airport
- 151 Petroleum Depot
- 152 Granary
- 153 Junk Yard
- 171 Parks
- 172 Undeveloped Land
- 173 Cemeteries
- 174 Waste Dump
- 175 Golf Course
- 176 Camping Area
- 211 Cropland
- 212 Pasture Land
- 231 Beef Cattle Feedlots
- 241 Farmsteads
- 330 Bare Ground
- 411 Deciduous Forest Land
- 431 Mixed Forest Land
- 511 Rivers
- 521 Lakes
- 531 Reservoirs

Scale 1:20,000
1 1667 3334 Feet



FIGURE 4-3
LAND USE IN SALINA, KANSAS, 1980

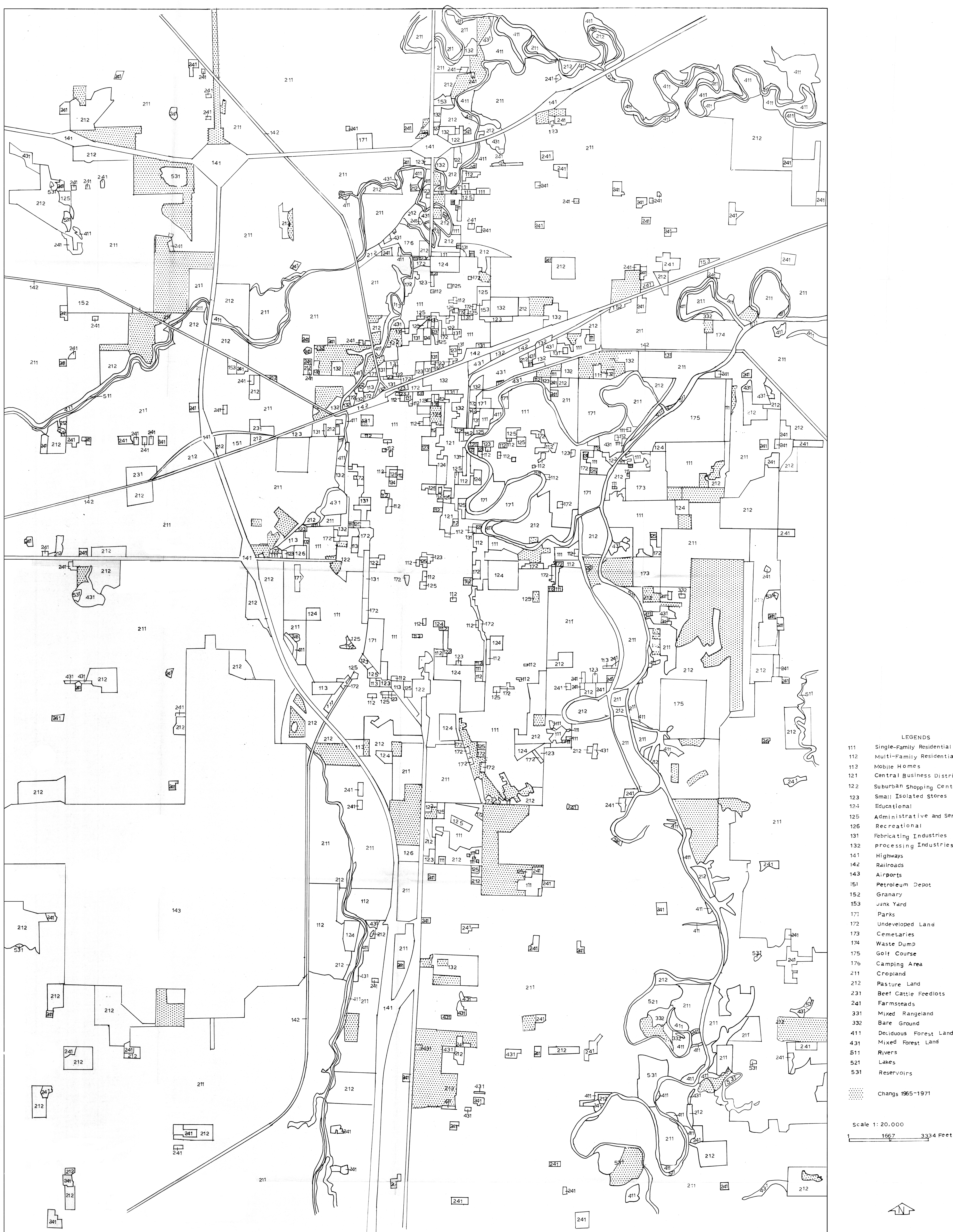
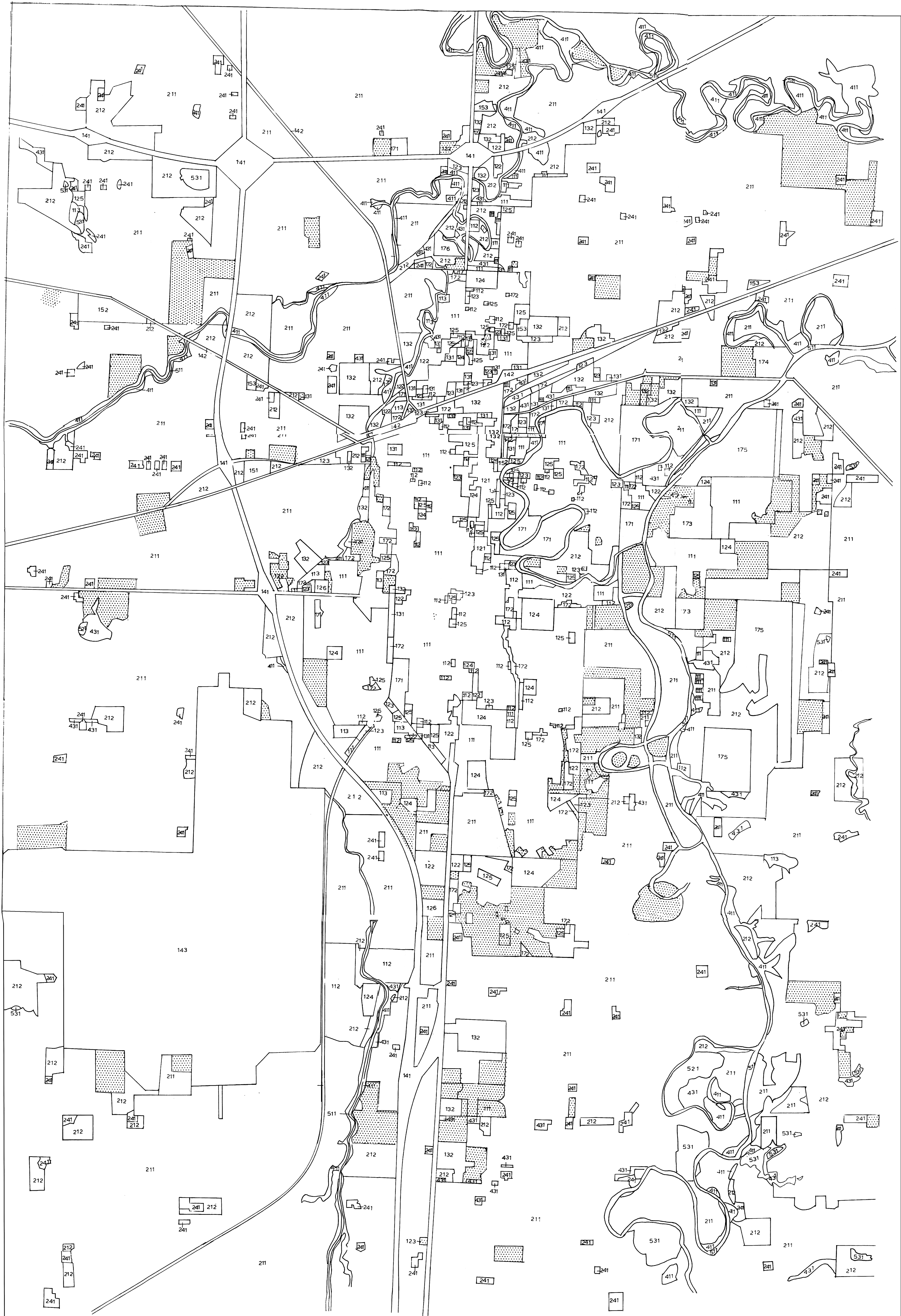


FIGURE 4-4
LAND USE CHANGES IN SALINA, KANSAS, 1965-1971



- LEGENDS
- 111 Single-Family Residential
 - 112 Multi-Family Residential
 - 113 Mobile Home Parks
 - 121 Central Business District
 - 122 Suburban Shopping Centers
 - 123 Small Isolated Stores or Centers
 - 124 Educational
 - 125 Administrative and Service Use
 - 126 Recreation
 - 131 Fabricating Industries
 - 132 Processing Industries
 - 141 Highways
 - 142 Railroads
 - 143 Airports
 - 151 Petroleum Depot
 - 152 Granary
 - 153 Junk Yards
 - 171 Parks
 - 172 Undeveloped Land
 - 173 Cemeteries
 - 174 Waste Dump
 - 175 Golf Course
 - 176 Camping Area
 - 211 Cropland
 - 212 Pasture Land
 - 231 Beef Cattle Feedlots
 - 241 Farmsteads
 - 331 Mixed Rangeland
 - 332 Bare Ground
 - 411 Deciduous Forest Land
 - 431 Mixed Forest Land
 - 511 Rivers
 - 521 Lakes
 - 531 Reservoirs
- Changes 1971-1980

Scale 1:20,000

1667 3334 Feet



FIGURE 4-5
LAND USE CHANGES IN SALINA, KANSAS, 1971-1980

END

OF

OVERSIZE

DOCUMENT(S)