An inventory of land use, Northwest, Omaha

Keith A. Nollen

University of Nebraska at Omaha

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AN INVENTORY OF LAND USES
NORTHWEST OMAHA

A Thesis
Presented to the
Department of Geography
and the
Faculty of the Graduate College
University of Nebraska at Omaha

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts

by
Keith A. Nollen
November, 1972
Accepted for the faculty of The Graduate College of the University of Nebraska at Omaha, in partial fulfillment of the requirements for the degree Master of Arts.

Graduate Committee

Harold J. Pitasciek, Jr.

Name

Department

Chairman
Spatial growth has been a significant factor contributing to and resulting from the changing structure of American cities. This research project attempts to identify the spatial growth and the resulting land use patterns and areal associations of a portion of the dynamic growth area of Omaha, Nebraska.

Research indicated that the study area is transitional in nature between rural and urban activities, that land use patterns and areal associations exist, and that the pre-1960 road pattern is an important factor shaping the character, pattern, and land use activities. It was recognized that heterogeneous land use activities characterize a changing, developing, or transitional area. Land use maps, land use profiles, and quarter section data sheets were constructed which would illustrate and identify the areal patterns and associations.

A land use analysis of quarter sections was conducted to measure, record, and interpret the data. The
amount of land in each land use classification was coded, mapped, and measured for each forty acre quarter of eighty-two quarter sections. The percentage of land in each forty acre quarter was determined and used to construct the final maps and land use profiles.

Analysis of the land use profiles indicates that a positive correlation exists between the areal distribution of residential, streets and roads, commercial, and vacant land activities within the study area. A negative correlation is indicated between the areal distribution of agricultural activities and all other land use activities.

It is suggested that the results of this research project indicate that an areal association exists between several land use activities within the study area. The location, distribution, and areal association of land use activities can be partially explained through the influence of topography, the pre-1960 road pattern, the planning process, and the development process.
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CHAPTER I

Introduction

In recent years, spatial growth has been an important factor contributing to and resulting from the changing structure of American cities. The urbanization of the American population should be recognized as a continuing process. The growth of the American population in terms of total numbers has been accompanied by a movement of the population from rural to urban areas. Based on data from the United States Bureau of the Census, slightly more than 50 percent of the American population was living in urban areas by 1920. This process has accelerated through the present time, while the cities themselves have undergone a movement of population from the central city to the suburban areas. Clawson (1971, p. 33) identified the population movement as follows:

The urban proportion of the total United States population has risen steadily since the first Census in 1790. On a national plane, movement toward cities is a form of population aggregation, a centripetal movement of people. But, from very early days to the present, cities have grown in population by expanding outward. Hence, at the scale of the city or metropolis, the population shift is one of disaggregation, and a
centrifugal movement. These twin move­ments -- population concentration on a national scale and population decen­tralization on a metropolitan scale -- have been under way for many decades and seem likely to continue indefinitely.

Numerous social, economic, and political processes are at work within the city producing the movement to the suburbs and the decline of the central city. An element in understanding these processes is the change in the structure and patterns of the city or any portion of the city. The city is continually changing and developing to meet new needs. With continued population growth, new living and working space must be added to the city. This space may be found within the central city by redevelop­ment of older areas or vacant parcels of land. However, much of the literature seems to agree that the living and working space necessary to accommodate the continual growth has been and will be found at the growing edges of the city. As stated by Niedercorn and Hearle (1964, p. 105):

The years subsequent to World War II have brought unprecedented changes in the nation's largest cities. Rapid urbanization of the population coupled with a high birthrate has caused metropolitan areas to mushroom all over the country. Most of the growth has occurred in the suburbs rather than the cen­tral cities. In fact, during the 1950-1960 period, twelve of the thirteen largest cities in the United States declined in population.
Purpose and Problem of Study

It was the purpose of this research project to investigate and identify the areal expansion of a central city -- Omaha, Nebraska -- and the resulting development of land use patterns within a specific study area. It was recognized that as the needs of the community change, the land use pattern changes. Preliminary research indicated that as the process of change takes place, patterns of land use begin to emerge as the land is developed, or converted from rural to urban purposes. The land use patterns which develop can be identified and evaluated in terms of their characteristics, distributions, areal associations, and development through time.

This research project therefore attempts to provide a solution to the following problem: Within the study area, what are the patterns and spatial distributions of the land use activities and what are the areal associations and interrelationships between these patterns and activities? The problem involves identifying the present distribution and characteristics of the land use patterns and their areal associations within a specific study area in the dynamic growth area immediately to the west of Omaha, Nebraska.

In an analysis of the development of land use patterns, attention must be given to the characteristics
of the land use patterns as they presently exist within the study area. Preliminary research indicated that land use patterns and areal associations could be identified within the study area. It is difficult to separate any particular growth area for study and analysis due to the numerous complex interrelationships with the central city. However, examination and analysis of land use patterns as they are developing at any specific time and within any specific growth area can aid in understanding the processes, the areal associations, and in planning for future growth and development.

Since this research project is concerned with land use patterns, the use of the term land use patterns merits further consideration and definition as it is used in the context of this research project. According to L.S. Bourne (1971, p. 69), land use patterns are the distribution of land uses and activities in a city. The patterns summarize the distribution of urban activities and populations and indicate regularities in land use activities. The patterns are an arrangement of form with a specific direction, tendency, or characteristics.

For the purposes of this research project, the term land use patterns is defined as a summary of the distribution of land use activities including both urban and rural land uses. It was necessary to identify the
land uses or elements which possess regularity, direction, tendency, or specific characteristics before a pattern can be said to exist.

Urbanisation and Location Theory

Population growth and areal expansion of American cities has resulted in a changing form and structure of urban areas. Several theories have attempted to explain the growth and spatial structure of land use in American cities. Among the early land use theories was the theory of urban growth presented by Hurd (1911) who contended that the observed pattern of land uses in the city was the result of the growth process of the city. According to Hurd's theory, central growth takes place from the heart of the city, and also from each subcenter of attraction, while areal growth pushes into the outlying territory along transport routes. (Garrison, Berry, et al., 1959, p. 144).

Other well-known theories are the concentric zone theory (Burgess, 1923), the sector theory (Hoyt, 1939), and the multiple-nuclei theory (Harris and Ullman, 1945). Colby (1933) maintained that the urban land use pattern is constantly in a process of evolution through modification of established functions and the additions of new ones. Colby's centrifugal-centripetal forces approach was therefore a dynamic approach which emphasized
the element of time.

Whatever the respective merits of each, the theories of urban spatial structure and growth provide concepts as a point to begin in understanding the spatial growth, structure, and land use patterns of American cities. The theories provide a means by which some degree of order and understanding can be achieved from the apparent mixture of commercial, industrial, residential, and public land uses.

Although generalizations concerning city structure and growth can be made which apply to all cities, land uses vary from city to city giving each city a character of its own. In a recent study by Allen D. Manuel for the National Commission on Urban Problems entitled Three Land Research Studies (1968), land uses in many of the major American cities were classified and generalized. Table 1 is a summary of Manuel's findings as reported by Clawson (1971, p. 49). The table provides a point of reference for comparison with specific cities such as Omaha. Clawson noted in particular the relatively large amounts of undeveloped land and land devoted to public use.

Table 1 indicates that in cities of over 100,000 population, more than 70 percent of the land is residential, undeveloped, or used in public streets. The
<table>
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<th>40 Cities of 250,000 Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent Acres Per 1,000 of Land Area</td>
<td>Popu- lation</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>130.1</td>
</tr>
<tr>
<td>Public Streets</td>
<td>17.5</td>
<td>22.8</td>
</tr>
<tr>
<td>Total excluding public streets</td>
<td>82.5</td>
<td>108.3</td>
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<tr>
<td>Privately owned, total</td>
<td>67.4</td>
<td>89.2</td>
</tr>
<tr>
<td>Residential</td>
<td>31.6</td>
<td>44.3</td>
</tr>
<tr>
<td>Commercial</td>
<td>4.1</td>
<td>5.4</td>
</tr>
<tr>
<td>Industrial</td>
<td>4.7</td>
<td>6.1</td>
</tr>
<tr>
<td>Railroads</td>
<td>1.7</td>
<td>2.4</td>
</tr>
<tr>
<td>Undeveloped</td>
<td>22.3</td>
<td>26.9</td>
</tr>
<tr>
<td>Public and semipublic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(excluding streets)</td>
<td>13.7</td>
<td>15.8</td>
</tr>
<tr>
<td>Recreational areas</td>
<td>4.9</td>
<td>5.6</td>
</tr>
<tr>
<td>Schools and colleges</td>
<td>2.3</td>
<td>3.3</td>
</tr>
<tr>
<td>Airports</td>
<td>2.0</td>
<td>3.1</td>
</tr>
<tr>
<td>Cemeteries</td>
<td>1.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Public Housing</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Others (by subtraction)</td>
<td>3.0</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Source: Clawson, 1971, p. 49
relatively large amounts of land in public streets and undeveloped land would seem to indicate a decrease in the intensity of land use, which is a point made by many writers on the topic of urban sprawl.

The purpose of this research project is to identify land use patterns and areal associations of land use activities. However, external social, economic, and political factors act upon the development of the various land use activities, patterns, and areal associations. These external factors must be accounted for since the land use patterns are the visible results of the social, economic, and political processes acting upon the landscape.

Many studies have dealt with the nature of the social, economic, and political processes involved in urban sprawl and in residential, commercial, and industrial location. The discussion which follows will attempt to provide an overview of how fringe areas come about (urban sprawl), to review the principles of location theories which aid in explaining residential, commercial, and industrial location, and to apply these principles to the study area of this research project.

The area under study in this project is typically a fringe area of an urban center (Omaha, Nebraska). It is a part of the urban sprawl about which much has been
written. Sprawl is sometimes described as the scattering of urban settlement over the rural landscape (Gottman, 1961, p. 334). According to R.G. Harvey and W.A.V. Clark,

Sprawl, measured as a moment of time, is composed of areas of essentially urban character located at the urban fringe but which are scattered or strung out or adjacent to undeveloped sites or agricultural areas. A sprawled area has a heterogeneous pattern of land use activities.

(L.S. Bourne, 1971, p. 476)

As the results of this research project indicate, urban settlement within the study area is scattered throughout the rural landscape and there is a heterogeneous land use pattern.

Harvey and Clark conclude that sprawl occurs in three major forms: low density continuous development, ribbon development sprawl which are compact developments within themselves but which extend axially and leave the interstices undeveloped, and leapfrog development which is the settlement of discontinuous patches of urban uses. (L.S. Bourne, 1971, p. 476).

The causes of urban sprawl were outlined by Harvey and Clark as follows:

1. Independence of decision among competitors.
2. Speculation which withholds land from development.
3. Physical terrain which is not suited for development.
4. Public regulation which may be limited or non-existent in fringe areas.
5. Transportation which provides access to remote areas.
6. Public policy which supported the single-family residence.
7. Buyers seeking a particular environment.
8. Taxation.

(L.S. Bourne, 1971, p. 477)

In addition, it might be added that new living and working space must be added to the city as the population increases. This space will most likely be added where physical and economic resistance is the least, which is primarily the agricultural areas of the urban fringe.

The preceding causes of urban sprawl outlined by Harvey and Clark identify the general factors influencing location in the fringe areas. The question remains as to what specific advantages fringe areas offer to commercial, industrial, and residential activities. Many theories of location attempt to explain fringe location advantages in terms of site, accessibility, lower taxes, more space, and other favorable aspects of location. However, recent research and literature has shown the economic process to be an active agent influencing commercial, industrial, and residential location.

Garrison and Berry (1959, p. 61), reviewed the
various theories of location and stated that Haig and subsequent contributors to location theory recognised that a basic ordered system of land uses resulted from the operation of economic processes in society. Garrison and Berry (1959, p. 61) concluded that

... the locational pattern of land uses in urban areas results from basic economic forces, and the arrangement of activities at strategic points on the web of transportation lines is a part of the economic mechanism of society. ... Since business foci (centers) provide one observable set of central locations and focal points in present complex patterns of urban land uses and rents, they can provide clues to the eventual understanding of the larger problem of competitive bidding for urban land and resulting patterns of land uses.

Much of the literature indicates that it is the economic ability of any particular land use activity to competitively bid for urban land which shapes the land use pattern. It is reasoned that industrial and commercial activities have the ability to bid for the high-value land. The literature on rent theory and location theory indicates that the high-value land is generally located along or near the major streets and street intersections. Therefore, within fringe areas, it is common to find oil stations, service centers, shopping centers, and other commercial activities which can afford the high-value land and depend upon access to street
traffic, located at street intersections and in ribbon developments along major streets. The ability of the individual to pay the high 'rents' is generally lacking. Therefore, residential developments are generally located within the 'grids' produced by the major streets.

It should be noted that according to Garrison and Berry social and political forces tend to restrain the economic factors mentioned above. For example, city and regional planning and zoning play an active role in shaping the land use patterns and the locations of various activities by controlling the use of the land. The social factor involves the desirability of any particular area for residential use which according to Garrison and Berry involves access to the rest of the city. Other factors such as lower taxes, more space, less congestion, and better access influence residential location. Private developers shape the land use pattern in an active manner due to the fact that they evaluate the trends, markets, and site desirability and decide where commercial and residential developments will be located.
CHAPTER II

Study Area Perspective

The Areal Expansion of Omaha

The process of land development within the Northwest Omaha study area is related to the development and growth of the Omaha metropolitan area. As Omaha grows in numbers of people, much of the resulting spatial growth takes place as land development or expansion in agricultural areas to the west and south of the built-up portions of Omaha.

The Omaha Standard Metropolitan Statistical Area has experienced a steady population growth consisting of a 12.7 percent increase from 1940 to 1950, a 25 percent increase from 1950 to 1960, and a 22.4 percent increase from 1960 to 1970. (Table 2). The projected increase from 1970 to 1980 shows the rate of increase slowing to about 13.8 percent. The Omaha City Planning Department, reflecting the percentage growth rate in the CMATS population trends and forecasts, has projected a growth of the Omaha SMSA and of Douglas County as indicated in Table 2. Table 2 indicates a population growth rate for both the SMSA and Douglas County of substantially more than one percent per year from 1940 to 1970, and projected
Table 2
Population Trends and Forecasts
Omaha SMSA, 1940-1985

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>Percent Growth</th>
<th>Population</th>
<th>Percent Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>325,153</td>
<td>7.4%</td>
<td>247,562</td>
<td>7.4%</td>
</tr>
<tr>
<td>1950</td>
<td>366,395</td>
<td>12.7%</td>
<td>281,020</td>
<td>13.5%</td>
</tr>
<tr>
<td>1960</td>
<td>457,873</td>
<td>25.0%</td>
<td>343,490</td>
<td>22.2%</td>
</tr>
<tr>
<td>1970</td>
<td>564,300</td>
<td>22.4%</td>
<td>416,200</td>
<td>20.4%</td>
</tr>
<tr>
<td>1980</td>
<td>644,600</td>
<td>13.6%</td>
<td>467,000</td>
<td>11.6%</td>
</tr>
<tr>
<td>1985</td>
<td>679,300</td>
<td>05.1%</td>
<td>469,700</td>
<td>04.8%</td>
</tr>
</tbody>
</table>

Source: OMATS, 1970, p. 18

to 1985. During the decades of 1950 and 1960 a growth rate of more than two percent per year is indicated while the projected growth rate is lower from 1970 to 1985. According to the 1985 projections in Table 2, the Omaha SMSA will double in size in terms of population from 1940 to 1985. The additional population growth will require new living and working space. According to past trends, the additional space will most likely be provided for by expansion into agricultural areas where land is available. The growth trends of Omaha, as identified by
the City Planning Office, indicate that Omaha originally expanded in a north and south direction until about 1920. From 1920 to the present time expansion has been primarily to the west with the current growth areas located to the northwest, west, and south. At the present time, there seems to be no reason to doubt that the growth to the west of Omaha will continue.

In 1958, William B. Baker conducted a study entitled *The Areal Growth of Omaha, Nebraska, with Emphasis on the Westside Area.* (Unpublished Ph.D. Dissertation, Department of Geography, University of Nebraska). Baker examined the historical growth of Omaha from 1887 to 1955 through the use of cartographic representations of land uses through time sequences. The purpose was to examine the areal expansion of Omaha through time and to examine the factors relative to the patterns developed by the growth of the city.

Baker examined in detail a study area of west Omaha which was located on the urban fringe in 1956. Cartographic representations of land uses through time, evaluations of land ownership, real estate values, and factors of expansion were used to identify characteristics of the zone of urban transition. From observations of Baker's work, it is noted that the area studied in 1958 and found to be undergoing development from rural to
urban uses is today nearly entirely an urbanized area.

A portion of Baker's study area overlaps a portion of the study area of this research project. The overlapping area is bounded by West Dodge Road, Blondo Street, 90th Street, and 120th Street. It is important to note at this point that the overlapping area was indicated by Baker as being almost entirely in large-scale agricultural use. The urban development which is evident in this area today has therefore taken place since Baker's study in 1958.

The significance of Baker's study to this research project is in the comparison of the two study areas which illustrates the fact that the urbanisation process 'enclosed' Baker's study area and is continuing in its westward movement as the Omaha population continues to grow in numbers and the city in area. Baker's study thereby provides a detailed study of land use activities at a moment in time (1958) to which comparisons to the present can be made.

John P. Zipay, in his research project entitled The Changing Population of the Omaha SMSA 1860-1967 with Projections for 1970 (Omaha Urban Area Research Project, University of Omaha, July, 1967) analyzed the population structure of the Omaha metropolitan area through time and illustrated the pattern of urban settlement. As
Evans though a metropolitan area like Omaha may be increasing its population, certain portions of that area are experiencing different rates of growth. A "typical" American city, for example, has a rapidly growing urban fringe but a central core that is losing population. By "changing scale" and focusing on smaller units within the metropolitan area, such as census tracts, one can note where the interval changes are taking place.

In summary, Zipay's study notes that Omaha's population growth has been greatest in the post-war period, resulting from cycles of residential construction in the fringes of the urbanized areas primarily to the west and south of the city of Omaha. (Zipay, 1967, p. 3). Although acknowledging the population growth of the city of Omaha in terms of total numbers of persons, Zipay contends that as much as 60 percent of the city's growth was due to annexation of urban fringe territory. Zipay concluded that the older inhabited sections of the city and the rural countryside lost population from 1940 to 1960 while the urban fringe areas to the west and south of the city were the rapidly growing sections of the metropolitan area of Omaha. (Zipay, 1967, pp. 18-30).

The continued expansion and growth of the urbanized area to the south and west of the city of Omaha will require additional agricultural land to be converted to
urban uses. The Douglas County Planning Commission and OMATS have projected the land acreage requirements for future urban expansion. The two projections differ greatly in projected total acreage requirements. The acreage requirements projected by OMATS are reported in Table 3.

Table 3
Omaha SMSA Land Use: 1966 - 1985

<table>
<thead>
<tr>
<th>Land Use</th>
<th>1966 Acres</th>
<th>1985 Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>21648</td>
<td>29161</td>
</tr>
<tr>
<td>Commercial</td>
<td>5744</td>
<td>5086</td>
</tr>
<tr>
<td>Industrial</td>
<td>3607</td>
<td>7405</td>
</tr>
<tr>
<td>Public and Semi-Public</td>
<td>12843</td>
<td>14542</td>
</tr>
<tr>
<td>Other</td>
<td>144447</td>
<td>132095</td>
</tr>
<tr>
<td>Total</td>
<td>188289</td>
<td>188289</td>
</tr>
</tbody>
</table>


The OMATS acreage requirement projection indicates an SMSA increase in urban acreage of 12,252 acres from 1966 to 1985 with a resulting decline in 'other' acreage by the same amount. It can be assumed that public street acreage requirements will increase with urbanization. Therefore, the difference of 12,252 acres must be taken
from the agricultural (other) acreage. However, the OMATS projection anticipated that 12,252 acres or more would be required for additional urbanization by 1985.

By contrast, the Douglas County Planning Commission (1964) has transposed the projected population increase into land requirements for the Omaha SMSA. The Commission as a result anticipates that an additional 27,600 acres will be needed for urban expansion by 1980, the total being over 100 percent of the 25,165 acres in urban use in 1964. The Commission projects more than twice the acreage requirements of the OMATS projection.

It is recognized and anticipated that whether the land acreage requirement is 12,000 or 27,000 acres, the requirement will be met where the economic and physical resistance is least, which is the agricultural areas primarily to the west and south of the city of Omaha. With over 12,000 acres of land development (anticipated) within a twenty year period (1964-1985), new patterns of land use will likely develop within the study area. It is therefore recognized that this research project should undertake to identify the developing land use patterns, spatial distributions, and areal associations within a portion of the growth area of west Omaha.

It is therefore established that there is a functional relationship and association between the Omaha metropolitan area and the study area (Map 01: Eastern Douglas
County and the Study Area in which the development of land within the study area relies basically upon the continued growth of the metropolitan area. The study area is not recognized as an independent, self-sustaining entity, but rather it is dependent upon the metropolitan area for sustained growth, public services, public utilities, employment of residents, and other social, economic, and factors which create the functional relationship.

The relationship of the study area to metropolitan Omaha is further illustrated by the findings of OMAATS which reported that in 1966 the area enclosed within the study area had a population of approximately 13,395 of which only 27 persons were employed in manufacturing and 854 persons employed in retail trade activities. The findings of the present research project indicate that only 167 acres or 1.27 percent of the study area is industrial land, and 214.5 acres or 1.63 percent of the study area is commercial land. In addition, the growth trends of the city of Omaha, as reported by the Omaha City Planning Office, indicate that annexations are primarily to the west of the central city. This indicates that the residents of the study area are dependent upon the central city for employment, public services, and continued growth of commercial and industrial areas. As a result, the study area does not appear to have the
economic base to support its residents without reliance upon the central city.

Delimitation of the Study Area

The foregoing discussion was concerned primarily with introducing the problem for study and with providing relevant background information, concepts, and summaries of previous studies concerned with the growth of Omaha in terms of population growth and areal expansion. In order to develop the solution to the problem of identifying characteristics, spatial distributions, and areal associations of land use patterns within the dynamic growth area of west Omaha, a study area was selected on the basis of the findings of preliminary research and observations conducted within the growth area. The northwest Omaha study area was selected on the basis of examination of previous development trends, availability of information, and the recognition that it is a portion of the dynamic growth area of west Omaha which differs in character from the immediate surrounding area.

The limits of the study area were established as 90th Street, West Dodge Road, 150th Street, and State Street. (Refer to Map 01: Eastern Douglas County and the Study Area). The limits of the study area were selected according to the differing nature of land use activities in the immediate surrounding area.
Preliminary investigation indicated that 90th Street would be the logical eastern limit. It was found that much of the area to the east of 90th Street was developed for urban purposes before 1960. West Dodge Road was selected as the southern limits due to the differing nature of development south of West Dodge Road. Much of the area south of West Dodge Road was developed before development began within the study area north of West Dodge Road. The western and northern limits of the study area were established at 150th Street and at State Street. West and north of these streets the land use is predominantly agricultural while pockets of urban development are to be found immediately to the east and south.

In general, the total study area was delimited as such because preliminary research seemed to indicate that the total area selected had a certain cohesiveness or similarity in the type of development and general land use patterns which were occurring throughout. Little or no urban development had taken place within the study area before 1960. The immediately surrounding areas differed subtly in their nature which became obvious once the total study area was delimited and researched.

The northwest Omaha study area consists of a total area of 20.5 square miles, of which 17 entire sections and portions of 7 sections are included. Each section or
square mile consists of 640 acres for a total of 13,120 acres within the study area. The 20.5 sections are divided into 82 quarter sections each of which were classified, measured, and evaluated throughout this research project.

It is necessary to note that the study area contains a relatively large amount of land classified as agricultural. Of the total 13,120 acres, 7,390 acres or 56 percent of the total study area are classified as agricultural. Research indicated that substantial urban development was to be found at a considerable distance from what would properly be termed the urbanized area. Since the purpose of the research project was to evaluate the development process, patterns, and associations of land uses, it was imperative that these important elements of urban growth be included within the study area. The study area is therefore an example of the urban sprawl of Omaha as it was discussed in Chapter 1.

Map 01: Eastern Douglas County and the Study Area is a location map showing the relationship of the location of the northwest Omaha study area to the immediately surrounding territory. The city of Omaha occupies much of the area to the east and south of the study area. Map 01 also serves to identify the range, township, and section numbers. The range, township, and section numbers were included in order to provide accurate locational description.
The study area maps for types of land use include the quarter-section index number for further locational description.

Perspective of the Study Area

The northwest Omaha study area is a dynamic growth area. The preceding discussion was concerned with the association of the study area with the central city of Omaha. Chapters 3, 4, and 5 which follow attempt to identify the characteristics of the study area. Before proceeding, it is necessary to develop a perspective of what the study area is like in general and in its social, economic, and political functions. Space, time, and social-economic dimensions must be accounted for before the land use patterns can be identified.

Within the study area, the natural physical features which may have an influence upon the land development process and urban growth patterns are the topography and the floodplains of Thomas Creek and Big Papillion Creek. The topography consists generally of relatively steep sloping loess hills. The stream valleys trend from the northwest to the southeast. Elevation varies from a high of about 1,240 feet in the north to a low of about 1,050 feet in the southern portions of the study area. Relative local relief averages about 100 feet throughout the study area.
Comparison of Illustration 1 (Northwest Omaha 1958) and Illustration 2 (Northwest Omaha 1971) provides a time and space perspective of the study area. Striking changes in land use activities are revealed such as the change from agricultural to residential land uses. Although the study area is dynamic in terms of urban growth and although the time dimension is considered to be an important element in explaining change, the time factor was secondary in this research project. This was due to the fact that in 1958 the entire study area was agricultural in nature, as observed in Illustration 1. As observed in Illustration 2, by 1971 the study area had undergone profound change and was in the process of urban development. It is therefore established that most of the change and urban development has occurred within the last fourteen years (1958-1972). With this fact established, the remainder of this research project concentrated on the space dimension or the identification of spatial distributions and areal associations of land use activities as they exist at one moment in time (1972).

Illustrations 1 and 2, which were both taken of the West Dodge Road and 90th Street intersection at two points in time, and are oriented to the north-northwest, illustrate not only the change which has taken place, but also the influence of topography and the pre-1960
'rural' road pattern has become the basic framework for the pattern of urban development. The pre-1960 roads tend to follow the trend of the floodplains and ridge-tops and also the section lines. The resulting network of roads which have developed since 1958 have been guilt within that framework.

It is recognized that it is the social, economic, and political factors which in the end decide where urban growth takes place and where a specific residential or commercial development is located. However, as reported in Chapter 5 of this research project, it is contended that the results of this research project indicate that the pre-existing pattern of streets and roads play an important role in shaping the patterns of urban development. Although the choices are made through economic, social, and political decisions, the framework is already 'preestablished.' The streets and roads pre-exist urban development, provide access to the metropolitan area, and influence the pattern of development.

In order to provide a perspective of the social and economic conditions and characteristics of the study area, the 1970 Census of Housing Block Statistics, Census of Population, and the Omaha Metropolitan Area Transportation Study (OMATS, 1966) were consulted. It was found that comparison of the data for 1966 and 1970 reveal rapid
population and housing growth. In 1966 the study area had a population of 13,395 and 3,558 housing units. By 1970, there was a population of 30,468 and 9,036 housing units. The data therefore indicates a population growth of 17,070 persons and 5478 housing units within four years, which verifies the dynamic character.

It was found that the average value of houses was $29,040 compared to an average of $16,700 for the city of Omaha. Average apartment rents paid was found to be $164 as compared to Omaha's $102 per month. The data also revealed that 43 percent of the population is under 18 years of age and 3.4 percent are over 62. By comparison, 35 percent of Omaha's population is under 18 and 12 percent is over 62.

The social and economic perspective of the study area in summary therefore reveals that the study area consists of a relatively young population, with above average value homes and apartment units. Rapid growth is evident as revealed by the 5478 housing units built from 1966 to 1970 and by the population increase of 17,070 persons within the same period.
CHAPTER III

Method of Study

The problem of identifying land use patterns and areal associations within the study area was approached from two dimensions — time and space. The present spatial distributions and areal associations of land use activities were considered as well as the development process through time. The method employed for this research project consisted of a quarter section analysis of the study area. Several steps were necessary in order to identify patterns and associations.

Land use patterns exist as a moment in time in the continuing process of urbanization. To evaluate the land use patterns as they presently exist, it was necessary to identify the change which has taken place through time. To accomplish this objective, vertical and oblique aerial photographs and maps of the study area were compared and evaluated for the years 1949, 1955, 1959, 1965, 1971, and 1972. The development of the growth pattern could be traced in this manner. The time element was considered as a secondary and preliminary factor.

Empirical data was needed which would test the
validity of the hypothesis and aid in reaching conclusions and generalizations concerning spatial distributions and areal associations. To provide the data, a quarter section analysis was undertaken. The procedure is outlined in the following discussion.

Quarter Section Analysis

The quarter section analysis began by obtaining eighty-two quarter section maps of the study area at a scale of 1 inch to 200 feet from the Omaha City Planning Department. The scale of the maps was such that individual lot lines were shown and streets and other areas were drafted to a measurable scale. Each of the quarter section maps was divided into quarters representing forty acres each. There was a total of 328 forty acre units for the entire study area which provided an efficient grid system for measurement and evaluation. The forty acre grid system provides the basis of Maps 02-09.

It was necessary to determine what information and land use data was essential to the study project. Several land use classification systems were considered with the decision being to modify and use the land use categories as developed by the Public Administration Service, *Mapping For Planning*, 1948. The modified land use classification is provided (Illustration 3) as a sample sheet for reference.
ILLUSTRATION 3

LAND USE CLASSIFICATION

<table>
<thead>
<tr>
<th>Residential:</th>
<th>Code:</th>
<th>Prismacolor:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Family ....................</td>
<td>SF</td>
<td>915 Lemon Yellow</td>
</tr>
<tr>
<td>2-Family ................................</td>
<td>2F</td>
<td>939 Flesh</td>
</tr>
<tr>
<td>3 and 4-Family ....................</td>
<td>34F</td>
<td>917 Yellow Orange</td>
</tr>
<tr>
<td>Multiple Dwelling .................</td>
<td>APT</td>
<td>946 Dark Brown</td>
</tr>
<tr>
<td>Mobile Homes ........................</td>
<td>M</td>
<td>930 Magenta</td>
</tr>
<tr>
<td>Hotels and Motels ................</td>
<td>MH</td>
<td>931 Purple</td>
</tr>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Local (neighborhood Business .</td>
<td>LB</td>
<td>929 Pink</td>
</tr>
<tr>
<td>Offices and Banks ................</td>
<td>O8</td>
<td>921 Vermilion Red</td>
</tr>
<tr>
<td>General Business ..................</td>
<td>GB</td>
<td>923 Scarlet Lake</td>
</tr>
<tr>
<td>Intensive Business ................</td>
<td>IB</td>
<td>925 Crimson Lake</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Industrial:</th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Industry ....................</td>
<td>LM</td>
<td>937 Light Gray</td>
</tr>
<tr>
<td>Railroads and Public Utilities ..</td>
<td>RM</td>
<td>936 Dark Gray</td>
</tr>
<tr>
<td>Heavy Industry ...................</td>
<td>HM</td>
<td>935 Black</td>
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<table>
<thead>
<tr>
<th>Public:</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Parks ................................</td>
<td>P</td>
<td>910 Emerald Green</td>
</tr>
<tr>
<td>Public Schools ....................</td>
<td>PS</td>
<td>909 Grass Green</td>
</tr>
<tr>
<td>Public Buildings ..................</td>
<td>PB</td>
<td>908 Dark Green</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Quasi-Public:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Quasi-Public Open Uses ...........</td>
<td>QPC</td>
<td>903 True Blue</td>
</tr>
<tr>
<td>Churches ...........................</td>
<td>QPC</td>
<td>902 Ultramarine</td>
</tr>
<tr>
<td>Quasi-Public Buildings ...........</td>
<td>QPB</td>
<td>901 Indigo Blue</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Agricultural:</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Crop Land ..........................</td>
<td>AC</td>
<td>912 Apple Green</td>
</tr>
<tr>
<td>Livestock Land ....................</td>
<td>AL</td>
<td>911 Olive Green</td>
</tr>
<tr>
<td>Woodland ...........................</td>
<td>AW</td>
<td>908 Dark Green</td>
</tr>
<tr>
<td>Vacant Land ........................</td>
<td>V</td>
<td>No Color</td>
</tr>
<tr>
<td>Streets-Roads-Highways ...........</td>
<td>SRH</td>
<td>964 Very Light Gray</td>
</tr>
</tbody>
</table>

All parcels of land within the study area were classified according to the categories outlined.

The procedure of classifying each parcel of land involved preliminary visual inspection in order to gain familiarity with the study area. As much classification as possible was done by examining vertical aerial photographs taken of the study area in January, 1972. Where the unit of land could be classified with certainty, the information from the aerial photograph was coded according to the categories outlined in Illustration 3. The code (SF, IB, P, etc.) was then entered in the appropriate unit area on the quarter section map.

In a number of areas the quarter section maps were incomplete in terms of portraying all of the unit areas, particularly in showing individual fields within the agricultural areas. The aerial photographs provided a means by which such boundaries could be drawn to scale on the quarter section maps.

If any uncertainty existed as to the use of a particular parcel of land, field observation was performed by surveying the area by automobile. Field inspection was the basis of the final classification and a check for accuracy.

When the initial classification was complete, a review of the field mapping was conducted to check for
accuracy. It should be noted at this point that a land use classification survey, such as this project, is by its nature outdated even before it is completed. For example, the initial classification was complete in April, 1972. While working on the remaining parts of this study project, the study area was traversed many times. It was noted that several areas which had previously been classified as vacant or agricultural land now contained new housing units or apartment buildings indicating that change is rapid within the study area. These changes in land use were updated as much as possible on the quarter section maps. The rapid change in land use emphasizes the dynamic character and growth of urban development within the study area.

The next step in the procedure was to color code the land use activities on the quarter section field maps. Classification and color codes established by the Public Administration Service, *Mapping for Planning* (1948, pp. 9-10) were used for this purpose. The color code is included for reference in Illustration 3.

In order to record and evaluate the data obtained from the completed quarter section field maps, the land use data sheets were developed and printed. Illustration 4 is a sample of the data sheets used in recording the total acres and the percent of total acres for each land use
### ILLUSTRATION 4
SAMPLE DATA INFORMATION SHEET

<table>
<thead>
<tr>
<th>CLASSIFIED LAND USE</th>
<th>NORTHEAST</th>
<th>NORTHWEST</th>
<th>SOUTHWEST</th>
<th>SOUTHEAST</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TA</td>
<td>%</td>
<td>TA</td>
<td>%</td>
<td>TA</td>
</tr>
<tr>
<td>SF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2F</td>
<td></td>
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<tr>
<td>34F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>APT</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>M</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>HM</td>
<td></td>
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<tr>
<td>SUBTOTAL:</td>
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<td></td>
</tr>
<tr>
<td>LB</td>
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<tr>
<td>OB</td>
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<td>GB</td>
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<td>SUBTOTAL:</td>
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<tr>
<td>LM</td>
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<tr>
<td>PM</td>
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<tr>
<td>AC</td>
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<td></td>
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<tr>
<td>AL</td>
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<tr>
<td>AW</td>
<td></td>
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<tr>
<td>SUBTOTAL:</td>
<td></td>
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<td></td>
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<tr>
<td>V</td>
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<td></td>
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<td>VA</td>
<td></td>
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<td></td>
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<tr>
<td>VU</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>VUD</td>
<td></td>
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<td></td>
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<tr>
<td>SRH</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>SUBTOTAL:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL:</td>
<td>40A</td>
<td>100%</td>
<td>40A</td>
<td>100%</td>
<td>40A</td>
</tr>
</tbody>
</table>

**NOTE:** TA = Acres, % = Percent of Total Area.
160 Acres/\(\frac{1}{4}\) Section, 40 Acres/\(\frac{1}{4}\) of \(\frac{1}{2}\) Section
Classifications are modified from: Mapping For Planning, Public Administration Service, 1948.
See same for descriptions of classifications.
classification. The data from one quarter section was recorded on one sheet with the appropriate quarter section description and sheet index number for identification. The sheet is divided vertically into ten columns to record the data for each forty acre unit (quarter of a quarter section) with the data being recorded horizontally for each classification. The use of this sheet made it possible to maintain a constant check for accuracy for each of the measurements. It was necessary for each vertical column to total either forty acres or 100 percent. The total column to the right required that the subtotal for each classification check with the vertical total immediately above it. The vertical total had to equal 160 acres or 100 percent for the total quarter section. If the columns did not total properly, the measurements were remade.

The procedure required using a compensating polar-planimeter to measure the total number of acres for each land use classification. The planimeter, once adjusted properly, was capable of measuring total acres by forty acre units. Each quarter section was previously divided into four quarters of forty acres each. For each forty acre unit, the color coded land use observed within that area was noted. The planimeter was used to measure the total number of acres for each land use classification for
each forty acre quarter. The derived data was recorded and checked on the data sheets as noted above. The percent of forty acres and the percent of 160 acres for each classification was obtained through slide rule calculations.

When all of the forty acre quarters (328) were measured and the data recorded, summary totals were computed for each quarter section and for the entire study area. The summary totals for the entire quarter section analysis of the total study area are presented as Table 4, Study Area Summary. Table 4 is provided as a reference for the evaluation and analysis of the data. Table 4 can also be compared to Table 1, Land Use in Sample of Largest Cities, in order to relate the character and nature of the study area to characteristics of American cities identified by Manuel (1968).

In order to evaluate the recorded data identifying land use patterns and areal associations, it was necessary to construct and draft Maps 02-09, Land Use as Percent of Forty Acres and Figures 1-10, Land Use Profiles. These maps and figures present the classified land use data both cartographically and graphically. The maps are tools which illustrate spatial distributions and patterns of individual land use activities.

The land use profiles were constructed from the data for each of the major north-south and east-west streets
## TABLE 4

**STUDY AREA SUMMARY**

<table>
<thead>
<tr>
<th>CLASSIFIED LAND USE</th>
<th>TOTAL ACRES</th>
<th>% OF CLASSIFICATION</th>
<th>% OF STUDY PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF</td>
<td>1251.71</td>
<td>78.26</td>
<td>9.25</td>
</tr>
<tr>
<td>2P</td>
<td>11.35</td>
<td>0.73</td>
<td>0.09</td>
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<tr>
<td>34F</td>
<td>2.49</td>
<td>0.16</td>
<td>0.02</td>
</tr>
<tr>
<td>APT</td>
<td>224.23</td>
<td>14.40</td>
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</tr>
<tr>
<td>M</td>
<td>89.63</td>
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<tr>
<td>HM</td>
<td>10.85</td>
<td>0.70</td>
<td>0.08</td>
</tr>
<tr>
<td><strong>SUBTOTAL:</strong></td>
<td><strong>1554.26</strong></td>
<td><strong>(100.00)</strong></td>
<td><strong>11.85</strong></td>
</tr>
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**NOTE:** Classifications are modified from Mapping For Planning, Public Administration Service, 1948. Same for description. Data derived from measurements and slide rule calculations, June, 1972. 13,120.00 Acres (20.5 sq. mi.) Total Study Area.
within the study area. Their purpose is to graphically portray and reveal the areal associations of land use activities. Graphic correlations, both positive and negative, are observable on the land use profiles. Each of the profiles was evaluated after the land use distributions and patterns were determined from Maps 02-09. The land use profiles form the basis of the analysis of areal associations presented in Chapter V of this research report. The profiles are therefore included as a part of Chapter V.

Maps 02-09 were drafted with a quarter section grid system. Each quarter section was divided into four quarters of forty acres each. The forty acre units compose the grid system which can be observed on the maps. All data was grouped and recorded on the maps by forty acre units.

To aid in the identification of the location of specific forty acre units, the index number as established by the Omaha City Planning Department was included for each quarter section. When reference is made to a specific forty acre unit, it is identified and located on the maps by stating the quarter section index number and the directional location (northeast, northwest, southeast, or southwest) of the specific forty acre unit within the quarter section. For example, when reference is made to the forty
MAP 02
NORTHWEST OMAHA
RESIDENTIAL
LAND USE

Per Cent Of 40 Acres
- 00.0 - 04.9
- 05.0 - 29.9
- 30.0 - 59.9
- 60.0 or more

000 Index Number
0 .5 1.0 miles

6-72 K.N.
MAP 06
NORTHWEST OMAHA
AGRICULTURAL
LAND USE

Per Cent Of 40 Acres

- 00.0 - 24.9
- 25.0 - 49.9
- 50.0 - 74.9
- 75.0 or more

000 Index Number

0 0.5 1.0
miles

6-72 K.N.
acre unit located at the intersection of 90th Street and West Dodge Road, the locational identification will state 212SE which identifies the location as the southeast quarter of quarter section index number 212. Street names of major streets are also included within the margins of each of the maps to provide a perspective with which to relate the study area and portions of the study area to available street maps of the area.

Maps 02-08 are a series of land use maps designed to identify the distribution and patterns of various land use activities. Each map records the spatial distribution of a particular land use classification. Patterns of urban development can be identified from these maps. For each map, the data was grouped, color coded, and recorded by the percent of forty acres occupied by the activity.

Map 09 is a generalized land use map of the study area for 1972. It was constructed from the data by determining the particular land use activity which occupied the greatest percent of each forty acre unit. Generally, with some exceptions, it was found that the dominant land use activity, whatever it might be for each forty acre unit, was forty percent of the total area or more. In eleven cases, the forty acre units had to be split between land use activities when it was difficult to determine the
greatest or dominant percentage in any one land use activity. For example, several times the land use activity was divided as 50 percent and 50 percent which required splitting the forty acre units. The purpose of Map 09, Land Use 1972, was to aid in determining the areal associations between the various land use activities by screening out the less important (in terms of area occupied) land use activities.

Maps 02-09 were grouped together to aid in making comparisons between the individual maps. Generalizations concerning patterns, distributions, and areal associations between differing land use activities could be more easily identified through easier reference in this manner.
CHAPTER IV

Land Use Analysis: 1972

The purpose of Chapter IV is to present and evaluate the researched information and data relating to the spatial distributions of land use activities. Each land use activity is considered separately in reference to Maps 02-09 and Figures 1-10. As noted in Chapter III, the researched information was classified, (Illustration 3), graphically portrayed as land use profiles, and mapped according to classifications modified from Mapping for Planning (Public Administration Service, 1948). Maps 02-09 and Figures 1-10, in addition to the data recorded on the eighty-two land use classification sheets, (Illustration 4), form the basis of the following spatial analysis of the study area. The following analysis is primarily a descriptive analysis of each land use activity by the percent of forty acres. Table 4, Study Area Summary, is included at this point for reference.

Residential Land Use

Of the total 13,120 acres with the study area, 1,554.26 acres or 11.85 percent was classified as residential land use.
Single-family housing accounted for 1,215.71 acres or 76.26 percent of all residential land uses. Apartments accounted for 224.23 acres or 14.40 percent of all residential land uses while the remaining 7.34 percent of all residential land uses was divided among two-family housing, three- and four-family housing, mobile homes, and motels.

Residential land use is widespread throughout the study area, ranging from dispersed farmsteads to high density apartment complexes. Map 02, Residential Land Use, indicates that the greatest proportion of residential land use is located along 90th Street between Western Avenue and Fort Street. The proportion of land in residential land use declines and scatters to the west of 108th Street. At the intersections of the main streets -- 90th Street and West Dodge Road, 90th Street and West Maple Road, and 90th Street and Fort Street, the proportion of land in residential use declines. This decline is attributed to the use of this land for other purposes such as commercial and agricultural uses.

It is important to note the alignment of residential land use along or near West Dodge Road. By comparing maps of other land use activities and by field observation it is found that very little of the street frontage is in residential use. A number of the residential areas located
near West Dodge Road are mobile homes and motels. This observation is accounted for by the fact that the Residential Land Use Map (Map 02) is a representation of residential land use as a percentage of forty acres. As such, housing units could be clustered or dispersed throughout the forty acre unit as far as one-fourth of a mile from West Dodge Road.

Interstate 680 appears to have "enclosed" the residential areas to the east. The route of Interstate 680 can be traced roughly on Map 02 by noting the lower percentage of residential land use found within units 290, 288, 286, 284, and 282.

Several outliers of residential land use are identifiable to the west of 108th Street. These residential clusters consist of single-family and apartment housing located within an area bounded by Maple Street, Fort Street, 108th Street, and 120th Street. (Sheet Index Numbers 468, 487, 490, 489, 492, 491). By comparison with other maps, Maps 06, 07, 08, and 09, it is found that these residential clusters are nearly surrounded by agricultural activities. The proportion of land in streets and roads and vacant land increases within the identified area. The large proportion of vacant land indicates the transitional nature of the area noted.

Within the northeast portion of the study area
(Map 02), a cluster of residential land use is identifiable and is accounted for by the existence of the town of Irvington. Irvington differs in nature from most of the remainder of the study area due to the fact that it consists of older, pre-1960 residential settlement and development. Irvington is in many ways typical of the small Nebraska town, although it is beginning to display evidence (such as recent residential development) of the approach and influence of urbanization. Irvington is identifiable in units 442SE and 456NE as an area with a greater proportion of residential land than the immediately surrounding areas.

Pre-1960 settlement following the route of Highway 133 is noted in units 444NE, 444SE, 443NE, 443SE, and 445NE. In addition, units 481SE and 446SW are recorded as forty acre units with more than 60 percent of the land occupied by residential uses. The residential use of the land consists of a relatively recent development of a mobile home park.

In summary, it was found that residential land use is widespread throughout the study area and accounts for 11.85 percent of the total area. The greatest proportion of land in residential use is located within an area bounded by 90th Street, 108th Street, Western Avenue, and Fort Street. The influence of roads and highways is
a factor which has played a major role in shaping the residential land use pattern. The influence is identified by the linear pattern of residential land along the major roads and highways and by the clustering of residential land between major streets. Important street intersections along 90th Street show a decline of residential uses due to their probable value for other uses such as commercial activities.

Commercial Land Use

Land used for commercial purposes was recorded as a percentage of forty acres on May 03. All commercial land use activities were included which consisted of a great variety. Types of commercial activities vary from those requiring only a small amount of actual land area such as offices to those requiring large amounts of land area such as shooting ranges and automobile racetracks.

Commercial land use is not an important activity in terms of the total area occupied by such uses. However, commercial activity is a very significant localized activity in terms of providing goods and services for the residents of the study area. Only 214.50 acres or 1.63 percent of the total 13,120 acres was used for commercial purposes.

The localized areas of commercial activities
identified on Map 03 occur in several areas near 90th Street. Commercial developments near 90th Street consist of both string type commercial areas and shopping centers. Shopping center commercial activity near 90th Street includes Irvington (456NE), the intersection of Fort Street and 90th Street, and the intersection of Maple Street and 90th Street. String type commercial activity is located primarily near 90th Street and between Maple Street and Blondo Street.

The most important commercial activity within the study area in terms of both amount of land occupied and providing goods and services is the Westroads Shopping Center located immediately north of West Dodge Road from about 96th Street to Interstate 680. (Sheet Index Numbers 289, 290SE). Although it is located within the study area, Westroads Shopping Center serves the entire metropolitan area of Omaha as a regional shopping center.

It should be noted that in classifying commercial land such as shopping centers, the entire land area occupied by the actual commercial activity and the parking facilities was classified as commercial land use. The reasoning for this classification was that the commercial activity could not function without parking facilities. Although land used for parking facilities could relatively easily be converted to other uses, it is unlikely that this
would occur due to the need for parking space.

Two additional commercial activities within the study area are of a different nature than those previously discussed. These commercial areas are a shooting range (543SE) and Sunset Speedway (480NE, 480SE) which are located in predominantly agricultural areas. Both commercial activities require relatively large amounts of land. The nature of these two commercial activities, involving noise and some element of danger, probably has much to do with their location outside the urbanized areas.

In summary, it was found that commercial land use activities are not a prominent feature in terms of the total land area occupied. Commercial activities are however important elements in localised areas providing goods and services to the community. Localized areas of commercial activities were identified as Irvington, 90th Street including both string type and shopping center development, Westroads Shopping Center, a shooting range, and Sunset Speedway.

Industrial Land Use

Industrial land use activities, much like commercial activities, are not a widespread element throughout the total study area. Of all classifications, industrial land use occupied the smallest amount of total land area. Only
167 acres or 1.27 percent of the total study area was classified as industrial. According to Map 04, industrial land use is located in localized areas primarily west of Interstate 680. This is likely due to the nature of industrial activities which generally require relatively large blocks of land but are considered undesirable elements in residential areas.

Five localized areas of industrial activities can be identified on Map 04, Industrial Land Use. Several manufacturing plants are located at 108th Street and West Dodge Road (290SE) which together occupy more than 25 percent of the total forty acres. It should be noted however, that Map 09, Generalized Land Use indicates that the greatest percentage of land use for this forty acre unit is streets and roads.

An electric power substation is located at the intersection of 108th Street and Blonde Street (286SW). Such public utilities are classified as industrial land uses. The power substation utilizes more than 25 percent of the total forty acres.

A sanitary landfill is located south of West Maple Road and west of 108th Street (491, 492). According to Map 04, this landfill utilizes the largest block of land of all industrial uses within the study area. This landfill's capacity is nearly exhausted and officials are
presently attempting to locate a new landfill site. The present site will then be closed and converted to some other activity.

A fourth industrial area is located near Fort Street at about 120th Street (486SW, 486SE). This industrial activity consists of another public utility consisting of natural gas storage and maintenance yards.

Perhaps the most intensely utilized industrial area is located in the northeast or Irvington portion of the study area. This industrial area (444, 443, 445, 442, 456) is composed of a variety of industrial activities. The predominant industrial activity appears to be the Chicago and Northwestern Railroad property which accounts for the linear pattern of industrial activity from northwest to southeast. Associated with and near the railroad right-of-way are a variety of industrial activities including public utilities, electrical maintenance yards, construction company storage yards, oil storage facilities, and manufacturing facilities among others. It is important to note that the Omaha Metropolitan Area Planning Agency and the Omaha City Planning Department have designated this particular area for future industrial expansion.

In summary, it was found that industrial activity was not widespread throughout the study area but was localized and concentrated in relatively large blocks of
land generally to the west of Interstate 680. Railroads, public utilities, and the sanitary landfill site comprise most of the industrial land use. Manufacturing plants are present in and near Irvington. The Chicago and Northwestern Railroad and Irvington was identified as a significant industrial area, relative to the total study area, and the site of probable future industrial expansion. Much of the industry near Irvington was established prior to 1960 and serves local needs. The linear pattern of these industrial uses was attributed to the location of the Chicago and Northwestern Railroad and the associated industrial activity located near the railroad.

Land Used for Public Purposes

Map 05 Public Land Use records and illustrates the pattern and distribution of land used for public purposes. All land used for public purposes was grouped together in one classification on Map 05. However, in classifying, recording, and evaluating the public land use data, distinctions were made between publically owned land (such as public parks and schools) and privately owned land (quasi-public) which is open to use by the public with certain restrictions such as churches and country clubs. Public and quasi-public land uses are both recorded on Map 05. Since both types of land use are available for public use, ownership was not considered
an important factor for the purposes of this research project.

The total land area occupied for public purposes is an important element but a relatively small proportion of the total study area. As noted in the Study Area Summary (Table 4), 450.77 acres or 3.45 percent of the total study area is used for public purposes. Of the 450.77 acres, 370.09 acres or 82.10 percent is used for public parks, 78.10 acres or 17.35 percent for public schools, and 2.50 acres or 0.55 percent for public buildings. Quasi-public uses total 252.96 acres or 1.94 percent of the total study area. Of these, 191.36 acres or 75.40 percent are used for country clubs and golf courses, 53.10 acres or 21.14 percent for churches, and 8.50 acres or 3.36 percent for quasi-public buildings. Together, public and quasi-public uses total 703.73 acres or 5.39 percent of the total study area.

Map 05 indicates that use of the land for public purposes is a relatively widespread factor although generally concentrated within the urbanized areas with a few exceptions. By comparing Map 02 Residential Land Use and Map 05 Public Land Use it is found that public use of the land correlates very closely with the residential areas east of 108th Street. This is attributed to the number of schools, churches, and other public facilities
usually required for a residential area. The forty acre unit numbered 2695SW appears to have a very large proportion (more than 50 percent or twenty acres) of land devoted to public use of the land. This is attributed to the location of Horton Junior High School and its associated grounds, ballfields, and parking facilities.

West of 108th Street two relatively large blocks of public land are encountered (541, 543, 545, 488, and 496, 497, 498). The nature of this public land differs from much of the public land east of 108th Street. The large blocks of public land (a golf course and a public park) are located in predominantly agricultural areas and the use made of them does not appear to be as intensive as the use generally made of public land east of 108th Street.

The public land located immediately to the west of 120th Street between West Maple Road to north of Fort Street is accounted for as land which has been designated and dedicated as Tranquility Park, a publicly owned park. Most of Tranquility Park at this time is undeveloped as park land and appears more as agricultural land although it is available for use by the public. The public land use observed immediately to the south of Blonde Street and to the east of 120th Street is accounted for by the golf course occupying the land.
In summary, it was found that all public use of the land accounted for 703.73 acres or 5.39 percent of the total study area which is a relatively small but significant proportion. Public use of the land is generally widespread throughout the residential areas while several large but localized blocks of public land were accounted for to the west of 108th Street in the predominantly agricultural area.

Land Used for Agricultural Purposes

The predominant use of the land within the study area is agriculture. Of the 13,120 total acres, 7,289.87 acres or 56.31 percent of the study area was classified as agricultural. It was explained in a preceding chapter that a relatively large amount of agricultural land was included within the study area due to the need to examine and evaluate significant urban developments beyond the urbanized area. In addition, the character of the study area is greatly influenced by the existence of agricultural activities in and near the urbanized areas. It should be recalled that the study area was recognized as an area undergoing rapid change and dynamic urban growth. The concern of the study project was not with urban features or land uses alone but with the combination of both urban and agricultural features and land uses as they relate
to the total character and nature of the study area. As recent as 1960, the entire study area, with a few exceptions such as Irvington, was almost entirely agricultural in terms of land use and general character (Refer to Illustration 1). Agriculture is therefore as much a part of the total study area and its patterns and character as are all the urban land uses combined.

Map 06 Agricultural Land Use, is significant by what it does not show as well as by what it does show. The percentage classification is grouped in such a way that forty acre units with less than 25 percent of the area (ten acres) in agricultural land uses are not recorded on the map. By arranging the percentage groups in this manner, the less important agricultural areas were screened out and the predominantly agricultural areas (75 percent or more) were emphasized.

The general outline and westward extent of the urbanized area is revealed on Map 06 by where agriculture is not present. The urbanized area is therefore determined to be located generally east of 108th Street between Blondo and Ida Street. It extends west to about 126th Street south of Blondo Street. There appears to be a transitional area between the agricultural and urban limits. There is some intermingling of land uses as indicated by urban outliers in predominantly agricultural areas and
some agricultural areas surrounded by urban areas.

Caution needs to be exercised in interpreting Map 06 in this manner due to the fact that a few forty acre units of agricultural land can be identified within the urbanized area. These relatively small blocks of agricultural land within the urbanized area contribute to the character and nature of the study area. However, by comparing Map 06 and Map 09 (Land Use 1972), it is found that there is a positive correspondence between the agricultural areas mapped on each map. This appears to verify the validity of the data and the percentage groupings for Map 06.

If the urbanized area is revealed by the area covered collectively by all land uses except agriculture, then the agricultural land use map (Map 06) should reveal the urbanized area where agriculture is not a major land use feature. This generalization is held to be valid by comparing the entire series of Maps 02-09. It is found that this relationship between urban and agricultural land uses is revealed within each map.

Besides revealing the general outline of the urbanized area and the limits of agricultural and urban activities, Map 06 reveals several features about the transitional character or nature of land use between urban and agricultural areas within the study area. The
percentage groupings were constructed so that predominantly agricultural areas would be emphasized (75 percent or more). As a result, it is found that a relatively great amount of the study area is classified within this grouping. The remaining two percentage groups (25.0-49.9 and 50.0-74.4) can be considered as transitional areas between urban and rural land.

The forty acre unit areas ranking within the 25 to 75 percent groups are generally located in areas on or near the urban limits where the change from urban to agricultural activities begins. It is proposed that these forty acre units represent valid transitional areas between agricultural and urban land use activities.

Map 06 reveals several additional features about the pattern of agricultural land use activities within the study area. It is found that even when taking into account the transitional character of many forty acre units, the physical change from agricultural to urban land uses is quite often very abrupt particularly within the western portions of the study area. In numerous instances, corn and bean fields adjoin residential properties. The abrupt nature of the change from urban to agricultural activities is also revealed and supported through examination and analysis of the land use profiles (Figures 1-10).

The abrupt change is partially accounted for by
the large blocks of land which are necessary for modern mechanized agriculture. When urban development begins within a predominantly agricultural area, the process usually involves the purchase and development of a large block of land such as an entire farm consisting of forty acres or more. Quite often an entire quarter section or even an entire section of land will be purchased and retired from agricultural activities. There is usually a waiting period of varying lengths of time between the purchase and the actual construction of structures and facilities upon the property. During this time the land would be considered vacant land under development if grading of the land had begun.

An example is Tranquility Park (541,543,545) which is presently undergoing development but is open to use by the public. Tranquility Park was suddenly withdrawn from agricultural use when the purchase of the property was made. It is still surrounded by land in active agricultural use. This would appear to account for the abrupt change between agricultural and urban land uses.

In contrast, the reverse situation is observed in the southeast quarter of sheet number 212 which is located at the intersection of 90th Street and West Dodge Road. This forty acre unit is predominantly agricultural with more than 75 percent or thirty acres in agricultural use.
The unit is surrounded by urban land uses. It would be expected that this forty acre unit would be used for commercial activities. It is assumed that this property is presently being withheld from the real estate market and that some type of commercial, residential, or public use will be made of the property at a future time. The site, with some grading, should make a choice commercial location since traffic is heavy on both 90th Street and on West Dodge Road. While waiting to market or develop the site for urban purposes, the present agricultural use would help to defray the expense of the taxes paid on the property as well as controlling the weeds.

In summary, it was found that of the total study area of 13,129 acres, 7,389.87 acres or 56.31 percent was used for agricultural purposes. Agricultural activities are important features relating to the total character of the study area. The transitional nature of areas located between agricultural and urban areas was recognized near 108th Street. It was also recognized that the change from agricultural to urban land uses is often an abrupt change largely due to the development process. An outline of the urbanized area was identified as being the areas where agricultural activities are not present to any great degree. A comparison analysis of Maps 02-09 aided in revealing the areal association between agricultural and urban areas.
Vacant Land

Although no apparent use is made of the land, a large proportion of the total study area was classified as vacant land. Of the 13,120 total acres, 1,638.60 acres or 12.5 percent had no apparent use at the present time.

Vacant land is a large proportion of the total area and is therefore an important factor influencing the character of the study area.

Land was classified as vacant if no structures or facilities and no apparent use was made of the land at the present time. If doubt existed as to whether any parcel of land was vacant, aerial photographs for 1970, 1971, and 1972 were examined and compared in order to establish the use of the land and to verify the classification.

Vacant land could also be termed idle land or land under development. R.C. Brown, in his study of idle land (Spatial Variations of Idle Land in Tulsa, Oklahoma, 1967, pp. 1-3), accounts for idle land as follows:

Theoretically, the reallocation process of land from agriculture to urban use is a smooth one. Land shifts from one use 'A' to another 'B' when the use of 'B' will provide a higher economic rent on the land than will use 'A'. . . . However, in reality the system does not work quite this smoothly. It is recognized that another stage, idleness, often enters the transitional process. Thus, instead of a smoothly flowing system from agricultural to urban uses, we have a triportite framework: Agriculture to
idleness to urban. Map inspection indicates that the patterns created by idle land upon a landscape are not significantly different from those of other forms of land use.

The findings of this research project on northwest Omaha are in agreement with Brown's conclusions on idle land in Tulsa, Oklahoma. Idle or vacant land is an important factor indicating the transitional nature of the northwest Omaha study area. The pattern of idle land as revealed by Map 07 Vacant Land is similar in many respects to patterns of other types of land use.

Relatively large areas of vacant land are observed in portions of the study area east of 120th Street which was previously identified as urban in character. Little or no vacant land is observed in the predominantly agricultural areas. Parcels of land ranging in size from individual vacant lots to large blocks of vacant land were classified as vacant if no apparent use was presently made of the land. Hence, these lands are "urban vacant" rather than "agricultural vacant" at this time.

West of 108th Street are several large areas of vacant land (467, 551, 757, 605, 487, 488, 462). It was found that each of these areas was an area undergoing the process of development. Each area, having previously been removed from agricultural use, was in the transitional or
idle stage as identified by Brown. Each was presently in the process of development into large commercial or residential housing areas.

In summary, it was found that vacant land is a large proportion (12.5 percent) of the total study area. The transitional character of the study area was revealed by the large percentage of vacant land and by the distribution and pattern of vacant land. The patterns created by the distribution of vacant land appear to resemble the patterns of other land uses. Large blocks of vacant land west of 108th Street were identified as examples of the transitional character of the vacant land.

Streets, Roads, and Highways

Although the original Public Administration Service land use classification (Mapping for Planning, 1948) did not provide for streets and roads, the classification was added when preliminary research indicated the relatively large amount of land devoted to such use. Streets and roads utilize 1,452.04 acres or 11.05 percent of the total 13,120 acres. It is believed that 11 percent is a conservative figure since the total land area devoted to motor vehicle use is in all probability much greater. The difference is accounted for, as discussed previously, by the parking facilities. Parking facilities for most
commercial, public, and apartment activities were classified within each respective classification rather than as streets or roads due to the inability of the respective activity to function without adequate parking facilities.

In cities of 100,000 population, Clawson (1971, p. 48) reported that 17.5 to 18.0 percent of the land is used for public streets. The average for Omaha is about 17 percent while the northwest Omaha study area is 11 percent.

It is important to note however that more than 50 percent of the study area is agricultural. As indicated by Map 08, Streets and Roads, the agricultural areas have a relatively low proportion of land devoted to streets and roads. It is also recognized that the study area is a dynamic growth area, is transitional in character, and contains a large proportion of vacant and agricultural land. This appears to indicate that many miles of streets and roads are yet to be constructed. These factors together would tend to lower the total proportion of land presently used for streets and roads.

Map 08 Streets and Roads reveals the pattern created by the distribution of land devoted to streets, roads, and highways. A large proportion of land devoted to streets and roads (more than 20 percent) is observed in the urbanized portion of the study area east of 108th
Street.

The percentage grouping is arranged in such a way that it emphasizes the forty acre units in which streets and roads are the predominant land use activity (more than 50 percent). The result is that the route of Interstate 680 can be traced between 99th Street and 108th Street from north to south across the study area. More precisely, only the intersections of Interstate 680 and major streets such as West Dodge Road, West Maple Road, Fort Street, and others are revealed by this grouping. In several cases it was found that such intersections utilized forty or more acres per intersection. The route of Interstate 680 between intersections required a large proportion of land also as revealed by the 20-50 percent grouping.

In summary, it was found that the major streets, roads, and highways in addition to Interstate 680 provide vital physical links and interconnections with areas outside the study area. Accessibility has played a vital part in shaping the patterns and influencing the extent and rate of growth of the study area. The influence of the topography and the pre-1960 road pattern on the major streets of today was discussed in a previous chapter. It is anticipated that the accessibility of the study area will continue to play an important and vital role in the future urban growth and development of the study area. The
accessibility of the study area is evidenced by the fact that almost any point within the Omaha metropolitan area can be reached by automobile from the study area within twenty to thirty minutes. Areal Associations and functional interrelationships with the Omaha metropolitan area are recognized as vital elements forming the basis of continued growth and development of the study area. However, much of the concern of this research project is with the distribution, patterns, and areal associations which exist among land uses within the study area.

Land Use 1972

Much of the preceding discussion has dealt with accounting for the location, distribution, and patterns of the various land use activities as they presently exist within the study area. Map 09 Land Use 1972 and Figures 1-10 Land Use Profiles were constructed in order to aid in identifying the interpreting the areal associations between the various land use activities within the study area.

Map 09 is a composite map which draws together the predominant land use activities for each forty acre unit. Map 09 should not be considered as a detailed land use map since many land uses are omitted. Generally all uses of less than 40 percent of the total unit area were
omitted in the mapping procedure. Map 09 was constructed to reveal only the predominant land use activities by screening out the less relevant land uses. The areal associations between the various predominant land use activities within the study area are revealed by Map 09.

Several generalizations can be made concerning the areal associations of land use activities as revealed by Map 09, keeping in mind that land use activities are mapped according to the predominant activity. It was found that agriculture is the predominant land use activity north of Ida Street and west of 108th Street. The urbanized portion of the study area is generally located south of Fort Street and east of 108th Street although there are several urban outliers or housing developments located within the agricultural area to the west of Interstate 680. Although the land use patterns are transitional in character, abrupt changes are frequently observed between urban developments and agricultural activities west of Interstate 680.

A positive correlation appears to exist between the location and distribution of vacant land, streets and roads, commercial activity, apartment complexes, and single family housing east of Interstate 680. It is therefore proposed that areal associations exist between these land use activities due to their location in relationship to each other.
It was also found that a relatively large proportion of land is presently vacant or under development. The vacant land is generally located to the east of Interstate 680 within the urbanized area. A few large areas of vacant land under development are located in the agricultural areas to the west of Interstate 680. The presence of large proportions of vacant land indicates the transitional character of the study area between urban and rural land uses.

The construction of Interstate 680 through the study area beginning in about 1960 appears to have fostered urban growth by providing access to metropolitan Omaha rather than limiting or containing growth. The urbanized portion of the study area appears to be "enclosed" by Interstate 680. However, research indicated that Interstate 680 was not containing urban growth but rather urban growth was "spilling over" into the agricultural areas to the west. Interstate 680 was built around the developing urbanized area in the decade of the 1960's. Urban expansion will likely continue to the west of Interstate 680. This process was identified or evidenced by the recent urban developments in the western portions of the study area. It seems probable that the future will find intensive urbanization far to the west of Interstate 680.
It was also found that commercial and industrial land uses are not important features of the study area in terms of the total area occupied. However, the commercial and industrial activities serve an important function by providing goods, services, and employment to the community.
A restatement of the problem investigated in this research project appears to be helpful in the presentation of the conclusions. The problem for investigation was:

Within the northwest Omaha study area, what are the patterns and spatial distributions of the various land use activities and what are the areal associations and interrelationships between these patterns and activities?

The social, political, and economic processes acting upon the development of land use activities, patterns, and areal associations are recognized as important factors. However, the focus and purpose of this research project was on the areal associations and spatial distributions of land use activities within the study area -- the visible results of the social, political, and economic processes acting upon the landscape. The development of land use patterns through time was also considered, although as a secondary factor, since it was established that most of the urban development within the study area had taken place since 1960. The influence of the pre-1960 road pattern and of the topography was established as a primary
force shaping the form of the present land use patterns.

As discussed in Chapter Three, the land use data was collected, classified, and analyzed by forty acre units. By evaluating the data and the derived maps in Chapter Four, it was established that land use patterns and associations exist within the northwest Omaha study area. This was determined through the observation and analysis of the distribution of the various land use activities within the study area.

The purpose of Chapter Five is to identify the areal associations of land use activities, to relate the meanings of these areal associations to the literature on urban growth, and to accurately report the findings and conclusions of this research project through the application of meaningful generalizations and conclusions. The structure of Chapter Five is provided by the Land Use Profiles (Figures 1-10) which reveal the areal associations of the four predominant land use activities which are residential, streets and roads, agriculture, and vacant land. The purpose of the land use profiles is to reveal the areal associations of land use activities near the primary east-west and north-south streets and roads. The spatial variations from place to place as well as the areal associations of each of the land use activities can thereby be identified.
The land use profiles (Figures 1-10) reveal definite land use patterns and associations. Each change in the direction (up or down) of each profile can be accounted for in some manner. Each profile can be evaluated and traced in correspondence to each of Maps 02-09 and thereby account in detail for each high, low, and intermediate point in the profiles. For the present purposes, it is sufficient to identify only the areal associations and spatial variations as revealed by the land use profiles.

It is suggested that the results of this research project indicate that the study area is transitional in nature between urban and rural land use activities, that areal associations exist between streets, residential, and vacant land. Also, the pre-1960 road pattern (discussed in Chapter Three) and the topography have been important forces shaping the character, patterns, and areal associations of land use activities within the study area.

The basic assumption of the preceding conclusion is that a transitional area is characterized by heterogeneous land uses. There will tend to be a clustering of developments, whether those developments consist of single-family houses, apartment complexes, or commercial areas. The clustering (or fragmentation) of developments is largely due to the nature of the development process (Refer to Chapter Four). A relatively large amount of vacant
FIGURE 1
LAND USE PROFILE - WEST DODGE ROAD

- Residential --- Streets and Roads

- Agricultural --- Vacant Land
FIGURE 2

LAND USE PROFILE - BLONDO STREET

- Residential
- Vacant Land
- Streets and Roads
- Agricultural
FIGURE 3

LAND USE PROFILE - MAPLE STREET

--- Residential --- Streets and Roads

--- Agricultural --- Vacant Land
FIGURE 4

LAND USE PROFILE - FORT STREET

--- Residential --- Streets and Roads

--- Agricultural --- Vacant Land
FIGURE 5

LAND USE PROFILE - IDA STREET

--- Residential ---- Streets and Roads

--- Agricultural ---- Vacant Land
FIGURE 6

LAND USE PROFILE - STATE STREET

--- Residential ----- Streets and Roads

--- Agricultural ------ Vacant Land
FIGURE 7

LAND USE PROFILE - 90th Street

- Residential
- Streets and Roads

- Agricultural
- Vacant Land
FIGURE 8
LAND USE PROFILE - 96th Street

Percent of 40 Acres

Street Name

Residential

Streets and Roads

Agricultural

Vacant Land
FIGURE 9

LAND USE PROFILE - 108th Street

--- Residential  --- Streets and Roads

--- Agricultural  --- Vacant Land
FIGURE 10

LAND USE PROFILE - 120th Street

--- Residential  --- Streets and Roads

--- Agricultural  --- Vacant Land
or agricultural land is quite often located between the scattered developments.

Boyce and Brown (1963, p. 3) have stated the situation as follows:

... the characteristic pattern is one of clusters and varying intensities of use at many points. ... Even residential land uses tend to cluster together.

Boyce and Brown (1963, p. 3) also identified the fragmented nature of land use patterns. They attribute the increased consumption of land to the growth of the urban population. They also reported the following generalization:

... the greater consumption of land for any given purpose today ... is also the result of the fragmented nature of emerging land use patterns with characteristic pockets of unused land becoming urban by default rather than by functional change.

Boyce and Brown (1963, p. 3)

Hugh Johnson (1958, p. 575) briefly described a similar situation in transitional areas. He described the land use as a blend of densely populated residential areas, large sections of tilled soil, and a sprinkling of commercial and industrial structures concentrated along the main transportation arteries. Johnson's description applies very well as a summary of the descriptions of the spatial variations of land uses presented in Chapter Four of this research report.
The Omaha Metropolitan Area Transportation Study (OMATS) has recognized the situation in the Omaha metropolitan area by making recommendations for more densely settled urban developments in the future. OMATS (1970, p. 38) stated the recommendations for future urban development of the Omaha metropolitan area as follows:

Two important factors in the conversion of vacant and agricultural land to urban development should be noted. First, the growth of urban development should take place so that the resulting urbanized area remains compact; this will result in economies in the provision of municipal utility and municipal services. Second, fill-in development in the form of residential, commercial, or light industrial within areas that are generally developed should be encouraged. This results in additions to the local tax base with very little, if any, additional construction for the provision of utilities and services, since these municipal functions are already available in these areas.

OMATS (1970, p. 38) also recommended that new residential development be in the form of self-contained neighborhoods characterized by higher densities, mixed housing types, planned unit development, and cluster subdivisions which would result in higher densities.

The literature cited above serves to identify the generally accepted and understood characteristics of transitional areas. The land use profiles (Figures 1-10) reveal many of the characteristics identified such as: (1) clustering of developments, (2) large proportions of
vacant land, (3) varying intensities of use, (4) fragmented land use patterns, (5) intermingling of urban and agricultural land uses, (6) localized commercial and industrial land uses near the main transportation routes, and (7) densely settled residential areas.

Clustering of developments is generally identifiable on the land use profiles by the "peaks" (large proportions) of the residential land use profiles. Large proportions of vacant land are identifiable in the same manner. The "peaks" represent a large proportion of land used for any particular activity. Vacant land is generally found to be located as a "pocket" surrounded by either agricultural or residential land uses.

The intermingling of agricultural and urban activities is identifiable by observing the agricultural profile east of 108th Street and the residential profile west of 108th Street. The fluctuations of the profiles indicate the changes in land uses or the spatial variations from area to area. Commercial and industrial activities were not included as land use profiles because of their localized or scattered nature and the relatively small proportion of land devoted to these activities. This in itself is in agreement with the characteristics of transition areas as outlined previously.

The fragmented land use patterns are singled-out
for consideration at this point because it is believed they are the most important identifying physical characteristics of transition areas. Fragmented land use patterns represent a variety of intermingling land uses and therefore the heterogeneous land use activities. The fragmented land use patterns are represented on the land use profiles by the fluctuating nature of each profile. The profiles fluctuate drastically from high to low proportions for each land use activity throughout the study area.

It is reasoned that if the study area consisted of an established, stable land use pattern, the resulting profiles would be smooth, even curves. The smooth, even curves of the profiles would indicate a relatively constant proportion of land devoted to each activity. This situation would be most likely to occur or to be characteristic of a homogeneous area consisting predominantly of a single land use activity. It would be expected that the older, established, more stable residential portions of the central city would portray such a smooth, even curve.

The closest approach to such homogeneous land uses within the study area are the agricultural areas located to the west of Interstate 680. The agricultural profiles exhibit a relatively constant, even, smooth curve of a high proportion in the western portions of the study area. In such areas, agriculture is the predominant land use
activity. The influence of approaching urbanization in the agricultural areas is identified as "gaps" in the relatively constant and even agricultural profiles. The "gaps" consist of primarily vacant land (held for urban development), housing developments, and public parks.

The transitional nature and character of the study area is therefore established on the basis of the fragmentation of land use patterns, the variety of land uses, and the characteristics identified in the preceding discussion. This question remains however: Since the land uses are heterogeneous and changing, and the land use pattern is fragmented, do areal associations exist among the land use activities and if so what are the associations?

Areal Associations

Examination of the land use profiles (Figures 1-10) reveals the existence of areal associations of land use activities throughout the study area. It is reasoned that associations exist when there is a positive correlation in the land use profiles. The positive correlations should display a trend or a characteristic which means that they should occur repetitively throughout the study area.

The areal associations in turn reveal the land use patterns. As noted by Bourne (1971, p. 69), land use patterns are the distribution of land uses and activities.
The patterns summarize the distribution of urban activities and indicate regularities in land use activities. The patterns are an arrangement of form with a specific disposition of parts or elements which show a definite direction, tendency, or characteristics.

Positive correlations are found to exist between residential streets and roads, and vacant land. Generally, throughout the study area, wherever the proportion of land devoted to residential use increases, there is a corresponding increase in the proportion of land devoted to streets and roads and vacant land. This correlation is observed as the profile's "peak" for each land use activity. Much larger proportions of land are devoted to these activities east of Interstate 680 than west of Interstate 680. However, the correspondence remains the same.

As noted previously, there is generally a positive correlation between vacant land, residential land, and streets and roads. However, the correlation is not consistent throughout the study area. It is found that vacant land occurs as parcels of varying size within urbanized areas and as large blocks of land awaiting or undergoing development within agricultural areas. The inconsistency of the correlation is thereby explained by the differing nature of vacant land. It is reasoned that a relatively large proportion of vacant land, especially when fragmented
and scattered, indicates the transitional nature of the study area.

The agricultural profiles generally display a negative correlation to all other land use profiles. In most instances, when the proportion of land in agriculture increases or decreases, the proportion of land in other uses moves in the reverse direction. An excellent example is found in Figure 1 West Dodge Road. As indicated, the proportion of land devoted to agriculture immediately west of 144th Street drops from nearly 100 percent to zero percent. A negative correlation is noted as vacant land increases from zero percent to about 75 percent at the same location. The vacant land is identified as a housing development which is in the early stages of the development process.

Urbanization of the Study Area

Much of the literature reviewed for this research project indicated that agricultural practices changed as urbanization approached. This influence on agricultural land has sometimes been referred to as "the urban shadow effect" of urbanization upon rural land whereby rural land values increase and agricultural practices change far in advance of urbanization.

Johnson (1958, pp. 576-583) reported that as
urbanization approaches, a general air of impermanence seems to prevail resulting in poorer farming practices. A large proportion of land becomes idle or unused and farmers are unwilling to make large, long-term capital investments for improvements which may only be used for a few years at the most. The remaining cropland is used more intensively. Johnson reported that rural residents in such transitional areas keep no livestock but shift to cash crops instead.

Boyce and Brown (1963, p. 4) report similar findings as follows:

Until the transportation revolution, there was a distinct tendency for agricultural use to decline in intensity of production from the market outward because of the overriding costs of transportation. Around the beginning of the 19th century, however, the pattern of world production areas began to change.

Boyce and Brown conclude that improved, more economical twentieth century transportation and economies of scale have reversed the pre-nineteenth century situation noted above.

Sinclair (1967, pp. 72-87), in an article entitled "Von Thunen and Urban Sprawl" developed the concept as follows:

In many advanced industrialized parts of the world, the basic forces determining agricultural
land use near urban areas are associated with urban expansion. Where these forces are in operation, the agricultural pattern quite often is one of increasing intensity with distance from the city, quite the reverse of the pattern generalized by Von Thunen's theory.

Sinclair's study dealt with developing evidence to illustrate that agricultural intensity increases with distance from the city. Sinclair expressed the effect of distance from the city as follows:

As the urbanized area is approached from a distance, the degree of anticipation of urbanization increases. As this happens, the ratio of urban to rural land values increases. Hence, although the absolute value of the land increases, the relative value for agricultural utilization decreases. Consequently, the capital and labor investment in agriculture, i.e., the intensity of agricultural land use, decreases. The result of this process is a basic agricultural land use pattern which is the reverse of that found in Von Thunen's time.

(Sinclair, 1967, p. 78).

According to Sinclair (1967, p. 78) the land use providing the greatest return is making the highest bid for the land and is displacing other land uses. The land use providing the highest rent is urban use, and it is displacing rural land uses. Sinclair attributed the decline in agricultural intensity near the city to such factors as the anticipation of urban development and the reluctance to invest in long-term capital improvements. It is difficult to measure by empirical data the degree of anticipation
or reluctance which are essentially unpredictable variables. However, Sinclair's theory and the characteristics of transition areas which he identified are useful tools in evaluating the developing land use patterns within the northwest Osaha study area.

For the purposes of this research project of northwest Osaha, it was not feasible to determine land values of either urban or agricultural land within the study area. However, the concept involved in the theory presented by Johnson, Boyce and Brown, and Sinclair is that agricultural land use intensity increases with distance from the urban areas. As Sinclair noted, urban land uses displace rural land uses because the urban uses can afford to pay a higher rent for the use of the land.

By relating the concept to land uses, it is reasoned that if agricultural land is used intensively, then large blocks of agricultural land should be identifiable as a homogeneous, single factor land use. This appears to be the case in the western portions of the study area. As revealed by the land use profiles (Figures 1-10), it is found that large areas of agricultural land are located generally to the west of 114th Street. The profiles also indicate that the "gaps" in agricultural land are due to the urbanization process. Urban developments are beginning to displace agricultural uses west of 114th Street.
Agricultural land east of 114th Street is revealed as being very irregular, and fragmented as indicated by the fluctuations of the agricultural profiles. Figures 7, 8, and 9 are land use profiles which traverse the study area from north to south. Each of these profiles are traverses of north-south streets located east of 114th Street. The fluctuating nature of agricultural land uses are revealed on these profiles.

The fluctuations of agricultural land use east of 114th Street can be interpreted to mean that agricultural land uses are being displaced by urban land uses. Agriculture most likely remains as a secondary factor in this area and is probably "anticipating" urban development within the near future.

It is therefore concluded that the results of this research project indicate that the study area is transitional in nature between urban and agricultural land use activities, that areal associations exist, and that the pre-1960 road pattern and the topography have been important factors shaping the patterns and character of the northwest Omaha study area. It was found that land uses are generally heterogeneous and exhibit positive correlations except for agricultural activities which are a single-factor, homogeneous land use exhibiting a negative
correlation to other land uses. It is concluded that the northwest Omaha study area is a transitional area between urban and rural where land use patterns are developing.
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